Seagate

Medalist 1720

ATA Interface Drive

Product Manual

Medalist 1720 (ST31720A)

ATA Interface Drive

Product Manual

Publication Number: 20401032-001, Rev. B, May 1997

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Introduction

The Medalist® 1720 (ST31720A) provides the following key features:

- Low power consumption
- Quiet operation
- Support for S.M.A.R.T. drive monitoring and reporting
- High instantaneous (burst) data-transfer rates (up to 16.6 Mbytes per second) using PIO mode 4 and DMA mode 2
- Full-track multisector transfer capability without local processor intervention
- 128-Kbyte adaptive multisegmented cache
- State-of-the-art cache and on-the-fly error-correction algorithms
- Support for Read/Write Multiple commands
- Support for autodetection of master/slave drives using cable select (CSEL)

Specification summary table

The specifications listed in this table are for quick reference. For details on specification measurement or definition, see the appropriate section of this manual.

Drive Specification	**ST31720A**
Guaranteed Mbytes ($\times 10^6$ bytes)	1,705
Guaranteed sectors	3,324,384
Bytes per sector	512
Default sectors per track	63
Default read/write heads	16
Default cylinders	3,305
Physical read/write heads	4
Discs	2
Recording density (bits/inch max)	108,770
Track density (tracks/inch)	5,104
Areal density (Mbits/inch^2)	553
Spindle speed (RPM)	4,500
Internal data-transfer rate (Mbits/sec max)	88
I/O data-transfer rate (Mbytes/sec max)	16.6
ATA data-transfer modes supported	PIO modes 0, 1, 3, 4; Multiword DMA modes 0, 1, 2
Cache buffer (Kbytes)	128
Height (mm max)	26.16
Width (mm max)	102.36
Length (mm max)	146.94
Weight (grams typical)	544.3
Track-to-track seek time (msec typical)	2 (seek), 2.5 (read), 3.5 (write)
Average seek time (msec typical)	12 (seek), 12.5 (read), 14.5 (write)
Full-stroke seek time (msec typical)	23.5 (seek), 24 (read), 25 (write)
Average latency (msec)	6.67
Power-on to ready (sec typical)	9
Standby to ready (sec typical)	9

Drive Specification	**ST31720A**
Startup current: 12V (peak) 5V (RMS)	1.4 amps 0.5 amps
Seek power and current (mean)	4.9 watts
Read/Write power and current (typical)	4.6 watts
Idle mode power and current (typical)	4.0 watts
Standby mode power and current (typical)	1.0 watts
Sleep mode power and current (typical)	0.7 watts
Voltage tolerance (including noise)	± 5%
Ambient temperature (°C)	5 to 55 (op.), –40 to 60 (nonop.)
Temperature gradient (°C per hour max)	20
Relative humidity (op. and nonop.)	8% to 80%
Relative humidity gradient	10% per hour max
Wet bulb temperature (°C max)	29 (op.), 40 (nonop.)
Altitude (meters above mean sea level, max)	–61 to 3,048 (op.) –61 to 12,192 (nonop.)
Shock, operating (Gs max at 11 msec)	5
Shock, nonoperating (Gs max at 11 msec)	75
Vibration, operating	0.020 in. (peak to peak, 5–22 Hz) 0.50 G (0 to peak, 22–400 Hz)
Vibration, nonoperating	0.081 in. (peak to peak, 5–22 Hz) 5.0 Gs (0 to peak, 22–400 Hz)
Drive acoustics (bels—sound power) Idle mode (dBA—sound pressure)	3.7 (typical), 4.1 (max) 34 (typical)
Drive acoustics (bels—sound power) Seek mode	4.1 (typical), 4.5 (max)
Nonrecoverable read errors	1 per 10^{14} bits read
Mean time between failures (power-on hours)	300,000
Contact start-stop cycles (40°C, ambient humidity)	40,000
Service life (years)	5

1.0 Drive specifications

Unless otherwise noted, all specifications are measured under ambient conditions, at 25°C, and nominal power. For convenience, the phrases *the drive* and *this drive* are used throughout this manual to indicate the ST31720A.

1.1 Formatted capacity

Guaranteed Mbytes (1 Mbyte = 10^6 bytes)	1,705
Guaranteed sectors	3,324,384
Bytes per sector	512

Note. DOS systems cannot access more than 528 Mbytes on a drive unless 1) the host system supports and is configured for LBA addressing or for extended CHS addressing, 2) the host system contains a specialized drive controller, or 3) the host system runs BIOS translation software. Contact your Seagate® representative for details.

