



CS/80

EXTERNAL EXERCISER

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1-1. INTRODUCTION

The purpose of this manual is to aid service-trained personnel in troubleshooting CS/80 devices to a replaceable assembly level. In this manual, the term "device" refers to any of the disc or disc/tape drives in the CS/80 family. The CS/80 External Exerciser functions as an interpreter which links the vast set of internal diagnostics and utilities within a CS/80 device to a service-trained person. One of the significant features incorporated into all CS/80 devices is internal storage of all diagnostic and utility routines. The CS/80 External Exerciser initiates a specific test and displays the results when the test has completed; the test itself is performed completely within the device using its intelligent controller.

CAUTION

Some of the CS/80 External Exerciser commands will erase data on the selected unit. Check with the appropriate section before issuing any command.

1-2. SCOPE OF MANUAL

The CS/80 External Exerciser is comprised of programs which run on all CS/80 supported computer systems as well as the HP 85 desktop computer. This manual divides the CS/80 External Exerciser into the following sections: Section I provides general information about the CS/80 External Exerciser. Section II contains the majority of the exerciser commands; these commands are located in the following programs: EXRSIZ, EXRSI2, D2D, and CRGTST. Section III contains unique tape drive commands for those devices which incorporate a cartridge tape drive. These commands are located in the TAPE program. Section IV covers the operator designed programs. Operator designed steps can be entered individually to form an executable program which consists of specific CS/80 instructions. These commands are located in the OPER program. Section V covers the exerciser commands for use on HP 794X devices. These commands are in the program named EX794X. When testing an HP 794X device, EX794X should be used in place of EXRSIZ. Section VI covers the exerciser commands for use on HP 7907 devices. These commands are in the program named EX7907. When testing an HP 7907 device, EX7907 should be used in place of EXRSIZ.

Appendices in this manual provide information on loading and running various system diagnostics. The main manual documents the CS/80 External Exerciser as implemented on the HP 85 desktop computer; some of the system diagnostics behave slightly different than the HP 85 but in all cases the operation performed for a given command is identical to the HP 85. Some system exercisers do not contain all of the commands described in this manual since special features of the HP 85 have been used to implement them (such as printing flag plots which give visual indication of tape cartridge wear). The service manual for the particular device being diagnosed should be consulted for a list of CS/80 External Exerciser commands which are supported, and any special attributes those commands might have, since some commands are designed for certain devices.

Complete documentation for the CS/80 instruction set can be found in the *CS/80 Instruction Set Programming Manual*, part number 5955-3442.

1-3. DIAGNOSTICS

Complete internal diagnostics are built into all CS/80 devices. Internal diagnostics consist of several routines which test individual PCAs, assemblies, and interfaces within the device. Microdiagnostics test specific hardware components; macrodiagnostics perform interactive tests among selected PCAs providing

General Information

vital subsystem analysis. Operational tests concatenate or link several micro- and macrodiagnostic routines to achieve dynamic system verification.

A list of the diagnostics a particular device will execute can be found in the service manual for that device. If an error is found during a diagnostic, a status message is sent along with parameters indicating which unit failed and any associated errors. A diagnostic test terminates when an error occurs and the maximum possible isolation of that error has taken place.

Some of the tests performed by the exerciser relay device-specific error codes. On HP 7908, 791X, and 793X devices these can be either test errors or drive errors. A list of diagnostic Test Errors (TERRORS) and Drive Errors (DERRORS) can be found in the service manual for the particular device; each device has different error codes. TERRORS occur only as a result of a diagnostic or utility while DERRORS indicate a run-time failure. On HP 794X devices, the codes consist of Field Replaceable Assemblies (FRAs), failing subtest numbers, and fault codes; on HP 7907 devices, the codes consist of fault codes and status codes. All of this information is listed in the service manual for each particular device.

1-4. ERROR RATE TESTS

An error rate test is a powerful tool used to establish media integrity within a CS/80 device. There are two general types of error rate tests: 1) A Read-Only Error Rate Test (RO ERT) is nondestructive to user data, and 2) A Write-Then-Read Error Rate Test (WTR ERT) which erases user data.

Both types of ERTs allow the user to input a loop count; the loop count is stored internally within the device and is the number of times the ERT is to be repeated.

A WTR ERT allows the user to specify the data pattern to be written. This pattern consists of eight hexadecimal digits; if the pattern entered is less than eight digits, the pattern will be right-justified in a 32-bit field and padded with zeros.

1-5. DISC ERROR RATE TESTS

On the disc unit, an ERT finds both correctable and uncorrectable read errors and accumulates information about each error, such as the address where the error occurs, the type of error and the number of times that particular address has had that error. The information obtained during an ERT may be logged on an area of the disc which is reserved for internal controller use. This area of the disc is the disc maintenance track. Disc maintenance tracks provide nonvolatile storage space for ERT information, spare track allocations, run-time faults, and special worst-case data patterns which can be written on the disc during a WTR ERT. When an ERT encounters a data error and logging has not been specified, the test will stop, report the error, and continue in this fashion until the loop count has been satisfied.

Both types of ERTs allow an offset to be entered. The offset parameter specifies a radial distance the heads are to be moved off track center during the read portion of the test (writes are always done with no offset). Any amount of offset will usually increase the error rate; if the offset is sufficiently large it may cause seek failures due to verify errors or hardware faults due to an off-track condition. The offset range allowed for each CS/80 device is specified in this manual with the appropriate commands (RO ERT and WTR ERT). Both HP 794X and HP 7907 devices do not perform offset reads.

An ERT catalogs errors by head number. Each error is accompanied by its logical address, the error type, the occurrence count, and an error byte. The error type is either uncorrectable, correctable, or CRC detected. The ERT information can be either logged on the disc maintenance tracks or printed out immediately as it is discovered. An explanation of the bits in the error byte can also be printed out during the test.

Read-Only Error Rate Tests (RO ERTs) can be either random or non-random (sequential). A random RO ERT reads 256 random addresses (sectors) of random length and finds all read errors. This method of testing allows a large physical area of the disc to be checked in a minimum amount of time. A non-random RO

ERT sequentially reads data over a specified area of the disc and finds all read errors. Both types of RO ERTs will not erase any user data.

WTR ERTs erase some or all of the user data on the selected unit. There are three types of addressing allowed during a WTR ERT. A pattern WTR ERT sequentially writes data on a specified area of the disc, then reads all of the data which was written in an attempt to locate any sensitive bit pattern errors, read errors, or media defects. A random WTR ERT will write-then-read 256 randomly generated data patterns of varying length at random addresses. A short WTR ERT executes a combination of random ERTs over a small portion of the media; this test is intended for quick verification of the media.

1-6. TAPE ERROR RATE TESTS

On the tape unit, an ERT finds read data errors in similar fashion as on the disc; however, errors are not reported until the completion of the test. Furthermore, the tape characterizes the types of read errors by retrying (re-reading) each address which has an error, including correctable errors. A tape with many errors, therefore, takes more time to complete an ERT than a tape with few errors. If the current address is tested using an ERT, the tape's sparing table will be obeyed; if a specified track or the entire tape is tested, the sparing table will be ignored, i.e. even the blocks which have been spared will be tested. The tape unit allows three types of ERTs to be performed: A RO ERT tests for read errors on a specified portion of the tape; a WTR ERT writes a specified pattern to each block over a specified portion of the tape, then reads the area which was written and locates any errors; Certification (CERT) is a special type of WTR ERT which tests every block address on the entire tape and automatically spares all those block addresses which have errors.

The tape's error correction circuit allows data to be reconstructed when its validity is questionable. When data is written to the tape, six frames are transmitted for each block. Frames one and three are combined in exclusive-or fashion to form frame five; correspondingly, frames two and four are combined in exclusive-or fashion to form frame six. Frames one through four are data; frames five and six are error correction information. If an error is detected (using CRC) in frame one, frame three, when exclusive-ored with frame five, will regenerate frame one. In this way, any of the four data frames may be reconstructed by combining the appropriate frames.

1-7. ERROR LOGGING

An area in RAM within the device controller is responsible for recording up to five uncorrectable data errors during run-time operation. During an ERT, the same memory space is used to record any data errors, if detected. If this area in RAM becomes full, the device requests release from the host in order to log the error information. The Run-time Log (RUN LOG) contains information about data errors found only during run-time. Run-time is defined as any time in which a test, diagnostic, or utility is *not* being performed. During run-time, the error correction circuitry is enabled (on those devices which have this feature). If the ECC cannot correct an error, it will be logged during run-time. While executing an ERT, however, ECC is disabled so that all types of errors may be logged. The Error Rate Test Log (ERT LOG) contains information which is obtained only while doing an ERT and specifying the LOG option; the RUN LOG is identical except that it stores errors found only during run-time.

When an ERT begins, the data errors which are currently in RAM are cleared. This is done to prevent confusion between current and previous tests. To avoid erasing these errors, enter a PRESET command first; this will force all of the data error information in RAM to be immediately logged onto the disc maintenance tracks.

In addition to the ERT LOG and RUN LOG, some devices maintain an Error Summary (ERRSUM) -- an accumulation of all TERRORS since the logs were last cleared using the CLEAR LOGS command. TERRORS point to both disc and tape unit faults. Each device has its own list of TERRORS provided in the service manual.

General Information

Error and fault information such as DERRORs, FRAs, subtest numbers and status are passed to the CS/80 External Exerciser when either an error occurs during run-time or an error is returned by the fault log. These can also appear in a status message (REQSTAT) as a result of a run-time fault. A list of all possible errors for each device can be found in the service manual for that device.

1-8. DISC ERROR LOGGING

On the disc unit, error logging is done on the disc maintenance tracks. Logging to these tracks is handled automatically by the device's internal controller. Each disc surface contains its own set of maintenance tracks. Maintenance tracks store error information which has been obtained during ERTs, and also log any drive faults into the FAULT LOG.

1-9. TAPE ERROR LOGGING

On the tape unit, three logs are maintained: 1) the Run-time Log (RUN LOG) stores run-time data errors, 2) the Error Rate Test Log (ERT LOG) stores ERT data errors, and 3) the Use Log (USE LOG) keeps track of the amount of use the tape cartridge has undergone. While a tape cartridge is write-protected, none of the logs on that tape can be updated.

ERTs provide a good indication of the general health of the tape system. The results of an ERT are stored on the tape's ERT LOG. The ERT LOG shows how many blocks were accessed (read or written) during the test, and displays information about bad or suspect blocks. A block is the smallest addressable entity on the tape; it consists of 6 frames, each 256 bytes. Four of the frames (1024 bytes) contain user data and the remaining two frames provide error correction code.

The ERT LOG separates the number of corrected blocks into those that have permanent errors and those that have transient errors. Permanent errors are blocks which have one or more frame errors after three retries. Permanent errors are usually caused by a defect on the tape; up to 32 defects per 16,000 blocks on a short tape (16 Mbyte) is typical. If more than 128 permanent errors are logged, the tape or tape system could be malfunctioning. Transient errors are blocks which have a frame error that disappears on retries; tape system performance is not degraded if 250-300 transient errors are found per 16,000 blocks. If more than 512 transient errors occur per 16,000 blocks read, this indicates loose connectors or a dirty tape head.

The ERT LOG also shows uncorrectable and unlocatable blocks. If the tape's error correction capability cannot correct a block, that block is determined to be uncorrectable. Before sparing, a short tape may have 1-5 of these blocks; a significantly higher number of uncorrectable blocks indicates a defective tape or a tape system problem. Unlocatable blocks are those blocks which have unreadable keys. Keys occur at the beginning of each block and contain the block address. Up to 16 unlocatable blocks per 16,000 blocks is normal; greater than this points to a tape or tape system problem.

Logical addresses are the only addresses logged during a tape ERT. The list of logical addresses includes only uncorrectable and unlocatable blocks which were found in the user's logical address space as determined by the current sparing technique. For this reason, the number of logical addresses listed during the test may not equal the sum of uncorrectable and unlocatable blocks since some of these may not be in the user's logical addressing space.

1-10. MEDIA INITIALIZATION

The controller within a CS/80 device must be able to recognize the addressing scheme used by each of its storage mediums or units. A unit is a separately addressable entity within a device such as a disc or a tape. The controller itself is also a separate unit. Parameters such as the disc sector format, sector interleaving, sparing technique, and tape block format are strictly governed by the internal controller. Media

initialization involves setting up those parameters which establish the foundation of all communications to follow with a particular unit.

1-11. DISC INITIALIZATION

On the disc unit, initializing the media erases all data sectors and allows sector interleaving to be set. Sector interleaving allows the transfer rate of a CS/80 device to be matched most efficiently with that of the host computer connected to it. A host computer cannot always process data as fast as it is sent by the disc. Often, by the time the host computer is ready for another sector, the data head has already passed that particular sector on the disc, and a time delay or latency equal to as much time as one revolution of the disc is incurred. Sector interleaving allows the data to be staggered or interleaved by one or more sectors; access time is delayed only enough to match the speed of the host computer. Sector interleaving, therefore, reduces inherent latencies which are characteristic of all rotational memories.

The INIT MEDIA command permits three options for the disc: retain both primary (factory) and secondary (field) spares; retain only primary spares; and full initialization, which retains no spares. Media initialization is performed on the disc before leaving the factory. Any defective sectors or tracks are found and primary spares take their places. If a full initialization is ever performed outside of the factory, it is imperative that an extensive ERT be performed, and that any questionable sectors are spared using the SPARE command. An HP 793X should *never* be fully initialized outside of the factory. A power-on diagnostic should be successfully completed before any sectors are spared; this ensures that the device is functioning properly and is capable of completing the spare operation. If a WTR ERT with a loop of 20 consistently finds a sector in error, that particular sector should be spared. Under normal circumstances, a full initialization will never be required. If the host system has inadvertently created too many secondary spares (the only kind performed by a host), it is recommended that the disc be initialized to retain primary spares. Regardless of the type of media initialization, all user data is erased as part of the initialization process.

Each disc surface within a CS/80 device contains a number of spare tracks. These tracks line up with identical tracks on all other data surfaces, forming spare cylinders. The total number of spare tracks, therefore, equals the number of data surfaces times the number of spare tracks per surface. Spare tracks are sequentially numbered starting at zero; this assigned number is defined as the *scalar* spare track number. When a track is spared, it is replaced by one of the available spare tracks. The difference between the spare's physical cylinder address and the defective track's cylinder address is an indication of how far the device had to seek in order to find an available spare. The service manual for each device provides information about the total number of available spare tracks and their corresponding physical addresses.

Two methods of sparing are used: data may be retained or it may be not retained. Each track has one extra sector set aside for a spare. The internal controller has the ability to map out one sector per track as defective and replace its logical address with that of the spare. All subsequent seeks to that address will go directly to the available spare.

If more than one spare sector is requested on a track, then the track sparing algorithm is invoked. The list of spared tracks is kept in controller RAM as well as on the maintenance tracks; therefore, a seek to a track which has been spared goes directly to the "new" track. The track sparing process is thus completely transparent to the user's logical addressing space.

1-12. TAPE INITIALIZATION

On the tape unit, initializing the media establishes the sparing technique. All sparing techniques involve altering the addressing scheme to eliminate defective blocks. A defective block is a block with either an uncorrectable data error or an unreadable key.

The INIT MEDIA command sets aside one out of every 512 blocks on the tape as an available spare. A defective block can either be skip-spared or jump-spared. Skip sparing changes the defective block's logical

address to the next sequentially available spare block address. The defective block's physical address is then added to the spare table on the tape and can no longer be used. Each logical address between the defective block and the spare block which was used to replace it is then incremented. Since the existing data blocks within the affected area must be "shuffled" to new addresses, skip sparing envelops the data between the defective block and the nearest available spare block. Skip sparing, therefore, should only be used on new tapes or when loss of user data is not a concern. Jump sparing, however, replaces a defective block with the closest available spare block (according to seek time). Any future reference to a block which was jump-spared generates a seek directly to the spare. Since no other addresses are altered, jump sparing does not erase any user data. Skip sparing is primarily used for optimization of a new tape; jump sparing is used once the tape contains data which is not to be erased.

A certification test is also permitted while initializing a tape. CERT locates all defective blocks and skip-sparses them if possible. When no available spare block exists beyond a defective block, then jump sparing is used.

1-13. OPERATOR DESIGNED PROGRAMS

Operator designed programs can be created by using the OPER program on the HP 85. The various steps include the ability to locate and read, locate and write, and incremental seek. Also, the sequence of program steps may contain nested loops which allow multiple executions of the same routine. Up to 16 steps are entered individually and can be modified once the program has been created. The OPER commands are described in section IV.

EXTERNAL EXERCISER COMMANDS

SECTION

II

2-1. INTRODUCTION

This section documents the commands which are in the EXRSIZ, EXRSI2, CRGTST and D2D programs on the HP 85 External Exerciser tape. Most of the commands in this section apply to all CS/80 devices. The commands are in alphabetical order and the following format is used:

COMMAND NAME

SHORT DEFINITION

Following the command name is an explanation of what the command does and when it should be used.

INPUT FORMAT:

Input the TEST name

?

[**COMMAND NAME**]

OUTPUT FORMAT:

NAME OF UTILITY OR TEST

This is what is printed when the command has been executed.

The following formats are used throughout this section:

nnnn - refers to a decimal number of any magnitude.

[VVVV] - refers to a decimal number of variable magnitude which must be input by the user. Bold numbers within brackets [**BOLD**] indicate all user inputs.

H - refers to a hexadecimal digit (0-F).

xxxx - refers to text printed out or displayed by the HP 85.

B - refers to a binary digit (bit) printed out or displayed by the HP 85.

2-1A. AHA

AUTOMATIC HEAD ALIGNMENT

This command, unique to HP 7933 and HP 7935 disc drives, issues a PRESET command followed by a Read-Only Error Rate Test (RO ERT). The error rate test checks random addresses.

INPUT FORMAT:

Input the TEST name
?

[AHA]

Input the loop count:
1 <= COUNT <= 254, INF
?

