

SPERRY UNIVAC

System Test

User Guide

W

Mini-Computer Operations

2722 Michelson Drive

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Irvine, California 92713

UP-9098 Rev. 2

6334-00

SYSTEM TEST

Rev E

9 TRK 800 BPI MAGNETIC TAPE

92G0114-001	E0	System Test (PROPRIETARY)
92W0114-001	E0	System Test Release Description
92M0114-001	E0	System Test Listing
UP-9098		System Test Manual



SYSTEM TEST

User Guide

UP-9098 Rev. 2

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Part/Section	Page Number	Update Level	Part/Section	Page Number	Update Level	Part/Section	Page Number	Update Level
Cover								
PSS	1							
CR	1							
Contents	1 thru 10							
1	1 thru 6							
2	1 thru 6							
3	1 thru 11							
4	1 thru 35							
5	1 thru 18							
6	1 thru 64							
7	1 thru 77							
Appendix A	1 thru 21							
User Comment								

*New pages

All the technical changes are denoted by an arrow (→) in the margin. A downward pointing arrow (↓) next to a line indicates that technical changes begin at this line and continue until an upward pointing arrow (↑) is found. A horizontal arrow (→) pointing to a line indicates a technical change in only that line. A horizontal arrow located between two consecutive lines indicates technical changes in both lines or deletions.

CHANGE RECORD

UP-9098 Rev. 2

Change Designation	Issue Date	Change Description
	April 1980	Original issue.
Revision 1	June 1981	The Laser Printer Test, Intercomputer Link Test, Terminal Test (UTS 10, TTY), MSC Disk Controller Test and Diskette Test unit programs were added to the system test. In addition, Diagnostic Test mode was incorporated into the V77-800 WCS/FPP (M4WC15) the memory (M4ME03), and the Magnetic Tape (M4MT07) Unit Test Programs.
Revision 2	November 1981	The Real Time Clock Test, 24-Level PIM test, Card Reader Test and UASC Test were added to the System Test. In addition, Diagnostic Test mode was incorporated into the Line Printer Test. Also added is the updated System Generation.

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Contents

PAGE STATUS SUMMARY

CHANGE RECORD

CONTENTS

1	INTRODUCTION	
1.1	GENERAL.	1-1
1.2	SCOPE.	1-1
1.3	DESCRIPTION OF THE SYSTEM TEST	1-2
1.4	RELATED PUBLICATIONS	1-3
1.5	NOTATIONS USED IN THIS MANUAL.	1-5
2	SYSTEM OVERVIEW	
2.1	COMPONENTS OF THE SYSTEM TEST.	2-1
2.1.1	PRELIMINARY TESTS.	2-1
2.1.1.1	Instruction Test	2-1
2.1.1.2	Memory Test.	2-1
2.1.1.3	24-Level Pim Test.	2-1
2.1.1.4	Real Time Clock Test	2-2
2.1.2	LOADER	2-1
2.1.3	SYSTEM TEST GENERATOR.	2-2
2.1.4	EXECUTIVE PROGRAM.	2-2
2.1.5	UNIT PROGRAM LIBRARY	2-2
2.2	DESIGN GOALS AND MAINTENANCE CONCEPTS.	2-4
2.3	OPERATIONAL FEATURES.	2-6
3	SYSTEM TEST GENERATION	
3.1	PURPOSE	3-1
3.2	HARDWARE CONFIGURATION	3-1

3.3	OVERVIEW OF THE PROCESS.	3-2
3.4	SAMPLE SYSTEM TEST GENERATION.	3-2
3.4.1	PREPARATION.	3-3
3.4.1.4.1	Preliminary Tests.	3-3
3.4.2	LOADING THE PRELIMINARY TESTS AND LOADER	3-7
3.4.2.1	Manual Loading Via the Computer Control Panel (V77-600 Computers Only).	3-7
3.4.2.2	Manual Loading Via the Virtual Console (V77-800 Computers Only)	3-8
3.4.3	MASTER SYSTEM TEST GENERATION FROM ONE MEDIUM TO ANOTHER.	3-8
3.4.4	ERROR INDICATIONS AND HANDLING	3-9
3.4.5	CONFIGURATION DIALOG	3-10
4	CONFIGURATION DIALOG	
4.1	GENERAL.	4-1
4.2	SYSTEM TEST CONFIGURATION GUIDE.	4-1
4.3	CONFIGURATION QUESTIONS.	4-4
4.3.1	CONFIGURATION HEADER INFORMATION	4-5
4.3.2	INTRODUCTORY CONFIGURATION QUESTION.	4-5
4.3.2.1	Acceptable Replies	4-6
4.3.2.2	Example.	4-7
4.3.3	CONFIGURATION QUESTION NUMBER 1.	4-7
4.3.3.1	Purpose.	4-7
4.3.3.2	Acceptable Replies	4-7
4.3.3.3	Example.	4-8
4.3.4	CONFIGURATION QUESTION NUMBER 2.	4-9
4.3.4.1	Purpose.	4-9
4.3.4.2	Acceptable Replies	4-9
4.3.4.3	Example.	4-10
4.3.5	CONFIGURATION QUESTION NUMBER 3.	4-10
4.3.5.1	Purpose.	4-10
4.3.5.2	Acceptable Replies	4-10
4.3.5.3	Example.	4-11
4.3.6	CONFIGURATION QUESTION NUMBER 4.	4-11
4.3.6.1	Purpose.	4-11
4.3.6.2	Acceptable Replies	4-11
4.3.6.3	Example.	4-12

4.3.7	CONFIGURATION QUESTION NUMBER 5.	4-12
4.3.7.1	Purpose.	4-12
4.3.7.2	Acceptable Replies	4-12
4.3.7.3	Example.	4-12
4.3.8	CONFIGURATION QUESTION NUMBER 6.	4-13
4.3.8.1	Purpose.	4-13
4.3.8.2	Acceptable Replies	4-13
4.3.8.3	Example.	4-14
4.3.9	CONFIGURATION QUESTION NUMBER 7.	4-14
4.3.9.1	Purpose.	4-14
4.3.9.2	Acceptable Replies	4-14
4.3.9.3	Example.	4-15
4.3.10	CONFIGURATION QUESTION NUMBER 8	4-15
4.3.10.1	Purpose.	4-16
4.3.10.2	Acceptable Replies	4-16
4.3.10.3	Example.	4-16
4.3.11	CONFIGURATION QUESTION NUMBER 9.	4-16
4.3.11.1	Purpose.	4-17
4.3.11.2	Acceptable Replies	4-17
4.3.11.3	Example.	4-17
4.3.12	CONFIGURATION QUESTION 10.	4-17
4.3.12.1	Purpose.	4-18
4.3.12.2	Acceptable Replies	4-18
4.3.12.3	Example.	4-18
4.3.13	CONFIGURATION QUESTION NUMBER 11	4-18
4.3.13.1	Purpose.	4-19
4.3.13.2	Acceptable Replies	4-20
4.3.13.3	Examples	4-23
4.3.14	CONFIGURATION QUESTION NUMBER 12	4-24
4.3.14.1	Purpose.	4-24
4.3.14.2	Acceptable Replies	4-25
4.3.14.3	Example.	4-26
4.3.15	CONFIGURATION QUESTION NUMBER 13	4-27
4.3.15.1	Purpose.	4-27
4.3.15.2	Acceptable Replies	4-27
4.3.15.3	Example.	4-28
4.3.16	CONFIGURATION QUESTION NUMBER 14	4-28
4.3.16.1	Purpose.	4-28
4.3.16.2	Acceptable Replies	4-29
4.3.16.3	Example.	4-30
4.3.17	CONFIGURATION QUESTION NUMBER 15	4-30
4.3.18	CONFIGURATION QUESTION NUMBER 16	4-30
4.3.19	CONFIGURATION QUESTION NUMBER 17	4-31
4.3.20	CONFIGURATION QUESTION NUMBER 99	4-31
4.3.21	PREPARATION OF THE CONFIGURED SYSTEM TEST	4-31
4.4	ERROR DETECTION DURING SYSTEM TEST GENERATION	4-33
4.4.1	PRELIMINARY PROGRAM.	4-33

4.4.2	ERRORS DETECTED BY THE SYSTEM TEST	
	GENERATOR.	4-34
4.4.2.1	Map Errors	4-34
4.4.2.2	Configuration Errors	4-35
4.4.2.3	Input and Output Errors.	4-35
5	CONFIGURATION SYSTEM TEST: OPERATIONAL THEORY	
5.1	GENERAL.	5-1
5.2	PURPOSE	5-1
5.3	COMPONENTS	5-1
5.3.1	PRELIMINARY INSTRUCTION TEST	5-2
5.3.2	PRELIMINARY MEMORY TEST.	5-2
5.3.3	PRELIMINARY 24 LEVEL PIM TEST.	5-3
5.3.4	PRELIMINARY REAL TIME CLOCK TEST	5-4
5.3.5	LOADER	5-4
5.3.6	EXECUTIVE PROGRAM.	5-7
5.3.7	UNIT PROGRAMS.	5-7
5.3.5.1	Identification	5-7
5.3.5.2	Assembly	5-8
5.3.5.3	Executive Service Calls.	5-13
5.3.5.4	Operational Theory	5-17
6	SYSTEM TEST OPERATION	
6.1	OVERVIEW	6-1
6.2	PREPARATION.	6-1
6.3	LOADING THE CONFIGURED SYSTEM TEST	6-2
6.4	OPERATOR COMMANDS.	6-2
6.4.1	USING THE OPERATOR COMMANDS.	6-4
6.4.1.1	Prompter Command	6-6
6.4.1.2	Status Command	6-6
6.4.2	HELP COMMAND	6-6
6.4.2.1	Purpose.	6-7
6.4.2.2	Format	6-7
6.4.2.3	Example.	6-7
6.4.3	INDEX COMMAND.	6-8
6.4.3.1	Purpose.	6-9
6.4.3.2	Format	6-9
6.4.3.3	Usage.	6-8
6.4.3.4	Example.	6-9
6.4.4	LOG COMMAND.	6-10

6.4.4.1	Purpose.	6-10
6.4.4.2	Format	6-11
6.4.4.3	Usage.	6-11
6.4.4.4	Example.	6-12
6.4.5	RUN COMMAND.	6-12
6.4.5.1	Purpose.	6-12
6.4.5.2	Format	6-12
6.4.5.3	Usage.	6-13
6.4.5.4	Examples	6-16
6.4.6	DISABLE COMMAND.	6-19
6.4.6.1	Purpose.	6-19
6.4.6.2	Format	6-19
6.4.6.3	Usage.	6-20
6.4.6.4	Examples	6-21
6.4.7	ENABLE COMMAND	6-22
6.4.7.1	Purpose.	6-22
6.4.7.2	Format	6-22
6.4.7.3	Usage.	6-23
6.4.7.4	Examples	6-24
6.4.8	CHANGE COMMAND	6-24
6.4.8.1	Purpose.	6-24
6.4.8.2	Format	6-25
6.4.8.3	Usage.	6-26
6.4.8.4	Examples	6-27
6.4.9	CHANGE MAP COMMAND	6-29
6.4.9.1	Purpose.	6-29
6.4.9.2	Format	6-30
6.4.9.3	Usage.	6-30
6.4.9.4	Examples	6-30
6.4.10	EDIT COMMAND	6-32
6.4.10.1	Purpose.	6-32
6.4.10.2	Format	6-32
6.4.10.3	Usage.	6-32
6.4.10.4	Examples	6-33
6.4.11	LIST COMMAND	6-35
6.4.11.1	Purpose.	6-35
6.4.11.2	Format	6-35
6.4.12	INSERT COMMAND	6-35
6.4.12.1	Purpose.	6-35
6.4.12.2	Format	6-35
6.4.12.3	Usage.	6-36
6.4.12.4	Examples	6-36
6.4.13	KEY COMMAND.	6-37
6.4.13.1	Purpose.	6-37
6.4.13.2	Format	6-37
6.4.13.3	Usage.	6-37
6.4.13.4	Example.	6-38
6.4.14	REG COMMAND.	6-38

6.4.14.1	Purpose.	6-39
6.4.14.2	Format	6-39
6.4.14.3	Usage.	6-40
6.4.14.4	Examples	6-40
6.4.15	SEARCH COMMAND	6-41
6.4.15.1	Purpose.	6-41
6.4.15.2	Format	6-41
6.4.15.3	Usage.	6-42
6.4.15.4	Examples	6-42
6.4.16	TRAP COMMAND	6-43
6.4.16.1	Purpose.	6-43
6.4.16.2	Format	6-43
6.4.16.3	Usage.	6-44
6.4.16.4	Examples	6-45
6.4.17	VIEW COMMAND	6-46
6.4.17.1	Purpose.	6-46
6.4.17.2	Format	6-46
6.4.17.3	Usage.	6-47
6.4.17.4	Examples	6-47
6.5	SUMMARY OF OPERATOR COMMANDS	6-48
6.6	EXECUTIVE SERVICE CALLS.	6-50
6.7	SAMPLE SESSION	6-50
6.8	ERROR DETECTION.	6-54
6.8.1	MAP ERRORS	6-54
6.8.2	COMMAND ERRORS	6-55
6.8.3.	EXECUTION ERRORS	6-56
6.8.3.1	Print Request Error.	6-56
6.8.3.2	Invalid BIC Request.	6-56
6.8.3.3	BIC Request Error.	6-57
6.8.3.4	Memory Protect Error	6-57
6.8.3.5	Unexpected Interrupt	6-61
6.8.3.6	I/O Request Error.	6-62
6.8.3.7	Unit Program Errors.	6-63

7 UNIT PROGRAM LIBRARY

7.1	V77-600 WRITABLE CONTROL STORE (F3034)	
	UNIT PROGRAM - M4WC01.	7-1
7.1.1	PURPOSE AND OPERATION.	7-1
7.1.2	WCS ERROR MESSAGES	7-1
7.1.3	EXAMPLES	7-2

7.2	V77-800 WRITABLE CONTROL STORE (WCS)/ FLOATING POINT PROCESSOR (FPP) TEST UNIT PROGRAM) - M4WC15	7-3
7.2.1	PURPOSE AND OPERATION.	7-3
7.2.1.1	System Test Mode	7-3
7.2.1.2	Diagnostic Test Mode	7-3
7.2.2	ERROR MESSAGES	7-5
7.3	V77-600 FLOATING POINT PROCESSOR (F3027) UNIT PROGRAM - M4FP02.	7-6
7.3.1	PURPOSE AND OPERATION.	7-6
7.3.2	FPP ERROR MESSAGES	7-6
7.3.3	EXAMPLES	7-7
7.4	MEMORY TEST - M4ME03	7-7
7.4.1	PURPOSE AND OPERATION.	7-7
7.4.1.1	System Test Mode	7-7
7.4.1.2	Diagnostic Test Mode	7-8
7.4.2	ERROR MESSAGES	7-9
7.5	CARTRIDGE DISK UNIT PROGRAM M4DF04	7-10
7.5.1	PURPOSE AND OPERATION.	7-10
7.5.1.2	System Mode.	7-10
7.5.1.3	Diagnostic Mode.	7-10
7.5.2	ERROR MESSAGES	7-14
7.5.2.1	Big Error Messages-.	7-15
7.5.2.2	Device Error Messages-.	7-15
7.5.3	EXAMPLES	7-17
7.6	DISK MEMORY AND CONTROLLER UNIT PROGRAM - M4DC05	7-19
7.6.1	PURPOSE AND OPERATION.	7-19
7.6.2	ERROR MESSAGES	7-19
7.6.3	EXAMPLES	7-21
7.7	DIRECT MEMORY ACCESS DISK UNIT PROGRAM - M4DH06	7-22
7.7.1	PURPOSE AND OPERATION.	7-22
7.7.2	ERROR MESSAGES	7-22
7.7.3	EXAMPLES	7-24
7.8	V77 MAGNETIC TAPE TEST UNIT PROGRAM - M4MT07	7-25
7.8.1	PURPOSE AND OPERATION.	7-25
7.8.1.1	System Test Mode	7-25
7.8.1.2.1	Diagnostic Test Mode	7-26
7.8.2	ERROR MESSAGES	7-29
7.8.3	EXAMPLE.	7-31

7.9	LINE PRINTER UNIT PROGRAM - M4LP08	7-32
7.9.1	PURPOSE AND OPERATION.	7-32
7.9.1.1	System Test Mode	7-32
7.9.1.2	Diagnostic Test Mode	7-33
7.9.1.2.1	Diagnostic Parameters.	7-33
7.9.2	ERROR MESSAGES	7-34
7.9.2.1	Bic Error Messages	7-35
7.9.2.2	Device Error Message	7-35
7.9.3	EXAMPLES.	7-36
7.10	DATA COMMUNICATIONS MULTIPLEXER UNIT	
	PROGRAM - M4DM09	7-36
7.10.1	PURPOSE AND OPERATION.	7-36
7.10.2	ERROR MESSAGES	7-37
7.10.3	EXAMPLE.	7-38
7.10.4	JUMPER CONFIGURATIONS	7-38
7.11	V77 LASER PRINTER TEST UNIT PROGRAM	
	(F3068-XX AND T0777) - M4ZP12.	7-40
	PURPOSE AND OPERATION.	7-40
7.11.1.1	System Test Mode	7-40
7.11.1.2	Diagnostic Mode.	7-40
7.11.2	ERROR MESSAGES	7-44
7.11.3	EXAMPLES	7-50
7.12	V77 INTERCOMPUTER LINK UNIT PROGRAM	
	(E-1499) - M4CC11.	7-51
7.12.1	PURPOSE AND OPERATION.	7-52
7.12.1.1	System Test Mode	7-52
7.12.1.2	Diagnostic Test Mode	7-32
7.12.2	ERROR MESSAGES	7-52
7.12.2.1	BIC Error Messages	7-53
7.12.2.2	Failure Messages	7-53
7.12.3	DIAGNOTIC MESSAGES	7-54
7.13	V77 TERMINAL TEST UNIT PROGRAM UTS10 TTY	
	X3.64 (F3577-00, -01) - M4TT10	7-54
7.13.1	PURPOSE AND OPERATION.	7-54
7.13.1.1	System Test Mode	7-55
7.13.1.2	Diagnostic Test Mode	7-55
7.13.2	ERROR MESSAGE.	7-58

7.14	V77 MSC DISK CONTROLLER TEST UNIT	
	PROGRAM - M4DG13	7-60
7.14.1	PURPOSE AND OPERATION.	7-60
7.14.1.1	System Test Mode	7-61
7.14.1.2	Diagnostic Test Mode	7-61
7.14.2	ERROR MEESSAGES.	7-64
7.15	V77 DISKETTE TEST UNIT PROGRAM - M4DJ16.	7-66
7.15.1	PURPOSE AND OPERATION.	7-66
7.15.1.1	System Test Mode	7-66
7.15.1.2	Diagnostic Test Mode	7-67
7.15.2	ERROR MESSAGES	7-71
7.16	V77 CARD READER TEST UNIT PROGRAM	7-72
7.16.1	PURPOSE AND OPERATION.	7-72
7.16.1.1	System Test Mode	7-72
7.16.1.2	Diagnostic Test Mode	7-73
7.16.2	HELP MESSAGES.	7-73
7.16.3	ERROR MESSAGES	7-74
7.17	V77 UASC TEST UNIT PROGRAM	7-75
7.17.1	PURPOSE AND OPERATION.	7-75
7.17.1.1	System Mode.	7-76
7.17.1.2	Diagnostic Mode.	7-76
7.17.2	ERROR MESSAGE.	7-76
7.17.2.2	BIC Error Message.	7-77
7.17.2.3	UASC Error Message	7-77

A SYSTEM TEST GENERATION TUTORIAL GUIDE

A-1	PURPOSE.	A-1
A-2	SYSTEM TEST CONFIGURATION GUIDE.	A-2
A-3	SAMPLE SYSTEM TEST GENERATION LISTING.	A-13
A-4	BLANK SYSTEM TEST CONFIGURATION GUIDE.	A-17

FIGURES

1-1	System Test: Operational Flow	1-4
A-1	Excerpts From A System Memo.	A-10
7-1	Test 1 System Mode Sample Print-out.	7-47
7-2	Test 6 Overprint Underscore Sample Print-out	7-48
7-3	Test 7 Graphic Character Modification Sample Print-out	7-49

TABLES

3-1	Magnetic Tape Bootstrap Routine (BIC Version)	3-5
3-2	Cartridge Disk Bootstrap Routine	3-6
4-1	Model 0 (Type DF) Disks and Corresponding Platter Numbers.	4-22
5-1	Preliminary Instructions Test Summary.	5-5
5-2	Preliminary Instruction Test Error Codes	5-6
5-3	TIBD (Task Information Data Block)	5-9
5-4	TIDB Status Word (Word 1 of TIDB) Format	5-10
5-5	Unit Program IDs	5-11
5-6	Contents of Location 01000 to 01007.	5-12
5-7	Contents of Location 01010-01027	5-10
5-8	Executive Service Calls.	5-13
5-9	Data Passed by Executive Service Calls	5-14
5-10	Data Passed By Executive Service Calls	5-15
7-1	Disk Memory Status Word Significance	7-21
	Significance.	7-18
7-2	Direct Memory Access Disk Status Word Significance.	7-23
7-3	Direct Memory Access Disk Secondary Status Word Significance.	7-24
7-4	LAD Type and Feature Number Cross-Reference.	7-37
7-5	Laser Printer Status	7-45
7-6	Channel Controller Status.	7-45
7-7	Laser Printer Sense Bytes.	7-46
7-8	Channel Controller Status.	7-8

Section 1 Introduction

1.1 GENERAL

This manual describes the SPERRY UNIVAC System Test. The System Test is a real-time, multiprogrammed, offline, standalone system test for SPERRY UNIVAC V77-600 and V77-800 computers. The System Test can be ordered as Type Number 6334-xx. The System Test supplements the MAINTAIN III Test Programs. It is neither a replacement nor a substitute for the MAINTAIN III Test Programs.

1.2 SCOPE

This manual contains descriptive data, operating instructions, and reference material. The material is directed toward the person who is responsible for diagnosing malfunctions and maintaining Sperry Univac minicomputers. This person is referred to, in this manual, as the "operator of the test".

Detailed procedures for generating a System Test configured for a specific system configuration, and running it on that system, are provided. Errors detected by the System Test result in the generation of error messages. All these error messages are listed and explained in this manual. The components of the System Test and their interrelationships are described. Information about the theory of operation is provided to allow the reader to develop an understanding of the design structure of the System Test.

This manual is intended to be used in conjunction with servicing manuals for the system's mainframe and peripheral equipment. Familiarity with the MAINTAIN III Test Program System is necessary, since this test is usually used in conjunction with the MAINTAIN III Test Programs.

The information in this manual is organized as follows:

Section 1	Introduction	Overview of the manual and the System Test.
Section 2	System Overview	Descriptive data about System Test components, concepts and features.

Section 3	System Test Generation	Explanation of the process and step-by-step procedures for the generation of a configured System Test.
Section 4	Configuration Dialog	Description of the dialog; discussion of each of the configuration questions; examples; preparation of the configured System Test, and error detection and handling during system test generation.
Section 5	Configured System Test: Operational Theory	Functional description of the configured System Test components.
Section 6	System Test Operation	Procedures for initial preparation and loading of the configured System Test; explanation of how the operator can interact with the test.
Section 7	Unit Program Library	Description of purpose and operation of each program in the Unit Program Library. Error messages output by each program are included.

1.3 DESCRIPTION OF THE SYSTEM TEST

The System Test is an offline, standalone, diagnostic software package for V75/76 and V77-500/600/700/800 Sperry Univac minicomputers. It allows system components to be tested simultaneously. The System Test allows the user to diagnose malfunctions and maintain Sperry Univac mainframe components and peripherals.

The System Test has the following features:

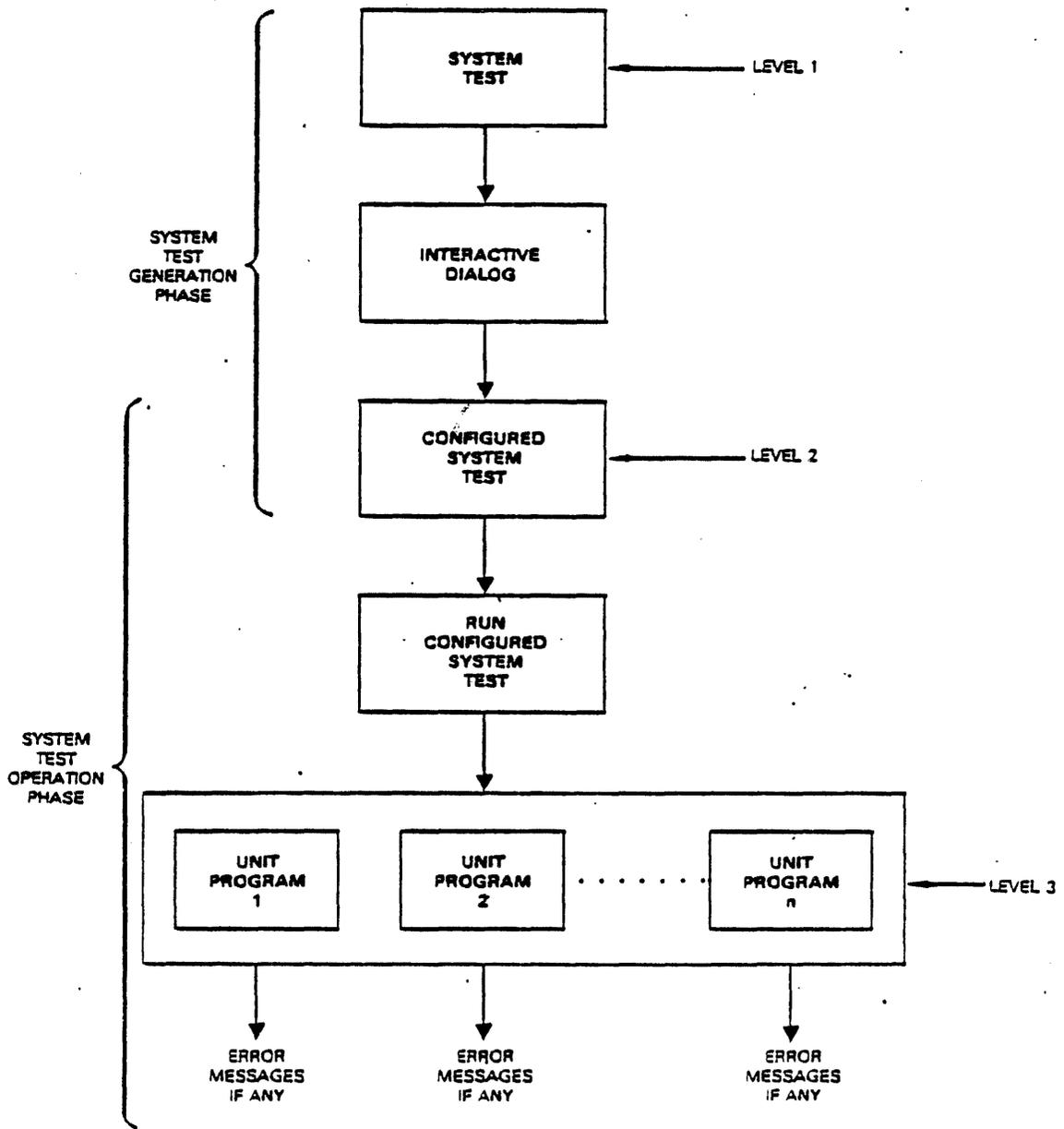
- It is an effective diagnostic tool which allows quick validation of system hardware.
- The operator is not required to have a detailed knowledge of the internal design of the system in order to operate the System Test.

- A simple procedure allows the operator to configure the System Test to meet the test requirements of a particular system. This procedure involves interactive dialog between the operator and the System Test Generator (which is a part of the System Test). The System Test Generator leads the operator step-by-step through the configuration process.
- For a given system configuration, the operator has to generate the configured System Test only once. The configured System Test can be saved on magnetic tape, cartridge disk, or floppy disk and this media can be used whenever System Test operation is required. Also, additional copies of the configured System Test can be easily made upon successful completion of System Test generation.
- Easy-to-use commands allow the operator to direct and interact with the test.
- Real-time, unit-level tests are available. Error messages output by these tests pinpoint failing mainframe or peripheral components in the system.
- Once activated, unit-level tests do not require any operator intervention. They run continuously unless the operator intervenes, and they automatically output any error messages that may be generated.
- The System Test provides the means for quick and concurrent validation of system hardware operation.
- A count of all the errors detected by each unit test is maintained.

Figure 1-1 is a simplified block diagram showing the three levels and two phases of the test. These concepts are discussed in greater depth in later sections of this manual.

1.4 RELATED PUBLICATIONS

The following Sperry Univac manuals are applicable to the use of the System Test.



UII-4545

Figure 1-1. System Test: Operational Flow

<u>Title</u>	<u>Document Number</u>
VORTEX II Operating System Programmer Reference	UP-8677
VORTEX II System Generation User Guide/ Programmer Reference	UP-9083
VORTEX II Online Test User Guide	UP-9120
MAINTAIN III Test Programs User Manual	UP-8672
V70 Series Architecture Reference	UP-8634
V77-500 Computer System Description	UP-8925
V77-600 System Reference	UP-8651
V77-700 Computer System Description	UP-8927
V77-800 Computer System Description	UP-8701
V77-800 Computer Operations Reference	UP-9028
Peripheral Equipment Manuals*	
System Memo	

1.5 NOTATIONS USED IN THIS MANUAL

The following notations are used throughout this document:

- ° - Indicates a space character.
- Any number with at least one leading zero denotes an octal number.
- All completely capitalized words must be entered exactly as indicated.

* A peripheral equipment manual is provided for each peripheral device in the system.

- All lowercase words and words enclosed within angle brackets < > represent generic terms to be supplied by the user. They denote variable entries which depend upon the nature of the field.

- [] - Square brackets enclose optional elements.

Braces enclose options of mandatory fields, indicating that one of the options must be selected.

- <cr> - Indicates a carriage-return character.
- <cc> - Indicates a Control C input.
- <sp> - Indicates a space input.
- <.> - Indicates a period input.

NOTE

These inputs are indicated in the manual for explanatory purposes only. They do not echo on the terminal.

- Shaded text - Represents text entered by the user (i.e., user input.)

Section 2 System Overview

2.1 COMPONENTS OF THE SYSTEM TEST

The System Test consists of the following components:

- Preliminary Tests
 - Instruction Test
 - Memory Test
- Loader
- System Test Generator
- Executive Program
- Unit Program Library

2.1.1 PRELIMINARY TESTS

2.1.1.1 Instruction Test

This test validates basic CPU operations. For a detailed discussion of this test, refer to Section 5 of this manual.

2.1.1.2 Memory Test

The Preliminary Memory Test is a 32K (map 0) memory test. It checks the operational status of the computer memory and detects faults. For more information about the Preliminary Memory Test, refer to Section 5 of this manual.

2.1.1.3 24-Level Pim Test

The 24-Level Pim Test insures interrupts are being handled properly for all 24 interrupt lines. For more information about the 24-Level Pim Test, refer to Section 5 of this manual.

2.1.1.4 Real Time Clock Test

The Real Time Clock Test insures that clock interrupts are being received. For more information about the Real Time Clock Test, refer to Section 5 of this manual.

2.1.2 LOADER

The Loader is a binary loader. Following successful execution of the Preliminary tests, the Loader automatically loads the rest of the System Test. For more details about the Preliminary Loader, refer to Section 5.

2.1.3 SYSTEM TEST GENERATOR

The System Test Generator helps the operator tailor the standard System Test to meet the test requirements of his particular system. An interactive dialog takes place, during which the System Test Generator asks the operator a number of questions regarding the following:

- (a) The system on which the configured System Test is being generated (the SYS GEN CPU), and
- (b) the system on which the configured System Test will be executed (the SYS TEST CPU).

The two systems, namely, the SYS GEN CPU and the SYS TEST CPU, can be identical or different.

At the conclusion of the dialog, a configured System Test is generated and output. This test is configured specifically for the system which the operator intends to test.

2.1.4 EXECUTIVE PROGRAM

The Executive Program is the principal controlling component of the System Test. It has the following functions:

- Controls the execution of the configured System Test.
- Creates the environment in which unit programs operate.
- Schedules and maps unit programs.
- Maintains a count of errors detected by each unit program.
- Provides the user interface. Commands entered by the operator to direct the System Test are executed by the Executive Program.
- Performs all interrupt and I/O functions.

2.1.5 UNIT PROGRAM LIBRARY

All available unit programs are contained in this library. To generate the configured System Test, the System Test Generator selects specific unit programs from this library. Unit programs are currently available to test the following system components:

- Writable Control Store (F3034) for V77-600
- Floating-Point Processor (F3027) for V77-600
- Writable Control Store (F3057) and Floating-Point Processor (F3053) for V77-800
- Main Memory
- Cartridge Disk and Controller
 - Models 70-7600 and 70-7610: (Type DB)*
 - F3094, F3096, F3310, F3016: (Type DF)*
- Disk Memory and Controller
 - 2822 (Type DC)*
 - Model 70-7510 (Type DD)*
 - 2823, 2824, F3092: (Type DE)*
- Direct Memory Disk Drive and Controller
 - 2825, 2826, 2842, 2843, 8433: (Type DH)*

- Magnetic Tape and Controller
 - Model 0 (F3088, F3089)
 - Model 1 (F3093, 0870)
- Line Printer and Controller
 - 2819, 2820, and 0786: (Printers)
 - F3361
- Data Communications Multiplexer (DCM)
 - DCM (F3000)
 - Line Adapters (LADs)
 - F3001-01, -02, -03, -04, -05.
 - F3006
 - Modem Controllers
 - F3002
 - F3003
 - F3004
 - F3005
 - F3006
- Flexible Disk Controller
 - F3353 and F3375 (Type DJ)*
- Card Reader
 - 2812

When the System Test is loaded and executed, each selected unit program is mapped into a separate memory protection key and runs in multitask, interrupt-driven mode. When a unit program is finished, it is relocated into the next available memory protect

* These are Software Model Codes used in Sysgen directives. Refer to VORTEX II System Generation User Guide, UP-9083.

key and rerun. Each unit program tests only one mainframe or I/O device option. Therefore, any error messages generated by a particular unit program will help the operator isolate the failing module or I/O device. The first line of the error message always identifies the unit program which generates it.

2.2 DESIGN GOALS AND MAINTENANCE CONCEPTS

The System Test helps the operator test and maintain Sperry Univac V75, V76, V77-600, and V77-800 minicomputers. It is designed to provide a quick validation of system hardware prior to running the VORTEX II Operating System. It should be run after the system has successfully executed the MAINTAIN III Test programs. (Refer to MAINTAIN III Test Programs User Manual, UP-8672).

NOTES

1. The System Test supplements the MAINTAIN III Test Programs. It is neither a replacement nor a substitute for the MAINTAIN III Test Programs.
2. The MAINTAIN III Test Programs do not have to be run each time the System Test is rerun.

The System Test has the following design features:

- It provides a real-time, mapped test environment for running unit-level test programs.
- It detects failing mainframe or peripheral components in the system, and automatically outputs error messages. Once activated, the unit programs do not require any operator intervention.
- It provides a means of generating a standalone system test for any VORTEX II system hardware configuration.

The configured System Test, which is generated from the Master System Test, is a real-time, multiprogrammed, mapped, standalone system test.

The Preliminary Instruction Test validates basic CPU operation. The Preliminary Memory Test checks the first 32K (map 0) of memory. The 24-Level Pim Test verifies functionality of the 24 interrupt lines. The Real Time Clock Test verifies that the clock interrupts occur. The various unit programs verify the correct operation of individual system peripherals and their controllers, and mainframe components (Writable Control Store, Floating-Point Processor and main memory).

Together, the MAINTAIN III programs and the System Test make effective fault isolation to the unit level possible.

2.3 OPERATIONAL FEATURES

Operation of the System Test has the following two phases:

1. The Master System Test is processed (by the System Test Generator) to create the configured System Test. This is the System Test Generation phase.
2. The configured System Test is then run on the computer system being tested. This is the System Test Operation phase.

System Test Generation is described in detail in Sections 3 and 4 of this manual. Procedures for System Test Operation are given in Section 6.

Section 3 System Test Generation

3.1 PURPOSE

The purpose of system test generation is to process the Master System Test, and generate from it a configured System Test. The configured System Test meets the specific test requirements of a given system configuration by including only those unit programs which are required. These unit programs are selected by the System Test Generator from the System Test unit program Library, which is part of the Master System Test.

3.2 HARDWARE CONFIGURATION

The System Test requires certain hardware elements to execute properly. These required elements comprise the minimum hardware configuration.

The minimum hardware configuration for the System Test is as follows:

- V77-500/600/700/800 processor
- 64K main memory,
- Memory mapping facility
- Teletypewriter or keyboard display terminal (CRT)
- Real-time clock
- Input peripheral device

The System Test supports the following mainframe and peripheral device options:

- Mainframe options
 - Floating-Point Processor (FPP)
 - Writable Control Store (WCS)
 - Cache (standard with V77-800, and optional with V77-600)

■ Peripheral device options

- Disk (VORTEX types DB, DC, DD, DE, DF, DG, DH, DJ)
- Magnetic tape
- Line printer
- SUL printer
- Laser printer
- Data Communications Multiplexer
- Keyboard-display terminal
- Intercomputer Link

3.3 OVERVIEW OF THE PROCESS

Basically, the System Test generation process consists of the following steps:

1. Loading the Loader
2. Executing the preliminary tests
3. Loading the System Test (performed by the Loader)
4. Conducting the configuration dialog
5. Generating the configured System Test.

The configured System Test is generated upon successful completion of the System Test generation process.

3.4 SAMPLE SYSTEM TEST GENERATION

A step-by-step procedure for generating a configured System Test follows.

3.4.1 PREPARATION

This procedure is designed for execution on any V77-Series system which is configured for VORTEX II*. However, on any given system, there are certain parameters which are applicable to that particular system. Steps involving such system-dependent

information are flagged as such, and directions are given to configure any desired (or required) system.

The Master System Test is available on either magnetic tape or disk. A variety of loading devices are available for use with Sperry Univac computers. Before using the following procedures, the operator should determine what equipment has been installed at his installation, and then obtain the system-dependent information and procedures by referring to the appropriate manuals.

Refer to V77-600 System Reference (UP-8651) for V77-600 operation procedures. Refer to V77-800 Computer Operations Reference (UP-9028) for V77-500/700/800 operation procedures. The procedures are:

1. Turn on computer power.
2. Ensure that all devices are online.
3. Initialize the computer control circuits by pressing RESET.
4. Reset Sense Switches 1,2, and 3 for the following processes.

Preliminary Tests If Sense Switch 1 (SS1) is SET on prior to executing the bootstrap loader, it provides the facility to execute the 24 Level Pim Test and/or select an alternate console. After booting the Preliminary Test, it will halt at 60. Enter non zero in register A to perform the 24 Level Pim Test or zero to skip test. After entering desired input, reset SS1 if an alternate Console is not desired and depress Run and Start.

If Sense Switch 2 (SS2) is set prior to executing the bootstrap loader, it will loop on error after halt.

If Sense Switch 3 (SS3) is set prior to executing the bootstrap loader, it will cause a loop on all Preliminary Tests.

* Currently implemented for V77-500, -600, -700 and -800 computers.

System Generation If Sense Switch 1 (SS1) is set prior to executing the bootstrap loader, it provides the facility to select an alternate console. After booting the system Test Generator, the CPU halts (blinking run mode) at location 64206. Register A is preset to device 01. Enter the desired device address, reset SS1, and depress Run and Start.

If Sense Switch 2 (SS2) is set prior to executing the bootstrap loader, it provides the facility to generate Master System Test, by copying the test from one medium to another. After the parameter message is displayed, enter the appropriate parameters, reset SS2 if copying disk to disk, or leave SS2 set if copying tape to disk.

If Sense Switch 3 (SS3) is set prior to executing the bootstrap loader, the configured System Test will be stored in map 0 and will not be written to a peripheral device.

System Test If Sense Switch 1 (SS1) is set prior to executing the bootstrap loader, it provides the facility to select an alternate console. After booting the configured System Test, the CPU halts (blinking run mode), register A is preset to device 01. Enter the desired device address Read and/on Write Ready Interrupt addresses, reset SS1, and depress Run and Start.

