HEWLETT PACKARD


# HP 12072A L/A-Series Data Link Slave Interface (DLSI) Diagnostic Operating Manual

**For HP 1000 L/A-Series Computers and HP 12072A Interface**

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# PRINTING HISTORY

The Printing History below identifies the Edition of this Manual and any Updates that are included. Periodically, Update packages are distributed which contain replacement pages to be merged into the manual, including an updated copy of this Printing History page. Also, the update may contain write-in instructions.

Each reprinting of this manual will incorporate all past Updates, however, no new information will be added. Thus, the reprinted copy will be identical in content to prior printings of the same edition with its user-inserted update information. New editions of this manual will contain new information, as well as all Updates.

To determine what software manual edition and update is compatible with your current software revision code, refer to the appropriate Software Numbering Catalog, Software Product Catalog, or Diagnostic Configurator Manual.

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# Chapter 1
# Introduction


This manual describes the HP 12072A L/A-Series Data Link Slave Interface Diagnostic. Included are a description of the diagnostic, instructions for running the diagnostic, and a list of error messages and their meanings.

# DESCRIPTION

The HP 12072A L/A-Series Data Link Slave Interface (DLSI) Diagnostic is written in Hewlett-Packard Diagnostic Design Language (DDL), a stand-alone language designed to test HP 1000 L/A-Series Computer interface cards.

The diagnostic verifies the proper operation of the HP 12072A DLSI card. All of the backplane protocol, except for those operations which require actual BISYNC data communication with the master, is checked. A simple data loop-back is performed to check the proper operation of the Z-80A SIO (Serial Input/Output) and CTC (Counter/Timer Circuit), and the unsolicited interrupt function.

The diagnostic consists of ten separate tests, described in the following paragraphs. All numbers in the following test descriptions are in hexadecimal, unless stated otherwise.

## Test Number 1 - Reset and Self-Test

This test sends the command 4100 to the card, forcing the card to reset and to perform a firmware self-test which checks all the major LSI components. This test solicits a status return from the card; the least significant byte of the return should contain zeros. The card has at least one second to respond to the test.

## Test Number 2 - NOOP Test

This test sends the command 4000 to the card. The firmware should return the status 8000. The only function of the 4000 command is to cause the card to generate an interrupt to the host.

## Test Number 3 - Abort Input Test

This test sends the command 4300 to the card. The card should return a solicited status with the least significant byte containing zeros.

## Test Number 4 - Abort Output Test

This test sends the command 4400 to the card. The card should return a solicited status with the least significant byte containing zeros.

## Test Number 5 - Dump Input Test

This test sends the command 4500 to the card. The card should return a solicited status with the least significant byte containing zeros.

## Test Number 6 - Enable Card Test

This test sends the command 4900 to the card. The card should return a solicited status with the least significant byte containing zeros.

## Test Number 7 - Status Request Test

This test checks that all status requests are cleared by Test Number 1.

The command 4200 is sent to the card; the card should return a solicited status with the least significant byte being non-zero.

The commands 4201, 4202, 4203, and 4204 should solicit the following status returns from the card:

Command 4201: Least significant byte contains zeros for the number of messages sent.

Command 4202: Least significant byte contains zeros for the number of messages received.

Command 4203: Least significant byte contains zeros for the number of send retries.

Command 4204: Least significant byte contains zeros for the number of receive retries.

## Test Number 8 - Host-to-Card Data Transfer Test (Primary)

Test Number 8 consists of a series of actions, as follows:

1. First, send the reset and self-test command 4100 and wait for the solicited status. This should put the card into a known state.

2. Next, perform a write to the card by using DMA (Direct Memory Access). The write sequence consists of the following:

    a. Send the write command 90C0 and wait for the solicited status.

    b. Set up the DMA channel and start the data transfer.

    c. Send the start-of-data-transfer command 4600.

    d. Send the end-of-data-transfer command 4A00 and wait for the solicited status.

3. Next, test the abort data transfer logic. This tests the ability of the firmware to abort in the middle of a data transfer. The sequence consists of the following:

   a. Send the write command 90C0 and wait for the solicited status.

   b. Send the start-of-data-transfer command 4600 and wait for the solicited status.

   c. Using programmed I/O, transfer approximately 48 words of data to the card.

   d. Using the special I/O instructions, send the abort-data-transfer command.

