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On-line HP 30060A Terminal Data Interface Diagnostic



This on-line diagnostic tests operation of the HP 30060A Terminal Interface. Operator control through SDM/3000 commands (and section and control flags) allows detailed testing of specific functions or comprehensive testing with little or no operator intervention.

HARDWARE CONFIGURATION

This diagnostic is run on an HP 3000 Computer under SDM/3000 with the minimum hardware necessary to operate SDM/3000. In addition, the diagnostic requires an operator terminal (not connected to the interface under test), an HP 30060A Terminal Data Interface card, an HP 30062A Terminal Connector panel, and HP 30062-60003 test cables.

PROGRAM ORGANIZATION

Scope

In the normal mode the diagnostic tests only two channels during a cycle (as shown in Figure 1). In the automatic mode (requiring a total of eight test cables connected as shown in Figure 2) the diagnostic tests all 16 channels in pairs.

Since the diagnostic cannot alter the interrupt mask, the ability of the mask to prevent interface interrupts is not tested. I/O reset functions are also not checked since the I/O RESET button cannot be pressed while the system is in operation.

Running Modes

NORMAL MODE. In the normal mode (selected during unit diagnostic (UD) configuration) the operator chooses which channels are to be tested by

1. Specifying them during UD configuration or
2. Clearing SDM/3000 flag 11 before execution and then entering the desired channels in response to a UD message

If flag 11 is set, the diagnostic tests the channels selected during configuration.

When running in normal mode, the diagnostic prints the title message, requests installation of the test connector (if flag 11 is clear), and pauses. The operator continues execution after installing the connector as shown in Figure 1. The diagnostic asks for the channel numbers to

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be tested. The operator responds by entering the decimal channel numbers on the operator terminal. The diagnostic then executes without further operator intervention according to the setting of the SDM/3000 control and section flags.