If Sense Switch 2 (SS2) is set prior to executing the bootstrap loader, it will skip all output messages.

If Sense Switch 3 (SS3) is set prior to executing the bootstrap loader, it will idle after error output message.

NOTE

When the selected Sense Switch option has been processed, the Sense Switch must be reset to continue, unless it is required for a subsequent function.

* Currently implemented for V77-500, -600, -700 and -900 computers.

Table 3-1. Magnetic Tape Bootstrap Routine
(BIC Version)

Location	Instruction Code	Label	Operation	Variable	Comment
000200	1031BE*	BLMT	OAR	MTBE	Set initial address
000201	005301		DECR	AD	A = 177777 for last address
000202	1031BO*	BLMT1	OAR	MTBO	Set final address
000203	1000BE*		EXC	MTBE	Activate BIC
000204	1000DA*	BLMT1	EXC	MT	Read one record from MT
000205	1012DA*		SEN	F2+MT,07002	Start if MT ready
000206	007002	BLMT1	NOP		
000207	005000		JMP	ABL+5	Loop (BLMT1)
000210	001000	BLMT2	JMP		
000211	000205		EXC	MTBO	Initialize BIC
000212	1000BO*	BLMT2	EXC2	MTUDA	Select MT unit
000213	104UDA*		INCR	XS+AD	Set A = 07001 (start address)
000214	005141	BLMT2	JMP	ABL	Start BIC (BLMT)
000215	001000				
000216	000200				
		MT	EQU	010	Mag tape device address
		MTBE	EQU	022	Mag tape BIC even address
		MTBO	EQU	023	Mag tape BIC odd address
		MTUA	EQU	0110	Mag tape unit and device address
NOTES					
1. Enter bootstrap routine into locations 0200 through 0216.					
2. Enter 007000 in the X register.					
3. Start execution at location 000212.					
4. Definitions:					
BE = BIC even address					
BO = BIC odd address					
DA = Device address					
U = Unit number (1-4)					
* See Note 4, above.					

Table 3-1. Magnetic Tape Bootstrap Routine with Symbolic Coding

```

*****
*****
*
* START AT 0212 WITH X=07000
*
* 0200 1031BE BOOT   OAR   BIC           SET INITIAL ADDRESS
* 0201 005301       DECR   1           A=177777 FOR LAST ADDRESS
* 0202 1031BO       OAR   BIC+1       SET FINAL ADDRESS
* 0203 1000BE       EXC   BIC         ACTIVATE BIC
* 0204 1000DA       EXC   DA          READ ONE RECORD FROM MT
* 0205 1012DA WAIT  SEN   0200+DA,07002 START IF MT READY
* 0206 007002
* 0207 005000       NOP
* 0210 001000       JMP   WAIT        WAIT LOOP
* 0211 000205
*
* START HERE WITH X=07000
*
* 0212 1000BO START EXC   BIC+1       INITIALIZE BIC
* 0213 104UDA       EXC2  (U*0100)+DA SELECT MT UNIT
* 0214 005141       INCR  041        SET A=07001 (START ADDR)
* 0215 001000       JMP   BOOT       START BIC
* 0216 000200
*****
* BE = BIC ADDRESS,EVEN
* BO = BIC ADDRESS,ODD
* U  = TAPE UNIT(1-4)
* DA = MT DA
*****
MT      EQU      010
BIC     EQU      020 (22,23)
U       EQU      01
*****

```

CLK. CHANGE.

; DEVDN, A100

1353 = 10577
577 = 24 x 2

LOAD SYS

A = 4
B = 300
X = 0

BIC OPERATED MAG TAPE

3-5

F37,0
40,22.

20 = HALT
22 = I/O
24 = WRITE PER
26 = JUMP
30 = UNASSIGNED
32 = INS FETCH
34 = DATA TRANS
36 = SPURIOUS INT

Table 3-2. Cartridge Disk Bootstrap Routine

Location	Instruction Code	Label	Operation	Variable	Comment
1130	100416	BLCD	EXC	0400+OSK	Initialize controller
1131	104016		EXC2	DSK	Select unit 0
1132	100216		EXC	0200+OSK	Set seek mode
*1133	005001		TZA		Cylinder 0 (DUPC)
1134	103116		OAR	DSK	Seek
1135	101016	BLCD1	SEN	DUDA,ABLD+011	Seek complete (BLCD2)
1136	001141				
1137	001000		JMP	ABLD+5	Loop (BLCD1)
1140	001135				
1141	102516	BLCD2	CIA	DSK	Get status
1142	151167		ANA	ABLD+037	Mask Status Bits (DSB)
1143	001016		JANZ	ABLD	Error, re-boot
1144	001130				
1145	100021	BLCD3	EXC	DBO	Initialize BIC
1146	100316		EXC	0300+OSK	Set sector mode
*1147	005102		INCR	SD	Sector 1 (DUPS)
1150	103216		OBR	DSK	Select sector
1151	103120		OAR	DBE	Set initial register
1152	006010		LDAL	01127	Record ending address
1153	001127				
1154	103121		OAR	DBO	Set final register
1155	100020	BLCD4	EXC	DBE	Activate BIC
1156	100016		EXC	DSK	Read disk
*1157	101416	BLCD5	SEN	F4+OSK,ABLD+027	Controller busy (BLCD5)
1160	001157				
1161	102516		CIA	DSK	Get status
1162	151167		ANA	ABLD+037	Mask Status Bits (DSB)
1163	001016	BLCD6	JANZ	ABLD	Error, re-boot
1164	001130				
1165	001000		JMP	0600	Start prelim loader
1166	000600				
1167	007760	DSB	DATA	07760	Status Bits
*1170	000001	DUPC	DATA	01	Bits 15,14=U;13=P;8-0=CYL 5-0=SEC
*1171	000001	DUPS	DATA	01	Bits 15,14=U;13=P;8-0=CYL or 5-0=SEC
	000020	DBE	EQU	020	BIC address, even
	000021	DBO	EQU	021	BIC address, odd
	000016	DUDA	EQU	016	Unit & device address
	000001	DUP	EQU	01	Unit & platter no.

<p>Enter bootstrap into 01130-01171 Start at 01130 with x=0 to run sys test or x=not 0 to run SYS GEN</p> <p>NOTE: If booting cartridge from ABL, change these locations:</p> <p>1133-011170 LDA ABLD+040 1147-021171 LDB ABLD+041 1153-001127 --- end address --- 1170-020000 --- unit 0, platter 1, cylinder 0 --- 1171-020001 --- unit 0, platter 1, sector 1 ---</p>					

NOTE

If there is a numbered HALT indicated, examine the I (Instruction) Register.

5. Prepare the media loading device.

Magnetic tape. Mount the Master system test magnetic tape on the tape drive unit at proper density. Advance the tape to the load point.

Disk. Mount the disk pack. Ensure that the disk is write enabled.

6. Load the preliminary tests and loader via the bootstrap routine.

3.4.2 LOADING THE PRELIMINARY TESTS AND LOADER

The Preliminary Tests and Loader can be loaded into memory using either the magnetic tape or the cartridge disk bootstrap loader routine listed in Tables 3-1 and 3-2, respectively.

The bootstrap routine must be manually loaded into memory through the virtual console or the computer control panel and then executed.

The V77-600 control panel contains all the switches and indicators needed for computer operation. The V77-800 virtual console consists of either a teletypewriter or a CRT terminal that interfaces directly with the V77-800 computer through console interface circuits in the processor.

Use one of the following procedures to manually enter the bootstrap routine.

3.4.2.1 Manual Loading Via the Computer Control Panel (V77-600 Computers only)

In the case of the V77-600 computer, the bootstrap routine can be manually entered via the computer control panel. Refer to the V77-600 System Reference, UP-8651, for these procedures.

1. Enter the instructions for the bootstrap routine into memory.
2. Enter the execution starting address in the P register. Refer to notes at the bottom of Table 3-1 or 3-2.
3. Enter zero in the A and B registers.
4. Press the STEP/RUN switch. This causes the STEP indicator to go out and the RUN indicator to blink. The computer is now ready to enter the run mode when the START switch is pressed.
5. Press the START switch. This causes the bootstrap routine to be executed.

3.4.2.2 Manual Loading Via the Virtual Console (V77-500/700/800 Computers Only)

Refer to V77-800 Computer Operations Reference, UP-9028, for information about virtual console operation.

1. Manually enter the appropriate bootstrap routine on the virtual console.
2. Enter the execution starting address in the P register. Refer to notes at the bottom of Table 3-1 or 3-2.
3. Enter zeros in registers R0 and R1.
4. Press key R. This places the processor in the run mode and causes the bootstrap routine to be executed.

3.4.3 MASTER SYSTEM TEST GENERATION FROM ONE MEDIUM TO ANOTHER

This is the procedure for generating a master V70 Series System Test from magnetic tape or disk (cartridge or floppy) to disk (cartridge or floppy).

PROCEDURE:

1. Mount the Master System Test medium.
2. Mount a formatted (VORTEX II or MAINTAIN III) scratch disk.

3. Set Sense Switch 2 (ON).
4. Enter the appropriate bootstrap routine into memory. See Table 3-1 for the magnetic tape bootstrap or Table 3-2 for the disk bootstrap routine.
5. Set the X register to 07000.
6. Start (set the program counter) at 0212 or 01130 for the magnetic tape boot or the disk boot, respectively. If a Preliminary error is detected, Sense switch 2 will cause the CPU to halt. In continuing with the Master Generation, reset Sense Switch 2, depress Start, enter "R" at the virtual sonsole, and set Sense switch 2 again.
7. After loading, the following message is printed:

```
V70-SERIES SYSTEM TEST GENERATION-REV D.O
*****
GENERATE MASTER SYSTEM TEST
```

```
SYSTEM GEN INPUT DEVICE?(H,0-3;1)
```

8. Enter the parameters as required by dialog questions #6 and #7.
9. When the generation is complete, the message "MST DONE, RESET 552 TO DO SGEN" is output. Proceed with the system configuration dialogue, or remove and save the input and output media.

If any error occurs during the generation of the Master System Test, the entire procedure must be repeated.

3.4.4 ERROR INDICATIONS AND HANDLING

During the execution of the Preliminary Tests, any error detected results in the following:

1. The computer is forced into STEP mode, and
2. An octal error code is returned in the instruction register. The meanings of these error codes are given in Section 5, Table 5-2.

When failure of the 24 Level PIM Test occurs, the interrupts failing the test may be determined and the rest of the run may be continued if desired. For the other Preliminary Tests, once such an error occurs, nothing further can be done at the system level. Run the MAINTAIN III diagnostics to isolate the fault. (Refer to MAINTAIN III Test Programs User Manual, UP-8672).

If, the preliminary tests are successfully executed, the full Master System Test is loaded.

Any error detected at this stage results in the following:

1. The message:

LOAD ERROR

is output to the operator's console;

2. The computer is placed in STEP mode, and
3. The error code '077' is returned in the instruction register.

If this happens, no recovery is possible. Reload and start again.

Error indications during System Test Generation are discussed in detail in Section 4.

3.4.5 CONFIGURATION DIALOG

After it is loaded, the System Test Generator outputs messages to the operator on the operator's console, and leads the operator step-by-step through the configuration process. An interactive dialog takes place between the System Test Generator and the operator. The aim of the dialog is to define the system hardware configuration of the following:

1. The system on which the configured System Test is being generated (the SYS GEN CPU), and
2. The system on which the configured System Test will be executed (the SYS TEST CPU).

The two systems, namely the SYS GEN CPU and the SYS TEST CPU, can be identical or different.

When the dialog is completed, a configured System Test, specifically tailored to the system that is to be tested, is generated. This is output to the device specified as the SYS GEN OUTPUT DEVICE during the interrogation.

The configuration dialog is described in detail in Section 4.

Section 4 Configuration Dialog

4.1 GENERAL

A series of configuration questions are output by the System Test Generator on the operator's console. These configuration questions and the operator's responses to them form the configuration dialog.

Most of the information that the operator requires for answering the configuration questions can be obtained from the System Memo which is shipped with each system. Some of the information must be obtained from other manuals. These manuals are identified in the appropriate places in this section.

4.2 SYSTEM TEST CONFIGURATION GUIDE

The System Test Configuration Guide is a checklist for use in preparing the correct responses to configuration questions. Complete the checklist before attempting to answer the configuration questions. An explanation of how the System Test Configuration Guide should be used, and where the required information is obtained from, is provided in Appendix A. The operator can use the blank checklist to prepare for the configuration dialog.

The configuration questions have the following features:

- Each configuration question is numbered.
- System questions (as opposed to unit program questions) are marked with asterisks (*). Questions 1 through 7 are system questions.
- Each configuration question has the following two parts:
 1. The body of the question.
 2. Acceptable user replies enclosed within parentheses. Some of the questions also have default values.

These default values are also specified within the parentheses, with a semicolon separating them from the preceding acceptable user replies.

NOTE

The following example is included here merely to explain the format common to all the configuration questions. Each configuration question is discussed in detail later in this section.

Example:

In the configuration question:

CNFG7(I,H,A,0,8,9,...,18,99;A)

①

②

③

① The user is asked to select configuration questions.

② Any one of the following replies is an acceptable response:

- H
- I
- A
- 0
- 8
- 9
- .
- .
- .
- 18
- 99

NOTE

Questions 1 through 7 are automatically selected, and therefore need not be selected by the operator.

- Any combination of these values, each value being separated from the next by a comma.
- <cr> or <.> which specifies the default value (A).

③ The value following the semicolon is the default value.

- If the user does not specify a value but merely enters a <cr> or a <.> as the response to a question, the default value is automatically used.
- In cases where the default value is not explicitly defined, it is assumed to be zero.

User responses should conform to the following:

- Each user response must be terminated with a <cr> or a <.>.
- Whenever the user enters an unacceptable reply, two question marks (??) are output by the system. The user must then enter a reply which is acceptable to the system.
- The leading zero, which indicates an octal number, may be omitted.
- To start again at the beginning of the configuration dialog, enter a Control-C character as the response to a numbered question.
- To back up the dialog to a previous major question (numbered), enter a Control Kn, where n in Kn is the number of questions to back up.
- If the response to a question is incorrectly entered:
 1. Type a back-arrow (←) to delete the previous character, or
 2. Type a back-slash (\) to delete the entire response.Reenter the response correctly.

Configuration questions 1 through 7 are system questions, concerning devices and internal computer options that are part of the SYS TEST and SYS GEN systems. Questions 8 through 18 concern unit programs for specific peripheral units or mainframe options. Question 99 permits user-supplied diagnostic software to be included in the configuration process.

Example:

The purpose of the following question:

8.WCS-UP1,15?(Y;N)

is to determine whether the WCS unit program is to be included in the configured System Test. The UP-numbers (UP1,15) are the unit program identification numbers. (Refer to Table 5-5 for a Unit program name-ID-number cross-reference.) Unit programs are identified by name as well as by number in configuration questions 8 through 99.

4.3 CONFIGURATION QUESTIONS

In this section, each configuration question is individually discussed. For each configuration question, the following are explained:

1. Question identification.
2. Purpose of the question.
3. Acceptable replies that the operator can enter.
4. Example.

A listing obtained during an actual System Test Generation is presented in Appendix A. Examples of operator responses shown in this section are keyed to this listing.

For a detailed explanation of how to prepare configuration responses, refer to Appendix A.

4.3.1 CONFIGURATION HEADER INFORMATION

Upon successful loading of the System Test Generator, a message is output to the operator's console, which provides the following information:

- a. Header
- b. Instruction on how to proceed
- c. Self-explanatory tutorial information

```
V70-SERIES SYSTEM TEST GENERATION-REV X.Y
*****
SELECT CONFIGURATION QUESTIONS
NOTE:ACCEPTABLE REPLIES ARE IN ( )
      DEFAULT=0 OR VALUE AFTER ;
      END EACH LINE WITH CARRIAGE RETURN OR PERIOD
      IF REPLY IS OMITTED, DEFAULT VALUE IS USED
      A=ALL,H=HELP,F=INDEX,N=NO OR NONE,Y=YES
      * INDICATES PRESELECTED SYSTEM QUESTION
      LEADING 0=OCTAL,MAY BE OMITTED
*****
```

4.3.2 INTRODUCTORY CONFIGURATION QUESTION

This configuration question asks the operator to select the configuration question numbers, where the numbers are required to define the system to be tested.

```
CNFG?(I,H,A,0,8,9,...18,99;A)
```

NOTE

Question numbers may be repeated to generate multiple copies of the unit programs.

4.3.2.1 Acceptable Replies

Acceptable replies to this question are:

$$\left\{ \begin{array}{l} H \\ I \\ A \\ O \\ 8, 9, \dots, 18, 99 \\ \text{No Entry} \end{array} \right\} \quad \left\{ \begin{array}{l} \langle \text{CR} \rangle \\ . \end{array} \right\}$$

where:

H

Is HELP. Type H to obtain a listing of all the available configuration questions.

I

Is Index. This scans the input medium and displays the ID of each unit program in the System Test Generation Library.

A

Is ALL. Type A to select all the configuration questions. If A is selected, after the operator answers each question satisfactorily, the next question is output automatically. A is the default value. Questions 1 through 7 are always output whether the operator does or does not specify them.

O

Zero indicates that no question are selected. This is a special case to generate a copy of the Preliminary Tests and the Executive without a unit program library.

8, 9, ...

All the configuration questions are numbered. The operator can ask for specific questions by number. He can specify one or more questions. Each number must be separated from the next by a comma. Note that questions 1 through 7 are required for each configuration and are displayed regardless of the operator's response.

No Entry

$$\left\{ \begin{array}{l} \langle \text{CR} \rangle \\ . \end{array} \right\}$$

Specifies the default value, A.

4.3.2.2 Example

Typing the following:

9.

results in eight questions (nos. 1 through 7, and 9) being output to the console.

- ① In the sample listing shown (A.3), the operator response is "H".
- ② After a list of all the configuration questions is output, the operator responds by entering "A".

4.3.3 CONFIGURATION QUESTION NUMBER 1

The first configuration question is:

```
*1.SYS TEST CPU, SYS GEN CPU?(H,0-2,0-2)
```

The asterisk identifies this as a system question.

4.3.3.1 Purpose

The question asks the operator to specify the types of computer (V77-800, V77-600, etc.) being used as:

- a. SYS TEST CPU - The computer which is going to be tested, and
- b. SYS GEN CPU - The computer being used for the system test generation.

4.3.3.2 Acceptable Replies

Valid operator responses are:

H

Type H to obtain a listing of the available CPU types.
The system responds with:

```
0 = V77-500/700/800  
1 = V77-600, V75, V76  
2 = V77-900
```

0-2,0-2

The first part of this response (any number in the range 0 to 4) identifies the type of the SYS TEST CPU. The second part (any number in the range 0 to 4) identifies the type of the SYS GEN CPU. The two numbers are separated by a comma. Terminate the response with a <cr> or <.>.

{<cr>
.

Specifies 0,0 since no default values are explicitly defined.

4.3.3.3 Example

In the sample listing, the operator response to configuration question number 1 is:

1,1.

This indicates that:

- a. The SYS TEST CPU is a type 1 (V77-600) computer.
- b. The SYS GEN CPU is a type 1 (V77-600) computer.

NOTES

1. The SYS GEN CPU and the SYS TEST CPU do not have to be of the same type.
2. Both CPUs must be individually specified, even if they are of the same type.
3. V77-500 or -700 users should specify 0 (same as V77-800).

CAUTION

Do not specify a type 2 (V77-400) because support for this model is not currently implemented.

4.3.4 CONFIGURATION QUESTION NUMBER 2

*2.START,END ADR(K) OF EACH MEM BLOCK?(S1,E1 S2,E2 ...;0,64)

4.3.4.1 Purpose

This is a system question. It asks the operator to specify the start and end address of each memory block being used in the SYS TEST CPU.

4.3.4.2 Acceptable Replies

The start and end addresses for each noncontiguous memory block must be specified in the following format:

S1,E1/S2,E2...Sn,En.

where:

- S1
Is the start address of the first memory block.
- E1
Is the end address of the first memory block.
- S2
Is the start address of the second memory block.
- E2
Is the end address of the second memory block.
- Sn
Is the start address of the nth memory block.
- En
Is the end address of the nth memory block.

NOTES

1. The default value of the start address of the memory block is 0. The default value of the end address of the memory block is 32K words. If the operator responds with a <cr> or a ".", without specifying any start or end addresses, these default values will be automatically used.
2. The values specified in the replies are decimal values.

4.3.4.3 Example

④ In the sample listing, the operator responds with a ".", and so the default values are automatically used.

4.3.5 CONFIGURATION QUESTION NUMBER 3

```
*3.MEMORY PARITY EVEN INTERRUPT ADR?(010-076;060)
ECC? (Y;N)
```

4.3.5.1 Purpose

This is also a system question. The ECC portion of the question appears after the interrupt address has been supplied. The operator is asked to specify the memory parity interrupt address. The memory parity interrupt address is variable on the V77-600 computer. The operator also specifies whether error correcting memory (ECC) is installed.

4.3.5.2 Acceptable Replies

Any even value from 010 to 076 is an acceptable response for the interrupt address. The information required to answer this question can be obtained from the System Memo, as explained in Appendix A. The default value is 060.

Reply with a Y or N for the ECC question. The default value is N.

NOTE

If the system does not have any parity, use the default value by entering a period (.).

4.3.5.3 Example

⑤ In the sample listing, the operator responds with a period. So the default value of 060 is used as the memory parity interrupt address.

4.3.6 CONFIGURATION QUESTION NUMBER 4

```
*4.SYSTEM TEST OPERATOR'S CONSOLE
  DEVICE ADDRESS?(0-07;1)
  READ READY EVEN INTERRUPT ADDRESS?(0100-0276)
  WRITE READY EVEN INTERRUPT ADDRESS?(0100-0276)
```

4.3.6.1 Purpose

This configuration question is a system question about the operator's console of the system to be tested. After the operator responds to one question, the next question is output.

4.3.6.2 Acceptable Replies

Any value from 0 to 07 can be specified as the device address. The default value is "01". Any even number from 0100 to 0276 can be specified as the interrupt addresses corresponding to READ READY and WRITE READY status.

The information required to answer this question can be obtained from the System Memo. (Refer to Appendix A.)

4.3.6.3 Example

⑥ In the sample listing, the operator specifies the following:

1. A Device Address of 1 (by default).
2. A READ READY interrupt address of 154.
3. A WRITE READY interrupt address of 156.

4.3.7 CONFIGURATION QUESTION NUMBER 5

```
*5.SYSTEM TEST LIST DEVICE?
.PRINTER X:      )
DEVICE ADDRESS?(0-076; 35)
TTY OR CRT X:
DEVICE ADDRESS?(0-07;1)
READ READY EVEN INTERRUPT ADDRESS? (0100-0276)
WRITE READY EVEN INTERRUPT ADDRESS? (0100-0276)
```

4.3.7.1 Purpose

This is a group of five questions about the system device selected for listing commands, messages, and dumps. If no list device is specified, the operator's console is used by default. The list device can be different than the operator's console specified in question number 4. If this is the case the READ READY and WRITE READY questions will be displayed; otherwise they will not.

4.3.7.2 Acceptable Replies

The Xs in the questions represent the unit number which is not required at this time. The Device Address of the line printer can be any number from 0 to 076. The default value is 35. The Device Address of the TTY or CRT can be any number from 0 to 076. The default value is 01.

If the system list device is the same as the operator's console (Question 4), the interrupt address questions are omitted.

4.3.7.3 Example

⑦ In the sample listing, the Device Address of the LPR is specified as 35, by default. The Device Address of the TTY/CRT is specified as 1, by default.

4.3.8 CONFIGURATION QUESTION NUMBER 6

*6.SYSTEM GEN INPUT DEVICE?(H,0-3;1)
DEVICE ADDRESS?(0-076; XX)
BIC/BTC EVEN DEVICE ADDRESS?(0-076)
UNIT NO?(0-3)

4.3.8.1 Purpose

This is a system question concerning the device from which the unit programs are loaded during system test generation.

After the operator specifies the device, he is asked to provide more information about the device address, the BIC/BTC device address, and the unit number.

4.3.8.2 Acceptable Replies

Enter one of the following responses to the first question concerning specification of a system generation input device:

H

Type H to obtain a list of devices that can be specified as the system generation input device. The system responds:

(0=PAPER TAPE)
(1=MAG TAPE)
(2=CARTRIDGE DISK)
(3=FLOPPY DISK)

0

Specifies paper tape.

1

Specifies magnetic tape.

2

Specifies cartridge disk.

3

Specifies floppy disk.

{<cr>
.

Specifies the default "1".

The device address can be any value to 076. The default value (XX) is dependent on the selected device, i.e., paper tape = 37, magnetic tape = 10, cartridge disk = 16, and floppy disk = 16. The BIC/BTC device address can be any even number from 0 to 076. The unit number can be any number from 0 to 3.

4.3.8.3 Example

⑧ In the sample listing shown, the system generation input device is magnetic tape. The device address of the magnetic tape unit is specified to be 10, and the BIC/BTC even device address is 24. Since the operator enters a "." as the response to the question about the unit number, the value "0" is assumed.

4.3.9 CONFIGURATION QUESTION NUMBER 7

```
*7.SYSTEM GEN OUTPUT DEVICE?(H,0-3;1)
  DEVICE ADDRESS?(0-076; XX)
  BIC/BTC EVEN DEVICE ADDRESS?(0-076)
  UNIT NO?(0-3)
```

4.3.9.1 Purpose

This is a system question about the device to which the configured system test is output.

After the operator specifies the system generation output device, he is asked to provide more information about that particular device: the device address, the BIC/BTC even device address, and the unit number.

4.3.9.2 Acceptable Replies

Enter one of the following responses to the first question concerning device specification:

H

Type H to obtain a list of devices that can be specified as the system generation output device. The system responds:

```
(0=PAPER TAPE)
(1=MAG TAPE)
(2=CARTRIDGE DISK)
(3=FLOPPY DISK)
```

- 0 Specifies paper tape.
- 1 Specifies magnetic tape.
- 2 Specifies cartridge disk.
- 3 Specifies floppy disk.
- { <cr>
 . }
- Specifies the default value "1".

The device address can be any value from 0 to 076. The default value XX is dependent on the selected device, i.e., paper tape = 37, magnetic tape = 10, cartridge disk = 16, and floppy disk = 16. The BIC/BTC even device address can be any even number from 0 to 076. The unit number can be any number from 0 to 3.

NOTE

The system generation output device can be the same type of device as the system generation input device, or it can be of a different type.

4.3.9.3 Example

⑨ In the sample listing, both the system generation input device and the system generation output device are magnetic tape devices. The device address of the system generation output device is 11. The BIC/BTC even device address is 22. The magnetic tape unit number is 0.

4.3.10 CONFIGURATION QUESTION NUMBER 8

8.WCS-UP1,15?(Y;N)
 EVEN DEVICE ADDRESS?(0-076; 74)
 LOWEST,HIGHEST PAGES? (L,H;4,017)

4.3.10.1 Purpose

The purpose of this question is to determine whether the Writable Control Store (WCS) unit program must be included in the configured System Test.

NOTE

The WCS unit program is identified by name and by number in this question.

4.3.10.2 Acceptable Replies

Enter one of the following:

Y

Specifies that the WCS unit program is to be included.

N

Specifies that the WCS unit program need not be included. This is the default answer.

{<cr>
.}

Specifies that the default answer N is to be used.

Any even number from 0 to 076 can be specified as the device address, the default value is 74. Any pages from 4 to 017 are acceptable for the lowest and highest pages. The default values are 4 and 017.

4.3.10.3 Example

⑩ In the sample listing, the operator indicates that the WCS unit program is to be included in the configured System Test, and specifies the default value 74 as the even device address.

4.3.11 CONFIGURATION QUESTION NUMBER 9

9.FLOATING POINT PROCESSOR-UP2,15?(Y;N)

4.3.11.1 Purpose

The purpose of this question is to determine whether the Floating-Point Processor (FPP) unit program is to be included in the configured System Test. The unit program is identified by name and number.

NOTE

For the V77-800 computer, the FPP unit program is combined with the WCS unit program. In this case, this configuration question is eliminated and is incorporated as a subquestion of Configuration Question Number 8. For the V77-600 computer, there are two separate unit programs: one for the FPP and one for the WCS.

4.3.11.2 Acceptable Replies

Enter one the following:

Y

Specifies that the FPP unit program is to be included.

N

specifies that the FPP unit program need not be included. This is the default answer.

{<cr>
.}

Specifies that the default answer N is to be used.

4.3.11.3 Example

① In the sample listing, the operator indicates that the FPP unit program is to be included in the configured System Test.

4.3.12 CONFIGURATION QUESTION 10

10.MEMORY TEST-UP3?(Y;N)

4.3.12.1 Purpose

This question determines whether the memory test unit program is included in the configured System Test.

4.3.12.2 Acceptable Replies

Enter one of the following:

Y
Specifies that the unit program is to be included.

N
Specifies that the unit program need not be included.
This is the default answer.

{<cr>
:}

Specifies that the default answer N is to be used.

4.3.12.3 Example

⑫ In the sample listing, the operator indicates that the memory test unit program is to be included in the configured System Test.

4.3.13 CONFIGURATION QUESTION NUMBER 11

11.HOW MANY DISC CONTROLLERS-UP4,5,6,13,14,16?(0-4)
DISC N: N advances from 1 to 4 according
MODEL CODE NO?(H,0-05) to the value entered above.
DEVICE ADDRESS?(0-076; 16)
BIC/BTC EVEN DEVICE ADDRESS?(0-076)
BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276)
EACH SEEK COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276)
WHICH TRACK, SECTOR(T=0-0312/0625,S=0-2)?(T,S)
WHICH PLATTERS, UNITS(P=0-3,U=0-3)?(PU,...)
DISC 2:
MODEL CODE NO?(H,0-05)
DEVICE ADDRESS?(0-076; 15)
BIC/BTC EVEN DEVICE ADDRESS?(0-076)
BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276)
SEEK COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276)
WHICH HEAD?(0-023)
WHICH UNITS?(0,1..7)

DISC 3:

MODEL CODE NO?(H,0-05)
DEVICE ADDRESS?(0-076; 14)
COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276)
WHICH CYLINDER, HEAD(C=0-0632/01466, H=0-4/022)?(C,H)
WHICH UNITS?(0,1..7)

DISC 4:

MODEL CODE NO?(H,0-05)
DEVICE ADDRESS?(0-076; 6)
BIC/BTC EVEN DEVICE ADDRESS?(0-076)
BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276)
CONTROLLER COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276)
WHICH UNITS?(0,1..3)

NOTE

The questions output after the first question about the model number depend upon the model specified by the operator.

4.3.13.1 Purpose

This question concerns the disk controllers for which unit programs have to be included in the configured System Test. A maximum number of 4 disk controllers can be tested at a time. For each disk controller, questions are asked about the following:

- a. Model
- b. Device Address
- c. BIC/BTC Even Device Address
- d. BIC/BTC COMPLETE Even Interrupt Address
- e. Each SEEK COMPLETE Even Interrupt Address.

Some additional questions are asked, which depend upon the type of disk specified.

4.3.13.2 Acceptable Replies

For the question about the number of disk controllers, any number from 0 to 4 can be specified.

The next question is:

DISC1:
MODEL CODE NO7(H,0-05)

Enter one of the following:

H
To obtain a list of all available models.

0-05
Any model number code from 0 to 5 depending upon the type of the disk being used.

{<cr>
.
}

To use the default value 0, which corresponds to a type DB or DF disk.

The following list of disk types and their corresponding model number codes is output when the operator enters "H":

- (0=TYPE DB or DF)
- (1=TYPE DC, DD and DE)
- (2=TYPE DH)
- (3= TYPE DJ)
- (4=TYPE DG)
- (5=TYPE DK)

In the above list, output by the H option, the following type and feature numbers apply:

<u>Model Code</u>	<u>Group</u>	<u>Type/Feature</u>
0	Type DB or DF	70-7600, 70-7610, F3094, F3096, F3310
1	Type DC, DD, DE	2822, 70-7510, 2823, 2824, F3092
2	Type DH	2825, 2826, 2842, 2843, 2833
3	Type DJ	F3353
4	Type DG	(MSC Locust)
5	Type DK	(Cobra - Suspended)

Questions that follow the first question depend upon the model number specified by the operator.

For Model 0 the following questions are asked:

DEVICE ADDRESS?(0-076;16)
 BIC/BTC EVEN DEVICE ADDRESS?(0-076)
 BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276)
 EACH SEEK COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276)
 WHICH TRACK, SECTOR(T=0-0312/0625,S=0-2/7)?(T,S)
 WHICH PLATTERS, UNITS(P=0-3,U=0-3)?(PU,...)

Each unit has a unique seek complete interrupt address, which must be furnished by the operator (that is, 110, 114, 116). Any track and sector within the specified limits can be selected for the test run. Only the selected address can be used during the test. When more than one upper limit is given in the question, for example, 0312/0625, the selection depends upon the disk type. For Type DB disks, 0312 is the maximum. For Type DF disks, the maximum is 0625. Each platter and corresponding unit in the system to be tested must be specified. The platter is the actual physical recording surface inside a unit. A unit is the actual physical drive. Each unit can have 1, 2, or 4 platters. A cross-reference list of disk types (Feature numbers) and the number of platters in each unit is given in Table 4-1.

The reply to the platters and units question consists of one or more two-digit entries. The first digit is the platter number and the second digit is the unit number. Multiple entries are separated by commas. 10.

Table 4-1. Model 0 (Type DF) Disks and Corresponding Platter Numbers

Disk Type (Feature Numbers)	Number of Platters Per Unit
F3094	2
F3096	1
F3310	2

For Model 1, the following questions are asked:

DEVICE ADDRESS?(0-076;15)
 BIC/BTC EVEN DEVICE ADDRESS?(0-076)
 BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276)
 SEEK COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276)
 WHICH HEAD?(0-023)
 WHICH UNITS?(0,1,..7)

The current arm position determines the cylinder selected for the test run. No arm motion is performed during the test. A recalibration to cylinder 0 occurs automatically when the disk is powered up. Any head within the specified limits can be selected for the test run. Only the selected address is used during the test. Each unit in the system to be tested must be specified.

For Model 2 disks, the following questions are asked

EVEN DEVICE ADDRESS?(0-076; 14)
 COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276)
 WHICH CYLINDER, HEAD(C=0-0632/01466,H=0-4/022)?(C,H)
 WHICH UNITS?(0,1,..7)

For Model 3 disks, the following questions are asked

DEVICE ADDRESS?(00-076;16)
 BIC/BTC EVEN DEVICE ADDRESS?(00-076)
 BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276)
 CONTROLLER COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276)
 WHICH UNITS?(0-3)

Device-specific information required to answer the above questions must be obtained from the appropriate peripheral equipment manuals.

For Model 4 disks, the following questions are asked:

DEVICE ADDRESS?(00-076;15)
BIC/BTC EVEN DEVICE ADDRESS?(00-076)
BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276)
SEEK COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276)
WHICH HEAD?(0-5/011/015)
WHICH UNITS?(0-1)

4.3.13.3 Examples

Example 1:

⑬ In the sample listing, the operator specifies that unit programs are to be included for two disk controllers. The two disks being tested are of type DF and DC. For the type DF (Model 0) disk, track 0 and sector 0 are specified (by default); platter 0 of unit 0 is specified (by default). For the type DC (Model 1) disk, head 0 and unit 0 are specified by default.

Example 2:

DISC 1:
MODEL?(H,0-5)0.
DEVICE ADDRESS?(0-076; 16).
BIC/BTC EVEN DEVICE ADDRESS?(0-076)20.
BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276)100.
EACH SEEK COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276)110.
WHICH TRACK, SECTOR(T=0-0312/0625,S=0-2)?(T,S)100,0.
WHICH PLATTERS, UNITS(P=0-3,U=0-3)?(PU,...)00,10.

A Model 0 (type DF) disk is specified by the operator. The device address is 016; the BIC/BTC even device address is 020; the BIC/BTC COMPLETE even interrupt address is 0100; and the SEEK COMPLETE even interrupt address is 0110. Track 0100 and sector 0 are specified. In response to the question about the number of platters and units, the operator response indicates the following:

- Platter 0 of unit 0; and
- Platter 1 of unit 0.

Example 3:

DISC 2:
MODEL CODE NO?(H,0-05).
DEVICE ADDRESS?(0-076; 15).
BIC/BTC EVEN DEVICE ADDRESS?(0-076)50.
BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276)140.
SEEK COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276)142.
WHICH HEAD?(0-023).
WHICH UNITS?(0,1..3).

The disk is a Model 1 (type DC) disk. The device address is 015 by default; the BIC/BTC even device address is 050; the BIC/BTC COMPLETE even interrupt address is 0140; and the SEEK COMPLETE even interrupt address is 0142. Head 0 and unit 0 are specified (default values).

Example 4

DISC 3:
MODEL CODE NO?(H,0-05)
DEVICE ADDRESS?(0-076; 14).
COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276)160.
WHICH CYLINDER(C=0-0632/01466),HEAD(H=0-4/022)?(C,H).
WHICH UNITS?(0,1..3).

The disk is a Model 2 (type DH) disk. The even device address is 014. The COMPLETE even interrupt address is 0160. Cylinder 0, head 0, and unit 0 are specified (the default values).

4.3.14 CONFIGURATION QUESTION NUMBER 12

12.HOW MANY MAG TAPE CONTROLLERS-UP7?(0-4)
MAG TAPE n: n advances from 1 to 4 depending
MODEL CODE NO?(H,0-01) upon the value entered above.
DEVICE ADDRESS?(0-076; 10)
BIC/BTC EVEN DEVICE ADDRESS?(0-076)
BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276)
MOTION COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276)
WHICH UNITS?(0,1..3)

4.3.14.1 Purpose

This question concerns the magnetic tape controllers for which unit programs have to be included in the configured System Test. A maximum number of 4 magnetic tape controllers can be tested at a time. One unit program has to be included for each controller. For each controller, questions are asked about the following:

- a. Model;
- b. Device Address;
- c. BIC/BTC Even Device Address;
- d. BIC/BTC COMPLETE Even Interrupt Address;
- e. MOTION COMPLETE Even Interrupt Address;
- f. Units.

4.3.14.2. Acceptable Replies

For the question about the number of magnetic tape controllers, specify any number from 0 to 4.

The next question is:

MAG TAPE 1:
MODEL CODE NO?(H,0-02)

Enter one of the following responses:

H To obtain a list of the models supported by the System Test.

$\left. \begin{matrix} 0 \\ 1 \\ 2 \end{matrix} \right\}$ To specify the type of magnetic tape controller.

The following list is output when the operator enters "H":

0 = NO STATUS WORD
1 = SINGLE SPEED STATUS WORD
2 = MULTI-SPEED, Status WORD

Refer to the System Configuration Guide (Appendix A) and Section 2 for a cross-reference list of magnetic tape models and type and feature numbers).

The following is a cross-reference list of magnetic tape type/feature numbers and status word usage by the controller.

<u>Magnetic Tape</u> <u>T/F Number</u>	<u>Status Word Usage</u>
0870	Uses status word
F3088	No status word
F3089	No status word

The next question is:

DEVICE ADDRESS?(0-076; 10)

Any number from 0 to 076 is acceptable. The default value of the device address for magnetic tape number 1 is 10.

The default value of the device address for magnetic tape number 2 is 11, for magnetic tape number 3 is 12, and so on.

Any even number from 0 to 076 can be specified as the BIC/BTC EVEN DEVICE ADDRESS.

Any even number from 0100 to 0276 can be specified as the BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS.

Any even number from 0100 to 0276 can be specified as the MOTION COMPLETE EVEN INTERRUPT ADDRESS.

Each unit in the system must be specified.

This set of six questions is repeated for each one of the magnetic tape controllers. Device-specific information required to answer the above questions must be obtained from the appropriate peripheral equipment manuals.

4.3.14.3 Example

⑭ In the sample listing, it is specified that unit programs are to be included for 3 magnetic tape controllers. All three are Model 0 units. In the cases where the operator responds with a ".", either an explicitly-defined default value or, when the former is absent, the value "0" is used.

