Operator Interface Units Release 3.4

User Manual, for

HE693OIU057, HE693OIU157, HE693OIU177,
HE693OIU277, HE693OIU327, HE693OIU357 and HE693OIU367
Revision B or later

> ## PREFACE

This manual explains how to use the Horner APG Operator Interface Units for use with the GE Fanuc Series 90 and CEGELEC Alspa 8000 family of Programmable Logic Controllers.

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ABOUT THE PROGRAM EXAMPLES

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CHAPTER 1: INTRODUCTION

Congratulations on your purchase of a Horner Electric Operator Interface Unit (OIU)! Horner Electric Operator Interfaces can provide a valuable window into your GE Fanuc Programmable Controller or Genius Distributed I/O application.

1.1   Why an Operator Interface Unit?

Programmable Logic Controllers offer industrial users an incredibly flexible electrical control system. The ability of the PLC to allow users to make significant changes in machine operation without the need for extensive rewiring has been long appreciated, in large and small PLCs alike. In addition to machine control, other areas of PLC integration have not been as fully utilized. One under-utilized area, especially with smaller systems, is the PLC's diagnostic and data handling capabilities. These capabilities must be accessed via a PLC's human interface, or Man Machine Interface (MMI). With the proper MMI, PLC information can be readily available to a machine operator, allowing PLCs to be used as a valuable tool for machine diagnostics, operational prompting, data logging, etc.

With small PLC systems in particular, cost is a large consideration. Traditionally, cost barriers have limited the useage of advanced MMIs with small PLCs. The MMIs most commonly used with PLCs are non-flexible hard-wired pushbuttons, pilot lights, and thumbwheel switches. These systems are fairly low in cost, but are inflexible and offer little diagnostics or other capabilities.

A modern Operator Interface Unit (OIU) however, can provide even users of small PLCs with a powerful, flexible, cost-effective instrument for PLC data access.

> With a Horner Electric Operator Interface Unit you can:

> 1.   Monitor and/or change machine setpoint and other data,

> 2.   Replace up to 12 non-critical hard-wired pushbuttons,

> 3.   Enunciate machine alarm conditions as detected by the PLC,

> 4.   Prompt operators with the proper machine operation sequence,

> 5.   Log machine alarms and/or data to a serial printer.

Horner Electric OIUs have the versatility to perform all of the above functions, yet are easy to set up and use.

1.2   Why a Horner Electric Operator Interface Unit?

At Horner Electric, we specialize in products which complement GE Fanuc PLC products such as the Series 90 PLCs and Genius Distributed I/O System. Because we specialize, we are able to focus on providing Operator Interface Products which are designed to take full advantage of some of the unique characteristics of a GE Fanuc PLC product.

As a result of our specialization, we have developed considerable expertise with GE Fanuc PLC products. Our staff not only understands operator interface operation and data access, but has a thorough understanding of the PLC backplane, I/O bus, and Series 90 ladder logic programming. This wealth of knowledge and experience is unique among GE Fanuc Operator Interface manufacturers, and allows our technical staff to provide you with excellent technical suppport.

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1.3   About this Manual

This manual describes the operation of Horner Electric's Release 3.4 Operator Interface Units for SNP Protocol. The Release 3.4 firmware incorporates some new OIU functions which take advantage of recent additions in GE Fanuc PLC product features. It also expands upon some previously available OIU functions, making them more flexible and easier to integrate. The Release 3.4 OIU firmware allows complete backward compatibility with the Release 3 OIUs, labelled as version "A" (OIU157A, OIU177A, etc.).

This manual takes a unique approach to describing the operation of the OIUs. As opposed to separate manuals for each OIU model, all OIUs are described in a single manual. This is possible because all Release 3.4 OIUs are programmed exactly alike, with identical keypad operation and software configuration. Also, instead of a simply describing "which keys to press" feature-by-feature, we are attempting to describe the usefulness of each feature and how it might be integrated into your control system as well as the necessary details. This attention to the "big picture" will make it easier to choose and integrate the particular OIU capabilities which will most effectively enhance your control system.

1.4   OIU Revision Levels

Revision "A" Units

The first Release 3 Operator Interfaces, these units were first released in April 1993. The models available included the OIU157A, OIU177A, OIU327A, OIU357A, OIU367A, and OIU907A. The firmware revision level of these units remained 3.30 without modification from April 1993 to November 1994. The OIU configuration software for this revision is Version 3.3 of "OIUCFG.EXE".

Revision "B" Units

This is a firmware only upgrade of the Revision "A" units. The "B" firmware version is 3.40, with "OIUCFG.exe" configuration software Version 3.4. Upgrade kits are available from Horner Electric to upgrade Revision "A" units to Revision "B". These kits consist of an EPROM, floppy diskette, updated manual, and product labels. **Table 1-1** lists many OIU features. An entry of "B/C" in this table indicates a Revision B feature not previously available.

Revision "C" Units

These units are nearly functionally identical to the Revision "B" units, but have significant hardware differences. Because of these hardware differences, these units offer some features not available with Revision A or Revision B units. An entry of "C" in**Table 1-1** indicates a feature only available in a Revision C unit. An entry of "B/C" indicates the feature is available in either Revision B or C.

1.5   Features

All Horner Electric Operator Interface Units allow direct connection to either a Series 90 PLC programming port (via SNP protocol) or to the Genius Distributed I/O network. All OIUs have two serial ports, one for PLC or Genius connection, and an RS-232 port for connection to a personal computer for optional software setup. All OIUs feature an alphanumeric textual display and programmable function keys. This manual describes only the OIUs for SNP communications. Genius OIUs are described in a different publication.

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Operator Interfaces	OIU057	OIU157	OIU177	OIU277	OIU327	OIU357	OIU367
Features							
RS-485 Port for SNP Connection	☑	☑	☑	☑	☑	☑	
RS-232 Port for SNP Connection							☑
RS-232 Port for Programming	☑	☑	☑	☑	☑	☑	☑
20 key Numeric Keypad		☑	☑		☑	☑	☑
Programmable Function Keys	6	12	12	14	12	12	12
I/O Mapped LED's						☑	☑
2 x 16 Liquid Crystal Display	☑	☑					
2 x 20 Vacuum Fluorescent Display			☑		☑	☑	☑
4 x 20 Vacuum Fluorescent Display				☑			
Character Height	.375"	.375"	.197"	.197"	.44"	.44"	.44"
Real-time Calendar Clock	opt.	☑	☑	☑	☑	☑	☑
Configurable with IBM Software	☑	☑	☑	☑	☑	☑	☑
Configurable from Keypad		☑	☑		☑	☑	☑
Alarm Enunciation Capability	☑	☑	☑	☑	☑	☑	☑
Serial Printer Support	☑	☑	☑	☑	☑	☑	RS-485
Double Integer Read/Write	☑	☑	☑	☑	☑	☑	☑
Performs Linear Scaling (mx + b)	☑	☑	☑	☑	☑	☑	☑
SNP Pass Through	C	C	C	C	C	C	
Hand Held Programmer Emulation		C	C		C	C	
Eight User Definable Characters	C	C					
Message Chaining	B/C	B/C	B/C	B/C	B/C	B/C	B/C
Keypad Masking to Disable Indiv. Keys	B/C	B/C	B/C	B/C	B/C	B/C	B/C
Multi-Dropped PLC Support	☑	☑	☑	☑	☑	☑	

Table 1-1. Feature List by Model Number.

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1.6   Model Specifications

Operator Interfaces	OIU057	OIU157	OIU177	OIU277	OIU327	OIU357	OIU367
Specifications							
NEMA Rating	NEMA 4-12						
Height (inches)	3.50"	5.50"	5.50"	5.50"	7.25"	7.25"	7.25"
Height (millimeters)	89	140	140	140	185	185	185
Width (inches)	6.00"	7.75"	7.75"	7.75"	11.75"	11.75"	11.75"
Width (millimeters)	153	197	197	197	299	299	299
Mounting Depth (inches)	2.13"	2.13"	2.13"	2.63"	2.13"	2.13"	3.50"
Mounting Depth (millimeters)	54	54	54	67	54	54	89
5VDC Power Requirements (mA)	250	250	NA	NA	NA	NA	NA
24VDC Power Requirements (mA)	120*	120*	120	340	300*	300*	350*
DC Power On Current Surge (A/ms)	1/30	1/30	1.5/50	2.1/100	3/100	3/100	3/100
85-267VAC Power Requirements (mA)	NA	NA	NA	NA	320	320	320
AC Power On Current Surge (A/ms)	-	-	-	-	8/25	8/25	8/25
Operating Temperature	0 to 60°C						
Relative Humidity (non-condensing)	5% to 95%						

NA = not available, * = optional (-24 suffix)

Table 1-2. Specifications List by Model Number.

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```
┌─────────────────────────────────────────────────┐
│  ┌───────────────────────────────────────────┐  │
│  │         CHAPTER 2: SCREEN UTILIZATION      │  │
│  └───────────────────────────────────────────┘  │
└─────────────────────────────────────────────────┘
```

This chapter describes the concept of Horner Electric's Operator Interface Unit Screens, and how they may be classified and mapped for the most effective use of the OIU resources.

2.1   Concept of "Screens"

The primary function of Horner Electric Operator Interface Units is to display text and/or data which is pertinent to the operation of the control system. This text and/or data may be used for the enunciation of machine alarms, the adjustment of machine setpoints, the display of production statistics, etc. The OIUs may be set up with up to 250 stored screens (messages), where a screen consists of 2-lines by 16 or 20 characters, or up to 150 stored screens (messages), where a screen consists of 4-lines by 20 characters, each containing text and/or data. The only restrictions on screen content are:

1)   Maximum of four (4) fields displaying PLC data per screen.

2)   Maximum of 32 total characters on a 2 line x 16 character display, or a maximum of 40 total characters on a 2 line x 20 character display, or a maximum of 80 total characters on a 4 line x 20 character display.

Potentially, up to 1000 different PLC data registers could be monitored (250 screens x 4 data fields/screen) by a 2 line version of the OIU, the 4 line versions are limited to 600 total register (150 screens x 4 data fields/screen). The manner in which text and/or data is placed on a screen is totally up to the user. Not all screens must contain data. For example, screens containing machine alarm messages are very likely to be entirely textual, while messages containing an adjustable machine setpoint would likely contain descriptive text and data.

PLC data is displayed by formatting an OIU screen to contain one or more PLC **data fields**. There are two types of data fields, **read-only** data fields, and **read-write** data fields. As stated previously, an individual screen may contain a maximum of four data fields.

When an OIU screen containing register data is being displayed, the OIU constantly reads and displays the current value of that data from the PLC (or Genius). A read-only data field may only be monitored, its value may not be changed by the operator. Read-only data fields are commonly used to display data fields such as temperatures, production counts, etc., which are not to be changed by the user. A read-write data field is also constantly read and displayed by the OIU, but the operator has the ability to change the value of the register data. Read-write data fields are commonly used to display data fields such as machine setpoints, etc. which may be changed by the operator.

2.2   Types of Screens

The system designer may utilize many different "types" of stored screens, that is, screens which are set up by the designer to serve different functions. While the OIU hardware and software does not make distinctions regarding the types of screens used, an effective system designer makes distinctions and plans carefully for the types of screens they will use in an application. Some example types are listed in **Table 2-1.** The types listed in Table 2-1 are examples and are not a complete list. They are listed simply to illustrate how screens may be classified by function, allowing the system designer to plan for a more complete application.

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Screen Type	Example Useage	Screen Access
Production Information	Production Count, Parts/Hour	From Keypad
Machine Status	Temperatures, Pressures	From Keypad
Machine Setpoints	Timer Setpoints	From Keypad
Operator Prompting	Start Motor, Start Pump	Forced by PLC
Alarm Enunciation	Motor Overload Tripped	Forced by PLC
Troubleshooting	PID Setpoints	From Keypad w/Password

Table 2-1. Example Screen Useage.

2.3   Screen Access

Another important screen characteristic listed in Table 2-1 which should be considered is screen access. Screen access is defined as the manner in which screens are selected for display. The OIUs allow screen access (screen selection) in four ways,

> 1)   selected directly from the keypad by the operator,
>
> 2)   forced for display by the screen chaining option,
>
> 3)   forced for display by the PLC, and
>
> 4)   selected from the keypad with a password.

Some screens may be accessible directly by the user from the keypad. These screens usually contain data which is useful to the operator at various times. Therefore, these screens may be accessed directly by the operator from the keypad whenever they need it. Some examples of screens which would be accessed directly by the user are Production Information, Machine Status and Machine Setpoint screens.

Some applications may require a series of screens to be shown, to either display a more complex message or to step an operator through a process. This could be done by forcing the screens with the PLC, but more simply the screen chaining option can be set allowing a screen to automatically go to another screen after a set amount of time. Complex messages, multiple related data screens, and process prompting are examples of the possible uses of the screen chaining.

There are some screens which should only be displayed when the PLC forces them to be displayed. These are typically screens which display a message stating that a current condition exists in the machine which should be brought to the operator's attention. Screens such as Operator Prompting and Alarm Enunciation would be examples of this. If these screens were directly accessible by the operator, confusion could result when an alarm or prompting message was displayed when the machine condition described by the message did not exist.

Screens used only by qualified personnel during system troubleshooting should not be available to the typical operator. These screens can be accessed utilizing the OIUs password protection. For a detailed description of the password protection capabilities of the OIUs, see section 2.5.

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How does the OIU distinguish which screens are accessible from the keypad and which screens are only accessible when forced by the PLC? It does so with a parameter called **"high user screen number"**. This parameter defines the highest screen number which may be accessed by the operator directly from the keypad. For instance, if the high user screen number is set at 27, screens 0-27 are accessible directly from the keypad, and screens 28 and higher may only be displayed when forced (or by entering a password).

The need to assign screens either above or below the high user number brings up the obvious need of planning or "mapping" the types of screens used and in which order they will be programmed. The next section describes the task of making a screen "map".

2.4   Making a Screen "Map"

Because of the number of screens available (250 or 150), the number of types (functions) of screens which may be classified by the system designer, and the two different ways in which screens may be accessed, it is recommended that a screen "map" be laid out before setting up individual screens. Mapping is not required by the OIU, but is very important for orderly system integration. It allows for the development and potential expansion of the Operator Interface setup. A sample screen map is shown below in **Table 2-2**:

Screen Number	Screen Type
0-3	Production Information
4-10	Machine Status
11-13	Machine Setpoints
High User Screen Number = 13	
14-100	*Empty (Future Expansion)*
101-115	Operator Prompting
116-121	*Empty (Future Expansion)*
121-152	Alarm Enunciation
153-200	*Empty (Future Expansion)*
201-205	Troubleshooting/Critical Setpoints
206-249	*Empty (Future Expansion)*

Table 2-2. Sample Screen Map

The sample map shows six types of screens. The first three, Production Information, Machine Status, and Machine Setpoints, may be accessed directly by the operator from the keypad. These are **user accessible** screens. The next two screen types, Operator Prompting and Alarm Enunciation, are only displayed when the PLC forces them to be displayed. The last type, Troubleshooting Screens, are accessed only by qualified personnel with a password. These last three screen types are **user protected** screens. In the above diagram, the High User Screen Number is shown as the highest user-accessible screen.

Typically, most applications utilize only a fraction of the OIU's available screens. It is important when laying out the screen map that future expansion be considered. It is a good idea to leave some empty screens between different screen types which may be filled in the future. Note that no empty screens should be left in the user accessible area, because the operator could potentially access a blank screen, which could confuse them into thinking that the OIU is malfunctioning.

2.5   Passwords

OIU models which feature full numeric keypads may be configured with passwords which can restrict OIU access to Operators. There are two levels of password protection:

1)   A Level-1 password restricts access to screens above the High User Screen Number (such as Troubleshooting, Critical Setpoints, etc.),

2)   A Level-2 password restricts access to the OIU Setup Mode and can also be used to access screens above the High User Screen Number

Operators who do not have access to either of these passwords may not exit Autorun mode, nor access any screen above the high user screen number.

2.6   Operator Interface Setup

Once the various types of screens to be utilized in an application have been established, and a screen map has been laid out, it is time to set into motion the process of configuring OIU screens. There are two mechanisms which may be used to set up the OIUs; the built-in Setup Menu, and the personal computer configuration software.

The configuration software is recommended for all users, because it gives them the ability to configure a number of OIU screens in the fastest possible manner, and because it provides diskette backup for the application. This makes it easier to program multiple units, which is critical for an Original Equipment Manufacturer (OEM). Furthermore, units without a numeric keypad may be configured exclusively with the software.

The built-in menu (available on models with numeric keypads) is also important, because it provides a simple way to make quick changes to the OIU setup without additional hardware (a personal computer). If available, it can be used exclusively to set up the OIU, but it takes considerably longer to enter OIU screen text due to the limited keyboard, and does not provide diskette backup.

This chapter lists the available features and functions of the OIUs, and how they might be applied in an application. It describes how the features work and how they may be used, but does not list the keystrokes necessary to set up the unit from the keypad or programming package. It is recommended that this chapter be read to understand the individual features available in the unit, before actually "keying in" the setup.

Multiple examples for the key features, including sample OIU configuration and PLC ladder logic illustrations, may be found in Chapter 7, Application Examples.

3.1   Autorun and Setup Modes

The OIU has two basic modes of operation, **Setup Mode** and **Autorun Mode**. In Setup mode, the OIU is configured from its keypad with the Setup Menu or from the personal computer configuration software. During Setup Mode, the OIU does not communicate with the PLC, and the RS-232 port can communicate only with a personal computer serial port for setup purposes. For units which may be configured from the keypad, the function keys have special setup functions during Setup Mode.

The OIU is put into Autorun Mode when its screens have been configured and it is ready to be placed into service. In Autorun Mode, the OIU communicates with the PLC, and all of its features (including function keys) are active. In this mode, the RS-232 port may communicate with other serial devices such as printers, modems, etc.

The OIU Mode can be set by the software, or from the keypad on some units. The procedure for setting the mode is discussed later in the manual.

3.2   Using the OIU to Display PLC Data

The ability to read and/or write PLC register data is a major function of the OIUs. "Register data" refers to any piece of data which is contained in the PLC which can be read or written by the OIU. This includes PLC I/O (%I, %Q, %AI, %AQ), internal PLC registers (%M, %R, %T, etc.), Global Data, etc. This data can be used for machine setpoints, the display of production information, or other functions.

A sample OIU screen as seen from the programming software is shown below:

```
           SCREEN #   0

    ┌──────────────────────┐
    │Part Count: RRRR pcs │
    │Cycle Time:  WWW sec │
    └──────────────────────┘
```

This screen contains two data fields. The first is a *read-only* data field, four characters in length, and is described with the text, "Part Count:". The second is a *read-write* data field, three characters long, and is described with the text, "Cycle Time". The read-only data field character is represented with a 'block-R', while the read-write data field character is represented by a 'block-W'.

When displaying this screen in Autorun Mode, the 'block-R' and 'block-W' characters will be replaced with valid register data from the PLC. In order for the OIU to determine which data register values are to be placed on the screen, several additional parameters must be specified for each data field during OIU setup. The register data field information for the example screen is shown below:

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```
┌─────────────────────────────────────────────┐
│            DATA FIELD INFORMATION           │
├──────┬───────────────┬─────────┬────────────┤
│ BLK  │   REGISTER    │  BITS   │    BASE     │
├──────┼───────────────┼─────────┼────────────┤
│  00  │ %AI  00012    │ 00-15   │ +Decimal    │
│  00  │ %R   00001    │ 00-15   │ +Decimal    │
│  --  │ ---  -----    │ -----   │ ----------  │
│  --  │ ---  -----    │ -----   │ ----------  │
└──────┴───────────────┴─────────┴────────────┘
```

The data field information parameters are summarized below:

Parameter	Description
Read-only/Read-write	Defines the ability of the data field to be changed by Operator
Block	Identifies the PLC containing the data field
Register	Lists the Series 90 Reference Type & Address
Bits	Defines the number of consecutive bits to be read
Base	Defines the form data is to be presented (decimal, hex, etc.)

Table 3-1. Data Field Defining Parameters

Each parameter is discussed in detail in the sections to follow.

3.2.1   Data Field Type

There are two types of data fields, read-only and read-write. During Autorun mode, Read-only data fields are constantly monitored by the OIU, and their value may not be changed by the user. During Setup Mode, Read-only data field characters are represented by a 'block-R'. During Autorun mode Read-write data fields are constantly monitored by the OIU, and their value may be changed by the operator from the keypad of the OIU. During Setup Mode, Read-Write data fields are represented by a 'block-W'.

3.2.2   Block Number

The OIUs have the ability to be used in multidrop applications, with a single OIU communicating to multiple PLCs. In these applications, a manner must be used to identify which PLC contains the data field to be displayed. The Block Number parameter is used for this purpose. However, most applications use a "point-to-point" architecture, with a single OIU communicating to a single PLC. In these applications, the Block Number parameter is simply left at its default of 0. For further details on utilizing the Block Number in multidrop applications, see Section 3-12, "Multidrop Applications".

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3.2.3   Reference Type and Address

Reference types identify the different locations where data is stored in the Series 90 PLC. These references are 1-bit or 1 word (16-bits) in length. There are a variety of reference types for the Series 90 PLCs, listed in Table 3-2. For a listing of the valid address ranges for the Reference Types listed below, see the GE Fanuc User's Manual for the Series 90 PLC used in your application.

For a detailed description of the Text Table and Floating Point bases listed in Table 3.3, see sections 3.6 and 3.7.

Reference Type	Description	Default # of Bits
%R	Register Memory	16
%AI	Analog Input	16
%AQ	Analog Output	16
%I	Discrete Input	1
%Q	Discrete Output	1
%T	Temporary Coils	1
%M	Internal Coils	1
%S	System Memory	1
%SA	System Memory	1
%SB	System Memory	1
%SC	System Memory	1
%G	Genius Global Data	1

Table 3-2. Series 90 Reference Types

3.2.4   Range

In addition to specifying single bit or word type data references, the OIU also gives users the ability to specify a "range" of data to be read and displayed in a single OIU data field. This can be useful to display a series of consecutive bits (up to 16) in a single data field. In most cases the system designer is interested in displaying an entire reference, so the default range is used. The default range for a bit-type reference is 1-bit, for a byte-type reference is 8-bits, and for word type references is 16-bits.

If a system designer is interested in displaying a series of consecutive bit-type references, or extracting a series of bits from a word or byte type reference, specifying range can be a useful feature. For example, specifying range allows the display of %M1-%M6 in a single data field. It also allows the display of %R1, bits 3-9 in a single data field. Bits extracted must fall within two 8-bit boundaries. For instance, you cannot specify %M7-%M20 for a data field because this data field resides in three 8-bit boundaries at %M1-8, %M9-16 and %M17-24.

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3.2.5   Base

The OIU allows register data to shown in several different display formats, listed below:

Base	Display Range	Maximum Length
+/- Decimal	+/- 32,767	6 (5 digits plus sign)
+ Decimal	0 to 65,535	5
Hexadecimal	0000H to FFFFH	4
Binary	0 to 1111 1111 1111 1111	16
+/- Double	+/- 9,999,999	9 (8 digits plus sign)
+ Floating Point	0 to 9,999,999	9 (8 digits plus decimal point)
+/- Floating Point	+/- 9,999,999.	10 (8 digits plus decimal point and sign)
Text Table	character based	one display line
ASCII	character based	one display line

Table 3-3. Available Bases. *Note that commas are not displayed in OIU data fields.*

3.3   Function Keys

Another key feature of the OIUs are the ability to utilize function keys. The function keys are clear in color, and can accept a customized template. The template inserted in the factory is yellow in color, with F1, F2, F3, etc. labelled on the front. Units which support keypad configuration have setup functions printed on the rear of the function key template. Function keys can be used by system designers in two different ways:

1)   Function keys may be mapped into I/O so that they emulate non-critical momentary pushbuttons,

2)   Function keys may be used as a "macro" to perform functions with a single keystroke that would normally take many keystrokes.

A function key can perform each of these two capabilities simultaneously, if desired. In most applications, function keys are used as momentary pushbuttons. They are mapped directly into the PLC or Genius as I/O, so they can perform any non-safety related function that a momentary pushbutton would perform. **Function keys are not to be used to perform safety related functions such as emergency stops. These functions should be performed by hard-wired pushbuttons wired to industrial safety standards.** In other applications, function key macros are used to automate functions which normally take many keystrokes. Examples of this are to select a particular screen for display, to enter a value for a PLC data register, etc.

3.3.1   Function Keys as Momentary Pushbuttons

To map the function keys into PLC I/O as a pushbutton, the **function key register** must be set. The function key register is a register in the PLC which is constantly updated by the OIU with the status of the function keys and/ or other keys on the OIU keypad.

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If the function key register is assigned a bit type reference (%M, %T, etc.), the user may monitor the status of up to 16 keys. If the function key is assigned a word-type reference (%R, etc.), the user may monitor the status of up to 32 keys on the OIU keypad. The order in which those keys are assigned is illustrated in Table 3-4.
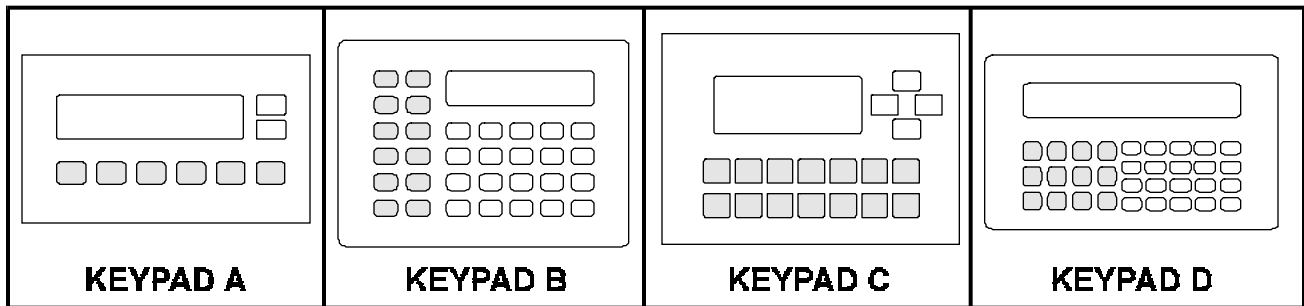
Keypad Type			Bit #	Bit Type Sample Addres	Word Type Sample Address	Keypad Type			Bit #	Bit Type Sample Addres	Word Type Sample Address
A	B/D	C				A	B/D	C			
Key						Key					
F1	F1	F1	1	%M1	%R5, bit 1		1		17	not avail.	%R6, bit 1
F2	F2	F2	2	%M2	%R5, bit 2		2		18	not avail.	%R6, bit 2
F3	F3	F3	3	%M3	%R5, bit 3		3		19	not avail.	%R6, bit 3
F4	F4	F4	4	%M4	%R5, bit 4		4		20	not avail.	%R6, bit 4
F5	F5	F5	5	%M5	%R5, bit 5		5		21	not avail.	%R6, bit 5
F6	F6	F6	6	%M6	%R5, bit 6		6		22	not avail.	%R6, bit 6
UP	F7	F7	7	%M7	%R5, bit 7		7		23	not avail.	%R6, bit 7
DOWN	F8	F8	8	%M8	%R5, bit 8		8		24	not avail.	%R6, bit 8
	F9	F9	9	%M9	%R5, bit 9		9		25	not avail.	%R6, bit 9
	F10	F10	10	%M10	%R5, bit 10		0		26	not avail.	%R6, bit 10
	F11	F11	11	%M11	%R5, bit 11		dec pt.		27	not avail.	%R6, bit 11
	F12	F12	12	%M12	%R5, bit 12		D/H/B		28	not avail.	%R6, bit 12
	SHIFT	F13	13	%M13	%R5, bit 13		UP	UP	29	not avail.	%R6, bit 13
	CLEAR	F14	14	%M14	%R5, bit 14		DOWN	DOWN	30	not avail.	%R6, bit 14
	MODE		15	%M15	%R5, bit 15		RIGHT	RIGHT	31	not avail.	%R6, bit 15
	ENTER		16	%M16	%R5, bit 16		LEFT	LEFT	32	not avail.	%R6, bit 16

Table 3-4. Function Keys (and remaining keys) mappable into PLC memory.

