MK-134FA
3.5-INCH FIXED DISK DRIVE
OEM MANUAL

TOSHIBA AMERICA, INC.
DISK PRODUCTS DIVISION

Contents of this manual are subject to change without prior notice.

REVISION RECORD		
Edition	**Date Published**	**Revised Contents**
01	September 1987	Initial Release
02	April 1988	iii, 1-1, 2-1, 2-3, 2-4, 3-1, 3-2, 3-3

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The MK-134FA is designed to comply with UL, CSA and TUV standards.
Contact Toshiba America, Inc. to obtain additional Information.

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SECTION 1

INTRODUCTION

1.1   PURPOSE OF MANUAL

The purpose of this manual is to describe the MK-134FA 3.5-inch fixed disk drive to the level of detail required for product integration.

System designers planning to develop a custom controller and others who require additional product information should refer to the MK-134FA Product Specification for additional product and interfacing details.

1.2   RELATED DOCUMENTS

Detailed product and interfacing information is given in the MK-134FA Product Specification.

Table 1 lists OEM Manuals that are available for other Toshiba disk products. The MK-134FA is included to indicate how its storage capacity compares to other disk products available from Toshiba.

Toshiba Product	Media Size	Storage Technology	Unformatted Capacity (MB)	Type Of Interface	Document Number
MK-134FA	3.5	Winchester	53	ST506/412	DW32-02-012
MK-50FB	5.25	Winchester	43 to 86	ST506/412	DW54-01-006
MK-150FA	5.25	Winchester	86 to 173	ESDI	DW54-01-007
MK-250FA	5.25	Winchester	382.5	ESDI	DW54-01-014
MK-180FB	8.0	Winchester	83 to 166	SMD	DW80-01-008
MK-280FC	8.0	Winchester	340 to 510	HSMD	DW80-01-009
MK-388FA	8.0	Winchester	720	HSMD	DW80-01-013

Table 1 — Related Documents

Contact your nearest Toshiba Disk Products Division Sales Representative to order a manual or obtain more detailed technical information.

MK-134FA OEM Manual

1.3   GENERAL DESCRIPTION

The MK-134FA is a 3.5-inch Winchester disk drive designed primarily to be incorporated into high perform-ance desk-top and lap-top computers.

An industry standard ST506/412 interface provides compatibility with other 3.5-inch and 5.25-inch Winches-ter storage products and commercially available controllers. The MK-134FA complies with the standard 3.5-inch mini floppy size, mounting and power requirements.

When used with conventional ST506/412 controllers, the MK-134FA offers a capacity of 53 megabytes (unformatted), or 44 megabytes (typical, formatted).

The positioning system utilizes a rotary voice coil actuator to provide a 25 millisecond average seek time and a 50 millisecond maximum seek time.

To facilitate operation in portable applications, extensive use of VLSI reduces average power consumption to only 10 Watts.

Careful choice of cylinder and head configuration allows for direct Operating System compatibility with existing PC's.

The Head Disk Assembly (HDA) is enclosed in a die cast aluminum base plate and shroud and incorporates numerous safety features to maximize reliability:

> The base plate and shroud assembly provides mechnical mounting and EMI (Electro-magnetic Interference) shielding for the heads, disks and actuator.

> The sealed assembly incorporates an air recirculatory system and a 0.3 micron lifetime filter to ensure a contamination-free environment and even thermal distribution.

> When power is removed, a fail-safe system automatically returns the heads to a dedicated landing zone and a solenoid automatically locks the carriage in this location. This prevents head and media damage during transit.

Careful planning in regard to the location of components on the circuit card, especially those with electrical noise potential, contributes to very low levels of read channel noise and enhances data recovery.

