HEWLETT PACKARD

OPERATOR'S MANUAL

HP 2635A/39A TERMINAL DIAGNOSTIC

(For 21XX-Series Computers)
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SECTION I

INTRODUCTION

1-1. GENERAL

This diagnostic verifies the operation of the 2635A Printer with the 12531D, 12880A, 12966A, 12845B, or 59310B interface and associated cable. The basic I/O portion of the interface card (except 59310B), which includes the Flag and Control circuits, will be tested. Various tests will select the 2635A via skip-on-flag, interrupt and Direct Memory Access (DMA). Dual Channel Port Controller (DCPC) and DMA are synonomous throughout this manual. Most of the standard features of the 2635A will be checked by either one or more tests. This diagnostic does not test 100 percent of the features that the 2635A or 2639A may have. It is not the purpose of this diagnostic to demonstrate every feature. The combinations of escape sequences and control characters which affect the 2635A could be put together in an almost endless fashion. This diagnostic does not claim to be inclusive of all such combinations and it has been decided to limit the testing of some features in any individual pass through the diagnostic.

Throughout this manual the label 2635A will refer to both the 2635A and 2639A unless specifically stated otherwise.

1-2. REQUIRED HARDWARE

A. HP 2100, 21MX-M, or 21MX-E computer with minimum 12K memory. (The 2114, 2115, and 2116 are not supported.)

B. HP 12531D, 12880A, 12966A, 12845B, and 59310B interface PCA and cable. The choice of cables on the 12531D is determined by whether the 2635A has an RS232 or 264X compatible connector.

INTERFACE	CABLE		
59310B	59310-60002		
12966A	12966-60008		
12531D	12531-60026	or	02640-60058
12880A	02640-60058		

C. Any one of the diagnostic input devices as listed in the HP Diagnostic Configurator Manual (24296-90157), paragraph 1-2.d is required for loading the diagnostic.

D. Console device for message reporting recommended, but not required.

E. 2635A line printer with one of the following internal interface cards installed.

1. RS232 MIN BOARD		02631-60043
	or	02631-60082
2. RS232 MAX BOARD		02631-60009
	or	02631-60083
	or	02631-60159
3. CURRENT LOOP *		02631-60021
	or	02631-60084
	or	02631-60160
4. HP-IB		02631-60006
	or	02631-60090
5. EXTENDED SERIAL		02635-60164

* Refer to ET0766 on how to interface.

F. Sufficient quantity of 136 column line printer paper.

Internal 2635A interfaces must be matched to the appropriate 2100 type interfaces, and cables. See table 1-1 for proper interface to interface configurations.

1-3. OPTIONAL HARDWARE

A. DMA (DCPC) in the computer.

B. Alternate language ROM in 2635A

C. Sufficient quantity of 136 column multi-part (up to 6 parts) paper may be substituted for single part paper.

1-4. SOFTWARE REQUIREMENTS

A. Diagnostic Configurator, HP Part No. 24296A used for equipment configuration and as a console device driver. Included are:

Binary object tape	24296-60001
Manual	02100-90157

B. HP 2635A Printer Diagnostic

Binary object tape	02635-16001
Manual (This manual)	02635-90906

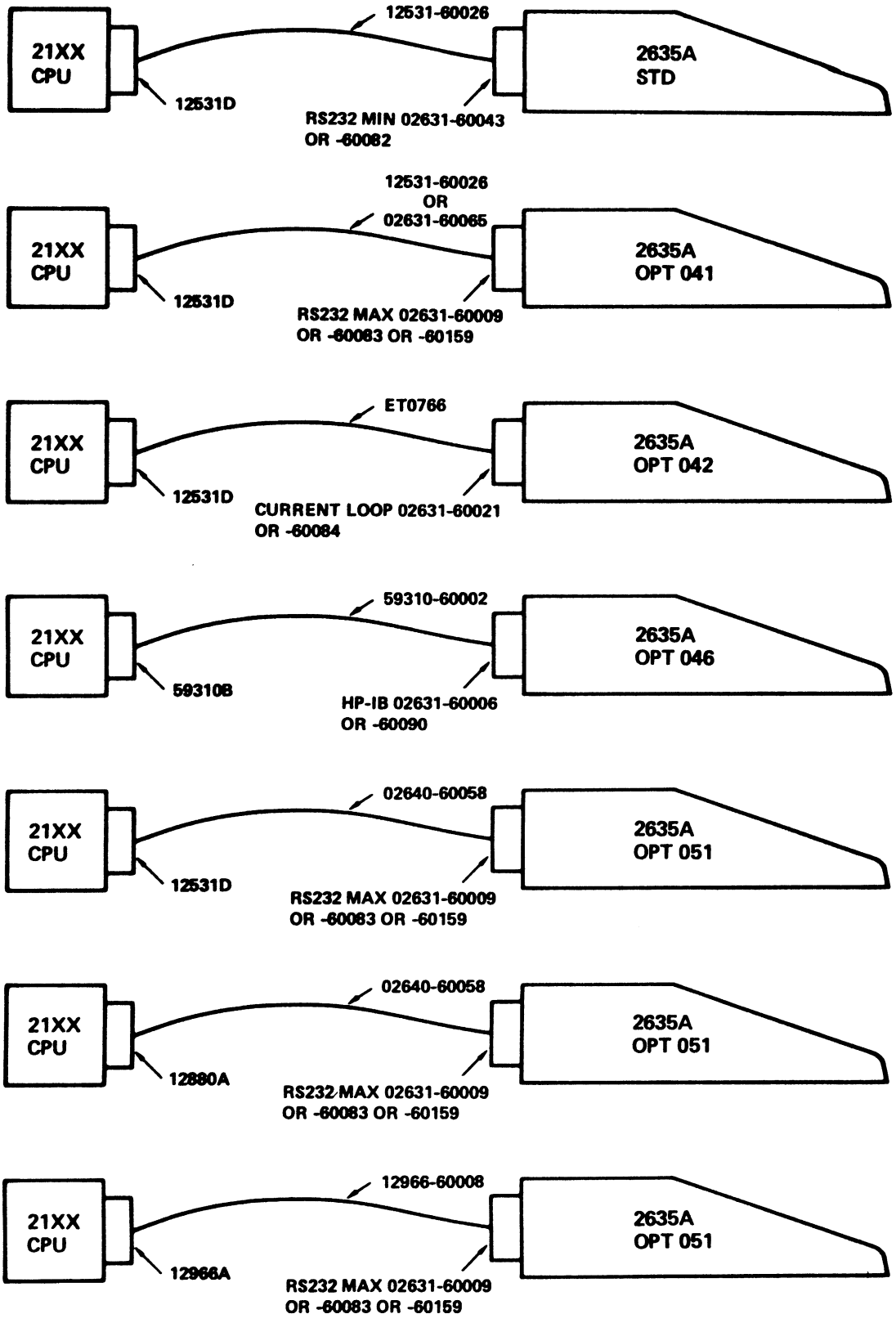
The diagnostic serial number (DSN) is contained in memory location 126 (Octal) of the program. The DSN is 105107 (Octal).

1-5. DESCRIPTION OF 2635A CHARACTER SETS

See Operator's Manual.

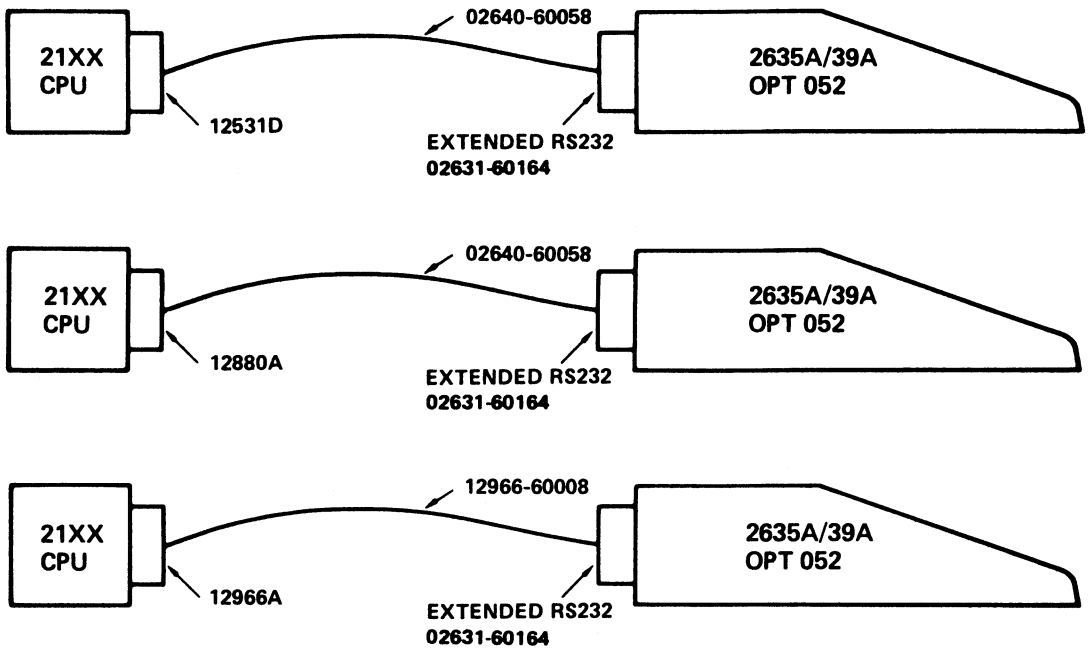
1-6 RELATED DOCUMENTS

HP2635A PRINTER OPERATORS MANUAL	02635-90901
HP2630 FAMILY SERVICE MANUAL	02631-90910
HP2630 FAMILY TECHNICAL REFERENCE MANUAL	02635-90905
DIAGNOSTIC CONFIGURATOR MANUAL	02100-90157
HP-IB 59310B DIAGNOSTIC MANUAL	59310-90061
HP2639A PRINTING TERMINAL MANUAL	02639-90901



2630-19

Figure 1-1. Interface To Interface Configurations



2630-19

Figure 1-1. Interface To Interface Configurations

SECTION II

PROGRAM ORGANIZATION

2-1. ORGANIZATION

This diagnostic program consists of an initialization section, a control section, 20 tests (see Table 4-2). The initialization section accepts the select code, sets up all I/O instructions and processes the operators choice of options. The device options must be specified in accordance with those indicated in Table 4-1. The control section allows for sequential or selective stepping through the various tests by monitoring the status of selected bits in the S-register. The tests themselves are specifically designed to verify operation of the 2635A.

This diagnostic is used in conjunction with the Diagnostic Configurator.

2-2. TEST CONTROL AND EXECUTION

The program outputs a title message to the console device for operator information and then executes the tests according to the options selected on the Switch Register by the operator. The control section primarily checks Switch Register bits 15, 13, 12, and 7. Bit 12, if set, is used to loop on the diagnostic; bit 13 is used to loop on a given test that is running at the time; and bit 15, if set, will halt the computer at the completion of each test. Bit 7 is available to the operator to select a shorter version of the diagnostic.

The program also keeps count of the number of passes that have been completed and will output the pass count(in decimal) at the completion of each pass (if Switch Register bit 10 is clear). The count will be reset only if the program is restarted.

The diagnostic has complete control of print font and line density. The default switches for print font and line density are tested only in the manual control test. In manual control each subtest can be looped upon when bit 13 is set.

