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**User manual MAXTOR ST31230N**  
**User guide MAXTOR ST31230N**  
**Operating instructions MAXTOR ST31230N**  
**Instructions for use MAXTOR ST31230N**  
**Instruction manual MAXTOR ST31230N**



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**HAWK 2LP Family:**

.....  
**ST32430N/ND**

.....  
**ST31230N/ND**  
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.....  
*Product Manual, Volume 1*  
.....



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**Manual abstract:**

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Revision Status Summary Sheet Revision A Issue

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Manual 77767471 is Volume 1 of a two Volume document with the SCSI interface information in the Volume 2 SCSI Interface Product Manual, P/N

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.... to use. As such the drive is supplied as a subassembly and is not subject to Subpart J of Part 15 of the FCC Rules and Regulations nor the Radio Interference Regulations of the Canadian Department of Communications. However, the unit has been tested using proper shielding and grounding and found to be compliant with Class A limits of the FCC Rules and the Regulations of The Canadian Department of Communications. The physical design characteristics of the drive serve to minimize radiation when installed in an enclosure that provides reasonable shielding. As such, the drive is capable of meeting the Class B limits of the FCC Rules and Regulations of the Canadian Department of Communication. However, it is the users responsibility to assure that the drive meets the appropriate EMI requirements in their system.

Shielded I/O cables may be required if the enclosure does not provide adequate shielding. If the I/O cables are external to the enclosure, shielded cables should be used, with the shields grounded to the enclosure and to the host controller. 2.2 Electromagnetic Compliance for the European Union If this model has the CE Marking it complies with the European Union requirements of the Electromagnetic Compatibility Directive 89/336/EEC of 03 May 1989 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 to the above directives. The drive was tested in a representative system for typical applications. The selected system represents the most popular characteristics for test platforms. The system configurations include: . . . 486, Pentium, and Power PC Microprocessors 3.5-inch Floppy Disc Drive Keyboard Monitor/Display Although the test system with this Seagate model complies to the directives, we cannot guarantee that all systems will comply. The computer manufacturer or system integrator shall confirm EMC compliance and provide CE Marking for their product.

2.3 Applicable reference documents Seagate P/N 77767475 Seagate P/N 77738479 Installation Guide SCSI Interface Manual ANSI Small Computer System Interface (SCSI): Document Number ANSI3.131-1986 (X3T9/84.40 Rev. 1B) (X3T9.2/82-2 Rev. 17B), X3T9.2/86-109 Revision 10H (SCSI-2) and X3T9.2-184 Rev. 4 (SCSI-3).

Package Test Specification Package Test Specification Seagate P/N 30190-001 (under 100 lb.) Seagate P/N 30191-001 (over 100 lb.) In case of conflict between this document and any referenced document, this document takes precedence. Product Manual - Hawk 2LP Family SCSI-2 (Volume 1), Rev. F 3

3.0 General description The drives are a member of a family of low cost, high performance, highly reliable, random access storage devices designed to meet the needs of the OEM marketplace.

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The drive records and recovers data on 3.7 inch (95 mm) fixed discs. The drive supports the Small Computer System Interface as described in the ANSI SCSI-1, SCSI-2 and SCSI3 Interface Manuals to the extent described in this product Manual (Vol. 1), which defines the product performance characteristics of the Hawk 2LP Family of drives, and the SCSI Interface Product Manual P/N 77738479 (Vol.

2, Version 2) which describes the general interface characteristics of this and other families of Seagate 3.5-inch drives. The drive interface supports multiple initiators, disconnect/reconnect, self configuring host software and automatic features that relieve the host from the necessity of knowing the physical characteristics of the targets (logical block addressing is used). The Head/Disc Assembly (HDA) is environmentally sealed at the factory. Air recirculates within the Head/Disc (HDA) through a nonreplaceable filter to maintain a contamination free head/disc environment. Refer to Figure 3.0-1 an exploded view of the drive. NEVER disassemble the Head/Disc Assembly (HDA). This exploded view is for information only. Do not attempt to service items in the sealed environmental enclosure (heads, media, actuator, etc.

) as this requires special facilities. The drive contains no parts replaceable by the user. The drive warranty is voided if the HDA is opened. The Hawk 2LP Family drives use a dedicated landing zone at the innermost radius of the media to eliminate the possibility of destroying or degrading data by landing in the data zone. The drive automatically goes to the landing zone when the power is removed.

The Hawk 2LP Family drives incorporate an automatic shipping lock which prevents potential damage to the heads and discs that result from movement during shipping and handling. The shipping lock is automatically disengaged when power is applied to the drive and the head load process begins. The Hawk 2LP Family drives decode track location from the dedicated servo surface to eliminate mechanical transducer adjustments and related reliability concerns. The Hawk 2LP Family drives use a high performance actuator assembly that consists of a low inertia, balanced, patented, straight arm design that provides excellent performance with minimum power dissipation. 4 Product Manual - Hawk 2LP Family SCSI-2 (Volume 1), Rev.

F \_\_\_\_\_ Figure 3.0-1. Hawk 2LP family drive Product Manual - Hawk 2LP Family SCSI-2 (Volume 1), Rev. F 5

4.0 Features The Hawk 2LP Family has the following standard features: . . . . . Integrated SCSI Controller Single Ended and Differential SCSI drivers and receivers Asynchronous and Synchronous data transfer protocol Firmware downloadable via SCSI interface Selectable sector size from 256 to 4096 bytes/sector Programmable sector reallocation scheme Flawed sector reallocation at format time Programmable auto write and read reallocation Reallocation of defects on command (Post Format) 96 bit Reed-Solomon error correcting code Sealed Head/Disc Assembly No preventative maintenance or adjustment required Dedicated head landing zone Automatic shipping lock Automatic Adaptive Thermal Compensation Patented Tri-phase Servo with embedded Grey Code Track Address to guarantee servo positioning. Self diagnostics performed at power on 1:1 Interleave Zoned Bit Recording (ZBR) Vertical, horizontal, or top down mounting Dynamic spindle brake Permanently mounted terminators on "N" models, enabled by installation of a jumper plug. 512 K byte data buffer Performance 4.1 . . . . . Programmable multi-segmentable cache buffer 5411 RPM Spindle. Average latency = 5.54 ms Command Queuing of up to 64 commands Background processing of queue Supports start and stop commands Low audible noise for office environment Low power consumption Reliability 4.

