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12587B ASYNCHRONOUS DATA INTERFACE DIAGNOSTIC

reference manual

For HP 2100 and HP 1000 M-Series Computers

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HP 12587B ASYNCHRONOUS DATA INTERFACE DIAGNOSTIC

INTRODUCTION

This diagnostic test program confirms proper operation of the HP 12587B Asynchronous Data Interface Board with an HP 2100-Series Computer.

The program is designed for maximum testing speed. The operator can repeat each function test within the diagnostic as often as desired; or he can run the entire program, stopping at the end of each function test to evaluate the results.

HARDWARE CONFIGURATION

The diagnostic program may be used with any HP 2100-Series Computer and requires a test connector on the interface board. Figure 1 shows how the test connector routes the interface outputs to the inputs and Figure 2 shows the I/O word formats. The diagnostic may use (optionally) a console device for reporting errors and messages to the operator. Without a console device, errors and messages will be indicated by specially coded halts in the T-register of the computer.

NOTE: Positions of jumpers W1 (bit transfer rate) and W2 (number of stop bits) on the interface board must be considered during configuration of the diagnostic (see Table 1, bits 14 and 15).

REQUIRED SOFTWARE

The following software is required:

a. Diagnostic Configurator (part numbers below) is used for equipment configuration and as a console device driver.

Binary object tape	Part No. 24296-60001
Manual	Part No. 02100-90157

b. HP 12587B Asynchronous Data Interface Diagnostic binary object tape, Part No. 12587-16001.

The diagnostic serial number (DSN) is contained in memory location 126 (octal) of the program. The DSN for this diagnostic is 103003 (octal).

DIAGNOSTIC LIMITATIONS

The diagnostic does not require direct memory access (or dual channel port controller) and proper functioning of the SRQ logic is not verified. Also, the interface capability for receiving, passing, and denying priority is not completely checked by the diagnostic.

FUNCTIONAL AND OPERATIONAL CHARACTERISTICS

If a teleprinter is to be used for reporting errors and messages, the diagnostic configurator must be configured before loading the diagnostic program. Then the diagnostic program may be loaded and set with the switch register selections shown in Table 1.

If any errors occur, the program types a message and halts. Exceptions to this are the trap cell halts $1060XX_8$ located in low memory 2_8 - 77_8. Trap cell halts are irrecoverable and are beyond the scope of this diagnostic. If a console device is not available, the A-register will contain the data. If a 2114, 2100, 21MX, or later computer is used, the data will be displayed via the switch or display register. The table of error messages (Table 3) should be consulted for the meaning of the A-register, switch register, or display register.

NOTE: Execution time of the diagnostic is 30 to 50 seconds, depending on position of interface jumper W1 and the computer type.

PROGRAM ORGANIZATION

The diagnostic program consists of the following routines:

CONFIGURATION	Configures the diagnostic to be run on the proper channel, one or two stop bits, high or low speed mode, and with or without a console device.
INITIALIZATION	Sets all trap cell halts in locations 2_8 - 77_8 and types the start message on the console device.

BI/O - Basic I/O Test

Clears the interface board then checks all flag instructions and tests the ability to enable and disable interrupts. Then BI/O tests the ability to interrupt by forcing an interrupt, checking the return address for interrupting at the right place, and checking the interrupt acknowledge. A select code screen test is performed to check that interface board responds only to its select code. Next, BI/O checks the control reset instructions and the PRESET switches. The PRESET test includes checks for flag set, interrupts disabled, control bit cleared, ready flip-flop set, clock enable reset, and CD, CE line reset (see Figure 2).

CKFRQ - Clock Frequency Test

Obtains the clock frequency and prints the value in decimal on the console device, or displays the value in octal in the A- (or S-) register if the console device is not available. This program may be used in the repeat mode to aid tuning of the clock frequency.

FCTST - Function/Status Test

Outputs a function signal and checks the status signal returned. All combinations of function/status signals and flag setting conditions obtainable through the test connector are tested.