4. Perform programmed I/O data transfer to fill the second buffer on the card. This checks step 3 to determine if the data transfer was aborted. In addition, it checks to determine if the card will return a buffer full status for step 5.

   a. Send the write command 90C0 and wait for the solicited status.

   b. Send the start-of-data-transfer command 4600 and wait for the solicited status.

   c. Using programmed I/O, transfer the data to the card.

   d. Send end-of-data-transfer command 4A00 and wait for the solicited status.

5. Send a write command 90C0 to verify that the card's buffers are full. The card should respond with the solicited status indicating that there is no buffer space.

6. Send the command 4100 to reset and clear the card.

## Test Number 9 - Data Loop-Back Test

Test Number 9 consists of the following actions:

1. Send the reset and self-test command 4100 and wait for the solicited status.
2. Enable diagnostic mode for the data loop-back test by sending the command 4800 and waiting for the solicited status.
3. Send the write command 90C0 and wait for the solicited status.
4. Using DMA, transfer data to the card.
5. Send the start-of-data-transfer command 4600.
6. Send the end-of-data-transfer command 4A00 and wait for the solicited status.
7. Wait approximately 1 to 2 seconds for the unsolicited status 10C0.
8. Acknowledge the unsolicited status by sending the command 4700 and waiting for an interrupt from the card.
9. Send the read command 00C0 and wait for the solicited status.
10. Use DMA to transfer the data.
11. Send the start-of-data-transfer command 4600.
12. Send the end-of-data-transfer command 4A00 and wait for the solicited status.
13. Compare the output and input buffers to determine if they match.
14. Send the reset command 4100 to clear the card.

### Test Number 10 - Host-to-Card Data Transfer Test (Secondary)

Test Number 10 consists of the following actions:

1. First, send the reset and self-test command 4100 and wait for the solicited status. This should put the card into a known state.

2. Next, perform a write to the card by using DMA (Direct Memory Access). The write sequence consists of the following:

    a. Send the write command 9110 and wait for the solicited status.

    b. Set up the DMA channel and start the data transfer.

    c. Send the start-of-data-transfer command 4600.

    d. Send the end-of-data-transfer command 4A00 and wait for the solicited status.

3. Send a write command 9110 to verify that the card's buffers are full. The card should respond with the solicited status indicating that there is no buffer space.

4. Send the command 4100 to reset and clear the card.

# EQUIPMENT SUPPLIED

The HP 12072A DLSI diagnostic is part of two products: the HP 24614A L-Series Diagnostic package and the HP 24612A A-Series Diagnostic package. Both diagnostic packages are available on CS-80 tape, mini-cartridge tape, flexible disc, or flexible mini-disc, depending on the HP 24614 option that you order. Part numbers and descriptions of the options are as follows:

NOTE

A Diagnostic Test Connector, part number 5061-4909, is included with every option.

HP 24614A L-Series Diagnostic Software
or
HP 24612A A-Series Diagnostic Software

Option 020: Mini-cartridge, containing both the HP 12042A Programmable Serial Interface (PSI) diagnostic and the HP 12072A Data Link Slave Interface (DLSI) interface diagnostic.

Part number for L-Series option is 24614-13302.
Part number for A-Series option is 24612-13304.

Option 022: CS/80 Tape cartridge for HP 7908/11/12 compatibility containing both the 12042A PSI and 12072A DLSI interface diagnostics

Part number for L-Series option is 24614-13311.
Part number for A-Series option is 24612-13311.

Option 041: Flexible disc (eight inch) containing both the HP 12042A PSI diagnostic and the HP 12072A DLSI diagnostic.

Part number for L-Series option is 24614-13401.
Part number for A-Series option is 24612-13401.

Option 042: Flexible mini-disc (five inch) containing both the HP 12042A PSI diagnostic and the HP 12072A DLSI diagnostic.

Part number for L-Series option is 24614-13402.
Part number for A-Series option is 24612-13403.

# EQUIPMENT REQUIRED

In addition to the diagnostic (which consists of the diagnostic test connector, and the diagnostic program on CS/80 tape mini-cartridge, flexible disc, or flexible mini-disc), the following equipment is necessary in order to run the diagnostic:

1. HP 1000 L/A-Series Computer with at least 32K words of memory.

2. The following equipment is dependent on the software option (because of the different medium associated with each option).

