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HP E1562 Throughput Disk Module
User's Guide

Part Number E1562-90003

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In This Book

The HP E1562 Throughput Disk Module is a high-speed SCSI throughput VXI module. The module plugs into two C-size slots in a VXI mainframe.

This book documents the HP E1562 module. It provides:

- installation and service information
- operational information
- information on using Sequences with the HP E1562
- SCPI command reference materials
- LIF library information

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Installing the HP E1562

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Installing the HP E1562

This chapter contains instructions for installing the HP E1562 Throughput Disk Module and its drivers. This chapter also includes instructions for transporting and storing the module.

To inspect the HP E1562

The HP E1562 Throughput Disk Module was carefully inspected both mechanically and electrically before shipment. It should be free of marks or scratches, and it should meet its published specifications upon receipt.

If the module was damaged in transit, do the following:

- Save all packing materials.
- File a claim with the carrier.
- Call your Hewlett-Packard sales and service office.

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What You Get With the HP E1562

The following items are included with your HP E1562:

Hardware:

- HP E1562D/E/F Throughput Disk Module – C-size 2-slot VXI module
- One blank DAT tape (with the HP E1562D only).
- One SCSI Cable; HP p/n 8120-6147 (HP E1562F only).

Documentation:

- HP E1562 User's Guide (this book)
- Sample programs and LIF libraries for HP-UX and Windows NT/95 (one CD ROM).

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To install the HP E1562

If you will be using the HP E1405/06 Command Module and an external computer with DOS based windows, use the HP VXI Installation Consultant (HP VIC) to install the HP E1562 module. HP VIC steps you through the installation procedure, then tests the modules using the *TST? command. HP VIC may time out before the test is finished and display a ‘‘timed out” message. If this occurs, exit HP VIC and send the *TST? command. For instructions on sending the *TST? command, see the chapter titled ‘‘Troubleshooting the HP E1562’

Caution

To protect circuits from static discharge, observe anti-static techniques whenever handling the HP E1562 Throughput Disk Module.

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1 Set up your VXI mainframe. See the installation guide for your mainframe.

2 Select two slots in the VXI mainframe for the HP E1562 module.

The HP E1562 module's local bus receives ECL-level data from the module immediately to its left and outputs ECL-level data to the module immediately to its right. Every module using the local bus is keyed to prevent two modules from fitting next to each other unless they are compatible. If you will be using the local bus, select two slots immediately to the left of the data-receiving module.

3 Using a small screwdriver or similar tool, set the Logical address configuration switch on the HP E1562.

Each module in the system must have a unique logical address. The factory default setting is 1001 0000 (144). If an HP E1485A Signal Processor Module will be controlling the HP E1562 module, select an address within the HP E1485A module's servant area. If an HP-IB command module will be controlling the HP E1562 module, select an address that is a multiple of 8.

4 Using a small screwdriver or similar tool, set switches CA1 and CA0 in the Hardware switchpack on the HP E1562.

The factory default setting is 1111 1100.

Note

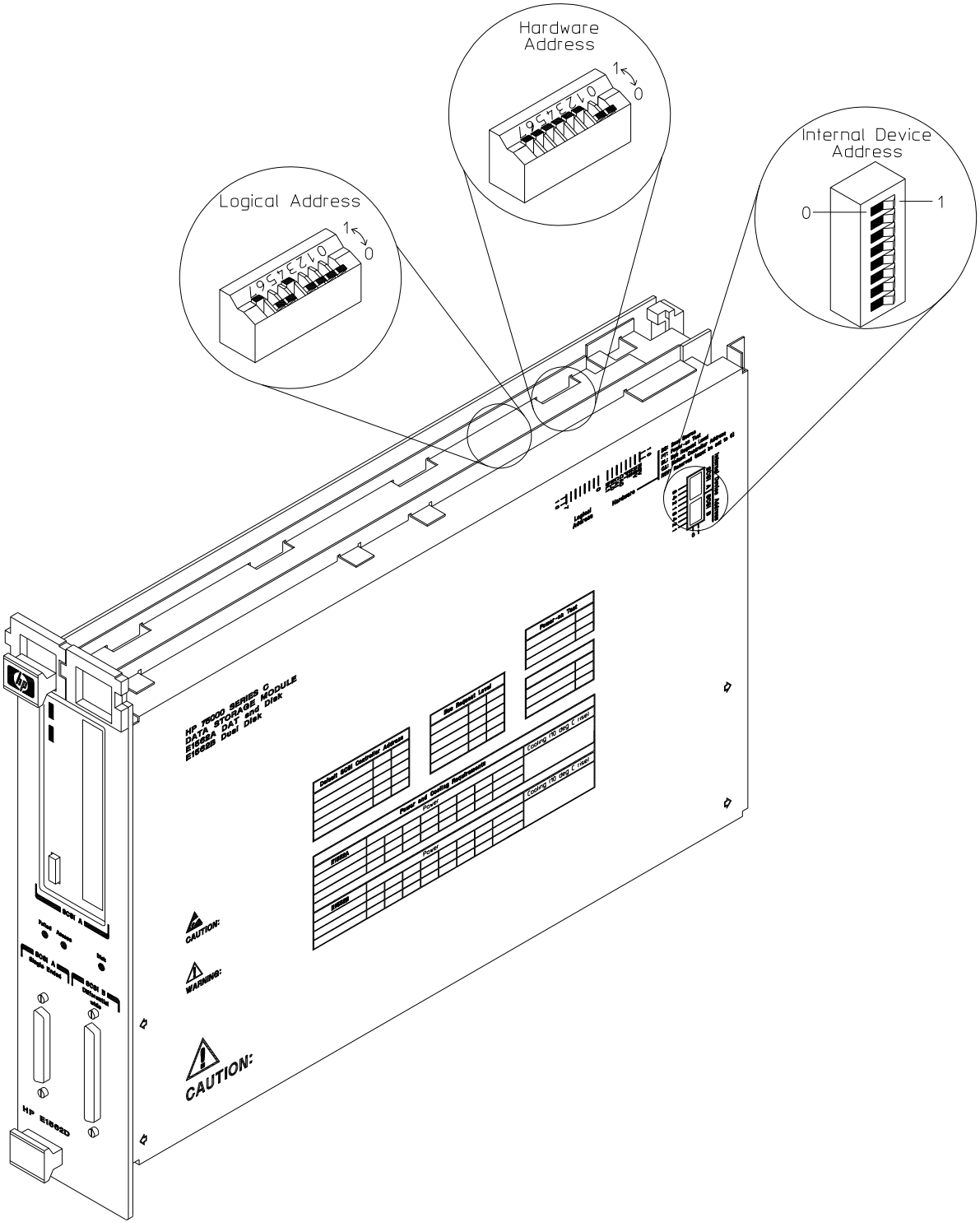
If you are using more than one HP E1562 on the same SCSI bus, you will need to be sure that no two SCSI controllers share the same SCSI bus address.

CA1	CA0	SCSI Controller Address
0	0	4
0	1	5
1	0	6
1	1	7

5 Using a small screwdriver or similar tool, set the Internal device address switches on the HP E1562.

The factory default setting is 0000 0000.

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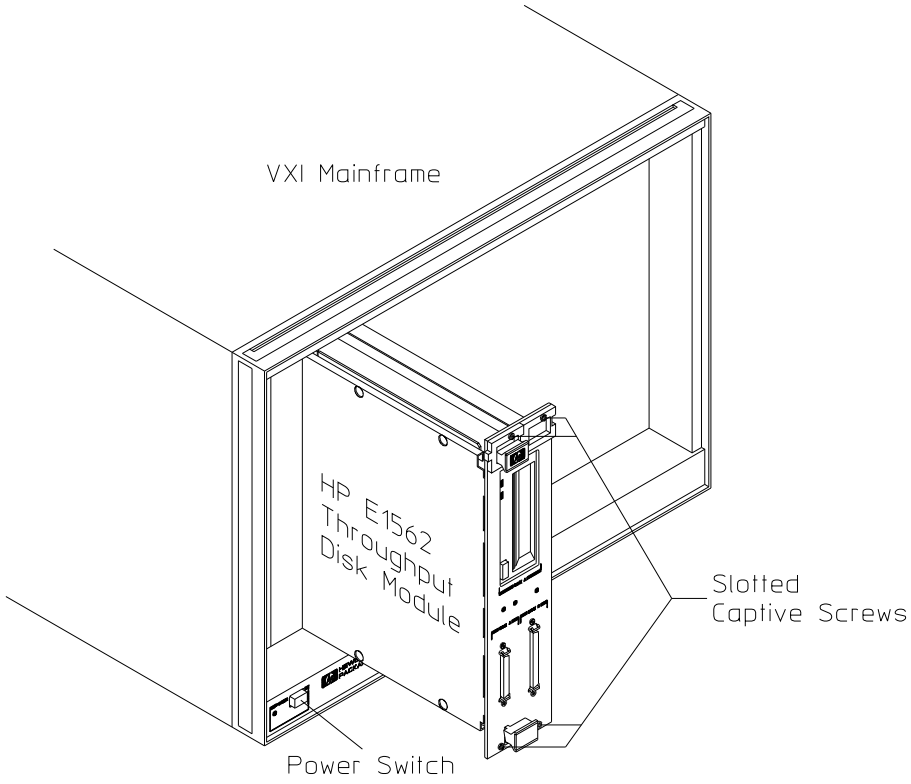
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6 Set the mainframe's power switch to standby (⏻).

7 Place the module's card edges (top and bottom) into the module guides in the slot.

8 Slide the module into the mainframe until the module connects firmly with the backplane connectors. Make sure the module slides in straight.

9 Attach the module's front panel to the mainframe chassis using the module's captive mounting screws.



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To install the HP E1562F

1 Setup your VXI

2 Select the standard or alternate SCSI system configuration for the HP E1562F.

Standard Configuration

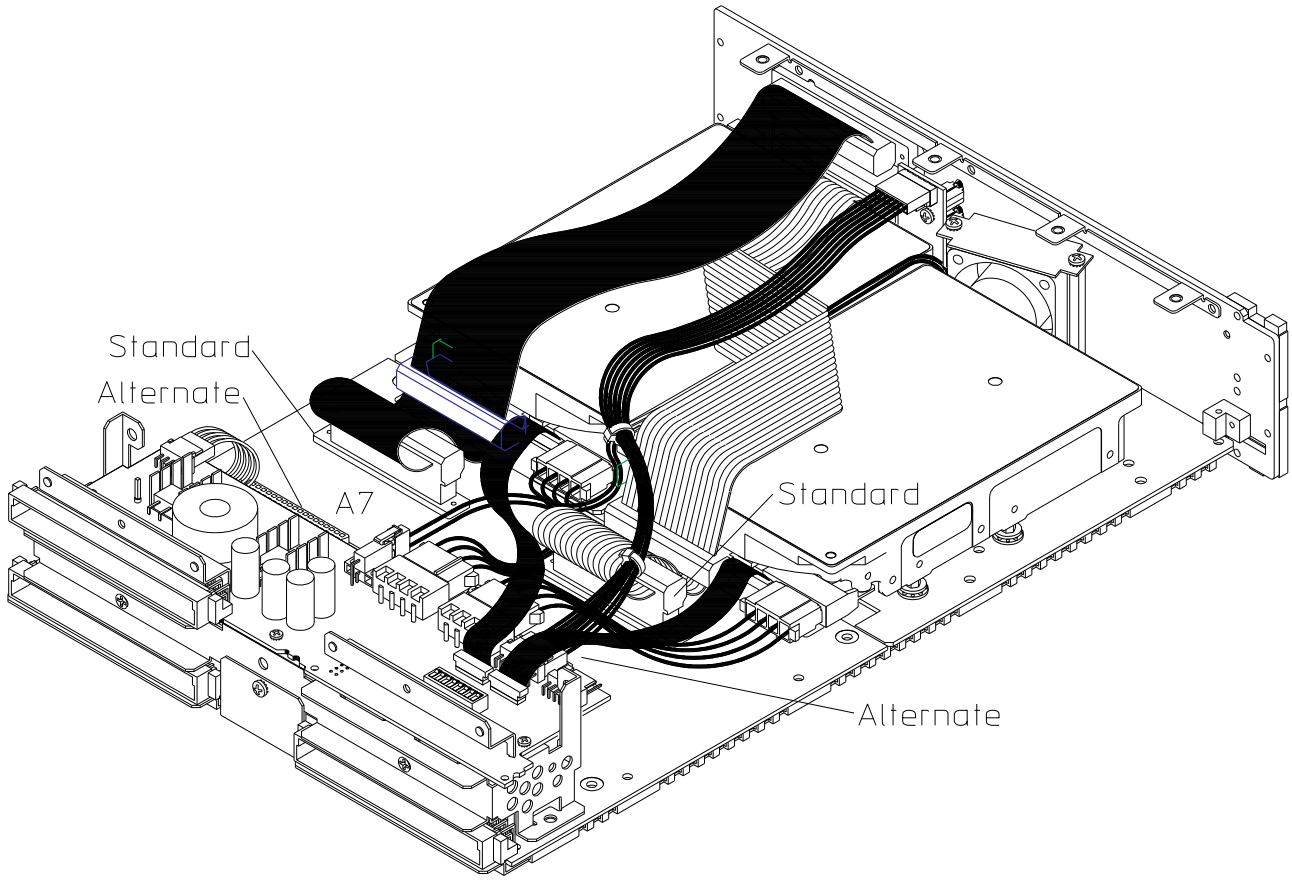
The HP E1562F can be configured to add two disk drives to one SCSI bus. Both disk drives are daisy-chained to one SCSI bus that passes through the module (see “Configuring multiple modules”). This is the factory default configuration and is indicated by the Thru LED on the module’s front panel.

Alternate Configuration

The HP E1562F can be configured to add one disk drive and an end-of-SCSI-bus termination to each of two different SCSI busses. Each front panel SCSI connector is connected to one internal disk and to an end-of-bus SCSI termination (see “Configuring multiple modules”). When in the alternate configuration, the Terminated LED is illuminated on the module’s front panel.

To change a module’s configuration, remove the top cover the chapter titled "Replacing Assemblies") and insert the SCSI cables into the appropriate connectors on the A7 assembly as shown on the next page. In the standard configuration, the SCSI cables are plugged into the connectors towards the front of the module (as shown). In the alternate configuration, the SCSI cables are plugged into the connectors towards the rear of the module.

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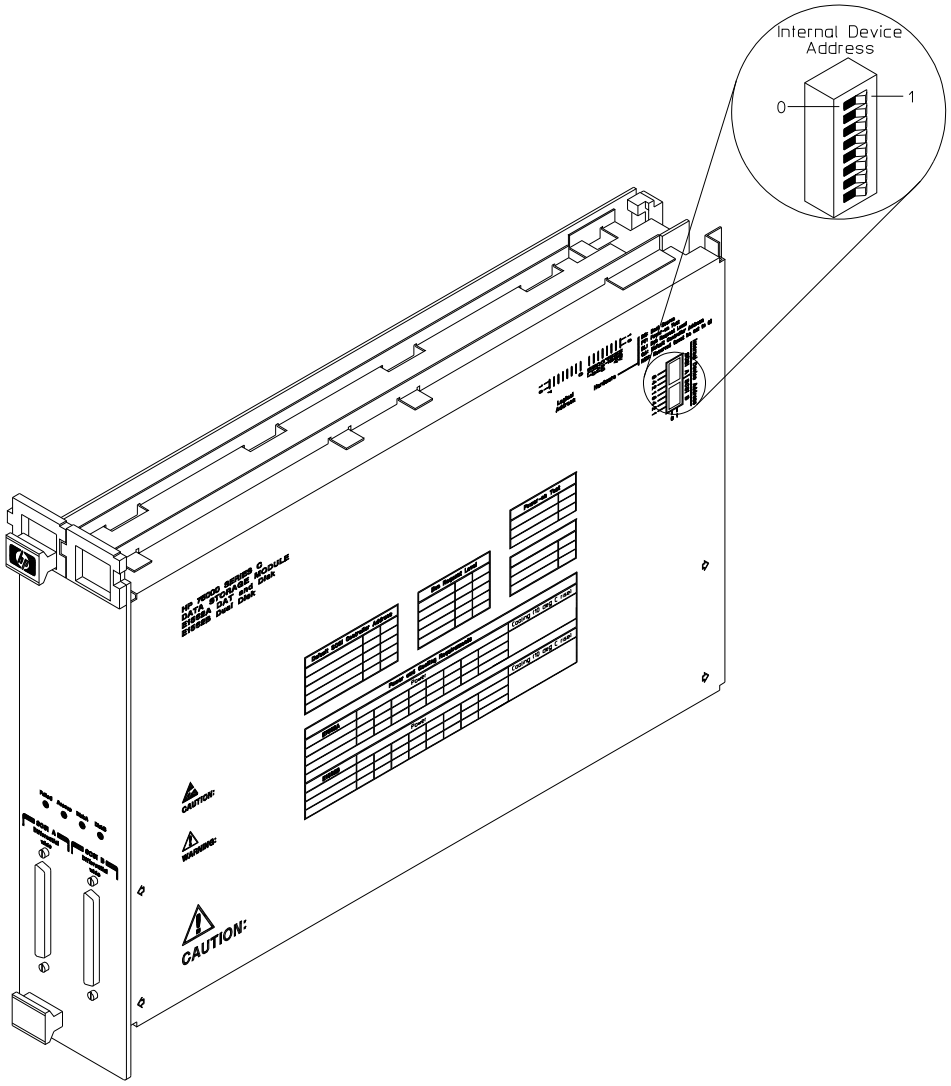
3 Set the SCSI address on the disk drives.

Each SCSI device on the SCSI bus must have a unique SCSI address. The addresses should also be the addresses that the system software expects. The HP E1562F module has SCSI address DIP switches that are accessible through the side panel as shown below.

Note

If you are using multiple HP E1562D/E/F modules or other SCSI devices, you will need to be sure that no two SCSI devises share the same SCSI bus address.

Using a small screwdriver or similar tool, set the Internal device address switches on the HP E1562F.



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4 Select two slots in the VXI mainframe for the HP E1562F module. Select slots close enough for the SCSI cable to reach (see “Configuring multiple modules”).

5 Set the mainframe’s power switch to standby (⏻).

6 Place the module’s card edges (top and bottom) into the module guides in the slot.

7 Slide the module into the mainframe until the module connects firmly with the backplane connectors. Make sure the module slides in straight.

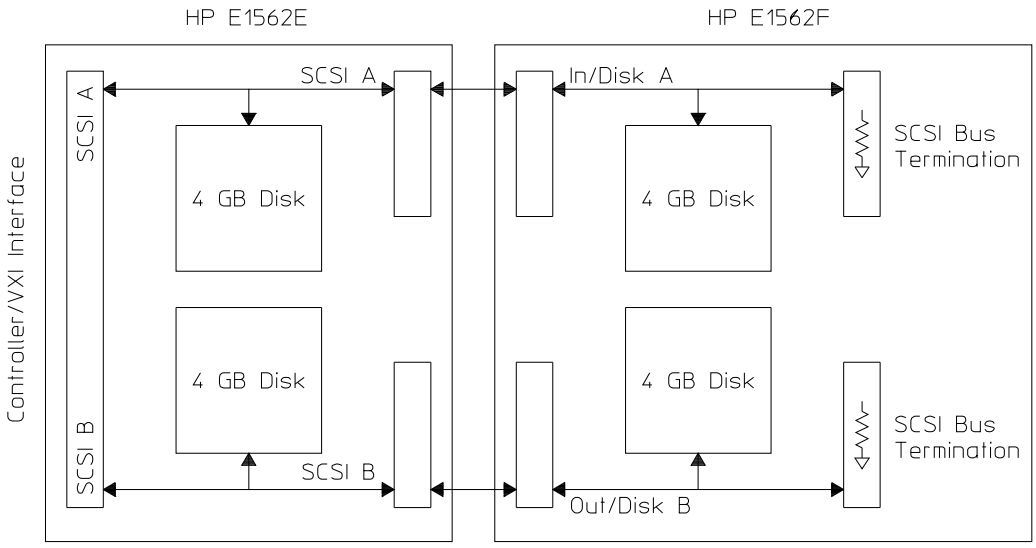
8 Attach the module’s front panel to the mainframe chassis using the module’s captive mounting screws.

Configuring multiple modules

Multiple HP E1562F modules may be installed in a VXI system. The SCSI bus inputs and outputs on the front of these modules with be daisy-chained, starting with an HP E1562D/E module and ending with a with bus terminator.

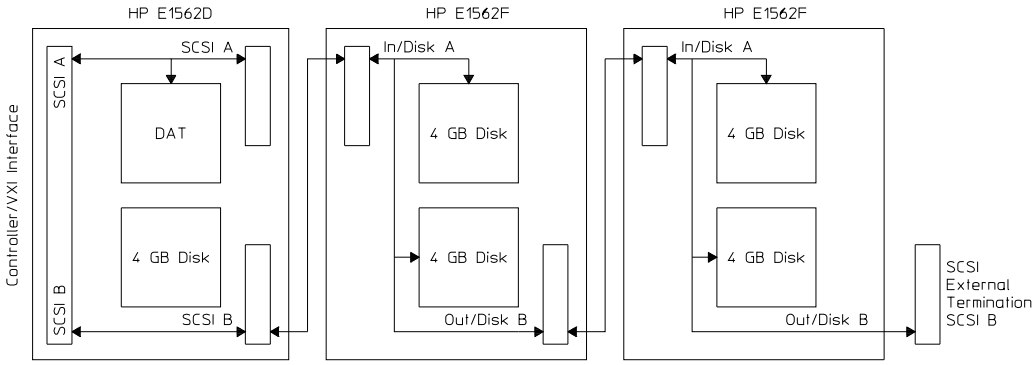
The following illustrations show several possible system co multiple HP E1562F modules. Each module is provided with one 0.5 meter external SCSI cable. Additional cables may be ordered. See the chapter titled "Replacing Assemblies," for ordering information.

This configuration shows two disk drives per SCSI Interface, an HP E1562E and an HP E1562F. The HP E1562F is in the alternate configuration.

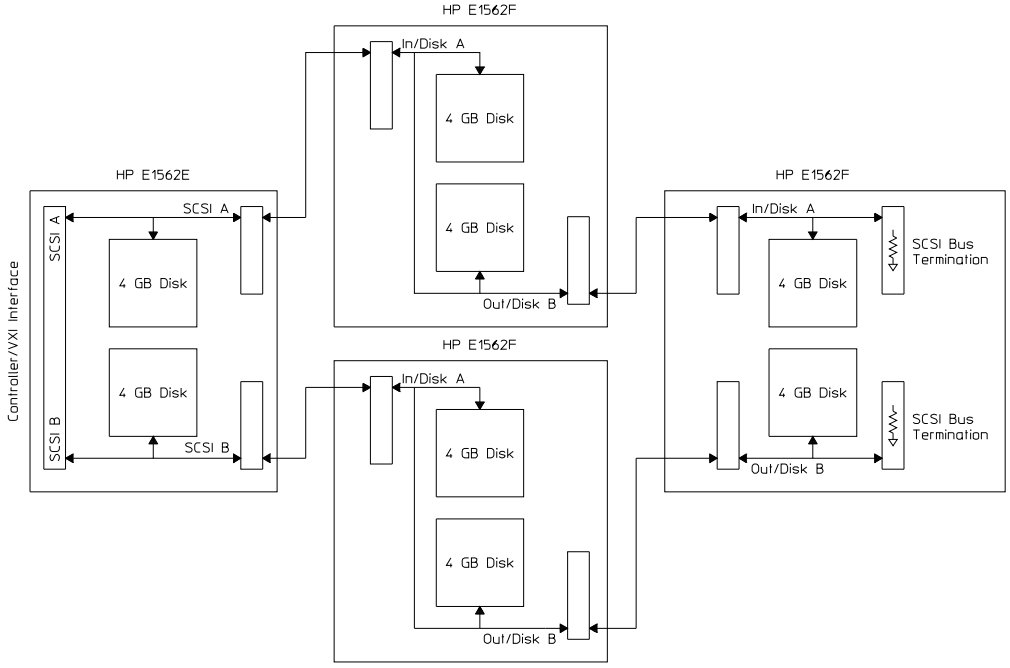


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This configuration shows an HP E1562D and two HP E1562Fs (standard configuration) with the last HP E1562F terminated externally. (For installation that require an external terminator, use the HP C2905A SCSI III terminator.)

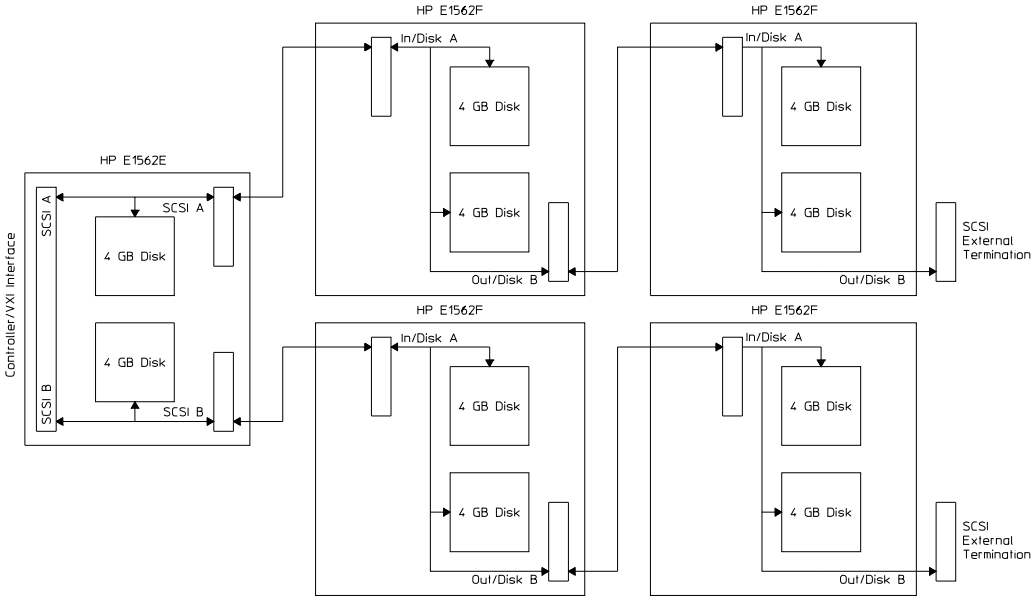


This configuration shows one HP E1562E and three HP E1562Fs . The first two HP E1562Fs are in standard configuration, but the last one is internally terminated (alternate configuration).



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This configuration shows an odd number of disk drives per SCSI interface. The four HP E1562Fs are in standard conf iguration with the last two externally terminated. (For installation that require an external terminator, use the HP C2905A SCSI III terminator.)



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To install the LIF interface libraries

❑ Using an HP-UX operating system and one of the following:

- HP Series 700 Computer
- HP V/743 Embedded VXI Computer

Do the following to install the LIF library files:

1 Log in as root.
2 Place the E1562 CD-ROM into the computer's CD-ROM drive.
3 Mount the CD-ROM file system. Use an appropriate modification of :

```
mount /dev/dsk/c201d2s0 /cdrom
```

where "c201d2s0" is the system file for the CD-ROM drive and "/cdrom" is the directory path of the root of the CD-ROM's file structure. (These names may differ on your system.)

4 On an HP-UX 9.x system type:

```
/etc/update -S700 -s /cdrom/LIFUTILS/E1562LIF.NIN \*
```

Or

On an HP-UX 10.x system type:

```
/usr/sbin/swinstall -s /cdrom/LIFUTILS/E1562LIF.TEN \*
```

5 The software installation program will proceed to install the software package.

❑ Using a Windows 95 or Windows NT operating system and one of the following:

- Personal Computer
- VXI "embedded PC" such as HP E6233A.

Do the following to install the LIF library files:

1 Place the E1562 CD-ROM into the computer's CD-ROM drive.
2 Using the "file manager" or "explorer", select the CD-ROM drive.
3 Then select the LIFUTILS directory.
4 Double-click on the HPE1562.EXE file to begin a self-extracting installation program.
5 Reply to the several questions promped by the dialog windows of the installation program.
6 The installation program will proceed to install the software.

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To install the example programs

❑ Using an HP-UX operating system and one of the following:

- HP Series 700 Computer
- HP V/743 Embedded VXI Computer

Do the following to install the example programs:

1 Log in as root.
2 Place the E1562 CD-ROM into the computer's CD-ROM drive.
3 Mount the CD-ROM file system. Use an appropriate modification of :

```
mount /dev/dsk/c201d2s0 /cdrom
```

where "c201d2s0" is the system file for the CD-ROM drive and "/cdrom" is the directory path of the root of the CD-ROM's file structure. (These names may differ on your system.)

4 On an HP-UX 9.x system type:

```
/etc/update -S700 -s /cdrom/EXMPL_UX/E1562EX.NIN \*
```

Or

On an HP-UX 10.x system type:

```
/usr/sbin/swinstall -s /cdrom/EXMPL_UX/E1562EX.TEN
```

5 The software installation program will proceed to install the software package.

❑ Using a Windows 95 or Windows NT operating system and one of the following:

- Personal Computer
- VXI "embedded PC" such as HP E6233A

Do the following to install the LIF library files:

1 Place the E1562 CD-ROM into the computer's CD-ROM drive.
2 Using the "file manager" or "explorer", select the CD-ROM drive.
3 Then select the EXMPL_PC directory.
4 Double-click on the HPE1562EX.EXE file to begin a self-extracting installation program.
5 Reply to the several questions promped by the dialog windows of the installation program.
6 The installation program will proceed to install the software.

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To store the module

Store the module in a clean, dry, and static free environment.

For other requirements, see storage and transport restrictions in the document: *HP E1562 Throughput Disk Module Technical Specifications.*

To transport the module

Package the module using the orginal factory packaging or packaging identical to the factory packaging.
Containers and materials identical to those used in factory packaging are available through Hewlett-Packard offices.

If returning the module to Hewlett-Packard for service, attach a tag describing the following:

- Type of service required
- Return address
- Model number
- Full serial number

In any correspondence, refer to the module by model number and full serial number.

Mark the container FRAGILE to ensure careful handling.

If necessary to package the module in a container other than original packaging, observe the following (use of other packaging is not recommended):

- Wrap the module in heavy paper or anti-static plastic.
- Protect the front panel with cardboard.
- Use a double-wall carton made of at least 350-pound test material.
- Cushion the module to prevent damage.

Caution

Do not use styrene pellets in any shape as packing material for the module. The pellets do not adequately cushion the module and do not prevent the module from shifting in the carton. In addition, the pellets create static electricity which can damage electronic components.

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2

Troubleshooting the HP E1562

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Introduction

The troubleshooting procedures found in this chapter are divided into two sections. The first section contains the information necessary to troubleshoot the HP E1562D/E. The second section contains the information necessary to troubleshoot the HP E1562F.

These are the commands that are used:

- *TST - checks the general operation of the Al/A7 Main and A2 SCSI assemblies.
- DIAG:VXI:DEV - checks the VM interface portion of the Main assembly.
- DIAG:SCSI:DEV - checks the specified SCSI controller of the SCSI assembly.
- DIAG:SCSI:DISK - checks the operation of a disk drive at the address specified.
- DIAG:SCSI:DAT - checks the DAT drive at the address specified (used only with the HP E1562D).
- DIAG:SNUMBER - used to program the serial number into the replacement Main assembly.
- DIAG:MNAME - used to program the model number into the replacement Main assembly.

For more information on these commands see the chapter titled "SCPI Command Reference."

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To troubleshoot the HP E1562D/E

Equipment Required: "C" size VXI mainframe
HP E1405/06 Command Module
HP Series 200/300/700 with an HPIB Interface and RMBASIC
Appropriate HPIB interface cable

❑ Step 1. Configure the system.

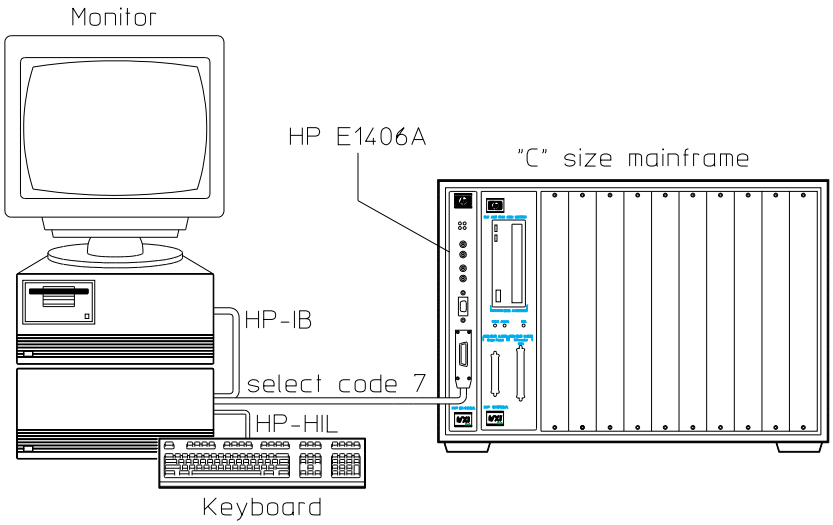
1 Set the mainframe's power switch to standby (⏻).

2 Check that the HP E1405/06 Command Module is configured as resource manager and slot 0 device (logical address = 0, system controller and slot 0 enabled, servant area = 255, HPIB address = 1001 (9), HPIB Controller = 0, Diagnostic = 0.).

See the command module's documentation for the location of the switches and information on using its terminal interface.

3 Slide the command module into the mainframe until it connects firmly with the backplane connectors.

4 Connect an HPIB cable from the controller to the command module's HPIB port.



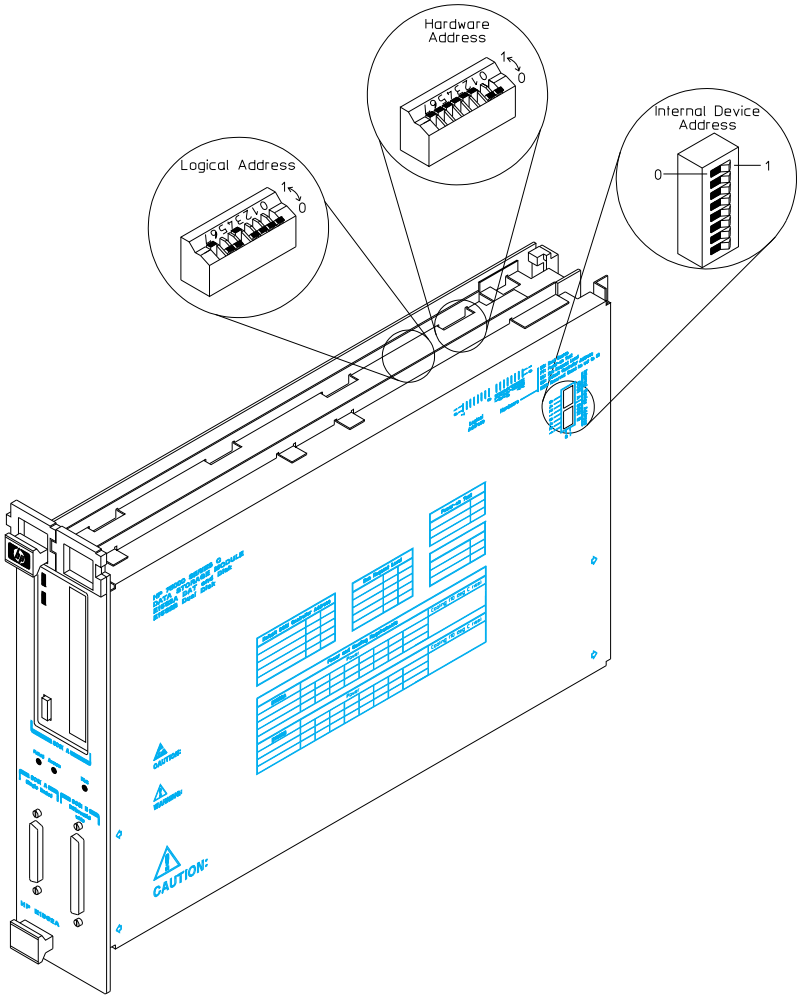
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5 Set the HP E1562's configuration switches as follows:

Note

Write down the current switch settings before you change them, so you can return them to the current settings after the testing/repair.

- Logical Address to 1001 0000 (144)
- Hardware switchpack to 1111 1100
- Internal Device Address SCSI A and SCSI B to 0000 0000



6 Slide the HP E1562 module into the mainframe until it connects firmly with the backplane connectors.

7 Set the mainframe's power switch to on.

8 Go to Step 2 in the "Manual procedure" to troubleshoot or to Step 2 in the "Automatic program" to check performance. (The "Automatic program" is located after the "Manual procedure.")

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Manual procedure

Note

The diagnostic tests must be run in the order given. Failure to run the tests in the order given may result in false indications.

❑ Step 2. Self test

1 Type in and run the following program:

```
10 DIM Response$ [80]
20 OUTPUT 70918;'*TST?'
30 ENTER 70918;Response$
40 DISP Response$
50 END
```

Test Response

2 If the response is +0, the Al and A2 assemblies are working properly. Go to Step 3.

3 If the response is 1 through 11, the Al Main assembly is probably faulty. For ordering and replacement procedures, see the chapter titled "Replaceable Parts." To program in the unit's serial number and model number, use DIAG:SNUMBER and DIAG:MNAME.

4 If the response is 12 through 14, the A2 SCSI assembly is probably faulty. For ordering and replacement procedures, see chapter titled "Replaceable Parts."

❑ Step 3. VXI interface test

1 Type in and run the following program:

```
10 DIM Response$ (80]
20 OUTPUT 70918;'DIAG:VXI:DEV?'
30 ENTER 70918;Response$
40 DISP Response$
50 MM
```

2 The response shown be similar in format to the following:
"000:-013,144:fff-210"

Test Response

3 The first three digits indicate the logical address of the VXI cards installed. The second group of three indicate the manufacturer (fff indicates Hewlett-Packard). The last group of three digits indicates the model number of the VXI card. If the response is not similar, replace the Al Main assembly.

For ordering and replacement procedures for the Al Main Assembly, see Chapter 3, *Replaceable Parts*. To program in the module's serial number and model number, use DIAG:SNUMBER and DIAG:MNAME.

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❑ Step 4. SCSI interface test

1 Type in and run the following program:

```
10 DIM Response$ [80]
20 OUTPUT 70918;"DIAG:SCSI:DEV?  A"
30 ENTER 70918;Response$
40 DISP Response$
50 = END
```

2 The response shown be similar in format to the following:
"00:HP C3325-OBQ"

3 Type in and run the following program:

```
10 DIM Response$ [80]
20 OUTPUT 70918;"DIAG:SCSI:DEV?  B"
30 ENTER 70918;Response$
40 DISP Response$
50 END
```

4 The response should be similar to the following:
`"00:HP C3325-OBQ3"`

Test Response

5 A correct response indicates the SCSI address of the device (in this case 00) followed by the type of device (in this case a Hewlett-Packard C3325 Disk Drive).

6 If either response is incorrect, the fuse on the A.2 assembly, the internal SCSI cable, or SCSI device is probably faulty. Check fuses A2 F600 and A2 F650. Swap the internal cables and retest. If the same connection fails, the disk drive is probably faulty. If the other connection fails, the internal cable is probably faulty.

7 If both responses are incorrect, the A3 Power Supply assembly is probably faulty.

For order and replacement procedures, see Chapter 3, Replaceable Parts.

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❑ Step 5. Disk test

1 Type in and run the following program for each SCSI controller, A and B:

```
10 DIM Response$[80]
20 OUTPUT 70918;,Diag:SCSI:DISK?  X,Ol    ! where X is either A or B
30  REPEAT
40  ENTER 70918;Response$
50  Print Response$
60  UNTIL LEN(Response$)
70  END
```

In line 20 above, **X** defines the SCSI controller A or B. If you are testing an HP E1562D use **B**. If you are testing an HP E1562E, use **A** then repeat the test using **B** if a second disk drive is installed. **0** indicates the SCSI device address, (0) in this case.

2 The response should be similar to the following:

```
“SCSI1 lA00: device open — blocksize=512    #blocks=4165272
SCSI1 la00: read serial number — 340OA65152
SCSI1 la00: read Manufacturing Info — C2490A
                    HDA serial number — H60065152
                    SCSI firmware revision — W13E3343
                    ESDI firmware revision — 01.37
SCSI1 la00:    Passed
```

3 Repeat this test for SCSI controller B if testing an HP E1562E with a second disk drive installed.

Test Response

4 A response similar in format and print **Passed** indicates a properly operating drive.

5 If the response is not similar in format to that listed, and followed by **Failed**, the disk drive assembly is probably faulty.

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❑ Step 6. DAT test

Note This test only applies to the HP E1562D with a DAT installed.

1 Type in and run the following program:

```
10  DIM Response$[80]
20  OUTPUT 70918;"Diag:SCSI:DAT?  A,O"
30  REPEAT
40  ENTER 70918;Response$
50  Print Response$
60  UNTIL LEN(Response$)
70  END
```

2 The response should be similar in format to the following:

```
“SCSIO la00:
SCSIO la00:   device open — blocksize=10240 SCSIO la00- ASCII
Information Page 01 — FRU 1 fail.  Brain Dead
SCSIO la00: ASCII Information Page 02 — FRU 2 fail.  Brain Dead
SCSIO la00: ASCII Information Page 03 — FRU 3 fail.  Brain Dead.
SCSIO la00: read VPD page c0 — Firmware Rev = 3.6 Build date = Fri
Mar 2
SCSIO la00: read VPD page cl — Servo Rev = 4.1
SCSIO la00: read medium partition page — partition 1 size = 0 M
SCSIO la00: read last block used — Partition 0: blocks used = 10
SCSIO la00:. Passed
```

Test Response

3 A response similar in format, and printing **Passed** indicates a properly operating DAT.

4 If the response is not similar in format to that listed and followed by **Failed**, the DAT drive is probably faulty.

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Automatic program

❑ Step 2. Type in and run the following program to automatically run through all the diagnostics and print the results.

```
10    ASSIGN @E1562 TO 70918
20    Send_query(@E1562,"*tst?",1)
30    Send_query(@E1562,"diag:boar:main?",8)
40    Send_query(@E1562,"diag:boar:scsi?",2)
50    Send_query(@E1562,"diag:vxi:dev?",1)
60    Send_query(@E1562,"diag:scsi:dev? a",1)
70    Send_query(@E1562,"diag:scsi:dev? b",1)
80    Send_query(@E1562,"diag:scsi:disk? a,0",8)
90    Send_query(@E1562,"diag:scsi:disk? b,0",8)
95    ! The following line only applies to the E1562A with a DAT
installed.
100    Send_query(@E1562, "diag:scsi:dat? a,0",8)
110   PRINT “TEST COMPLETE!”
120   END
130   SUB Send_query(@Card,Query$,Lines)
140     DIM Response$[80]
150     T0=TIMEDATE
160     PRINT “Sending: ”;Query$
170     OUTPUT @Card;Query$
180     PRINT “Received:”
190     IF Lines=1 THEN
200       ENTER @Card;Response$
210       PRINT “   ”;Response$
220     ELSE
230       REPEAT
240         ENTER @Card;Response$
250         PRINT “   ”;Response$
260       UNTIL LEN(Response$)
270     END IF
280     PRINT “Elapsed time: ”;TIME$(TIMEDATE-T0);"s"
290     PRINT “”
300     PRINT “”
310     PRINT “”
320     PRINT “”
330     PRINT “”
340   SUBEND
```

Test response

If any of the tests fail, go to the “Manual procedure” and see the “Test response” section for the failing test.

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To troubleshoot the HP E1562F

Equipment Required: "C" size VXI mainframe
HP E1405/06 Command Module HP Series 200/300/700 with an HP-IB Interface and RMBASIC
Appropriate HP-IB interface cable
HP E1562D/E module
SCSI HI external cable; HP 8120-6147

❑ Step 1. Configure the system and verify functionality of the HP E1562D/E by following the troubleshooting procedure in the previous section.

❑ Step 2. Configure the HP E1562F.

1 Set the HP E1562F to the alternate configuration (page I- 8).
2 Set each disk drive's SCSI address switch to "2". (See page 1-5 "To install the HP E1562F.")
3 Set the mainframe's power switch to standby (⏻).
4 Slide the HP E1562F module into the VXI mainframe with the HP E1405/06 and the HP E1562D/E modules.
5 Connect the SCSI cable from the "SCSI B" connector on the front of the HP E1562D/E module to the left "SCSI" connector on the HP E1562F.

❑ Step 3. Run the program.

1 Type in and run the following program:

```
10 DIM Response$ [80]
20 OUTPUT 70918; "DIAG:SCSI:DEV?  B"
30 ENTER 70918;Response$
40 DISP Response$
50 =
```

2 The response should be similar to the following:

"00:HP C3325-0HP0
  02:HP C3325-0HP0
"

3 Move the SCSI cable connection to the right "SCSI" connector on the HP E1562F.
4 Run the program in step 1 again.

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Test Response

5 Both connections fail.

If this test fails for both connections, the external SCSI cable or the A3 power supply assembly is probably faulty. Replace the external cable and retest. If the test still fails both connections, replace the A3 assembly and retest.

6 One connection fails.

If either connection but not both connections fail, the internal SCSI cable or the disk drive connected to the failing front panel SCSI connector is probably faulty. Swap the internal cables. If the same connection fails, replace the disk drive. If the other connection fails, replace the internal cable.

7 Test passes.

If this test passes, type in the following program:

```
10DIM Response$[80]
20  OUTPUT 70918; "Diag:SCSI:DISK?  B,2"
30  REPEAT
40  FMER 70918;Response$
50  Print Response$
60  UNTIL LEN(Response$)
70  MM
```

The response should be similar to the following:

```
“SCSI1 la00:   device open – blocksize=512 #blocks=4165272
SCSI1 la00:   read serial number – 340OA65152
SCSI1 la00:   read Manufacturing Info – C2490A
                        HDA serial number – H60065152
                        SCSI firmware revision – W13E3343
                        ESDI firmware revision – 01.37
"
SCSI1 la00:   Passed
"
```

Run this test with the external SCSI cable connected to the left SCSI connector on the HP E1562F, and repeat it with the cable connected to the right SCSI connector. If either side fails, the disk drive attached to that cable is probably faulty.

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3

Replacing Assemblies

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Replaceable Parts

Replacement parts are listed in the following tables:

- Assemblies: HP E1562D
- Assemblies: HP E1562E
- Assemblies: HP E1562F
- Cables: HP E1562D
- Cables: HP E1562E
- Cables: HP E1562F
- Front Panel

Ordering Information

To order a part listed in one of the tables, quote the Hewlett-Packard part number (HP Part Number), the check digit (CD), indicate the quantity required, and address the order to the nearest Hewlett-Packard sales and service office (see the inside back cover of this guide). The check digit verifies that an order has been transmitted correctly, ensuring accurate and timely processing of the order. The first time a part is listed in the table, the quantity column (Qty) lists the total quantity of the part used in the module. For the corresponding name and address of the manufacturers' codes shown in the tables, see "Code Numbers."

Caution The module is static sensitive. Use the appropriate precautions when removing, handling, and installing to avoid unnecessary damage.

Direct Mail Order System

Within the U.S.A., Hewlett-Packard can supply parts through a direct mail order system. Advantages of the Direct Mail Order System are:

- Direct ordering and shipment from the HP Parts Center.
- No maximum or minimum on any mail order. There is a minimum order for parts ordered through a local HP sales and service office when the orders require billing and invoicing.
- Transportation charges are prepaid. A small handling charge is added to each order.
- No invoicing. A check or money order must accompany each order.
- Mail order forms and specific ordering information are available through your local Hewlett-Packard sales and service office. See the inside back cover of this guide for a list of Hewlett-Packard sales and service office locations and addresses.

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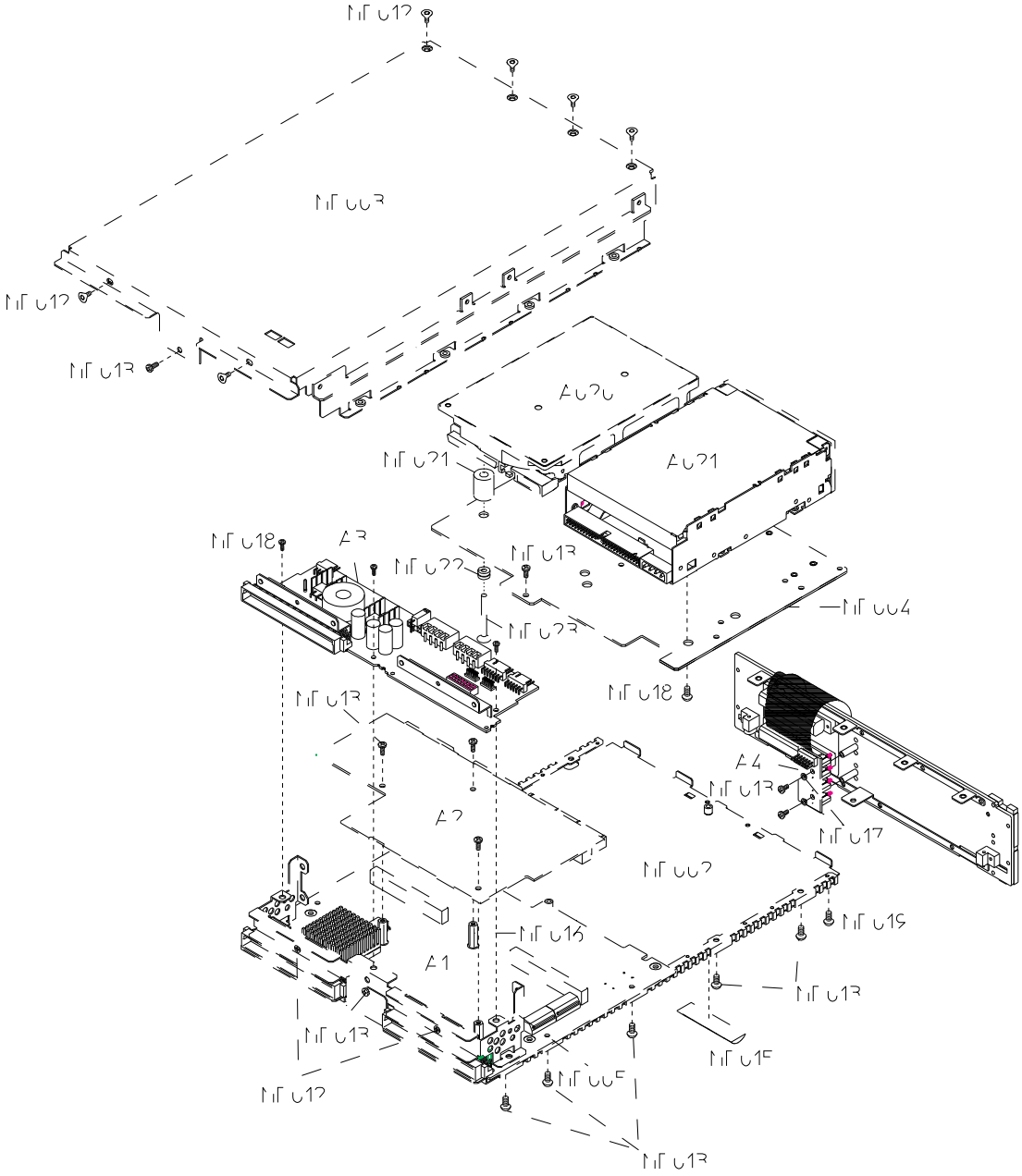
Code Numbers

The following table provides the name and address for the manufacturers' code numbers (Mfr Code) listed in the replaceable parts tables.

Mfr No.	Mfr Name	Address
00779	AMP Inc.	Harrisburg, PA 17105-3608 U.S.A.
03934	E-A-R Corporation	Indianapolis, IN 46268 U.S.A.
04703	Littelfuse, Inc	Des Plaines, IL 60016 U.S.A.
05791	Lyn-Tron Inc.	Burbank, CA 91505 U.S.A.
28480	Hewlett-Packard Company	Palo Alto, CA 94304 U.S.A.
30817	Instrument Specialties Co. Inc.	Placentia, CA 92670 U.S.A.
83486	Elco Industries Inc.	Rockford, IL 61101 U.S.A.

