PAPER TAPE NO. 13184-16001 series 1629

HP 7970E/13184A MAGNETIC TAPE DRIVE AND INTERFACE DIAGNOSTIC

for

hp- 2022 SERIES SYSTEMS

reference manual

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HP 7970E/13184A Magnetic Tape Drive and Interface Diagnostic

INTRODUCTION

This diagnostic program verifies the proper operation of the HP 7970E Master and Slave Multi-format Magnetic Tape Drives and the HP 13184A Digital Magnetic Tape Unit Interface Kit. The program provides a check of all capabilities of the tape drive and interface. In addition, it is used to detect and isolate errors.

The HP 7970E/13184A diagnostic can be run with or without a teleprinter console device. When a teleprinter is used, error messages are printed on it. When a teleprinter is not used, the error messages are stored in an error buffer.

The operator has the option of selecting a command exercise operating mode. In this mode, one or two command functions of the tape drive and interface can be performed repeatedly until halted by the operator.

The magnetic tape drive and interface capabilities are checked in the read-only mode of the following tape formats:

- 9 track, 1600 cpi, Phase Encoded, odd parity
- 9 track, 800 cpi, NRZI, odd parity
- 7 track, 800 cpi, NRZI, odd and even parity
- 7 track, 556 cpi, NRZI, odd and even parity
- 7 track, 200 cpi, NRZI, odd and even parity

GENERAL ENVIRONMENT

Required Hardware

The following hardware is required to run the HP 7970E/13184A diagnostic program:

- HP 2100 Series Computer with an 8192 word (8K) or larger memory
- Direct Memory Access (DMA) — Dual Channel — called Dual Channel Port Controller (DCPC) in 21MX Series Computers
- HP 7970E (Master) Magnetic Tape Unit*
- HP 13184A Interface

*Note: Tape Drive and Tape Unit are synonymous.

Miscellaneous Requirements

A prerecorded magnetic tape, HP Part No. 13184-80007, containing test segments in eight recording formats is required to run the diagnostic program (see Figures 3 and 4).

Optional Hardware

Optional hardware that can be used with the HP 7970E/13184A diagnostic program is:

- Teleprinter with paper tape reader
- Paper tape photoreader
- HP 7970E Slave Magnetic Tape Unit

Required Software

The following software is required to use the HP 7970E/13184A diagnostic program:

- HP 13184A Diagnostic Program binary object tape Part No. 13184-16001.
- HP 2100 Basic Binary Loader (BBL), or Initial Binary Loader* (IBL), or Basic Magnetic Tape Loader
- The Diagnostic Configurator is used for equipment configuration and as a console device driver. Software includes:

  Binary object tape Part No. 24296-60001

  Manual Part No. 02100-90157

*Note: *IBL located within 21MX Series Computers.*

PROGRAM ORGANIZATION

The HP 7970E/13184A diagnostic program has four major sections:

- Initialization section
- Main Diagnostic Test section
- Error Recording section
- Command Exercise section

Initialization

This section configures the I/O instructions with the proper select codes after the Diagnostic Configurator is loaded and sets the program timing constants from drive speed information entered through the switch register.

Main Diagnostic Tests

The Main Diagnostic Test section contains the tests that verify proper operation of the command and control circuitry, I/O channel, data transfer, and tape drive rewind, load point, read, motion, and status capability.

Error Recording

The Error Recording section handles the processing of errors encountered during execution of the diagnostic program. If a teleprinter is used, the error messages are listed on the teleprinter. Otherwise, coded error messages are stored in an error buffer and subsequently can be retrieved by the operator through front panel controls (see "Operating Procedures").

Command Exercise

The Command Exercise section is operator selectable. When selected, it allows the operator to set options in the switch register so that one or two functional commands are issued repeatedly until halted by the operator. In addition, the rewind off-line test is contained in this section.

TEST SECTIONS

The Main Diagnostic Test section has six subsections, as follows:

- Initial clear and unit-select tests
- I/O channel tests
- Rewind and load point tests
- Cycle start and format verification tests
- Initial read, motion, and status tests
- Data transfer tests

Initial Clear and Unit-Select Tests

These tests are performed in the following sequence:

Test Number	Test
1	The clear command is issued to the interface. After a short delay, the busy status bit is checked.
2	A de-select command (no units selected) is issued to the interface. The on-line status bit is checked.
3	A forward space record command is issued to the interface without the control being set. The de-select command (test 2) remains in effect. The command reject status bit is checked.

