0663 Model L&H

IBM OEM StorageProducts

FEATURES

- Industry-standard interface: ANSI/SCSI-2
- Integrated controller
- 1,004 MB formatted capacity (512 & 520 bytes/sector) (models H12 and   L12)
- Logical block addressing
- Implied seeks
- SCSI disconnect and reconnect capability
- SCSI bus parity
- 1:1 interleave
- High performance (H12 & H11) and low power (L12 & L11) models   available
- (0,4/4) 8/9 rate encoding
- Media data transfer rate: 3 MB/S
- SCSI data transfer rate: up to 10 MB/S (synchronous)
- 256K byte dual-ported data buffer
- Read-ahead caching
- Multi-segmented data buffer
- Scatter/Gather function support
- Tagged and Untagged command queuing (selectable)
- Automatic sector reallocation (selectable)
- Error logging
- Variable logical block lengths (256-6000 bytes with exceptions)
- Down-loadable SCSI firmware
- Automatic retry and data correction in read errors
- In-line alternative sector assignment for high performance
- Sector reassignment without reformat
- Predictive Failure Analysis

PERFORMANCE

Data transfer rate

		Read	Write
Buffer to/ from media	3 MB/S (instantaneous)		
Host to buffer	up to 5 MB/S (synchronous)		
Host from buffer	up to 5 MB/S (synchronous)		
Rotational Speed	4316 RPM		
Average latency	6.95 mS		
Seek time		Read	Write
Single cylinder (all models)		0.6 mS	2.5 mS

|			
Average	(L11, L12)	10.6 mS	12.6 mS
(weighted)	(H11, H12)	9.4 mS	11.4 mS
Full stroke	(L11, L12)	20.0 mS	22.0 mS
	(H11, H12)	18.5 mS	20.5 mS

ELECTRICAL CONNECTOR LOCATIONS

SCSI Pin 1   Power Pin 1

Options Jumper Block
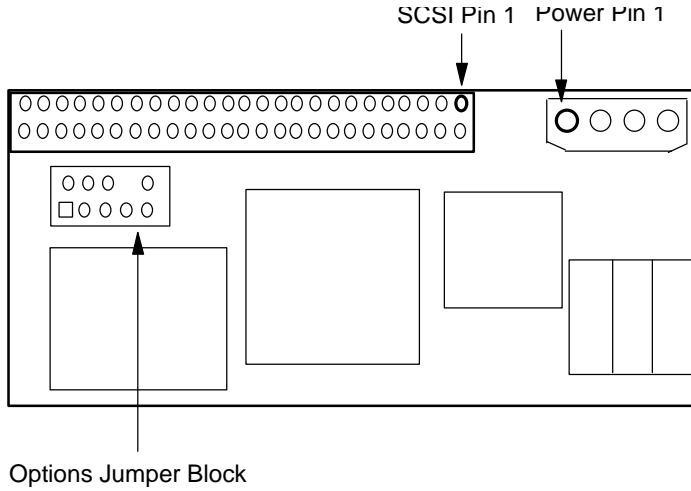
Electrical Connectors (view from back of Disk Drive)

JUMPER SETTINGS

The jumper block shown above is used to select the SCSI device ID, to control the spindle motor start and to select the appropriate option pin (B1) function. There are four ground pins, A1, A2, A3, B2. If pin B1 is jumpered to ground, drive initiated synchronous negotiation is disabled, but requests from the initiator will still be accepted. Option block ground pins must only be used for selecting jumper block functions.

