



MEMTECH

AT1830 Mustang 1.8" IDE Solid State Flash Drive

User Guide

154232-001

Revision 1.2

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1. HIGHLIGHTS

- 64 Mbyte to 8 Gbyte Capacity
- Full -40°C to +85°C operating temperature range
- 5 volt, low power operation
- Completely solid state - no moving parts and no batteries
- Extremely Rugged - 1000G operating shock, 15G operating vibration
- Extremely small 1.8" drive form factor with a 44 pin, 2mm IDE interface
- 32-bit ECC for exceptional data reliability
- 4.0 Mbyte/second sustained Read throughput
- 3.5 Mbyte/second sustained Write throughput
- Nonvolatile NAND E²PROM with 10 year data retention
- Pending EMC and CSA Safety Compliance

2. INTRODUCTION

The AT1830 Mustang is a new line of 100% compatible IDE solid state drives packaged in the industry standard 1.8" drive form factor. It is completely solid state, with no moving parts. This accounts for the unit's exceptional ruggedness and wide operating temperature range.

Sector Erasable NAND E²PROM (Flash) is used to provide up to 8192 Mbytes of nonvolatile, solid state storage in an extremely small, rugged and low-cost form factor. 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 32-bit Reed-Solomon error detection and on-the-fly correction mechanism that enhance data reliability. The ECC circuitry, in conjunction with the controller's wear-leveling algorithms, makes for a virtually bulletproof medium for data retention.

The drive is available in a number of standard capacities ranging from 64 to 8192 Mbytes. 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 AT1830, 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 CABLE

Typical installation of the Memtech AT1830 is on an application specific adapter board with a vertical, 2mm DIP socket. These boards are available from a number of suppliers, and allow for STD bus application, VME installation, or PC104 stack usage. The drive may also be interfaced using a standard 2.5" IDE cable for prototyping purposes.

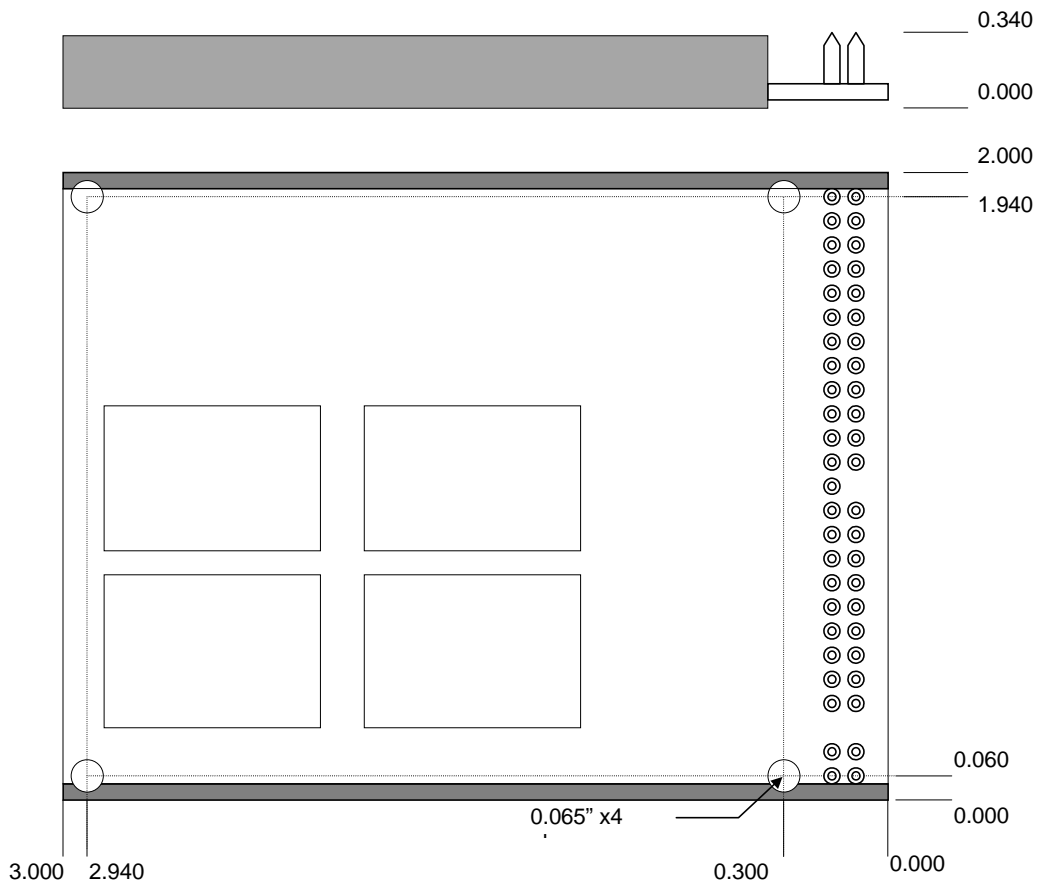
Note pin 1 orientation and alignment. Care should be taken when installing the AT1830 into the system, as misalignment can permanently damage the drive interface connector or electronics. A separate power cable is not required as the 2mm socket or ribbon cable connector supplies both signals and power.



