MAXTOR

XT - 1000

PRODUCT SPECIFICATION

&

OEM MANUAL

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1.0 INTRODUCTION

1.1 General Description

The XT-1000™ disc drives are low cost, high capacity, high performance random access storage devices utilizing from 4 to 8 non-removable 5 1/4-inch disks as storage media. Each disk surface employs one moveable head to service 918 data tracks. The total unformatted capacity of the disk drives ranges from 66.99 MB to 143.55 MB.

Low cost and high performance are achieved through the use of a rotary voice coil actuator and a closed loop servo system utilizing a dedicated servo surface. The innovative **MAXTORQ**™ rotary voice coil actuator provides average access times of 30 msec.; a performance usually achieved only with larger sized, higher powered linear actuators. The closed loop servo system and dedicated servo surface combine to allow state-of-the-art recording densities (980 tpi, 11,155 bpi) in a 5 1/4-inch package.

High capacity is achieved by a balanced combination of high areal density and high density packaging techniques. Maxtor's advanced **MAXPAK**™ electronic packaging techniques utilize miniature surface mount devices to allow all electronic circuitry to fit on one printed circuit board. Advanced 3380 Whitney type head flexures and sliders allow closer spacing of disks and therefore allow a higher number of disks in a 5 1/4-inch package. Maxtor's unique integrated drive motor/spindle design allows a deeper deck casting than conventional designs, thus permitting more disks to be used.

The XT-1000 electrical interface is compatible with the industry standard ST506/412 family of 5 1/4-inch fixed disk drives. The XT-1000 <u>size</u> <u>and</u> <u>mounting</u> are also identical to the industry standard 5 1/4-inch minifloppy and winchester disk drives, and they use the same DC voltages and connector. No AC power is required.

Key Features:

* Storage capacity of 66.99 to 143.55 megabytes unformatted (52.6 to 112.8 megabytes formatted with a ST506/412 compatible format).

* Same physical size and mounting as standard minifloppy disk drives.

* Same DC voltages as standard minifloppy disk drives.

* No AC voltage required.
* Rotary voice coil and closed loop servo system for fast, accurate head positioning.
* Microprocessor controlled servo for fast access times, high reliability and high density functional packaging.
* 5.0 megabit/second transfer rate.
* ST412 compatible interface.
* ST412 track capacity plus spare sector.
* Plated media for higher bit density and resolution plus improved durability.
* Single printed circuit board for improved reliability.
* Automatic actuator lock.
* Brushless DC spindle motor inside hub.

1.2 SPECIFICATION SUMMARY

1.2.1 Physical Specifications

Environmental Limits

Ambient Temperature
Operating: 40° to 122° F (4° to 50° C)
Non-Operating: -40° to 140° F (-40° to 60° C)

Max Temperature Gradient
Operating: 18° F/hr. (10° C/hr)
Non-operating: Below Condensation

Relative Humidity: 8 to 80% non-condensing
Maximum wet bulb: 78.8° F (26° C)

Maximum Elevation
Operating: 10,000 ft.
Non-Operating: -1000 ft. to 30,000 ft.

Shock
Operating: 10 G's
Non-operating: 20 G's

DC Power Requirements
+12V ± 5%, 1.37A typical, 4.5A max. (at power on)
+5V ± 5%, 0.7A typical, 1.0A maximum
+12V Maximum Ripple = 50mV P-P

Mechanical Dimensions
Height .... 3.25 inches
Width .... 5.75 inches
Depth .... 8.00 inches
Weight .... 6.3 lbs (2.8kg)
Shipping Weight .... 8.0 lbs (3.6kg)

Heat Dissipation
20 watts typical

Max Accoustic Output: 50 DBA

1.2.2 Performance Specifications

Performance Specifications	XT-1065	XT-1105	XT-1140
Capacity, unformatted			
Per drive (Mbytes)	66.99	105.27	143.55
Per surface (Mbytes)	9.57	9.57	9.57
Per track (bytes)	10,416	10,416	10,416
Capacity, XT-1000 alternate format (per sect. 9.1.1)			
Per drive (Mbytes)	54.2	85.3	116.3
Per surface (Mbytes)	7.75	7.75	7.75
Per track (bytes)	8448	8448	8448
Per sector (bytes)	256	256	256
Sectors/track	33	33	33
Capacity, ST506/412 compatible format (per sect. 9.1.2)			
Per drive (Mbytes)	52.6	82.7	112.8
Per surface (Mbytes)	7.52	7.52	7.52
Per track (bytes)	8192	8192	8192
Per sector (bytes)	256	256	256
Sectors/track	32	32	32
Transfer rate, Mbits/sec	<-------------5.0------------->		
Access Time, msec			
Average*	<-------------30------------->		
Track-to-track*	<-------------8------------->		
Maximum*	<-------------60------------->		
Settling	<-------------5------------->		

* Includes settling

1.2.3 Functional Specifications

	XT-1065	XT-1105	XT-1140
Rotational Speed (rpm)	<------------3600------------>		
Average latency (ms)	<------------8.33------------>		
Recording density (bpi)	<-----------11,155----------->		
Flux Density (fci)	<-----------11,155----------->		
Track density	<-------------980------------->		
Cylinders	<-------------918------------->		
Tracks	6426	10,098	13,770
Sectors(33 sectors/track)	212,058	333,234	454,410
Data heads	7	11	15
Servo heads	1	1	1
Disks	4	6	8

1.2.4 Reliability Specifications:

MTBF .... 11,000 POH, typical usage
PM .... Not Required
MTTR .... 30 minutes
Component Design Life .... 5 years

1.2.5 Error Rates

Soft read errors .... 1 per 10^{10} bits read
Hard read errors * .... 1 per 10^{12} bits read
Seek errors .... 1 per 10^{6} seeks

* Not recoverable within 16 retries

2.0 FUNCTIONAL CHARACTERISTICS

2.1 General Theory of Operation

The XT-1000 disc drive consists of read/write and control electronics, read/write heads, servo head, head positioning actuator, media, and air filtration system. The components perform the following functions:

1. Interpret and generate control signals.
2. Position the heads over the desired track.
3. Read and write data.
4. Provide a contamination free environment.

2.2 Read/Write and Control Electronics

Drive Electronics are packaged on a single printed circuit board. This board, which includes two microprocessors, performs the following functions:

1. Reading/writing of data
2. Index detection
3. Head positioning
4. Head selection
5. Drive selection
6. Fault detection
7. Voice coil actuator drive circuitry.
8. Track 0 detection
9. Recalibration to track 0 on power-up
10. Track position counter
11. Power and speed control for spindle drive motor.
12. Braking for the spindle drive motor.
13. Drive up-to-speed indication circuit
14. Reduced write current on the inner tracks
15. Monitoring for write fault conditions
16. Control of all internal timing
17. Generation of seek complete signals

2.3 Drive Mechanism

A brushless DC drive motor contained within the spindle hub rotates the spindle at 3600 rpm. The spindle is direct driven with no belt or pulleys being used. The motor and spindle are dynamically balanced to insure a low vibration level. Dynamic braking is used to quickly stop the spindle motor when power is removed. The head/disk assembly is shock mounted to minimize transmission of vibration through the chassis or frame.

2.4 Air Filtration System (Figure 1)

The disks and read/write heads are assembled in an ultra clean-air environment and then sealed within the module. The module contains an internal absolute filter mounted inside the casting to provide constant internal air filtration. A second filter, located on the enclosure top cover, permits pressure equalization between internal air and ambient air.

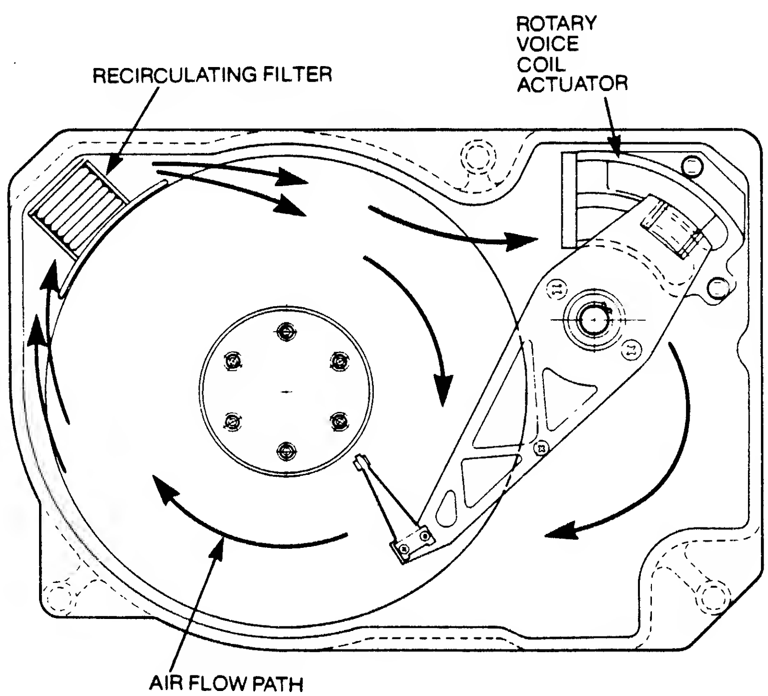


Figure 1

XT-1000 Air Filtration System

2.5 Positioning Mechanism (Figure 2)

The read/write heads are mounted on a head arm assembly which is then mounted to a ball-bearing supported shaft. The voice coil, an integral part of the head/arm assembly, lies inside the magnet housing when installed in the drive. Current from the power amplifier, controlled by the servo system, causes a magnetic field in the voice coil which either aids or opposes the field around the permanent magnets. This reaction causes the voice coil to move within the magnetic field. Since the head-arm assemblies are mounted to the voice coil, the voice coil movement is translated through the pivot point directly to the heads and achieves positioning over the desired cylinder.

