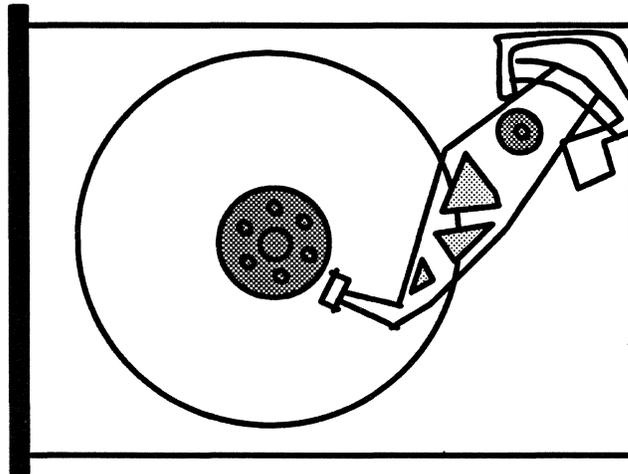




REVISION HISTORY

REV	DOCUMENT	APPVD BY	DATE



*4.0 Gigabyte 3.5 inch
Disk Drive Specification*

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2.0 INTRODUCTION

2.1 SCOPE

This specification outlines the requirements for a 4GB 3.5 inch, 1.6 inch high form factor, SCSI rigid disk drive. This document specifies the electrical, mechanical, environmental, reliability, and certification functional requirements of the drive. In the event of a difference between the manufacturer's specifications and those outlined in this document the latter shall take precedence.

2.2 APPLICABLE DOCUMENTS

The following is a list of the documents by which this specification is based. For more detail, please reference these documents as required.

“Enhanced Small Computer System Interface (SCSI-II)”,
X3T9.2/86-109 Rev. 10h, available through CBEMA

”ISO 7779” Acoustics – Measurement of airborne noise emitted by computer and
business equipment

Plug and Play SCSI Specification Version 1.0 (March 30, 1994)

HP A-xxxx-xxxx-24 Vendor Specific Information

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3.0 REQUIRED DESIGN FEATURES

The device must contain and maintain certain design features that are required in the workstation environment. The following is a list of the appropriate design requirements:

3.1 MECHANICAL/HARDWARE

- 1) The device must automatically move the recording heads to a landing zone (completely free of user data) and latch them there, upon the loss of DC power, without operator or software intervention.
- 2) Not require any periodic or preventive maintenance.
- 3) Mechanism is to have a breather and filtration system in the HDA.
- 4) Provide dynamic braking of the disks on a power-down cycle.
- 5) Require no sequencing of power.
- 6) Device must have the minimum of a 32K dual port buffer system.
- 7) Be capable of supporting a minimum 48 bit ECC.
- 8) Glitchless drivers/receivers are to be used on the SCSI bus.
- 9) A set of adjacent pins, on the front of the drive, so that a cable for a remote LED indicator can be used.

3.2 FIRMWARE

Refer to the Hewlett-Packard document "Standard Firmware for Disk Devices"

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4.0 FUNCTIONAL SPECIFICATIONS

The appropriate manufacturer's specifications contain information which must be used in conjunction with this document. In the case of conflicting information, the HP specification shall take precedence.

4.1 GENERAL SPECIFICATIONS

4.1.1 Capacity

Unformatted:	4.2GB (ref only)
Formatted (512):	TBD blocks (must be exact)
Max LBA (512)	TBD (must be exact)

4.2 PERFORMANCE SPECIFICATIONS

Note: The requirements of this section are to be met under all combinations of operating environment and DC supply voltages of sections 5 and 6. Therefore it represents worst-case requirements.

4.2.1 Seek Times (all numbers include settling time)

Track to track (read):	1 ms
Track to track (write):	2 ms
Average (read):	8.5 ms
Average (write):	10 ms
Maximum:	20 ms

4.2.2 Disk Speed / Rotational Latency

Average Latency:	4.17 msec or less (ref only)
Disk Speed:	7200 RPM minimum +/-0.5% (ref only)

4.2.3 Data Transfer Rates

4.2.3.1 Internal (disk)

Burst: TBD mbits/sec

4.2.3.2 External (bus)

Async:	5 MB/s
Sync:	10 MB/s

4.2.4 Head Switching

Must be less than 2 msec

4.2.5 Command Overhead

Controller overhead: < 150 usec (ref only)

4.2.6 Spin-up / Spin-down time

Power-on to selection:	1 sec
Power-on to ready:	20 sec
Start command:	20 sec
Stop command:	20 sec

4.2.7 Interleaving

Interleave: 1:1

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4.3 RELIABILITY AND LIFE

The following information specifies the reliability, read and seek error rates, and the expected life of the device. The requirements shall be met with no stabilization time and with no regard to any particular environmental conditions under which the data was written so long as it was within the operating range of section 5 and 6.