1.1.1 Default logical geometry

CHS Mode

Sectors per track	63
Read/Write heads	16
Cylinders	3,305

LBA Mode

When addressing either drive in LBA mode, all blocks (sectors) are consecutively numbered from 0 to *n – 1.*

1.1.2 Supported CHS translation geometries

The ST31720A supports any translation geometry that satisfies *all* of the following conditions:

- Sectors per track ≤ 63
- Read/Write heads ≤ 16
- (Sectors per track) × (Read/Write heads) × (cylinders) ≤ 3,324,384

1.2 Physical organization

Read/Write heads	4
Discs	2

1.3 Recording and interface technology

Interface	ATA
Recording method	2/3 (1,7) RLL
Recording density (bits/inch)	108,770
Track density (tracks/inch)	5,104
Areal density (Mbits/inch^2)	553.82
Spindle speed (RPM) ($\pm$ 0.5%)	4,500
Internal data-transfer rate (Mbits per second max)	88
I/O data-transfer rate (Mbytes per second max)	16.6 (PIO mode 4 with IORDY) 16.6 (multiword DMA mode 2)
Interleave	1:1
Cache buffer (Kbytes)	128

1.4 Physical characteristics

Maximum height	(inches)	1.030
	(mm)	26.16
Maximum width	(inches)	4.030
	(mm)	102.36
Maximum length	(inches)	5.785
	(mm)	146.94
Typical weight	(pounds)	1.2
	(grams)	544.3

1.5 Seek time

All seek times are measured using a 486 AT computer (or faster) with an 8.3 MHz I/O bus. The measurements are taken with nominal power at 25°C ambient temperature. All times are measured using drive diagnostics. The specifications in the table below are defined as follows:

- Track-to-track seek time is an average of all possible single-track seeks in both directions.
- Average seek time is a true statistical random average of at least 5,000 measurements of seeks between random tracks, less overhead.
- Full-stroke seek time is one-half the time needed to seek from the first data cylinder to the maximum data cylinder and back to the first data cylinder. The full-stroke typical value is determined by averaging 100 full-stroke seeks in both directions.

Seek type	Seek (msec, typ.)	Read (msec, typ.)	Write (msec, typ.)
Track-to-track	2.0	2.5	3.5
Average	12.0	12.5	14.5
Full-stroke	23.5	24.0	25.0

Average latency: 6.67 msec

Note. This drive is designed to consistently meet the seek times represented in this manual. Physical seeks, regardless of mode (such as track-to-track and average) are expected to meet or exceed the noted values. Due to the manner in which this drive is formatted, however, benchmark tests that include command overhead or that measure logical seeks may produce results that vary from these specifications.

1.6 Start/stop times

Power-on to Ready (sec)	9 (typical)
Standby to Ready (sec)	9 (typical)
Ready to complete stop (sec)	9 (typical)

1.7 Power Specifications

The drive receives DC power (+5V or +12V) through a four-pin standard drive power connector.

1.7.1 Power consumption

Power requirements for the drive are listed in the table below. Typical power measurements are based on an average of drives tested under nominal conditions, using 5.0V input voltage at 25°C ambient temperature.

Spinup power is measured from the time of power-on to the time that the drive spindle reaches operating speed.

During seek mode the read/write actuator arm moves toward a specific position on the disc surface before executing a read or write operation. Servo electronics are active. Seek mode power is measured through the drive's serial port while the drive executes a series of sequential seeks.

Read/Write power and current are measured with the heads on track, based on a 16-sector write followed by a 32-msec delay, then a 16-sector read followed by a 32-msec delay.

Operating power and current are measured using 40% random seeks, 40% read/write mode (1 write for each 10 reads), and 20% drive inactive.

Idle mode power is measured with the drive up to speed, servo electronics are active, and the heads are left in a random track location.

During standby mode the drive accepts commands, but the drive is not spinning, and the servo and read/write electronics are in power-down mode.

Mode	**Typical Watts RMS**	**Typical Amps RMS**	
		5V, RMS	**12V, Peak**
Spinup		0.5	1.4
Active			
Seeking	4.9	0.42	0.23
Read/Write	4.6	—	—
Operating	4.6	0.42	0.21
Idle	4.0	0.40	0.17
Standby	1.0	0.2	—
Sleep	0.7	0.7	—

1.7.1.1 Typical current profile

Figure 1 shows a typical current profile for this drive.

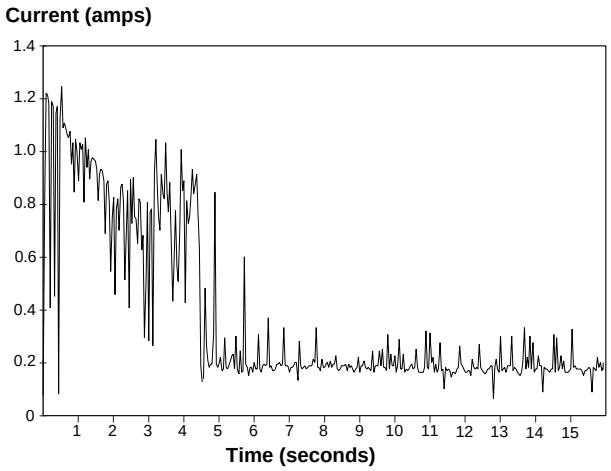

Figure 1. Typical startup and operation current profile

1.7.2 Conducted noise

Input noise ripple is measured at the host system power supply across an equivalent 80-ohm resistive load on the +12 volt line or an equivalent 15–ohm resistive load on the +5 volt line.

