HEWLETT-PACKARD

SUBSET 80 EXTERNAL EXERCISER REFERENCE MANUAL

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Subset 80 External Exerciser Reference Manual

5958-4142 NOVEMBER 1988

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Printing History

New editions are complete revisions of the manual. Update packages, which are issued between editions, contain additional and replacement pages to be merged into the manual by the customer. The dates on the title page change only when a new edition or a new update is published. No information is incorporated into a reprinting unless it appears as a prior update; the edition does not change when an update is incorporated.

A software code may be printed before the date; this indicates the version level of the software product at the time the manual or update was issued. Many product updates and fixes do not require manual changes and, conversely, manual corrections may be done without accompanying product changes. Therefore, do not expect a one-to-one correspondence between product updates and manual updates.

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Introduction 1

Scope of Manual

This manual provides information on the Subset 80 (SS/80) Exerciser program. This manual does not provide information on the SS/80 command set or on the troubleshooting of specific products. SS/80 command set details are provided in the Subset 80 Reference Manual (part no. 5958-4129), and troubleshooting information is provided in the Service Manuals and CE Handbooks for the PDS products supported by the SS/80 Exerciser.

Text Conventions

The following conventions are used for the text in this manual:

- Text that you enter in answer to a prompt is capitalized: EXIT.
- Text that is printed to the HP 85 screen or the thermal printer appears in an alternate font: `Unrec data error`.
- Keys on the HP 85 keyboard are capitalized and bracketed: [END LINE].
- A function key and its associated label appear with the function key in brackets, followed by the capitalized label: [k5] INIT.

Overview of Exerciser

General Information

The SS/80 Exerciser (part no. 5010-0310) is a diagnostic program to aid in the analysis and repair of Personal Data Storage (PDS) disk products. The SS/80 Exerciser can transfer data and commands between a PDS product and an HP 85 via HP-IB to test servo and read/write functions of a PDS product. The SS/80 Exerciser can invoke internal diagnostics in PDS products, perform service routines, or run extensive error rate tests.

Products Supported

The SS/80 Exerciser, Rev. 2835, supports the following PDS products, also called SS/80 devices:

- HP 9122D/S/C
- HP 9123D
- HP 9125S
- HP 9127A
- HP 9133D/H/L
- HP 9134D/H/L
- HP 9153A/B/C
- HP 9154A/B

Program Modules

The SS/80 Exerciser consists of one autostart module, AUTOST, and three test modules, RW_TST, SERVC, and OPER. The following is a brief description of each module:

AUTOST Module

The AUTOST module enables you to display a list of the test modules, print out the commands for each test module, or load a test module. Refer to "Loading the Autostart Module" in chapter 2 for more details on the AUTOST module.

RW_TST Module

The RW_TST module enables you to perform extensive read-only or write-then-read error rate tests at specific locations or at random locations. Chapter 3 describes the RW_TST module in more detail.

SERVC Module

The SERVC module enables you to invoke intc.nal diagnostics in SS/80 devices, format flexible disks and hard disks, and perform service routines to maintain and repair flexible disk mechanisms. Chapter 4 describes the SERVC module in more detail.

OPER Module

The OPER module enables you to write a test sequence of up to 32 steps to perform extended functional tests on a disk drive. Chapter 5 describes the OPER module in more detail.

Using the SS/80 Exerciser 2

Equipment Required

The following equipment is required to run the SS/80 Exerciser:

- HP 85A or HP 85B
- HP 82936A ROM Drawer
- HP 82903A 16K Memory Module (needed for HP 85A only)
- HP 82937A HP-IB Interface
- I/O ROM (part no. 00085-15003)
- SS/80 Exerciser Tape (part no. 5010-0310)
- SS/80 Device (refer to "Products Supported" in chapter 1)

Equipment Configuration

Configure the HP 85 and the SS/80 device as follows:

1. Install the I/O ROM into the HP 82936A ROM Drawer.

2. Install the HP 82936A ROM Drawer, the HP 82903A Memory Module (for an HP 85A only), and the HP 82937A HP-IB Interface into the I/O slots on the back of the HP 85.

NOTE

The select code switch inside the HP 82937A HP-IB Interface is factory-set to 7 and should not be changed.

3. Connect the HP 82937A Interface cable to the HP-IB port on the rear panel of the SS/80 device.

CAUTION

Do not connect more than one defective SS/80 device to the HP 82937A Interface cable. Bus interference problems may result.

4. Set the LINE~ switch to 1 on the SS/80 device and wait for power-on self-test to complete.

NOTE

If the SS/80 device is an HP 9123D, it must be powered by an HP 150.

SS/80 Exerciser Key Sets

Each of the SS/80 Exerciser program modules contains sets of softkeys, or key sets. Each key set has command labels that correspond to the function keys [k1] through [k8] on the HP 85 keyboard. When a module is first loaded, the labels for key set 1 appear at the bottom of the HP 85 screen. To select a command, press the corresponding function key. (To select a command which corresponds to one of the function keys [k5] through [k8], press [SHIFT] then press the function key.)

Loading the Autostart Module

Load the autostart (AUTOST) module as follows:

1. Insert the SS/80 Exerciser tape into the HP 85 internal tape drive.

2. Set the HP 85 power switch from 0 to 1.

3. The HP 85 will automatically load the AUTOST module, and a message will appear on the HP 85 screen asking if you want a description of all the programs (test modules) on the tape printed out.

   a) If you want a printout of test module descriptions, enter Y and press [END LINE]. After the descriptions are printed out, the AUTOST key set will appear on the HP 85 screen (refer to table 2-1). To load a test module, press [k1] RW_TST, [k2] OPER, or [k4] SERVC. To obtain a printout of the commands in a test module, press the corresponding HELP key for the test module.

   b) If you do not want a printout of test module descriptions, enter N and press [END LINE]. the AUTOST key set will appear on the HP 85 screen (refer to table 2-1). To load a test module, press [k1] RW_TST, [k2] OPER, or [k4] SERVC. To obtain a printout of the commands in a test module, press the corresponding HELP key for the test module.

NOTE

If an "Error 19 Memory Overflow" message appears on the HP 85 screen when loading one of the test modules, it may be necessary to remove one or more ROMs from the HP 82936A ROM Drawer or add an additional memory module prior to loading the program. ROMs utilize a certain amount of computer memory that was previously available working space.

Table 2-1. AUTOST Key Set

HELP	HELP		HELP
k5	k6	k7	k8
RW_TST	OPER		SERVC
k1	k2	k3	k4

Testing an SS/80 Device

To test an SS/80 device, first perform the following steps:

1. Load a test module using one of the following methods:

   a) From the AUTOST module, press [k1] RW_TST, [K2] OPER, or [k4] SERVC.

   b) From key set 3 of one of the test modules, press [k2] or [k3] (refer to "RW_TST Key Sets" in chapter 3, "SERVC Key Sets" in chapter 4, or "OPER Key Sets" in chapter 5).

2. The name of the test module and the current unit (device) number will appear on the HP 85 screen for two seconds, then you will be prompted to select an output device. Select an output device as follows:

   a) To select the HP 85 screen, press [k2] DISP.

   b) To select the HP 85 thermal printer, press [k3] PRINTR. (The printer can be selected to provide documentation of the data.)

3. Select the unit you want to test in the SS/80 device (refer to the UNIT command in chapter 3, 4, or 5).

4. Select a volume only if you are testing a hard disk that has been divided into volumes (refer to the VOLUME command in chapter 3, 4, or 5).

5. From the test module which has been loaded, press a function key to select a command (refer to "RW_TST Key Sets" in chapter 3, "SERVC Key Sets" in chapter 4, or "OPER Key Sets" in chapter 5).

RW_TST Module 3

RW_TST Key Sets

The RW_TST module contains three key sets which map command labels onto the HP 85 function keys [k1] through [k8]. Tables 3-1 through 3-3 show the key sets for the RW_TST module. Some labels are intentionally left blank because no label appears for the corresponding function key.

Table 3-1. RW_TST Module, Key Set 1

LCRD	LCWRT	LCVFY	UNIT
k5	k6	k7	k8
MORE	RO_TST	WRT_TST	EXIT
k1	k2	k3	k4

Table 3-2. RW_TST Module, Key Set 2

DESCRIB	AMCLEAR		REQSTAT
k5	k6	k7	k8
MORE	UNIT	VOLUME	EXIT
k1	k2	k3	k4

Table 3-3. RW_TST Module, Key Set 3

			HELP
k5	k6	k7	k8
MORE	OPER	SERVC	EXIT
k1	k2	k3	k4

RW_TST Command Format

The following section titled "RW_TST Commands" contains a description of each command in the RW_TST module. Each command description is presented in the following format:

COMMAND NAME (SHORT DESCRIPTION)

Key Function:
This is a statement which explains what happens immediately after the function key is pressed.

Action Required:
This is a list of the steps you may need to perform before the command can be executed.