MTBF of the device: 800,000 hrs

MTTR of the device: 30 minutes

Design Component Life: 5 years

Preventive Maintenance: not required

Errors (rates specified with retries and ECC enabled)

Correctable Read Error Rate: 1 in 10^{10} bits read

Uncorrectable Read Error Rate: 1 in 10^{14} bits read

Seek Error Rate: 1 in 10^6 seeks

Media Defects:

The manufacturer shall identify all media defects and provide a list of their locations that is retrievable by accessing the drive's primary defect list. The defect list need not be attached physically to the outside of the drive, although it can be. The drive will be shipped with all defects found during manufacturing, mapped to spare blocks.

No more than a maximum of 2 additional defects shall be allowed during the first 24 hours of operation. After the initial 24 hours of operation a maximum of 50 defects will be allowed during the life of the drive.

Power Cycling: 20,000

The head / media interface shall be able to withstand 20,000 power-on / power-off cycles without suffering any permanent damage or loss of data.

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4.4 INTERFACE SPECIFICATION

Unless otherwise noted the drive shall meet all of the requirements of the above mentioned HP "Standard Firmware for Disk Devices". Any specific requirement not covered will follow the following specifications in weighted order:

SCSI-2 ANSI X3T9.2/86-109 Rev. 10h

4.5 POWER SPECIFICATIONS

The following requirements are applicable to the main PCB board power interface connector (J2).

Voltage Requirements: +5 Volts (1.2A max.)
+12 Volts (2.2 A max.)

(Refer to Table 1 for specific requirements under typical use.)

Voltage Tolerance: 5 Volts +/- 5%
12 Volts +/- 5%
+/-10% during start-up

Allowable Ripple: 5 Volts: 100 mV p-p from 0 to 100 KHz
12 Volts: 120 mV p-p from 0 to 100 KHz

Power Consumption: 14 watts (idle)
17 watts (operational)

Voltage sequencing requirements: None

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5.0 MECHANICAL SPECIFICATIONS

5.1 PHYSICAL SPECIFICATIONS

The disk drive must conform to the industry standard low profile form factor and mounting scheme. Dimensions do not include the face plate.

Width of the device: 101.6 mm (4.0")

Height of the device: 41.3 mm (1.63")

Depth of the device: 146.2 mm (5.75")

Weight of the device: 1.04 kg (2.3 lbs.)

5.2 MOUNTING ORIENTATION

The disk drive may be mounted in any orientation.

Mounting Specification: Refer to Figure 1

There should not be any additional clearance around the physical limits of the device required to allow for movement.

5.3 ACOUSTIC NOISE LEVEL

The drive shall meet the acoustic requirements below. Output measured according to the test procedures outlined in ISO 7779.

Idle: 32 dbA (A weighted sound pressure)
4.3 bels (sound power)

Seeking: 34 dbA (A weighted sound pressure)
4.5 bels (sound power)

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5.4 POWER INTERFACE

The power interface shall adhere to the following specifications:

- 1. Power connector: AMP mate-n-lock (P/N 350543-1) or equivalent
- 2. Power connector pin assignment: see Figure 2
- 3. Power connector location: see Figure 1
- 4. Mating connector: AMP 1-480424-0 or equivalent
- 5. Ground: The HDA base and cover shall be connected to PCB (DC) ground in order to provide noise shielding.

5.5 SIGNAL INTERFACE

Interface:

SCSI single ended (Ref. to ANSI SCSI spec X3.131)

SCSI signal pin assignments:

See Table 2

SCSI connector:

A fifty pin, low density, unshielded, keyed, shrouded connector consisting of two rows of 25 male pins with adjacent pins 2.54 mm (0.1 in.) apart.

