SOI-SPS
PROGRAMMING SOFTWARE

IMPORTANT NOTES

1. READ ALL OF THE INFORMATION CONTAINED IN THIS MANUAL BEFORE YOU INSTALL THE PRODUCT.

2. The information contained in this manual applies to hardware and software version 1.0 or later.

3. This manual assumes a full working knowledge of the relevant PLC.

NOTICE

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Static, Inc.	(800-782-8424)	8000 Series bag
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CONTENTS

CHAPTER 1: USING THIS MANUAL

This manual has been primarily written with the SOI-200 Series product in mind. Most example screens, etc., are based on the SOI-200 Series. This SOI-100 Series product will program and operate in a similar manner to the SOI-200 Series with the exception of a smaller display screen and the addition of function keys.

Read this chapter to familiarize yourself with the rest of the manual. You will learn about:

- Contents of this manual

- Intended audience

- Related publications

Overview of this Manual

This manual provides instructions on how to install and use the SOI-SPS Programming Software.

Chapter Title	Purpose
Using this Manual	Provides an overview of the manual
Installing SOI-SPS	Describes installation of the programming software into your computer.
Running SOI-SPS	Provides a basic overview of how to run the software.
SOI Opening Menu	Describes the functions that can be accessed from the SOI opening menu display.
SOI Configuration Data	Describes the functions available using the SOI Data Configuration screen.
SOI Screen Builder	Describes the SOI-260 Screen Builder screen.
SOI Alarm Screen Builder	Describes the SOI-260 Alarm Builder screen.
SOI-120 Function Key Builder	Describes the SOI-120 Function Key Builder screen.
SOI-260 Background Monitor	Describes the SOI-260 Background Monitor screen.
SOI-260 Print Form Builder	Describes the SOI-260 Print Form Builder screen.
Data Formats	Describes data format options.
Memory Allocation	Lists the amount of memory required for screen and register types.
ASCII Display Characters	Describes how to program supported ASCII characters.
SOI-260 Application Example	Provides an SOI-260 application example
SOI Worksheet	Provides worksheets

Intended Audience

No special knowledge is needed to use the SOI-SPS Programming Software. You should be familiar with the SOI-100 or 200 series products, refer to the User Manual (Publication 0300050-xx and 0300051-xx, respectively).

Related Publications

The table below lists the publications that you may require for additional reference.

Related Publications

Publication / Catalog Number	Title
0300050-xx	SOI-260 User Manual
0300051-xx	SOI-120 User Manual
0300135-xx	SOI-260 Instrinsically Safe User Manual
0300062-xx	Modicon Reference Manual
0300119-xx	Square D (SY/MAX) Reference Manaul
0300129-xx	Siemens (S5 Communications) Reference Manual
0300142-xx	DeviceNet Communications Reference Manual
0300155-xx	Multi-drop ASCII Communications Reference Manual
0300159-xx	Omron HostLink Communications Reference Manual
0300160-xx	TI405 Communications Reference Manual
0300158-xx	IDEC FA-XX Communications Reference Manual

CHAPTER 2: INSTALLING SOI-SPS

Introduction to the SOI-SPS Programming Software

The SOI-SPS Programming Software provides a self-prompting, menu driven package that allows you to create and edit programs that run on the SOI-100 and 200 series Operator Interface products. SOI-SPS does not assume or require any programming knowledge.

SOI-SPS allows the programmer to select between the SOI-100 and 200 series of products. In brief, the SOI-120 product contains a 2x20 LCD display, 8 programmable function keys and may store up to 244 programmed application screens. The SOI-260 contains a 4x20 LCD or VFD display, advanced functionality, real-time clock, printer port and may store up to 240 programmed application screens.

Note: *See SOI-120 User Manual #0300051-xx and SOI-260 User Manual #0300050-xx for additional features and capabilities.*

In addition to selecting the SOI hardware, the programmer selects the PLC protocol being used for a particular application. The protocol choices are available in a menu selection format.

Note: *See the "PLC REFERENCE" appendices for information on the supported PLC's.*

The SOI-100/200 series product and protocol choices are user selectable and are described in further detail later in this chapter.

Hardware Requirements

The following computer hardware is required to run SPS:

- IBM PC/AT™ or 100% compatible

- One 3.5" disk drive

- One fixed (hard) disk drive with 2 MB RAM free.

- 640K of RAM

- DOS™ 3.0 or later

- Serial port at COMM1 or COMM2

- Monochrome or color monitor. Because SPS makes extensive use of color to clarify screen data, a color monitor is highly recommended.

Before installing SPS on any system, be certain to make a backup copy of the supplied SOI-SPS Programming Software disks.

Note: *The SOI-SPS Programming Software disks are not copy protected and may be used to make multiple backups.*

Installing SOI-SPS Programming Software

All files on the SPS diskettes are compressed and unusable unless you execute the INSTALL program. Once installed, SPS contains 3 files:

- **SPS.EXE** SOI Programming Software

- **SPS_CFG.EXE** Utility for changing software license information.

- **SPS_xx.SLB** Operating system for the SOI-100 and -200 series operator interface products.

Note: *Also included on a separate disk are two files - SOI120.EDS and SOI260.EDS. These files are only needed for DeviceNet communication. It is Not necessary to install these files, if a DeviceNet network is not used. Refer to Publication 0300142-xx, DeviceNet Communications Reference Manual.*

During installation, you will be asked to enter your name, company name, and software serial number. You will find the serial number on the warranty registration card.

You may also enter the type of video monitor (color or monochrome) and communications port (1 or 2) on your computer. If a prompt is selected, SPS will prompt you to specify these items each time SPS requires them. Defining these parameters during installation, will save you from redefining them each time you execute SPS.

Installing SOI-SPS Programming Software

Insert the SOI-SPS Programming Software disk (labelled 'Disk 1 of 2') into a diskette drive. Select the drive containing the diskette (A: or B:). Type INSTALL1 at the prompt and press Return. The following is displayed:

```
This program will install SPS Programming Software Version x.xx
 on your computer system and verify the integrity of the
distribution disk(s).

You may press the [Esc] key at anytime to abort the installation.

Each question has a default answer.  If the default answer is correct,
press the ENTER key in response to the question.  Otherwise, type
the answer and then press the ENTER key.

Press [Esc] to quit, any other key to continue ...
```

Press any key to continue.

You will be prompted for the drive you want to install SPS on.

```
On which disk drive do you wish to install
SPS Programming Software?
                              Drive A
                              Drive B
                              Drive C
                              Drive D
                              Drive E
                              Drive F
                              Drive H
                              Drive R
```

The Install program does not allow you to install SOI-SPS Program-ming Software on the same drive that the Install program resides. After you select the drive, the install program will prompt you for the direc-tory to store the SOI-SPS Programming Software files.

**Now you need to specify the disk destination subdirectory.
The subdirectory is the location on your disk where the
SPS Programming Software will be installed.**

**If you don't know what a "subdirectory" is, you probably
need not worry about it, and should press [Enter] for the next
prompt (don't type the quote characters).**

Which subdirectory ([Enter] = \SPS) ?
\SPS

Enter the subdirectory. We recommend that you select the default SPS by pressing Enter.

When the instllation for Disk 1 is complete, follow the on-screen instructions to install Disk 2.

You will then be prompted to enter your name, company name, soft-ware serial number (on registration card), and whether or not the operator is prompted for the monitor type and communication port. In addition, you will have to select which SOI-100 or -200 series operator interface products you are programming. You may choose a specific operator interface product, or you can select the prompt "p" command to prompt the programmer to choose an operator interface product every time SPS is opened.

Please Enter Your Name:
Please Enter Your Company Name:
Please Enter Software Serial Number:

Please Enter Video Type -- Color (C), Mono (M), Prompt User (P):   **P**

Please Enter Comm Port -- SOI200 (2), SOI100 (1), Prompt (P):   **P**

Please Enter Product Series Type -- SOI200 (2), SOI100 (1), Prompt (P):   **P**

After responding to the prompts, the installation is complete. You are then returned to the DOS prompt for your subdirectory C:\SPS>. You are now ready to execute SPS. Entering SPS at this prompt runs the program.

CHAPTER 3: RUNNING SOI-SPS

Program Development

Refer to the following procedures as a guide to efficiently developing your programs.

1. On paper, design all of the operator screens with the associated register numbers, and produce a map of how all the screens are linked together.

2. Construct all of the screens with SPS and save the program file without linking.

3. Link all of the screens that were constructed in Step 2. Use the design from Step 1. When you have established all of the links, save the program file.

4. Set the SOI DIP switch SW1-1 to closed (ON) for Upload/Download mode. The SOI will automatically reset and enter the Upload/Download mode. Connect the SOI to your computer serial port for Upload/Download communications. Download the program file (that you saved in Step 3) to the SOI.

5. Set the SOI DIP switch SW1-1 to open (OFF) to disable the Upload/Download mode. Set the SOI to simulate mode. Test the SOI program operation for screen content and screen flow (linking). Remember that in the Simulate mode all data information is represented as zeros.

   If your program requires changes, return to Step 2.

6. Disable simulate mode using the function key menu. This places your SOI on-line and communicating with the PLC, therefore all data interactions between the SOI and the PLC should be accurate (no simulated zeros). Verify that all entry data at the SOI is being entered to the correct address and in the correct format to the PLC. Verify that the SOI is displaying all PLC data from the correct location and in the correct format.

If communications are not established correctly, check the communications cabling between the SOI and the PLC (refer to SOI-120/-260 User Manual). In addition, check the communications parameters defined at the SOI CONFIGURATION DATA menu. Return to Step 4.

7. Produce a hard copy printout of the program file for documentation requirements.

You can run SPS on ahard drive system. The executable file for the SOI-SPS Programming Software is SPS.EXE.

Hard Disk Systems

The following operations must be performed in the order presented.

To run SPS on a hard disk system:

1. Go to the directory that contains the SOI-SPS Programming Software file (SPS.EXE), type SPS and press ENTER.

Note: *The file with the .SLB extension that was installed must be in the same directory as the file with the .EXE extension. The .SLB file enables operation with the PLC.*

All files that you create are stored in this directory by default.

2. To save program files in a different directory, when the Opening Menu is displayed, select the task you want to perform. You are then prompted for the program file name.

3. Prefix the name of the file with the path information (for example, \mySPS\MYFILE refers to the file MYFILE in the subdirectory mySPS). All programs that you create are stored according to this path.

Note: *The DOS path and file name rules apply to all SPS program file names whenever you select or save a program file.*

Running SOI-SPS Programming Software from Your Default Directory

You can execute SPS from your standard (default) directory. However, when working with files that reside in a directory other than that containing SPS.EXE and the .SLB file, you do risk forgetting to assign the proper path, and possibly overwriting the wrong file.

In order to ensure proper maintenance of program files, you may want to assign SPS program files (files having the .CFG extension) to sub-directories based on some distinguishing feature (such as the type of program or project name).

The Title Screen

When executing the software, the first prompt asks if you are using a color monitor. This prompt does not appear if no monitor prompt was specified during the install. After responding Y or N, the title screen appears. This screen identifies the SPS version and licensed owner.

SOI-100/200 SERIES
PROGRAMMER AND LOADER
Version 1.00

(C) COPYRIGHT SPECTRUM CONTROLS, INC. 1989 THROUGH 1994

This software is licensed to:
John Smith
XYZ Co.
Ser # 12345

Press any key to continue

Once you have reviewed the Title screen and confirmed that everything on the Title screen is accurate, you are ready to begin programming.

Press any key to continue. After a key is pressed, the Product Selection menu appears.

Note: If edits are required in the Title screen, a utility program can be executed in DOS to make modifications. The file for editing is SPS_CFG.exe.

13

SOI-SPS Screen Formats

Before you begin programming, it is important to understand how the SPS menu selection screens and the screen building format were designed. The standard SPS screen format is determined by whether the current operation is a menu selection screen or for screen development. The following information describes how the Screen formatting operates.

Menu Format

All menus are formatted as follows:

```
+-------------------------------------------------+
|                    MENU NAME                    |
+-------------------------------------------------+
|                                                 |
|                   MENU WINDOW                   |
|                                                 |
+-------------------------------------------------+
|                                                 |
|                                                 |
|                OPERATIONS WINDOW                |
|                                                 |
+-------------------------------------------------+
|               INFORMATION WINDOW                |
+-------------------------------------------------+
```

<u>Menu Window</u>

The Menu Window lists the operations available at the current menu. To select one of the operations, highlight the operation and press ENTER.

<u>Operations Windows</u>

The Operations Window displays the keyboard operations available at the current Menu Window.

<u>Information Window</u>

The Information Window displays a brief explanation of each operation available for the selected menu item.

Screen Format

Screen building operations use the following type of display format:

FILE NAME: *(path) filename*.CFG   ___BYTES SCREEN MEMORY USED

EDIT FILE -- SCREEN BUILDER   User Screen #___: *screen type*

Parameters Window

Display Window

Row X, Column X

```
F1               F2
F3  Link Screen  F4  Copy Screen
F5  Insert Time  F6  Insert D
F7  Clear Screen F8  Chang
F9  SAVE         F10 EXIT
```

Control Window

Information Window
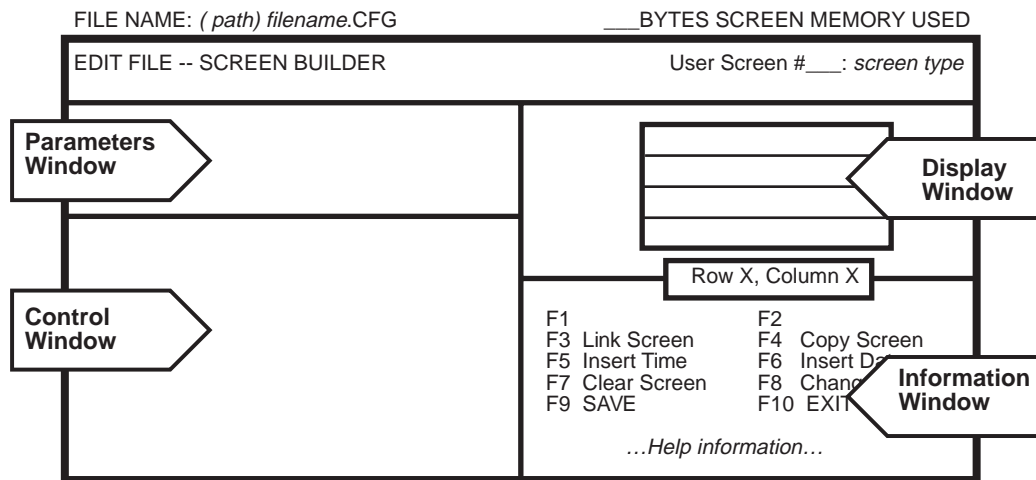
…Help information…

Notice that there are two informational lines at the top of the screen:

- The first line of information identifies the current program path and file name, as well as screen memory usage to help you track the size of your program file.

- The second line of information identifies the current operational area of SPS, as well as the current screen number and type.

In addition, the screen format is distinguished by four windows:

Parameters Window

The parameters Window displays the linking definitions that have been established for the current screen.

Display Window

The Display Window simulates the 2x20 or 4x20 display screen found in the SOI-100 and -200 series products, respectively. It displays the formatted data and text that you define for the current screen as it would appear to the SOI operator.

Note: *The display window in Figure 2.2 shows a 4x20 window, representing the SOI-200 series products. If a SOI-100 series product were selected, a 2x20 window would be shown.*

Control Window

The Control Window displays the available data format selection, and the register information that you can define for the current screen.

<u>Information Window</u>

The Information Window displays information about the function key operations available at the current screen.

<u>Cursor Status Line</u>

The cursor status line of SPS displays the current row and column of the cursor but also lists the ASCII character along with the decimal and hex codes for that character as selected by the cursor position. This is very useful when programming SOI text characters which are not directly compatible with the IBM character set. Character code confirmation may quickly be obtained by placing the cursor on the character and reading the code from the cursor status line. The cursor status line is located between the Display and Information windows of SPS.

Example: row 2, col 15 'C', 43h, 67d

The above character at row 2, column 15 is shown as C on the SOI display.

Getting Around

SPS uses menus to guide you through the program development process. Simply select a menu item and the next menu or screen is displayed. The standard keyboard operations are as follows:

Arrow keys

Use the up/down arrow keys to highlight a selection.

ENTER

Press ENTER to select an item.

ESC

Press ESC to return to the previous menu.

SPS Function Key Descriptions

The SPS function key operation is dynamic in nature due to multiple SOI product support. Most of the function key operations are the same between the SOI-100 and 200 series products. The below information describes the function key operations and differences.

The following function keys are common to all screen types throughout the Screen Builder:

- F3   (Link/Map Screen)

- F4   (Copy Screen)

- F5   (Insert Time)   (SOI-260 ONLY)

- F6   (Insert Date)   (SOI-260 ONLY)

- F7   (Clear Screen)

- F8   (Change Screen)

F3   LINK/MAP SCREEN

The screens that you develop need to be presented to the operator in a meaningful sequence, a hierarchy of possible tasks and operations. To do this, you need to specify a link or mapping for each screen.

The linking function is the basis of the SOI's power and flexibility. When screens are linked, the SOI becomes an interactive operator workstation, one that can guide an operator through a hierarchy of operations. This hierarchy can be as simple or as complicated as your application requires.

Note: You should first create all of your screens before you link them. Refer to Linking the Screens, for more information.

F4   COPY SCREEN

The F4 key copies an existing screen to the current Display Window. Both screens must be of the same type (Data Display Screens, for example). This is useful when you are creating many similar screens.

When you press F4, you are prompted for the number of the screen you wish to copy. If you enter the number for a dissimilar screen type, an error occurs.

When a screen is copied, all information is copied. If there are display and/or entry definitions in the copied screen, then the same data will be displayed at the current screen. You may want to edit the register specifications to correspond to the design of the current screen.

F5   INSERT TIME

The F5 key enables the current time to be displayed on the SOI-260 screen. The Time field that is inserted is five characters in length.

The SOI-260 must have the Calendar/Clock option installed in order to use the Insert Time function.

Note: *The SOI-100 series products do not currently support this feature.*

F6   INSERT DATE

The F6 key enables the date to be displayed on the SOI-260 Screen. The Date field that is inserted is nine characters in length.

The SOI-260 must have the Calendar/Clock option installed in order to use the Insert Date function.

Note: *The SOI-100 series products do not currently support this feature.*

F7   CLEAR SCREEN

The F7 key clears the current operator screen. You have the option of clearing only the screen text or deleting the entire screen, including any linking that you may have established.

F8   CHANGE SCREEN

The F8 key displays another operator screen. You can only display those screens constructed with the Screen Builder (not Alarm or Printer Form screens). You have the following options after you press F8:

- To display the next unprogrammed screen, press ENTER.

- To display the next programmed screen, press F8 again. If there are no programmed screens after the current screen, the initial operator screen (the Main Menu) is displayed.

- To display the Main Menu (the initial operator screen), press F1. Other function keys work differently depending on the screen type. These are described in the relevant sections.

F9   SAVE

The F9 key allows you to save your program. The original file name previously selected will come up as the program name to save. If this is the desired file name, press ENTER to save. If you want to change the name, simply edit the existing name and press ENTER. The program has now been saved.