- With 12-volt power, the drive is expected to operate with a maximum of 120 mV peak-to-peak triangular-wave injected noise at up to 25 MHz.
- With 5-volt power, the drive is expected to operate with a maximum of 100 mV peak-to-peak triangular-wave injected noise at up to 25 MHz.

Note. Equivalent resistance is calculated by dividing the nominal voltage by the typical RMS read/write current.

1.7.3 Voltage tolerance

Voltage tolerance (including noise): ± 5%

1.7.4 Power-management modes

This drive provides programmable power management to provide greater energy efficiency. In most systems, you can control power management through the system setup program. This Seagate drive features several power-management modes, which are summarized in the following table and are described in more detail below:

Mode	Heads	Spindle	Buffer
Active	Moving	Rotating	Enabled
Idle	Parked	Rotating	Enabled
Standby	Parked	Stopped	Enabled
Sleep	Parked	Stopped	Disabled

Active mode. The drive is in Active mode during the read/write and seek operations.

Idle mode. At power-on, the drive sets the idle timer to enter Idle mode after 5 seconds of inactivity. You can set the idle timer delay using the system setup utility. In Idle mode, the spindle remains up to speed. The heads are parked away from the data zones for maximum data safety. The buffer remains enabled, and the drive accepts all commands and returns to Active mode any time disc access is necessary.

Standby mode. The drive enters Standby mode when the host sends a Standby Immediate command. If the host has set the standby timer, the drive can also enter Standby mode automatically after the drive has been inactive for a specifiable length of time. The standby timer delay is system-dependent and is usually established using the system setup utility. In Standby mode, the buffer remains enabled, the heads are parked and the spindle is at rest. The drive accepts all commands and returns to Active mode any time disc access is necessary.

Sleep mode. The drive enters Sleep mode after receiving a Sleep Immediate command from the host. The heads are parked and the spindle is at rest. The drive leaves Sleep mode after it receives a Hard Reset or Soft Reset command from the host. After receiving a soft reset, the drive exits Sleep mode and enters Standby mode with all current emulation and translation parameters intact.

Idle and standby timers. The drive sets the default time delay for the idle timer at power-on. In most systems, you can set this delay using the system setup utility. Each time the drive performs an Active function (read, write or seek), the idle and standby timers are reinitialized and begin counting down from their specified delay times to zero. If the idle timer reaches zero before

any drive activity is required, the drive makes a transition to Idle mode. If the host has set the standby timer, the standby countdown continues. If the host has not set the standby timer, the drive remains in Idle mode. If the standby timer reaches zero before any drive activity is required, the drive makes a transition to Standby mode. In both Idle and Standby mode, the drive accepts all commands and returns to Active mode when disc access is necessary.

1.8 Environmental tolerances

1.8.1 Ambient temperature

Operating	5° to 55°C (41° to 131°F)
Nonoperating	–40° to 60°C (–40° to 140°F)

Note. Above 1,000 feet (305 meters), the maximum temperature is derated linearly to 112°F (44°C) at 10,000 feet (3,048 meters). Operating ambient temperature is defined as the temperature of the environment immediately surrounding the drive.

1.8.2 Temperature gradient

Operating	20°C / hr (36°F / hr) max, without condensation
Nonoperating	20°C / hr (36°F / hr) max, without condensation

1.8.3 Humidity

1.8.3.1 Relative Humidity

Operating	8% to 80% noncondensing (10% per hour max)
Nonoperating	8% to 80% noncondensing (10% per hour max)

1.8.3.2 Wet bulb temperature

Operating	28.9°C (84°F) max
Nonoperating	28.9°C (84°F) max

1.8.4 Altitude

Operating	–61 m to 3,048 m (–200 ft to +10,000 ft)
Nonoperating	–61 m to 12,192 m (–200 ft to +40,000 ft)

1.8.5 Shock

All shock specifications assume that the drive is mounted securely with the input shock applied at the drive mounting screws. Shock may be applied in the X, Y or Z axis.

1.8.5.1 Operating shock

The Medalist 1720 complies with the performance levels specified in this document when subjected to a maximum operating shock of 5.0 Gs (based on half-sine shock pulses of 11 msec, as specified in MIL-STD-202F). Shocks are not to be repeated more than two times per second.

1.8.5.2 Nonoperating shock

The nonoperating shock level that the drive can experience without incurring physical damage or degradation in performance when subsequently put into operation is 75 Gs (based on nonrepetitive half-sine shock pulses of 11 msec duration, as defined in MIL-STD-202F).