SECTION 2

SPECIFICATIONS

2.1 STORAGE CAPABILITY

STORAGE CAPACITY	MK-134FA
Unformatted Capacity	53.4 MB
Number of Disks	4
Number of Data Read/Write Heads	7

Table 2 — Storage Capability

2.2 FUNCTIONAL SPECIFICATIONS

Number of Cylinders	733
Tracks per Inch	930 TPI
Bits per Inch	9,383
Flux Changes per Inch	9,383
MFM Data Transfer Rate	5.0 Megabits per Second

Head Recovery Time:
    Head Change
    Write to Read
	
	13 Microseconds
	8 Microseconds

Seek Time:*
(including step pulses and settling)
    Track-to-Track
    Average
    Full Stroke
	
	7 Milliseconds
	25 Milliseconds
	50 Milliseconds

Start Time Stop Time	20 Seconds Typical - 30 Seconds Maximum 20 Seconds Typical - 30 Seconds Maximum

Rotational Speed:
    Average Latency Time
    Maximum Latency Time
	$3,600$ RPM $\pm 1\%$
	8.33 Milliseconds
	17.10 Milliseconds

Write Pre-Compensation	Cylinder 512 onwards (12ns)

* As shown, average and maximum seek times will vary if very long step pulse periods are used.

Table 3 — Functional Specifications

STEP PULSE PERIOD IN MICROSECONDS	SEEK TIME IN MILLISECONDS	
	AVERAGE	MAXIMUM
40	26	55
50	28	62
75	33	80
100	38	100
150	51	140
200	63	182

2.3   ENVIRONMENTAL SPECIFICATIONS

Operating Environment:	
Ambient Temperature	41° to 122° F (5° to 50° C)
Temperature Gradient	27° F per Hour (15° C)
Relative Humidity	8 to 80% No Condensation Maximum Wet Bulb 84° F (29° C)
Altitude	-1000 to 10,000 Feet (-300 to 3,000 Meters)
Vibration (all axis)	0.5 G Peak at 5-200 Hz
Shock (recoverable errors allowed)	10.0 G Peak*
Cooling:	
Convection Cooling	Any enclosure (see Section 3) must allow the drive to operate within specified environmental limits.
Non-Operating (Unpacked) Environment:	
Ambient Temperature	14° to 122° F (-10° to 50° C)
Temperature Gradient	27° F per Hour (15° C)
Relative Humidity	20 to 80% No Condensation
Altitude	-1,000 to 10,000 Feet (-300 to 3,000 Meters)
Vibration	2.0 G/0.04 Inch (1.0 mm) at 5-200 Hz
Shock	40.0 G Peak*
Storage (Packed) Environment:	
Ambient Temperature	-40° to 140°F (-40° to 60° C)
Temperature Gradient	27° F per Hour (15° C)
Relative Humidity	5 to 90% No Condensation
Altitude	-1,300 to 49,000 Feet (-400 to 15,000 Meters)
Vibration	6G (Maximum) at 5-400 Hz
Shock (maximum free drop)	30 Inches (0.75 Meter)

Table 4 — Environmental Specifications

*When fixed to a rigid structure (excluding resonances) and when an 11 millisecond half-sine-wave impulse is applied to the rigid structure.
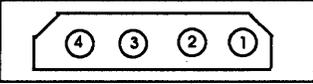
2.4 RELIABILITY CHARACTERISTICS

CHARACTERISTIC	MK-134FA

Media Defects:
    Maximum Defects per Surface
    Maximum Defects per Drive
	15
	50

At the time of factory shipment, Track 00, Heads 0 and 1 have no media defects and no defect is greater than 11 bits in length. A defect map, identifying the location of known media defects by cylinder, head and number of bytes from Index is attached to the drive.	

Error Rates:
        Recoverable
        Unrecoverable
        Seek
 	
    Preventive Maintenance
 	
    Mean Time Between Failures (MTBF)
    (Note 1)
 	
    Mean Time To Repair (MTTR)
 	
    Service Life
	1 in 10^{10} Bits
	1 in 10^{12} Bits
	1 in 10^6 Seeks
	
	Not Required
	
	30,000 Hours
	
	Less than 0.5 hour
	
	5 Years

Table 5 — Reliability Characteristics

Note 1:   A failure is defined as the drive's inability to perform to specification when operated within the defined limits. Exclusions are shipping and handling damage and operator, user, service, environmental or system induced faults.

