



Deskstar 16GP

DTTA-350320, DTTA-350430, DTTA-350640, DTTA-350840,
DTTA-351010, DTTA-351290, DTTA-351680

IBM OEM has introduced a new range of disk drives for the desktop personal computer marketplace.

Available in seven capacity points with AT interface, the drive provides excellent performance and reliability.



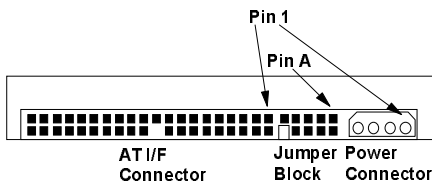
Applications

Desktop personal computers
Entry servers
Entry workstations

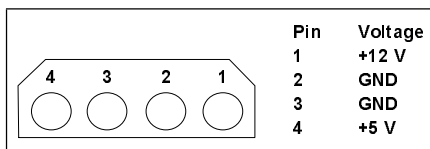
Features Benefits

| | |
|--|--|
| 3.2GB, 4.3GB, 6.4GB, 8.4GB, 10.1GB, 12.9GB, 16.8GB at (512 bytes/sector) | Wide range of capacities to meet the need for diverse storage requirements |
| PIO and DMA data transfer modes PIO Mode 4 rates up to 16.6MB/sec Ultra DMA/33 rates up to 33.3MB/sec | Fast interface data rates |
| Average seek time 9.1ms (Read) 9.5ms(Write) 5400 RPM | Fast access to data |
| 464KB adaptive sector buffer | Fast data retrieval in single and multitasking applications |
| Industry standard mounting The drive can be mounted with any of its six surfaces facing down | Ease of installation |
| Advanced ECC on the fly (EOF) | Improved data throughput |
| CHS and LBA addressing modes | Flexibility to support most appropriate addressing |
| Power saving modes | Reduced power consumption |
| Robust design for EMC/RFI | Easy integration across multiple platforms |
| GMR (Giant Magneto Resistive) head technology | High areal density, low component count |
| No ID sector format PRML Data Channel | More data stored per track, increased sustained data transfer rate |
| S.M.A.R.T. function support | High reliability and availability |
| Security function support | Password protection for sensitive data |

Connectors



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, viewed from the end of the drive.



AT I/F Connector

The drive uses single-ended drivers and receivers. The connector is designed to mate with 3M part 3417-7000 or equivalent.

Note: It is intended that the hard disk should only be in electrical contact with the chassis of the PC 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.

Jumper Block

Jumper Settings¹

Jumpers may be fitted to select the following options:-

16 head logical architecture

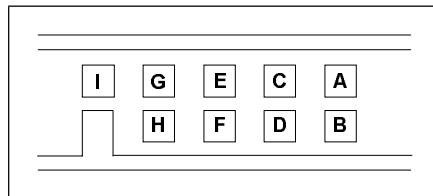
| | Pin Numbers |
|---------------|-------------|
| MASTER active | A-B and G-H |
| SLAVE active | A-B and C-D |
| Cable sel | A-B and E-F |
| SLAVE Present | E-F and G-H |
| Reserved | |

Jumper Block

15 head logical architecture

| | Pin Numbers |
|---------------|------------------|
| MASTER active | A-C and G-H |
| SLAVE active | A-C |
| Cable sel | A-C and E-F |
| SLAVE Present | A-C, E-F and G-H |
| Reserved | |

All other jumper setting patterns are reserved. **DO NOT MAKE OTHER SETTINGS!**



¹ 16 head logical architecture is not available on 4.3GB and 6.4GB drives. 15 head logical architecture is not available on 3.2GB drive.

Shipping Default Settings

MASTER is set to on.
15 head logical architecture is enabled on 4.3GB and 6.4GB drive.
On all other capabilities 16 head logical architecture is enabled.

Operating Environment

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 3048m |

Non Operating Conditions

| | |
|------------------------------|----------------------------|
| Temperature | -40° to 65°C |
| Relative Humidity | 5 to 95% non-condensing |
| Maximum Wet Bulb Temperature | 35°C non-condensing |
| Maximum Temperature Gradient | 15°C/Hour |
| Altitude | -300 to 12,000m |

Operating Environment

Note: * The system is responsible for providing sufficient air movement to maintain surface temperature below 60°C at the centre of the 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 data loss 10G, 11ms half-sine shock pulse

Non-Operating Shock

The drive withstands without damage or degradation of performance, a 75G half-sine wave shock pulse of 11ms duration on six sides when heads are parked. (When power is not applied to the unit the heads are automatically located in the parked position). Above specification is for shocks applied in each direction of the drives three mutually perpendicular axis, one axis at a time.