Actuator movement is controlled by the servo feed-back signal from the servo head. The servo head is located on the lower surface of the bottom disk, where servo information is pre-written at the factory. This servo information is used as a control signal for the actuator to provide track-crossing signals during a seek operation, track-following signals during ON CYLINDER operation, and timing information such as index and servo clock.

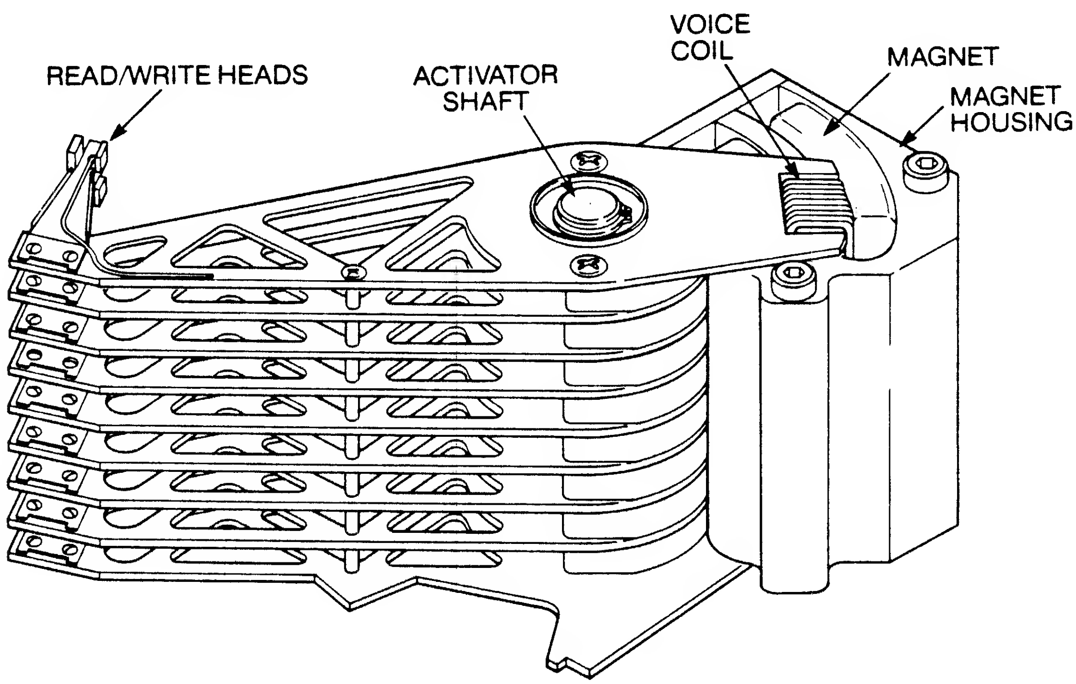


Figure 2

XT-1000 Head Positioning System

2.6 Read/Write Heads and Disks

The XT-1000 employs composite manganese-zinc ferrite 3380 "Whitney" type head sliders and flexures The manganese-zinc is used instead of the conventional nickel-zinc formulation to maximize head output and to allow wide bandwidth read/write capability. The Whitney type sliders and flexures provide improved aerodynamic stability, superior head/disk compliance and a higher signal-to-noise ratio.

The XT-1000 media utilizes thin metallic film plated on 130mm diameter aluminum substrates. The coating formulation together with the low load-force/low mass Whitney type heads permit highly reliable contact start/stop operation. The nickle-cobalt metallic film yields high amplitude signals, and very high resolution performance compared to conventional oxide coated media. The plated media also provides a highly abrasion-resistant surface, decreasing the potential for damage caused by shipping shock and vibration.

Data on each of the data surfaces is read by one read/write head, each of which accesses 918 tracks. There is one surface dedicated to servo information in each drive.

3.0 FUNCTIONAL OPERATIONS

3.1 Power-Up Sequencing

DC power (+5V and +12V) may be supplied to the drive in any order, but +12VDC is required to start the spindle motor. When the spindle speed reaches 100% (phased-locked), the actuator lock automatically disengages and the heads then recalibrate to track 0. For this recalibration to occur, the STEP signal must be inactive and +5VDC accurate. Upon a successful recalibrate, TRACK 0, READY and SEEK COMPLETE status signals will be true. The unit will not perform any Read/Write or Seek functions until READY is true.

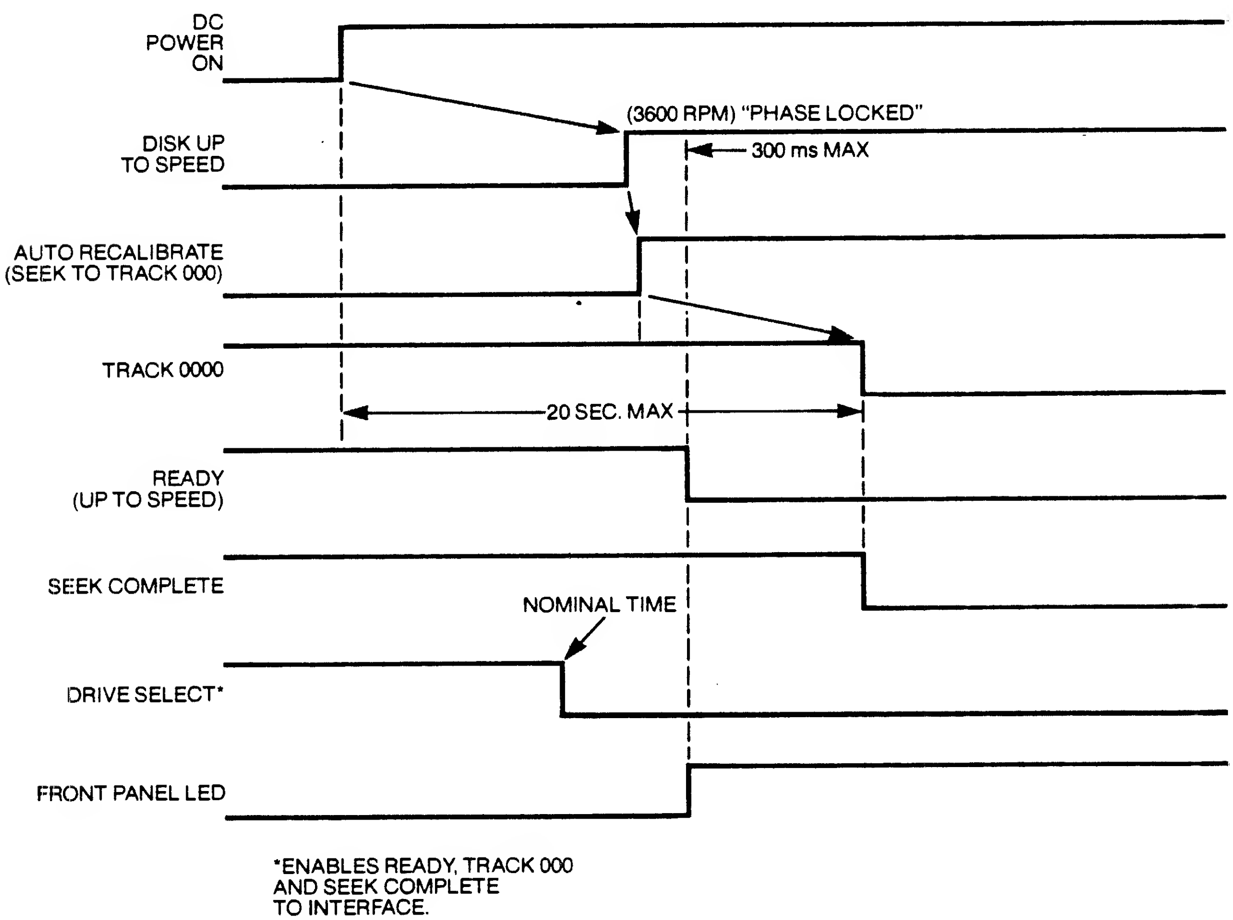


Figure 3

Power-up Sequence

3.2 Drive Selection

Drive selection occurs when one of the DRIVE SELECT lines is activated from the controller. Only the selected drive will respond to the input signals, and only that drive's output signals are then gated to the controller.

3.3 Track Accessing

Read/Write head positioning is accomplished by:

a) Deactivating WRITE GATE.
b) Activating the appropriate DRIVE SELECT line.
c) Being in the READY condition with SEEK COMPLETE true.
d) Selecting the appropriate direction
e) Pulsing the STEP line

Each STEP pulse will cause the heads to position either 1 track in or 1 track out depending on the level of the DIRECTION line. A low level on the DIRECTION line will cause a seek inward toward the spindle; a high level will cause a seek outward toward track 0.