4.3.15 CONFIGURATION QUESTION NUMBER 13

13. HOW MANY LINE PRINTERS-UP8,12?(0-4)

PRINTER n: n advances from 1 to 4 depending
MODEL CODE NO?(H,0-02) upon the value entered above.

4.3.15.1 Purpose

This question concerns the line printers for which unit programs have to be included in the configured System Test. The maximum number of line printers that can be configured for testing is four. For each line printer, a series of questions are asked.

4.3.15.2 Acceptable Replies.

For the question about the number of line printers, specify any number from 1 to 4. A zero entry indicates that no printers are to be tested.

For each printer to be tested, a model number will be requested. Depending on the model number, a series of questions will be asked.

A model number of 0 (2820, 0786) causes the following questions to be asked:

DEVICE ADDRESS? (0-076; 35)
BIC/BTC EVEN DEVICE ADDRESS? (0-076)
BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS? (0100-0276)

A model number of 1 (0776, 0780, and 0789) causes the following questions to be asked:

DEVICE ADDRESS? (0-076; 35)
BIC/BTC EVEN DEVICE ADDRESS? (0-076)
BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS? (0100-0276)
BAND NO? (0-022)

A model number 2 (0777) causes the following questions to be asked:

DEVICE ADDRESS? (0-076; 37)
CHANNEL COMPLETE EVEN INTERRUPT ADDRESS? (0100-0200)
CCB ADDRESS? (0100-0270)

For the Device Address, any number from 0 to 076 can be specified. The default value is 37. Any even number from 0 to 076 can be specified as the BIC/BTC EVEN DEVICE ADDRESS. Any even number from 0100 to 0276 can be specified as the BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS.

4.3.15.3 Example

⑮ In the sample listing, it is specified that the line printer unit program is to be included for one line printer. This line printer has a device address of 37 (by default), a BIC/BTC EVEN DEVICE ADDRESS of 26, and a BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS OF 106.

4.3.16 CONFIGURATION QUESTION NUMBER 14

14.HOW MANY DCM'S-UP9?(0-4)
DCM n: n advances from 1 to 4 depending
MODEL CODE NO?(H,0-3) upon the value entered above.
DEVICE ADDRESS?(0-076; 70)
INTERRUPT ADDRESS ORIGIN?(0100-0260;260)
BITS PER BYTE?(5-010;10)
LCB MEMORY PAGE?(070-077;075)
NON-POLL/BACK-TO-BACK LINES?(N,0,1,...,077;A)
POLLING LINES?(00-077;A)
TERMINAL-UP10?(Y;N)

4.3.16.1 Purpose

The purpose of this question is to determine the number of DCMs for which unit programs are to be included in the configured System Test. The DCM unit program tests the DCM and its associated Line Adapters (LADs). The test currently supports the following LAD types:

F3001-00 Asynchronous LAD RS232 Modem
F3001-01 Asynchronous LAD RS232
F3001-02 Asynchronous LAD, Current Loop
F3001-03 Asynchronous LAD, Relay I/O
F3001-04 Synchronous LAD RS232 Modem
F3001-05 Binary Synchronous Communications LAD
F3006-00 BSC LAD with Wide Band option

The maximum number of DCMs that can be tested at a time is 4.
For each DCM, questions are asked about the following:

- a. Line adapter type (model code no.);
- b. Device address;
- c. Interrupt Address Origin;
- d. Bits per byte;
- e. LCB Memory Page;
- f. Line identification.
- g. Terminal test.

4.3.16.2 Acceptable Replies

For the question about the number of DCMs, specify any number from 0 to 4.

For each DCM, the following questions are asked:

LINE ADAPTER TYPE?(H,0-3)
DEVICE ADDRESS?(0-076; 70)
INTERRUPT ADDRESS ORIGIN?(0100-0260; 260)
BITS PER BYTE?(5-010;010)
LCB MEMORY PAGE?(070-077;075)
NON-POLL/BACK-TO-BACK LINES?(N,0,1,....,077;A)
POLLING LINES?(00-077;A)
*TERMINAL-UP10?(Y;N)

Note: Terminal Test Supports LAD Type 1 and 2 only.

As a response to the first question, type: "H" to obtain a listing of the supported LAD types. The following list is output:

0=ASYNCHRONOUS DIRECT CONNECT
1=ASYNCHRONOUS DATA SET
2=SYNCHRONOUS
3=BI-SYNCHRONOUS

Then, depending upon the type of LAD, the appropriate number should be entered.

For the device address, any number from 0 to 076 can be specified. The default value is 70. Any number from 0100 to 0260 can be specified as the DCM Interrupt Address Origin. The default value is 260. The number of bits per byte can be any number from 5 to 010. The default number is 010. The LCB (Line Control Block) memory page can be any number from 070 to 077. The default value is 075. The line numbers to be tested are specified in response to the line question.

Non-Poll lines pertain to non-polling type terminals. The back-to-back lines are the lines to be tested, whenever no terminals are present (a back-to-back adapter is used in lieu of the terminals). Polling lines refer to polling type terminals. Model codes 0 and 3 do not support the terminal test.

The final question, TERMINAL-UP10?(Y;N), asks whether the unit program 10 terminal test is to be configured. If Y is entered, all the answers supplied for question 14 are applied to UP-10.

4.3.16.3 Example

⑩ In the sample listing, one DCM unit program is included in the configured System Test. The LAD is specified to be of the asynchronous direct connect type. The device address is 66. Default values are used for the DCM Interrupt Address Origin, the number of bits per byte, and the LCB memory page. Two line numbers are specified: 0 and 1.

4.3.17 CONFIGURATION QUESTION NUMBER 15

15.INTER-COMPUTER LINK-UP11?(Y;N)
DEVICE ADDRESS?(0-07; 60)
BIC/BTC EVEN DEVICE ADDRESS?(0-076)
BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276)

The purpose of this question is to determine if an inter-computer link is going to be tested.

4.3.18 CONFIGURATION QUESTION NUMBER 16

16.CARD READER-UP17?(Y;N)
DEVICE ADDRESS?(0-76;30)
BIC/BTC EVEN DEVICE ADDRESS?(0-076)
BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276)

The purpose of this question is to determine whether the Card Reader unit program must be included in the Configured System Test. It asks to provide more information about the device address, the BIC/BTC device address, and the BIC/BTC completed even interrupt address.

4.3.19 CONFIGURATION QUESTION NUMBER 17

17.HOW MANY LOCAL TERMINALS-UP18?(0-7)
TTY/CRTn where: n advances from 1 to 7 depending upon
the value entered above.
DEVICE ADDRESS?(0-07,1)
BIC/BTC EVEN DEVICE ADDRESS?(0-076)
BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0216)
READ READY EVEN INTERRUPT ADDRESS?(0100-0276)
WRITE READY EVEN INTERRUPT ADDRESS?(0100-0276)

The purpose of this question concerns the terminals for which unit programs have to be included in the configured System Test. The maximum number of terminals that can be configured for testing is 7. For each line printer, a series of questions are asked. A zero entry indicates that no terminals are to be tested.

4.3.20 CONFIGURATION QUESTION NUMBER 99

This question enables users to mold user-generated unit programs to System Test. The following information is requested for each unit program added to System Test.

99.NEXT ADD-ON UNIT PROGRAM NO?(XX) _____
MODEL CODE NO?(H,0-77) _____
DEVICE ADDRESS?(0-076) _____
BIC/BTC EVEN DEVICE ADDRESS?(0-076) _____
BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) _____
DEVICE COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) _____
WHICH UNITS?(0-7) _____
DMA RUN TIME? _____
MORE PARAMETERS?(P1,P2,...) _____

4.3.21 PREPARATION OF THE CONFIGURED SYSTEM TEST

After all the configuration questions have been answered, the selected unit programs are input from the Master System Test tape, and the following actions take place:

1. Parameters specified during the configuration dialog are processed to prepare the configured System Test.
2. Selected unit programs are then read into the second 32K words of memory in map key 1 by EXEC.
3. If unit program selected by the operator is not found on the Master System Test tape, the following message is output:

```
END OF LIBRARY  
UNIT PROGRAM XX NOT FOUND
```

(See sample listing 22.)

4. If the first 32K memory module gets filled before all selected unit programs are input, the following message is output:

```
END OF 32K MEMORY  
UNIT PROGRAM XX NOT FOUND
```

5. An input error is indicated by the message:

```
INPUT ERROR (AR)(BR)(XR)
```

where:

The contents of A, B, and X register are furnished as an aid in investigating the cause of the error.

If the input device can be set up at the start of the first unit program, an attempt to recover can be made by entering a space character; otherwise, no recovery is possible (a rerun is required).

6. Successful completion of the configuration is indicated by the following message:

```
SYSTEM CONFIGURATION DONE  
ENTER OPTION:  
<cc>=REPEAT DIALOG  
<sp>=OUTPUT CONFIGURED SYSTEM TEST  
<.>=REBOOT SYS GEN  
<CR>=BOOT SYSTEM TEST
```

If the space option (output) is selected, the following message occurs:

```
PREPARE OUTPUT DEVICE-ENTER SPACE WHEN READY
```

The next space character causes the configured System Test to be output. This double space requirement provide an added protection against destroying the Master System Test tape.

If there is an output error, the message:

OUTPUT ERROR (AR)(BR)(XR)

is generated, followed by a repeat of the option message namely:

PREPARE OUTPUT DEVICE-ENTER SPACE WHEN READY

A recovery may be attempted by entering a space character, or enter a Control-C to restart the dialog.

Successful output of the configured System Test is indicated by the message:

SYSTEM GENERATION DONE

NOTE

To make another copy of the configured System Test, prepare the output device again, and enter a space. Procedures for loading and executing the configured System Test are given in Section 6.

4.4 ERROR DETECTION DURING SYSTEM TEST GENERATION

System errors may be detected by the Preliminary Tests, the System Test Generator, the Executive Program (EXEC), or the unit programs. Errors detected by the unit programs are discussed in later sections of the manual.

4.4.1 PRELIMINARY TESTS

During execution of the Preliminary Tests, an Instructions Test, and a Preliminary Memory Test, a Real Time Clock Test and a 24-Level Pim Test (Option) are executed prior to loading the rest of the System Test. (Refer to Sections 3 and 5 of this manual).

Any errors detected by these preliminary tests, force the CPU into HALT mode with an error code of 01 to 062 in the instruction register. (Refer to Table 5-2 for a list of the error codes.) If such errors occur, nothing further can be done at the system level, except for the optional 24 Level Pim Test, where the option for continuing the run exists. The MAINTAIN III diagnostics must be run at this stage.

If the preliminary tests are successfully executed, the rest of the System Test (master or configured, depending upon the phase of the operation) is loaded from the input device. An error detected at this stage results in the following message:

LOAD ERROR

and the CPU goes into STEP mode with the error code 077 in the instruction register. No recovery is possible. The System Test must be reloaded.

4.4.2 ERRORS DETECTED BY THE SYSTEM TEST GENERATOR

Errors detected by the System Test Generator can be grouped into the following categories:

- Map Errors.
- Configuration Errors.
- Input Errors.
- Output Errors.

4.4.2.1 Map Errors

These errors are detected while writing to or reading from the map registers. Map errors are not recoverable. Map error messages have the following format:

MAP TIME OUT ERROR

or

MAP WRITE/READ ERROR, MAP REG xx, (y) (z)

where:

xx

Is the map register number. Can be any number from 00 to 077.

y

Is the data written.

z

Is the data read.

4.4.2.2 Configuration Errors

An invalid (unacceptable) response to a configuration question generates the following error message:

??

Enter the correct reply, or enter a Control-C to return to the beginning of the configuration dialog.

If the response to a question is incorrectly entered:

1. Type a back-arrow (←) to delete the previous character, or
2. Type a back-slash (\) to delete the entire reply.

Reenter the response correctly.

4.4.2.3 Input and Output Errors

Input and output errors have already been described in this section under "Preparation of the Configured System Test" (subsection 4.3.21).

Section 5

Configuration System Test: Operational Theory

5.1 GENERAL

This section describes how the various components of the configured System Test function. User interactions with the test and operational procedures are discussed in later sections.

5.2 PURPOSE

The configured System Test is generated from the Master System Test. It is a tailored version of the Master System Test configured for a given system configuration.

5.3 COMPONENTS

The configured System Test has the following components:

1. Preliminary Test
 - Instruction Test
 - Memory Test
 - Real Time Clock Test
 - 24-Level Pim Test
2. Loader
3. Executive Program
4. Unit programs

The first three components are identical to the corresponding components in the Master System Test. The System Test Generator is not one of the components of the configured System Test. The fourth component, namely, the unit programs, is the set of programs selected from the Library of unit programs which is a part of the Master System Test. The selection is specified during the configuration dialog, and is made during configured System Test generation.

5.3.1 PRELIMINARY INSTRUCTION TEST

The Preliminary Instruction Test portion of the System Test is identical to the Preliminary Instructions Test portion of the executive test program of MAINTAIN III. (Refer to Section 2, MAINTAIN III TEST PROGRAMS User Manual, UP-8672).

After the bootstrap routine loads the Loader and the Preliminary Tests, it jumps to address 007000. Then, the Preliminary Instruction Test is automatically executed, starting at address 007002.

The Preliminary Instruction Test validates central processing unit (CPU) operations by testing the machine instructions listed in Table 5-1. Successful execution of this test indicates that the System Test can be correctly loaded.

If an error is detected by the Preliminary Instructions Test, the program halts with the error code in the instruction register. Preliminary instructions test error codes are listed in Table 5-2.

To continue program execution after an error halt, press START or RUN. To loop on the subtest in error:

- a. Set Sense Switch 2.
- b. Refer to the program listing for the jump address specified by the preceding JSS2 instruction, and set the P register to that address.
- c. Press START or RUN.

5.3.2 PRELIMINARY MEMORY TEST

This test is automatically executed after successful execution of the Preliminary Instruction Test. The test verifies correct operation of the first 32K of memory (with the exception of the area in memory where the Memory Test resides). Memory addresses 000000 through 077777 are tested in two passes. The first pass checks each address with a pattern of 0125252. The original contents of memory are saved and restored by the program.

If an error is detected in the memory test, the program halts with 000052 in the instruction register, the address of the

faulty cell in the X register, and the bits in error in the A register. To continue the test, press START or RUN. To loop on an error:

- a. Set Sense Switch 2.
- b. Press START or RUN.

Following successful execution of the Preliminary Memory Test, the Loader loads the rest of the configured System Test.

5.3.3. PRELIMINARY 24-LEVEL PIM TEST

This Test is optional and may be selected by setting Sense Switch 1 (SS1) prior to booting the system. The program will then Halt with 00060 in the instruction register. To run the 24 Level PIM Test enter a non-zero value in the A register. If an alternate console is desired for the run, leave SS1 set; otherwise, reset SS1. To execute the test, press START or RUN. If an alternate console was desired and the 24-Level PIM Test is not to be run, leave the A Register zero and press START or RUN. The 24-Level PIM Test uses the masking function to check for proper execution of all 24 interrupt lines. It also checks the Disable PIM instruction by use of a sense command. There are 2 halts possible if failure occurs. Program halt with 000061 in the instruction register indicates the Sense PIM Disabled command did not detect PIM's disabled after execution of a Disable PIM's command. Program halt 00062 the A Register contains the address of a table showing the sequence of interrupts received. For program halt with 00063 in the instruction register indicates one or more interrupts did not occur. Each entry in the table has a bit set corresponding to the interrupt line causing the interrupt. The Band X registers indicate interrupts received as follows;

Interrupt Lines 07-00 are represented by bits 8-0 of the B register.

Interrupt Lines 17-10 are represented by bits 15-9 of the B Register.

Interrupt Lines 27-00 are represented by bits 8-0 of the X Register.

NOTE

- A one bit indicates an interrupt was received. When a numbered HALT is indicated, examine the I (Instruction) Register.

A loop on the error may be made by setting Sense Switch 3 and pressing START or RUN. If the error is valid for the configuration and you wish to continue press START or RUN.

5.3.4 PRELIMINARY REAL TIME CLOCK TEST

This test is automatically executed after a successful execution of the Preliminary Memory Test, or optionally the 24-Level Pim Test. The test verifies that the Real Time Clock interrupt occur. Program Halt with 57 in the instruction register indicates an interrupt should have occurred, but did not. To loop on the error set Sense Switch 3 and press START or RUN.

5.3.5 LOADER

The Loader is a binary loader which loads formatted object data into computer memory, computes the check-sum, and transfers program control as directed. The Loader computes the check-sum of each record of the System Test (object) as it is loaded, and compares the result with the expected value in the check-sum frames at the end of each record.

If a check-sum error is detected during the program loading, the program stops, and the following message is output:

CHECKSUM ERROR X = xxxxxx

where:

xxxxxx

Is the error address in the X register.

Table 5-1. Preliminary Instructions Test Summary

Mnemonic	Description
ADD	Add memory to A register
ADDI	Add immediate
ANAI	AND immediate
DAR	Decrement A register
DBR	Decrement B register
DECR 02	Set B register to -1
DXR	Decrement X register
ERA	Exclusive-OR memory and A register
ERAI	Exclusive-OR immediate
IAR	Increment A register
IBR	Increment B register
INCR 03	Set A and B registers to +1
IXR	Increment X register
JAN	Jump if A register negative
JAP	Jump if A register positive
JAZ	Jump if A register zero
JBZ	Jump if B register zero
JIF 011	Jump if A register = 0 and OVFL is set
JMP	Jump (unconditional)
JMPM	Jump and mark (unconditional)
JMP*	Jump indirect
JOF	Jump if overflow indicator set
JXZ	Jump if X register zero
LDA	Load A register
LDAI	Load A register immediate
LDB	Load B register
LDBI	Load B register immediate
LDX	Load X register
LDXI	Load X register immediate
LLRL	Load logical rotation left
LLSR	Long logical rotation right
LRLA	Logical rotation left A register
LSRA	Logical shift right A register
MERG 032	Transfer ORed A and B registers to B register
NOP	No operation
ORAI	Inclusive-OR immediate
ROF	Reset overflow indicator
STA	Store A register
STAI	Store A register immediate
STB	Store B register
STX	Store X register
SUB	Subtract memory from A register
TBA	Transfer B register to A register
TBX	Transfer B register to X register
TXA	Transfer X register to A register
TZA	Transfer zero to A register
TZB	Transfer zero to B register
TZX	Transfer zero to X register
XAZ	Execute if A register zero
XBZ	Execute if B register zero
XIF 022	Execute if B register = 0 and A register = ≥ 0

Table 5-2. Preliminary Instruction Test Error Codes

Error Code	Instruction Subtest
000001	TZA/DAR/JAZ/JAN
000002	LDA/IAR/STA
000003	LDB/JBZ/TZB
000004	IBR/DBR
000005	LDX/JXZ/TZX
000006	IXR/DXR
000007	LDAI/JAN
000010	LDAI/ERA/JAN
000011	ERAI/JAP
000012	LDBI/TBA
000013	LDXI/TXA
000014	LDB/TEX
000015	LDA/ERA
000016	LDA/STA
000017	LDB/STB
000020	LDX/STX
000021	XAZ
000022	XBZ
000023	ROF/SOF/JOF
000024	ROF/JOF/JMP
000025	JMPM/(JMP)
000027	LRLA
000030	LLSR
000031	LLSR
000032	LLRL
000033	LLRL
000034	ADD
000035	ADDI/ORAI
000036	SUB
000037	NOP
000040	INCR 03 (005103)
000041	DECR 02 (005302)
000042	MERG 032 (005032)
000043	LSRA
000044	LDA
000045	STA
000046	ANAI
000047	STAI
000050	XIF 022 (003022)
000051	JIF 011 (001011)

After a check-sum error halt:

1. Run the MAINTAIN III Test Programs to determine whether the tape drive is malfunctioning.
2. If the tape drive appears to be functioning properly, redo the System Test generation.

5.3.6 EXECUTIVE PROGRAM

The Executive Program (EXEC) controls the execution of the configured System Test. It performs the scheduling and mapping functions required to execute the unit programs in a real-time, multiprogrammed, mapped, interrupt-driven environment. The Executive also performs an error-logging function. A count of errors detected by each unit program is maintained. The EXEC provides an interface which allows the operator to perform various operational and debugging functions. The functions are performed using commands which are executed by the EXEC. All interrupt and I/O functions are performed by the EXEC in response to service calls made by the unit programs. The Executive communicates with the unit programs via the TIDB (Task Identification Block) assigned to the unit program at System Generation time. The TIDB consists of 64 words, which will contain key information pertaining to the running of the unit Programs. See table 5-3 and 5-4 on the structures of the TIDB.

5.3.7 UNIT PROGRAMS

The unit programs in the configured System Test are those selected from the Library of Unit Programs in the standard System Test. The selection is specified by the operator during the configuration dialog. It is effected by the System Test Generator (refer to Section 2) during the system test generation process.

All the unit programs run under the control of the EXEC and conform to certain interface requirements. Unit programs have a standard identification format.

5.3.5.1 Identification

Each unit program has a standard identification (ID).

This ID has the following format:

M4xxnn.v

where:

- M4 Is the prefix common to all the unit programs.
- xx Is a two-character literal identification.
- nn Is a two-digit decimal number identification.
- v Is the version level (0 or A - Z).

The IDs of all the currently available unit programs are listed in Table 5-5.

Examples:

In the following unit program ID:

M4WC01.0

M4 is the unit program ID prefix. WC is the two-character literal identification. The letters WC indicate that the unit program being discussed is the WCS unit program. 01 is the two-digit decimal number identification. The version level is 0.

Consider the following unit program ID:

M4MT07.A

M4 is the unit program ID prefix. The letters MT indicate that the unit program is the Magnetic Tape unit program. 07 is the decimal number identification. The version level is A.

5.3.5.2 Assembly

All the unit programs are assembled relative to 0, and start at location 01000 with a jump instruction to the program execution starting address. The contents of locations 01000 to 01007 are listed in Table 5-6.

Table 5-3. TIDB (TASK INFORMATION DATA BLOCK)
FORMAT TABLE

Name	Word No.	Function
TNTA	0	NEXT TIDB ADDRESS
TTSW	1	TIDB STATUS WORD
TUPP	2	UNIT PROGRAM PRIORITY
TIEW	3	INTERRUPT EVENT WORD
TRSS	4	RO REENTRANT SUSPEND STACK
*	5	R1 "
*	6	R2 "
*	7	R3 "
*	8	R4 "
*	9	R5 "
*	10	R6 "
*	11	R7 "
TRPC	12	OFF, PC "
TISS	13	RO INTERRUPT SUSPEND STACK
*	14	R1 "
*	15	R2 "
*	16	R3 "
*	17	R4 "
*	18	R5 "
*	19	R6 "
*	20	R7 "
TIPC	21	OFF, PC "
TBIA	22	BIC INT LINE HANDLER ADDRESS
TDTA	23	DEVICE INT LINE HANDLER # 1 ADDRESS
*	24	DEVICE INT LINE HANDLER # 2 ADDRESS

***UNIT PROGRAM PARAMETER DATA TABLE-25 TO 40 ***		
* PARAMETERS PASSED BY EXECUTIVE TO UNIT PROGRAM		
TKEY	25	MAP KEY
*	26	MODEL, TYPE, LAD CODE, 0 IF NONE
TDAD	27	DEVICE ADDRESS
TBIC	28	BIC ADDRESS
TRMF	29	RUN MODE FLAG;0=SYSTEM,1=DIAGNOSTIC
*	30	30+ TO +40, ADDITIONAL PARAMETERS

Table 5-3. TIBD (TASK INFORMATION DATA BLOCK)
 FORMAT TABLE (CONTINUED)

Name	Word No.	Function

*	41	UNUSED
*	42	UNUSED
*	43	UNUSED
*	44	UNUSED
*	45	UNUSED

TCBP	46	CHANNEL CONTROL BLOCK TABLE PAGE NO
TCBA	47	CHANNEL CONTROL BLOCK TABLE ADDRESS
TDRT	48	DMA RUN TIME

*** PROGRAM ID	49	SYSTEM TEST ID(ALWAYS M4)
TPID	50	PROGRAM ID(2-CHARACTERS)
*	51	PROG. NO.(2-DIGIT ASCII)
TUPN	52	REVISION LEVEL(.N IN ASCII)
*	53	MUST=0 TO END ID
*		

TPPI	54	1 ST PROGRAM PAGE ASSIGNED
TPPN	55	NO OF PROGRAM PAGES ASSIGNED
TBPI	56	1ST BUFFER PAGE ASSIGNED
TBPN	57	NO OF BUFFER PAGES ASSIGNED
TTRA	58	TRAP ADDRESS
TGOA	59	'GO TO' ADDRESS IN USER'S MAP
TPW1	60	TRAPPED PROGRAM WORD 1
TPW2	61	TRAPPED PROGRAM WORD 2
TPSA	62	PGM STARTING ADDRESS IN MAP 0
TPFA	63	PGM ENDING ADDRESS+1 IN MAP 0

Table 5-4. TIDB Status word (word 1 of TIDB) Format

Name	Bit	Function
TSRL	B15	RUN LIST FLAG
*		-----
TSEN	B14	ENABLE(=0)/DISABLE(=1) FLAG
TSIS	B13	INTERRUPT SUSPENDED
TSWI	B12	WAITING FOR INTERRUPT
*		-----
TSDA	B11	TIME DELAY ACTIVE
TSPF	B10	PRINT ROUTINE ENTRY FLAG
TSWP	B9	WAITING FOR PRINT ROUTINE
*		-----
TSBA	B8	BIC AVAILABLE
TSWB	B7	WAITING FOR BIC AVAILABLE
TSUB	B6	UNIT PROGRAM BUSY
*		-----
*	B5	UNUSED
*	B4	UNUSED
TSIR	B3	INTERRUPT RECEIVED
*		-----
TSDC	B2	TIME DELAY COMPLETE
TSPB	B1	PRINT ROUTINE BUSY
TSRM	B0	RUN MODE FLAG; 0=SYSTEM, 1=DIAGNOSTIC

Table 5-5. Unit Program IDs

Unit Program Name	Unit Program ID	UP-No.
V77-600 Writable Control Store	M4WC01	UP1
V77-600 Floating-Point Processor	M4FP02	UP2
Memory	M4ME03	UP3
Cartridge Disk	M4DF04	UP4
Disk Memory and Controller	M4DC05	UP5
Direct Memory Access Disk	M4DH06	UP6
Magnetic Tape	M4MT07	UP7
Line Printer	M4LP08	UP8
Data Communications Multiplexer	M4DM09	UP9
V77 Terminal Test	M4TT10	UP10
V77 Intercomputer Link	M4CC11	UP11
Laser Printer	M4ZP12	UP12
V77 MSC Disk Controller	M4DG13	UP13
V77-800 Writable Control Store and Floating-Point Processor	M4WC15	UP15
V77 Diskette Test	M4DJ16	UP16
V77 Card READER Test	M4CR17	UP-17
V77 UASC Test	M4LT18	UP-18

Table 5-6. Contents of location 01000 to 01007

Location address	Contents
01000,1	Jump instruction to execution starting address
01002	M4
01003	Two-character literal identification
01004	Two-digit decimal number
01005	.v where v is the version level
01006,7	Alternate entry point

Locations 01010 to 01027 are used by the EXEC to pass parameters to the unit programs. Refer to Table 5-7.

Table 5-7. Contents of Locations 01010-01027

Location	Contents
01010	Map key assigned to unit program
01011	Model number, unused if not applicable
01012	Device address to be used by the unit program
01013	BIC/BTC address, if any
01014	Run mode flag (0 = System Mode, non zero = Diagnostic Mode)
01015-27	Depends upon unit program

5.3.5.3 Executive Service Calls

All interrupt and I/O functions required by the unit programs (except for the DCM and terminal programs) are performed by the EXEC. Unit programs request these services by using executive

service calls. A call is made by executing a jump to the service routine address. Data registers are used to pass information between the EXEC and the unit programs. The call name, address of the service routine being called, and the function of the call are described in Table 5-8. Data passed between the EXEC and the unit programs during execution of the service calls in the A, B, X, and R3 registers is described in Table 5-9. Transfer of data between the unit program and the device controller is accomplished by use of a BIC (Buffer Interlace Controller) or direct memory access depending upon the type of controller. Interrupts are processed by use of a PIM (Priority Interrupt Module).

Table 5-8. Executive Service Calls

Call Name	Address	Function
M\$SMEM	0400	Allocates physical memory.
M\$RSUM	0401	Resume EXEC interrupt handler.
M\$SBIC	0402	Allocates BIC/BTC or I/O device.
M\$RBIC	0403	Releases a previously selected BIC/BTC or I/O device.
M\$PREQ	0405	Prints a message on the operator's console, or system list device.
M\$CCBA	0407	Sets Channel Control Block (CCB) address in Unit Address Word Table.
M\$EXIO	0410	Executes one of the following I/O instructions: <div style="text-align: center;"> EXC SEN CIB EXC2 CIA OAR OBR </div>
M\$FINI	0411	Indicates that the unit program has completed execution and can be rescheduled.
M\$DIAG	0412	Gets parameters from the operator which are required by the unit programs when run in diagnostic mode.
M\$TRAP	0417	Special debugging call generated by the operator command: "TRAP". (Refer to Section 6).

Table 5-9. Data Passed by Executive Service Calls

Call Name	Data Required by Executive		Data Returned by Executive	
	Register	Data	Register	Data
M\$SMEM	A	Starting logical address of required memory.	A	Starting physical address, low 16 bits.
	B	Ending logical address of required memory.	B	Ending physical address, low 16 bits.
			X	Physical address, high 4 bits.
M\$SBIC	A	BIC/BTC even address or device address.		None
	B	Time delay.		
M\$RBIC	A	BIC/BTC even address or device address.		None
M\$PREQ	A	<p>Logical address of message table in unit program's map. A positive address (bit 15=0) indicates a non-error message. A negative address (bit 15=1) indicates an error message.</p> <p>Message Table Format:</p> <ul style="list-style-type: none"> + address=starting address of an ASCII string. - address=address of an octal word +1 Generates a <cr-lf> pair. -1 Suppresses the <cr-lf> pair. 0 Terminates the message and generates a <cr-lf>. -2 Skip error log and header 		None

Table 5-10. Data Passed By Executive Service Calls

Call Name	Data Required by Executive		Data Returned by Executive	
	Register	Data	Register	Data
MSCBA	A	Logical address of CCB in unit program's map.	A	Unit Address Word Table address in map 0.
	B	Drive unit number	B	CCB physical address, low 16 bits.
MSEXIO			X	CCB physical address, high 4 bits.
	A	OAR data, if any	A	0 if the instruction is an SEN which jumped.
	B	OBR data, if any; or time delay		1 if the instruction is an SEN which did not jump.
	X	I/O instruction		<data> if the instruction is a CIA.
	R3	Interrupt expected code: 0=no interrupt expected +1=BIT/BTC complete interrupt. -1=device interrupt #1. -1=device interrupt #2. +2=return with interrupts off. +3=BIT/BTC interrupt, ignore multiple interrupt.	B	0 if lapsed time delay. Non-zero (remaining time) if time delay did not lapse. <data> if the instruction is a CIA
MSPINI		None.		None.
MSDIAG		None	R0-R7	Parameters entered by operators and/or default values entered by unit program
MSRSUM	A	0 to post interrupt received in TIDS status word. 1 to inhibit posting.		None.
	X	TIDS address passed by EXEC to caller,		

5.3.5.4 Operational Theory

Each unit program handles one controller and all units attached to that controller. Unit program operation for I/O controllers consists of the following steps:

1. Records are written to each unit on the controller, alternating between units.
2. The records are then read back into memory from the units.
3. The data read is compared with the data written to determine whether a valid read/write operation has taken place.

For this operation, all the memory from the end of the unit program through the end of its 32K memory map is used as buffer space. Variable size records are moved through this buffer space and written out.

For Magnetic Tape controllers, the tape is backspaced between the read and write operations. If the end of the tape is reached before the program ends, the tape is rewound, and the writing is continued.

For non-I/O devices and devices which only output data, action appropriate to the particular device is performed. Error messages are output when either erroneous results are obtained or equipment malfunctions occur.

Once a program is scheduled for operation by the EXEC, it continues in operation until one of the following occurs:

- a. For a non I/O device, function of the program is completed.
- b. For other devices, all available buffer space has been used to output data on each available unit on the assigned controller.

When an error occurs, an error message is output, and that unit is flagged as down.

NOTE

The only external input provided to a unit program is that provided by the EXEC at system generation time. The only output from a unit program consists of records written to the device and any error messages that may be generated.

Once execution of the System Test is started, it operates continually. The operation is automatic, and requires no operator intervention. Execution of the System Test can be stopped either by shutting down the system, or by entering a Control-C.

If at any time during the execution of the System Test the computer is forced into STEP mode, restart at location 0.

There is no operator interface for a unit program. Data required by the unit programs and responses to any error message that may be generated are both handled exclusively by the EXEC.

After the configured system test has been loaded a reboot may be performed at any time, as follows;

1. Place CPU in STEP mode.
2. Reset CPU.
3. Set P-register equal to 02.
4. If bootstrap is from magnetic tape, skip step 5.
5. Set X-register equal to 0 (go to system test) or non-zero (go to system test generator).
6. Depress R on the operator console or START on the computer control panel.

Section 6 System Test Operation

6.1 OVERVIEW

This section describes the following phases of System Test operation:

- Initial preparation
- Loading the configured System Test
- Operator interaction with the test.

6.2 PREPARATION

Place all units to be tested in the READY or online state, as follows:

1. Line printer: Load with paper, and place online.
2. Teletypewriter or CRT terminal: Place online.
3. Magnetic Tape Units: Mount the configured System Test tape on the system boot device. Mount scratch tapes which are write-enabled, on the other magnetic tape units. Position the tapes to load point. Press ON-LINE.

CAUTION

The configured System Test tape should not be write-enabled.

4. Disk units: Mount disk packs on units. Use formatted, scratch disk packs. Place unit in READY mode. Refer to the VORTEX II System Generation User Guide/Programmer Reference, UP-9083, for information about disk formatting.

6.3 LOADING THE CONFIGURED SYSTEM TEST

Load the configured System Test using the procedures described in Section 3. Preparation and procedures for loading the Preliminary Loader are identical to those described in Section 3. After the Preliminary Loader is loaded, and it loads the rest of the configured System Test, the following message is output to the operator's console:

```
V70-SERIES SYSTEM TEST-REV X.Y
*****
FOR COMMAND LIST,TYPE H.
EXEC PROMPTER IS EX**
DIAGNOSTIC PROMPTER IS DG**
VERIFIED MEMORY SIZE= 0XXXX
*****
EX**
```

The operator can now enter any one of the operator commands described in the following paragraphs.

6.4 OPERATOR COMMANDS

Once the configured System Test is loaded, the operator can direct the Test using operator commands. A summary of operator commands is presented in paragraph 6.5. The operator commands are simple and short. Operator commands are also referred to as Executive commands, since they are directives to the Executive Program (EXEC). They allow the operator to perform a variety of Test control functions, including the following:

- Select unit programs to be scheduled for execution.
- Debug unit programs.
- Alter the map key and pages assigned to a unit program scheduled for execution.
- Examine and alter the contents of a specific location in a specific map key.
- Examine the Error Log Table for the preceding run.

The operator commands are grouped into the following categories:

- Control Commands
 - CONTROL C
 - CONTROL Kn
- Tutorial/Reference Commands
 - HELP
 - INDEX
 - LOG
- Executive Commands
 - RUN
 - DISABLE
 - ENABLE
- Manipulation Commands
 - CHANGE
 - CHANGE MAP
 - EDIT
 - LIST
 - INSERT
 - KEY
 - REG
 - SEARCH
 - TRAP
 - VIEW

In the following paragraphs, these commands are discussed in the order presented above. In the command summary (Section 6.5), the commands are listed in alphabetic sequence.

If the computer is forced into STEP mode at any time during the execution of the System Test, restart at location 0.

6.4.1 USING THE OPERATOR COMMANDS

The System Test informs the operator that it is ready for execution, by sending the following message to the operator's console:

```
V70-SERIES SYSTEM TEST-REV X.Y
*****
FOR COMMAND LIST,TYPE H.
EXEC PROMPTER IS EX**
DIAGNOSTIC PROMPTER IS DG**
VERIFIED MEMORY SIZE= 0XXXX
*****
EX**
```

Operator commands can be entered only after the EXEC prompter appears.

The operator commands have some features (requirements, parameters, and options) that are common to many of them. These common features are:

- If a command is erroneously entered, before terminating the command, type a back-slash (\) character to erase the line, or type a back-arrow (←) character to erase the previously typed character; the command can now be reentered correctly.

Example:

```
EX**
C\
V60\
V67020,67037,0.
```

The first back-slash erases the "C" command. The second back-slash erases the "V60" command.

- Multiple fields must be separated by commas.

Example:

```
RU1,2,3.
```

Numbers 1, 2, and 3 must be separated by commas.

- If one optional field is omitted, but a following optional field is included, a comma must be entered in the position of the omitted field.

- Each command must be terminated with a <cr> or period. In most cases, the two can be used interchangeably. Cases where they cannot be used interchangeably are flagged as such in the manual, and the differences in usage are explained.
- All numbers required by a command must be entered in octal notation, with the exception of unit program numbers. The unit program number is the two-digit decimal number which is part of the unit program ID. (See Section 5).

Example:

```

EX**
RU/FDS
M4LP08.0 DA=035 KY=015 PP=0153 BP=0,01 TM=H:M:S
*****
EX**
K
M4LP08.0 DA=035 KY=015 PP=0153 BP=0,01 TM=H:M:S
EX**
C1575(030300).

```

- ① The unit program number entered as a part of the RUN command is a decimal number.
- ② 1575 is an octal number. Note, however, that the leading zero may be omitted.
- If the command results in program output, the output is automatically sent to the list device. Selection of a list device is accomplished by using the following options:
 - /L selects the line printer for output.
 - /P selects the line printer and the operator's console for output.
 - If neither the /L nor the /P is used, the operator's console is used for the output.

Example:

If the HELP command is entered as:

H/L.

the resulting list is output on the line printer.

- If the selected list device is not available or not ready, the output is sent to the other (alternate) list device.
- When the output is being listed on the operator's console, after every 20 lines are output, the following message occurs:

 *** ENTERS SPACE TO CONTINUE*** The operator can then either continue by entering space or terminate the output entering any character other than a space.

This feature gives the operator enough time to view the data when it is being displayed on a keyboard-display terminal.

6.4.1.1 Prompter Command

EX** is the Executive prompter. The EX stands for EXEC. EXEC is the Executive Program which is the chief controlling component of the System Test.

The EX** prompter can be invoked at any time during the operation of the System Test by entering the Control-C character. This reinitializes the system, but saves the map keys of the unit programs. Since the map keys are saved, the user can subsequently access the unit programs in their respective maps.

NOTE

The EX** prompter can also be invoked with a control panel or micro-processor interrupt.

6.4.1.2 Status Command

The Status of all running programs may be obtained without rerunning by entering a Control Kn at any time. This causes the status to be displayed. The status consists of the data furnished by the RUN command plus the current time. If n=<.>, the status will be displayed at once. If n=number, the status will be displayed every n minutes.

6.4.2 HELP COMMAND

6.4.2.1 Purpose

HELP command assists the user by providing him with tutorial information about all the operator commands. The command causes all the operator commands, along with a brief description of each, to be listed on the list device.

6.4.2.2 Format

The HELP command has the following format:

$$H \begin{bmatrix} /L \\ /P \end{bmatrix} \left\{ \begin{array}{l} \langle cr \rangle \\ . \end{array} \right\}$$

If the /L is used, the output is directed to the line printer. If the /P is used, the output is directed to both the line printer and the operator's console.

If neither the /L or /P is used, the output is directed to the operator's console.