[VVVV] or [INF]

OUTPUT FORMAT:

AUTO HEAD ALIGNMENT UTILITY

AUTO HEAD ALIGNMENT
UTILITY COMPLETED

2-2. CANCEL

CANCEL TRANSACTION

The CANCEL command causes graceful termination of most CS/80 transactions, leaving them in the reporting phase. CANCEL is useful when a device is not responding due to its internal state. The cancel command does not affect any of the logs. If a cancel command is sent during an error rate test, all data errors in RAM are logged on the disc maintenance tracks.

INPUT FORMAT:

Input the TEST name
?

[CANCEL]

OUTPUT FORMAT:

CANCEL UTILITY

CANCEL UTILITY COMPLETED

2-2A. CACHEOFF

TURN OFF DISC CACHE

This command, unique to HP 793X disc drives, turns off the disc cache.

INPUT FORMAT:

Input the TEST name

?

[CACHEOFF]

OUTPUT FORMAT:

CACHE CONTROL UTILITY

Cache now disabled

CACHE CONTROL UTILITY COMPLETED

2-2B. CACHEON

TURN ON DISC CACHE

This command, unique to HP 793X disc drives, turns on the disc cache.

INPUT FORMAT:

Input the TEST name

?

[CACHEON]

OUTPUT FORMAT:

CACHE CONTROL UTILITY

Cache now enabled

CACHE CONTROL UTILITY COMPLETED

2-2C. CACHE LOG

DISPLAY CACHE LOG

The cache log interrogates HP 793X disc drives about the status of the disc cache, if one is installed. It displays the number of correctable and uncorrectable errors since the log was last cleared.

INPUT FORMAT:

Input the TEST name

?

[CACHE LOG]

OUTPUT FORMAT:

READ CACHE ERROR LOG UTILITY

Correctable errors = nnnn

Uncorrectable errors = nnnn

READ CACHE ERROR LOG

UTILITY COMPLETED

2-2D. CACHE STATUS

DISPLAY CACHE STATUS

This command, unique to HP 793X disc drives, tells you the status of the disc cache.

INPUT FORMAT:

Input the TEST name

?

[CACHE STATUS]

OUTPUT FORMAT:

CACHE STATUS UTILITY

Cache enabled (or disabled)

CACHE STATUS UTILITY COMPLETED

2-3. CHANNEL

TEST HP-IB CHANNEL

The CHANNEL command initiates a read and write loopback test over the HP-IB channel. A loopback test checks the integrity of the HP-IB channel and its interface to the device. If the channel test fails, either the HP-IB channel is at fault or the Processor-to-HP-IB (PHI) circuitry on the device controller is not working properly.

INPUT FORMAT:

Input the TEST name
?

[CHANNEL]

Current HPIB device
address = nnnn
Do you want to test another
device address
?

[YES] or [NO]

Select one HPIB address
?

[VVVV]

OUTPUT FORMAT:

HPIB CHANNEL TEST

READ loopback test passed
WRITE loopback test passed

HPIB CHANNEL UTILITY COMPLETED

If an error occurs, any of the following may be output:

ERROR in READ LOOP BACK data,
Byte was nnnn
Should have been nnnn

ERROR in WRITE LOOP BACK data,
Byte was nnnn
Should have been nnnn

READ loopback test
transfer length error
Received nnnn bytes
Expected 512 bytes

WRITE loopback test
transfer length error
Received nnnn bytes
Expected 512 bytes

2-4. CICLEAR

CHANNEL INDEPENDENT CLEAR

This command will clear any device connected to the channel. If the controller unit is selected prior to issuing CICLEAR, all units within the device are cleared; otherwise, only the current unit selected will be cleared.

INPUT FORMAT:

Input the TEST name

?

[CICLEAR]

OUTPUT FORMAT:

CHANNEL INDEPENDENT CLEAR
UTILITY

CHANNEL INDEPENDENT CLEAR
UTILITY COMPLETED

2-5. CLEAR LOGS

ERASE LOGS

CAUTION

CLEAR LOGS will erase information from one or more of the logs on the selected unit.

The CLEAR LOGS command clears the run-time data error log, the error rate test log, the fault log, and the cache log. The error summary is cleared if the disc unit is selected prior to issuing the CLEAR LOGS. The user has the option of clearing just the ERT LOG which allows each error rate test to accumulate its own errors in the error log.

INPUT FORMAT:

Input the TEST name

?

[CLEAR LOGS]

0-clear all logs

1-ERT LOG

2-fault run log(HP 794X only)

3-cache log(7933XP)

Which log?

[VVVV]

OUTPUT FORMAT:

CLEAR LOGS UTILITY

ERT, CACHE, or ALL log(s) cleared

CLEAR LOGS UTILITY COMPLETED

2-6. CRGTST

TEST 7933/35 CARRIAGE

This program tests the operation of the carriage assembly within HP 7933/35 disc drives. First a power-on spin-up diagnostic is performed, then a random read-only error rate test is initiated and finally, the head value table is read. The head values are stored and the previously described sequence is executed five times. At the end of the fifth loop the head values which were stored from each loop are evaluated and the change in slopes is derived. A change in slope greater than 45 microinches causes the test to fail; this means that the carriage bearings and rails must be cleaned thoroughly or possibly replaced.

In order for CRGTST to execute properly, the disc drive must be spun up prior to the test. This is done by pressing the LOAD/UNLOAD switch to the LOAD (in) position and waiting until the message "DRIVE <device number>" appears on the alphanumeric display.

INPUT FORMAT:

Input the TEST name

?

Press the [PAUSE] key.

Type [LOAD "CRGTST"]

Press the [RUN] key.

OUTPUT FORMAT:

CARRIAGE TEST UTILITY

PASSED!

If the test fails, the following is output:

FAILED!

CLEAN THE RAILS AND CARRIAGE
BEARINGS THOROUGHLY.
IF THE RAILS HAVE ALREADY BEEN
CLEANED IT MAY BE NECESSARY TO
REPLACE THE CARRIAGE ASSEMBLY.

2-6A. D2D

DISC-TO-DISC BACK UP

D2D is a program used to recover data. The utility establishes a full-volume transfer between two CS/80 devices. This utility is useful when a disc exhibits media problems that prevent a successful system reload. The data is copied from the source device to another disc called the destination device. D2D is not intended to be used for normal backup because it has been purposely designed to be fault-tolerant. If an unrecoverable data error is encountered on the source, the normal 800 millisecond retry algorithm will be performed; but, any data bits that are not read successfully will be passed to the destination as good data. If a Drive Error (DERROR) occurs during the transfer, the operation will be aborted.

Some DERRORs can occur as a result of a write problem or a media defect. Any sector which produces a DERROR which is not hardware related must be spared with the SPARE utility (use the option which retains data). The only data which cannot be recovered by the spare operation is the bad data itself, which is unrecoverable anyway. Sparing the defective area allows the rest of the track to be recovered without causing the offending DERROR. To determine if reading any sectors will cause hard DERRORs, perform a Read-Only Error Rate Test (RO ERT) on the entire volume and inspect the fault log. Any sectors with solid DERRORs should be spared and then the RO ERT should be repeated until no sectors have DERRORs.

Be certain that any sector suspected of having a solid DERROR is proven to be solid by performing a RO ERT on the particular track on which the sector resides while checking for repeatable failure. Normally, the length of any uncorrected data will be about two bytes, with the remaining 254 bytes in that sector not exhibiting any error. This means that the chance of a particular data error actually corrupting the user's data base is small, but possible. Other defects on the source media such as an automatic head-alignment band which has been erased (7933/35 only) or servo defects are ignored during the transfer. For these types of defects, the integrity of the recovered data is very high since these are non-data errors. Since this utility is only to be used when a fault condition exists, it is mandatory that the transfer operation be verified after completion. To verify the data transfer, use the RF SECTOR utility (7933/35 and 791X with revision 5 firmware or later only) or the Locate-and-Read (LCRD in OPER) command to match selected sectors on the media. Recommended locations to match are the first, last, and approximate middle sector of the volume size which was transferred.

Since this utility allows transferring between two different sized discs, always use the smaller capacity disc size to determine the last sector (block addressing is recommended).

INPUT FORMAT:

Input the TEST name
?

Press the [PAUSE] key.

Type [LOAD "D2D"]

Press the [RUN] key.

External Exerciser Commands

OUTPUT FORMAT:

Disc to disc transfer program

Revision - nnnn

The following CS'80 devices
responded:

nnnn nnnn nnnn etc.

Select source address <=7

?

[VVVV]

Select destination address <=7

?

[VVVV]

Input the unit number for the
source

?

[VVVV]

Source dev type = DISC or TAPE

HPIB addr= nnnn

Input the unit number for the
destination

?

[VVVV]

Destination dev type = DISC or TAPE

HPIB addr= nnnn

Transfer from nnnn to nnnn

Press 'CONT' to continue

Press the [CONT] key.

Transfer in progress

DESTINATION error status is:

Status message follows:

nnnn nnnn nnnn nnnn nnnn nnnn nnnn nnnn nnnn nnnn

nnnn nnnn nnnn nnnn nnnn nnnn nnnn nnnn nnnn nnnn

Final status for SOURCE:

Status message follows:

nnnn nnnn nnnn nnnn nnnn nnnn nnnn nnnn nnnn nnnn

nnnn nnnn nnnn nnnn nnnn nnnn nnnn nnnn nnnn nnnn

Final status for DESTINATION:

Status message follows:

nnnn nnnn nnnn nnnn nnnn nnnn nnnn nnnn nnnn nnnn

nnnn nnnn nnnn nnnn nnnn nnnn nnnn nnnn nnnn nnnn

End of transfer

PROGRAM WILL NOW STOP

2-7. DESCRIBE

DESCRIBE SELECTED UNIT

The DESCRIBE command allows information within the currently addressed unit to be sent to the HP 85. The information consists of identification and addressing parameters about the unit which is currently addressed.

INPUT FORMAT:

Input the TEST name
?

[DESCRIBE]

OUTPUT FORMAT:

DESCRIBE UTILITY

Model: 79XX or CTD
Unit: nnnn
Type: DISC, TAPE, CONTROLLER, or UNKNOWN
Max cyl addr: nnnn
Max head addr: nnnn
Max sect addr: nnnn
Max block addr: nnnn
Current interleave: nnnn

DESCRIBE UTILITY COMPLETED

2-8. DIAG

PERFORM INTERNAL DIAGNOSTICS

This test will invoke diagnostic routines which reside in the internal device controller firmware. The specific diagnostics are unique to each device and are therefore described in the service manual for each device. Certain macrodiagnostics involve extensive device verification which re-establish default parameters such as selected unit and length.

INPUT FORMAT:

Input the TEST name

?

[DIAG]

Input diagnostic number <= 127

?

[VVVV]

Input the loop count <= 65535

?

[VVVV]

OUTPUT FORMAT:

INTERNAL DIAGNOSTIC TEST

Diagnostic # = nnnn

Number of times to loop= nnnn

INTERNAL DIAGNOSTIC

TEST COMPLETED

If a fault occurs during a diagnostic test, a status message will be output. See the **REQSTAT** command in this section for an explanation of the output.

2-9. ERRSUM

OUTPUT TEST ERROR SUMMARY

The Error Summary (ERRSUM) utility, unique to HP 7908 and HP 791X devices, prints a list of all Test Errors (TERRORS) which have occurred since the last power-on sequence or self test operation. The device keeps a record of the last four error summaries on the disc maintenance tracks. The CLEAR LOGS command clears the error summaries only if the disc unit is selected. The service manual for the particular device being diagnosed should be consulted for a list of TERRORS as the information is device dependent.

INPUT FORMAT:

Input the TEST name

?

[ERRSUM]

Do you want the previous (P) or
current (C) results

?

[P] or [C]

OUTPUT FORMAT:

READ ERROR SUMMARY UTILITY

CURRENT or PREVIOUS ERROR SUMMARY

CURRENT error numbers:

HHH HHH HHH HHH HHH HHH HHH HHH
HHH HHH HHH HHH HHH HHH HHH HHH
Until all TERRORS are displayed.

or

No errors found.

If [P] is entered, the following additional information is output:

CURRENT - 1 error numbers:

HHH HHH HHH HHH HHH HHH HHH HHH
Until all errors are displayed.

CURRENT - 2 error numbers:

HHH HHH HHH HHH HHH HHH HHH HHH
Until all errors are displayed.

CURRENT - 3 error numbers:

HHH HHH HHH HHH HHH HHH HHH HHH
Until all errors are displayed.

READ ERROR SUMMARY
UTILITY COMPLETED

2-10. ERT LOG

OUTPUT ERROR RATE TEST LOG

The error rate test log contains an accumulation of all read errors which were found during a read-only or a write-then-read error rate test. Since the Error Correction Circuitry (ECC) is disabled during an error rate test, the ERT LOG will accumulate both correctable and uncorrectable errors. Each data head has its own error rate test log for that surface. Error rate test errors are accumulated until the log is cleared using the CLEAR LOGS command.

INPUT FORMAT:

Input the TEST name

?

[ERT LOG]

Print error decoding information

?

[YES] or [NO]

The following is the error decoding information:

TYPE:

UNC = ECC uncor. data error

COR = ECC correctable data error

CRC = Error detected only by CRC

CNT = Occurrence count

(RUN/ERT logs only)

LPC = Loop count

(RO/WTR ERT's only)

ERR BYTE:

00000000 ECC found cor. error
(ERT LOG only)

00000001 ECC found uncor. error

00000010 ECC didn't detect error

00000100 Error is in sect header

00001000 CRC didn't detect error

00010000 First retry didn't
recover data

00100000 Extra offset used

01000000 Formatter/Separator
error

10000000 Unrecoverable error
(RUN LOG only)

Input the head number or ALL

?

[VVVV] or [ALL]

OUTPUT FORMAT:

READ ERT DATA ERROR LOG UTILITY

The following is output for each head which was selected:

Head # = nnnn
No. of sectors read = nnnn
ECC correctable errors = nnnn
ECC uncorrectable errors = nnnn
Error addresses logged = nnnn

The following is output for each error:

 CYL HEAD SECT TYPE CNT ERR BYTE
nnnn nnnn nnnn xxxx nnnn BBBBBBBB
Until all errors are displayed.

READ ERT DATA ERROR LOG
UTILITY COMPLETED

2-11. EXIT

EXIT PROGRAM OR COMMAND

EXIT can be entered after any prompt. If EXIT is entered in response to "Input the TEST name", the program will halt. Any other time EXIT is entered, the prompt "Input the TEST name" will be displayed.

INPUT FORMAT:

Input the TEST name
?
[EXIT]

OUTPUT FORMAT:

PROGRAM WILL NOW HALT.

2-12. FAULT LOG

OUTPUT FAULT LOG

The fault log is an accumulation of the faults which have occurred on a device since the last time a CLEAR LOGS command was issued. The fault log resides on the disc maintenance tracks.

INPUT FORMAT:

Input the TEST name
?

[FAULT LOG]

OUTPUT FORMAT:

READ DRIVE FAULT LOG UTILITY

Number of faults logged = nnnn.

CURRENT Address:

Cyl = nnnn Head = nnnn Sect = nnnn*

TARGET Address:

Cyl = nnnn Head = nnnn Sect = nnnn*

TERROR = nnnn (if any)

DERROR = nnnn (if any)

Fault reg. = BBBB BBBB binary

*Physical addresses print "N/A".

or

No drive faults to report

On the 7908/1X products the
Fault reg. is valid only for
DERRORs 64 and 203. (decimal)

READ DRIVE FAULT LOG
UTILITY COMPLETED

2-13. HELP

OUTPUT HELP INFORMATION

HELP prints out all command names. An asterisk (*) appears before commands that are not in the program currently running. Consult the service manual for the particular device being diagnosed.

INPUT FORMAT:

Input the TEST name

?

[HELP]

OUTPUT FORMAT:

AHA-Auto head alignment (7933/35)	OPER-create user programs
AMCLEAR-794X or 7907 device clear	PRESET-update device logs
CACHEOFF-disable cache	RESET STATS-clear cache stats
CACHEON-enable cache	REQSTAT-request status
CACHE LOG-read cache error log	REV-output firmware revision
CACHE STATUS-check cache status	RF SECTOR-read full sector
CANCEL-cancel transaction	RO ERT-perform read-only error rate test
CERT-perform tape certification	RUN LOG-output run log data
CHANNEL-test HP-IB channel	SDCLEAR-clear selected device
CICLEAR-channel independent clear	SENSE-output sensor data
CLEAR LOGS-erase logs	SERVO-perform 794X or 7907 servo test
CRGTST-test 7933/35 carriage	SPARE-spare block
D2D-disc-to-disc back up program	SPARE TABLE-output spare table
DESCRIBE-describe selected unit	TABLES-output device tables
DIAG-perform internal diagnostics	UNIT-set unit number
ERRSUM-output ERROR summary	UNLOAD-unload tape cartridge
ERT LOG-output error rate test log	USE LOG-output tape use log
EXIT-exit program or command	WRITE FM-write file mark
FAULT LOG-output fault log	WTR ERT-perform write-then-read error rate test
HELP-output help information	
INIT MEDIA-initialize media	

2-14. INIT MEDIA

INITIALIZE MEDIA

CAUTION

INIT MEDIA will erase all user data on the selected unit. Depending on the amount of memory in the device, INIT MEDIA could take a long time to complete.

This utility performs an initialization routine on the disc media. INIT MEDIA allows the user to: retain primary (factory) and secondary (field) spares; retain only primary spares; or, retain no spares (a full initialization). After a full initialization, it is imperative that an extensive error rate test be performed and that all questionable sectors be spared. INIT MEDIA erases all user data.

INPUT FORMAT:

Input the TEST name

?

[INIT MEDIA]

This utility will destroy all current data.

Should this utility continue

?

[YES] or [NO]

Do you want to:

I = Initialize maintenance
tracks and retain no spares

P = retain only primary spares
or

B = retain primary and
secondary spares

?

[I] or [P] or [B]

Input the interleave value <=32

?

