Seagate

PRODUCT MANUAL

ST1.2 Series

ST68022CF

ST68022FX

ST64022CF

ST64022FX

ST66022CF

ST66022FX

Rev. B

February 2007

Revision status summary sheet

Revision	Date	Sheets Affected
Rev. A	05/27/05	All.
Rev. B	02/27/07	Front cover and 18.

Contents

List of Figures

1.0   Introduction

This manual describes the functional, mechanical and interface specifications for the following Seagate® ST1.2 Series drives:

• ST68022CF, ST66022CF and ST64022CF CompactFlash+ Type II disc drives.

• ST68022FX, ST66022FX and ST64022FX Flex (IDE interface) disc drives.

These drives provide the following key features.

• 3,600-RPM spindle speed and 2-Mbyte buffer combine for superior performance.

• Quiet operation. Fluid Dynamic Bearing (FDB) motor.

• Giant magnetoresistive (GMR) recording heads and EPRML technology, which provide the drives with increased areal density.

• State-of-the-art cache and on-the-fly error-correction algorithms.

• 1.5K Gs nonoperating shock, and 200 Gs operating shock.

• SeaTools™ diagnostic software performs a drive self-test that eliminates unnecessary drive returns.
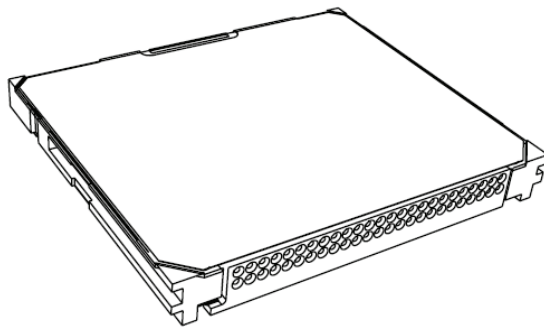
Figure 1.   ST1.2 Series CompactFlash+ disc drive
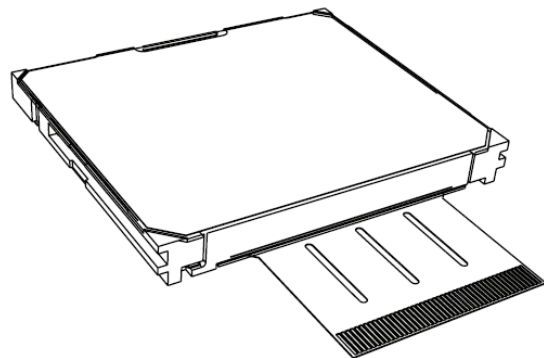
Figure 2.   ST1.2 Series Flex (IDE interface) disc drive

1.1   Disclaimer

Seagate Technology LLC makes no warranties whatsoever, including any warranty of merchantability, non-infringement, fitness for any particular purpose, or any warranty otherwise arising out of any proposal, specification or sample. Seagate may not be held liable for any direct, indirect, incidental, special, exemplary, or consequential damages (including, but not limited to, loss of use, data, or profits; procurement of substitute goods or services; or business interruptions) however caused and on any theory of liability, whether in contract, strict liability, or tort (including negligence or otherwise) arising in any way from the use of this kit, even if advised of the possibility of such damage.

1.2   Drive care

Do not use the ST1.2 Series disc drives outside of the ranges of environmental conditions found in Section 2.8, "Environmental specifications." Doing so may void the warranty of the ST1.2 Series disc drive.

1.3   Handling precautions

• Do not cover or seal the breather hole! Covering or sealing the breather hole may result in loss of data.
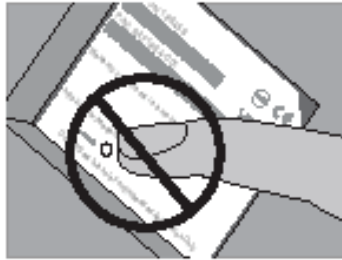
Figure 3.   ST1.2 Series breather hole location

• Do not apply any force to the drive during handling or installation.

• Always handle the drive with care to prevent damage from shock, vibration, or electrostatic discharge (ESD).

• Handle the drive carefully by the edges. Do not touch any exposed printed circuit board or the top cover.

• The drive is fragile—handle it with care. Do not press down on the top cover or attempt to use a pen to write on the drive's label. Do not apply more than 1.5 kg of force to the top cover.

Figure 4.   ST1.2 Series improper handling example

• Always carry the drive in its plastic case.

• Do not drop the drive.

• Do not expose the drive to wet conditions.

• Do not place the drive near a strong magnetic field.

• Do not expose the drive to extreme temperatures.

• Do not use the drive in CF+ Type II slots without an ejection mechanism.

• The drive may become hot during operation. Be careful when removing the drive from the host device immediately after operation.

2.0 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 ST68022CF, ST68022FX, ST66022CF, ST66022FX, ST64022FX and ST64022CF model drives.

2.1 Power, access times and acoustics

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

Table 1: Specifications

Drive specification	ST68022CF ST68022FX	ST66022CF ST66022FX	ST64022CF ST64022FX
Formatted Gbytes	8.0	6.0	4.0
Guaranteed sectors	15,625,008	11,719,008	7,999,488
Bytes per sector	1024		
Cache (Mbytes)	2		
Recording density, BPI (bits/inch max)	663,000		
Track density. TPI (tracks/inch max)	110,000		
Areal density (Gbits/inch^2 max)	72.9		
Spindle speed (RPM)	3,600		
Internal data transfer rate OD (Mbits/sec max)	130.0		
Sustained data transfer rate OD (Mbytes/sec)	8.8		
I/O data-transfer rate (Mbytes/sec max)	33.3MB/s (UDMA 2)		
ATA data-transfer modes supported	PIO modes 0–4; Multiword DMA modes 0-2; Ultra DMA modes 0–2		
Height	5.0 +/-0.1 mm (0.1968 +/-0.004 inches)		
Width	42.80 +/-0.101 mm (1.685 +/-0.004 inches)		
Length	36.40 +/-0.15 mm (1.433 +/-0.006 inches)		
Weight (typical)	18.0 grams (0.0397 lb.)		
Average latency (msec)	8.3		
Power-on to ready (sec typical / max) (without retry)	1.2 / 2.5		
Standby to ready (sec typical / max) (without retry)	1.0 / 2.5		
Startup current 5V (peak) (maximum RMS in 10ms window)	350 mA		
Seek power (typical 3.3V)	226 mA		
Read/write power (typical 3.3V)	330 mA		
Performance idle mode (typical 3.3V)	200 mA		
Low power idle mode (typical 3.3V)	90 mA		

Table 1: **Specifications**

Drive specification	ST68022CF ST68022FX	ST66022CF ST66022FX	ST64022CF ST64022FX
Standby/Sleep mode (typical 3.3V)	30 mA		
Voltage tolerance (including noise)	3.3V ± 5% 5V ± 10%		
Ambient temperature	0° to 70°C (operating)　　　　(70°C case temperature) –40° to 70°C (nonoperating)		
Temperature gradient (°C per hour max)	20°C (operating) 30°C (nonoperating)		
Relative humidity (noncondensing)	5% to 90% (operating) 5% to 95% (nonoperating)		
Relative humidity gradient	30% per hour max		
Wet bulb temperature (°C max)	33°C (operating) 40°C (nonoperating)		
Altitude, operating	–60.98 m to 3,048 m (–200 ft to 10,000+ ft)		
Altitude, nonoperating (below mean sea level, max)	–60.98 m to 12,192 m (–200 ft to 40,000+ ft)		
Shock, operating (Gs max at 1 msec) Read	200		
Shock, operating (Gs max at 2 msec) Write	175		
Shock, nonoperating (Gs max at 1 msec)	1500		
Shock, nonoperating (Gs max at 0.5 msec)	1500		
Vibration, operating (max displacement may apply below 10 hz)	1.0 Gs (0 to peak, 5–500 Hz) @ 2 oct/min sweep rate		
Vibration, nonoperating (max displacement may apply below 22 hz)	5.0 Gs (0 to peak, 5–500 Hz) @ 0.5 oct/min sweep rate		
Drive acoustics, sound power (bels) Idle (typical / max) Operational (typical / max)	2.1/ 2.4 2.2 / 2.5		
Nonrecoverable read errors	1 per 10^{14} bits read		
Annualized Failure Rate	0.4% AFR at 25°C		
Load/Unload (LUL) cycles (40°C)	300,000 software-controlled power on/off cycles 20,000 hard power on/off cycles		
Warranty	Per agreement		

2.2   Formatted capacity

Model	Formatted capacity	Guaranteed sectors	Bytes per sector
ST68022CF ST68022FX	8.0 Gbytes	15,625,008	1024
ST66022CF ST66022FX	6.0 Gbytes	11,719,008	1024
ST64022CF ST64022FX	4.0 Gbytes	7,999,488	1024

2.3   Default logical geometry

Model	Cylinders	Read/write heads	Sectors per track
ST68022CF ST68022FX	15,501	16	63
ST66022CF ST66022FX	11,626	16	63
ST64022CF ST64022FX	7,936	16	63

LBA mode
When addressing these drives in LBA mode, all blocks (sectors) are consecutively numbered from 0 to $n-1$, where n is the number of guaranteed sectors as defined above.

2.4   Recording and interface technology

Technology	Specification
Interface	CompactFlash 2.0 (CF+ 2.0)
Recording method	RLL 0,20
Recording density BPI (bits/inch max)	663,000
Track density TPI (tracks/inch max)	115,000
Areal density (Gbits/inch^2 max)	72.9
Spindle speed (RPM) (± 0.2%)	3,600
Internal data-transfer rate OD (Mbits/sec max)	130.0
Sustained data transfer rate OD (Mbytes/sec max)	8.8
I/O data-transfer rate (Mbytes/sec max)	33.3MB/s (UDMA 2)
Interleave	1:1
Cache buffer ST68022CF, ST68022FX, ST66022CF, ST66022FX, ST64022CF and ST64022FX	2 Mbytes (2,048 Kbytes)

2.5   Physical characteristics

Height	(mm) (inches)	5.0 +/-0.1 mm 0.1968 +/-0.004
Width	(mm) (inches)	42.80 +/-0.101 1.685 +/-0.004
Length	(mm) (inches)	36.40 +/-0.15 1.433 +/-0.006
Typical weight	(grams) (pounds)	18.0 0.0397
Interface Connector ST68022CF, ST66022CF and ST64022CF ST68022FX, ST66022FX and ST64022FX		CompactFlash Type II Connector (50-pin) Seagate Flex Connector (45-way)

2.6   Time to ready

Time to ready	Typical	Max (without retry)
Power-On to Ready (sec)	1.2	2.5
Standby to Ready (sec)	1.0	2.5

2.7 Power specifications

The drive receives DC power (+3.3V or +5V) through the CompactFlash interface connector for ST68022CF, ST66022CF and ST64022CF models, and (+3.3V or +5V) through the Flex interface connector for ST68022FX, ST66022FX and ST64022FX models.

2.7.1 Power consumption

Power requirements for the drives are listed in the table on page 8. Typical power measurements are based on an average of drives tested, under nominal conditions, using +3.3V and +5.0V input voltage at 25°C ambient temperature.

- **Spinup power**

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

- **Seek mode**

  During seek mode, the read/write actuator arm moves toward a specific position on the disc surface and does not execute a read or write operation. Servo electronics are active. Seek mode power is measured based on three random seek operations every 100 msecs. This mode is not typical.

- **Read/write power and current**

  Read/write power is measured with the heads on track, at the moment while the head is writing/reading from/to disc. It is performed with 100 percent duty cycle of write/read operation.

- **Idle mode power, low**

  Spindle motor is working normally with actuator unloaded to the parked position.

- **Standby mode / Sleep mode**

  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.

