SQUARE D COMPANY

Instruction Bulletin

MICRO-1™

Class 8003 Type SFW30 Programming Software

For use with Class 8003 MICRO-1 Processor

Bulletin # 30598-788-01A1

December, 1990

Dedicated to Growth
Committed to Quality

WARNING

The application of this product requires expertise in the design and programming of control systems. Only persons with such expertise should be allowed to program, install, alter and apply this product. Potential bodily injury, death or equipment damage could result if the product is improperly applied to any equipment application.

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IMPORTANT

The Class 8003 Type SFW30 software is only meant to be used with the MICRO-1 Controller. DO NOT attempt to communicate with any other electronic controller.

CAUTION

Be aware that any Terminate and Stay Resident (TSR) programs that you may have running on your personal computer, such as mouse drivers and other background utilities, may interfere with the operation of the SFW30 software.

WARNING

Programming multiple external outputs, timers, counters, internal relays or transitionals with the same address may cause unanticipated output actuation resulting in personal injury or property damage. If you assign the same address to more than one element within the same program, make certain of the consequences before running the program.

WARNING

Make absolutely sure that the same control program exists in the MICRO-1 processor and offline memory when using the DISPLAY function. If different control programs with similarly numbered contacts and coils exist, the display you see on the monitor screen may not reflect actual output conditions, and personal injury may result from unanticipated output actuation.

WARNING

DO NOT wire an Emergency Stop function through the MICRO–1 controller. In the case of a malfunction, the MICRO–1 processor might not be able to recognize the Emergency Stop input and might fail to shut down the system. This could result in personal injury or property damage.

WARNING

The MICRO–1 processor will attempt to go into RUN on power–up. Unexpected actuation of real–world output devices may occur since there is no external indicator on the processor (such as a keyswitch) to alert a user that a RUN condition is possible. This may result in personal injury or property damage.

TABLE OF CONTENTS

APPENDICES

SOFTWARE SUPPORT SYSTEM
Registration Card and Users Group Application

Make a copy of this page and complete this application to take advantage of these important benefits.

1. Special Notice Of New Production Enhancements

Registered owners will receive advance notice of all product upgrades and new product enhancements.

2. Special Prices For Upgrades And New Product Introductions

Square D continually enhances its own software products. These enhancements will be offered to registered owners at a special price.

3. Notice of New Production Enhancements Membership In the MICRO–1 Users Group

Membership makes you eligible to receive application notes at periodic intervals. These notes include helpful hints and techniques and answers to frequently asked questions.

INTRODUCTION

About This Manual

This manual is intended to provide information for the novice to experienced user of the Square D Company Class 8003 Type SFW30 Programming Software. This manual contains operations and programming examples along with detailed explanations of basic concepts. Also included are discussions of the hardware and software requirements and loading, the SFW30's capabilities, programming concepts and editing operations.

SFW30 Programming Software

The Class 8003 Type SFW30 Programming Software is designed to run on an IBM compatible computer as listed in Section 1.1.1. The SFW30 is used to program, monitor, and enter data functions for Square D's MICRO–1 controller.

The SFW30 software package contains:

- One (1) 5.25 inch floppy diskette
- One (1) 3.5 inch floppy diskette
- One (1) Instruction Bulletin 30598–788–01

The two floppy disks contain three files each, SFW30.EXE, AUTO30.SQD and SFW.SEC. These disks are identical in content and are provided for convenience. If your SFW30 package is not complete, contact your Square D Distributor.

Before You Start

The first step in using this manual is to become familiar with the hardware, software, and required cabling described in Section 1. The second step is to load the SFW30 software as identified in Section 2.

It is recommended that Sections 1 through 4 be read before running the SFW30 software, then determine which section from the general table of contents most closely describes your area of interest. Use the selected section's table of contents to find a specific heading or use the Index in the back of this manual to locate specific information.

Manual Organization

In the front of this manual, a general table of contents is listed which covers all of the major sections. At the beginning of each major section, an additional table of contents is provided to easily locate the information. At the end of this manual are appendices to supplement the information in the manual. The following summarizes the sections appearing in this manual:

- **Section 1** – describes the hardware and software requirements for SFW30.
- **Section 2** – explains how to load SFW30 and setup the parameters.
- **Section 3** – explains how to access and understand the status screens which provide information about your computer's memory (OFFLINE) or conditions specific to the processor with which you are communicating (ONLINE).
- **Section 4** – gives information about setting up important communications parameters and internal functions.
- **Section 5** – describes the programming instruction set.
- **Section 6** – describes the editing, search, and display procedures.
- **Section 7** – explains how to transfer programs and function settings from the personal computer to the MICRO–1 controller.
- **Section 8** – describes the ONLINE/DATA mode which allows you to view dynamic register and I/O data.
- **Section 9** – gives information about the SYMBOL function which allows you to obtain an intermediate code printout.
- **Section 10** – describes the LABEL feature which lets you customize your processors ladder logic by assigning alphanumeric names to program rungs.
- **Section 11** – explains how to use the cross reference feature.
- **Appendix A** – provides optional cabling to single MICRO–1 controller configurations.
- **Appendix B** – lists the error codes for the MICRO–1 controller.
- **Appendix C** – lists the error messages for SFW30 programming software.
- **Appendix D** – describes the MICRO–1 controller ring network specifications.
- **Appendix E** – describes the RS232 to MICRO–1 controller communications.

How Keystrokes Are Shown In This Manual (IMPORTANT)

There are two types of key identifications used in this manual. One use is a dedicated key and the other is a "function" key. The dedicated key is one of the alpha-numeric keys on the key board (e.g., a–b, A–B, 1–0, etc). The other type of key is a "function key" which is also located on the keyboard and identified as F1 through F10 (on some keyboards F1 through F12). The function keys on the keyboard relate to the function selections on each of the SFW30 screens (e.g., the screen shows a word, number or symbol above a box). The location of the function keys may vary for different personal computer keyboards, but is usually located on the left side or at the top of the keyboard.

The functions appearing on the SFW30 screens do change assignment throughout the different screens and modes, however the numbers 1 through 10 on the screen always reflect the functions keys F1 through F10 on the keyboard. See Section 1.2 for detailed information about the function key assignments.

DESCRIPTION OF HARDWARE/SOFTWARE

1

1.1 Hardware and Software Requirements

1.1.1 HARDWARE

The following hardware is necessary to operate the SFW30 programming software:

- SY/VIEW® Class 8010 Type SDF602 Industrial Workstation
- Class 8010 Type SPR350 Laptop Programmer
- 100% IBM–Compatible Personal Computer (XT/AT® or PS/2®)
- 100% IBM–Compatible Laptop Computer

NOTE: *The minimum RAM requirement of the personal computers listed above is 512K. The system program requires approximately 384K bytes of memory and the additional memory is used for OFFLINE memory programming.*

Associated Hardware

- Monochrome or color monitor
- SY/VIEW Class 8010 Type SDF202 Industrial Monitor
- Class 8030 Type ICM200 Isolator Converter Module
- SFI3xx SY/MAX® Interface Board* or IBM Asynchronous Board
- Class 8003 Type RIU20 RS–232 Interface
- Class 8005 Type NLU10 Network Link Unit
- Class 8005 Type RIU10 Remote Interface Unit (RS–422)
- Optional Cables (see Appendix A)

SFW30 will work with any SFI3xx board (RS–422) or with an asynchronous serial board installed in the personal computer. If using an asynchronous board, however, make sure that the pinout is compatible. More information on proper cabling and connection to the MICRO–1 processor can be found in Section 1.3.

***NOTE:** The SFI3xx interface board or asynchronous board is only required when online operations are indicated. No interface board is necessary for programming while in the offline mode. The SFI3xx interface board is not recommended for machines operating at bus speeds faster than 4.7MHz.*

***NOTE:** The SFI5xx SY/LINK® interface board is not compatible with SFW30.*

1.1.2 SOFTWARE

The following operating systems support SFW30:

- PC/DOS® or MS/DOS® version 2.1 and up

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1.2 Keyboard Overview

The arrangement of the keys on the personal computer keyboard may vary for different personal computers. The description of the keyboard is based upon a typical IBM keyboard. The following sections provide general information about the keyboard. More complete information about specific uses of the various keys on either the alphanumeric or numeric keyboard can be found in Section 6.0, Ladder Editing, Search and Display.

1.2.1 ALPHANUMERIC KEYBOARD

The alphanumeric keyboard, shown in Figure 1–1, is made up of 49 keys configured in a standard typewriter format.

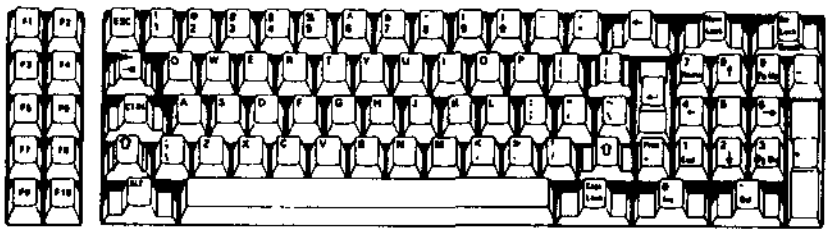


Figure 1–1 Typical IBM Keyboard

ESC Key

The SFW30 is designed in a layered screen structure, where different screens appear within certain modes that may be selected. There may be only one or two screen levels within a mode or there may be many screens. To EXIT the current screen or RETURN BACK to the screen level that was previous to the current screen, press the **ESC** (escape) key. The ESC key may be pressed several times in succession to return to the INITIAL screen.

When the INITIAL screen is displayed, the ESC key is not functional, because it is the first screen that is displayed in the software.

Prtsc Key

The Prtsc (print screen) key is used with the Shift key to get a hard copy of any monitor display. *It is very useful when displaying ONLINE register and input/output (I/O) data* (Section 8). If the system printer is connected and running, hold down the Shift key and press the Prtsc key to generate a printed copy of everything that is currently being displayed on the screen.

Tab Key / Cursor Keys

The Tab key may be used to jump to the next modifiable field when entering data into the highlighted areas (modifiable fields) of the timer, and counter boxes. This key can be used instead of repeatedly arrowing in the direction of the next data location.

The UP, DOWN, RIGHT, and LEFT cursor or arrow keys are also used to move around the screen when data entry or function selection is required.

Del Key

The Del (delete) key may be located below the numeric keys on the numeric keyboard and/or above the alphanumeric keys, and/or to the left of the numeric keypad depending upon the keyboard layout.

The Del key has two uses:

- When an error occurs, an error message is displayed on the bottom of the screen; the Del key must be pressed to clear the error before the user can continue with any other function.

- Pressing Del while editing a data field will cause the data value to be cleared (set to zero in the case of a numeric data field).

1.2.2 NUMERIC KEYBOARD

To the right of the alphanumeric keyboard is the numeric keyboard (Figure 1–1). The numeric key functions are identical to the numeric keys on the alphanumeric keyboard. The cursor or directional arrow keys are also located on this keypad. If using the numerical keypad, make sure that the Num Lock key is OFF. A summary of editing keystrokes can be found in Section 6.1.5.

1.2.3 FUNCTION KEYS

There are ten or more function keys on the keyboard identified as F1, F2 . . . F10, F11, etc. These function keys correspond with the functions named at the bottom of the SFW30 screen displays. A number is associated with each of these keys for easier function key identification. Figure 1–2 shows the relationship of the computer's keyboard with the SFW30 keys appearing on each screen. The numbers 1 through 10 on the screen indicate the corresponding function keys F1 through F10.

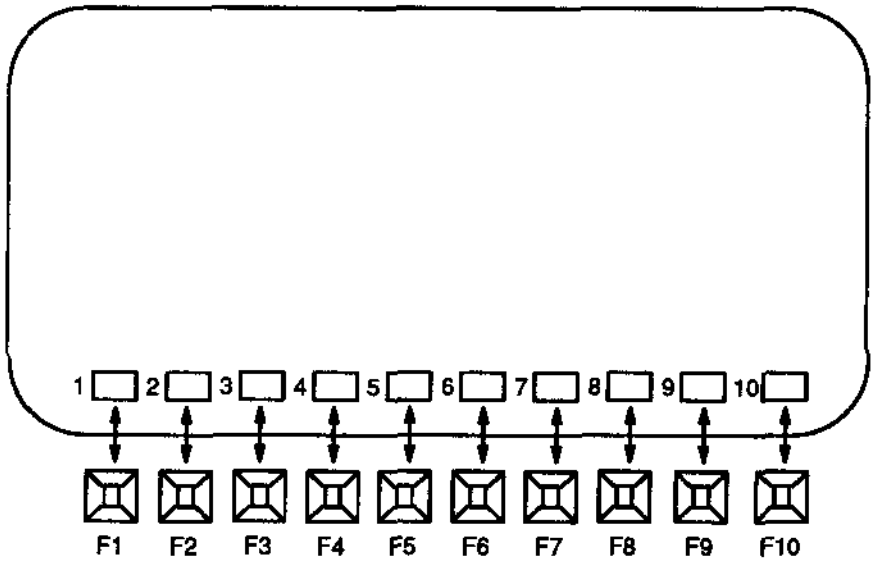


Figure 1–2 Keyboard Function Keys and SFW30 Screen Function Key Relationship

Function keys are not dedicated keys. They change as the different modes and functions are selected in SFW30. In some SFW30 screens, the function keys are not identified with text, which indicates that the function key has no operation.

ETC Function Key

On some SFW30 screens, the ETC text appears in the function key 10 position. When this appears, access to a second screen within the same mode (e.g., INIT mode) may be selected for additional functions.

1.3 Communication Cabling

1.3.1 CONNECTION BETWEEN THE PERSONAL COMPUTER (PC) AND AND THE MICRO–1 PROCESSOR

The personal computer can be connected to either a single MICRO–1 processor or up to 32 MICRO–1 processors on a ring network. The ring network is a "slave" network and processors may only respond to commands from SFW30. Communications between one MICRO–1 processor and another MICRO–1 processor is *NOT* supported.

Single MICRO–1 Processor To PC Connection

To connect a single MICRO–1 processor to a computer, one of the following *communications standards must exist in the personal computer: an RS–232 asynchronous* board (RS–232 serial port; COM1 or COM2), an SFI3xx (RS–422 software interface) board, or an RS–422 asynchronous serial board.

The Class 8010 Type SFI3xx interfaces are single circuit boards which plug into an expansion slot of a personal computer. The SFI boards support an RS–422 serial *differential* communications port with a *9–pin "D" type connector. The differential port is* electrically isolated from the personal computer and the baud rate is selectable. The MICRO–1 controller *ONLY* communicates at baud rate of 9600.

When using an RS–232 communications port on the computer, a Type 8003 RIU20 interface should be used. When using an RS–422 port on the computer, an 8005 RIU10 interface should be used. Refer to Section 2 for detailed installation and connection instructions.

The Class 8030 Type ICM200 Isolator Converter Module may be used for RS–232 to RS–422 conversion and isolation. The ICM200 is an externally connected device.

The following lists the SFI3xx boards compatible with various Square D Company programming packages:

- The Class 8010, Type SFI321 board supports the 8003 SFW30, 8010 SFW50, 8010 SFW321, and Screenware2® programming software.
- The Class 8010, Type SFI322 board supports the 8003 SFW30, 8010 SFW50, 8010 SFW321, 8010 SFW322, and Screenware2 programming software.
- The Class 8010, Type SFI323 board supports the 8003 SFW30, 8010 SFW50, 8010 SFW321, 8010 SFW322, SFW323, and Screenware2 programming software.
- The Class 8010, Type SFI324 board supports the 8003 SFW30, 8010 SFW50, 8010 SFW321, SFW322, SFW323, SFW323, and Screenware2 programming software.
- The Class 8030, Type ICM200 board supports the 8003 SFW30, the 8010 SFW50, and the 8010 SFW374 programming packages.

The following products ***CANNOT*** be used to program or communicate with a MICRO–1 processor:

- SPR250
- SPR300

- SFW3XX SY/MAX Programming Software
- SFW5XX SY/MAX Programming Software
- SFW50 Model 50 Programming Software

- SFI–5XX SY/LINK® Board
- Class 8030 CRM540 SY/NET® Communications Module

RS-232 Communications Connections

The following identifies the connections and devices required to communicate from an *RS-232* serial communications port to a *MICRO-1* processor. *An RIU20 Interface module* (RS-232) may be used to convert the communication port of the MICRO-1 processor to an RS-232 communications standard. Note that the serial communications port in the PC is connected to the RIU20. The SFW30 interface port can only be configured as "COM1" or "COM2". COM3, COM4, etc., are NOT acceptable port configurations even though the physical ports may exist.

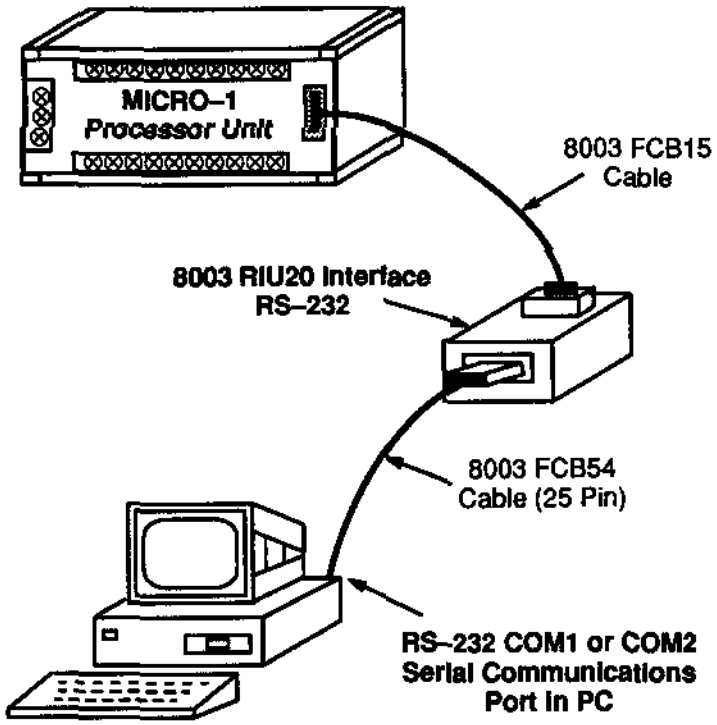


Figure 1-3 Single MICRO-1 Processor Connected to PC's RS-232 Communications Port (COM1 or COM2)

NOTE: *In this configuration, SFW30's interface must be configured for RIU20-RS232 in the INIT/UTILITY mode. Refer to Section 2.2.*

RS–422 Communications Connections

The following figures identify the connections and devices required to communicate from an RS–422 serial differential communications port to a MICRO–1 processor.
In the connection in Figure 1–4, a Class 8005, Type RIU10 Remote Interface Unit is required between the PC and the MICRO–1 processor. A Square D Company SFI3xx board (RS422 port) or an RS–422 asynchronous board may be used in the computer.

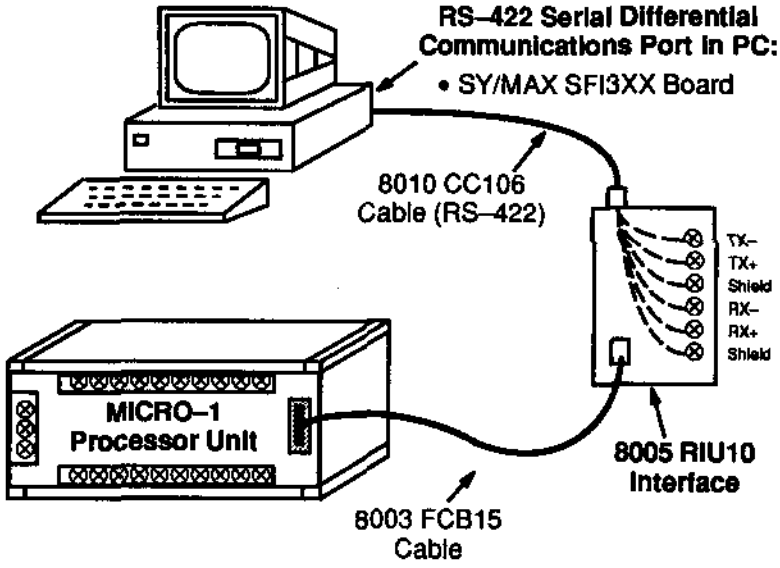


Figure 1–4 Single MICRO–1 Processor Connected to PC's RS–422 Serial Differential Communications Port or SFI3xx Board

NOTE: *In this configuration, SFW30's interface must be configured for RIU10–RS422 in the INIT/UTILITY mode. Refer to Section 2.2.*

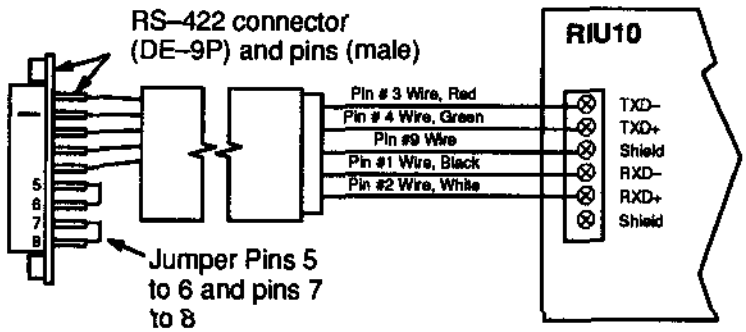


Figure 1–5 Pin/Wire Connections for 8010 CC106 Cabled to the RIU10 Terminal Block

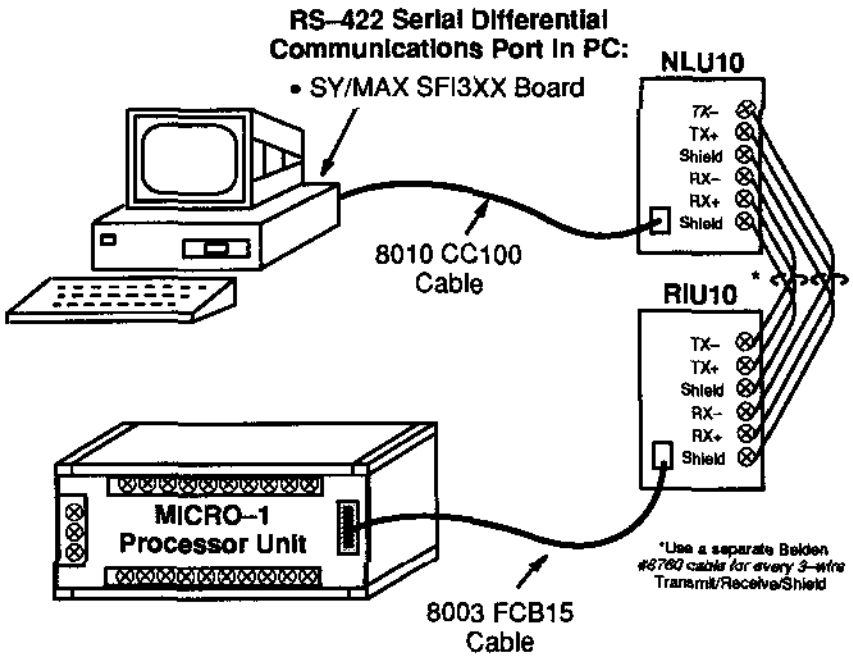


Figure 1–6 Single MICRO–1 Processor Connected to PC's RS–232 Serial Communications Port with RS–422 Converter

NOTE: *In this configuration, SFW30's interface must be configured for RIU10–RS422 in the INIT/UTILITY mode. Refer to Section 2.2.*

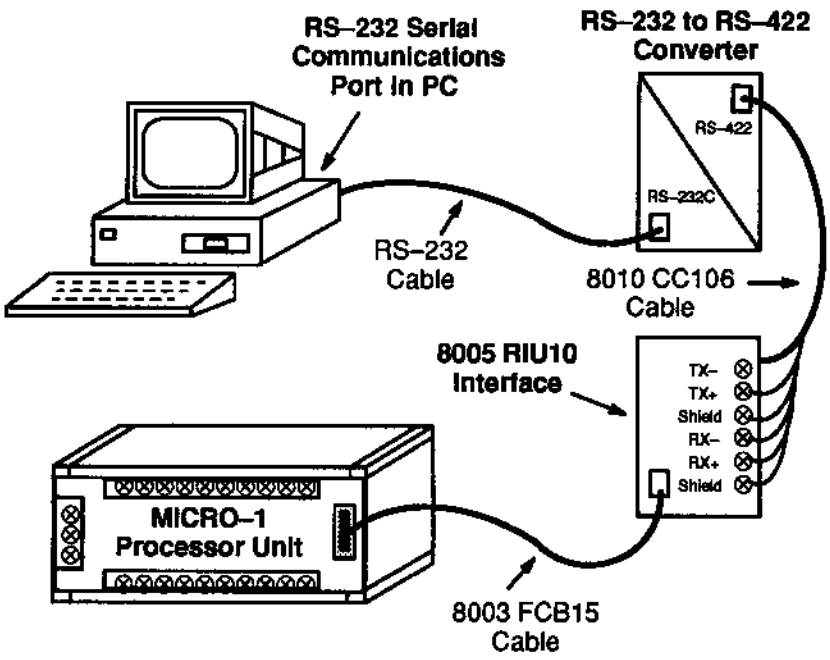


Figure 1–7 Single MICRO–1 Processor Connected to PC's RS–232 Serial Communications Port with RS–422 Converter

NOTE: *In this configuration, SFW30's interface must be configured for RIU10–RS422 in the INIT/UTILITY mode. Refer to Section 2.2. Refer to Figure 1–5 for connection of 8010 CC106 to 8005 RIU10.*

In Figure 1–7, the PC's RS–232 communications may be converted to RS–422 by using an appropriate converter, such as a Square D Company ICM200 RS–232 to RS–422 Isolator Converter. Also, a Class 8005, Type RIU10 Remote Interface Unit is required between the converter and the MICRO–1 processor.

MICRO–1 Processor Ring Network Communications Connections

To connect from 1 to 32 MICRO–1 processors on a ring network, the Class 8005, Type NLU10 Network Link Unit and the Class 8005, Type RIU10 Remote Interface Unit are required. An SFI3xx board (RS422 port) or an RS422 asynchronous board must be installed in the PC. The following figures identify the ring network connections, devices, and cables. A separate RIU10 must be used for each MICRO–1 processor connection.

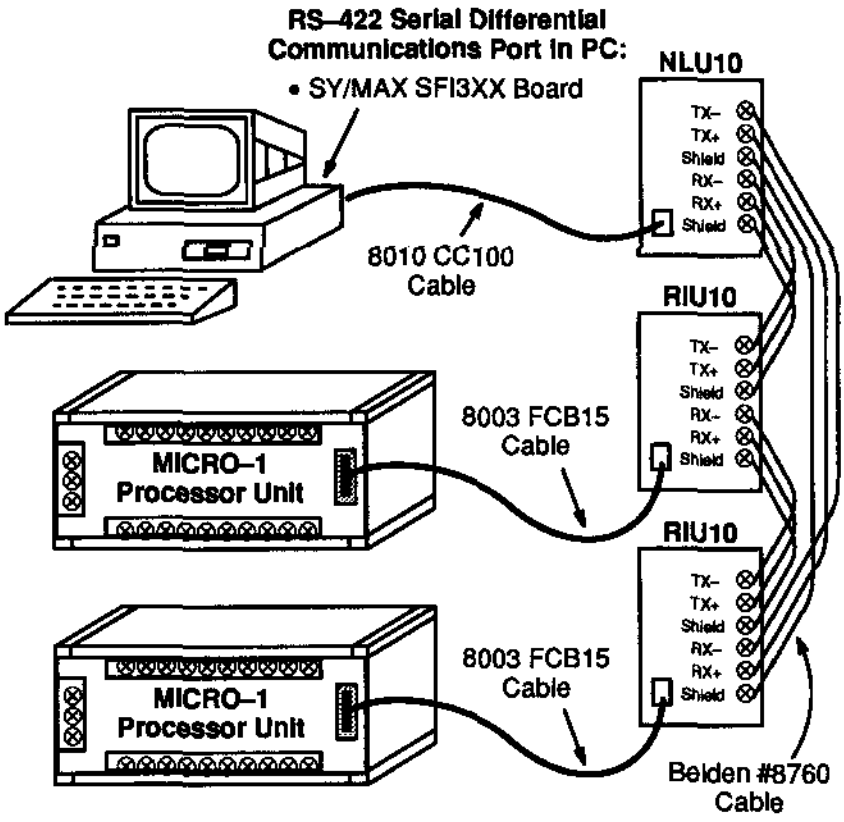


Figure 1–8 MICRO–1 Processors Connected to PC on Ring Network Using an RS–422 Port

NOTE: *For additional cabling connections, refer to Appendix A.*

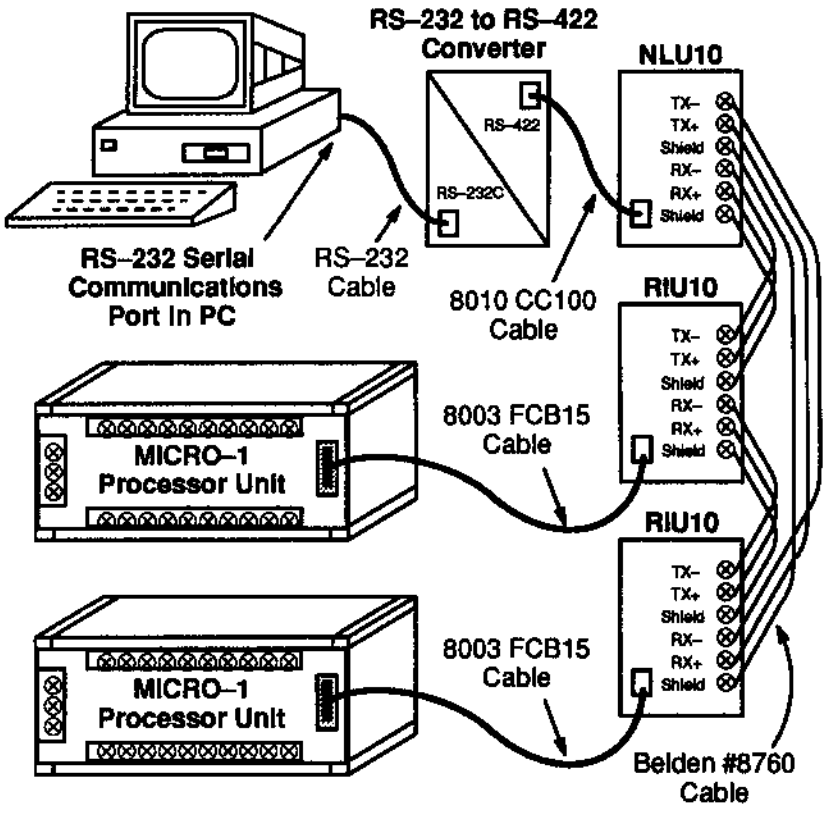


Figure 1–9 MICRO–1 Processors Connected to PC on Ring Network Using an RS–232 Port

NOTE: *In this configuration, SFW30's interface must be configured for RIU10–RS422 in the INIT/UTILITY mode. Refer to Section 2.2.*

NOTE: *For additional cabling connections, refer to Appendix A.*

1.4 OFFLINE Memory

1.4.1 GENERAL

The SFW30 allows programming to be done OFFLINE without the MICRO–1 processor connected to a personal computer. The OFFLINE memory allows the user to develop control programs without connecting the personal computer to the MICRO–1 processor.

The specific uses for **OFFLINE memory** are as follows:

LADDER PROGRAM – The ladder control program can be developed and stored in offline memory. See Sections 5 and 6 for ladder programming.

FUNCTION – Lists and describes processor functions as well as provides the opportunity to modify function values. Functions are described in Section 4.

LABELS – Lets you customize your ladder logic by assigning easily recognizable alphanumeric names to certain ladder elements that are in your program. Refer to Section 10.

XREF (Cross reference) – Enables you to determine where a particular register or address is used in the control program. Also finds data which is subject to change if the cross–referenced data changes. Refer to Section 11.

DISK – Allows you to load and save ladder files to a floppy disk or to the computer's internal hard disk. See Section 7.

TRANSF – Allows programs created in the offline memory to be transferred to the MICRO–1 (CPU) memory and vice versa. (Must be connected to MICRO–1 processor.)

SYMBOL – Lets you obtain an intermediate code printout (hand–held equivalent) of the entire ladder program or a part of the ladder program placed in the offline memory.

1.4.2 MEMORY USAGE

Both OFFLINE and ONLINE memory utilization can be considered essentially the same. This section deals with specific elements of the ladder and lists how many words of memory are used for each element.

For Labels

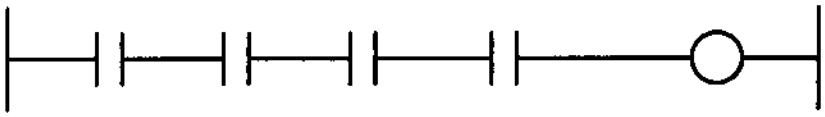
Refer to Section 10.1.1, Memory Required to Program Labels. Table 1–1 lists the memory used for the ladder instructions. Memory required for ladder rungs containing only one line of programming elements, can be determined easily by totaling the number of words required for each instruction in the rung. However, the total memory required for ladder rungs containing branches will vary slightly with the complexity of the branches. Figure 1–10 provides some example rungs and their associated memory usage.

For Ladder

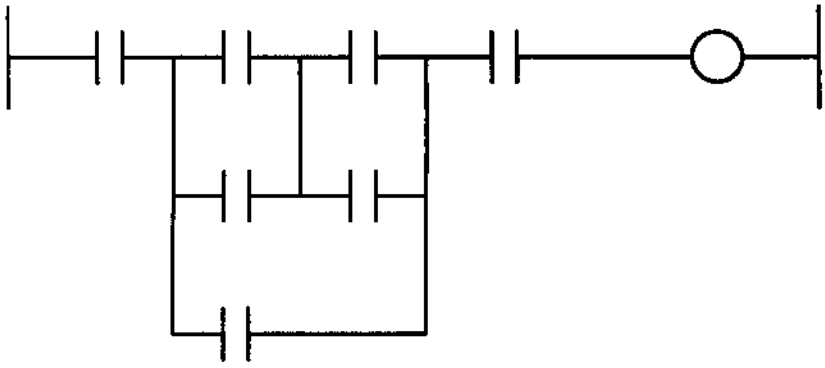
INSTRUCTION	NUMBER OF WORDS USED (MEMORY)
Contact	1 word per contact
Coil (all types)	1 word per coil
Timer	5 words per timer instruction
Counter	5 words per counter instruction
Shift Registers	3 words per shift register
JUMP	1 word per JUMP instruction
JEND	1 word per JEND (JUMP) end instruction
Counter Comparison	4 words of memory
Branches (AND LOAD /OR LOAD)	Words of memory will vary with the complexity of the branch.

Table 1–1 Instruction / Component Memory Allocation Summary

The Following Rung Uses 5 Words of Memory (One Word for Each Rung Instruction):



The Following Rung Uses 10 Words of Memory (One Word for Each Rung Instruction and Two Additional Words for the Branches):



The Following Rung Uses 7 Words of Memory (One Word for Each Rung Instruction and One Additional Word for the Branches):

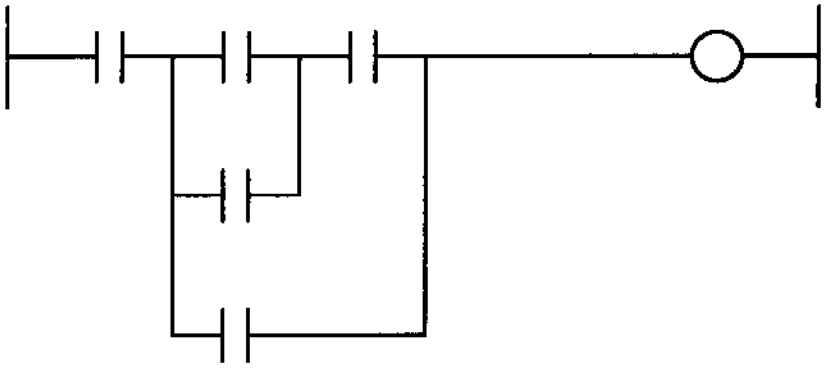


Figure 1–10 Example Rungs and Memory Usage

GETTING STARTED 2

2.1 Loading SFW30

To load SFW30 into the personal computer is essentially the same whether programming in OFFLINE or ONLINE mode. ONLINE MICRO–1 processor communications allows monitoring of the system status or transferring of programs from computer memory to the MICRO–1 processor's memory. Programming the MICRO–1 processor's memory directly using SFW30 is ***NOT*** possible.

Use the following steps to load SFW30:

1. Turn ON the personal computer and load the Disk Operating System (DOS) if not already installed. Enter the date and time as prompted on the monitor.

2. Insert the SFW30 disk into a floppy disk drive (e.g., A: or B:). Make sure the default drive indication on the screen matches that of the disk drive containing SFW30 program disk.

   For example, if the SFW30 disk is placed in drive B:, the default drive indicated on the monitor must be drive B:>. If drive B: is not indicated on the monitor, enter the disk drive alpha character with a colon (:) and press the ENTER key.

3. If you want to save and run SFW30 from a hard drive, make a directory called SFW30 on the destination drive (e.g, C:>mkdir SFW30). Change directories into the newly created SFW30 directory (e.g. C:>cd SFW30). Copy everything on SFW30 program disk in the floppy to your hard drive (e.g., A:>copy *.* c:\SFW30).

4. To run SFW30 from a floppy or hard drive:

   - Change to the appropriate drive and directory:

     If installed in a floppy and you are in the C:> drive type in:

     C:>A: (press **ENTER / RETURN**)

     If installed on a hard drive type in:

     C:>cd SFW30 (press **ENTER / RETURN**)

   - Type in **SFW30** and press **ENTER / RETURN** to start SFW30.

NOTE: *It is recommended that a copy be made of SFW30 and retain the master in a safe place. In the event the working copy is lost or corrupted, a secure copy of the software is available.*

Figures 2–1 and 2–2 show the INITIAL displays which are displayed when SFW30 is executed as described in the previous steps.

From the INITIAL display, any one of the modes named at the bottom of the screen may be selected by pressing the corresponding function key. Each of these modes is described in the following sections.

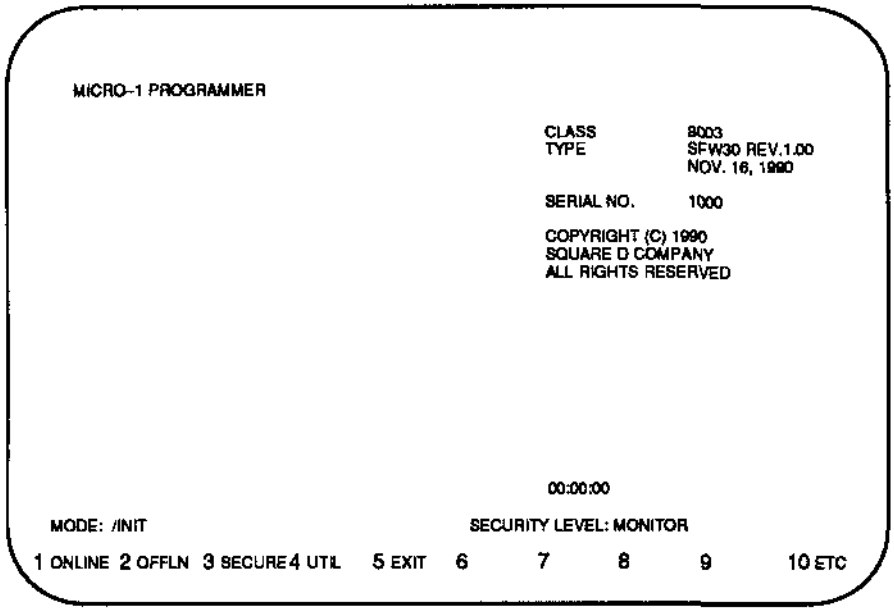


Figure 2–1 INITIAL Display

1) Press the **ETC [F10]** function key

A second INIT screen appears which allows the selection of additional functions as shown in Figure 2–2.

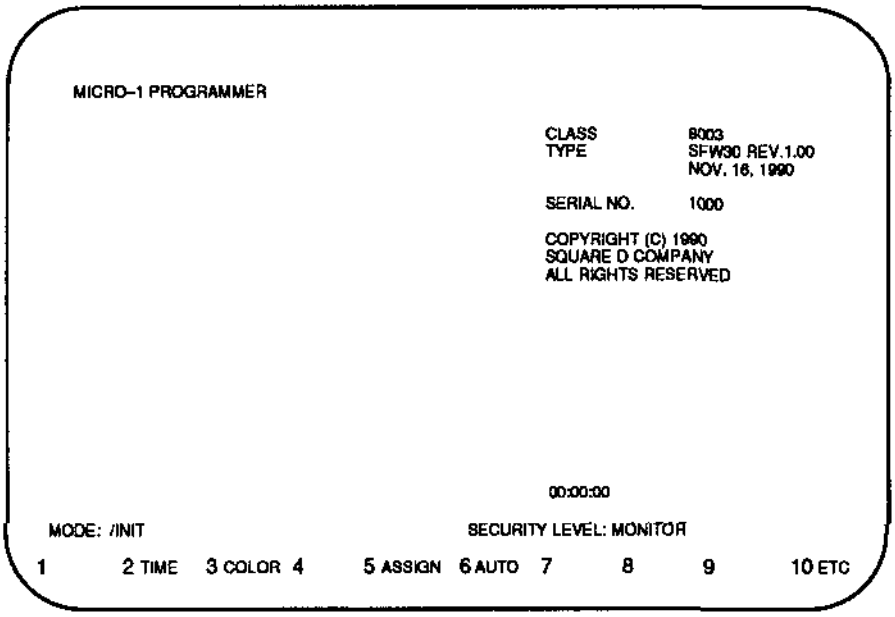


Figure 2–2 INITIAL Display After Pressing ETC [F10]

2.1.1 SETTING THE DISK PATH FOR SFW30 FILES (OPTIONAL)

There are three files on SFW30 program diskette:

- **SFW30.EXE** – This is the executive file and contains the basic procedural structure for all your SFW30 applications.
- **SFW.SEC** – This is the security file and contains the default password protection for accessing certain features of SFW30.
- **AUTO30.SQD** – This is the file which supports the auto power–up feature of SFW30.

Each of the above files is automatically loaded into the personal computer's RAM memory every time "SFW30" is typed in and entered. When the SFW files are kept on a hard disk, the security file (SFW.SEC) and the auto–powerup file (AUTO30.SQD) can be kept in sub–directories of the hard disk, apart from the executive file (SFW30.EXE), and still be indirectly accessed each time SFW30 is typed. Using the DOS supported "SET" command in conjunction with the variable SFWPATH will accomplish this.

If this feature is not used, the security and auto–powerup files must be located in the current directory, on the current drive. If SFWPATH is defined, then the files may either be in the current directory and drive, or they may be in the directory and drive specified by SFWPATH. The current drive and directory is searched first, and if either file is missing, the SFWPATH drive and directory will be searched for the missing file(s).

To implement this feature, use the "SET" command as shown:

SET SFWPATH = drive:\path

The "drive" parameter in the example above indicates the disk drive (floppy or hard disk) where the SFW program resides (e.g., A:, B:, C:, etc.). If drive is not specified, the current drive that appears at the cursor is assumed to be the correct drive. If a drive is specified it must be followed by a colon (:) and a backslash (\). Path indicates the disk path (sub–directory) where the files are stored. Path must be specified, and there must be a trailing backslash (\) after the path specification.

This statement may be entered on the command line, or it may be included in the computer's "AUTOEXEC.BAT" file, to be executed when the personal computer is turned on or rebooted.

2.2 Setting Up Utility Mode Parameters (Offline and Online)

To establish communications between the personal computer and the MICRO-1 processor or the printer, access the UTILITY mode in SFW30. The UTILITY mode is used to define the drop and port assignment and also indicate certain parameters of the printed copy when choosing ladder diagram program printing. A unique drop number is assigned to each MICRO-1 processor connected on the ring network. The drop number allows independent identification and communication with each MICRO-1 processor.

In order to access the UTILITY mode, from the INIT screen:

1) Press the **UTIL [F4]** function key

The screen should appear as shown in Figure 2-3.

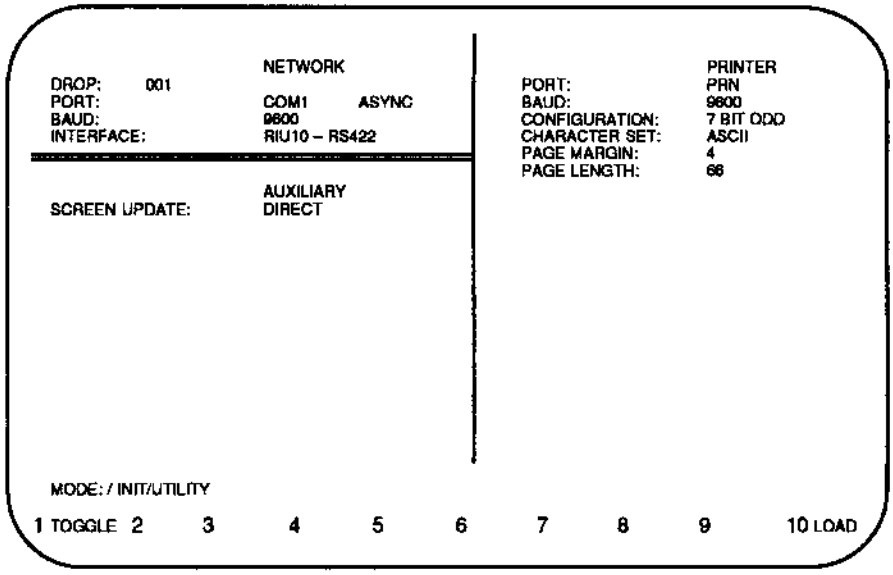


Figure 2-3 UTILITY Display

The function keys which appear on the bottom of the display are TOGGLE and LOAD.

The TOGGLE function sequentially indicates the possible options for any field.

The LOAD function is used after all the necessary settings have been indicated in the UTILITY mode. If you have entered an invalid number for any selectable field, pressing the LOAD key causes the software to check for conflicts, and you will be advised of the improper selection with a message that will appear at the bottom of the screen.

2.2.1 DROP

The drop is the first item shown on the UTILITY screen. The drop number is used to uniquely identify each MICRO–1 processor. For all on–line communications the drop number set in the UTILITY screen must match the drop number in the MICRO–1 processor except when assigning a drop number (refer to Section 2.6). It is necessary when using a ring network to assign a unique drop number to each processor. A drop must be entered which shows the path from the personal computer to the specific MICRO–1 processor.

For ring network operations and communications, all the 8005 RIU10 interfaces must be *powered up.*

NOTE: *See Section 2.6 for important information about assigning a drop number to the MICRO–1 controller.*

When the personal computer is attached to a ring network, the drop number may be from 1 to 255 and is the drop number of the desired processor. For example, the drop 003 means that the MICRO–1 processor has been assigned a drop of number 3. Note that the physical number of MICRO–1 processors on the ring network is between 1 to 32, however, drop numbers 1 through 255 may be assigned to any of the 1 to 32 MICRO–1 processors.

To enter this drop, use the arrow keys on the numeric keyboard to first position the cursor at the drop field and then press the numeral 3. The drop will show as 003 on the screen. More information about drop numbers and how to assign them in an initial installation or how to reassign them can be found in Section 2.6.

2.2.2 PORT ASSIGNMENT

Establishing a port assignment is absolutely necessary in order to communicate with the MICRO–1 processor. You must first select either COM1 or COM2 and then the software will automatically indicate the type of board present (SFI, ASYNC or NONE).

