



**ALLEN-BRADLEY**  
A ROCKWELL INTERNATIONAL COMPANY

## ***User's Manual***

# **Bulletin 1745 SLC Personal Computer Software**

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## **Important User Information**

Solid-state equipment has operational characteristics differing from those of electromechanical equipment. "Application Considerations for Solid-State Controls" (Publication SGI-1.1) describes some important differences between solid-state equipment and hard wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid-state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Allen-Bradley Company be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Allen-Bradley Company cannot assume responsibility or liability for actual use based on the examples and diagrams.

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### **Disk Handling Precautions for the SLC Personal Computer Software**

**Do** store your disk in its protective sleeve when not in use.

**Do** store your disk in an environment where temperatures are within 10°C-52°C (50°F-125°F).

**Do** insert and remove your disk carefully when using it in a disk drive.

**Do not** touch the exposed portion of the disk.

**Do not** bend your disk.

**Do not** expose your disk to any types of magnetism.

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### **Bulletin 1745 SLC Family of Programmable Controllers**

The Bulletin 1745 SLC Programmable Controllers are microprocessor based programmable controllers. They are a technologically advanced control system having the inherent flexibility and advantages characteristic of other programmable controllers – but with an important difference: Simplicity. They were designed with the first time user in mind.

You will find that the controllers are easy to program, operate, and maintain, allowing you to take advantage of their capabilities in the shortest possible time.

Once you have learned how to program and operate the SLC programmable controllers, you will find the Personal Computer Software very helpful for documenting your programs and increasing your productivity.

This manual should be used in conjunction with the SLC User's Manual, Publication 1745-800. The SLC User's manual describes the instruction set and provides useful examples to help you understand and program the SLC Programmable Controllers. A Self-Teach Manual, Publication 1745-800A, is also available to supplement the User's Manual by providing more examples, questions, and exercises to reinforce the concepts you have learned in the User's Manual.

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### **SLC Personal Computer Software**

The SLC Personal Computer Software is IBM compatible software on a 5¼" floppy diskette (Cat. No. 1745-PCD) or a 3½" micro disk (Cat. No. 1745-PCDM). The software is compatible with both SLC 100 and SLC 150 Programmable Controllers. Software features:

- Prompt messages and selection menus to make program development easy and user friendly. Ladder diagram programming format allows easy system troubleshooting for maintenance personnel.
- Programs can be clearly documented with rung comments and instruction labels. Ladder diagrams can be printed along with sequencer tables, cross reference tables and contact histograms.
- You can monitor the functions of the SLC programmable controller from the personal computer. In the Run mode you can observe your program in the ladder diagram format or the data display table format. TRUE status of instructions is shown by screen intensification or reverse video. Timer/counter/sequencer parameters can be adjusted on-line.
- Software that is compatible with industry standard hardware. Your personal computer becomes a multi-purpose tool. You can purchase software packages for other production control functions or for programming other Allen-Bradley programmable controllers.

We strongly suggest that you fill out and return the registration card enclosed with the software. This will allow us to keep you informed of any future literature or software upgrades.

The following paragraphs will discuss DOS Requirements, IBM compatibility, software capabilities, hardware description, hardware connection procedures, and interface converter pinouts.

## **DOS Requirements**

SLC Personal Computer Software (PCIS) Catalog Number 1745-PCD must be installed on a diskette that you have formatted. Procedures for installing PCIS are given in Chapter 2, Getting Started, of this manual. Your personal computer must have a minimum of 256 Kbytes of memory in order to run SLC Personal Computer Software. We recommend 384 Kbytes of memory.

The computers listed below are IBM compatible. There are other IBM compatible computers that are not listed here.

- Allen-Bradley 6120 Industrial Computer
- Allen-Bradley 6121 Industrial Computer
- Allen-Bradley T45
- Allen-Bradley T50
- IBM PC XT
- IBM PC AT
- IBM PC
- IBM Portable
- IBM Convertible
- IBM 5531 Industrial Computer
- Compaq Portable
- Compaq Plus

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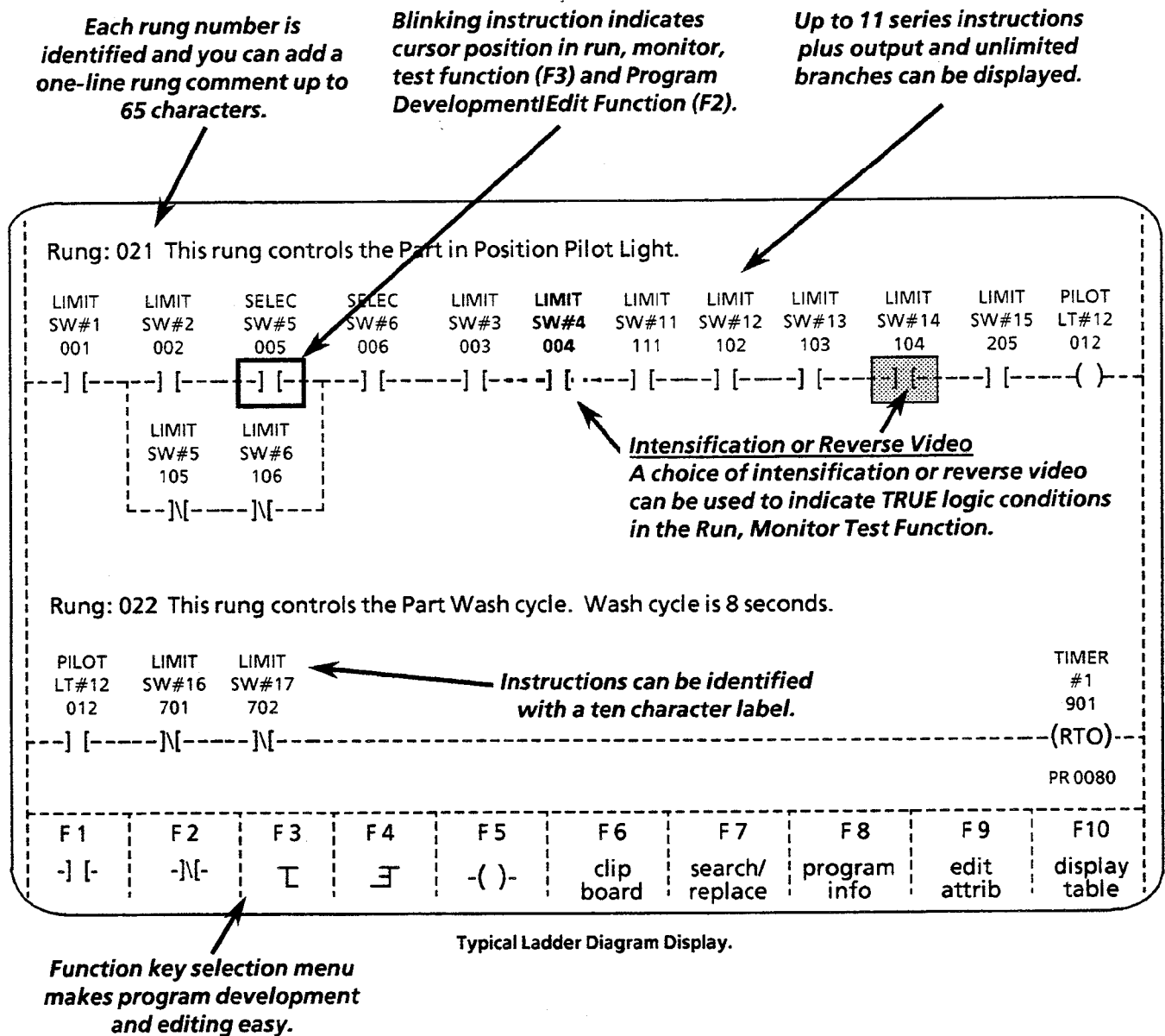
## **SLC Software Capabilities**

**Program Transfer** – Your personal computer can be used to store a library of SLC user programs. These programs can then be individually selected and transferred to an SLC Programmable Controller for program execution. Program transfer functions include Program Upload/Download, File – save/read, EEPROM – save/read, Print, and Clear.

**Hard Copy Generation** – SLC ladder diagrams including sequencer and cross reference tables can be printed via your personal computer printer interface. Instruction comments and rung comments may be added while programming or editing your program to help provide clear program documentation.

**Program Development and Documentation** – SLC programs can be developed off-line. Rung comments and instruction labels can be created to clearly document ladder diagrams. A Data Display Table can also be created for monitoring selected instructions. Cross reference tables created in the print-out automatically organize instructions, addresses, rung numbers, and comments so that the inter-relationships can be easily identified.

Typical displays are shown below and on Page 1-4.



## SLC Software Capabilities

(continued)

| ELEMENT          | ACCM         | PRESET       | STEP # | DATA | GROUP# | TABLE COMMENT  |
|------------------|--------------|--------------|--------|------|--------|--|
| T 901<br>-(SQO)- | 1111         | 1111         | 03     | 0F   | 00     | TIME SQO#1: This sequencer controls the staging lights for ramp 1. |
| E902<br>-(SQI)-  | prot<br>0000 | prot<br>0001 | 00     | 0A   | 07     | EVENT SQI#1: This sequencer checks the ramp staging positions.     |
| 003<br>-] [-     | ---          | ---          | --     | --   | --     | LIMIT SW#3: This switch controls the ramp closed light.            |
| 004<br>-] [-     | ---          | ---          | --     | --   | --     | LIMIT SW#4: This switch controls the ramp open light.              |
| 902<br>-(CTU)-   | 0800         | 9999         | --     | --   | --     | CNTR #1 : This counter counts the number of parts on ramp.         |
| 903<br>-(CTU)-   | prot<br>0001 | prot<br>9999 | --     | --   | --     | CNTR #2 : This counter counts the number of parts off ramp.        |

Instructions can be inserted into the display table for selective monitoring of parameters and status.

Screen intensification or reverse video is used in the monitor mode to show instruction status.

Comments can be added in the program mode to document the function of an instruction. These comments will also appear in cross reference table printouts.

Typical data table.

|   |          |             |   |   |   |   |   |   |   |              |                  |
|---|----------|-------------|---|---|---|---|---|---|---|--------------|------------------|
| I/O Address : 018 017 016 015 014 013 012 011 |          |             |   |   |   |   |   |   |   | Time Driven  | CON 1            |
| Hex Mask : 3 F                                |          |             |   |   |   |   |   |   |   |              | 905              |
| Binary Mask: 0 0 1 1 1 1 1 1                  |          |             |   |   |   |   |   |   |   |              | -(SQO)-<br>GRP 0 |
| STEP #  | Hex Data | Binary Data |   |   |   |   |   |   |   | Preset Value |                  |
| 00  | 00       | -           | - | 0 | 0 | 0 | 0 | 0 | 0 | 0010         |                  |
| 01  | 01       | -           | - | 0 | 0 | 0 | 0 | 0 | 1 | 0005 P       |                  |
| 02  | 03       | -           | - | 0 | 0 | 0 | 0 | 1 | 1 | 0010 P       |                  |
| 03  | 07       | -           | - | 0 | 0 | 0 | 1 | 1 | 1 | 0005 P       |                  |
| 04  | 0F       | -           | - | 0 | 0 | 1 | 1 | 1 | 1 | 0010 P       |                  |
| 05  | 1F       | -           | - | 0 | 1 | 1 | 1 | 1 | 1 | 1115         |                  |
| 06  | 3F       | -           | - | 1 | 1 | 1 | 1 | 1 | 1 | 0110 P       |                  |
| 07  | 00       | -           | - | 0 | 0 | 0 | 0 | 0 | 0 | 0005 P       |                  |
| 08  | 3F       | -           | - | 1 | 1 | 1 | 1 | 1 | 1 | 0010 P       |                  |
| 09  | 01       | -           | - | 0 | 0 | 0 | 0 | 0 | 1 | 0005         |                  |

Step number and binary data makes monitoring and programming sequencers easy.

Typical sequencer table.



## Hardware Description

The interface converter (Cat. No. 1745-PCC) will convert RS-422 signals transmitted by the SLC processor to RS-232-C signals that are compatible with your computer. The interface converter also isolates the SLC processor from the RS-232-C port which will help to minimize the chance of damage due to noise transients. The interface converter connects to an RS-232-C serial port on the back of your computer with the ribbon cable that is attached. The software allows you to select either COM1 or COM2 operation.

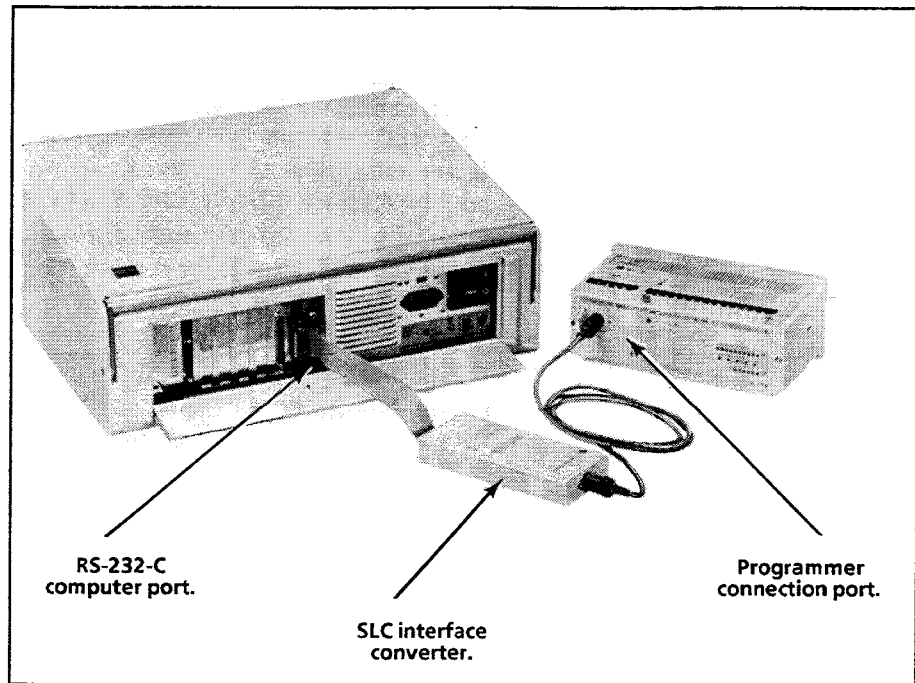
The interface converter connects to the SLC processor unit via the 6 ft. interconnect cable. Remote communication up to 4,000 feet is possible with SLC 150 Series A or later processor units and SLC 100 Series B or later processor units. Remote communication requires a plug-in power supply, Catalog No. 1745-PCP. **SLC 100 Series A processor units are limited to remote communications of 100 feet maximum.** You must supply your own cable for remote communication.

**Important Note:** When communicating via computer with the SLC 150 in a "non-run" mode (e.g. Program Transfer, Program Development), removing power from your computer could cause the SLC processor to fault. You can clear this fault by following the procedures outlined below.

