Seagate

Marathon 810sl

ATA Interface Drive

Product Manual

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ATA Interface Drive

Product Manual

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Introduction

The Marathon™ 810sl provides high storage capacity in a small, low-profile hard disc drive. This drive is available in two models: the standard model ST9810A, and the ST9810AG, which includes SafeRite™ shock protection.

Key Features:

- Low power consumption
- Low profile (12.75-mm high); compact, MCC-compatible form-factor
- Quiet operation
- SafeRite shock protection (optional; ST9810AG only)
- Supports PIO modes 0, 1, 2, 3 and 4, as well as single-word and multiword DMA modes 0, 1 and 2.
- High instantaneous data-transfer rates (up to 16.6 Mbytes per second) using PIO mode 4 and DMA mode 2.
- 120-Kbyte adaptive multisegmented cache
- Improved caching and on-the-fly error-correction algorithms
- Supports Read/Write Multiple commands
- Supports autodetection of master/slave drives using cable select (CSEL) signal.

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	**Marathon 810sl**
Guaranteed Mbytes ($\times 10^6$ bytes)	811.3
Guaranteed sectors	1,584,576
Bytes per sector	512
Default sectors per track	63
Default read/write heads	16
Default cylinders	1,572
Physical read/write heads	4
Discs	2
Recording density (bits/inch, max)	109,000
Track density (tracks/inch)	6,027
Areal density (Mbits/inch^2)	657
Spindle speed (RPM)	3,968
Internal data-transfer rate (Mbits/sec max)	44
I/O data-transfer rate (Mbytes per sec max)	16.6
ATA data-transfer modes supported	PIO modes 0, 1, 2, 3, 4; Multiword DMA modes 0, 1, 2
Cache buffer (Kbytes)	120
Height (mm max)	12.75
Width (mm max)	70.10
Length (mm max)	101.85
Weight (grams typical)	162
Track-to-track seek time (msec typical)	5 (read), 6 (write)
Average seek time (msec typical)	14 (read), 18 (write)
Full-stroke seek time (msec typical)	26 (read), 28 (write)

Drive Specification	**Marathon 810sl**
Average latency (msec)	7.56
Power-on to ready (sec typical)	5
Standby to ready (sec typical)	3
Spinup power and current (typical)	3.0 watts, 0.60 amps
Seek power and current (typical)	2.15 watts, 0.43 amps
Read/Write power and current (typical)	2.2 watts, 0.44 amps
Idle mode power and current (typical)	0.9 watts, 0.17 amps
Standby mode power and current (typical)	0.3 watts, 0.06 amps
Sleep mode power and current (typical)	0.2 watts, 0.04 amps
Voltage tolerance (including noise)	+5 volts +5% –10%
Ambient temperature (°C)	5 to 55 (op.), –40 to 70 (nonop.)
Temperature gradient (°C per hour max)	30
Relative humidity (operating)	8%–80% (10%/hr max grad.)
Wet bulb temperature (°C max)	29 (op.), 40 (nonop.)
Altitude (meters above mean sea level, max)	–300 to 3,040 (op.), –300 to 12,190 (nonop.)
Shock, operating (Gs max at 2 or 11 msec)	10 (ST9810A) 100 (ST9810AG)
Shock, nonoperating (Gs max)	300 (2 msec), 150 (11 msec)
Vibration (Gs max at 22-450 Hz, without nonrecoverable errors)	0.75 (op.) 4.0 (nonop.)
Drive acoustics: Idle mode (sound power, bels) Seeking (sound power, bels) Idle mode (sound pressure, dBA) Seeking (sound pressure, dBA)	 3.5 (typical), 3.9 (max) 4.0 (typical), 4.4 (max) 24 (typical), 28 (max) 26 (typical), 30 (max)
Nonrecoverable read errors	10 per 10^{14} bits read
Mean time between failures (power-on hours)	300,000
Contact start-stop cycles	50,000
Service life (years)	5

1.0 Drive specifications

Unless otherwise noted, all specifications are measured under ambient conditions, at 25°C, at sea level, and nominal power.

