



Product summary

Ultrastar 36LP

Ultra 160 SCSI



Models: DPSS-336950
 DPSS-318350
 DPSS-309170

Introduction

IBM's new Ultrastar 36LP offers capacities of 36.9GB, 18.3GB, and 9.1GB in Ultra 160 SCSI models. The high reliability and excellent performance of the Ultrastar 36LP are the result of the implementation of a number of advanced disk drive technologies, including giant magnetoresistive head technology, No-ID sector formatting, Predictive Failure Analysis, and ECC on the fly correction.

Applications

- Technical/commercial workstations
- Network servers
- High-end personal computers
- CAD/CAM
- Multimedia
- Transaction processing
- Data mining applications

Features

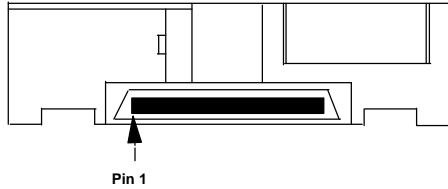
- 9.1GB, 18.3GB, and 36.9GB formatted capacity
- Industry standard interface
 - Ultra 160, 68 pin
 - Ultra 160, 80 pin
- 19.5 - 31.9MB/sec sustained data transfer rate
- 24 - 37MB/sec media transfer rate
- Rotational speed 7,200 RPM
- Average seek time 6.8ms (typical read)
- Latency 4.17ms
- 4MB multi-segmented cache buffer
- ECC on the fly (EOTF) correction
- No-ID sector formatting
- Partial Response Maximum Likelihood (PRML) data channel
- Giant magnetoresistive (GMR) head technology
- Predictive Failure Analysis (S.M.A.R.T. compliant)
- Drive-TIP
- Glass substrate disks

Benefits

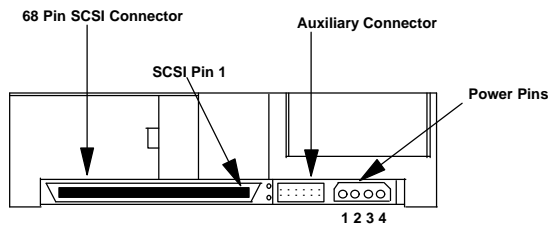
- Range of capacities to meet the need for increasing storage requirements
- Fast interface data rates
 - 80 & 160MB/sec
 - 80 & 160MB/sec
- High data rate across entire disk surface
- Fast access to data
- Fast data retrieval in single and multi-tasking applications
- Improved data throughput
- More data stored per track, increased sustained data transfer rate
- High areal density
- High reliability and availability
- Improved data integrity
- Longer disk lifetime

Electrical connectors

The electrical connectors are located as shown. 68 pin model power connectors comply with the ANSI SCSI "P" connector specifications. 80 pin SCA-2 models use a DDK connector which is compatible with SCSI Parallel Interface 3 (SPI-3).

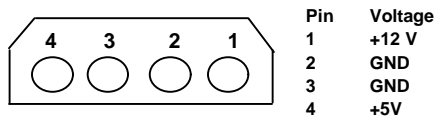


Electrical connectors (rear view) 80 pin SCA models.



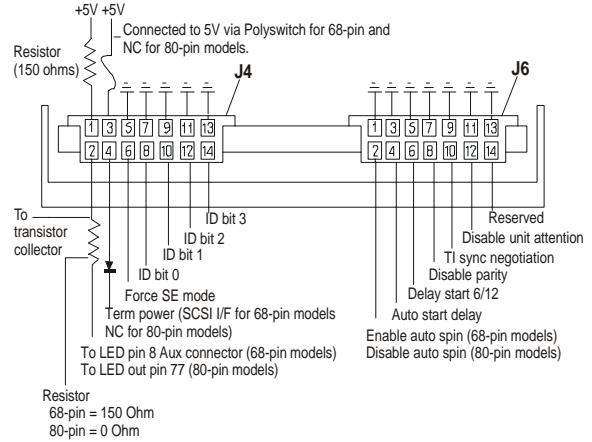
Electrical connectors (rear view) 68 pin models.

Power pin assignment of 68 pin models is shown below.