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Assemblies: HP E1562D

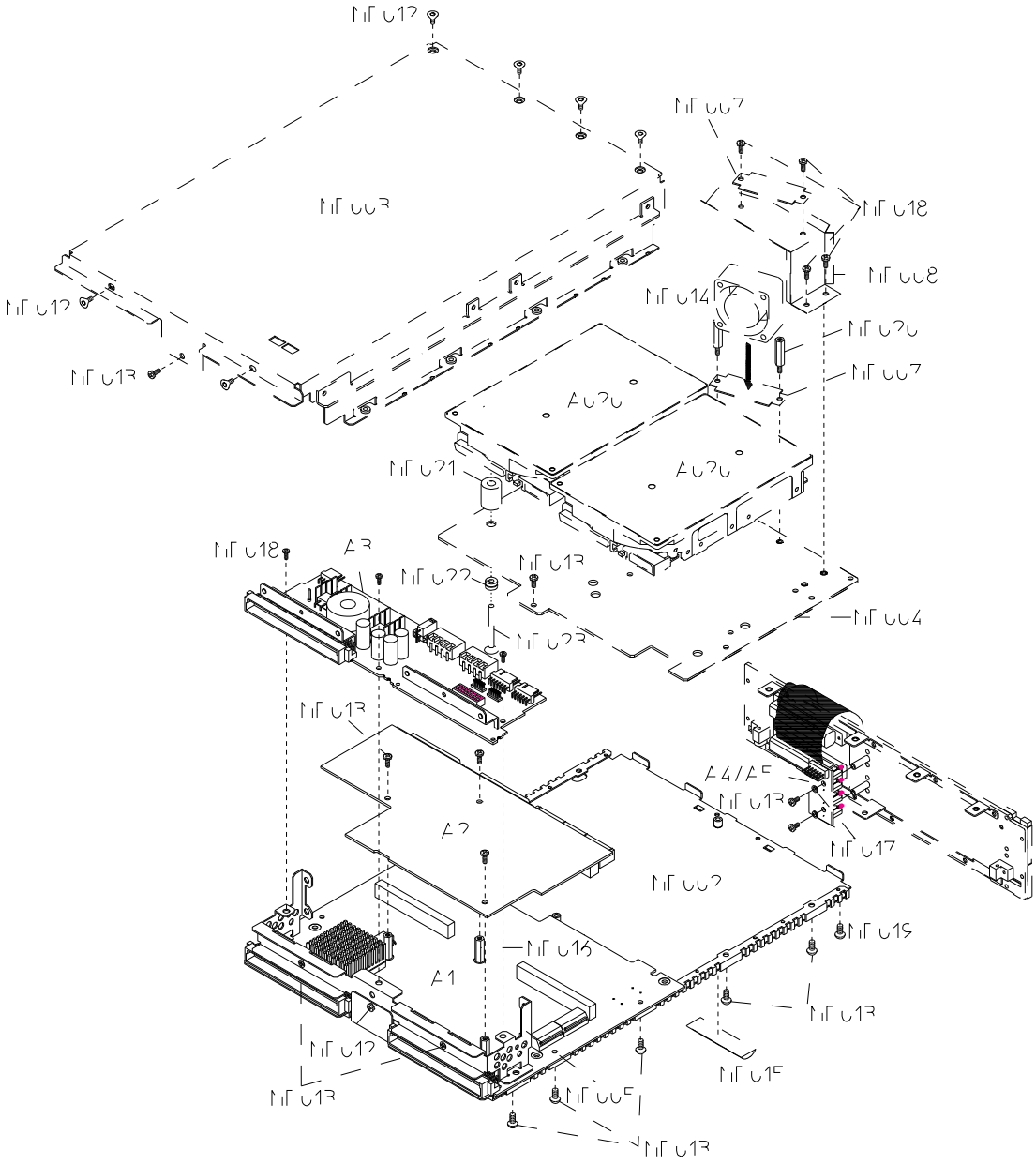


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Ref Des	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
A1	E1562-66501	8	1	PC-ASSY MAIN BD	28480	E1562-66501
A2	E1562-66502	9	1	PC-ASSY SCSI INTERFACE BD	28480	E1562-66502
A3	E1562-66503	0	1	PC-ASSY DISC POWER SUPPLY	28480	E1562-66503
A4	E1562-66504	1	1	PC-ASSY LED	28480	E1562-66504
A021	0950-2658	3	1	DISC; DAT 4 GB 5.2" WS FIRMWARE	28480	0950-2658
A020	0950-3042	1	1	DISC 4GBT W/D IOEM-LINXII	28480	0950-3042
MP002	E1562-00602	2	1	SHTF; MODULE BASE & PLTG	28480	E1562-00602
MP003	E1562-00603	3	1	SHTF; VXI MODULE COVER W/SILKSC	28480	E1562-00603
MP004	E1562-00105	0	1	SHTF; MNTG PLATE	28480	E1562-00105
MP005	E1499-04101	6	1	SHTF; COVER, REAR	28480	E1499-04101
MP012	0515-1946	8	8	SCR-MCH M3.0 6MM FHTX SST	28480	0515-1946
MP013	0515-0372	2	21	SCR-MCH M3.0 8MM	28480	0515-0372
MP015	8160-0686	6	1	STMP FNGRS-RFI STRP BECU	30817	786-185
MP016	0380-2070	4	3	STDF-HXMF M3.0	05791	SS5172-14.0-01
MP017	3050-1161	6	4	WASHER-SHLDR NO. 4	28480	3050-1161
MP018	0515-0430	3	7	SCR-MCH M3.0 6MM	28480	0515-0430
MP019	0515-0368	6	2	SCR-MCH M2.5 X 0.45	28480	0515-0368
MP021	0380-1752	7	4	SPACER	28480	0280-1752
MP022	0400-0353	6	4	GROMMET ROUND 0.155-IN-ID	03934	G-410-1
MP023	2360-0185	8	4	SCREW-MACHINE 6-32	28480	2360-0185

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Assemblies: HP E1562E

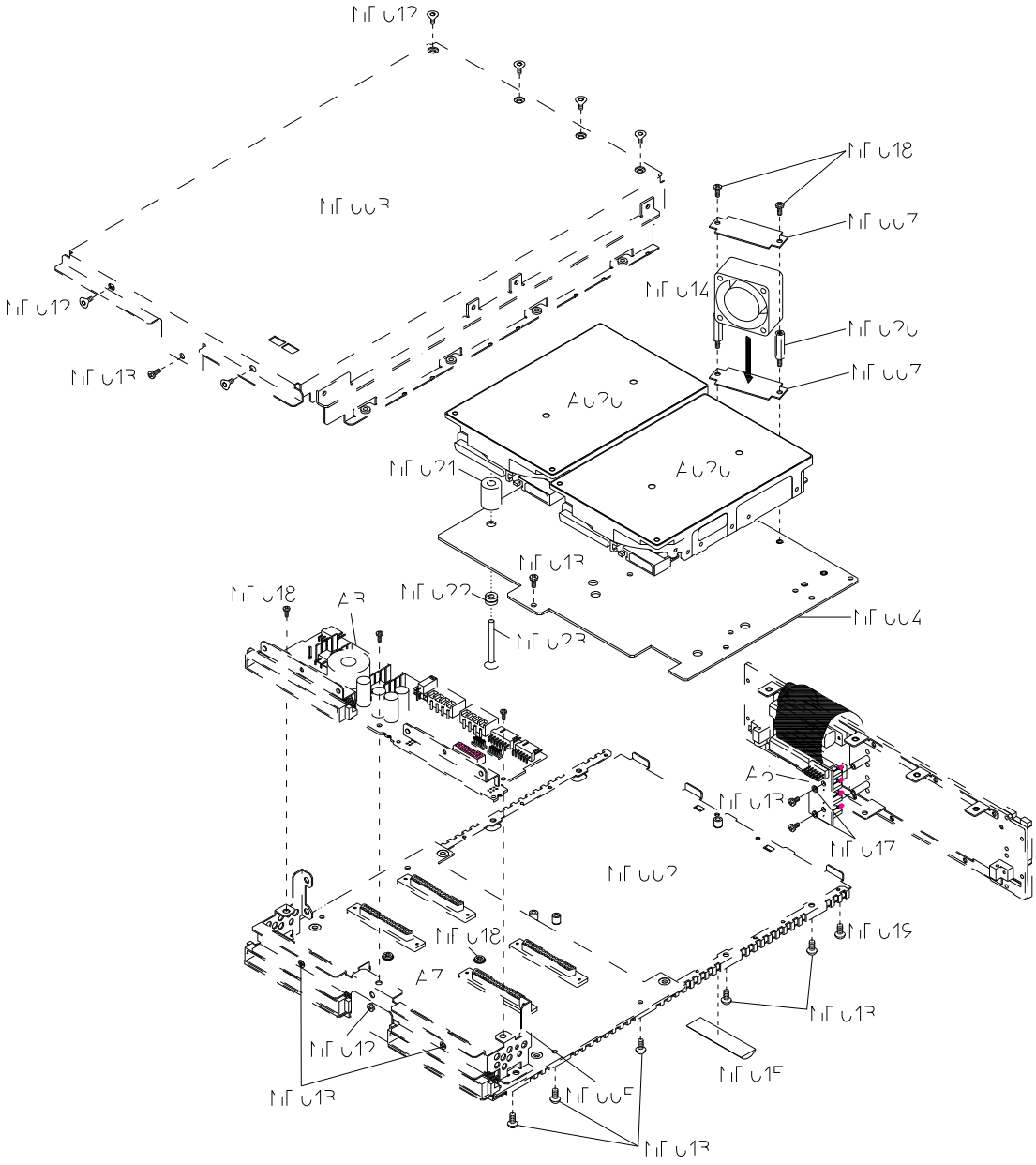


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Ref Des	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
A1	E1562-66501	8	1	PC-ASSY MAIN BD	28480	E1562-66501
A2	E1562-66502	9	1	PC-ASSY SCSI INTERFACE BD	28480	E1562-66502
A3	E1562-66503	0	1	PC-ASSY DISC POWER SUPPLY	28480	E1562-66503
A4	E1562-66504	1	1	PC-ASSY LED	28480	E1562-66504
A5	E1562-66505	2	1	PC-ASSY LED	28480	E1562-66505
A020	0950-3042	1	2	DISC 4GBT W/D IOEM-LINX II	28480	0950-3042
MP002	E1562-00602	2	1	SHTF; MODULE BASE W/SILK & PLTG	28480	E1562-00602
MP003	E1562-00603	3	1	SHTF; VXI MODULE COVER W/SILKSC	28480	E1562-00603
MP004	E1562-00105	0	1	SHTF; MNTG PLATE	28480	E1562-00105
MP005	E1499-04101	6	1	SHTF; COVER REAR	28480	E1499-04101
MP007	E1562-00102	7	2	SHTF; FAN MNT PLATE	28480	E1562-00102
MP008	E1562-00103	8	1	SHTF; FAN DUCT POLYCARBONATE	28480	E1562-00103
MP012	0515-1946	8	8	SCR-MCH M3.0 6MM	28480	0515-1946
MP013	0515-0372	2	21	SCR-MCH M3.0 8MM	28480	0515-0372
MP014	E1562-68501	2	1	FAN	28480	E1562-68501
MP015	8160-0686	6	1	STMP FNGRS-RFI STRP BECU	30817	786-185
MP016	0380-2070	4	3	STDF-HXMF M3.0	05791	SS5172-14.0-01
MP017	3050-1161	6	2	WASHER-SHLDR NO. 4	28480	3050-1161
MP018	0515-0430	3	5	SCR-MCH M3.0 6MM	28480	0515-0430
MP019	0515-0368	6	2	SCR-MCH M2.5 X 0.45	28480	0515-0368
MP020	0380-4355	1	2	STDF HXMF M3.0	05791	SS5171-40.0-01
MP021	871001	7	8	SPACER	28480	871001
MP022	0400-0353	6	8	GROMMET ROUND 0.155-IN-ID	03934	0400-0353
MP023	2360-0185	8	8	SCREW-MACHINE 6-32	28480	2360-0185

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Assemblies: HP E1562F

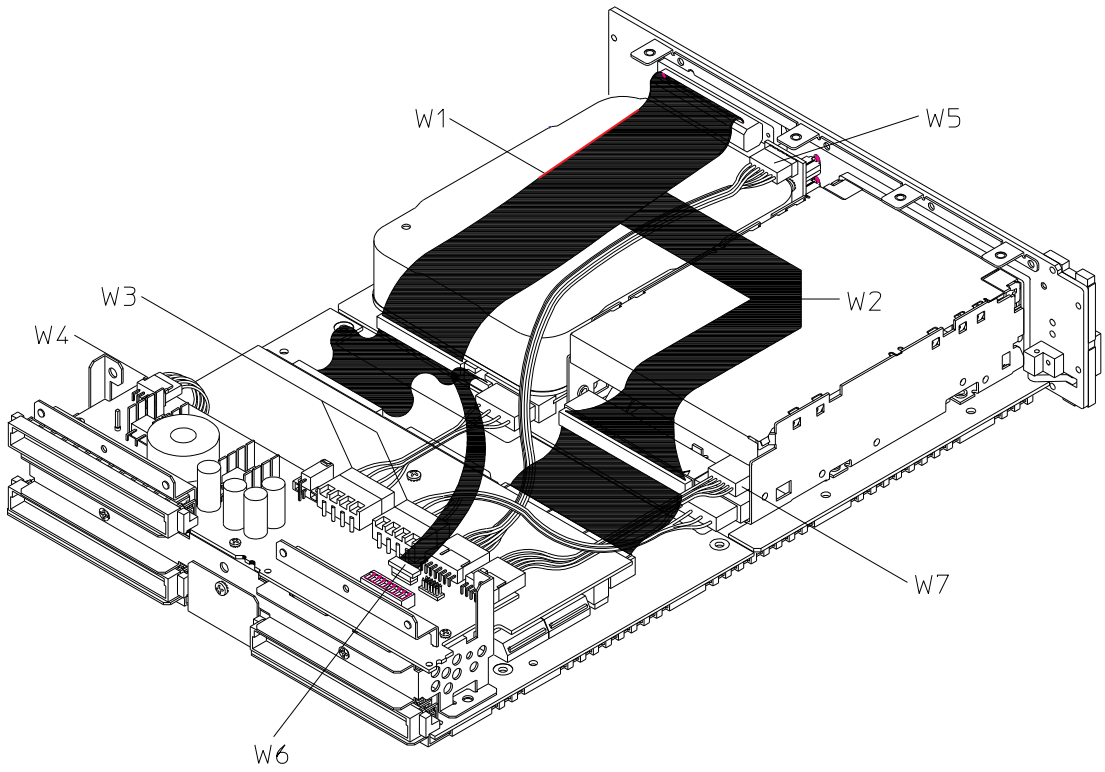


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Ref Des	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
A3	E1562-66503	0	1	PC-ASSY DISC POWER SUPPLY	28480	E1562-66503
A6	E1562-66506	3	1	PC-ASSY LED	28480	E1562-66506
A7	E1562-66507	4	1	PC-ASSY MAIN BD	28480	E1562-66507
A020	0950-3042	1	2	DISC 4GBT W/D IOEM-LINX II	28480	0950-3042
MP002	E1562-00602	2	1	SHTF; MODULE BASE W/SILK & PLTG	28480	E1562-00602
MP003	E1562-00601	1	1	SHTF; VXI MODULE COVER W/SILKSC	28480	E1562-00601
MP004	E1562-00105		1	SHTF; MNTG PLATE	28480	E1562-00105
MP005	E1499-04101	6	1	SHTF; COVER REAR	28480	E1499-04101
MP007	E1562-00102	7	2	SHTF; FAN MNT PLATE	28480	E1562-00102
MP012	0515-1946	8	8	SCR-MCH M3.0 6MM	28480	0515-1946
MP013	0515-0372	2	21	SCR-MCH M3.0 8MM	28480	0515-0372
MP014	E1562-68501	2	1	FAN	28480	E1562-68501
MP015	8160-0686	6	1	STMP FNGRS-RFI STRP BECU	30817	786-185
MP017	3050-1161	6	2	WASHER-SHLDR NO. 4	28480	3050-1161
MP018	0515-0430	3	5	SCR-MCH M3.0 6MM	28480	0515-0430
MP019	0515-0368	6	2	SCR-MCH M2.5 X 0.45	28480	0515-0368
MP020	0380-4355	1	2	STDF HXMF M3.0	05791	SS5171-40.0-01
MP021	871001	7	8	SPACER	28480	871001
MP022	0400-0353	6	8	GROMMET ROUND 0.155-IN-ID	03934	G-410-1
MP023	2360-0185	8	8	SCREW-MACHINE 6-32	28480	2360-0185

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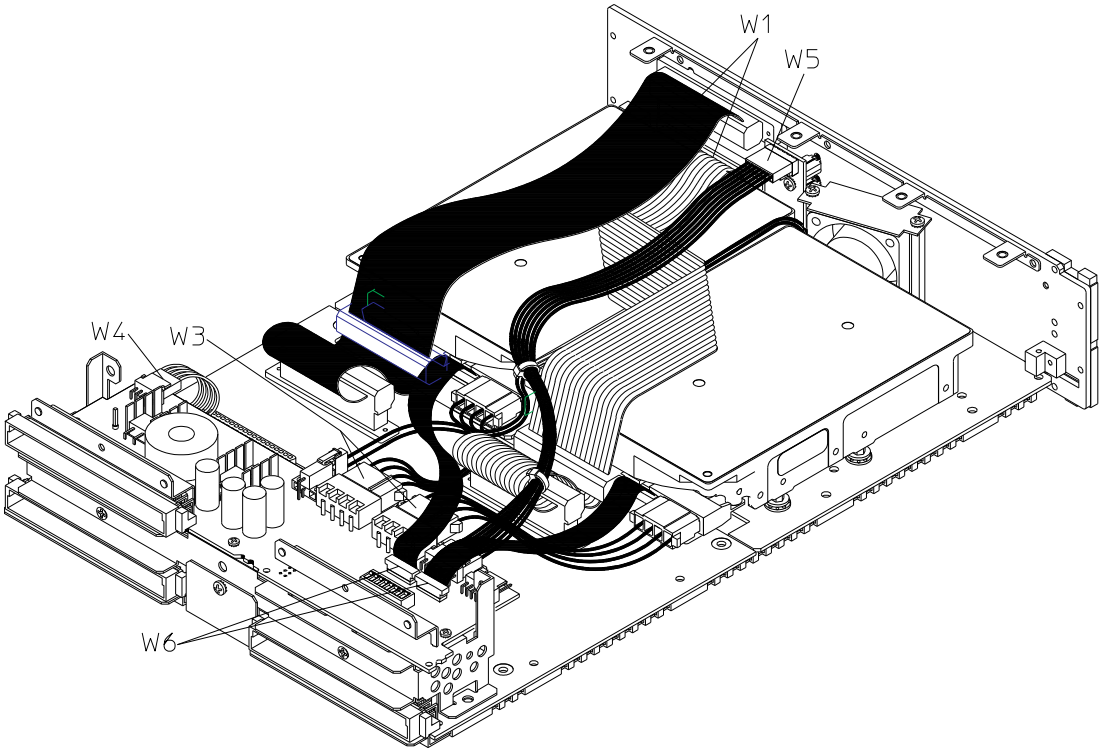
Cables: HP E1562D



Ref Des	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
W1	E1562-61601	9	1	CBL-SCSI	28480	E1562-61601
W2	E1562-61602	0	1	CBL-DAT	28480	E1562-61602
W3	E1562-61603	1	2	CBL-DISK POWER	28480	E1562-61603
W4	E1562-61604	2	1	CBL-AUX	28480	E1562-61604
W5	E1562-61605	3	1	CBL-CTRL BRD TO LED BRD	28480	E1562-61605
W6	E1562-61606	4	1	CBL-DISK ADDRESS	28480	E1562-61606
W7	E1562-61607	5	1	CBL-DAT ADDRESS	28480	E1562-61607

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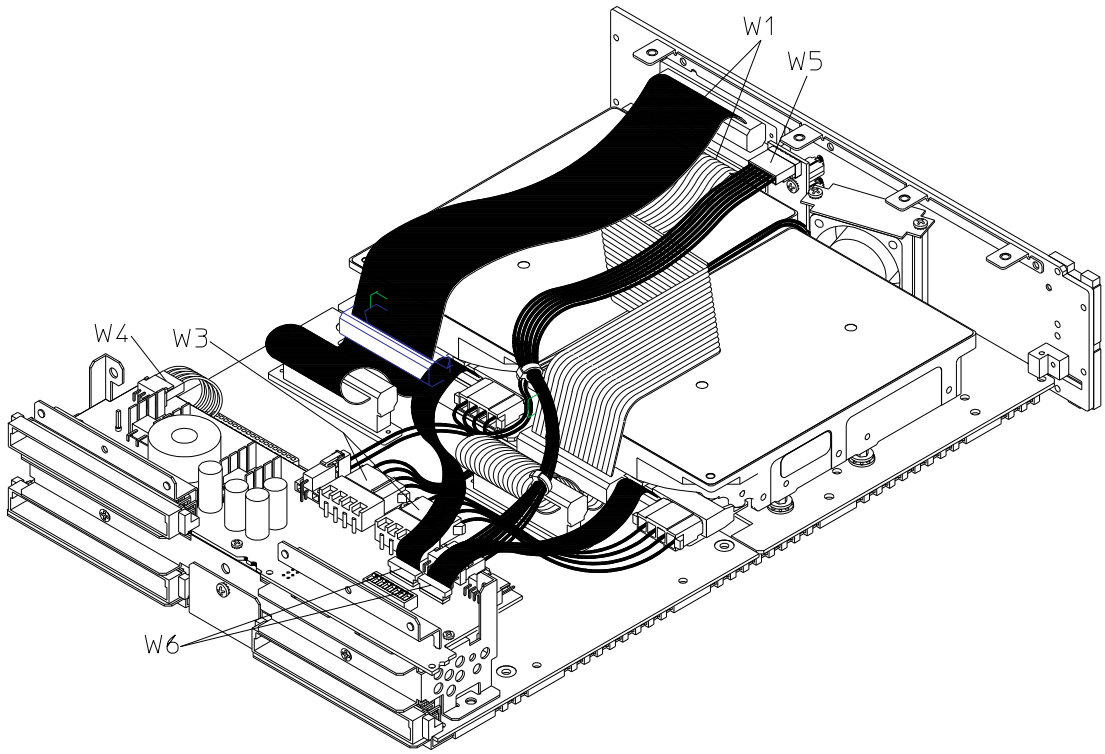
Cables: HP E1562E



Ref Des	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
W1	E1562-61601	9	2	CBL-SCSI	28480	E1562-61601
W3	E1562-61603	1	2	CBL-DISK POWER	28480	E1562-61603
W4	E1562-61604	2	1	CBL-AUX	28480	E1562-61604
W5	E1562-61605	3	1	CBL-CTRL LED	28480	E1562-61605
W6	E1562-61606	4	2	CBL-DISK ADDRESS	28480	E1562-61606

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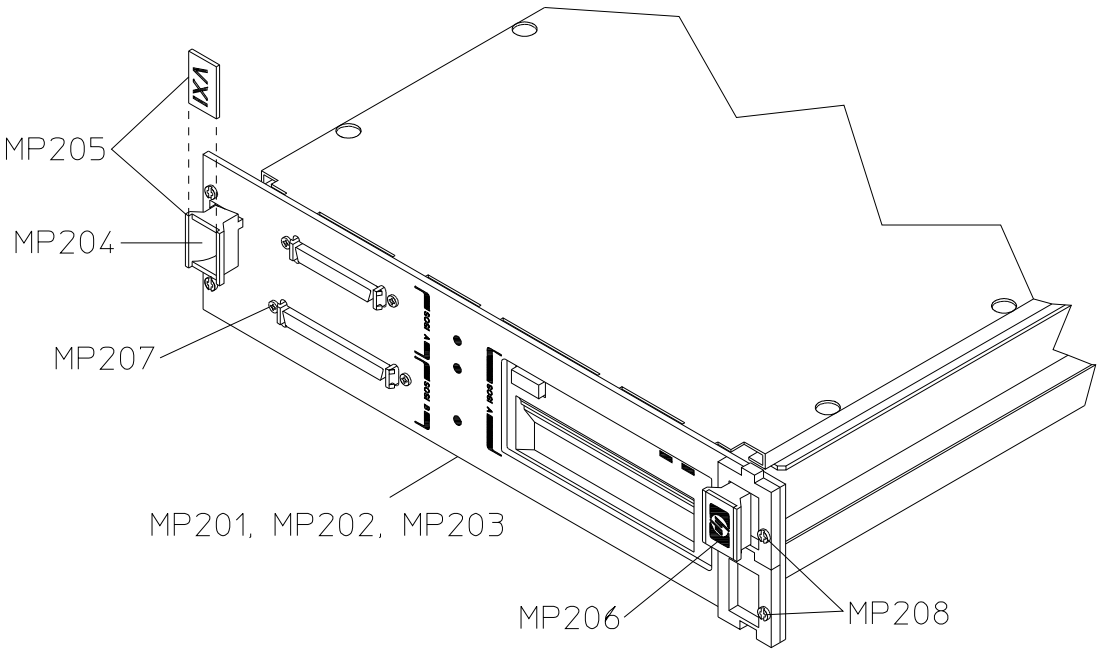
Cables: HP E1562F



Ref Des	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
W1	E1562-61601	9	2	CBL-SCSI	28480	E1562-61601
W3	E1562-61603	1	2	CBL-DISK POWER	28480	E1562-61603
W4	E1562-61604	2	1	CBL-AUX	28480	E1562-61604
W5	E1562-61605	3	1	CBL-CTRL LED	28480	E1562-61605
W6	E1562-61606	4	2	CBL-DISK ADDRESS	28480	E1562-61606
	8120-6147	2	1	SCSI III EXTERNAL CABLE	28480	8120-6147

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Front Panel



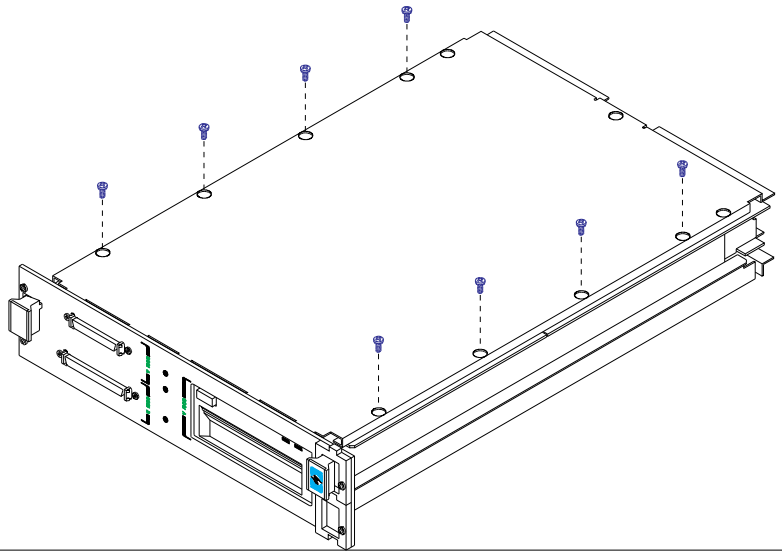
Ref Des	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
MP201	E1562-00205	***	1	Front Panel; HP E1562D & HP E1562D Option 1CD	28480	E1562-00205
MP203	E1562-00206	***	1	Front Panel; HP E1562E & HP E1562E Option 1BD	28480	E1562-00206
MP204	0515-1375	7	2	SCR-MCH M2.5 6MM	83486	343-300-02506
MP205	E1400-84105	1	1	MOLD KIT-BTTM EXTR HDL "VXI"	28480	E1400-84105
MP206	E1400-84106	2	1	MOLD KIT-TOP EXTR HDL "HP"	28480	E1400-84106
MP207	1252-6155	4	4	SCR-JACK 2-56-X2-56 THRDW/SHL	00779	786585-2
MP208	0515-1968	4	4	SCR-MCH M2.511MMLG PHSPS SST	28480	0515-1968
MP209	E1562-00207	3	1	Front Panel; HP E1562F	28480	E1562-00207

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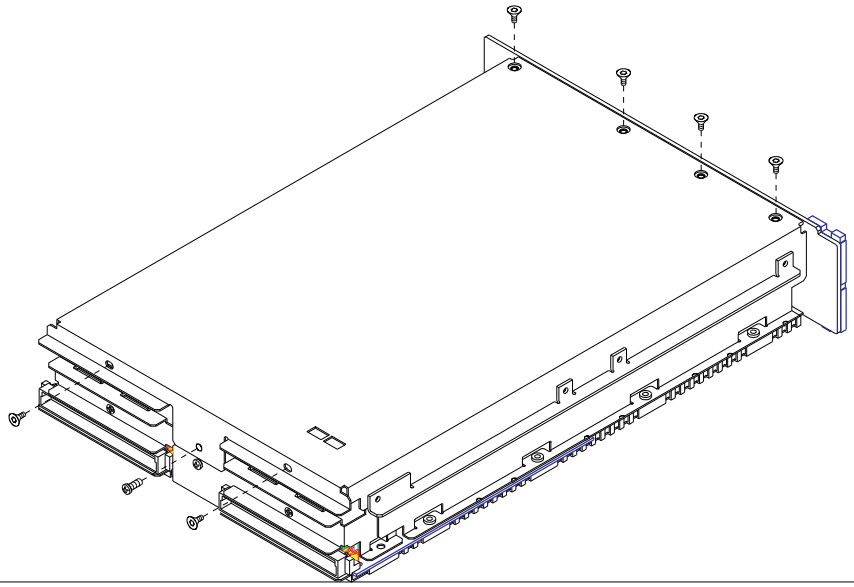
To remove the top cover

The following illustrations show an HP E1562D. The procedures are the same for an HP E1562E/F.

1 Using a T-10 torx driver, remove the four screws along each side of the bottom cover.



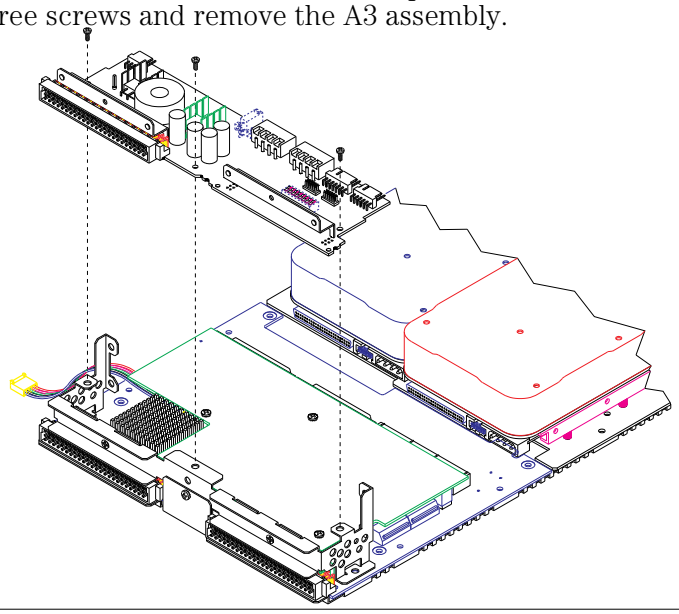
2 Using a T-10 torx driver, remove the four screws along the top and the three screws along the back of the top cover.



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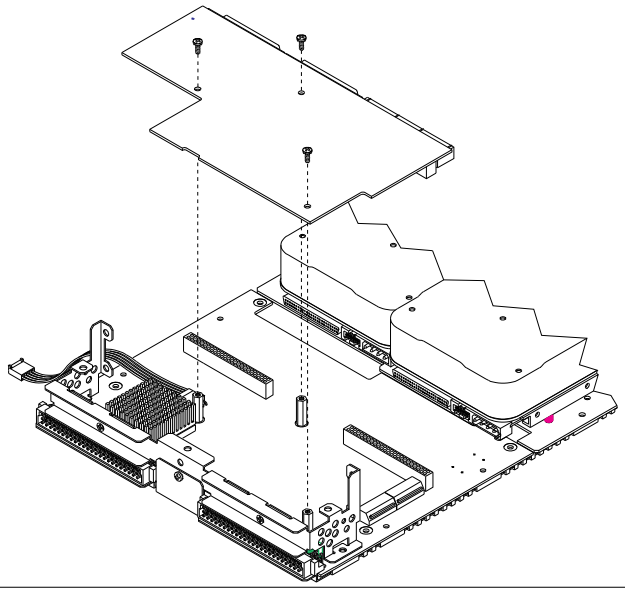
To remove the printed circuit assemblies

1 Remove top cover. Disconnect all cables from the printed circuit boards. Using a T-10 torx driver, Remove the three screws and remove the A3 assembly.



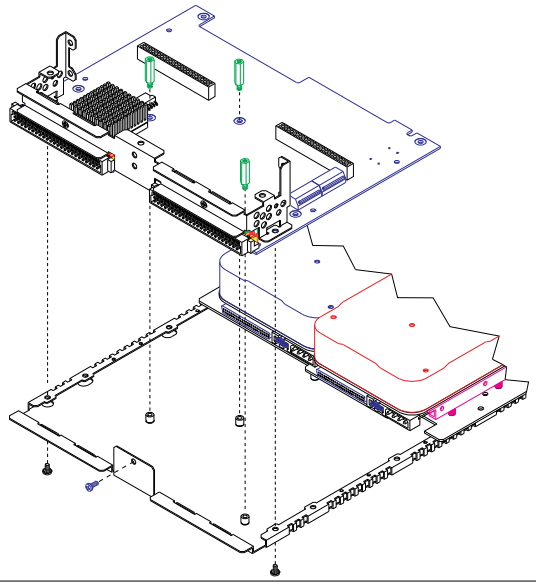
Note: There is no A2 board in the HP E16562F. Skip this step if disassessembling an HP 1562F.

2 Using a T-10 Torx driver, remove the three screws on the A2 assembly. Carefully, to avoid stressing solder joints, pry the boards apart at the connectors and remove the A2 assembly.

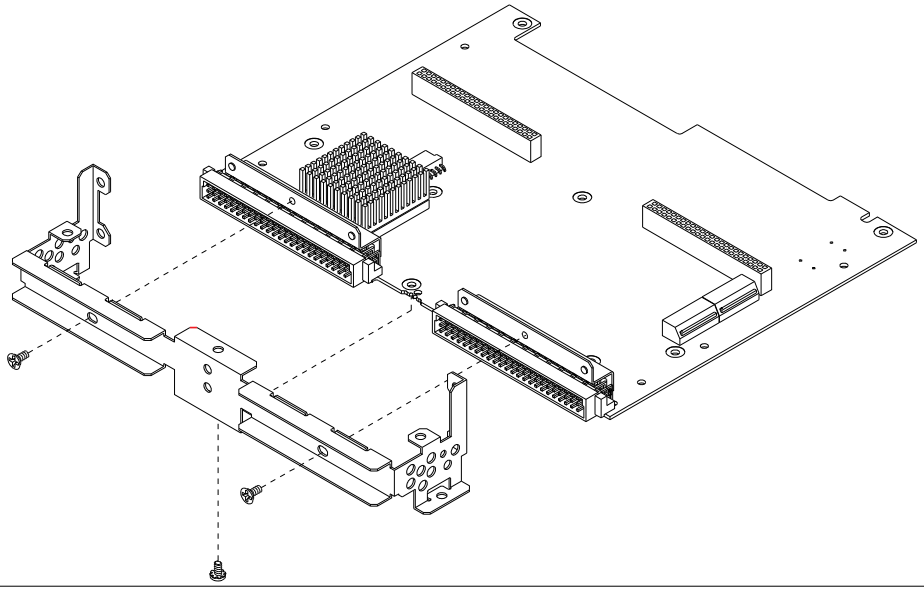


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3 Remove screw from rear of bottom cover using a T-10 torx driver. Remove the two screws on the sides of the bottom cover using a T-10 torx driver. Using a 6 mm nut driver, remove the three standoffs and remove the A1/A7 assembly. (For the HP E1562F, use a T-10 torx driver to remove the screws.)



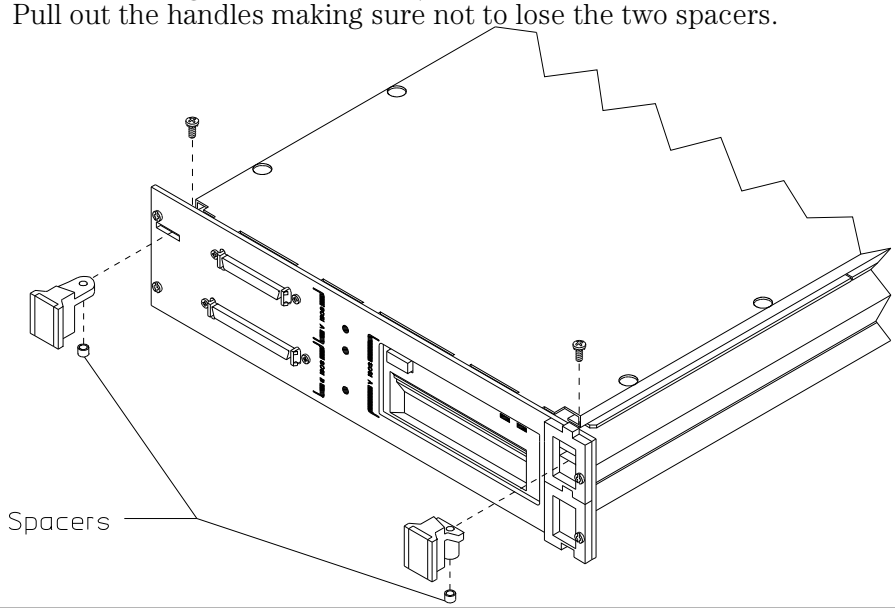
4 Using a T-10 torx driver, remove the three screws from the rear cover of the A1 assembly. Remove the rear cover of the A1/A7 assembly.



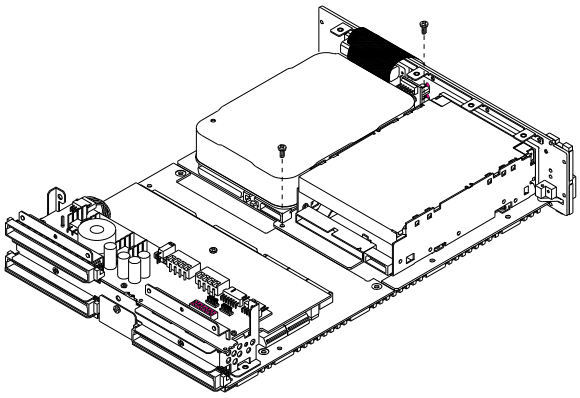
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To remove the Disk/DAT assembly

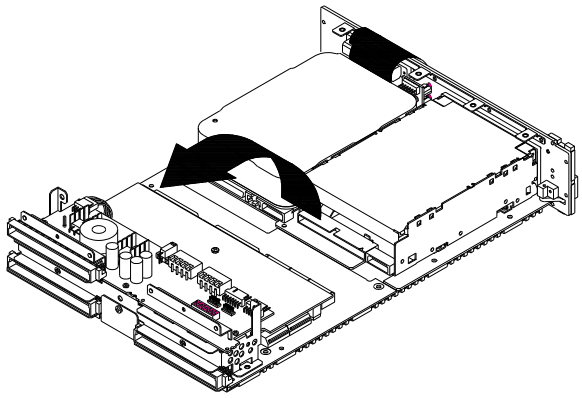
1 Remove top cover. Using a T-8 torx driver, remove the two screws that attach the handles to the assembly. Pull out the handles making sure not to lose the two spacers.



2 Disconect cables to the Disk/DAT & move out of the way. Remove the two mounting plate screws using a T-10 torx driver.

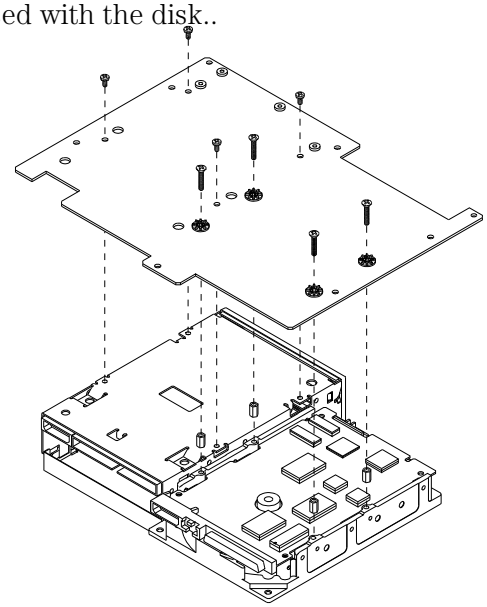


3 From the back of the assembly lift up and back to remove.



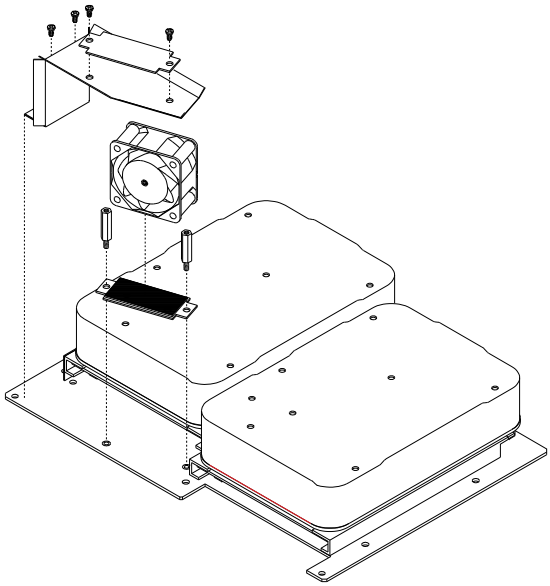
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4 Turn the assembly over and remove the screws that hold the Disk and DAT assemblies to the mounting plate. Use a T-10 torx driver for the DAT and a #2 pozidrive for the disk. Be careful not to lose the spacers that are used with the disk..



Note: This step only applies to the HP 1562E and HP 1562F models.

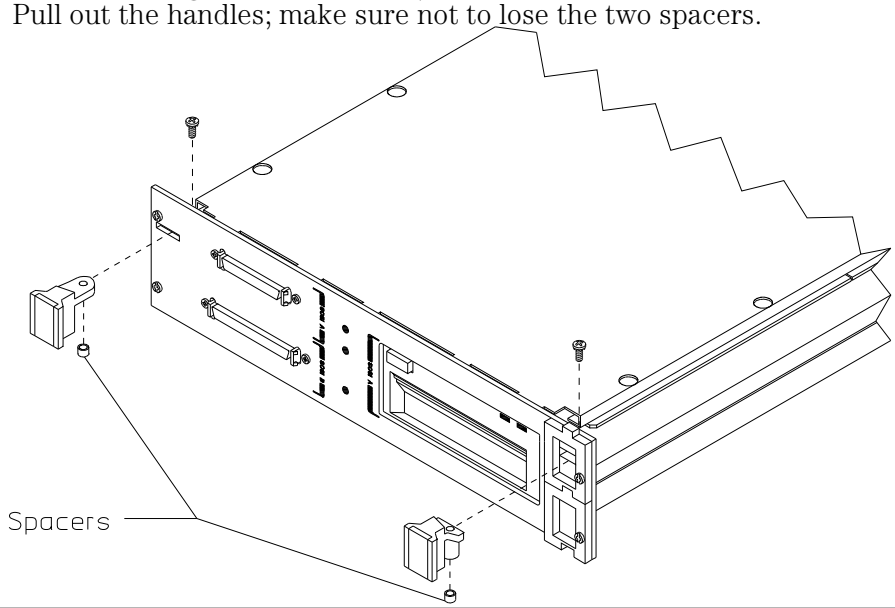
5 To remove the fan assembly, remove four screws and lift off fan plate and duct. Remove the fan and fan mounting plate by removing the two standoffs using a 4.5 mm nut driver.



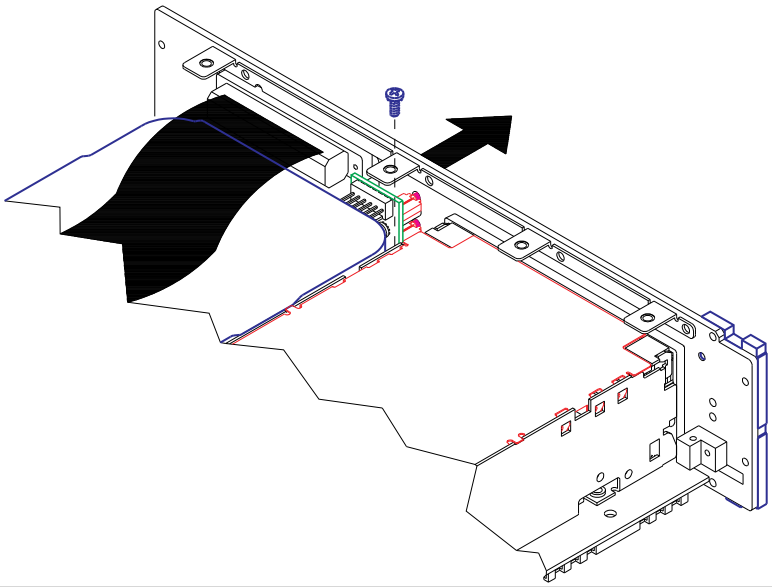
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To remove the front panel

1 Remove top cover. Using a T-8 torx driver, remove the two screws that attach the handles to the assembly. Pull out the handles; make sure not to lose the two spacers.

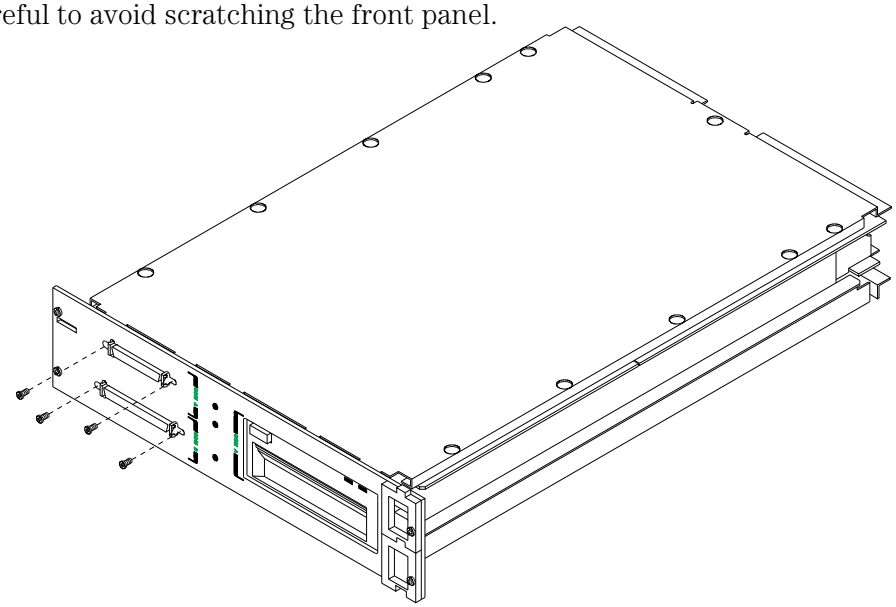


2 Using a T-10 torx driver, remove the screw that attaches the front panel to the bottom cover. Lift the lower part of the front panel off of the tabs on the bottom cover and slide it away from the module.

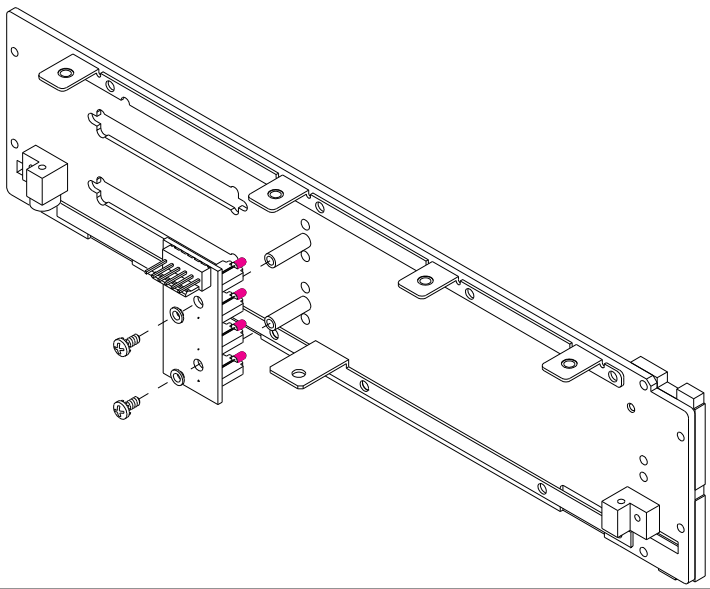


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3 Using a thin flat-blade screwdriver, remove the screws that attach the connectors to the front panel. Be careful to avoid scratching the front panel.

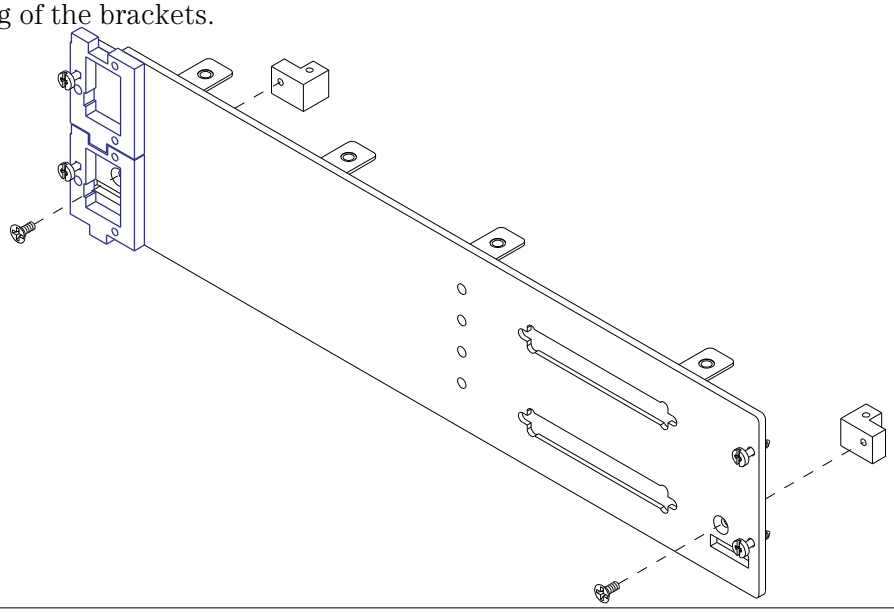


4 To remove the LED board from the front panel, use a T-10 torx driver to remove the two screws.



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5 To replace the front panel with another that does not have its own side brackets, use a T-8 torx driver to remove the brackets from the old front panel . Because alignment is critical, be sure to note the positioning of the brackets.



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4

Backdating

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Backdating

This chapter will document modules that differ from those currently being produced. This information will allow this guide to be modified so that it applies to any earlier version or configuration of the module.

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5

Hardware Description

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General Description

The HP E1562 is a high speed SCSI Throughput module. The following table shows each HP 1562 model and its main features.