1.1 Formatted capacity

Guaranteed Mbytes (1 Mbyte = 10^6 bytes)	811.3
Guaranteed sectors	1,584,576
Bytes per sector	512

Note. DOS systems cannot access more than 528 Mbytes on the Marathon 810sl 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

Sectors per track	63
Read/Write heads	16
Cylinders	1,572

1.1.2 Supported translation geometries

The Marathon 810sl 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)* ≤ 1,583,576

1.2 Physical organization

Read/Write heads	4
Discs	2

1.3 Recording and interface technology

Interface	ATA
Recording method	RLL (1,7)
Recording density (bits/inch)	109,000
Track density (tracks/inch)	6,027
Areal density (Mbits/inch^2)	657
Spindle speed (RPM) ($\pm$ 0.5%)	3,968
Internal data-transfer rate (Mbits per second max—ZBR)	Up to 44.8
I/O data-transfer rate (Mbytes per second max)	Up to 16.6 (PIO mode 4 with IORDY) Up to 16.6 (multiword DMA mode 2)
Interleave	1:1
Cache buffer (Kbytes)	120

1.4 Physical characteristics

Maximum Height	(inches)	0.502
	(mm)	(12.75)
Maximum Width	(inches)	2.760
	(mm)	(70.10)
Maximum Length	(inches)	4.010
	(mm)	(101.85)
Typical Weight	(ounces)	5.7
	(grams)	(162)

Note. Maximum length excludes I/O connector pins, which may extend up to 0.015 inches beyond the edge of the head/disc assembly, per SFF 8004 specification.

1.5 Seek time

All seek times are measured using a 25 MHz 486 AT computer (or faster) with a 8.3 MHz I/O bus. The measurements are taken with nominal power at sea level and 25°C ambient temperature. 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	Typical read (msec)	Typical write (msec)
Track-to-track	5	6
Average	14	18
Full-stroke	26	28

Average latency: 7.56 msec

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

1.6 Start times

Power-on to Ready (sec)	5 (typical)
Standby to Ready (sec)	3 (typical), 10 (max.)

1.7 Power specifications

The drive receives DC power (+5V) through pin 41 and pin 42 of the ATA interface connector.

1.7.1 Power consumption

Power requirements for the drive are listed in the table following this paragraph. Typical power measurements are based on an average of drives tested under nominal conditions, using 5.0V input voltage at 25°C ambient temperature at sea level. Active mode current and power are measured with a 32-msec delay between each operation and the drive in default logical geometry. Seeking power and currents are measured during one-third-stroke buffered 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. Spinup power is measured from time of power-on to time of drive-ready for normal operation.

Mode	Typical Watts RMS (at nominal voltage)	Typical Amps RMS (at nominal voltage)
Spinup*	3.0	0.60
Active		
Seeking	2.15	0.43
Read/Write	2.2	0.44
Idle	0.9	0.17
Standby	0.3	0.06
Sleep	0.2	0.04

* Under motor restart conditions, which may last for 2 seconds, peak spinup power and current (measured at 5.25 volts) may reach 6.56 watts and 1.25 amps, respectively.

1.7.1.1 Typical current profile

Figure 1 shows a typical current profile for a Marathon 810sl.

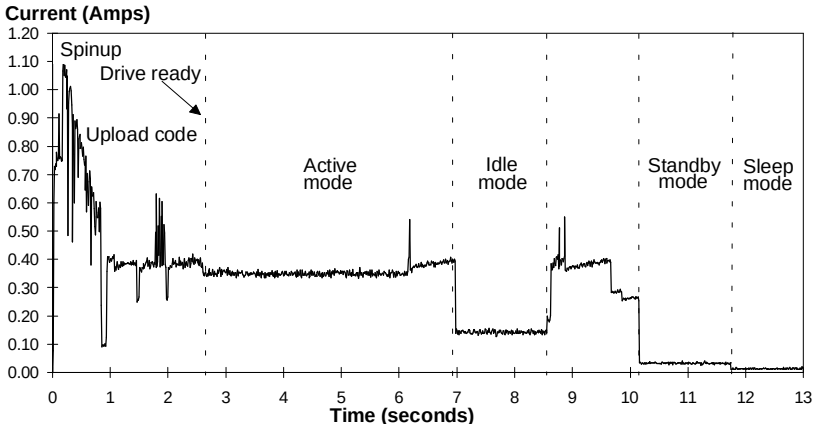

Figure 1. Typical startup and operation current profile

1.7.2 Power recovery

Except during execution of a write command, the drive's power can be interrupted without adversely affecting the drive or previously written data. If power is removed while the drive is performing a write operation, the integrity of the written data cannot be guaranteed.