3.3.2   Function Keys as Macros

When using a function key as a macro, it can perform any function that could be performed by the operator from the keypad in Autorun mode, but in a single keystroke. These functions include changing screens, setting a register to a new value, etc. The operations or keystrokes available for function key macros are listed below:

```
Increment screen / field
Decrement screen / field
Select screen #_____
Select next field
Select previous field
Go to original screen
0-9, +-. = Numeric entry
ENT = Accept numeric entry
```

For example, in an application, screen #13 contains a key machine setpoint. The system designer wants to set up a function key which displays screen #13 when pressed. To accomplish this using a function key macro, it is helpful to first determine the sequence of keystrokes which the operator would have to execute in order to change to screen #13 manually. Provided that the screen is accessible and non-password protected, the proper key sequence to change to screen #13 in Autorun mode is as follows:
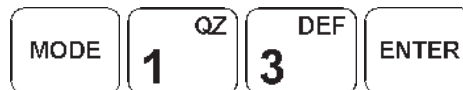
When configuring this key sequence from the keypad (some units only), the exact key sequence is simply entered for the function key. When setting this function key sequence with the OIU configuration software, the following key sequence would be configured:

```
┌─────────────────────────────────────────┐
│            KEY:   F1                      │
├─────────────────────────────────────────┤
│ <Select screen #> 13 <ENTER>             │
│                                          │
└─────────────────────────────────────────┘
```
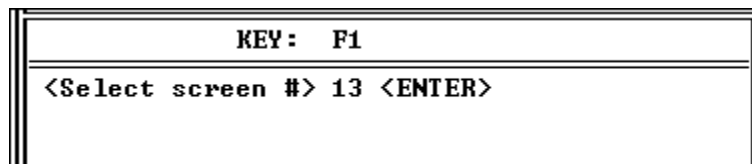
When a screen is displayed as a result of a function key macro, or when being triggered by the PLC, no passwords are prompted, even if the displayed screen is above the high user screen number.

Another commonly used function key macro would perform the function of setting a data register in the PLC to a particular data value. When performing this function manually during Autorun mode, the operator would perform the following steps:

1)   Change to the screen containing the data,
2)   select the data field to be changed,
3)   enter the new value, and
4)   return to the screen previously displayed.

The first three steps of the key sequence may be programmed rather easily. For instance, suppose the first read/write data field on screen #37 is to be set to a decimal value of 100. The first part of the key sequence follows:

This sequence will bypass the level 1 password

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The difficulty arises when trying to program in step 4 of the sequence, "return to the previous screen". This is a problem because the operator could be on one of any number of screens when he presses the function key. When programming a function key sequence from the keypad (some units only) a special key combination performs the "return to previous screen" function. This key sequence is as follows:

Whenever this key combination is placed **at the end** of a function key macro, the current screen active when the function key is pressed by the operator is the screen displayed at the completion of the sequence. During this operation the OIU will display "Executing Function Key...".

Configuring this function key sequence from the OIU software is much more intuitive. The function key sequence as configured by the OIU software is below:

```
                     KEY:   F1

<Select screen #> 37
<Select next field>
100 <ENTER>
<Revert to original screen>
>
```
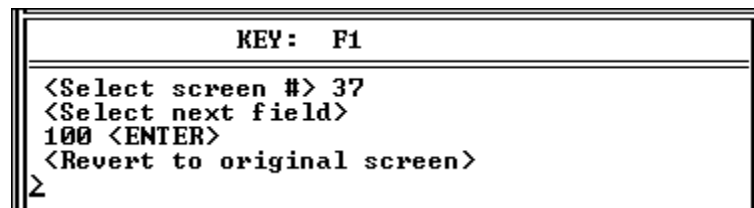
The above sequence selects screen #100, selects the first data field for editing, enters a value of 100, and reverts to the original screen.

3.3.3   Function Keys Used for PLC Data Editing

OIUs which do not contain numeric keypads do not contain the RIGHT ARROW or ENTER key. Therefore, the manner in which PLC data is modified by the operator is different. The final function key is programmed by default as a "Modify / Fast" key (F6 for the OIU057 and F14 for the OIU277). The operator presses this key to select the PLC data field among the read/write data fields displayed on the current screen. The operator then uses the UP and DOWN arrow keys to increment / decrement the data. He may also press the "Modify / Fast" key with an arrow key to change the data value rapidly. For complete details on the operation of these keys in Autorun Mode, see Chapter 6.

If an application does not intend to change PLC data fields, the final function key may be overwritten with a macro function. Figure 3-1 shows the function key configuration screen for an OIU057, showing F6 configured as the "Modify / Fast" key by default.

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```
┌──────────────────────────────────────────────────────────────────────────┐
│ Horner Electric Operator Interface Unit Setup Utility  V3.42    OIU057     │
├────────────────────────────────────────┬──────────────────────────────────┤
│         Small 8-Key Keypad             │   FUNCTION KEY SELECTION MENU     │
│                                        │                                  │
│                                        │  F1-F6 = F1-F6                   │
│  ┌──────────────────────────┐  ┌───┐   │                                  │
│  │▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨│  │ ▲ │   │  Note: If F6 is not programmed   │
│  │▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨▨│  ├───┤   │        by the user, it is used   │
│  └──────────────────────────┘  │ ▼ │   │        as the "MODIFY/FAST"      │
│                                └───┘   │        key.                      │
│                                        │                                  │
│  ┌──┐ ┌──┐ ┌──┐ ┌──┐ ┌──┐ ┌──┐         │                                  │
│  │F │ │F │ │F │ │F │ │F │ │F │         │                                  │
│  │1 │ │2 │ │3 │ │4 │ │5 │ │6 │         │  ESC = Main Menu                 │
│  └──┘ └──┘ └──┘ └──┘ └──┘ └──┘         ├──────────────────────────────────┤
│                                        │  Select the function key to be   │
│                                        │           programmed.            │
└────────────────────────────────────────┴──────────────────────────────────┘
```
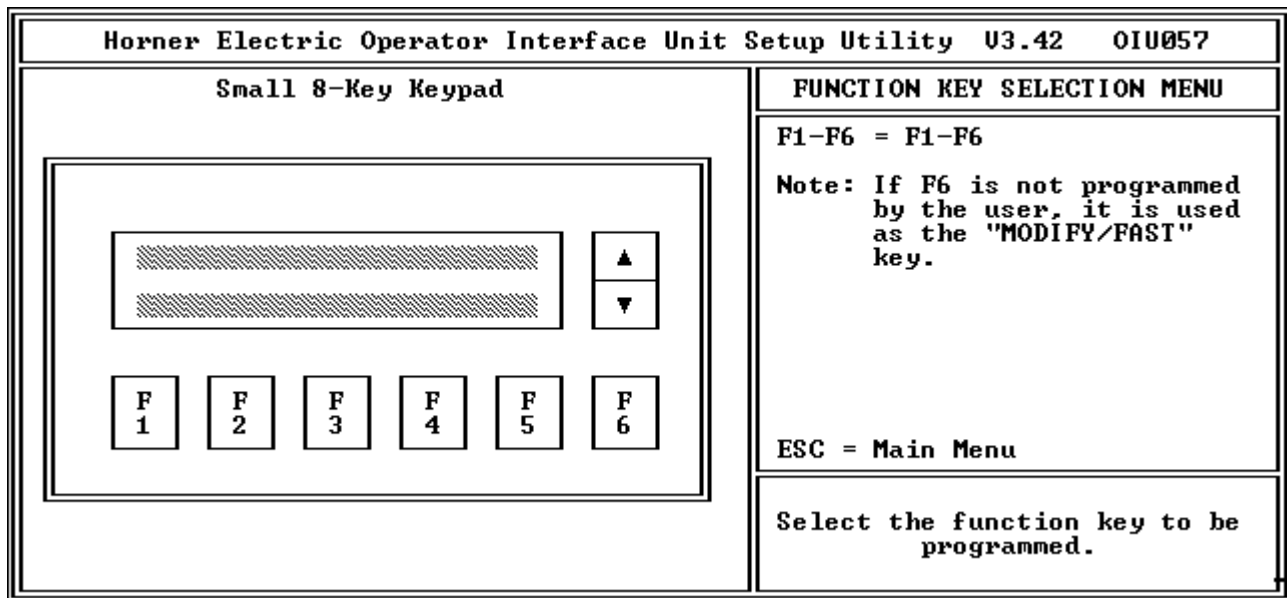
Figure 3-1. OIU057 Function Key screen showing F6 defaulting to "Modify / Fast" functionality.

3.4   Controlling Screen Selection with the Trigger Register

As stated in the Screen Management chapter, there are two ways in which screen selection can be accomplished:

    1)   The Operator may select a user accessible OIU screen from the keypad, or

    2)   The PLC may force the display of any OIU screen using the Trigger Register.

The **trigger register** is a data register in the PLC which is constantly monitored by the OIU. The numerical value of the trigger register either forces display of an OIU screen, or allows the Operator to select a screen from the keypad. If the value of the trigger register is between 0 and 249 inclusive, the screen number corresponding to the trigger register value will be forced for display. If the value of the trigger register is 250 or higher, the operator may select which screen below the high user screen number is to be displayed from the keypad.

This feature is critical for alarm enunciation applications, or applications in which a "menu" system is set up to lead the Operator through a series of data entry screens. The trigger register is an optional parameter, and if unused the operator will have control of screen selection at all times.

The **screen status register** is a data register in the PLC which the OIU updates with the current screen number whenever a change has occurred. This can be useful for detecting when the Operator enters or leaves a particular screen on the OIU, for those periods of time when the trigger register has relinquished screen control to the operator.

For examples utilizing the trigger register and/or screen status register, refer to the application examples section of the manual.

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3.5   Print Register & Print Status Register

In addition to forcing the display of a particular screen, the PLC can also force the printing of screen(s) through its RS-232 port (the RS-485 port on the OIU367) to a serial printer using the **print register**. Text, embedded data, and printer control characters (carriage return, line feed, and form feed) can be passed to the printer, allowing for a very versatile printer interface.

When utilized, the print register is constantly monitored by the OIU. When the value of the print register changes to a legal screen number, the text, data and/or printer control codes contained on that screen are printed out the printer port. The print status register is then updated with the number of the last screen which was printed, and no additional screens are printed until the value of the print register changes to another legal screen number.

For examples utilizing the print register and/or print status register, refer to the applications examples section of the manual.

3.6   Text Tables

Text Tables are a feature of the OIU which can be very useful in the description of machine operation. Text Tables are a special base which allow text strings stored in the OIU to be displayed instead of numerical data when monitoring PLC register data. For example, say Machine "A" has three modes of operation, "Off", "Hand", and "Auto". In the PLC, these modes are represented by values of 0, 1 and 2 respectively in data register %R1. If the PLC data is shown numerically on the OIU screen, in Autorun mode the "Machine Mode" screen would look like the following:

```
┌─────────────────────────┐
│ Current Machine Mode     │
│            0             │
└─────────────────────────┘
```

or

```
┌─────────────────────────┐
│ Current Machine Mode     │
│            1             │
└─────────────────────────┘
```

or

```
┌─────────────────────────┐
│ Current Machine Mode     │
│            2             │
└─────────────────────────┘
```
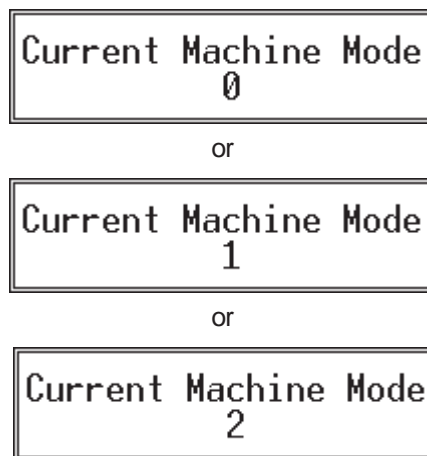
Using the Text Table feature, a Text Table can be set up so that PLC register values 0, 1 and 2 correspond to the text strings "OFF", "HAND", and "AUTOMATIC". The Text Table setup, as seen on the configuration software, is shown below:

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TABLE #	VALUE	TEXT
1	2	AUTOMATIC
3 used 251 left	0 1 2	OFF HAND AUTOMATIC

As a result of this text-to-numeric correlation, the "Machine Mode" screen displaying data utilizing the text table base would look like this:

```
Current Machine Mode
        OFF
```

or

```
Current Machine Mode
        HAND
```

or

```
Current Machine Mode
     AUTOMATIC
```

It is obvious that the above textual representation of the current machine mode is much clearer to the operator than the numeric representation. For detailed instructions on setting up text tables, see Chapters 4 and/or 5.

3.7   Floating Point Values

Another convenient OIU feature is the ability to display floating point data. This performs two main functions:

1)   Allows users to monitor and enter data which contains a decimal point.

2)   Allows data stored in the PLC as an integer value to be scaled to engineering units and displayed on the OIU.

The OIU performs these two functions by performing linear scaling on the PLC integer data. This scaling is represented with the following formula:

$$y = mx + b$$

where x is the integer value stored in the PLC,
       y is the floating point value shown on the display,
       m is the slope (multiplier), and
       b is the offset (adder).

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The math package used in the OIU is capable of 8 digits of accuracy. When displaying a floating point data field in Autorun mode, the OIU reads the integer value of the register from the PLC, scales it, and displays it in floating point format. If the operator wishes to change the value of the floating point data field, he enters it in floating point format, and the OIU performs the scaling in reverse, writing the appropriate integer value to the PLC data register.

For instance, let's say that a system designer wishes to display a decimal data value between 0.0 and 99.9 on the OIU screen. This data is stored in PLC register %R13 as an integer value between 0 to 999. In order to display the data on the screen with the decimal point, he must set up a data field on the OIU which is 4 characters long (3 digits plus the decimal point) and uses the floating point base. The screen and data field information table as seen on the configuration software would look like the following:

```
          SCREEN #   0
    ┌─────────────────────────────┐
    │ Machine Setpoint #1         │
    │         WWWW                │
    └─────────────────────────────┘
```
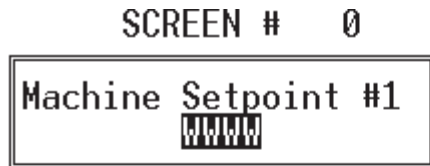
DATA FIELD INFORMATION			
BLK	REGISTER	BITS	BASE
00	%R 00013	00-15	+Float 1
--	--- -----	-----	----------
--	--- -----	-----	----------
--	--- -----	-----	----------

The system designer must now set configure the floating point data parameters (in this case, parameter set number 1) to scale the data from 0-999 to 0.0 - 99.9. In this case, the floating point parameter set number 1 would be equal to a slope m of 0.1 (multiply by 0.1) and an offset b of 0 (add 0). The number of digits to the right of the decimal point must also be configured in the floating point parameters, and in this case that would be 1.

When the above screen is selected in Autorun mode, if %R13 contains an integer value of 357, for instance, the data will be displayed as follows:

```
    ┌─────────────────────────────┐
    │ Machine Setpoint #1         │
    │         35.7                │
    └─────────────────────────────┘
```
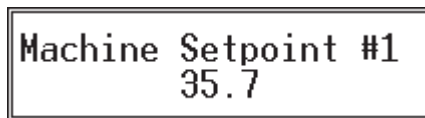
If the operator wishes to change the value to 42.2, he may enter the data with the decimal point, and the OIU will perform the scaling in reverse and write a value of 422 to %R13.

For more complex examples of scaling PLC integer data values to engineering units and displaying them on the OIU, see the applications examples section of the manual.

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3.8   Calendar Clock

The OIUs (except the OIU057) come standard with a built-in calendar clock. This feature is useful when used on PLCs such as the 90-20, 90-30 CPU 311, etc. which do not have a built in clock. When enabled, the OIU downloads six registers of time/date information to the PLC at a programmable interval. The content of the six registers, and the available update intervals are listed in the tables below. The time/date data is downloaded to the PLC in BCD format, matching the format used by the Series 90 PLCs which do incorporate a built-in clock of their own (90-30 CPU 331, 90-70, etc.)

Word #	Data Stored	Data Range	Data Type
1	Hour	0-23	BCD
2	Minute	0-59	BCD
3	Day of Week	1-7	BCD
4	Month	1-12	BCD
5	Date	1-31	BCD
6	Year	1990-2089	BCD

Table 3-7. Calendar Clock data format.

Interval
At power-up
Once per Minute
Once per Hour
Once per Day

Table 3-8. Available Calendar Clock update intervals.

3.9   The LED Register

This feature is available only on some units, such as the OIU357 and OIU367. These OIU models feature 12 LEDs located on the function keys which can be used as indicating lights. The OIU continually monitors a register in the PLC, and the LEDs are lit according to the value of that register. This register is known as the **LED register**. If the LED register is a 1-bit data reference (%M, etc.), 12 consecutive references should be specified. If the LED register is a 16-bit data reference (%R, etc.), the LEDs reflect the status of the 12 least significant bits of the reference.

3.10   The Expansion Register

The **expansion register** feature is available only on OIU models which are equipped with an expansion slot, such as the OIU367. This expansion slot can be filled with custom developed add-on boards for high volume OEMs. The interface to the add-on board is a multiple register interface. Those OEMs who have a special need for the additional functionality that this board can provide (communications, etc.) contact Horner Electric to discuss the possibility of custom development.

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3.11   The Keypad Mask

This feature can prevent the operator from performing undesired keystrokes, or can be used to essentially "re-map" some of the keys on the keypad. This feature is very useful when using one of the OIUs with a numeric keypad. For example, using the masking feature, the system designer can prevent the "Change to Mode #:" message from being displayed when the operator presses the MODE key. If the keypad is mapped to PLC I/O, the keystroke is still seen by the PLC, but the OIU ignores it.

The keypad mask register is constantly monitored by the OIU. If the mask is mapped to a bit-type PLC reference, up to 16 keys may be masked. If a word-type reference is used, up to 32 keys may be masked. Each bit of the keypad mask register corresponds to a particular key on the keypad (See **Table 3-4** for the proper mapping order). If the bit is "1", than the corresponding key is "masked". If the bit is "0", the corresponding key is not masked.

3.12   Multidrop Applications

SNP or SNPX Protocol

The OIUs support two distinct Series 90 Protocols.   "SNP" protocol is designed primarily for point-to-point applications -- where a host (in this case, a OIU) communicates with a single PLC. A characteristic of the protocol is a long "attach" sequence, which may take several seconds to complete. This attach sequence must be performed every time communications is initiated with a particular PLC. For this reason, SNP is not recommended for OIU multidrop applications, because of the long delay required to switch communications from one PLC to another. After attaching, SNP performance exceeds SNPX performance.

SNPX protocol has been developed with multidrop data acquisition in mind. The SNPX messages contain little overhead, but do include a PLC address in every message. There is no "attach" sequence, and no appreciable delay when communications is switched from PLC to PLC. Therefore, for an OIU multidrop application to be successful, SNPX protocol must be utilized. This is set via a configuration parameter on the "CPU Address" menu, discussed below.

SNPX Multi-Drop using the PLC ID Table

Series 90 multi-drop applications utilize the PLC ID to uniquely identify each PLC. The PLC ID is a one-to-eight character identifier assigned to a Series 90 CPU during Logicmaster™ 90 configuration (For more information regarding this ID, see your GE Fanuc Series 90 and Logicmaster 90 documentation). The OIU contains a table that can be configured by the system designer during Setup Mode which lists the PLC IDs present on the network. This PLC ID table contains 32 entries, numbered Block 0 to Block 31. Each Block number has a corresponding PLC ID assigned to it. In a multi-drop application, one Block number would be configured with a PLC ID for each multi-dropped PLC, and the remainder would be left blank (see the example configuration screen that follows).

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```
            SNP Mode <SNP OR SNP-X>:    SNP
        ┌──────────────────────────────┬───────────┐
        │    ENTER PLC CPU ADDRESS      │  OPTIMIZE │
        │   <UP TO 8 DIGITS, 0-9, A-F>  │     FOR   │
        └──────────────────────────────┴───────────┘
    BLOCK #00:   SNP ID = [A1       ]        OIU
    BLOCK #01:   SNP ID = [B0007    ]        OIU
    BLOCK #02:   SNP ID = [F32911   ]        OIU
    BLOCK #03:   SNP ID = [███████  ]        OIU
    BLOCK #04:   SNP ID = [         ]        OIU
    BLOCK #05:   SNP ID = [         ]        OIU
    BLOCK #06:   SNP ID = [         ]        OIU
    BLOCK #07:   SNP ID = [         ]        OIU
    BLOCK #08:   SNP ID = [         ]        OIU
    BLOCK #09:   SNP ID = [         ]        OIU
    BLOCK #10:   SNP ID = [         ]        OIU
    BLOCK #11:   SNP ID = [         ]        OIU
    BLOCK #12:   SNP ID = [         ]        OIU
    BLOCK #13:   SNP ID = [         ]        OIU
    BLOCK #14:   SNP ID = [         ]        OIU
    BLOCK #15:   SNP ID = [         ]        OIU
```

For instance, in an application with three PLCs connected to a single OIU, three block numbers in the PLC ID table would be configured with PLC IDs, and the remainder would be left blank. All data fields accessed by an OIU in a multi-drop application must reference a block number which has been configured with a PLC ID. **Referencing a block number with an empty PLC ID in a multi-drop application will not allow communications between the OIU and any PLC!**

A sample PLC ID table is shown above. A total of three block numbers have been configured, for PLC IDs "A1", "B0007", and "F32911". To read/write data to PLC "A1", the OIU data field must specify Block 00 in the data field parameter. To read/write data to PLC "F32911", Block 02 should be specified, etc.

3.13   SNP Optimization

Any serial device communicating with a PLC causes an increase in PLC scan time. While the Horner Electric OIUs do have this effect as well, they also may be configured to minimize this effect. "SNP Optimization" is an OIU feature which allows the system designer to select between an optimal PLC scan, or optimal OIU update time. If SNP optimization is set to **OIU** (the default), the update time of PLC data monitored by the OIU is at its minimum. However, the effect of the OIU communications on the PLC scan time is at its maximum. If SNP optimization is set to **PLC**, the PLC scan time is at its minimum, with a somewhat slower OIU update time. The SNP Optimization feature is set on the "CPU address" menu (see the example screen that follows on the next page). Optimization is not available for the SNPX protocol.

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```
┌─────────────────────────────────────────────────────────────────────────┐
│     Horner Electric Operator Interface Unit Setup Utility  V3.42   OIU157 │
│  ┌──────────────────────────────────────┐ ┌────────────────────────────┐ │
│  │     SNP Mode <SNP OR SNP-X>:   SNP    │ │      CPU ADDRESS MENU       │ │
│  │  ┌───────────────────────────┬──────┐ │ │                            │ │
│  │  │   ENTER PLC CPU ADDRESS    │OPTIMIZE│ │ 0-9, A-F = CPU Address     │ │
│  │  │  (UP TO 8 DIGITS, 0-9, A-F)│  FOR │ │ ◄        = Backspace       │ │
│  │  └───────────────────────────┴──────┘ │ │ ▼▲       = Move Cursor     │ │
│  │  BLOCK #00:  SNP ID = [███████]   OIU  │ │                            │ │
│  │  BLOCK #01:  SNP ID = [      ]    OIU  │ │ SPACE    = Select SNP mode │ │
│  │  BLOCK #02:  SNP ID = [      ]    OIU  │ │                            │ │
│  │  BLOCK #03:  SNP ID = [      ]    OIU  │ │ TAB      = Select SNP      │ │
│  │  BLOCK #04:  SNP ID = [      ]    OIU  │ │            Optimization    │ │
│  │  BLOCK #05:  SNP ID = [      ]    OIU  │ │                            │ │
│  │  BLOCK #06:  SNP ID = [      ]    OIU  │ │                            │ │
│  │  BLOCK #07:  SNP ID = [      ]    OIU  │ │                            │ │
│  │  BLOCK #08:  SNP ID = [      ]    OIU  │ │                            │ │
│  │  BLOCK #09:  SNP ID = [      ]    OIU  │ │                            │ │
│  │  BLOCK #10:  SNP ID = [      ]    OIU  │ │ ESC = File Menu            │ │
│  │  BLOCK #11:  SNP ID = [      ]    OIU  │ ├────────────────────────────┤ │
│  │  BLOCK #12:  SNP ID = [      ]    OIU  │ │  Enter the hexadecimal CPU ID │
│  │  BLOCK #13:  SNP ID = [      ]    OIU  │ │     string for this block.  │ │
│  │  BLOCK #14:  SNP ID = [      ]    OIU  │ │        <blank = NULL>       │ │
│  │  BLOCK #15:  SNP ID = [      ]    OIU  │ │                            │ │
│  └──────────────────────────────────────┘ └────────────────────────────┘ │
└─────────────────────────────────────────────────────────────────────────┘
```

Figure 3-2. CPU Address Menu, containing the "SNP Mode" and the "Optimize for OIU/PLC" Configuration options

3.14   Serial Pass Through

This feature, present only on OIU Revision C or later, allows other serial devices to share the PLC programming port with the OIU. This can be used to add another communications connection to a CPU311, which cannot support the CMM Communicaitons Module. A serial device can be connected to the RS-232 port of the OIU. When this serial device wishes to communicate with the PLC, it asserts its RTS (or carrier detect) handshaking line, causing the OIU to monitor the RS-232 port. When the OIU detects an SNP protocol message at the RS-232 port, it passes the message through the OIU RS-485 port to the PLC. While this message is being passed through, the OIU is not communicating with the PLC. The serial device and the OIU cannot communicate with the PLC simultaneously. This feature is best used for applications where occassional communications through the RS-232 port is desired, such as a modem application.

3.15   Definable Characters

OIUs which feature the 2 line x 16 character display, such as the OIU057 and OIU157, have the ability to store up to 8 custom characters. These custom characters are definable with the OIU software, and each consist of a 5 x 7 dot matrix, with a 5 dot "underline" area below. This feature is most effective when defining foreign characters, or a special logo or symbol. Sets of 8 characters can be stored to disk as "libraries". This can be useful for defining different libraries for various foreign languages, etc. See Chapter 5 for more information.

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```
┌─────────────────────────────────────────────────┐
│                                                 │
│   CHAPTER 4:     THE KEYPAD SETUP MENU           │
│                                                 │
└─────────────────────────────────────────────────┘
```

This chapter describes, step by step, the operation of the OIU from its built-in **Setup Menu**. The purpose of this chapter is to describe to the system designer the necessary keystrokes used to perform various functions from this menu. For a greater understanding of the function or purpose of the OIU features, see Chapter 3, "Application Development". *OIU models without a numeric keypad do not support the setup menu. These units may only be setup from the OIU configuration software*.