All seeks performed by the XT-1000 are "buffered" type seeks. Optimal seek times are dependent upon the drive receiving STEP pulses at a rate greater than one pulse every 13 usec; STEP pulses slower than this causes average access times to degenerate per Table 1.

STEP TIME (usec)	AVERAGE ACCESS TIME (msec)	MAXIMUM ACCESS TIME (msec)
2—13	30	53
14	36	74
15	36	74
20	36	74
30	40	67
50	44	88
100	57	139
150	70	200
220	101	285
330	143	415
500	211	620
1000	412	1230
3000	1227	3670

Time between step pulses cannot exceed 3100μsec.

All seek times include settling, and begin upon reception of the first step pulse.

SEEK PERFORMANCE VS STEP TIME

Table 1

3.4 Head Selection

Any of the drive's data heads can be selected by placing the head's binary address on the four HEAD SELECT lines.

3.5 Read Operation

Reading data from the disk is accomplished by:

a) Deactivating the WRITE GATE line.
b) Activating the appropriate DRIVE SELECT line.
c) Assuring the drive is READY
d) Selecting the appropriate head.

3.6 Write Operation

Writing data on to the disk is accomplished by:

a) Activating the appropriate DRIVE SELECT line.
b) Assuring that the drive is READY.
c) Selecting the proper head.
d) Insuring no Write Fault conditions exist.
e) Activating Write Gate and placing data on the WRITE DATA line.

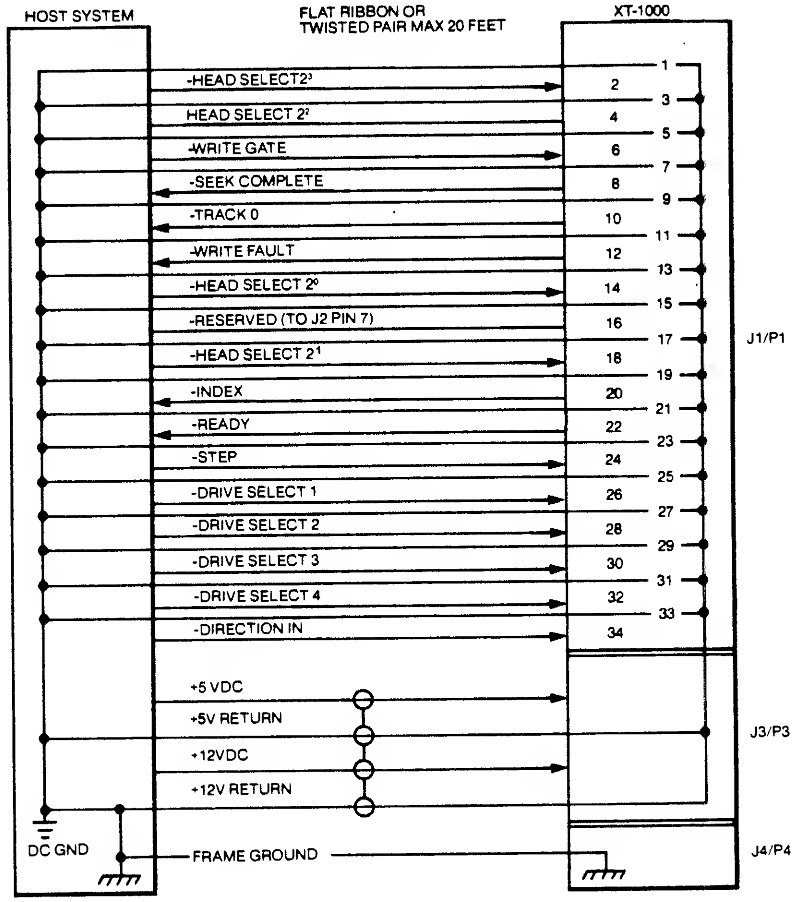
4.0 ELECTRICAL INTERFACE

The interface to the XT-1000 can be divided into three categories, each of which is physically separated.

1. Control signals.
2. Data signals
3. DC power.

All control lines are digital in nature (open collector TTL) and either provide signals to the drive (input) or signals to the host (output) via interface connection J1/P1. The data transfer signals are differential in nature and provide data either to (write) or from (read) the drive via J2/P2 (defined by EIA RS-422).

Figures 4 and 5 and Tables 2 and 3 show connector pin assignments and interconnection of cabling between the host controller and drives.



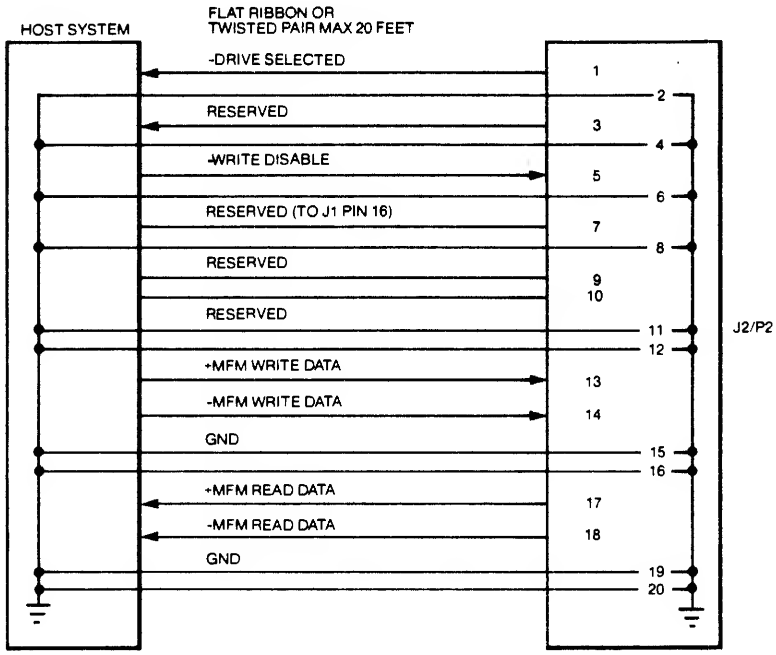
J1/P1—CONNECTOR PIN ASSIGNMENT

Figure 4

GND RTN PIN	SIGNAL PIN	SIGNAL NAME
1	2	—HEAD SELECT 2^3
3	4	—HEAD SELECT 2^2
5	6	—WRITE GATE
7	8	—SEEK COMPLETE
9	10	—TRACK 0
11	12	—WRITE FAULT
13	14	—HEAD SELECT 2^0
15	16	RESERVED (TO J1 PIN 7)
17	18	—HEAD SELECT 2^1
19	20	—INDEX
21	22	—READY
23	24	—STEP
25	26	—DRIVE SELECT 1
27	28	—DRIVE SELECT 2
29	30	—DRIVE SELECT 3
31	32	—DRIVE SELECT 4
33	34	—DIRECTION IN

CONTROL SIGNALS
(DAISY CHAINED)

Table 2



J2/P2—CONNECTOR PIN ASSIGNMENT

Figure 5

GND RTN PIN	SIGNAL PIN	SIGNAL NAME
2	1	—DRIVE SELECTED
4	3	RESERVED
6	5	RESERVED
8	7	RESERVED (TO J1 PIN 16)
	9,10	RESERVED
12	11	GND
	13	+MFM WRITE DATA
	14	—MFM WRITE DATA
16	15	GND
	17	+MFM READ DATA
	18	—MFM READ DATA
20	19	GND

DATA SIGNALS (RADIAL)