Note. Do not remove power from the drive while keeping the interface signals active (at low impedance). Power may enter the input buffers.

1.7.3 Conducted noise

The drive is expected to operate with a maximum of:

- 150 mV peak-to-peak triangular-wave injected noise at the power connector. The frequency is 10 Hz to 100 KHz with equivalent resistive loads.
- 100 mV peak-to-peak triangular-wave injected noise at the power connector. The frequency is 100 KHz to 10 MHz with equivalent resistive loads.

Note. Equivalent resistance (11.4 ohms) is calculated by dividing the nominal voltage (5.0V) by the typical RMS read/write current (0.44 amps).

1.7.4 Voltage tolerance

Voltage tolerance (including noise): +5 volts + 5% – 10%

1.7.5 Power-management modes

The Marathon 810sl provides programmable power management to enhance battery life and 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 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 standby timer has been set by the host system, 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 70°C (–40° to 158°F)

Note. This drive requires sufficient airflow so that the maximum surface temperature at the center of the top cover of the drive does not exceed 62 degrees C (144 degrees F).

1.8.2 Temperature gradient

Operating	30°C / hr (54°F / hr) max, without condensation
Nonoperating	30°C / hr (54°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	29.4°C (85°F) max
Nonoperating	40°C (104°F) max

1.8.4 Altitude

Operating	–300 m to 3,040 m (–1,000 ft to 10,000 ft)
Nonoperating	–300 m to 12,190 m (–1,000 ft to 40,000 ft)

1.8.5 Shock

All shock specifications assume that the drive is mounted securely with the input levels at the drive mounting screws. The nonoperating specifications assume that the read/write heads are positioned in the shipping zone.

Note. At power-down, the read/write heads automatically move to the shipping zone. The head and slider assembly park inside of the maximum data cylinder. When power is applied, the heads recalibrate to Track 0.

1.8.5.1 Operating shock

The ST9810A can withstand a maximum operating shock of 10 Gs without nonrecoverable data errors (based on half-sine shock pulses of 2 or 11 msec). The optional ST9810AG version of the Marathon 810sl incorporates SafeRite shock protection and can withstand a maximum operating shock of 100 Gs without nonrecoverable data errors (based on half-sine shock pulses of 2 or 11 msec).

1.8.5.2 Nonoperating shock

The nonoperating shock level that the Marathon 810sl can experience without incurring physical damage or degradation in performance when subsequently put into operation is 300 Gs (based on half-sine shock pulses of 2 msec duration) or 150 Gs (based on half-sine shock pulses of 11 msec duration). Shock pulses are defined by MIL-STD-202F, with the amplitude tolerance controlled to ± 5%.

1.8.6 Vibration

All vibration specifications assume that the drive is mounted in an approved orientation with the input levels at the drive mounting screws. The nonoperating specifications assume that the read/write heads are positioned in the shipping zone.

1.8.6.1 Operating vibration

The following table lists the maximum vibration levels that the drive may experience without incurring physical damage or nonrecoverable errors.

5–450 Hz	0.75 Gs acceleration (peak)
450–5 Hz	0.75 Gs acceleration (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 put into operation.

5–22 Hz	0.162-inch displacement (double amplitude)
22–450 Hz	4 Gs acceleration (peak)
450–22 Hz	4 Gs acceleration (peak)
22–5 Hz	0.162-inch displacement (double amplitude)

1.9 Drive acoustics

Drive acoustics are measured as overall A-weighted acoustic sound power levels. 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	Maximum
Idle (sound power–bels):	3.5	3.9
Seek (sound power–bels):	4.0	4.4
Idle (sound pressure–dBA):	24	28
Seek (sound pressure–dBA):	26	30

1.10 Reliability

Nonrecoverable read errors	10 per 10^{14} bits read
Mean time between failures	300,000 power-on hours (nominal power, at sea level, 25°C ambient temperature)
Contact start-stop cycles	50,000 cycles (at nominal voltage and temperature, with 60 cycles per hour and a 50% duty cycle)
Preventive maintenance	None required
Service life	5 years

1.11 Agency certification

1.11.1 Safety certification

The drive is recognized in accordance with UL 1950 and CSA C22.2 (950-M89) and meets all applicable sections of IEC 380, IEC 435, IEC 950, VDE 0806/08.81 and EN 60950 as tested by TUV-Rheinland, North America.