1.8.6 Vibration

All vibration specifications assume that the drive is mounted securely with the input shock applied at the drive mounting screws. Vibration may be applied in the X, Y or Z axis.

1.8.6.1 Operating vibration

The following table lists the maximum vibration levels that the drive may experience while meeting the performance standards specified in this document.

5–22 Hz	0.020 inches displacement (peak to peak)
22–400 Hz	0.50 Gs acceleration (zero to peak)

1.8.6.2 Nonoperating vibration

The following table lists the maximum nonoperating vibration that the drive may experience without incurring physical damage or degradation in performance when subsequently put into operation.

5–22 Hz	0.081-inch displacement (peak to peak)
22–400 Hz	5 Gs acceleration (zero to peak)

1.9 Drive acoustics

Drive acoustics are measured as overall A-weighted acoustic sound power levels (no pure tones). All measurements are generally consistent with ISO document 7779. Sound power measurements are taken under essentially free-field conditions over a reflecting plane. For all tests, the drive is oriented with the cover facing upward.

Mode	Typical sound power (bels)	Maximum sound power (bels)
Idle	3.7	4.1
Seek (read/write)	4.1	4.5

1.10 Electromagnetic susceptibility

The drive operates without errors when subjected to the following:

Radiated noise	≤ 3 volt/meter, 30 to 1 GHz
Electrostatic discharge*	≤ 10 KVolts
Magnetic field strength	≤ 5 Gauss

* Electrostatic discharge susceptibility is measured with the drive mounted in a representative computer system (mounted to a ground plane with earth grounding). Discharges are applied to the bezel or other external surfaces on the ground plane.

1.11 Reliability

Nonrecoverable read errors	1 per 10^{14} bits read, max
Mean time between failures	300,000 power-on hours (nominal power, 25°C ambient temperature)
Contact start-stop cycles	40,000 cycles (at nominal voltage and temperature, with 60 cycles per hour and a 50% duty cycle)
Preventive maintenance	None required

1.12 Agency certification

1.12.1 Safety certification

The drive is recognized in accordance with UL 478, UL 1950 and CSA C22.2 (950) and meets all applicable sections of IEC 950 and EN 60950 as tested by TUV North America.

1.12.2 Electromagnetic Compatibility

Hard drives that display the CE marking comply with European Union requirements specified in Electromagnetic Compatibility Directives. Testing is performed to standards EN50082-1 and EN55022-B.

Seagate uses an independent laboratory to confirm compliance with the EC directives specified in the previous paragraph. Drives are tested in representative end-user systems. Although CE-marked Seagate drives comply with the directives when used in the test systems, we cannot guarantee that all systems will comply with the directives. The drive is designed for operation inside a properly designed enclosure, with properly shielded I/O cable (if necessary) and terminators on all unused I/O ports. Computer manufacturers and system integrators should confirm EMC compliance and provide CE marking for their products.

1.12.3 FCC verification

This drive is intended to be contained solely within a personal computer or similar enclosure (not attached as an external device). As such, each drive is considered to be a subassembly even when it is individually marketed to the customer. As a subassembly, no Federal Communications Commission verification or certification of the device is required.

Seagate Technology, Inc. has tested this device in enclosures as described above to ensure that the total assembly (enclosure, disc drive, motherboard, power supply, etc.) does comply with the limits for a Class B computing device, pursuant to Subpart J, Part 15 of the FCC rules. Operation with noncertified assemblies is likely to result in interference to radio and television reception.

Radio and Television Interference. This equipment generates and uses radio frequency energy and if not installed and used in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception.

This equipment is designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this

equipment does cause interference to radio or television, which can be determined by turning the equipment on and off, you are encouraged to try one or more of the following corrective measures:

- Reorient the receiving antenna.
- Move the device to one side or the other of the radio or TV.
- Move the device farther away from the radio or TV.
- Plug the computer into a different outlet so that the receiver and computer are on different branch outlets.

If necessary you should consult your dealer or an experienced radio/television technician for additional suggestions. You may find helpful the following booklet prepared by the Federal Communications Commission: *How to Identify and Resolve Radio-Television Interference Problems*. This booklet is available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. Refer to publication number 004-000-00345-4.

2.0 Drive mounting and configuration

2.1 Handling and static-discharge precautions

After unpacking, and before installation, the drive may be exposed to potential handling and electrostatic discharge (ESD) hazards. Observe standard static-discharge precautions. A grounded wrist-strap is preferred.

Handle the drive only by the sides of the head/disc assembly. Avoid contact with the printed circuit board, all electronic components and the interface connector. Do not apply pressure to the top cover of the drive. Always rest the drive on a padded antistatic surface until you mount it in the host system.

2.2 Jumper settings

2.2.1 Master/slave configuration

You must establish a master/slave relationship between two drives that are attached to a single AT bus. You can configure a drive to become a master or slave by setting the master/slave jumpers, shown in Figure 2 on page 18.