[VVVV]

OUTPUT FORMAT:

INITIALIZE MEDIA UTILITY

This utility may take several minutes to complete.

INITIALIZE MEDIA
UTILITY COMPLETED

2-15. PRESET

UPDATE DEVICE LOGS

This command causes all recent information in controller RAM to be logged on the disc maintenance tracks, and an automatic head alignment takes place on devices which utilize this feature.

INPUT FORMAT:

Input the TEST name

?

[PRESET]

OUTPUT FORMAT:

PRESET DRIVE UTILITY

PRESET DRIVE UTILITY COMPLETED

2-16. REQSTAT

REQUEST STATUS

This utility sends a status message from the device to the exerciser. The status message consists of addressing information and any fault or error information which may be available. A status message can result during any transaction sequence while using the exerciser. REQSTAT or CICLEAR will clear the current status information.

INPUT FORMAT:

Input the TEST name

?

[REQSTAT]

OUTPUT FORMAT:

REQUEST STATUS UTILITY

The following four lines are output for HP 7907 devices:
Current unit = nnnn (Fixed, Removable, or Controller)

Status bytes follow (hex):

HH HH HH HH HH HH HH HH HH HH

HH HH HH HH HH HH HH HH HH HH

Status message follows:

Current unit is nnnn

Unit type: Disc, Tape, Controller, or Unknown

Unit nnnn (or No units) with pending status

New target address is:

Cyl=nnnn Head=nnnn Sect=nnnn

REQUEST STATUS UTILITY COMPLETED

Any of the following messages may be output as part of the status message.

Status bits set are:

Channel parity error

Illegal opcode

Illegal volume or unit number

Address bounds error

Parameter bounds error

Illegal parameter error

Message sequence error

Message length error

External Exerciser Commands

Cross units which failed are: nnnn
Status bit set but no unit
numbers in parameter field
Controller fault
Unit fault
Hardware failed diagnostics
Error codes are:
Part number = nnnn failed
TERROR = nnnn
or
FRA number nnnn failed
Failing subtest num.(nnnn)= nnnn hex
Non-responding host on PRI/SEC port
Unknown (parameter field used)
Release required for:
OPERATOR request
or
DIAGNOSTIC result
or
INTERNAL maintenance
Power on or media just loaded
Retransmit error

Illegal parallel operation
Uninitialized media
No more spares available
Selected drive is not ready
Volume is write protected
No data found
Inconsistent lock or unlock
Device, Unit, Sector range, Lock table or
Resource unavailable
(Resource unavailable if parameter field is used)
Unrecoverable data overflow
Unrecoverable data error
Address of unrecoverable data:
Cyl=nnnn Head=nnnn Sect=nnnn
or
Block address = nnnn
or
Unknown (parameter field used)
End of File encountered
End of Volume encountered

Release requested for:
 Operator request
 or
 Diagnostic result
 or
 Internal maintenance
 Unit requesting release is:
 Unit nnnn
 or
 Unknown (parameter field used)
 Media wearing out
 Data overrun
 Auto sparing invoked
 Device, Unit, Sector range or Resource available
 (Resource available if parameter field is used)
 Recoverable data overflow
 Marginal data error
 Address of marginal data:
 Cyl=nnnn Head=nnnn Sect=nnnn
 or
 Block address = nnnn
 or
 Unknown (parameter field used)
 Recoverable data error, latency
 induced in order to
 recover the data
 Address of recoverable block:
 Cyl=nnnn Head=nnnn Sect=nnnn
 or
 Block address = nnnn
 or
 Unknown (parameter field used)
 Maintenance track overflow
 Derrors follow:
 DERROR = nnnn
 Fault reg. =BBBBBBBB binary
 New target address is:
 Cyl=nnnn Head=nnnn Sect=nnnn
 or
 Block address = nnnn
 or
 Unknown (parameter field used)

2-17. REV

OUTPUT FIRMWARE REVISION

This utility reads the current revision numbers of the ROM's within the internal device controller.

INPUT FORMAT:

Input the TEST name

?

[REV]

OUTPUT FORMAT:

READ REVISION NUMBER UTILITY

Part number	Revision number
-----	-----
0	nnnn - r (nnnn=revision number)
1	nnnn - r (r=rework number)
2	nnnn - r
3	nnnn - r
4	nnnn - r
5	nnnn - r
6	nnnn - r (HP 793X only)

READ REVISION NUMBER
UTILITY COMPLETED

2-17A. RESET STATS

RESET STATS

This command, unique to HP 793X disc drives, allows the cache table to be cleared.

INPUT FORMAT:

Input the TEST name

?

[RESET STATS]

OUTPUT FORMAT:

Clear cache Statistic Table

?

[YES] or [NO]

CLEAR CACHE STATISTICS
UTILITY COMPLETED

2-18. RF SECTOR

READ FULL SECTOR

This utility (unique to HP 7933/35 and 791X with revision 5 firmware or later) reads and prints out a full sector from the specified logical address. A full sector includes the sector header, user data, CRC, and ECC information.

INPUT FORMAT:

Input the TEST name

?

[RF SECTOR]

Number of times to loop reading
the same sector<=32767

?

[VVVV]

Do you want block 'B' or three
vector 'V' addressing

?

[B] or [V]

Enter address changes or just
END LINE to keep the current
the current values

If [B] is entered:

Current block address = nnnn

?

[VVVV] or [END LINE]

If [V] is entered:

Current cylinder addr = nnnn

?

[VVVV] or [END LINE]

Current head address = nnnn

?

[VVVV] or [END LINE]

Current sector addr = nnnn

?

[VVVV] or [END LINE]

External Exerciser Commands

OUTPUT FORMAT:

READ FULL SECTOR UTILITY

Cyl=nnnn Head=nnnn Sect=nnnn

Status = nnnn
Physical sector # = nnnn
Head # = nnnn
Physical cylinder # = nnnn
Spare sector = nnnn

1 HH HH HH HH HH HH HH HH
9 HH HH HH HH HH HH HH HH
17 HH HH HH HH HH HH HH HH
.
.
.
249 HH HH HH HH HH HH HH HH

CRC = BBBB BBBB BBBB BBBB

ECC follows:
1 = BBBB BBBB
2 = BBBB BBBB
3 = BBBB BBBB
4 = BBBB BBBB
5 = BBBB BBBB

READ FULL SECTOR
UTILITY COMPLETED

2-19. RO ERT

PERFORM READ-ONLY ERROR RATE TEST

There are two types of RO ERT's: The standard type allows the user to specify a starting address for a sequential read; the random type reads 256 random addresses using random lengths. The results of the test can be logged or immediately displayed.

The offset value range that each device allows is as follows:

Device	Maximum Offset Range
HP 7908	± 20
HP 7911	± 15
HP 7912	± 15
HP 7914	± 7
HP 7933	±127
HP 7935	±127

INPUT FORMAT:

Input the TEST name

?

[RO ERT]

Input the loop count;

1 <= count <=254 or INF

?

[VVVV] or [INF]

Do you want a random read only

ERT

?

[YES] or [NO]

If [YES] is entered, the following addressing information is asked:

Enter address changes or just

END LINE to keep the current
values

Current cylinder addr = nnnn

?

[VVVV] or [END LINE]

Current head address = nnnn

?

[VVVV] or [END LINE]

Current sector addr = nnnn

?

[VVVV] or [END LINE]

External Exerciser Commands

Do you want to test the
V = volume, H = head, T = track
C = cylinder, or S = sector
?
[V] or [H] or [T] or [C] or [S]

Do you want to enter an offset
?
[YES] or [NO]
Input offset -127<=offset<=127
?
[VVVV]

Output formats are:
PRT = print error information
LOG = log in error rate log
Enter the format
?
[PRT] or [LOG]

If [PRT] was entered:

Print error decoding information
?
[YES] or [NO]

The following is the error decoding information:

TYPE:
UNC = ECC uncor. data error
COR = ECC correctable data error
CRC = Error detected only by CRC

CNT = Occurrence count
(RUN/ERT logs only)

LPC = Loop count
(RO/WTR ERT's only)

ERR BYTE:
00000000 ECC found cor. error
(ERT LOG only)
00000001 ECC found uncor. error
00000010 ECC didn't detect error
00000100 Error is in sect header
00001000 CRC didn't detect error
00010000 First retry didn't
recover data
00100000 Extra offset used
01000000 Formatter/Separator
error
10000000 Unrecoverable error
(RUN LOG only)

OUTPUT FORMAT:

READ ONLY ERT TEST

If **[PRT]** was entered:

 CYL HEAD SECT TYPE LPC ERR BYTE
 nnnn nnnn nnnn xxxx nnnn BBBBBBBB
 Error begins at byte nnnn (if TYPE=COR)
 Until all errors are displayed.

If **[LOG]** was entered:

Do you want to see the ERT LOG

?

[YES] or **[NO]**

If **[YES]** is entered, refer to ERT LOG, section II.

READ ONLY ERT TEST COMPLETED

2-20. RUN LOG

OUTPUT RUN LOG

The run log contains an accumulation of all read errors which were found during run time. Run-time data errors are accumulated and logged on the disc maintenance tracks automatically during normal device operation. Each data head has its own run log for that surface. Run-time data errors are accumulated until the log is cleared using the CLEAR LOGS command.

INPUT FORMAT:

Input the TEST name

?

[RUN LOG]

Print error decoding information

?

[YES] or [NO]

The following is the error decoding information:

TYPE:

UNC = ECC uncor. data error

COR = ECC correctable data error

CRC = Error detected only by CRC

CNT = Occurrence count

(RUN/ERT logs only)

LPC = Loop count

(RO/WTR ERT's only)

ERR BYTE:

00000000 ECC found cor. error
(ERT LOG only)

00000001 ECC found uncor. error

00000010 ECC didn't detect error

00000100 Error is in sect header

00001000 CRC didn't detect error

00010000 First retry didn't
recover data

00100000 Extra offset used

01000000 Formatter/Separator
error

10000000 Unrecoverable error
(RUN LOG only)

Input the head number or ALL

?

[VVVV] or [ALL]

OUTPUT FORMAT:

READ RUN TIME DATA ERROR LOG
UTILITY

The following is output for each head which was selected:

Head # = nnnn
No. of sectors read = nnnn
ECC correctable errors = nnnn
ECC uncorrectable errors = nnnn
Error addresses logged = nnnn

The following is output for each uncorrectable error:

CYL HEAD SECT TYPE CNT ERR BYTE
nnnn nnnn nnnn xxxx nnnn BBBB BBBB
Until all errors are displayed.

READ RUN TIME DATA ERROR LOG
UTILITY COMPLETED

2-21. SDCLEAR

CLEAR SELECTED DEVICE

This command clears the device on the channel which is currently addressed. Any operation the device is performing when SDCLEAR is received is terminated as soon as possible such that no data corruption takes place. All complementary parameters such as unit and length are restored to their default values and any pending status is cleared. The internal device RAM is cleared also. To clear HP 794X or HP 7907 devices, use the AMCLEAR command (refer to section V or VI); do not use SDCLEAR.

INPUT FORMAT:

Input the TEST name

?

[SDCLEAR]

OUTPUT FORMAT:

SELECTED DEVICE CLEAR UTILITY

SELECTED DEVICE CLEAR
UTILITY COMPLETED

2-22. SENSE

OUTPUT SENSOR DATA

This utility is unique to HP 793X devices since they have temperature and air pressure sensors. SENSE reads the value of the temperature and air pressure within the device and also displays the hardware and read/write fault register contents. The bit pattern definitions are as follows:

Hardware (H/W) Fault Register Values	
SPINDLE SPEED DOWN	00000001
HEADS OFF TRACK	00000010
TRACK FOLLOWER PLL ERROR	00001000
TOP DOOR IS OPEN	00010000
EMERGENCY RETRACT IS SET	00100000
POWER FAILURE	01000000
READ/WRITE FAULT	10000000

Read/Write (R/W) Fault Register Values	
WRITE WITHOUT AC WRITE CURRENT	00000001
DC WRITE CURRENT WITHOUT WRITE	00000010
WRITE WITHOUT DC WRITE CURRENT	00000100
MULTIPLE HEADS ARE SELECTED	00001000

INPUT FORMAT:

Input the TEST name

?

[SENSE]

OUTPUT FORMAT:

READ SENSORS UTILITY

Blower pressure = GOOD or BAD

Filter pressure = GOOD or BAD

Exhaust air temperature

= nnnn (+/-)3 degrees C

Actuator coil temperature

= nnnn (+/-)3 degrees C

H/W fault reg = BBBB BBBB

binary

R/W fault reg = BBBB BBBB

binary

READ SENSORS UTILITY COMPLETED

2-23. SPARE

SPARE SECTOR

CAUTION

A full power-on diagnostic should be successfully performed before sparing any sectors. This will prove that the device is capable of sparing.

This utility physically relocates a sector to an address which is reserved for sparing. The user has the option to retain the data on the affected track (except the sector which is determined to be bad). All sectors which are spared with the CS/80 External Exerciser are secondary (field) spares. The second sparing operation performed on a given track causes the entire track to be relocated since there is only one available spare sector per track.

A WTR ERT with a loop of 20 should be performed on a particular logical sector address after it has been spared. This ensures that the previously unused available spare sector is good. Since the entire track may have been spared, a RO ERT with a loop of 20 should be performed on the logical track also. This ensures that the previously unused available spare track is good. If either the logical sector or track which was addressed during the spare operation fails the error rate tests, the same logical sector should be spared again (relocated) until both error rate tests pass successfully.

INPUT FORMAT:

Input the TEST name

?

[SPARE]

Do you want to retain the data

?

[YES] or **[NO]**

Do you wish block 'B' or three
vector 'V' addressing

?

[B] or **[V]**

The spare command sequence restarts here for sparing multiple sectors.

Enter address changes or just
END LINE to keep the current
the current values

If **[B]** was entered:

Current block address = nnnn

?

[VVVV] or **[END LINE]**

If **[V]** was entered:

Current cylinder addr = nnnn

?

[VVVV] or **[END LINE]**

Current head address = nnnn
?
[VVVV] or [END LINE]

Current sector addr = nnnn
?
[VVVV] or [END LINE]

OUTPUT FORMAT:

SPARE BLOCK UTILITY

Spared address was:
Cyl = nnnn Head = nnnn Sect = nnnn
 or
BLOCK nnnn

Spare another address
?
[YES] or [NO]

SPARE BLOCK UTILITY COMPLETED

2-24. SPARE TABLE

OUTPUT SPARE TABLE

This command accesses the information in the spare table. It provides identical information as that obtained when using the TABLES command and selecting table number 1. The spare table is a list of all logical tracks which have been spared for each head.

INPUT FORMAT:

Input the TEST name

?

[SPARE TABLE]

READ DRIVE SPARE TABLES UTILITY

Head number = nnnn

of secondary spare

operations = nnnn

of tracks used = nnnn

of logical tracks spared = nnnn

Until all heads are displayed.

The following is output for each logical track which is spared:

CYL	TYPE	SCALAR
nnnn	xxxx	nnnn (xxxx = PRIMARY or SECONDARY)

READ DRIVE SPARE TABLES

UTILITY COMPLETED

2-25. TABLES

OUTPUT DEVICE TABLES

This utility accesses the tables stored internally within the device. The tables consist of: the spare track table, which is a list of all logical tracks that have been spared for each head; the head value table, which shows alignment values for each head; the configuration table, which is a list of the current configuration variables that allow custom device operation; and, the runout table, which shows the amount of eccentric runout (radial shift) for each head.

INPUT FORMAT:

Input the TEST name
?

[TABLES]

Drive table numbers are:

- 1 = Spare track table
- 2 = Head value table (HP 7933/35 only)
- 3 = Configuration table (HP 7933/35 only)
- 4 = Not used
- 5 = Not used
- 6 = Servo runout table (HP 7933/35 only)
- 7 = Cache table (HP 7933/35 only)

Input drive table number
?

[VVVV]

OUTPUT FORMAT:

READ DRIVE SPARE TABLES UTILITY

Head number = nnnn
of secondary spare
operations = nnnn
of tracks used = nnnn
of logical tracks spared = nnnn
Until all heads are displayed.

The following is output for each logical track which is spared:

CYL	TYPE	SCALAR	
nnnn	xxxx	nnnn	(xxxx = PRIMARY or SECONDARY)

READ DRIVE SPARE TABLES
UTILITY COMPLETED

READ DRIVE HEAD VALUE TABLES UTILITY

Alignment values for head # nnnn
BAND 0 = nnnn (outside diameter)

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Δ0,1 = nnnn (change from middle to outside diameter)
BAND 1 = nnnn (middle diameter)
Δ1,2 = nnnn (change from inside to middle diameter)
BAND 2 = nnnn (inside diameter)
Until all heads are displayed.

Skew values for head # nnnn
BAND 0 = nnnn
Δ0,1 = nnnn
BAND 1 = nnnn
Δ1,2 = nnnn
BAND 2 = nnnn
Until all heads are displayed.

Current Cylinder Offset Table
Head 0 = nnnn
Head 1 = nnnn
Head 2 = nnnn
Until all heads are displayed.

READ DRIVE TABLES
UTILITY COMPLETED

READ DRIVE CONFIGURATION TABLES UTILITY

Transfer length = nnnn
Burst length = nnnn
Retry time = nnnn
Status mask = BBBB
RPS window = nnnn
RPS advance = nnnn
Set release Z bit = ON/OFF
Set release T bit = ON/OFF
Options flag = BBBB
Burst with EOI = ON/OFF
Return address = BLOCK/3 VECTOR

READ DRIVE TABLES
UTILITY COMPLETED

READ DRIVE RUNOUT TABLES UTILITY

HEAD	RUNOUT
0	nnnn
1	nnnn
2	nnnn

Until all heads are displayed.

