IBM OEM STORAGE PRODUCTS
WDA L80 & L160

FEATURES

- 85/171MB formatted capacity (512 bytes/sector)
- AT standard interface- Integrated controller
- 1:1 interleave
- 1,7 Run-Length Limited (RLL) encoding
- 32KB Read Look-Ahead Buffer
- Self diagnostics on power up
- Automatic retry and data correction on read errors
- No preventative maintenance required
- Media data transfer rate: 13.3 Mbits/Sec
- Closed loop actuator servo (embedded sector servo)
- Rotary voice coil actuator
- Automatic actuator lock
- Dedicated head landing zone
- Average seek time = 16mS
- All axis (6 directions) mounting permitted
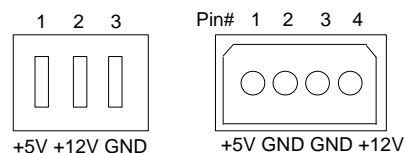
Performance

Media Read/Write
Data Transfer rate in Mbits/Sec.   13.3
Seek times (in mS, averaged & inc. settle)

	Read	Write
Track to Track	4.0	5.0
Average Length	16.0	18.5
Full Length	30.0	32.5

Spindle Speed   3600 RPM
Average Latency   8.33 mS
Power On to Drive Ready   10 Sec (ave), 31 Sec (max)
Power Off to Spindle Stop   6 Sec (ave), 12 Sec (max)

Connectors

There is a choice of 2 power connections to this drive. One DC power connector is designed to mate with AMP part 1-480424 (using AMP pins PN 350078-4). The other (3-pin) DC power

```
  1   2   3          Pin#  1   2    3   4
 ┌─────────┐        ┌──────────────────┐
 │ ▯  ▯  ▯ │        │   ○ ○ ○ ○        │
 └─────────┘        └──────────────────┘
 +5V +12V GND        +5V GND GND +12V
```

connector is designed to mate with MOLEX 5480-03 (using MOLEX pins 5479). Equivalent connectors may be used. Pin assignments are shown below, as viewed from the end of the drive.
 AT Signal Connector
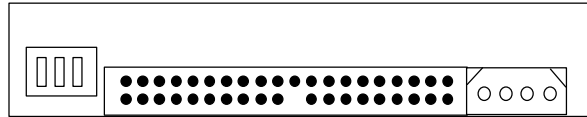
The drive uses single-ended drivers and receivers. The connector is designed to mate with 3M part 3417-7000 or equivalent.
    Note: It is indented that the hard disk drive should only be in electrical contact with the chassis of the PC at a designated set of mounting holes. Other electrical contact 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.
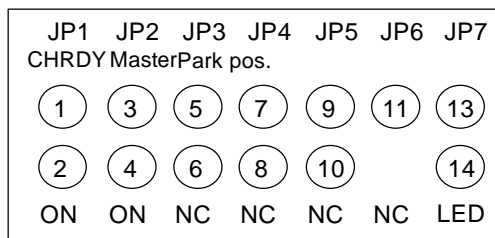
Option Block

Jumper Settings
Jumpers may be fitted to select the following options:

Pin Numbers

JP1	JP2	JP3	JP4	JP5	JP6	JP7
CHRDY	Master	Park pos.				
1	3	5	7	9	11	13
2	4	6	8	10		14
ON	ON	NC	NC	NC	NC	LED

IOCHRDY active   1-2
MASTER active   3-4
 (remove this jumper to make it a slave)
LED drive lines   13-14

 Shipping Default Settings

IOCHRDY is set to on (ie, jumper on pins 1-2)
Device ID is set to Master (ie, jumper on pins 3-4)
Note: LED connections, pin 13 can source up to 18mA. Pin 14 can sink up to 100mA.

Data Organization

Physical Layout	WDA-L80	WDA-L160
Bytes per Sector	512	512
Total Data Sectors	167301	334602
Total Data Bytes	85,658,112	171,316,224
BIOS Capacity of Drive (MB {sectors x 512})		
	*	*
Sectors per Track	44	44
Sectors per Cylinder	87	174
Spare Sectors per Cylinder	1	2
Numbers of Data Heads	2	4
Numbers of Disks	1	2

Logical Layout		
Logical Heads	10	10
Sectors/Track	17	34
Logical Cylinders	984	984

Operating Environment

Humidity
Operating Relative	8% to 90% noncondensing
Nonoperating Relative	5% to 95% noncondensing

Wet Bulb Temperature:
Maximum Wet Bulb:
Operating	29.4 degrees Centigrade non-condensing
Non-operating	35.0 degrees Centigrade non-condensing

Elevation:
Operating Altitude	-150 to 3000m
Ship/Storage Altitude	-150 to 12000m

Temperature:
Operating	5 to 55 degrees Centigrade
Storage	-40 to 65 degrees Centigrade
Shipping	-40 to 65 degrees Centigrade
Temperature Gradient	15 degrees Centigrade per hour (maximum)

 (Operating, Storage and Shipping)

Air Cooling Requirement
The host system must provide sufficient air flow across the drive to maintain the temperature at less than 60 degrees Centigrade (measured at the center of the drives' top cover).

