

SIEMENS

SIMATIC VPU200/560

Programming Manual

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 **DANGER**

DANGER indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury.

DANGER is limited to the most extreme situations.

 **WARNING**

WARNING indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury, and/or property damage.

 **CAUTION**

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Chapter 1
Manual Overview

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1.1 Introduction

This manual gives instructions for loading the operating system (O.S.) disk and explains the functions available with the SIMATIC® VPU200™. These functions include formatting and copying disks running diagnostics, and entering the SIMATIC® 560™ program.

This manual is arranged according to the hierarchy of the menus on the VPU200. Each section describes the functions available from a particular menu and lists the function keys used with that menu.

1.2 Manual Contents

The VPU200 manual is divided into Chapters which discuss topics as follows:

Chapter 1: Manual Overview	The Overview describes the contents of the manual.
Chapter 2: The VPU200–3104	This chapter provides instructions for performing the utility operations of the VPU200, such as loading, copying, and formatting of disks. The VPU200 diagnostics and error messages are also explained in this chapter.
Chapter 3: Menu Structure of the VPU200	Chapter 3 describes the menu hierarchy of the VPU200 operating system and lists the functions available from each menu.
Chapter 4: Configuring Memory	The process of configuring memory in the desired allocations is explained in this chapter.
Chapter 5: Configuring I/O	This chapter presents the information required for entry of I/O configuration.
Chapter 6: Naming the Program Disk	Chapter 6 explains the procedure for giving a title to a program disk.
Chapter 7: Printing	Configuring the parameters for printing and selecting the type of output to be printed are discussed in this chapter.
Chapter 8: Entering Ladder Programs	The procedure for entering ladder networks is given in detail in this chapter.
Chapter 9: Using VPU200 Support Functions	The Auxiliary Functions available with the VPU are explained in this chapter, and procedures for accessing the functions are given.
Chapter 10: Programming SF I/O Modules	This chapter explains programming box functions for Special Function I/O modules, such as the ASCII module.
Appendix A: Error Messages	Appendix A gives illustrations of typical illegal network constructions and explains the different types of error messages displayed by the VPU.

Chapter 2

The VPU200–3104

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2.1 Description

The VPU200-3104 (VPU200) is a programming device for the Model 560 Programmable Controller (P/C). In addition to the programming function, the VPU200 provides additional functions such as printing, diagnostics, and assignment of comments and/or synonyms to program elements. The VPU200 is composed of a CRT screen, a keyboard, and a disk drive as shown in Figure 2-1.

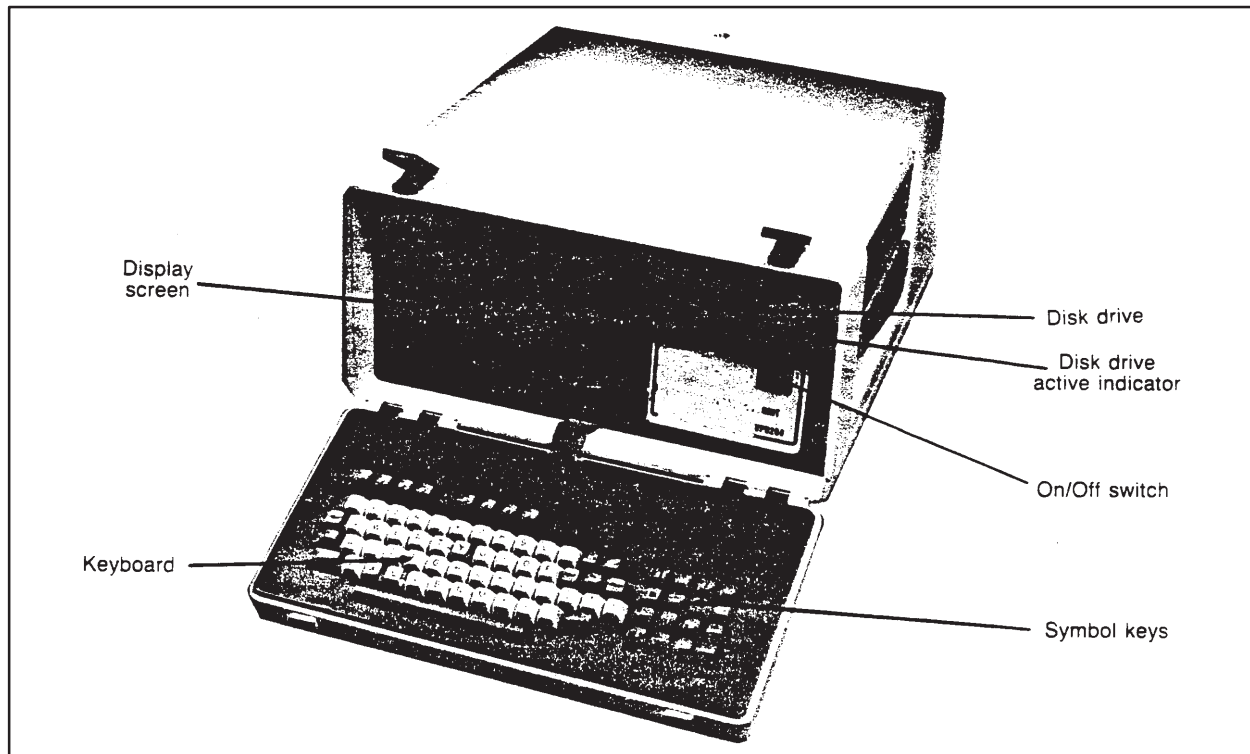


Figure 2-1 VPU200-3104

The screen of the VPU200 (Figure 2-2) has three areas reserved for display of specific types of messages:

- The Function Key numbers and labels which describe the operation available with the keys on that particular menu appear on the last line of the screen.
- System messages and prompts are given on the left side of the screen on second and third lines from the bottom.
- Operating status is shown two lines from the bottom on the right side of the screen.

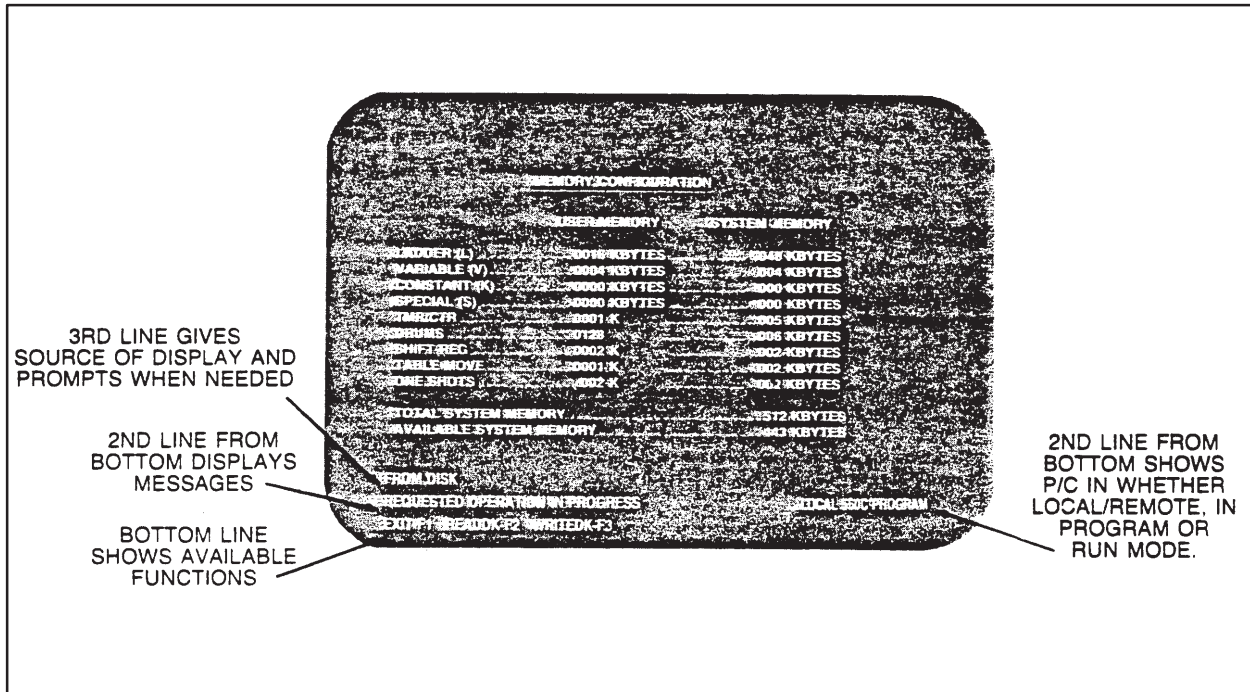


Figure 2-2 Screen and Message Areas of the VPU200

Keyboard

The VPU200 main keypad consists of letters and numbers in an arrangement similar to that of a typewriter keyboard. In addition to the main keypad, there are eight function keys labeled F1 through F8 at the top of the keyboard and a set of arrow keys on the right of the keyboard. The eight function keys are used to initiate certain operations. The operation performed by each key depends upon the particular menu in use.

The plus sign (“+”) appears in the lower right corner of the screen when more than eight function keys are available for a particular menu. When the sign appears pressing the spacebar displays the additional function keys. Pressing the spacebar once more will return the original group of function keys to the screen.

The keypad on the right of the keyboard contains several keys. In this group of keys, only the four arrow keys and the print key are required with the 560 P/C. The arrow keys are used to move the cursor in the direction indicated by the arrow on the key. The cursor will wrap around from one side to the other if it goes beyond the edge of the screen. The Print key is used to print the currently displayed screen. Note that this is different from what is performed by the print operation, which is used to print entire groups of related information (such as I/O Configuration charts) that are often longer than one screen.

Description (continued)

On the main keypad, aside from the function keys at the top of the keyboard, the remaining keys are used to identify and initialize elements. The Return key enters displayed information and begins a requested operation. When a chart is displayed, the Return key will step through the chart line by line.

VPU200-3104 Disk Drive

The VPU200 has high-density data storage capacity. The VPU200-3104 has 768K bytes of RAM and uses disks capable of 3.3M bytes of storage (2.78M bytes of storage after formatting). This is in contrast to the current "low density" VPU200-3102 which has 160K bytes of RAM and uses disks containing 180K bytes of storage. The larger memory and storage capability are necessary for use with the 560 P/C. In addition, low density disks cannot be used in the high density VPU200. However, a program stored on a low density disk may be copied to a high density disk for use with the VPU200-3104. This procedure is detailed in the paragraphs on copying disks. Note, however, that the high density VPU200 is compatible with all Siemens products (provided the disks are correctly formatted as described in this chapter). In the remainder of this manual, the term "VPU200" refers to the high density VPU200-3104; it does not refer to the low density VPU200-3102.



CAUTION

A high density disk should only be used in the high density VPU200.

2.2 Basic Operations of the VPU200

When the VPU200 is powered up and the spacebar is pressed, a menu of options appears (Figure 2-3). The following paragraphs explain each of these options.

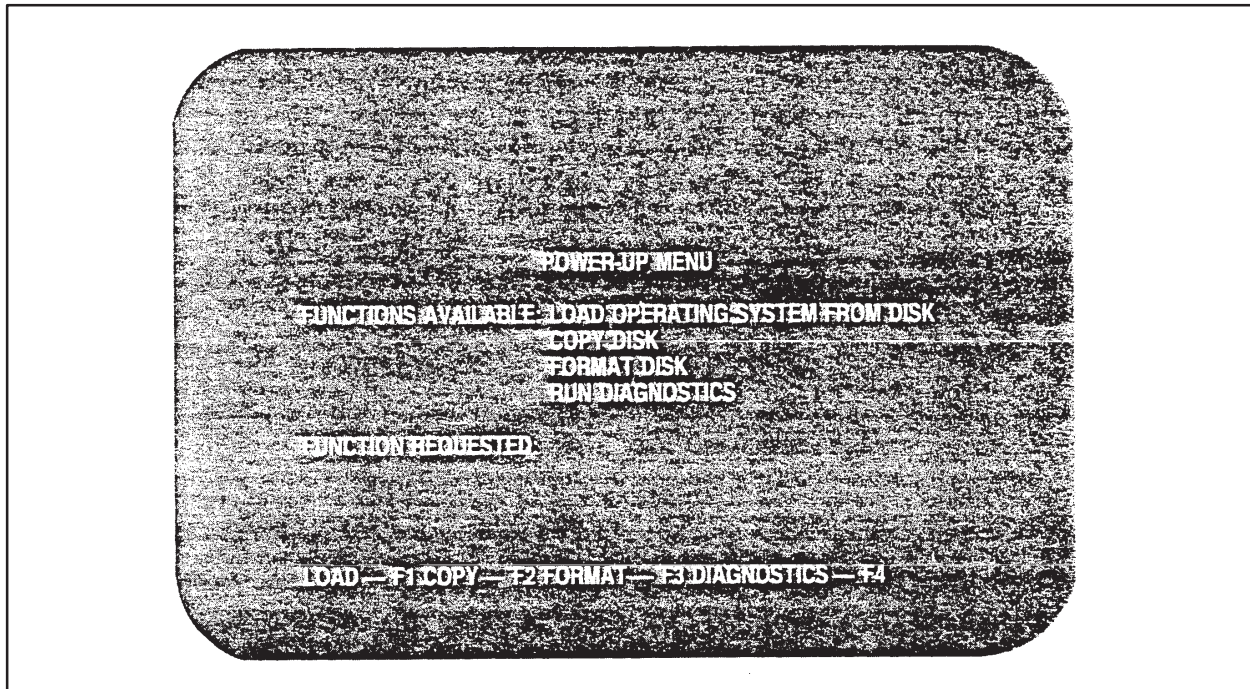


Figure 2-3 Power-up Menu

The LOAD (F1) Function Key

The LOAD (F1) function key initiates the first function on the Power-up menu. After the F1 function key is pressed, the system prompts you to insert the operating system (O.S.) disk. When you have inserted the disk, press the CONTINUE (F2) function key to ready the VPU for loading the operating system. After F2 is pressed, the selection shown in Figure 2-4 appears at the bottom of the screen.



Figure 2-4 Display after Loading O.S. Disk

Select the desired mode from the function keys available, and press the appropriate key. The operating system for the selected operation is then loaded.

Loading the O.S.

As the O.S. is loaded, a message and a series of dots appear on the screen. The message tells you what operating system is being loaded; i.e., OFFLINE, ONLINE, etc. If any errors occur at the beginning of the load operation, the operation will halt, and an error message will be displayed. The ABORT and CONTINUE function keys are available then to allow you to correct the problem and resume the load operation without returning to the original menu. Errors occurring during the load operation will cause the operation to abort.

**The FORMAT (F3)
Function Key**

Because all disks must be formatted before copying, the Format option is discussed here prior to the Copy option available on the Power-up Menu. Pressing the F3 (FORMAT) function key elicits the prompt, **SELECT VPU200 GENERATION FOR THIS DISK.**

The function keys available will change to allow you to choose either **FIRST GENERATION** (the F2 function key) or **SECOND GENERATION** (the F3 function key). (The F1 function key will remain an **ABORT**, should you wish to halt this option.) "First Generation" refers to all software which is used with the 510, the 520/530, the 5TI/PM550 P/Cs, and the ASCII and BASIC modules; it also refers to disks which were created with the "low density" VPU200-3102. "Second Generation" refers to all software which is used with the 560/565 and later P/Cs, as well as the disks programmed with the second generation software.

Based on these definitions, choose the function key for the appropriate generation. After the format is chosen, the system will prompt you to insert the disk to be formatted (the "target" disk). A target disk must always be a high density disk. After inserting the disk, press the **CONTINUE (F2)** function key to begin the format operation. If you wish to abort the format operation, press the **ABORT (F1)** function key. While the disk is being formatted, the word "FORMATTING" will be displayed. When the disk is formatted, the phrase, **FORMAT COMPLETE**, will appear and you may select another option from the list.

Any errors which occur before the format operation begins will halt the format operation and display an error message. Also, the **ABORT** and **CONTINUE** function keys will become available, which allow you to correct the problem and continue with the operation without returning to the original menu. If an error occurs after the format operation begins, the operation will abort and the original menu will be shown on the screen.

If a bad track is found on the disk during the format operation the phrase, **FORMAT ERROR**, will appear on the screen and the operation will abort. The system will also write a code on the disk which prevents it from being used by a VPU200.

**The COPY (F2)
Function Key**

This function key is used to copy the contents of one disk onto another. The source disk (the one being copied) may be either low or high density, but the target disk (the one to which the source disk is copied) must be a formatted high density disk.

Basic Operations of the VPU200 (continued)

NOTE: The disk to which information will be copied must first be formatted. Always insure that a disk is formatted before trying to use it in any VPU function. Formatting instructions are given in the preceding paragraphs.

After the F2 function key is pressed, the system will respond with the prompt, **SELECT SOURCE DISK DENSITY TYPE**.

The choice of high or low density depends on the type of disk used for the source disk. Press the function key corresponding to the type of disk which you are using.

After you choose low or high density, the system will prompt for you to insert the source disk. The source disk must be write-protected or the operation will halt. (When the operation halts, an error message will appear to indicate that an unprotected source disk was inserted.) To continue, you must remove the disk and replace the write-protect tab. Alternately, you may press the **ABORT (F1)** function key to terminate the **COPY** operation. Once the disk is inserted, press the **CONTINUE (F2)** function key to begin the copy operation. The copy operation will differ depending on whether a First or Second Generation format is being copied.

Copying First Generation Formats. For a source disk with First Generation format, the first step of the operation is for the VPU200 to read the disk. While this step is in progress, the word **“READING”** is displayed on the screen. After the disk is read, the VPU200 beeps and prompts you to insert the target disk. Note that the target disk must not be write-protected. Once the target disk is inserted, press the **CONTINUE (F2)** function key. This begins the second step of the copy operation, which is the transfer of the data to the target disk. During this step, the word **“WRITING”** appears on screen. When the copy is complete, the phrase, **COPY COMPLETE**, appears; and the display returns to the Power-up Menu.

CAUTION

There is no method for determining which format was used unless you label the disk.

When a First Generation format disk is copied, be sure to label the new disk **“First Generation Format”**.

Copying Second Generation Formats. For a source disk which has a Second Generation format, the copy operation requires the following steps to be performed.

1. Insert the source disk into the VPU200.
2. Press the CONTINUE (F2) function key to begin. While the Operation is in progress, three types of information are given on the screen. First, the word "READING" appears on the left side of the screen to indicate that the operation is in progress,. Second, a message will be shown on the right side of the screen to indicate how many times the source and target disks must be exchanged to copy the disk. Finally, a series of dashes will appear on the screen. Each dash represents 2K bytes of data, which is called a cluster. As each cluster is read, the dash will change to a dot.
3. Wait for the VPU200 to beep. Then remove the source disk.
4. Insert the target disk in the disk drive.
5. Press the CONTINUE (F2) function key to resume the operation: The word "WRITING" now appears, and the message on the right side of the screen is updated to show the number of disk changes left to do. Also, the series of dashes reappear and change to dots as described above.
6. Wait for the VPU200 to beep, which will indicate that the writing portion of the copy operation is complete.
7. Repeat steps 1 through 6 until the entire disk is copied.
8. When the disk is copied, the phrase, COPY COMPLETE, will appear and the Power-up Menu is then displayed.

Any errors which occur before the copy operation begins will halt the copy operation and display an error message. Also, the ABORT and CONTINUE function keys will become available, which allow you to correct the problem and continue with the operation without returning to the original menu. If an error occurs after the copy operation begins, the operation will abort and the original menu will be shown on the screen.

Basic Operations of the VPU200 (continued)

The DIAGNOSTICS (F4) Function Key

This option is used to test the operation of the VPU200. It performs the following diagnostic checks:

- Interrupt testing of the VPU200. This four part test checks the CRU bits, parity, software, and timer. It will take 1 second to complete.
- Disk Interface testing. This six part test checks side bit, controller RAM, controller register, controller chip, watchdog timer, and 5 second timer. It will take 8 seconds to complete.
- RAM testing. This five part test performs an address check of the expansion RAM with both consecutive and non-consecutive maps, an address check of the default RAM, a data check of the expansion RAM, and a data test of the default RAM. It will take 3.5 minutes to complete.

After the F4 function key is pressed, the system will prompt for a disk to be inserted in the disk drive. The disk should be formatted for second generation, and the write-protect tab should be removed. This disk should not contain data which is valuable since any data on the disk will be destroyed during the diagnostic test.

After the disk is inserted, press the CONTINUE (F2) function key to begin the diagnostic checks. You may quit the operation by pressing the ABORT (F1) function key.

The VPU200 will perform the diagnostic checks in the order shown above. At the start of each test, the name and number of the test will appear on the screen of the VPU200. While the test is underway, the word "RUNNING" will appear after the name of the test. If the test is passed, "RUNNING" will change to "PASSED" and the VPU200 will proceed with the next group of diagnostic checks. If the test fails, the word "RUNNING" will change to "FAILED" and the VPU200 will proceed with the next test group. (The specific test within a group which failed is indicated by the last number of the group which appears on the screen.) For example, if the following were displayed:

```
INTERRUPT TEST PASSED 1 2 3 4
DISK TEST PASSED 1 2 3 4 5 6
RAM TEST FAILED 1 2 3
```

the cause of the failure would be the third part of the RAM diagnostic checks.

(If a test does fail and you are unsure of how to correct the problem, please contact Siemens Technical Service group at 423-461-2501 for assistance.)

When the diagnostic tests are complete the following message will appear:

PRESS SPACE BAR TO RETURN TO THE POWER-UP MENU

The list of the diagnostic checks will remain on the screen until the spacebar on the keyboard is pressed.

Menu Structure of the VPU200

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3.1 Introduction

This chapter describes the menu structure of the VPU200. The menus are grouped by functions available within each operating mode (Online or Offline).

3.2 Menu Divisions

The menus are structured in a hierarchy of operations from the most general to the most specific. A program composed of network elements is entered by following the prompts through the system to the desired operation. Figure 3-1 is a flow diagram of the menu structure. Basically, there are two main divisions:

- The Menus accessed in the Online mode, and
- The Menus available in the Offline mode.

3.3 Function Keys

As noted in Chapter 2 during the discussion of the keyboard, the eight function keys are labeled as to operation performed on a particular menu. These labels change from menu to menu to accommodate the function required. However, five operations are required on various menus and retain their basic functions wherever they occur. These functions are described below:

1. **ABORT:** This function discards any changes made and returns to the previous display.
2. **EXIT:** This function retains all changes made and returns to the previous display.
3. **ENTER:** The Enter key appears mainly for writing comments and compiling rungs of ladder logic. Pressing Enter records the data on the Program Disk or in P/C memory (as appropriate for the mode selected) and returns the screen to the previous display.
4. **UP:** This function key is used to view the next screen of a ladder logic program.
5. **DOWN:** This function key displays the previous screen of a ladder logic program.

NOTE: If a single rung is too large to fit on one screen, you cannot use the UP or DOWN function keys to view the part outside the screen. Instead, the up and down arrow keys on the keyboard must be used to view the entire rung. The up arrow key will show the next line of the rung; the down arrow will show the previous line of the rung. The arrow keys cannot be used to step to the next rung of the program.

3.4 Accessing the Menus

To begin operation of the VPU200, load the operating system. (This procedure is detailed in Chapter 2.) After the operating system is loaded, the Mode Selection screen appears.

The function keys available on the initial display are labeled as follows:

F1	F2	F3	F4	F5
ABORT	ONLINE	OFFLINE	SUPPORT	XREF

The F1 key provides access to the Power-up Menu for copying and formatting disks or running VPU diagnostics.

The operating modes are ONLINE and OFFLINE. In Online mode, the VPU and the programmable controller (P/C) communicate; and any changes entered on the VPU can be written directly to the P/C and to disk in some instances. In Offline mode, there is no communication between the VPU and P/C; and programs, edits, etc., must be written to disk to save.

Function keys F4 and F5 provide the options of accessing support functions or printing cross-references. If F4, Support, is selected, the VPU performs this operation in Online mode. With the selection of F5, printing of cross-references is done in the Offline mode.

3.5 Online Menus

After selection of the Online mode, Function keys F1 – F5 appear for entering desired baud rate. The keys are labelled as shown below:

BAUD RATE				
EXIT	300	1200	2400	9600
F1	F2	F3	F4	F5

FUNCTION KEYS

After you select a baud rate, the Function Key labels change as follows:

EXIT	CONFME	CONFIO	CONT
F1	F2	F3	F4

FUNCTION KEYS

Two primary operations are available with the F2 and F3 keys. The F4 key calls another set of functions keys, which provide access to additional operations. The two primary operations initiated by F2 and F3 are:

- F2** CONFME (CONFigure MEmory.) This begins the series of operations which allow you to allocate the memory areas for the P/C. (See Chapter 4 for instructions on performing this operation.)
- F3** CONFIO (CONFigure I/O.) This begins the series of operations which allow you to configure inputs and outputs for the 560 P/C. (See Chapter 5 for the details of this operation.)

The F4 key calls another set of function keys, which provide access to additional operations, as shown and described below.

EXIT	PRINT	LADDER	AUX	SFBOX
F1	F2	F3	F4	F5

FUNCTION KEYS

- F2** PRINT This begins the series of operations which allow you to set the parameters for printing and choose what to print. See Chapter 7 for the details of this function.
- F3** LADDER This begins the series of operations through which networks may be created or modified. See Chapter 8 for details on this operation.
- F4** AUX AUXiliary. This operation is used to access auxiliary functions which get information from or to the P/C. See Chapter 9 for explanation of these functions.
- F5** SFBOX This operation is used to program SF box instructions for SF modules, such as the ASCII module. See Chapter 10 for programming instructions.

NOTE: Disks must be initialized before using the first time. This operation is performed only in the offline mode and is an automatic procedure that occurs when the program disk is first inserted after the O.S. is loaded. Therefore, then using a disk for the first time, format and insert it for initialization in the offline mode.

3.6 Offline Menus

After pressing the F3 function key for selection of the Offline mode, the Offline O.S. is loaded and a prompt appears requesting that a Program Disk be inserted. When the disk is inserted, press the FONT (F2) function key. the VPU200 will then check to see if the inserted disk is new. If it is new, the VPU200 will initialize the disk. (While the disk is being initialized, the phrase DISK INITIALIZATION IN PROGRESS, will be displayed.) When the operation is complete, Function Keys 1 – 6 are displayed with labels as shown and described below.

NOTE: To insure proper operation of a program disk that was used with a prior release of VPU software, initialize the disk before using with the REL 2.0 VPU operating system.

EXIT	CONFME	CONFIO	CONT	TITLE	COMPACT
F1	F2	F3	F4	F5	F6

FUNCTION KEYS

- F2** CONFME (CONFigure MEmory.) This begins the series of operations which allow you to allocate the memory areas of the P/C. See Chapter 4 for instructions on performing this operation.
- F3** CONFIO (CONFigure I/O.) This begins the series of operations which allow you to configure the inputs and outputs for the 560 P/C. See Chapter 5 for procedures on this operation.
- F5** TITLE This begins the series of operations through which the title, date, and version of the Program Disk can be written. See Chapter 6 for the details of this operation.
- F6** COMPACT (COMPACT DISK.) This operation frees up space on the disk after offline changes have been made to ladders, comments, synonyms, etc. COMPACT rearranges the files to allow maximum usage of available disk space.

NOTE: Depending upon the size of the program, the number of comments and synonyms, and the amount of editing that has been done, compacting may require from a few minutes up to 24 hours for completion.