SENDP - Send Pattern Test

Tests all patterns possible for all word sizes in the no-parity, odd-parity and even-parity modes.

RECVP - Receive Pattern Test

The same word patterns, word sizes and parity modes are tested in this program as in the SENDP program.

ERRFF - Error Flip-Flop Test

Tests the error flip-flop by forcing a parity error in both the even- and odd-parity modes. Then, in the no-parity mode, two receive cycles are used to test the error flip-flop detection of computer failure to accept two words.

END — Prints the end-of-test message (if the console device is available) and, if the repeat diagnostic option is selected (see Table 2, bit 12), restarts the diagnostic.

OPERATING INSTRUCTIONS

a. Load and configure the Diagnostic Configurator and load the diagnostic program using the Binary Loader.

b. LOAD ADDRESS 100_8. Load switch register with select code/option bits (see Table 1).

c. Press RUN. Halt 102074_8 will occur.

d. Select desired options from Table 2 by setting the appropriate bits of the S-register.

e. Press PRESET (EXT, INT), RUN.

f. After the program has advanced through all the tests, a message indicates completion of the diagnostic program. The diagnostic will come to an orderly halt (102077_8) if bit 12 of the switch register is clear.

g. To reconfigure the diagnostic, return to step b. To restart but not reconfigure, set the P-register to 2000_8 and continue at step d.

ERROR ANALYSIS

All messages to the operator printed on the console device (called TTY in Table 3) are prefixed by an alpha-numeric code. An H prefix indicates an operating instruction while an E prefix indicates an error message.

All halts are coded and may be found in Table 3 opposite the appropriate HALT CODE value. After the computer has halted, the operator may press RUN to continue with the diagnostic.

If trap cell halts occur on the console device channel, operate the diagnostic without selecting the console device.

The DMA portion of the HP 12587 Interface Board is not tested in this diagnostic.

Four possible priority string errors can exist in an interface board. Each is tested for the HP 12587 board as follows:

1. Does the board receive priority? Tested by this diagnostic.
2. Can the board be denied priority? To make this test, the user must extract an unused higher priority board, then run this diagnostic and expect an error halt 102005_8 (see Table 3).
3. Does the board deliver priority? This can be tested only by running a diagnostic for a lower priority interface board to some other device.
4. Can the board deny priority? Not tested by this diagnostic.