Bit
0 1 2   Address

= 0   = 4

C1 C2 C3   D2

= 1   = 5

A1 A2 A3 B1 B2

= 2   = 6

= 3   = 7
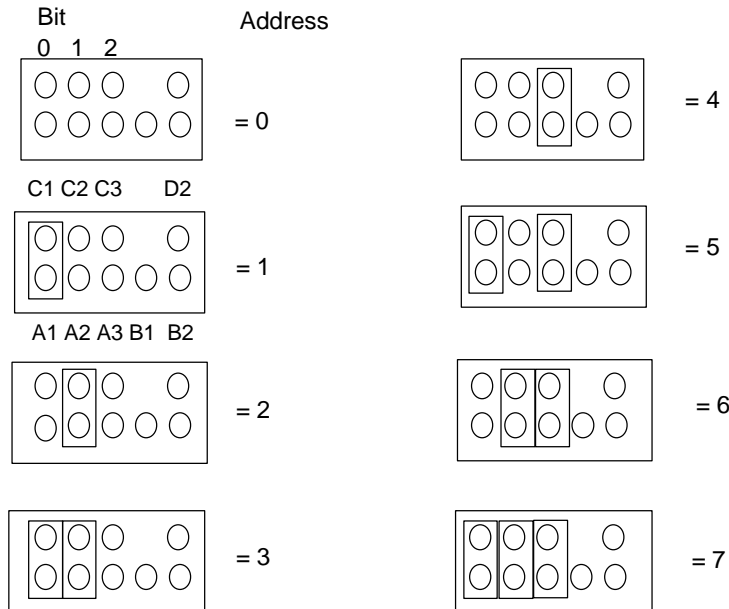
Figure 1 Option Block

With the auto start jumper in place the motor spins up when power is applied. With the auto start jumper removed the motor spins up when the drive is issued a Start Unit command.

Note:
 During the power up sequence the option pin is interrogated. If it is grounded the pin remains an input. If it is not grounded it becomes an output, indicating Motor Active or Command Active depending on the state of the CMDAC bit in Mode page 0.

As an input the option pin has several effects upon the SCSI function. Please refer to the 0661 SCSI Specification for details.

MODE SELECT OPTIONS

Certain 'Mode Select' parameters are alterable via the SCSI 'Mode Select' command. This allows certain drive characteristics to be modified to optimize performance on a particular system. Refer to the 0663 Disk Drive SCSI Specification for detailed definition of Mode Select parameters. Changeable parameters are:

Block Descriptor
  Number of Blocks
   Block length
 Page 0
   QPE (Qualify Post Error)
   UQE (Untagged Queueing Enable)
   DWD (Disable Write Disconnect)
   ASDPE (Additional Save Data Pointer Enable)
   CMDAC
   RPFAE (Report Predictive Failure Analysis Error)
   CPE (Concurrent Processing Enable)
 Page 1
   AWRE (Automatic Write Reallocation Enable)
   ARRE (Automatic Read Reallocation Enable)
   TB (Transfer Block)
   RC (Read Continuous)
   PER (Post Error)
   DTE (Disable Transfer on Error)
   DCR (Disable Correction)
   Read Retry Count
 Page 2
   Read Buffer Full Ratio
   Write Buffer Empty Ratio
   Maximum Burst Size
 Page 7
   PER
   DCR

DATA ORGANIZATION

Capacity

Model H12 & L12

bytes/ logical block	gross sectors/ track	formatted capacity (bytes)	logical blocks/ file
256	111	856,692,480	3,346,455
512	66	1,004,559,360	1,962,030
520	65	1,004,257,800	1,931,265
524	64	995,862,000	1,900,500
1024	66	1,004,559,360	981,015
2048	66	1,004,558,336	490,507
4096	66	1,004,556,288	245,253
6000	47	1,033,116,000	172,186

Model H11 & L11

bytes/ logical block	gross sectors/ track	formatted capacity (bytes)	logical blocks/ file
256	111	741,180,160	2,895,235
512	66	868,044,800	1,695,400
520	65	867,743,240	1,668,737
524	64	860,446,776	1,642,074
1021	66	868,044,800	847,700
2048	66	868,044,800	423,850
4096	66	868,044,800	211,925
6000	47	891,600,000	148,600

	S/N Suffix	
Cylinders	Ck & CL	CD & CB
Total cylinders	2057	2469
User cylinders	2051	2463
Disks	8	7
Tracks/cylinder		

H12 & L12	15	13
H11 & L11	13	11
User bytes/sector		256 - 750
User bytes/logical block		256 - 6000
		with exceptions
(increments in bytes)	= 1	256 - 750
	= 2	752 - 1500
	= 4	1504 - 3000
	= 8	3008 - 6000
Band 1 user cylinders	1366	1641
spares/cylinder		
H12 & L12	30	27
H11 & L11	28	26
Band 2 user cylinders	685	822
spares/cylinder		
H12 & L12	40	36
H11 & L11	28	26
Last cylinder extra spares		
H12 & L12	80	72
H11 & L11	80	68

Note:

Banding as defined here refers to the number of spare sectors provided per cylinder to reallocate defective sectors. Band 2 cylinders are those nearer the inside diameter of the data surfaces. These have additional spare sectors since the likelihood of defective sectors is higher in this region. This feature does not affect the instantaneous media data rate which is constant across all cylinders.