Test Number	Test
4	The tape unit select command, for the unit selected by the switch register, is issued to the interface. The tape unit on-line status bit and the ready status bit are checked.

I/O Channel Tests

The I/O channel tests are performed in the following sequence:

Test Number	Test
5	The data channel flag is set, cleared, and then checked by an SFC operation.
6	The data channel flag remains unchanged from test 5; it is rechecked by an SFS operation.
7	The data channel flag is set and then checked by an SFS operation.
8	The data channel flag remains unchanged from test 7; it is rechecked by an SFC operation.
9	The command channel flag is set, cleared, and then checked by an SFC operation.
10	The command channel flag remains unchanged from test 9; it is rechecked by an SFS operation.
11	The command channel flag is set and then checked by an SFS operation.
12	The command channel flag remains unchanged from test 11; it is rechecked by an SFC operation.
13	A normal data channel interrupt condition is set up and checked.
14	A normal command channel interrupt condition is set up and checked.
15	A suspension of a normal data channel interrupt by a higher priority channel interrupt is set up and checked.
16	The ability of either channel (in test 15) to interrupt is checked. (This test is skipped if the previous test passes.)

Test Number	Test
17	A suspension of a normal command channel interrupt by a higher priority channel interrupt is set up and checked.
18	The ability of either channel (in test 17) to interrupt is checked. (This test is skipped if the previous test passes.)

Rewind and Load Point Tests

This series of tests is optional. If program control switch 4 (see Table 1) is clear, they will be performed in the following sequence:

Test Number	Test
19	A forward space record command is issued to the interface followed by a rewind command. The status of the drive and interface is checked.
20	The load point status bit is checked.
21	At load point, the command reject status bit is checked by issuing a back space record command to the interface. The command reject status bit and load point status bit are checked.
22	At load point, a rewind command is issued. The interface busy status bit is checked for the busy condition.
23	The interface busy status bit is rechecked for the not busy condition.

Cycle Start and Format Verification Tests

This subsection locates the start of a group of records that form one test cycle. The starting point is designated by two consecutive tape marks. The program will make 64 attempts to find the starting point before halting. In addition, if an end-of-tape marker is encountered during the above search, and program control switch 10 is set, the program halts. This allows the operator to change to a new format on the tape drive and set the new data format ID in the switch register. The cycle start and format verification tests are performed in the following sequence:

Test Number	Test
24	A search is made for a double file mark. If found, the interface status is checked.
25	The format ID record is read from the pre-recorded tape and compared to the format ID set in the switch register.

Initial Read, Motion, and Status Tests

The initial read, motion, and status tests are performed in the following sequence:

Test Number	Test
26	The interface file protect status bit is checked for the set condition. (The pre-recorded tape reel must not contain a write ring.)
27	A forward space record command is issued to the interface to space over the third tape mark (see Figures 3 and 4). The tape mark status bit is checked.
28	A read operation (2 bytes) is started and the data flag is checked to be sure it is not setting too early.
29	From test 28, the data flag is allowed to set and the command flag is checked to be sure that it is not setting too early.
30	From test 29, the command flag is checked to make sure it set. The tape is backspaced one record.
31	The second record (see Figures 3 and 4) consisting of two bytes is read using DCPC (DMA). The DCPC word count is checked to ensure completion of the transfer.
32	The data transferred in test 31 is checked for data errors.
33	A forward space record command is issued to the interface to space over the fourth tape mark (see Figures 3 and 4). The tape mark status bit is checked.
34	The third record (see Figures 3 and 4) is read. The transfer status is checked for the presence of the odd byte status bit. *Note: Test 34 is run only if the tape format is 9 track, NRZI.*
35	The data in the third record is transferred from the tape to a core buffer where it is compared to data in core.
36	The third record is read (see Figures 3 and 4). The transfer status is checked for forced data errors.
37	The data transferred in test 36 is compared to data in core.
38	A back space record command is issued and the third record is re-read with the parity enable set. Transfer status is checked for forced data errors.
39	The preset parity error word from the interface is checked. (The standard parity error word is 125252_8 in core location 130_8. See Front Panel Procedures to modify preset parity error word.) *Note: Tests 36 through 38 and 39 are run only for 7 track tape formats.*