1.11.2 Electromagnetic Compatibility

Hard drives that display the CE marking comply with European Union requirements specified in Electromagnetic Compatibility Directive 89/336/EEC as amended by Directive 92/31/EEC of 28 April 1992 and Directive 93/68/EEC of 22 July 1993.

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 using 80486, Pentium and PowerPC microprocessors. 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.

1.11.3 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 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 attached to a single AT bus. You can configure a drive to become a master or slave by setting the master/slave jumpers, as described below and shown in Figure 2 on page 18.

Alternatively, you can configure the drive as a master or slave 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 a Marathon 810sl for cable select, install both master/slave jumpers.

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.

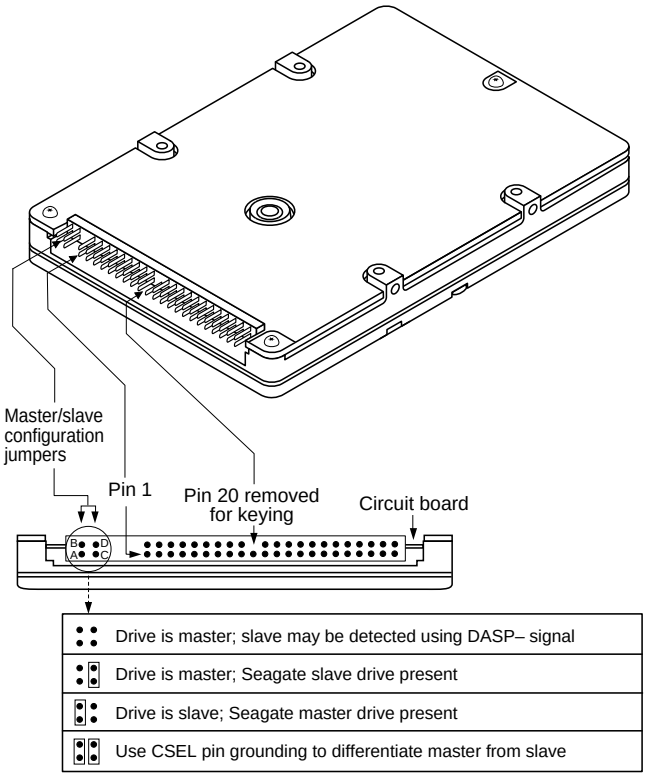

Figure 2. Connector and master/slave jumper setup

Jumper for pins A and B	Jumper for pins C and D	Configuration
Off	Off	Drive is master; slave drive may be detected using DASP– signal. CSEL is ignored.
Off	On	Drive is master; slave drive is present. CSEL is ignored. DASP– is ignored.
On	Off	Drive is slave (a master drive should be present also). CSEL is ignored.
On	On	Differentiate master and slave drives using cable select: If a drive is attached to a connector in which pin 28 is grounded, then it becomes a master. If a drive is attached to a connector in which pin 28 is ungrounded, then it becomes a slave.

2.3 Remote LED configuration

The drive indicates activity to the host through the DASP– line (pin 39) on the ATA interface. This line may be connected to a drive status indicator driving an LED at 5V. The line has a 30 mA nominal current limit. To avoid potential damage to the drive, the host should include a resistor in the line with the LED for current limiting. This resistor should have minimum resistance of 470 ohms (1,000 to 3,000 ohms recommended).

2.4 Drive mounting

You can mount the drive in any orientation using four screws in the four side-mounting or four bottom-mounting holes.