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



PACKAGING: The drive must be protected against Electrostatic 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.

DC Power Requirements

The following voltage specifications apply at the drive power connector. Damage to the drive electronics may result if the power supply cable is connected or disconnected while power is being applied to the drive (**Hot plug/unplug is not allowed**). There is no special power on/off sequencing required.

Input Voltage

+5 Volts Supply 5V(+/-5% during run and spin up)¹

+12 Volts Supply 12V(+10%,-8% during run and spin up)²

¹ To avoid damage to the file electronics 5V power supply voltage spikes must not exceed 7V.

² To avoid damage to the file electronics 12V, power supply voltage spikes must not exceed 15V.

Power Supply Current¹

| (All values in Amps.) | + 5 volts Pop Mean | +12 volts Pop Mean |
|---------------------------------|--------------------|--------------------|
| Idle average | 0.29 (0.29) | 0.16 (0.29) |
| Idle ripple (peak to peak) | 0.22 (0.25) | 0.30 (0.60) |
| Seek peak ² | 0.50 (0.55) | 1.23 (1.6) |
| Seek average ² | 0.33 (0.33) | 0.37 (0.6) |
| Start up (max) | 0.7 (0.7) | 1.2 (2.0) |
| Random R/W peak ³ | 0.6 (0.8) | 0.38 (0.65) |
| Random R/W average ³ | 0.42 (0.42) | 0.34 (0.55) |
| Standby/Sleep average | 0.08 (0.15) | 0.005 (0.005) |

¹ Unbracketed values apply to drives with capacities from 3.2GB to 10.1GB. Bracketed values apply to drives with capacities of 12.9GB or 16.8GB.

² Random Seeks at 40% duty cycle.

³ Seek duty = 30%, W/R duty = 45%, Idle duty = 25%.

DC Power Requirements

Power Supply Generated Ripple as seen at file power connector.

| | Maximum | Notes |
|---------|----------|----------|
| +5V DC | 100mV pp | 0-10 MHz |
| +12V DC | 150mV pp | 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 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 which has no electrical level difference at the four screws position, and has less than +/- 300 millivolts peak to peak level difference to the file power connector ground.

Cabling

The maximum cable length from the Host system to the drive, plus the circuit pattern length inside the Host systems, must not exceed 18 inches (45.7cm).

For higher data transfer application >8.3MB/sec, a consideration in system design is recommended to reduce cable noise and/or cross-talk, such as shorter cable, bus termination, shielded cable, etc.

Interface

The interface conforms to the working document of information technology - AT Attachment with Packet Interface Extension (ATA/ATAPI-4) Revision 16 dated 25th August 1997 with the following deviators.

Interface

Check Power Mode

CHECK POWER MODE command returns FFh to Sector Count Register when the device is in Idle mode. This command does not support 80h as the return value.

Hard Reset

Hard Reset response is identical to Soft Reset response with the following exception:

When drive is MASTER the DASP line is not checked and SLAVE presence is assumed to be unchanged. When drive is set as a SLAVE it will activate DASP line to indicate it is present.

Electromagnetic Compatibility

The drive meets the following EMC requirements when installed in a suitable 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 (ECC) directive #76/889 related to the control of radio frequency interference and the Verband Deutscher Elektrotechniker (VDE) requirements of Germany (GOP).

Council Directive 89/336/EEC on the approximation of laws of the Member States relating to electromagnetic compatibility.

C-Tick Mark complies with Australian EMC standard, AS/NZS 3348:1995 CLASS-B..

Data Organisation

| Description | DTTA 350320 | DTTA 350430 | DTTA 350640 | DTTA 350840 | DTTA 3501010 | DTTA 351290 | DTTA 351680 |
|-----------------------------------|----------------|----------------|----------------|----------------|-----------------|----------------|----------------|
| Physical Layout | | | | | | | |
| Label Capacity (MB) | 3,200 | 4,300 | 6,400 | 84,000 | 10,100 | 12,900 | 16,800 |
| Bytes per Sector | 512 | 512 | 512 | 512 | 512 | 512 | 512 |
| Sector per Track | 181 - 330 | 181 - 330 | 181 - 330 | 181 - 330 | 181 - 330 | 181 - 330 | 181 - 330 |
| No. of Heads | 2 | 3 | 4 | 5 | 6 | 8 | 10 |
| No. of Disks | 1 | 2 | 2 | 3 | 3 | 4 | 5 |
| Logical Layout¹ | | | | | | | |
| No. of Heads ² | 16 | 15 | 15 | 16 (15) | 16 (15) | 16 (15) | 16 (15) |
| No. of Sectors/Track ³ | 63 | 63 | 63 | 63 | 63 | 63 | 63 |
| No. of Cylinders ⁴ | 6,296 | 8,960 | 13,431 | 16,383 | 16,383 | 16,383 | 16,383 |
| No. of Sectors ⁵ | 6,346,368 | 8,467,200 | 12,692,295 | 16,514,064 | 19,807,200 | 25,385,472 | 33,022,080 |