Table 2:   DC power

ST1 Power Consumption (W) Max current the average of the peak value in 10ms window	Average 3.3V (mA)	Max 3.3V (mA)	Average 5.0V (mA)	Max 5.0V (mA)
Current		350		350
Spinup		300		300
Load/Unload current		300		300
Write	330	350	330	350
Read	330	350	340	350
Seek	226	300	226	300
Performance idle	200		205	
Low power idle	90		92	
Standby/Sleep	30		33	

*During periods of drive idle, some offline activity may occur according to the S.M.A.R.T. specification, which may increase acoustic and power to operational levels.

2.7.1.1   Typical current profile
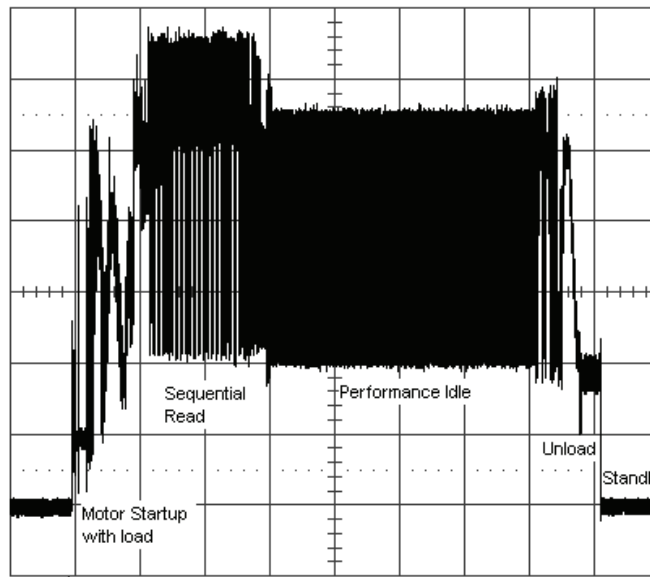
Figure 5.   Typical 3.3V startup and operation current profile

2.7.2 Conducted noise

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

Using 5-volt power, the drive is expected to operate with a maximum of 100 mV peak-to-peak square-wave injected noise at up to 20 MHz.

Using 3.3-volt power, the drive is expected to operate with a maximum of 70 mV peak-to-peak square-wave injected noise at up to 20 MHz.

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

2.7.3 Voltage tolerance

Voltage tolerance (including noise):

5.0V ± 10%
3.3V ± 5%

2.7.4   Power-management modes

The drive provides programmable power management to provide greater energy efficiency. The drive features the following power-management modes:

Table 3:   Power-management modes

Power modes	Heads	Spindle	Buffer
Active (operating)	Tracking	Rotating	Enabled
Idle, low power	Parked	Rotating	Disabled
Standby/Sleep	Parked	Stopped	Disabled

- **Active mode**

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

- **Low power idle mode**

  Drive enters Low Power Idle mode from Active Idle mode when the Advanced Power Management Level is set above 80h and the Idle timer is reached at 2 seconds. Disc is spinning and head is parked and drive accepts all commands and returns to Active mode any time disc access is necessary.

- **Performance idle mode**

  The buffer remains enabled, and the drive accepts all commands and returns to Active mode any time disc access is necessary.

- **Standby/Sleep 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 established using a Standby or Idle command. In Standby mode, the drive buffer is disabled, 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.

- **Standby timers**

  Each time the drive performs an Active function (such as read, write or seek), the standby timer is reinitialized and begins counting down from its specified delay times to zero. 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.

2.8   Environmental specifications

2.8.1   Ambient temperature

Ambient temperature is defined as the temperature of the environment immediately surrounding the drive. Actual drive case temperature should not exceed 70°C (158°F) within the operating ambient conditions.

Above 1,000 feet (305 meters), the maximum temperature is derated linearly by 1°C every 1000 feet.

Operating	0° to 70°C (41° to 158°F) (70°C @ case temperature)
Nonoperating	–40° to 70°C (–40° to 153°F)

2.8.2   Temperature gradient

Operating	20°C per hour (68°F per hour max), without condensation
Nonoperating	30°C per hour (86°F per hour max), without condensation

2.8.3   Humidity

2.8.3.1   Relative humidity

Operating	5% to 90% noncondensing (30% per hour max)
Nonoperating	5% to 95% noncondensing (30% per hour max)

2.8.3.2   Wet bulb temperature

Operating	33°C (91.4°F max) [1]
Nonoperating	40°C (104°F max) [2]

[1]   Operating: Wet bulb temperature is calculated by the operating Temperature and the Relative Humidity levels.
[2]   Nonoperating: Wet bulb temperature is calculated by the nonoperating Temperature and the Relative Humidity levels.

2.8.4   Altitude

Operating	–60.98 m to 3,048 m (–200 ft to 10,000+ ft)
Nonoperating	–60.98 to 12,192 m (–200 ft to 40,000+ ft)

2.8.5 Shock

All shock measurements in this section are carried out at drive level. For all linear shock test, operating or non-operating, the input shock level shall be measured at the frame of the disk drive at the specific location indicated by the red ellipse in Figure 6 below for the CF and interface drives.
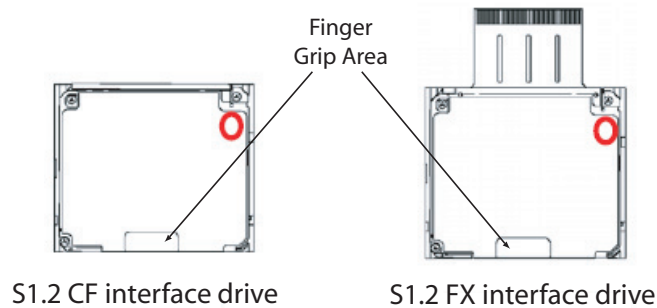
Figure 6. Location where tri-axial accelerometer will be placed on ST1.2 drive

All shock test will cover all the 6 directions, +/- x, y and z axes. The drive axis definition in shown in Figure 7 below.
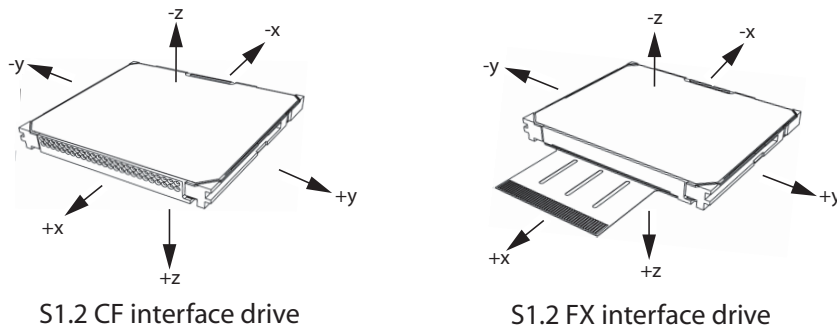
Figure 7. Drive axis definition for ST1.2 drives

2.8.5.1 Operating shock

The drive will be subjected to 10 shocks for each direction. During the shocks, there must be a minimum delay of 3 seconds between shock pulses. Soft errors and automatic retries are allowed during the test. No data loss or permanent damage occurs during a half sine shock pulse of:

200 Gs, 1 msec (on-track read at OD)

175 Gs, 2 msec (random write)

2.8.5.2 Nonoperating shock

The nonoperating shock level that the drive can experience without incurring any physical damage when subsequently put into operation is 750 Gs based on a non-repetitive half sine shock pulse of 2 msec duration. The same applies for shock levels of 1500 Gs, 1 msec pulse duration and 1500 Gs, 0.5 msec pulse duration on fresh drives for each level.

2.8.6 Vibration

All vibration specifications assume that the drive is mounted securely in a fixture that does not have fixture resonances in the frequency test range. The input vibration is applied through the disc drive guide rails of the device under test. Testing is carried out in the x, y and z axes.

2.8.6.1   Operating sweep sine vibration

The following lists the maximum operating sweep sine vibration levels that the drive may experience while meeting the performance standards specified. It will consist of a forward and backward sweep from 5 Hz to 500 Hz to 5 Hz. The drive will operate without a hard error while being subjected to the following vibration levels.

5 Hz to 500 Hz @ 2 oct/min	1.0 Gs (0 to pk). Maximum displacement may apply below 10 Hz.

2.8.6.2   Operating random vibration

The test consists of 30 minutes of random vibration using the power spectral density (PSD) levels specified in the table below. The vibration test level is 0.67 Gs RMS. The drive will operate without a hard error while being subjected to the following vibration levels.

Table 4:   Operating random vibration profile

Frequency (Hz)	G^2/Hz
17	1.1 x E-03
45	1.1 x E-03
48	8.0 x E-03
62	8.0 x E-03
65	1.0 x E-03
150	1.0 x E-03
200	5.0 x E-04
500	5.0 x E-04

2.8.6.3   Nonoperating sweep sine vibration

The following table lists the maximum nonoperating sweep sine vibration levels that the drive may experience while meeting the performance standards specified. It will consist of a forward and backward sweep from 5 Hz to 500 Hz to 5 Hz. The drive will not incur any physical damage when subsequently put into operation.

5 Hz to 500 Hz @ 0.5 oct/min	5.0 Gs (0 to pk). Maximum displacement may apply below 22 Hz.

2.8.6.4   Nonoperating random vibration

The test consists of 15 minutes of random vibration using the power spectral density (PSD) levels specified in the table below. The vibration test level is 3.01 Gs RMS. The drive will not incur any physical damage when subsequently put into operation.

Table 5:   Nonoperating random vibration profile.

Frequency (Hz)	G^2/Hz
2.5	1.0 x E-03
5	3.0 x E-02
40	1.8 x E-02
500	1.8 x E-02

2.8.6.5   Corrosive environment

Seagate electronic drive components pass accelerated corrosion testing equivalent to ten years of exposure to light industrial environments containing sulfurous gases, chlorine and nitric oxide, classes G and H per ASTM B845. However, this accelerated testing cannot duplicate every potential application environment.

Users should use caution exposing any electronic components to uncontrolled chemical pollutants and corrosive chemicals as electronic drive component reliability can be affected by the installation environment. The silver, copper, nickel and gold films used in Seagate products are especially sensitive to the presence of sulfide, chloride, and nitrate contaminants. Sulfur is found to be the most damaging. In addition, electronic components should never be exposed to condensing water on the surface of the printed circuit board assembly (PCBA) or exposed to an ambient relative humidity greater than 95 percent. Materials used in cabinet fabrication, such as vulcanized rubber, that can outgas corrosive compounds should be minimized or eliminated. The useful life of any electronic equipment may be extended by replacing materials near circuitry with sulfide-free alternatives.

2.9 Acoustics

Drive acoustics are measured as overall A-weighted acoustic sound power levels (no pure tones). Discrete tone penalties are added to the A-weighted sound power (LW) with the following formula only when determining compliance:

LWt(spec) == LW + 0.1Pt + 0.3 < 4.0 (Bels)

where

LW = A-weighted sound power level

pt == Value of discrete tone penalty [==dLt-6.0 (dBA)]

dLt = Tone-to-noise ratio taken in accordance with ISO 7779.

All measurements are 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.

Note. For seek mode tests, the drive is placed in seek mode only. The number of seeks per second is defined by the following equation:

(Number of seeks per second = 0.4 / (average latency + average access time)

Table 6:   Drive level acoustics

Acoustic mode	
Idle	Operational
2.1 bels (typ) 2.4 bels (max)	2.2 bels (typ) 2.5 bels (max)

2.10 Electromagnetic immunity

When properly installed in a representative host system, the drive operates without errors or degradation in performance when subjected to the radio frequency (RF) environments defined in the following table:

Table 7:   Electromagnetic immunity

Test	Description	Performance level	Reference standard
Radiated RF immunity	80 to 1,000 MHz, 3 V/m, 80% AM with 1 kHz sine 900 MHz, 3 V/m, 50% pulse modulation @ 200 Hz	A	EN 61000-4-3: 96 ENV 50204: 95
Electrical fast transient	± 1 kV on AC mains, ± 0.5 kV on external I/O	B	EN 61000-4-4: 95
Surge immunity	± 1 kV differential, ± 2 kV common, AC mains	B	EN 61000-4-5: 95
Conducted RF immunity	150 kHz to 80 MHz, 3 Vrms, 80% AM with 1 kHz sine	A	EN 61000-4-6: 97
Voltage dips, interrupts	0% open, 5 seconds 0% short, 5 seconds 40%, 0.10 seconds 70%, 0.01 seconds	C C C B	EN 61000-4-11: 94

2.11   Reliability

Measurement type	Specification
Nonrecoverable read errors	1 per 10^{14} bits read, max.
Annualized Failure Rate	0.4% AFR at 25°C
Load/Unload (LUL) cycles (40°C)	300,000 software-controlled power on/off cycles 20,000 hard power on/off cycles
Warranty	Per agreement

2.12 Agency certification

2.12.1 Safety certification

The drives are recognized in accordance with UL60950-1, CAN/CSA-C22.2 No.60950-1, EN60950 and IEC 60950 as tested by TUV Essen.