F10   EXIT

The F10 key allows you to exit SOI-SPS back to DOS. Before exiting, you are prompted to save your file. The original file name previously selected will come up as the program name to save. If this is the desired file name, press ENTER to exit. This will save your program file. If you want to change the name, simply edit the existing name and press ENTER. If you want to exit without saving anything, press the ESC key. You are then prompted to lose edits. Pressing the Y key will exit you back to DOS without saving any previous edits.

Note: *You should first create all of your screens before you link them. Refer to Linking the Screens for more information.*

Product Selection Menu

Spectrum Controls offers the SOI-100 and -200 series of Operator Interface products, and the SOI-SPS programming software programs both of these. The following illustration displays the Product Selection screen.

```
┌─────────────────────────────────────────────────────┐
│                PRODUCT SELECTION MENU                │
├─────────────────────────────────────────────────────┤
│                                                      │
│                                                      │
│                  SOI-100 SERIES                      │
│                  SOI-200 SERIES                      │
│                                                      │
│                                                      │
├─────────────────────────────────────────────────────┤
│  USE ⇅ KEYS TO CHOOSE AN ITEM.                       │
│  PRESS 'ENTER' TO SELECT.                            │
│                                                      │
│  PRESS 'ESC' TO EXIT.                                │
├─────────────────────────────────────────────────────┤
│                                                      │
│                                                      │
│                                                      │
│                                                      │
└─────────────────────────────────────────────────────┘
```

There are two selections to choose from. You can select the SOI-100 or -200 series product by selecting your choice and pressing Enter.

Note: *For further information on the SOI-120 and -260 products offered,*
please refer to the SOI-120 and -260 User Manuals (Publications
0300050-xx and 0300051-xx).

After selecting and pressing Enter, the Opening Menu appears.

CHAPTER 4: SOI OPENING MENU

This chapter describes the Opening Menu of the Configuration Software and all functions that can be accessed from this menu when programming an SOI series operator interface product.

Note: Formatted screens in this manual assume SOI-260 nomenclature. Some dialogs might be slightly different for the SOI-120 product.

Opening Menu

The Opening Menu is the first menu that is displayed after you select the desired product.

```
                    SOI-200 SERIES OPENING MENU
_____

                        EDIT PROGRAM FILE
                  DOWNLOAD FILE TO SOI-200 SERIES
                  UPLOAD FILE FROM SOI-200 SERIES
                      OUTPUT HARD COPY OF FILE
                      UPGRADE OPERATING SYSTEM
_____

USE ⇅ KEYS TO CHOOSE AN ITEM.
PRESS 'ENTER' TO SELECT.

PRESS 'ESC' TO EXIT.
_____
EDIT PROGRAM FILE
USE TO CREATE OR MODIFY A SOI-200 SERIES CONFIGURATION FILE.
A MODIFIED FILE CAN BE SAVED UNDER A NEW NAME.
```

The Opening Menu displays four operations:

- Edit Program File

- Download File to SOI-200 Series

- Upload File from SOI-200 Series

- Output Hard Copy of File

- Upgrade Operating System

Edit Program File

Choose this menu item to create or edit a SOI-260 program file.

When you select EDIT PROGRAM FILE, you are prompted for the file name to edit or create. Any SOI-260 program files in the current directory are listed.

Note: *If no files are present, the text "No SOI-200 Series OI Files Found" will be located in the current directory.*

```
FILE NAME?  DEMO1


FILES IN PATH -- C:\SPS
DEMO1 - PROTOCOL




ENTER FILE NAME                              F1                  F2
OR USE ↑↓ KEYS TO CHOOSE AN ITEM.            F3                  F4
PRESS 'ENTER' TO SELECT.                     F5                  F6
                                             F7                  F8
                                             F9                  F10 EXIT
```

Once a new file name has been created, the file name is followed by the Operating System (PLC protocol) selection menu. You are prompted to select which Operating System you will be working with. The following screen displays the Operating System prompt:

```
FILE NAME?  NEW

                          Protocol #1
                          Protocol #2
                          Protocol #3
                        Other Protocols


ENTER FILE NAME                          F1              F2
OR USE ↑↓ KEYS TO CHOOSE AN ITEM.        F3              F4
PRESS 'ENTER' TO SELECT.                 F5              F6
                                         F7              F8
                                         F9              F10 EXIT

PROTOCOL
TO BE USED WITH THE SELECTED PLC
THIS PROTOCOL MUST BE USED WITH SOI SERIES VERSIONS 1.00 AND NEWER
```

Select the PLC protocol required for the application.

After entering a file name and the operating system has been selected, the Edit File Menu appears.

```
            EDIT FILE — OPTION SELECTION

                  SOI CONFIGURATION DATA
                    SCREEN BUILDER
                  ALARM SCREEN BUILDER
                  BACKGROUND MONITOR
                  PRINTER FORM BUILDER

USE↑↓ KEYS TO CHOOSE AN ITEM.            F1              F2
PRESS 'ENTER' TO SELECT.                 F3              F4
                                         F5              F6
PRESS 'ESC' WHEN DONE.                   F7              F8
                                         F9              F10 EXIT

SOI CONFIGURATION DATA
USE TO SETUP SOI-xxx SERIES CONFIGURATION OPTIONS
OPTIONS INCLUDE:
PLC PROTOCOL, PLC SPECIFIC OPTIONS AND COMMUNICATION BAUD RATES
```

You can access the following functions from the Edit File menu:

Select this Menu Option	To
SOI Configuration Data	Specify SOI-260 configuration and operating parameters.
Screen Builder	Create or modify SOI-260 operator screens.
Alarm Screen Builder	Create or modify Alarm Screens. An Alarm Screen is an operator screen that can be called by the PLC or Background Monitor (SOI-260 only) to display specific alarm conditions. Alarm Screens can contain register information for display on the SOI-xxx.
Background Monitor (SOI-260 only)	Assign background register conditions for the SOI-260 to monitor. The SOI-260 invokes an Alarm Screen or a Printer Form when one of the background registers it is monitoring deviates from preset limits.
Printer Form Builder (SOI-260 only)	Create or modify Printer Forms. Printer Forms are operator screens that are sent to the optional printer port of the SOI-260, instead of its display.
Function Key Builder (SOI-120 only)	Configure the Function Keys of the SOI-120 opeartor interface. The Function Keys may be programmed to perform "Hot Screen" call-up, provide Bit manipulation to control process elements, or a combination of both.

Download File to SOI

Choose this menu item to download a finished program into the SOI.

Note: *Make sure the DIP switch for Upload/Download is enabled. You must also have the proper cable connection. Refer to the SOI User Manual for more information about DIP switch settings and cable connections.*

To download a file or Operating System to the SOI:

1. Select the Download File to SOI on the Opening Menu. You will be prompted to select the communications port.

Note: *This option is not displayed if a communication port was specified during installation. Any communication port selected during installation will automatically be selected.*

```
┌─────────────────────────────────────────────────────────┐
│              COMMUNICATION PORT SELECTION                 │
├─────────────────────────────────────────────────────────┤
│                                                           │
│                                                           │
│                                                           │
│                        COMM 1                             │
│                        COMM 2                             │
│                                                           │
│                                                           │
│                                                           │
├─────────────────────────────────────────────────────────┤
│ USE ⇅ KEYS TO CHOOSE AN ITEM.                             │
│ PRESS 'ENTER' TO SELECT.                                  │
│                                                           │
├─────────────────────────────────────────────────────────┤
│ COMM 1                                                    │
│ THIS WILL BE THE HARDWARE PORT THAT WILL BE USED          │
│ TO COMMUNICATE WITH THE SOI-200 SERIES 0I                 │
│                                                           │
│                                                           │
└─────────────────────────────────────────────────────────┘
```

2. Select the serial port on your computer that is connected to the SOI (COMM 1 or COMM 2).

3. The computer will attempt to establish communications.

    If communications are not established within approximately 10 seconds, you will get an error message. Check your DIP switch settings and cable connections, refer to the SOI User Manuals.

4. When communications are established, the following is displayed:

```
┌─────────────────────────────────────────────────────────┐
│ FILE NAME?  DEMO1                                         │
├─────────────────────────────────────────────────────────┤
│                                                           │
│ FILES IN PATH -- C:\SPS                                   │
│ DEMO1 - PROTOCOL                                          │
│                                                           │
│                                                           │
│                                                           │
│                                                           │
├─────────────────────────────────────────────────────────┤
│ ENTER FILE NAME                      F1            F2      │
│ OR USE ⇅ KEYS TO CHOOSE AN ITEM.     F3            F4      │
│ PRESS 'ENTER' TO SELECT.             F5            F6      │
│                                      F7            F8      │
│                                      F9            F10 EXIT│
│                                                           │
├─────────────────────────────────────────────────────────┤
│                                                           │
└─────────────────────────────────────────────────────────┘
```

5. Enter or select the file name that you want to download. If the application file type selected is different from the existing Operating System, you will be prompted to download a new Operating System.

```
FILE NAME?  DEMO1

FILES IN PATH -- C:\SPS
DEMO1 - PROTOC
        Protocol
        Protocol          THE SOI must be programmed with
        Protocol          the file's Operating System before the
        Other Pr          file can be downloaded.


ENTER FILE NAM                PRESS 'Y'  to download new protocol      F2
OR USE ⬆⬇ KEYS T              PRESS 'N' to abort                       F4
PRESS 'ENTER' T                                                        F6
                                                                       F8
                                             F9                     F10 EXIT
```
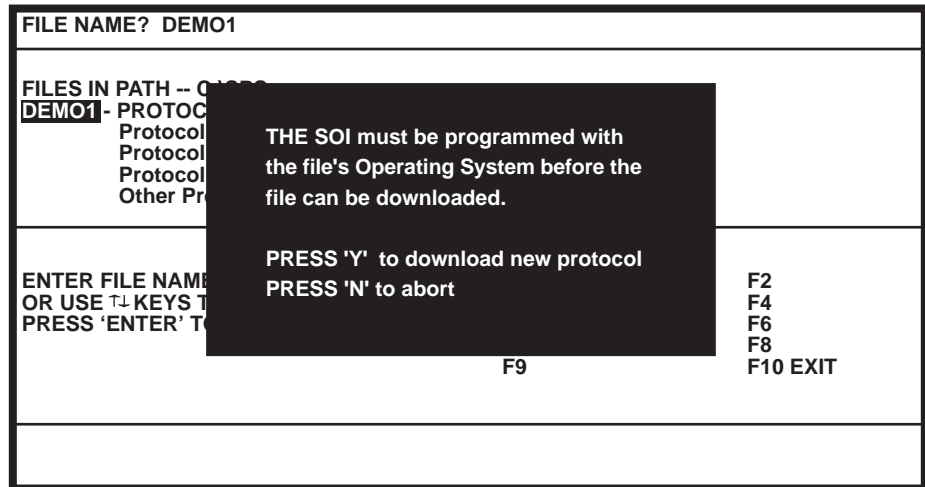
6. The following screen is displayed showing the progress for each block of the download:

```
                         DOWNLOAD FILE

                      LINK ESTABLISHED
                      SENDING DATA


                             >>>>>>>>>
                                20%



PRESS 'ESC' TO ABORT DOWNLOAD.
```
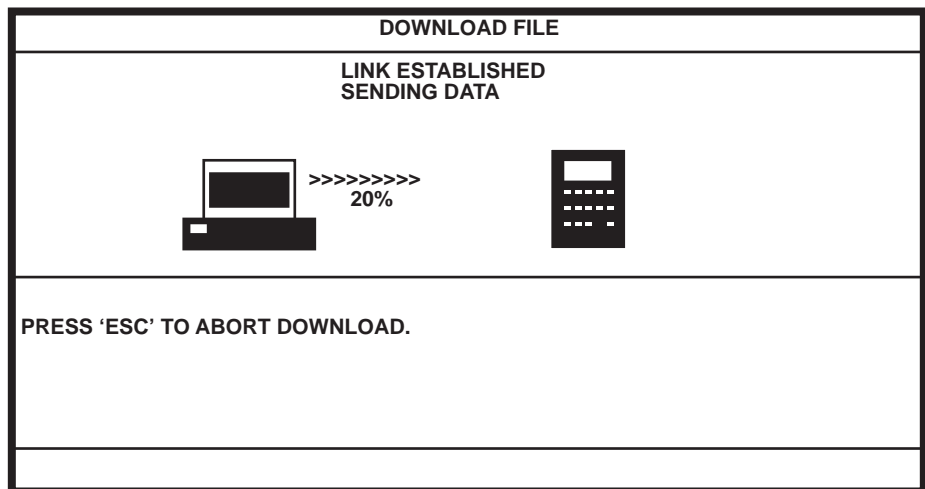
7. After the download is completed, the Opening Menu is displayed.

```
┌─────────────────────────────────────────────────────────────┐
│              SOI-200 SERIES OPENING MENU                      │
├─────────────────────────────────────────────────────────────┤
│                                                               │
│                   EDIT PROGRAM FILE                           │
│              DOWNLOAD FILE TO SOI-200 SERIES                  │
│             UPLOAD FILE FROM SOI-200 SERIES                   │
│                OUTPUT HARD COPY OF FILE                       │
│                UPGRADE OPERATING SYSTEM                       │
│                                                               │
├─────────────────────────────────────────────────────────────┤
│                                                               │
│  USE ⇅ KEYS TO CHOOSE AN ITEM.                                │
│  PRESS 'ENTER' TO SELECT.                                     │
│                                                               │
│  PRESS 'ESC' TO EXIT.                                         │
│                                                               │
├─────────────────────────────────────────────────────────────┤
│  EDIT PROGRAM FILE                                            │
│  USE TO CREATE OR MODIFY AN SOI-200 SERIES CONFIGURATION FILE.│
│  A MODIFIED FILE CAN BE SAVED UNDER A NEW NAME.               │
└─────────────────────────────────────────────────────────────┘
```
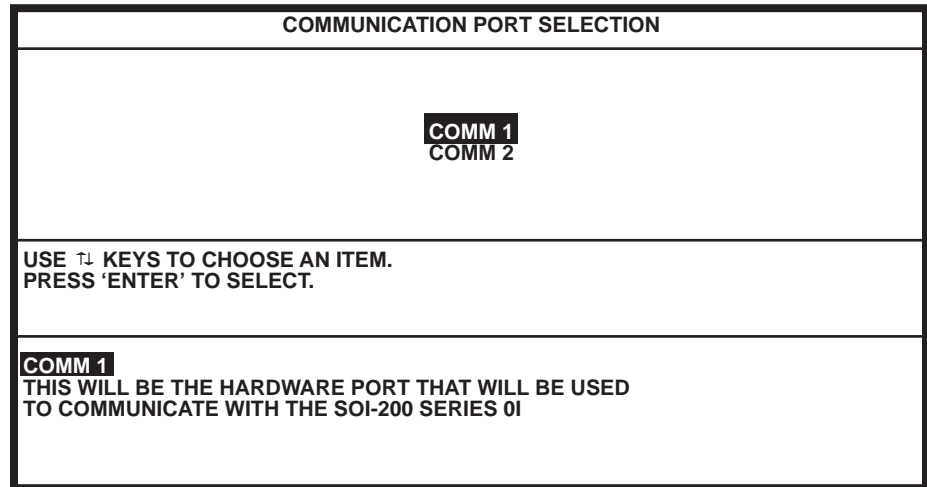
Upload File from SOI

Choose this menu item to upload a program from the SOI. This selection also allows you to upload the Operating System (.SLB) file from the SOI.

Note: *Make sure the DIP switch for Upload/Download is enabled. You must also have the proper cable connection. Refer to the SOI User Manual for more information about DIP switch settings and cable connections.*
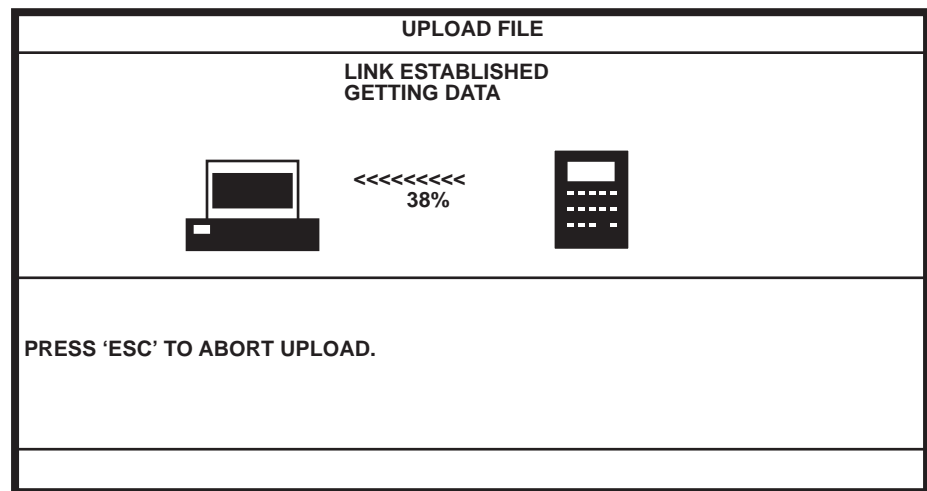
To upload a file or Operating System from the SOI:

1. Select "Upload File from SOI-200 Series" on the Opening Menu. You will be prompted to select the communications port.

Note: *This option is not displayed if a communication port was specified during installation. Any communication port selected during installation will automatically be selected.*

```
┌─────────────────────────────────────────────────────────┐
│              COMMUNICATION PORT SELECTION                │
├─────────────────────────────────────────────────────────┤
│                                                          │
│                                                          │
│                         COMM 1                           │
│                         COMM 2                           │
│                                                          │
│                                                          │
├─────────────────────────────────────────────────────────┤
│  USE ⇅ KEYS TO CHOOSE AN ITEM.                           │
│  PRESS 'ENTER' TO SELECT.                                │
│                                                          │
├─────────────────────────────────────────────────────────┤
│  COMM 1                                                  │
│  THIS WILL BE THE HARDWARE PORT THAT WILL BE USED        │
│  TO COMMUNICATE WITH THE SOI-200 SERIES 0I               │
│                                                          │
└─────────────────────────────────────────────────────────┘
```

2. Select the serial port on your computer that is connected to the SOI (COMM 1 or COMM 2).

3. The computer will attempt to establish communications and upload the application file.

```
┌─────────────────────────────────────────────────────────┐
│                      UPLOAD FILE                         │
├─────────────────────────────────────────────────────────┤
│                 LINK ESTABLISHED                         │
│                 GETTING DATA                             │
│                                                          │
│                    <<<<<<<<<                             │
│                      38%                                 │
│                                                          │
├─────────────────────────────────────────────────────────┤
│                                                          │
│  PRESS 'ESC' TO ABORT UPLOAD.                            │
│                                                          │
│                                                          │
├─────────────────────────────────────────────────────────┤
│                                                          │
└─────────────────────────────────────────────────────────┘
```

If communications are not established within approximately 10 seconds, you will get an error message. Check your DIP switch settings and cable connections, refer to the SOI User Manual.

4. After the file has been uploaded, you will be prompted to enter a name to save the file as:

```
                        UPLOAD FILE
                      UPLOAD COMPLETED


              FILE NAME FOR SAVE?

              current path  —  C:\SPS


 PRESS 'ESC' TO ABORT UPLOAD.