6.4.2.3 Example

In the following example, the operator types "H" after the EX** prompter, and obtains a listing of all the operator commands. After the list is completed the EX** prompter appears again. The operator can now enter a new command.

```
EX**
H.
EXECUTIVE COMMANDS
NOTE:ALL COMMANDS END WITH CR OR .
CONTROL C REINITIALIZES & RETURNS TO EX**
CONTROL K[N] OBTAINS STATUS REPORT
N=REPORT TIME PERIOD IN MINUTES
/L=OUTPUT TO LPR
/P=OUTPUT TO LPR &TTY/CRT
[K]=MAP KEY
HELP:PRINT COMMAND LIST
H[/L]
INDEX:PRINT UNIT PROGRAM LIST
IN[/L]
RUN:RUN UNIT PROGRAMS
```

```

RU[/L][/F][/T][/D][N1,N2,...]
  /L=OUTPUT TO LPR
  /P=OUTPUT TO LPR &TTY/CRT
  /F=FIXED MODE
  /T=TRAP(DEBUG) MODE
  /D=DIAGNOSTIC MODE
ENABLE:ENTER UNIT PGMS IN RUN LIST
PGM(OR DEVICE):EN[N1,N2,...]
PARITY INTERRUPT:EP
CACHE:EC
SPURIOUS INTERRUPT:ES
DISABLE:DELETE UNIT PGMS FROM RUN LIST
PGM(OR DEVICE):DN[N1,N2,...]
PARITY INTERRUPT:DP
CACHE:DC
SPURIOUS INTERRUPT:DS
EDIT:DISPLAY/ALTER KEYS, PAGES
  ED(CR OR .)[K][,P]
LIST:PRINT ENABLED UNIT PROGRAMS LIST
  LI[/L,/P](CR OR.)
CHANGE MAP:ALTER NEXT MAP KEY, PAGE
  CM[K][,P]
LOG:PRINT ERROR LOG TABLE
  L[/L]
REGISTER:DISPLAY/ALTER REGISTERS
  ([A][B][X][R[N]])[,K](CR OR .)[D](T)
  NOTE:D=NEW DATA, IF ANY
  T=COMMA DISPLAYS/ALTERS NEXT REGISTER
  =OTHER TERMINATES COMMAND
KEY:DISPLAY KEYS/SET DEBUG MAP KEY
  K[/L,/P][N]
CHANGE:DISPLAY/ALTER MEMORY IN K
  C(X)[,K](CR OR .)[D](T)
  NOTE:D=NEW DATA, IF ANY
  T: ,=NEXT; .=PREV; *=INDIRECT; CR=END
VIEW:FROM X TO Y, IN K, ON LPR AND/OR TTY
  V[/L,/P](X)[,Y][,K]
OR VIEW MAP REGISTERS
  VM[/L,/P][K]
INSERT:INSERT P INTO X TO Y, IN K
  I(X),(Y)[,P][,K]
SEARCH:FROM X TO Y, IN K, FOR P MASKED BY M
  S[/L,/P](X),(Y)[,P][,M][,K]
TRAP:TRAP AT X, GO TO Y, IN K
  T[X][,Y][,K]
EX**

```

6.4.3 INDEX COMMAND

6.4.3.1 Purpose

The INDEX command lists the IDs of all the unit programs residing in memory in map key 0. The command assists the operator by identifying all the unit programs that he can run. The unit programs are identified by ID, device address (DA), and TIDB (Task Identification Block). The TIDB contains all the information about a task during its execution.

6.4.3.2 Format

The command has the following format:

```
IN      [ /L ]   { <cr> }
         [ /P ]   { .   }
```

6.4.3.3 Usage

The command can be terminated either with a <cr> or with a ".".

To use the operator's console as the list device, enter the following:

```
IN.
```

or

```
IN<cr>
```

To use the line printer as the list device, enter the following:

```
IN/L.
```

or

```
IN/L<cr>
```

6.4.3.4 Example

The example shown here is an excerpt from a listing obtained during System Test operation on a V77-600 system.

```
EX**
IN.
EXEC00.C DA=0 TIDB=017400
M4WC01.0 DA=074 TIDB=017500
```

M4ME03.0 DA=0 TIDB=017600
M4DH06.A DA=014 TIDB=017700
M4MT07.A DA=010 TIDB=02000
M4LP08.0 DA=035 TIDB=020100
M4DM09.0 DA=070 TIDB=020200
EX**

In response to the operator command: "IN" a list is output. The first program on the list is the executive program (EXEC). All the other programs on the list are unit programs residing in map key 0 of memory.

For each program, the program ID, Device address, and TIDB are listed.

Refer to Section 5 for the format of the program ID and a cross-reference list of unit program names and IDs.

In the example:

M4WC01.0
Is the V77-600 Writable Control Store (WCS) unit program.

M4ME03.0
Is the Memory unit program.

M4DH06.A
Is the Direct Memory Access Disk (Type DH) unit program.

M4MT07.A
Is the Magnetic Tape unit program.

M4LP08.0
Is the Line Printer unit program.

M4DM09.0
Is the DCM unit program.

6.4.4 LOG COMMAND

6.4.4.1 Purpose

The LOG command is used to list the entries made in the Error Log during the previous run of the System Test. The Error Log

maintains a record of the number of errors detected by each unit program. Each entry shows the decimal number code of a unit program and the number of errors detected by it. The Error Log is automatically initialized each time a new RUN command is entered.

6.4.4.2 Format

The LOG command has the following format:

$$L \quad \left[\begin{array}{l} /L \\ /P \end{array} \right] \quad \left\{ \begin{array}{l} \langle cr \rangle \\ . \end{array} \right\}$$

6.4.4.3 Usage

The Error Log is particularly useful when the System Test is being run over a long period of time, without operator intervention, and without output of error messages to the line printer. By analyzing the Error Log, the operator can:

- a. Determine which unit programs have detected errors, and
- b. Rerun these unit programs.

He can thus focus on the problem areas quickly. The operator can also use the Error log as a reference point, to gauge the progress he is making in detecting and remedying errors.

To use the teletypewriter or keyboard-display terminal as the list device, enter:

L<cr>
or
L.

To use the line printer as the list device, enter the following:

L/L<cr>
or
L/L.

6.4.4.4 Example

```
EX**
L
ERROR LOG TABLE
UNIT PROGRAM ERRORS - TM=H:M:S
  0      01
  01     0
  02     0
  03     0
  04     0
  05     0
  06     0
  07     0
  08     0
  09     0
  010    0
  011    0
  012    0
  013    0
  014    0
  015    0
  016    0
  017    0
  018    0
```

where:

TM=H:M:S

Is the current relative time (hours, minutes, seconds).

Program 0 refers to the EXEC.

6.4.5 RUN COMMAND

6.4.5.1 Purpose

The RUN command identifies the unit programs (by decimal number codes) which are to be scheduled for execution, and executes them.

6.4.5.2 Format

The command has the following format:

```
RU  [ /L ] [ /P ] [ /F ] [ /T ] [ /D ] [ n1, n2, n3, ... ] { <cr> }
      .
```

where:

[/L
 /P]

Selects the list device.

L - Messages to line printer only.

P - Messages to operator's console and line printer.

/F

Specifies the fixed mode of operation.

/T

Specifies the trap mode of operation.

/D

Specifies the diagnostic mode of operation. Not implemented on some unit programs and will be ignored where not implemented.

n1,n2,n3,...

Are the decimal number codes of the unit programs to be scheduled for execution. This list of unit programs is the "run list".

{ <cr>
 . }

Is the termination character.

6.4.5.3 Usage

The command can be terminated either with a <cr> or with a "." following the run list. The list of unit programs (n1,n2,...) specified in the RUN command, is the "run list". If no unit programs are specified, the character which terminates the command determines what action is taken as follows:

- If the command is terminated with a <cr>, all the enabled unit programs in the configured System Test, are automatically included in the run list.
- If the command is terminated with a ".", the run list specified in the previous RUN command is used again.

The RUN command has four modes of operation:

- Normal System mode. This is the normal or default mode of operation.
- Fixed mode. This is specified by the /F option.
- Trap mode. This is specified by the /T option.
- Diagnostic mode. Specified by the /D option.

In the normal system mode of operation, after each unit program completes execution, it is assigned a new map key and pages when it is subsequently rescheduled. This new map key is the first free (available) map key.

In the fixed mode of operation, each unit program is initially assigned a map key and pages. Each unit program continues to use the map key and pages originally assigned to it whenever it is rescheduled.

In the trap mode of operation, the unit programs specified in the RUN command are stored in their respective maps. After the Executive Program (EXEC) issues the EX** prompt, the operator can enter any one of the operator commands. Some of the operator commands, however, are particularly suitable for use in this mode of operation. These commands allow the operator to perform the following trap operations:

- Examine and/or alter locations within a unit program
 - CHANGE command
 - VIEW command
 - INSERT command
 - SEARCH command
- Alter the map key and pages assigned to a particular unit program
 - CMAP command
 - EDIT command
 - KEY command

- Display the contents of a specified register at the time of the previous interrupt
 - REG command
- Set a breakpoint at a particular location
 - TRAP command

The operator can use the /T option either:

1. in combination with the normal (variable) mode, or
2. in combination with the fixed mode.

NOTE

If more than one slash option is chosen, the options need not be separated by slashes. Only one slash is required.

Example:

To run unit program 4 in both the fixed and trap modes simultaneously, enter:

RU/FT4, not RU/F/T4.

NOTE

To exit from the trap mode, enter a <Control-C> character. This causes the EX** prompt to reappear. The RUN command can be entered only after a EX** prompt.

6.4.5.4 Examples

Example 1:

```
EX**  
RUN  
  
M4WC01.0 DA=074 KY=01 PP=0100,01 BP=0,0  
M4ME03.0 DA=0 KY=02 PP=0101,01 BP=0,0  
M4DH06.A DA=014 KY=03 PP=0102,03 BP=0,0  
M4MT07.A DA=010 KY=04 PP=0105,03 BP=0,0  
M4LP08.0 DA=035 KY=05 PP=0110,02 BP=0,0  
M4DM09.0 DA=070 KY=06 PP=0112,02 BP=0,0  
*****
```

In this example, after the EX** prompt, the operator enters the RUN command. The run list specifies all the unit programs in the configured System Test. The EXEC lists descriptive information about each unit program in the run list, as it is executed. The descriptive information provided consists of the following:

- Program ID
- Device Address
- Map key
- Contiguous physical pages assigned to the unit program (1st page and page count)
- Physical pages assigned to the temporary work-area (buffer) which the unit program uses (1st page and page count).

The following information is provided about the first unit program in the above run list example:

```
M4WC01.0 DA=074 KY=01 PP=0100 BP=0,0
```

where:

M4WC01.0

Is the program ID. (See the INDEX command for a description of the program ID).

DA=074

Gives the Device Address.

KY=01

Is the map key assigned to this unit program.

PP=0100,01

Is the physical page(s) assigned to the unit program. Each time the program is rescheduled, the EXEC assigns pages to it. The 0100 is the 1st page of the assigned contiguous pages. In this example, the second value (01), indicates that only 1 page was assigned.

BP=0,0

This information relates to the buffer used by the unit program, during execution. The first number (0) is the address of the first physical page assigned to the buffer. The second number (0) is the actual number of pages used by the buffer. These pages are released when the unit program completes execution. Unit programs request buffer pages using the M\$SMEM call. (Refer to Section 5.)

The same format is used to provide descriptive information about all the unit programs in the run list.

For example:

M4MT07.A DA=010 KY=04 PP=0105,3 BP=0,0

This unit program has been assigned physical pages 0105, 0106, and 0107.

By entering a <Control-C>, the operator can invoke the EX** prompt. After the EX** prompt appears, the operator can enter another command.

Example 2:

EX**
RU4

*UNEXPECTED INTERRUPT

M4DM09.0 DA=070 KY=0 PP=0115,02 BP=0470,01 TIDB=20200 TM=0:0:0
000001 002731 017600 000002 002734 002734 052525 125252 002246

EX**

In this example, the run list consists of unit program 4. After the descriptive information about the unit program is listed, error messages detected by the unit program are listed.

Example 3:

```
EX**
RUN 1,2,3,4 ①
UNIT PROGRAM 02 NOT FOUND

M4WC01.0 DA=074 KY=01 PP=0100 BP=0,02
M4ME03.0 DA=0 KY=02 PP=0101 BP=0,03
M4MT07.A DA=010 KY=03 PP=0102,03 BP=0,01
*****
*UNEXPECTED INTERRUPT AT 260
M4DM09.0 DA=070 KY=0 PP=0112,02 BP=0242,01 TIDB=20200 TMO:0:0
000001 002733 017200 000002 002734 002734 052525 125252 002246

EX**
RUN 1,7 ②
M4WC01.0 DA=074 KY=01 PP=0100 BP=0,01
M4MT07.A DA=010 KY=02 PP=0101,03 BP=0,02
*****

EX**
RUN ③
M4WC01.0 DA=074 KY=05 PP=0300 BP=0,01
M4MT07.A DA=010 KY=06 PP=0301,03 BP=0,03
*****
EX**
```

① This RUN command has a run list consisting of unit programs 1, 2, 3, and 7. This command could have been terminated with a <cr> instead of a ".". This would not have changed the effect of this command in any way, since the two can be interchangeably used as command terminators, provided they are preceded by a run list.

② This RUN command specifies a run list consisting of unit programs 1 and 7.

③ The third RUN command does not specify a run list. Since the command is terminated with a ".", the run list specified in the previous command (1 and 7) is used.

Example 4:

```
EX**
RU/T3<CR>

M4ME03.0 DA=0 KY=01 PP=0100 BP=0,03
*****
EX**
KO
EX**
```

The operator wants to run unit program number 3 in the trap mode. After the EX** prompt appears, the operator can enter any command with the exception of the RUN command. (The command K shown in this example is explained later in this section.)

In order to exit from the trap mode of operation, the operator enters a <Control-C> character. Once he exits from the trap mode, the EX** prompt reappears.

6.4.6 DISABLE COMMAND

6.4.6.1 Purpose

This command allows the operator to disable cache memory, devices, unit programs, parity error interrupts or spurious interrupts. Disabled functions or devices will not be activated by the EXEC, even if the operator requests that they be run (using the RUN command). In order to activate the device or function, the ENABLE command must be used.

6.4.6.2 Format

The DISABLE command has the formats:

- Disable cache (DC)

DC { <cr> . }

- Disable device or unit program

DN { [uno] [uno] [device address <cr>]
[puno] [puno] [,...]
[lno] [lno] }
[n1, n2, ... n15].

where:

uno

Is the unit number.

puno

Is the platter number and unit number.

lno

Is the line number.

n1,n2,...n15

Are the two-digit decimal unit program numbers. If no programs are specified, the entire run list is disabled.

- Disable parity error interrupt

DP { <cr> }
 .

- Disable Spurious interrupt

DS { <cr> }
 .

6.4.6.3 Usage

Use this command to disable the specified devices or unit programs.

In the case where a device is to be disabled (DN), the device number entries are separated with commas. The entry must be terminated with a <cr>. The <cr> interprets the entries as device numbers.

If more than one program is to be disabled (DN), separate the entries with commas. The line entry must be terminated with a period. The period interprets the entries as unit programs. If multiple copies of a unit program were generated at System Test Generation, each copy is disabled individually and in sequence.

When disabling cache (DC), parity error interrupts (DP), or the spurious interrupt (DS), the termination character can be either a <cr> or period.

The DS command causes a memory protect violation to occur if a spurious interrupt is detected. The program counter in the error messages or at the step mode transition indicates the vector address of the spurious interrupt.

6.4.6.4 Examples

Example 1:

```
DN 35,210,1016,3470<cr>
```

This entry specifies that:

1. Unit number 0 (by default) of device address 35 is disabled.
2. Unit number 2 of device address 10 is disabled.
3. Platter number 1 of unit number 0 of device address 16 is disabled.
4. Line 34 of device address 70 is disabled.

Example 2:

```
DN 2,7.
```

This specifies that unit programs 2 and 7 are to be disabled.

Example 3:

```
EX**  
RU<cr>
```

```
M4WC01.0 DA=074 KY=01 PP=0100 BP=0,01  
M4ME03.0 DA=0 KY=02 PP=0101 BP=0,03  
M4MT07.A DA=010 KY=03 PP=0102,03 BP=0,01  
M4DM09.0 DA=070 KY=04 PP=0105,02 BP=0,01  
*****  
M4DM09.0 DA=070 KY=04 PP=0105,02 BP=0137,01 TM=0:0:033  
DCM TIMEOUT ERROR ON LINE 000003
```

```
EX**  
DN070,170,270,370<cr>
```

```
EX**  
RU<cr>
```

```
M4WC01.0 DA=074 KY=01 PP=0100 BP=0,02
M4MEO3.0 DA=0 KY=02 PP=0101 BP=0,02
M5MT07.A DA=010 KY=03 PP=0102,03 BP=0,02
*****
*UNEXPECTED INTERRUPT AT 260
M4DM09.0 DA=070 KY=0 PP=0105,02 BP=0711,01 TIDB=20200 TM=0:0:0
000001 002720 017200 000002 002734 002734 052525 125252 002246
```

```
EX**
RU<<<>
```

```
M4WC01.0 DA=074 KY=01 PP=0100 BP=0,01
M4MEO3.0 DA=0 KY=02 PP=0101 BP=0,02
M4MT07.A DA=010 KY=03 PP=0102,03 BP=0,03
*****
```

6.4.7 ENABLE COMMAND

6.4.7.1 Purpose

This command allows the operator to enable cache memory, devices, unit programs, parity error interrupts, or spurious interrupts. It is required only if these devices or functions have previously been disabled by means of the DISABLE command.

6.4.7.2 Format

The ENABLE command has three formats:

- Enable cache (EC)

```
EC { <CR>
    . }
```

- Enable device or unit program

$$EN \left\{ \begin{array}{l} \left[\begin{array}{l} \text{uno} \\ \text{puno} \\ \text{lno} \end{array} \right] \left[\begin{array}{l} \text{uno} \\ \text{puno} \\ \text{lno} \end{array} \right] \left[\dots \right] \\ \left[n1, n2, \dots, n15 \right]. \end{array} \right. \text{device address } \langle \text{cr} \rangle$$

where:

uno

Is the unit number.

puno

Is the platter number and unit number.

lno

Is the line number.

n1, n2, ... n15

Are the two-digit decimal unit program numbers. If no programs are specified, the entire run list is enabled.

- Enable parity error interrupt

$$EP \left\{ \begin{array}{l} \langle \text{cr} \rangle \\ . \end{array} \right.$$

- Enable spurious interrupt

$$ES \left\{ \begin{array}{l} \langle \text{cr} \rangle \\ . \end{array} \right.$$

6.4.7.3 Usage

Use this command to enable the specified devices or unit programs that were previously disabled.

In the case where a device is to be enabled (EN), the device number entries are separated with commas. The entry must be terminated with a <cr>. The <cr> interprets the entries as device numbers.

If more than one unit program is to be enabled (EN), separate the entries with commas. The line entry must be terminated with a period. The period interprets the entries as unit programs. If multiple copies of a unit program were generated at System Test Generation, each copy is enabled individually and in sequence, i.e., the first disabled copy is the first copy enabled, etc.

When enabling cache (EC), parity error interrupts (EP), or spurious interrupts, the termination character can be either a <cr> or period.

6.4.7.4 Examples

Example 1:

EN 35,210,1016,3470<cr>

This entry specifies that:

1. Unit number 0 of device address 35 is enabled.
2. Unit number 2 of device address 10 is enabled.
3. Platter number 1 of unit number 0 of device address 16 is enabled.
4. Line 34 of device address 70 is disabled.

Example 2:

EN 110<cr>

This specifies that the unit program for unit number 1 of device address 10 is to be enabled.

Example 3:

EN 2,7.

This specifies that unit programs 2 and 7 are to be enabled.

6.4.8 CHANGE COMMAND

6.4.8.1 Purpose

The purpose of the CHANGE command is to display the contents of a particular location in a specific map key. This is useful when debugging a unit program. The command also gives the operator the capability to alter the contents of the location after examining it. This feature is an option.

6.4.8.2 Format

The command has the following format:

$$C(x)[,k] \left[\left[\begin{array}{c} \langle cr \rangle \\ . \end{array} \right] \right] [d] \left[\begin{array}{c} \langle cr \rangle \\ ' \\ * \end{array} \right]$$

where:

- x
Is the location whose contents are to be displayed.
- k
Is the map key of the desired location..
- d
Is the new data which replaces the previous contents of location x.

This data may be entered as follows:

- d= Positive octal data
- d= negative octal data
- :d= Positive, decimal data
- :d= negative decimal data
- d= ASCII data

$$\left[\begin{array}{c} cr \\ ' \\ * \end{array} \right]$$

One of these characters must be entered after d, depending on which one of the following options is desired:

- <cr> terminates the command.
- , displays the contents of the next location, that is location (x+1).
- . displays the contents of the previous location, that is location (x-1).
- * displays the contents of the indirect address, that is the address in location x.

6.4.8.3 Usage

To display the contents of location x in map key k, enter the following:

Cx,k<cr>

or

Cx,k.

To display the contents of location x in map key k, and then alter the contents of the location to d, the command format must be as follows:

Cx,k,d $\left\{ \begin{array}{l} \text{cr} \\ , \\ . \\ * \end{array} \right\}$

If only the location which has been displayed has to be examined and altered, terminate the command with a <cr>, thus:

Cx,k,d<cr>

If locations following or preceding the first location also need to be examined and altered, one of the other three command terminators (",", ".", or "*") must be used. This automatically displays the address and contents of the appropriate location. The operator does not have to enter a new CHANGE command for each successive location.

A copy of each unit program is kept in map 0 of the first 32K words of memory. When a unit program is selected by the RUN

command for execution, it is moved from map 0 to the key and physical pages assigned to it. When the operator changes a location in a unit program, this change is effected both in the key in which it is being run and in the permanent map 0 copy. Consequently, as the unit program moves around in memory, the changed location retains its new value (since the change has also been made in the permanent map 0 copy).

If the CHANGE command is entered after the EX** prompt without a map key being specified, the map key last selected is assumed.

The map key corresponding to each one of the unit programs being executed can be determined using a KEY command. (The KEY command is described later in this section.) If there are indications (error messages) that a particular unit program must be scrutinized more closely, the map key of this program can be determined using the KEY command. Then, the contents of various locations in this map key can be examined (and altered if necessary) using the CHANGE command.

NOTE

The normal mode of operation for unit programs is the variable mode. In this mode, each time the unit program is rescheduled, it is assigned a new map key. Therefore, the map key must be ascertained before the CHANGE command is used. When the fixed mode of operation is being used, the map keys of the unit programs do not change after execution.

6.4.8.4 Examples

Example 1:

```
EX**
CL651(005001)2000
001652(005000)3157
001653(002000)5001
001654(003157)55070
```

```
EX**
```

In this example, the operator directs the EXEC to display the contents of location 1651. Since he terminates this part of the command with a ".", he can exercise the option to alter the contents of the location later. No map key is specified. Therefore, the map key last selected is assumed.

The numbers enclosed by the parentheses are the contents of location 1651. After the contents are output to the list device, the operator changes the contents to octal 2000. Note that the leading zero for the octal number is omitted. The command is terminated with a comma (,). This causes the contents of the next location, 001652, to be displayed. The contents (005000) are changed to octal 3157. This command is also terminated with a comma. So the contents of the next location are displayed. After the contents of location 001654 are displayed and altered, the operator terminates the command with a <cr>. This terminates the CHANGE command, and the EX** prompt appears.

Example 2:

```

EX**
C67006.(000000)7071. ①
067007(000000)13. ②
067010(000000)26014.
067011(000000)15031.
067012(000000)1016.
067013(000000)5712.
067014(000000)15001.
067015(000000)6455.
067016(000000)67023.
067017(000000)6150.
067016(067023)15777.
067017(006150)1000.
067020(000000). ③
067017(001000).
067016(157777).
067015(006455).
067014(015001).
067013(005712). ④

```

EX**

- ① The contents of location 67006 are displayed and then altered to (octal) 7071. The command is terminated with a comma.
- ② The contents of the next location (067007) are automatically displayed, since the previous command was terminated with a comma.

- ③ After the contents of location 067020 are displayed, the operator enters a "." This results in the contents of the previous location (067017) being displayed next.
- ④ After the contents of location 067013 are displayed, the operator terminates the command by entering a <cr>.

Example 3:

```

EX**
CI651,0.(002000)2002, ①
001652(004656)4666, ②
001653(014677) ③
EX**

```

- ① The contents of location 1651 in map key 0 is displayed. A comma is then entered.
- ② Since the previous command was terminated with a comma, the next address (001652) and the contents of the location with that address are automatically displayed. After the display, the contents are altered to (octal) 4666, and a comma is entered.
- ③ After the contents of location 001653 are automatically displayed, the operator terminates the command by entering a <cr>.

6.4.9 CHANGE MAP COMMAND

6.4.9.1 Purpose

This command permits the operator to specify the starting map key and page to be assigned to the unit programs in the run list. The EDIT and CHANGE MAP commands are similar in that they both affect the map key and page assignment of unit programs in the run list. They differ in that the EDIT command applies to individual programs, whereas the CHANGE MAP command affects the entire run list.

6.4.9.2 Format

The CHANGE MAP command has the following format:

$$CM[k][,p] \left\{ \begin{array}{l} \langle cr \rangle \\ . \end{array} \right.$$

where:

k

Is the map key to be assigned for the next run. Can be any octal number from 1 to 17.

p

Is the starting memory page to be assigned for the next run. It can be any octal number from 100 to 3777.

6.4.9.3 Usage

Use this command to alter the map key and page assignment of the entire run list. The starting map key and memory page, that is the map key and page of the first program in the run list, is specified in the command. Since the map key and page assignment for the other programs in the run list follow in numerical sequence, the map key and page assignment of the entire run list is changed.

Command terminators can be used interchangeably.

6.4.9.4 Examples

```
EX**
RUL_7_————— ①
M4WC01.0 DA=074 KY=01 PP=0100 BP=0.01
M4MT07.A DA=010 KY=02 PP=0101,03 BP=0,02
*****
EX**
CMS_300_————— ②
EX**
RUL_————— ③
M4WC01.0 DA=074 KY=05 PP=0300 BP=0,01
M4MT07.A DA=010 KY=06 PP=0301,03 BP=0,03
*****
```

```

EX**
RUL,3,6,7,8. ————— ④
M4WC01.0 DA=074 KY=01 PP=0100 BP=0,01
M4ME03.0 DA=0 KY=02 PP=0101 BP=0,03
M4DH06.A DA=014 KY=03 PP=0102,03 BP=0,01
M4MT07.A DA=010 KY=04 PP=0105,03 BP=0,01
M4LP08.0 DA=035 KY=05 PP=0110,02 BP=0,0
*****
M4DH06.A DA=014 KY=03 PP=0102,03 BP=0114,01 TM=0:0:02
DC 000014 LAST CCB EXECUTED-NONE
UNIT BUSY - ERROR
PRIMARY STATUS WORD 00
EX**
CMS,300. ————— ⑤
EX**
RU ————— ⑥
M4WC01.0 DA=074 KY=05 PP=0300 BP=0,01
M4ME03.0 DA=0 KY=06 PP=0301 BP=0,03
M4DH06.A DA=014 KY=07 PP=0302,03 BP=0,01
M4MT07.A DA=010 KY=010 PP=0305,03 BP=0,02
M4LP08.0 DA=035 KY=011 PP=0310,02 BP=0,0
M4DM09.0 DA=070 KY=012 PP=0312,02 BP=0,01
*****

```

- ① Unit programs 1 and 7 are run. Initially, unit program 1 is assigned map key 01 and page 0100. This is the starting assignment, and assignments for the other programs in the run list follow in sequence: unit program 7 is assigned map key 02 and pages 0101, 0102, and 0103.
- ② The CHANGE MAP command sets the starting map key to be 05 (leading zero is omitted in example), and the starting memory page to be 0300, for the next run.
- ③ The RUN command is entered again. Since it is terminated with a ".", the current run list is used. Because of the preceding CHANGE MAP command, unit program 1 is assigned map key 05 and page 0300, and unit program 7 is assigned map key 06 and pages 0301, 0302, and 0303.
- ④ The run list consists of unit programs 1, 3, 6, 7, and 8. Initially, unit program 1 is assigned map key 01 and page 0100. Assignments for the other unit programs follow in sequence.
- ⑤ The CHANGE MAP command sets the starting map key to be 05 and the starting memory page to be 0300, for the next run.

- ⑥ The RUN command is terminated with a <cr>, and so the entire index of unit programs is made the run list. Because of the preceding CHANGE MAP command, the starting map key and page assignments are 05 and 0300, respectively.

6.4.10 EDIT COMMAND

6.4.10.1 Purpose

The EDIT command provides the operator with the capability of altering the map key and pages assigned to a particular unit program in the run list.

6.4.10.2 Format

The EDIT command has the following format:

$$ED \left\{ \begin{array}{c} \cdot \\ \langle cr \rangle \end{array} \right\} [k][,p] \left\{ \begin{array}{c} \cdot \\ \langle cr \rangle \end{array} \right\}$$

where:

k

Is the octal key (1 to 17).

p

Are the new page numbers (octal 100-3777).

6.4.10.3 Usage

It can be terminated with either a <cr> or a ".".

After the command is entered, the program ID of the first unit program in the run list is listed, with its assigned key and pages being used. The key and/or pages can be altered by entering new values for the key (k) and page numbers (p). The new value for k can be any octal number from 1 to 17. The new page numbers can have values from (octal) 100 to 3777.

If the pages are not being altered, terminate the command after specifying "k", as follows:

ED<cr>k<cr>

or

ED.k.

This process is repeated for all the unit programs in the run list.

CAUTION

The EXEC does not check for errors. Therefore, it is the operator's responsibility not to assign the same map key or pages to different unit programs.

NOTE

The RUN command which follows the EDIT command must specify the fixed memory mode (/F). If this is not specified, the new values for k and p will be ignored.

The CHANGE MAP (CMAP) and EDIT commands are similar. However, EDIT is used on a program-by-program basis, whereas CMAP sets the starting key and page assignment for the entire run list.

6.4.10.4 Examples

EX**

K———①

M4WC01.0 DA=074 KY=01 PP=0100 BP=0750,01
M4ME03.0 DA=0 KY=03 PP=0745 BP=0751,03
M4DH06.A DA=014 KY=07 PP=0302,03 BP=0316,01
M4MT07.A DA=010 KY=010 PP=0305,03 BP=0744,01
M4LP08.0 DA=035 KY=011 PP=0310,02 BP=0,0
M4DM09.0 DA=070 KY=012 PP=0312,02 BP=0370,01

EX**

ED———②

M4WC01.0 DA=074 KY=01 PP=0100 BP=0750,01:01,0100———③

```

M4ME03.0 DA=0 KY=03 PP=0745 BP=0751,03:02,0101.
M4DH06.A DA=014 KY=07 PP=0302,03 BP=0316,01:03,0102.
M4MT07.A DA=010 KY=010 PP=0305,03 BP=0744,01:04,0105.
M4LP08.0 DA=035 KY=011 PP=0310,02 BP=0,0:04,010
010 INVALID
M4DM09.0 DA=070 KY=012 PP=0312,0313,077 BP=0370,01:06,114

```

```

EX**
M4WC01.0 DA=074 KY=01 PP=0100 BP=0750,01
M4ME03.0 DA=0 KY=02 PP=0101 BP=0751,03
M4DH06.A DA=014 KY=03 PP=0102 BP=0316,01
M4MT07.A DA=010 KY=04 PP=0105 BP=0744,01
M4LP08.0 DA=035 KY=04 PP=0310,02 BP=0,0
M4DM09.0 DA=070 KY=06 PP=0114 BP=0370,01
EX**

```

- ① By using the KEY command, the operator lists the IDs of all the unit programs in the run list, their current key and pages.
- ② The EDIT command, terminated with a <cr>, is entered.
- ③ Information about the first program in the run list is displayed. After the ":", the operator enters the new values for key and page and a <cr>.
- ④ Information about the next unit program in the run list is displayed. The operator changes the map key of this program to 02, and the page to 0101. He then enters a ".". Information about the next program is then displayed, and so on, until all the unit programs in the run list are edited. (The operator has the option to alter or retain existing values.)
- ⑤ The operator attempts to change the value of <p> to 010. This is invalid, since only values from 0100 to 03777 are acceptable. The change is rejected, and the original value retained.
- ⑥ By using the KEY command, the operator verifies the new values assigned to the unit programs.
- ⑦ The unit programs are run in the fixed mode.

6.4.11 LIST COMMAND

6.4.11.1 Purpose

The List command scans the RUN list and print the program ID of only those programs which are currently enabled.

6.4.11.2 Format

$$LI \left[\begin{array}{l} /L \\ /P \end{array} \right] \{ \langle cr \rangle \}$$

6.4.12 INSERT COMMAND

6.4.12.1 Purpose

The INSERT command stores a specified bit pattern into locations specified by the operator.

6.4.12.2 Format

The INSERT command has the following format:

$$I(x),(y)[,p][,k] \left\{ \begin{array}{l} \langle cr \rangle \\ . \end{array} \right\}$$

where:

x

Is the address of the first memory location into which the bit pattern is to be stored.

y

Is the address of the last memory location into which the bit pattern is to be stored.

p

Is the bit pattern. The default value for p is -1(177777).

k

Is the map key.

6.4.12.3 Usage

This command is useful for debugging purposes. The <cr> and "." can be interchangeably used as command terminators.

6.4.12.4 Examples

EX**

I67000,67010,10101. ①

EX**

V6700,67077,0. ②

```
(067000) 010101 010101 010101 010101 010101 010101 010101 010101
(067010) 010101 000000 000000 000000 000000 000000 000000 000000
(067020) 000000 000000 000000 000000 000000 000000 000000 000000
(067030) 000000 000000 000000 000000 000000 000000 000000 000000
(067040) 000000 000000 000000 000000 000000 000000 000000 000000
(067050) 000000 000000 000000 000000 000000 000000 000000 000000
(067060) 000000 000000 000000 000000 000000 000000 000000 000000
(067070) 000000 000000 000000 000000 000000 000000 000000 000000
```

EX**

I67000,67077,10101,0. ③

EX**

V67000,67077,0. ④

```
(067000) 010101 010101 010101 010101 010101 010101 010101 010101
(067010) 010101 010101 010101 010101 010101 010101 010101 010101
(067020) 010101 010101 010101 010101 010101 010101 010101 010101
(067030) 010101 010101 010101 010101 010101 010101 010101 010101
(067040) 010101 010101 010101 010101 010101 010101 010101 010101
(067050) 010101 010101 010101 010101 010101 010101 010101 010101
(067060) 010101 010101 010101 010101 010101 010101 010101 010101
(067070) 010101 010101 010101 010101 010101 010101 010101 010101
```

① The bit pattern 10101 is inserted in locations 67000 through 67010.

② After the insertion is made, the contents of locations 67000 through 67077 in map key 0 are viewed. (The VIEW command is discussed later in this section.)

③ The bit pattern 10101 is inserted in locations 67000 through 67077 in map key 0.

④ The contents of locations 67000 through 67077 in map key 0 are viewed.

6.4.13 KEY COMMAND

6.4.13.1 Purpose

This command has two options. One option allows the operator to set the map key to a particular value. This value is then used by all subsequent memory-accessing commands, until the value is altered by another KEY command. The second option allows the operator to list the ID of each unit program in the run list, with its current key and pages.

6.4.13.2 Format

The KEY command has the following format:

$$K \quad \left[\begin{array}{l} /L \\ /P \end{array} \right] \quad [k] \quad \left\{ \begin{array}{l} \langle cr \rangle \\ . \end{array} \right\}$$

where:

/L

Specifies that the list is to be sent to the line printer. This option is applicable only when the map key k is omitted.

/P

Selects the line printer and the operator console for output. This option is applicable only when the map key k is omitted.

k

Is the map key.

6.4.13.3 Usage

The <cr> and the "." can be interchangeably used as command terminators.

To set the map key to k, enter the following:

$$Kk \quad \left\{ \begin{array}{l} \langle cr \rangle \\ . \end{array} \right\}$$

To list the IDs of all the unit programs in the run list, with the current key and pages corresponding to each, on the operator's console, enter one of the following:

K<cr>

or

K.

To obtain the above listing on the line printer, enter one of the following:

K/L<cr>

or

K/L.

Note that the /L option is applicable only when k is not specified in the command.

6.4.13.4 Examples

```
EX**
K①
M4WC01.0 DA=074 KY=01 PP=0100 BP=01410,02
M4ME03.0 DA=0 KY=013 PP=01216 BP=01405,03
M4DH06.A DA=014 KY=012 PP=0773,03 BP=0100,01
M4MT07.A DA=010 KY=04 PP=0105,03 BP=01400,01
M4LP08.0 DA=035 KY=014 PP=01335,02 BP=0,0
M4DM09.0 DA=070 KY=06 PP=0112,02 BP=0164,01
EX**
KL②
EX**
```

- ① A list of all the unit programs in the run list is obtained by entering this command.
- ② The map key is set to the value 01. This value is then used by subsequent memory-accessing commands, until it is altered by another KEY command.

6.4.14 REG COMMAND

6.4.14.1 Purpose

The purpose of this command is to display the contents of a specified register at the time of the previous interrupt. A, B, X, or R registers can be specified in this command. These registers are referred to as pseudo registers.

The command provides the operator with the optional capability of altering or retaining the current value of the specified register.

6.4.14.2 Format

The REG command has the following format:

$$\begin{Bmatrix} A \\ B \\ X \end{Bmatrix} \quad \begin{Bmatrix} \langle cr \rangle \\ . \end{Bmatrix} \quad [d] \quad \begin{Bmatrix} \langle cr \rangle \\ . \end{Bmatrix}$$

or

$$R \quad n \quad \begin{Bmatrix} \langle cr \rangle \\ . \end{Bmatrix} \quad [d] \quad \begin{Bmatrix} \langle cr \rangle \\ . \end{Bmatrix}$$

where:

A, B, and X

Are the pseudo A, B, and X registers. They are equivalent to the R0, R1, and R2 registers.

n

Refers to pseudo registers 0 to 7. n can have any value from 0 to 7. If n is not specified, or is greater than 7, all the registers are displayed.

d

The new octal value which is to replace the current value of the specified register.

6.4.14.3 Usage

To display the contents of a particular register, but not alter it, enter the following:

```

      { A }
      { B }
      { X }
or   R   n   { <cr> }
      { . }
      { <cr> }
      { . }
```

To display the contents of a particular register, and then alter it, enter:

```

      { A }
      { B }
      { X }
      .d   { <cr> }
      { . }
or   R   n   .d   { <cr> }
      { . }
```

NOTE

The first "." provides the operator with the option of altering or retaining the current value of the register. The next <cr> or "." terminates the command.

If a number greater than 7 is selected as follows:

RS<cr>

all the registers (0 to 7) will be displayed.

6.4.14.4 Examples

```

      EX**
  ① — EL(000303)
      EX**
  ② — XL(00303)
      EX**
```

The contents of register B are displayed.

The contents of register X are displayed.

6.4.15 SEARCH COMMAND

6.4.15.1 Purpose

The SEARCH command allows the operator to examine all locations within a specified range and in a specified map key for a particular bit pattern.

6.4.15.2 Format

The SEARCH command has the following format:

$$s \left[\begin{array}{l} /L \\ /P \end{array} \right] (x),(y)[,p][,m][,k] \left\{ \begin{array}{l} \langle cr \rangle \\ . \end{array} \right\}$$

where:

/L Specifies that the listing is to be output on the line printer.

/P Selects the line printer and the operator console for output.

x Location at which the search is to begin.

y Location at which the search is to end.

p Is the bit pattern for which the search is conducted. The default value is -1(177777).

m Is the mask that specifies which portion of each word is searched for the bit pattern, p. The default value is -1(177777).

k Is the map key.

6.4.15.3 Usage

Use this command to search for a specific bit pattern, either masked or unmasked by another pattern. A mask is a pattern of characters, (in this case, a bit pattern), that is used to control the retention or elimination of portions of another pattern of characters.

Example:

If the bit pattern 55 (i.e., 101 101) is masked by 77 (i.e., 111 111), the portion of the words that are searched are the least significant six bits.

A search will be conducted through the range of memory specified for locations containing the pattern 101 101 in bit positions 0-5 (000077).

When a location is found whose contents match the bit pattern specified by the operator, the memory location and its contents are output.

6.4.15.4 Examples

Example 1:

```
S/L1000,1177,55,77,0.
```

Locations from 1000 to 1177, in map key 0, are searched for the bit pattern 55, masked by 77. The resulting matches are listed on the line printer (/L option), as follows:

```
001051(004155)  
001066(004155)  
001157(001155)
```

Example 2:

```
S/L1000,1177,4,7000,0.
```

Locations from 1000 to 1177, in map key 0, are searched for the bit pattern 4 masked by 7000, and the matches are listed on the line printer. This command results in the following output:

```
001051(004155)  
001066(004155)  
001105(014677)
```

The search is made for the pattern 4 (100) in bits 9-11 of each word in the specified range.

