IDE 3000 2.5” Flash Disk

Solid State IDE Drive

M-Systems
Flash Disk Pioneers

Highlights

M-Systems’ IDE 3000 2.5” is a solid-state IDE drive family based on nonvolatile NAND flash technology. The IDE 3000 2.5” family is a rugged flash disk solution designed as a drop-in replacement for mechanical HDDs when high reliability is a primary concern.

Scope

This product specification defines the performance, design, manufacturing and acceptance requirements of the IDE 3000 2.5” flash disk.

Features

The IDE 3000 2.5” drive family offers the following benefits:

- Capacities ranging from 16MB to 1GB
- Solid state: no moving parts
- 2.5" form factor with a height of 6 mm/0.25"
- Interface transfer rate of 16.6MB/s (PIO mode 4)
- Low power consumption (0.05W to 0.9W)
- MTBF 1,000,000 Power-on hours (typical)
- ATA compliance

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1. Specifications

1.1 Critical Item Definition

The dimensions of the IDE 3000 2.5" flash disk enable mounting it in a standard 2.5" disk drive bay.

1.1.1 Interface Definition

The IDE 3000 2.5" drive family supports the full range of commands listed in Section 4, in compliance with ATA4 standards.

1.2 Characteristics

1.2.1 IDE Transfer Modes

The IDE 3000 2.5" flash disk supports the following transfer modes:

- PIO modes 0 through 4

1.2.2 Performance

The IDE 3000 2.5" complies with the performance requirements, as illustrated in Table 1.

Table 1: IDE 3000 2.5" Maximum Transfer Rates

Operation	Host Interface Maximum Transfer Rate (MB/sec)	Sustained Rate (MB/sec)
Read	8	2.4
Write	8	2.4

Performance was measured on a computer with the following configuration:

- Pentium 133 processor
- DOS
- IDE Transfer Mode: PIO mode 4

To measure IDE 3000 2.5" performance, an IDE bus monitor was attached to the IDE bus. The read and write operations were recorded, and performance was calculated offline according to the following formula:

$$\text{Write/Read\_rate} = \frac{Number\_of\_blocks\_\times\_sector\_size}{Command\_complete\_time\_-\_selection\_time}$$

1.2.3 Access Time

Standby to active (typical.): 2.5 msec

1.2.4 Seek Time

Maximum track-to-track seek time: <0.1 msec

1.2.5 Current Consumption

The current consumption is measured at input voltage of +5 VDC, with a tolerance of ±10%.

Table 2: IDE 3000 2.5" Input Current Consumption

Function	Current (max) mA DC
Read	55
Write	55
Sleep/Standby	N/A

1.2.6 Memory Capacity

Table 3 describes the different densities of the IDE 3000 2.5", along with internal data storage specifications.

Table 3: IDE 3000 2.5" Flash Disk Capacities

Unformatted Disk Capacity (MB)	Formatted Disk Capacity (number of sectors)	Cylinders	Heads	Sector/Cylinder	Bytes/Sector
16	31,104	243	4	32	512
32	62,336	487	4	32	512
48	94,080	735	4	32	512
64	125,184	978	4	32	512
80	156,160	610	8	32	512
96	187,904	734	8	32	512
128	250,368	978	8	32	512
192	377,856	738	16	32	512
256	503,808	984	16	32	512
320	628,992	624	16	63	512
384	754,992	749	16	63	512
512	1,001,952	994	16	63	512
640	1,258,992	1249	16	63	512
768	1,510,992	1499	16	63	512
896	1,762,992	1749	16	63	512
1024	2,014,992	1999	16	63	512

1.2.7 Endurance

The IDE 3000 2.5" can typically undergo 1 million erase and program cycles, and an unlimited number of read cycles over the entire media.

1.2.8 Physical Characteristics

Weight

The weight of the IDE 3000 2.5” complies with the values defined in Table 4.

Table 4: IDE 3000 2.5” Assembly Weight

Memory Capacity	2.5” Maximum Weight in g/oz
1024MB	78/2.753

Dimensions

Table 5 describes the nominal dimensions of the IDE 3000 2.5”. Refer to Figure 1 for detailed mounting configuration dimensions.

