



# Ultrastar ES DORS 32160

- Models: *SCSI-2 FAST (50 pin Single-Ended)*  
*SCSI-3 FAST 20 (50 pin Single-Ended)*  
*SCSI-3 FAST 20 wide (68 pin Single-Ended)*  
*SCSI-3 FAST 20 wide (80 pin Single-Ended)*

The performance characteristics of the DORS family make it ideal for desktop applications where high performance and capacity are required. The drives spin at 5400 rpm, have sector servo, PFA (S.M.A.R.T.) and a media data rate of 6-9MB/sec.

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## Applications

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- High-end desktop
- Entry workstations
- Low capacity servers and arrays




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## Features

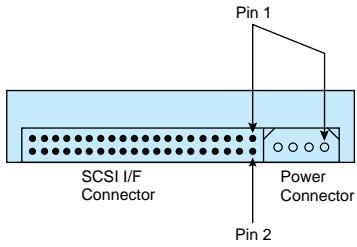
- 2.16GB formatted capacity
- Industry standard interface
  - 50 pin ANSI SCSI-2
  - 50 pin ANSI SCSI-3
  - 68 pin ANSI SCSI-3
  - 80 pin ANSI SCSI-3
- 5.93/8.95 MB/s media data rate
- Rotational speed 5400 rpm
- Sustained data rate 3.8 - 5.7 MB/s
- Average seek time 8.5 ms
- Average latency 5.56 ms
- Magneto resistive heads
- Connection for external activity LED
- Sector servo
- 448 KB multi-segmented dual port data buffer
- On-board SCSI bus terminator (50 & 68 pin models)
- SCAM 2 Compliant (SCSI-3 models)
- Industry standard mounting
- Low command overhead •Read ahead caching
- ECC on the fly •Write cache support
- Predictive Failure Analysis (S.M.A.R.T. Compliant)
- MTBF 800,000 hours

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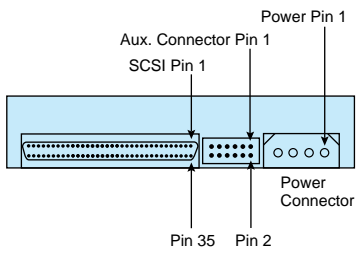
## Benefits

- Popular capacity point
  - High interface data rates
    - 10MB/sec data transfer speed
    - 20MB/sec data transfer speed
    - 40MB/sec data transfer speed
    - 40MB/sec data transfer speed
  - High data rate across entire disk surface
  - Fast access to data
  - Areal density 731 Mbit/sq in. (Max)
  - Visibility of Drive Activity
  - No thermal recalibration
  - Fast data retrieval in multi-tasking environments
  - Easy integration across multiple platforms
  - Easy installation
  - Improved data throughput
  - Improved data reliability
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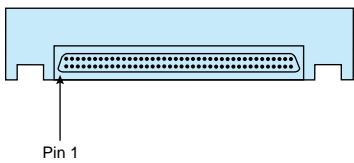
## Connectors



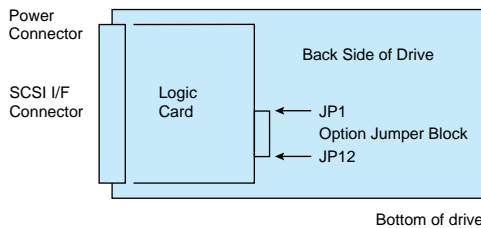
Electrical Connectors (rear view) 50 Pin models



Electrical Connectors (rear view) 68 Pin models

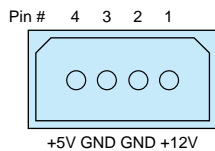


Electrical Connectors (rear view) 80 Pin SCA models



Bottom of drive

The DC power connector is designed to mate with AMP part 1-480424 (using AMP pins P/N 350078-4). Equivalent connectors may be used. Pin assignments are shown below, as viewed from the end of the drive.