Test Number	Test
40	Two successive back space file commands are issued to the interface (backspacing over tape marks 4 and 3). The tape mark status bit is checked after each operation.
41	A forward space record command is issued to the interface (spacing over tape mark 3). The status is checked and held. Record two is read, the status is checked and the single word transferred is compared to data in core.
42	A back space record command is issued to the interface (backspacing over the second record). The back space record operation status bit is checked.
43	A forward space record operation is started and another select command is issued to the interface. The command reject status bit is checked.
44	A forward space record operation is started (spaces over tape mark 4) and a back space record command is immediately issued to the interface without setting control. The operation status is checked for the presence of the command reject status bit.
45	A read record operation (third record) is started; the data channel flag is not cleared. At the end of the operation, the status is checked for the presence of the data error status bit and the timing error status bit.
46	A read record operation (fourth record) is started. The time for DCPC (DMA) to transfer 400 words (800) bytes) is checked within the range of -10% to +10%.

Data Transfer Tests

Extended transfers of data records are performed by the data transfer tests. The records vary in length, from eight bytes to 2048 bytes, and contain different data patterns. The record organization on the prerecorded tape is given in Figure 4. The sequence of data transfers is performed as follows:

Test Number	Test
47	An 816-byte record with the ANSI format "A" data pattern is read and the data is compared to data in core.
48	An 816-byte record with the ANSI format "B" data pattern is read and the data is compared to data in core.

Data transfer tests 49 through 59 read a record composed of random data patterns. This input data is compared to data in core. The record size (in bytes) for each test follows:

Test Number	Test
49	An 8-byte record is read and compared.
50	A 16-byte record is read and compared.
51	A 32-byte record is read and compared.
52	A 64-byte record is read and compared.
53	A 128-byte record is read and compared.
54	A 256-byte record is read and compared.
55	A 512-byte record is read and compared.
56	A 1024-byte record is read and compared.
57	A 2048-byte record is read and compared.
58	A 4096-byte record is read and compared.
59	An 8192-byte record is read and compared.

Data transfer tests 60 through 68 read a record composed of track single rotating bit patterns. The input data is compared to data in core. The record size (in bytes) for each test follows:

Test Number	Test
60	An 8-byte record is read and compared.
61	A 16-byte record is read and compared.
62	A 32-byte record is read and compared.
63	A 64-byte record is read and compared.
64	A 128-byte record is read and compared.
65	A 256-byte record is read and compared.
66	A 512-byte record is read and compared.
67	A 1024-byte record is read and compared.
68	A 2048-byte record is read and compared.

Data transfer tests 69 through 77 read a record composed of track sawtooth bit patterns. The input data is compared to data in core. The record size (in bytes) for each test follows:

Test Number	Test
69	An 8-byte record is read and compared.
70	A 16-byte record is read and compared.

Test Number	Test
71	A 32-byte record is read and compared.
72	A 64-byte record is read and compared.
73	A 128-byte record is read and compared.
74	A 256-byte record is read and compared.
75	A 512-byte record is read and compared.
76	A 1024-byte record is read and compared.
77	A 2048-byte record is read and compared.

The following data transfer tests, 78 through 86, read a record composed of channel sawtooth bit patterns. The input data is compared to data in core. The record size (in bytes) for each test follows:

Test Number	Test
78	An 8-byte record is read and compared.
79	A 16-byte record is read and compared.
80	A 32-byte record is read and compared.
81	A 64-byte record is read and compared.
82	A 128-byte record is read and compared.
83	A 256-byte record is read and compared.
84	A 512-byte record is read and compared.
85	A 1024-byte record is read and compared.
86	A 2048-byte record is read and compared.

Operating Procedures

GENERAL

After the hardware is properly connected, and the Diagnostic Configurator has been loaded and configured, the HP 7970E/13184A diagnostic program is loaded through the available input device. Program initialization consists of entry of the select code for the HP 13184A interface and the speed (inches per second) of the magnetic tape drive through the switch register.

When initialization is completed, program operation and run sequence is controlled by the operator through the switch register. Program control switch settings are given in Table 1. Program execution continues until one or more of the following events occur:

- Program control switch 15 is set; the program halts at the end of the current test.
- Program control switch 14 is not set; on encountering an error, the program stores or lists a message and halts.
- Program control switch 12 is not set; the program stores or lists the cycle count and halts at the end of the current cycle.
- Program control switch 10 is set; on encountering an end-of-tape marker, the program halts with the next format ID in the Memory Data register.
- The tape drive is unable to read the current data format on the tape.
- A fata error occurs (the program and the tape are out of sequence).

Program halts are described in Table 2.

