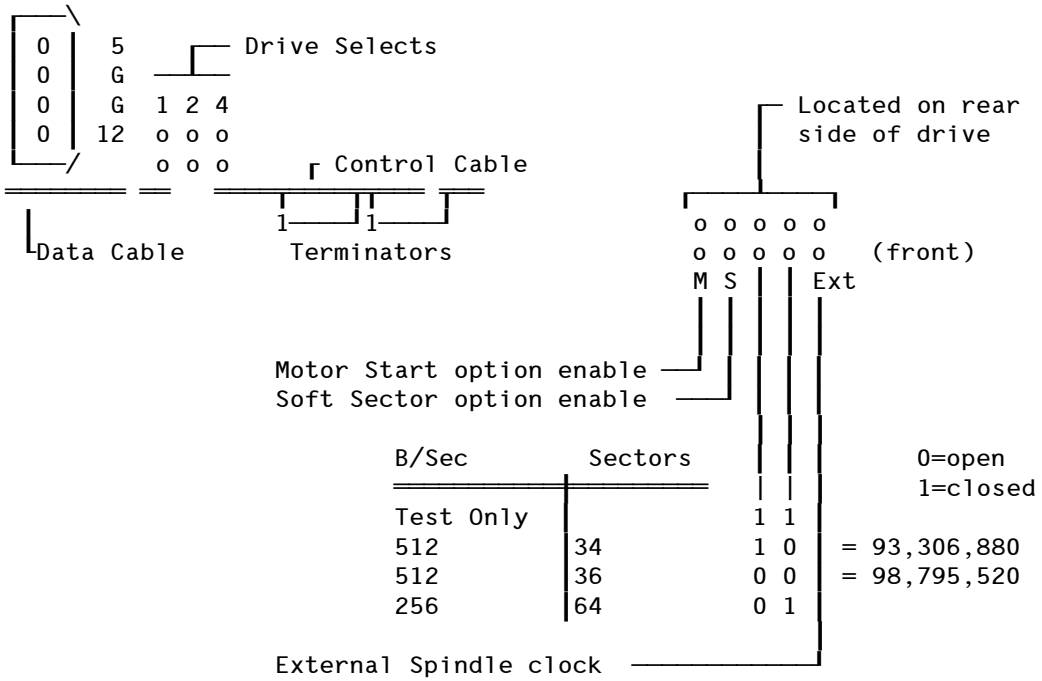



ST-1111E
94356-111 Swift

| | |
|---|---|
| UNFORMATTED CAPACITY (MB) | 111 |
| FORMATTED CAPACITY (36 SECTORS) (MB) | 98 ** |
| ACTUATOR TYPE | VOICE COIL |
| TRACKS | 5,360 |
| CYLINDERS | 1,072 |
| HEADS | 5 |
| DISCS | 3 |
| MEDIA TYPE | THIN FILM |
| RECORDING METHOD | RLL (2,7) |
| TRANSFER RATE (mbytes/sec) | 1.25 |
| SPINDLE SPEED (RPM) | 3,600 |
| AVERAGE LATENCY (mSEC) | 8.33 |
| INTERFACE | ESDI |
| SECTORS PER DRIVE | 192,960 |
| TPI (TRACKS PER INCH) | 1,350 |
| BPI (BITS PER INCH) | 28,103 |
| AVERAGE ACCESS (ms) | 15 |
| SINGLE TRACK SEEK (ms) | 4 |
| MAX FULL SEEK (ms) | 35 |
| MTBF (power-on hours) | 150,000 |
| POWER REQUIREMENTS: +12V START-UP (amps) | 2.5 |
| +12V TYPICAL (amps) | 0.7 |
| +5V START-UP (amps) | 0.75 |
| +5V TYPICAL (amps) | 0.4 |
| TYPICAL (watts) | 11 |
| MAXIMUM (watts) | 33.75 |
| BUFFERED STEP PULSE RATE (micro sec) | 6-200 |
| WRITE PRECOMP (cyl) | N/A (1073) |
| REDUCED WRITE CURRENT (cyl) | N/A (1073) |
| LANDING ZONE (cyl) | AUTO PARK |
| IBM AT DRIVE TYPE | * |

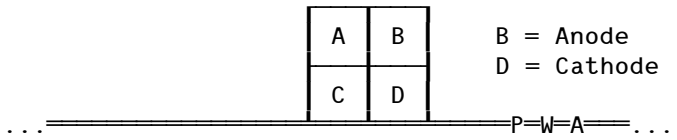
* MAY REQUIRE A CONTROLLER WITH BIOS SUPPORT, OR FORMATTING AND PARTITIONING

SOFTWARE. ALSO, CHECK TO SEE IF YOUR CMOS SETUP HAS A "CUSTOM" OR "USER DEFINABLE" DRIVE TYPE AVAILABLE.