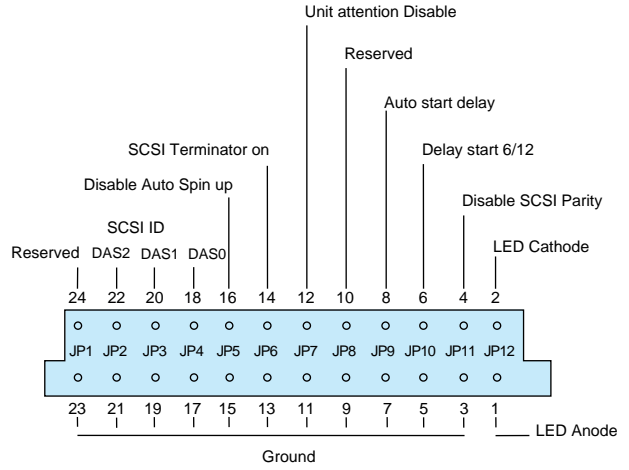


## Option Block

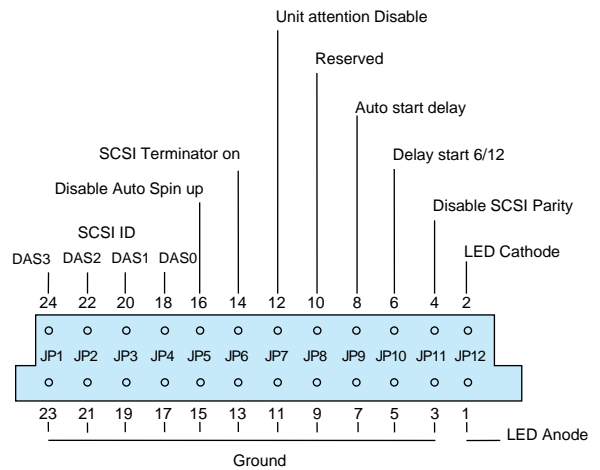
### Jumper Setting

Jumper position and function are as shown below.

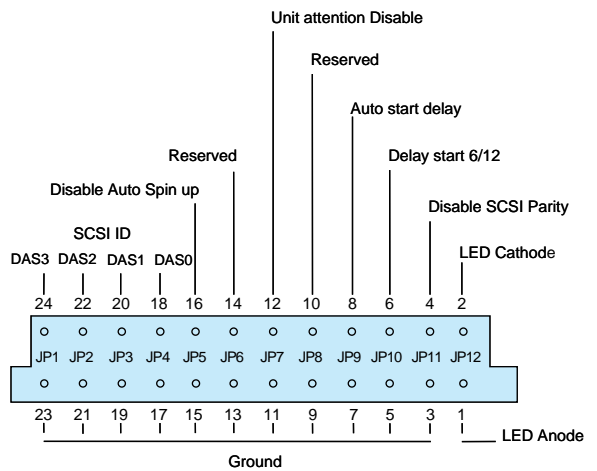
Pin pitch is 2mm.



50 Pin Model Jumper Pins Assignment



68 Pin Model Jumper Pins Assignment



80 Pin Model Jumper Pins Assignment

## Jumper Options

### SCSI ID (Address) Pins

**Note:** In the address determination tables, "off" means jumper is not in place and "on" means jumper is in place.

#### 50 pin model SCSI ID (Address) pins

- DSA2 JP2	- DSA1 JP3	- DSA0 JP4	Device ID
off	off	off	0
off	off	on	1
off	on	off	2
off	on	on	3
on	off	off	4
on	off	on	5
on	on	off	6*
on	on	on	7

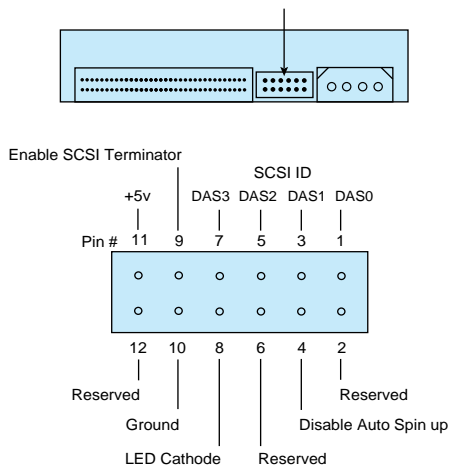
\* Shipping default ID

#### 68 and 80 pin model SCSI ID (Address) pins

- DAS3 JP1	- DAS2 JP2	- DAS1 JP3	- DAS0 JP4	Device ID
off	off	off	off	0*
off	off	off	on	1
off	off	on	off	2
off	off	on	on	3
off	on	off	off	4
off	on	off	on	5
off	on	on	off	6**
off	on	on	on	7
on	off	off	off	8
on	off	off	on	9
on	off	on	off	10
on	off	on	on	11
on	on	off	off	12
on	on	off	on	13
on	on	on	off	14
on	on	on	on	15

\* Shipping default ID for 80 pin drive

\*\* Shipping default ID for 68 pin drive



68 Pin Auxiliary Connector

## Disable auto spin up (JP5)

This jumper controls how the drive starts when power is applied. If the jumper is NOT installed then the file will spin up automatically after power-on reset. If the jumper IS installed the file will NOT spin up unless the host system issues a 'START UNIT' command to the file.