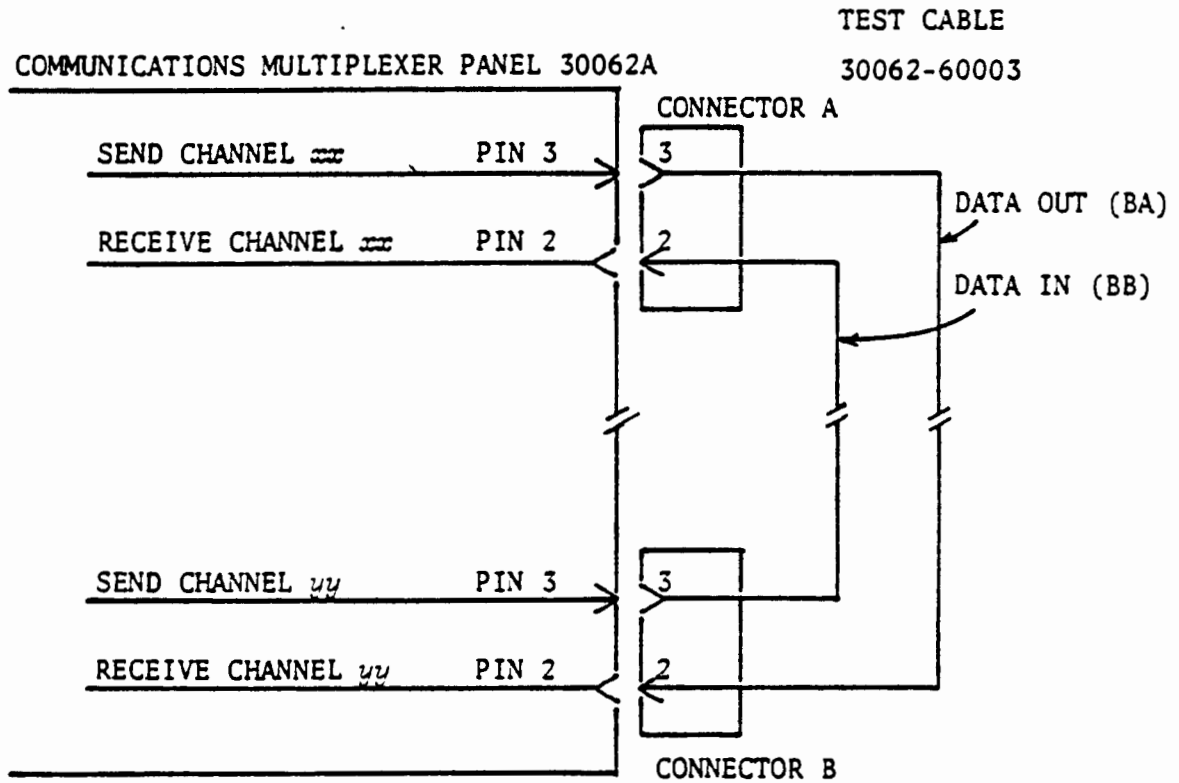


Figure 1. Test Cable Scheme for Normal Mode

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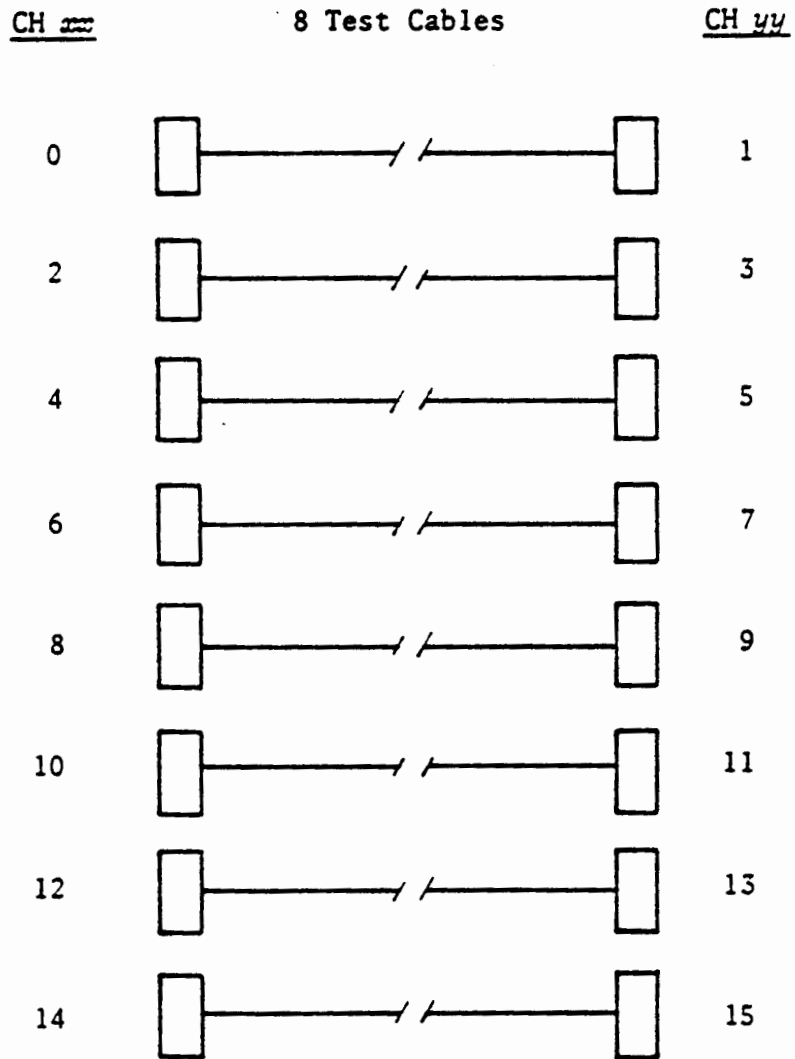


Figure 2. Test Cable Scheme for Automatic Mode

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AUTOMATIC MODE. In automatic mode (chosen during UD configuration), the operator places the eight test connectors (only one is supplied with the diagnostic) as shown in Figure 2 prior to UD execution. When the operator starts diagnostic execution, the program tests the channels in a predetermined order. No message asking for channel numbers is printed, regardless of the setting of flag 11, and no pause for cable installation occurs.

Error Messages

The diagnostic prints error messages on the operator terminal when error conditions occur during program execution. Various options can be exercised (through the SDM/3000 control flags) to shorten or omit these messages.