Operating Vibration
Due to the complexity of this subject, we recommend that users contact the Distributor to discuss how to perform the necessary measurements if they believe this to be an area which requires evaluation.

Nonoperating Vibration
The Drive will withstand the following continuous vibration levels with no degradation in performance: 2 - 200Hz @ 0.5G peak acceleration (for a resonance search). Resonance points: 1.5G peak acceleration (for 15 minutes).

Operating Shock
The Drive will withstand (with no permanent damage or loss of data) a 10G half-sine wave shock pulse of 11mS duration.

Nonoperating Shock
The Drive will withstand (with no permanent damage or loss of data) a 75G half-sine wave shock pulse of 11mS duration.

DC Power Requirements

Nominal Supply Voltages	+5 Volts	+12 Volts
Maximum Ripple (0-10 MHz)	100mV p-p	200mV p-p
Voltage Supply Tolerance (Including Ripple)	+/-5%	+10%/-8%
Power Supply Current Amps	+5 Volts	+12 Volts
* Startpeak	0.5	0.93
* Idle Average	0.3	0.12 (WD-L80)
		0.13 (WD-L160)
* Random R/W	0.3	0.14 (WD-L80)
		0.15 (WD-L160)

Random R/W = 40% random seek +40% read/write (1 write in 10 reads) +20% idle

Signal Definition
The pin assignments of interface signal are listed as follows:

PIN	Signal	I/O	PIN	Signal	I/O
01	-HRESET	I	02	GND	
03	HD07	I/O	04	HD08	I/O

05	HD06	I/O	06	HD09	I/O
07	HD05	I/O	08	HD10	I/O
09	HD04	I/O	10	HD11	I/O
11	HD03	I/O	12	HD12	I/O
13	HD02	I/O	14	HD13	I/O
15	HD01	I/O	16	HD14	I/O
17	HD00	I/O	18	HD15	I/0
19	GND		(20)	Key	
21	(Resv)		22	GND	
23	-HIOW	I	24	GND	
25	-HIOR	I	26	GND	
27	IORDY	O	28	(Resv)	
29	(Resv)		30	GND	
31	HIRQ	O	32	-HIOCS16	O
33	HA01	I	34	-PDIAG	I/O
35	HA00	I	36	HA02	I
37	-HCSO	I	38	-HCS1	I
39	-DASP	I/O	40	GND	

Note:
"O" designates an output from the Drive. "I" designates an input to the Drive.
"I/O" designates an input/output common.
"PWR" designates a power supply to the Drive.
"(Resv)" designates reserved pins and all of these have to be left unconnected.

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).

Interface

This data sheet describes some aspects of the host interface to ATA drives. The interface conforms to the CAM draft proposal for an AT attachment with certain limitations described below.

Automatic Power-Down Sequence
A hard reset will disable the automatic power-down sequence.

Format Track Alternate Sectors
The Drive does not support alternate sector locations and will ignore any descriptors whose values are 20h (Unassign Alternate Sector) or 40h (Assign Alternate Sector), without returning an error.

Format Track Interleave Factor

The Drive only supports an interleave factor of 1:1, and may ignore any other specified interleave, without returning an error.

Format Track Sector Count
The drive will return an Abort error if the specified sector count is not the same as the number of sectors per track designated by the drive in the Initialize Drive Parameters command, or default setting as reported by Identify Drive command.

Format Track Sector Number
The drive will return an Abort error if any sector number in the format table is zero or greater than the actual number of sectors per track, or the same sector number is used more than once in the format table. The drive always operates with sectors numbered consecutively between one and the number of sectors per track.

Initialize Drive Parameters
The parameters specified in the Initialize Drive Parameters command are only in effect until the next power off, soft reset, or hard reset operation. Afterwards, the default parameters in the Identify Drive information will be in effect.

Seek Overlap
The drive will wait for the seek to complete before interrupting the host. Therefore, no seek overlap can occur. This will be transparent to the host except that performance may be degraded in certain environments where the host could perform other work while waiting for seek complete, such as multitasking operating systems.