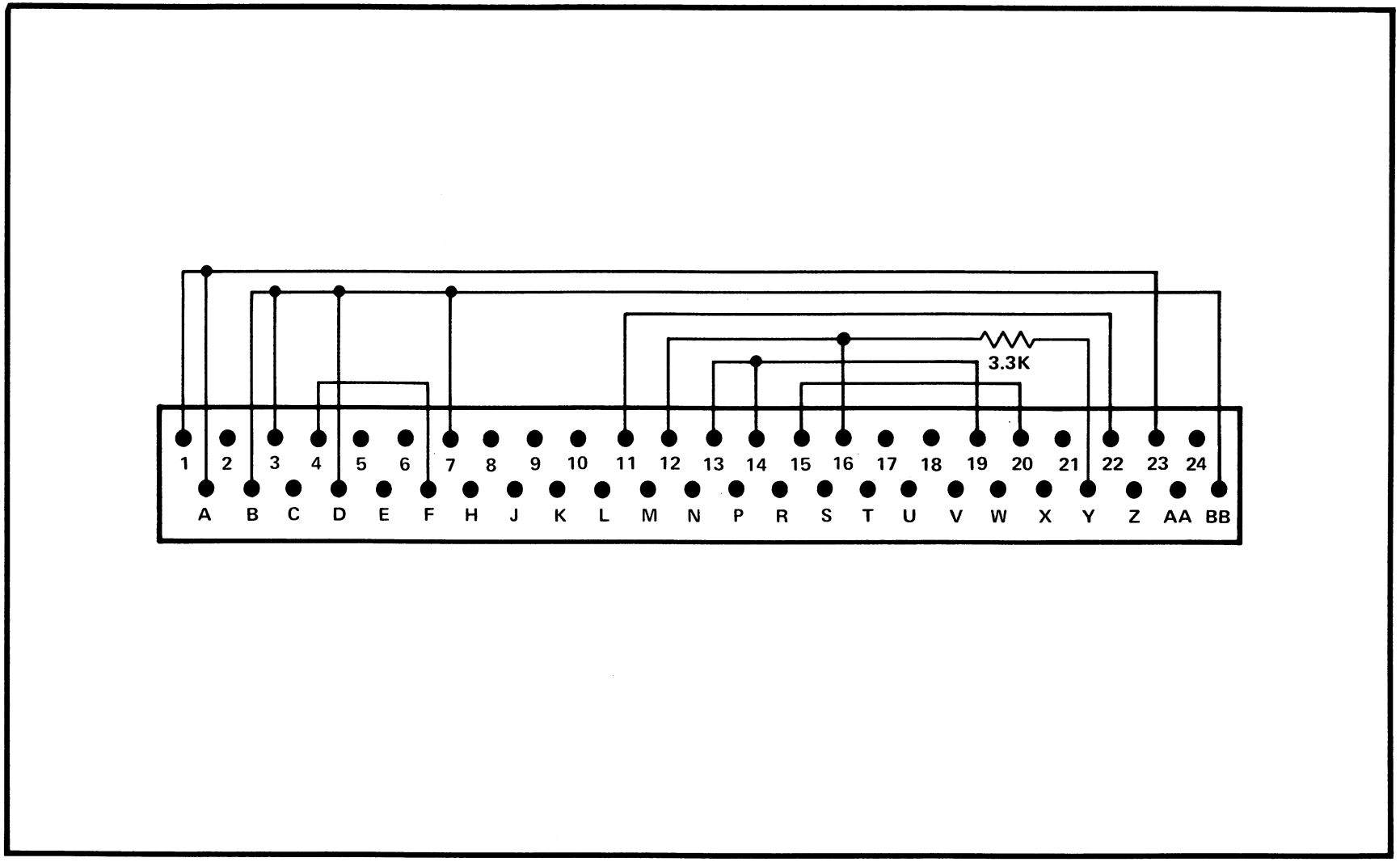

Figure 1. Test Connector (12587-60009) Wiring Diagram

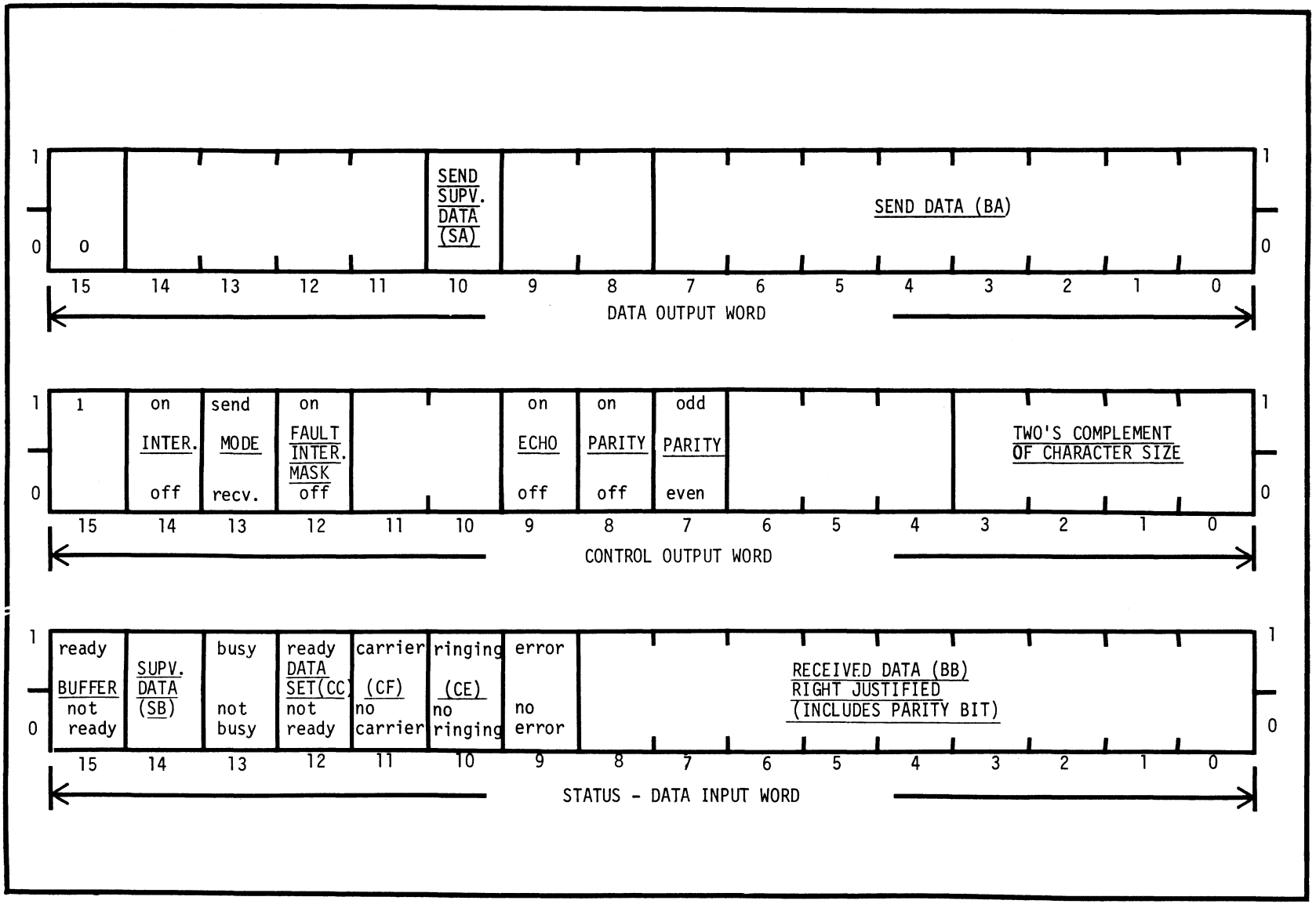

Figure 2. I/O Word Formats

Table 1. Hardware Select Code and Options

BITS	MEANING
5-0	Select Code of device.
13-6	Spares.
*14	Set if the interface board is jumpered for 2 stop bits.
*15	Set if the interface board is jumpered for high speed mode.
*Incorrect selection of bits 14 and 15 results in error message E103.	

Table 2. Switch Register Options

BITS	MEANING IF SET
0-6	Spares.
7	If set to zero, this program will execute the PRESET test. If set to one, this test will be omitted.
8	If set to zero, the program will execute the CKFRQ test. If set to one, this test will be omitted.
9	Spare.
10	If set to one, non-error messages are suppressed.
11	If set to one, error printouts are suppressed. If set to zero, error messages are typed on the teleprinter.
12	If set to one, the diagnostic will repeat all tests after a complete cycle of the program.
13	If set to one, the program recycles the current test instead of advancing to the next test within the diagnostic. If set to zero, the program automatically advances to the next test.
14	If set to one, the computer will suppress error halts.
15	If set to one, each separate test within the diagnostic runs and halts (with the appropriate messages typed on the teleprinter). This allows the operator to continue on to the next test or repeat the last test by setting bit 13.