```

5. After entering the file name, the upload is complete, the Opening Menu is displayed.

```
                 SOI-200 SERIES OPENING MENU

                      EDIT PROGRAM FILE
                DOWNLOAD FILE TO SOI-200 SERIES
                UPLOAD FILE FROM SOI-200 SERIES
                   OUTPUT HARD COPY OF FILE
                   UPGRADE OPERATING SYSTEM


 USE ↕ KEYS TO CHOOSE AN ITEM.
 PRESS 'ENTER' TO SELECT.

 PRESS 'ESC' TO EXIT.

 EDIT PROGRAM FILE
 USE TO CREATE OR MODIFY AN SOI-200 SERIES CONFIGURATION FILE.
 A MODIFIED FILE CAN BE SAVED UNDER A NEW NAME.
```

Output Hard Copy of File

Choose this menu item to send a program file to the default printer screen or disk file for documentation purposes.

You can send the program file to:

- the attached printer

- the computer screen

- another file (using the current file name with an extension)

To output a hard copy of the file:

1. Select Output Hard Copy of File on the Opening Menu. You will be prompted for the application file to print.

```
FILE NAME?  DEMO1

FILES IN PATH -- C:\SPS
DEMO1 - PROTOCOL




ENTER FILE NAME                              F1            F2
OR USE ⇅ KEYS TO CHOOSE AN ITEM.             F3            F4
PRESS 'ENTER' TO SELECT.                     F5            F6
                                             F7            F8
                                             F9            F10 EXIT

```

2. Enter the name of the application file you want to print. You are then prompted for the type of output device.

```
                       HARD COPY DEVICE OPTIONS


                              PRINTER
                              SCREEN
                              DISK FILE


USE ⇅ KEYS TO CHOOSE AN ITEM.
PRESS 'ENTER' TO SELECT.


PRINTER
THE OUTPUT WILL BE DIRECTED TO THE PRINTER
```

3. Enter the device type. You are then prompted for the screens that you want printed. You have the option of printing all screens, a summary only, or selected screens.

```
┌─────────────────────────────────────────────────────────┐
│                                                         │
│              HARD COPY DEVICE OPTIONS                   │
│  ┌───────────────────────────────────────────────────┐ │
│  │                                                   │ │
│  │                                                   │ │
│  │                  ▐ ALL SCREENS ▌                  │ │
│  │                   SUMMARY ONLY                    │ │
│  │                  SELECTED SCREENS                 │ │
│  │                                                   │ │
│  │                                                   │ │
│  ├───────────────────────────────────────────────────┤ │
│  │ USE ⇅ KEYS TO CHOOSE AN ITEM.                     │ │
│  │ PRESS 'ENTER' TO SELECT.                          │ │
│  │                                                   │ │
│  ├───────────────────────────────────────────────────┤ │
│  │ ▐ ALL SCREENS ▌                                   │ │
│  │ ALL FILE INFORMATION WILL BE PRINTED              │ │
│  │                                                   │ │
│  └───────────────────────────────────────────────────┘ │
│                                                         │
└─────────────────────────────────────────────────────────┘
```

Select this Option	To do this…
All Screens	Print all program screens including summary information.
Summary Only	Print only summary information including: PLC Type, File Size and Number of Screens, SOI Configuration Data, Advisor Register Data, Time Synchronization Data, Background Monitor Assignments, and Numerical Listing of Programmed Screen Types
Selected Screens	Print block of specified screens.

4. If you specified more than one screen, you will see the following prompt:

compact output?

This prompt enables as many screens to be printed on one page as possible.

5. Enter Y to compact output or N for standard format.

You are prompted to start the hard copy printout by pressing any key. After the printout has begun, the following function keys are available:

• Space Bar, which pauses the printout. Pressing the Space Bar again resumes printing.

- ESC , which aborts the printout and returns to the Opening Menu.

Upgrade Operating System

This option lets you update or refresh the Operating System currently installed in the SOI.

To upgrade the operating system:

1. Select *Upgrade Operating System* on the Opening Menu. You will be prompted to select the communications port.

Note: ***This option is not displayed if a communication port was specified during installation.***

```
┌────────────────────────────────────────────────────────────┐
│                COMMUNICATION PORT SELECTION                │
├────────────────────────────────────────────────────────────┤
│                                                            │
│                                                            │
│                          COMM 1                            │
│                          COMM 2                            │
│                                                            │
│                                                            │
├────────────────────────────────────────────────────────────┤
│  USE ↑↓ KEYS TO CHOOSE AN ITEM.                            │
│  PRESS 'ENTER' TO SELECT.                                   │
│                                                            │
├────────────────────────────────────────────────────────────┤
│  COMM 1                                                    │
│  THIS WILL BE THE HARDWARE PORT THAT WILL BE USED          │
│  TO COMMUNICATE WITH THE SOI-100 SERIES 0I                 │
└────────────────────────────────────────────────────────────┘
```

2. Select the serial port on your computer that is connected to the SOI-120 (COMM 1 or COMM 2).

3. A message will be displayed indicating the Operating System in the SOI-120 and the Operating System of the application file. For example:

```
┌──────────────────────────────────────────┐
│  Protocol #1 application file is resident │
│  in your SOI-100 Series.                 │
│                                          │
│  Protocol #1 Operating System will       │
│  be downloaded.                          │
│                                          │
│  Press 'Y' to continue                   │
│  Press 'N' to abort                      │
└──────────────────────────────────────────┘
```

> *Note:* *If you want to change the operating system to a system that is different from the current system, you must first download an application file of that type. For example:*
>
> *If an Protocol #1 file is currently installed in the SOI-120 and you want to load a Protocol #2 operating system, you must first load a Protocol #2 application file, then the operating system.*

4. If you select Y, the Operating System which matches the application file will be downloaded.

    If you select N, the downloaded is aborted and the opening menu is displayed.

CHAPTER 5: SOI CONFIGURATION DATA

This chapter describes the functions that can be performed using the SOI Configuration Data menu.

The SOI Configuration Data Menu

When SOI Configuration is selected from the Edit Program menu, the following screen appears.

```
         SPS CONFIGURATION  —  OPTION SELECTION

                      UPDATE INTERVAL
                        SOI ADVISOR
                     TIME SYNCHRONIZATION
                  SET MASTER SECURITY CODE
                   SPECIAL SECURITY SCREEN
                   PRINTER PORT PARAMETERS
                   PLC HARDWARE PARAMETERS

  ENTER FILE NAME                       F1              F2
  OR USE ↑↓ KEYS TO CHOOSE AN ITEM.     F3              F4
  PRESS 'ENTER' TO SELECT.              F5              F6
                                        F7              F8
                                        F9  SAVE        F10 EXIT


  UPDATE INTERVAL
  THIS IS USED TO CONTROL HOW OFTEN THE SOI POLLS THE PLC FOR DATA.
```

The SOI Configuration Data menu lets you specify information for the following parameters:

- Update Interval

- SOI Advisor

- Time Synchronization   (SOI-260 ONLY)

- Set Master Security Code

- Special Security Screen

- Printer Port Parameters   (SOI-260 ONLY)

- PLC Hardware Parameters

Update Interval

When selecting Update Interval from the SOI Configuration menu, the following screen appears.

CURRENT UPDATE SETTING: 0.50   **ENTER UPDATE TIME:**   __
ANSWER QUESTION
THE UPDATE DELAY IS USED TO SET A DELAY BETWEEN SOI UPDATES OF PLC DATA. THE RESOLUTION IS 0.05 SECONDS WITH A MAXIMUM DELAY OF 12.75 SECONDS.

The Update Interval is the delay interval between SOI updates of PLC registers. Use this parameter to optimize system communications and eliminate bottlenecks.

The Update Interval setting keeps the SOI from tying up a network by overloading it with communication requests. The valid range for an interval is from 0.05 to 12.75 seconds. The default is 0.5 seconds. SOI-SPS Programming Software automatically rounds up to the next 0.05 second.

> ⚠ **ATTENTION: Long update interval times may not be wise if critical control functions, necessitating faster updating, are required. The update interval defines the length of time between SOI communications with the PLC.**

To assign a new update interval, enter a valid decimal number and press ENTER.

To save the new update interval setting, press ESC. You are then returned to the SOI Configuration Data Menu.

SOI Advisor

When selecting SOI Advisor from the SOI Configuration menu, the following screen appears.

```
                        SOI ADVISOR

        SCREEN READ ENABLED (Y OR N):          N
          SCREEN READ REGISTER NUMBER:
          ACK/NAK WRITE REGISTER NUMBER:
          ACK BIT:
          ACK/NAK  BIT POLARITY:               0

        SCREEN WRITE ENABLED (Y OR N):         N
        SCREEN WRITE REGISTER NUMBER:

USE ↑↓ KEYS TO CHANGE QUESTIONS.      F1                    F2
PRESS 'DEL' TO DELETE ITEM.           F3                    F4
ANSWER QUESTION AND PRESS 'ENTER'     F5                    F6
                                      F7  CLEAR DATA        F8
PRESS 'ESC' WHEN DONE.                F9  SAVE              F10 EXIT

ENTER 'Y' IF YOU WANT THE SOI200 SERIES OI TO MONITOR THE PLC FOR SCREEN
NUMBERS.
```

The SOI Advisor consists of five processes.

- Screen Read Register Number

- Ack/Nak Write Register Number

- Ack Bit

- Ack/Nak Bit Polarity

- Screen Write Register Number

37

Specifying an Advisor Read Register

When you select SOI Advisor at the SOI Configuration Data menu, you are prompted for the information necessary to monitor and acknowledge the Advisor Read Register status.

To assign an Advisor Read Register, enter the appropriate register and acknowledge information at each prompt and press ENTER.

To save the Advisor Read Register specification, press ESC. You are then returned to the SOI Configuration Data menu.

Note: *If you have set up several SOIs to communicate with one PLC (which is possible with some network protocols), you should assign different Advisor Registers for each SOI.*

The Read Register Process

The Read Register number indicates the Advisor Read Register within the PLC that the SOI will continuously read for Alarm or other valid screen numbers. This register must be a 16 bit location. The screen number entered to the Advisor Read Register must be a decimal number.

Note: *The Read Register is monitored on a time base of 2 seconds as a default.*

The Ack/Nak Write Register Process

The Ack/Nak Write Register indicates the 16 bit location used for the Acknowledge (ACK) and Not-Acknowledge (NAK) bits. The Ack bit is one of 15 bits specified in the ACK/NAK Write Register, the next sequential location is a Not-Acknowledge bit.

When the SOI reads a valid screen number (programmed screen) it sets or clears the ACK bit, depending on the ACK bit polarity. If the screen number read from the Advisor Read Register is not valid (not a programmed screen) it sets or clears the NAK bit. The ACK bit may be monitored by the PLC ladder program to acknowledge that the SOI has read the screen number loaded to the Advisor Read Register, and that the Advisor Register may be cleared and ready for the next screen number to be loaded.

Note: *The ladder program must reset the ACK/NAK bits since the SOI only sets the bits to the polarity defined below (ACK Bit Polarity).*

ACK Bit

ACK Bit defines which bit number of the 16 bit location entered for the ACK/NAK Write Register number is to be used. This entry should be a number from 0 to 15 or 1 to 16, depending on the protocol selected.

ACK Bit Polarity

Ack Bit Polarity defines the polarity (0 or 1) that the SOI sets the ACK/NAK bits when a valid/invalid screen number is read from the Advisor Register.

Screen Write Register

The Write Register allows the unit to write its present screen number to the PLC whenever a new screen is moved to, regardless of how the screen is moved to. The screen number will only be written once upon moving to a new screen and will not be written to the PLC at the advisor rate. The advisor read function can be disabled in this mode, or both the advisor read function and the advisor screen number write function enabled. If the unit moves to a new screen, because it is directed to by the advisor read, the unit will perform an advisor screen number write informing the PLC that it has moved to the new screen. Note that the advisor read occurs before the advisor screen number write.

The function menu of the SOI-260 and SOI-120 is not a screen. Upon entering the function menu the unit will perform a one time screen number write to the PLC to inform the PLC that it is in the function menu. The screen number value written to the PLC will be 255 (FF H) which will designate that the unit is in the function menu. Upon exiting the function menu, and entering a screen, the unit will write the new screen number to the PLC.

In summary, SPS allows three modes of advisor operation: advisor read only enabled, advisor screen number write only enabled, or both advisor read and advisor screen number write enabled. The advisor function may also be completely disabled.

Time Synchronization (SOI-260 ONLY)

When selecting Time Synchronization from the SOI Configuration menu, the following screen appears.

```
┌─────────────────────────────────────────────────────────────────┐
│        TIME SYNCHRONIZATION —  OPTION SELECTION                   │
├─────────────────────────────────────────────────────────────────┤
│                                                                   │
│                         READ TIME                                 │
│                         WRITE TIME                                │
│                                                                   │
│                                                                   │
├─────────────────────────────────────────────────────────────────┤
│                                     F1                   F2        │
│  USE ↑↓ KEYS TO CHOOSE AN ITEM.     F3                   F4        │
│  PRESS 'ENTER' TO SELECT.           F5                   F6        │
│                                     F7                   F8        │
│                                     F9  SAVE             F10 EXIT  │
├─────────────────────────────────────────────────────────────────┤
│  READ TIME                                                        │
│  USE TO SYNCHRONIZE THE SOI CLOCK TO AN EXTERNAL DEVICE           │
│                                                                   │
└─────────────────────────────────────────────────────────────────┘
```

If the Calendar/Clock option is installed in the SOI-260, you can choose to synchronize it to an external clock source within the PLC.

Note: *The Calendar/Clock is standard on units with the Printer Port option installed.*

The SOI-260 clock is automatically synchronized to the external clock source every 60-69 seconds.

When you select Time Synchronization, you are offered the following choices:

- READ TIME
- WRITE TIME

Read Time

The Read Time option synchronizes the SOI to the clock within the PLC. When you select Read Time, the base register is displayed and you are prompted to enter a new base register. The base register is the initial register (of eight sequential registers) currently storing time data in the PLC.

Note: *In order to read the time data stored in the PLC, your PLC must have a clock source.*

For example, if the time is stored in PLC registers 8100 to 8106, the base register would be 8100.

The time data must be entered in a 16 bit integer format. The data stored in each of the eight sequential registers are as follows:

Location	Time	Data
1	Seconds	0-59 (Decimal)
2	Minutes	0-59 (Decimal)
3	Hours	0-23
4	Day (Week)	1-7 (Sun.-Sat.)
5	Day (Month)	1-31
6	Month	1-12
7	Year	1980-2079
8	AM/PM	0 or 1 (Bit Designation)

Note: *Time synchronization can not occur if the base register is zero, or if the Calendar/Clock option is not installed in the SOI.*

Write Time

The Write Time option synchronizes the clock within the PLC to the SOI clock. When you select Write Time, the base register is displayed and you are prompted to enter a new base register. The base register is the initial register location (of eight sequential registers) to which the time and register information is written.

Refer to the Read Register information for the format and locations to store time data.

Note: *You can write time data to the PLC even though your PLC may not have a clock source.*

Set Master Security Code

When selecting "Set Mastery Security Code" from the SOI Configuration menu, the following screen appears.

```
CURRENT MASTER CODE:          00000000
ENTER NEW MASTER CODE:       000000000



ENTER MASTER CODE.




THE MASTER CODE IS USED BY AN OPERATOR TO CHANGE
THE SECURITY CODES OF THE SECURITY SCREENS.
IF THE MASTER CODE IS 0, ANY CODE WILL BE ACCEPTED.
IF THE MASTER CODE IS 99999999, NO MASTER CODE WILL BE ACCEPTED.
```

The Master Security Code has two functions:

- It allows access to any Security Screen.

- It allows an SOI operator with master security code privileges to change the security code(s) assigned to any Security Screen.

When you choose Set Master Security Code, you are prompted for the code to use. Acceptable security codes are eight numbers.

To set the master security code, enter the eight numbers and press ENTER. If you enter less than eight digits, the remaining numbers are set to zeros.

Special Master Security Codes

Two Security codes have special significance and are used to:

- Disable security

- Disable the master security code function

Disabling Security

You can disable security altogether by assigning a master security code of 00000000 (eight zeros). Any number then, that an operator might enter is accepted as a valid access code. This is useful when you want to send programmed SOI units to the field without setting the master security code.

Note: *The operator can select and set the master security code using the Mode key on the SOI-120 and the F key on the SOI-260.*

Disabling the Master Security Code Function

You can disable the use of master security codes by setting the master security code to 99999999 (eight nines). Only the security codes assigned to the individual Security Screens are then valid. This is useful when you do not want a master security code to override or change the security codes for Security Screens.

Special Security Screen

The Special Security Screen is a security screen to restrict access to the Special parameters area of the Function Key menu. You may program up to three, eight digit, security code numbers. When the operator selects Special Security, this security screen is displayed.

```
                                                    SPECIAL SECURITY SCREEN


                                        *RESTRICTED ACCESS*
                                           ENTER CODE
                                               :



              SECURITY CODES           F1              F2
                                       F3              F4
 CODE 1:    ????????                   F5              F6
 CODE 2:    ????????                   F7              F8
 CODE 3:    ????????                   F9  SAVE        F10  EXIT
                                       USE ↑↓ KEYS TO MOVE BETWEEN CODES.
                                       ENTER NEW CODE AND PRESS 'ENTER'.
                                       PRESS 'ESC' WHEN DONE

                                       ENTER UP TO EIGHT DIGITS FROM 0-9 OR
                                       USE '?' FOR EACH WILD CARD CHARACTER
```

Access to the Special function is enabled when the operator enters any one of the three programmed access codes. If the numeric security codes are not programmed, this security screen is not displayed, and the Special function is available to any operator.

Note: *You cannot link this screen. It is displayed for the Special function only and does not require mapping or linking.*

Printer Port Parameters (SOI-260 ONLY)

When selecting Printer Port Parameters from the SOI-260 Configuration menu, the following screen displays.

```
┌──────────────────────────────────────────────────────────────┐
│           PRINTER PORT COMMUNICATION PARAMETERS                │
│                                                                │
│                                                                │
│                        BAUD RATE                               │
│                         PARITY                                 │
│                        DATA BITS                               │
│                                                                │
│                                                                │
├────────────────────────────────┬──────────────┬──────────────┤
│                                 │      F1      │     F2       │
│  USE ↑↓ KEYS TO CHOOSE AN ITEM. │      F3      │     F4       │
│  PRESS 'ENTER' TO SELECT.       │      F5      │     F6       │
│                                 │      F7      │     F8       │
│                                 │      F9      │     F10      │
├────────────────────────────────┴──────────────┴──────────────┤
│  CURRENT SETTINGS:    BAUD RATE:  9600                         │
│                       PARITY:     EVEN                         │
│                       DATA BITS:  8                            │
└──────────────────────────────────────────────────────────────┘
```

Use this screen to set the operating parameters of the optional SOI-260 Printer Port (RS-232C).

When you select Printer Port Parameters, a sub-menu displays the following:

- BAUD RATE

- PARITY

- DATA BITS

Baud Rate

The Baud Rate parameter determines the speed of data transfer assigned to the Printer Port. You can choose any one of the following rates:

- 300

- 1200

- 2400

- 4800

- 9600 (default)

- 19200

- 38400

To select a baud rate, use the cursor keys to highlight the desired rate, and press ENTER.

Data Bits

The Data Bits parameter determines the data "word" length used for the Printer Port. You can choose one of the following bit lengths.

- 7

- 8 (default)

To select a bit length, use the cursor keys to highlight the desired length, and press ENTER.