4.1   Menu Selections

The Setup Menu consists of a number of selections in a single list. Each "selection" is the name of a different configuration screen. Using these configuration screens, the system designer has the capability to completely configure the OIU without additional software or hardware. Normally, however, the Setup Menu is used to make minor modifications to the OIU setup as opposed to creating the application from scratch.

The available menu choices are listed below:

```
        >   Access PLC Data
            Cfg Screens
            Cfg Text Tables
            Cfg Func Key
            Cfg Float Scale
            Cfg High Screen
            Cfg Passwords
            Cfg LED Reg
            Cfg Expansion Reg
            Cfg Trigger Reg
            Cfg CPU Address
            Cfg Com Port
            Cfg Prn Port
            Adjust Display
            Set Clock
            Enter AUTORUN
            Hand-held prg
            Run Self Test
```

*   The available menu choices differ on some units. For example, the OIU277 does not support the hand held programmer menu selection

4.2   Key Assignments

During Setup Mode, several keys on the OIU keypad serve different functions than their Autorun functions. These are summarized below:

While on the Setup Menu, the up and down arrow keys are used to move the menu pointer to the desired menu item.

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ENTER

When the menu pointer is pointing at the desired menu item, pressing the ENTER key causes the display to switch to the configuration screen for the selected item.

MODE
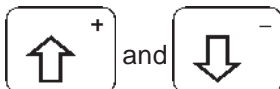
The Mode key allows the user to return to the Setup Menu from a configuration screen.

4.3   Access PLC Data

This first selection on the Setup Menu does not perform a configuration function. The "Access PLC Data" screen allows the OIU to display PLC data in a manner which is similar to the Series 90-30 Hand Held Programmer's "Data Access" Mode. This can be useful for qualified engineers or technicians to access any of the Series 90 data table during system setup, troubleshooting, etc.

After selecting the Access PLC Data menu item, the screen appears as follows:

```
Enter Data Type:
0 0  % R
```

The "00" shown on the display is a "block number" which identifies the PLC to be accessed. In a typical point-to-point application, it is always 00. Next to the Block Number is the Reference Type. There are many different data reference types available with the Series 90 and Genius. For a complete list, see Tables 3-2 and 3-3 in Chapter 3.

Pressing the LEFT and RIGHT arrow keys increments/decrements the Block Number. The UP and DOWN arrows toggle through the available reference types (%R, %AI, %I, %M, etc). Once the desired block number and reference type are displayed, the data address may be keyed in numerically, followed by ENTER. The OIU will then display the current value of the data register selected. Pressing the DEC-HEX-BIN key toggles the base of the displayed data between decimal, hexadecimal, and binary. Pressing the RIGHT arrow key allows the data value to be changed. After pressing the RIGHT arrow key, the data value begins to flash. The new data value may then be keyed in, followed by ENTER. If the PLC program does not contain ladder logic overwriting the data value, the data value will be changed successfully by the OIU. To select another reference to display, press the MODE key. To return to the Setup Menu, press MODE a second time.

4.4   Cfg Screens (Configure Screens)

Even though most users use the personal computer configuration software to set up the OIU, it still is possible to set up the OIU completely from the keypad, if desired. This ability is most useful for making minor changes after the unit has been installed. While configuring screens from the keypad, it is recommended that the function key insert be flipped over to reveal the function keys' screen setup functions.

After selecting the Cfg Screens menu item, the user is prompted with the following display:

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

To set up screens (displays) from the keypad, the system designer keys in the screen number to be created or edited, followed by ENTER. The screen then appears to go "blank" with a underlining cursor in the first position on the top line.

```
_
```

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The descriptive text and/or data fields may now be entered. The cursor keys (UP, DOWN, RIGHT, and LEFT arrows) may be used to move the cursor. To place alphabetic text, the 1-9 keys are used. Each number key (except 0), has 2 or 3 letters associated with it, similar to a telephone keypad. Pressing the key once will cause the first alphabetic character to be displayed, a second time toggles to the next alphabetic character, a third time toggles the next character, and a fourth toggles to the number itself. For instance, to display the letter L, the 5 key must be pressed 3 times. To display the number 9, the 9 key must be pressed 4 times.

If the next character to be setup is on a different key than the current character, pressing that different key will cause the cursor to automatically move over one position to the right. For example, "A", "T", "X", and "S" are all on different keys. If the next character is on the same key as the current character, the right arrow must be used to move over one position to the right before entering the next character. For example, "A", "B", and "C" are all on the same key.
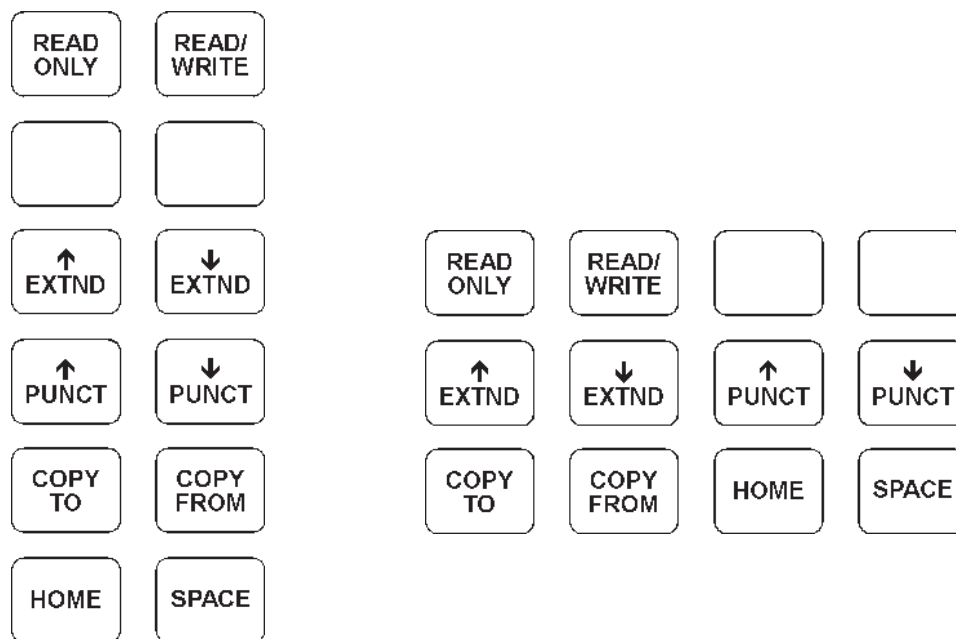
Figure 4-1. Function Key Configuration Template(s) for OIU157, OIU177 (left),
and OIU327, OIU357, OIU367 (right).

To place PLC data fields on the screen (maximum of 4/screen), Function Keys 1 (F1) and 2 (F2) are used. F1 places a read-only data field character on the screen, and F2 places a read-write data field character on the screen. A "flashing R" (read-only) or "flashing W" (read-write) character will be placed at the cursor position. The length of a data field is defined by the number of adjacent "flashing R" (read-only) or "flashing W" (read-write) characters placed on the screen. The necessary length is determined by the possible range of values, and the base which the data is displayed in (see Chapter 3 for more details). An example screen with one read/write data field 5 characters long is shown below:

After placing descriptive text and/or data fields on the screen, pressing the ENTER key will cause the OIU to automatically prompt the user for the block number, data reference, and address of the data to be read or written.

Pressing the LEFT and RIGHT arrow keys increments or decrements the block number. Pressing the UP and DOWN arrow keys toggles between the available reference types (%M, %R, etc.). After displaying the desired reference type, the address may be keyed in numerically, followed by ENTER. The OIU will now prompt the user for the base of the data field. Pressing the UP and DOWN arrow keys toggles between the available choices (+/- decimal, hex, binary, etc.). After displaying the desired base, press the ENTER key. If text table or floating point scale has been selected the user will be prompted to enter the table number. If more than one data field exists on a screen, the OIU will continue to prompt the user until all data fields are defined. Note that data fields are numbered 1 to 4 as they are placed on the screen from left to right, and top to bottom.

4.5   Cfg Text Tables

Text tables are a special feature which provide a mechanism by which numerical data in the PLC may be displayed in the form of descriptive text on the OIU.

To set up a text table, select the Cfg Text Tables menu item.

```
Select txt table
number: ???
```

Text tables may be given any number from 0 to 255. However only 256 total elements may be defined. Key in the text table number to be defined, and press ENTER. For text table 1, the display will look like this:

```
Tb:  1 Vl:     0
```

Tb: indicates the text table number. Vl: indicates the numerical PLC data value which is to be tied to a text string. The initial value displayed is 0, and the 0 is flashing to indicate that the numerical value is ready to be entered. As an example, we will set up a text table which will correspond three numerical values 0,1, and 2 to the text strings "OFF", "HAND", and "AUTOMATIC", respectively. For this example 0 is the first entry, and corresponds to "OFF". Pressing ENTER causes "0" to be accepted as the initial data value, and moves the cursor to the first position on the bottom line. The alphanumeric string may now be keyed in by using the same keying method used for entering alphabetic text when defining strings. To key in "OFF", press the "6" key three times, the "3" key three times, the right arrow, and then the "3" key three more times.

```
Tb:  1 Vl:     0
O F F
```

Pressing ENTER completes the table entry for numeric value 0. The number in the Vl: column now flashes again. A new numeric value may be entered for this text table. In our example, that would be a "1". After setting Vl: to a 1, the cursor now moves back down to the text line, where HAND may be entered ("4" key twice, "2" key once, "6" key twice, "3" key once, followed by ENTER). All numeric and textual contents of a text table may be entered in this

fashion. If a new text table is created (Forward, Reverse, for example), pressing the MODE key when all entries for the current table is complete will allow you to select another text table. Pressing the MODE key a second time will return you to the main menu.

4.6   Cfg Func Key

After selecting the Cfg Func Key menu item, the user is prompted to enter the function key register.

```
Select Func Reg
00%R
```

The register is specified in the same manner as all other PLC data references, with the LEFT and RIGHT arrow keys selecting the Block Number, UP and DOWN arrow keys selecting the reference type, and the numeric keys used to enter the register address. A function key register is not required to be defined. Pressing ENTER when prompted for the function key register without entering a register number disables the function key register. The CLEAR key is used to clear out the function key register once one is defined.

```
Press the Func
Key to Define
```

After entering (or not entering) the data register, the OIU prompts the user to "press the function key to define". This is to enable the user to configure the function keys with "macro" functions. Macros are typically used to configure function keys to change to a particular screen, set a PLC data register to a particular value, etc. In many applications, the function keys are simply used as momentary pushbuttons, and no macro functions are to be performed by the function keys. If no function keys are to be programmed with macros, pressing ENTER at the prompt returns to the setup menu.

If function key macros are to be defined, the first step is to record on paper the sequence of keystrokes which will be stored in the function key (see Chapter 3). After the keystroke sequence has been established, press the key to define, as prompted by the OIU display. To configure F1 with a macro, press the F1 key. The display will change to the following:

```
Define Func F1
```

The top line identifies the function key being defined, in this case F1, and the bottom line is where the key sequence is entered. To enter the sequence, simply press the keys to be included in the sequence in the proper order. To include the ">" and "<" keys, shift must first be pressed. When the sequence is complete, press the function key being defined to complete the process.

When editing a function key sequence, the left and right cursor keys may be used to navigate through the key sequence. To delete a key from the sequence, use the left and/or right cursor keys until the key to be deleted is flashing. Pressing the DEL (0) key while holding the SHIFT key will delete the key from the sequence. To insert a key into a sequence, position the cursor, then press the INS (.) key while holding the SHIFT key. The message on the screen will change from "Define Func F1" to "Insert Func F1". After the key or keys have been inserted into the sequence, pressing the SHIFT and INS keys again changes the OIU back into overwrite mode from insert mode.

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4.7   Cfg Float Scale

The purpose of the floating point scaling parameters are discussed in detail in Chapter 3. Up to 200 different sets of floating point parameters may be setup and stored in the OIU memory. These parameters consist of slope (multiplier), offset (adder), and number of fractional decimal places displayed. After selecting the "Cfg Float Scale" menu item, the OIU display shows the following screen:

```
   0           m= 1
F=0           b= 0
```

The flashing 0 on the screen indicates that the displayed floating point data values are for set 0. The lower-case m indicates the slope, lower case b indicates the offset, and upper case F indicates the number of digits to the right of the decimal point. The values of m, and b may be positive or negative, integer or fractional. The number of digits to the right of the decimal place must be a positive integer between 0 and 7, inclusive.

To set the values, first key in the floating point scale set number (0-199) followed by ENTER. The value for the slope m will begin to flash. Press the CLEAR key to clear the default value of 1, and then key in the value for m. To key in a negative value, press the - key while holding in the SHIFT key. After keying in the value, press ENTER. The data value for b will now flash. Press the CLEAR key to clear the default value of 0, and then key in the value followed by ENTER. The value for F (the number of digits to the right of the decimal point) will flash. Pressing CLEAR clears out the old value, and keying in the value followed by ENTER sets the number of digits to the right of the decimal point.

At this point, another floating point data set may be configured, or pressing the MODE key will return to the main menu.

4.8   CFG High Screen

The concept of the high user screen number is discussed in Chapter 2. To set the high user screen number, select the "Cfg High Screen" menu item. The display will display the following text:

```
Enter High User
Screen :    249
```

Pressing the CLEAR key clears the default value of 249, allowing the new value to be entered. This is entered by keying in the screen number, followed by ENTER. Pressing the MODE key returns to the main menu.

4.9   Configure Passwords

The functionality of "Level 1" and "Level 2" passwords are discussed in Chapter 2. These passwords may be set by selecting the "Cfg Passwords" menu item. When no passwords exist, the user will be prompted with the following display:

```
New Lvl 1 Password?
```

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The Level 1 password is entered by keying in the password, followed by ENTER. Valid password characters are 0-9,. The password may be up to 1 display line (16 or 20 characters) long. After entering the Level 1 password, the OIU prompts the user to enter the Level 2 password. After entering the Level 2 password, the OIU automatically returns to the main menu.

To change a password, the user is first prompted to enter the old password, before the new password is entered. In this case, the OIU displays the following message:

```
Old Lvl 1 Password?
```

To clear a password, first enter the old password, and then simply press ENTER when prompted for the new password.

4.10   Cfg LED Reg

The LED register is only available on certain OIU models such as the OIU357 and OIU367. It is explained in Chapter 3. After selecting the Cfg LED Reg menu item, the display is shown as follows:

```
Select LED Register?
0 0 % R
```

Pressing the LEFT and RIGHT arrow keys increments/decrements the block number from 00-31. Pressing the UP and DOWN arrows allows the different reference types (%R, AI, %M, etc.) to be selected. After the desired block number and data reference type are displayed, the register number may be keyed in, followed by ENTER. After entering the LED register, the OIU will automatically return to the main menu.

4.11   Cfg Trigger Reg

The "Cfg Trigger Register" menu item allows the trigger register and screen status register to be configured. The function of these registers are described in detail in Chapter 3. After selecting the "Cfg Trigger Reg" menu item, the display shows the following text:

```
Select Trig Reg
0 0 % R
```

Pressing the LEFT and RIGHT arrow keys increments/decrements the block number from 00-31. Pressing the UP and DOWN arrows allows the different reference types (%R, AI, %M, etc.) to be selected. After the desired block number and data reference type are displayed, the register number may be keyed in, followed by ENTER.

After entering the trigger register, the OIU will prompt the user to enter the screen status register. If the user does not wish to utilize the trigger register or screen status register, he may simply press ENTER without entering a register number. If a screen status register is to be utilized, the register may be entered in the same fashion as the trigger register. The OIU will return automatically to the main menu after configuration of the trigger and screen status regsiters.

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4.12   Cfg CPU Address

As described in Chapter 3, the OIU maintains a table of CPU IDs which allow it to be used in Series 90 multi-drop applications, or in point-to-point applications where a PLC ID is specified in the Series 90 CPU. For a typical Series 90 point-to-point application where no PLC ID is specified in the CPU, this feature is not used, and BLK 00 is used in all data references.

After selecting the "Cfg CPU Address" menu item, the following screen is displayed:

```
CPU ID - BLK 00
```

Pressing the UP and DOWN arrow keys select the block number to be configured. After selecting the block number, the CPU ID may be entered. The CPU ID is a 1 to 8 character text string which may include the characters 0-9, and A-F. To enter the characters A through F from the keypad use F1 through F6. After configuring the PLC ID for a particular block number, the UP and/or DOWN arows may be used to select another block number. After the last block number to be configured has been set up with a PLC ID, pressing the ENTER key returns the display to the main menu.

4.13   Cfg Com Port

The "Cfg Com Port" menu item allows the user to set the communications parameters for the RS-422 port which communicates to the Series 90 PLC.

```
>Baud Rate:19200
 Parity:       Odd
 Data Bits:     8
 Stop Bits:     1
 Handshake: None
```

Pressing the UP and DOWN arrows allows for the selection of the parameter to be changed. Pressing the RIGHT and LEFT arrow keys toggles through the available options, and pressing ENTER when the desired option is selected causes that parameter to be stored. Pressing the MODE key returns to the main menu.

4.14   Cfg Prn Port

The "Cfg Prn Port" option allows the registers and communications rates associated with printing to be set in the OIU. After selecting the menu item, the display shows the following:

```
Select Print Reg
0 0 % R
```

Pressing the LEFT and RIGHT arrow keys increments/decrements the block number from 00-31. Pressing the UP and DOWN arrows allows the different reference types (%R, AI, %M, etc.) to be selected. After the desired block number and data reference type are displayed, the register number may be keyed in, followed by ENTER.

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The OIU then prompts the user to enter the Print Status Register, which may be set in the same fashion as the print register. After entering the print status register, the communications parameters for the port may be set. These parameters only set the ports communications rate during Autorun mode, when connected to a printer. When connected to a computer during setup mode, the communications rate is fixed to match that of the configuration software. The communications parameters are as follows:

```
>Baud Rate:19200
 Parity:      Odd
 Data Bits:     8
 Stop Bits:     1
 Handshake: None
```

Pressing the UP and DOWN arrows allows for the selection of the parameter to be changed. Pressing the RIGHT and LEFT arrow keys toggles through the available options, and pressing ENTER when the desired option is selected causes that parameter to be stored. Pressing the MODE key returns to the main menu.

4.15   Adjust Display

This menu item allows the contrast of the display to be adjusted. Pressing the UP arrow increases intensity, and the DOWN arrow decreases intensity.

4.16   Set Clock

This menu item allows for the configuration of the built-in calendar clock feature (optional on the OIU057). This is an important feature in Series 90 PLCs which do not feature a clock of their own (Series 90-20, Series 90-30 CPU311, CPU313, CPU323).

After selecting this item, the current time and date are displayed.

```
MON  MAY 17,1994
14:43:46
```

The month, date, year, hours, minutes, and seconds parameters are all changeable. The day of the week is automatically set by the OIU according to the date.

Pressing the RIGHT and LEFT arrow keys allow the date, year, hour, minute, and second parameters to be selected. Pressing the UP and DOWN arrow keys allow the value to be incremented or decremented. The day of the week is calculated from the date and year automatically by the OIU. Pressing the ENTER key completes the time setting process.

The OIU will next prompt the user to enter the clock register. This is the first of 6 consecutive registers in the PLC which will be updated with the time and date.

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```
Select Clock Reg
00%R
```

Pressing the LEFT and RIGHT arrow keys increments/decrements the block number from 00-31. Pressing the UP and DOWN arrows allows the different reference types (%R, AI, %M, etc.) to be selected. After the desired block number and data reference type are displayed, the register number may be keyed in, followed by ENTER. The interval in which the clock registers are updated by the OIU may now be selected, through the use of the UP and DOWN arrow keys. The available intervals are at powerup only, once per minute, once per hour, and once per day. The OIU will automatically return to the main menu.

4.17   Enter Autorun

This menu item allows the user to leave OIU Setup Mode and enter Autorun Mode, where screen data fields will be filled with data from the PLC data registers, and function keys will be active. The Autorun Mode is described in detail in Chapter 6.

When entering Autorun mode, the OIU prompts the user to enter the starting screen number:

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

The user may enter the initial screen to be displayed.

4.18   Hand Held Programmer Emulation

This feature is only available on Revision C or later OIU157, OIU177, OIU327, and OIU357 units. This menu item places the OIU in Hand Held Emulation Mode. This allows the OIU to operate exactly as a hand held programmer, allowing it to be used for module configuration, logic editing, and setting the PLC Run/Stop mode.

A function key template is included with the OIU indicating the Hand Held Programmer functions performed by each function key. Several keys perform multiple functions. The function performed by each keystroke is contingent upon when it is pressed. For example, F1 performs both the "LD" and the "I/AI" functionality. If the current HHP mode is "Data", pressing the F1 key will cause the data type displayed to toggle between %I and %AI data types. If the current mode is "Program", pressing F1 may cause the start of a new rung of logic (the LD function); or, it may cause the %I/%AI data type to be entered for a function. For detailed instructions on Hand Held Programmer operation, see the GE Fanuc "Hand Held Programmer User's Manual".

To exit Hand Held Programmer mode and return to the main menu, press and hold SHIFT, then press and release ENTER)

4.19   Run Self Test

The Self Test menu item is typically only run at the factory. However, there are some instances where it may be desirable to verify the OIU hardware operation in the field. There are a number of tests performed by the self test:

Random Access Memory (RAM) Test. During this test, the OIU systematically tests its RAM memory, which is typically 32K in length. If the test fails, contact Horner Electric Technical support. If the test passes, the OIU will proceed to the keypad test.

Keypad Test. During the keypad test, as each key is pressed by the user, the display will indicate the key that is

being pressed. The user should press each key sequentially, verifying its operation. If a problem apparently exists, contact Horner Electric. After all keys have been pressed, pressing the SHIFT and ENTER keys simultaneously will move on to the next test.

Contrast Adjustment. At this point, the user may set the contrast, if desired. Typically most users simply leave it adjusted at its maximum setting. Pressing ENTER when complete moves on to the next test.

LED Test (if present). This is the next test for those OIUs which contain LEDs (i.e. OIU357, OIU367, etc.). The LEDs should sequence from 1 to 12 continuously. If they do not, contact Horner Electric. Pressing ENTER moves on to the next test.

RS-485 Port Test (if present). **This test requires a loopback connector** to be installed on the 15-pin communications port. If the loopback connector is not installed, the unit will enunciate that the test failed, and that no loopback was present. If the loopback connector is installed and the test fails, contact Horner Electric. Pressing ENTER moves on to the next test.

RS-232 Port Test **This test also requires a loopback connector**, this time on the 9-pin RS-232 port. If the loopback connector is not installed, the unit will enunciate that the test failed, and that no loopback was present. If the loopback connector is installed and the test fails, contact Horner Electric. Pressing ENTER moves on to the next test.

Date/Time Set. The time and/or date maintained in the OIUs memory may be set during the self test. For details on the keystrokes required for setting the time and/or date, see the "Set Clock" menu item earlier in this chapter. Remember that a Real Time Calendar Clock feature is optional with the OIU057 (-CLK suffix).

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│                                                 │
│      CHAPTER 5: SOFTWARE CONFIGURATION          │
│                                                 │
└─────────────────────────────────────────────────┘
```

This chapter describes, step by step, the operation of the configuration software. This software allows the OIU to be completely configured from a personal computer. This allows the OIU setup to be created, saved to diskette, printed out, and downloaded to the OIU. This is an invaluable tool for application developers, allowing the OIU to be configured in the most expedient fashion.

5.1   System Requirements

The OIU configuration software requires a personal computer with the following:

> 8088 microprocessor or better
> MS DOS operating system, version 3.30 or later
> Interrupt-driven RS-232 serial port
> Monochrome or Color (EGA/VGA/SVGA) display

MS-DOS machines such as the GE Fanuc Workmaster I are not compatible with the software, because they utilize a non interrupt-driven RS-232 serial port.

5.2   Connecting the Personal Computer to the OIU

The OIU configuration software communicates serially to the OIU via RS-232. The OIU software includes a cable to connect a 9-pin personal computer serial port to the OIU RS-232 port. In order for the software to successfully upload or download the configuration to/from the OIU, the OIU must be in Autorun mode with no print register active or in Setup mode on the Main Menu. The software may run without the OIU connected, so the application can be completely developed "offline".

5.3   Invoking the Software from DOS

It is recommended that the 3.5" floppy diskette provided with the software package be copied to another diskette, and used as the working copy. This allows additional backup copies to be made from the distribution diskette at a future date, if necessary.

To execute the program, place the working copy of the distribution diskette in the floppy drive. At the DOS prompt, type A: (or B:) followed by RETURN to access the floppy drive. Then at the DOS prompt, type the following:

OIUCFG*port*

where *port* is the COM: port to be used; 1, 2, 3, or 4.
If COM1: is used, the *port* parameter may be omitted.