2 . . . . . 800,000 hour MTBF Adaptive servo calibration for improved seek performance LSI circuitry Balanced low mass rotary voice coil actuator 5 year warranty 6 Product Manual - Hawk 2LP Family SCSI-2 (Volume 1), Rev. F

4.3 Unformatted and formatted capacities Formatted capacity depends on the number of spare reallocation sectors reserved and the number of bytes per sector. The following table shows some typical 512 byte sector size [1] formatted capacities. ST32430N/ND GB Spare Sector or Cylinders Reserved for reallocation No Spares Five Spare Sectors per Cylinder [2] Nine Spare Sectors per Cylinder [2] 2 Spare Cylinders per Unit [3] One Spare Sector per Cylinder and 2 Spare Cylinder per Unit [3] Unformatted Capacity ST31230N/ND GB 2.16 2.14 2.16 2.16 2.59 1.07 1.06 1.07 1.06 1.28 Notes.

[1] Sector size selectable at format time. Users having the necessary equipment may modify the data block size before issuing a format command and obtain different formatted capacities than those listed. User available capacity depends on spare reallocation scheme selected. See Mode Select Command and Format Command in the SCSI Interface Product Manual P/N 77738479. [2] All spare sectors are on one track.

[3] Spare cylinders are on the two inner tracks. The standard OEM model is as follows: Formatted Data Block Size 512 Byte/Sector 2.14 GB\* 1.06 GB\* Unformatted 2.59 GB 1.28 GB ST32430N/ND ST31230N/ND \* Sparing equivalent to one spare sector per head (all spare sectors are on one track), two spare cylinders/ unit. Installation Guide P/N 77767473 is shipped with each drive unless otherwise requested. 4.4 Options (factory installed) The capacities shown in paragraph 4.3 are available upon request.

Other capacities can be ordered depending on sparing scheme and sector size requested. The following options are incorporated at the time of production. See Section 12.0. · Front panel (green LED) - See Figure 3.0-1 · Single Unit shipping pack 4.5 Optional accessories (user installed) The following accessories are available. All kits may be installed in the field. See Section 13.0.

· Front Panel Kit (with green LED) - See Figure 3.0-1 · Single Unit shipping pack kit · Adapter Accessory Frame Kit P/N 75790701 (adapts 3.5-inch drive to fit in 5.25-inch drive mounting space) Product Manual - Hawk 2LP Family SCSI-2 (Volume 1), Rev. F 7

4. 6 Installation For option jumper locations and definitions refer to Figure 10.1-1. Drive default mode parameters are not normally needed for installation. Refer to Section 11.3.

2 for default mode parameters if they are needed.



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· Ensure that the SCSI ID of the drive is not the same as the host adapter. Most host adapters use SCSI ID 7. · If multiple devices are on the bus set the drive SCSI ID to one that is not presently used by other devices on the bus. · If the drive is the only device on the bus, attach it to the end of the SCSI bus cable. Permanently installed terminators must be enabled on the drive for "N" models using jumper plug TE. On "ND" models, external terminators must be provided by the user, systems integrator or host equipment manufacturer. · If the drive is attached to a bus that contains other devices, and the new drive is not attached to the end of the bus, the Terminator Enable jumper (TE) should be removed from the new drive. · Set all appropriate option jumpers for desired operation prior to power on. If jumpers are changed after power has been applied, recycle the drive power to make the new settings effective.

· Installation instructions are provided by host system documentation or with any additionally purchased drive installation software. If necessary see section 14.0 for Seagate support services telephone numbers. · The Manufacturers installed labels must not be removed from the drive or covered with additional labels, as they contain information required when servicing the product. Formatting · It is not necessary to low level format this drive. The drive is shipped from the factory low level formatted in 512 byte sectors. · Reformat the drive if one of the following occurs. - A different sector size is selected. - A different spare sector allocation scheme is selected. 8 Product Manual - Hawk 2LP Family SCSI-2 (Volume 1), Rev.

F \_\_\_\_\_ 5.0 5.1 Performance characteristics Internal drive characteristics (transparent to user) ST32430N/ND 2.59 ..

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 .... GByte (UNF)\* 5 64242 .....  
 ..... Bytes (Avg)\* 255.6 ..  
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 .....  
 . Mbytes (UNF) 3992 .....  
 .....  
 .... Tracks (user accessible) 4200 .....  
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 .... TPI 1 33.  
 9 - 56.7 ..... Mbits/sec (variable with zone) 5411 +0.5% ...  
 r/min 5.54 .....

ms Drive Capacity Read/Write Heads Bytes/Track Bytes/Surface Tracks/Surface, Total Tracks/Inch Servo Heads Internal Data Rate Disc Rotational Speed Average Rotational Latency \*Rounded off values. 5.2 SCSI Seek, Read and Write performance characteristics (visible to user) [8]\* The values given in section 5.2 apply to all models of the Hawk 2LP family unless otherwise specified.



Refer to Section 11.7 and to the SCSI-2 Interface Product Manual 77738479 for additional timing details. 5.2.1 Access time Including Controller Overhead (without disconnect) [1] [4] Drive Level Read ms Average Typical [3] 10.4 11.4 13.4 2.5 Write Max. Single Track - [2] 11.

9 2.1 Typical [3] Product Manual - Hawk 2LP Family SCSI-2 (Volume 1), Rev. F 9

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Typical (Zero Stroke Seek) 2. Typical (Average Seek) 3. Maximum (Full Stroke Seek) 7.32 ms [3]\* 17.14 ms [3] 31. 78 ms [2] b. Single Sector Read and Transfer of data to Host (time from receipt of last byte of the CDB to the request for a status byte transfer to Host) [7]. 1. Typical (Zero Stroke Seek) 2. Typical (Average Seek) 3.

Maximum (Full Stroke Seek) 5.2.4 7.42 ms [3] 17.24 ms [3] 31.84 ms [2] Write data command execution time [4] (512 byte sector size, without disconnect and with read look ahead disabled.) Latency time is included. a. From CDB reception to the request for the first byte of write data from the Host. 1.

Typical 1.49 ms 2. Maximum 1.61 ms b. Single Sector Write and Data Transfer from Host [7] [6] (Time from receipt of the last byte of the CDB to the request for a completion status transfer to the Host) 1. 2. 3. Typical (Zero Stroke Seek) Typical (Average Seek) Maximum (Full Stroke Seek) 7.72 ms [3] 17.29 ms [3] 32.

28 ms [2] \*[ ] All notes are listed in Section 5.3.1. 10 Product Manual - Hawk 2LP Family SCSI-2 (Volume 1), Rev. F

5. Generalized performance characteristics 1 to 1 Minimum Sector Interleave (All Hawk 2LP models) Data transfer rate (< 1 sector) - 512 Byte Sector, Data Buffer To/From Disc Media: ST32430N/ND Min. [4]\* 4.48 MByte/sec Avg. [4] 6.50 MByte/sec Max.