	SCSI Disk Drive	DAT Tape Backup	Throughput Control
HP E1562D	yes - one	yes	yes
HP E1562D Option ICD	yes - one	no	yes
HP E1562E	yes - two	no	yes
HP E1562E Option IBD	no	no	yes
HP E1562F	yes - two	no	no

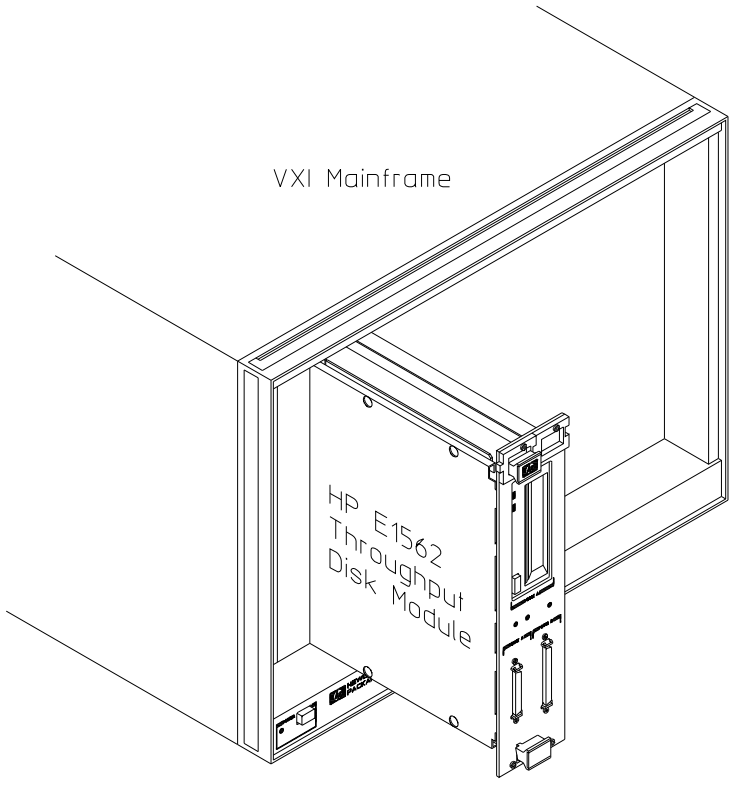


Figure 5-1: HP E1562D Throughput Disk Module

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The HP E1562 occupies two slots in a C-size VXI mainframe.

The HP E1562 can be used for local bus disk throughput from input modules such as the HP E1431A 8-channel Input, the HP E1430A 10 MHz Input, and the HP E1429A/B Digitizer.

The HP E1562 can also be used for throughput from high channel count applications using the HP E1413A 64-channel Input, which does not have a local bus interface. In this case, the HP E1562 orchestrates high-speed throughput transfers without the interaction of a controller. For high-speed applications the HP E1562E (with two internal disk drives) is required.

In Static+Dynamic applications, the HP E1562 can store data from both local-bus-based modules and non-local-bus-based modules simultaneously.

The HP E1562F is designed to provide additional disk storage space to a VXI device with a SCSI contoller. The HP E1562F is contolled by progamming a SCSI contoller. The HP E1562F does not respond to any signals of the VXI bus.

The cache size for the disks included in the HP E1562 is 256 kBytes.

The Local Bus is a flexible daisy-chain structure connecting the modules of a VXI system. It is 12 lines wide in each direction through the P2 connector and an additional 24 lines wide though the P3 connector.

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Circuit Description

A block diagram for the HP E1562D/E is shown below. Note that the DAT and single-ended SCSI connector are present only on the HP E1562D. The second disk and differential-wide SCSI connector are present only on the HP E1562E.

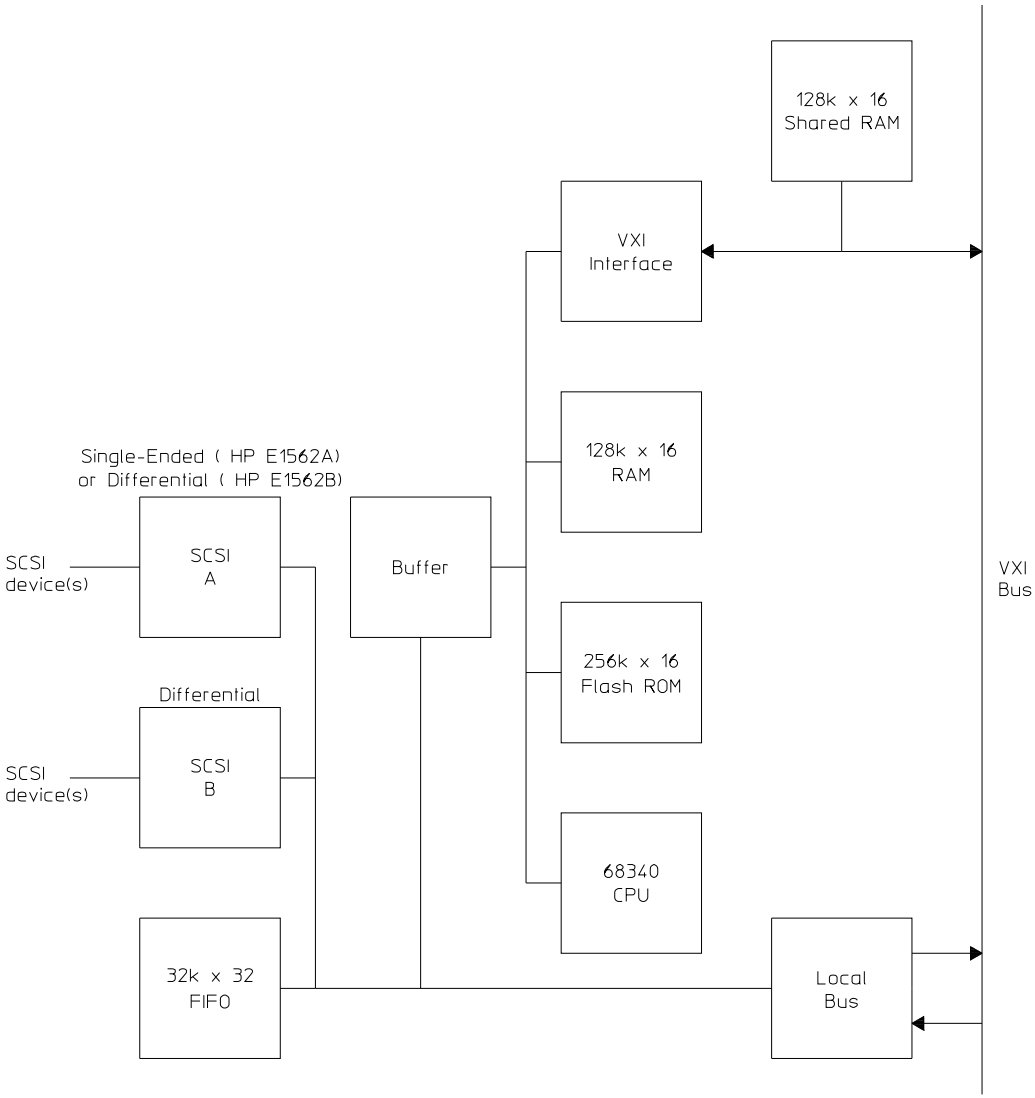


Figure 5-2: Block diagram of the HP E1562D/E

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The following is a simplified block diagram of the HP E1562D. Most of the circuitry shown in the previous diagram is in the represented by the block labeled “Throughput Controller.”

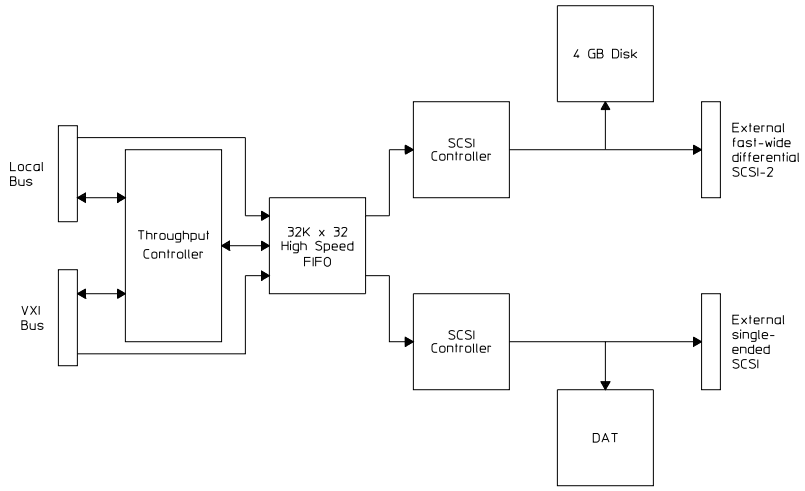


Figure 5-3: Block diagram of the HP E1562D

The following is a simplified block diagram of the HP E1562E. The HP E1562E has two SCSI disks and two differential-wide SCSI connectors.

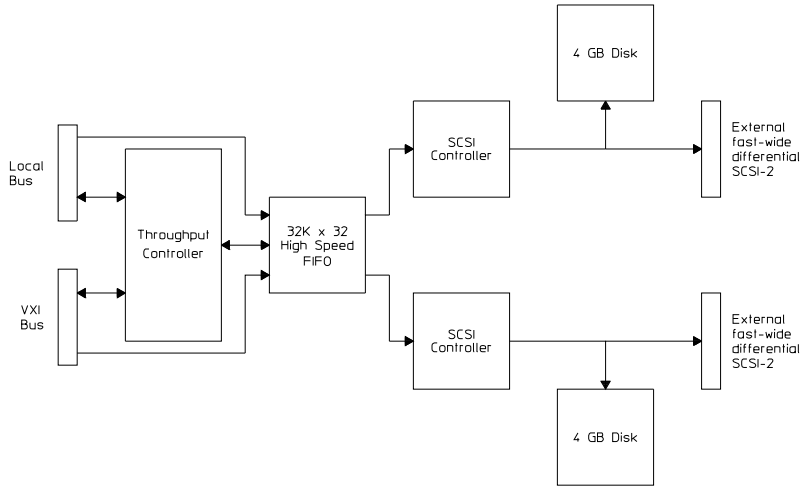


Figure 5-4: Block diagram of the HP E1562E

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The following is a simplified block diagram of the HP E1562D Option ICD. This option deletes the DAT drive from the HP E1562D.

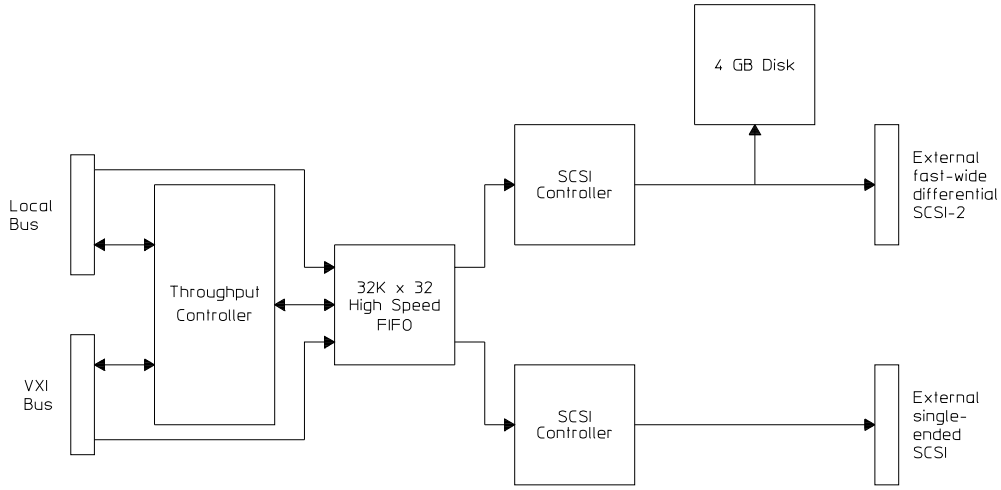


Figure 5-5: Block diagram of the HP E1562D Option ICD

The following is a simplified block diagram of the HP E1562E Option IBD. This option deletes both disks from the HP E1562E.

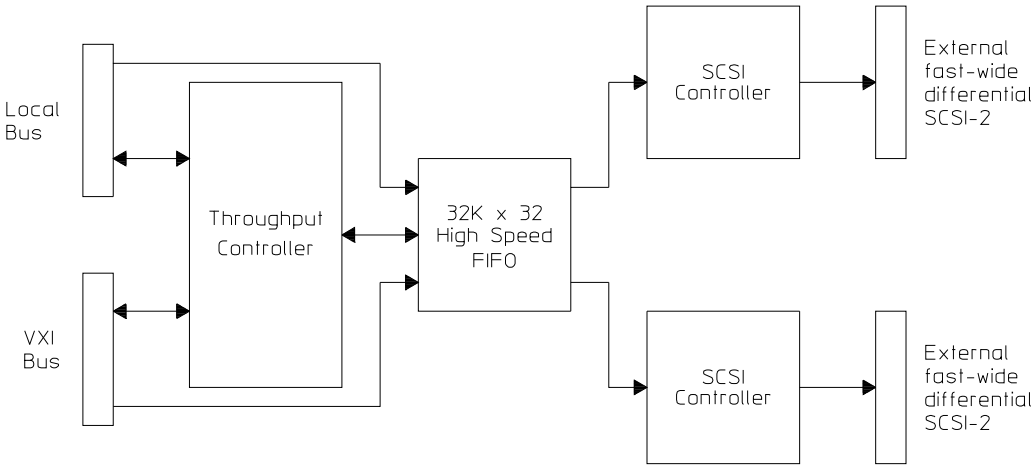


Figure 5-6: Block diagram of the HP E1562E Option IBD

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The following is a simplified block diagram of the HP E1562F. This module simply provides SCSI disks for data storage. Its disks must be written to by an HP E1562D/E. An example of this is shown in the chapter titled "Using the HP E1562."

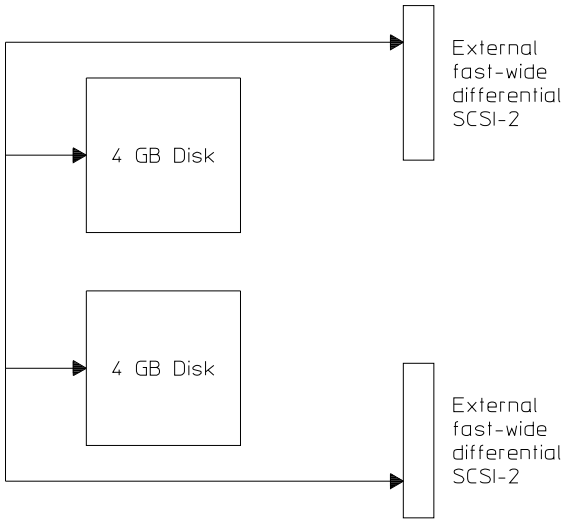


Figure 5-7: Block diagram of the HP E1562F, Standard Configuration

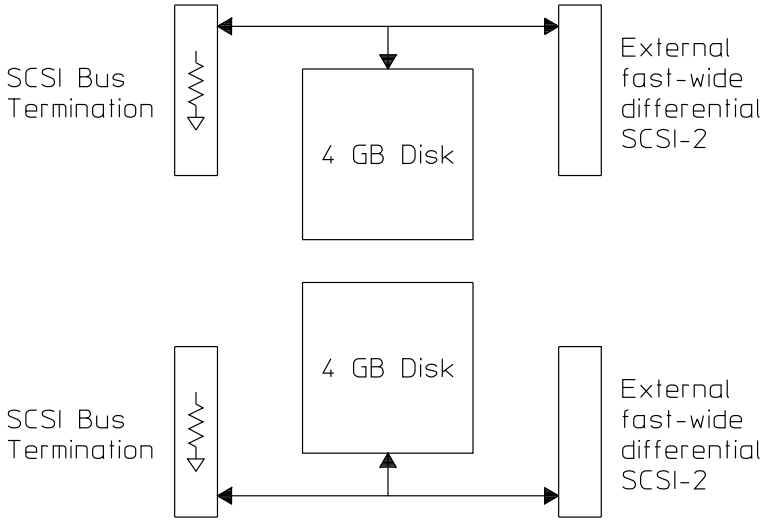


Figure 5-8: Block diagram of the HP E1562F, Alternate Configuration

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HP E1562 Front-panel Description

Status LEDs

- Failed
- Access
- Disk (HP E1562D)
- Disk A and Disk B (HP E1562E)
- In/Disk A and Out/Disk B (HP E1562F)
- Terminated (HP E1562F)
- Thru (HP E1562F)

The Disk LED lights when the corresponding disk is in use.

SCSI connectors

The HP E1562D has two SCSI connectors – SCSI A and SCSI B.

SCSI A is a single-ended (narrow) connector which can handle 10 MBytes of data per second. SCSI B is a differential-wide connector which can handle 20 MBytes of data per second. The HP E1562D uses both interfaces to increase the overall transfer rate.

On the HP E1562E both SCSI A and SCSI B are differential-wide SCSI connectors.

On the HP E1562D the built-in DAT appears on the upper part of the front panel.

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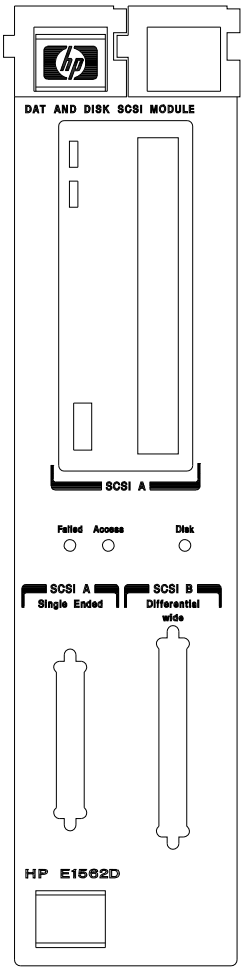


Figure 5-9: Front panel - HP E1562D

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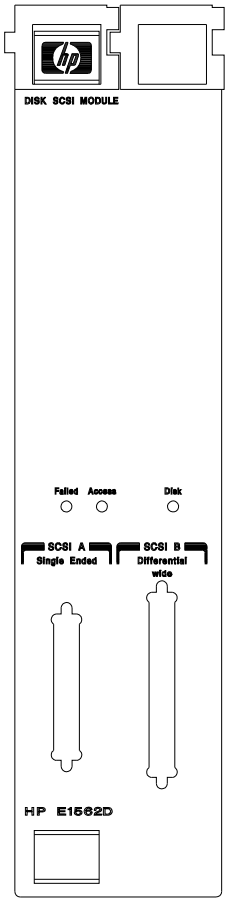


Figure 5-10: HP E1562D Option ICD

Front Panel - HP E1562D Option ICD

This front panel is the same as that of the HP E1562D described above except that it has no DAT.

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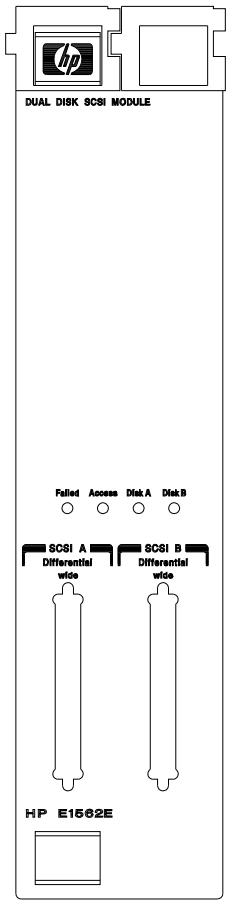


Figure 5-11: HP E1562E

Front Panel - HP E1562E

This front panel is the same as that of the HP E1562D described above except that it has no DAT; it has two disk LEDs (Disk A and Disk B); and both of its SCSI connectors are differential wide.

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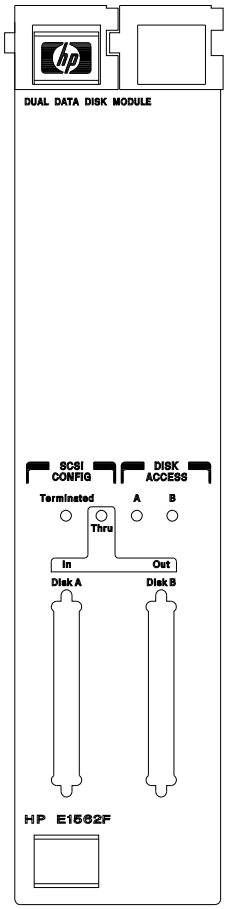


Figure 5-12: HP E1562F Front Panel

Front Panel - HP E1562F

This front panel is the same as that of the HP E1562D described above except that it has two disk LEDs (In/Disk A and Out/Disk B); and both of its SCSI connectors are differential wide. The Terminated and Thru LED's indicate the HP E1562F's configuration..

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6

Using the HP E1562

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VXI and SCPI

Note

The HP E1652F provides additional storage space to a VXI system with a SCSI controller, such as an HP E1562D/E. The HP E1562D/E is controlled by programming the SCSI controller. The HP E1652F does not respond to any commands on the VXI bus.

This chapter pertains to the HP E1562D/E.

Message-based VXI devices

The HP E1562 is a message-based VXI module. A message-based device is typically the most intelligent device of a VXIbus system. High performance instruments are typically available as message-based devices. Besides the basic configuration registers supported by the register-based devices, the message-based device has common communication elements and a Word Serial Protocol to allow ASCII-level communication with other message-based modules. This allows easier multi-manufacturer support, though at some sacrifice in speed to interpret the ASCII messages. Since the Word Serial Protocol mandates only a byte transfer per transition, which then must be interpreted by the onboard micro-prosessor message-based devices are typically limited to IEEE-488 speeds.

SCPI

In the past, systems instruments spoke many different languages. This caused test system developers to spend valuable time learning instrument control languages. Test program written using these languages were hard to modify, and the substitution of one instrument with another was nearly impossible.

There was obviously a need for standardization of instrument languages. To fill that need, HP took the lead in the definition and delivery of SCPI. SCPI (Standard Commands for Programmable Instruments) is a closely defined, but broadly accepted, standard instrument command language. SCPI has the advantage that test programmers need to learn only one language. Also, test programs written in SCPI can be easily understood and easily modified, and test systems can be easily upgraded.

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The VXI Registers

The HP E1562 is a message-based VXI device and cannot be programmed by way of registers like a register-based device. However, it does use the following VXI registers:

- Offset Register
- Status/Control Register
- Device Type Register
- ID/Logical Address Register
- Data Low Register
- Response/Data Extended Register
- Protocol/Signal Register

These registers are common to many VXI devices. Refer to VXI documentation for more information.

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Throughput Terminology

SCPI Commands

The following is an overview of the some of the capabilities of the HP E1562 which are controlled by SCPI commands. See the chapters titled "Programming the HP E1562 with SCPI" and "SCPI Command Reference" for details.

One group of commands begins with the command MMEMory. These are all commands which refer to mass storage capabilities. They are HP E1562 defined commands and not part of the SCPI standard.

The process by which the HP E1562 transfers data can be organized as shown in this illustration. Data for the individual devices is organized into *Transfer Units* (TUNITs) and *Sessions* which are controlled by *Sequences*. The following sections explain more about these terms.

Individual SCSI Devices

The HP E1562 provides two SCSI buses with a controller on each bus. The controller SCSI logical address is set by switches to SCSI address 4, 5, 6, or 7, but may be changed via the SYST:COMM:SCSI:SELF:ADDR command in case of an address conflict.

The MMEMory:SCSI subsystem provides a means of initializing and controlling a single SCSI device. The device may be a disk or a tape drive, but the commands are the same. Special configurations are set up using this subsystem. Higher level data Transfer Units are built using this lowest level entity — an individual device.

The subsystem which refers to devices is MMEMory:SCSI[1|2|...|30]. These are commands which refer to individual devices on a SCSI bus.

All commands in this subsystem refer to a single device. Commands are provided to open and close these devices as well as configure special aspects of these devices. Data reads and writes are *not* done using the MMEMory:SCSI commands. See the MMEMory:TUNit and MMEMory:SESSion commands for further explanation about how to completely configure the SCSI system on an HP E1562.

The MMEMory:SCSIx:* commands do *not* refer to a specific SCSI device depending upon the value of x. Instead the SCSI controller, logical address and logical unit are specified in the MMEMory:SCSIx:OPEN command. The letter x just provides a convenient means to refer to one of several open SCSI devices.

See the chapter titled "SCPI Command Reference" for more information.

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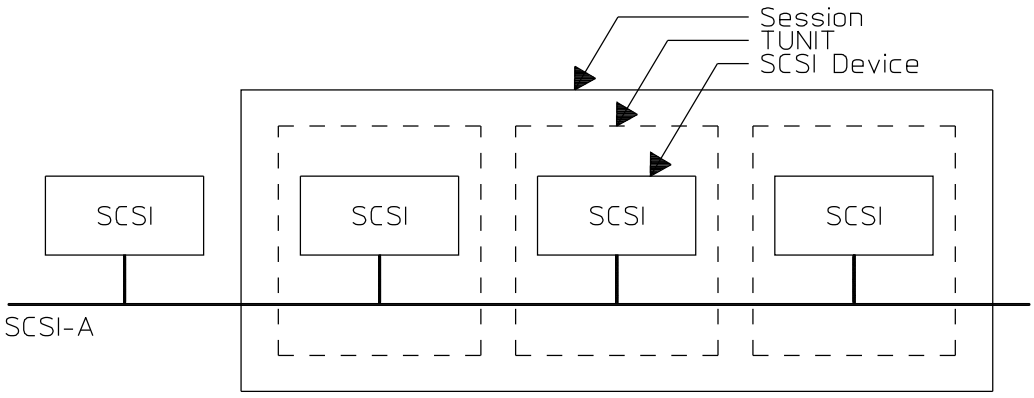


Figure 6-1: An example of SCSI devices, Sessions, and TUNITs

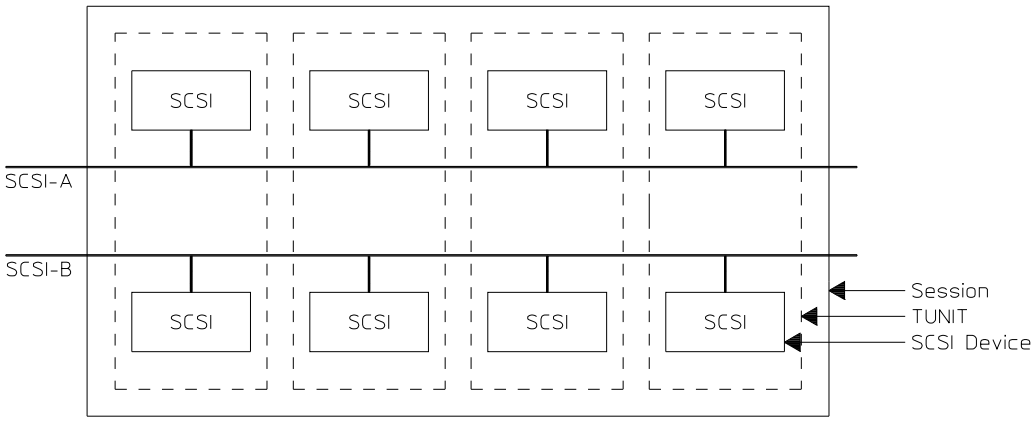


Figure 6-2: An example of SCSI devices, Sessions, and TUNITs

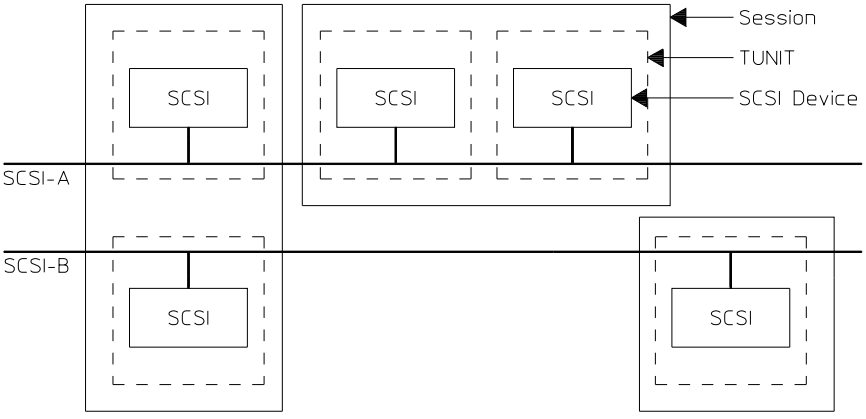


Figure 6-3: An example of SCSI devices, Sessions, and TUNITs

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Transfer Unit (TUNIT)

A Transfer Unit can refer to data from either one or two devices.

The subsystem which refers to Transfer Units is MMEMory:TUNit[1|2|...|15]. These are commands which refer to a simultaneous data transfer.

Since the HP E1562 provides a pair of SCSI buses and may contain two internal devices, a means is provided to send data to this pair of devices (one on each controller). The MMEMory:TUNIT subsystem informs the HP E1562 whether it will be transferring data from just a single device, or a pair of devices. When data is sent to a pair of devices, the throughput rate is twice that of a single device, but the data is "split" between the devices — two bytes to one device and two bytes to the other device. Special internal hardware makes it possible for these four bytes to be transferred at the same time for the highest possible throughput rate. In order to transfer data to/from a pair of devices, it is necessary for the SCSI blocksize to be the same for the two devices.

This subsystem refers to a continuous sequential stream of data. The name "TUNIT" means Transfer UNIT. This data may be transferring to/from a single SCSI device. Or for the HP E1562, a TUNIT may refer to data which is split across devices in such a way as to make the upper 16 bits of a 32 bit quantity go to one device and the lower 16 bits of the quantity go to another device. This type of data split requires that the two devices be on different SCSI controllers. This subsystem does *not* refer to data which is split in terms of blocks such that N logical blocks reside on device 1 and N blocks reside on device 2 or some more complicated scheme. See the MMEMory:SESSion commands for data which is split in this manner.

This subsystem was introduced to describe data split across the two SCSI controllers supported by the HP E1562. It is also a core element in creating a Session (see the MMEMory:SESSion subsystem).

See the chapter titled "SCPI Command Reference" for more information.

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Sessions and Striping

A Session provides the ability to combine one or more Transfer Units together into one logical data repository.

The subsystem which refers to Sessions is MMEMory:SESSion[1|2|3|4]. These are commands which refer to a complete repository of data.

The reason for using more than one Transfer Unit is to use more of the overall SCSI bandwidth by writing enough data to one (pair of) disks to fill up its cache, then switching to another (pair of) disks while the first one writes its data to its media. In this manner, several disks can be supported on each SCSI bus which increases the overall SCSI throughput. The MMEMory:SESSion subsystem is the main point of interaction when reading and writing data — it makes the number of disks involved in the data transfer transparent.

This subsystem describes how data is divided between one or more Transfer Units. Sessions using multiple Transfer Units will contain data which has N blocks on Transfer Unit 1, M blocks on Transfer Unit 2, and so on. This is called disk *striping*. Where a *TUNIT* describes a width-wise split, a *Session* describes a length-wise split. Sessions are useful in very high speed throughputs as a means of keeping several slower devices busy at the same time. For instance, the wide SCSI bus has a maximum data transfer rate of 20 Mbytes per second. However, most disks have a maximum continuous transfer rate to media of ~2.5 Mbytes per second. It is easy to see that by using the cache on the disk, data split across several disks could attain a higher overall throughput than data written to a single disk.

Disk striping can also be used to optimize disk storage. For an example see figure 6-2. Using only one pair of SCSI devices would allow 8 GBytes of storage. Striping allows the data to be spread across four pairs of devices for a total of 32 GBytes.

In most cases throughputs and playbacks require both a Sequence and a Session. A Session is required for all reads and writes including throughputs and playbacks. However, a simple throughput from a single non-LBUS device or a non-LBUS playback can be done without a Sequence.

During a throughput Sequence using multiple Transfer Units, each Transfer Unit will have a specified number of logical blocks written to it before switching to the next Transfer Unit in the Session. When the last Transfer Unit in the Session has completed its set of logical blocks, the first Transfer Unit is again accessed.

There are some constraints upon Sessions which are difficult to describe in the individual command descriptions. The first constraint is that every Transfer Unit in a Session must have the same number of SCSI devices in it. The second constraint is that if each Transfer Unit is made up of only a single device, each device must be on the same SCSI controller. An error will be returned from the MMEMory:SESSion:ADD command if these constraints are not followed.

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It is also important to know the cache size of the disks the data is being written to. For the disks included in the HP E1562, the cache size is 256 kBytes. This means that the parameter <Count> in the MMEMory:SESSion:ADD command should be no more than 512 blocks for one disk or 1024 blocks for a pair of disks. A count larger than this would require that the disk be read more often and slow down the data transfer.

See the chapter titled “SCPI Command Reference” for more information.

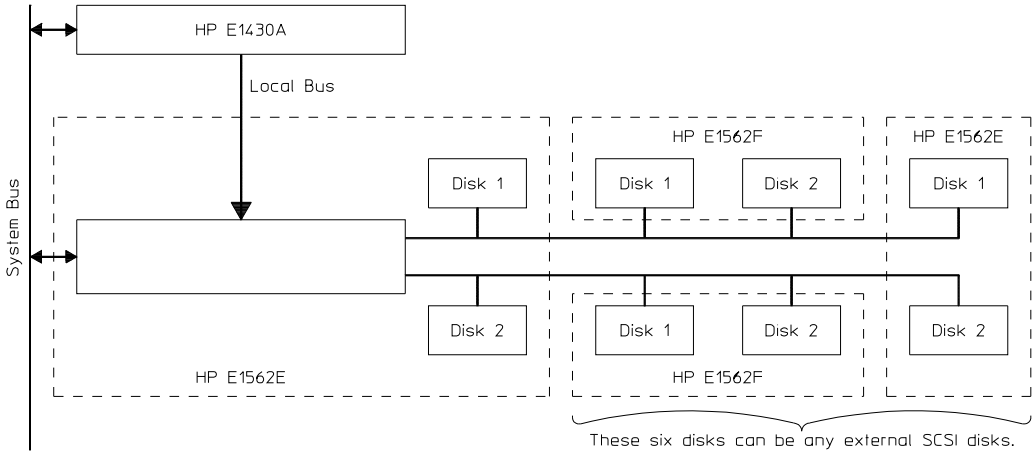


Figure 6-4: Example of disk striping - schematic view

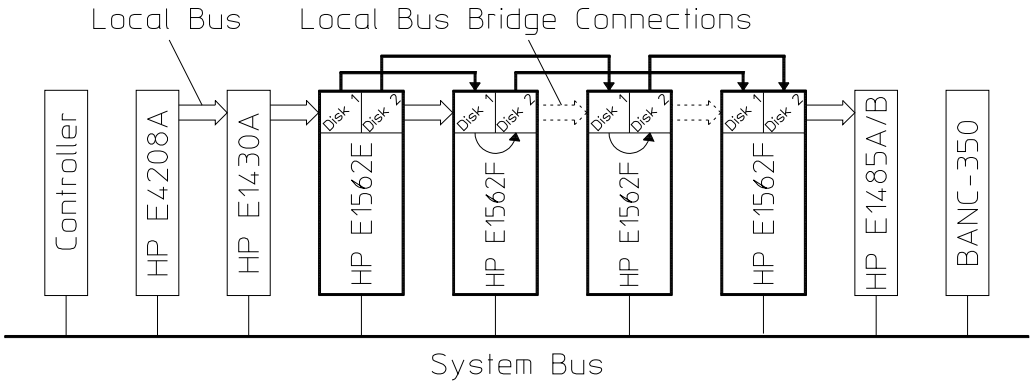


Figure 6-5: Example of disk striping - view representing modules in mainframe

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Sequence

A Sequence specifies the order of operations for a throughput or playback Session.

The subsystem which refers to Sequences is SEQuence[1|2|3|4]. These are commands which provide a means to specify a complex throughput or playback.

The SEQuence subsystem is used to specify the order of operations for a throughput or playback Session. This list of operations may contain data transfer requests from both the local bus and the VME bus in throughput Sequences, but may contain only VME or LBUS data transfers upon playback. Synchronization and control operations are provided for both throughput and playback.

The fields contained in every element of the Sequence list are: operation, count, address, and miscellaneous. The operation field specifies the action to be done: data transfer, synchronization, or control. The count field is used by many operations to indicate how many operation units will be transferred. The unit of count is sometimes bytes and sometimes blocks — see the description of the operation to determine which. The address field is used by operations which do VME data transfers. The value of address is an offset from the beginning of one of the address spaces. The miscellaneous field has various meanings depending upon the operation. Not every operation uses all fields, but every Sequence element contains all four fields. Fields which are not used should be set to zero.

A Session must be initialized before starting a Sequence. See the MMEMory:SESSion subsystem.

The behavior of a Sequence is undefined if a throughput operation is requested in a playback Sequence or vice versa. It is also undefined if an LBUS playback operation is included in a VME playback Sequence.

SEQuence is *not* a SCPI supported subsystem.

The Sequence operations which are labeled as utility, may be used in either playback or throughput Sequences. They are intended to help provide synchronization between the Sequence and the devices which are generating/receiving the data.

See the chapter titled “Using Sequence Operations with the HP E1562" for details on using Sequence commands.

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Operation Status Register

The subsystem which refers to the operation status register is STATus:OPERation. These are commands which provide the necessary commands to interface with the operation register.

For more information about the operation status register and other status registers, see the chapter titled "Programming the HP E1562 with SCPI."

LIF Directories and Files

This diagram represents the way files are laid out on a disk or tape using the LIF format (Logical Interchange Format). The first field, the volume label, references the directory which follows. The directory contains a number of entries each of which references one of the user files, which are on the remainder of the disk or tape.

For more information about LIF functions see the chapter titled: "Using the LIF Library with the HP E1562."

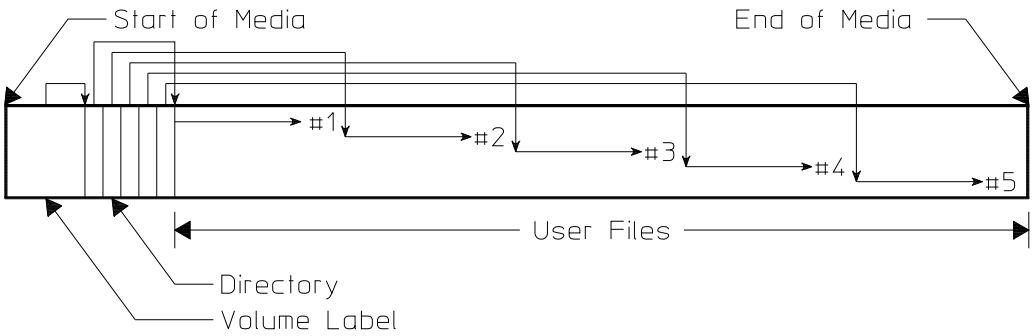


Figure 6-6: Logical Interchange Format - media layout

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Address Space

The VXI system architecture defines three types of address space. A16 space consists of 64 KBytes, A24 is 16 MBytes, and A32 is 4 GBytes.

The HP E1562 has access to A16, A24, and A32 space through a 16-bit port. Or, if devices support it, it can also use a 32-bit port using D32. The type of VME cycle performed depends on the type of processor cycle (2 cycles for 16-bit or 1 cycle for 32-bit).

Shared Memory

Shared memory provides a way for the HP E1562 to transfer data to a controller. The shared memory in the HP E1562 is mapped to the A24 VXI address space. The controller can then access that same address space to receive or write data. Note that if SCPI commands or Sequences refer to shared memory in the HP E1562, the addresses begin at zero. However if they refer to shared memory in the A24 space, they may begin at a different value, depending on how the A24 memory has been allocated among devices.

TTLTRG

TTLTRG consist of eight lines on the VXI backplane on connector P2. They are available to provide synchronization between devices. The HP E1562 can use the TTLTRG lines for simple communication with other devices. For example, it can wait for a line to go high before taking an action, or it can assert a line as a signal to another device.

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The HP E1562 Throughput/Playback Process

Acquisition

Local Bus

The illustration below shows the HP E1562 acquiring 24 channels of dynamic data over the local bus. Each HP E1431A module takes in eight channels of data and sends it to the HP E1562 over the local bus. In this example the HP E1562B places the data in its two disk drives.

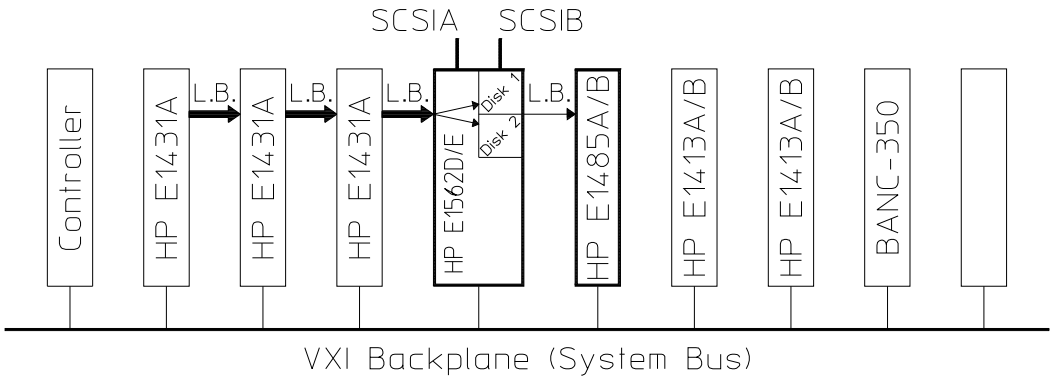


Figure 6-7: Data acquisition using the local bus

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System Bus

This is a generalized illustration of the HP E1562 acquiring data over the System Bus.

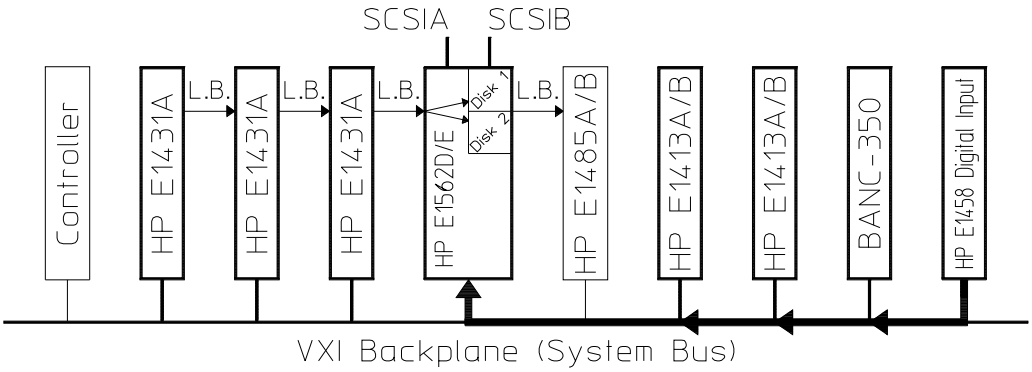


Figure 6-8: Data acquisition using the VXI system bus

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Mixed System Bus and Local Bus

In this process the HP E1562 combines the data from the two busses prior to storing it on the disk.

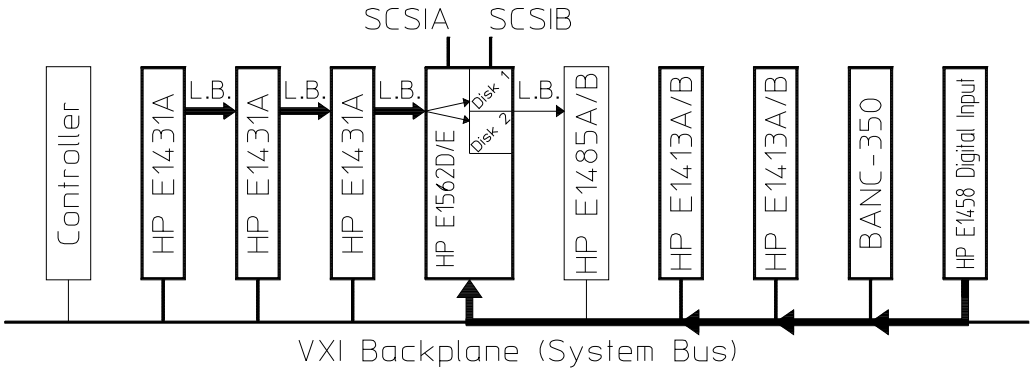


Figure 6-9: Data acquisition using the VXI system bus and the local bus

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Monitoring the Local Bus during Throughput

In this example, the HP E1562 copies a subset of the channels from the local bus to the system bus. The data is then monitored over the system bus by a controller.

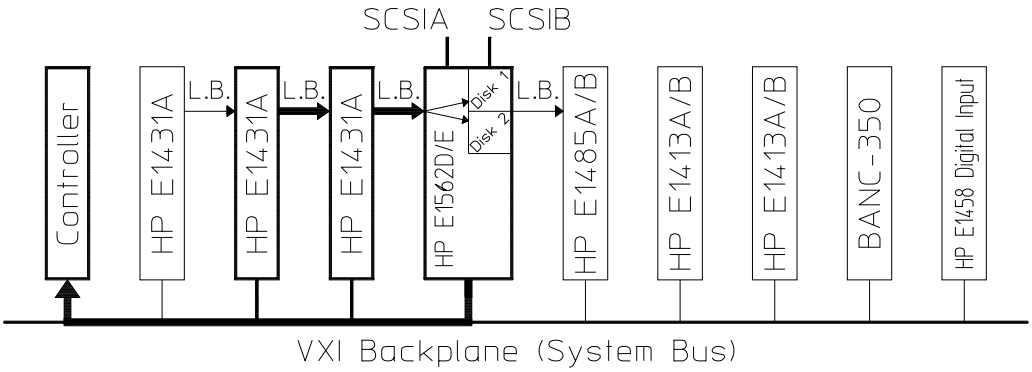


Figure 6-10: Monitoring during local bus throughput

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Monitoring the System Bus during Throughput (using CVT)

The HP E1413A FIFO is accessed for real-time acquisition of all data to the HP E1562 data disk. The HP E1413A Current Value Table (CVT) is monitored by the controller. The HP E1562 cannot provide data to be monitored.

Monitoring by way of the Current Value Table allows higher bandwidth compared to monitoring the local bus. A disadvantage is that some samples may be missed, but for many applications this is not be a problem.

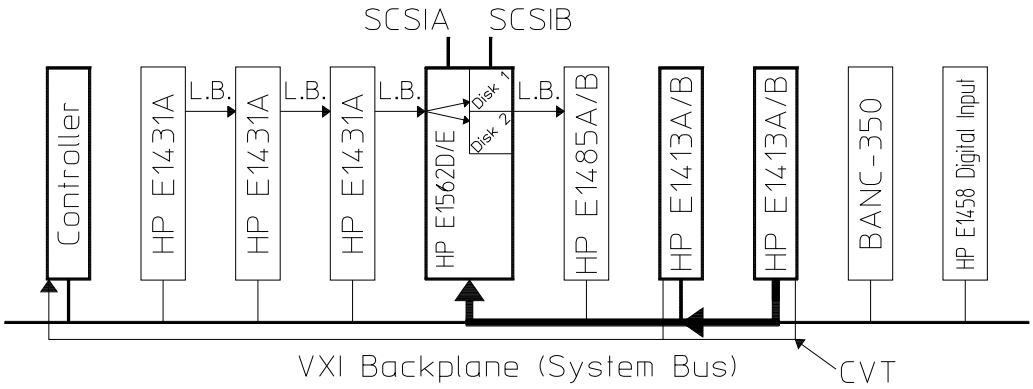


Figure 6-11: Monitoring during system bus throughput (using CVT)

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Monitoring the System Bus during Throughput (via the HP E1562D/E)

In this method of monitoring, all data input by the HP E1562 is "reflected" back out by way of the System Bus for monitoring purposes. The destination for the data could be controller-shared memory.

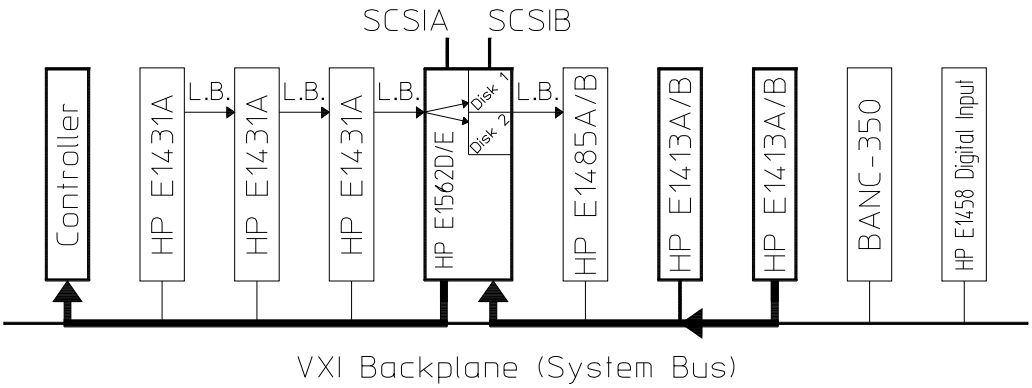


Figure 6-12: Monitoring during system bus throughput (via the HP E1562D/E)

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Data flow

An example of data flow in a system using the HP E1562 is shown below. In this example a system is set up using eight HP E1413B scanning ADC (Analog-to-Digital Converter) cards to acquire input and send it to a HP E1562E.

The following diagram illustrates the data flow in this system.

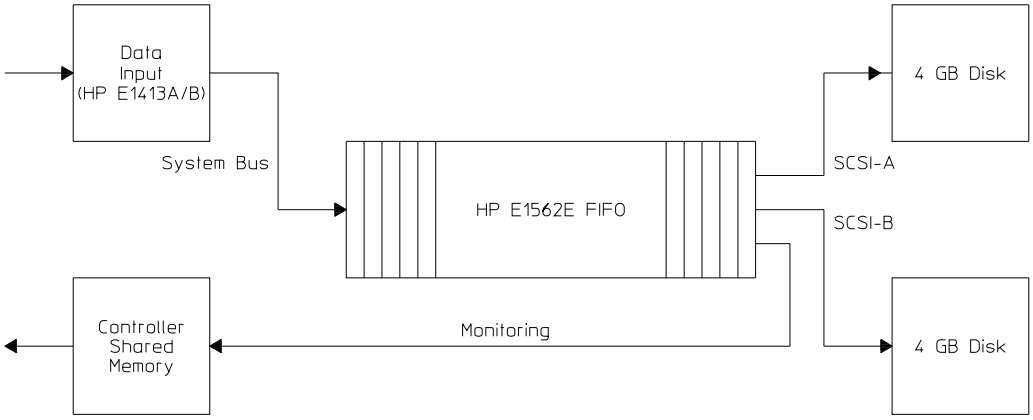


Figure 6-13: Data flow

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Throughput Directly to an External Digital Recorder

This configuration requires the HP E1562D Option ICD which has a single disk drive and no internal DAT. Data from the four HP E1431A modules is input to the HP E1562D. The HP E1562D then outputs the data from its SCSI A (Single-ended SCSI) connector to an External Digital Recorder.

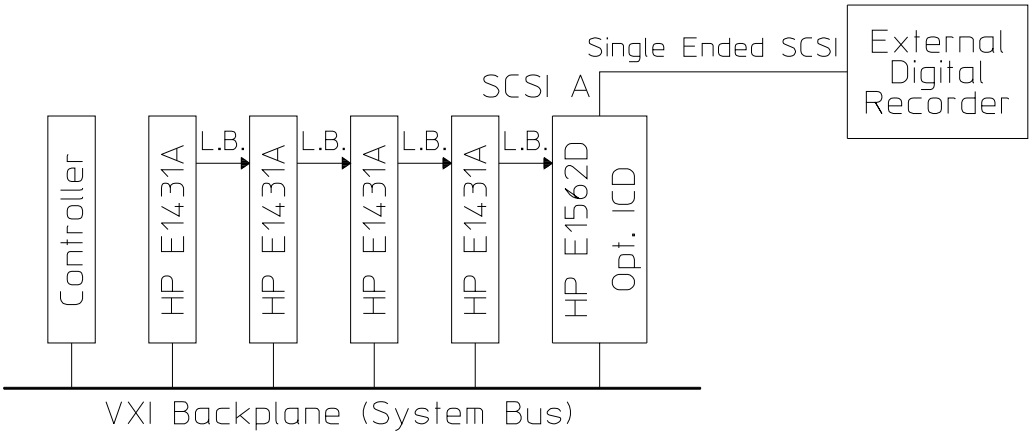


Figure 6-14: Throughput Directly to an External Digital Recorder (using the HP E1562D Option ICD)

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Post-processing

In post-processing we can use a Sequence to unwind the data from the disk in the same order as the corresponding acquisition Sequence.

Post-processing using the HP 1485A/B VXI Signal Processor

In this example the HP 1485A/B VXI Signal Processor reads data from the HP E1562 using the local bus.