The F4 key calls another set of function keys, which provide access to additional operations, as shown and described below.

EXIT	PRINT	LADDER
F1	F2	F3

FUNCTION KEYS

- F1** PRINT This begins the series of operations which allow you to set the parameters for printing and choose what to print. See Chapter 7 for the details of this operation.
- F2** LADDER This begins the series of operations through which networks may be created or modified. See Chapter 8 for the details of this operation.

3.7 Support Functions

After pressing F4, Support, on the mode selection screen, the function keys for setting baud rate are displayed since this operation is performed in the online mode. After selection of baud rate, the first page of the Support Functions menu is displayed. For a complete description of each of the support functions, refer to Chapter 9.

3.8 Print Cross-references

Pressing F5, XREF, on the mode selection screen brings up the prompt to insert the program and documentation disk. Once this is done, the display for selecting print parameters appears. The print options may then be selected. This operation is discussed in detail in Chapter 7.

Chapter 4

Configuring Memory

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4.3	Configuring Memory	4-6

4.1 Introduction

This chapter describes the function keys which become available after pressing the CONFME (F2) function key in either the Online or Offline mode. Figure 4-1 shows the function keys which are in the CONFME hierarchy. An explanation of the process of configuring memory follows the description of the function keys in this chapter.

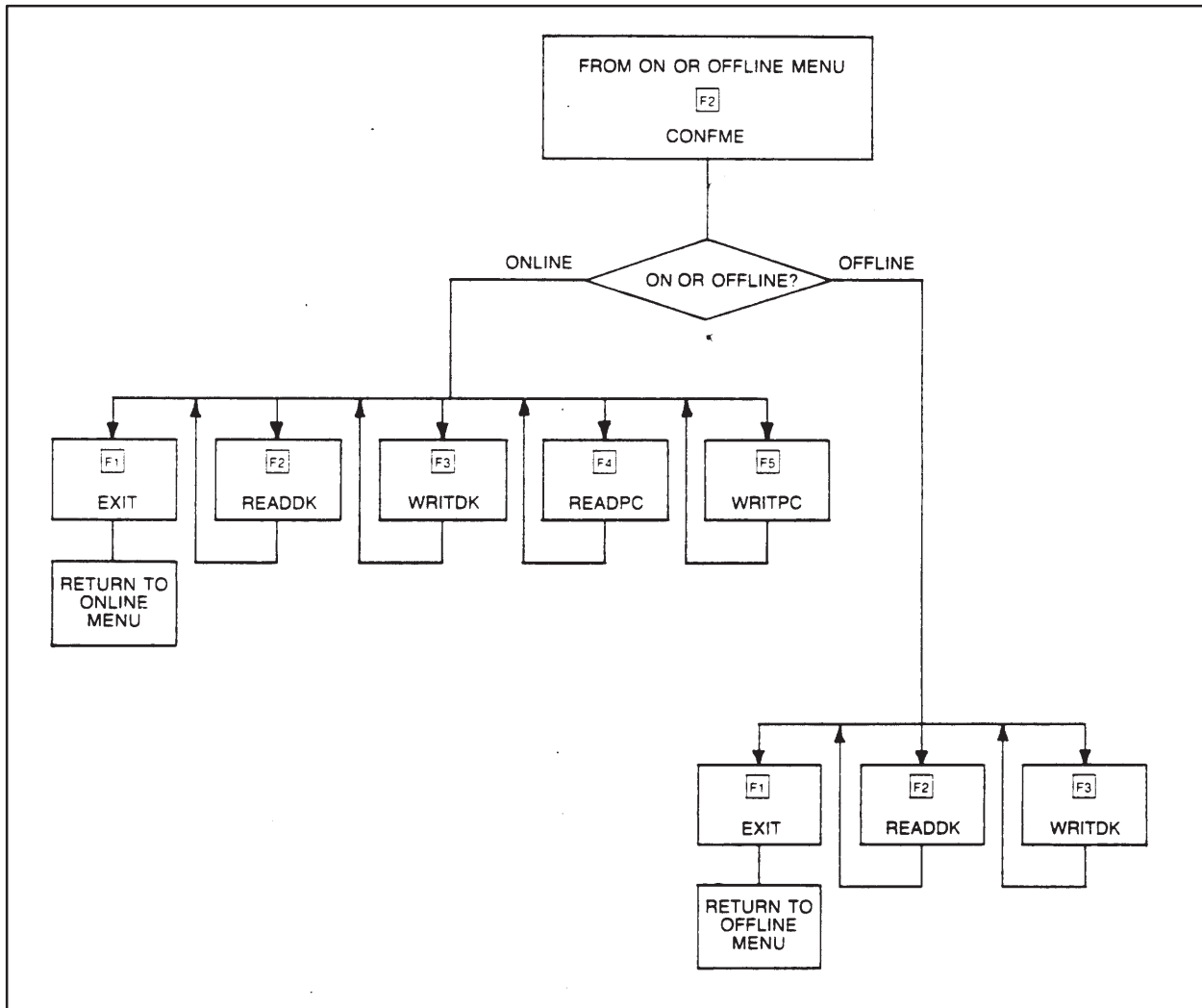


Figure 4-1 Configure Memory Hierarchy

4.2 Configure Memory Display

When the CONFME function key is pressed, a table showing the current memory assignments will be displayed. The values which appear in the table are either the default values (if the chart has not been previously programmed) or the current values. If the VPU200 is in the Online mode, the current values will be those which are in the P/C; if the mode is Offline, the values will be those which are currently on the Program Disk. Figure 4-2 shows the default display with a P/C memory of 512 KBytes.

MEMORY CONFIGURATION		
	USER MEMORY	SYSTEM MEMORY
LADDER (L)	0016 KBYTES	048 KBYTES
VARIABLE (V)	0004 KBYTES	004 KBYTES
CONSTANT (K)	0000 KBYTES	000 KBYTES
SPECIAL (S)	0000 KBYTES	000 KBYTES
TMR/CTR	0001 K	005 KBYTES
DRUMS	0128	006 KBYTES
SHIFT REG	0002 K	002 KBYTES
TABLE MOVE	0001 K	002 KBYTES
ONE SHOTS	002 K	002 KBYTES
TOTAL SYSTEM MEMORY		512 KBYTES
AVAILABLE SYSTEM MEMORY		443 KBYTES

Figure 4-2 Default Memory Configuration

The function keys which become available depend on whether the system is in the Online or Offline mode. The following paragraphs describe the function keys available in each mode.

Configure Memory Display (continued)

Function Keys Available in Online Mode

Function Keys Available in the Online Mode.

In the Online mode, Function Keys 1–5 are displayed as shown and described below.

EXIT	READDK	WRITDK	READPC	WRITPC
F1	F2	F3	F4	F5

FUNCTION KEYS

- F2** READDK (READ DisK.) This displays the memory configuration from the Program Disk. The message line on the screen will change to indicate that the data is from the disk.
- F3** WRITDK (WRITe DisK.) This function key sends the displayed configuration to the Program Disk. You must press this function key to save any changes which were made in the configuration.
- F4** READPC This function key will obtain the memory configuration from the P/C. A message will appear on the screen to indicate that the data is from the P/C.
- F5** WRITPC This function key sends the displayed configuration to the P/C. You must press this key if the changes made in the configuration are to be loaded in the P/C.

Note that only the F1 function key (EXIT) will allow you to leave the CONFME. Also, if you press the EXIT function key before you save any changes made to the chart (by pressing the WRITDK or WRITPC function keys), a warning message will appear. This message states that the changes were not saved and will be lost. It also asks whether you wish to discard your changes. If you press the F1 function key for NO, the EXIT operation will abort and you may save the changes. If you press the F2 function key for YES, the changes will be discarded and the EXIT operation will proceed.

**Function Keys
Available in the
Offline Mode**

In the Offline mode, Function Keys 1 – 3 are labeled as shown and described below.

EXIT	READDK	WRITDK
F1	F2	F3

FUNCTION KEYS

- F2** READDK (READ DisK.) This will obtain the memory configuration from the Program Disk. The message line on the screen will change to indicate that the data is from the disk.
- F3** WRITDK (WRITe DisK.) This function key saves the displayed configuration the Program Disk. You must press this function key to save any changes which were made in the configuration.

Note that only the F1 function key (EXIT) can be used to leave the CONFME hierarchy. All other operations return to the CONFME line. Remember to save all changes before pressing the EXIT function key.

4.3 Configuring Memory

To change the memory size, move the cursor (using the up and down arrow keys on the VPU200 keyboard) to the desired memory category. You may also use the Return key to step through the different categories.

Once you reach the desired memory category, use the number keys to type in the amount of memory needed. Note that you may only alter the “User Memory” column in the table. The “System Memory” column cannot be altered and is only included to show you the amount of P/C memory allocated to each type of memory.

The total of the values in the “System Memory” column is shown at the bottom of the table. If the display is created from information in the P/C with the VPU in the Online mode of operation, then the total will be the size of the installed P/C memory cards (512K bytes maximum). When the system is offline or when the information is from the Program Disk, the total will always be 512K bytes. Read the prompt on the screen to find out whether the table is being read from the P/C or from a Program Disk.

NOTE: You will not be able to download a program into the P/C if the memory configuration for the P/C is different from any of the memory configuration categories on the Program Disk in the VPU200.

After typing in the size of the memory, move the cursor to the next memory category. The system will compute the new memory space and will change the “Available System Memory” entry at the bottom of the chart accordingly. The memory categories are limited to incremental changes in the user memory allocation. If a number is entered into the user memory field that is not one of the allowed increments, the VPU200 will adjust the number to fit the next boundary. For instance, L memory can be allocated only in 4K-byte increments. Therefore, an L memory entry of 17K bytes will be adjusted to 20K bytes by the VPU. Please see the 560 Program Design Manual, Chapter 2, for a full discussion of memory configuration. If you enter a size which causes the value for the total system memory to be exceeded, an error message will appear when you move the cursor. The value for the available system memory will also be set to zero.

After the table is completed, use the WRITPC (F5) or WRITDK (F4) function keys to enter the changes into the P/C or save them on a Program Disk.

Chapter 5

Configuring I/O

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	Function Keys Available via SHOW in Online Mode	5-5
	Function Keys Available with SHOW in Offline Mode	5-7
5.2	Configuring the I/O Variables	5-8
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5.1 Introduction

This section describes the function keys available after pressing the CONFIO (F3) function key in either the Online or Offline mode. Figure 5-1 shows the arrangement of the function keys used with this operation. Following the discussion on the function keys, the process of configuring the I/O variables is described.

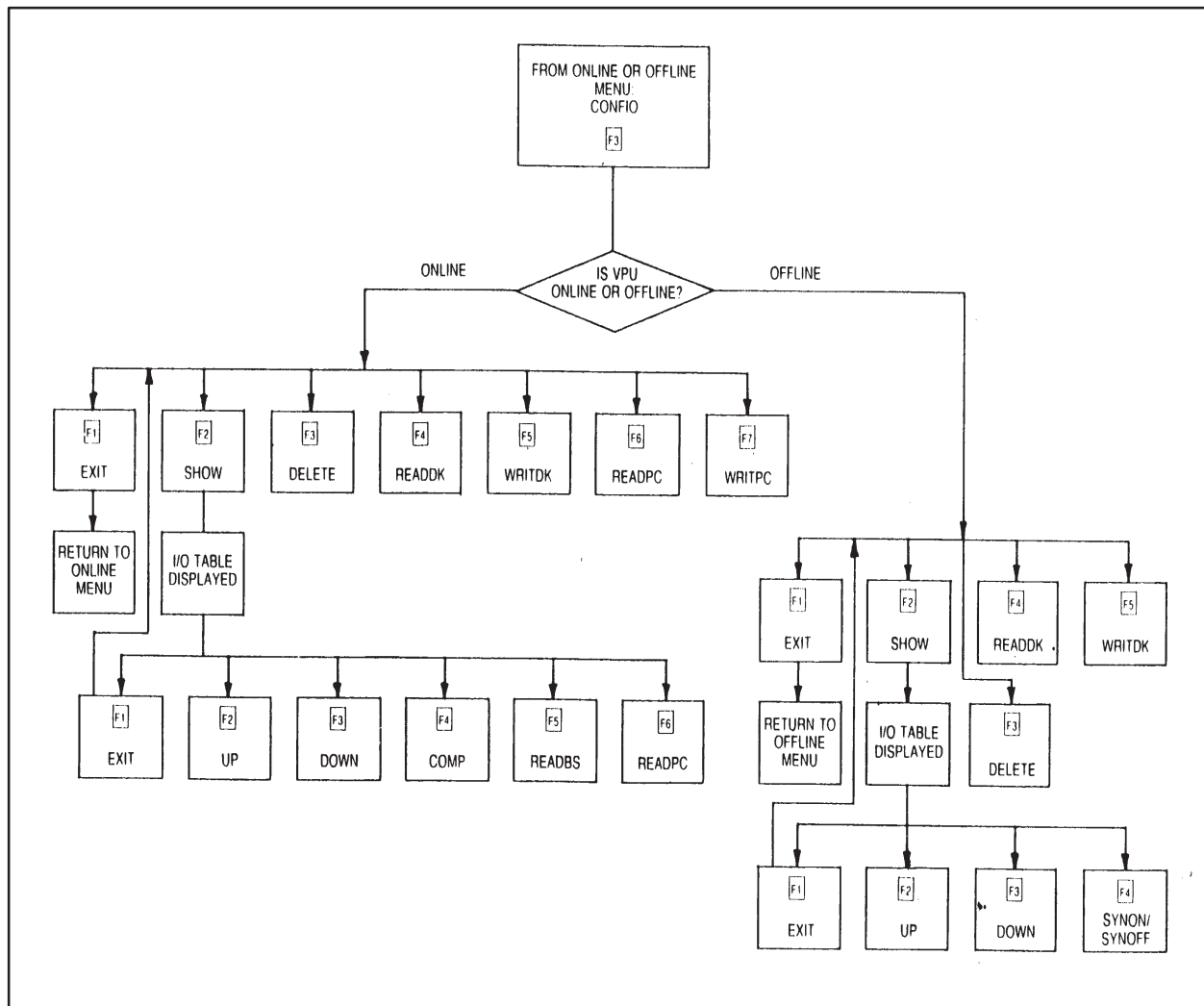


Figure 5-1 Configure I/O Hierarchy

Function Keys Available

When the Configure I/O function is selected, Function Keys F1 – F7 are labeled as shown and described below; and the chart shown in Figure 11 is displayed.

EXIT	SHOW	DELETE	READDK	WRITDK	READPC	WRITPC
F1	F2	F3	F4	F5	F6	F7

FUNCTION KEYS

NOTE: When the system is Offline, the READPC and WRITPC function keys are not available and will not be displayed.

F2 SHOW This function key accesses two menus, depending on the mode (Online or Offline) in which it is used. In the Online mode, F2 calls a menu with the I/O Configuration Chart. The Function Keys are then labeled as shown and described under Function Keys Available via SHOW in Online Mode, below. These keys are used to perform a comparison of the I/O configuration in the P/C to the actual configuration in the I/O base. In the Offline mode, F2 again calls a menu with the I/O Configuration Chart. However, in this mode, the function keys perform the operation of adding synonyms for each I/O point. The Function Keys are labeled as shown and described in Function Keys Available with SHOW in Offline Mode.

F3 DELETE (DELETE disk configuration.) This function key erases the I/O configuration from the disk for the channel selected number on the menu. Two important points to remember:

1. You cannot delete the I/O configuration for Channel 1 and 2.
2. Channels are paired as on the RCC card; i.e., 1 & 2, 3 & 4, etc. Whenever one of a pair of channels is deleted, so is the other. For example, if you enter Channel 4 and press the Delete (F4) key, the Channel 3 configuration is also deleted from the disk. In addition, any channels configured following 4 are also deleted. Likewise, selecting channel 6 for deletion will delete 5 and 6, 7 and 8.

When the function key is pressed, a prompt will appear to ask if you are sure you wish to delete the I/O configuration. If you press the NO (F1) function key, the delete operation will abort; if you press the YES (F2) function key, the I/O configuration will be deleted.

- F4** READDK (READ DisK.) This function key obtains the I/O Module Definition chart from the Program Disk for the base and channel which were typed on the screen. The displayed chart will be redrawn to show the values obtained from the Program Disk. NOTE THAT THIS WILL ERASE THE CURRENT DISPLAY OF THE CHART. Also, the prompt line on the screen will change to indicate that the values are from the disk.
- F5** WRITDK (WRITe DisK.) This function key saves the displayed I/O Module Definition chart on the Program Disk. You must press this function key to save any changes which were made in the chart.

NOTE: Any information entered into the chart that is not within the correct range or does not fall on the correct boundary will be corrected upward or flagged as an error. After the WRITDK or WRITPC operation has completed, read the chart to note any corrections that may have been made.

- F6** READPC This function key appears only in the Online mode of operation and will obtain the I/O Module Definition chart from the P/C. It will obtain the chart for the base and channel which were typed before the function key was pressed. The displayed chart will be re-drawn to show the values obtained. NOTE THAT THIS WILL ERASE THE CURRENT INFORMATION IN THE CHART. Also, the message area on the screen will change to indicate that the values are from the P/C.
- F7** WRITPC This function key also appears only in the Online mode of operation and will send the displayed I/O Module Definition chart to the P/C. You must press this key if the changes made in the I/O Module Definition chart are to be placed in the P/C.

Note that only the EXIT (F1) function key will allow you to leave the Configure I/O hierarchy and return to the menu in which the CONFIO function key was pressed. If you press the EXIT function key without saving the changes made to the chart (by using the WRITDK or WRITPC function keys), a prompt will appear asking whether you wish to discard the changes. If you press the F1 function key for NO, the EXIT operation will abort. If you press the F2 function key for YES, the EXIT operation will proceed and the changes will be discarded.

Function Keys
Available via
SHOW in Online
Mode

When the SHOW (F2) function key is pressed while in the Online mode, the displayed I/O Module Definition chart will be replaced with the "I/O Configuration" chart. An example of the chart is shown in Figure 5-2. The first slot shown on the screen will be the one on which the cursor was placed in the I/O Module Definition chart. To view the rest of the chart, you must use the UP and DOWN function keys.

I/O CONFIGURATION CHART FOR: CHANNEL 1, BASE 01									
I/O POINT									
SF	SLOT 1	1 X0001	2 X0002	3 X0003	4 X0004	5 X0005	6 X0006	7 X0007	8 X0008
	SLOT 2	1 Y0097	2 Y0098	3 Y0099	4 Y0100	5 Y0101	6 Y0102	7 Y0103	8 Y0104
SF	SLOT 3	1 WX0009	2 WX0010	3 WX0011	4 WX0012	5 WX0013	6 WX0014	7 WX0015	8 WX0016
	SLOT 4	1 WX0241	2 WX0242	3 WX0243	4 WX0244	5 WX0245	6 WX0246	7 WX0247	8 WX0248
	SLOT 5	1 WY0249	2 WY0250	3 WY0251	4 WY0252	5 WY0253	6 WY0254	7 WY0255	8 WY0256
SF	SLOT 6	1 WX1001	2 WX1002	3 WX1003	4 WX1004	5 WX1005	6 WX1006	7 WX1007	8 WX1008

Figure 5-2 I/O Configuration Chart

Introduction (continued)

As shown in Figure 5-2, the I/O Configuration Chart is displayed when the SHOW Function Key is pressed. The Function Keys now available are labeled as shown and described below.

EXIT	UP	DOWN	COMP	READBS	READPC
F1	F2	F3	F4	F5	F6

FUNCTION KEYS

- F4** COMP (COMPare.) Pressing this function key compares the displayed I/O Configuration chart with the actual configuration of the I/O modules in a particular base. Since the comparison is based on the displayed chart, the chart must show the I/O configuration as stored in the P/C or an invalid comparison will be made. To obtain a valid comparison, use F6, ReadPC, to call the PC configuration to the screen before doing the compare. Any differences will be shown in bright intensity in the chart and by two "*" symbols to the left of the slot affected.
- F5** READBS (READ BaSe.) Pressing this function key obtains the I/O configuration for the base shown on the top line of the chart. The displayed I/O Configuration chart will be re-drawn to show values obtained.
- F6** READPC Pressing this function key will obtain the I/O Configuration stored in the P/C and will redraw the I/O Configuration chart to show the values obtained.

**Function Keys
Available with
SHOW in Offline
Mode**

When the SHOW (F2) function key is pressed .while in the Offline mode, the I/O Configuration Chart is displayed as shown in Figure 10. The Function Keys now available are labeled as shown and described below.

EXIT	UP	DOWN	SYNON/ SYNOFF
F1	F2	F3	F4

FUNCTION KEYS

- F4** SYNON/SYNOFF (SYNONym ON or SYNONym OFF.) This function key allows you to choose whether the synonyms will be displayed. When “SYNON” is displayed, pressing the function key will cause the chart to be re-drawn with synonyms. “SYNON” will change to “SYNOFF”, which indicates that pressing the function key once more will remove the synonyms from the screen.

Note that there will be three lines for the synonyms above each I/O point. To read another section of the chart, use the UP and DOWN function keys.

5.2 Configuring the I/O Variables

After the Configure I/O (F3) key is pressed, a chart, Figure 5-3, appears for entry of I/O module configurations. The values shown in the table will be for the current I/O configuration and will be obtained from the P/C (if Online) or from the Program Disk (if Offline).

I/O MODULE DEFINITION FOR: CHANNEL 1 BASE 00						
SLOT	I/O ADDRESS	NUMBER OF BIT AND WORD I/O				SPECIAL FUNCTION
		X	Y	WX	WY	
1	0001	08	00	00	00	NO
2	0009	08	00	00	00	NO
3	0017	08	00	00	00	NO
4	0025	08	00	00	00	NO
5	0033	08	00	00	00	NO
6	0041	08	00	00	00	NO
7	0049	08	00	00	00	NO
8	0057	08	00	00	00	NO
9	0065	08	00	00	00	NO
10	0073	08	00	00	00	NO
11	0081	08	00	00	00	NO
12	0089	08	00	00	00	NO
13	0097	08	00	00	00	NO
14	0105	08	00	00	00	NO
15	0113	08	00	00	00	NO
16	0121	08	00	00	00	NO

Figure 5-3 I/O Module Definition Chart

CAUTION

Be careful when assigning the addresses for the slots in a base. It is possible to assign one address to two slots, which could cause the module placed in the slot or the P/C to perform unpredictably.

Note that you can only create or change the I/O Module Definition chart. You cannot create or change the I/O Configuration chart, which is displayed when the SHOW (F2) function key is pressed. This chart is built by the system from the information supplied in the I/O Module Definition chart and the Synonym charts (which are described in Section 8.9).

The first step in creating an I/O Module Definition chart is to press the CONFIO function key in either the Online Menu or the Offline Menu. (Remember that the mode of operation affects what you will be able to do. Please see the preceding paragraphs for what is allowed in each mode of operation.)

After the function key is pressed, the I/O Module Definition chart will be placed on the screen. The cursor will be next to the word "Channel" when the chart appears. You should type the number of the channel and base you wish to configure. Once the channel and base numbers are typed, use the arrow keys to move the cursor off to the next Yield.

You can now configure the I/O for the specified channel and base. Type the beginning I/O address for the first slot in the column labeled "I/O Address". The number for the address **MUST** begin on an eight point boundary. Further, the address is restricted to the range allowed for each channel. The following table shows the range of allowable addresses for each channel:

CHANNEL	ADDRESS RANGE	CHANNEL	ADDRESS RANGE
1	1 - 1024	5	4097 - 5120
2	1025 - 2048	6	5121 - 6144
3	2049 - 3072	7	6145 - 7168
4	3073 - 4096	8	7169 - 8192

Next, use the arrow keys to move to the appropriate fields and type in the addresses. Modules which have more than 8 I/O points are not to be assigned addresses that extend over the boundary between two channels. See the *SIMATIC 560 Hardware Manual* or the specific module data sheet for the number of bit and/or word I/O points required for each module.

Configuring the I/O Variables (continued)

NOTE: The I/O points do not have to follow in strict sequential order. The slots may be assigned any I/O points you desire (keeping within the 8-point boundary rule). Remember that the I/O points assigned to each slot must be unique. The VPU will not flag duplicate I/O points.

Proceed through the remaining entries in the manner described above. If a particular slot is not used, be sure to type all zeros for that slot. When all the entries for the particular base and channel are typed, they must be saved to the disk or the P/C. If you do not do this, when you go to configure another channel and base, the first chart will be lost. After the data is saved, you may specify another base and channel and proceed with configuring the I/O.

Time-saving Tip

In Online mode, if a base is connected to a channel with the I/O modules installed as they will be in actual operation, an easy way to assign the I/O configuration is to select that base and channel in the Module Definition chart, then do a SHOW operation. While in SHOW, read the base configuration and then exit. When the display returns to the Definition chart, the number of bit and word I/O will be displayed as configured on the base; and the I/O points will all be assigned for the lowest allowable points for that channel. You can then edit the I/O points to the desired addresses and save the data to the P/C or the disk. Configuring in this manner eliminates having to determine how many bit and/or word I/O points are needed for a particular module.

Chapter 6

Naming the Program Disk

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6.2	Available Function Keys	6-3
6.3	Creating or Changing a Title	6-5

6.1 Introduction

This section describes how to place a title, version, and date onto a Program Disk. Figure 6-1 shows the arrangement of function keys in the Title operation.

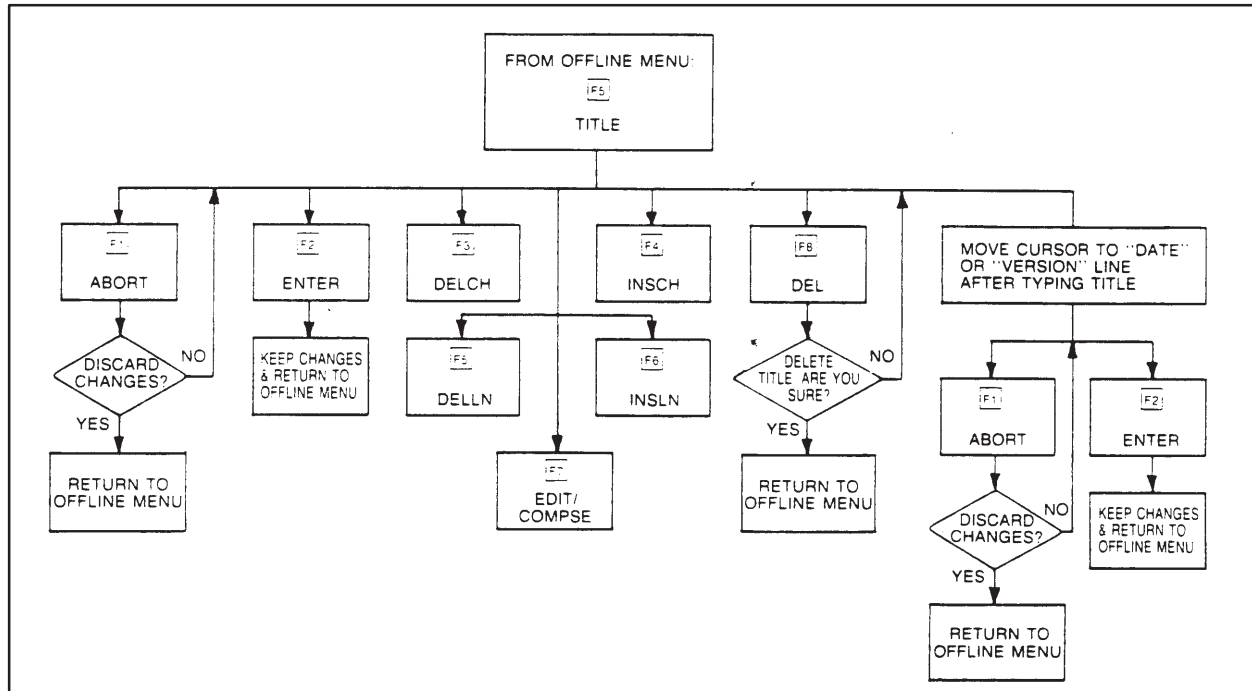


Figure 6-1 The Title Hierarchy

A title may be composed of up to 16 lines with 60 characters in each line. The TITLE (F5) function key in the Offline Menu is the access to this operation.