Command Execution:
This is the command execution sequence, which includes any steps you may need to perform after the command is executed.

RW_TST Commands

AMCLEAR (AMIGO CLEAR)

Key Function: Executes the AMCLEAR command.

Action Required: None.

Command Execution:

1. Clears the currently selected AMIGO device on the selected channel. Any operation the device is performing is terminated as soon as possible after receiving the AMCLEAR command, and any pending status on the device is cleared.

2. Press [CONT] to return to key set 1.

DESCRIB (DESCRIBE CURRENT UNIT)

Key Function: Executes the DESCRIB command.

Action Required: None.

Command Execution:

1. Prints the following information to the current output device: model number, unit number, volume number, unit type, sector size, maximum block address, and current interleave value.

2. Press [CONT] to return to key set 1.

EXIT (EXIT CURRENT MODULE)

Key Function:
Displays a warning that the current program will halt and executes the EXIT command.

Action Required: None.

Command Execution:

1. Causes the current program module to halt.

2. Press [RUN] to restart the program module.

HELP (HELP SCREEN)

Key Function: Executes the HELP command.

Action Required: None.

Command Execution:

1. Prints a list of RW_TST command descriptions to the current output device.

2. Press [CONT] to return to key set 1.

LCRD (LOCATE-AND-READ)

Key Function:
Prompts you to set parameter values for a locate-and-read test.

Action Required:

1. Enter the starting block address and press [END LINE].

2. Enter the test length in bytes and press [END LINE].

3. To print read data to the current output device, enter Y and press [END LINE]. (If read data is printed to the HP 85 thermal printer during long reads, the test will be slower and much paper will be ejected.) To suppress printing of read data to the current output device, enter N and press [END LINE]. To exit the LCRD command and halt the RW_TST program, enter EXIT and press [END LINE].

Command Execution:

1. The SS/80 device reads the specified number of data bytes from the selected unit, and transfers the data to the HP 85. (If the specified length in bytes is zero, the SS/80 device only seeks to the starting block address, and no data is transferred.)

2. If Y was entered in step 3 above, the HP 85 prints the read data to the current output device. The following is a sample of 30 bytes of random data which was printed to the HP 85 thermal printer (the numbers 1, 10, 19, and 28 in the left column are the byte counts of the first byte in each row):

```
 1 09 43 7D E5 7B 71 B0 CB AA
10 11 D3 3A A9 65 9F 0F FD DA
19 BA 84 95 79 0F A3 03 AA 5C
28 92 8A A0
```

3. The HP 85 prints error messages to the current output device based on the scheme in steps a through d below. The following is a sample error message from an HP 9153C flexible disk mechanism. Each blank and non-blank message line is numbered for reference in steps b through d. The reference numbers are not printed by the HP 85.

```
(1)   Status message follows:
(2)
(3)   Current unit is 1
(4)   Current volume is 0
(5)   Unit type:
(6)   Removable Disc or Combination
(7)
(8)   Status bits set are:
(9)   Unrec data overflow
(10)  Unrec data error
(11)  Address of unrecoverable data:
(12)  Block address = 50
(13)  Cyl= 0 head= 1 sec= 18
(14)
(15)  Rec data error
(16)  Recoverable data error, latency
(17)  induced in order to
(18)  recover the data
(19)  Address of recovered block:
(20)  Unknown (parameter field used)
(21)  DERRORS follow:
(22)  DERROR = E3
```

a) If the data is successfully transferred, no error messages will be printed.

b) If a data error is detected, the SS/80 device will first try to correct the error with error correction circuitry (ECC), then perform latency-induced read retries to recover the data. If the data is successfully recovered, the address of the data error will be "unknown" (line 20), and will be followed by a DERROR (line 22) which indicates that the data was recovered in the first set of retries. If more than one set of read retries is required to recover the data, a "recoverable data overflow" message is also printed.

c) If the data cannot be recovered with ECC and read retries, the data is unrecoverable (line 10). The SS/80 device sends the most accurate reconstruction of the data to the HP 85 and the address of the unrecoverable data error is printed in block and vector formats (lines 12 and 13). If an error is detected in a sector header and the error cannot be recovered with read retries, the data is also unrecoverable. The block and vector address of the header error is printed, followed by a DERROR indicating the retry count was exceeded while reading a header. If more than one unrecoverable data error is detected at the same address, an "unrecoverable data overflow" message (line 9) is also printed.

d) If a hardware fault occurs during execution of the LCRD command, the command terminates with a DERROR which indicates the type of hardware fault.

NOTE

DERRORS are device specific errors. Refer to the PDS product's CE handbook for a detailed description of DERRORS.

4. Press [CONT] to return to key set 1.

LCVFY (LOCATE-AND-VERIFY)

Key Function:
Prompts you to set parameter values for a locate-and-verify test.

Action Required:
1. Enter the starting block address and press [END LINE].

2. Enter the test length in bytes and press [END LINE].

Command Execution:
1. The SS/80 device reads the specified number of data bytes from the selected unit, and verifies that the data can be recovered. If the specified length in bytes is not a multiple of the number of bytes in a block, all the bytes in the last block will be read. None of the data read is transferred to the HP 85 and no read retries or error correction is performed. The LCVFY command will terminate immediately when an unrecoverable data error is detected.

2. The HP 85 prints error messages to the current output device based on the scheme in steps a through c below. The following is a sample error message from an HP 9153C flexible disk mechanism. Each blank and non-blank message line is numbered for reference in steps b and c. The reference numbers are not printed by the HP 85.

```
(1)   Status message follows:
(2)
(3)   Current unit is 1
(4)   Current volume is 0
(5)   Unit type:
(6)   Removable Disc or Combination
(7)
(8)   Status bits set are:
(9)   Unrec data error
(10)  Address of unrecoverable data:
(11)  Block address = 1002
(12)  Cyl= 15 head= 1 sec= 10
(13)
(14)  DERRORS follow:
(15)  DERROR = 6F
```

a) If the data is successfully verified, no error messages will be printed.

b) If a data error is detected, the data is automatically unrecoverable (line 9) since neither error correction nor read retries are performed. The address of the unrecoverable data error is printed in block and vector formats (lines 11 and 12), followed by a DERROR (line 15) which always indicates that the error occurred during a verify command.

c) If a hardware fault occurs during execution of the LCVFY command, the command terminates with a DERROR which indicates the type of hardware fault.

NOTE

DERRORS are device specific errors. Refer to the PDS product's CE handbook for a detailed description of DERRORS.

3. Press [CONT] to return to key set 1.

LCWRT (LOCATE-AND-WRITE)

CAUTION

Execution of the LCWRT command will result in the destruction of data on the disk.

Key Function:
Prompts you to set parameter values for a locate-and-write test.

Action Required:
1. Enter the starting block address and press [END LINE].

2. Enter the test length in bytes and press [END LINE].

3. To specify a user data pattern of up to 12 hex digits, enter Y and press [END LINE], then enter the data pattern and press [END LINE]. To specify the default (worst case) pattern, enter N and press [END LINE]. To exit the LCWRT command and return to key set 1, enter EXIT and press [END LINE].

Command Execution:

1. The HP 85 transfers the specified number of data bytes consisting of a user defined pattern or a default data pattern to the SS/80 device. The SS/80 device then writes the data to specified locations in the selected unit. If the specified number of bytes is not a multiple of the number of bytes in a block, the SS/80 device will pad the block with duplications of the last data byte, or with zeros. (If the specified length in bytes is zero, the SS/80 device only seeks to the starting block address, and no data is transferred.)

2. The HP 85 prints error messages to the current output device based on the scheme in steps a through c below. The following is a sample error message from an HP 9153C flexible disk mechanism. Each blank and non-blank message line is numbered for reference in steps b and c. The reference numbers are not printed by the HP 85.

```
(1)   Status message follows:
(2)
(3)   Current unit is 1
(4)   Current volume is 0
(5)   Unit type:
(6)   Removable Disc or Combination
(7)
(8)   Status bits set are:
(9)   Unrec data error
(10)  Address of unrecoverable data:
(11)  Block address = 1018
(12)  Cyl= 15 head= 1 sec= 26
(13)
(14)  DERRORS follow:
(15)  DERROR = 8B
```

   a) If the data is successfully transferred, no error messages will be printed.

   b) If a sector header cannot be read after repeated read retries, a header error is detected, the SS/80 device will immediately stop writing blocks, and the data transfer will terminate with an unrecoverable data error (line 9). The address of the unrecoverable data error is printed in block and vector formats (lines 11 and 12), followed by a DERROR (line 15) indicating that the SS/80 device could not write to the sector.

c) If a hardware fault occurs during execution of the LCWRT command, the command terminates with a DERROR which indicates the type of hardware fault.

NOTE

DERRORS are device specific errors. Refer to the PDS product's CE handbook for a detailed description of DERRORS.