[4] 7.78 MByte/sec ST31230N/ND 4.23 MByte/sec 5.79 MByte/sec 7.09 MByte/sec Data Transfer Rate (< 1 Track) - 512 Byte Sector, Data Buffer To/From Disc Media: ST32430N/ND Min. [4] 3.76 MByte/sec divided by (Interleave Factor) Avg. [4] 5.46 MByte/sec divided by (Interleave Factor) Max. [4] 6.

54 MByte/sec divided by (Interleave Factor) ST31230N/ND 3.56 MByte/sec 4.87 MByte/sec 5.96 MByte/sec SCSI Interface Data Transfer Rate (Asynchronous) [5] (All Hawk 2LP models) N family 5.2 [9] MBytes/sec 3.1 MBytes/sec ND family 3.3 MBytes/sec 2.4 MBytes/sec -Maximum Instantaneous -Maximum Average The remainder of the specifications of section 5.3 apply to all Hawk 2LP models: Sector Sizes 512 byte user data blocks (default) Variable (256 to 4096 bytes per sector) in even number of bytes per sector. If n (number of bytes per sector) is odd, then n-1 will be used.

Synchronous Transfer Rate From 1.25 MBytes/sec to 10.0 MBytes/sec (See section 11.5.) Read/Write consecutive sectors on a track Flaw reallocation performance impact (For flaws reallocated at format time using the spare sectors per track reallocation scheme.) [10] Flaw reallocation performance impact (For flaws reallocated at format time using the spare sectors per cylinder reallocation scheme.) [10] Flaw reallocation performance impact (For flaws reallocated at format time using the spare tracks per volume reallocation scheme.) Overhead time for head switch (512 byte sectors) Overhead time for one track cylinder switch Average rotational latency \*[ ] Notes listed in Section 5.3.1 YES Negligible Negligible 35 ms (typical) 1 ms <3 ms Typical 5.

54 ms Product Manual - Hawk 2LP Family SCSI-2 (Volume 1), Rev. F 11

5.3.1 [1] Notes for sections 5.2 and 5.3. Execution time measured from receipt of the last Byte of the Command Descriptor Block (CDB) to the request for a Status Byte Transfer to the Initiator (excluding connect/disconnect). [2] Maximum times are specified over the worst case conditions of temperature, voltage margins and drive orientation. When comparing specified access times, care should be taken to distinguish between typical access times and maximum access times.



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The best comparison is obtained by system benchmark tests conducted under identical conditions.

Maximum times do not include error recovery. [3] Typical Access times are measured under nominal conditions of temperature, voltage, and horizontal orientation as measured on a representative sample of drives. [4] Assumes no errors and no sector has been relocated. [5] Rate measured from the start of the first sector transfer to or from the Host. [6] Assumes the Initiator immediately sends Write Data to the drive when requested. [7] Command execution requires a data transfer phase (data to or from the disc media). Assumes the initiator is instantly ready to send or receive the data when the drive generates first request for a data byte transfer, and assumes an average data transfer rate between the drive and the Initiator as specified in section 5.3. [8] All performance characteristics assume that automatic adaptive temperature compensation is not in process when the SCSI command is received. The following paragraphs give highlights of thermal calibration operation.

a. At spin-up, all heads are calibrated on the outer and inner diameter calibration tracks. b. A timed calibration occurs 1 minute after spin-up, and every 10 minutes thereafter. During these timed calibrations, the firmware alternates between the inner and outer diameter calibration tracks.

For example, all heads are calibrated on the inner track, then 10 minutes later all heads are calibrated on the outer track. Automatic adaptive temperature calibration does not interrupt SCSI commands being executed. c. If automatic adaptive thermal calibration is in process when the drive receives a SCSI command, the drive queues the command until the compensation for the specific head being compensated completes. When compensation completes for the specific head being compensated, the drive executes the first queued command.

When execution of the first queued command completes, the drive continues compensation for the remaining head(s). The above procedure continues until the drive completes compensation for all heads. d. When a timed calibration comes due, the drive postpones the calibration until the drive has been idle for 25 to 50 milliseconds. e. When the drive receives a Write command, the drive performs a single head calibration if a calibration has been delayed for 1 to 5 minutes. The drive performs an uninterruptible calibration of all heads if the calibration has been delayed more than 5 minutes. f. The drive performs a calibration of all heads prior to the first retry of any media error if a timed calibration has been delayed for over one minute. g.

Automatic adaptive temperature compensation takes less than 0.1% of bus time. h. Automatic adaptive temperature compensation occurs at times other than mentioned above, but should be transparent to the user (e.g., during execution of Format, Rezero, and Reassign Block commands). i. A rezero command can be used to reset the Automatic adaptive temperature compensation timer back to start so that the host can know when the interruption for timed thermal compensation will occur. [9] Assumes system ability to support 5.2 Mb/s and no cable loss.

[10] Simulated. \_\_\_\_\_ \*SCSI commands are described in the SCSI Interface manual, 77738479. 12 Product Manual - Hawk 2LP Family SCSI-2 (Volume 1), Rev. F \_\_\_\_\_ 5.4 Start/stop time After DC

power has been applied, the drive becomes ready within 20 seconds (15 seconds typical) if the Motor Start Option is disabled (i.

e. the motor starts as soon as the power has been applied). During this time the drive responds to some commands over the SCSI interface\* in less than 3 seconds. Stop time is less than 20 seconds from removal of DC power. If the Motor Start Option is enabled, the internal controller accepts the commands listed in the SCSI Interface Product Manual\* less than 3 seconds after DC power has been applied.

After the Motor Start Command has been received the drive becomes ready for normal operations within 13 seconds typically. The Motor Start Command can also be used to command the drive to stop the spindle\*. There is no power control switch on the drive. 5.5 Prefetch/multi segmented cache control The drive provides prefetch (read look-ahead) and multi-segmented cache control algorithms that in many cases can enhance system performance. "Cache" as used herein refers to the drive buffer storage space when it is used in "cache" operations. To select prefetch and cache features the host sends the Mode Select command with the proper values in the applicable bytes in Mode Page 08h\*. Prefetch and cache operation are independent features from the standpoint that each is enabled and disabled independently via the Mode Select command. However, in actual operation the prefetch feature overlaps cache operation somewhat as is noted in sections 5.5.

1 and 5.5.2. All default cache and prefetch Mode parameter values (Mode Page 08h) for standard OEM versions of this drive family are given in Tables 11.3.2-1 through 11.3.2-4. 5.5.

