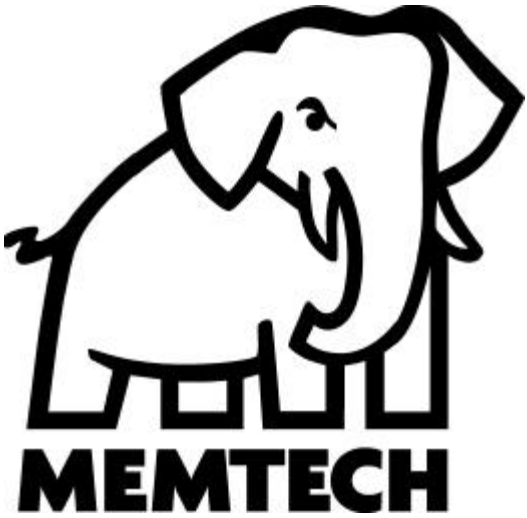

AT2520 2.5” Rocket
2.5” IDE Solid State Flash Drive

User Guide

153860-001
Revision 1.1
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1. HIGHLIGHTS

- 3Gbyte uncompressed capacity
- Full -40°C to +85°C operating temperature range
- 5 volt, low power operation
- Kicker™ Hold Up Technology
- Completely solid state - no moving parts and no batteries
- Extremely Rugged - 1000G operating shock, 15G operating vibration
- 2.5" drive form factor with a 44 pin, 2mm IDE interface
- 24 bit ECC for exceptional data reliability
- 4.0 Mbyte/second media transfer rate
- 1.7 Mbyte/secon sustained Read throughput
- 1.0 Mbyte/second sustained Write throughput
- Nonvolatile NAND E^2PROM with 10 year data retention
- Pending EMC and CSA Safety Compliance

2. INTRODUCTION

The AT2520 Rocket is the most cost effective 2.5" IDE drive available today. With a maximum capacity of 3 Gbyte in an extremely compact 2.5" drive form-factor, it delivers exceptional value for its features. It is completely solid state, with no moving parts. This accounts for the unit's exceptional ruggedness and wide operating temperature range.

The AT2520 employs sector erasable NAND E^2PROMs (Flash) to deliver up to 3 Gbytes of uncompressed, non-volatile solid state storage in an extremely small, rugged form factor. Raw sustained data throughput is a 1.7 Mbytes per seconds for reads and 1.0 Mbytes/second for writes. The drive is 100% IDE compatible and requires no special drivers to operate. It is essentially a drop in replacement for standard rotating media.

The IDE interface is implemented using an application specific IDE Flash controller with an integrated 24-bit Reed-Solomon error detection and on-the-fly correction mechanism that enhance data reliability. The ECC circuitry, in conjunction with the controller's remapping algorithms, makes for a virtually bulletproof medium for data retention.

The drive is available in a number of standard capacities ranging from 64 Mbytes to 3 Gbytes. Please contact the factory with your capacity requirements. Disk compression utilities may be used to effectively double the usable capacity of the drive.

Each drive is fully tested under environmental and voltage extremes, to guarantee data integrity in even the harshest conditions.

3. INSTALLATION

3.1 PROCEDURE

3.1.1 ESD PRECAUTIONS

Static electricity kills... electronics! Before handling the AT2520, please observe the following precautions to avoid ESD damage to the unit:

- Keep the drive in its shielded bag until ready to install.
- Ground yourself by touching a grounded chassis frame of the computer, or use a grounded wrist strap before and during the installation process.
- Do not touch the exposed drive electronics or connectors. Always handle the drive by the edges or mounting rails.

3.1.2 CONFIGURATION

Configure the drive using the jumper diagrams given in Section 3.2. The drive is shipped configured for a single drive system or as the master in a two-drive system. Change the configuration as required. Never attempt to change the jumpers while the drive is plugged in and the computer is on.

3.1.3 CONNECTOR

The drive may be interfaced directly to a standard 2.5" 2mm IDE socket connector, a standard 2.5" IDE ribbon cable, or through a 3.5" IDE to 2.5" adapter or interposer for prototyping purposes. See drawing below for pin 1 orientation and alignment. Care should be taken when installing the AT2520 into the system, as misalignment can permanently damage the drive interface connector or electronics. A separate power cable is not required as the 2mm socket or ribbon cable connector supplies power.