Parity

The parity parameter determines the communications parity used for the Printer Port. You can choose any one of the following:

- Even (default)

- Odd

- None

To select a parity setting, use the cursor keys to highlight the desired parity, and press ENTER.

PLC Hardware Parameters

When selecting PLC Hardware Parameters from the SOI Configuration menu, one of the following screens appears (depending on which PLC protocol you have selected). Choose this menu selection to set the PLC address or routing path, change Communications Port settings, or change the Advisor Update Rate.

```
┌──────────────────────────────────────┐  ┌──────────────────────────────────────┐
│   PLC CONFIGURATION — OPTION SELECTION │  │  MODICON CONFIGURATION - OPTION SELECTION │
│                                        │  │                                        │
│            ▌CPU ADDRESS▐               │  │          ▌PLC ROUTING PATHS▐           │
│            COMM PORT SETUP             │  │          ADVISOR UPDATE RATE           │
│            ADVISOR UPDATE RATE         │  │                                        │
│                                        │  │                                        │
│                        F1        F2    │  │                        F1        F2    │
│ USE ↑↓ KEYS TO CHOOSE AN ITEM.  F3   F4 │  │ USE ↑↓ KEYS TO CHOOSE AN ITEM.  F3   F4 │
│ PRESS 'ENTER' TO SELECT.   F5        F6 │  │ PRESS 'ENTER' TO SELECT.   F5        F6 │
│                            F7        F8 │  │                            F7        F8 │
│                        F9  SAVE   F10 EXIT│ │                        F9  SAVE   F10 EXIT│
│                                        │  │                                        │
│ ▌CPU ADDRESS▐                          │  │ ▌PLC ROUTING PATHS▐                    │
│ USED TO SET THE PLC ADDRESS            │  │ USED TO SET THE PLC ADDRESS.           │
└──────────────────────────────────────┘  └──────────────────────────────────────┘
```

Note: *Refer to the PLC Reference Section for the hardware parameters specific to your PLC.*

CPU address

The CPU address allows you to set the PLC address, typically required for the SOI to identify which PLC it is communicating with.

```
┌────────────────────────────────────────────────────────┐
│                                                        │
│           PLC CONFIGURATION - UNIT ADDRESS             │
│                                                        │
├────────────────────────────────────────────────────────┤
│                                                        │
│ CURRENT ADDRESS:            1 (DEC)   1 (HEX)           │
│                                                        │
│ ENTER NEW ADDRESS:             __                      │
│                                                        │
├────────────────────────────────────────────────────────┤
│                                                        │
│ ANSWER QUESTION                                        │
│                                                        │
│                                                        │
│                                                        │
├────────────────────────────────────────────────────────┤
│                                                        │
│ THE ADDRESS IS USED BY THE SOI FOR DIRECT ADDRESSING OF THE PLC. │
│                                                        │
│                                                        │
└────────────────────────────────────────────────────────┘
```

PLC routing path

The PLC routing path lets you set the path to use for communicating with a PLC. (Some network topologies let you link 2 or more networks with bridges, which means you must identify the address of each bridge in the path to the PLC, as well as the address of the PLC itself.)

```
┌──────────────────────────────────────────────────────────────┐
│          MODBUS PLUS CONFIGURATION - PLC ROUTING PATHS         │
├──────────────────────────────────────────────────────────────┤
│                                                                │
│ CURRENT ADDRESS:              1  0   0   0   0                  │
│ ENTER NEW ADDRESS:            __  0   0   0   0                 │
│                                                                │
├──────────────────────────────────────────────────────────────┤
│ ANSWER QUESTION.                                               │
│                                                                │
│                                                                │
├──────────────────────────────────────────────────────────────┤
│ THE ROUTING PATHS ARE USED BY THE SOI FOR DIRECT              │
│ ADDRESSING OF THE PLC.                                         │
│                                                                │
└──────────────────────────────────────────────────────────────┘
```

COM Port Setup

To define the Communications Port Parameters, select SOI Configuration Data from the Edit File - Option Selection menu. At the SOI Configuration Data menu, select the PLC Hardware Parameters item. The baud rate, data bits, and parity information must be entered to match the respective settings of the PLC.

The Communications Port parameters will have the same default values as the selected PLC protocol. An example appears below:

Baud Rate: 9600

Data Bits: 8

Parity: EVEN

Advisor Update Rate

The Advisor Update Rate is used to set the frequency that the SOI reads the Advisor register in the PLC. The default for this value is 2 seconds. Valid rates are between 1 and 12.5 seconds. Changing this value to a larger number will help improve network performance if communications is being done over a network.

CURRENT UPDATE SETTING: 2.00

ENTER UPDATE TIME: __

ANSWER QUESTION

THE ADVISOR UPDATE RATE IS USED TO SET THE FREQUENCY THAT THE SOI READS THE ADVISOR REGISTER. THE DEFAULT FOR THIS VALUE IS 2 SECONDS. VALID RATES ARE BETWEEN 1 AND 12.5 SECONDS. CHANGING THIS VALUE TO A LARGER NUMBER WILL HELP IMPROVE NETWORK PERFORMANCE

CHAPTER 6: SOI SCREEN BUILDER

This chapter describes the functions that can be performed using the Screen Builder menu option when creating a program.

The Screen Builder Screens

Screen Builder for the Main Menu Screen (Screen #1) appears like this:

```
EDIT FILE -- SCREEN BUILDER                              USER SCREEN #001: MAIN MENU
┌──────────────────────────────────────┬────────────────────────────────────────┐
│                                       │                                        │
│                                       │        ┌────────────────────┐          │
│                                       │        │                    │          │
│                                       │        │                    │          │
│                                       │        │                    │          │
│                                       │        └────────────────────┘          │
│          MENU ITEM LINKAGE            │                                        │
│                                       │                                        │
│   ITEM 1 IS UNLINKED                  │   F1                 F2                │
│   ITEM 2 IS UNLINKED                  │   F3   LINK SCREENS  F4   COPY SCREEN  │
│   ITEM 3 IS UNLINKED                  │   F5   INSERT TIME   F6   INSERT DATE  │
│   ITEM 4 IS UNLINKED                  │   F7   CLEAR SCREEN  F8                │
│   ITEM 5 IS UNLINKED                  │   F9   SAVE          F10  EXIT         │
│   ITEM 6 IS UNLINKED                  │                                        │
│   ITEM 7 IS UNLINKED                  │   USE CURSOR KEYS TO MOVE AROUND SCREEN│
│   ITEM 8 IS UNLINKED                  │   PRESS 'INS' TO TOGGLE INSERT MODE    │
│                                       │   PRESS ' DEL' TO DELETE CHARACTER     │
│                                       │   USE FUNCTION KEYS WHERE APPROPRIATE  │
└──────────────────────────────────────┴────────────────────────────────────────┘
```

Screen Builder for other screens appears like this:

```
EDIT FILE -- SCREEN BUILDER                              USER SCREEN #002: NEW SCREEN
 ┌──────────────────────────────┐      ┌──────────────────────────────────────┐
 │                              │      │          ┌──────────────┐            │
 │                              │      │          │              │            │
 │                              │      │          │              │            │
 │                              │      │          │              │            │
 │                              │      │          └──────────────┘            │
 │  SCREEN TYPE                 │      │                                      │
 │   SUB-MENU SCREEN            │      │  F1                F2                │
 │   DATA DISPLAY SCREEN        │      │  F3                F4                │
 │   DATA ENTRY SCREEN          │      │  F5                F6                │
 │   SECURITY SCREEN            │      │  F7                F8    CHANGE SCREEN│
 │   BARGRAPH SCREEN            │      │  F9   SAVE         F10   EXIT         │
 │   RECIPE SCREEN              │      │  USE ↑↓ KEYS TO CHOOSE AN ITEM.       │
 │                              │      │  PRESS 'ENTER' TO SELECT              │
 │                              │      │                                      │
 │                              │      │  SUB-MENU SCREENS ALLOW THE OPERATOR TO│
 │                              │      │  EASILY SELECT A DESIRED FUNCTION OR  │
 │                              │      │  SCREEN                              │
 └──────────────────────────────┘      └──────────────────────────────────────┘
```

Screen Types

Screen Builder enables you to construct the operator screens to be used in your application. The following types of screens are available:

- Sub-Menu

- Data Display

- Data Entry

- Security

- Bargraph   (SOI-260 ONLY)

- Recipe

Editing Screens

When you are building screens, the following editing operations are available:

- The arrow keys move around the operator screen.

- The DEL key deletes the character above the cursor.

- The BACKSPACE key deletes the character to the left of the current cursor position. The cursor is moved back one space.

- In INS key toggles the Insert mode off and on. In Insert mode, characters are shifted to the right as you enter text. A block cursor indicates Insert mode is active.

- Extended SOI character set.

When you specify data information for the Operator Screen, a star (*) is displayed as a place holder to show allowed character length.

For the SOI-120, the Operator Screen is 40 characters (2 lines, 20 characters per line).

In most applications, the SOI-260 Operator Screen is 80 characters (4 lines, 20 characters per line). The exception is the bargraph screen (2 lines, 40 characters per line).

Data Formats

When programming Data Display and Data Entry fields and positioning them on the SOI display, each field must be defined according to its PLC location, data format, and other data parameters specific to the data format selected.

You are prompted for the register definitions at the Control Window. Each register definition is somewhat different, depending on the data format selected and whether the data field is a Data Display or Data Entry field.

Appendix A lists the applicable data formats and the Control Window prompts associated with each Data Display and Data Entry screens.

Note: *Refer to the PLC Reference Section for additional information on registers specific to the selected PLC.*

Screen Types and Data Formats

Each SOI Screen type may or may not support all data formats. The following lists each screen type and the associated data formats supported. Refer to Appendix A for a description of the data formats. Those formats only available on the SOI-260 are noted as such.

Display, Alarm, and Printer Form Screens

Bit

16 Bit Signed Integer

16 Bit Unsigned Integer

16 Bit BCD

16 Bit HEX

32 Bit Floating Point

32 Bit Unsigned Integer

32 Bit BCD

32 Bit HEX

ASCII

Bargraph Screens (SOI-260)

16 Bit Signed Integer

16 Bit BCD

Recipe Screens

16 Bit Integer

16 Bit Unsigned Integer

16 Bit BCD

32 Bit Floating Point (SOI-260)

32 Bit Unsigned Integer

32 Bit BCD

Entry Screens

Bit

16 Bit Signed Integer

16 Bit Unsigned Integer

16 Bit BCD

32 Bit Floating Point (SOI-260)

32 Bit Unsigned Integer

32 Bit BCD

Background Monitor (SOI-260 only)

Bit

16 Bit Signed Integer

16 Bit BCD

Note: *Refer to the PLC Reference section for additional information on registers specific to the selected PLC.*

Registers

All of the non-menu screens may require access to PLC data registers for their operation. When you construct a screen, you need to specify:

- the type of data stored in the PLC register.
- The register to access.
- Any data format and display information.

Note: *Refer to the PLC Reference for additional information on registers specific to the selected PLC.*

Refer to Appendix B for approximate memory allocations for each type of register you might use in your programs.

Menu Screens

Menu Screens provide easy access to different parts of an application, enabling you to construct an application on the basis of specific tasks and responsibilities.

Each Menu Screen may consist of up to 8 different menu items. When selected, each of the menu items displays a subsequent menu or screen, or performs a process.

An example of a menu screen might be:

```
1. CHAMBER TEMP
2. FLOW CONTROL
3. HEATER CONTROL
```

There are two types of menu screens:

- Main Menu

- Sub-Menus

Main Menu Screens

The Main Menu is always operator screen #1, at the top of your menu/screen hierarchy. There can be only one Main Menu. This menu lists the primary components of your application. All other menus and data screens are accessed on the basis of this information.

The Main Menu functions differently than any other menu in the following ways:

- The Main Menu key on the SOI keypad calls the Main Menu directly. This key is active in all situations, except when an Alarm is detected.

- The Main Menu is the first screen that appears after a restart or reset (unless an Alarm is detected).

Sub-Menu Screens

In appearance, Sub-Menu Screens are identical to the Main Menu. Sub-Menu Screens enable you to expand the scope of an operation by providing the operator with directed choices through linked menus. This enables you to construct a large application and maintain the operator's efficient access to specific areas.

Building a Menu

When you build a menu, you are defining the scope of a process and directing the operator to more specific components of the process. Any given menu is a numbered list of the components available to the operator at the current stage of the process. Specifying the list is a simple editing operation.

To assign the menu information, position the cursor at the location that you want the list to begin and enter the text.

Data Display Screens

The Data Display Screen Builder appears like this:

```
EDIT FILE -- SCREEN BUILDER                          USER SCREEN #002:DATA DISPLAY

   SCREEN LINKAGE
   PREVIOUS MENU IS UNLINKED

   NEXT SCREEN IS UNLINKED
   PREVIOUS SCREEN IS UNLINKED


                                          F1   DISPLAY REG        F2
                                          F3   MAP SCREEN         F4    COPY SCREEN
                                          F5   INSERT TIME        F6    INSERT DATE
                                          F7   CLEAR SCREEN       F8    CHANGE SCREEN
                                          F9   SAVE               F10   EXIT

                                          USE CURSOR KEYS TO MOVE AROUND SCREEN
                                          PRESS 'INS' TO TOGGLE INSERT MODE
                                          PRESS ' DEL' TO DELETE CHARACTER
                                          USE FUNCTION KEYS WHERE APPROPRIATE
```

Data Display Screens allow the operator to monitor the value of registers in the PLC. The SOI continuously reads the PLC registers to update the displayed values in real time.

To construct Data Display Screens, you need to specify:

- The type of screen as Data Display

- Any text information that you want to display

- The type of data stored in the PLC register

- The register to access

- Any data format and display information

- The display position for the data

Data Display Screen Function Keys

Data Display Screens use two additional function keys:

F1 (Display register specification)

F3 (Map screen to another screen)

Note: *The F3 function key displays four process-specific function key operations. Refer to Linking the Screens.*

F1   DISPLAY REG

When you press F1, you are prompted at the Control Window for the type of data to display. After selecting the data format, you are prompted for the register number and any data format or display information.

Note: *Refer to the PLC Reference section for the register information specific to your PLC.*

You can modify previously defined display fields by placing the cursor at the field position and pressing the F1 key.

F3   MAP SCREEN

When you press F3, you are prompted at the Control Window for the mapping information.

Note: *All of the screens for a program should be constructed before you establish any links. Refer to Linking the Screens, for a discussion of the F3 key (Link/Map Screen) functionality.*

Specifying Display Register Information

To display the PLC register data correctly, you need to specify the register for the SOI to read, and the manner in which you want the data formatted and displayed. Refer to Appendix A for data format descriptions.

You are prompted for the data format and register information at the Control Window.

Note: Refer to the PLC Reference section for the register information specific to your PLC.

To select a register value for display:

1. Position the cursor at the location on the Display Window where you want the register display data to appear and press F1.

2. You are then prompted for the data format. Use the cursor keys to select the data format, and press ENTER.

3. After you have completed this operation, the Control Window prompts you for the register identifier, and any associated format and display information.

4. To assign register information, enter the appropriate data at each prompt and press ENTER.

EDIT FILE -- SCREEN BUILDER	USER SCREEN #: DATA DISPLAY
16 B IT SIGNED INTEGER DISPLAY	

REGISTER NUMBER:	▮
DIGITS RIGHT OF DECIMAL:	0
DIGITS LEFT OF DECIMAL:	5
LEAVE PLACE FOR SIGN (Y OR N):	Y
SHOW LEADING ZEROS (Y OR N):	N
MINIMUM REGISTER VALUE:	-32768
MAXIMUM REGISTER VALUE:	32768
MINIMUM DISPLAYED VALUE:	-32768
MAXIMUM DISPLAYED VALUE:	32768

Note: The numeric values for the data type selected automatically default to a 1:1 scaling ratio. For further information on scaling, refer to the "Scaling Data" section later in this chapter.

5. To save the register information, press ESC. The cursor is then returned to the Display Window.

The Display Window displays a * (star) for each character displayed as register data, and a sign (if specified). On color displays, the stars appear in blue.

For example, the display data for a register type of Integer, having two characters to the right of the decimal and three to the left with a sign would be: +***.**.

Data Entry Screens

The Data Entry Screen Builder appears like this:

```
EDIT FILE -- SCREEN BUILDER                              USER SCREEN #003: DATA  ENTRY

   SCREEN LINKAGE
   PREVIOUS MENU IS UNLINKED

   NEXT SCREEN IS UNLINKED
   PREVIOUS SCREEN IS UNLINKED


                                          F1   DISPLAY REG        F2    ENTRY REG
                                          F3   MAP SCREEN         F4    COPY SCREEN
                                          F5   INSERT TIME        F6    INSERT DATE
                                          F7   CLEAR SCREEN       F8    CHANGE SCREEN
                                          F9   SAVE               F10   EXIT

                                          USE CURSOR KEYS TO MOVE AROUND SCREEN
                                          PRESS 'INS' TO TOGGLE INSERT MODE
                                          PRESS ' DEL' TO DELETE CHARACTER
                                          USE FUNCTION KEYS WHERE APPROPRIATE
```

Data Entry Screens are used for operator entry (input). These screens have all of the programmable attributes of the Data Display Screens, in addition to accepting data entered by an operator. However, there may only be one Data Entry field for each screen.

Note: *Register values displayed at a Data Entry Screen are not continuously updated.*

All data entry types can have a default value sent to the PLC when the operator presses ENTER. The default values you specify appear on the SOI screen in the space provided for the operator's entry. A flashing cursor identifies the first digit of the default value for the operator.

To construct Data Entry Screens, you need to specify:

- The type of screen as Data Entry

- Any text information that you want to display

- The type of data stored in the PLC register

- The register to access

- Any data format and display information

- The display position for the entry field

Data Entry Screen Function Keys

Data Entry Screens use three additional function keys:

F1 (Display register specification)

F2 (Data entry field specification)

F3 (Map screen to another screen)

Note: ***The F3 function key displays four process-specific function key operations. Refer to Linking the Screens.***

F1   DISPLAY REG

When you press F1, you are prompted at the Control Window for the type of data to display. After selecting the data format, you are prompted for the register number and any data format or display information.

Note: ***The Display register must be positioned first on the screen followed by the Entry register in order to properly operate. For example:***
> ***Line 1 = Display Register***
> ***Line 2 = Entry Register***

You can modify previously defined fields by placing the cursor at the field position and pressing the F1 key.

F2   ENTRY REG

When you press F2, you are prompted at the Control Window for the type of data. After selecting the data format, you are prompted for the register number and any format or display information.

Note: *Refer to the PLC Reference section for the register information specific to your PLC.*

You can modify previously defined fields by placing the cursor at the field position and pressing the F2 key.

F3   MAP SCREEN

When you press F3, you are prompted at the Control Window for the mapping information.

Note: *All of the screens for a program should be constructed before you establish any links. Refer to Linking the Screens, for a description of the F3 key (Link/Map Screen) functions.*

Specifying Data Entry Register Information

You are prompted for the register information at the Control Window.

Note: *Refer to the PLC Reference section for the register information specific to your PLC.*

To select the type of data for data input:

1. Position the cursor at the location on the Display Window where you want the data entry field to appear and press F2.

Note: *The data entry field should be the last field located on the display. When the operator enters the data and presses ENTER, the next linked screen is displayed.*

2. You are then prompted for the data format at the Control Window. Use the cursor keys to select the data format, and press ENTER.