6.2 Available Function Keys

After the TITLE function key is pressed in the Offline Menu, the screen displays the word "Title" at the top of the screen and the words "Date" and "Version" at the bottom. The function keys available in the Offline Menu will change to the following:

ABORT	ENTER	DELCH	INSCH	DELLN	INSLN	EDIT/ COMPSE	DEL
F1	F2	F3	F4	F5	F6	F7	F8

FUNCTION KEYS

Aside from the ABORT and ENTER function keys there are six function keys for creating a title. The following explains these six function keys:

- F3** DELCH (DELEte CHAracter.) This function key is used to delete the character on which the cursor is placed and will move the other characters over to fill the vacated space.
- F4** INSCH (INSert CHAracter.) This function key will allow a character (or string of characters) to be inserted. The characters will be inserted at the space just before the cursor. When the key is first pressed, "INSERT ON" will appear on the screen to indicate that characters may be inserted. Characters will continue to be inserted until the function key is pressed again, which will remove the "INSERT ON" phrase from the screen.
- F5** DELLN (DELEte LiNe.) This function key will delete the line on which the cursor is placed. The location of the cursor on the line is not important. The rest of the lines of text will move up to fill the vacated line.
- F6** INSLN (INSert LiNe.) This function key will insert a line above the line on which the cursor is placed. Note, however, that if the maximum of 16 lines are already on the screen, you will be unable to insert another line. To insert the line, a line would first have to be deleted so that there was room on the screen for the new line. The location of the cursor in the line is not important. After the blank line is inserted, the cursor will move to the first position of the new line.

Available Function Keys (continued)

F7 EDIT/COMPSE (EDIT or COMPoSE mode.) This function key switches between Compose and Edit modes. When “EDIT” is displayed, pressing the function key will change the mode from Compose to Edit. “EDIT” will change to “COMPSE”, which indicates that pressing the function key once more will return the mode to Compose.

The difference between Edit and Compose mode is the operation performed when the Return key is pressed. This is also equivalent to what happens when you type beyond the end of a line. In Compose mode the Return key will cause a blank line to be inserted below the current line. The cursor will move to the first position of the new blank line. Also, any characters of a word which are entered beyond the end of the line will cause the entire word to be carried around to the beginning of the new line. This means that you may enter text without stopping to hit the Return key.

On the other hand, in Edit mode, the Return key will not cause a blank line to be inserted. Instead, the cursor will move to the first character of the next line of text. Also, the system will stop accepting and displaying characters which are typed beyond the last space of the current line.

F8 DEL (DELeTe title.) This function key will delete the title. After the function key is pressed, the system will ask if you are sure you wish to delete the title. Pressing the YES (F2) function key will cause the title to be deleted; pressing the NO (F1) function key will abort the delete operation and display the first menu on the screen.

6.3 Creating or Changing a Title

To begin the process of creating or entering a title, first press the TITLE (F5) function key in the Offline Menu. This will cause the system to respond with the menu and words described in the previous section. The cursor will be placed on the first position after the word "Title". An asterisk (*) will appear below the line with the cursor. This symbol will move as you enter the title and serves as the marker for the end of the title.

Once the title screen is displayed, type the title of the Program Disk. If you make a mistake, or you wish to change an existing title, use the arrow keys to place the cursor over the incorrect character and type the correct character. You could also use the DELCH, INSCH, DELLN, or INSLN function keys to modify an existing title. Remember the differences caused by being in Compose or Edit mode: Compose mode allows text to "wrap-around" from line to line, but Edit mode does not.

After the title is written, use the arrow keys or the Return key to move the cursor to the Date and Version lines at the bottom of the screen. Type in the date and version as needed. Note, however, that the edit operations will not be available at this level. Instead, when the cursor is moved to the Date line, the Function Keys offer the following two choices:

ABORT	ENTER
F1	F2

FUNCTION KEYS

These function keys are used after the title, date, and version are typed. The ENTER (F2) function key will store the new title, date, and version (or any changes made to an existing title) on the Program Disk. If you do not wish to keep the changes or the new title, press the ABORT (F1) function key.

After pressing either of the function keys, the system will leave the TITLE operation and return to the previous display.

Chapter 7

Printing

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This section describes the function keys which appear after pressing the PRINT (F2) or the XREF (F4) function key. The arrangement of the function keys in the PRINT hierarchy is shown in Figure 7-1. In addition to the Print function key, a Print key is available on the VPU200 keyboard. The Print key is available at any time except during the print operation and will print the currently displayed screen. The PRINT function key, on the other hand, appears on the screen of the VPU200 rather than on the keyboard and is used to print entire groups of related information (such as Memory Configuration charts, ladder logic programs, and synonyms.)

Note that the mode of operation is important when using the PRINT function key. The principal difference between the two modes is that synonyms and comments can only be printed in the Offline mode. All other categories may be printed regardless of the mode of operation.

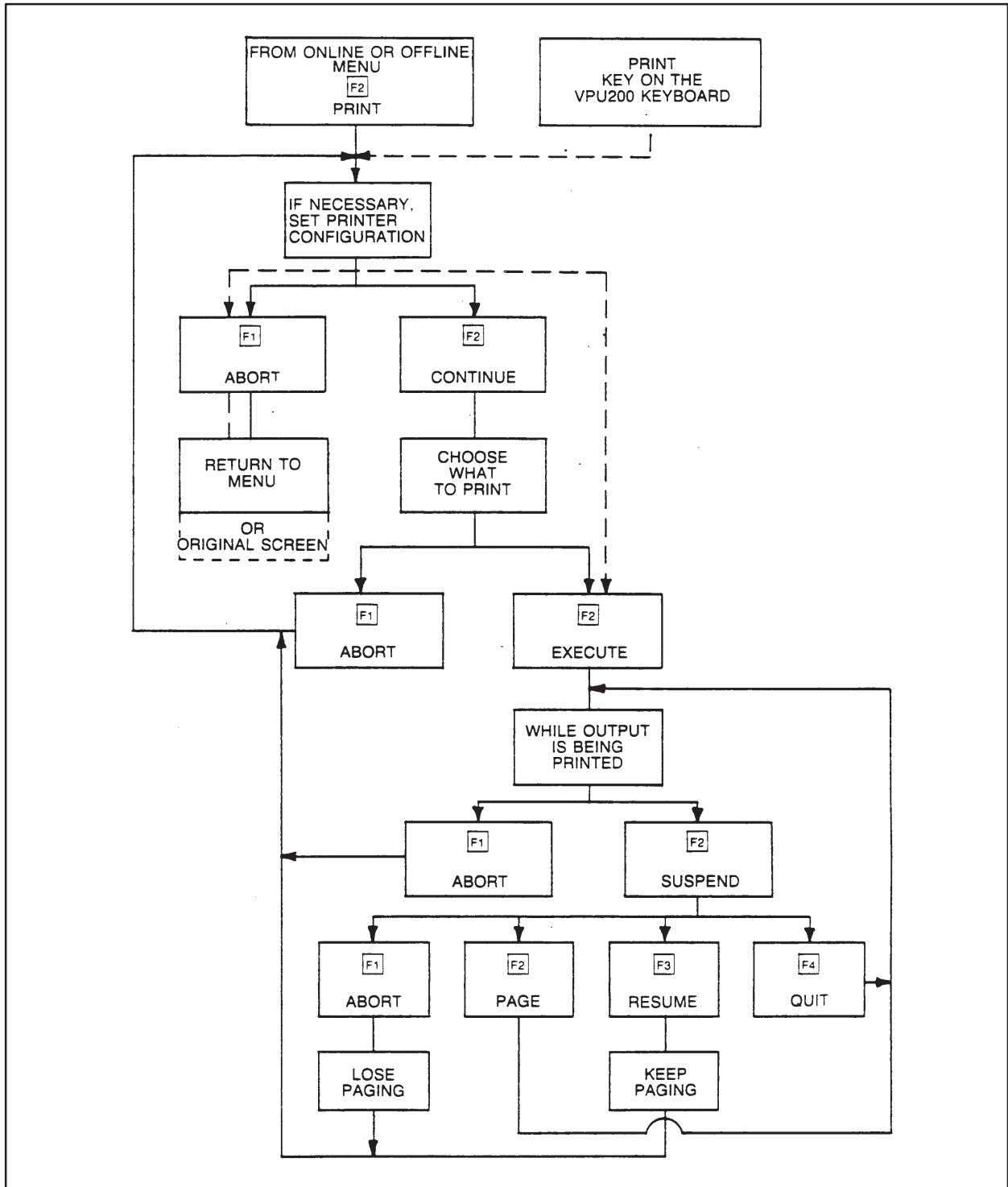


Figure 7-1 Print Hierarchy

7.2 Configuring the Parameters for Printing

The first step is to set the parameters for printing. Once the parameters are set, they will remain until you modify them.

After the Print key or the PRINT function key is pressed, the configuration chart for printing will be displayed. This chart and the default values for the entries in the chart are shown in Figure 7-2. (If the parameters have previously been created, these values will be shown in the chart.)

COLUMNS	
72 80	80
BAUD RATE	
110 300 600	
1200 2400 4800 9600	0300
LINES PER PAGE	
66 70	66
DATE	
	00-00-00
PRINT RIGHT RAILS	
YES NO	YES

Figure 7-2 Printing Parameters

To select the values for the chart, use the arrow keys to move to the desired category and then place the cursor on the value that you want. Once the cursor is on the desired value, press the Return key. This displays the chosen value on the right side of the chart and moves the cursor to the next category. For example, if you wanted to change the baud rate from 300 to 4800 baud, you would place the cursor on the “4800” parameter under the “BAUD RATE” category. Then you would press the Return key, which would change the baud rate and show it on the right side of the screen.

NOTE: To set the date, place the cursor on the first position of the date entry and type the numerical equivalent of the month; next, move the cursor to the next position and type the day; finally, move the cursor to the last position and type the last two digits of the year.

The following list describes what each of the parameters controls:

1. **COLUMNS:** This sets the width of the printed page. Note that if 72 is chosen here, the PRINT RIGHT RAILS entry will automatically be set to NO.
2. **BAUD RATE:** This controls the rate of communication to the printer and should be set the same as on the printer. (The VPU hardware is set to 7 bit, odd parity, 1 stop bit, and is not user-selectable.)
3. **LINES PER PAGE:** This sets the length of the printed page.
4. **DATE:** This sets the date in the order of Month, Day, and Year which will be shown on the printout.
5. **PRINT RIGHT RAILS:** This parameter is used to specify whether ladder logic diagrams will be printed with the right rail (which is the long vertical line which joins the networks together). Note that if 72 was chosen for the number of columns, only NO will be allowed for this entry.

7.3 Operation of the Print Key

The Print key on the VPU200 keyboard may be used at any time except while the PRINT operation is in effect. It is used to print the currently displayed screen. This section will describe the steps necessary to print a displayed screen.

Once you reach a screen which you wish to print, press the Print key on the keyboard. The printing parameters chart appears. If the parameters for printing have not been set or need to be changed, enter them as previously explained in the paragraph on configuring print parameters. If the chart is correct, proceed with the print operation by pressing the EXECUTE (F2) function key. This will begin the printing of the displayed screen. The phrase, PRINT SCREEN, will appear while the operation is in progress. When the print operation is complete, the original display appears.

7.4 Operation of the Print Function Key

The following types of printouts can be obtained by using the Print Function key.

- Memory Configuration charts
- I/O Configuration charts (with synonyms if in the Offline mode)
- Ladder Diagrams (with synonyms and comments if in the Offline mode)
- Special Function Boxes (if in the Online Mode)
- Synonym listings (if in the Offline mode)

As can be seen from the list above, the mode of operation is important in this operation. Before proceeding with the print operation, be sure you are in the correct mode for what you wish to print.

Printing While in the Online Mode

When you first press the PRINT function key, the printing parameters menu will appear on the screen (Figure 7-3). Set the desired parameters as described above. If the parameters are correct, proceed with the print operation by pressing the CONT (F2) function key.

	Y/N	FROM	TO
MEMORY CONFIGURATION	Y		
I/O CONFIGURATION:			
CHANNEL. BASE	Y	1. 00	8, 15
LADDERS:			
ADDRESS	Y	00001	65536
NOP	Y		
SF BOXES	Y		

Figure 7-3 Online Mode Print Options

This menu shows the default values for printing in a fully expanded system. Unless specified otherwise, all available categories will be printed. To prevent a category from being printed, change the "Y" (Yes) to an "N" (No).

Operation of the Print Function Key (continued)

You should type the starting and ending addresses for the category if you want only a particular section. Otherwise, everything in that category will be printed. The following paragraphs describe each of the categories in the menu.

Memory Configuration: This category prints the memory configuration as found in the P/C. (If you wish to print the memory configuration as it appears on a Program Disk, you must be in the Offline mode.)

I/O Configuration: This category prints the I/O configuration as obtained from the P/C. As shown in the chart, you may print all the channels and bases, or you may specify a particular channel and base. Note that this prints the "I/O Configuration Chart" rather than the "I/O Module Definition Chart".

Ladders: This category prints the relay ladder logic program. You may print the entire program, or just those addresses you specify on the menu. You may also choose to include NOP (empty) rungs when the ladder logic is printed. However, unless a "Y" appears next to the "ADDRESS" entry, NOP rungs will not be printed. Also, remember that if the width of the page is set to 72 columns, both power rails will be omitted when the networks are printed.

SF Boxes: This category prints all the special function boxes that are programmed. Three boxes are printed on each printer page.

Once the items to be printed are chosen in the chart, you can begin the print operation by pressing the EXECUTE (F2) function key. When all the items are printed, the final page of the printout will read "***PRINTING COMPLETE***".

Printing While in the Offline Mode

To begin the operation, press the PRINT function key. The system will respond with a menu for selecting the printer parameters. Configure the parameters as described in the preceding paragraphs on configuring print parameters. If the parameters are already set, proceed with the print operation by pressing the CONT (F2) function key. A menu then appears for entry of what you desire to print. See Figure 7-4.

	Y/N	FROM	TO
SYNONYMS:			
I/O ELEMENTS	Y	0001	8192
CONTROL RELAY OUTPUTS	Y	0001	8192
MEMORY CONFIGURATION:			
	Y		
I/O CONFIGURATION:			
CHANNEL, BASE SYNONYMS	Y	1, 00	8, 15
LADDERS:			
ADDRESS	Y	00001	65536
NOP	Y		
W/SYNONYMS	Y		
W/COMMENTS	Y		

Figure 7-4 Offline Mode Print Options

The default values for the print options in a fully expanded system are shown in this menu. To prevent the printing of an entry in the menu, change the “Y” (Yes) to an “N” (No). The Return and arrow keys will allow you to step through the menu line by line. The following paragraphs explain each of the categories in the offline print menu.

Synonyms: This category allows you to print the synonyms assigned to an element of the network. The synonyms will be printed in tabular format rather than with the rungs of ladder logic. (To print synonyms with the ladders, specify this in the “ladders” category.) You may choose to print only the synonyms for the input and output variables, control relay synonyms only, JMP/MCR/END/SSI synonyms only, or any combination of the three. In order to save time in searching and printing you should change the “From” and “To” columns to the minimum necessary.

Memory Configuration: This category prints the memory configuration as found on the Program Disk. (If you wish to print the memory configuration as it appears in the P/C, the VPU200 must be in the Online mode.)

Operation of the Print Function Key (continued)

I/O Configuration: This category is similar to that which is available in the Online mode. The difference is that in the Offline mode you can also choose to print the synonyms assigned to each I/O point.

Ladders: The final category is also similar to that which is available in the Online mode. The difference is that by being in the Offline mode, you may choose to print any comments and synonyms associated with the rungs. Remember that “Y” must appear for the “ADDRESS” entry or nothing will be printed and that if the column width of the page is set to 72 columns, neither power rail will be printed.

Once the items to be printed are typed in the menu, begin the print operation by pressing the EXECUTE (F2) function key. When all the items are printed, the final page of the printout will read ***PRINTING COMPLETE***.

7.5 Interrupting the Print Operation

While the screen or the categories are being printed, the function keys at the bottom of the screen will change to allow the printing operation to be interrupted. The function keys which become available are shown below:

ABORT	SUSPEND
F1	F2

FUNCTION KEYS

If you wish to halt printing, press the ABORT (F1) function key. This will halt the printing of the screen at the end of the line being transmitted. The page numbering will be reset to zero – which means that the next page printed will begin at one. Also, the screen showing the printer parameters will return to the screen.

Pressing the SUSPEND (F2) function key will also halt the printing of the screen at the end of the current line being transmitted. Note, however, that the printer may not stop immediately (pressing either ABORT or SUSPEND) because of characters stored in the buffer memory of the printer. After the SUSPEND key is pressed, the following function keys will be displayed at the bottom of the screen:

ABORT	PAGE	RESUME	QUIT
F1	F2	F3	F4

FUNCTION KEYS

Interrupting the Print Operation (continued)

The ABORT (F1) function key performs as described above; the remaining function keys are described below:

- | | | |
|-----------|--------|---|
| F2 | PAGE | This function key is used when the printer paper needs to be changed. Pressing it will resume the printing until the end of the page is reached. When the end of the page is reached the printing will again halt and the four function keys will again be available. |
| F3 | RESUME | Pressing this function key will restart the printing operation. |
| F4 | QUIT | Pressing this will terminate the printing operation and advance the paper to the top of the next page. |

If a printer error occurs while printing, an error message will be displayed and only the ABORT key will be functional. If the error was not due to the printer, a VPU200 error message will appear and the print operation will abort.

NOTE: The time required for printing depends on the number of options selected, the size of V-memory, and the printing baud rate.

7.6 Printing Cross-references

Figure 7-5 shows the menu hierarchy for accessing the print cross-reference function. While the printing operation is in progress, no other VPU functions can be used.

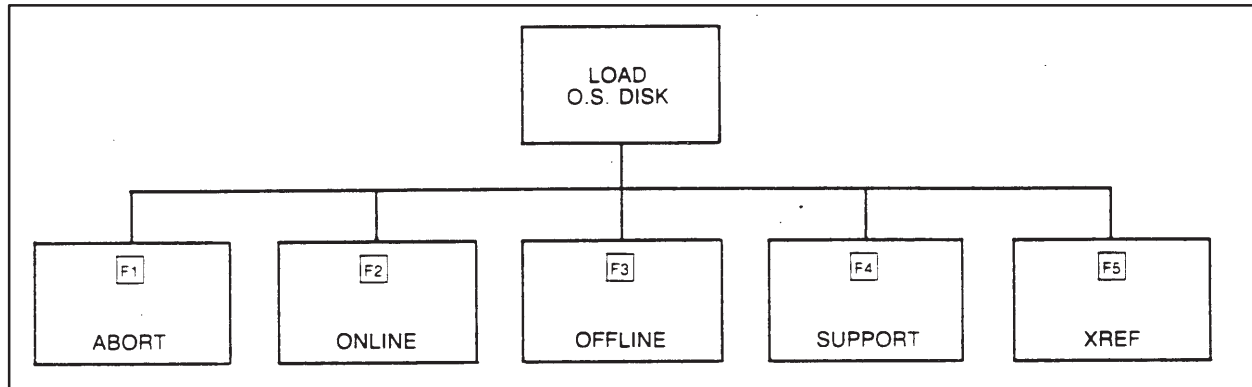


Figure 7-5 Accessing Print Cross-reference

The Print Cross-reference function provides the option of listing all I/O points (X, Y, WX, WY), control relays (C), and user word memory (K, V) used in the ladder program. You may also request synonyms be printed with the cross-reference listing. The memory locations are printed in numerical sequence in the order: X, Y, C, WX, WY, K, V. Each type begins a new page. The specified maximum value determines search range. If you do not want a printout of all values, change the maximum listings to those desired to save searching time.

After pressing F5 (XREF), the chart of selecting print parameters appears for selection of column width, baud rate, lines per page and data. Upon completion of these items, press F2 to continue. A listing of cross-reference options then appears as shown in Figure 7-6.

		Y/N	FROM	TO
CROSS REFERENCE:	I/O ELEMENTS	Y	0001	8192
	CONTROL RELAYS	Y	0001	8192
	V MEMORY	Y	000001	228352
	K MEMORY	Y	000001	226304
	W/SYNONYMS	Y		
SELECTION OPTIONS AND BOUNDARIES				
ABORT—F-1 EXECUTE—F2				

Figure 7-6 Cross-reference Options

Chapter 8

Entering Ladder Programs

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8.1 Introduction

This section provides information necessary to enter ladder programs into the P/C with the VPU200. The peripheral functions associated with ladder programs such as debugging, editing, and entering comments, are also explained in this section.

8.2 Overview of the Ladder Hierarchy

Figure 8-1 shows the main divisions of the Ladder Hierarchy. Programming may be done in either the Online or Offline mode. Functions other than programming are available according to mode selected. The following paragraphs describe the operations available in each of the modes.

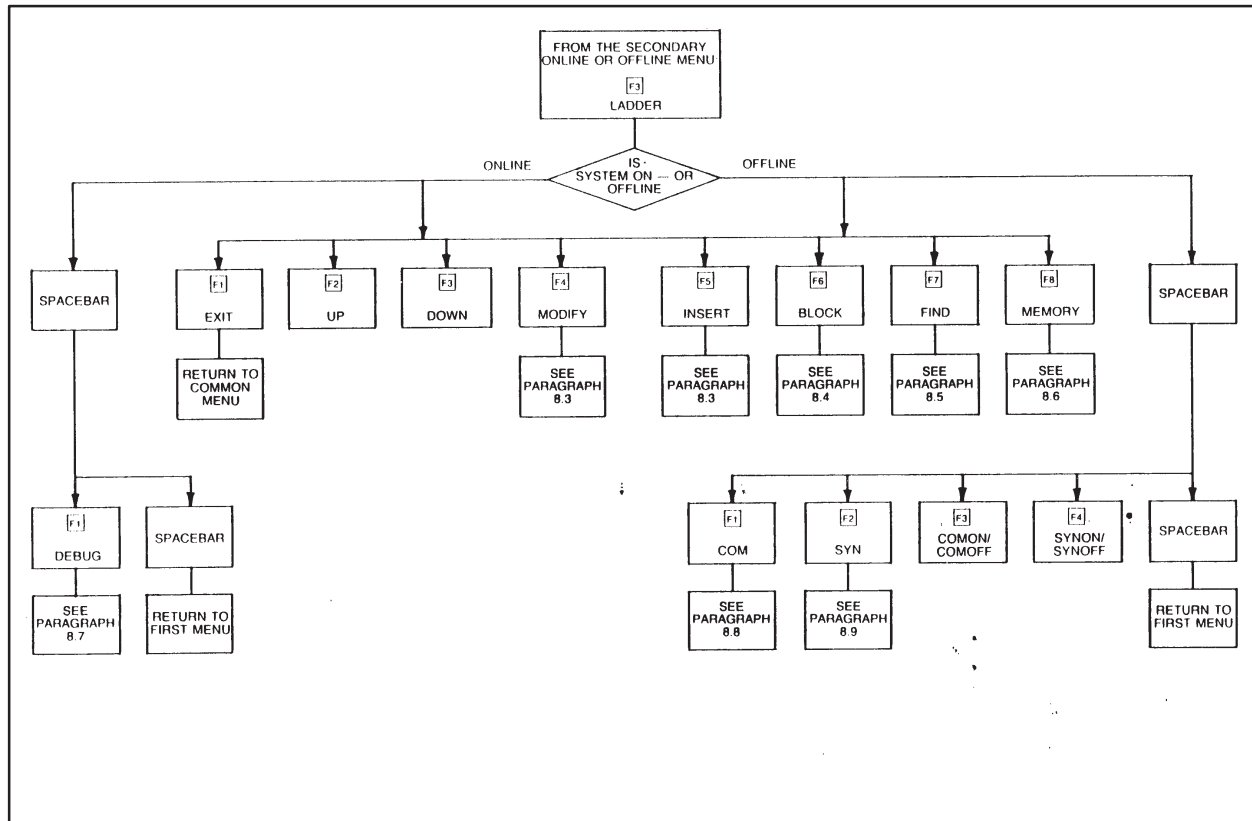


Figure 8-1 Main Divisions of Ladder Hierarchy

Overview of the Ladder Hierarchy (continued)

Operations
Available in the
Online Mode

In the Online mode, the Function keys are labeled as shown and described below.

EXIT	UP	DOWN	MODIFY	INSERT	BLOCK	FIND	MEMORY	+ (SPACE BAR)
F1	F2	F3	F4	F5	F6	F7	F8	

FUNCTION KEYS

- F4** MODIFY: This function key begins the series of operations which are used to edit an existing program. Section 8.3 of this section explains the MODIFY function in detail.
- F5** INSERT: This function key is similar to the MODIFY function key and is used to add a new rung to the network. Section 8.3 of this section gives the details of this operation.
- F6** BLOCK: This function key is used to select a section of a program for moving, copying or deleting. See Section 8.4 for detailed explanation.
- F7** FIND: This function key begins the series of operations which are used to locate network elements or addresses. Section 8.5 provides a description of the operations which become available through the FIND function key.
- F8** MEMORY: This function key will begin the series of operations for entering and modifying V and K memory. See Section 8.6.

Pressing the spacebar displays the following additional keys.

- F1** DEBUG: This function key begins the series of operations which are used to troubleshoot a program. See Section 8.7.

Operations Available in the Offline Mode

In the Offline mode, the Functions keys are labeled as shown and described below:

EXIT	UP	DOWN	MODIFY	INSERT	BLOCK	FIND	MEMORY	+ (SPACE BAR)
F1	F2	F3	F4	F5	F6	F7	F8	

FUNCTION KEYS

Pressing F1 returns the screen to the previous display. Pressing F2 scrolls the display forward, and F3 scrolls back through previous displays.

F4 MODIFY: This function key begins the series of operations which are used to edit an existing program. See Section 8.3.

F5 INSERT: This function key is similar to the MODIFY function key and is used to add a new rung to the network. See Section 8.3.

F6 BLOCK: This function key is used to select a section of a program which can then be moved, copied or deleted. See Section 8.4.

F7 FIND: This function key begins the series of operations which are used to locate network elements or addresses. See Section 8.5.

F8 MEMORY: This function key will begin the series of operations for entering and modifying V and K memory. See Section 8.6.

Pressing the spacebar displays the following additional function keys.

