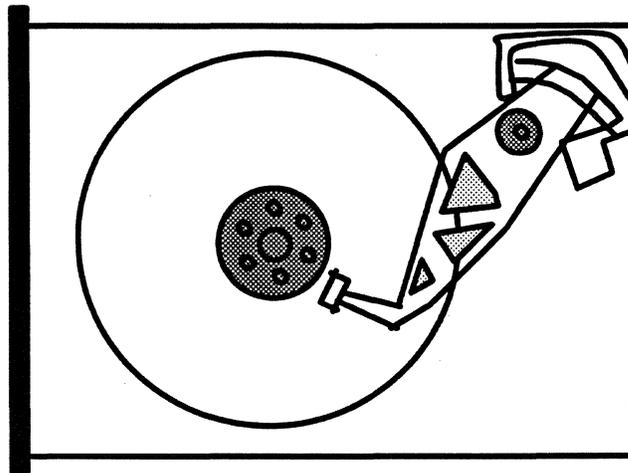




REVISION HISTORY			
REV	DOCUMENT	APPVD BY	DATE



*4.0 Gigabyte Wide, Differential,
3.5 inch Disk Drive Specification*

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2.0 INTRODUCTION

2.1 SCOPE

This specification outlines the requirements for a 3.5 inch, 4.0 gigabyte, 1.6 inch high form factor, SCSI rigid disk drive with 16 bit differential interface. This document specifies the electrical, mechanical, environmental, reliability, and certification 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)

Small Form Factor Committee Specification for the Unitized Connector for Cabled Application Rev 2.1 (October 9,1993)

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 a 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:	4.2 GB (ref only)
Formatted (512):	TBD blocks (must be exact)
Max LBA	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 (writes):	2 ms
Average (read):	8.5 ms
Average (writes):	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:	10 MB/s
Sync:	20 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 (using retries and ECC)

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 10,000 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 following specification:

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: 15 watts (idle)
18 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: .104 kg (2.31 bs)

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. The values listed are maximum allowable levels.

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

Seeking: 34dbA (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 16 bit differential (Ref. to ANSI SCSI spec X3.131)

SCSI signal pin assignments:

See Table 2

SCSI auxiliary connector pin assignment

See Table TBD

SCSI connector:

A 68 pin, high density, unshielded, connector.

SCSI connector location:

See Figure 1

Termination:

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

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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 onboard terminators and the TERM POWER interface 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 (code 39 preferred)</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 AND LED

The drive is to be shipped without a bezel.

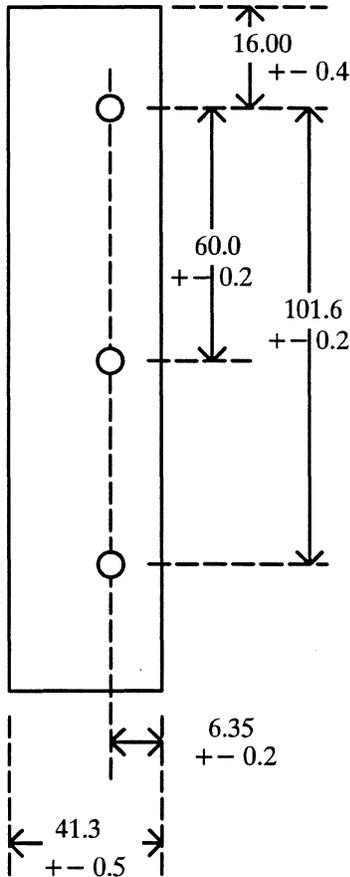
The drive shall have a green LED mounted on the front of the PCB.