2.12.2 Electromagnetic compatibility

Hard drives that display the CE mark comply with the European Union (EU) requirements specified in the Electromagnetic Compatibility Directive (89/336/EEC). Testing is performed to the levels specified by the product standards for Information Technology Equipment (ITE). Emission levels are defined by EN 55022, Class B and the immunity levels are defined by EN 55024.

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.

Korean RRL

If these drives have the Korea Ministry of Information and Communication (MIC) logo, they comply with paragraph 1 of Article 11 of the Electromagnetic Compatibility control Regulation and meet the Electromagnetic Compatibility (EMC) Framework requirements of the Radio Research Laboratory (RRL) Ministry of Information and Communication Republic of Korea.

These drives have been tested and comply with the Electromagnetic Interference/Electromagnetic Susceptibility (EMI/EMS) for Class B products. Drives are tested in a representative, end-user system by a Korean-recognized lab.

• EUT name (model numbers): ST68022CF, ST68022FX, ST66022CF, ST66022FX, ST64022CF and ST64022FX

    Certificate numbers:
    ST68022CF, ST66022CF and ST64022CF   E-H011-05-2175(B)
    ST68022FX, ST66022FX and ST64022FX   E-H011-05-2175(B)

• Trade name or applicant: Seagate Technology International

• Manufacturing date: May 2005

• Manufacturer/nationality: Seagate Technology International

Australian C-Tick (N176)

If these models have the C-Tick marking, they comply with the Australia/New Zealand Standard AS/NZS3548 1995 and meet the Electromagnetic Compatibility (EMC) Framework requirements of the Australian Communication Authority (ACA).

2.12.3 European Union Restriction of Hazardous Substances (RoHS) Directive

Seagate designs its products to meet environmental protection requirements worldwide, including regulations restricting certain chemical substances. A new law, the European Union Restriction of Hazardous Substances (RoHS) Directive, will restrict the presence of chemical substances, including Lead (Pb), in electronic products, effective July 2006. The Directive's requirements have not been finalized. This drive is manufactured with components and materials that are expected to comply with the RoHS Directive when the Directive takes effect.

2.12.4 China Restriction of Hazardous Substances (RoHS) Directive

2.12.4 中国限制危险物品的指令

This product has an Environmental Protection Use Period (EPUP) of 20 years. The following table contains information mandated by China's "Marking Requirements for Control of Pollution Caused by Electronic Information Products" Standard.

该产品具有20年的环境保护使用周期 （EPUP）。 下表包含了中国 "电子产品所导致的污染的控制的记号要求" 所指定的信息。

Name of Parts 部件名称	Toxic or Hazardous Substances or Elements有毒有害物质或元素					
	Lead 铅 (Pb)	Mercury 汞 (Hg)	Cadmium 镉 (Cd)	Hexavalent Chromium 六价铬 (Cr6+)	Polybrominated Biphenyl 多溴联苯 (PBB)	Polybrominated Diphenyl Ether 多溴二苯醚 (PBDE)
PCBA	X	O	O	O	O	O
HDA	X	O	O	O	O	O

"O" indicates the hazardous and toxic substance content of the part (at the homogenous material level) is lower than the threshold defined by the China RoHS MCV Standard.

"O"表示该部件（于同类物品程度上）所含的危险和有毒物质低于中国RoHS MCV标准所定义的门槛值。

"X" indicates the hazardous and toxic substance content of the part (at the homogenous material level) is over the threshold defined by the China RoHS MCV Standard.

"X"表示该部件（于同类物品程度上）所含的危险和有毒物质超出中国RoHS MCV标准所定义的门槛值。

2.12.5 FCC verification

These drives are 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 LLC 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.

3.0   Configuring and mounting the drive

This section contains the specifications and instructions for configuring and mounting the drive.

3.1   Handling and static discharge precautions

After unpacking, and before installation, the drive may be exposed to potential handling and electrostatic discharge (ESD) hazards. Observe the following standard handling and static-discharge precautions:

Caution:

• Keep the drive in the electrostatic discharge (ESD) bag until you are ready for installation to limit the drive's exposure to ESD.

• Before handling the FX interface model drives (ST68022FX, ST66022FX and ST64022FX), put on a grounded wrist strap, or ground yourself frequently by touching the metal chassis of a computer that is plugged into a grounded outlet. Wear a grounded wrist strap throughout the entire installation procedure.

• Handle the drive only by its edges or frame.
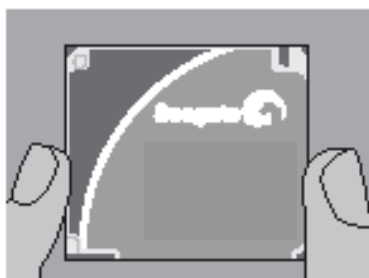
Figure 8.   ST1.2 Series proper handling example

• The drive is fragile—handle it with care. Do not press down on the drive top cover or attempt to use a pen to write on the drive's label.

• Do not apply more than 1.5 kg of force to the top cover.
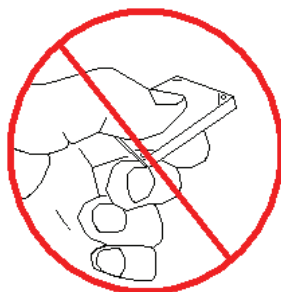
Figure 9.   ST1.2 Series improper handling example

• Always rest the FX interface model drives (ST68022FX, ST66022FX and ST64022FX) on a padded, antistatic surface until you mount it in the system.

- Do not remove the factory-installed labels from the drive or cover them with additional labels. Removal voids the warranty. Some factory-installed labels contain information needed to service the drive. Other labels are used to seal out dirt and contamination.
- Store drive in the provided protective casing when not in use. (CF interface)
- For the FX interface model drives (ST68022FX, ST66022FX and ST64022FX), turn the power off before installing or removing the drive.
- Do not cover the breather hole with any type of label, sticker, or impede the flow of air at any time.

3.2   Drive installation

See figures 10 and 11 for drive mechanical dimensions.

Follow these installation precautions when inserting the drive:
- Follow instructions for the installation of data storage devices, provided with your device's user manual.
- Do not obstruct the breather hole on the drive (see Figure 4).
- Handle the drive only by its edges or frame or designated finger grip region during mounting (see Figure 4).

CF Dimension Table

	Inches	Millimeters
A	0.197 ± .004	5.00 ± .10
B	1.433 ± .006	36.40 ± .15
C	1.685 ± .004	42.80 ± .10
D	1.015 ± .003	2x 25.78 ± .07
E	1.152 ± .010	29.25 ± .25
F	0.299 ± .010	7.61 ± .25
G	0.394 min	10.00 min
H	0.063 ± .002	1.60 ± .05
J	0.040 ± .003	2x 1.01 ± .07
K	0.039 ± .002	1.00 ± .05
L	0.039 ± .004	2x 1.00 min
M	0.065 ± .004	1.65 ± .10
N	0.243 ± .004	2x 6.16 ± .10
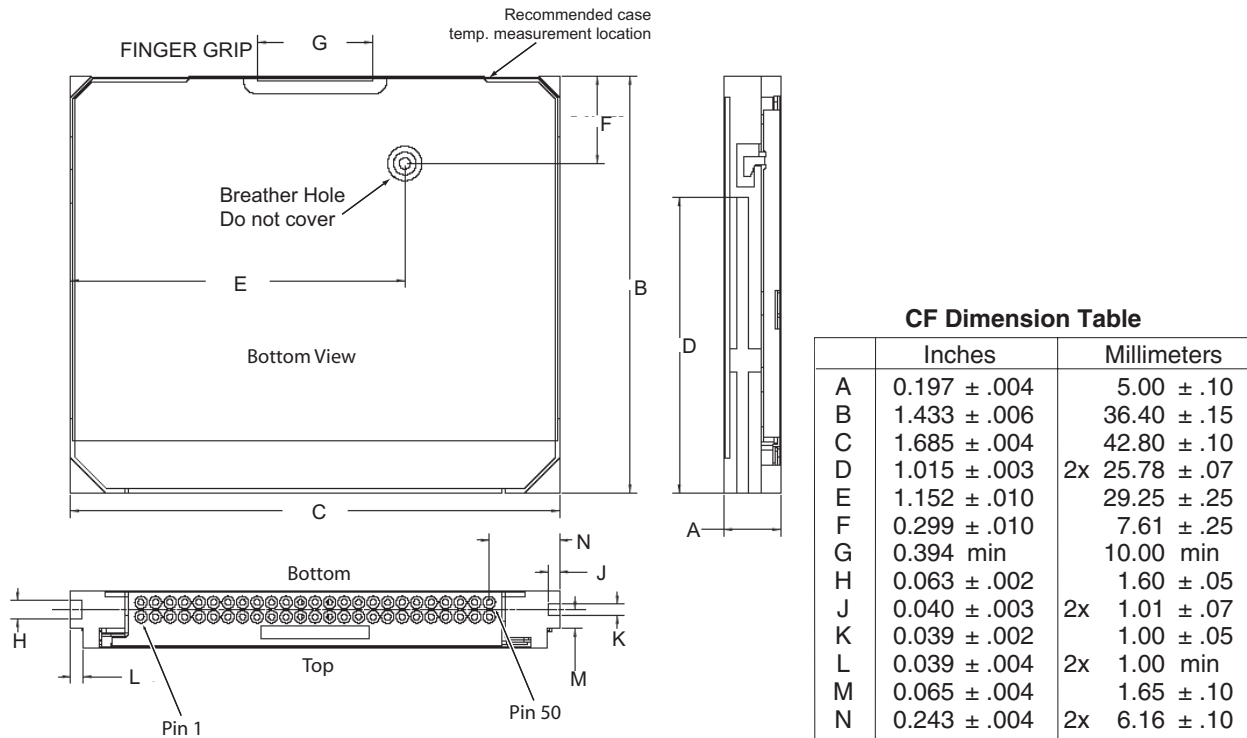
Figure 10.   CF model mechanical dimensions—top, side and end view