OPERATING ENVIRONMENT

The drive operates within its' performance limits when the following environment is maintained. Product life calculations are based on the nominal environment for a typical application.
Humidity:
Operating	8% to 90% noncondensing
Storage	5% to 95% noncondensing
Shipping	5% to 100% (applies at a packaged level)

Wet Bulb Temperature:
Operating	80 degrees F (26.7 degrees C) maximum
Shipping/Storage	85 degrees F (29.4 degrees C) maximum

Elevation:
Operating	-1000 to 10,000 feet
	(-304 to 3,048 meters)
Shipping/Storage	-1000 to 40,000 feet

(-304 to 12,192 meters)

Temperature:
  Operating ambient   41 to 131 degrees F (5 to 55 degrees C)
  Operating casting   41 to 131 degrees F (5 to 60 degrees C)
  temperature
  Operating casting   Not to exceed 3.6 degrees F (2 degrees C)
  temperature delta   (see note below)
  Shipping   -40 to 149 degrees F (-40 to 65 degrees C)
  Storage   34 to 149 degrees F (1.1 to 65 degree C)

Temperature Gradient
  Operating   18 degrees F (10 degrees C) per hour
  Shipping/Storage   below condensation

These temperature limits are extremely important and must not be exceeded at the worst case drive and system operating conditions with the drive randomly seeking, reading, and writing.

Note:
 Measured between top and bottom of disk enclosure. See Figure 3 on back page for location of measurement points.

COOLING
 This drive does require airflow in order to fulfill its' reliability performance.

Please refer to Environmental section of the 0663 Disk Drive product specification for full details of the maximum allowable temperatures and measurement points.

Integration into using System
 ■ The drive's mounting frame is electrically isolated from the drive's   disk enclosure.

NOTE: THE DISK ENCLOSURE IS NOT AT GROUND POTENTIAL.

Any user mounting scheme must not result in the disk enclosure being shorted to ground. Drive malfunction will result if this occurs.

COMPATIBILITY
 ■ Testing should be carried out to ensure that the drive is fully   compatible with the using system.

System BIOS, Operating system, Device drivers and interface card BIOS/ characteristics can effect the ability to attach the drive to the system. All need to be verified jointly as compatible with the drive.

The drive should be verified in the mode it will be attached to the system.

It cannot be assumed that a drive which attaches as an additional SCSI device on a system providing only additional data storage will have no problems when attached as the only/boot drive.

SCSI ADAPTERS
- The following SCSI Adapters have been operated with the 0663 drives   on Typical ISA and E15A platforms under MS-DOS and worked in these   environments with no observed problems.

ISA Bus Adapters
ADAPTEC AHA 1542BS6
INFOSYS C5630B
WESTERN DIGITAL WD7000-ASC
 DATA TECHNOLOGY CORP DTC3180
 DATA TECHNOLOGY CORP DTC3280A
 DATA TECHNOLOGY CORP DTC3150
 FUTURE DOMAIN TMC 850M
 FUTURE DOMAIN TMC 860M
 FUTURE DOMAIN TMC 885M
 TENTIME TNT-6000

Note:
 The option pin jumper on the drive must be grounded when attaching to TMCXXX M cards.

 EISA Bus Adapters
ADAPTEC AHA 1740
 DATA TECHNOLOGY CORP DTC3290

- The Adaptec AHA1542B SCSI controller is not compatible with the   0663 drives.

Adaptec provides an upgrade kit comprising new BIOS and Microcode PROMS to allow conversion of existing AHA1542B cards to the AHA1542BS6 version.