This drive conforms to the industry-standard MCC direct-mounting specifications and requires the use of MCC-compatible connectors in direct-mounting applications. Per SFF 8004 specifications, the I/O connector pins may extend up to 0.015 inches beyond the edge of the head/disc assembly. See Figures 3 and 4 on pages 20 and 21 for drive mounting dimensions.

Important mounting precautions:

- Provide sufficient airflow so that the maximum surface temperature at the center of the top cover of the drive does not exceed 62 degrees C (144 degrees F).
- Allow a minimum clearance of 0.030 inches (0.76 mm) around the entire perimeter of the drive for cooling.
- Use only M3X0.5 *metric* mounting screws.
- Do not insert the mounting screws more than 0.150 inches (3.81 mm) into the mounting holes.
- Do not overtighten the mounting screws (maximum torque: 3 inch-lb).

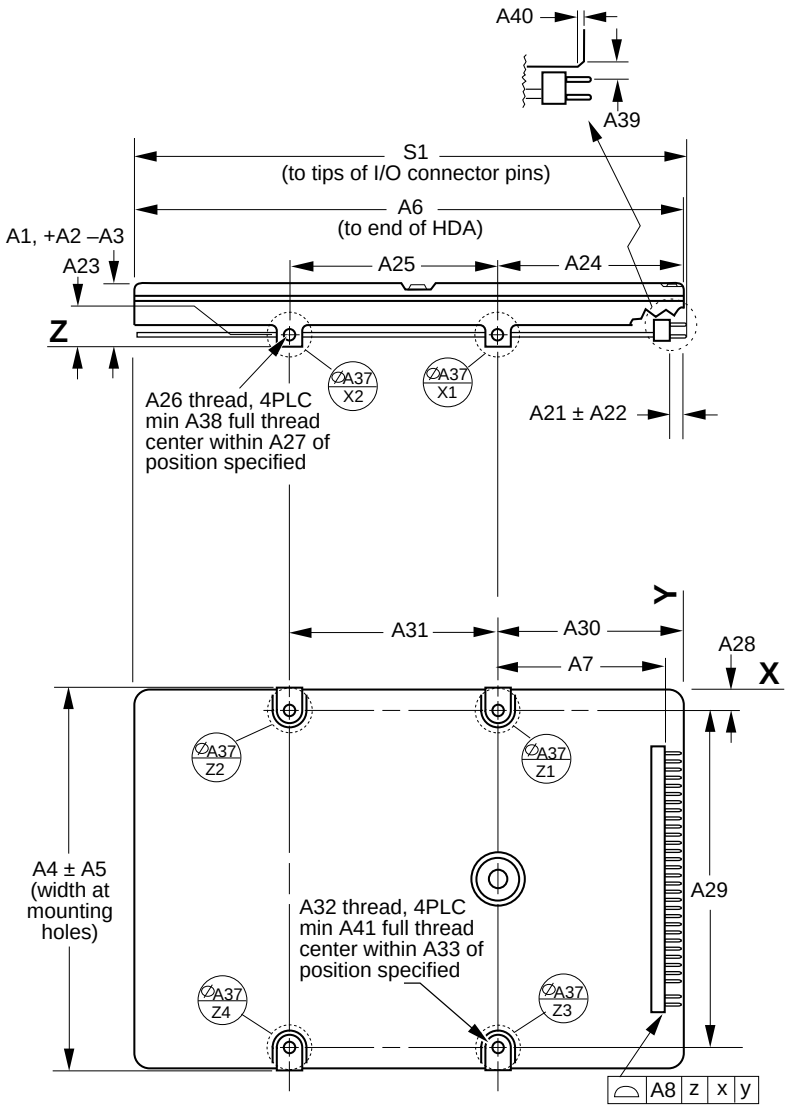

Figure 3. Mounting dimensions—side and bottom view (for dimension specifications, see table on pages 21 and 22).