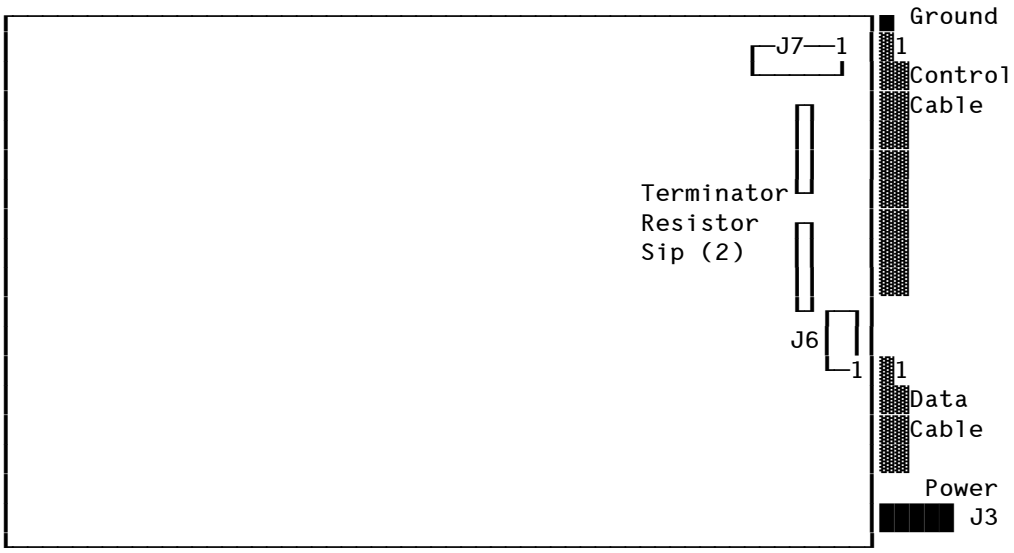
** ESDI controllers which offer an Alternate/Spare sector per track option will format to a capacity = Cyl*Hd*(SPT-1)*512 bytes

Swift Remote LED Option

Front View of Drive Without the Plastic Bezel



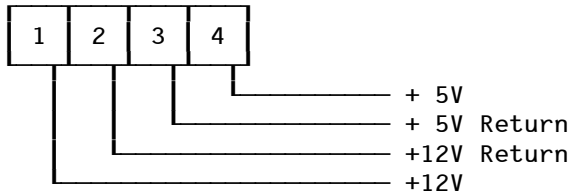

- Default jumper at C-D for LED mounted on drive PWA
- To use remote LED, remove jumper and extend B (Anode) and D (Cathode).
- Swift LED kit 75912397 allows connection to a remote LED
- Swift LED kit 95913369 has an LED for attachment to the system front bezel or a 5.25-inch frame kit




Jumper setting

■ = Jumpers set at factory

J3 Power Connector




J6 Drive select

| | Drive | 1 | 2 | 3 |
|---|---|---|---|---|
| | 0 | OPEN | OPEN | OPEN |
| ■ | 1 | CLOSED | OPEN | OPEN |
| | 2 | OPEN | CLOSED | OPEN |
| | 3 | CLOSED | CLOSED | OPEN |
| | 4 | OPEN | OPEN | CLOSED |
| | 5 | CLOSED | OPEN | CLOSED |
| | 6 | OPEN | CLOSED | CLOSED |
| | 7 | CLOSED | CLOSED | CLOSED |

Drive Select 0 is not allowed!

Drive Select

The following characteristics apply to the Drive Select lines:

1. Logical unit designation for up to 7 drives is performed during installation by installing jumpers on pins on a connector header on the PWA. The jumpers are installed in a complemented binary coded position configuration to select device addresses 1 through 7. Zero is not a valid address.