3. Press [CONT] to return to key set 1.

MORE (MORE KEY SETS)

Key Function: Executes the MORE command.

Action Required: None.

Command Execution:
Displays the next key set on the HP 85 screen. (Moves from key set 1 to key set 2, from key set 2 to key set 3, and from key set 3 back to key set 1.)

OPER (LOAD OPER MODULE)

Key Function: Prompts you to load the OPER module (program).

Action Required:
To load the OPER module, enter Y and press [END LINE]. To return to key set 1 of the RW_TST module, enter N and press [END LINE]. To exit the OPER command and halt the RW_TST program, enter EXIT and press [END LINE].

Command Execution:
1. Loads the OPER program module and prompts you to select an output device.

2. To select the HP 85 screen as the output device, press [k2] DISP. To select the HP 85 thermal printer as the output device, press [k3] PRINTR.

3. OPER key set 1 is displayed on the screen.

REQSTAT (REQUEST STATUS)

Key Function: Executes the REQSTAT command.

Action Required: None.

Command Execution:

1. Sends a status message containing the following information to the current output device: current unit number, current volume number, unit type, the new target address in block and vector formats, status errors, and DERRORS. (A status message can result from any transaction sequence performed by the Exerciser. REQSTAT or CICLEAR will clear the current status.) Table 3-4 lists status error numbers and error descriptions for SS/80 devices.

NOTE

DERRORS are device specific errors. Refer to the PDS product's CE handbook for a detailed description of DERRORS.

2. Press [CONT] to return to key set 1.

Table 3-4. Request Status Error Information

Error Number	Error Description
2	Channel command received without odd parity.
5	Illegal opcode received by SS/80 device.
6	Illegal volume or unit number specified.
7	Target address out of bounds.
8	Parameter out of bounds.
9	Parameter field wrong length for preceding opcode.
10	Message sequence violation.
12	Execution message length miscompare between host and SS/80 device.
17	Command sent to controller caused a unit to receive bad status.
19	Controller hardware fault.
22	Unit hardware fault.
24	Power-on self-test diagnostic failed.
30	Power was cycled on a unit or flexible disk media was loaded.
31	Preceding transaction re-transmitted.
33	Uninitialized media detected.
34	Not enough spare blocks available to initialize media.
35	SS/80 device not ready (flexible disk media not installed).
36	Current volume write-protected.
40	Unrecoverable data overflow (>1 unrecoverable data error detected).
41	Unrecoverable data error detected at indicated address; unable to recover data with error correction and latency-induced read retries.
43	End of file encountered on file-structured device.
44	End of volume encountered while crossing volume boundary.
51	Flexible disk media wear detected.
52	Latency induced to recover data.
55	Auto sparing invoked while initializing media.
57	Recoverable data overflow (>1 recoverable data error detected).
59	Recoverable data error detected at indicated address; required error correction or latency-induced read retries to recover data.

RO_TST (READ-ONLY ERROR RATE TEST)

Key Function:
Prompts you to set parameter values for a read-only error rate test.

Action Required:

1. Enter the number of times you want to perform the test (loop count) and press [END LINE].

2. To test random addresses of random length, press [k3] RAND. To test sequential addresses of specified length, press [k2] SEQ and perform the following steps:

   a) Enter the starting block address and press [END LINE].

   b) Enter the test length in bytes and press [END LINE].

3. To print the last error that occurs before the error rate test completes or aborts, press [k1] for output option 1. To print all errors and status information, press [k2] for output option 2. To print status information only, press [k4] for output option 3. (All errors that occur during the test are stored in an array in the RO_TST program. When the test completes, the errors are printed to the current output device according to which output option has been selected.)

4. To print the following list of tests and test numbers to the current output device, enter Y and press [END LINE]. (You should print this list so that you can decode the numbers that may appear in the "Test #" column when the test results are printed.) To suppress printing of the list, enter N and press [END LINE]. To exit the RO_TST command and return to key set 1, enter EXIT and press [END LINE].

```
TYPE        DESCRIPTION
  1    Random Read-LCVFY
  2    Random Read-LCRD
  3    Normal Read-LCVFY
  4    Normal Read-LCRD
  5    Sequential W/R-LCWRT
  6    Sequential W/R-LCVFY
  7    Sequential W/R-LCRD
  8    Random W/R-LCWRT
  9    Random W/R-LCVFY
 10    Random W/R-LCRD
```

5. Enter the number of errors to allow before the test will abort and press [END LINE].

Command Execution:

1. The HP 85 employs both the LCVFY and LCRD commands to perform a read-only error rate test at specified locations in the selected unit of the SS/80 device.

2. During the error rate test, the HP 85 displays the loop count and a running total of the number of errors detected.

3. To stop the test at any time, press [k4] STOP.

4. When the test completes, the following column headings are printed to the current output device, whether or not any data errors were detected:

   ```
   Loop ct   Test#   Error   Address
   ```

   If data errors are detected during the test, the following data is printed under each corresponding column heading: the loop count (`Loop ct`) when the error was detected, the number of the test (`Test#`) being performed when the error was detected (refer to step 4 of the "Action Required" catagory), the status error number (`Error`) of the error detected (refer to table 3-4), and the block address (`Address`) where the error was detected. More than one data error and its corresponding block address may be printed for each set of loop count and test number.

   Following the columnar data, detailed error messages are then printed for each data error detected during a set of loop count and test number. Refer to the LCRD command for a sample set of error messages and an explanation of the data error structure for a read operation.

5. Press [CONT] to return to key set 1.

SERVC (LOAD SERVC MODULE)

Key Function: Prompts you to load the SERVC module (program).

Action Required:

To load the SERVC module, enter Y and press [END LINE]. To return to key set 1 of the RW_TST module, enter N and press [END LINE]. To exit the SERVC command and halt the RW_TST program, enter EXIT and press [END LINE].

Command Execution:

1. Loads the SERVC program module and prompts you to select an output device.

2. To select the HP 85 screen as the output device, press [k2] DISP. To select the HP 85 thermal printer as the output device, press [k3] PRINTR.

3. SERVC key set 1 is displayed on the screen.

UNIT (SET UNIT NUMBER)

Key Function: Prompts you to set the unit number.

Action Required:

1. Check the HP-IB address of the SS/80 device and refer to table 3-5 or 3-6 for the unit value of the hard disk drive or flexible disk mechanism you want to test.

2. Enter a value of 0, 1, or 15 and press [END LINE]. (Unit 15 is the controller of any SS/80 device.)

Command Execution:

1. Sets the unit number.

2. Prints the unit number to the current output device.

3. Press [CONT] to return to key set 1.

Table 3-5. Unit Values for HP-IB Addresses 0-7

Disk Drive Configuration	Unit Value
1 hard disk drive	0
1 hard disk drive + 1 flexible disk mechanism	0 1
2 hard disk drives* + 1 flexible disk mechanism	0 1
1 flexible disk mechanism, left slot + 1 flexible disk mechanism, right slot	0 1

*Appear as one disk drive.

Table 3-6. Unit Values for HP-IB Addresses 8 and 9

Disk Drive Configuration	Unit Value
1 hard disk drive	1
1 hard disk drive + 1 flexible disk mechanism	1 0
2 hard disk drives* + 1 flexible disk mechanism	1 0
1 flexible disk mechanism, left slot + 1 flexible disk mechanism, right slot	0 1

*Appear as one disk drive.

VOLUME (SET VOLUME NUMBER)

Key Function: Prompts you to set the volume number.

Action Required: Enter a volume number and press [END LINE].

NOTE

This command is optional for a flexible disk mechanism, but must be used to test separate volumes of a hard disk drive. The volume number is automatically set to the default number zero when the test module is loaded. If you enter 1 as the volume number for a flexible disk mechanism, the messages "Illegal volume or unit" and "Volume 1 was not selected" are printed to the current output device. If you are testing an HP 9153C with a total hard disk capacity of 40-Mbytes (two 20-Mbyte hard disk drives), divide the 40-Mbyte volume into two 20-Mbyte volumes as follows: set the HP 9153C LINE~ switch to 0, set the configuration switch to 2, then set the LINE~ switch back to 1. To select the front 20-Mbyte disk drive, enter 0 for the volume number. To select the rear 20-Mbyte disk drive, enter 1 for the volume number. Refer to the HP 9153C owner's manual for other volume configurations.

Command Execution:

1. Sets the volume number.
2. Prints the volume number to the current output device.
3. Press [CONT] to return to key set 1.

W/R_TST (WRITE-THEN-READ ERROR RATE TEST)

CAUTION

Execution of the LCWRT command will result in the destruction of data on the disk.

Key Function:

Displays a warning that data on the current volume will be destroyed, and prompts you to answer whether or not the test should continue.

Action Required:

1. To continue the write-then-read error rate test, enter Y and press [END LINE], then follow steps 2 through 7 below. To terminate the write-then-read test, enter N and press [END LINE], then press [CONT] to return to key set 1. To exit the W/R_TST command and halt the RW_TST program, enter EXIT and press [END LINE].