3. After you have completed this operation, the Control Window prompts you for the register identifier, and any associated format and display information.

Use the following procedure to assign register information.

To assign register information:

1. Enter the appropriate data at each prompt and press ENTER.

```
EDIT FILE -- SCREEN BUILDER                          USER SCREEN #: DATA DISPLAY


    16 B IT SIGNED INTEGER DISPLAY

    REGISTER NUMBER:                   ▉
    DIGITS RIGHT OF DECIMAL:           0
    DIGITS LEFT OF DECIMAL:            5
    LEAVE PLACE FOR SIGN (Y OR N):     Y
    MINIMUM REGISTER VALUE:            -32768
    MAXIMUM REGISTER VALUE:            32768
    MINIMUM DISPLAYED VALUE:           -32768
    MAXIMUM DISPLAYED VALUE:           32768
    LOW USER INPUT LIMIT:              -32768
    HIGH USER INPUT LIMIT:             32768
    DEFAULT VALUE:                     NONE
```

Note: **The numeric values for the data type selected automatically default to a 1:1 scaling ratio. For further information on scaling, refer to the "Scaling Data" section later in this chapter.**

2. To save the register information, press ESC. The cursor is then returned to the Display Window.

3. The Display Window displays a ◊ (diamond) for each character displayed as register data, and a sign (if specified). On color displays the diamonds appear in white.

   For example, the display data for a register of type signed integer, having two characters to the right of the decimal and three to the left would be: ◊◊◊.◊◊

Bargraph Screens (SOI-260 only)

The Bargraph Screen Builder appears like this:

```
EDIT FILE -- SCREEN BUILDER                          USER SCREEN #005: NEW SCREEN


    SELECT REGISTER TYPE:
    16 BIT SIGNED INTEGER
    16 BIT BCD
                                        F1              F2
                                        F3              F4
                                        F5              F6
                                        F7              F8
                                        F9   SAVE       F10    EXIT
```

A Bargraph Screen provides a graphic, analog display of PLC data.

Note: *Refer to the PLC Reference section for the register information specific to your PLC.*

The Display Window display is formatted as follows:

- Lines one and two are used for text and numeric bar data display.

- The third line displays a horizontal bargraph having a left to right scale. The bar can represent up to forty elements. Each element represents 2.5% of the bar range.

- The fourth line displays the minimum and maximum numeric values, and horizontal axis marks at 25%, 50%, and 75% of scale.

The following is an example of a Bargraph Screen displayed on the SOI-260 device:

```
650.00
OPERATING TEMP
▌▌▌▌▌▌▌▌▌▌▌▌▌▌▌
-300|           |           | 1000
```
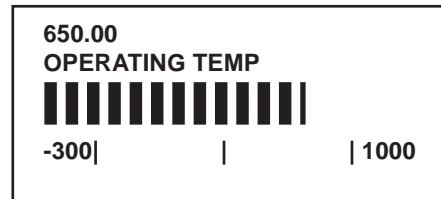
Constructing a Bargraph Screen consists of specifying:

- The text that you want to be displayed

- The type of data stored in the PLC register

- The register to access

- Any data format and display information

- Range of register values

- Range of display values

- Range of graphical display

Bargraph Screen Function Keys

Bargraph Screens use three additional function keys:

> F1 (Display bargraph data)
>
> F2 (Edit register and graph specification)
>
> F3 (Map screen to another screen)

Note: *The F3 function key displays four process-specific function key operations. Refer to Linking the Screens.*

F1   DISPLAY BAR REG

When you press F1, the numeric bargraph data is displayed at the cursor position.

F2   EDIT BAR DATA

When you press F2, the register and graph information is displayed at the Control Window. You can then edit any or all of the specifications.

Note: *Refer to the PLC Reference section for the register information specific to your PLC.*

F3   MAP SCREEN

When you press F3, you are prompted at the Control Window for the mapping information.

Note: *All of the screens for a program should be constructed before you establish any links. Refer to Linking the Screens, for a description of the F3 key (Link/Map Screen) functions.*

Bargraph Register Data

The Control Window prompts you for:

- The register number
- The data format
- The range of values stored in the register
- The corresponding display values available to the operator
- The display range for the bargraph

The Bargraph can correspond to any range of values within the minimum and maximum values stored in a register. In this way, you can represent the optimum or strategic range of control for an operator.

For example, suppose a register has values between 0 and 9999 that correspond to -300°F and 1000°F for the display limits (the range available to the operator). If the major region of interest for the Bargraph were 100°F to 300°F, you would enter these limits and the Bargraph will display only this 200°F range.

To specify the bargraph information:

1. Enter the appropriate data at each prompt and press ENTER.

2. To save the bargraph specifications, press ESC. The cursor is then returned to the Display Window.

The Display Window displays an asterisk (*) for each character displayed as register data, and a sign (if specified).

For example, the display data for a register of type Integer, having two characters to the right of the decimal and three to the left with a sign would be: +***.**.

Recipe Screens

The Recipe Screen Builder appears like this:

```
EDIT FILE -- SCREEN BUILDER                          USER SCREEN #015: NEW SCREEN




                    RECIPE SCREEN DOWNLOAD

PROMPT OPERATOR TO SEND?                     F1                F2
(Y OR N)                              _      F3                F4
                                             F5                F6
                                             F7                F8
                                             F9                F10
```

Recipe Screens allow an operator to download a block of data for up to 10 register addresses. These addresses can be in any order and need not be sequential. Multiple recipe screens may be linked together in sequential order to download more than 10 register addresses, or to download more than one data format. You can choose to have the operator initiate the download either automatically or manually.

Successive screens linked to the first recipe screen are downloaded immediately following the first screen. The operator prompt enabled for the first screen prompts the operator to press Y to send the recipe. If the other linked recipes do not have the operator prompt enabled they are sent automatically. This appears to the operator as though all recipes were sent as one large recipe.

There is only one exception to the immediate download of successive screens. If an alarm is initiated before all recipe screens are finished, the alarm screen is displayed, temporarily halting the succession of downloading. As soon as the operator presses Y to acknowledge the alarm, the downloading continues until finished.

The first three lines of the Display Window, are reserved for you to enter any text that you want the operator to see when the recipe screen is displayed. The fourth line of the display is reserved for the operator prompt and may not be edited.

Specifying Recipe Screens

When you select a Recipe Screen you are prompted for whether or not you wish the operator to acknowledge the download (a manual or automatic operation).

To select a manual download, enter Y at the prompt, and press EN-TER. The operation defaults to automatic (N at the prompt).

```
                      RECIPE SCREEN DOWNLOAD

PROMPT OPERATOR TO SEND?
(Y OR N)                                      _


```

You are then prompted for the data format.

```
SELECT REGISTER TYPE:
16 BIT SIGNED INTEGER
16 BIT UNSIGNED INTEGER
16 BIT BCD
32 BIT FLOATING POINT
32 BIT UNSIGNED INTEGER
32 BIT BCD
```

Note: *Refer to the PLC Reference section for register information specific to your PLC.*

After you have completed this operation, the Control Window prompts you for the register identifier, and the data that you wish to send.

- To specify the register and data information, enter the register number. You can define up to 10 registers. Press the ENTER key, the Data to Send column is then highlighted. You can then enter the data for the register.

- When entering data, you must conform to the data formats acceptable to the data format you have specified.

```
                    RECIPE DATA
              16 BIT SIGNED INTEGER DATA
            REGISTER            DATA TO SEND
    1.                          0
    2.
    3.
    4.
    5.
    6.
    7.
    8.
    9.
    10.
    DOWNLOAD: PROMPT OPERATOR
```

- To save the register and data specifications, press ESC. The cursor is then returned to the Display Window.

Recipe Screen Function Keys

Recipe Screens use three additional function keys:

F1 (Display register specification)

F2 (Operator prompt)

F3 (Map screen to another screen)

Note: The F3 function key displays four process-specific function key operations. Refer to Linking the Screens.

F1   EDIT DATA

When you press F1, the Control Window is activated, enabling you to modify the recipe data.

F2   AUTO PROMPT

When you press F2, you are prompted for the operator prompt acknowledgment to use.

F3   MAP SCREEN

When you press F3, you are prompted at the Control Window for the mapping information.

Note: All of the screens for a program should be constructed before you establish any links. Refer to Linking the Screens, for a description of the F3 key (Link/Map Screen) functions.

Scaling Data

A major feature of the SOI is the ability to translate PLC register data to and from values the operator can readily use. This translation process is called scaling. Scaling of data to and from the SOI is accomplished by defining a proportional ratio between the minimum and maximum range of the register values and the minimum and maximum display or entry values. A 1:1 ratio is defined if the range of the minimum and maximum register values is equal to the range of the minimum and maximum display or entry values.

For example, suppose an analog input module inputs data to a register with the limits of 0 to 4095. These limits represent temperatures between the range of -100 degrees F and +300 degrees F. The SOI will display values from -100 to +300 by scaling the data as it reads it from the register. If the data read from the register is 0, the value -100 will be displayed. For a value of 4095, the value +300 will be displayed. PLC register values between 0 and 4095 will be displayed with a directly proportional value between -100 and +300. A PLC register value of 2047 (50%) will display +100 (50%) degrees. The control window definitions for this scale are as follows.

```
EDIT FILE -- SCREEN BUILDER                              USER SCREEN #: DATA DISPLAY

    16 B IT SIGNED INTEGER DISPLAY

    REGISTER NUMBER:                     ██
    DIGITS RIGHT OF DECIMAL:             0
    DIGITS LEFT OF DECIMAL:              5
    LEAVE PLACE FOR SIGN (Y OR N):       Y
    MINIMUM REGISTER VALUE:              -32768
    MAXIMUM REGISTER VALUE:              32768
    MINIMUM DISPLAYED VALUE:             -32768
    MAXIMUM DISPLAYED VALUE:             32768
    LOW USER INPUT LIMIT:                -32768
    HIGH USER INPUT LIMIT:               32768
    DEFAULT VALUE:                       NONE
```

Note: *To display the scaling parameters, you first must position the cursor in the Display Window where you want the register data to be placed. Then press the F1 or F2 Key (Display or Entry) to access the scaling parameters.*

When the ratio between the ranges is not a power of 2, rounding must be performed to calculate an operable number. This rounding during the scaling computation may not always give the desired numbers when translating between the register range and the display or entry ranges. In fact, the computation can generate a 1 count error.

In practice, the displayed value can be off by one count when translating a register value, or the register value can be off by one count when translating an entered value.

The following error screens are displayed when the SOI-SPS Programming Software detects a rounding error at the end points of the range. These screens indicate that endpoint values must be either increased or decreased in order to alter the scaling ratio. This enables you to eliminate the rounding error and provide exact data scaling at the endpoints. Increasing the minimum or decreasing the maximum of either range will fine tune the ratio.

Lower Endpoint

Warning: Due to rounding during scaling the
lower endpoint values will not match. Press "Y"

The scaled value may be one count from the lower endpoint, but the value will still be within the defined range. If it is important for the lower endpoints to match in your application, alter the scaling ratio by pressing Y and adjust any of the 4 endpoints.

High Endpoint

**Warning: Due to rounding during scaling the
upper endpoint values will not match. Press "Y"**

The scaled value may be one count from the high endpoint, but the value will still be within the defined range. If it is important for the high endpoints to match in your application, alter the scaling ratio by pressing Y and adjust any of the 4 endpoints.

Upper Overflow

**Warning: Due to rounding during scaling the
upper endpoint value will overflow the number range.
Press "Y"**

The scaled value may be one count from the upper endpoint and the value will exceed the defined range. This is a serious error for some applications, since the endpoint value plus one may correspond to another point used. If necessary, alter the scaling ratio by pressing Y and adjust any of the 4 endpoints.

Provided that the alteration of the range values does not generate another rounding error, the above error screens will not be displayed when the ESC key is pressed to re-activate the display window.

Note: *The formula for scaling a display value is:*
  Display Value = m * Register Value + b.
Where m = (Display High - Display Low) / (Register High - Register Low), and b = Display Low - (m * Register Low).

The formula for scaling the entry value is:
  Register Value = m * Entry Value + b.
Where m = (Register High - Register Low) / (Entry High - Entry Low), and b = Register Low - (m * Entry Low).

Security Screens

The Security Screen Builder appears like this:

```
EDIT FILE -- SCREEN BUILDER                              USER SCREEN #004: SECURITY

SCREEN LINKAGE
PREVIOUS MENU IS UNLINKED
                                                    *RESTRICTED ACCESS*
NEXT SCREEN IS UNLINKED                                  ENTER CODE
PREVIOUS SCREEN IS UNLINKED                                  :


            SECURITY CODES

CODE 1: ????????                        F1                  F2
CODE 2: ????????                        F3   MAP SCREEN     F4    COPY SCREEN
CODE 3: ????????                        F5                  F6
                                        F7                  F8    CHANGE SCREEN
                                        F9   SAVE           F10   EXIT
                                        USE ↑¬ KEYS TO MOVE BETWEEN CODES.
                                        ENTER NEW CODE AND PRESS 'ENTER'.
                                        PRESS 'ESC' WHEN DONE.

                                        ENTER UP TO EIGHT DIGITS FROM 0-9 OR
                                        USE '?' FOR EACH WILD CARD CHARACTER.
```

Security Screens use numeric codes to restrict access to any associated information or processes. For ease of programming, Security Screens are provided with default text:

```
        *RESTRICTED ACCESS*
            ENTER CODE
               :
```

If you prefer a different message, simply edit the Security Screen to suit your requirements.

Constructing a Security Screen consists of:

- Assigning the security code(s).

- Establishing the screen mapping.

Security Screen Function Keys

Security Screens use two additional function keys:

F1 (Edit security codes)

F3 (Map screen to another screen)

Note: *The F3 function key displays four process-specific function key operations.*

F1 EDIT CODES

When you press F1, you are prompted at the Control Window to edit the previously defined security codes.

F3 MAP SCREEN

When you press F3, you are prompted at the Control Window for the mapping information.

Note: *All of the screens for a program should be constructed before you establish any links. Refer to Linking the Screens, for a description of the F3 key (Link/Map Screen) functions.*

Assigning Security Codes

As the operator enters a security code, an asterisk (*) is displayed for each character input. When the operator presses ENTER, the security code is checked for agreement. If a valid security code has been entered, the next linked screen is displayed. If an invalid security code is entered, an error message appears. Once the error condition is acknowledged (by pressing the Y key), the operator can re-enter the code or return to the Main Menu.

You can specify up to three security codes for each Security Screen. The operator is allowed access by entering any one of the assigned security codes.

To assign the security codes:

1. Enter at least one digit at each prompt and press ENTER. You can enter up to eight digits. If you enter less than eight, each remaining digit is displayed as a question mark (?). The question mark is a wildcard character, designating any character entry as acceptable.

2. To modify a security code, highlight the value and overwrite the old code.

3. To save the security code, press ESC. The cursor is then re-turned to the Display Window.

Linking the Screens

After you have developed all of the screens necessary for your application, you need to decide how to link them. It is very helpful to create a flowchart of the screens to use as a map, before you begin to define the links.

The PREV and NEXT keys of the SOI-260 use the linking information to move between screens. However, not all links need to have a "next" and "previous" screen. Otherwise this would result in endless, circular links. For this reason, a link may create a two-way or one-way relationship.

Two-way links utilize a **Link** function:

From screen A to screen B (the NEXT screen from screen A)

and

From screen B to screen A (the PREV screen from screen B)

One-way links only utilize a **Goto** function:

From screen A to screen B (the NEXT screen from screen A)

There is no Previous link (PREV) established for screen B.

The following is a list of rules for linking screens:

•   Only screens that are already defined can be linked.

•   Wait until you have developed all of your screens and menus before establishing links. It is much easier to create your links once, rather than change them whenever you change the order of screens.

- A non-menu screen cannot link to a menu screen (see instead, the Insert Goto operation below).

- A link is a one-to-one relation: it effects a relation only between the current screen and the target screen. Consequently, you cannot establish more than one two-way link to any particular screen.

- If you attempt to link to a destination screen that is already linked, you have the option of inserting the screen (changing the current link) or aborting the operation.

When you press F3 at a screen, there are four additional function key operations available. These function keys are not available for menus:

F1   INSERT LINK

Press F1 to establish a two-way link between the current screen and the target screen.

For example, suppose the current screen is Screen #6 and you want to establish a two-way link with Screen #7. Press F1, and enter "7" at the prompt for the target screen.

F3   INSERT GOTO

Press F3 to perform a one-way link. This is helpful if you want to avoid a "circular link" or jump to a Sub-Menu from this screen.

Since this is a one-way link, there is no Previous link (PREV) established from the target screen to the current screen.

For example, suppose the current screen is Screen #6 and you want to go directly to Screen #10. Press F3, and enter "10" at the prompt for the target screen. When the operator is at Screen #6 and presses the NEXT key, Screen #10 will display. If the operator presses the PREV key at Screen #10, Screen #6 will not be displayed, instead Screen #10 continues to be displayed.

F5   DELETE MAPPING

The Delete Mapping function deletes all links (both one and two-way) that are established for the current screen.

F7   DELETE NEXT

The DELETE NEXT function deletes the link established for the next screen only. For two-way links, this will affect the Previous (PREV) link established for the next screen as well.

For example, if the current screen is Screen #6, and it has a two-way link with Screen #7, then Screen #7 loses its Previous link when Screen #6 loses its Next link.

If the screen link is one-way, the current screen's next link is deleted.

CHAPTER 7: SOI ALARM SCREEN BUILDER

This chapter describes the functions that can be performed using the Alarm Screen Builder menu item.

Alarm Screen Builder

When selecting Alarm Screen Builder from the Edit File menu, the following screen appears.

```
EDIT FILE -- ALARM BUILDER
┌─────────────────────────────┬──────────────────────────┐
│                             │    ┌──────────────┐       │
│                             │    │              │       │
│                             │    │              │       │
│                             │    └──────────────┘       │
├─────────────────────────────┤──────────────────────────┤
│  WHICH SCREEN NUMBER DO YOU │                          │
│  WANT TO BE YOUR FIRST ALARM │       ■                  │
│  SCREEN?                     │                          │
│                             │                          │
│                             │                          │
└─────────────────────────────┴──────────────────────────┘
```

Alarm Screens identify cautionary or emergency conditions. They are displayed when called by the Advisor functions. For the SOI-260 they can also be called by the Background Monitor.

The Background Monitor triggers an Alarm Screen when the assigned register data exceeds the programmed limits.

The SOI-260 Advisor triggers the Alarm Screen when the PLC ladder program writes the decimal screen number to the SOI-260 Advisor register location.

When you select an Alarm Screen, you are prompted for the first screen number to assign. This may be any undefined screen.

The fourth line of an Alarm Screen automatically defaults to "PRESS Y TO CLEAR". You can edit this line to any text you want.

The following is an example of an Alarm Screen for the SOI-120:

```
            ** PUMP #1 ALARM**
            PRESS Y TO CLEAR
```

The following is an example of an Alarm Screen for the SOI-260:

```
            ** PUMP #1 ALARM**
            "BEARING OVERTEMP"
              148.5 DEG. F
            PRESS Y TO CLEAR
```

Alarm Screens are much like Data Display Screens with two exceptions:

- Alarm Screens cannot be linked together.

- They can contain an alarm acknowledge to be sent back to the PLC.