Table 3

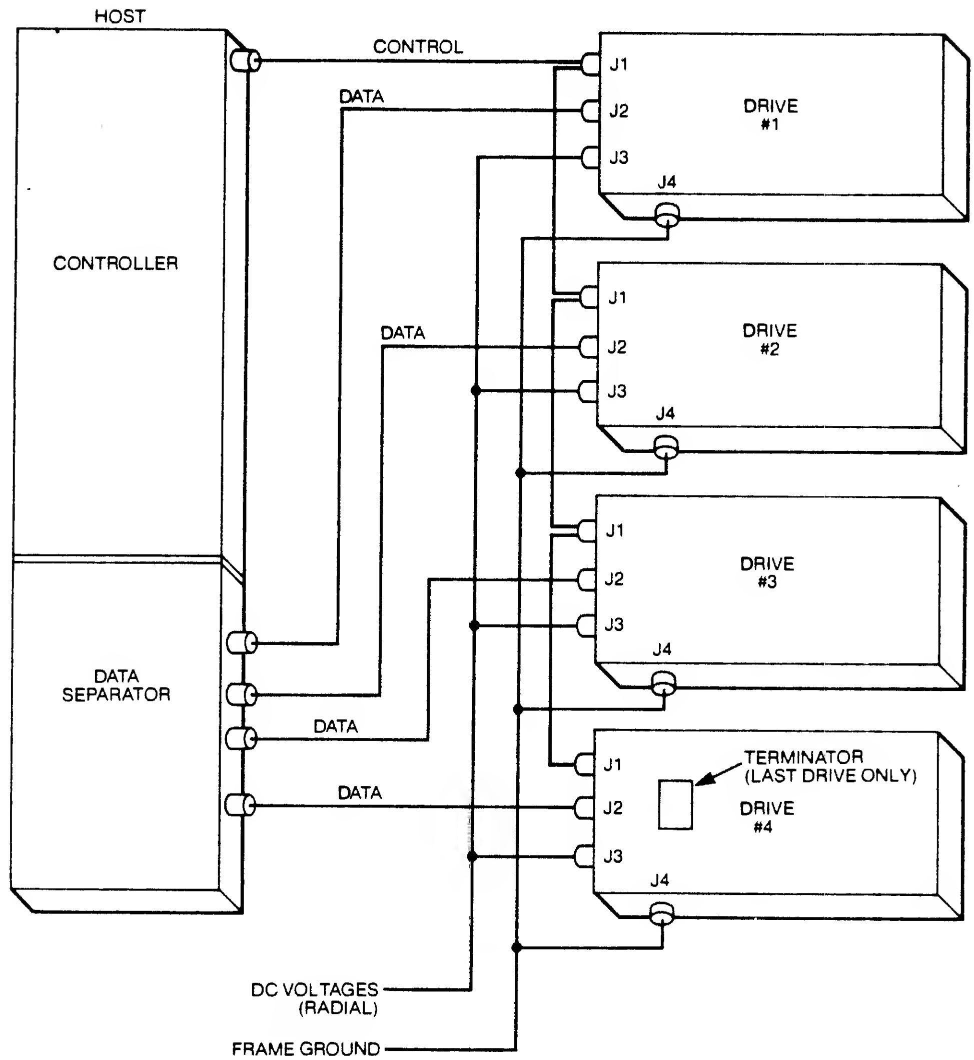


Figure 6

Typical Connection, Four Drive System

4.1 Control Input Lines

The control input signals are of two types: those to be multiplexed in a multiple drive system and those intended to do the multiplexing. The control input signals to be multiplexed are WRITE GATE, HEAD SELECT 2^0, HEAD SELECT 2^1, HEAD SELECT 2^2, HEAD SELECT 2^3, STEP and DIRECTION IN. The signal to do the multiplexing is DRIVE SELECT 1, DRIVE SELECT 2, DRIVE SELECT 3, or DRIVE SELECT 4.

The input lines have the following electrical specifications. Refer to Figure 6 for the recommended circuit.

TRUE: 0.0 VDC to 0.4 VDC @ 1= -48mA (Max)

FALSE: 2.5 VDC to 5.25 VDC @ 1= +250 uA (Open Collector)

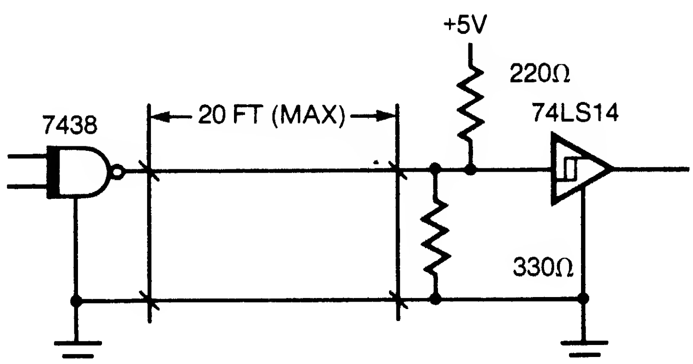


Figure 7

CONTROL SIGNALS DRIVER/RECEIVER COMBINATION

4.1.1 Reduced Write Current

This function is automatically performed by the drive microprocessor.

4.1.2 Write Gate

The active state of this signal, or low level, enables write data to be written on the disc. The inactive of this signal, or high level, enables data to be transferred from the drive.

A 220/330 ohm resistor pack allows for termination.

4.1.3 Head Select 2^0, 2^1, 2^2, and 2^3.

These four lines allow selection of each individual read/ write head in a binary coded sequence. HEAD SELECT 2^0 is the least significant line. Heads are numbered 0 through 15. When all HEAD SELECT lines are high (inactive), head 0 will be selected.

Addressing more heads than contained in the drive will result in a write fault when attempting to perform a write operation.

A 220/330 ohm resistor pack allows for line termination.

4.1.4 Direction In

This signal defines the direction of motion of the R/W heads when the STEP line is pulsed. An open circuit or high level defines the direction as "out" and if a pulse is applied to the STEP line, the R/W heads will move away from the center of the disc. If this line is a low level, the direction of motion is defined as "in" and the R/W heads will move toward the center of the disc. A change in direction must meet the requirement shown in Figure 8.

A 220/330 ohm resistor pack allows for line termination.

NOTE: DIRECTION must not change during step time.

4.1.5 Step

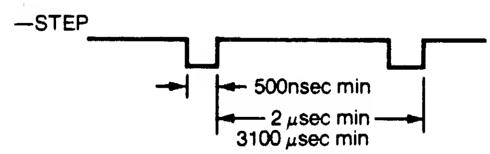
This interface line is a control signal which causes the Read/Write heads to move in the direction of motion defined by the DIRECTION LINE.

The access motion is initiated at the low to high level transition or trailing edge of the signal pulse. Any change in the DIRECTION line must be made at least 100 nsec before the leading edge of the step pulse. (refer to Figure 8A for general timing requirements).

A 220/330 resistor pack allows for line termination.

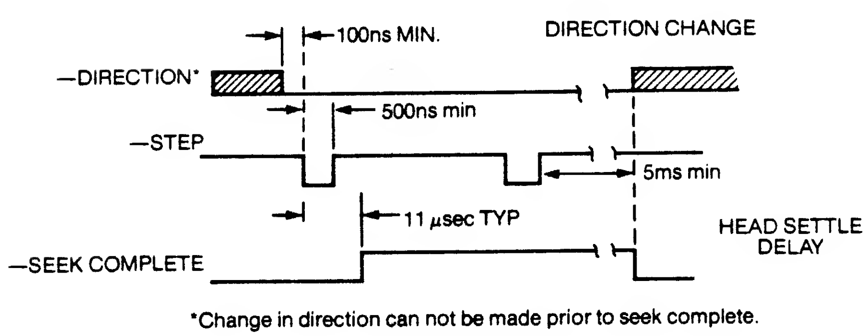
4.1.6 Buffered Seek

Microprocessor utilization on the XT-1000 adds the capability of capturing and storing up to 917 step pulses for optimal seeking capability. Optimum seek times require that the time between step pulses be less than 13 usec; however, any time up to 3100 usec will be accepted by the drive.



STEP PULSE TIMING

Figure 8A



GENERAL STEP TIMING

Figure 8B

4.1.7 Drive Select

DRIVE SELECT, when low, connects the drive interface to the control lines. Positioning the DRIVE SELECT jumper between the two appropriate pins on the drive printed circuit board determines which drive will be selected. The following table indictes which drive will be selected for each jumper position.

DRIVE SELECTED	JUMPER POSITION PIN NUMBERS
Drive 0	1, 2
Drive 1	2, 3
Drive 2	4, 5
Drive 3	5, 6

4.2 Control Output Lines

The output control signals are driven with an open collector output stage capable of sinking a maximum of 48mA at low level or true state with maximum voltage of 0.4V measured at the driver. When the line driver is in the high level or false state, the driver transistor is off and collector leakage current is a maximum of 250uA.

All J1 output lines are enabled by their respective DRIVE SELECT line.

Figure 7 shows the recommended circuit.

4.2.1 Seek Complete

This line will go to a low level or true state when the Read/Write heads have settled on the final track at the end of a seek. Reading or writing should not be attempted when seek complete is false.

SEEK COMPLETE will go false in three cases:

1) A recalibration sequence is initiated (by drive logic) at power on, if the R/W heads are not over track zero.

2) 11 usec (typical) after the leading edge of a step pulse or series of step pulses.

3) If +5 volts or +12 volts are lost momentarily but restored.

4.2.2 Track 0

This interface signal indicates a low level or true state only when the drive's Read/Write heads are positioned at cylinder zero (the outermost data track).

4.2.3 Write Fault

This signal is used to indicate a condition at the drive that may cause improper writing on the disk. When this line is a low level or true, further writing and stepping is inhibited at the drive until the condition is corrected. Write fault cannot be reset via the interface.

Note: controller should edge detect this signal.

There are four conditions detected:

a) Write current in a head without WRITE GATE active or no write current with WRITE GATE active and DRIVE SELECTED.

b) Multiple heads selected, no head selected, or improperly selected.

c) DC voltages are grossly out of tolerance.

d) Head not properly positioned over track (OFF-TRACK detected).

4.2.4 Index

This interface signal is provided by the drive once each revolution (16.67 ms nominal) to indicate the beginning of a track. Normally, this signal is high and makes the transition to low to indicate INDEX. Only the transition from high to low is valid.