Also, the baud rate will show "hardware selected" if an SFI3xx board is being used. For example, if the computer is equipped with an SFI324 interface board configured for COM2, once COM2 is selected in the UTILITY mode, the software shows the port assignment as COM2 SFI and the baud rate as HARDWARE SELECTED.

2.2.3 BAUD RATE SELECTION

The baud rate (communications bit rate) of the MICRO–1 processor set at 9600 baud and is not changeable. If an SFI3xx board is installed, the baud rate field is displayed as "HARDWARE SELECTED". The setting is not software selectable because an external thumbwheel switch is used to set the baud rate on an SFI board.

NOTE: *When using an SFI board, make sure that the baud rate is set up for 9600 baud.*

2.2.4 INTERFACE

This selects either the RIU10 to RS–422 or the RIU20 to RS–232 communications . Select the appropriate interface for the connection that is being used. For proper settings, refer to the NOTES in the Section 1 configuration diagrams.

2.2.5 AUXILIARY

Under the Auxiliary heading on the UTILITY screen the SCREEN UPDATE field can be set to either DOS or DIRECT. When set to DOS, data is written to the screen with DOS function calls. When set to DIRECT, data is written directly to screen memory. This is considerably faster than using DOS calls, but it may not work correctly on some types of IBM–compatible computers. To set this parameter press the TOGGLE function key until the desired selection appears.

2.2.6 PRINTER

The selectable fields for the system printer include the following.

PORT – This field allows selection of PRN, COM1 or COM2. Use the TOGGLE function key to select the correct communications port.

BAUD – This field shows any of the communication rate settings, 110 through 9600. Use the TOGGLE function key to select.

CONFIGURATION – This field allows selection of 8Bit Odd, 8Bit Even, 7Bit Odd or 7Bit Even. Use the TOGGLE function key to select the correct data format.

CHARACTER SET – This field allows selection of ASCII or IBM text format. Use the TOGGLE function key to select the correct character type.

MARGIN – This field sets the top–of–page and bottom–of–page margins. This value is the number of blank lines at the top and bottom of each printout page. The allowable values range from 0 to less than half of the page length.

LENGTH – This field sets the printer page length in lines. The length value is the total number of lines per printed page. The allowable values range from 1 to 99.

Serial Printout Directly to a Printer:

To print directly from the personal computer to a printer, insure the printer serial port assignment is different than the MICRO–1 processor port assignment (i.e. if the MICRO–1 processor port is COM1, the printer port must be assigned COM2 and vice versa).

The baud rate assigns the speed at which data is sent through the printer port. The default setting of the BAUD rate is 9600 Baud. The default setting of the configuration parameter is 7 Bit Odd. The default setting of the character set is ASCII. To change any of these parameters, use the TOGGLE function key.

The MARGIN field sets the top–of–page and bottom–of–page margins (number of blank lines). The range of valid values is 0–49 (the default is 4), but it must be less than half of the page length (although this is only checked when LOAD is pressed).

The LENGTH field sets the printer page length in lines. The range of valid values is 1–99 (the default is 66).

Parallel Printer Setup:

If a parallel printer is used, the printer port assignment should show PRN. This is the default setting for the printer port parameter.

To complete the setup in the UTILITY mode continue, if necessary, to define the baud rate, configuration and character set by toggling through the allowable choices. Also, set the MARGIN and LENGTH fields as described the "Serial Printout Directly to a Printer" Section.

For information about proper printer cabling and connection to the personal computer, see the manufacture's manual for the specific printer (refer to Appendix E, Printer Setup and Print Operations for specific SFW30 information).

2.3 Security (OFFLINE OR ONLINE)

After the power–up procedure has been completed, the INITIAL screen will be displayed. The next thing necessary before you proceed further is to select a security level. To do this, access the SECURITY screen.

1) Press the **SECURE [F3]** function key

The screen should appear as shown in Figure 2–4.

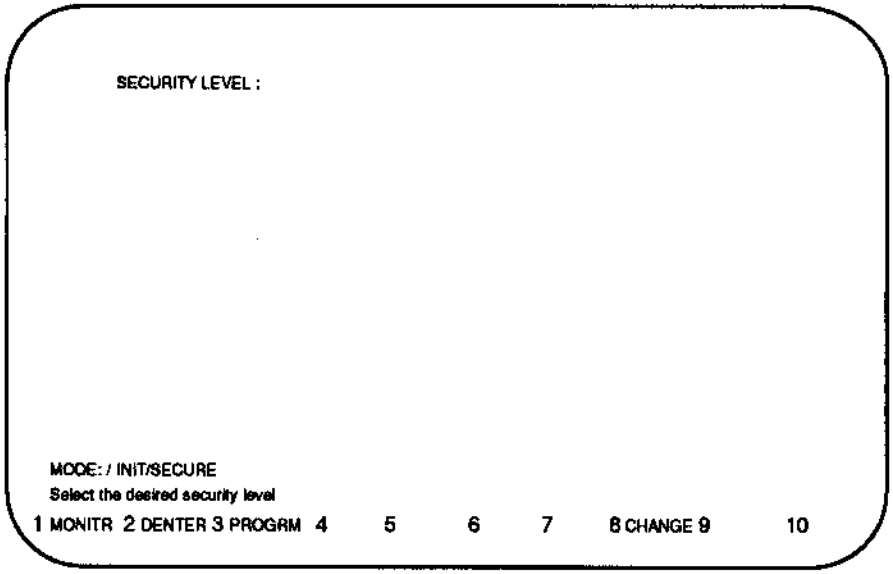


Figure 2–4 Security Display

The function keys which appear on the bottom of the SECURITY display are MONITR, DENTER, PROGRM and CHANGE.

MONITR (Monitor) – This is the security level that allows you to inspect data but restricts you from changing processor data and the ladder program. Offline memory cannot be modified, and disk files cannot be recorded or loaded.

DENTER (Data Enter) – This is the security level that allows you to read and write processor data from the ONLINE/DATA mode. This security level prohibits you from modifying the processor ladder, disk files, and function settings in both ONLINE and OFFLINE modes.

PROGRM (Program) – This is the security level that allows you to read and write processor data, ladder programs and disk files. All program functions are available at this security level.

CHANGE – This is used to change a password from its default designation.

Table 2–1 lists the various functional modes of each screen and the minimum security level required for each function.

OPERATION/FUNCTION	MONITR	DENTER	PROGRM
Read processor registers	●	●	●
Display registers	●	●	●
Directory Disk	●	●	●
Search Ladder Program	●	●	●
Change UTILITY screen parameters	●	●	●
Define Time and Color options	●	●	●
Save AUTO file parameters	●	●	●
Print Ladder/Symbols	●	●	●
Search for Labels	●	●	●
Use XREF	●	●	●
Write processor registers (*see exceptions)		●	●
Change function data			●
Load disk data to OFFLINE memory			●
Clear processor error			●
Change Halt/Run state of processor			●
Assign drop number			●
Preset Upload/Restore			●
Load and record processor disk files			●
Delete or program ladder			●
Create, delete, or edit labels			●
Transfer files from OFFLINE to CPU and CPU to OFFLINE			●

* DENTER cannot write to special control relays R701–R707 and R710–R713. (R714–R717 are read–only registers.)

Table 2–1 Security Level Hierarchy

2.3.1 SELECTING A SECURITY LEVEL (OFFLINE OR ONLINE)

A password is necessary to access the Data Enter, Program and Change security levels. This password may contain up to twenty characters and is programmed into the software by the purchaser. An example of how to program a password is included in this section.

The default passwords presently in place in SFW30 are identified in Table 2–2.

	SECURITY LEVEL:			
	MONITOR	DATA ENTER	PROGRAM	CHANGE
DEFAULT PASSWORD	Password NOT Needed	DATA ENTER	PROGRAM	SQD/PSWD

Table 2–2 Default Passwords

If, for example, you choose to operate at the PROGRAM security level, the following steps are required from the SECURITY display.

1) Press the **PROGRM [F3]** function key

The screen should appear as shown in Figure 2–5.

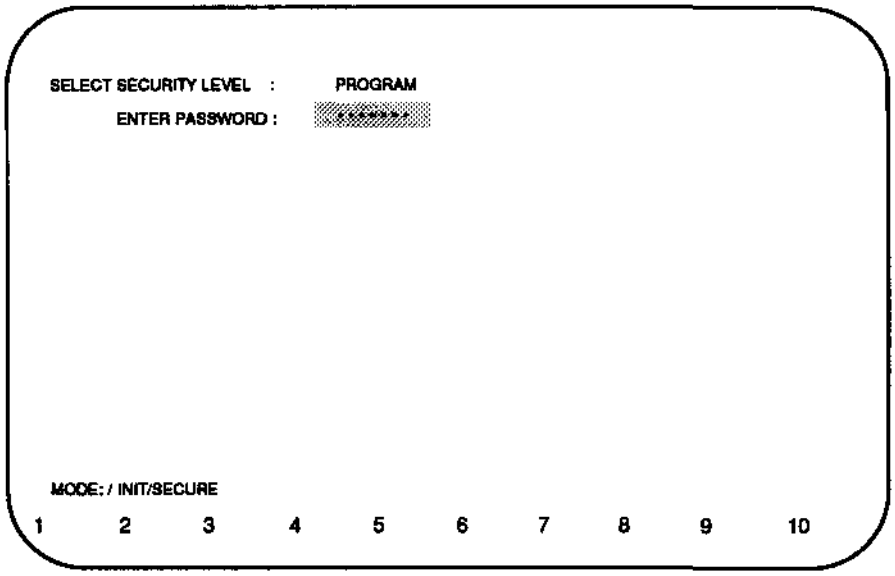


Figure 2–5 Password Prompting

Now type in the password for the security level you wish to access, such as:

2) Type in the word **PROGRAM**

As this password is entered, asterisks appear on the screen in place of the characters in order to retain the confidentiality of the password.

3) Press **ENTER / RETURN**

The display will return to the INITIAL mode where the selected security level will be indicated to the right of the mode designation.

2.3.2 CHANGING A PASSWORD (OPTIONAL)

You may assign passwords different from those presently defined within the software. These assignments may consist of up to twenty alphanumeric characters. If, for example, you wish to redefine the password for the PROGRAM security level from "PROGRAM" to "XYZ", it would be necessary to perform the following steps from the SECURITY screen.

1) Press the **CHANGE** function key

The words "ENTER PASSWORD" appear on the screen followed by a flashing cursor. At this time you must enter SFW30's main password "SQD/PSWD" to effect a change.

2) Type in **SQD/PSWD**

3) Press **ENTER / RETURN**

The words "SELECT LEVEL FOR PASSWORD CHANGE" appear on the screen.

4) Press the **PROGRAM** function key

The words "ENTER NEW PASSWORD" appear on the screen. Enter the new password. This entry reassigns the default password of PROGRAM in the PROGRAM security level of the SFW.SEC file. For example,

5) Type in **XYZ**

6) Press **ENTER / RETURN**

The word "VERIFICATION" now appears on the screen.

7) Again, type in **XYZ**

8) Press **ENTER / RETURN**

If both selections are in agreement, the changed password will be written to the disk. This concludes the procedure for a password change. In addition to changing the passwords for security level entry, you may alter the SQD/PSWD password. To do this, follow the same procedure for a security level password change, but select the CHANGE level when the software prompts for the level you wish to change.

NOTE: *Password security is not case sensitive. The software will not distinguish between upper case or lower case letters as they occur in a password.*

CAUTION

Always retain a copy of the software security file (SFW.SEC) with the default password in place. Once the new password change has been saved to the file, it is impossible to enter the assigned security levels if the new password is forgotten. Renaming the security file or relocating it in a separate directory on your system will ensure that it is retained intact. See Section 2.1.1 for more information about the security file.

2.4 Setting the Time Display (Optional)

As a convenience, a time display is provided. When set, it will display the time of day (in military time). For example, in order to set 3:45 P.M. as the time of day, do the following from the INITIAL display.

1) Press the **ETC** function key

2) Press the **TIME** function key

The screen should appear as shown in Figure 2–6.

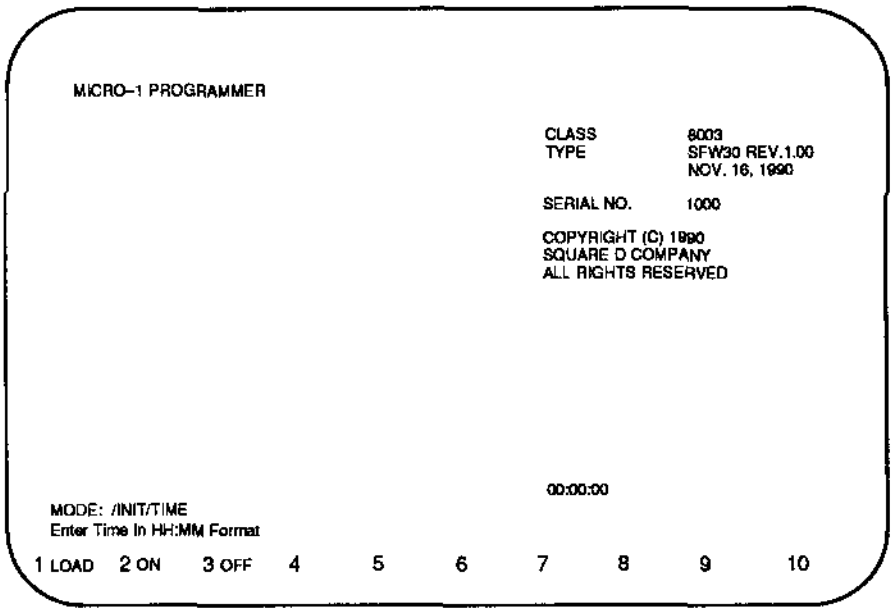


Figure 2–6 Prompting in TIME Display

The next step is to enter the hour (in military time), press the colon (:) key, and enter the minutes value. For example:

3) Type in **15:45**

4) Press the **LOAD** function key

The system software returns to the INITIAL display which will include a continuously updated indication of the time of day.

The ON and OFF function keys that appear with the LOAD function key on the TIME display screen can be used to turn the time of day display on and off. When the time display is turned off the time of day is no longer displayed, but the clock will continue to run.

2.5 Setting Monitor Display Colors (Optional)

The background and foreground colors can be selected when using a color monitor. Use the following procedure from the INITIAL display to set the display colors.

1) Press the **ETC [F10]** function key

2) Press the **COLOR [F3]** function key

The screen should appear as shown in Figure 2–7.

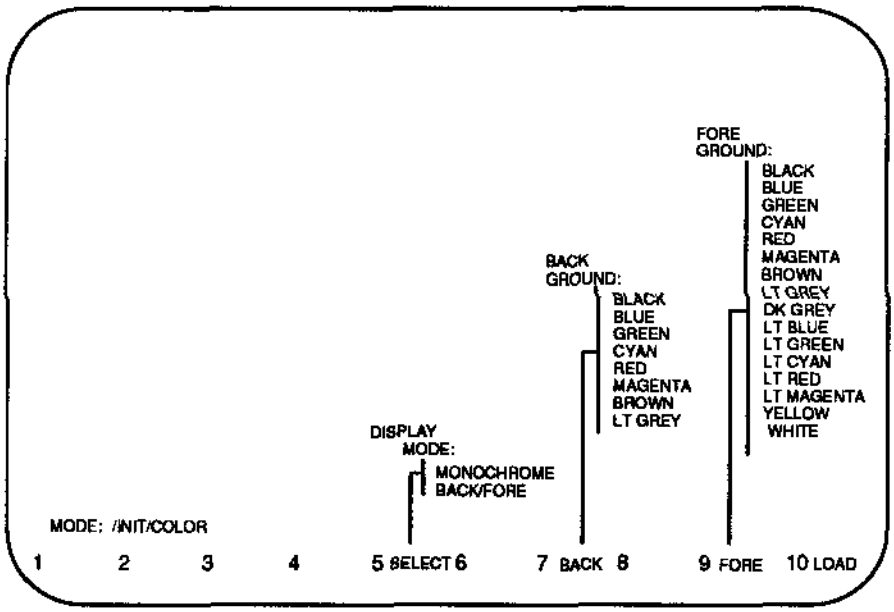


Figure 2–7 COLOR Selection Display

- Press the **SELECT [F5]** function key to select the display mode
- Press the **BACK [F7]** function key to select the desired background color
- Press the **FORE [F9]** function key to select the desired foreground color
- After colors have been selected, press the **LOAD [F10]** function key

2.6 Assigning A Drop Number In the MICRO-1 Processor (ONLINE)

In order to communicate with a single MICRO-1 processor or multiple MICRO-1 processors over a ring network, you must specify the drop number assigned in the MICRO-1 processor. This drop number is used to uniquely identify each processor on a ring network. Changing the drop was discussed earlier in Section 2.2. The ASSIGN screen must be accessed to determine which drop number has been assigned to a particular MICRO-1 processor. This screen is also used if you wish to reassign a drop number to a MICRO-1 processor which already has been given a drop number. The range of valid drop numbers is 1-255. Once a reassignment is completed, the new number is loaded into processor memory and initialized.

IMPORTANT: *When using the ASSIGN function, a single MICRO-1 processor must be connected to the personal computer through ONE remote interface unit. Then the correct interface configuration, RIU20-RS232 or RIU10-RS422, MUST be selected in the UTIL (UTILITY) mode from the INIT (INITIAL) screen.*

Accessing the ASSIGN display requires that the MICRO-1 processor's entire program be transferred in order to read the drop number. An "OPERATION PENDING" message is displayed while the program is being transferred.

In order to get the DROP NUMBER display, from the INITIAL mode:

1) Press the **ETC [F10]** function key

2) Press the **ASSIGN [F5]** function key

The screens appear as in Figures 2-8 and 2-9. Depending upon which connection is selected, RIU20-RS232 or RIU10-RS422, information shown on the screen includes a basic diagram of the system. This diagram must be followed in order for the software to read or write the MICRO-1 processor's drop number.

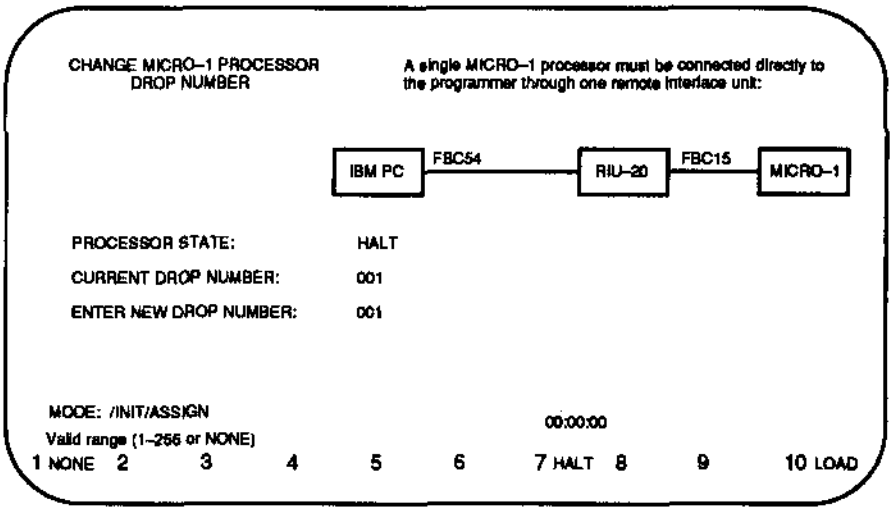


Figure 2–8 RIU20 to RS–232 Selection Screen

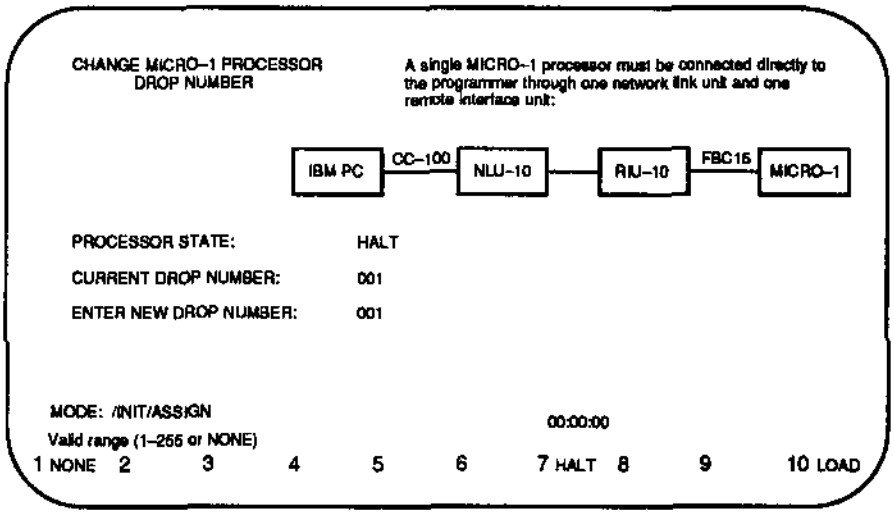


Figure 2–9 RIU10 to RS–422 Selection Screen

Other items on the DROP NUMBER screen include:

PROCESSOR STATE – This will show RUN or HALT. If the MICRO–1 processor is currently in RUN, it is necessary to first halt the processor before reassigning any drop number to it. This is done by pressing the HALT function key.

CURRENT DROP NUMBER – This will show the drop number presently assigned to the MICRO–1 processor. This drop number may have been assigned using the PR3 Program Loader. If the word NONE appears here, this means that no drop number had been previously assigned. This would be the case in an initial installation.

ENTER NEW DROP NUMBER – A cursor will be shown here indicating that you may enter a drop number for an initial installation or redefine the existing drop number if desired. The current drop number will be displayed as the default for this field.

The function keys which may be used to program a DROP NUMBER include the following:

HALT – This key allows you to halt the processor before loading a new drop number.

LOAD – *This verifies the new drop number and loads it into the MICRO–1 processor* memory. An "OPERATION PENDING" message is displayed while the new drop number is being transferred.

When you have made the proper connections as shown in the INIT/ASSIGN screen, use the following steps when reassigning a drop number in the MICRO–1 controller.

1) HALT the MICRO–1 controller.

2) Assign the new drop number for the MICRO–1 controller in the INIT/ASSIGN mode.

3) Press the **LOAD** function key to load the drop number into the processor's memory.

4) Set the **DROP** on the UTIL screen.

5) Restart the processor by exiting to the ONLINE/STATUS screen

6) Press the **H/R (HALT/RUN)** function key

7) Press the **RESTRT** function key

8) Press **ENTER / RETURN**

NOTE: *See Section 2.2.1 for important information about setting the communication drop number.*

CAUTION

Never assign a drop number over the ring network.

2.7 Using the AUTO-Powerup File

It is possible to set SFW30 so that certain program configuration data can be saved to an AUTO-powerup file. This is a convenient time saving option since it automatically will enter parameters essential for communication as well as initializing other key start-up features.

The parameters which can be stored in the auto-powerup file include:

- Screen color mode and background and foreground colors
- Time mode (ON or OFF)
- The register numbers last shown on the ONLINE/DATA screen
- All parameters from the UTIL mode, including the following:
    - Drop and port (baud rate is fixed at 9600 baud)
    - Screen update mode (DOS or DIRECT)
    - Printer communications port parameters and page/margin size.
    - Interface (RIU20-RS232 or RIU10- RS422)

The following steps show how to use the AUTO function:

1) Press the **ETC [F10]** function key

2) Press the **AUTO [F6]** function key

The message "Press SAVE to store all parameters in the auto–powerup file" is displayed. Continuing to press SAVE causes the current configuration parameters to be stored in the file, while any other key aborts the save.

The screen should appear as shown in Figure 2–10.

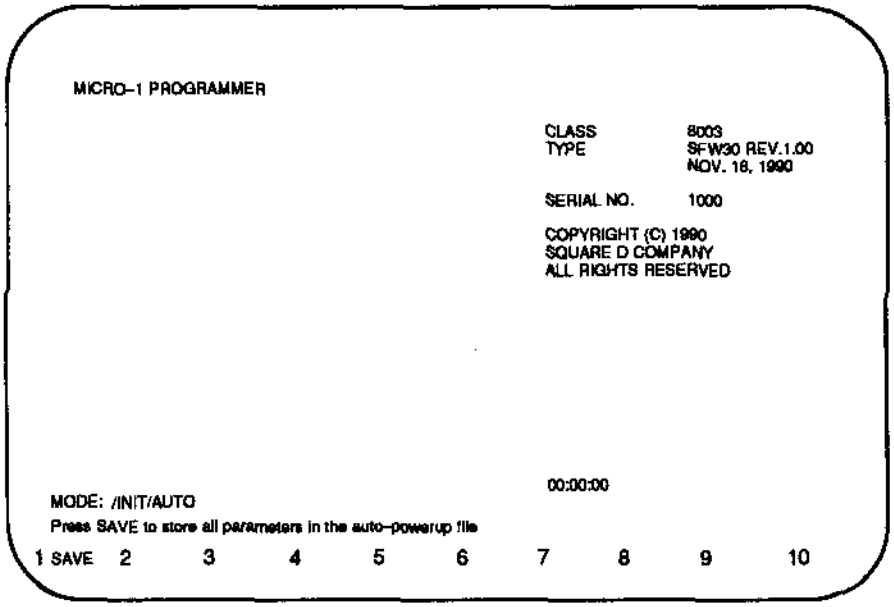


Figure 2–10 Prompting in the AUTO Display

CAUTION

Any use of the AUTO function will cause data that had been previously stored in the AUTO30.SQD file under the SFW directory will be overwritten by the most recent configuration that is entered.

2.8 Exiting To DOS

Pressing the EXIT function key from the INITIAL display will cause the personal computer to exit SFW30 and return to the Disk Operating System (DOS).

To exit the system software and return to the Disk Operating System:

1) Press the **EXIT** function key

The message "Enter Y or 1 to exit to DOS" will appear at the bottom of the screen display. To continue:

2) Press either the **Y** key or the **1** key

- If you wish to **ABORT** the operation press **ANY OTHER KEY**.

> **CAUTION**
>
> **All OFFLINE memory will be cleared when SFW30 is exited. Any program residing in OFFLINE memory will be lost.**

2.9 Special Start and Stop Operations

There are two techniques which may be used to control program start and stop operations in the MICRO-1 processor as explained in the following sections. These methods are all interrelated, as they are controlled by the state of special internal relays which control the RUN/HALT state of the processor.

2.9.1 AUTOMATIC START

Using An Input Signal

The stop input works as a start and stop input. The input number is defined by using FUN4 (see Section 4.4.1). When the input is turned ON, the processor goes into the HALT state (RUN LED goes OFF). When the input is turned OFF, the processor goes into the RUN state (RUN LED goes ON).

When OFF, the stop input allows the processor to automatically resume operation after power is cycled. When the stop input has been designated by FUN4, the RUN/HALT from the SFW30 is disabled.

Using A Power Supply

A second method of starting the operation is to use the power source as a means of control. When power is turned on at the power source, the operation will start. When power is turned OFF, the operation stops.

2.9.2 STOP AND RESET

For systems requiring stop and reset inputs, any input numbers may be designated by using Functions 4 and 5. See Section 4.1 for an explanation of this setting.

NOTE: *Functions may only be set or modified in the OFFLINE mode.*

When a stop or reset input is turned ON during program operation, the RUN LED goes off and operation stops. All the outputs will be turned OFF. When only the reset input is set, the start input remains as a start/stop input.

The priority of the signals is:

1) **RESET** (reset input has precedence over the others)

2) **STOP**

Table 2–3 identifies the conditional status of various program elements (timers, counters, etc.) depending upon the operational state of the MICRO–1 processor. Retentive registers are those which maintain their values after a power interruption. Non–retentive registers are reset after a power interruption.

CONTROLLER OPERATING STATUS	OUT-PUTS STATUS	Internal Register And Shift Register Status; Counter Counted Value		TIMER CURRENT VALUE	Counters 45 and 46 Counted Value
		Retentive	Non–Retentive		
RUN	Operating	Operating	Operating	Operating	Operating
RESET	OFF	Cleared	Cleared	No change	No change
STOP	OFF	No change	No change	No change	No change
At START	No change	No change	Cleared	Cleared (Initialized)	No change

Table 2–3 Program Element Status In Various Operating Modes

STATUS INFORMATION 3

3.1 General

There are two device status screens which are very useful for accessing information about conditions which may affect program execution. The two status screens are:

- The OFFLINE/STATUS screen
- The ONLINE/STATUS screen

3.2 OFFLINE/STATUS Screen

The OFFLINE memory is located within the personal computer. The personal computer does not have to be connected to a MICRO–1 processor to access the OFFLINE/STATUS mode screen in SFW30.

The OFFLINE memory is used for programming ladder programs which may later be transferred to the MICRO–1 processor's memory. The OFFLINE/STATUS screen in this mode provides information about the amount of memory that is used by a ladder program.

To select the OFFLINE/STATUS screen from the INITIAL mode screen:

1) Press the **OFFLN [F2]** function key

The screen should appear as shown in Figure 3–1.

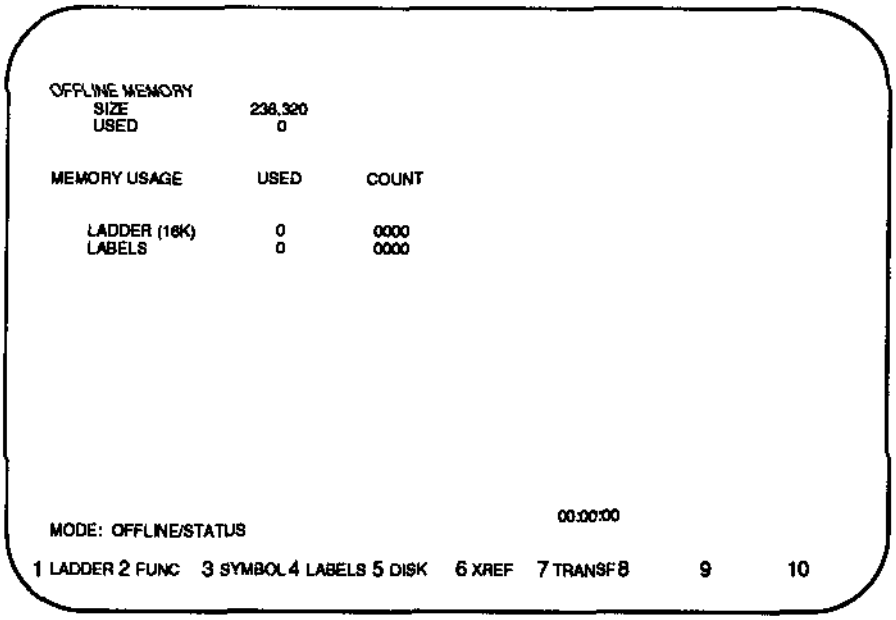


Figure 3–1 OFFLINE/STATUS Screen

3.2.1 OFFLINE/STATUS SCREEN

The OFFLINE/STATUS screen provides information about memory usage for programs currently in the computer's OFFLINE memory. The specific items listed on the screen include the following:

OFFLINE MEMORY SIZE – This shows the maximum number of bytes available in the OFFLINE memory for ladder programming.

USED – This shows the total number of bytes used in the OFFLINE memory for ladder programming.

MEMORY USAGE LADDER (Used) – This shows the number of words used in the OFFLINE memory for ladder diagrams. (60 words of overhead memory are needed for function values. See note1.)

NOTE:[1] *The 60 words of overhead memory used for function values is not displayed on the status screen. Therefore, the MICRO-1 processor memory will hold AT LEAST 600 words of displayed program memory.*

LADDER (COUNT) – *This shows the number of rungs programmed in the OFFLINE* memory.

NOTE:[2] *Up to 16K words can be programmed in OFFLINE memory. The MICRO-1 processor will hold at least 600 words of displayed program memory (user memory). This is important to keep in mind when creating a ladder program in the OFFLINE mode which will later be transferred to a memory location.*

LABELS (USED) – This shows the number of bytes of OFFLINE memory used for labels. See Section 10.1.1 for complete details about computing the amount of OFFLINE memory needed to program labels.

LABELS (COUNT) – This shows the number of labels programmed in the OFFLINE memory.

3.2.2 OFFLINE/STATUS FUNCTION KEYS

The following identifies the OFFLINE/STATUS screen function keys:

LADDER – This function key allows you to perform functions related to the ladder diagram. These functions include SEARCH, DELETE, and PROGRAM.

FUNC – This function key displays certain functions from FUN4 to FUN60 on the monitor screen along with descriptive labels as to what they control. From the FUNCTION mode it is possible to enter or modify the values of specific internal settings in the MICRO–1 processor which will define certain conditions. This is particularly important if you are using the MICRO–1 processor's memory for the first time. An explanation of the function screen appears in Section 4.

SYMBOL – This function key is used to obtain a symbol printout (PR3 program loader equivalent) of the entire ladder program or a part of the ladder program placed in the OFFLINE memory. See Section 9 for more information on this feature.

LABELS – This function key accesses the OFFLINE/LABELS/SEARCH screen and corresponding function keys. From this screen alpha–numeric identifiers (labels) can be assigned to all registers including data and I/O. Labels may be up to 18 characters in length. The LABELS mode is also used to enter rung comments which may be up to 1600 characters in length. Section 10 explains how to use LABELS.

DISK – This function key allows you to save OFFLINE ladder and labels to disk or to load the contents of a disk into the computer's OFFLINE memory.

XREF (Cross Reference) – This function key gets the XREF screen and function keys. Using XREF allows you to track the use and number of occurrences of a particular register, including data and I/O, in a program. Section 11 explains how to use XREF.

TRANSF (Transfer) – This function key is used to transfer the contents of the computer's OFFLINE memory to the MICRO–1 processor's memory or vice versa.

3.3 Online Status

The main function of the ONLINE/STATUS screen is to provide an accurate description and account of the state of the processor during communications with the personal computer. This section defines the items listed on the screen and it will also give information about the function keys appearing at the bottom of the screen.

To select the ONLINE/STATUS screen from the INITIAL mode screen:

1) Press the **ONLINE [F1]** function key

The screen should appear as shown in Figure 3–2.

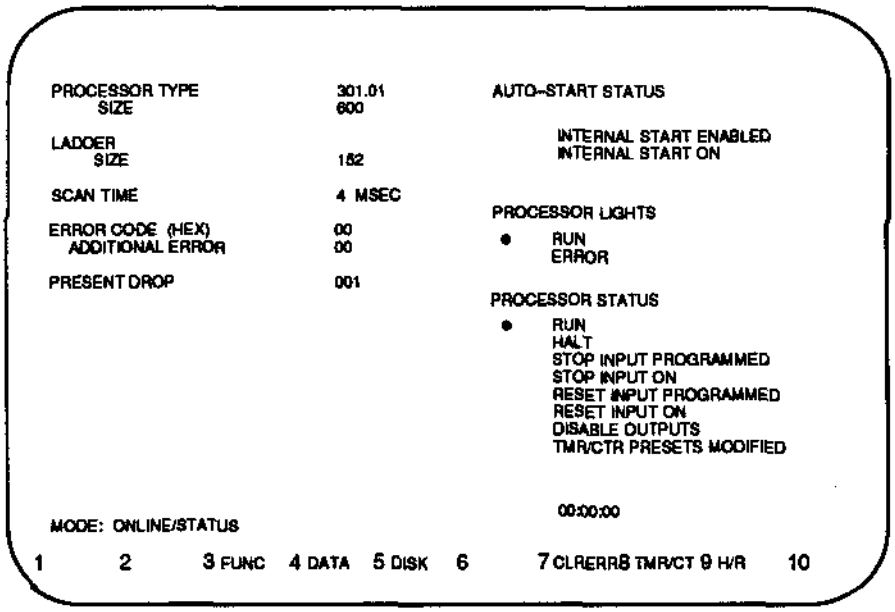


Figure 3–2 ONLINE/STATUS Screen

3.3.1 ONLINE STATUS SCREEN DISPLAY

The ONLINE/STATUS display provides information about the MICRO–1 processor, such as processor memory information, a specific breakdown of error coding, drop information, and the processor's AUTO–START STATUS. The information that appears in this screen is continually updated. The specific items displayed on the screen include:

PROCESSOR TYPE – This consists of two parts: the number **30X**, which indicates a MICRO–1 processor and **.XX** indicating the processor's firmware revision.

SIZE – This is the MICRO–1 processor size and is always 600 words.

LADDER SIZE – This is indicated by the "WORDS USED" line display and can be greater than 600.

SCAN TIME – This number indicates the time (in milliseconds) it takes for the processor to execute the user program once.

ERROR CODE – When a non–zero number is present, this indicates either a personal computer to processor communication error, processor operation error, or system error has occurred. Appendix B includes a complete error code listing.

ADDITIONAL ERROR – When an error code is displayed, there may be a number here which further identifies the error. Appendix B includes a complete error code listing.

AUTO–START STATUS – This indicates the state of internal special relays 701 and 702.

PROCESSOR LIGHTS – This shows which LEDs are lighted on the processor case.

PROCESSOR STATUS	MONITORS
Run	R717
Halt	R717
Stop Input Programmed	FUN4
Stop Input ON	Status of Stop Input, if programmed
Reset Input Programmed	FUN5
Reset Input ON	Status of Reset Input, if programmed
Disable Outputs	R703
TMR/CTR Presets Modified	R716

Table 3–1 Processor Status Display

3.3.2 ONLINE STATUS FUNCTION KEYS

A description of the function keys which appear on the bottom of the ONLINE/STATUS display follows.

FUNC – This function key displays certain functions from 4 to 60 on the monitor screen along with a description as to what they control. These functions may only be inspected; they may not be modified from the ONLINE mode.

DATA – This provides functions to:
DISPLAY – I/O, internal relays, counters, timer values, and shift registers.
MODIFY – I/O, internal relays (counter/timer preset values), and shift register values.

This display is shown in decimal hexadecimal and binary forms and can include any combination of up to 21 registers. Refer to Section 8.1 for further details.

DISK – This function allows the saving of REGISTERS (I/O, internal registers, etc.) to disk or load the contents of a disk into the MICRO–1 processor.

CLRERR – This function key is used to attempt to clear an existing error. The message "Clearing error may restart processor; press CLRERR to do so" is displayed and all function keys except CLRERR are erased.

Pressing any key except CLRERR will cause the clear operation to be aborted. Pressing the ESC key will abort the clear operation and re–display the INITIAL screen. Pressing CLRERR will attempt to clear the error from the processor. If successful, the ERROR CODE and ADDITIONAL ERROR entries will show 0, and the processor will begin running (if it wasn't already) if all other run conditions are met.

TMR/CT – This function key allows you to read or clear modified timer and counter preset values from the processor. This function is normally used when the TMR/CTR *PRESETS MODIFIED entry is marked with an asterisk.*

Once this function is accessed it is possible to UPLOAD the timer and counter preset values from the processor EEPROM (not the RAM memory) into OFFLINE computer memory or to RESTORE the timer and counter preset values from the MICRO–1 processor's memory to the processor (OFFLINE memory is not affected).

If UPLOAD is selected, timers and counters in the OFFLINE ladder program are modified to use the new presets. Pressing the ENTER function key after selecting either UPLOAD or RESTOR will begin the specified operation.

H/R (Halt/Restart) – This function key is used to halt or restart the processor. If a STOP INPUT is programmed by using FUN4, the message "CPU cannot be halted when a STOP input is programmed" is displayed, and no HALT operation is allowed.

RESTRT (Restart) – This function will restart the processor.

Pressing the ENTER function key after selecting either HALT or RESTRT will begin the specified operation.

NOTE: *It is possible that other processor conditions, such as an error, may prevent the processor from restarting when this option is selected. For example, if the ERROR indicator is ON, the HALT/RESTART function does not operate until the error is cleared.*

SETTING INTERNAL FUNCTIONS 4

4.1 What Are Internal Functions?

A part of the initialization process when using SFW30 to program the MICRO–1 processor is to define user programmable functions which set certain program conditions. These conditions guide the operation of the program. They must be given a value which will determine how certain program features are to be carried out.

It is only possible to modify fields in the FUNCTION display from the PROGRAM security level and only from the OFFLINE/FUNCTION mode. The ONLINE/FUNCTION mode is only used to inspect function settings.

NOTE: *All of the functions listed in this section have default settings which you may use in your control program, however, if you wish to change the default values, do so before transferring your control program to the processor memory. It is not possible to change function values while ONLINE.*

IMPORTANT: *Do not change any internal function setting without first reading about the function. Section 4.1.1 contains descriptions and examples of each of each internal function. In order to designate the required functions, perform the following actions from the INITIAL screen:*

To access the OFFLINE/FUNCTION screen:

1) Press the **OFFLN [F2]** function key

2) Press the **FUNC [F2]** function key

The screen should appear as shown in Figure 4–1.

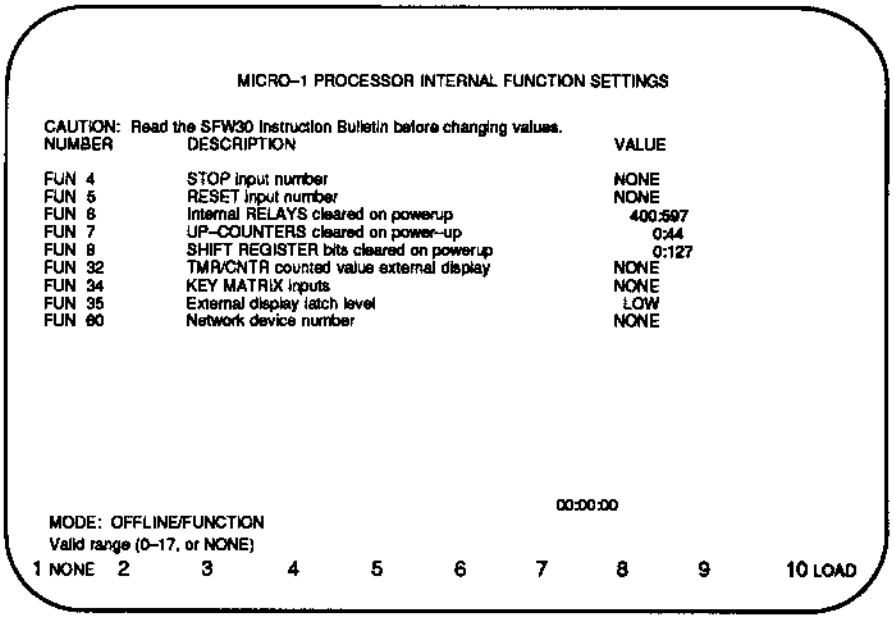


Figure 4–1 OFFLINE/FUNCTION Screen

4.1.1 GENERAL INFORMATION

The OFFLINE/FUNCTION screen display lists all of the functions which can be user programmed. To modify the values listed for any of the functions, cursor to the desired value field and overwrite the existing value. The new value will continue to flash until it has been stored by pressing the LOAD function key.

NOTE: *Out of range values are displayed as question marks.*

Function 4 – STOP input number

Any input terminal with a value in the range of 0 to 17 may be assigned to halt the MICRO–1 processor's operation when that terminal becomes activated. This function is NOT meant to be used to reserve an input for an emergency stop condition. The program operation is restarted if the stop input goes OFF. The default condition for a STOP input is NONE.

See Section 2.9.2 for more information about the STOP input and RESET input operations.

NOTE: *When a stop input is designated by Function 4, the RUN/STOP switch on the PR3 program loader cannot be used to start or stop program operation.*

Once a STOP input has been programmed and transferred to the MICRO–1 processor and the MICRO–1 processor has been halted with the HALT/RESET function ([F9] H/R in the ONLINE screen), the only way to halt the MICRO–1 processor is to assert the STOP input.

After the MICRO–1 processor has been placed in the stop mode, via the STOP input, the user can clear the STOP input by changing FUN4 to "NONE" in the OFFLINE/FUNCTION mode. The program must then be transferred to the MICRO–1 processor.

Example Procedure:

To designate input #5 as a STOP input, cursor to the value shown at Function 4 on the monitor screen and then press 5.

Function 5 – RESET input number

Any input terminal with a value in the range of 0 to 17 may be assigned to reset the MICRO–1 processor's operation when that terminal becomes activated. The program operation is restarted if the reset input goes off while the start input is on. When the RESET input is turned ON, the RESET input has priority over the STOP input. A pulse signal input can activate either a RESET input.

The default condition for a RESET input is NONE.

See Section 2.9.2 for more information about the STOP input and RESET input operations.

Example Procedure:

To designate input #11 as a RESET input, cursor to the value shown at Function 5 on the monitor screen and then press 11.

CONTROLLER OPERATING STATUS	OUT-PUTS STATUS	Internal Register And Shift Register Status; Counter Counted Value		TIMER CURRENT VALUE	Counters 45 and 46 Counted Value
		Retentive	Non–Retentive		
RUN	Operating	Operating	Operating	Operating	Operating
RESET	OFF	Cleared	Cleared	No change	No change
STOP	OFF	No change	No change	No change	No change
At START	No change	No change	Cleared	Cleared (Initialized)	No change

Table 4–1 Program Element Status In Various Operating Modes

Function 6 – Internal Relays Cleared on Power–up

Ordinarily, internal replays (IR400 to R597) are reset when a power interruption occurs. However, it is possible to designate that some internal relays retain their status when the operation restarts. In order to do this, you must select FUN 6 and enter a number that will separate and identify two separate ranges of internal relays so that some of them will retain their statuses and others will be cleared.

All internal relays before the designated relay will retain their status after restarting the MICRO–1 processor. The designated internal relay and all others following it are cleared on RESTART. Figure 4–2 shows how to designate retentive relays. If retentive internal relays are to be designated, designate them before transferring the application program from the personal computer to the MICRO–1 processor.

NOTE: *Retentive internal relays must be designated in a contiguous block..*

In order to designate that all internal relays retain their state on power–up you must use the NONE function key. Doing this will show a range value of NONE:597.

Example Procedure:

To designate that internal relays 400–497 retain their state after startup, cursor down to the value shown for Function 6 on the monitor screen and press 500.

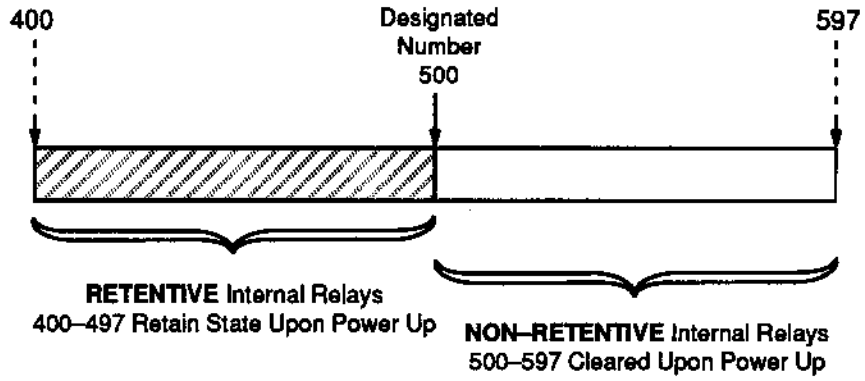


Figure 4–2 Example – Designating Retentive and Non–Retentive Registers

Function 7 – UP–COUNTERS Cleared on Power–Up

Ordinarily, the counted values of incremental type counters 0 through 44 are cleared when there is an interruption of power to the MICRO–1 processor. However, a range of incremental counters can be assigned that will retain the present count when operation restarts. In order to do this, select FUN 7 and enter a number that will separate and identify two separate ranges of incremental counters so that some of them will retain their counted values and others will be reset.