2. Enter the loop count and press [END LINE].

3. To test random addresses of random length, press [k3] RAND. To test sequential addresses of specified length, press [k2] SEQ and perform the following steps:

   a) Enter the starting block address and press [END LINE].

   b) Enter the length in bytes and press [END LINE].

4. To select a worst case pattern source, press [k1] WC_PAT. To select a random pattern source, press [k2] RND_PAT. To enter a user pattern source, press [k3] USR_PAT then enter a data pattern of up to 12 hex digits and press [END LINE].

5. To print the last error that occurs before the error rate test completes or aborts, press [k1] for output option 1. To print all errors and status information, press [k2] for output option 2. To print status information only, press [k4] for output option 3. (All errors that occur during the test are stored in an array in the RO_TST program. When the test completes, the errors are printed to the current output device according to which output option has been selected.)

6. To print the following list of tests and test numbers to the current output device, enter Y and press [END LINE]. (You should print this list so that you can decode the numbers that may appear in the "Test #" column when the test results are printed to the current output device.) To suppress printing of the list, enter N and press [END LINE]. To exit the W/R_TST command and return to key set 1, enter EXIT and press [END LINE].

TYPE	DESCRIPTION
1	Random Read-LCVFY
2	Random Read-LCRD
3	Normal Read-LCVFY
4	Normal Read-LCRD
5	Sequential W/R-LCWRT
6	Sequential W/R-LCVFY
7	Sequential W/R-LCRD
8	Random W/R-LCWRT
9	Random W/R-LCVFY
10	Random W/R-LCRD

7. Enter the number of errors to allow before the test will abort and press [END LINE].

Command Execution:

1. The HP 85 employs the LCWRT, LCVFY, and LCRD commands to perform a write-then-read at specified locations in the selected unit of the SS/80 device.

2. During the error rate test, the HP 85 displays the loop count and a running total of the number of errors detected.

3. To stop the test at any time, press [k4] STOP.

4. When the test completes, the following column headings are printed to the current output device, whether or not any data errors were detected:

```
Loop ct   Test#   Error   Address
```

   If data errors were detected during the test, the following data is printed under each corresponding column heading: the loop count (`Loop ct`) when the error was detected, the number of the test (`Test#`) being performed when the error was detected (refer to step 7 of the "Action Required" catagory), the status error number (`Error`) of the error detected (refer to table 3-2), and the block address (`Address`) where the error was detected. More than one data error and its corresponding block address may be printed for each set of loop count and test number.

   Following the columnar data, detailed error messages are then printed for each data error detected during a set of loop count and test number. Refer to the LCRD and LCWRT commands for sample sets of error messages and explanations of the data error structures of read and write operations.

5. Press [CONT] to return to key set 1.

SERVC Module 4

SERVC Key Sets

The SERVC test module contains three key sets which map command labels onto the HP 85 function keys [k1] through [k8]. Tables 4-1 through 4-3 show the key sets for the SERVC module. Some labels are intentionally left blank because no label appears for the corresponding function key.

NOTE

Do not be alarmed if the WEAR_CT, HD_CLN, MTR_SPD, or TRK_0 labels don't appear on the screen when key set 2 is loaded. These commands are valid for flexible disk mechanisms only, and are built into the firmware of only some SS/80 devices. Refer to the command descriptions for these commands to determine which SS/80 devices support these commands.

Table 4-1. SERVC Module, Key Set 1

DESCRIB	DIAG	LOOPBAK	REQSTAT
k5	k6	k7	k8
MORE	UNIT	VOLUME	EXIT
k1	k2	k3	k4

Table 4-2. SERVC Module, Key Set 2

INIT			TRK_0
k5	k6	k7	k8
MORE	WEAR_CT	HD_CLN	MTR_SPD
k1	k2	k3	k4

Table 4-3. SERVC Module, Key Set 3

	CICLEAR	AMCLEAR	HELP
k5	k6	k7	k8
MORE	RW_TST	OPER	EXIT
k1	k2	k3	k4

SERVC Command Format

The following section titled "SERVC Commands" contains a description of each command in the SERVC module. Each command description is presented in the following format:

COMMAND NAME (SHORT DESCRIPTION)

Key Function:
This is a statement which explains what happens immediately after the function key is pressed.

Action Required:
This is a list of the steps you may need to perform before the command can be executed.

Command Execution:
This is the command execution sequence, which includes any steps you may need to perform after the command is executed.

SERVC Commands

AMCLEAR (AMIGO CLEAR)

Key Function: Executes the AMCLEAR command.

Action Required: None.

Command Execution:

1. Clears the currently selected AMIGO device on the selected channel. Any operation the device is performing is terminated as soon as possible after receiving the AMCLEAR command, and any pending status on the device is cleared.

2. Press [CONT] to return to key set 1.

CICLEAR (CHANNEL INDEPENDENT CLEAR)

Key Function: Executes the CICLEAR command.

Action Required: None.

Command Execution:

1. Clears any device connected to the channel. If the controller (unit 15) is selected prior to issuing a CICLEAR command, all units within the device are cleared. Otherwise, only the current unit will be cleared.

2. Press [CONT] to return to key set 1.

DESCRIB (DESCRIBE CURRENT UNIT)

Key Function: Executes the DESCRIB command.

Action Required: None.

Command Execution:

1. Prints the following information to the output device: model number, unit number, volume number, unit type, sector size, maximum block address, and current interleave value.

2. Press [CONT] to return to key set 1.

DIAG (POWER-ON DIAGNOSTICS)

Key Function: Executes the DIAG command.

Action Required: None.

Command Execution:

1. Performs a power-on self-test diagnostic routine.
2. Prints a status message containing the following information to the current output device: current unit number, unit type, new target block address, and DERRORS if the diagnostic fails (refer to the product's CE Handbook for a description of DERRORS).
3. Press [CONT] to return to key set 1.

EXIT (EXIT CURRENT MODULE)

Key Function:
Displays a warning that the current program will halt, and executes the EXIT command.

Action Required: None.

Command Execution:

1. Causes the current program module to halt.
2. Press [RUN] to restart the program module.

HD_CLN (HEAD CLEAN ROUTINE)

NOTE

This command is only valid for the following products: HP 9122D/S, 9122C, 9123D, 9127A, and 9133D/H/L. The HD_CLN label will not appear if you are testing any other product.

Key Function: Executes the HD_CLN command.

Action Required:

1. Install a cleaning disk (part no. 09122-89415 for all products listed above except the HP 9127A, or kit part no. 92193K for the HP 9127A) into the flexible disk mechanism.
2. Press [k3] HD_CLN.

Command Execution:

1. Loads the head and moves it across the surface of the cleaning disk for approximately 20 seconds.
2. Press [CONT] to return to key set 1.

HELP (HELP SCREEN)

Key Function: Executes the HELP command.

Action Required: None.

Command Execution:

1. Prints a list of SERVC command descriptions to the current output device.
2. Press [CONT] to return to key set 1.

INIT (INITIALIZE MEDIA)

CAUTION

Execution of the INIT command will result in the destruction of data on the disk. If you are diagnosing a problem that relates to the media, initializing the media may mask the problem.

Key Function:

Displays a warning that all current data on the volume will be destroyed, and prompts you to answer whether or not the command should continue.

Action Required:

1. To continue the INIT command, enter Y and press [END LINE], then follow step 2 if the current unit is a hard disk drive, or follow step 3 if the current unit is a flexible disk mechanism. To terminate the INIT command, enter N and press [END LINE], then press [CONT] to return to key set 1. To exit the INIT command and halt the SERVC program, enter EXIT and press [END LINE] (press RUN to restart the SERVC program).

2. If the current unit is a hard disk drive, initialize (format) the disk as follows:

   a) Press [k0] 0 to choose format option 0 (initialize media and retain both factory spares and auto spares), or press [k1] 1 to choose format option 1 (initialize media and retain only factory spares), or press [k4] EXIT to exit the SERVC program.

   b) You will not be prompted to enter an interleave value. The hard disk will automatically be formatted with the option you chose in step a, and with a default interleave of 1.

3. If the current unit is a flexible disk mechanism, initialize (format) the flexible disk as follows:

CAUTION

Some flexible disk media is not recommended for continual use in certain PDS products. The bottom side of a 0.5-Mbyte disk is not polished as well as the data side. Continual use of 0.5-Mbyte media in a double-sided flexible disk mechanism will result in wear on the bottom head. Refer to table 4-4 to determine which flexible disk media is recommended for the PDS product being tested.

a) Press [k1] MORE two times to return to key set 1, then press [k5] DESCRIB and check the interleave value.

b) Press [k1] MORE to select key set 2.

c) Press [k5] INIT.

d) Enter Y and press [END LINE].

e) Press a function key to select a formatting option (refer to tables 4-5 through 4-7 to determine which formatting option to select for the flexible disk mechanism being tested.)