Example 3:

S/L1000,1177,1,700,0.

Locations from 1000 to 1177, in map key 0, are searched for the bit pattern 1 masked by 700. The resulting listing is sent to the line printer:

001051(004155)
001066(004155)
001157(001155)

6.4.16 TRAP COMMAND

6.4.16.1 Purpose

This command provides the operator with a breakpoint facility for debugging unit programs.

6.4.16.2 Format

The TRAP command has the following format:

T[x][,y][,k] {<cr>
 .}

where:

x

Is the location where the breakpoint is set. If omitted, the command is interpreted as a jump to location y.

y

Is the location to which a jump is executed. If omitted, the command is interpreted as a jump to the previous trap address.

k

Is the map key. If omitted, the previously specified map key is used.

6.4.16.3 Usage

This command is very useful for debugging purposes. In the command, if x is omitted, the command is interpreted as a jump to location y. If y is omitted, the command is interpreted as a jump to the previous trap address.

The following three options are available for continuing from the trap:

1. A new trap can be set before continuing, by entering the following:

$$T[x][,y] \left\{ \begin{array}{c} \langle cr \rangle \\ . \end{array} \right\}$$

2. To continue at address y after the trap, enter:

$$T[,y] \left\{ \begin{array}{c} \langle cr \rangle \\ . \end{array} \right\}$$

3. To continue at the previous trap address, enter:

$$T \left\{ \begin{array}{c} \langle cr \rangle \\ . \end{array} \right\}$$

If the trap address is encountered during program execution, a message is output, which has the following format:

```
*x(y)(z) KY=k
r0 r1 r2 r3 r4 r5 r6 r7 pc
```

where:

*

Is the EXEC message.

x

Is the trap address.

y

Represents the contents of trap address.

z

Represents the contents of (trap address + 1).

r0-r7

Are the registers 0 to 7. (Registers 0, 1, and 2 are registers A, B, and X, respectively).

pc

Is the program counter for return (i.e., trap address +2).

If the trap address is never encountered by the executing program, the trap gets cleared when the next RUN command is executed.

NOTE

A trap is set by storing a jump to M\$TRAP at the specified address in the unit program. (Refer to Section 5 for information about M\$TRAP). The original contents of the two locations are saved in the TIDB (Task Identification Block). The trap is also stored into the permanent copy of the program in map 0. Consequently, the program remembers the trap even when it is moved around in memory. This is particularly useful when a trap is set in the error detection code to debug intermittent problems.

6.4.16.4 Examples

EX**

TI1754,1000 — (1)

*001754(001010)(001770) KY=01

000001 000020 101021 000000 002203 177777 052525 125252 001756

EX**

T,1770 — (2)

M4DF04.A DA=016 KY=01 PP=0100,03 BP=0103,01 TM=0:0:02

BIC 000020 ABNORMAL BIC DEVICE STOP READ ERROR

INITIAL ADDRESS 004000

FINAL ADDRESS WAS 004700 SHOULD BE 004740

EX**

RU/04

where:

- x
Is the address of the first memory location whose contents are to be displayed. It is the lower limit of the range of locations.
- y
Is the address of the last memory location (the upper limit of the range) whose contents are to be displayed.
- k
Is the map key.

6.4.17.3 Usage

To view the contents of memory locations x through y, in map key k, on the operator's console, enter the following:

Vx,y,k.
or
Vx,y,k<cr>

If y is omitted, the dump continues until some character is entered on the operator's console. If this character is a comma, the dump continues. All other characters terminate the dump.

To view the contents of the map registers in any map key, enter:

VMK. or VMK<cr>

where:

K= the map key
This command results in the printing of the 64 map registers of the specified map key.

6.4.17.4 Examples

Example 1:

EX**
V17600.

```

(017600) 017300 100000 000007 000000 000001 002731 017600 000002
(017610) 002734 002734 052525 125252 002246 146716 006746 006546
(017620) 000002 000000 000030 052525 125252 002006 000000 013473
(017630) 000000 000000 000000 000070 000010 000077 140070 140170
(017640) 000000 000000 000000 000000 000000 000000 000000 000000
EX**

```

In the above example, the operator specifies that he wants to view the contents of locations beginning with location 17600. The last location to be viewed is not specified. The display is terminated when the operator enters some character (other than a comma) on the operator's console. If the operator had entered a comma, the display would have continued.

Example 2:

```

EX**
067000,067077,0

(067000) 000000 000000 000000 000000 000000 000000 000000 000000
(067010) 000000 000000 000000 000000 000000 000000 000000 000000
(067020) 000000 000000 000000 000000 000000 000000 000000 000000
(067030) 000000 000000 000000 000000 000000 000000 000000 000000
(067040) 000000 000000 000000 000000 000000 000000 000000 000000
(067050) 000000 000000 000000 000000 000000 000000 000000 000000
(067060) 000000 000000 000000 000000 000000 000000 000000 000000
(067070) 000000 000000 000000 000000 000000 000000 000000 000000

```

In this example, the operator specifies that he wants to view the contents of locations 067000 through 067077 in map key 0.

6.5 SUMMARY OF OPERATOR COMMANDS

<u>Command Name</u>	<u>Function</u>	<u>Reference Section Number</u>
CHANGE	Displays contents of a particular location in a specific map key.	6.4.8
CHANGE MAP	Specifies starting map key and page assignment for all the unit programs in the run list.	6.4.9
DISABLE	Disables cache memory, devices or unit programs, parity error interrupts, or spurious interrupts.	6.4.6

<u>Command Name</u>	<u>Function (continued)</u>	<u>Reference Section Number</u>
EDIT	Alters the map key and pages assigned to a specific unit program in the run list.	6.4.10
ENABLE	Reactivates cache memory, devices or unit programs, parity error interrupts, or spurious interrupts previously disabled by the DISABLE command.	6.4.7
HELP	Lists tutorial information about all the operator commands.	6.4.2
INDEX	Lists all the unit programs residing in map key 0 by ID, device address, and TIDB.	6.4.3
INSERT	Stores a specified bit pattern into locations specified by the operator.	6.4.12
KEY	Has two options. One option sets the trap map key to a particular value. The other option lists the ID of each unit program in the run list with its current key and pages.	6.4.13
LIST	List the ID of each currently enabled unit program	6.4.11
LOG	Lists the entries made in the Error Log during the previous run of the system Test.	6.4.4
REG	Displays (and optionally alters) the contents of a specified register: A, B, X, or R.	6.4.14
RUN	Executes unit programs scheduled for execution, and lists information about them.	6.4.5

<u>Command Name</u>	<u>Function (continued)</u>	<u>Reference Section Number</u>
SEARCH	Searches through all the locations within a specified range for a specified bit pattern.	6.4.15
TRAP	Sets breakpoints	6.4.16
VIEW	Display contents of specified memory locations, or map registers.	6.4.17

6.6 EXECUTIVE SERVICE CALLS

All interrupt and I/O functions required by the unit programs are performed by the Executive Program (EXEC). The unit programs request these services by issuing Executive service calls. These calls execute a jump instruction to the address of the called service routine. For more details about Executive Service calls, refer to Section 5.

6.7 SAMPLE SESSION

V70-SERIES SYSTEM TEST-REV X.Y

FOR COMMAND LIST, TYPE HE.
EXEC PROMPTER IS EX**
ENTER SPACE IF OUTPUT PAUSES
VERIFIED MEMORY SIZE= 0256K

EX**

HE

EXECUTIVE COMMANDS

NOTE: ALL COMMANDS END WITH CR OR .

CONTROL C RE-INITIALIZES & RETURNS TO EX**

CONTROL K [N] OBTAINS STATUS REPORT

N=REPORT TIME PERIOD IN MINUTES

/L=OUTPUT TO LPR

/P=OUTPUT TO LPR & TTY/CRT

[K]=MAP KEY

HELP: PRINT COMMAND LIST

H[/L]

INDEX: PRINT UNIT PROGRAM LIST

IN[/L]

```

RUN:RUN UNIT PROGRAMS
  RU[/L][F][T][D][N1,N2,...]
  /L=OUTPUT TO LPR
  /P=OUTPUT TO LPR & TTY/CRT
  /F=FIXED MODE
  /T=TRAP(DEBUG) MODE
  /D=DIAGNOSTIC MODE
ENABLE:
  PGM(OR DEVICE): EN[N1,N2...
  PARITY INTERRUPT: EP
  CACHE: EC
  SPURIOUS INTERRUPT: ES
DISABLE:
  PGM(OR DEVICE): DN[N1,N2....]
  PARITY INTERRUPT: DP
  CACHE: DC
  SPURIOUS INTERRUPT: DS
  EDIT:DISPLAY/ALTER KEYS,PAGES
  LIS:ED(CR OR .)[K][,P]
CHANGE MAP:ALTER NEXT MAP KEY,PAGE
CM[K][,P]
LOG:PRINT ERROR LOG TABLE
  L[/L,/P]
REGISTER:DISPLAY/ALTER REGISTERS
  ([A][B][X][R[N]])[,K](CR OR .)[D](T)
  NOTE:D=NEW DATA,IF ANY
  T=COMMA DISPLAYS/ALTERS NEXT REGISTER
  =OTHER TERMINATES COMMAND
KEY:DISPLAY KEYS/SET DEBUG MAP KEY
  K[/L,/P][N]
CHANGE:DISPLAY/ALTER MEMORY IN K
  C(X)[,K](CR OR .)[D](T)
  NOTE:D=NEW DATA,IF ANY
  T:.,=NEXT;.=PREV;*=INDIRECT;CR=END
VIEW:FROM X TO Y,IN K,ON LPR & OR TTY
  V[/L,/P][X][,Y][,K]
  OR VIEW MAP REGISTERS
  VM[/L,/P][K]
INSERT:INSERT P INTO X TO Y,IN K
  I(X),(Y)[,P][,K]
SEARCH:FROM X TO Y,IN K,FOR P MASKED BY M
  S[/L,/P](X),(Y)[,P][,M][,K]
TRAP;TRAP AT X,GO TO Y,IN K
  T[X] [,Y] [,K]
EX**

```

L.

ERROR LOG TABLE
UNIT PROGRAM ERRORS

0	0
01	0
02	0
03	0
04	0
05	0
06	0
07	0
08	0
09	0
010	0
011	0
012	0
013	0
014	0
015	0
016	0
017	0

~~EX**~~

IN.

EXEC00.A DA=0 TIDB=016400
M4WC01.0 DA=074 TIDB=016500
M4FP02.0 DA=0 TIDB=016600
M4ME03.0 DA=0 TIDB=016700
M4DF04.A DA=016 TIDB=017000
M4DC05.A DA=015 TIDB=017100
M4DH06.A DA=014 TIDB=017200
M4MT07.A DA=010 TIDB=017400
M4LP08.0 DA=035 TIDB=017500
M4DM09.0 DA=070 TIDB=017600
M4DM09.0 DA=066

EX**

~~DI4.5.~~

EX**

DIS.

EX**

RUL.

M4WC01.0 DA=074 KY=01 PP0100 BP=0,0

EX**

K.

M4WC01.0 DA=074 KY=02 PP=0612 BP=0624,02
EX**

RU
M4WC01.0 DA=074 KY=01 PP=0100 BP=0,02

EX**
K
M4WC01.0 DA=074 KY=03 PP=0425 BP=0503,01
EX**
C103L.(003306)

EX**
C1030,3.(006030)

EX**
RU
M4WC01.0 DA=074 KY=01 PP=0100 BP=1,01

EX**
K
M4WC01.0 DA=074 KY=03 PP=0425 BP=0743,01
EX**
C333.(000003)

EX**
RU2
M4FP02.0 DA=0 KY=01 PP=0100 BP=0,0

EX**
K
M4FP02.0 DA=0 KY=016 PP=0533 BP=0,0

EX**
EN8
EWX**
RU8

M4LP08.0 LDA=035 KY=01 PP=0100,0101 BP=0,01

EX**
RU3
M4ME03.0 DA=0 KY=01 PP=0100 BP=0,0

EX**
RUS

M4DMO9.0 DA=070 KY=06 PP=0113,0114,077 BP=0,01

*UNEXPECTED INTERRUPT AT 260

M4DMO9.0 DA=070 KY=06 PP=0113,02 BP=0,01 T1DB 20200 TM=0:0:0
000001 002727 017600 000002 002734 002734 052525 125252 002246

6.8 ERROR DETECTION

During System Test operation, errors (if any) are detected by the Preliminary Loader, the EXEC, and the unit programs. Errors detected by the Preliminary Loader are discussed in Section 4. Errors detected by the individual unit programs are discussed in Sections 7 through 16. Errors detected by EXEC are discussed in this section.

Two types of errors are detected by the EXEC. They are:

- a. Errors not directly related to unit programs. Error messages for such errors are identified by a leading *.
- b. Error messages directly related to unit programs.

After the error message is output, EXEC continues normal processing. However, for some types of errors, the unit program causing the error may be aborted until its next scheduled execution.

6.8.1 MAP ERRORS

If the EXEC detects a map error while storing a unit program into its assigned map key, it generates an error message having the following format:

```
*PGM STORE ERROR:XXXXXX(Correct Data) YYYYYY(actual data)
.uuuuuu.u DA=d KY=k PP=p,n BP=b,n TM=h:m:s
```

where:

XXXXXX

Is the address in Map 0 from which data is obtained for storage in assigned key.

u

Is the unit program ID. (See Section 5 for the format of the Program ID).

YYYYYY

Address in assigned key which is to receive data. |

d

Is the Device Address.

k

Is the map key.

P

Is the first physical page being used by the unit program.

b

Is the first buffer page being used.

n

Is the number of continuous pages assigned.

h:m:s

Is the time:

h - Hours

m - Minutes

s - Seconds

6.8.2 COMMAND ERRORS

Invalid entries in a command generate the following message:

XX INVALID

where:

XX

Is the invalid entry.

If an invalid map key is specified (or used by default) in a memory accessing command, the following message is generated:

XX INVALID

XX is the invalid key.

If a unit program number that is not in the library of unit programs is specified, the following message is generated:

UNIT PROGRAM xx NOT FOUND

6.8.3 EXECUTION ERRORS

6.8.3.1 Print Request Error

If the number of print requests from unit programs exceeds 16, the following message is generated:

*PRINT REQUEST TABLE FULL

Unit programs making print requests which exceed this limit are aborted.

6.8.3.2 Invalid BIC Request

An invalid BIC requests generates the following message:

*BIC xx ADDRESS ERROR
uuuuuu.u DA=d KY=k PP=p,n BP=b,n TM=h:m:s

where:

- x Is the BIC device address.
- uuuuuu.u Is the unit program ID.
- d Is the device address.
- k Is the map key.
- p Is the first physical page assigned to the unit program.
- b Is the first buffer page assigned.

n
Is the number of pages being used.

h:m:s
Is the time:

h - Hours

m - Minutes

s - Seconds

6.8.3.3 BIC Request Error

If the number of BIC requests made by unit programs exceeds 8, the following message is generated:

*BIC xx REQUEST TABLE FULL

Unit programs making BIC requests after this limit has been reached are aborted.

6.8.3.4 Memory Protect Error

If a memory protect error occurs, and the computer is a V77-800 computer, a message with the following format is generated:

*IIA xx,MPI cc-ZZ, aaaaaa(iiiii)PSW=(sssss)
CSW=(wwwww)
uuuuu.u DA=y KY=k PP=p,n BP=b,n TM=h:m:s
r0 r1 r2 r3 r4 r5 r6 r7 pc

where:

IIA

Is the abbreviation for internal interrupt address.

xx

Is the internal interrupt address (or PE if parity error). The significance of this address is as follows:

<u>xx</u>	<u>Significance</u>
20	Non-jump (see cc code)
22	Track interrupt

26	Jump
30	Spurious interrupt
32	Spurious interrupt
34	Spurious interrupt
36	Spurious interrupt

cc

Is the memory protect interrupt code (applies only to V77-800 computer). The significance of the cc code is as follows:

<u>cc</u>	<u>ZZ</u>	<u>Significance</u>
0	PI	Privileged Instruction
1	IF	Instruction Fetch
2	WE	Write Error
3	UA	Unassigned Address

a

Is the address of the instruction causing the violation.

i

Is the contents of the address specified by a.

s

Is the processor status word.

w

Is the cache status word.

u

Is the unit program ID.

y

Is the device address.

k

Is the map key.

p Is the first program page.

b Is the first buffer page.

n Is the number of pages assigned.

h:m:s Is the time:

 h - Hours

 m - Minutes

 s - Seconds

r0-r7 Are the pseudo registers.

pc Is the program counter for return.

The unit program causing the violation is aborted.

If a memory protect error occurs, and the computer is a V77-600, a message with the following format is generated:

```
*IIA xx,aaaaaa(iiiii) MSR=(MMMMMM) MUR=(rrrrrr)
uuuuuu.u DA=y KY=k PP=p,n BP=b,n TM=h:m:s
r0 r1 r2 r3 r4 r5 r6 r7 pc
```

where:

IIA Is the abbreviation for internal interrupt address.

xx Is the internal interrupt address (or PE is parity error). The significance of this address is as follows:

<u>xx</u>	<u>Significance</u>
20	Halt
22	I/O

24	Write Protect
26	Jump
30	Unassigned Mem para error
32	Instruction Fetch
34	Data Transfer
36	Spurious Interrupt

a Is the address of the instruction causing the violation.

i Is the instruction.

M Is the map status register.

r Is the map unassigned address register, displayed only when an unassigned error occurs.

u, y, k, p, b, n, h:m:s, r0-r7, pc
Refer to the explanation of these parameters in the discussion of the V77-600 memory protect error message.

The unit program causing the violation is aborted.

Examples:

The following are examples of memory parity error messages (V77-600 computer):

Example 1

```
*IIA 26,001264(001010 MSR=(046044)
M4MT07.A DA=010 KY=04 PP=0105,03 BP=0,01 TM=0:0:0
177772 000224 100610 177777 001221 000000 052525 125252 001573
```

The internal interrupt address is 26. The address of the instruction causing the violation is 001264. The instruction itself is 001010. The processor status word is 046044. The cache status word is 077777. The second line of the error message gives information about the unit program causing the violation. The third line shows the contents of the pseudo registers (r0-r7) and the program counter for return (pc).

Example 2

```
*IIA 30,001214(001010) MSR=(046045), MUR=(003240)
M4LP08.0 DA=035 KY=05 PP=0106,02 BP=0,0 TM=0:0:0
000026 000223 001611 000000 001221 000000 052525 125252 001214
```

This is an example of a memory protect error message in which 30 indicates that it is an unassigned address violation.

6.8.3.5 Unexpected Interrupt

An unexpected interrupt from an I/O device generates an error message with the following format:

```
*UNEXPECTED INTERRUPT
uuuuuu.u DA=yy KY=k PP=p,n BP=b,n TM=h:m:s
r0 r1 r2 r3 r4 r5 r6 r7 pc
```

where:

- VA Is the Vector address at which the interrupt occurred.
- u Is the unit program ID.
- y Is the device address.
- k Is the map key.
- P Is the first physical page used by the program.
- b Is the first buffer page.
- n Is the number of pages used.
- h:m:s Is the time:
 - h - Hours
 - m - Minutes
 - s - Seconds

r0-r7

Are the pseudo registers.

pc

Is the program counter for return.

Example:

EX**

RU

```
M4WC01.0 DA=074 KY=01 PP=0100 BP=0,01
M4ME03.0 DA=0 KY=02 PP=0101 BP=0,02
M4DF04.A DA=016 KY=03 PP=0102,03 BP=0,04
M4DH06.A DA=014 KY=04 PP=0105,03 BP=0,04
M4MT07.A DA=010 KY=05 PP=0110,03 BP=0,03
M4LP08.0 DA=035 KY=06 PP=0113,02 BP=0,01
M4DM09.0 DA=070 DY=07 PP=0115,02 BP=0,01
*****
```

*UNEXPECTED INTERRUPT AT 260

```
M4DM09.0 DA=070 KY=07 PP=0115,02 BP=0,01 TIDB 20200 TM=0:0:0
000001 002716 017600 000002 002734 002734 052525 125252 002246
```

This is an example of the type of error message generated when an unexpected interrupt is received from an I/O device. The second line of error message identifies the unit program (M4DM09.0) and gives descriptive information about it. The third line gives the contents of the pseudo registers (r0-r7) and the program counter for return.

6.8.3.6 I/O Request Error

An invalid I/O request from a unit program generates an error message with the following format:

```
*INVALID I/O INSTRUCTION xxxxxx
uuuuuu.u DA=y KY=k PP=p,n BP=b;n TM=h:m:s
r0 r1 r2 r3 r4 r5 r6 r7 pc
```

where:

x

Is the invalid instruction.

u

Is the unit program ID.

y Is the device address.

r0-r7 Are the pseudo registers.

pc Is the program counter for return.

The unit program making the invalid requests is aborted.

Example:

```
EX**
RUB:
M4LP08.0 DA=035 KY=01 PP=0102,0103 BP=0,0
*****
*INVALID I/O INSTRUCTION 001000
M4LP08.0 DA=035 KY=01 PP=-1-2,02 BP=0,0 TM=0:0:0
000000 000226 001000 000000 001400 000000 052525 125252 001136
```

When unit program M4LP08.0 makes an invalid I/O request, the above error message is generated.

6.8.3.7 Unit Program Errors

Messages generated as a result of errors detected by individual unit programs are described in Sections 7 through 16.

The Executive Program (EXEC) generates a message which precedes each unit error message. This EXEC message has the following format:

```
uuuuuu.u DA=y KY=k PP=p,n BP=b,n TM=h:m:s
```

where:

u Is the unit program ID.

y Is the device address.

k Is the map key.

p Is the first page being used by the program.

b Is the first buffer page.

n Is the number of pages assigned.

h:m:s Is the time:

h - Hours

m - Minutes

s - Seconds

Example:

M4DH06.A DA=014 KY=03 PP=0102,03 BP=0116,01 TM=0:0:02 — ①
DC 000014 LAST CCB EXECUTED-NONE
UNIT BUSY - ERROR
PRIMARY STATUS WORD 002400 STATUS WORD UNIT 000000
B8/10 - OFF LINE

M4LP08.0 DA=035 KY=05 PP=0110,02 BP=0252,01 TM=0:0:010 — ②
LP PRINTER ERROR

① and ② are messages generated by EXEC. They precede error messages generated by individual unit programs. The EXEC message identifies the unit program generating the error message.

Section 7 Library of Unit Programs

7.1 V77-600 WRITABLE CONTROL STORE (F3034) UNIT PROGRAM - M4WC01

7.1.1 PURPOSE AND OPERATION

The V77-600 Writable Control Store (WCS) unit program (M4WC01) tests the operation of the WCS. This unit program executes firmware instructions written into the WCS, by moving data through a buffer. The buffer extends from the end of the unit program to the end of the map in which the program is currently executing.

The program continues in operation until the function of the program is completed. When erroneous results are obtained, or equipment malfunction occurs, error messages are generated.

7.1.2 WCS ERROR MESSAGES

The first line of error messages generated by the unit program identifies the unit program, and is created by the EXEC. (Refer to Section 4). The remainder of the error message is generated by the unit program itself, and consists of:

1. The identification WCS.
2. Device Address of the unit.
3. Description of the error that has been detected.

Error messages generated by the WCS unit program are listed in this section. Only the descriptive portion of the error message is described here, since the identification and the device address portions are the same for all the error messages generated by the unit program.

<explanatory message>

or

TIMEOUT <explanatory message>

where:

<explanatory message> is one or more of the following:

WCS INITIALIZATION ERROR
WCS SELECT ERROR
WCS DATA OUT ERROR
WCS EXECUTION ERROR
MEMORY ADDRESS xxxxxx
DATA EXPECTED xxxxxx FOUND xxxxxx

7.1.3 EXAMPLES

Example 1

EX**

READ

M4UC01.0 DA=074 KY=01 PP=0100 BP=0,0

M4UC01.0 DA=074 KY=01 PP=0100 BP=0101,01 TM=0:0:02
WCS 000074 WCS EXECUTION ERROR
MEMORY ADDRESS 002234 DATA EXPECTED 125252 FOUND 000000

*IIA 30,001123***** (046042),(025252)
M4UC01.0 DA=074 KY=02 PP=0102 BP=0103,01 TM=0:0:05
125252 125441 003175 000000 001221 000167 052525 125252 001203

EX**

Example 2

EX**

READ

M4UC01.0 DA=074 KY=01 PP=0100 BP=0,01

M4UC01.0 DA=074 KY=01 PP=0100 BP=0,01 TM=0:0:01
WCS 000074 TIMEOUT WCS INITIALIZATION ERROR

*IIA 30,001123***** (046042),(025252)
M4UC01.0 DA=074 KY=02 PP=0101 BP=0102,01 TM=0:0:03
125252 125441 003175 000000 001221 000167 052525 125252 001203

7.2 V77-800 WRITABLE CONTROL STORE (WCS)/FLOATING POINT PROCESSOR (FPP) TEST UNIT PROGRAM - M4WC15

7.2.1 PURPOSE AND OPERATION

The purpose of the WCS/FPP test (M4WC15) is to verify the correct operation of the V77-800 Writable Control Store (WCS) and Floating Point Processor (FPP) through execution of firmware.

The RUN Command is used to execute all unit programs. The format of this command and the options available are given in Section 6.4.5. The following discussion covers the purpose and operation of the System Test Mode and the Diagnostic Mode.

7.2.1.1 System Test Mode

In System Mode the program is always run in all available pages of WCS. The program verifies that WCS is available, writes firmware instructions into WCS and then executes the firmware. Each set of firmware executed tests various functions and capabilities of the firmware in a building block fashion. There are 23 separate tests, one of which verifies the current operation of the FPP. Each test returns data in registers R0-R7. The register contents are compared to expected values and an error message is output when a mismatch occurs.

When all 23 tests have been executed, the program exits to the Test Executive. System Test Mode is an option of the RUN Command. See section 6.4.5.

7.2.1.2 Diagnostic Test Mode

When scheduled in Diagnostic Test Mode the program checks for available pages of WCS. An octal word is developed with a '1' bit set for each available WCS page. The position of the bit indicates the available page. The following message is output:

```
AVAILABLE WCS PAGES (BIT=1) xxxxxx
```

Individual unit programs have a diagnostic capability which requires entry of test commands and/or parameters by the operator during program execution. Diagnostic Mode commands are positional and must be entered as follows:

Command, continous run, page to test (octal)-(0=010 default), starting location (octal)/pattern/test number, number of micro-instructions

or

Z, low page of WCS, high page of WCS, page to run test in (010=default), print test complete message. (This command must be entered for each run).

Valid commands are:

- O - Runs as if in System Test Mode. Parameters are not applicable.
- D - Dump WCS. Continuous run parameter is not applicable. The page number parameter is an octal number indicating the page of WCS to be dumped. The starting location is an octal offset from first micro-instruction of WCS. The number of micro-instructions parameter indicates number of micro-words to be dumped.
- E - Execution Test. The continuous run flag is applicable. The page to run the test in may be specified, -1 may be used to test all specified pages or default to page 010. Instructions are loaded throughout a page of WCS and are then executed. The instruction executed is an Increment RF and jump to next location.
- H - Help. Lists all valid commands.
- M - Memory Test. The continuous run flag is applicable. The pattern may be specified or defaulted to a set of patterns. The page to test may be specified or use -1 for all pages. Patterns, and their complement, are written throughout WCS, read back and compared. Any mismatch will cause an error printout and the check of memory will continue.
- R - Runs as if in Systems Test Mode, but returns to diagnostic command entry routine. The continuous run parameter is applicable. If the page parameter is not specified the test will run in page 010.
- S - Single Test. Executes a single test. The continuous run parameter may be used. The test number parameter is the octal number for the test to be run. If the page parameter is not specified, the test will run in page 010.

- U - Unique Address Test. The continuous run flag is applicable. The page to run the test in may be specified, -1 may be used for all or default to page 010. Incremental addresses are written into WCS, read back and compared. A mismatch will cause an error printout and checking will continue.
- Z - Parameter Input. The lowest available page of WCS and the highest available page of WCS must be specified. If the page to run the test in is not specified, page 010 is used as a default. The print test complete field when non-zero will cause a completion message to be printed each time a test has been run.

7.2.2 ERROR MESSAGES

Any errors encountered during a System Test run will cause an error message to be output.

The first line of each error message is generated by the Test Executive and is described in the Test Executive design description. The following information is output by the unit program:

SYSTEMS TEST RUN:

```
(Line 2) WCS xxxxxx PAGE xxxxxx TIMEOUT (error message)
          WCS xxxxxx PAGE xxxxxx          (error message)
```

```
(Line 2) error messages)
          WCS READ ERROR
          WCS WRITE ERROR
          NO PAGE OF WCS AVAILIABLE FOR TEST
          TEST NUMBER xx
```

(Line 3-11)

```
REGISTER FOUND EXPECTED
R0    xxxxxx xxxxxx
R1    xxxxxx xxxxxx
R2    xxxxxx xxxxxx
R3    xxxxxx xxxxxx
R4    xxxxxx xxxxxx
R5    xxxxxx xxxxxx
R6    xxxxxx xxxxxx
R7    xxxxxx xxxxxx
```

DIAGNOSTIC RUN:

(Line 2) WCS xxxxxx PAGE xxxxxx MEMORY TEST ERRORS

(Line 2) UNIQUE ADDRESS ERROR - WCS PAGE LOCATION xxxxxx
(Line 3) VALUE EXPECTED xxxxxx VALUE FOUND xxxxxx

(Line 2) WCS ADDRESS xxxxxx PAGE xxxxxx
(Line 3) DATA FOUND xxxxxx xxxxxx xxxxxx
(Line 4) DATA EXPECTED xxxxxx xxxxxx xxxxxx

(Line 3) WCS PARITY ERROR
(Line 4) PARITY BITS xxxxxx
(Line 5) WCS ADDRESS xxxxxx
(Line 6) DATA FOUND xxxxxx
(Line 7) DATA EXPECTED xxxxxx xxxxxx xxxxxx

(Line 3) EXECUTION TEST FAILURE - PAGE xxxxxx
DATA FOUND xxxxxx DATA EXPECTED xxxxxx

7.3 V77-600 FLOATING POINT PROCESSOR (F3027) UNIT PROGRAM -
M4FP02

7.3.1 PURPOSE AND OPERATION

The V77-600 Floating-Point Processor (FPP) unit program (M4FP02) verifies the correct operation of the FPP. The unit program performs this by executing floating-point arithmetic instructions in the FPP. These instructions are executed to move data through a buffer area. The buffer area extends from the end of the unit program to the end of the map in which the program is currently executing. At the end of this operation, the data (result) obtained is compared with the data expected. Discrepancies result in the generation of error messages.

7.3.2 FPP ERROR MESSAGES

All error messages generated by this unit program are preceded by an EXEC message which identifies the unit program. (Refer to Section 4). The FPP error message consists of the identification "FPP" and descriptive information about the error.

It has the following format:

FPP CALCULATION DATA EXPECTED xxxxxx xxxxxx FOUND xxxxxx xxxxxx

7.3.3 EXAMPLES

EX**

RUN

M4FP02.0 DA=0 KY=01 PP=0100 BP=0,0

M4FP02.0 DA=0 KY=01 PP=0100 BP=0,0 TH=0:0:01

FPP CALCULATION DATA EXPECTED 040526 077024 FOUND 123456 054321

7.4 MEMORY TEST - M4ME03

7.4.1 PURPOSE AND OPERATION

The purpose of the Memory test (M4ME03) is to verify the correct operation of the central processor unit memory.

The RUN Command is used to execute all unit programs. The format of this command and the options available are given in section 6.4.5. The following discussion covers the purpose and operation of the System Test Mode and the Diagnostic Mode.

7.4.1.1 System Test Mode

The System Test Mode starts with a pattern of 052525 which is stored into a buffer. The buffer is then compared against the pattern to insure the data was correctly stored in memory. The pattern is then complemented, 125252, and the procedure is repeated using the same buffer. The last test involves storing an IAR instruction into the entire buffer with a JMP to a compare routine as the last instruction in the buffer. The A register is cleared to zero and the program jumps to the beginning of the buffer. Upon return the contents of the A register is compared to a fixed value to determine if memory functioned properly.

The buffer area utilized during execution of the program is the logical memory from the end of the program to 32767. A record size of 960 is used for each buffer request. Buffers are requested from the executive consecutively until all of the buffer area has been used, then after a short delay the program exits back to the Test Executive. Each time a buffer is requested from the Test Executive the next available physical memory pages are assigned to the logical addresses passed by the unit program.

A compare error will cause an error message to be output and the program will exit to the Test Executive. System Test Mode is an option of the RUN Command. See section 6.4.5.

7.4.1.2 Diagnostic Test Mode

In the Diagnostic Mode the program requests a diagnostic command be input. Each command entered causes the indicated test to be run through one execution. Then, request for entry of another command is output. Some tests also allow provision of a continuous loop of the test. After entering the diagnostic option of the RUN Command, the console will display:

INPUT DIAGNOSTIC COMMAND

Diagnostic Mode commands are positional and must be entered as follows:

command, pattern, continuous run flag

where:

command

O, B, F, or H (see list of valid commands below for meanings of these commands).

pattern

Any octal value.

continuous run flag = C

This parameter is not applicable to the O command.

When a command has been entered and executed, exit is to the routine which outputs the INPUT DIAGNOSTIC COMMAND message.

Valid commands are:

- 0 Run as if in systems test mode. If a pattern follows the O command it will be used in place of the normal pattern. The continuous run flag is not applicable.

- B Floating Bit Test. This test uses a 1 bit and its complement for the pattern. After each compare the bit is shifted to the left. Comparison continues until all bit positions have been stored and compared. The pattern parameter is not applicable. If the continuous run flag is entered it must be preceded by two commas. The continuous run flag C is used to cause the program to loop continually, executing the test until a Control C is entered to return to the Test Executive.

- F Fixed Pattern. This command causes the pattern indicated and its complement to be used during the test. The continuous run flag C may be used to loop on this pattern.

- H Help. Lists all valid commands.

7.4.2 ERROR MESSAGES

The first line of each error message is generated by the Test Executive and is described in the Test Executive design description. The following information is output by the unit program:

TEST COMMAND ERROR MESSAGE

(Line 1) (Generated by System Test Executive)

(Line 2) INVALID TEST COMMAND

DATA COMPARE ERROR MESSAGE

(Line 1) (Generated by System Test Executive)

(Line 2) (error message) ERROR

Error message slot in line 2 will contain one of the following:

MEM DATA COMPARE
MEM INSTRUCTION EXECUTION

(Line 3) BUFFER ADDRESS xxxxxx SIZE (OCTAL) xxxxxx

(Line 4) DATA EXPECTED xxxxxx DATA FOUND xxxxxx

(Line 5) LOCATION xxxxxx (Not printed for Instruction Execution Error)

7.5 CARTRIDGE DISK UNIT PROGRAM - M4DF04

7.5.1 PURPOSE AND OPERATION

The Cartridge Disk unit program (M4DF04) verifies the correct operation of the F3094, F3096, F3310, F3016, and Models 70-7600 and 70-7610 (types DB and DF) cartridge disks and controllers. (Refer to Section 2 for a list of the Software Model codes corresponding to these disks).

The purpose of the test is to verify the correct operation of the cartridge disk type configured into the generation of the System Test version being run. The unit configured must be one of the types listed in the test title above.

The Run Command is used to execute all unit programs. The format of this command and the options available are given in Section 6.4.5, page 6-12 of UP-9098.

7.5.1.2 System Mode

The System Mode consists of building a buffer full of data, writing the buffer to the disk, clearing the buffer, reading the record and comparing the data read to the pattern written. This is a continuous operation alternating between all disk units being tested. The patterns used in System Mode are 052525 and its complement 125252. The buffer utilized is the logical memory area from the end of the program to the end of memory in the assigned map key. Logical memory is assigned physical memory as it is required. The record size used is random. When all available memory has been used as buffer space, the program exists to the Test Executive. System Mode is an option of the Run Command. See Section 6.4.5, page 6-12.

7.5.1.3 Diagnostic Mode

In the Diagnostic Mode the program requests a diagnostic command be input. Each command entered causes the indicated test to be run through one execution. Then, request for entry of another command is output. Some tests also allow provision of a continuous loop of the test. After entering the Diagnostic option of the Run Command, the console will display:

INPUT DIAGNOSTIC COMMAND

Diagnostic Mode commands are positional and must be entered as follows:

command, continuous run flag "C", status mask/unit

or

Z, read retry count, write retry count, fixed record length, fixed pattern, sector number, track number one, track number two (for seek only).

where:

Command = O,A,C,D,F,H,R,S,T, or W
(see list of valid commands on page 7-13 for meanings of these commands)

Continuous Run Flag =C
(This parameter is not applicable to some commands. See command list below)

Status Mask = a 16-bit mask corresponding to the following list:

- * B15 - SYNC BYTE NOT FOUND
 - * B14 - FORMAT ERROR
 - * B13 - HEADER COMPARE ERROR
 - B12 - UNIT NOT READY
 - B11 - UNIT WRITE PROTECTED
 - * B10 - END OF TRACK ERROR
 - * B9 - READ CRC ERROR
 - B8 - CRC SEARCH ERROR
 - * B7 - SELECTED UNIT TIMING ERROR
 - B6 - SELECTED UNIT MALFUNCTION
 - B5 - SELECTED UNIT ILLEGAL ADDRESS
 - B4 - SELECTED UNIT ILLEGAL SECTOR
 - B3 - UNIT 3 SEEK COMPLETE
 - B2 - UNIT 2 SEEK COMPLETE
 - B1 - UNIT 1 SEEK COMPLETE
 - B0 - UNIT 0 SEEK COMPLETE
- * WHEN BOTH BITS 7 AND 9 ARE SET (1) STATUS BITS MARKED WITH AN ASTERISK HAVE THE FOLLOWING MEANING:

B15 - SERIAL PARITY ERROR (BITS 8-15)
B14 - SERIAL PARITY ERROR (BITS 0-7)
B13 - BUS PARITY ERROR (BITS 8-15)
B10 - BUS PARITY ERROR (BITS 0-7)
B9 - PAIRTY ERROR FLAG
B7 - PARITY ERROR FLAG

When the status mask is entered, zero bits represent errors that the test will ignore. One bits represent errors the test will report. The status mask default will report all errors.

Unit = Platter-Unit-Device Address applies to the format command only. (F,,1016 for Platter 1-Unit 0-Device Address 16)

The Z command is a special case:

Z, Read Retry Count, Write Retry Count, Fixed Record Length, Fixed Pattern Sector Number, Track Number One, Track Number Two (For Seek Test Only)

This command sets parameters used for all other tests selected. See the list of valid commands for the duration of these parameters.

The parameter values are:

Read Retry Count = 0-32767

Write Retry Count = 0-3267

Fixed Record Length = Word count. If maximum count for the drive under test is exceeded, the program will select the maximum size for the drive.

Fixed Pattern = 0-77777 (octal) a one-word bit pattern.

Sector Number = 1-057 (octal). A 0 indicates a random sector number.
A -1 indicates Sector 0.

Track Number One = 1-0624 (octal). A 0 indicates a random track number.
A - 1 indicates track 0.

Track Number Two (Used only for Seek Test) = 1-0624 (octal).
A 0 indicates a random track number. A -1
indicates track 0.

After the Z command has been entered,

INPUT DIAGNOSTIC COMMAND

will again be output to the console.

When a command has been entered and executed, exit is to the routine which outputs the Enter Diagnostic command message.

Valid commands are:

- O - Run as if in System Test Mode. The continuous run flag is not applicable. Any parameters entered with the 'Z' command will apply. At the end of execution the program will exit to the Test Executive and be rescheduled in the Diagnostic Mode another map key.
- A - Unique Address Test. The program starts with Sector 0 and Track 0. Using a fixed record length of 0170 (octal) and a random buffer pattern records are written to every sector and track of the disk. Before writing the record word zero of the buffer is changed to the track number and word one is changed to the sector number. When the last sector (057) of the last track (0624) has been written, the disk is recalibrated. The entire disk is then read and the data is compared to the expected value. This test may be run with the continuous run flag "C" but it should be remembered that one execution of the test takes 25 or more minutes.
- C - Compatability Test. When a unique address test (A) has been run on a cartridge, the cartridge may be mounted on another unit and run using this command to insure compatability between the two drives. This test is the read portion of the unique address test. The continuous run flag is applicable.
- D - Runs as if in System Test Mode. The program will not exit upon completion of the run. Instead it will again output the enter diagnostic command message. The continuous run flag "C" is applicable.
- F - Format Test. The program will format the disk. Requires Platter-Unit-Device Address as third parameter. Example: F,,1016 for Platter 1-Unit 0-Device Address 16.