## SCSI Terminator On (JP6)

When this jumper is installed, the on-card SCSI bus terminator is enabled. No Terminator on 80 pin model.

## Unit Attention Disable (JP7)

When this jumper is installed the drive will not generate a Unit Attention following a Power On Reset (POR) or SCSI Bus Reset. Any pending Unit Attention conditions will also be cleared at POR or SCSI Bus Reset.

## Auto start delay and Delay start (JP9, JP10)

The auto Start Delay and Delay Start pins control when and how the drive can spin up, with the combination of Auto Spin up option (pin #5).

When in Auto Spin up and Start delay mode the drive start will be delayed by a period of time multiplied by its own SCSI address. If Auto Spin up is disabled, these jumpers will be ignored.

Disable Auto Spin up	Auto Start Delay	Delay Start 6/12	Option
JP5	JP9	JP10	Option
on	don't care	don't care	Drive will NOT spin up Requires Start Command
off	off	off	Spin up immediately after POR
off	on	off	Spin up six seconds multiplied by SCSI address after POR
off	on	on	Spin up twelve seconds multiplied by SCSI address after POR

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### Disable SCSI parity (JP11)

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When this jumper is installed, the drive's SCSI parity checking is disabled.

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### External Activity (LED) pins (JP12)

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The LED pins can be used to drive an external Light Emitting Diode. Up to 8 mA of sink current capability is provided. The LED Anode must be tied to the current limited + 5V source provided on Pin # 1 of the Option Jumper Block. The LED Cathode is then connected to the Pin # 2 to complete the circuit.

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### Default Setting

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The default jumper setting at shipment is as follows. *Jumpers installed on 50 and 68 pin models.*

JP2 } JP3 }	SCSI Address #6
JP6	SCSI Terminator enabled

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### SCSI Signal Connector

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The SCSI 50 and 68 pin Signal Connector meets the ANSI SCSI specification. The SCSI SCA -80 pin Connector conforms to SFF 8046.

**Note:** It is intended that the hard disk drive should only be in electrical contact with the chassis of the system at a designated set of mounting holes. Other electrical contact may degrade error rate performance. As a result of this it is recommended that there should be no metal contact to the hard disk drive except at the mounting holes or the side rails into which the mounting holes are tapped.

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### Operating Environment

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#### Operating Conditions

Temperature	5 to 55°C
Relative Humidity	8 to 90% non-condensing
Maximum Wet Bulb	
Temperature	29.4°C non-condensing
Maximum Temperature	
Gradient	15°C/Hour
Altitude	-300 to 3000m

#### Non-operating Conditions

Temperature	-40 to 65°C (shipping) 0 to 65°C (storage)
Relative Humidity	5 to 95% non-condensing
Maximum Wet Bulb	
Temperature	35°C non-condensing
Altitude	-300 to 12,000m

#### Notes:

The system is responsible to provide sufficient air movement to maintain surface temperature below 60°C at the centre of top cover of the drive.

#### Operating Shock

The hard disk drive meets the following criteria while operating in respective conditions described below. There must be a delay between shock pulses, long enough to allow the drive to complete all necessary error recovery procedure.

#### No errors

5G, 11ms half-sine shock pulse

#### No data loss, seek errors or permanent damage

10G, 11ms half-sine shock pulse

#### No data loss or permanent damage

15G, 5ms half-sine shock pulse

30G, 4 ms half-sine shock pulse

#### Operating and Non-Operating Vibration

Due to the complexity of this subject we recommend that users contact the IBM technical support group representative to discuss how to perform the necessary measurements if they believe this to be an area which requires evaluation.



