

**HP 3000 SERIES II
COMPUTER SYSTEM
MANUAL OF STAND-ALONE DIAGNOSTICS**

**HP 30360A
HARDWIRED SERIAL INTERFACE
STAND-ALONE DIAGNOSTIC PROGRAM**

Diagnostic No. D432
Update #1 Incorporated 8/77

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CONTENTS

	Page
How To Use This Manual	iv
Section I	
MINI-OPERATING INSTRUCTIONS	1-1
Section II	
DETAILED DESCRIPTION	
Test Section 1	2-1
Test Section 2	2-2
Test Section 3	2-2
Test Section 4	2-2
Test Section 5	2-2
Test Section 6	2-3
Test Section 7	2-3
Test Section 8	2-3
Test Section 9	2-4
Section III	
DETAILED OPERATING PROCEDURES	3-1
Appendix A	
TABLES	
Switch Register Assignments	A-1
Halt Codes	A-1
Diagnostic Messages	A-2
Appendix B	
CONFIGURING D432 USING SDUPII	B-1

HOW TO USE THIS MANUAL

- The mini-operating instructions in Section I are given as a memory aid for those persons already familiar with the Hardwired Serial Interface Diagnostic D432. If you are not familiar with this program, first refer to Sections II and III.
- This manual references:
SDUPII Utility Program Manual.(D417A) 03000-90125

MINI-OPERATING INSTRUCTIONS

SECTION

I

This section summarizes how to run the first seven test sections of the stand-alone diagnostic, D432, in a single-computer environment.

1. For the channel to be tested, set the corresponding TEST/NORMAL switch on the HSI Cable Assembly Panel to the TEST position.
2. Cold load the D432 diagnostic program from a stand-alone diagnostic tape. Press RETURN on the system console. A title message is printed, followed by a prompt for you to enter Switch Register options (refer to Table A-1). The program halts (HALT %6) to allow for entering options through the System Control Panel switch register.
3. To run the diagnostic program when it has been preconfigured (using SDUPII), ensure bit 0 of the System Control Panel switch register is OFF (0). Press RUN.
4. The program executes each test section (tests 1 through 7) and prints an End-of-Section message after the test completes successfully. If a hardware error occurs, an error message is printed and execution terminates.
5. After all seven test sections execute, the program prints an End-of-Diagnostic message and halts (HALT %15).

NOTE

The preset baud rate is 2.5 Mbits/sec and the preset channel is 0. For a complete test, these values must be changed. Channel and baud selection is part of the preconfiguration procedure described in Section III.

DETAILED DESCRIPTION

SECTION

II

This stand-alone diagnostic program tests an HP 30360A Hardwired Serial Interface (subsequently called HSI). The diagnostic, D432A, contains nine test sections, the first seven of which execute in either a single or double computer configuration. (Note, however, that test section 7 is relevant only in a double-computer configuration.) Test sections 8 and 9 execute in a double-computer configuration only.

In single-computer configuration, the output of the channel being tested is connected to the input of the same channel by setting the TEST/NORMAL switch on the HSI Cable Assembly Panel to the TEST position.

In double-computer configuration, the HSI is connected to another HP 30360A HSI in another HP 3000 Computer System, or to an HP 12889A Hardwired Serial Interface installed in an HP 21XX Computer. At a site containing an HP 21XX, the diagnostic for the HP 12889A Hardwired Serial Interface PCA, HP 24335A, is run concurrently with D432.

The following paragraphs describe the nine test sections of D432. At the end of each section description, the equivalent HP 24335A Diagnostic test number is given. This information is useful when you run D432 in a double-computer environment where the second computer is an HP 21XX model.

2-1. TEST SECTION 1

This section tests:

- the response to I/O commands (CIO, TIO, RIO, WIO, and SIO).
- the initial status (a status check).
- the ability to set the interrupt flip-flop with the SIN instruction.
- the ability to enable and disable interrupts originating from the Interface PCA.
- the function of programmed I/O reset and interrupt reset.
- Control Function 3, bits 8 through 11 and bits 12 through 15, for the appropriate functions of Disable Service Request, Device End, Conditional Jump, and Interrupt -- once receive and transmit are verified as being operational.

with the exception of the SMSK and RMSK instructions, all functions unique to the HP 30360A HSI that are not found on the HP 12889A Hardwired Serial Interface are tested in Test Section 1.

Step numbers may range from %10 to %60.