SCSI connector location:

See Figure 1

Mating Connector/Cable:

A fifty pin, low density, keyed, strain-relief connector consisting of two rows of 25 female contacts with adjacent contacts 2.54mm (0.1 in.) apart.

Termination:

Removable packs or disableable termination is to be used and must conform to the ANSI standard.

Terminator location:

Location of terminators should be on the back end of the PCB.

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5.6 OPTIONS

Reference section 7 for default values.

5.6.1 TID JUMPERS

The device must have a set of ID jumpers, consisting of two rows of male pins with adjacent pins 2 mm apart.

5.6.2 TERMINATION POWER

The drive shall supply power to the terminators and the TERM POWER pin through a zener diode and a fuse.

5.6.3 SPINDLE CONTROL

The drive shall power-up automatically upon application of power.

5.6.4 BUS PARITY

The drive shall check parity on commands and data.

5.6.5 BARCODE

There shall be a barcode label affixed to the drive following the EIA-556 code 39 standard with the serial number printed and barcoded.

5.7 COOLING REQUIREMENTS

Per manufacturing Product Specification or via natural convection if not specified.

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6.0 ENVIRONMENTAL SPECIFICATIONS

6.1 OPERATING ENVIRONMENT

Temperature: +0 to +55 C

Temperature Gradient: 24 C per hour

Relative Humidity: 8% to 85% non-condensing
26.7 C maximum wet bulb non-condensing

Vibration:

 Swept Sine: 0.5 G (0-peak), 5 – 500 Hz

 Random: 0.0001 G²/Hz, 5 – 500 Hz

There will also be a 5 minute dwell at every predominant resonance per axis.

Shock: 2 G (peak), 11 ms, 1/2 sine wave (no soft errors)
10 G (peak), 11 ms, 1/2 sine wave (no hard errors)

Altitude: -200 to 10,000 ft.

6.2 NON-OPERATING ENVIRONMENT

Temperature: -40 to +70 C

Temperature Gradient: 24.0 C per hour

Relative Humidity: 10% to 90% non-condensing
26.7 C maximum wet bulb non-condensing

Vibration:

 Swept Sine: 0.2 inches (peak to peak), 5-30 Hz
1.0 G (0-peak), 30 – 500 Hz

 Random: 0.015 G²/Hz, 5 – 500 Hz

Shock: 20G (peak), 11ms, 1/2 sinewave
25 G (peak), 26 ms, trapezoidal

Altitude: -1000 to 40,000 feet

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6.3 TRANSPORTATION ENVIRONMENT

Every unit shall be shipped in a ESD bag with desiccant.

The original shipping container must be capable of withstanding (without functional or cosmetic damage) three 30 inch free fall drops onto any face, edge and corner of the shipping container.

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6.4 PRODUCT SAFETY AND EMISSIONS

The device shall comply with the following agency regulations. The device when installed in any system or subsystem for which its use is intended shall not prevent HP from obtaining approval from any agency.

1. UL 1950 (1st edition), Safety of Information Technology Equipment Including Electrical Business Equipment, UL RECOGNIZED.
2. CSA C22.2 No. 950–M89 Safety of Information Technology Equipment, Including Electrical Business Equipment.
3. IEC 950 (1st edition), Safety of Information Technology Equipment Including Electrical Business Equipment, TUV or VDE' Bauart Geprüft' COMPONENT LICENSED.
4. ZH 1/618, Edition 10/80, safety Regulations for Display Work places in the of Office Sector. Certified by Technischer Uberwachungs–Verein or Verband Deutscher Elektrotechniker.
5. This product shall demonstrate statistical compliance with the radiated emission requirements of EN55022 class B. Statistical compliance shall be determined by the methods of par. 7.2.3 of EN55022 using a sample size of no less than 5 units.