All counters before the designated counter will retain their counted value after restarting the *MICRO–1 processor. The designated counter and all others following it (except reversible* counters 45 and 46 which are always retentive) will be cleared on restart. Figure 4–3 shows how to designate a range of counters that will retain their counted values. If this function is modified, do so before transferring the application program from the personal computer to the controller.

Retentive Up–Counters must be designated in a contiguous block. In order to designate that all counters retain their state on power–up you must use the NONE function key. Doing this will show a range value of NONE:44.

Example Procedure:

To designate that counters 0 to 21 retain their state after startup, cursor down to the value shown for Function 7 and press 22.

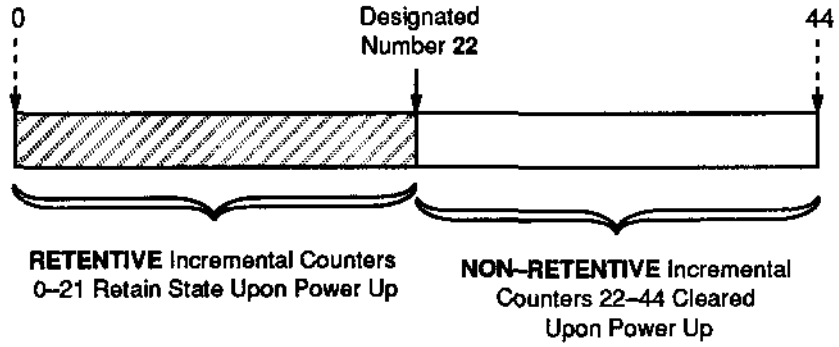


Figure 4–3 Example – Designating Retentive and Non–Retentive Counters

Function 8 – SHIFT REGISTER Bits Cleared on Power–up

Shift Register Bits 0 through 127 are cleared when there is an interruption of power to the MICRO–1 processor. However, a range of shift register bits can be assigned to maintain state when operation restarts. In order to do this, select FUN 8 and enter a number that will separate and identify two separate ranges of shift register bits so that some of them will retain their state and others will be cleared.

All shift register bits before the designated bit will retain their state (0 or 1) after restarting the MICRO–1 processor. The shift register bit named by the function setting and all others following it will be cleared on restart. Figure 4–4 shows how to do this. If this function is desired, make sure that it is set before transferring it to the application program from the personal computer to the MICRO–1 processor.

In order to designate that all bits retain their state on power–up you must use the NONE function key. Doing this will show a range value of NONE:127.

Example Procedure:

To designate that Shift Register bits 0–62 retain their state on power–up, cursor down to the value shown for Function 8 on the monitor screen and press 63.

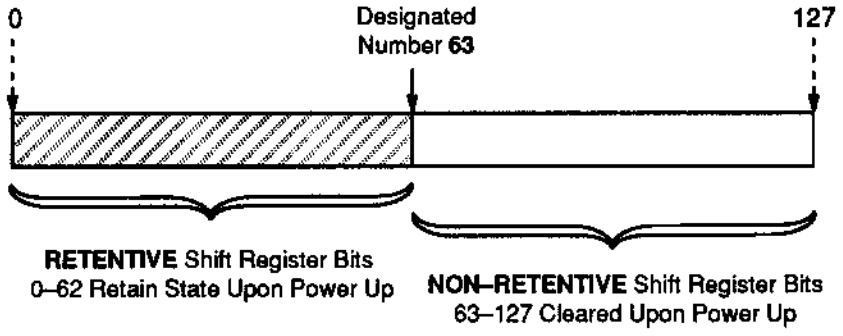


Figure 4–4 Example – Designating Retentive and Non–Retentive Bits

Function 32 – TMR/CNTR Counted Value External Display

This function is reserved for future use. DO NOT MODIFY.

Function 34 – Key Matrix Inputs

This function is reserved for future use. DO NOT MODIFY.

Function 35 – External Display Latch Level

This function is reserved for future use. DO NOT MODIFY.

Function 60 – Network Device Number

This function is only provided in an advisory capacity and is useful as a reminder to access the ASSIGN screen in order to change the drop number to conform with the value of this function setting.

When the control program is transferred from OFFLINE to CPU, the MICRO–1 processor's device (drop) number is not affected. The processor will retain any drop number previously assigned to it in the INIT/ASSIGN mode.

The device drop number may be any number from 1 through 255 or it may indicate NONE. The default condition for function 60 is NONE. See Section 2.6 for complete information about assigning a device's drop number to a MICRO–1 processor.

4.2 Loading Internal Functions

Once all of the internal functions have been modified to show the conditions required in your particular program, it is necessary to load these values into offline memory. You need not load after each individual value is entered, but only after the all the necessary parameters are displayed and flashing.

Press the LOAD function key one time to load the values into offline memory. The fields which had been modified will now display in a steady state and the cursor will return to the top of the display.

BASIC PROGRAMMING INSTRUCTIONS

5

5.1 General Programming Information

5.1.1 INTRODUCTION

The purpose of an electronic controller system is to *SENSE* the conditional state of a device via its input signals, make a *DECISION* based on those conditions, and *CONTROL* the outputs by turning them ON and OFF accordingly, as illustrated in Figure 5–1.

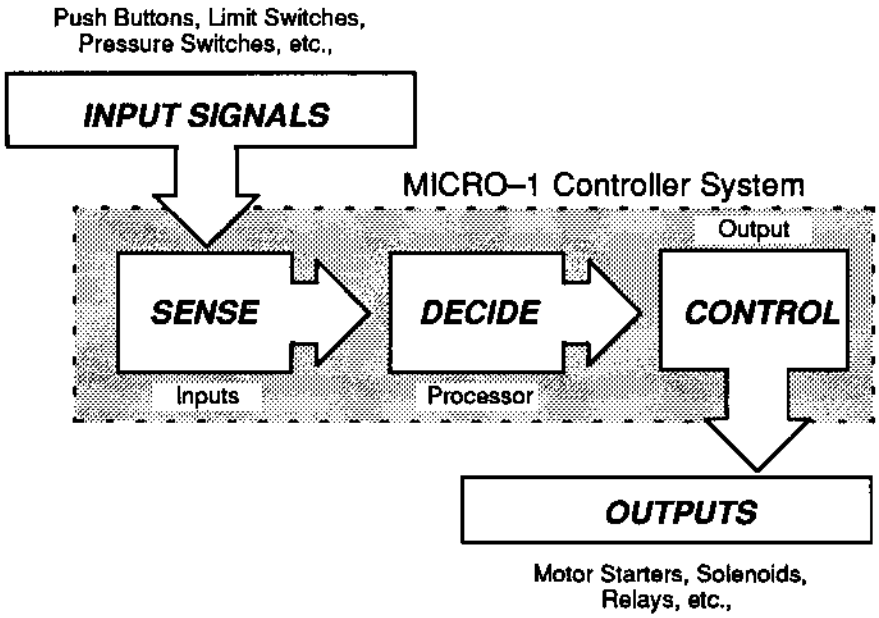


Figure 5–1 MICRO–1 Controller System Control Functions

The MICRO–1 processor senses the ON or OFF status of the inputs (push buttons, limit switches, contacts of a relay, etc.) then based on those conditions, makes a decision whether to turn the outputs (motor starter solenoids, relays etc.) ON or OFF.

The decisions a processor makes are done via the manipulation of registers which reside within the controller system. However, this manipulation does not occur unless a user–developed control program is stored in the processor memory. The control program directs the processor on how to use the registers in the MICRO–1 controller system to execute system functions described previously. Section 5 explains the programming procedure to create the processor's control programs.

To simplify development of ladder diagram circuits, programming work sheets similar to the one shown in Figure 5–2 may be ordered from your local Square D Field Office. The part number of the work sheet is form # M–8014.

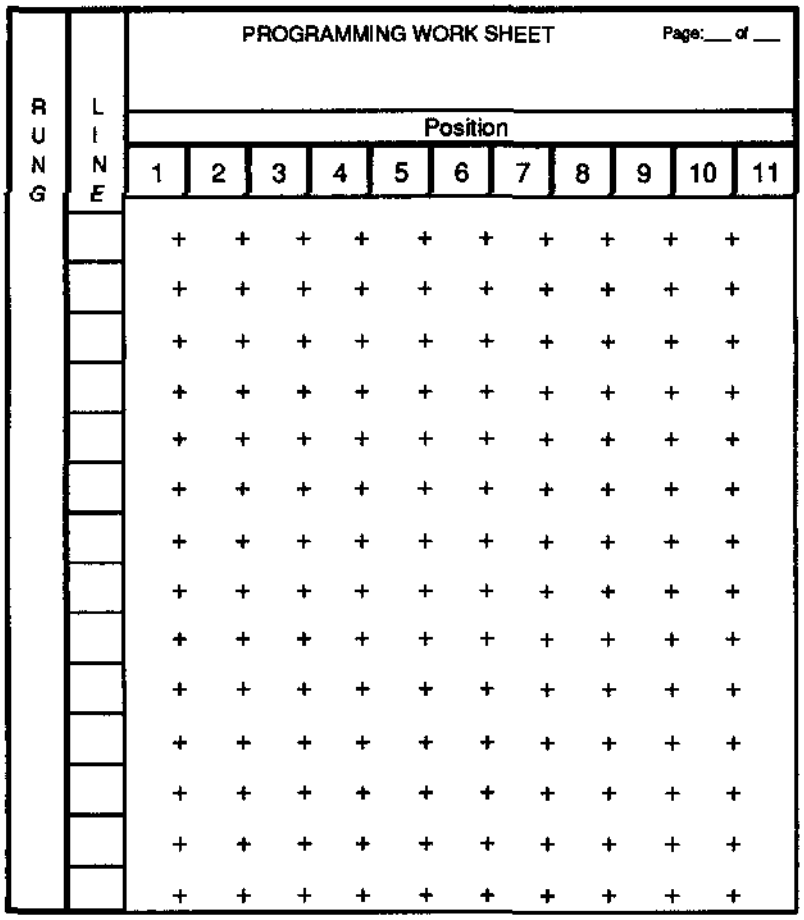


Figure 5–2 Programming Work Sheet – Form M–8014

Programs may only be developed in the SFW30's OFFLINE mode and transferred to the MICRO-1 processor memory after the processor has been halted. For an explanation of transfer operations, refer to Section 8.

There are ladder configurations which cannot be redrawn by the SFW30. An example of a rung incorrectly drawn is shown in Figure 5-3. The first rung will cause an error message to be displayed because of the contact "04" positioning. The second rung shows the correct way to draw the rung where contact 04 was moved to the line single MICRO-1 processor below where it was incorrectly placed.

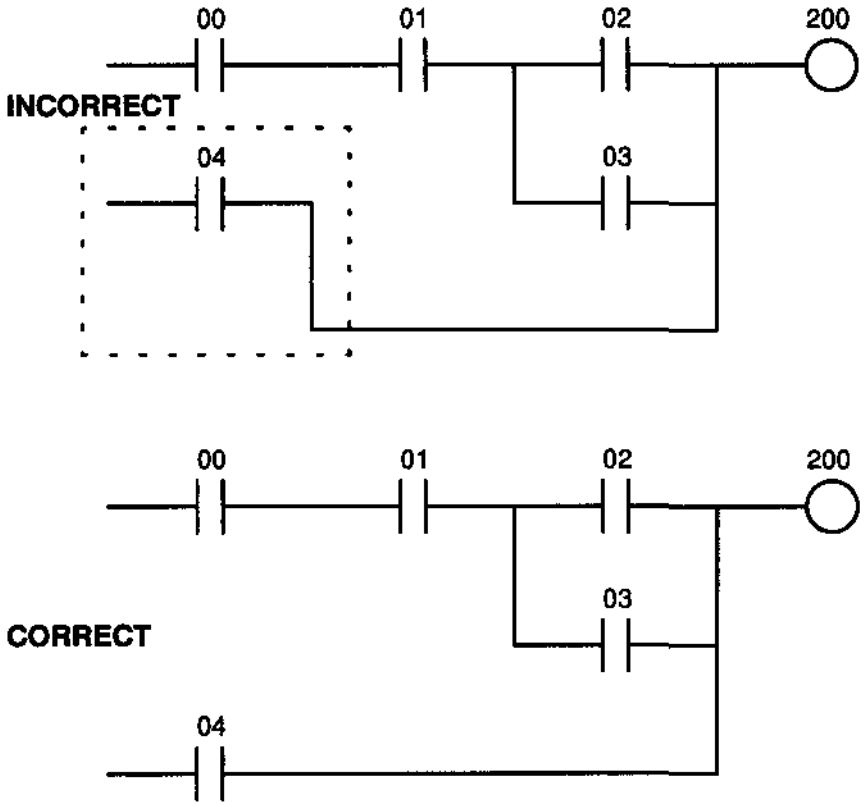


Figure 5-3 Incorrect and Correct Ways to Draw a Rung

5.1.2 REGISTER USAGE

The MICRO–1 processor is capable of using various "types" of registers. The registers can be related to as memory areas where each register location has a specific purpose and a specific allocation number.

When selecting a register number, make sure that the number reflects the type of register desired, and that the number is within its own valid range. Note that acceptable allocation numbers relate to the type of register that is selected. Table 5–1 identifies the ladder elements that can be used to create logic diagrams with the MICRO–1 processor and provides the allowable register ranges for the various register types. The "prefix" is used to identify each register type.

LADDER ELEMENT	PREFIX	ALLOWABLE REGISTER RANGE
Input	I	000–007, 010–017
Output	O	200–205, 210–215 (216, 217 when using PANL–PAK™ Operator Panels)
Internal Relay	R	400–407, 410–417, 420–427, 430–437, 440–447, 450–457, 460–467, 470–477, 480–487, 490–497, 500–507, 510–517, 520–527, 530–537, 540–547, 550–557, 560–567, 570–577, 580–587, 590–597
Special Internal Relays	R	600–607, 610–617, 620–627, 630–637, 640–647, 650–657, 660–667, 670–677, 680–687, 690–697, 700–707, 710–717
Timer (TMR)	T	00–79
Counter (CTR)	C	00–46
Shift Register Bit (SFR)	S	000–127
Transitional	– –	00–95

Table 5–1 Register Allocation Numbers

The numbers "0 through 9999" are all valid values for data that may be used in timers, counters, and counter comparisons.

5.1.3 EXTERNAL INPUT AND OUTPUT ADDRESSING

All input and output devices connected to a MICRO-1 processor are assigned input and output address numbers. These address numbers allow the user to reference the inputs and outputs (I/O) assigned in the control program. The inputs are fixed from "0 to 7" and "10 to17" and the outputs are fixed from "200 to 205" and "210 to 215" (216 and 217 when using PANL-PAK™ Operator Panels). The I/O number of each expansion unit is allocated automatically. Figure 5-4 illustrates the method of addressing I/O when using the MICRO-1 Processor Unit and the MICRO-1 Expansion Unit.

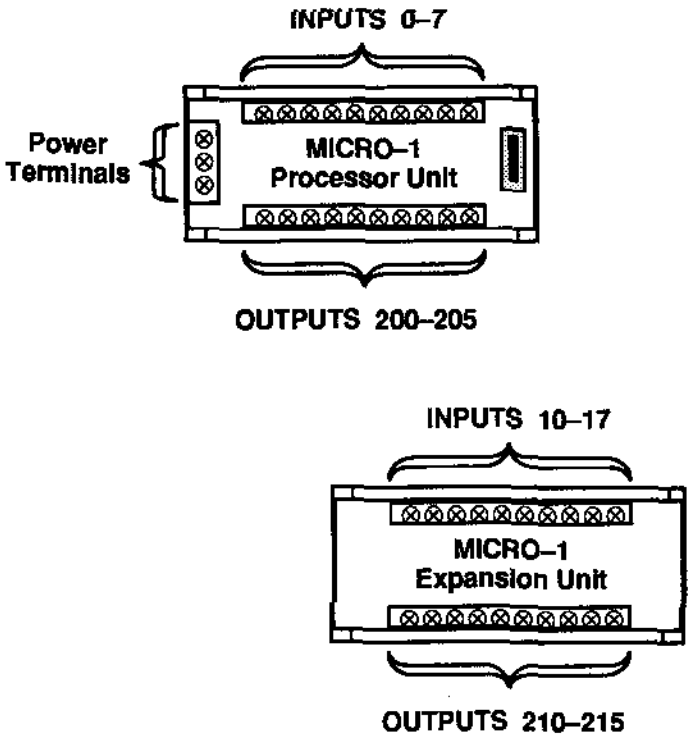


Figure 5-4 External I/O Addressing Method

5.1.4 SPECIAL INTERNAL RELAYS

Special internal relays are used to control certain conditions in the MICRO–1 processor. In some cases, the special relays may be set after designating a value for a specified internal function (see Section 4) or may be assigned after execution of the ladder logic program. The ONLINE/STATUS screen in the SFW30 displays the state of some special relays in the Processor Status column. An asterisk (*) appearing before any specific condition in the Processor Status column, indicates that the controlling relay is **SET**.

The following defines each of the MICRO–1 controller's special internal relays.

IR 600–677 – Reserved for future use

These special internal relays are reserved for future use. These Registers are READ ONLY.

IR 680–687 – Reserved for future use

These special internal relays are reserved for future use. These Registers are READ ONLY.

IR 690 – Short–pulse Input status

This internal relay holds the short–pulse input status. Any short–pulse input (an input that has a pulse width of at least 0.5 millisecond) received at input address # 0 is read and stored in this special internal relay.
This is a READ ONLY register.

IR 691–697 – Unused

IR 700 – Unused

IR 701 AND 702 – Start/Stop control

These special internal relays can be used to start or stop the MICRO–1 controller.

NOTE: *Refer to Section 2.10, Special Start and Stop Operations.*

IR 703 – All Outputs OFF

When this internal relay is turned ON, all outputs 200–205 and 210–217 are turned OFF. Self holding circuits using outputs 200–205 and 210–217 also are turned OFF, and are not restored when IR703 is turned OFF. Internal relays and shift registers remain unchanged.

IR 704 – Initialize

When the MICRO–1 controller starts operation, IR704 goes ON for a period of one scan time.

IR 705 – 712 – Unused

IR 713 – Clock reset (1 millisecond)

When this internal relay is set, IR714, which generates clock pulses for timers, will be set to zero.

IR 714 – Internal 1second clock

This is a one second clock. This special internal relay generates clock pulses for timers. The pulses oscillate at 500 millisecond ON and 500 millisecond OFF. R714 will be ON only if IR713 is OFF.
This is a READ ONLY register.

IR 715 – Internal 100 millisecond clock

This is a 100 millisecond clock. This special internal relay always generates clock pulses for timers. The pulses oscillate at 50 millisecond ON and 50 millisecond OFF. R714 will be ON only if IR713 is OFF.
This is a READ ONLY register.

IR 716 – TMR/CRT preset modified

This special internal relay will be set when the TMR/CTR presets have been modified by the program loader or SFW30. This special internal relay will be reset when the control program is written (transferred) into the user memory. This is a READ ONLY register.

IR 717 – RUN status

This special internal relay is always ON when the processor is in RUN.
This is a READ ONLY register.

5.2 Ladder Diagram Programming

5.2.1 INTRODUCTION

The control decisions a processor makes are based on a control program developed by the user. The SFW30's programming is based on a programming format referred to as "ladder diagram programming". This format is similar to relay logic diagrams used to represent relay control circuits. The main difference between the two types of programming is that in ladder diagramming, all inputs are represented by contact symbols (⊣⊢) and all outputs are represented by coil symbols (—○—). The coils are automatically placed in the last column of the first line of a rung.

Figure 5–5 illustrates a wiring diagram of a relay logic circuit and its equivalent ladder logic diagram created using the SFW30. Notice that in the ladder diagram, all inputs associated with a switching device in the relay logic diagram are shown as contact symbols. The "M1" output coil in the relay logic diagram is represented with an output coil symbol in the ladder logic diagram.

The address numbers appearing above each contact/coil symbol in the ladder logic diagram references either the location of the external input/output connections to the processor or the internal relay equivalent addresses within the processor. After *ANY* rung has been loaded into OFFLINE memory, the input address is preceded by the letter "I" (for input) and the output address is preceded by the letter "O" (for output).

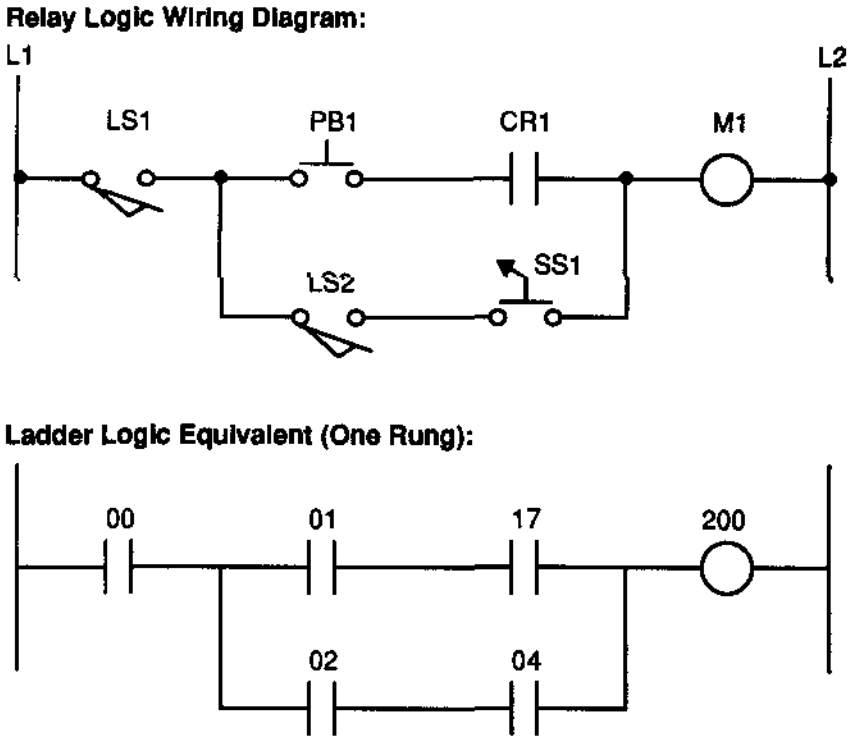


Figure 5–5 Relay Logic Diagram and Equivalent Ladder Diagram

Referring to the ladder logic diagram in Figure 5–5, coil 200 is turned ON if one or both of the following is true:

- Contacts 000, 001 and 017 are CLOSED.
- Contacts 000, 002 and 004 are CLOSED.

NOTE: *The flow of continuity in any rung diagram is from left to right.*

Section 5.2 provides the rules and considerations which are necessary to design ladder diagrams such as the one in Figure 5–2. The specific programming procedures are illustrated at the end of the section.

5.2.2 GENERAL PROGRAMMING RULES

Each rung in a ladder diagram can have a maximum of ten contacts in series and a maximum of seven lines of contacts in parallel. When your output is a coil it must be programmed at the end of the first line (only one coil per rung). This results in the following maximum contact arrangement.

NOTE: *The SFW30 programming does not support Forcing.*

The SFW30 does not allow "SHORTS" or "OPENS" to be programmed within the ladder logic rung, since there are no special instructions to accommodate these conditions. The messages "Shorted Network" or Open Rung" will appear if either condition is present in the rung. Figure 5–6 shows the INCORRECT usage of a SHORT or OPEN when programmed into a rung.

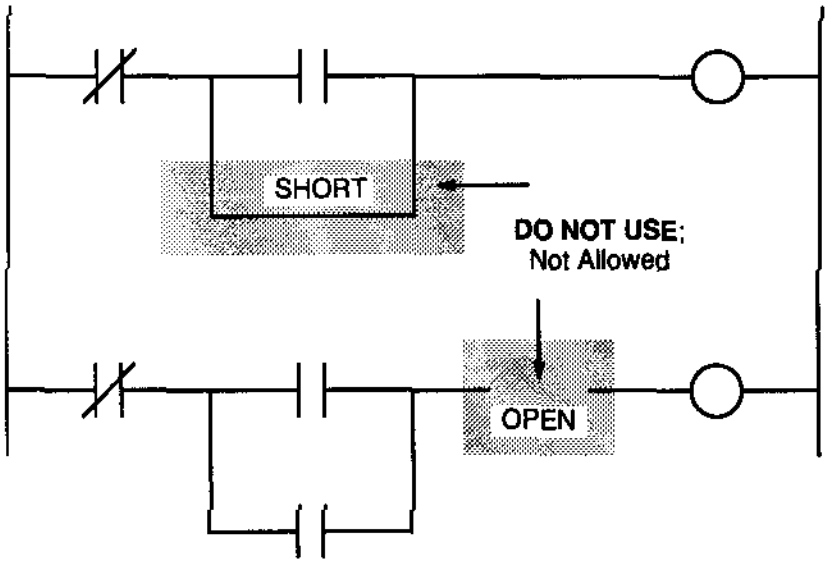


Figure 5–6 Relay Logic Diagram and Equivalent Ladder Diagram

Circuits cannot be programmed which allow a path of continuity flow from right to left (reverse current path or sneak path) through a contact.

ALL logic in a rung MUST flow from left to right. Figure 5–7 shows example of an incorrect ladder logic diagramming procedure where the circuit flow is from right to left.

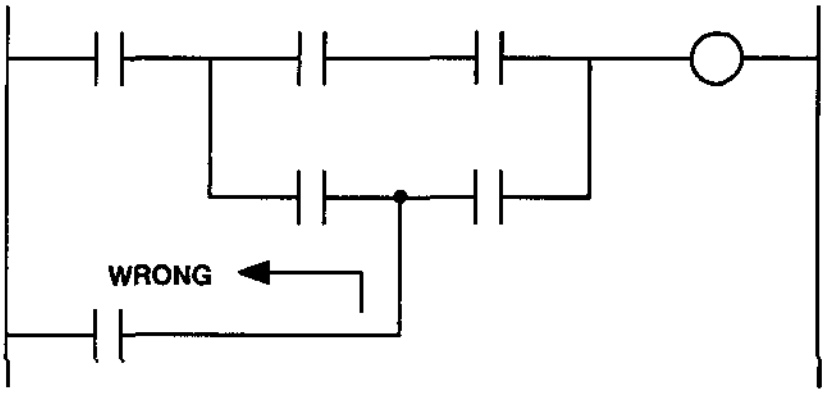


Figure 5–7 Relay Logic Diagram and Equivalent Ladder Diagram

5.2.3 EXTERNAL INPUT INSTRUCTION

Figures 5-8A and 5-8B show a relay logic diagram that illustrates a number of input devices controlling a motor starter. If this same control function was to be performed by a processor, the inputs would no longer be connected in series and parallel, as shown in A, but would individually be connected to the controller, as shown in B. This situation would then be analogous to each input being wired to a control relay, having a normally open and a normally closed contact block. The result is the relay logic diagram shown in C. Notice that the last rung in C looks similar to the ladder diagram programming format in Figure 5-9, however, the contacts in the ladder diagram format are referenced to a controller connection point rather than a control relay. The ladder diagram shown in Figure 5-9 would be the actual rung programmed using the SFW30.

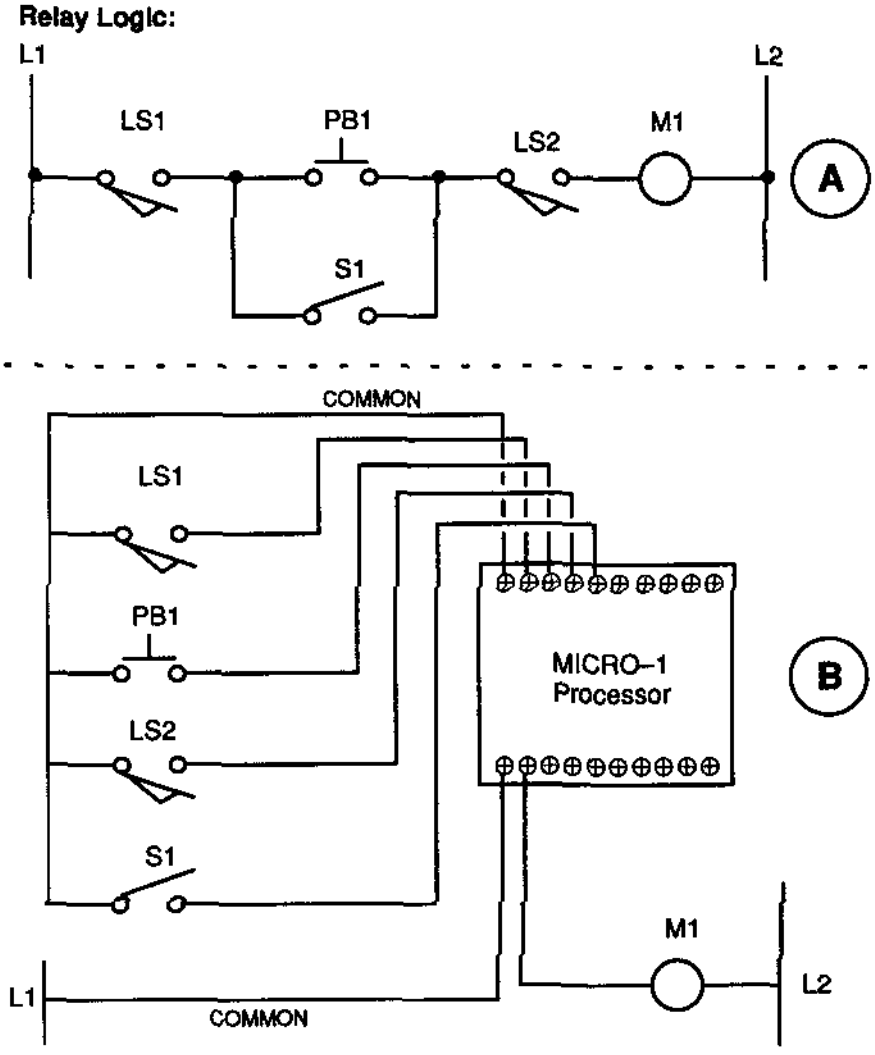


Figure 5-8A Relay Logic as Performed by a Processor

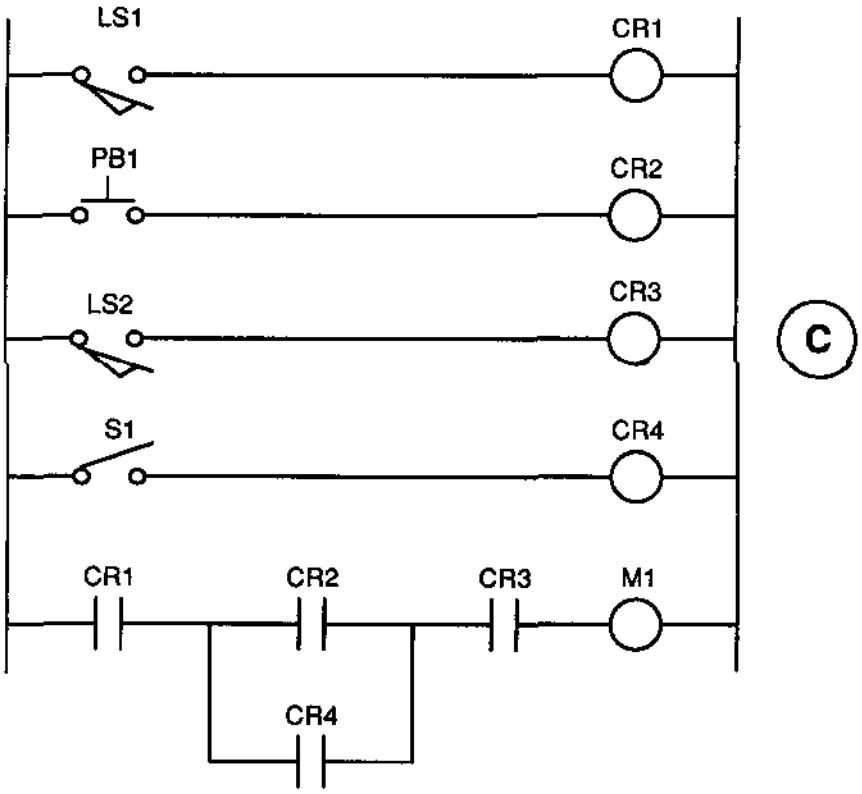


Figure 5–8B Relay Logic as Performed by a MICRO–1 Controller

Processor Ladder Logic Diagram:

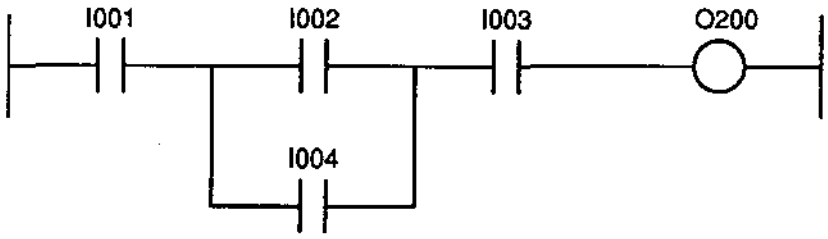


Figure 5–9 Equivalent Processor Ladder Diagram

Although not indicated in Figure 5–9, the address number of an input can be used as many times throughout the ladder diagram program as needed. The only restriction will be the amount of memory provided by the processor.

Normally Open Contact of an External Input

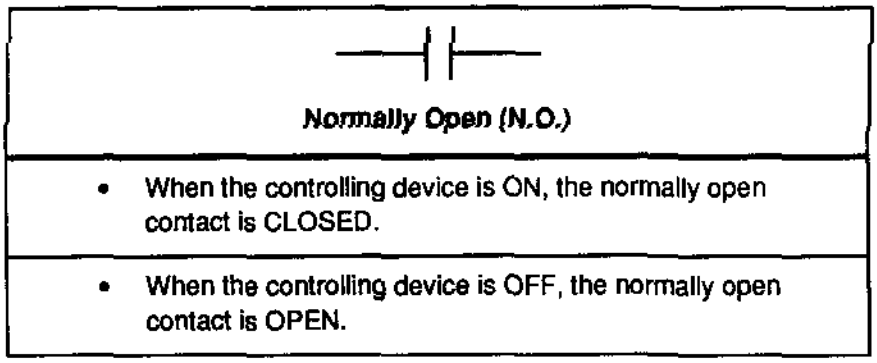


Figure 5–10 uses the preceding analogy from section 5.2.3 to illustrate the operation of a normally open (N.O.) contact of a stop button and a start button. Notice that the equivalent ladder diagram references the input point as the controlling device. When ON voltage is present at the terminal connection, normally open contact 01 will conduct causing the output in the program rung to turn ON.

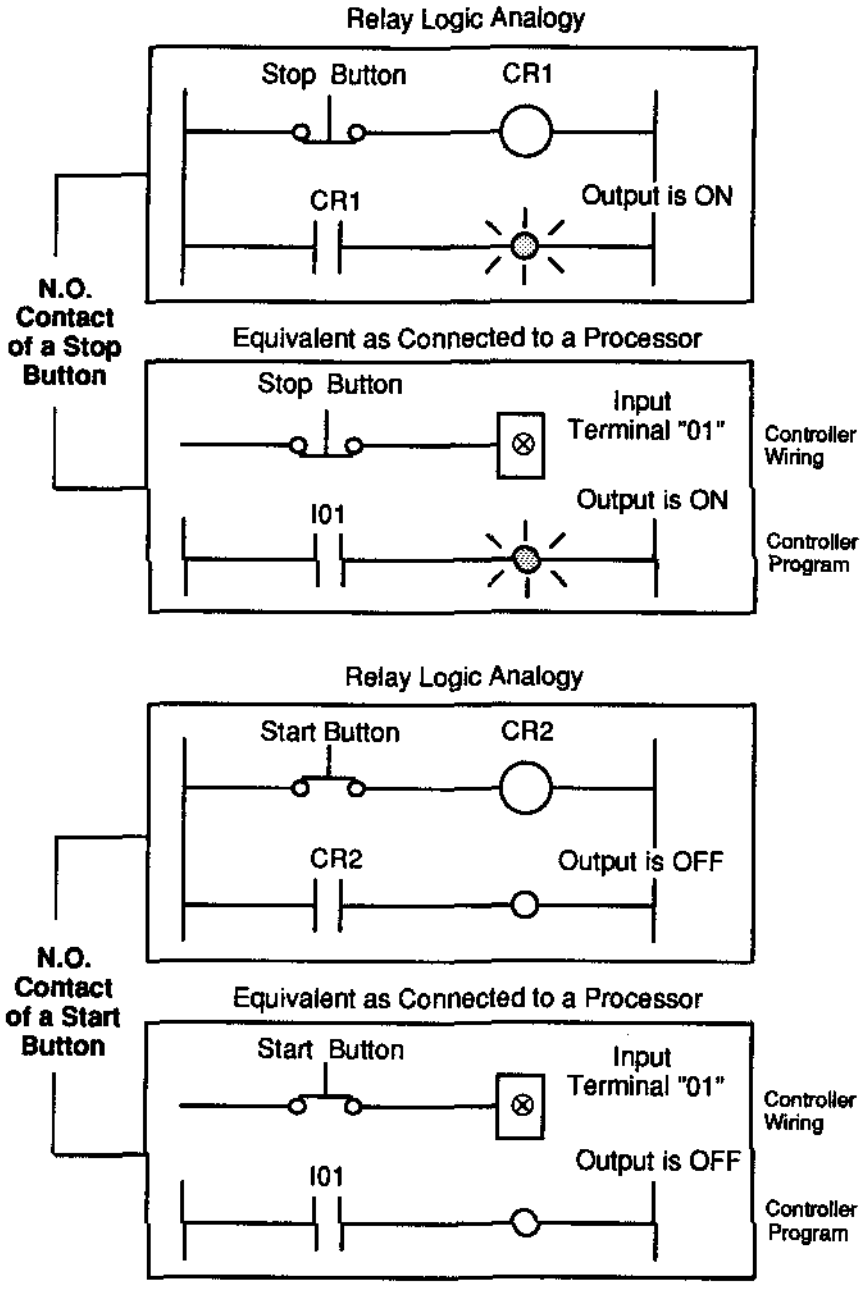
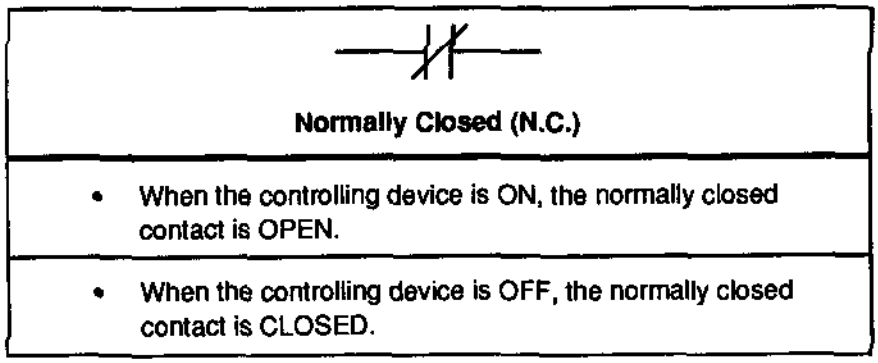


Figure 5–10 N.O. Contact Relay Logic/Ladder Logic/Wiring

Normally Closed Contact of an External Input



In the following Figure 5–11, the preceding analogy from section 5.2.3 is used to illustrate the operation of a normally closed circuit of both a normally open and a normally closed limit switch. Notice that the equivalent ladder diagram references the input module point as the controlling device. When ON, voltage is present at the terminal connection, normally closed contact 02 will NOT conduct causing the output in the program to be off.

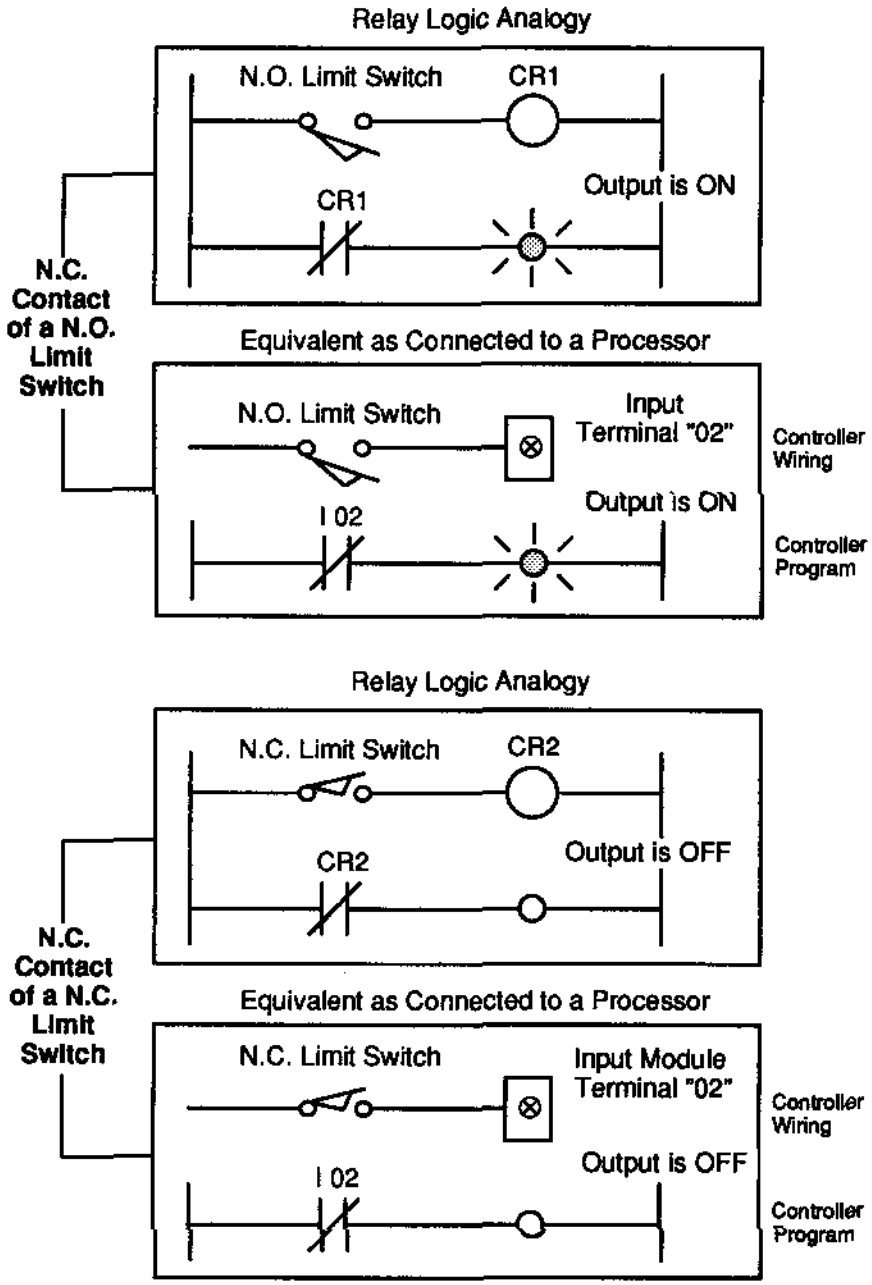


Figure 5–11 N.C. Contact Relay Logic/Ladder Logic/Wiring

5.2.4 CONTACT OF AN EXTERNAL OUTPUT

It is possible to have a contact and an external output coil in a ladder diagram with the same address. In this case, the controlling device is considered the coil. The operation of the contact in the ladder diagram depends directly on the input conditions within the rung that controls the output coil having the same address.

Note that the operation of a contact of an external output is controlled by the output of ladder diagram rung and not the condition of the actual output device connected to the processor. Also, the number of contacts having the same address as an external output is unlimited, the only restriction being the amount of memory provided by the processor.

Normally Open Contact of an External Coil

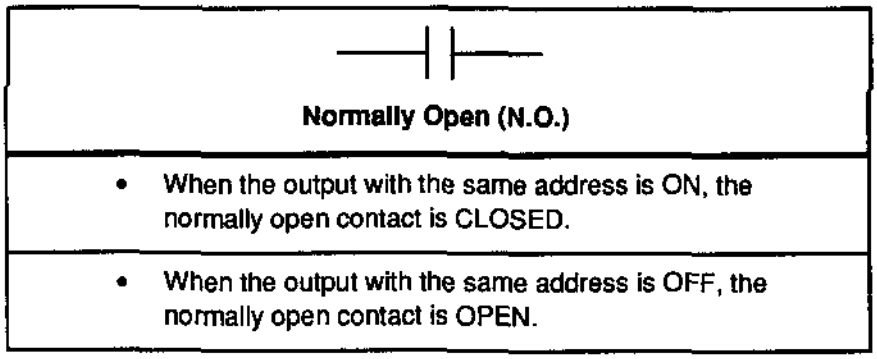


Figure 5–12 illustrates two rungs where the first rung contains a number of inputs controlling an output. The second rung contains a normally open contact with the same address as the output of the first rung. Notice the indicated operation of the second output when the output in the first rung is ON or OFF.

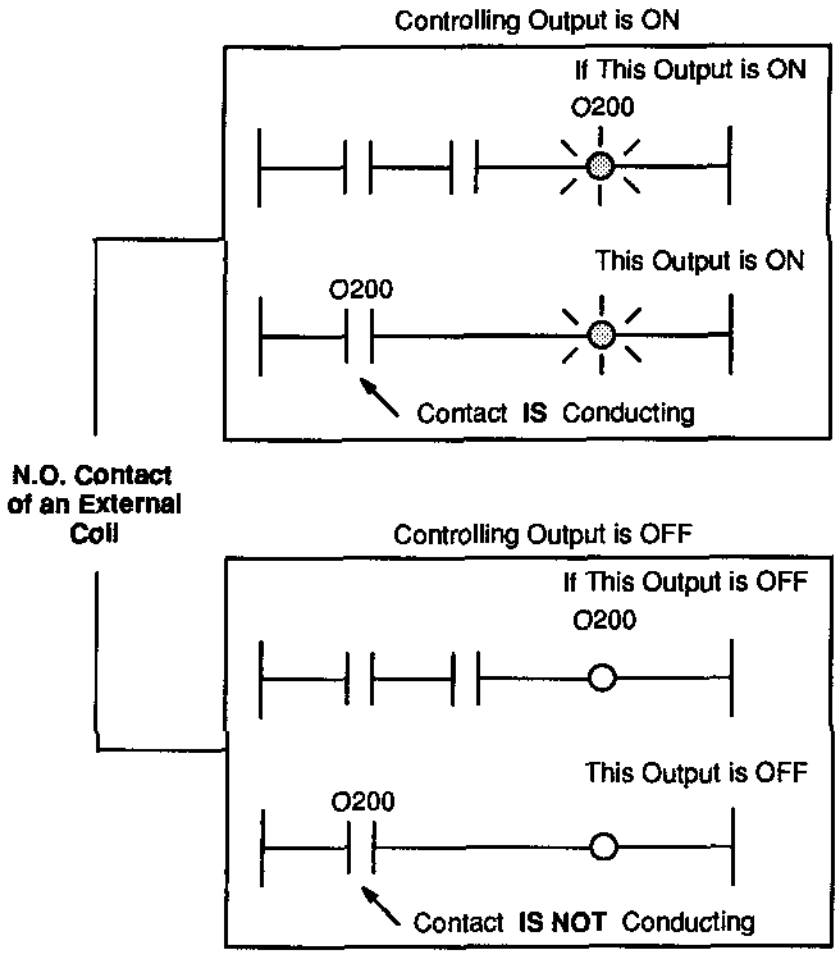


Figure 5–12 Relay and Ladder Logic of a N.O. Contact of an External Coil

Normally Closed Contact of an External Coil

Normally Closed (N.C.)

- When the output with the same address is ON, the normally closed contact is OPEN.
- When the output with the same address is OFF, the normally closed contact is CLOSED.