This drive supports master/slave configuration using the cable select option. This requires a special daisy-chain cable that grounds pin 28 (CSEL) on one of its two drive connectors. If you attach the drive to the grounded CSEL connector, it becomes a master. If you attach the drive to the ungrounded CSEL connector, it becomes a slave. To use this option, the host system and both drives must support cable select, and both drives must be configured for cable select. To configure this drive for cable select, install a jumper as shown in Figure 2 on page 18.

For the master drive to recognize the slave drive using the DASP– signal, the slave drive must assert the DASP– signal at power up, and the master drive must monitor DASP– at power up.

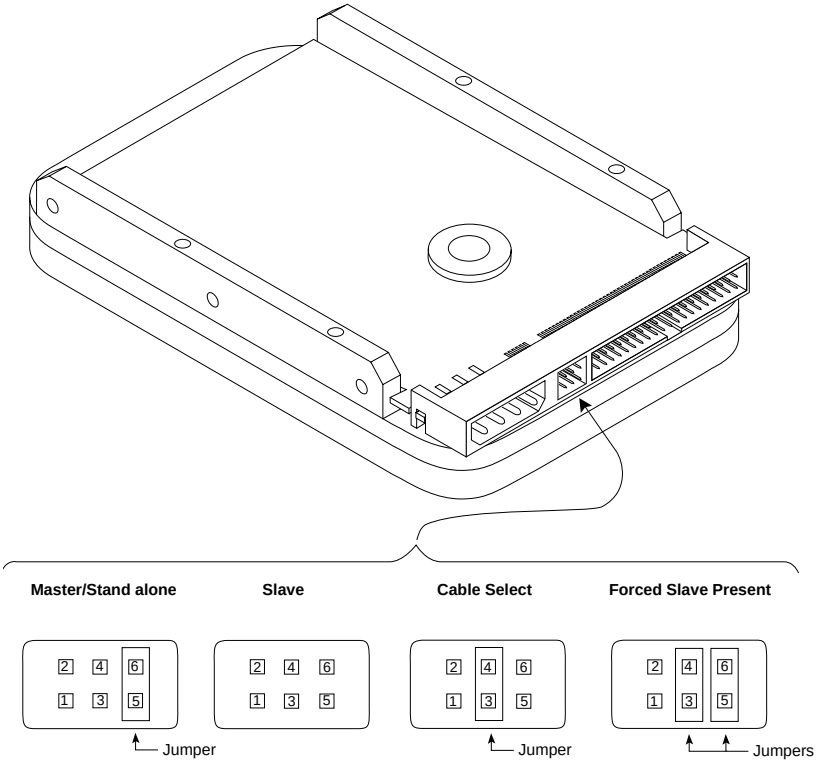

Figure 2. Master/slave jumpers for the ST31720A

2.3 Drive mounting

You can mount the drive in any orientation using four screws in the side-mounting or four screws in the bottom-mounting holes. See Figure 3 on page 19 for drive mounting dimensions.

Important mounting precautions:

- Allow a minimum clearance of 0.030 inches (0.76 mm) around the entire perimeter of the drive for cooling.
- Use only 6*x*32 UNC mounting screws.
- Do not insert the mounting screws more than 0.250 inches (6.35 mm) into the mounting holes.
- Do not overtighten the mounting screws (maximum torque: 3 inch-lb).
- Do not use a drive interface cable that is more than 18 inches long.