2-3. SELECTION OF TESTS BY OPERATOR

The operator has the option of selecting his own test or sequence of tests to be run. The operator sets switch register bit 9 to indicate he wants to make a test(s) selection. The computer will clear bit 9 and come to a halt 102075 to indicate it is ready for the selection. In most tests, bit 9 is monitored so that setting it will cause an immediate exit of the running test. Now the operator loads the A and B register with the tests desired. A register bit 0 represents Test 00, bit 1 represents Test 01, and so on for all available tests. (See Table 4-2). The operator's selection will then be run. If the operator clears all bits, the standard sequence of all tests will be run.

2-4. MESSAGE REPORTING

There are two types of messages: error and information. Error messages are used to inform the operator when the interface fails to respond to a given control or command sequence. Information messages are used to inform the operator of the progress of the diagnostic or to instruct the operator to perform some operation related to the function of the unit. In this case, an associated halt will occur to allow the operator time to perform the function. The operator must then hit RETURN (If a console device is used). The printed message will be preceded by the letter E (error) or the letter H (information) and a number (in octal). The number is also related to the halt code when a console device is not available. The table of Information and Error halts (Table 5-2) is used to interpret these halts when the console device is not available. Examples of error and information messages are as follows:

Example - Error with halt
Message: E032 INCORRECT STATUS
Halt Code: 102032 (octal)

Example - Information with halt
Message: H024 PRESS PRESET(EXT & INT); HIT RETURN
Halt Code: 102024 (octal)

Example - Information only
Message: H025 BI-O COMP
Halt Code: None

Error messages can be suppressed by setting Switch Register bit 11 and error halts can be suppressed by setting Switch Register bit 14. This is useful when looping on a single section that has several errors. Due to the many different types of status and consequently the many status possibilities, the expected and actual status is not displayed (See Table 3-1 for status bit definitions.)

Information messages are suppressed by setting Switch Register bit

10. Tests which require operator intervention are suppressed by setting Switch Register bit 8 (i.e., Preset Test in BI-O, Manual Control Test). When Switch Register bit 12 is set, the tests that are selected will be repeated. All operator intervention will be suppressed.

2-5. PRIORITY STRING

The capability of the interface to receive, pass and deny priority is not completely checked by this diagnostic. If the interface does not receive priority (i.e., PRH (Priority High) from next lower select code), an error E014 NO INT will occur. To check this, remove a board of a lower select code and run the Basic I/O Test and the above mentioned error should occur. No error will occur for HP-IB. Checking the ability of the board to pass or deny priority is beyond the scope of this diagnostic.

2-6. ERROR ISOLATION

This diagnostic requires the microprocessor in the 2635A to be functioning properly. If an error in the microprocessor is detected, neither the diagnostic program nor the operator by visual inspection will be able to isolate the error to the hardware or the firmware. Therefore, it is mandatory that the microdiagnostics available in the 2635A function successfully prior to executing this software diagnostic. See PRINTER SELF TEST(3-3) for details on microdiagnostic selection/execution.

SECTION III

THEORY OF OPERATION

3-1
INTERFACE CHARACTERISTICS

It must be noted that both the visual and audible results of executing this diagnostic can vary depending on the type of interface used.

Particuarly noticeable will be the impact of testing with the serial interfaces with their wide range of baud rates. Generally speaking, the higher the baud rate the smoother and faster the actions of the 2635A under test. At baud rates of 2400 and above, both the execution time per test and observable actions will be approximately the same for the parallel interfaces. Most noticeable at the low baud rates will be the absence of bi-directional printing and, while printing over a large number of spaces (blanks) the head will appear to make jerking motions. Although the 8 bit duplex(02631-60046) is a parallel interface it will technically appear as a serial interface to the diagnostic since it is tested thru a 264X type terminal. Therefore actions of the printer will appear the same as that of the serial interfaces. However the printed output on paper should not vary either in line or column position for any interface.

Another difference between types of interfaces is the abililty to return status to the computer. The following table lists the interfaces and their possible status returns. Since this diagnostic is designed to accommodate many interfaces it is paramount that the operator understand the relationship of status to interface type. For the purpose of clarity, allow the phrase "I/O status" to relate to that which is always available to the computer via an input instruction or HP-IB secondary command. "Programmable status" is special status available only if a specific status request is transmitted to the 2635A.

The Extended Serial Interface (02631-60164) will strip out the delete character (oct 177) out of the data stream and the delete character will not be printed.

TABLE 3-1

INTERFACE STATUS CHARACTERISTICS

12531D, 12880A, AND 12966A INTERFACES
(Programmable Status)

byte 0 bit
- 7 - always clear
- 6 - always clear
- 5 - always set
- 4 - always set
- 3 - 1 = alternate set available
- 2 - 1 = SO/SI select
  0 = 8th bit select
- 1 - secondary set
  0 = ROM 1
  1 = ROM 0
- 0 - primary set
  0 = ROM 0
  1 = ROM 1

byte 1 bit
- 7 - alway clear
- 6 - always clear
- 5 - always set
- 4 - always set
- 3 - present character set
  0 = ROM 0
  1 = ROM 1
- 2 - 1 = underline enabled
- 1,0 - 00 = normal print enabled
  01 = compressed print enable
  10 = expanded print enable

byte 2 bit
- 7 - always clear
- 6 - always clear
- 5 - always set
- 4 - always set
- 3-0 - line density(octal)
  01 = one line per inch
  02 = two lines per inch
  03 = three lines per inch
  04 = four lines per inch
  06 = six lines per inch
  10 = eight lines per inch
  00 = twelve lines per inch

byte 3 bit
- 7 - always clear
- 6 - always clear
- 5 - always set
- 4 - always set
- 3 - 1 = power on 8 LPI default
- 2 - spare
- 1 - 1 = power on compressed print default
- 0 - 1 = power on expanded print default

byte 4 bit 7 - always clear
6 - always clear
5 - always set
4 - always set
(Bits 3-0 always clear)

byte 5 bit 7 - always clear
6 - always clear
5 - always set
4 - always set
3 - 1 = 12 inch page strap
2 - 1 = printer out of paper
1 - 0 = self test malfunction detected
0 - 1 = out-of-paper restart pending

59310B INTERFACE

Two types of status are available on the 59310B. The first is programmable status identical to the above definition for serial interfaces, except that byte 4 bits 3-0 have the following definition:

byte 4 bit 3 - 1 = receive ready mask
2 - 1 = power fail mask
1 - 1 = send ready mask
0 - 1 = paper out mask

The second type is a 1-byte I/O status defined as follows:

7 - 1 = printer online
6 - 1 = ready for data
5 - spare
4 - spare
3 - 1 = parity error
2 - spare
1 - 1 = paper out
0 - 1 = power fail

NOTE: This diagnostic does not compare status for any general state. Due to the many status possibilities, status is only checked one bit at a time, and only the bit or bits relating to the specific function being tested. For example, throughout the many steps of the manual control test a single bit of either the I/O and/or Programmable status will be the only bit tested. The operator must be aware which I/O is being used to properly troubleshoot the failure.

Table 3-1 is for quick referance only. It is assumed that the operator has read the appropriate operator and hardware manuals before attempting to use the printer. If not, it is recommended

that the operator do so at this point. This manual should be the last not the first read. For a complete list of manuals, see paragraph 1-6. The I/O status of all interfaces will be stored in addresses 150 through 157 in base page. The programmable status for both serial and HP-IB interfaces will be stored in addresses 151 thru 156. The 1 byte 59310B I/O status is stored in address 157.

3-2 INTERNAL 2635A STRAPS

The internal strap positions in the 2635A will affect the output of the diagnostic. The operator must have the knowledge of how these straps are implemented and how they affect the output in order to verify printer operation. These jumpers are located on the Printer Logic PCA (02631-60005) next to U56. With the pin connections at the bottom and numbering left to right, they are W1, W2 and W3. W1 is the SO/SI-8th bit jumper. Jumper W1 out, enables SO/SI capabilities. Jumper W1 in, enables 8th bit capability. Jumper W2 is not relevant to this description. W3 is the Alternate set available jumper. Jumper out, enables both ROM location 0 and ROM location 1 to be selected as either the primary or secondary language. Jumper in, enables only ROM location 0 to be selected as a printable character set, and any attempt to print from ROM location 1 will print blanks. By ROM location, it is meant the actual physical location on the Printer Logic Board into which the character set ROM chips are inserted. At least one character set must be inserted into ROM location 0. A character set in location 1 is optional.

The new Printer Logic PCA (02631-60081) for the 2635A, has a quad dip switch mounted on the board. This switch is labeled "SW1". S3 corresponds to jumper W1 above, and S2 corresponds to jumper W3 above. When reading the table below please translate the appropriate jumper position.

Table 3-2 which follows explains the possible combinations of both programmable and physical events which affect the actual printed output for the 2635A.

TABLE 3-2

LOGICAL MAP OF SI/SO/8th BIT POSSIBILITIES FOR 2635A

Alternate set avail. (jmpr W3)	SO/SI 8th bit (jmpr W1)	Primary set ROM location	Secondary set ROM location	Comments
OUT	OUT	Loc 0	Loc 0	Print from ROM 0 only
OUT*	OUT	Loc 0	Loc 1**	Print from ROM 0 after SI Print from ROM 1 after SO
OUT	OUT	Loc 1	Loc 0	Print from ROM 0 after SO Print from ROM 1 after SI
OUT*	OUT	Loc 1	Loc 1	Print from ROM 1 only
OUT	IN***	Loc 0	Loc 0	Print from ROM 0 only
OUT*	IN***	Loc 0	Loc 1**	Print from ROM 0 when 8=0 Print from ROM 1 when 8=1
OUT	IN***	Loc 1	Loc 0	Print from ROM 0 when 8=1 Print from ROM 1 when 8=0
OUT*	IN***	Loc 1	Loc 1	Print from ROM 1 only
IN	OUT	Loc 0	Loc 0	Print from ROM 0 only
IN	OUT	Loc 0	Loc 1**	Print from ROM 0 after SI Print blanks only after SO
IN	OUT	Loc 1	Loc 0	Print from ROM 0 after SO Print blanks only after SI
IN	OUT	Loc 1	Loc 1	Print all blanks
IN	IN***	Loc 0	Loc 0	Print from ROM 0 only
IN	IN***	Loc 0	Loc 1**	Print from ROM 0 when 8=0 Print blanks when 8=1
IN	IN***	Loc 1	Loc 0	Print from ROM 0 when 8=1 Print blanks when 8=0
IN	IN***	Loc 1	Loc 1	Print all blanks

* !!CAUTION!! Jumper W3 out and no character set installed in ROM location 1 will cause blackout printing to occur and possible damage to the ribbon, paper and/or the print head.

** Printer will power on in one of these states depending on the selection of the straps. (For more information related to reassignment of character sets to ROM locations see section 6 of the HP2635A OPERATORS MANUAL (02631-90901))

***If 2635A is serial with RS232 Min (02631-60043) this switch is a "do nothing" switch since the Min card does not allow

the 8th bit.

If the 2635A is serial with RS232 Max (02631-60009), then the following conditions must be satisfied to actually enable selection of the alternate language via the 8th bit:

1. Switch S2-8 on the RS232 card (02631-60009) must be in the enabled or open position.
2. The parity slide switch on the control panel must be in the "NONE" parity position.