The operator should consult the appropriate *HP 2100 Series Computer Front Panel Procedures* manual.* The manual describes computer front panel controls and procedures for using them.

NOTE: The main program can be restarted at address 2000_8 at any time after the program has been initialized.

**NOTE: HP 2100 Front Panel Procedures manual is HP Part No. 5951-1371.*

OPERATING WITH OR WITHOUT A TELEPRINTER

a. Load and configure the Diagnostic Configurator.

b. Load the HP 7970E/13184A diagnostic program.

c. Load address 100 (octal) in the P-register. Check memory location 126_8 to see that the Diagnostic Serial Number equals 112102_8.

d. Enter the select code (in octal) for the HP 13184A interface in switch register positions 5 through 0. (Load the lower select code of the interface pair.) Enter the speed of the tape unit (see Figure 1) in switch register bit positions 9 through 6 and the DCPC (DMA) channel selection in switch register bit 11.

e. Press PRESET (INTERNAL and EXTERNAL as applicable), then press RUN.

f. After a halt 102074 (octal), mount the data test tape (HP Part No. 13184-80007) on the tape unit and prepare it for reading the tape.

g. Select, then clear, the switch register and set the switch corresponding to the logical unit number of the tape unit containing the data test tape (see Table 1, switches 3 through 0).

NOTE: It is recommended that only the unit select switches (bits 3 through 0) of the switch register be set for the first diagnostic cycle; after which, any of the switches described in Table 1 may be used as desired.

h. If no teleprinter is available, messages will be stored in the error buffer.

i. Select the data format to be read on the tape drive (specify density, number of tracks and parity; for example, 1600 bpi, 9-track, ODD pairty is the first format). See Figure 3 for the sequence of recording formats on the test tape.

NOTE: The first beginning-of-tape (BOT #1) on the test tape denotes the start of 1600 bpi density data (see Figure 3). The tests should be performed in a sequential manner.

j. Press RESET and LOAD on the tape drive; the tape will position to a load point marker and the LOAD light will illuminate. Press ON LINE.

k. Enter the format ID associated with the selected recording mode into the switch register (see Table 1, switches 8 through 6.

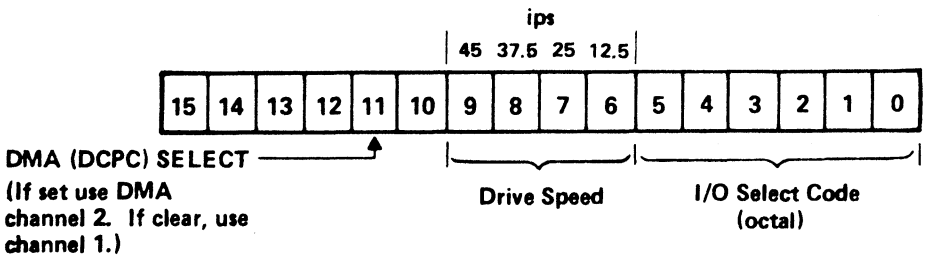


Figure 1. Switch Register Bit Positions

l. Enter any desired direct control program options into the switch register (see Table 1, switches 15 through 10).

m. Press PRESET (INTERNAL and EXTERNAL as applicable), then RUN.

n. If switch 4 in the switch register is clear, the tape will move forward and then rewind to load point repeatedly. To proceed to the end of this test segment, inhibit the rewind-to-load-point tests by setting switch 4.

NOTE: Forward tape motion is normally spasmodic.

o. When the tape proceeds to the end of this test segment, it stops at the end-of-tape marker (EOT) if switch register switch 10 is set. The computer halts with halt code $10200x_8$ displayed in the Memory Data register (x may be 0 through 7). The halt code represents the format ID of the next sequential data format (see Table 2).

To proceed to the next format, go to step g and continue.

To recycle on the same data format rewind the tape to the last previous BOT marker and clear switch register switch 10, then press RUN.

To restart the diagnostic program, select the P-register, enter address 2000_8, go to step g and continue. Re-configuration is possible at any time by starting at step c.

The tape drive speed bit settings follow:

Drive Speed (ips)	Switches 9 8 7 6
12.5	0 0 0 1
25	0 0 1 0
37.5	0 1 0 0
45	1 0 0 0

COMMAND EXERCISE MODE

a. At any time after the HP 7970E/13184E diagnostic program has been initialized and is not executing, load address 1000_8.

b. Clear the switch register.

c. Set the command selections in the switch register. The commands and associated switches are shown below. Any of the first set of four commands can be combined with any of the second set of four commands, or any of the commands can be used alone.