NOTE

The HP 9134D/H/L and HP 9154A/B products will not prompt you for an interleave value because they contain hard disk drives only. An interleave value of 2 is recommended for all flexible disk mechanisms, except HP 9153B/C mechanisms, as that value optimizes system performance for most flexible disk applications. An interleave of 1 is only recommended for HP 9153B/C mechanisms. However, if you are using an HP 9153B or 9153C to format a 0.5-Mbyte disk that will be installed into an HP 9122S, an interleave of 2 is recommended in order to avoid system latencies.

f) Enter an interleave value and press [END LINE].

Command Execution:

Formats the current unit with the format option and interleave value selected, or with a default format and an interleave of 1 if the current unit is a hard disk drive.

Table 4-4. Flexible Disk Media Usage

PDS Product	0.5-Mbyte Media	1.0-Mbyte Media	2.0-Mbyte Media
HP 9122D/S	E	D	N
HP 9122C	E/2	D/2	D
HP 9123D	E/2	D	N
HP 9133D/H/L	E	D	N
HP 9153A/B	E	D	N
HP 9153C	E/2	D/2	D

D = Recommended for daily use.
D/2 = Recommended for daily use; data transferred at one-half the normal rate.
E = Recommended for data exchange only.
E/2 = Recommended for data exchange only; data transferred at one-half the normal rate.
N = Never use; product unable to identify 2-Mbyte media.

Table 4-5. Format Data: HP 9122D/S, 9123D, 9133D/H/L, 9153A/B

Funct. Key	Format Option*	Bytes/ Sector	Sectors/ Track	Tracks/ Surface	Surfs/ Disk	Capacity (Bytes)
k1	1	256	16	77	2	630,784
k2	2	512	9	77	2	709,632
k3	3	1024	5	77	2	788,480
k5	4**	256	16	66	1	270,336

*Formatting 1-Mbyte media only, except Option 4.
**Option 4 can be used to format single-sided 0.5-Mbyte media and double-sided 1-Mbyte media. If a 1-Mbyte disk is formatted with Option 4 in an HP 9122S, only one side of the disk will be formatted.

Table 4-6. Format Data, HP 9122C and 9153C Only

Funct. Key	Format Option*	Bytes/ Sector	Sectors/ Track	Tracks/ Surface	Surfs/ Disk	Capacity (Bytes)
k1	1	256	32	77	2	1,261,568
k2	2	512	18	77	2	1,419,264
k3	3	1024	10	77	2	1,576,960
k5	4	256	32	77	2	1,261,568

*Formatting 2-Mbyte media only.

Table 4-7. Format Data, HP 9125S and 9127A Only

Funct. Key	Format Option*	Bytes/ Sector	Sectors/ Track	Tracks/ Surface	Surfs/ Disk	Capacity (Bytes)
k1	1	256	16	33	2	270,336
k2	2**	512	9	40	2	368,640
k3	3	1024	5	37	2	378,880
k5	4**	512	8	40	1	163,840
k6	5**	512	9	40	1	184,320
k7	6**	512	8	40	2	327,680

*Formatting 5.25-inch media only.
**IBM compatible format.

LOOPBAK (HP-IB CHANNEL READ-WRITE-LOOPBACK)

Key Function:

1. Prints the current HP-IB device address to the current output device.

2. Executes the LOOPBAK command.

Action Required: None.

Command Execution:

1. Prints the current HP-IB device address to the current output device.

2. Executes first a read loopback test, then a write loopback test on the current unit to determine if the phi chip in the current unit can communicate with the HP 85 via HP-IB.

3. Press [CONT] to return to key set 1.

MORE (MORE KEY SETS)

Key Function: Executes the MORE command.

Action Required: None.

Command Execution:

Displays the next key set on the HP 85 screen. (Moves from key set 1 to key set 2, from key set 2 to key set 3, and from key set 3 back to key set 1.)

MTR_SPD (SPINDLE MOTOR SPEED)

NOTE

The MTR_SPD command is valid for the HP 9122C only. The MTR_SPD label will not appear if you are testing any other product.

Key Function:
Executes the MTR_SPD command on an HP 9122C flexible disk mechanism only.

Action Required: Install a flexible disk into the flexible disk mechanism.

Command Execution:
1. Measures the period of the index pulse on a track to determine the spindle motor speed.
2. Prints the index period of the disk to the current output device.
3. Press [CONT] to return to key set 1.

OPER (LOAD OPER MODULE)

Key Function: Prompts you to load the OPER module (program).

Action Required:
To load the OPER module, enter Y and press [END LINE]. To terminate the OPER command, enter N and press [END LINE], then press [CONT] to return to key set 1. To exit the OPER command and halt the SERVC program, enter EXIT and press [END LINE]. (Press [RUN] to restart the SERVC program.)

Command Execution:
1. Loads the OPER program module and prompts you to select an output device.
2. To select the HP 85 screen as the output device, press [k2] DISP. To select the HP 85 thermal printer as the output device, press [k3] PRINTR.
3. OPER key set 1 is displayed on the screen.

REQSTAT (REQUEST STATUS)

Key Function: Executes the REQSTAT command.

Action Required: None.

Command Execution:

1. Sends a status message containing the following information to the current output device: current unit number, current volume number, unit type, the new target address in block and vector formats, status errors, and DERRORS. (A status message can result from any transaction sequence performed by the Exerciser. REQSTAT or CICLEAR will clear the current status.) Table 4-8 lists status error numbers and error descriptions for SS/80 devices.

NOTE

DERRORS are device specific errors. Refer to the PDS product's CE handbook for a detailed description of DERRORS.

2. Press [CONT] to return to key set 1.

Table 4-8. Request Status Error Information

Error Number	Error Description
2	Channel command received without odd parity.
5	Illegal opcode received by SS/80 device.
6	Illegal volume or unit number specified.
7	Target address out of bounds.
8	Parameter out of bounds.
9	Parameter field wrong length for preceding opcode.
10	Message sequence violation.
12	Execution message length miscompare between host and SS/80 device.
17	Command sent to controller caused a unit to receive bad status.
19	Controller hardware fault.
22	Unit hardware fault.
24	Power-on self-test diagnostic failed.
30	Power was cycled on a unit or flexible disk media was loaded.
31	Preceding transaction re-transmitted.
33	Uninitialized media detected.
34	Not enough spare blocks available to initialize media.
35	SS/80 device not ready (flexible disk media not installed).
36	Current volume write-protected.
40	Unrecoverable data overflow (>1 unrecoverable data error detected).
41	Unrecoverable data error detected at indicated address; unable to recover data with error correction and latency-induced read retries.
43	End of file encountered on file-structured device.
44	End of volume encountered while crossing volume boundary.
51	Flexible disk media wear detected.
52	Latency induced to recover data.
55	Auto sparing invoked while initializing media.
57	Recoverable data overflow (>1 recoverable data error detected).
59	Recoverable data error detected at indicated address; required error correction or latency-induced read retries to recover data.

RW_TST (LOAD RW_TST MODULE)

Key Function: Prompts you to load the RW_TST module (program).

Action Required:
To load the RW_TST module, enter Y and press [END LINE]. To terminate the RW_TST command, enter N and press [END LINE], then press [CONT] to return to key set 1. To exit the RW_TST command and halt the SERVC program, enter EXIT and press [END LINE]. (Press [RUN] to restart the SERVC program.)

Command Execution:
1. Loads the RW_TST program module and prompts you to select an output device.

2. To select the HP 85 screen as the output device, press [k2] DISP. To select the HP 85 thermal printer as the output device, press [k3] PRINTR.

3. RW_TST key set 1 is displayed on the screen.

TRK_0 (TRACK ZERO DETECTOR)

NOTE

This command is valid for HP 9122D/S/C and HP 9123D products only. The TRK_0 label will not appear if you are testing any other product.

Key Function: Executes the TRK_0 command.

Action Required: Install a flexible disk into the flexible disk mechanism.

Command Execution:
1. Commands the heads in a flexible disk mechanism to seek to track zero, then move off track. The track zero detector indicates that track zero was accessed.

2. Press [CONT] to return to key set 1.

UNIT (SET UNIT NUMBER)

Key Function: Prompts you to set the unit number.

Action Required:

1. Check the HP-IB address of the SS/80 device and refer to table 4-8 or 4-9 for the unit value of the hard disk drive or flexible disk mechanism you want to test.
2. Enter a value of 0, 1, or 15 and press [END LINE]. (Unit 15 is the controller of any SS/80 device.)

Command Execution:

1. Sets the unit number.
2. Prints the current unit number to the current output device.
3. Press [CONT] to return to key set 1.