1. Turn power to the SLC OFF and then back ON.
2. Turn power to your computer back ON.
3. Re-establish communication with the SLC via SLC Personal Computer Software via Program Transfer function (F1) or SLC Diagnostics (F4).
4. A processor memory error will be displayed by the computer. Press Esc to return to the Main Menu.
5. To clear the processor fault, clear the SLC RAM memory via the Program Transfer function (F1).

**Hardware Connection  
Procedure***(local communication)*

1. Connect the ribbon cable connector of the interface converter to the RS-232-C serial port on your computer. Connectors are keyed to prevent improper connection.
2. Connect the 6 foot interconnect cable on the interface converter to the SLC processor unit programming port. Connectors are keyed to prevent improper connection.

**Hardware Connection  
Procedure***(remote communication)*

1. Remote communication via the interface converter requires a plug-in power supply (Cat. No. 1745-PCP). The power supply is pre-wired to a DIN connector compatible with the SLC interface converter. An additional DIN connector is provided for connection to the SLC processor unit. You must assemble the connectors and cables yourself. Assembly instructions are provided with the power supply kit.
2. After you assemble the remote communications cable, follow the same connection procedures described in local connection.

### **SLC Personal Computer Interface Converter Pinouts**

The SLC Personal Computer Interface Converter (Cat. No. 1745-PCC) has a 25 pin ribbon cable connector which plugs in to the RS-232-C Serial port of an IBM compatible computer. The table below will define the pinouts for the interface converter ribbon cable.

| RS-232-C CONNECTOR PINOUTS |                         |
|----------------------------|-------------------------|
| PIN                        | FUNCTION                |
| 7                          | GND Signal Ground       |
| 2                          | TXD Transmit Data       |
| 20                         | DTR Data Terminal Ready |
| 4                          | RTS Request to Send     |
| 3                          | RXD Receive Data        |

### **9-Pin Adapter Pinouts for Allen-Bradley and IBM Personal Computers**

Personal computers with 9-pin serial adapter ports will require a 9-pin to 25-pin adapter cable in order to interface with the SLC Personal Computer Interface Converter. Provided below is pin-out information and part numbers for 9-pin to 25-pin adapter cables for interfacing with the IBM AT, A-B 6120, 6121 and 1784-T50.

| SERIAL/PARALLEL ADAPTERS<br>(IBM AT, 6121-AAS, 1784-T50)   |               | COMBINATION ADAPTER SI & II<br>(6120-CBA, 6121-CBB)   |               |
|--|---------------|---|---------------|
| 9-PIN (female)   | 25-Pin (male) | 9-PIN (female)  | 25-Pin (male) |
| 2  | 3             | 2   | 2             |
| 3  | 2             | 3   | 3             |
| 4  | 20            | 4   | 4             |
| 5  | 7             | 7   | 7             |
| 7  | 4             | 9   | 20            |
| <b>Pre-Made Cables</b><br>A-B Catalog Number    6121-CA1 (10 ft.)<br>6121-CA2 (6 in. adapter)<br>IBM Number              6450217 (10 ft.)<br>6450242 (6 in. adapter) |               | <b>Pre-Made Cables</b><br>A-B Catalog Number    6120-CA2 (10 ft.)<br>IBM Number              6421646 (10 ft.) |               |

### Installing PCIS on a Blank Diskette

In order to run the SLC Personal Computer Software (PCIS) Catalog Number 1745-PCD on your computer, you must install it on a diskette that has been formatted to allow room for DOS 2.0 or later. Doing this will provide you with an operational form of PCIS and your original PCIS diskette.


To install PCIS on a blank diskette, you will need a blank diskette, DOS 2.0 or later diskette, and the SLC software diskette. Follow the instructions outlined below to install PCIS on a blank diskette. (If you wish to install the SLC Personal Computer Software on a hard disk, follow the instructions on Pages 2-2 and 2-3.)

Insert your DOS diskette in Drive A and a blank diskette in Drive B and power up your computer. If you have a single disk drive system, DOS will tell you when to switch disks to format the blank diskette.

After the power up diagnostics, you will be prompted for the date and time. **Enter the correct date and time.** You will see the A > prompt after you have done this. At the A > prompt line type:

**FORMAT B: /S**

and press Enter. (If your computer has a 62-key keyboard, you will probably have a key marked 

An 83-key keyboard will have a carriage return key marked . Depending on your type of keyboard, use the key you have to when you have finished typing a whole command. In this document we will refer to this key as Enter.

The /S parameter copies the operating system files from the default drive to the new diskette. The formatting instructions are displayed on the screen. Follow them.

When the formatting is complete, the screen display asks if you want to format another diskette. Type: N and press Enter.

Remove your DOS diskette from drive A and remove the diskette you have just formatted from drive B and install it in drive A.

Install the SLC Personal Computer Software diskette (Cat. No. 1745-PCD) into Drive B. At the A > prompt line type:

**COPY B:PCIS.EXE**

and press Enter. Your computer will respond with "1 file(s) copied" when done.

Remove the SLC Personal Computer Software diskette from Drive B and *put it in a safe place.*

To startup the software, at the A > prompt line type:

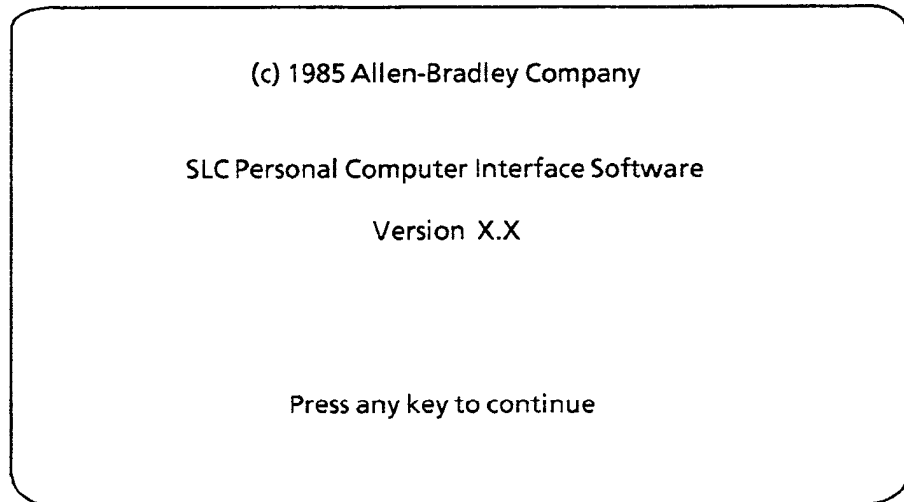
**PCIS**

and press Enter. You will then see the display shown in Figure 2.1 on Page 2-2.

## Installing PCIS on a Blank Diskette

(continued)

Figure 2.1



While this display is shown, pressing any key on your computer keyboard will bring up the main menu display shown in Figure 2.2 on Page 2-3.

## Installing PCIS on a Hard Disk

To install the SLC Personal Computer Software on a hard disk requires the SLC Personal Computer Software diskette.

Power up your system in the way your system's user's manual recommends to obtain the prompt for the hard disk. In most cases this will be the C>. If your system prompt for the hard disk is different, replace the C> with your symbol in the instructions.

We recommend that you invoke the PROMPT command. This will display the name of the current default drive and working directory. To use this command, type:

**PROMPT \$p\$g**

and press the Enter key.

At the C> prompt, type:

**MKDIR \PCIS**

and press the Enter key.

This command sets up a unique work area for the SLC personal computer software to operate in. The effect of executing this command is to make a directory. To access this area, at the C> prompt type:

**CHDIR \PCIS**

and press the Enter key. This puts you in the directory you created.

When you are in the PCIS directory, your prompt will now look like:

**C:\PCIS>**

Now make sure you are in the directory you created – the PCIS directory. Insert the SLC Personal Computer Software diskette into drive A and close the drive door. At the prompt, type:

**COPY A:PCIS.EXE**

and press the Enter key.

## Installing PCIS on a Hard Disk

(continued)

When the copy is finished, the computer will display the default drive prompt. Remove the SLC personal computer software diskette and

*PUT IT IN A SAFE PLACE!*

To start up the SLC Personal Computer Software, at the C > prompt, type:

**CHDIR\PCIS**

and press the Enter key.

Then type:

**PCIS**

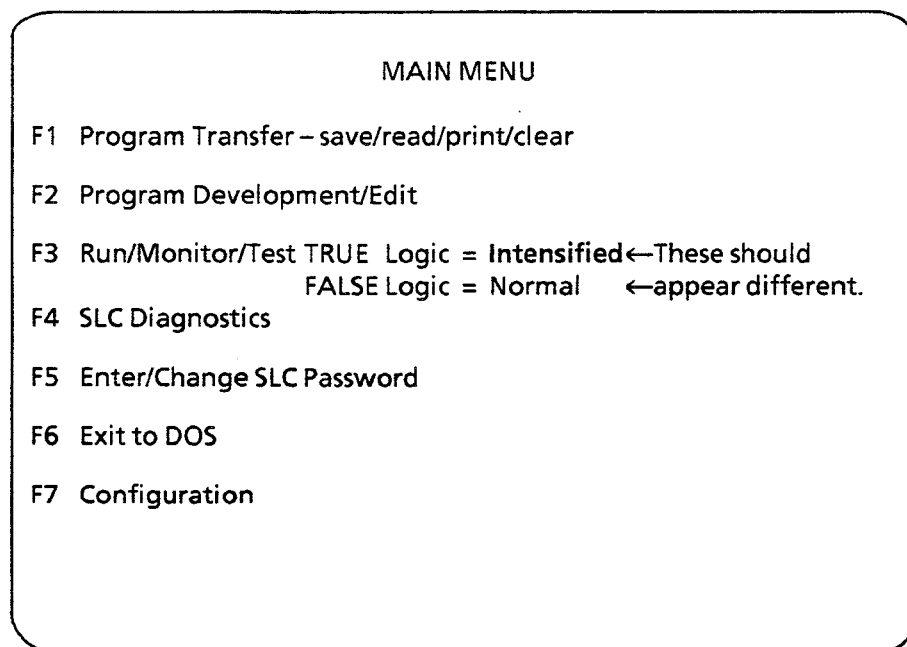
and press the Enter key.

You will then see the display shown in Figure 2.1 on Page 2-2.

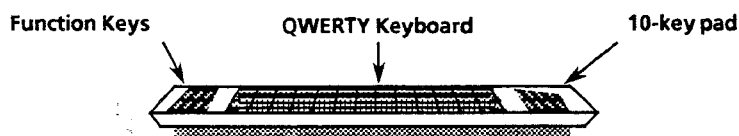
## Main Menu

This main menu is where you will select one of the seven functions available with this software. Function F1 is discussed in Chapter 3. Function F2 is discussed in Chapter 4 and function F3 is discussed in Chapter 5. Functions F4, F5, F6 and F7 are discussed in Chapter 6.

Figure 2.2



To select one of these functions, press the function key on the keyboard associated with the function you wish to use. The screen will change to show the features associated with the selected functions and assign new meanings to the function keys. Most computer keyboards will have ten function keys located on the left side of the keyboard as shown below.



**General**

When you press the F1 function key on your computer keyboard while the main menu is displayed, you will move into the program transfer function of the SLC Personal Computer Software. With this function you will be able to:

1. Read a ladder diagram from a file on diskette, hard disk, or from the SLC processor unit memory into the computer workspace.
2. Save a ladder diagram from the computer workspace to a disk or to the SLC processor unit memory. (**Note: Programs transferred from the workspace to the SLC will not include the labels and comments when transferred back into the workspace from the SLC.**)
3. Print a ladder diagram and cross reference table from the computer workspace.
4. Clear a ladder diagram from the disk, computer workspace, or SLC processor memory.
5. Transfer the program in the SLC NVRAM (Non-Volatile Random Access Memory which stores the user program) to the SLC EEPROM (Electrically Erasable Programmable Read Only Memory cartridge Cat. No. 1745-M1) or vice versa.

When you are in the program transfer function, the contents of the computer workspace will always be identified in the upper left corner of the display with the window shown below.

Workspace = XXXXX

The XXXXX in the window represents 'Empty' if there is nothing in the workspace; it represents 'SLC NVRAM Program' if there is a program obtained from the SLC in the workspace; it represents the disk file name if the program in the workspace was read in from a disk; or it represents New Ladder Diagram if the program is developed using the F2 Program development/edit function.

The following paragraphs will describe how to use the program transfer function.

### **Read Ladder Diagram from SLC Processor Memory**

You can read a ladder diagram into the workspace on the computer from the SLC processor memory or you can read a ladder diagram into the workspace from a file on your personal computer software diskette or hard disk. We will look at reading a ladder diagram from the SLC processor memory first.

Let's assume that the workspace is clear and you want to read a ladder diagram from the SLC processor memory to the workspace. When you select the F1 Program Transfer function from the main menu, you will see the display and options shown below.

|      |     |     |       |        |               |     |     |     |      |
|------|-----|-----|-------|--------|---------------|-----|-----|-----|------|
| F 1  | F 2 | F 3 | F 4   | F 5    | F 6           | F 7 | F 8 | F 9 | F 10 |
| read |     |     | clear | EEPROM | change<br>dir |     |     |     |      |

## Read Ladder Diagram From SLC Processor Memory (continued)

To read a ladder diagram, select the F1 function – read, from the program transfer function menu. When you do this, the F1 function key in the transfer function menu will be displayed in reverse video to indicate your menu choice. This will be true of all functions you select in the transfer function menu.

When you select the F1 read function the window shown below will be displayed.

|                                 |
|---------------------------------|
| Read the<br>ladder diagram from |
| disk                            |
| ...SLC...                       |
| into the workspace.             |

The cursor will be positioned on "...disk...". Cursor position is indicated by reverse video. If you wanted to read a ladder diagram from the disk you could just press Enter because the cursor is positioned on disk. If you wish to read the ladder diagram from the SLC, you can use the down arrow key on your computer keyboard to position the cursor on the SLC.

Position the cursor on SLC, press Enter, and the ladder diagram will be read into your workspace if the SLC is not password protected. While the transfer is being made, the window shown below will be displayed.

|            |
|------------|
| Working... |
|------------|

Once you have the ladder diagram in the work area of your computer, you can save the ladder diagram in a file, print the ladder diagram, or clear the ladder diagram from the work area. The program transfer function menu shown below will appear at the bottom of the screen.

|      |      |       |       |        |               |    |    |    |     |
|------|------|-------|-------|--------|---------------|----|----|----|-----|
| F1   | F2   | F3    | F4    | F5     | F6            | F7 | F8 | F9 | F10 |
| read | save | print | clear | EEPROM | change<br>dir |    |    |    |     |

If the SLC is password protected, you will have to enter the correct password before you can read its program into the computer workspace. Refer to Chapter 6 for more information on the password.