3.1.4 MOUNTING

The AT1830 may be mounted in any orientation. Four mounting holes are available for installation. Stand-offs may be required for proper installation. The mounting holes are unthreaded, with an internal clearance of 0.065" (1.65mm)

The diagram given below is valid for all capacities of the drive. The outline dimensions are 2.00" (50.8mm) wide, 3.00" (76.2mm) long, and 0.340" (8.6mm) tall. Please refer to the following drawing for hole locations.





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 AT1830 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 an MB is equal to 1024*1024 bytes.

Drive Type	Physical Capacity	Cylinders	Heads	Sectors	Available Capacity
AT1830-64	64 MB	500	8	32	62.5 MB
AT1830-128	128 MB	500	16	32	125.0 MB
AT1830-256	256 MB	1000	16	32	250.0 MB
AT1830-512	512 MB	1015	16	63	499.6 MB
AT1830-640	640 MB	1269	16	63	624.6 MB
AT1830-768	768 MB	1523	16	63	749.6 MB
AT1830-1024	1024 MB	2031	16	63	999.6 MB
AT1830-1536	1536 MB	3047	16	63	1499.7 MB
AT1830-2048	2048 MB	4063	16	63	1999.8 MB
AT1830-3072	3072MB	6095	16	63	2,999.8 MB
AT1830-4096	4096MB	8126	16	63	3,999.5 MB
AT1830-5120	5120MB	10158	16	63	4,999.6 MB
AT1830-6144	6144MB	12190	16	63	5,999.7 MB
AT1830-7168	7168MB	14222	16	63	6,999.8 MB
AT1830-8192	8192MB	16253	16	63	7,999.5 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 AT1830 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.



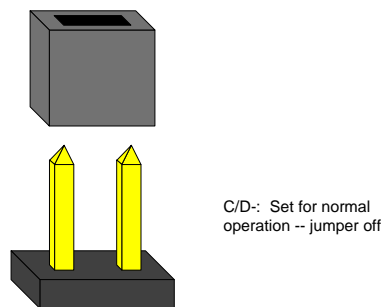
3.2 JUMPERS

The following diagram illustrates the location of the drive selection jumper on the AT1830. The jumper controls the master/slave configuration.

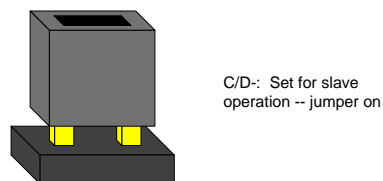


3.2.1 MASTER/SLAVE

The C/D- jumper on the main J1 connector allows the drive to be configured as either drive C: (Master) or drive D: (Slave). This jumper is a 2-pin vertical header on 2mm centers. Leaving the pins open configures the drive as the master, drive C:.



Connecting the pins forces the drive to drive D:, the slave.



This location is factory shipped with no jumper, configuring the drive as the master drive.