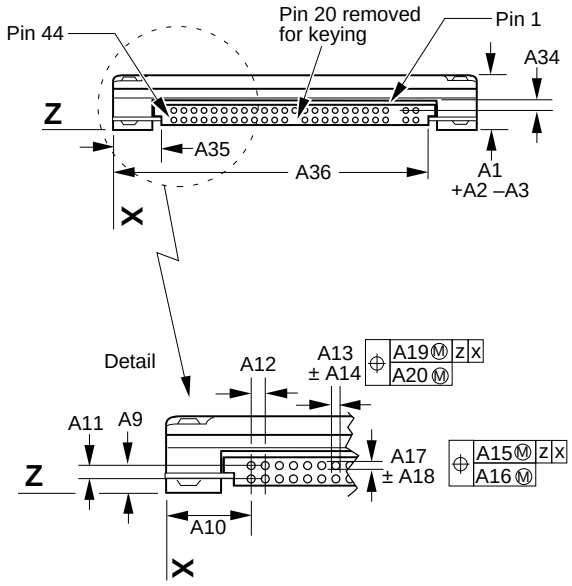

Figure 4. Mounting dimensions—end view (for dimension specifications, see table below).

Mounting dimension specifications for the Marathon 810sl			
Dim.	**Description**	**inches**	**mm**
A1	Drive height	0.494	12.55
A2	+ tolerance on drive height	0.008	0.20
A3	– tolerance on drive height	0.008	0.20
A4	Drive width at mounting holes	2.750	69.85
A5	+ and – tolerance on drive width at mounting holes	0.010	0.25
A6	Maximum drive length (not including I/O pins)	4.010	101.85
A7	Front-to-back connector location	1.227	31.17
A8	Allowable range, front-to-back connector location	0.039	1.00
A9	Top-to-bottom connector location, pin center line	0.157	3.99
A10	Side-to-side connector location, pin center line	0.399	10.14
A11	Top-to-bottom pin spacing	0.079	2.00
A12	Side-to-side pin spacing	0.079	2.00
A13	Pin side-to-side dimension	0.020	0.50
A14	+ and – tolerance on pin side-to-side dimension	0.002	0.05
A15	Allowable range, side-to-side connector location	0.030	0.75
A16	Allowable range, side-to-side, pins within connector	0.003	0.08

continued on following page

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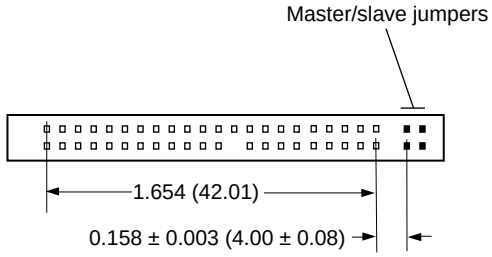
Mounting dimension specifications for the Marathon 810sl			
Dim.	**Description**	**inches**	**mm**
A17	Pin top-to-bottom dimension	0.020	0.50
A18	+ and – tolerance on pin top-to-bottom dim.	0.002	0.05
A19	Allowable range, top-to-bottom connector location	0.020	0.50
A20	Allowable range, top-to-bottom, pins in connector	0.003	0.08
A21	Connector pin length	0.152	3.86
A22	+ and – tolerance on pin length	0.008	0.20
A23	Side mounting hole height	0.118	3.00
A24	Front-to-back location of side mounting holes	1.375	34.93
A25	Front-to-back distance between side mounting holes	1.500	38.10
A26	Thread description, side mounting holes	n/a	M3
A27	Diameter of cylinder into which hole center must fall	0.020	0.50
A28	Distance between side of drive and center of nearest bottom mounting holes (on pin-44 side)	0.160	4.06
A29	Side-to-side distance between bottom mounting holes	2.430	61.72
A30	Front-to-back location of bottom mounting holes	1.375	34.93
A31	Front-to-back distance between bottom mounting holes	1.500	38.10
A32	Thread description, bottom mounting holes	n/a	M3
A33	Diameter of cylinder into which hole center must fall	0.020	0.50
A34	Min. vertical clearance for mating connector	0.039	1.00
A35	Max. side-to-side distance from pin 44 edge of HDA near I/O connector to start of clearance for mating connector	0.315	8.00
A36	Min. side-to-side clearance from pin 44 edge of HDA near I/O connector to the first part interrupting clearance of mating connector	2.370	60.20
A37	Diameter of datum targets and reference areas	0.315	8.00
A38	Min. thread depth, side mounting holes	0.118	3.00
A39	Min. pin centerline to chamfer above connector	0.049	1.25
A40	Min. chamfer above connector	0.010	0.25
A41	Min. thread depth, bottom mounting holes	0.098	2.50
S1	Maximum drive length to tips of I/O pins (Non-SFF dimension—for reference only)	4.025	102.23