Table 3. Error/Information Messages and Halt Codes

HALT CODE	TEST	MESSAGE	COMMENTS
102001	BI/O	E1. CLF DID NOT CLEAR FLAG, OR SFS CAUSED SKIP WITH FLAG CLEAR	Test the ability to clear the interface flag and test the SFS instruction.
102002	BI/O	E2. SFC DID NOT SKIP WITH FLAG CLEAR	Test the ability of the SFC instruction.
102003	BI/O	E3. STF DID NOT SET FLAG, OR SFC CAUSED SKIP WITH FLAG SET	Test the ability to set the interface flag and test the SFC instruction.
102004	BI/O	E4. SFS DID NOT SKIP WITH FLAG SET	Test the SFS instruction.
102005	BI/O	E5. DID NOT INTERRUPT	Test the interface interrupt capability.
102006	BI/O	E6. THE RETURN ADDRESS IS NOT CORRECT	The return address that resulted from the interrupt is incorrect.
102007	BI/O	H7. PRESS PRESET (EXT, INT), THEN PRESS RUN	
(no halt)	INIT	H8. START SEND/RECEIVE INTERFACE DIAGNOSTIC	Message omitted if bit 9 set on (up).
102010	BI/O	E1Ø. EXTERNAL PRESET DID NOT SET THE FLAG	
102011	BI/O	H11. END BI/O	Select program options (see Table 2) and press RUN.
102012	BI/O	E12. STF *xx* SET CARD FLAG	Select code screen test failed. *xx* = select code that caused failure.
102013	BI/O	E13. EXTERNAL PRESET DID NOT SET FLAG AND INTERNAL PRESET DID NOT DISABLE INTERRUPTS	
102014	BI/O	E14. INTERRUPT ACKNOWLEDGE DID NOT WORK. TEST ABORTED	Remaining tests of BI/O are terminated.
102015	BI/O	E15. CLC Ø DID NOT CLEAR CONTROL FLIP-FLOP	Control bit did not reset with CLC Ø instruction.

Table 3. Error/Information Messages and Halt Codes (Continued)

HALT CODE	TEST	MESSAGE	COMMENTS
102016	BI/O	E16. EXTERNAL PRESET DID NOT CLEAR CONTROL	
102017	BI/O	(none)	CLF Ø did not disable interrupts or SFS Ø caused a bad skip.
102020	BI/O	(none)	CLF Ø did not disable interrupts or SFC Ø caused a bad skip.
102021	BI/O	E21. STF Ø OR SFC Ø DID NOT WORK	STF Ø did not enable interrupts or SFC Ø caused a bad skip.
102022	BI/O	E22. STF Ø OR SFS Ø DID NOT WORK	STF Ø did not enable interrupts or SFS Ø caused a bad skip.
102023	BI/O	E23. STATUS BITS ARE *xxxxxx* AND SHOULD BE 1ØØØØØ	PRESET switch failed. Bit 15 should = 1, bits 13 and 10 should = 0. No other bits are considered.
102024	BI/O	(none)	First non-TTY display of E23. A-Register contains incorrect status bits.
102025	BI/O	(none)	Second non-TTY display of E23. A-Register contains correct status bits (100000). Press RUN to proceed.
102026	CKFRQ	H26. END CKFRQ	Select program options (see Table 2) and press RUN.
102027	BI/O	E27. INTERNAL PRESET DID NOT DISABLE INTERRUPTS	
(no halt)	CKFRQ	H3Ø. THE CLOCK FREQUENCY IS *xxxxxx*	If test is to recycle, set bit 13 on (up); only the clock frequency (decimal) is printed on the teleprinter.
102030	CKFRQ	(none)	Non-TTY display of H3Ø. A-Register contains the clock frequency (octal).

Table 3. Error/Information Messages and Halt Codes (Continued)