- H - Help. Lists all valid commands.
- R - Read Test. A fixed length (0170) is read and the program exits. The continuous run flag "C" may be used for continuous reads. The test must be preceded by the write test (W).
- S - Seek Test. This test seeks back and forth between two tracks. The continuous run flag "C" may be used. The "Z" command should be used preceding this test to set the two track addresses for the seeks.
- T - Sense Test. This test checks various status bits to see if they are properly set and cleared under appropriate conditions. The Sense Seek complete commands is also tested. Bits in the status word which are tested are bits 4,5,8 and 10.
- W - Write Test. A fixed length record (0170) is written and the program exits. The continuous run flag "C" may be used for continuous writes.
- Z - Command Parameters. This command allows certain parameters to be entered. These parameters will apply to all following tests run until the program is rescheduled, another "Z" command is input, or a test is run which overlays any of these fields. The parameters are positional, and missing parameters must be indicated by ",". The parameters which may be input are:

Read Retry Count, Write Retry Count, Fixed Record Length, Fixed Pattern, Sector Number, Track Number One, Track Number Two (For Seek Test Only)

The Status word mask may be changed to ignore certain errors by following a command with the desired mask. A "0" bit in the mask causes that bit to be ignored.

7.5.2 ERROR MESSAGES

Any errors encountered during a System Test run will cause an error message to be output. The unit having the error condition is flagged as down and processing continues as long as there is a unit available for processing. When a unit is in the ready condition, even though it has been flagged as down, another attempt to use the unit will be made.

The first line of each error message is generated by the Test Executive and is described in the Test Executive design description UP9098. The following information is output by the unit program.

7.5.2.1 Bic Error Messages

(Line 1) Generated by System Test Executive)

(Line 2) BIC XXXXXX TIMEOUT (error message) ERROR
BIC XXXXXX (error message) ERROR

"ERROR MESSAGE" slot in line 2 will contain one of the following:

BUSY
SETUP
ABNORMAL BIC DEVICE STOP ON WRITE
ABNORMAL BIC DEVICE STOP ON READ
BIC STOPPED-MAP MEMORY
NOT AVAILABLE

(Line 3-where applicable)

INITIAL ADDRESS XXXXXXXX

(Line 4-where applicable)

FINAL ADDRESS WAS XXXXXXXX SHOULD BE XXXXXXXX

7.5.2.2 Device Error Messages

(Line 1) (Generated by System Test Executive)

(Line 2) DK XXXXXX TIMEOUT (error message) ERROR
DK XXXXXX (error message) ERROR

"ERROR MESSAGE" slot in line 2 will contain one of the following:

RECALIBRATION
INITIALIZE CONTROLLER
FORMAT DISK
HEADER READ
VERIFY FORMAT
WRITE
READ
WRITE/READ DATA COMPARE
OUTPUT TRACK ADDRESS
OUTPUT SECTOR ADDRESS

SELECT SEEK MODE
SELECT SECTOR MODE
SEEK COMPLETE
SENSE ERROR
SELECTED UNIT NOT READY
UNIT WRITE PROTECTED
ILLEGAL ADDRESS BIT (5) NOT SET
ILLEGAL SECTOR BIT (4) NOT SET
END OF TRACK ERROR (B10) NOT SET
HEADER WRITE
SEARCH ERROR (B8) NOT SET
SEARCH ERROR (B8) SET

(Line 3) TRACK XXXXXX SECTOR XXXXXX

(Line 4--where applicable)

STATUS WORD XXXXXX

(Line 5-n for each bit set)

- * B15 - SYNC BYTE NOT FOUND
- * B14 - FORMAT ERROR
- * B13 - HEADER COMPARE ERROR
- B12 - UNIT NOT READY
- B11 - UNIT WRITE PROTECTED
- * B10 - END OF TRACK ERROR
- * B9 - READ CRC ERROR
- B8 - CRC SEARCH ERROR
- * B7 - SELECTED UNIT TIMING ERROR
- B6 - SELECTED UNIT MALFUNCTION
- B5 - SELECTED UNIT ILLEGAL ADDRESS
- B4 - SELECTED UNIT ILLEGAL SECTOR
- B3 - UNIT 3 SEEK COMPLETE
- B2 - UNIT 2 SEEK COMPLETE
- B1 - UNIT 1 SEEK COMPLETE
- B0 - UNIT 0 SEEK COMPLETE

- * WHEN BOTH BITS 7 AND 9 ARE SET (1)
STATUS BITS MARKED WITH AN ASTERISK
HAVE THE FOLLOWING MEANING:

B15 - SERIAL PARITY ERROR (BITS 8-15)
B14 - SERIAL PARITY ERROR (BITS 0-7)
B13 - BUS PARITY ERROR (BITS 8-15)
B10 - BUS PARITY ERROR (BITS 0-7)
B9 - PARITY ERROR FLAG
B7 - PARITY ERROR FLAG

7.5.2.3 Format Error Message

(Line 1) (Generated by System Test Executive)

(Line 2) DK XXXXXX FORMAT ERROR-

(Line 3) EXPECTED XXXXXX XXXXXX XXXXXX

(LINE 4) FOUND XXXXXX XXXXXX XXXXXX

DATA COMPARE ERROR MESSAGE

(Line 1) (Generated by System Test Executive)

(Line 2) DK XXXXXX BUFFER ADDRESS XXXXXX SIZE (OCTAL) XXXXXX

(Line 3) DATA EXPECTED XXXXXX DATA FOUND XXXXXX

(Line 4) LOCATION XXXXXX

7.5.3 EXAMPLES

Example 1:

EX**

RU/4

M4DF04.A DA=016 KY=01 PP=0100,0101,0102 BP=0,04

M4DF04.A DA=016 KY=01 PP=0100,0101,0102 BP=0103,01 TM=0:0:02
BIC 000020 ABNORMAL BIC DEVICE STOP READ
INITIAL ADDRESS 004000
FINAL ADDRESS WAS 004730 SHOULD BE 004740

Example 2:

EX**

RU/4

M4DF04.A DA=016 KY=01 PP=0100,0101,0102 BP=0,0

M4DF04.A DA=016 KY=02 PP=0104,0105,0106 BP=0107,01 TM=0:0:05
BIC 000020 TIMEOUT NOT AVAILABLE ERROR

Example 3:

M4DF04.A DA=016 KY=015 PP=01025,01026,01027 BP=0703,03 TM=0:01:023
DC 001016 WRITE ERROR
STATUS WORD 000217
B7 - SELECTED UNIT TIMING ERROR
B3 - UNIT 3 SEEK COMPLETE
B2 - UNIT 2 SEEK COMPLETE
B1 - UNIT 1 SEEK COMPLETE
B0 - UNIT 0 SEEK COMPLETE

Example 4:

M4DF04.A DA=016 KY=01 PP=0762,0763,0764 BP=01042,02 TM=4:02:010
DC 001016 READ ERROR
STATUS WORD 000217
B7 - SELECTED UNIT TIMING ERROR
B3 - UNIT 3 SEEK COMPLETE
B2 - UNIT 2 SEEK COMPLETE
B1 - UNIT 1 SEEK COMPLETE
B0 - UNIT 0 SEEK COMPLETE

Example 5:

M4DF04.A DA=016 KY=05 PP=0525,0526,0527 BP=01523,04 TM=4:03:047
DC 000016 RECALIBRATION ERROR
STATUS WORD 004017
B11 - UNIT WRITE PROTECTED
B3 - UNIT 3 SEEK COMPLETE
B2 - UNIT 2 SEEK COMPLETE
B1 - UNIT 1 SEEK COMPLETE
B0 - UNIT 0 SEEK COMPLETE

7.6 DISK MEMORY AND CONTROLLER UNIT PROGRAM - M4DC05

7.6.1 PURPOSE AND OPERATION

The Disk Memory and controller unit program (M4DC05) verifies the correct operation of 2822, 2823, 2824, F3092, and Model 70-7510 (types DC, DD, and DE) disks. Refer to Section 2 for the Software Model code corresponding to each disk.

The unit program operates as follows:

1. Data is written from memory onto the disk, alternating between the units on the controller.
2. This data is read back into memory.
3. Data written is compared with data read, to ensure a valid write/read operation.
4. Errors result in the generation of error messages.

7.6.2 ERROR MESSAGES

Error messages generated by the unit program are preceded by the EXEC message which identifies the unit program which is generating the messages. The error message consists of:

1. Identification
 - DC - For Disk controller
 - BTC - For Block Transfer Controller.
2. Device address of the unit.
3. Descriptive error information.

The following is a list of the descriptive error information generated by the unit program:

BTC Error Messages:

TIMEOUT <explanatory message>

or

<explanatory message>

where:

<explanatory message> is one or more of the following:

BUSY ERROR
SETUP ERROR
ABNORMAL, BTC DEVICE STOP ERROR
BTC STOPPED - MAP MEMORY ERROR
FINAL ADDRESS xxxxxx

DC Error Messages:

TIMEOUT <explanatory message>

or

<explanatory message>

where:

<explanatory message> is one or more of the following:

BUSY ERROR
SELECT CYLINDER ERROR
RESTORE CYLINDER REGISTER ERROR
STOP TRANSFER AND INITIALIZE ERROR
OUTPUT SUW ERROR
WRITE ERROR
READ ERROR
WRITE/READ DATA COMPARE ERROR
BUFFER ADDRESS xxxxxx SIZE (OCTAL) xxxxxx
DATA EXPECTED xxxxxx FOUND xxxxxx LOCATION xxxxxx
STATUS WORD xxxxxx
Bxx - <descriptive message>

(For correlation of xx and <descriptive message>, refer to Table 7-1).

7.6.3 EXAMPLES

EX**

RUS

M4DC05.A DA=015 KY=01 PP=0100,0101,0102 BP=0,0

M4DC05.A DA=015 KY=01 PP=0100,0101,0102 BP=0,0 TM=0:0:02

DC 000015 BUSY ERROR

M4DC05.A DA=015 KY=02 PP=0103,0104,0105 BP=0,0 TM=0:0:05

DC 000015 BUSY ERROR

Table 7-1. Disk Memory Status Word Significance

Bit	<descriptive message>
B15	NOT USED
B14	NOT USED
B13	NOT USED
B12	BAD TRACK FLAG SET
B11	HEAD SELECT ERROR
B10	UNIT NOT SELECTED
B9	WRITE PROTECT ERROR
B8	SEEK ERROR (INCOMPLETE)
B7	DISK PACK UNSAFE
B6	UNIT NOT ON LINE
B5	END OF FILE (DATA LENGTH=0)
B4	DATA ERROR (BAD CYCLIC CHECK)
B3	SEARCH ERROR (BAD CYCLIC CHECK)
B2	FORMAT ERROR (RECORD TOO LONG)
B1	TRACK STOP (RECORD NOT FOUND)
B0	TIMING ERROR

7.7 DIRECT MEMORY ACCESS DISK UNIT PROGRAM - M4DH06

7.7.1 PURPOSE AND OPERATION

The Direct Memory Access Disk unit program (M4DH06) verifies the correct operation of the 2825, 2826, 2842, 2843, and 8433 (Type DH) disks and associated controllers.

Operation is identical to that of the other disk unit programs. (Refer to Sections 11 and 12).

7.7.2 ERROR MESSAGES

All error messages output by this unit program are preceded by the EXEC message which identifies the unit program generating the message. The error message itself consists of the following:

1. Identification "DC" for disk controller.
2. Device address of the unit.
3. Descriptive error information.

The following descriptive error information is output by this unit program:

TIMEOUT <explanatory message>

or

<explanatory message>

where:

<explanatory message> is one or more of the following:

WAITING FOR DISK
LAST CCB EXECUTED-NONE
LAST CCB EXECUTED-POSITION
LAST CCB EXECUTED-WRITE
LAST CCB EXECUTED-READ
COMMAND STATUS NOT AVAILABLE ERROR
OUTPUT UAW ADDRESS ERROR

UNIT BUSY-ERROR
 SECONDARY STATUS INPUT ERROR
 WRITE/READ ERROR
 WRITE/READ DATA COMPARE ERROR
 WRONG UNIT STATUS ERROR
 DATA COMPARE ERROR
 PURGE CACHE ERROR
 PRIMARY STATUS WORD xxxxxx
 Bxx - <descriptive message>

(For correlation of xx and <descriptive message>, refer to Table 7-2).

Table 7-2. Direct Memory Access Disk Status Word Significance

Status Word	<descriptive message>
B15	UNIT BUSY
B14	SECONDARY STATUS
B13	END OF UNIT (NON-EXISTENT CYLINDER)
B12	END OF FILE (HEADER STATUS BYTE SET)
B9/11	MEMORY DATA BUS VERIFICATION ERROR
B8/11	RATE ERROR
B11	COMMAND REJECT
B8-10	MEMORY TIMEOUT
B9-10	CHAINING INTERRUPT (NOT USED)
B8/10	OFF LINE
B10	ATTENTION
B8-9	UNIT DATA ERROR
B9	MAP ERROR
B8	MEMORY ERROR

CYLINDER xxxxxx TRACK/SECTOR xxxxxx SECONDARY STATUS WORD xxxxxx

(Refer to Table 7-3 for significance of secondary status word).

BUFFER ADDRESS xxxxxx SIZE (OCTAL) xxxxxx
DATA EXPECTED xxxxxx FOUND xxxxxx LOCATION xxxxxx

Table 7-3. Direct Memory Access Disk
Secondary Status Word Significance

Secondary Status Word	<descriptive message>
B9	CORRECTABLE ECC ERROR (NOT USED)
B8	WRITE PROTECT ERROR
B7	SECTOR FLAGGED BAD
B6	DATA SYNC FAIL
B5	HEADER SYNC FAIL
B4	SECTOR SEARCH ERROR
B3	TRACK SELECT ERROR
B2	CYLINDER SEEK ERROR
B1	DATA CHECK ERROR
B0	HEADER CRC ERROR

7.7.3 EXAMPLES

Example 1:

EX**
RUG

M4DH06.A DA=014 KY=03 PP=0102,0103,0104 BP=0,01
M4DH06.A DA=014 KY=03 PP=0102,0103,0104 BP=0116,01 TM=0:0:02
DC 000014 LAST CCB EXECUTED-NONE
UNIT BUSY - ERROR

PRIMARY STATUS WORD 002400 STATUS WORD UNIT 000000
B8/10 - OFF LINE

Example 2:

M4DH06.A DA=014 KY=016 PP=0377,0400,0401 BP=0405,01 TM=0:03:034
DC 000014 LAST CCB EXECUTED-WRITE
SECONDARY STATUS INPUT ERROR
PRIMARY STATUS WORD 040000 STATUS WORD UNIT 000000
B14 - SECONDARY STATUS
CYLINDER 000002 TRACK/SECTOR 001000 SECONDARY STATUS WORD 000400
B8 - WRITE PROTECT ERROR

7.8 V77 MAGNETIC TAPE TEST UNIT PROGRAM - M4MT07

7.8.1 PURPOSE AND OPERATION

The purpose of the test (M4MT07) is to verify the correct operation of the tape unit type configured into the generation of the System Test version being run. The unit configured must be one of the following types: 0870-XX, F3088-XX MOD 7100, F3089-XX MOD 7102 and 7103, F3093-XX MOD 7104 and 7105

The RUN Command is used to execute all unit programs. The format of this command and the options available are given in section 6.4.5. The following discussion covers the purpose and operation of the System Test Mode and the Diagnostic Mode.

7.8.1.1 System Test Mode

The System Test Mode consists of building a buffer full of data, writing the buffer to tape, clearing the buffer, backspacing one record, reading the record and comparing the data read to the pattern written. This is a continuous operation alternating between all tape units being tested. When end of tape is reached, the unit is rewound and processing continues. The pattern used in System Test Mode are 052525 and its complement 125252. The buffer utilized is the logical memory area from the end of the program to the end of memory in the assigned map key. Logical memory is assigned physical memory as it is required. The record size used is random. When all available memory has been used as buffer space, the program exits to the Test Executive. System Test Mode is an option of the RUN Command. See section 6.4.5.

7.8.1.2 Diagnostic Test Mode

In the Diagnostic Mode the program requests a diagnostic command be input. Each command entered causes the indicated test to be run through one execution. Then, request for entry of another command is output. Some tests also allow provision of a continuous loop of the test. After entering the diagnostic option of the RUN Command, the console will display:

ENTER TEST NUMBERS OR H(ELP)

**DG

The operator has three options available at this time. These are as follows:

- Entering a period or carriage return will run the previously selected tests.
- Entering the numeric test numbers. Each number must be separated by a comma. A maximum of 8 tests, in any order, can be entered. A zero (0) entry is invalid.
- Entering the H, Help, will display the test menu. Refer to Subsection 7.8.1.2.1 for the test number descriptions. After the test menu is displayed, the program displays the following message:

ENTER TEST NUMBERS OR H(ELP) message.

If test numbers are entered these are saved and the program displays the following message.

PARAMETER SELECTION. DEFAULT VALUES (N)
1. RUN COUNT (1). RANGE +1 TO -1
2. ERROR RETRY (2). RANGE + 1 TO -1
3. FIXED PATTERN
4. RECORD LENGTH (2)
5. STATUS MASK

The Run Count default is 1 and this value determines the number of times the selected tests will be run. When the Run Count reaches 0, the program displays the:

ENTER TEST NUMBERS OR H(ELP) message.

The Error Retry default is 2. This value is used when an error occurs and determines the number of times the program will retry the function.

The Run Count and Error Retry range is +1 to -1. If a negative value is entered, then the program will operate in a continuous mode.

The Fixed Pattern is optional and the value entered is used instead of the normal patterns.

The Record Length is optional. If the entered value exceeds the maximum count for the drive under test, then the program selects the preset maximum record length.

The Status Mask is optional. The operator can select the status bits to test.

The operator enters the parameters numbers to be changed or a period or carriage return. The period or carriage return implies no changes to the parameter list and testing will begin.

If parameter numbers are entered, then each parameter is displayed in turn, and the operator enters the appropriate value. When all parameters have been entered, testing begins.

7.8.1.2.1 Diagnostic Test Numbers

1. WRITE TEST. A fixed length record is written (0170).
2. READ TEST. A fixed length record is written (0170).
3. GROWING RECORD TEST. The program starts with a minimum record size (1 or 2) and writes, backspaces, then reads a record. If the data compares, the record length is incremented by one word and the process continues until the maximum record length (9999) or end of tape is reached.
4. WRITE FILE MARK. Writes a file mark.
5. READ FILE MARK. The program reads a fixed record which it expects to be a file mark.
6. FORWARD ONE RECORD. Moves tape backward to the next inter-record gap or to EOT sentinel.

7. BACKSPACE ONE RECORD. Moves tape backward to the next inter-record gap or to BOT sentinel.
10. MOTION TEST. This test checks for tape motion. The test involves rewind, write file mark, backspace, forward record and writing large and small records. Records are written, then read with comparison of data.
11. RANDOM MOTION TEST. The random motion test writes short records, long records and file marks based on random number selection. A fixed pattern is used. Tape will be rewound at end of run and exit. Records written are read to insure the correct data was written.
12. COMPATABILITY TEST. When a growing record test (3) has been run on a tape, the tape may be mounted on another tape unit and run using this command to insure compatibility between the two drives. This test is the read portion of the growing record test.
13. DIAGNOSTIC TEST. The System Mode tests. Refer to paragraph C.3.2.
14. PARITY TEST. Writes sequential records with a pattern containing a changing bit pattern, then reads them back to determine if a parity error has occurred.
15. REWIND. Rewinds the tape drive.

The following are the status bits definitions:

B15	RATE ERROR
B14	LRC ERROR/MULTIPLE DEAD TRACKS (PE)
B13	DEAD TRACK ERROR
B12	FORMATTER FATAL ERROR
B11	CRC ERROR/FALSE POSTAMBLE ERROR (PE)
B10	CHARACTER PARITY ERROR
B9	HIGH DENSITY
B8	NOT USED
B7	REWIND
B6	BOT
B5	EOT
B4	ODD LENGTH
B3	FILE MARK
B2	TRANSPORT NOT READY
B1	WRITE ENABLE
B0	TAPE ERROR

7.8.2 ERROR MESSAGES

Any errors encountered during a System Test run will cause an error message to be output. The unit having the error condition is flagged as down and processing continues as long as there is a unit available for processing. When a unit is in the ready condition, even though it has been flagged as down, another attempt to use the unit will be made.

The first line of each error message is generated by the Test Executive and is described in the Test Executive design description. The following information is output by the unit program:

BIC ERROR MESSAGES

(Line 1) (Generated by System Test Executive)

(Line 2) BIC xxxxxx TIMEOUT (error message) ERROR
BIC xxxxxx (error message) ERROR

ERROR MESSAGE slot in line 2 will contain one of the following:

BUSY
SETUP
ABNORMAL BIC DEVICE STOP ON WRITE
ABNORMAL BIC DEVICE STOP ON READ
BIC STOPPED-MAP MEMORY
NOT AVAILABLE

(Line 3 where applicable)

INITIAL ADDRESS xxxxxx

(Line 4 where applicable)

FINAL ADDRESS WAS xxxxxx SHOULD BE xxxxxx

DEVICE ERROR MESSAGES

(Line 1) (Generated by System Test Executive)

(Line 2) MT xxxxxx TIMEOUT (error message) ERROR
MT xxxxxx (error message) ERROR

ERROR MESSAGE slot in line 2 will contain one of the following:

REWINDING
NOT READY
REWIND
TRANSPORT SELECT
WRITE
WRITE PARITY
BACKSPACE
READ BINARY RECORD
READ FILE MARK INSTEAD OF DATA
READ PARITY
WRITE/READ DATA COMPARE
WRITE FILE MARK
SENSE END OF TAPE
BEGINNING OF TAPE
SENSED HIGH DENSITY
FORWARD ONE RECORD
DID NOT SENSE FILE MARK

(Line 3 where applicable)

STATUS WORD xxxxxx

(Line 4, n for each bit set)

B15 RATE ERROR
B14 LRC ERROR/MULTIPLE DEAD TRACKS (PE)
B13 DEAD TRACK ERROR
B12 FORMATTER FATAL ERROR
B11 CRC ERROR/FALSE POSTAMBLE ERROR (PE)
B10 CHARACTER PARITY ERROR
B9 HIGH DENSITY
B8 NOT USED
B7 REWIND
B6 BOT
B5 EOT
B4 ODD LENGTH
B3 FILE MARK
B2 TRANSPORT NOT READY
B1 WRITE ENABLE
B0 TAPE ERROR

The system which have the U24 Magnetic Tape drive and the F3320 controller have a unique status definition for status bits 10 thru 15.

During System Generation, question 12, the model code of 2 is used to denote the special controller F3320.

The status error messages are as follows:

TAPE POSITION OR TAPE RUNAWAY OR I.D. BURST MISSING.
This is bit 12 or bits 12 and 9.

NRZI CRC ERROR. This is bits 12 and 11.

P.E. FALSE PREAMBLE. This is bits 12 and 11 and 9.

DATA RECOVERED. This is bit 13 or bits 13 and 9. With this condition the controller recovered the data and the program does not perform a retry.

DATA UNRECOVERABLE ERROR. This is bit 13 or bits 13 and 12.

NRZI LRC ERROR. This is bits 14 and 12.

P.E. MULTIPLE DEAD TRACK ERROR. This is bits 14 and 12 and 9.

RATE ERROR. This is bits 15 and 12.

CHARACTER PARITY ERROR. This is bits 10 and 12.

DATA COMPARE ERROR MESSAGE

(Line 1) (Generated by System Test Executive)
(Line 2) MT xxxxxx BUFFER ADDRESS xxxxxx SIZE (OCTAL) xxxxxx
(Line 3) DATA EXPECTED xxxxxx DATA FOUND xxxxxx
(Line 4) LOCATION xxxxxx

7.8.3 EXAMPLE

EX**
RUT

M4MT07.A DA=010 KY=01 PP=0516,0517,0520 BP=01426,05 TM=0:01:035
BIC 000022 ABNORMAL BIC DEVICE STOP ON WRITE ERROR

INITIAL ADDRESS 061545
FINAL ADDRESS 065275 SHOULD BE 065345

M4MT07.A DA=010 KY=017 PP=0350,0351,0352 BP=0207,03 TM=0:03:029
MT 000010 NOT READY ERROR

7.9 LINE PRINTER UNIT PROGRAM - M4LP08

7.9.1 PURPOSE AND OPERATION

The Line Printer unit program (M4LP08) verifies the correct operation of Sperry Univac Line Printers (Types T0789-68(BI), T0789-71(UNI), T0789-75/78/81, 2819, and 2820) and associated controllers including the F3361 controller. The program is designed to test one line printer at a time.

The RUN Command is used to execute all unit programs. The format of this command and the options available are given in Section 6.4.5. The following discussion covers the purpose and operation of the Line Printer Unit Test Program.

7.9.1.1 System Mode

The System Mode consists of advancing to top of form clearing the Print Buffer, filling the Print Buffer with a header, printing the header, skipping one line, filling the Print Buffer with data, printing the data. When forty-four lines have been printed it will advance to top of form and continue printing beginning with the header. After eight pages have been printed, the program will time out for one half hour then restart in the next available map key. The pattern used in System Mode consists of a standard 64 ASCII character set in an incrementing Spiral Pattern 104 characters long by 44 lines per page. The buffer utilized is the logical memory area from the end of the program to the end of memory using every tenth page in the assigned map key. Logical memory is assigned physical memory as it is required. When all available memory has been used as buffer space, the program exits to the Test Executive.

System Mode is an option of the Run Command. See Section 6.4.5, page 6-12 of UP-9098.

7.9.1.2 Diagnostic Mode

In the Diagnostic Mode the program requests diagnostic parameters to be input beginning with the Run and Retry Counts. All succeeding questions have a menu which will be displayed if desired so by the operator. These parameters are explained in Section 7.9.3.1.

During execution of Diagnostic Mode the same steps occur advancing to top of form, clearing the print buffer, etc. The program will print eight patterns per count of the Run Count e.g., (Run Count = 216 patterns will be printed). When the Run Count has been decremented to zero, control will be returned to the top of the Diagnostic Mode and the questions will be asked again.

7.9.1.2.1 Diagnostic Parameters. This parameter is the Run and Retry Count. The Run Count is the number of how many times you want the program to loop thru memory. The Retry Count is the number of unsuccessful attempts to make before returning to the top of the Diagnostic Mode prompter.

ENTER THE RUN AND RETRY COUNTS
IN THE FOLLOWING FORMAT (RUN/RETRY)

This parameter is the type of printer you are about to test. Input the type of printer accordingly. The SUL printer is a T0789 type of printer.

TYPE IN PRINTER CODE NO.
IF UNKNOWN ENTER H
1=LINE & CHARACTER PRINTER
2=SUL PRINTER

The Character Set number is the maximum ASCII printable code for the print chain.

INPUT CHARACTER SET CODE NO.
IF UNKNOWN ENTER H

CHARACTER SET CODE NO. MENU
1=48 CHARACTER - CHARACTER SET
2=64 CHARACTER - CHARACTER SET
3=96 CHARACTER - CHARACTER SET
4=128 CHARACTER - CHARACTER SET

This parameter is the pattern selection the code will define the pattern accordingly.

INPUT PATTERN CODE NO.
IF UNKNOWN ENTER H
PATTERN CODE NO. MENU
0=FIXED PATTERN
1=PYRAMID PATTERN
2=SPIRAL PATTERN

If a fixed pattern was selected, an additional question will be asked.

ENTER CHARACTER FOR FIXED PATTERN

*Only the standard 64 ASCII Character Set is recognized by the Test Executive. To input lower case and special characters, input the octal ASCII equivalent number for that character, e.g., (a=141g)

Form size will determine the size of the printing, select this parameter accordingly.

ENTER PRINT SIZE
IF UNKNOWN ENTER H

CHARACTER PRINT SIZE MENU
CHAR. PER LINE LINES PER PAGE
0 = 9633
1 = 104.....44
2 = 132.....66

After this interrogation is complete, the following message will be displayed:

EXECUTION BEGINS.....

This is to notify the operator that execution has begun.

7.9.2 ERROR MESSAGES

Any errors encountered during the System Mode will cause an error message to be displayed on the opcom. The program will exit to the Test Executive to be rescheduled in another map. However, during the Diagnostic Mode when an error is encountered it will display the error then go back for a retry. Depending on the retry count, it will perform one retry per count of retry for each count of the Run Count.

The first line of each error message is generated by the Test Executive and is described in the Test Executive design description UP9098. The following information is output by the Unit Program.

7.9.2.1 Bic Error Messages

(Line 1) (Generated by System Test Executive)
(Line 2) BIC (Error Message) ERROR

"ERROR MESSAGE" slot in line 2 will contain one of the following:

BIC BUSY PRIOR TO ACTIVATION
ABNORMAL DEVICE STOP
BIC - STOPPED - MEMORY MAP
TIMEOUT AFTER BIC REQUEST

(Line 3-where applicable)

BIC HALT ADDRESS XXXXXX

(Line 4-where applicable)

BUFFER START ADDRESS XXXXXX

(Line 5-where applicable)

BUFFER START ADDRESS XXXXXX

7.9.2.2 Device Error Message

(Line 1) (Generated by System Test Executive)

(Line 2) LP (Error Message) ERROR

"ERROR MESSAGE" slot in line 2 will contain one of the following:

PRINTER NOT READY
BUFFER NOT READY
PRINTER ERROR
TIMEOUT AFTER BIC CONNECT
REPORT STACKER FULL
REPORT BAND
REPORT PARITY
REPORT ACTUATOR

REPORT TEMPERATURE
REPORT FORMS RUNAWAY
REPORT PAPER FEED MOTION
REPORT FORMS JAM
REPORT INVALID BAND NO./PROM/TRANSFER
REPORT DATA PARITY ERROR
REPORT VFU ERROR
REPORT POWER LOSS
REPORT PAPER CHECK

7.9.3 EXAMPLES

Example 1:

```
EX**  
HUB  
M4LP08.0 DA=035 KY=016 PP=0155,0156 BP=0,01  
*****  
M4LP08.0 DA=035 KY=016 PP=0155,0156 BP=0,01 TM=0:0:02  
LP      PRINTER ERROR
```

Example 2:

```
M4LP08.0 DA=035 KY=05 PP=0110,0111 BP=0,0 TM=0:0:010  
LP      PRINTER NOT READY
```

7.10 DATA COMMUNICATIONS MULTIPLEXER UNIT PROGRAM - M4DM09

7.10.1 PURPOSE AND OPERATION

The Data Communications Multiplexer (DCM) unit program (M4DM09) verifies the correct operation of the DCM (F3000) and its associated Line Adapters (LADs). The following LAD types are currently supported:

```
F3001-00 Asynchronous LAD RS232 Modem  
F3001-01 Asynchronous LAD RS232  
F3001-02 Asynchronous LAD, Current Loop  
F3001-03 Asynchronous LAD, Relay I/O  
F3001-04 Synchronous LAD RS232 Modem  
F3001-05 Binary Synchronous Communication LAD  
F3006-00 BSC LAD with Wide Band option.
```

The unit program runs from 1 to 4 lines consecutively. These lines are specified during the System Test Generation phase.

Test connectors must be installed on the LADs to place them in a back-to-back configuration. The jumper configuration is described later in this section. It is identical to the jumper configuration for the MAINTAIN III diagnostic program. All of the lines must be of the same type. (Refer to Table 7-4 for a cross-reference of type and feature numbers of LADs.)

Table 7-4. LAD Type and Feature Number Cross-Reference

Type	Feature Number
0	F3001-00
1	F3001-01, F3001-02, F3001-03
2	F3001-04
3	F3001-05, F3006-00

For LAD types 0, 1, and 2, the program uses an ascending binary pattern of 256 bytes for test data. For the type 3 LAD, a pattern with zeros and ones alternating is used. The lines are run consecutively, and all errors are reported to the operator, via error messages.

7.10.2 ERROR MESSAGES

The following is a list of error messages generated by this unit program:

- DCM ERROR ON LINE <octal line number>
- LINE ERROR INTERRUPT
- FRAMING ERROR
- PARITY ERROR
- STATUS CHANGE INTERRUPT
- STATUS WORD IS xxxxxx
- OUTPUT UNDERFLOW
- CONTROL-LINE-IN
- RING INDICATOR
- CLEAR TO SEND
- CARRIER ON
- INTERLOCK ON
- FORMAT ERROR
- STATUS-LINE-IN
- CONTROL CHARACTER DETECTED

OUTPUT COMPLETE
NO CONTROL INTERRUPT
DCM TIMEOUT ERROR ON LINE <octal line number>
DCM DATA COMPARE ERROR ON LINE <octal line number>
TOTAL NUMBER OF ERRORS IS <octal line number>
FIRST ERROR AT <octal address>
DCM SELECTION TIMEOUT ERROR

7.10.3 EXAMPLE

RUP

M4DM99.0 DA=070 KY=01 PP=0100,0101,077 BP=0,01

M4DM99.0 DA=070 KY=02 PP=0102,0103,077 BP=0,01 TM=0:0:032
DCM SELECTION TIMEOUT ERROR

M4DM99.0 DA=070 KY=03 PP=0104,0105,077 BP=0,01 TM=0:01:05
DCM SELECTION TIMEOUT ERROR

EX**

7.10.4 JUMPER CONFIGURATIONS

Test connectors (Part Number 57 A 0036-000) are required for testing. The jumper configuration for each type of LAD is described in this section.

LAD type F3001-00

Pin 29 to Pin 35
Pin 35 to Pin 33
Pin 29 to Pin 25
Pin 27 to Pin 37
Pin 31 to Pin 23
Pin 21 to Pin 18
Pin 1 to Pin 13
Pin 13 to Pin 11
Pin 1 to Pin 7
Pin 3 to Pin 19
Pin 5 to Pin 9
Pin 6 to Pin 8

LAD type F3001-01

Pin 2 to Pin 22

Pin 4 to Pin 24

LAD type F3001-02

Pin 3 to Pin 11

Pin 29 to Pin 39

Pin 37 to Pin 40

Pin 27 to Pin 34 to Pin 6

Pin 12 to Pin 7

NOTE

R27, R30, R39, R42, R51, R54, R63, and R66 must be shorted across when using this test connector.

LAD type F3001-03

Pin 1 to Pin 25 to Pin 44

Pin 10 to Pin 5

Pin 31 to Pin 38

Pin 7 to Pin 27 to Pin 37

NOTE

R33, R29, R45, R41, R53, R57, R65, and R69 must be shorted across, and jumpers placed where R22 and R46 are mounted in order to use this test connector.

LAD type F3001-04

Same jumper configuration as for the type F3001-00 with the following additions:

Pin 38 to Pin 39

Pin 39 to Pin 41

Pin 38 to Pin 17

Pin 17 to Pin 15

LAD type F3001-05

Pin 29 to Pin 33 to Pin 25
Pin 27 to Pin 37
Pin 31 to Pin 23
Pin 21 to Pin 18
Pin 17 to Pin 35
Pin 38 to Pin 39
Pin 10 to Pin 41

LAD type F3006-00

Pin 5 to Pin 23
Pin 3 to Pin 37
Pin 7 to Pin 18 to Pin 33 to Pin 25
Pin 17 to Pin 35
Pin 44 to Pin 39 to Pin 41

7.11 V77 LASER PRINTER TEST UNIT PROGRAM (F3068-XX AND T0777) - M4ZP12

7.11.1 PURPOSE AND OPERATION

The purpose of the (M4ZP12) test is to verify the correct operation of the F3068 Channel Interface and the T0777 Laser Printer.

The RUN Command is used to execute the unit program. The format of this command and the options available are given in section 6.4.5. The following paragraphs describe the purpose and operation of the unit program operating in System Mode and the Diagnostic Mode.

7.11.1.1 System Mode

The System Mode consists of two tests scheduled for execution in System Mode. Test 1 produces three pages of print using the ASCII alpha numeric print set. Each page contains 49 lines of print with the following preset options:

- Form size is 8-1/2 x 11 inches.
- 6 lines per inch vertical spacing.
- 10 characters per inch horizontal spacing.
- Gothic 10 character set.

The Unit Program loops on the print advance function until the end of page is detected, signified by the printer status of Channel End, Device End, and Unit Exception. This procedure is repeated for each page printed. Refer to Figure 7-1 for sample printout.

Test 2 issues a Mark Form function to the printer, which causes the controller to 'Home' to the top of the page and print three lines of a specified character across the perforation of the form for two consecutive perforations.

When the tests have been completed, the Unit Program calls the System Test Executive to reschedule the program in another map.

7.11.1.2 Diagnostic Mode

The Diagnostic Mode is initiated when the RUN command is issued in the following format:

'RU/D12'. The console will display the following message:

```
'INPUT DIAGNOSTIC TEST SELECTION/(H)ELP'
```

If the operator is not familiar with the test selections he can enter 'H' for HELP. This will cause a list of all the test selections to be displayed on the console, followed again by the input test selection prompt message.

The tests are assigned numbers which identifies each test in the selection list. In response to the test selection prompt a single test or a series of tests may be requested by inputting the corresponding test numbers in any run order desired.

After the test selection is made the console will display the Diagnostic parameter list. If the operator chooses to let the tests run using the parameter default values, he needs only to press carriage return or the period and testing will begin.

If the operator chooses to change one or more of the parameter values, he must key in the corresponding numbers from the parameter list. The selected entries are displayed again one at a time. When the change value for a parameter is input, the next entry if any, is displayed.

Samples of the Test Selection List and the Parameter List formats are shown Section 7.11.3, examples 1 and 2 respectively. Note that the default settings are shown in the parameter option list enclosed in parenthesis.

Each parameter has either a set number of options or in the case where the option is a repeat count, a maximum count is shown. An exception is in the case of the error retry count or the test run count, where a -1 indicates a continuous run or no limit.

There are a total of 7 unique Diagnostic Tests which may be scheduled for execution in Diagnostic Mode. They are numbered from 1 to 7, each performing the following task:

- TEST 1 - This test can be scheduled in either the System Mode or Diagnostic Mode. As previously described under System Mode definition, this test produces three pages of print using the ASCII alpha numeric character set. The difference is that in the Diagnostic Mode the options that are listed in the parameter option list, Section 7.11.3, example 2 are available to the operator to change as he chooses.
- TEST 2 - This test can also be scheduled in either the System Mode or Diagnostic Mode; the test is normally run in conjunction with Test 1. A Mark Form command is issued to the printer. This function forces the printer to print any pages stored in the print buffer, and causes the form to 'Home' to the top of page and to print three lines across the page perforation.
- TEST 3 - The program issues the Read Disk I.D. command to the printer channel. The command will cause header information to be read from the diskette currently being utilized by the printer. The header data is read from the diskette in EBCDIC character format. The program converts a portion of the input data into ASCII format. The information that is displayed identifies the feature number of the disk, part number and revision level.
- TEST 4 - The program issues the Sense Error Log command to the printer channel. In program to this command, the 256 bytes of information stored in the Printer Error Log is transferred into the specified buffer in computer memory.

The program scans through the Error Log data and displays on the operator console this information in octal format. The displayed octal words are grouped at 8 words per line. Just those lines which contain non-zero data input from the Error Log are displayed.
- TEST 5 - This test issues the Load Copy Number command to the printer channel. The command will cause a line from the print buffer to be printed repeatedly, according to the value set by the copy number parameter, to a maximum 255₁₀ times.

- TEST 6 - This is a test of the overprint/underscore logic in the Laser Printer.

To perform the test two print buffers are used; one to overprint or merge with the other by alternate use of the Advance Print (ADVPR) and Print Advance (PRADV) commands.

The test outputs 5 lines to the printer, with each line testing a different combination of the overlay logic.