COM	SYN	COMON/ COMOFF	SYNON/ SYNOFF	+ (SPACE BAR) *
F1	F2	F3	F4	

FUNCTION KEYS

Overview of the Ladder Hierarchy (continued)

- F1** COM (COMments.) This function key is the entry into the operations which are used to create and modify comments. See Section 8.8.
- F2** SYN (SYNonyms.) This function key begins the series of operations used to create and modify synonyms. See Section 8.9.
- F3** COMON/COMOFF (COMments ON or COMments OFF.) This function key allows you to choose whether comments will be displayed with the ladder logic. If “COMON” is displayed, pressing the function key will cause the comments to appear on the screen. “COMON” will change to “COMOFF”, which indicates that pressing the function key once more will remove the comments from the screen.
- F4** SYNON/SYNOFF (SYNonyms ON or SYNonyms OFF.) This function is similar to that above: it allows you to choose whether synonyms are displayed with the ladder logic. If “SYNON” is shown, pressing the key will cause the synonyms to be placed on the screen. “SYNON” will change to “SYNOFF”, which indicates that pressing the key once more will cause the synonyms to be removed from the screen.

NOTE: When comments or synonyms are placed on the screen, a single rung of the network may be too large to fit on one screen. When this occurs, you cannot use the UP or DOWN function keys to view the part outside the screen. Instead, the up and down arrow keys on the keyboard must be used to view the entire rung. The up arrow key will show the next line of the rung; the down arrow will show the previous line of the rung. To step to another rung of the program, you must use the UP and DOWN function keys rather than the arrow keys.

8.3 Using the MODIFY and INSERT Operations

The following paragraphs detail use of the MODIFY and INSERT operations. The MODIFY operation is used to alter an existing network. Figure 8-2 describes the function keys available after pressing the Modify or Insert Function key.

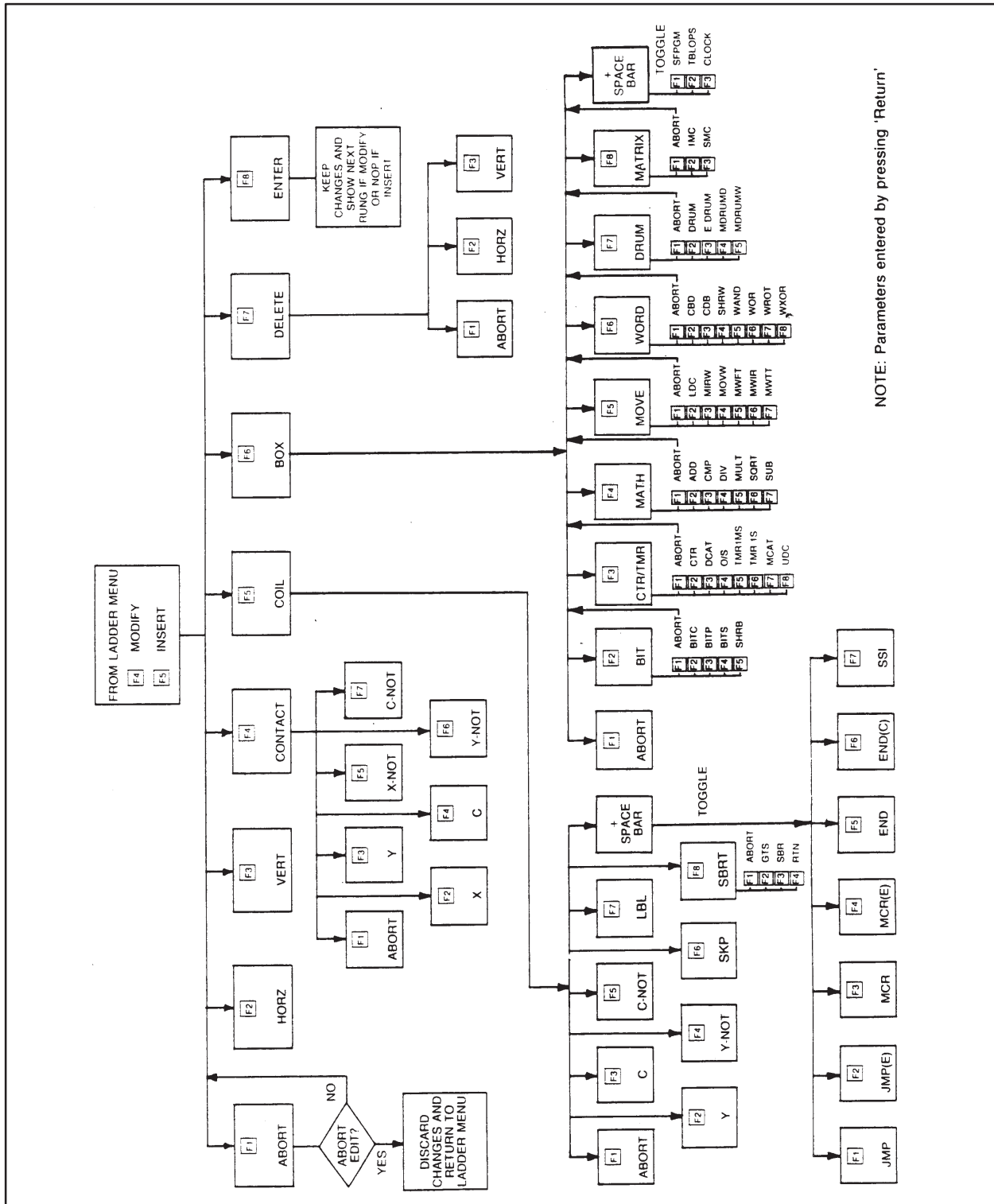


Figure 8-2 Modify and Insert Hierarchy

After the MODIFY or INSERT function key is pressed the Function keys available are labeled as shown and described below. Before pressing any function keys use the arrow and/or return keys to position the cursor at the location desired for the element being programmed.

ABORT	HORZ	VERT	CONTACT	COIL	BOX	DELETE	ENTER
F1	F2	F3	F4	F5	F6	F7	F8

FUNCTION KEYS

Pressing the ABORT function key halts the previously selected operation.

F2 HORZ (HORiZontal line.) This function key draws a horizontal line beginning at the position of the cursor. A line cannot be drawn in the output section of a rung, over a box or on a contact.

F3 VERT (VERTical line.) This function key will draw a vertical line below and to the left of the position of the cursor.

F4 CONTACT This function key places ladder logic input elements into a rung. When the key is pressed, the symbol for a contact and the following keys appear on the screen:

ABORT	X	Y	C	X-NOT	Y-NOT	C-NOT
F1	F2	F3	F4	F5	F6	F7

FUNCTION KEYS

Using the MODIFY and INSERT Operations (continued)

After the element type is chosen, the identifying number for it must be typed. If you are changing an existing element, press the function key for the new element desired. It is not necessary to change the identifying number, but you may do so if you wish. (You may also change just the number for an existing element.) Once the contact is completed, press the Return key to enter into buffer memory.

F5 COIL This function key is used to place output elements into a rung. The elements which become available after this key is pressed are shown below:

ABORT	Y	C	Y-NOT	C-NOT	SKP	LBL	SBRT	+ (SPACE BAR)
F1	F2	F3	F4	F5	F6	F7	F8	

FUNCTION KEYS

Pressing the spacebar displays the following additional keys.

JMP	JMP(E)	MCR	MCR(E)	END	END(C)	SSI	+ (SPACE BAR)
F1	F2	F3	F4	F5	F6	F7	

FUNCTION KEYS

After the element type is chosen, if necessary type the identifying number for it. If you are changing an existing element, press the function key for the new element desired. It is not necessary to change the identifying number, but you may do so if you wish. (You may also change just the number for an existing element.) Once the element is completed, press the Return key to enter into buffer memory.

F6 BOX This function key allows you to place box operations (for example, counters and timers) into a rung of ladder logic. After the function key is pressed, the following choices become available:

ABORT	BIT	CTR/TMR	MATH	MOVE	WORD	DRUM	MATRIX	+ (spacebar)
F1	F2	F3	F4	F5	F6	F7	F8	(toggle)

FUNCTION KEYS

Pressing the spacebar displays the following additional keys.

SFPGM	TBLOPS	CLOCK	+ (spacebar)
F1	F2	F3	(toggle)

These function keys are the general categories of box operations. When one of these is chosen, the available function keys are labeled for entry of the specific box chosen.

Once a box operation is chosen, the identifying number for it must be typed. Also, the values for the box operation must be created. To do this, use the arrow keys to move to the location of the desired parameter. Then choose the type of parameter from the function keys. Finally, use the number keys to identify the variable.

You may also correct or modify previously chosen parameters by simply overwriting them. Once the box is completed, press the Return key to enter the box into buffer memory.

Pressing the spacebar gives access to F1, SFPGM, for entering a SFPGM number to be called from the ladder program. Special Function programming is discussed in detail in Chapter 5 of the *VPU200/565 Programming Manual*.

F7 DELETE This function key is used to delete elements from a rung of ladder logic. When this function key is pressed, the keys displayed are the following:

Using the MODIFY and INSERT Operations (continued)

ABORT	HORZ	VERT
F1	F2	F3

FUNCTION KEYS

The VERT (VERTical line) function key will remove the vertical line to the left and below the cursor. The HORZ (HORiZontal element) function key will delete the element or line under the cursor. To delete a box, place the cursor at the upper left corner and press the HORZ function key.

F8 ENTER

This function key will enter the created or changed rung into memory if the rung is correct. If there is a mistake in the rung, the system will not allow the rung to be entered. Instead a message will be displayed to indicate that the rung is incorrect. You must correct the error (or abort the operation) before proceeding to another operation.

8.4 Using the BLOCK Operation

Blocks (sections of a ladder logic program) may be moved, copied or deleted with the Block operation. The function keys which are within the BLOCK hierarchy are shown in Figure 8-3 and are described in the paragraphs following.

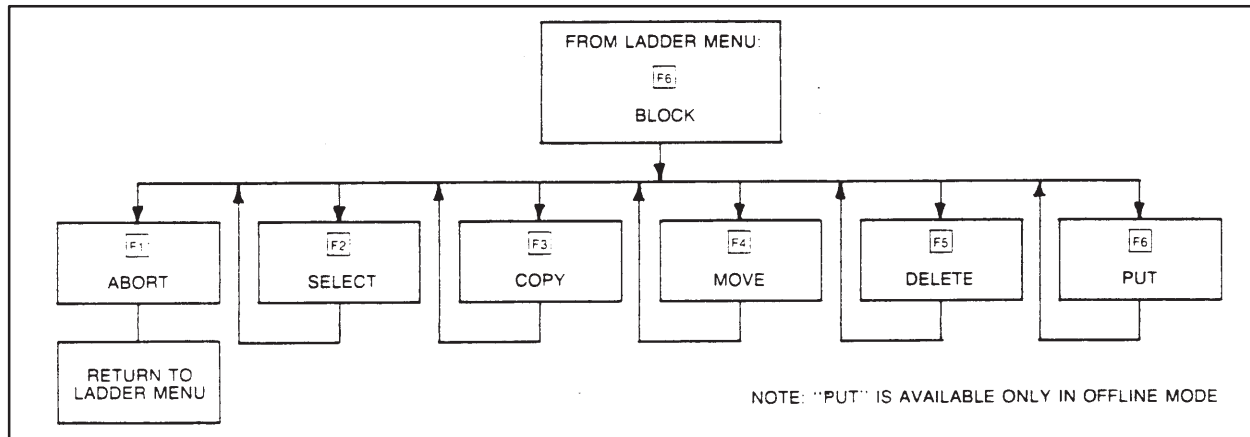
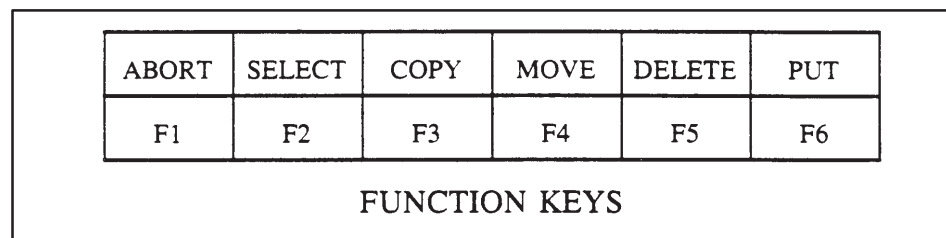


Figure 8-3 Block Hierarchy

NOTE: If you exceed the allocated memory size when manipulating blocks of ladder logic, an error message will result. To complete the BLOCK operation, you may have to first reconfigure the memory size to allow the operation. See Section 4 for information on configuring memory size.

Pressing the BLOCK function key displays function keys labeled as shown and described below.



NOTE: The PUT function key will only be available when the VPU200 is in the Offline mode of operation.

Using the BLOCK Operation (continued)

When a choice is made by pressing a function key, prompts will guide you in entering the necessary information. The F1 function key will remain an ABORT if you need to halt the operation; the other choices will disappear from the screen. After the information is typed, pressing the Return key will begin the requested operation. While the operation is in progress, REQUESTED OPERATION IN PROGRESS, will be displayed on the screen.

- F2** SELECT This function key is used to select the block which will be manipulated. The block which is selected will remain selected until you leave the BLOCK hierarchy or you select a new block. To select a block, use the arrow keys to position the cursor over the appropriate fields and enter the values. (The default value for the block is the rung currently at the top of the screen.) If you wish to select only one rung, type the same address or zero for the second prompt.
- F3** COPY This function key will copy the selected block to a specific location in the program. The selected block will then exist in both places: that is, the block will be in its original location and in the location to which it was sent; The address AFTER which the block is to be placed is typed next to the prompt on the screen. Finally, press the Return key to start the copy operation. NOTE: if you copy box operations, such as timers and counters, be sure to change the identifying number for the box operation so that each box operation has an identifying number which is unique. Also, you must copy the block to a location outside of itself.
- F4** MOVE This function key is essentially a COPY operation, except that the original block is deleted. To move a block, press the function key and type the address AFTER which the block is to be placed.
- F5** DELETE This function key will delete the block selected. After the key is pressed, a prompt asks if you are sure you wish to delete the selected block. If you do not wish to delete the block, press the NO (F1) function key to halt the operation. If you do wish to delete the block, press the YES (F2) function key to start the operation. After the block is deleted, the rungs following the block will be moved into the vacated space. Also, the selected block will default to the rung shown at the top of the screen.

F6 PUT

This function key is only available in the Offline mode of operation. It moves the selected block to a second Program Disk. However, the system will first check that the second disk is initialized. If it is not initialized, a prompt will appear to allow you to initialize it. If you say “no” to the prompt, the operation will abort; if you say “yes”, the memory configuration of the second disk will be set to the default values.

To put the block on the second disk, press the function key and type the address AFTER which the block is to be placed.

When the address is typed, press the Return key to begin the PUT operation. The system will then load as much of the selected block as will fit into the memory of the VPU200 and request that you insert the second Program Disk. Once the disks are exchanged, press the Return key to load the contents of the VPU200's memory onto the second disk.

After the contents are loaded, the system will request that you replace the original Program Disk. If there is more of the block to be copied, the operation will then repeat the cycle described above until the entire block is copied to the second disk.

NOTE: If a PUT request will exceed the memory configuration of the second Program Disk, the operation will be aborted with an error message displayed on the screen. The second disk must be reconfigured before the PUT operation will copy the block to the second disk.

8.5 Description of the FIND Operation

The FIND operation is used to locate ladder logic elements or addresses. When the FIND operation is in progress, a message to that effect appears on the screen. When the requested element or address is found, it is displayed at the top of the screen. If it is not found, the message, ELEMENT NOT FOUND, will appear on the screen. Figure 8-4 shows the hierarchy of the FIND operation function keys.

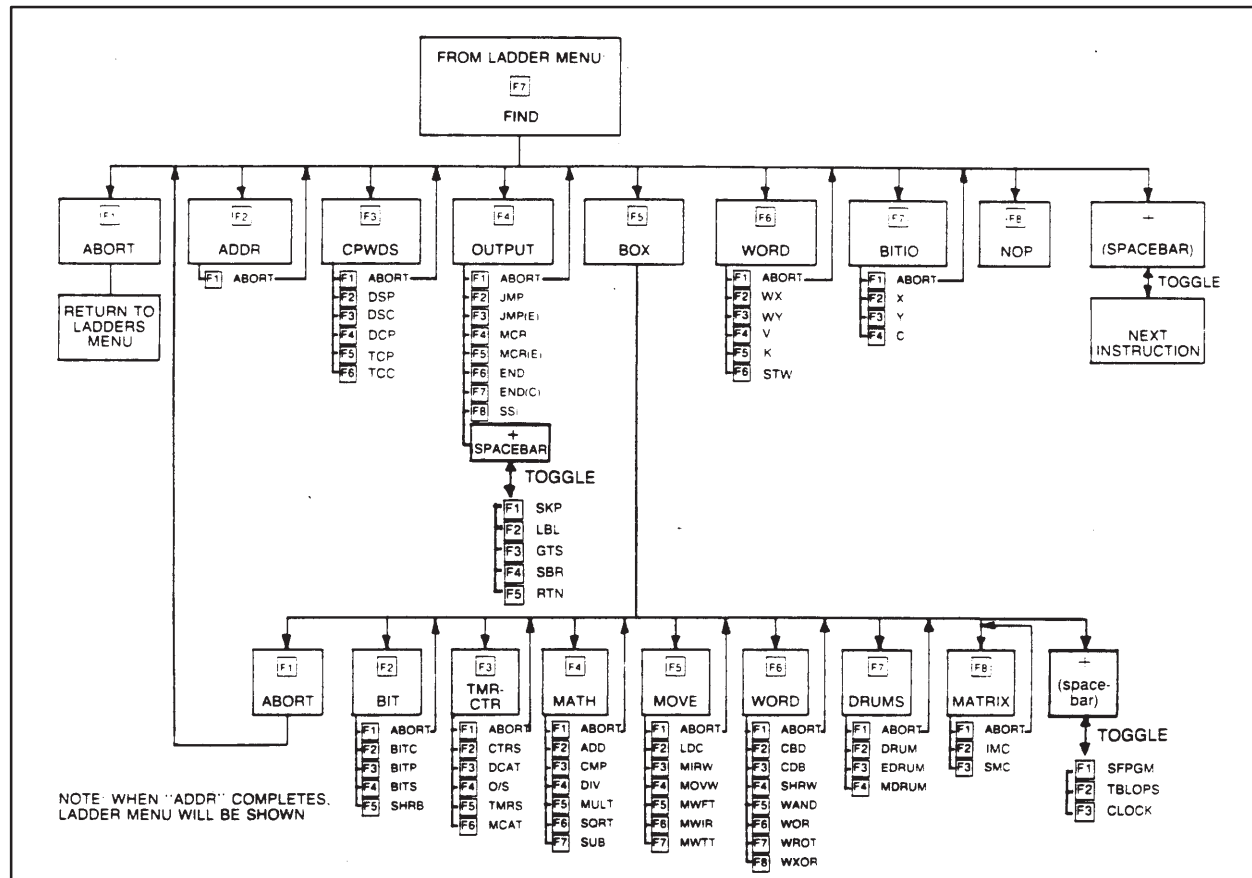


Figure 8-4 Find Hierarchy

The F2 (ADDRESS) function key is used to locate a particular rung in the program. When the function key is pressed, the prompt line will change to read "FIND ADDRESS:" and all function keys except the ABORT function key will be disabled. After the new prompt appears, type the desired rung address. To begin the operation, press the Return key. When the address is found, it will be shown at the top of the screen.

The F8 (Null Operation) function key is used to find the next empty rung in the ladder logic program.

When the spacebar is pressed, the function keys shown above will disappear and will be replaced by a single operation over the F1 function key. This operation is the "NEXT INSTRUCTION" and it will find the next non-NOP rung of ladder logic.

NOTE: Use the "NEXT INSTRUCTION" function key with care. If you press this function key when the bottom of a program is displayed, the system will look through the remainder of configured memory for the next instruction. If you have a large amount of memory configured and the system is in the Online mode, this could take a long time. Also, once the function key is pressed and the system begins searching, there are no keys on the VPU200 to halt the search.

The remaining function keys are used to find particular I/O elements, words, or box operations in the rungs of ladder logic. "CPWDS" is used to find the variables for the current and preset values of drums, counters, and timers; "OUTPUT" is used to find an end, jump, skip forward, label, or master control relay; "BOX" allows you to locate box operations; "WORD" is used to locate word variables; and "BITIO" allows you to find X, Y, and C contacts and coils.

To locate an element, press the function key for the desired category. This will bring a second menu to the screen. Press the function key for the particular element you wish to find. Next, type the identifying number for the element on the prompt line. (Note that to find a DCP value you must type both the number of the drum and the number of the step. The first prompt which appears on the screen will be for the drum; to enter the number for the step, press the right arrow key. This will place the prompt for the step on the screen. You may return to the previous prompt by pressing the left arrow key.) Finally, press the Return key to start the FIND operation. Note that if you wish to find a box operation and you are unsure of the identifying number for it, type a zero for the identifying number. This will then find the next occurrence of the box operation (after the Return key is pressed) and you may continue to press the Return key until the sought box operation is found. When the sought element is found, it is displayed. To quit the FIND operation, you must press the ABORT (F1) function key.

8.6 Using the MEMORY Operation

The MEMORY operation is used to initialize the V and K memory locations in the P/C (if Online) or the Program Disk (if Offline). The function key which become available in this operation are shown in Figure 8-5.

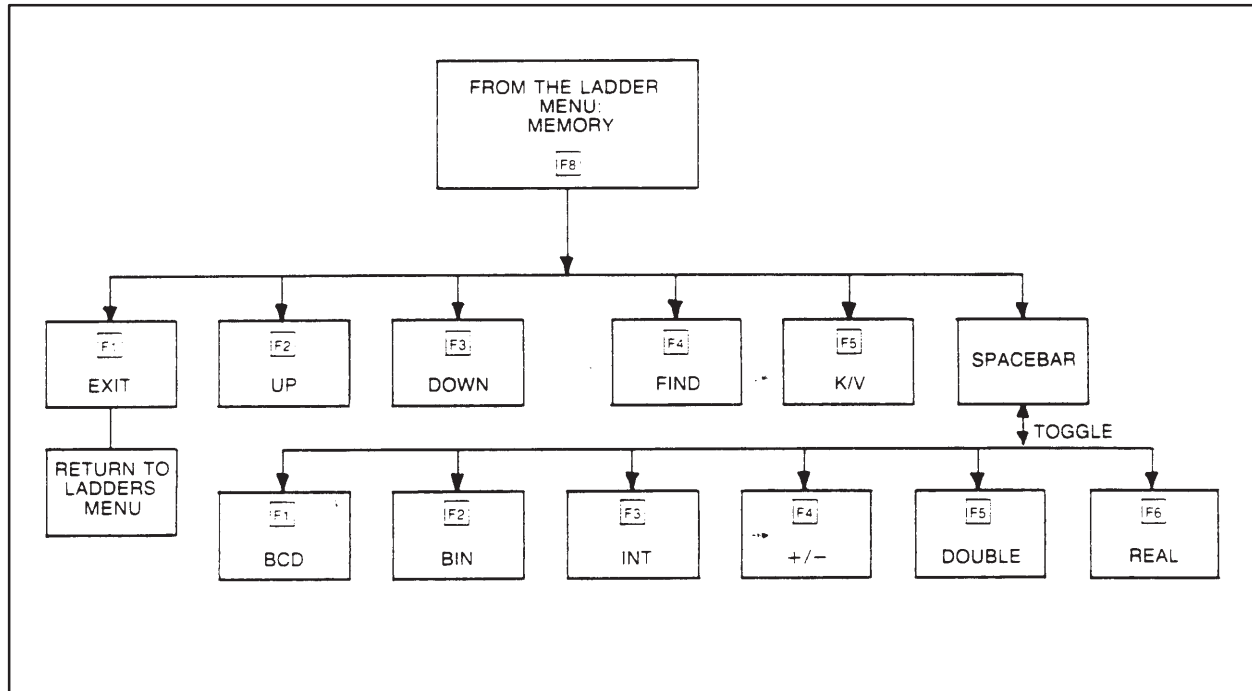


Figure 8-5 Memory Function Hierarchy

The MEMORY operation is used to view and modify several memory locations at once. When the function key is pressed the memory locations will be displayed in numeric order. The format for each memory location will be integer by default. Additionally, the following function keys will become available:

EXIT	UP	DOWN	FIND	K/V	+ (SPACE BAR)
F1	F2	F3	F4	F5	

FUNCTION KEYS

The FIND (F4) function key displays a section of an existing table. To display the section, press the FIND function key and then type the starting address of the table as requested by the prompt on the screen. Next, press the Return key to enter the address. This will cause the table to appear with the cursor at the sought address. Once the table is displayed, you may change any entries in the table by moving the cursor to the memory location desired and typing the new information in the format witch is currently on the screen.

The F5 function key is used to switch between displaying a table of V-memory and one of K-memory. When “K” is displayed, pressing the function key will remove the current V-memory table and replace it with a K-memory table. (If no K-memory is configured, the V-memory table will remain on the screen and “NO K MEMORY CONFIGURED” will appear at the bottom of the screen.) “K” will also change to “V”, which indicates that pressing the function key once more will return the V-memory table to the screen.

The arrow keys function as an enter key in this operation. Once a change is made to a V- or K-memory location, this value is entered when an arrow key is used to move the cursor to a new location.

Pressing the spacebar displays the following additional function keys as shown and described below.

BCD	BIN	INT	+/-	DOUBLE	REAL	+
F1	F2	F3	F4	F5	F6	(SPACE BAR)

FUNCTION KEYS

When one of these function keys is pressed, the format for the memory address in which the cursor is located will change to the chosen format. (“BCD” is Binary Coded Decimal format; “BIN” is BINary format; “INT” is INTeger format; “+ / -” is signed integer format; and “DOUBLE” is for DOUBLE precision, signed integer format. Note that DOUBLE will cause the value to occupy two memory locations and that the second memory location will be inaccessible. REAL is floating point IEEE format, and also requires two memory locations.) Pressing the spacebar again returns the previous display of function keys to the screen.

Using the MEMORY Operation (continued)

F1	BCD	F1 functions for both BCD and Hexadecimal formats. For display in BCD format, the values should be entered with digits 0–9. For Hexadecimal, the values should be entered as 0–F.
F2	BIN	F2 allows entry of up to 16 1s and 0s in any combination from all 0s to all 1s.
F3	INT	F3 allows entry of a number from 0 to 65535. Any entry above 65535 defaults to 65535.
F4	=/-	F4 allows entry of a signed integer between –32768 and +32767. Any entry out of this range will default either to the lower or upper limit according to the sign (+ or –).
F5	Double	F5 permits entry of a signed integer between +2147483647 and –2147483648. Entries outside this range will default to either the upper or the lower limit depending on the sign (+ or –).
F6	Real	F6 allows entry of numbers in a six-digit plus decimal format or in a six-digit, plus decimal and a two-digit exponent. The range is + 1.17550E–38 to +3.40282E+38 for positive numbers; –1.17550E–38 to –3.40282E+38 for negative numbers. Numbers greater than +3.40282E+38 are displayed as +INF. Numbers less than –3.40282E+38 are displayed as –INF, and numbers between +1.17550E–38 and –1.17550E–38 are displayed as 0.

To enter a number with an exponent, press the letter E after entry of the mantissa. To return to the mantissa, press the decimal point.

NOTE: The format assigned to a particular memory address will be lost when you stop displaying the screen showing the memory location. (When the memory chart is displayed again, all memory locations will have integer formats. Also, the section of the chart which appears will be the section that was last displayed before you quit the memory operation.)