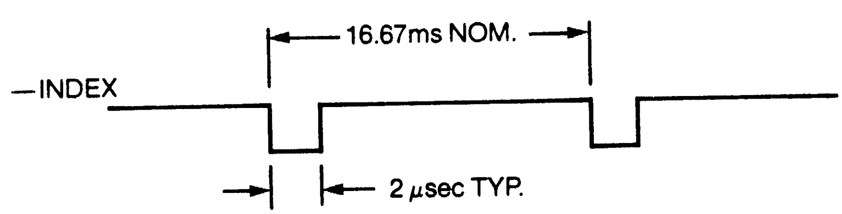


Figure 9

INDEX TIMING

4.2.5 Ready

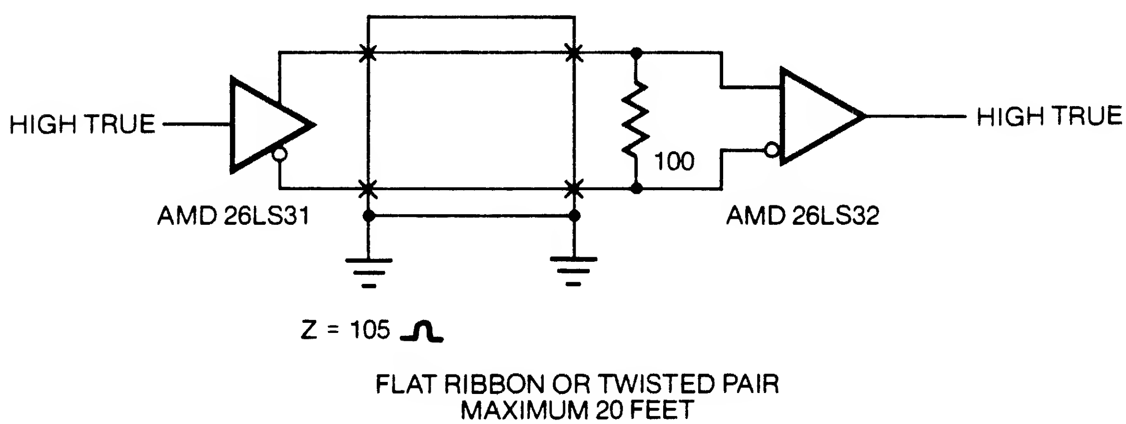
This interface signal when true together with SEEK COMPLETE, indicates that the drive is ready to read, write or seek, and that the I/O signals are valid. When the line is false, all writing and seeking is inhibited.

The typical time after power on for READY to be true is 15 seconds.

4.3 DATA TRANSFER LINES

All lines associated with the transfer of data between the drive and the host system are differential in nature and may not be multiplexed. These lines are provided at the J2/P2 connectors on all drives.

Two pair of balanced signals are used for the transfer of data: WRITE DATA and READ DATA. Figure 10 illustrates the driver/receiver combination used in the drive for data transfer signals.



NOTE: Any EIA RS 422 Driver/receiver pair will interface.

Figure 10

DATA LINE DRIVER/RECEIVER COMBINATION

4.3.1 MFM Write Data

This is a differential pair that defines the transistions to be written on the track. The transition of +MFM WRITE DATA line going more positive than the - MFM WRITE DATA will cause a flux reversal on the track provided WRITE GATE is active. This signal must be driven to an inactive state (+ MFM WRITE DATA more negative than - MFM WRITE DATA) by the host system when in a read mode.

No write precompensation is required by the drive; if write precomcompensation is used, some loss in performance (window margin within the data separator) may result.

4.3.2 MFM Read Data

The data recovered by reading a pre-recorded track is transmitted to the host system via the differential pair of MFM READ DATA lines. The transition of the + MFM READ DATA line going more positive than the MFM READ DATA line represents a flux reversal on the track of the selected head.

4.3.3 Read/Write Timing

The timing diagram as shown in Figure 12 depicts the necessary sequence of events (with associated timing restrictions for proper read/write operation of the drive).

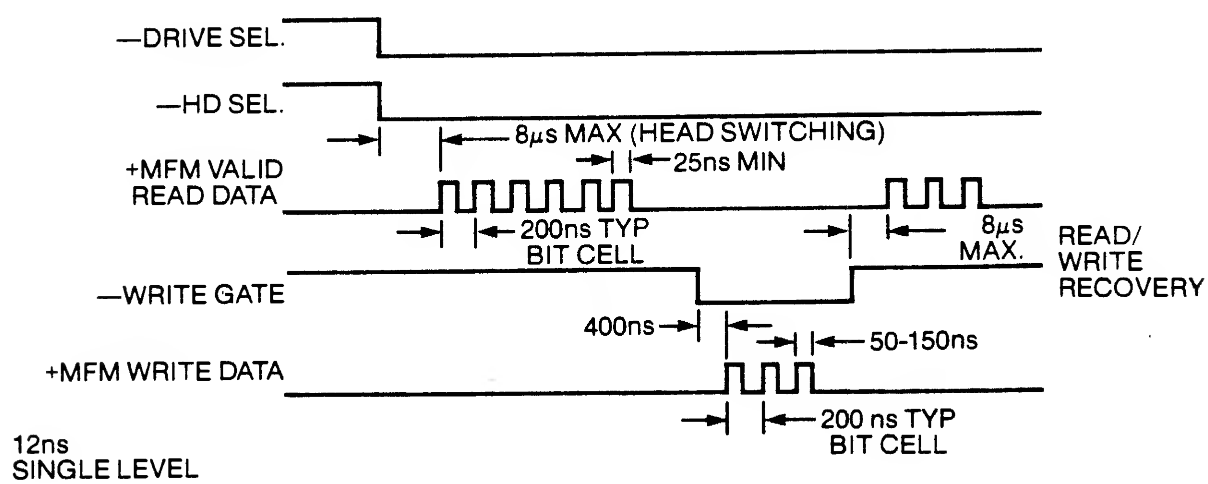


Figure 11

READ/WRITE DATA TIMINGS

4.4 Drive Selected

A status line is provided at the J2/P2 connector to inform the host system of the selection status of the drive.

The DRIVE SELECTED line is driven by a TTL open collector driver as shown in Figure 7. This signal will go active only when the drive is programmed as drive x (x= 1,2,3, or 4) by the drive. The DRIVE SELECT X line at J1/P1 is activated by the host system.

4.5 General Timing Requirements

Figure 12 is a timing diagram showing the necessary sequence of events and associated timing restrictions for proper operation of the drive.

Note that an automatic recalibration to track 0 occurs at DC power on. At DC power off, the disks are brought to a complete stop in approximately 20 seconds.

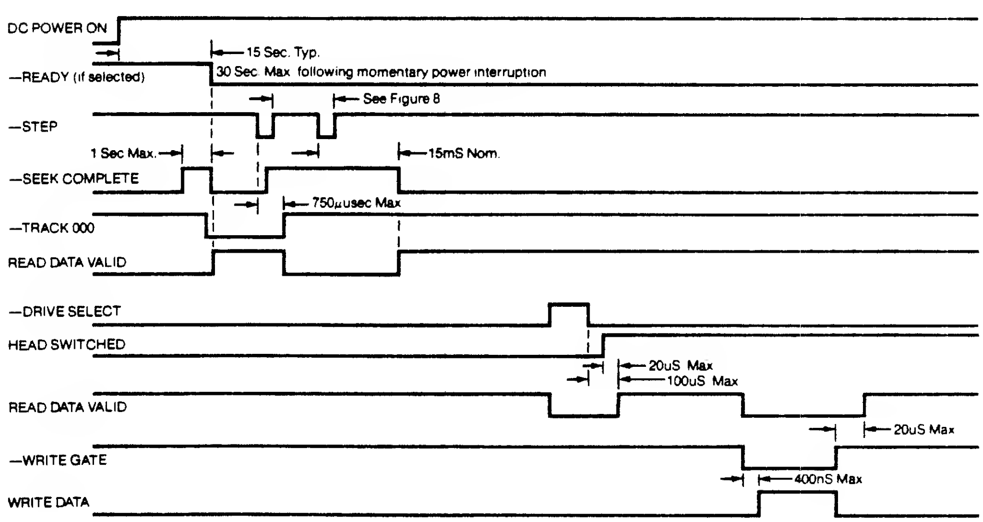


Figure 12

GENERAL TIMING REQUIREMENTS

5.0 PHYSICAL INTERFACE

The electrical interface between the XT-1000 and the host controller is via four connectors:

1. J1 - Control signals (multiplexed)
2. J2 - Read/write signals (radial)
3. J3 - DC power input
4. J4 - Frame ground

Refer to Figure 13 for connector locations.