8.0 FIGURES AND TABLES

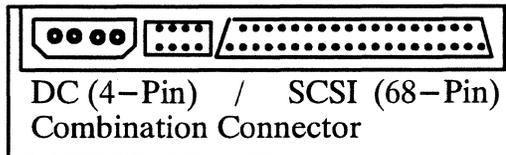
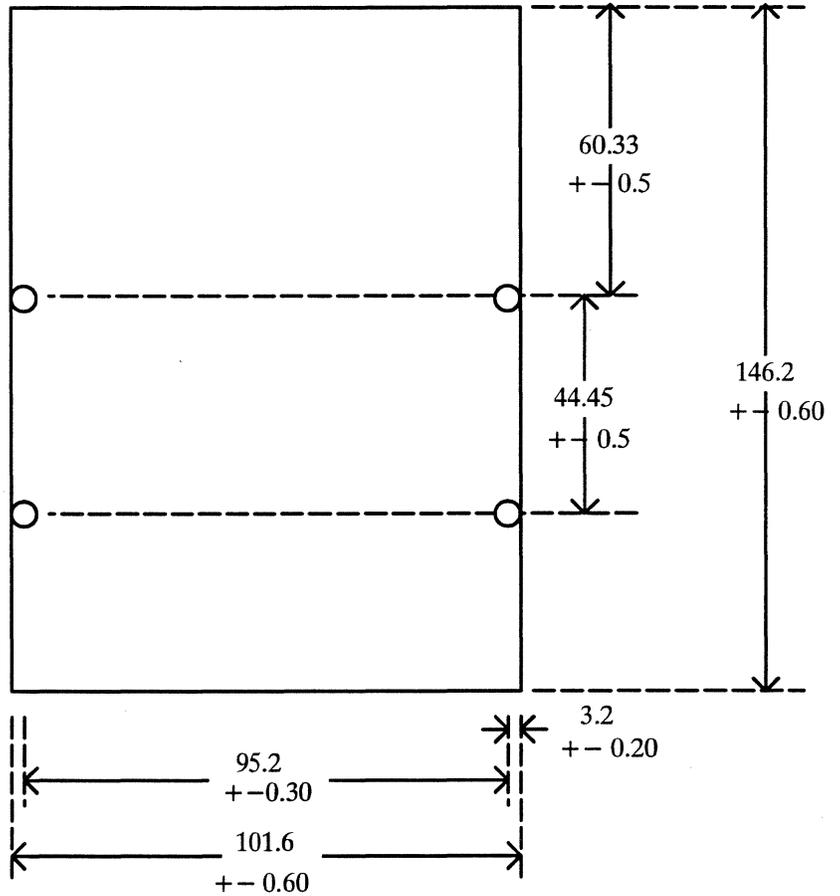
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SIDE



**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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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 1 Maximum Current Requirements

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Pin	Signal	Description	Host Direction Device
01	Sel 0	SCSI ID Sel 0	x -----> x
02	XTFALT	External Fault	x <----- x
03	Sel 1	SCSI ID Sel 1	x -----> x
04	VUNIQ	Vendor Unique	x <----- x
05	Sel 2	SCSI ID Sel 2	x -----> x
06	SPSYNC	Spindle Synch	x <----- x
07	Sel 3	SCSI ID Sel 3	o -----> x
08	XTACTV	External Activity	x <----- x
09	ENTERM	Enable Termination	o -----> x
10	Ground	Ground	<----- x
11	+5v	+5v	<----- x
12	Fault	Drive Fault	x -----> x

Notes:

Direction column indicates the direction of the signal between host and device.

An x in the Host column means this signal shall be supported by the Host.

An x in the Device column means the signal shall be supported by the Device.

An o means this signal is optional.

If there is nothing in the Device column for a pin location, than no connection should be made to that pin.

Pins 2, 4, 6 and 8 are open-collector outputs.

Table 2 Signal Assignments for Auxiliary Connector

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Table 3 SCSI Interface Signals

PIN NO.	NAME	PIN NO.	NAME
01	DB(12)	35	-DB(12)
02	DB(13)	36	-DB(13)
03	DB(14)	37	-DB(14)
04	DB(15)	38	-DB(15)
05	DB(P1)	39	-DB(P1)
06	GROUND	40	GROUND
07	DB(0)	41	-DB(0)
08	DB(1)	42	-DB(1)
09	DB(2)	43	-DB(2)
10	DB(3)	44	-DB(3)
11	DB(4)	45	-DB(4)
12	DB(5)	46	-DB(5)
13	DB(6)	47	-DB(6)
14	DB(7)	48	-DB(7)
15	DB(P)	49	-DB(P)
16	DIFFSENS	50	GROUND
17	TERMPWR	51	TERMPWR
18	TERMPWR	52	TERMPWR
19	RESERVED	53	RESERVED
20	ATN	54	-ATN
21	GROUND	55	GROUND
22	BSY	56	-BSY
23	ACK	57	-ACK
24	RST	58	-RST
25	MSG	59	-MSG
26	SEL	60	-SEL
27	C/D	61	-C/D
28	REQ	62	-REQ
29	I/O	63	-I/O
30	GROUND	64	GROUND
31	DB(8)	65	-DB(8)
32	DB(9)	66	-DB(9)
33	DB(10)	67	-DB(10)
34	DB(11)	68	-DB(11)

NOTE: The minus sign preceding the signal name indicates active low.

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Table 4 SCSI ID SETTINGS

SCSI ID Address	A3	A2	A1	A0
0	OFF	OFF	OFF	OFF
1	OFF	OFF	OFF	ON
2	OFF	OFF	ON	OFF
3	OFF	OFF	ON	ON
4	OFF	ON	OFF	OFF
5	OFF	ON	OFF	ON
6	OFF	ON	ON	OFF
7	OFF	ON	ON	ON
8	ON	OFF	OFF	OFF
9	ON	OFF	OFF	ON
10	ON	OFF	ON	OFF
11	ON	OFF	ON	ON
12	ON	ON	OFF	OFF
13	ON	ON	OFF	ON
14	ON	ON	ON	OFF
15	ON	ON	ON	ON

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