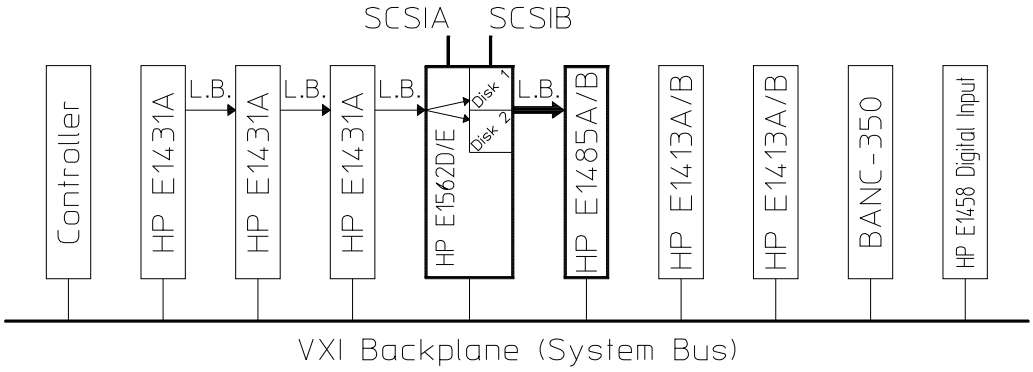


Figure 6-15: Data post-processing using the HP 1485A/B

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Post-processing using an embedded host

The data can be transferred in several ways. The controller can read the data from the HP E1562 disks via shared memory, or directly via SCPI commands. Or, the HP E1562 can place the data directly into the controller's shared memory. The controller can then transfer the data into its own local memory.

Shared memory is memory space in the controller and in the HP E1562 which can be accessed by both modules.

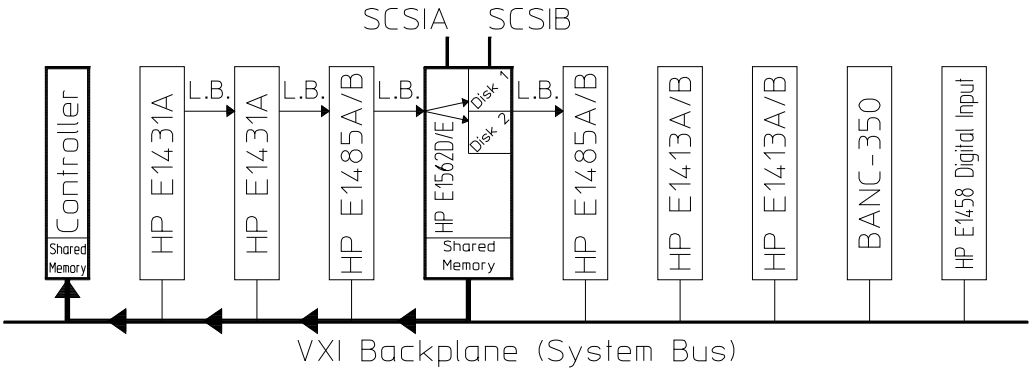


Figure 6-16: Data post-processing using an embedded host controller

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Pre-processing using the HP 1485A/B VXI Signal Processor

Using the local bus, the HP 1485A/B VXI Signal Processor can act as a pre-processor for data which is destined for the HP E1562 data disk.

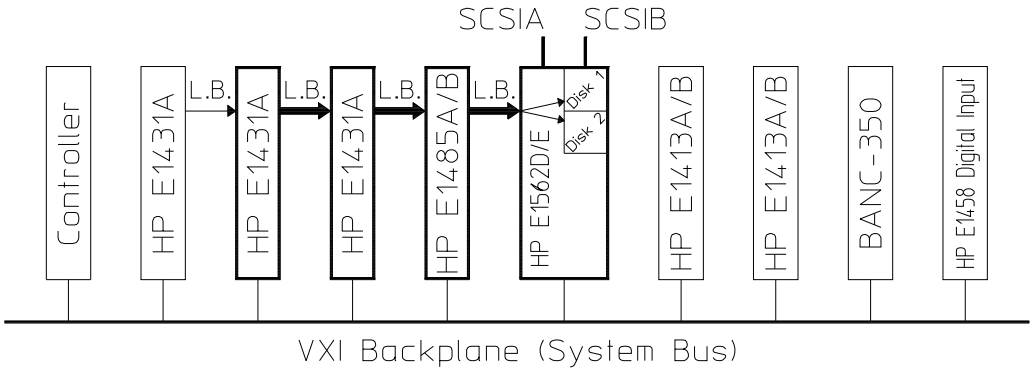


Figure 6-17: Data pre-processing using the HP 1485A/B

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Backup

Backup via Local Bus

Data may be sent up to the host controller after first passing through the HP 1485A/B VXI Signal Processor for preliminary processing.

The archive shown in the diagram can be disk or tape.

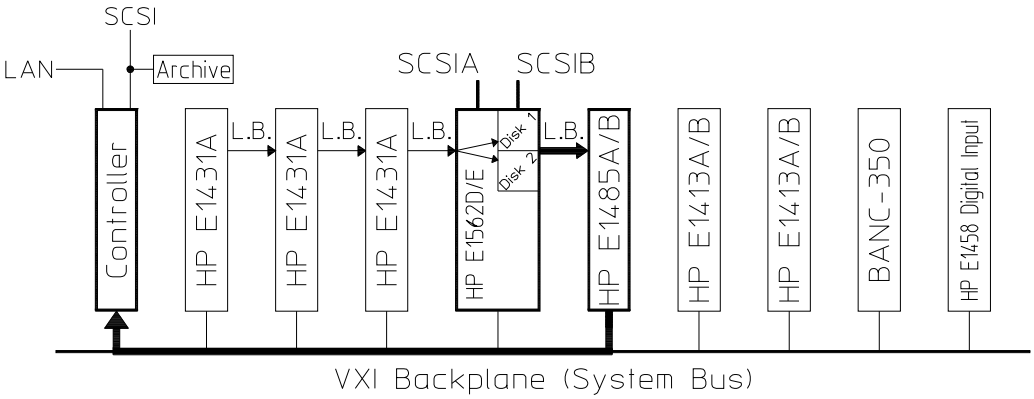


Figure 6-18: Backup via local bus and post-processing

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Backup via System Bus (VME)

A throughput Session may be directly backed up to the host controller. This is the same as the data post-processing using an embedded host controller, described above.

From the controller, the data can be archived to disk or tape.

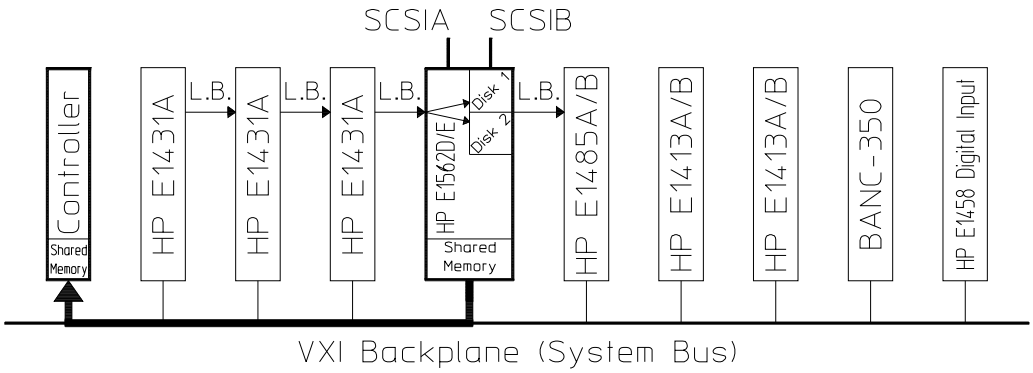


Figure 6-19: Backup via system bus

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Backup to DAT

A command can be issued to copy a throughput Session which has been saved on the disk drive to digital audio tape (DAT). This applies to the HP E1562D only. The HP E1562D can save to its own internal DAT or an external DAT.

The SCPI command used for backup is MMEMory:SESSion:COPY. See the chapter titled “SCPI Command Reference” for more information.

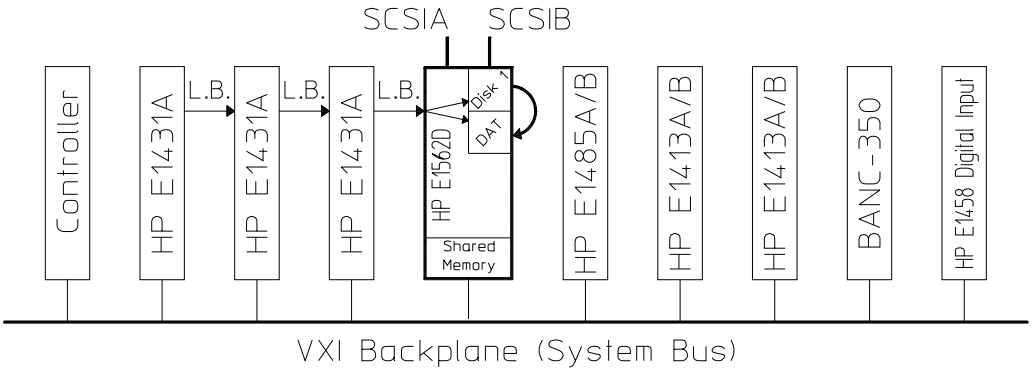


Figure 6-20: Backup disk file to DAT

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Backup to Host via SCSI

This figure illustrates copying a throughput Session to the host controller via SCSI. If the throughput Session has been formatted with LIF, and exists on a single SCSI device, then that device may be mounted under HP-UX, and the file copied out under control of the host computer.

For this type of backup the host must have a differential-wide SCSI-2 interface and that data must be sent to a LIF file.

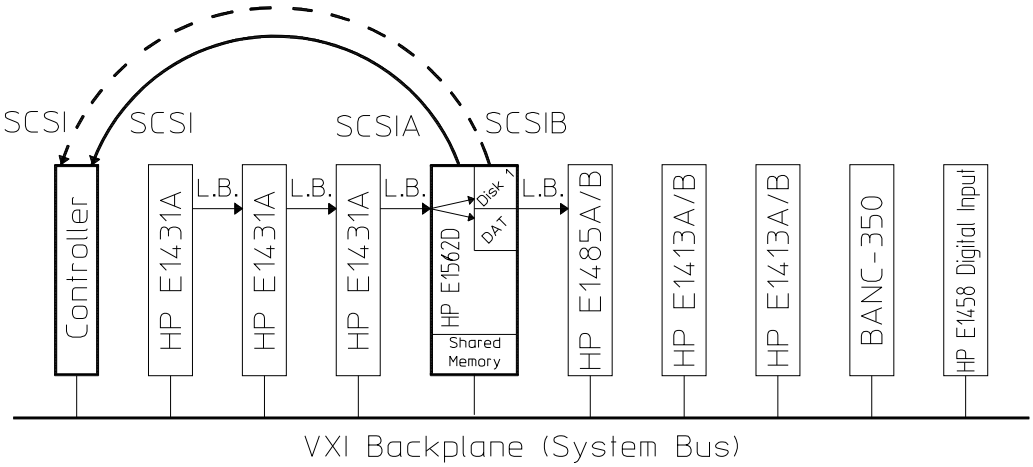


Figure 6-21: Backup to host via SCSI

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Copying a Split Session to One Disk File

You can copy a split Session, (a TUNIT split between two SCSI disk drives), to a Session on a single disk.

In the example shown here, data from the two disks of a HP E1562E is placed on one of the disks. An alternative is to send the combined data to an external disk, which could then be used as a backup file for the Session.

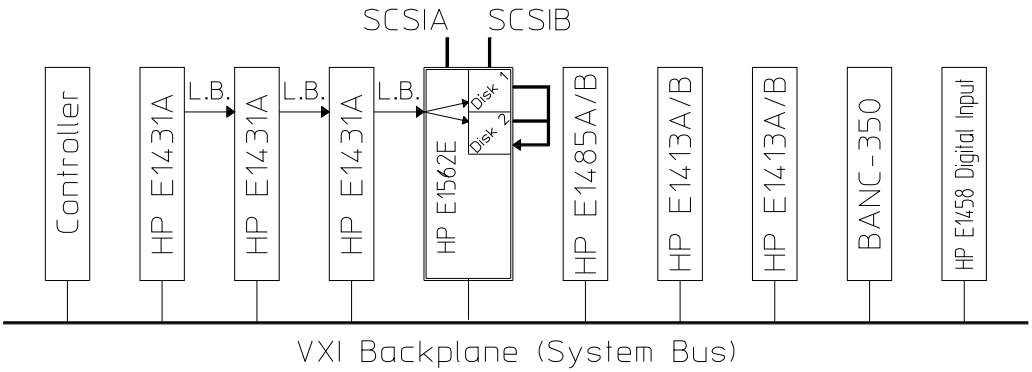


Figure 6-22: Copying a split Session

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7

Using Sequence Operations with the HP E1562

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Sequence Overview

Note

The HP E1652F provides additional storage space to a VXI system with a SCSI controller, such as an HP E1562D/E. The HP E1562D/E is controlled by programming the SCSI controller. The HP E1652F does not respond to any commands on the VXI bus.

This chapter pertains to the HP E1562D/E.

What is a Sequence?

Sequence operations are your primary method of transferring data to or from HP E1562 Sessions on either the Local Bus or the VXI System Bus. A Sequence is a list of data transfer operations which are performed repeatedly until an entire throughput or playback is complete. Throughput Sequences may contain operations which transfer data from the Local and/or VXI Bus to a Session which consists of one or more SCSI devices. Playback Sequences contain operations which transfer data from the Session to either the Local or the VXI Bus, but not to both. Sequences may also contain synchronization and control operations. See the chapter, “Using the HP E1562” in this book for an overview of the HP E1562 and explanation of these terms.

Four Sequences may be defined in Sequence memory at any one time but only one can run at a time. An individual Sequence may perform either throughput or playback operations but throughput and playback operations may not be mixed in an individual Sequence. The behavior of a Sequence is undefined if a throughput operation is requested in a playback Sequence or vice versa. The behavior is also undefined if both VXI and Local Bus playback operations are included in a Sequence.

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How are Sequences and SCPI related?

Sequences are defined by SCPI commands but you may run them either independently or within a SCPI program. You may notice that SCPI commands exist which may also be used to throughput and playback data to the HP E1562. In some cases the data transfer could be accomplished either with SCPI commands (`MMEMory:SESSion:READ`:* and `MMEMory:SESSion:WRITE`:*) or with Sequence operations (Lbus Consume, Lbus Generate, Throughput, and Playback). You will find that Sequences provide an easier way (and in some cases the only way) to perform complex throughput and playback operations.

It is best to use Sequences for nearly all throughput operations because of the ability of Sequences to handle large data transfers and multiple devices. SCPI throughput commands are limited to small amounts of data with a single device.

You may use either SCPI commands or Sequences to playback data which involves all of the data from a Session. However, you must use Sequences for any playback operations which involve only parts of the data (such as one channel from multiple-channel data).

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Creating Sequences

Adding Sequence elements

Sequences are defined by an instrument-specific SCPI subsystem. All the Sequence operations documented in this chapter are implemented by using the SCPI command:

SEQuence[1|2|3|4]:ADD <Operation>,<Count>,<Address>,<Misc>

Each time this command is issued an element representing one operation is added to the end of the Sequence queue in memory. The maximum number of operations in a single sequence is 100.

It is normally more convenient to define Sequence operations programmatically, so that a Sequence may be altered by changing the program and re-executing it. By creating a SCPI program to define the Sequence, you will be able to alter the Sequence more easily.

If the Sequence number [1|2|3|4] is not specified the Sequence element is added to Sequence 1.

Required fields

Every Sequence element requires that all four fields: (<Operation>,<Count>,<Address>,<Misc>) be filled though not every operation uses all fields. For some Sequence operations certain fields represent two pieces of information as indicated in the Sequence operation descriptions.

The `<Operation>` field specifies what type of action will take place: data transfer, synchronization, or control. This value corresponds to the code listed in the the programming reference section of this chapter for the specific type of operation.

The `<Count>` field is used by many operations to indicate how many units will be transferred. The unit of <Count> may be either bytes or blocks, as indicated in the description of each operation. For some Sequence operations this field represents two pieces of information as indicated in the Sequence operation descriptions.

The `<Address>` field is used mainly by operations which transfer data over the VXI System Bus. The value of `<Address>` is an offset from the beginning of one of the address spaces. The Shared RAM space is local to the HP E1562.

The miscellaneous `<Misc>` field has various meanings depending on the operation.

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Accepted Field Values

Field values must be specified as numeric values. All decimal representations, including signs, decimal points, and scientific notation are accepted as field values:

123, 123E2, -123, -1.23E2, .123, 1.23E-2, 1.23000E-01

Note, however, that negative numbers will generate an error and fractional values will be automatically rounded to the nearest integer.

The fields may be specified in decimal, hex, octal, or binary:

123, #h7B, #q173, #b1111011

Related SCPI commands

Other SCPI commands in addition to SEQuence:ADD which can or must be used with relation to Sequence operations are documented in detail in the SCPI programming section of this book. These commands include:

- MMEMory:SCSI, MMEMory:TUNit, and MMEMory:SESSion. These subsystems which must be used to initialize the a Session before starting a Sequence.
- SEQuence:BEGin which starts Sequence execution.
- SEQuence:DELete:ALL which deletes all operations from the current Sequence list. This command should be sent before adding elements to a Sequence.
- SEQuence:SIZE? which returns the number of elements in the Sequence.

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Sequence Quick Reference

Operation	Code (hex)	Count	Address	Misc
Control operations				
Do nothing	0000	N/A	N/A	N/A
Terminate Sequence	0001	N/A	N/A	N/A
Pause N msec	0002	Milliseconds	N/A	N/A
Pause N loops	000a	Loops	N/A	N/A
Execute new Sequence	0004	Seq nbr	N/A	N/A
New Sequence if count	0005	Seq nbr	MSB	LSB
TTLTRG control	0003	Bit field	N/A	N/A
TTLTRG arm	0006	Bit field	N/A	N/A
TTLTRG wait	0007	Bit field	N/A	N/A
IRQ arm	0008	Bit field	N/A	N/A
IRQ wait	0009	Bit field	N/A	N/A
Local bus throughput operations				
Lbus Consume	1000	Lbus blocks	N/A	Lbus width-Bytes/block
Lbus Eavesdrop	1001	Lbus blocks	N/A	Lbus width-Bytes/block
Lbus Consume Pipe	1002	Blks pass Blks consume	N/A	Lbus width-Bytes/block
Lbus Eavesdrop Pipe	1003	Blks pass Blks eaves	N/A	Lbus width-Bytes/block
Lbus Consume Continuous	1100	Lbus blocks	N/A	Lbus width-Bytes/block
Lbus Eavesdrop Continuous	1101	Lbus blocks	N/A	Lbus width-Bytes/block
Lbus Consume Pipe Continuous	1102	Blks pass Blks consume	N/A	Lbus width-Bytes/block
Lbus Eavesdrop Pipe Continuous	1103	Blks pass Blks eaves	N/A	Lbus width-Bytes/block
Local bus playback operations				

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Operation	Code (hex)	Count	Address	Misc
Lbus Generate	2000	Lbus blocks	N/A	Lbus width-Bytes/block
Lbus Append	2001	Lbus blocks	N/A	Lbus width-Bytes/block
VXI bus throughput operations				
Throughput A16 Buff 16	3000	Transfer bytes	A16 address	N/A
Throughput A16 Buff D32	3002	Transfer bytes	A16 address	N/A
Throughput A24 Buff 16	3003	Transfer bytes	A24 address	N/A
Throughput A24 Buff D32	3005	Transfer bytes	A24 address	N/A
Throughput A32 Buff 16	3006	Transfer bytes	A32 address	N/A
Throughput A32 Buff D32	3008	Transfer bytes	A32 address	N/A
Throughput A16 FIFO 16	3009	Transfer bytes	A16 address	N/A
Throughput A16 FIFO 32	300A	Transfer bytes	A16 address	N/A
Throughput A16 FIFO D32	300B	Transfer bytes	A16 address	N/A
Throughput A24 FIFO 16	300C	Transfer bytes	A24 address	N/A
Throughput A24 FIFO 32	300D	Transfer bytes	A24 address	N/A
Throughput A24 FIFO D32	300E	Transfer bytes	A24 address	N/A
Throughput A32 FIFO 16	300F	Transfer bytes	A32 address	N/A
Throughput A32 FIFO 32	3010	Transfer bytes	A32 address	N/A
Throughput A32 FIFO D32	3011	Transfer bytes	A32 address	N/A
Throughput Shared RAM	3012	Transfer bytes	RAM address	N/A
Throughput Dummy Bytes	3100	Pad bytes	N/A	N/A
VXI bus playback operations				
Playback A16 Buff 16	4000	Transfer bytes	A16 address	N/A
Playback A16 Buff D32	4002	Transfer bytes	A16 address	N/A
Playback A24 Buff 16	4003	Transfer bytes	A24 address	N/A
Playback A24 Buff D32	4005	Transfer bytes	A24 address	N/A
Playback A32 Buff 16	4006	Transfer bytes	A32 address	N/A
Playback A32 Buff D32	4008	Transfer bytes	A32 address	N/A
Playback A16 FIFO 16	4009	Transfer bytes	A16 address	N/A

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Operation	Code (hex)	Count	Address	Misc
Playback A16 FIFO 32	400A	Transfer bytes	A16 address	N/A
Playback A16 FIFO D32	400B	Transfer bytes	A16 address	N/A
Playback A24 FIFO 16	400C	Transfer bytes	A24 address	N/A
Playback A24 FIFO 32	400D	Transfer bytes	A24 address	N/A
Playback A24 FIFO D32	400E	Transfer bytes	A24 address	N/A
Playback A32 FIFO 16	400F	Transfer bytes	A32 address	N/A
Playback A32 FIFO 32	4010	Transfer bytes	A32 address	N/A
Playback A32 FIFO D32	4011	Transfer bytes	A32 address	N/A
Playback Shared RAM	4012	Transfer bytes	RAM address	N/A
Playback Bit Bucket	4100	Discard bytes	N/A	N/A
Local bus throughput operations with monitor				
Lbus Consume Monitor Shared RAM	5000	Lbus blocks	RAM address	Lbus width-Bytes/block
Lbus Eavesdrop Monitor Shared RAM	5001	Lbus blocks	RAM address	Lbus width-Bytes/block
Lbus Consume Pipe Monitor Shared RAM	5002	Blks pass Blks consume	RAM address	Lbus width-Bytes/block
Lbus Eavesdrop Pipe Monitor Shared RAM	5003	Blks pass Blks eaves	RAM address	Lbus width-Bytes/block
Lbus Consume Monitor A24	5014	Lbus blocks	A24 address	Lbus width-Bytes/block
Lbus Eavesdrop Monitor A24	5015	Lbus blocks	A24 address	Lbus width-Bytes/block
Lbus Consume Pipe Monitor A24	5016	Blks pass Blks consume	A24 address	Lbus width-Bytes/block
Lbus Eavesdrop Pipe Monitor A24	5017	Blks pass Blks eaves	A24 address	Lbus width-Bytes/block
VXI throughput operations with monitor				
Throughput Shared RAM Monitor Shared RAM	3812	Monitor bytes	RAM address	RAM address
Throughput Shared RAM Monitor A24 Buff D32	3912	Monitor bytes	RAM address	A24 address
Throughput Shared RAM Monitor A24 Buff	3a12	Monitor bytes	RAM address	A24 address
Throughput A16 FIFO D32 Monitor Shared RAM	380b	Monitor bytes	A16 address	RAM address
Throughput A16 FIFO D32 Monitor A24 Buff D32	390b	Monitor bytes	A16 address	A24 address
Throughput A16 FIFO D32 Monitor A24 Buff	3a0b	Monitor bytes	A16 address	A24 address
Throughput A16 FIFO16 Monitor Shared RAM	3809	Monitor bytes	A16 address	RAM address

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	Operation	Code (hex)	Count	Address	Misc
	Throughput A16 FIFO16 Monitor A24 Buff D32	3909	Monitor bytes	A16 address	A24 address
	Throughput A16 FIFO16 Monitor A24 Buff	3a09	Monitor bytes	A16 address	A24 address
	Throughput A16 Buff 16 Monitor Shared RAM	3800	Monitor bytes	A16 address	RAM address
	Throughput A16 Buff 16 Monitor A24 BuffD32	3900	Monitor bytes	A16 address	A24 address
	Throughput A16 Buff 16 Monitor A24 Buff	3a00	Monitor bytes	A16 address	A24 address
	Throughput A16 Buff D32 Monitor Shared RAM	3802	Monitor bytes	A16 address	RAM address
	Throughput A16 Buff D32 Monitor A24 Buff D32	3902	Monitor bytes	A16 address	A24 address
	Throughput A16 Buff D32 Monitor A24 Buff	3a02	Monitor bytes	A16 address	A24 address
	Throughput A24 FIFO D32 Monitor Shared RAM	380e	Monitor bytes	A24 address	RAM address
	Throughput A24 FIFO D32 Monitor A24 Buff D32	390e	Monitor bytes	A24 address	A24 address
	Throughput A24 FIFO D32 Monitor A24 Buff	3a0e	Monitor bytes	A24 address	A24 address
	Throughput A24 FIFO 16 Monitor Shared RAM	380c	Monitor bytes	A24 address	RAM address
	Throughput A24 FIFO 16 Monitor A24 Buff D32	390c	Monitor bytes	A24 address	A24 address
	Throughput A24 FIFO 16 Monitor A24 Buff	3a0c	Monitor bytes	A24 address	A24 address
	Throughput A24 Buff 16 Monitor Shared RAM	3803	Monitor bytes	A24 address	RAM address
	Throughput A24 Buff 16 Monitor A24 Buff D32	3903	Monitor bytes	A24 address	A24 address
	Throughput A24 Buff 16 Monitor A24 Buff	3a03	Monitor bytes	A24 address	A24 address
	Throughput A24 Buff D32 Monitor Shared RAM	3805	Monitor bytes	A24 address	RAM address
	Throughput A24 Buff D32 Monitor A24 Buff D32	3905	Monitor bytes	A24 address	A24 address
	Throughput A24 Buff D32 Monitor A24 Buff	3a05	Monitor bytes	A24 address	A24 address
Synchronization operations					
	Wait Bit Set A16	6000	Bit mask	A16 address	Loops
	Wait Bit Clear A16	6001	Bit mask	A16 address	Loops
	Wait Bit Set A24	6002	Bit mask	A24 address	Loops
	Wait Bit Clear A24	6003	Bit mask	A24 address	Loops
	Wait Bit Set A32	6004	Bit mask	A32 address	Loops
	Wait Bit Clear A32	6005	Bit mask	A32 address	Loops
	Wait Bit Set Shared RAM	6006	Bit mask	RAM address	Loops

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Operation	Code (hex)	Count	Address	Misc
Wait Bit Clear Shared RAM	6007	Bit mask	RAM address	Loops
Wait A16 Count 16	6008	16 bit value	A16 address	Loops
Wait A24 Count 16	6009	16 bit value	A24 address	Loops
Wait A32 Count 16	600A	16 bit value	A32 address	Loops
Wait Count Shared RAM 16	600B	16 bit value	RAM address	Loops
Wait A16 Count 32	600C	32 bit value	A16 address	Loops
Wait A24 Count 32	600D	32 bit value	A24 address	Loops
Wait A32 Count 32	600E	32 bit value	A32 address	Loops
Wait Count Shared RAM 32	600F	32 bit value	RAM address	Loops
Wait FIFO Empty	6010	N/A	N/A	N/A
Wait FIFO Half Empty	6011	N/A	N/A	N/A
Control A16 Reg16	6018	N/A	A16 address	Value
Control A24 Reg16	6019	N/A	A24 address	Value
Control A32 Reg16	601A	N/A	A32 address	Value
Control Reg Shared RAM 16	601B	N/A	RAM address	Value
Control A16 Reg 32	601C	N/A	A16 address	Value
Control A24 Reg 32	601D	N/A	A24 address	Value
Control A32 Reg 32	601E	N/A	A32 address	Value
Control Reg Shared RAM 32	601F	N/A	RAM address	Value
Dump A24 Seq Bytes	6020	N/A	A24 address	N/A
Dump A32 Seq Bytes	6021	N/A	A32 address	N/A
Dump Shared RAM Seq Bytes	6022	N/A	RAM address	N/A

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HP E1562 Sequence Operations

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Do Nothing 0000

No Sequence operation is performed

Sequence Syntax: #h0000,<Count>,<Address>,<Misc>

<Count> ::= 0

<Address> ::= 0

<Misc> ::= 0

SCPI example: SEQ:ADD #h0000,0,0,0

Description: No fields are used.

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Terminate Sequence 0001

The Sequence stops executing.

Sequence Syntax: #h0001,<Count>,<Address>,<Misc>

<Count> ::= 0

<Address> ::= 0

<Misc> ::= 0

SCPI example: SEQ:ADD #h0001,0,0,0

Description: This operation terminates the Sequence even if the final count has not been met. This is useful only for creating a non-looping or one-time Sequence. No fields are used.

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Pause N msec 0002

The Sequence stops executing for a designated period of time.

Sequence Syntax: #h0002,<Count>,<Address>,<Misc>

<Count> ::= 10:4294967295

<Address> ::= 0

<Misc> ::= 0

SCPI example: SEQ:ADD #h0002,40,0,0

Description: This operation causes the Sequence to stop executing for the number of milliseconds designated by <Count>. The resolution of the clock is only 10 msec, therefore the specified count is rounded to the nearest 10 msec value. For a pause of shorter duration see the 'Pause N loops' operation (000a).

<Address> and <Misc> are not used.

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TTLTRG Control 0003

Controls the assertion of the TTLTRG lines.

Sequence Syntax: #h0003,<Count>,<Address>,<Misc>

<Count> ::= 0:#b11111111

<Address> ::= 0

<Misc> ::= 0

SCPI example: SEQ:ADD #h0003,#b1010101,0,0

Description: All TTLTRG lines are controlled simultaneously. Therefore, one (or more) lines may be set while all others are cleared. Any bits set to 1 in bits 0-7 of <Count> represent corresponding TTLTRG lines which are asserted.

<Address> and <Misc> are not used.

See the related TTLTRG Arm (0006) and TTLTRG Wait (0007) operations.

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Execute New Sequence 0004

Begins executing a new logical Sequence.

Sequence Syntax: #h0004,<Count>,<Address>,<Misc>

<Count> ::= 1:4

<Address> ::= 0

<Misc> ::= 0

SCPI example: SEQ:ADD #h0004,3,0,0

Description: This operation begins executing the new logical Sequence specified by <Count>. The new Sequence inherits the Sequence type and total bytes remaining from the currently executing Sequence. This operation is useful in situations which require a one-time set of operations at the beginning of a throughput followed by a looping set of data acquisition operations. An example of such a one-time action is writing a header at the beginning of a data stream.

<Address> and <Misc> are not used.

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New Sequence If Count 0005

Begins executing a new logical Sequence if the remaining byte count is less than the value specified.

Sequence Syntax: #h0005,<Count>,<Address>,<Misc>

<Count> ::= 1:4

<Address> ::= 0:#hFFFFFFFF

<Misc> ::= 0:#hFFFFFFFF

SCPI example: SEQ:ADD #h0005,2,#hAEC,#h33E1F671

Description: This operation begins executing the new logical Sequence number specified by <Count> if the remaining byte count is less than that specified by <Address> and <Misc>. Since the byte count is a 64-bit value and the Sequence fields are only 32-bit values, both the <Address> and <Misc> are used to specify the byte count. The most significant 32 bits are specified in the <Address> field and the least significant 32 bits are specified in the <Misc> field. The new Sequence inherits the Sequence type and total bytes remaining from the currently executing Sequence.

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TTLTRG Arm 0006

Clears a set of latched TTLTRG assertions.

Sequence Syntax: #h0006,<Count>,<Address>,<Misc>

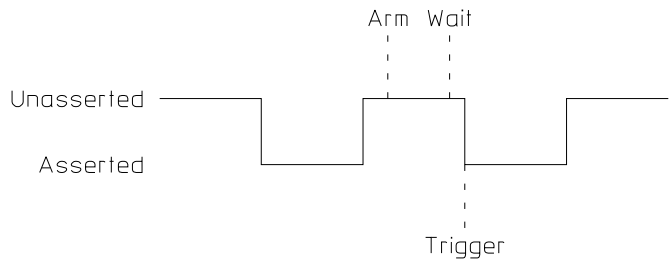
<Count> ::= 0:#b11111111

<Address> ::= 0

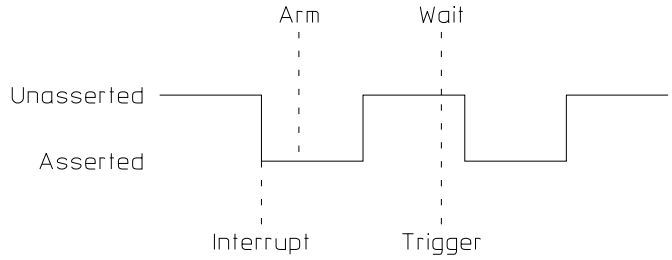
<Misc> ::= 0

SCPI example: SEQ:ADD #h0006,#b11011101,0,0

Description: Clearing latched TTLTRG assertions guarantees that any subsequent TTLTRG Wait will not be satisfied by an old latched TTLTRG assertion. Any bits set to 1 in bits 0-7 of <Count> clear assertions for corresponding to TTLTRG lines. The diagram below illustrates the effect of TTLTRG Arm and TTLTRG Wait on triggering in response to TTLTRG line assertion:



A perceived exception occurs if the trigger line is already asserted (set to the low voltage level) when the TTLTRG arm command is issued. In this case a subsequent TTLTRG Wait will result in no delay because the assertion requirement was previously fulfilled by the interrupt generated prior to TTLTRG Arm:



<Address> and <Misc> are not used.

See the related TTLTRG Control (0003) and TTLTRG Wait (0007) operations.

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TTLTRG Wait 0007

Waits for a set of TTLTRG lines to be asserted.

Sequence Syntax: #h0007,<Count>,<Address>,<Misc>

<Count> ::= 0:#b11111111

<Address> ::= 0

<Misc> ::= 0

SCPI example: SEQ:ADD #h0007,#b10101010,0,0

Description: Because TTLTRG assertions are latched, it is not necessary that all of the specified lines be set at the same time; only that each specified line undergo an unasserted-to-asserted transition since the last TTLTRG Wait or TTLTRG Arm operation. Any bits set to 1 in bits 0-7 of <Count> represent corresponding TTLTRG lines which await assertion.

<Address> and <Misc> are not used.

See the related TTLTRG Control (0003) and TTLTRG Arm (0006) operations.

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IRQ Arm 0008

Clears a set of latched IRQ assertions from a specified logical address.

Sequence Syntax: #h0008,<Count>,<Address>,<Misc>

<Count> ::= 0:255

<Address> ::= 0

<Misc> ::= 0

SCPI example: SEQ:ADD #h0008,86,0,0

Description: Clearing latched IRQ assertions guarantees that any subsequent IRQ Wait will not be satisfied by an old latched IRQ assertion. The <Count> field indicates the logical address for which the latched IRQ should be cleared.

<Address> and <Misc> are not used.

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IRQ Wait 0009

Waits for IRQ from a specific logical address.

Sequence Syntax: #h0009,<Count>,<Address>,<Misc>

<Count> ::= 1:255

<Address> ::= 0

<Misc> ::= 0

SCPI example: SEQ:ADD #h0009,222,0,0

Description: When a VXI system is configured, each IRQ line is assigned an IRQ Handler. The IRQ Handler may be any device which supports this capability. In order for the HP E1562 to proceed after executing the IRQ Wait Sequence operation, it must receive and IRQ from the specific logical address on any IRQ line for which it has been assigned as IRQ Handler. See the documentation for your VXI Resource Manager to determine how to assign IRQ Handlers.

<Address> and <Misc> are not used.

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Pause N loops 000a

The Sequence stops executing for a designated number of loops.

Sequence Syntax: #h0002,<Count>,<Address>,<Misc>

<Count> ::= 1:4294967295

<Address> ::= 0

<Misc> ::= 0

SCPI example: SEQ:ADD #h000a,10,0,0

Description: This operation causes the Sequence to execute a delay loop for the number of repetitions designated by <Count>. This operation may be used to pause a Sequence for a shorter duration of time than may be achieved with the 'Pause N milliseconds' (0002) operation for which the minimum time is 10 milliseconds. A <Count> of 1560927 results in a delay of ≥ 1 second. The actual delay time may be longer due to the unpredictable nature of interrupts.

<Address> and <Misc> are not used.

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Lbus Consume 1000

A throughput operation which reads reads blocks of data from the local bus and writes them to a SCSI Session.

Sequence Syntax: #h1000,<Count>,<Address>,<Misc>

<Count> ::= 1:256

<Address> ::= 0

<Misc> ::= 0:3 #h10:#hFFFF (see description below)

SCPI example: SEQ:ADD #h1000,8,0,#h03000800

Description: The Lbus Consume operation puts the local bus chip into a mode which acts as a sink for bytes on the local bus. In other words no bytes are passed to the next module to the right.

<Count> indicates the number of local bus blocks to transfer.

<Address> is not used.

<Misc> contains two pieces of information: the lower 24 bits indicate the number of bytes in a local bus block; the upper 8 bits indicate the local bus width. The value indicating the local bus width is presented as the number of bytes minus 1:

Bits 24-31 of Misc parameter		Bits 0-23 of Misc parameter
A local bus width of:	Is represented by a parameter value of:	This value represents the number of bytes in a local bus block. Every local bus block is assumed to be the same size and equal to the count specified here.
8	0	
16	1	
24	2	
32	3	

The bytes-per-block value is used to decrement the bytes-remaining count, thus determining when the final Sequence count has been met. The number of bytes per block must be specified correctly in order for the Sequence to terminate properly.

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Lbus Eavesdrop 1001

A throughput operation which reads blocks of data from the local bus and and writes them to a SCSI Session in addition to passing them along to the next local bus module to the right.

Sequence Syntax: #h1001,<Count>,<Address>,<Misc>

<Count> ::= 1:256

<Address> ::= 0

<Misc> ::= 0:3 #h10:#hFFFF (see description below)

SCPI example: SEQ:ADD #h1001,2,0,#h3004000

Description: The Lbus Eavesdrop operation puts the local bus chip into a mode in which each byte received from the module to the left is copied into the HP E1562 and is also passed to the next module to the right.

<Count> indicates the number of local bus blocks to transfer.

<Address> is not used.

<Misc> contains two pieces of information: the lower 24 bits indicate the number of bytes in a local bus block; the upper 8 bits indicate the local bus width. The value indicating the local bus width is presented as the number of bytes minus 1:

Bits 24-31of Misc parameter		Bits 0-23 of Misc parameter
A local bus width of:	Is represented by a parameter value of:	This value represents the number of bytes in a local bus block. Every local bus block is assumed to be the same size and equal to the count specified here.
8	0	
16	1	
24	2	
32	3	

The bytes-per-block value is used to decrement the bytes-remaining count, thus determining when the final Sequence count has been met. The number of bytes per block must be specified correctly in order for the Sequence to terminate properly.

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Lbus Consume Pipe 1002

A throughput operation which writes some blocks of local bus data to a SCSI Session while passing other blocks of local bus data to the next module to the right.

Sequence Syntax: #h1002,<Count>,<Address>,<Misc>

<Count> ::= 1:256 1:256 (see description below)

<Address> ::= 0

<Misc> ::= 0:3 #h10:#hFFFF (see description below)

SCPI example: SEQ:ADD #h1002,#h40002,0,#h3008000

Description: The Lbus Consume Pipe operation reads N blocks of data from the local bus and writes them to a SCSI Session then passes M blocks to the next module to the right without copying those bytes to the HP E1562. This operation is used for high data rate applications which require multiple HP E1562 modules.

<Count> has the dual purpose of specifying both the number of blocks to pass (M) as well as the number of blocks to consume(N). This is accomplished by placing M in the most significant 16 bits of the <Count> field and N in the least significant 16 bits of the <Count> field. M and N must have a greatest common denominator (cd) of ≤ 256 where the largest of M/cd and N/cd is ≤ 16.

<Address> is not used.

<Misc> also contains two pieces of information: the lower 24 bits indicate the number of bytes in a local bus block. The upper 8 bits indicate the local bus width. The value indicating the local bus width is presented as the number of bytes minus 1:

Bits 24-31of Misc parameter		Bits 0-23 of Misc parameter
A local bus width of:	Is represented by a parameter value of:	This value represents the number of bytes in a local bus block. Every local bus block is assumed to be the same size and equal to the count specified here.
8	0	
16	1	
24	2	
32	3	

The bytes-per-block value is used to decrement the bytes-remaining count, thus determining when the final Sequence count has been met. The number of bytes per block must be specified correctly in order for the Sequence to terminate properly.

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Lbus Eavesdrop Pipe 1003

A throughput operation which writes some blocks of local bus data to a SCSI Session while passing those blocks plus additional blocks of local bus data to the next module to the right.

Sequence Syntax: #h1003,<Count>,<Address>,<Misc>

<Count> ::= 1:256 1:256 (see description below)

<Address> ::= 0

<Misc> ::= 0:3 #h10:#hFFFF (see description below)

SCPI example: SEQ:ADD #h1003,#h20001,0,#h03004000

Description: The Lbus Eavesdrop Pipe operation reads N blocks of data from the local bus, writes them to a SCSI Session, and also passes them to the next module to the right. The operation then passes M blocks to the next module to the right without copying them to the HP E1562. This operation is used for high data rate applications which require multiple HP E1562 modules.

<Count> has the dual purpose of specifying both the number of blocks to pass (M) as well as the number of blocks to Eavesdrop (N). This is accomplished by placing M in the most significant 16 bits of the <Count> field and N in the least significant 16 bits of the <Count> field . M and N must have a greatest common denominator (cd) of ≤ 256 where the largest of M/cd and N/cd is ≤ 16.

<Address> is not used.

<Misc> also contains two pieces of information: the lower 24 bits indicate the number of bytes in a local bus block; the upper 8 bits indicate the local bus width. The value indicating the local bus width is presented as the number of bytes minus 1:

Bits 24-31 of Misc parameter		Bits 0-23 bits of Misc parameter
A local bus width of:	Is represented by a parameter value of:	This value represents the number of bytes in a local bus block. Every local bus block is assumed to be the same size and equal to the count specified here.
8	0	
16	1	
24	2	
32	3	

The bytes-per-block value is used to decrement the bytes-remaining count, thus determining when the final Sequence count has been met. The number of bytes per block must be specified correctly in order for the Sequence to terminate properly.

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Lbus Consume Continuous 1100

A throughput operation which reads reads blocks of data from the local bus and writes them to a SCSI Session.

Sequence Syntax: #h1100,<Count>,<Address>,<Misc>

<Count> ::= 1:256

<Address> ::= 0

<Misc> ::= 0:3 #h10:#hFFFF (see description below)

SCPI example: SEQ:ADD #h1100,8,0,#h03000800

Description: The Lbus Consume operation puts the local bus chip into a mode which acts as a sink for bytes on the local bus. In other words no bytes are passed to the next module to the right.

<Count> indicates the number of local bus blocks to transfer.

<Address> is not used.

<Misc> contains two pieces of information: the lower 24 bits indicate the number of bytes in a local bus block; the upper 8 bits indicate the local bus width. The value indicating the local bus width is presented as the number of bytes minus 1:

Bits 24-31 of Misc parameter		Bits 0-23 of Misc parameter
A local bus width of:	Is represented by a parameter value of:	This value represents the number of bytes in a local bus block. Every local bus block is assumed to be the same size and equal to the count specified here.
8	0	
16	1	
24	2	
32	3	

The bytes-per-block value is used to decrement the bytes-remaining count, thus determining when the final Sequence count has been met. The number of bytes per block must be specified correctly in order for the Sequence to terminate properly.

Note This operation stops executing only when the sequence terminates.

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Lbus Eavesdrop Continuous 1101

A throughput operation which reads blocks of data from the local bus and and writes them to a SCSI Session in addition to passing them along to the next local bus module to the right.

Sequence Syntax: #h1101,<Count>,<Address>,<Misc>

<Count> ::= 1:256

<Address> ::= 0

<Misc> ::= 0:3 #h10:#hFFFF (see description below)

SCPI example: SEQ:ADD #h1101,2,0,#h3004000

Description: The Lbus Eavesdrop operation puts the local bus chip into a mode in which each byte received from the module to the left is copied into the HP E1562 and is also passed to the next module to the right.

<Count> indicates the number of local bus blocks to transfer.

<Address> is not used.

<Misc> contains two pieces of information: the lower 24 bits indicate the number of bytes in a local bus block; the upper 8 bits indicate the local bus width. The value indicating the local bus width is presented as the number of bytes minus 1:

Bits 24-31of Misc parameter		Bits 0-23 of Misc parameter
A local bus width of:	Is represented by a parameter value of:	This value represents the number of bytes in a local bus block. Every local bus block is assumed to be the same size and equal to the count specified here.
8	0	
16	1	
24	2	
32	3	

The bytes-per-block value is used to decrement the bytes-remaining count, thus determining when the final Sequence count has been met. The number of bytes per block must be specified correctly in order for the Sequence to terminate properly.

Note This operation stops executing only when the sequence terminates.

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Lbus Consume Pipe Continuous 1102

A throughput operation which writes some blocks of local bus data to a SCSI Session while passing other blocks of local bus data to the next module to the right.

Sequence Syntax: #h1102,<Count>,<Address>,<Misc>

<Count> ::= 1:256 1:256 (see description below)

<Address> ::= 0

<Misc> ::= 0:3 #h10:#hFFFF (see description below)

SCPI example: SEQ:ADD #h1102,#h40002,0,#h3008000

Description: The Lbus Consume Pipe operation reads N blocks of data from the local bus and writes them to a SCSI Session then passes M blocks to the next module to the right without copying those bytes to the HP E1562. This operation is used for high data rate applications which require multiple HP E1562 modules.

<Count> has the dual purpose of specifying both the number of blocks to pass (M) as well as the number of blocks to consume(N). This is accomplished by placing M in the most significant 16 bits of the <Count> field and N in the least significant 16 bits of the <Count> field. M and N must have a greatest common denominator (cd) of ≤ 256 where the largest of M/cd and N/cd is ≤ 16.

<Address> is not used.

<Misc> also contains two pieces of information: the lower 24 bits indicate the number of bytes in a local bus block. The upper 8 bits indicate the local bus width. The value indicating the local bus width is presented as the number of bytes minus 1:

Bits 24-31of Misc parameter		Bits 0-23 of Misc parameter
A local bus width of:	Is represented by a parameter value of:	This value represents the number of bytes in a local bus block. Every local bus block is assumed to be the same size and equal to the count specified here.
8	0	
16	1	
24	2	
32	3	

The bytes-per-block value is used to decrement the bytes-remaining count, thus determining when the final Sequence count has been met. The number of bytes per block must be specified correctly in order for the Sequence to terminate properly.

Note This operation stops executing only when the sequence terminates.

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Lbus Eavesdrop Pipe Continuous 1103

A throughput operation which writes some blocks of local bus data to a SCSI Session while passing those blocks plus additional blocks of local bus data to the next module to the right.

Sequence Syntax: #h1103,<Count>,<Address>,<Misc>

<Count> ::= 1:256 1:256 (see description below)

<Address> ::= 0

<Misc> ::= 0:3 #h10:#hFFFF (see description below)

SCPI example: SEQ:ADD #h1103,#h20001,0,#h03004000

Description: The Lbus Eavesdrop Pipe operation reads N blocks of data from the local bus, writes them to a SCSI Session, and also passes them to the next module to the right. The operation then passes M blocks to the next module to the right without copying them to the HP E1562. This operation is used for high data rate applications which require multiple HP E1562 modules.

<Count> has the dual purpose of specifying both the number of blocks to pass (M) as well as the number of blocks to Eavesdrop (N). This is accomplished by placing M in the most significant 16 bits of the <Count> field and N in the least significant 16 bits of the <Count> field . M and N must have a greatest common denominator (cd) of ≤ 256 where the largest of M/cd and N/cd is ≤ 16.

<Address> is not used.

<Misc> also contains two pieces of information: the lower 24 bits indicate the number of bytes in a local bus block; the upper 8 bits indicate the local bus width. The value indicating the local bus width is presented as the number of bytes minus 1:

Bits 24-31 of Misc parameter		Bits 0-23 bits of Misc parameter
A local bus width of:	Is represented by a parameter value of:	This value represents the number of bytes in a local bus block. Every local bus block is assumed to be the same size and equal to the count specified here.
8	0	
16	1	
24	2	
32	3	

The bytes-per-block value is used to decrement the bytes-remaining count, thus determining when the final Sequence count has been met. The number of bytes per block must be specified correctly in order for the Sequence to terminate properly.

Note This operation stops executing only when the sequence terminates.

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Lbus Generate 2000

A playback operation which reads blocks of data from a SCSI Session then writes them to the local bus.

Sequence Syntax: #h2000,<Count>,<Address>,<Misc>

<Count> ::= 1:256

<Address> ::= 0

<Misc> ::= 0:3 #h10:#hFFFC (see description below)

SCPI example: SEQ:ADD #h2000,16,0,#h03000c00

Description: The Lbus Generate operation causes data to flow from the SCSI Session to the next module to the right of the HP E1562. This operation can only be used for local bus playback Sequences.

<Count> indicates the number of local bus blocks to transfer.

<Address> is not used.

<Misc> contains two pieces of information: the lower 24 bits indicate the number of bytes in a local bus block; the upper 8 bits indicate the local bus width. The value indicating the local bus width is presented as the number of bytes minus 1:

Bits 24-31 of Misc parameter		Bits 0-23 bits of Misc parameter
A local bus width of:	Is represented by a parameter value of:	This value represents the number of bytes in a local bus block and must be a multiple of 4. Every local bus block is assumed to be the same size and equal to the count specified here.
8	0	
16	1	
24	2	
32	3	

A block marker is asserted on the local bus following every block-size number of bytes. A frame marker is placed following the last block written to the local bus by this Sequence operation.

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Lbus Append 2001

A playback operation which reads blocks of data from a SCSI Session then appends them to the local bus stream of blocks.

Sequence Syntax: #h2001,<Count>,<Address>,<Misc>

<Count> ::= 1:256

<Address> ::= 0

<Misc> ::= 0:3 #h10:#hFFFC (see description below)

SCPI example: SEQ:ADD #h2001,4,0,#h03000800

Description: The Lbus Append operation causes data to flow from the SCSI Session and appends the data to the end of an Lbus frame as it passes to the next module to the right of the HP E1562. This operation can only be used for local bus playback Sequences.

<Count> indicates the number of local bus blocks to transfer.

<Address> is not used.

<Misc> contains two pieces of information: the lower 24 bits indicate the number of bytes in a local bus block; the upper 8 bits indicate the local bus width. The value indicating the local bus width is presented as the number of bytes minus 1:

Bits 24-31 of Misc parameter		Bits 0-23 of Misc parameter
A local bus width of:	Is represented by a parameter value of:	This value represents the number of bytes in a local bus block and must be a multiple of 4. Every local bus block is assumed to be the same size and equal to the count specified here.
8	0	
16	1	
24	2	
32	3	

A block marker is asserted on the local bus following every block-size number of bytes. A frame marker is placed following the last block written to the local bus by this Sequence operation.

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Throughput A16 Buff 16 – Throughput Shared RAM

3000-3012

Throughput operations which write data from a memory buffer or FIFO to a SCSI Session.

Sequence Syntax:

#h3000,<Count>,<Address>,<Misc>
through
#h3012,<Count>,<Address>,<Misc>

<Count> ::= 4:#hFFFFFFFC

A16 <Address> ::= 0:#hFFFE

A24 <Address> ::= 0:#hFFFFFE

A32 <Address> ::= 0:#hFFFFFFFE

Shared RAM <Address> ::= 0:262144

<Misc> ::= 0

SCPI example:

SEQ:ADD #h300B,#h10000,#hD420,0

Notes:

Refer to the Sequence Quick Reference part of this chapter (beginning on page 7-6) for a list of all 16 operations included in this description.