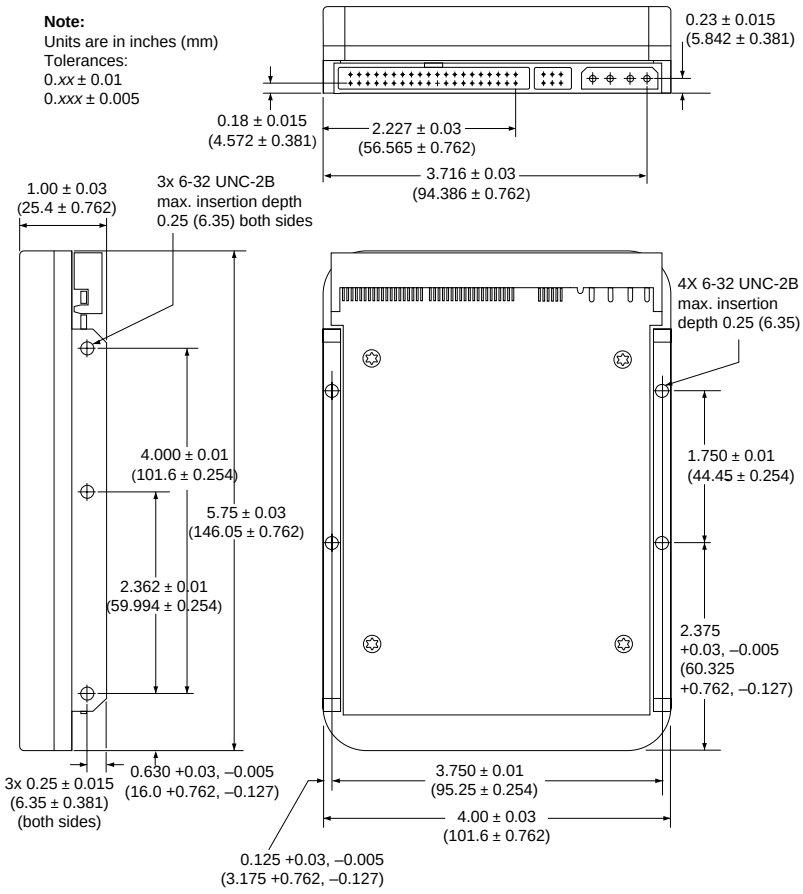

Figure 3. Mounting dimensions for the ST31720A—top, side and end view

3.0 ATA interface

This drive uses the industry-standard ATA task file interface. It supports both 8-bit and 16-bit data transfers. It supports ATA programmed input/output (PIO) modes 0, 1, 2, 3 and 4; ATA single-word DMA modes 0, 1 and 2; and ATA multiword DMA modes 0, 1 and 2. The drive also supports the use of the IORDY signal to provide reliable high-speed data transfers.

You can use a daisy-chain cable to connect two drives to a single AT host bus. For detailed information regarding the ATA interface, refer to the *Draft ATA-3 document X3T10 2008, Revision 6,* subsequently referred to as the *Draft Proposed ATA-3 Standard*.

3.1 ATA interface signals and connector pins

Figure 5 on page 22 summarizes the signals on the ATA interface connector that the drive supports. For a detailed description of these signals, refer to the *Draft Proposed ATA-3 Standard.*

3.1.1 AT bus signal levels

Signals that the drive receives must have the following characteristics at the drive connector:

Logic low	0.0V to 0.7V
Logic high	2.0V to 5.25V

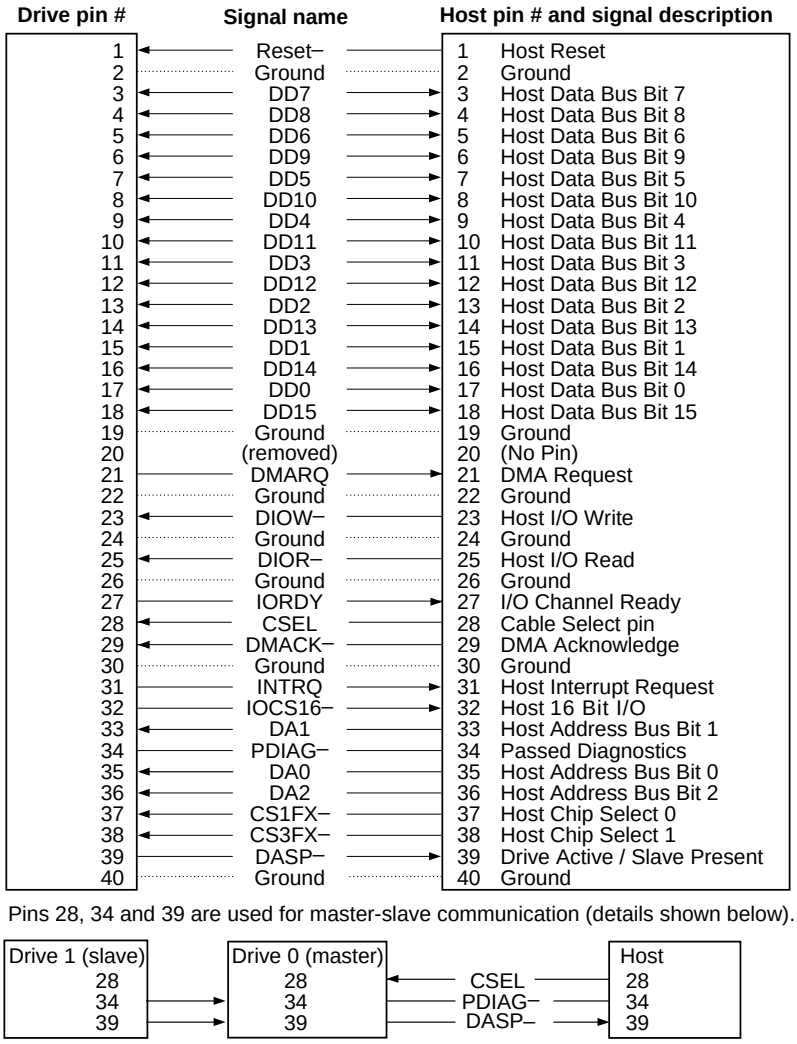

Figure 4. I/O pins and supported ATA signals

3.2 ATA Interface commands

3.2.1 Supported ATA commands

The following table lists ATA-standard commands that the drive supports. For a detailed description of the ATA commands, refer to the *Draft Proposed ATA-3 Standard.* See Section 3.2.4 on page 29 for details and subcommands used in the S.M.A.R.T. implementation.