HALT CODE	TEST	MESSAGE	COMMENTS
102031	CKFRQ	(none)	A-Register display of current program options. Confirm or change program options (see Table 2) and press RUN.
102032	FCTST	E32. STATUS BITS ARE *xxxxxx* AND SHOULD BE ØØØØØØ	Bits 15, 14, 13, 11 should = 0.
102033	FCTST	(none)	First non-TTY display of E32. A-Register contains incorrect status bits.
102034	FCTST	(none)	Second non-TTY display of E32. A-Register contains correct status bits (000000).
102035	FCTST	E35. STATUS BITS ARE *xxxxxx* AND SHOULD BE Ø44ØØØ	Bit 15 should = 0, bits 14, 11 should = 1.
102036	FCTST	(none)	First non-TTY display of E35. A-Register contains incorrect status bits.
102037	FCTST	(none)	Second non-TTY display of E35. A-Register contains correct status bits (044000).
102040	FCTST	E4Ø. STATUS BIT 1Ø NOT SET	Check only bit 10, then check flag conditions, (E41, E42).
102041	FCTST	E41. FLAG NOT SET	Follows test E4Ø.
102042	FCTST	E42. FLAG DID NOT STAY CLEAR	Follows test E41.
102043	BI/O	E43. CLC ON CHANNEL DID NOT CLEAR CONTROL FLIP-FLOP	Control bit did not reset with CLC ch instruction. (ch = interface channel.)
102044	BI/O	E44. CLC CH,C DID NOT CLEAR FLAG OR SFC DID NOT SKIP WITH FLAG CLEAR	This tests the ,C part of the instruction to clear flag.

Table 3. Error/Information Messages and Halt Codes (Continued)

HALT CODE	TEST	MESSAGE	COMMENTS
102045	FCTST	E45. FLAG CLEAR AND SHOULD BE SET	Interface not setting flag.
102046	FCTST	E46. INCORRECT STATUS IS *xxxxxx* AND SHOULD BE Ø44ØØØ	Bits 14, 11 should = 1, bit 12 should = 0.
102047	FCTST	(none)	First non-TTY display of E46. A-Register contains incorrect status bits.
102050	FCTST	(none)	Second non-TTY display of E46. A-Register contains correct status bits (044000).
102051	FCTST	E51. FLAG CLEAR AND SHOULD BE SET	Interface not setting flag.
102052	FCTST	E52. INCORRECT STATUS IS *xxxxxx* AND SHOULD BE Ø5ØØØØ	Bits 14, 12 should = 1, bit 11 should = 0.
102053	FCTST	(none)	First non-TTY display of E52. A-Register contains incorrect status bits.
102054	FCTST	(none)	Second non-TTY display of E52. A-Register contains correct status bits (050000).
102055	FCTST	E55. FLAG CLEAR AND SHOULD BE SET	Interface not setting flag.
102056	FCTST	E56. INCORRECT STATUS IS *xxxxxx* AND SHOULD BE Ø14ØØØ	Bits 12 and 11 should = 1, bits 15 and 14 should = 0.
102057	FCTST	(none)	First non-TTY display of E56. A-Register contains incorrect status bits.
102060	FCTST	(none)	Second non-TTY display of E56. A-Register contains correct status bits (014000).
102061	FCTST	E61. FLAG SET AND SHOULD BE CLEAR	Interface not setting flag.

Table 3. Error/Information Messages and Halt Codes (Continued)

HALT CODE	TEST	MESSAGE	COMMENTS
102062	FCTST	E62. INCORRECT STATUS IS *xxxxxx* AND SHOULD BE Ø44ØØØ	Bits 14, 11 should = 1, bit 12 should = 0.
102063	FCTST	(none)	First non-TTY display of E62. A-Register contains incorrect status bits.
102064	FCTST	(none)	Second non-TTY display of E62. A-Register contains correct status bits (044000).
102065	FCTST	E65. CLOCK NOT WORKING. TEST ABORTED	Interface clock failure.
102066	FCTST	E66. STATUS BIT 11 NOT SETTING (SERIAL DATA)	Error in Function/Status test 6.
102067	FCTST	E67. BUSY BIT (13) NOT SET	Error in Function/Status test 8.
102070	FCTST	H7Ø. END FCTST	Select program options (see Table 2) and press RUN.
102073	CFGR	(none)	Configuration error halt. Set correct bits in switch register (see Table 1) and press RUN.
102074	CFGR	(none)	Configuration complete. Select options in Table 2 and press RUN.
(no halt)	END	H77. DIAGNOSTIC HAS BEEN COMPLETED	End of test. Bit 12 of switch register is clear. The program will halt (102077).
102077	END	(none)	End of test.
1060*xx*	Any	(none)	Trap cell interrupt. M = memory address when interrupted, *xx* = the trap cell location.
107002	SENDP	E1Ø2. CLOCK NOT WORKING	Interface clock failure.