8.7 Description of the DEBUG Operation

The DEBUG operation is available only in the Online mode. The function keys which are in the DEBUG hierarchy are shown in Figure 8-6. The DEBUG operation is used to troubleshoot a program.

Description of the DEBUG Operation (continued)

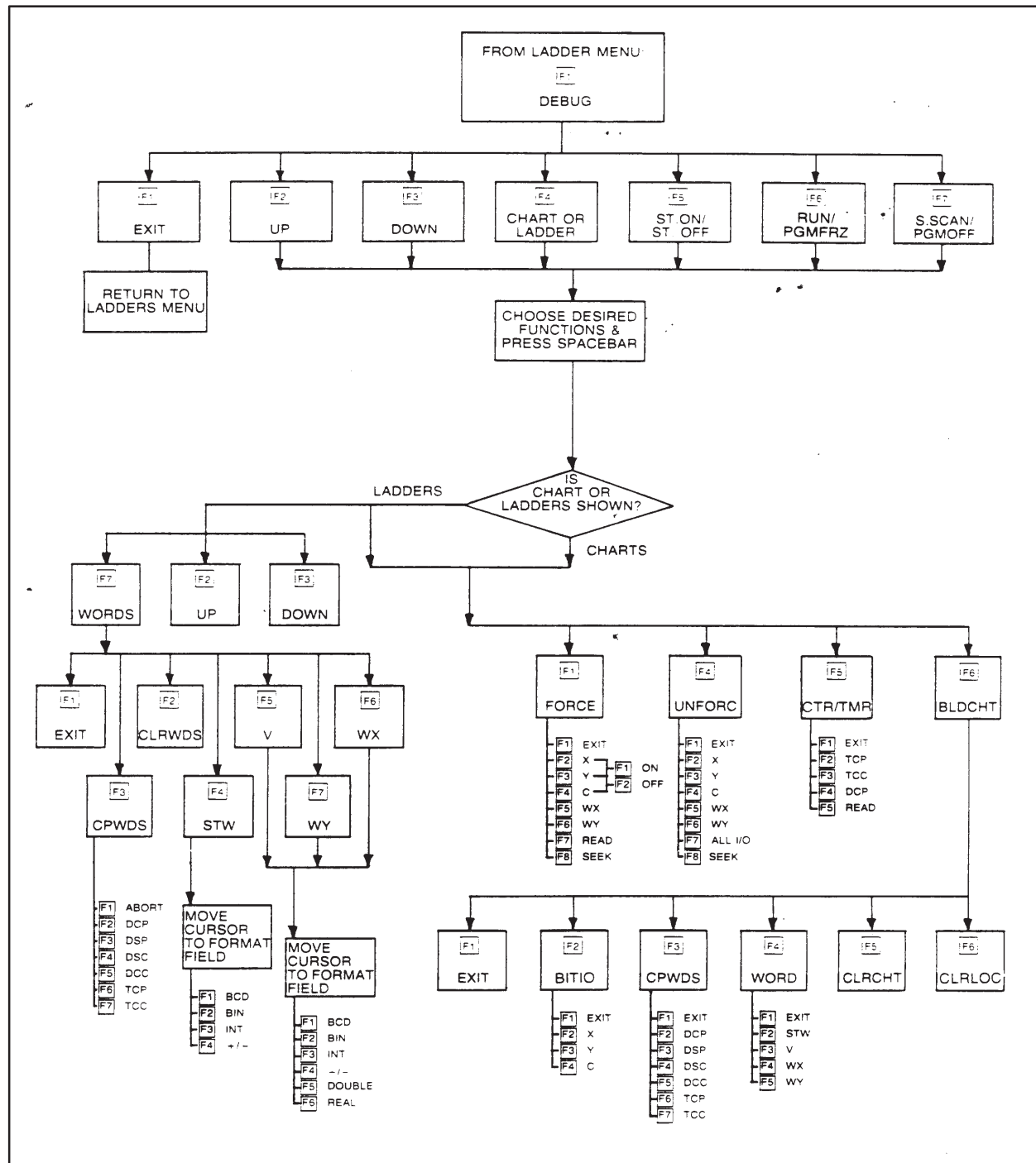


Figure 8-6 DEBUG Operation Hierarchy

Pressing the DEBUG function key displays the following function keys:

EXIT	UP	DOWN	CHART/ LADDER	ST.ON/ ST.OFF	•RUN/ PGMFRZ	S.SCAN/ PGMOFF	+ (SPACE BAR)
F1	F2	F3	F4	F5	F6	F7	

FUNCTION KEYS

As shown, some function keys perform two operations by switching between two complementary modes. Depending on how these are chosen, other function keys will be enabled or disabled. The following list describes the function keys shown above and the manner in which they are accessed:

- F2** UP This function key is only available while the rungs of a program are being displayed. It will display the next rung of the program.
- F3** DOWN This function key is also only available while the rungs of a program are being displayed. It will display the previous rung of the program.
- F4** CHART/LADDER This function key allows you to choose whether the rungs or the status chart for a program will be displayed. If “CHART” is displayed, pressing the function key will cause the rungs to be replaced by the chart. This will also disable the UP and DOWN function keys. “CHART” will change to “LADDER”, which indicates that pressing the key will return the rungs of the program to the screen and re-enable the UP and DOWN function keys.
- F5** ST.ON/ST.OFF (S**T**atus ON or S**T**atus OFF.) This function key allows you to choose whether the status of the entries in the chart or the elements in ladder rungs will be shown on the screen. If “ST.ON” is displayed pressing the function key will show the status of the chart or the ladder rung elements. ST.ON will change to “ST.OFF”, which indicates that pressing the function key will turn the status off again.

Description of the DEBUG Operation (continued)

- F6** RUN/PGMFRZ (RUN or ProGraM FReeZe.) This function key allows you to switch between Run and Program Freeze modes. When "RUN" is displayed, pressing the function key will place the system in the Run mode. This will also disable the S.SCAN (Single SCAN) function key and enable the PGMOFF (F7) function key. "RUN" will change to "PGMFRZ", which indicates that pressing the function key will place the system in Program Freeze mode. In this mode, all outputs will cease changing and will remain in the state they were in when the PGMFRZ function key was pressed.
- F7** S.SCAN/PGMOFF (Single SCAN or ProGraM OFF.) The Single Scan operation is only available when the system is in the Program mode. When "S.SCAN" is displayed, pressing the function key will cause one scan of the network program to be performed and will change the status of the ladder logic elements accordingly. "S.SCAN" will change to "PGMOFF" when the RUN (F6) function key is pressed. In the Program Off mode, discrete outputs will be set to zero and all word outputs will be "frozen" (that is, kept in the state they were in when the function key was pressed).

When the spacebar is pressed, one or more of the following function keys are displayed. The particular keys displayed is determined by whether the ladder logic program or the status chart is being displayed. Each of the keys is described below, and the mode in which it is available is given.

FORCE	UP	DOWN	UNFORC	CTR/TMR	BLDCHT	WORDS	+ (SPACE BAR)
F1	F2	F3	F4	F5	F6	F7*	

FUNCTION KEYS

F1 FORCE This function key is used to force the status of an element regardless of input or internal conditions. Once an element is forced, it will remain in that state until changed by using the UNFORCE (F4) function key.

When the FORCE function key is pressed, the screen will display the following choices for elements to be forced:

ABORT	X	Y	C	WX	WY	READ	SEEK
F1	F2	F3	F4	F5	F6	F7	F8

FUNCTION KEYS

The READ (F7) function key obtains the status for the element shown on the prompt line. The SEEK (F8) function key is used to find the next forced element of the type on the prompt line. The SEEK function key will check the entire program for the forced element, beginning with the current position in the program.

To force an element, first press the appropriate key. Next, identify the element with its number next to the prompt which appears. After this, press the right arrow key. If the element which was chosen is X, Y or C, then pressing the right arrow key will allow you to choose the on or off status. If the element chosen is WX or WY, then a menu of formats will appear after the arrow key is pressed. From the selection of formats you should choose the format for the word variable and then type the identifying number for it. Finally, press the Return key to force the desired element and complete the operation. If the cursor is on the right side of the prompt, press the left arrow key to exit.

F2 UP This function key is only available while the rungs of the program are being displayed. It displays the next rung of the program.

F3 DOWN This function key is also available only while the rungs of the program are displayed. It displays the previous rung of the program.

F4 UNFORC This function key “unforces” an element previously forced.

Description of the DEBUG Operation (continued)

Note, though, that this does not change the state of the element; it will remain in the state it was in when the UNFORC function key was pressed. This function key simply frees the element so that it may change as input conditions dictate. Also, the following function keys will appear at the bottom of the screen:

EXIT	X	Y	C	WX	WY	ALLIO	SEEK
F1	F2	F3	F4	F5	F6	F7	F8

FUNCTION KEYS

(The SEEK (F8) function key finds the next forced element of the type shown on the prompt line. It checks the entire program regardless of the current location in the program.)

To unforce an element, first press the function key for the element to be unforced. Next type the identifying number for the element as requested on the prompt line. Finally, to complete the operation, press the Return key. Note that all forced elements may be unforced by pressing the ALLIO (F7) function key.

F5 CTR/TMR (CounTeRs and TiMeRs.) This function key allows you to read or change the presets of timers and counters in the program. When the function key is pressed, the following choices are available:

EXIT	TCP	TCC	DCP	READ
F1	F2	F3	F4	F5

FUNCTION KEYS

The READ (F5) function key is used to obtain the current value or the preset of timers/counters and preset values of EDRUMS and place it on the prompt line.)

To change a preset, first press the appropriate function key. The prompt line will change to show the choice made. Next, type the identifying number of the parameter. (Note that for a DCP value, you must enter both the number of the drum and the number of the step. The first prompt will be for the drum number; to find the prompt for the step number, press the right arrow key. You may return to the original prompt by pressing the left arrow key. This applies to event drum presets only.) After this, move the cursor to the space next to the parameter and type the preset value for the parameter. Finally, press the Return key to complete the operation.

F6 BLDCHT (BuiLD CHarT.) This function key allows you to create or alter a chart. When the function key is pressed, the following choices will be displayed:

EXIT	BITIO	CPWDS	WORD	CLRCHT	CLRLOC
F1	F2	F3	F4	F5	F6

FUNCTION KEYS

These choices allow you to perform specific operations on the chart. The “CLRCHT” (CLear CHarT) function key removes all entries from the chart. When it is pressed, the system will first ask if you are sure you wish to destroy the chart. Pressing the function key for NO will halt the operation; pressing the function key for YES will proceed with the operation and clear the chart. If you would rather remove only an entry from the chart, use the “CLRLOC” (CLear LOCation) function key. This will delete the entire entry under the cursor.

The remaining function keys are used to place I/O elements into the chart. “BITIO” is used to create X, Y, or C entries in the chart; “CPWDS” is used to enter the parameters for timers, counters and drums into the chart; “WORD” is used to select the type of word which will appear in the I/O chart.

Creating an entry is the same for each. First, press the desired function key. Next type the identifying number and select the format for the element chosen. If you wish to put other elements in the chart, press the function keys for these and identify the elements with a number. When all entries are typed into the chart, press the EXIT function key to save the chart and complete the operation.

Description of the DEBUG Operation (continued)

To enter consecutive elements in the chart, enter the first one as directed above. Then press RETURN. For example, after entering X1, Press RETURN; and X2 is displayed.

F7 WORDS This function key is only available when the rungs of the ladder program are on the screen. When enabled, this key allows you to place three variables on the bottom of the screen so that you may see their status as the program is executed. When the WORDS function key is pressed, the following keys become available:

EXIT	CLRWDS	CPWDS	STW	V	WX	WY
F1	F2	F3	F4	F5	F6	F7

FUNCTION KEYS

Using the arrow keys, position the cursor over the desired field. Press the function key corresponding to the specific element that is to be put on the screen. After the element is chosen, the format for the element can be changed by moving the cursor to the area after the "=" sign. Finally, when all three words have been chosen, press the EXIT function key to complete the operation.

8.8 Description of the COMMENTS Operation

The COM (COMMENTS) operation is available only in the Offline mode. The function keys which become available after this function key is pressed are shown in Figure 8-7.

The COMMENTS operation allows you to include information for a rung in the program. Only one comment is allowed per rung and it is "tied" to the first output element for the rung. A comment may be up to 16 lines long with 60 characters in each line. All comments are in uppercase only.

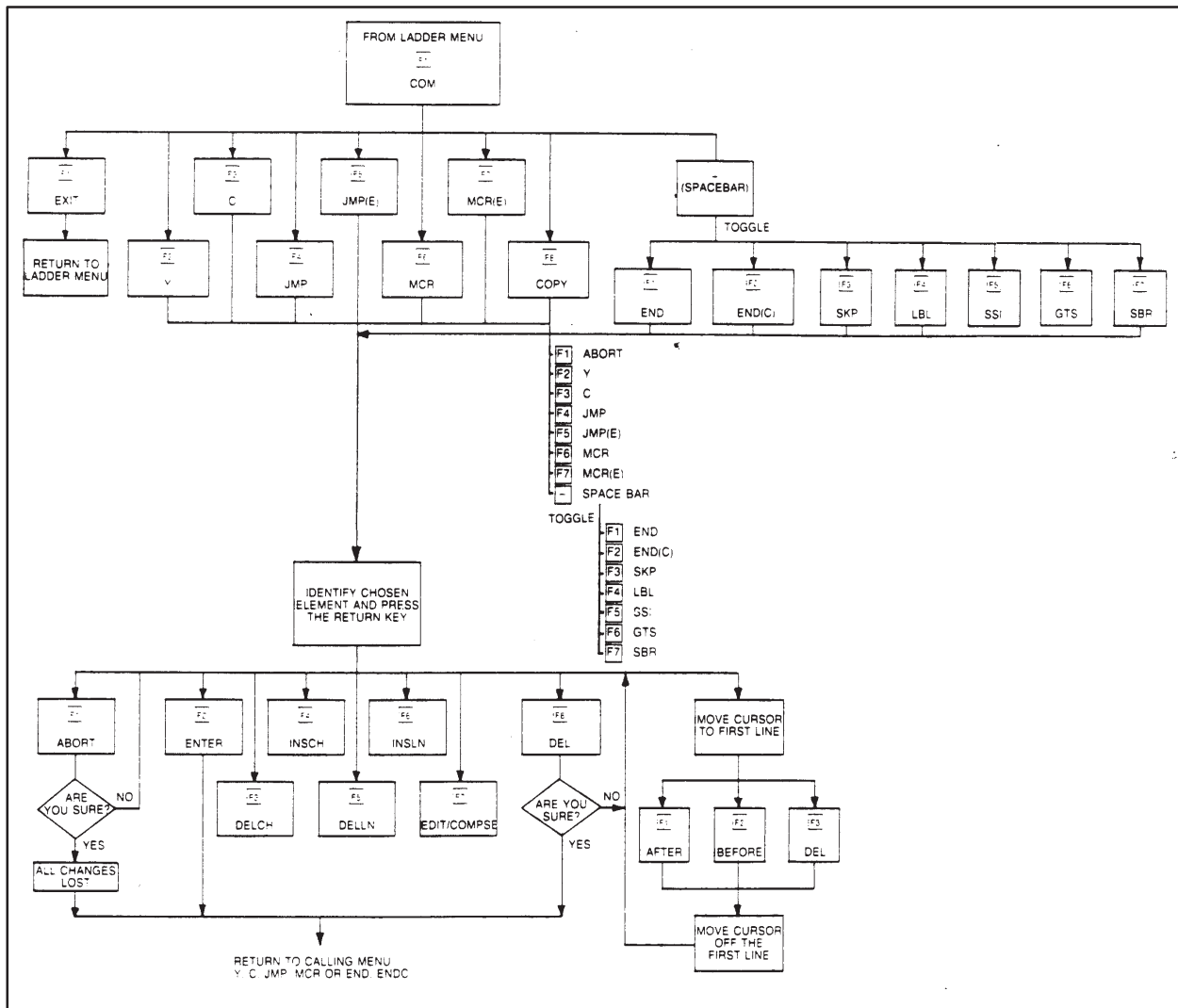


Figure 8-7 COMMENT Operation Hierarchy

Description of the COMMENTS Operation (continued)

Creating or
Modifying
Comments

To create or modify a comment, press the COM function key. The function keys then available are as shown and described below.

EXIT	Y	C	JMP	JMP (E)	MCR	MCR (E)	COPY	+ (SPACE BAR)
F1	F2	F3	F4	F5	F6	F7	F8	

FUNCTION KEYS (see 8.8.2)

Pressing the spacebar displays the following additional keys:

END	END(C)	SKP	LBL	SSI	GTS	SBR	+ (SPACE BAR)
F1	F2	F3	F4	F5	F6	F7	

FUNCTION KEYS

With these two sets of keys, you can choose the element to which the comment will be "tied". To create a comment, first press the appropriate function key for the desired element, i.e.; C, JMP, LBL, etc. The prompt line will change to show the element category chosen. Next, type the identifying number for the element on the prompt line. Then, press the Return key to display any existing comment for the element. The element will appear one line from the top of the screen with the cursor next to it. The available choices will change to the following:

ABORT	ENTER	DELCH	INSCH	DELLN	INSLN	EDIT/ COMPOSE	DEL
F1	F2	F3	F4	F5	F6	F7	F8

FUNCTION KEYS

These choices allow you to change the comment as needed. Aside from the ABORT and ENTER function keys, there are six function keys for creating comment. The following paragraphs explain these six function keys:

-
- | | | |
|-----------|--------------|--|
| F3 | DELCH | (DELEte CHAracter.) This function key is used to delete the character on which the cursor is placed and will move the other characters over to fill the vacated space. |
| F4 | INSCH | (INSert CHAracter.) This function key will allow character (or string of characters) to be inserted. The characters will be inserted at the space just before the cursor. When the key is first pressed "INSERT ON" will appear on the screen to indicate that characters may be inserted. Characters will continue to be inserted until the function key is pressed again, which will also remove the "INSERT ON" phrase from the screen. |
| F5 | DELLN | (DELEte LiNe.) This function key will delete the line on which the cursor is placed. The location of the cursor on the line is not important. The rest of the lines of text will move up to fill the vacated line. |
| F6 | INSLN | (INSert LiNe.) This function key will insert a line above the line on which the cursor is placed. Note, however, that if the maximum of 16 lines are already on the screen, you will be unable to insert another line. To insert the line, a line would first have to be deleted so that there was room on the screen for the new line. The location of the cursor in the line is not important. After the blank line is inserted, the cursor will move to the first position of the new line. |
| F7 | EDIT/COMPOSE | (EDIT or COMPoSE mode.) This function key switches between Compose and Edit modes. When "EDIT" is displayed, pressing the function key will change the mode from Compose to Edit. "EDIT" will change to "COMPSE", which indicates that pressing the function key once more will return the mode to Compose. |

The difference between Edit and Compose mode is the operation performed when the Return key is pressed. This is also equivalent to what happens when you type beyond the end of a line. In Compose mode the Return key will cause a blank line to be inserted below the current line. The cursor will move to the first position of the new blank line. Also, any characters of a word which are entered beyond the end of the line will cause the entire word to be carried around to the beginning of the new line. This means that you may enter text without stopping to hit the Return key.

In Edit mode, the Return key will not cause a blank line to be inserted. Instead, the cursor will move to the first character of the next line of text. Also, the VPU will stop accepting and displaying characters which are typed beyond the last space of the current line.

Description of the COMMENTS Operation (continued)

F8 DEL (DELeTe comment.) This function key will delete the entire comment. After the function key is pressed, the system will ask if you are sure you wish to delete the comment. Pressing the YES (F2) deletes the comment; pressing the NO (F1) key aborts the delete operation.

Copying Comments

To copy a comment, select the type (X, C, MCR, etc.) and key in the location number (001, 202, etc.) as with creating a comment. Then press F8, Copy. The display is then as shown and described below.

COMMENTS: Y0001 COPY TO: Y0001

ABORT-F1 Y-F2 C-F3 JMP-F4 JMP(E)-F5 MCR-F6 MCR(E)-F7+

The selected comment is displayed at the top of the screen, and the cursor is positioned in the COPY TO field for entry of the location where the comment will be copied.

Press the function key that identifies the type (F2-Y, F4-JMP, etc.) to receive the copied comment. Then key in the location number. If another comment exists at that location, the message, COMMENT DATA ALREADY EXISTS, DO YOU WANT TO REPLACE, is displayed, with F1 and F2 labeled NO and YES, respectively. After the copy is complete, the VPU remains in copy mode until F1-ABORT is pressed.

Adding Paging Commands

Note that a comment cannot appear on the first line of the screen. The first line is reserved for paging commands. Paging commands are used to set how the rung and comment will appear when they are printed by using the PRINT function key (as opposed to the Print key on the keyboard of the VPU200). Without paging commands, the rungs of ladder logic will be printed in consecutive order on the page without breaks.

If you wish to set the paging command for the comment, move the cursor to the first line of the screen by using the arrow keys. When the cursor is on this line, the function keys at the bottom of the screen will change to the following:

AFTER	BEFORE	DELETE
F1	F2	F3

FUNCTION KEYS

The AFTER function key will cause “.PA.” to appear on the first line to indicate that the command is in effect. This command will cause the printer to skip to the beginning of the next page once the rung and comment are printed.

The BEFORE function key will cause “.PB.” to appear on the first line to indicate that the command is in effect. This command will cause the printer to skip to the beginning of a page before beginning the printing of the rung and comment.

The DEL (DELeTe) function key removes an AFTER or BEFORE command from a comment. When it is pressed, “.PA.” or “.PB.” will disappear from the first line of the comment to indicate that the paging command is no longer in effect.

After the paging command is entered, move to the line below the paging command and type the comment. Note that any blank lines or extra spaces between words will be retained; the system will not remove these blanks. The way it looks when typed is the way it will look when shown on the screen or when printed. The asterisk (*) will keep moving as you type the comment and will serve as the marker to indicate the end of the comment. When you have completed the comment, press the ENTER function key to complete the operation. The comment will remain, but the prompt for selecting the output element will reappear with the output element incremented by one. You may continue creating comments or press the EXIT (F1) function key to leave the COMMENT operation.

8.9 Using the SYNONYM Operation

The SYN (SYNONYMS) operation is available only in the Offline mode. The SYNONYMS operation allows you to place a short description above ladder logic elements. Synonyms are allowed to be up to 3 lines long, with 5 characters in each line. Note that when the synonym is typed, the system will automatically break the entry into three 5-letter groups. The function keys available in this operation are shown in Figure 8-8.

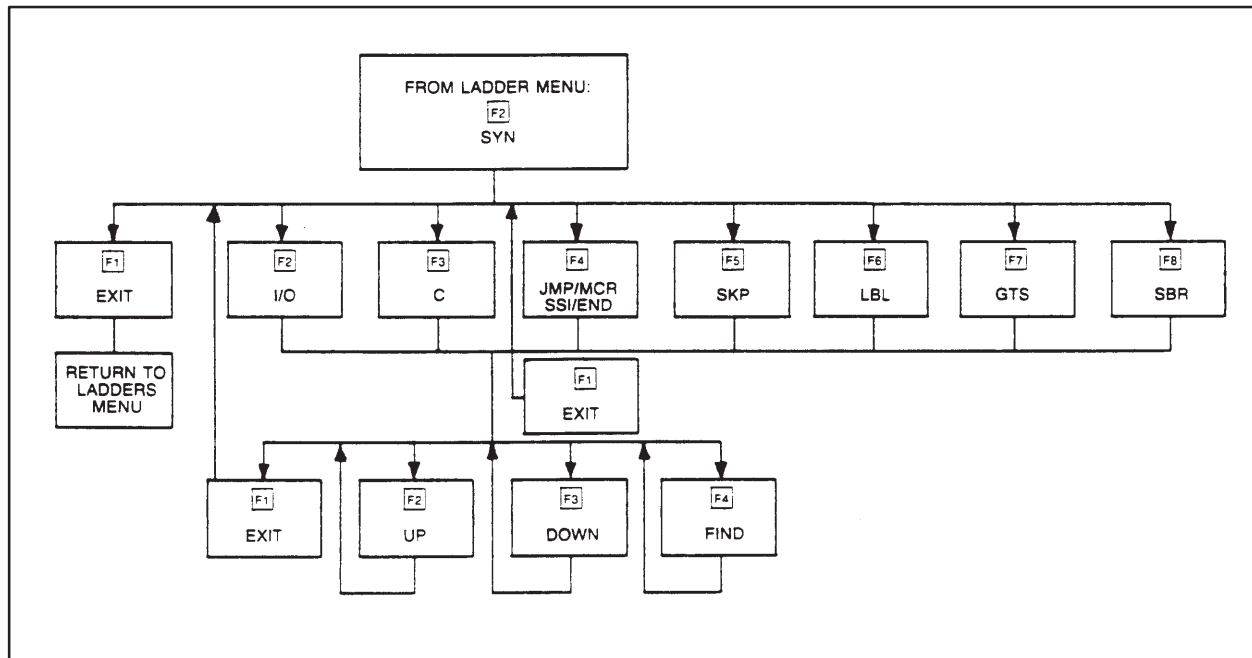


Figure 8-8 SYNONYM Hierarchy

After pressing F2 (SYN), function keys are available as shown and described below:

EXIT	I/O	C	JMP/MCR/END/SSI	SKP	LBL	GTS	SBR
F1	F2	F3	F4	F5	F6	F7	F8

FUNCTION KEYS

These are the categories for the ladder logic elements which may receive synonyms. To create a synonym, first press the desired element category. This will cause the screen to clear and a chart to be placed on the screen showing the addresses of the category chosen. Since the "I/O," "C," "SKP," and "LBL" charts extend beyond one screen, "UP" and "DOWN" function keys will become available to allow you to move from screen to screen to find the desired address.

If you wish to find a specific element rather than just stepping through the screens, a "FIND" operation is available. When this function key is pressed, a prompt will appear for the address of the sought element. You should type the address and press the Return key to begin the operation.

The synonym for an element is created by typing the description in the synonym column next to the element address. Once the synonym is typed, use the arrow keys to move to the next location in the chart. Each synonym is entered into memory when the cursor is moved off location of the synonym. To terminate the operation, press the EXIT (F1) function key.

Chapter 9

Using VPU200 Support Functions

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9.3	Accessing Support Functions	9-5
9.4	Accessing Auxiliary Support Functions	9-16

9.1 Introduction

Support Functions are available at two locations in the menu hierarchy. The first menu contains the complete support functions and is accessible after loading the operating system disk (Figure 9-1). The second menu, Auxiliary Support Functions, is reached from the primary operations menu (Figure 9-2). The Auxiliary Support Functions Menu contains only those functions for clearing P/C memory, restarting the P/C, displaying P/C errors and setting scan time.