KNOWN INTEGRATION SOLUTIONS
- The drive initiates negotiation for synchronous data transfer rate   during the initialization sequence. This may cause problems which   prevent attachment to some systems/SCSI controller cards. Jumpering   the option pin to ground on the jumper block prevents the drive from   sending the synchronous negotiation message. However, other changes   are also made to the drive's behavior ref error reporting and sense   information returned. These are detailed in the Disk Drive SCSI   specification.

Platform(s)   DECDECStation 3100
                               DECVAXStation 3100
                               DECMicroVax 3100
Operating System(s)   VMS V5.4.2
                               VMS V5.5
                               VMS V5.6
Note: Attachment to earlier versions of the VMS operating systems is not possible.

Configuration Required:
 Alter MODE SELECT Page 1, Byte 2 to '04'
 Alter MODE SELECT Page 7, Byte 2 to '04'
 Platform(s)   DECDECStation 3100
                               DECVAXStation 3100
                               DECMicroVax 3100
 Operating System(s)   Ultrix V4.1
                               Ultrix V4.2

Configuration Required:
 Connect 'OPTION PIN' on drive jumper block to ground.
 Platform   DECStation 5000
 Operating System(s)   Ultrix V4.1
                               Ultrix V4.2

Configuration Required:
 No modifications to the drive are required. However it is necessary to modify the list of device
types on the table of known drives contained in the 'usr/sys/data/scsi-data,c' system file as follows:

Change first line from '/*UNKNOWN DISK*/' TO '/*IBM OEM*/'. Following this change, the
operating system kernel must be rebuilt (recompiled).
Platform   SUNSpareStation
Operating System(s)   Sunos V4.1.2
                               Sunos V4.1.3

Configuration Required:
 The drive will attach with no changes but should the drive enter degraded mode, due for instance
to an interrupted format, it will be necessary to ground the option pin on the drive jumper block
before the drive can be reformatted on the system.

Device Parameter Settings Declared to System:
 The system will accept a wide range of settings provided these do not result in the total number
of data sectors declared (Data Cylinders x Heads x Sectors per track) exceeding the number
available on the drive.
 Platform(s)   NEXTStation, NEXTCube
 Operating System(s)   Proprietary (supplied with platform)

Configuration Required:
 Alter MODE SELECT Page 0, Byte 2 to '40'
Alter MODE SELECT Page 0, Byte 3 to '80'
Platform   HEWLETT PACKARD
                            HP9000-710
Operating System(s)   Proprietary (Supplied with platform)

Configuration Required:
 Connect 'OPTION PIN' on drive jumper block to ground.
 Platform   APPLESYSTEMS
Operating System(s)   Proprietary (supplied with platform)

Configuration Required:
 No modification to the drive are required. However, attachment to many APPLE systems is not possible using the device drivers supplied.

There are third-party device drivers which allow attachment including 'SPOT ON' from MacPeak Research.

These overcome the incompatibility associated with the drive returning the 'UNIT ATTENTION' condition in response to the first SCSI command following power-up or a SCSI bus RESET. They also allow the APPLE 'Blind Write' feature to be turned off, which is necessary since this feature is not supported by the drive and would result in SCSI Write errors occurring.

PLEASE NOTE THAT TURNING 'BLIND WRITE' OFF WILL RESULT IN DEGRADED SYSTEM PERFORMANCE WRITE OPERATIONS.

TROUBLE SHOOTING
- The drive reports status in response to the SCSI 'Sense' command and   this is a powerful troubleshooting tool on any drive whose failure   mode still allows it to communicate.
- If the drive is interrupted by powering down during a format   operation it will enter degraded mode. In this mode it will return   a 'Unit Attention' condition to most SCSI commands.

Issuing a 'Sense' Command immediately after issuing a 'Test Unit Ready' Command will return sense data which indicates that the drive is in degraded mode.

The way to recover the drive is to issue the SCSI 'Format' command and allow the drive to format to completion.