Table 3. Error/Information Messages and Halt Codes (Continued)

HALT CODE	TEST	MESSAGE	COMMENTS
107003	SENDP	E1Ø3. ERROR IN SEND PATTERN TEST. *xxxx* PARITY MODE SELECTED. DATA SIZE IS *x* BITS, DATA PATTERN SENT IS *xxxxxx*, PATTERN READ BACK IS *xxxxxx*, PATTERN EXPECTED IS *xxxxxx*	Interface send failure or incorrect selection of bits 14 and 15 in Table 1 during configuration of diagnostic.
107004	SENDP	(none)	First non-TTY display of E1Ø3. If A-Register contains 0 = no parity, 1 = odd parity, 2 = even parity.
107005	SENDP	(none)	Second non-TTY display of E1Ø3. A-Register contains number of bits in send character.
107006	SENDP	(none)	Third non-TTY display of E1Ø3. A-Register contains data pattern out.
107007	SENDP	(none)	Fourth non-TTY display of E1Ø3. A-Register contains incorrect data pattern read back.
107010	SENDP	(none)	Fifth non-TTY display of E1Ø3. A-Register contains correct data pattern.
107011	SENDP	(none)	A-Register display of current program options. Confirm or change program options (see Table 2) and press RUN.
107020	SENDP	H12Ø. END SENDP.	Select program options (see Table 2) and press RUN.
107021	RECVP	E121. ERROR FLIP-FLOP SET. LAST CONTROL WORD WAS *xxxxxx*	Error status during receive cycle.
107022	RECVP	(none)	Non-TTY display of E121. A-Register contains last control word.

Table 3. Error/Information Messages and Halt Codes (Continued)

HALT CODE	TEST	MESSAGE	COMMENTS
107023	RECVP	(none)	A-Register display of current program options. Confirm or change program options (see Table 2) and press RUN.
107024	RECVP	E124. ERROR IN RECEIVE PATTERN TEST. *xxxx* PARITY MODE SELECTED. DATA SIZE IS *x* BITS, DATA PATTERN SENT IS *xxxxxx*, PATTERN READ BACK IS *xxxxxx*, PATTERN EXPECTED IS *xxxxxx*	Interface receive failure.
107025	RECVP	(none)	First non-TTY display of E124. If A-Register contains 0 = no parity, 1 = odd parity, 2 = even parity.
107026	RECVP	(none)	Second non-TTY display of E124. A-Register contains number of bits in receive character.
107027	RECVP	(none)	Third non-TTY display of E124. A-Register contains current data pattern.
107030	RECVP	(none)	Fourth non-TTY display of E124. A-Register contains incorrect pattern read in.
107031	RECVP	(none)	Fifth non-TTY display of E124. A-Register contains correct pattern.
107032	RECVP	(none)	A-Register display of current program options. Confirm or change program options (see Table 2) and press RUN.
107040	RECVP	H14Ø. END RECVP	Select program options (see Table 2) and press RUN.

Table 3. Error/Information Messages and Halt Codes (Continued)

HALT CODE	TEST	MESSAGE	COMMENTS
107041	ERRFF	E141. EVEN PARITY CONTROL WORD AND ODD PARITY DATA DID NOT SET ERROR BIT 9 IN STATUS	Error flip-flop failed to set when error condition was forced on interface. Even parity mode.
107042	ERRFF	E142. ODD PARITY CONTROL WORD AND EVEN PARITY DATA DID NOT SET ERROR BIT 9 IN STATUS	Same as E141. Odd parity mode.
107043	ERRFF	E143. TWO RECEIVE CYCLES WITHOUT INPUTTING DATA DID NOT SET ERROR FLAG	Same as E141. No parity mode.
107060	ERRFF	H16Ø. END ERRFF	Select program options (see Table 2) and press RUN.

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