Description:

This description covers 16 operations for which some essential properties are indicated in the operation name. Buff indicates a memory buffer whereas FIFO refers to reading from the same address as if reading from a FIFO. The buffer or FIFO corresponds to the address space specified in the name: A16, A24, A32, or Shared RAM. The last part of the operation name refers to an access type: a 16-bit access, a 32-bit access implemented as two 16-bit accesses, or a D32 access. The D32 access applies only to devices which support D32. Shared RAM is always accessed as a 16-bit buffer.

<Count> designates the number of bytes to transfer and must be a multiple of 4.

<Address> designates an offset in the the specified memory space (A16, A24, A32, or Shared RAM) at which memory will be accessed. The value must be a multiple of 2.

<Misc> is not used.

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Throughput Dummy Bytes 3100

A throughput operation which places dummy bytes in the data stream.

Sequence Syntax: #h3100,<Count>,<Address>,<Misc>

<Count> ::= 0:#hFFFFFFFC

<Address> ::= 0

<Misc> ::= 0

SCPI example: SEQ:ADD #h3100,#h10000,0,0

Description: This operation is used to add padding to certain data structures in the data stream to make it compatible with some post-processing programs which expect data in a certain location.

<Count> designates the number of dummy bytes to place in the data stream and must be a multiple of 4.

<Address> and <Misc> fields are not used.

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Throughput Shared RAM Monitor Shared RAM - Throughput A24 Buff D32 Monitor A24 Buff 3812-3a05

Throughput operations which perform a VXI bus throughput to a Session while providing a means for the host computer to monitor the data.

Sequence Syntax: #h3812,<Count>,<Address>,<Misc>
through
#h3a05,<Count>,<Address>,<Misc>

<Count> ::= 4:#hFFFFFFFF

A16 <Address> ::= 0:#hFFFF

A24 <Address> ::= 0:#hFFFFFF

Shared RAM <Address> ::= 0:262144

A24 <Misc> ::= 0:#hFFFFFF

Shared RAM <Misc> ::= 0:262144

SCPI example: SEQ:ADD #h3a00,#h200,#h400,#h8000

Note: Refer to the Sequence Quick Reference part of this chapter (beginning on page 7-6) for a list of all 27 operations included in this description.

Description: This description covers 27 operations for which some essential properties are indicated in the operation name:

The address location indicated in the operation name before the word 'Monitor' represents the memory location from which to draw data. The address location indicated in the operation name after the word 'Monitor' represents the memory location to which to monitor data.

Buff indicates a memory buffer whereas FIFO refers to reading from the same address as if reading from a FIFO. The buffer or FIFO corresponds to the address space specified in the name: A16, A24, A32, or Shared RAM.

<Count> is the number of bytes to monitor

<Address> is the VXI address from which to read data.

<Misc> is the VXI address to which to monitor data

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Playback A16 Buff 16 – Playback Shared RAM

4000-4012

Playback operations which write data from a SCSI Session to a memory buffer or FIFO.

Sequence Syntax:

#h4000,<Count>,<Address>,<Misc>
through
#h4012,<Count>,<Address>,<Misc>

<Count> ::= 4:#hFFFFFFFC

A16 <Address> ::= 0:#hFFFE

A24 <Address> ::= 0:#hFFFFFE

A32 <Address> ::= 0:#hFFFFFFFE

Shared RAM <Address> ::= 0:262144

<Misc> ::= 0

SCPI example:

SEQ:ADD #h400B,#h10000,#hD420,0

Note:

Refer to the Sequence Quick Reference part of this chapter (beginning on page 7-6) for a list of all 16 operations included in this description.

Description:

This description covers 16 operations for which some essential properties are indicated in the operation name. Buff indicates a memory buffer whereas FIFO refers to writing to the same address as if writing to a FIFO. The buffer or FIFO corresponds to the address space specified in the name: A16, A24, A32, or Shared RAM. The last part of the operation name refers to an access type: a 16 bit access, a 32-bit access implemented as two 16-bit accesses, or a D32 access. Shared RAM is always accessed as a 16-bit buffer.

<Count> designates the number of bytes to transfer and must be a multiple of 4.

<Address> indicates an offset in the the specified memory space (A16, A24, A32, or Shared RAM) at which memory will be accessed. This value must be a multiple of 2.

<Misc> is not used.

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Playback Bit Bucket 4100

A playback operation which discards bytes from the data stream.

Sequence Syntax: #h4100,<Count>,<Address>,<Misc>

<Count> ::= 4:#hFFFFFFFC

<Address> ::= 0

<Misc> ::= 0

SCPI example: SEQ:ADD #h4100,#h10000,0,0

Description: This operation can be used to playback a single channel from a multiple-channel throughput.

<Count> designates the number bytes to discard and must be a multiple of 4.

<Address> and <Misc> are not used.

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Lbus Consume Monitor Shared RAM – Lbus Eavesdrop Pipe Monitor A24

5000-5017

Throughput operations which perform a local bus throughput to a Session while providing a means for the host computer to monitor the data via the VXI system bus.

Sequence Syntax:

#h5000,<Count>,<Address>,<Misc>
through
#h5017,<Count>,<Address>,<Misc>

Monitor <Count> ::= 1:256

Pipe Monitor <Count> ::= 1:256 1:256 (see description below)

A24 <Address> ::= 0:#hFFFFFF

Shared RAM <Address> ::= 0:262144

<Misc> ::= 0:3 #h10:#hFFFF (see description below)

SCPI example:

SEQ:ADD #h5016,#h100004,#h400000,#h3008000

Note:

Refer to the Sequence Quick Reference part of this chapter (beginning on page 7-6) for a list of all 8 operations included in this description.

Description:

This description covers 8 operations for which some essential properties are indicated in the operation name:

- The part of the name preceding 'Monitor' indicates the type of throughput operation and the description corresponds to the description for the same type of operation described earlier in local bus throughput operations.

- In addition, the part of the name following 'Monitor' indicates the address space to which the data will be monitored (Monitor Shared RAM or Monitor A24).

The following considerations apply to throughput operations with a Monitor:

- All monitored data is passed into a memory buffer, not into a FIFO.

- All monitoring to Shared RAM is performed via D16 accesses.

- The A16 and A32 address spaces are not supported for monitoring.

- D32 monitoring is not available.

<Count> and <Misc> for monitoring are the same as the <Count> and <Misc> fields for the corresponding local bus throughput operations (1000-1003) described earlier.

<Address> indicates an offset in the the specified memory space (A24 or Shared RAM). The memory block at the offset specified in the address space is 4 bytes larger than the local bus block size multiplied by the number of local bus blocks.

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The following tips are applicable to running Sequences using Monitor:

- The act of monitoring a local bus transfer slows down the overall throughput rate because data must be copied to RAM which would not otherwise be done. The more data monitored, the slower the maximum throughput rate.
- You must specify all local bus blocks which are to be monitored before running the Sequence. Once the Sequence is running it is not possible to change which blocks to monitor.
- Flags are used to synchronize the host and the HP E1562 for monitor operations. The flags are represented by the first 4 bytes of the memory to which Monitor data is being written, beginning at the address specified in that memory (A24 or Shared RAM). You must initialize all the flag values before running the Sequence.

  The flag is used to indicate the presence of data in the Monitor block. When the flag is 0 the HP E1562 will write data into the block and set the flag to 1. It is expected that the host (or controller) will read the data and then set the flag to 0. If the monitor operation is executed with the flag non-zero, the memory copy will not be done, but the data will flow through the normal data stream to the SCSI Session. This allows the host to read data at a different rate than the actual acquisition of data without affecting the throughput rate. In fact throughputs will be faster when the flag is set because the memory copy will not need to be done.

  The intention for monitoring many channels is that there will be a Sequence operation to monitor one block for each of the many channels. The flag values will initially be set to non-zero which means that no data will be copied to memory. As you decide to monitor different local bus blocks, the flag can be cleared allowing data to be written to that monitor block. Upon seeing the 0 flag the HP E1562 will write data to that block and then set the flag indicating that a block of data is available. This scheme will allow you to change which local bus blocks are being monitored during the throughput.

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Wait Bit Set A16 – Wait Bit Clear Shared RAM

6000-6007

Synchronization operations which can be used to wait for data to be available from a device which generates data slower than the HP E1562 can transfer it.

Sequence Syntax:

#h6000,<Count>,<Address>,<Misc>
through
#h6007,<Count>,<Address>,<Misc>

<Count> ::= 0:#b1111111111111111

A16 <Address> ::= 0:#hFFFF

A24 <Address> ::= 0:#hFFFFFF

A32 <Address> ::= 0:#hFFFFFFFF

Shared RAM <Address> ::= 0:262144

<Misc> ::= 0:#hFFFFFFFF

SCPI example:

SEQ:ADD #h6002,0,#h380024,#b1000

Note:

Refer to the Sequence Quick Reference part of this chapter (beginning on page 7-6) for a list of all 8 operations included in this description.

Description:

These operations wait for a single bit or a group of bits to be set or cleared in another device. This description covers 8 operations for which some essential properties are indicated in the operation name. Each reference is to a 16 bit value and performs a D16 access to the memory location specified. Both the memory space referenced and whether to wait for the bit(s) to be set or cleared are indicated in the name of the operation.

<Count> specifies a bit mask which is ANDed with the 16 bit register specified by the memory offset and memory space. For the Set operations all bits in the mask must be set. For the Clear operations all bits in the mask must be clear. The HP E1562 reads this register and checks the bits until the condition is met. If the condition is never met the Sequence will not be completed.

<Address> indicates the offset into the memory space indicated in the operation name.

<Misc> represents a user-programmable delay prior to the next VXI access. The number of loops specified here is performed before another VXI access. This frees the VXI bus to perform additional activities, rather than having Sequence operations completely dominate VXI bus usage. Loop time is approximately 3 μs.

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Wait A16 Count16– Wait Count Shared RAM 32

6008-600f

Synchronization operations which can be used to wait for data to be available from a device which generates data slower than the HP E1562 can transfer it.

Sequence Syntax:

#h6008,<Count>,<Address>,<Misc>
through
#h600f,<Count>,<Address>,<Misc>

16 bit <Count> ::= 1:#hFFFF

32 bit <Count> ::= 1:#hFFFFFFFF

A16 <Address> ::= 0:#hFFFF

A24 <Address> ::= 0:#hFFFFFF

A32 <Address> ::= 0:#hFFFFFFFF

Shared RAM <Address> ::= 0:262144

<Misc> ::= 0:#hFFFFFFFF

SCPI example:

SEQ:ADD #h600B,#h4000,128000,0

Note:

Refer to the Sequence Quick Reference part of this chapter (beginning on page 7-6)for a list of all 8 operations included in this description.

Description:

These operations wait for the count register in another device to be greater than the value specified by <Count>. This description covers 8 operations for which some essential properties are indicated in the operation name. The memory space referenced is indicated in the name of the operation (A16, A24 or A32, or Shared RAM). The count register may be a 16-bit or a 32-bit value as indicated by the name of the operation, but all accesses are done using D16 (a 32-bit count will be performed by using two 16-bit accesses).

<Count> specifies the number which must be met or exceeded before proceeding. The HP E1562 reads this register and checks the count until the condition is met. If the condition is never met the Sequence will not be completed.

<Address> indicates the offset into the memory space indicated in the operation name.

<Misc> represents a user-programmable delay prior to the next VXI access. The number of loops specified here is performed before another VXI access. This frees the VXI bus to perform additional activities, rather than having Sequence operations completely dominate VXI bus usage. Loop time is approximately 3 μs.

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Wait FIFO Empty
Wait FIFO Half Empty

6010-6011

The Sequence stops executing until data in the E1562 FIFO has been depleted.

Sequence Syntax:

#h6010,<Count>,<Address>,<Misc>
and
#h6011,<Count>,<Address>,<Misc>

<Count> ::= 0

<Address> ::= 0

<Misc> ::= 0

SCPI example:

SEQ:ADD #h6010,0,0,0

Description:0

These operations wait for the HP E1562 FIFO (131072 bytes in size) to be either half or completely empty. These operations may be used to synchronize with a device which does not have a FIFO but is able to burst large amounts of data very quickly. In this case, it is necessary to wait for the HP E1562 FIFO to be (half) empty before reading data from the device.

As an example, these operations may be necessary to synchronize with the HP E1485 in conjunction with a Control Register operation.

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Control A16 Reg 16– Control Reg Shared RAM 32

6018-601f

Synchronization operations which allow the HP E1562 to write directly to a memory location.

Sequence Syntax:

#h6018,<Count>,<Address>,<Misc>
through
#h601F,<Count>,<Address>,<Misc>

<Count> ::= 0

A16 <Address> ::= 0:#hFFFF

A24 <Address> ::= 0:#hFFFFFF

A32 <Address> ::= 0:#hFFFFFFFF

Shared RAM <Address> ::= 0:262144

<Misc> ::= #h0:FFFFFFFF

SCPI example:

SEQ:ADD #h601A,0,#h2D860860,#hF020

Note:

Refer to the Sequence Quick Reference part of this chapter (beginning on page 7-6) for a list of all 8 operations included in this description.

Description:

These operations allow the HP E1562 to write to a memory location, usually for the purpose of controlling another device on the bus. The register can be either 16 bits wide or 32 bits wide (a 32-bit register is written as two D16-bit writes). The memory space and register width are indicated in the Sequence name.

<Count> is not used.

<Address> indicates the offset into the memory space indicated in the operation name.

<Misc> contains the value which is to be written to the memory location specified by the memory space and the memory offset in the <Address> field.

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Dump A24 Seq Bytes- Dump Shared RAM Seq Bytes

6020-6022

Writes to a memory space the number of bytes which have been transferred.

Sequence Syntax:

#h6020,<Count>,<Address>,<Misc>
through
#h6022,<Count>,<Address>,<Misc>

<Count> ::= 0

A24 <Address> ::= 0:#hFFFFFF

A32 <Address> ::= 0:#hFFFFFFFF

Shared RAM <Address> ::= 0:262144

<Misc> ::= 0

SCPI example:

SEQ:ADD #h6022,0,#h100,0

Note:

Refer to the Sequence Quick Reference part of this chapter (beginning on page 7-6) for a list of all 3 operations included in this description.

Description:

During both throughput and playback Sequences an internal counter keeps a count of how many bytes have been transferred. The contents of this counter may be written to a memory space in order to monitor progress of a Sequence.

<Address> indicates the offset into the memory space indicated in the operation name.

<Count> and <Misc> are not used.

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8

Programming the HP E1562 with SCPI

SCPI (Standard Commands for Programmable Instruments) is an industry-standard instrument control language. SCPI builds on the IEEE 488.1 and 488.2 standards.

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Getting Started

Note

The HP E1652F provides additional storage space to a VXI system with a SCSI controller, such as an HP E1562D/E. The HP E1562D/E is controlled by programming the SCSI controller. The HP E1652F does not respond to any commands on the VXI bus.

This chapter pertains to the HP E1562D/E.

Message-based VXI devices

SCPI Command Structure and Format

SCPI organizes related functions by grouping them together on a common branch of a command tree. Each branch is assigned a keyword to indicate the nature of the related functions. For example, the functions that control and monitor the status registers are grouped under the STATUS branch of the command tree. The STATUS branch is only one of the major SCPI branches which are called subsystems.

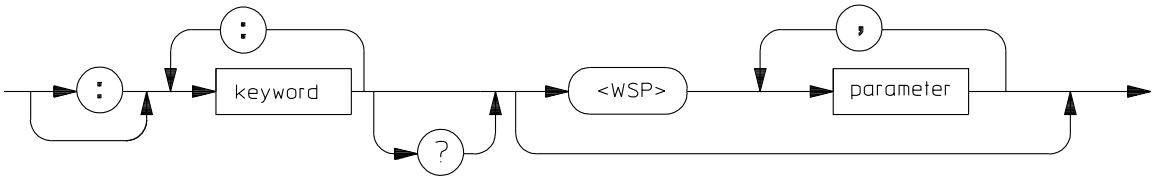
Colons indicate branching points on the command tree. A parameter is separated from the rest of the command by a space.

You can send multiple commands within a single message by separating commands with semicolons. One of the main functions of the command parser is to keep track of a program message's position in the command tree. If a program message contains two commands separated by a semicolon, the command parser assumes that the keywords of the second command come from the same branch of the tree as the final keyword of the preceding command. This allows you to simplify multiple command program messages.

Another way to simplify program messages is to delete implied mnemonics. You can omit some keywords from the command without changing the effect of the command. Implied mnemonics are identified by brackets [ ] in SCPI syntax diagrams.

The illustration below describes the basic syntax of SCPI commands.

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NOTE:
WSP = whitespace, ASCII character (Decimal 0-9 or 11-32)

For additional information about SCPI command structure and format, see the *Beginner's Guide to SCPI*, available through your local Hewlett-Packard Sales Office.

Parameter Settings

As the illustration shows, there must be a <WSP>, whitespace or <space>, between the last command keyword and the first parameter in a command. This is one of the few places in SCPI where <space> is required. If you send more than one parameter with a single command, you must separate adjacent parameters using a comma.

Each parameter format has one or more corresponding response-data formats. For example, a setting that you program using a numeric parameter would return either floating point or integer response data when queried. Whether floating point or integer response data is returned, depends on the particular VXI module you are using. However, response data is clearly defined for the module and query. The next chapter, "SCPI Command Reference" specifies the data format for individual commands.

For additional information about SCPI data formats, see the *Beginner's Guide to SCPI*, available through your local Hewlett-Packard Sales Office.

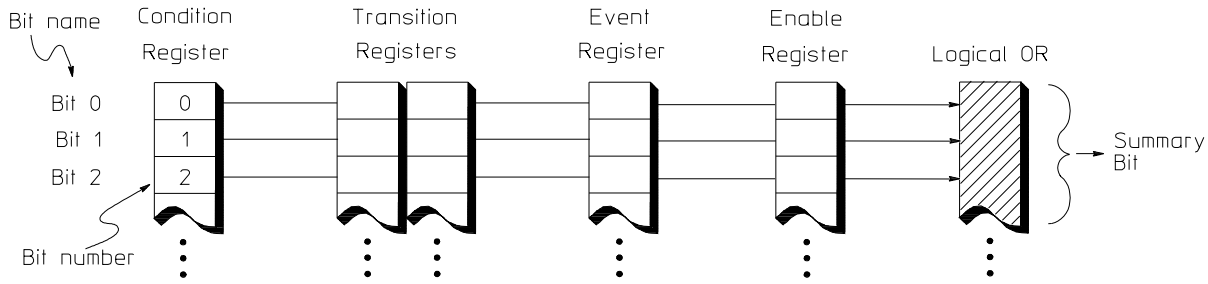
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Using the Status Registers

The HP E1562's status registers contain information about various module conditions. The following sections describe the registers and tell you how to use them in your programs.

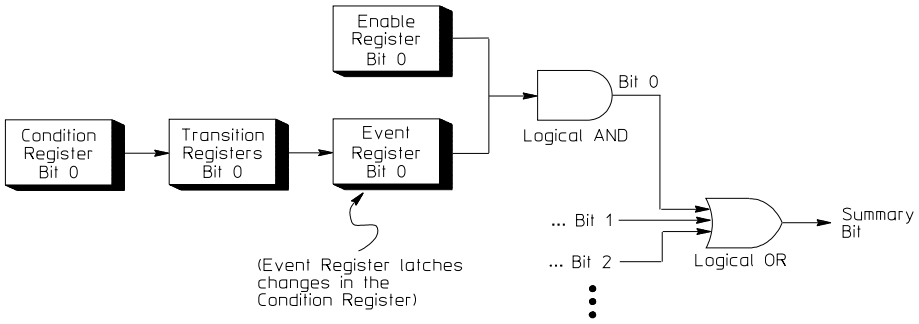
The General Status Register Model

The general status register model, shown below is the building block of the HP E1562's status system. Most register sets in the module include all of the registers shown in the general model, although commands are not always available for reading or writing a particular register. The model consists of a condition register, two transition registers, an event register, and an enable register.



The flow within a status group starts at the condition register and ends at the register summary bit. (See the illustration below.) You control the flow by altering bits in the enable and transition registers.

The Operation Status and Questionable Status groups are 16 bits wide, while the Status Byte and Standard Event groups are 8 bits wide. In the 16-bit groups, the most significant bit (bit 15) is not used. Bit 15 is always set to 0.



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Condition Register

The condition register continuously monitors hardware and firmware status. It represents the current state of the module. It is updated in real time. When the condition monitored by a particular bit becomes true, the bit is set to 1. When the condition becomes false, the bit is reset to 0. Condition registers are read-only.

If there is no command to read a particular condition register, it is simply invisible to you.

The Transistion Registers

The positive and negative transition registers specify which type of bit transition in the Condition register will set corresponding bits in the Event register. Transition register bits may be set for positive transitions (0 to 1), or negative transitions (1 to 0).

Each bit set in the negative transition register indicates that a 1 to 0 transition of that bit in the Condition register sets the associated bit in the Event register. Each bit set in the the positive transition register indicates that a 0 to 1 transition of that bit in the Condition register sets the associated bit in the Event register. Setting the same bits in both the positive and negative transition registers indicates that any transition of those bits in the Condition register sets corresponding bits in the Event register.

Event Register

The event register records condition changes. When a change occurs in the condition register, the corresponding event bit is set to 1 in accordance with the transition register settings. Once set, an event bit is no longer affected by condition changes and subsequent events corresponding to that bit are ignored. The event bit remains set until the event register is cleared— either when the register is read or when the *CLS (clear status) command is sent. Event registers are read-only.

Note Reading the Event Register, clears the Event Register.

Enable Register

The enable register specifies which bits in the event register set a summary bit to 1. The module logically ANDs corresponding bits in the event and enable registers, and ORs all the resulting bits to determine the state of a summary bit. Summary bits are in turn recorded in the Status Byte. (The summary bit is only set to 1 if one or more enabled event bits are set to 1.) Enable registers are read-write.

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Enable registers are cleared by *CLS (clear status). Querying enable registers does not affect them. There is always a command to read and write to the enable register of a particular register set.

How to Use Registers

There are two methods you can use to access the information in register sets:

- The polling method
- The service request (SRQ) method

Use the polling method when:

- Your language/development environment does not support SRQ interrupts.
- You want to write a simple, single-purpose program and do not want to add the complexity of setting up an SRQ handler.

Use the SRQ method when:

- You need time-critical notification of changes.
- You are monitoring more than one device which supports SRQ.
- You need to have the controller do something else while it is waiting.
- You cannot afford the performance penalty inherent to polling.

The Polling Method

In the polling method, the module has a passive role. It only tells the controller that conditions have changed when the controller asks the right question. In the SRQ method, the module notifies the controller of a condition change without the controller asking. Either method allows you to monitor one or more conditions.

When you monitor a condition with the polling method, you must

1. Determine which register contains the bit that monitors the condition.
2. Send the unique SCPI query that reads that register.
3. Examine the bit to see if the condition has changed.

The polling method works well if you do not need to know about changes the moment they occur. The SRQ method is more effective if you must know immediately when a condition changes. To detect a change in a condition using the polling method, your program would need to continuously read the registers at very short intervals. This makes the program less efficient. In this case it is better to use the SRQ method.

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The SRQ Method

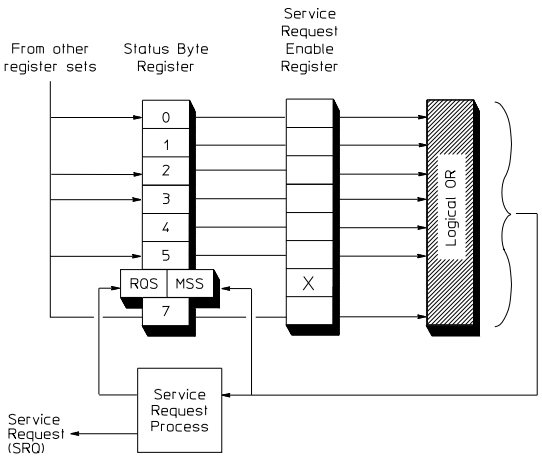
When you monitor a condition with the SRQ method, you must

1. Determine which bit monitors the condition.
2. Determine how that bit reports to the request service (RQS) bit of the Status Byte.
3. Send SCPI commands to enable the bit that monitors the condition and to enable the summary bits that report the condition to the RQS bit.
4. Enable the controller to respond to service requests.

When the condition changes, the module sets its RQS bit and generates an SRQ. The controller is informed of the change as soon as it occurs. The time the controller would otherwise have used to monitor the condition can now be used to perform other tasks. Your program determines how the controller responds to the SRQ.

Generating a Service Request

To use the SRQ method, you must understand how service requests are generated. As shown below, other register sets in the module report to the Status Byte. Many of them report directly, but some may report indirectly.



Bit 6 of the Status Byte serves two functions; the request service function (RQS) and the master summary status function (MSS). The RQS bit changes whenever something changes that it is configured to report. The RQS bit is cleared when it is read with a serial poll. The MSS bit is set in the same way as the RQS bit. However, the MSS bit is cleared only when the condition that set it is cleared. The MSS bit is read with *STB?.

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When a register set causes its summary bit in the Status Byte to change from 0 to 1, the module can initiate the service request (SRQ) process. However, the process is only initiated if both of the following conditions are true:

- The corresponding bit of the Service Request enable register is also set to 1.
- The module does not have a service request pending.
- (A service request is considered to be pending between the time the module's SRQ process is initiated and the time the controller reads the Status Byte register with a serial poll.)

The SRQ process generates an SRQ. It also sets the Status Byte's request service (RQS) bit to 1. Both actions are necessary to inform the controller the module requires service. Generating an SRQ only informs the controller that some device on the bus requires service. Setting the RQS bit allows the controller to determine which device requires service. That is, it tells the controller that this particular device requires service.

If your program enables the controller to detect and respond to service requests, it should instruct the controller to perform a serial poll of all modules when an SRQ is generated. Each device on the bus returns the contents of its Status Byte register in response to this poll. The device whose RQS bit is set to 1 is the device that requested service.

Note

When you read the module's Status Byte with a serial poll, the RQS bit is reset to 0. Other bits in the register are not affected.

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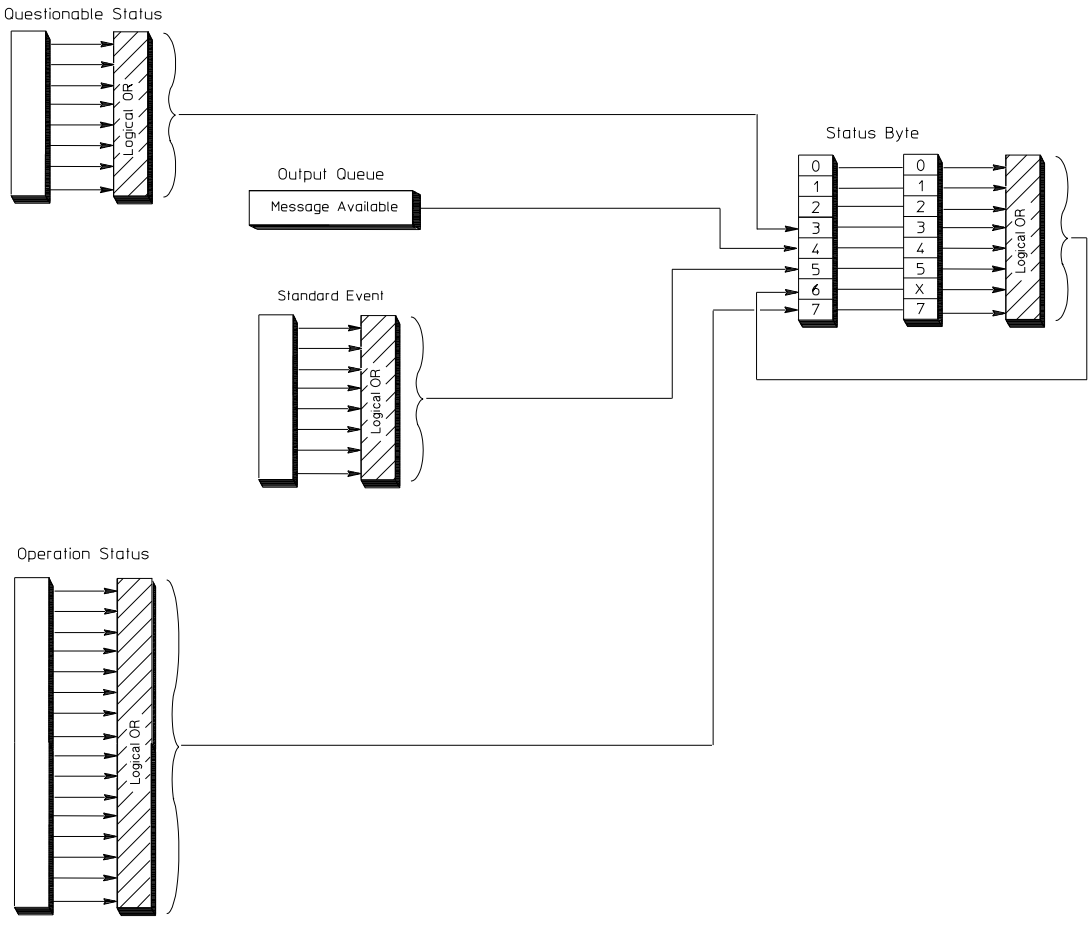
The HP E1562 Registers Sets

The HP E1562 uses four register sets to keep track of the module's status:

- Status Byte
- Questionable Status
- Standard Event
- Operational Status

Their reporting structure is summarized in the illustration below. They are described in greater detail in the following sections.

Register bits not explicitly presented in the following sections are not used in the HP E1562. A query to one of these bits returns a value of 0.

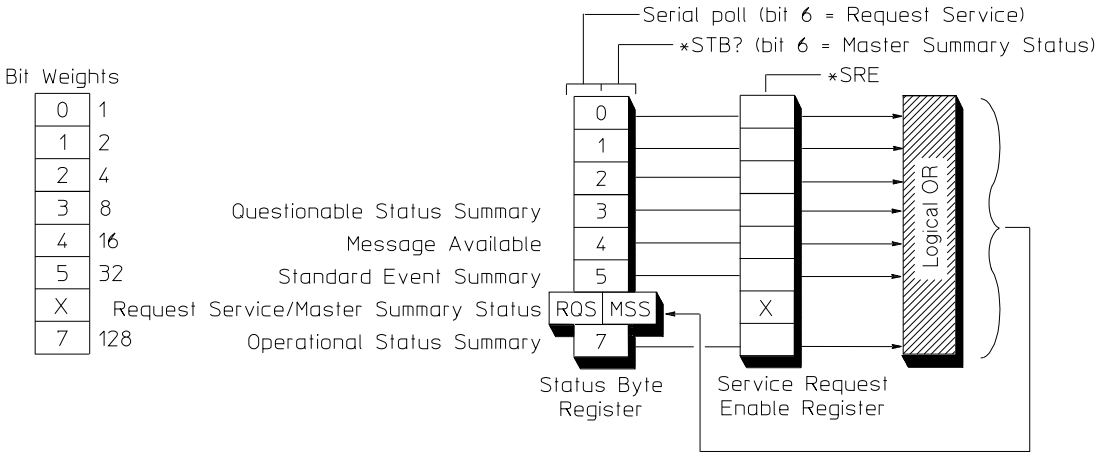


HP E1562 Register Sets

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Status Byte

The Status Byte summarizes the states of the other register sets and monitors the HP E1562's output queue. It is also responsible for generating service requests (see "Generating Service Requests" earlier in this chapter).



The Status Byte is unique because it does not exactly conform to the general status model presented earlier. It contains only two registers: the Status Byte register and the Service Request enable register. The Status Byte registers behaves like a condition register for all bits except bit 6. The Service Request enable behaves like a standard enable register except that bit 6 is always set to 0.

Bits in the Status Byte register are set to 1 under the following conditions:

- Questionable Status Summary (bit 3) is set to 1 when one or more enabled bits in the Questionable Status event register are set to 1.
- Message Available (bit 4) is set to 1 when the output queue contains a response message.
- Standard Event Summary (bit 5) is set to 1 when one or more enabled bits in the Standard Event event register are set to 1.
- Master Summary Status (bit 6, when read by *STB?) is set to 1 when one or more enabled bits in the Status Byte register are set to 1.
- Request Service (bit 6, when read by serial poll) is set to 1 by the service request process (see "Generating a Service Request" earlier in this chapter).
- Operation Status Summary (bit 7) is set to 1 when one or more enabled bits in the Operation Status event register are set to 1.

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The illustration also shows the commands you use to read and write the Status Byte registers. The following statements are example commands using the Status Byte and Status Byte enable register.

***SRE 16** Generate an SRQ interrupt when messages are available in the output queue.

***SRE?** Find out what events are enabled to generated SRQ interrupts.

***STB?** Read the Status Byte event register.

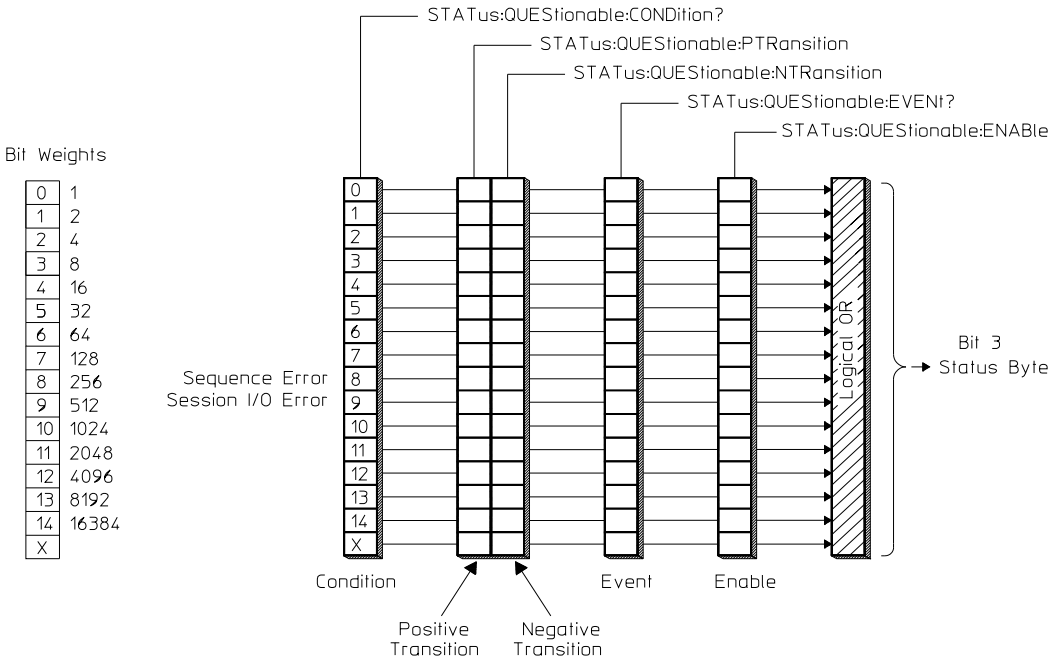
See "Setting and Querying Registers" later in this chapter for more information about these commands.

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Questionable Status Register Set

The Questionable Status register monitors conditions that affect the the quality of the data transfer.

This register set includes a condition register, two transition registers, an event register, and an enable register. It is accessed through the STATUS subsystem. See "Setting and Querying Registers" later in this chapter for more information about using these commands.



The Condition Register

Bits in the Questionable Status condition register are set to 1 under the following conditions:

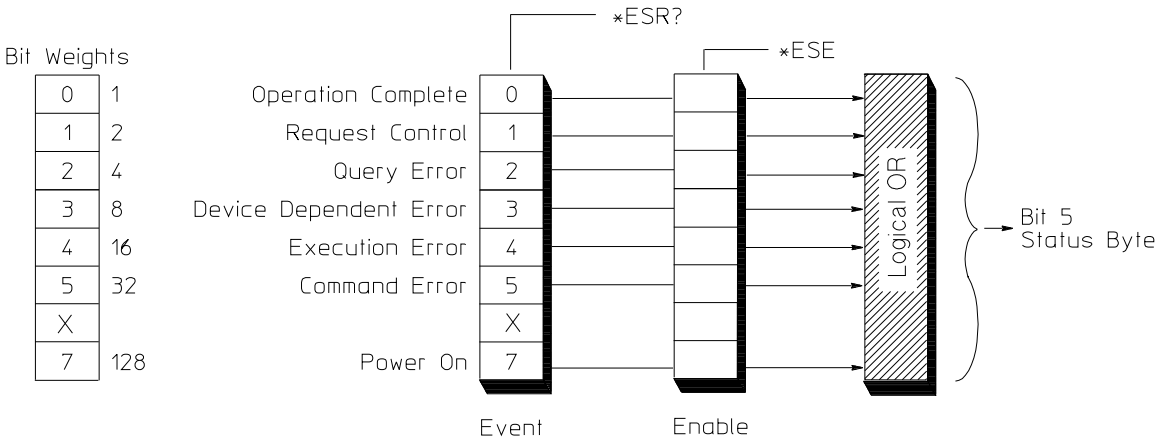
- Sequence Error (bit 8) is set to 1 when an error is detected during Sequence execution
- Session I/O Error (bit 9) is set to 1 when an error is detected during Session I/O operation

The illustration shows the commands you use to read and write the Questionable Status registers.

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Standard Event Status Register Set

The Standard Event Status register set monitors module errors as shown below. It is one of the simplest and most frequently used. The unique aspect of this group is that you program it using common commands, while you program other register sets through the STATUS subsystem.



The Standard Event Status Register set does not conform to the general status register model described at the beginning of this chapter. It contains only two registers: the Standard Event Status event register and the Standard Event Status enable register.

Bits in the Standard Event Status event register are set to 1 under the following conditions:

- Operation Complete (bit 0) is set to one when the following two events occur (in the order listed):
  - You send the *OPC command to the module.
  - The module completes all pending overlapped commands.
- Query Error (bit 2) is set to 1 when the module detects a query error.
- Device Dependent Error (bit 3) is set to 1 when the command parser or execution routines detect a device-dependent error.
- Execution Error (bit 4) is set to 1 when the command parser or execution routines detect an execution error.
- Command Error (bit 5) is set to 1 when the command parser detects a command or syntax error.
- Power On (bit 7) is set to 1 when you turn on the module.

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The illustration also shows the commands you use to read and write the Standard Event Status register sets. Example commands using Standard Event Status registers:

***ESE 48** Generate a summary bit whenever there is an execution or command error

***ESE?** Query the state of the Standard Event Status enable register?

***ESR?** Query the state of the Standard Event Status event register.

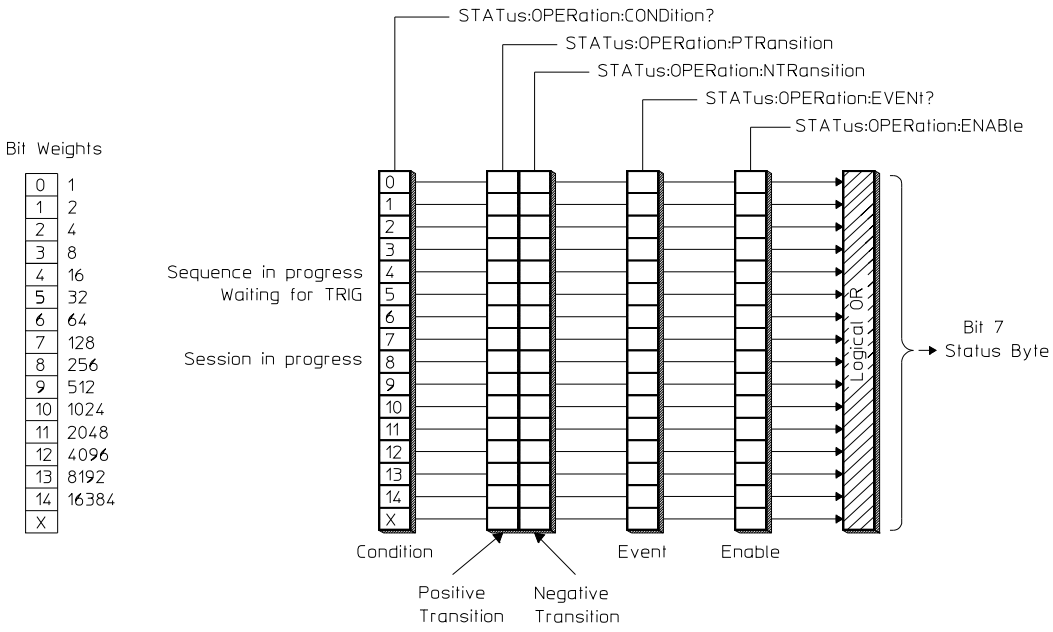
See "Setting and Querying Registers" later in this chapter for more information about using these commands.

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Operation Status Register Set

The Operation Status register set monitors conditions in the module's data transfer process.

This register set includes a condition register, two transition registers, an event register, and an enable register. It is accessed through the STATUS subsystem. See "Setting and Querying Registers" later in this chapter for more information about using these commands.



Bits in the Operation Status condition register are set to 1 under the following conditions:

- Sequence in Progress (bit 4) is set to 1 while a Sequence is in progress and to 0 when the Sequence has finished.
- Waiting for TRIG (bit 5) is set to 1 when the module is ready to accept a trigger signal from one of the trigger sources. (If a trigger signal is sent before this bit is set, the signal is ignored.)
- Session in Progress (bit 8) is set to 1 while a Session is in progress and to 0 when a Session is has finished.

The illustration shows the commands you use to read and write the Operation Status registers.

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Setting and Querying Registers

The previous register set illustrations include the commands you use to read from and to write to the registers. Most commands have a *set form* and a *query form*.

Use the set form of the command to write to a register. The set form is shown in the illustrations. The set form of a command takes an extended numeric parameter.

Use the query form of the command to read a register. Add a "?" to the set form to create the query form of the command. Commands ending with a "?" in the illustrations are query-only commands. These commands cannot set the bits in the register, they can only query or read the register.

The register set illustrations also include the bit weights you use to specify each bit in the register. For example, to get the Waiting for Trigger condition register (bit 5 in Operation Status register set) to generate a service request, send the following commands:

STATUS:PRESET Sets the Enable register bits in the Operational Status and the Questionable Status register sets to 0.

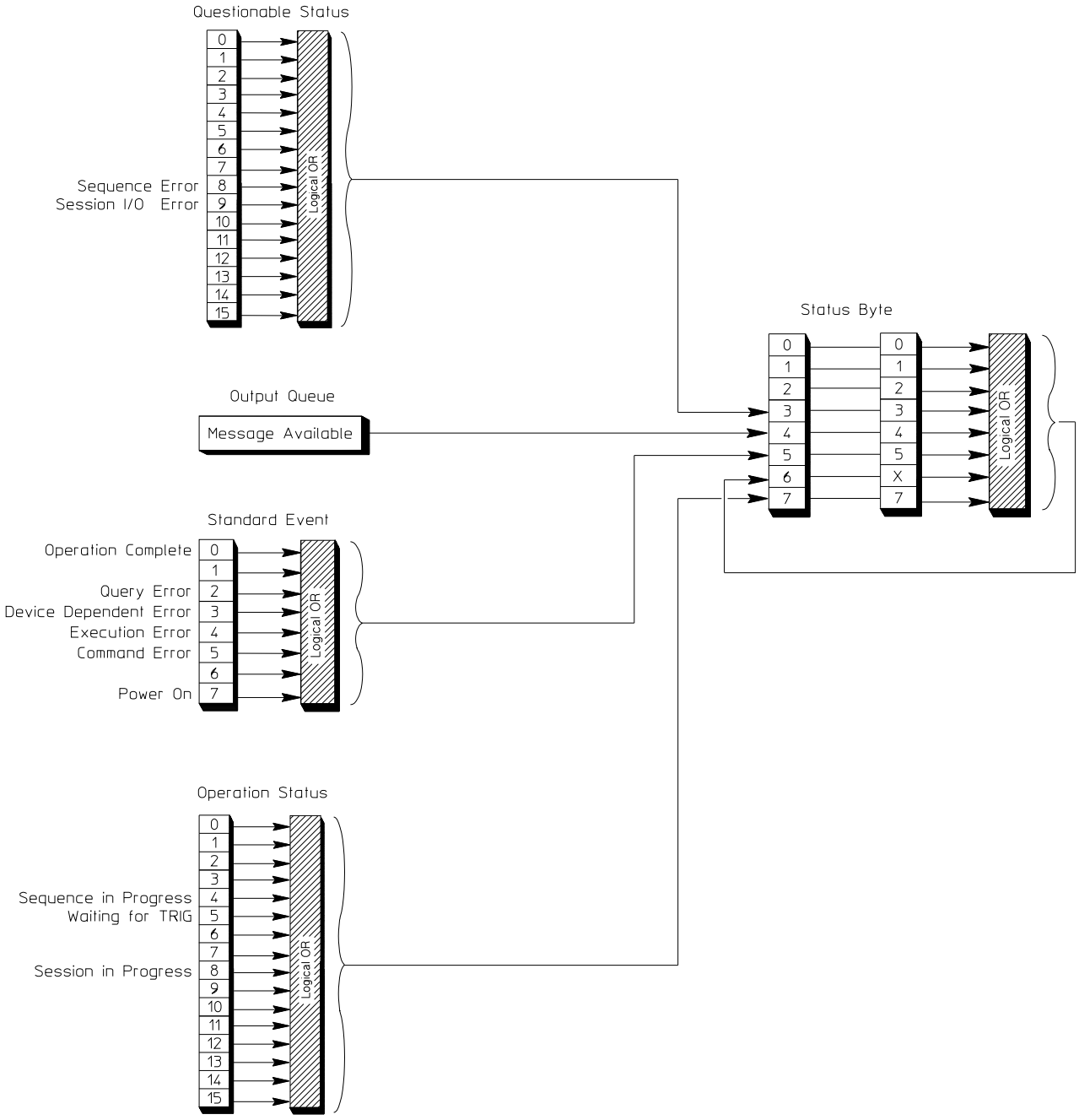
STATUS:OPERATION:ENABLE 32 Sets the Waiting for Trigger Enable register (bit 5) to 1.

***SRE 128** Sets bit 7 of the Service Request Enable register to 1.

See the next chapter for more information about these commands.

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HP E1562 Register Set Summary



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Addressing the HP E1562

The HP E1562 address in a SCPI environment consist of 3 parts; an interface select code, the primary address and the secondary address.

The interface select code specifies the interface. Seven (7) is a typical number for the HP-IB interface.

The primary address, typically 09, indicates which HP-IB port in the system controller is used to communicate with the Slot 0 Control Module, for example the HP E1406A/B.

The secondary address indicates the device-specific address. In this case, it represents the VXI logical address.

The VXI logical address ranges in value from 1 to 255. For use with a command module the logical address to the HP-IB cannot be used directly, but must be encoded into the HP-IB secondary address. In addition, the logical address of the HP E1562 must be a multiple of 8, not including 0.

If the logical address is 8, the HP-IB secondary address is encoded to 1. If the logical address is 40, the secondary address is encoded to 5. In these examples, the HP-IB address is 70901 and 70905.

Software running in a computer writing to a Slot 0 Control Module needs to use all three addresses: the select code, the primary HP-IB address, and the secondary address.

If a command module is not used, but rather another type of controller such as MXI, V382, or V743, the divide by 8 restriction for the VXI logical address does not apply and any logical address from 1 to 255 may be used.

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HP E1562 SCPI example programs

HP E1562 example programs have been shipped with your module in both DOS (3.5" floppy) and HP-UX (DAT tape) formats. These examples may provide a basis for your own programs.

Any throughput application will require setup and control via SCPI of the HP E1562 and other VXI modules in the system. This section describes four “C” language example programs which demonstrate throughput and playback operations for particular applications. All of the programs are written using SICL function library calls to the VXI hardware, and have been tested on the HP Series 700 computers, with a MXI interface to the VXI mainframe. They will also run on the V743 embedded controller. One of the programs will execute on the Radisys EPC7 embedded PC.

As hardware platforms and instrument drivers change in the future, these programs should continue to compile and run in the new environments since all the hardware calls use SICL. HP will continue to maintain the example programs as new controller platforms become available.

The current HP E1562 example programs are described below. See the README file on the disk for the most recent list.

MAKEFILE HP-UX makefile used to build the executable programs

LBUS1431.C This program demonstrates how to throughput data from an HP E1431 dynamic input module to an HP E1562 using the local bus. Both the SICL and the HP E1431 libraries must be present on your computer.

LBUS1430.C This program demonstrates how to throughput data from an HP E1430 high-speed ADC to an HP E1562 using the local bus. Using the HP E1430 as a data source, it is possible to exceed the transfer rate limit toa single HP E1562. Thus this example also shows how to configure an HP E1562 session for disk splitting and striping. Both the SICL and the HP E1430 libraries must be present on your computer.

VXI1413.C This program demonstrates how to throughput data from an HP E1413B scanning ADC module to the HP E1562 using the VXI system bus. Both the SICL and HP E1413 C-SCPI libraries must be present on your computer. This example will also run on the EPC7 embedded PC controller.

MIXDTPUT.C This program demonstrates how to throughput data from an HP E1413B and HP E1431 simultaneously to an HP E1562. The HP E1413 data is transferred using the VXI system bus, while the HP E1431 data is transferred via the local bus. A playback sequence is used to read the data off the disk. This example demonstrates some of the complexities encountered while doing throughput from different kinds of devices, particularly in the design of relative transfer blocksizes.

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9

SCPI Command Reference

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Note

The HP E1652F provides additional storage space to a VXI system with a SCSI controller, such as an HP E1562D/E. The HP E1562D/E is controlled by programming the SCSI controller. The HP E1652F does not respond to any commands on the VXI bus.

This chapter pertains to the HP E1562D/E.

Message-based VXI devices

The Command Reference chapter describes all of the HP E1562's SCPI commands. Each command has the following:

1. The heading. This includes two fields. The field to the left shows the command name. The field to the right indicates whether the command has a command form, a query form, or both.
2. A brief description of the command. This one- or two-line description appears just below the heading.
3. A syntax description. This may consist of one or two parts: only a command syntax, only a query syntax, or both. The syntax description shows you the syntax expected by the command parser. A detailed description for the elements appearing in the syntax description follows. For additional information about message syntax see the *Beginner's Guide to SCPI*, available through your local Hewlett-Packard Sales Office.
4. Example statements. This field appears at the end of the syntax description. It contains two examples of HP BASIC output statements that use the command.
5. A return format description. This field is only used if the command has a query form. It tells you how data is returned in response to the query.
6. An attribute summary. This field defines the command's preset state, identifies overlapped commands requiring synchronization, and specifies compliance with SCPI. A "confirmed" command complies with SCPI 1994.
7. A detailed description. This field contains additional information about the command.

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Finding the Right Command

- If you do not find a command where you expect it, try scanning the quick reference tables that begin on page 9-7 for the equivalent command that contains the implied mnemonic.

  Each command has a brief description. After you locate the equivalent command, you can find a more detailed description in the command reference.

- If you are looking for a command that accesses a particular function, use the index.

  For example, if you want to find the commands that open or close a Transfer Unit, look for “transfer unit” in the index. It sends you to the pages that describe the MMEMory:TUNit[1|2|...|15]:OPEN and MMEMory:TUNit[1|2|...|15]:CLOSe commands.

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Command Syntax

This section describes the syntax elements used in the SCPI command reference. It also describes the general syntax rules for both kinds of command and query messages.

Note

For a more detailed discussion of message syntax, including example program listings, refer to the *Beginner's Guide to SCPI* available through your local Hewlett-Packard Sales Office.