2. The controller shall not attempt to select the drive until one (1) second after DC power is applied. The Ready output will be valid (whether asserted or negated) within 1 us after the drive is selected.

3. The drive will be selected (and the Drive Selected Signal asserted) within 1 us after the Drive Select lines contain that unit's select address. The drive will be deselected (and the Drive Selected signal negated) within 1 us after the Drive Select lines contain another unit's select address.

4. The Drive Select lines must remain asserted for 1 us after a write operation.

5. When the Drive Select lines are asserted, a head change will occur, requiring a delay before a read or write operation can be initiated.

J7 Motor Start Option

| | | |
|---|---|---|
| 1 | OPEN | Spindle motor starts on power-up |
| | CLOSED | Spindle motor start command required to start motor |

J7 Sector Mode

| | | |
|---|---|---|
| 2 | OPEN | Hard sector mode |
| | CLOSED | Soft sector mode |

The SWIFT supports the use of the soft sector format as described in the CDC ESDI Specification, 77738076, Section 6.4.4.

To implement the optional soft sectored format operation, select "Address Mark" mode in the SWIFT by installing configuration jumper.

J7 Sector Configuration

| | | |
|---|---|---|
| 3 | CLOSED | |
| 4 | OPEN | 34 sectors per track at 512 bytes pro sector |
| 3 | OPEN | |
| 4 | OPEN | 36 sectors per track at 512 bytes per sector |
| 3 | OPEN | |
| 4 | CLOSED | 64 sectors per track at 256 bytes per sector |
| 3 | CLOSED | |
| 4 | CLOSED | Factory test |

J7  External Spindle Clock (optional)

| | | |
|---|---|---|
| 5 | OPEN | Spindle sync disabled |
| | CLOSED | Spindle sync enabled |

The external spindle clock option allows for synchronized rotation of multiple disk drives in a system. Each drive can be configured to one of the following modes:

a. Use internal spindle clock, omit spindle reference clock.
b. Use external spindle clock with a line terminator.
c. Use external spindle clock without the line terminator.

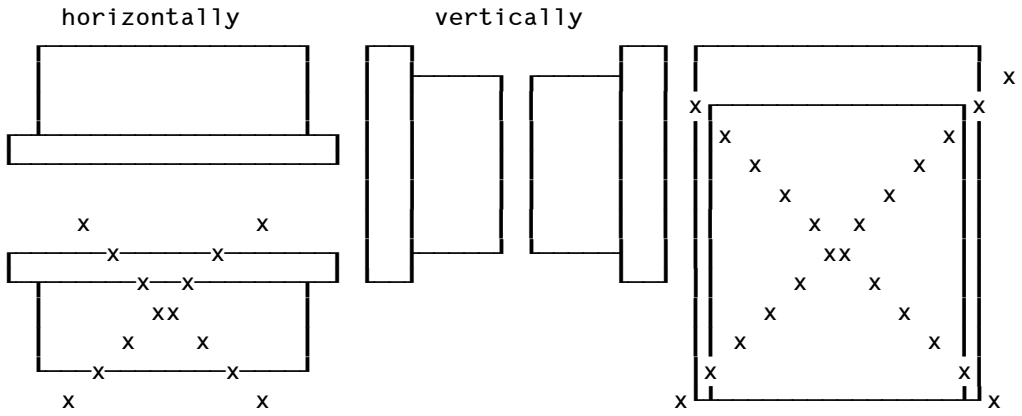
System Configuration

The spindle rotation synchronization uses one of the following methods:

a. Reference clock is generated by the controller. All the disk drives are connected radially to the controller. Each end must be terminated.
b. Reference clock is generated by the controller. All the disk drives are connected in parallel (daisy chain) to the controller. The controller end and the last drive in the chain must be terminated.
c. Reference clock is generated by a master disk drive. The controller receives the clock and provides all other drives in the system with the reference clock using the radial or the daisy chain connection method. Each end (master disk drive and controller) must be terminated.
d. Reference clock is generated by a master disk drive. All disk drives are connected in parallel (daisy chain) to the master disk drive. The master disk drive end and the last drive in the chain must be terminated.

Notes on installation

Drive mounting




Never install PC board on the Top!

Drive Orientation

The permissible drive mounting orientations include operation in the horizontal plane with PCB down and in the vertical plane. Mounting with either end down (front or rear) is not permissible.