TEST SECTIONS

The diagnostic has twelve sections. Each section is a set of tests and functions. Each test and function is called a *step*, and each step is assigned a unique number.

Control Section

The outer block of the diagnostic is the control section, which controls diagnostic operation. The control section executes sections 1 through 9 either sequentially or selectively, according to the settings of the SDM/3000 section and control flags.

Configuration Section

This section consists of steps 1 through 4 and returns the maximum section and step numbers used by the diagnostic to SDM/3000 and configures the diagnostic to test all 16 channels or to test two channels of the operator's choice.

Initialization Section

Step	Function
5	Establishes the initial value of program variables and prints the diagnostic title on the teleprinter.
6	Prints a message instructing the operator to install the test cable, then pauses. This step is omitted if SDM/3000 flag 11 is set or if the diagnostic is configured to run in automatic mode.
7	Prints a message requesting the operator to input channel number one of the channels to be tested. This step is omitted if SDM/3000 flag 11 is set or if the diagnostic is configured to run in automatic mode.
8	Prints a message requesting the channel number for the other channel to be tested. This step is omitted if SDM/3000 flag 11 is set or if the diagnostic is configured to run in automatic mode.

Interrupt Test (Section 1)

Step	Function
10	Tests the interface interrupt capability.



Send/Receive Test (Section 2)

The two test channels are checked by this test for sending and receiving various combinations of data (consisting of alternate ones and zeros) at varying baud rates and character sizes.

The test is then repeated with the complement data pattern.

Step	Function
20	Outputs data on the send channel under test with the send parameter and receive parameter enable bits set; confirms that the send flag is set and that an interrupt occurred.
21	Checks status.
22	Issues a read I/O (RIO) instruction to input the interrupting channel number and confirms that the send channel caused the interrupt.
23	Issues an acknowledge interrupt and confirms that the receive channel interrupts.
24	Confirms that the receive flag is set.
25	Inputs data on the receive channel under test; confirms that the receive channel number is correct.
26	Compares the data sent with the data received; confirms that the data received is same as the data sent.
27	Checks status and issues an acknowledge interrupt.

Break Test (Section 3)

Step	Function
31	Sends and receives a nonzero test character on the channels under test; confirms that status word bit 7 is clear after the test character is received.
32	Sends and receives a break character (all zeros) on the channels under test; confirms that status word bit 7 is set after the test character is received.

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Parity Test (Section 4)

Step	Function
35	Sends and receives odd ASCII parity; confirms that bit 5 (parity check bit) of the received word is set.
36	Sends and receives even ASCII parity; confirms that bit 5 (parity check bit) of the received word is clear.

Diagnose Test (Section 5)

The test is repeated for each auxiliary channel (16 through 20).

Step	Function
40	Confirms that data is routed to the proper auxiliary channel when the send parameter word bit 4 (diagnose bit) is set.
41	Confirms that the data received is the same as data sent.
42	Confirms that data is routed to the proper auxiliary channel when the receive parameter word bit 4 (diagnose bit) is set.
43	Confirms that data received is the same as data sent.

Echo Test (Section 6)

Step	Function
45	Receives a test character with the receive parameter bit 3 (echo bit) set; confirms that the character is echoed back on the corresponding send channel.

Sync Test (Section 7)

Step	Function
50	Confirms that an all mark (all ones) character is sent when the output data word bit 4 (sync bit) is set.

Character-lost Test (Section 8)

Step	Function
55	Sends three characters to a receive channel before acknowledging the first interrupt; confirms that the condition is flagged by setting status word bit 6 (character - lost bit).

Read/Write Test (Section 9)

Step	Function
60	Attempts to send data on a nonexistent channel; confirms that status word bit 1 (R/W OK bit) is clear.

Operating Procedures

SECTION FLAG SETTINGS

Section flag settings for program control options are summarized in Table 1.

Table 1. Section Flag Settings

Flag Number	Function
1	Set to execute Section 1 (Interrupt Test).
2	Set to execute Section 2 (Send/Receive Test).
3	Set to execute Section 3 (Break Test).
4	Set to execute Section 4 (Parity Test).
5	Set to execute Section 5 (Diagnose Test).
6	Set to execute Section 6 (Echo Test).
7	Set to execute Section 7 (Sync Test).
8	Set to execute Section 8 (Character-lost Test).
9	Set to execute Section 9 (Read/Write Test).
10	Unused.
11	Set to avoid pausing for test-cable installation and avoid printing the channel number requests during execution of the Initialization test.
12	Set to print a message after completing each numbered section (1 through 9).
13	Set to pause after each numbered section.