1 Cache operation In general, 480 Kbytes of the 512 Kbytes of physical buffer space in the drive can be used as storage space for cache operations. The buffer can be divided into logical segments (Mode Select Page 08h, byte 13) from which data is read and to which data is written. The drive maintains a table of logical block disk medium addresses of the data stored in each segment of the buffer. If cache operation is enabled (RCD bit = 0 in Mode Page 08h, byte 2, bit 0. See SCSI Interface Product Manual\*), data requested by the host with a Read command is retrieved from the buffer (if it is there), before any disc access is initiated.

If cache operation is not enabled, the buffer (still segmented with required number of segments) is still used, but only as circular buffer segments during disc medium read operations (disregarding Prefetch operation for the moment). That is, the drive does not check in the buffer segments for the requested read data, but goes directly to the medium to retrieve it. The retrieved data merely passes through some buffer segment on the way to the host. On a cache "miss", all data transfers to the host are in accordance with "buffer-full" ratio rules. On a cache "hit" the drive ignores the "bufferfull" ration rules.

See explanations associated with Mode page 02h (disconnect/reconnect control) in the SCSI Interface Product Manual\*. The following is a simplified description of a read operation with cache operation enabled: Case A - A Read command is received and the first logical block (LB) is already in cache: 1. Drive transfers to the initiator the first LB requested plus all subsequent contiguous LB's that are already in the cache. This data may be in multiple segments. 2. When the requested LB is reached that is not in any cache segment, the drive fetches it and any remaining requested LB's from the disc and puts them in a segment of the cache.



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The drive transfers the remaining requested LB's from the cache to the host in accordance with the disconnect/reconnect specification mentioned above. 3. If the prefetch feature is enabled, refer to section 5.5.

2 for operation from this point. \_\_\_\_\_ \*SCSI Interface Product Manual, 77738479. Product Manual - Hawk 2LP Family SCSI-2 (Volume 1), Rev. F 13 Case B - A Read command requests data, the first LB of which is not in any segment of the cache: 1. The drive fetches the requested LB's from the disc and transfers them into a segment, and from there to the host in accordance with the disconnect/reconnect specification referred to in case A. 2. If the prefetch feature is enabled, refer to section 5.5.2 for operation from this point. Each buffer segment is actually a self-contained circular storage (wrap-around occurs), the length of which is an integer number of disc medium sectors.

The wrap-around capability of the individual segments greatly enhances the buffer's overall performance as a cache storage, allowing a wide range of user selectable configurations, which includes their use in the prefetch operation (if enabled), even when cache operation is disabled (see section 5.5.2). The number of segments may be selected using the Mode Select command, but the size can not be directly selected. Size is selected only as a by-product of selecting the segment number specification.

The size in Kbytes of each segment is reported by the Mode Sense command page 08h, bytes 14 and 15. If a size specification is sent by the host in a Mode Select command (bytes 14 and 15) no new segment size is set up by the drive, and if the "STRICT" bit in Mode page 00h (byte 2, bit 1) is set to one, the drive responds as it does for any attempt to change unchangeable parameters (see SCSI I/O Product Manual\*). The drive supports operation of any integer number of segments from 1 to 16. 5.5.

2 Prefetch operation If the Prefetch feature is enabled, data in contiguous logical blocks on the disc immediately beyond that which was requested by a Read command can be retrieved and stored in the buffer for immediate transfer from the buffer to the host on subsequent Read commands that request those logical blocks (this is true even if "cache" operation is disabled). Though the prefetch operation uses the buffer as a "cache", finding the requested data in the buffer is a prefetch "hit", not a "cache" operation "hit". Prefetch is enabled using Mode Select page 08h, byte 12, bit 5 (Disable Read Ahead - DRA bit). DRA bit = 0 enables prefetch. Since data that is prefetched replaces data already in some buffer segment(s), the host can limit the amount of prefetch data to optimize system performance. The max prefetch field (bytes 8 and 9) limits the amount of prefetch. The drive does not use the prefetch "ceiling" field (bytes 10 and 11).

During a prefetch operation, the drive crosses a cylinder boundary to fetch more data only if the Discontinuity (DISC) bit is set to one in bit 4 of byte 2 of Mode parameters page 08h. Whenever prefetch (read look-ahead) is enabled (enabled by DRA = 0), it operates under the control of ARLA (Adaptive Read Look-Ahead). ARLA enables prefetch of contiguous blocks from the disk when it senses that a prefetch "hit" will likely occur, even if two consecutive read operations were not for physically contiguous blocks of data (e.

g. "software interleave"). ARLA disables prefetch when it decides that a prefetch "hit" will not likely occur. If the host is not using software interleave, and if two sequential read operations are not for contiguous blocks of data, ARLA disables prefetch, but as long as sequential read operations request contiguous blocks of data, ARLA keeps prefetch enabled. \_\_\_\_\_ \*SCSI Interface Product Manual, P/N 77738479. 14 Product Manual - Hawk 2LP Family SCSI-2 (Volume 1), Rev. F \_\_\_\_\_ 5.6 Caching write data Write

caching is a write operation by the drive that makes use of a drive buffer storage area where the data to be written to the medium is stored in one or more segments while the drive performs the write command. Write caching is enabled along with read caching. For write caching, the same buffer space and segmentation is used as set up for read functions.

The buffer segmentation scheme is set up or changed independently, having nothing to do with whether or not read and write caching is enabled or disabled. When a write command is issued, the cache is first checked to see if any logical blocks that are to be written are already stored in the cache from a previous read or write command. If there are, the respective cache segments are cleared. The new data is cached for subsequent Read commands. If the number of write data logical blocks exceeds the size of the segment being written into when the end of the segment is reached, the data is written into the beginning of the same cache segment, overwriting the data that was written there at the beginning of the operation.

However, the drive does not overwrite data that has not yet been written to the medium. Tables 11.3.2-1 through 11.3.2-4 show Mode default settings for the drives. Product Manual - Hawk 2LP Family SCSI-2 (Volume 1), Rev. F 15

\_\_\_\_\_ 6.0 Reliability specifications The following reliability specifications assume correct host/drive operational interface, including all interface timings, power supply voltages, and environmental requirements. Seek Errors Read Error Rates [1] Unrecovered Data Miscorrected Data MTBF Service Life Preventive Maintenance Note. [1] Error rate specified with automatic retries and data correction with ECC enabled and all flaws reallocated. 6.1 Error rates Less than 1 in 107 seeks Less than 1 sector in 1014 bits transferred Less than 1 sector in 1021 bits transferred 800,000 hours 5 years None required The error rates stated in this specification assume the following: a. The drive is operated per this specification using DC Power as defined in this Manual (see Section 7.2).

b. The drive has been formatted with the SCSI FORMAT commands. c. Errors caused by media defects or host system failures are excluded from error rate computations. Refer to Paragraph 8.0, Media Characteristics. 6.1.1 Read errors Before determination or measurement of read error rates: a. The data that is to be used for measurement of read error rates must be verified as being written correctly on the media.

b. All media defect induced errors must be excluded from error rate calculations. 6.1.2 Environmental interference When evaluating systems operation under conditions of Electromagnetic Interference (EMI), the performance of the drive within the system shall be considered acceptable if the drive does not generate an unrecoverable condition.