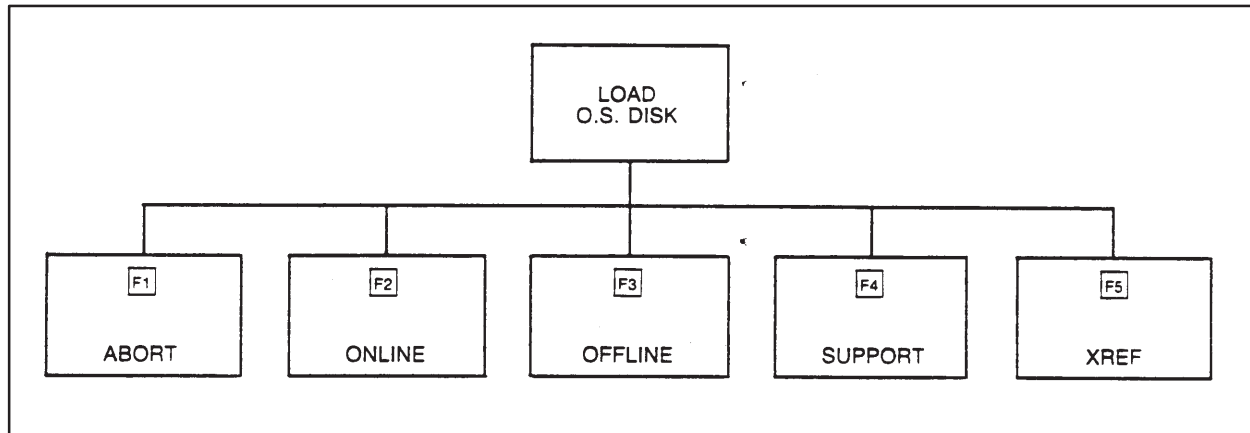


Figure 9-1 Accessing Support Functions Menu

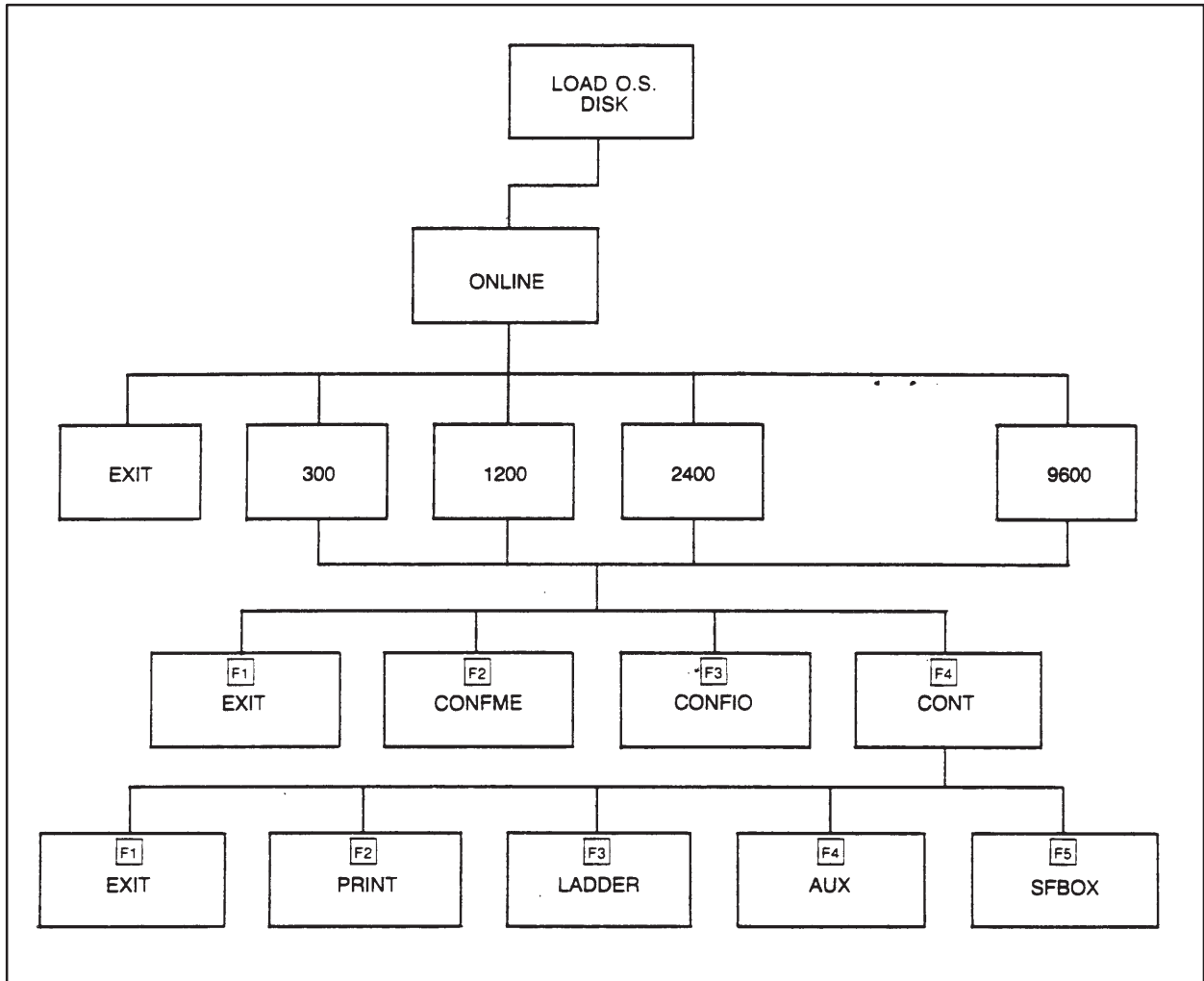


Figure 9-2 Accessing Auxiliary Support Functions Menu

9.2 Complete Support Functions

As described at the beginning of the section, complete support functions are accessed by pressing the support (F4) function key. The VPU200 enters the online mode of operation and loads the support operating system upon selection of the support functions. The first page of the Support Functions menu is displayed as shown in Figure 9-3.

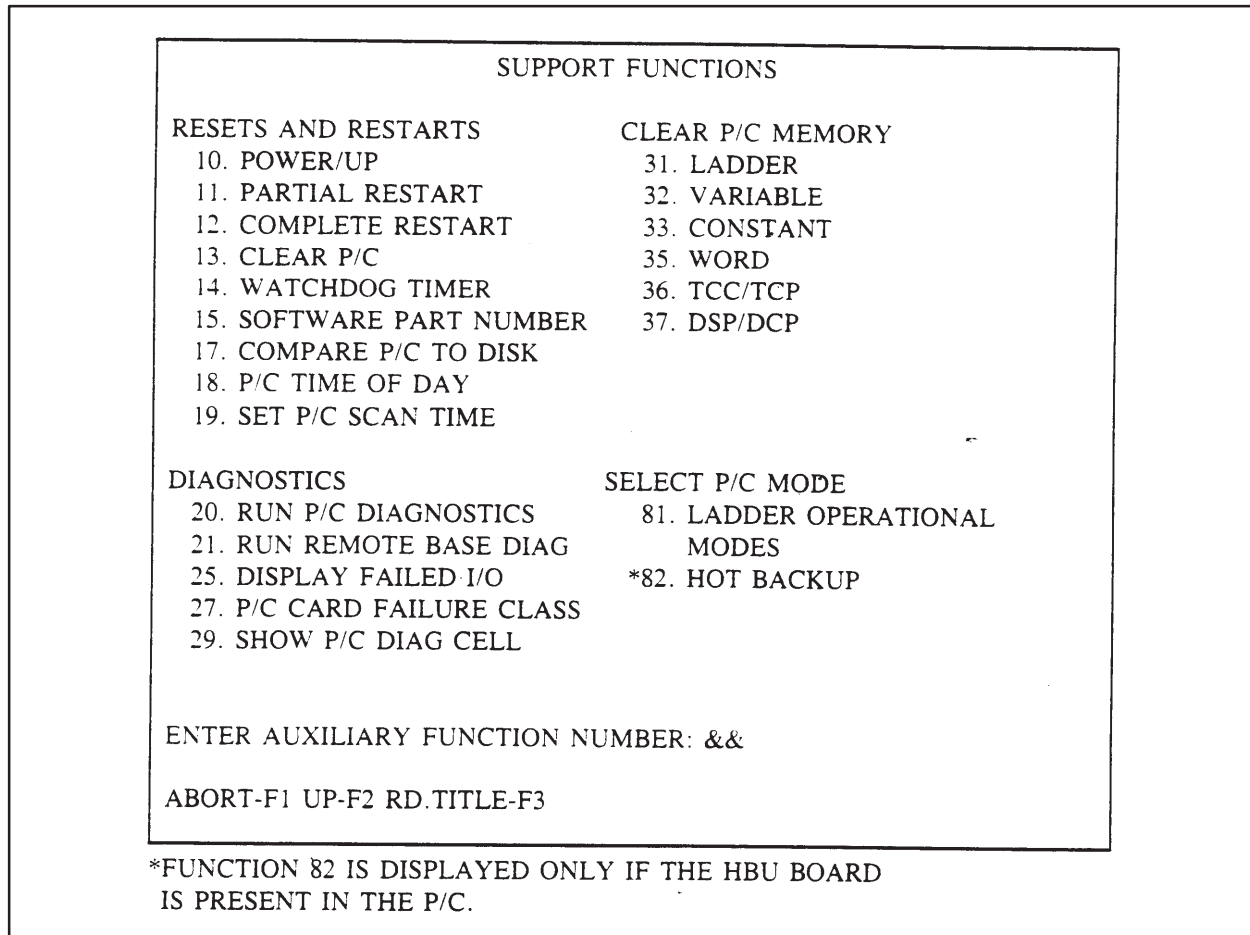


Figure 9-3 Support Functions Menu, page 1

9.3 Accessing Support Functions

To initiate one of the functions, type the number of the desired function next to the prompt on the screen of the VPU200. Then press the Return key to begin the function. The system will prompt for more information if it is needed. To leave the SUPPORT function, press the EXIT (F1) function key.

Support Functions 10–13: These four functions are used to reset (or restart) the P/C. Each of the four functions clears a certain portion of memory. (A “cleared” memory is one in which all values are set to zero.) The following describes which portions of memory will clear for each of the functions:

Function 10: (“Power-up”) clears all discrete registers (that is, the registers for X, Y, and C elements) will not be affected. Note however, that if the battery is low or missing, all registers including forced and word elements will be cleared, as well as ladder logic, memory configuration and I/O configuration.

Function 11: (“Partial Re-start”) clears all discrete registers except retentive-C and forced elements. The word registers and presets will not be reset to zero.

Function 12: (“Complete Re-start”) clears all discrete registers (including retentive-C elements). Forced elements and word registers will not be reset to zero.

Function 13: (“Clear P/C”) places the P/C in program mode, sets the scan to 50 milliseconds, and clears all memory locations including the ladder logic program.

After the number of the function is entered by pressing the Return key, the screen will repeat the name of the function and ask whether you are sure you wish that function performed.

If you press the F1 (NO) function key, the system will abort the selected function and return to the screen which shows the menu for the support functions. If you press the F2 (YES) function key, the system will begin the requested function. When the requested function is complete, the system will return to the menu showing the available support functions.

Accessing Support Functions (continued)

Function 14: Function 14 (“Watchdog Timer”) allows you to set and read the timer. The timeout range that may be entered on the VPU is from 0 to 32767 milliseconds. (However, the minimum timeout supported by the 560 is 500 msec.) When the Watchdog Timer function is selected, the function keys available are displayed, along with the watchdog timer value. The Support Function menu remains in the upper part of the display.

Function 15: Function 15 (“Software Part Number”) obtains the software part number of each of the printed circuit boards currently installed in the P/C. The part numbers will be displayed next to a number indicating the slot in which the board is installed. Note that for the Global Memory Card, the slot number in which the card is installed will be followed by blanks. After completion of the function, press the EXIT (F1) function key to return to the screen showing the available support functions.

Function 17: Function 17 (“Compare P/C to Disk”) allows a comparison of the data on disk to that in the P/C. When Function 17 is used the first time, a message informs you that no verification file has been found. (See the descriptions of SAVE–F2 and LOAD–F3 given below.) In order to continue the verification operation, press the CONTINUE–F2 key. If Function 17 has been used before and a file saved, the VPU proceeds directly into the function. Figure 9-4 shows the menu that appears the first time Function 17 is called.

VERIFICATION FUNCTION			
TYPE	MEMORY	STATUS	MODIFIED LOCATIONS
I	LADDER NETWORKS		
I	FORCED WORD I/O		
I	FORCED DISCRETE I/O		
I	FORCED CONTROL RELAYS		
I	SEQUENCER SCAN TIME		
I	V-MEMORY		
I	V-MEMORY		
I	V-MEMORY		
I	V-MEMORY		
I	V-MEMORY		

SELECT P/C MEMORY TO BE COMPARED AGAINST DISKETTE
ABORT-F1 SAVE-F2 LOAD-F3 START-F4 VERIFY-F5 IGNORE-F6 EXAMINE-F7

Figure 9-4 Compare P/C to Disk Menu

The fields available in the Function 17 menu are defined as follows:

- **Type** – The default for this field is I, Ignore, which tells the VPU to ignore this memory category. The other options for this field are V, Verify, or E, Examine.
- **Memory** – The memory category to be verified or examined is listed in this field.
- **Status** – After verification or examination, the VPU displays in this field whether the memory type passed or failed the comparison.
- **Modified Locations** – The VPU lists in this field the memory addresses of ladder logic or the number of the discrete elements that fail the compare. For the Verify function, only the first failure is listed. With the Examine function, at the fourth error found, the VPU operator is given the option to continue the search or go to the next memory category. The Sequencer Scan Time and Ladder Networks categories are treated differently from the other options. Since there is only one memory location for the scan time information, a passed or failed status only is indicated. If the status is failed, a 1 is listed in the Modified Locations field. When the Ladder Networks are verified, only the first address in a rung is listed in the Modified Locations field.

The four arrow keys on the VPU are used to move the cursor from field to field for selection and entry of the type of compare to perform on a particular memory category. The function keys shown in Figure 9-4 are listed and described below.

- | | | |
|-----------|--------|--|
| F1 | ABORT | Before the compare operation is begun, the F1 key returns the display to the Master Support Functions menu. After the compare is initiated, F1 returns the display to the Function 17 menu. |
| F2 | SAVE | The F2 key saves the options selected to the program disk. |
| F3 | LOAD | The F3 key displays the last screen loaded to disk. |
| F4 | START | The F4 key initiates the compare function you select. |
| F5 | VERIFY | The Verify, F5, key tells the VPU to compare a memory category in the P/C to the same memory category on the disk. This is the key used for entry in the Type field as described above. The Verify function for a particular category stops when the first error is logged and moves to the next category. |
| F6 | IGNORE | The Ignore, F6, key is entered in the Type field for any memory categories that are not to be examined or verified. |

Accessing Support Functions (continued)

F7 EXAMINE When the F7 key, Examine, is entered in the Type field, the compare function works as described above. The Examine function logs errors up to the fourth error found and gives you the option of continuing or moving to the next category.

Figure 31 shows a sample display that might appear after the comparison (Function 17) is completed.

NOTE: To determine the approximate time for completing the verify operation, allow 20 minutes for each 16K bytes of ladder memory to be verified. For example, 32K bytes of ladder memory should require approximately 40 minutes (maximum) for verification.

VERIFICATION FUNCTION			
TYPE	MEMORY	STATUS	MODIFIED LOCATIONS
V	LADDER NETWORKS	PASSED	
V	FORCED WORD I/O	FAILED	5 7 ...
E	FORCED DISCRETE I/O		5 7 8
E	FORCED CONTROL RELAYS		
VERIFYING DISCRETE I/O			IDENTIFIES THE DISCRETE POINT WHICH MISCOMPARED.
ADDITIONAL DIFFERENCES FOUND IN THIS SECTION AT			12
ABORT—F1		CONTINUE—F2	

Figure 9-5 Figure 31 Sample Function 17 Display

Function 18: Function 18 (“P/C Time of Day”) allows you to read and/or set the current time. After the function is initiated by typing the number, pressing the Return key, and answering yes to the prompt, the following line will appear on the screen:

YEAR= MONTH= DAY= HOUR= MINUTE= SECOND= DAY OF WEEK=

The areas next to each entry on the line will contain the appropriate number to signify the date, the time, and the day of the week. (Note that the hour is expressed in 24-hour format, and that the day of the week is a number between 1 and 7.) The function keys which are available will also change to the following:

EXIT	READ	WRITE
F1	F2	F3

Function Keys

The EXIT (F1) function key terminates this auxiliary function and returns to the screen showing the support function menu. The READ (F2) function key is used to obtain the current time from the P/C. The time is set by moving the cursor to the appropriate entry, typing the desired information, and then pressing the WRITE (F3) function key. If the information which was typed is invalid, the system will not allow the new time to be entered when the WRITE function key is pressed.

Function 19: Function 19 (“Set P/C Scan Time”) allows you to set the scan time for the P/C. After the function is entered by pressing the Return key, the screen will show the phrase “SCAN TIME =” followed by the scan time in milliseconds. If the scan time is . variable, the word “VARIABLE” will appear after the value for the scan time. To set the scan time, type the new scan time and press the Return key. Or, if you want to have variable scan time, type zero and press the Return key.

Function 20: Function 20 (“Run P/C Diagnostics”) will cause the system to respond with “RUN P/C DIAGNOSTICS: ARE YOU SURE?” and the following function keys at the bottom of the screen:

NO	YES
F1	F2

FUNCTION KEYS

If you press the NO (F1) function key, the system will abort the auxiliary function and return to the screen showing the available auxiliary functions. If instead you press the YES (F2) function key, the system will instruct the P/C to begin its self-diagnostics. If the diagnostics pass, the message, “P/C PASSED SELF-DIAGNOSTICS,” will be shown. If the diagnostics fail, a phrase describing why the diagnostics failed will be shown on the screen.

Accessing Support Functions (continued)

Function 21: Function 21 (“Run Remote Base Diagnostics”) allows you to run diagnostics on the I/O bases. You may select a particular channel and base for running the diagnostics, or you may choose to run the diagnostics on all channels and bases. When the function is started, a prompt appears to ask you if you are sure. If you press the NO (F1) function keys the operation aborts, and the Support Function menu is displayed. If you press the YES (F2) function key, the diagnostics begin. When the checks are complete the channels and bases are displayed with a “Diagnostics Passed” message or an error message indicating the failure(s). The function key labels change to EXIT (F1) and CONTINUE (F2). The EXIT function key terminates the operation; the CONTINUE key shows the next display of channels and bases (if any).

Function 25: Function 25 (“Display Failed I/O”) will cause the system to assess the status of all I/O modules attached to the system. It will then display in chart format the location (in the order of Channel, Base, and Slot) of any failed I/O modules. Also the following function keys will appear at the bottom of the screen:

EXIT	CONTINUE
F1	F2

FUNCTION KEYS

If the list of failed I/O modules is too long to fit on one screen, the CONTINUE (F2) function key will place the next page of failed I/O modules on the screen. When you wish to leave this function, pressing the EXIT (F1) function key terminates the function and returns the support menu to the screen. Note that this function works only for those modules which set the F (failure) bit. To determine if a particular module does set the F bit, check the manual that accompanies the module.

Function 27: Function 27 (P/C Card Failure Class) allows you to specify whether or not failure of a particular board (card) will cause the system to fail. After selecting Function 27 from the menu, a display listing the P/C slot, type of board, and failure class, appears as shown in Figure 9-6.

P/C/ CARD FAILURE CLASS		
P/C SLOT	P/C CARD	FAILURE CLASS
1	CPU	FATAL
2	GLOBAL MEMORY	FATAL
3	RCC	NON-FATAL
4	LOOP	NON-FATAL
ABORT-F1 FATAL-F2		

Figure 9-6 Example Listing of P/C Card Failure Class

The card failure class listing will only show slot numbers that contain boards. To change the class of a board use the UP/DOWN arrow keys to position the cursor in the failure class field for the board to be changed. Use the F2 key to change the failure class field from “FATAL” to “NON-FATAL” or vice versa. After F2 is pressed, the displayed failure class of the board will change to the new class. Some boards must be classed as “FATAL,” and cannot be changed. If a change is made to one of these the message, “INVALID DATA SENT WITH COMMAND,” is displayed.

Function 29: Function 29 “Show P/C Diagnostic Cell”) will obtain the diagnostic cell from the P/C. The function will then display the cell on the screen in the form shown in Figure 9-7.

560 OPERATIONAL STATUS	
SCAN = 50 MSECS/VARIABLE	BATTERY = LOW
KEY = UNLOCKED	DOWNLOAD = ON
MODE = PROGRAM	PROGRAM IN RAM
FATAL ERROR	= NONE
NON FATAL ERROR	= NONE

Figure 9-7 Result of Function 29

Accessing Support Functions (continued)

To leave this auxiliary function, press the EXIT (F1) function key. This will return the system to the menu displaying the available functions.

Functions 31–37: The remaining functions on page 1 of the support menu clear P/C memory as indicated by their names. After the number of the auxiliary function is entered by pressing the Return key, the screen will repeat the name of the function and ask whether you are sure you wish that function performed.

If you press the F1 (NO) function key, the system will abort the function and return to the menu showing the available functions. If you press the F2 (YES) function key, the system will begin the requested function. When the requested function is complete, the system will return to the menu showing the available auxiliary function keys.

Function 81: Function 81 (“Select P/C Mode”) is available to set the P/C operating mode to Program or Run. After Function 81 is selected, the function keys appear as shown and described below.

EXIT	RUN	PGMFRZ	PGMOFF
F1	F2	F3	F4

FUNCTION KEYS

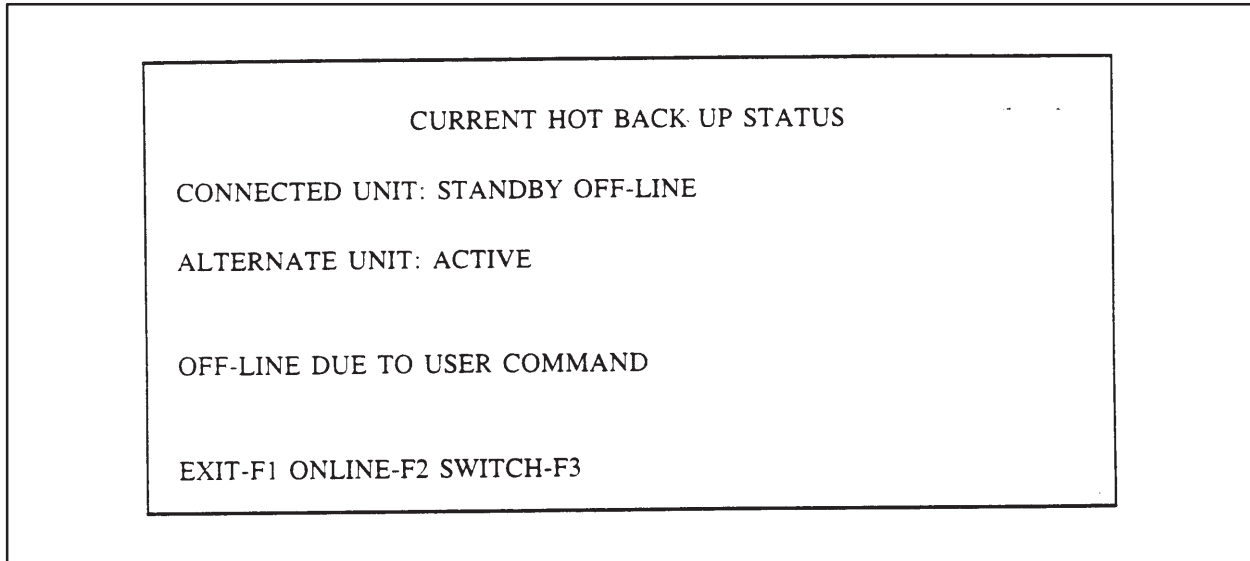
- F1 EXIT Pressing F1 leaves the Function 81 operation and returns to the previous display.

- F2 RUN Pressing F2 changes the system to RUN mode. In the Run Mode, the program is executed; and I/O are updated.

- F3 PGMFRZ Pressing F3 switches the system to Program Freeze mode. In the Program Freeze mode, all outputs cease changing and remain in the state they were prior to pressing F3.

- F4 PGMOFF Pressing F4 places the system in Program Off mode. In the Program Off mode, discrete outputs are set to zero, and word outputs are frozen (remain in the state they were when F4 was pressed).

Function 82: Function 82 (“Hot Back-Up”) is used for examining or modifying the HBU status. After Function 82 is selected, a menu is displayed. The following illustration contains sample entries that may appear.



This menu displays the current status of the active and standby units and provides the function keys to change status. In addition, if the standby unit is offline, one of the following messages is displayed to give the reason.

- State entered at power-up
- Offline due to Hardware Mismatch
- Offline due to User Command
- Offline due to Active unit in PROGRAM mode
- Offline requesting online but inhibited by user program in active unit
- Offline due to failure in Standby
- Offline due to loss of HBU Communications.

Appendix A provides a listing of communication error messages that are given when a communication error occurs with a Hot Back-up unit connected.

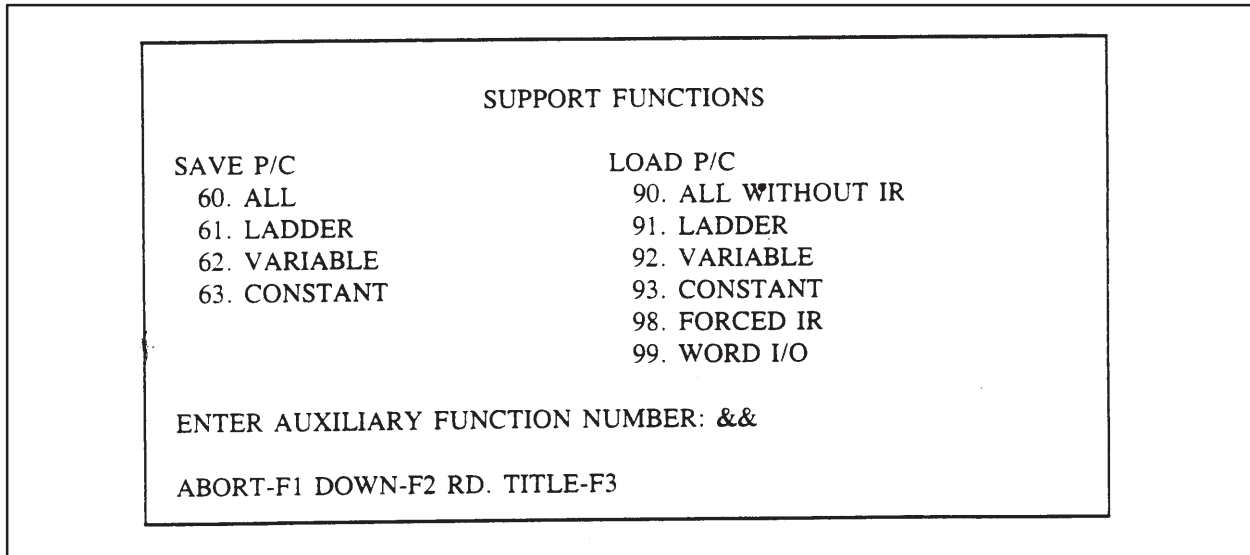


Figure 9-8 Support Functions Menu, page 2

Functions 60–63: Functions 60–63, Figure 9-8, are used to save data from the P/C to a VPU disk. The memory type saved is indicated by the name of the function; i.e., All, Ladder, Variable, Constant.

Enter the number corresponding to the type of memory you wish to save; press Return. A prompt asks whether you are sure you wish that function performed. If you press F1 (NO), the function is aborted. Pressing F2 (YES) begins the requested operation.

Note that for Function 60, “ALL” means that Ladder Memory, V-Memory, K-Memory, Word I/O, Forced Word I/O, Discrete I/O, I/O Configuration for all bases and channels, Memory Configuration, and Scan Time will be saved to the disk. Any errors encountered in saving any of these items will cause the function to fail.