Special Syntactic Elements

Several syntactic elements have special meanings:

- colon (:) — When a command or query contains a series of keywords, the keywords are separated by colons. A colon immediately following a keyword tells the command parser that the program message is proceeding to the next level of the command tree. A colon immediately following a semicolon tells the command parser that the program message is returning to the base of the command tree.
- semicolon (;) — When a program message contains more than one command or query, a semicolon is used to separate them from each other. For example, if you want to set up Session devices to begin at a specified block number and then start a measurement using one program message, the message would be:

```
MMEMory:SESSion2:SEEK 8191;:SEQuence:BEGin VPL,262144,1
```

- comma (,) — A comma separates the data sent with a command or returned with a response. For example, the SEQuence:BEGin command requires three values to determine the destination, size, and data source of a Sequence which is to be executed. For example, a message to begin a playback to the local bus of 8388608 bytes from Session 3 would be:

```
SEQuence:BEGin LPL,8388608,3
```

- <WSP> — One white space is required to separate a program message (the command or query) from its parameters. For example, the command "SEQuence:BEGin VPL,262144,1" contains a space between the program header (SEQuence:BEGin) and its program data (VPL,262144,1). White space characters are not allowed within a program header.

For more information, see the *Beginner's Guide to SCPI* available through your local Hewlett-Packard Sales Office.

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Conventions

Syntax and return format descriptions use the following conventions:

- < > Angle brackets enclose the names of items that need further definition. The definition will be included in accompanying text. In addition, detailed descriptions of these elements appear at the end of this section.
- ::= "is defined as" When two items are separated by this symbol, the second item replaces the first in any statement that contains the first item. For example, A::=B indicates that B replaces A in any statement that contains A.
- | "or" When items in a list are separated by this symbol, one and only one of the items can be chosen from the list. For example, A|B indicates that A or B can be chosen, but not both.
- ... An ellipsis (trailing dots) is used to indicate that the preceding element may be repeated one or more times.
- [ ] Square brackets indicate that the enclosed items are optional.
- { } Braces are used to group items into a single syntactic element. They are most often used to enclose lists and to enclose elements that are followed by an ellipsis.

Although the command interpreter is not case sensitive, the case of letters in the command keyword is significant in the Command Reference. Keywords that are longer than four characters can have a short form or a long form. SCPI accepts either form. Upper-case letters show the short form of a command keyword. For more information, see the *Beginner's Guide to SCPI*.

SCPI is sensitive to white space characters. White space characters are not allowed within command keywords. They are only allowed when they are used to separate a command and a parameter.

A message terminator is required at the end of a program message or a response message. Use <NL>, <^END>, or <NL> <^<END> as the *program message terminator*. The word <NL> is an ASCII new line (line feed) character. The word <^END> means that End or Identify (EOI) is asserted on the HP-IB interface at the same time the preceding data byte is sent. Most programming languages send these terminators automatically. For example, if you use the HP BASIC OUTPUT statement, <NL> is automatically sent after your last data byte. If you are using a PC, you can usually configure your system to send whatever terminator you specify.

For more information about terminating messages, see the *Beginner's Guide to SCPI*.

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Syntax Descriptions

Syntax descriptions in the SCPI command reference chapter use the following elements:

<CHAR> This item designates a string of ASCII characters. There are no delimiters. Usually, the string is from an explicit set of responses. Maximum length is 12 characters.

<STRING> This item specifies any 8-bit characters delimited by single quotes or double quotes. The beginning and ending delimiter must be the same. If the delimiter character is within the string, it must be entered twice. (For example, to get "EXAMPLE", enter ""EXAMPLE"").

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HP E1562 SCPI Quick Reference

Command	Description
Common Commands	
*CLS	Clears the Status Byte
*ESE	Sets or queries bits in the Standard Event Status enable register
*ESR?	Reads and clears the Standard Event Status event register
*IDN?	Returns module's identification string
*OPC	Eanbles status bit or query completion of all pending overlapped commands
*RST	Executes a device reset
*SRE	Sets or queries bits in the Service Request enable register
*STB?	Reads the Status Byte register
*TST?	Performs selftest
*WAI	Wait-to-continue command
Local Bus Configuration	
LBUS:READ:BUFFer	Transfers data from the module to the left of the HP E1562 to a memory buffer
LBUS:WRITe:BUFFer	Transfers data from a memory buffer to the module to the right of the HP E1562
VINStrument[:CONFigure]:LBUS[:MODE]	Configures the local bus
VINStrument:LBUS:RESet	Resets the HP E1562 local bus
Mass Memory Control	
MMEMory:SCSI[1|2|...|30]:BSIZe	Returns the number of bytes in a logical block of an open SCSI device
MMEMory:SCSI[1|2|...|30]:CAPacity?	Returns the number of logical blocks on an open SCSI device
MMEMory:SCSI[1|2|...|30]:CLOSe	Closes a SCSI device
MMEMory:SCSI[1|2|...|30]:EBYPass[:STATe]	Sets or queries erase bypass mode of certain magneto-optical disks
MMEMory:SCSI[1|2|...|30]:ERASe	Erases blocks on an cetain device magneto-optical disks

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Command	Description
MMEMory:SCSI[1|2|...|30]:OPEN	Opens a SCSI device
MMEMory:SESSion[1|2|...|12]:ADD	Adds a Transfer Unit to a SCSI Session (HP disk drives only)
MMEMory:SESSion[1|2|...|12]:COPY	Copies data from one SCSI Session to another
MMEMory:SESSion[1|2|...|12]:DELete:ALL	Deletes all Transfer Units from the specified SCSI Session
MMEMory:SESSion[1|2|...|12]:READ:BUFFer	Reads data from a Session into a memory buffer
MMEMory:SESSion[1|2|...|12]:READ:FIFO	Reads data from a SCSI Session into a FIFO
MMEMory:SESSion[1|2|...|12]:SEEK	Locates a specific logical block in a Session
MMEMory:SESSion[1|2|...|12]:SIZE?	Returns the number of Transfer Units in the Session
MMEMory:SESSion[1|2|...|12]:WRITe:BUFFer	Writes data to a SCSI Session from a memory buffer
MMEMory:SESSion[1|2|...|12]:WRITe:FIFO	Writes data to a SCSI Session from a FIFO
MMEMory:TUNIT[1|2|...|15]:CLOSe	Closes an open Transfer Unit
MMEMory:TUNIT[1|2|...|15]:OPEN	Opens a Transfer Unit
Sequence Operations	
SEQuence[1|2|3|4]:ADD	Appends an operation to the specified Sequence
SEQuence[1|2|3|4]:BEGin	Begins a Sequence for data transfer
SEQuence[1|2|3|4]:DELete:ALL	Removes all operations from the specified Sequence list
SEQuence[1|2|3|4]:SIZE?	Returns the number of elements in the Sequence
SEQuence[1|2|3|4]:TRANsferred?	Returns the number of bytes transferred in the Sequence
Status Reporting	
STATus:OPERation:CONDition?	Reads the Operation Status condition register
STATus:OPERation:ENABle	Sets and queries bits in the Operation Status enable register
STATus:OPERation[:EVENt]?	Reads and clears the Operation Status event register
STATus:OPERation:NTRansition	Sets and queries bits in the Operation Status negative transition register
STATus:OPERation:PTRansition	Sets and queries bits in the Operation Status positive transition register
STATus:PRESet	Sets bits in most enable and transition registers to the default state

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	Command	Description
	STATus:QUEStionable:CONDition?	Reads the Questionable Status condition register
	STATus:QUEStionable:ENABle	Sets and queries bits in the Questionable Status enable register
	STATus:QUEStionable[:EVENt]?	Reads and clears the Questionable Status event register
	STATus:Questionable:NTRansition	Sets and queries bits in the Questionable Status negative transition register
	STATus:Questionable:PTRansition	Sets and queries bits in the Questionable Status positive transition register
System Control		
	SYSTem:ABORt	Aborts a data transfer Session and/or Sequence
	SYSTem:COMMunicate:SCSI[:SELF]:ADDRess	Changes the module's SCSI bus controller address
	SYSTem:ERRor?	Returns one error message from the module's queue
	SYSTem:VERSion	Returns the SCPI version to which the module complies
Diagnostics		
	DIAGnostic:BOARd:MAIN?	Tests the A1 PC board
	DIAGnostic:BOARd:SCSI?	Tests the A2 PC board
	DIAGnostic:LBUS:CONsume?	Tests the local bus data transfer to module
	DIAGnostic:LBUS:GENerate?	Tests the local bus data transfer from module
	DIAGnostic:SCSI:DAT?	Tests DAT at specific SCSI bus/addresss
	DIAGnostic:SCSI:DEVices?	Tests a device's SCSI bus controller
	DIAGnostic:SCSI:DISK?	Tests disk at specific SCSI bus/addresss
	DIAGnostic:VXI:DEVices?	Tests the interface to other devices in the VXI mainframe

The following commands are provided for backward compatability with models HP E1562A/B/C (which use HP-manufactured disk drives) and application software designed to support them. Their behavior for the non-HP-manufactured disk drives used in the HP 1562D/E/F or for non-HP- manufactured disk drives supplied by the customer are described in the command descriptions on the following pages.

	MMEMory:SCSI[1 | 2 | ... | 30]:CALibrate:AUTO	Sets or queries the Auto Head Calibration Mode of an open SCSI device
	MMEMory:SCSI[1 | 2 | ... | 30]:CALibrate[:IMMediate]	Performs head calibration on an open SCSI device
	MMEMory:SCSI[1 | 2 | ... | 30]:CALibrate:TIME?	Returns the time until the next head calibration

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Command	Description
MMEMory:SCSI[1|2|...|30]:TEMPerature?	Returns drive temperature

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HP E1562 SCPI Commands

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*CLS command

Clears the Status Byte by emptying the error queue and clearing all event registers.

Command Syntax: *CLS

Example Statements:
```
OUTPUT 70918;":*CLS"
OUTPUT 70918;"*cls"
```

Attribute Summary: Preset State: not applicable
Synchronization Required: no
SCPI Compliance: confirmed

Description: This command clears the Status Byte register. It does so by emptying the error queue and clearing (setting to 0) all bits in the event registers of the following register sets:

- Questionable Status
- Standard Event
- Operation Status

In addition, *CLS cancels any preceding *OPC command or query. This ensures that bit 0 of the Standard Event register will not be set to 1 and that a response will not be placed in the instrument's output queue when pending overlapped commands are completed.

*CLS does not change the current state of enable registers or transition filters.

Note To guarantee that the Status Byte's Message Available and Master Summary Status bits are cleared, send *CLS immediately following a Program Message Terminator.

For more information on the Status Byte register, see "The HP E1562's Register Sets" in the previous chapter.

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*ESE command/query

Sets or queries bits in the Standard Event Status enable register.

Command Syntax: *ESE <Mask>

<Mask>::=number
limits: 0:255

Example Statements: OUTPUT 70918;"*ese 1"
OUTPUT 70918;"*ESE 60"

Query Syntax: *ESE?

Return Format: Integer

Attribute Summary: Preset State: not applicable
Synchronization Required: no
SCPI Compliance: confirmed

Description: This command allows you to set bits in the Standard Event Status enable register. Assign a decimal weight to each bit you want set (to 1) according to the following formula:

$$2^{(bit_number)}$$

with acceptable values for bit_number being 0 through 7. Add the weights and then send the sum with this command.

When an enable register bit is set to 1, the corresponding bit of the Standard Event Status event register is enabled. All enabled bits are logically ORed to create the Standard Event Status summary, which reports to bit 5 of the Status Byte. Bit 5 is only set to 1 if both of the following are true:

- One or more bits in the Standard Event Status event register are set to 1.
- At least one set bit is enabled by a corresponding bit in the Standard Event Status enable register.

The query returns the current state of the Standard Event Status enable register. The state is returned as a sum of the decimal weights of all set bits.

For more information on the Standard Event Status register set, see "The HP E1562's Register Sets" in the previous chapter.

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*ESR? query

Reads and clears the Standard Event Status event register.

Query Syntax: *ESR?

Example Statements: OUTPUT 70918;":*ESR?"
OUTPUT 70918;"*esr?"

Return Format: Integer

Attribute Summary: Preset State: +0
Synchronization Required: no
SCPI Compliance: confirmed

Description: This query returns the current state of the Standard Event Status event register. The state is returned as a sum of the decimal weights of all set bits. The decimal weight for each bit is assigned according to the following formula:

$$2^{(\text{bit_number})}$$

with acceptable values for bit_number being 0 through 7.

The query clears the register after it reads the register.

A bit in this register is set to 1 when the condition it monitors becomes true. A set bit remains set, regardless of further changes in the condition it monitors, until one of the following occurs:

- You read the register with this query.
- You clear all event registers with the *CLS command.

For more information on the Standard Event Status enable register set, see "The HP E1562's Register Sets" in the previous chapter.

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*IDN? query

Returns a string that uniquely identifies the module.

Query Syntax: *IDN?

Example Statements: OUTPUT 70918;":*IDN?"
OUTPUT 70918;"*idn?"

Return Format: HEWLETT-PACKARD,E1562,<serial_number><software_revision>

Attribute Summary: Preset State: instrument dependent
Synchronization Required: no
SCPI Compliance: confirmed

Description: This query returns:

- The name of the manufacturer, Hewlett Packard
- The product number, E1562
- The serial number
- The version of the software

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*OPC command/query

Enable status bit or query completion of all pending overlapped commands.

Command Syntax: *OPC

Example Statements:
```
OUTPUT 70918;":*OPC"
OUTPUT 70918;"*opc"
```

Query Syntax: *OPC?

Return Format: Integer

Attribute Summary:
Preset State: not applicable
Synchronization Required: no
SCPI Compliance: confirmed

Description: Some commands are processed sequentially. A sequential command holds off the processing of subsequent commands until it has been completely processed. However, some commands do not hold off the processing of subsequent commands. These commands are called overlapped commands. At times, overlapped commands require synchronization. The Attribute Summary for each command indicates whether it requires synchronization.

The module uses the No Pending Operation (NPO) flag to keep track of overlapped commands that are still pending (that is, not completed). The NPO flag is reset to 0 when an overlapped command is pending. It is set to 1 when no overlapped commands are pending. You cannot read the NPO flag directly, but you can use *OPC and *OPC? to tell when the flag is set to 1.

If you use *OPC, bit 0 of the Standard Event Status event register is set to 1 when the NPO flag is set to 1. This allows the instrument to generate a service request when all pending overlapped commands are completed (assuming you have enabled bit 0 of the Standard Event Status register and bit 5 of the Status Byte register).

If you use *OPC?, +1 is placed in the output queue when the NPO flag is set to 1. This allows you to effectively pause the controller until all pending overlapped commands are completed. It must wait until the response is placed in the queue before it can continue.

Note The *CLS and *RST commands cancel any preceding *OPC command or query. Pending overlapped commands are still completed, but you can no longer determine when.

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*RST command

Executes a device reset.

Command Syntax: *RST

Example Statements: OUTPUT 70918;":*RST"
OUTPUT 70918;"*rst"

Attribute Summary: Preset State: not applicable
Synchronization Required: no
SCPI Compliance: confirmed

Description: This command returns the instrument to a reset state. In addition, *RST cancels any pending *OPC command or query.

The reset state is the same as the preset state. The preset state of each command is listed in the Attribute Summary.

The following are *not* affected by this command:

- The error queue
- The state of all enable registers
- The state of all transition registers

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*SRE command/query

Sets or queries bits in the Service Request enable register.

Command Syntax: *SRE <Mask>

<Mask>::=number
limits: 0:255

Example Statements: OUTPUT 70918;":*SRE 128"
OUTPUT 70918;"*sre 32"

Query Syntax: *SRE?

Return Format: Integer

Attribute Summary: Preset State: not applicable
Synchronization Required: no
SCPI Compliance: confirmed

Description: This command allows you to set bits in the Service Request enable register. Assign a decimal weight to each bit you want set (to 1) according to the following formula:

$$2^{(bit_number)}$$

with acceptable values for bit_number being 0 through 7. Add the weights and then send the sum with this command.

Note The module ignores the setting you specify for bit 6 of the Service Request enable register. This is because the corresponding bit of the Status Byte register is always enabled.

The module requests service from the active controller when one of the following occurs:

- A bit in the Status Byte register changes from 0 to 1 while the corresponding bit of the Service Request enable register is set to 1.
- A bit in the Service Request enable register changes from 0 to 1 while the corresponding bit of the Status Byte register is set to 1.

The query returns the current state of the Service Request enable register. The state is returned as a sum of the decimal weights of all set bits.

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*STB? query

Reads the Status Byte register.

Query Syntax: *STB?

Example Statements: OUTPUT 70918;":*STB?"
OUTPUT 70918;"*stb?"

Return Format: Integer

Attribute Summary: Preset State: variable
Synchronization Required: no
SCPI Compliance: confirmed

Description: This command allows you to set bits in the Status Byte register. The state is returned as a sum of the decimal weights of all set bits. The decimal weight for each bit is assigned according to the following formula:

$$2^{(\text{bit_number})}$$

with acceptable values for bit_number being 0 through 7.

The register is not cleared by this query. To clear the Status Byte register, you must send the *CLS command.

For more information on the Status Byte register, see "The HP E1562's Register Sets" in the previous chapter.

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*TST? query

Performs a selftest on the instrument hardware and returns the results.

Query Syntax: *TST?

Example Statements: OUTPUT 70918;":*TST?"
OUTPUT 70918;"*tst?"

Return Format: Integer

Attribute Summary: Preset State: not applicable
Synchronization Required: no
SCPI Compliance: confirmed

Description: This command performs tests on both the internal main board and the internal SCSI board by sending the commands DIAGnostic:BOARd:MAIN? and DIAGnostic:BOARd:SCSI?

The following errors indicate that DIAG:BOAR:MAIN failed:

1: diagErr_versionOrSwitch
2: diagErr_fitsReset
3: diagErr_lbusStatic
4: diagErr_fitsStatic
5: diagErr_vxiStatic
6: diagErr_sharedRam
7: diagErr_fifo
8: diagErr_sramMagicRead
9: diagErr_sramMagicWrite
10: diagErr_a24MagicRead
11: diagErr_a24MagicWrite

The following errors indicate that DIAG:BOAR:SCSI failed:

12: diagErr_staticScsi
13: diagErr_inScsi
14: diagErr_outScsi

See the DIAGnostic commands for additional diagnostic tests.

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*WAI command

Holds off processing of subsequent commands until all preceding commands have been processed.

Command Syntax: *WAI

Example Statements:
```
OUTPUT 70918;":*WAI"
OUTPUT 70918;"*wai"
```

Attribute Summary:
Preset State: not applicable
Synchronization Required: no
SCPI Compliance: confirmed

Description: Use *WAI to hold off the processing of subsequent commands until all pending overlapped commands have been completed.

Some commands are processed sequentially by the instrument. A sequential command holds off the processing of any subsequent commands until it has been completely processed. However, some commands do not hold off the processing of subsequent commands; they are referred to as overlapped commands. *WAI ensures that overlapped commands are completely processed before subsequent commands (those sent after *WAI) are processed.

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DIAGnostic:BOARd:MAIN? query

Tests the main internal PC board (A1).

Query Syntax: DIAGnostic:BOARd:MAIN?

Example Statements:
```
OUTPUT 70918;":DIAGNOSTIC:BOARD:MAIN?"
OUTPUT 70918;"diag:boar:main?"
```

Return Format: String

Attribute Summary:
Preset State: not applicable
Synchronization Required: no
SCPI Compliance: instrument-specific

Description: Failures return a string describing the error.

Refer to the *Service Manual* for usage information.

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DIAGnostic:BOARd:SCSI? query

Tests the internal SCSI PC board (A2).

Query Syntax: DIAGnostic:BOARd:SCSI?

Example Statements:
```
OUTPUT 70918;":DIAGNOSTIC:BOARD:SCSI?"
OUTPUT 70918;"diag:boar:scsi?"
```

Return Format: String

Attribute Summary:
Preset State: not applicable
Synchronization Required: no
SCPI Compliance: instrument-specific

Description: Failures return a string describing the error.

Refer to the *Service Manual* for usage information.

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DIAGnostic:LBUS:CONSume? query

Tests the a local bus data transfer to the module.

Query Syntax: DIAGnostic:LBUS:CONSume? <Logical Address>

<Logical Address> ::= number
limits 0-255

Example Statements: OUTPUT 70918;":DIAGNOSTICLBUS:CONSUME? 32"
OUTPUT 70918;"diag:lbus:cons? 96"

Return Format: String

Attribute Summary: Preset State: not applicable
Synchronization Required: no
SCPI Compliance: instrument-specific

Description:. This test requires more than one HP E1562 module. This command is sent to the HP E1562 on the right of two adjacent HP E1562s and tests the ability to transfer data from the local bus to the module.

<Logical Address> specifies the VXI logical address of the HP E1562 to the left of this module

Failures return a string describing the error.

Refer to the *Service Manual* for usage information.

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DIAGnostic:LBUS:GENerate? query

Tests the local bus data transfer from the module.

Query Syntax: DIAGnostic:LBUS:GENerate? <Logical Address>

Example Statements:
OUTPUT 70918;":DIAGNOSTIC:BUS:GENERATE? 64"
OUTPUT 70918;"diag:bus:gen? 136"

Return Format: String

Attribute Summary:
Preset State: not applicable
Synchronization Required: no
SCPI Compliance: instrument-specific

Description: This test requires more than one HP E1562 module to perform. This command is sent to the HP E1562 on the left of two adjacent HP E1562s and tests the ability to transfer data from the module to the local bus.

<Logical Address> specifies the VXI logical address of the HP E1562 to the left of this module

Failures return a string describing the error.

Refer to the *Service Manual* for usage information.

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DIAGnostic:SCSI:DAT? query

Performs tests on a SCSI DAT.

Query Syntax: DIAGnostic:SCSI:DAT? <Controller>,<Bus Address>

<Controller>::=A|B

<Bus Address>::=number
limits: 0:15

Example Statements: OUTPUT 70918;":DIAGNOSTIC:SCSI:DAT? A,0"
OUTPUT 70918;"diag:scsi:dat? a,7"

Return Format: String

Attribute Summary: Preset State: not applicable
Synchronization Required: no
SCPI Compliance: instrument-specific

Description: Tests the DAT specified at the given SCSI bus address. If the device at this address is not a DAT and error will be returned.

Note A DAT tape must be inserted in the DAT drive in order to perform this test. All data on the tape will be destroyed during this test.

Failures return a string describing the error.

Refer to the *Service Manual* for usage information.

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DIAGnostic:SCSI:DEVices? query

Verifies the interface for a specific SCSI controller.

Query Syntax: DIAGnostic:SCSI:DEVices? <Controller>

<Controller>::=A|B

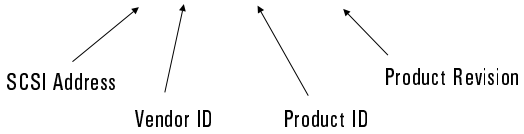
Example Statements: OUTPUT 70918;":DIAGNOSTIC:SCSI:DEVICES? A"
OUTPUT 70918;"diag:scsi:dev? b"

Return Format: String

Attribute Summary: Preset State: not applicable
Synchronization Required: no
SCPI Compliance: instrument-specific

Description: This command verifies correct operation of in a single SCSI controller chip and also its interface to external devices. The command must be sent to each controller to verify that both of the SCSI controller chips are functioning. If the test is successful the command returns a string which contains the SCSI address, vendor id, product id, and product revision in a "dd.aa aaaaa-aaaa" format. A null string is returned if the test fails.

Example of the string returned when the SCSI bus contains a C2490 disk at SCSI address 0: 00:HP C2490-3256



This command does not verify that that the devices connected to the SCSI bus are operating correctly. The command DIAG:BOARd:SCSI? verifies that the HP E1562 side of the controller chip is functioning correctly. The commands DIAG:SCSI:DISK? and DIAG:SCSI:DAT? verify that individual devices are functioning correctly

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DIAGnostic:SCSI:DISK? query

Performs tests on a SCSI disk drive.

Query Syntax: DIAGnostic:SCSI:DISK? <Controller>,<Bus Address>

<Controller>::=A|B

<Bus Address>::=number
limits 0:15

Example Statements:
```
OUTPUT 70918;":DIAGNOSTIC:SCSI:DISK? A,12"
OUTPUT 70918;"diag:scsi:disk? b,2"
```

Return Format: String

Attribute Summary:
Preset State: not applicable
Synchronization Required: no
SCPI Compliance: instrument-specific

Description: Tests the disk drive specified at the given SCSI bus address. If the device at this address is not a disk, an error will be returned.

Failures return a string describing the error.

Refer to the *Service Manual* for usage information.

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DIAGnostic:VXI:DEVices? query

Performs tests on the HP E1562 VXI interface and returns a list of VXI modules in the mainframe.

Query Syntax: DIAGnostic:VXI:DEVices?

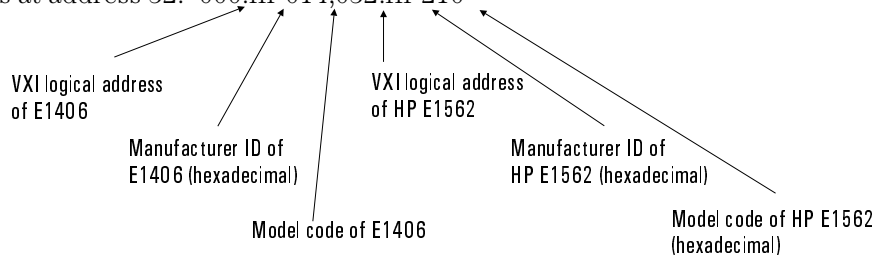
Example Statements:
```
OUTPUT 70918;":DIAGNOSTIC:VXI DEVICES?"
OUTPUT 70918;"diag:vxi:dev?"
```

Return Format: String

Attribute Summary:
Preset State: not applicable
Synchronization Required: no
SCPI Compliance: instrument-specific

Description: This comand verifies correct operation of the VXI master and slave capability of a HP E1562 module, thus verifying most of the capabilities of the VXI interface chip. At the same time it provids a list of all modules connected to the VXI mainframe. If successful, this command returns a string which contains the VXI logical address, manufacturer ID, and model code (in a “ddd:hhh-hhh,ddd:hhh-hhh” format) of every device connected to the VXI bus. A null string is returned if the test fails.

Example of the string returned when an E1406 command module is at address 0 and an HP E1562 is at address 32: 000:fff-014,032:fff-210



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LBUS:READ:BUFFer command

Reads data from the module to the left of the HP E1562 and writes it to a memory buffer.

Command Syntax: LBUS:READ :BUFFer<Count>, <Blocksize>, <Offset>,<Memory Space>

<Count>::=number
limits: 1:256

<Blocksize>::=number
limits: 16:65536

<Offset>::=number
limits: 0:4294967295

<Memory Space>::=A24|A32|SRAM

Example Statements:
```
OUTPUT 70918;":LBUS:READ:BUFFER 16,#H3000D000,A32"
OUTPUT 70918;"lbus:read:buff 64,#h20a080,a24"
```

Attribute Summary:
Preset State: not applicable
Synchronization Required: yes
SCPI Compliance: instrument-specific

Description: This command may be used in conjunction with MMEM:SESS:WRIT:BUFF to transfer data from the local bus to a session. In most cases you will find it easier and faster to use Sequence throughput operations.

This command reads data from the module to the left of the HP E1562 on local bus and writes it using D16 to a designated memory location using LBUS CONSUME mode and 4 bytes per local bus element. You must have previously sent the VINStrument:LBUS command with the NORMal parameter.

<Count> specifies the number of Lbus blocks to write to the memory buffer from the local bus.

<Blocksize> specifies the number of bytes per local bus block. A block marker will be received after this many bytes have been read. The maximum number of local bus blocks read is 256.

<Offset> indicates where in the designated memory buffer space the data will be written. The value is an offset from the beginning of the address space. All address spaces start at offset 0. A24 has an upper limit of 16777215, A32 has an upper limit of 4294967295, SRAM has an upper limit of 262143. The value of offset must be divisible by 2.

<Memory space> specifies into which memory to write the data blocks. The usable memory spaces for this command are A24,A32, and SRAM. SRAM indicates the HP E1562 shared RAM.

Note Be sure enough memory space is available for the data to be transferred.

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LBUS:WRITe:BUFFer command

Reads data from a memory buffer and writes it to the module to the right of the HP E1562.

Command Syntax: LBUS:WRITe:BUFFer <Count>, <Blocksize>,<Offset>,<Memory Space>

<Count>::=number
limits: 1:256

<Blocksize>::=number
limits: 16:65536

<Offset>::=number
limits: 0:4294967295

<Memory Space>::=A24|A32|SRAM

Example Statements:
```
OUTPUT 70918;"LBUS:WRITE:BUFFER 128,16,#H20000000,A32"
OUTPUT 70918;"lbus:writ:buff 16,#h10,#h128,sram"
```

Attribute Summary: Preset State: not applicable
Synchronization Required: yes
SCPI Compliance: instrument-specific

Description: This command may be used in conjunction with MMEM:SESS:READ:BUFF to transfer data from a session to the local bus. In most cases you will find it easier and faster to use Sequence playback operations.

This command uses D16 to read blocks of data from a designated offset in a memory buffer then writes them to the module to the right of the HP E1562 on the local bus using LBUS GENERATE mode and 4 bytes per local bus element. The VINStrument:LBUS command must have been previously sent with the NORMal parameter.

<Count> specifies the number of local bus blocks to read from the memory buffer and copy to the local bus.

<Blocksize> specifies the number of bytes per local bus block. A block marker will be asserted after this many bytes have been transferred on the local bus. A frame marker will also be asserted periodically, but there should be no particular meaning associated with the frame marker. The maximum number of local bus blocks written is 256.

<Offset> indicates from where in the designated memory buffer space the data will be read. The value is an offset from the beginning of the address space. All address spaces start at offset 0. A24 has an upper limit of 16777215, A32 has an upper limit of 4294967295, SRAM has an upper limit of 262143. The value of offset must be divisible by 2.

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MMEMory:SCSI[1|2|...|30]:BSIZe? query

Returns the number of bytes in a logical block for an open SCSI device.

Query Syntax: MMEMory:SCSI[1|2|...|30]:BSIZe?

Example Statements:
```
OUTPUT 70918;":MMEMory:SCSI4:BSIZe?"
OUTPUT 70918;"mmemory:scsi23:bsize?"
```

Return Format: Integer

Attribute Summary:
Preset State: not applicable
Synchronization Required: no
SCPI Compliance: instrument-specific

Description: The returned value is the number of bytes in a logical block for any SCSI device which has been opened by the MMEM:SCSI:OPEN command. An error will be generated if the device is not currently open. To find the number logical blocks on a device send MMEM:SCSI:CAPacity?

Some of the MMEM commands require addresses and counts specified in terms of logical blocks. The return value of this query specifies the size of a logical block.

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MMEMory:SCSI[1|2|...|30]:CALibrate:AUTO command/query

Note

This command is provided for backward compatability with models HP E1562A/B/C (which use HP-manufactured disk drives) and application software designed to support them. Using this command with the non-HP-manufactured disk drives (including those in the HP 1562D/E/F) results in no action. The query returns the current head calibration mode, but the number does not mean anything for a non-HP drive.

Sets or queries the Auto Head Calibration Mode of an open HP disk drive.

Command Syntax: MMEMory:SCSI[1|2|...|30]:CALibrate:AUTO <Auto Cal Mode>

<Auto Cal Mode>::=ON|OFF

Example Statements:
```
OUTPUT 70918;":MMEM:SCSI14:CAL:AUTO OFF"
OUTPUT 70918;"mmemory:scsi18:calibrate:auto ON"
```

Query Syntax: MMEMory:SCSI[1|2|...|30]:CALibrate:AUTO?

Return Format: Integer

Attribute Summary:
Preset State: ON
Synchronization Required: no
SCPI Compliance: instrument-specific

Description: Auto head calibration mode is supported only for certain Hewlett-Packard SCSI Direct-Access devices (hard disks). Many disks periodically perform a head recalibration to assure that the positioning capability is within spec through temperature changes and over time. This command is useful for disabling head calibration during medium to high speed data transfers.

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An example of the head calibration schedule of a C2490 disk drive follows:

Time since spin up (minutes)	Delta (minutes)
0	
2	2
4	2
6	2
8	2
10	2
12	2
15	3
18	3
22	4
27	5
33	6
42	9
60	18
100	40
160	60
220	60
etc	

Caution

If auto calibration is disabled for a period of time longer than the device finds acceptable (in the instance of the C2490 this is twice the time in the table above), writes to the device may be disabled or the device may force a head calibration to be done without regard to the state of the auto calibration flag. This may result in an overflow condition due to an interuption of real-time data flow.

When any SCSI device is opened, the auto-calibration mode will be enabled.

<Auto Cal Mode> indicates whether the automatic head recalibration mode should be enabled or disabled.

This command generates an error if the device is not currently open.

This command is not available for SCSI devices which are not Hewlett-Packard disks and will generate an error.

The query returns the current state of the automatic head calibration mode for the device: 0=OFF, 1=ON.

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MMEMory:SCSI[1|2|...|30]:CALibrate [:IMMediate] command

Note

This command is provided for backward compatability with models HP E1562A/B/C (which use HP-manufactured disk drives) and application software designed to support them. Using this command with the non-HP-manufactured disk drives (including those in the HP 1562D/E/F) results in no action.

Performs head calibration on an HP disk drive.

Command Syntax: MMEMory:SCSI[1|2|...|30]:CALibrate[:IMMediate]

Example Statements:
```
OUTPUT 70918;":MMEMORY:SCSI8:CALIBRATE:IMMEDIATE"
OUTPUT 70918;"mmem:scsi:cal"
```

Attribute Summary: Preset State: not applicable
Synchronization Required: no
SCPI Compliance: instrument-specific

Description: This command is intended only for certain Hewlett-Packard SCSI Direct-Access devices (hard disks). Many disks periodically perform a head recalibration to assure that the positioning capability is in spec through temperature changes and over time. This command will force certain Hewlett-Packard supported disks to perform a head calibration immediately. This command is useful before starting a high speed data transfer. It is not useful when the data transfer rate will be significantly less than the disk's sustained media transfer rate.

This command generates an error if the device is not currently open.

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MMEMory:SCSI[1|2|...|30]:CALibrate:TIME? query

Note This command is provided for backward compatability with models HP E1562A/B/C (which use HP-manufactured disk drives) and application software designed to support them. Using this command with the non-HP-manufactured disk drives (including those in the HP 1562D/E/F) returns a value of 9,999,999.

Returns the time until the next head calibration.

Query Syntax: MMEMory:SCSI[1|2|...|30]:CALibrate:TIME?

Example Statements:
```
OUTPUT 70918;":MMEMORY:SCSI7:CALibrate:TIME?"
OUTPUT 70918;"mmem:scsi7:cal:time?"
```

Return Format: Integer

Attribute Summary:
Preset State: not applicable
Synchronization Required: no
SCPI Compliance: instrument-specific

Description: This command will work only HP disk drives only. It is a good idea to check the time remaining until the next calibration before starting a long throughput. If the time is short send the MMEM:SCSI:CAL command to each of the devices in the Session and send this query again. If the time is still short, wait for the disks to be spun up for a longer length of time. See the MMEM:SCSI:CAL:AUTO command for a schedule of calibration times.

This query generates an error if the device is not currently open.

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MMEMory:SCSI[1|2|...|30]:CAPacity? query

Returns the number of logical blocks on an open SCSI device.

Query Syntax: MMEMory:SCSI[1|2|...|30]:CAPacity?

Example Statements:
```
OUTPUT 70918;":MMEMORY:SCSI7:CAPACITY?"
OUTPUT 70918;"mmem:scsi7:cap?"
```

Return Format: Integer

Attribute Summary:
Preset State: not applicable
Synchronization Required: no
SCPI Compliance: instrument-specific

Description: The returned value is the number of available logical blocks for any SCSI device which has been opened by the MMEM:SCSI:OPEN command. All Direct-Access SCSI devices (disks) support this capability and will return a meaningful result. Other types of devices may not be able to provide any meaningful information and will return 4294967295.

The size, in bytes, of each logical block can be determined by sending the MMEM:SCSI:BSIZe? query. By using the combination of both commands and multiplying their results you can determine the total byte capacity of the device.

This command generates an error if the device is not currently open.

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MMEMory:SCSI[1|2|...|30]:CLOSe command

Closes an open SCSI device.

Command Syntax: MMEMory:SCSI[1|2|...|30]:CLOSe

Example Statements:
```
OUTPUT 70918;":MMEM:SCSI2:CLOS"
OUTPUT 70918;"mmemory:scsi20:close"
```

Attribute Summary:
Preset State: not applicable
Synchronization Required: no
SCPI Compliance: instrument-specific

Description: Use of this command will make the specified logical device descriptor unavailable for use with other commands. If a SCSI device has been opened more than once using different logical device descriptors, it will need to be closed more than once. An error will be returned if the device is not currently open.

If the MMEM:SCSI:CLOS command is sent while the logical descriptor is in use in a TUNIT or SESSION; indeterminate and undesirable results will occur.

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MMEMory:SCSI[1|2|...|30]:EBYPass[:STATe] command/query

Sets or queries the Erase Bypass Mode of an open SCSI device.

Command Syntax: MMEMory:SCSI[1|2|...|30]:EBYPass[:STATe] <Erase Mode>

<Erase Mode>::=ON|OFF

Example Statements:
```
OUTPUT 70918;":MMEMORY:SCSI16:EBYPASS ON"
OUTPUT 70918;"mmem:scsi22:ebyp:stat OFF"
```

Query Syntax: MMEMory:SCSI[1|2|...|30]:EBYPass[:STATe]?

Return Format: Integer

Attribute Summary:
Preset State: OFF
Synchronization Required: no
SCPI Compliance: instrument-specific

Description: Erase bypass mode is supported only by certain magneto-optical disks which require an erase before write. This mode must only be enabled when the media has never been written to, or if an erase has already been performed in the area to be written.

Caution When erase bypass mode is active, a write command to a non-erased block on a device will fail and the data will be lost. In addition the error correction bits on the device will be corrupted making the block unreadable.

This command generates an error if the device is not currently open or if the device does not support erasing.

<Erase Mode> indicates whether the erase bypass mode should be enabled or disabled. The value upon opening a device is OFF or disabled.

The query returns the current state of the erase bypass mode for the device: 0=OFF, 1=ON.

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MMEMory:SCSI[1|2|...|30]:ERASe command

Erase blocks on an open SCSI device.

Command Syntax: MMEMory:SCSI[1|2|...|30]:ERASe <Address>, <Length>

<Address>::=number
limits: 0:4294967295

<Length>::=number
limits: 0:4294967295

Example Statements:
```
OUTPUT 70918;":MMEM:SCSI15:ERAS #H1CC00,#H200"
OUTPUT 70918;"mmemory:scsi3:erase 117760,512"
```

Attribute Summary: Preset State: not applicable
Synchronization Required: no
SCPI Compliance: instrument-specific

Description: This command should be sent only for certain magneto-optical devices. It is used to speed up writes to these types of devices which require an erase before write. This command should be used in conjunction with the command MMEM:SCSI:EBYP.

Caution Any block which has been erased cannot be read. The erasure removes data as well as the error correction bits on the media. A read of media without correction bits will fail.

<Address> is the logical block number at which to start erasing.

<Length> is the number of logical blocks to erase.

This command generates an error if the device is not currently open or if the device does not support erasing.

This command does not have a query form.

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MMEMory:SCSI[1|2|...|30]:OPEN command/query

Opens a SCSI device.

Command Syntax: MMEMory:SCSI[1|2|...|30]:OPEN <Controller>, <Bus address>, <Device unit>, <Mode>

<Controller>::=A|B

<Bus address>::=number
limits: 0:15

<Device unit>::=number
limits: 0:7

<Mode>::=number
limits: 0:4294967295

Example Statements:
```
OUTPUT 70918;":MMEM:SCSI5:OPEN A,5,0,#H40"
OUTPUT 70918;"mmemory:scsi2:open b,0,0,#he8"
```

Query Syntax: MMEMory:SCSI[1|2|...|30]:OPEN?

Return Format: Integer

Attribute Summary:
Preset State: not applicable
Synchronization Required: no
SCPI Compliance: instrument-specific

Description: This command opens the logical device descriptor specified by the subopcode [1|2|...|30] on the SCSI node.

The following conditions generate an error:

- This logical descriptor is already open
- No device responds at the address specifed by <Controller>, <Bus address>, <Device unit>.
- The device at the designated address is not a block-oriented, mass storage device.

With no other errors, the device is opened and ready for use in other commands.

The query version of this command requires no parameters. It returns 0 if the logical device descriptor is not currently open and 1 if the logical descriptor is already open.

<Controller> is A or B indicating to which SCSI controller the device is connected. The A or B corresponds to the A or B on the front-panel of the module.

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<Bus address> is 0-15 indicating the SCSI logical address. If a SCSI narrow device is used, the allowed range is only 0 through 7. DAT drives usually have a single-ended narrow SCSI interface. The HP E1562A module has SCSI controller A connected to a narrow SCSI interface. All other SCSI interfaces on HP E1562 modules are wide-differential SCSI interfaces.

<Device unit> is 0-7 indicating the logical unit number. The logical unit number for all HP E1562 devices is 0. Some external devices may have other logical unit numbers.

<Mode> is an unsigned integer representing a bitfield which indicates various options for the device. Bits in the <Mode> field are:

Mode Bitfield	Description	Bits	
		Decimal	Hexa-decimal
TM_verifyAfterWrite	Performs a medium verification after every write. *Not* supported for sequential devices	1	0x001
TM_reserve	Do not allow other SCSI initiators to access the device while it is open	2	0x002
TM_preventRemoval	For devices with removable media, do not allow the media to be removed while the device is open.	4	0x004
TM_ejectOnClose	For devices with removable media, eject the media when the device is closed. For fixed-media devices, spin down the drive when it is closed	8	0x008
TM_writeWithoutErase	For optical memory devices, disable the erase-before-write to increase speed of writes. See SCPI commands MMEM:SCSI:ERAS and MMEM:SCSI:EBYP for warnings about this mode.	16	0x010
TM_asynchronousTransfer	Use asynchronous instead of synchronous transfers to the device. This cuts the max transfer rate in half	32	0x020
TM_preventDisconnect	Do not allow the device to disconnect while doing certain operations. This is slightly faster than allowing disconnect	64	0x040
TM_narrowTransfer	Use 8-bit transfers to the device. This cuts the max transfer rate in half. Set this bit when using a narrow SCSI bus	128	0x080
TM_dontStartUnit	Do not spin up a disk or load a tape. Reads and writes will cause errors under these conditions but the disks may be configured to spin up on powerup. This bit is good for a quick check for which devices are present without waiting for a spin up.	256	0x100
TM_readOnly	Return an error if any write to the device is attempted	512	0x200

In order to specify more than one of the above modes, add the desired bit values together to obtain the mode value to send to the HP E1562.

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SCSI devices may be opened more than once via different logical device descriptors (represented by the subopcode in the command), but the mode field specified the first time a device is opened is used for all successive times it is opened even if the specified value is different. Any device which is opened multiple times, must also be closed multiple times.

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MMEMory:SCSI[1|2|...|30]:TEMPerature? query

Note

This command is provided for backward compatability with models HP E1562A/B/C (which use HP-manufactured disk drives) and application software designed to support them. Using this command with the non-HP-manufactured disk drives (including those in the HP 1562D/E/F) returns a value 1.0° C (first integer = 1, second integer = 0).

Returns the temperature of an HP disk drive

Query Syntax: MMEMory:SCSI[1|2|...|30]:TEMPerature?

Example Statements:
```
OUTPUT 70918;":MMEMORY:SCSI4:TEMPERATURE?"
OUTPUT 70918;"mmemory:scsi23:temp?"
```

Return Format:
Integer
Integer

Attribute Summary:
Preset State: not applicable
Synchronization Required: no
SCPI Compliance: instrument-specific

Description: This command is supported for certain Hewlett-Packard disk drives only. Two integer values are returned. The first integer represents the temperature in degrees Centrigrade. The second integer represents the fractional part of an additional degree and is designated as the number of 256ths of a degree.

Absolute accuracy of tempeature is ±5° C.

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MMEMory:SESSion[1|2|...|12]:ADD command

Adds a Transfer Unit to a Session.

Command Syntax: MMEMory:SESSion[1|2|...|12]:ADD <Transfer Unit>, <Count>

<Transfer Unit>::=number
limits: 1:15

<Count>::=number
limits: 1:33554430

Example Statements:
```
OUTPUT 70918;":MMEMORY:SESSION12:ADD 5,26974"
OUTPUT 70918;"mmemory:session:add 12,#h7fff"
```

Attribute Summary: Preset State: not applicable
Synchronization Required: no
SCPI Compliance: instrument-specific

Description: All data transfers, including Sequences, are performed using Sessions. A Session may contain no more than 15 Transfer Units. This command adds a Transfer Unit to the specified Session. The Session can be cleared using the MMEM:SESS:DEL:ALL command.

Every Transfer Unit which is added to a Session must contain the same number of SCSI devices. If each Transfer Unit in a Session is made up of a single device, each device must be on the same SCSI controller. This command generates an error if these constraints are not met.

<Transfer Unit> determines which logical Transfer Unit is to be added to the SESSION. Transfer units are always added to the end of the current list of Transfer Units. The command generates an error if the Transfer Unit is not currently open. A Transfer Unit may be included in more than one Session. It is also permissible to include the same Transfer Unit more than once in a single Session, although there is no good reason to do so.

<Count> is the number of logical blocks to transfer to or from this Transfer Unit before switching to the next Transfer Unit in the Session. The size of a logical block can be determined by sending the MMEM:SCSI:BSIZ? query. When there are multiple Transfer Units in the Session, <Count> should be chosen such that the total number of bytes written at one time is less than or equal to the number of bytes of cache contained on the device(s). (For example, a C2490 disk drive has 256 Kbytes of cache.) If the Transfer Unit contains two devices, <Count> specifies the number of logical blocks to be written to or read from the pair of devices, half of which will be written to or read from an individual device. The largest value of <Count> for disk drives is 65535 per disk drive, or 131070 for a pair of disk drives.

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MMEMory:SESSion[1|2|...|12]:COPY command

Copies data from one Session to another.

Command Syntax: MMEMory:SESSion[1|2|...|12]:COPY <Destination Session>, <Count>

<Destination Session>::=number
limits: 1:12

<Count>::=number
limits: 1:4294967295

Example Statements:
```
OUTPUT 70918;":MMEMORY:SESSION2:COPY 10,#H40000"
OUTPUT 70918;"mmemory:session:copy 1,262144"
```

Attribute Summary: Preset State: not applicable
Synchronization Required: no
SCPI Compliance: instrument-specific

Description: This command copies the contents of a Session (which may be split width-wise across two devices and/or length-wise across N Transfer Units) to another Session. The Session may consist of a single Transfer Unit or even a single SCSI device. It is even possible to copy data from one part of a device to another part of the same device as long as the copied data does not overlap the original data. Both Sessions must have been properly initialized using open Transfer Units and open SCSI devices. This command provides a convenient means to backup a previously acquired throughput Session, or to recombine a throughput Session which was split lengthwise and/or widthwise into a linear file.

Data is read from one Session into the HP E1562 FIFO; then data is written to the destination Session.

<Destination Session> is the destination Session of the copy. An error will be generated if the Session does not contain any Transfer Units.

<Count> is the number of logical disk blocks to copy. It refers to the number of logical blocks on the source Session since it is possible to have different sized logical blocks between the source Session and the destination Session. The size of a logical block for a given device can be obtained by sending the MMEM:SCSI:BSIZ query.

The expected backup performance is greater than the total time required for source plus destination device access.

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MMEMory:SESSion[1|2|...|12]:DELete:ALL command

Deletes all Transfer Units from the specified Session.

Command Syntax: MMEMory:SESSion[1|2|...|12]:DELete:ALL

Example Statements:
```
OUTPUT 70918;":MMEMORY:SESSION:DELETE:ALL"
OUTPUT 70918;"mmem:sess3:del:all"
```

Attribute Summary:
Preset State: not applicable
Synchronization Required: no
SCPI Compliance: instrument-specific

Description: All Transfer Units are removed from the Session definition. The Transfer Units are NOT closed. To close the Transfer Units send the command MMEM:TUN:CLOS.

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MMEMory:SESSion[1|2|...|12]:READ:BUFFer command

Reads data from a Session into a memory buffer.

Command Syntax: MMEMory:SESSion[1|2|...|12]:READ:BUFFer <Count>, <Offset>, <Memory Space>

<Count>::=number
limits: 1:4294967295

<Offset>::=number
limits: 0:4294967295

<Memory Space>::=A24|A32|SRAM

Example Statements:
```
OUTPUT 70918;":MMEM:SESS6:READ:BUFF 256,131072,SRAM"
OUTPUT 70918;"mmem:sess1:read:buff #H200,3354430,A32"
```

Attribute Summary: Preset State: not applicable
Synchronization Required: yes
SCPI Compliance: instrument-specific

Description: The memory buffer may be in the A24, A32 or E1562 shared RAM memory spaces. The A16 memory space is not usable, due to the limited addressable area available in that memory space. MMEM:SESS:SEEK may be used to position the Session to where the read will take place. All data transfers to the buffer are done using D16.

<Count> specifies the number of logical blocks to read from the Session and copy to the specified memory space. If the Session contains Transfer Units which consist of two SCSI devices, count must be an even number or the data transfer will be indeterminate.

<Offset> specifies where in the memory space, the data will be written. The value is an offset in bytes from the beginning of the address space. It is up to the user to make sure that there is enough space available starting at this offset in which to write the data. All address spaces start at offset 0. A24 has an upper limit of 16777215, A32 has an upper limit of 4294967295, SRAM has an upper limit of 262143. The value of offset must be divisible by 2.

<Memory Space> specifies the memory space into which to copy the data. The memory spaces which make sense for this command are A24, A32, and SRAM. SRAM indicates the E1562 shared RAM.

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MMEMory:SESSion[1|2|...|12]:READ:FIFO command

Reads data from a SCSI Session into a FIFO.

Command Syntax: MMEMory:SESSion[1|2|...|12]:READ:FIFO <Count>, <Offset>, <Memory Space>, <FIFO width>

<Count>::=number
limits: 1:4294967295

<Offset>::=number
limits: 0:4294967295

<Memory Space>::=A16|A24|A32|SRAM

<FIFO width>::=number
limits: 16|32

Example Statements:
```
OUTPUT 70918;":MMEMORY:SESSION8:READ:FIFO 32768,#HDA2A,A16,16"
OUTPUT 70918;"mmemory:session:read:fifo 128,#h280040,A24,32"
```

Attribute Summary:
Preset State: not applicable
Synchronization Required: yes
SCPI Compliance: instrument-specific

Description: The FIFO may be in the A16, A24, A32 or E1562 shared RAM memory spaces. MMEM:SESS:SEEK may be used to position the Session to where the read will take place. This command differs from MMEM:SESS:READ:BUFF in that the offset is not incremented – every write to the FIFO is at the same offset in the memory space.

<Count> specifies the number of SCSI logical blocks to read from the Session and copy to the specified memory space. If the Session contains Transfer Units which consist of two SCSI devices, count must be an even number or the data transfer will be indeterminate.

<Offset> specifies where in the memory space, the data will be written. The value is an offset in bytes from the beginning of the address space. All address spaces start at offset 0. A16 has an upper limit of 65535, A24 has an upper limit of 16777215, A32 has an upper limit of 4294967295, SRAM has an upper limit of 262143. The value of offset must be divisible by 2.

<Memory Space> specifies into which memory space to copy the data. The memory spaces are A16, A24, A32, and SRAM. SRAM indicates the E1562 shared RAM.

<FIFO width> indicates the number of bits in each element of the FIFO. The only acceptable values are 16 and 32. All writes to the FIFO are done using D16, thus a 32 bit FIFO consists of two writes.

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MMEMory:SESSion[1|2|...|12]:SEEK command

Sets up all devices in a Session to allow the next data transfer to begin at the specified block number.

Command Syntax: MMEMory:SESSion[1|2|...|12]:SEEK <Block>

<Block>::=number
limits: 0:4294967295

Example Statements:
```
OUTPUT 70918;":MMEM:SESS11:SEEK 8191"
OUTPUT 70918;"mmemory:session4:seek #h1FFF"
```

Attribute Summary: Preset State: not applicable
Synchronization Required: yes
SCPI Compliance: instrument-specific

Description: This command sets the current position of the Session to be offset to the specified logical block from the beginning of the Session. If Transfer Units in the Session contain two SCSI devices, the specified logical block must be even. All Transfer Units in the Session will be positioned such that a MMEM:SESS:READ:*, MMEM:SESS:WRIT:*, or SEQ:BEG will start at the specified logical block.