READ DRIVE TABLES
UTILITY COMPLETED

READ DRIVE CACHE TABLE

Cache Statistic Table

Cache enabled on ldev nnnn

Cache page size (bytes) = nnnn
number of pages = nnnn

number of reads = nnnn
number of read hits = nnnn

number of writes = nnnn
number of write hits = nnnn

read hit % = nnnn
write hit % = nnnn
read % = nnnn

READ DRIVE TABLES
UTILITY COMPLETED

2-26. UNIT**SET UNIT NUMBER**

This utility allows the user to select the unit number to be addressed within the device. The units within a CS/80 device include the disc unit, the controller, and possibly a cartridge tape unit. The disc is always unit "0". The tape unit in a standard disc/tape drive is always unit "1"; devices with dual controllers (Option 001) have both disc and tape units of "0" (each has its own channel).

INPUT FORMAT:

Input the TEST name

?

[UNIT]

Input the unit number <= 15

?

[VVVV]

OUTPUT FORMAT:

SET UNIT NUMBER UTILITY

If the device has just been powered-on, or media has just been loaded or is not initialized, one or both of the following status messages will be output:

Power on or media just loaded

status on unit nnnn

Media uninitialized

Current unit selected = nnnn

SET UNIT NUMBER

UTILITY COMPLETED

2-27. WTR ERT

PERFORM WRITE-THEN-READ ERROR RATE TEST

CAUTION

WTR ERT will erase some or all of the user data on the selected unit.

There are three types of WTR ERT's. The pattern test (PT) allows the user to input a starting address; the test sequentially writes and then reads the entire volume from the specified starting address until the end-of-volume is reached. The random test (RN) writes and then reads 256 random addresses. The short test (SH) is a combination of the two other tests: random addresses near the outer edge of the disc are written and then read; this test is optimized for speed. A WTR ERT can LOG error information obtained during the test on the disc maintenance tracks or print (PRT) the information out immediately.

The offset value range that each device allows is as follows:

Device	Maximum Offset Range
HP 7908	± 20
HP 7911	± 15
HP 7912	± 15
HP 7914	± 7
HP 7933	±127
HP 7935	±127

INPUT FORMAT:

Input the TEST name

?

[WTR ERT]

This test will destroy current data.

Should it continue

?

[YES] or [NO]

Input the loop count;

1 <= count <=254 or INF

?

[VVVV] or [INF]

Types of Write Then Read ERT's:

PT = Pattern test ERT

RN = Random address ERT.

SH = Short ERT.

Enter the type of test

?

[PT] or [RN] or [SH]

If [PT] was entered:

Enter address changes or just
END LINE to keep the current
values

Current cylinder addr = nnnn
?
[VVVV] or [END LINE]

Current head addr = nnnn
?
[VVVV] or [END LINE]

Current sector addr = nnnn
?
[VVVV] or [END LINE]

Do you want to test the
V = volume, H = head, T = track
C = cylinder, or S = sector
?
[V] or [H] or [T] or [C] or [S]

Do you want to enter an offset
?
[YES] or [NO]
Input offset -127<=offset<=127
?
[VVVV]

Sources of the bit pattern are:
PT = ERT internal Pattern Table
RN = ERT generates Random
pattern table
UP = User inputs pattern table

Enter the pattern source
?
[PT] or [RN] or [UP]

If [UP] was entered:

Input a hexadecimal pattern of
up to 8 hex digits.
?
[HHHHHHHH]

Output formats are:
PRT = print error information
LOG = log in error rate log
Enter the format
?
[PRT] or [LOG]

If [PRT] was entered:

External Exerciser Commands

Print error decoding information

?

[YES] or [NO]

The following is the error decoding information:

TYPE:

UNC = ECC uncor. data error

COR = ECC correctable data error

CRC = Error detected only by CRC

CNT = Occurrence count

(RUN/ERT logs only)

LPC = Loop count

(RO/WTR ERT's only)

ERR BYTE:

00000000 ECC found cor. error
(ERT LOG only)

00000001 ECC found uncor. error

00000010 ECC didn't detect error

00000100 Error is in sect header

00001000 CRC didn't detect error

00010000 First retry didn't
recover data

00100000 Extra offset used

01000000 Formatter/Separator
error

10000000 Unrecoverable error
(RUN LOG only)

OUTPUT FORMAT:

WRITE THEN READ ERT TEST

If [PRT] was entered:

 CYL HEAD SECT TYPE LPC ERR BYTE
nnnn nnnn nnnn xxxx nnnn BBBBBBBB
Error begins at byte nnnn (if TYPE=COR)
Until all errors are displayed.

If [LOG] was entered:

Do you want to see the ERT LOG

?

[YES] or [NO]

If [YES] is entered, refer to ERT LOG, section II.

WRITE THEN READ ERT
TEST COMPLETED

TAPE EXERCISER COMMANDS

SECTION

III

3-1. INTRODUCTION

This section documents the commands which are in the TAPE program on the HP 85 External Exerciser tape. All of the commands in this section apply specifically to Cartridge Tape Drives (CTDs) which are integrated into CS/80 devices. Some commands in the TAPE program have identical syntax and operation as documented in section II; these commands have not been repeated in this section, i.e. CANCEL, CICLEAR, CLEAR LOGS, DESCRIBE, EXIT, HELP, PRESET, REQSTAT, SDCLEAR, and UNIT.

Before any command in this section is used, the unit must be set to that of the tape drive. In all standard CS/80 devices, the CTD is unit "1"; in dual controller models (Option 001), the CTD is unit "0" (the CTD has its own channel). The commands are in alphabetical order and the following format is used:

COMMAND NAME

SHORT DEFINITION

Following the command name is an explanation of what the command does and when it should be used.

INPUT FORMAT:

Input the TEST name

?

[**COMMAND NAME**]

OUTPUT FORMAT:

NAME OF UTILITY OR TEST

This is what is printed when the command has been executed.

The following formats are used throughout this section:

nnnn - refers to a decimal number of any magnitude.

[**VVVV**] - refers to a decimal number of variable magnitude which must be input by the user. Bold numbers within brackets [**BOLD**] indicate all user inputs.

H - refers to a hexadecimal digit (0-F).

xxxx - refers to text printed out or displayed by the HP 85.

B - refers to a binary digit (bit) printed out or displayed by the HP 85.

3-2. CERT

PERFORM TAPE CERTIFICATION

CAUTION

CERT will erase all user data from the tape cartridge.

This command performs a write-then-read operation on the entire tape, and skip-spares any block which has two or more frame errors or has an unreadable key. The results of this test are obtained by issuing an ERT LOG command to the tape unit. During the certify test, the gain of the signal coming from the tape is purposely reduced by 14%; this permits more stringent testing to be done during the certify error rate test.

INPUT FORMAT:

Input the TEST name

?

[CERT]

This test will destroy current data.

Should it continue

?

[YES] or **[NO]**

Input the loop count;

1 <= count <=255

?

[VVVV]

Sources of the bit pattern are:

PT = ERT internal Pattern Table

UP = User inputs pattern table

RN = ERT generates Random

pattern table

Enter the pattern source

?

[PT] or **[UP]** or **[RN]**

If **[UP]** was entered:

Input a hexadecimal pattern of up to 8 hex digits

?

[HHHHHHHH]

This may take a few minutes.

OUTPUT FORMAT:

CERTIFICATION ERT TEST

Do you want to see the ERT log
?

[YES] or [NO]

If [YES] is entered, refer to ERT LOG, section III.

CERTIFICATION UTILITY COMPLETED

3-3. ERT LOG

OUTPUT ERROR RATE TEST LOG

The error rate test log contains an accumulation of all read errors which were found during a read-only or a write-then-read error rate test. Since the Error Correction Circuitry (ECC) is disabled during an error rate test, the ERT LOG will accumulate both correctable and uncorrectable errors. The tape has one error rate test log area for the entire tape. Error rate test errors are accumulated until the log is cleared using the CLEAR LOGS command.

The HP 85 External Exerciser TAPE program has the additional capability of drawing a flag plot and printing an error listing during an ERT LOG. A flag plot is a visual image of the entire tape cartridge with blocks shown in the X direction and tracks shown in the Y direction. A "+" indicates a permanent error, a "U" indicates an uncorrectable error, and a "K" indicates an unlocatable key error. The error listing shows the logical addresses which were in error, the frames within the particular block which were at fault (1-6), and whether the error was an uncorrectable error or an unlocatable key error (U or K, respectively).

A flag plot prints out only logical addresses; spared addresses are not recorded. Permanent errors are to be expected during the life of a tape cartridge. Since spare addresses which have errors are placed into the ERT LOG, the number of permanent, uncorrectable, or unlocatable errors may differ from the number indicated in the error listing. These differences are due to the spared addresses.

The flag plot is particularly useful for detecting tape system and tape media problems. When permanent errors are grouped on odd tracks at BOT (0000) or on even tracks at EOT (1021 or 4087), usually with the number of errors per track increasing with track number, this indicates Instantaneous Speed Variation (ISV). Tapes which exhibit ISV should be replaced.

Permanent error clumping in the horizontal direction indicates either a dirty tape head, a faulty tape mechanism, or a media defect (especially errors clumped near the edge of the tape, tracks 0 and 1 or 14 and 15). Defective media should be replaced.

Permanent and/or unlocatable error clumping in the vertical direction indicates cartridge contamination. Look for evidence of white powder on tape friction pins and on the cartridge drive belt.

Excessive spares or vertical clumping on alternate tracks indicates poor formatting by the tape manufacturer. This is only a problem if all available spares are used.

INPUT FORMAT:

Input the TEST name

?

[ERT LOG]

OUTPUT FORMAT:

READ ERT DATA ERROR LOG UTILITY

ERT LOG HEADER

of BLOCKS accessed = nnnn

of CORRECTABLE errors = nnnn

due to: Permanents = nnnn

Transients = nnnn

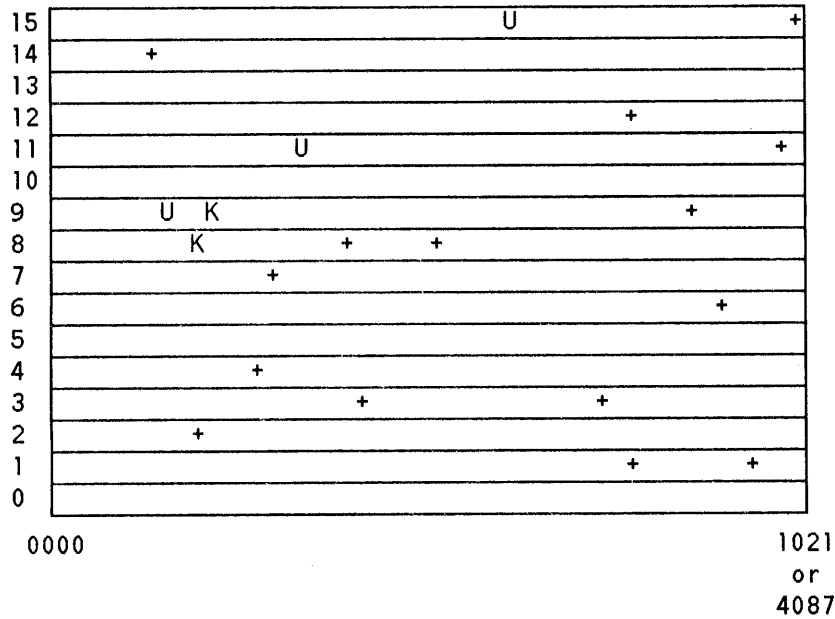
of UNCORRECTABLE BLOCKS = nnnn

of UNLOCATABLE BLOCKS = nnnn

Do you want a flag plot

?

[YES] or [NO]



- + - permanent error
- U - uncorrectable error
- K - unlocatable key

Do you want an error listing

?

[YES] or [NO]

LOG. ADDRESS 123456 U K

 nnnn BBBBBB B B

 nnnn BBBBBB B B

Until the last error is displayed.

Binary bits set to "1" indicate frames which have errors.

Tape Exerciser Commands

The maximum number of the various types of errors allowed after one complete volume test (option "C" with length equal to "ALL" for either RO ERT or WTR ERT) is shown below. This *must* not be an accumulative error rate test; make sure the ERT LOG is cleared using the CLEAR LOGS command *before* running the ERT that is used to compare with the following table.

Tape →	88140L, LC-long		88140S, SC-short	
Type →	WTR ERT	RO ERT	WTR ERT	RO ERT
#Blocks*	130,816	65,408	32,704	16,532
#Permanent	250	250	128	128
#Transient	N/A	N/A	N/A	N/A
#Unlocatable	15	N/A	10	N/A
#Uncorrectable	0	1	0	1
*These may vary if tape is not certified.				

READ ERT DATA ERROR LOG
UTILITY COMPLETED

3-4. INIT MEDIA

INITIALIZE MEDIA

CAUTION

INIT MEDIA will erase all user data on the selected unit.

This utility performs an initialization routine on the tape cartridge currently installed in the tape drive. Two options are allowed for tape initialization. The first option defaults the sparing table so that one spare block is set aside out of every 512 blocks. The second option accesses the run log to determine whether or not the tape is certified; if the tape is not certified, then the CERT error rate test utility is performed automatically. If the tape was previously certified, then all jump spares are converted to skip spares (for optimizing throughput).

INPUT FORMAT:

Input the TEST name

?

[INIT MEDIA]

This utility will destroy data,

Do you wish to continue

?

[YES] or **[NO]**

INIT MEDIA options are:

1 = Reset spare table and label
tape uncertified.

2 = Read certification status.

If tape is uncertified then
certification utility is
run.

If tape is certified then
convert jump spares to skip
spares. Tape is not recert-
ified.

Input option number

?

[1] or **[2]**

Tape Exerciser Commands

OUTPUT FORMAT:

INITIALIZE MEDIA UTILITY

Checking tape certification

Tape was ON-LINE, 3M, HP or not certified.

If the tape is certified and option 2 is entered:

Converting jump spares to skip spares

If the tape is not certified:

Tape will now be certified

This may take a few minutes to
execute

INITIALIZE MEDIA
UTILITY COMPLETED

3-5. RO ERT

PERFORM READ-ONLY ERROR RATE TEST

There are three types of read-only error rate tests allowed on the tape. The current type checks the presently addressed block up to the specified length. The next type checks the specified track and next adjacent track (unless 15 is entered). The third type tests the entire tape. Results of each type of test are always logged on the tape's ERT LOG.

INPUT FORMAT:

Input the TEST name
?

[RO ERT]

Input the loop count;

1 <= count <=255

?

[VVVV]

Do you want to test

L = logical addresses

S = specified track (physical)

E = entire tape (physical)

?

[L] or [S] or [E]

If [L] is entered:

Enter new block address or just

END LINE to keep the current

block address

Current block addr = nnnn

?

[VVVV] or [END LINE]

Current length = nnnn

Enter new length, END LINE to

keep current length or ALL for

the entire tape

Input the length in blocks or ALL

?

[VVVV] or [END LINE] or [ALL]

If [S] was entered:

Input the track number <=15

?

[VVVV] This may take a few minutes.

Tape Exerciser Commands

OUTPUT FORMAT:

READ ONLY ERT TEST

Do you want to see the ERT log

?

[YES] or [NO]

If [YES] is entered, refer to ERT LOG, section III.

READ ONLY ERT TEST COMPLETED

3-6. RUN LOG**OUTPUT RUN LOG**

This log is an accumulation of errors which have occurred during run time (i.e. not during an error rate test). The run log is cleared with the CLEAR LOGS command.

INPUT FORMAT:

Input the TEST name

?

[RUN LOG]

OUTPUT FORMAT:

READ RUN TIME DATA ERROR LOG
UTILITY

RUN LOG HEADER

of UNCORRECTABLE BLOCKS = nnnn
of UNLOCATABLE BLOCKS = nnnn
CERTIFICATION: ON-LINE, 3M, HP, or NOT

If logical error addresses are found:

LOGICAL ADDR	ERRORS
-----	-----
nnnn	UNLOCATABLE
nnnn	UNCORRECTABLE

Until the last error is displayed.

READ RUN TIME DATA ERROR LOG
UTILITY COMPLETED

3-7. SPARE

SPARE BLOCK

This utility replaces a known defective block with an available spare block and assigns it the logical address of the old defective block. Either jump or skip sparing may be used. Jump sparing takes more time but retains all user data except the defective block itself; skip sparing optimizes the spare for quick access but erases all user data between the defective block and the nearest available spare since all logical addresses must be shuffled.

INPUT FORMAT:

Input the TEST name

?

[SPARE]

Do you want S (Skip) or J (Jump)

sparing

?

[S] or [J]

The spare command sequence restarts here for sparing multiple blocks.

Enter new block address or just

END LINE to keep the current

block address

Current block addr = nnnn

?

[VVVV] or [END LINE]

OUTPUT FORMAT:

SPARE BLOCK UTILITY

Spared address was:

Block nnnn

Spare another address?

?

[YES] or [NO]

SPARE BLOCK UTILITY COMPLETED

3-8. SPARE TABLE

OUTPUT SPARE TABLE

This command accesses the information in the spare table. It provides identical information as that obtained when using the TABLES command and selecting table option "S". The spare table is a list of all logical blocks which have been spared.

INPUT FORMAT:

Input the TEST name
?

[SPARE TABLE]

OUTPUT FORMAT:

READ TAPE SPARE TABLE UTILITY

ENTRY	TRACK #	PHYSICAL
nnnn	nnnn	BLOCK #
nnnn	nnnn	nnnn
nnnn	nnnn	nnnn

Until all spares are displayed.

Do you want a flag plot
of spare locations
?

[YES] or [NO]

If [YES] is entered, the following flag plot is output:

15	S	
14		
13		
12		
11	S	
10		
9	S	
8		
7		
6	S	
5		
4		S
3		
2		
1		
0		

0000 1021
or
4087

S - spared location

READ TAPE SPARE TABLE
UTILITY COMPLETED

3-9. TABLES

OUTPUT DEVICE TABLES

This utility accesses the tables stored on the tape. The tape manufacturer's table identifies the type of cartridge and its date code. The tape spare table shows the physical addresses of the blocks which have been spared.