Table 5: 2.5” Nominal Dimensions

Dimensions	IDE 3000 2.5”	
Height	0.25 in	6 mm
Width	2.75 in	69.85 mm
Depth	3.945 in	100.20 mm

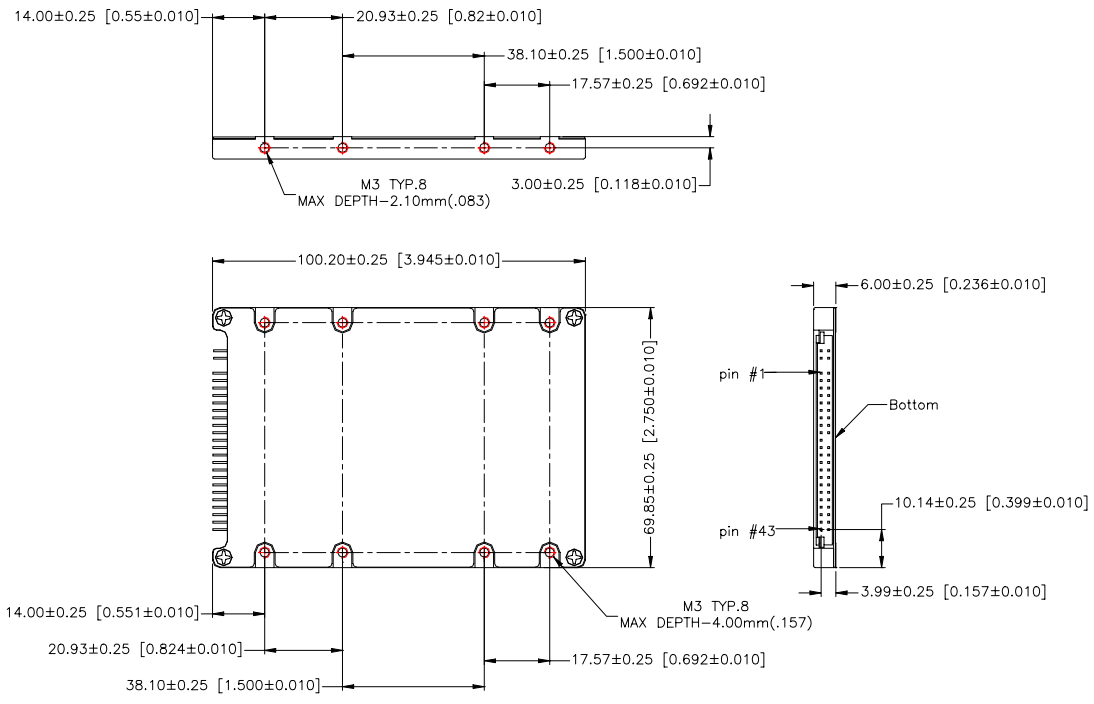

Figure 1: IDE 3000 2.5” Assembly

Connector Interface

The pinout for the IDE 3000 2.5" interface connector is detailed in Table 6, Table 7 and Figure 2.

Table 6: J1 Pin Assignment

Pin Number	Signal Name	Pin Number	Signal Name
1	RESET-	2	GND
3	HD7	4	HD8
5	HD6	6	HD9
7	HD5	8	HD10
9	HD4	10	HD11
11	HD3	12	HD12
13	HD2	14	HD13
15	HD1	16	HD14
17	HD0	18	HD15
19	GND	20	KEY
21	N.C.	22	GND
23	HIOW-	24	GND
25	HIOR-	26	GND
27	IORDY	28	CSEL
29	N.C.	30	GND
31	INTRQ	32	IOCS16-
33	HA1	34	PDIAG-
35	HA0	36	HA2
37	CS0-	38	CS1-
39	DASP-	40	GND
41	VCC	42	VCC
43	GND	44	RSVD

Table 7: J2 Pin Assignment for 2.5" Format

Pin Number	Signal Name	Pin Number	Signal Name
47	Master/Slave	48	Master/Slave
49	Master/Slave	50	Master/Slave