Figure 11.   FX model mechanical dimensions—top, side and end view
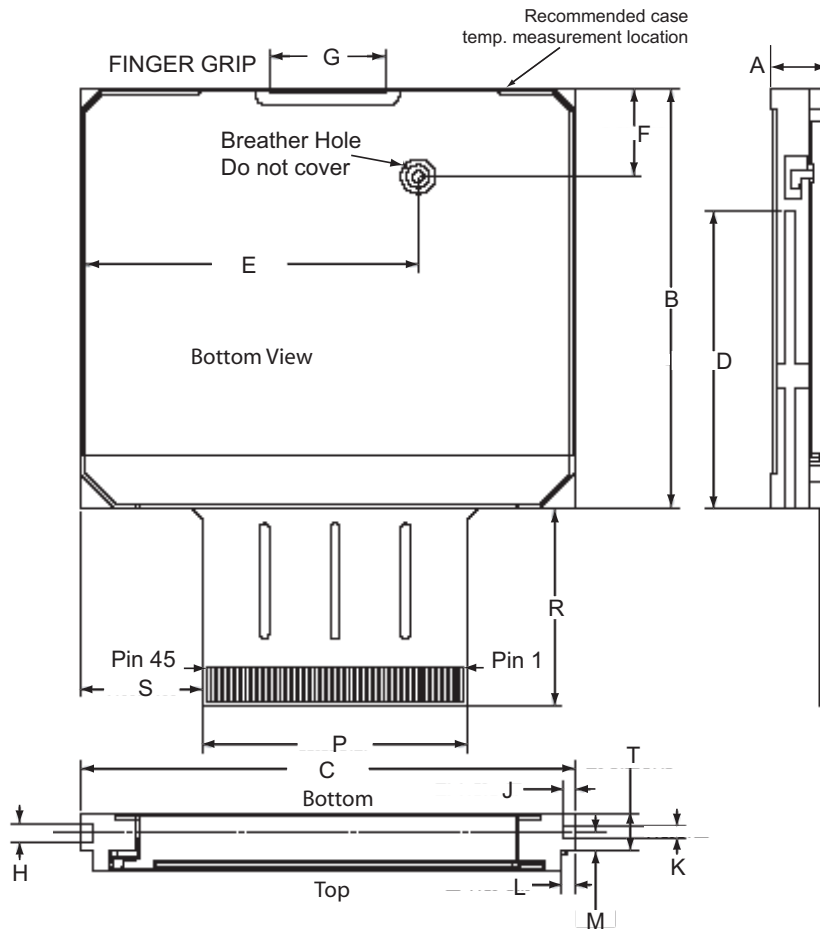
FX Dimension Table

	Inches	Millimeters
A	0.197 ± .004	5.00 ± .10
B	1.433 ± .006	36.40 ± .15
C	1.685 ± .004	42.80 ± .10
D	1.015 ± .003	2x 25.78 ± .07
E	1.152 ± .010	29.25 ± .25
F	0.299 ± .010	7.61 ± .25
G	0.394 min	10.00 min
H	0.063 ± .002	1.60 ± .05
J	0.040 ± .003	2x 1.01 ± .07
K	0.039 ± .002	1.00 ± .05
L	0.039 ± .004	2x 1.00 min
M	0.065 ± .004	1.65 ± .10
P	0.906 ± .003	23.00 ± .07
R	0.669 ± .020	17.00 ± .50
S	0.414 ± .020	10.51 ± .50
T	0.130 ± .004	2X 3.30 ± .10

4.0   Interface description

These drives use the industry-standard ATA task file interface that supports 16-bit data transfers. It supports ATA programmed input/output (PIO) modes 0–4; multiword DMA modes 0–2, and Ultra DMA modes 0–2. The drive also supports the use of the IORDY signal to provide reliable high-speed data transfers.

For detailed information about the CompactFlash interface, refer to CF+ and CompactFlash Spec Rev 2.0.

4.1   Connector interface signals and connector pins

The following table summarizes the signals on the CompactFlash interface connector. For a detailed description of these signals, refer to CF+ and CompactFlash Spec Rev 2.0.

Table 8:   CompactFlash+ interface connector signals

PC Card Memory Mode				PC Card I/O Mode				True IDE Mode[4]			
Pin Num	Signal Name	Pin Type	In, Out Type	Pin Num	Signal Name	Pin Type	In, Out Type	Pin Num	Signal Name	Pin Type	In, Out Type
1	GND		Ground	1	GND		Ground	1	GND		Ground
2	D03	I/O	I1Z, OZ3	2	D03	I/O	I1Z, OZ3	2	D03	I/O	I1Z, OZ3
3	D04	I/O	I1Z, OZ3	3	D04	I/O	I1Z, OZ3	3	D04	I/O	I1Z, OZ3
4	D05	I/O	I1Z, OZ3	4	D05	I/O	I1Z, OZ3	4	D05	I/O	I1Z, OZ3
5	D06	I/O	I1Z, OZ3	5	D06	I/O	I1Z, OZ3	5	D06	I/O	I1Z, OZ3
6	D07	I/O	I1Z, OZ3	6	D07	I/O	I1Z, OZ3	6	D07	I/O	I1Z, OZ3
7	-CE1	I	I3U	7	-CE1	I	I3U	7	-CS0	I	I3U
8	A10	I	I1Z	8	A10	I	I1Z	8	A10[2]	I	I1Z
9	-OE	I	I3U	9	-OE	I	I3U	9	-ATA SEL	I	I3U
10	A09	I	I1Z	10	A09	I	I1Z	10	A09[2]	I	I1Z
11	A08	I	I1Z	11	A08	I	I1Z	11	A08[2]	I	I1Z
12	A07	I	I1Z	12	A07	I	I1Z	12	A07[2]	I	I1Z
13	VCC		Power	13	VCC		Power	13	VCC		Power
14	A06	I	I1Z	14	A06	I	I1Z	14	A06[2]	I	I1Z
15	A05	I	I1Z	15	A05	I	I1Z	15	A05[2]	I	I1Z
16	A04	I	I1Z	16	A04	I	I1Z	16	A04[2]	I	I1Z
17	A03	I	I1Z	17	A03	I	I1Z	17	A03[2]	I	I1Z
18	A02	I	I1Z	18	A02	I	I1Z	18	A02	I	I1Z
19	A01	I	I1Z	19	A01	I	I1Z	19	A01	I	I1Z
20	A00	I	I1Z	20	A00	I	I1Z	20	A00	I	I1Z
21	D00	I/O	I1Z, OZ3	21	D00	I/O	I1Z, OZ3	21	D00	I/O	I1Z, OZ3
22	D01	I/O	I1Z, OZ3	22	D01	I/O	I1Z, OZ3	22	D01	I/O	I1Z, OZ3
23	D02	I/O	I1Z, OZ3	23	D02	I/O	I1Z, OZ3	23	D02	I/O	I1Z, OZ3

Table 8: CompactFlash+ interface connector signals

PC Card Memory Mode				PC Card I/O Mode				True IDE Mode[4]			
24	WP	O	OT3	24	-IOIS16	O	OT3	24	-IOIS16	O	ON3
25	-CD2	O	Ground	25	-CD2	O	Ground	25	-CD2	O	Ground
26	-CD1	O	Ground	26	-CD1	O	Ground	26	-CD1	O	Ground
27	D11[1]	I/O	I1Z, OZ3	27	D11[1]	I/O	I1Z, OZ3	27	D11[1]	I/O	I1Z, OZ3
28	D12[1]	I/O	I1Z, OZ3	28	D12[1]	I/O	I1Z, OZ3	28	D12[1]	I/O	I1Z, OZ3
29	D13[1]	I/O	I1Z, OZ3	29	D13[1]	I/O	I1Z, OZ3	29	D13[1]	I/O	I1Z, OZ3
30	D14[1]	I/O	I1Z, OZ3	30	D14[1]	I/O	I1Z, OZ3	30	D14[1]	I/O	I1Z, OZ3
31	D15[1]	I/O	I1Z, OZ3	31	D15[1]	I/O	I1Z, OZ3	31	D15[1]	I/O	I1Z, OZ3
32	-CE2[1]	I	I3U	32	-CE2[1]	I	I3U	32	-CS1[1]	I	I3Z
33	-VS1	O	Ground	33	-VS1	O	Ground	33	-VS1	O	Ground
34	-IORD	I	I3U	34	-IORD	I	I3U	34	-IORD	I	I3Z
35	-IORW	I	I3U	35	-IORW	I	I3U	35	-IORW	I	I3Z
36	-WE	I	I3U	36	-WE	I	I3U	36	-WE[3]	I	I3U
37	READY	O	OT1	37	-IREQ	O	OT1	37	INTRQ	O	OZ1
38	VCC		Power	38	VCC		Power	38	VCC		Power
39	-CSEL[5]	I	I2Z	39	-CSEL[5]	I	I2Z	39	-CSEL	I	I2U
40	-VS2	O	OPEN	40	-VS2	O	OPEN	40	-VS2	O	OPEN
41	RESET	I	I2Z	41	RESET	I	I2Z	41	-RESET	I	I2Z
42	-WAIT	O	OT1	42	-WAIT	O	OT1	42	IORDY	O	ON1
43	-INPACK	O	OT1	43	-INPACK	O	OT1	43	DMARC	O	OZ1
44	-REG	I	I3U	44	-REG	I	I3U	44	-DMACK[6]	I	I3U
45	BVD2	O	OT1	45	-SPKR	O	OT1	45	-DASP	I/O	I1U, ON1
46	BVD1	O	OT1	46	-STSCHG	O	OT1	46	-PDIAG	I/O	I1U, ON1
47	D08[1]	I/O	I1Z, OZ3	47	D08[1]	I/O	I1Z, OZ3	47	D08[1]	I/O	I1Z, OZ3
48	D09[1]	I/O	I1Z, OZ3	48	D09[1]	I/O	I1Z, OZ3	48	D09[1]	I/O	I1Z, OZ3
49	D10[1]	I/O	I1Z, OZ3	49	D10[1]	I/O	I1Z, OZ3	49	D10[1]	I/O	I1Z, OZ3
50	GND		Ground	50	GND		Ground	50	GND		Ground

Note. RFU is Reserved for Future Use

[1] These signals are required only for 16 bit accesses and not required when installed in 8 bit systems. Devices should allow for 3-state signals not to consume current.
[2] The signal should be grounded by the host.
[3] The signal should be tied to VCC by the host.
[4] The mode is optional for CF+ Cards, but required for CompactFlash Storage Cards.
[5] The -CSEL signal is ignored by the card in PC Card modes. However, because it is not pulled up on the card in these modes, it should not be left floating by the host in PC Card modes. In these modes, the pin should be connected by the host to PC Card A25 or grounded by the host.
[6] If DMA operations are not used, the signal should be held high or tied to VCC by the host. For proper operation in older hosts: while DMA operations are not active, the card shall ignore this signal, including a floating condition.

4.1.1 Flex interface connector signals

The following table summarizes the signal on the Seagate Flex interface connector. For a detailed description of these signals, refer to *Draft ATA-7 Standard*.

Table 9: Flex interface connector signals

Pin	Signal	Description
1	Ground	Ground
2	DD11	Data bus bit 11
3	DD10	Data bus bit 10
4	DD8	Data bus bit 8
5	RESET-	Reset
6	DD14	Data bus bit
7	DD15	Data bus bit
8	IORDY-	I/O Ready DMA ready during Ultra DMA data-in bursts Data strobe during Ultra DMA data-out bursts
9	INTRQ	Interrupt request
10	DA1	Device address bit 1
11	GROUND	Ground
12	DA2	Device address bit 2
13	DA0	Device address bit 0
14	DIOW-	I/O Write Stop during Ultra DMA data bursts
15	GROUND	Ground
16	DIOR-	I/O Read DMA ready during Ultra DMA data-in bursts Data strobe during Ultra DMA data-out bursts
17	GROUND	Ground
18	PDIAG-	Passed diagnostics
19	GROUND	Ground
20	DASP-	Device active or slave present
21	GROUND	Ground
22	CS1-	Chip select 0
23	GROUND	Ground

Table 9: Flex interface connector signals

24	DD9	Data bus bit 9
25	GROUND	Ground
26	DD13	Data bus bit 13
27	CSEL	Cable select
28	DD12	Data bus bit 12
29	DD7	Data bus bit 7
30	DD6	Data bus bit 6
31	DD5	Data bus bit 5
32	DD4	Data bus bit 4
33	DD3	Data bus bit 3
34	DD2	Data bus bit 2
35	GROUND	Ground
36	DD1	Data bus bit 1
37	DD0	Data bus bit 0
38	DMARQ	DMA request
39	DMACK-	DMA Acknowledge
40	IOCS16-	Data transfer size is one word per transfer cycle
41	CS0	Chip select 0
42	Reserved 1	Reserved for device use only
43	Reserved 2	Reserved for device use only
44	VCC +3.3V	3.3V Voltage supply to device
45	VCC +3.3V	3.3V Voltage supply to device

4.1.2   Supported ATA commands

The following table lists ATA-standard commands that the drive supports. For a detailed description of the CF commands, refer to CF+ and CompactFlash Spec Rev 2.0.