Switch Number	Function
0	Read one record forward
1	Forward space one record
2	Forward space one file
3	Clear the interface
4	Back space one record
5	Back space one file
6	Rewind to load point
7	Clear the interface
8	Run the rewind off-line test
12	10 milliseconds delay between commands
13	15 milliseconds delay between commands
14	30 milliseconds delay between commands

d. Press PRESET (INTERNAL and EXTERNAL as applicable).

e. Press RUN.

f. To halt the program to change functions, set switch 15 in the switch register.

NOTE: Ignore the test numbers that are printed when error messages occur.

If the program becomes uncontrollable or gets into an infinite loop, press HALT and return to step a of this procedure.

PROGRAM CONTROL SWITCHES

The program control switch selections are entered in the switch register following program initialization. Program control is comprised of four groups of switches; direct control, data format ID, optional programs, and unit select. Figure 2 shows program control switch group assignment. Table 1 gives individual switch functions.

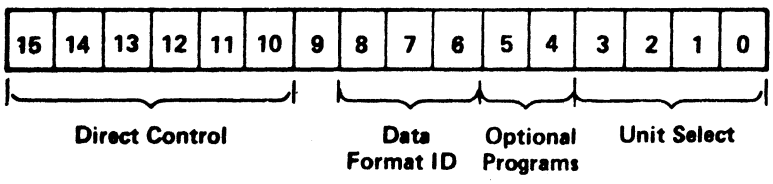


Figure 2. Program Control Switch Assignments

Table 1. Program Control Switches

Control Group	Switch Number	State	Function
Direct Control	15	set	Program halts after current test. The A-register contains the test number. The B-register contains the test status (binary integer). The Memory Data register contains 102076_8.
Direct Control	14	set	Error halts are suppressed. Switch 14 does not suppress format error halt codes 10200x (octal) where x = 0 through 7. If any of these occur while switch register switch 10 is not set, check the format entered in the switch register switches 6 through 8 to see that it corresponds with the test tape format.
Direct Control	13	set	Program loops on the last test or group of tests.
Direct Control	12	set	Program loops on current diagnostic cycle.
Direct Control	11	set	The printing or storing of error messages is suppressed.
Direct Control	10	set	Program halts when end-of-tape marker is detected. The Memory Data register contains the format ID Code for the next sequential data recording format.
Data Format ID	8, 7, 6	000	Recording mode is 9 track, 1600 cpi, PE, odd parity.
		001	Recording mode is 9 track, 800 cpi, NRZI, odd parity.
		010	Recording mode is 7 track, 800 cpi, NRZI, even parity.
		011	Recording mode is 7 track, 556 cpi, NRZI, even parity.
		100	Recording mode is 7 track, 200 cpi, NRZI, even parity.
		101	Recording mode is 7 track, 800 cpi, NRZI, odd parity.
		110	Recording mode is 7 track, 556 cpi, NRZI, odd parity.
		111	Recording mode is 7 track, 200 cpi, NRZI, odd parity.

Table 1. Program Control Switches (continued)

Control Group	Switch Number	State	Function
Optional Programs	5[1]	set	DCPC (DMA) transfers are inhibited. Transfers are made under normal I/O and flag control.
Optional Programs	4	set	The rewind-load point tests are inhibited.
Unit Select	3[2]	set	Selects tape drive 3
Unit Select	2[2]	set	Selects tape drive 2
Unit Select	1[2]	set	Selects tape drive 1
Unit Select	0[2]	set	Selects tape drive 0

NOTES: [1] *Switch 5 should not be set in 1600 cpi PE mode.*
[2] *Only one unit select switch should be set at a time.*
Switch 9 is reserved.