- A. IEC 801–3 : 1984
- B. FCC Part 15, Class B with 6 db margin
- C. EN 55022 (CISPER Class B) with 6dB margin
- D. VCCI Class 1 ITE
- E. IEC 801–2: 1991

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6.5 LABELS AND MARKINGS

The drive shall have the following markings and labels:

1. Manufacturer's Model, Serial, and Part numbers (with revision)
2. UL Recognition Mark
3. CSA Component Certification Mark
4. TUV or VDE "Bauart Geprüft" mark
5. The following label should be applied to both newly manufactured and customer service drives:

Model# (your model #)	Mfg. p/n aaaa – aaaa	Cust. Serv. p/n xxxxx – xxxxx	Cust Serv. Exchange p/n yyyyy – yyyyy
---------------------------------	--------------------------------	---	---

<p>HP MANUFACTURING USE Part Number: aaaa – aaaa Serial Number: bbbbbbbbbbb is barcoded Supplier serial number</p> <p>HP CUSTOMER SERVICE USE Part Number: xxxxx – xxxxx Exchange Part Number: yyyyy – yyyyy</p>

aaaa – aaaa is HP Manufacturing p/n
bbbbbbbbbb is Supplier serial number
||||| is barcoded Supplier serial number (code 39 preferred)
xxxxx – xxxxx is HP Spare p/n
yyyyy – yyyyy is HP Exchange p/n

HP Spare p/n and HP Exchange p/n will change if there is a major quality problem which requires rework.

- Supplier may put information on parts in any one of the following ways:
- A single additional label with all above information.
 - Two additional labels, one for HP Manufacturing, one for HP Customer Service.
 - Print this information on an existing label.
- Supplier may customize the size and layout of the label to fit on part.

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7.0 DEFAULT VALUES

7.1 TID JUMPERS

The drive is to be shipped at target ID 6.

7.2 TERMINATION AND TERMINATION POWER

The device is to be shipped with terminators removed or termination disabled.

7.3 BEZEL

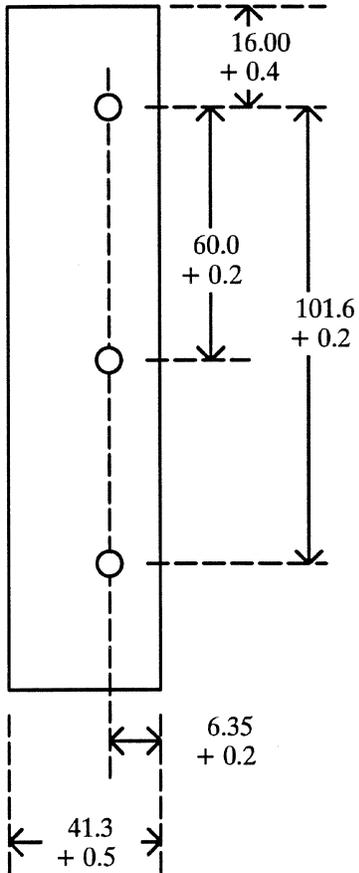
The drive is to be shipped without a bezel but must have a green LED mounted on the PCB.

8.0 FIGURES AND TABLES

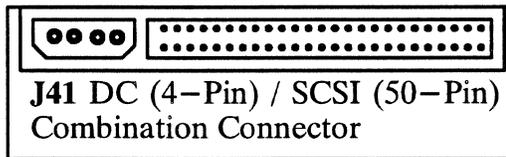
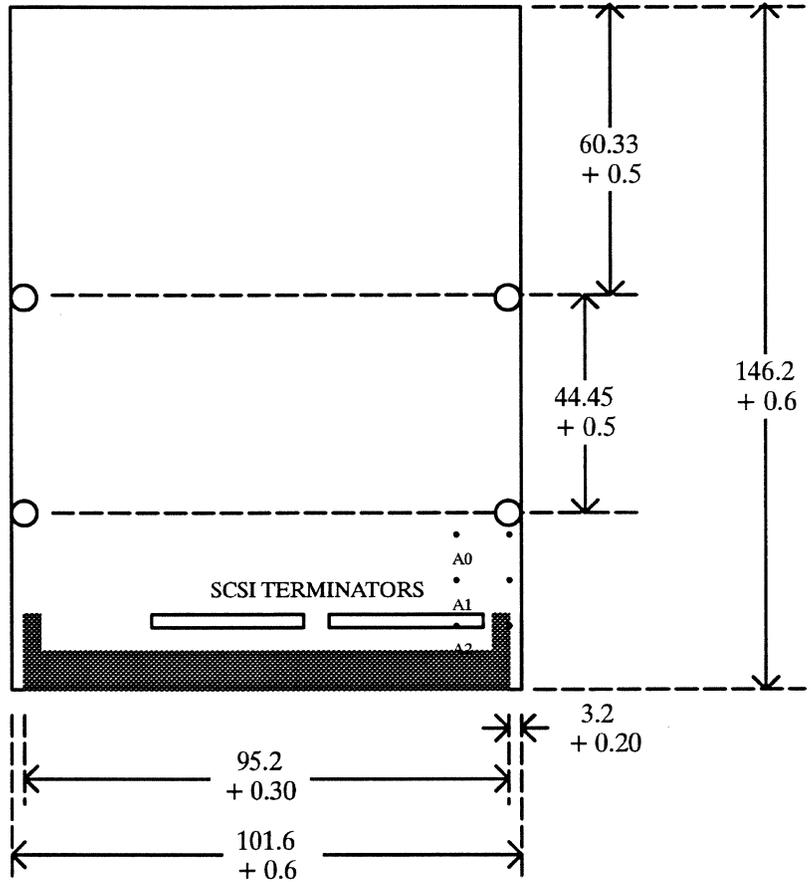
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SIDE