2-2. TEST SECTION 2

This section tests whether the Direct Write to SIO Read data modes function correctly. A 100-word block of data is sent and received. The received block is compared to the memory resident transmit block to test for errors.

This test section is equivalent to Test 8 in HP 24335A. Step numbers may range from %61 to %110.

2-3. TEST SECTION 3

This section tests whether the Direct Write to Direct Read data modes function correctly. A 100-word block of data is sent and received. The received block is compared to the memory resident transmit block to test for errors.

This section is equivalent to Test 9 in HP 24335A. Step numbers may range from %111 to %140.

2-4. TEST SECTION 4

This section tests the Watch Dog Timer. One word is transmitted and received. The watch Dog Timer Interrupt is enabled and checked, and the status word is checked for the WDO bit.

This section is equivalent to Test 10 in HP 24335A. Step numbers may range from %141 to %170.

2-5. TEST SECTION 5

This section tests the clear CRC function. The CRC is cleared, then transmitted and received. The status word is checked for a CRC character error which would be asserted if a set bit (1) is detected.

This section is equivalent to Test 11 in HP 24335A. Step numbers may range from %171 to %220.

2-6. TEST SECTION 6

This section tests CRC accumulation and transmission as a text word. In Configuration #1 (refer to Section III, Item 5), the board is set to accumulate CRC on transmit and then the software calculates CRC on the transmit. At the end of the data block, the CRC is sent and compared to the calculated CRC. Next the board is set to accumulate CRC on receive and then the software calculates CRC on receive. At the end of the data block, the CRC is sent and compared to the calculated CRC.

In a double-computer configuration, the transmitter accumulates CRC on transmit, the receiver accumulates CRC on receive, and the software calculates CRC on receive. At the end of the data block, the transmitter sends the CRC, the receiver compares it to the calculated CRC, and the RCVR CPU responds by receiving and then sending CRC, and testing the error bit in the status word. The XMTR tests for reception of zero.

This section is equivalent to Test 12 in HP 24335A. Step numbers may range from %221 to %247.

2-7. TEST SECTION 7

This section tests the Hardware Handshake Mode between two HP 3000 Computers. First, the Handshake word is sent in burst mode. Next, the control words that transmit and receive the Handshake are established. The words are compared to detect errors. Finally, the 100-word block of data is transmitted and received in Handshake Mode of SIO Write and SIO Read, and compared to test for errors.

This section is equivalent to Test 13 in HP 24335A. Step numbers may range from %250 to %277.

Note that this test can run only if both systems are HP 3000 Computers.

2-8. TEST SECTION 8 (NOT TO BE RUN WITH WITH DS 3000)

This section tests the Listen-Repeat and address recognition functions. The transmitter sends all addresses from %2 to %176 (address is incremented by 2). Upon recognition, the receiver sends confirmation to the transmitter and increments its address starting with address %2. This is Direct write and SIO Read. After sending all addresses, the transmitter checks for any non-recognized addresses and all repeated words are compared to the word that was sent. This section is equivalent to Test 14 in HP 24335A. Step numbers may range from %300 to %327.

2-9. TEST SECTION 9

This section tests the ability to terminate an SIO Read with a Tag One Word. The receiving CPU is set to expect more words than the transmit CPU will send before sending the Tag One word. Device End should occur before completion of the SIO Read. The residue is checked and the Tag word verified.

This section is equivalent to Test 15 in HP 24335A. Step numbers may range from %330 to %360.

DETAILED OPERATING PROCEDURES

SECTION

III

1. Connect the hardware for either single or double computer configuration.

For test sections 1 through 7 (single-configuration only), connect the input of the channel to be tested to the output of the same channel by setting the TEST/NORMAL switch for that channel to the TEST position.

For double-computer configuration, make the connection between the channels using HP 30220A cables. The TEST/NORMAL switches for the selected channels should be in the NORMAL position.

2. Cold-load diagnostic D432 (on both computers, if two computers will be used). After loading is complete, press RETURN on the system console. Execution begins with a title message:

```
HP30360A HARDWIRED SERIAL INTERFACE DIAGNOSTIC D432A.00.0
```

3. A message instructing you to enter switch register options is printed and the program halts (HALT %6).

```
P1 ENTER SWITCH REG. OPTIONS
```

With double-computer configuration, the same test sections must be selected on both computers. Configuration on the two computers also must be consistent. For example, the channel specification should correspond to the hardware connection and both computers must be configured for the same baud rate.