Table 2. Program Halts

Memory Data Register contents (octal)	Type of Halt	Operator Action
102000	Format error halt for 9 track, 1600 cpi, PE mode.	Check tape recording format type and the format ID in the switch register. Correct either, if necessary. If control switch 10 is set, change the recording format and the format ID in the switch register (see "Operating Procedures"). Press RUN to continue.
102001	Format error halt for 9 track, 800 cpi, NRZI.	Same as above.
102002	Format error halt for 7 track, 800 cpi, NRZI, even parity.	Same as above.
102003	Format error halt for 7 track, 556 cpi, NRZI, even parity.	Same as above.
102004	Format error halt for 7 track, 200 cpi, NRZI, even parity.	Same as above.
102005	Format error halt for 7 track, 800 cpi, NRZI, odd parity.	Same as above.
102006	Format error halt for 7 track, 556 cpi, NRZI, odd parity.	Same as above.
102007	Format error halt for 7 track, 200 cpi, NRZI, odd parity.	Same as above.
102055	Error Halt; the current test is in error and control switch 14 is not set. A-register = test number . B-register = current status.	Press RUN to continue.
102056	Error buffer is full.	Review the coded errors stored in the buffer; press RUN to continue.
102057	Error halt; the data record could not be read successfully.	Press RUN to continue.
102070	Unit select halt; no unit select switch in the switch register.	Set one unit select switch in the switch register; press RUN.
102071	Unit select halt; tape unit selected is off-line or busy.	Put tape unit on-line or wait until ready; press RUN.

Table 2. Program Halts (continued)

Memory Data Register contents (octal)	Type of Halt	Operator Action
102072	Initialization halt; no tape drive speed entered in the switch register.	Set the code for the tape drive speed in the switch register (bits 6 through 9); press RUN.
102073	Initialization halt; no select code entered in the switch register for the HP 13184A.	Set the HP 13184A select code in the switch register (bits 0 through 5); press RUN.
102074	Normal Initialization halt.	Clear the switch register and continue with the operating instructions.
102076	Normal halt after current test. A-register = test number. B-register = status.	Press RUN to continue.
102077	Normal halt after the complete current cycle. Cycle count (binary) is in the A-register.	Press RUN to continue.

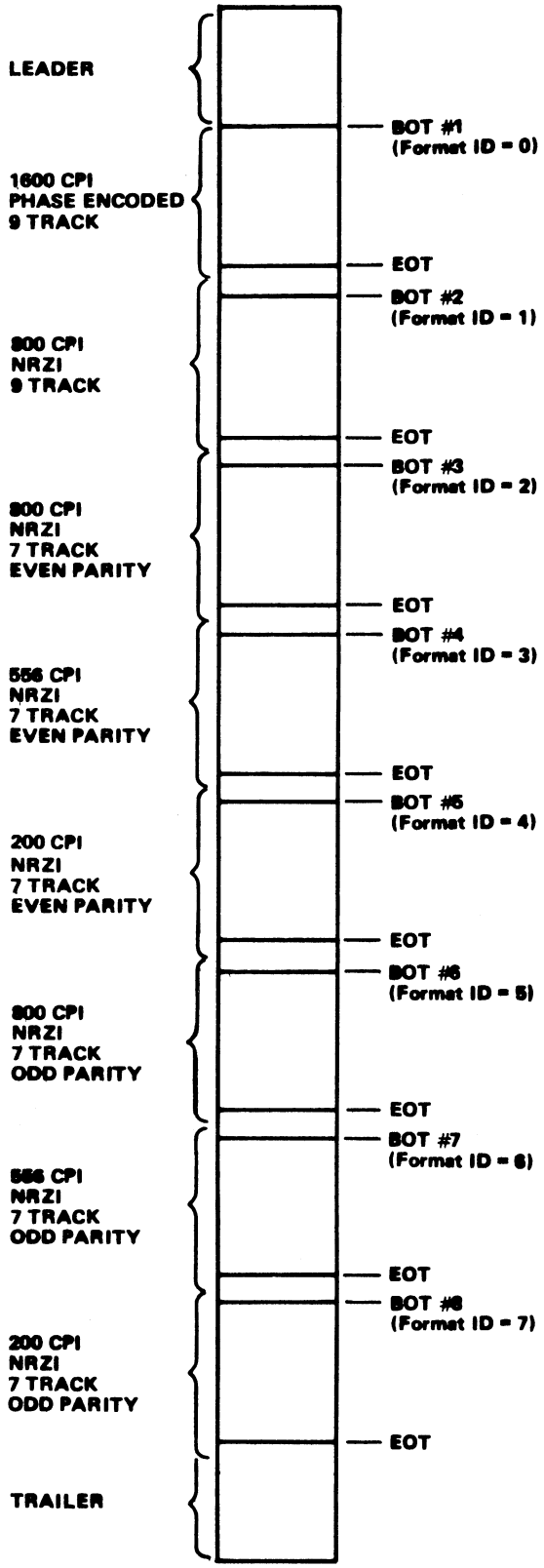
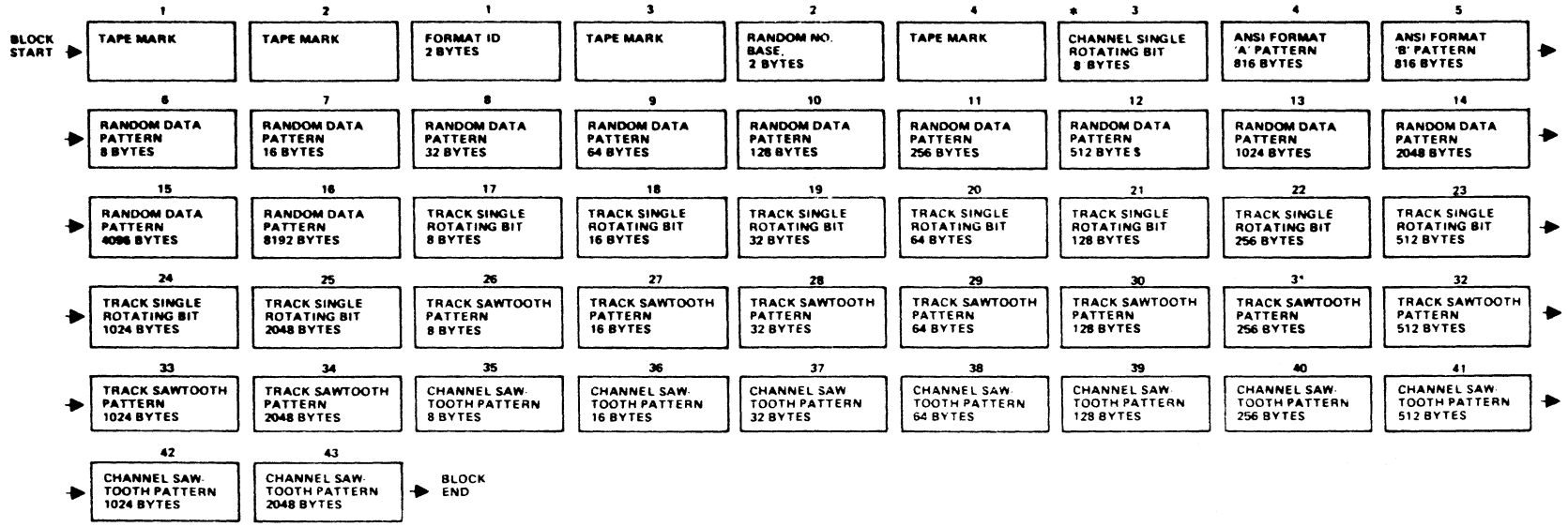