 PRODUCT VARIATIONS

Model   Comments
PN 0663 L12   8 disk version of L12 (1 GB) drive with low power
55F5208   (11 msec) actuator. Preferred where low power
                    dissipation is of more importance than high seek
                     performance. Production of this drive has been

phased out in favor of the functionally equivalent
7 disk version PN 55F9813. Current users of the
8 disk drive should evaluate the 7 disk version
to ensure compatibility with their application(s)
before receiving quantity shipments. New integrators
should evaluate the 7 disk version.
NB: This drive is not suitable for attachment to
'Apple' systems as it does not support the 'Blind
Write' and 'Unit Attention Disable' features used by
the majority of these systems.

PN 0663 H12   8 disk version of H12 (1 GB) drive with fast (9.8 mSec)
actuator. Preferred where high seek performance is of
more importance than low power dissipation. Production
of this drive has been phased out in favor of the
functionally equivalent 7 disk version PN 55F9819.
Current users of the 8 disk drive should evaluate
7 disk version to ensure compatibility with their
application(s) before receiving quantity shipments.
New integrators should evaluate the 7 disk version.
NB: This drive is not suitable for attachment to
'Apple' systems as it does not support the 'Blind
Write' and 'Unit Attention Disable' features used by
the majority of these systems.

DC POWER REQUIREMENT LIMITS

The following voltage specifications apply at the file voltage connector, there are no special
power on/off sequencing requirements.
 +12 Volt Supply
    +/- 5.0% (during run)
    -7.0% +5.0% (during start)
 +5 Volt Supply
    +/- 5.0%
Power supply current (Amps) - Population mean

|	+5 Volt	+12 Volt
Idle average	1.07	0.49
Seek peak (H11, H12)	--	1.84 (see note 1)
(L11, L12)	--	0.78 Spin-up
(H11, H12)	--	3.75 (see note 2)
(L11, L12)	--	3.59
Commutation	--	0.35

Note 1: The idle average, communication and seek peak should be added together to determine
the total 12 volt peak current.

Note 2: The current at start is the total 12 volt current required (ie the motor start current, module current and voice coil retract current.

ELECTRICAL INTERFACE SPECIFICATIONS

The IBM OEM 0663 Disk Drive uses single-ended drivers and receivers that permit cable lengths of up to 6 meters (19.68 feet).

Connectors

```
Pin#  1   2    3   4
     ┌─────────────────┐
     │  ○   ○   ○   ○   │
     └─────────────────┘
      +5V GND GND +12V
```
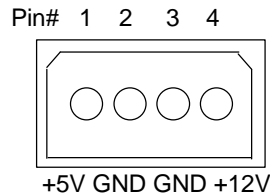
The drive has two connectors: one for power, the other for connecting to the SCSI bus.

Power
The DC power connector is designed to mate with a MOLEX AMP PN 1-480424-0 connector or equivalent. Pin assignments are shown in Figure 2.

Figure 2 Power Connector Pin Assignments

SCSI Signal Connector
 The SCSI signal connector is a 50-pin connector. Molex PN 70246 or equivalent, meeting ANSI/SCSI specifications.

SCSI Bus Terminators
The drive has no internal SCSI bus terminators. The user is responsible for properly terminating and powering the SCSI bus in the system.

AMP PN 88-4163-081-1, DATAMATE DM500-06-8, or equivalent external terminal may be used.

For a single-ended cable, a 50-conductor flat cable or a 25 twisted pair cable can be used, with a maximum length of 6.0 meters and a stub length not to exceed 0.1 meters.

This file has a maximum internal stub length of 0.072 meters on all SCSI signals except -RST; the -RST signal has an internal stub length of 0.096 meters. To remain compliant with ANSI, the SCSI bus cable must not add more than 0.028 meters additional stub length to all SCSI signals except -RST, and no more than 0.004 meters additional stub length to -RST.

SCSI Bus Electrical Characteristics
Note: The drive incorporates the Western Digital WD33C93B SCSI Interface Controller and conforms to the ANSI/SCSI Interface standard.

ELECTROMAGNETIC COMPATIBILITY

The Drive meets the following EMC requirements when installed in the user system and exercised with a random accessing routine at maximum data rate:
- United States Federal Communications Commission (FCC) Rules and   Regulations. Part 15, Subject J-Computer Devices "Class B Limits".
- European Economic Community EEC directive #76/889 related to the   control of radio frequency interference and the Verband Deutscher   Elektrotechniker (VDE) requirements of Germany (COP).