**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 details if you need assistance.

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## DC Power Requirements

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The following voltage specifications apply at the file power connector. Damage to the file electronics may result if the power supply cable is connected or disconnected while power is being applied to the file (no hot plug/unplug is allowed except on 80 pin model). There are inductive loads in the file which could cause destructively high voltage spikes on the file if the power connection is opened. There is no special power on/off sequencing required.

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Nominal Supply		
Voltages	+5 volts	+12 volts
Power Supply Ripple		
(mV p-p, 0-10MHz) <sup>1</sup>	100 max	150 max
Tolerance <sup>2</sup>	±5%	+10%/-8%
Supply Current		
(Population Mean)		
Idle (average)	0.25	0.20
R/W (average)	0.30	0.37
Seek (average)	0.30	0.35
Standby	0.13	0.01
Start up (peak)	0.46	1.10

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### Notes:

1. The maximum ripple is measured at input of the drive.
2. To avoid damage to the file electronics; spikes on the 5V supply must not exceed 7V and spikes on the 12V supply must not exceed 15V.

During the 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 of +10/-8%. A common supply with separate power leads to each file is a more desirable method of power distribution.

To prevent external electrical noise from interfering with the file's performance, the file must be held by four screws in a user system frame. There should be no electrical level difference at the four screws position, and less than ±300 millivolts peak to peak difference to the file power connector ground.

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## Data Organisation

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Logical Layout	DORS-32160
Bytes per Sector	512
Number of heads	5
Number of Disks	3
Number of LBAs	4226725
Total logical Data Bytes	2164083200

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## SCSI Cable

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### SCSI 2

The disk drive uses single-ended drivers and receivers which will permit cable lengths of up to 6 metres (19.68 feet). For a single ended cable a 50 conductor flat cable or a 25 signal twisted cable can be used with a maximum length of 6.0 metres, and a stub length not exceeding 0.1 metres.

### SCSI 3

The maximum cable length is 3.0 metres when using up to 4 drives. If you are using greater than 4 drives the cable length must be 1.5 metres or less.

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## SCSI Bus Terminator (50 and 68 pin models)

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The file has an internal Active SCSI bus terminator, which can be controlled on/off at the drive Option block. The user is responsible for properly terminating and powering the SCSI bus in the using system.

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## Electromagnetic Compatability

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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 Communication Commission (FCC) Rules and Regulations Part 15, Subject J – Computer Devices "Class B Limits".

European Economic Community directive number 76/889 related to the control of radio frequency interference and the Verband Deutscher Elektrotechniker (VDE) requirements of Germany (GOP).

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## Mode Select Options

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Certain parameters are alterable using the SCSI 'Mode Select' command. This allows certain drive characteristics to be modified to optimise performance on a particular system. Refer to the DORS-3XXXX Interface Specification for detailed definition of Mode Select parameters.

The changeable parameters are:

### Page 0

#### Vendor Unique Parameters

OPE – Qualify Post Error	(0)
UQE – Untagged Queuing Enable	(1)
UAI – Unit Attention Inhibit	(0)
DADM – Disable Automatic Drive Maintenance	(0)
CMDAC – Command Active	(1)
CPE – Current Processing Enable	(1)
CAEN – Command Age Limit Enable	(1)
ADC – Adaptive Cache Enable	(1)
LED Mode	(0000b)
Command Aging Limit	(48)
OPE – Read Threshold	(10)
OPE – Write Threshold	(10)

### Page 1

#### Read-Write Error Recovery Parameters

AWRE – Automatic Write Reallocation Enable	(1)
ARRE – Automatic Read Reallocation Enable	(1)
TB – Transfer Block	(0)
PER – Post Error	(0)
DTE – Disable Transfer on Error	(0)
DCR – Disable Correction	(0)
Read Retry Count	(01h)
Write Retry Count	(01h)

### Page 2

#### Disconnect/Reconnect Parameters

Read Buffer Full Ratio	(00h)
Write Buffer Empty Ratio	(00h)

### Page 7

#### Verify Error Recovery Parameters

PER	(0)
DCR	(0)
Verify Retry Count	(01h)

### Page 8

#### Caching Parameters

WCE – Write Cache Enable	(1)
RCD – Read Cache Disable	(0)
MF – Multiplication Factor	(0)
Disable Pre Fetch Transfer Length	(0)
Minimum Pre Fetch	(0)
Maximum Pre Fetch	(0)
Maximum Pre Fetch Ceiling	(0)