2.5 POWER REQUIREMENTS

+5 VDC ± 5%:
    Current   0.9 Amperes Maximum

    Allowable Ripple/Noise   100 Millivolts Peak-to-Peak

+12 VDC ±5%:
    Power ON Current   2.3 Amperes Maximum

    Seek Operation Current   2.7 Amperes Maximum

    On-Track Current   0.6 Amperes

    Allowable Ripple/Noise   100 Millivolts (or less) Peak-to-Peak

DC Power Connector: AMP 480424 with pin (strip) 3500784 or pin (loose) 61173-4, or equivalent.

Power Plug Pin Assignment:

    ④ ③ ② ①

(as viewed from top of drive)

Pin Number	Assignment
1	+12 VDC
2	+12 VDC Return
3	+ 5 VDC Return
4	+ 5 VDC

Table 6 — Power Requirements

2.6 PHYSICAL DIMENSIONS, WEIGHT AND MOUNTING HOLES

Refer to the following diagram. Nominal dimensions and weight of the MK-134FA are:

Height:	1.63 ± 0.02 Inches (41.3 ± 0.5 Millimeter)
Width:	4.00 ± 0.02 Inches (101.6 ± 0.5 Millimeter)
Depth:	5.75 ± 0.02 Inches (146.0 ± 0.5 Millimeter)
Weight:	2.0 Pounds (0.9 Kilograms)

Mounting holes are:
6 x 32UNC (USA models)
M3 X 0.5 (other models)
Four on the bottom and
two on each side
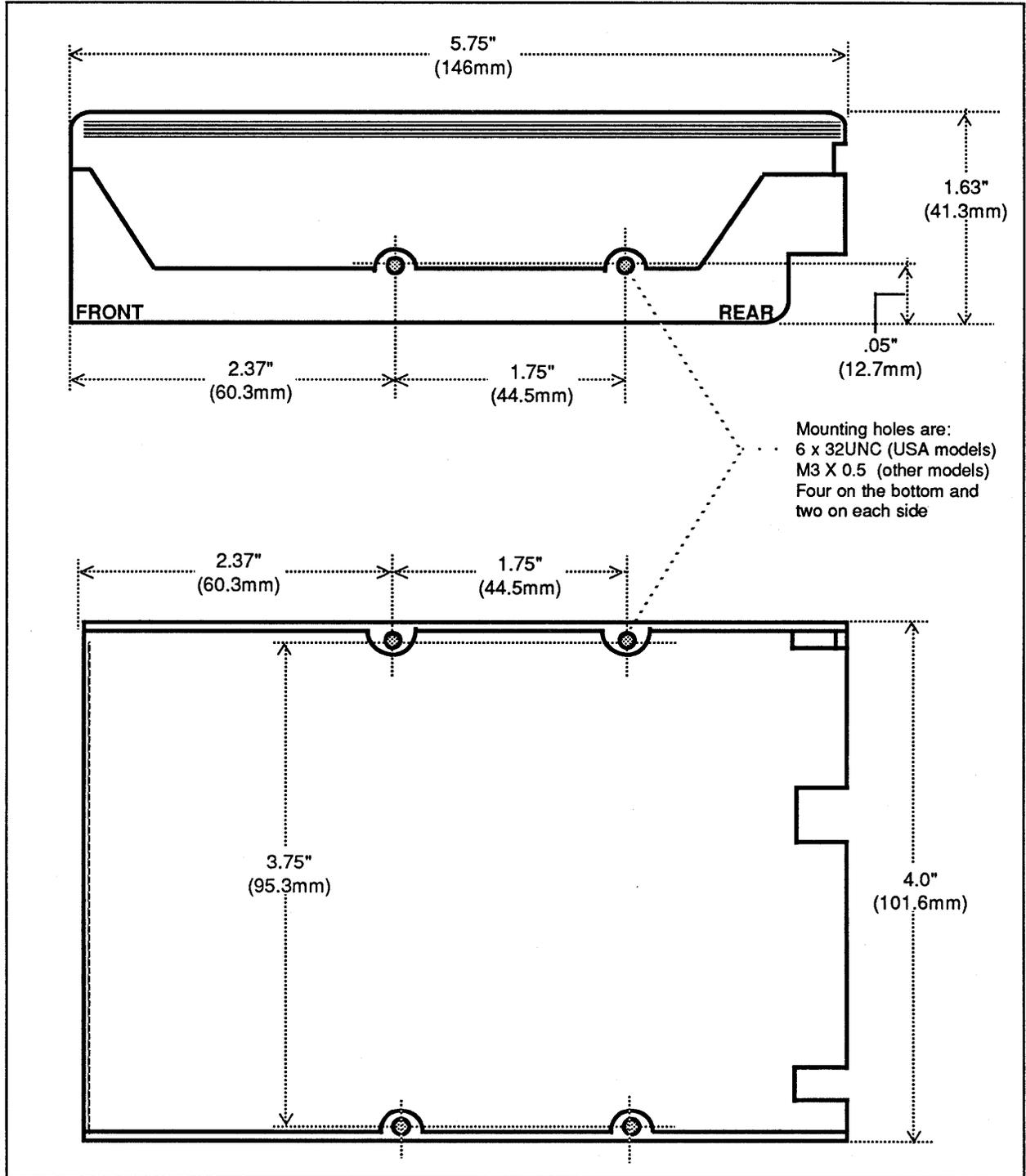
Figure 1 — MK-134FA Dimensions and Mounting Holes