- LINE 1 - Merges a line of non-space and non-underscore characters with a line of spaces. The results should be that non-space and non-underscore characters will replace spaces.
- LINE 2 - This line is the reverse of the first line in that a line of spaces is merged with a line of non-space and non-underscore characters. The result is the same, in effect, a space will not replace non-space or non-underscore characters.
- LINE 3 - This line is a test of spaces overlaying a line of underscore characters.
- LINE 4 - This line is produced from underscore characters being merged with a line of ASCII characters, demonstrating the overprint feature of the Laser Printer.
- LINE 5 - This line is an attempt to overlay a line of non-space/non-underscore ASCII characters with a second line of ASCII characters. This is an illegal use of the overprint feature, and causes the printer channel status to return a data check error. Also, the second line will not overprint the first line of ASCII character output to the channel. Refer to Figure 7-2 for sample of the overprint/underscore test output.

- TEST 7 - Load Graphic Character Modification Command Test. The program tests the use of the Load Graphic character modification feature of the Laser Printer. A unique character is generated that replaces one of the normal alpha/numeric characters in the ASCII print set, used in the diagnostic testing.

Test 1 is called by the program which produces three pages of print to confirm the graphic character modification.

Refer to Figure 7-3 for a sample Load Graphic Character Printout.

7.11.2 ERROR MESSAGES

Any errors or failures encountered either during System or Diagnostic Modes will cause the program to first of all try to recover by retrying the failed test. Recovery attempts depend on the setting of the program Retry Count, which is given a default value of 1. In Diagnostic Mode however, the Retry Count is an option that can be given any value desired including a no limit indication by setting the count to a -1.

When error recovery cannot resolve the error, the error routine determines the printer function which generated the error and calls on the System Test Executive to print the error message, and then to reschedule the program. The error message includes the following information:

- Printer function when error was detected
- Channel status word in binary
- Sense bytes in binary

See Tables 7-6 and 7-7 for printing and channel status formats, and Table 7-8 for Printer Sense Bytes.

The Status word is displayed in two groups of 8 bits. The left 8 bits is the Printer Status, the right 8 bits is the Channel Controller Status.

The following error message displays indicate the printer function when the error occurred, status word in binary and the 18 sense bytes in binary. The following is an example:

M4ZP12.0 DA=07 KY=03 PP=056,03 BP=061,01 TM=0:01:04

LZP ERROR DURING INITIALIZE PRINTER

BIT POSITIONS	01234567	01234567
STATUS WORD	10000010	00000011
SENSE BYTES	(00) 01000000	(01) 00000000
	(02) 00000001	(03) 00001000
	(04) 00000000	(05) 00001001
	(06) 00000000	(07) 00000000
	(08) 00000000	(09) 00000000
	(10) 00100000	(11) 00000000
	(12) 00000000	(13) 00000000
	(14) 00000000	(15) 00000000
	(16) 00000000	(17) 01110000

The Status word is displayed in two groups of 8 bits. The left 8 bits are the Printer Status, the right 8 bits are the Channel Controller Status.

Table 7-5 defines the Printer Status Bits.

Table 7-5. Laser Printer Status

Bit	Description
0	Attention
1	Status Modifier
2	Control Unit End
3	Busy
4	Channel End
5	Device End
6	Unit Check
7	Unit Exception

Table 7-6 defines the Channel Controller Status.

Table 7-6. Channel Controller Status

Bits 01234567	Octal	Description
00000000	00	Normal Completion
00000001	01	Halt Channel
00000010	02	Suspend Function
00000011	03	Check C.U. Status
00000100	04	Chain Interrupt
00000101	05	No Unit Response
00000110	06	C.U. Timed Out
00000111	07	Retry Count Exhausted
00001000	10	Control Unit Requesting Service

Table 7-6. Channel Controller Status (Continued)

Bits 01234567	Octal	Description
00001001	11	Parity Error
00001010	12	Buffer Size Error
00001011	13	C.U. Issued Disconnect
00001100	14	CPT Error
00001101	15	CCT Error
00001110	16	C.U. Write Terminate

Table 7-7 defines the 13 Laser Printer Sense Bytes.

Table 7-7. Laser Printer Sense Bytes.

		BIT POSITIONS							
		0	1	2	3	4	5	6	7
PROGRAMMING	0	COMMAND SELECT	HYPERVENTION RESOLVED	END SUP CHECK	COLLECTION CHECK	DATA CHECK	PROGRAM ALERT	SUPPER LOAD CHECK	HYPERLOAD REQUEST
	1	HYPERLOAD CHARACTER GENERATOR	HYPERLOAD DATA CHECK	HYPERLOAD STAPLES IN	NOISE W/	HYPERLOAD HYPERVENTION	HYPERLOAD ONE OR SE LECTIVE RESET	HYPERLOAD VOB	HYPERLOAD SELECTED TRANSLATE TABLE
	2	HYPERLOAD ADDRESS	HYPERLOAD DATA LENGTH	HYPERLOAD JOB ID	HYPERLOAD	CODE 9 ADVANCE	HYPERLOAD ADVANCE	(HYPERLOAD OVERFLOW	(HYPERLOAD LOW LEVEL
PROGRAMMING	3	DATA IN PAGE BUFFER	HYPERLOAD FLASH NUMBER	HYPERLOAD COPY INDICATION	PAGE OVERFLOW	PRINTING ACTIVE			
	4								
PROGRAMMING	5								
	6								
ELECTRONICAL	7	CHARACTER PER PAGE PARITY CHECK	HYPERLOAD CHARACTER CHECK	HYPERLOAD	INPUT BUS PARITY CHECK SEPARATION P/B	INPUT BUS PARITY CHECK DATA MEMORY	INPUT BUS PARITY CHECK (HYPERLOAD BUS	PRINTING IN M PARITY CHECK	(HYPERLOAD INPUT BUS PARITY CHECK
	8		(HYPERLOAD)		HYPERLOAD OUTPUT REGISTER PARITY CHECK	HYPERLOAD TEST FEATURE (ADULT MARKING)	UNCONNECTABLE IN PAGE SUPER CHECK	UNCONNECTABLE IN OUTPUT LINE SUPER CHECK	UNCONNECTABLE IN OUTPUT LINE SUPER CHECK
	9		(HYPERLOAD)			OVERTYPE NOT READY	TRAY UNLOCKED	SECTION NOT FOUND	OVERTYPE ONE (HYPERLOAD)
MECHANICAL	10	DEVICE POWER CHECK	POWER ON DELAY	FILE ERROR	CONTROL OFF	FORM EMPTY	CATCHER FULL	END OF JOB FEEL	FORM OVER DEFECTION
	11	TRAY COVER OPEN	END OF JOB	PAWER CHECK	DEVELOPER STATION OPEN	FORM ERROR (HYPERLOAD)	AIR PRESSURE (HYPERLOAD)	WIPING CLOSER PAPER STOP	RECLEANING LAMP
	12	WICK DRUM IMPRINT PARITY CHECK	NO PAPER MOTION	FUSER OVER TEMPERATURE	PAPER STOP ERROR	FUSER POSITION (HYPERLOAD)	TRANSFER BY POSITION (HYPERLOAD)	GLASSBAR (HYPERLOAD)	NO LASER MARK
	13	LASER READY SIGNAL	LOOP ERROR	FUSER TEMPERATURE LOW	PAPER GRADE	FUSER ON (HYPERLOAD)	CLEANING CYCLE FAILURE	CHANGE FLICE	CLEANING CYCLE
	14	OVERLOAD OFF TIME	OVERLOAD LAMP FAILED	OVERLOAD NOT INSTALLED	OVERLOAD STATION JAMMED	CHANGE FILTER	HYPERLOAD ROLLER JAM	STAPLER FULL	WIPER MOTOR FAILURE
	15			(HYPERLOAD)			TEMPERATURE SENSOR FAILURE	WIPER FAILURE	WIPER TEMPERATURE FAILURE
ADDITIONAL DEVICE	16			(HYPERLOAD)			ADDITIONAL DEVICE ON LINE	ADDITIONAL DEVICE STOP	ADDITIONAL DEVICE ADDRESS
FEATURES	17	(HYPERLOAD)	OPTIONAL FEATURE	ADDRESS CHECK FEATURE	FORM OVERLAY FEATURE	HYPERLOAD FEATURE		(HYPERLOAD)	

7.11.3 EXAMPLE

EXAMPLE 1 DIAGNOSTIC TEST SELECTION LIST:

M4ZP12.A DA=07 KY=02 PP=0107,06 BP=0115,01 TM=0:0:0
INPUT DIAGNOSTIC TEST SELECTIONS/(H)ELP

DG**
H

M4ZP12.A DA=07 KY=02 PP=0107,06 BP=0115,01 TM=0:0:0

LASER PRINTER DIAG COMMAND LIST

- 1- PRINT 3 PAGES OF SPIRAL 64 CHARA SET
 - 2- MARK FORMS TEST
 - 3- READ DISK ID AND DISPLAY
 - 4- READ ERROR LOG AND DISPLAY
 - 5- COPY NUMBER FUNCTION
 - 6- OVERPRINT/UNDERSCORE LOGIC TEST
 - 7- LOAD GRAPHIC CHARACTER MODIFICATION
- USE ', ' TO SEPARATE MULTIPLE ENTRIES

M4ZP12.A DA=07 KY=02 PP=017,06 BP=0115,01 TM=0:0:03
INPUT DIAGNOSTIC TEST SELECTIONS/(H)ELP

DG**
5

The sample list is an example of the Diagnostic Test Selection List, as it is displayed on the operator console.

In this example, Test 5 has been selected to run.

EXAMPLE 2 DIAGNOSTIC TEST PARAMETER OPTION LIST:

M4ZP12.A DA=07 KY=02 PP=0107,06 BP=0115,01 TM=0:0:04

LASER PTR DIAG TESTING PARAMETER LIST

DEFAULT VALUES ARE SHOWN IN ()

TO CHANGE 1 OR MORE PARAMETER ARGUMENTS

ENTER PARAM NUMBERS TO BE CHANGED

SEPARATE MULTIPLE ENTRIES WITH A COMMA

ENTER CHANGE VALUES FOLLOWING THE SELECTED

PARAMETER REPEAT MESSAGE

PARAMETER INPUT LIST

1. FORM SIZE (1= 8.5 x 11), 2= 11 x 14
2. CHARA'S/INCH (1= 10 CPI), 2= 12 CPI, 4= 15 CPI
3. LINES/INCH (1= 6 CPI), 2= 8 LPI, 4= 12 LPI
4. NUM OF COPIES, 1,2,(3)...377
5. ADV CODE (1),2,3...17
6. ERROR RETRY COUNT (1)...; -1= NO LIMIT
7. RUN COUNT (1),2,3...; -1= NO LIMIT

DG**
4,7

M4ZP12.A DA=07 KY=02 PP=0107,06 BP=0115,01 TM=0:0:08
4. NUM OF COPIES, 1,2,(3)...377

DG**
10

M4ZP12.A DA=07 KY=02 PP=0107,06 BP=0115,01 TM=0:0:08
7. RUN COUNT (1),2,3...; -1= NO LIMIT

DG**
3

The above is a sample list of the Diagnostic Parameter Option List as it is displayed on the operator console. In this example, parameters 4 and 7 have been selected for change; parameter 4 'number of copies' is set to 10, and parameter 7 'run count' is set to 3.

7.12 V77 INTRERCOMPUTER LINK UNIT PROGRAM (E-1499) - M4CC11

7.12.1 PURPOSE AND OPERATION

The purpose of the test (M4CC11) is to verify the current operation of the E-1499 controller which is a communication link between two CPUs. The unit program M4CC11.X is configured into the generation of the System Test version being run.

The RUN Command is used to execute the unit program. The format of this command and the options available are given in section 6.4.5.

7.12.1.1 System Test Mode

The System Test Mode will try to reset and boot the V77-200 or compatible Front End Communication Processor (FECF) and then use the BIC to transfer a preliminary test program to FECF.

When the transferring operation from the host is finished, the FECF will run a preliminary Instruction and Memory Test. It will then build a buffer with an incrementing pattern to transfer back to the host. When the host has received this data from the FECF, it will check the received data and exit to the System Test Executive.

7.12.1.2 Diagnostic Test Mode

At the present time, the Diagnostic Mode will run exactly the same as the System Test Mode. However, the Diagnostic mode will output messages to tell the operator how to set up the equipment to run the test properly.

7.12.2 ERROR MESSAGES

Any errors encountered during a System Test run will cause an error message to be output. The unit having the error condition is flagged as down and processing continues as long as there is a unit available for processing. When a unit is in the ready condition, even though it has been flagged as down, another attempt to use the unit will be made.

The first line of each error message is generated by the Test Executive and is described in the Test Executive design description in paragraph 6.8.3.7. The following information is output by the unit program.

7.12.2.1 BIC Error Messages

When a BIC error is detected by the program, it will print out:

```
BIC ERROR
BIC ADDRESS IS          XXXX
INITIAL ADDRESS IS     XXXX
FINAL ADDRESS IS       XXXX
ACTUAL FINAL ADDRESS IS XXXX or NOT TRANSFER YET
```

The above messages will be accompanied by one of the following messages:

- When the program could not get a BIC:
BIC NOT AVAILABLE
- When BIC is doing something else:
BIC BUSY
- When memory map error occurs:
BIC STOP BECAUSE MEMORY MAP ERROR
- When device could not connect BIC:
TIMEOUT - CANNOT CONNECT BIC WRITE or
TIMEOUT - CANNOT CONNECT BIC READ
- When final address is different than actual final address:
DIFFERENT FINAL ADDRESS

Accompanied with the above messages will be a retry message:

```
RETRY   XX   MORE
```

7.12.2.2 Failure Messages

- Host cannot transfer:
HOST CANNOT TRANSFER DATA TO FRONT END
- No complete receiving signal from Front End (FE):
FE CANNOT RECEIVE DATA FROM THE HOST

- No complete Instruction Test from FE:

FE CANNOT FINISH INSTRUCTION TEST

- No complete Memory Test from FE:

FE CANNOT FINISH MEMORY TEST

- When the program detects an error in data received from the FE, it will printout:

HOST CANNOT RECEIVE DATA

7.12.3 DIAGNOSTIC MESSAGES

Initial set up messages: .

DIAGNOSTIC MODE JUST SHOWS HOW TO SET UP. YOU HAVE TO SET SENSE SWITCH 3 OF THE FRONT END PROCESSOR.

AFTER SETTING IT, COME BACK AND TYPE "DC".

If the operator does not respond correctly to this prompt, then the program will respond:

DO IT CORRECTLY, NEXT TIME I WILL EXIT. YOU HAVE TO SET SENSE SWITCH 3 OF THE FRONT END PROCESSOR.

AFTER SETTING IT, COME BACK AND TYPE "DO".

If the operator fails to set up the equipment properly after two prompts, then the program prints out the following message and exits.

FAIL TO SET SS3 OF FRONT END PROCESSOR AND TYPE "DO" ON CONSOLE.

7.13 V77 TERMINAL TEST UNIT PROGRAM UTS10 TTY X3.64 (F3577-00, -01) - M4TT10

7.13.1 PURPOSE AND OPERATION

The purpose of the test (M4TT10) is to verify the correct operation of the UTS10/20/40/60/400, U100, U200 Hardware and Microcode for F3577-00, -01 (TTY X3.64).

The RUN Command is used to execute all unit programs. The format of this command and available options are given in section 6.4.5. The following discussion covers the purpose and operation of the System Mode and the Diagnostic Mode.

7.13.1.1 System Test Mode

The System mode runs in two main loops using common routines. One loop will build a buffer of data, transfer that data to the screen. The data pattern used is an ascending ASCII 253 through 373 octal. The other main loop outputs a poll to the intelligent terminals. Both loops are a continuous operation alternating between all the terminals configured at system time. The buffer utilized for the no traffic, retransmit, messages, etc., and/or for building a buffer of data is the logical memory area from the end of the program to the end of memory in the assigned map key.

NOTE

Pressing the transmit key will only cause the CRT to sit in a wait state. Do not touch any keyboards operating in System mode.

7.13.1.2 Diagnostic Test Mode

In the Diagnostic Mode the program requests the operator to answer the following question:

DO YOU HAVE ANY AUXILIARY PRINTERS?

If the operator answers (Y) the program will display a note to the operator, that the program is only capable of bringing in eight line numbers each time the Diagnostic Prompts appears. The display of the note is as follows:

NOTE: I CAN ONLY BRING IN EIGHT LINES AT A TIME

Then a message will be displayed soliciting the line numbers as follows:

INPUT LINE NUMBERS 1,2,3...

If the operator answers (N) to the auxiliary printers' questions, then the program will solicit for the input of a diagnostic command to be inputted.

Each command entered causes the indicated test to be run through one execution. Request for entry of another command is then output. All tests also allow provision of a continuous loop of the test. After entering the diagnostic option of the RUN Command, the console will display.

INPUT DIAGNOSTIC COMMAND

***(1)(2)(3)(4)(5)(6) (H)ELP

To select a Command enter C,R

where:

C is the Command Number and R is the Run Count*.

*NOTE:

The Run Count is the number of times the test will be repeated on each terminal. A Run Count of -1 will mean to run continuously.

The program solicits the Run Count. The range is +1 to -1, the -1 implies continuous run.

When a command has been entered and executed, exit is to the routine which outputs the ENTER DIAGNOSTIC COMMAND message.

Valid commands are:

- 1 - Input/Echo Test. The program displays the same pattern as in System Mode, and is waiting for the operator to input a character on the terminal to be tested. When a character is input, every terminal will halt display. The message THIS IS AN ECHO TEST is displayed. At this time, the operator should key in from 1 to 80 characters. Inputting 80 characters will activate ECHO automatically. If less than 80 characters is input, terminate the string with a return; this return will activate ECHO. When a ECHO is activated, all the characters input to the terminal are sent by the host back to the screen, followed by the message END OF ECHO TEST. Then the program will resume displaying the original pattern on all the screens, ready for the next terminal to test. The program gives the operator more time to run the test according to the number of terminals configured in the system. There is adequate time for conclusive testing on all the terminals. The program will return to prompter when this time is exhausted.

- 2 - Printer Test. The host will cause a transfer of data from the terminals display memory to the printer. It will function as if the print key had been pressed.
- 3 - Transparent Print Test. In this test the host will turn on the Transparent Print Mode. A TP will appear on the status line to inform the operator. Then a buffer will be filled with 140 characters and transferred to the printer transparently to the display.

NOTE

The Transparent Print Test must run before the Local Print Test.

- 4 - Cursor Position Test. This test will first display ENTER TYPE OF CRT, UTS10 = 0, OTHER = 1. Then the program moves the cursor to home and asks the CRT to report the position of its cursor. If there are any discrepancies between where the program told the cursor to move and where the CRT reported the cursor position to be, then an error message will be displayed.

NOTE

All 1920 positions are tested on each terminal, then the program returns to the prompter.

- 5 - Runs as if in System Mode. At the end of execution the program will display its status and then exit to the Test Executive and be rescheduled in the Diagnostic mode in another map key.
- 6 - Echo 400 Mode. This test polls the intelligent terminals similar to Systems mode but will respond with data turn around when data is input to the CRT and the transmit key is depressed. The Run Count on this test is the number of times each terminal will be polled. If no number was specified for the Run Count, then a three is used as a default value.

NOTE

Do not transmit more than eighty characters due to the limited buffer space.

- H Help. Lists all valid commands.
- X Exit. Exit to the Executive to be rescheduled in another map.

NOTE

The CRT must be in buffered mode for all tests except INPUT/ECHO.

7.13.2 ERROR MESSAGES

Any errors encountered during a System Test Run will cause an error message to be output. Only timeout errors will cause a CRT to be downed. On all other errors, processing continues as long as there is a CRT available for testing.

The program will not make another attempt on the downed CRT until the program is loaded into another map.

The first line of each error message is generated by the Test Executive and is described in the Test Executive design description, paragraph 6.8.3.7. The following information is output by the unit program.

DCM ERROR MESSGES

(Line 1) (Generated by System Test Executive)

(Line 2) (Error Message)

(Error Message) in line 2 will contain one of the following:

- DCM ERROR ON LINE (aaaaaa)
- DCM TIMEOUT ERROR ON LINE (aaaaaa)
- DCM NOT AVAILABLE
- FRAMING ERRORS
- PARITY ERRORS
- OUTPUT UNDERFLOW
- CONTROL-LINE-IN
- FORMAT ERROR

where:

(aaaaaa)
Is octal line number.

NOTE

In the event of a timeout error, the following additional messages will be displayed.

INTERRUPT EVENT WORD 000000	
BIT POSITION	INTERRUPT RELIEVED
0	INPUT BYTE COUNT ZERO
1	OUTPUT BYTE COUNT ZERO
2	LINE ERROR
3	STATUS ERROR
4	CONTROL CHARACTER DETECTED
5	CONTROL
15	LINE COMPLETE (NON-INTERRUPT)

INTERRUPT ERROR MESSAGES

(Line 1) (Generated by System Test Executive)

(Line 2) (Error Message)

(Error Message) in line 2 will contain one of the following:

NO CONTROL INTERRUPT
LINE ERROR INTERRUPT
*STATUS CHANGE INTERRUPT

(Line 3 applicable to * above)

STATUS WORD IS xxxxxx

where:

xxxxxx
Status. .Refer to DCM manual, UP-8629.

UTS10 ERROR MESSAGES

(Line 1) (Generated by System Test Executive)

(Line 2) (Error Message)

(Error Message) in line 2 will contain one of the following:

DISPLAY BUSY DOING A LOCAL PRINT (aaaaaa)

where:

(aaaaaa)
Octal line number.

PRINTER ERROR MESSAGES

(Line 1) (Generated by System Test Executive)

(Line 2) (ERROR MESSAGE)

"ERROR MESSAGE" in slot 2 will contain one of the following:

PRINTER NOT ON LINE (aaaaaa)
DEVICE MALFUNCTION (aaaaaa)
PRINTER BUSY (aaaaaa)

where:

(aaaaaa)
Octal line number.

7.14 V77 MSC DISK CONTROLLER TEST UNIT PROGRAM - M4DG13

7.14.1 PURPOSE AND OPERATION

The purpose of the test (M4DG13) is to verify the correct operation of the MSC disk controller (F2834).

The RUN Command is used to execute all unit programs. The format of this command and the options available are given in section 6.4.5. The following discussion covers the purpose and operation of the System Test Mode and the Diagnostic Mode.

7.14.1.1 System Test Mode

The test operates in a continuous loop mode. Each loop consists of two write/read/compare cycles per drive unit. This is accomplished in successive physical areas of the assigned map.

In each loop, two record lengths and data patterns are used. A new buffer is requested from the executive at the beginning of each loop. The new buffer borders on the previous buffer and at a higher address. This process continues until all of the map (that map portion not occupied by the unit program) has been used. The program is then rescheduled in another map.

This mode of operation is capable of testing one to two disk units. However, all units to be tested must be ready before this unit program is loaded.

7.14.1.2 Diagnostic Test Mode

In the Diagnostic Mode, the program requests a diagnostic command be input. Each command entered causes the indicated test to be run through one execution. Then, request for entry of another command is output. Some tests also allow provision of a continuous loop of the test. After entering the diagnostic option of the RUN Command, the console will display:

INPUT DIAGNOSTIC COMMAND

Diagnostic Mode commands are positional and must be entered as follows:

command, continuous run flag C, status mask

or

Z, read retry count, write retry count, fixed record length, fixed pattern, cylinder, head, section

where:

command

A, B, C, E, G, H, I, K, L, N, R, S, T, W, X, Y, Z
(see list of valid commands below for meanings of these commands).

continuous run flag C

(This parameter is not applicable to some commands. See command list, below)

status mask

A 16-bit mask. Should only be used to mask hot bits and not status words since there are no single bits representing errors.

When the status mask is entered, zero bits represent bits that the test will ignore. One bits represent errors the test will report. The status mask default will report all errors.

The Z command is a special case:

Z, read retry count, write retry count, fixed record length, fixed pattern

This command sets parameters used for all other tests selected. See the list of valid commands for the duration of these parameters.

The parameter values are:

read retry count	0-32767
write retry count	0-32767
fixed record length	If maximum count for the drive under test is exceeded, the program will select the maximum size for the drive.
fixed pattern	0-77777 (octal) a one-word bit pattern.
cylinder address	0-558 (1056 octal).
head number	0-13 (15 octal)
sector address	0-63 (77 octal)

After the Z command has been entered,

INPUT DIAGNOSTIC COMMAND

will again be output to the console.

When a command has been entered and executed, exit is to the routine which outputs the INPUT DIAGNOSTIC COMMAND message.

Valid commands are:

- A Unique Address Test. This test will access every sector on the drive. It will perform a Read Address to compare expected and actual address. This test is non-destructive.
- B DCU Buffer Test. Read and write to the DCU buffer without any disk I/O to the test DCU DMA operation.
- C ECC Test. Writes data with random length errors using the write long sector command. The data is then read insuring the errors are corrected.
- E Echo Test. This test will perform a read, write, and verify record. The pattern used will be the value at location CPAT if in diagnostic mode, or alternate between APAT and BPAT if in system mode.
- G Restore Cylinder Register. Seeks to a cylinder other than the current cylinder address. Performs a restore cylinder register to the current address, performing a record read and tests for a header compare error.
- H Help. Outputs command list on operator's console.
- I Self Test. Issues self test command and examines status.
- K Surface Test. Issues self test command and examines status.
- L Loop Back Test. Issues loop back test command. (Requires loop back cable hookup.)
- N Select Unit. Parameter 1 is the unit number to be selected.
- R Read Record. Read a record using current parameters.
- S Seek Test. Performs seeks in either of the two (2) fashions depending on current parameters:

1. Recalibrate, and seek to current cylinder address.
 2. Seek to random addresses.
- T Sense Status Test. This test will force error conditions to verify error status.
- W Write Record. Write a record using current parameters.
- X Exit to System Mode. Transfers control to system mode. All current parameter values at time of transfer will be used (see Restrictions).
- Y List Current Parameters.
- Z Input Parameters. Allows operator to input a new set of parameters: read and write retry counts, data pattern, and cylinder and track addresses.

7.14.2 ERROR MESSAGES

Any errors encountered during a System Test run will cause an error message to be output. The unit having the error condition is flagged as down and processing continues as long as there is a unit available for processing. When a unit is in the ready condition, even though it has been flagged as down, another attempt to use the unit will be made.

The first line of each error message is generated by the Test Executive and is described in the Test Executive design description. The following information is output by the unit program:

BIC ERROR MESSAGES

(Line 1) Generated by System Test Executive.

(Line 2) BIC xxxxxx TIMEOUT (error message) ERROR
 BIC xxxxxx (error message) ERROR

(error message) slot in line 2 will contain one of the following:

BUSY
 SETUP
 ABNORMAL BIC DEVICE STOP ON WRITE
 ABNORMAL BIC DEVICE STOP ON READ
 BIC STOPPED-MAP MEMORY
 NOT AVAILABLE

(Line 3 where applicable)

INITIAL ADDRESS xxxxxx

(Line 4 where applicable)

FINAL ADDRESS WAS xxxxxx SHOULD BE xxxxxx

DEVICE ERROR MESSAGES

(Line 1) Generated by System Test Executive

(Line 2) DC xxxxxx TIMEOUT (error message) ERROR
DC xxxxxx (error message) ERROR

(error message) slot in line 2 will contain one of the following:

SELECT CYLINDER
RESTORE CYLINDER REGISTER
STOP TRANSFER AND INITIALIZE
OUTPUT SUW
WRITE
READ
RESTORE
DCU RESET
FILL/EMPTY BUFFER

(Line 3 where applicable)

STATUS WORD xxxxxx

(Line 4 through n for each status word)

HEADER ECC ERROR
CORRECTABLE ECC ERROR
INVALID CYLINDER ADDRESS
INVALID HEAD ADDRESS
INVALID SECTOR ADDRESS
INVALID TRANSFER COUNT
BIC IS NOT ACTIVE
MEMORY PARITY ERROR
DMA EXECUTION ERROR
DRIVE DID NOT SELECT
SEEK TIMEOUT
DRIVE FAULT
SEEK ERROR
DRIVE NOT ON CYLINDER
DRIVE NOT READY
NO SELECT AT COMPLETION
WRITE PROTECT ERROR
END OF TRACK
PROGRAMMATIC COMMAND ABORT
HEADER COMPARE ERROR
DEFECTIVE TRACK

DATA COMPARE ERROR MESSAGE

(Line 1) (Generated by System Test Executive)
(Line 2) UNIT xxxxxx BUFFER ADDRESS xxxxxx SIZE (OCTAL)
xxxxxx
(Line 3) DATA EXPECTED xxxxxx DATA FOUND xxxxxx
(Line 4) LOCATION xxxxxx

7.15 V77 DISKETTE TEST UNIT PROGRAM - M4DJ16

7.15.1 PURPOSE AND OPERATION

The purpose of the test (M4DJ16) is to verify the correct operation of the diskette unit type configured into the System Test version being run. The unit configured must be either an F3353 or F3375 diskette.

The RUN Command is used to execute all unit programs. The format of this command and the options available are given in section 6.4.5. The following discussion covers the purpose and operation of the System Test Mode and the Diagnostic Mode.

7.15.1.1 System Test Mode

The test operates in a continuous loop mode. Each loop consists of two write/read/compare cycles per drive unit. This is accomplished in successive physical areas of the assigned map.

In each loop, two record lengths and data patterns are used. A new buffer is requested from the executive at the beginning of each loop. The new buffer borders on the previous buffer and at a higher address. This process continues until all of the map not occupied by the unit program has been used. This program is then rescheduled in another map.

This mode of operation is capable of testing from one to four disk units. However, all units to be tested must be ready before this unit program is loaded.

The floppy unit program system mode uses random track and sector addresses to prevent diskette wear since the read/write heads physically touch the media.

7.15.1.2 Diagnostic Test Mode

In the Diagnostic Mode the program requests a diagnostic command be input. Each command entered causes the indicated test to be run through one execution. Then, request for entry of another command is output. Some tests also allow provision of a continuous loop of the test. After entering the diagnostic option of the RUN Command, the console will display:

INPUT DIAGNOSTIC COMMAND

Diagnostic Mode commands are positional and must be entered as follows:

command, continuous run flag C, status mask

or

Z, read retry count, write retry count, fixed record length, fixed pattern, track, sector

where:

command

A, C, D, E, F, H, I, L, R, S, T, W, Z

(See list of valid commands below for meanings of these commands).

continuous run flag C

(This parameter is not applicable to some commands. See command list, below.)

status mask

A 16-bit mask corresponding to the following list:

B15	NOT USED	B7	TRANSFER TIMING ERROR
B14	NOT USED	B6	SEEK ERROR
B13	TRACK ANALYSIS RECOMMENDED	B5	BAD SECTOR ADDRESS
B12	SELECTED UNIT NOT READY	B4	ILLEGAL DISK ADDRESS
B11	WRITE PROTECT VIOLATION	B3	RECORD SEARCH ERROR
B10	TRACK OVERFLOW	B2	NOT USED
B9	DATA CRC ERROR	B1	NOT USED
B8	HEADER CRC ERROR	B0	CONTEXT ERROR

When the status mask is entered, zero bits represent errors that the test will ignore. One bits represent errors the test will report. The status mask default will report all errors.

The Z command is a special case and has the following format:

Z, read retry count, write retry count, fixed record length, fixed pattern, track, sector

This command sets parameters used for all other tests selected. See the list of valid commands for the duration of these parameters.

The parameter values are:

read retry count	0-32767.
write retry count	0-32767.
fixed record length	Word count. If maximum count for the drive under test is exceeded, the program will select the maximum size for the drive.
fixed pattern	0-77777 (octal) a one-word bit pattern.
track	0-73 (113 octal).
sector	0-59 (MCO), 0-25 (IBM).

After the Z command has been entered,

INPUT DIAGNOSTIC COMMAND

will again be output to the console.

When a command has been entered and executed, exit is to the routine which outputs the INPUT DIAGNOSTIC COMMAND message.

Valid commands are:

- A Unique Address Test. Writes data pattern in every sector. First and second bytes contain track and sector address (unique address) of that sector.
- C Compatibility Test. Reads every sector. Verifies the data pattern and unique address.
- D Diagnostic Exit. Control is transferred to system mode. Current parameters remain the same. A CONTROL-C causes an exit to System Test EXEC.

- E Echo Test. Performs read, write, and data verification. Use alternating track and random sector addresses if parameter 3 = A. Use random track and random sector addresses if parameter 3 = R. Default value of parameter 3 is continuous current track and current sector address.
- F Format. Issue format command to unit being tested. Parameter 3 specifies disk recording type. When F or FO specified, error message displayed and list of types is output.
- Format types are:
- 2 = Double sided MCO
 - 3 = Single density IBM
 - 4 = Double density IBM
- H Help. Print list of diagnostic commands.
- I Toggle Read/Write Interrupts. Toggles the interrupt vector for read and write between BIC and controller.
- L Report Disk Configuration. Update current disk configuration and print status.
- R Read. Read a record by using current parameters. Perform data verification.
- S Seek. Return to track 0 and search for current address. If parameter 3 = R, will seek random track(s).
- T Sense Status Test. Test error bits by forcing error conditions. Generate a report that includes bits not tested.
- W Write. Write a record by using current parameters.
- Z Change Input Parameters. Input parameters in the following order:
1. Read retry count
 2. Write retry count
 3. Record length
 4. Fixed pattern
 5. Track address
 6. Sector address

When a diagnostic command is entered, the operator can enter three parameters: continuous flag, status mask, and a command dependent parameter (parameter 3). Valid entries are:

- Continuous flag (command parameter 1).

No entry indicates a single cycle through the selected test. This is the default value. An entry of C indicates a continuous test cycle mode until terminated with a Control-C.

- Status Mask (command parameter 2)

No entry causes a default mask of -1 to be used. If the mask has been modified by a previous test entry, the last entered mask is used. Any mask, except -1, can be entered by the operator. This mask will be used for subsequent tests until changed by the operator.

- Command dependent parameter (command parameter 3).

The meaning of this parameter changes with each diagnostic command. The meanings are:

<u>COMMAND</u>	<u>FUNCTION</u>	<u>COMMAND</u>	<u>FUNCTION</u>
A	Not used	L	Not used
C	Not used	R	Not used
D	Not used	S	Random Trk Addr
E	C = Continuous	T	Not used
	R = Random Trk Addr	W	Not used
	A = Alternating Trk Addr	Z	Not used

The following commands utilize Parameter 1 only:

F - Format Type 2 through 4
 2 = MCO Double Sided
 3 = IBM Single Density
 4 = IBM Double Density (not released)

N - Select Unit
 Unit number to be tested

The Floppy Diagnostic Tests do not default to any unit. The operator should request the unit to be tested using the N command; otherwise, he will be solicited for one prior to any test execution. Once selected, no further select commands are required unless the operator wishes to test a different unit.

7.15.2 ERROR MESSAGES

Any errors encountered during a System Test run will cause an error message to be output. The unit having the error condition is flagged as down and processing continues as long as there is a unit available for processing. When a unit is in the ready condition, even though it has been flagged as down, another attempt to use the unit will be made.

The first line of each error message is generated by the Test Executive and is described in the Test Executive design description. The following information is output by the unit program:

BIC ERROR MESSAGES

(Line 1) Generated by System Test Executive

(Line 2) BIC xxxxxx TIMEOUT (error message) ERROR
 BIC xxxxxx (error message) ERROR

(error message) slot in line 2 will contain one of the following:

BUSY
SETUP
ABNORMAL BIC DEVICE STOP ON WRITE
ABNORMAL BIC DEVICE STOP ON READ
BIC STOPPED-MAP MEMORY
NOT AVAILABLE

(Line 3 where applicable)

INITIAL ADDRESS xxxxxx

(Line 4 where applicable)

FINAL ADDRESS WAS xxxxxx SHOULD BE xxxxxx

DEVICE ERROR MESSAGES

(Line 1) Generated by System Test Executive

(Line 2) DC xxxxxx TIMEOUT (error message) ERROR
 DC xxxxxx (error message) ERROR

(error message) slot in line 2 will contain one of the following:

BUSY ERROR
SELECT UNIT ERROR
WRITE ERROR
READ ERROR
OUTPUT TRACK ADDRESS ERROR
WRITE/READ DATA COMPARE ERROR
BUFFER ADDRESS xxxxxx SIZE (OCTAL) xxxxxx
DATA EXPECTED xxxxxx FOUND xxxxxx LOCATION xxxxxx

(Line 3 where applicable)

STATUS WORD xxxxxx

(Line 4 through n for each bit set)

DATA COMPARE ERROR MESSAGE

(Line 1) (Generated by System Test Executive)
(Line 2) UNIT xxxxxx BUFFER ADDRESS xxxxxx SIZE (OCTAL)
xxxxxx
(Line 3) DATA EXPECTED xxxxxx DATA FOUND xxxxxx
(Line 4) LOCATION xxxxxx

7.16 V77 CARD READER TEST UNIT PROGRAM- M4CRL7

7.16.1 PURPOSE AND OPERATION

The purpose of the test is to verify the correct operation of the card reader type configured into the generation of the System Test version being run. The unit configured must be one of the types 2812-xx.

The Run Command is used to execute all Unit Programs. The format of this command and the options available are given in Section 6.4.5, page 6-12. The following discussion covers the purpose and operation of the System Test mode and the Diagnostic mode.

7.16.1.1 System Mode

The System mode consists of initializing the card reader, requesting BIC, set up BIC and reading three cards and comparing the data transferred. The data pattern is predefined in Unit

Program. Either normal termination or error termination, the program returns to the Test Executive for rescheduling.

Card Test Deck (9250167-044A) is required.

7.16.1.2 DIAGNOSTIC MODE

In the Diagnostic mode, the program requests a test number be input. Each valid input entered causes the selected tests to be run through each execution. The Run Count flag will allow the test to be run again n times. Any invalid command will cause help message to be printed. After entering the diagnostic option of the Run Command, the console will display:

ENTER TEST NUMBER OR H (HELP)

- 1 - Read-A-Card Test. As in the System Test Mode, but this only reads one card. The error is reliable and recoverable.
- 2 - Feed-Card Test. This test will feed-cards continuously for 20 seconds about 60 cards.
- 3 - Wrap-Around Test. Test the sense command in both Card Reader and Line Printer. Also test the data turn around (from Line Printer to Card Reader) in either 8-bit or 12-bit. (12-bit is default).

Any other input will cause help message to be output.

Program then will ask for Run Count.

ENTER RUN COUNT

Default is one (1).

7.16.2 HELP MESSAGE

Any invalid command will cause the following message to be output in the console.

VALID TEST NUMBER:

- 1 = READ-A-CARD TEST
- 2 = FEED-CARDS TEST (MAXIMUM 60 CARDS IN HOPPER)
- 3 = WRAP-AROUND TEST

7.16.3 ERROR MESSAGES

Any error encountered during the test will cause the error message(s) to be output. In System mode, if unrecovered error occurs, the test will be aborted. In Diagnostic, the program will let the user have a chance to correct it (if possible).

The first line of each error message is generated by the Test Executive and is described in the Test Executive Design Description. The following is output by the Unit Program:

BIC ERROR MESSAGES

(Line 1) (Generated by System Test Executive)
(Line 2) BIC xxxxxx ERROR (error message) ERROR
BIC xxxxxx (error message) ERROR

ERROR MESSAGE slot in line 2 will contain one of the following:

SUSY
NOT AVAILABLE
ABNORMAL BIC DEVICE STOP
BIC STOPPED-MAP MEMORY
FINAL ADDRESS IS DIFFERENT
INITIAL ADDRESS LOAD NOT CORRECTLY
NO BIC COMPLETE AS EXPECTED
NOT AVAILABLE

(Line 3 where applicable)

INITIAL ADDRESS xxxxxx

(Line 4 where applicable)

FINAL ADDRESS WAS xxxxxx SHOULD BE xxxxxx

When Card Reader error occurs:

CARD READER ERROR

Accompanied with the above message will be one of the following:

- If hopper is empty
CARD READER HOPPER IS EMPTY
- If initialization fails
CARD READER NOT READY AFTER INITIALIZATION

- If Card Reader has error
CARD READER ERROR SUCH AS MOTION ERROR, PICK FAIL ETC.
- If Feed-Cards Test Fails
SENSE HOPPER ERROR OR MORE CARDS THAN EXPECTED IN THE
FEED-CARDS TEST

WRAP-AROUND ERROR MESSAGE

- If sense instruction fails

	CR	CLEAR
SENSE xx OF	NOT	
	LP	SET
- If data is not correct

WRAP-AROUND DATA TRANSFER ERROR		
COLUMN	EXP. DATA	REC. DATA
XXXX	YYYY	ZZZZ

where:

xxxx: Data output to Line Printer
 yyyy: Data expected to be when read back from Card Reader
 zzzz: Actual data received from Card Reader

The following questions are displayed for the Wrap Around Test:

- PLEASE ENTER LINE PRINTER ADDRESS
- PLEASE DISCONNECT PRINTER AND CARD READER CABLES
- The 12 bit test is the default.
ENTER 010 FOR 8-BIT TEST

7.17 V77 UASC TEST UNIT PROGRAM-M4LT18

7.17.1 PURPOSE AND OPERATION

The purpose of the test is to verify the correct operation of the UASC type configured into the generation of the System Test version being run. The unit configured must be one of the types F3004-xx.