The copy data table is unique to the HP 7914. Two 67 Mb tapes are required to perform an image copy of the HP 7914; therefore, the copy data table is responsible for storing the starting disc address onto the tape during an image copy. The disc starting address points to the address on the disc where that particular tape's information should begin. The disc starting address on the first tape is zero; the disc starting address on the second tape is equal to one-half the total number of sectors on the disc (261,632 for the HP 7914).

INPUT FORMAT:

Input the TEST name

?

[TABLES]

Drive tables are:

M = Manufacturer's table

S = Tape spare table

C = Copy data address (HP 7914 only)

?

[M] or [S] or [C]

OUTPUT FORMAT:

MANUFACTURER'S BLOCK TABLE

Cartridge type = xxxx

of user blocks/track = nnnn

Copyright notice

FORMAT (C) 19XX,

MINN. MINING & MFG. CO.

Manufacturer's code = xxxx

Date code = nnnn

READ TABLES UTILITY COMPLETED

READ TAPE SPARE TABLE UTILITY

ENTRY	TRACK #	PHYSICAL BLOCK #
-------	---------	---------------------

nnnn	nnnn	nnnn
------	------	------

nnnn	nnnn	nnnn
------	------	------

Until all spares are displayed.

Do you want a flag plot
of spare locations
?
[YES] or [NO]

15	S
14	
13	
12	
11	S
10	
9	S
8	
7	
6	S
5	
4	S
3	
2	
1	
0	

0000 1021
or
4087

S - spared location

READ TAPE SPARE TABLE
UTILITY COMPLETED

COPY DATA ADDRESS TABLE

Disc starting address = nnnn

READ TABLES UTILITY COMPLETED

3-10. UNLOAD

UNLOAD TAPE CARTRIDGE

This command unloads the tape cartridge in the same manner as the front panel UNLOAD button. The error rate log is updated if necessary, and the tape is rewound to End-Of-Tape (EOT). Then the use log is updated and the tape is unlocked from the mechanism. The eject lever can then be used to remove the tape cartridge from the tape drive.

INPUT FORMAT:

Input the TEST name

?

[UNLOAD]

OUTPUT FORMAT:

UNLOAD TAPE UTILITY

UNLOAD TAPE UTILITY COMPLETED

3-11. USE LOG

OUTPUT TAPE USE LOG

The use log stores the number of times that particular tape has been inserted for use and also the number of blocks which have been accessed on the tape to date. The use log can *not* be written to if the tape is "write-protected". The recommended maximum usage is 2,500 cycles from BOT to EOT and back to BOT. This is equivalent to approximately 277 full volume accesses; 20,480,000 blocks on a long tape or 5,120,000 blocks on a short tape.

INPUT FORMAT:

Input the TEST name
?

[USE LOG]

OUTPUT FORMAT:

READ TAPE USE LOG UTILITY

USE COUNT = nnnn
OF BLOCKS
ACCESSED = nnnn

READ TAPE USE LOG
UTILITY COMPLETED

3-12. WRITE FM

WRITE FILE MARK

This command writes an End-Of-File (EOF) mark at the current position on the tape. Whenever a file mark is encountered during a tape read operation, the process is immediately terminated.

INPUT FORMAT:

Input the TEST name

?

[WRITE FM]

Enter new block address or just
END LINE to keep the current
block address

Current block addr = nnnn

?

[VVVV] or [END LINE]

OUTPUT FORMAT:

WRITE FILE MARK UTILITY

WRITE FILE MARK
UTILITY COMPLETED

3-13. WTR ERT

PERFORM WRITE-THEN-READ ERROR RATE TEST

CAUTION

WTR ERT will erase some or all of the user data on the selected unit.

There are three types of write-then-read error rate tests allowed on the tape. The current type checks the presently addressed block up to the specified length. The next type checks the specified track and next adjacent track (unless 15 is entered). The third type tests the entire tape. Results of each type of test are always logged on the tape's ERT LOG. A full-length WTR ERT takes twice as long as a full-length RO ERT.

INPUT FORMAT:

Input the TEST name

?

[WTR ERT]

This test will destroy current data.

Should it continue

?

[YES] or **[NO]**

Input the loop count;

1 <= count <=255

?

[VVVV]

Do you want to test

L = logical addresses

S = specified track (physical)

E = entire tape (physical)

?

[L] or **[S]** or **[E]**

If **[L]** was entered:

Enter new block address or just

END LINE to keep the current

block address

If **[L]** is entered:

Current block addr = nnnn

?

[VVVV] or **[END LINE]**

Current length = nnnn

Enter new length, END LINE to keep current length or ALL for the entire tape

Input length in blocks or ALL

?

[VVVV] or **[END LINE]** or **[ALL]**

Tape Exerciser Commands

If **[S]** was entered:

Input the track number <=15

?

[VVVV]

Sources of the bit pattern are: PT = ERT internal Pattern Table UP = User inputs pattern table RN = ERT generates Random pattern table

Enter the pattern source

?

[PT] or **[UP]** or **[RN]**

If **[UP]** is entered:

Input a hexadecimal pattern of up to 8 hex digits.

?

[HHHHHHHH] This may take a few minutes.

OUTPUT FORMAT:

WRITE THEN READ ERT TEST

Do you want to see the ERT log

?

[YES] or **[NO]**

If **[YES]** is entered, refer to ERT LOG, section III.

WRITE THEN READ ERT
TEST COMPLETED

4-1. INTRODUCTION

This section documents the commands which are in the OPER program on the HP 85 External Exerciser tape. Most of the commands in this section apply to all CS/80 devices. This section describes the editing commands in the first part, and the executable commands in the second part. The following format is used:

COMMAND NAME

SHORT DEFINITION

Following the command name is an explanation of what the command or step does and when it should be used.

INPUT FORMAT:

Enter the command for step nnnn

?

[COMMAND OR STEP NAME]

OUTPUT FORMAT:

This is what is printed when the command has been executed.

The following formats are used throughout this section:

nnnn - refers to a decimal number of any magnitude.

[VVVV] - refers to a decimal number of variable magnitude which must be input by the user. Bold numbers within brackets [**BOLD**] indicate all user inputs.

H - refers to a hexadecimal digit (0-F).

xxxx - refers to text printed out or displayed by the HP 85.

B - refers to a binary digit (bit) printed out or displayed by the HP 85.

4-2. EDIT

EDIT PROGRAM STEP

This command replaces one of the OPER commands with a new command. It does not allow existing OPER commands to be modified. At least two steps must exist in an OPER program when using EDIT.

INPUT FORMAT:

Enter the command for step nnnn

?

[EDIT]

Which step do you want to edit?

?

[VVVV]

Enter the new command for

step nnnn

?

[NULL] or [NEW COMMAND]

4-3. EXEC

EXECUTE PROGRAM

Once all the commands have been entered, this command begins execution of the program.

INPUT FORMAT:

Enter the command for step nnnn

?

[EXEC]

OUTPUT FORMAT:

START OF COMMAND EXECUTION

Step # = 1 Cmd = xxxx

Step # = 2 Cmd = xxxx

Until all commands have been executed.

4-4. EXIT

EXIT PROGRAM

This command terminates the OPER program. EXIT can be entered in response to any prompt during any input sequence. The current program will be lost.

INPUT FORMAT:

Enter the command for step nnnn

?

[EXIT]

OUTPUT FORMAT:

PROGRAM WILL NOW STOP

4-5. HELP

OUTPUT HELP INFORMATION

This command prints out all the valid OPER command names.

INPUT FORMAT:

Enter the command for step nnnn

?

[HELP]

OUTPUT FORMAT:

```
          COMMANDS
HELP - output help information
EXEC - execute program
EDIT - edit program step
LIST - list program
NEW  - start new program
NULL - delete program step
EXIT - exit program
-----
          PROGRAM STEPS
LCRD - locate and read
LCWR - locate and write
CMPR - write-then read and
      compare
COMP - complementary command
RQST - request status
CLR  - channel independent clear
LOOP - begin loop
ENDLP- end loop
INSK - incremental seek
```

4-6. LIST

LIST PROGRAM

This command lists the current program commands in order to verify what has been entered.

INPUT FORMAT:

Enter the command for step nnnn

?

[LIST]

OUTPUT FORMAT:

Step 1 = xxxx

Step 2 = xxxx

Until all steps are listed.

4-7. NEW

START NEW PROGRAM

This command erases the current program and prompts for the first step in a new program.

INPUT FORMAT:

Enter the command for step nnnn

?

[NEW]

OUTPUT FORMAT:

Enter the command for step 1

?

4-8. NULL

DELETE PROGRAM STEP

This command is only allowed in edit mode. The remaining steps are renumbered after a NULL. At least two commands must exist in an OPER program before using a NULL command.

INPUT FORMAT:

Enter the command for step nnnn

?

[EDIT]

Which step do you want to edit

?

[VVVV]

Enter the new command for

step nnnn

?

[NULL]

4-9. EXECUTABLE OPER COMMANDS

The rest of this section contains the executable OPER commands. Part or all of the program can be repeated using the LOOP and ENDLP commands. Since the OPER program actually sends and receives CS/80 instructions, it depicts an actual portrayal of device operation.

4-10. CLR

CHANNEL INDEPENDENT CLEAR

This command clears the selected device(s) on the HP-IB channel. All complementary values such as burst size, retry time, and current target address are returned to their default settings.

INPUT FORMAT:

Enter the command for step nnnn

?

[CLR]

4-11. CMPR

WRITE-THEN-READ AND COMPARE

CAUTION

CMPR will erase user data on the selected unit.

This command performs a write-then-read check on the selected unit, and then compares the data read with the data previously written. If a length is not specified, then a length of zero is assumed and only a seek to the specified address occurs. The maximum length allowed is determined by the data buffer size of the HP 85 (1024 bytes). The retry time is in tens of milliseconds. Burst will remain set until changed.

INPUT FORMAT:

Enter the command for step nnnn
?

[CMPR]

1=Set Unit 4=Set Retry time
2=Set Length 5=Set Burst
3=Set Address

Enter the number(s) which
represent the complementary
command(s); Delimit the
number(s) with a space
?

[1] [2] [3] [4] or [5]

You entered the following
number(s): nnnn nnnn nnnn nnnn nnnn
UNIT NUMBER =?

?

[VVVV]

LENGTH =?

?

[VVVV]

Do you want BLOCK 'B' or
VECTOR 'V' addressing?

?

[B] or [V]

Input the block address

?

[VVVV]

Cylinder?

?

[VVVV]

Head

?

[VVVV]

Operator Designed Programs

Sector

?

[VVVV]

Input the retry time

?

[VVVV]

How many sectors per burst?

?

[VVVV]

Do you want to specify
a pattern?

?

[YES] or [NO]

Input a pattern <= 8 hex digits?

?

[HHHHHHHH]

4-12. COMP

COMPLEMENTARY COMMAND

This command allows the complementary values to be altered. To restore the default values, use the CLR command. The maximum length allowed is determined by the data buffer size of the HP 85 (1024 bytes). The retry time is in tens of milliseconds. Burst will remain set until changed.

INPUT FORMAT:

Enter the command for step nnnn

?

[COMP]

1=Set Unit 4=Set Retry time

2=Set Length 5=Set Burst

3=Set Address

Enter the number of the
complementary command

?

[1] [2] [3] [4] or [5]

UNIT NUMBER =?

?

[VVVV]

LENGTH =?

?

[VVVV]

Do you want BLOCK 'B' or
VECTOR 'V' addressing?

?

[B] or [V]

Input the block address

?

[VVVV]

Cylinder?

?

[VVVV]

Head

?

[VVVV]

Sector

?

[VVVV]

Input the retry time

?

[VVVV]

How many sectors per burst?

?

[VVVV]

4-13. ENDLP

END LOOP

This command ends a loop within an OPER program (loops are set up with the LOOP command).

INPUT FORMAT:

Enter the command for step nnnn

?

[ENDLP]

4-14. INSK

INCREMENTAL SEEK

This command performs incremental seeks on the disc unit.

INPUT FORMAT:

Enter the command for step nnnn

?

[INSK]

What is the starting cylinder

?

[VVVV]

What is the ending cylinder

?

[VVVV]

What is the increment?

?

[VVVV]

4-15. LCRD

LOCATE AND READ

This command performs a locate and read on the selected unit. If the set address parameter is not specified, then each successive LCRD will automatically increment the target address. If a length is not specified, then a length of zero is assumed and only a seek to the specified address occurs. The maximum length allowed is determined by the data buffer size of the HP 85 (1024 bytes). The retry time is in tens of milliseconds. Burst will remain set until changed.

INPUT FORMAT:

Enter the command for step nnnn

?

[LCRD]

1=Set Unit 4=Set Retry time

2=Set Length 5=Set Burst

3=Set Address

Enter the number(s) which
represent the complementary
command(s); Delimit the
number(s) with a space
?

[1] [2] [3] [4] or [5]

You entered the following

number(s): nnnn nnnn nnnn nnnn nnnn

UNIT NUMBER =?

?

[VVVV]

LENGTH =?

?

[VVVV]

Do you want BLOCK 'B' or

VECTOR 'V' addressing?

?

[B] or [V]

Input the block address

?

[VVVV]

Cylinder?

?

[VVVV]

Head

?

[VVVV]

Sector

?

[VVVV]

Input the retry time

?

[VVVV]

How many sectors per burst?

?

[VVVV]

Display read data

?

[YES] or [NO]

OUTPUT FORMAT:

1 HH HH HH HH HH HH HH HH HH

10 HH HH HH HH HH HH HH HH HH

19 HH HH HH HH HH HH HH HH HH

28 etc

Until all data is displayed.

4-16. LCWR

LOCATE AND WRITE

CAUTION

LCWR will erase user data on the selected unit.

This command performs a locate and write on the selected unit. If the set address parameter is not specified, then each successive LCRD will automatically increment the target address. If a length is not specified, then a length of zero is assumed and only a seek to the specified address occurs. The maximum length allowed is determined by the data buffer size of the HP 85 (1024 bytes). The retry time is in tens of milliseconds. Burst will remain set until changed.

INPUT FORMAT:

Enter the command for step nnnn

?

[LCWR]

1=Set Unit 4=Set Retry time

2=Set Length 5=Set Burst

3=Set Address

Enter the number(s) which represent the complementary command(s); Delimit the number(s) with a space

?

[1] [2] [3] [4] or [5]

You entered the following

number(s): nnnn nnnn nnnn nnnn nnnn

UNIT NUMBER =?

?

[VVVV]

LENGTH =?

?

[VVVV]

Do you want BLOCK 'B' or

VECTOR 'V' addressing?

?

[B] or [V]

Input the block address

?

[VVVV]

Cylinder?

?

[VVVV]

Head

?

[VVVV]

Sector

?

[VVVV]

Input the retry time

?

[VVVV]

How many sectors per burst?

?

[VVVV]

Do you want to specify
a pattern?

?

[YES] or [NO]

Input a pattern <= 8 hex digits?

?

[HHHHHHHH]

4-17. LOOP

BEGIN LOOP

This command allows a section of an OPER program to be executed a number of times. ENDLP or the end of the program is used to designate the loop boundary.

INPUT FORMAT:

Enter the command for step nnnn

?

[LOOP]

Input the loop count?

?

[VVVV]

4-18. RQST

REQUEST STATUS

This command reports the status of the last transaction. The output is identical to that of the REQSTAT command in section II of this manual.

INPUT FORMAT:

Enter the command for step nnnn

?

[RQST]

OUTPUT FORMAT:

See REQSTAT, section II, for the request status output information.

4-19. OPER PROGRAM EXAMPLES

The following program performs a variable length seek on the disc unit. Enter the program as shown.

Enter the command for step 1

?

[LOOP]

Input the loop count?

?

[300]

Enter the command for step 2

?

[INSK]

What is the starting cylinder

?

[0]

What is the ending cylinder

?

[300]

What is the increment?

?

[10]

Enter the command for step 3

?

[INSK]

What is the starting cylinder

?

[300]

What is the ending cylinder

?

[0]

What is the increment?

?

[-10]

Enter the command for step 4

?

[ENDLP]

Enter the command for step 5

?

[EXEC]

The next program will implement a write/read comparison on unit zero, vector address: cylinder 0, head 0, sectors 0 and 1. In this example, the number of bytes transferred is set to 36, and the hexadecimal pattern written is FFFFFFFF. For this example, only the commands and certain parameters are shown to save space; included after the program is an actual printout of the results.

```

Step 1 = COMP (Set Unit=0)
Step 2 = COMP (Set VECTOR Address=0,0,0)
Step 3 = LOOP (Set LOOP=2)
Step 4 = RQST
Step 5 = LCWR (Set Length=36; write FFFFFFFF)
Step 6 = ENDLP
Step 7 = COMP (Set VECTOR Address=0,0,0)
Step 8 = LOOP (Set LOOP=2)
Step 9 = RQST
Step 10 = LCRD (Set LENGTH=36; display YES)
Step 11 = ENDLP
Step 12 = EXEC

```

START OF COMMAND EXECUTION

```

Step # = 1  Cmd = COMP (Unit=0)
Step # = 2  Cmd = COMP (Address=0,0,0)
Step # = 3  Cmd = LOOP
Step # = 4  Cmd = RQST (First sector's address)

```

Status message follows:

```

Current unit is 0
Unit type: Disc
No units with pending status

```

New target address is:

```

VECTOR ADDRESS:
Cyl = 0  Head = 0  Sect = 0

```

```

Step # = 5  Cmd = LCWR (Write on target address)
Step # = 6  Cmd = ENDLP
Step # = 4  Cmd = RQST (Shows address of next sector)

```

Status message follows:

```

Current unit is 0
Unit type: Disc
No units with pending status

```

New target address is:

```

VECTOR ADDRESS:
Cyl = 0  Head = 0  Sect = 1

```

```

Step # = 5  Cmd = LCWR (Write on target address)
Step # = 6  Cmd = ENDLP
Step # = 7  Cmd = COMP (Set Address=0,0,0)
Step # = 8  Cmd = LOOP
Step # = 9  Cmd = RQST (Shows address of first sector)

```

Operator Designed Programs

Status message follows:

Current unit is 0
Unit type: Disc
No units with pending status

New target address is:

VECTOR ADDRESS:

Cyl = 0 Head = 0 Sect = 0

Step # = 10 Cmd = LCRD (Read the first sector)

```
 1 FF FF FF FF FF FF FF FF FF
10 FF FF FF FF FF FF FF FF FF
19 FF FF FF FF FF FF FF FF FF
28 FF FF FF FF FF FF FF FF FF
```

Step # = 11 Cmd = ENLDP

Step # = 9 Cmd = RQST (Shows address of next sector)

Status message follows:

Current unit is 0
Unit type: Disc
No units with pending status

New target address is:

VECTOR ADDRESS:

Cyl = 0 Head = 0 Sect = 1

Step # = 10 Cmd = LCRD (Read the next sector)

```
 1 FF FF FF FF FF FF FF FF FF
10 FF FF FF FF FF FF FF FF FF
19 FF FF FF FF FF FF FF FF FF
28 FF FF FF FF FF FF FF FF FF
```

Step # = 11 Cmd = ENLDP (End of program)

794X EXERCISER COMMANDS

SECTION

V

5-1. INTRODUCTION

This section documents the commands which are in the EX794X program on the HP 85 External Exerciser tape. All of the commands in this section apply specifically to HP 794X devices. Some commands in the EX794X program have identical syntax and operation as documented in section II; these commands have not been repeated in this section, i.e. CANCEL, CHANNEL, CICLEAR, CLEAR LOGS, DESCRIBE, DIAG, EXIT, HELP, INIT MEDIA, PRESET, REQSTAT, SPARE, SPARE TABLE, TABLES, and UNIT behave as shown in section II. The commands are in alphabetical order and the following format is used:

COMMAND NAME

SHORT DEFINITION

Following the command name is an explanation of what the command does and when it should be used.