As shown in Figure 5–13, the operation of a normally closed contact of an external coil operates as the inverted status of the output with the same address. The first rung contains a number of inputs controlling an output. The second rung shown in the diagram contains a normally closed contact with the same address as the output the first rung. Notice the indicated operation of the second output when the output in the first rung is ON or OFF.

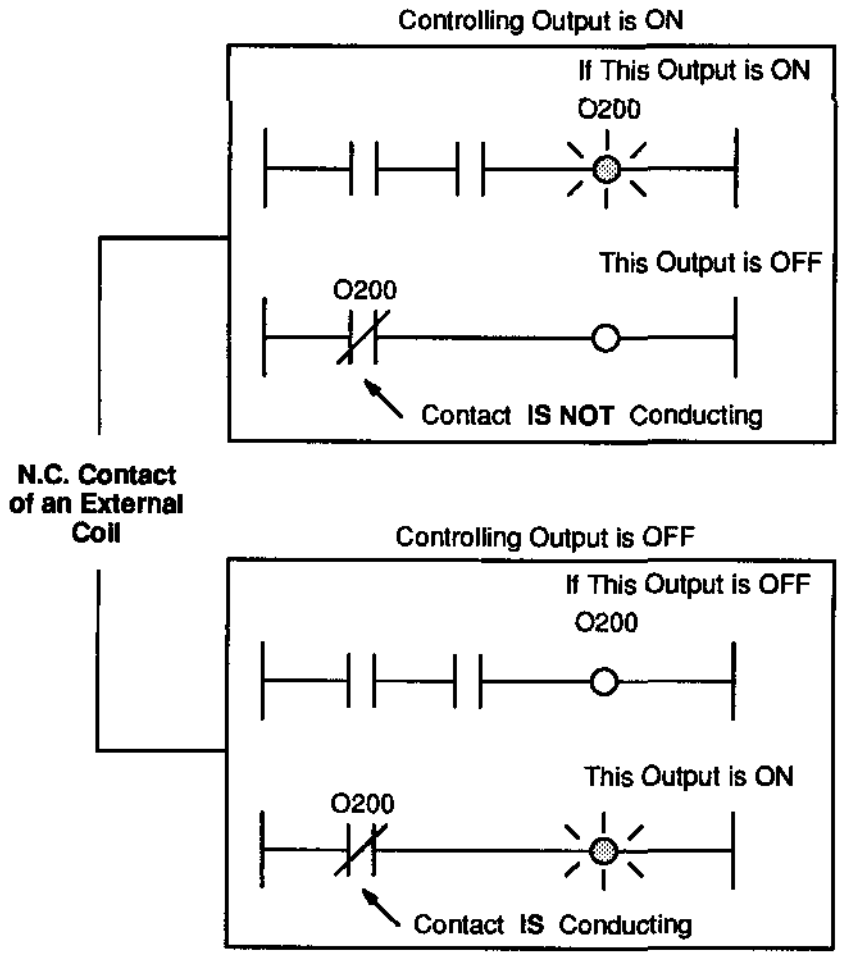


Figure 5–13 Relay and Ladder Logic of a N.C. Contact of an External Coil

5.2.5 CONTACT OF AN INTERNAL RELAY EQUIVALENT (COIL, TIMER, COUNTER, SHIFT REGISTER)

Like a contact of an external coil, it is also possible to have a contact of an internal relay equivalent with the same address number. In this case, the internal relay is considered the controlling device. The concept of using a contact of a relay coil to repeat the input conditions of the relay throughout the control scheme is one of the basic principles of relay control. Unlike a control relay, the number of contacts having the same address as an internal relay equivalent is unlimited. The only restriction as to the number of times used would be the amount of memory provided by the processor. An "R, T, C or S" will precede the address number after the relay number is entered. The "R, T, C or S" is used to designate an internal contact or output.

Internal relay equivalents may include timer contacts (address preceded by a "T"), counter contacts (address preceded by a "C"), or shift register bit contacts (address preceded by an "S").

Normally Open Contact of an Internal Relay Equivalent

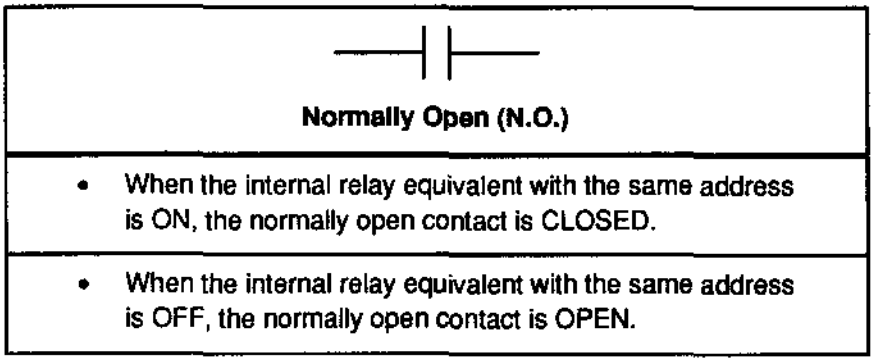


Figure 5–14 illustrates two rungs where the first rung contains a number of inputs controlling an internal relay equivalent. The second rung contains a normally open contact with the same address number as the internal relay equivalent in the first rung. Notice the indicated operation of the second output when the output in the first rung is ON or OFF.

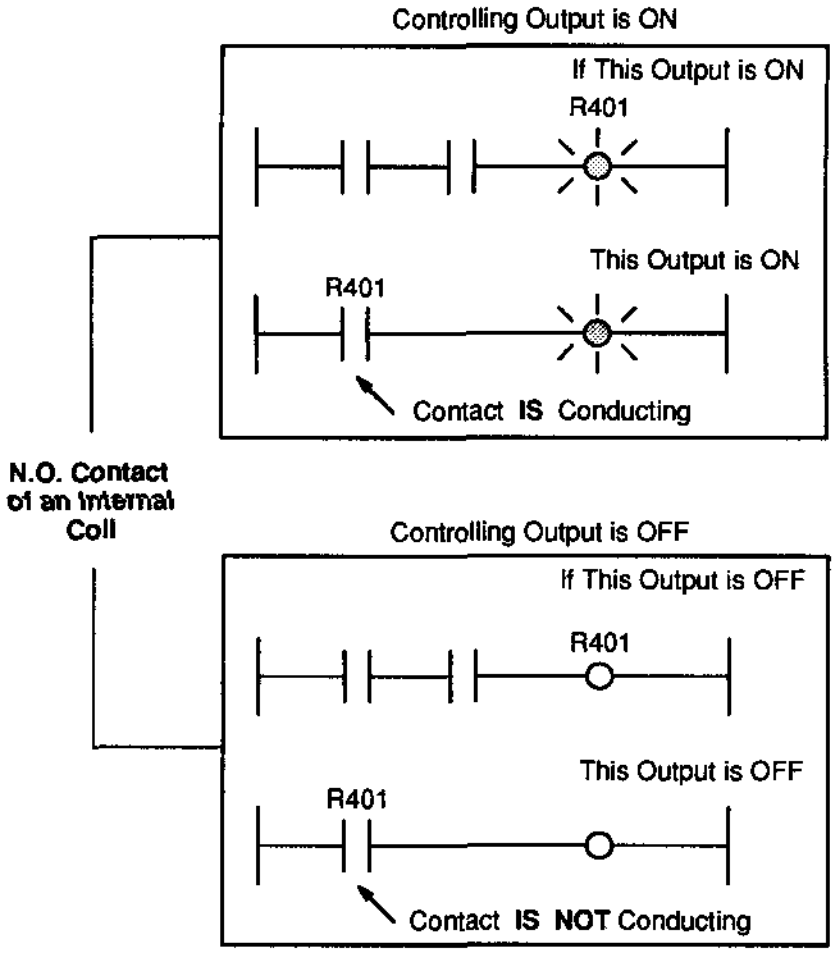


Figure 5–14 Relay and Ladder Logic of a N.O. Contact of an Internal Coil

Normally Closed Contact of an Internal Relay Equivalent

Normally Closed (N.C.)

- When the internal output with the same address is ON, the normally closed contact is OPEN.
- When the internal output with the same address is OFF, the normally closed contact is CLOSED.

In Figure 5–15, the operation of a normally closed contact of an internal relay equivalent operates as the inverted status of the internal relay equivalent with the same address. The first rung contains a number of inputs controlling an internal relay equivalent. The second rung contains a normally closed contact with the same internal address as the output in the first rung. Notice the indicated operation of the second output when the internal output in the first rung is ON or OFF.

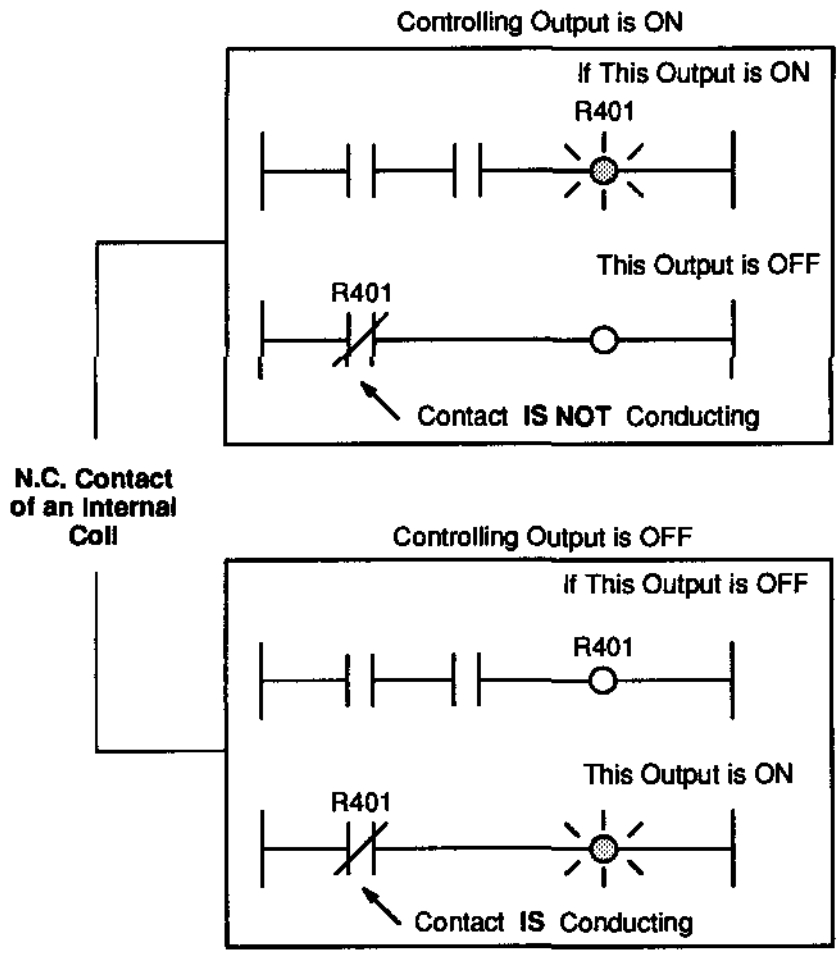


Figure 5–15 Relay and Ladder Logic of a N.C. Contact of an Internal Coil

5.2.6 EXTERNAL OUTPUT INSTRUCTION

An external output instruction is one whose address number corresponds to a point on an output module. Figure 5–16 shows a rung containing a typical external output instruction. The input conditions controlling the external output instruction controls the output device connected to the output module. The address of an external output is preceded by the letter "O". The "O" precedes the address as soon as the output number is entered.

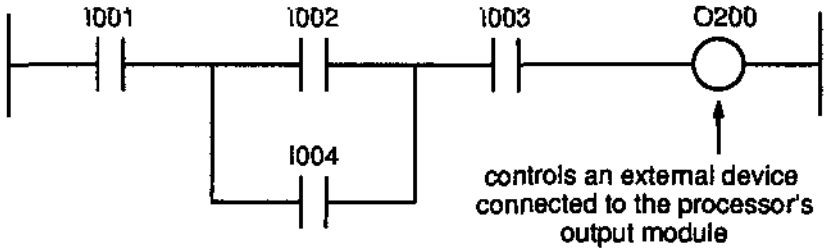


Figure 5–16 Coil Output Conditions Control External Device

Programming Considerations

1. A rung for an external output may contain ten contacts across by seven down plus the output.

2. Only one external output may be programmed per rung.

3. The status of the external output, as seen by the programmer, does not necessarily indicate the status of the output device connected to the processor.

> **WARNING**
>
> **Programming multiple external outputs, timer, counters, internal relays, or transitionals with the same address may cause unanticipated output actuation resulting in personal injury or property damage. If you assign the same address to more than one element within the same program, make certain of the consequences before running the program.**

5.2.7 INTERNAL RELAY EQUIVALENT INSTRUCTION

An internal relay equivalent DOES NOT directly control output devices connected to the controller. Therefore, its operation is much the same as a control relay used in a relay system. Unlike a conventional control relay, the internal output can have an unlimited number of contacts referencing it by using the same address. An "R" will precede the address number of an internal output as soon as the output number is entered.

Programming Considerations

1. A rung for an internal output may contain ten contacts across by seven down plus the output.

2. Only one internal relay equivalent output may be programmed per rung.

5.2.8 LATCHED OUTPUT INSTRUCTION

Outputs, internal relay equivalent outputs, and shift registers can be latched on (SET) or unlatched (RESET) using the LATCH and UNLATCH function keys appearing in the SFW30 screen. These instructions operate at the OFF to ON transition of the input contact. Once an output is latched, it will remain ON regardless of any changes in the input status of the contacts controlling the rung. By satisfying the input conditions of an unlatch rung whose output coil has the same address as the latch output, the latch output will be released. A latched or unlatched output will be cleared if power to the processor is interrupted or if the processor is halted. Figure 5–17 shows a latched and unlatched rung.

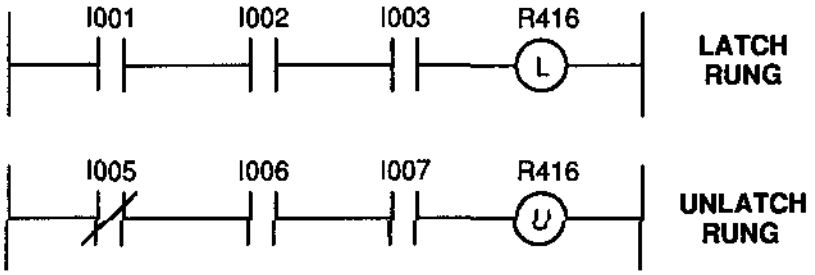


Figure 5–17 Latch and Unlatch Rung Examples

Circuit Operation:

Referring to Figure 5–17 above, when contacts 001, 002 and 003 are closed, internal relay R416 is latched ON and remains ON even if the input conditions and/or contacts change. When contact 005 is OFF and contacts 006 and 007 are ON, output R416 is unlatched. A latched coil is displayed with the letter "L" inside the symbol and an unlatch coil is displayed with a "U" inside the symbol.

Programming Considerations

1. The latch and unlatch instructions correspond to the SET and RESET instructions when using the PR3 Program Loader for programming.

2. For easier programming, it is recommended that the latch and unlatch rungs be programmed sequentially (one rung immediately following the other rung).

3. Any normal output, or internal relay can be programmed as a latched or unlatched output.

4. Any rung may have ten contacts across by seven contacts down plus the output.

5. When both the latch and unlatch conditions are true, the second rung programmed determines the overriding condition.

6. The same output or internal relay equivalent can be latched and unlatched more than once within a program.

5.2.9 TRANSITIONAL INSTRUCTION (TRANS)

A transitional is an external output or internal relay equivalent that is ON for one scan when the rung elements preceding the transitional instruction are closed. The output or internal relay equivalent will be turned OFF for the next scan of program memory.

To turn the output ON again, the input conditions controlling the transitional must make the transition from CLOSED to OPEN then back to CLOSED. Figure 5–18 shows an example of a transitional rung.

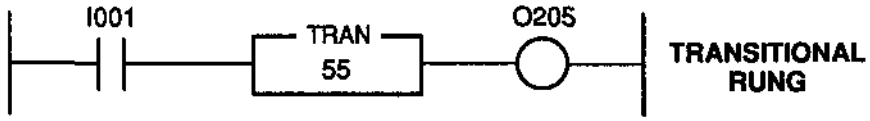


Figure 5–18 Transitional Example

Circuit Operation:

When contact 001 makes the transition from open to closed, output 0205 turns ON. When the processor executes the next scan, output 0205 will turn OFF.

Programming Considerations

1. The transitional instruction corresponds to the SOT instruction when using the PR3 Program Loader for programming.

2. If program operation is started with the input signal ON, the transitional does not turn ON. To turn ON the transitional, the input signal must turn ON after program execution has begun.

3. If a transitional instruction is used in between an MCS (Master Control Set) and an MCR (Master Control Reset) instruction, and the input signal to the transitional instruction turns ON before or at the same time as the input signal to the MCS instruction, the transitional does NOT turn ON.

4. If the input instruction to the transitional is either special relay R704 (initialize pulse) or R717 (in–operation output), then the transitional will NOT turn ON.

5. The transitional rung may be ten contacts across, plus seven contacts down, plus the output coil. The transitional box takes the space of one contact on the screen.

6. It is possible to use a contact (normally open or normally closed) of an output or relay equivalent controlled by a transitional in other control program rungs.

7. The default number that appears when the TRANS function is selected is a number which is one greater than the number of TRANS instructions already programmed. For example, if TRANS #5 is selected to indicate the first transitional instruction box in the control program, the next time a transitional instruction box is selected, it will automatically default to #1, because the count of a transitional instruction starts at "0". If the number that appears is not the desired number, change it by entering a new number.

5.2.10 PROGRAMMING PROCEDURE

ONLINE ladder programming is not possible with the SFW30. All programming must be *done in the OFFLINE mode and later transferred to the MICRO-1 processor's* EEPROM (Electronically Erasable Programmable Read Only Memory) memory. Refer to Section 7 for details on transferring ladder programs to processor memory.

To program a ladder diagram, from the INIT mode screen:

1) Press the **OFFLINE [F2]** function key

2) Press the **LADDER [F1]** function key

3) Press the **PROGRM [F3]** function key

The screen should appear as shown in Figure 5-19.

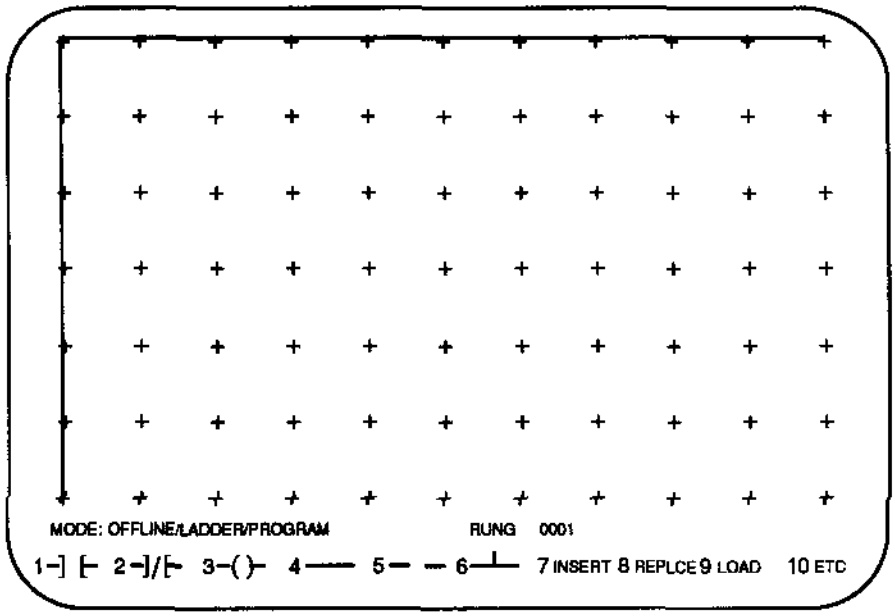
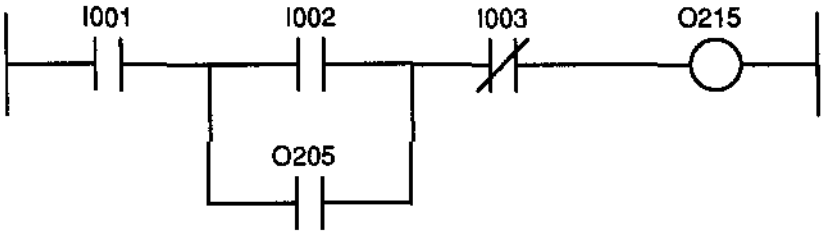


Figure 5-19 OFFLINE/LADDER/PROGRAM Display

Loading a Ladder Diagram Rung into Memory

The following shows an example of a ladder diagram rung and the steps needed to load the rung into processor memory. *This particular rung contains some instructions previously* discussed. The output shown is a standard output but any type of output would use the same general programming procedure.

The rung should look like this:



To enter the OFFLINE/LADDER/PROGRAM screen for creating the example shown in steps 4 through 18:

1) Press the **OFFLINE** **[F2]** function key

2) Press the **LADDER** **[F1]** function key

3) Press the **PROGRM** **[F3]** function key

To create the example rung:

4) Press the ⊣ ⊢ **[F1]** function key

5) Type in **1** ("I001" contact number)

6) Press the ⊣ ⊢ **[F1]** function key

7) Type in **2** ("I002" contact number)

8) Press the ⊣ /⊢ **[F2]** function key

9) Type in **3** ("I003" contact number)

10) Press the ⇐ **[left arrow]** key

11) Press the ⇓ **[down arrow]** key

12) Press the —┴— **[F6]** function key

13) Press the ⊣ ⊢ **[F1]** function key

14) Type in **205** ("O205" contact output number)

15) Press the —| |— **[F6]** function key

16) Press the —( )— **[F3]** function key

17) Type in **215** ("O215" coil number)

After the example rung has been created, it may be loaded into memory by:

*18) Pressing the **LOAD** [F9] function key*

19) Again, pressing the **LOAD** **[F9]** function key

After the rung has been loaded, the OFFLINE/LADDER/PROGRAM screen is cleared and a blank program matrix reappears. Also, the rung number that is displayed at the bottom of the screen increments by one, indicating that the next rung can now be created.

5.3 Master Control Set and Reset

5.3.1 INTRODUCTION

In relay control systems, a master control relay is often used to switch the control voltage supplied to certain relay rungs ON or OFF. Using the MCS (Master Control Set) and MCR (Master Control Reset) instructions provides a way to collectively de-energize one or more outputs. The only exception is that latched coils will remain in the last state that they were in (e.g., ON or OFF). Figure 5-20 illustrates the use of the MCS and MCR instructions in ladder programming.

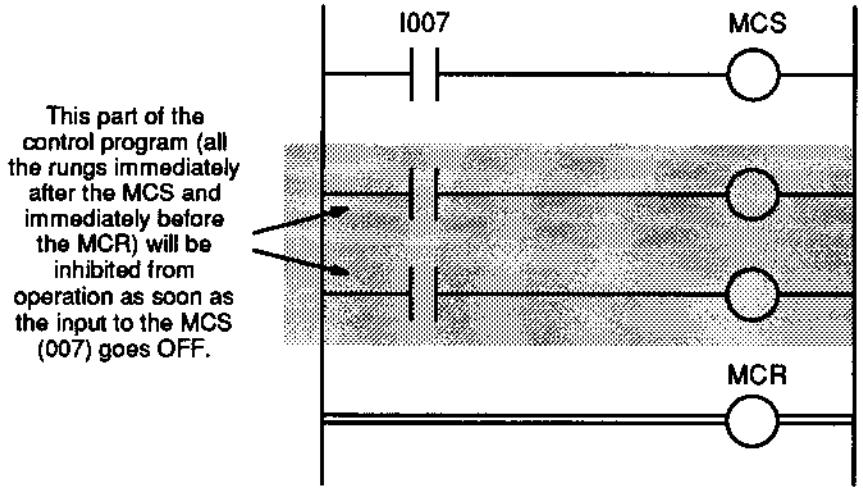


Figure 5-20 Master Control Set and Reset Instructions

Programming Considerations:

1. The MCS instruction must be used in combination with the MCR instruction.

2. If the input to the MCS instruction is OFF, all inputs of the program read after the MCS instruction are forced OFF until the MCR instruction is executed. If the input to the MCS instruction is turned OFF, the program up to the MCR is inhibited from operation.

3. Input elements are NOT allowed in the MCR rung.

4. More than one MCS instruction can be used with only one MCR instruction.

5. Latched coils will remain in their last state when the input to the MCS instruction goes ON. Table 5-2 shows the status of each instruction during a MCS/MCR execution.

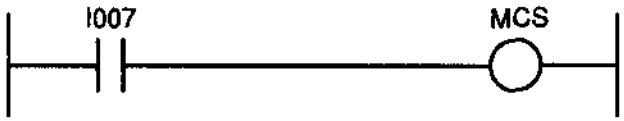
INSTRUCTION TYPE	CURRENT STATUS
Outputs or Transitionals (TRANS)	Turned OFF.
Timers	Counted values and outputs are reset.
Counters Shift Registers	Counted values are kept. Pulse inputs are turned OFF. Outputs are turned OFF.
Latch / Unlatch	Retain their LAST state.

Table 5–2 Instruction Status During MCS/MCR Execution

5.3.2 PROGRAMMING PROCEDURE FOR RUNG WITH AN MCS

The following diagram shows an example of a rung containing an MCS instruction and an example of how it would be programmed.

The rung should look like this:



To enter the OFFLINE/LADDER/PROGRAM screen for creating the example shown in steps 4 through 8:

1) Press the **OFFLINE** **[F2]** function key

2) Press the **LADDER** **[F1]** function key

3) Press the **PROGRM** **[F3]** function key

To create the example rung with an MCS instruction:

4) Press the ⊣ ⊢ **[F1]** function key

5) Type in **7** ("I007" contact number)

6) Press the ⊣( )⊢ **[F3]** function key

7) Press the **MCS** **[F3]** function key

8) Press the **ETC** **[F10]** function key

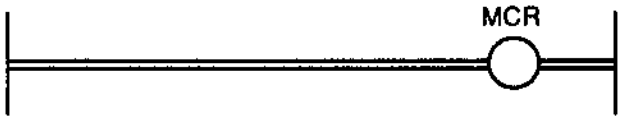
After the example rung (shown previously) has been created, it may be loaded into memory by:

9) Pressing the **LOAD** **[F9]** function key

10) Again, pressing the **LOAD** **[F9]** function key

The following diagram shows an example of a rung containing an MCR instruction and an example of how it would be programmed.

The rung should look like this:



To create the example rung with an MCR instruction:

1) Press the —( )— **[F3]** function key

2) Press the **MCR** **[F4]** function key

3) Press the **ETC** **[F10]** function key

After the example rung (shown above) has been created, it may be loaded into memory by:

4) Pressing the **LOAD** **[F9]** function key

5) Again, pressing the **LOAD** **[F9]** function key

5.4 Jump And Jump End Instructions

5.4.1 INTRODUCTION

The JUMP and JEND (Jump End) instructions operate similarly to the MCS and MCR instructions described in Section 5.3, with the exception that the program within the JUMP instruction is not executed. For example, if an output is currently ON, its status is maintained (not de–energized) during the execution of the JUMP instruction.

Figure 5–21 illustrates the use of the JUMP and JEND (Jump End) instructions in the SFW30 ladder logic programming

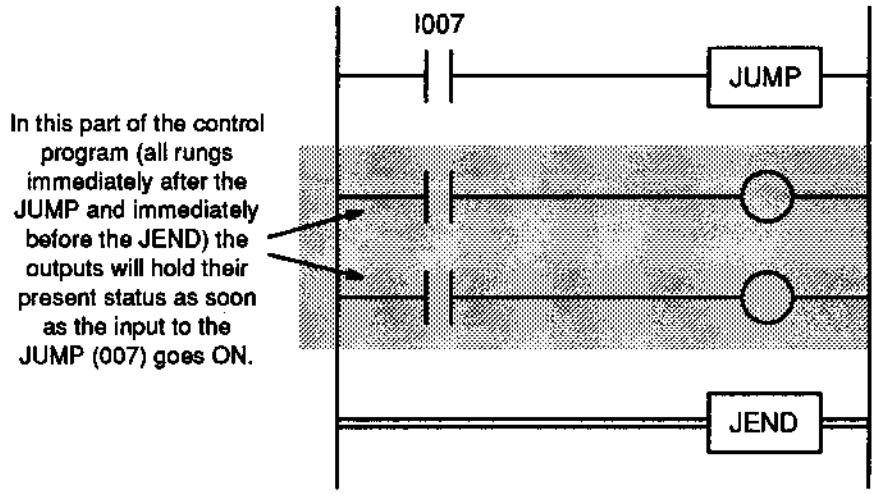


Figure 5–21 JUMP and JEND (JUMP END) Instructions

Programming Considerations

1. *DO NOT* program a pair of JUMP and JEND instructions between another pair of JUMP and JEND instructions.

2. During a JUMP instruction execution, the status in between the JUMP and JEND is held for:
   - Outputs, internal relays, timers, counters and shift registers are all held in their current state.
   - Timer/counter counted values are held in their current state.
   - Transitional instructions are all turned OFF.

3. The difference between a Master Control Set and a Jump instruction is that the program within the JUMP instruction is not executed: for example, if the output is ON beforehand, it is maintained during the execution of the JUMP instruction.

4. No contacts are allowed in the JEND (Jump End) rung.

5.4.2 PROGRAMMING PROCEDURE

This section provides the procedure to enter the OFFLINE/LADDER/PROGRAM screen, create an example ladder diagram rung that contains a JUMP instruction, and load it into memory. Programming a JEND instruction (JUMP END) follows the JUMP example.

The following diagram is an example of a rung containing a JUMP instruction. An example of how it would be programmed follows the diagram.

The rung should look like this:

To enter the OFFLINE/LADDER/PROGRAM screen for creating the example shown in steps 4 through 9:

1) Press the **OFFLINE** **[F2]** function key

2) Press the **LADDER** **[F1]** function key

3) Press the **PROGRM** **[F3]** function key

To create the example rung with a JUMP instruction:

4) Press the ⊣ ⊢ **[F1]** function key

5) Type in **7** ("I007" contact number)

6) Press the **ETC** **[F10]** function key

7) Press the **ETC** **[F10]** function key

8) Press the **JUMP** **[F3]** function key

9) Press the **ETC** **[F10]** function key

After the example rung (shown previously) has been created, it may be loaded into memory by:

10) Pressing the **LOAD** **[F9]** function key

11) Again, pressing the **LOAD** **[F9]** function key

After the rung has been loaded, the OFFLINE/LADDER/PROGRAM screen is cleared and a blank program matrix reappears. Continue on to the following procedures to create an example rung containing a JEND instruction instead of a JUMP. It is assumed that the program is still in OFFLINE/LADDER/PROGRAM.

The following diagram is an example of a rung containing the JEND instruction. An example of how it would be programmed follows the diagram.

The rung should look like this:

To create the example rung with a JEND (JUMP END) instruction:

1) Press the **ETC** **[F10]** function key

2) Press the **ETC** **[F10]** function key

3) Press the **JEND** **[F4]** function key

4) Press the **ETC** **[F10]** function key

After the example rung (shown above) has been created, it may be loaded into memory by:

5) Pressing the **LOAD** **[F9]** function key

6) Again, pressing the **LOAD** **[F9]** function key

5.5 Programming Timers

5.5.1 GENERAL DESCRIPTION

A timer rung consists of a TIME input line, a CLEAR input line, and a TIMER BOX which contains the following programmable information: the timer (storage) register address, the time base of the timer, the timer preset, and the output address represented by a coil. The time base is not modifiable by the user and is constant at .1sec. (100 milliseconds). Figure 5–22 shows a timer (TMR) component.

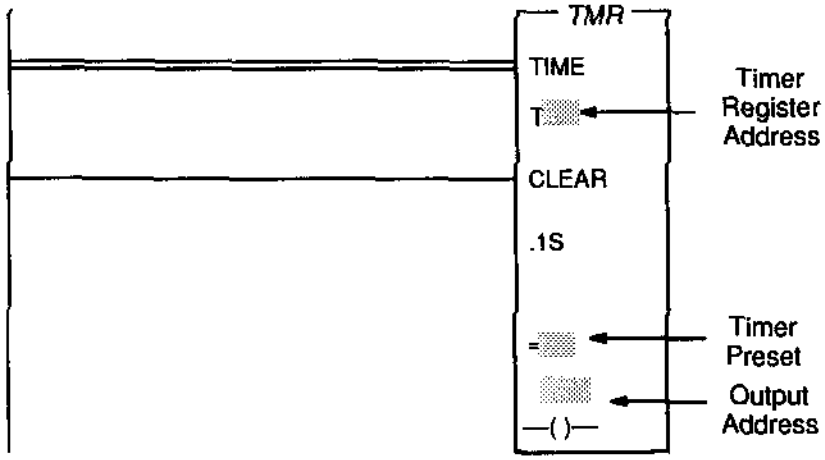


Figure 5–22 Timer Rung

The following describes the components that appear in the TIMER (TMR) box in Figure 5–22.

TIMING LINE – This line is displayed as a double line because no contacts are allowed.

CLEAR LINE – When continuity exists in the clear line, the timer is enabled. If continuity does not exist in the clear line, the timer storage register will be set to the timer preset value. Contacts on this line are called reset/enable contacts.

TIMER REGISTER ADDRESS – This is the address of the storage register which will be used to store the timer value. Valid register numbers are T00–T79.

TIMER PRESET – The timer preset can be a number from 0 to 9999 (999.9 seconds). The timer times down to zero from the preset value and sets the output ON when it reaches zero.

OUTPUT ADDRESS – The address of the output which will turn ON when the timer value is equal to zero.

5.5.2 GENERAL PROGRAMMING RULES

1. As soon as the reset/enable contact(s) on the CLEAR line is energized, the timer begins timing.

2. When the counted value reaches zero, the timer output turns ON.

3. When the reset/enable contact(s) is de–energized, the preset value is set.

4. After timing is completed, the counted value remains a 0 (zero) until the timer reset/enable contact(s) on the CLEAR line turns OFF. If the CLEAR line is turned OFF before the output is turned ON, then the accumulated time is lost.

5. A specific timer should not be programmed more than once.

6. If the preset value is changed during a timing operation (using the programmer or the DATA mode of the software), the preset value remains unchanged for the duration of that cycle and is only be changed for the next time cycle.

7. No more than (5) parallel contacts are allowed in the CLEAR line.

8. The Tab key on the alphanumeric keyboard may be used to move the cursor to the next programmable field within a timing box.

5.5.3 ON DELAY TIMER

The following is an example of an electromechanical ON DELAY timing circuit.

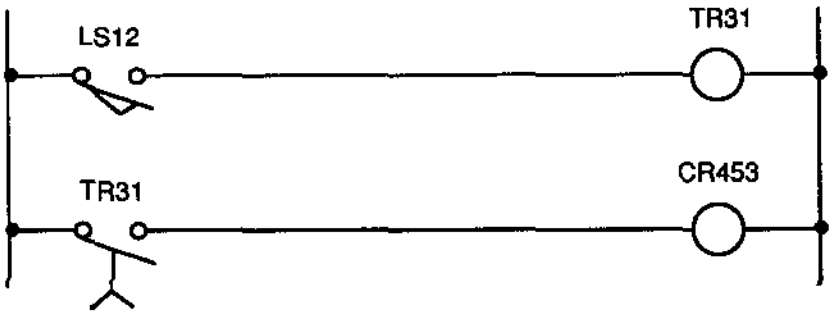


Figure 5–23 ON Delay Timing Circuit Example

If timing relay TR31 is set for a time delay of ten seconds, then CR453 turns ON ten seconds after the closure of LS12. This assumes that LS12 remains closed for at least ten seconds. Whenever LS12 is opened, CR453 de-energizes. Figure 5–24 shows a MICRO–1 processor ON DELAY timing circuit equivalent to the electromechanical circuit shown in Figure 5–23 (above).

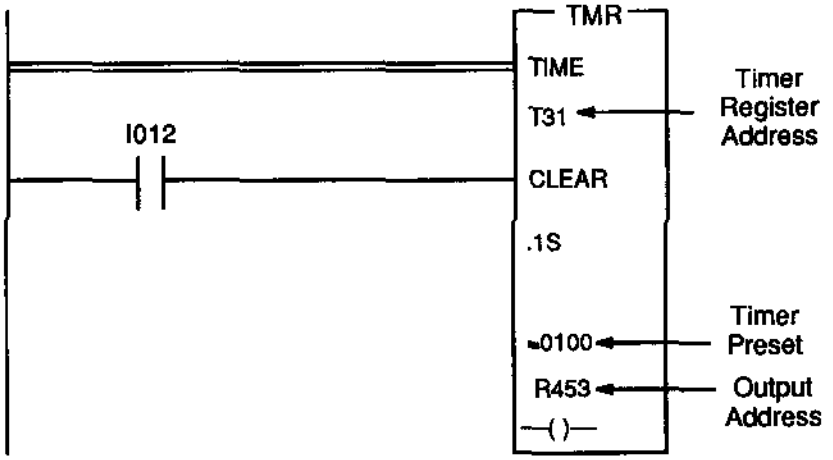


Figure 5–24 Equivalent ON–DELAY Timer Rung For Figure 5–23

Circuit Operation:

In Figure 5–24, when contact 012 opens, the timer stops timing and the contents of timer register T31 is preset (=100). When contact 012 is closed, the timer starts timing and continues to time until contact 012 is opened or until T31 is equal to zero (=0). When the timer value is zero, the timer is stopped and the coil address R453 is energized.

Programming Considerations

1. All the information in "General Programming Rules" applies.

2. A de-energized master control relay programmed before an ON DELAY timer rung stops the timer and de-energizes the output if it is ON.

5.5.4 OFF DELAY TIMER

Figure 5–25 is an example of an electromechanical OFF DELAY timing circuit.

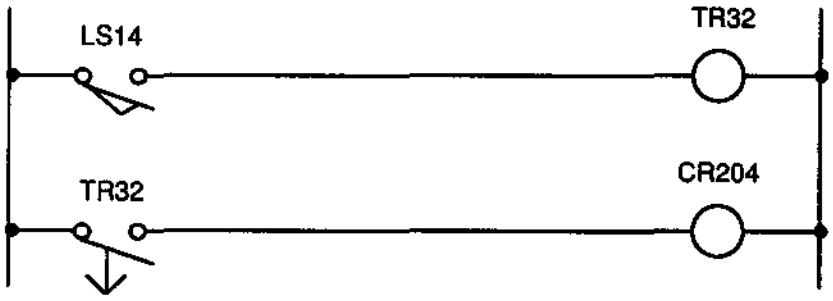


Figure 5–25 OFF Delay Timing Circuit Example

In Figure 5–25, TR32 is an OFF DELAY timing relay set for a time delay of five minutes. TR32 energizes CR204. When LS14 opens, TR32 starts timing and de–energizes after five minutes and opens contact TR32 which causes CR204 to turn OFF. Contact TR32 is termed a Normally Open Timed Open (N.O.T.O.) contact.

Figure 5–26 shows a MICRO–1 processor OFF DELAY timing circuit which is similar to the electromechanical circuit.

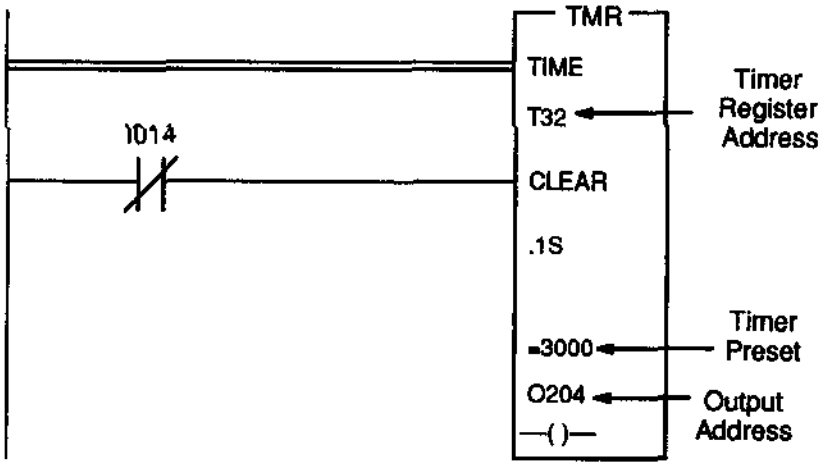


Figure 5–26 Equivalent OFF–DELAY Timer Rung For Figure 5–25

Circuit Operation:

In Figure 5-26, when input 014 is energized, the normally closed contact 014 opens in the clear line, causing the contents of timer register T32 to be preset to the timer preset value (3000). When input 014 is de-energized, normally closed contact 014 closes and the timer starts timing. The timer continues to time down until contact 014 is opened (input 014 energized) or until T32 is equal to zero. When the timer value equals zero, the timer stops timing and energizes the output address 0204.

The circuit is termed as OFF DELAY because the timing starts when the input device 014 is OFF. However, this circuit does not act exactly as the electromechanical circuit does. In the electromechanical circuit when input 014 is closed, the timing relay is energized immediately. This causes its contacts to change state. The timing starts when the timing relay is turned OFF (LS14 opens). To program a circuit to act exactly in this manner a second rung must be programmed with the timing rung. This equivalent circuit is shown in Figure 5-27.

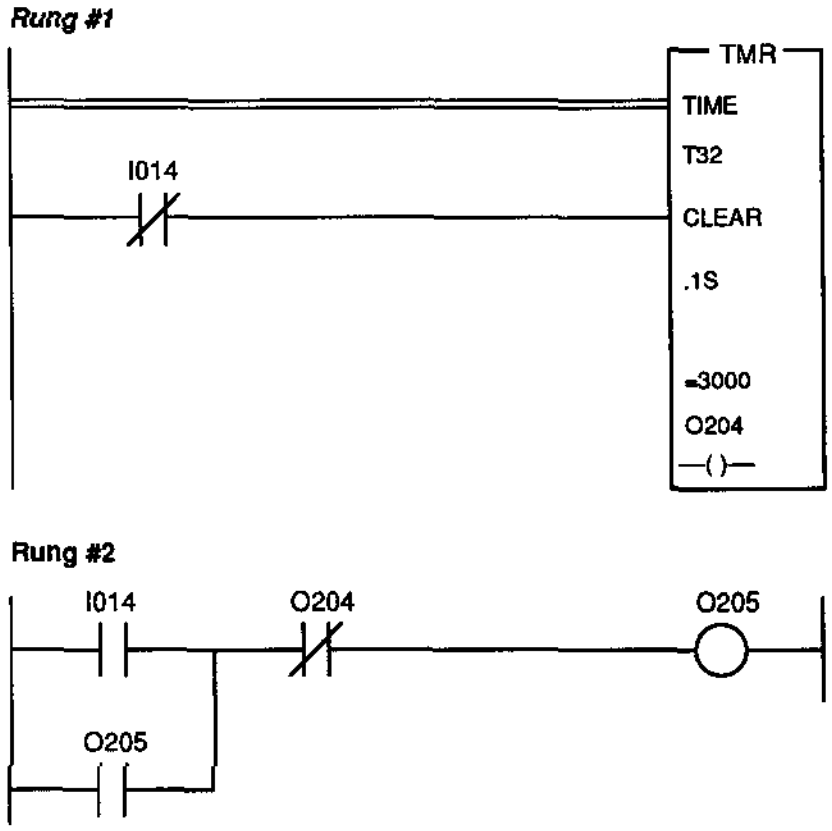


Figure 5-27 Equivalent OFF-DELAY Timer Rung - Version 2

Circuit Operation:

The operation of the timing rung (rung #1) is exactly as explained in the preceding circuit operation description. In rung #2, coil 205 turns ON immediately after closure of contact 014. Because of the seal–in contact 0205, coil 0205 cannot turn OFF until normally closed contact 0204 opens. This does occur until the timer value is equal to 5.0 minutes, at which time the timer output 0204 turns ON.

A normally open contact of address 0205 is termed Normally Open Timed Open (N.O.T.O.). A normally closed contact of address 0205 is termed Normally Closed Timed Closed (N.C.T.C.).

Programming Considerations

1. All the information in "General Programming Rules" applies.

2. A de–energized master control relay, programmed before an OFF DELAY rung, stops the timer and turns the output OFF if it is ON. For this reason, the rungs shown as #1 and #2 must be programmed consecutively.

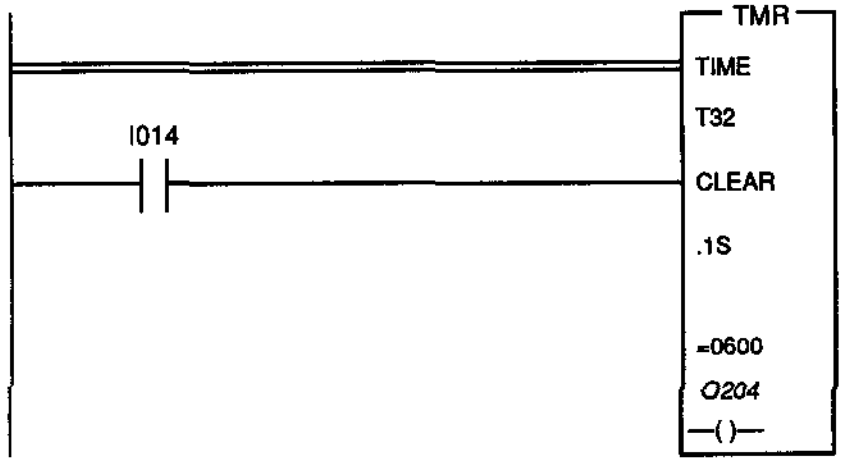
5.5.5 INTERVAL TIMER

An interval timer turns an output ON after a certain timer period and then turns the same output OFF after another time period has elapsed.

The basic interval timing circuit consists of a counter and an IF box which is used to establish the condition for the comparison. An explanation of an interval timer is included in Section 5.7.

5.5.6 LOADING A TIMER RUNG INTO MEMORY

The following diagram shows an example of a Timer rung and could represent the timing rung of any of the timers previously discussed. The steps for loading the rung into memory follow the rung diagram.



1) Press the **OFFLINE [F2]** function key

2) Press the **LADDER [F1]** function key

3) Press the **PROGRM [F3]** function key

4) Press the **ETC [F10]** function key

To create the example timer rung:

5) Press the **TMR [F4]** function key

6) Press the ⇓ **[down arrow]** key

7) Type in **32** ("T32" timer register address)

8) Press the **TAB** key

9) Type in **600** (timer preset value)

10) Press the **TAB** key

11) Type in **204** ("204" output address)

12) Press the ⇐ **[left arrow]** key

13) Press the ⇑ **[up arrow]** key **4 times**

14) Press the ⊣ ⊢ **[F1]** function key

15) Type in **14** ("I014" contact number)

16) Press the ⇐ **[left arrow]** key

After the example rung (shown above) has been created, it may be loaded into memory by:

17) Pressing the **LOAD [F9]** function key

18) Again, pressing the **LOAD [F9]** function key

After the rung has been loaded, the OFFLINE/LADDER/PROGRAM screen is cleared and a blank program matrix reappears.

5.6 Programming Counters

5.6.1 GENERAL DESCRIPTION

There are three types of counters, the UP Counter, the DUAL Counter, and the SELECTABLE Counter, that may be programmed in the OFFLINE/LADDER/PROGRAM mode. A counter rung consists of a a counter box with programmable counter information. Up to three lines connect to the counter box for programming of contacts, etc. Figure 5–28 illustrates the three types of counter boxes. Refer to the following sections for details on each specific counter type. The single lines allow contacts to be programmed into the input. The double lines indicate that a contact cannot be programmed in the line.