¹ Logical layout describes imaginary HDD parameters which are used to access customer data on the disk drive. Logical layout to physical layout (ie. actual Head, Sector translation) is done automatically in the HDD. Default setting can be obtained by issuing IDENTIFYING DRIVE command.

² Bracketed values show alternate jumper selectable option. Value is reported in Word 3 of HDD IDENTIFY data.

³ Value is reported in Word 6 of HDD IDENTIFY data.

⁴ Value is reported in Word 1 of HDD IDENTIFY data.

⁵ Value is reported in Word 60 & 61 of HDD IDENTIFY data

Command Descriptions

The following Commands are supported by the Drive:

| Commands | (Hex) | P | | | | | | |
|-----------------------------|-------|----|---|------|----|----------------------------------|------|---|
| Check Power Mode | (E5) | 3 | Read Verify Sectors (retry) | (40) | 3 | SMART Save Attribute Values (BO) | 3 | |
| Check Power Mode* | (98) | 3 | Read Verify Sectors (no retry) | (41) | 3 | Standby | (E2) | 3 |
| Executive Drive Diagnostics | (90) | 3 | Recalibrate | (1X) | 3 | Standby* | (96) | 3 |
| Flush Cache | (E7) | 3 | Security Disable Password | (F6) | 2 | Standby Immediate | (EO) | 3 |
| Format Track | (50) | 2 | Security Erase Prepare | (F3) | 3 | Standby Immediate* | (94) | 3 |
| Identify Drive | (EC) | 1 | Security Erase Unit | (F4) | 2 | Write Buffer | (E8) | 2 |
| Identify Drive DMA | (EE) | 4 | Security Freeze Lock | (F5) | 3 | Write DMA (retry) | (CA) | 4 |
| Idle | (E3) | 3 | Security Set Password | (F1) | 2 | Write DMA (no retry) | (CB) | 4 |
| Idle* | (97) | 3 | Security Unlock | (F2) | 2 | Write DMA Queued | (CC) | 5 |
| Idle Immediate | (E1) | 3 | Seek | (7X) | 3 | Write Long (retry) | (32) | 2 |
| Idle Immediate* | (95) | 3 | Service | (A2) | 5 | Write Long (no retry) | (33) | 2 |
| Initialise Drive Parameters | (91) | 3 | Set Features | (EF) | 3 | Write Multiple | (C5) | 2 |
| Red Buffer | (E4) | 1 | Set Max LBA/CYL | (F9) | 3+ | Write Sectors (retry) | (30) | 2 |
| Read DMA (retry) | (C8) | 4 | Set Multiple | (C6) | 3 | Write Sectors (no retry) | (31) | 2 |
| Read DMA (no retry) | (C9) | 4 | Sleep | (E6) | 3 | | | |
| Read DMA Queued | (C7) | 5 | Sleep* | (99) | 3 | | | |
| Read Long (retry) | (22) | 1 | SMART Disable Operations | (BO) | 3 | | | |
| Read Long (no retry) | (23) | 1 | SMART Enable/Disable Attribute Autosave | (BO) | 3 | | | |
| Read Multiple | (C4) | 1 | SMART Enable Operations | (BO) | 3 | | | |
| Read Native Max LBA/CYL | (F8) | +3 | SMART Execute Off-line Data Collection | (BO) | 3 | | | |
| Read Sectors (retry) | (20) | 1 | SMART Read Attribute Values | (BO) | 1 | | | |
| Read Sectors (no retry) | (21) | 1 | SMART Read Attribute Threshold | (BO) | 1 | | | |
| | | | SMART Return Status | (BO) | 3 | | | |

(Protocol):

- 1 PIO data IN command
- 2 PIO data OUT command
- 3 Non data command
- 4 DMA command
- + Vendor specific command
- Alternate command codes for previous defined commands

Registers (Primary Channel Addresses)

| Address | Input Register | Output Register |
|---------|----------------------------------|----------------------------------|
| 1F0h | Data | Data |
| 1F1h | Error | Features |
| 1F2h | Sector Count | Sector Count |
| 1F3h | Sector Number *LBA bits 0-7 | Sector Number *LBA bits 0-7 |
| 1F4h | Cylinder Low *LBA bits 8-15 | Cylinder Low *LBA bits 8-15 |
| 1F5h | Cylinder High *LBA bits 16-23 | Cylinder High *LBA bits 16-23 |
| 1F6h | Drive/Head *LBA bits 24-27 | Drive/Head *LBA bits 24-27 |
| 1F7h | Status | Command |
| 3F6h | Alternate Status | Device Control |
| 3F7h | Drive Address | Not Used |

The host uses the register interface to communicate to and from the drive. The registers are accessed through the host port addresses shown. The host should not read or write any registers when the Status Register BSY bit = 1.