If the diagnostic was preconfigured (using SDUPII) and you want to run the program with the preset options and configuration, set the System Control Panel Switch Register bit 0 OFF (0). Press RUN and continue reading at step 6.

If you want to select different options or to configure D432 through the console, set bit 0 ON (1), set bits 1 through 15 according to Table A-1, and press RUN. If bit 1 is ON when you press RUN, program execution continues at step 4. If bit 1 is OFF, execution skips step 4 and continues with step 5.

4. After you press RUN with bits 0 and 1 ON (refer to step 3), the following message is printed and the program halts (HALT %5).

P2 ENTER SECTION SEL. OPTIONS

Use bits 1 through 9 of the System Control Panel Switch Register to select the corresponding test sections. Press RUN.

5. After you press RUN with bit 0 ON and bit 1 OFF as described in step 3, or after you pressed RUN in step 4, the following prompts are printed, one at a time.

Q1 ENTER HSI DEVICE NUM

Type an octal DRT number and press the RETURN key.

Q2 ENTER CPU CONFIGURATION

Specify the CPU configuration as follows:

- 0 = 1 CPU
- 1 = 2 CPUs - TRANSMITTER
- 2 = 2 CPUs - RECEIVER

Q3 ENTER BAUD RATE

Specify the baud rate as follows:

- 0 = 2.5 Mbits/sec
- 1 = 1.25 Mbits/sec

Q4 ENTER CHANNEL NUMBER

Specify the channel number by typing a number from 0 through 3. The number corresponds to the channel to be tested.

After you respond to this prompt and press RETURN, program execution begins.

6. with single-computer configuration, the selected test section begins to execute immediately. With double-configuration, the program waits indefinitely until the second computer has been started. Then testing begins.

If testing completes without an error, the interface is error free (at least for the channel and baud rate selected). For a complete test, you must reconfigure both the channel and the baud rate.

If an error occurs, diagnostic execution terminates and you receive an error message. The messages you can receive are listed in Table A-3.

7. After the test completes, you can change configuration and section selections by setting bit 0 (1) and pressing RUN.

Table A-1. Switch Register Assignment

BIT NUMBER	MEANING WHEN SET (1)
0	Update switch register options
1	Change section select options
2	Not used
3	Not used
4	Not used
5	Not used
6	Not used
7	Send messages to line printer
8	Not used
9	Suppress non-error messages
10	Suppress error messages
11	Loop on step
12	Halt on error
13	Halt after step
14	Halt after section
15	Halt after complete test cycle

Table A-2. Halt Codes

HALT NUMBER	MEANING
01	Unexpected trap
05	Halt to enter Section Selection options
06	Halt to enter Switch Register options
10	Halt for synchronization in double-computer configuration
12	Error halt
13	Halt after step
14	Halt after section
15	Halt after complete program cycle
17	Maximum error limit reached

Table A-3. Diagnostic Messages

STEP NUMBER/MESSAGE	COMMENTS
HP 30360A HARDWIRED SERIAL INTERFACE DIAGNOSTIC (D432A.00.0)	
Q1 ENTER HSI DEVICE NUM	Type DRT of HSI.
Q2 ENTER CPU CONFIGURATION	See Section III.
Q3 ENTER BAUD RATE	See Section III.
Q4 ENTER CHANNEL NUM	See Section III.
<p>NOTE: The following error messages may be preceded by one of the general messages E361 through D400.</p>	
E10 CIO FAILED, TEST ABORTED	Direct CIO instruction failed and the remainder of the diagnostic did not execute.
E11 TIO FAILED, TEST ABORTED	Direct TIO instruction failed and the remainder of the diagnostic did not execute.
E12 WIO FAILED, TEST ABORTED	Direct WIO instruction failed and the remainder of the diagnostic did not execute.
E13 RIO FAILED, TEST ABORTED	Direct RIO instruction failed and the remainder of the diagnostic did not execute.
E14 SIO FAILED, TEST ABORTED	Simple END/INTP SIO program failed and the remainder of the diagnostic did not execute.
E15 SIN FAILED	Direct SIN instruction failed.
E16 ENABLE INTP FAILED	Control word %50000 failed to enable interrupts.
E17 DISABLE INTP FAILED	Control word %40000 failed to disable interrupts.
E20 OVER-RUN INTP FAILED	Control word %60400 failed to enable interrupt on a forced data over-run.
E22 ENABLE CHANNEL INTP FAILED	Control word %160040 failed to enable interrupt on a forced service request.