Option 020 (mini-cartridge tape):

HP 12005A Asynchronous Serial Interface

HP 264xA Terminal with cartridge tape units (CTUs), and enabled as the Virtual Control Panel (VCP).

Option 022 (CS/80 tape):

HP 12005A Asynchronous Serial Interface

HP 264x or 262x Terminal enables as the Virtual Control Panel (VCP)

HP 12009A HP-IB Interface

HP 7908/11/12 Disc/Tape drive unit.

Option 041 (flexible disc):

HP 12005A Asynchronous Serial Interface

HP 262x or HP 264x Terminal enabled as the Virtual Control Panel (VCP)

HP 12009A HP-IB Interface

HP 9885M Flexible Disc Drive

Option 042 (flexible mini-disc):

HP 12005A Asynchronous Serial Interface

HP 262x or HP 264x Terminal enabled as the Virtual Control Panel (VCP)

HP 12009A HP-IB Interface

HP 82901M Flexible Mini-disc Drive

# DIAGNOSTIC LIMITATIONS

The I/O processor and its support logic are not tested. This circuitry is common to every L/A-Series I/O interface card and is tested by the L/A-Series computer self-test and the kernel diagnostic.

Refer to the following documentation for further information of these tests:

L-SERIES

HP 1000 L-Series Computer Installation and Service Manual, part no. 02103-90003.

HP 1000 L-Series Computer System Installation and Service Manual, part no. 02145-90003.

Kernel Diagnostic Operating Manual, part no. 24397-90002.

A-SERIES

HP 1000 A700 Computer Installation and Service Manual, part

number 02137-90002.

HP 1000 A600 Computer Installation and Service Manual, part number 02156-90002.

HP 1000 A600 Computer System Installation and Service Manual, part number 02136-90001.

HP 1000 A-Series Computer Kernel Diagnostic Reference Manual, part number 24612-90003.

# Chapter 2
# Operation

# PREPARING FOR DIAGNOSTIC OPERATION

NOTE

This chapter provides diagnostic loading instructions for L-Series Computers. A-Series users must reference the following manual:

HP 1000 A-Series Operating and Troubleshooting Manual, part number 24612-90001.

In order to run the DLSI diagnostic, switches must be set on the HP 12072A DLSI card, the HP 12001A Processor card, the HP 12005A Asynchronous Serial Interface card, and (if the program is on flexible disc or flexible mini-disc) the HP 12009A HP-IB Interface card.

Before preparing any card for diagnostic operation, turn the computer power off.

## Preparing the DLSI Card

Before loading and running the DLSI diagnostic, the HP 12072A DLSI card must be set up and installed as follows:

1. Install the Diagnostic Test Connector, part number 5061-4909, on the DLSI card.

2 On the DLSI card, set switch set 1 as follows (for switch locations, see figure 2-1 in the HP 12072A Installation and Service Manual, part number 12072-90001):

SW1 - OPEN
SW2 - OPEN
SW2 - OPEN

SW4 - CLOSED
SW5 - CLOSED
SW6 - CLOSED
SW7 - OPEN
SW8 - OPEN

3. Set all switches of switch set 2 to OPEN.

4. Install the DLSI card in the host computer.

## Preparing the HP 12001A Processor Card

1. Set the HP 12001A Processor card U1 switches as follows to enter the Virtual Control Panel (VCP) routine after power-up:

   Switch U1

   SW1 - OPEN
   SW2 - CLOSED
   SW3 - CLOSED
   SW4 - CLOSED
   SW5 - CLOSED
   SW6 - CLOSED
   SW7 - CLOSED
   SW8 - OPEN

2. Install the processor card in the host computer.

## Preparing the HP 12005A Asynchronous Serial Interface Card

1. Set the HP 12005A Asynchronous Serial Interface U1 switches as follows (U1 is the switch pack that faces the rear of the computer card cage):

   SW1 - CLOSED
   SW2 - CLOSED
   SW3 - CLOSED
   SW4 - OPEN
   SW5 - CLOSED
   SW6 - CLOSED
   SW7 - OPEN
   SW8 - CLOSED

## Preparing the HP 12009A HP-IB Interface Card

The HP 12009A HP-IB Interface card is prepared for diagnostic operation only if the diagnostic program is on flexible disc, flexible mini-disc, or CS/80 tape. See the following paragraph.