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An unrecoverable error, or condition, is defined as one that: 1. Is not detected and corrected by the drive itself; 2. Is not capable of being detected from the error or fault status provided through the drive or SCSI interface; or 3. Is not capable of being recovered by normal drive or system recovery procedures without operator intervention. 16 Product Manual - Hawk 2LP Family SCSI-2 (Volume 1), Rev.

F 6.1.3 Write errors Write errors can occur as a result of media defects, environmental interference, or equipment malfunction. Therefore, write errors are not predictable as a function of the number of bits passed. If an unrecoverable write error occurs because of an equipment malfunction in the drive, the error is classified as a failure affecting MTBF.

Unrecoverable write errors are those which cannot be corrected within two attempts at writing the record with a read verify after each attempt (excluding media defects). 6.1.4 Seek errors A seek error is defined as a failure of the drive to position the heads to the addressed track. There shall be no more than one recoverable seek error in 107 physical seek operations.

After detecting an initial seek error, the drive automatically reseek to the addressed track up to 3 times. If a reseek is successful, the Extended Sense reports a seek positioning error (15h), no seek complete error (02h), or track follow error (09h), and the sense key reports a recovered error (1h). If all three reseek fail, a seek positioning error (15h) is reported with a Medium (3h) or Hardware error (4h) reported in the Sense Key. This is an unrecoverable seek error.

Unrecoverable seek errors are classified as failures for MTBF calculations. Ref. section 5.1.1.2 of SCSI-2 Interface Product Manual P/N 77738479.

6.2 6.2.1 Reliability and service Mean time between failure The production disc drive shall achieve an MTBF of 800,000 hours when operated in a benign atmosphere at an average disc drive ambient temperature of 95°F (35°C) or less as measured per this Product Manual, paragraph 7.4.

1. Short term excursions up to the specification limits of the operating environment will not affect MTBF performance. The following expression defines MTBF: Estimated power-on operating hours in the period MTBF per measurement period = Number of drive failures in the period Estimated power-on operation hours means power-up hours per disc drive times the total number of disc drives in service. Each disc drive shall have accumulated at least nine months of operation. Data shall be calculated on a rolling average base for a minimum period of six months.

Drive failure means any stoppage or substandard performance caused by drive malfunction. 6.2.2 Preventive maintenance No routine scheduled preventive maintenance shall be required. 6.2.3 Service life The drive shall have a useful service life of five years. Depot repair or replacement of major parts is permitted during the lifetime (6.2.4).

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6.2.4 Service philosophy Special equipment is required to repair the drive HDA. In order to achieve the above service life, repairs must be performed only at a properly equipped and staffed service and repair facility. Troubleshooting and repair of PCBs in the field is not recommended, because of the extensive diagnostic equipment required for effective servicing. Also, there are no spare parts available for this drive. Drive warranty is voided if the HDA is opened. 6.2.

5 Installation The drive is designed, manufactured, and tested with a "Plug in and Play" installation philosophy. This philosophy minimizes the requirements for highly trained personnel to integrate the drive into the OEM's system, whether in a factory or field environment. The drive has been low level formatted at the factory and need not be reformatted. 6.2.

6 Service tools No special tools are required for site installation or recommended for site maintenance. Refer to Paragraph 6.2.4. The depot repair philosophy of the drive precludes the necessity for special tools.

Field repair of the drive is not practical since there are no user purchasable parts in the drive. 6.2.7 Product warranty Beginning on the date of shipment to customer and continuing for a period of five years, Seagate warrants that each product (including components and subassemblies) or spare part that fails to function properly under normal use due to defect in materials or workmanship or due to nonconformance to the applicable specifications will be repaired or replaced, at Seagate's option and at no charge to customer, if returned by customer at customer's expense to Seagate's designated facility in accordance with Seagate's Warranty Procedure. Seagate will pay for transporting the repair or replacement item to customer. For more detailed warranty information refer to the Standard terms and conditions of Purchase for Seagate products. Shipping: When transporting or shipping a drive, a Seagate approved container must be used. Keep your original box. They are easily identified by the Seagate Approved Package label. Shipping a drive in a non-approved container voids the drive warranty.

Seagate repair centers may refuse receipt of components improperly packaged or obviously damaged in transit. Contact your Authorized Seagate Distributor to purchase additional boxes. Seagate recommends shipping by an air-ride carrier experienced in handling computer equipment. Product repair and return information Seagate customer service centers are the only facilities authorized to service Seagate drives. Seagate does not sanction any third-party repair facilities. Any unauthorized repair or tampering with the factory-seal voids the warranty. 18 Product Manual - Hawk 2LP Family SCSI-2 (Volume 1), Rev. F 7.0 7.1 7.

2 Physical/electrical specifications AC power requirements: None DC power requirements The voltage and current requirements for a single drive are shown in the following table. Values indicated apply at the drive power connector. The single ended power requirements includes the internal disc drive SCSI I/O termination. Table 7.2-1.

DC power requirements ST32430 Single Ended Differential I/O +5 V +12 V +5 V +12V ±5% ±5% +5% +5% 0.36 A 0.35 A 0.51 A 0.35 A 0.61 A 0.56 A 0.80 A 0.85 A 1.1 A 2.0 A 0.22 A 0.40 A 0.42 A 1.9 A 0.

71 A 0.56 A 0.90 A 1.05 A 1.3 A 2.0 A 0.22 A 0.40 A 0.42 A 1.9 A ST31230 Single Ended Differential I/O +5 V +12 V +5 V +12V ±5% ±5% +5% +5% 0.36 A 0.35 A 0.51 A 0.35 A 0.61 A 0.56 A 0.80 A 0.85 A 1.1 A 2.0 A 0.

22 A 0.40 A 0.42 A 1.9 A 0.71 A 0.56 A 0.90 A 1.05 A 1.3 A 2.0 A 0.

22 A 0.40 A 0.42 A 1.9 A Voltage Regulation [4] [2] Average Idle Current [1] Maximum Starting Current (Peak) [5][2][6] Delayed Motor Start (Max) [3][5] Operating Current [6] Typ.