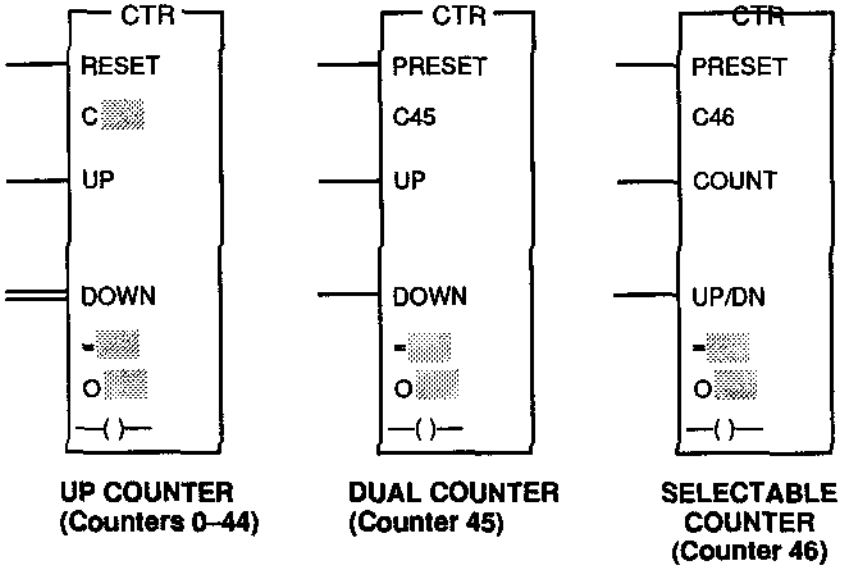


Figure 5–28 UP, DUAL, and SELECTABLE Counter Rungs

In Figure 5–28, the shaded areas are:

COUNTER REGISTER NUMBER – This is the address of the counter register which *will be used to store the counter values. For an UP counter this register number is* selectable. However, for both the DUAL and SELECT counters the register number is not user–programmable.

PRESET VALUE – When the accumulated counter value is equal to the preset value, the output address will turn ON (output will turn OFF at count values above or below the decode value). Unlike timers, all counters except the UP–counter will continue to count past the preset value. The preset value can be a number from 0 to 9999..

OUTPUT ADDRESS – If the counter is an UP–counter, the output address will turn ON when the accumulated counter value is equal to the preset; for DUAL and SELECTABLE counters, the output will turn ON when the counted value equals zero.

5.6.2 UP COUNTER

The following summarizes the operation of an up counter. While the reset input is off, the counter counts the leading edges of pulse inputs, and compares them with the preset value. When the counted value reaches the preset value, the counter turns the output ON and the output remains ON until the reset input is turned ON. When the reset input is changed from OFF to ON, the counted value is reset to zero. While the reset input is ON, all pulse inputs are ignored. In order for an OFF to ON transition of the contact in the UP line to be recognized, the transition pulse must occur after at least one complete program scan since the last transition.

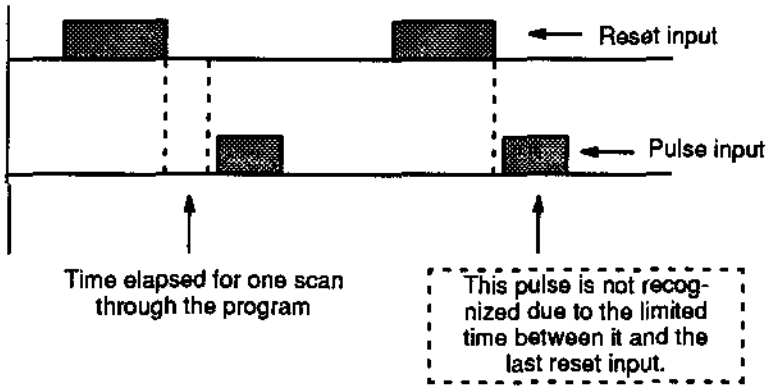


Figure 5–29 Analysis of Circuit Operation for Up Counter

Figure 5–30 shows an UP counter. The actual circuit operation and programming considerations which must be followed when using an UP counter complete this section.

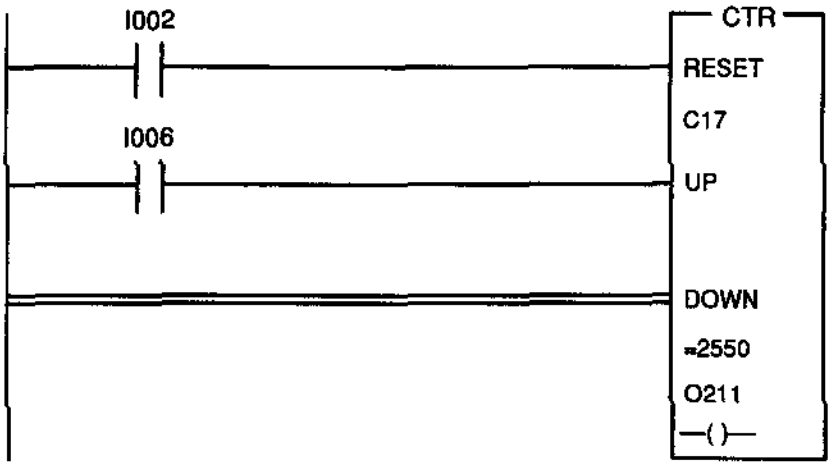


Figure 5–30 Up Counter

Circuit Operation:

If contact 002 is closed, the accumulated counter value is cleared (C17=0000) and transitions of the up count line are ignored. When contact 002 is open, an open to closed transition of contact 006 on the up count line causes the accumulated counter value to increment. A closed to open transition of contact 006 has no effect on the accumulated counter value. In the example rung in Figure 5–30, when the counter value equals the preset value of 2550, the output address of 0211 turns ON.

Programming Considerations

1. The same counter should not be programmed more than once.

2. It is possible to control whether the counted value in an UP counter will be held or reset on power–up. To do this use Function 7 (Section 4.1.1).

3. No contacts may be placed in the DOWN line of an UP counter.

4. No more than (2) parallel contacts are allowed on either the reset line or the up line of an UP counter.

5. It is possible to cursor to the next modifiable field within the counter box by pressing the Tab key on the keyboard.

6. An energized master control set (MCS) or a JUMP programmed before an up counter holds the counter in its present state. The accumulated count remains unchanged.

5.6.3 DUAL COUNTER (C45 only)

The following summarizes the operation of a dual counter. When the preset input of the counter is turned ON, the preset value is set. As soon as the preset input turns OFF and subsequently either the UP or DOWN line becomes energized, counting begins.

When the accumulated counter register value is equal to zero, the output turns ON. In incremental counting (counting up) the value in the counter register increments (rolls over) from 9999 to 0. When using decremental counting (counting down), the counter register decrements from 0 to 9999.

Figure 5-31 shows a DUAL counter. When using this type of counter, refer to the next sections CIRCUIT OPERATION and PROGRAMMING CONSIDERATIONS before programming.

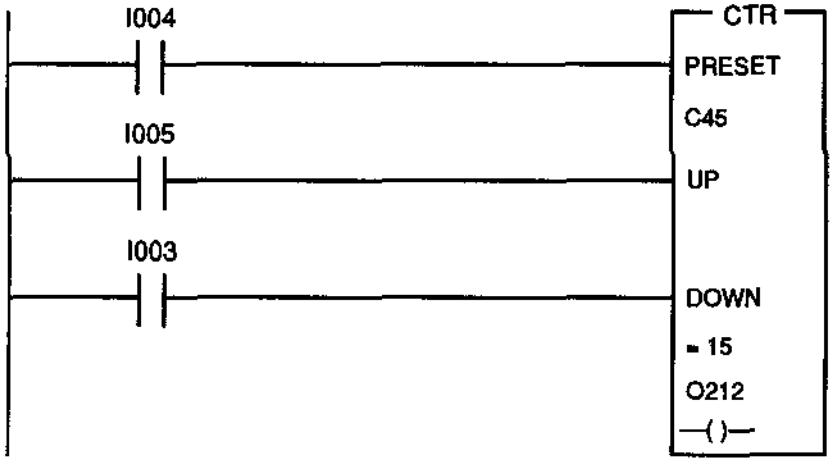


Figure 5-31 Dual (Up/Down) Counter

Circuit Operation:

When contact 004 is closed, the accumulated counter value is preset to 015 and the counter output address 0212 is turned OFF. When contact 004 is open and an open to closed transition of contact 005 occurs, the accumulated counter value increments by one. When contact 004 is open and an open to closed transition of contact 003 occurs, the accumulated counter value decrements by one. If contact 004 is closed, the counter is disabled and transitions of contact 003 and 005 are ignored. When the accumulated counter register value is equal to zero, the output 0212 turns ON.

Programming Considerations

1. Counter C45 is used for a dual counter and may not be used for any other purpose.
2. Counter C45 should not be programmed more than once.
3. No more than (2) parallel contacts are allowed on either the preset line or the up line of a DUAL counter.
4. No more than three parallel contacts are allowed on the down line of a DUAL counter.
5. It is possible to cursor to the next modifiable field within the counter box by pressing the Tab key on the keyboard.
6. An energized master control set (MCS) or a JUMP programmed before a dual counter holds the counter in its present state. The accumulated count remains unchanged.
7. If both the UP and DOWN lines are energized simultaneously, the counter does not count.

5.6.3 SELECTABLE COUNTER (C46 Only)

The following summarizes the operation of a selectable counter. When the reset input is turned ON, the reset value is set. When the reset input is turned OFF, counting can begin. If the UP/DN (up/down) contact is closed, the counter counts up, providing that the count line is energized. When the UP/DN contact is open, the contact counts down, provided the count line is energized.

Figure 5–32 shows a SELECTABLE counter. When using this type of counter, refer to the CIRCUIT OPERATION and PROGRAMMING CONSIDERATIONS sections before programming.

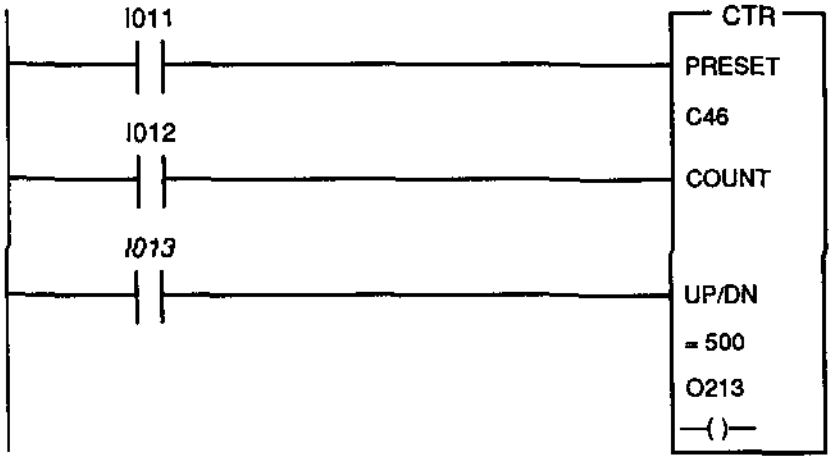


Figure 5–32 Selectable Counter

Circuit Operation:

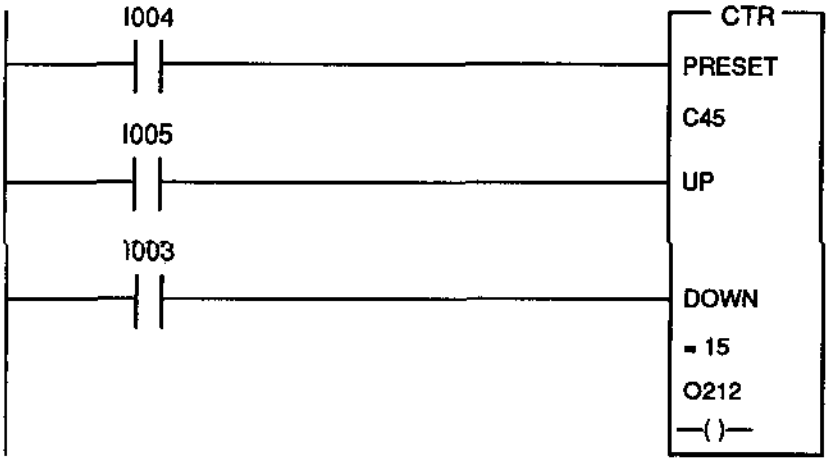
When contact 011 is closed, the accumulated counter value is preset (=500) and the counter output address 0213 is turned OFF. When contact 011 is open and contact 013 is closed, the accumulated counter value increases by one when contact 012 closes. When contact 011 is open and contact 013 is open, the accumulated counter value decreases by one when contact 012 closes. When the counter register value is equal to zero, output 0213 is energized.

Programming Considerations

1. Counter C46 is used for a selectable counter and may not be used for any other purpose.
2. Counter C46 should not be programmed more than once.
3. No more than (2) parallel contacts are allowed on either the reset line or the count line of a selectable counter.
4. No more than three parallel contacts are allowed on the up/down line of a selectable counter.
5. It is possible to cursor to the next modifiable field within the counter box by pressing the Tab key on the keyboard.
6. When the preset value is changed during counter operation, the new preset value becomes effective immediately. However, counting does not begin again until the UP/DOWN line pulses. This holds true even if you are using an UP– counter and the new preset is larger than the old preset, or if you are using a DOWN– counter and the new preset is smaller than the old preset.

5.6.4 LOADING A COUNTER RUNG INTO MEMORY

The following diagram shows an example of a counter rung. The steps required to load the rung into memory are listed after the diagram.



1) Press the **OFFLINE [F2]** function key

2) Press the **LADDER [F1]** function key

3) Press the **PROGRM [F3]** function key

4) Press the **ETC [F10]** function key

To create the example dual counter rung:

5) Press the **CTR [F3]** function key

6) Press the **DUAL [F2]** function key

7) Press the **TAB** key

8) Type in **15** ("C15" counter preset value)

9) Press the **TAB** key

10) Type in **212** ("O212" output address)

11) Press the ⇐ **[left arrow]** key

12) Press the ⇑ **[up arrow]** key **2 times**

13) Press the ⊣ ⊢ **[F1]** function key

14) Type in **3** ("I003" contact number)

15) Press the ⇑ **[up arrow]** key **2 times**

16) Press the ⊣ ⊢ **[F1]** function key

17) Type in **5** ("I005" contact number)

18) Press the ⇑ **[up arrow]** key **2 times**

19) Press the ⊣ ⊢ **[F1]** function key

20) Type in **4** ("I004" contact number)

21) Press the ⇐ **[left arrow]** key

After the example rung has been created, it may be loaded into memory by:

22) Pressing the **LOAD [F9]** function key

23) Again, pressing the **LOAD [F9]** function key

After the rung has been programmed, the OFFLINE/LADDER/PROGRAM screen is *cleared and a blank program matrix reappears.*

5.7 IF Instructions

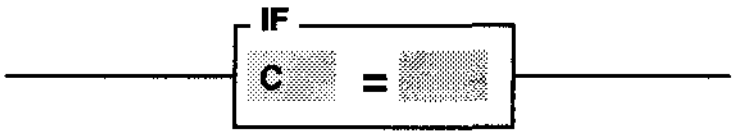


Figure 5–33 IF Instruction Box

5.7.1 GENERAL INFORMATION

The IF instruction is used to compare the counted value of a counter with a specified constant value. There are two different ways to define the IF instruction. These include:

1. **CTR=**

   This tests to see if the current counted value of a specified counter is equal to a value specified in the IF instruction box. The first of these values will name the counter and the second value is a constant between 0 and 9999.

2. **CTR ≥**

   This tests to see if the current counted value of a specified counter is equal to or greater than a value specified in the IF instruction box. The first of these values names the counter and the second value is a constant between 0 and 9999.

The IF instruction is programmed in a horizontal box as shown in Figure 5–33. The box may contain two modifiable fields (when it compares the counted value of a counter).

When programming the MICRO–1 processor using a PR3 Program/Loader FUN 1XX and FUN 2XX are used as the compare operation. With SFW30 programming software, the IF instruction box is used.

Programming Considerations

1. An IF box may occupy any position in the programming matrix except the coil position (position #11).

2. Multiple IF boxes can be programmed in series and/or parallel providing the 10 X 7 contact matrix is not exceeded.

3. Contacts may be programmed in series or parallel with an IF box.

4. When the IF instruction is not the first instruction in a rung, then the IF instruction must have a parallel contact/instruction when ANDed with other rung elements for proper operation.

For Example:

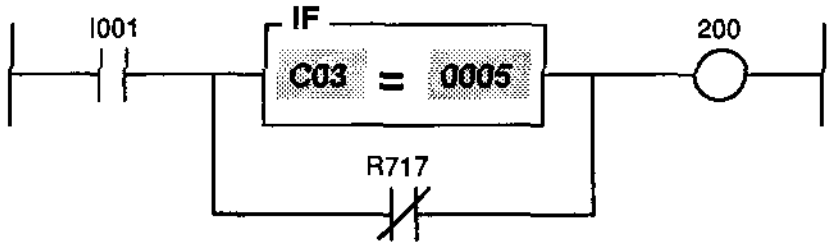


Figure 5–34 IF Instruction Box Example

In Figure 5–34, contact R717 is used as a place holder. This contact is "ON" when the processor is in RUN.

Using an IF Instruction as an Interval Timer

The following example shows how an IF instruction would be used to direct the operation of an interval timer. The operation consists of a counter instruction being used as a counter.

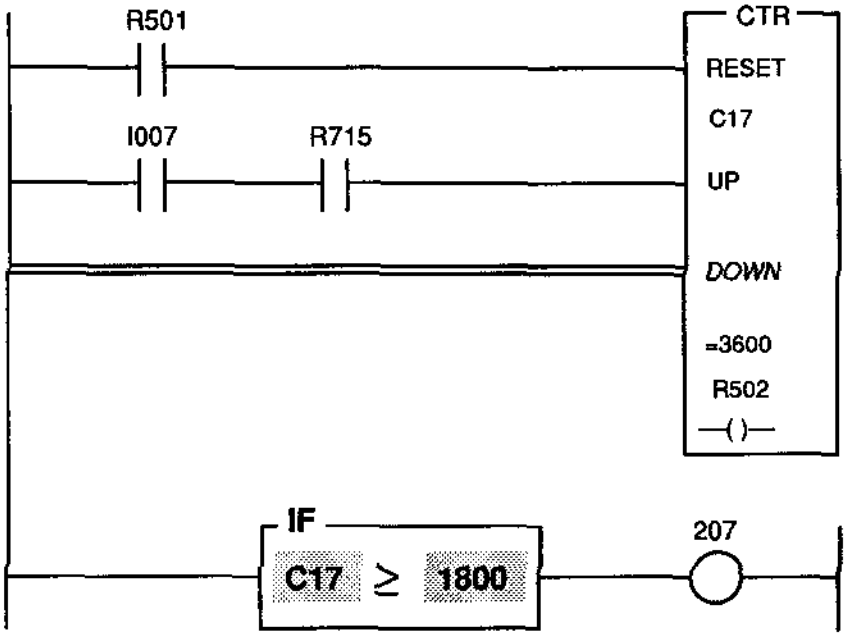


Figure 5–35 IF Instruction as an Interval Timer

In Figure 5–35, if contact R501 is CLOSED, the accumulated counter value is cleared (C17 = 0000), and any transitions in the UP count line are ignored. When contact R501 is OPEN, and input 007 is ON, R715 (internal 100msec clock) provides a pulse to the counter providing a 100 msec time base. The output of the counter R502 will turn ON when the accumulated value reaches 3600 (360.0 seconds or 6 minutes). The IF instruction compares the accumulated counter value to an intermediate value (1800). Output 207 will trun ON and remain ON when the accumulated value reaches or exceeds 1800 (180.0 seconds or 3 minutes). Output 207 will be turned OFF when the counter is RESET (R501 is turned ON). A contact can be added in conjuction with additional IF statements to create interval timing.

5.8 Programming Shift Registers

5.8.1 INTRODUCTION

The SFW30 is capable of programming both forward and reverse shifting shift registers. This method of shifting registers is also known as synchronous shifting and is commonly used in applications that require sequencing. Devices such as drum switches can be replaced by programming the forward and reverse shift registers. Figure 5–39 shows both the forward and reverse shift registers that appear in the SFW30 OFFLINE/LADDER/PROGRAM screen.

The shift register is capable of handling up to 128 bits. The individual bits are numbered from 0 to 127 as shown in Figure 5–36. These bits may be shifted in either the forward or reverse direction. A forward shifting register moves data as shown in the 8–bit shift register in Figure 5–37, and a reverse shifting register moves data as shown in the 8–bit shift register in Figure 5–38.

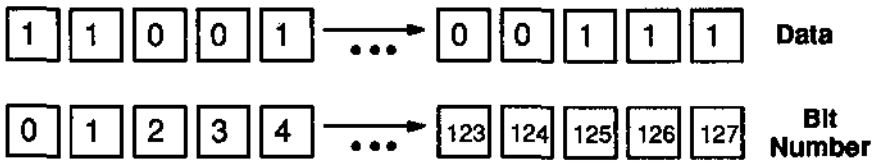
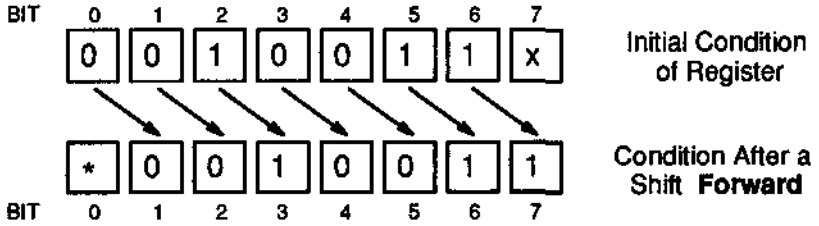
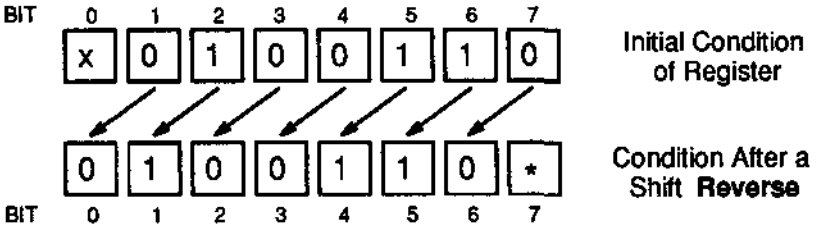


Figure 5–36 Shift Register Bit Assignments



* The state of bit #0 after the shift depends upon the condition of the data–in rung.

Figure 5–37 Result After a Forward (Left to Right) Shift



* The state of bit #7 after the shift depends upon the condition of the data–in rung.

Figure 5–38 Result After a Reverse (Right to Left) Shift

Both the forward and reverse shift boxes have three input lines identified as "RESET", "FORWARD" (FWD) OR "REVERSE" (REV), and "DATA". Each of these inputs can be programmed with a contact to control the input state. The components shown in the forward and reverse shift boxes and how they are programmed in the SFW30 is described in the following sections.

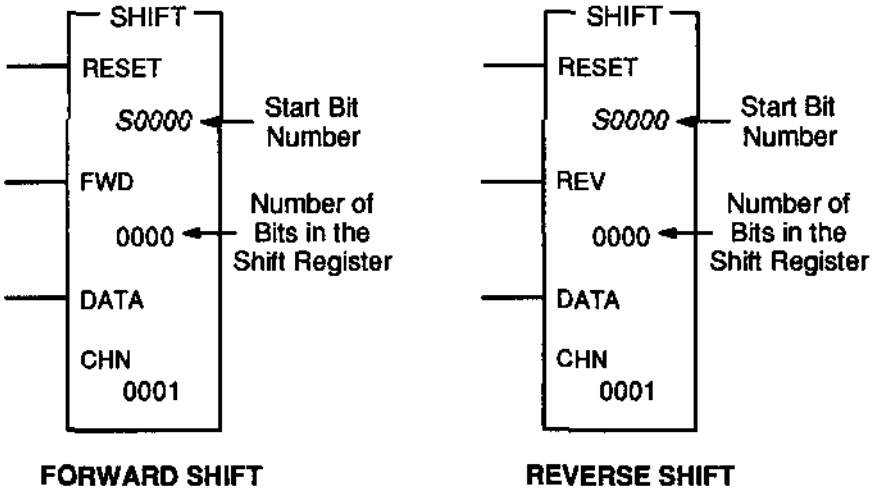


Figure 5–39 SFW30 Forward and Reverse Shift Register Instructions

5.8.2 FORWARD SHIFTING REGISTER

A forward shifting register instruction consists of a RESET line, a FORWARD line, a DATA line and a SHIFT box which contains two pieces of information. This information includes the starting shift register bit and the number of bits in the shift register. There is also a channel number indicated in the shift register box. This number is always one and indicates that any bit can be shifted only one bit position at a time. A description of each component of the rung follows.

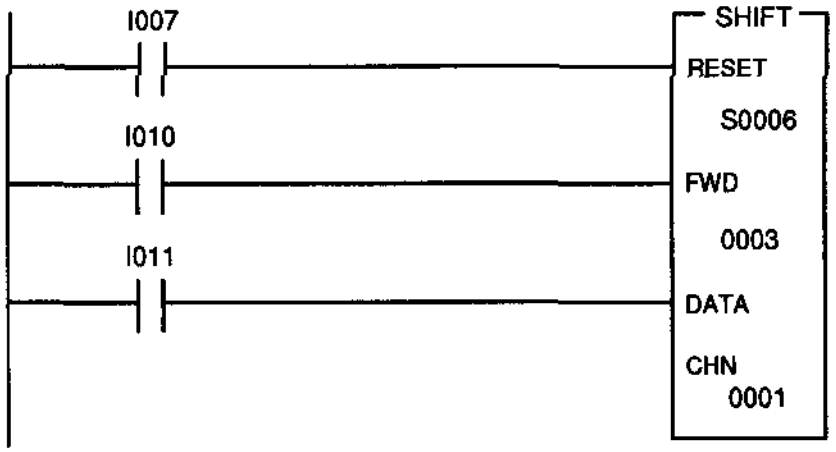


Figure 5–40 Forward Shift Register (Forward Direction) Example

RESET LINE – When continuity exists in the reset line, all bit positions used in the shift register are set to zero. When continuity does not exist, the shift box is enabled.

FORWARD LINE – When the shift box is enabled, an open to closed transition of the forward (FWD) line causes a shift in the forward direction (left to right).

DATA LINE – If the shift box is enabled and the FORWARD line goes from open to closed, when continuity exists in the data line, a value of (1) is placed in the starting shift register bit (leftmost bit in the forward shifting register).

The forward shift register is the default and the software automatically places a forward shift register in the ladder program. A reverse shift register instruction is selected by using the functions keys at the bottom of the screen.

Circuit Operation:

Referring to Figure 5–40, when contact 007 is closed, shift register bits 6,7, and 8 are reset to zero. When contact 007 is opened, the shift register is enabled and an open to closed transition of contact 010 causes a shift of one bit in the forward direction. A closed to open transition of contact 010 has no effect on the shift box.

If contact 011 is closed, a data value of "1" is placed into the first bit position (bit #6) with each forward shift. If contact 011 is opened, a data value of "0" is placed into the first bit position (bit #6) each time the register shifts forward.

Programming Considerations

1. The shift register has a total of 128 bits. Any number of consecutive bits between 2 and 128 may be used in the shift forward operation. The sum of the start bit and the number of bits in the shift register must not exceed 128.

2. In a forward shifting register the first bit position is considered to be the leftmost bit in the shift register.

3. Any number of shift registers can be programmed.

5. A de–energized master control relay programmed before a shift register rung stops the shifting of bits and causes all the data in the shift to remain unchanged.

6. The address of the last bit position in the shift register can be used to drive an external output or equivalent internal relay.

5.8.3 REVERSE SHIFTING REGISTER

A reverse shifting shift register instruction consists of a RESET line, a REVERSE line, a DATA line and a SHIFT box which contains two pieces of information. This information includes the starting shift register bit and the number of bits in the shift register. There is also a channel number indicated in the shift register box. This number is always one and indicates that any bit can be shifted only one bit position at a time. A description of each component of the rung follows.

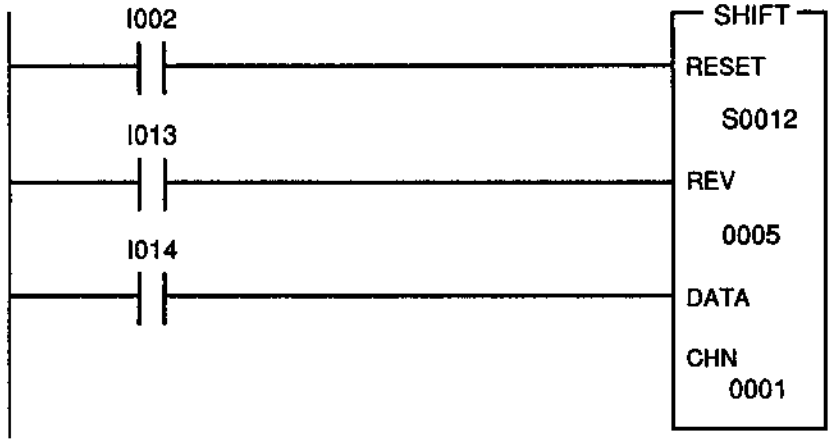


Figure 5–41 Reverse Shift Register (Reverse Direction) Example

RESET LINE – When continuity exists in the reset line, all bit positions used in the shift register is set to zero. When continuity does not exist the shift box is enabled.

REVERSE LINE – If the shift box is enabled, an open to closed transition of the reverse (REV) line causes a shift in the reverse direction (right to left).

DATA LINE – If the shift box is enabled and the REVERSE line goes from open to closed, when continuity exists in the data line, a value of (1) is placed in the starting shift register bit (rightmost bit in the reverse shifting register).

The shift register default is a forward shift register. Note that when programming a reverse shift register, it must be selected from the programming function keys at the bottom of the screen.

Circuit Operation:

When contact 002 is closed, shift register bits 12 through 16 are reset to zero. When contact 002 is opened, the shift register is enabled and an open to closed transition of contact 013 causes a shift of one bit in the reverse direction. A closed to open transition of contact 013 has no effect on the shift box.

If contact 014 is closed, a data value of "1" is placed into the last bit position (bit #16) with each reverse shift. If contact 014 is opened, a data value of "0" is placed into the last bit position (bit #16) with each reverse shift.

Programming Considerations:

1. The shift register has a total of 128 bits. Any number of consecutive bits between 2 and *128 may be used in the reverse shift operation. The sum of the start bit and the number* of bits in the shift register must not exceed 128.

2. In a reverse shifting register the last bit position (not the start bit) is considered to be the rightmost bit in the shift register.

3. Any number of shift registers can be programmed.

4. A de–energized master control relay programmed before a shift register rung stops the shifting of bits and causes all the data in the shift to remain unchanged.

5. The address of the first bit position in the shift register can be used to drive an external output or equivalent internal relay.

5.8.4 BI–DIRECTIONAL SHIFT REGISTER

To program a bi–directional shift register, use both the forward and reverse shift registers as shown in Figure 5–42. Assign the same shift register bits to each shift register. Also the contacts for both RESET lines must have the same address.

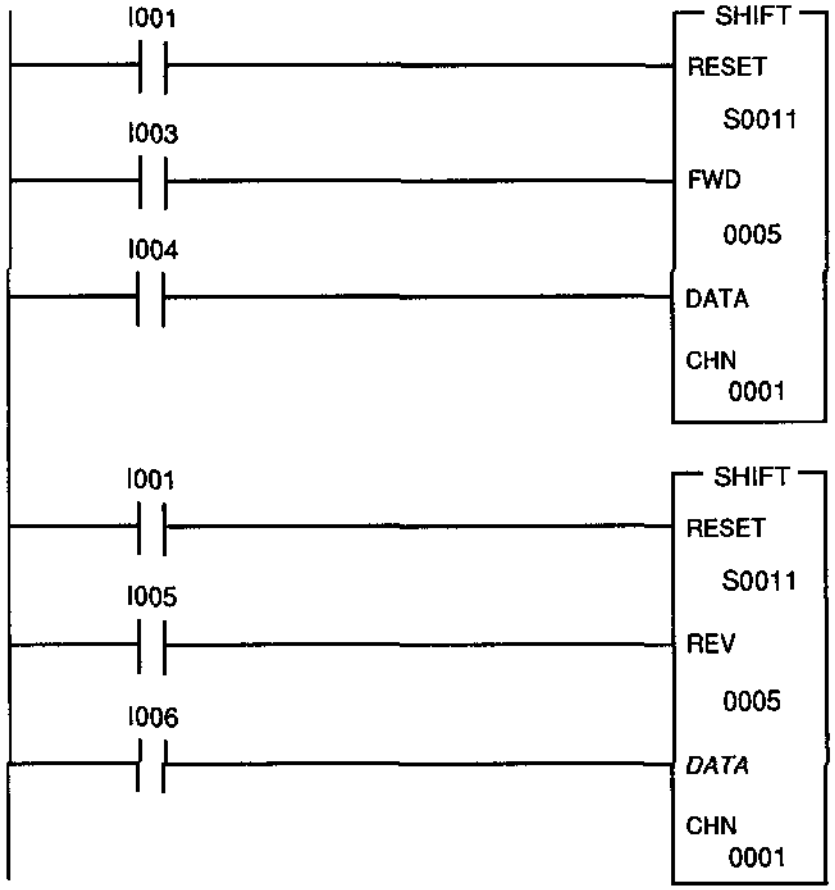


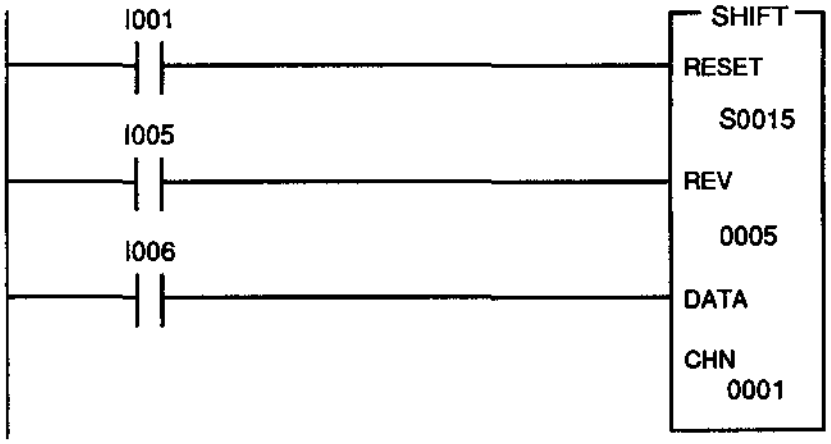
Figure 5–42 Bi–Directional Shift Register Operation

Circuit Operation:

Referring to Figure 5–42, when contact 001 is opened, each closure of contact 003 causes a forward shift in bit positions 11 through 15. Similarly, any closure of contact 005 causes a reverse shift in the same bit positions. Closure of contact 001 resets the bi–directional shift register.

5.8.5 LOADING A SHIFT REGISTER RUNG INTO MEMORY

The following diagram shows an example of a reverse shift register rung. The steps required to load the rung into memory are listed after the diagram.



To enter the OFFLINE/LADDER/PROGRAM screen for creating the example shown in steps 5 through 22:

1) Press the **OFFLINE [F2]** function key

2) Press the **LADDER [F1]** function key

3) Press the **PROGRM [F3]** function key

4) Press the **ETC [F10]** function key

To create the example timer rung:

5) Press the **SHIFT [F5]** function key

6) Press the **REV [F2]** function key

7) Press the **TAB** key

8) Type in **15** (register start bit)

9) Press the **TAB** key

10) Type in **5** (number of bits in the shift register)

11) Press the ⇐ **[left arrow]** key

12) Press the ⇓ **[down arrow]** key

13) Press the **→[–** **[F1]** function key

14) Type in **6** (DATA line contact number)

15) Press the ⇑ **[up arrow]** key **2 times**

16) Press the **→[–** **[F1]** function key

17) Type in **5** (REV line contact number)

18) Press the ⇑ **[up arrow]** key **2 times**

19) Press the **→[–** **[F1]** function key

20) Type in **1** (RESET line contact number)

21) Press the ⇐ **[left arrow]** key

After the example rung (shown previously) has been created, it may be loaded into memory by:

22) Pressing the **LOAD** **[F9]** function key

23) Again, pressing the **LOAD** **[F9]** function key

After the rung has been loaded, the OFFLINE/LADDER/PROGRAM screen is cleared and a blank program matrix reappears.

LADDER EDITING, SEARCH, AND DISPLAY

6

6.1 Editing Prior to Loading

6.1.1 INTRODUCTION

All the editing sequences described in Section 6.1 may be used to modify a ladder rung before it is loaded into the computer's offline memory. To modify a ladder diagram that has already been loaded into memory, use the Delete, Insert and Replace operations described in Sections 6.4 and 6.5.

6.1.2 CLEAR PROGRAM MATRIX

To obtain a cleared program matrix while in the OFFLINE/ LADDER/PROGRAM mode:

1) Press and hold the **CTRL** key

2) Press the L key

The screen displays a cleared matrix with the rung number indicated at the bottom of the display.

6.1.3 CHANGING CONTACTS OR COILS

The procedures that follow describe how to:

- Change the address of a contact or coil.
- Change the type of contact or coil.
- Remove a contact.

Change the Address of a Contact or Coil:

To change the address of a contact (or coil), use the four arrow keys of the numeric keypad section to position the cursor over the contact (or coil) with the address to be changed, then re-enter the new address.

Change the Type of Contact or Coil:

To change the type of contact, use the four arrow keys of the numeric key pad section to position the cursor over to the contact to be changed, and enter the correct symbol and the address. To change the type of coil, press the coil function key and enter the correct symbol and the address.

Remove a Contact:

To remove a contact, use the arrow keys of the numeric key pad to place the cursor in the same position of the contact to be removed. Press the <Del> key, then press the "_____" (horizontal connect) function key. To remove a contact or horizontal connect (open a rung), press "__ __" on the function keypad.

Place a Vertical Connect in a Rung:

To place a vertical connect in a rung, use the left or right arrow and the down arrow keys on the numeric key pad to position the cursor at the lower junction where the vertical connect will precede a rung element, then press the "__|__" (vertical connect) function key.

Remove a Vertical Connect in a Rung:

To remove a vertical connect, position the cursor at the lower end of the vertical connect and press the "__|__" (vertical connect) function key.

6.1.4 CHANGING SPECIAL FUNCTION OPERATIONS

The following procedures describe how to change the information inside vertical boxes (timers, counters, etc.) or change the information inside horizontal boxes (IF, TRANSITIONAL) prior to loading the rung into memory. If any required data fields within a box are not entered, arrowing out of the box is prohibited.

To Change Information Inside Vertical Boxes:

1) Press the **[arrow]** keys or **TAB** key to position the cursor anywhere inside the instruction box.

2) Either select the appropriate function key appearing at the bottom of the screen, or Type in the new information.

NOTE: *When a register number is entered, it must be within the range of acceptable allocation numbers for that type of register. The terminal will beep if an invalid register number is entered. when moving out of the register number field. Also, the error "Out of range" appears (see Section 5.1.2 for ranges).*

3) Press the **[arrow]** keys to get out of the box.

To Change Information Inside Horizontal Boxes (Transitional, IF)

To change the information inside a horizontal box, use the arrow keys or tab key to position the cursor and enter the new information over the existing information using the function keys and/or numerical keys where appropriate. If any required data fields within a box are not entered, arrowing out of the box is prohibited.

1) Press the **[arrow]** keys to position the cursor at the register or constant to be changed.

2) *Either select the appropriate function key appearing at the bottom of* the screen, or Type in the new information.

3) Press the **[arrow]** keys to get out of the box.

6.1.5 SUMMARY OF EDITING KEYSTROKES

FUNCTION KEY / KEY	OPERATION
DEL	Removes the rung element in the same position as the cursor. Make sure that the NUM LOCK key on the keypad is not set.
ENTER	Moves the cursor to the beginning of the next line.
CONTROL L	Clears the program matrix allowing you to program rungs which will be placed sequentially after the last rung or inserted into your control program.
TAB	Positions the cursor at the next modifiable field in an instruction box (e.g. timer, counter).
F5	Opens the rung in the location of the cursor. If a rung element had been programmed in this position, it will be replaced by an opening in the rung.
F4	Places a horizontal connect in the location of the cursor. If a rung element had been programmed in this position, it will be replaced by a direct horizontal connect in the rung.
F6	Places or removes a vertical connect in the location just ahead of the cursor. Be sure to position the cursor at the bottom junction of the vertical connect.

Table 6–1 Summary of Editing Keystrokes

6.2 Search Mode

6.2.1 DESCRIPTION AND SELECTION

The OFFLINE/LADDER/SEARCH mode allows:

- Search for any type of normally open or normally closed ladder contact or coil instruction, such as: inputs, outputs, internal relays, timer contacts, counter contacts or shift register contacts.
- Search for an MCS or MCR instruction.
- Search for any occurrence of a timer or counter.
- Search for rungs directly.

NOTE: *After the rung containing the searched element is displayed on the computer screen, any corresponding programmed labels may be displayed by toggling the LABEL function key in the OFFLINE/LADDER/ SEARCH mode. For complete information about programming labels, refer to Section 10.*

The following elements cannot be searched:

- JUMP or JEND instructions.
- Transitional contacts (TRANS) .
- Shift register bits.

NOTE: *If the ladder program contains undisplayable rungs (because of a transfer or disk–load operation) the error message "Program is UNDISPLAYABLE after rung N (at program address N)" appears on the screen upon entering the OFFLINE/ LADDER mode. The last displayable rung and the word address of the "undisplayable" instruction are given in the message. The PR3 Program Loader may be used to examine and modify the instruction at the specified word address.*

To Enter the OFFLINE/LADDER/SEARCH Mode:

From the INIT screen:

1) Press the **OFFLINE [F2]** function key

2) Press the **LADDER [F1]** function key

3) Press the **SEARCH [F1]** function key

The result is a cleared matrix indicating the OFFLINE/LADDER/SEARCH mode along with the prompting required to perform the search operations described in the following sections.

6.2.2 SEARCHING FOR A PARTICULAR RUNG

After selecting the SEARCH mode, in order to search for a particular rung, do the following:

1) Enter the number of the rung to be searched. When a number is entered, the rung number at the bottom center of the screen is changed to the selected number.

2) Press **ENTER / RETURN** key.

The selected rung is displayed at the lowest possible position in the program matrix. If the rung searched for contains a vertical box format, the entire program matrix is used for display. Up to 7 single line rungs can be displayed at one time. The rung numbers of the rungs displayed are indicated at the bottom of the screen, the first number indicating the bottom-most rung.

Search for the Following Rung:

After a rung has been searched for, search for the next rung as follows:

1) Press the rung down **[↓ RUNG]** function key or the down arrow [↓] key to get out of the box.

The previously searched and displayed rung is moved up and the next sequential rung takes its place. The rung numbers located below the program matrix indicate both rungs. The left most number corresponds to the bottom most rung displayed, etc.

NOTE: *If the rung down function key is pressed after the last possible rung has been searched for the programmer beeps indicating the end of the program has been reached.*

Search for the Preceding Rung:

After a rung has been searched for, search for the preceding rung as follows:

1) Press the rung up **[↑ RUNG]** function key or the up arrow [↑] key to get out of the box.

The last searched and displayed rung is moved up and the rung immediately preceding it in the ladder diagram takes its place. The rung numbers located below the program matrix indicate both rungs.

NOTE: *If the rung up function key is pressed after rung one has been searched for, the computer beeps indicating the beginning of the program has been reached.*

6.2.3 SEARCH FOR THE RUNG CONTAINING A PARTICULAR CONTACT OR COIL

After selecting the SEARCH mode, search for the first rung containing a contact or coil as follows:

1) Press the coil function key if an output is to be searched for, or the specific contact function key if a contact is to be searched for. An MCS or an MCR statement may be searched by pressing the ETC function key in order to display the MCS or MCR function key. A latch or unlatch coil can be searched by its particular relay address after first pressing the coil function key. The function to be searched for is indicated in the bottom right corner of the screen and identified as the "Search Object".

2) Enter the address of the contact or coil to be searched for, then press the ENTER key. When searching for an MCS or an MCR, an address number is not needed. The control program is searched for the indicated ladder element from rung #1 to the end of the control program.

NOTE: *The computer beeps and the message "Search object not found" is displayed if the contact or coil searched for does not exist in the program. The computer beeps if no search object had been indicated before pressing the ENTER key.*

If the address of a particular contact or coil is not entered prior to pressing Enter, the search object becomes any contact, any contact of the specified type or any coil.

Searching For The Next Rung Containing The Same Contact or Coil:

After the first rung containing a particular contact or coil has been found, press the NEXT function key to find the next rung containing the same function.

If no other rungs containing the same function exist in the program, pressing the NEXT function key causes the programmer to beep and the message "Search object not found" is displayed.

6.2.4 SEARCH FOR RUNG CONTAINING A PARTICULAR TIMER OR COUNTER

When searching for a timer or counter, the REG function key must be used in the OFFLINE/LADDER/SEARCH mode. After pressing the REG function key different function keys are displayed on the bottom of the screen. The new function keys allow selection of a timer or counter. After selecting the register type, a number can be entered to specify which register to search for. If no number is entered, the search object becomes ANY register of that type. The ETC key changes back to the original function keys so that PRINT can be pressed.

After selecting the SEARCH mode, search for the first rung containing a particular timer register as follows:

1) Press the **REG** function key and then press the TMR function key. The function to be searched for is indicated in the bottom right corner of the screen.

2) Enter the number of the timer being searched and then press the ENTER key. The first rung containing the timer register is displayed in the lowest position of the program matrix. The first number next to the word Rung (below the program matrix) indicates the rung number containing the function.

Search for Next Rung Containing the Register:

After the first rung containing a specific counter or timer has been found, press the NEXT function key to find the next rung containing an associated function.

If no other rungs containing an associated function exist in the program, pressing the NEXT function key causes the message "Search object not found" to appear on the screen and the same rung to be displayed again.

6.3 Printing Selected Rungs or Search Objects

6.3.1 PRINTER UTILITY SCREEN SELECTIONS

After having followed the procedure in the preceding section to search for a particular rung or ladder element, it is possible to get printout of the searched object or rung. A function key displayed in the OFFLINE/LADDER/SEARCH mode is used to accomplish this.

For information about proper printer cabling and connection to the personal computer, see the printer bulletin provided with your specific printer.

Once the proper connections have been made (refer to Appendix E, Printer Setup and Print Operation), and before a printer may be used, it is necessary to have properly set printer utility parameters in the UTILITY mode. Refer to Section 2.2.6.

6.3.2 OPERATING PROCEDURE

After the printer parameters have been selected in the UTILITY mode, and a particular rung or rung element has been selected and displayed in the OFFLINE/LADDER/SEARCH screen, a printout of a ladder diagram may be generated by:

NOTE: *You must execute a search before selecting the PRINT function.*

1) Pressing the **PRINT [F8]** function key (instead of the ENTER key)

The screen should appear as shown in Figure 6–1.