# LOADING THE DIAGNOSTIC PROGRAM

If the diagnostic program is on mini-cartridge, proceed to step 1; if on flexible disc, proceed to step 2; if on flexible mini-disc, proceed to step 3; if on CS/80 tape, proceed to step 4.

1. Mini-cartridge tape:

   a. Turn on computer power.

   b. Hard reset (press the RESET TERMINAL key twice within 0.5 second) the HP 264x terminal.

   c Insert the mini-cartridge tape (part no. 24614-13301) into the left CTU of the terminal.

   d. Press the BREAK key on the terminal.

   e. On the terminal, type %L and press RETURN.

   f. After the diagnostic program is loaded, type %E and press RETURN.

   g. The terminal should display:

```
12072A DATA LINK DIAG - REV XXXX

READY
>
```

2. Flexible disc:

   a. Set the U1 switches on the HP 12009A HP-IB Interface that is connected to the flexible disc drive as follows (U1 is the switch pack facing the rear of the computer card cage):

```
SW1 - OPEN
SW2 - CLOSED
SW3 - CLOSED
SW4 - OPEN
SW5 - CLOSED
SW6 - OPEN
```

SW7 - OPEN
SW8 - OPEN

b. The U16 switches on the HP 12009A HP-IB Interface that is connected to the flexible disc drive can be set to any position; their settings do not affect diagnostic operation (U16 is the switch pack facing the side of the computer card cage).

c. Connect the flexible disc drive to the HP 12009A HP-IB Interface using an HP-IB cable.

d. Insert the flexible disc (part no. 24614-13401) into the flexible disc drive.

e. Turn on power to the computer.

f. On the HP 262x or HP 264x terminal (VCP), type %LbuscDL, then press RETURN

where

%L is the load command.

"busc" is an octal number defined as:

b - the HP-IB address of the flexible disc drive (0 to 7).

u - the flexible disc drive unit number.

sc - the octal select code of the HP 12009A HP-IB Interface to which the flexible disc drive is connected.

DL is the program name assigned to the diagnostic.

g. On the terminal, type %E and press RETURN.

h. The terminal should display:

```
12072A DATA LINK DIAG - REV XXXX

READY
>
```

3. Flexible mini-disc:

a. Perform steps 2a. and 2b. above.

b. Connect the flexible mini-disc drive to the HP 12009A HP-IB Interface using an HP-IB cable.

c. Insert the flexible mini-disc (part no. 24614-13402) into the flexible mini-disc drive.

d. Turn on power to the computer.

e. On the HP 262x or HP 264x terminal (VCP), type %LbuscDL, then press RETURN

where


%L is the load command.

"busc" is an octal number defined as:

b - the HP-IB address of the flexible mini-disc drive (0 to 7).

u - the flexible mini-disc drive unit number.

sc - the octal select code of the HP 12009A HP-IB Interface to which the flexible mini-disc drive is connected.

DL is the program name assigned to the diagnostic.

f. On the terminal, type %E and press RETURN.

g. The terminal should display:

```
12072A DATA LINK DIAG - REV XXXX

READY
>
```

4. CS/80 Tape

a. Perform steps 2a. and 2b. above.

b. Connect the CS/80 tape drive to the HP 12009A HP-IB interface using an HP-IB cable.

c. Insert the CS/80 tape (part no. 24614-13311) into the tape drive.

d. Turn on power to the computer

e. On the HP 264x or 262x terminal (VCP), type %LbuscDLSI, then press RETURN

where

%L is the load command.

"busc" is an octal number defined as:

b - the HP-IB address of the CS/80 tape drive (0 to 7).

u - the CS/80 tape drive unit number.

sc - the octal select code of the HP 12009A HP-IB Interface to which the CS/80 tape drive is connected.