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[1] Max. [1] Max. (Peak) [1] Measured with average reading DC ammeter. Instantaneous current peaks will exceed these values. [2] A droop of up to -10% is permissible during the T2 portion of power up (see Figure 7.2.

2-1). @ [4] See paragraph 7.2.1 "Conducted Noise Immunity". @ @ @ @ in duration are allowed.

General Notes from Table 7.2-1: 1. @ @ 2. Operating condition is defined as random seek read of 64 blocks. 3.

@ @ 4. The +5 and +12 volt supplies shall employ separate ground returns. 5. @ T1 -Controller self tests are performed. @ @ See Note 1 of Table 7.2-1. @ @ T4 -The heads move from the landing zone to the data area. T5 -The adaptive calibration sequence is performed. @ @ Note. All times and currents are typical.

@ @ @ @ @ Typical power dissipation under idle conditions is 6.0 watts (20.5 BTUs per hour). For drives with differential interface circuits, typical operating random read power dissipation is 9.5 watts (32.5 BTUs per hour) of DC power average at nominal voltages. Typical power dissipation under idle conditions is 6.75 watts (23.1 BTUs per hours). 7.

4 Environmental limits Temperature and humidity values experienced by the drive must be such that condensation does not occur on any drive part. Altitude and atmospheric pressure specifications are referenced to a standard day at 58.7°F (14.8°C). Maximum Wet Bulb temperature is 82°F (28°C).

7.4.1 Temperature a. Operating The drive meets all specifications over a 41°F to 131°F (5°C to 55°C) drive ambient temperature range with a maximum gradient of 36°F (20°C) per hour. The enclosure for the drive should be designed such that the temperatures at the locations specified in Table 7.

4.1-1, column 1 are not exceeded. Air flow may be needed to achieve these temperature values. Operation at case temperatures above these values may adversely affect the drives ability to meet specifications. The MTBF specification for the drive is based on operating at an ambient temperature of 95°F (35°C). Occasional excursions to drive ambient temperatures of 55°C or 5°C may occur without impact to specified MTBF. To achieve the specified MTBF, the values of Table 7.4.1-1 Column 2 must be considered maximum average operating case temperatures. Air flow may be needed to achieve these temperatures.

Continual or sustained operation at case temperatures above these values may degrade MTBF. Table 7.4.1-1. PCB and HDA temperatures Items in Figure 7.4.1-1 HDA U2 U31 U17 U5 U3 Column 1 Maximum Case Temperatures (°C) Operating (55° Ambient) [2] 65 88 100 101 98 91 Column 2 Typical Case Temperatures (°C) at 35°C Ambient [1] 45 68 59 60 58 54 Note. [1] The temperatures shown in Column 2 were measured on an unmounted drive lying on its side during random write/reads at 100% duty cycle in still air. [2] The temperatures in Column 1 are calculated and may not reflect actual operating values. Sufficient cooling air may be required to ensure that these values are not exceeded.

b. Non-Operating -40° to 158°F (-40° to 70°C) package ambient with a maximum gradient of 45°F (25°C) per hour. This specification assumes that the drive is packaged in the shipping container designed by Seagate for use with drive. Product Manual - Hawk 2LP Family SCSI-2 (Volume 1), Rev. F 21

HDA Model ST32430N/ST31230N Single Ended

I/O PCB \* U15 U17 U16 U2 U2Ø U7 U3 U11 U31 Q13 U11 U31 Q4 U1 Q1 Q2 U4 U1Ø U25 U5 U25 U1Ø U4 J1 \* Bottom side of PCB Figure 7.

4.1-1. Locations of components listed in table 7.4.1-1.

7.4.2 Relative humidity The values below assume that no condensation on the drive occurs. a. Operating 8% to 80% relative humidity with a maximum gradient of 10% per hour. b. Non-Operating 5% to 95% relative humidity. SE AG AT E Model ST32430ND/ST31230ND Differential I/O PCB \* U15 U17 U16

U2 U2Ø U7 U3 Q13 U1 Q4 Q1 Q2 U13 U14 J1 22 Product Manual - Hawk 2LP Family SCSI-2 (Volume 1), Rev. F 7.4.

3 Effective altitude (sea level reference) a. Operating -1000 to +10,000 feet (-305 to +3048 metres) b. Non-Operating -1000 to +40,000 feet (-305 to +12,210 metres) 7.4.4 Shock and vibration Shock and vibration limits specified in this document are measured directly on the drive chassis. If the drive is installed in an enclosure to which the stated shock and/or vibration criteria is applied, resonance's may occur internally to the enclosure resulting in drive movement in excess of the stated limits. If this situation is apparent, it may be necessary to modify the enclosure to minimize drive movement. The limits of shock and vibration defined within this document are specified with the drive mounted by any of the four methods shown in Figure 7.4.4-1.

Orientation of the side nearest the LED may be up or down. 7.4.4.1 Shock a.

Operating The drive, as installed for normal operation, shall operate error free while subjected to intermittent shock not exceeding 10 g's at a maximum duration of 11 ms (half sinewave). Shock may be applied in the X, Y, or Z axis. b. Nonoperating The limits of nonoperating shock shall apply to all conditions of handling and transportation. This includes both isolated drives and integrated drives.

The drive subjected to nonrepetitive shock not exceeding 75 g's at a maximum duration of 11 ms (half sinewave) shall not exhibit device damage or performance degradation. Shock may be applied in the X, Y, or Z axis. c. Packaged The drive as packaged in a single or multiple drive pack of gross weight 20 pounds (8.95 kg) or less by Seagate for general freight shipment shall withstand drop test from heights listed below against a concrete floor or equivalent. For additional details refer to specifications 30190-001 (under 100 lbs) or 30191-001 (over 100 lbs). Package Size Drop Height 48 in (121 cm) 600 - 1800 in3 (9,832 - 29,502 cm3) >1800 in3 (>29,502 cm3) 42 in (106 cm) Product Manual - Hawk 2LP Family SCSI-2 (Volume 1), Rev. F 23

B A E A1 D C C1 SE AG AT E Z Y X Figure

7.4.4-1.

Recommended mounting SE AG AT E B1 B1 B A Z X A1 Y E1 D1 E1 D1 C1 E D C 24 Product Manual - Hawk 2LP Family SCSI-2 (Volume 1), Rev. F

7.4.4.2 Vibration a. Operating The drive as installed for normal operation, shall comply with the complete specified performance while subjected to continuous vibration not exceeding 5-22 Hz @ 0.020 inches (0.51 mm) displacement 22-400 Hz @ 0.5 g Vibration may be applied in the X, Y, or Z axis. b.

Nonoperating The limits of nonoperating vibration shall apply to all conditions of handling and transportation.