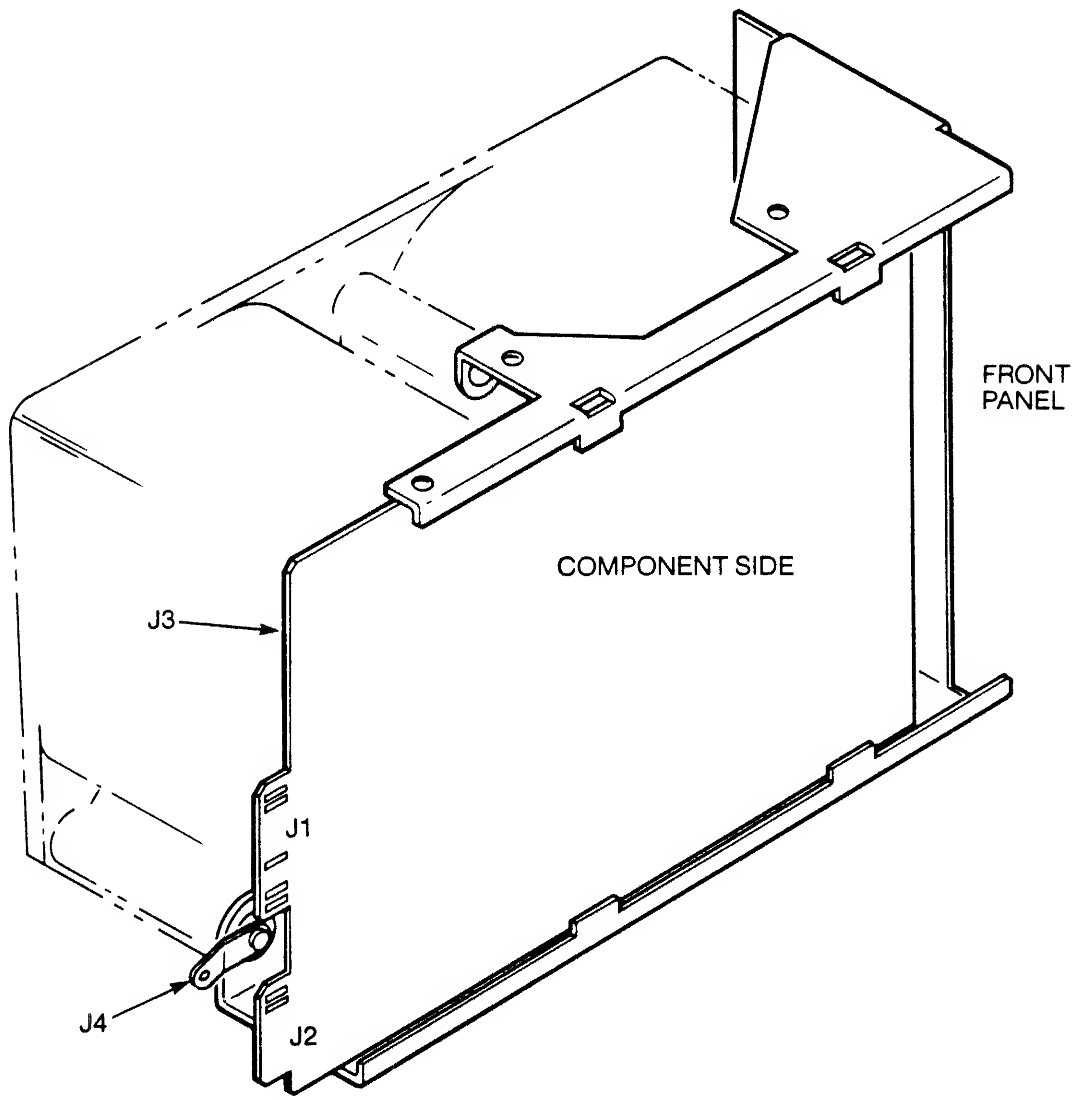


Figure 13

INTERFACE CONNECTOR PHYSICAL LOCATION

5.1 J1/P1 CONNECTOR

Connection to J1 is via a 34 pin PCB edge connector. The dimensions for this connector are shown in figure 14. The pins are numbered 1 through 34 with the even pins located on the component side of the PCB. Pin 2 is located on the end of the PCB connector closest to the DC power connector J3/P3. A key slot is provided between pins 4 and 6. The recommended mating connector for P1 is AMP ribbon connector PIN 88373-3.

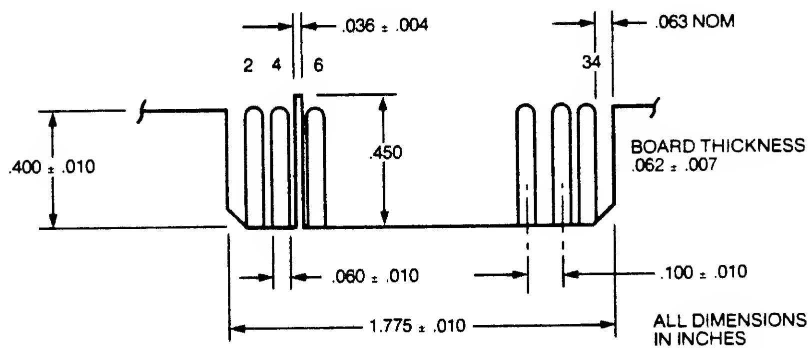


Figure 14

J1 CONNECTOR DIMENSIONS

5.2 J2/P2 CONNECTOR

Connection of J2 is via a 20 pin PCB edge connector. The dimensions for the connector is shown in figure 15. The pins are numbered 1 through 20 with the even pins located on the component side of the PCB. The recommended mating connector for P2 is AMP ribbon connector P/N 88373-6. A key slot is provided between pins 4 and 6.

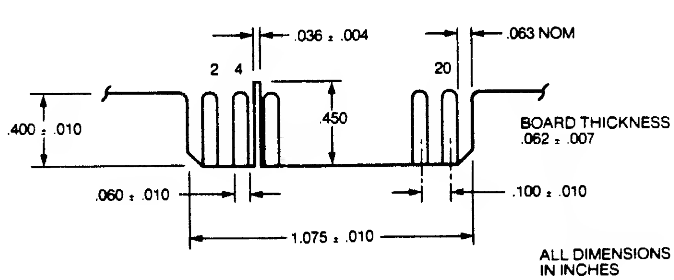


Figure 15

J2 CONNECTOR DIMENSIONS

5.3 J3/P3 CONNECTOR

The DC power connector (J3), Figure 16, is a 4 pin AMP MATE-N-LOCK connector P/N 350543-1 mounted on the solder side of the PCB. The recommended mating connector (P3) is AMP P/N 1-48042-0 utilizing AMP pins P/N 350078-4 (strip) or P/N 61173-4 (loose piece). J3 pins are numbered as shown in Figure 16.

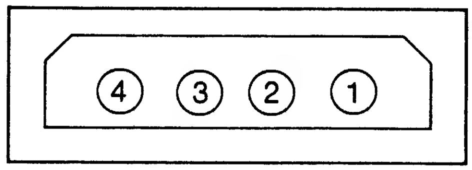


FIGURE 16

J3 CONNECTOR (DRIVE PCB SOLDER SIDE)

The required voltages and current levels on connector J3/P3 are shown below.

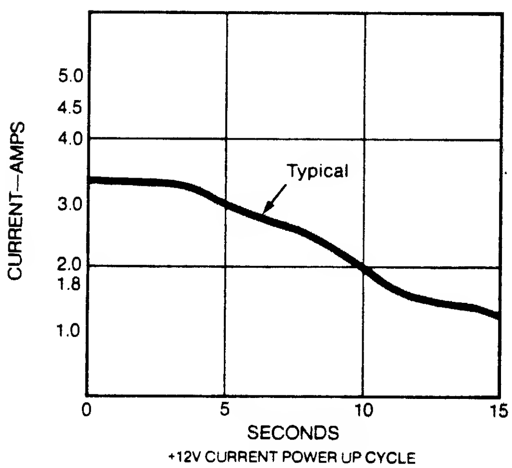


Figure 17

MOTOR START CURRENT REQUIREMENTS

DC POWER REQUIREMENTS

J3 CONNECTOR	CURRENT AMPS	
	MAX	TYP
PIN 4 +5 VOLTS DC ± 5% PIN 3 +5 VOLT RETURN	1.0	0.7
PIN 1 +12 VOLTS DC ± 5%* PIN 2 +12 VOLT RETURN	4.5**	1.37

* ±10% AT POWER ON OR SEEKING, ±5% FOR READING OR WRITING
** OCCURS ONLY DURING POWER UP, PER CURVE BELOW.

Table 5

DC POWER REQUIREMENTS

5.4 J4/P4 Frame Ground Connector

The frame ground connection is a Faston type connection, AMP P/N 61761-2. The recommended mating connector is AMP 62187-1. If wire is used, the hole in J1 will accomodate a wire size of 18AWG maximum.

6.0 PHYSICAL SPECIFICATIONS

This section describes the mechanical and mounting recommendations for the XT-1000.

6.1 Mounting Orientation

The XT-1000 may be mounted in any orientation. In any final mounting configuration, insure that the operation of the three shock mounts which isolate the base casting from the frame is not restricted.