The block number specified here does not correspond to a specific logical block number on a particular device. Rather the block number corresponds to an offset from the logical block number specified as the beginning logical block when each Transfer Unit was opened with MMEM:TUN:OPEN. In other words, when a Transfer Unit is opened you can specity it to begin at some non-zero logical block number. Therefore, specifying a seek to block zero means that the next data transfer will begin at the first block of the Session. This corresponds to the non-zero block number specified when each Transfer Unit was opened. This is also true if a Transfer Unit consists of a single device, such that a single-device Session may also start at a non-zero block. Furthermore, for Transfer Units which consist of a pair of SCSI devices, the data is two logical blocks in size and is spread across the pair of devices alternating two bytes to each device.

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MMEMory:SESSion[1|2|...|12]:SIZE? query

Returns the number of Transfer Units in the Session.

Query Syntax: MMEMory:SESSion[1|2|...|12]:SIZE?

Example Statements:
```
OUTPUT 70918;":MMEMORY:SESSION1:SIZE?"
OUTPUT 70918;"mmemory:session7:size?"
```

Return Format: Integer

Attribute Summary:
Preset State: not applicable
Synchronization Required: no
SCPI Compliance: instrument-specific

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MMEMory:SESSion[1|2|...|12]:WRITe:BUFFer command

Writes data to a SCSI Session from a memory buffer.

Command Syntax: MMEMory:SESSion[1|2|...|12]:WRITe:BUFFer <Count>, <Offset>, <Memory Space>

<Count>::=number
limits: 1:4294967295

<Offset>::=number
limits: 0:4294967295

<Memory Space>::=A24|A32|SRAM

Example Statements:
```
OUTPUT 70918;":MMEMORY:SESSION11:WRITE:BUFFER 16384,#H300AD0,A24"
OUTPUT 70918;"mmemory:session2:write:buffer 64,4608,SRAM"
```

Attribute Summary: Preset State: not applicable
Synchronization Required: yes
SCPI Compliance: instrument-specific

Description: The memory buffer may be in the A24, A32 or E1562 shared RAM memory spaces. The A16 memory space should not be specified, due to the limited addressable area available in that memory space. MMEM:SESS:SEEK may be used to position the Session to where the SCSI write will be done. All reads from the buffer are done using D16.

<Count> specifies the number of logical blocks to write to the Session from the specified memory space. If the Session contains Transfer Units which consist of two SCSI devices, count must be an even number or the data transfer will be indeterminate.

<Offset> specifies from where in the memory space the data will be read. The value is an offset in bytes from the beginning of the address space. You must make sure that there is enough space available starting at this offset from which to read data. All address spaces start at offset 0. A24 has an upper limit of 16777215, A32 has an upper limit of 4294967295, SRAM has an upper limit of 262143. The value of offset must be divisible by 2.

<Memory Space> specifies from which memory space to copy the data. The memory spaces which make sense for this command are A24, A32, and SRAM. SRAM indicates the E1562 shared RAM.

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MMEMory:SESSion[1|2|...|12]:WRITe:FIFO command

Writes data to a SCSI Session from a FIFO.

Command Syntax: MMEMory:SESSion[1|2|...|12]:WRITe:FIFO <Count>, <Offset>, <Memory Space>, <FIFO width>

<Count>::=number
limits: 1:4294967295

<Offset>::=number
limits: 0:4294967295

<Memory Space>::=A16|A24|A32|SRAM

<FIFO width>::=number
limits: 16|32

Example Statements: OUTPUT 70918;":MMEMORY:SESSION:WRITE:FIFO 3840,#H20000A800,A32,16"
OUTPUT 70918;"mmemory:session2:write:fifo #F00,#hCC38,A16,32"

Attribute Summary: Preset State: not applicable
Synchronization Required: yes
SCPI Compliance: instrument-specific

Description: The FIFO may be in the A16, A24, A32 or E1562 shared RAM memory spaces. MMEM:SESS:SEEK may be used to position the Session to where the write will be done. This command differs from MMEM:SESS:WRIT:BUFF in that since the offset is not incremented – every FIFO read is at the same offset in the memory space.

<Count> specifies the number of SCSI logical blocks to write to the Session from the specified memory space. If the Session contains Transfer Units which consist of two SCSI devices, count must be an even number or the data transfer will be indeterminate.

<Offset> specifies from where in the memory space the data will be read. The value is an offset in bytes from the beginning of the address space. All address spaces start at offset 0. A16 has an upper limit of 65535, A24 has an upper limit of 16777215, A32 has an upper limit of 4294967295, SRAM has an upper limit of 262143. The value of offset must be divisible by 2.

<Memory Space> specifies from which memory space to copy the data. The memory spaces which make sense for this command are A16, A24, A32, and SRAM. SRAM indicates the E1562 shared RAM.

<FIFO width> indicates the number of bits in each element of the FIFO. The only acceptable values are 16 and 32. All reads from the FIFO are done using D16, thus a 32 bit FIFO consists of two reads.

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MMEMory:TUNit[1|2|...|15]:CLOSe command

Closes an open Transfer Unit.

Command Syntax: MMEMory:TUNit[1|2|...|15]:CLOSe

Example Statements:
```
OUTPUT 70918;":MMEMORY:TUNIT12:CLOSE"
OUTPUT 70918;"mmemory:tunit:close"
```

Attribute Summary:
Preset State: not applicable
Synchronization Required: no
SCPI Compliance: instrument-specific

Description: An error will be generated if the Transfer Unit is not currently open.

This command only disassociates individual SCSI devices from this Transfer Unit. The underlying SCSI devices will not be closed with this command. The SCSI devices must be closed later with the MMEM:SCSI:CLOS command.

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MMEMory:TUNit[1|2|...|15]:OPEN command/query

Opens a Transfer Unit given the underlying SCSI devices and starting logical block numbers.

Command Syntax: MMEMory:TUNit[1|2|...|15]:OPEN <Device1>, <Block1>[, <Device2>, <Block2>]

<Device1>::=number
limits: 1:30

<Block1>::=number
limits: 0:4294967295

<Device2>::=number
limits: 0:30

<Block2>::=number
limits: 0:4294967295

Example Statements:
```
OUTPUT 70918;":MMEMORY:TUNIT2:OPEN 20,0,0,0"
OUTPUT 70918;"mmem:tun13:open 3,2048,1,2048"
```

Query Syntax: MMEMory:TUNit[1|2|...|15]:OPEN?

Return Format: Integer

Attribute Summary: Preset State: not applicable
Synchronization Required: no
SCPI Compliance: instrument-specific

Description: <Device1> is the logical device number used in a previous call to MMEM:SCSIx:OPEN, where x is the value to use here. An error will be generated if the logical device MMEM:SCSIx is not currently open.

<Block1> is the SCSI logical block number specifying the beginning position on the device specified by <Device1>. It will be impossible for MMEM:TUN:* commands or MMEM:SESS:* commands using this MMEM:TUN to reference SCSI logical blocks smaller than the number specified here.

<Device2> is the logical device number used in a previous call to MMEM:SCSIx:OPEN. If the Transfer Unit is to be opened using only a single device this field must be set to 0. An error will be generated if the logical device MMEM:SCSIx is not currently open or if <Device1> and <Device2> are on the same SCSI bus. For a split pair <Device1> must be on the SCSI A bus and <Device2> must be on the SCSI B bus.

<Block2> is the SCSI logical block number specifying the beginning position on the device specified by <Device2>. For a single-device Transfer Unit this field should be set to 0.

The query version of this command requires no parameters. It returns 0 if the logical Transfer Unit is not currently open and 1 if the logical Transfer Unit is open.

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It is possible to use a single open SCSI device in more than one Transfer Unit, but it is important that all Transfer Units in a Session include an individual SCSI device only once.

By including two SCSI units in a Transfer Unit, 32-bit data may be transferred by splitting the data across two devices in such a way at to make the upper 16 bits go to one device and the lower 16 bits of the quantity go to another device. This type of data splitting requires that the two devices be on different SCSI controllers. If two SCSI devices are used in the Transfer Unit, they must both have the same blocksize. The blocksize can be determined by sending the MMEM:SCSI:BSIZ? command.

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SEQuence[1|2|3|4]:ADD command

Append an operation to the specified Sequence.

Command Syntax: SEQuence[1|2|3|4]:ADD <Operation>, <Count>, <Address>, <Misc>

<Operation>::=number
limits: 0:65535

<Count>::=number
limits: 0:4294967295

<Address>::=number
limits: 0:4294967295

<Misc>::=number
limits: 0:4294967295

Example Statements:
```
OUTPUT 70918;"SEQUENCE:ADD #h1000,#h10,0,#h03000800"
OUTPUT 70918;"seq3:add #h3012,65536,2048,0"
```

Attribute Summary: Preset State: not applicable
Synchronization Required: no
SCPI Compliance: instrument-specific

Description: Add the specified operation to the end of the specified Sequence. The maximum number of operations in a single Sequence is 100. The number of operations currently in the Sequence may be determined by sending the SEQ:SIZE? command.

The list of Sequence operations should be cleared by sending the SEQ:DEL:ALL command before adding new Sequence operations using this command.

Note For a list and detailed description of all Sequence operations which may be added using this command and an explanation of the above parameters see the chapter entitled “Using Sequence Operations with the HP E1562”.

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SEQuence[1|2|3|4]:BEGin command

Begin a Sequence for throughput or playback data transfer.

Command Syntax: SEQuence[1|2|3|4]:BEGin <Type>, <Byte Count>, <Session>

<Type>::=THRoughput|VPLayback|LPLayback|MTHRoughput|MPLayback

<Byte Count>::=number
limits: 1:9223372036854775807

<Session>::=number
limits: 1:12

Example Statements: OUTPUT 70918;":SEQ:BEG VPL,262144,1"
OUTPUT 70918;"sequence3:begin throughput,#h200000000,2"

Attribute Summary: Preset State: not applicable
Synchronization Required: yes
SCPI Compliance: instrument-specific

Description: Begin execution of the specified Sequence. A Session must already be set up before sending this command. See the commands MMEM:SESS:*.

<Type> indicates whether the Sequence will be a throughput or a playback. The internal software needs to be told this in order to get data flowing inthe right direction. It also needs to be told whether a playback will be to the VXI bus, or to the LBUS, and whether block and frame markers will be saved with the data on a throughput or restored on a playback.

Transfer type name	Transfer action performed
THRoughput	Throughput without block and frame markers. Data may subesquently be played back with either VPLayback or LPLayback.
VPLayback	VXI playback only. For use with data previously transferred with THRoughput.
LPLayback	Local bus playback only without block and frame markers. For data previously transferred with THRoughput.
MTHRoughput	Throughput in which all local bus data will have the block and frame markers embedded in the data stream. Data acquired via MTHROUGHPUT may only be played back using MPLAYBACK.
MPLayback	Local bus playback which will reconstruct the block and frame markers from information in the data stream. For use with data previously transferred with MTHRoughput.

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<Byte Count> is a 64-bit integer which indicates the total number of bytes which will be transferred by the Sequence. Once this byte count is reached, the Sequence will terminate. This byte count is used to determine how many SCSI logical blocks will be transferred to/from the devices. The software will round up to the next even number of logical blocks

<Session> indicates which Session will be used for this Sequence. The commands to initialize the Session must already have been successfully sent to the module. See MMEM:SESS:*.

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SEQuence[1|2|3|4]:DELete:ALL command

Remove all elements from the specified Sequence list.

Command Syntax: SEQuence[1|2|3|4]:DELete:ALL

Example Statements:
```
OUTPUT 70918;":SEQUENCE4:DELETE:ALL"
OUTPUT 70918;"seq2:del:all"
```

Attribute Summary:
Preset State: not applicable
Synchronization Required: no
SCPI Compliance: instrument-specific

Description: Delete all elements of the Sequence. This is the only command which removes elements from a Sequence. You should send this command before beginning to add elements to a Sequence.

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SEQuence[1|2|3|4]:SIZE? query

Return the number of elements in the Sequence.

Query Syntax: SEQuence[1|2|3|4]:SIZE?

Example Statements:
```
OUTPUT 70918;":SEQ2:SIZE?"
OUTPUT 70918;"sequence:size?"
```

Return Format: Integer

Attribute Summary:
Preset State: not applicable
Synchronization Required: no
SCPI Compliance: instrument-specific

Description: The number returned should equal the number of times SEQ:ADD has been sent since the last SEQ:DEL:ALL, *RST, or powerup. The maximum number of elements in a Sequence is 100.

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SEQuence[1|2|3|4]:TRANsferred? query

Return the number of bytes transferred in the Sequence.

Query Syntax: SEQuence[1|2|3|4]:TRANsferred?

Example Statements:
```
OUTPUT 70918;":SEQUENCE2:TRANSFERRED?"
OUTPUT 70918;"seq4:tran?"
```

Return Format: Integer

Attribute Summary:
Preset State: not applicable
Synchronization Required: no
SCPI Compliance: instrument-specific

Description: If the Sequence completed without errors and was not aborted, the returned value will be almost equal to the number of bytes specified with the SEQ:BEG command. Otherwise, the returned value will indicate the number of bytes which were successfully transferred.

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STATus:OPERation:CONDition? query

Reads the Operation Status condition register.

Query Syntax: STATus:OPERation:CONDition?

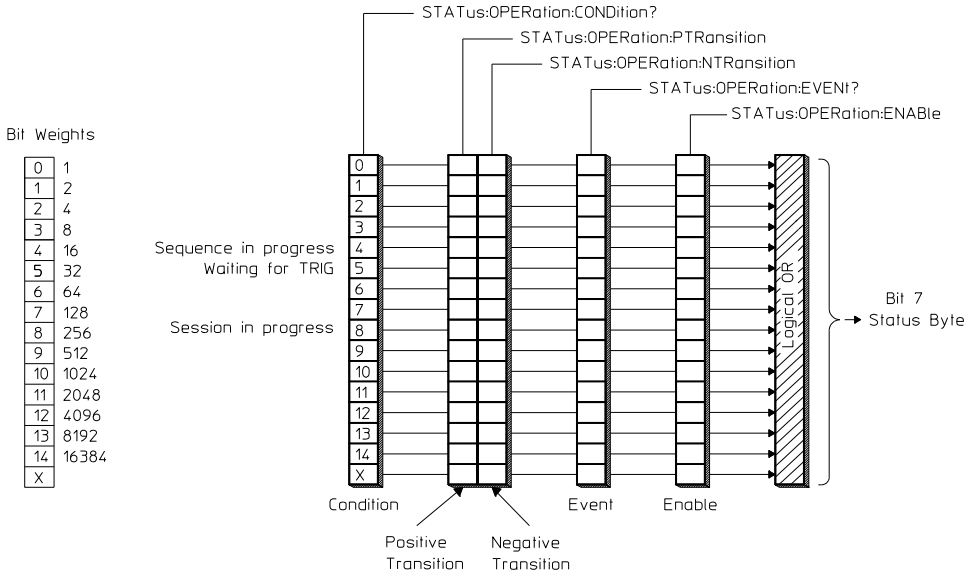
Example Statements: OUTPUT 70918;":STATUS:OPERATION:CONDITION?"
OUTPUT 70918;"status:operation:condition?"

Return Format: Integer

Attribute Summary: Preset State: not applicable
Synchronization Required: no
SCPI Compliance: confirmed

Description: This query returns the sum of the decimal weights of all bits currently set to 1 in the Operation Status condition register. (The decimal weight of a bit is 2^n, where n is the bit number.)

See "Operation Status Register Set" in the previous chapter for a defintion of bits in the register set.



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STATus:OPERation:ENABle command/query

Sets and queries bits in the Operation Status enable register.

Command Syntax: STATus:OPERation:ENABle <Bit Mask>

<Bit Mask>::=number
limits: 0:32767

Example Statements: OUTPUT 70918;":STATUS:OPER:ENAB 304"
OUTPUT 70918;"status:operation:enable 32"

Query Syntax: STATus:OPERation:ENABle?

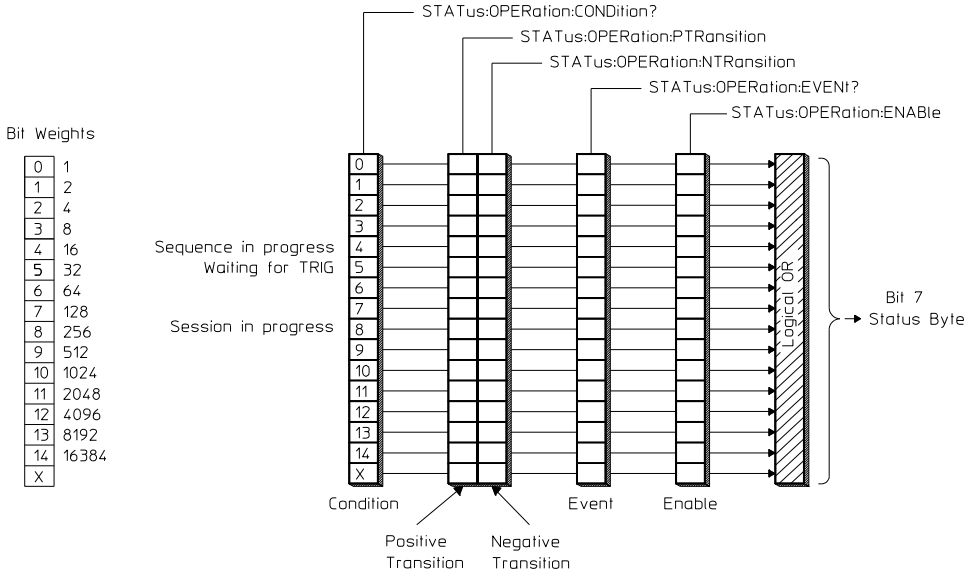
Return Format: Integer

Attribute Summary: Preset State: not affected by Preset
Synchronization Required: no
SCPI Compliance: confirmed

Description: To set a single bit in the Operation Status enable register to 1, send the bit's decimal weight with this command. To set more than one bit to 1, send the sum of the decimal weights of all the bits. (The decimal weight of a bit is 2^n, where n is the bit number.)

All bits are initialized to 0 on powerup or when the STAT:PRES command is sent. However, the current setting of bits is *not* modified when you send the *RST command.

See "Operation Status Register Set" in the previous chapter for a defintion of bits in the register set.



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STATus:OPERation[:EVENt]? query

Reads and clears the Operation Status event register.

Query Syntax: STATus:OPERation[:EVENt]?

Example Statements:
```
OUTPUT 70918;":STATUS:OPERATION?"
OUTPUT 70918;"stat:oper:even?"
```

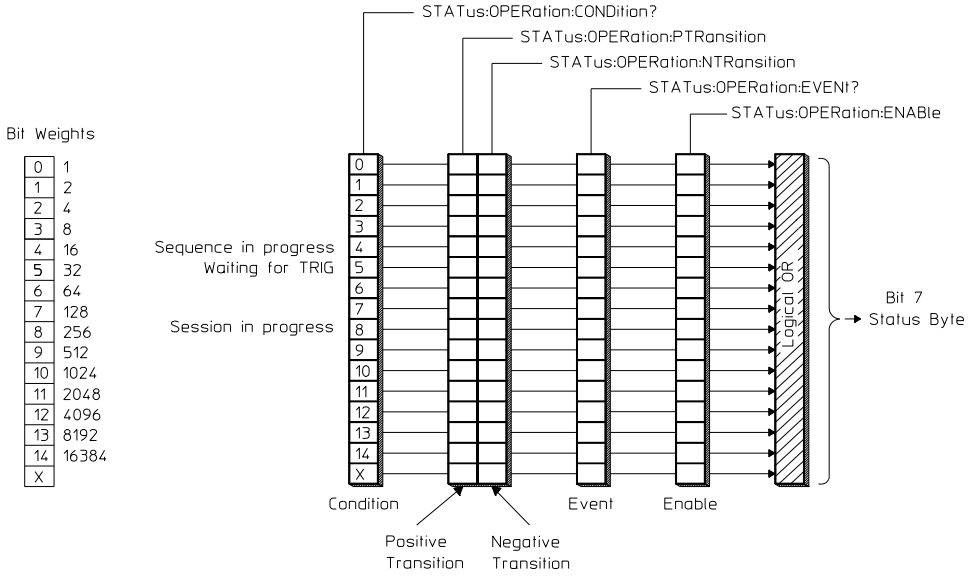
Return Format: Integer

Attribute Summary:
Preset State: not applicable
Synchronization Required: no
SCPI Compliance: confirmed

Description: This query returns the sum of the decimal weights of all bits currently set to 1 in the Operation Status event register. (The decimal weight of a bit is 2^n, where n is the bit number.)

Note The Operation Status event register is automatically cleared after it is read by this query.

See "Operation Status Register Set" in the previous chapter for a defintion of bits in the register set.



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STATus:OPERation:NTRansition command/query

Sets and queries bits in the Operation Status negative transition register.

Command Syntax: STATus:OPERation:NTRansition <Bit mask>

<Bit mask>::=number
limits: 0:32767

Example Statements: OUTPUT 70918;":STAT:OPER:NTR 256"
OUTPUT 70918;"status:operation:ntransition 48"

Query Syntax: STATus:OPERation:NTRansition?

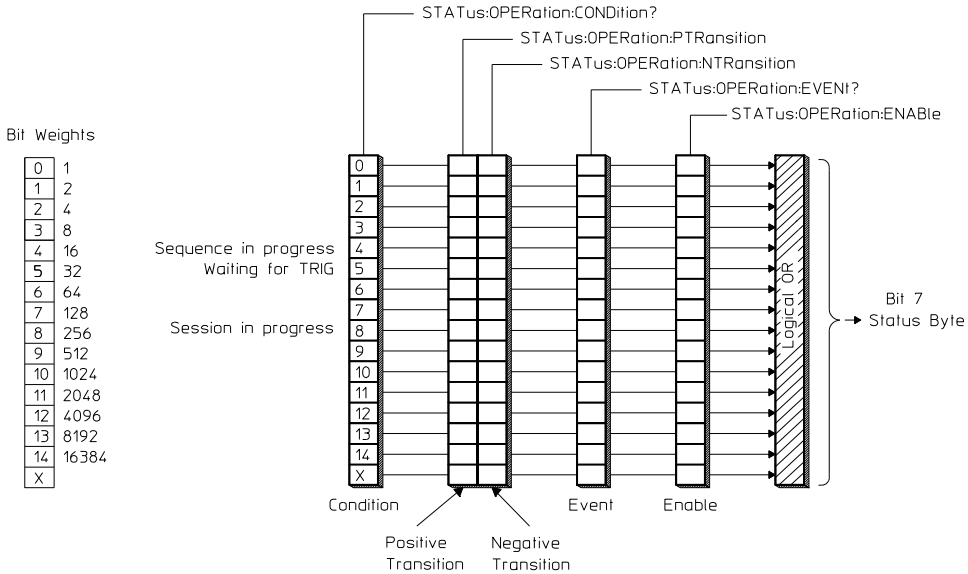
Return Format: Integer

Attribute Summary: Preset State: not affected by Preset
Synchronization Required: no
SCPI Compliance: confirmed

Description: To set a single bit in the Operation Status negative transition register to 1, send the bit's decimal weight with this command. To set more than one bit to 1, send the sum of the decimal weights of all the bits. (The decimal weight of a bit is 2^n, where n is the bit number.)

All bits are initialized to 0 on powerup or when the STAT:PRES command is sent. However, the current setting of bits is *not* modified when you send the *RST command.

See "Operation Status Register Set" in the previous chapter for a defintion of bits in the register set.



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STATus:OPERation:PTRansition command/query

Sets and queries bits in the Operation Status positive transition register.

Command Syntax: STATus:OPERation:PTRansition <Bit mask>

<Bit mask>::=number
limits: 0:32767

Example Statements: OUTPUT 70918;":STAT:OPER:PTR 304"
OUTPUT 70918;"status:operation:ptransition 32"

Query Syntax: STATus:OPERation:PTRansition?

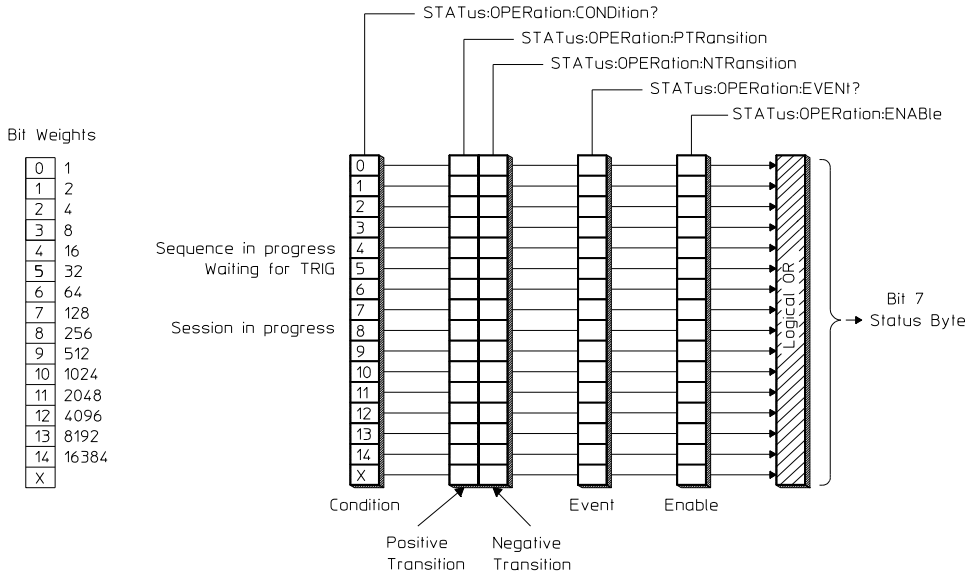
Return Format: Integer

Attribute Summary: Preset State: not affected by Preset
Synchronization Required: no
SCPI Compliance: confirmed

Description: To set a single bit in the Operation Status positive transition register to 1, send the bit's decimal weight with this command. To set more than one bit to 1, send the sum of the decimal weights of all the bits. (The decimal weight of a bit is 2^n, where n is the bit number.)

All bits are initialized to 1 on powerup or when the STAT:PRES command is sent. However, the current setting of bits is *not* modified when you send the *RST command.

See "Operation Status Register Set" in the previous chapter for a defintion of bits in the register set.



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STATus:PRESet command

Sets bits in most enable and transition registers to their default state.

Command Syntax: STATus:PRESet

Example Statements:
```
OUTPUT 70918;":STATUS:PRESET"
OUTPUT 70918;"stat:pres"
```

Attribute Summary:
Preset State: not applicable
Synchronization Required: no
SCPI Compliance: confirmed

Description: STATUS:PRESet has the effect of bringing all events to the second level register sets (Questionable Status and Operation Status) *without* creating an SRQ or reflecting events in a serial poll.

It also affects these register sets (Questionable Status and Operation Status) as follows:

- Sets all enable register bits to 0.
- Sets all positive transition register bits to 1.
- Sets all negative transition register bits to 0.

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STATus:QUEStionable:CONDition? query

Reads the Questionable Status condition register.

Query Syntax: STATus:QUEStionable:CONDition?

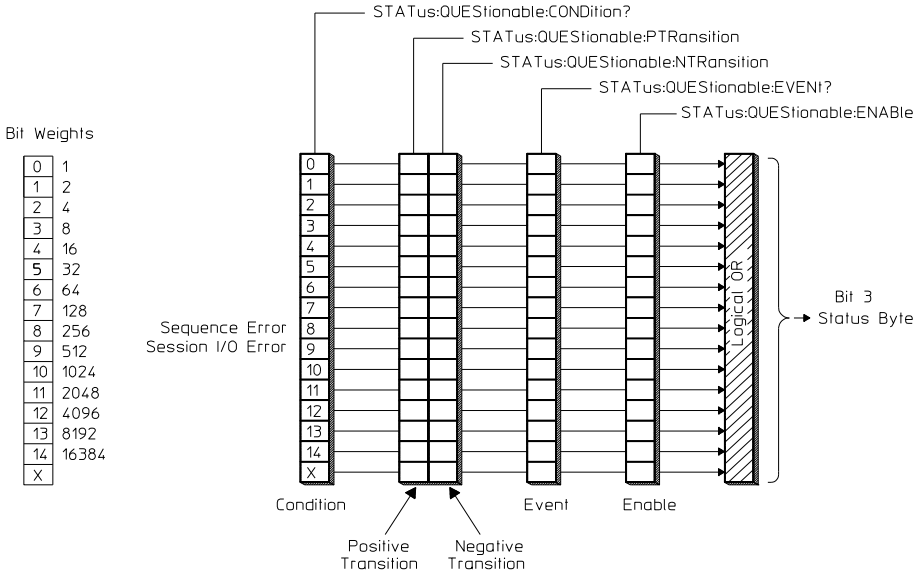
Example Statements:
```
OUTPUT 70918;":STAT:QUES:COND?"
OUTPUT 70918;"status:questionable:condition?"
```

Return Format: Integer

Attribute Summary:
Preset State: not applicable
Synchronization Required: no
SCPI Compliance: confirmed

Description: This query returns the sum of the decimal weights of all bits currently set to 1 in the Questionable Status condition register. (The decimal weight of a bit is 2^n, where n is the bit number.)

See "Questionable Status Register Set" in the previous chapter for a defintion of bits in the register set.



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STATus:QUEStionable:ENABle command/query

Sets and queries bits in the Questionable Status enable register.

Command Syntax: STATus:QUEStionable:ENABle <Bit Mask>

<Bit Mask>::=number
limits: 0:32767

Example Statements: OUTPUT 70918;":STAT:QUES:ENAB 256"
OUTPUT 70918;"status:questionable:enable 512"

Query Syntax: STATus:QUEStionable:ENABle?

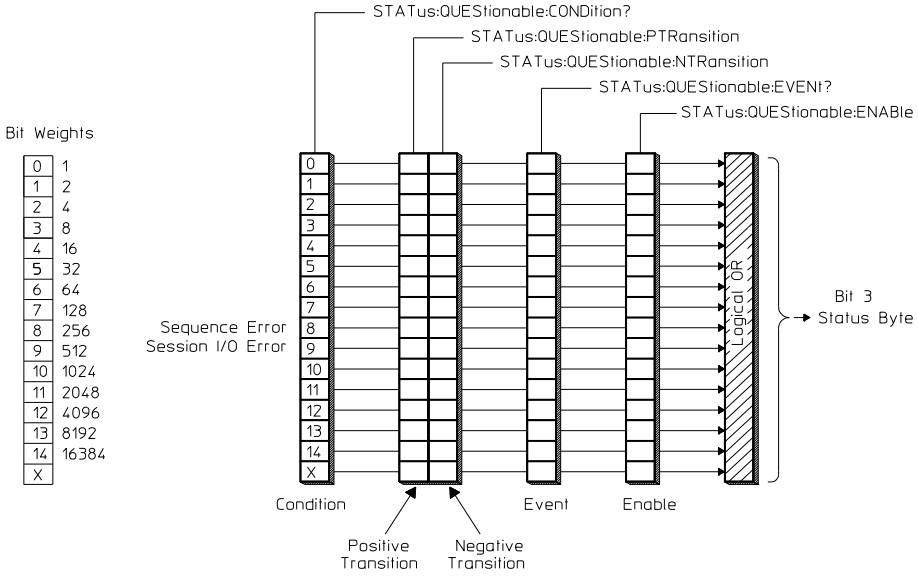
Return Format: Integer

Attribute Summary: Preset State: not affected by Preset
Synchronization Required: no
SCPI Compliance: confirmed

Description: To set a single bit in the Questionable Status enable register to 1, send the bit's decimal weight with this command. To set more than one bit to 1, send the sum of the decimal weights of all the bits. (The decimal weight of a bit is 2^n, where n is the bit number.)

All bits are initialized to 0 on powerup or when the STAT:PRES command is sent. However, the current setting of bits is *not* modified when you send the *RST command.

See "Questionable Status Register Set" in the previous chapter for a defintion of bits in the register set.



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STATus:QUEStionable[:EVENt]? query

Reads and clears the Questionable Status event register.

Query Syntax: STATus:QUEStionable[:EVENt]?

Example Statements: OUTPUT 70918;":STATUS:QUESTIONABLE:EVENT?"
OUTPUT 70918;"status:questionable?"

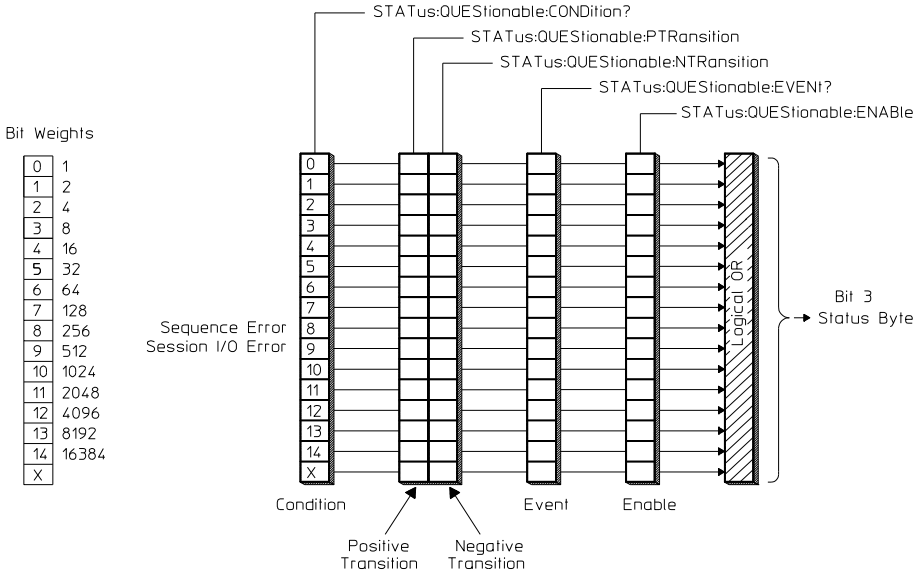
Return Format: Integer

Attribute Summary: Preset State: not applicable
Synchronization Required: no
SCPI Compliance: confirmed

Description: This query returns the sum of the decimal weights of all bits currently set to 1 in the Questionable Status event register. (The decimal weight of a bit is 2^n, where n is the bit number.)

Note The Questionable Status event register is automatically cleared after it is read by this query.

See "Questionable Status Register Set" in the previous chapter for a defintion of bits in the register set.



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STATus:QUEStionable:NTRansition command/query

Sets and queries bits in the Questionable Status negative transition register.

Command Syntax: STATus:QUEStionable:NTRansition <Bit mask>

<Bit mask>::=number
limits: 0:32767

Example Statements: OUTPUT 70918;":STAT:QUES:NTR 768"
OUTPUT 70918;"Status:Questionable:Ntransition 256"

Query Syntax: STATus:QUEStionable:NTRansition?

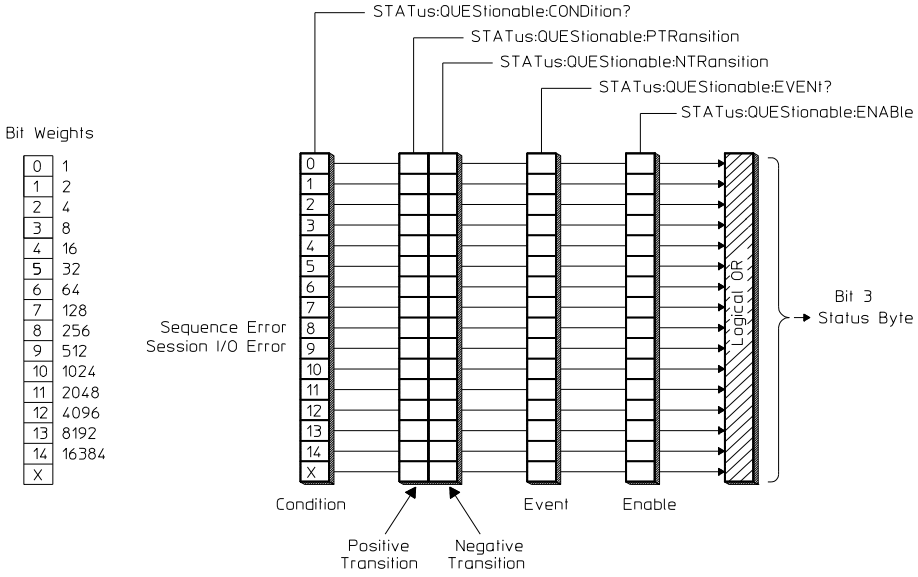
Return Format: Integer

Attribute Summary: Preset State: not affected by Preset
Synchronization Required: no
SCPI Compliance: confirmed

Description: To set a single bit in the Questionable Status negative transition register to 1, send the bit's decimal weight with this command. To set more than one bit to 1, send the sum of the decimal weights of all the bits. (The decimal weight of a bit is 2^n, where n is the bit number.)

All bits are initialized to 0 on powerup or when the STAT:PRES command is sent. However, the current setting of bits is *not* modified when you send the *RST command.

See "Questionable Status Register Set" in the previous chapter for a defintion of bits in the register set.



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STATus:QUEStionable:PTRansition command/query

Sets and queries bits in the Questionable Status positive transition register.

Command Syntax: STATus:QUEStionable:PTRansition <Bit mask>

<Bit mask>::=number
limits: 0:32767

Example Statements: OUTPUT 70918;":STATUS:QUESTIONABLE:PTRANSITION 256"
OUTPUT 70918;"stat:ques:ptr 512"

Query Syntax: STATus:QUEStionable:PTRansition?

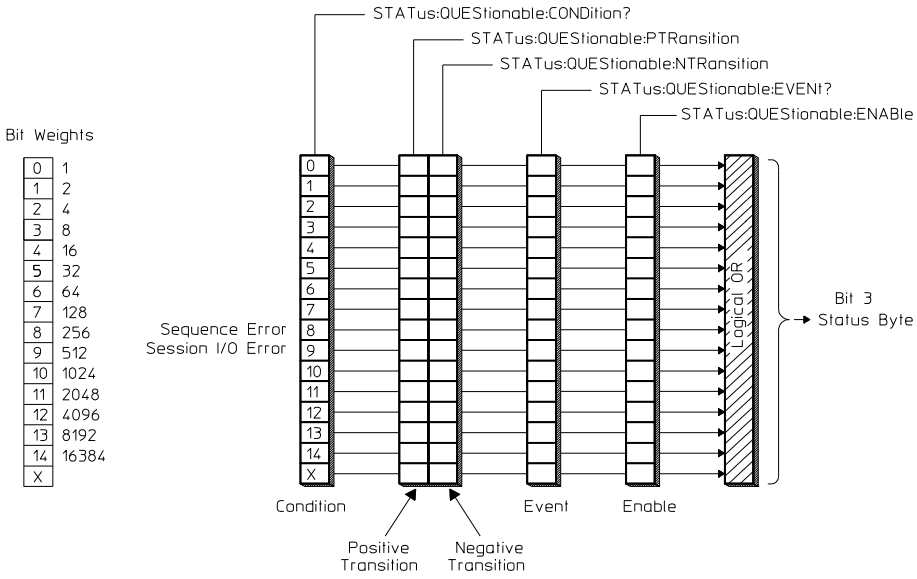
Return Format: Integer

Attribute Summary: Preset State: not affected by Preset
Synchronization Required: no
SCPI Compliance: confirmed

Description: To set a single bit in the Questionable Status positive transition register to 1, send the bit's decimal weight with this command. To set more than one bit to 1, send the sum of the decimal weights of all the bits. (The decimal weight of a bit is 2^n, where n is the bit number.)

All bits are initialized to 1 on powerup or when the STAT:PRES command is sent. However, the current setting of bits is *not* modified when you send the *RST command.

See "Questionable Status Register Set" in the previous chapter for a defintion of bits in the register set.



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SYSTem:ABORt command

Aborts a data transfer Session and/or Sequence.

Command Syntax: SYSTem:ABORt

Example Statements:
```
OUTPUT 70918;":SYSTEM:ABORT"
OUTPUT 70918;"syst:abor"
```

Attribute Summary:
Preset State: not applicable
Synchronization Required: no
SCPI Compliance: instrument-specific

Description: Any data transfer Session in progress is aborted. The Session data structures will not be altered and all Transfer Units and SCSI devices will remain open. The local bus is placed into the reset state. Any Sequence in progress is aborted. Sequence data structures are updated such that a SEQ:TRAN? query will correctly indicate the number of bytes actually transferred during the Sequence.

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SYSTem:COMMunicate:SCSI[:SELF]:ADDRess command/query

Changes the SCSI address on an HP E1562 individual SCSI bus controller.

Command Syntax: SYSTem:COMMunicate:SCSI[:SELF]:ADDRess <Controller>,<SCSI address>

<Controller>::=A|B

<SCSI address>::=number
limits 0:15

Example Statements:
```
OUTPUT 70918;":SYSTEM:COMMUNICATE:SCSI:SELF:ADDRESS A,5"
OUTPUT 70918;"syst:comm:scsi:addr b,13"
```

Query Syntax: SYSTem:COMMunicate:SCSI:SELF:ADDRess? <Controller>

Return Format: Integer

Attribute Summary:
Preset State: not applicable
Synchronization Required: no
SCPI Compliance: instrument-specific

Description: The HP E1562 SCSI bus address is an internal address which is set on powerup by switches CA0 and CA1. When multiple HP E1562s are on the same SCSI bus, you will need to be sure that no two SCSI controllers share the same SCSI bus address before any SCSI accesses can be performed. This command allows you to query and change the SCSI address values of the HP E1562, overriding the switch settings. (See the Installation chapter of this book for information on setting the switches manually.) You will also need to change the HP E1562 SCSI address if an external host or other SCSI device is at the same address as any SCSI bus controller.

The query returns the current address.

Note This address should not be confused with the SCSI logical address of a device which is designated by MMEM:SCSI:OPEN. The address set by SYST:COMM:SCSI:ADDR is only used internally by the E1562 and will not be used by any SCPI commands.

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SYSTem:ERRor? query

Returns one error message from the module's error queue.

Query Syntax: SYSTem:ERRor?

Example Statements:
```
OUTPUT 70918;":SYSTEM:ERROR?"
OUTPUT 70918;"syst:err?"
```

Return Format: Integer
STRING

Attribute Summary: Preset State: not affected by Preset
Synchronization Required: no
SCPI Compliance: confirmed

Description: The error queue temporarily stores up to 10 error messages. When you send the SYST:ERR query, one message is moved from the error queue to the output queue so your controller can read the message. The error queue delivers messages to the output queue in the order received.

If more than 10 error messages are reported before any are read from the queue, the oldest error messages are saved. The last error message indicates that too many error messages were received for the queue.

Note The error queue is cleared when you turn on the VXI system and when you send the *CLS command.

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SYSTem:VERSion? query

Returns the SCPI version to which the module complies.

Query Syntax: SYSTem:VERSion?

Example Statements:
```
OUTPUT 70918;":SYSTEM:VERSION?"
OUTPUT 70918;"syst:vers?"
```

Return Format: YYYY.V

Attribute Summary:
Preset State: not applicable
Synchronization Required: no
SCPI Compliance: confirmed

Description: The Ys represent the SCPI year-version and the V represents the revision number for that year.

The HP E1562 will return 1994.0.

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VINStrument[:CONFigure]:LBUS[:MODE] RESet|NORMal|PIPE — command/query

Configures the local bus.

Command Syntax: VINStrument[:CONFigure]:LBUS[:MODE] <Lbus Mode>

<Lbus Mode>::=RESet|PIPE|NORMal

Example Statements:
```
OUTPUT 70918;":VINSTRUMENT:CONFIGURE:LBUS:MODE RESET"
OUTPUT 70918;"vins:lbus norm"
```

Query Syntax: VINStrument[:CONFigure]:LBUS[:MODE]?

Return Format: CHAR

Attribute Summary:
Preset State: RESet
Synchronization Required: no
SCPI Compliance: instrument-specific

Description: The local bus interface has strict requirements as to the order in which modules in a VXI mainframe have their local bus interface reset. On powerup, or whenever any module in the mainframe is put in the reset state, all modules should be placed into the reset state from left to right. Then all modules can be put into the un-reset state from left to right.

Sending VINStrument:CONfigure:LBUS:MODE RESet, places the HP E1562 local bus interface into the LBUS RESet state. Sending either PIPE or NORMAL takes the local bus interface out of the LBUS RESet state. In order for the HP E1562 to use the local bus, the mode must be set to NORMal.

Sending VINStrument:LBUS PIPE puts the local bus interface into a state such that all local bus data from the module to the left is automatically routed to the module on the right. This is useful if you want to route local bus data past the HP E1562 to other modules rather than have the HP E1562 participate in any local bus throughput or playback. In this mode, the local bus cannot be used in a Sequence operation, or via the LBUS:READ:BUFFer or LBUS:WRITe:BUFFer commands. The behavior is undefined if this value is set to PIPE then a Sequence operation is executed which either reads from or writes to the local bus.

When transitioning from PIPE to NORMal mode one additional block will be piped after the change. In order to make this transition easier to coordinate it is best to reset the local bus on all modules then go to NORMal.

This command may be used instead of VINStrument:LBUS:RESet to place the HP E1562 local bus in the un-reset state.

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VINStrument:LBUS:RESet command

Resets the local bus.

Command Syntax: VINStrument:LBUS:RESet

Example Statements:
```
OUTPUT 70918;":VINSTRUMENT:LBUS:RESET “
OUTPUT 70918;”vins:lbus:res"
```

Attribute Summary:
Preset State: not applicable
Synchronization Required: no
SCPI Compliance: instrument-specific

Description: The local bus interface has strict requirements as to the order in which modules in a VXI mainframe have their local bus interface reset. On powerup or whenever any module in the mainframe is put in the reset state, all modules should be placed into the reset state from left to right. Then all modules can be put into the un-reset state from left to right.

This command toggles the local bus reset state for the HP E1562; first going into the reset state, then back out. Once this is completed the local bus mode is NORMal.

This command is *not* required if you use the VINStrument:CONFigure:LBUS:MODE command to configure the local bus.

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Errors

SCPI Command Errors

Error Number	Description
-100	Command error. This is the generic syntax error for devices that cannot detect more specific errors. This code indicates only that a Command Error as defined in *IEEE 488.2*, 11.5.1.1.4 has occurred.
-101	Invalid character. A syntactic element contains a character which is invalid for that type; for example, a header containing an ampersand, SETUP&. This error might be used in place of errors -114, -121, -141, and perhaps others.
-102	Syntax error. An unrecognized command or data type was encountered; for example, a string was received when the device does not accept strings.
-103	Invalid separator. The parser was expecting a separator and encountered an illegal character; for example, the semicolon was omitted after a program message unit, *EMC 1 :CH1:VOLTS 5.
-104	Data type error. The parser recognized a data element different than one allowed; for example, numeric or string data was expected but block data was encountered.
-105	GET not allowed. A Group Execute Trigger was received within a program message (see *IEEE 488.2*, 7.7).
-108	Parameter not allowed. More parameters were received than expected for the header; for example, the *EMC common command only accepts one parameter, so receiving *EMC 0,,1 is not allowed.
-109	Missing parameter. Fewer parameters were recieved than required for the header; for example, the *EMC common command requires one parameter, so receiving *EMC is not allowed.
-110	Command header error. An error was detected in the header. This error message is used when the device cannot detect the more specific errors described for errors -111 through -119.
-111	Header separator error. A character which is not a legal header separator was encountered while parsing the header; for example, no white space followed the header, thus *GMC"MACRO" is an error.
-112	Program mnemonic too long. The header contains more than twelve characters (see *IEE488.2*, 7.6.1.4.1).
-113	Undefined header. The header is syntactically correct, but it is undefined for this specific device; for example, *XYZ is not defined for any device.
-114	Header suffix out of range. The value of a numeric suffix attached to a program mnemonic, see Syntax and Style section 6.2.5.2, makes the header invalid.
-120	Numeric data error. This error, as well as errors -121 through -129, are generated when parsing a data element which apprears to be numeric, including the nondecimal numeric types. This particular error message is used if the device cannot detect a more specific error.
-121	Invalid character in number. An invalid character for the data type being parsed was encountered; for example, an alpha in a decimal numeric or a “9” in octal data.
-123	Exponent too large. The magnitude of the exponent was larger than 32000 (see *IEEE 488.2*, 7.7.2.4.1).
-124	Too many digits. The mantissa of a decimal numeric data element contained more than 255 digits excluding leading zeros (see *IEEE 488.2*, 7.7.2.4.1).

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SCPI Command Errors

-128 Numeric data not allowed. A legal numeric data element was received, but the device does not accept one in this position for the header.

-130 Suffix error. This error, as well as errors -131 through -139, are generated when parsing a suffix. This particular error message is used if the device cannot detect a more specific error.

-131 Invalid suffix. The suffix does not follow the syntax described in *IEEE 488.2*, 7.7.3.2, or the suffix is inappropriate for this device.

-134 Suffix too long. The suffix contained more than 12 characters (see *IEEE 488.2*, 7.7.3.4).

-138 Suffix not allowed. A suffix was encountered after a numeric element which does not allow suffixes.

-140 Character data error. This error, as well as errors -141 through -149, are generated when parsing a character data element. This particular error message is used if the device cannot detect a more specific error.

-141 Invalid character data. Either the character data element contains an invalid character or the particular element received is not valid for the header.

-144 Character data too long. The character data element contains more than twelve characters (see *IEEE 488.2*, 7.7.1.4).

-148 Character data not allowed. A legal character data element was encountered where prohibited by the device.

-150 String data error. This error, as well as errors -151 through -159, are generated when parsing a string data element. This particular error message is used if the device cannot detect a more specific error.

-151 Invalid string data. A string data element was expected, but was invalid for some reason (see *IEEE 488.2*, 7.7.5.2); for example, an END message was received before the terminal quote character.

-158 String data not allowed. A string data element was encountered but was not allowed by the device at this point in parsing.

-160 Block data error. This error, as well as errors -161 through -169, are generated when parsing a block data element. This particular error message is used if the device cannot detect a more specific error.

-161 Invalid block data. A block data element was expected, but was invalid for some reason (see *IEEE 488.2*, 7.7.6.2); for example, an END message was received before the length was satisfied.

-168 Block data not allowed. A legal block data element was encountered but was not allowed by the device at this point in parsing.

-170 Expression error. This error, as well as errors -171 through -179, are generated when parsing an expression data element. This particular error message is used if the device cannot detect a more specific error.

-171 Invalid expression. The expression data element was invalid (see *IEEE 488.2*, 7.7.7.2); for example, unmatched parentheses or an illegal character.

-178 Expression data not allowed. A legal expression data was encountered but was not allowed by the device at this point in parsing.

-181 Invalid outside macro definition. Indicates that a macro parameter placeholder ($<$number) was encountered outside of a macro definition.

-183 Invalid inside macro definition. Indicates that the program message unit sequence, sent with a *DDT or *DMC command, is syntactically invalid (see *IEEE 488.2*, 10.7.6.3).