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This includes both isolated drives and integrated drives. The drive shall not incur physical damage or degraded performance as a result of continuous vibration not exceeding 5-22 Hz @ 0.081 inches (2.05 mm) displacement 22-400 Hz @ 2.

00 g Vibration may be applied in the X, Y, or Z axis. 7.4.5 Air cleanliness The drive is designed to operate in a typical office environment with minimal environmental control. 7.

5 7.5.1 Electromagnetic compatibility Electromagnetic susceptibility As a component assembly, the drive is not required to meet any susceptibility performance requirements. It is the responsibility of the system integrator to perform those tests required to ensure that equipment operating in the same system as the drive does not adversely affect the performance of the drive. See section 6.1.2, and see Table 7.2-1, DC Power Requirements. Product Manual - Hawk 2LP Family SCSI-2 (Volume 1), Rev. F 25

6 Mechanical specifications The following nominal dimensions are exclusive of the decorative front panel accessory. However, dimensions of the front panel are shown in figure below. Refer to Figure 7.6-1 for detailed mounting configuration dimensions. See section 7.6.3, Drive mounting. Height: Width: Depth:

Weight: 1.00 in 4.00 in 5.

74 in 1.5 pounds 25.4 101.6 145.8 0.

68 mm mm mm kilograms [4] C [3] G L [1] A D F E Notes: [1] Mounting holes three on each side, 6-32 UNC. Max screw length into side of drive 0.15 in. (3.81 mm).

Screw tightening torque 6.0 in-lb (.675 NM) max with minimum thread engagement of 0.12 in. (3.05 mm). B J [2] Mounting holes four on bottom, 6-32 UNC. Max screw length into bottom of drive 0.20 in. (5.

08 mm). Screw tightening torque 6.0 in-lb (.675 NM) max with minimum thread engagement of 0.12 in. (3.05 mm). [3] Power and interface connectors can extend past the "A" dimension by 0.040 in. (1.

02 mm). [2] [4] Decorative front panel (optional). Inches 5.74 ± .010 4.

00 ± .010 1.00 + .026 .010 2.

362 ± .010 .620 ± .010 4.000 ± .010 .250 + .010 .005 1.750 ± .

010 3.750 ± .010 2.370 ± .010 1.00 ± .010 4.000 ± .010 0.19 ± .

010 0.015 max Millimeters 145.80 ± .25 101.60 ± .

25 25.40 + .66 .25 60.00 ± .

25 15.75 ± .25 101.60 ± .25 6.35 + .25 .12 44.45 ± .25 95.

25 ± .25 60.20 ± .25 25.4 ± .25 101.6 ± .25 4.83 ± .25 0.

381 max H A B C D E F G K N P [4] M H J K L M N P Figure 7.6-1. Mounting configuration dimensions 26 Product Manual - Hawk 2LP Family SCSI-2 (Volume 1), Rev. F 7.6.

1 Drive orientation The balanced rotary arm actuator design of the drive allows it to be mounted in any orientation. All drive performance characterization, however, has been done with the drive in horizontal (discs level) and vertical (drive on its side) orientations, and these are the two preferred mounting orientations. 7.6.2 Cooling Cabinet cooling must be designed by the customer so that the ambient temperature immediately surrounding the drive will not exceed temperature conditions specified in 7.

4.1. Specific consideration should be given to make sure adequate air circulation is present around the PCBs to meet the requirements of 7.4.1. Cables should be routed such that they do not block cooling air flow. 7.6.3 Drive mounting When mounting the drive using the bottom holes care must be taken to ensure that the drive is not physically distorted due to a stiff non-flat mounting surface. The allowable mounting surface stiffness is 80 lb/in (14.

0 N/mm). The following equation and paragraph define the allowable mounting surface stiffness:  $k \cdot x = 80 \text{ lb (14.0 N)}$  where  $k'$  represents the mounting surface stiffness (units of lb/in or N/mm), and  $x'$  represents the out-of-plane mounting surface distortion (units of inches or millimeters). The out-of-plane distortion ( $x'$ ) is determined by defining a plane with three of the for mounting points fixed and evaluating the out-of-plane deflection of the fourth mounting point when a known force is applied to the fourth point. Product Manual - Hawk 2LP Family SCSI-2 (Volume 1), Rev. F 27

8.0 8.1 Media characteristics Media description

The media used on the drive has a diameter of approximately 3.7 inches (95 mm). The aluminum substrate is coated with a thin film magnetic material, overcoated with a proprietary protective layer for improved durability and environmental protection.

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9.0 Defect and error management The drive, as delivered, complies with this specification. The read error rate and specified storage capacity are not dependent upon use of defect management routines by the host (initiator). Defect and error management in the SCSI system involves the drive internal defect/error management and SCSI systems error considerations (errors in communications between Initiator and the drive).

Tools for use in designing a defect/error management plan are briefly outlined in this section, with references to other sections where further details are given. 9.1 Drive internal defects/errors Identified defects are recorded on the drive defects list tracks (referred to as the primary or ETF defect list). These known defects are reallocated during the initial drive format operation at the factory. (See Format Unit command Section 5.

2.1.2 in SCSI Interface Product Manual\*). Data correction by ECC will be applied to recover data from additional flaws if they occur. Details of the SCSI commands supported by the drive are described in SCSI Product Interface Manual\*. Also, more information on the drive Error Recovery philosophy is presented in Section 6 of the SCSI Interface Product Manual. 9.2 SCSI systems error considerations Information on the reporting of operational errors or faults across the interface is given in the SCSI Interface Product Manual. Message Protocol System is described in the SCSI Interface Product Manual\*.

Several of the messages are used in the SCSI systems error management system.

The Request Sense command returns information to the host about numerous kinds of errors or faults. The Receive Diagnostic Results reports the results of diagnostic operations performed by the drive. Status returned by the drive to the Initiator is described in the SCSI Interface Manual\*. Status reporting plays a role in the SCSI systems error management and its use in that respect is described in sections where the various commands are discussed. \*SCSI Interface Product Manual P/N 77738479. Product Manual - Hawk 2LP Family SCSI-2 (Volume 1), Rev. F 29

10.



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0 10.1 Option/configuration headers Drive ID/option select header Figure 10.1-1 shows a bottom view of the drive (PCB toward viewer) for the purpose of showing the drive ID select and configuration option select jumper connectors.