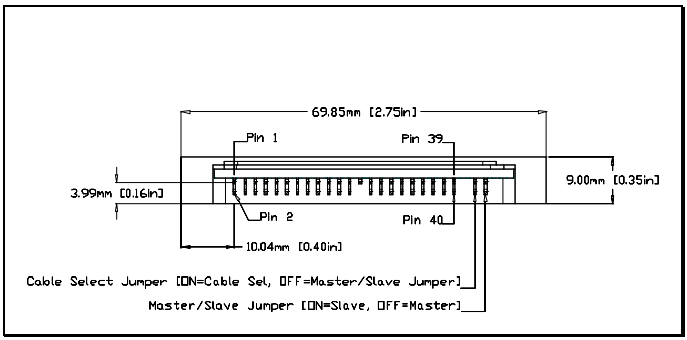


Figure 1 - Drive Connector

3.1.4 MOUNTING

The AT2520 may be mounted in any orientation. Eight bottom and eight side mounting holes are available for installation. The mounting holes require metric M3 screws with a maximum depth of 5mm.

The diagram given below is valid for all capacities of the AT2520 drive. The outline dimensions are 2.75" (69.85 mm) wide, 3.94" (100.2mm) long, and 0.35" (9.0mm) tall. Please refer to the following drawing for dimensions and mounting hole locations.

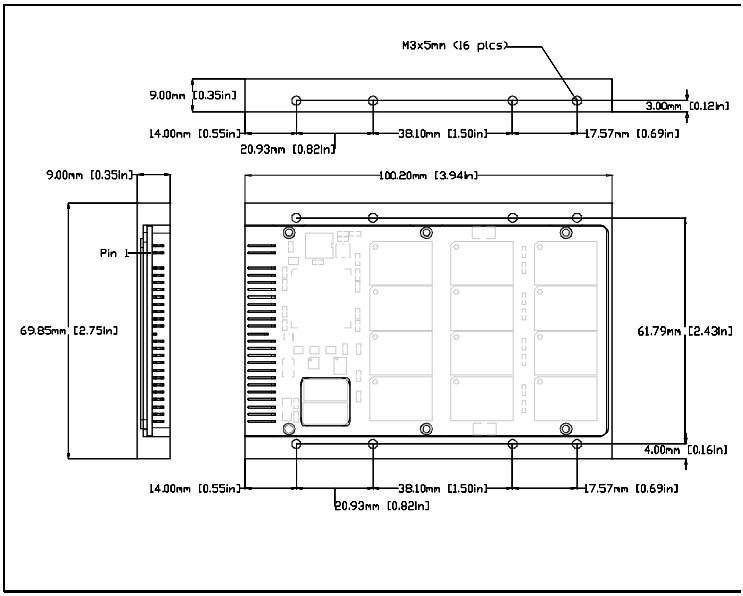


Figure 2 - Mechanical Dimensions

3.1.5 COMPUTER SETUP

To be recognized by the computer, the drive translation information must typically be entered into the System Setup or CMOS Setup utility. For non-PC compatible computers, this may not apply. The AT2520 supports automatic configuration if offered by the BIOS. If the drive configuration must be manually entered, select drive type 47 or type USER and use the table below to determine proper setup parameters. Automatic CHS translation and LBA mode is supported. Note that a MB is equal to 1024*1024 bytes.

Drive Type	Physical Capacity	Cylinders	Heads	Sectors	Available Capacity
AT2520-64	64 MB	245	16	32	64 MB
AT2520-128	128 MB	490	16	32	128 MB
AT2520-256	256 MB	980	16	32	245 MB
AT2520-512	512 MB	1960	16	32	502 MB
AT2520-768	768 MB	3360	14	32	752 MB
AT2520-1024	1.0 GB	3920	14	32	1004 MB
AT2520-1536	1.5 GB	5880	16	32	1505 MB
AT2520-2048	2.0 GB	7840	16	32	2007 MB
AT2520-2560	2.5 GB	9800	16	32	2508 MB
AT2520-3072	3.0 MB	11760	16	32	3010 MB

3.1.6 PARTITION

The drive must be partitioned using the system's FDISK utility. For operating systems other than DOS, please refer to your OS operating guides. Note that changing the partition information will erase all data currently on the drive. Refer to your OS manual for information regarding partitioning a hard disk.

3.1.7 FORMAT

The AT2520 is low-level formatted at the factory, which establishes the 512 byte sector size. A high-level format is required after the partition has been established on the drive. Refer to your OS manual for information regarding hard disk drive format procedures.

3.2 JUMPERS

The following diagram illustrates the location of the drive selection jumper on the AT2520. The jumper controls the master/slave configuration and cable select. The jumper required is a 2-pin vertical header on 2mm centers.