The SWIFT is designed, manufactured, and tested with a "Plug-in and Play"

installation philosophy. Basically, this philosophy minimizes the requirements for highly trained personnel to integrate the SWIFT into an OEM's system, wether in a factory or field environment.

## Front Panel

The SWIFT is available with a black front panel. The panel has a single green rectangular lens through which ligth from a LED mounted on the PWA radiates. The LED indicates the drive is selected when glowing. A flashing LED indicates the presence of a non-recoverable fault. A fault indication is displayed irrespective of DRIVE SELECT status.

## Cooling

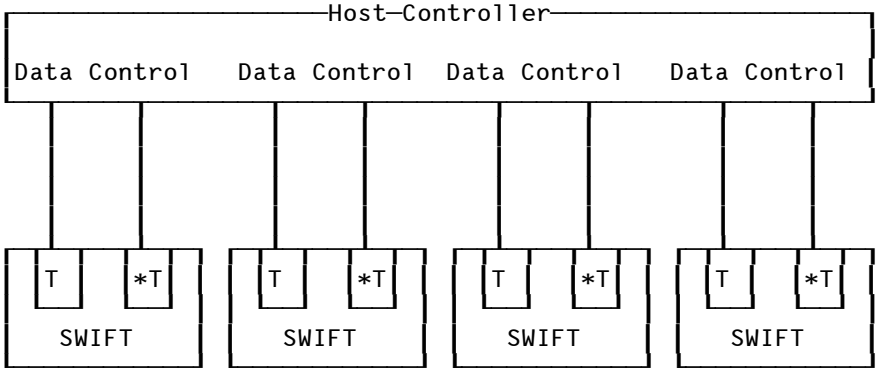
Cabinet cooling must be designed by the customer so that the ambient temperature immediately surrounding the SWIFT does not exceed temperature conditions.

## Sway

The sway of the HDA left to right and front to rear is within the envelope. The sway of the HDA up and down is ± 0.05 inch outside the envelope.

## Interface Cabling Options

View A



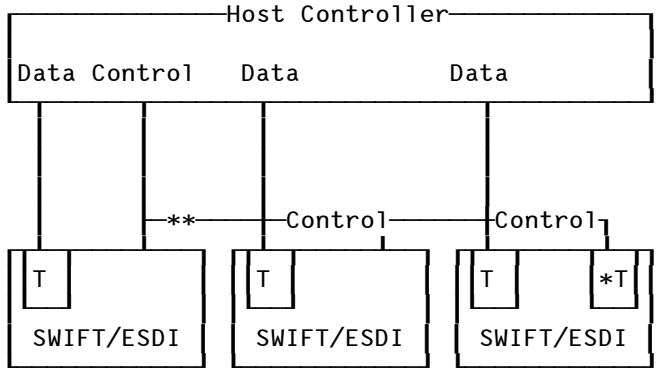

Each control cable length must not exceed 10 feet (3.00m). Each data cable length must not exceed 10 feet (3.00m).

*T indicates removable terminator resistor pack. SWIFT data ports are permanently terminated.

## Radial Configuration

View A shows each drive interfaced to its own control cable, which allows interfacing an arbitrary number of drives and a variety of system operational techniques. Each drive has its data cable and control cable connected to the host controller. The length of each individual cable must not exceed 10 feet (3.00 meters). Terminator resistors must be installed in the host controller for each data cable and for each control cable. For this configuration, a terminator resistor pack must be installed in each SWIFT Disc Drive.

View B




Total control cable length must not exceed 10 feet (3.00m). Each data cable length must not exceed 10 feet (3.00m).

*T indicates removable terminator resistor pack. SWIFT data ports are permanently terminated.
** May be up to seven (7) devices in daisychain.

## Daisychain Configuration

A daisychain configuration connects a maximum of seven drives in parallel on a common control cable. Only the drive selected by the host system has its control signals enabled through this common interface. View B illustrates a daisy chain of SWIFT Disk Drives or other ESDI devices. A terminator resistor pack is required in the host controller for each data cable. Only the last ESDI device in the daisychain requires a terminator resistor pack for the control cable. Terminator resistor packs for the control cable or other drives must be removed. The total combined control cable length (from the controller to the first drive, to the second and subsequent drives) must not be more than 10 feet (3.00 meters).