The software will display an identification screen, which identifies the software with version number. After several seconds it will display an OIU model selection screen. This screen lists all the current Horner Electric Release 3 OIUs, along with the identifying characteristics of size, display type, communications protocol, and installed options (some of the models listed are sold exclusively in Europe). The user selects the model to be programmed by keying in the letter listed in the first column ("#") to the left of the model number, or cursoring through the models and pressing ENTER. In addition to model selection, this screen allows the software color scheme to be customized. This screen may be called up at any time using the HOME key. After selecting the model to be programmed, the Main Menu screen is displayed.

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```
#    Model number    Size    #Keys   Display      Comm      Options

A>   HE6930IU027     Small     8     2x16 LCD    MICRO
B>   HE6930IU057     Small     8     2x16 LCD    SNP
C>   HE6930IU127     Compact   32    2x16 LCD    MICRO
D>   HE6930IU157     Compact   32    2x16 LCD    SNP
E>   HE6930IU177     Compact   32    2x20 VFD    SNP
F>   HE6930IU187     Compact   32    2x16 LCD    GENIUS
G>   HE6930IU197     Compact   32    2x20 VFD    GENIUS
H>   HE6930IU277     Compact   18    4x20 VFD    SNP
                              ▼ ▼ MORE ▼ ▼
  Press the letter (A-R) that corresponds to the desired model,
    or use ▲ and ▼ to move the highlight to the desired model
                          and press ENTER.

  Models with the -E suffix feature the European character set

             Press <F1> to <F4> to change screen colors
         Press <F5> to see highlighted OIU model graphically
```

Figure 5-1. The OIU Model Selection Screen

5.4   Program Organization

The organization of the OIU Configuration software is shown below in Figure 5-1.
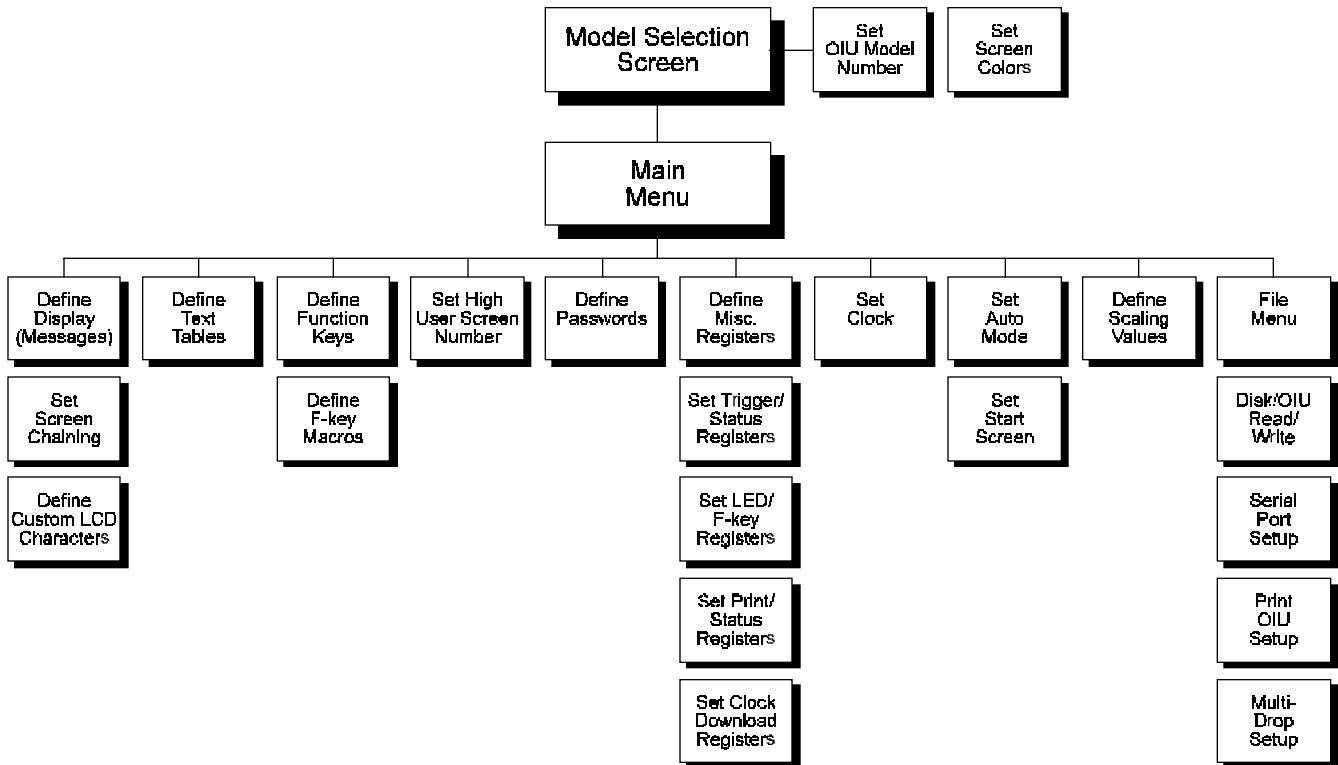
Figure 5-2. Software Screen Organization

As is indicated by Figure 5-2, the software organization consists of a Main Menu, and a series of sub-menus. From these sub-menus, all OIU configuation and software disk and printer access functions are performed. Each sub-menu is accessed from the Main Menu. The Main Menu and sub-menu screens are all organized in the same fashion, with three screen regions, shown in Figure 5-3.
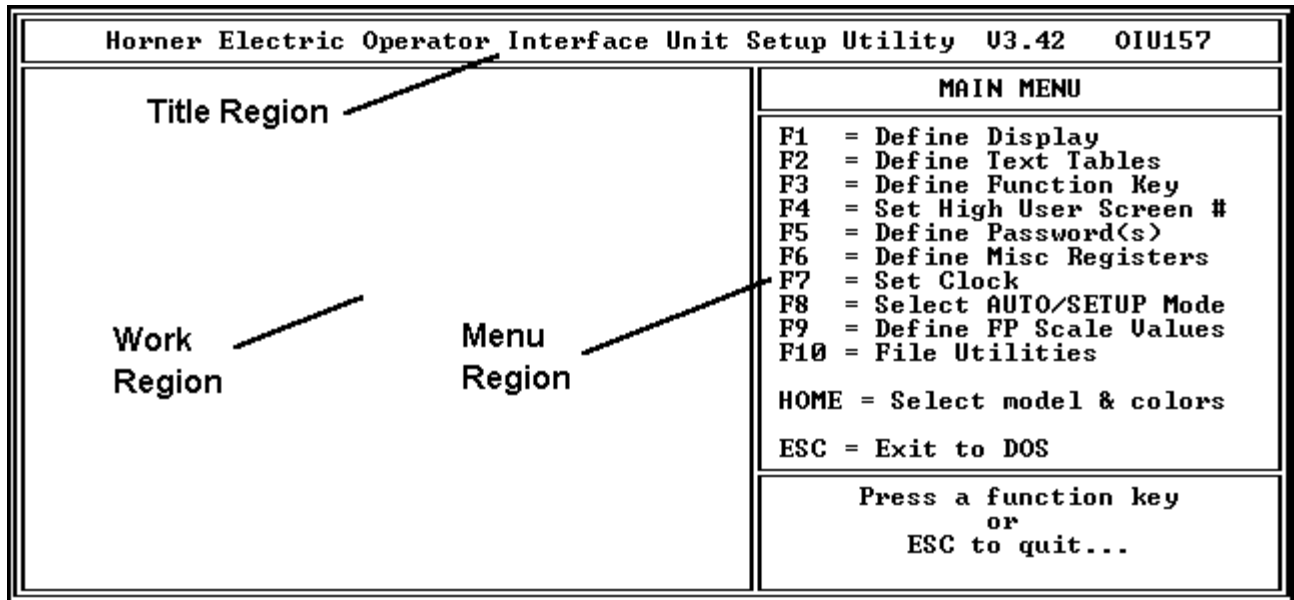
Figure 5-3. Screen Layout of all Screens. The Main Menu is shown above.

Title Region. This region is along the top of the screen, and it indicates the software revision and current OIU model being edited. This region is exactly the same for all menus.

Menu Region. The menu region lists all the available functions performed by the menu, along with all the keystroke information.

Work Region. This is the area on the left half of the screen in which the various configurable parameters are set by the user. Each menu has a different work area, depending upon the function performed by the menu.

5.5   The Main Menu

From the Main Menu, all the sub-menus may be accessed by utilizing function keys F1 through F10. To exit the program, press the ESC key. The program will prompt the user, verifying that the exit is desired (see below). Make sure that the application has been saved before exiting. **The software performs no autobackup file functions**.
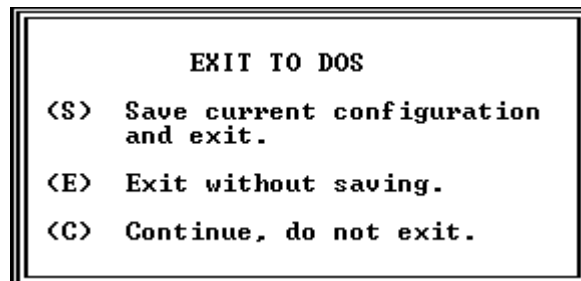
5.6   The Screen Menu

The Screen Menu is accessed by selecting the Define Display item on the Main Menu. From this menu, all 250 or 150 OIU "screens" stored in the OIU may be configured. The work region of the Screen Menu consists of three areas:

Screen Area. This is the area where text and/or data fields are inserted for each screen. The explanation for the legal keystrokes for this menu are listed in the "Menu" Region (note that pressing F10 brings up a second page of legal keystrokes). Pressing F1 moves the cursor to this area. Above the "box" which mocks the 2 line display of an OIU is the number of the current screen being configured. Pressing the PageUp and PageDown keys toggles through the available screens. To access a screen directly, pressing F4 will allow the user to specify a screen number. Text may be placed simply by typing in the text from the keyboard. To place data fields, pressing the CTRL and R keys simultaneously brings up a read-only character, and pressing CTRL and W brings up a read-write character.

```
Horner Electric Operator Interface Unit Setup Utility  V3.42    OIU157

        SCREEN #   0           CHAR CODE              SCREEN MENU

  ┌─────────────────────┐   ┌─────────┐   F1  = Define Screen Text
  │-                    │   │         │   F2  = Enter Extended code
  │                     │   │         │   F3  = Define Data Field(s)
  └─────────────────────┘   │         │   F4  = Go to Screen ___
                            └─[20]─┘   F5  = Copy this Screen to ___
                                           F6  = Show Screen on OIU
                                           F7  = Define LCD characters

     DATA FIELD INFORMATION                PgUp= Select next screen
  ┌────┬──────────┬───────┬──────────┐     PgDn= Select previous screen
  │BLK │ REGISTER │ BITS  │   BASE   │     TAB = Select next group
  ├────┼──────────┼───────┼──────────┤
  │ -- │ --- ---- │ ----- │ -------- │     F10 = More...
  │ -- │ --- ---- │ ----- │ -------- │     ESC = Main Menu
  │ -- │ --- ---- │ ----- │ -------- │
  │ -- │ --- ---- │ ----- │ -------- │     Enter the ASCII text and/or
  └────┴──────────┴───────┴──────────┘     data fields for this screen.
```

```
              SCREEN MENU

  DEL = Delete Screen Text
  INS = Insert Screen Text

  CTRL-C = Center Screen Text
  CTRL-D = Delete Screen ___
  CTRL-I = Insert Screen ___

  CTRL-R = Read only field
  CTRL-W = Read/write field

  CTRL-X = Toggle Screen Chain

  F10 = More...
  ESC = Main Menu
```

Figure 5-4. Screen Menu, including both pages of legal keystrokes.

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Character Code Area. This area consists of a box which emulates the 5x7 matrix of the OIU's character format. Some characters which can be displayed on the OIU display do not have corresponding keys on a personal computer keyboard. In order to include these special characters on a display, position the cursor in the screen box at the location in which the character is to be placed. Then select the F2, "Enter Extended Code" option from the screen menu. The Up and Down arrow keys may be used to toggle through the available characters set. If two digit hexadecimal charactrer code is known, it may be directly keyed in in lieu of using the arrow keys.

Data Field Information Area. This area should not be edited until all PLC data fields have been placed on the screen. The data field information table is initially blank, but as PLC data fields are added to the screen area, the table will be filled with the default specifications for the PLC data fields.. To access this area, press the F3, "Define Data Fields" option. The cursor will move to the first line of the table, which corresponds to the first data field. The data field which corresponds to the line of the table being edited will be flashing.

The cursor keys are used to navigate within the various lines and columns of the table. Place the cursor on the parameter to be configured, and follow the instructions below:

> **Block**. The block number is edited by positioning the cursor, and then keying in the block number. The Backspace key may be used to edit the value.

> **Register**. The register is represented by the reference type (%R, %T, %I, etc.) and the address number. To select the reference type, position the cursor, and then press the Spacebar to toggle through the available reference types. Once the reference type is selected, the register number may be keyed in by moving the cursor one position to the right, and keying in the appropriate register number.

> **Bits.** This column allows the user to specify the number of consecutive bits which are to be extracted from the register specified in the previous column. To edit this field, position the cursor, and press the + and/or - keys to increment/decrement the starting or ending bit. Note that the bit numbers are numbered from 0-15, while bits in Series 90 data references are usually numbered from 1-16.

> **Base**. To set the data field base, position the cursor and press the spacebar to toggle through the available choices. For the text table and floating point bases, the text table number or floating point

data set number must also be specified. To set this value, position the cursor and key in the value. The backspace key may be used to edit the value if entered incorrectly.

5.6.1   Screen Chaining

Release 3.4 OIU's may be setup to automatically "chain" to another screen at a programmable interval. This "chaining" only occurs when the trigger register is active. A screen will not automatically chain to another screen if the trigger register is inactive and the user is simply toggling through available screens. Screens which chain to other screens are limited to a maximum of 3 data fields per screen.

In order to set up a screen to chain to another, the "CTRL-X" key combination is pressed. This causes the data field information area to be reduced from four to three rows, with a "chaining" area beneath it as follows:

```
┌──────────────────────────────────────────────┐
│ CHAIN TO SCREEN    0 AFTER   3.0 SECONDS │
└──────────────────────────────────────────────┘
```

The TAB key is used to toggle between the Screen, Character Code, Data Field Information and Chaining Areas. The Screen to be chained to, as well as the time interval may be set with the numeric keys. The values take effect after the ENTER key is pressed. The left and right arrow keys are used to toggle between the two parameters. The time interval may be set in tenth second increments.

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5.7   The Text Table Menu

The Text Table Menu work area consists principly of four areas. The Table #, Value, and Text columns, and the Character Code window.

```
┌────────────────────────────────────────────────────────────────────────────┐
│  Horner Electric Operator Interface Unit Setup Utility  V3.42    OIU157     │
├──────────┬──────────┬──────────────────┬──────────────────────────────────┤
│ TABLE #  │  VALUE   │       TEXT       │          TEXT TABLE MENU         │
├──────────┼──────────┼──────────────────┼──────────────────────────────────┤
│    1     │    4     │  Die Change      │  0-9 = Enter Table # / Value     │
│          │          │                  │  F1  = Select New Table #        │
├──────────┼──────────┼──────────────────┤  ▼▲  = Select Extended Char      │
│          │    0     │  Off             │                                  │
│  4 used  │    1     │  On              │                                  │
│ 250 left │    2     │  Manual          │                                  │
│          │    3     │  Automatic       │                                  │
│          │          │                  │                                  │
│ CHAR CODE│          │                  │                                  │
│ ┌──────┐ │          │                  │                                  │
│ │      │ │          │                  │                                  │
│ │      │ │          │                  │                                  │
│ │      │ │          │                  │  ESC = Main Menu                 │
│ └[20]──┘ │          │                  │                                  │
│          │          │                  ├──────────────────────────────────┤
│          │          │                  │   Enter the ASCII text and/or    │
│          │          │                  │   extended character codes for   │
│          │          │                  │         this text string.        │
└──────────┴──────────┴──────────────────┴──────────────────────────────────┘
```

Figure 5-5. Text Table Screen

Table # Column. This column sets the current text table to be configured. Pressing F1 moves the cursor to this column, where the table number may be keyed in. When the desired table number has been keyed in, pressing ENTER automatically moves the cursor to the "Value" column.

Value Column. While the cursor is on the "Value" column, the numeric value may be keyed in directly. Pressing the ENTER key moves the cursor to the Text column.

Text Column. In the text column, text may be typed in directly. To insert an extended character, pressing the UP and/or DOWN arrows will toggle through the available characters. The extended character will be shown in detail in the Character Code box. Pressing the ENTER key moves the cursor back to the Value column where another value can be entered.

5.8   The Function Key Menu

The macros that may be performed by function keys are configured from the function key menu. **If Function Keys are strictly to be used as momentary pushbuttons, than this menu is not used. In this case, the "Miscellaneous Registers" Menu is used to map the function keys directly to PLC I/O**. Only the function key macros are configured in the Function Key Menu.
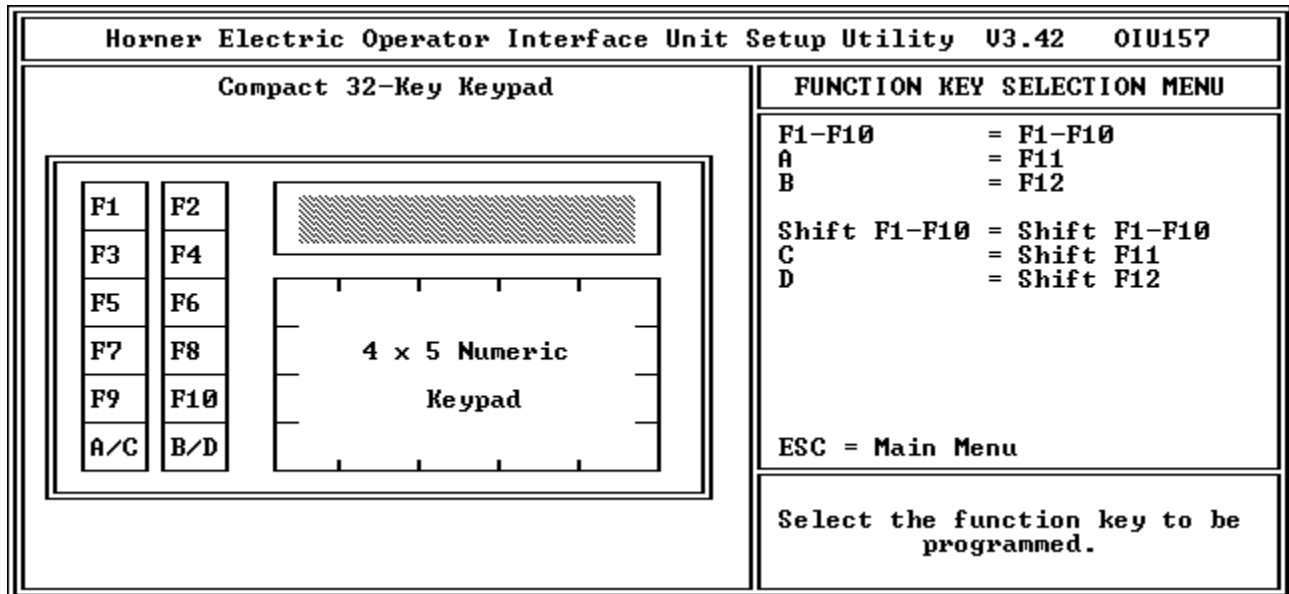
Figure 5-6. Initial Function Key Screen

The initial function key screen shows a physical layout of the keys on the current OIU being configured. From this screen, the user selects the function key to be configured Note that up to two macros per function key may be configured, one for the key itself and one SHIFTed function. The menu region shows the correct keystroke to for the appropriate key.
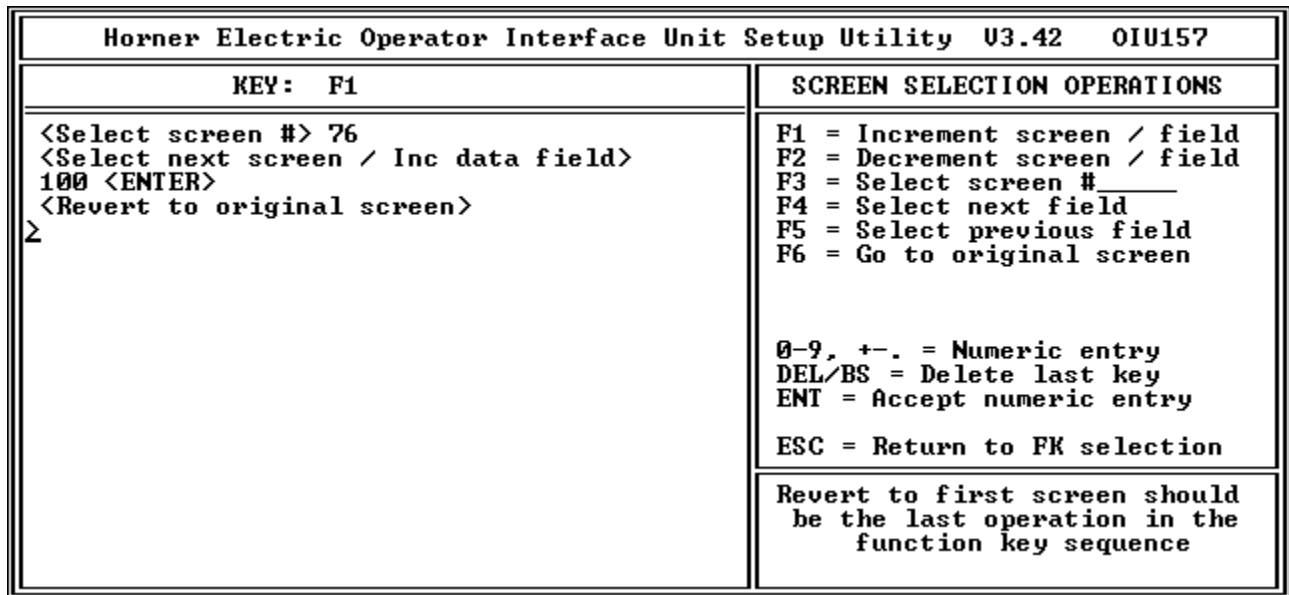
Figure 5-7. Function Key Configuration Screen

The available macro operations are listed in the menu area. These operations, when combined with numeric keystrokes and the ENTER key, make up a macro function. They mimic operations performed during Autorun mode by an Operator such as Changing screens, Setting a register value, etc.

5.9   High Screen Menu

The high user screen may be set by keying in the high user screen from the keyboard. To clear the previous high user screen, press the Backspace key before entering keying in the new value.

```
Horner Electric Operator Interface Unit Setup Utility   V3.42     OIU157
                                          HIGH SCREEN MENU
                                    0-9 = Enter Numeric Screen #




        HIGH USER SCREEN:
             249



                                    ESC = Main Menu

                                      Numerically enter the high
                                    user screen boundry (0 to 249).
```

Figure 5-8. High User Screen Menu

```
Horner Electric Operator Interface Unit Setup Utility   V3.42     OIU157
                                          PASSWORD MENU
                                    0-9 = Numeric password

                                    TAB = Toggle Password Select
        LEVEL 1 PASSWORD:

        7152


        LEVEL 2 PASSWORD:

        46278



                                    ESC = Main Menu

                                       Numerically enter the
                                       level 2 password string.
                                    (Protects the OIU's setup mode)
```

Figure 5-9. Set Password Screen

5.10   Password Menu

The Level 1 and Level 2 Passwords are configured from the Password Menu. The TAB key is used to toggle the cursor between the Level 1 and Level 2 passwords, and the numeric keys are used to enter the passwords.

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```
Horner Electric Operator Interface Unit Setup Utility  V3.42   OIU157

                                              MISC REGISTER MENU

  MISCELLANEOUS REGISTER CONFIGURATION        ▼▲◀▶  = Move Cursor
                                              SPACE = Select type
  FUNCTION      BLK    REGISTER    BITS        0-9   = Enter block/register
                                              +/-   = Adjust bits
  FUNCTION KEY   0    %M  00001   00012
  LED           --    --- -----   -----
  TRIGGER        0    %R  00100   00-15        Note that some of the reg-
  CURRENT SCRN   0    %R  00101   00-15        isters may not be supported
  PRINT          0    %R  00102   00-15        by the module that you have.
  PRINT STATUS   0    %R  00103   00-15
  CLOCK          0    %R  00097   -----
  EXPANSION     --    --- -----   -----       ESC = Main Menu
  REDUNDANCY    --    --- -----   -----
  KEYPAD MASK    0    %R  00104   00-31        Press SPACE to cycle through
                                              the available register 'types'.
                                              Numerically enter the register
                                              offset value.
```

Figure 5-10. Miscellaneous Registers Screen

5.11   Miscellaneous Register Menu

A variety of register settings may be set from the Misc. Register Menu. The cursor keys are used to position the cursor from line to line and column to column. When the "Register" column is edited, pressing the SPACE bar toggles between the available reference types. The Register number and "Block" number may be keyed in from the keyboard. The + and - keys are used to increment/decrement the "Bits" column.

```
Horner Electric Operator Interface Unit Setup Utility  V3.42   OIU157

                                                    CLOCK MENU

                                              ◀▶  = Move Cursor
                                              +/- = Adjust Field




      Current time: 09:07:07

      Current date: 11/04/1994

      PLC update frequency:
        Once per minute                       ESC = Main Menu


                                              Press + or - to change the
                                              clock update frequency.
```

Figure 5-11. Set Clock Screen

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5.12   The Clock Menu

From the Clock Menu, the time, date, and update frequency may be configured. The time and date used by the software program are based upon the time/date stored in the personal computer's clock. If the time and/or date on the personal computers clock needs adjustment, the modification can be made from the program.