SECTION 3

INSTALLATION

3.1   MOUNTING ORIENTATION

Location of the mounting holes is shown in Figure 1. Recommended mounting orientations are:

| Vertically | Horizontally | Vertically |
| Left side down | Circuit card down | Right side down |
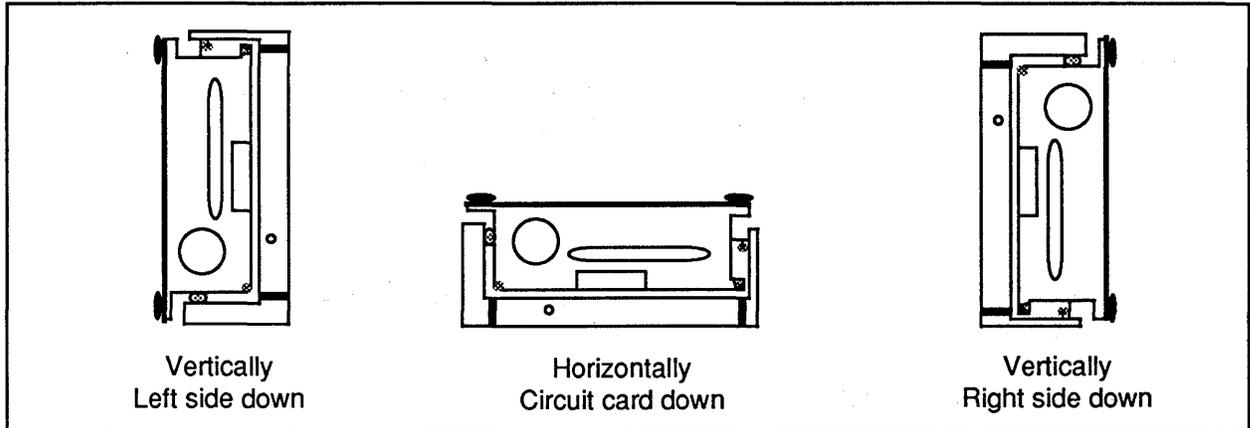
Figure 2 — Mounting Orientation

3.2   COOLING AND DISK DRIVE ENCLOSURE

Convection cooling is used. It is recommended that cabinetry design allow for adequate air flow. The disk enclosure must be designed to maintain an even temperature within the drive's environmental limits and throughout the drive's various components. Minimum clearance requirements for a disk enclosure are shown in Figure 3.

Figure 3 — Clearance Requirements

3-1   *MK-134FA OEM Manual*

3.3   INDICATORS

The MK-134FA drive has a Ready Indicator and two Unit Selected Indicators.

Ready Indicator: This indicator is mounted on the circuit board. It is illuminated on completion of the head load operation and remains illuminated until the start of a head unload.

Unit Selected Indicators: There are two indicators, one is mounted on the circuit board and the other is on the front panel. These indicators are illuminated when the Unit Selected signal is set true.