## DC Cable and Connector

The SWIFT receives DC power through a 4 pin connector mounted on the HDA. Recommended part numbers of the mating connector are provided, but equivalent parts may be used.

| | |
|---|---|
| Type of cable: | 18 AWG |
| Connector: | AMP 1-480424-0 |
| Contacts: | AMP 60619-4 (Loose Piece); AMP 61117-4 (Strip) |

## Ground Connection

A quick disconnect, Amerlock MTL-1802-A, is provided on the drive chassis.

| | |
|---|---|
| Type of cable: | 26-24 AWG |
| Connector: | WALDOM ST-2750 |
| Contacts: | Quick Disconnect (Ground) |

## Data Cable and Connector

The I/O connector for the data interface is a 20 pin board edge connector. The odd pins are located on the side of the printed circuit board facing towards the HDA. The

even pins are on the side of the printed circuit board facing away from the HDA. A key slot is provided between pins 3 and 5. CDC recommends keying this connector to prevent installing it upside down. However, the SWIFT will not be damaged if the connector is installed upside down.

Recommended part numbers for the mating connector are included below, but equivalent parts may be used.

| | |
|---|---|
| Connector: | 20 pin, 3M-3461-0001, AMP 88373-6 |
| Cable: | Flat Cable (Stranded AWG 28) 3M-3365-20 |
| | Flat Cable (Stranded AWG 28) 3M-3517-20 (Shielded Cable) |
| Key: | AMP 583274-1, 3M-3439-0000 |

## Command Cable and Connector

The I/O connector for the control interface is a 34 pin board edge connector. The odd pins are located on the front side of the printed circuit board facing towards the HDA and are connected to the ground plane. The even pins are on the side of the printed circuit board facing away from the HDA. A key slot is provided between pin 3 and 5. CDC recommends keying this connector to prevent installing it upside down.

Recommended part numbers for the mating connector are provided, but equivalent parts may be used.

| | |
|---|---|
| Connector: | 34 pin, 3M-3463-0001, AMP 88373-3 |
| Key: | AMP 583274-1, 3M-3439-0000 |
| Cable: | Flat cable (Stranded AWG 28) 3M-3365-34 |
| | Flat cable (Stranded AWG 28) 3M-3517-34 (Shielded Cable) |
| | Spectra Strip Twist'n Flat 455-248-34 (Stranded AWG 28 Twisted Pair) |

## Spindle reference clock Cable and Connector

The connector for the spindle reference clock signal is a 2-pin 2.0 mm pitch connector. The recommended connector consists of:

a. DuPont Housing 69305-002
b. DuPont Terminal 77138-001

or equivalent.

The cable consists of two 28 AWG wires. The maximum cable length is 20 feet (6.1 metres).

## Interface Drivers/Receivers

The SWIFT uses both single ended and balanced differential signals on the I/O. The data signals use balanced differential drivers and receivers. All other signals use single ended drivers and receivers.

## Single Ended Drivers/Receivers

Transmitter Characteristics
The SWIFT uses the 74F38 open collector quad invertor buffer/driver to transmit status to the host. This driver is capable of sinking a current of 40 mA with a low level output voltage of 0.7 V.

Receiver Characteristics
The SWIFT uses a custom receiver with hysteresis gate as a line receiver. The input of each receiver is terminated with a 150 ohm pull–up resistor.

Terminator Characteristics
The terminator are resistor modules which plug into sockets in the last drive in a daisychain. Each drive is furnished with terminators.
Terminators must be removed from all except the last drive on the cable prior to daisychain operation. Equivalent terminators must be provided in the controller on each input signal line from the drive to the controller. Only the command cable resistor modules are removable. The removable terminators are Beckman Industrial P/N L081C151F or equivalent.

## Balanced Differential Drivers/Receivers

Transmitter Characteristics
The SWIFT uses 75158 type balanced differential drivers. An assertion on the interface is defined when the "+" output is more positive than the "–" output.

Receiver Characteristics
The SWIFT uses 75157 type balanced differential receivers. An assertion on the interface is defined when the "+" input is more positive than the "–" input.

Terminator Requirements
Each differential receiver in the drive is terminated with a 100 ohm resistor. These terminators are not removable. An equivalent terminator must be provided in the controller on each input signal line from the drive to the controller.

## General Description

The SWIFT is 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.