Constructing an Alarm Screen consists of specifying:

- Screen text information

- The type of data stored in the PLC register

- The register to access

- Any data format and display information

- The alarm acknowledge specifications

Alarm Screen Function Keys

Alarm Screens use two additional function keys:

F1 (Display register specification)

F3 (Acknowledge alarm register specification)

F1   DISPLAY REG

When you press F1, you are prompted at the Control Window for the type of data to display. After selecting the data format, you are prompted for the register number and any data format or display information.

Note: *Refer to the PLC Reference section for register information specific to your PLC.*

F3   ACKNOWLEDGE

This allows you to send an automatic acknowledge back to the PLC when the operator acknowledges an alarm (by pressing the Y key). When you press F3, you are prompted for:

- The PLC register to receive the acknowledgment.

- The register bit to set.

- The bit setting (0 or 1).

If an acknowledge has already been defined for the current screen, pressing F3 displays the specifications for you to edit. An acknowledge is not required.

Note: *The date and time shown on the alarm screen for the SOI-260 reflects the current time not the time that the alarm screen was initiated. In other words, it's not a time stamp.*

Specifying the Alarm Screen Register Information

To display the PLC register data correctly, you need to specify the register for the SOI-260 to read and the manner in which you want the data formatted and displayed.

You are prompted for the register information at the Control Window.

Note: *Refer to the PLC Reference section for register information specific to your PLC.*

To select a register value for display:

1. Position the cursor at the location on the Display Window where you want the register display data to appear and press F1.

2. You are then prompted for the data format. Use the cursor keys to select the data format, and press ENTER.

3. After you have completed this operation, the Control Window prompts you for the number identifying the register, and any associated format and display information.

   To assign register information, enter the appropriate data at each prompt and press ENTER.

   To save the register information, press ESC. The cursor is then returned to the Display Window.

   The Display Window displays a * (star) for each character displayed as register data, and a + (plus) or - (minus) sign if you have specified one.

   For example, the display data for a register of type signed integer, having two characters to the right of the decimal and three to the left would be: +***.**.

Specifying the Alarm Screen Acknowledge

Once received by the SOI-260, Alarm Screens have to be acknowledged before they will disappear from the operator screen. This acknowledgment may be programmed to set an PLC register bit.

Setting a bit in the PLC requires that you assign:

- The register number.

- The register bit number 0-15 or 1-16 depending on the protocol selected.

- The setting (0 or 1) for the bit.

To specify the alarm acknowledge, press F3. You are then prompted for the register and bit information.

Note: *Current alarm acknowledge assignments are displayed in the Parameters window.*

If additional Alarm Screens (or Printer Form Screens for the SOI-260) are detected by the SOI while an Alarm Screen is being displayed, the SOI will stack the Alarm Screens in temporary storage (on a first-in-first-out basis).

An Alarm Screen can only appear in temporary storage once. If an alarm is sent to the SOI and it already exists in the alarm stack, the new alarm is ignored. The only way to clear the Alarm Screen from the display or the alarm stack is for the operator to acknowledge it by pressing the Y key. In other words, when an Alarm Screen is displayed, all keys are nonfunctional except the Y key.

CHAPTER 8: SOI-120 FUNCTION KEY BUILDER

The Function Key Builder is where Function Keys 1-8 are programmed for the SOI-120 OI product. When Function Key Builder is accessed, the first screen is displayed:

```
┌─────────────────────────────────────────────────────────────────────────┐
│ EDIT FILE -- FUNCTION KEY BUILDER                                         │
├──────────────────────────────────┬──────────────────────────────────────┤
│        FUNCTION KEY REGISTERS     │                                      │
│                                   │        ┌──────────────────┐          │
│    NO REGISTERS DEFINED           │        │                  │          │
│                                   │        │                  │          │
│                                   │        └──────────────────┘          │
│                                   │                                      │
├──────────────────────────────────┤                                      │
│           FUNCTION KEYS           │                                      │
│  FUNCTION   SCREEN      AUTO      │                                      │
│  KEY        NUMBER      RETURN    │  F1   PREV SCREEN    F2   NEXT SCREEN │
│  F1:        ▂▂▂▂▂▂▂               │  F3                  F4              │
│  F2:        NOT LINKED            │  F5   BIT WRITE REG  F6              │
│  F3:        NOT LINKED            │  F7   CLEAR F KEYS   F8              │
│  F4:        NOT LINKED            │  F9   SAVE           F10  EXIT        │
│  F5:        NOT LINKED            │  USE CURSOR KEYS TO MOVE BETWEEN F KEY│
│  F6:        NOT LINKED            │  OPTIONS.                            │
│  F7:        NOT LINKED            │  PRESS 'ESC'  WHEN DONE              │
│  F8:        NOT LINKED            │  PRESS ' DEL' TO DELETE F KEY LINK.  │
│                                   │  ENTER SCREEN NUMBER TO LINK TO      │
│                                   │  THIS FUNCTION KEY.                  │
└──────────────────────────────────┴──────────────────────────────────────┘
```

Function keys in the Information window

F1   PREV SCREEN

Pressing this key on the computer keyboard causes the display window to display each programmed screen in reverse order. For example, if you were displaying screen 5 and pressed F1, screen 4 would appear.

F2   NEXT SCREEN

Pressing this key on the computer keyboard causes the display window to display each programmed screen in numeric order. For example, if you were displaying screen 5 and pressed F2, screen 6 would appear.

F5   BIT WRITE REG

The F5 key allows access to the Bit Write feature. The Bit Write feature prompts you for the base register and automatically assigns the range in a contiguous manner. This is also where you identify if the bit is set (1) or cleared (0).

F7   CLEAR F KEYS

The F7 key allows you to clear ALL function key settings.

F9   SAVE

The F9 key allows you to save your program. The original file name previously selected will come up as the program name to save. If this is the desired file name, press ENTER to save. If you want to change the name, simply edit the existing name and press ENTER. The program has now been saved.

F10   EXIT

The F10 key allows you to exit SOI-SPS back to DOS. Before exiting, you are prompted to save your file. The original file name previously selected will come up as the program name to save. If this is the desired file name, press ENTER to exit. This saves your program file. If you want to change the name, simply edit the existing name and press ENTER. If you want to exit without saving anything, press the ESC key. You are then prompted to lose edits. Pressing the Y key exits you back to DOS without saving any previous edits.

Function Key Operation

Before programming begins, it is important to clearly understand the capabilities and operation of the Function Keys. The Function Keys perform three types of functionality:

- F Keys can perform "HOT" screen call-up, allowing immediate access to critical data display, entry or process screens

- F keys can perform a Bit Write, which sets (1) or clears (0) a bit in the PLC for On/Off control

- Or a combination of both

There are 8 Function Keys located on the front panel of the SOI-120 product. They are sequentially labeled F1 through F8. The function keys allow the user to implement a desired activity with a single key-stroke. The keys may be directly linked to screens residing in user memory. Therefore, pressing the function key bypasses the normal linked path to a screen. For example, F2 may be linked to a recipe screen, so pressing F2 would trigger the recipe screen, regardless of which screen currently is displayed. The function key provides an alternate link to any screen, which then executes the same whether the user triggers it via a function key, advisor, or normal linked path.

When a function key is pressed, the SOI-120 confirm to the user which key was pressed. The Function key number appears for approximately 1 second before advancing to the screen it is linked to. For example, pressing F3 displays the following:

```
┌─────────────────────────┐
│      Function Key        │
│           F3             │
└─────────────────────────┘
```

Note: **This is what is actually seen on the SOI-120 device after the F3 key is pressed.**

Function keys that have not been defined in SOI-SPS have no effect on the SOI-120 operation when pressed.

As part of defining the function key linkage in SOI-SPS, the system design engineer has the ability to define one of two program control methods for each function key. The two types of operation are Auto Return Mode and Continue Mode. Function keys may also be defined for Bit Write in conjunction with either control mode.

Auto Return Mode

Function keys defined as Auto Return Mode cause the application to return to the initial screen following implementation of the screen linked to by that function key. For example: An application is display-ing screen 6 and function key F3 is linked to a recipe at screen 10, so when F3 is pressed, the recipe at screen 10 would execute. Following execution of the recipe download, the display would return to screen 6.

Upon entering a defined function key, all other function keys are disabled until the operation returns to the initial screen. The rules for returning are different based on the screen type that is linked to the function key. Returning from a function key to the initial screen adheres to the following rules.

F-Key Linked To:	Return Rules
Data Display	While the screen is being displayed, pressing ENTER, PREV, or NEXT will return. Pressing the mode key allows the user access to the mode menus. On exiting the mode menu, the SOI-120 abandons the return link and returns operation to the main application menu.
Data Entry	Return occurs after entering the value by pressing the ENTER key. Pressing PREV or NEXT aborts the function link and returns operation to the initial screen.
Recipe	Return occurs following download of all recipe data. Download must first be acknowledged if "prompt" is enabled for the recipe screen. Pressing PREV or NEXT aborts the function link and returns operation to the initial screen.

Continue Mode

Function keys defined as continue mode (if auto return is disabled, then Continue mode is in effect) provide a one-way link to the screen it is routed to. Operation then continues utilizing the established linkages of that screen. For example: The SOI-120 is on screen #3 and function key F2 is linked to a data entry at screen #5, so when F2 is pressed, screen 5 would be displayed. The linkages at screen 3 would no longer take effect. Operation would then continue from screen 5.

Note: Function keys may NOT be linked to alarm screens.

Bit Write Mode

Defining the function keys with Bit Write enabled allows each function key to either set (1) or clear (0) a bit in the PLC. Bit Write may be enabled with or without Auto Return or Continue Mode screen linking enabled. The function keys access contiguous registers defined by the user in SOI-SPS. Example: F1 through F8 are assigned to Register 101 through 108, respectively, so pressing a function key would send the corresponding integer value to the PLC, depending on whether the function is to set (1) or clear (0) the bit, per the following.

SOI-120 Function Key	Set Value	Clear Value	Register Location
F1	00000000 00000001	00000000 00000000	1
F2	00000000 00000010	00000000 00000000	2
F3	00000000 00000100	00000000 00000000	3
F4	00000000 00001000	00000000 00000000	4
F5	00000000 00010000	00000000 00000000	5
F6	00000000 00100000	00000000 00000000	6
F7	00000000 01000000	00000000 00000000	7
F8	00000000 10000000	00000000 00000000	8

All function keys shall be defined with the same bit manipulation such that all keys either set or clear the assigned bit. It is the responsibility of the system design engineer to read and reset the bit in the PLC program.

Function key screen link and Bit Write

The F1-F8 Function Keys may perform a "HOT" screen call-up and perform a Bit Write simultaneously, if programmed to do so. All of the above capabilities and operation guidelines apply to this combination functionality.

For example, F1 has been programmed to call up screen 5 and F1 has been programmed to set (1) a bit on to a PLC register. When the F1 key is pressed, the Bit Write is performed, the screen window on the SOI-120 comes up for 1 second (indicating you have pressed the F1 key, as shown in an example above) and then screen 5 comes up after this. All eight function keys may be programmed in this manner if desired.

Programming the Function Key Builder

Linking a screen to a Function Key

When accessing the Function Key Builder, the first screen is displayed.

```
 EDIT FILE -- FUNCTION KEY BUILDER
┌──────────────────────────────────┬────────────────────────────────┐
│       FUNCTION KEY REGISTERS      │                                │
│                                   │      ┌──────────────────┐      │
│   NO REGISTERS DEFINED            │      │                  │      │
│                                   │      │                  │      │
│                                   │      └──────────────────┘      │
│                                   │                                │
├──────────────────────────────────┤                                │
│           FUNCTION KEYS           │                                │
│  FUNCTION   SCREEN      AUTO      ├────────────────────────────────┤
│  KEY        NUMBER      RETURN    │  F1  PREV SCREEN   F2  NEXT SCREEN │
│  F1:        ▐████▌                │  F3                F4           │
│  F2:        NOT LINKED            │  F5  BIT WRITE REG F6           │
│  F3:        NOT LINKED            │  F7  CLEAR F KEYS  F8           │
│  F4:        NOT LINKED            │  F9  SAVE          F10  EXIT    │
│  F5:        NOT LINKED            │  USE CURSOR KEYS TO MOVE BETWEEN F KEY │
│  F6:        NOT LINKED            │  OPTIONS.                       │
│  F7:        NOT LINKED            │  PRESS 'ESC'  WHEN DONE         │
│  F8:        NOT LINKED            │  PRESS ' DEL' TO DELETE F KEY LINK. │
│                                   │  ENTER SCREEN NUMBER TO LINK TO │
│                                   │  THIS FUNCTION KEY.             │
└──────────────────────────────────┴────────────────────────────────┘
```

Note: *To link a screen to a Function Key, that screen must be programmed first.*

The Control Window (lower left section on the CRT screen), displays all 8 Function Keys with prompts to fill in the Screen Number and Auto Return information.

The screen number identifies which screen will be linked to that function key. The auto return prompts you for a Y or N. If the auto return is programmed as N, the Continue mode is enabled.

To link a screen to a Function Key, just type the screen number that you wish to link and press ENTER. The Auto Return then prompts you for a response. Continue programming in this manner for all Function Keys that you wish to link to a screen. When finished, pressing the ESC key exits you to the Edit File menu screen.

Programming Function Keys to perform a Bit Write

When accessing the Function Key Builder, the first screen is displayed.

```
EDIT FILE -- FUNCTION KEY BUILDER

     FUNCTION KEY REGISTERS

   NO REGISTERS DEFINED



              FUNCTION KEYS
  FUNCTION    SCREEN        AUTO
  KEY         NUMBER        RETURN       F1    PREV SCREEN      F2     NEXT SCREEN
  F1:         ▬▬▬                        F3                    F4
  F2:         NOT LINKED                 F5    BIT WRITE REG    F6
  F3:         NOT LINKED                 F7    CLEAR F KEYS     F8
  F4:         NOT LINKED                 F9    SAVE             F10    EXIT
  F5:         NOT LINKED                 USE CURSOR KEYS TO MOVE BETWEEN F KEY
  F6:         NOT LINKED                 OPTIONS.
  F7:         NOT LINKED                 PRESS 'ESC' WHEN DONE
  F8:         NOT LINKED                 PRESS ' DEL' TO DELETE F KEY LINK.
                                         ENTER SCREEN NUMBER TO LINK TO
                                         THIS FUNCTION KEY.
```

To program Bit Write capability, Press the F5 key in the Information Window (lower right-hand section in the CRT Screen). The next screen is displayed.

```
EDIT FILE -- FUNCTION KEY BUILDER

     FUNCTION KEY REGISTERS

   NO REGISTERS DEFINED




              BIT WRITE REGISTER

   REGISTER NUMBER;          ▬▬▬         F1                    F2
   BIT SET (1) OR CLEARED (0):   1       F3                    F4
                                         F5                    F6
                                         F7                    F8
                                         F9   SAVE             F10    EXIT
                                         USE↑¬ KEYS TO MOVE BETWEEN QUESTIONS
                                         ANSWER QUESTION AND PRESS 'ENTER'.
                                         PRESS 'ESC' WHEN DONE.

                                         ENTER BASE PLC REGISTER NUMBER TO
                                         WRITE WHEN FUNCTION KEY IS PRESSED.
```

Note: *The Bit Write function requires 8 contiguous PLC registers and correlates to F1 through F8. Refer to the above Bit Write section in this chapter.*

Select the Base PLC Register that will contain the Bit Write information. Then select if you want a (1) or (0) sent to the PLC when a function key is pressed. When finished, pressing the 'ESC' key exits you to the initial Function Key Builder screen.

```
┌─────────────────────────────────────────────────────────────────────┐
│ EDIT FILE -- FUNCTION KEY BUILDER                                     │
├──────────────────────────────────────┬──────────────────────────────┤
│         FUNCTION KEY REGISTERS        │   ┌──────────────────────┐    │
│                                       │   │                      │    │
│   REGISTERS: 40001 - 40008            │   │                      │    │
│   FUNCTION BIT:  SET (1)              │   │                      │    │
│                                       │   └──────────────────────┘    │
├──────────────────────────────────────┤                               │
│           FUNCTION KEYS               │                               │
│  FUNCTION   SCREEN      AUTO          │ F1  PREV SCREEN   F2  NEXT SCREEN│
│  KEY        NUMBER      RETURN        │ F3                F4          │
│  F1:        ▬▬▬▬        │ F5  BIT WRITE REG  F6          │
│  F2:        NOT LINKED                │ F7  CLEAR F KEYS   F8          │
│  F3:        NOT LINKED                │ F9  SAVE          F10  EXIT    │
│  F4:        NOT LINKED                │ USE CURSOR KEYS TO MOVE BETWEEN F KEY│
│  F5:        NOT LINKED                │ OPTIONS.                      │
│  F6:        NOT LINKED                │ PRESS 'ESC'  WHEN DONE        │
│  F7:        NOT LINKED                │ PRESS ' DEL' TO DELETE F KEY LINK.│
│  F8:        NOT LINKED                │ ENTER SCREEN NUMBER TO LINK TO│
│                                       │ THIS FUNCTION KEY.            │
└──────────────────────────────────────┴──────────────────────────────┘
```

Note: *After programming the Bit Write information, the Parameter Window (upper left screen) reflects the Bit Write addressing.*

If the desired operation of Function Keys F1-F8 is to be screen call-up or Bit Write only, program only the desired funtionality. If the combination functionality is desired, then programming of both sections is required.

CHAPTER 9: SOI-260 BACKGROUND MONITOR

This chapter describes the functions that can be performed using the Background Monitor menu item.

Background Monitor

When selecting Background Monitor from the Edit File menu, the following screen appears.

```
FILE NAME:  test.CFG              EDIT FILE -- BACKGROUND BUILDER


                   BACKGROUND REGISTER #1
                   BACKGROUND REGISTER #2
                   BACKGROUND REGISTER #3
                   BACKGROUND REGISTER #4


SELECT BACKGROUND REGISTER        F1              F2
TO PROGRAM                        F3              F4
                                  F5              F6
USE ⇅ KEYS TO CHOOSE AN ITEM.     F7              F8
PRESS 'ENTER' TO SELECT.          F9  SAVE        F10  EXIT

BACKGROUND REGISTER #1
THIS BACKGROUND REGISTER IS UNUSED.
```

The Background Monitor function is available at the Edit Program File menu. This function allows the SOI-260 to monitor registers in the PLC and display the appropriate Alarm Screen or execute a Printer Form when the register values exceed the assigned limits.

The Background Monitor is similar to the SOI-260 Advisor with two important differences:

- The message triggered to alert an operator of an existing condition is generated within the SOI-260 and not the PLC. This means that no ladder logic programming is required for the SOI-260 to operate independently.

- There is a predetermined number of screens or forms that can be triggered. The Background Monitor allows a total of four background registers to be monitored. If triggered by a bit status change in the PLC, up to 64 individual Alarm Screens or Printer Forms can be executed (4 registers x 16 bits = 64 screens/forms), or the Background Monitor Registers may be set up to trigger from an analog value. The 4 registers may be programmed for both bit and analog monitoring.