Table 10:   Supported commands

Command name	Command code (in hex)	Does command cause drive to transition to active mode? [1]
ATA-standard commands		
Check Power Mode	98_H, $E5_H$	
Download Microcode	92_H (for FX models only)	X
Erase Sector	$C0_H$	X
Execute Device Diagnostics	90_H	
Flush Cache	$E7_H$	X
Format Track (Legacy)	50_H	
Identify Device	EC_H	
Idle	97_H, $E3_H$	X
Idle Immediate	95_H, $E1_H$	X
NOP	00h	X
Read Buffer	$E4_H$	X
Read DMA	$C8_H$, $C9_H$	X
Read Multiple	$C4_H$	X
Read Native Max Address	F8h	X
Read Sectors	20_H, 21_H	X
Read Verify Sectors	40_H, 41_H	X
Recalibrate	10_H	X
Request Sense	03_H	X
Seek	$7X_H$	X
Set Drive Parameters	91_H	X
Set Features	EF_H	X
Set Max Address	F9h	X
Set Multiple Mode	$C6_H$	X [2]
Sleep	99_H, $E6_H$	
Smart	B0h	X
Standby	96_H, $E2_H$	X
Standby Immediate	94_H, $E0_H$	X
Translate Sector	87_H	X
Wear Level	$F5_H$	X
Write Buffer	$E8_H$	X

Table 10:   Supported commands

Command name	Command code (in hex)	Does command cause drive to transition to active mode? [1]
Write DMA	CA_H, CB_H	X
Write Multiple	$C5_H$	X
Write Multiple w/o Erase	CD_H	X
Write Sectors	30_H, 31_H	X
Write Sector w/o Erase	38_H	X
Write Verify	$3C_H$	X
ATA-standard power-management commands		
Check Power Mode	98_H or $E5_H$	
Idle	97_H or $E3_H$	X
Idle Immediate	95_H or $E1_H$	X
Sleep	99_H or $E6_H$	
Standby	96_H or $E2_H$	
Standby Immediate	94_H or $E0_H$	

[1]   'X' indicates: If the drive is in Standby mode, it will cause the drive to spin up to Active mode in order to execute the command.
[2]   Except 0Ah, 8Ah and DFh.

4.1.3 Identify Device command

The Identify Device 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 on page 31. 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 2.0 on page 3 for default parameter settings.

The following commands contain drive-specific features that may not be included in the *Draft ATA-7 Standard.*

Word	ATA specification	CF specification	Value	Value	Value
			CF Mem/IO	CF TruIDE	FX (Flex)
0	Configuration information: • Bit 15: 0 = ATA; 1 = ATAPI • Bit 7: removable media • Bit 6: removable controller • Bit 0: reserved	General Config	$848A_H$	$848A_H$	$0C5A_H$
1	Obsolete	Default number of cylinders	16,383	16,383	16,383
2	Special Config	Reserved	0000_H	0000_H	0000_H
3	Obsolete	Default number of heads	16	16	16
4	Retired	Number of unformatted bytes/track (Obsolete)	0000_H	0000_H	0000_H
5	Retired	Number of unformatted bytes/sector (Obsolete)	0000_H	0000_H	0000_H
6	Obsolete	Default number of sectors/track	$003F_H$	$003F_H$	$003F_H$
7	Reserved for CF Spec	Number of sectors per card (MSW)	$xxxx\ xxxx_H$	$xxxx\ xxxx_H$	$xxxx\ xxxx_H$
8	Reserved for CF Spec	Number of sectors per card (LSW)			
9	Retired	Obsolete	0000_H	0000_H	0000_H
10–19	Serial number: (20 ASCII characters, 0000_H = none)	Serial number: (Right justified)	ASCII	ASCII	ASCII
20	Retired	Obsolete	0000_H	0000_H	0000_H
21	Retired	Obsolete	0000_H	0000_H	0000_H
22	Obsolete	Number of ECC bytes	0004_H	0004_H	0004_H
23–26	Firmware revision (8 ASCII character string, padded with blanks to end of string)	Firmware revision	x.xx	x.xx	x.xx
27–46	Drive model number: (40 ASCII characters, padded with blanks to end of string)	Drive model number (left justified) big endian byte order in word	ST68022CF ST66022CF ST64022CF	ST68022CF ST66022CF ST64022CF	ST68022FX ST66022FX ST64022FX

Word	ATA specification	CF specification	Value	Value	Value
47	(Bits 7–0) Maximum sectors per interrupt on Read multiple and Write multiple (16)	Maximum number of sectors on Read/Write Multiple command	8010_H	8010_H	8010_H
48	Reserved	Reserved	0000_H	0000_H	0000_H
49	Capabilities	Capabilities	$0A00_H$	$0B00_H$	$0B00_H$
50	Reserved	Reserved	0000_H	0000_H	0000_H
51	Obsolete	PIO data transfer cycle timing mode	0200_H	0200_H	0200_H
52	Obsolete	Obsolete	0000_H	0000_H	0000_H
53	Words 64–70 and 88 valid	Field validity	0003_H	0003_H	0003_H
54	Obsolete	Current number of cylinders	$xxxx_H$	$xxxx_H$	$xxxx_H$
55	Obsolete	Current number of heads	$xxxx_H$	$xxxx_H$	$xxxx_H$
56	Obsolete	Current number of tracks	$xxxx_H$	$xxxx_H$	$xxxx_H$
57	Obsolete	Current capacity in sectors (LBA) LSW	capacity $xxxx_H$	capacity $xxxx_H$	capacity $xxxx_H$
58	Obsolete	Current capacity in sectors (LBA) MSW	capacity $xxxx_H$	capacity $xxxx_H$	capacity $xxxx_H$
59	Multiple sector setting	Multiple sector setting	0100_H	0100_H	0100_H
60–61	Total number of user-addressable LBA sectors available (see Section 2.2 for related information)	Total number of user-addressable LBA sectors available (see Section 2.2 for related information)	capacity $xxxx_H$	capacity $xxxx_H$	capacity $xxxx_H$
62	Obsolete	Reserved			
63	Retired	Reserved	0000_H	0407_H	0407_H
64	Advanced PIO modes supported (modes 3 and 4 supported)	Advanced PIO modes supported (modes 3 and 4 supported)	0003_H	0003_H	0003_H
65	Reserved	Reserved	0000_H	0078_H	0078_H
66	Reserved	Reserved	0000_H	0078_H	0078_H
67	Minimum PIO cycle time without IORDY flow control (120 nsec)	Minimum PIO cycle time without IORDY flow control (120 nsec)	0078_H	0078_H	0078_H
68	Minimum PIO cycle time with IORDY flow control (120 nsec)	Minimum PIO cycle time with IORDY flow control (120 nsec)	0078_H	0078_H	0078_H
69–79		Reserved	0000_H	0000_H	0000_H
80–81		Reserved	0000_H	0000_H	0000_H
82	Features/Command sets supported	Features/Command sets supported	7068_H	7068_H	7068_H
83	Features/Command sets supported	Features/Command sets supported	$500C_H$	$500C_H$	$500D_H$

Word	ATA specification	CF specification	Value	Value	Value
84	Features/Command sets supported	Features/Command sets supported	4000$_H$	4000$_H$	4000$_H$
85	Features/Command sets enabled	Features/Command sets enabled	7068$_H$	7068$_H$	7068$_H$
86	Features/Command sets enabled	Features/Command sets enabled	100C$_H$	100C$_H$	100D$_H$
87	Features/Command sets enabled	Features/Command sets enabled	4000$_H$	4000$_H$	4000$_H$
88	Ultra DMA support and current mode (see note following this table)	Reserved	0000$_H$	0007$_H$	0007$_H$
89	Time required for security erase complete	Time required for security erase complete	0000$_H$	0000$_H$	0000$_H$
90	Time required for enhanced security erase complete	Time required for enhanced security erase complete	0000$_H$	0000$_H$	0000$_H$
91	Advanced power management value	Advanced power management value	4040$_H$	4040$_H$	4040$_H$
92–105		Reserved	0000$_H$	0000$_H$	0000$_H$
106		Physical / Logical Sector size		6001$_H$	6001$_H$
107–127		Reserved	0000$_H$	0000$_H$	0000$_H$
128	Security status	Security status	0000$_H$	0000$_H$	0000$_H$
129–159	Seagate-reserved	Seagate-reserved	0000$_H$	0000$_H$	0000$_H$
160	CFA power mode 1	Power Level Description	814A$_H$	814A$_H$	814A$_H$
161		Reserved for assignment by the CFA	0000$_H$	0000$_H$	0000$_H$
162		Key management schemes supported	0000$_H$	0000$_H$	0000$_H$
163–175	ATA-reserved	Reserved for assignment by the CFA	0000$_H$	0000$_H$	0000$_H$
176–255	Reserved	Reserved	0000$_H$	0000$_H$	0000$_H$

Note. See the bit descriptions below for words 63, 88, 93 and 94 of the Identify Drive data:

Description (if bit is set to 1)

	Bit	Word 63
	0	Multiword DMA mode 0 is supported.
	1	Multiword DMA mode 1 is supported.
	2	Multiword DMA mode 2 is supported.
	8	Multiword DMA mode 0 is currently active.
	9	Multiword DMA mode 1 is currently active.
	10	Multiword DMA mode 2 is currently active.
	Bit	**Word 88**
	0	Ultra DMA mode 0 is supported.
	1	Ultra DMA mode 1 is supported.
	2	Ultra DMA mode 2 is supported.
	8	Ultra DMA mode 0 is currently active.
	9	Ultra DMA mode 1 is currently active.
	10	Ultra DMA mode 2 is currently active.

4.1.4 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. The acceptable values for the Features register are defined as follows:

Table 11:   Features register values

Feature	Description		Availability in Interface Mode	
			CF Memory or I/O	TrueIDE or IDE
01_H	Enable 8-bit data transfer; Only in True IDE mode.		No	Yes
02_H	Enable Write Cache.		Yes	Yes
03_H	Used for Set transfer mode Command. Sector Count register values:		Yes	Yes
	00_H	Set PIO mode to default (PIO mode 2).	Yes	Yes
	01_H	Set PIO mode to default and disable IORDY (PIO mode 2).	Yes	Yes
	08_H	PIO mode 0	Yes	Yes
	09_H	PIO mode 1	Yes	Yes
	$0A_H$	PIO mode 2	Yes	Yes
	$0B_H$	PIO mode 3	Yes	Yes
	$0C_H$	PIO mode 4 *(default)*	Yes	Yes
	20_H	Multiword DMA mode 0	No	Yes
	21_H	Multiword DMA mode 1	No	Yes
	22_H	Multiword DMA mode 2	No	Yes
	40_H	Ultra DMA mode 0	No	Yes
	41_H	Ultra DMA mode 1	No	Yes
	42_H	Ultra DMA mode 2	No	Yes
05_H	Enable advanced power management		Yes	Yes
$0A_H$	Enable Power Level 1 commands		Yes	Yes
44_H	Product Specific ECC bytes (XX bytes) apply on Read/Write Long Command		Yes	Yes
55_H	Disable read look-ahead (read cache) feature.		Yes	Yes
66_H	Disable Power On Reset (POR) establishment of defaults at Soft Reset.		Yes	Yes

Table 11:   Features register values

69$_H$	NOP- Accepted for backward compatibility	Yes	Yes
81$_H$	Disable 8 bit transfer; Only in True IDE mode	No	Yes
82$_H$	Disable write cache. *(default)*	Yes	Yes
85$_H$	Disable Advanced Power Management	Yes	Yes
8A$_H$	Disable Power Level 1 Commands	Yes	Yes
96$_H$	NOP- Accepted for backward compatibility	Yes	Yes
97$_H$	Accepted for backward compatibility	Yes	Yes
9A$_H$	It's NOP for backward compatibility	Yes	Yes
AA$_H$	Enable read look-ahead (read cache) feature *(default)*.	Yes	Yes
BB$_H$	4 Bytes of ECC apply on Read/Write Long Command	Yes	Yes
CC$_H$	Enable Power On Reset (POR) establishment of defaults at soft reset	Yes	Yes
D0$_H$	Seagate Unique; Disable Reassignment	Yes	Yes
D1$_H$	Seagate Unique; Enable Reassignment	Yes	Yes

Note.   At power-on, or after a hardware or software reset, the default values of the features are as indicated above.