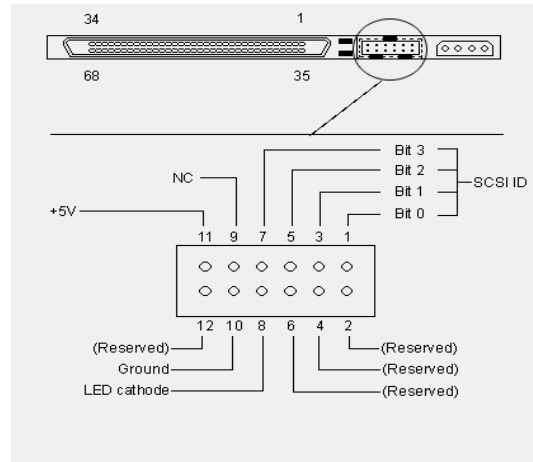


Option jumper block

The position and function of jumpers are shown below. 68 pin models have two option jumper blocks located on the circuit board, J-4 and J-6.



The auxiliary jumper block on 68 pin models is shown below.



J-6 Jumper settings

Enable Auto Spin Up - 68 pin

Installing a jumper in position #1-2 on 68 pin models causes the drive to spin up automatically after a power on reset. If this position is not jumpered, the drive will not spin up unless a START UNIT command is received.

Disable Auto Spin Up - 80 pin

If position #1-2 on 80 pin models is not jumpered, the drive will spin up automatically after a power on reset. Installing a jumper on this position will prevent the drive from spinning up unless a START UNIT command is received.

Auto Start Delay/Delay Start 6/12

Jumpering positions #3-4 and #5-6 control when and how the drive spins up in conjunction with position #1-2. When both Auto Spin Up and Auto Start Delay are enabled, the drive start will be delayed by a period of time multiplied by the drive's SCSI address. If Auto Spin Up is disabled, these jumpers will be ignored.

Disable SCSI Parity Check

Installing a jumper in position #7-8 disables SCSI Parity checking.

Enable TI-SDTR

Installing a jumper in position #9-10 enables Target Initiated Synchronous Data Transfer Request Negotiation.

Disable Unit Attention

Installing a jumper in position #11-12 enables control of the Unit Attention Inhibit (UAI) bit in Mode Page 0.

J-4 Jumper settings

LED pins

The LED pins are used to drive an external Light Emitting Diode. Up to 30 mA of sink current is provided. The LED Anode must be tied to the current limited +5 V source provided on position #1. The LED Cathode is then connected to the pin at position #2 to complete the circuit. Refer to the Ultrastar 36LP Hard Disk Drive

Specification for a more detailed functional description of this pin.

Termination Power

If a jumper is installed on 68 pin models, termination power is supplied to pins 17, 18, 51, and 52 of the 68 pin SCSI interface.

Force SE Mode

Installing a jumper in position #5-6 causes the drive to function in single-ended mode.

SCSI ID (address) settings

'X' indicates that a jumper is placed on that ID position.

| Address | Bit 0 | Bit 1 | Bit 2 | Bit 3 |
|---------|-------|-------|-------|-------|
| 0 | | | | |
| 1 | X | | | |
| 2 | | X | | |
| 3 | X | X | | |
| 4 | | | X | |
| 5 | X | | X | |
| 6 | | X | X | |
| 7 | X | X | X | |
| 8 | | | | X |
| 9 | X | | | X |
| 10 | | X | | X |
| 11 | X | X | | X |
| 12 | | | X | X |
| 13 | X | | X | X |
| 14 | | X | X | X |
| 15 | X | X | X | X |

Address 0 is shipping default for 80 pin models.

Address 6 is shipping default for 68 pin models.

Address 7 is normally reserved for the host adapter.