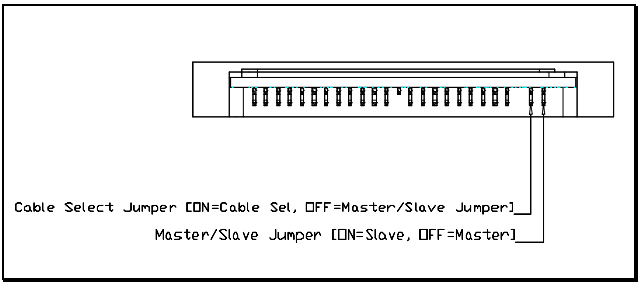
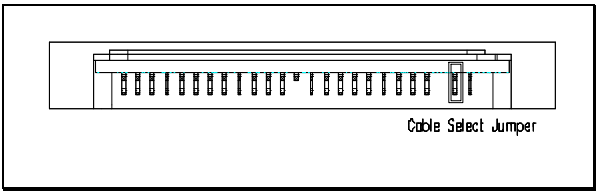


Figure 3 - Configuration Jumpers

CABLE SELECT

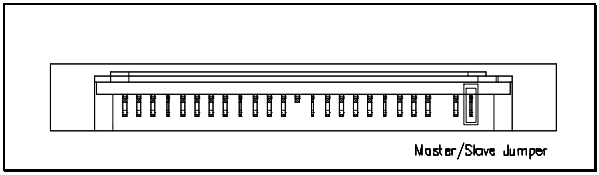


The Cable Select jumper allows the drive to be configured through the IDE cable. A maximum of two drives may only be connected to one standard IDE cable. Connecting the drive to the end of the cable configures the drive to be a Master (drive C:) and connecting the drive to

the middle connector of the cable configures the drive for a Slave (drive D:).

Leaving the pins open configures the drive to use the Master/Slave jumper for drive configuration.

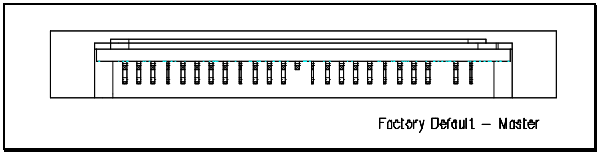
MASTER/SLAVE



The Master/Slave jumper allows the drive to be configured as either Master (drive C:) or Slave (drive D:).

Leaving the pins open configures the drive as the master or drive C:.

FACTORY DEFAULTS



The factory default configuration is set to Master or drive C:. No jumpers are installed.

3.3 IDE INTERFACE

The AT2520 uses a 44-pin 2mm connector mounted on the PCB to create both a power and signal connection to the host. Maximum cable length is 18 inches. Recommended cable length is 12 inches or less, especially if advanced PIO transfer modes are used.

3.3.1 IDE ADAPTER

An adapter or interposer, converting the 2mm IDE connector to a standard 40 pin 0.100" IDE connector is available from the factory. Order part number 153264-002. The adapter converts the signals from the 2mm connector on the drive to a 0.100" connector. Power arrives via a 4-pin Amp power header (EI series) identical to the connector used to supply power to 3.5-inch floppy drives. To convert the 4-pin Amp power connector to a standard 4-pin AT power connector, an ATA power cable adapter, part number 153273-002, is included.