START AND STOP TIMES

Time	Nominal	Maximum
Power Up	2.0 sec	2.4 sec
Start Unit	19.5 sec	1 min
Stop	9 sec	12.5 sec

During the start sequence diagnostics are performed and are divided into two sections. Power-up pre motor-start diagnostics test the static RAM (control store memory), post motor-start diagnostics test the data buffer, upload the code, perform channel testing and 'Reassign in Progress' operations. For more information on diagnostics see the 0663 Disk Drive SCSI Specifications.

If a Reset is issued before the drive is ready, the power-on sequence starts again. Otherwise, when a Reset is issued the present state of the motor is not altered.

A timeout of one minute or more is recommended for the Start Unit command. This allows the system to take advantage of the extended ERP that the drive does in order to successfully start up.

Note: It is the integrators' responsibility to ensure that equipment into which this drive is fitted meets the relevant regulatory requirements (EMC etc).

MECHANICAL SPECIFICATIONS

This section detailed the mechanical specifications of the IBM OEM 0663 disk drive.

Weight
 Approximately 2.2 pounds (1.0 kilograms)

Dimensions

	U.S.	*S.I. Metric*
Height	*1.63 in*	*41.3 mm*
Width	*4.00 in*	*101.6 mm*
Depth*	*5.75 in*	*146.0 mm*

* The connectors exceed the depth dimension by 6.37 mm

Clearances
 A minimum of 2 mm clearance should be given to the top and bottom surfaces except for a 10 mm diameter area around the bottom mounting holes.
To assist cooling, it is recommended that a clearance of 6 mm be provided above and below the drive.
Precautions must be taken to avoid blocking any of the vent holes (on the side and ends of the drive).

Mounting
 The drive can be mounted with any surface facing down except the front surface (opposite end to power and SCSI connectors).
See diagram below for location of mounting holes.
The torque applied to the mounting screws must not exceed 1.0 + or - 0.1 Newton meters. The maximum penetration of any mounting screw must NOT exceed 3.8 mm.

Front   Side View   Rear

Bottom View

○ = 6-32 UNC-2B thread
● = M4 thread
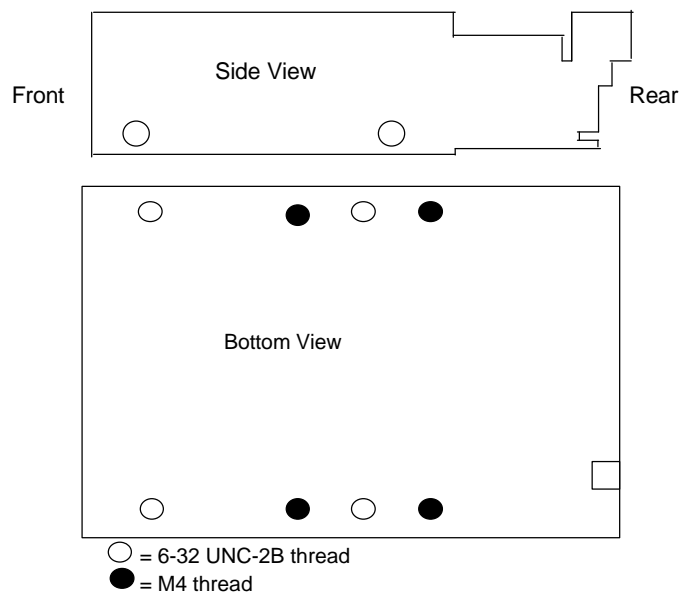
NOTE: Screws must not penetrate more than 3.8 mm