The LEFT and RIGHT cursor keys position the cursor between the hour, minute, second, month, date, year, and update frequency. When the field to be modified is highlighted, pressing the + and - keys increment/decrement the value.

```
┌──────────────────────────────────────────────────────────────────────────┐
│  Horner Electric Operator Interface Unit Setup Utility   V3.42    OIU157   │
│┌────────────────────────────────────┬────────────────────────────────────┐│
││                                    │            AUTORUN MENU             ││
││   ┌──────────────────────────┐     │  0-9   = Enter Screen #            ││
││   │  Enter AUTORUN mode      │     │  SPACE = Toggle Parameter          ││
││   │  after OIU download      │     │  TAB   = Select Field              ││
││   ├──────────────────────────┤     │                                    ││
││   │           YES            │     │                                    ││
││   ├──────────────────────────┤     │                                    ││
││   │  Start Screen   │   0 │  │     │                                    ││
││   └──────────────────────────┘     │                                    ││
││                                    │  ESC = Main Menu                   ││
││                                    ├────────────────────────────────────┤│
││                                    │   Numerically enter the start      ││
││                                    │    screen number (0 to 249).       ││
││                                    │   Press SPACE to select SETUP      ││
││                                    │   mode, TAB to advance cursor.     ││
│└────────────────────────────────────┴────────────────────────────────────┘│
└──────────────────────────────────────────────────────────────────────────┘
```
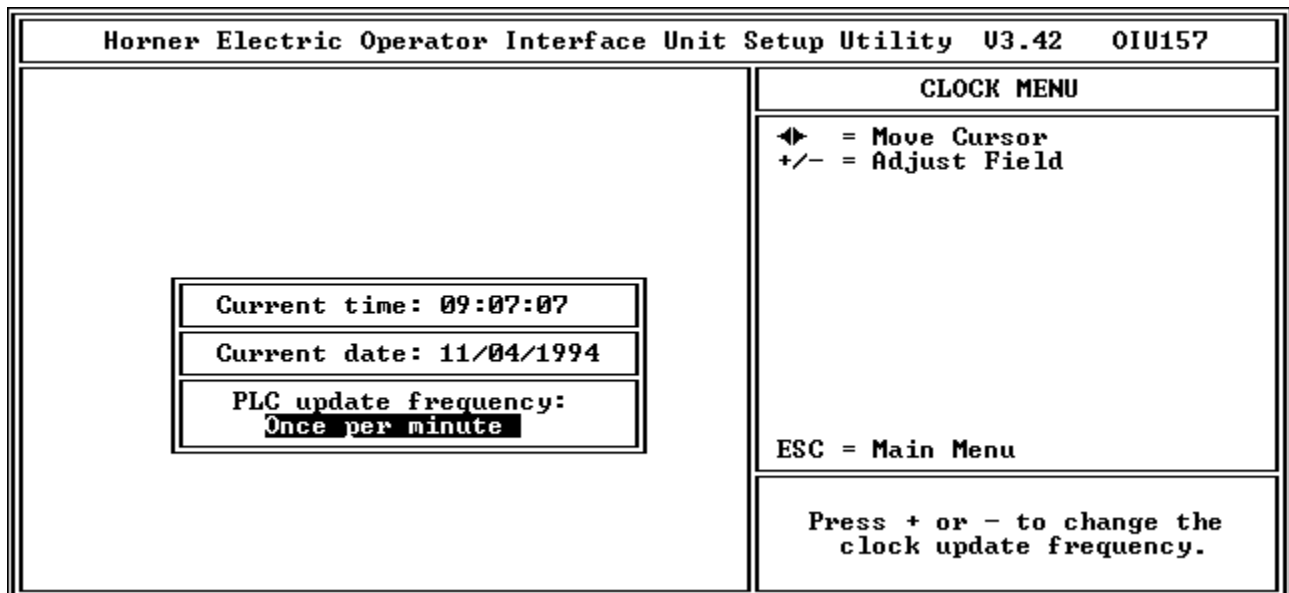
5-12. Auto/Setup Mode Screen

5.13   The Autorun Menu

From the Autorun Menu, the user may specify whether or not the OIU is to enter Autorun mode immediately after receiving the configuration from the software package. If the OIU is to enter Autorun mode after configuration download, the Screen to be initially displayed must be entered. Press the SPACE bar to toggle between YES and NO, and type in the value of the start screen. Note that if Autorun is set to NO there is no start screen to set.

5.14   Floating Point Scale Set-up Menu

From this menu, the floating point data parameters may be configured. The work area consists of a table with a column for floating point data set # (FP#), slope (m), offset (b), and number of places after the decimal point (precision). The cursor keys are used to position the cursor on the parameter to be adjusted. After positioning the cursor, the value may be entered numerically. Pressing ENTER moves on to the next parameter.

```
Horner Electric Operator Interface Unit Setup Utility  V3.42   OIU157
 FP #       m            b       precision DP   FLOATING POINT SCALE SET-UP
  0       .02442         0           2     .        Integer data can be scaled
  1       5              2           1     .     internally by the OIU using
  2       1              0           0     .     the formula:  Y=mX+b, where
  3       1              0           0     .     X=raw data and Y=displayed
  4       1              0           0     .     floating point value.
  5       1              0           0     .        m and b are floating-point
  6       1              0           0     .     numbers with up to 8 signif-
  7       1              0           0     .     icant digits.
  8       1              0           0     .        The precision specifies
  9       1              0           0     .     the number of decimal places
 10       1              0           0     .     (0-8) to display.
 11       1              0           0     .        DP is the decimal point
 12       1              0           0     .     character (. or ,).
 13       1              0           0     .   ESC = Main Menu
 14       1              0           0     .
 15       1              0           0     .   Numerically enter this scale's
 16       1              0           0     .   multiplier, up to 8 digits, sign
 17       1              0           0     .   and decimal point, then press
 18       1              0           0     .   ENTER.  Use arrow keys to move.
```

Figure 5-13. Floating Point Parameters Screen

```
Horner Electric Operator Interface Unit Setup Utility  V3.42   OIU157

                                              FILE MENU

                                         F1  = Read Disk File
                                         F2  = Read Remote OIU
                                         F3  = Write Disk File
                                         F4  = Write Remote OIU
                                         F5  = Print
                                         F6  = Set up Serial port(s)
                                         F7  = Set PLC CPU Address




                                         ESC = Main Menu

                                            Press a function key
                                                    or
                                              ESC to quit...
```

Figure 5-14. File Utilities Menu

5.15   File Menu

From the File Menu, OIU configurations may be saved to disk, loaded from disk, downloaded to the OIU, and printed
to a printer. It also has menu items for setting up the OIU serial ports, and setting SNP IDs (if applicable).

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Read Disk File, Write Disk File. When performing any file function, the user can specify which configuration information to read or write. This is specified from the File sub-menu, which is automatically displayed when any one of the first 5 File Menu functions are selected. After selecting the "Read Disk File" or "Write Disk File" menu item, the File Sub-Menu displays a list of configuration parameters on the screen. Each parameter has a YES/NO box, which may be set by the user to determine which items are uploaded/downloaded. The default is all parameters read/written. For further flexibility, the user may specify the range of custom screens to be read/written.

After specifying the configuration parameters, the software prompts the user to enter a path and file name. The file name must be a legal DOS file name. After entering the path and filename, the OIU will attempt to read/write the file.

Read Remote OIU, Write Remote OIU. When performing uploads/downloads to the OIU, the user will once again have the option of specifying which parameters are uploaded/downloaded. After specifying the configuration parameters the OIU will attempt to communicate with the OIU. If it is unsuccessful, it will display the message, "no communications with OIU". If it is successful the upload/download will be performed, and a status line will indicate which parameters are being uploaded/downloaded as it occurs.

```
┌─────────────────────────────────────────────────────────────────┐
│ Horner Electric Operator Interface Unit Setup Utility  V3.42   OIU157 │
│┌───────────────────────────┬───────────────────────────────────┐│
││                           │          FILE SUB-MENU            ││
││                           ├───────────────────────────────────┤│
││                           │ F1  = Read   Screen Data  [YES]   ││
││                           │ F2  =              [  0] to [249]  ││
││                           │ F3  = Read   Text Tables  [YES]   ││
││                           │ F4  = Read   Fkey Data    [YES]   ││
││                           │ F5  = Read   High Screen  [YES]   ││
││                           │ F6  = Read   Passwords    [YES]   ││
││                           │ F7  = Read   Misc Regs    [YES]   ││
││                           │ F8  = Read   OIU Clock    [YES]   ││
││                           │ F9  = Read   Auto/Ser/CPU[YES]    ││
││                           │ F10 = Read   FP Scales    [YES]   ││
││                           │                                   ││
││                           │ ENT = Begin transfer              ││
││                           │                                   ││
││                           │ ESC = File Menu                   ││
││                           ├───────────────────────────────────┤│
││                           │       Configure the items to be   ││
││                           │    transferred, use F2 to limit   ││
││                           │        the range of screens.      ││
││                           │    Press ENTER to begin transfer. ││
│└───────────────────────────┴───────────────────────────────────┘│
└─────────────────────────────────────────────────────────────────┘
```

Figure 5-15. The File Sub-Menu

Print Menu. To make a printout of the OIU configuration, the Print menu item may be selected. After selecting which parameters are to be printed, the software prints the information to the printer residing at LPT1:. If the printer is not connected to the LPT1: printer port, the MODE command must be issued in from the DOS prompt to re-route LPT1: to another port. See your DOS manual for details on the MODE command. Also, the configuration may also be printed to a file instead of a printer.
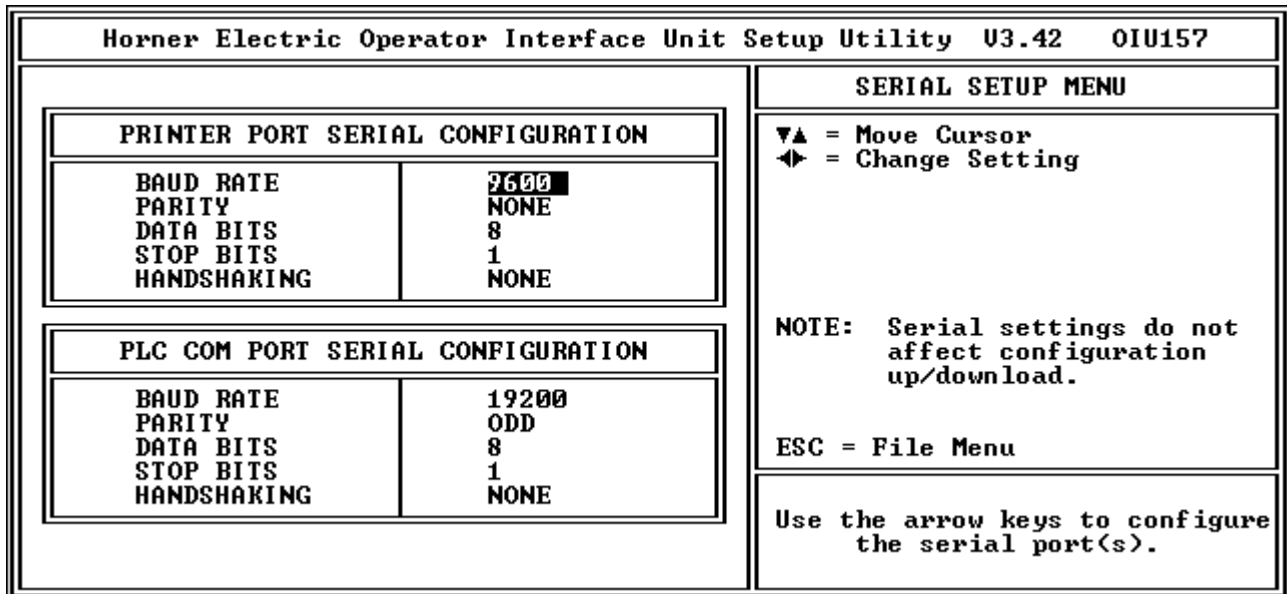
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```
┌──────────────────────────────────────────────────────────────────────┐
│   Horner Electric Operator Interface Unit Setup Utility  V3.42   OIU157 │
│ ┌──────────────────────────────────────────┐ ┌─────────────────────────┐│
│ │                                          │ │    SERIAL SETUP MENU     ││
│ │ ┌──────────────────────────────────────┐ │ ├─────────────────────────┤│
│ │ │  PRINTER PORT SERIAL CONFIGURATION   │ │ │ ▼▲ = Move Cursor         ││
│ │ │                                      │ │ │ ◄► = Change Setting      ││
│ │ │   BAUD RATE          9600            │ │ │                          ││
│ │ │   PARITY             NONE            │ │ │                          ││
│ │ │   DATA BITS          8               │ │ │                          ││
│ │ │   STOP BITS          1               │ │ │                          ││
│ │ │   HANDSHAKING        NONE            │ │ │                          ││
│ │ └──────────────────────────────────────┘ │ │ NOTE:  Serial settings do not ││
│ │ ┌──────────────────────────────────────┐ │ │        affect configuration ││
│ │ │  PLC COM PORT SERIAL CONFIGURATION   │ │ │        up/download.      ││
│ │ │                                      │ │ │                          ││
│ │ │   BAUD RATE          19200           │ │ │ ESC = File Menu          ││
│ │ │   PARITY             ODD             │ │ ├─────────────────────────┤│
│ │ │   DATA BITS          8               │ │ │ Use the arrow keys to configure ││
│ │ │   STOP BITS          1               │ │ │     the serial port(s).  ││
│ │ │   HANDSHAKING        NONE            │ │ │                          ││
│ │ └──────────────────────────────────────┘ │ └─────────────────────────┘│
│ └──────────────────────────────────────────┘                            │
└──────────────────────────────────────────────────────────────────────┘
```

Figure 5-16. Serial Setup Menu

Serial Ports Menu. The serial ports menu allows the user to configure the communications parameters for the OIUs RS-422 communications port (if present) and RS-232 printer port. The UP and DOWN arrow keys are used to position the cursor on the parameter to be modified, and the LEFT and RIGHT arrow keys toggle through the available choices.

CPU Address Menu. The SNP CPU addresses may be entered by first positioning the cursor with the UP and DOWN keys, and then keying in the string. To modify an address, the Backspace key may be used. The OIU protocol (SNP or SNPX) may be selected using the SPACE Bar. Optimization may be set using the TAB key. It may be set for "OIU" (optimum response time) or "PLC" (optimum PLC scan rate).
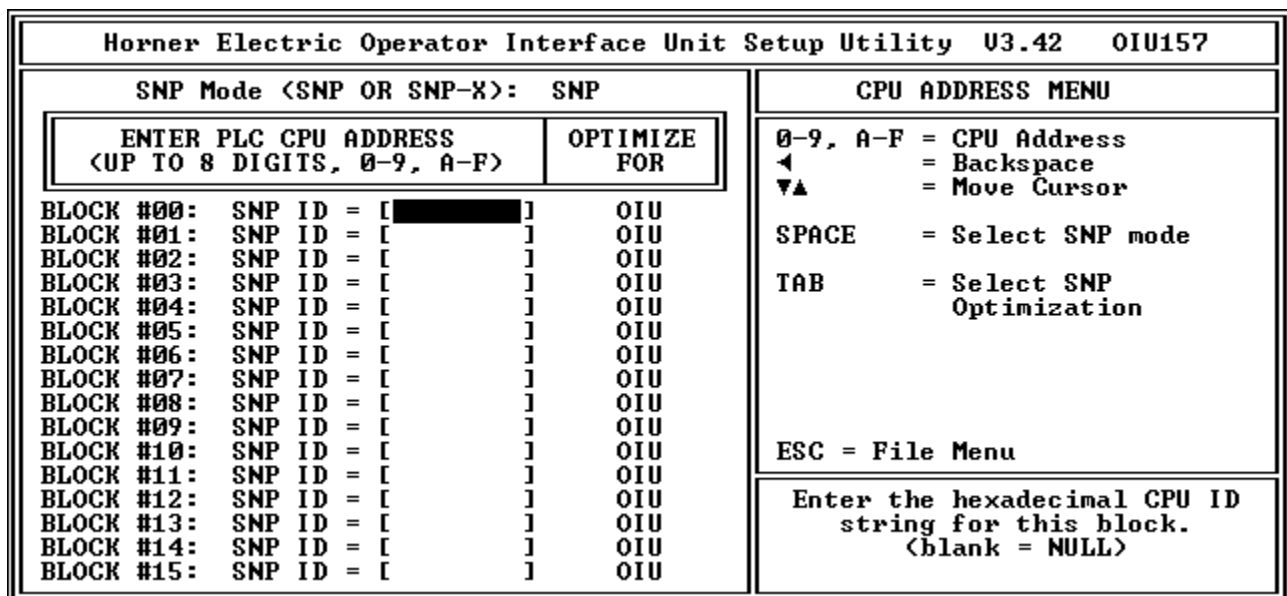
```
┌──────────────────────────────────────────────────────────────────────┐
│   Horner Electric Operator Interface Unit Setup Utility  V3.42   OIU157 │
│ ┌──────────────────────────────────────────┐ ┌─────────────────────────┐│
│ │ SNP Mode (SNP OR SNP-X):   SNP           │ │    CPU ADDRESS MENU      ││
│ │ ┌────────────────────────┬─────────────┐ │ ├─────────────────────────┤│
│ │ │   ENTER PLC CPU ADDRESS │  OPTIMIZE   │ │ │ 0-9, A-F = CPU Address   ││
│ │ │ (UP TO 8 DIGITS, 0-9, A-F)│   FOR     │ │ │ ◄        = Backspace     ││
│ │ ├────────────────────────┴─────────────┤ │ │ ▼▲       = Move Cursor   ││
│ │ │ BLOCK #00:  SNP ID = [        ]   OIU │ │ │                          ││
│ │ │ BLOCK #01:  SNP ID = [        ]   OIU │ │ │ SPACE    = Select SNP mode ││
│ │ │ BLOCK #02:  SNP ID = [        ]   OIU │ │ │                          ││
│ │ │ BLOCK #03:  SNP ID = [        ]   OIU │ │ │ TAB      = Select SNP    ││
│ │ │ BLOCK #04:  SNP ID = [        ]   OIU │ │ │            Optimization  ││
│ │ │ BLOCK #05:  SNP ID = [        ]   OIU │ │ │                          ││
│ │ │ BLOCK #06:  SNP ID = [        ]   OIU │ │ │                          ││
│ │ │ BLOCK #07:  SNP ID = [        ]   OIU │ │ │                          ││
│ │ │ BLOCK #08:  SNP ID = [        ]   OIU │ │ │                          ││
│ │ │ BLOCK #09:  SNP ID = [        ]   OIU │ │ │                          ││
│ │ │ BLOCK #10:  SNP ID = [        ]   OIU │ │ │ ESC = File Menu          ││
│ │ │ BLOCK #11:  SNP ID = [        ]   OIU │ │ ├─────────────────────────┤│
│ │ │ BLOCK #12:  SNP ID = [        ]   OIU │ │ │ Enter the hexadecimal CPU ID ││
│ │ │ BLOCK #13:  SNP ID = [        ]   OIU │ │ │    string for this block.││
│ │ │ BLOCK #14:  SNP ID = [        ]   OIU │ │ │      (blank = NULL)      ││
│ │ │ BLOCK #15:  SNP ID = [        ]   OIU │ │ │                          ││
│ │ └──────────────────────────────────────┘ │ └─────────────────────────┘│
│ └──────────────────────────────────────────┘                            │
└──────────────────────────────────────────────────────────────────────┘
```

Figure 5-17. The SNP CPU Address Screen

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```
┌─────────────────────────────────────────┐
│     CHAPTER 6: AUTORUN MODE              │
└─────────────────────────────────────────┘
```

This chapter describes, step by step, the operation of the OIUs during Autorun mode. As previously described, Autorun mode is the mode in which the OIU is placed when it is put into service. During Autorun mode the Operator has the ability to monitor data, change data, use function keys, etc. depending upon the configuration established during Setup mode by the system designer.

The Autorun operation of OIUs featuring numeric keypads varies significantly from units without numeric keypads. For that reason, the Autorun operation of these different OIU styles will be discussed separately in this chapter.

KEYPAD A	KEYPAD B	KEYPAD C	KEYPAD D
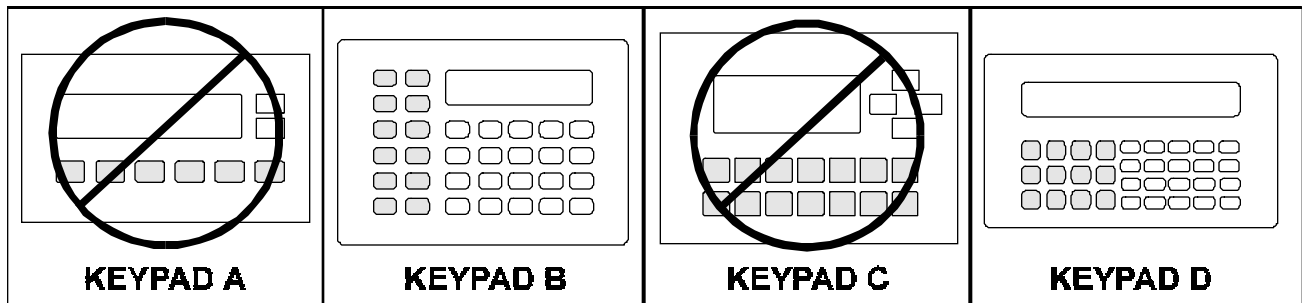
SECTION A -- UNITS WITH NUMERIC KEYPADS

6A.1   Changing Screens

The Operator may select the screen for display from the keypad. However, screen access is limited to the screens at or below the high user screen number. The high user screen number is set by the system designer during Setup mode, and is detailed in Chapter 2.

To scroll through the available screens, the UP and/or DOWN arrow keys may be used. For instance, if the high user screen number is set at 25, the operator may scroll through screens 0-25 by using the UP and DOWN arrow keys. The screens will "wrap around" when the highest or lowest screen number is encountered.

Screens may also be accessed directly by using the MODE key. When the MODE key is pressed during Autorun mode, the OIU displays the following message:

```
┌─────────────────────────┐
│ Change to mode          │
│ (0 to 25):       0      │
└─────────────────────────┘
```

The screens available for direct access are also limited by the high user screen number. In the screen above, the high user screen number is 25, so the operator may directly select any of screens 0-25. To select the screen, the operator may directly key in the screen number, followed by ENTER. The OIU will then switch to that screen.

If a screen above the high user screen number is selected by the Operator, the OIU displays the following message:

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```
Enter Password:
```

If the Operator has access to either the Level 1 or Level 2 password, the password may be keyed in, followed by the ENTER key. While the password is being keyed in, the characters are not shown on the display, but asterisks are shown instead. This provides some security against unauthorized bystanders learning the password. If the incorrect password is entered, a "Wrong Password!" message is displayed, and the OIU returns to the most recent screen. If the correct password is entered, the OIU allows access to the requested screen. When the operator wishes to exit from that screen, pressing the UP arrow key will return the display to screen 0, and pressing the DOWN arrow key will return to the highest unprotected screen. An attempt to directly access another protected screen with the MODE key will require the password be re-entered before access is allowed.

6A.2   Monitoring and/or Changing PLC Data

If the current screen displayed during Autorun mode contains PLC data, the OIU continually updates that data field through communications with the PLC. This is true for both read-only and read-write data fields. Read-only data fields may only be monitored, while read-write data fields may be monitored and changed. In order to change PLC data, the operator must first select the data field to be edited. Selecting the data field is accomplished by pressing the right or left arrow keys, until the data field to be edited is flashing. (If the data field to be edited is the first read-write field on the screen, the right arrow need not be pressed. The data field will automatically begin to flash as soon as the first numeric key is pressed). Once the data field is flashing, it will continue to flash until the new value is entered, or until the keypad is left inactive for 10 seconds. The data value may be edited using any of the methods listed below:

Incrementing/Decrementing a Numeric Value. A flashing numeric data field may be incremented by pressing the UP arrow key, or decremented with the DOWN arrow key. For binary data fields, pressing the UP arrow sets the value to 1, and pressing the DOWN arrow sets the value to 0.

Selecting a Textual "Text Table" Data Field. A flashing field which utilizes the text table base may be edited by pressing the UP and/or DOWN arrow keys to toggle through the available choices.

Directly Entering Numeric Data. A flashing numeric data field may also be entered directly by keying in the new value from the keypad. For negative values, the negative sign is specified by pressing the - key while holding down the SHIFT key.

Directly Entering ASCII Data. When editing a READ/WRITE ASCII-based data field, the alphabetic characters are active on the keypad. For example, the "2" key toggles between A, B, C, and 2.

Once the data value has been set to the desired value, pressing the ENTER key causes the OIU to write the data value to the PLC. After performing the write function, the OIU returns to the task of continually monitoring the data value in the PLC. If the PLC ladder logic is overwriting the data value, the write performed by the OIU will be overwritten by the PLC within 1 scan.

6A.3   Function Key Operation

During Autorun mode, function keys perform the functions which were configured for them during Setup mode by the system designer. This function may include emulating a momentary pushbutton directly with the PLC, performing a "macro" function, or both. If the function key register is utilized, the OIU writes the status of the function keys to a register in the PLC whenever the keypad changes state. If the function key is performing a macro, it will display on the screen the following message:

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```
Executing
Function key...
```

The amount of time that this message is displayed depends upon the complexity of the macro. After performing the function, the OIU will once again display the current screen.

6A.4   Setting the Calendar Clock and Contrast

Pressing the SHIFT and ENTER keys simultaneously brings up a two item menu from which the operator may set the calendar clock or adjust the display contrast. After pressing the SHIFT and ENTER keys, the following is displayed:

```
>Set Clock
 Adjust Display
```

From this menu, the clock and display contrast may be changed, using the same keystrokes described for these menu items in Chapter 4. After setting either the clock or contrast, pressing ENTER returns the OIU to Autorun mode.

6A.5   Exiting Autorun Mode

In order to exit Autorun mode (to enter Setup mode), a special key sequence must be performed. First, the MODE key is pressed to bring up the "screen change" display:

```
Change to mode
(0 to 25):     0
```

From this screen, pressing the ENTER key while holding the SHIFT key will return the OIU to setup mode (if no password exists) or cause the "Enter Password" screen to be displayed:

```
Enter Password:
```

If the proper Level 2 password is entered, the OIU will exit Autorun mode. If the incorrect password is entered, the OIU will return to the current screen in Autorun mode.

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6A.5   FLASH EPROM Corruption Detection

The OIUs have the ability to detect when the OIU Application code has been corrupted. Each time the OIU is powered up, it calculates a checksum based upon the contents of the FLASH EPROM application site. If its calculated checksum does not match that stored within the FLASH, it will display the following message(s):

```
NV-RAM checksum
fault,press f1
```

after F1 is pressed by the operator, a choice of operations is offered, as follow:

```
F1 = ignore error
f2 = erase config
```

If F2 is selected, the unit will display the following message:

```
Initializing nv-ram
please wait...
```

After initialization is complete, the unit is cleared and ready for a new configuration. If the FLASH is unable to be cleared, the following message is display

```
nv-ram failure!!
write protected?
```

The above message indicates that either the NV-RAM protect dip switch is OPEN (see Appendix), or there is a failure of the OIU's FLASH EPROM chip.