4.1.5 Card Information Structure (CIS) information for CF

CIS information for the CF card is as follows:

Address	Data	Description of data
Common memory device information in 5V operation		
000H	01H	CISTPL_DEVICE
002H	04H	TPL_LINK = 04 bytes

004H	DFH	CISTPL_DEVICE: Device ID
		    Device type (bit 4...7 = D (DTYPE_FUNCSPEC)
		    WPS (write protect switch) (bit 3) = 1 (non WP)
		    Device Speed (bit 0...2) = 7 (DSPEED_EXT)

006H	12H	CISTPL_DEVICE: EXT (bit 7) = 0
		    Mantissa (bit 3...6) = 2 (1.2) - -> 120ns
		    Exponent (bit 0...2) = 2 (100)

008H	01H	CISTPL_DEVICE: Device size = 1 (2K bytes)
00AH	FFH	CISTPL_DEVICE: End Marker
Other operating conditions device information for common memory		
00CH	1CH	CISTPL_DEVICE_OC
00EH	05H	TPL_LINK = 05 bytes

010H	03H	CISTPL_DEVICE_OC: Other conditions Information
		    EXT (bit 7) = 0
		    Reserved (bit 3...6) = 0
		    Vcc used (bit 1,2) = 1 (3.3V)
		    MWAIT (bit 0) = 1

012H	DFH	CISTPL_DEVICE_OC: Device ID Information
		    Device Type (bit 4...7) = D (DTYPE_FUNCSPEC)
		    WPS (write protect switch) (bit 3) = 1 (non WP)
		    Device Speed (bit 0...2) = 7 (DSPEED_EXT)

014H	12H	CISTPL_DEVICE_OC: EXT (bit 7) = 0
		    Mantissa (bit 3...6) = 2 (1.2) - -> 120ns
		    Exponent (bit 0...2) = 2 (100)

016H	01H	CISTPL_DEVICE_OC: Device size = 1 (2K bytes)
018H	FFH	CISTPL_DEVICE_OC: End Marker
JEDEC programming information for common memory		
01AH	18H	CISTPL_JEDEC_C
01CH	02H	TPL_LINK = 02 bytes
01EH	DFH	CISPTL_JEDEC_C: PCMCIA JEDEC Code
020H	01H	

		Manufacturer identification string
022H	20H	CISTPL_MANFID
024H	04H	TPL_LINK = 04 bytes
026H	11H	TPL_MANF: Manufacturer's ID code (Low byte) = 11 for SEAGATE
028H	01H	TPL_MANF: Manufacturer's ID code (High byte) = 01 for SEAGATE
02AH	00H	TPLMID_CARD: Product code (Low byte) (Manufacturer Info)
02CH	00H	TPLMID_CARD: Product code (High byte) (Manufacturer Info)
02EH	15H	CISTPL_VERS_1
030H	0EH	TPL_LINK = 0Eh bytes
032H	04H	TPLLV1_MAJOR: Major Version Number (JEIDA 4.2/PCMCIA 2.1)
034H	01H	TPLLV1_MINOR: Minor Version Number = 1
036H	53H	TPLLV1_INFO: ' S ' (Vender Specific Strings)
038H	45H	TPLLV1_INFO: ' E ' (Vender Specific Strings)
03AH	41H	TPLLV1_INFO: ' A ' (Vender Specific Strings)
03CH	47H	TPLLV1_INFO: ' G ' (Vender Specific Strings)
03EH	41H	TPLLV1_INFO: ' A ' (Vender Specific Strings)
040H	54H	TPLLV1_INFO: ' T ' (Vender Specific Strings)
042H	45H	TPLLV1_INFO: ' E ' (Vender Specific Strings)
044H	00H	TPLLV1_INFO: Null terminator (End of Name)
046H	53H	TPLLV1_INFO: ' S ' (Vender Specific Strings)
048H	54H	TPLLV1_INFO: ' T ' (Vender Specific Strings)
04AH	51H	TPLLV1_INFO: ' 1 ' (Vender Specific Strings)
04CH	00H	TPLLV1_INFO: Null terminator (End of Name)
04EH	FFH	CISTPL_VERS_1: End marker
050H	21H	CISTPL_FUNCID
052H	02H	TPL_LINK = 02 bytes
054H	04H	TPLFID_FUNCTION: (IC Card Function Code) = 04 (Fixed Disk)

056H	01H	TPLFD_SYSINT: (System Initialization bit mask)
		   POST (bit 0) =1
		   ROM (bit 1) =0

058H	22H	CISTPL_FUNCE :(Function Extension Tuple)
05AH	02H	TPL_LINK = 02 bytes
05CH	01H	TUPLE_TYPE: (Extension Type) = 01 (Disk Device Interface)
05EH	01H	TUPLE_DATA: (Interface Type) = 01 (PC Card ATA Interface)

060H	22H	CISTPL_FUNCE: (Function Extension Tuple)
062H	03H	TPL_LINK =3 bytes
064H	02H	TUPLE_TYPE: (Extension Type) = 02 (Basic PC Card ATA Interface)
066H	08H	TPLFE_DATA V : Vpp[2::1] (bit0,1) = 00 (Vpp not required) S : Silicon (bit2) = 0 (Rotating Device) U : Inique (bit3) = 0 (Single Drive) D : Dual Drive (bit4) = 0 (Single Drive)
068H	0FH	TPLFE_DATA P0 : Sleep (bit0) = 1 (Support Sleep mode) P1 : Standby (bit1) = 1 (Support Standby mode) P2 : Idle (bit2) = 1 (Support Idle mode) P3 : Auto (bit 3) = 1 (Support Automatic Power Control) N : 3F7/377 (bit4) = 0 (Include 3F7h/377h for I/O Address) E : Index Emulate (bit5) = 0 (Index Emulation is not supported) I : IOIS16 (bit6) =0
06AH	1AH	CISTPL_CONFIG (Configuration Tuple)
06CH	05H	TPL_LINK = 5 bytes
06EH	01H	TPCC_SZ :(Size of Field Byte) TPCC_RASZ (Size of TPCC_RADR) (bit0,1) = 1 (2 bytes) TPCC_RMSZ (Size of TPCC_RMSK) (bit 2..5) = 0 (1 byte)
070H	07H	TPCC_LAST: (Last Entry Index) =07
072H	00H	TPCC_RADR: (Low byte) (Base address of Configuration Register = 00h)
074H	02H	TPCC_RADR: (High byte) (Base address of Configuration Register = 02h)
076H	0FH	TPCC_RMSK: (Register Presence Mask) = 00001111b (200, 202, 204, 206)
Configuration for PC card memory mode in 5V operation (default)		
078H	1BH	CISTPL_CFTABLE_ENTRY: (16 Bit PCCard Configuration Table Entry Tuple)
07AH	0CH	TPCE_LINK = 0C bytes
07CH	C0H	TPCE_INDX: (Configuration Table Entry Tuple) Config Entry Number (bit0..5) = 00 (Memory Mode) Default (bit6) = 1 Interface (bit7) = 1 (Interface Field Exist)
07EH	C0H	TPCE_IF: (Interface Description Field) Interface Type (bit0..3) = 00 (Memory) BVDS active (bit4) = 0 WP active (bit5) = 0 READY active (bit6) = 1 MWAIT required (bit7) = 1

080H	A1H	TPCE_FS: (Feature Selection Byte)
		    Power (bit0,1) = 01 (Vcc Only)
		    Timing (bit2) = 0
		    I/O (bit3) = 0
		    Interrupt (bit4) = 0
		    Memory (bit5,6) = 01
		    Misc (bit7) = 1
		    TPCE_PD (Power Description Structure)

082H	27H	TPCE_PS: Parameter Selection Byte
		    NomV (bit0) =1
		    MinV (bit1) = 1
		    MaxV (bit2) =1
		    PeakI (bit5) =1

084H	55H	TPCE_PD: Power Parameter Definition (NomV)
		    Exponent (bit 0..2) = 5 (1V) - ->5.0V
		    Mantissa (bit3..6) = A (5.0)

086H	4DH	TPCE_PD: Power Parameter Definition (MinV)
		    Exponent (bit 0..2) = 5 (1V) - ->4.5V
		    Mantissa (bit3..6) = 9 (4.5)

088H	5DH	TPCE_PD: Power Parameter Definition (MaxV)
		    Exponent (bit 0..2) = 5 (1V) - ->5.5V
		    Mantissa (bit3..6) = C (5.5)

08AH	B6H	TPCE_PD: Power Parameter Definition (PeakI)
		    Exponent (bit 0..2) = 6 (100mA) - -+- ->330mA
		    Mantissa (bit3..6) = 6 (3) +
		    Extension (bit7) = 1 (Extension Byte Exists) +

08CH	1EH	TPCE_PD: Extension = 1Eh = +30 - -+ TPCE_MS: (Memory Space Description Structure)

08EH	08H	TPCE_MS: Memory Space Descriptor Space
		    # of Windows (-1) (bit0..2) = 0 (# of window =1)
		    Length Size (bit3..4) =1 (Length Field Size =1 byte)
		    Card Address Size (bit5..6) = 0 (no card addr field)
		    Host Addr (bit7) = 0 (arbitrary host addr)

090H	00H	TPCE_MS: Window Descriptor Length of the window = 0

092H	20H	TPCE_MI: (Miscellaneous Features Field)
		    Max Twin Card (bit0..2) = 0
		    Audio (bit3) =0
		    Read Only (bit4) =0
		    Power Down (bit5) =1 (Support Power Down Mode)

Configuration for PC card memory I/O mode in 3.3V operation (alternative)		
094H	1BH	CISTPL_CFTABLE_ENTRY: (16 bit PCCard Configuration Table Entry Tuple)
096H	07H	TPCE_LINK = 07h bytes

098H	00H	TPCE_INDX: (Configuration Table Index Byte)
		    Config Entry Number (bit0..5) = 00 (Memory Mode)
		    Default (bit6) = 0
		    Interface (bit7) = 0 (Interface Field Exist)

09AH	01H	TPCE_FS
		    Power (bit0,1) = 01 (Vcc Only)
		    Timing (bit2) = 0
		    I/O (bit3) = 0
		    Interrupt (bit4) = 0
		    Memory (bit5,6) = 00
		    Misc (bit7) = 0

09CH	21H	TPCE_PD: Parameter Selection Byte
		    NomV (bit0) =1
		    MinV (bit1) = 0
		    MaxV (bit2) =0
		    PeakI (bit5) =1

09EH	B5H	TPCE_PD: Power Parameter Definition (NomV)
		    Exponent (bit0..2) = 5 (1V) - -+ - ->3.3V
		    Mantissa (bit3..6) =6 (3.0) +
		    Extension (bit7) =1 (Extension Exists) +

0A0H	1EH	TPCE_PD: Extension = 1Eh =+0.30 - - +

0A2H	B6H	TPCE_PD: Power Parameter Definition (PeakI)
		    Exponent (bit0..2) = 6 (100mA) - ->330mA
		    Mantissa (bit3..6) = 6 (3)
		    Extension (bit7) =1 (Extension Exists) +

0A4H	1EH	TPCE_PD: Extension = 1Eh =+30 - - +
For PC card ATA I/O in contiguous memory mode in 5V operation (default)		
0A6H	1BH	CISTPL_CFTABLE_ENTRY: (16 Bit PCCard Configuration Table Entry Tuple)
0A8H	0EH	TPCE_LINK = 0E bytes

0AAH	C1H	TPCE_INDX: (Configuration Table Entry Tuple)
		    Config Entry Number (bit0..5) = 01 (I/O and Memory Mode)
		    Default (bit6) = 1
		    Interface (bit7) = 1 (Interface Field Exist)