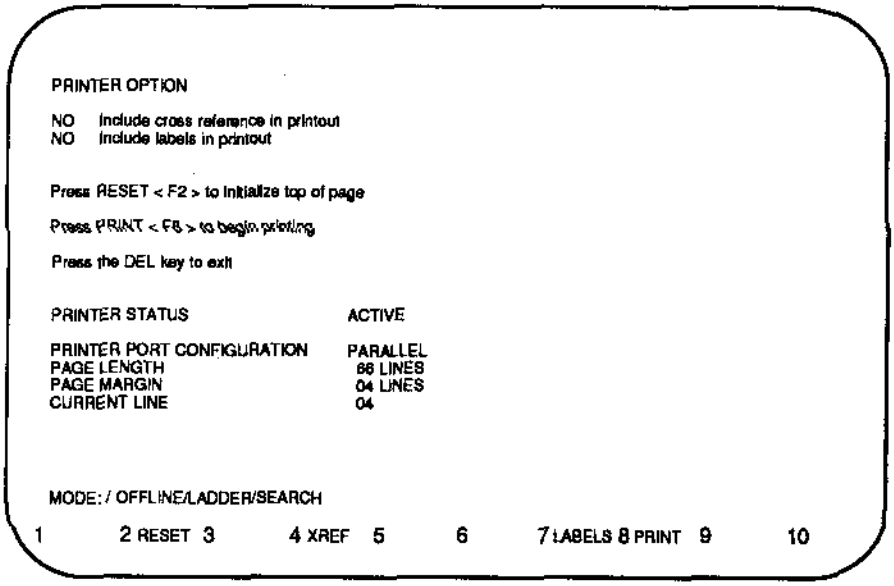


Figure 6–1 PRINT Screen

2) Press the **PRINT [F8]** function key again

Referring to Figure 6–1, the two options at the top of the page with "NO" in front of them are used to set the characteristics of the printout .

To generate a cross reference listing for the following rung elements to be printed immediately following the rung:

- Output Coil
- Internal Relay
- Timer output
- Counter output
- Shift register bit

1) Press the **XREF [F4]** function key to toggle the first entry to YES or NO.

NOTE: *Any logic that can be changed by the action of the rung is cross referenced.*

To printout all of the labels programmed for each of the rung elements above their address: (NOTE: This also causes comments to be printed.)

1) Press the **LABELS [F7]** function key to toggle the third entry to YES.

RESET [F2] – This resets the current printer page line to the current margin.

PRINT [F8] – This begins the printout (only if the printer is ACTIVE). The screen is replaced with a ladder grid, and each rung is displayed and printed in turn. The line that is currently being printed appears in reverse video on the screen.

If a rung number had previously been entered in the SEARCH mode, that rung and all the following rungs are printed. *If a search object was selected, all the rungs containing that* search object are printed. At any point, a printout of the entire screen contents can be printed by:

1) Pressing and holding the **SHIFT** key

2) Pressing the **PRTSC (Print Screen)** key

3) Press the **ESC** key to abort a printing operation

Figure 6–2 is an example printout showing both cross reference options and the labels option "enabled" (see Section 11 for a description of an XREF printout).

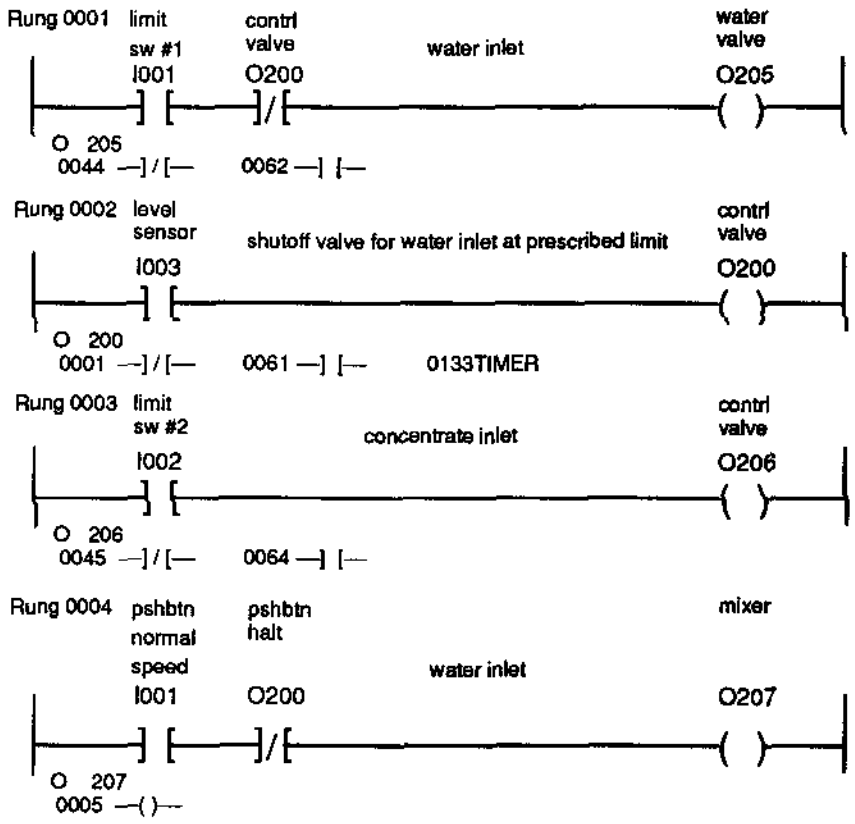


Figure 6–2 Example Printout of Labels and XREF Options

6.4 Delete

6.4.1 GENERAL DESCRIPTION

The DELETE mode is a subroutine of the LADDER mode. When used in the LADDER mode, DELETE can be used to clear a particular rung or a range of rungs from the ladder program. It may also be used to clear the entire ladder program.

When used in this manner, the operation is commonly referred to as a "CLEAR ALL". When clearing a particular rung from memory, the SEARCH mode should be used in conjunction with the DELETE mode to display the rung on the monitor before clearing it from memory.

6.4.2 DELETE A PARTICULAR RUNG FROM MEMORY

To delete a particular rung from memory, use the SEARCH mode to display the rung (to be deleted) on the screen. Be sure the rung to be deleted is in the bottom position of the SEARCH mode display, then press the ESC and DELETE function keys.

After these keys are pressed, the rung is displayed at the top of the screen and the prompting changes. The cursor moves to the rung number at the bottom of the screen indicating the number of the rung to be cleared. Press the LOAD function key twice to clear the rung from offline memory.

NOTE: *It is recommended that the user display the rung to be deleted (using the SEARCH mode) prior to performing the delete operation; however, a rung can be deleted from memory by selecting the delete mode, entering the rung number and pressing the LOAD function key twice.*

The following procedure shows how to delete a specific rung from offline memory.

1) Select the SEARCH mode (from the INITIAL mode) by pressing the OFFLINE, LADDER and SEARCH function keys. Once in the SEARCH mode, display the specific rung to be deleted on the screen by pressing the appropriate number and the ENTER key.

2) Select the DELETE mode from the SEARCH mode by pressing the ESC key and the DELETE key.

3) Delete the rung from memory by pressing the LOAD function key twice.

6.4.3 DELETE A SELECTED RANGE OF RUNGS FROM MEMORY

To delete a range of rungs from memory, use the following procedure.

1) Select the DELETE mode (from the INITIAL mode) by pressing the OFFLINE, LADDER, and DELETE function keys.

2) PRESS the RANGE function key. The line "DELETE FROM 0000 TO 0000" is displayed at the bottom center of the screen. This modifiable message indicates that the starting and ending rung number must be entered. The message "Enter range limits, then press LOAD" is displayed on the bottom of the screen, and all function keys except LOAD are erased.

3) Use the left and right arrows to move between the two number fields in the message on the screen. Enter the beginning and the ending rung number.

4) Press LOAD to delete the specified rungs.

6.4.4 DELETE THE LADDER PROGRAM

To clear the ladder program from the personal computer's offline memory, the following procedure should be used.

1) Select the DELETE mode (from the INITIAL mode) by pressing the **OFFLINE**, **LADDER**, and **DELETE** function keys.

2) Press the **CLRALL** function key.

3) Clear the ladder program by pressing the **LOAD** function key.

The result is cleared ladder program with the OFFLINE/ LADDER mode displayed on the screen.

6.4.5 WHEN THE PROGRAM CONTAINS UNDISPLAYABLE RUNGS

If the ladder contains undisplayable rungs, as might be the case if a transfer or disk load operation had just occurred, the function display shown at the bottom of the screen contains the following keys.

CLRALL – This function clears all ladder rungs (including undisplayable rungs) from the computer's offline memory. To use this function follow the procedure in Section 6.4.4.

UNDISP – This function key displays the message "Press LOAD to clear all rungs after rung N" (where N is the last displayable rung). Press the LOAD function after pressing UNDISP to clear only undisplayable rungs from the offline memory. Pressing DEL cancels the operation.

6.5 Insert and Replace

6.5.1 INSERT A RUNG AT A PARTICULAR POSITION IN MEMORY

The INSERT capability is available in the PROGRAM mode and allows a rung in any position in the control program to be inserted. When a rung is inserted at a particular location in memory, the rung at that position, along with the following rungs, are moved down to allow the insertion (the existing rung is not written over). Any rung to be inserted in the ladder program may be programmed directly and inserted or it may be searched and inserted. The steps listed next are for the program and insert method.

If the search and insert method is used, first search for the appropriate rung according to the directions in Section 6.2.2. Then enter the program mode by pressing ESC and PROGRM and continue with step 2.

To insert a rung, first select the OFFLINE/PROGRAM/INSERT mode of the software.

1) Select the OFFLINE/PROGRAM mode (from the INITIAL display) by pressing the OFFLINE, LADDER and PROGRAM function keys. The prompting at the bottom of the screen in the PROGRAM mode includes the word "INSERT".

2) Program the rung which is to be inserted in the ladder program by using the methods described in Section 5.2 "Ladder Diagram Programming," up to and including the coil and its address.

3) Press the INSERT function key. The screen display changes to show only one function key (LOAD). In addition, the words "RUNG NNNN" are displayed on the bottom center portion of the screen, where NNNN are the number of rungs presently in the ladder program or the number of the rung searched, if a search operation was performed in order to display the rung to be inserted in the program.

4) Press a rung number. This number selects the position for the searched or programmed rung in the control program. For example, if #7 is selected, then the rung is inserted in the ladder program as rung #7. The rung previously numbered 7 is moved down to position #8. No rungs are overwritten using this procedure.

5) Press the **LOAD** function key to complete the insert operation.

The personal computer automatically enters the SEARCH mode and the rung being displayed with the selected rung number. This allows easy viewing of the new rung.

6.5.2 REPLACING A RUNG WITH ANOTHER RUNG

The REPLACE capability is available in the PROGRAM mode and allows changing an existing rung in memory. When replacing a rung with another, the new rung can be totally new or it can be a reconfiguration of the original rung (in either case, the original rung is written over by the new rung).

Replace a Rung with a New Rung:

Use the following steps to replace a rung with a new rung:

1) Select the OFFLINE/PROGRAM mode (from the INITIAL display) by pressing the **OFFLINE**, **LADDER** and **PROGRAM** function keys. The prompting at the bottom of the screen includes the word "REPLACE".

2) Program the rung according to the programming procedure in section 5.2 "Ladder Diagram Programming," up to and including the coil and it address.

3) Replace any previously programmed rung number with the currently programmed rung by first pressing the **REPLACE** function key. The cursor moves to the rung number at the bottom center of the screen. Enter the rung number to be replaced.

4) Press the **LOAD** function key to complete the replace operation. The original rung is written over by the new rung.

Replacing a Rung with a Reconfiguration of the Original

The procedure for reconfiguring an existing rung is to first search for the rung using the SEARCH subroutine. The original rung is now displayed on the screen. The prompting at the bottom of the screen provides the capability to change and replace the rung.

1) Select the SEARCH mode (from the INITIAL mode) and search for the rung to be reconfigured according to the procedures in Section 6.2.2.

2) Switch to the PROGRAM mode by pressing the **ESC** key and the **PROGRAM** function key.

3) Make the changes to the displayed rung using the programming procedures and rules in Section 5.1.

4) Press the **REPLACE** function key to indicate that the currently configured rung is to replace a previously programmed rung. The cursor moves to the rung number at the bottom center of the screen. Enter the number which the rung is to be loaded into memory as.

5) Press the **LOAD** function key to complete the replace operation. The original rung is written over by the new rung.

6.6 Display

6.6.1 GENERAL DESCRIPTION

The DISPLAY function is provided in the OFFLINE/LADDER/ SEARCH and PROGRAM modes. When the DISPLAY function is pressed, the state of any contact or coil shown on the screen is indicated.

In order to use the DISPLAY function correctly, the personal computer's offline memory must contain the same control program as the MICRO–1 processor (see warning below) . Transfer the offline program to the MICRO–1 processor or transfer the MICRO–1 control program into offline memory before pressing DISPLY. Section 7 describes transfer operations. Once this has been done the state of any contact or coil in the MICRO–1 control program can be shown since the personal computer is connected to the MICRO–1 processor and its associated inputs and outputs.

Contacts and coils are shown with the appropriate prefix in front of the addresses, as follows:

I – Input
O – Output (or contact of external output)
R – Internal relay equivalent
T – Timer
C – Counter
S – Shift register bit

In addition to the I/O prefixes, the data within the registers shown on the screen are also indicated using the DISPLAY operation.

Once the offline ladder has been transferred to the MICRO–1 processor, in order to use the DISPLAY mode, first use the SEARCH or PROGRAM modes to show any desired rung(s) on the screen. Next, press DISPLY.

WARNING

Make absolutely sure that the same control program exists in the MICRO–1 processor and offline memory when using the DISPLAY function. If different control programs with similarly numbered contacts and coils exist, the display you see on the monitor screen may *not reflect actual output conditions, and personal injury may result* from unanticipated output actuation.

Application Considerations

1. Timer and counter preset data cannot be displayed.

2. Coils are highlighted on the screen display when they become energized.

3. Normally open contacts are shown in reverse video on the screen display when their associated bit is equal to 1.

4. Normally closed contacts are shown in reverse video on the screen display when their associated bit is equal to 0.

MEMORY TRANSFER AND DISK OPERATIONS

7

7.1 Transfer Mode

The memory transfer mode allows ladder rungs and function settings to be transferred from the personal computer's OFFLINE memory to the MICRO–1 processor memory and vice versa. Only complete ladder diagrams may be transferred. It is not possible to transfer selected ladder rungs. After a transfer operation takes place, the transferred control program will exist both in the processor and in offline memory.

NOTE: *Although up to 16K words can be programmed in offline memory the MICRO–1 memory will not support a program this large. The MICRO–1 memory capacity is at least 600 steps. It is important to keep this in mind when creating a ladder program in the offline mode which will later be transferred to the memory.*

Before beginning any transfer operation, all functions settings must be complete. See Sections 1 and 4 for an explanation of cable connections (1) and an explanation of how to set internal functions (4).

7.1.1 HOW TO TRANSFER LADDER RUNGS

This section contains a step by step procedure showing how to transfer a complete ladder diagram program from offline memory to the MICRO–1 memory or vice versa.

STEP 1 – Call up the OFFLINE/TRANSFER screen by pressing the following keys from the Initial display:

1) Press the **OFFLINE [F2]** function key

2) Press the **TRANSF [F7]** function key

The screen should appear as shown in Figure 7–1.

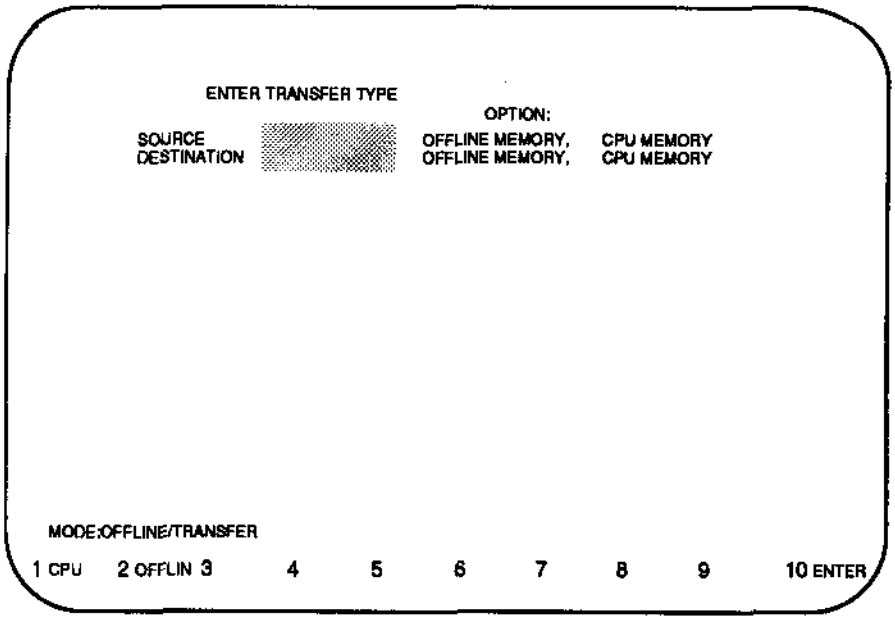


Figure 7–1 OFFLINE/TRANSFER Mode

STEP 2 - Indicate the source of the transfer operation. If you are transferring from offline memory to the MICRO-1 memory, press OFFLIN. If you are transferring from the memory to the computer's offline memory, press CPU. Your selection will appear on the screen display in the box to the right of the source label.

STEP 3 - After having indicated the source, the software will automatically enter the destination.

STEP 4 - Finally, press ENTER to begin the transfer process.

1) Press the **ENTER** key

CAUTION

Since it is possible to create a program in offline memory which is actually greater than the true size of the MICRO-1 controller's memory, it is important to verify the size of the offline program before transferring it to the controller. If too large a program is transferred, an error will occur causing the processor to be halted. A program of valid size must be loaded to clear the error.

7.2 Disk Mode

The DISK mode allows the user to record ladder programs and register data on disk and later load the information from disk into memory. Ladder programs can be recorded from and loaded into OFFLINE memory. Register data can be recorded from and loaded into the processor.

NOTE: *It is imperative that good documentation identifying the files contained on a disk be kept on the disk label. This practice will help prevent you from accidentally loading the wrong control program into a processor.*

NOTE: *Names given to a disk file cannot contain DOS reserved words (i.e. AUX, CON, PRN, NULL etc.). Also, do not use the following characters in the filename:.* " / \ [ ] : < > + ; , or [space] The name given to a disk file can *include the drive specification and path. See Section 2.1.1 for more information.*

File format is defined by the MS–DOS operating system.

Before performing any disk operation, you must first enter one of the two disk modes and then select the disk drive which is to be used. The following sections describe selection of the disk mode and selection of the disk drive.

7.2.1 SELECTING THE DISK MODE

The two disk modes available are the ONLINE/DISK mode and the OFFLINE/DISK mode. The ONLINE/DISK mode must be selected when when you wish to record from or load register data into the processor memory. The OFFLINE/DISK mode must be selected when you wish to load or record the entire control program from the personal computer's offline memory. The following keystrokes demonstrate how the two disk modes are selected from the INITIAL display.

1) Press the **OFFLN [F2]** key

2) Press the **DISK [F5]** key

-OR-

1) Press the **ONLINE [F1]** key

2) *Press the **DISK [F5]** key*

The result will be either the OFFLINE/DISK mode or the ONLINE/DISK mode. Figure 7-2 illustrates the OFFLINE/DISK mode. The ONLINE/DISK mode will look similar except for the 23rd line which will display "ONLINE" instead of "OFFLINE".

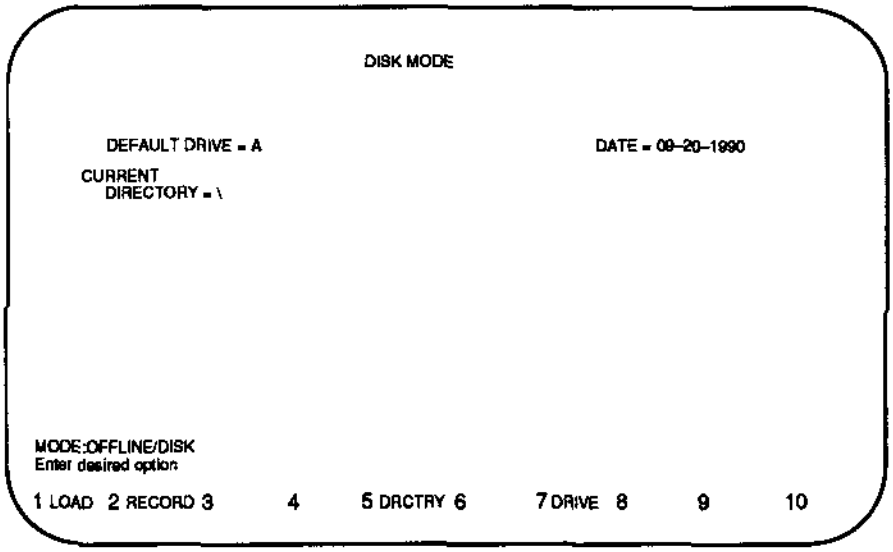


Figure 7-2 OFFLINE/DISK Display

7.2.2 SELECTING THE DISK DRIVE

Selection of the disk drive that you will use for your disk load and record operations is the same whether you are offline or online. The procedure necessary to make your selection is given in this section. After entering the OFFLINE or ONLINE DISK modes, you must select the disk drive that will be used for all disk operations. The following keystrokes demonstrate this selection.

The DRIVE function key is pressed to select the disk drive.

1) Press the **DRIVE [F7]** key

The result will be:

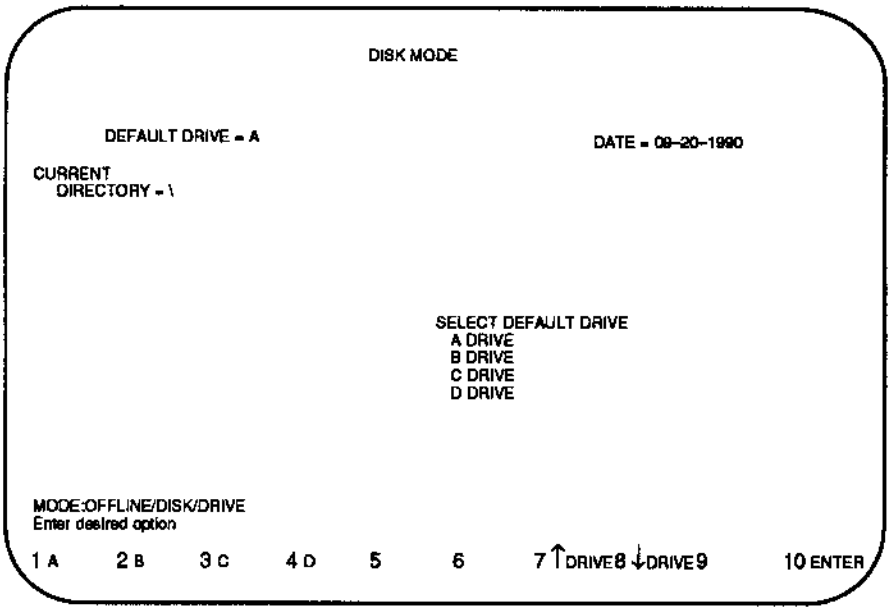


Figure 7–3 OFFLINE/DISK/DRIVE Display

NOTE: *After entering the DISK/DRIVE mode, the current disk drive is automatically selected. Thus, the following keystrokes are only necessary if a drive other than the current drive is used.*

Use one of four function keys to select drive A, B, C, or D or use the DRIVE or DRIVE function keys to position the cursor on the drive selection for your use; then press the ENTER function key.

NOTE: *Instead of using the A, B, C or D function keys to select the disk drive, it is possible to use the cursor keys, space bar, and A, B, C, D letter keys to select the disk drive.*

7.2.3 USING THE DIRECTORY

The directory operation allows you to display information on the screen about the files on the disk. The directory operation can be performed from either the ONLINE or OFFLINE/DISK mode. The following step–by–step procedure describes the directory operation.

STEP 1 – Insert the disk into a disk drive.

STEP 2 – Select either the ONLINE or OFFLINE disk mode.

STEP 3 – Use one of the methods described in the previous section to choose then drive; then press the ENTER function key.

STEP 4 – Press the DRCTRY (directory) **[F5]** function key.

Shown following is a typical screen display after following the steps listed above.

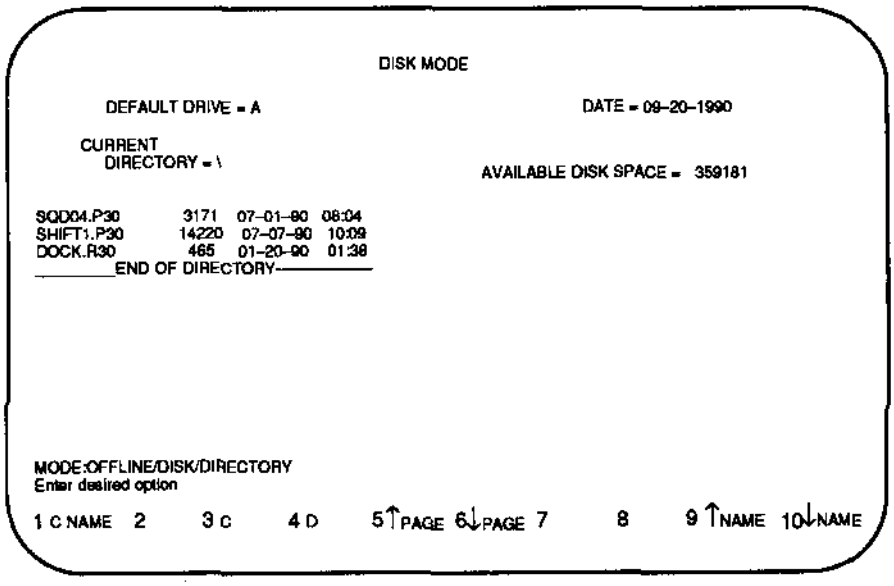


Figure 7–4 OFFLINE/DISK/DIRECTORY Display

The information contained on the screen is described as it appears in column form from left to right.

Column 1: This is the file name and the type of file. There are three different types of files which may be listed here; they are:

.P30 – This indicates a ladder file.
.R30 – This indicates a register file.
.L30 – This indicates a label file.

Column 2: This column indicates the size of the program in number of bytes.

Column 3: This is the date the recording transaction occurred.

Column 4: This is the time of day the recording occurred.

Using the ↑NAME or ↓NAME function keys or the arrow cursor keys in the DIRECTORY display allows you to highlight the desired file name. Doing this causes the highlighted file to automatically appear in the file name box on a subsequent LOAD or RECORD screen display. This expedites the LOAD or RECORD procedure since you then do not have to type in the desired file name.

The C NAME function key is used to clear an indicated file name selection from the directory display. The file is retained in the directory, only the highlighting is removed.

The ↑PAGE and ↓PAGE function keys display the previous or next screen of file names.

7.2.4 RECORD INHIBIT

When attempting to record files on a floppy disk, make sure to follow these simple precautions for the particular size disk you are using or else all record operations will be inhibited.

For Users Of 5 1/4 Inch Disks:

Remove the write–protect tab that may be covering the write–protect notch on the upper right corner of the disk. Covering this notch on a 5 1/4 inch disk prevents data from being written to the disk and only allows data to be read from it.

For Users Of 3 1/2 Inch Disks:

Make sure that the write–protect tab, a small movable square in the corner of the disk, is covering the write–protect opening. Unless this opening is covered on a 3 1/2 inch disk, all record operations will be inhibited and data is prevented from being written to the disk.

7.2.5 RECORDING AND LOADING LADDER FILES

The recording and loading of rungs can be accomplished in the OFFLINE disk mode only. This section describes the step–by–step procedure for these disk operations.

NOTE: *The PROGRAM security level must be selected from the SECURE mode (Section 2.4) in order to RECORD or LOAD ladder files to/from a floppy disk..*

Recording Ladder Files onto a Disk from the Offline Memory

The following procedure will record the entire control program contained in the personal computer's offline memory onto a floppy disk. This will include the function values if they had been specified in the FUNCTION mode of the software.

STEP 1 – Select the PROGRAM security level in the SECURE mode as described in Section 2.4.

STEP 2 – Insert the disk into a disk drive. Make sure the write protect notch on the disk is not covered by a write protect tab.

STEP 3 – Select the OFFLINE/DISK mode to record the ladder program from the offline memory onto a disk.

STEP 4 – Press the RECORD function key and then select the PROGRM function key.

STEP 5 – The next step is to assign a file name to the ladder file. Any combination of up to eight alphanumeric characters can be used for the file name.

NOTE: *If the file name already exists on the disk, the system will ask if the file should be replaced. An answer of "Y" or "1" will record over the original information associated with that file name. See Section 7.2 for a description of legal file names.*

STEP 6 – Now press the ENTER function key to start the recording operation. The message "OPERATION PENDING" will be displayed. This message will disappear upon completion of the operation.

This procedure will cause the entire control program contained in the computers offline memory to be recorded to the floppy disk.

NOTE: *A filename may contain the DOS path description, i.e. (DRIVE:\path\filename). See Section. 2.1.1 for more information.*

Loading Ladder Files from a Disk into Offline Memory

The following procedure describes how to load a ladder program from a disk file into OFFLINE memory. Function values will also be loaded if they were previously recorded to the specified file.

STEP 1 – Select the PROGRAM security level in the SECURE mode as described in Section 2.4.

STEP 2 – Insert the disk containing the ladder files.

STEP 3 – Select the OFFLINE/DISK mode and then select the drive which you are using for your ladder file according to the procedure in Section 7.2.1.

STEP 4 – From the OFFLINE/DISK mode now press the LOAD and the PROGRM function keys.

STEP 5 – The next step is to specify which file on the disk is to be loaded into memory. The prompt displayed at the bottom of the screen will show "Enter desired option". If the file name is unknown, use the ESC key to return to the OFFLINE/DISK mode. Then use the DRCTRY (Directory) key to obtain a list of file names. You may either highlight the selected file in the directory display in which case it will automatically appear in the file name field, or you may type in the file name.

STEP 6 – Press the LOAD function key (or the ENTER key). While the loading process is taking place the message "OPERATION PENDING" will be displayed at the bottom of the screen. After the load is completed, the screen will again display the OFFLINE/DISK/LOAD mode. You may exit this mode by pressing ESC.

This procedure will cause the contents of the personal computer's offline memory to be replaced with the contents of the ladder file selected in the LOAD operation.

NOTE: *A filename may contain the DOS path description, i.e. (DRIVE:\path\filename). See Section 2.1.1 for more information.*

Appending Ladder Files

The following procedure describes how to append (add to) the rungs currently in the computer's offline memory. This is done by attaching a disk file to the offline memory. After this procedure, the rungs contained in the disk file will immediately follow those currently held in offline memory.

STEP 1 – Select the PROGRAM security level in the SECURE mode as described in Section 2.4.

STEP 2 – Insert the disk containing the ladder files.

STEP 3 – Select the OFFLINE/DISK mode and then select the drive which you are using for your rung file disk according to the procedure in Section 7.2.1 and 7.2.2.

STEP 4 – From the OFFLINE/DISK mode now press the LOAD and the PROGRM function keys.

STEP 5 – The next step is to specify which file on the disk is to be loaded into memory. The prompt displayed at the bottom of the screen will show "Enter desired option". If the file name is unknown, use the ESC key to return to the OFFLINE/DISK mode. Then use the DRCTRY (Directory) function key to obtain a list of file names. You may either highlight the selected file in the directory display in which case it will automatically appear in the file name field, or you may type in the file name.

STEP 6 – Press the APPEND function key. While the APPEND process is taking place the message "OPERATION PENDING" will be displayed at the bottom of the screen. After the APPEND is completed, the screen will again display the OFFLINE/DISK/LOAD mode. You may exit this mode by pressing ESC.

This procedure will cause the contents of the ladder file selected from the disk to be added to the ladder contained in the personal computer's offline memory.

NOTE: *A filename may contain the DOS path description, i.e. (DRIVE:\path\filename). See Section. 2.1.1 for more information.*

7.2.6 RECORDING AND LOADING REGISTER DATA

The recording and loading of register data can only be accomplished in the ONLINE/DISK mode. This section describes the step–by–step procedure for these disk operations.

NOTE: *The PROGRAM security level must be selected from the SECURE mode (Section 2.4) in order to RECORD or LOAD register data to/from a floppy disk.*

Recording Register Data

STEP 1 – Select the PROGRAM function from the SECURE mode, as described in Section 2.4.

STEP 2 – Insert the disk into a disk drive. Make sure the write protect notch on the disk is covered by a write protect tab.

STEP 3 – Select the ONLINE/DISK mode and then select the disk drive according to the procedure in Section 7.2.1 and 7.2.2.

STEP 4 – From the ONLINE/DISK mode now press the RECORD and the REGS function keys.

STEP 5 – The next step is to assign a file name to the register file. Any combination of up to eight alphanumeric characters can be used for the file name.

NOTE: *If the file name already exists on the disk, the system will ask if the file should be replaced. An answer of "Y" or "1" will record over the original information associated with that file name. See Section 7.2 for a description of legal file names.*

STEP 6 – Next, define exactly which registers you wish to record to the disk. To do this, cursor to the appropriate field (use the ↑FIELD or ↓FIELD function keys to do this or use the arrow keys on the numeric keyboard) and type in the numbers of the first and last register which define the range you wish to record. You may also select ALL from the function keys at the bottom of the screen display to transfer all the registers to the disk. Selecting ALL will write "713" to the LAST REG field on the screen display.

STEP 7 – Finally press LOAD to begin the record process. The register numbers are printed at the bottom of the screen display as they are transferred.

NOTE: *A filename may contain the DOS path description, i.e. (DRIVE:\path\filename). See Section. 2.1.1 for more information.*

Press the ESC key to exit the RECORD mode after the operation completes.

Loading Register Data

STEP 1 – Select the PROGRAM security level in the SECURE mode as described in Section 2.4.

STEP 2 – Insert the register file disk into a disk drive.

STEP 3 – Select the ONLINE/DISK mode and then select the drive which you are using for your register file disk according to the procedure in Section 7.2.1 and 7.2.2.

STEP 4 – From the ONLINE/DISK mode now press the LOAD and the REGS function keys.

STEP 5 – The next step is to specify which file on the disk is to be transferred to the processor memory. The prompt displayed at the bottom of the screen will show "Enter desired option". If the file name is unknown, use the ESC key to return to the OFFLINE/DISK mode. Then use the DRCTRY (Directory) function key to obtain a list of file names. You may either highlight the selected file in the directory display, in which case it will automatically appear in the file name field, or you may type in the file name.

STEP 6 – Finally press the LOAD function key. The words "OPERATION PENDING" will be shown at the bottom of the screen display while the LOAD operation is taking place. To exit the ONLINE/DISK/LOAD screen after the procedure has ended press the ESC key.

This procedure will transfer register data from a disk into the MICRO–1 processor.

NOTE: *A filename may contain the DOS path description, i.e. (DRIVE:\path\filename). See Section. 2.1.1 for more information.*

7.2.7 RECORDING AND LOADING LABELS

The recording and loading of register labels can only be accomplished in the OFFLINE/DISK mode. This section describes the step–by–step procedure for these disk operations.

NOTE: *The PROGRAM security level must be selected from the INIT/SECURE mode (Section 2.4) in order to RECORD or LOAD labels to/from a floppy disk.*

Recording Labels

STEP 1 – Select the PROGRAM function from the SECURE mode, as described in Section 2.4.

STEP 2 – Insert the disk into a disk drive. Make sure the write protect notch on the disk is covered by a write protect tab.

STEP 3 – Select the OFFLINE/DISK mode and then select the drive which you are using for your formatted disk according to the procedure in Section 7.2.1 and 7.2.2.

STEP 4 – From the OFFLINE/DISK mode now press the RECORD and the LABELS function keys.

STEP 5 – The next step is to assign a file name to the label file. Any combination of up to eight alphanumeric characters can be used for the file name.

NOTE: *If the file name already exists on the disk, the system will ask if the file should be replaced. An answer of "Y" or "1" will record over the original information associated with that file name. See Section 7.2 for a description of legal file names.*

STEP 6 – Finally press LOAD to begin the record process.

Press the ESC key to exit the RECORD mode after the operation completes.

Loading Labels

STEP 1 – Select the PROGRAM security level in the SECURE mode as described in Section 2.4.

STEP 2 – Insert the label file into a disk drive.

STEP 3 – Select the OFFLINE/DISK mode and then select the drive which you are using for your label file disk according to the procedure in Section 7.2.1 and 7.2.2.

STEP 4 – From the OFFLINE/DISK mode now press the LOAD and the LABELS function keys.

STEP 5 – The next step is to specify the name of the label file. The prompt displayed at the bottom of the screen will show "Enter desired option". If the file name is unknown, use the ESC key to return to the OFFLINE/DISK mode. Then use the DRCTRY (Directory) function key to obtain a list of file names. You may either highlight the selected file in the directory display, in which case it will automatically appear in the file name field, or you may type in the file name.

STEP 6– Finally press the LOAD function key. The words "OPERATION PENDING" will be shown at the bottom of the screen display while the LOAD operation is taking place. To exit the OFFLINE/DISK/LOAD screen after the procedure has ended press the ESC key.

This procedure will transfer labels from a disk into offline memory.

Appending Labels

The following procedure describes how to append (add to) the labels currently in the computer's offline memory. This is done by attaching a disk file to the offline memory. After this procedure, the labels contained in the disk file will immediately follow those currently held in offline memory.

STEP 1– Select the PROGRAM security level in the SECURE mode as described in Section 2.4.

STEP 2– Insert the label disk into a disk drive.

STEP 3– Select the OFFLINE/DISK mode and then select the drive which you are using for your label disk according to the procedure in Sections 7.2.1 and 7.2.2.

STEP 4– From the OFFLINE/DISK mode now press the LOAD and the LABELS function keys.

STEP 5– The next step is to specify which file on the disk is to be loaded into memory. The prompt displayed at the bottom of the screen will show "Enter desired option". If the file name is unknown, use the ESC key to return to the OFFLINE disk mode. Then use the DRCTRY (Directory) function key to obtain a list of file names. You may either highlight the selected file in the directory display in which case it will automatically appear in the file name field, or you may type in the file name.

STEP 6– Press the APPEND function key. While the APPEND process is taking place the message "OPERATION PENDING" will be displayed at the bottom of the screen. After the APPEND is completed, the screen will again display the OFFLINE/DISK/LOAD mode. You may exit this mode by pressing ESC.

This procedure will cause the contents of the label file selected from the disk to be merged with the labels contained in the personal computer's offline memory.

NOTE: *A filename may contain the DOS path description. For example, DRIVE:\path\filename. See Section 2.1.1 for more information.*

7.2.8 PROCESSOR DISK OPERATIONS OVER A MICRO–1 RING NETWORK

The register LOAD and RECORD operations previously described may also be done over the network providing the proper communications cabling is in place (Section 1.3) and if the proper drop assignment is indicated in the UTILITY mode of your software (Section 2.2).

To halt a remote MICRO–1 processor select the ONLINE/STATUS display and press the H/R function key. The Halted state of the processor will be indicated on the screen display. You may also use the DATA mode to halt the processor. See Section 8.0.

DATA ENTER 8

8.1 Introduction

From the ONLINE/DATA mode you can view and continuously display dynamic register and I/O data. You may also modify I/O data. You are, however, restricted from changing, timer values and counter accumulated values. When changing I/O contents, the data can be entered in bit format. When changing the preset value of timers or counters, the data can be entered in decimal, hexadecimal or binary numbers. When monitoring timer and counter registers, the decimal, hexadecimal, and binary values are displayed concurrently on the screen and are updated continuously. All registers placed on the screen will be remembered the next time the DATA screen is re–entered.

8.2 Mode Selection and Description of Function Keys

The DATA mode is selected from the INITIAL mode by pressing the ONLINE and DATA function keys.

The screen should appear as shown in Figure 8–1.

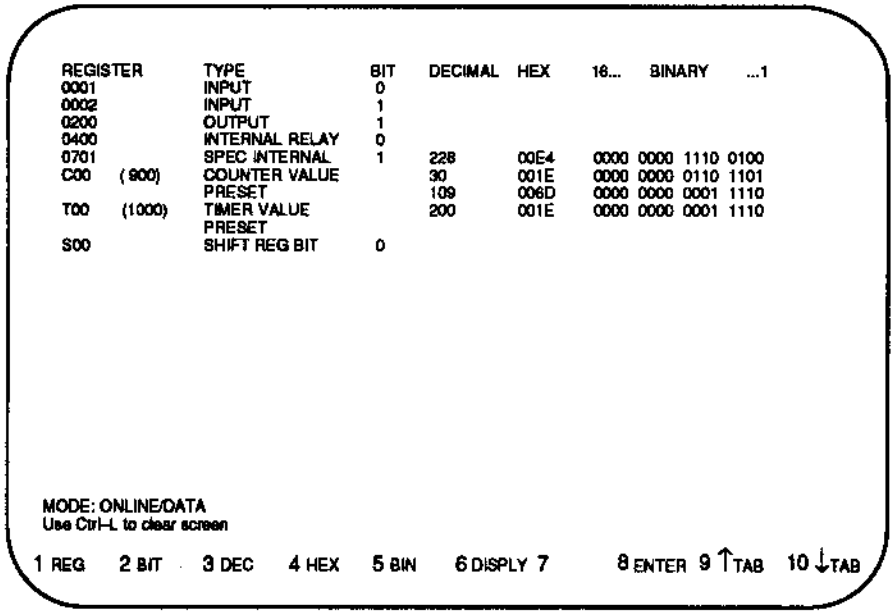


Figure 8–1 ONLINE/DATA Display

The REGISTER column displays the register number.

The TYPE column displays the register type (i.e. INPUT, OUTPUT, INTERNAL RELAY, TIMER VALUE, TIMER PRESET, etc.).

The four fields to the right of the TYPE column (BIT, DECIMAL, HEX and BINARY) display the register value in the appropriate form; fields that do not apply to a particular type of register are left blank for that register. Any fields that have been modified by the user flash on and off. Once the data has been sent to the processor by pressing the ENTER function key, those fields are once again displayed in the normal mode.

NOTE: *The upper two bits of the binary field also contain counter or timer status information.*

Timer values and counter accumulated values cannot be modified. If you press one of the data–modification keys while in one of these lines, the bell will sound.

When first entering the ONLINE/DATA screen, the cursor is at the left edge of the screen in the first line. It can be moved with the up and down arrow keys to a desired line, where the REG function key can be pressed to enter a register number to be displayed. The keyboard Enter key will always position the cursor at the beginning of the next line (whether or not there is a register number displayed there).
A description of the DATA mode function keys follows:

REG – The REG (register) function key selects an I/O point or register number to display. Once you select a register type and fill in the register number, the register type and numeric data will be displayed when one of the data–entry keys or the DISPLAY key is pressed. The data entry keys will cause the register data to be read from the processor and displayed on the screen before you can enter a new value. When a counter register or timer register is selected, the corresponding allocation number will be displayed in parentheses after the register number.

When a counter or timer is selected, two lines will be displayed; the first for the current value (this field cannot be modified), and the second for the preset.

The following function keys are displayed when the REG function key is pressed:

I/O/R – Changes the register to a normal I/O point, where the register number determines its type (input, output, internal relay, or special internal relay). This is the default if no function key is pressed.

CTR – Changes the register to a counter register and displays the number as "C00".

TMR – Changes the register to a timer register and displays the number as "T00".

SFR – Changes the register to a shift register bit and displays the number as "S000".

BIT – This function key moves the cursor to the BIT field of the current line and allows bit data (0 or 1, where 0=OFF and 1=ON) to be entered; if there is no BIT field in the current line, the bell sounds and the cursor does not move. The up and down arrow keys can be used to move to other lines that have a modifiable BIT field.

DEC – The DEC (decimal) function key moves the cursor to the DECIMAL field of the current line and is used to enter decimal values. If there is no DECIMAL field in the current line, the bell sounds and the cursor does not move. The range of valid values is 0000–9999. The up and down arrow keys can be used to move to other lines that have a modifiable DECIMAL field.

HEX – The HEX (hexadecimal) function key is used to enter hexadecimal values. Pressing this function key will automatically position the cursor in the HEX column of the monitor so data can be entered. If there is no HEX field in the current line, the bell sounds and the cursor does not move. The range of valid values is 0000–270F (270F HEX = 9999 DEC). The up and down arrow keys can be used to move to other lines that have a modifiable HEX field.

BIN – The BIN function key is used to enter binary values. Pressing this function key will automatically position the cursor in the BINARY column of the monitor so data can be entered. If there is no BINARY field in the current line, the bell sounds and the cursor does not move. The range of valid values is 0–1, and the largest number that can be programmed is 9999 (hexadecimal 270F). The left and right arrow keys can be used to move within the 16 binary fields for one register, and the up and down arrow keys can be used to move to other lines that have modifiable BINARY fields.

DISPLY – The DISPLAY mode is a subset of the DATA mode which provides the capability of dynamically displaying the status of I/O groups, internal relay equivalent groups, and registers in any combination of up to 21 addresses. The DISPLY function key is used to enter and exit the display mode. The first time the DISPLY function key is pressed, the system software will enter the display mode and will display the changing contents of all register addresses which appear on the screen. Pressing the DISPLY function key again will cause the system software to exit the display mode. Pressing ESC cancels the display mode and returns to the previous screen (ONLINE/STATUS).

ENTER – The ENTER function key is used to store any modified register data to the processor. Pressing this key returns modified fields to normal video (the keyboard *ENTER key does not have the same effect). If a special internal relay has been* modified, and since these relays control aspects of the processor's operation, the message "SPECIAL INTERNAL RELAY ––2nd ENTER <F8> REQUIRED" will be displayed on the 24th line of the screen. In addition, the following function keys will be displayed:

NO CHG – The current register is not modified, and its value is re–read from the *processor.*

ABORT – This cancels the store operation for this register and all following registers on the screen. Modified registers that were not sent to the processor remain flashing.

ENTER – Pressing this function key will store the new value to the processor, and the program will continue with the next register.

↑TAB OR ↓TAB – The TAB function keys are used to move the cursor down one line in the register address column and will automatically enter the descending register address number (within the limits of the MICRO–1 controller's register numbering scheme). If the current line has no register number when this function key is pressed, the cursor moves down to the next line but no register number is displayed.

KEYPAD ARROW KEYS – are used to move the cursor from one data field to another, but only in the type of data field currently selected. For example, if the HEX data field is being edited (by pressing the HEX function key), the left arrow key will not move the cursor to the decimal field, and the right arrow key will not move to the binary field (although the up and down arrow keys will move the cursor to the next register in the appropriate direction with the same data field displayed).

The terminal bell will sound if any invalid arrow movement is attempted. If no data fields are being modified, the cursor will be located at the beginning of the current line. It may be moved up or down to any desired line by the arrow keys; the main keyboard Enter key also moves the cursor down one line. Pressing the DEL key when the cursor is positioned at the beginning of a line will cause the register on that line to be removed from the screen; the line will be left blank (the following registers will not move up one line).

Registers placed on the screen will be remembered the next time the DATA screen is entered.

NOTE: *By using the AUTO function (Section 2.8), the selected DATA screen will be remembered each time the software is loaded.*

8.3 Entering Data

8.3.1 INTRODUCTION

The data enter ability allows data to be entered into processor registers single MICRO–1 processor from the keyboard. Data can be entered into the register in decimal, hexadecimal, or binary format. Data may be read and displayed while the SECURE mode is in the MONITOR mode, however, data may only be written to processor registers if the SECURE mode is in the DATA ENTER or PROGRAM modes.

Writing data to special internal relays 701–704, 713 requires that the PROGRAM security mode of your software is selected. It is not possible to write data to Special Internal relays 600–697 and 705–712; these are READ ONLY. Note that some of these registers are for future use or not used and should not be modified.