Data organization

| Model | 36.9GB | 18.3GB | 9.1GB |
|-----------------|--------|--------|-------|
| Number of disks | 5 | 3 | 2 |
| Number of heads | 10 | 5 | 3 |

Total usable data bytes

| | |
|---------|----------------|
| 36.9 GB | 36,951,490,560 |
| 18.3 GB | 18,351,959,040 |
| 9.1 GB | 9,173,114,880 |

Seek times (in milliseconds)

| | | |
|-----------------------|-------|------|
| Average (typical) | Read | 6.8 |
| | Write | 7.8 |
| Full stroke (typical) | Read | 13.0 |
| | Write | 14.0 |

DC power requirement limits

The following voltage specifications apply at the drive power connector. Connection to the drive should be made in safety extra low voltage (SELV) circuits. No special power on/off sequencing is required.

| | |
|-----------------|------------|
| +5 volt supply | 5V+/- 5% |
| +12 volt supply | 12V +/- 5% |

Power supply current +5VDC

| (in Amps) | All models |
|------------------|------------|
| Idle average | 0.57 |
| Seek average | 0.60 |
| Start up maximum | 0.94 |

Power supply current +12VDC

| (in Amps) | 36.9GB Pop. mean | 18.3GB Pop. mean | 9.1B Pop. mean |
|------------------|------------------|------------------|----------------|
| Idle avg | 0.50 | 0.42 | 0.36 |
| Seek avg | 1.00 | 1.00 | 1.00 |
| Start up maximum | 2.20 | 2.20 | 2.20 |

Generated ripple at drive power connector

| | Maximum | Notes |
|---------|-----------|------------|
| +5V DC | 250 mV pp | 0-10 [MHz] |
| +12V DC | 250 mV pp | 0-10 [MHz] |

During drive start up and seeking, 12 volt ripple is generated by the drive (referred to as dynamic loading). If the power of several drives is daisy chained together, the power supply ripple as well as the dynamic loading of other drives must remain within the regulation tolerance of ± 0.5%. A more desirable method of power distribution is a common supply with separate power leads to each drive.

Hot Plug/Unplug support

The term 'Hot Plug' refers to the action of mechanically engaging a device to the power and/or bus when other devices may be active on the same bus.

While every effort was made to design the drive not to influence the SCSI bus during these events, it is the responsibility of the system to insure voltage regulation and conformity to operational and nonoperational shock limits. During Hot Plug events the nonoperational shock levels should not be exceeded. The operational shock levels of adjacent drives should also not be exceeded. The recommended procedure is to prohibit write operations to adjacent drives during Hot Plug and Hot Unplug actions.

During Hot Unplug the operational shock limit specifications should not be exceeded. If this cannot be guaranteed, the drive should be issued a SCSI Stop Unit command that is allowed to complete before unplugging. The basic requirement is that the operational shock limits are in effect while the drive is operational or spinning down. Once the drive has completely stopped, the nonoperational shock limits are in effect. The recommended procedure is to allow the unplugged drive to rest in the drive bay for a minimum of 15 seconds and then complete the removal. During Hot Plug or Unplug events the power supply ripple on adjacent operational drives should not be outside the $\pm 5\%$ regulation tolerance

SCSI bus connectors and cables

Refer to ANSI SCSI Parallel Interface-3 T10/1142, revision 8 for detailed specifications.

SCSI bus terminators (optional)

On board SCSI active termination is not supported. The using system is responsible for making sure that all required signals are terminated at both ends of the bus cable.

Terminator power

Terminator power can be provided by the 5V power supply through current limiter and Schottky diode. This function can be selected by jumper. 80pin SCA-2 models do not support SCSI bus Terminator Power.

Vibration and shock

Operating vibration

The overall RMS (root mean square) level of horizontal vibration is 0.67G. The overall RMS level of vertical vibration is 0.56G.

Nonoperating vibration

The overall RMS level of vibration is 1.04G.

Operating shock

The drive withstands with no data loss a 10G half-sine shock pulse of 11ms duration. It also withstands a 45G half-sine shock pulse of 2ms duration.

The shock pulses are applied ten pulses for each direction and for all three axes. There must be a delay between shock pulses long enough to allow the drive to complete all necessary error recovery procedures.

Nonoperating shock

The drive withstands with no data loss a 75G half-sine shock pulse of 11ms duration. It also withstands a 225G half-sine shock pulse of 2ms duration.

The shocks are applied in each direction of the drive's three mutually perpendicular axes.

Rotational shock

The drive withstands with no data loss a rotational shock of 25,000 rad/s², 1ms applied around the axis of the actuator pivot.

Operating environment

The drive operates within its performance limits when the following environment is maintained.