0ACH	41H	TPCE_IF: (Interface Description Field)
		    Interface Type (bit0..3) = 01 (I/O and Memory)
		    BVDS active (bit4) = 0
		    WP active (bit5) = 0
		    READY active (bit6) = 1
		    MWAIT required (bit7) = 0

0AEH	99H	TPCE_FS: (Feature Selection Byte)
		  Power (bit0,1) = 01 (Vcc Only)
		  Timing (bit2) = 0
		  I/O (bit3) = 0
		  Interrupt (bit4) = 0
		  Memory (bit5,6) = 01
		  Misc (bit7) = 1
		  TPCE_PD (Power Description Structure)

0B0H	27H	TPCE_PD: Parameter Selection Byte
		  NomV (bit0) =1
		  MinV (bit1) = 1
		  MaxV (bit2) =1
		  PeakI (bit5) =1

0B2H	55H	TPCE_PD: Power Parameter Definition (NomV)
		  Exponent (bit 0..2) = 5 (1V) - ->5.0V
		  Mantissa (bit3..6) = A (5.0)

0B4H	4DH	TPCE_PD: Power Parameter Definition (MinV)
		  Exponent (bit 0..2) = 5 (1V) - ->4.5V
		  Mantissa (bit3..6) = 9 (4.5)

0B6H	5DH	TPCE_PD: Power Parameter Definition (MaxV)
		  Exponent (bit 0..2) = 5 (1V) - ->5.5V
		  Mantissa (bit3..6) = C (5.5)

0B8H	B6H	TPCE_PD: Power Parameter Definition (PeakI)
		  Exponent (bit 0..2) = 6 (100mA) - -+- ->330mA
		  Mantissa (bit3..6) = 6 (3) +
		  Extension (bit7) = 1 (Extension Byte Exists) +

0BAH	1EH	TPCE_PD: Extension = 1Eh = +30 - -+ TPCE_MS: (Memory Space Description Structure)

0BCH	64H	TPCE_IO: (I/O Space Address required for this configuration)
		  I/O Address Lines (bit0..4) =4 (16 byte boundary)
		  Bus 16/8 (bit5,6) = 3 (Support 16/8 bit access)
		  Range (bit7) = 0
		  TPCE_IR (Interrupt Request Description Structure)

0BEH	F0H	TPCE_IR: IRQ Line 0..15 (bit0..3) =0
		  MASK (bit4) = 1
		  Level (bit5) = 1
		  Pulse (bit6) = 1
		  Share (bit7) = 1

0C0H	FFH	TPCE_IR+1: IRQ0..IRQ7 = All Supported
0C2H	FFH	TPCE_IR+2: IRQ8..IRQ15 = All Supported

0C4H	20H	TPCE_MI :(Miscellaneous Features Field)
		  Max Twin Card (bit0..2) = 0
		  Audio (bit3) = 0
		  Read Only (bit4) = 0
		  Power Down (bit5) = 1 (Support Power Down Mode)

		For PC card ATA I/O in contiguous memory mode in 3.3V operation (default)
0C6H	1BH	CISTPL_CFTABLE_ENTRY: (16 Bit PCCard Configuration Table Entry Tuple)
0C8H	07H	TPCE_LINK = 07h bytes

0CAH	01H	TPCE_INDX :(Configuration Table Index Byte)
		    Config Entry Number (bit0..5) = 01 (I/O and Memory Mode)
		    Default (bit6) = 0
		    Interface (bit7) = 0 (Interface Field Exist)

0CCH	01H	TPCE_FS
		    Power (bit0,1) = 01 (Vcc Only)
		    Timing (bit2) = 0
		    I/O (bit3) = 0
		    Interrupt (bit4) = 0
		    Memory (bit5,6) = 00
		    Misc (bit7) = 0

0CEH	21H	TPCE_PD: Parameter Selection Byte
		    NomV (bit0) =1
		    MinV (bit1) = 0
		    MaxV (bit2) =0
		    PeakI (bit5) =1

0D0H	B5H	TPCE_PD: Power Parameter Definition (NomV)
		    Exponent (bit0..2) = 5 (1V) - -+ - ->3.3V
		    Mantissa (bit3..6) =6 (3.0) +
		    Extension (bit7) =1 (Extension Exists) +

0D2H	1EH	TPCE_PD: Extension = 1Eh =+0.30 - - +

0D4H	B6H	TPCE_PD: Power Parameter Definition (PeakI)
		    Exponent (bit0..2) = 6 (100mA) - ->330mA
		    Mantissa (bit3..6) = 6 (3)
		    Extension (bit7) =1 (Extension Exists) +

0D6H	1EH	TPCE_PD: Extension = 1Eh =+30 - - +
		For PC card ATA I/O primary mode (1F0-1F7, 3F6, 3F7) in 5V operation (default)
0D8H	1BH	CISTPL_CFTABLE_ENTRY: (16 Bit PC Card Configuration Table Entry Tuple)
0DAH	13H	TPCE_LINK = 13h bytes

0DCH	C2H	TPCE_INDX :(Configuration Table Entry Tuple)
		    Config Entry Number (bit0..5) = 02 (Primary I/O Mode)
		    Default (bit6) = 1
		    Interface (bit7) = 1 (Interface Field Exist)

0DEH	41H	TPCE_IF: (Interface Description Field)
		    Interface Type (bit0..3) = 01 (I/O and Memory)
		    BVDS active (bit4) = 0
		    WP active (bit5) = 0
		    READY active (bit6) = 1
		    MWAIT required (bit7) = 0

0E0H	99H	TPCE_FS: (Feature Selection Byte)
		   Power (bit0,1) = 01 (Vcc Only)
		   Timing (bit2) = 0
		   I/O (bit3) = 0
		   Interrupt (bit4) = 0
		   Memory (bit5,6) = 01
		   Misc (bit7) = 1
		   TPCE_PD (Power Description Structure)

0E2H	27H	TPCE_PD: Parameter Selection Byte
		   NomV (bit0) =1
		   MinV (bit1) = 1
		   MaxV (bit2) =1
		   PeakI (bit5) =1

0E4H	55H	TPCE_PD: Power Parameter Definition (NomV)
		   Exponent (bit 0..2) = 5 (1V) - ->5.0V
		   Mantissa (bit3..6) = A (5.0)

0E6H	4DH	TPCE_PD: Power Parameter Definition (MinV)
		   Exponent (bit 0..2) = 5 (1V) - ->4.5V
		   Mantissa (bit3..6) = 9 (4.5)

0E8H	5DH	TPCE_PD: Power Parameter Definition (MaxV)
		   Exponent (bit 0..2) = 5 (1V) - ->5.5V
		   Mantissa (bit3..6) = C (5.5)

0EAH	B6H	TPCE_PD: Power Parameter Definition (PeakI)
		   Exponent (bit 0..2) = 6 (100mA) - -+- ->330mA
		   Mantissa (bit3..6) = 6 (3) +
		   Extension (bit7) = 1 (Extension Byte Exists) +

0ECH	1EH	TPCE_PD: Extension = 1Eh = +30 - -+

0EEH	EAH	TPCE_IO: (I/O Space Address required for this configuration)
		   I/O Address Lines (bit0..4) =A (1K byte boundary)
		   Bus 16/8 (bit5,6) = 3 (Support 16/8 bit access)
		   Range (bit7) = 1 (See I/O Range Description Byte)

0F0H	61H	TPCE_IO: I/O Range Description Byte
		   # of address range - 1 (bit0..3) = 1 (#of field = 2)
		   Size Of Address (bit4,5) = 2 (2 byte address)
		   Size Of Length (bit6,7) = 1 (1 byte length)

0F2H	F0H	TPCE_IO: I/O Address Range Description Field #1 Address = 1F0
0F4H	01H	
0F6H	07H	TPCE_IO: I/O Address Block Length = 8
0F8H	F6H	TPCE_IO: I/O Address Range Description Field #2 Address = 3F6
0FAH	03H	
0FCH	01H	TPCE_IO: I/O Address Block Length = 2

0FEH	EEH	TPCE_IR: (Interrupt Request Description Structure)
		    IRQ Line 0..15 (bit0..3) = E
		    MASK (bit4) = 0
		    Level (bit5) = 1
		    Pulse (bit6) = 1
		    Share (bit7) = 1

100H	20H	TPCE_MI: (Miscellaneous Features Field)
		    Max Twin Card (bit0..2) = 0
		    Audio (bit3) = 0
		    Read Only (bit4) = 0
		    Power Down (bit5) = 1 (Support Power Down Mode)

For PC card ATA I/O primary mode (1F0-1F7, 3F6, 3F7) in 3.3V operation (alternative)		
102H	1BH	CISTPL_CFTABLE_ENTRY: (16 Bit PC Card Configuration Table Entry Tuple)
104H	07H	TPCE_LINK = 07 bytes

106H	02H	TPCE_INDX: (Configuration Table Index Byte)
		    Config Entry Number (bit0..5) = 02 (Primary I/O Mode)
		    Default (bit6) = 0
		    Interface (bit7) = 0 (Interface Field Exist)

108H	01H	TPCE_FS
		    Power (bit0,1) = 01 (Vcc Only)
		    Timing (bit2) = 0
		    I/O (bit3) = 0
		    Interrupt (bit4) = 0
		    Memory (bit5,6) = 00
		    Misc (bit7) = 0

10AH	21H	TPCE_PD: Parameter Selection Byte
		    NomV (bit0) =1
		    MinV (bit1) = 0
		    MaxV (bit2) =0
		    PeakI (bit5) =1

10CH	B5H	TPCE_PD: Power Parameter Definition (NomV)
		    Exponent (bit0..2) = 5 (1V) - -+ - ->3.3V
		    Mantissa (bit3..6) =6 (3.0) +
		    Extension (bit7) =1 (Extension Exists) +

10EH	1EH	TPCE_PD: Extension = 1Eh =+0.30 - - +

110H	B6H	TPCE_PD: Power Parameter Definition (PeakI)
		    Exponent (bit0..2) = 6 (100mA) - ->330mA
		    Mantissa (bit3..6) = 6 (3)
		    Extension (bit7) =1 (Extension Exists) +

112H	1EH	TPCE_PD: Extension = 1Eh =+30 - - +
For PC card ATA I/O secondary mode (170-177, 377, 377) in 5V operation (default)		
114H	1BH	CISTPL_CFTABLE_ENTRY (16 Bit PC Card Configuration Table Entry Tuple)
116H	13H	TPCE_LINK = 13h bytes

118H	C3H	TPCE_INDX :(Configuration Table Entry Tuple)
		    Config Entry Number (bit0..5) = 03 (Secondary I/O Mode)
		    Default (bit6) = 1
		    Interface (bit7) = 1 (Interface Field Exist)

11AH	41H	TPCE_IF: (Interface Description Field)
		    Interface Type (bit0..3) = 01 (I/O and Memory)
		    BVDS active (bit4) = 0
		    WP active (bit5) = 0
		    READY active (bit6) = 1
		    MWAIT required (bit7) = 0

11CH	99H	TPCE_FS: (Feature Selection Byte)
		    Power (bit0,1) = 01 (Vcc Only)
		    Timing (bit2) = 0
		    I/O (bit3) = 0
		    Interrupt (bit4) = 0
		    Memory (bit5,6) = 01
		    Misc (bit7) = 1
		    TPCE_PD (Power Description Structure)

11EH	27H	TPCE_PD: Parameter Selection Byte
		    NomV (bit0) =1
		    MinV (bit1) = 1
		    MaxV (bit2) =1
		    PeakI (bit5) =1

120H	55H	TPCE_PD: Power Parameter Definition (NomV)
		    Exponent (bit 0..2) = 5 (1V) - ->5.0V
		    Mantissa (bit3..6) = A (5.0)

122H	4DH	TPCE_PD: Power Parameter Definition (MinV)
		    Exponent (bit 0..2) = 5 (1V) - ->4.5V
		    Mantissa (bit3..6) = 9 (4.5)

124H	5DH	TPCE_PD: Power Parameter Definition (MaxV)
		    Exponent (bit 0..2) = 5 (1V) - ->5.5V
		    Mantissa (bit3..6) = C (5.5)