The Model 94356 SWIFT supports the Enhanced Small Device Interface (ESDI) as described in Control Data's ESDI Specification (77738076).
This product specification was created to be used in conjunction with this industry standard interface specification.

## Standards

The SWIFT has been developed as a system peripherals to the highest standards of design and construction. The SWIFT depends upon its host equipment to provide adequate power and environment in order to achieve optimum performance and compliance with applicable industry and governmental regulations. Special attention must be given in the areas of safety, power distribution, shielding, audible noise control, and temperature regulation.

The SWIFT complies with CDC standards.

The SWIFT is a UL Recognized component per UL478 and a CSA Certified product per CSA C22.2, No. 220–M1986. It also meets the requirements of DIN IEC 380/IEC 435/IEC 950/VDE 0806/8.81.

The SWIFT, as delivered, is designed for system integration before use. It is supplied as a Class A Computing device per the FCC Rules and Regulations, Part 15, Subpart J governing EMI of computing devices.

The SWIFT uses a dedicated landing zone at the innermost radius of the media, where there is no user data, thus eliminating the possibility of destroying or degrading customer data. Read/write heads are automatically moved to the landing zone upon loss of power.

The SWIFT incorporates an automatic shipping look which prevents potential damage to the heads and discs caused by movement during shipping and handling. The shipping lock is automatically disengaged when power is applied to the drive and nominal spindle speed is achieved.

The SWIFT decodes Track locations from the dedicated servo surface thereby eliminating mechanical transducer adjustments and related reliability concerns.

The SWIFT uses a high performance actuator assembly consisting of a low inertia, patented straight arm driven by a highly efficient pancake coil assembly. This actuator mechanism provides excellent performance with minimal power dissipation.

## Media Description

The media used in the SWIFT has a diameter of approximately 95 mm. The aluminum substrate is coated with a thin film magnetic material, and lubricated to permit the heads to contact the surface when starting and stopping.

Each data surface has a total of 1072 tracks and is capable of recording 22,383,360 bytes of unformatted data.

Media defects are characterized as beeing ether correctable or uncorrectable as a function of the type and magnitude of the media flaw. Various error correction codes may be implemented to correct errors in the data read from the disk. However, the code chosen should be consistent with Control Data media testing and certification methods. In the SWIFT media certification is performed using the following standards:

An error burst of 11 bits or less is a correctable error.

An error burst greater than 11 bits in length is an uncorrectable error.

Host systems using the SWIFT should have, as a minimum, resident capabilities to recognize and map defective tracks and perform track reallocation routines.

At the time of shipment from the point of manufacture, the SWIFT recording surfaces meet the following requirements.

1. 1072 total data tracks per surface.
2. Track 0 to be error free on each data surface.
3. 40 bad tracks per surface maximum.
4. Cumulative defects not to exceed 1 per megabyte, based on total available unformatted drive capacity.

## Defect and Error Management

The SWIFT, as delivered, complies with this specification. The read error rate and specified storage capacity are not dependent upon use of defect management routines. However, a carefully chosen defect management plan can significantly enhance overall system performance.

Identified defects are recorded on the defects list tracks per CDC ESDI specification. It is recommended that these known defects be reallocated during the initial format operation. Sector reallocation is suggested because, in general, it is more efficient and may offer significant performance improvement. Error Correction Code (ECC) should be used to correct additional flaws as they occur. ECC is recommended since most of the defects are recoverable with ECC. If ECC is not used, defects are usually unrecoverable and need to be reallocated as they are discovered.

## Acoustic Noise Level

Acoustic noise power level of the SWIFT should be less than TBD bels during idle/operating mode. Equivalent typical average sound pressure level should be less than TBD dba when measured with microphone at a distance of one meter from the drive.

## Custom Formatting

The SWIFT is formatted during production. CDC maintains custom formatting capability which can incorporate many of the unique formats used in the Winchester marketplace. A majority of special format requirements can be implemented as specified.

## Drive/Receiver Characteristics

| Logic Level | Drive Output | Receiver Input |
|---|---|---|
| High (false/negated) (0) | ≥ 2.5 V; ≤ 5.25 V | ≥ 2.0 V; ≤ 5.25 V |
| Low (true/asserted) (1) | ≤ 0.4 V; ≥ 0.0 V | ≤ 0.5 V; ≥ 0.0 V |

The difference in the voltages between input and output signals is due to the losses in the cable.