INPUT FORMAT:

Input the TEST name

?

[COMMAND NAME]

OUTPUT FORMAT:

NAME OF UTILITY OR TEST

This is what is printed when the command has been executed.

The following formats are used throughout this section:

nnnn - refers to a decimal number of any magnitude.

[VVVV] - refers to a decimal number of variable magnitude which must be input by the user. Bold numbers within brackets [**BOLD**] indicate all user inputs.

H - refers to a hexadecimal digit (0-F).

xxxx - refers to text printed out or displayed by the HP 85.

B - refers to a binary digit (bit) printed out or displayed by the HP 85.

5-2. AMCLEAR

AMIGO CLEAR

The HP 794X devices respond to an Amigo clear instead of a selected device clear (SDCLEAR).

INPUT FORMAT:

Input the TEST name

?

[AMCLEAR]

AMIGO CLEAR UTILITY

AMIGO CLEAR UTILITY COMPLETED

5-3. ERT LOG

OUTPUT ERROR RATE TEST LOG

The error rate test log contains an accumulation of all read errors which were found during a read-only or a write-then-read error rate test. Since the Error Correction Circuitry (ECC) is disabled during an error rate test, the ERT LOG will accumulate both correctable and uncorrectable errors. Each data head has its own error rate test log for that surface. Error rate test errors are accumulated until the log is cleared using the CLEAR LOGS command.

INPUT FORMAT:

Input the TEST name

?

[ERT LOG]

Print error decoding information

?

[YES] or [NO]

The following is the error decoding information:

TYPE:

REC = Recoverable data
 M-RE = Marginal data / retries
 M-EC = Marginal data / ECC cor.
 UNC = Uncorrectable data
 error

CNT = Occurrence count
 (RUN/ERT logs only)

LPC = Loop count
 (RO/WTR ERT's only)

ERR BYTE:

XXXXXX10 REC
 XXXXX1X0 M-RE
 XXXX1XX0 M-EC
 XXX1XXX0 UNC
 XX1XXXX0 Sector error
 X1XXXXX0 Header error
 1XXXXXX0 Address mark error
 00000000 UNC error during write

Input the head number or ALL

?

[VVVV] or [ALL]

OUTPUT FORMAT:

READ ERT DATA ERROR LOG UTILITY

The following is output for each head which was selected above:

Head # = nnnn
No. of sectors read = nnnn
No. of errors = nnnn
Error addresses logged = nnnn

CYL HEAD SECT TYPE CNT ERR BYTE
nnnn nnnn nnnn xxxx nnnn BBBBBBBB
Until all errors are displayed.

READ ERT DATA ERROR LOG
UTILITY COMPLETED

5-4. FAULT LOG

OUTPUT FAULT LOG

The fault log is an accumulation of the faults which have occurred on a device since the last time a CLEAR LOGS command was issued. The fault log resides on the disc maintenance tracks. An explanation of the subtest and servo status bits is contained in the HP 794X service manual.

INPUT FORMAT:

Input the TEST name

?

[FAULT LOG]

OUTPUT FORMAT:

READ DRIVE FAULT LOG UTILITY

Number of faults logged = nnnn

Current address:

 Cyl = nnnn Head = nnnn Sect = nnnn

TARGET Address:

 Cyl = nnnn Head = nnnn Sect = nnnn

Fault code = nnnn hex

Subtest = nnnn hex

Status = nnnn hex

READ DRIVE FAULT LOG
UTILITY COMPLETED

5-5. RO ERT

PERFORM READ-ONLY ERROR RATE TEST

A read-only error rate test performs a sequential read operation over a specified area of the media. The results of the test can be logged or immediately displayed.

INPUT FORMAT:

Input the TEST name

?

[RO ERT]

Input the loop count;

1 <= count <=254 or INF

?

[VVVV] or [INF]

Do you want a random read only

ERT

?

[YES] or [NO]

If [NO] is entered, the following addressing information is asked:

Enter address changes or just

END LINE to keep the current

values

Current cylinder addr = nnnn

?

[VVVV] or [END LINE]

Current head addr = nnnn

?

[VVVV] or [END LINE]

Current sector addr = nnnn

?

[VVVV] or [END LINE]

Do you want to test the

V = volume, T = track,

S = sector

?

[V] or [T] or [S]

Output formats are:

PRT = print error information

LOG = log in error rate log

Enter the format

?

[PRT] or [LOG]

Print error decoding information

?

[YES] or [NO]

The following is the error decoding information:

TYPE:

REC = Recoverable data
 M-RE = Marginal data / retries
 M-EC = Marginal data / ECC cor.
 UNC = Uncorrectable data
 error

CNT = Occurrence count
 (RUN/ERT logs only)

LPC = Loop count
 (RO/WTR ERT's only)

ERR BYTE:

XXXXXX10 REC
 XXXXX1X0 M-RE
 XXXX1XX0 M-EC
 XXX1XXX0 UNC
 XX1XXXX0 Sector error
 X1XXXXX0 Header error
 1XXXXXX0 Address mark error
 00000000 UNC error during write

OUTPUT FORMAT:

READ ONLY ERT TEST

If **[PRT]** was entered:

 CYL HEAD SECT TYPE LPC
 nnnn nnnn nnnn xxxx nnnn
 Until all errors are displayed.

If **[LOG]** was entered:

Do you want to see the ERT LOG
 ?

[YES] or **[NO]**

If **[YES]** is entered, refer to ERT LOG in this section.

READ ONLY ERT TEST COMPLETED

5-6. RUN LOG

OUTPUT RUN LOG

The run log contains an accumulation of all read errors which were found during run time. Run-time data errors are accumulated and logged on the disc maintenance tracks automatically during normal device operation. Each data head has its own error rate test log for that surface. Run-time data errors are accumulated until the log is cleared using the CLEAR LOGS command.

INPUT FORMAT:

Input the TEST name

?

[RUN LOG]

Print error decoding information

?

[YES] or [NO]

The following is the error decoding information:

TYPE:

REC = Recoverable data
M-RE = Marginal data / retries
M-EC = Marginal data / ECC cor.
UNC = Uncorrectable data
error

CNT = Occurrence count
(RUN/ERT logs only)

LPC = Loop count
(RO/WTR ERT's only)

ERR BYTE:

XXXXXX10 REC
XXXXX1X0 M-RE
XXXX1XX0 M-EC
XXX1XXX0 UNC
XX1XXXX0 Sector error
X1XXXXX0 Header error
1XXXXXX0 Address mark error
00000000 UNC error during write

Input the head number or ALL

?

[VVVV] or [ALL]

OUTPUT FORMAT:

READ RUN TIME LOG UTILITY

The following is output for each head which was selected above:

Head # = nnnn
No. of sectors read = nnnn
No. of errors = nnnn
Error addresses logged = nnnn

CYL HEAD SECT TYPE CNT ERR BYTE
nnnn nnnn nnnn xxxx nnnn BBBBBBBB
Until all errors are displayed.

READ RUN TIME DATA ERROR LOG
UTILITY COMPLETED

5-7. SERVO

PERFORM SERVO TEST

The servo test checks the operation of the servo system in HP 794X devices. An exhaustive sequence of seeks is executed, both verifying the subsequent location as well as monitoring the speed performance. Specifically, the test begins by positioning the heads over physical cylinder zero (at the OD). Now a series of seeks are performed: first one track, then two tracks, four, eight etc. until the ID is reached. Then two full stroke seeks are performed, from the ID to OD and back to the ID. Finally, a series of seeks (one track, two tracks, four, eight etc.) are done until the heads arrive at physical cylinder zero. This entire sequence of seeks is performed six times. At the end of each seek operation, the sector header is checked to make sure that its ID is correct. If any mismatches occur, the test fails.

INPUT FORMAT:

Input the TEST name

?

[SERVO]

Input the loop count;

1 <= count <=255

?

[VVVV] or [INF]

OUTPUT FORMAT:

One of the following is output at the end of the test:

Test Passed

or

Seek failure

or

Position Failure

or

Timeout

Seeks completed = nnnn

SERVO TEST UTILITY COMPLETED

5-8. WTR ERT

PERFORM WRITE-THEN-READ ERROR RATE TEST

CAUTION

WTR ERT will erase some or all of the user data on the selected unit.

A write-then-read error rate test performs a sequential write operation over a specified area of the media, and then attempts to read the same area and locate any errors. The results of the test can be logged or immediately displayed.

INPUT FORMAT:

Input the TEST name

?

[WTR ERT]

This test will destroy current data.

Should it continue

?

[YES] or [NO]

Input the loop count;

1 <= count <=254 or INF

?

[VVVV] or [INF]

Types of Write Then Read ERT'S:

PT = Pattern test ERT

RN = Random address ERT

Enter the type of test

?

[PT] or [RN]

If [PT] is entered the following addressing information is asked:

Enter address changes or just

END LINE to keep the current

values

Current cylinder addr = nnnn

?

[VVVV] or [END LINE]

Current head addr = nnnn

?

[VVVV] or [END LINE]

Current sector addr = nnnn

?

[VVVV] or [END LINE]

794X Exerciser Commands

Do you want to test the

V = volume, T = track,

S = sector

?

[V] or [T] or [S]

Sources of the bit pattern are:

PT = ERT internal Pattern Table

SP = ERT uses Selected Pattern

RN = ERT generates Random
pattern table

Enter the pattern source

?

[PT] or [SP] or [RN]

If [SP] is entered, the following is displayed:

Available patterns are:

(patterns in hex)

1 = DB, 6D, B6

2 = 92, 49, 24

3 = DA

4 = 17

5 = AA

6 = FF

7 = 0

Enter number of desired
pattern

?

[VVVV]

Output formats are:

PRT = print error information

LOG = log in error rate log

Enter the format

?

[PRT] or [LOG]

Print error decoding information

?

[YES] or [NO]

The following is the error decoding information:

TYPE:

REC = Recoverable data
 M-RE = Marginal data / retries
 M-EC = Marginal data / ECC cor.
 UNC = Uncorrectable data
 error

CNT = Occurrence count
 (RUN/ERT logs only)

LPC = Loop count
 (RO/WTR ERT's only)

ERR BYTE:

XXXXXX10 REC
 XXXXX1X0 M-RE
 XXXX1XX0 M-EC
 XXX1XXX0 UNC
 XX1XXXX0 Sector error
 X1XXXXX0 Header error
 1XXXXXX0 Address mark error
 00000000 UNC error during write

OUTPUT FORMAT:

WRITE THEN READ ERROR RATE TEST

If **[PRT]** was entered:

 CYL HEAD SECT TYPE LPC
 nnnn nnnn nnnn xxxx nnnn
 Until all errors are displayed.

If **[LOG]** was entered:

Do you want to see the ERT LOG
 ?

[YES] or **[NO]**

If **[YES]** is entered, refer to ERT LOG in this section.

WRITE THEN READ ERT
 TEST COMPLETED

6-1. INTRODUCTION

This section documents the commands which are in the EX7907 program on the HP 85 External Exerciser tape. All of the commands in this section apply specifically to HP 7907 devices. Some commands in the EX7907 program have identical syntax and operation as documented in section II; these commands have not been repeated in this section, i.e. CANCEL, CHANNEL, CICLEAR, CLEAR LOGS, DESCRIBE, EXIT, HELP, INIT MEDIA, PRESET, REQSTAT, SPARE TABLE, TABLES, and UNIT behave as shown in section II. The commands are in alphabetical order and the following format is used:

COMMAND NAME

SHORT DEFINITION

Following the command name is an explanation of what the command does and when it should be used.

INPUT FORMAT:

Input the TEST name
?

[COMMAND NAME]

OUTPUT FORMAT:

NAME OF UTILITY OR TEST

This is what is printed when the command has been executed.

The following formats are used throughout this section:

nnnn - refers to a decimal number of any magnitude.

[VVVV] - refers to a decimal number of variable magnitude which must be input by the user. Bold numbers within brackets [**BOLD**] indicate all user inputs.

H - refers to a hexadecimal digit (0-F).

xxxx - refers to text printed out or displayed by the HP 85.

B - refers to a binary digit (bit) printed out or displayed by the HP 85.

6-2. AMCLEAR

AMIGO CLEAR

The HP 7907 devices respond to an Amigo clear instead of a selected device clear (SDCLEAR).

INPUT FORMAT:

Input the TEST name

?

[**AMCLEAR**]

OUTPUT FORMAT:

AMIGO CLEAR UTILITY

Current unit = nnnn (Fixed, Removable, or Controller)

AMIGO CLEAR UTILITY COMPLETED

6-3. ERT LOG

OUTPUT ERROR RATE TEST LOG

The error rate test log contains an accumulation of all read errors which were found during a read-only or a write-then-read error rate test. Since the Error Correction Circuitry (ECC) is disabled during an error rate test, the ERT LOG will accumulate both correctable and uncorrectable errors. Each data head has its own error rate test log for that surface. Error rate test errors are accumulated until the log is cleared using the CLEAR LOGS command.

INPUT FORMAT:

Input the TEST name

?

[ERT LOG]

Print error decoding information

?

[YES] or [NO]

The following is the error decoding information:

TYPE:

REC = Recoverable error

M-RE = Marginal data / retries

UNR = Unrecoverable data err

CNT = Occurrence count

(RUN/ERT logs only)

LPC = Loop count

(RO/WTR ERT's only)

ERR BYTE:

XXXXXX1X REC

XXXXX1XX M-RE

XXX1XXXX UNR

XX1XXXXX error in data

X1XXXXXX error in header

1XXXXXXX other error

Input the head number or ALL

?

[VVVV] or [ALL]

OUTPUT FORMAT:

READ ERT DATA ERROR LOG UTILITY

Current unit = nnnn (Fixed, Removable, or Controller)

The following is output for each head which was selected above:

Head # = nnnn

No. of sectors read = nnnn

No. of errors = nnnn

Error addresses logged = nnnn

CYL HEAD SECT TYPE CNT ERR BYTE
nnnn nnnn nnnn xxxx nnnn BBBBBBBB
Until all errors are displayed.

READ ERT DATA ERROR LOG
UTILITY COMPLETED

6-4. FAULT LOG

OUTPUT FAULT LOG

The fault log is an accumulation of the faults which have occurred on a device since the last time a CLEAR LOGS command was issued. The fault log resides on the disc maintenance tracks. An explanation of the substest and servo status bits is contained in the HP 7907 service manual.

INPUT FORMAT:

Input the TEST name

?

[FAULT LOG]

OUTPUT FORMAT:

READ DRIVE FAULT LOG UTILITY

Current unit = nnnn (Fixed, Removable, or Controller)

Number of faults logged = nnnn

Current address:

Cyl = nnnn Head = nnnn Sect = nnnn

TARGET Address:

Cyl = nnnn Head = nnnn Sect = nnnn

Fault code = HH hex

Status1 =BBBBBBBB Binary

Status2 = HH hex

or

No drive faults to report

READ DRIVE FAULT LOG

UTILITY COMPLETED

6-5. RO ERT

PERFORM READ-ONLY ERROR RATE TEST

A read-only error rate test performs a sequential read operation over a specified area of the media. The results of the test can be logged or immediately displayed.

INPUT FORMAT:

Input the TEST name

?

[RO ERT]

Input the loop count;

1 <= count <=254 or INF

?

[VVVV] or [INF]

Do you want a random read only

ERT

?

[YES] or [NO]

If [NO] is entered, the following addressing information is asked:

Enter address:

Cylinder (0-626)?

[VVVV]

Head (0-1)?

[VVVV]

Sector (0-63)?

[VVVV]

Do you want to test the

V = volume, T = Track,

or S = sector?

?

[V] or [T] or [S]

Output formats are:

PRT = print error information

LOG = log in error rate log

Enter the format

?

[PRT] or [LOG]

Print error decoding information
?
[YES] or [NO]

The following is the error decoding information:

TYPE:

REC = Recoverable error
M-RE = Marginal data / retries
UNR = Unrecoverable data err

CNT = Occurrence count
(RUN/ERT logs only)

LPC = Loop count
(RO/WTR ERT's only)

ERR BYTE:

XXXXXX1X REC
XXXXX1XX M-RE
XXX1XXXX UNR
XX1XXXXX error in data
X1XXXXXX error in header
1XXXXXXX other error

OUTPUT FORMAT:

READ ONLY ERT TEST

Current unit = nnnn (Fixed, Removable, or Controller)

If [PRT] was entered:

CYL HEAD SECT TYPE LPC
nnnn nnnn nnnn xxxx nnnn
Until all errors are displayed.