If the user chooses to ignore the checksum error fault (by selecting F1, "Ignore Error"), the OIU will either initialize normally, or it will be unable to ignore the fault and will display the following message:

```
Config /firmware
change, press f1
```

This message indicates that a change in the configuration or a firmware change (such as when an OIU's EPROM is updated) has made it impossible to ignore the checksum fault. Pressing F1 at this point will cause the OIU to reinitialize the FLASH EPROM, erasing any application code contained within it. The user will be forced to reload his application program.

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KEYPAD A   KEYPAD B   KEYPAD C   KEYPAD D
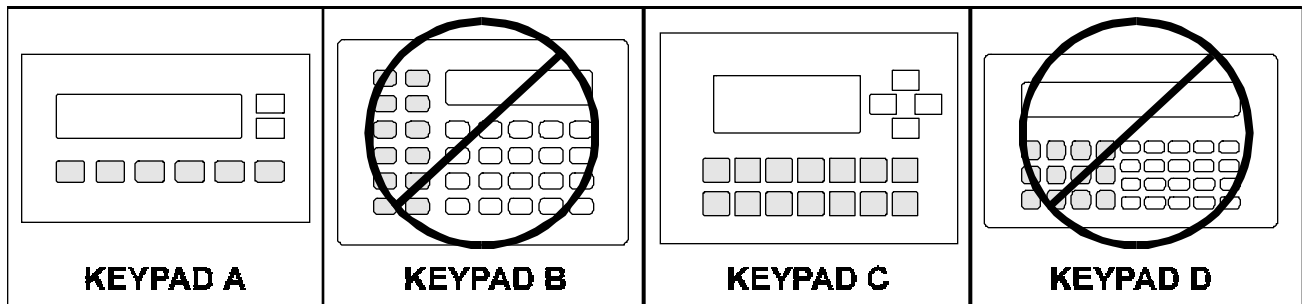
SECTION B --   UNITS WITHOUT NUMERIC KEYPADS

6B.1   Changing Screens

The Operator may select the screen for display from the keypad. However, screen access is limited to the screens at or below the high user screen number. The high user screen number is set by the system designer during Setup mode, and is detailed in Chapter 2.

To scroll through the available screens, the UP and/or DOWN arrow keys may be used. For instance, if the high user screen number is set at 25, the operator may scroll through screens 0-25 by using the UP and DOWN arrow keys. The screens will "wrap around" when the highest or lowest screen number is encountered.

If it is desired to quickly access a particular screen, a function key macro could be programmed to access that screen.

6B.2   Monitoring and/or Changing PLC Data

If the current screen displayed during Autorun mode contains PLC data, the OIU continually updates that data field through communications with the PLC. This is true for both read-only and read-write data fields. Read-only data fields may only be monitored, while read-write data fields may be monitored and changed.

In order to change PLC data, the operator must first select the data field to be edited. Selecting the data field is accomplished by pressing the "Modify / Fast" function key until the data field to be edited is flashing. Once the data field is flashing, it will continue to flash until the keypad is left inactive for 15 seconds, or until a function key configured as "ENTER" is pressed.. The data value may be edited using any of the methods listed below:

Incrementing/Decrementing a Numeric Value. A flashing numeric data field may be incremented by pressing the UP arrow key, or decremented with the DOWN arrow key. The data value is written to the PLC every time it changes. To increment / decrement more quickly, the "Modify / Fast" function key may be pressed while holding down an arrow key. The data field is not written to the PLC until the "Modify / Fast" key is released.

Selecting a Textual "Text Table" Data Field. A flashing field which utilizes the text table base may be edited by pressing the UP and/or DOWN arrow keys to toggle through the available choices.

Directly Entering Numeric Data. Data may **not** be entered directly, unless function keys are configured as numeric keys. Only the OIU277 has enough available function keys to simulate all the numeric keys, as well as the "select next data field" and "ENTER" keys.

After performing the write function, the OIU returns to the task of continually monitoring the data value in the PLC. If the PLC ladder logic is overwriting the data value, the write performed by the OIU will be overwritten by the PLC within 1 scan.

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6B.3   Function Key Operation

During Autorun mode, function keys perform the functions which were configured for them during Setup mode by the system designer. This function may include emulating a momentary pushbutton directly with the PLC, performing a "macro" function, or both. If the function key register is utilized, the OIU writes the status of the function keys to a register in the PLC whenever the keypad changes state. If the function key is performing a macro, it will display on the screen the following message:

```
Executing
Function key...
```

The amount of time that this message is displayed depends upon the complexity of the macro. After performing the function, the OIU will once again display the current screen.

```
CHAPTER 7: APPLICATION EXAMPLES
```

This chapter is dedicated to providing numerous examples illustrating in practice the application of the Operator Interface Units with their many capabilities. Information provided includes a description of the system functions performed by the OIU, and pertinent programming information (OIU setup, ladder logic, etc.).

7.1   Changing Screens with a Function Key

A common usage of an OIU function key is to change to a screen containing a data field which is of particular interest to an operator. This can be accomplished by using either the OIU trigger register feature or the function key macro feature. This example will utilize the OIU's macro feature to allow the function key to switch screens. No PLC ladder logic would be required, but the trigger register, if used, must have a decimal value greater than the highest screen number (usually 250).

Description
Periodically on Machine X, the operator needs to check the air pressure. OIU screen #12 has been configured by the system designer to display the machine air pressure. To display this screen, the operator will press function key F1, which has been configured by the system designer to select screen #12 when pressed.

OIU Configuration
Screen #12 has been configured to read register %R287, and display it with the appropriate descriptive text.

```
SCREEN #  12              CHAR CODE

Air Pressure
  RRR psi

                              [20]
```

```
       DATA FIELD INFORMATION

 BLK |   REGISTER   | BITS  |    BASE
 00  | %R  00287    | 00-15 | +Decimal
 --  | --- -----    | ----- | ----------
 --  | --- -----    | ----- | ----------
 --  | --- -----    | ----- | ----------
```
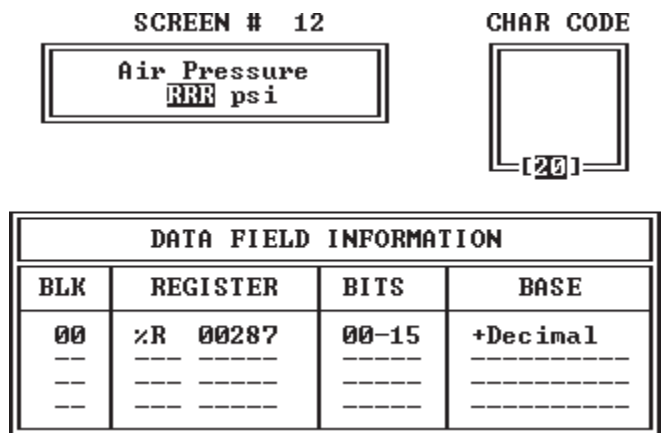
The function key sequence mimics the operations and keystrokes an operator would normally have to press in order to select screen #12 manually. The proper function key sequence is shown below.

```
                KEY:  F1

<Select screen #> 12 <ENTER>
>
```
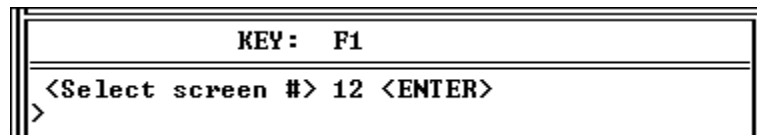
7.2   Emulating a Multi-Position Selector Switch with a Function Key

Function keys, when mapped into I/O space using the "function key register" feature, automatically emulate momentary pushbuttons. Using a simple bit sequencer in ladder logic, function keys may also easily emulate a multi-position selector switch.

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Description

Function key F3 is emulating a 4-position selector switch, by sequencing through bits %M73 - %M76.

%M73	Hand Mode
%M74	Off Mode
%M75	Setup Mode
%M76	Automatic Mode

Each time the machine operator presses F3, the machine toggles between the four modes listed above.

OIU Configuration

The Function Key register is configured for %M1-%M12. Function keys F1 through F12 are mapped to %M1 through %M12, respectively.

```
MISCELLANEOUS REGISTER CONFIGURATION

   FUNCTION       BLK      REGISTER      BITS

 FUNCTION KEY      0     %M   00001      00012
 LED              --     ---  ------     ------
 TRIGGER           0     %R   ------     ------
 CURRENT SCRN      0     %R   ------     ------
 PRINT             0     %R   ------     ------
 PRINT STATUS      0     %R   ------     ------
 CLOCK             0     %R   ------     ------
 EXPANSION        --     ---  ------     ------
 REDUNDANCY       --     ---  ------     ------
 KEYPAD MASK       0     %R   ------     ------
```

Ladder Logic

A bit sequencer is used, which occupies %R1 - %R3. When Function Key F3 is pressed, %M3 is energized, shifting the bit sequencer 1 place. One of bits %M73-%M76 are energized, depending upon the current state of the sequencer.

```
      F3
     ─┤ ├──        BIT_
                    SEQ
   ALW_OFF
     ─┤ ├──        R
                    LEN
   ALW_ON          00003
     ─┤ ├──        DIR


    CONST   ─      STEP
    +00001

    %M0073  ─      ST


                  %R0001
```
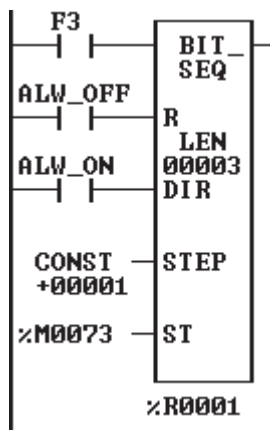
7.3   Enunciating Prioritized Alarms

The OIU may be used as an effective means of enunciating prioritized machine alarms. The following example allows the OIU to easily enunciate 32 prioritized alarms, detected by the PLC.

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Description

The OIU is to be used to enunciate 32 alarm conditions which may occur in Machine X. These alarm conditions are detected by the ladder logic programmed by the system designer. The highest priority active alarm is enunciated by the OIU at any given moment. If no alarm conditions exist, a screen with "System OK" is displayed.

OIU Configuration

Screens 101-132 are configured with descriptive text which describes each of the 32 alarm conditions. The OIU trigger register %R100 is monitored by the OIU, and if the decimal value of %R100 is between 101 and 132, the appropriate alarm screen is displayed. If the value of %R100 is equal to 100, screen number 100, the "System OK" screen is displayed.

```
MISCELLANEOUS REGISTER CONFIGURATION

    FUNCTION      BLK      REGISTER      BITS

  FUNCTION KEY     0     %M  -----      ------
  LED             --     ---  -----     ------
  TRIGGER          0     %R  00100      00-15
  CURRENT SCRN     0     %R  -----      ------
  PRINT            0     %R  -----      ------
  PRINT STATUS     0     %R  -----      ------
  CLOCK            0     %R  -----      ------
  EXPANSION       --     ---  -----     ------
  REDUNDANCY      --     ---  -----     ------
  KEYPAD MASK      0     %R  -----      ------
```

```
SCREEN # 100

        System
          OK
```

```
SCREEN # 101

Alarm #01 Active
```

```
SCREEN # 102

Alarm #02 Active
```

Ladder Logic

The system designer has set aside bits %M1 through %M32 as alarm bits. The most critical alarm condition energizes %M1, the next most critical energizes %M2, and so on until the least important alarm energizes %M32. The rung of logic shown below scans bits %M1-%M32, and the number of the first of those bits to be energized is written to %R99. If no bits are energized, %R99 is set to 0. The ADD function block then adds 100 to %R99 and writes the value to %R100, which is the trigger register. Therefore, if bit %M1 is the first bit on, a value of 101 is written to the trigger register %R100. This will cause the OIU to display screen #101, which will enunciate the alarm condition.

```
ALW_ON
 | |         BIT_                      ADD_
 |-| |-------POS_                      INT
 |           WORD
 ALARM1     IN                 CONST -I1   Q-TRIGGER
 %M0001     LEN                +00100       %R0100
            00002
            POS -%R0099    %R0099 -I2
```
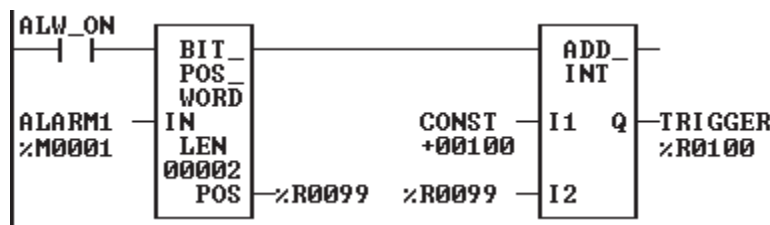
7.4   Prompting Data Entry with the Trigger Register and Function Keys

The trigger register can also be used to force the display of a screen for reasons other than enunciating alarms. A common usage would be to display a screen to the operator, prompting the operator to enter a new value for a machine setpoint.

Description
Machine X has 3 setpoints which must be set by the operator prior to its running in Automatic mode. The operator presses F1, which puts the machine in "Data Entry Mode". The OIU then prompts the user to enter the first setpoint. The data value is keyed in, followed by ENTER. The OIU then prompts the user for the second setpoint, and then finally the third. After the third setpoint has been entered, the machine exits "Data Entry Mode", the OIU displays screen #0 ("Systems OK") and the machine may then be placed in Automatic mode.

OIU Setup
Screens 75, 76, and 77 each contain a data field which is tied to one of the three machine setpoints. The trigger register is configured for %R50, and the function key register is set for %M1 through %M16. Therefore all 12 function keys, as well as SHIFT, CLEAR, MODE, and ENTER keys are mapped into %M1-%M16.

```
┌────────────────────────────────────────────────────┐
│  MISCELLANEOUS  REGISTER  CONFIGURATION             │
│ ┌──────────────┬─────┬──────────────┬──────────┐    │
│ │   FUNCTION   │ BLK │   REGISTER   │   BITS   │    │
│ ├──────────────┼─────┼──────────────┼──────────┤    │
│ │ FUNCTION KEY │  0  │ %M    00001  │  00016   │    │
│ │ LED          │ ──  │ ───   ─────  │  ──────  │    │
│ │ TRIGGER      │  0  │ %R    00050  │  00-15   │    │
│ │ CURRENT SCRN │  0  │ %AI   ─────  │  ──────  │    │
│ │ PRINT        │  0  │ %R    ─────  │  ──────  │    │
│ │ PRINT STATUS │  0  │ %R    ─────  │  ──────  │    │
│ │ CLOCK        │  0  │ %R    ─────  │  ──────  │    │
│ │ EXPANSION    │ ──  │ ───   ─────  │  ──────  │    │
│ │ REDUNDANCY   │ ──  │ ───   ─────  │  ──────  │    │
│ │ KEYPAD MASK  │  0  │ %R    ─────  │  ──────  │    │
│ └──────────────┴─────┴──────────────┴──────────┘    │
└────────────────────────────────────────────────────┘
```

Ladder Logic
The F1 key is pressed by the operator, to set latched coil %M33. Every time the ENTER key is pressed, %M16 is energized. A counter counts the number of times that the ENTER key is pressed by the operator. Initially, the value of the counter is 0. The current count is added to a constant of 75 and written to the trigger register %R50. The initial value of the counter is 0, so the first screen displayed is 75, which will prompt the user to enter the first setpoint. Each time the ENTER key is pressed, the next screen is displayed. After the ENTER key has been pressed a third time, the counter resets, the trigger register is set to a value of 0, and the "Data Entry Mode" latched coil is reset.

```
   F1                                                              ENTRYMD
 ──┤ ├──────────────────────────────────────────────────────────────(S)──

  ENTER   ┌──────┐                                                 ENTRYMD
 ──┤ ├────│→UPCTR│                           ┌──────┐                 (R)──
          │      │                           │MOVE_ │
 ENTRYMD  │      │                           │ INT  │
 ──┤/├────│R     │                           │      │
          │      │         CONST ───────────│IN   Q│─TRIGGER
  CONST ──│PV    │         +00000            │LEN   │  %R0050
  +00003  │      │                           │00001 │
          └──────┘                           └──────┘
           COUNT
```

```
 ENTRYMD   ┌──────┐
 ──┤ ├─────│ADD_  │──
           │ INT  │
  COUNT ───│I1   Q│─TRIGGER
           │      │
  CONST ───│I2    │
  +00075   └──────┘
```
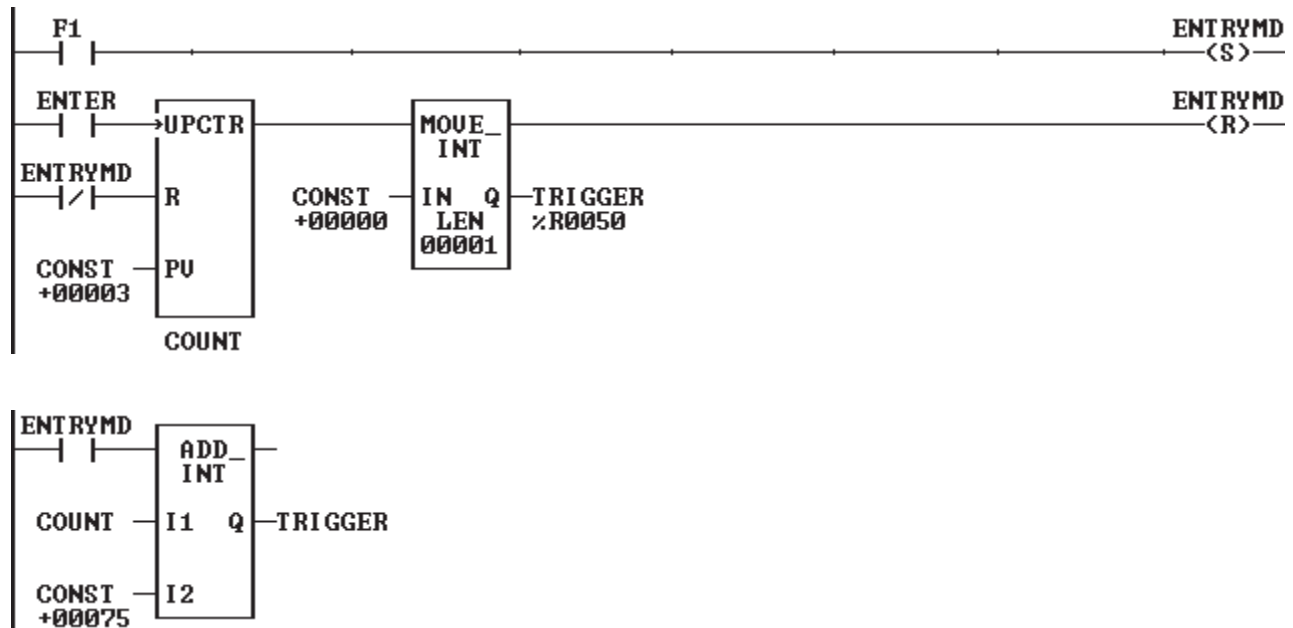
7.5   Printing Hourly Production Data

One potential application for the OIU's serial printing capabilities is to log production data on a periodic basis. Printing is accomplished in the OIU by formatting a screen to be printed, and triggering its printing using the printer register.

Description
Company X's production supervisor must log the production count on an hourly basis on all the machines in his assigned area. Because of the amount of time it takes to log the count for all the machines, the counts are all taken over a 5 minute span. More exact data recording would take the count on each machine at exactly the same time. In order to accomplish this, OIUs mounted on the machines will print the production count at exactly the top of the hour to serial printers. The production supervisor can then log the data from the printer when it is convenient.

OIU Setup
Screen #201 is configured with the text, data, and printer codes to be printed each hour. Descriptive text, time and production count will be printed, followed by a number of spaces and carriage return and line feed. The carriage return and line feed characters are special extended characters. It is important that the carriage return and line feed are placed as the last two characters on the screen, so that the print head will be positioned at exactly the first position of the next line for the next printed entry.

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```
┌─────────────────────────────────────────────────────┐
│        MISCELLANEOUS REGISTER CONFIGURATION           │
├──────────────────┬───────┬──────────────────┬─────────┤
│     FUNCTION      │  BLK  │     REGISTER     │  BITS   │
├──────────────────┼───────┼──────────────────┼─────────┤
│ FUNCTION KEY      │   0   │ %M   ------      │ ------  │
│ LED               │  --   │ ---  ------      │ ------  │
│ TRIGGER           │   0   │ %R   ------      │ ------  │
│ CURRENT SCRN      │   0   │ %AI  ------      │ ------  │
│ PRINT             │   0   │ %R   00079       │ 00-15   │
│ PRINT STATUS      │   0   │ %R   00080       │ 00-15   │
│ CLOCK             │   0   │ %R   00011       │ ------  │
│ EXPANSION         │  --   │ ---  ------      │ ------  │
│ REDUNDANCY        │  --   │ ---  ------      │ ------  │
│ KEYPAD MASK       │   0   │ %R   ------      │ ------  │
└──────────────────┴───────┴──────────────────┴─────────┘
```

SCREEN # 201

```
┌─────────────────────┐
│Machine X Prod Count │
│ RR:RR   RRRRRR    ◄▼ │
└─────────────────────┘
```

```
┌───────────────────────────────────────────┐
│          DATA FIELD INFORMATION            │
├───────┬──────────────┬─────────┬───────────┤
│  BLK  │   REGISTER    │  BITS   │   BASE    │
├───────┼──────────────┼─────────┼───────────┤
│  00   │ %R   00011    │ 00-15   │ Hex       │
│  00   │ %R   00012    │ 00-15   │ Hex       │
│  00   │ %R   01000    │ 00-15   │ +Decimal  │
│  --   │ ---  -----    │ ------  │ --------- │
└───────┴──────────────┴─────────┴───────────┘
```

```
CHAR CODE        CHAR CODE
┌─────────┐      ┌─────────┐
│  CAR.   │      │  LINE   │
│  RETN   │      │  FEED   │
│ =[0D]=  │      │ =[0A]=  │
└─────────┘      └─────────┘
```

The print register and print status register are configured as %R79 and %R80, respectively. The clock register is configured as %R11, so time and date information will be written to %R11-%R17.

Ladder Logic
The ladder logic triggers screen #201 to be printed by detecting a change in the register containing the hour (%R11). It accomplishes this by storing the hour of the current scan, and comparing it to the hour register on the next scan. When an hour change is detected, the "print active" coil latches in, and decimal 201 is written to the print register. As soon as the print status register is equal to 201 (meaning the screen has been successfully printed), a value of 250 is written to the print register and print status register. The print active coil is then reset.

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```
ALW_ON     ┌──────┐                                                    %M0050
──┤ ├──────┤ NE_  │──────────────────────────────────────────────────( S )──
           │ INT  │
           │      │
  HOUR   ──┤I1   Q│
  %R0011    │      │
           │      │
 LAST_HR ──┤I2    │
  %R0010    └──────┘


%M0050     ┌──────┐                      ┌──────┐                      %M0050
──┤ ├──────┤MOVE_ │──────────────────────┤ EQ_  │          ┌──────┐    ( R )──
           │ INT  │                      │ INT  │          │MOVE_ │
           │      │                      │      │          │ INT  │
 CONST   ──┤IN   Q│── PRINT    CONST   ──┤I1   Q│──────────┤      │
 +00201    │ LEN  │   %R0079   +00201    │      │  CONST ──┤IN   Q│── PRINT
           │00001 │                      │      │  +00250  │ LEN  │   %R0079
           └──────┘            STATUS  ──┤I2    │          │00002 │
                               %R0080    └──────┘          └──────┘


ALW_ON     ┌──────┐
──┤ ├──────┤MOVE_ │
           │ INT  │
           │      │
  HOUR   ──┤IN   Q│── LAST_HR
  %R0011    │ LEN  │   %R0010
           │00001 │
           └──────┘
```
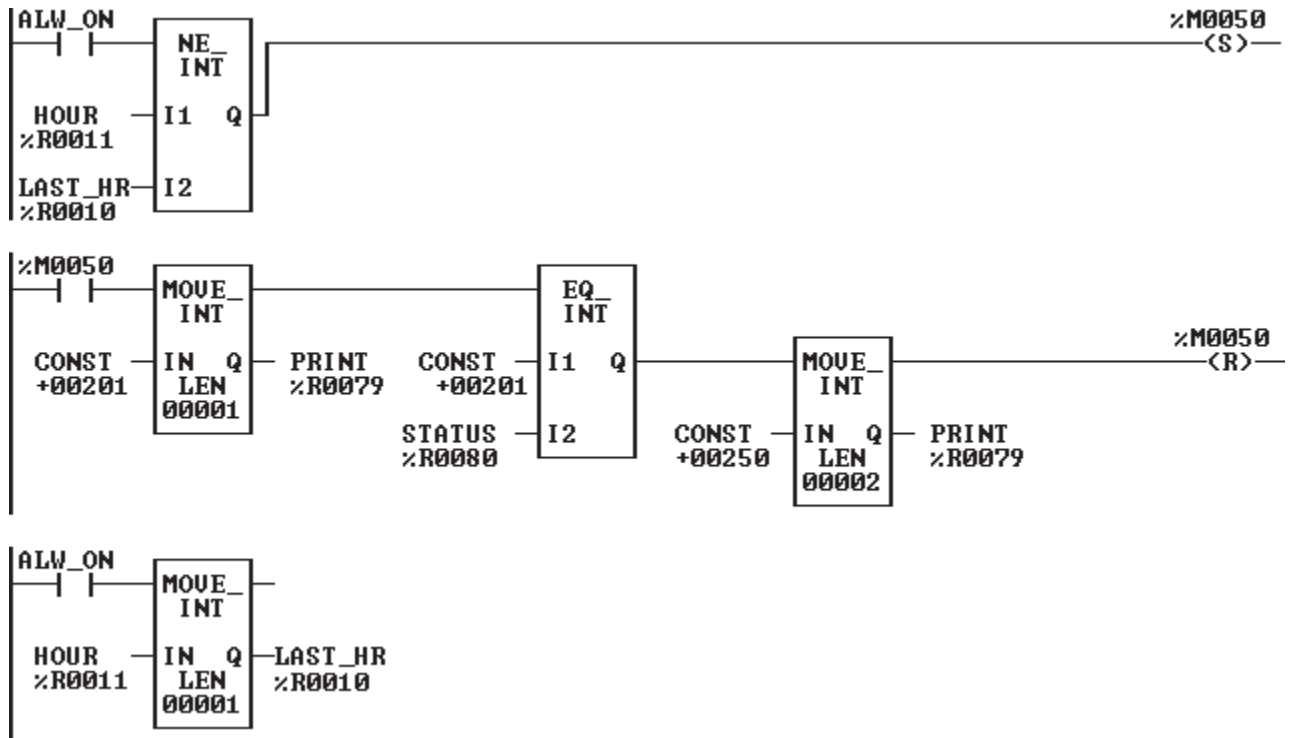
> **APPENDIX A: INSTALLATION INFORMATION**

This appendix lists all the pertinent installation information for each of the OIU model numbers. Panel installation, power connection, dip switch settings, communications diagrams, etc.