Table 4-9. Unit Values for HP-IB Addresses 0-7

Disk Drive Configuration	Unit Value
1 hard disk drive	0
1 hard disk drive + 1 flexible disk mechanism	0 1
2 hard disk drives* + 1 flexible disk mechanism	0 1
1 flexible disk mechanism, left slot + 1 flexible disk mechanism, right slot	0 1

*Appear as one disk drive.

Table 4-10. Unit Values for HP-IB Addresses 8 and 9

Disk Drive Configuration	Unit Value
1 hard disk drive	1
1 hard disk drive + 1 flexible disk mechanism	1 0
2 hard disk drives* + 1 flexible disk mechanism	1 0
1 flexible disk mechanism, left slot + 1 flexible disk mechanism, right slot	0 1

*Appear as one disk drive.

VOLUME (SET VOLUME NUMBER)

Key Function: Prompts you to set the volume number.

Action Required: Enter a volume number and press [END LINE].

NOTE

This command is optional for a flexible disk mechanism, but must be used to test separate volumes of a hard disk drive. The volume number is automatically set to the default number zero when the test module is loaded. If you enter 1 as the volume number for a flexible disk mechanism, the messages "Illegal volume or unit" and "Volume 1 was not selected" are printed to the current output device. If you are testing an HP 9153C with a total hard disk capacity of 40-Mbytes (two 20-Mbyte hard disk drives), divide the 40-Mbyte volume into two 20-Mbyte volumes as follows: set the HP 9153C LINE~ switch to 0, set the configuration switch to 2, then set the LINE~ switch back to 1. To select the front 20-Mbyte disk drive, enter 0 for the volume number. To select the rear 20-Mbyte disk drive, enter 1 for the volume number. Refer to the HP 9153C owner's manual for other volume configurations.

Command Execution:

1. Sets the volume number.
2. Prints the volume number to the current output device.
3. Press [CONT] to return to key set 1.

WEAR_CT (MEDIA WEAR COUNT)

NOTE

This command is valid for the HP 9122D/S/C and HP 9123D products only. The WEAR_CT label will not appear if you are testing any other product.

Key Function: Executes the WEAR_CT command.

Action Required: Install a flexible disk into the flexible disk mechanism.

Command Execution:

1. Reads the head-loaded revolution log on a single-sided or double-sided flexible disk and prints the number of head-loaded revolutions to the current output device.

2. Press [CONT] to return to key set 1.

OPER Module 5

Entering an OPER Test Sequence

The OPER module enables you to enter an operator designed test sequence of up to 32 steps to perform extensive functional tests on an SS/80 device. The test sequence can include single loops, but no nested loops are allowed. If you are testing an SS/80 device which contains two units, you can enter a test sequence that will test the flexible disk mechanism first, then test the hard disk drive for a comprehensive test of the whole product. Enter an OPER test sequence as follows:

1. Press [k2] DISP to select the HP 85 screen as the output device, or press [k3] PRINTR to select the HP 85 thermal printer as the output device. (The printer can be selected to obtain as much data as possible.)

2. Select any of the following commands from key set 1 in the order you wish the commands to be executed by pressing the corresponding function key: [k2] LOOP, [k3] ENDLP, [k5] LCVFY, [k6] LCRD, [k7] LCWRT, or [k8] CMPR. (The LCVFY, LCRD, LCWRT, and CMPR commands will automatically call key set 1a, and prompt you to enter values for the following complementary parameters: UNIT, VOLUME, ADDRESS, and LENGTH. Press [k5] DONE after selecting the complementary parameters for which you want to set values.)

3. To review the command sequence you have just entered, press [k1] MORE until key set 3 is displayed, then press [k6] LIST.

   a) If you want to delete one of the previously entered command steps, press [k5] MODIFY, enter the step number you want to delete, then press [k7] DELETE.

   b) If you want to modify one of the previously entered command steps, press [k5] MODIFY, enter the step number you want to modify and press [END LINE], enter another command, and press [CONT].

4. If you want to enter a new test sequence, press [k1] MORE until key set 2 is displayed, then press [k3] NEW to purge the existing test sequence.

5. When you are finished adding command steps, press [k2] EXEC to execute the test sequence.

6. After the test sequence has been executed, you can add more command steps to the same test sequence or press [k3] NEW to start a new test sequence.

7. To exit the OPER program at any time, press [k4] EXIT.

OPER Key Sets

The OPER module contains four key sets which map command labels onto the HP 85 function keys [k1] through [k8]. Tables 5-1 through 5-4 show the key sets for the OPER module. Key set 1a is a complementary command key set called by the LCVFY, LCRD, LCWRT, and CMPR commands in key set 1. Some labels are intentionally left blank because no label appears for the corresponding function key.

Table 5-1. OPER Module, Key Set 1

LCVFY	LCRD	LCWRT	CMPR
k5	k6	k7	k8
MORE	LOOP	ENDLP	EXIT
k1	k2	k3	k4

Table 5-2. OPER Module, Key Set 1a

DONE			EXIT
k5	k6	k7	k8
UNIT	VOLUME	ADDRESS	LENGTH
k1	k2	k3	k4

Table 5-3. OPER Module, Key Set 2

	CICLEAR		REQSTAT
k5	k6	k7	k8
MORE	EXEC	NEW	EXIT
k1	k2	k3	k4

Table 5-4. OPER Module, Key Set 3

MODIFY	LIST	DELETE	HELP
k5	k6	k7	k8
MORE	RW_TST	SERVC	EXIT
k1	k2	k3	k4

OPER Command Format

The section on OPER commands contains a description of each command in the OPER module. Each command description is presented in the following format:

COMMAND NAME (SHORT DESCRIPTION)

Key Function:
This is a statement which explains what happens immediately after the function key is pressed.

Action Required:
This is a list of the steps you may need to perform before the command can be executed.

Command Execution:
This is the command execution sequence, which includes any steps you may need to perform after the command is executed.

OPER Commands

ADDRESS (SET ADDRESS)

Key Function: Prompts you to specify the starting block address.

Action Required: Enter the starting block address and press [END LINE].

Command Execution: Sets the starting block address.

CICLEAR (CHANNEL INDEPENDENT CLEAR)

Key Function:
Enters the CICLEAR command into the test sequence, increments the sequence line number by one, and returns to OPER key set 1.

Action Required: None.

Command Execution:
Clears any device connected to the channel. If the controller is selected prior to issuing a CICLEAR command, all units within the device are cleared. Otherwise, only the current unit will be cleared.

CMPR (WRITE-READ-COMPARE)

Key Function:
Displays key set 1a, and prompts you to enter complementary parameters for the CMPR command.

Action Required:

1. Press the following complementary command keys in sequence: [k1] UNIT, [k2] VOLUME (only if you are testing a hard disk), [k3] ADDRESS, and [k4] LENGTH.

2. Press [k5] DONE.

3. Enter a value for each complementary command and press [END LINE] after each value is entered (refer to the UNIT, VOLUME, ADDRESS, and LENGTH commands in this section).

4. To specify a user data pattern, enter Y and press [END LINE], then enter a pattern of up to 8 hex digits and press [END LINE]. To specify the default random data pattern, enter N and press [END LINE].

5. The CMPR command is entered into the test sequence, the sequence line number is incremented by one, the program returns to key set 1, and you are prompted to select a command for the next step.

Command Execution:

1. Executes a LCWRT command followed by a LCRD command at the location specified by the complementary parameters, then read data is compared to write data.

2. The HP 85 prints error messages to the current output device based on the following scheme:

   a) If the data read is the same as the data written, no error messages will be printed.

   b) If an unrecoverable error is detected during a read or a write, one of the following messages, (1) or (2), is printed.

```
(1)   Write had error, compare is cancelled.

(2)   Read had error, compare is cancelled.
```

   c) If no unrecoverable errors are detected but a data miscompare occurs, three lines are printed in the format of the following sample message. Each blank and non-blank message line is numbered for reference purposes. The reference numbers are not printed by the HP 85.

```
(1)   Error is in byte 261.
(2)
(3)   Error byte 168.
(4)
(5)   Should be 169.
```

   Line 1, in the sample message above, indicates that the data miscompare occurred 261 bytes from the starting address. Thus, if the starting address was block 500, and the disk was formatted with a block size of 256 bytes per block, then the miscompare occurred five bytes into the second block. Line 3 indicates that the byte in error was read as 168 decimal (A8 hex), and line 5 indicates that the byte was written as 169 decimal (A9 hex).

DELETE (DELETE SEQUENCE STEP)

Key Function: Executes the DELETE command.

Action Required:

1. Press [k6] LIST to see which command you want to delete.
2. Press [k5] MODIFY.
3. Enter the step number you want to delete (edit), then the program will automatically return to key set 1.
4. Press [k1] MORE two times.
5. Press [k7] DELETE.
6. Press [CONT] to return to key set 1.

Command Execution:

Deletes a step in the current test sequence.

DONE (PARAMETER SELECTION DONE)

Key Function: Executes the DONE command.

Action Required: None.