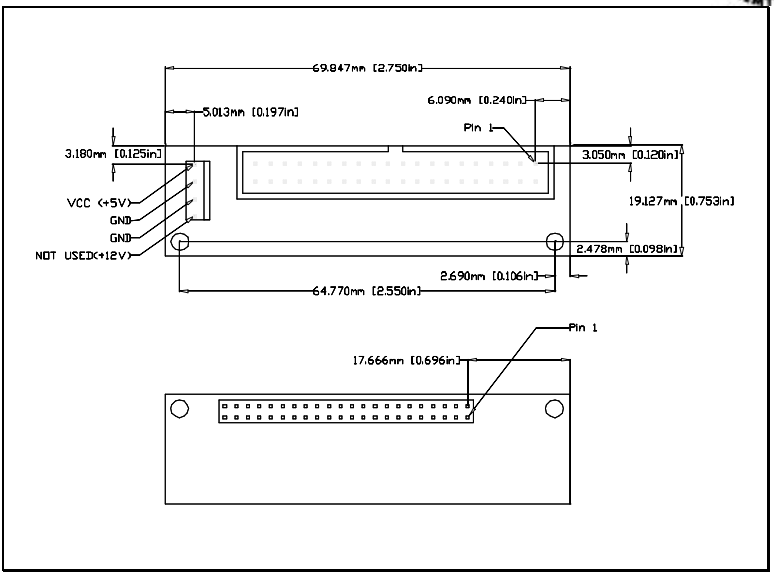


Figure 4 - IDE Adapter Board

3.3.2 IDE CONNECTOR PINOUT

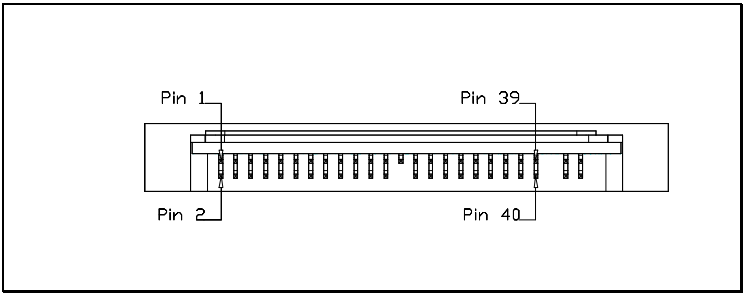


Figure 5 - IDE Connector

The following table depicts the 44-pin, 2mm-signal cable interface pinout.

PIN	SIGNAL	PIN	SIGNAL
1	RESET-	2	GND
3	DATA7	4	DATA8
5	DATA6	6	DATA9
7	DATA5	8	DATA10
9	DATA4	10	DATA11
11	DATA3	12	DATA12
13	DATA2	14	DATA13
15	DATA1	16	DATA14
17	DATA0	18	DATA15
19	GND	20	KEY (NO PIN)
21	NU	22	GND
23	IOW-	24	GND
25	IOR-	26	GND
27	IOCHRDY	28	CSEL
29	NU	30	GND
31	IRQ	32	IOCS16-
33	ADDR1	34	PDIAG-
35	ADDR0	36	ADDR2
37	CS0-	38	CS1-
39	DASP-	40	GND
41	+5VOLTS	42	+5VOLTS
43	GND	44	RESERVED

4. OPERATION

4.1 ECC

The IDE controller implements a 24-bit Reed-Solomon ECC polynomial for each sector on the drive. It is capable of correcting all single bit read errors, and detecting 2-bit errors. Error rate is $1/10^{15}$ bits read.

4.2 MTBF

The MTBF can be logically calculated in hours using the following formula.

$$MTBF = \frac{\#\ Flash\ Chips * \#\ Blocks * Re\text{-}programming\ Cycles * Area\ Rate}{Average\ Programming\ Sectors\ per\ hour\ (1\ sector = 512\ bytes)}$$

Note: The program area is the area that is not changed once it has been programmed. The remainder of the drive is thus considered "Reprogrammable". In the case where 32 Kbytes (64 sectors) are written every 5 minutes into an area occupying 30% of a 48 MB disk (64 Mbit x 6 chips), the MTBF is calculated as shown below:

MTBF = (6*1024*1,000,000*0.3)/(64*12)
= 2.4 million hours

4.3 POWER

4.3.1 POWER DOWN

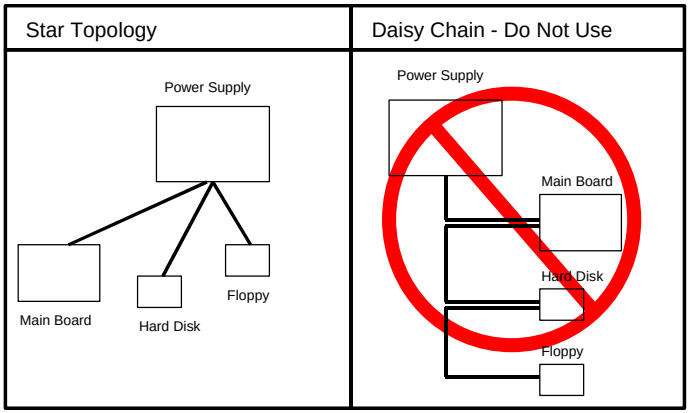
If the Kicker™ hold-up circuit is not installed, do not power down the computer during a write command sequence to any mass storage device. This includes during the normal operation of the drive, and with the use of disk cache programs such as Microsoft® SmartDrive. If a write routine must interrupted, use the push button reset or a soft reset. Powering down an AT2520 while it is being written without the Kicker™ Holdup Circuit may cause an incomplete write sequence, and leave as many as 32 sectors with an Address Mark Found Error or Uncorrectable Errors. DOS will report these with a message "Error Reading Drive X:", with X: being the AT2520 drive.