Functions 90–99: Functions 90–99, Figure 9-8, are used to load data from the VPU disk to the P/C. The memory type loaded is indicated by the name of the function; i.e., All without IR, Ladder, Variable, etc.

Enter the number corresponding to the type of memory you wish to load to the P/C; press Return. A prompt asks whether you are sure you wish that function performed. If you press F1 (NO), the function is aborted. Pressing F2 (YES) begins the requested operation.

Function 90: Load All without IR, loads Ladder Memory, V-Memory, K-Memory, Scan Time, I/O Configuration for all bases and channels, and Memory Configuration. It does not load Word I/O, Forced Word I/O, Discrete I/O, nor Forced Discrete I/O.

Function 98: Load Forced IR, loads Forced Word I/O (WX, WY) and Forced Discrete I/O (X Y, C).

Function 99: Load Word I/O loads both Forced and Unforced Word I/O (WX, WY).

NOTE: To load or save a specific memory type (V-, K-, etc.), the memory configuration in the P/C and on the disk must be identical. Load All without IR (Function 90) will copy the memory configuration from the disk to the P/C. Save all (Function 60) will copy the memory configuration from the P/C to the disk.

9.4 Accessing Auxiliary Support Functions

As shown in Figure 9-2 at the beginning of the section, the Auxiliary Support Functions are accessed at the System Operations Menu. Pressing F4 (AUX) displays the menu shown in Figure 9-9.

RESETS AND RESTARTS	CLEAR P/C MEMORY
10. POWER/UP	31. LADDER
11. PARTIAL RESTART	32. VARIABLE
12. COMPLETE RESTART	33. CONSTANT
13. CLEAR P/C	35. WORD
14. WATCHDOG TIMER	36. TCC/TCP
19. SET P/C SCAN TIME	37. DSP/DCP
DIAGNOSTICS	*SELECT P/C MODE
25. DISPLAY FAILED I/O	81. LADDER OPERATIONAL
27. P/C CARD FAILURE CLASS	MODES
29. SHOW P/C DIAG CELL	82. HOT BACKUP
ENTER FUNCTION NUMBER: &&	
ABORT-F1	

* FUNCTION 82 IS DISPLAYED ONLY IF THE HBU BOARD IS PRESENT IN THE P/C

Figure 9-9 Online Auxiliary Support Functions Menu

The auxiliary support functions are a subset of the complete support functions described in the preceding paragraphs. Each auxiliary function operates from this menu just as it does in the complete support functions menu.

Chapter 10

Programming SF I/O Modules

10.1	Introduction	10-2
10.2	Operating Mode	10-3
10.3	Functions Available	10-4

10.1 Introduction

Box functions can be programmed for Special Function I/O modules, such as the ASCII module. Figure 10-1 shows the menu hierarchy to access the SFBOX operation.

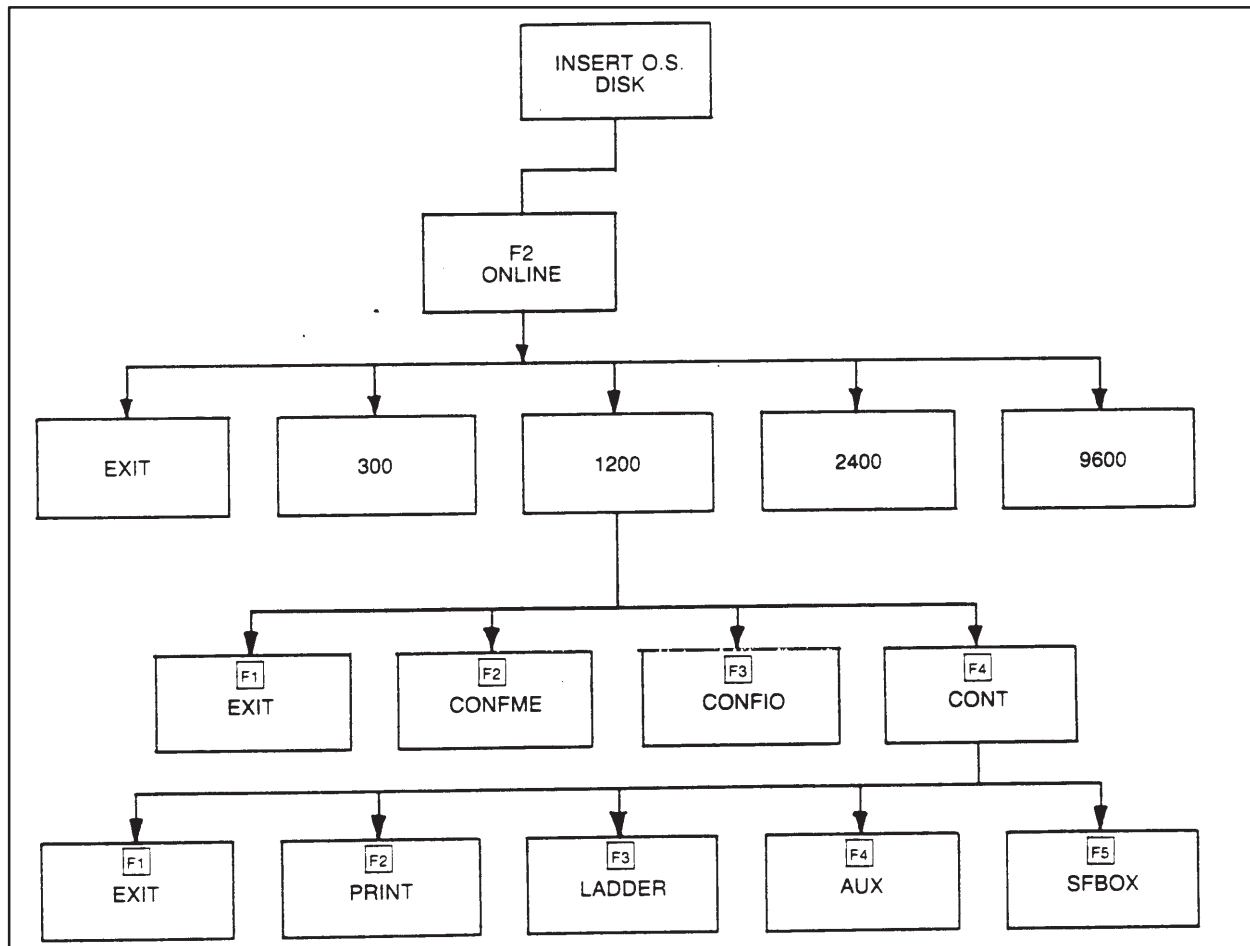


Figure 10-1 Accessing SFBOX Operation

10.2 Operating Mode

SF Box operations are available only in the Online mode since communication with the module is required. After pressing the SFBOX key, a directory appears as shown in Figure 10-2.

SPECIAL FUNCTION PROGRAMMABLE MODULE DIRECTORY							
MODULE NAME	CHAN	BASE	SLOT	MODULE NAME	CHAN	BASE	SLOT
ASCII	1	1	0	ASCII	1	5	1
ASCII	1	1	2	ASCII	1	5	3
ASCII	1	1	4	ASCII	1	5	5
ASCII	1	2	6	ASCII	1	5	7
ASCII	1	2	1	ASCII	1	6	2
ASCII	1	2	3	ASCII	1	6	4
ASCII	1	2	5	ASCII	1	6	6
ASCII	1	2	7	ASCII	1	6	8
ASCII	1	3	1	ASCII	1	7	2
ASCII	1	3	3	ASCII	1	7	4
ASCII	1	3	5	ASCII	1	7	7
ASCII	1	3	8	ASCII	1	8	1
ASCII	1	4	2	ASCII	1	8	3
ASCII	1	4	4	ASCII	1	8	5
ASCII	1	4	6	ASCII	1	8	7
ASCII	1	4	8	ASCII	1	9	1

EXIT-F1 UP-F2 DOWN-F3 TYPE-F4

Figure 10-2 Special Function Programmable Module Directory

10.3 Functions Available

The directory displays up to 32 entries on each page. Use the arrow keys and the Return key to move the cursor from entry to entry. Function keys are available as shown and described below.

The EXIT key leaves the directory and returns the previous display.

F2 UP The UP key displays the next 32 directory entries.

F3 DOWN The DOWN key displays the previous 32 directory entries.

Use the arrow and Return keys to select the entry line in the SF Programmable Module Directory for the module data to be displayed by pressing F4, TYPE.

F4 TYPE The TYPE key displays a Box Type directory for editing or creating boxes. See Figure 10-3.

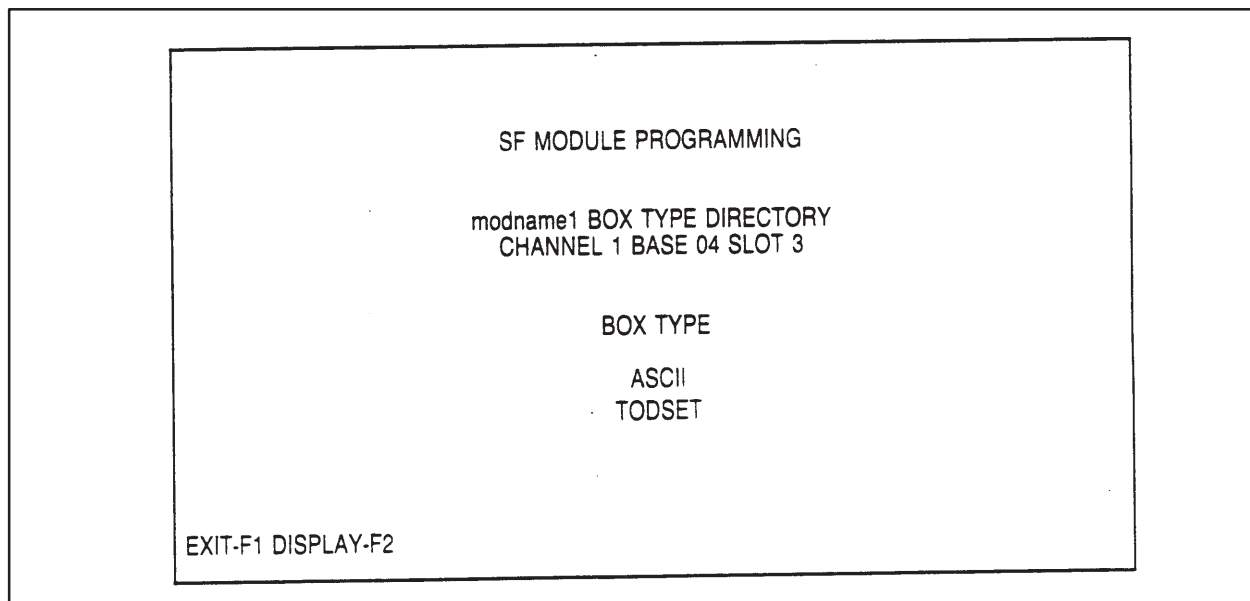


Figure 10-3 Box Type Directory

The function keys available with the Box Type Directory are labeled Exit and Display. The Exit (F1) key returns to the previous display. The Display (F2) key displays the first box instruction for the type selected. If no boxes of this type are programmed a box is displayed for creating an instruction (Figure 10-4). The function keys are labeled as shown and described in the paragraphs following Figure 10-5.

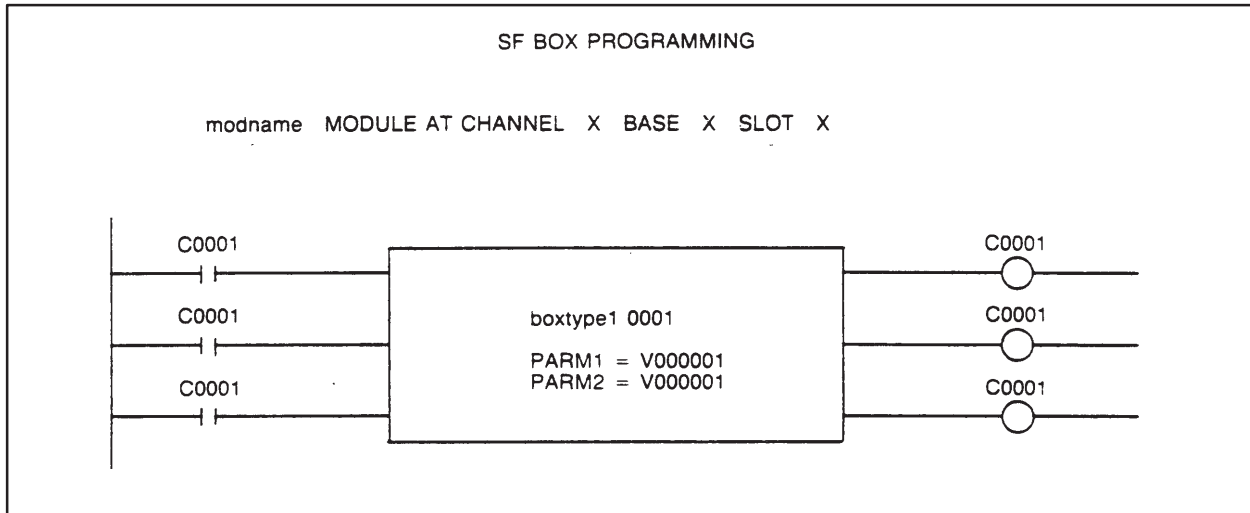


Figure 10-4 SF Box in Display Mode

EXIT	UP	DOWN	MODIFY	DEBUG	FIND	COPY	DEL
F1	F2	F3	F4	F5	F6	F7	F8

Figure 10-5 Function Keys

- F1 EXIT The EXIT key returns the display to the SF Box Type Directory.
- F2 UP The UP key displays the next box instruction. If no further instructions exist, a message to that effect is displayed.
- F3 DOWN The DOWN key displays the previous box instruction. If none exist, a message to that effect is displayed.
- F4 MODIFY The MODIFY key allows editing of the box currently displayed; or, if the display is an unlabeled box, a new instruction can be programmed. The function key labels change to accommodate the type of entry being made as each parameter for the instruction is entered.
- F5 DEBUG The DEBUG key provides for debugging of an SFBOX. After F5 is pressed, the function key labels are as follows:

Functions Available (continued)

EXIT	UP	DOWN	FORCE	UNFORC	ST. ON/ OFF	RUN/PGM
F1	F2	F3	F4	F5	F6	F7

F1, F2, and F3 retain their previous functionality. F4 allows forcing of X, Y, and C; F5 unforces the points. F6 turns the status display ON/OFF. F7 changes the module mode to RUN or PGM.

- F6** FIND The FIND key enables location of a SFBOX by entering a box number.
- F7** COPY The COPY key initiates the copy operation. The function key labels change to indicate the valid responses to make for completion of the copy function.
- F8** DELETE The DELETE key allows deletion of the box currently displayed.

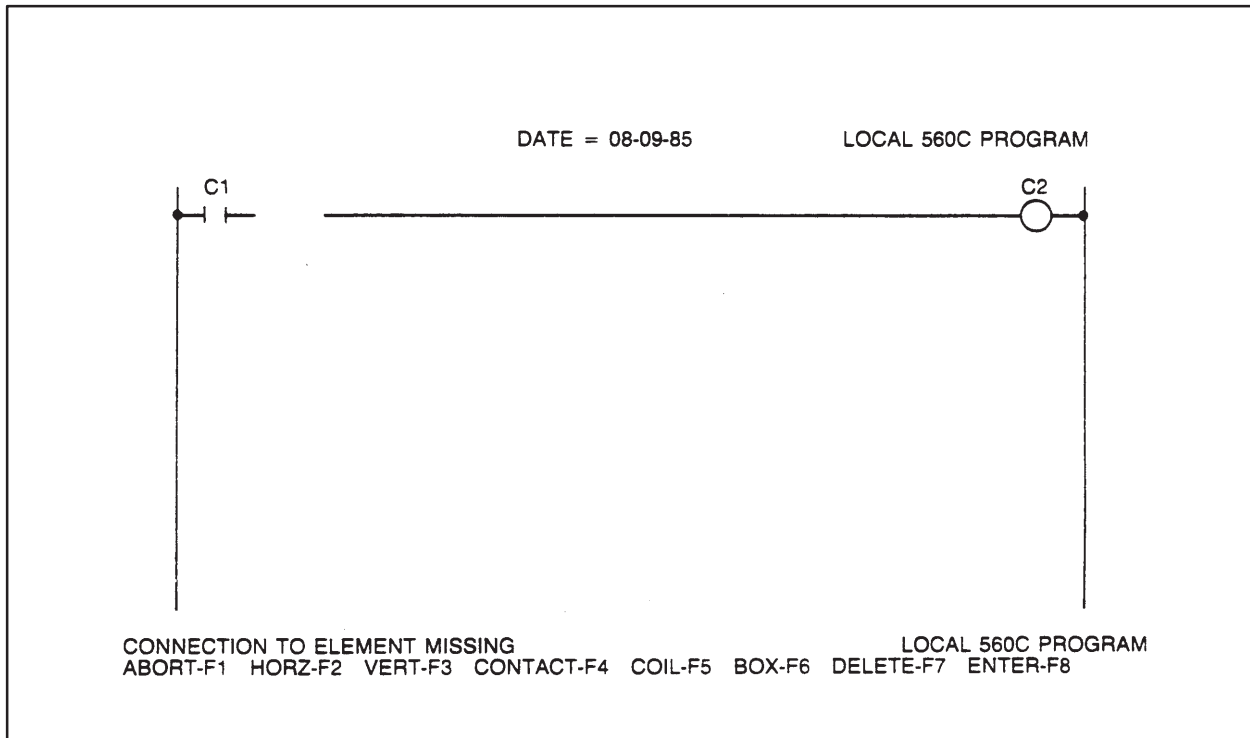
Appendix A

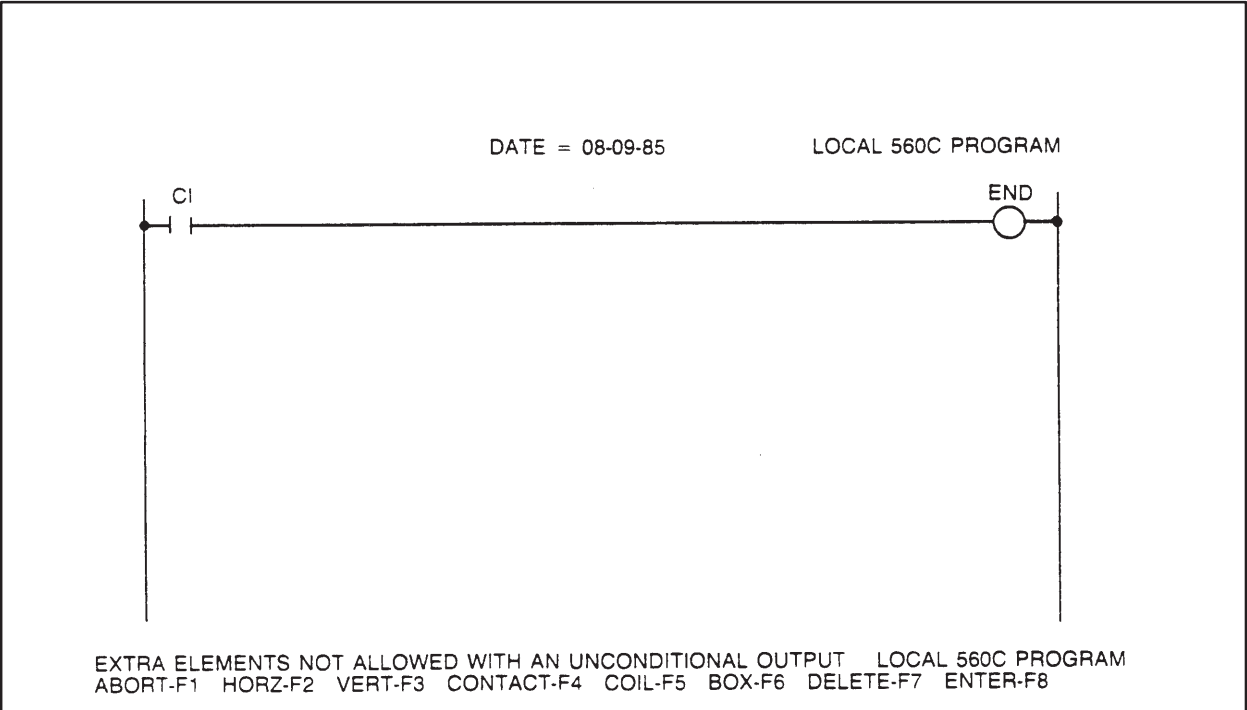
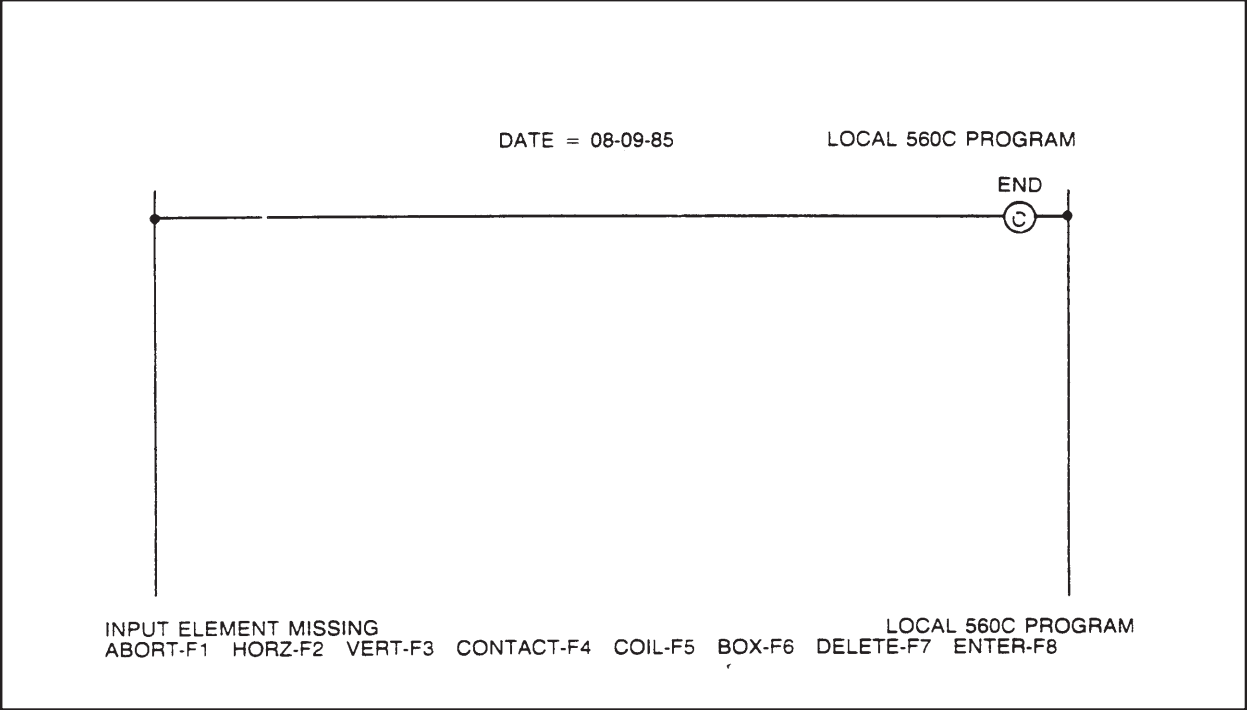
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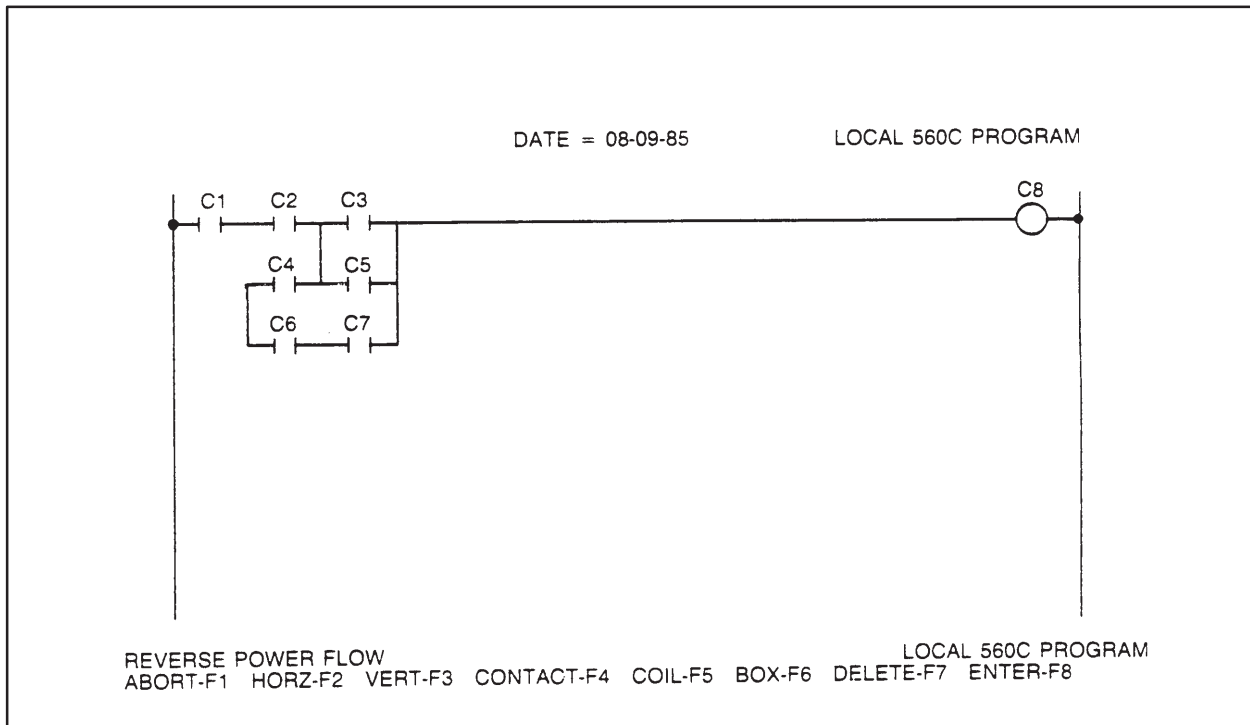
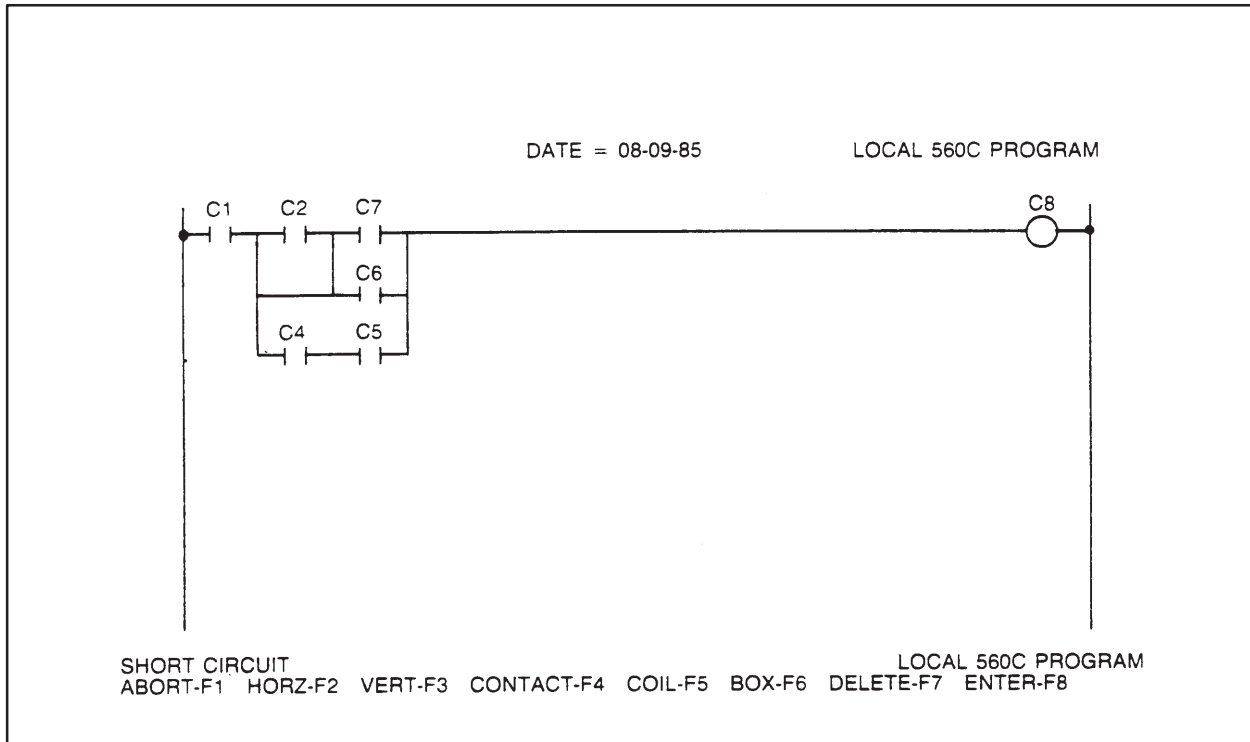
A.1 Invalid Ladder Logic Constructions