Registers

Address	Input Register	Output Register
1F0h	Data	Data
1F1h	Error	Features
1F2h	Sector Count	Sector Count
1F3h	Sector Number	Sector Number
1F4h	Cylinder Low	Cylinder Low
1F5h	Cylinder High	Cylinder High
1F6h	Drive/Head	Drive/Head
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.

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 Communication Commission (FCC) Rules and   Regulations, Part 15, SubjectJ--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 (GOP).

Command Description

The following Commands are supported by the Drive:

Data In Commands	*(HEX)*
Identify Drive	(EC)
Read Buffer	(E4)
Read Long (& retry)	(22)
Read Long (no retry)	(23)
Read Multiple	(C4)
Read Sectors (& retry)	(20)
Read Sectors (no retry)	(21)

| *Data Out Commands*	*(HEX)*
Format	(50)
Write Buffer	(E8)
Write Long (& retry)	(32)
Write Long (no retry)	(33)
Write Multiple	(C5)
Write Sectors (& retry)	(30)
Write Sectors (no retry)	(31)
Write Verify	(3C)

Execution includes the transfer of one or more 512 byte sectors of data (>512 bytes for Read Long) from the Drive to the Host for Data In and from the Host to the Drive for Data Out commands.
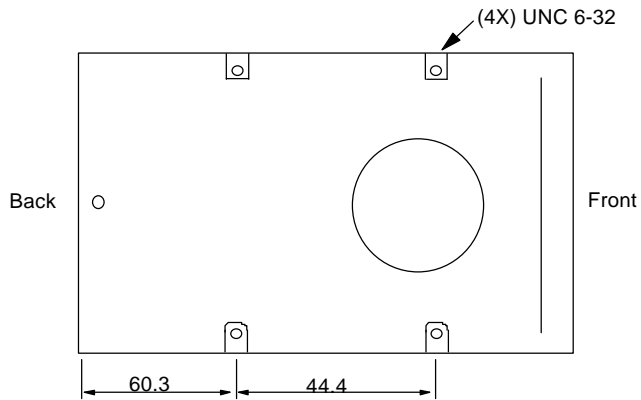
Nondata Commands	
Read Verify Sectors (& retry)	(40)
Read Verify Sectors (no retry)	(41)
Seek	(7X)
Set Multiple	(C6)
Execute Drive Diagnostics	(90)
Initialize Drive Parameters	(91)

Set Features   (EF)
Recalibrate   (1X)
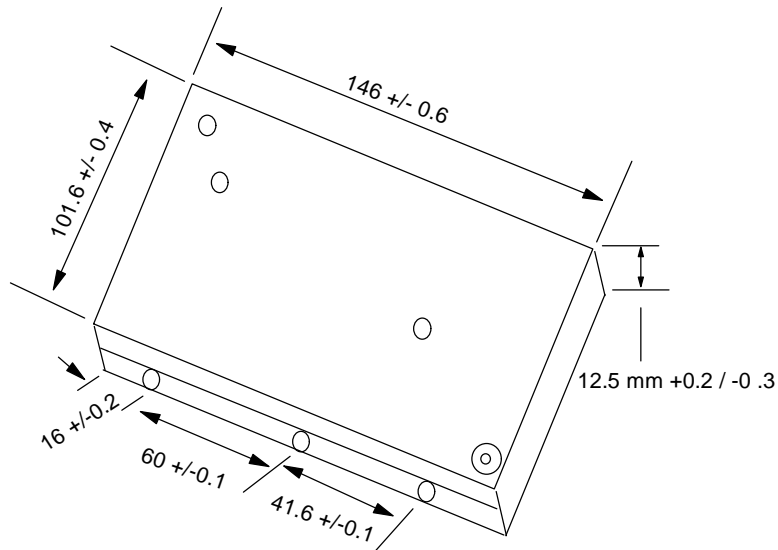
Execution of these commands involves no data transfer.

Mechanical Data

Dimensions
Height   19.9 +/-0.4mm
Width   101.6+/-0.4mm
Depth   146.0+/-0.6mm
Weight   410g maximum

Mounting Orientation:
The drive can be mounted in any axis (6 directions).

Note: Maximum screw lengths must not be exceeded.

WARNING:
This disk drive can be damaged by Electrostatic Discharge; please follow recommended ESD procedures before unpacking or handling the drive. Ask your Dealer for details if you need assistance.

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 antistatic 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.

This data sheet is not a substitute for the full product specification which should be used when detailed information is required.
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