Command name	Command code	Supported by this drive
ATA-standard commands		
Execute Drive Diagnostics	90_H	Yes
Execute S.M.A.R.T. Command	$B0_H$	Yes
Format Track	50_H	Yes
Identify Drive	EC_H	Yes
Initialize Drive Parameters	91_H	Yes
NOP	00_H	No
Read Buffer	$E4_H$	Yes
Read DMA (w/retry)	$C8_H$	Yes
Read DMA (no retry)	$C9_H$	Yes
Read Long (w/retry)	22_H	Yes
Read Long (no retry)	23_H	Yes
Read Multiple	$C4_H$	Yes
Read Sectors (w/retry)	20_H	Yes
Read Sectors (no retry)	21_H	Yes
Read Verify Sectors (w/retry)	40_H	Yes
Read Verify Sectors (no retry)	41_H	Yes
Recalibrate	$1x_H$	Yes
Seek	$7x_H$	Yes

continued

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Command name	Command code	Supported by this drive
Set Features	EF_H	Yes
Set Multiple Mode	$C6_H$	Yes
Write Buffer	$E8_H$	Yes
Write DMA (w/retry)	CA_H	Yes
Write DMA (no retry)	CB_H	Yes
Write Long (w/retry)	32_H	Yes
Write Long (no retry)	33_H	Yes
Write Multiple	$C5_H$	Yes
Write Same	$E9_H$	No
Write Sectors (w/retry)	30_H	Yes
Write Sectors (no retry)	31_H	Yes
Write Verify	$3C_H$	No
ATA-standard power-management commands		
Check Power Mode	98_H or $E5_H$	Yes
Idle	97_H or $E3_H$	Yes
Idle Immediate	95_H or $E1_H$	Yes
Sleep	99_H or $E6_H$	Yes
Standby	96_H or $E2_H$	Yes
Standby Immediate	94_H or $E0_H$	Yes

The following commands contain drive-specific features that may not be described in the *Draft Proposed ATA-3 Standard*.

3.2.2 Identify Drive command

The Identify Drive command (command code EC_H) transfers information about the drive to the host following power up. The data is organized as a single 512-byte block of data, whose contents are shown in the table below. All reserved bits or words should be set to zero. Parameters listed with an "*x*" are drive-specific or vary with the state of the drive. See Section 1 of this manual for default parameter settings for the Medalist 1720.

Word	Description	Contents
0	Configuration information: • Bit 10: disc transfer > 10 Mbits/sec • Bit 6: fixed drive • Bit 4: head switch time > 15 µsec • Bit 3: not MFM encoded • Bit 1: hard-sectored disc	$0C5A_H$
1	Number of fixed cylinders (default logical emulation): 3,305	$0CE9_H$
2	ATA-reserved	0000_H
3	Number of heads (default logical emulation): 16	0010_H
4	Number of unformatted bytes per track (36,240)	$8D90_H$
5	Number of unformatted bytes per sector (584)	0248_H
6	Number of sectors per track (default logical emulation): 63	$003F_H$
7–9	ATA-reserved	0000_H
10–19	Serial number: (20 ASCII characters, 0000_H = none)	ASCII
20	Controller type = dual-port multisector buffer with caching	0003_H
21	Buffer size (240 sectors of 512 bytes each)	$00F0_H$
22	Number of ECC bytes available (16)	0004_H
23–26	Firmware revision (8 ASCII character string)	*x.xx*

continued

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Word	Description	Contents
27–46	Drive model number: (40 ASCII characters, padded with blanks to end of string)	ST31720A
47	(Bits 0–7) Maximum sectors per interrupt on read/write multiple (16)	8010_H
48	Double word I/O (not supported)	0000_H
49	DMA data transfer, IORDY (supported), LBA mode, ATA-2 standby times supported	$0F01_H$
50	ATA-reserved	0000_H
51	PIO data-transfer cycle timing mode	0100_H
52	DMA transfer cycle timing mode (not used)	0200_H
53	Validity of words 54–58 and words 64–70 (words may be valid)	0003_H
54	Number of cylinders (current emulation mode)	$xxxx_H$
55	Number of heads (current emulation mode)	$xxxx_H$
56	Number of sectors per track (current emulation mode)	$xxxx_H$
57–58	Number of sectors (current emulation mode)	$xxxx_H$
59	Number of sectors transferred during a Read Multiple or Write Multiple command	$01xx_H$
60	LBA sectors available (1,584,968) (w/word 61)	0032_H
61	LBA sectors available (continued)	$D70C_H$
62	Single-word DMA active and modes supported (see note following this table)	0000_H
63	Multiword DMA active and modes supported (see note following this table)	$0x07_H$
64	Advanced PIO modes supported (modes 3 and 4 supported)	0003_H
65	Minimum multiword DMA transfer cycle time per word (120 nsec)	0078_H