**BOTTOM
(PC BOARD SIDE)**



BACK

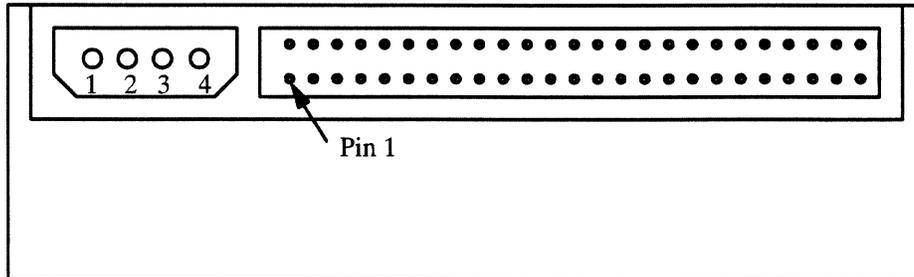
Note:
All dimensions are in mm.
Mounting Holes are 6-32

FIG. 1 DIMENSIONS AND MOUNTING

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DC (4-Pin) / SCSI (50-Pin) Combination Connector



DC Power Connector Pin Assignment

- Pin 1 +12 Volts DC
- Pin 2 +12 Volts Return
- Pin 3 +5 Volts Return
- Pin 4 +5 Volts DC

Figure 2 Combination Connector Pin Assignment

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Table 1 Current Requirements

Voltage	Start-Up		Idle		Random Read/Write	
	Avg	Peak	Avg	Peak	Avg	Peak
+5 Volts	TBD	TBD	TBD	TBD	TBD	TBD
+12 Volts	TBD	TBD	TBD	TBD	TBD	TBD

Table 2 SCSI Interface Signals

PIN NO.	NAME	TO	DESCRIPTION
02	DB(0)	B	Data Bus (LSB)
04	DB(1)	B	Data Bus
06	DB(2)	B	Data Bus
08	DB(3)	B	Data Bus
10	DB(4)	B	Data Bus
12	DB(5)	B	Data Bus
14	DB(6)	B	Data Bus
16	DB(7)	B	Data Bus (MSB)
18	DB(P)	B	Data Bus Parity
20			Not Used (GND)
22			Not Used (GND)
24			Reserved
26	Tempwr	B	Terminator Power
28			Reserved
30			Not Used (GND)
32	ATN	D	Indicates Message available for drive
34			Not Used (GND)
36	BSY	B	Signal indicating bus is in use
38	ACK	D	Data/Command transfer handshake
40	RST	B	Or-tied signal indicating reset condition
42	MSG	H	Indicates message phase
44	SEL	B	Signal indicating selection/reselection phase
46	C/D	H	Indicates whether control or data information is on data bus. Assertion indicates control.
48	REQ	H	Data/Command transfer handshake
50	I/O	H	Indicates direction of information transfer. Assertion indicates transfer to host.

H = Host D = Drive B = Bidirectional

NOTE: All odd pins shall be signal returns and shall be connected to signal GND at the drive, except pin 25 which is left free to protect against mis-insertion.

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Table 3 SCSI ID SETTINGS

SCSI ID Address	A2	A1	A0
0	OFF	OFF	OFF
1	OFF	OFF	ON
2	OFF	ON	OFF
3	OFF	ON	ON
4	ON	OFF	OFF
5	ON	OFF	ON
6	ON	ON	OFF
7	ON	ON	ON

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