Command Execution:

Associates complementary parameters with a CMPR, LCRD, LCVFY, or LCWRT command, returns to key set 1, and prompts you to select a command for the next step.

ENDLP (END LOOP)

Key Function:
Enters the ENDLP command into the test sequence, increments the sequence line number by one, returns to key set 1, and prompts you to select a command for the next step.

Action Required: None.

Command Execution: Ends a sequence loop started by the LOOP command.

EXEC (EXECUTE TEST SEQUENCE)

NOTE

At least one sequence step must be entered before the EXEC label will appear on the screen.

Key Function: Executes the EXEC command.

Action Required: None.

Command Execution:

1. Starts execution of the test sequence and prints each command step to the current output device as the command is executed.

2. Press [CONT] to return to key set 1 after the test sequence completes.

EXIT (EXIT CURRENT MODULE)

Key Function:
Displays a warning that the command will exit from the program, and prompts you to answer whether or not the command should continue.

Action Required:

1. To exit the program, enter Y and press [END LINE]. The HP 85 will beep, and the screen will display the following message:

```
PROGRAM WILL NOW STOP
```

2. To stay in the OPER program, enter N and press [END LINE].

Command Execution:

1. Causes the OPER program to halt. Also, if you press [k4] EXIT after pressing another command key, the program will return to key set 1.

2. Press [RUN] to restart the OPER program.

HELP (HELP SCREEN)

Key Function: Executes the HELP command.

Action Required: None.

Command Execution:

1. Prints a list of OPER command descriptions to the current output device.

2. Press [CONT] to return to key set 1.

LCRD (LOCATE-AND-READ)

Key Function:
Displays key set 1a, and prompts you to enter complementary parameters for the LCRD command.

Action Required:

1. Press the following complementary command keys in sequence: [k1] UNIT, [k2] VOLUME (only if you are testing a hard disk), [k3] ADDRESS, and [k4] LENGTH.

2. Press [k5] DONE.

3. Enter a value for each complementary command and press [END LINE] after each value is entered (refer to the UNIT, VOLUME, ADDRESS, and LENGTH commands in this section).

4. To print read data to the current output device, enter Y and press [END LINE]. (If read data is printed to the HP 85 printer during long reads, the test will be slower and much paper will be ejected.) To suppress printing of read data to the current output device, enter N and press [END LINE].

5. The LCRD command is entered into the test sequence, the sequence line number is incremented by one, the program returns to key set 1, and you are prompted to select a command for the next step.

Command Execution:

1. The SS/80 device reads the specified number of data bytes from the selected unit, and transfers the data to the HP 85. (If the specified length in bytes is zero, the SS/80 device only seeks to the starting block address, and no data is transferred.)

2. If Y was entered in step 3 above, the HP 85 prints the read data to the current output device. The following is a sample of 30 bytes of random data which was printed to the HP 85 thermal printer (the numbers 1, 10, 19, and 28 in the left column are the byte counts of the first byte in each row):

```
 1 09 43 7D E5 7B 71 B0 CB AA
10 11 D3 3A A9 65 9F 0F FD DA
19 BA 84 95 79 0F A3 03 AA 5C
28 92 8A A0
```

3. The HP 85 prints error messages to the current output device based on the scheme in steps a through d below. The following is a sample error message from an HP 9153C flexible disk mechanism. Each blank and non-blank message line is numbered for reference in steps b through d. The reference numbers are not printed by the HP 85.

```
(1)  Status message follows:
(2)
(3)  Current unit is 1
(4)  Current volume is 0
(5)  Unit type:
(6)  Removable Disc or Combination
(7)
(8)  Status bits set are:
(9)  Unrec data overflow
(10) Unrec data error
(11) Address of unrecoverable data:
(12) Block address = 50
(13) Cyl= 0 head= 1 sec= 18
(14)
(15) Rec data error
(16) Recoverable data error, latency
(17) induced in order to
(18) recover the data
(19) Address of recovered block:
(20) Unknown (parameter field used)
(21) DERRORS follow:
(22) DERROR = E3
```

a) If the data is successfully transferred, no error messages will be printed.

b) If a data error is detected, the SS/80 device will first try to correct the error with error correction circuitry (ECC), then perform latency-induced read retries to recover the data. If the data is successfully recovered, the address of the data error will be "unknown" (line 20), and will be followed by a DERROR (line 22) which indicates that the data was recovered in the first set of retries. If more than one set of read retries is required to recover the data, a "recoverable data overflow" message is also printed.

c) If the data cannot be recovered with ECC and read retries, the data is unrecoverable (line 10). The SS/80 device sends the most accurate reconstruction of the data to the HP 85 and the address of the unrecoverable data error is printed in block and vector formats (lines 12 and 13). If an error is detected in a sector header and the error cannot be recovered with read retries, the data is also unrecoverable. The block and vector address of the header error is printed, followed by a DERROR indicating the retry count was exceeded while reading a header. If more than one unrecoverable data error is detected at the same address, an "unrecoverable data overflow" message (line 9) is also printed.

d) If a hardware fault occurs during execution of the LCRD command, the command terminates with a DERROR which indicates the type of hardware fault.

NOTE

DERRORS are device specific errors. Refer to the PDS product's CE handbook for a detailed description of DERRORS.

LCVFY (LOCATE-AND-VERIFY)

Key Function:

Displays key set 1a, and prompts you to enter complementary parameters for the LCVFY command.

Action Required:

1. Press the following complementary command keys in sequence: [k1] UNIT, [k2] VOLUME (only if you are testing a hard disk), [k3] ADDRESS, and [k4] LENGTH.

2. Press [k5] DONE.

3. Enter a value for each complementary command and press [END LINE] after each value is entered (refer to the UNIT, VOLUME, ADDRESS, and LENGTH commands in this section).

4. The LCVFY command is entered into the test sequence, the sequence line number is incremented by one, the program returns to key set 1, and you are prompted to select a command for the next step.

Command Execution:

1. The SS/80 device reads the specified number of data bytes from the selected unit, and verifies that the data can be recovered. If the specified length in bytes is not a multiple of the number of bytes in a block, all the bytes in the last block will be read. None of the data read is transferred to the HP 85 and no read retries or error correction is performed. The LCVFY command will terminate immediately when an unrecoverable data error is detected.

2. The HP 85 prints error messages to the current output device based on the scheme in steps a through c below. The following is a sample error message from an HP 9153C flexible disk mechanism. Each blank and non-blank message line is numbered for reference in steps b and c. The reference numbers are not printed by the HP 85.

```
(1)   Status message follows:
(2)
(3)   Current unit is 1
(4)   Current volume is 0
(5)   Unit type:
(6)   Removable Disc or Combination
(7)
(8)   Status bits set are:
(9)   Unrec data error
(10)  Address of unrecoverable data:
(11)  Block address = 1002
(12)  Cyl= 15 head= 1 sec= 10
(13)
(14)  DERRORS follow:
(15)  DERROR = 6F
```

a) If the data is successfully verified, no error messages will be printed.

b) If a data error is detected, the data is automatically unrecoverable (line 9) since neither error correction nor read retries are performed. The address of the unrecoverable data error is printed in block and vector formats (lines 11 and 12), followed by a DERROR (line 15) which always indicates that the error occurred during a verify command.

c) If a hardware fault occurs during execution of the LCVFY command, the command terminates with a DERROR which indicates the type of hardware fault.

NOTE

DERRORS are device specific errors. Refer to the PDS product's CE handbook for a detailed description of DERRORS.

LCWRT (LOCATE-AND-WRITE)

CAUTION

Execution of the LCWRT command will result in the destruction of data on the disk.

Key Function:

Displays key set 1a, and prompts you to enter complementary parameters for the LCWRT command.

Action Required:

1. Press the following complementary command keys in sequence: [k1] UNIT, [k2] VOLUME (only if you are testing a hard disk), [k3] ADDRESS, and [k4] LENGTH.

2. Press [k5] DONE.

3. Enter a value for each complementary command and press [END LINE] after each value is entered (refer to the UNIT, VOLUME, ADDRESS, and LENGTH commands in this section).

4. To specify a user data pattern, enter Y and press [END LINE], then enter a pattern of up to 8 hex digits. To specify the default random data pattern, enter N and press [END LINE].

5. The LCWRT command is entered into the test sequence, the sequence line number is incremented by one, the program returns to key set 1, and you are prompted to select a command for the next step.

Command Execution:

1. The HP 85 transfers the specified number of data bytes consisting of a user defined pattern or a default data pattern to the SS/80 device. The SS/80 device then writes the data to specified locations in the selected unit. If the specified number of bytes is not a multiple of the number of bytes in a block, the SS/80 device will pad the block with duplications of the last data byte, or with zeros. (If the specified length in bytes is zero, the SS/80 device only seeks to the starting block address, and no data is transferred.)