## Read Ladder Diagram from Disk

When you select the read function you will see the display shown below.

|                                 |
|---------------------------------|
| Read the<br>ladder diagram from |
| disk                            |
| ...SLC...                       |
| into the workspace.             |

Select disk and the window shown below will open on the display if there are no files on the disk.

|   |
|---|
| There are no SLC files on the disk.<br>Press any key to continue. |
|---|

If there are one to 15 files on the disk, the window shown below on the left will open on the display. If there are more than 15 files on the disk, the window shown below on the right will open.

|          |
|----------|
| ABFILE01 |
| ABFILE02 |
| " "      |
| " "      |
| " "      |
| " "      |
| " "      |
| " "      |
| ABFILE14 |
| ABFILE15 |

|          |
|----------|
| ABFILE01 |
| ABFILE02 |
| " "      |
| " "      |
| " "      |
| " "      |
| " "      |
| " "      |
| ABFILE14 |
| ABFILE15 |
| more ↑↓  |

**Note:** The double headed arrow means that there are more file names either above and/or below the file names currently shown in the window. You can scroll the window by using the up and down arrow keys on your keyboard.

To read the file you want moved to your workspace, you must position the cursor on the file name and press Enter on your keyboard. (Pressing the first letter of the filename will also move the cursor to the closest filename in the window with that first letter.) When you press Enter, that file will then be read to your workspace and the workspace = window will identify the file you have just read into the workspace.

If a ladder diagram is already in the computer workspace and you want to read a new ladder diagram into the workspace, you can select the F1 read function and the window shown below will be displayed.

|  |
|--|
| Overwrite existing workspace? (y/n): n |
|--|

If you want to avoid overwriting the workspace, press Enter. If you type a 'y' and press Enter, you will be allowed to select a new filename to replace the program currently in the workspace.

### **Save the Ladder Diagram from the Work Area**

When you select the F2 save function of the transfer function, the window shown below will open on the display.

|   |
|---|
| Save the<br>ladder diagram from<br>the workspace to the |
| disk  |
| ...SLC.   |

The cursor will be positioned on disk as shown above. To select the SLC as the destination, use the down arrow key on your keyboard to position the cursor on SLC. When you select the SLC as the destination for the ladder diagram and press Enter, the ladder diagram will be placed in the SLC NVRAM memory and the transfer function menu will be displayed.

If the SLC was password protected when you tried to save the ladder diagram, you will have to enter the correct password before the ladder diagram will be saved. Refer to Chapter 6 for more information on the password. If the SLC was in the Run mode when you tried to save the ladder diagram, the window shown below will open on the display.

|  |
|--|
| If you continue, the SLC will be<br>taken out of the run mode.<br>The SLC can be placed into the run<br>mode from the Run/Monitor/Test function. |
| Do you wish to continue? (y/n): n  |

The computer will display an 'n' response and wait for you to press the Esc key, the Enter key, or enter a 'y' response. If you press the Esc key or Enter key, you will return to the transfer function menu. If you type a 'y', and press Enter, the SLC will be taken out of the Run mode and the ladder diagram in the workspace will be placed in the SLC NVRAM memory. (You can return the SLC to the Run mode with the F3 function on the Main Menu.) While the computer is saving the ladder diagram, the display shown below will be flashing.

|            |
|------------|
| Working... |
|------------|

## Save the Ladder Diagram from the Work Area (continued)

Your other option with the Save function is to save the ladder diagram from the workspace to the disk. If you select the disk as the destination for the ladder diagram and press Enter, the window shown below will open on the display.

Save ladder diagram as:

You must assign a file name in order to save the ladder diagram on the disk. File names up to eight characters may be assigned. We suggest you use all eight characters for clear and consistent file identification. Commas and periods are not valid for file names. Lower case letters are treated the same as upper case letters. Valid keys for file names are: A through Z and 0 through 9 and the underscore symbol `_`. Type in a file name and press Enter. Your computer disk drive light will illuminate while the program is being saved on your disk.

If the ladder diagram you want to save was read into the workspace from a file on the disk, that ladder diagram will already have a name and the window shown below will open on the display when you try to save it to disk.

Save ladder diagram as: ABFILE01

In this example, the file that was read from the disk was named ABFILE01. Pressing Enter will save ABFILE01 back to the disk. If you want to change the name of ABFILE01 to something else, backspace to erase the current name and type in a new name. If for example you changed the name of the file to ABFILE02 and a file named ABFILE02 already exists on the disk, when you try to save ABFILE02 to the disk the window shown below will open on the display.

Overwrite existing file? (y/n): n

If you press Enter, the file will not be saved on the disk. If you type a 'y' response, the file in your workspace will be renamed ABFILE02 and replace the file named ABFILE02 that is already on the disk. This is what overwrite existing file means. Your yes response to the 'overwrite existing file?' prompt will cause the window below to open on the display.

Save ladder diagram as: ABFILE02

The window above will remain open and your computer disk drive light will illuminate while the program is being saved on the disk.

## Print the Ladder Diagram

If you have a printer for your personal computer, you can get a printout of your ladder diagram. A sample of a ladder diagram printout is illustrated in Chapter 1 on Page 1-3. The screen intensification and menu bar are not printed. Sequencer tables are printed at the end of the ladder diagram printout. An example of a sequencer table printout is shown in Chapter 1 on Page 1-4.

Selecting F1 from the main menu will put you into the program transfer function. The F3 function of program transfer is Print. You will not be able to select the F3 function unless you have a ladder diagram in your workspace. When you select the F3 print function, the window shown below will open on the display.

Print the ladder diagram? (y/n): y ☒

From rung: 1 To rung: mmm

Print the cross reference table? (y/n): y

Width of the printout (s/w/x): s  
s – standard, 80 characters  
w – wide, 96 characters  
x – extra wide, 132 characters

Name of list device/file: LPT 1

The print function asks you some questions and gives you several options. **If you want to print the entire ladder diagram and the cross reference table with a standard width of printout, press Enter 6 times and printing will begin.** If not, read on.

The first question you must answer is whether to print the ladder diagram. Let's assume here that you want to print the ladder diagram. The cursor will be positioned after the 'y' as illustrated by the little box in the figure above. If you press Enter, the cursor will move to the next line and be positioned after the '1' in the 'From rung' prompt. The computer automatically enters the '1' assuming you want to print the ladder diagram from the beginning. If you want to print only a portion of the ladder diagram, and you want to start the printout from a rung other than rung 1, backspace and type in the rung number you want to start the printout from. If you want to start from rung 1, just press Enter.

The cursor will then move to the 'To rung' option and automatically enter the number of the last rung in the ladder diagram you are trying to print. Again, if you wish to print only a portion of the ladder diagram, change the number the computer entered for 'To rung' to the last rung number you want to print and press Enter. **The number value that you enter for 'From rung' must be less than or equal to the number value you enter for 'To rung'.** Note that SLC Personal Computer software ladder programs are limited in length to 882 rungs.

After you press Enter for the 'To rung' prompt, the cursor will move to the next line and be positioned after the 'y' for the 'Print the cross reference table?' prompt. The cursor will also move here if you answered no to the

## Print the Ladder Diagram (continued)

'Print the ladder diagram?' prompt. If you want to print the cross reference table, press Enter. If you do not want to print the cross reference table, backspace, type an 'n' and press Enter.

The 'Print the cross reference table?' option allows you to get a hard copy of a cross reference table. The cross reference table is a type of I/O address map. The instruction address is linked to the type of instruction and the rung numbers that the instruction and address appear in. The cross reference table can be very useful in troubleshooting the controller. A portion of a sample cross reference table is shown below.

| Input   |         |               |                                  |
|---------|---------|---------------|----------------------------------|
| Address | Element | Rung Nos.     | Instruction Comment              |
| 001     | -] [-   | 001, 005, 043 | LIMIT SW#1: Part in position     |
| 001     | -]N[-   | 002, 044      | LIMIT SW#1: Part not in position |
| 002     | -] [-   | 001, 010      | LIMIT SW#2: Gate #1 Open         |
| 002     | -]N[-   | 003, 011      | LIMIT SW#2: Gate #1 closed       |
| 003     | -] [-   | 015           | PUSH BUT#3: Start conveyor #1    |
| 004     | -] [-   | 004           | PUSH BUT#4: Stop conveyor #1     |
| 005     | -] [-   | 005, 029      | SELEC SW#1: Speed selector       |
| 006     | -] [-   | 008           | TOGL SW#6: Speed override        |
| 007     | -]N[-   | 059           | PUSH BUT#7: Part wash start      |

The cross reference table is divided into 4 groups. The groups are Input, Output, Internal, and Timer/Counter/Sequencer/Reset. Each group starts on a new page of the printout. The header will only be printed on the first page of every group. If you print only a portion of the ladder diagram, only that portion present in the ladder diagram is printed in the cross reference table.

The input group will contain all instructions with the address of an external input circuit in the range of 001-010, 101-110, 201-210, 301-310, 401-410, 501-510 and 601-610. The output group will contain all instructions with the address of an external output circuit in the range of 011-016, 111-116, 211-216, 311-316, 411-416, 511-516 and 611-616. The Timer/Counter/Sequencer/Reset group will contain all instructions that have addresses in the range 901 through 932 and 951 through 982. Instructions with addresses 701-876 will be in the Internal group.

A space is provided for writing instruction comments. You can enter instruction comments with the F9 key when you are in the Program Development/Edit function.

The next question to answer in the 'Print the ladder diagram?' window is the 'Width of the printout' option. The 'Width of the printout' option allows printing in one of three different column widths. The standard width is 80 characters. Using a pica type style you would get 10 characters to the inch. A column width of 96 characters is suitable for an elite type style which gives you 12 characters to the inch. On many printers you must select a compressed type style to get a column width of 132 characters. Select a column width that is compatible with your printer. The computer will automatically enter an 's' for standard width. If this is what you need, press Enter. If you need a different width, backspace, type in 'w' for wide or 'x' for extra wide and press Enter. After

### **Print the Ladder Diagram** (continued)

you press Enter, the cursor will move to the bottom line and ask you to select a list device or file name. The current selection will be the list device selected with the configuration function (F7, main menu). If you wish to change the list device to a file name, simply back space to delete and type in the file name. Now press Enter, and printing will begin.

Once you have selected all of the options you wish to use, the option window will close and the window below will open in the center of the display.

Printing in progress...  
To terminate printing,  
Press the Esc key.

After printing is completed, the window above will close and the transfer function will be displayed. If you press the Esc key while printing is in progress, the printer will stop printing at the end of the current line being printed. You may receive an error message while trying to print your ladder diagram. An 'Out of Paper' error message means your printer is out of paper. Load your printer with paper and try to print again. A 'Not Ready' error means that the printer is not ready. Check power and connections and try to print again.

Note: When using DOS 2.XX, pressing the Esc key to exit the print function after receiving a printer error message, will work properly only after the printer error has been corrected.

---

### **Clear the Ladder Diagram**

The F4 function key in the transfer function will let you clear a ladder diagram from the disk, workspace, or SLC NVRAM memory. When you select the F4 function, the window below will open on the display.

Clear the  
ladder diagram in the

disk.

...workspace.

...SLC.

## Clear the Ladder Diagram (continued)

If you press the Esc key at this point, you will return to the transfer function. When you want to clear a ladder diagram from a disk, you must select the file on the disk that you want to clear. Depending upon how many files you have on the disk, one of the three file message windows shown on Page 3-3 will open. When you select the file you want cleared and press Enter, the window below will open on the display.

Are you sure? (y/n): n

This window gives you one more chance to avoid clearing the ladder diagram. If you type a 'y' and press Enter, the ladder diagram will be cleared from the disk and you will not be able to recover it.

If you want to clear the ladder diagram from the workspace, select the workspace from the window and press Enter. Confirm your choice by typing 'y' in the 'Are you sure' window and pressing Enter. The ladder diagram will then be cleared from the workspace.

You can also clear the ladder diagram from the SLC NVRAM memory. When you select the SLC from the window and press Enter, the window below will open on the display.

Are you sure? (y/n): n

Pressing Enter or Esc will return you to the transfer function. If you type a 'y' and press Enter, you will clear the ladder diagram from the SLC NVRAM memory and return to the transfer function menu.

If the SLC is password protected, you will have to enter the correct password before you can clear memory. If the SLC is in the Run mode when you try to clear memory, the window below will open on the display.

If you continue the SLC will be  
taken out of the run mode.  
The SLC can be placed into the run  
mode from the Run/Monitor/Test function.  
Do you wish to continue? (y/n): n

If you press Enter or the Esc key, you will return to the transfer function menu. If you enter a 'y', the SLC will be taken out of the Run mode and the 'Are you sure?' prompt window will open. If you type a 'y', and press Enter, you will clear the ladder diagram from the SLC NVRAM memory and return to the transfer function menu.

**EEPROM  
Functions**

Function key **F5** of the transfer function is labeled EEPROM. When you select **F5** of the transfer function, the window shown below will open on the display.

|                     |
|---------------------|
| Transfer the SLC... |
| ...NVRAM to EEPROM  |
| ...EEPROM to NVRAM. |

Select the transfer you wish to make, (SLC processor NVRAM to EEPROM or EEPROM to NVRAM) and press Enter. If the SLC is password protected, you will have to enter the correct password before you can access the EEPROM functions. Refer to Page 6-1 for more information on the password function. If the SLC was in the Run mode, the window below will open on the display.

|   |
|---|
| <p>If you continue the SLC will be taken out of run mode.<br/>The SLC can be placed into the run mode from the Run/Monitor/Test function.<br/>Do you wish to continue? (y/n): n</p> |
|---|

If you press Enter or the Esc key, you will return to the transfer function menu. If you enter a 'y', the transfer function that you have selected will start and the window below will open on the display.

|            |
|------------|
| Working... |
|------------|

When the transfer is complete, the window above will close and you will return to the transfer function menu.

The EEPROM to NVRAM transfer occurs so quickly that you may not see the 'Working!' window. Do not worry about it. When the transfer is complete, the window above will close and you will return to the transfer function menu. The SLC processor unit will be left in the mode that is appropriate to the transfer you have just completed. You can return the SLC to the Run mode with the **F3**, Run/Monitor/Test function on the main menu.



## ***Change Directory Function***

The change directory function allows you to easily choose a disk drive or subdirectory for storing your SLC ladder programs. This capability allows programs to be logically grouped on different diskettes or in different subdirectories.

When you press the F6 function key, a window will be displayed indicating the current drive and subdirectory. For example, the window below indicates that your SLC ladder programs are being stored on hard disk (C:drive) in a subdirectory named PCIS.



C:/PCIS

You may use the ←, →, and backspace keys to edit this directory to any existing drive and subdirectory. An error message will be displayed if you choose an invalid drive or directory. The escape key allows you to close the window and return to the program transfer function.

**General**

When you press the **F2** function key on your computer keyboard while the Main Menu is displayed, you will move into the Program Development/Edit function of the SLC Personal Computer Software. With this function you will be able to:

1. Develop a new SLC program on your computer.
2. Edit an existing program on your computer.
3. Add rung comments, instruction comments, and instruction labels to document your SLC programs more clearly.
4. Edit/develop the display table.

**Note:** Ladder programs developed with SLC personal computer software are limited in length to 882 rungs. However, "words used" are limited only by computer RAM space and disk space. When developing SLC ladder programs, always monitor "words used" with the program info function (**F8**) to ensure that program length does not exceed memory capacity of the SLC processor that you are using. If memory capacity is exceeded in an SLC processor, the CPU fault light will illuminate and your computer will display an error message.