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SCPI Execution Errors

Error Number	Description
-200	Execution error. This is the generic syntax error for devices that cannot detect more specific errors. This code indicates only that an Execution Error as defined in *IEEE 488.2*, 11.5.1.1.5 has occurred.
-220	Parameter error. Indicates that a program data element related error occurred. This error message is used when the device cannot detect the more specific errors described for errors -221 through -229.
-221	Settings conflict. Indicates that a legal program data element was parsed but could not be executed due to the current device state (see *IEEE 488.2*, 6.4.5.3 and 11.5.1.1.5.)
-222	Data out of range. Indicates that a legal program data element was parsed but could not be executed because the interpreted value was outside the legal range as defined by the device (see *IEEE 488.2*, 11.5.1.1.5.)
-223	Too much data. Indicates that a legal program data element of block, expression, or string type was received that contained more data than the device could handle due to memory or related device-specific requirements.
-224	Illegal parameter value. Used where exact value, from a list of possibles, was expected.
-240	Hardware error. Indicates that a legal program command or query could not be executed because of a hardware problem in the device. Definition of what constitutes a hardware problem is completely device-specific. This error message is used when the device cannot detect the more specific errors described for errors -241 through -249.
-241	Hardware missing. Indicates that a legal program command or query could not be executed because of missing device hardware; for example, an option was not installed. Definition of what constitutes missing hardware is completely device-specific.
-250	Mass storage error. Indicates that a mass storage error occurred. This error message is used when the device cannot detect the more specific errors described for errors -251 through -259.
-251	Missing mass storage. Indicates that a legal program command or query could not be executed because of missing mass storage; for example, an option that was not installed. Definition of what constitutes missing mass storage is device-specific.
-252	Missing media. Indicates that a legal program command or query could not be executed because of a missing media; for example, no disk. The definition of what constitutes missing media is device-specific.
-253	Corrupt media. Indicates that a legal program command or query could not be executed because of corrupt media; for example, bad disk or wrong format. The definition of what constitutes corrupt media is device-specific.
-254	Media full. Indicates that a legal program command or query could not be executed because the media was full; for example, there is no room on the disk. The definition of what constitutes a full media is device-specific.
-258	Media protected. Indicates that a legal program command or query could not be executed because the media was protected; for example, the write-protect tab on a disk was present. The definition of what constitutes protected media is device-specific.
-272	Macro execution error. Indicates that a syntactically legal macro program data sequence could not be executed due to some error in the macro definition (see *IEEE 488.2*, 10.7.6.3.)
-273	Illegal macro label. Indicates that the macro label defined in the *DMC command was a legal string syntax, but could not be accepted by the device (see *IEEE 488.2*, 10.7.3 and 10.7.6.2); for example, the label was too long, the same as a common command header, or contained invalid header syntax.
-276	Macro recursion error. Indicates that a syntactically legal macro program data sequence could not be executed because the device found it to be recursive (see *IEEE 488.2*, 10.7.6.6).

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SCPI Execution Errors

-277 Macro redefinition not allowed. Indicates that a syntactically legal macro label in the *DMC command could not be executed because the macro label was already defined (see *IEEE 488.2*, 10.7.6.4).

-278 Macro header not found. Indicates that a syntactically legal macro label in the *GMC? query could not be executed because the header was not previously defined.

SCPI Device-Specific Errors

Error Number	Description
-310	System error. Indicates that some error termed "system error" by the device, has occurred. This code is device-dependent.
-311	Memory error. Indicates that an error was detected in the device's memory. The scope of this error is device-dependent.
-315	Configuration memory lost. Indicates that nonvolatile configuration data saved by the device has be lost. The meaning of this error is device-specifict.
-321	Out of memory.
-330	Self-test failed.
-350	Queue overflow. A specific code entered into the queue in lieu of the code that caused the error. This code indicates that there is no room in the queue and an error occurred but was not recorded.

SCPI Query Errors

Error Number	Description
-400	Query error. This is the generic query error for devices that cannot detect more specific errors. This code indicates only that a Query Error as defined in *IEEE 488.2*, 11.5.1.1.7 and 6.3 has occurred.
-410	Query INTERRUPTED. Indicates that a condition causing an INTERRUPTED Query error occurred (see *IEE 448.2*, 6.3.2.3); for example, a query followed by DAB or GET before a response was completely sent.
-420	Query UNTERMINATED. Indicates that a condition causing an UNTERMINATED Query error occurred (see *IEEE 488.2*, 6.3.2.2); for example, the device was addressed to talk and an incomplete program message was received.
-430	Query DEADLOCKED. Indicates that a condition causing an DEADLOCKED Query error occurred (see *IEEE 488.2*, 6.3.1.7); for example, both input buffer and output buffer are full and the device cannot continue.
-440	Query UNTERMINATED after indefinite response. Indicates that a query was received in the same program message after an query requesting an indefinite response was executed (see *IEEE 488.2*, 6.5.7.5).

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HP E1562-Specific Errors

Error Number	Description
6201	Device not open. A read, write or other command was used to access a device which was not already open. See MMEM:SCSI:OPEN
6202	Device not ready A command was used to access a device which had been opened with the donStartUnit bit set. Try closing the device and re-opening it without that bit set in the mode word.
6203	Device already open. A second open was attempted on a device which was already open.
6204	Device incompatible. This error is returned if a MMEM:TUN:OPEN is sent with two devices on the same SCSI bus, or with the devices swapped (specifying the SCSI B device first and then the SCSI A device). This error is returned from MMEM:SESS:ADD if a two device Transfer Unit is added to a Session which already contains one device Transfer Units or vice versa; or if a single device Transfer Unit on SCSI A is added to a Session containing single device Transfer Units on SCSI B or vice versa. Also, there are a few commands which will only execute on a certain type of device, MMEM:SCSI:ERAS will only execute on optical memory devices.
6205	Device error. A device returned an error after attempting to perform some operation for which there is no further information.
6206	Session full. A MMEM:SESS:ADD was attempted on a Session which already contained the maximum number of Transfer Units.
6207	Session busy. A SCPI command attempted to use a Session which was already performing some SCSI operation. Use of the Session Busy bit in the Operation Status register may help avoid this error.
6208	Session empty. A SCPI command attempted to use a Session which did not contain any Transfer Units.
6209	Sequence full. A SEQ:ADD was attemtped on a Sequence which already contained the maximum number of Sequence operations.
6210	Sequence busy. A SEQ:BEG command was attempted when a Sequence was already running.
6211	Sequence empty. A SEQ:BEG command was attempted on a Sequence containing no Sequence operations.
6212	Local bus busy. The local bus chip was not in the paused state when a SEQ:BEG was attempted.
6213	Require even block count. A SCPI command with an odd number of SCSI blocks attempted an opertion on a Session containing split Transfer Units. Only even block counts are accepted on split Sessions.
6214	Device timeout. A SCSI device timed out when a SCSI command was sent to it.
6215	Sequence bus error. The sequencer detected a bus error while running a Sequence. This could be due to a VXI device not existing at the expected logical address or due to memory not existing at an expected location. Check the operations in the Sequence for errors.
6216	(This error is only applicable to the HP 1562A/B/C, not to the HP 1562D/E/F.) Maximum safe disk temperature exceeded. This error indicates that the disk drive has exceeded 72 degrees C. It has been spun down if it was spinning. The temperature check is done every 30 minutes after powerup. This check can only be done for HP disks due to the use of non-SCSI-defined commands. The SCSI controller and bus address will be included in the error message. For example, the results of SYST:ERR? might return: `16, “Maximum safe disk temperature exceeded; SCSI B, bus address 0"`
6217	Write to a read-only device. Either the device was opened with the read-only bit in the open mode set, or the device is write-protected (i.e. a tape in the DAT is write protected) and a write operation was attempted to this device.

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10

Using the LIF Library with the HP E1562

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Getting Started

Note

The HP E1652F provides additional storage space to a VXI system with a SCSI controller, such as an HP E1562D/E. The HP E1562D/E is controlled by programming the SCSI controller. The HP E1652F does not respond to any commands on the VXI bus.

This chapter pertains to the HP E1562D/E.

Why Use the LIF Library?

LIF (Logical Interchange Format) and is a directory and file format used to exchange files among various Hewlett-Packard computer systems and instruments. Any HP E1562 Session, including one or more disks, may be formatted as a LIF volume.

LIF library functions provide a higher level of access to HP E1562 data. For example you can set up Sessions by using LIF library functions as an alternative to using MMEM:SCSI:OPEN, MMEM:TUN:OPEN, and MMEM:SESS:ADD. Data can then be transferred using either LIF functions, Sequences, or SCPI commands.

An advantage of using the LIF library to access an E1562 Session as a LIF volume is that multiple data acquisitions may easily be stored with each group of data identified by its own name and size in a directory. Furthermore a single disk volume may be directly accessed by a host computer when connected via a SCSI cable.

Installation

The library functions documented here allow you to access the HP E1562 VXI module using SICL on the following computers:

- HP-UX Series 700
- HP RADI-EPC7

For instructions on how to install the LIF library, see the chapter “Installing the HP E1562.”

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Special Considerations for the LIF Library

The implementation of the LIF library for the HP E1562 involves some special constraints and conventions:

- LIF can be supported only on disks; DAT support is not available

- The number of open volumes is limited to the number of available Sessions on the HP E1562. A volume describes a single file-system which may exist on a single device or may cross several devices as do Sessions on the HP E1562. Many files may be accessed simultaneously on one volume.

- The LIF library assumes that every SCSI block in a Session is the same size. This implies that for Sessions involving striping each Transfer Unit must have the same SCSI block size. This is only an issue for striped Sessions since both devices within a Transfer Unit must already be the same size due to restrictions imposed by the HP E1562. The additional restriction imposed by the LIF libraries requires that all Transfer Units within a Session also have the same SCSI block size.

- This library assumes that every volume starts at the beginning of all devices which make up the volume. For example, if a Session is built from individual devices, the MMEM:TUN:OPEN command will always be sent with the starting SCSI block parameter set to 0.

- The LIF library can read and write only BDAT files. Files of other types may be written to volumes but they cannot be accessed by the LIF library.

- Each BDAT file on a volume begins with a 256-byte block of additional header information including, most importantly, file size. The library protects this header from reads and writes and designates that seeks to the beginning of the file go to the block following this BDAT header information.

- All LIF functions set ‘e1562_errno.’ Error codes are listed at the end of this chapter.

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Naming Conventions

Several functions expect that a name be passed as a parameter. In some cases the name refers to a single file (i.e. `e1562_fopen`), and in other cases the name refers to a volume only (i.e. `e1562_pack`).

Volume names and file names use a special naming convention to indicate which SCSI device is being referenced, and also provides for a single file system consisting of many SCSI devices. The special conventions include:

- A device pair always starts with a capital 'V' followed by the A SCSI bus disk address then the B SCSI bus disk address
- Addresses are designated by lower case hexadecimal numbers
- Unused devices are designated by the placeholder 'x'
- File size designations (when required) are decimal ASCII
- File names are made up of the volume name followed by a colon followed by a base LIF file name.
- A volume consisting of a striped Session has a name which includes several of the disk pairs described above, each followed by a burst block count. This is analogous to the <Count> parameter used in MMEM:SESS:ADD.

Volume name examples:

A single device at address 3 on controller B:
`"Vx3"` (SCSI A is absent; SCSI B at address 3)

A split pair of devices with the controller/address pairs of A/5 and B/11:
`"V5b"` (SCSI A at address 5; SCSI B at address 11)

A split and striped disk set using a pair of disks at A/1 and B/7, and a second pair at A/14 and B/12 with a burst block count of 512:
`"V17512Vec512"` (First pair: SCSI A at address 1; SCSI B at address 7; Second pair: SCSI A at address 14; SCSI B at address 12)

File name example:

A file named "file1" on a volume with data split between a pair of devices:
`"Vaf:file1"`

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LIF Library Quick Reference

	Function	Description
Library Management		
	e1562_closeLibrary	Release all dynamic data structures
	e1562_initializeLibrary	Initialize the internal data structures
	e1562_mapModule	Associate a module with an id
Volume Management		
	e1562_available	Return the number of LIF blocks available on the volume
	e1562_copy	Copy a file or volume
	e1562_defaultVolume	Define the default volume
	e1562_dirFirst	Return information from the first valid directory entry on a volume
	e1562_dirInit	Replace information on a volume with an empty LIF file system
	e1562_dirNext	Return information from a subsequent valid directory entry on a volume
	e1562_pack	Reorganize the file system to delete empty space
	e1562_remove	Delete the specified file from the LIF directory
	e1562_rename	Change the name of a file
File Management		
	e1562_allocated	Return the number of 256-byte blocks allocated to the file
	e1562_block	Return the current HP E1562 Session block number
	e1562_fclose	Flush the stream and close the associated file
	e1562_fflush	Cause any unwritten data for a stream to be written to its associated file
	e1562_fgetpos	Store the current file position indicator for the stream
	e1562_fopen	Open the file specified by the string name
	e1562_fread	Read data from a file into an array
	e1562_fsetpos	Sets the file position indicator for the stream
	e1562_fwrite	Write data to a file from an array
	e1562_setEOF	Set the end-of-file marker for the file

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LIF Commands Available from the Command Line

Command	Description
e1562ls	List contents of current volume
e1562mv	Rename a file
e1562cp	Copy a file
e1562in	Initialize a volume
e1562pk	Pack a volume
e1562rm	Remove a file

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HP E1562 LIF Functions

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e1562_allocated

Returns the physical file length.

Synopsis:

```
#include “e1562lif.h”

unsigned long e1562_allocated(e1562_FILE *stream);
```

Description: This function returns the number of 256-byte blocks allocated to the file. This may be different from the number of blocks actually occupied by data. This number is the physical length of the file, whereas the logical length of the file is the amount of data contained in the file.

Notes: To determine how much data is in the file, use `e1562_fsetpos` to go to the end of the file, then call `e1562_fgetpos` to determine the offset from the beginning of the file in bytes.

Example:

```
e1562_FILE *fp;
unsigned long LIF blocks;

fp = e1562_fopen(2,"Vx0:jan20temp","r");
LIF blocks = e1562_allocated(fp);
```

Return Value: Number of 256-byte blocks allocated to the file

See Also: `e1562_fopen`

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e1562_available

Returns available space and available contiguous space on a volume.

Synopsis:

```
#include “e1562lif.h”

e1562_errors e1562_available(e1562ID id, const char *volname,
                             unsigned long *totalBlocks,
                             unsigned long *largestBlock);
```

Description: This function returns the number of LIF blocks (256 bytes) available on the entire volume as well as the largest sequential number of blocks available. The value returned in ‘largestBlock’ is the size of the longest file which can be created on this volume. It is possible that a larger file might be created after calling `e1562_pack`.

Example:

```
e1562_errors error;
unsigned long Total, Large;

error = e1562_mapModule(1,"Vx1", 48);
error = e1562_available(1,"V24512Vc3512", &Total, &Large);
```

Return Value: This function returns zero if successful, and an error number if it fails.

See Also:

```
e1562_pack
e1562_mapModule
```


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e1562_block

Returns the next volume block number to be used.

Synopsis:

```
#include “e1562lif.h”

unsigned long e1562_block(e1562_FILE *stream,
                          unsigned long  *blockSize,
                          unsigned long *byteOffset);
```

Description: This function returns the physical location on an E1562 volume to or from which the next character would be transferred on a one byte read or write. The ‘blockSize’ argument will reflect the number of bytes in the volume’s block. For a split volume the ‘blockSize’ will be twice the size of a volume consisting of a single device.

The value pointed to by the ‘byteOffset’ argument will be set to the byte offset into the returned block number at which the next byte would be read or written on the current volume. The block returned is a SCSI block offset from the beginning of the E1562 Session associated with the LIF volume on which the file resides.

Notes: The file must be opened with `e1562_fopen` before this function can be executed.

Example:

```
e1562_FILE *file;
unsigned long block, bytes;

file = e1562_fopen(0,"V0x:pressure", “r”);
block = e1562_block(file, &bytes);
```

Return Value: If an error is detected, 0xffffffff will be returned, otherwise the Session block number is returned.

See Also: `e1562_fopen`

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e1562_copy

Copy a file or volume.

Synopsis:

```
#include “e1562lif.h”

e1562_errors e1562_copy(e1562ID id, const char *filename,
                        const char *newfile);
```

Description:

The file ‘filename’ is duplicated as ‘newfile’. This function copies a file or an entire volume.

If ‘filename’ is a file, ‘newfile’ may be either a filename or a volume name. If ‘filename’ is a volume name (must include the ‘:’) then ‘newfile’ must be a volume name.

If ‘filename’ and ‘newfile’ are on different volumes, this function requires that two E1562 Sessions be available for use.

Notes:

If ‘newfile’ already exists, an error is returned.

It is not possible to copy from one E1562 to another with this function.

Example:

Copy a file to another file:

```
error = e1562_copy(1,"V1x:pump3", “V1x:pump3_bak”);
```

Copy a file to a volume:

```
error = e1562_copy(0,"V55:frf4_5","V1x");
```

Copy a volume to a volume:

```
error = e1562_copy(3,"Vab:","Vxc:");
```

Return Value:

This function returns zero if successful, and an error number if it fails.

See Also:

`e1562_mapModule`

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e1562_closeLibrary

Closes all volumes and files and deallocates all dynamic memory.

Synopsis:

```
#include “e1562lif.h”

e1562_errors e1562_closeLibrary(void);
```

Description: This function cleans up all data structures in preparation for program termination.

Example:

```
e1562_closeLibrary();
```


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e1562_defaultVolume

Define the default volume.

Synopsis:

```
#include “e1562lif.h”

e1562_errors e1562_defaultVolume(e1562ID id, const char *volname);
```

Description: This function defines ‘volname’ as the default volume. If ‘volname’ does not specify a valid volume, an error will be returned. The default volume is initially null upon startup. Calling this function successfully allows the programmer to reference names on that volume without being required to specify the volume name as part of the filename. Any file specified without a volume name will be assumed to reside on the default volume. It is still possible to place a volume name in the filename to reference a specific volume which may not be the default volume.

Example:

```
e1562_errors err;
err = e1562_defaultVolume(1, “V05512V12512");
```

Return Value: This function returns zero if successful, and an error code if it fails.

See Also: `e1562_mapModule`

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e1562_dirFirst

Returns information from the first valid directory entry.

Synopsis:

```
#include “e1562lif.h”

e1562_dirEntry *e1562_dirFirst(e1562ID id, const char *volname,
                               e1562_dirEntry *buffer);
```

Description:

This function returns information from the first valid directory entry on volume ‘volname.’ The received pointer to ‘e1562_dirEntry’ must point to an actual e1562_dirEntry structure (memory is allocated in the calling function). This function, in conjunction with `e1562_dirNext`, is used to traverse a LIF directory.

The following fields in the structure returned by this function provide information about a file in the directory:

Type	Definition
unsigned char name [12]	name of file
unsigned long date stamp	create date in BCD - YYMMDD
unsigned long time stamp	create time in BCD - HHMMSS
signed long type	type of file
unsigned long LIFstart	first 256-byte block of file
unsigned long LIFallocated	number of 256-byte blocks allocated
unsigned long sizeHigh	MS half of the byte count
unsigned long sizeLow	LS half of the byte count
unsigned long volume	volume number, MSB=1 is last volume
unsigned long reserved	not used
unsigned long entryNumber	index into directory
unsigned long session	session number
e1562 id	which E1562
void * vid	volume id

Notes:

Deleted directory entries, or otherwise invalid directory entries will never be returned from this fuction.

Example:

```
e1562_dirEntry entry;
e1562_dirEntry *entryp;

entryp = e1562_dirFirst(2, “V13", &entry);
```

Return Value:

If an error is found or there are no files in the directory the return value will be zero, otherwise a pointer to that structure will be returned.

See Also:

`e1562_dirNext`
`e1562_mapModule`

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e1562_dirInit

Replace information on a volume with an empty LIF file system.

Synopsis:

```
#include “e1562lif.h”

e1562_errors e1562_dirInit(e1562ID id, const char *volname);
```

Description: This function replaces all information on the designated volume with an emply LIF file system.

Note: Any information previously existing on the volume will be lost

Example:

```
e1562_errors err;
err = e1562_dirInit(1, “Vxe”);
```

Return Value: This function returns zero if successful, and an error number if it fails.

See Also: `e1562_mapModule`

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e1562_dirNext

Retreive the next entry from a LIF directroy.

Synopsis:

```
#include “e1562lif.h”

e1562_dirEntry *e1562_dirNext(e1562_dirEntry *previous);
```

Description: Assuming the received pointer to ‘e1562_dirEntry’ already contains valid directory information from a volume, this function replaces the structure with information about the next valid file in the directory.

The same structure type definitions apply to this function as listed in the description of the function `e1562_dirFirst`.

It is important that the contents of the structure returned by a previous call to `e1562_dirFirst` or `e1562_dirNext` NOT be modified before calling this function.

Notes: Deleted directory entries, or otherwise invalid directory entries will never be returned from this fuction.

Example:

```
e1562_dirEntry entry;
e1562_dirEntry *entryp;

entryp = e1562_dirFirst(2, “V13", &entry);
entryp = e1562_dirNext(entryp);
```

Return Value: If there are no more files in the directory zero will be returned, otherwise the received pointer is returned.

See Also: `e1562_dirFirst`

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e1562_fclose

Flush the stream and close the associated file.

Synopsis:

```
#include “e1562lif.h”

int e1562_fclose(e1562_FILE *stream);
```

Description: Any unwritten data is written to the file; any unread data is discarded. Any buffers are deallocated.

Notes: The file must be opened with `e1562_fopen` before this function can be executed.

Example:

```
e1562_FILE *f;

f = e1562_fopen (3, “Vx0:trace5,1048576", ”w");
if (e1562_fclose(f) ! = 0)
    fprintf(stderr “ Close failed\n”);
```

Return Value: This function returns 0 if successful; returns -1 if any errors were detected

See Also: `e1562_fopen`

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e1562_fflush

Causes any unwritten data for the stream to be written to its associated file.

Synopsis:

```
#include “e1562lif.h”

int e1562_fflush(e1562_FILE *stream);
```

Notes: The file must be opened with `e1562_fopen` before this function can be executed.

Example:

```
e1562_FILE *fp

fp = e1562_fopen (2, “V5x:rotor”, “r+”);
                .
                .
          read/write data
                .
                .
e1562_fflush(fp);
```

Return Value: This function returns 0 if successful and -1 if a write error occurs.

See Also: `e1562_fopen`

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e1562_fgetpos

Stores the current value of the file position indicator.

Synopsis:

```
#include “e1562lif.h”

e1562_errors e1562_fgetpos(e1562_FILE *stream,
                           e1562_fpos_t *byteOffset);
```

Description: This function stores the current value of the file position indicator for the stream into the object pointed to by ‘byteOffset.’ The value stored contains information usable by the `e1562_fsetpos` function for repositioning the stream.

Notes: The file must be opened with `e1562_fopen` before this function can be executed.

This function differs from the ANSI C `fgetpos` in two ways:

- The returned information is defined to be the byte offset from the beginning of the file at which the file position indicator is currently located
- Upon failure the value of errno is NOT modified.

Example:

```
e1562_FILE *data;
e1562_fpos_t position;

data = e1562_fopen(0, “Vbc:spl_5", ”w+");
e1562_fgetpos(data, &position);
```

Return Value: This function returns 0 if successful, and an error number if it fails.

See Also:

```
e1562_fsetpos
e1562_fopen
```


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e1562_fopen

Open the file specified by the string name and designate the file size.

Synopsis:

```
#include “e1562lif.h”

e1562_FILE *e1562_fopen(e1562ID id, const char *name,
                        const char *mode);
```

Description:

The filename may include the volume name as a prefix to the file name separated by a colon, or may rely on the default volume (see `e1562_defaultVolume`). The argument ‘mode’ points to a string with one of the following options:

r	open file for reading
w	truncate to zero length or create file for writing
a	append; open or create file for writing at end-of-file
r+	open file for update (reading and writing)
w+	truncate to zero length or create file for update
a+	append; open or create file for update; writing at end-of-file

Opening a file with ‘r’ as the first character in mode fails if the file does not exist or cannot be read. Opening a file with ‘a’ as the first character causes all writes to be forced to the end-of-file, regardless of any intervening calls to the `e1562_fsetpos` function. When a file is opened for update (‘+’ contained in the mode string), both input and output may be performed on the file. However output may not be directly followed by input unless either the function `e1562_fsetpos` or `e1562_fflush` is called, and input may not be directly followed by output unless the input encountered the end-of-file or `e1562_fsetpos` is called.

Notes:

This is the only LIF library function which may include file size in the file name.

A filename may include up to 54 characters: a prefix of up to 28 characters for the volume specifier, a 10 character name conforming to the LIF restriction, a suffix of up to 13 characters to specify the file length, and 3 additional characters to accommodate a colon, a comma and the null terminator.

Up to 10 files may be open sinultaneously.

Example:

```
e1562_FILE *f;
```

Open file for reading only:

```
   f = e1562_fopen(1, “Vfx:piston2", ”r");
```

Create file for writing:

```
   f = e1562_fopen(2, “Vac:chan7,1048576", ”w");
```

Open file for reading and writing:

```
   f = e1562_fopen(0, “Vx2:station4", ”r+");
```

Return Value:

If successful this function returns a pointer to the object controlling the stream, and returns a null pointer if errors are detected.

See Also:

`e1562_defaultVolume`
`e1562_mapModule`

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e1562_fread

Reads data from the file associated with the stream into an array.

Synopsis:

```
#include "e1562lif.h"

size_t e1562_fread(void *buff, size_t bufelSize, size_t count,
                   e1562_FILE *stream);
```

Description: Data of a size up to 'count' elements is read from the file associated with the stream into the array pointed to by 'buff', whose size is specified by 'bufelSize'. The file position indicator for the steam is advanced by the number of bytes successfully read.

Notes: If an error occurs the resulting value of the file position indicator is indeterminate. If a partial element is read its value is indeterminate.

The file must be opened with `e1562_fopen` before this function can be executed.

Example:

```
unsigned char data[8192]
e1562_FILE *file;
size_t count;

file = e1562_fopen("V3x:vib", "r");
count = e1562_fread(data, sizeof(data[0]), 8192, file);
```

Return Value: This function returns the number of elements successfully read, which may be less than 'count' if a read error or end-of-file is encountered. If 'count' or 'bufelSize' is zero, the function returns zero and the contents of 'buff' and the state of the stream remain unchanged.

See Also: `e1562_fopen`

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e1562_fsetpos

Sets the file position indicator.

Synopsis:

```
#include “e1562lif.h”

e1562_errors e1562_fsetpos(e1562_FILE *stream,
                    N       const e1562_fpos_t *byteOffset);
```

Description: This function sets the file position indicator for the stream to the value of the object pointed to by ‘byteOffset.’ A successful call to `e1562_fsetpos` clears the end-of-file indicator for the stream. The next operation on an update stream may be either input or output.

Notes: The file must be opened with `e1562_fopen` before this function can be executed.

If you attempt to set the file position beyond the end of file, an error will be returned, but the file position will be set to the end of file.

This function differs from the ANSI C `fsetpos` in two ways:

- The data received in the object pointed to by ‘byteOffset’ need not have been obtained from a call to `e1562_fgetpos` but may be set by the caller as a byte offset from the beginning of the file
- Upon failure the value of errno is NOT modified.

Example:

```
e1562_FILE *fp;
e1562_fpos_t offset;

offset.positionHigh = 0;
offset.positionLow = 4096;

fp = e1562_fopen(“V6x:temp”, “r”);
e1562_fsetpos(fp, &offset);
```

Return Value: This function returns 0 if successful, and and error number if it fails.

See Also:

```
e1562_fgetpos
e1562_fopen
```


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e1562_fwrite

Writes data from an array into the file associated with the stream.

Synopsis:

```
#include "e1562lif.h"

size_t e1562_fwrite(const void *buff, size_t bufelSize,
                    size_t count, e1562_FILE *stream);
```

Description: Data of a size up to 'count' elements is written to the file associated with the stream from the array pointed to by 'buff', whose size is specified by 'bufelSize.' The file position indicator for the steam is advanced by the number of bytes successfully written.

Notes: If an error occurs the resulting value of the file position indicator is indeterminate.

The file must be opened with `e1562_fopen` before this function can be executed.

Example:

```
#define DATA_SIZE 65536
e1562_FILE *file;
long data[DATA_SIZE];
size_t count;

file = e1562_fopen("Vxd:data", "w");
count = e1562_fwrite(data, sizeof(data[0]), DATA_SIZE, file);
if (count < DATA_SIZE)
     fprintf(stderr, "Error writing data: %ld\n", e1562_errno);
```

Return Value: This function returns the number of elements successfully written, which will be less than count only if a write error is encountered.

See Also: `e1562_fopen`

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e1562_initializeLibrary

Initializes internal data structures which are referenced by the other functions in the HP E1562 LIF library.

Synopsis:

```
#include “e1562lif.h”

e1562_errors e1562_initializeLibrary(void);
```

Description: This function allocates memory and initializes data structures in preparation for calling other functions in the LIF library.

Notes: This function MUST be called before using other functions in the LIF library.

Example:

```
e1562_initializeLibrary();
```


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e1562_mapModule

Associates an HP E1562 module with the given id.

Synopsis:

```
#include “e1562lif.h”

e1562_errors e1562_mapModule(e1562ID id, const char *interface,
                             unsigned char logicalAddr);
```

Description: Four modules may be open at a time; the valid range for ‘id’ is 0-3. The argument ‘interface’ is a string appropriate to be passed to the SICL `iopen` function. If ‘id’ already refers to a valid HP E1562, the module will no longer be accessable from the previous id upon successful completion of this function.

Notes: This function MUST be called before using id as an argument to another function since initially all ‘id’ are null.

Example:

```
e1562_mapModule(0, “vxi”, 32);
```

Return Value: If ‘logical address’ does not refer to an HP E1562, an error will be returned

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e1562_pack

Removes empty space left by deleted files.

Synopsis:

```
#include “e1562lif.h”

e1562_errors e1562_pack(e1562ID id, const char *volname);
```

Description: This function reorganizes the file system specified by ‘volname’ such that there is no empty space caused by deleted files.

Unlike other file systems, data in a LIF file system is all sequential. This means that as files are created and deleted the largest available contiguous file space becomes smaller due to fragmentation. This function makes all the files contiguous at the beginning of the file system, possibly allowing a larger file to be created at the end of the file system.

Notes: Once this operation begins it must not be interrupted until it has completed or the file system will be corrupted.

Example:

```
e1562_pack(2, “V05256V12256");
```

Return Value: This function returns zero if successful, and an error number if it fails.

See Also: `e1562_mapModule`

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e1562_remove

Delete the specified file from the LIF directory.

Synopsis:

```
#include “e1562lif.h”

e1562_errors e1562_remove(e1562ID id, const char *filename);
```

Description: The space used by the file ‘filename’ is released to the file system for use by other files.

Example:

```
e1562_remove(0, “Vx9:myfile”);
```

Return Value: This function returns 0 if successful. If the file is not found or the file is open an error is returned and the file is not removed.

See Also: `e1562_mapModule`

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e1562_rename

Change the name of a file.

Synopsis:

```
#include "e1562lif.h"

e1562_errors e1562_rename(e1562ID id, const char *oldname,
                          const char *newname);
```

Description: This function changes the name of a file from 'oldname' to 'newname.' 'Newname' need not contain the volume in its name.

The following conditions generate an error:

- 'oldname' does not exist on either the default volume or on the volume specified in the name
- the volume name for 'newname' (if used) does not match the volume on which 'oldname' resides
- 'newname' is the same as a current file in the directory
- the file 'oldname' is open

Example:

```
e1562_rename(3, "Vex:myfile", "yourfile");
```

Return Value: If successful this function returns a 0 and 'oldname' no longer refers to an existing file, otherwise an error is generated and the original filename is not changed.

See Also:

```
e1562_defaultVolume
e1562_mapModule
```


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e1562_setEOF

Sets the end-of-file marker for the file.

Synopsis:

```
#include “e1562lif.h”

e1562_errors e1562EOF(e1562_FILE *stream,
                      const e1562_fpos_t *byteOffset);
```

Description: This function is useful in establishing a logical end of file when the data is written to the file by some method other than the LIF file system (such as by using HP E1562 sequences).

Notes: The EOF cannot be set beyond the size of the file specified when it was created.

Example:

```
e1562_FILE *f;
e1562_fpos_t offset;

f = e1562_fopen(“Vax:auto_jun14", ”w");
offset.positionHigh = 0;
offset.positionLow = 8388608;
e1562_setEOF(f, &offset);
```

Return Value: This function returns zero if successful, and an error code if it fails.

See Also: `e1562_fopen`

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HP E1562 LIF Commands

The six following commands allow you to perform certain actions on volumes directly from the command line, without having to write and compile a C program.

The same volume and file name conventions apply as for the previous functions. See page 10-4.

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e1562cp

Copy files.

Synopsis:

```
e1562cp [-Lisuv] file 1 [file2 ...] target
```

Description:

Copy `file 1` to `target`. If `target` specifies either a LIF volume or is "." (for the current directory on the host), `file1` is copied to that directory, otherwise a file with the name `target` is created with the contents of `file1`. If more than one file is specified, `target` must be a volume name or ".". e1562cp may be used to copy files from the E1562 to the host, from the host to the E1562, or from the E1562 to the E1562 (either the same volume, or a different volume).

Each file and/or target must be prefixed with a LIF volume specifier to indicate files on the E1562. A target consisiting of only a volume name must include the ":" at the end of the name.

Option	Description
-L	specifies the logical address of the E1562. Default address is 144
-i	specifies the interface which connects to the VXI cardcage containing the E1562. The default is "vxi"
-s	specifies the size of the block used to copy files between the host and the E1562. The default is 8192
-u	specifies that usage information should be printed then exit
-v	specifies that the verbose mode should be enabled

Example:

Copy a file from the host to an E1562 volume:

```
e1562cp jan20note Vx0:jan20note
```

or

```
e1562cp jan20note Vx0:
```

Copy several files from an E1562 to the host:

```
e1562cp -L96 -s524288 V24:engNotes V24:engVib V24:engTemp .
```

Copy a file between E1562 volumes:

```
e1562cp Vx0:SPLmar12 Vx4:SPLmax
```


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e1562in

Create a LIF file system on the specified volume.

Synopsis: `e1562in [-Liuv] volume`

Description: Initializes a LIF file system on the specified volume.

Caution: This will destroy the contents of the disk.

Option	Description
-L	specifies the logical address of the E1562. Default address is 144
-i	specifies the interface which connects to the VXI cardcage containing the E1562. The default is "vxi"
-u	specifies that usage information should be printed then exit
-v	specifies that the verbose mode should be enabled

Example:

```
e1562in V00
```


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e1562ls

List contents of a LIF volume.

Synopsis: `e1562ls [-Liluv] volume`

Description: This command lists the files on the specified LIF volume to STDOUT. One file per line is printed to STDOUT. The volume name must not contain the ":" which normally separates a file name from the volume name.

Option	Description
-L	specifies the logical address of the E1562. Default address is 144
-i	specifies the interface which connects to the VXI cardcage containing the E1562. The default is "vxi"
-l	Specifies the long format of directory listing. The default is to list just the names of the files
-u	specifies that usage information should be printed then exit
-v	specifies that the verbose mode should be enabled

Example:

```
e1562ls V00
```


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e1562mv

Rename a file on a LIF volume.

Synopsis: `e1562mv [-LVivu] file newname`

Description: This command renames an existing file. `file` must exist, and the `newname` must not. If `newname` contains a volume name prefix, it must be the same as that of `file.`

Option	Description
-L	specifies the logical address of the E1562. Default address is 144
-V	specifies a default volume so that several files may be specified without including the volume in each one.
-i	specifies the interface which connects to the VXI cardcage containing the E1562. The default is "vxi"
-u	specifies that usage information should be printed then exit
-v	specifies that the verbose mode should be enabled

Example:
```
e1562mv Va4:spl43 spl43.old
```


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e1562pk

Coalesce files on a LIF volume.

Synopsis: `e1562pk [-Liuv] volume`

Description: This comand coalesces files on the specified LIF volume, by packing together files in the directory and on the volume into contiguous space at the beginning of the volume. This allows a larger file to be created later if there were several deleted files, or if a small file has been used to fill the spot originally used for a large file.

Caution

Once this commmand starts working it must not be interrupted or the file system will be corrupted.

Option	Description
-L	specifies the logical address of the E1562. Default address is 144
-i	specifies the interface which connects to the VXI cardcage containing the E1562. The default is "vxi"
-u	specifies that usage information should be printed then exit
-v	specifies that the verbose mode should be enabled

Example:

```
e1562pk Vx3
```


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e1562rm

Remove one or more files from a LIF volume or volumes.

Synopsis:

```
e1562rm [-LViuv] file1 [file2 ...]
```

Description:

This command deletes each of the files specified. Usually, each file will be specified with the volume prefix as 'volume:file'. If the -V option is used to specify the volume name, all files which do not contain a volume will use the specified default volume.

Option	Description
-L	specifies the logical address of the E1562. Default address is 144
-V	specifies a default volume so that several files may be specified without including the volume in each one.
-i	specifies the interface which connects to the VXI cardcage containing the E1562. The default is "vxi"
-u	specifies that usage information should be printed then exit
-v	specifies that the verbose mode should be enabled

Example:

Remove a single file:

```
e1562rm -L32 -ivxi2 Vx2:temp.old
```

Remove multiple files, most from V8x, one from Vxc:

```
e1562rm -VV8x abc def ghi Vxc:xyz mno
```


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LIF Library Errors

Error Number	Name	Description
0	e1562Err_noError	No error was generated
1	e1562Err_noSessionAvailable	A Session is not available
2	e1562Err_invalidVolumeName	The specified volume name is not valid
3	e1562Err_missingVolumeName	No volume name was specfied
4	e1562Err_VolumeOpen	The specified volume is already open
5	e1562Err_interfaceError	An error was detected on the interface
6	e1562Err_outOfMemory	Memory space is insufficient for the designated function
7	e1562Err_systemError	A system error occured
8	e1562Err_idInvalid	The specified id is invalid
9	e1562Err_fileSizeInvalid	The specified file size is invalid
10	e1562Err_fileNameInvalid	The specified file name is invalid
11	e1562Err_fileModeInvalid	The specified file mode is invalid
12	e1562Err_fileDoesNotExist	The specified file does not exist
13	e1562Err_fileDoesNotExistNoSize	The specified file has no size designation
14	e1562Err_fileExistsWithSize	The specified file already has a specified file size; remove size designation
15	e1562Err_fileEOF	The end of the file was encountered before the transfer was completed
16	e1562Err_fileTypeBad	The file type specified is not valid
17	e1562Err_endOfDirectory	The end of the directory was encountered before the transfer was completed
18	e1562Err_volumeNotLIF	The specified volume is not of a LIF type
19	e1562Err_renameVolumeDifferent	The file to be renamed is specified with two different volume designations
20	e1562Err_seekPastEOF	The read/write location designated is past the end of file marker
21	e1562Err_setEOFpastSize	The EOF specified is beyond the created size of the file
22	e1562Err_fileOpen	A file which is open has been designated to delete, rename, or copy

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Glossary

A16
16-bit address space. A16 has an upper limit of 65535.

A24
24-bit address space. A24 has an upper limit of 16777215.

A32
32-bit address space. A32 has an upper limit of 4294967295.

ADC
an Analog-to-Digital Converter module used as the input to a VXI system. Examples include the HP E1413B and HP E1431A.

address space
a range of addresses in memory. See also A16, A24, A32, and Shared RAM.

bit bucket
a place to put unwanted data.

blocksize (Local Bus)
the amount of of data, in bytes, moving in a block on the Local Bus.

blocksize (SCSI)
the size of a block of data on a disk or DAT.

cache
a block of RAM used to allow fast transfers to a slow device.

CVT
Current Value Table.

D16
a single 16-bit transfer over the VXI system bus.

D32
a single 32-bit transfer over the VXI system bus.

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DAT
Digital Audio Tape, used in the HP E for mass storage of data.

differential-wide
a SCSI connector in which the signal is difference between high and low wires. Wide refers to a 16-bit connection (narrow is 8 bits).

DMA
Direct Memory Access.

embedded computer
a computer (functioning as controller) which is installed in the VXI mainframe. An example is the HP V743.

HP-IB
Hewlett-Packard Interface Bus.

implied mnemonic
keywords in a SCPI command which can be deleted without changing the effect of the command. Implied mnemonics are identified by brackets [ ] in SCPI syntax diagrams.

internal device address
a SCSI or DAT address .

LBUS
see Local Bus.

LIF libraries
Logical Interchange Format, a directory and file format used to exchange files among various Hewlett-Packard computer systems and instruments. HP E1562 Sessions may be accessed by using LIF functions.

Local Bus
a daisy-chain bus structure connecting the modules in a VXI system.

logical address
the VXI address of a module.

memory space
see address space.

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monitoring
A method of transferring data which allows the host computer to access part of the data during transfer operations. This is done by transferring part of the data to host memory at the same time as to the HP E1562 Session.

MXI
an interface to extend the VXI bus to the memory space of a host computer.

primary address
one of 3 parts of HP E1562 address in a SCPI environment. The primary address, typically 09, indicates which HP-IB port in the system controller is used to communicate with the Slot 0 Control Module, for example the HP E1406A/B.

SCPI
Standard Commands for Programmable Instruments, a standard instrument command language.

SCSI
Small Computer System Interface.

secondary address
one of 3 parts of HP E1562 address in a SCPI environment. The secondary address indicates the device-specific address. In this case, the VXI logical address.

select code
one of 3 parts of HP E1562 address in a SCPI environment. The select code specifies the interface. Seven (7) is a typical number for the HP-IB interface.

Sequence
specifies the order of operations for a throughput or playback Session.

Session
provides the ability to combine one or more Transfer Units together into one logical data repository.

shared memory
see Shared RAM.

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Shared RAM
Memory space that is available to be shared with other devices, as a way of passing data. Shared RAM has an upper limit of 262143. (RAM = Random Access Memory).

single-ended
a SCSI connector in which one wire is ground and the other wire is the signal.

split session
data from one Session split across two SCSI devices.

SRAM
Static RAM.

SRQ
Service Request.

static+dynamic
a measurement that combines low sample-rate data from static sensors (such as temperature or pressure) with dynamic data (such as vibration or acoustics).

striping
Sessions using multiple Transfer Units containing data which has N blocks on Transfer Unit 1, M blocks on Transfer Unit 2, and so on.

system bus
a way of referring to the VXI bus not including the Local Bus.

Transfer Unit
a quantity of data transferred as a unit. A transfer unit can refer to data from either one or two devices. Also called a TUNIT.

TTLTRG
eight lines on the VXI backplane which are available to provide synchronization between devices. The HP E1562 uses the TTLTRG lines for simple communication with other devices.

TUNIT
see Transfer Unit

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Declaration of Conformity

According to ISO/IEC Guide 22 and EN 45014

Manufacturer's name:	Hewlett-Packard Company
Manufacturer's address:	Lake Stevens Instrument Division 8600 Soper Hill Road Everett, Washington 98205-1298

declares, that the product

Product Name:	Throughput Disk Module
Model Number:	HP E1562A/B/C/D/E/F

conforms to the following specifications:

Safety:	IEC 1010-1:1990 + A1/EN61010:1993
EMC:	CISPR 11: 1990/EN55011 (1991), Group1, Class A IEC 801-2: 1991/EN50082-1 (1992): 4 kV CD, 8 kV AD IEC 801-3: 1984/EN50082-1 (1992): 3 V/m (1) IEC 801-4: 1988/EN50082-1 (1992): 1 kV

Supplementary Information:

The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC.

Everett, Washington - Aug. 8, 1995

Manfred Bartz, Quality Manger

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Need Assistance?

If you need assistance, contact your nearest Hewlett-Packard Service Office listed in the HP Catalog, or contact your nearest regional office listed at the back of this book. If you are contacting Hewlett-Packard about a problem with your HP E1562 Throughput Disk Module, please provide the following information:

- ❑ Model number: HP E1562D or HP E1562E or HP E1562F
- ❑ Software version:
- ❑ Serial number:
- ❑ Options:
- ❑ Date the problem was first encountered:
- ❑ Circumstances in which the problem was encountered:
- ❑ Can you reproduce the problem?
- ❑ What effect does this problem have on you?

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About this edition

February 1996: Fourth Edition. The manual was updated for the change from models HP E1562A/B/C to models HP E1562D/E/F. The main change is different disk drives.

September 1995: Third Edition. A problem reading the disk was corrected and its revision was changed to A.01.02.

August 1995: Second Edition. The manual was updated to include information for the HP E1562C.

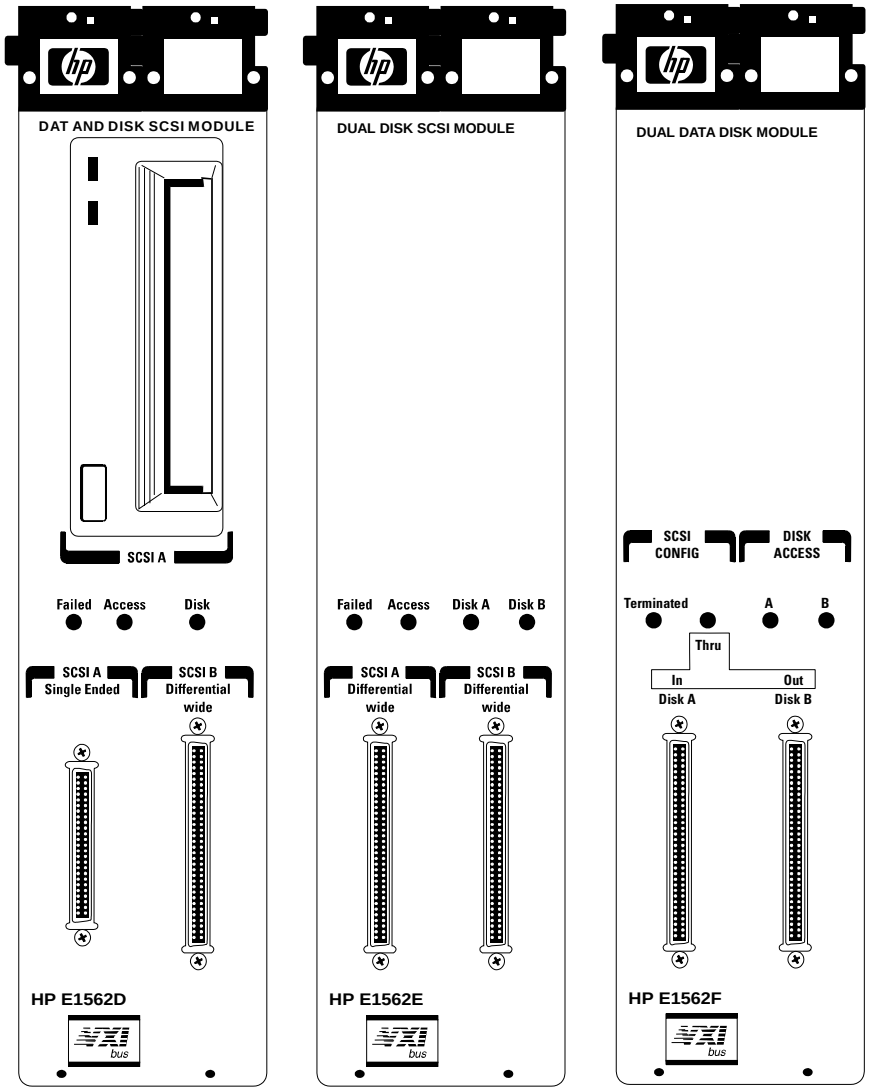
September 1994: First Edition. The diagnostic programs were designed for firmware version A.00.00.

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HP E1562D/E/F

Technical Specifications

HP E1562D
VXI Data Disk, Dat and SCSI-2 Interface Module
HP E1562E
VXI Dual Data Disk and SCSI-2 Interface Module
HP E1562F
VXI Dual Data Disk Without Controller Module



Specifications describe warranted performance. **Benchmarks** provide useful information indicative of performance of product in typical operational scenarios. The actual performance in a given application will depend on the actual hardware and software used.

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Specifications

Disk Size

E1562D	4.29 Gbytes
E1562E	4.29 Gbytes Disk A, 4.29 Gbytes Disk B
E1562F	4.29 Gbytes Disk A, 4.29 Gbytes Disk B

Throughput

Throughput to single internal disk via local bus (128 Kbyte LBUS blocksize, disk zones 9 & 10 [slowest zones])	$> 5.0 \times 10^6$ bytes/second
Throughput to single internal disk via local bus (128 Kbyte LBUS blocksize, disk zones 0 & 1 [fastest zones])	$> 8.5 \times 10^6$ bytes/second
Throughput to dual internal disks via local bus (data split across two SCSI controllers, 128 Kbyte LBUS blocksize, disk zones 9 & 10 [slowest zones])	$> 10 \times 10^6$ bytes/second
Throughput to dual internal disks via local bus (data split across two SCSI controllers, 128 Kbyte LBUS blocksize, disk zones 0 & 1 [fastest zones])	$> 16 \times 10^6$ bytes/second
Throughput to four internal disks via local bus (data split across two SCSI controllers and striped across two disks [one HP E1562E plus one HP E1562F], 128 Kbyte LBUS blocksize, disk zones 9 & 10 [slowest zones])	$> 20 \times 10^6$ bytes/second

General Specifications

EMI/RFI standards	CISPR 11, Group 1, Class A
VXI bus standards (HP E1562D and HP E1562E)	VXI (Rev. 1.4); Message-based servant; A16/A24/A32, D08/D16/D32 Master; A16/A24, D08/D16 Slave Interrupter/handler

VXI power requirement	HP E1562D		HP E1562E		HP E1562F	
	dc	dynamic current	dc	dynamic current	dc	dynamic current
+5 V	3.2A	0.44 A	3.0 A	0.65 A	2.4 A	0.55 A
−5.2 V	0.6 A	0.03 A	0.6 A	0.03 A	0.6 A	0.03 A
−2 V	0.05 A	0.01 A	0.05 A	0.01 A	0.05 A	0.01 A
+12 V	0.00 A	0.00 A	0.00 A	0.00 A	0.00 A	0.00 A
−12 V †	0.00 A	0.00 A	0.00 A	0.00 A	0.00 A	0.00 A
+24 V ‡	0.4 A	0.3 A	0.6 A	0.4 A	0.6 A	0.4 A
−24 V	0.00 A	0.00 A	0.00 A	0.00 A	0.00 A	0.00 A
+5 V Standby	0.00 A	0.00 A	0.00 A	0.00 A	0.00 A	0.00 A

VXI cooling requirement (10°C rise)	3.3 liter/second, 0.13 mm H_2O
Orientation (HP E1562D with DDS tape drive in operation)	Mainframe should be oriented with front panel vertical.
Acoustics (when measured in HP E1401A mainframe)	LpA < 70 dB, operator position, normal position, per ISO 7779 LpA < 70 dB, am Arbeitsplatz, normaler Betrieb, nach DIN 45635 T. 19

Weight	HP E1562D	HP E1562E	HP E1562F
Net	4.6 kg (10.2 lbs)	5.1 kg (11.2 lbs)	3.8 kg (8.4 lbs)
Shipping	8.8 kg (19.5 lbs)	9.3 kg (20.5 lbs)	8 kg (17.7 lbs)

Dimensions	Dual slot, C-size VXI module

† The HP E1562D/E will consume up to 60 mA while programming internal flash ROM.
‡ +24 V current will increase during disk spin-up.

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Environmental

Operating restrictions

Ambient temperature	
All units except those with DDS tape drive (HP E1562D opt 1CD, HP E1562E, HP E1562F)	0° to 55°C
Units with DDS Tape drive (HP E1562D Standard)	5° to 40°C
Humidity, non-condensing	
HP E1562D Standard or Option 1CD	20 - 80% RH non-condensing (max wet bulb temperature = 26°C)
HP E1562E Standard, HP E1562F	8 - 80% RH (max wet bulb temperature = 28°C)
HP E1562E Option 1BD	< 95% RH at 40°C
Maximum altitude	2300 meters (7,500 feet)

Operating vibration

Frequency	Slope	Power Spectral Density
5 - 350 Hz	0 dB/octave	0.0002 g^2/Hz
350 - 500 Hz	– 6 dB/octave	. . .
500 Hz	NA	0.0001 g^2/Hz

Storage and transport restrictions

Ambient temperature	– 40° to 65°C
Humidity, non-condensing	20% RH, 90% RH at 65°C
Maximum altitude	4600 meters (15,000 feet)

Performance Benchmarks

VME throughput rate per module
(using HP E1413B modules as data source)

9 HP E1413B modules	0.39 MB/s (97.5 K samples/second)
8 HP E1413B modules	0.397 MB/s (99.25 K samples/second)
< 8 HP E1413B modules	0.4 MB/s (100 K samples/second)

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Asia Pacific:

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1 Matheson Street, Causeway Bay,
Hong Kong
Tel: (852) 2599-7777
Fax: (852) 2506-9285

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