The notes following the figures describe the functions of the various jumper positions on the 3 connectors J2, J5 and J6. Suggested part numbers for the jumpers used on J2 is Molex 52747-0211 (Seagate P/N 77679052). Side View of Drive Pin 1 HDA J1 J5 A0 A1 A2 SCSI ID = 0 SCSI ID = 1 J6 SCSI ID = 2 SCSI ID = 3 SCSI ID = 0 SCSI ID = 4 SCSI ID = 1 SCSI ID = 5 SCSI ID = 2 SCSI ID = 6 SCSI ID = 3 SCSI ID = 7 SCSI ID = 4 SCSI ID = 5 SCSI ID = 6 SCSI ID = 7 Reserved Remote LED Shipped with cover installed. Do not remove. Do not install jumpers on these four positions.

3 4 RLR Reserved EEE A2 A1 A0 S D S SCSI I/O Connector Drive with HDA up, PCB down, viewed from front Pin 1 Pin 1 End Pin 1 J6 HDA Drive Front J5 J1 DC Power Connector J2 J2 Jumper Positions Enable Terminators Delay Motor Start Enable Motor Start Write Protect Parity Option Usage Reserved Term. Power from Drive Term. Power to SCSI Bus Term. Power from SCSI Bus Position A CATH T E D S MW EP P E S S T P T P Pin 1 [2] [3] [2] [2] Figure 10.1-1.

Hawk 2LP family drive ID and option select header Notes for Figure 10.1-1. [1] Notes explaining the functions of the various jumpers on jumper header connectors J2, J5 and J6 are given below in left to right order of jumper position. The term "default" means as standard OEM units are configured when shipped from factory. "Off" means no jumper is installed; "On" means a jumper is installed. Off or on underlined is factory default condition. [2] "ND" models do not have terminators on the drive PCB, so these jumpers are not applicable. [3] Reserved usage. Do not install a jumper. 30 Product Manual - Hawk 2LP Family SCSI-2 (Volume 1), Rev.

F \_\_\_\_\_ J2 Jumper Installation TE On Off DS Off Off On ME Off On Off Jumper Function Description (Applies only to "N" models) With the jumper installed, the On-board (non-removable) terminator circuits are enabled (connected to the I/O lines). Default is jumper installed. Terminator circuits not connected to I/O lines. On On Spindle starts immediately after power up - Default setting. Drive spindle does not start until Start Unit command received from host. Spindle Startup is delayed by SCSI ID times 12 seconds after power is applied, i.e., drive 0 spindle starts immediately when DC power connected, drive 1 starts after 12 second delay, drive 2 starts after 24 second delay, etc. Drive spindle starts when Start Unit command received from host. Delayed start feature is overridden and does not apply when ME jumper is installed. WP On Off PE On Off SS Off Entire drive is write protected. Drive is not write protected. Default is no WP jumper installed. Parity checking and parity error reporting by the drive is enabled. Default is PE jumper installed.

Drive does not report result of parity checking to host. Reserved jumper position. Default is no jumper installed. TP Off On Off TP Off Off On On On No terminator power is connected to drive terminators or SCSI bus I/O pin 26. Drive supplies its own terminator power only. Jumper on this position is factory default. Drive supplies power to I/O pin 26 of SCSI bus; none to internal terminators. When drives have differential I/O circuits, a jumper on the right TP position may be needed to power external terminators (see system documentation). The "ND" drive has differential I/O circuits which have no terminator circuits on the drive. Drive supplies terminator power to itself (internal connection) and to I/O pin 26 of SCSI bus. This is a legal jumper setting. Product Manual - Hawk 2LP Family SCSI-2 (Volume 1), Rev. F 31

\_\_\_\_\_ continued from previous page TP Position A (Applies to "N" models only) On This horizontally positioned jumper across the two TP positions nearest PCB edge, connects terminator power from SCSI bus I/O pin 26 to the drive's internal terminators (for single-ended I/O only). Off See above explanations for TP jumpers. J5 Jumper Installation A0,A1,A2 Drive ID on SCSI Bus (J6 may be used instead, as J5 and J6 are in parallel.

Use only one set for drive ID). The drive ID is binary coded positionwise i.e., jumper in position A2 is drive ID 4, in position A1 is ID 2, position A0 is ID 1 and no jumpers is ID 0. Default is ID = 0. J6 Jumper Installation A2,A1,A0 Drive ID on SCSI bus. Either J5 or J6 (optional) may be used to select drive ID.

Both should not be used at the same time, because at some future time when the ID is changed the user could fail to configure both J5 and J6 the same. Default is ID = 0. No jumper ever installed.

These pins used to connect a cable for a remote LED indicator. Pin 3 (top, nearest HDA), the anode connection, connects in the drive to the +5V supply through a pull-up resistor. Pin 4 (bottom), the cathode connection connects in the drive to signal common through the emitter-collector junction of a transistor switch that controls the LED on/off condition. Grounding LED 10.2 Signal ground (PCB) and HDA ground are connected together in the drive and cannot be separated by the user.

The equipment in which the drive is mounted is connected directly to the HDA and PCB with no electrically isolating shock mounts. If it is desired for the system chassis to not be connected to the HDA/PCB ground, the systems integrator or user must provide a nonconductive (electrically isolating) method of mounting the drive in the host equipment. 32 Product Manual - Hawk 2LP Family SCSI-2 (Volume 1), Rev. F

11.0 11.

1 Interface requirements General description This section partially describes the interface requirements as implemented on the drives. The major portion of the interface requirements/implementation is described in the Seagate SCSI Interface Product Manual, P/N 77738479. This section has tables that give the Hawk 2LP Family drives version of the SCSI implementation described in the 77738479 document. 11.2 SCSI interface messages supported Table 11.2-1 following lists the messages supported by the SCSI-1, SCSI-2 and SCSI-3 modes of the Hawk 2LP Family drives. Table 11.2-1. SCSI messages supported by Hawk 2LP family drives Msg Code 01h [1] 06h 0Dh 0Ch 0Eh 00h 12h 04h 80h-FFh 23h 0Fh 05h 0Ah 0Bh 09h 07h [1] 08h 21h 22h 20h 10h 03h 02h [1] 13h 11h [1] Supported by: SCSI-1 Y Y Y Y Y Y Y Y N N Y N N Y Y N Y Y Y Y N Y Y Y N SCSI-2/3 Y Y Y Y Y Y Y Y N N Y N N Y Y Y Y Y Y Y Y N N Message Name Extended Messages Abort Abort-tag Bus device reset Clear queue Command complete Continue I/O process Disconnect Identify Ignore wide residue (two bytes) Initiate recovery Initiator detected error Linked command complete [2] Linked command complete with flag [2] Message parity error Message reject Modify data pointer No operation Queue tag messages (two bytes) Head of queue tag Ordered queue tag Simple queue tag Release recovery Restore pointers Save data pointer Synchronous data transfer req.



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