A.1   Mounting

A.2   Providing Power

A.3   Communications Wiring

A.4   Placing the Module Into Service

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Mounting

A1.1   Mounting Requirements

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

A.   Cut the host panel as described in the coresponding drawing below:

B.   Remove the rear cover by removing the four (4) [OIU057,327,357,and 367] or five (5)
          [OIU157,177, and 277] screws holding it in place.

C.   Insert the OIU through the panel cutout (from the front). The gasket material should lie
          between the host panel and the OIU panel.

D.   Install four (4) [OIU057,157,177, or 277] or six (6) [OIU327,357 and 367] #6-32
          hex nuts on the four mounting studs of the OIU. Tighten these nuts until the gasket material
          forms a tight seal. Do not overtighten.

E.   Replace the rear cover screws which secure it to the OIU.

F.   Connect the communications and/or printer cables to the OIU serial ports.

Panel Cutout for HE693OIU057

6.8750
[175mm]

[127mm] 5.0000

4.6250 [117.5mm]

[4.8mm]
0.1875

0.1875   [4.8mm]

7.2500

[184mm]

0.1875

[4.8mm]
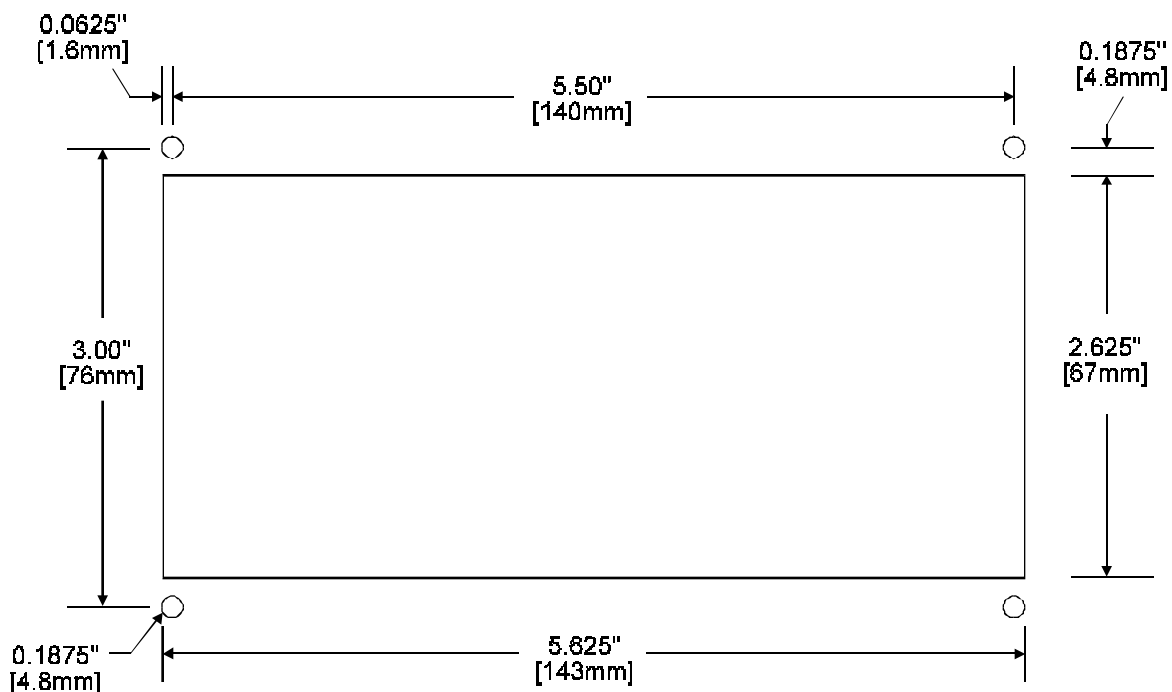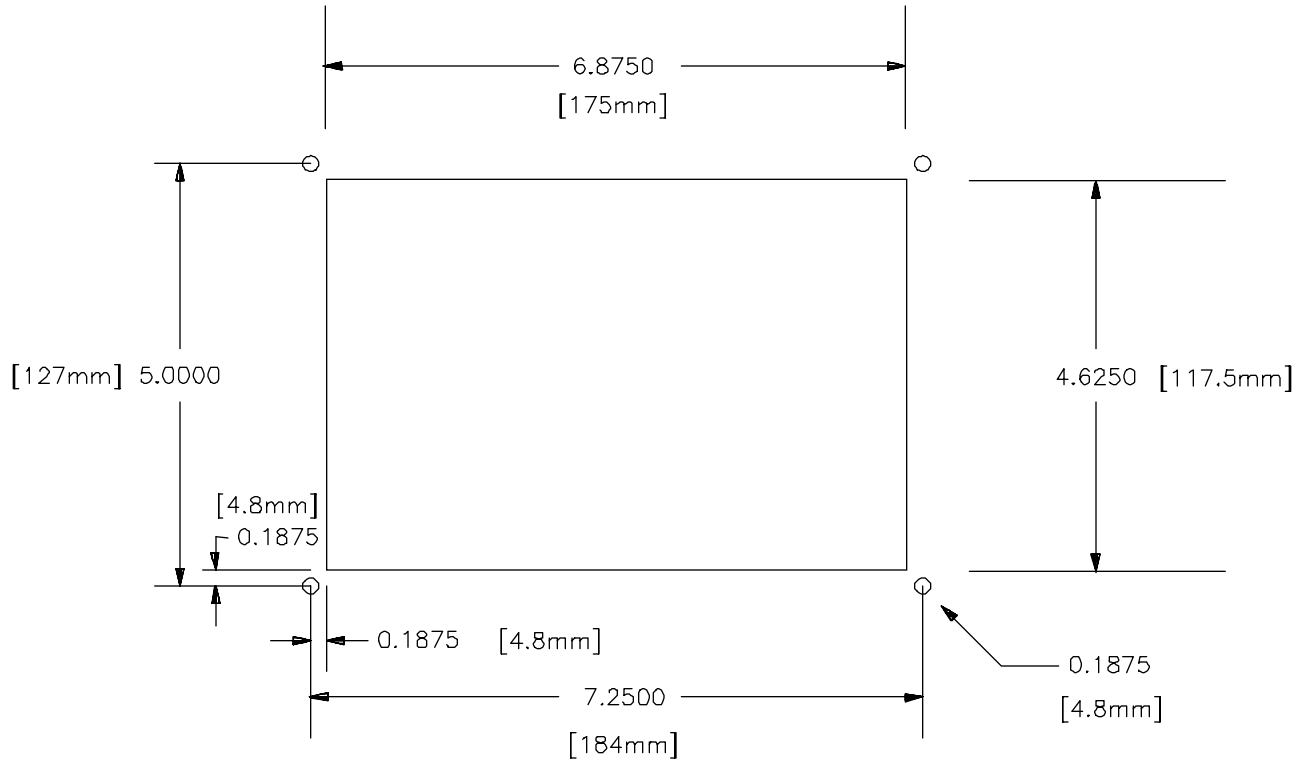
**Panel Cutout for HE693OIU157, OIU177,
and OIU277**

[4mm]
.156
(6 PLCS.)

[276mm]
10.8750

[4.8mm]
0.1875

0.1875

[4.8mm]

[168mm]

6.6250

[159mm]

6.2500

[143mm]
5.6250

[143mm]
5.6250
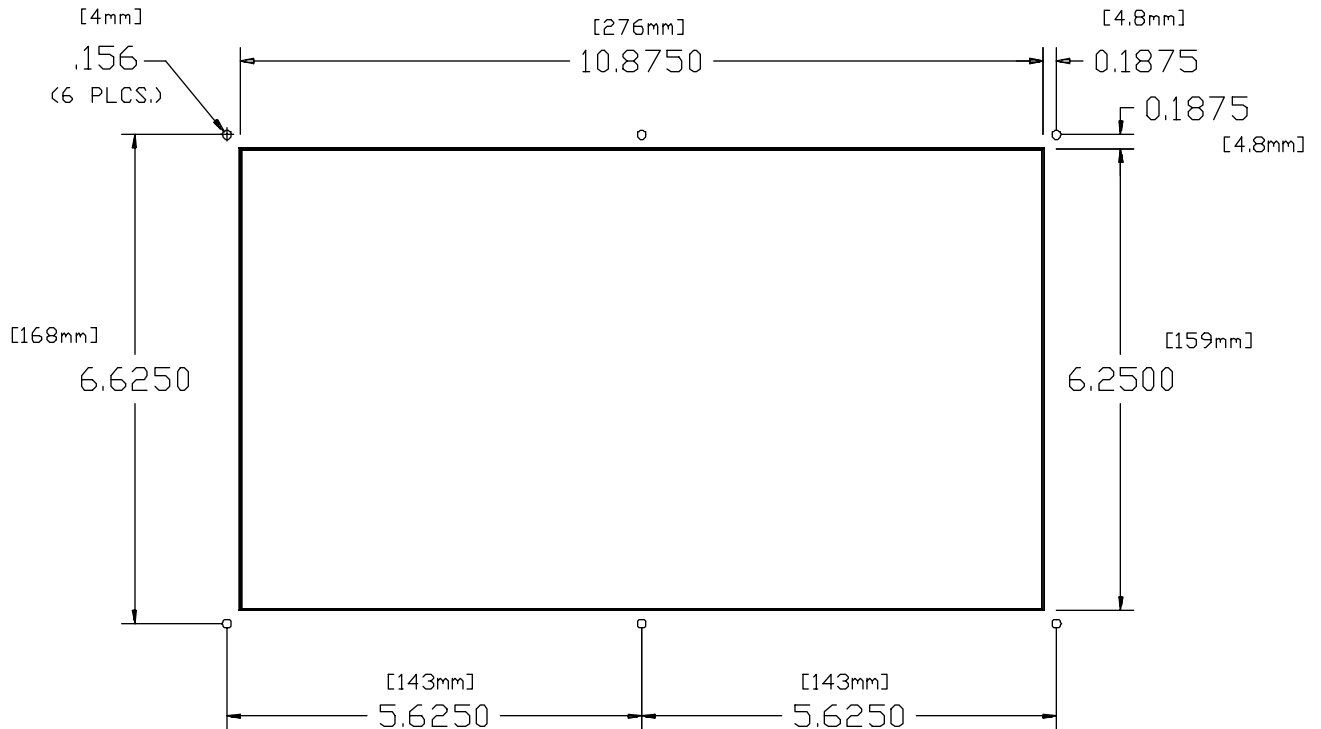
Panel Cutout for HE693OIU327, OIU357, and OIU367

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Providing Power

Power Requirements for the HE693OIU057 and HE693OIU157

The power that must be provided to Horner Electric Operator Interfaces varies by model and option. At the lower end of the product line, the OIU057 and OIU157 are powered by 5V. This power may be obtained from the Series 90 Programming Port (SNP port pin 5) or from an external power supply. If either of the standard six foot communications cables (HE693CBL150 or HE693CBL250) are used, these OIUs will draw their power from the Series 90 PLC Programming Port. If these OIUs are to be located more than 10 feet from the PLC, an external power supply must be used. This power supply should be connected to pins 5 (+5VDC) and 7 (GND) of the OIU's 15-pin RS-422 port, and should be located within 10 feet of the OIU.

Optionally, the OIU057 and OIU157 may be powered from 9-32VDC, when the (-24) suffix is added to the part number. The most typical voltage range used in this case is 24VDC. Due to the higher voltage levels, these units may be located a considerable distance from the power supply.
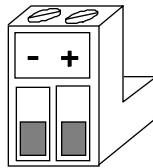
Power Connection for HE693OIU057-24
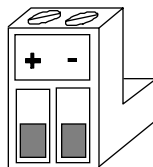
Power Connection for the HE693OIU157-24

Power Requirements for the HE693OIU177 and HE693OIU277

The OIU177 and OIU277 units, which feature vacuum fluorescent displays must be powered from 9-32V DC. The OIU177 can be jumpered so that it is powered from 5VDC, but this is typically not recommended due to the current draw required at that voltage.
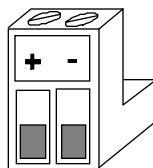
Power Connection for the HE693OIU177 and HE693OIU277

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Power Requirements for the HE693OIU327 and HE693OIU357

The OIU327 and OIU357 units require AC power, standard. They accept a wide range AC input, 85-267VAC, 40-440 Hz.

Power Connection for the HE693OIU327 and HE693OIU357

These units may optionally be DC powered, from 9-32VDC, with a (-24) suffix added to the part number. This power must be supplied to the three position removable terminal strip mounted on the rear cover of the OIU. The terminal connection is as follows:
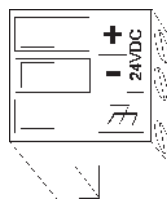
Power Connection for the HE693OIU327-24 and HE693OIU357-24

For OIU Current Draw Specifications, See Page 1-4

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Communications Wiring

A3.1   PLC Communications Wiring

All of the OIUs described in this manual communicate with the PLC through their RS-422/485 port. The exception to this is the OIU367 model, which connects to the PLC through its RS-232 port. The OIUs can connect to the PLC through either the Programming Port or one of the CMM Module's Communications Ports.

This section of the appendix describes (among other things) the necessary cable connections which are required for successful communications. Two factory built communications cables are available from Horner Electric for connection between OIU RS-422/485 port and the PLC Programming Port. The HE693CBL150 is a six foot cable of standard duty, which can be utilized in industrial environments of medium harshness. The HE693CBL250 is a heavy duty six foot cable, which should be used in harsh industrial environments. When in doubt, the HE693CBL250 should be used, despite its greater cost.

If the application precludes the use of a factory built cable, the diagrams listed here can be used to guide custom cable construction. High quality cable and connectors should be used. Communications cables are a common entry point for electrical noise, so proper care should be placed in their construction and placement. For RS-422/485 cabling, shielded, twisted pairs wiring should be employed

A3.2   Installation Considerations

In addition to construction, proper cable routing is of utmost importance. Communications cabling should be routed away from high power and I/O wiring, as electrical noise from these conductors can be induced upon the communications cabling. Proper shielding of the cabling is critical, and the shield must be landed to a good earth ground at one or both ends. In some installations, grounding the shield at both ends provides superior noise shunting. However, this practice could lead to unwanted circulating currents (ground loops) if the two grounds are of differing potential. For long distance cabling, it is generally safer to ground the shield at one end only.

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A3.3 Communications Cables for the OIU057 and the OIU157
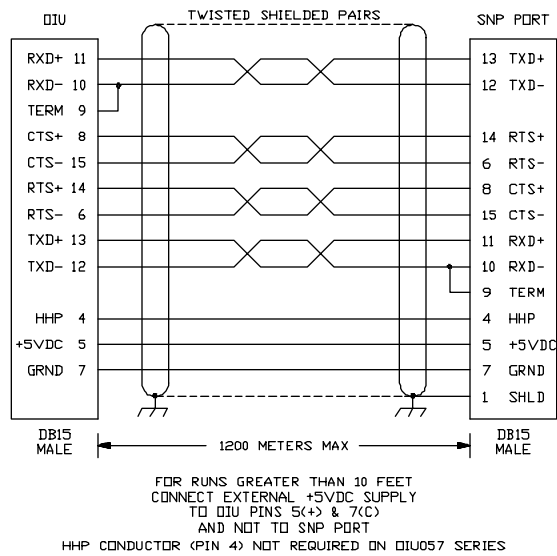
OIU057 and OIU157 to Series 90 SNP Port

OIU057 and OIU157 to GE Fanuc Communications Module (CMM) RS-422 Port 2

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OIU057 and OIU157 to GE Fanuc Communications Module (CMM) RS-232 Port 1

The above cabling requires the use of a Horner Electric RS-422/485 to RS-232 converter, part number HE693SNP232. This is a compact "mini-converter" which requires 5V power for proper operation. This power must be provided to pins 5 and 7 of the RS-422/485 side of the converter. The 5V power supply must be located within 10 feet of the converter.

A3.4   Communications Cables for the OIU057-24, OIU157-24, OIU177, OIU277, OIU327, OIU327-24, OIU357 and OIU357-24

OIU to Series 90 SNP Port

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OIU to GE Fanuc Communications Module (CMM) RS-422 Port 2

OIU to GE Fanuc Communications Module (CMM) RS-232 Port 1

The above cabling requires the use of a Horner Electric RS-422/485 to RS-232 converter, part number HE693SNP232. This is a compact "mini-converter" which requires 5V power for proper operation. The OIU models described in this section have the capacity, when jumpered properly, to provide the 5V to the miniconverter when it is directly connected to the OIU. For proper jumpering, see **Section A3.6, "Providing Power to the Miniconverter"**.

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A3.5   Communications Cables for the OIU367 and OIU367-24
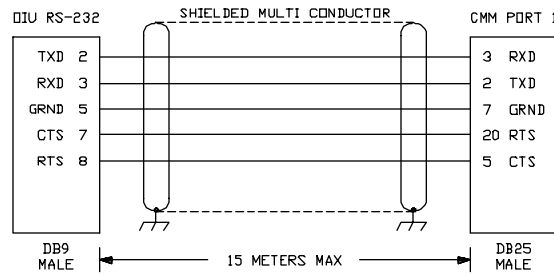
OIU to GE Fanuc Communications Module (CMM) RS-232 Port 1

A3.6   Providing Power to the Miniconverter

When communicating from the OIU RS-422/485 port to the CMM Module RS-232 port (port 1), a Horner Electric SNP Adapter (HE693SNP232) is employed. The SNP Adapter, otherwise known as a miniconverter, requires 5V for proper operation. This 5V can be provided by the OIU, through proper jumpering. The following diagrams show the jumper settings required for the various OIU models.

Keep in mind that when the OIU is providing power to its RS-422/485 port, it is critical that it not be connected to any device providing power to that port (such as the PLC programming port). The PLC programming port provides power to the same pin as the OIU, and equipment damage to the OIU and/or PLC will result.
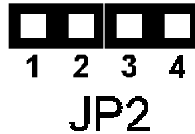
OIU057-24 Jumper Setting to Provide +5V to the RS-422/485 Port
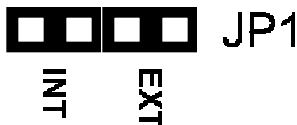
OIU157-24 & OIU177 Jumper Setting to Provide +5V to the RS-422/485 Port
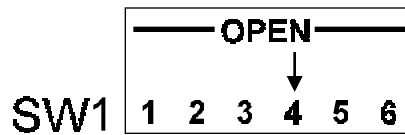
OIU277 Dip Switch Setting (Switch 4 Closed) to Provide +5V to the RS-422/485 Port

OIU327, OIU327-24, OIU357, OIU357-24 Jumper Setting to Provide +5V to the RS-422/485 Port

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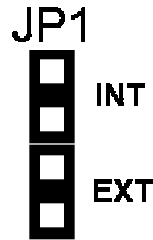
OIU367, OIU367-24 Jumper Setting to Provide +5V to the RS-422/485 Port

The OIU367 and OIU367-24, which communicate to the PLC via their RS-232 port, can utilize a miniconverter to connect an RS-232 serial printer to their RS-422/485 port. The jumpering arrangement to provide 5V for the miniconverter power is shown in the diagram above.

A3.7   RS-232 Communications Wiring

The OIUs feature an RS-232 port for connection to a personal computer (for programming the OIU) or a serial printer. The exception to this is the OIU367 and OIU367-24, which utilize the RS-232 port for PLC communications. Wiring diagrams for the RS-232 ports (except for the OIU367 and OIU367-24) are shown below. Shielded, multiple pair wire should be used. Note that for serial printers, pinouts vary. Check the user's manual provided with the serial printer for verification of pinout.
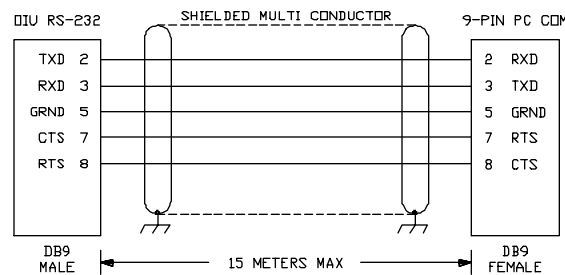
OIU RS-232 port to 9-pin personal computer serial port.
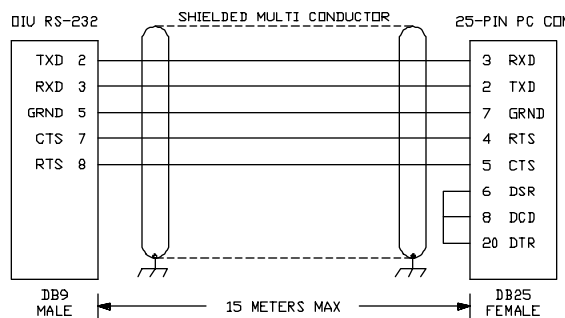
OIU RS-232 port to 25-pin personal computer serial port.

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```
OIU RS-232          SHIELDED MULTI CONDUCTOR        25-PIN MODEM

   TXD  2                                            2  RXD
   RXD  3                                            3  TXD
   GRND 5                                            7  GRND
   CTS  7                                            5  RTS
   RTS  8                                            4  CTS