Note: Screws must not penetrate more than 3.8 mm

TEMPERATURE MEASUREMENTS

Temperature measurements should be made at the points shown Figure 3 to ensure that the maximum values are not exceeded under any circumstances. Forced air cooling may be required in order to achieve this.
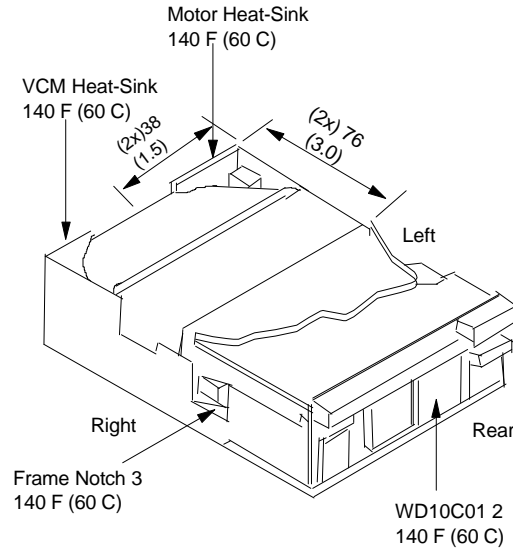

Motor Heat-Sink
140 F (60 C)

VCM Heat-Sink
140 F (60 C)

(2x)38 (1.5)

(2x) 76 (3.0)

Left

Right

Rear

Frame Notch 3
140 F (60 C)

WD10C01 2
140 F (60 C)

Figure 3 Temperature Measurement Points

 Figure 3 defines where measurements should be made to determine module and casting temperatures, top side and bottom side (the difference between the two points is defined as the delta). There must be sufficient air flow through the drive so as not to exceed the casting and module temperature limits.

EXTERNALLY GENERATED RIPPLE

as seen at file power connector

Voltage	*Maximum*	*Notes*
+5 VDC	100mV peak-to-peak	0-10 MHz
+12 VDC	150mC peak-to-peak	0-10 MHz

During file start up and seeking, 12 volt ripple is generated by the file (referred to as dynamic loading). If several files have their power daisy chained together then the power supply ripple plus other file's dynamic loading must remain within the regulation tolerance window of +/- 5%. A common supply with separate power leads to each file is a more desirable method of power distribution.

The file's mounting frame is electrically isolated from the file's disk enclosure. The disk enclosure is not at ground potential. Therefore any user mounting scheme must not result in the disk enclosure being shorted to ground.

To prevent external electrical noise form interfering with the file's performance, the file's mounting frame may be electrically isolated from the system mounting frame. If isolation is not practical then the file's mounting frame must be within + or -150 millivolts of the file's power supply ground. At no time should more than 35 milliamps of current be injected into the file frame. The frequency range that has been tested with this specification is 0 to 100 MHz.

Hot plug/unplug support
 If there is a need to plug or unplug the file while the power supply is active then the using system must assure that the ground pin makes contact first. This prevents a possible CMOS latch-up condition. During the hot "plug-in" event the 5 or 12 volt power supply voltage must not go out of tolerance in the high voltage direction. During the not "unplug" event capacitors on the file will prevent inductive flyback voltages from increasing to the point of damage to the file.

If the SCSI bus is connected while it has power active on any of its lines then a power or signal glitch may occur on the bus. If any other devices are sharing the bus than this glitch may cause them to produce an error.

 ## *VIBRATION AND SHOCK*
Operating/Nonoperating Vibration
 Due to the complexity of this subject we recommend that users contact the Distributor to discuss how to perform the required measurements if they believe this to be an area which requires evaluation.

Operating Shock
 The drive continues to operate, at the stated performance, when subjected to a 5 G half sine wave shock pulse of 11 milliseconds duration.

No permanent damage will occur to the drive when subjected to a 10 G half sine wave shock pulse of 11 milliseconds duration.

The shock pulses are applied in either direction in each of three mutually perpendicular axes, one axis at a time.

Non-Operating Shock
 No damage will occur if the unpackaged drive is not subjected to a square wave shock greater than a value of 35 Gs applied to all of the three axes for a period of 20 milliseconds, one direction at a time.

WARNING: This disk drive can be damaged by Electro-Static Discharge, please follow recommended ESD procedures before unpacking or handling the drive. Ask your Dealer for detailed if you need assistance.

PACKAGING: The drive must be protected against Electro-Static Discharge especially when being handled. The safest way to avoid damage is to put the drive in an anti-static bag before ESD wrist straps etc are removed.

Drives should only be shipped in approved containers, severe damage can be caused to the drive if the packaging does not adequately protect against the shock levels induced when a box is dropped. Consult the dealer if you do not have an approved shipping container.

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