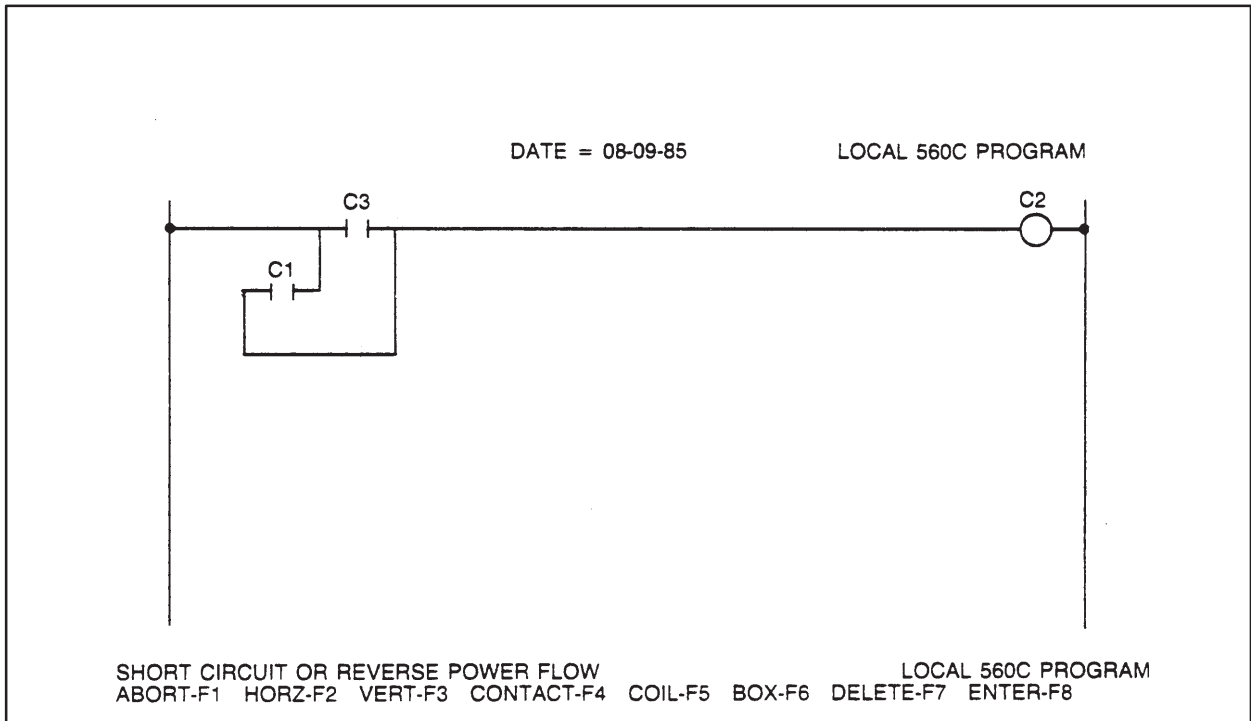
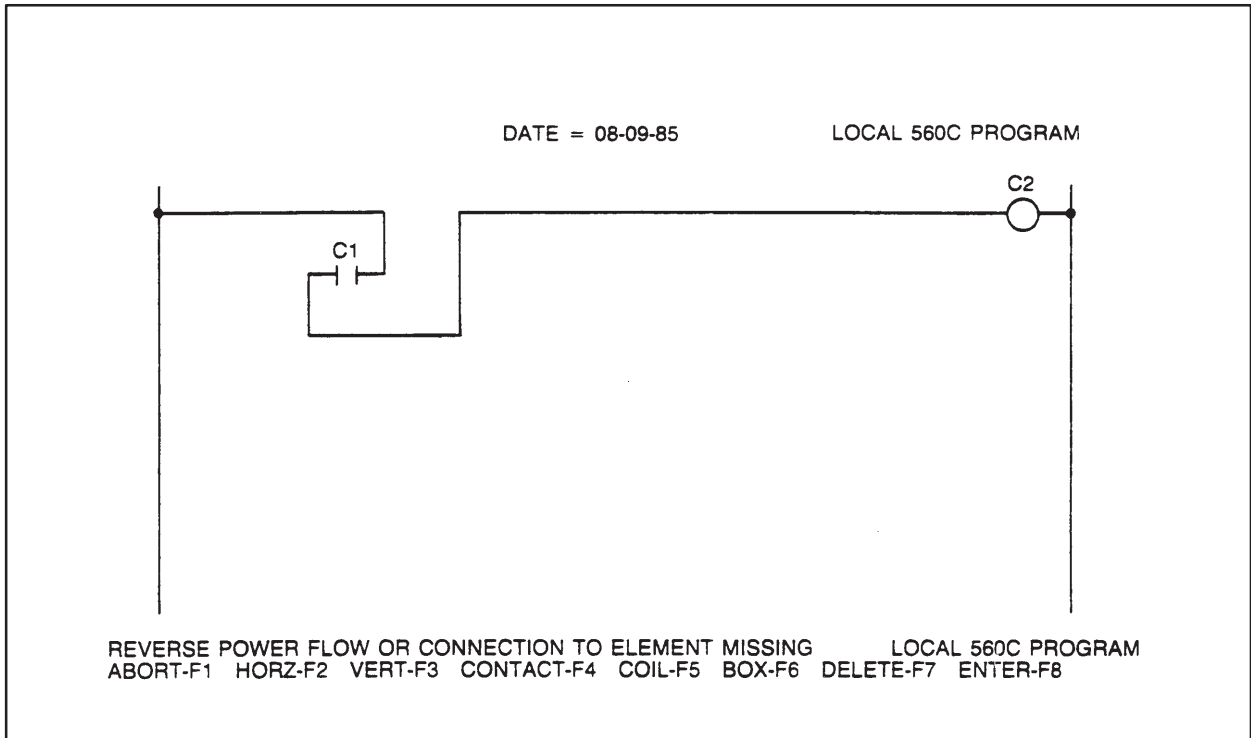
The ladder diagrams shown in the following figures illustrate errors that may be encountered while programming ladder logic in the MODIFY or INSERT mode. The ladder logic shown for each error represents a typical example of what might cause the error condition. The error message you receive with the structure is given beneath the ladder diagram.



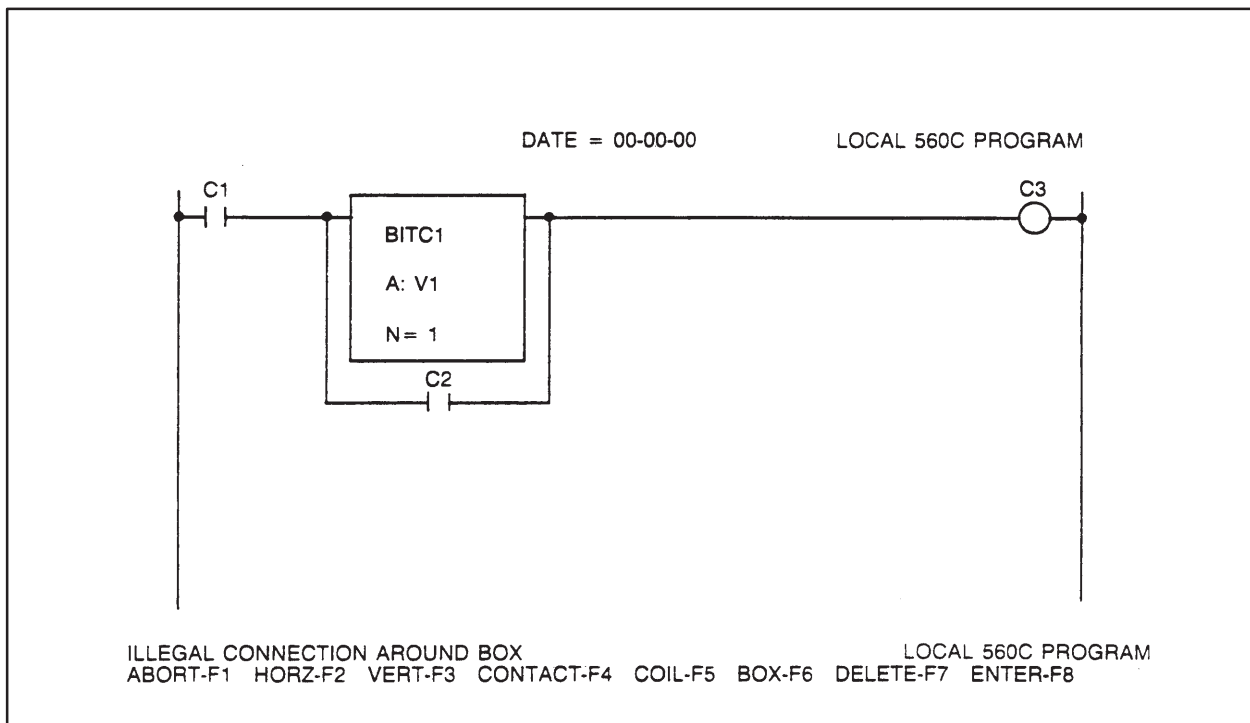
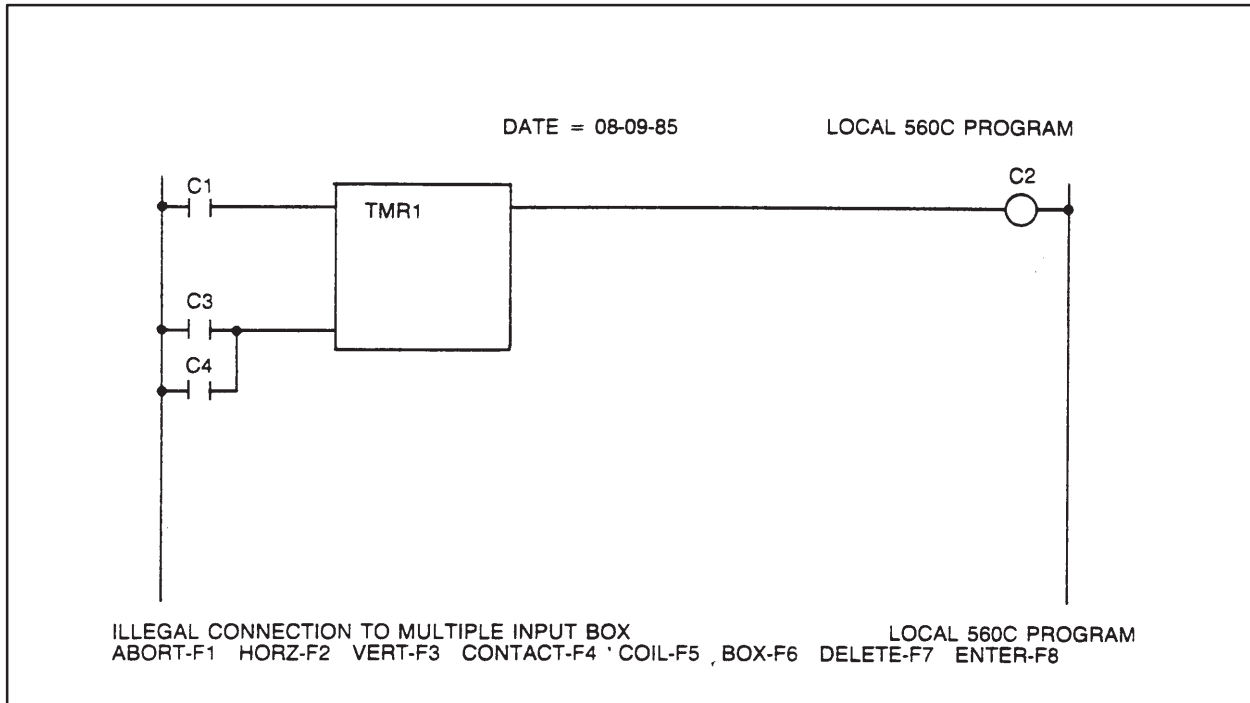


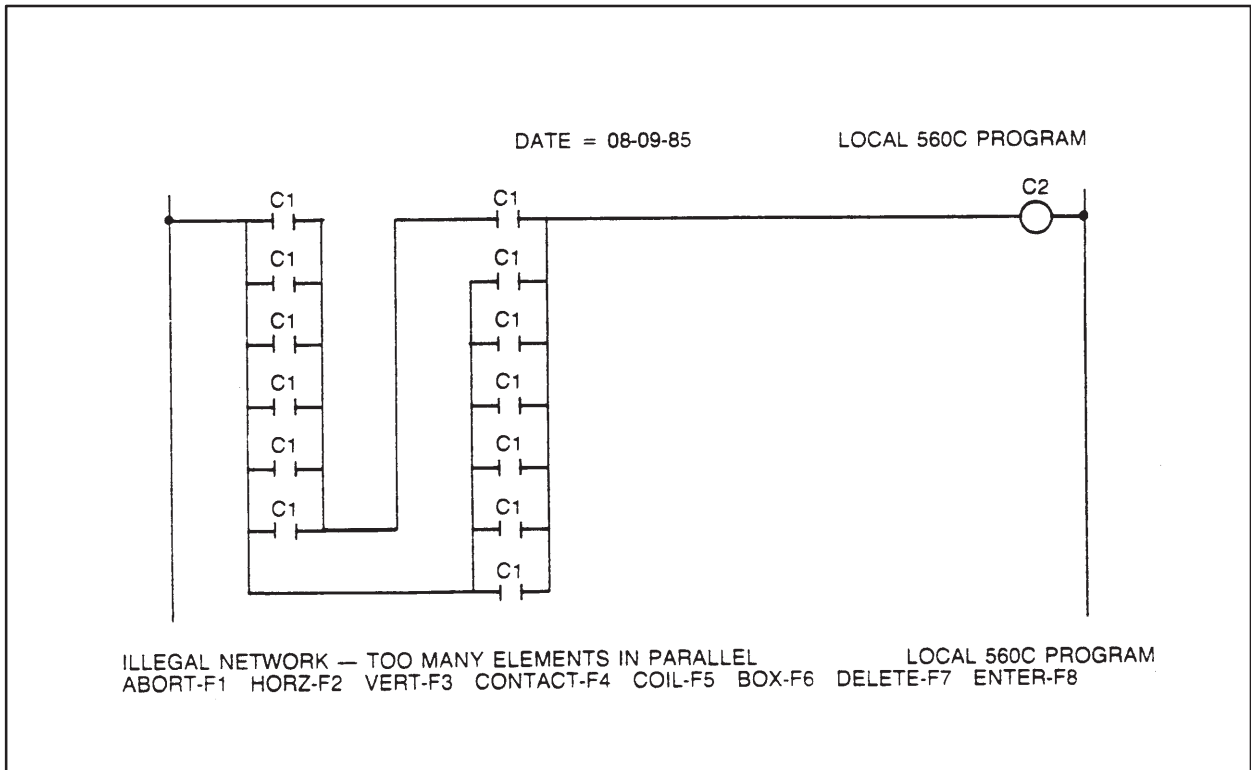
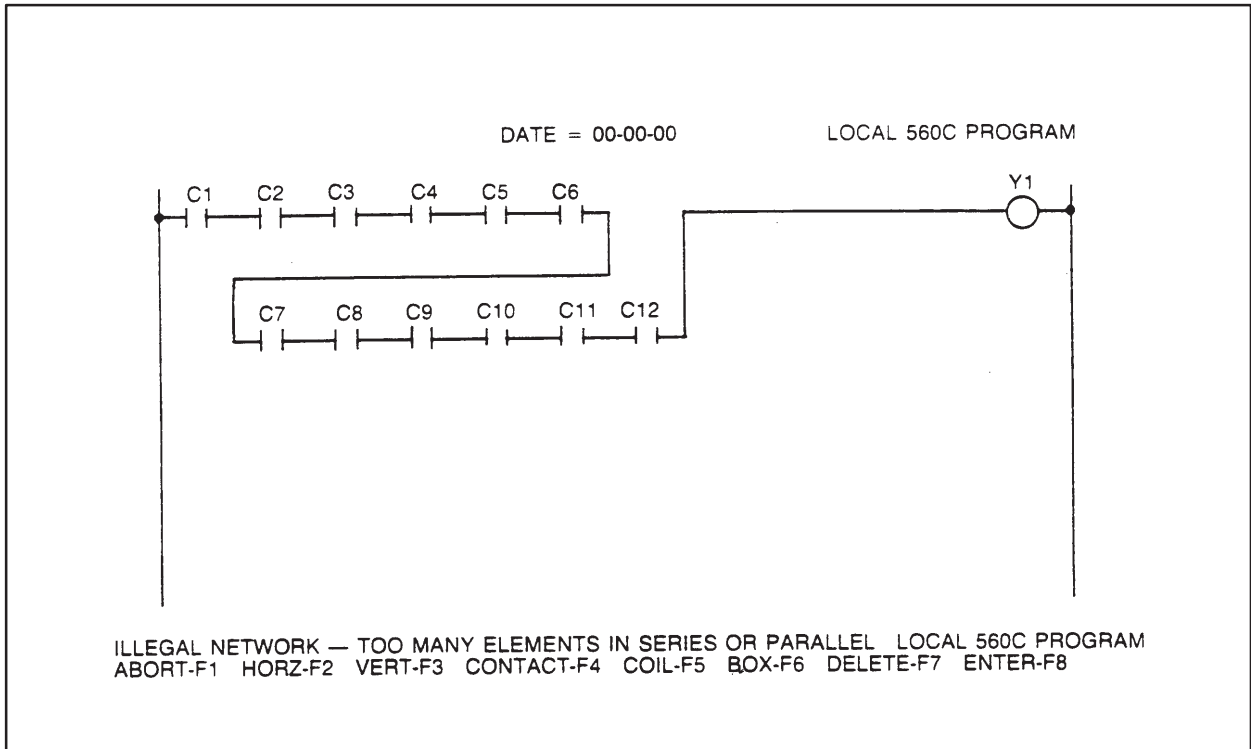
Invalid Ladder Logic Constructions (continued)



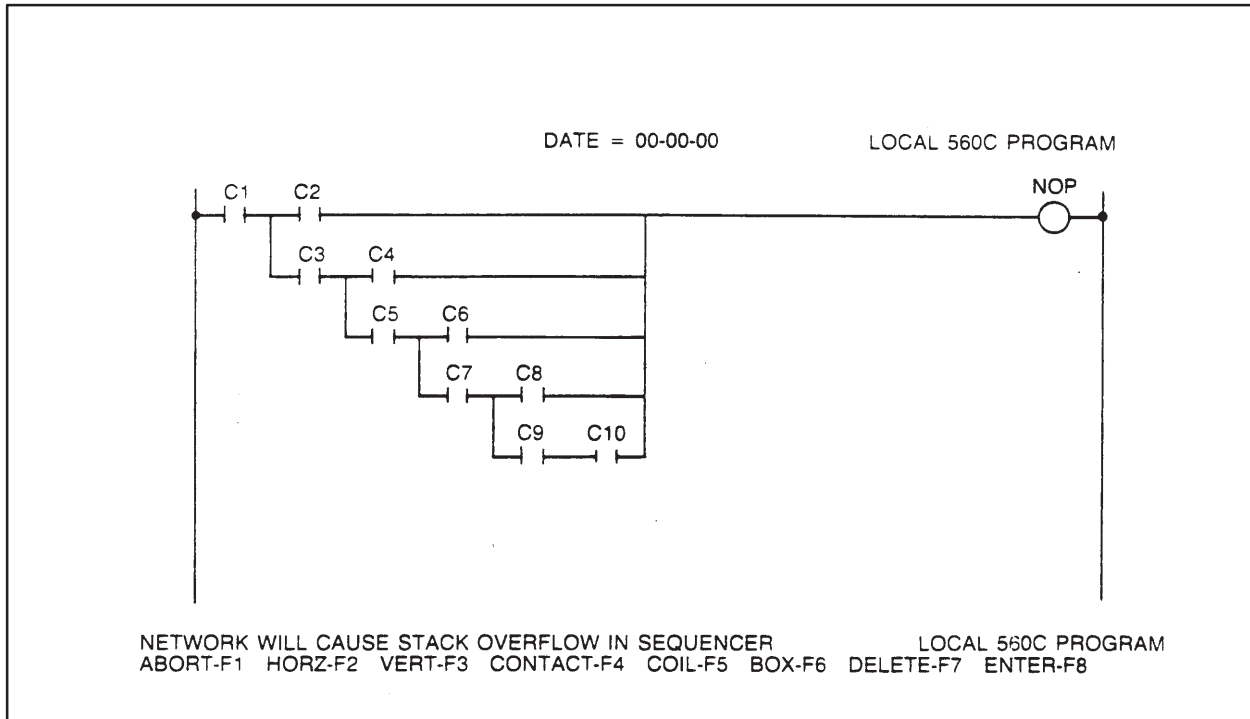


Invalid Ladder Logic Constructions (continued)





Invalid Ladder Logic Constructions (continued)



A.2 560/565 Online Error Conditions

	<p>The following are SIMATIC 560/565 error conditions reported by the VPU200 that require a change or a fix for the situation that caused the error before the requested operation can proceed.</p>
Fatal Error Detected	<p>The sequencer will not perform or continue with the requested operation because a fatal error was found. Use AUX or SUPPORT Function 29 to determine what type of fatal error occurred.</p>
Illegal Instruction at Address #####	<p>The sequencer found an illegal instruction at the specified address during a Program-to-Run transition. Use the VPU to edit and reenter the logic at the given address.</p>
Illegal Request in Current Operation Mode	<p>The requested operation cannot be performed while the sequencer is in the current mode. This usually occurs if the sequencer is in the Run mode. Put the sequencer in the Program or Freeze mode and retry the operation.</p>
COMM Error in Hold Mode-Transition to Run Not Allowed	<p>A communications error occurred while a runtime edit was in progress. this may have caused the ladder rung being edited to contain an error. You must switch from RUN to PROGRAM and verify that the rung is correct before going to the RUN mode.</p>
Invalid Operation with the Local/Remote Mode	<p>The requested operation cannot be performed while the NIM is in the current mode. Change the mode of the NIM and retry the operation.</p>
Keylock Protect Error	<p>The requested operation cannot be performed because the key lock on the 560/565 is in the PROTECT position.</p>
No Response from the SF Module	<p>Communication cannot be established with the Special Function module. Check that the module is properly configured, and that all communication lines are intact.</p>
P/C Busy-Cannot Complete Requested Operation	<p>The command sent from the VPU200 was not completed after three attempts because the sequencer was busy. Retry the operation. or perform it with the VPU connected directly to the P/C. This message is most likely to occur when communicating through a remote base.</p>

A.3 VPU Generated Error Messages

The following is a list of VPU error messages and warnings that may appear. A description of what may have caused the error and what can be done to correct it is given after the message.

Communications Error	The VPU200 has lost communications with the sequencer. Check the cable running from the VPU to the sequencer or the remote base for proper connection.
Disk Not Initialized	This message occurs if the operating system cannot find information on the user disk. This is caused by not initializing your disk before trying to write information to it not having a disk in the drive. or by opening the drive door. See ERROR READING FROM DISK for more information.
Error Reading from Disk/Error Writing to Disk	Error writing occurs if the disk is write-protected and an attempt is made to write to the disk. Error reading occurs on the first attempt at a disk read or write after the disk door has been opened and the original disk reinserted or the disk swapped. Retrying the operation will clear the error and proceed with the requested function. If the error does not clear after a few retries, the disk is probably damaged. Try to copy the data to a new disk or use your backup disk.
I/O Configuration Error-Too Many Points	The maximum number of I/O points per base is exceeded with the current configuration. Reduce the number of points or distribute them over more than one base.
Memory Configuration does not Match that of Disk	An attempt was made to load or save data to a destination P/C or disk which has a smaller memory size than the source P/C or disk. For example, trying to save 32K of L-memory to a disk with 16K of L-memory configured would give this error. Use the Configure Memory function to make the memory sizes equal or use a Save/Load All which will make the memory size of the destination device equal to that of the source device.
Memory Configuration Error-Requested Memory Size is Larger than Maximum Defined Value	The VPU cannot write the requested memory configuration to the P/C because the P/C does not contain enough memory. This error will occur if an attempt is made to write S-memory to a 560 controller with no 565 controller present.
Non Ladder Logic Address Out-of-Range	This occurs if a location was written using a large memory configuration, and the memory size was then reduced. For example. having V10000 in a timer and then reducing the memory size to 4K would cause the out-of-range error. Either increase the memory size, or change the out-of-bounds designation to one within the new memory size.

Unable to Redraw
Ladders because
of Error

This will occur when you go to the Ladder mode if there is no communication with the sequencer. (See Communications Error.)

Network Too Large
to Insert into
Program

This error occurs on a Modify or Insert operation when the newly edited rung is too large to fit in the existing L-memory. This usually occurs if a rung is at or near the end of L-memory and you try to insert a rung before it. The result is to try to push the last rung beyond L-memory. The error message is given and the Insert/Modify is not performed.

Inefficient Space to
Copy Block

This error is essentially the same as NETWORK TOO LARGE TO INSERT INTO PROGRAM except that it occurs when doing a block copy of ladder logic rather than a Modify/Insert operation.

Box Writes to
Multiple Memory
Values, Max Limit
Exceeded

The requested box configuration would cause writes across channel boundaries. For example, if your destination address started at X2045 and your N value were 8, the resulting destination addresses would be X2045–X2052. The channel boundary is 1025 – 2048, so the error would result.

Customer Response

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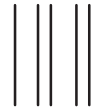
Edition: Fourth

Manual Assembly Number: 2597773-0006

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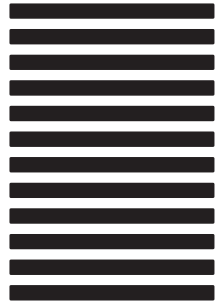
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