3.4   JUMPER FUNCTIONS

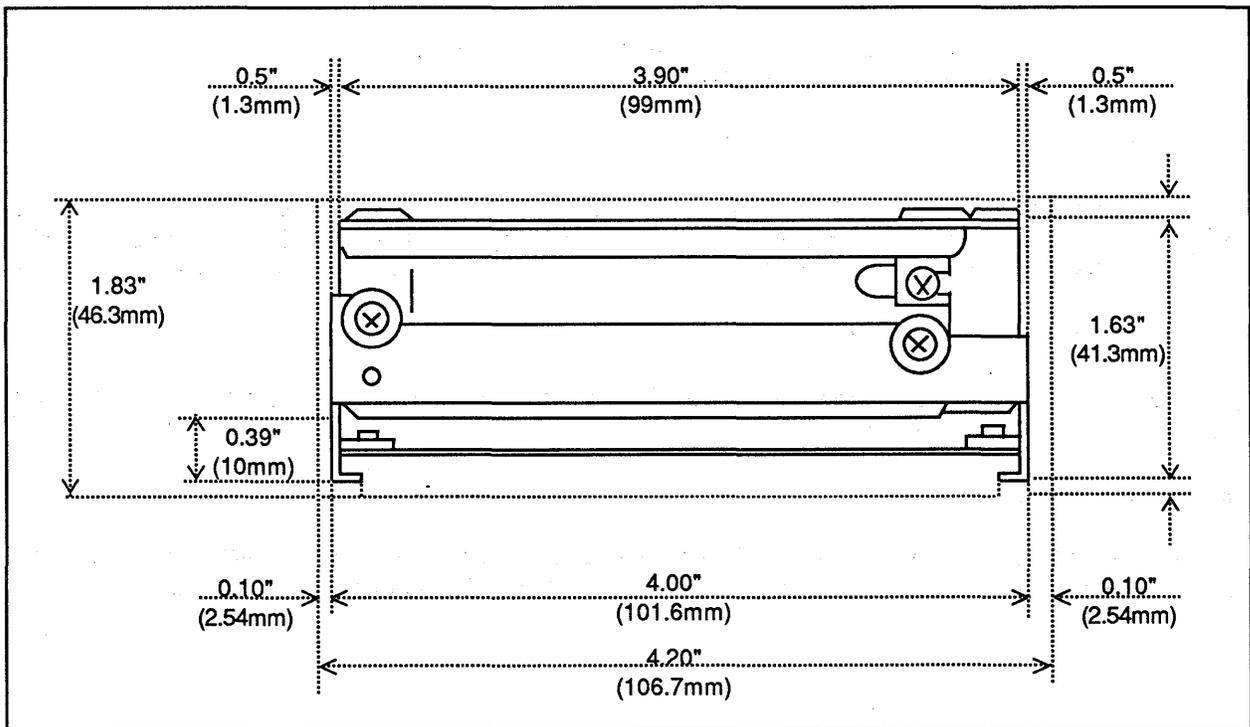Placement of jumpers in PJ4, a 32-pin connector on the circuit board, determines the drive's write protect status, interface mode, address, and other functions (refer to Table 7).

Jumpers must be set before applying power to the drive.

3.4.1   Write Protect

Write protect is activated and all writing is inhibited when a jumper is installed between pins 1 and 2. When this jumper is OUT (as shipped) Write Protect is deactivated and writing on the disk surface is allowed.

3.4.2   Radial/Daisy-Chain Mode

The drive is always selected and Radial mode is set when a jumper is installed between pins 3 and 4. When this jumper is OUT (as shipped) the drive is in Daisy-Chain Mode.

In Daisy-Chain mode a jumper is installed in Drive Select 1, 2, 3 or 4 to allow the host system to select the desired drive by activating the corresponding interface signal line.

3.4.3   Terminator

The pins defined "Terminator" may also be used as test points. When a jumper is installed in any of these positions a terminating resistance is connected to the corresponding interface signal line. Jumpers should be installed in all Terminating positions for a single drive system, or on the last drive in a multiple drive system.

3.4.4   Switch 0 through Switch 3

Jumpers labeled Switch 0 through Switch 3 (if present) are for factory use only. These jumper positions should not be altered outside of the factory.