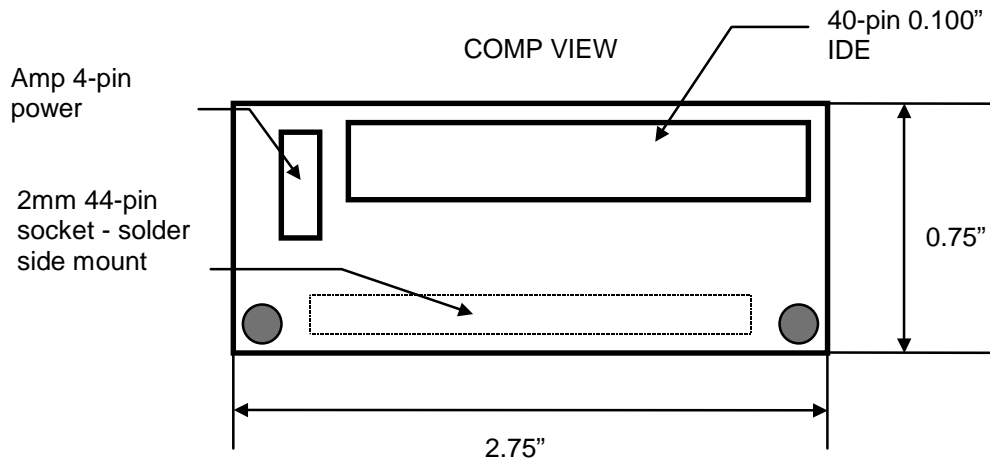


3.3 IDE INTERFACE

The AT1830 uses a 44-pin 2mm vertical 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. The recommended mating socket connector is 3M 150244-6002-TB or equivalent.

3.3.1 IDE ADAPTER

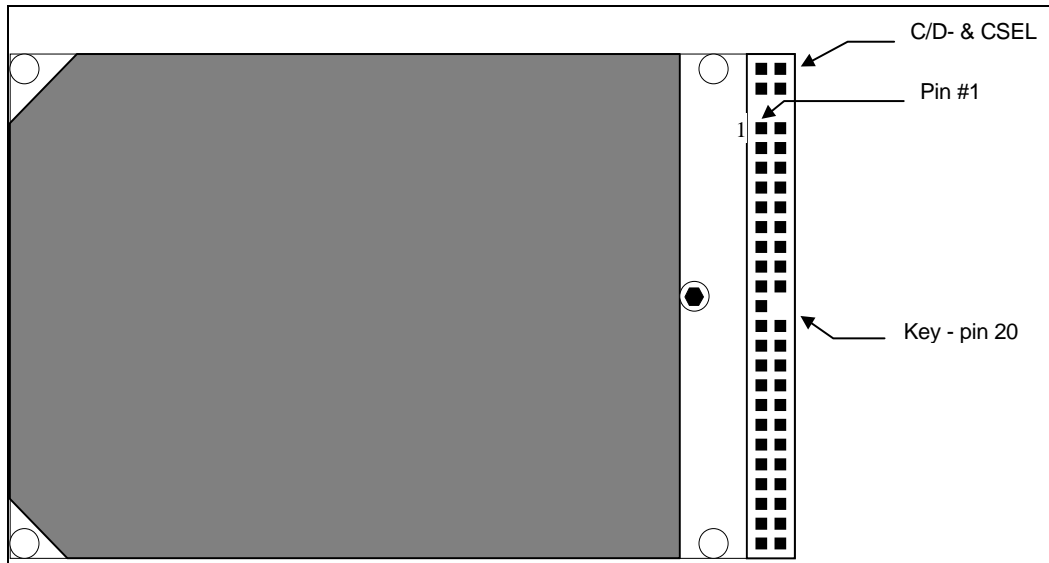
An adapter, converting the 2mm IDE connector to a standard 40-pin 0.100" IDE connector is available from the factory. Order part number ATA-250-350. The adapter converts the signals from the 2mm connector on the drive to a 0.100" connector. Power arrives via a 4-pin Amp power header (EI series) identical to the connector used to supply power to 3.5-inch floppy drives. An adapter to convert the 4-pin Amp power connector to a standard 4-pin AT power connector, an ATA power cable adapter is included in the kit.





3.3.2 IDE CONNECTOR PHYSICAL ORIENTATION

The diagram below depicts connector orientation and location.



3.3.3 IDE CONNECTOR PINOUT

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 32-bit Reed-Solomon ECC polynomial for each sector on the drive. It is capable of correcting two single-bit errors, and detecting up to 4 bits in error. Error rate is greater than $1/10^{15}$ bits read.

4.2 MTBF

TBD

4.3 POWER

4.3.1 POWER DOWN

The AT1830 is shipped with Memtech's proprietary Kicker™ hold-up circuit. The Kicker™ provides enough residual power for the drive to complete a write sequence, thus avoiding data corruption.