Any other settings will produce random results.

3-3. PRINTER SELF TEST

SELF TEST is intended to test the major machine components as well as to exercise the machine and demonstrate a subset of its features. If SELF TEST fails, it makes an error code available to the host processor(if HP-IB). This error code is not available to the machine operator but it can be determined by watching the action of the machine. (Note: The operator cannot distinguish between a ROM, RAM, or real-time clock failure by observation of the machine). When SELF TEST fails, it bypasses the remaining tests and executes its normal termination sequence. The operator will see the head move in the same way that it does during a "power on" or "terminal reset" sequence.

Nonprinting tests: SELF TEST first checks the ROMs which contain the firmware, the RAM, and the real-time clock. These tests are intended to indicate a gross failure, and are not exhaustive. If these tests complete successfully SELF TEST rings the bell. It then moves the head to the left crash stop (it is usually already there), then to the right crash stop, and then back to the left again. This test can fail because the head did not reach the crash stop or because the column counters or direction bit did not read the correct values. If this test does not fail, SELF TEST again rings the bell. SELF TEST then tests the I/O. On the 2635-E01 interface when self test enters the I/O the bell will ring an extended period of time due to the large amount of RAM that needs testing. This period could be as much as 5 seconds, depending how much RAM is installed on the interface. If this test passes, it begins the printing tests. The I/O test is the last test that can cause SELF TEST to fail and return an error code. Thus, if the machine rings the bell the second time, and then executes a "power on" sequence and remains idle, there is an I/O failure.

Printing tests: SELF TEST first prints the ASCII character set from 41 through 177 octal in normal mode. It then executes a "shift out" and prints characters from 241 through 377 octal, thus printing from the alternate character set (if installed) with either alternate character set selection method. If the machine is

configured so that the alternate character set is selected by the 8th bit of the character (Throughout this manual the term "8th bit" will mean the selection of the alternate character set with bit eight of the character- see table 3-2) this line will print in the reverse direction. Otherwise it will not. If an alternate language is not installed in the printer, the second line will be all blanks. SELF TEST then returns to the normal character set and tests the different printing modes. For these tests it uses the characters displayed on line 1. It begins by switching to eight lines per inch and printing two lines. The second of these will print in the right-to-left direction. SELF TEST then returns to six lines per inch and prints a line in compressed mode, a line in expanded mode, and a line in auto-underline mode. All of these lines will print in the forward direction. The expanded "line" will appear as two lines because there are more characters than can fit on a physical line in expanded mode. After printing the auto-underlined line and returning to normal mode, SELF TEST prints the full standard character set (0 through 177 octal) in display functions mode. Since the machine responds to the carriage return character in display functions mode, the character set appears on two lines, the first containing 0 through 15, and the second line containing the rest of the characters. After these characters, SELF TEST prints a "CR", and on the next line a "LF" character. After this, it resets the machine (except for top-of-form and some I/O conditions) to the power on state. If the self test is remotely initiated, the machine is returned to ON LINE. Otherwise, it is left OFF LINE.

With the 2635-60164 serial interface installed the extended I/O self test is included. See HP2639 Printing Terminal 02639-90901 for complete describtion.

3-4. ENQ—ACK & XON—XOFF PROTOCOL

Enquiry and Acknowledge (ENQ-ACK) and Transmit on, Transmit off (XON-XOFF) are enabled or disabled by bit 10 in the switch register at configuration time(see table 4-1). ENQ-ACK and XON-XOFF are necessary when using serial interfaces at baud rates greater than 1200 baud, 300 baud if expanded mode is selected. If handshakes are not used, data will over run the printer and printed output will be unpredictable. At configuration time, when bit 10 is clear ENQ-ACK protocol will be in force. When bit 10 is set XON-XOFF protocol is enabled. But the printer does not necessarily need to do XON-XOFF in order to operate on the diagnostic when in this mode. That is to say- if the printer is only capable of doing ENQ-ACK handshakes, then bit 10 will serve only to disable ENQ-ACK handshaking. For complete discription of the ENQ-ACK and XON-XOFF protocols, see IEEE RS232 manual. This Diagnostic does not presume to know alternate ENQ, ACK, XON or XOFF characters. The ENQ character must be the USASCII Enquiry character (oct 4). ,The ACK must be USASCII Acknowledge (oct 5). Same for the XON (oct 21), and XOFF (oct 23).

NOTE: Prior to testing insure that the switches on the 02631-60164 interface board are configured as stated in the FINAL BOARD CONFIGURATION section of the 263X EXTENDED SERIAL INTERFACE TEST PROCEDURE. A-02631-90110-1.

SECTION IV

OPERATING PROCEDURES

4-1. OPERATING PROCEDURES

A flowchart of the operating procedures is provided on the following page (Figure 4-1.).

If an unconfigured Diagnostic Configurator is used, start at entry point A.

If a configured Diagnostic Configurator is used, start at entry point B.

If a combined configured Diagnostic Configurator and an unconfigured Diagnostic is used, start at entry point C.

If a combined configured Diagnostic Configurator and a configured Diagnostic is used, start at point D.

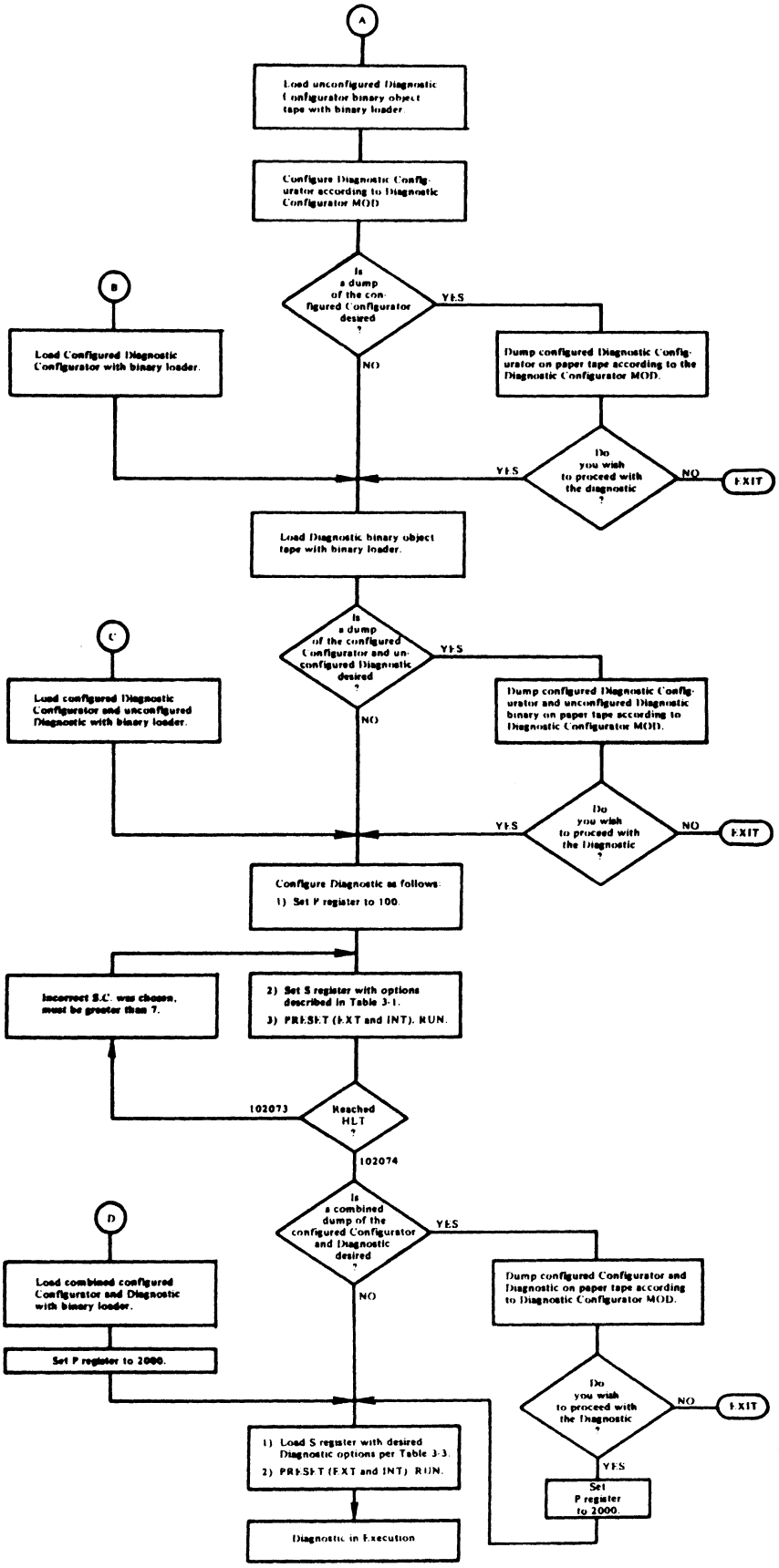


Figure 4-1. Diagnostic Flowchart

4-2. RUNNING THE DIAGNOSTIC

Before running the diagnostic the operator must first satisfy the following conditions (see figure 4-2 for layout of 2635A control panel)---

1) Power cord installed
2) Power switch(on rear of printer) set to the on position
3) PRINT mode default slide switch set to NORM
4) 6/8 LPI power on default slide switch set to 6 LPI
5) DISP. FUNC. push button light must be off
6) 6LPI LED indicator should be on
7) Install 136 column paper and adjust to top of form
8) Install Ribbon cartridge
9) Set printer to ON LINE

In addition for serial interfaces---

10) PARITY switch set to NONE
11) DUPLEX switch set to FULL
12) BAUD rate switch set to desired baud rate

The baud rate setting must correspond to the setting supplied by the operator in bits 6 thru 9 in the S register(see Table 4-1). Remember, to start, restart or to resume the diagnostic from any point(except within manual control, test 02) the above conditions should be satisfied.

For HP-IB interfaces, the operator must select an address for the printer on the bus. The address is selected by a switch assembly on the HP-IB ADAPTER PLATE located at the rear of the printer in the lower left hand corner. This switch assembly contains seven small rocker switches (see figure 4-3). Switches one thru five set the address. These switches repesent the binary equivalent of the address. Switch one is the most significant bit, and switch five is the least significant bit of the binary address. The printer address must correspond to the address in switch register bits 6 thru 9 at configuration time (see table 4-1). For diagnostic purposes only, the address must be in the range of 0 thru 17 octal. If the operator has no specific address to select, it is recommended that address one be selected.

NOTE: Prior to testing 2639A insure that the switches on the 02631-60164 interface board are configured as stated in the FINAL BOARD CONFIGURATION section of the 263X EXTENDED SERIAL INTERFACE TEST PROCEDURE. A-02631-90110-1.

Diagnostic execution begins according to:

1. Operator's selection of Diagnostic Configurator-- configured or unconfigured.

2. Operator's selection of diagnostic program--

configured or unconfigured.

3. Starting address of diagnostic:

   A. P = 100 (Octal)

      Operator selects the subchannel (SC) of the 2635A under test in S-register bits 0 thru 5 and the device options are indicated in the S register in accordance with Table 4-1. Press RUN. Upon valid halt 102074, select options defined in Table 4-3. It is not necessary to reset P register to 2000 at this point. Press RUN. If halt other than 102074 check Table 5-2.