3.4.5   Write Pre-compensation

The Drive may be operated without Write Pre-compensation, but for optimum performance, Write Pre-Compensation should be applied at Cylinder 512 and above .12ns of compensation is required.

3.4.6 Jumper Selections

FACTORY SELECTION	PIN NUMBERS		SIGNAL NAME	DEFINITION
OUT	1	2	WRPRTCT	Write Protect
OUT	3	4	DRVSEL	Radial Mode
OUT	5	6	DRVSEL4	Drive Select 4
OUT	7	8	DRVSEL3	Drive Select 3
OUT	9	10	DRVSEL2	Drive Select 2
IN	11	12	DRVSEL1	Drive Select 1
IN	13	14	WRTGT	Terminator
IN	15	16	HDSEL0	Terminator
IN	17	18	HDSEL1	Terminator
IN	19	20	HDSEL2	Terminator
IN	21	22	STEP	Terminator
IN	23	24	DIRCT	Terminator
OUT	25	26	SWITCH3	Factory Use Only
OUT	27	28	SWITCH2	Factory Use Only
OUT	29	30	SWITCH1	Factory Use Only
OUT	31	32	SWITCH0	Factory Use Only

Table 7 — Connector PJ4 Jumper Selections

SECTION 4

INTERFACE

4.1 CONTROL CABLE

The daisy-chained Control Cable is a flat cable consisting of 17 twisted pairs (34-conductors).

> The 34-position connector recommended for the Control Cable is AMP part number 88373-3, or equivalent.

> Maximum cable length is 20 feet (6 meters).

Control Cable signals are TTL compatible.

Control Cable signals, with the exception of DRIVE SELECT, are inhibited until the drive is selected.

See Table 8 for Control Cable pin assignments.

In a daisy -chain configuration, the last drive in the chain must be terminated (see Section 3.4.3).

4.2 DATA CABLE

The star-configured Data Cable is a flat cable consisting of 10 twisted pairs (20-conductors).

> The 20-position connector recommended for the Data Cable is AMP part number 88373-6, or equivalent.

> Maximum cable length is 20 feet (6 meters).

Data Cable signals are differential signal pairs, with the exception of DRIVE SELECTED which is TTL compatible.

Data Cable signals are enabled at all times, regardless of the drive's selected status.

See Table 9 for Data Cable pin assignments.

4.3   CONTROL CABLE PIN ASSIGNMENTS

SIGNAL NAME	PIN NUMBERS		MK-134FA
	SIGNAL	GROUND	
-HEAD SELECT 2^3	2	1	Input
-HEAD SELECT 2^2	4	3	Input
-WRITE GATE	6	5	Input
-SEEK COMPLETE	8	7	Output
-TRACK 00	10	9	Output
-WRITE FAULT	12	11	Output
-HEAD SELECT 2^0	14	13	Input
-RESERVED	16	15	N/A
-HEAD SELECT 2^1	18	17	Input
-INDEX	20	19	Output
-READY	22	21	Output
-STEP	24	23	Input
-DRIVE SELECT 1	26	25	Input
-DRIVE SELECT 2	28	27	Input
-DRIVE SELECT 3	30	29	Input
-DRIVE SELECT 4	32	33	Input
-DIRECTION IN	34	N/A	Input

Table 8 — Control Cable Pin Assignments

4.4 DATA CABLE PIN ASSIGNMENTS

SIGNAL NAME	PIN NUMBERS		MK-134FA
	SIGNAL	GROUND	
-DRIVE SELECTED	1	2	Output
RESERVED	3	4	N/A
RESERVED	5	6	N/A
RESERVED	7	8	N/A
RESERVED	9	10	N/A
GROUND	N/A	11	N/A
GROUND	N/A	12	N/A
+WRITE DATA	13	N/A	Input
-WRITE DATA	14	N/A	Input
GROUND	N/A	15	N/A
GROUND	N/A	16	N/A
+READ DATA	17	N/A	Output
-READ DATA	18	N/A	Output
GROUND	N/A	19	N/A
GROUND	N/A	20	N/A