**Selecting the Program  
Development / Edit  
Function**

When you press the **F2** function key while the main menu is displayed, you will see the display shown below if your workspace is empty.

|                           |      |    |    |       |               |                    |                 |                |                  |
|---------------------------|------|----|----|-------|---------------|--------------------|-----------------|----------------|------------------|
| ----- End Of Ladder ----- |      |    |    |       |               |                    |                 |                |                  |
| F1                        | F2   | F3 | F4 | F5    | F6            | F7                 | F8              | F9             | F10              |
| -] [-                     | -[N- | T  |    | -( )- | clip<br>board | search/<br>replace | program<br>info | edit<br>attrib | display<br>table |

If there is currently a program in your workspace when you enter the Program Development/Edit function, that ladder diagram will be displayed.

If you are currently in a function other than the Program Development/Edit function, press the Esc key to return to the main menu so that you can select the **F2**, Program Development/Edit function.

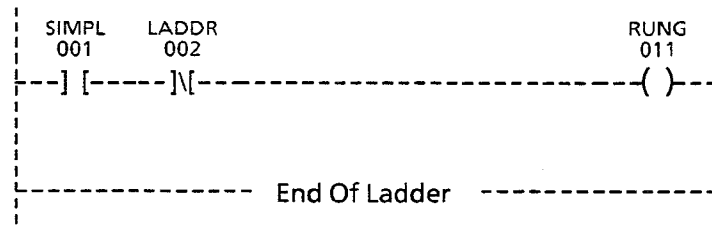
## Entering a Simple Ladder Rung

When the Program Development/Edit function is displayed as shown in the figure above, you will have several programming options available to you. The instruction set is the same as the set used on the pocket programmer. The features this software provides will allow you to create a program that is easier to understand. The interrelationships between instructions can be identified more easily and comments for each instruction and rung can be entered.

To enter a simple ladder rung, you need one or more conditional instructions followed by a single output instruction. The **F1** and **F2** function keys are your conditional instruction keys and the **F5** function key represents a pop-up menu containing all of the output instructions. These are the three basic keys you will use to program a simple ladder rung.

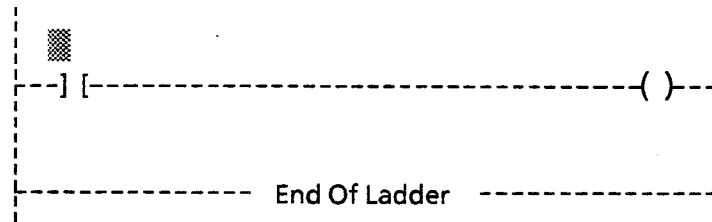
To enter the ladder rung illustrated here, follow the instructions outlined below.

Rung: 001 This is a simple ladder rung.



Press the **F1** function key for the Examine On instruction.  
The display will show:

Rung: 001



A blinking cursor box appears over a blinking Examine On instruction. The cursor is prompting you for an address for the Examine On instruction you have just entered. The software will only let you enter an address that corresponds to a legitimate SLC address for a conditional instruction. You will not be able to assign an address of 1000, 100 or 232 for example. For our example, we want to assign address 001 to the Examine On instruction. Leading zeroes do not need to be entered so we just enter "1" for the instruction address. At this point we can press Enter to complete the instruction address or we can add a label to the instruction.

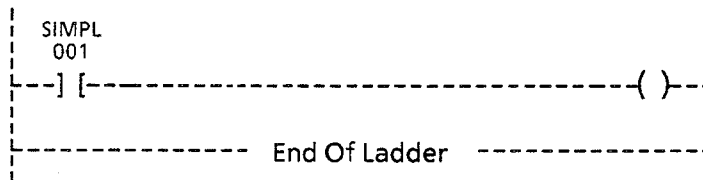
### Entering an Instruction Label

SIMPL is the instruction label. In order to help you identify instructions more clearly, this software will allow you to add a label of up to 10 characters per instruction (2 lines x 5 characters). Letters, numbers, spaces, and the symbols ( ) ! @ # \$ % - [ ] ' are all acceptable for instruction labels. Labels cannot begin with a number or a space when first entered. To use a number as the first character in a label, you must enter the label using a letter first and then go back and edit the label later. The label is not self centering so you may want to insert spaces for clarity or appearance. However, note that these spaces must be inserted when you attempt to search for the label in your ladder program.

To add the label SIMPL, enter the letters for the label after the address number has been entered and press Enter. The label SIMPL will now be automatically assigned to all instructions with address 001. Each address in your program may have only one label associated with it. An error message will be displayed if you attempt to re-use a label already assigned to another address.

Your first conditional instruction along with its address and label is entered and the display will now show:

Rung: 001



A segment of rung directly to the right of the instruction just entered will be blinking indicating the place on the rung where the next conditional instruction would be entered.

Programming a longer label (6-10 characters) is identical to the steps described above. Characters 6 thru 10 are displayed below the first 5 characters entered, e.g.

```

SIMPL
EXAMP
001
---] [---
  
```

### Entering a Rung Comment

At this point you could enter another conditional instruction, enter a rung comment, or enter an output instruction. Let's enter the rung comment for this rung. Press the F7 function key and the cursor will move to the right of the words Rung: 001 just above your first conditional instruction. Now you can type in "This is a simple ladder rung." Press the enter key and the cursor will return to the spot on the rung just after the first conditional instruction. Rung comments can also be created when you are adding a new rung to the end of your program. To do this, press the Enter key to terminate the output instruction and begin the next rung with a rung comment by pressing the F9 (edit attrib) key.

You are ready now to enter the second conditional instruction in the rung. Press the F2 function key for the Examine Off instruction. The display

### Entering a Rung Comment (continued)

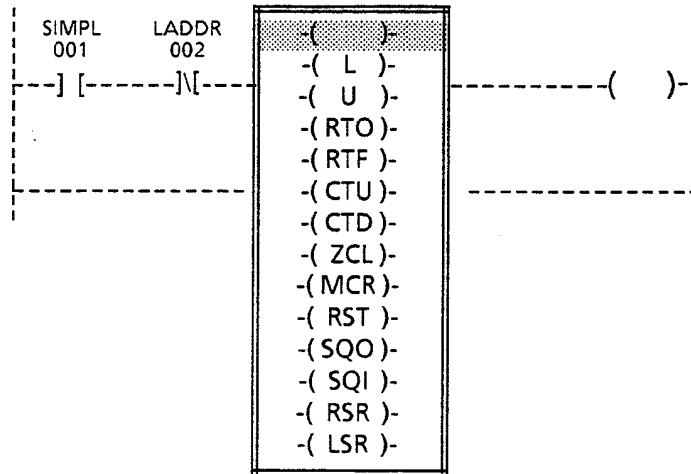
will show the blinking Examine Off instruction with the cursor box blinking above the instruction. The blinking cursor is prompting you for an address and a label for the instruction.

Press 2 for the address and LADDR for the label and press Enter. The blinking cursor will move to the position on the rung just to the right of the Examine Off instruction.

### Entering an Output Instruction

Now press the F5 key for the output instruction. The display will show:

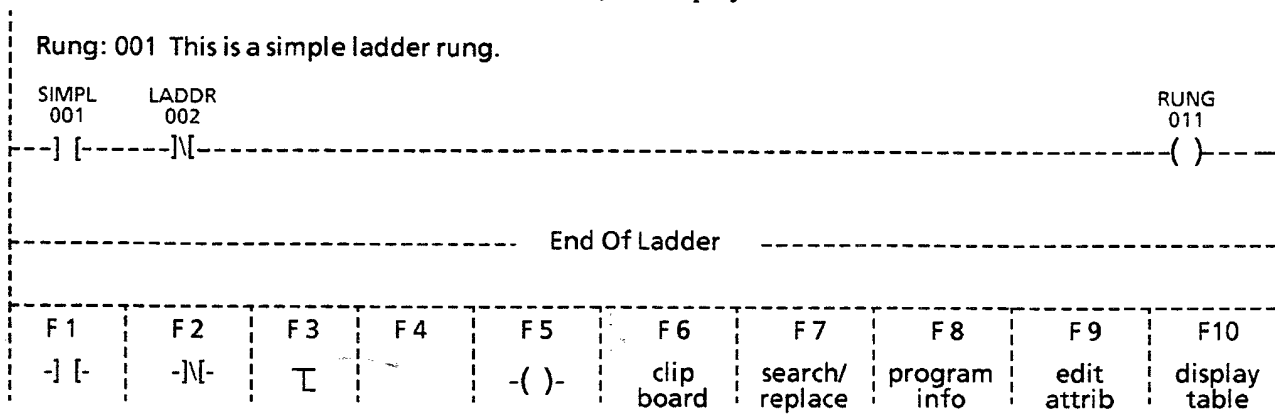
Rung: 001 This is a simple ladder rung.



The output coil in the ladder rung will be blinking and the Output Energize instruction in the pop-up menu window is highlighted. Since the Output Energize instruction that is highlighted is the instruction that you want to program, you only need to press enter to program this instruction. After you press enter the pop-up menu window will close and you can enter an address and a label for the Output Energize instruction.

If you wanted to program a different output instruction, you would use the down arrow key on your keyboard to move the cursor to the instruction that you want to program. When the cursor is positioned on the instruction that you want, press enter and that instruction will be placed on the rung.

After you have entered the Output Energize instruction along with its address and label, the display will show:



**Entering a Program Title**

SLC personal computer software allows a 65 character program title to be created. The title can be created by pressing the **F8** (Program Info) function key while in the Program Development/Edit function. When you press **F8**, the window shown below will appear on the display.

Filename: XXXXXXXX  
 Title: *A title can be created on this line.*  
 There are XXXX words used in this ladder diagram.

The backspace key and the right and left arrow keys can be used for editing your title. The title will appear on each page of your ladder diagram printout as shown below.

Date: 1-01-87 Time: 12:01:01 Filename XXXXXXXX

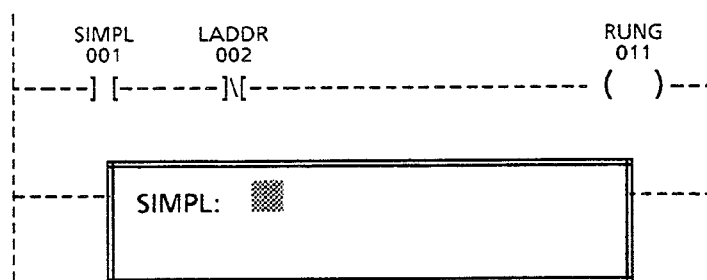
Title: *Your program title will appear here.*

SLC Personal Computer Software Ladder Diagram.

**Entering an Instruction  
Comment**

If you want to enter an instruction comment for an instruction, simply press the **F9** function key after you have entered the instruction address or label. After you press **F9**, the window shown below will open on the display.

Rung: 001 This is a sample ladder rung.



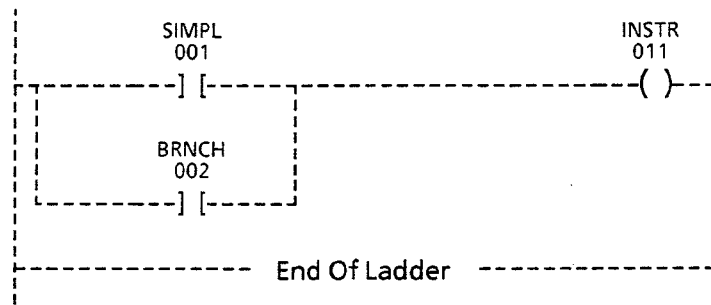
The cursor is blinking after the instruction label SIMPL. You can type in a comment of up to 65 characters (a space counts as a character).

**You can type an instruction comment for any instruction** after it is entered in a rung. Move the cursor to the instruction you want to add a comment to and press the **F9** edit attrib key. Instruction comments appear in the display table when you are in the run or monitor modes. They also appear in the cross reference section of the printout when you print a copy of your program. The instruction comment helps to tie each individual instruction in to the total picture of the ladder diagram.

## Entering A Simple Branch Instruction

The ladder diagram shown below illustrates the use of branch instructions. To program this rung, move the cursor to the end of ladder and refer to the instructions that follow.

Rung: 001 Branch Instructions are easy to program.



Press: **F3** to open the branch.

Press: **F1** to enter the Examine On instruction and then enter the address and label for that instruction.

Press: **F3** again to open the branch for the next parallel instruction.

Press: **F1** for the Examine On instruction and then enter the address and label for that instruction.

Press: **F4** to close the branch, and **F7** to enter the rung comment.

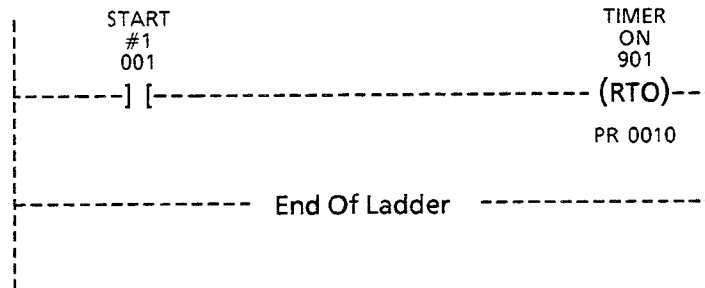
Press: **F5** for an output instruction and enter its address and label.

The **F4** Branch Close function key will only appear on the menu when you are in the middle of programming a branch.

## Entering Timer Instructions

To program the RTO Timer instruction shown below, refer to the instructions that follow.

Rung: 001 This is a sample timer rung.



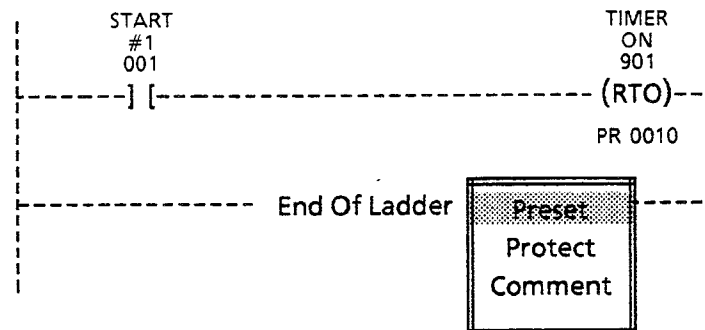
Press: **F1** for the Examine On instruction and enter its address and label.

Press: **F7** if you want to enter a rung comment.

Press: **F5** for an output instruction. When the output instruction window opens, move the cursor to select the RTO instruction and press Enter. Enter the address, add the label and press Enter. A small window shown in the example below will open and Preset will be highlighted. Press Enter to select Preset, type in the preset value for the timer, and press Enter.

When you press enter after typing in your preset value, the cursor will move to the start of the next rung. If you wish to protect the preset value or add an instruction comment, you will have to move the cursor back to the RTO instruction and press the **F9** edit attrib key. When you move the cursor to the RTO instruction and press the **F9** edit attrib key, the display will show:

Rung: 001 This is a sample timer rung.