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 3048 m |

Nonoperating conditions

| | |
|------------------------------|-------------------------|
| Temperature | -40 to 65° C |
| Relative humidity | 5 to 95% non-condensing |
| Maximum wet bulb temperature | 35° C non-condensing |
| Altitude | -300 to 12,000 m |

NOTE: The system must provide sufficient ventilation to maintain a surface temperature below 60°C at the center of the top cover of the drive. Non-condensing conditions should be kept at all times. Maximum storage period in shipping package is one year.

Corrosion test

The hard disk drive shows no signs of corrosion inside or outside of the HDA and is functional after being subjected to 7 days of 50° C with 90% relative humidity

Electromagnetic compatibility

When installed in a suitable enclosure and exercised with a random accessing routine at maximum data rate, this drive meets the worldwide EMC requirements listed below.

- United States Federal Communications Commission (FCC) Rules and Regulations (Class B), Part 15
- EC Directive 89/336/EEC
- The Australian EMC standard AS/NZS 3548:1995 Class B

Acoustics

The criteria of the A-weighted sound power levels are given in Bel relative to one pico watt and are shown in the following table. The measurement method is in accordance with ISO7779. Drives are to meet these criteria in both board up and board down orientations.

A-weighted sound power levels

| Mode | A-weighted sound power level (Bel) |
|-----------|------------------------------------|
| Idle | 3.6 (typical) 4.0 (maximum) |
| Operating | 4.8 (typical) 5.0 (maximum) |

The acoustical characteristics of the drive subsystem are measured under the following conditions:

Idle mode: powered on, disks spinning, track following, unit ready to receive and respond to interface commands.

Operating mode: continuous random cylinder selection and seek operation of the actuator with a dwell time at each cylinder. The seek rate N_s is to be calculated according to the following formula:

$$N_s = 0.4 / (T_t + T_1)$$

where

N_s = average seek rate in seeks/ sec,
 T_t = published random seek time, and
 T_1 = time for the drive to rotate by half a revolution.



ATTENTION: The drive must be protected against electrostatic discharge especially when being handled. The safest way to avoid damage is to put the drive into an antistatic bag before ESD wrist straps, etc. are removed.

Drives should be shipped only 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 representative if you do not have an approved shipping container.

Mechanical specifications

Physical dimensions

| | |
|----------------|-------------|
| Height (mm) | 25.4 ± 0.4 |
| Width (mm) | 101.6 ± 0.4 |
| Length (mm) | 146.0 ± 0.6 |
| Weight (grams) | 670 maximum |

Mounting

The drive will operate in all axes (6 directions). Performance and error rate will stay within specification limits if the drive is operated in the other orientations from which it was formatted.