   DB9                                               DB25
   MALE      |◄─────── 15 METERS MAX ───────►|      FEMALE
```
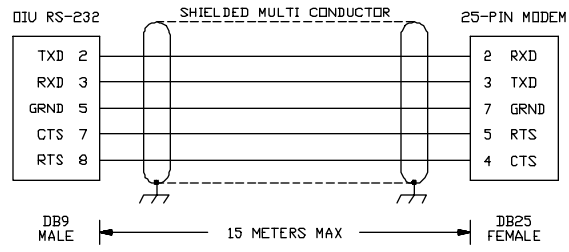
OIU RS-232 port to Typical Serial Printer (check pinout on your printer).

Placing the OIU into Service

A4.1   General Considerations

Even though the OIUs have been designed for use in industrial environments, the installation of the unit has a huge impact on its immunity to noise. A number of considerations must be made when placing the OIU into service to ensure years of reliable operation. A listing of some of these considerations follows:

Secure Physical Mounting
The OIU should be securely mounted, isolated from severe vibration.

Ground the OIU Chassis
The OIU chassis should be connected to a good earth ground. This connection should be made to one of the OIU's four or six mounting studs. These studs provide a direct connection to the OIU chassis, to which all OIU printed circuit board earth ground connections are made. Generally, with the OIU chassis grounded electrical noise can be effectively shunted to earth ground.

Install the OIU Rear Cover
The OIU's steel rear cover provides important protection agains RF (radio frequency) interference.

Use a Properly Constructed Communications Cable
Great care should be made in the construction of the communications cable connecting the OIU to the PLC. For details on cable construction, see Section A.3, Communications.

Ground the Communications Cable Shield
Proper attention should be paid to the proper grounding of the communications cable shield. Without proper shield grounding, the shield typically acts as an antenna, increasing the amount of noise induced upon the cable.

Route Communications Cable Properly
Make sure that the communications cable is routed away from higher voltage wiring. Communications cable should be routed in conduit or wireway containing only communications or low energy signals. Be especially careful to route around traditionally noisy electrical components such as motor starters, solenoids, drives, inverters, etc. These components can inductively couple electrical noise onto the communications wiring.

Route Power Wiring Properly
When using OIUs using 24V or 120/240VAC power, route the OIU power conductors away from noise inducing electrical components and wiring.

Protect the OIU Application Memory
When placed into service, the OIUs can be placed into a mode which makes it impossible (barring component failure) for the OIU application program to be overwritten or corrupted. A dip switch or jumper (see the appropriate diagram) must be set to protect the FLASH EPROM or EEPROM integrated circuit chip. It is very important that this protection be implemented, or noise transients could corrupt the program.

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Memory Protected   **Memory Not Protected**

JP5   JP5

□ 1   ■ 1
■ 2   ■ 2
■ 3   □ 3

OIU057, OIU057-24 Memory Protect Jumper Arrangement

OPEN

SW1 | 1 2 3 4 5 6
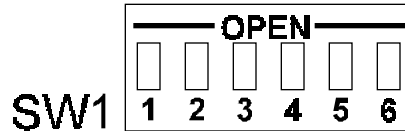
Dip Switch 1, present on OIU157, OIU157-24, OIU177, OIU277, OIU327, OIU327-24, OIU357, OIU357-24, OIU367, and OIU367-24

Switch #	Name	Definition when Closed	Default
1	**NVE**	**Memory Not Protected**	**Closed**
2	NVD	Always Closed	Closed
3	NVF	NV-RAM is 32K FLASH	Closed
4	C64	System EPROM size 64K	Closed
5	WDE	Watchdog Timer Enabled	Closed
6	SW6	Always Closed	Closed

**Dip Switch 1 Settings on OIU157 and OIU157-24.
Switch #1 should be OPENed when placing the module into service.**

Switch #	Name	Definition when Closed	Default
1	**NVE**	**Memory Not Protected**	**Closed**
2	NVD	Always Closed	Closed
3	NVF	NV-RAM is 32K FLASH	Closed
4	PWR	+5V Output at RS-485 Port	Open
5	WDE	Watchdog Timer Enabled	Closed
6	SW6	Always Closed	Closed

**Dip Switch 1 Settings on OIU277.
Switch #1 should be OPENed when placing the module into service.**

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Switch #	Name	Definition when Closed	Default
1	**NVE**	**Memory Not Protected**	**Closed**
2	NVD	Always Closed	Closed
3	NVF	NV-RAM is 32K FLASH	Closed
4	C64	System EPROM size 64K	Closed
5	WDE	Watchdog Timer Enabled	Closed
6	SW6	U.S./ Japanese Character Set	Closed

Dip Switch 1 Settings for the OIU327, OIU327-24, OIU357, OIU357-24, OIU367, and OIU367-24.
Switch #1 should be OPENed when placing the module into service.

A4.2   Series 90 CPU Configuration

Before attempting communications between the OIU and the Series 90 CPU, the Series 90 CPU must be configured with the first two levels of password protection disabled. This will allow the OIU to read and write to/from the PLC I/O table. Password Levels 3 and 4, as well as OEM Protection, do not effect the operation of the OIU.

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HORNER
APG

26 January 2000

Revision pages for

Horner APG's Release 3.4 Operator Interface Units Manual, First Edition

for HE693OIU057, HE693OIU157, HE693OIU177, HE693OIU277, HE693OIU327, HE693OIU357, and HE693OIU367, Revision B or later.

Attached to this cover page are revisions for the **Release 3.4 Operator Interface Units User Manual** dated 12-10-1997.

THESE REVISED REQUIREMENTS ARE NOW IN EFFECT.

New and revised pages may be issued periodically. For user manual updates, please contact Horner APG, Technical Support Division, at (317) 916-4274 or visit our website at www.heapg.com.

Revision Key
Changes to text, tables or graphics contained in the attached revision are indicated as follows:

1. **Added text is underlined.**
2. **Deleted text is lined through.**
3. **New, revised, or deleted items are specified as such in ( ).**

List of Effective Pages

*The most current user manual consists of the following list of effective pages including the attached revision pages: * Denotes new or revised pages*

Page   **Date**

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(REVISED. Reflects name change from Horner Electric, Inc. to Horner APG, LLC.)

PREFACE

This manual explains how to use the Horner APG Operator Interface Units for use with the GE Fanuc Series 90 and CEGELEC Alspa 8000 family of Programmable Logic Controllers.

Information in this document is subject to change without notice and does not represent a commitment on the part of Horner APG, LLC.

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LIMITED WARRANTY AND LIMITATION OF LIABILITY

Horner APG,LLC ("HE-APG") warrants to the original purchaser that the Operator Interface Unit Module manufactured by HE-APG is free from defects in material and workmanship under normal use and service. The obligation of HE-APG under this warranty shall be limited to the repair or exchange of any part or parts which may prove defective under normal use and service within two (2) years from the date of manufacture or eighteen (18) months from the date of installation by the original purchaser whichever occurs first, such defect to be disclosed to the satisfaction of HE-APG after examination by HE-APG of the allegedly defective part or parts. THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR USE AND OF ALL OTHER OBLIGATIONS OR LIABILITIES AND HE-APG NEITHER ASSUMES, NOR AUTHORIZES ANY OTHER PERSON TO ASSUME FOR HE-APG, ANY OTHER LIABILITY IN CONNECTION WITH THE SALE OF THIS Operator Interface Unit Module. THIS WARRANTY SHALL NOT APPLY TO THIS Operator Interface Unit Module OR ANY PART THEREOF WHICH HAS BEEN SUBJECT TO ACCIDENT, NEGLIGENCE, ALTERATION, ABUSE, OR MISUSE. HE-APG MAKES NO WARRANTY WHATSOEVER IN RESPECT TO ACCESSORIES OR PARTS NOT SUPPLIED BY HE-APG. THE TERM "ORIGINAL PURCHASER", AS USED IN THIS WARRANTY, SHALL BE DEEMED TO MEAN THAT PERSON FOR WHOM THE Operator Interface Unit Module IS ORIGINALLY INSTALLED. THIS WARRANTY SHALL APPLY ONLY WITHIN THE BOUNDARIES OF THE CONTINENTAL UNITED STATES.

In no event, whether as a result of breach of contract, warranty, tort (including negligence) or otherwise, shall HE-APG or its suppliers be liable of any special, consequential, incidental or penal damages including, but not limited to, loss of profit or revenues, loss of use of the products or any associated equipment, damage to associated equipment, cost of capital, cost of substitute products, facilities, services or replacement power, down time costs, or claims of original purchaser's customers for such damages.

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ABOUT PROGRAMMING EXAMPLES

Any example programs and program segments in this manual or provided on accompanying diskettes are included solely for illustrative purposes. Due to the many variables and requirements associated with any particular installation, Horner APG cannot assume responsibility or liability for actual use based on examples and diagrams. It is the sole responsibility of the system designer utilizing the Operator Interface Unit Module to appropriately design the end system, to appropriately integrate the Operator Interface Unit Module 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.

Note: The programming examples shown in this manual are for illustrative purposes only. Proper machine operation is the sole responsibility of the system integrator.

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(REVISED)

CHAPTER 3 (CONTINUED)

CHAPTER 4: THE KEYPAD SETUP MENU

(Table of Contents revised 26 January 2000.)

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CHAPTER 1: INTRODUCTION

(REVISED - Reflects name change from Horner Electric, Inc. to Horner APG, LLC.)

Congratulations on your purchase of a Horner ~~Electric~~ APG Operator Interface Unit (OIU).~~!~~ The ~~Horner Electric~~ Operator Interfaces can provide a valuable window into your GE Fanuc Programmable Controller or Genius Distributed I/O application.

1.1   Why an Operator Interface Unit?

Programmable Logic Controllers offer industrial users an incredibly flexible electrical control system. The ability of the PLC to allow users to make significant changes in machine operation without the need for extensive rewiring has been long appreciated, in large and small PLCs alike. In addition to machine control, other areas of PLC integration have not been as fully utilized. One under-utilized area, especially with smaller systems, is the PLC's diagnostic and data handling capabilities. These capabilities must be accessed via a PLC's human interface, or Man Machine Interface (MMI). With the proper MMI, PLC information can be readily available to a machine operator, allowing PLCs to be used as a valuable tool for machine diagnostics, operational prompting, data logging, etc.

With small PLC systems in particular, cost is a large consideration. Traditionally, cost barriers have limited the useage of advanced MMIs with small PLCs. The MMIs most commonly used with PLCs are non-flexible hard-wired pushbuttons, pilot lights, and thumbwheel switches. These systems are fairly low in cost, but are inflexible and offer little diagnostics or other capabilities.

A modern Operator Interface Unit (OIU) however, can provide even users of small PLCs with a powerful, flexible, cost-effective instrument for PLC data access.

> With a Horner APG ~~Electric~~ Operator Interface Unit you can:

> 1.   Monitor and/or change machine setpoint and other data,

> 2.   Replace up to 12 non-critical hard-wired pushbuttons,

> 3.   Enunciate machine alarm conditions as detected by the PLC,

> 4.   Prompt operators with the proper machine operation sequence,

> 5.   Log machine alarms and/or data to a serial printer.

~~Horner Electric~~ The OIUs have the versatility to perform all of the above functions, yet are easy to set up and use.

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1.2   Why a Horner ~~Electric~~ Operator Interface Unit?

At Horner APG, ~~Electric~~ we specialize in products which complement GE Fanuc PLC products such as the Series 90 PLCs and Genius Distributed I/O System. Because we specialize, we are able to focus on providing Operator Interface Products which are designed to take full advantage of some of the unique characteristics of a GE Fanuc PLC product.

As a result of our specialization, we have developed considerable expertise with GE Fanuc PLC products. Our staff not only understands operator interface operation and data access, but has a thorough understanding of the PLC backplane, I/O bus, and Series 90 ladder logic programming. This wealth of knowledge and experience is unique among GE Fanuc Operator Interface manufacturers, and allows our technical staff to provide you with excellent technical suppport

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1.3   About this Manual

This manual describes the operation of Horner APG's Electric's Release 3.4 Operator Interface Units for SNP Protocol. The Release 3.4 firmware incorporates some new OIU functions, which take advantage of recent additions in GE Fanuc PLC product features. It also expands upon some previously available OIU functions, making them more flexible and easier to integrate. The Release 3.4 OIU firmware allows complete backward compatibility with the Release 3 OIUs, labeled as version "A" (OIU157A, OIU177A, etc.).

This manual takes a unique approach to describing the operation of the OIUs. As opposed to separate manuals for each OIU model, all OIUs are described in a single manual. This is possible because all Release 3.4 OIUs are programmed exactly alike, with identical keypad operation and software configuration. Also, instead of a simply describing "which keys to press" feature-by-feature, we are attempting to describe the usefulness of each feature and how it might be integrated into your control system as well as the necessary details. This attention to the "big picture" will make it easier to choose and integrate the particular OIU capabilities, which will most effectively enhance your control system.

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1.4   OIU Revision Levels

Revision "A" Units

The first Release 3 Operator Interfaces, these units were first released in April 1993. The models available included the OIU157A, OIU177A, OIU327A, OIU357A, OIU367A, and OIU907A. The firmware revision level of these units remained 3.30 without modification from April 1993 to November 1994. The OIU configuration software for this revision is Version 3.3 of "OIUCFG.EXE".

Revision "B" Units

This is a firmware only upgrade of the Revision "A" units. The "B" firmware version is 3.40, with "OIUCFG.exe" configuration software Version 3.4. Upgrade kits are available from Horner APG Electric to upgrade Revision "A" units to Revision "B". These kits consist of an EPROM, floppy diskette, updated manual, and product labels. **Table 1-1** lists many OIU features. An entry of "B/C" in this table indicates a Revision B feature not previously available.

Revision "C" Units

These units are nearly functionally identical to the Revision "B" units, but have significant hardware differences. Because of these hardware differences, these units offer some features not available with Revision A or Revision B units. An entry of "C" in **Table 1-1** indicates a feature only available in a Revision C unit. An entry of "B/C" indicates the feature is available in either Revision B or C.

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1.5   Features

All Horner APG Electric Operator Interface Units allow direct connection to either a Series 90 PLC programming port (via SNP protocol) or to the Genius Distributed I/O network. All OIUs have two serial ports, one for PLC or Genius connection, and an RS-232 port for connection to a personal computer for optional software setup. All OIUs feature an alphanumeric textual display and programmable function keys. This manual describes only the OIUs for SNP communications. Genius OIUs are described in a different publication.

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CHAPTER 2: Screen Utilization

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This chapter describes the concept of Horner APG's ~~Electric's~~ Operator Interface Unit Screens, and how they may be classified and mapped for the most effective use of the OIU resources.

2.1   Concept of "Screens"

The primary function of Horner APG ~~Electric~~ Operator Interface Units is to display text and/or data which is pertinent to the operation of the control system. This text and/or data may be used for the enunciation of machine alarms, the adjustment of machine setpoints, the display of production statistics, etc. The OIUs may be set up with up to 250 stored screens (messages), where a screen consists of 2-lines by 16 or 20 characters, or up to 150 stored screens (messages), where a screen consists of 4-lines by 20 characters, each containing text and/or data. The only restrictions on screen content are:

    1)   Maximum of four (4) fields displaying PLC data per screen.

    2)   Maximum of 32 total characters on a 2 line x 16 character display, or a maximum of 40 total characters on a 2 line x 20 character display, or a maximum of 80 total characters on a 4 line x 20 character display.

Potentially, up to 1000 different PLC data registers could be monitored (250 screens x 4 data fields/screen) by a 2 line version of the OIU, the 4 line versions are limited to 600 total register (150 screens x 4 data fields/screen). The manner in which text and/or data is placed on a screen is totally up to the user. Not all screens must contain data. For example, screens containing machine alarm messages are very likely to be entirely textual, while messages containing an adjustable machine setpoint would likely contain descriptive text <u>and</u> data.

PLC data is displayed by formatting an OIU screen to contain one or more PLC **data fields**. There are two types of data fields, **read-only** data fields, and **read-write** data fields. As stated previously, an individual screen may contain a maximum of four data fields.

When an OIU screen containing register data is being displayed, the OIU constantly reads and displays the current value of that data from the PLC (or Genius). A read-only data field may only be monitored, its value may not be changed by the operator. Read-only data fields are commonly used to display data fields such as temperatures, production counts, etc., which are not to be changed by the user. A read-write data field is also constantly read and displayed by the OIU, but the operator has the ability to change the value of the register data. Read-write data fields are commonly used to display data fields such as machine setpoints, etc. which may be changed by the operator.

2.2   Types of Screens

The system designer may utilize many different "types" of stored screens, that is, screens which are set up by the designer to serve different functions. While the OIU hardware and software does not make distinctions regarding the types of screens used, an effective system designer makes distinctions and plans carefully for the types of screens they will use in an application. Some example types are listed in **Table 2-1.** The types listed in Table 2-1 are examples and are not a complete list. They are listed simply to illustrate how screens may be classified by function, allowing the system designer to plan for a more complete application.

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3.8   Calendar Clock

The OIUs (except the OIU057) come standard with a built-in calendar clock. This feature is useful when used on PLCs such as the 90-20, 90-30 CPU 311, etc. which do not have a built in clock. When enabled, the OIU downloads six registers of time/date information to the PLC at a programmable interval. The content of the six registers, and the available update intervals are listed in the tables below. The time/date data is downloaded to the PLC in BCD format, matching the format used by the Series 90 PLCs which do incorporate a built-in clock of their own (90-30 CPU 331, 90-70, etc.)

Word #	Data Stored	Data Range	Data Type
1	Hour	0-23	BCD
2	Minute	0-59	BCD
3	Day of Week	1-7	BCD
4	Month	1-12	BCD
5	Date	1-31	BCD
6	Year	1990-2089	BCD

Table 3-7. Calendar Clock data format.

Interval
At power-up
Once per Minute
Once per Hour
Once per Day

Table 3-8. Available Calendar Clock update intervals.
(REVISED - Reflects name change from Horner Electric, Inc. to Horner APG, LLC.)

3.9   The LED Register

This feature is available only on some units, such as the OIU357 and OIU367. These OIU models feature 12 LEDs located on the function keys which can be used as indicating lights. The OIU continually monitors a register in the PLC, and the LEDs are lit according to the value of that register. This register is known as the **LED register**. If the LED register is a 1-bit data reference (%M, etc.), 12 consecutive references should be specified. If the LED register is a 16-bit data reference (%R, etc.), the LEDs reflect the status of the 12 least significant bits of the reference.

3.10   The Expansion Register

The **expansion register** feature is available only on OIU models which are equipped with an expansion slot, such as the OIU367. This expansion slot can be filled with custom developed add-on boards for high volume OEMs. The interface to the add-on board is a multiple register interface. Those OEMs who have a special need for the additional functionality that this board can provide (communications, etc.) contact Horner APG ~~Electric~~ to discuss the possibility of custom development.

CHAPTER 4: The KEYPAD SETUP MENU

This chapter describes, step by step, the operation of the OIU from its built-in **Setup Menu**. The purpose of this chapter is to describe to the system designer the necessary keystrokes used to perform various functions from this menu. For a greater understanding of the function or purpose of the OIU features, see Chapter 3, "Application Development". ***OIU models without a numeric keypad do not support the setup menu. These units may only be setup from the OIU configuration software***.

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4.1   Menu Selections

The Setup Menu consists of a number of selections in a single list. Each "selection" is the name of a different configuration screen. Using these configuration screens, the system designer has the capability to completely configure the OIU without additional software or hardware. Normally, however, the Setup Menu is used to make minor modifications to the OIU setup as opposed to creating the application from scratch.

The available menu choices are listed below:

```
>      ~~Access PLC Data~~
>      Cfg Screens
       Cfg Text Tables
       Cfg Func Key
       Cfg Float Scale
       Cfg High Screen
       Cfg Passwords
       Cfg LED Reg
       Cfg Expansion Reg
       Cfg Trigger Reg
       Cfg CPU Address
       Cfg Com Port
       Cfg Prn Port
       Adjust Display
       Set Clock
       Enter AUTORUN
       Hand-held prg
       Run Self Test
```
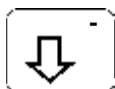**(Section 4.1 revised 26 January 2000.)**

4.2   Key Assignments

During Setup Mode, several keys on the OIU keypad serve different functions than their Autorun functions. These are summarized below:

⬆ (+) and ⬇ (-)   While on the Setup Menu, the up and down arrow keys are Used to move the menu pointer to the desired menu item.

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ENTER   When the menu pointer is pointing at the desired menu item, pressing the ENTER key causes the display to switch to the configuration screen for the selected item.

MODE   The Mode key allows the user to return to the Setup Menu from a configuration screen.

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~~**4.3   Access PLC Data**~~

~~This first selection on the Setup Menu does not perform a configuration function. The "Access PLC Data" screen allows the OIU to display PLC data in a manner which is similar to the Series 90-30 Hand Held Programmer's "Data Access" Mode. This can be useful for qualified engineers or technicians to access any of the Series 90 data table during system setup, troubleshooting, etc.~~

~~After selecting the Access PLC Data menu item, the screen appears as follows:~~

```
Enter Data Type:
00 %R
```

~~The "00" shown on the display is a "block number" which identifies the PLC to be accessed. In a typical point-to-point application, it is always 00. Next to the Block Number is the Reference Type. There are many different data reference types available with the Series 90 and Genius. For a complete list, see Tables 3-2 and 3-3 in Chapter 3.~~

~~Pressing the LEFT and RIGHT arrow keys increments/decrements the Block Number. The UP and DOWN arrows toggle through the available reference types (%R, %AI, %I, %M, etc). Once the desired block number and reference type are displayed, the data address may be keyed in numerically, followed by ENTER. The OIU will then display the current value of the data register selected. Pressing the DEC-HEX-BIN key toggles the base of the displayed data between decimal, hexadecimal, and binary. Pressing the RIGHT arrow key allows the data value to be changed. After pressing the RIGHT arrow key, the data value begins to flash. The new data value may then be keyed in, followed by ENTER. If the PLC program does not contain ladder logic overwriting the data value, the data value will be changed successfully by the OIU. To select another reference to display, press the MODE key. To return to the Setup Menu, press MODE a second time.~~
(Section 4.3 deleted 26 January 2000.)

4.4   Cfg Screens (Configure Screens)

Even though most users use the personal computer configuration software to set up the OIU, it still is possible to set up the OIU completely from the keypad, if desired. This ability is most useful for making minor changes after the unit has been installed. While configuring screens from the keypad, it is recommended that the function key insert be flipped over to reveal the function keys' screen setup functions.

After selecting the Cfg Screens menu item, the user is prompted with the following display:

```
Enter Display:
(0-259)    0
```

To set up screens (displays) from the keypad, the system designer keys in the screen number to be created or edited, followed by ENTER. The screen then appears to go "blank" with a underlining cursor in the first position on the top line.

```
_
```

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Section 4.19 Continued
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being pressed. The user should press each key sequentially, verifying its operation. If a problem apparently exists, contact Horner APG ~~Electric~~. After all keys have been pressed, pressing the SHIFT and ENTER keys simultaneously will move on to the next test.

Contrast Adjustment. At this point, the user may set the contrast, if desired. Typically most users simply leave it adjusted at its maximum setting. Pressing ENTER when complete moves on to the next test.

LED Test (if present). This is the next test for those OIUs which contain LEDs (i.e. OIU357, OIU367, etc.). The LEDs should sequence from 1 to 12 continuously. If they do not, contact Horner APG ~~Electric~~. Pressing ENTER moves on to the next test.

RS-485 Port Test (if present). **This test requires a loopback connector** to be installed on the 15-pin communications port. If the loopback connector is not installed, the unit will enunciate that the test failed, and that no loopback was present. If the loopback connector is installed and the test fails, contact Horner Electric. Pressing ENTER moves on to the next test.

RS-232 Port Test **This test also requires a loopback connector**, this time on the 9-pin RS-232 port. If the loopback connector is not installed, the unit will enunciate that the test failed, and that no loopback was present. If the loopback connector is installed and the test fails, contact Horner APG ~~Electric~~. Pressing ENTER moves on to the next test.

Date/Time Set. The time and/or date maintained in the OIUs memory may be set during the self test. For details on the keystrokes required for setting the time and/or date, see the "Set Clock" menu item earlier in this chapter. Remember that a Real Time Calendar Clock feature is optional with the OIU057 (-CLK suffix).

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**Power Requirements for the HE693OIU327 and HE693OIU357**

The OIU327 and OIU357 units require AC power, standard. They accept a wide range AC input, 85-267VAC, 40-440 Hz.
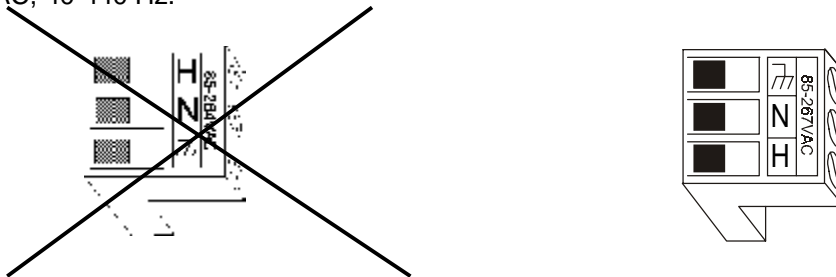
(Graphic revised 26 January 2000)

**Power Connection for the HE693OIU327 and HE693OIU357**

These units may optionally be DC powered, from 9-32VDC, with a (-24) suffix added to the part number. This power must be supplied to the three position removable terminal strip mounted on the rear cover of the OIU. The terminal connection is as follows:
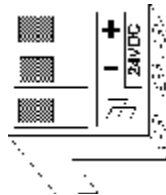
Power Connection for the HE693OIU327-24 and HE693OIU357-24

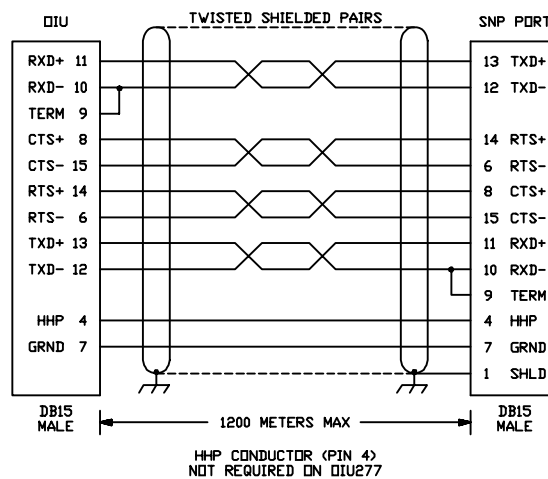**For OIU Current Draw Specifications, See Pages 1-4**
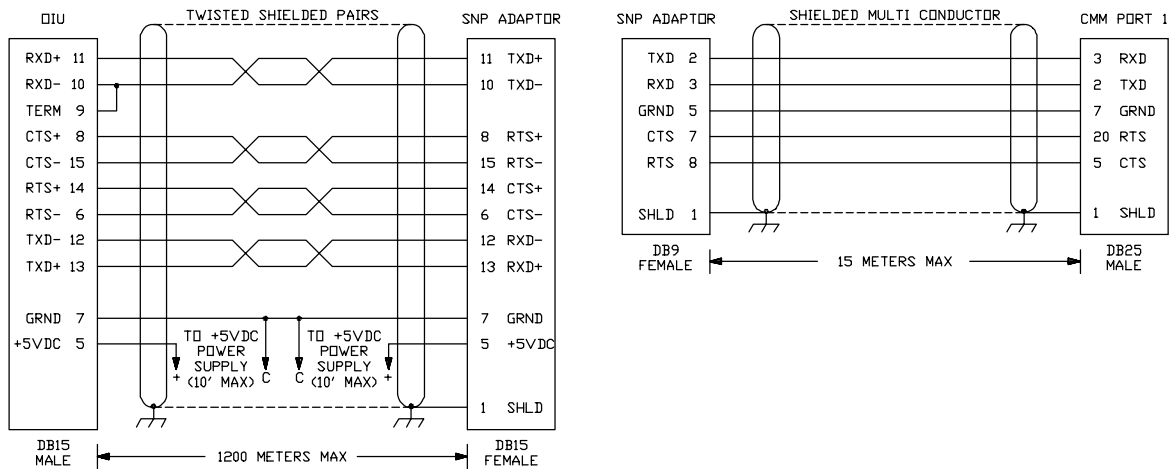
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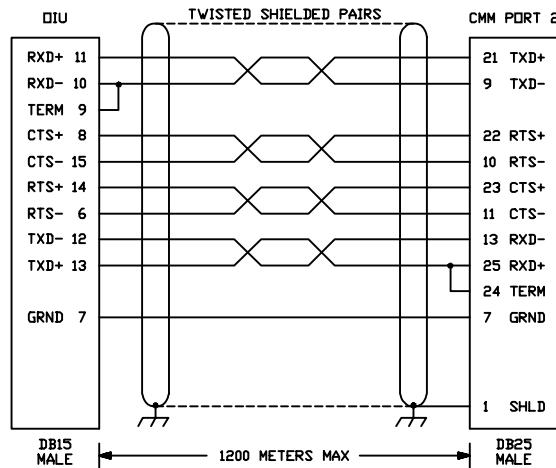**OIU057 and OIU157 to GE Fanuc Communications Module (CMM) RS-232 Port 1**

The above cabling requires the use of a Horner APG ~~Electric~~ RS-422/485 to RS-232 converter, part number HE693SNP232. This is a compact "mini-converter" which requires 5V power for proper operation. This power must be provided to pins 5 and 7 of the RS-422/485 side of the converter. The 5V power supply must be located within 10 feet of the converter.

A3.4   Communications Cables for the OIU057-24, OIU157-24, OIU177, OIU277, OIU327, OIU327-24, OIU357 and OIU357-24
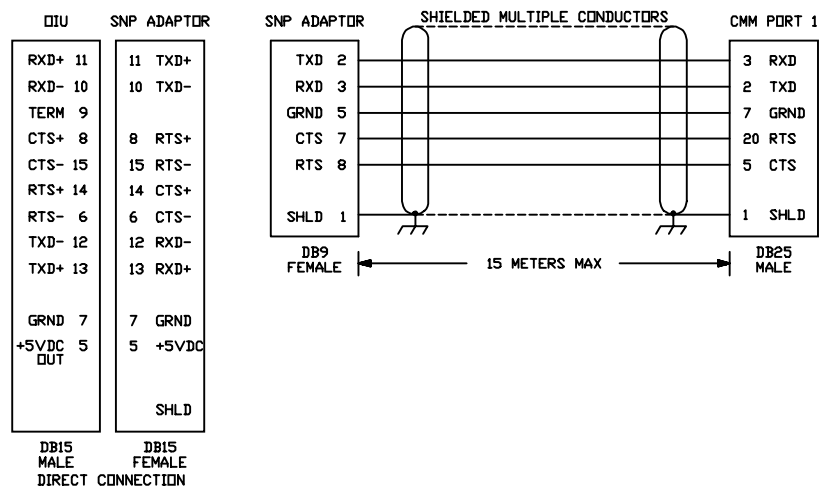

OIU TO Series 90 SNP Port

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OIU to GE Fanuc Communications Module (CMM) RS-422 Port 2

OIU to GE Fanuc Communications Module (CMM) RS-232 Port 1

The above cabling requires the use of a Horner APG Electric RS-422/485 to RS-232 converter, part number HE693SNP232. This is a compact "mini-converter" which requires 5V power for proper operation. The OIU models described in this section have the capacity, when jumpered properly, to provide the 5V to the miniconverter when it is directly connected to the OIU. For proper jumpering, see **Section A3.6, "Providing Power to the Miniconverter"**.