126H	B6H	TPCE_PD: Power Parameter Definition (PeakI)
		    Exponent (bit 0..2) = 6 (100mA) - -+- ->330mA
		    Mantissa (bit3..6) = 6 (3) +
		    Extension (bit7) = 1 (Extension Byte Exists) +

128H	1EH	TPCE_PD: Extension = 1Eh = +0.30 - -+

12AH	EAH	TPCE_IO: (I/O Space Address required for this configuration)
		    I/O Address Lines (bit0..4) =A (1K byte boundary)
		    Bus 16/8 (bit5,6) = 3 (Support 16/8 bit access)
		    Range (bit7) = 1 (See I/O Range Description Byte)

12CH	61H	TPCE_IO: I/O Range Description Byte
		    # of address range - 1 (bit0..3) = 1 (#of field = 2)
		    Size Of Address (bit4,5) = 2 (2 byte address)
		    Size Of Length (bit6,7) = 1 (1 byte length)

12EH	70H	TPCE_IO: I/O Address Range Description Field #1 Address = 170

130H	01H	
132H	07H	TPCE_IO: I/O Address Block Length = 8
134H	76H	TPCE_IO: I/O Address Range Description Field #2 Address = 376
136H	03H	
138H	01H	TPCE_IO: I/O Address Block Length = 2

13AH	EEH	TPCE_IR: (Interrupt Request Description Structure)
		    IRQ Line 0..15 (bit0..3) = E
		    MASK (bit4) = 0
		    Level (bit5) = 1
		    Pulse (bit6) = 1
		    Share (bit7) = 1

13CH	20H	TPCE_MI: (Miscellaneous Features Field)
		    Max Twin Card (bit0..2) = 0
		    Audio (bit3) = 0
		    Read Only (bit4) = 0
		    Power Down (bit5) = 1 (Support Power Down Mode)

For PC Card ATA I/O Secondary Mode (170-177, 377, 377) in 3.3V Operation (Default)		
13EH	1BH	CISTPL_CFTABLE_ENTRY (16 Bit PC Card Configuration Table Entry Tuple)
140H	06H	TPCE_LINK = 07h bytes

142H	03H	TPCE_INDX: (Configuration Table Index Byte)
		    Config Entry Number (bit0..5) = 03 (Secondary I/O Mode)
		    Default (bit6) = 0
		    Interface (bit7) = 0 (Interface Field Exist)

144H	01H	TPCE_FS
		    Power (bit0,1) = 01 (Vcc Only)
		    Timing (bit2) = 0
		    I/O (bit3) = 0
		    Interrupt (bit4) = 0
		    Memory (bit5,6) = 00
		    Misc (bit7) = 0

146H	21H	TPCE_PD: Parameter Selection Byte
		    NomV (bit0) =1
		    MinV (bit1) = 0
		    MaxV (bit2) =0
		    PeakI (bit5) =1

148H	B5H	TPCE_PD: Power Parameter Definition (NomV)
		    Exponent (bit0..2) = 5 (1V) - -+ - ->3.3V
		    Mantissa (bit3..6) =6 (3.0) +
		    Extension (bit7) =1 (Extension Exists) +

14AH	1EH	TPCE_PD: Extension = 1Eh =+0.30 - - +

14CH	B6H	TPCE_PD: Power Parameter Definition (PeakI)
		    Exponent (bit 0..2) = 6 (100mA) - -+- ->330mA
		    Mantissa (bit3..6) = 6 (3) +
		    Extension (bit7) = 1 (Extension Byte Exists) +

14EH	1EH	TPCE_PD: Extension = 1Eh = +30 - -+
150H	14H	CISTPL_NO_LINK
152H	00H	TPCE_LINK
154H	FFH	CISTPL_END

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5.0   Seagate Technology support services

Online services

Internet
www.seagate.com for information about Seagate products and services. Worldwide support is available 24 hours daily by e-mail for your questions.

Presales Support: www.seagate.com/support/email/email_presales.html *or* Presales@Seagate.com
Technical Support: www.seagate.com/support/email/email_disc_support.html *or* DiscSupport@Seagate.com

mySeagate
my.seagate.com is the industry's first Web portal designed specifically for OEMs and distributors. It provides self-service access to critical applications, personalized content and the tools that allow our partners to manage their Seagate account functions. Submit pricing requests, orders and returns through a single, password-protected Web interface—anytime, anywhere in the world.

reseller.seagate.com
reseller.seagate.com supports Seagate resellers with product information, program benefits and sales tools. You may register for customized communications that are not available on the web. These communications contain product launch, EOL, pricing, promotions and other channel-related information. To learn more about the benefits or to register, go to reseller.seagate.com, any time, from anywhere in the world.

Automated phone services

SeaFONE® (1-800-SEAGATE) is the Seagate toll-free number (1-800-732-4283) to access our automated directory assistance for Seagate Service Center support options. International callers can reach this service by dialing +1-405-324-4770.

Seagate Service Centers

Presales Support
Our Presales Support staff can help you determine which Seagate products are best suited for your specific application or computer system, as well as drive availability and compatibility.

Technical Support
If you need help installing your drive, consult your system's documentation or contact the dealer's support services department for assistance specific to your system. Seagate technical support is also available to assist you online at support.seagate.com or through one of our call centers. Have your system configuration information and your drive's "ST" model number available.

SeaTDD™ (+1-405-324-3655) is a telecommunications device for the deaf (TDD). You can send questions or comments 24 hours daily and exchange messages with a technical support specialist during normal business hours for the call center in your region.

Customer Service Operations

Warranty Service
Seagate offers worldwide customer support for Seagate drives. Seagate distributors, OEMs and other direct customers should contact their Seagate Customer Service Operations (CSO) representative for warranty-related issues. Resellers or end users of drive products should contact their place of purchase or one of the Seagate CSO warranty centers for assistance. Have your drive's "ST" model number and serial number available.

Data Recovery Services
Seagate offers data recovery services for all formats and all brands of storage media. Our Data Recovery Services labs are currently located in North America. To get a free quick quote or speak with a case management representative, call 1-800-475-0143. Additional information, including an online request form and data loss prevention resources, is available at www.datarecovery.seagate.com.

Authorized Service Centers
In some locations outside the US, you can contact an Authorized Service Center for service.

USA/Canada/Latin America support services

Seagate Service Centers

Presales Support

Call center	Toll-free	Direct dial	FAX
Americas	1-877-271-3285[1]	+1-405-324-4730[1]	+1-405-324-4704

Technical Support

Call center	Toll-free	Direct dial	FAX
Americas	1-800-SEAGATE[2]	+1-405-324-4700[2]	+1-405-324-3339

Customer Service Operations

Warranty Service

Call center	Toll-free	Direct dial	FAX / E-mail
USA, Canada, Mexico and Latin America	1-800-468-3472[3]	—	+1-956-664-4725
Brazil			
Jabil Industrial Do Brasil LTDA[4]	—	+55-11-4191-4761	+55-11-4191-5084 SeagateRMA.br@jabil.com

Data Recovery Services

Call center	Toll-free	Direct dial	FAX
USA, Canada, and Mexico	1-800-475-01435	+1-905-474-2162	1-800-475-0158 +1-905-474-2459

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[1]Hours of operation are 8:00 A.M. to 11:45 A.M. and 1:00 P.M. to 6:00 P.M., Monday through Friday (Central time).
[2]Hours of operation are 8:00 A.M. to 8:00 P.M., Monday through Friday (Central time).
[3]Hours of operation are 8:00 A.M. to 5:00 P.M., Monday through Friday (Central time).
[4]Authorized Service Center
[5]Hours of operation are 8:00 A.M. to 8:00 P.M., Monday through Friday, and 9:00 A.M. to 5:00 P.M., Saturday (Eastern time).

European support services

For presales and technical support in Europe, dial the Seagate Service Center toll-free number for your specific location. If your location is not listed here, dial our presales and technical support call center at +1-405-324-4714 from 8:00 A.M. to 11:45 A.M. and 1:00 P.M. to 5:00 P.M. (Central Europe time) Monday through Friday. The presales and technical support call center is located in Oklahoma City, USA.

For European warranty service, dial the toll-free number for your specific location. If your location is not listed here, dial our European CSO warranty center at +31-20-316-7222 from 8:30 A.M. to 5:00 P.M. (Central Europe time) Monday through Friday. The CSO warranty center is located in Amsterdam, The Netherlands.

Seagate Service Centers

Toll-free support numbers

Call center	Presales and Technical Support	Warranty Service
Austria	—	00 800-47324289
Belgium	00 800-47324283 (00 800-4SEAGATE)	00 800-47324289
Denmark	00 800-47324283	00 800-47324289
France	00 800-47324283	00 800-47324289
Germany	00 800-47324283	00 800-47324289
Ireland	00 800-47324283	00 800-47324289
Italy	00 800-47324283	00 800-47324289
Netherlands	00 800-47324283	00 800-47324289
Norway	00 800-47324283	00 800-47324289
Poland	00 800-311 12 38	00 800-311 12 38
Spain	00 800-47324283	00 800-47324289
Sweden	00 800-47324283	00 800-47324289
Switzerland	00 800-47324283	00 800-47324289
Turkey	00 800-31 92 91 40	00 800-31 92 91 40
United Kingdom	00 800-47324283	00 800-47324289

FAX services—All Europe (toll call)

Technical Support	+1-405-324-3339
Warranty Service	+31-20-653-3513

Africa/Middle East support services

For presales and technical support in Africa and the Middle East, dial our presales and technical support call center at +1-405-324-4714 from 8:00 A.M. to 11:45 A.M. and 1:00 P.M. to 5:00 P.M. (Central Europe time) Monday through Friday. The presales and technical support call center is located in Oklahoma City, USA.

For warranty service in Africa and the Middle East, dial our European CSO warranty center at +31-20-316-7222 from 8:30 A.M. to 5:00 P.M. (Central Europe time) Monday through Friday, or send a FAX to +31-20-653-3513. The CSO warranty center is located in Amsterdam, The Netherlands.

Asia/Pacific support services

For Asia/Pacific presales and technical support, dial the toll-free number for your specific location. The Asia/Pacific toll-free numbers are available from 6:00 A.M. to 10:45 A.M. and 12:00 P.M. to 6:00 P.M. (Australian Eastern time) Monday through Friday, except as noted. If your location is not listed here, direct dial one of our technical support locations.

Warranty service is available from 9:00 A.M. to 6:00 P.M. April through October, and 10:00 A.M. to 7:00 P.M. November through March (Australian Eastern time) Monday through Friday.

Seagate Service Centers

Call center	Toll-free	Direct dial	FAX
Australia	1800-14-7201	—	—
China (Mandarin)[1, 4]	800-810-9668	+86-10-6225-5336	—
Hong Kong	800-90-0474	—	—
Hong Kong (Cantonese)[1, 4]	001-800-0830-1730	—	—
India[2, 4]	1-600-180-1104	—	—
Indonesia	001-803-1-003-2165	—	—
Japan[3, 4]	0034 800 400 554	—	—
Korea[3, 4]	007 98 8521 7635	—	—
Malaysia	1-800-80-2335	—	—
New Zealand	0800-443988	—	—
Singapore	800-1101-150	—	+65-6488-7525
Taiwan (Mandarin)[1, 4]	00-800-0830-1730	—	—
Thailand	001-800-11-0032165	—	—

Customer Service Operations

Warranty Service

Call center	Toll-free	Direct dial	FAX
Asia/Pacific	—	+65-6485-3595	+65-6485-4860
Australia	1800-12-9277	—	—
India[4]	—	+91-44-821-6164	+91-44-827-2461

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[1]Hours of operation are 8:30 A.M. to 5:30 P.M., Monday through Friday (Australian Western time).
[2]Hours of operation are 9:00 A.M. to 6:00 P.M., Monday through Saturday.
[3]Hours of operation are 9:30 A.M. to 6:30 P.M., Monday through Friday.
[4]Authorized Service Center

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Thank you for your time and comments.

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