OPERATING INSTRUCTIONS

- a. Relinquish all 16 terminal data interface channels for the exclusive use of the diagnostic. If the diagnostic is configured, skip to step c; otherwise continue with step 6.
- b. Use the SDM/3000 NEW command to configure the diagnostic. During configuration, respond to the SDM/3000 message

DEVICE?

by typing the terminal data interface logical device number (decimal). Respond to the SDM/3000 message

SET FLAGS?

by typing the section flag numbers and letters according to Table 1 and the description in the *HP 3000 System Diagnostic Monitor* (93000-90016). Set flag 11 if the diagnostic is to run in normal mode and the channels are to be preselected. After SDM/3000 types all of the standard configuration questions, the diagnostic types

AUTOMATIC MODE?

If the diagnostic is to run in automatic mode (all 16 channels tested in sequence) type YES followed by a carriage return. Skip to step c.

If the diagnostic is to run in normal mode, type NO followed by a carriage return. The diagnostic then asks

PRESELECT CHANNELS?

To preselect the channels to be tested, type YES followed by a carriage return. The diagnostic requests the channel numbers and configures the diagnostic for those channels.

To bypass channel preselection, type NO followed by carriage return. (If normal mode was selected, and the answer to PRESELECT CHANNELS is NO, flag 11 should be cleared before the diagnostic is executed.)

- c. Using SDM/3000 commands, activate the diagnostic and issue a RUN command. The diagnostic prints the title message. If flag 11 is set or if the diagnostic was configured to run in automatic mode, the diagnostic executes according to the setting of the section and control flags (Table 1). Skip to step f.
If flag 11 is clear, the diagnostic requests cable installation (Figure 1) and pauses.
- d. After installing the cable, issue a CONTINUE command.
- e. If the diagnostic was configured for normal mode, or if flag 11 is clear, the diagnostic requests the numbers of the channels to be tested. Enter the decimal channel numbers. The diagnostic executes according to the settings of the section and control flags.
- f. Upon completion, the diagnostic types an end message

END TERM DATA TEST

and control is returned to SDM/3000.

MESSAGE FORMAT



Diagnostic Messages

Diagnostic messages to the operator begin with an alphabetic character followed by the step number which generated the message. The alphabetic prefix identifies the message class:

Prefix Class	Type of Message
D	Data or information requiring no operator response.
E	Error message.
P	Message requiring some operator response (program pauses).
Q	Message requiring operator data to continue execution.

Error Messages

Appendix A shows all possible error messages from the diagnostic and their meaning. In addition, SDM/3000 outputs the following error messages if the diagnostic program and hardware (other than the unit under test) are not performing correctly.

Message	Comment
### ERROR 100, <i>Unit diagnostic name</i> STEP <i>yyy</i>	The RECEIVEMAIL intrinsic returned a value other than 0 (null) or 2 (incoming). The current diagnostic step number is <i>yyy</i> .
### ERROR 101, <i>Unit diagnostic name</i> STEP <i>yyy</i>	SDM/3000 sent an order with an opcode (OPI) greater than 16.

APPENDIX A

Diagnostic Messages

The messages in this appendix are prefixed by an alphabetic character and the diagnostic step number, as explained in "Message Format." No comment is given where the message is self-explanatory.