6.2 Mounting Holes

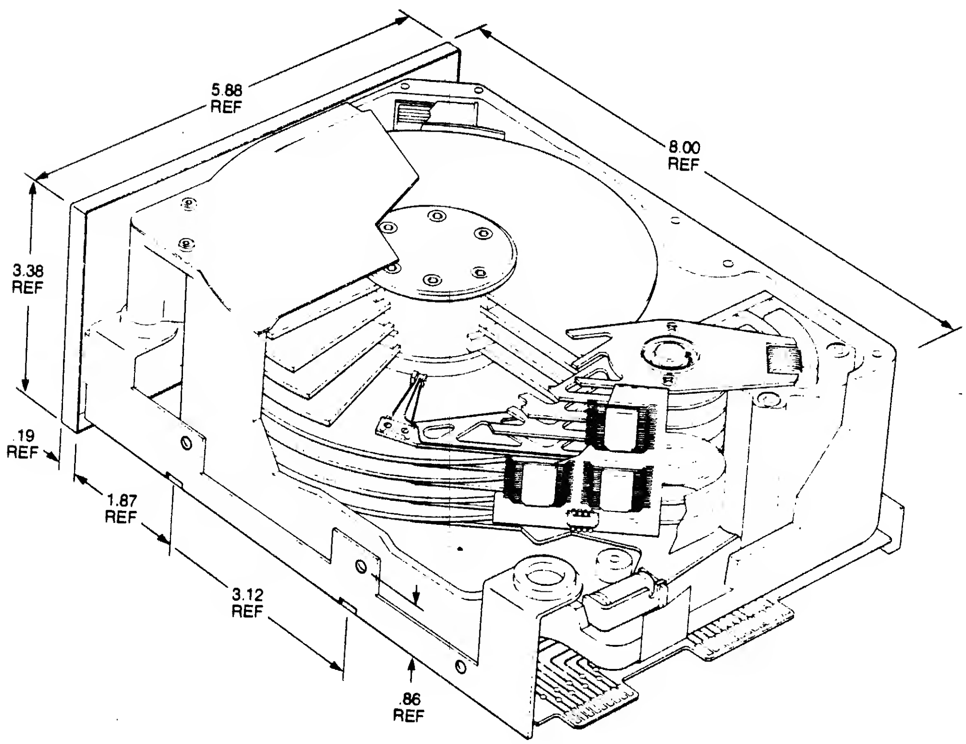
Eight mounting holes, four on the bottom and two on each side are provided for mounting the drive into an enclosure. The size and location of these holes, shown in figure 18, are identical to industry standard minifloppy drives.

6.3 Physical Dimensions

Overall height, width, and depth along with other key dimensions are shown in Figures 18 and 19. As in the case of the mounting holes. the dimensions are identical to the industry standard minifloppy drives, thus allowing a direct physical replacement.

6.4 Shipping Requirements

At powerdown, the heads are automatically positioned over the non-data, dedicated landing zone on each disk surface. The automatic shipping lock solenoid is also engaged at this time.

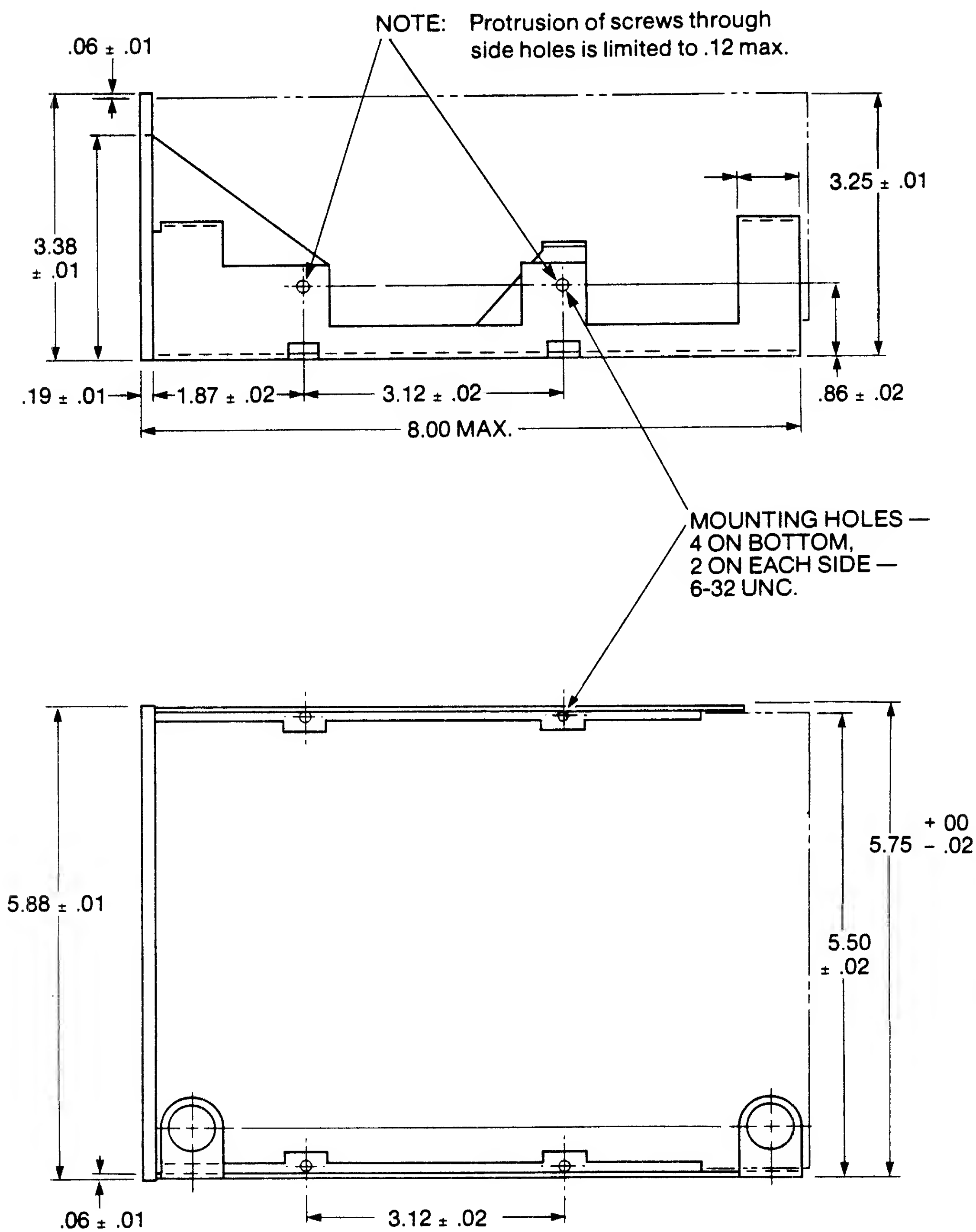


XT-1000 MECHANICAL OUTLINE

and

MOUNTING HOLE LOCATION

Figure 18



XT-1000 MECHANICAL OUTLINE
BOTTOM AND SIDE VIEWS

Figure 19

7.0 MEDIA DEFECTS AND ERRORS

Any defects on the media surface will be identified on a defect map provided with each drive. This defect map will indicate the head number, track number, and number of bytes from index for each defect.

The maximum allowable number of defects per surface is six (6) with track 0 certified to be defect-free on each surface. Each defect shall be no longer than 11 bits maximum.

(A defect is defined as an area during which the signal amplitude falls below 55% of track average amplitude or pulses which are greater than 140% of track average amplitude.)

8.0 XT-1000 Drive Address Selection Jumper

In multiple drive configurations, it is necessary to configure each drive (maximum of 4 per host controller) with a unique address. This is accomplished by locating the jumper plug over the correct pins as indicated in figure 22 and Table bb. The standard drive is shipped as Drive 1.

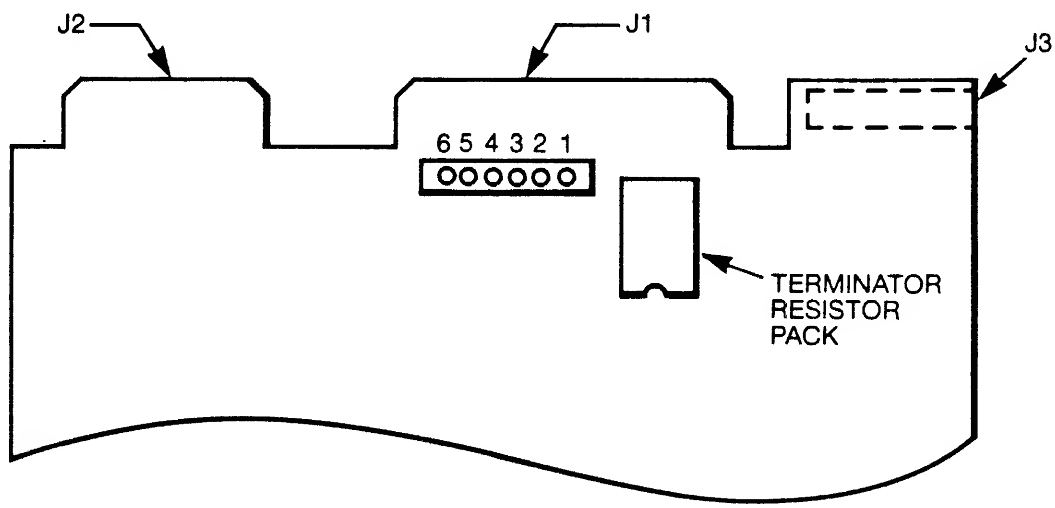


Figure 20

DRIVE SELECT JUMPER OPTIONS

Function	Jumper Block Pin Numbers
Drive Select 0	1, 2
Drive Select 1	2, 3
Drive Select 2	4, 5
Drive Select 3	5, 6

Table 6

DRIVE SELECT JUMPER OPTIONS

9.0 APPENDIX

9.1 Track Format

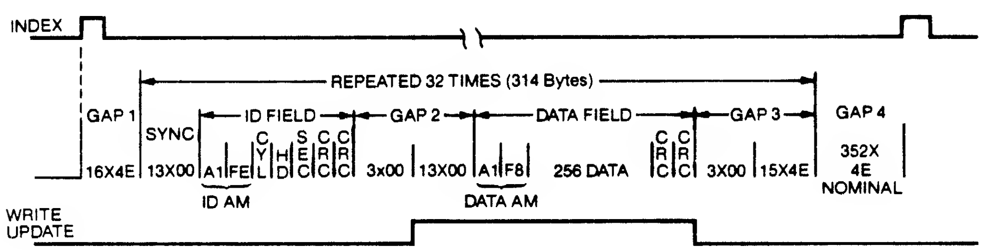
The purpose of a format is to organize a data track into smaller sequentially numbered blocks of data called sectors.