Word	Description	Contents
66	Recommended multiword DMA transfer cycle time per word (120 nsec)	0078_H
67	Minimum PIO cycle time without IORDY flow control (383 nsec)	$017F_H$
68	Minimum PIO cycle time with IORDY flow control (120 nsec)	0078_H
69–127	ATA-reserved	0000_H
128–159	Seagate-reserved	$xxxx_H$
160–255	ATA-reserved	0000_H

Note. The following DMA mode settings are used in word 63 of the Identify Drive command:

Word	Bit	Description (if bit is set to 1)
63	0	Multiword DMA mode 0 available
63	1	Multiword DMA mode 1 available
63	2	Multiword DMA mode 2 available
63	8	Multiword DMA mode 0 currently active
63	9	Multiword DMA mode 1 currently active
63	10	Multiword DMA mode 2 currently active

3.2.3 Set Features command

This command controls the implementation of various features that the drive supports. When the drive receives this command, it sets BSY, checks the contents of the Features register, clears BSY and generates an interrupt. If the value in the register does not represent a feature that the drive supports, the command is aborted. Power-on default has the read look-ahead and write caching features enabled and 4 bytes of ECC. The acceptable values for the Features register are defined as follows:

- 02_H Enable write cache *(default)*
- 03_H Set transfer mode (based on value in Sector Count register)
  Sector Count register values:
  - 00_H Set PIO mode to default (PIO mode 2)
  - 01_H Set PIO mode to default and disable IORDY (PIO mode 2)
  - 08_H PIO mode 0
  - 09_H PIO mode 1
  - $0A_H$ PIO mode 2 *(default)*
  - $0B_H$ PIO mode 3
  - $0C_H$ PIO mode 4
  - 10_H Single-word DMA mode 0
  - 11_H Single-word DMA mode 1
  - 12_H Single-word DMA mode 2
  - 20_H Multiword DMA mode 0
  - 21_H Multiword DMA mode 1
  - 22_H Multiword DMA mode 2
- 44_H Sixteen bytes of ECC apply on read long and write long commands
- 55_H Disable read look-ahead (read cache) feature
- 66_H Disable reverting to power-on defaults
- 82_H Disable write cache
- AA_H Enable read look-ahead (read cache) feature *(default)*
- BB_H 4 bytes of ECC apply on read long and write long commands *(default)*
- CC_H Enable reverting to power-on defaults *(default)*

At power-on, or after a hardware reset, the default values of the features are as indicated above. A software reset also changes the features to default values unless a 66_H command has been received.

3.2.4 S.M.A.R.T. commands

Self-Monitoring, Analysis and Reporting Technology (S.M.A.R.T.) is an emerging technology that provides near-term failure prediction for disc drives. When S.M.A.R.T. is enabled, the Seagate drive monitors predetermined drive attributes that are susceptible to degradation over time. If self-monitoring determines that a failure is likely, S.M.A.R.T. makes a status report available so that the host can prompt the user to back up data on the drive. Not all failures are predictable. S.M.A.R.T. predictability is limited to only those attributes the drive can monitor. For more information on S.M.A.R.T. commands and implementation, see the *Draft Proposed ATA-3 Standard.*

This drive is shipped with S.M.A.R.T. features disabled. You must have a recent BIOS or software package that supports S.M.A.R.T. to enable the feature. The table below shows the S.M.A.R.T. command codes that this drive uses.

Before executing a S.M.A.R.T. command by writing $B0_H$ to the Command Register, the host must do the following:

- Write the value $4F_H$ to Cylinder_Low register.
- Write the value $C2_H$ to the Cylinder_High register.
- Write the appropriate S.M.A.R.T. code to the Features register, as shown in the table below:

Code in Features Register	S.M.A.R.T. Command	Supported by Medalist 1720
$D0_H$	Enable/Disable Attribute Autosave	Yes
$D1_H$	Enable S.M.A.R.T. Operations	Yes
$D2_H$	Enable/Disable Attribute Autosave	Yes
$D3_H$	Save Attribute Values	Yes
$D4_H$	Execute Off-line Immediate	Yes
$D7_H$	Write Warranty Threshold	Yes
$D8_H$	Enable S.M.A.R.T. Operations	Yes
$D9_H$	Disable S.M.A.R.T. Operations	Yes

continued

continued from previous page

Code in Features Register	**S.M.A.R.T. Command**	**Supported by Medalist 1720**
DA_H	Return S.M.A.R.T. Status	Yes
DB_H	Enable/disable Automatic Off-line	Yes

Note. If an appropriate code is not written to the Features Register, the command will be aborted and 0x04 (abort) will be written to the Error register.

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