Message	Comment
Q1 AUTOMATIC MODE?	Enter YES to configure diagnostic for automatic mode. Otherwise, enter NO. (Follow either number with a carriage return.)
Q2 PRESELECT CHANNELS?	Enter YES to configure diagnostic for specific channels. Otherwise, enter NO.
Q3 CH X=	Enter channel number (decimal).
Q4 CH Y=	Enter channel number (decimal).
D5 30060A TERMINAL DATA INTERFACE TEST (32363A.00.0)	Initial message.
P6 INSTALL TEST CABLE	
Q7 CH X=	Enter channel number (decimal).
Q8 CH Y=	Enter channel number (decimal).
E20 NO SEND FLAG	Bit 4 of status word not set within time-out after data sent.
E21 SUNIT = xx RUNIT = xx CSP = %x BRP = %xxx STATUS IS x xxx xxx xxx xxx xxx SHOULD BE x xxx xxx xxx xxx xxx	Status error. Send unit (SUNIT) and receive unit (RUNIT) in decimal, character size (CSP) and baud rate (BRP) parameters in octal. Status indicator is displayed in binary.
E22 SEND UNIT IS xx SHOULD BE xx	Data was sent on a channel different than the one intended.
E24 NO RECV FLAG	Bit 4 of status word not set within time-out after data received.
E25 RCV UNIT IS xx SHOULD BE xx	Data was received on a channel different than the one intended.



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Message	Comment
E26 SUNIT = xx RUNIT = xx CSP = %x BRP = %xxx DATAOUT IS xxxxxx DATAIN IS xxxxxx	Data sent did not compare to data received. Send unit (SUNIT) and receive unit (RUNIT) in decimal, character size (CSP) and baud rate (BRP) parameters in octal.
E27 SUNIT = xx RUNIT = xx CSP = %x BRP = %xxx STATUS IS x xxx xxx xxx xxx xxx SHOULD BE x xxx xxx xxx xxx xxx	Status error. Send unit (SUNIT) and receive unit (RUNIT) in decimal, character size (CSP) and baud rate (BRP) parameters in octal.
E31 BREAKBIT SHOULD NOT BE SET	A nonzero test character was sent, but bit 7 of status word was not cleared.
E32 BREAKBIT SHOULD BE SET	A zero test character was sent, but bit 7 of status word was not set.
E35 PARITY CHECK BIT IS NOT SET	Odd ASCII parity sent, but bit 5 of received word was not set.
E36 PARITY CHECK BIT SET	Even ASCII parity sent, but bit 5 of received word was not cleared.
E40 RCV UNIT IS xx SHOULD BE xx	Receive channel number in diagnose test is incorrect.
E41 SEND DATA NOT ON AUX CH xx	Bit 4 (diagnose) of send parameters was set, but data sent was not routed to auxiliary channel xx (decimal).
E42 RCV UNIT IS xx SHOULD BE xx	Receive channel number in diagnose test is incorrect.
E43 RECV DATA NOT ON AUX CH xx	Bit 4 (diagnose) of receive parameters was set, but data received was not routed to auxiliary channel xx (decimal).
E 45 NO ECHO ON CH xx	Bit 3 (echo) of receive parameters was set but data was not echoed back on channel xx.
E50 SYNC FAILED	Failed to send an all mark (all ones) character when sync bit was set and all data bits were ones.
E55 CHAR LOST FAILED	Bit 6 (character lost) of status word should be set to indicate character-lost condition.
E60 R/W OK FAILED	Bit 1 (R/W OK) of status word should be cleared to indicate interface is seeking.
E100 NO RESPONSE TO CIO IN STEP xx	Condition code = CCL after CIO instruction.
E105 NO RESPONSE TO RIO IN STEP xx	Condition code = CCL after RIO instruction.
E106 NOT READY FOR RIO IN STEP xx	Condition code = CCG after RIO instruction.

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Message	Comment
E110 NO RESPONSE TO TIO IN STEP <i>xx</i>	Condition code = CCG after WIO instruction.
E115 NO RESPONSE TO WIO IN STEP <i>xx</i>	Condition code = CCL after WIO instruction.
E116 NOT READY FOR WIO IN STEP <i>xx</i>	Condition code = CCG after WIO instruction.
E120 NO RESPONSE TO <i>YYY</i> IN STEP <i>xx</i>	Condition code = CCL after <i>YYY</i> instruction (<i>YYY</i> = SIN or CIO).
E125 NO INTERRUPT IN STEP <i>xx</i>	Interface did not cause an external interrupt within time-out period in step number <i>xx</i> .
D145 END SECTION <i>x</i>	Section <i>x</i> has been completed.
D150 END TERM DATA TEST	Diagnostic has executed one complete pass.