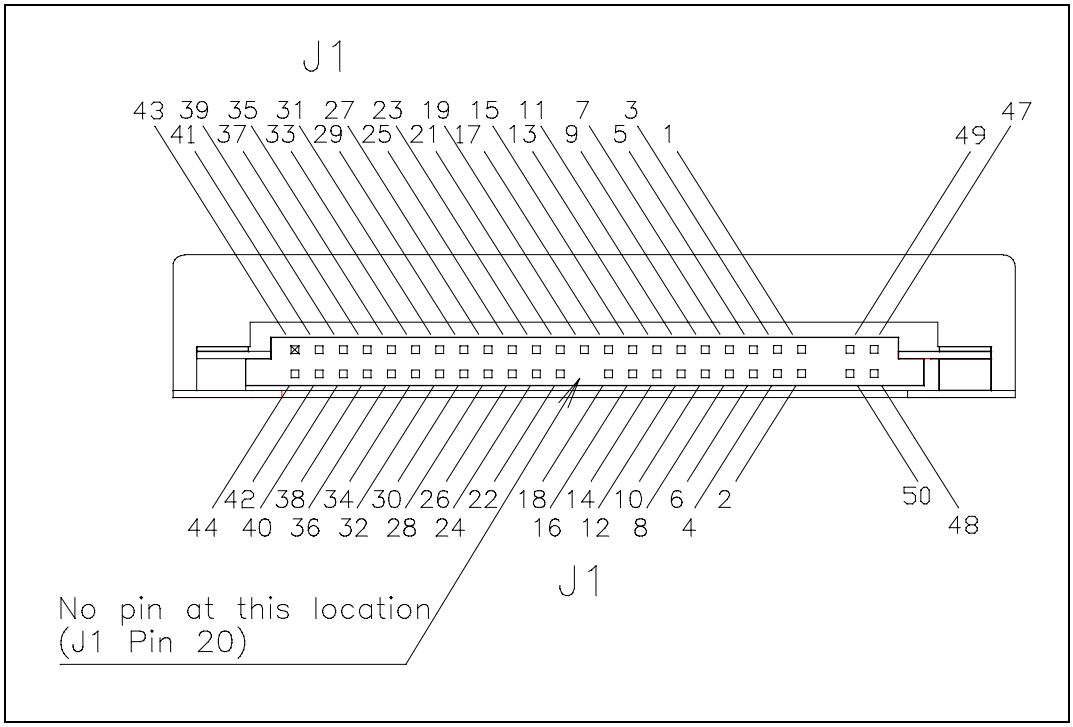

Figure 2: IDE 3000 2.5" Pin Configuration

1.3 Environmental Conditions

The IDE 3000 2.5" meets the performance requirements specified below, after exposure to non-operating environmental conditions, or during and after exposure to operating environmental conditions.

1.3.1 Temperature

Operating

The IDE 3000 2.5" operates without degradation at a pressure of 1 atm over the following ambient temperature range:

- **Commercial temperature version**: 0°C to +70°C
- **Extended temperature version**: -40°C to +85°C

The maximum temperature change rate shall not exceed 5°C per minute.

Non-Operating

The IDE 3000 2.5" commercial temperature version meets the performance requirements specified in this document after having been tested via exposure to a nominal ambient temperature of -40°C for not less than 3 days, and +85°C for a period of not less than 6 hours.

The maximum temperature change rate shall not exceed 5°C per minute.

Airflow Requirements

General airflow guideline: 3-5 cu.feet/min.

1.3.2 Altitude

The IDE 3000 2.5” sustains full operation at altitudes ranging from sea level to 50,000 feet above sea level. It is also capable of full operation during air transportation via non-pressurized flights at altitudes greater than 50,000 feet above sea level.

1.3.3 Relative Humidity

The IDE 3000 2.5” withstands conditions of 8% to 95% non-condensing relative humidity (operation and non-operation).

1.3.4 Shock

The IDE 3000 2.5” sustains full operation after being subjected to 1000 G shock testing in the vertical axis.

1.3.5 Vibration

The IDE 3000 2.5” remains operable without degradation when subjected to 15 G vibration testing.

1.3.6 Storage Life

The IDE 3000 2.5” can be placed in non-operational storage, in shipping containers or crates, for a period of up to 3 years without its capabilities being permanently affected.

2. IDE 3000 2.5” Drive Configuration

The IDE 3000 2.5” must be configured as shown in Figure 3 before being mounted in the system’s drive bay.