Table 9 — Data Cable Pin Assignments

SECTION 5

DATA FORMATS

5.1 SOFT SECTOR FORMATS

Figure 4 shows a typical Soft Sector Format. Each sector has the same number of bytes (256 data bytes and 59 overhead bytes per sector). Any remaining bytes are recorded in Gap 4, between the last sector and the Index Pulse.
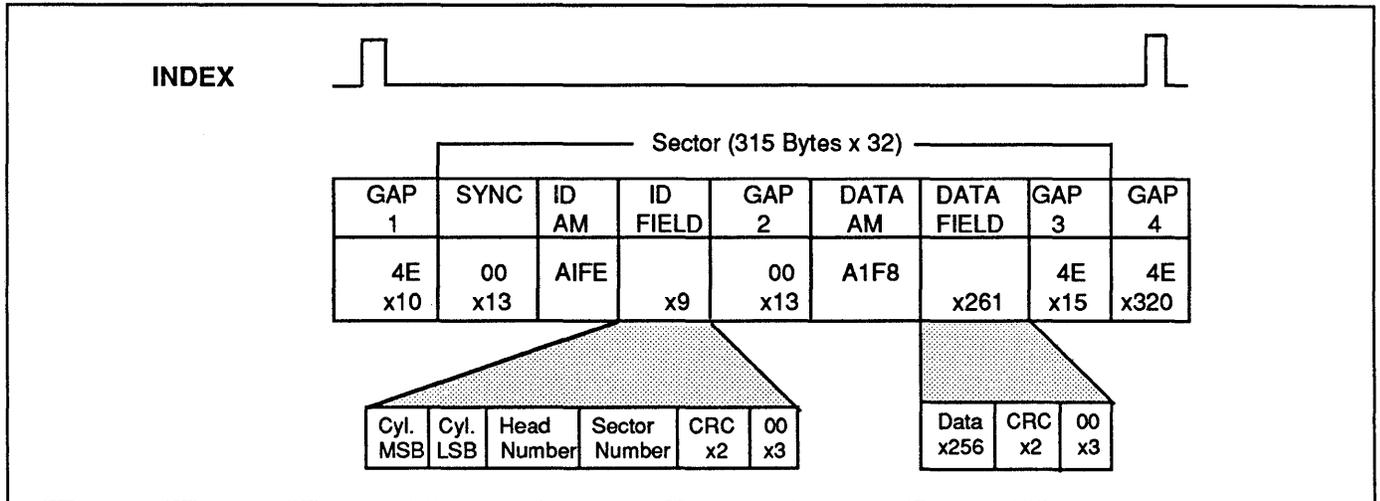

Figure 4 — Soft Sector Format

5.2 DEFINITION OF FIELDS

Gap 1:   Minimum of 10 bytes allows variance in the detection of the Index Pulse.

Sync: 13 bytes of zeros to allow read channel synchronization prior to detection of the ID Field Address Mark.

ID Field: Identified by a unique Address Mark; contains cylinder, head and sector addresses, two bytes of CRC and three bytes of zeros.

Gap 2:   Serves as a tolerance when the Data Field is recorded; contains 13 bytes of zeros (Data Field Sync) to allow read channel synchronization prior to detection of the Data Field Address Mark.

Data Field: Identification by a unique Address Mark; contains 256 data bytes, two bytes of CRC and three bytes of zeros (CRC and zeros could be ECC).

Gap 3:   Minimum of 8 bytes required; allows sector length variances caused by rotation speed. In the above example, 15 bytes are shown.

Gap 4:   Allows variance in the track length due to rotational speed. In the above example, 320 bytes are shown.

SECTION 6

MAINTENANCE CONSIDERATIONS

6.1   EQUIPMENT MAINTENANCE

Refer to Toshiba America, Inc., Disk Products Division (herein after referred to as "Toshiba America") Maintenance Policies and Procedures for a complete description of in-warranty procedures, terms and conditions.

6.1.1   In-Warranty Maintenance

Toshiba America will provide parts and labor at no charge to the customer for all in-warranty repair actions. The drive must be returned to Toshiba America's Customer Service point of repair (see paragraph 6.1.3 for instructions) at the customer's expense, inclusive of shipping and insurance costs.