Background Monitor Function Keys

Background Monitor screens utilize a number of additional function keys:

```
F1   SHOW NEXT ALARM  F2      NEXT FORM #
F3   DELETE SCREEN #  F4
F5   PREVIOUS BIT     F6      NEXT BIT
F7   PREVIOUSE REG    F8      NEXT REGISTER
F9   SAVE             F10     EXIT
USE ↑↵ KEYS TO MOVE BETWEEN QUESTIONS.
ANSWER QUESTIONS AND PRESS 'ENTER'


ENTER SLC REGISTER NUMBER TO MONITOR
```

F1   SHOW NEXT ALARM

This function displays all defined Alarm Screens to easily enable you to select a particular Alarm Screen to be assigned to the monitor definition. Pressing the F1 key, scrolls through a list of the defined Alarm Screens.

F2   NEXT FORM

This function is similar to the F1 (Show Next Alarm) function, however defined Printer Form numbers are displayed rather than Alarm Screens. Printer Forms exceed the display format of the editing screen, therefore only the Printer Form numbers are displayed.

F3   DELETE SCREEN #

This function allows you to delete a selected Alarm or Printer Form Screen number. The screen number is removed from the field in the Control Window definitions.

F5   PREVIOUS BIT (Bit selections only)

This function displays the programmed parameters for the previous bit within the 16 bit background register selected. It is only available for Bit data formats.

F6   NEXT BIT (Bit selections only)

This function displays the programmed parameters for the next bit within the 16 bit background register selected. It is only available for Bit data formats.

F7   DELETE REGISTER

This function deletes all definitions that you have defined for this background register.

F8   NEXT REGISTER

This function key displays the next background register and its respective parameters.

Specifying Register Information

To define a Background Monitor screen, assign the register to monitor.

1. Select the background register and press ENTER.

2. Select Bit, Integer or BCD for the type of data.

    The Control Window then displays the parameters that you need to specify.

3. Enter the parameter values for the data format that you selected.

Bit Selections

```
           MONITOR BIT REGISTER

REGISTER NUMBER:      ███████████
BIT NUMBER:               0
ALARM STATE:              ON (1)
SCREEN NUMBER:
```

When you select the Bit data format for the register, the following
parameters are displayed:

Register Number

The register number that you want to monitor.

Bit Number

The bit number of the register to monitor.

Alarm State

The bit status that will indicate an alarm state. The bit status may be
either 1 (on) or 0 (off).

Screen Number

The number of the screen to display when the status of the monitored
bit indicates an alarm state.

Integer or BCD Selections

When you select the Integer or BCD data formats for the register, the
following parameters are displayed:

```
            MONITOR INTEGER REGISTER

REGISTER NUMBER:          ███████████
LOW ALARM LIMIT:                    0
HIGH ALARM LIMIT:                   0
LOW RETURN TO NORMAL:               0
HIGH RETURN TO NORMAL:              0
SCREEN NUMBER:
```

Register Number

The register number that you want to monitor.

Low Alarm Limit

The lowest value that is acceptable before an alarm state is indicated.

High Alarm Limit

The highest value that is acceptable before an alarm state is indicated.

Low Return to Normal

The predetermined value that the register data must exceed before a new alarm state may be triggered. Defaults to the value of the Low Alarm Limit.

High Return to Normal

The predetermined value that the register data must fall below before a new alarm state may be triggered. Defaults to the value of the High Alarm Limit.

Screen Number

The number of the screen to display when the status of the monitored register indicates an alarm state.

CHAPTER 10: SOI-260 PRINT FORM BUILDER

This chapter describes the functions that can be performed using the Print Form Builder menu item.

Print Form Builder

When selecting Print Form Builder from the File Edit menu, the following screen displays.

```
WHICH SCREEN NUMBER DO YOU    F1              F2
WANT TO BE YOUR FIRST PRINT   F3              F4
FORM?           ▮▮▮▮▮▮▮        F5              F6
                              F7              F8
                              F9 SAVE         F10  EXIT
                              ANSWER QUESTION AND PRESS 'ENTER'

                              THIS IS THE 'SCREEN' WHERE THE FIRST
                              PRINT FORM WILL BE LOCATED.
```

The Printer Form Builder enables you to create formats for printing alarm messages, production reports, or any other message using the Printer Port option of the SOI-260. Up to 8 lines of text can be printed.

After entering the number of the screen that you want to print, you must specify the column width of your printer (16 to 80).

```
HOW MANY COLUMNS DOES YOUR
PRINTER HAVE?  (16 - 80)
```

After specifying the column width, the SOI-260 sends the screen to the printer.

Print Form Builder Function Keys

```
F1   REGISTER DATA      F2    PRINT CONTROL
F3   CHANGE WIDTH       F4    COPY SCREEN
F5   INSERT TIME        F6    INSERT DATE
F7   CLEAR SCREEN       F8    CHANGE SCREEN
F9   SAVE               F10   EXIT


USE ↑↓ KEYS TO MOVE AROUND SCREEN
PRESS 'INS' TO TOGGLE INSERT MODE
PRESS 'DEL' TO DELETE CHARACTER
USE FUNCTION KEYS WHERE APPROPRIATE
```

Printer Form screens use three additional function keys:

F1 (Display register data)

F2 (Printer control codes)

F3 (Change column width)

F1   REGISTER DATA

This allows you to place or allocate a data display field on the printer form. Multiple fields of data can be placed anywhere on the printer form. Any of the supported data formats can be printed.

Note: *Refer to the PLC Reference section for register information specific to your PLC.*

F2   PRINTER CONTROL

When you press F2, you are given the choice between F1 (form feed) and F2 (printer codes). Form feed executes a form feed before the form is printed. Printer codes allow you to enter decimal printer control codes (decimal, hex, or ASCII). The hexadecimal and ASCII codes are displayed for the purposes of verification.

F3   CHANGE WIDTH

This function enables you to change the existing column width.

Note: *Changing the column width affects "All" Printer Forms. If you choose this function, check all Printer Forms for proper text and data field placement.*

Developing Printer Forms

The Printer Form Builder selection is located at the Edit File menu. When you select Printer Form Builder, you are prompted for:

- The screen number of your first print screen

- The column width for your printer form

- The text or data for your printer form

The number (of characters) for the column width must be at least 16 and less than or equal to 80.

After you have entered the column width, a blinking cursor in the Printer Form window indicates that you can enter the text for your printer form.

To save the Printer Form, press ESC. The Edit File menu is then displayed.

Note: *The Date and time reflect the actual time that the form is printed. This may be a useful feature for time/date stamping activities.*

APPENDIX A: DATA FORMATS

The data formats below are standard formats that the SOI supports. Your specific PLC may not support all of the data formats shown. Please refer to the PLC Reference section for register information on the specific PLC or the PLC User's Manual.

The data formats supported by the SOI may be used with any PLC location. The data selected for a particular PLC location must reflect the same format as the data actually stored in that location. This is the only way you can ensure that correct, consistent information is displayed on the SOI.

For example, selecting the 16 Bit Signed Integer format for location Register XX will display data in one way. Selecting the 16 Bit BCD format for the same location will display the data in another way. It is important to understand each data format and its characteristics.

The following table illustrates all data formats supported by the SOI, including the point types and ranges applicable to each format, and whether the scaling feature may be applied to the format.

Date Format	Range	Scaling	User Input Ranges
Bit	0,1,Y,N	N/A	0,1,Y,N
16 Bit Signed Integer	-32,768 to +32,767	YES	-32,768 to +32,767
16 Bit Unsigned Integer	0 to +65,535	YES	0 to +65,535
16 Bit BCD	0 to +9,999	YES	0 to +9,999
16 Bit HEX	0 to FFFF	NO	Not Applicable
32 Bit Floating Point	$+/-1.2 \times 10^{-38}$ to $+/-3.4 \times 10^{38}$	YES	$+/-1.2 \times 10^{-38}$ to $+/-3.4 \times 10^{38}$
32 Bit Unsigned Integer	0 to +4,294,967,295	NO	0 to +4,294,967,295
32 Bit BCD	0 to +99,999,999	NO	0 to +99,999,999
32 Bit HEX	0 to FFFFFFFF	NO	Not Applicable
ASCII	20 characters (max)	N/A	Not Applicable

Note: **The SOI-120 product does not support 32 Bit Floating Point.**

The following descriptions define the above list of supported data formats for an SOI operator interface product.

Note: *Refer to the PLC Reference Section for data format information specific to your PLC.*

Bit Format

Bit Data

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

16 individual bits
(One 16 bit location)
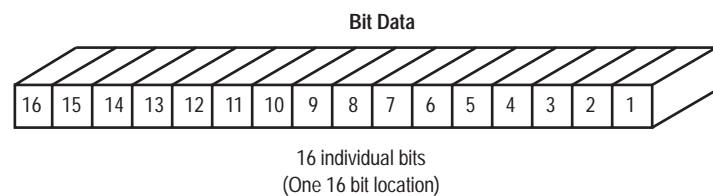
The PLC stores a binary (0 or 1) status at each bit location. The SOI reads an PLC bit location and determines whether the operational status of the bit is ON (1) or OFF (0). You can specify associated text to be displayed for either state of a specified bit. This description can be up to twenty characters.

For example, the OFF (0) state of a bit might display "Pump is OFF", and the ON (1) state "Pump is ON". SOI-SPS Programming Software allocates enough screen characters for the longest of the two text strings. In this example, 11 characters would be allocated to display "Pump is OFF".

Note: *The fewer the characters used, the less memory is required. In the example above, displaying "OFF" (given the appropriate context) conveys the same information in 3 characters as "Pump is OFF" does with 11 characters.*

8 Bit Unsigned Byte

8 Bit Unsigned Byte
(One 16 bit location-2 Bytes)

Byte 1	Byte 0
Range 0 to 255	Range 0 to 255

Bit 16   Bit 9   Bit 8   Bit 1
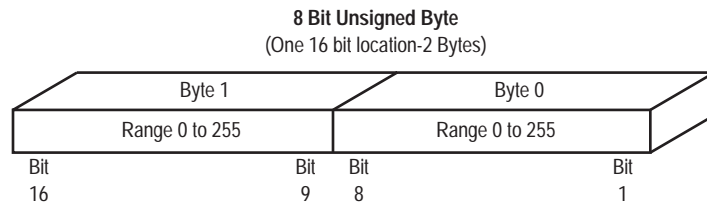
This data format allows you to store or read data in byte (8 bit) blocks. Since all register addresses are defined as 16 bit (2 byte) locations, you can determine which byte is to be addressed. The lower byte of an address is defined as byte 0 and the upper byte is defined as byte 1.

Note: *This data format is unsigned, therefore it has a range of 0 to +255 (8 bits set, 11111111, is equal to 255 decimal). It may also be scaled to different engineering units.*

16 Bit Signed Integer

16 Bit Signed Integer

15 Bit Data Field

Bit 16
(sign bit)   Bit 1

Range = -32768 to +32767
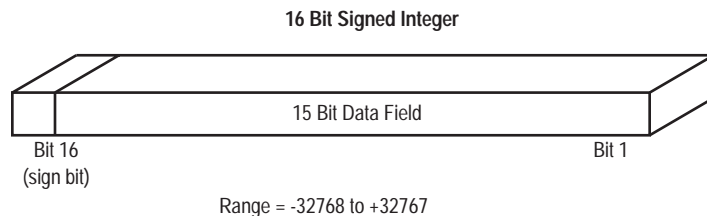
This data format displays a 16 bit register as a signed Integer (two's complement) value. The 16th bit of the register is the sign bit and is set (1) for a negative and cleared (0) for a positive number.

Note: *The 16 bit signed integer values have a range of -32768 to +32767. This data format may also be scaled to different engineering units.*

101

16 Bit Unsigned Integer

16 Bit Unsigned Integer

16 Bit Data Field

Bit 16   Bit 1
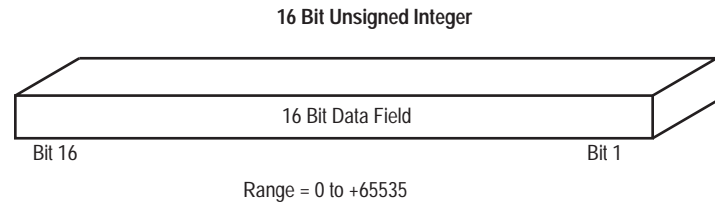
Range = 0 to +65535

This data format displays a 16 bit register as an unsigned integer value. The 16th bit is not a sign bit but a data bit.

Note: *The 16 bit unsigned integer values have a range of 0 to +65,535. It may also be scaled to different engineering units.*

16 Bit BCD (Binary Coded Decimal)

16 Bit BCD

| Digit 4 | Digit 3 | Digit 2 | Digit 1 |

Bit 16   Bit 13 Bit 12   Bit 9 Bit 8   Bit 5 Bit 4   Bit 1
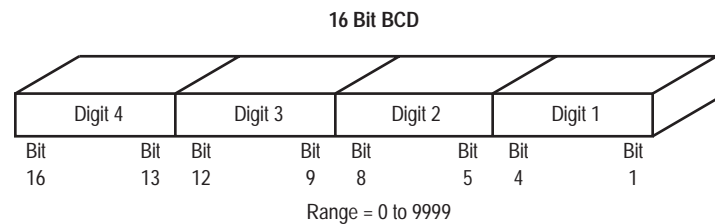
Range = 0 to 9999

This data format displays a 16 bit register location as a 4 digit Binary Coded Decimal value.

Note: *The range for the 16 bit BCD selection is 0 to +9999. It may also be scaled to different engineering units.*

16 Bit HEX (Hexadecimal)

16 Bit HEX

| Digit 4 | Digit 3 | Digit 2 | Digit 1 |

Bit 16   Bit 13 Bit 12   Bit 9 Bit 8   Bit 5 Bit 4   Bit 1
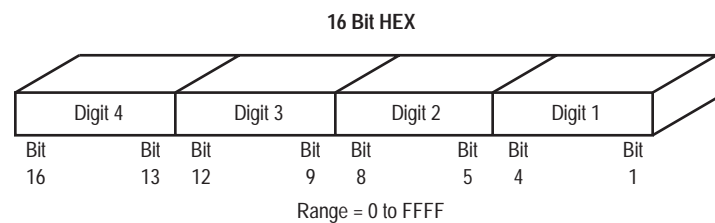
Range = 0 to FFFF

This data format displays a 16 bit register location as a 4 digit hexadecimal value. The range for the 16 bit Hex format is 0 to +FFFF. The Hexadecimal number system is defined as a base of 16 (0-9 and the characters A, B, C, D, E, F).

Note: *This data format may not be scaled to different engineering units. It is used for display-only (non-entry) operations.*

32 Bit Unsigned Integer

32 Bit Unsigned Integer

16 Bit Location #2	16 Bit Location #1
(next sequential location)	

Range = 0 to 4,294,967,295
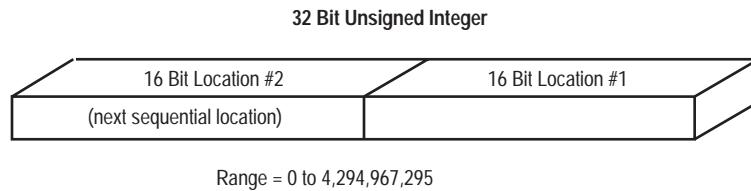
This data format displays two consecutive 16 bit register locations as a 32 bit unsigned integer. It uses a memory register plus the next higher register to form the 32 bit location.

Note: *The range for the 32 bit unsigned integer is 0 to +4,294,967,295. It may not be scaled to different engineering units.*

32 Bit BCD (Binary Coded Decimal)

32 Bit BCD

16 Bit Location #2	16 Bit Location #1
(next sequential location)	
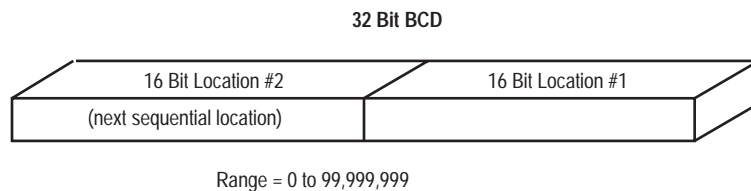
Range = 0 to 99,999,999

This data format displays two consecutive 16 bit register locations as a 32 bit BCD value. It uses a memory register plus the next higher register to form the 32 bit location.

Note: *The range for the 32 bit BCD value is 0 to +99,999,999. It may not be scaled to different engineering units.*

32 Bit HEX (Hexadecimal)

32 Bit HEX

16 Bit Location #2	16 Bit Location #1
(next sequential location)	
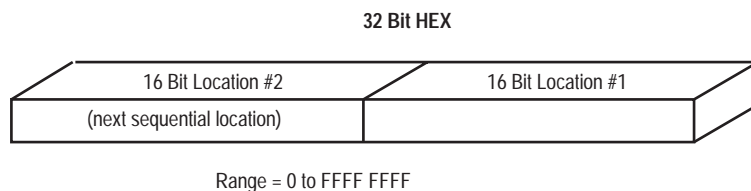
Range = 0 to FFFF FFFF

This data format displays two consecutive 16 bit register locations as a 32 bit Hex value. It uses a memory register plus the next higher register to form the 32 bit location.

Note: *The range for the 32 bit HEX value is 0 to +FF,FFF,FFF. It may not be scaled to different engineering units. This data format is used for display-only (non-entry) operations.*

32 Bit Floating Point

Floating Point
(Two consecutive 16 bit locations)

	Exponent	Mantissa	
Bit	Bit	Bit	Bit	Bit
32	31	24	23	1

Range= ±1.2E-38 to ±3.4E+38
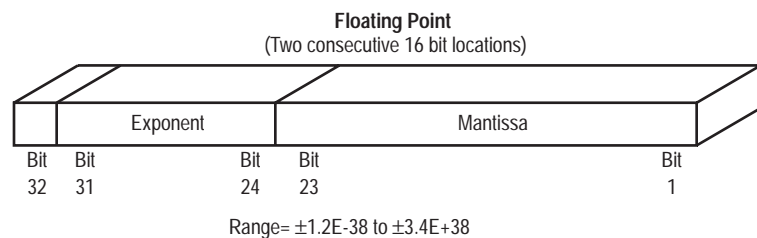
This data format displays data located in two consecutive 16 bit locations as a 32 bit floating point value. It uses a memory register plus the next higher register to form the 32 bit location. The range for the floating point value is +/- 1.2 x 10-38 to +/- 3.4 x 1038.

Note: *The floating point format adheres to the ANSI/IEEE 754 standard.*

ASCII Data

ASCII data formats are fields up to 20 characters long. Each 16 bit location may contain two ASCII characters (1 byte each). The lowest byte of the base address stores the first character, the highest byte stores the second character, the first byte of the next sequential location stores the third character, and so on. The data held in this range of address locations is expected to be ASCII data.