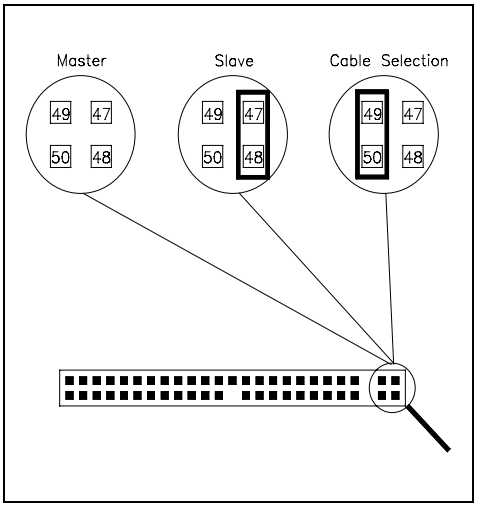

Figure 3: IDE 3000 2.5” Disk Address Setting by Jumper

3. Interface Connectors

The IDE 3000 2.5” has a 2-mm pitch interface connector located on the rear panel. It accesses the DC power source and the IDE bus through a non-shielded 44-pin flat cable. Figure 4 provides an example of a connector that can be used to interface with this connector, but any compatible connectors may be used.

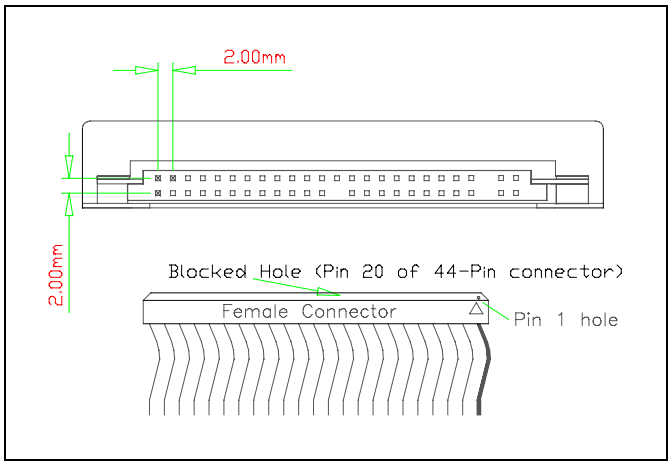

Figure 4: IDE 3000 2.5” Interface Connector

In order to prevent damage to the disk by connecting the cable with a 180º rotation, ensure that the special plastic key at pin 20 mating connector is blocked, as shown in Figure 4. This key should be ordered from the connector manufacturer.

IDE Cable

The cable length should not exceed 18 in.

4. Supported IDE Commands

The IDE 3000 2.5" supports the commands listed in Table 8.

Table 8: IDE Commands

Command Name	Command Code
CHECK POWER MODE	98h E5h
EXECUTE DEVICE DIAGNOSTIC	90h
FORMAT TRACK	50h
IDENTIFY DEVICE	Ech
IDLE	97h E3h
IDLE IMMEDIATE	95h E1h
INITIALIZE DEVICE PARAMETERS	91h
READ BUFFER	E4h
READ MULTIPLE	C4h
READ SECTOR(S) (with retry)	20h
READ SECTOR(S) (without retry)	21h
READ LONG	22h 23h
READ VERIFY SECTOR(S) (with retry)	40h
READ VERIFY SECTOR(S) (without retry)	41h
RECALIBRATE	10h
SECURITY DISABLE PASSWORD	F6h
SEEK	70h
SET FEATURES	Efh
SET MULTIPLE MODE	C6h
SLEEP	99h E6h
STANDBY	96h E2h
STANDBY IMMEDIATE	94h E0h
WRITE BUFFER	E8h
WRITE MULTIPLE	C5h
WRITE SECTOR(S) (with retry)	30h
WRITE SECTOR(S) (without retry)	31h
WRITE LONG	32h 33h
NOP	FFh

5. CE and FCC Compatibility

The IDE 3000 2.5” conforms to CE requirements, and FCC standards.

6. Label Information

The outside label contains the following information (see Figure 5):

1. M-Systems logo in the lower left corner
2. Unformatted-capacity value in the center
3. Declaration (Made In Israel) along the right edge
4. CE and FCC logos in the upper left corner
5. Ordering Info (written ordering info will be printed in the upper right corner after production)
6. Part number (written number and bar code to be printed in the upper right corner after production)
7. Serial number, including date code (written number and bar code to be printed in the upper right corner after production)
8. ESD warning logo and statement in the lower right corner

Figure 5: Outside Label

7. Ordering Information

Ordering Information: IDE-25-CCCC-S-T

Where:

CCCC:	Capacity (MB)	16, 32, 64, 80, 96, 128, 192, 256, 320, 384, 512, 640, 768, 896, and 1024	
S:	Revision		
T:	Temperature Range	Blank	Commercial: 0°C to +70°C
		X	Extended: -40°C to +85°C

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