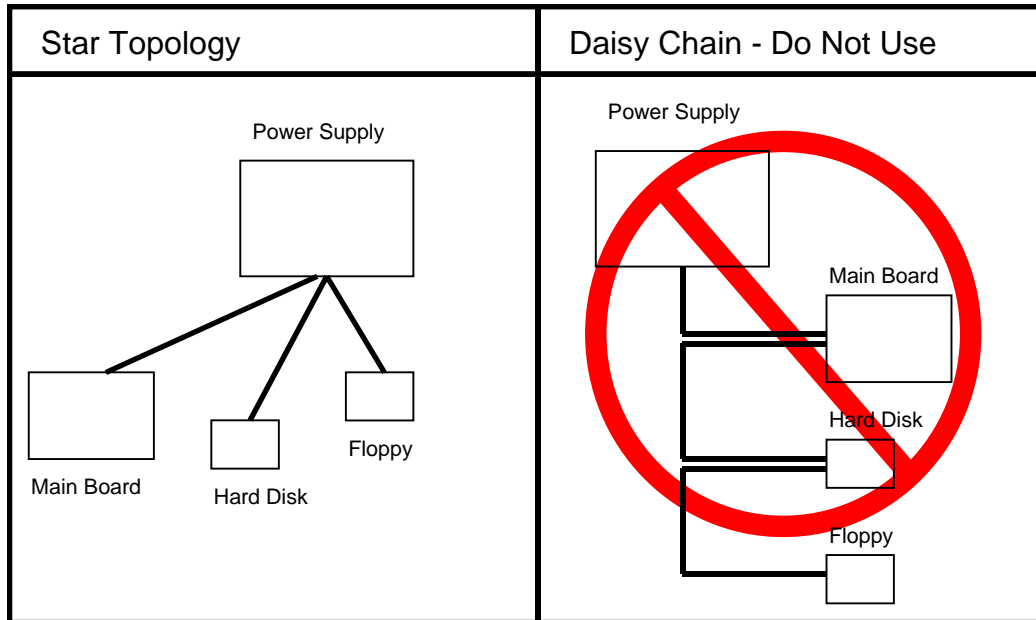
Still, it is recommended that power not be removed from any mass storage device while a write sequence is in progress. This is especially true when disk-caching programs are being used. Though the Kicker™ protects against data corruption and media errors, it cannot prevent OS or file errors from occurring. These types of errors arise when the OS breaks a large transfer into many smaller ones, and only part of the transfer arrives from the host.

4.3.2 POWER SUPPLY

The AT1830 voltage requirement is specified at +5 volts, +/- 10%. Operation outside of these limits is not guaranteed. Note that the drive will "operate" down to 3 volts, but reliability issues such as Uncorrectable Errors or invalid data reads may occur. An on board voltage monitor will inhibit writes when the on-board 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 AT1830. 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 E²PROM 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	8192 Mbytes
Physical Sector Size	512 bytes

6.2 PERFORMANCE

Random Access	.40 ms
Track/Track Access	.40 ms
Media Transfer Rate	12.5 Mbytes/sec
Read Transfer Rate	4.0 Mbytes/sec sustained
Write Transfer Rate	3.5 Mbytes/sec sustained
Transfer Mode	PIO Mode 4

6.3 ENVIRONMENTAL

Commercial Temperature Range	
Operating	0° to 70° C
Storage	-45°C to 125° C
Extended Temperature Range	
Operating	-20°C to 75°C
Storage	-45°C to 125° C
Industrial Temperature Range	
Operating	-40° to 85° C
Storage	-55° to 125° 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	AT1830-1024
Idle	8 mA
Read	30 mA
Write	35 mA

6.5 MECHANICAL

Length	3.00 inches (76.2 mm)
Width	2.00 inches (50.8 mm)
Height	0.34 inches (8.6 mm)
Cable Interface	44-pin, 2mm
Max. Cable Length	18 inches (457 mm)
Rec. Cable Length	12 inches (305 mm)
Weight	(1024 Mbytes) 1.4 oz (39 g)



7. APPENDIX

7.1 CONTACT INFORMATION

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

2107 N. First Street, Suite 415
San Jose, CA 95131
Phone: (800) 445-5511
Email: Info@memtech.com
Web: www.memtech.com

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 LIMITED LIFETIME WARRANTY

Memtech warrants your AT1830 against defects in material and workmanship for the life of the drive. 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 with shipping prepaid. If the product fails to conform and warranty repair is necessary, Memtech will reimburse customer for the transportation charges incurred.