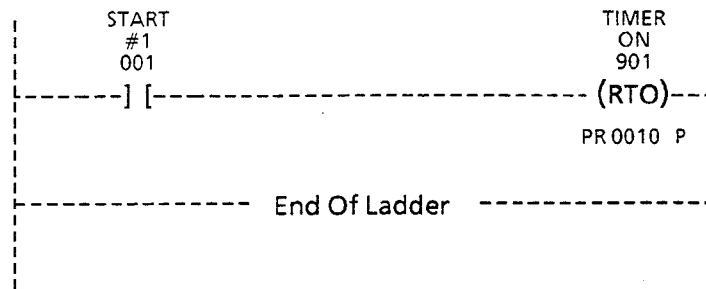




## Entering Timer Instructions (continued)

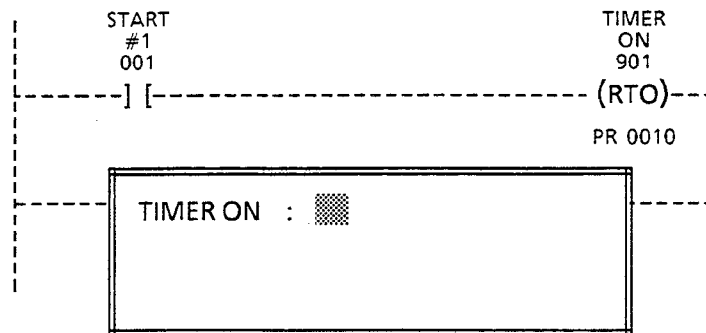
If you want to protect the preset value, move the cursor to protect with the down arrow key and press Enter. The display will show

Rung: 001 This is a sample timer rung.



If you want to enter an instruction comment for the RTO instruction, you will have to press the **F9** function key again. Move the cursor in the pop-up window to comment and press enter. The window shown below will open on the display.

Rung: 001 This is a sample timer rung.



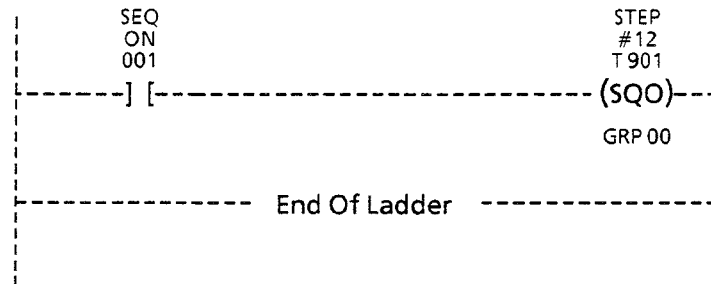
The cursor is blinking after the instruction label. You can type in a comment of up to 65 characters (spaces count as characters). Press Enter after you have finished typing the instruction comment.

RTF, CTU and CTD instructions are entered much the same as the RTO timer instruction. When you press the **F5** key for an output instruction, each of these instructions will appear in the pop-up menu.

## Entering Sequencer Instructions

To program the Sequencer Output instruction shown below, follow the instructions outlined below the rung. A blank sequencer data form is available in the back of this manual for recording sequencer data.

Rung: 001 This is a sample Sequencer Output rung.



Press: **F1** to program the Examine On instruction. Type in the address, label and press Enter.

Press: **F7** to enter the rung comment. Type in your comment and Press Enter.

Press: **F5** to select an output instruction. Press the down arrow key 10 times or hold it down until the cursor is on the SQO instruction and press Enter. Type in the address and label for the SQO instruction and press Enter.

At this point, the window shown below will open on the display.

Enter the group number for this Sequencer (00-69):

The group number for this sequencer is 00. Just press 0 and press Enter. The display will show:

Rung: 001 This is a sample Sequencer Output rung.

|                           |                    |                     |                     |                       |     |     |     |     |                     |                 |        |
|---------------------------|--------------------|---------------------|---------------------|-----------------------|-----|-----|-----|-----|---------------------|-----------------|--------|
| SEQ<br>ON<br>001          | Time Driven        |                     |                     |                       |     |     |     |     | STEP<br>#12<br>T901 |                 |        |
| ] [-----                  |                    | I/O Address :       | 018                 | 017                   | 016 | 015 | 014 | 013 | 012                 | 011             | (SQO)  |
|                           |                    | Hex Mask :          | 0                   |                       |     |     |     |     |                     |                 | GRP 00 |
|                           |                    | Binary Mask:        | 0                   | 0                     | 0   | 0   | 0   | 0   | 0                   | 0               |        |
| STEP<br>#                 | Hex<br>Data        | Binary<br>Data      |                     |                       |     |     |     |     |                     | Preset<br>Value |        |
| ----- End Of Ladder ----- |                    |                     |                     |                       |     |     |     |     |                     |                 |        |
| F1<br>edit<br>group       | F2<br>edit<br>mask | F3<br>make<br>event | F4<br>edit<br>steps | F5<br>edit<br>comment | F6  | F7  | F8  | F9  | F10                 |                 |        |

## Entering Sequencer Instructions (continued)

You have now selected the group of outputs that you want to control. Your next step is to select the bit addresses in that group that you want to control. Select **F2** edit mask from the sequencer menu bar. The Hex Mask window will open on the display as shown below.

Rung: 001 This is a sample Sequencer Output rung.

|   |                    |                     |                     |                       |    |    |    |    |     |                   |                      |   |
|---|--------------------|---------------------|---------------------|-----------------------|----|----|----|----|-----|-------------------|----------------------|---|
| SEQ<br>ON<br>001                          | Hex Mask:          |                     | Time Driven         |                       |    |    |    |    |     |                   | STEP<br>#12<br>T 901 | STEP<br>#12<br>T 901<br>(SQQ)<br>GRP 00 |
| Address : 018 017 016 015 014 013 012 011 |                    | Mask : 3 F          |                     |                       |    |    |    |    |     | -(SQQ)-<br>GRP 00 |                      |   |
| Binary Mask: 0 0 1 1 1 1 1 1              |                    |                     |                     |                       |    |    |    |    |     |                   |                      |   |
| STEP #                                    |                    | Hex Data            |                     | Binary Data           |    |    |    |    |     | Preset Value      |                      |   |
| End Of Ladder                             |                    |                     |                     |                       |    |    |    |    |     |                   |                      |   |
| F1<br>edit<br>group                       | F2<br>edit<br>mask | F3<br>make<br>event | F4<br>edit<br>steps | F5<br>edit<br>comment | F6 | F7 | F8 | F9 | F10 |                   |                      |   |

The cursor will be blinking after the words Hex Mask in the pop-up window. Type in the Hex Mask code for the bit addresses you want to control. For this example we want to control bit addresses 11 through 16 so we would type in 3F for the Hex Mask and press Enter. Refer to the SLC User's Manual for the Hex Mask code table.

Note that the sequencer is automatically programmed as time-driven. You can change it to event-driven by pressing the **F3** "make event" key and back to time-driven by pressing **F3** again.

To enter step data for the sequencer instruction you need to press the **F4** edit steps function key. When you press this key, the display will change and the menu function will also change as shown below. Note that the software automatically enters data for step 0. Step 0 will be blinking to indicate the cursor position.

Rung: 001 This is a sample Sequencer Output rung.

|                              |   |          |                     |                      |    |    |    |    |     |                   |                      |   |
|------------------------------|---|----------|---------------------|----------------------|----|----|----|----|-----|-------------------|----------------------|---|
| SEQ<br>ON<br>001             | I/O Address : 018 017 016 015 014 013 012 011 |          | Time Driven         |                      |    |    |    |    |     |                   | STEP<br>#12<br>T 901 | STEP<br>#12<br>T 901<br>(SQQ)<br>GRP 00 |
| Hex Mask : 3 F               |   |          |                     |                      |    |    |    |    |     | -(SQQ)-<br>GRP 00 |                      |   |
| Binary Mask: 0 0 1 1 1 1 1 1 |   |          |                     |                      |    |    |    |    |     |                   |                      |   |
| STEP #                       |   | Hex Data |                     | Binary Data          |    |    |    |    |     | Preset Value      |                      |   |
| 00                           |   | 00       |                     | - - 0 0 0 0 0 0      |    |    |    |    |     | 0001              |                      |   |
| —                            |   | —        |                     | — end of sequencer — |    |    |    |    |     | —                 |                      |   |
| F1<br>protect<br>step        | F2<br>insert<br>step                          | F3       | F4<br>go to<br>step | F5<br>edit<br>step   | F6 | F7 | F8 | F9 | F10 |                   |                      |   |

### **Entering Sequencer Instructions** (continued)

Your next step is to program the bit addresses that you want ON or OFF for each step. You must first edit the step data that has been entered for step 0. Press the **F5** edit step function key and the step data pop-up window will open as shown below. The cursor will be blinking after the words Hex Data in the pop-up window.

Rung: 001 This is a sample Sequencer Output rung.

| SEQ<br>ON<br>001 | Hex Data: | Preset Value: | Address :        | 018 | 017 | 016 | 015 | 014 | Time Driven | 013 | 012 | 011 | STEP<br>#12<br>T901<br>-(SQQ)-<br>GRP 00 |
|------------------|-----------|---------------|------------------|-----|-----|-----|-----|-----|-------------|-----|-----|-----|--|
|                  |           |               | Mask :           |     |     | 3   |     |     | F           |     |     |     | (SQQ)                                    |
|                  |           |               | ary Mask:        | 0   | 0   | 1   | 1   | 1   | 1           | 1   | 1   | 1   | GRP 00                                   |
|                  | #         | Hex Data      | Binary Data      |     |     |     |     |     |             |     |     |     | Preset Value                             |
|                  | 00        | 00            | 0 0 0 0 0 0 0 0  |     |     |     |     |     |             |     |     |     | 0001                                     |
|                  |           |               | End Of Sequencer |     |     |     |     |     |             |     |     |     |  |

End Of Ladder

| F1           | F2          | F3 | F4         | F5        | F6 | F7 | F8 | F9 | F10 |
|--------------|-------------|----|------------|-----------|----|----|----|----|-----|
| protect step | insert step |    | go to step | edit step |    |    |    |    |     |

Type in the Hex code for the bit addresses you want on or off for step 0. For this example we want bit addresses 11 through 16 to be off for 2 seconds so we would type in 00 for the Hex Data and press Enter. The cursor will move to the Preset value. Type 0020 for the preset value for this example and press Enter. When you press Enter, the display will change to reflect the data you have just programmed for step 0.

**Entering Sequencer  
Instructions***(continued)*

The table below shows the Hex Data (00) and Preset Value (0020) entered for the first step.

Rung: 001 This is a sample Sequencer Output rung.

|                              |   |                      |                     |                    |    |    |    |    |     |                 |             |                    |                      |
|------------------------------|---|----------------------|---------------------|--------------------|----|----|----|----|-----|-----------------|-------------|--------------------|----------------------|
| SEQ<br>ON<br>001             | I/O Address : 018 017 016 015 014 013 012 011 |                      |                     |                    |    |    |    |    |     |                 | Time Driven | STEP<br>#12<br>901 | STEP<br>#12<br>T 901 |
| Hex Mask : 3 F               |   |                      |                     |                    |    |    |    |    |     |                 | -(SQQ)-     | (SQQ)              |                      |
| Binary Mask: 0 0 1 1 1 1 1 1 |   |                      |                     |                    |    |    |    |    |     |                 | GRP 00      |                    |                      |
| STEP<br>#                    |   | Hex<br>Data          |                     | Binary<br>Data     |    |    |    |    |     | Preset<br>Value |             |                    |                      |
| 00                           |   | 00                   |                     | 0 0 0 0 0 0 0 0    |    |    |    |    |     | 0020            |             |                    |                      |
| — End Of Sequencer —         |   |                      |                     |                    |    |    |    |    |     |                 |             |                    |                      |
| End Of Ladder                |   |                      |                     |                    |    |    |    |    |     |                 |             |                    |                      |
| F1<br>protect<br>step        | F2<br>insert<br>step                          | F3<br>delete<br>step | F4<br>go to<br>step | F5<br>edit<br>step | F6 | F7 | F8 | F9 | F10 |                 |             |                    |                      |

Press the down arrow key to move the cursor and to start entering data for more steps. The words "end of sequencer" will be blinking.

To enter step data for more steps, press the **F2** insert step function key and proceed as described above. Steps will be entered in sequential order after step 0.

When you have completed programming the Sequencer Output instruction, press Esc twice to enter the instruction in the rung.

**Special Sequencer Instructions:** When developing special sequencer instruction programs, which use group numbers 38 thru 69, your sequencer table will appear as shown below:

Decimal data required

|               |             |     |             |                    |
|---------------|-------------|-----|-------------|--------------------|
| I/O Address : |             | 901 | Time Driven | STEP<br>#12<br>901 |
|               |             |     |             | -(SQQ)-<br>GRP 38  |
| STEP<br>#     | Dec<br>Data |     |             | Preset<br>Value    |
|               |             |     |             |                    |

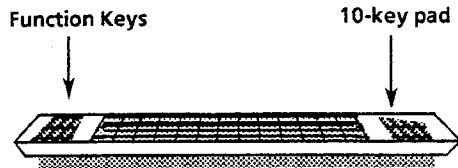
This table requires that you enter decimal data which corresponds to sequencer step numbers. Refer to your SLC User's Manual for information regarding special sequencer instruction techniques.

**Editing Your  
Ladder Program**

The program editing functions of this software will allow you to control the cursor position, search, and edit your ladder program. Special keys discussed are Clipboard (**F6**), Search and Replace (**F7**) and Edit Attributes (**F9**).

**Cursor Control**

The cursor position in your ladder diagram is indicated by a blinking instruction or, in the case of labels or comments, a blinking reverse video box. The table below summarizes special keys you can use to control the cursor. These keys are usually located on the right hand side of the keyboard if you have an 83-key keyboard.



| KEY   | FUNCTION                                     |
|-------|--|
| ←     | Moves cursor one position to the left.       |
| →     | Moves cursor one position to the right.      |
| ↑     | Moves cursor to rung above or branch above.  |
| ↓     | Moves cursor to rung below or branch below.  |
| →     | Moves cursor to output instruction.          |
| ←     | Moves cursor to beginning of rung.           |
| Pg Up | Moves cursor up one full screen display.     |
| Pg Dn | Moves cursor down one full screen display.   |
| Home  | Moves cursor to beginning of ladder program. |
| End   | Moves cursor to end of ladder program.       |

**Search / Replace  
Function**

You can search your ladder diagram for addressed instructions, labels, rung numbers, and sequencer step numbers.

- Searching for a Rung Number

Press: **F7** (search/replace)

The window below will appear on the display:

|         |
|---------|
| search  |
| goto rg |
| replace |

Press: ↓ once to select "go to rg"

Press: Enter

Press: Numeric keys for appropriate rung number

Press: Enter

### Search / Replace Function (continued)

- Searching for an instruction

Press: **F7** (search/replace)

Press: Enter to select search

The window shown below will appear on the display.

|                    |
|--------------------|
| search for label   |
| search for element |

Press: ↓ to select "search for element"

Press: Enter (a pop-up menu containing all the instructions you can search for will appear on the display).