   B. P = 2000 (Octal)

      Diagnostic retains options as selected per Table 4-1 in previous step. Options described in Table 4-3 are supplied at this time.

Regardless of either starting address, the introductory message below is printed on the console device.

"H027 2635A PRINTING TERMINAL DIAG. DSN=105107"

It is recommended that the operator start the diagnostic at top of form. All tests(except tests 0,1,7 and 12) start at TOF. This will enable the operator to test the ability of the printer to maintain TOF throughout the diagnostic. Test seven starts two lines above top of form and test twelve starts two lines above TOF in long version. Subtests do not necessarily start at top of form.

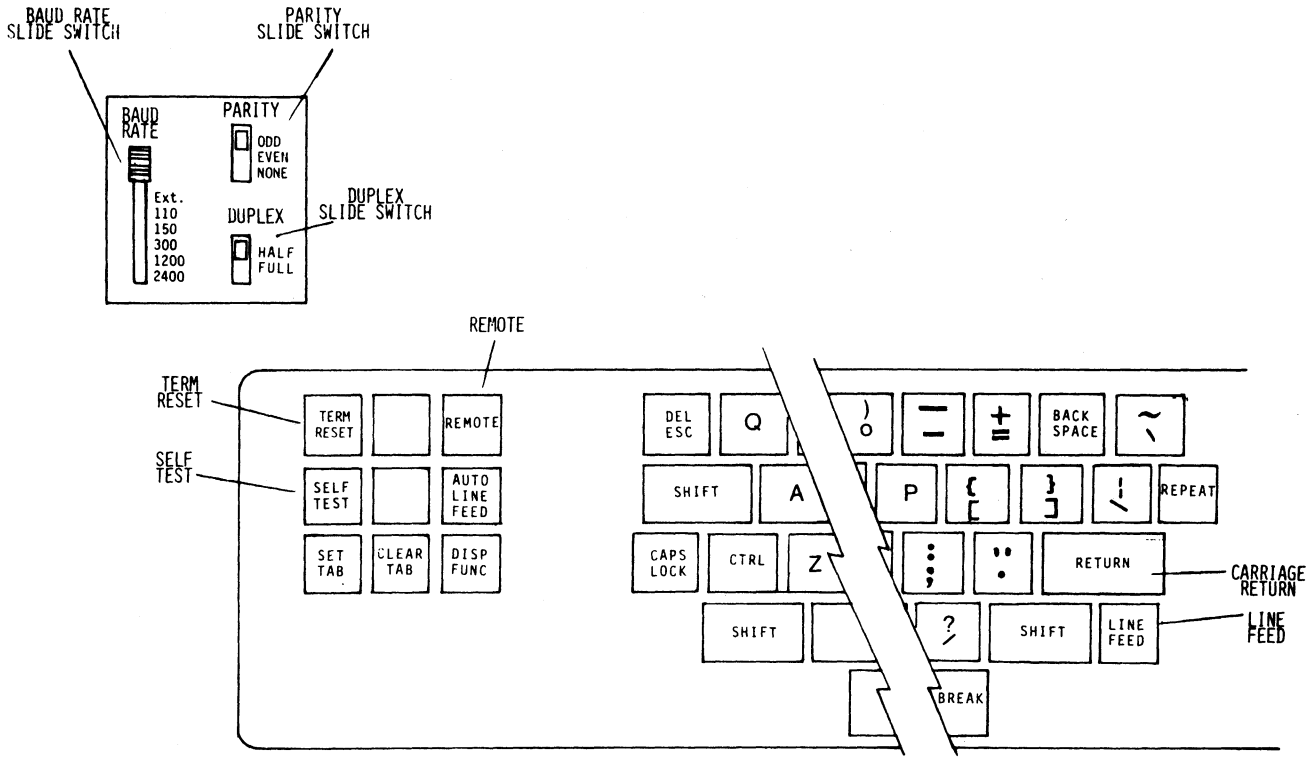


Figure 4-2. Control Panel

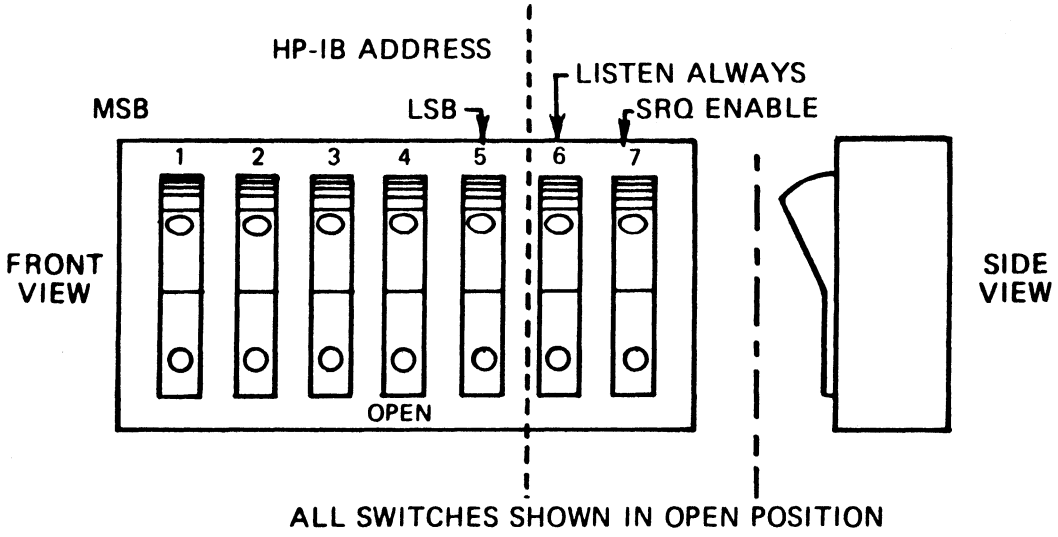


Figure 4-3. HP-IB Address Switch

TABLE 4-1. DEVICE OPTIONS SELECTION (P=100)

S-Register bit set to select,	Device Option Indicated
Bits 0 thru 5	Device Select Code
Bits 6 Thur 9 (serial intf.)	Baud Rate(12966A,12531D,12880A) 0000 = External Baud* 0001 = 50 Baud 0010 = 75 Baud 0011 = 110 Baud* 0100 = 134.5 Baud 0101 = 150 Baud* 0110 = 300 Baud* 0111 = 600 Baud 1000 = 900 Baud 1001 = 1200 Baud* 1010 = 1800 Baud 1011 = 2400 Baud* 1100 = 3600 Baud 1101 = 4800 Baud 1111 = 9600 Baud (The selected Baud rate must agree with that of the 2635A under test, and the interface PCA used.)
Bits 6 Thur 9 (HP-IB)	Printer address (59310B only) 0000 = No address 0001 = Address one 0010 = Address two . . 1110 = Address fourteen 1111 = Address fifteen
Bit 10	0 = Enable ENQ-ACK handshake** 1 = Enable XON-XOFF handshake (Serial interfaces only)
Bit 11-13	Reserved
Bits 14 Thru 15	Interface select 00 = 12531D 10=12966A 12880A 01 = 11 = 59310B

* Selectable from front panel on printer.
** See paragraph 3-4
NOTE: These selections are saved in address 116 octal.

TABLE 4-2. TEST SELECTION AND IDENTIFICATION (halt 102075)

A-REGISTER BIT SET TO SELECT; CLEAR TO BYPASS	TEST NUMBER	DESCRIPTION
A-Register		
0	TEST 00	BASIC I/O
1	TEST 01	MICRODIAGNOSTIC/HP-IB PROTOCOL
2	TEST 02	MANUAL CONTROL TEST
3	TEST 03	RIPPLE PRINT TEST
4	TEST 04	TRIANGULAR PRINT TEST
5	TEST 05	VERTICAL FORMAT CONTROL
6	TEST 06	BI-DIRECTIONAL PRINT TEST
7	TEST 07	DOT MATRIX
8	TEST 08	CHARACTER SET TEST
9	TEST 09	DMA/DCPC TEST
10	TEST 10	FAST SKIP OVER BLANKS TEST
11	TEST 11	HORIZONTAL TABS TEST
12	TEST 12	VARIABLE LINE DENSITY TEST
13	TEST 13	AUTO UNDER LINE TEST
14	TEST 14	PRIMARY/SECONDARY SELECT
15	TEST 15	BACK SPACE SHORT LINE TEST
B-Register		
0	TEST 16	INTERMIX PRINT FONT TEST
1	TEST 17	ON LINE/OFF LINE TEST
2	TEST 18	PAPER SLEW RATE TEST
3	TEST 19	PRINT SPEED TEST
4-15	RESERVED	

* Not selected with default

TABLE 4-3. SWITCH REGISTER OPTIONS (P=2000 OR HALT 102074)

BITS	FUNCTION IF SET
0	Select new primary language at end of pass. See section V for details.
1	Select alternate language with 8th bit rather than the default SI/SO sequence.
2	Suppress characters "H" and "I" in TEST 07.
3	Suppress characters "#" and "j" in TEST 07.
4	Reserved
5-6	Print font select -- see paragraph 4-7 00 = Print in normal font 01 = Print in expanded font 10 = Print in compressed font
7	Enable short form of diagnostic
8	Suppress tests requiring operator intervention.
9	Abort current test and HALT with MDR=102075; user sets bits of A and B register with test selection where bit 0 set selects TEST 00, bit 1 set selects TEST 01, etc. Abort should occur immediatly unless the interface is failing to respond.
10	Suppress printing of operator information messages (H-type; see Table 5-2).
11	Suppress printing of error messages (E-type; see Table 5-2).
12	Repeat all selected tests after diagnostic run is complete without halting. Message "PASS XXXXXX" will be printed on console device before repeating tests unless Bit 10 is set or console is not present. All tests requiring operator intervention will be suppressed.
13	Repeat the currently executing test (loop). In manual control test 2 this will cause a repeat of current subtest.
14	Suppress error halts (see Table 5-2).
15	Halt at the end of each test with MDR=102076. The A-register holds the octal equivalent of the test number of the test just executed.

At the completion of each pass of the diagnostic, the decimal pass count is printed on the console device to inform the operator. The computer halts with 102077 octal displayed in the T-register and the pass count displayed in the A-register. At this point, the operator need only press RUN to execute another pass of the diagnostic.

4-3. RESTARTING

The program may be restarted by setting the P-register to 2000 octal, selecting Switch Register options as defined in Table 4-3. and pressing RUN. The introductory message will always be repeated.

If a trap cell halt (106077 octal) occurs, the user must determine the cause of the interrupt or of the transfer of control to the location in the M register. The program may need to be reloaded to continue.

4-4. MODIFICATION OF PRIMARY LANGUAGE

At the end of each pass through this diagnostic, a check will be made to see if the operator wishes to modify the default primary language, which is always assumed to be ASCII, to the alternate language (see Section VI for details). A decision by the operator to modify the primary language will necessarily modify the appearances of all output directed to the printer, in those tests which are so identified. In all descriptions of the tests which cause printing, ASCII will be assumed to be the primary language. It is left to the operator's imagination to visualize the output in other languages. Note that the ASCII code chart is contained in the Operator's Manual. Certain tests are not available for language modification either because the output within the test is readable or because the test itself is designed to specifically put certain "marks" at specific places as in the dot matrix test (TEST 07).