NOTE: *Timer values and counter values cannot be modified. These registers may only be monitored using the DISPLAY function.*

Displaying and Entering Data in a Single Register

Data contained in timers or counters may be displayed and monitored. Also, data may be entered into a timer or counter preset, or the state of an I/O, shift register bit, or (special) internal relay may be set ON or OFF. The procedure listed next is a basic step by step approach to performing any of these operations.

STEP 1 – Select the DATA ENTER function from the SECURE mode if you plan to enter or modify data. If you plan only to read or display data you may continue to do so in the MONITOR security level; proceed to step 2.

STEP 2 – Select the ONLINE/DATA mode.

STEP 3 – Press the REG function key. Next, press the function key which defines the type of register (this may be I/O/R, CTR, TMR or SFR) and then enter the register address number.

STEP 4 – Now press the DISPLAY function key for the current data to display on the monitor screen. The DISPLAY function key flashes on and off while in this mode. If you wish to modify current values (presets, I/O/R or shift register bit), go to step 5, otherwise press ESC to cancel the display mode and return to the ONLINE /STATUS screen after getting the data information you need.

STEP 5 – If you wish to modify the currently displayed values (presets, I/O/R, or shift register bits only), press DISPLAY again to return to the normal data–entry function of the DISPLAY screen. Now press the BIT, DECIMAL, HEX or BINARY function key in order to move the cursor to the column in which you wish to enter or modify data, and enter the appropriate data. To enter a binary number, use the cursor keys to position the cursor under the bit to be changed. Then press the 1 or 0 key to change the bit. Recently modified data will continue to flash on the screen until it is entered into the processor.

STEP 6 – Finally, press the ENTER function key.

STEP 7 – To verify that the values have been entered properly depress the DISPLY function key.

NOTE: *When a counter or timer is selected at step 3, two lines will be displayed. The first line will show the current value of the counter or timer and may not be modified. The second line will indicate the preset value. Only the preset value may be modified.*

Data Operations with Multiple Registers

You may monitor several registers or I/O points at a single time or enter multiple values into *various presets, I/O locations or shift register bits simultaneously.* The *following procedure* demonstrates this technique.

STEP 1 – Select the DATA ENTER function from the SECURE mode if you plan to enter or modify data. If you plan only to monitor data you may continue to do so in the MONITOR security level; proceed to step 2.

STEP 2 – Select the ONLINE/DATA mode.

STEP 3 – Press the REG function key. Next, press the function key which defines the type of register (this may be I/O/R, CTR, TMR or SFR) and then enter the register address number for the first register in the sequence you wish to display. Now depress the ↑TAB or ↓TAB function key to automatically enter successive register addresses which are greater than or less than the register address entered. For example, to display input registers 0 through 7, press 0 and then press ↓TAB (7 times) *until* input registers *0–7* are *listed in the left column of the screen display.* You may also press 7 and then press ↑TAB (7 times) to get the same input registers.

To display registers which are not successive, first press the number of the first register in the list, then press ↓TAB. Next press REG followed by the function key *necessary to define the type of register and finally type the number of the register* address which is next in the list of registers you wish to display. Continue in this *manner* until all the registers you wish to display are indicated on the screen.

STEP 4 – Press the DISPLAY function key for the current data to display on the monitor screen. The DISPLAY function key flashes on and off while in this mode. If you wish to modify current values (presets, I/O/R or shift register bits only), go to step 5, otherwise press ESC to cancel the display mode and return to the ONLINE /STATUS screen after getting the data information you need.

STEP 5 – If you wish to modify any of the currently displayed values (presets, I/O or shift register bits only), press DISPLAY again to return to the normal data–entry function of the DISPLAY screen. Now press the BIT, DEC (Decimal), HEX (Hexadecimal) or BIN (Binary) function key in order to move the cursor to the column in which you wish to enter or modify data, and enter the appropriate data. You may cursor up or down within any selected column in order to modify the values for the other registers in your screen display. The keyboard Enter key will always position the cursor at the beginning of the next line (whether or not there is a register number displayed there). Remember that flashing entries have not yet been entered into the processor's memory.

STEP 6 – Finally, press the ENTER function key.

STEP 7 – To verify that the values have been entered properly depress the DISPLY function key.

NOTE: *When a counter or timer is selected at step 3, two lines will be displayed. The first line will show the current value of the counter or timer and may not be modified. The second line will indicate the preset value. Only the preset value may be modified.*

The rate at which the screen information is updated is dependent on the number of registers being displayed at a given time. The fewer the number of items being displayed, the faster the screen information is updated.

USING THE SYMBOL FUNCTION 9

9.1 Introduction

The SYMBOL function provides a convenient method of obtaining an intermediate code printout (PR3 Program Loader instructions) of the entire ladder program or a part of the ladder program in the personal computer's offline memory. The printout shows the program loader instructions which would be used if the program (or a part of the program) contained in the offline memory were to be loaded into EEPROM memory using the PR3 Program Loader. The SYMBOL/PRINT operation may be performed in all security levels.

9.2 Mode Selection and Description of Function Keys

The OFFLINE/SYMBOL/PRINT mode is selected from the INITIAL mode by pressing the OFFLINE and SYMBOL function keys as follows:

1) Press the **OFFLINE [F2]** function key

2) Press the **SYMBOL [F3]** function key

The screen should appear as shown in Figure 9–1.

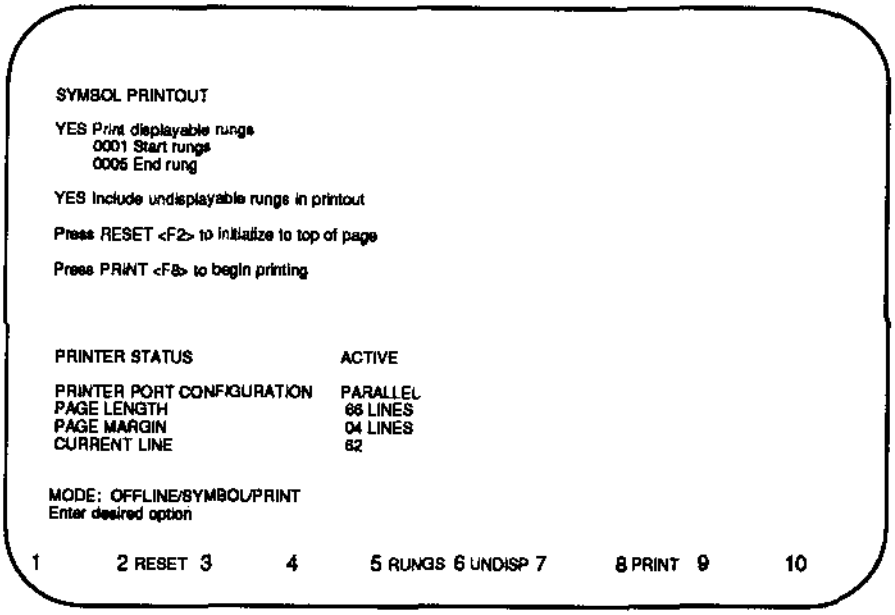


Figure 9–1 SYMBOL/PRINT Display

The screen display shown in Figure 9–1 includes the information described in the following subsections.

9.2.1 DISPLAYABLE AND UNDISPLAYABLE RUNGS

The first line on the screen will show whether or not the system is set up to print displayable ladder rungs. The default setting of this field is YES. To change this to NO, press the RUNGS function key.

Upon entry to the SYMBOL/PRINT screen, the cursor flashes at the "Start rung" heading. The default setting of this field is 0001. If you wish to get a symbol printout of only a portion of your ladder program, use the numeric keys to indicate the starting rung. The "End rung" field will automatically display the number of the last rung programmed in offline memory. If you wish to get a symbol printout of only a portion of your ladder program , use the numeric keys to indicate the end rung.

It is possible that your offline ladder program may contain undisplayable rungs. Undisplayable rungs may result after a transfer or disk load operation in which the program loaded into the computer's offline memory was previously programmed using the PR3 Program Loader. In some cases the exact placement of the elements contained in a rung which was programmed using the PR3 Program Loader cannot be displayed on the monitor screen. Even though these rungs may not be displayed, they may be included in the symbol printout generated in the SYMBOL/PRINT screen.

NOTE: *To determine whether your offline program contains undisplayable rungs, retrieve the OFFLINE LADDER mode of your software. The message "Program is UNDISPLAYABLE after rung N (at program address N)" will be displayed at the bottom of the screen if there are undisplayable rungs in your offline control program. Use Transfer or Disk Load operations in order to get an offline display of any control program contained in a processor or held on a floppy diskette.*

The default setting for printing undisplayable rungs is YES. If you have undisplayable rungs in your program and do not want them included in the printout, press the UNDISP function key. The setting will show NO on the screen.

9.2.2 PRINTING

The information about the printer and page settings, shown on the OFFLINE/SYMBOL/PRINT screen, is obtained from the parameters previously set in the UTILITY mode. To make sure that the printout is initialized to the top of the page, press the RESET function key. To get a symbol printout, press PRINT.

After pressing PRINT, a SYMBOL printout will begin printing if the printer is active. The word "PRINTING" flashes on the screen while the printout is being generated. Displayable rungs are separated with headings that indicate the rung number, while undisplayable ladder code is displayed as one section at the end of the printout. Each line contains a word address and the intermediate code that is stored at that address. Both the address and intermediate code correspond to what a user would see on the PR3 Program Loader.

Before pressing the PRINT function key, the printout can be aborted by pressing Del or ESC. After the printout has been started (by pressing PRINT), it can be aborted by pressing ESC.

NOTE: *There will be no on–screen display of the symbol printout. Only a hard copy printout may be obtained.*

NOTE: *With SFW30, internal relays have a prefix of "R" and shift register bits have a prefix of "S". The prefix "R" is used for shift register bits on the PR3 Program Loader.*

9.3 An Example of a Symbol Printout

Figure 9–2 shows a portion of ladder diagram which might be programmed in offline memory. After selecting the ONLINE and SYMBOL function keys and then the PRINT *function key, the symbol printout shown in Figure 9–3 would result. Finally, Figure 9–4* shows how to enter the rungs using the PR3 Program Loader.

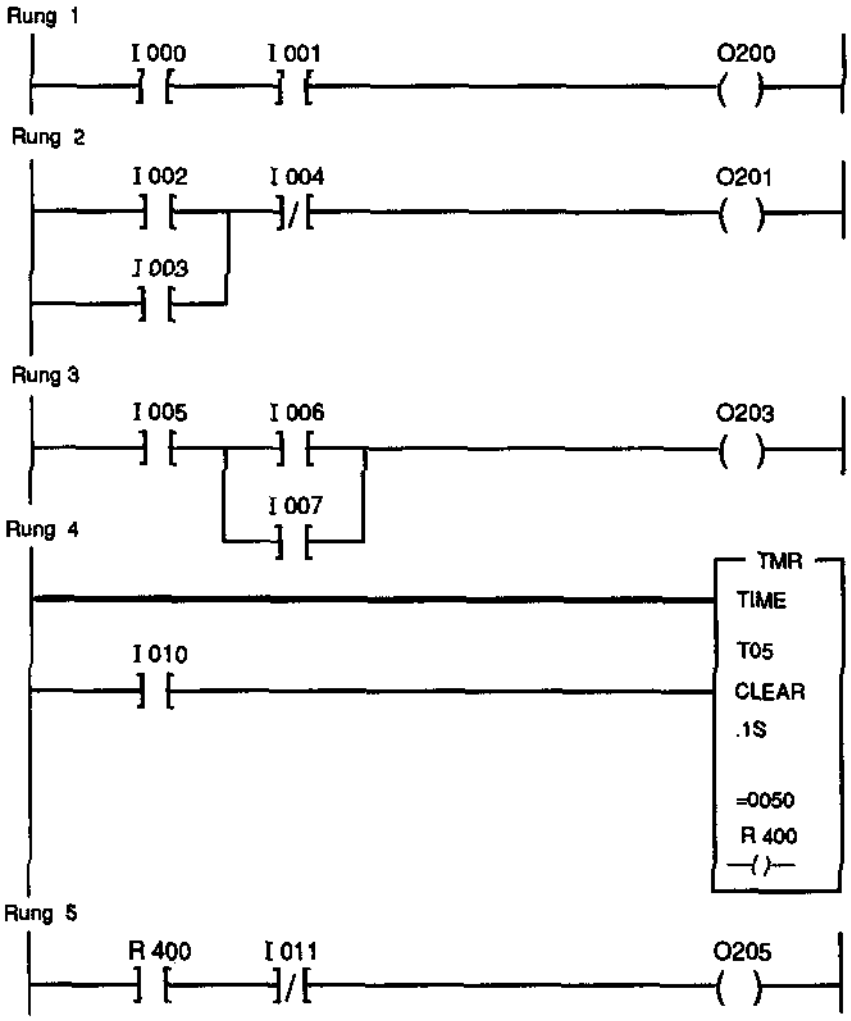


Figure 9–2 Ladder Diagram Rungs (1–5)

NOTE: *It is good practice to keep a symbol printout of all your ladder programs. It will be easier for you to interpret the meaning of "ADDITIONAL ERRORS" occurring on the ONLINE status screen if you are able to examine the instruction address in the symbol printout.*

	Rung 0001	
0000 :	LOD	0
0001 :	AND	1
0002 :	OUT	200
	Rung 0002	
0003 :	LOD	2
0004 :	OR	3
0005 :	ANDN	4
0006 :	OUT	201
	Rung 0003	
0007 :	LOD	5
0008 :	LOD	6
0009 :	OR	7
0010 :	AND LOD	
0011 :	OUT	203
	Rung 0004	
0012 :	LOD	10
0013 :	TIM	5
0014 :		50
0015 :	OUT	400
	Rung 0005	
0016 :	LOD	400
0017 :	ANDN	11
0018 :	OUT	205

Figure 9–3 Example of SYMBOL Printout

Using the information shown in the printout of Figure 9–3, the rungs from Figure 9–2 could be loaded into any memory using the Type PR3 Program Loader. The exact key operations are shown on the following pages.

Program Loader Key Operation

The following two figures are the function keys for programming with the PR3 hand-held programmer.

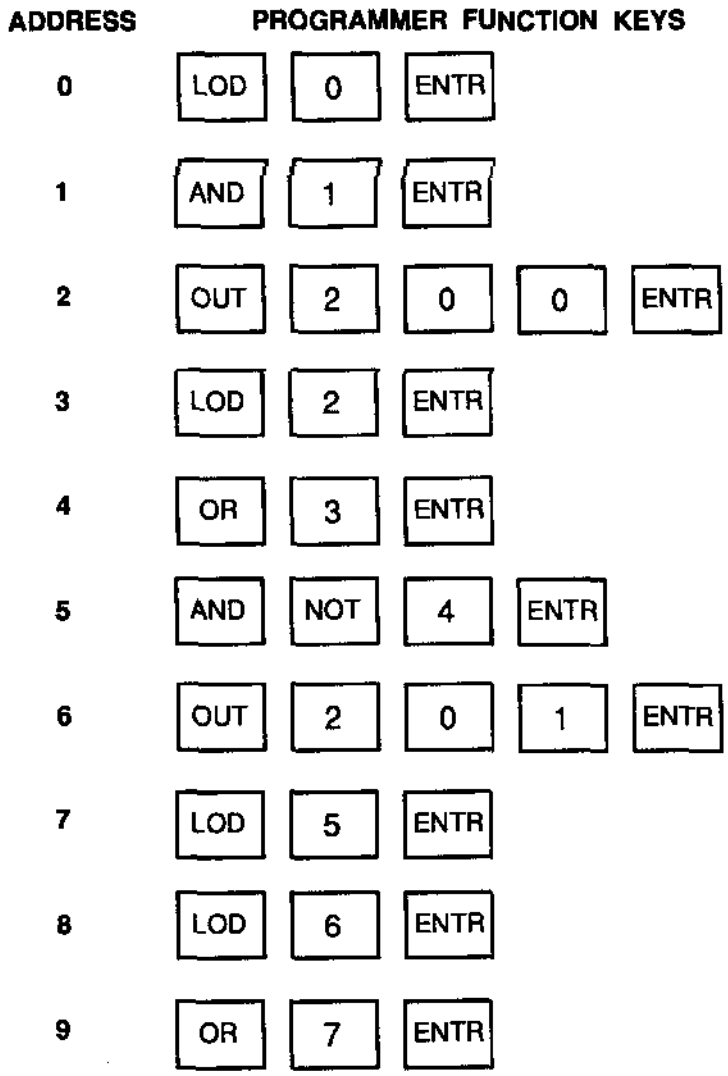


Figure 9–3 PR3 Keystrokes

ADDRESS	PROGRAMMER FUNCTION KEYS				
10	AND	SHF	LOD	ENTR	
11	OUT	2	0	3	ENTR
12	LOD	1	0	ENTR	
13	TIM	5	ENTR		
14	5	0	ENTR		
15	OUT	4	0	0	ENTR
16	LOD	4	0	0	ENTR
17	AND	NOT	1	1	ENTR
18	OUT	2	0	5	ENTR

Figure 9–3 PR3 Keystrokes (Continued)

GENERATING LABELS 10

10.1 Introduction

By using the LABEL feature of the SFW30 you can customize your processor's ladder logic by assigning easily recognizable alphanumeric names to certain rung elements that are in your program. The use of these labels can then help you to quickly examine and analyze your ladder logic, proving a great benefit when trouble shooting becomes necessary. Using the SFW30 you can create a label for any of the following rung elements.

I	Inputs	**CTR**	Counters
O	Outputs	**TMR**	Timers
R	Internal Relays	**SFR**	Shift Register Bits

The following rung elements cannot have labels programmed.

MCS	Master Control Set	**JUMP**	Jump
MCR	Master Control Reset	**JEND**	Jump End

Any alphanumeric and symbol character on the keyboard can be used in creating a label. Each label can consist of 1 to 18 characters. Once a label has been programmed, only the first 12 characters of the label will be be visible in the ladder mode on the monitor screen. This is illustrated in Figure 10–1. In printouts, however, up to 18 characters of the label will be printed above the ladder contact in rows of 6 characters each. See Figure10–2.

The following figures illustrate how labels might be abbreviated so that they are more clearly identifiable on a display or printout. Since the third line of the label is only available on hard copy printouts, the most important descriptive parts of the label should be in the first two six–character blocks.

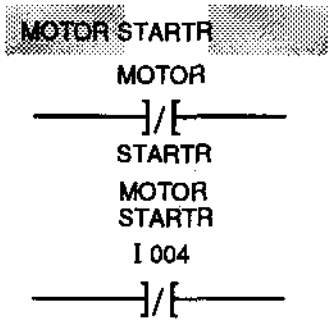


Figure 10–1 Example Monitor Display and Hard Copy Printout of Labels and Ladder

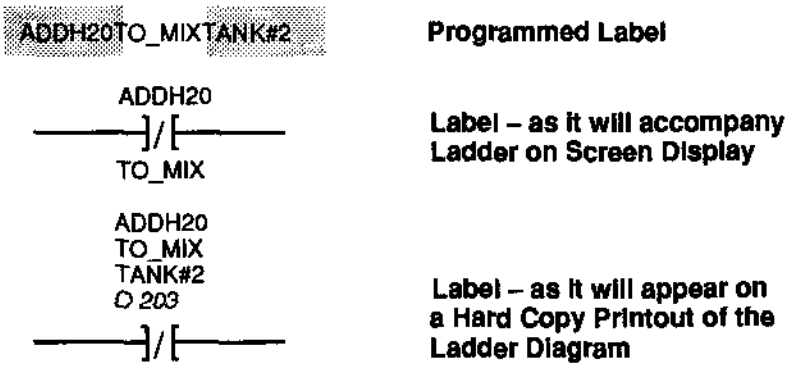


Figure 10–2 Example Monitor Display and Hard Copy Printout of Labels and Ladder

In addition to labels, comments can be programmed using SFW30. Comments may be used when more than 18 characters are needed in the label or to provide the operator and maintenance personnel with pertinent information about the operation of the rung. A comment can be up to 21 lines in length. Unlike labels, comments will not appear with the rung element on the monitor display. Comments stored in offline memory may only be viewed in OFFLINE /LABEL/ SEARCH mode. They will also be printed as part of the label printout.

Although they may not be viewed on the monitor screen in ladder rungs, certain comments will appear printed out in hard copy. A comment programmed for the output address of a rung will be printed immediately following the rung number in a printout of your ladder. If a rung does not contain an output coil, the comment printed after the rung number will be that of the address indicated in Table 10.1 .

TYPE OF RUNG	COMMENT PRINTED
Timer	Comment of timer output coil
Counter	Comment of counter output coil
Shift Register	Comment of shift register

Table 10–1 Comments Printed in Rungs Without an Output Coil

10.1.1 MEMORY REQUIRED TO PROGRAM LABELS

To calculate the number of bytes of offline memory needed to program labels, follow these guidelines.

1. The overhead required for each programmed label is 14 bytes of memory.

2. The ladder specifier and label field (18 characters maximum) always require 28 bytes of memory.

3 The comment requires1 byte of memory for each ASCII character in the comment. Trailing spaces in a comment field of more than one line are included in the byte count. Labels with comments requiring more than one line use 80 bytes of memory per line. See the examples:

NOTE: *The amount of disk space that a label file will require, as determined by standard IBM disk storage parameters, may be more than the byte count determined here.*

C 11 = mix cycles

This label uses 42 bytes of offline memory.

14 – overhead
28 – label
42 – bytes used

C 11 = mix cycles :increments with each stop cycle.

This label uses 74 bytes of offline memory.

14 – overhead
28 – label
32 – comment
74 – bytes used

C 11 = mix cycles :increments with each stop cycle.
This cycle count is to be monitored every 2 hours.

This label uses 195 bytes of offline memory.

14 – overhead
80 – label/comment, line 1
54 – comment, line 2
138 – bytes used

10.2 Mode Selection and Description of Function Keys

This section gives you more information about the OFFLINE/LABEL/ SEARCH screen. After you have a good understanding of the screen display and function keys, you can get step by step information about creating, editing, searching for and deleting labels in subsequent sections. In order to search for existing labels, create new labels, edit existing labels, or delete existing labels, you must first access the OFFLINE/ LABEL/SEARCH mode. This mode can be accessed from the OFFLINE/STATUS screen. If you are using this display for the first time, a blank screen is displayed. If you have previously defined label information, the labels you have written are displayed. Make sure that you are operating in the PROGRAM security level (see Section 2.4.1) then perform the following to enter the OFFLINE/LABEL/SEARCH mode:

1) Press the **OFFLINE [F2]** function key

2) Press the **LABELS [F4]** function key

The screen should appear as shown in Figure 10–3.

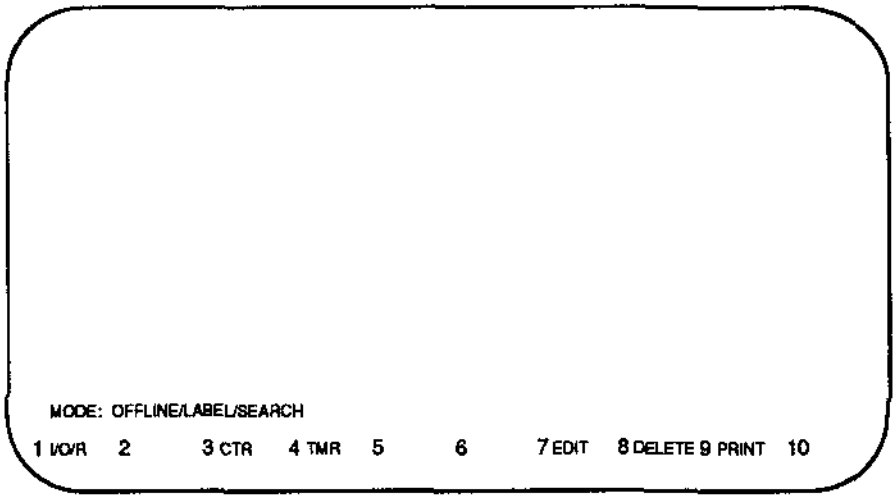


Figure 10–3 OFFLINE/LABEL/SEARCH Display

NOTE: *Figure 10–3 is typical only if no labels currently exist in offline memory. If labels had previously been saved the screen would look similar to Figure 10–5.*

The following function keys are shown on the OFFLINE/LABEL/ SEARCH screen. Function keys F1 through F9 may be used to search for a label existing in offline memory, to create new labels and/or comments, or to edit or delete existing labels.

I/O/R – Pressing this function key allows you to enter an I/O/R (Input, Output or Special Internal Relay) address. The prompt: "Enter an address: input (0–17), output (200–217), internal relay (400–717)" will appear at the bottom of the screen. This message provides the valid address range for the register type selected.

CTR – This function key allows you to enter a counter contact or register address. The prompt: "Enter a counter register address (0–46)" is shown on the display.

TMR – Pressing this function key allows you to enter a timer contact/register address. The prompt: "Enter a timer register address (0–79) " is shown on the display.

SFR – You can enter a shift register bit address after pressing this function key. The prompt: "Enter a shift register bit address (0–127)" is displayed.

NOTE: *If you press any of the function keys listed above (F1 through F5) and indicate a valid address, and the message "Cannot find searched for label" is shown on the screen, this means that the software cannot find a label programmed in offline memory for the rung element indicated.*

EDIT – Pressing this function key will get the OFFLINE/ LABEL/EDIT screen display. From this screen display you may enter new labels or change existing labels in the label file.

DELETE– Pressing the DELETE function key will get the OFFLINE/LABEL/DELETE screen display. From this screen you may choose to delete a single label from offline memory, all labels from offline memory, or you may delete a range of labels from a selected label to the end of the label file.

PRINT – Using this function key will generate a hard copy printout of all (or a range from selected label to end) labels in the label file to the currently assigned printer port.

In addition to the function keys already listed, using the following alphanumeric keyboard keys will accomplish the indicated result.

UP ARROW – Using this key scrolls the previous label to the top of the screen.

DOWN ARROW – Using this key scrolls the next label to the top of the screen.

PGUP – This key scrolls to the group of labels previously displayed on the computer screen. If a label was truncated (shown in a shortened form) on the previous screen it will appear in its entirety upon page up.

PGDWN – Using this key scrolls to the next group of labels to be displayed on the screen.

ESC – Pressing this key will return to the OFFLINE/STATUS display. If any printing was previously started, it will be terminated.

HOME – Using this key will display the first page of the label file, and the first label in the file will be highlighted.

END – Pressing this key will display and highlight the last label in the label file.

Step by step instructions explaining how to perform the following operations are given in the next sections.

Refer to the appropriate section for more information.

10.3 Creating A Label File (With Comments)

This section explains how to create a label file using SFW30. Remember, any alphanumeric and symbol character on the keyboard can be used in creating a label. Each label can consist of 1 to 18 characters. If more characters are desired, these may be programmed as the label comment. A single Label/Comment can occupy up to 21 lines. Keystrokes used to maneuver from field to field when creating labels/comments are summarized in Table 10.2 in Section 10.4, Editing a Label File.

Starting from the INITIAL mode of the software:

1) Press the **OFFLINE [F2]** function key

2) Press the **LABELS [F4]** function key

This sequence of keystrokes will automatically place you in the OFFLINE/LABELS/SEARCH mode. If no labels are in offline memory, upon entry into this mode a blank screen will display.

If a label file currently exists, up to 21 lines of labels/comments are displayed in order of ascending register address downward, starting with Input followed by Output, Internal Relay, Counter, Timer, and Shift Register Bit.

This example assumes the file is currently empty.

3) Press the **EDIT [F7]** function key

= LABEL LABEL LABEL : COMMENT

The screen shows two horizontal boxes in reverse video. The first box will hold the first 6 characters of the label, the unhighlighted area between will hold the second 6 characters of the label, and the last box is for the last 6 characters of the label. This allows you to easily predict how the label will appear on the monitor and in the ladder printout. The comment begins after the colon.

Enter the following label into offline memory. Note that in this procedure use of the <Enter> key tabs you to the next information field in the label/comment entry.

I 006 = PSHBTN HALT : STOP CYCLE

1) Press the **I/O/R [F1]** function key

2) Type **6**

3) Press **ENTER / RETURN**

4) Type **PSHBTN HALT**

5) Press **ENTER / RETURN**

6) Type **S T O P**

7) Press the **SPACE BAR** once

8) Type **CYCLE**

9) Press the **LOAD [F9]** function key

The label is now entered into the label file in offline memory. You can continue to enter labels in this manner. Each label entered will be held in a label file in offline memory. These labels can be edited, searched, deleted or printed. Each of these operations is described in the following sections. Remember that all files in offline memory will be lost when the system is turned off. You must save your files to a floppy or hard disk for permanent storage.

For information about how to save your label file on a floppy disk, refer to Section 7.2.7, Recording and Loading Label Files.

10.4 Editing A Label File

In the previous section you learned how to create labels. In this section you will learn how to modify the labels already created and replace them with the changed versions.

The OFFLINE/LABEL/EDIT screen appears below.

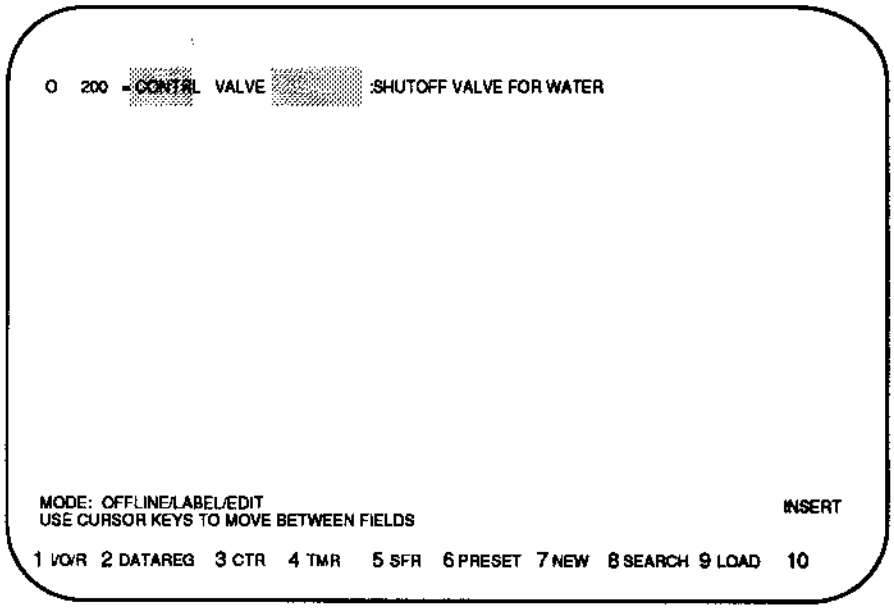


Figure 10–4 OFFLINE/LABEL/EDIT Display

The following function keys are displayed on the OFFLINE/LABEL/ EDIT screen.

I/O/R – Pressing this key allows you to enter an input, output register address, or relay register address.

CTR – Using this key allows you to enter a counter contact/register address.

TMR – Pressing this key allows you to enter a timer contact/register address.

SFR – Using this function key, you can enter a shift register bit address.

All of the function keys listed above have a prompt displayed indicating the valid address range for the register(s) selected. The cursor will be positioned at the last digit of the zeroed address. The selected register type(s) will be displayed at the beginning of the field.

An acceptable number must be entered in order to be able to leave the address field (either by pressing the keyboard <ENTER> key, TAB key, or by cursor movement off the address field. Pressing the <Del> key will zero the address, or it will clear any entry that may have been made in error and zero the address.

The following function keys may also be selected from the OFFLINE/ LABEL/EDIT screen. An explanation of their purpose follows each key listing.

NEW – Using this key clears the top 21 lines except for the "=" and ":" characters. The cursor will be positioned at the top left corner, awaiting selection of register type and a valid address.

SEARCH – Using this function key proceeds to the OFFLINE/ LABEL/SEARCH screen. The following message will be displayed if changes have been made but not saved:

"Label changed | (CONT) to continue | (SEARCH) to exit | (LOAD) to save "

LOAD – Pressing this key places any modified or new label/comment in offline memory. To prevent accidentally overwriting a valid label, a message "Do you want to replace existing label Y/N" is posted. If <NEW> had been executed for this label, a "new" screen will be presented after the load, allowing you to stay in the OFFLINE/LABEL/ EDIT mode; otherwise a return to the OFFLINE/LABEL/SEARCH screen will take place.

After returning to the OFFLINE/LABEL/SEARCH screen, the last saved label will be displayed at the top of the screen in reverse video in the same manner a selected label is displayed. The balance of the 21 lines will be filled with subsequent label/comments in normal video.

In addition to the function keys already listed, using the following alphanumeric keyboard keys will accomplish the indicated result.

<ESC> – Using this key will return the display to the OFFLINE/ LABEL/SEARCH mode without performing a SAVE operation.

< ← > (Backspace key) – Using this key will delete the character to the left of the cursor and move the text forward on the line to take up the space left by the deleted character. In INSERT mode and with the cursor at the first column, a reformat will be attempted from the line above to the end of text; or should the current line or the line above be blank, it will be removed and the text scrolled up one line.

<DELETE> – Pressing this key will delete the character at the cursor and move the balance of the text forward. When deleting characters from the label or comment field using the DELETE key, all character to the right of the deleted character will move one space to the left, filling the void left by the deleted character.

<INSERT> – This key toggles between INSERT and TYPEOVER mode in the comment field. A message in the lower right corner of the bottom of the screen indicates the mode. INSERT mode is the default setting.

In **INSERT** mode, any character(s) typed at the cursor location will be inserted to the left of the cursor. This causes the character at the cursor location and all characters to the right of the cursor to move one space to the right.

In **TYPEOVER** mode, any character typed at the cursor location will replace the character currently in that position. The characters immediately to the right of the replaced character will then be typed over by subsequent key strokes.

<ENTER> – Pressing this key will cause one of several possible actions to occur depending upon the field being modified and the position of the cursor when the ENTER key is pressed. The list indicates the activity, and the result of pressing the ENTER key after performing that activity.

Address field
The cursor moves to the first position of the label field if the address is valid.

Label field
The cursor moves to the first position of the comment field.

Comment field

1. In Typeover mode the cursor moves to the first position of the next line.

2. In Insert mode with the cursor in the very first character position in a row, a blank line will be inserted at the cursor, and the cursor will move down one line. The text is scrolled down one line.

3. In Insert mode with the cursor in any position except the very first character position in a row, the text at and to the right of the cursor is moved to the next line along with the cursor. The balance of any text is scrolled down.

<HOME> – Using this key moves the cursor to the beginning of the comment line when in the comment field, or to the first character of the label when in the label field.

<END> – Using this key moves the cursor to the end of the comment line (or end of text line in Insert mode) when in the comment field, or to the last character of the label when in the label field.

When in the comment field the action of adding (insert mode) or deleting a character will activate a reformat of the text from that line to the end of the page of text, preserving paragraphs. Paragraphs will remain indented and no character will be in the first character position of the row.

Remember that when editing labels any or all fields of the label can be changed. The address field can be changed and a new contact or register address can be indicated, providing that it is a valid address. Screen prompts will inform you of the valid addressable range for each ladder element. The label itself may be changed and up to 18 new characters can be entered. And finally, the comment can be modified and new information added.

Table 10.2 includes a summary of the keystrokes that you can use to move the cursor from location to location within the address, label and comment fields within the label. Note that these same keystrokes will work as you create labels for the first time.

TO MAKE THIS EDIT:	USE THIS KEYSTROKE:	
	Insert Mode	Typeover Mode
Delete character to left of cursor	Back Space key	Back Space key
Delete character at cursor	Delete key	Delete key
Move cursor to first position of next line in the comment field	Home key	Enter key
Move cursor to first position of comment field from label field	Enter or Tab key	Enter or Tab key
Move cursor to first position of label field from address field	Enter or Tab key	Enter or Tab key
Move cursor to beginning of field currently in	Home key	Home key
Move cursor to end of line currently in	End key (End of text)	End key (End of line)
Exit edit mode without saving modified label/comment	Escape key	Escape key
Toggles from insert mode to typeover mode and vice–versa	Insert key	Insert key
Move cursor one space to left	←	←
Move cursor one space right	→	→
Move cursor directly above current placement	↑	↑
Move cursor directly below current placement	↓	↓
Break line at cursor	Enter key	none
Delete line cursor is on	Ctrl Y	Ctrl Y

Table 10–2 Summary of Label Edition Strokes

You may edit a label before or after it is loaded into memory. In either case, the same editing functions can be used. If the label has already been loaded into memory, it must first be recalled and displayed on the screen before entering the EDIT mode to accomplish the editing.

The following steps demonstrate the procedure for recalling a label from memory, entering the EDIT mode, and changing a label and its corresponding label comment.

Starting from the INITIAL mode of the software:

1) *Press the* **OFFLINE [F2]** *function key*

2) Press the **LABELS [F4]** function key

A screen similar to the one shown below is displayed. The actual data will vary.

In a typical display up to 21 lines of labels/comments will be displayed in order of ascending register address downward, starting with Input followed by Output, Internal Relay, Counter, Timer, and Shift Register Bit.

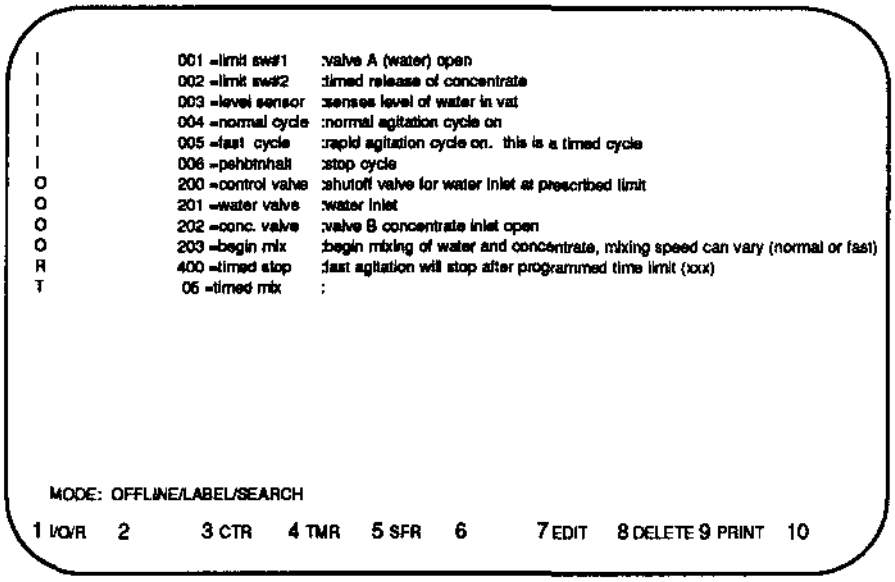


Figure 10–5 OFFLINE/LABEL/SEARCH Display

Select the third label in the list for editing. You can do this by scrolling to the label, or by searching for the label. A search is most effective when the label you wish to select from the label file is not yet visible on the screen (see information about using the SEARCH function in Section 10.5). Use the following to move to a label for editing:

3) Press the ↓ **[down arrow]** key twice

4) Press the **EDIT [F7]** function key

Notice that the selected label appears in reverse video as the uppermost item on the screen and is always presented in its entirety. The balance of the 21 lines display the succeeding label/comments. After selecting EDIT in the keystroke listing only the label/comment that was displayed in reverse video in OFFLINE/LABELS/SEARCH is presented.
Change the label "level sensor" to read "HIGH level sensor". Also, change the comment from the current wording: "senses level of water in vat" to the words: "senses HIGH level of water in vat".

5) Press **ENTER / RETURN**

6) Type **HIGH**

7) Press the **SPACE BAR 2 times**

8) Press **ENTER / RETURN**

9) Press the → **[right arrow]** key **7 times**

10) Type **HIGH**

11) Press the **SPACE BAR** once

Now load the changed label into offline memory.

12) Press the **LOAD [F9]** function key

13) Type **y**

The OFFLINE/LABEL/SEARCH mode will again be displayed, however, the last saved label will be displayed at the top in reverse video as would a selected label. The balance of the 21 lines will be filled with subsequent label/comments in normal video.

10.5 Searching For A Specific Label

There are three methods you can use to search for a particular label in the label file. You can indicate the searched for ladder element along with the proper address number, you can search for a type of element, or you can scroll through the label file until you find the particular label that you are looking for. The examples provided here will give you brief examples of each technique.

10.5.1 SEARCH BY ADDRESS NUMBER

Starting from the INITIAL mode of the software:

1) Press the **OFFLINE [F2]** function key

2) Press the **LABELS [F4]** function key

The screen will display up to 21 lines of labels/comments.

Search for Timer # 07:

3) Press the **TMR [F4]** function key

4) Type **7**

5) Press **ENTER / RETURN**

The label file will be searched for timer #7. The label/comment corresponding to the selected timer will be shown at the top of the monitor screen in reverse video. If there was no label associated with the timer address entered, the message "Cannot find searched for label" would be shown on the screen just under the mode designation.

Using this method of search is most convenient if you are not sure that a label has been programmed for a particular element, or if the label file is extensive.

10.5.2 SEARCH FOR A PARTICULAR LADDER ELEMENT

This method of searching will find the first occurrence of a timer with a label programmed. Repeating step 2 will find subsequent timers programmed with labels in your label file.

Starting from the INITIAL mode of the software:

1) Press the **OFFLINE [F2]** function key

2) Press the **LABELS [F4]** function key

Search for any Timer

3) Press the **TMR [F4]** function key

4) Press the **TMR [F4]** function key again

5) Press **ENTER / RETURN**

10.5.3 SEARCH BY SCROLLING THE LABEL FILE FOR A PARTICULAR LABEL

Finally by repeatedly pressing the (down arrow) key, you can continue to scroll the next label in the file to the top of the screen. Remember that you may also use any of the alphanumeric editing keystrokes listed in Section 10.4 to move through the label file.

NOTE: *Searching for labels is allowed in the MONITOR security mode of your software. However, if you wish to modify or delete the searched label, you will have to operate in the PROGRAM security level.*

10.6 Deleting Labels From A Label File

The DELETE mode allows you to delete a single label from offline memory, all labels from offline memory, or a range of labels from a specified label to the end of the label file.

An example of the OFFLINE/LABEL/DELETE screen appears below.

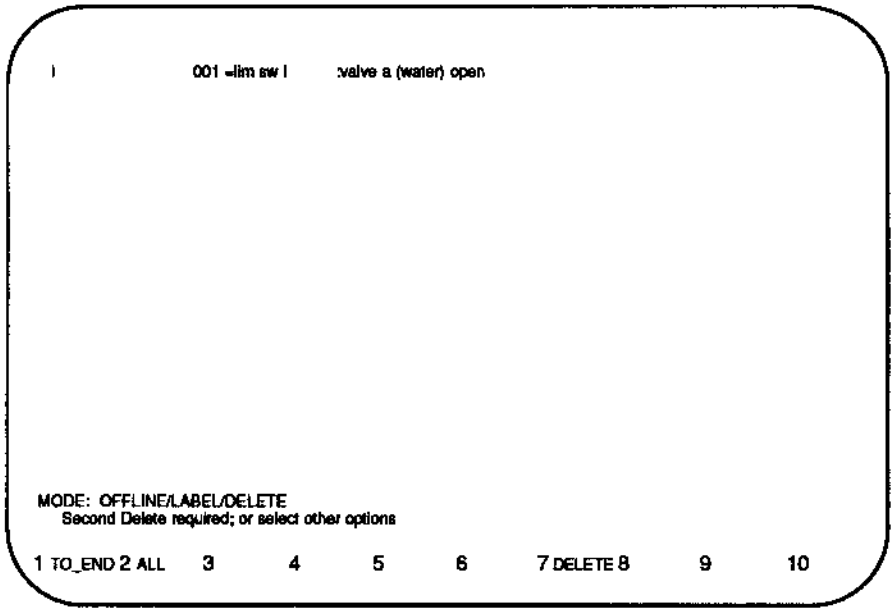


Figure 10–6 OFFLINE/LABEL/DELETE Display

Upon entry into the OFFLINE/LABEL/DELETE mode, only the label/comment that was selected in OFFLINE/LABEL/SEARCH, remains on the screen. If no label was searched the first label of the label file will be shown in reverse video on the screen.

The following function keys are displayed on the OFFLINE/LABEL/DELETE screen.

TO_END – Pressing this function key will delete a range of labels from the label displayed to the end of the file. A second confirming keystroke is required before the indicated delete procedure is started; pressing ESC c an stop you in mid process. Upon return, the screen will have scrolled up one label, displaying the label previous to the label beginning the range which was deleted. This label will be displayed in reverse video.

ALL – Pressing this function key deletes all labels. The message "Second ALL required" is displayed. Pressing any other key at this time will get the previous SEARCH display. After this operation a blank SEARCH display will be shown.

DELETE – Using this function key will delete the one label displayed and return to the OFFLINE/ LABEL/SEARCH mode. Upon return, the screen will have scrolled up one label, displaying the label previous to the label which was deleted. This label will be displayed in reverse video.

Pressing the ESC key will return the display to the OFFLINE/ LABEL/SEARCH mode without deleting any label or comment.

10.7 Printing The Label File

After having followed the procedures described earlier in this section for searching out labels, it is possible to get a printout of the searched label. A function key displayed in the OFFLINE/LABEL/SEARCH mode is used to accomplish this. First however, you must be sure of proper cabling and connections to your system printer. Appendix F can supply you with cabling information and connection diagrams.

Once the proper connections have been made, before a printer may be used, it is necessary to have properly set printer utility parameters in the UTILITY mode. For a complete description of the UTILITY mode, refer to Section 2.2.

To make a printout of the **entire label file** do the following:

1) Press the **OFFLINE [F2]** function key

2) Press the **LABELS [F4]** function key

3) Press the **PRINT [F9]** function key

The screen will display the following options:

TO_END and ALL

The entire label file will be printed by the system printer.

4) Press the **ALL [F2]** function key

5) Press the **PRINT [F9]** function key

If you had wished to print only a portion of the label file from a selected label to the end of the file, you would have first selected the particular label. Next you would press <PRINT> <TO_END> <PRINT>. This would cause the portion of the label you designated to be printed by the system printer.

USING THE XREF (CROSS REFERENCE) FUNCTION

11

11.1 Introduction

By using the XREF (Cross reference) feature of the SFW30 you can generate a screen display or hard copy documentation of the rung elements contained in your ladder program that have the same register type and address. For example, by pressing a function key which corresponds to a particular rung element (this may be an I/O register, counter, timer, shift register bit, MCS or MCR) and then indicating the register address of that element, you will display a listing by rung number of other occurrences of the selected rung element.

Selecting XREF can help you to reference an individual address or groups of address. The screen display provides you with the location (rung number) and verifies the usage, such as O for Output and R for internal relay. If an address is used more than once in a rung, the rung number will only be displayed once.

11.2 Mode Selection and Description of Function Keys

You may be operating in the MONITOR security level to use the XREF function of the software. Press these function keys from the INITIAL mode of the software to get the OFFLINE/XREF mode.

1) Press the **OFFLN [F2]** function key

2) Press the **XREF [F6]** function key

The screen should appear as shown in Figure 11–1.