Figure 3. Prerecorded Magnetic Tape Test Segments



* This record is 9 bytes in length in the 9 track NRZI recording mode. In the 7 track recording modes, the parity for this record is reversed, i.e., for even parity mode, this record has odd parity.

OBTAINING ERROR MESSAGES FROM THE ERROR BUFFER

When a teleprinter is not used, error messages are stored in the error buffer. This buffer resides in locations 4000_8 through 5677_8. Each error message occupies four consecutive words. However, error messages for tests other than data transfer tests utilize only the first two words; words three and four are zero filled. All types of error messages begin in a memory location with an octal, absolute address which ends in a 0 or 4. Error buffer format is as follows:

Address (octal)	Word	
5677	four	Last Message
5676	three	
5675	two	
5674	one	
5673	four	Last Message − 1
5672	three	
5671	two	
5670	one	
.	.	.
.	.	.
.	.	.
4003	four	First Message
4002	three	
4001	two	
4000	one	

For instruction on examining the contents of a memory location, refer to the applicable *HP 2100 Series Computer Front Panel Procedures.* (For example, the HP 2100 Front Panel Procedures Manual, HP Part No. 5951-1371.)

Error Message Formats

GENERAL

If program control switch 11 is clear, error messages are either printed on the teleprinter or stored in the error buffer.

TELEPRINTER OUTPUT

The error messages are printed in the form:

xxx TEST # *nn*

STATUS WAS ss_1

AND IT SHOULD BE ss_2, ss_3

xxx is the diagnostic cycle number (1 through 256).

nn is the number of the test in error (1 through 83).

ss are status mnemonics, as follows:

CB Controller Busy

CR Issued Command Rejected

DE Data Error detected during data transfer

ET End-of-Tape marker encountered

FP File Protect; no write ring on the tape reel

LP Load Point marker encountered

OB Odd Byte contained in last record read

OF Selected tape unit Off-line or in LOAD state

RW Selected tape unit in REWIND state

SE Single-track Error detected during phase encoded data transfer

TB Selected Tape unit Busy

TE Data Timing Error

TM Tape Mark (file mark) read

If the test is a data transfer, the following three lines are added to the error message:

WORD IN ERROR # *cc*

WORD IN ERROR IS *zzzz zzzz zzzz zzzz*

AND IT SHOULD BE *yyyy yyyy yyyy yyyy*

ccc	is the number of the word in the record that is in error.
zzzz zzzz zzzz zzzz	is the bit configuration of the erroneous word.
yyyy yyyy yyyy yyyy	is the bit configuration of the correct word.