4-5. ERROR/HALT MESSAGES ON CONSOLE

In all cases the error and/or halt messages which are printed on the console device will be in ASCII. Modification of the primary language for line printer output will NOT affect these messages. When a console is available a "soft halt" will be incorporated. The CPU does not actually halt but diagnostic operation will halt. The cursor or carriage will wait at the end of the halt message for a return and will continue with diagnostic exicution. The contents of the A and B registers is displayed on the console for all error messages. When there is no console the CPU will halt accordingly.

4-6. RESERVED CONTROL CHARACTERS AND ESCAPE SEQUENCES

Certain control characters and escape sequences have special meaning to the printer. The 2635A inspects all of the characters

it receives and in these special cases performs a predefined action. If the display functions mode is enabled, the control codes and escape sequences become printable characters. The functions defined by these codes are disabled with the exception of Carriage Return.

See section 6 of the HP2635A PRINTER OPERATORS MANUAL(02631-90901) for complete description and implementation of control characters, escape sequences, and operator selectable switches.

4-7 COMPRESSED AND EXPANDED PRINT FONTS

The operator has the option of running the diagnostic in normal, compressed or expanded print fonts by selecting the appropriate setting in switch register bits 5 and 6. This will affect all printing tests (except tests 17 and 19), and will cause the number of characters per line to change. In normal mode the number of characters that can be printed in a line with out wraparound is 136. This number increases to 227 in compressed mode, and decreases to 67 characters in expanded mode. The operator must be aware that changing these bits does not cause an immediate change in the print font. The change will occur only at the beginning of each test. The descriptions of the individual tests in Section IV will discuss the output in terms of printing in normal mode. If the tests are run in either expanded or compressed font, then the number of characters in the line will be increased in compressed and decreased in expanded to reflect the column width of the printer. If the printer fails to respond to the request for a selected print font, E062,E063 or E064 will be reported.

4-8 LONG & SHORT VERSION OF DIAGNOSTIC

Due to the extensive nature of some tests in this diagnostic and low baud rates on serial interfaces, a provision has been made to shorten the length of the diagnostic. By the selection of bit 7 on the switch register the operator has the option of choosing the short version. The tests that are affected and how they are affected is described in section V under each test description.

4-9 DIAGNOSTIC EXECUTION TIMES

In measuring the execution times of a complete pass of the diagnostic, the following is assumed:

- All test requiring manual intervention are suppressed
- Interface is not a serial I/O at baud rates below 2400

Under these conditions a complete long pass through the diagnostic in normal font takes approximately 22 minutes. In the short version the time is 7 minutes. The expanded font times are about 40 percent longer, and compressed times are 15 percent longer.

SECTION V

DIAGNOSTIC PERFORMANCE

5-1. TEST DESCRIPTIONS

Each of the tests associated with the 2635A is designed to verify operation of a portion of the device. Some of the tests will produce messages and/or halts that uniquely identify which test is in operation and what function is being tested. In other cases the messages/halts may result from any one of several tests. Table 5-2 is available to the operator to provide quick referance about the error and the test in which it occurred.

Each individual test description contains the following information:

1. What function is under test.
2. Unique errors and/or halt messages that occur in its execution.
3. Unique halts that occur if a failure is detected.
4. If the test requires manual intervention.
5. When the operator must examine the printout to determine the test results.
6. If the line printer output is in the current primary language and print font.
7. If length of test is effected by selection of the short version of diagnostic.
8. If the flow of the test is affected by the selection of the interface.

5-2. BASIC I/O TEST (not executed on HP-IB interface)

TEST 00

This test verifies the basic I/O functions of the computer and its associated interface card.

Subtest 1 thru subtest 7 are the standard diagnostic tests for the CPU interface card (except 59310B).

Subtest 8 - This subtest is bypassed if the operator chooses to suppress tests requiring operator intervention. If not suppressed, the message below is printed on the console device:

H024 PRESS PRESET (EXT&INT); HIT RETURN

When the operator responds, the following are checked:

1. Did the interface Flag set (EXTERNAL)?
2. Did Control clear (EXTERNAL)?
3. Did interrupt system go "off" (INTERNAL)?
4. Did I/O data lines clear (EXTERNAL)?

Error messages E020, E021, E022, or E023 result if an error is found.

At the conclusion of this test the following is printed on the console device:

H025 BI-O COMP

Execution of selected peripheral tests begins immediately.

5-3. MICRODIAGNOSTIC/HP-IB PROTOCOL TEST

TEST 01

SUBTEST 01

This test is designed to programmatically verify the ability of the 2635A to respond to a remote self-test command(It is assumed that the operator has already verified the ablility to initiate a local self-test via the front panel). Prior to the self-test command, the test verifies that the 2635A is ON LINE and ready to accept data via the appropriate interface status. On the 12845B interface it is not possible to determine if the printer is busy or not, so an eight second delay is done before self test. Once it is determined that the 2635A is not busy, the self-test command is issued. After ten seconds, the status is checked to see that the machine will not accept data, and if so- proceeds to wait 7 more seconds after which the 2635A should accept data to indicate that it is not too fast or slow to complete self-test. E072 will result if self-test did not complete within the 10 to 17 second window. Additionally, E067 is possible with the serial and HP-IB interfaces. If the diagnostic detects a self test failure based on bit 1 of byte 5 of programmable status, then the following will be reported:

1) For serial interfaces:

   E067 SELF TEST MALFUNCTION
   (No further information is available on a serial interface)

2) For HP-IB interface:

   E067 SELF TEST MALFUNCTION, ERROR CODE XXXXX

If the interface is the HP-IB, then the 2635A will be further interrogated to determine the specific cause of failure. The code returned is placed into the E067 message and also placed in the A register. Possible values are:

00200 - ROM failure
00220 - RAM failure
00260 - Real time clock failure
00300 - Servo test failure
00320 - I/O test failure.

E067 is not possible with the 12845B interface. If the interface is NOT an HP-IB, then the test is complete. See operators manual for sample print outs of self test.

SUBTEST 02 (HP-IB Only)

Four HP-IB functions are tested here:

1) Device Identify - Error E034 will occur if incorrect identity is received. Actual identity is in A reg. expected identity is in B reg.

2) Parallel Poll - Error E035 will occur if printer fails to respond to a parallel poll.

3) Device Specified Jump - Error E036 will occur if printer does not respond correctly. Actual DSJ in A reg. expected in B.

4) Ping Pong - Error E037 will occur if printer fails to to do a ping pong operation. If failure was due to incorrect data, bad data will be in A reg. expected data will be in B reg. The value in the B reg. will also be the byte count.

This test is not preceeded by a top of form command. Nor is there a header message associated with the test. Therefore the self-test printout will occur where ever the paper happens to be positioned. The operator should examine the printout to verify preformance. A Test Complete message will be printed.

MANUAL CONTROL TEST

TEST 02

This test allows the operator to test the manual controls of the 2635A Printing Terminal. A status check is made after each step through this test to see that the correct sequence of status data is received. This test is suppressed if the operator selects bits

8 or 12 in the switch register (see Table 3-2.).

This test is most easily executed when a console is available for display of the various messages. However, the operator may run this test by observing the halts displayed in the memory data register (T-register) that correspond to the various messages.

Throughout the Manual Control test, error message E032 INCORRECT STATUS will frequently be returned to indicate the requested response was not achieved. In most cases the error results from failure of a single bit to indicate the proper state. The A and B register contents are not significant. The actual status is available in memory locations 151-156 (octal).

To exit Manual Control test before normal test completion, set bit 9. If this precedure is not used the diagnostic must be restarted at P=100.

Subtest 1 - The console device types:

H110 POWER OFF LP (BACK, LOWER RIGHT); HIT RETURN

The operator turns off the terminal power (the switch is located in the lower right hand corner of the rear of the machine as viewed by the operator standing in front of the device). After the operator presses RUN, the program will sense the terminal's condition. If the condition is correct, the test advances to Subtest 2. If the condition is not correct, error message E032 is printed. To continue, hit RETURN.

Subtest 2 - The console types:

H111 POWER ON, INSTALL PAPER, LATCH REMOTE; HIT RETURN

The operator is now requested to satisfy all the conditions required to print and then to hit RETURN. The program then senses the terminal's status. If it is correct, control is passed to Subtest 3. If the status is not correct, then error message E032 is printed. To continue, hit RETURN.

Subtest 3 - The console types:

H112 UNLATCH REMOTE; HIT RETURN

The operator unlatches the REMOTE switch and then presses RUN. The program senses the status to verify that it is correct. If so it advances

to Subtest 4. If not correct error message E032 is printed. To continue, hit RETURN.

Subtest 4 - The console types:

H114 LATCH REMOTE; HIT RETURN

The operator latches the REMOTE switch and then presses RUN. If the terminal's status is correct, the program advances to Subtest 5. If the status is not correct, error message E032 is printed. To continue, hit RETURN.

NOTE: With the 2639 Terminals the operator must wait a full 10 seconds before hitting return, otherwise an error will result.

Subtest 5 - The program commands the terminal to 1 LPI mode and verifies that the terminal responded. If the terminal did not respond, E070 is displayed.

The console types:

H115 PRESS RESET; HIT RETURN

The operator depresses the TERM RESET switch of the terminal and presses RUN. The status is checked to verify that the terminal is in the default mode. If status is correct, the program will continue to subtest 6. If an error is detected, message E070 is printed. To continue, hit RETURN.

Subtest 6 - The console types:

H117 UNLATCH REMOTE, PRESS SELF TEST, VERIFY SELF TEST, LATCH REMOTE; HIT RETURN

The operator unlatches the REMOTE switch and is asked to verify local operation of self test. No unique error is associated with this test. To continue press run.

Subtest 7 - The console types:

H126 PRESS LINE FEED, VERIFY PAPER ADVANCE

The operator presses the LINE FEED key. If an error is detected then E061 is printed. If no error is detected the program will continue to subtest 8. The operator should verify that a single line is advanced. Note: This does not mean AUTO LINE FEED.

Subtest 8 - The console types:

H127 DEPRESS CNTL AND L SIMULTANEOUSLY,
VERIFY FORM FEED

The operator is asked to issue a FORM FEED character and verify paper motion. If a FORM FEED character is received by the program, it will procede to subtest 9. If any other character is received E061 will be printed.

Subtest 9 - The console types:

H130 KEY IN THE FOLLOWING CHARACTERS:
"2635 TERMINALS."

The operator is asked to input the specific string of characters contained within the quotes. If any one of the characters is not correct, E061 will be reported immediately. This subtest checks all of the scan lines and strobes of the keyboard. If no failure is detected in this subtest and a key is failing then check that particular switch. If this test fails then the offending line or strobe can be isolated by consulting the keyboard schematic.

Subtest 10 - The console types:

H131 ENTER ANY PATTERN TERMINATED BY RETURN.

The operator is asked to key in any string of characters and terminate it with a carriage return. This string is then printed on the terminal. The operator should verify that both lines are identical. There is no error associated with this subtest.

Subtest 11 - The console types:

H132 UNLATCH REMOTE, LATCH DISPLAY FUNCTIONS AND REMOTE; HIT RETURN, VERIFY FUNCTIONS DISPLAYED.

The operator is asked to enable display functions and verify that the terminal is printing the following control characters: Ę&l1VĘZ. No error is associated with this test. If a form feed results then the terminal did not "display functions". The terminal will be commanded out of display function before proceeding to the next test.