Note: *The first character may be placed in the high byte of the base address. This is selectable in SOI-SPS*

Note: *The ASCII data format is very useful for PLC applications reading ASCII data resident in the PLC that has been read by bar code readers or data collection terminals.*

ASCII Data Field
Maximum 20 Characters-Ten 16 bit locations

Location 1
| CHR #2 | CHR #1 |

Location 2
| CHR #4 | CHR #3 |

Location 3
| CHR #6 | CHR #5 |

Location 4
| CHR #8 | CHR #7 |

Location 5
| CHR #10 | CHR #9 |

Location 6
| CHR #12 | CHR #11 |

Location 7
| CHR #14 | CHR #13 |

Location 8
| CHR #16 | CHR #15 |

Location 9
| CHR #18 | CHR #17 |

Location 10
| CHR #20 | CHR #19 |
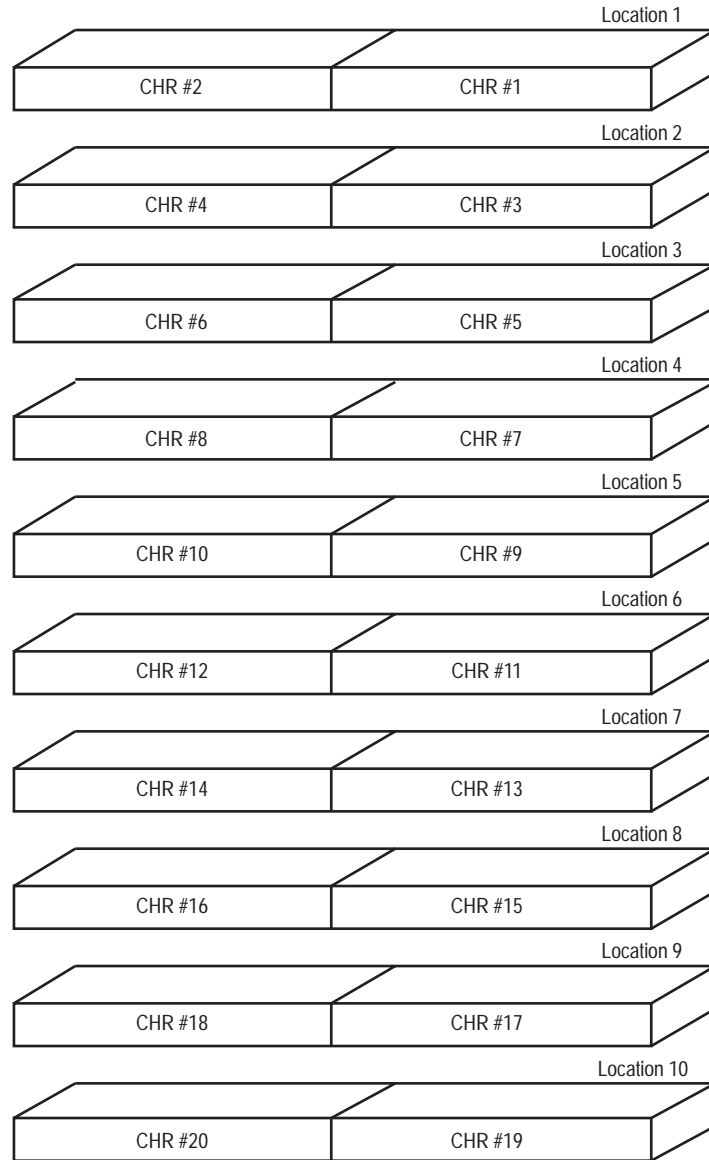
Data Display Screen Format Selections

The data format selections available for Data Display screens are listed below and their parameters described.

Bit

Register Number

The PLC data location address.

Bit Number

The bit number if the register number designates a multiple bit location (a 16 bit data address, for example). This selection is irrelevant if the register number refers to a Bit type address.

Text when Bit is OFF (0)

The 20 character text description to be displayed when the bit is in an OFF (0) state.

Text when Bit is ON (1)

The 20 character text description to be displayed when the bit is in an ON (1) state.

16 Bit Signed Integer,
16 Bit unsigned Integer,
16 Bit BCD (Binary Coded Decimal)

Register Number

The PLC data location address.

Digits Right of Decimal

The number of digits to be placed to the right of the decimal.

Digits Left of Decimal

The number of digits to be placed to the left of the decimal.

Leave Place for Sign (Y or N)

Leave a one character place for the polarity sign (+ or -) when the data is displayed.

Show Leading Zeros (Y or N)

Display any zeros to the left of the data.

Minimum Register Value

The minimum data value of the PLC location.

Maximum Register Value

The maximum data value of the PLC location.

Minimum Display Value

The minimum data value to be displayed. This value is displayed when the data in the PLC location is equal to the minimum register value.

Maximum Displayed Value

The maximum data value to be displayed. This value is displayed when the data in the PLC location is equal to the maximum register value. The range defined by the Minimum Displayed Value and the Maximum Displayed Value is proportionally scaled to the range of the minimum and maximum register values. If both ranges are equal then the scaling ratio is 1:1.

Minimum Bar Value
(Bar Graph Only)

The minimum value of data to be displayed in the Bar Graph. This value must be greater or equal to the Minimum Displayed Value.

Maximum Bar Value
(Bar Graph Only)

The maximum value of data to be displayed in the Bar Graph. This value must be less than or equal to the Maximum Displayed Value. The Minimum and Maximum bar graph values may be used to display a particular range or window of an overall range (Minimum and Maximum Displayed Values).

32 Bit Unsigned Integer,
32 Bit BCD (Binary Coded Decimal)

Register Number

The PLC data location address.

Digits Right of Decimal

The number of digits to be placed to the right of the decimal.

Digits Left of Decimal

The number of digits to be placed to the left of the decimal.

Show Leading Zeros (Y or N)

Display any zeros to the left of the data.

Note: *For the 32 Bit selections, scaling of data is not supported. The selected register number and the next higher sequential register number identify the locations defining the 32 bit data value.*

16 Bit HEX (Hexadecimal),
32 Bit HEX

Register Number

The PLC data location address.

ASCII

Register Number

The PLC data location address.

Character Count

The number of characters (2 characters for each 16 bit data location) to be displayed, up to a maximum of 20 characters. The initial byte of the location identified by the register number is displayed first, then the second byte, the first byte of the next higher sequential location, and so on. To display 20 characters, a sequential block of ten 16 bit locations is read by the SOI.

Data Entry Format Selections

The data format selections available for Data Display screens are listed below and their parameters described.

Bit

The data format selections available for Data Display screens are listed below and their parameters described.

Register Number

The PLC data location address.

Bit Number

The Bit number if the register number designates a multiple bit location (a 16 bit data address, for example). This selection is irrelevant if the register number refers to a Bit type address.

Input Data by Pressing '1'/'0' or 'Y'/'N' ?
(Enter 1 or Y)

This parameter determines whether the operator will enter 1 or Y to set the defined bit location. If 1 is entered, 0 will clear the bit location. If Y is entered, N will clear the bit location.

Default Value ? Z = No Default
(Enter 1,0,Y,N,Z)

This parameter defines the default value that is displayed at the data entry position of the SOI display. If a default value of Y is entered, a Y is displayed, and the operator is only required to press ENTER to set the bit location.

An entry of Z defines no default value.

16 Bit Signed Integer,
16 Bit Unsigned Integer,
16 Bit BCD (Binary Coded Decimal)

Register Number

The PLC data location address.

Digits Right of Decimal

The number of digits to be placed to the right of the decimal.

Digits Left of Decimal

The number of digits to be placed to the left of the decimal.

Leave Place for Sign (Y or N)

Leave a one character place for the polarity sign (+ or -) when the data is displayed.

Minimum Register Value

The minimum data value of the PLC location.

Maximum Register Value

The maximum data value of the PLC location.

Minimum Entry Value

The minimum data value to be entered. When this value is entered the minimum register value is entered to the defined PLC location.

Maximum Entry Value

The maximum data value to be entered. When this value is entered the maximum register value is entered to the defined PLC location. The range defined by the minimum entry value and the maximum entry value is proportionally scaled to the range of the minimum and maximum register values. If both ranges are equal then the scaling ratio is 1:1.

Low User Input Limit

The minimum entry value that an operator may enter. This value must be within the minimum and maximum entry values. If a value lower than this limit is entered the SOI will display an "Input Error" screen displaying the minimum and maximum entry limits.

High User Input Limit

The maximum entry value that an operator may enter. This value must be within the minimum and maximum entry values. If a value higher than this limit is entered the SOI will display an "Input Error" screen displaying the minimum and maximum entry limits.

Default Value

This parameter defines a default value that is displayed at the entry location of the display. An entry of Z defines no default value.

32 Bit Floating Point

Register Number

The PLC data location address.

Low User Input Limit

The minimum entry value that an operator may enter. This value must be within the range of $+/-1.2 \times 10^{-38}$ to $+/-3.4 \times 10^{38}$. If a value lower than this is entered, the SOI will display an "Input Error" screen displaying the minimum and maximum entry limits.

High User Input Limit

The maximum entry value that an operator may enter. This value must be within the range of $+/-1.2 \times 10^{-38}$ to $+/-3.4 \times 10^{38}$. If a value higher than this is entered, the SOI will display an "Input Error" screen displaying the minimum and maximum entry limits.

Default Value

This parameter defines a default value that is displayed at the entry location of the display. An entry of Z defines no default.

Note: *The defined register number and the next higher sequential number locations will define the data value.*

32 Bit Unsigned Integer,
32 Bit BCD (Binary Coded Decimal)

Register Number

The PLC data location address.

Digits Right of Decimal

The number of digits to be placed to the right of the decimal.

Digits Left of Decimal

The number of digits to be placed to the left of the decimal.

Low User Input Limit

The minimum entry value that an operator may enter. This value must be within the range of the data format selected. If a value lower than this is entered, the SOI will display an "Input Error" screen displaying the minimum and maximum entry limits.

High User Input Limit

The maximum entry value that an operator may enter. This value must be within the range of the data format selected. If a value higher than this is entered, the SOI will display an "Input Error" screen displaying the minimum and maximum entry limits.

Default Value

This parameter defines a default value that is displayed at the entry location of the display. An entry of Z defines no default.

Note: *For the 32 Bit selections, scaling of data is not supported. The defined register number and the next higher sequential number locations will define the data value.*

APPENDIX B: MEMORY ALLOCATION

Screens

The following table provides approximate memory overhead required for each type of screen you might use in your programs. Memory usage will vary depending upon how data display and entry fields are used.

Screen Memory Usage

Screen Type	Memory Required (bytes approximate)
Menu Screens	15
Entry Screens	7
Recipe Screens	31-196
Display Screens	7
Bargraph Screens	47
Printer Forms	14
Alarm Screens	32
Security Screens	61
Background Monitor	37

Before you begin building screens, you need to be aware of the necessary editing functions, as well as the PLC register and data format information that may be required.

Note: **Actual memory usage in the SOI is calculated and shown in the upper right corner of the Screen Builder display.**

Registers

All of the non-menu screens may require access to PLC data registers for their operation. When you construct a screen, you need to specify:

- The type of data stored in the PLC register.

- The register to access.

- Any data format and display information.

Note: **Refer to the PLC Reference section for the register information specific to your PLC.**

The following table provides approximate memory allocations for each type of data you might use in your programs:

Register Memory Usage

Data Format	Memory Required (bytes approximate)
Text	1
Bit Entry Field	19
Bit Display Field	59
16 Bit Signed Integer Entry Field	43
16 Bit Signed Integer Display Field	28
32 Bit Unsigned Integer Entry Field	39
32 Bit Unsigned Integer Display Field	28
16 Bit Unsigned Integer Entry Field	44
16 Bit Unsigned Integer Display Field	36
16 Bit BCD Entry Field	41
16 Bit BCD Display Field	37
32 Bit BCD Entry Field	37
32 Bit BCD Display Field	26
Floating Point Entry Field	44
Floating Point Display Field	32
16 Bit Hex Display Field	18
32 Bit Hex Display Field	22
ASCII Display Field	16
Time Of Day Display	1
Date Display	1

APPENDIX C: ASCII DISPLAY CHARACTERS

How to Program Supported ASCII Characters

The SOI is capable of displaying additional characters above the 96 standard ASCII characters (127 decimal / 80 Hex). To access characters above 127 decimal / 80 Hex using the programming software, you must enter a special sequence.

To program the desired character(s):

1. Identify the character in the ASCII character set table (Table D.1). As an example, we will use the ∞ character.

Note: *You must be in the program mode and ready to program a screen. Position the cursor where you want the special character positioned and perform the following steps:*

2. Identify the equivalent decimal code of the character. For example, the ∞ character is equivalent to 243 decimal.

3. In the program mode and with the cursor in the correct position, press the ALT key and enter the decimal equivalent value. A character will be displayed in the specified position. For example, press the ALT key and enter 243 to enter a ∞ character.

Note: *The displayed character may be displayed as a ≤ character on your computer monitor. When you download and display the character on the SOI, the correct character will be displayed.*

Values C0 through Cf are reserved for SOI-SPS functions and cannot be inserted into a screen display. However, you can display these characters on the SOI when received in the terminal mode (refer to SOI User Manual).

ASCII Display Character Set*

DEC	HEX	CHR
32	20	
33	21	!
34	22	"
35	23	#
36	24	$
37	25	%
38	26	&
39	27	'
40	28	(
41	29	)
42	2A	*
43	2B	+
44	2C	,
45	2D	-
46	2E	.
47	2F	/
48	30	0
49	31	1
50	32	2
51	33	3
52	34	4
53	35	5
54	36	6
55	37	7

DEC	HEX	CHR
56	38	8
57	39	9
58	3A	:
59	3B	;
60	3C	<
61	3D	=
62	3E	>
63	3F	?
64	40	@
65	41	A
66	42	B
67	43	C
68	44	D
69	45	E
70	46	F
71	47	G
72	48	H
73	49	I
74	4A	J
75	4B	K
76	4C	L
77	4D	M
78	4E	N
79	4F	O

DEC	HEX	CHR
80	50	P
81	51	Q
82	52	R
83	53	S
84	54	T
85	55	U
86	56	V
87	57	W
88	58	X
89	59	Y
90	5A	Z
91	5B	[
92	5C	\
93	5D	]
94	5E	^
95	5F	_
96	60	`
97	61	a
98	62	b
99	63	c
100	64	d
101	65	e
102	66	f
103	67	g

All of the above characters are supported when 8 data bit communication is enabled. Hex codes below 80H are supported by 7 data bit communication.

ASCII Display Character Set*

DEC	HEX	CHR
104	68	h
105	69	i
106	6A	j
107	6B	k
108	6C	l
109	6D	m
110	6E	n
111	6F	o
112	70	p
113	71	q
114	72	r
115	73	s
116	74	t
117	75	u
118	76	v
119	77	w
120	78	x
121	79	y
122	7A	z
123	7B	{
124	7C	|
125	7D	}
126	7E	→
127	7F	←

DEC	HEX	CHR
160	A0	
161	A1	
162	A2	
163	A3	
164	A4	
165	A5	
166	A6	
167	A7	
168	A8	
169	A9	
170	AA	
171	AB	
172	AC	
173	AD	
174	AE	
175	AF	
176	B0	
177	B1	
178	B2	
179	B3	
180	B4	
181	B5	
182	B6	
183	B7	

DEC	HEX	CHR
184	B8	
185	B9	
186	BA	
187	BB	
188	BC	
189	BD	
190	BE	
191	BF	

*All of the above characters are supported when 8 data bit communication is enabled. Hex codes below 80H are supported by 7 data bit communication.

ASCII Display Character Set*

DEC	HEX	CHR
208	D0	
209	D1	
210	D2	
211	D3	
212	D4	
213	D5	
214	D6	
215	D7	
216	D8	
217	D9	
218	DA	
219	DB	
220	DC	
221	DD	
222	DE	
223	DF	
224	E0	
225	E1	
226	E2	
227	E3	
228	E4	
229	E5	
230	E6	
231	E7	

DEC	HEX	CHR
232	E8	
233	E9	
234	EA	
235	EB	
236	EC	
237	FD	
238	EE	
239	EF	
240	F0	
241	F1	
242	F2	
243	F3	
244	F4	
245	F5	
246	F6	
247	F7	
248	F8	
249	F9	
250	FA	
251	FB	
252	FC	
253	FD	
254	FE	
255	FF	

All of the above characters are supported when 8 data bit communication is enabled. Hex codes below 80H are supported by 7 data bit communication.

APPENDIX D: SOI-260 APPLICATION EXAMPLE

Figure D.1 is an example that illustrates a typical SOI-260 application program. It shows how screens may be linked and how items are grouped together to provide a continuous flow of operation. The SOI-120 has the same linking and flow capabilities.

Main Menu
```
1. PUMP/TANK LEVELS
2. PUMP CONTROL
3. FLOW/LEVEL STATUS
4. PLC STATUS
```

Sub Menu
```
1. EAST PUMP/TANK
2. WEST PUMP/TANK
```

Security
```
* RESTRICTED ACCESS *
ENTER YOUR SECURITY
CODE:********
```

Data Display
```
EAST PUMP:  280 GPM
WEST PUMP:    0 GPM
NORTH PUMP: 207 GPM
SOUTH PUMP:  70 GPM
```

Data Display
```
PLC SYSTEM STATUS
SCAN TIME IS: 7 mS
PLC IS: ONLINE
BATTERY POWER: OK
```

Data Display
```
EAST FEED PUMP
MAIN PUMP IS: ON
FILL RATE: 280 GPM
TANK IS 38% FULL
```

Data Display
```
WEST FEED PUMP
MAIN PUMP IS: OFF
FILL RATE:   0 GPM
TANK IS 72% FULL
```

Data Entry
```
EAST TANK: 38% FULL
SETPOINT IS 280 GPM
PLEASE ENTER NEW
SETPOINT: 145
```

Data Display
```
EAST TANK: 38% FULL
WEST TANK: 72% FULL
NORTH TANK:16% FULL
SOUTH TANK: 5% FULL
```

Data Display
```
EAST FEED PUMP
EFFICIENCY: 77%
RUN TIME:  693 HRS
NEXT SERV: 307 HRS
```

Data Display
```
WEST FEED PUMP
EFFICIENCY: 89%
RUN TIME:   22 HRS
NEXT SERV: 978 HRS
```

Data Entry
```
WEST TANK: 72% FULL
SETPOINT IS 170 GPM
PLEASE ENTER NEW
SETPOINT:
```

Bar Graph
```
TANK TOTAL PUMPING
RATE IS:  557 GPM
```

Figure D.1.

Main Menu

The Main Menu (at the top of the diagram) allows the operator to branch to any of four different areas of the application by entering the number of the menu item.

Step 1. PUMP/TANK LEVELS

When the operator selects Pump/Tank Levels from the Main Menu, a Sub-Menu displays two new choices (East Pump/Tank and West Pump/Tank).

Selecting either of these Sub-Menu items (by entering the item number) then allows the operator to display pump and tank information for the East or West systems.

Step 2. PUMP CONTROL

When the operator selects this Main Menu item, they can enter new setpoints for the pumps. The operator must enter a valid security code at the Security screen before gaining access to the Data Entry screens.

The first Data Entry screen captures two pieces of data from the PLC (38% Full & 280 CFM) and displays this information, prompting the operator to enter a new setpoint.

When the operator enters the new setpoint and presses ENTER, the SOI-260 program checks the value to see that it is within the programmed limits. If the value is within the programmed entry limits, the number is then scaled to engineering units and sent to the PLC. If the value is outside the limits, an error message informs the operator of the valid range. The operator can then enter another value.

The new setpoint is then sent to the PLC, and the second Data Entry screen is displayed for the operator to enter a new setpoint.

Step 3. FLOW/LEVEL STATUS

When the operator selects this menu item, the first of three Data Display screens identifies the flow rates for all four pumps. All of the values shown are updated in real time and are scaled to engineering units by the SOI-260.

Using the NEXT key on the SOI-260 keypad, the operator can display the sequence of Data Display screens:

- The next screen, displaying the level for each tank.

- The Bar Graph screen, enabling the operator to view the data in a graphic format.

- The initial Data Display screen.

APPENDIX E: SOI WORKSHEET

You can use the worksheet templates on the following pages when designing your SOI application program.

INDEX

SPECTRUM
C O N T R O L S