ERROR BUFFER OUTPUT

The error messages for all tests except data transfer tests are stored in the form:

Word 1: bits 8 through 15 = Diagnostic cycle number (binary integer)
bits 0 through 7 = Test number (binary integer)

Word 2: Status word

Status bit 0 set:	Selected tape unit Off-line or in LOAD state
1 set:	Data error detected during data transfer
2 set:	File protect; no write ring on the tape reel
3 set:	Issued command rejected
4 set:	Data timing error
5 set:	End-of-tape marker encountered
6 set:	Load point marker encountered
7 set:	Tape mark (file mark) read
8 set:	Controller busy
9 set:	Selected tape unit busy
10 set:	Selected tape unit in REWIND state
11 set:	Odd byte contained in last record read
12 set:	Single-track error detected during phase encoded data transfer.

Word 3: zero filled

Word 4: zero filled

Data transfer test error messages are stored in the form:

Word 1: bits 8 through 15 = Diagnostic cycle number
bits 0 through 7 = Test number

Word 2: Status word (see Status bit definitions above)

Word 3: The bit configuration of this word corresponds to the bit configuration of the erroneous word.

Word 4: The bit configuration of this word corresponds to the bit configuration of the original (correct) word.

Error Message Analysis

INITIAL CLEAR AND UNIT SELECT TESTS

Test in Error	Description
1	The interface busy status bit is set.
2	The tape unit off-line status bit or busy status bit is clear.
3	The interface command reject status bit is clear.
4	The tape unit off-line status bit or busy status bit is set.

I/O CHANNEL TESTS

Test in Error	Description
5	The data channel flag is set.
6	The data channel flag is set.
7	The data channel flag is clear.
8	The data channel flag is clear.
9	The command channel flag is set.
10	The command channel flag is set.
11	The command channel flag is clear.
12	The command channel flag is clear.
13	The data channel did not respond to an interrupt.
14	The command channel did not respond to an interrupt.
15	The data channel interrupt was not suspended by a DCPC (DMA) channel interrupt.

Test in Error	Description
16	Neither DCPC (DMA) nor data channel responded to the interrupt condition.
17	The command channel interrupt was not suspended by a data channel interrupt.
18	Neither data channel nor command channel responded to the interrupt condition.

REWIND AND LOAD POINT TESTS

Test in Error	Description
19	The rewind status bit, tape unit busy status bit, or interface busy status bit is clear.
20	The load point status bit is clear.
21	The command reject status bit is clear.
22	The interface busy status bit is clear.
23	The interface busy status bit is set.

CYCLE START AND FORMAT VERIFICATION

Test in Error	Description
24	Two consecutive tape marks could not be found.
25	The data read from the tape did not compare to core buffer data.
26	The file protect status bit is clear.
27	The tape mark status bit is clear.
28	Data flag set too soon.
29	Command flag set too soon.
30	Command flag did not set in time.
31	The DCPC (DMA) transfer did not complete. DCPC (DMA) word count is not zero.
32	The data transfer contained errors.
33	The tape mark status bit is clear.
34	The odd byte status bit is clear.

Test in Error	Description
35	The transferred data did not compare to the core buffer data.
36	The data error status bit is clear.
37	The transferred data did not compare to the core buffer data.
38	The data error status bit is clear.
39	The interface did not transfer the parity error word.
40	The tape mark status bit was clear after each operation.
41	The tape mark status bit was clear after the first operation, or data errors occurred in the transfer, or the tape was positioned to read the wrong record.
42	The back space record operation status bit is set.
43	The command reject status bit is clear.
44	The command reject status bit is clear.
45	The data error status bit and timing error status bit are clear.
46	The DCPC (DMA) channel flag did not set in the fixed time frame.
47 thru 86	The data transferred from the tape drive to the interface contained errors and/or the data transferred from the interface to the CPU did not compare.