Subtest 12 - The console types:

H133 SELECT HALF DUPLEX; HIT RETURN.

The operator is asked to select half duplex and then hit RETURN. The console then types:

H134 PRESS A KEY AND VERIFY ECHO

The operator then presses a key and verifies that the corresponding character is printed. The console then types:

H134 PRESS A KEY AND VERIFY ECHO

The operator again presses a key. This will produce either 1 or 2 characters, corresponding to the key that was pressed, to be printed. The number of characters produced is a function of the current modem selection on the RS232 board (P/N 02631-60009). There will usually be 2 characters produced. There is no error associated with this test.

Subtest 13 - The console types:

H135 SELECT FULL DUPLEX; HIT RETURN.

The operator is asked to select full duplex and then hit RETURN. The console then types:

H136 PRESS A KEY AND VERIFY NO ECHO

The operator then presses a key and verifies that no character is printed. The console then types:

H134 PRESS A KEY AND VERIFY ECHO

The operator again press a key. The corresponding character should be printed. There is no error associated with this test.

Subtest 14 - The console types:

H137 SELECT ODD PARITY; HIT RETURN.

The operator is asked to select odd parity and hit RETURN. If odd parity is selected then the program will proceed to subtest 15. If an error is detected then error message E032 is printed. To continue hit RETURN.

Subtest 15 - The console types:

H140 SELECT EVEN PARITY; HIT RETURN,

"@" SHOULD BE PRINTED

The operator is asked to select even parity and hit RETURN. If no problem is detected the program proceeds to subtest 16. If an error occurs, error message E032 is printed. The operator should verify that a single "@" is printed. To continue, hit RETURN.

Subtest 16 - The console types:

H141 SELECT NONE PARITY; HIT RETURN.

The operator is asked to select none parity and press run. if no problem is detected the program proceeds to subtest 17. If an error occurs, error message E032 is printed. To continue, hit RETURN.

Subtest 17 -

NOTE: For Subtest 17, bits 6-9 of the A register will contain the best fit baud rate for the H145 message. In subtests 17-22, upon occurrance of message H143 and if error message E060 occurs, bits 6-9 of the A register will contain the requested baud rate as defined by bits 6-9 in Table 3-1.

On the 12966A interface the console types:

H142 SELECT EXT BAUD; HIT RETURN

The operator is asked to select EXT baud rate and hit RETURN. The machine is then commanded to output a non-printing character and calculates the baud rate. The calculated baud rate is then printed with the folowing message.

H145 EXTERNAL BAUD RATE IS XXXXX

This is the best fit baud rate not the exact. If the measured baud rate is not within +-05 percent of any valid baud rate, then E060 is printed.

On the 12531D or 12880A interfaces no message is printed. The baud rate of the interface is measured and and a check to see if this is the baud rate selected in bits 6 thru 9 at configuration time. The baud rate must be within plus or minus 5 percent to pass. If not, E060 is reported and the operator should check the crystal for proper frequency. Do not select external baud rate switch position with the 12880A interface.

In either case, hit RETURN to continue.

Subtest 18 - (Executes on 12966A interface only) The console types:

H143 SELECT 00110 BAUD; HIT RETURN

The operator is asked to select 110 baud rate and hit RETURN. The machine is then commanded to output a non-printing character and verify baud rate. If the rate is within tolerance (+/- 5 percent) then the program continues to subtest 19. If an error is detected, error message E060 is printed. To continue, hit RETURN.

Subtest 19 - (Executes on 12966A interface only) The console types:

H143 SELECT 00150 BAUD; HIT RETURN

The operator is asked to select 150 baud rate and hit RETURN. The machine is then commanded to output a non-printing character and verify baud rate. If the rate is within tolerance then the program continues to subtest 20. If an error is detected, error message E060 is printed. To continue, hit RETURN.

Subtest 20 - (Executes on 12966A interface only) The console types:

H143 SELECT 00300 BAUD; HIT RETURN

The operator is asked to select 300 baud rate and hit RETURN. The machine is then commanded to output a non-printing character and verify baud rate. If the rate is within tolerance then the program continues to subtest 21. If an error is detected, error message E060 is printed. To continue, hit RETURN.

Subtest 21 - (Executes on 12966A interface only) The console types:

H143 SELECT 01200 BAUD; HIT RETURN

The operator is asked to select 1200 baud rate and hit RETURN. The machine is then commanded to output a non-printing character and verify baud rate. If the rate is within tolerance then the program continues to subtest 22. If an error is detected, error message E060 is printed. To continue, hit RETURN.

Subtest 22 - (Executes on 12966A interface only) The console types:

H143 SELECT 02400 BAUD; HIT RETURN

The operator is asked to select 2400 baud rate and hit RETURN. The machine is then commanded to output a non-printing character and verify baud rate. If the rate is within tolerance then the program continues to the next test. If an error is detected, error message E060 is printed. To continue, hit RETURN.

Subtest 23 - the console types:

H144 ALIGN TOP OF FORM, PRESS TERM RESET;
HIT RETURN

The operater is asked to align top of form, press TERM RESET, and hit RETURN. E070 will occur if the terminal will not respond to a command to go to 6LPI. This concludes manual control.

Throughout the execution of these subtests, the operator may visually inspect the status of the light indicators on the control panel to verify their function. At any time switch register bit 9 may be set to terminate this test.

5-5.
RIPPLE PRINT TEST

TEST 03

The Ripple Print Test is a general printing test. It prints a ripple pattern which is a set of lines containing all characters from 40 octal to 177 octal rotated one print position on each succeeding line. A total of 100 lines are printed (30 if short diagnostic selected). The pattern is printed on two pages at 6 lines per inch. Sixty lines are printed on the first page then a form feed is issued (octal 14). This should cause the head to be at right margin when the form feed occurs. Therefore the first line on the second page should be printed in the reverse direction. The operator must visually verify that this occurs.

No unique errors are generated by this test.

The output from this test is in the currently selected primary language. Print is in the currently selected print font.

5-6. TRIANGULAR PRINT TEST

TEST 04

The Triangular Print Test prints a triangular pattern of 136 lines normal, 67 expanded, and 220 compressed (if short diagnostic is selected, 68 normal, 33 expanded, 110 compressed). Each succeeding line of print contains one less character than the previous line (if the short diagnostic is selected, then two less characters per line). The triangle pattern diminishes to the right, so each succeeding line contains one(two) more leading blank. The print head should not return to left margin or move over any of the leading blanks. The pattern should be bi-directionally printed, unless a serial interface is selected. It should be noted here that bi-directional printing in compressed mode on the 12845B occurs with decreasing frequency as the end of the pattern is approached.

Visual inspection of the output is required to verify results. No unique errors are generated by this test.

The output from this test is in the currently selected primary language. Print is in the currently selected print font.

5-7 VERTICAL FORMAT CONTROL

TEST 05

The Vertical Format Control test verifies the VFC capability of the 2635A. A VFC command will be executed and its identity printed. The identity should be printed in its corresponding location on the page. This test is not designed to test all possible combinations of VFC commands. The long version will test all possible VFC stops in 6 and 8 LPI. The short version will just verify the operation of each command. E070 will occur if the printer fails to go into the selected density. No unique errors occur on the 12845B interface.

The operator must verify that the proper print action occurs and that each VFC is in its proper location on the page.

The output is in the currently selected print font, but is independent of the currently selected primary language.

5-8 BI-DIRECTIONAL PRINT TEST

TEST 06

The capabilities of the 2635A to print in single or bi-directional mode according to the line length will be tested. The 2635A will print with the head moving left to right and right to left if the

currently received print line is no greater than twice the length of the line being printed. This capability is tested by outputting successive lines containing a specific number of the character ">" or "<" to indecate head direction. The test is divided into two subtests. Subtest 1 forces the 2635A to print in a bi-directional mode, subtest 2 forces print to occur only from left to right.

SUBTEST 01 - Bi-Directional Print

Print should occur in a bi-directional manner with odd numbered lines(the short lines) printing with head movement left to right, and even numbered lines(the long lines) printing with head movement right to left. Odd numbered lines are half the length of the following even numbered line rounded of to the nearest even character. Remember, on the serial interfaces at baud rates of 2400 and below, bi-directional printing is not guaranteed.

SUBTEST 02 - Single Direction Print

During this subtest, the print head should return to left margin at the beginning of each line. The odd numbered lines are half the length of the even numbered lines minus one, rounded off to the nearest character. Odd numbered lines are printed with a "Shift in" character to force them to print left to right.

No unique errors are generated by this test. The operator must visually verify that during printing the motion of the print head agrees with that specified in Table 5-1.

Output is in the currently selected print font, but is independent of the currently selected primary language.

5-9.
DOT MATRIX TEST

TEST 07

This test verifies that the printer is capable of printing data in most locations in the 7x9 dot matrix. Four characters are used for testing; the "H", "I", "#", and a lower case "j". The printing of pairs of these characters may be selectively disabled by setting S-register bits 2 (disables "H" and "I") and 3 (disables "#" and "j") as described in Table 4-3. This test is performed at 8 LPI. E070 is reported if the printer does not respond to 8 LPI mode. No unique errors occur for the 12845B interface. 80 lines of each (10 lines if short diagnostic selected) pattern is printed and each pattern should be on its own separate page(same page if short version). A VFC to channel 3 is performed at the end of each line. All lines are full length in each font. The test heading is printed two lines above the TOF.

Visual inspection of the output is required to verify results.

Output is in the currently selected print font, but is independent of the currently selected primary language.

5-10
CHARACTER SET TEST

TEST 08

This test verifies that the selection of all octal codes from 0 to 177 yields the correct characters which in turn are properly printed. The test is performed in the display function mode with all control characters appearing. For each language installed in the printer, one full line of print is produced. For the 2635A a maximum of two lines of print can be produced. Each line will begin with an ESCZ followed by characters 0 to octal 177. The carriage return character (octal 15) is printed out of place at the end of the line, because it is the only character acted upon in display function mode.

No unique errors are generated by this test. Visual inspection of the output is required to verify results.

Output is in the currently selected print font, but is independent of the currently selected primary language.

5-11
DMA/DCPC TEST (12966A, 12845B, 59310B only)

TEST 09

The DMA Test verifies that the printer will run under DMA control. A buffer of 42 characters is output to the printer under DMA control. This line is repeated 20 times. This test will be executed only if the DMA option has been manually or automatically specified during the set-up procedure of the CONFIGURATOR. It is assumed that the DMA hardware is working correctly and only the service request logic of the line printer interface and corresponding timing relation are tested. H071 will be reported if DMA is not available. If DMA does not complete within 10 seconds, E107 is generated.

Visual inspection of the output is required to verify results.

The output from this test is in the currently selected primary language and print font.

5-12.
FAST SKIP OVER BLANKS TEST

TEST 10

This test verifies the ability of the printer to do high speed (45 ips) skip over blanks. The test is designed to print a right and left column of data on both extreme edges of the print page separated by blanks. The number of blanks will depend on whether expanded, normal or compressed was selected by the operator via the switch register. 50 lines are printed in normal, 10 lines in short version.

No unique errors are generated by this test. The operator must verify that the proper print action occurs.

Output is in the currently selected print font, but is independent of the currently selected primary language.