## Seek Time

| | | SWIFT |
|---|---|---|
| Track-to-track | msec. max. | 4 |
| Average | msec. typ. | 15 |
| Average | msec. max. | 16.5 |
| Latency | msec. avg. | 8.33 |

Seek time is defined as the time required from the receipt of a seek or position command by the SWIFT until the drive signals the controller that it is ready to perform another seek or read/write function on the new cylinder. Average seek time is determined by dividing the sum of the time for all possible movements by the total number of movements.

## Spindle Speed and Latency

The spindle speed is 3600 ± 0.5% r/min. The speed tolerance includes motor performance and motor control circuit tolerances.

The average latency time is 8.33 milliseconds, based on a nominal disk speed of 3600 r/min. The maximum latency time is 16.75 milliseconds based on a minimum disc speed of 3582 r/min.

## Read Data Transfer Rate

The nominal read serial data transfer rate is 10.0225 MHz ± 1% Megabits per second, 1.25 Megabytes per second.

## Power Sequencing

Power sequencing is not required for the SWIFT. The SWIFT protects against inadvertent writing during power up and down. Daisychain operation requires that power be maintained on the terminated unit to ensure proper termination of the peripherals I/O cables.

## Temperature

50° to 122°F (10°C to 50°C) (dry air) operating ambient with a maximum gradient of 18° F (10° C) per hour. Above 1000 feet (305 meters) altitude the maximum temperature is derated linearly to 112°F (44.0°C) at 10,000 feet (3048 meters). Cabinet packaging designs must provide ample air circulation around the SWIFT to make sure environmental limits are not exceeded as a result of heat transfer from other system components. Operating ambient for specification purposes is defined as the environment immediately surrounding the SWIFT. The temperature of the HDA is restricted to a maximum of TBD during operations.

## Reliability

The following reliability specifications assume correct host/drive operational interface has been implemented, including all interface timings, power supply voltages, and environmental conditions and appropriate data handling circuits in the host system.

| | |
|---|---|
| MTBF | 30,000 hours |
| Service Life | 5 years |
| Preventive Maintenance | None required |

ESDI (Enhanced Small Device Interface)
2 Cables: 1 each 34-pin Command Cable and 1 each 20-pin Data Cable

## ESDI INTERFACE SPECIFICATIONS

### CONTROL CABLE (J1/P1 PIN ASSIGNMENTS
(Disk Implementation - Serial Mode)

Command Cable Description

| SIGNAL NAME | SIGNAL PIN | GROUND PIN |
|---|---|---|
| -HEAD SELECT 2(3) | 2 | 1 |
| -HEAD SELECT 2(2) | 4 | 3 |
| -WRITE GATE | 6 | 5 |
| -CONFIGURATION/STATUS DATA | 8 | 7 |
| -TRANSFER ACK | 10 | 9 |
| -ATTENTION | 12 | 11 |
| -HEAD SELECT 2(0) | 14 | 13 |
| -SECTOR/BYTE CLOCK/ ADDRESS MARK FOUND | 16 | 15 |
| -HEAD SELECT 2(1) | 18 | 17 |
| -INDEX | 20 | 19 |
| -READY | 22 | 21 |
| -TRANSFER REQ | 24 | 23 |
| -DRIVE SELECT 2(0) | 26 | 25 |
| -DRIVE SELECT 2(1) | 28 | 27 |
| -DRIVE SELECT 2(2) | 30 | 29 |
| -READ GATE | 32 | 31 |
| -COMMAND DATA | 34 | 33 |

DATA CABLE (J2/P2) PIN ASSIGNMENTS
(Disk Implementation – Serial Mode)

| SIGNAL NAME | SIGNAL PIN | GROUND PIN |
|---|---|---|
| –DRIVE SELECTED | 1 | |
| –SECTOR/BYTE CLOCK/ ADDRESS MARK FOUND | 2 | |
| –COMMAND COMPLETE | 3 | |
| –ADDRESS MARK ENABLE | 4 | |
| GROUND | | 5 |
| +/–WRITE CLOCK | 7/8 | 6 |
| +/–READ REF CLOCK | 10/11 | 9/12 |
| +/–NRZ WRITE DATA | 13/14 | 15/16 |
| +/–NRZ READ DATA | 17/18 | 19 |
| –INDEX | 20 | |