If [LOG] was entered:

Do you want to see the ERT LOG
?
[YES] or [NO]

If [YES] is entered, refer to ERT LOG in this section.

READ ONLY ERT TEST COMPLETED

6-6. RUN LOG

OUTPUT RUN LOG

The run log contains an accumulation of all read errors which were found during run time. Run-time data errors are accumulated and logged on the disc maintenance tracks automatically during normal device operation. Each data head has its own error rate test log for that surface. Run-time data errors are accumulated until the log is cleared using the CLEAR LOGS command.

INPUT FORMAT:

Input the TEST name

?

[RUN LOG]

Print error decoding information

?

[YES] or [NO]

The following is the error decoding information:

TYPE:

REC = Recoverable error

M-RE = Marginal data / retries

UNR = Unrecoverable data err

CNT = Occurrence count

(RUN/ERT logs only)

LPC = Loop count

(RO/WTR ERT's only)

ERR BYTE:

XXXXXXIX REC

XXXXXIXX M-RE

XXXIXXXX UNR

XXIXXXXX error in data

XIXXXXXX error in header

IXXXXXXX other error

Input the head number or ALL

?

[VVVV] or [ALL]

OUTPUT FORMAT:

READ RUN TIME LOG UTILITY

Current unit = nnnn (Fixed, Removable, or Controller)

The following is output for each head which was selected above:

Head # = nnnn

No. of sectors read = nnnn

No. of errors = nnnn

Error addresses logged = nnnn

```
  CYL HEAD SECT TYPE  CNT ERR BYTE
nnnn nnnn nnnn xxxx nnnn BBBBBBBB
Until all errors are displayed.
```

```
READ RUN TIME DATA ERROR LOG
UTILITY COMPLETED
```

6-7. SERVO

PERFORM SERVO TEST

The servo test checks the operation of the servo system in HP 7907 devices. An exhaustive sequence of seeks is executed; refer to the service manual for detailed information about the servo test.

INPUT FORMAT:

Input the TEST name

?

[SERVO]

Input the loop count:

1 <= count <=255?

?

[VVVV]

OUTPUT FORMAT:

SERVO TEST UTILITY

Current unit = nnnn (Fixed, Removable, or Controller)

One of the following is output at the end of the test:

Test Passed

or

Seek failure

or

Position Failure

or

Timeout

Seeks completed = nnnn

SERVO TEST UTILITY COMPLETED

6-8. SPARE

SPARE BLOCK

CAUTION

A full power-on diagnostic should be successfully performed before sparing any sectors. This will prove that the device is capable of sparing.

This utility physically relocates a sector to an address which is reserved for sparing. The user has the option to retain the data on the affected track (except the sector which is determined to be bad). All sectors which are spared with the CS/80 External Exerciser are secondary (field) spares. The second sparing operation performed on a given track causes the entire track to be relocated since there is only one available spare sector per track.

A WTR ERT with a loop of 20 should be performed on a particular logical sector address after it has been spared. This ensures that the previously unused available spare sector is good. Since the entire track may have been spared, a RO ERT with a loop of 20 should be performed on the logical track also. This ensures that the previously unused available spare track is good. If either the logical sector or track which was addressed during the spare operation fails the error rate tests, the same logical sector should be spared again (relocated) until both error rate tests pass successfully.

INPUT FORMAT:

Input the TEST name
?

[SPARE]

The spare command sequence restarts here for sparing multiple sectors.

Spare Maintenance track?
[YES] or [NO]

If [YES] is entered, the following is asked:

Logging or Scratch (LOG, SCR)?
[LOG] or [SCR]

If [NO] was entered, the following is asked:

Do you want to retain the data?
[YES] or [NO]

Do you wish block 'B' or three
vector 'V' addressing
?

[B] or [V]

If [B] is entered:

Enter block addr(0-80255)?
[VVVV]

If [V] is entered:

Enter address:

Cylinder (0-626)?

[VVVV]

Head (0-1)?

[VVVV]

OUTPUT FORMAT:

SPARE BLOCK UTILITY

Current unit = nnnn (Fixed, Removable, or Controller)

Spared address was:

Cyl = nnnn Head = nnnn

or

BLOCK nnnn

Spare another address?

[YES] or [NO]

SPARE BLOCK UTILITY COMPLETED

6-9. WTR ERT

PERFORM WRITE-THEN-READ ERROR RATE TEST

CAUTION

WTR ERT will erase some or all of the user data on the selected unit. If the selected unit is write-protected, WTR ERT will not occur.

A write-then-read error rate test performs a sequential write operation over a specified area of the media, and then attempts to read the same area and locate any errors. The results of the test can be logged or immediately displayed.

INPUT FORMAT:

Input the TEST name

?

[WTR ERT]

This test will destroy current data.

Should it continue?

?

[YES] or [NO]

Input the loop count:

1 <= count <=254 or INF

?

[VVVV] or [INF]

Types of Write Then Read ERT'S:

PT = Pattern test ERT

RN = Random address ERT

Enter the type of test

?

[PT] or [RN]

If [PT] is entered the following addressing information is asked:

Enter address:

Cylinder (0-626)?

[VVVV]

Head (0-1)?

[VVVV]

Sector (0-63)?

[VVVV]

Do you want to test the

V = volume, T = Track,

or S = sector?

?

[V] or [T] or [S]

Sources of the bit pattern are:

PT = ERT internal Pattern Table

SP = ERT uses Selected Pattern

RN = ERT generates Random
pattern table

Enter the pattern source

?

[PT] or [SP] or [RN]

If [SP] is entered, the following is displayed:

Available patterns are:

(patterns in hex)

1 = CD

2 = E7, 39

3 = 33

4 = DB, 6D, B6

5 = 49, 33

6 = FF

7 = 00

Enter number of desired

pattern

?

[VVVV]

Output formats are:

PRT = print error information

LOG = log in error rate log

Enter the format

?

[PRT] or [LOG]

Print error decoding information

?

[YES] or [NO]

The following is the error decoding information:

TYPE:

REC = Recoverable error
 M-RE = Marginal data / retries
 UNR = Unrecoverable data err

CNT = Occurrence count
 (RUN/ERT logs only)

LPC = Loop count
 (RO/WTR ERT's only)

ERR BYTE:

XXXXXX1X REC
 XXXXX1XX M-RE
 XXX1XXXX UNR
 XX1XXXXX error in data
 X1XXXXXX error in header
 1XXXXXXX other error

OUTPUT FORMAT:

WRITE THEN READ ERROR RATE TEST

Current unit = nnnn (Fixed, Removable, or Controller)

If [PRT] was entered:

CYL HEAD SECT TYPE LPC
 nnnn nnnn nnnn xxxx nnnn
 Until all errors are displayed.

If [LOG] was entered:

Do you want to see the ERT LOG
 ?
 [YES] or [NO]

If [YES] is entered, refer to ERT LOG in this section.

WRITE THEN READ ERT
 TEST COMPLETED

Note: The following items are required for implementing the CS/80 external exerciser using the HP 85:

Description	HP Order Number
ROM DRAWER	HP 82936A
I/O ROM	00085-15003
16K MEMORY MODULE	HP 82903A
HP-IB INTERFACE	HP 82937A
EXERCISER PROGRAM	07908-16001

Due to HP 85 memory size limitations, the CS/80 external exerciser has been stored as many separate programs on the tape. Some of the commands are repeated in two or more programs where necessary. Since loading another program is time consuming, it is suggested that the user become familiar with the commands and the program(s) in which they reside using the HELP command.

To load the exerciser into an HP 85, proceed as follows:

- a. Connect the HP-IB cable from the HP 85 to the CS/80 device.
- b. Power-on the CS/80 device.
- c. Insert the CS/80 external exerciser tape into the HP 85.
- d. Power-on the HP 85.

The HP 85 goes through an automatic loading sequence, and lists the programs along with their HELP routines. The program desired is selected by pressing the appropriate "k" key on the HP 85.

If the CS/80 external exerciser tape has been inserted into the HP 85 before power-on, then once power is turned on the tape will automatically enter autoloading. During autoloading, a help listing is displayed and the "k" keys on the HP 85 are set up with the program names and their associated HELP listings. To load a program, press the appropriate "k" key; for the HELP listing of a program, hold down the shift key and press the appropriate "k" key.

If the tape is inserted after the HP 85 has been powered on, or if another program is desired, loading can be done as follows:

- a. Press the [PAUSE] key (if a program is already running).
- b. Type [LOAD "NAME"], where NAME is the desired program.
- c. Press the [END LINE] key.

The autoloading feature within the HP 85 allows the program to start running immediately once it has loaded. If the program was loaded otherwise (such as by typing LOAD "NAME") then the RUN key must be pressed to run the program. RUN always restarts the program from the beginning. To stop and start a program, press PAUSE and CONT respectively. CONT re-enters the program at exactly the same point at which PAUSE caused it to stop.

If a command in another program is entered, the question "Another program will now be loaded from the tape, Do you want the program loaded?" will be asked. If YES is entered, the program in which the command resides will be loaded; if NO is entered, the current program module is re-entered and "Input the TEST name" is displayed again. After typing in a command, press the END LINE key to enter the command.

If any problems are encountered while running a specific program, the program can usually be restarted by pressing the PAUSE key and then the RUN key. If the program does not restart, it is recommended that the power is cycled on the HP 85. This will cause the tape to autoload. If a read error is displayed while loading the tape, it is recommended that the tape head be cleaned.

The CS/80 external exerciser sets up three "k" keys while each test is running. If k1 is pressed (ABORT), the program will ask "Do you wish to ABORT?". If YES is entered, then a CANCEL is issued. Certain tests such as INIT MEDIA or CERT cannot be aborted due to the nature of the test. If k2 is pressed (DISPLA), then all printer output is forced to go to the display screen; conversely, if k3 is pressed (PRINTR), then the output is redirected to the thermal printer.

Note: The following items are required for implementing the CS/80 external exerciser using the HP 64000:

Description	HP Order Number
EXERCISER PROGRAM	64932-10002

To load the CS/80 external exerciser, proceed as follows:

- a. Connect an HP-IB cable from the HP 64000 to the CS/80 device.
- b. Set the rear panel switches on the 64000 mainframe for local mass storage.
- c. Turn on the HP 64000.
- d. Insert the CS/80 external exerciser tape into the 64000.

CAUTION

When inserting the cartridge into the transport, there is no need to push hard. Use of too much force may result in a "Servo Fail" error message. Also, do not remove the tape cartridge while the "Tape Drive On" indicator is on. This could result in damage to the information stored on the tape.

After initialization the tape goes through an automatic loading sequence. Then, the CRT will display the following format:

BOOT IN PROGRESS

When the output buffer fills the test will

Continue (the test will continue and the first data received will be lost)

OR

Print and Continue (The buffer will be printed and the test continued)

OR

Pause (You will then be asked if you want to print the buffer and then continue or if you just want to Continue, losing the first data received)

STATUS: Select 'CONTINUE', 'PRINT&CONTINUE' or 'PAUSE'

EXIT PRINT DSP CONTINUE PRNT_CONT PAUSE

At this time, the user may choose how information is displayed.

After formatting, five levels of softkeys are available (by pressing the ---ETC---key) for formatting or performing disc diagnostic operations. Furthermore, a brief description of the CS/80 external exerciser commands are given by pressing the HELP softkey. Since the softkeys only allow 9 characters to be displayed, a few of the command names have been slightly abbreviated. In all cases, however, typing in the entire command will invoke that particular operation.

After entering the desired command or string of commands, pressing the **RETURN** key will begin execution of the functions desired. Should the user require termination of a command operation, press the RESET key twice, this will put the system in the awaiting input level.

The locate and read (LCRD), locate and write (LCWR) and compare (CMPR) commands are limited by memory space. These commands will load a software buffer located in mainframe memory. The buffer can hold only 2048 bytes of information at a time; use beyond these bounds will result in an error indication. Since the screen cannot always display all available information at one time, occasionally the ROLL UP key must be used to scroll the information so it can be seen.

It is not recommended that termination of INIT MEDIA or SPARE commands be done using RESET-RESET as this will cause formatting problems. If any problems are encountered during other command sequences, press the RESET key twice; if the problem still exists after re-entering the command, it is recommended that the exerciser tape be loaded again. If a read error is displayed while loading the tape, it is suggested that the tape head be cleaned.

Note: The following items are required for implementing the CS/80 external exerciser using the HP 9845B/C:

Description	HP Order Number
HP-IB INTERFACE EXERCISER PROGRAM	HP 98034A 09845-94064

Due to the nature of the programs, the CS/80 external exerciser has been stored as separate programs on the tape. Some of the commands are repeated in two or more programs where necessary. Since loading another program is time consuming, it is suggested that the user become familiar with the commands and the program(s) they reside in by using the **HELP** command.

To load the exerciser into an HP 9845, proceed as follows:

- a. Connect the **HP-IB** interface cable from the HP 9845 to the CS/80 device.
- b. Power-on the CS/80 device.
- c. Insert the CS/80 external exerciser tape into T-15 (the right tape drive) on the HP 9845.
- d. Ensure that the key labeled "AUTO ST" on the HP 9845 is in the down position.
- e. Power-on the HP 9845.

The tape goes through an automatic loading sequence, and lists the programs along with **HELP** routines. The program desired is selected by pressing the appropriate "k" key on the HP 9845.

If the CS/80 external exerciser tape has been inserted into the HP 9845 before power-on, then once power is turned on the tape will automatically enter autoloading. During autoloading, a help listing is displayed and the "k" keys on the HP 9845 are set up with the program names and their associated **HELP** listings. To load a program, press the appropriate "k" key; for the **HELP** listing of a program, hold down the shift key and press the appropriate "k" key.

If the tape is inserted after the HP 9845 has been powered on, or if another program is desired, loading can be done as follows:

- a. Press the **[PAUSE]** key (if a program is already running).
- b. Type **[LOAD "NAME",1]**, where **NAME** is the desired program.
- c. Press the **[EXECUTE]** key.

The autoloading feature within the HP 9845 allows the program to start running immediately once it has loaded. If the program was loaded otherwise (such as by typing **LOAD "NAME",1**) then the **RUN** key must be pressed to run the program. **RUN** always restarts the program from the beginning. To stop and start a program, press **PAUSE** and **CONT** respectively. **CONT** re-enters the program at exactly the same point at which **PAUSE** caused it to stop.

If a command in another program is entered, the question "Another program will now be loaded from the tape, Do you want the program loaded?" will be asked. If YES is entered, the program in which the command resides will be loaded; if NO is entered, the current program is re-entered and "Input the test name" is displayed again. After typing in a command, use the CONT key to enter the command.

If any problems are encountered while running a specific program, the program can usually be restarted by pressing the PAUSE key and then the RUN key. If the program does not restart, it is recommended that the power is cycled on the HP 9845. This will cause the tape to autoloading. If a read error is displayed while loading the tape, it is recommended that the tape head be cleaned.

The CS/80 external exerciser sets up three "k" keys while each test is running. If k1 is pressed (ABORT), the program will ask "Do you wish to ABORT?". Certain tests such as INIT MEDIA or CERT cannot be aborted due to the nature of the test. If k2 is pressed (DISPLA), then all printer output is forced to go to the display screen; conversely, if k3 is pressed (PRINTR), then the output is redirected to the thermal printer.

Note: The following items are required for implementing the CS/80 external exerciser using the HP 250 system:

Description	HP Order Number
EXERCISER PROGRAM:	
FLEXIBLE DISC	45260-18001
CARTRIDGE TAPE	45260-19001

The HP 250 uses a BASIC version of the CS/80 external exerciser in a 64K user block. Either a flexible disc drive or a CS/80 tape backup system (DC 600) is required to load the program; it is also necessary to boot a special operating system. The time required to go from one program to another is small when running from disc, but when running from tape, it is recommended that very little program switching be done; the tape was not designed for this use.

To load the exerciser into the HP 250, via flexible disc, proceed as follows:

- a. Boot up the system from the CS/80 external exerciser flexible disc. Ensure that the system configuration is compatible with the particular devices currently connected to the system.
- b. Enter the command RUN "AUTOST". This program will list the four programs available and provide a description of the commands available within each. Run any one of the programs by pressing the appropriate softkey.

To load the exerciser into the HP 250, via DC 600 tape cartridge, proceed as follows:

- a. Boot up the system from the DC 600 exerciser tape cartridge.
- b. Try to minimize program loads from tape. Determine which program to use (using the HELP command) and explicitly load it by entering the command [RUN "programname:K"], where programname is one of the exerciser programs.

It is possible to have AUTOST load automatically at boot-up. This can be accomplished by using the CONFIG utility to specify AUTOST as the Autostart program. Similarly, any of the programs can be configured to be automatically loaded.

Execute the programs by using the RUN command. When one exerciser program cannot load another, it will retain control and signal that the load failed; the message UNABLE TO LOAD PROGRAM will appear. The likely causes are: trying to run in a 32K user block; or the system is searching the wrong mass storage device. If your user block is too small, attempt to run the exerciser from another larger block (the system may have to be reconfigured). If the wrong storage device is being searched, use the MSI (Mass Storage Is) command to set it to the desired one: MSI ":Q" tells the operating system to search the tape and MSI ":F2 ,6 ,X" (where X is 0, 1, or 2) tells it to search a flexible disc drive. If an error occurs while attempting to load any of the programs, check to be sure that the HP-IB DROM is configured in the current operating system.

When a function is requested which resides in another program the command will automatically be performed when that program is loaded; it is not required to repeat the command.

Softkey labels are always visible and the labeled key active. The HALT key has been defined to behave the same as the ABORT softkey. The PRINT softkey will display a label like Printer is 8. The number (8) is the address of a device which may be used as a printer; 0 and 1 are typically assigned to a printer, 8 is assigned to the work station CRT, and 9 is unassigned. Pressing the PRINTER IS key causes the next functioning printer to be selected. Notice that pressing the DISPLAY key also affects the PRINTER IS key; the label appearing is Printer is 8.