9.2 ST506/412 Format

The format shown below in Figure 21, the ST506/412 format, is a format commonly used on lower performance disk drives. It's efficiency of 81% (unformatted capacity/formatted capacity) is typical; however other efficiencies can be obtained by varying the number of sectors per track.

The ST506/412 format is a soft sectored type of sector which means that the beginning of each sector is defined by a prewritten identification (ID) field which contains the physical sector address plus cylinder and head information. The ID field is then followed by a used supplied data field.

The ST506/412 format is a slightly modified version of the IBM System 34 double density format which is commonly used on floppy disk drives. The encoding method is Modified Frequency Modulation (MFM).



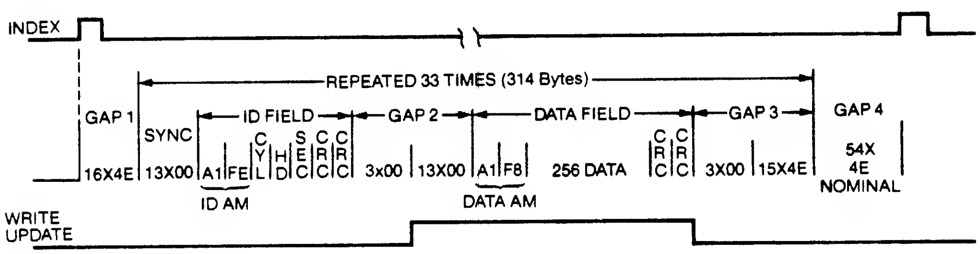
NOTES:
1. Nominal Track Capacity = 10416 Bytes unformatted
2. Total Data Bytes/Track = 256 × 32 = 8,192
3. Sector interleave factor is 4. Sequential ID Fields are sector numbered 0, 8, 16, 24, 1, 9, 17, 25, 2, 10, 18, 26,...etc.
4. Data Fields contain the bit pattern 0000 as shipped
5. CRC Fire Code = $x^{16}+x^{12}+x^{5}+1$
6. Bit 7 of Head Byte ID Field equals 1 in a defective sector (Cylinder Ø is error free)
7. Bit 6 of Head Byte is cylinder 2^8 bit
8. Bit 5 of Head Byte is cylinder 2^9 bit
9. Bit 4 of Head Byte is reserved for cylinder 2^{10} bit
10. Bit 0-3 of Head Byte are Head 2^0 to Head 2^3 respectively

Figure 21

ST506/412 FORMAT

9.3 XT-1000 Alternate Track Format

Figure 22 shows an alternate format available on the XT-1000. This format is similar to the ST506/412 format with the exception that it contains 33 sectors per track instead of 32. The additional sector is available because the XT-1000 maintains a tighter tolerance on rotational speed than comparable drives, hence a smaller Gap 4 is required. A total of 8448 bytes are available, each having 256 bytes of user data.



NOTES:
1. Nominal Track Capacity = 10416 Bytes unformated
2. Total Data Bytes/Track = 256 × 33 = 8,448
3. Data Fields contain the bit pattern 0000 as shipped
4. CRC Fire Code = $x^{16}+x^{12}+x^{5}+1$
5. Bit 7 of Head Byte ID Field equals 1 in a defective sector (Cylinder Ø is error free)
6. Bit 6 of Head Byte is cylinder 2^{8} bit
7. Bit 5 of Head Byte is cylinder 2^{9} bit
8. Bit 4 of Head Byte is reserved for cylinder 2^{10} bit
9. Bit 0-3 of Head Byte are Head 2^{0} to Head 2^{3} respectively

Figure 22

XT-1000 ALTERNATE TRACK FORMAT

9.4 Address Marks

The beginnings of both the ID field and the data field are flagged by unique characters called address marks. An address mark is two bytes in length. The first byte is an "A1" data pattern. This is followed by either an "FE" pattern for an ID address mark, or an "F8" pattern for the data address mark.

The "A1" pattern is made unique by violating the encoding rules of MFM by omitting one clock bit. This makes the address mark pattern unique to any other serial bit combination that couldf occur on the track. See figure depiction of the "A1" byte. Each ID and data field is followed by a 16 bit cyclic redundancy check (CRC) character used for a particular data pattern; an error correction code (ECC) may be used instead.

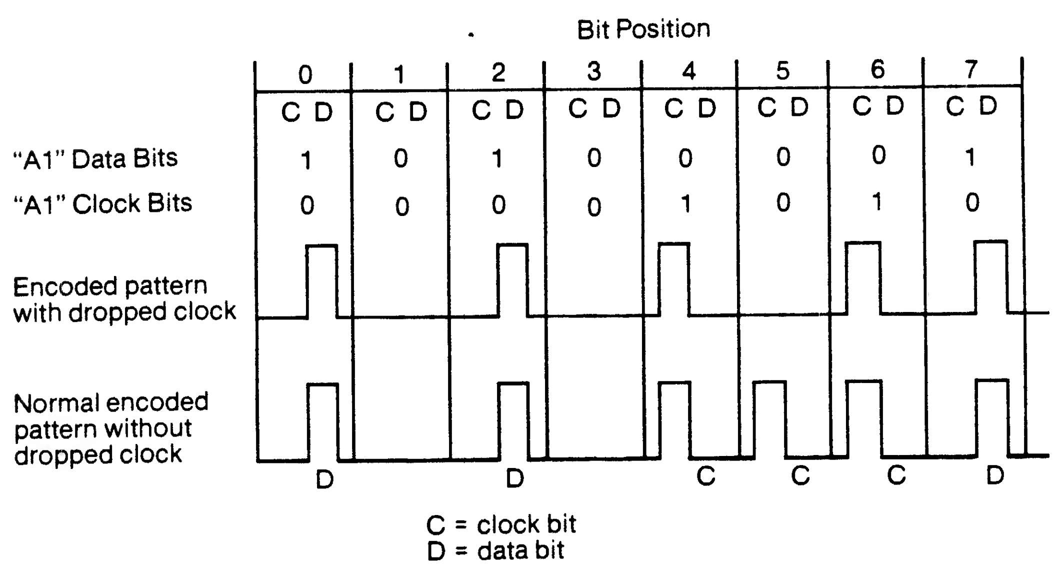


Figure 23

"A1" ADDRESS MARK BYTE

9.5 Gap Length Calculations

Gaps surrounding the ID and data fields establish physical and timing relationships between these fields.

9.5.1 Gap 1

Gap 1 is to provide for variations in Index detection. As shipped, gap 1 is 16 bytes long, but must be at least 12 bytes. Gap 1 is immediately followed by a sync field preceeding the first ID field.

9.5.2 Gap 2

Gap 2 follows the CRC or ECC bytes of the ID field, and continues to the data field address mark. It provides a known area for the data field write splice to occur. The latter portion of this gap serves as the sync up area for the data field AM. Gap 2 is normally 16 bytes; however, its minimum length is determined by the "lock up" performance of the phase-lock-loop in the data separator, which is part of the host control unit.

9.5.3 Gap 3

Gap 3 following each data field allows for the spindle speed variations. This allows for the situation where a track has been formatted while the disk is running faster than nominal, then write updated with the disk running slower than normal. Without this gap, or if it is too small, the sync bytes or ID field of the next field could be overwritten. As shipped, the gap allows for a ± 0.5% rotational speed variation. Minimum gap is 8 bytes for a 256 byte record size.

9.5.4 Gap 4

Gap 4 is a speed tolerance buffer for the entire track, which is applicable in full track formatting operations to avoid overflow into the index area. The format operation which writes ID fields begins with the first encountered index and continues to the next index. The actual bytes in gap 4 depends on the exact rotational speed during the format operation.

9.6 Sector Interleaving

The ST506/412 format normally uses an interleave factor of 4: that is, sequentially sectored ID numbers are 0, 8, 16, 24, 1, 9, 17, 25, 2, 10, 18, 26, etc. This allows sufficient system turnaround time to process multiple sectors during a single revolution, thus enhancing through-put of typical file read/write operations. Other interleave factors can be used.

9.7 Unpacking and Inspection

To be supplied.

9.8 Installation

To be supplied.