Table A-3. Diagnostic Messages (Continued)

STEP NUMBER/MESSAGE	COMMENTS
E23 RCVR DISABLE FAILED	Control word %62000 failed to disable the receiver.
24	Set up and execute control word %100000 (I/O reset). Check status. An error produces message E361
E25 XMTR DISABLE FAILED	Control word %160004 failed to disable the transmitter.
26	Set up and execute a Direct write and Direct Read of one word. An error produces message E364. Configuration #1 only.
E27 TAG BC DID NOT CAUSE DISABLE SR	Control word %60200 failed to cause a disable service request on the reception of a Tag Word with Broadcast bit set.
E30 TAG BC DID NOT CAUSE DEV END	Control word %60100 failed to cause a device end on the reception of a Tag Word with Broadcast bit set.
31 TAG BC DID NOT CAUSE JUMP	Control word %60040 failed to cause a conditional jump on the reception of a Tag word with Broadcast bit set.
E32 TAG BC DID NOT CAUSE INTP	Control word %60020 failed to cause an interrupt on the reception of a Tag word with Broadcast bit set.
E33 TAG NC DID NOT CAUSE DIS-ABLE SR	Control word %60010 failed to cause a disable service request on the reception of a non-compare word.
E34 TAG NC DID NOT CAUSE DEV END	Control word %60004 failed to cause a device end on the reception of a Tag Non-compare word.
E35 TAG NC DID NOT CAUSE JUMP	Control word %60002 failed to cause a conditional jump on the reception of a Tag Non-compare Word.

Table A-3. Diagnostic Messages (Continued)

STEP NUMBER/MESSAGE	COMMENTS
E36 TAG NC DID NOT CAUSE INTP	Control word %60001 failed to cause an interrupt on the reception of a Tag Non-Compare Word.
37	Steps 37 and 40 execute only with Configuration #1. Control word %140001 failed to cause an interrupt. A timeout produces message E3b2.
40	Check status. An error produces message E361.
41	End of Section 1 message. (D400)
P61 START RCVR AND XMTR AT SAME TIME	Instruction to operator for dual-computer configuration. Followed by HALT %14 in segment 20.
62	Synchronize the two computers. An abort produces message E363.
63	Set up and execute Direct Write and SIO Read programs. A timeout produces message E362.
64	Check status. An error produces message E361.
65	Compare data blocks. An error produces message E364.
66	End of Section 2 message. (D400)
111	Synchronize the two computers. An abort produces message E363.
112	Set up and execute Direct write and Direct Read programs. A timeout produces message E362.
113	Check status. An error produces message E361.
114	Compare data blocks. An error produces message E364.
115	End of Section 3 message. (D400)

Table A-3. Diagnostic Messages (Continued)

STEP NUMBER/MESSAGE	COMMENTS
141	Synchronize the two computers. An abort causes message E363.
142	Transmit and receive one word.
143	Enable watch Dog Timer interrupt.
144	Enable 15 ms timeout. A timeout produces message E362.
145	Check Status. An error produces message E361.
146	End of Section 4 message. (D400)
171	Synchronize the two computers. An abort produces message E363.
172	Output control word %120000 (CRC reset).
173	Transmit and receive CRC.
174	Check Status. An error produces message E361.
175	End of Section 5 message. (D400)
221	Synchronize the two computers. An abort produces message E363.
222 (CPU configuration #1)	Set up and execute Direct write and Direct Read programs and calculate CRC on each write. A timeout produces message E362.
223 (CPU configuration #1)	Compare data blocks. An error produces message E364.
224 (CPU configuration #1)	Transmit CRC.
225 (CPU configuration #1)	Compare to calculated CRC. An error produces message E364.
226	Set up and execute Direct write and Direct Read programs and calculate CRC on each Read. A timeout produces message E362.

Table A-3. Diagnostic Messages (Continued)

STEP NUMBER/MESSAGE	COMMENTS
227	Compare data blocks. An error produces message E364.
230	Transmit CRC (Transmitter to receiver).
231	Compare to calculated CRC. An error produces message E364.
232 (CPU configuration #2)	Transmit CRC (receiver to transmitter).
233 (CPU configuration #2)	Compare to expected zero. An error produces message E364.
234 (CPU configuration #2)	Check status. An error produces message E361.
235	End of Section 6 message (D400)
250	Check CPU configuration. If #1, will produce message E370.
251	Synchronize the two computers. An abort produces message E363.
252	Output control word %140004 to receiver and set up for Handshake.
253	Transmitter writes one word and waits for reply. A timeout produces message E362.
254	Compare reply to expected reply. An error produces message E364.
255	Output control word %140004 to transmitter and set up for Handshake.
256	Receiver writes one word and waits for reply. A timeout produces message E362.
257	Compare reply to expected reply. An error produces message E364.
260	Receiver notifies transmitter ready for data block.