4.3.2 POWER SUPPLY

The AT2520 voltage requirement is specified at +5 volts, +/- 10% on the drive itself. Operation outside of these limits is not guaranteed. Note that the drive will "operate" down to 4.0 volts, but reliability issues such as Uncorrectable Errors or invalid data reads may occur. An on board voltage monitor will inhibit writes when the supply voltage falls below 3 volts, thus preserving data integrity on the drive.

4.3.3 POWER ROUTING

Bad power can lead to bad data. To avoid “glitches” or noise on the Vcc and ground lines, power in the system should be routed so that all peripherals are sourced from the power supply in a star configuration, as opposed to routing a single continuous supply line to each device in the system. Routing power in the star configuration, as is done on most desktop PCs, will minimize the effect on one device’s current draw on another device. This is key to maintaining data integrity on the AT2520. See diagrams below.



5. MAINTENANCE

No maintenance is required during the normal use of this drive.

If data is to be archived for long periods of time (> 10 years), it is recommended that the data on the drive be refreshed every 5 to 10 years. The manufacturer of the NAND E^2PROM devices will only guarantee data integrity for a period of 10 years. Programs such as Norton Speedisk©, which reallocates all sectors on the drive, or Microsoft® Scandisk, which writes and reads every sector on the disk during its surface test, achieve this end very well.

6. SPECIFICATIONS

6.1 INTERFACE

IDE Compatibility	X3T10 2008D, Rev. 6
IDE Drive Number	Drive 0 or 1
Physical Capacity	64 Mbytes to 3Gbytes
Physical Sector Size	512 bytes

6.2 PERFORMANCE

Average Access	30 ms
Track/Track Access	0.3 ms
Media Transfer Rate	4.0 Mbytes/sec
Read Transfer Rate	1.7 Mbytes/sec sustained
Write Transfer Rate	1.0 Mbytes/sec sustained

6.3 ENVIRONMENTAL

Commercial Temperature Range	
Operating	0^{o} to 70^{o} C
Storage	-45^{o}C to 125^{o} C
Extended Temperature Range	
Operating	-20^{o}C to 75^{o}C
Storage	-45^{o}C to 125^{o} C
Industrial Temperature Range	
Operating	-40^{o} to 85^{o} C
Storage	-55^{o} to 125^{o} C
Shock - operating	1000G Operating (target)
Vibration - operating	15G Random (target)
Airflow	None required
Humidity	5% to 95% NC (target)

6.4 POWER REQUIREMENTS

Voltage	5V +/- 10%
Current	AT2520-3072
Idle	5 mA
Read	33 mA
Write	40 mA

6.5 MECHANICAL

Length	3.94 inches (102.00 mm)
Width	2.75 inches (69.85 mm)
Height	0.35 inches (9.00 mm)
Cable Interface	44-pin, 2mm
Max. Cable Length	18 inches (457 mm)
Rec. Cable Length	12 inches (305 mm)
Weight (128 Mbytes)	2.6 oz (74 g)
(3 Gbytes)	3.0 oz (84 g)

7. APPENDIX

7.1 CONTACT INFORMATION

For Technical Support or Warranty Repair information, please contact Memtech at:

Memtech SSD Corporation
7628 Las Positas Road
Livermore, CA U.S.A. 94550
phone: (925) 294-8483 or (800) 445-5511
fax: (925) 294-5920

7.2 ATA SPECIFICATION INFORMATION

Information regarding the ATA-3 specification may be obtained from the following locations:

AT-Attachment Document Distribution
Global Engineering
15 Inverness Way East
Englewood, Co. 80112-5704
Phone: (303) 792-2181 or (800) 854-7179
Fax: (303) 792-2192

ATA Anonymous FTP Site
fission.dt.wdc.com
ATA3 directory is: "/pub/standards/ata/ata-3"

7.3 WARRANTY

Memtech warrants your AT2520 against defects in material and workmanship for a period of one (1) year from date of purchase. The warranty is void in the case of misuse, accident, alteration, improper installation, misapplication or the result of unauthorized service or repair.

The implied warranties of merchantability and fitness for a particular purpose, and all other warranties, expressed or implied, except as set forth in this warranty, shall not apply to the products delivered.

In no event shall Memtech be liable for any lost profits, lost savings or other incidental or consequential damages arising out of the use of, or inability to use, this product.

BEFORE RETURNING PRODUCT, A RETURN MATERIAL AUTHORIZATION (RMA) MUST BE OBTAINED FROM MEMTECH.

Product shall be returned to Memtech FOB customer's plant. If product fails to conform, Memtech will reimburse customer for the transportation charges incurred.