If the operating system does not boot properly, or the programs cannot be loaded, then there is most likely a problem within the loading device or its controller. If no other loading device is available, then a stand-alone device such as the HP 85 should be used to run the exerciser.

The HP 1000A/L must have at least 128 kbytes of memory. The maximum data buffer size while using OPER with an HP 1000A/L is 4156 words. The following items are required for implementing the CS/80 External Exerciser using the HP 1000A/L:

HP 1000A	
Description	HP Order Number
INTERFACE CARD	HP 12009A
EXERCISER PROGRAM:	
8" FLEXIBLE DISC	24398-13407/19
DC 600 CARTRIDGE TAPE	24398-13318
MINI CARTRIDGE TAPE	24398-13319/20/21/22/23/25/26/37 /39/40/41/45/47
5 1/4" MINI FLEXIBLE DISC	24398-13408/09/10/11/13/20/21/22
3 1/2" MICRO FLOPPY DISC	24398-13414/15/16/17/18/23/24/25
MAG TAPE (1600 BPI)	24398-13501

HP 1000L	
Description	HP Order Number
INTERFACE CARD	HP 12009A
EXERCISER PROGRAM:	
FLEXIBLE DISC	24398-13401
DC 600 CTG. TAPE	24398-13301
MINI CARTRIDGE TAPE	24398-13306/8/9
MINI FLEXIBLE DISC	24398-13403/4/6

The input device used must be compatible with the software medium chosen. To load the CS/80 External Exerciser, proceed as follows:

- a. Power-on the 1000A/L and the loading device.
- b. Insert the disc or tape into the loading device.
- c. For 264X, enter [%LCT]. (Enter [%LCT0120] if the right tape drive is used).

To run EXER or TAPE, proceed as follows:

1. Insert tape 24398-13345 (label !SYSCS #12). Enter [%LCT] for left drive.
2. Wait for VCP prompt to appear.
3. To run EXER:

- Insert tape 24398-13323 (label !EXER #5).
- Enter [%BCT] for left drive.
- Press return; the prompt RTE-A will show up on the screen.
- Enter [RU,EXER]

4. To run TAPE:

- Insert tape 24398-13325 (label !TAPE #6).
- Enter [%BCT] for left drive.
- Press return; the prompt RTE-A will show up on the screen.
- Enter [RU,TAPE]

5. To run EXER or TAPE, load the tapes in the following order:

- load 24398-13345. Enter [%LCT].
- load 24398-13323. Enter [%LCT].
- load 24398-13325. Enter [%BCT].

d. When the system prompt RTE-A appears, enter [RU,EXER] or [RU,TAPE] for EXER or TAPE program respectively.

e. For flexible disc, enter [%BDCbuscNAME] where "busc" is an octal number defined as:

- b - HP-IB address of the flexible disc drive (0-7).
- u - the flexible disc drive unit number
- sc - the octal select code of the HP 12009A HP-IB interface connected to the flexible disc drive (usually set to 27).

NAME is:

- EXER - CS/80 External Exerciser
- TAPE - Tape exerciser
- OPER - Operator designed CS/80 Program Set

f. For DC 600, enter [%BDCxbusc], where "xbusc" is an octal number defined as:

x - file number as follows:

Program	HP 1000A	HP 1000L
EXER	12B	0
TAPE	16B	4
OPER	20B	6

- b - the HP-IB address of the CS/80 device (0-7).
- u - cartridge tape drive unit number (always "1")
- sc - the octal select code of the HP 12009A HP-IB interface connected to the CS/80 device (usually set to 27).

When the program has loaded, the following is displayed:

BOOT PROCESS COMPLETE

RTE-A SYSTEM READY

g. To run a program, press any key to get the RTE-A colon prompt (:), then enter the following:

[RUN,FILENAME,1,1], where FILENAME is the program

h. CS/80 LUs at select code xx: xx, xx, xx, ...

CS/80 LUs at select code xx: LU numbers depend upon system configuration.

i. Input DRIVE ADDRESS?

[HP-IB address of CS/80 device]

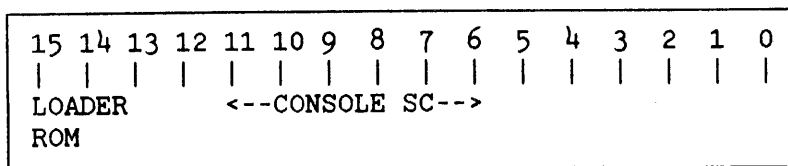
Input the TEST name
?

The maximum data buffer size while using OPER with an HP 1000M/E/F is 4156 words. The following items are required for implementing the CS/80 external exerciser using the HP 1000M/E/F systems:

Description	HP Order Number
BUFFERED ASYNCHRONOUS COMM. INTERFACE WITH CABLE	HP 12966A
HP-IB INTERFACE WITH HP-IB CABLE	HP 12821A
MEMORY EXPANSION MOD.	HP 12731A
TIME BASE GENERATOR	HP 12539C
MEMORY PROTECT	HP 12892B
DYNAMIC MAPPING ROMs	HP 13307A or 13307B
FIRMWARE EXP. MODULE	HP 12791A or 13304A
EXERCISER PROGRAM: MINI-CTG. TAPE MAG TAPE	part of system optional with sys

The CS/80 external exerciser can be loaded from magnetic tape or an HP mini cartridge. Only the procedure for loading and booting from mini cartridge will be discussed here. Loading instructions for magnetic tape is in the 12992 Loader ROM manual (HP part number 12992-60001). From there on the procedures are identical for both. The CS/80 external exerciser is supported through an RTE-4E Operating System Host. The host must be loaded first, then the desired exerciser program can be loaded. To load the RTE-4E host, insert the tape (provided with the system) into the loading device and perform the following steps:

- a. Select the S register.
- b. Set the bits as shown below.



- c. Press [STORE] [PRESET] [IBL] [PRESET] [RUN]

HP 1000M/E/F

d. A good load will be signified by 102077₈ displayed in the T register.

e. Select the S register.

f. Set bits as shown below.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
SET															
1	0	0	0												

g. Press [STORE].

h. Select P register.

i. Set bit 1 = 1 (P=2 octal)

j. Press [STORE] [RUN].

At this point the operating system will make all communications through the console.

CONSOLE RESPONSES

The following is an example of the expected inputs and outputs.

```

END OF SESSION
START RECONFIGURATION
LIST DEVICE LU#?
[1]

```

```

I/O RECONFIGURATION ALREADY PERFORMED:
CURRENT SELECT CODE ,NEW SELECT CODE ?
13 ,15      *SYSTEM CONSOLE
CURRENT I/O CONFIGURATION:
SELECT CODE 11= TBG
SELECT CODE 12= EQT 1,TYPE 32      : 7906 Mac disc
SELECT CODE 15= EQT 2,TYPE 5       : 264x, 262x terminal
SELECT CODE 16= EQT 3,TYPE 12      : Line printer 2631 type
SELECT CODE 17= EQT 4,TYPE 00      : 12531A Compatable terminal
SELECT CODE 20= EQT 5,TYPE 23      : Magtape 1
SELECT CODE 21= EQT 5,TYPE 23      : Magtape 2
SELECT CODE 22= EQT 6,TYPE 33      : CS80 Disc
I/O RECONFIGURATION?(YES/NO)
[YES]
CURRENT SELECT CODE#,NEW SELECT CODE#?(/E TO END)

```

At the I/O reconfiguration stage, the system will allow the operator to enter OLD SC,NEW SC to configure the I/O map to match the real I/O structure of the system being used. Terminate the reconfiguration by entering [/E].

NOTE: The generation for the host operating system has the TBG mapped to select code 11. If you put the DISC in select code 11, it is important to note that the TBG will be overlaid and will not show up in the

I/O map. To alleviate this problem move the disc to a temporary select code and then move the TBG to the real select code. Then move the disc back to select code 11.

After /E is entered the following messages will come up.

CURRENT PHYSICAL MEM SIZE IS 64 PAGES

MEM RECONFIGURATION? (YES/NO) [NO]

RECONFIGURATION COMPLETE

At this point the operating system will bring in the mapped portions from the loading device. Press any key, and the system will prompt with an "*" and APLDR can now be used to bring in the exerciser. The first thing that should be done before loading any program is to run the I/O mapping program. Enter:

[RU,MAPIO,1]

Record the lu designations and remove the program so that the other programs can be loaded. Remove MAPIO by entering:

[OF,MAPIO,8]

This must always be done whether the I/O map is needed or not. If unsure of the HP-IB address of the device, the time-out should be set to prevent an infinite loop. Once the system is loaded and running, the magnetic tape or mini-cartridge must be positioned to the file which contains the desired CS/80 external exerciser program module. A list of the program modules for each type of tape is as follows:

Mag Tape Format

- 1. Directory
- 2-18. Skip
- 19-32. RTE-4E Host
- 33. EXR1
- 34. TAPE
- 35. OPER

Mini-Cartridge Format (as part of 91711B)

Cartridge 1	Cartridge 2	Cartridge 3
1. Directory	1. Directory	1. Directory
2-15. RTE	2. EXR1	2. TAPE
		3. OPER

Positioning can be done using the memory resident program XCNTL or, for the mini-cartridge, positioning is simpler if done with the terminal file search soft keys.

USING XCNTL

The XCNTL program is provided in the RTE-4E system, and is executed as follows:

[RU,XCNTL,<lu>,<function>]

Where: lu = 8 for magnetic tape, 4 for mini-cartridge

HP 1000M/E/F

Function = 13B file forward
 04B rewind
 02B record backward
 14B file backward
 03B forward space

Each of the functions allow the tape to move one program unit. It is important to note that when using the file backward command (14B) that the tape is left in front of the last End-Of-File mark. In order to move to the next file, enter `RU,APLDR,<lu>` twice or `RU,XCNTL,<lu>,03B` and `RU,APLDR,<lu>`. This moves the tape past the end of file mark and loads in the next program.

Note: Although XCNTL can be used with the mini-cartridge, it is recommended that the tape control soft-keys be used instead.

USING APLDR

Once the tape is positioned, APLDR is used to load the appropriate program as follows:

`[RU,APLDR,<lu>]` (lu = 8 for mag tape, 4 for mini-cartridge)

Use the HELP command for a list of the command names and the programs they reside in. The programs take a maximum of three minutes to load from the mini cartridge. The program will now be loaded and the message "EXR1 READY, TAPE READY, or OPER READY" will be displayed on the terminal.

To run the current program, enter:

`[RU,NAME,<input lu>,<output lu>]`

NAME = EXR1, TAPE or OPER

input lu = 1; the console is always the input lu

output lu = 1

In most cases the console will be the output lu, although the line printer can be used instead. The only problem with using the line printer is that no output will be seen at the console.

Note: This will only work if the lineprinter was set up during reconfiguration.

SWITCHING BETWEEN PROGRAMS

To execute a different program the old program must be cleared from memory to allow the new program to be loaded. Enter:

`[OF,<program name>,8]`

Note that if this is not done the message NO PARTITION BIG ENOUGH will appear when the load is attempted. In this case the first record was read in and the system attempted to load it into the only partition. Even after removing the old program the tape must be repositioned in order to avoid the message CHECKSUM ERROR. Enter the following to do this:

`[RU,XCNTL,<lu>,14B] [RU,XCNTL,<lu>,03B]`

BREAKMODE

Breakmode is supported in this diagnostic and may be entered during a loop by hitting any key and then entering `*[BR,<program>,1]`. The exerciser can also be stopped by entering `*[OF,<program>,1]` for example.

PROBLEMS WITH RUNNING THE EXERCISER

There are some particular situations which require special attention in order to avoid complications when attempting to run the exerciser.

1. The lu for the disc drive is requested and is only used to linkup with the select code of the controller. It will always be 10 or 11. This can be verified when running MAPIO in the initialization stage. Range checking is employed in the program to insure that the input is 10 or 11.
2. If an invalid drive address is input or if the CS/80 device is powered down the program will hang without a message. The reason for this is that the timeout for the drive is set to zero. This is necessary due to some of the waiting periods in the programs, but it can be temporarily changed for set up purposes. Press any key to get the prompt "*" and enter:

`[OF,<program name>,1]`

The timeout can now be changed to 200 msec by entering.

`[TO,5,20]`

The program can now be run and if an invalid address is entered and the program hangs the following message:

"Continual QSTAT error of -1 being reported please check drive PASCAL halt -1"

Once the correct address has been determined the timeout should be reset to 0 by entering.

`[TO,5,0]`

The program can be run again.

3. If an invalid device address is input and the time is still set to zero, the program will hang without a message. At this point the RTE-4E host must be restarted.
4. If at anytime the system status is desired the program WHZAT can be executed.

`[RU,WHZAT]`

Note: The following items are required for implementing the CS/80 external exerciser using the HP 3000:

Description	HP Order Number
EXERCISER PROGRAM:	
MAG TAPE	32231-11002
FLEXIBLE DISC	30070-13401

To load the CS/80 external exerciser, proceed as follows:

- a. Cold load the Diagnostic Utility System.
- b. Once the DUS program has output its title message and prompt (:) enter "AID".
- c. AID will respond with a prompt character (>) and line number: > 10
- d. Enter "LOAD CS80DIAG". The response should be "Program Loaded!!" >n***

The CS/80 Offline Diagnostic is now loaded and may be run with the "RUN" command.

- e. When the program is loaded enter "RUN" to run the diagnostic. The dialogue will then be as follows:

CS/80 Offline Diagnostic Program (revision n.nn)

CS/80 Device Configuration

```

-----
IMB number n (Inter-Module Bus)
Channel n ID=!0 General I/O Channel (GIC)
Device n ID=!nnnn device name
-----
    
```

NOTE: At this point if there is more than one CS/80 device present then the following two questions are asked. The first question is asked only on multiple IMB systems.

Input the IMB number of the device to test (0-2)?

?

[n]

Input the Channel and Device number of the device

you wish to test (1-15,0-7)?

?

[n,n]

Default Sections are 1-4. Type "GO" to continue.

>

NOTE: If the diagnostic did not find any CS/80 devices, the following message is printed and the diagnostic will end.

HP 3000

NO CS/80 DEVICES WERE FOUND.

NOTE: Possible inputs are:
(loop)
(test [+ or -] [X[[/Y],Z]])
(test all)
(go [n])

The loop command will cause the test to loop through the selected sections until control Y halts the program. At the end of each loop the program will print a message that the n'th loop has completed.

The test command allows the user to select which sections to execute. The parameters allow a list of sections to be selected, or to add or subtract sections from the already selected ones.

- Section 1: GIC test
- Section 2: Loopback test
- Section 3: Selftest
- Section 4: Status test
- Section 5: System Type test
- Section 6: CS/80 External Exerciser

Both the loop and the test commands will be followed by the greater than prompt. Thus commands could be changed or canceled.

The GO command will cause the diagnostic to continue.

GO Execute the tests and direct
 the output to the terminal.

GO 1 Execute the tests and direct
 the output to the printer.

NOTE: Each section selected will then execute. If the Loop command was used the following will then be printed. The looping will continue until control "Y" is pressed. The break-mode prompt (>) will then be displayed and "EXIT" can be entered to terminate the program.

```
Start of Section n [test name]
End of Section n
Start of Section m [test name]
End of Section m
End of pass 1
Start of Section n [test name]
(control Y)
Break in statement nnnn
>
[EXIT]
```

```
End of AID user program
>nnnn
```

NOTE: If the Loop command was not used the following will be printed.

Start of Section n [test name]
 End of Section n
 Start of Section m [test name]
 End of Section m
 Test complete

NOTE: If the default sections are selected then the program will end after the test complete message.

End of Program

NOTE: Or if the default sections were not selected then the program will branch to the point where sections can be selected.

Default Sections are 1-4. Type "GO" to continue.

>

EXAMPLE:

(cold load DUS)
 Diagnostic/Utility System Revision nn.nn
 Enter Your Program Name (type HELP for information)

:

[AID]

AID nn.nn

> 10

[LOAD CS8ODIAG]

Program Loaded!!

The Next Available Statement Number is

> nnnn

[RUN]

CS/80 Offline Diagnostic Program (revision n.nn)

CS/80 Device Configuration

```

-----
IMB number n
Channel n      ID=!0      General I/O Channel (GIC)
  Device n     ID=!nnnn   device name
-----
  
```

Default Sections are 1-4. Type "GO" to continue.

>[TEST 6]

>[GO]

Start of Section 6 External Exerciser

Input the TEST name

?

UPDATE NOTICE

18 JULY 1986**MANUAL IDENTIFICATION**

Manual Part No.: 5955-3462

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Manual Printed: NOVEMBER 1984

UPDATE NOTICE DESCRIPTION

The purpose of this update is to adapt the manual to equipment containing production improvements made subsequent to the printing of the manual and to correct manual errors. Use the pages provided in this update to replace the corresponding pages in the manual; or, if a new page is being added, insert the page at the appropriate spot in the manual.

All updated pages are indicated with an update number next to the page number. A vertical line (update bar) added to the outside margin indicates text that has been updated, added, or deleted. An update number only indicates that text has been moved with no updates, additions, or deletions.

UPDATE HISTORY

Update 1, dated 12 JULY 1985.

Update 2, dated 18 JULY 1986.

UPDATE**DESCRIPTION**

This update notice contains the following pages:

- | | |
|---|--|
| 1 | v, 1-1, 1-2, 2-1, 2-2, 2-6A, 2-6B, 2-17, 2-18, 2-21, 2-22, 2-27, 2-28, Section VI, Appendix E. |
| 2 | Title page, ii, iii, iv, 2-2A, 2-2B, 2-2C, 2-2D, 2-5, 2-6, 2-13, 2-14, 2-20A, 2-33, 2-34. |

NOTE

Pages in Update 1 superceded by Update 2 have been removed from Update 1.