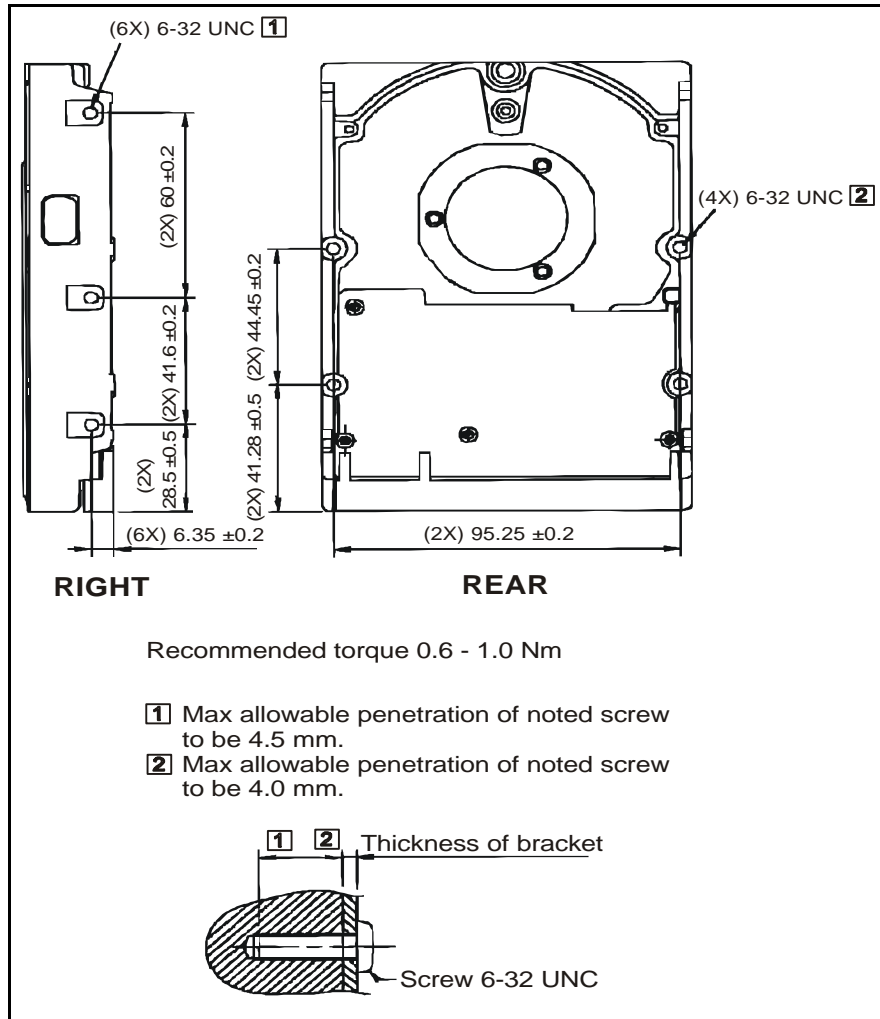
The recommended mounting screw torque is 0.6 - 1.0 Nm (6 - 10 Kgf.cm). The recommended mounting screw depth is 4 mm maximum for bottom and 4.5 mm maximum for horizontal mounting.

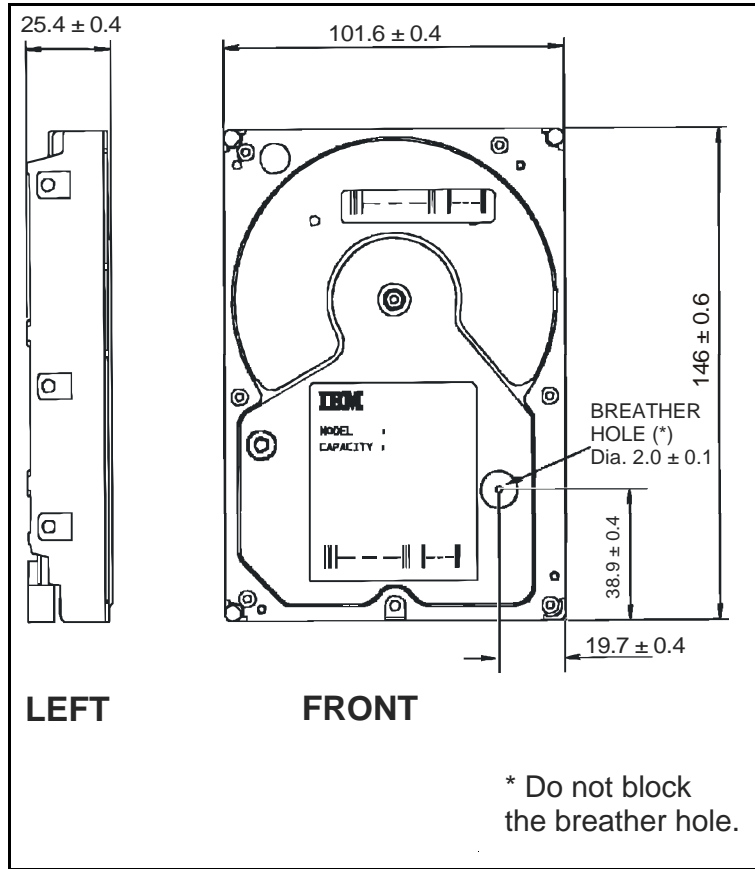
To avoid performance degradation, mount the drive in the system securely enough to prevent excessive motion or vibration of the drive at seek operation or spindle rotation, using appropriate screws or equivalent mounting hardware.

Drive level vibration tests and shock tests are to be conducted with the drive mounted to the table using the bottom four screws.

Refer to the diagrams on the following pages for mounting positions and tappings.

Outline dimensions and mounting hole locations





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