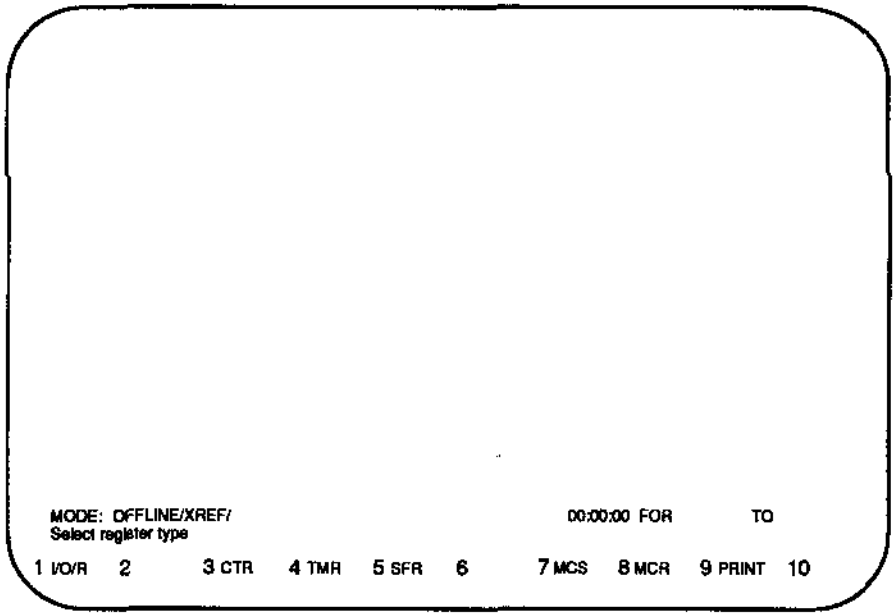


Figure 11–1 OFFLINE/XREF Display

The following function keys appear on the OFFLINE/XREF screen:

I/O/R – Pressing this function key allows you to enter an I/O/R (Input or Output Relay) address to cross reference.

CTR – This function key allows you to enter a counter contact/ register address to cross reference.

TMR – Pressing this function key allows you to enter a timer contact/register address to cross reference.

SFR – Pressing this function key allows you to enter a shift register bit address to cross reference.

MCS – Pressing this function key allows you to enter an *MCS (Master Control Set) to cross* reference.

MCR – Pressing this function key allows you to enter an MCR (Master Control Reset) to cross reference.

All of the above keys will display a prompt which will indicate the valid address message *for the register(s) selected.*

PRINT – Pressing this key instead of the <ENTER> key after indicating the address range will print the selected cross reference data to the currently defined system printer as well as being displayed on the screen.

In addition to the function keys listed above, pressing the <SPACEBAR> will pause the *XREF display from scrolling to the screen and/or printer.* Pressing the <SPACE BAR> a second time will restart the scrolling. Pressing the <ESC> key will also stop the printing procedure.

11.3 How Does Cross Reference Work?

Once you have accessed the OFFLINE/XREF screen shown in Figure 11–1, you will notice the prompting to select register type. At this time you must select one of the function keys (F1 through F8) that identifies the type of ladder element you would like to cross reference. For example, if you press F1 (I/O/R) the displayed message will change to show the valid address range for the registers.

Now you must indicate a valid register address that marks the beginning of the range of registers that you want to cross reference. After this has been done, press the <ENTER> key. Follow this with the register address that marks the end of the range of data registers that you want to cross reference.

If you want your cross reference registers printed out, press the PRINT function key. If you want a screen display of the cross reference registers, press the <ENTER> key.

A single entry in your cross reference listing will look like this:

O 210
0006 –] [–

Where **O** means that you are cross referencing an output coil.

Where **210** is the address of the coil.

Where **0006** is the number of the rung containing the cross– referenced output address.

Where **–] [–** is the symbol showing that the address belongs to a normally open contact in rung 6.

When a XREF (cross reference) is initiated, the screen will display only those addresses found in the program. All others will be ignored. Up to six rung numbers can be displayed across the screen. If the address is used more than six times, a second line begins, and continues until the listing is complete. If an address is used more than once in a rung as the same function, it will only be displayed once.

Table 11.1 is a list of symbols that might occur in your cross reference listing.

SYMBOL/FUNCTION	CURRENT STATUS
—] [—	Normally Open Contact
—]/[—	Normally Closed Contact
—( )—	Coil
—(L)—	Latch (Set)
—(U)—	Unlatch (Reset)
TIM	Timer
CNT	Counter
IF	IF Box (Counter Comparison)
(MCS)	Master Control Set
(MCR)	Master Control Reset
SFR	Shift Register

Table 11–1 Cross Reference Symbols and Functions

11.4 Example Procedure For Displaying and Printing Cross Reference Lists

The examples included in this section will list the steps necessary to cross reference a particular register. The steps would be similar to the steps necessary to initiate a cross reference listing for any of the symbols/functions listed in Table 11.1. The only difference is the selection of the actual symbol/function to cross reference and the valid address range allowable for that function.

11.4.1 DISPLAYING CROSS REFERENCE DATA

To enter the OFFLINE/STATUS mode:

1) Press the **OFFLN [F2]** function key

2) Press the **XREF [F6]** function key

To indicate that you want to cross reference an input, output or relay register:

3) Press the **I/O/R [F1]** function key

The screen should appear as shown in Figure 11–2.

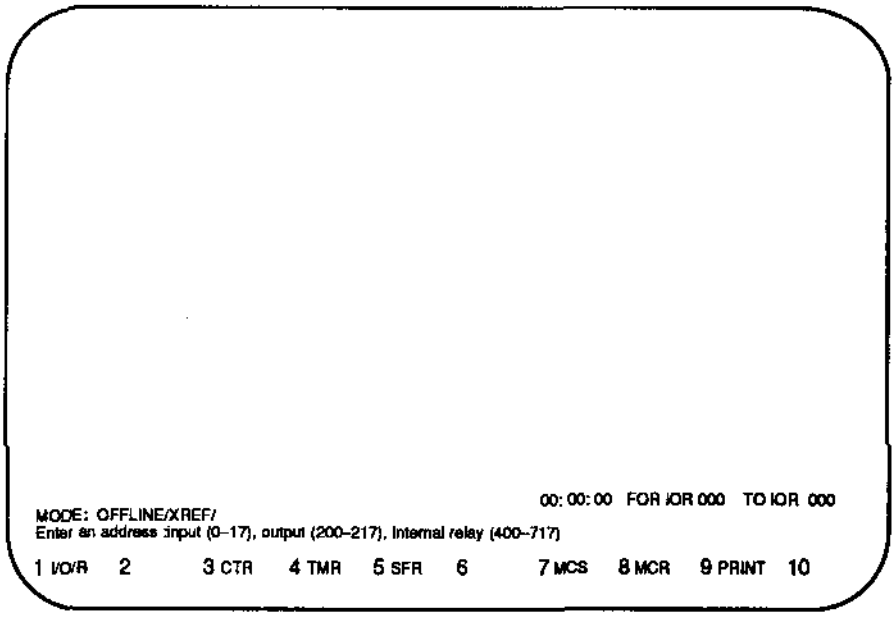


Figure 11–2 OFFLINE/XREF Display

Now enter the register address that marks the beginning of the range of registers you wish to have cross referenced. The default in each position is zero. In this example we will ask for a cross reference for the registers in the range 0–17. It is only necessary to press the <Enter> key since the default start range of "0" is already displayed.

4) Press **ENTER / RETURN**

Now enter the register address that marks the end of the range of registers (range 0–17 in this example), and then press the ENTER key to begin the cross reference operation.

5) Type **1**

6) Type **7**

7) Press **ENTER / RETURN**

The message "OPERATION PENDING" will be displayed while the software searches for cross reference data for the selected range of registers. After the operation completes, a screen display similar to the one shown in Figure 11–3 will appear, depending upon your control program. The range indicator at the bottom right side of the screen is empty indicating that the software is ready for the next cross reference request.

The screen should appear as shown in Figure 11–3.

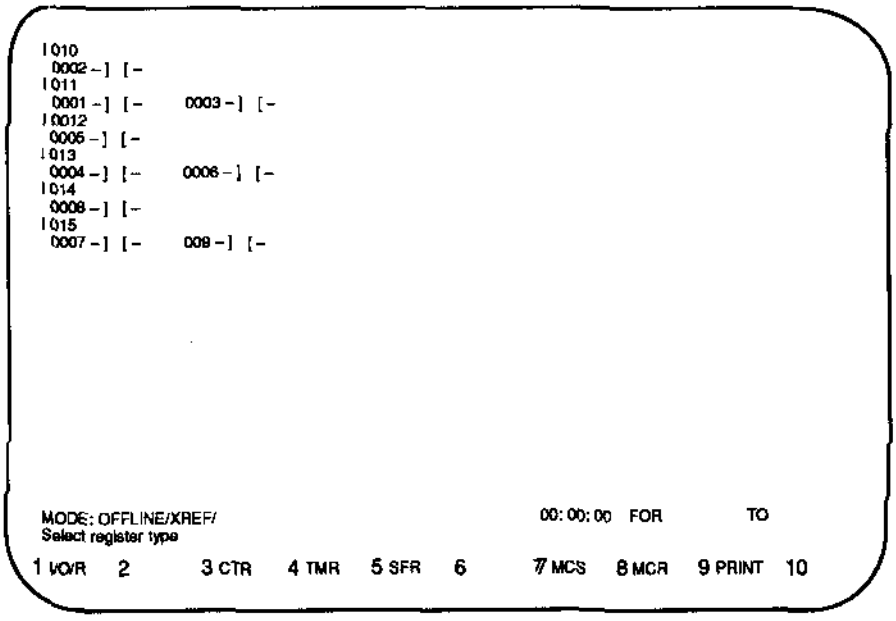


Figure 11–3 Cross Reference Data

11.4.2 PRINTING CROSS REFERENCE DATA

The procedure required to print cross reference data is very similar to the procedure in the previous section for displaying cross reference data. The only difference is that in Step 4 you would press the Print function key instead of enter. Once again the message "OPERATION PENDING" will be displayed while the software searches for cross reference data for the selected range of data registers. When the operation is complete, the cross reference data will display on the screen and will have been sent to the system printer.

OPTIONAL CABLING FOR A SINGLE MICRO-1 PROCESSOR

A

A.1 Using A Type CCK102 Cable Kit

One method for connection to a MICRO-1 controller is to construct a Square D Class 8010 Type CCK102 Cable Kit and a Belden UL/CSA Approved #9502 or equivalent cable. The CCK102 Cable Kit includes all the connection hardware required except the Belden cable. Be very careful to configure the differential cable as illustrated in the wiring diagrams in Section 1.

CAUTION

If any of the wires are incorrectly connected, your system will not work correctly and component damage may result.

A Class CCK102 Cable Kit includes two 9-pin, Male slide-lock connectors (CINCH #DE-9P). Configure a connector on one end of your cable using the pin-out shown in Figure A.1 on the following page. This end will be connected to the SFI3xx card in your personal computer. The other end of the cable will be tied directly to the Class 8005 Type RIU10 (Remote Interface Unit) as shown in Section 1.

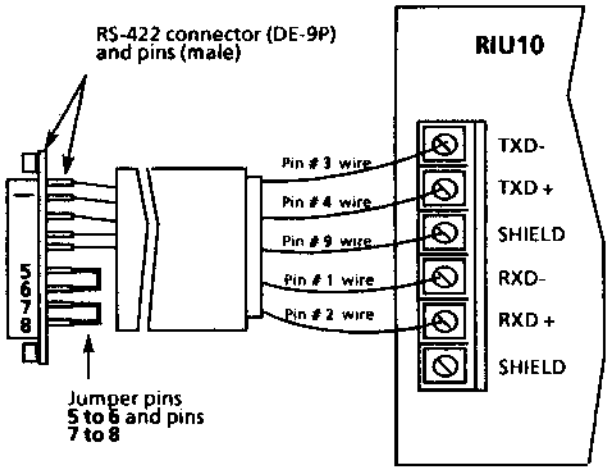


Figure A.1 Pin/Wire Connections for CCK102 Cabled to the RIU10 Terminal Block

(Once the differential cable has been configured, it may be used as shown in Section 1.)

Note: *The total cable length between the transmission device (personal computer) and the Class 8005 Type RIU10 may not exceed 990 feet.*

MICRO-1 CONTROLLER ERROR CODES

B

B.1 General Information

Although the MICRO-1 controller has been designed to be as reliable as possible there may be times when the red ERROR LED on the processor unit goes on. A lighted ERROR LED is an indication that one of the following has occurred.

- User program error
- Processor operation error
- System error

User program errors require that you use the diagnostic features present in the MICRO-1 controller to examine and correct the condition causing the ERROR LED to display.

Processor operation errors will usually be reset automatically. Depending upon the condition causing the specific error, the ERROR LED may go OFF automatically, or you may have to turn the ERROR LED off through a set procedure.

System errors may be a sign of significant internal processing errors and usually require replacement of the MICRO-1 controller.

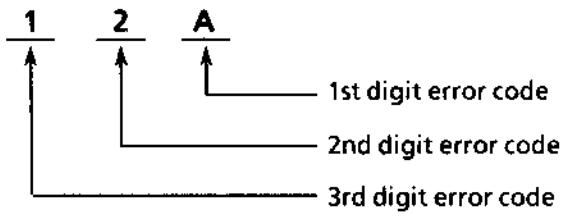
In addition to the above named problems, the ERROR LED may be ON due to insufficient voltage being applied to the unit. If this is the case, make sure to apply the proper rated voltage.

B.2 Checking Error Data

If you notice that the ERROR LED on your MICRO-1 controller is lighted, perform the following key operation using the program loader to determine the cause of the error.

The error code is displayed in **three digits** on the ONLINE STATUS screen.

12A - The digits shown on the right side of the display are the hexadecimal codes that define the error. Each separate digit has a unique error definition. The example error code given in the display is composed of a first, second and third digit error code.



The error codes are explained respectively in Tables B.1, B.2 and B.3. When using the tables, note that two or more (●) marks indicate that multiple errors have occurred at the same time.

Reason for ERROR	First digit Error Code														
	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
User program Cyclic Redundancy Check error (CRC)								●	●	●	●	●	●	●	●
CRC Comparison Code error (retained as alarm signal)				●	●	●	●					●	●	●	●
Watchdog Timeout Error		●	●			●	●			●	●			●	●
Power Failure	●		●		●		●		●		●		●		●

Note: If a zero appears in the first digit, there is no first digit error.

Table B.1 Explanation of First Digit Error Codes

User program Cyclic Redundancy Check error (CRC error)

MICRO-1 controller operation halted	
Output = OFF	ERROR LED = ON

Upon starting its operation, the MICRO-1 controller performs a self-diagnostic procedure. A Cyclic Redundancy Check (CRC) is executed as a part of the self-diagnostics. The CRC verifies the user program with the stored CRC comparison codes; if there is some mismatch this error results.

To clear the error, transfer a correct program from the program loader. The ERROR LED will go OFF when the program transfer is complete.

CRC Comparison Code error

MICRO-1 controller running	
Output = retentive	ERROR LED = ON

This error is detected when the contents of the user program CRC comparison codes in the MICRO-1 controller RAM have changed during a power failure.

No action is required to clear the error because the system program restores operation automatically. An error data code is stored as an alarm signal.

Watchdog Timeout Error

MICRO-1 controller operation halted	
Output = OFF	ERROR LED = OFF

In each scan the watchdog timer monitors the time required for one program cycle to detect abnormal repeating operation functions, and announces an alarm if the processing is not complete in a specific period of time.

If the error is temporary, the system program restarts its operation automatically. If the MICRO-1 controller does not restart automatically, it must be replaced.

Power Failure

MICRO-1 controller operation halted	
Output = OFF	ERROR LED = ON

This error is detected when the power voltage is lower than the rated power voltage.

To clear the error supply the rated power voltage.

Reason for ERROR	Second digit Error Code														
	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
TIM/CNT preset value (CRC) error	●		●		●		●		●		●		●		●
Program Sum Check Error		●	●			●	●			■	●			●	●
Maintained Data Sum Check Error				●	●	●	●					●	●	●	●
User Program Syntax Error								●	●	●	●	●	●	●	●

Table B.2 Explanation of Second Digit Error Codes

Timer/Counter preset value (CRC error)

MICRO-1 controller running	
Output = retentive	ERROR LED = OFF

Upon starting operation, the CRC is executed on the timer/counter preset value data stored in the MICRO-1 controller RAM to verify with the stored CRC comparison codes. Any discrepancy results in a CRC error.

Program Checksum Error

MICRO-1 controller operation halted	
Output = OFF	ERROR LED = ON

This error is detected when an error occurs during execution of the user program.

Retentive Data Checksum Error

MICRO-1 controller running	
Output = retentive	ERROR LED = OFF

If the timer/counter data or internal relay ON/OFF statuses, which have been stored in the MICRO-1 controller RAM have changed during a power failure, this error is detected when power is restored.

The system program resets this error automatically. An error data code is stored as an alarm signal. If the power failure duration is much shorter than three days and still this error occurs, the MICRO-1 controller must be replaced.

User Program Syntax Error

MICRO-1 controller operation halted	
Output = OFF	ERROR LED = ON

This error occurs when a syntax error is found in the user program. To clear the error, correct the program and transfer the corrected program to the MICRO-1 controller. When the corrected program is transferred to the MICRO-1 controller the ERROR LED will go OFF.

Reason for ERROR	Third digit Error Code														
	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
System Program Error	●		●												
User Program Writing Error		●	●												

Table B.3 Explanation of Third Digit Error Codes

System Program Error

```
MICRO-1 controller operation halted
Output = OFF          ERROR LED = ON
```

This error is detected when the system program is damaged. The unit must be replaced when this error occurs.

User Program Writing Error

```
MICRO-1 controller operation halted
Output = OFF          ERROR LED = ON
```

This error is detected when the user program is not correctly written into the MICRO-1 controller memory during program transfer. The check is performed when writing a program to the processor. The unit must be replaced when this error occurs.

Special Considerations

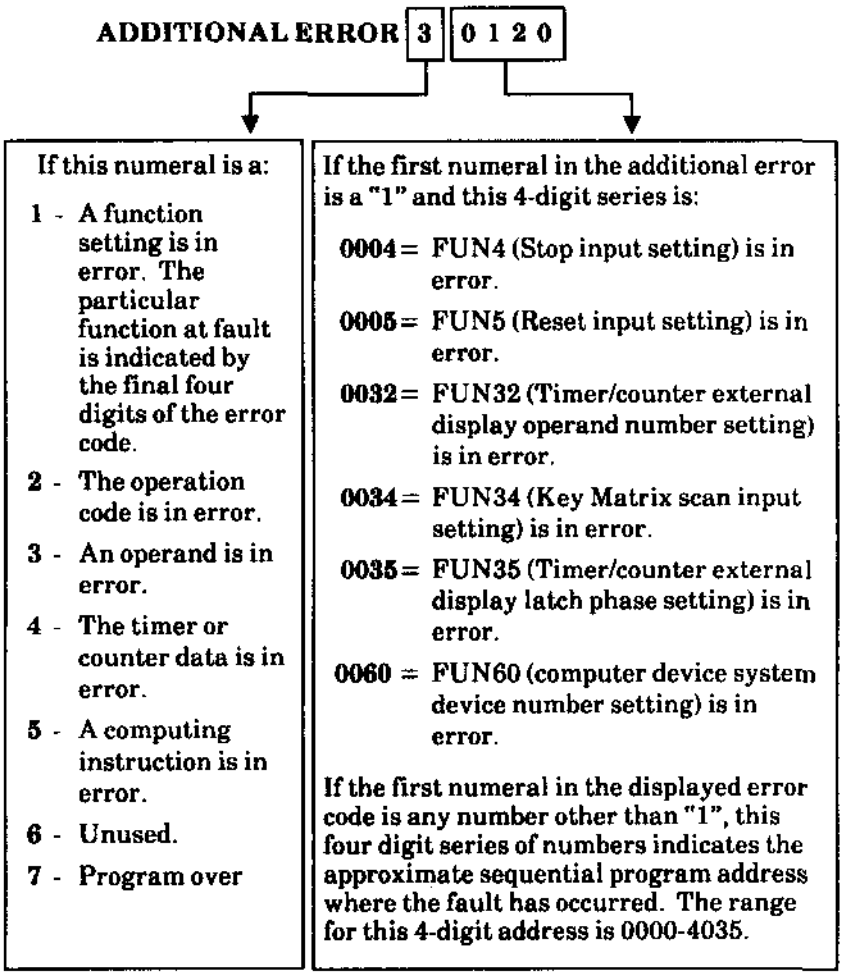
1. If the ERROR LED on the MICRO-1 processor lights up, the processor will HALT. When the cause of the error is removed to restore operation, the ERROR LED maintains its previous ON state. Clear this indication by pressing the CLRERR function key on the ONLINE/STATUS display. It is important to not that pressing the CLRERR function key may restart the processor. Section 3.3.2 explains what can be expected after pressing the CLRERR function key.

2. If the MICRO-1 processor is powered down for a long period of time, an on-board capacitor, which is used for back-up protection against RAM memory loss, will discharge and result in a wrong ERROR display. After turning power ON, be sure to use the CLRERR function key on the ONLINE/STATUS display to clear the error indication.

B.3 Additional Errors

In some cases the status display will contain an error code after the ADDITIONAL ERROR heading. The additional error is used to further define the hexadecimal number error which is shown after the ERROR CODE heading (usually 80).

The additional error is displayed as a 5 or 6-digit decimal number on the ONLINE/STATUS screen. The display is similar to that shown below.



*The example code (**30120**) means that an improper operand has been* programmed at or near the program address 120.

Note: *All additional errors will be detected as soon as MICRO-1 controller power is turned on or as soon as a program has been changed.*

Note: *It is helpful to keep a SYMBOL printout of all your ladder programs. It will be easier for you to interpret the meaning of "ADDITIONAL ERRORS" by examining the SYMBOL printout.*

SFW30 ERROR MESSAGES EXPLAINED

C

C.1 General Information

This appendix lists all the error messages you may encounter while programming using the SFW30 software. Each error message is listed as it would appear on the monitor screen, followed by an explanation of the error message. The error messages are listed in alphabetical order.

C.1.1 ALPHABETICAL LISTING OF ERROR MESSAGES

"Cannot continue APPEND due to presence of undisplayable rungs"

Occurs in the OFFLINE/DISK/LOAD screen, when attempting to append a program to offline memory, and the program in offline memory contains undisplayable rungs. Because of the nature of undisplayable rungs, the program cannot be edited in any way, including appending another program to it.

"Cannot perform indicated operation due to device presence in row <n>"

In the OFFLINE/LADDER/PROGRAM screen, a timer, counter, MCR, or JEND could not be placed on the screen because of the presence of one or more devices in row <n>. This occurs when the timer or counter requires a solid double line back to the left rail in a row, but the row is not empty.

"Cannot perform indicated operation due to vertical connection in row <n>"

In the OFFLINE/LADDER/PROGRAM screen, a timer, counter, MCR, or JEND could not be placed on the screen because of the presence of a vertical connection to row <n>. This occurs when the timer or counter requires a solid double line back to the left rail in a row, and the row is empty, but the row has vertical connections from above or below.

"Can't download while CPU is in RUN"

This error should never occur in normal operation. It occurs when the user attempts to download while the CPU is in RUN.

"Can't write on protected device"

This error indicates an attempt was made to record a disk file to a write-protected disk. The write-protect tab should be removed from a disk before attempting to write a file to it.

"Color assignment conflict"

In the /INIT/COLOR screen, the background and foreground colors have been selected to be the same color. This error does NOT appear when two different low-contrast colors result in a nearly-unreadable display.

"Comm port not active"

Occurs in any screen that attempts to communicate with a MICRO-1 processor, when the comm port selected in the /INIT/UTILITY screen is neither an SFI card nor an ASYNC card. The word NONE is displayed after the COM1 or COM2 designation on the INIT/UTILITY screen when no serial interfaces exist in the personal computer.

"Comm port set-up failure"

In the INIT/UTILITY screen, the communications port assigned as the MICRO-1 controller port could not be properly initialized.

"Communications difficulties, check hardware and utility parameters."

From the UTIL screen (Section 2.2), check that the drop matches the number of the MICRO-1 controller with which you are communicating. Also check the interface selection and the wiring.

"Communications error <n>"

A communications error occurred. Communication errors due to hardware problems are annunciated on the CRT screen by the message "Communications Error" followed by a number. The error code numbers that appear will be 72 or 74. If either error occurs, do the following: 1. Check for incompatible baud rate settings. 2. Check all cable connections. 3. Use the DEL key to clear the error indication. 4. Retry the operation.

"Communications timeout"

The reply for a communication message was not received within the timeout period. The default timeout period for messages is two seconds, although some functions increase the timeout as necessary. This error can be caused by any of the following conditions: 1. The dip-shunt jumpers in the converter may be placed in the wrong location. 2. The wrong type of communication cable may be being used. 3. The wiring of the user assemble cable may be incorrect.

This error can also result from an incorrect drop number (the last number in the route string), an incorrect baud rate setting or a disconnected cable.

If this error occurs randomly, try using another personal computer since some early model personal computers may have an unusually slow operating serial communication port.

"Counter is missing an output"

This error indicates an internal software problem. The OFFLINE /LADDER/ PROGRAM screen forces the user to program a counter output, and the OFFLINE/DISK and OFFLINE/TRANSFER screens will signal a counter rung as undisplayable if it doesn't have an output programmed. This error should never occur under normal circumstances.

"CPU is in RUN"

Occurs when attempting to load a new drop number to a *MICRO-1* controller (on the /INIT/ASSIGN screen), or when attempting to transfer a program from offline memory to a processor (on the OFFLINE /TRANSFER screen). The MICRO-1 controller must be halted before either of these operations can take place.

"Data error"

A type of DOS disk error. It shouldn't occur in normal operation.

"Disk access error"

Occurs when the program opens a disk file but is unable to read it. This error may indicate a problem with the disk itself; it shouldn't appear in normal operation (even if the user gives an incorrect file name).

"Disk is full"

The record-to-disk operation could not complete because the disk had no more room. The file is incomplete and should not be loaded back into SFW30.

"Drive not ready"

Make sure that the disk drive contains a floppy diskette.

"End of file found"

The end of an input file was found before it was expected. The file may have incorrect or incomplete data in it.

"Error opening/creating auto-powerup file <n>"

Occurs in the /INIT screen (in the /INIT/AUTO mode) when SFW30 is unable to create a new auto-powerup file or open an existing auto-powerup file. The number reported is the disk error code. In general this error will occur only when SFW30 tries to save the file to a floppy disk and no disk is presently in the drive (or the disk is write-protected).

"Error writing to auto-powerup file <n>"

Like the previous error, this means SFW30 is unable to write to the disk.

"File not found"

The specified file could not be found in the selected directory on the selected disk drive. The directory screen can be used to scan through a directory to locate a desired file.

"First register address exceeds last"

Occurs on the ONLINE/DISK/RECORD screen when the starting register number of the register range is greater than the ending register number.

"Illegal counter placement"

This error indicates an illegal rung format has been detected. Illegal counters cannot be generated by the ladder editor, and the disk/load and transfer operations will flag a rung as undisplayable if it contains an illegal counter. This error should never occur under normal circumstances.

"Illegal file name"

An illegal file name was entered on one of the disk screens.

"Illegal format"

Occurs when loading a file, and the file doesn't contain the correct data format. This usually indicates that the wrong file was specified.

"Illegal JEND placement"

This error indicates an internal software problem. Incorrectly placed JEND instructions cannot be generated by the ladder editor, and the disk/load and transfer operations will flag a rung as undisplayable if it contains an illegal JEND. This error should never occur under normal circumstances.

"Illegal MCR placement"

This error indicates an internal software problem. Incorrectly placed MCR instructions cannot be generated by the ladder editor, and the disk/load and transfer operations will flag a rung as undisplayable if it contains an illegal MCR. This error should never occur under normal circumstances.

"Illegal output placement"

This error indicates an internal software problem. Incorrectly placed outputs cannot be generated by the ladder editor, and the disk/load and transfer operations will flag a rung as undisplayable if it contains an illegal output. This error should never occur under normal circumstances.

"Illegal rung number range"

This error occurs on the OFFLINE/LADDER/DELETE screen when you are entering a range of rungs to delete. The last rung number is lower than the first rung number selected.

"Illegal rung number"

Occurs in the OFFLINE/LADDER/DELETE screen when an attempt is made to delete a non-existent rung.

"Illegal shift register placement"

Incorrectly-placed shift registers cannot be generated by the ladder editor, and the disk/load and transfer operations will flag a rung as undisplayable if it contains an illegal shift register. This error should never occur under normal circumstances.

"Illegal TIMER placement"

This error indicates an internal software problem. Incorrectly-placed timers cannot be generated by the ladder editor, and the disk/load and transfer operations will flag a rung as undisplayable if it contains an illegal timer. This error should never occur under normal circumstances.

"Illegal transitional placement"

Occurs in the OFFLINE/LADDER/PROGRAM screen when a transitional is incorrectly placed. A transitional must be preceded by a contact.

"INCORRECT PASSWORD"

Occurs in the /INIT/SECURE screen when an incorrect password is entered.

"Insufficient security level to write to special internal relay"

This error occurs on the ONLINE/DATA screen when an attempt is made to modify a special internal relay at the DATA ENTER security level. These relays may only be modified at the PROGRAM security level.

"Internal error - Intermediate code nodal error"

This error indicates an internal software problem in the OFFLINE /LADDER/ PROGRAM mode. This error should never occur under normal circumstances.

"Internal error - Node interconnection error"

This error indicates an internal software problem in the OFFLINE /LADDER/ PROGRAM mode. This error should never occur under normal circumstances.

"Internal error - Too many devices in rung"

This error indicates an internal software problem in the OFFLINE /LADDER/ PROGRAM mode. This error should never occur under normal circumstances.

"Internal error - Too many nodes assigned in LTM"

This error indicates an internal software problem in the OFFLINE /LADDER/ PROGRAM mode. This error should never occur under normal circumstances.

"Internal error <n>"

These internal errors are generated in the communications routines; the number displayed indicates what type of internal error occurred. This error should never occur under normal circumstances.

"Invalid address"

Occurs when an I/O address is out of the specified range.

"Invalid counter comparison placement"

Occurs in the OFFLINE/LADDER/PROGRAM screen when a counter-comparison IF box is incorrectly placed. In general, a counter comparison must have a contact ORed with it (an always-open contact is fine), although in some cases this is not necessary.

"Invalid counter output"

This error indicates an internal software problem. Invalid counter outputs cannot be generated by the ladder editor, and the disk/load and transfer operations will flag a rung as undisplayable if it contains an illegal counter. This error should never occur under normal circumstances.

"Invalid counter"

This error indicates an internal software problem. Invalid counters cannot be generated by the ladder editor, and the disk/load and transfer operations will flag a rung as undisplayable if it contains an illegal counter. This error should never occur under normal circumstances.

"Invalid disk change"

This error is a type of DOS disk error. It should not occur in normal operation.

"Invalid drive code"

This error is a type of DOS disk error. It should not occur in normal operation.

"Invalid drop field"

Occurs when an invalid drop field has been programmed, and the user initiates a function that requires communication.

"Invalid drop or communications difficulties"

From the UTIL screen, check that the drop matches the number of the MICRO-1 controller with witch you are communicating. Also check the interface selection and the wiring.

"Invalid intermediate code"

This error indicates an internal software problem. Invalid intermediate code cannot be generated by the ladder editor, and the disk/load and transfer operations will flag a rung as undisplayable if it contains any illegal intermediate code. This error should never occur under normal circumstances.

"Invalid rung data"

This error indicates an internal software problem in the OFFLINE /LADDER/PROGRAM screen. This error should never occur under normal circumstances.

"Invalid shift register"

This error indicates an internal software problem. Invalid shift registers cannot be generated by the ladder editor, and the disk/load and transfer operations will flag a rung as undisplayable if it contains an illegal shift register. This error should never occur under normal circumstances.

"Invalid timer output"

This error indicates an internal software problem. Invalid timer outputs cannot be generated by the ladder editor, and the disk/load and transfer operations will flag a rung as undisplayable if it contains an illegal timer. This error should never occur under normal circumstances.

"Invalid timer"

This error indicates an internal software problem. Invalid timers cannot be generated by the ladder editor, and the disk/load and transfer operations will flag a rung as undisplayable if it contains an illegal timer. This error should never occur under normal circumstances.

"MICRO-1 Processor error <n>"

This is a MICRO-1 processor error. The range of displayed values is 48-55 (decimal), corresponding to protocol errors 30 hex through 37 hex. The errors are:

53 (35H) - program transfer/write ... read/write error
54 (36H) - program transfer/write ... total CRC error
55 (37H) - program transfer/write ... overtime/frame error

These errors should never be seen in normal operation.

"No more files"

This is a type of DOS disk error; it should not occur in normal operation.

"No rungs selected"

Occurs in the OFFLINE/SYMBOL/PRINT screen when the PRINT key is pressed and no rungs (displayable or undisplayable) have been selected for printing. This error is generated if:

Print Rungs is NO, or there are no printable rungs,
-and-
Print Undisplayable is NO, or there are no undisplayable rungs.

"Not enough memory"

Occurs in the OFFLINE/LADDER/PROGRAM screen when a rung cannot be loaded into offline memory because the offline memory is full. There are 16K words of offline memory, 16,324 of which are available for ladder rung storage; the OFFLINE/STATUS screen shows how many words are currently used.

"Not enough offline memory available"

Occurs when SFW30 is loaded into a personal computer that contains less than the minimum amount of memory needed to support SFW30 offline memory. The IBM PC must have at least approximately 210K bytes of memory available to start up SFW30.

"Not enough room"

Occurs when a rung is physically too large to display on the screen (for example, there are too many series or parallel contacts). Such rungs can be generated in the OFFLINE/LADDER/PROGRAM screen because of the way rungs are reformatted, but they can also occur when a rung transferred from a MICRO-1 controller contains more than 7 parallel or 10 series contacts.

"Offline program is too large"

Occurs in the OFFLINE/TRANSFER screen when attempting to transfer the offline program into a MICRO-1 processor, and the processor's memory pack is not large enough to store the entire program. No transfer will take place.

"Open rung"

Occurs in the OFFLINE/LADDER/PROGRAM screen when an incomplete rung has been entered and the LOAD key is pressed.

"OSERR Error <n>"

This is a type of DOS disk error; it should not occur in normal operation.

"Out of offline memory"

Occurs in the OFFLINE/LADDER/PROGRAM screen when there isn't enough offline memory left to store a rung.

"Out of range"

A numerical input was outside the range of valid values. Generally, the range of allowable values is printed on the 23rd line on the screen when the cursor is in a numerical-entry field.

"Output shorted to left rail"

Occurs in the OFFLINE/LADDER/PROGRAM screen when an output, compute box, or any timer, counter, or shift register input is connected directly to the left rail. All outputs must be driven by at least one device (contact, IF box, etc.).

"Page margin conflict"

In the /INIT/UTILITY screen, the specified page margin is greater than half the page size.

"Parameter file corrupted"

Occurs on program startup when the auto-powerup parameter file contains illegal data. The user can set up the program configuration and save a new auto-powerup file to remove this error.

"Printer route must be different than MICRO-1 controller route"

Occurs in the /INIT/UTILITY screen when the printer port is the same as the MICRO-1 controller port and the two routes are identical. It is illegal to direct printer output to the processor.

"Program is too large for memory"

This error may occur when an attempt is made to download a program from offline memory which is larger than the MICRO-1 controller user memory.

"Program is too large to load into offline"

Occurs in the OFFLINE/TRANSFER screen if the MICRO-1 controller's memory is larger than the offline program memory (16K words). This error indicates corrupted memory.

"Program is UNDISPLAYABLE after rung <n> (at program address <n>)"

Occurs after transferring a program from a processor or loading a program from a disk file, and the program contains undisplayable rungs. This error occurs when entering the OFFLINE/LADDER screen, and it means that the program cannot be edited in any way, except for deleting the undisplayable rungs (or the whole program).

"Program with undisplayable rungs cannot be edited"

Occurs in the OFFLINE/LADDER screen when the user attempts to enter the program mode, and the program contains undisplayable rungs. The program mode cannot be entered.

"Protocol error <n>"

This is a low-level communications error. It usually happens when cables are connected incorrectly, or an incorrect COM port, baud rate, or drop is specified in the /INIT/UTILITY screen.

This error can also be caused by incorrectly wiring the user-assembled cable. When this error occurs in the ONLINE mode of operation, and you are using an asynchronous communications adapter or serial RS232 port, try to reduce the personal computer's processor speed so that it is operating at 16MHz or less.

"Register is read-only"

This error occurs on the ONLINE/DATA screen when an attempt is made to change a read-only special internal relay.

"Resultant register value too large"

Occurs in the ONLINE/DATA screen when changing a register's binary value and a number greater than 9999 results.

"Reverse current"

Occurs in the OFFLINE/LADDER/PROGRAM screen when a rung contains reverse current connections.

"Search object not found"

Occurs in the OFFLINE/LADDER/SEARCH screen when the specified search object or the next such object cannot be found.

"Sector not found"

This is a type of DOS disk error and should not occur in normal operation.

"Security level prohibited"

This error occurs whenever an attempt is made to use a function without entering the necessary security level.

"Seek error"

This is a type of DOS disk error and should not occur in normal operation.

"Shift register address and count exceed 128"

Occurs in the OFFLINE/LADDER/PROGRAM screen when a shift register has been programmed, and too many shift register bits have been specified. Since there are 128 available shift register bits (numbered 0 through 127), the starting bit number plus the bit count must always be less than or equal to 128.

"Shorted network"

Occurs in the OFFLINE/LADDER/PROGRAM screen when horizontal and/or vertical connects are used to short out contacts or other ladder elements.

"Timer is missing an output"

This error indicates an internal software problem. The OFFLINE /LADDER /PROGRAM screen forces the user to program a timer output, and the OFFLINE/DISK and OFFLINE/TRANSFER screens will signal a timer rung as undisplayable if it doesn't have an output programmed. This error should never occur under normal circumstances.

"Too many AND-LOD/OR-LOD instructions"

This error indicates an internal software problem. The OFFLINE/LADDER/ PROGRAM screen inserts these instructions correctly, and the OFFLINE/DISK and OFFLINE/TRANSFER screens will signal a rung as undisplayable if it has this problem. This error should never occur under normal circumstances.

"Too many LOD instructions"

This error indicates an internal software problem. The OFFLINE/LADDER/ PROGRAM screen inserts these instructions correctly, and the OFFLINE/DISK and OFFLINE/TRANSFER screens will signal a rung as undisplayable if it has this problem. Thus this error should never occur under normal circumstances.

"Unable to close file"

The file could not be closed properly. The file contents may be corrupted.

"Unable to open file <n>"

The specified file could not be opened for reading.

"Unable to open SFW.SEC"

Occurs when first calling up SFW30 if the security-password file SFW.SEC could not be found in the current directory or the directory specified by the environment *variable SFWPATH (if defined). The program* will exit immediately.

"Unable to read disk"

The disk file could not be read.

"Unable to write disk"

The disk file could not be written. This can happen if a disk is write-protected.

"Unknown media type"

A type of DOS disk error; it should not occur in normal operation.

"Unknown unit"

A type of DOS disk error; it should not occur in normal operation.

"VERIFICATION FAILURE"

Occurs in the /INIT/SECURE screen when the user fails to correctly verify a new password. The password remains unchanged.

"Waiting for printer Press <ESC> to quit"

Occurs when printing data to the printer, and the printer is inactive. ESCAPE will abort the printout, and Del will attempt to continue. The printer must become active before the printout will actually continue; if it doesn't become active, this error will occur again.

"Wrong file type"

The specified disk file contains the wrong type of data. For example, a file containing register data was specified as the input for a program-load operation.

MICRO-1 CONTROLLER RING NETWORK SPECIFICATIONS

D

D.1 General Specifications

The block diagram shown in Figure D.1 illustrates a possible MICRO-1 controller ring network. The specifications for the RIU10 (Remote Interface Unit), NLU10 (Network Link Unit) and general ring network transmission/communication specifications are included in this appendix.

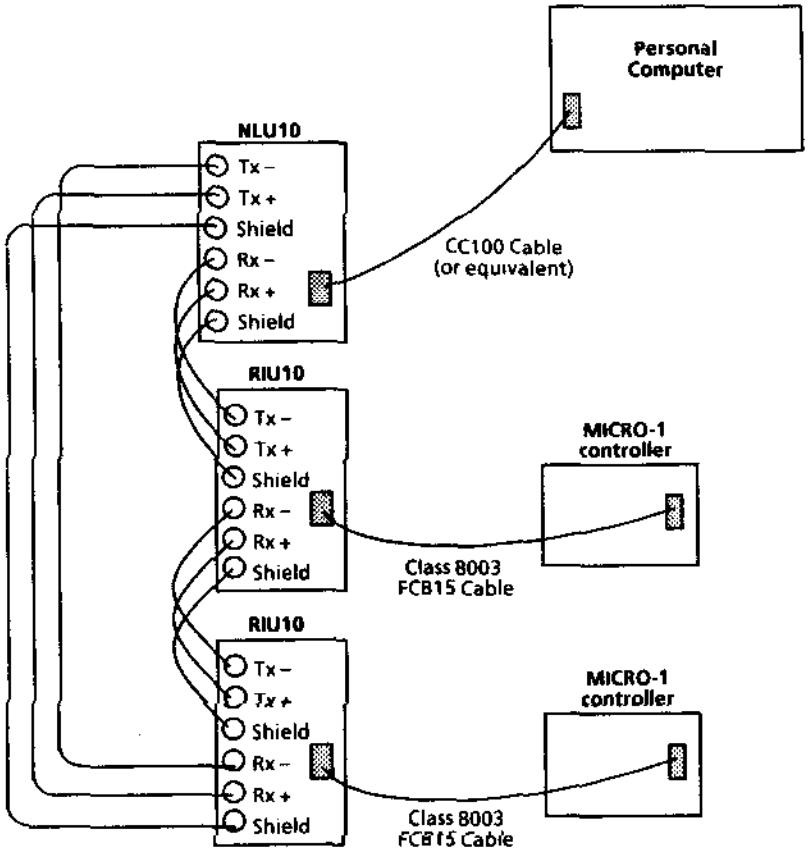


Figure D.1 Networking the MICRO-1 Controller

D.2 Remote Interface Unit (Class 8005 Type RIU10)

The Class 8005 Type RIU10 (Remote Interface Unit) must be used in order to access the MICRO-1 processor. The RIU10 converts the MICRO-1 processor's 12VDC to RS-422 levels and provides the hardware echo for the ring network.

D.2.1 SPECIFICATIONS

Power requirement	+12VDC, ±10% (Supplied by MICRO-1 processor. 120mA current draw on MICRO-1 processor.)
Storage temperature	-20° to +70°C. -4° to +158°F.
Operating temperature	0 to 60° C. 32° to 140°F.
Humidity range (operating)	30-95% RH, non-condensing
Connectors	One connector for Class 8003 Type FCB15 cable from MICRO-1 processor. One terminal strip: [TXD-, TXD+, RXD-, RXD+, SHIELD (2)] for Class 8005 Type NLU10 connection.
LED	"NETWORK" LED will show dimly in standby mode and it will flash when communication occurs. The LED will be off when the MICRO-1 processor is powered down.

D.3 Network Link Unit (Class 8005 Type NLU10)

The Class 8005 NLU10 (Network Link Unit) is an interface between the MICRO-1 controller RS-422 network and SY/MAX RS-422 port on the SFI3xx card in your personal computer. *It provides a bridge between the RIU10's terminal strip and a* SY/MAX 9-pin COMM port. The NLU10 provides the following features:

- Convenient wiring connections using a standard CC100 cable.
- Ground and shield integrity.
- Noise immunity.

D.3.1 SPECIFICATIONS

Operating temperature	0 to 60° C. 32° to 140°F.
Storage temperature	–20° to +70°C. –4° to +158°F.
Humidity range (operating)	30-95% RH, non-condensing
Connector	One, standard, female 9-pin SY/MAX RS-422 connector. One terminal strip: [TXD–, TXD+, RXD–, RXD+, SHIELD (2)].

Note: *Both the Class 8005 NLU10 and the Class 8005 RIU10 should be grounded by properly securing them with two mounting screws at the top and bottom of each unit. Star washers (user provided) should be used with each mounting screw to assure a good connection and proper ground.*

D.4 Ring Network Transmission/Communication Specifications

System	Full duplex, conforms to EIA RS-422 standard.
Mode	1:N (1:1 for setting device number)
Protection	TransZorbs™ on TX and RX terminals (within Class 8005 Type RIU10 only). TransZorb is a trademark of General Semiconductor Industries, Inc., a subsidiary of Square D Company.
Medium	Shielded, twisted-pair cable (Belden 8760 or equal).
Baud rate	9600
Cable length	990 feet (300 meters) total length between transmission device and furthest distant 8005 RIU10. See Figure D.2. Maximum distance from one RIU10 to another RIU10 is also 990 feet.
Error checking	Checksum, parity even.
Synchronization	Stop/Start
Protocol	Proprietary
Number of drops	32 maximum

PRINTER SETUP AND PRINT OPERATIONS

E

E.1 General Information

This appendix describes the printer hardware and wiring connections, printer setup, and print operations supported by SFW30. You may print rungs (with and without labels), labels and cross reference data.

Square D does not offer printers as a standard product. Your local Square D distributor can recommend printers for your application. A parallel interface is recommended for faster printing operation. In all cases, it is assumed that the printer internal switches are correctly set for proper operation.

Note: *Make all communication connections before power to the printer and computer is turned on.*

E.2 Printer Connections

Serial Printout Directly to a Printer

To connect a serial printer directly to the IBM compatible computer, a serial port must exist which matches the printer assignment in INIT/UTIL mode (COM1 or COM2). Many personal computers do not have a built-in serial port and thus require a serial board to be plugged into one of the expansion slots.

Note: *The SY/MAX interface board (SF13xx) cannot be used when printing directly to a printer, except during the OFFLINE mode. OFFLINE transfer is not allowed in this configuration.*

Figure E.1 illustrates an example of an IBM XT compatible computer to printer connection.

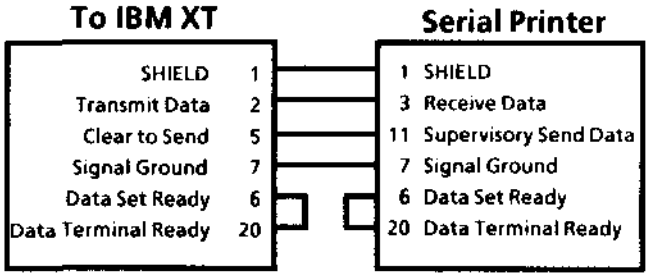


Figure E.1 Special Cable for Connecting the IBM XT Compatible (25 Pin Serial Port) to Serial Printer

IBM AT Compatible Connections

The illustration shown in Figure E.2 can help you to connect the IBM AT compatible to the printer.

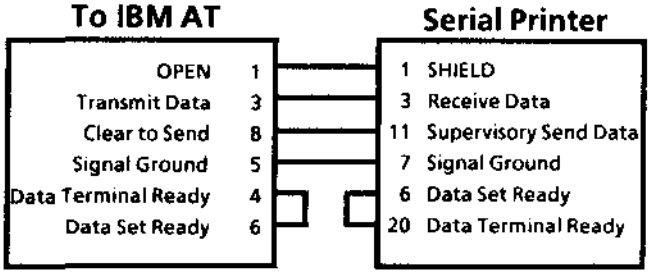


Figure E.2 IBM AT Compatible (9 Pin Serial Port) to Serial Printer

Parallel Connections

To connect a parallel port on a printer to an IBM compatible computer or SY/MAX Class 8010 Type SPR30 Laptop programmer, refer to the printer and computer manuals for the pinouts of the 25-pin cable that is required. Refer to Section 2.2 for software configuration procedures.

INDEX

The boldfaced entries in this index indicate the section or appendix in which the information can be found.

-A-

-B-

-C-

-D-

–E–

– F –

– H –

– I –

–J–

–K–

–L–

–M–

–N–

–O–

–P–

-R-

–S–

–T–

-U-

-X-