2.5 ATA interface connector

The drive connector is a 44-conductor connector with 2 rows of 22 male pins on 0.079-inch (2 mm) centers (see Figure 4 on page 21 and Figure 5 below). The mating cable connector is a 44-conductor, nonshielded connector with 2 rows of 22 female contacts on 0.079-inch (2 mm) centers. The connectors should provide strain relief and should be keyed with a plug in place of pin 20.

These drives are designed to support the industry-standard MCC direct-mounting specifications. When installing these drives in fixed mounting applications, use only MCC-compatible connectors such as Molex part number 87368-442*x*. For applications involving flexible cables or printed circuit cables (PCCs), use Molex part number 87259-4413 or equivalent to connect the drive to the system. Select a connector that provides adequate clearance for the master/slave configuration jumpers if the application requires the use of such jumpers. The ATA interface cable should be no more than 18 inches long.

Note. Per SFF 8004 specifications, the I/O connector pins may extend up to 0.015 inches beyond the edge of the head/disc assembly.



Dimensions are in inches (mm)

Figure 5. ATA Interface connector dimensions (non-SFF dimension; for reference only)

3.0 ATA interface

The Marathon 810sl 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.

The drive can differentiate between a hard reset and a soft reset while in Sleep mode. 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 *Working Draft of the ATA-2 Proposed American National Standard*, document X3T10/948D (subsequently referred to in this manual as the *Draft Proposed ATA-2 Standard)*.

Note. Bit 1 of the Status register (IDX) is defined in the *Draft Proposed ATA-2 Standard* as vendor-unique. This bit is not used by the Marathon 810sl and should be ignored by the host system.

3.1 ATA interface signals and connector pins

Figure 6 on page 26 summarizes the signals on the ATA interface connector that the Marathon 810sl supports. For a detailed description of these signals, refer to the *Draft Proposed ATA-2 Standard.*

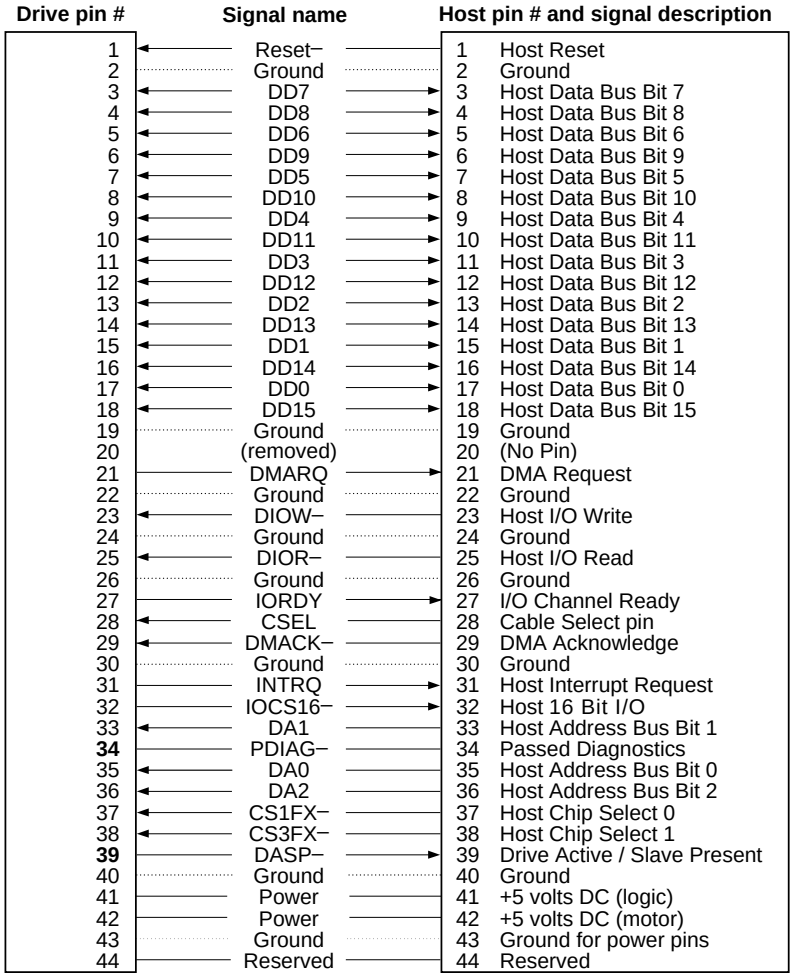
3.1.1 AT bus signal levels

Signals that the drive sends have the following output characteristics at the drive connector:

Logic low	0.0V to 0.4V
Logic high	2.5V to 5.25V

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

Logic low	0.0V to 0.8V
Logic high	2.0V to 5.25V



Pins 28, 34 and 39 are used for master-slave communication (details shown below).

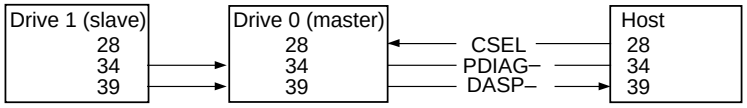


Figure 6. I/O pins and supported ATA signals

3.2 ATA Interface commands

3.2.1 Supported ATA commands

The following table lists ATA-standard and Seagate-specific drive commands that the Marathon 810sl supports. For a detailed description of the ATA commands, refer to the *Draft Proposed ATA-2 Standard.*

Command name	Command code	Supported by Marathon 810sl
ATA-standard commands		
Execute Drive Diagnostics	90_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
Set Features	EF_H	Yes
Set Multiple Mode	$C6_H$	Yes
Write Buffer	$E8_H$	Yes

continued on following page

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Command name	Command code	Supported by Marathon 810sl
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
Seagate-specific commands		
Active and Set Idle timer	FB_H	Yes
Active Immediate	$F9_H$	Yes
Check Idle Mode	FD_H	Yes
Idle Immediate	$F8_H$	Yes
Idle and Set Idle timer	FA_H	Yes

The following commands contain drive-specific features that may not be described in the *Draft Proposed ATA-2 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 Marathon 810sl.

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	$045A_H$
1	Number of fixed cylinders (default logical emulation): 1,572	0624_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)	0010_H
23–26	Firmware revision (8 ASCII character string): *xx* = ROM version, *ss.tt* = RAM version	*xx.ss.tt*

continued on following page

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Word	Description	Contents
27–46	Drive model number: (40 ASCII characters, padded with blanks to end of string)	ST9810A or ST9810AG
47	Maximum sectors per interrupt on read/write multiple	0010_H
48	Double word I/O (not supported)	0000_H
49	DMA data transfer, IORDY (supported), LBA mode, ATA-2 standby times supported	$2F00_H$
50	ATA-reserved	0000_H
51	PIO data-transfer cycle timing mode	0200_H
52	DMA transfer cycle timing mode (not used)	0000_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)	0018_H
61	LBA sectors available (continued)	$2F48_H$
62	Single-word DMA active and modes supported (see note following this table)	$0x07_H$
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 (180 nsec)	$00B4_H$
67	Minimum PIO cycle time without IORDY flow control (363 nsec)	$016B_H$
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 words 62 and 63 of the Identify Drive command:

Word	Bit	Description (if bit is set to 1)
62	0	Single-word DMA mode 0 available
62	1	Single-word DMA mode 1 available
62	2	Single-word DMA mode 2 available
62	8	Single-word DMA mode 0 currently active
62	9	Single-word DMA mode 1 currently active
62	10	Single-word DMA mode 2 currently active
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.

Appendix. Compatibility Notes

ECC testing

When a Marathon 810sl performs hardware-based ECC error correction on-the-fly, the drive does not report an ECC error. This allows ECC correction without degrading drive performance. Some older drive diagnostic programs test ECC features by creating small data errors and then checking to see if they are reported. Such tests, when run on these drives, may incorrectly report an ECC detection failure because the drive hardware corrects the data automatically, avoiding the error rather than reporting it. Such a report does not indicate a drive malfunction.

Seagate

Seagate Technology, Inc.
920 Disc Drive, Scotts Valley, California 95066, USA

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