Table A-3. Diagnostic Messages (Continued)

STEP NUMBER/MESSAGE	COMMENTS
261	Set transmitter and receiver to Handshake Mode.
262	Set up and execute SIO Write and SIO Read programs. A timeout produces message E362.
263	Check Status. An error produces message E361.
264	Compare data blocks (in receiver). An error produces message E364.
265	End of Section 7 message. (D400)
300	Check CPU configuration. If #1, will produce message E370.
301	Synchronize the two computers. An abort produces message E363.
302	Output control word %140002 to receiver and set address (initially 2) for Listen-Repeat. A timeout produces message E362.
303	Transmitter writes address.
304	Transmitter waits for repeat and compares it to transmitted word. A timeout produces message E362. An error produces message E364.
305	Receiver writes Tag word that caused compare without Tag for address confirmation. Transmitter waits briefly for address confirmation and logs information if true. An error produces message E364. Check status for TAG. An error produces message E361.
307	If no confirmation, transmitter increments address (+2) and returns to step 303 until address equals %176 +2, when it goes to step 311. If confirmation occurs, the transmitter resets address to initial address and returns to step 303.

Table A-3. Diagnostic Messages (Continued)

STEP NUMBER/MESSAGE	COMMENTS
310	Receiver increments address (+2) and returns to step 302 until address equals %176 +2, when it goes to step 312.
E311 NO RECOGNITION ADDRESS xxx	Transmitter checks for any non-recognized address and prints a message for each failure.
312	End of Section 8 message. (D400)
330	Check CPU configuration. If #1, will produce message E370.
331	Synchronize the two computers. An abort produces message E363.
332	Set up receiver with control word %60004 for SIO Read of 100 words and execute. A timeout produces message E362 and goes to step 335.
333	Set up transmitter for SIO Write of 50 words and execute. A timeout produces message E362.
334	Transmitter writes one Tag Non-compare word.
E335 RESIDUE WRONG EXP xxxxxx ACT xxxxxx	Receiver checks residue upon interrupt or timeout and prints failure message.
336	End of Section 9 message. (D400)
D500 END OF PASS xxxxxx	End of pass message if switch 12 is reset.
D600 END 30360A TEST	Diagnostic completion message.
NOTE: The following messages, E361 to D450, are general messages which may be associated with any of the previous steps.	
E361 STATUS ERR IN STEP xxx EXP xxxxxx ACT xxxxxx	Expected and actual status do not agree.

Table A-3. Diagnostic Messages (Continued)

STEP NUMBER/MESSAGE	COMMENTS
E362 NO INTP IN STEP xxx	Expected interrupt did not occur or a timeout occurred.
E363 ABORTED SECTION xx STEP xxx	The section currently in execution was aborted by clearing the associated switch on the Switch Register.
E364 DATA ERR IN STEP xxx DATA IS xxxxxx SHOULD BE xxxxxx	Received data does not compare with memory resident transmit data or calculated CRC.
E365 NO RESPONSE IN STEP xxx	Condition code of CCL returned when I/O operation is tried.
E366 DEVICE NOT READY IN STEP xxx	Condition code of CCG returned when I/O operation is tried.
E367 UNEXPECTED INTERRUPT IN STEP xxx	Unexpected interrupt received.
E370 THIS CONFIGURATION CANNOT RUN THIS SECTION xx	Sections 8 and 9 for CPU configuration #1 only.
D400 END SECTION xx	End of Section.
D450 HALT AT STEP xxx	Step halt message if switch register bit 13 is set.

CONFIGURING D432 USING SDUPII

APPENDIX

B

D432 memory locations are assigned as follows. They may be changed using SDUPII to customize the diagnostic for a particular installation.

DB+0	External Switch Register
DB+1	Internal Switch Register (Section Selections)
DB+2	Version/Update
DB+3	HSI DRT Number
DB+4	Maximum Errors
DB+5	Clock DRT
DB+6	Configuration (0,1,2)
DB+7	Baud Rate (0,1)
DB+10	Channel # (0,1,2,3)