2. The HP 85 prints error messages to the current output device based on the scheme in steps a through c below. The following is a sample error message from an HP 9153C flexible disk mechanism. Each blank and non-blank message line is numbered for reference in steps b and c. The reference numbers are not printed by the HP 85.

```
(1)   Status message follows:
(2)
(3)   Current unit is 1
(4)   Current volume is 0
(5)   Unit type:
(6)   Removable Disc or Combination
(7)
(8)   Status bits set are:
(9)   Unrec data error
(10)  Address of unrecoverable data:
(11)  Block address = 1018
(12)  Cyl= 15 head= 1 sec= 26
(13)
(14)  DERRORS follow:
(15)  DERROR = 8B
```

a) If the data is successfully transferred, no error messages will be printed.

b) If a sector header cannot be read after repeated read retries, a header error is detected, the SS/80 device will immediately stop writing blocks, and the data transfer will terminate with an unrecoverable data error (line 9). The address of the unrecoverable data error is printed in block and vector formats (lines 11 and 12), followed by a DERROR (line 15) indicating that the SS/80 device could not write to the sector.

c) If a hardware fault occurs during execution of the LCWRT command, the command terminates with a DERROR which indicates the type of hardware fault.

NOTE

DERRORS are device specific errors. Refer to the PDS product's CE handbook for a detailed description of DERRORS.

LENGTH (LENGTH OF TEST)

Key Function: Prompts you to specify the test length in bytes.

Action Required: Enter the length in bytes and press [END LINE].

Command Execution: Sets the test length in bytes.

LIST (LIST TEST SEQUENCE)

NOTE

At least one sequence step must be entered before the LIST label will appear on the screen.

Key Function: Executes the LIST command.

Action Required: None.

Command Execution:

1. Lists all the steps in the current test sequence.
2. Press [CONT] to return to OPER key set 3.

LOOP (BEGIN LOOP)

Key Function: Prompts you to enter the loop count.

Action Required:

1. Enter the number of times the loop is to be executed and press [END LINE]. (Nested loops are not allowed, but there may be multiple loops within an OPER test.)
2. The LOOP command is entered into the test sequence, the sequence line number is incremented by one, the program returns to key set 1, and you are prompted to select a command for the next step.

Command Execution:

Starts a loop for the command sequence following the LOOP command until ENDLP is encountered.

MODIFY (MODIFY SEQUENCE STEP)

NOTE

At least one sequence step must be entered before the MODIFY label will appear on the screen.

Key Function: Executes the MODIFY command.

Action Required:

1. Press [k6] LIST.
2. Press [k5] MODIFY.
3. Enter the step number you want to modify (edit) and press [END LINE].
4. Press any key to enter a new command (press [k1] MORE to display other key sets).
5. Perform the action required for the command you select (refer to the command in this section).
6. Press [CONT] to return to key set 1.

Command Execution:
Replaces an existing OPER step with a new command and activates the DELETE key.

MORE (MORE KEY SETS)

Key Function: Executes the MORE command.

Action Required: None.

Command Execution:
Displays the next key set on the HP 85 screen. (Moves from key set 1 to key set 2, from key set 2 to key set 3, and from key set 3 back to key set 1.)

NEW (NEW TEST SEQUENCE)

Key Function:
Warns you that all steps previously entered into the test sequence will be purged, and prompts you to answer whether or not you want to continue.

Action Required:
1. If you want to purge all previously entered steps, enter Y and press [END LINE]. If you want to keep the existing steps, enter N and press [END LINE].
2. If you entered Y, select a command for step 1.
3. If you entered N, select the next command for the existing test sequence.

Command Execution:
Purges the existing test sequence, and prompts you to enter the command for step 1 of the new test sequence.

REQSTAT (REQUEST STATUS)

Key Function:
Enters the REQSTAT command into the test sequence, increments the sequence line number by one, returns to OPER key set 1, and prompts you to select a command for the next step.

Action Required: None.

Command Execution:
Sends a status message containing the following information to the current output device: current unit number, current volume number, unit type, the new target address in block and vector formats, status errors, and DERRORS. (A status message can result from any transaction sequence performed by the Exerciser. REQSTAT or CICLEAR will clear the current status.) Table 5-5 lists status error numbers and error descriptions for SS/80 devices.

NOTE

DERRORS are device specific errors. Refer to the PDS product's CE handbook for a detailed description of DERRORS.

Table 5-5. Request Status Error Information

Error Number	Error Description
2	Channel command received without odd parity.
5	Illegal opcode received by SS/80 device.
6	Illegal volume or unit number specified.
7	Target address out of bounds.
8	Parameter out of bounds.
9	Parameter field wrong length for preceding opcode.
10	Message sequence violation.
12	Execution message length miscompare between host and SS/80 device.
17	Command sent to controller caused a unit to receive bad status.
19	Controller hardware fault.
22	Unit hardware fault.
24	Power-on self-test diagnostic failed.
30	Power was cycled on a unit or flexible disk media was loaded.
31	Preceding transaction re-transmitted.
33	Uninitialized media detected.
34	Not enough spare blocks available to initialize media.
35	SS/80 device not ready (flexible disk media not installed).
36	Current volume write-protected.
40	Unrecoverable data overflow (>1 unrecoverable data error detected).
41	Unrecoverable data error detected at indicated address; unable to recover data with error correction and latency-induced read retries.
43	End of file encountered on file-structured device.
44	End of volume encountered while crossing volume boundary.
51	Flexible disk media wear detected.
52	Latency induced to recover data.
55	Auto sparing invoked while initializing media.
57	Recoverable data overflow (>1 recoverable data error detected).
59	Recoverable data error detected at indicated address; required error correction or latency-induced read retries to recover data.

RW_TST (LOAD RW_TST MODULE)

Key Function: Prompts you to load the RW_TST module (program).

Action Required:
To load the RW_TST module, enter Y and press [END LINE]. To return to key set 1 of the OPER module, enter N and press [END LINE], then press [CONT].

Command Execution:
1. Loads the RW_TST program module and prompts you to select an output device.
2. To select the HP 85 screen as the output device, press [k2] DISP. To select the HP 85 thermal printer as the output device, press [k3] PRINTR.
3. RW_TST key set 1 is displayed on the screen.

SERVC (LOAD SERVC MODULE)

Key Function: Prompts you to load the SERVC module (program).

Action Required:
To load the SERVC module, enter Y and press [END LINE]. To return to key set 1 of the OPER module, enter N and press [END LINE], then press [CONT].

Command Execution:
1. Loads the SERVC program module and prompts you to select an output device.
2. To select the HP 85 screen as the output device, press [k2] DISP. To select the HP 85 thermal printer as the output device, press [k3] PRINTR.
3. SERVC key set 1 is displayed on the screen.

UNIT (SET UNIT NUMBER)

Key Function: Prompts you to set the unit number.

Action Required:
1. Check the HP-IB address of the SS/80 device and refer to table 5-2 or 5-3 for the unit value of the hard disk drive or flexible disk mechanism you want to test.
2. Enter a value of 0, 1, or 15 and press [END LINE]. (Unit 15 is the controller of any SS/80 device.)

Command Execution: Sets the unit number.

Table 5-6. Unit Values for HP-IB Addresses 0-7

Disk Drive Configuration	Unit Value
1 hard disk drive	0
1 hard disk drive + 1 flexible disk mechanism	0 1
2 hard disk drives* + 1 flexible disk mechanism	0 1
1 flexible disk mechanism, left slot + 1 flexible disk mechanism, right slot	0 1

*Appear as one disk drive.

Table 5-7. Unit Values for HP-IB Addresses 8 and 9

Disk Drive Configuration	Unit Value
1 hard disk drive	1
1 hard disk drive + 1 flexible disk mechanism	1 0
2 hard disk drives* + 1 flexible disk mechanism	1 0
1 flexible disk mechanism, left slot + 1 flexible disk mechanism, right slot	0 1

*Appear as one disk drive.

VOLUME (SET VOLUME NUMBER)

Key Function: Prompts you to set the volume number.

Action Required: Enter a volume number and press [END LINE].

NOTE

This command is optional for a flexible disk mechanism, but must be used to test separate volumes of a hard disk drive. The volume number is automatically set to the default number zero when the test module is loaded. If you enter 1 as the volume number for a flexible disk mechanism, the messages "Illegal volume or unit" and "Volume 1 was not selected" are printed to the current output device. If you are testing an HP 9153C with a total hard disk capacity of 40-Mbytes (two 20-Mbyte hard disk drives), divide the 40-Mbyte volume into two 20-Mbyte volumes as follows: set the HP 9153C LINE~ switch to 0, set the configuration switch to 2, then set the LINE~ switch back to 1. To select the front 20-Mbyte disk drive, enter 0 for the volume number. To select the rear 20-Mbyte disk drive, enter 1 for the volume number. Refer to the HP 9153C owner's manual for other volume configurations.

Command Execution: Sets the volume number.

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