Press: ↓ to select which instruction you wish to search for

Press: Enter (a pop-up menu will appear on the display prompting you for the address of the instruction you want to search for).

Press: Numeric keys for appropriate address of instruction you wish to search for

Press: Enter

The cursor is now moved from its present position to the first location of the addressed instruction.

If you wish to find the next location of the instruction

Press: **F7** (search/replace). The window has srch nx for at the top.

Press: Enter

The next location of the instruction will be found and the menu below will appear:

| F 1          | F 2 | F 3 | F 4 | F 5 | F 6 | F 7 | F 8 | F 9 | F 10 |
|--------------|-----|-----|-----|-----|-----|-----|-----|-----|------|
| srch<br>next |     |     |     |     |     |     |     |     |      |

Each location of the instruction can now be found by repeatedly pressing **F1**. Press Esc to return to the previous menu.

- Searching for a Label.

The procedure for searching for a label is similar to searching for elements. When you search for a label, the search routine will locate every type of instruction with that label. Note that when searching for labels, you must enter the label exactly as it appears in your ladder diagram including spaces.

- To Replace an Instruction With Another Instruction.

Press: **F7** (search/replace)

Press: Down arrow key as necessary to select replace.

A pop-up menu containing all the instructions you can search for will appear on the display along with the prompt "Search for?".

## Search / Replace Function (continued)

Press: ↓ to select the instruction you wish to search for

Press: Enter (a pop-up menu will appear on the display prompting you for the address of the instruction you want to search for).

Press: Numeric keys for the appropriate address of the instruction you wish to search for

Press: Enter

The cursor is now moved from its present position to the first location of the addressed instruction. A menu will open on the display showing all of the instructions that the cursored instruction can be replaced with along with the prompt "Replace with?".

If you are replacing a conditional instruction, this window will show only Examine On and Examine Off. If you are replacing an output instruction, the window will contain only output instructions.

Select the new instruction that will replace the instruction that the cursor is positioned on and press Enter.

Another window will open, prompting you for an address for the new instruction and other data pertinent to that instruction (preset, reset etc.). Type in that information and press Enter and the menu shown below will open on the display.

Note: If a timer, counter, sequencer, or reset instruction is chosen as the "replace with" instruction, all parameters of those instructions must be programmed before the replace function can be executed.

|              |                   |                |         |    |    |    |    |    |     |
|--------------|-------------------|----------------|---------|----|----|----|----|----|-----|
| F1           | F2                | F3             | F4      | F5 | F6 | F7 | F8 | F9 | F10 |
| srch<br>next | replace<br>& srch | replace<br>all | replace |    |    |    |    |    |     |

Press F4 and the instruction will be replaced with the new instruction you have just selected.

If you have an instruction that appears in your program more than once and you want to replace that instruction every place it appears with a new instruction, Press F3 (replace all) and the new instruction will appear in place of the old instruction.

If you want to replace only a few of these instructions, use F2 (replace & srch) to selectively replace these instructions. Pressing F2 when you are on an instruction to be replaced will replace that instruction and move the cursor to the next location of that instruction. If you don't want to replace that instruction, press F1 (srch next) and the cursor will move to the next location that instruction appears in.



**Insert and Remove  
Functions**

While in the Program Development/Edit function you can insert and remove instructions, branches, and rungs, by using the Ins and Del keys located on the lower right side of your keyboard.

- To insert an examine instruction.

Press: The arrow keys to locate the cursor on the instruction immediately following the point where you wish to insert the new instruction.

Press: The **Ins** key

The menu below will appear on the display: (Note: if the cursor is on a coil instruction, the **F3** function is blank.)

| F1    | F2  | F3 | F4   | F5 | F6 | F7 | F8 | F9 | F10 |
|-------|-----|----|------|----|----|----|----|----|-----|
| -] [- | -N- | └  | rung |    |    |    |    |    |     |

Press: **F1** or **F2**

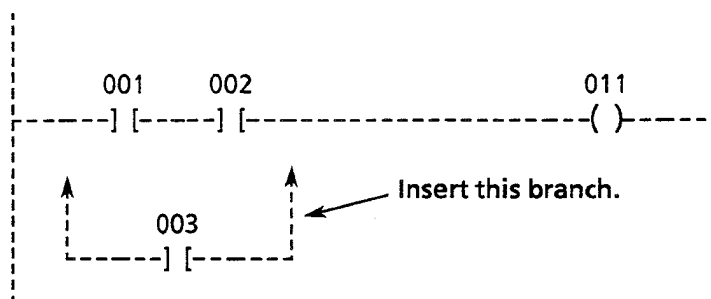
The selected examine instruction will be inserted into your program.

Press: Keys necessary to enter an address and label as desired

Press: Enter

- To insert a branch

**Example:**



Locate the cursor on the instruction immediately following the point where you wish to insert the branch start. In this example It would be -] 001[- Examine On at address 001. Then

Press: The **Ins** key

Press: **F3** to select the branch open instruction

You have just marked the beginning of your branch. The computer now asks where you wish to end the branch.

Locate the cursor on the instruction immediately following the point where you wish to end your branch. In this example -( 11 )- is that instruction. Then

Press: Enter. The branch is now inserted on the rung.

Press: **F1**, 3, Enter. An examine instruction with address 3 is inserted onto the branch. Enter the address and label and press Enter.

Press: **F4** to end the branch.

## Deleting Instructions and Rungs

Press: The arrow keys to locate the cursor on the instruction or rung you wish to delete.

Press: The **Del** key.

The menu below will appear on the display: (Note: The menu will not include the "del instr" function if there are no conditional instructions in the rung or if the cursor is located on the left rail of the rung.)

|              |             |     |     |     |     |     |     |     |      |
|--------------|-------------|-----|-----|-----|-----|-----|-----|-----|------|
| F 1          | F 2         | F 3 | F 4 | F 5 | F 6 | F 7 | F 8 | F 9 | F 10 |
| del<br>instr | del<br>rung |     |     |     |     |     |     |     |      |

Press: **F1** or **F2**

- Press **F1** if you wish to delete an instruction
- Press **F2** if you wish to delete a rung  
(To delete a branch instruction you must delete the instructions within the branch or use the **F3** del branch function which appears on the menu when the cursor is located on a branch.)

### • Deleting Entire Programs

Refer to Page 3-8 for instructions on how to clear:

- SLC NVRAM
- Computer workspace
- Disk files

## Correcting Keystroke Errors

### • Correcting Keystroke Errors.

|                            |   |
|----------------------------|---|
| ←, →<br>left, right arrows | These keys are used to move the cursor to the character in your label or comment you wish to edit.  |
| <b>Del</b><br>Delete key   | Use for deleting characters in your labels or comments.   |
| ←<br>Backspace key         | Use for backing cursor up to delete erroneous key entries when entering labels, comments, addresses, and timer/counter/sequencer data.  |
| <b>ESC</b><br>Escape key   | Use for canceling incorrect function key selections.  |
| <b>Undo Rung</b>           | The Undo rung function will delete the rung you are currently entering. If you enter a conditional instruction incorrectly and want to start the rung over, press <b>F6, Undo rung</b> , after you enter the conditional instruction and before you enter the output instruction. <b>The entire rung will be deleted.</b> |

### • Changing Instructions, Addresses, and Labels.

- Overstrike** You can also change instructions, addresses and labels after program entry has been completed. Just locate the cursor on the instruction to be changed and make the necessary changes. The instruction, address or label can be changed individually or all three items can be changed. Press Enter to enter your changes into computer memory.

### Correcting Keystroke Errors (continued)

#### • Changing Instruction Comments

**F9**  
Edit Attribute

This function key must be used in order to make a change to any comments associated with instructions.

Press: **F9**

If you are changing a comment associated with examine instructions (-) [- or -](-) or a simple output instruction -( )-, -( L )-, -( U )-, -( MCR )-, -(ZCL)-, the window below will appear:



LABEL: This is the instruction comment.

The present comment can be erased by pressing the backspace key. A new comment can then be entered. If you are changing complex instructions such as timers, counters and sequencers, a selection menu will appear listing the attributes that can be changed. The word comment must be selected in order to edit a comment associated with these instructions.

#### • Changing Rung Comments

Locate the cursor on the left ladder rail of the rung you wish to edit. Then

Press: **F9** (edit attrib)

The rung comment can now be erased with the backspace key and a new comment entered.

Press: Enter to enter the new comment.

### Editing Timer and Counter Attributes

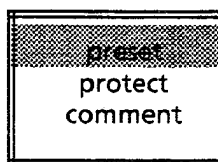
Timer and Counter Attributes include preset values, protect/unprotect status and comments. These attributes can be changed by using the edit attribute function (**F9**).

#### • Changing a Timer or Counter Preset

Locate the cursor on the timer or counter you wish to change. Then

Press: **F9** (edit attrib)

The window below will appear on the display: (If the instruction is protected, "unprot" will replace protect in the window.)



Press: Enter to select preset

Press: Numeric keys for new preset data

Press: Enter

The change is entered.

### Editing Timer and Counter Attributes (continued)

- Protecting and Unprotecting Preset Values.

Press: The arrow keys needed to locate the cursor on the timer or counter you wish to protect/unprotect.

Press: **F9** (edit attrib).

The window below will appear on the display: (If the instruction is protected, "unprot" will replace protect in the window.)



Press: ↓ to select protect/unprotect.

Press: Enter.

The protect/unprotect status will be changed.

- Changing a Timer or Counter Comment.

Press: The arrow keys needed to locate the cursor on the timer or counter you wish to edit the comment for.

Press: **F9** (edit attrib).

Press: ↓, ↓, Enter – to select comment.

Press: Backspace key to erase the present comment .  
Type in the the new comment and press Enter.

### Editing Sequencer Attributes

Sequencer attributes include:

- Group no.
- Mask data
- Event/Time classification
- Step data, preset, protect/unprotect
- Instruction comment

The above sequencer attributes can be changed by pressing the Edit Attribute function key (**F9**).

Locate the cursor on the sequencer instruction you wish to change. Then

Press: **F9** (edit attrib)

The menu shown below will appear on the display: (The **F2** function may not appear in the menu for certain group numbers.)

|               |              |               |               |                 |    |    |    |    |     |
|---------------|--------------|---------------|---------------|-----------------|----|----|----|----|-----|
| F1            | F2           | F3            | F4            | F5              | F6 | F7 | F8 | F9 | F10 |
| edit<br>group | edit<br>mask | make<br>event | edit<br>steps | edit<br>comment |    |    |    |    |     |

### Editing Sequencer Attributes (continued)

- To Change the Group Number:

Press: The F1 function key and enter the new group number.

Press: Enter.

Note: Group numbers 1-37 incorporate hex step data and group numbers 38-69 incorporate decimal step data. Reference SLC User's Manual (Pub. 1745-800) for more information on special sequencer programming techniques. You will not be allowed to change a group number  $\leq 37$  to a group number  $\geq 38$  (or vice versa) since the group numbers use different step data coding and unpredictable operation could occur with your SLC program.

- To Change the Mask Data:

Press: F2 and enter the new mask data.

Press: Enter.

- To Change Time-Driven/Event-Driven Parameter:

Press: F3 and the parameter will be changed from time-driven to event-driven or vice versa.

- To Change Step Data, Preset, Protect/Unprotect:

Press: F4 and the menu below will open on the display. (Only insert step and goto step appear in the menu when the cursor is on end of sequencer.)

|                           |                |                |              |              |     |     |     |     |      |
|---------------------------|----------------|----------------|--------------|--------------|-----|-----|-----|-----|------|
| F 1                       | F 2            | F 3            | F 4          | F 5          | F 6 | F 7 | F 8 | F 9 | F 10 |
| protect<br>unprot<br>step | insert<br>step | delete<br>step | goto<br>step | edit<br>step |     |     |     |     |      |

Locate the cursor on the step no. you wish to change. You can use the  $\uparrow, \downarrow$  arrows on the keyboard or the "go to step" function key (F4).

- To Protect/Unprotect the Preset Data:

Press: F1

A "P" will appear next to the preset value if protected.

- To Insert a Step:

New steps are inserted in front or before the present cursor location

Press: F2

Press: Enter step data for new step.

Press: Enter.

Press: Enter preset value for new step.

Press: Enter.

- To Delete a Step:

Press: F3

The step which the cursor is located on will be deleted from the sequencer table.

- To Goto a Step:

Press: F4 and a prompt window will appear.

Press: Enter step number.

Press: Enter.

### Editing Sequencer Attributes (continued)

- To Change Step Data or Preset Value:

Press: **F5**  
 Press: Enter new step data for the step  
 Press: Enter  
 Press: Enter new preset value  
 Press: Enter

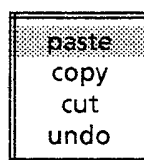
### The Clipboard Function

The clipboard function (**F6**) allows instructions, branches, and rungs to be copied to an invisible workspace (clipboard) and then pasted to a different area of your ladder diagram.

- To Copy an Instruction, Branch, or Rung to the Clipboard

Locate the cursor on the instruction, branch, or rung you wish to copy.  
 Then:

Press: **F6** (clipboard). The window below will appear:



Press: ↓ (to select either copy or cut)

**The copy function** will copy an instruction, branch, or rung to the clipboard. The ladder program is not changed.

**The cut function** will copy an instruction, branch, or rung to the clipboard and remove it from the ladder program.

After copy or cut is selected the menu below will appear: (The menu may differ slightly depending upon the cursored instruction.)

|              |               |               |     |     |     |     |     |     |      |
|--------------|---------------|---------------|-----|-----|-----|-----|-----|-----|------|
| F 1          | F 2           | F 3           | F 4 | F 5 | F 6 | F 7 | F 8 | F 9 | F 10 |
| copy<br>rung | copy<br>instr | copy<br>brnch |     |     |     |     |     |     |      |

Press: **F1**, or **F2**, or **F3**

Your selection will be copied to the clipboard.

- To Paste an Instruction or Rung from the Clipboard to a New Location

Locate the cursor on the area of your program where you wish to paste the contents of the clipboard.

Conditional instructions are copied from the clipboard and placed immediately to the left of the cursor location.

Rungs are copied from the clipboard and placed immediately above the rung that the cursor is located on.

Press: **F6** (clipboard)  
 Press: Enter to select Paste

The contents of the clipboard will be placed at the new location.

## The Clipboard Function

(continued)

- To Paste a Branch From the Clipboard to a Rung Without Branches.

Locate the cursor on the instruction immediately following the point where you want the branch to begin. Then

Press: **F6** (clipboard)

Press: Enter to select Paste

The branch start has now been located and you are asked where you wish to end the branch.

Locate the cursor on the instruction immediately following the point where you wish the branch to end. Then

Press: Enter

The branch will be placed on the rung.

- To Paste a Branch From the Clipboard to an Existing Branch.