5-13.
HORIZONTAL TABS TEST

TEST 11

The horizontal tabs function of the 2631A is tested by setting and clearing the tabs function of each print column of the device. Tabs are first set at every even column starting in column 2. The character "X" is then printed at each position where the tabs are set. The tabs are then cleared and Tabs are then set at every odd colunm position starting at column 3. The character "X" is then printed at every tab set position. Each tab positon is cleared before the "X" is printed and a carriage return given after each "X". The number of tab positions are determine by the currently selected print font. The line should wrap around one "X" except in compressed mode for the 2631A. After the last line, all tabs are cleared and then a tab and data character are transmitted. This will cause the bell to ring three times and the data character, "X", to be printed in column 1.

No unique errors are generated by this test. The operator must verify that the proper print action occurs.

Output is in USASCII and the currently selected print font.

5-14.
VARIABLE LINE DENSITY TEST

TEST 12

This test will test the ability of the printer to change line density. Seven pages each containing a different line density are produced by this test. If short diagnostic is selected only one

inch per density is printed for a total of seven inches on a single page. Each line of output is identified as to line density and is followed by 33 underlines to enable measurements to be taken for accuracy. For example:

X LPI _____

where X will cycle thru 1, 2, 3, 4, 6, 8, and 12 LPI.

Error E070 will occur if printer fails to go into selected density. No error will occur with the 12845B interface.

The output is in the currently selected print font, but is independent of the currently selected primary language.

5-15. AUTO UNDERLINE TEST

TEST 13

The Auto Underline mode of the 2635A is exercised by outputting a ripple print pattern identical to test 03. This test produces 50 lines(10 lines if short version) with ten characters underscored alternating with ten characters not underscored. Error E066 will be generated if the 2635A fails to go to the auto underline mode when requested. Error E041 will occur if the printer fails to go out of the auto underline mode. No errors will occur with the 12845B interface. The print quality and character alignment must be visually inspected by the operator.

The output is in the currently selected primary language and print font.

5-16. PRIMARY/SECONDARY SELECT TEST

TEST 14

This test verifies the capability to programmatically select the required character set in ROM 0, and the optional character set in ROM 1, both as the primary and secondary language according to the setting of switch register bit 0 (see section 5). Eight lines of ripple print will be printed for the primary set and eight lines for the secondary set. SO/SI or 8th bit will be used according to the setting of switch register bit 1(see Table 4-3). If no alternate set is availiable then the printing of blanks will occur for ROM 1.

No unique errors are generated by this test. The operator must examine the output to determine the success of this test.

Output is in the currently selected print font, but is independent

of the currently selected primary language.

5-17.
BACK SPACE/SHORT LINE TEST

TEST 15

Each subtest defined below describes the condition under test, the output used, and the expected results.

Subtest 1 - Goal: Verify that characters will not be lost by an excessive number of backspaces occurring in succession.
Output: One full line (55, 136, or 220 per line for selected print font) of octal 101, followed by an equal number of backspaces (10 octal). Next, one full line of underscore (octal 137) is printed followed by CR/LF.
Result: One full line of 55, 136 or 220 under- scored "A".

Subtest 2 - Goal: Verify the ability of print mechanism to interspace backspace commands in current print line.
Output: The sequence 101,10, 137 octal is output either 55, 136 or 220 times (as per current print font) followed by CR/LF.
Result: One line of underscored A's identical to that of Subtest 1.

Subtest 3 - Goal: Verify the printer will not make any errors when a print command is executed during a head viewing operation. Output: One full line in the current print font, of the letter "M". A 1.2 second delay between each character, decreased by 10 Milli-seconds each character until entire line is done.
Result: One full line of the character "M" printed without any misprints.
Note: This subtest is bypassed when short test is selected.

Subtest 4 - Goal: Insure that characters are not lost during short line print operations and the ribbon advances on short lines.
Output: 120 lines, each containing one decimal number corresponding to the last digit of the line number are output.
Result: 120 lines of print are produced with the contents of each line the last digit corresponding to the decimal line number.

No unique errors are generated by this test. The operator must

examine the output to determine the success of this test.

Output is in the currently selected print font, but is independent of the currently selected primary language.

5-18. INTERMIX PRINT FONT TEST

TEST 16

This test verifies the ability of the printer to change print font within a line. A number of font combinations are printed on all lines. The six combinations are, normal,expanded, compressed, normal underlined, expanded underlined and compressed underlined. The lines should all be relatively the same length and the transition from one font to another should be sharp and clearly defined. E062, E063 or E064 will occur if the printer does not respond to the programmatic request for specific print fonts. No unique errors occur for the 12845B interface. 48 lines are printed. If the short version is selected only 24 lines are printed.

The operator must examine the output to determine the success of this test.

Output is independent of the currently selected primary language and print font.

5-19. ON LINE/OFF LINE TEST

TEST 17

This test will alternately output X's and dash's(-) while causing the printer to go ON LINE for the X's and OFF LINE for the dash's. An example is as follows:

X (OFF LINE) - (ON LINE) X (OFF LINE) - (ON LINE) etc.

The result should be 10 lines of X's without any dash's in between. Following the printing of the 10 lines, the test will then output consecutive ON LINE, OFF LINE commands. The operator may observe the ON LINE LED blinking. No printing should occur. No unique errors are generated by this test.

Output is in the currently selected primary language and print font.

5-20
PAPER SLEW RATE TEST (Not executed on Serial Interface)

TEST 18

This test verifies that the 2635A can slew paper at its rated speed of 6.95 inches per second (+-3 percent). The message "TEST 19 SLEW RATE" will be printed on the TOF. Ten lines of ripple print followed by two VFC Channel 1 command Form Feed will be issued. This will be followed by 10 more lines of ripple print. The slew rate time in IPS (inches per second) will be printed. No unique errors are generated by this test.

Output is in the currently selected primary language, but is independent of the currently selected print font.

5-21
PRINT SPEED TEST (Not executed on Serial Interface)

TEST 19

This test measures the total through-put of the printer per line. The total through-put is the time it takes to do head turnaround and line feeds. Forty lines are printed. The first eight lines are ripple print, followed by sixteen pairs of ripple print lines. The output of this test is not significant. The operator must observe that the lines are of equal length and that they were all bi-directionally printed, otherwise the measured speed will not be accurate. A message will be printed on the terminal saying if the test passed or failed, and if failed if it was fast or slow. No unique errors are generated by this test.

The print speed varies according to the font currently selected. A speed of 180 CPS (+-9 CPS) is considered passing speed for normal and compressed modes. 45 CPS (+-3 CPS) is considered passing for expanded mode.

Output is in the currently selected primary language and print font.

TABLE 5-2.

ERROR INFORMATION MESSAGES AND HALT CODES

NOTE: Halt or error codes marked with an asterisk (*) do not occur on the 12845B interface. Messages specific to either the HP-IB or serial interfaces will be noted in the comment field. This table has been established as a quick reference guide to halt codes, and is not intended to give detailed information about the halt. It is assumed the operator has read and is familiar with the test discriptions in section IV of this manual.

HALT CODE	SECTION	MESSAGE	COMMENTS
102073	Configuration	None	I/O select code entered at configuration is invalid. Must be greater than 7 octal. Reenter a valid select code and press RUN
102074	Configuration	None	Select code entered during configuration is valid. Enter program option bits in Switch Register and press RUN.
102075	Test Control	None	Test selection request resulting from Switch Register bit 9 being set. Enter in A/B-register the desired group of tests to be executed, and press RUN. (See Table 4-2).
102076	Test Control	None	End-of-test halt resulting from Switch Register bit 15 being set (A-register has the test number). To continue, press RUN.
102077	Test Control	PASS XXXXXX DEC	Diagnostic run complete. S-Register options may be changed (A-register has the pass count) To continue press RUN.
106077	Test Control	None	Halt stored in location 2-77 octal to trap interrupts which may occur unexpectedly because of hardware malfunctions. M-register contains the I/O slot which interrupted. Diagnostic may be partially destroyed if halt occurs. The program may have to be reloaded; problem should be corrected before proceeding.

TABLE 5-2.

ERROR INFORMATION MESSAGES AND HALT CODES (continued)

HALT CODE	SECTION	MESSAGE	COMMENTS
None	Test Control	H027 2635A PRINTER DIAG. DSN = 105006	Introductory message. Printed on initial pass through the diagnostic and whenever the operator restarts the program at 2000 octal.
None	Test Control	TEST XX DEC	Information message before error message (XX=test number in decimal). Message occurs only once within a test and is suppressed for any subsequent messages within the same test.
102000	TEST 00	E000 CLF 0- SFC 0 ERROR	CLF/SFC 0 combination failed. CLF did not clear Flag or SFC caused no skip with Flag clear.
102001	TEST 00	E001 CLF 0- SFS 0 ERROR	CLF/SFS 0 combination failed. CLF did not clear Flag or SFS caused skip with Flag clear.
102002	TEST 00	E002 STF 0- SFC 0 ERROR	STF/SFC 0 combination failed. STF did not set Flag or SFC caused skip with Flag set.
102003	TEST 00	E003 STF 0- SFS 0 ERROR	STF/SFS 0 combination failed. STF did not set Flag or SFS caused no skip with Flag set.
102004	TEST 00	E004 CLF 0 DID NOT INHIBIT INT	With card Flag and Control set, CLF 0 did not turn off interrupt system.

TABLE 5-2.

ERROR INFORMATION MESSAGES AND HALT CODES (continued)

HALT CODE	SECTION	MESSAGE	COMMENTS
102005	TEST 00	E005 CLF CH-SFC CH ERROR	CLF/SFC CH combination failed. CLF did not clear Flag or SFC caused no skip with Flag clear.
102006	TEST 00	E006 CLF CH-SFS CH ERROR	CLF/SFS CH combination failed. CLF did not clear Flag or SFS caused skip with Flag clear.
102007	TEST 00	E007 STF CH-SFC CH ERROR	STF/SFC CH combination failed. STF did not set Flag or SFC caused skip with Flag set.
102010	TEST 00	E010 STF CH-SFS CH ERROR	STF/SFS CH combination failed. STF did not set Flag or SFS caused no skip with Flag set.
102011	TEST 00	E011 STF XX SET CARD FLAG	Select code screen test failed. A-register contains XX octal where XX= select code that caused that card Flag to set.
102012	TEST 00	E012 INT DURING HOLD OFF INSTR	Interrupt occurred during an I/O instruction or a JMP/JSB indirect instruction.
102013	TEST 00	E013 SECOND INT OCCURRED	Card interrupted a second time after initial interrupt was processed.
102014	TEST 00	E014 NO INT	No interrupt occurred with card Flag and Control set and the interrupt system on.
102015	TEST 00	E015 INT RTN ADDR ERROR	Interrupt did not occur at the correct location in memory.

TABLE 5-2.

ERROR INFORMATION MESSAGES AND HALT CODES (continued)

HALT CODE	SECTION	MESSAGE	COMMENTS
102016	TEST 00	E016 CLC CH ERROR	CLC CH did not clear card Control with the interrupt system on.
102017	TEST 00	E017 CLC 0 ERROR	CLC 0 did not clear Control with the interrupt system on.
102020	TEST 00	E020 PRESET (EXT) DID NOT SET FLAG	PRESET (EXT) did not set the card Flag.
102021	TEST 00	E021 PRESET (INT) DID NOT DISABLE INTS	PRESET (INT) did not disable the interrupt system.
102022	TEST 00	E022 PRESET (EXT) DID NOT CLEAR CONTROL	PRESET (EXT) did not clear Control.
102023	TEST 00	E023 PRESET (EXT) DID NOT CLEAR I-O LINES	PRESET (EXT) did not clear I/O data lines.
102024	TEST 00	H024 PRESS PRESET (EXT & INT); PRESS RUN	Press PRESET (External, Internal) and RUN.
None	TEST 00	H025 BI-O COMP	Basic I/O Tests completed.
102026	TEST 00	E026 INT EXECUTION ERROR	Interrupt was not processed correctly.