DSLI is the program name assigned to the diagnostic.

f. On the terminal, type %E and press RETURN.

g. The terminal should display:

```
12072 DATA LINK DIAG - REV XXXX

READY
>
```

# RUNNING THE DIAGNOSTIC

Once the foregoing message is displayed on the terminal, the diagnostic is ready to be run. The default conditions are loop mode disabled, and message printing enabled. The only commands you will need are explained below.

?? - Displays a HELP message listing the tests that are available.

EX - Terminates the diagnostic.

LD - Disables loop mode.

LE - Enables loop mode.

PD - Disables message printing.

PE - Enables message printing.

RF - Runs diagnostic tests numbers 1 through 10.

SC - Sets the select code of the DLSI. If this command is not given before the first test, the program will automatically ask for the information.

# Chapter 3
# Diagnostic Error Messages

Two different types of error messages can be output by the DLSI diagnostic:

```
TEST  xx ERROR = yyyyy

TEST  xx ERROR = yyyyy  iijj
```

where xx and yyyyy are decimal values and iijj is a hexidecimal value.

The format used for the error message depends on the type of error and whether additional reasons for the error are available or not.

A complete list of error messages and their meanings are shown in table 3-1.

Table 3-1. Diagnostic Error Messages

| ERROR NUMBER | MEANING |
|---|---|
| 101 | Failed to receive a response from the card for a reset-and-self-test command. |
| 102 | Failed to receive the correct solicited status for the reset-and-self-test command. Field iijj shows the status received. |
| 201 | Failed to receive a response from the card for the no-op command. |
| 202 | Failed to receive the correct solicited status for the no-op command. Field iijj shows the status received. The status should be 8000. |
| 301 | Failed to receive a response from the card for the enable-card command. |
| 302 | Failed to receive the correct solicited status for the enable-card command. Field iijj shows the status received. |
| 401 | Failed to receive a response from the card for the abort-input command. |
| 402 | Failed to receive the correct solicited status for the abort-input command. Field iijj shows the status received. |
| 501 | Failed to receive a response from the card for the abort-output command. |
| 502 | Failed to receive the correct solicited status for the abort-output command. Field iijj shows the status received. |
| 601 | Failed to receive a response from the card for the dump-input command. |

Table 3-1. Diagnostic Error Messages (Continued)

| ERROR NUMBER | MEANING |
|---|---|
| 602 | Failed to receive the correct solicited status for the dump-input command. Field iijj shows the status received. |
| 701 | Failed to receive a response from the card when requesting the buffer size status. |
| 702 | The buffer size returned was zero. Field iijj shows the actual status received. jj should be nonzero. |
| 703 | Failed to receive a response from the card when requesting the message sent count status. |
| 704 | Message sent count is nonzero. Field iijj shows the status received. jj should be zero. |
| 705 | Failed to receive a response from the card when requesting the message receive count. |
| 706 | Message receive count is nonzero. Field iijj shows the status received. jj should be zero. |
| 707 | Failed to receive a response from the card when requesting the send retry count. |
| 708 | The send retry count is nonzero. Field iijj shows the status received. jj should be zero. |
| 709 | Failed to receive a response from the card when requesting the receive retry count. |
| 710 | The receive retry count is nonzero. Field iijj shows the status received. jj should be zero. |
| 801 | Failed to receive a response from the card for the reset-and-self-test command. |
| 802 | Failed to receive the correct solicited status to the reset-and-self-test command. Field iijj shows the status received. |

Table 3-1. Diagnostic Error Messages (Continued)

| ERROR NUMBER | MEANING |
|---|---|
| 803 | Failed to receive a response from the card for the write command. |
| 804 | Failed to receive the correct solicited status for the write command. Field iijj shows the status received. jj should be nonzero. Field iijj shows the status received. |
| 805 | Data transfer from host to card failed when using the host DMA. |
| 806 | Failed to receive a response from the card for the end-of-data-transfer command. |
| 807 | Failed to receive the correct solicited status for the end-of-data-transfer command. Field iijj shows the status received. |
| 808 | Failed to receive a response from the card for the write command. |
| 809 | Failed to receive the correct solicited status for the write command. Field iijj shows the status received. jj should be nonzero. |
| 810 | Failed to receive a response from the card for the start-of-data-transfer command. |
| 811 | Failed to receive the correct solicited status for the start-of-data-transfer command. Field iijj shows the status received. |
| 812 | Programmed I/O failed. No response from the card was received to send a data word. |
| 813 | Failed to receive a response from the card for the write command. |
| 814 | Failed to receive the correct solicited status to the write command. Field iijj shows the status received. jj should be nonzero. |