Locate the cursor on the branch where you wish to append the new branch. Then

Press: **F6** (clipboard)

Press: Enter to select Paste

The branch will be copied from the clipboard and added as the last parallel branch of the branch network that the cursor is located on.

- To undo a Pasted Instruction(s)

The Undo function gives you a chance to delete all of the changes you made to a rung since you moved to the rung. With the cursor on any position in the rung, press **F6** and the window shown below will open.

Undo all changes to rung (y/n)?: y

Pressing Enter would delete all changes you made to the rung and restore it to the previous state.

## Display Table

Instructions can be inserted into the display table for selective monitoring of parameters and status (see illustration, Page 1- 4). Instructions can be inserted into the table in either the Program Development/Edit function or Run, Monitor, Test Function. When an instruction is inserted into the table its corresponding label and instruction comment will also be displayed in the table.

- To Insert an Instruction into the Display Table in the Program Development/Edit Mode.

Press: **F10** (Display Table)

The display table will appear on the display.

Press: **F6** to insert instruction

The window shown below will appear on the display.

insert by label  
insert by element

### Display Table

**(continued)**

Press: ↓ to select "insert by element"

Note that instructions can be inserted via label selection also.

Press: Enter

Press: ↓ to select the desired instruction

Press: Enter

**Press:** Numeric keys for the address of instruction

Press: Enter

The instruction is inserted into the table along with any associated label or comment.

**Note:** An instruction and address may appear in the display table only as many times as it appears in the ladder diagram.

When you enter an instruction in the display table in the Program Development/Edit function, the display will look like the table shown below. A blinking instruction will indicate the present cursor position.

| below. A blinking instruction will indicate the present cursor position. |      |        |        |      |        |  |
|--|------|--------|--------|------|--------|--|
| ELEMENT  | ACCM | PRESET | STEP # | DATA | GROUP# | TABLE COMMENT                          |
| 001<br>-] [-   | ---  | ---    | --     | --   | --     | LIMIT SW#1 : This is a sample display. |
| end  | ---  | ---    | --     | --   | --     |  |
| ---  | ---  | ---    | --     | --   | --     |  |
| ---  | ---  | ---    | --     | --   | --     |  |
| ---  | ---  | ---    | --     | --   | --     |  |
| ---  | ---  | ---    | --     | --   | --     |  |

| F1 | F2 | F3 | F4     | F5 | F6     | F7     | F8 | F9 | F10 |
|----|----|----|--------|----|--------|--------|----|----|-----|
|    |    |    | search |    | insert | remove |    |    |     |

Functions **F4** and **F7** will not appear in the menu until you have placed an instruction into the table. The **F4** function (search) will help you locate an instruction in the table. This function is very helpful if you have inserted many instructions in the table.

Refer to Page 5-4 for information on monitoring data with the display table.



**General**

SLC Personal Computer Software allows monitoring and on-line control of SLC ladder programs. These functions include:

- Monitoring ON/OFF status of external and internal I/O.
- Monitoring timer, counter, sequencer and shift register instructions.
- Changing preset, accumulator, and reset values.

**Run / Monitor, Test Function**

The Run/Monitor, Test function (F3) allows you to set the SLC Processor to any of the following modes of operation:

- Run Mode
- Test - Continuous Scan Mode
- Test - Single Scan Mode (The F3 function key is used to initiate single scan.)

When you select the Run, Monitor, Test function (F3), the contents of the computer workspace and SLC NVRAM are compared. If the programs are the same, the ladder program is displayed with the menu below and the **SLC processor is set to the Test-Single Scan Mode.**

|     |              |                |        |    |               |    |                    |    |                  |
|-----|--------------|----------------|--------|----|---------------|----|--------------------|----|------------------|
| F1  | F2           | F3             | F4     | F5 | F6            | F7 | F8                 | F9 | F10              |
| run | cont<br>scan | single<br>scan | search |    | go to<br>rung |    | display<br>history |    | display<br>table |

If the programs in the computer workspace and the SLC NVRAM do not match, the window below will appear:

The workspace ladder diagram does not match the SLC ladder diagram.  
Press any key to return to the main menu.

If the SLC NVRAM program does not match the program stored in EEPROM (with EEPROM memory module plugged into SLC processor) the following error message will appear:

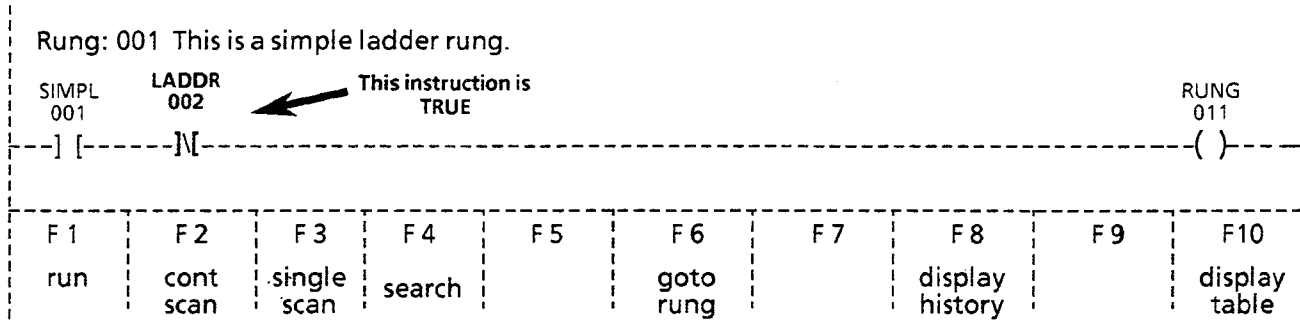
**CAUTION:** The NVRAM program in the SLC does not match the EEPROM program in the SLC. The NVRAM program can be saved to an EEPROM in the Program Transfer Function. Press the ENTER key to enter the SINGLE SCAN mode or any other key to abort the mode change.

The Program Transfer function can be used for transferring programs between the SLC processor and computer workspace and between the SLC processor NVRAM memory and EEPROM memory.

Once you have entered the Test-Single Scan mode, the Run mode or Test-Continuous Scan mode can be entered by pressing the F1 or F2 keys.

**True / False Status  
Indication**

You may choose either intensification or reverse video for indicating TRUE logic, when monitoring your ladder program.

**TRUE LOGIC INDICATED BY INTENSIFICATION****TRUE LOGIC INDICATED BY REVERSE VIDEO**

Your choice of reverse video or intensification for monitoring true logic in the run, monitor, test mode can be selected when you run your SLC software program by typing in the following letters at your DOS prompt line:

A>PCIS IN <Return>

(The above letters will select intensification)

A>PCIS RV <Return>

(The above letters will select reverse video)

Default Condition:

A>PCIS <Return>

(If no letters are used to select either reverse video or intensification SLC software will automatically select a format for you according to the following rules:

CRT Type Display – Intensification will be selected.

LCD Type Display – Reverse Video will be selected.

**Note:** When using the default condition, the Compaq Portable Computer with CRT display and the Compaq Plus Computer with CRT display are falsely identified as having LCD display adapters and reverse video is automatically chosen for TRUE LOGIC. Other computers may also exhibit this characteristic. With these computers, if intensification is desired to show TRUE LOGIC, the letters PCIS IN must be used to start the software.

## True / False Status Indication (continued)

The TRUE logic identification format being used by the software is always identified for you on your Main Menu screen at the Run, Monitor, Test Function (F3) (see Fig. 5.1). TRUE logic identification and FALSE logic identification should always appear different. If the TRUE and FALSE logic states do not appear different, the words "These should appear different" will flash to alert you of the problem.

If intensification has been chosen and the word "intensified" is not intensified, your computer may not have the ability to intensify instructions and you should change your selection to reverse video.

If reverse video has been chosen and the word "reverse video" does not appear in reverse video, your reverse video color and your background color are the same and they should be made different by adjusting your screen colors via the configuration function (F7).

Figure 5.1

MAIN MENU

F1 Program Transfer – save/read/print/clear

F2 Program Development/Edit

F3 Run/Monitor/Test TRUE Logic = Intensified ← These should  
FALSE Logic = Normal ← appear different.

F4 SLC Diagnostics

F5 Enter/Change SLC Password

F6 Exit to DOS

F7 Configuration

## Monitoring and Changing Timers and Counters

Locate the cursor on the timer/counter you wish to monitor. Then

Press: **F9** (instr attrib)

The window and menu below will open on the display:

|   |  |
|---|--|
| TIMER<br>ON<br>901<br>-(RTO)-           |  |
| preset 9999<br>accm 1200<br>protect off |  |

|     |              |                |    |    |    |                |                  |    |                   |
|-----|--------------|----------------|----|----|----|----------------|------------------|----|-------------------|
| F1  | F2           | F3             | F4 | F5 | F6 | F7             | F8               | F9 | F10               |
| run | cont<br>scan | single<br>scan |    |    |    | change<br>accm | change<br>preset |    | protect<br>preset |

## Monitoring and Changing Timers and Counters (continued)

If the timer is ON, the accm value will be incrementing.

- To Change a Preset Value.  
Press: **F8** (change preset).  
Enter new preset value.  
Press: Enter.
- To Change an Accm Value.  
Press: **F7** (change accm).  
Enter new accm value.  
Press: Enter.
- To Protect/Unprotect Preset Values.  
Press: **F10** (protect preset)

This will change the protect/unprotect parameter.

If the timer/counter is protected, the **F7**, **F8**, and **F10** functions are not available and the window is labeled protected. To unprotect you must return to the Program mode.

## Monitoring and Changing Sequencer Instructions

- To monitor a sequencer instruction.

Locate the cursor on the sequencer you wish to monitor. Then

Press: **F9** (instr attrib)

The window and menu shown below will open on the display: (The **F9** function will not be available for SQI instructions with group numbers of 38 and above.)

Rung: 001 This is a sample Sequencer Output rung.

|                  |   |                      |                |    |    |    |    |                   |     |   |                 |  |  |  |                    |                      |
|------------------|---|----------------------|----------------|----|----|----|----|-------------------|-----|---|-----------------|--|--|--|--------------------|----------------------|
| SEQ<br>ON<br>001 | Accumulator: 0001                             |                      |                |    |    |    |    |                   |     |   | Time Driven     |  |  |  | STEP<br>#12<br>901 | STEP<br>#12<br>T 901 |
|                  | I/O Address : 018 017 016 015 014 013 012 011 |                      |                |    |    |    |    |                   |     |   |                 |  |  |  |                    |                      |
|                  | Hex Mask : 3 F                                |                      |                |    |    |    |    |                   |     |   |                 |  |  |  |                    |                      |
|                  | Binary Mask : 0 0 1 1 1 1 1 1                 |                      |                |    |    |    |    |                   |     |   |                 |  |  |  |                    |                      |
|                  | STEP<br>#                                     | Hex<br>Data          | Binary<br>Data |    |    |    |    |                   |     |   | Preset<br>Value |  |  |  |                    |                      |
|                  | 00  | 00                   | 0              | 0  | 0  | 0  | 0  | 0                 | 0   | 0 | 0001            |  |  |  |                    |                      |
| End Of Ladder    |   |                      |                |    |    |    |    |                   |     |   |                 |  |  |  |                    |                      |
| F1<br>run        | F2<br>cont<br>scan                            | F3<br>single<br>scan | F4             | F5 | F6 | F7 | F8 | F9<br>edit<br>seq | F10 |   |                 |  |  |  |                    |                      |

## Monitoring and Changing Sequencer Instructions

(continued)

If the sequencer is ON, the step no., hex, and binary data, and preset will be incrementing as the sequencer moves through the steps.

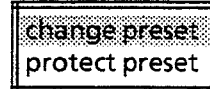
- To Change a Sequencer Preset.

Press: **F9** (edit sequencer)

Step data for the current step and beyond will be displayed. The ↓, ↑, arrows and "go to step" function key can be used to search for the step number you wish to change. A blinking step number indicates the present cursor position.

Press: **F9** (edit step)

The window shown below will open on the display:



Press: Enter to select 'change preset'. If you wished to change the protect/unprotect parameter you would select 'protect preset'.

Press: Numeric keys for new preset value.

Press: Enter.

- To protect a preset from changes in the run mode select protect preset from the window above and press Enter. The **F9** edit step function will not appear on the menu for that step. To unprotect the step you must return to the Program mode.

## Monitoring Data with the Display Table

Often times in a ladder rung, instructions that are related in function are not related as far as placement in the ladder. If you wanted to monitor an instruction in rung 1 and another instruction in rung 25 of your ladder diagram, you would have a difficult time to say the least. The display table makes it easy to monitor selected instructions the way you want to monitor them. The display table allows you to monitor six instructions at one time from any part of the ladder. You can insert as many instructions as you like in the display table and use the cursor control keys to move through the table and monitor different instructions. An instruction and address may appear in the display table only as many times as it appears in the ladder diagram.

In the Run/Monitor/Test function, the display table can be accessed by pressing the **F10** function key. Doing this will give you a blank table on the display. When you insert an instruction in the display table (**F6** function key) in the Run/Monitor/Test function the display will change as shown below.

| ELEMENT      | ACCM | PRESET | STEP # | DATA | GROUP# | TABLE COMMENT                          |
|--------------|------|--------|--------|------|--------|--|
| 001<br>-] [- | ---  | ---    | --     | --   | --     | LIMIT SW#1 : This is a sample display. |
| end          | ---  | ---    | --     | --   | --     |  |
| --           | ---  | ---    | --     | --   | --     |  |
| --           | ---  | ---    | --     | --   | --     |  |
| --           | ---  | ---    | --     | --   | --     |  |
| --           | ---  | ---    | --     | --   | --     |  |

| F1  | F2           | F3             | F4     | F5 | F6              | F7              | F8            | F9              | F10 |
|-----|--------------|----------------|--------|----|-----------------|-----------------|---------------|-----------------|-----|
| run | cont<br>scan | single<br>scan | search |    | insert<br>instr | remove<br>instr | lock<br>table | instr<br>attrib |     |

The cursor, indicated by a blinking instruction, is positioned on the first instruction in the table as shown above. Instructions will be inserted above the cursor position. If you do not move the cursor, all new instructions will be inserted in the top of the table. To insert instructions in a different spot in the table, or between two other instructions, move the cursor to the instruction below the spot where you want the new instruction inserted and press **F6** (insert instr).

To remove an instruction from the table, move the cursor to the instruction you want to remove and press **F7**. The instruction will be removed.

When using the display table, complex instructions such as timers, counters, and sequencers can have their parameters changed while in the Run or Test modes. The **F9** (instr attrib) key is used to make on-line changes. Key sequences for making these on-line changes are the same as when monitoring in the ladder diagram format. These are discussed on Pages 5-2 and 5-3.

## Monitoring Data with the Display Table

(continued)

The F1 function key will place the SLC into the Run mode. When you press F1, a window will open on the display asking you if you are sure you want to enter the Run mode. Press "Y" for yes and press Enter. The SLC will be placed in the Run mode.