TABLE 5-2.

ERROR INFORMATION MESSAGES AND HALT CODES (continued)

HALT CODE	SECTION	MESSAGE	COMMENTS
102032	ALL TESTS	E032 INCORRECT STATUS	Status returned is incorrect for the specific operation just done.
102033*	ALL TESTS	E033 STATUS SEQUENCE	Programmable Status bytes did not return in the expected order. A = actual, B = expected.
102034*	TEST 01	E034 IDENTIFY	Incorrect identity returned from an identify command. (HPIB only)
102035*	TEST 01	E035 PARALLEL POLL	Reports an error in the HP-IB parallel poll sequence.
102036*	TEST 01	E036 DSJ	Failure to respond to a DSJ command. (HP-IB only)
102037*	TEST 01	E037 PING PONG	Failure te execute a Ping Pong command or data miscompare
102040*	ALL TESTS	E040 STATUS INPUT TIME OUT	Status requested from the printer was not received in time.
102041*	ALL TESTS	E041 UNDER LINE DID NOT TURN OFF	Printer did not respond to a "turn off underline" command
102042*	ALL TESTS	E042 UNDER LINE DID NOT TURN ON	The printer did not respond to an auto underline command.
102045	ALL TESTS	E045 PRIMARY LANGUAGE IS ROM 1	Status shows the primary language is coming from ROM 1 and it should be ROM 0.

TABLE 5-2.

ERROR INFORMATION MESSAGES AND HALT CODES (continued)

HALT CODE	SECTION	MESSAGE	COMMENTS
102046*	ALL TEST	E046 SECONDARY LANGUAGE IS ROM 0	Status shows the seconday language is coming from ROM 0 and it should be ROM 1.
102051*	ALL TESTS	E051 HP-IB STATUS	HP-IB status was incorrect Recommend running 59310B diagnostic.
102052	ALL TESTS	E052 DATA OUTPUT TIME OUT	Data sent to the printer was not accepted in a reasonable amount of time.
102053*	ALL TESTS	E053 HP-IB TIME OUT	HP-IB did not complete its handshake in time.
102054*	TEST 20	E054 DID NOT GO INTO GRAPHICS MODE	Printer did not respond to a graphics mode command.
102055*	TEST 20	E055 DID NOT GO OUT OF GRAPHICS MODE	Printer did not respond to a 'TERMINATE GRAPHICS MODE' command.
102056*	TEST 20	E056 TOO MANY DOTS	The printer's 'Too Many Dots' circuitry is not functioning properly.
102060*	TEST 02	E060 BAUD RATE OUT OF TOLERANCE	Reports a baud rate out of tolerance. Bits 6-9 of the A register contain the requested baud rate as defined by bits 6-9 in Table 4-1. (Serial interface only)
102061*	ALL TESTS	E061 EXPECTED AN ACK	Program sent an ENQ and a character other than an ACK returned. (Serial interface only)
102062*	ALL TESTS	E062 DID NOT GO INTO NORMAL MODE	Printer did not respond to a normal mode command.
102063*	ALL TESTS	E063 DID NOT GO INTO EXP-ANDED MODE	Printer did not respond to an expanded mode command.

TABLE 5-2.

ERROR INFORMATION MESSAGES AND HALT CODES (continued)

HALT CODE	SECTION	MESSAGE	COMMENTS
102064*	ALL TESTS	E064 DID NOT GO INTO COMPRESSED MODE	Printer did not respond to a compressed mode command.
102067*	TEST 01	E067 SELF TEST MALFUNCTION DETECTED	Programmable status indicates self test failure.
		, ERROR CODE XXXXX	The error code is appended to E067 for HP-IB.
102070*	ALL TESTS	E070 LINE DENSITY IS XX LPI, AND IT SHOULD BE XX LPI	Reports an error in the line density. The current line density is in the A register and the expected line density is in the B register.
102071	TEST 09	H071 DMA NOT AVAILIABLE	Reports that the computer being used is not equipped with DMA.
102072	TEST 01	E072 SELF TEST TIME OUT	Reports that self test did not complete within 15 sec.
106007	TEST 09	E107 DMA TIME OUT	DMA did not complete in 10 seconds.
106010	TEST 02	H110 POWER OFF LP (BACK, LOWER RIGHT); HIT RETURN	Turn power line switch to the OFF position and then press the computer RUN button. (see pargraph 5-4, subtest 1)
106011	TEST 02	H111 POWER ON, INSTALL PAPER, ON LINE; HIT RETURN	Turn power line switch to the ON position and install paper in the printer, press the ON LINE button and press RUN on the computer. (see pargragh 5-4, subtest 2)
106012	TEST 02	H112 PRESS OFF LINE; HIT RETURN	Press the OFF LINE switch of the printer and press RUN on the computer.

TABLE 5-2.

ERROR INFORMATION MESSAGES AND HALT CODES (continued)

HALT CODE	SECTION	MESSAGE	COMMENTS
106013	TEST 02	H113 REMOVE PAPER, ON LINE; PRESS RUN	Remove the paper from the printer, press ON LINE to update status and press RUN on the computer.
106014	TEST 02	H114 REINSTALL PAPER, ON LINE; HIT RETURN	Reinstall paper into the printer, press ON LINE, and press RUN. (see paragragh 5-4, subtest 5)
106015	TEST 02	H115 PRESS RESET, ON LINE; HIT RETURN	Press RESET on the printer, press ON LINE and press RUN.
106017	TEST 02	H117 PRESS OFF LINE,SELF TEST, VERIFY SELF TEST; HIT RETURN	Press OFF LINE and SELF TEST. Verify self test results. Press RUN on the computer. (see paragragh 5-4, subtest 7 also see Operator's Manual)
106020	TEST 02	H120 SELECT COMP DEFAULT, PRESS ON LINE ; HIT RETURN	Select Compressed mode on the print mode default slide switch, press ON LINE on the printer, and press RUN on the computer.
106021	TEST 02	H121 PRESS OFF LINE, SELECT EXP DEFAULT, PRESS ON LINE ; HIT RETURN	Take printer OFF LINE and select expanded mode on the print mode default slide switch, press ON LINE and press RUN on the computer.
106022	TEST 02	H122 PRESS OFF LINE, SELECT NORM DEFAULT, PRESS ON LINE ; HIT RETURN	Take the printer OFF LINE and select normal mode on the print mode default slide switch, press ON LINE and RUN.

TABLE 5-2.

ERROR INFORMATION MESSAGES AND HALT CODES (continued)

HALT CODE	SECTION	MESSAGE	COMMENTS
106023	TEST 02	H123 SELECT 8 LPI DEFAULT, PRESS RESET, PRESS ON LINE; HIT RETURN	Select 8 LPI with the 6/8 LPI pow on default slide switch, press RESET press RUN. On 12845B interface, operator must verify performance observing that the 8 LPI LED is on.
106024	TEST 03	H124 SELECT 6 LPI DEFAULT , PRESS RESET , PRESS ON LINE; HIT RETURN	Select 6 LPI with the 6/8 LPI power on default slide switch. Press RESET to implement the change, put ON LINE and press RUN. On 12845B interface, the operator must verify performance by observing that the 6 LPI LED is on.
106025	TEST 02	H125 DEPRESS OFF LINE, 8 LPI, ON LINE; HIT RETURN	Press OFF LINE and select 8 LPI. put ON LINE and press RUN. On 12845B interface, the operator must verify performance by observing that the 8 LPI LED is on prior to pressing RUN. Immediately after "RUN", the 6LPI LED should come on.
106026	TEST 02	H126 PRESS OFF LINE, LINE FEED, VERIFY PAPER ADVANCE; HIT RETURN	Take printer OFF LINE and press LINE FEED. Verify paper motion, then press RUN.
106027	TEST 02	H127 DEPRESS FORM FEED, VERIFY PAPER MOTION; HIT RETURN	Strike the FORM FEED key and verify paper motion. Press RUN.
106032	TEST 02	H132 PRESS DISPLAY FUNC-TIONS, ON LINE; PRESS RUN, VERIFY FUNCTIONS DISPLAYED.	Enable display functions and put machine ON LINE. Verify that ESC&l1VESCZ escape sequence is printed after RUN is pressed.

TABLE 5-2

ERROR INFORMATION MESSAGES AND HALT CODES (continued)

HALT CODE	SECTION	MESSAGE	COMMENTS
106037*	TEST 02	H137 SELECT ODD PARITY; HIT RETURN	Set PARITY to ODD and press RUN. (Serial interface only)
106040*	TEST 02	H140 SELECT EVEN PARITY; HIT RETURN, "@" SHOULD BE PRINTED	Set PARITY to EVEN and press RUN to continue. (Serial interface only)
106041*	TEST 02	H141 SELECT NONE PARITY; HIT RETURN	Set PARITY to NONE and press RUN. (Serial interface only)
106042*	TEST 02	H142 SELECT EXT BAUD; HIT RETURN	Select the external baud position and press RUN. (Serial interface only)
106043*	TEST 02	H143 SELECT XXXXX BAUD; HIT RETURN	Select the specified baud rate and press RUN. Bits 6-9 of the A register contain the requested baud rate as defined by bits 6-9 in Table 4-1. (Serial interface only)
106044	TEST 02	H144 ALIGN TOP OF FORM, PRESS RESET, ON LINE; HIT RETURN	Set top of form to it's proper position for the remainder of the test.
106045*	TEST 02	H145 EXTERNAL BAUD RATE IS XXXXX	Tells operator what the external baud rate is for this printer. Bits 6-9 of the A register contain the best fit baud rate as defined by bits 6-9 in Table 4-1. (Serial interface only)

SECTION VI

MODIFICATION OF PRIMARY LANGUAGE

6-1. GENERAL

At any time while running the diagnostic the operator may initiate a request to modify the current primary language. This feature is not considered to be part of the standard tests used by this diagnostic to verify operation of the printer. The diagnostic program is distributed with ASCII defined as the primary language and if this option is never selected, then all passes through the diagnostic will result in ASCII being the predominant visible output. Should the operator decide to assign the alternate language as the primary language, then only between tests will the diagnostic check to see if a change has been requested. To make the request, Bit 0 of the S-register is used. If the printer is a 2635A then when bit 0 equals zero, the primary language will be in ROM location 0. When bit 0 equal one, the primary language will be in ROM location 1.

When bit zero is selected in the switch register a halt 102030 will occur for primary language and 102031 for secondary. The operator then will enter the numeric portion of the code in the a register and the alphanumeric portion in the "B" register for each halt. See table 6-1 for existing character set codes at the time of this printing.

Modification of the primary language by the operator must be done with knowledge that the resultant output will conform to the description provided by Table 3-2. Without physical disassembling the machine, the operator may or may not have full knowledge of the settings of the hardware straps and whether or not an alternate language is available.