Table 3-1. Diagnostic Error Messages

| ERROR NUMBER | MEANING |
|---|---|
| 815 | Failed to receive a response from the card for the start-of-data-transfer command. |
| 816 | Failed to receive the correct solicited status for the start-of-data-transfer command. Field iijj shows the status received. |
| 817 | Programmed I/O failed. No response from the card was received to send the next data word. |
| 818 | Failed to receive a response from the card for end-of-data-transfer command. |
| 819 | Failed to receive the correct solicited status for the end-of-data-transfer command. Field iijj shows the status received. |
| 820 | Failed to receive a response from the card for the write command. |
| 821 | Failed to receive the correct solicited status for the write command. Field iijj shows the status received. jj should be zero. |
| 822 | Failed to receive a response from the card for the reset-and-self-test command. |
| 823 | Failed to receive the correct solicited status for the reset-and-self-test command. Field iijj shows the status received. |
| 901 | Failed to receive a response from the card for the reset-and-self-test command. |
| 902 | Failed to receive the correct solicited status for the reset-and-self-test command. Field iijj shows the status received. |
| 903 | Failed to receive a response from the card for the enable diagnostics mode command. |

Table 3-1. Diagnostic Error Messages (Continued)

| ERROR NUMBER | MEANING |
|---|---|
| 904 | Failed to receive the correct solicited status for the enable diagnostics mode command. Field iijj shows the status received. |
| 905 | Failed to receive a response from the card for the write command. |
| 906 | Failed to receive the correct solicited status for the write command. Field iijj shows the status received. |
| 907 | DMA failed when transfering data from the host to the card. |
| 908 | Failed to receive a response from the card for the end-of-data-transfer command. |
| 909 | Failed to receive the correct solicited status for the end-of-data-transfer command. Field iijj shows the status received. |
| 910 | Failed to receive the unsolicited read status from the card. |
| 911 | Failed to receive a response from the card for the unsolicited status acknowledge command. |
| 912 | Failed to receive the correct solicited status for the unsolicited status acknowledge command. Field iijj shows the status received. |
| 913 | Failed to receive the correct unsolicited status. Field iijj shows the status received. |
| 914 | Failed to receive a response from the card for the read command. |
| 915 | Failed to receive the correct solicited status for the read command. Field iijj shows the status received. |

Table 3-1. Diagnostic Error Messages (Continued)

| ERROR NUMBER | MEANING |
|---|---|
| 916 | DMA failed for the data transfer from the card to the host. |
| 917 | Failed to receive a response from the card for the end-of-data-transfer command. |
| 918 | Failed to receive the correct solicited status for the end-of-data-transfer command. Field iijj shows the status received. |
| 919 | The loop-back data is not the same as the sent data. |
| 920 | Failed to receive a response from the card for the reset-and-self-test command. |
| 921 | Failed to receive the correct solicited status for the reset-and-self-test command. Field iijj shows the status received. |
| 1001 | Failed to receive a response from the card for the reset-and-self-test command. |
| 1002 | Failed to receive the correct solicited status to the reset-and-self-test command. Field iijj shows the status received. |
| 1003 | Failed to receive a response from the card for the write command. |
| 1004 | Failed to receive the correct solicited status for the write command. Field iijj shows the status received. jj should be nonzero. |
| 1005 | Data transfer from host to card failed when using host DMA. |
| 1006 | Failed to receive a response from the card for the end-of-data-transfer command. |

Table 3-1. Diagnostic Error Messages

| ERROR NUMBER | MEANING |
|---|---|
| 1007 | Failed to receive the correct solicited status for the end-of-data-transfer command. Field iijj shows the status received. |
| 1020 | Failed to receive a response from the card for the write command. |
| 1021 | Failed to receive the correct solicited status for the write command. Field iijj shows the status received. jj should be zero. |
| 1022 | Failed to receive a response from the card for the reset-and-self-test command. |
| 1023 | Failed to receive the correct solicited status for the reset-and-self-test command. Field iijj shows the status received. |


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