The F2 function key will place the SLC in the Test Continuous Scan mode. The F3 function key will place the SLC in the Test Single Scan mode. If you are currently in the Run mode when you press either of these keys, a window will open on the display asking you "Are you sure you wish to exit the Run mode?". If you do not want to exit the Run mode, press Enter and you will stay in the Run mode. If you want to exit the Run mode and enter a different mode, type a "Y" for yes and press Enter.

The F4 function key will allow you to search for an instruction or a label in the display table. When you press F4, a window will open giving you the choice of searching for a label or an element. If you elect to search for a label, a window will open asking you to type the label you wish to search for.

If you elect to search for an element, a window will open containing all the elements that you can search for. Select the element and press Enter. A window will open asking you to enter the address of the element you want to search for. Type in the address and press Enter. If you are searching for a sequencer instruction, a window will open asking you to enter the group number of the sequencer you are searching for. When you press Enter, the cursor will move to the instruction you are searching for. If the instruction appears more than once in the table, you can press F5 (search next) to find the next occurrence of that instruction.

If the instruction you are searching for is not in the table, a window will open telling you that the instruction you are searching for was not found and to press any key to continue.

The F8 lock table function key will help to prevent unauthorized manipulation of the display table. When you press the F8 function key, the window shown below will open on the display.

Enter keyword (up to eight characters) :

Enter a key word or (password) that you can remember and press Enter. The window shown below will open on the display.

Enter the keyword again for verification :

Enter the key word again and the table will lock up. The keyboard will only respond to the F8 function key which is "unlock table" when the table is locked. When you press F8 to unlock the table, you will have to enter the keyword again and the F8 function key will return as "lock table".

If your keyword is lost or forgotten, a special keyword (DV-3334) can be used for unlocking the table.

## Monitoring Shift Register Instructions

Shift register instructions can be monitored using the display table function (F10). To do this, insert the shift register instruction into the display table. When monitoring your program using the display table, shift register bit status will be displayed as shown below.

| ELEMENT        | ACCM | PRESET | STEP # | DATA | GROUP# | TABLE COMMENT |
|----------------|------|--------|--------|------|--------|---------------|
| 018<br>-(RSR)- | 1100 | 0011   | --     | --   | --     |               |
| end            | ---  | ---    | --     | --   | --     |               |
| --             | ---  | ---    | --     | --   | --     |               |
| --             | ---  | ---    | --     | --   | --     |               |
| --             | ---  | ---    | --     | --   | --     |               |
| --             | ---  | ---    | --     | --   | --     |               |

Shift register bit status is shown under the Accm and Preset columns. The bit address at the far right under Preset is the least significant bit address, in this example address 11. The bit address at the far left under Accm is the most significant bit address, in this example address 18.

## Contact Histogram

While in the Run or Test (cont scan) modes, a contact histogram for any external input or output may be displayed and printed.

Press: **F8** (display history)

Headings and menu are shown below.

HISTOGRAM 011

--( )--

FALSE  
hh:mm:ss  
hh:mm:ss

TRUE  
hh:mm:ss  
hh:mm:ss

These values represent the elapsed time when the instruction is either FALSE or TRUE.

| F1  | F2        | F3          | F4          | F5           | F6 | F7 | F8 | F9 | F10 |
|-----|-----------|-------------|-------------|--------------|----|----|----|----|-----|
| run | cont scan | single scan | printer off | select instr |    |    |    |    |     |



**Contact Histogram***(continued)*

- To Select an Instruction for Histogram Display

Press: **F5** (select instr)

The window below will appear on the display:

|                   |
|-------------------|
| select by label   |
| select by element |

Instructions can be selected by label or element.

Press: ↓ to select "select by element".

Press: Enter.

The window below will appear. Any of the instructions shown can be monitored via the histogram.

|         |
|---------|
| -I I-   |
| -I \ I- |
| -( )-   |
| -( L )- |
| -( U )- |

Press: ↓ to select an instruction

Press: Enter

Press: Numeric keys for address of instruction. Only external input and output addresses can be monitored with the histogram.

Press: Enter

The instruction histogram will be displayed as shown in the figure.

- To Print a Contact Histogram

Press: **F8** (display history)

Select an instruction as described in the previous example. Check your printer to make sure it is ready for printing. Then

Press: **F4** (printer off)

The contact histogram will now be printed.

**Note:** When the print function is ON, the histogram cannot operate faster than the printer can print. Transitions that occur faster than the printer can print will be lost. The printer will only print when OFF to ON transitions occur with instruction addresses. The software contains a buffer which will store several transitions (about half a monitor screen will be displayed) before the data is sent to the printer.

**General** This Chapter will describe the auxiliary functions available with the SLC Personal Computer Software. These functions are selected from the main menu as functions **F4**, **F5**, **F6** and **F7**.

---

**Function F4  
SLC Diagnostics** Selecting the **F4** function from the main menu will allow you to run the SLC diagnostics. If the SLC is in the Run mode when you select the **F4** function, the window shown below will open in the center of the display.

If you continue the SLC will be  
taken out of the run mode.  
The SLC can be placed into the run  
mode from the Run/Monitor/Test function.  
Do you wish to continue? (y/n): n

The computer has entered an 'n' response. If you press the Enter or Esc key, you will return to the main menu. If you wish to run the diagnostics and take the SLC out of the Run mode, you must type a 'y' response, and press Enter. If the SLC is functioning properly you should see the window shown below open on the display.

|                            |    |
|----------------------------|----|
| Processor                  | OK |
| Processor RAM              | OK |
| Processor ROM              | OK |
| Press any key to continue. |    |

If you receive any other message, refer to Appendix A in the back of this manual for error code remedies.

---

**Function F5  
Change SLC  
Password** Selecting the **F5** function from the main menu will allow you to change the SLC Password. (You do not have to take the SLC processor out of its current mode of operation to change the password.) If you select the **F5** function and the SLC is already password protected the window shown below will open on the display.

The SLC is password protected.  
Please enter its password.  
Password: ■

**Function F5  
Change SLC  
Password***(continued)*

After you enter the correct password, or if the SLC was not password protected, the window shown below will open on the display.

Enter a new password for the SLC.  
Password: ■

The SLC User's Manual (Publication 1745-800) describes acceptable passwords for the SLC in Chapter 4.

When the SLC is password protected, you will be prompted for a password when you:

1. Read the ladder diagram from the SLC NVRAM to the work area.
2. Clear the ladder diagram from the SLC NVRAM.
3. Transfer the SLC NVRAM to EEPROM or EEPROM to NVRAM.
4. Place the SLC into the Run mode.
5. Run the SLC Diagnostics.
6. Change SLC Password.

If you enter an incorrect password, the window shown below will open in the center of the display.

Password is invalid. Access denied.  
Press any key to continue.

When you press any key you will return to the main menu and you can try to enter the correct password again. If you fail to enter the correct password on your third attempt, the SLC processor will continue to operate but the personal computer will ignore any of your further input. You will have to restart the personal computer to continue.

An access code can be overridden. To do this, press: 9, 4, 0, Enter, Ins when prompted for a password. **IMPORTANT:** The processor will no longer be protected by the access code. It must be re-entered.

**Function F6  
Exit to DOS**

When you select Function **F6** from the main menu, the main menu display will be replaced with the current directory DOS prompt. The computer will then respond to DOS commands. If you edit a program and don't save the changes before you try to exit to DOS, an error message will appear on the display. Follow the instructions to continue.

## Function F7 Configuration

The configuration function allows several parameters to be selected for SLC software operation. Press **F7** from the main menu and you will be allowed to configure communication baud rate, SLC communication serial port, display screen colors, printer default port, and fast video option. If the configuration function is not used to change these parameters, they will default to the following:

Baud rate: 9600  
 SLC Communication Serial Port: COM1  
 Display screen colors: Background = black Foreground = white  
 Printer default: LPT1  
 Fast video: OFF

After pressing **F7**, a menu will appear at the bottom of your screen. The following paragraphs describe your options for software configuration.

- F1 Change Baud** – Selecting **F1** will allow you to change the communication baud rate between an SLC 150 and your computer serial port. When you press **F1**, a window will open on the display with possible baud rate selections including 300, 1200, 2400, 9600, and 19200. The cursor will be located on the baud rate you are currently operating at. Use the up and down arrow keys to move the cursor to a different baud rate and press Enter to select that rate. SLC 100 processors can communicate at 9600 baud only.
- F2 SLC Port** – This function will allow you to select a computer serial port for communicating with the SLC. Select **F2** and the window shown below will open on the display.



The cursor will be located on the port currently being used for SLC communication. Use the up and down arrow keys to move the cursor to COM1 or COM2. Press Enter to select your choice.

- F3 Screen Colors** – This function will allow you to select different normal video, reverse video, and window border colors for a color monitor. Monochrome monitors will not be able to fully utilize this function. When you press the **F3** function key the window below will open on the display.

|  |
|--|
| Foreground and background screen colors<br>can be changed for the items below.<br>Press ← to select item.                                |
| ■ normal video color<br>reverse video color<br>window border color   |
| Press ← or → to change foreground color.<br>Press ↑ or ↓ to change background color.<br>Press Esc when you have selected desired colors. |

## **Function F7 Configuration**

*(continued)*

Press the Enter key to move the cursor and to select a choice. Use the right and left arrow keys to change the foreground colors. Use the up and down arrow keys to select the background colors. Choices for foreground screen colors include black, grey, blue, light blue, green, light green, red, light red, magenta, light magenta, cyan, light cyan, brown, yellow, white, and bright white. Choices for background colors include black, blue, green, cyan, magenta, brown, white, and red.

- F4** Printer Default – Selecting **F4** will allow you to select the printer default port. The up and down arrow keys are used to move the cursor to one of the five selections in the window including parallel ports LPT1, LPT2, LPT3, and serial ports COM1 and COM2. Note that the printer port and the SLC communications port cannot be the same. The cursor will be located on the port currently being used.
- F5** Fast Video – Select **F5** to choose the fast video option. Fast video is for color display adapters which do not require synchronized access. If fast video is enabled and you see interference on the screen, then your color display adapter requires synchronized access and fast video should be disabled. If fast video is enabled and you don't experience interference, leave it enabled and you will experience faster screen updates. This option has no effect for monochrome video adapters.
- F6** Save Configuration – Select **F6** to save the parameters you have selected in the configuration function. The parameters are saved to filename PCIS.CFG. Version 2.0 software can be directed to a sub-directory or default drive for the configuration file thru DOS environmental strings. For example, the command A>SET PCIS=B: would direct the software to the B drive for the PCIS.CFG file.

**General**

This Chapter will describe the error messages you may receive about your computer or about the SLC Programmable Controller.

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**Device Error  
Messages**

When an error is detected during reading or writing to any of the devices on your system such as a disk drive or a printer, the window shown below will open in the center of the display.

xx  
Press any key to continue.

The xxx in the window represents the error message. Consult your DOS User's Guide for further information regarding device error messages.

Note: When using DOS 2.XX, pressing the Esc key to exit the print function after receiving a printer error message, will work properly only after the printer error has been corrected.

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**SLC Error  
Messages**

SLC Personal Computer Software will display an error message if it is connected to the SLC and any of the following conditions exist:

1. SLC processor fault.
2. Communications problem detected by the SLC.
3. Communication problem detected by the Personal Computer Software.
4. SLC expansion unit problem.
5. EEPROM module problem.
6. The cable to the SLC is disconnected or switched to another SLC.

An error message will also be displayed if a ladder diagram is read from a file on a disk or from the SLC and an error is detected in that ladder diagram. All error messages describe the problem and recommend remedies.

**General**

This chapter describes the differences between version numbers of the SLC personal computer software. The label on the software diskette identifies the version number of the software. The version number is also identified on the first screen you see when the software is booted up.

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**Version 1.0**

- Compatibility: SLC 100 processors.
- A characteristic of version 1.0 software that you should be aware of has to do with on-line changes made to sequencer preset and reset accumulator values. When you are in the Run/Monitor/Test function, the software may detect a program mismatch between the computer workspace and the SLC processor RAM memory after the following sequence of events occurs:

1. An on-line change is made to a sequencer preset or reset accumulator value.
2. A communication error occurs between the SLC and the computer, which will create an error message on the screen and force you to return to the main menu.

To avoid a program mismatch error after the conditions described above occur, enter the Program Development/Edit function (F2) from the main menu before you re-enter the Run/Monitor/Test function.

If you do not follow the procedures above and try to transfer the contents of the computer workspace to the SLC processor RAM memory, the following will result:

1. The on-line changes that were made to the sequencer preset or reset accumulator values prior to the communication error will be set back to their previous values in the SLC.
  2. The computer display screen will continue to show the new value.
- 

**Version 2.0**

Software version 2.0 includes all the functionality of version 1.0 software. In addition, version 2.0 software includes the following important enhancements.

- Compatibility: SLC 100 and SLC 150 processors.
- A characteristic of version 2.0 software that you should be aware of has to do with assigning sequencer group numbers. When you are programming a sequencer output instruction, -(SQO)-, the software will not allow you to assign group numbers 7 thru 15 to it.
- The program mismatch error that may occur with version 1.0 software (described above) will not occur with version 2.0 software.

**Version 2.0**  
(continued)

- Number of characters per instruction label has been increased from 5 to 10.
  - A configuration function (F7, main menu) has been added, allowing you to configure your software for communication baud rate, computer serial port (COM1 COM2), computer parallel port (LPT1, LPT2, LPT3), screen colors for color monitors, and fast video option.
  - Capability has been added allowing you to direct your SLC ladder printout to a disk file.
  - Capability has been added allowing you to create a ladder program title.
- 

**Version 2.1**

Software version 2.1 includes all of the features of version 2.0. In addition, software version 2.1 will display messages under the following conditions:

1. The SLC processor is in the "Run mode – wait condition". This occurs in the Run mode when the Auto/Man switch is in the manual position and power is removed, then restored to the processor. The software will display a message indicating that the SLC processor is no longer in the Run mode. The steps necessary for restarting the processor will also be displayed.
  2. Communication is attempted with an SLC processor (program transfer, monitor, or diagnostics for example) and the communicating computer has a single serial port which is not hardware configured as COM1. The software will display a message indicating that the computer must be hardware configured for COM1.
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**Version 3.0**

Software version 3.0 includes all the functionality of version 2.1 software. In addition, version 3.0 includes the following important enhancements:

- Your choice of reverse video or intensification for monitoring TRUE logic in the Run, Monitor, Test mode can be selected when you run your SLC software program.
- The TRUE logic identification format (intensification or reverse video) being used by the software is always identified for you on your Main Menu screen at the Run, Monitor, Test function (F3).
- The reverse video block that was used by version 2.1 software and earlier to indicate cursor position has now been replaced by a blinking cursor. The blinking cursor is used in the Run, Monitor, Test function (F3) and the Program Development/Edit function (F2) to identify the position of the cursor in your ladder diagram.
- When in the Run, Monitor, Test function (F3) or the Program Development/Edit function (F2), the cursor position in sequencer tables and display tables is now identified with a blinking step number or instruction at the lefthand side of the table. With version 2.1 software and earlier the cursor position was identified with a reverse video block.