### Page A

#### Control Mode Page Parameters

Queue Algorithm Modifier	(0h)
QErr – Queue Error	(0)
DQue – Disable Queuing	(0)

### Page 1C

#### Informational Exceptions Control

DEXCPT – Disable Exception Control	(0)
Method of Reporting	(0)
Report Count	(0)

### Page 38

#### Power Control

Automatic Shutdown Time	(0)
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Note: (XX) saved options at Shipment

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## Mechanical Data

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### Dimensions

Height	25.4±0.4mm
Width	101.6±0.4mm
Depth	146.0±0.6mm
Weight	570g maximum

### Mounting Orientation

The Drive can be mounted in any axis (6 directions).

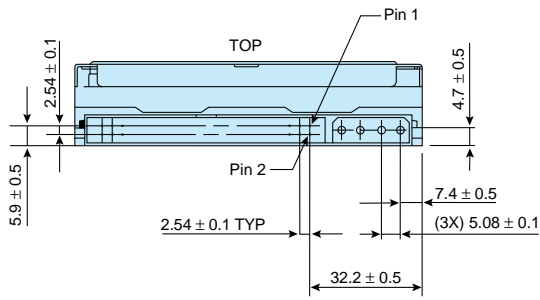
The maximum allowable penetration of the mounting screws is  3.5mm  6mm



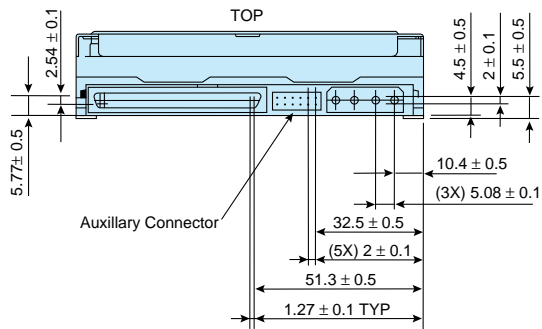
**PACKAGING:** The drive must be protected against Electro-Static Discharge especially when being handled. The safest way to avoid damage is to put the drive in an anti static bag before ESD wrist straps etc are removed.

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 your IBM marketing representative if you do not have an approved shipping container.

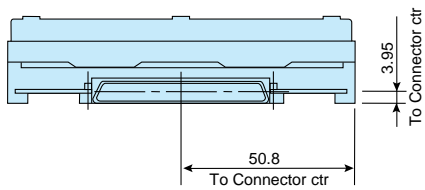
## Outline Dimensions



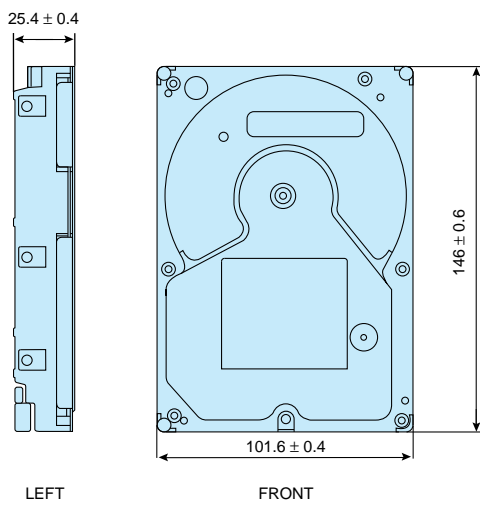
50 Pin Model Connector Locations



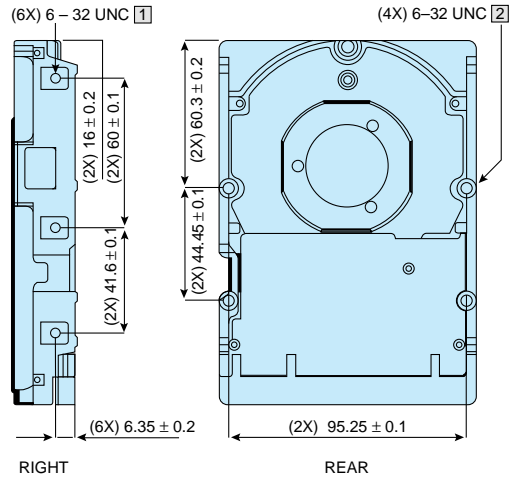
68 Pin Model Connector Locations



80 Pin SCA Model Connector Locations



## Mounting Holes





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