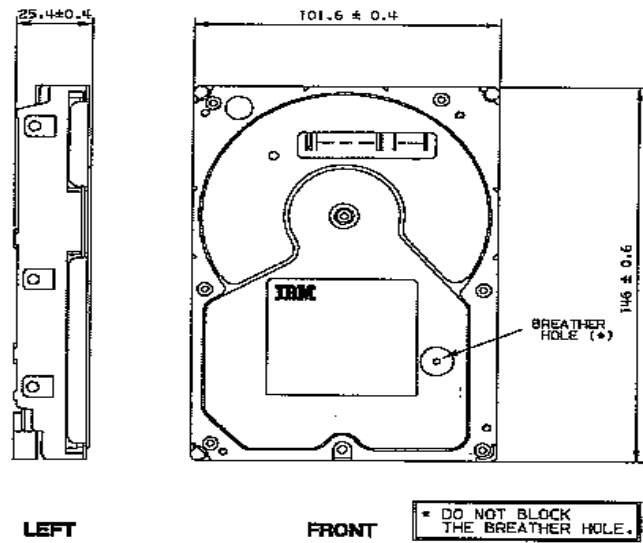
Note: * Meaning of Register contents when LBA addressing mode used.

Mechanical Data

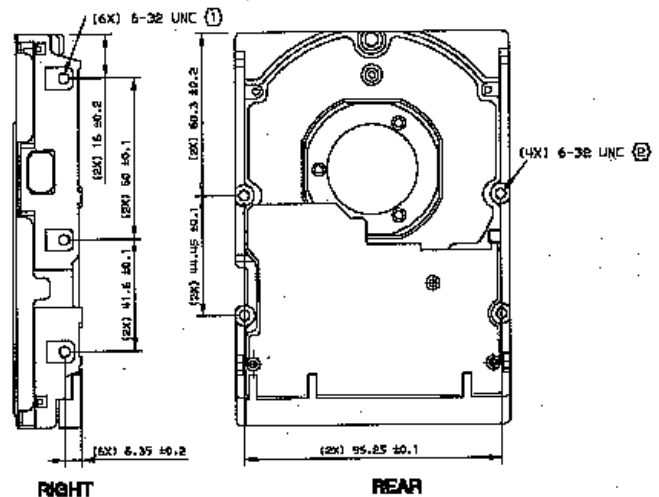
Dimensions

| | |
|-----------------|----------------|
| Height | 25.4 +/- 0.4mm |
| Width 0.4mm | 101.6 +/- |
| Length 0.6mm | 146.0 +/- |
| Weight | 630g maximum |

Outline Dimensions



Mounting Holes

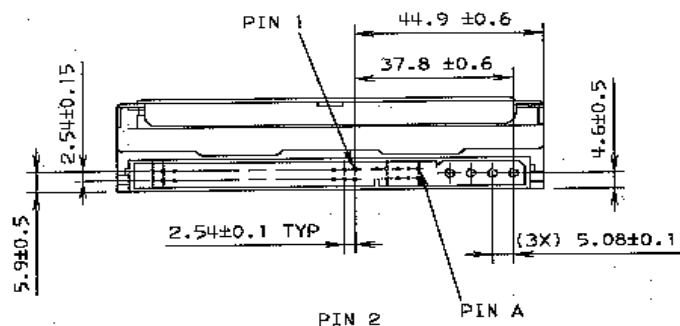


The recommended mounting screw torque is 0.6-1.0(NM) (6-10[Kgf.cm]).

¹ Max allowable penetration of noted screw to be 4.5mm

² Max allowable penetration of noted screw to be 4.0mm.

Connector Locations





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Storage Systems Division
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Japan Headquarters: (81) 466-45-1384

Asia-Pacific Headquarters: (65) 320-1503

Internet access at:
<http://www.ibm.com/storage/hddtech>

Registered in England: No. 741598

UK company-wide registration to ISO90001.
Certificate number FM12587.

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