The Run Command is used to execute Unit Program. The format of this command and the options available are given in section 6.4.5, page 6-12. The following discussion covers the purpose and operation of the System Test mode and the Diagnostic mode.

7.17.1.1 System Mode

The System mode consists of initializing the controller, using sense mode to output two lines of buffer. Either normal termination or error termination, the program returns to the Text Executive for rescheduling.

7.17.1.2 Diagnostic Mode

In the Diagnostic mode, the program requests a test number be input. Each valid input entered causes the selected test to be run through each execution. The Run Count flag will allow the test to be run again n times. Any invalid command will cause help message to be printed. After entering the diagnostic option of the Run Command, the console will display:

ENTER TEST NUMBER OR H (HELP)

- 1 - Pyramid and Spiral Test. This will print 70 lines using sense mode and BIC mode (if BIC address is given).
- 2 - Key Echo Test. This test will echo the key that operator entered in the key board (using sense mode only).
- 3 - Back to Back Test. This will enable the data to loop back either with the correct shoe or with Exc 7 command in the combo board. The data is output to one controller and then read back from another to compare.

Any other will cause invalid message to be output.

Program then will ask for Run Count (1 is default).

ENTER RUN COUNT

7.17.2 ERROR MESSAGE

Any error encountered during the test will cause the error message(s) to be output. In System mode, if unrecovered error occurs, the test will be aborted. In Diagnostic, the program will let the user have a chance to correct (if possible).

The first line of each message is generated by the Test Executive and is described in the Test Executive Design Description UP-9098. The following is output by the Unit Program:

7.17.2.2 BIC Error Message

(Line 1) (Generated by the System Test Executive)

(Line 2) BIC xxxxxx ERROR (ERROR MESSAGE)

ERROR MESSAGE slot in line 2 will contain one of the following:

BUSY
NOT AVAILABLE
INITIAL ADDRESS LOADED NOT CORRECTLY
ABNORMAL BIC DEVICE STOP
BIC STOPPED-MAP MEMORY
FINAL ADDRESS IS DIFFERENT

(Line 3 where applicable)

INITIAL ADDRESS xxxxxx

(Line 4 where applicable)

FINAL ADDRESS WAS xxxxxx SHOULD BE xxxxxx

7.17.2.3 UASC Error Message

When UASC error occurs:

UASC ERROR

Accompanied with the above message will be one of the following:

- * OUTPUT SHOULD BE READY AFTER INITIALIZATION
- * FRAME OR BREAK ERROR
- * INPUT MUST NOT BE READY AFTER INITIALIZATION
- * INPUT PARITY ERROR
- * INPUT OVERFLOW ERROR
- * TRANSMIT NOT READY
- * RECEIVE NOT READY
- * TIMEOUT - CAN NOT TRANSMIT A CHARACTER
- * TIMEOUT - CAN NOT DO A LF & CR UNDER SENSE MODE
- * DATA ERROR IN BACK TO BACK TEST

TRANSMITTED DATA
xxxxxxx

RECEIVED DATA
xxxxxxx

Appendix A

System Test Generation Tutorial Guide

A.1 PURPOSE

The purpose of this section is to guide the user in the preparation of system configuration dialog responses.

All input responses should be prepared prior to performing the system test configuration. The System Memo shipped with the system is the primary source of information required by the operator to accomplish this. In this section, a "System Test Configuration Guide" filled in with values applicable to a given system configuration is used for explanatory purposes. This sample system configuration is as follows:

- V77-600 CPU
- 256K words of memory
- Keyboard-display terminal (CRT): System List device
- Teletypewriter: System List device
- Central complex options:
 - Writable Control Store (WCS)
 - Floating-Point Processor (FPP)
- Peripheral device options:
 - Two disk controllers
 - Disk Type DC
 - Disk Type DF
 - Three magnetic tape controllers (Model 0)
 - Line Printer
 - Data Communications Multiplexer (DCM)
 - Buffer Interlace Controller (BIC)
 - Block Transfer Controller (BTC)

The System Test Configuration Guide is followed by a discussion which is keyed to the Guide. The discussion presents pointers to sections in the System Memo where the operator can obtain information to correctly respond to the configuration questions. Sections of the Guide which are not applicable to the sample system configuration are framed. Excerpts from the System Memo associated with the sample system are included.

A listing obtained during an actual System Test Generation on the sample system configuration follows the System Test Configuration Guide. The detailed discussion of configuration questions in Section 4 is keyed to this listing.

NOTE

The number keys in this listing do not correspond with the number keys in the System Test Configuration Guide.

A.2 SYSTEM TEST CONFIGURATION GUIDE

The System Test Configuration Guide duplicates the sequence and content of all the configuration questions output during System Test Generation. Since all the configuration questions are numbered, corresponding sections in the System Test Generation listing can be easily identified.

NOTE

Question 11 in the System Test Configuration Guide does not list those questions that are asked depending upon the type of disk specified by the operator. For information about these questions, refer to Section 4. Determine the model type of the disk in your system; determine the questions you will be asked (by referring to Section 4), and prepare your responses accordingly.

SYSTEM TEST CONFIGURATION GUIDE

SALES ORDER NUMBER _____

DATE PREPARED _____

SYSTEM TEST CONFIG PAGE-1

V70-SERIES SYSTEM TEST GENERATION-REV X.Y

SELECT CONFIGURATION QUESTIONS

NOTE:ACCEPTABLE REPLIES ARE IN ()
DEFAULT=0 OR VALUE AFTER ;
END EACH LINE WITH CARRIAGE RETURN OR PERIOD
IF REPLY IS OMITTED, DEFAULT VALUE IS USED
A=ALL,H=HELP,N=NO OR NONE,Y=YES
ENTER SPACE IF OUTPUT PAUSES
* INDICATES PRESELECTED SYSTEM QUESTION
LEADING 0=OCATAL,MAY BE OMITTED

CONFG?(H,A,I,1,2,...;A) H

- *1.SYS TEST CPU,SYS GEN CPU?(H,0-4,0-4)
- *2.START,END ADR(K) OF EACH MEM BLOCK?(S1,E1 S2,E2 ...;0,256)
- *3.MEMORY PARITY INTERRUPT ADR?(010-077;060)
- *4.SYSTEM TEST OPERATOR'S CONSOLE?
- *5.SYSTEM TEST LIST DEVICE?
- *6.SYSTEM GEN INPUT DEVICE?(H,0-3;1)
- *7.SYSTEM GEN OUTPUT DEVICE?(H,0-3;1)
- 8.WCS-UP1,15?(Y;N)
- 9.FLOATING POINT PROCESSOR-UP2,15?(Y;N)
- 10.MEMORY TEST-UP3?(Y;N)
- 11.HOW MANY DISC CONTROLLERS-UP4,5,6,13,14,16?(0-4)
- 12.HOW MANY MAG TAPE CONTROLLERS-UP7?(0-4)
- 13.HOW MANY LINE PRINTERS-UP8,12?(0-4)
- 14.HOW MANY LINE DCM'S-UP9?(0-4)
- 15.INTER-COMPUTER LINK-UP11?(Y;N)
- 99.NEXT ADD-ON UNIT PROGRAM NO?(XX)

CNFG?(H,A,I,1,2,...;A) A

- *1.SYS TEST CPU,SYS GEN CPU?(H,0-4,0-4) 1,1 1
 - (0=V77-800)
 - (1=V77-600)
 - (2=V77-400)
 - (3=V76)
 - (4=V75)
- *2.START,END ADR(K) OF EACH MEM BLOCK?(S1,E1 S2,E2 ...;0,256) 0,256 2
- *3.MEMORY PARITY INTERRUPT ADR?(010-077;060) 060 3
ECC?(Y;N)

*4.SYSTEM TEST OPERATOR'S CONSOLE?
 DEVICE ADDRESS?(0-076; 01) 01.
 READ READY COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) 0154.
 WRITE READY COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) 0156. } ④

*5.SYSTEM TEST LIST DEVICE?
 PRINTER X:
 DEVICE ADDRESS?(0-076; 35) 035.
 TTY OR CRT X:
 DEVICE ADDRESS/(0-076; 01) 02. } ⑤
 (note if DA=DA of *4, next two questions are skipped)
 READ READY COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) 0154.
 WRITE READY COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) 0156.

*6.SYSTEM GEN INPUT DEVICE?(H,0-3;1) 1.
 DEVICE ADDRESS?(0-076; xx) 010. } ⑥
 (if PT the next two questions are skipped)
 BIC/BTC EVEN DEVICE ADDRESS?(0-076) 024.
 UNIT NO?(0-3) 0.

*7.SYSTEM GEN OUTPUT DEVICE?(H,0-3;1) 1.
 DEVICE ADDRESS(0-076; xx) 011.
 (if PT the next two questions are skipped)
 BIC/BTC EVEN DEVICE ADDRESS?(0-076) 022.
 UNIT NO?(0-3) 0.

8.WCS-UP1,15?(Y;N) Y.
 EVEN DEVICE ADDRESS?(0-076; 74) 074.

9.FLOATING POINT PROCESSOR-UP2,15?(Y;N) Y.

10.MEMORY TEST-UP3?(Y;N) Y.

11.HOW MANY DISC CONTROLLERS-UP4,5,6,16?(0-4) 2.

DISK 1: (for Model 0)
 MODEL CODE NO?(H,0-05) 4
 (0=TYPE DB,DF)
 (1=TYPE DC,DD,DE)
 (2=TYPE DH)
 (3=TYPE DJ)
 (4=TYPE DG)
 (5=TYPE DK NOT SUPPORTED)
 DEVICE ADDRESS?(0-076; 16) 013.
 BIC/BTC EVEN DEVICE ADDRESS?(0-076) 020.
 BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) 0100.
 EACH SEEK COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) 0174.
 WHICH TRACK SECTOR(T=0-0312/0625,S=0-2)?(T,S) 00.
 WHICH PLATTERS, UNITS(P=0-1,U=0-3)?(PU,...) 00.

DISK 2: (for models 1 & 4)
 MODEL?(H,0-5) 7
 DEVICE ADDRESS?(0-076; 15) 015
 BIC/BTC EVEN DEVICE ADDRESS?(0-076) 070
 BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) 0170
 SEEK COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) 0170
 WHICH HEAD?(0-023) 0 [(0-5/011/015) for Model 4]
 WHICH UNITS?(0-3) 0 [(0-1) for Model 4]
 DISK n: (for Model 2)
 MODEL CODE NO?(H,0-05) _____
 EVEN DEVICE ADDRESS?(0-076; 14) _____
 COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) _____
 WHICH CYLINDER, HEAD(C=0-0632/01466, H=0-4/022)?(C,H) _____
 WHICH UNITS?(0-7) _____
 DISK n: (for Model 3)
 MODEL CODE NO?(H,0-05) _____
 DEVICE ADDRESS?(0-076L 12) _____
 BIC/BTC EVEN DEVICE ADDRESS?(0-076) _____
 BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) _____
 CONTROLLER COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) _____
 WHICH UNITS?(0-3) _____
 12.HOW MANY MAG TAPE CONTROLLERS-UP??(0-4) 3
 MAG TAPE 1:
 MODEL CODE NO?(H,0-01) 0
 (0=NO STATUS WORD)
 (1=USES STATUS WORD)
 DEVICE ADDRESS?(0-076; 10) 070
 BIC/BTC EVEN DEVICE ADDRESS?(0-076) 024
 BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) 0104
 MOTION COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) 0732
 WHICH UNITS?(0-3) 0
 MAG TAPE 2:
 MODEL?(H,0-01) 0
 DEVICE ADDRESS?(0-076; 11) 077
 BIC/BTC EVEN DEVICE ADDRESS?(0-076) 077
 BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) 0702
 MOTION COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) 0730
 WHICH UNITS?(0-3) 0
 MAG TAPE 3:
 MODEL?(H,0-01) 0
 DEVICE ADDRESS?(0-076; 12) 077
 BIC/BTC EVEN DEVICE ADDRESS?(0-076) 076
 BIC/VTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) 0706
 MOTION COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) 0734
 WHICH UNITS?(0-3) 0

MAG TAPE 4:

MODEL CODE NO?(H,0-01) _____
DEVICE ADDRESS?(0-076;13) _____
BIC/BTC EVEN DEVICE ADDRESS?(0-076) _____
BIC/BTC COMPLETE INTERRUPT ADDRESS?(0100-0276) _____
MOTION COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) _____
WHICH UNITS?(0-3) _____

13.HOW MANY LINE PRINTERS-UP8?(0-4) 7

PRINTER 1:
DEVICE ADDRESS?(0-076; 35) 035
BIC/BTC EVEN DEVICE ADDRESS?(0-076) 026
BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) 0706

PRINTER 2:
DEVICE ADDRESS?(0-076; 35) _____
BIC/BTC EVEN DEVICE ADDRESS?(0-076) _____
BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) _____

PRINTER 3:
DEVICE ADDRESS?(0-076; 35) _____
BIC/BTC EVEN DEVICE ADDRESS?(0-076) _____
BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) _____

PRINTER 4:
DEVICE ADDRESS?(0-076; 35) _____
BIC/BTC EVEN DEVICE ADDRESS?(0-076) _____
BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) _____

14.HOW MANY DCM'S-UP9?(0-4) 7

DCM 1:
LINE ADAPTER TYPE?(H,0-3) 0 (7)
(0=ASYNCHRONOUS DIRECT CONNECT)
(1= " DATA SET)
(2=SYNCHRONOUS)
(3=BI-SYNCHRONOUS)

DEVICE ADDRESS?(0-076; 70) 066
DCM INTERRUPT ADDRESS ORIGIN?(0100-0260) 0760
BITS PER BYTE?(5-010;010) 010
LCB MEMORY PAGE?(070-077;075) 075
WHICH LINES?(00-077; A) 0,7
TERMINAL-UP10?(Y;N) _____

DCM 2:
LINE ADAPTER TYPE?(H,0-3) _____
DEVICE ADDRESS?(0-076; 71) _____
DCM INTERRUPT ADDRESS ORIGIN?(0100-0260;0260) _____
BITS PER BYTE?(5-010;010) _____
LCB MEMORY PAGE?(070-077;075) _____
WHICH LINES?(00-077; A) _____

DCM 3:
 LINE ADAPTER TYPE?(H,0-3) _____
 DEVICE ADDRESS?(0-076; 72) _____
 DCM INTERRUPT ADDRESS ORIGIN?(0100-0260;0260) _____
 BITS PER BYTE?(5-010;010) _____
 LCB MEMORY PAGE?(070-077;075) _____
 WHICH LINES?(00-077; A) _____
 DCM 4:
 LINE ADAPTER TYPE?(H,0-3) _____
 DEVICE ADDRESS?(0-076; 73) _____
 DCM INTERRUPT ADDRESS ORIGIN?(0100-0260;0260) _____
 BITS PER BYTE?(5-010;010) _____
 LCB MEMORY PAGE?(070-077;075) _____
 WHICH LINES?(00-077; A) _____
 15. INTER-COMPUTER LINK-UP11?(Y:N) Y
 DEVICE ADDRESS?(0-076;60) _____
 BIC/BTC EVEN DEVICE ADDRESS?(0-076) 24
 BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) 706
 OR
 DEVICE ADDRESS?(0-076; 60) _____
 BIC/BTC EVEN DEVICE ADDRESS?(0-076) _____
 READ READY COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) 734
 WRITE READY COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) 736
 16. CARD READER-UP17?(Y:N) _____
 DEVICE ADDRESS?(0-076;30) _____
 BIC/BTC EVEN DEVICE ADDRESS?(0-076) _____
 BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) _____
 17. HOW MANY LOCAL TERMINALS-UP18?(0-7) _____
 TTY/CRTn
 DEVICE ADDRESS?(0-07;1) _____
 BIC/BTC EVEN DEVICE ADDRESS?(0-076) _____
 BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) _____
 READ READY EVEN INTERRUPT ADDRESS?(0100-0276) _____
 WRITE READY EVEN INTERRUPT ADDRESS?(0100-0276) _____
 18. INSTRUCTION TEST-UP?(Y;N)N.
 Note:Not supported in this release
 19. NEXT ADD-ON UNIT PROGRAM NO?(XX) 78
 MODEL CODE NO?(H,0-77) _____
 DEVICE ADDRESS?(0-076) _____
 BIC/BTC EVEN DEVICE ADDRESS?(0-076) 26
 BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) 704
 DEVICE COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) 706
 WHICH UNITS?(0-7) _____
 DMA RUN TIME? 40000
 MORE PARAMETERS?(P1,P2,...) 7,7

- ① Information for configuration question number 1 can be obtained from the EQUIPMENT SUMMARY section of the System Memo.
- ② Refer to the SYSTEM BLOCK DIAGRAM section of the System Memo to determine start and end of addresses of each memory block.
- ③ Refer to the OPTION ASSIGNMENTS section (5.2) of the System Memo to determine memory parity interrupt address.
- ④ Information for questions 4, 5, and 6 can be obtained from the PIM/BIC ASSIGNMENTS section (4.1) and the DEVICE ADDRESS ASSIGNMENTS section (4.2) in the System Memo. Figure A-1 consists of three pages from the System Memo associated with the specific system being discussed here. These three pages show the PIM/BIC and device assignments for this particular system. From page 3 of the figure, it can be seen that the device address of the operator's console is 01, and that of the printer (one of the list devices) is 035. From page 1 of the figure it can be seen that the operator's console (TYOB) is associated with PIM #3. Note that the interrupt addresses for PIM #3 start from 140. To calculate the READ READY COMPLETE EVEN INTERRUPT ADDRESS associated with the operator's console, apply the following formula using octal (base 8) arithmetic:

Starting Interrupt Address + (2 x priority level)

For the operator's console, the starting interrupt address is 140. The priority level (for READ) is 6. Therefore, the READ READY COMPLETE EVEN INTERRUPT ADDRESS is:

$$(140)_8 + (2 \times 6)_8 = 154.$$

Using the same formula, the WRITE READY COMPLETE EVEN INTERRUPT ADDRESS for the operator's console can be calculated to be: 156.

- ⑦ For configuration question number 14, obtain information from the DCM section of the System Memo.

For configuration question number 5, if the device address specified for the TTY or CRT List device is the same as the System Test operator's console device address, the operator will not be asked for the READ and WRITE READY COMPLETE EVEN INTERRUPT ADDRESSES.

The operator needs to refer to only these three pages of the System Memo (Figure A-1), to obtain most of the information required to answer the rest of the configuration questions. Correlation of the sample System Test Configuration Guide and Figure A-1 will itself clearly illustrate how this is done.

4.2 Device Address Assignments

DA	DEVICE	DA	DEVICE
* 01	Operator Console TYOB	* 040	PIM #1 IA = 100-117
02	CTOB	* 041	PIM #2 IA = 120-137
03		* 042	PIM #3 IA = 140-157
04		* 043	PIM #4 IA = 160-177
05		* 044	All PIMs, ECC Memory
06		* 045	MP
07		* 046	MAP
* 010	Mag Tape	* 047	RTC
011	Mag Tape	050	BIC #5
012	Mag Tape	051	
013	Hawk Disc	052	
* 014	Direct Memory Disc	053	
* 015	Direct Memory Disc	054	
* 016	Cartridge Disc	055	
017		056	
* 020	BIC #1	057	
021		060	
* 022	BIC #2	061	
023		062	
* 024	BIC #3	063	
025		064	
* 026	BIC #4	065	
027		066	DCM
* 030	Card Reader	067	
031	Card Punch	* 070	BTC #1
032		071	
033		072	
034		073	
* 035	Line Printer LPOB	* 074	WCS
036	STATOS	* 075	
* 037	Paper Tape Reader/Punch	076	
		* 077	CONSOLE

*Standard Device Addresses

Figure A-1. Excerpts From A System Memo (Part 3 of 3)

A.3 SAMPLE SYSTEM TEST GENERATION LISTING

V70-SERIES SYSTEM TEST GENERATION-REV D.0

SELECT CONFIGURATION QUESTIONS

NOTE:ACCEPTABLE REPLIES ARE IN ()

DEFAULT=0 OR VALUE AFTER ;

END EACH LINE WITH CARRIAGE RETURN OR PERIOD

IF REPLY IS OMITTED, DEFAULT VALUE IS USED

A=ALL,H=HELP,N=NO OR NONE,Y=YES

ENTER SPACE IF OUTPUT PAUSES

* INDICATES PRESELECTED SYSTEM QUESTION.

LEADING 0=OCTAL,MAY BE OMITTED

CNFG?(I,H,A,0,8,9,...,18,99;A)E

*1.SYS TEST CPU,SYS GEN CPU?(H,0-2,0-2)

*2.START,END ADR(K) OF EACH MEM BLOCK?(S2,E1 S2,E2 ...;0,64)

*3.MEMORY PARITY EVEN INTERRUPT ADR?(010-077;060)

*4.SYSTEM TEST OPERATOR'S CONSOLE

*5.SYSTEM TEST LIST DEVICE?

*6.SYSTEM GEN INPUT DEVICE(H,0-3;1)

*7.SYSTEM GEN OUTPUT DEVICE?(H,0-3;1)

8.WCS-UP1,15?(Y;N)

9.FLOATING POINT PROCESSOR-UP2,15?(Y;N)

10.MEMORY TEST-UP3?(Y;N)

11.HOW MANY DISC CONTROLLERS-UP4,5,6,13,14,16?(0-4)

12.HOW MANY MAG TAPE CONTROLLERS-UP7?(0-4)

13.HOW MANY LINE PRINTERS-UP8?(0-4)

15.INTER-COMPUTER LINK-UP11?(Y;N)

16.CARD READER-UP17?(Y;N)

17.HOW MANY LOCAL TERMINALS-UP18?(0-7)

18.INSTRUCTION TEST-UP19?(Y;N) NOTE: This test is not supported
in this release

99.NEXT ADD-ON UNIT PROGRAM NO?(XX)

CONFG?(I,H,A,0,8,9,...,18,99;A)A

*1.SYS TEST CPU,SYS GEN CPU?(H,0-2,0-2) I,I.

*2.START,END ADR(K) OF EACH MEM BLOCK?(S1,E1 S2,E2 ...;0,64)

*3.MEMORY PARITY INTERRUPT ADR?(010-077;060)
ECC?(Y;N)

*4.SYSTEM TEST OPERATOR'S CONSOLE?

DEVICE ADDRESS?(0-076; 01)

READ READY COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) I54.

WRITE READY COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) I56.

*5.SYSTEM TEST LIST DEVICE?

PRINTER X:

DEVICE ADDRESS?(0-076; 35)

TTY OR CRT X:

DEVICE ADDRESS?(0-076; 01)

*6.SYSTEM GEN INPUT DEVICE?(H,0-3;1) -
 DEVICE ADDRESS?(0-076; 10) -
 BIC/BTC EVEN DEVICE ADDRESS?(0-076) 24.
 UNIT NO?(0-3) - } 8

*7.SYSTEM GEN OUTPUT DEVICE?(IF, 0-3;1) -
 DEVICE ADDRESS?(0-076; 10) 11.
 BIC/BTC EVEN DEVICE ADDRESS?(0-076) 22.
 UNIT NO?(0-3) - } 9

8.WCS-UP1,15?(Y;N) Y. 10
 EVEN DEVICE ADDRESS?(0-076; 74) -

9.FLOATING POINT PROCESSOR-UP2,15?(Y;N) Y. 11

10.MEMORY TEST-UP3?(Y;N) Y. 12

11.HOW MANY DISC CONTROLLERS-UP4,5,6,13,14,16?(0-4) 2.
 DISC 1:
 MODEL?(H,0-5) .
 DEVICE ADDRESS?(0-076; 16) 13.
 BIC/BTC EVEN DEVICE ADDRESS?(0-076) 20.
 BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) 100.
 EACH SEEK COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) 124.
 WHICH TRACK,SECTOR(T=0-0312/0625,S=0-2)?(T,S) -
 WHICH PLATTERS,UNITS(P=0-1,U=0-3)?(PU,...) - } 13

DISC 2:
 MODEL?(H,0-5) 1.
 DEVICE ADDRESS?(0-076; 15) -
 BIC/BTC EVEN DEVICE ADDRESS?(0-076) 70.
 BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) 110.
 SEEK COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) 116.
 WHICH HEAD?(0-023) -
 WHICH UNITS?(0-3/7) -

12.HOW MANY MAG TAPE CONTROLLERS-UP7?(0-4) 3.
 MAG TAPE 1:
 MODEL?(H,0,1) -
 DEVICE ADDRESS?(0-076; 10) -
 BIC/BTC EVEN DEVICE ADDRESS?(0-076) 24.
 BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) 102.
 MOTION COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) 130.
 WHICH UNITS?(0,1,..7) -

MAG TAPE 2:
 MODEL?(H,0,1) -
 DEVICE ADDRESS?(0-076; 11) -
 BIC/BTC EVEN DEVICE ADDRESS?(0-076) 22.
 BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) 102.
 MOTION COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) 130.
 WHICH UNITS?(0,1,..7) - } 14

MAG TAPE 3
 MODEL?(H,0,1) -
 DEVICE ADDRESS?(0-076; 12) -
 BIC/BTC EVEN DEVICE ADDRESS?(0-076) 26.
 BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) 106.
 MOTION COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) 135.
 WHICH UNITS?(0,1,..7) -

13. HOW MANY LINE PRINTERS-UP8? (0-4) I.

PRINTER 1:

DEVICE ADDRESS? (0-076; 35)

BIC/BTC EVEN DEVICE ADDRESS? (0-076) 26.

BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS? (0100-0276) 106.

14. HOW MANY DCM'S-UP9? (0-4) I.

DCM 1:

LINE ADAPTER TYPE? (H, 0-3)

DEVICE ADDRESS? (0-076; 70) 66.

DCM INTERRUPT ADDRESS ORIGIN? (0100-0260; 0260)

BITS PER BYTE? (5-010; 010)

LCB MEMORY PAGE? (070-077; 075)

NON-POLL/BACK-TO BACK LINES? (N, 0, 1, ..., 077; A)

POLLING LINES? (00-077; A) 0, I.

TERMINAL-UP10? (Y; N)

15. INTER-COMPUTER LINK-UP11? (Y; N) Y.

DEVICE ADDRESS? (0-076; 60)

BIC/BTC EVEN DEVICE ADDRESS (0-076)

READ READY COMPLETE EVEN INTERRUPT ADDRESS? (0100-0276) 140.

WRITE READY COMPLETE EVEN INTERRUPT ADDRESS? (0100-0276) 142.

16. CARD READER-UP17? (Y; N) Y.

DEVICE ADDRESS? (0-076; 30)

BIC/BTC EVEN DEVICE ADDRESS? (0-76)

BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS? (0100-0276)

17. HOW MANY LOCAL TERMINALS-UP18? (0-7) I.

TTY/CRT1

DEVICE ADDRESS? (0-07; 1)

BIC/BTC EVEN DEVICE ADDRESS? (0-076)

BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS? (0100-0276)

READ READY EVEN INTERRUPT ADDRESS? (0100-0276)

WRITE READY EVEN INTERRUPT ADDRESS? (0100-0276)

18. INSTRUCTION TEST-UP? (N) N. NOTE: Not supported in this release

99. NEXT ADD-ON UNIT PROGRAM NO? (XX)

END OF LIBRARY

UNIT PROGRAM 10 NOT FOUND

UNIT PROGRAM 11 NOT FOUND

UNIT PROGRAM 11 NOT FOUND

UNIT PROGRAM 12 NOT FOUND

UNIT PROGRAM 13 NOT FOUND

SYSTEM CONFIGURATION DONE

PREPARE OUTPUT DEVICE-ENTER SPACE WHEN READY

SYSTEM TEST CONFIGURATION GUIDE

SALES ORDER NUMBER _____

DATE PREPARED _____

A.4 BLANK SYSTEM TEST CONFIGURATION GUIDE

Use the blank System Test Configuration Guide provided in this section to prepare system configuration dialog responses.

V70-SERIES SYSTEM TEST GENERATION-REV X.Y

SELECT CONFIGURATION QUESTIONS

NOTE: ACCEPTABLE REPLIES ARE IN ()

DEFAULT=0 OR VALUE AFTER ;

END EACH LINE WITH CARRIAGE RETURN OR PERIOD

IF REPLY IS OMITTED, DEFAULT VALUE IS USED

A=ALL, H=HELP, N=NO OR NONE, Y=YES

* INDICATES PRESELECTED SYSTEM QUESTION

LEADING 0=OCTAL, MAY BE OMITTED

CNFG?(I,H,A,0,8,9...;18,99;A) _____

- *1.SYS TEST CPU, SYS GEN CPU?(H,0-2,0-2)
 - *2.START, END ADR(K) OF EACH MEM BLOCK?(S2,E1 S2,E2 ...;0,64)
 - *3.MEMORY PARITY EVEN INTERRUPT ADR?(010-076;060)
 - *4.SYSTEM TEST OPERATOR'S CONSOLE
 - *5.SYSTEM TEST LIST DEVICE?
 - *6.SYSTEM GEN INPUT DEVICE(H,0-3;1)
 - *7.SYSTEM GEN OUTPUT DEVICE?(H,0-3;1)
 - 8.WCS-UP1,15?(Y;N)
 - 9.FLOATING POINT PROCESSOR-UP2,15?(Y;N)
 - 10.MEMORY TEST-UP3?(Y;N)
 - 11.HOW MANY DISC CONTROLLERS-UP4,5,6,13,14,16?(0-4)
 - 12.HOW MANY MAG TAPE CONTROLLERS-UP7?(0-4)
 - 13.HOW MANY LINE PRINTERS-UP8?(0-4)
 - 15.INTER-COMPUTER LINK-UP11?(Y;N)
 - 16.CARD READER-UP17?(Y;N)
 - 17.HOW MANY LOCAL TERMINALS-UP18?(0-7)
 - 18.INSTRUCTION TEST-UP19?(Y;N) NOTE: This test is not supported in this release
 - 99.NEXT ADD-ON UNIT PROGRAM NO?(XX)
- CNFG?(I,H,A,0,8,9...;18,99;A) _____

- *1.SYS TEST CPU, SYS GEN CPU?(H,0-2,0-2) _____
 - (0=V77-800)
 - (1=V77-600)
 - (2=V77-400)
 - (3=V76)
 - (4=V75)
- *2.START, END ADR(K) OF EACH MEM BLOCK?(S1,E1 S2,E2 ...;0,64) _____
- *3.MEMORY PARITY EVEN INTERRUPT ADR?(010-076;060) _____
ECC?(Y;N) _____

SYSTEM TEST CONFIG PAGE-2

*4.SYSTEM TEST OPERATOR'S CONSOLE?
 DEVICE ADDRESS?(0-076; 01) _____
 READ READY COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) _____
 WRITE READY COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) _____

*5.SYSTEM TEST LIST DEVICE?
 PRINTER X:
 DEVICE ADDRESS?(0-076; 35) _____
 TTY OR CRT X:
 DEVICE ADDRESS/(0-007; 01) _____
 (note if DA=DA of *4, next two questions are skipped)
 READ READY COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) _____
 WRITE READY COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) _____

*6.SYSTEM GEN INPUT DEVICE?(H,0-3;1) _____
 DEVICE ADDRESS?(0-076; xx) _____
 (if PT the next two questions are skipped)
 BIC/BTC EVEN DEVICE ADDRESS?(0-076) _____
 UNIT NO?(0-3) _____

*7.SYSTEM GEN OUTPUT DEVICE?(H,0-3;1) _____
 DEVICE ADDRESS(0-076; xx) _____
 (if PT the next two questions are skipped)
 BIC/BTC EVEN DEVICE ADDRESS?(0-076) _____
 UNIT NO?(0-3) _____

8.WCS-UP1,15?(Y;N) _____
 EVEN DEVICE ADDRESS?(0-076; 74) _____

9.FLOATING POINT PROCESSOR-UP2,15?(Y;N) _____

10.MEMORY TEST-UP3?(Y;N) _____

11.HOW MANY DISC CONTROLLERS-UP4,5,6,13,14,16?(0-4) _____
 DISC n: (for Model 0)
 MODEL?(H,0-05) _____
 (0=TYPE DF)
 (1=TYPE DC,DD,DE)
 (2=TYPE DH)
 (3=TYPE DJ)
 (4=TYPE DG)
 (5=TYPE DK)
 DEVICE ADDRESS?(0-076; 16) _____
 BIC/BTC EVEN DEVICE ADDRESS?(0-076) _____
 BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) _____
 EACH SEEK COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) _____
 WHICH TRACK, SECTOR(T=0-0312/0625,S=0-2)?(T,S) _____
 WHICH PLATTERS, UNITS(P=0-3),(U=0-3)?(PU,...) _____
 DISC n: (for Model 1)
 MODEL?(H,0-05) _____
 DEVICE ADDRESS?(0-076; 15) _____
 BIC/BTC EVEN DEVICE ADDRESS?(0-076) _____
 BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) _____
 SEEK COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) _____
 WHICH HEAD?(0-023) _____
 WHICH UNITS?(0-3/7) _____

DISC n: _____ (for Model 2)
 MODEL?(H,0-5) _____
 EVEN DEVICE ADDRESS?(0-076; 14) _____
 COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) _____
 WHICH CYLINDER (C=0-0632/01466), HEAD(H=0-4/022)?(C,H) _____
 WHICH UNITS?(0-7) _____
 DISC n: _____ (for Model 3)
 MODEL?(H,0-6;5) _____
 DEVICE ADDRESS?(0-076; 12) _____
 BIC/BTC EVEN DEVICE ADDRESS?(0-076) _____
 BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) _____
 CONTROLLER COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) _____
 WHICH UNITS?(0-3) _____
 12.HOW MANY MAG TAPE CONTROLLERS-UP??(0-4) _____
 MAG TAPE 1:
 MODEL?(H,0,1) _____
 (0=NO STATUS WORD)
 (1=USES STATUS WORD)
 DEVICE ADDRESS?(0-076; 10) _____
 BIC/BTC EVEN DEVICE ADDRESS?(0-076) _____
 BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) _____
 MOTION COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) _____
 WHICH UNITS?(0-3) _____
 MAG TAPE 2:
 MODEL?(H,0,1) _____
 DEVICE ADDRESS?(0-076; 11) _____
 BIC/BTC EVEN DEVICE ADDRESS?(0-076) _____
 BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) _____
 MOTION COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) _____
 WHICH UNITS?(0-3) _____
 MAG TAPE 3:
 MODEL?(H,0,1) _____
 DEVICE ADDRESS?(0-076; 12) _____
 BIC/BTC EVEN DEVICE ADDRESS?(0-076) _____
 BIC/VTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) _____
 MOTION COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) _____
 WHICH UNITS?(0-3) _____
 MAG TAPE 4:
 MODEL?(H,0,1) _____
 DEVICE ADDRESS?(0-076;13) _____
 BIC/BTC EVEN DEVICE ADDRESS?(0-076) _____
 BIC/BTC COMPLETE INTERRUPT ADDRESS?(0100-0276) _____
 MOTION COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) _____
 WHICH UNITS?(0-3) _____

13. HOW MANY LINE PRINTERS-UPS? (0-4) _____

PRINTER 1:
 DEVICE ADDRESS? (0-076; 35) _____
 BIC/BTC EVEN DEVICE ADDRESS? (0-076) _____
 BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS? (0100-0276) _____

PRINTER 2:
 DEVICE ADDRESS? (0-076; 35) _____
 BIC/BTC EVEN DEVICE ADDRESS? (0-076) _____
 BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS? (0100-0276) _____

PRINTER 3:
 DEVICE ADDRESS? (0-076; 35) _____
 BIC/BTC EVEN DEVICE ADDRESS? (0-076) _____
 BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS? (0100-0276) _____

PRINTER 4:
 DEVICE ADDRESS? (0-076; 35) _____
 BIC/BTC EVEN DEVICE ADDRESS? (0-076) _____
 BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS? (0100-0276) _____

14. HOW MANY DCM'S-UP? (0-4) _____

DCM 1:
 LINE ADAPTER TYPE? (H,0-3) _____
 (0=ASYNCHRONOUS DIRECT CONNECT)
 (1= " DATA SET)
 (2=SYNCHRONOUS)
 (3=BI-SYNCHRONOUS)
 DEVICE ADDRESS? (0-076; 70) _____
 DCM INTERRUPT ADDRESS ORIGIN? (0100-0260) _____
 BITS PER BYTE? (5-010; 010) _____
 LCB MEMORY PAGE? (070-077; 075) _____
 WHICH LINES? (00-077; A) _____
 TERMINAL-UP10? (Y;N) _____

DCM 2:
 LINE ADAPTER TYPE? (H,0-3) _____
 DEVICE ADDRESS? (0-076; 71) _____
 DCM INTERRUPT ADDRESS ORIGIN? (0100-0260; 0260) _____
 BITS PER BYTE? (5-010; 010) _____
 LCB MEMORY PAGE? (070-077; 075) _____
 WHICH LINES? (00-077; A) _____

DCM 3:
 LINE ADAPTER TYPE? (H,0-3) _____
 DEVICE ADDRESS? (0-076; 72) _____
 DCM INTERRUPT ADDRESS ORIGIN? (0100-0260; 0260) _____
 BITS PER BYTE? (5-010; 010) _____
 LCB MEMORY PAGE? (070-077; 075) _____
 WHICH LINES? (00-077; A) _____

DCM 4:
 LINE ADAPTER TYPE? (H,0-3) _____
 DEVICE ADDRESS? (0-076; 73) _____

DCM INTERRUPT ADDRESS ORIGIN?(0100-0260;0260) _____
 BITS PER BYTE?(5-010;010) _____
 LCB MEMORY PAGE?(070-077;075) _____
 WHICH LINES?(00-077; A) _____
 15.INTER-COMPUTER LINK-UP11?(Y:N) _____
 DEVICE ADDRESS?(0-076;60) _____
 BIC/BTC EVEN DEVICE ADDRESS?(0-076) _____
 BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) _____
 OR
 DEVICE ADDRESS?(0-076; 60) _____
 BIC/BTC EVEN DEVICE ADDRESS?(0-076) _____
 READ READY COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) _____
 WRITE READY COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) _____
 16.CARD READER-UP17?(Y:N) _____
 DEVICE ADDRESS?(0-076;30) _____
 BIC/BTC EVEN DEVICE ADDRESS?(0-076) _____
 BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) _____
 17.HOW MANY LOCAL TERMINALS-UP18?(0-7) _____
 TTY/CRTn
 DEVICE ADDRESS?(0-07; 01) _____
 BIC/BTC EVEN DEVICE ADDRESS?(0-076) _____
 BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) _____
 READ READY EVEN INTERRUPT ADDRESS?(0100-0276) _____
 WRITE READY EVEN INTERRUPT ADDRESS?(0100-0276) _____
 18.INSTRUCTION TEST-UP?(Y:N) N. NOTE: Not supported
 in this release
 99.NEXT ADD-ON UNIT PROGRAM NO?(XX) _____
 MODEL CODE NO?(H,0-77) _____
 DEVICE ADDRESS?(0-076) _____
 BIC/BTC EVEN DEVICE ADDRESS?(0-076) _____
 BIC/BTC COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) _____
 DEVICE COMPLETE EVEN INTERRUPT ADDRESS?(0100-0276) _____
 WHICH UNITS?(0-7) _____
 DMA RUN TIME? _____
 MORE PARAMETERS?(P1,P2,...) _____

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