6.1.2   Out-of-Warranty Maintenance

Toshiba America repairs major assemblies on a fixed cost basis and all other repairable assemblies on an hourly rate plus parts basis. The drive or repairable assembly must be returned to Toshiba America's Customer Service point of repair (see paragraph 6.1.3 for instructions) at the customer's expense, inclusive of shipping and insurance costs.

6.1.3   Equipment Return Instructions

A Return Authorization Number is required and must accompany any equipment returned for repair. Contact a Toshiba America Customer Service Representative for return instructions and a Return Authorization Number. All equipment must be returned to the address listed below.

Toshiba America, Inc.
Disk Products Division
Customer Service Center
9740 Irvine Boulevard
Irvine, CA 92718

(714) 583-3000

MK-134FA HARD DISK DRIVE INSTALLATION NOTES

Congratulations and thank you for purchasing a Toshiba disk drive. Your disk drive is of the highest quality and should be fully compatible with industry standards. When properly installed and configured, your drive is designed to give you years of trouble-free operation.

GENERAL DESCRIPTION

The MK-134FA is a 3.5-inch hard disk drives designed primarily to be incorporated into high performance desk-top and lap-top computers. An industry standard ST506/412 interface provides compatibility with other 3.5-inch and 5.25-inch Winchester storage products and commercially available controllers. The MK-134FA also complies with the standard 3.5-inch mini floppy size, mounting and power requirements.

When used with conventional ST506/412 controllers, the MK-134FA offers a unformatted capacity of 53 megabytes (unformatted) or 44 megabytes (typical, formatted).

The Head Disk Assembly (HDA) is enclosed in a die cast aluminum base plate and shroud and incorporates numerous safety features to maximize reliability:

The base plate and shroud assembly provides mechnical mounting and EMI (Electronic Magnetic Interference) shielding for the heads, disks and actuator.
The sealed assembly incorporates an air recirculatory system and a 0.3 micron lifetime filter to ensure a contamination-free environment and even thermal distribution. When power is removed, a fail-safe system automatically returns the heads to a dedicated landing zone and a solenoid automatically locks the carriage in this location. This prevents head and media damage during transit.

Careful planning in regard to the location of components on the circuit card, especially those with electrical noise potential, contributes to very low levels of read channel noise and enhances data recovery. Extensive use of VLSI minimizes the number of components and optimizes MTBF (Mean Time Between Failures).

COOLING AND DISK DRIVE ENCLOSURE

The MK-134FA can be mounted vertically or horizontally. Convection cooling is used. It is recommended that cabinetry design allow for air flow. The disk enclosure must be designed to maintain an even temperature within the drive's environmental limits and throughout the drive's various components. Minimum clearance requirements for a disk enclosure is shown below.
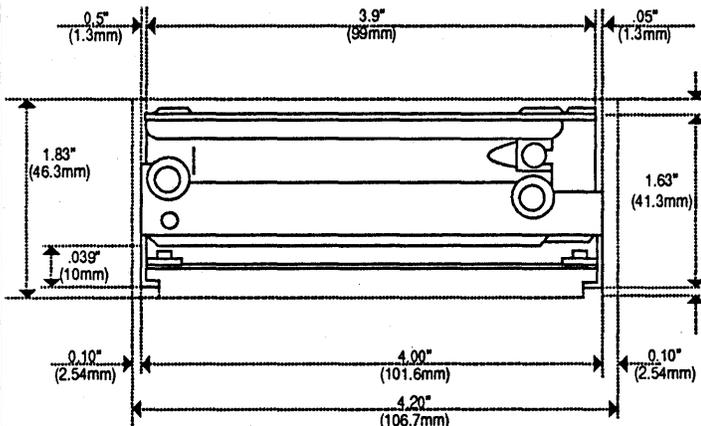
CONTROL CABLE

The daisy-chained Control Cable consists of 17 matched pairs (34-conductors). The 34-position connector recommended for the Control Cable is AMP part number 88373-3, or equivalent. Maximum cable length is 20 feet (6 meters). Control Cable signals are TTL compatible. Control Cable signals, with the exception of the four DRIVE SELECT lines, are ignored by the drive until it is selected. In a daisy-chain configuration, the last drive in the chain must be terminated.

CONTROL CABLE PIN ASSIGNMENTS

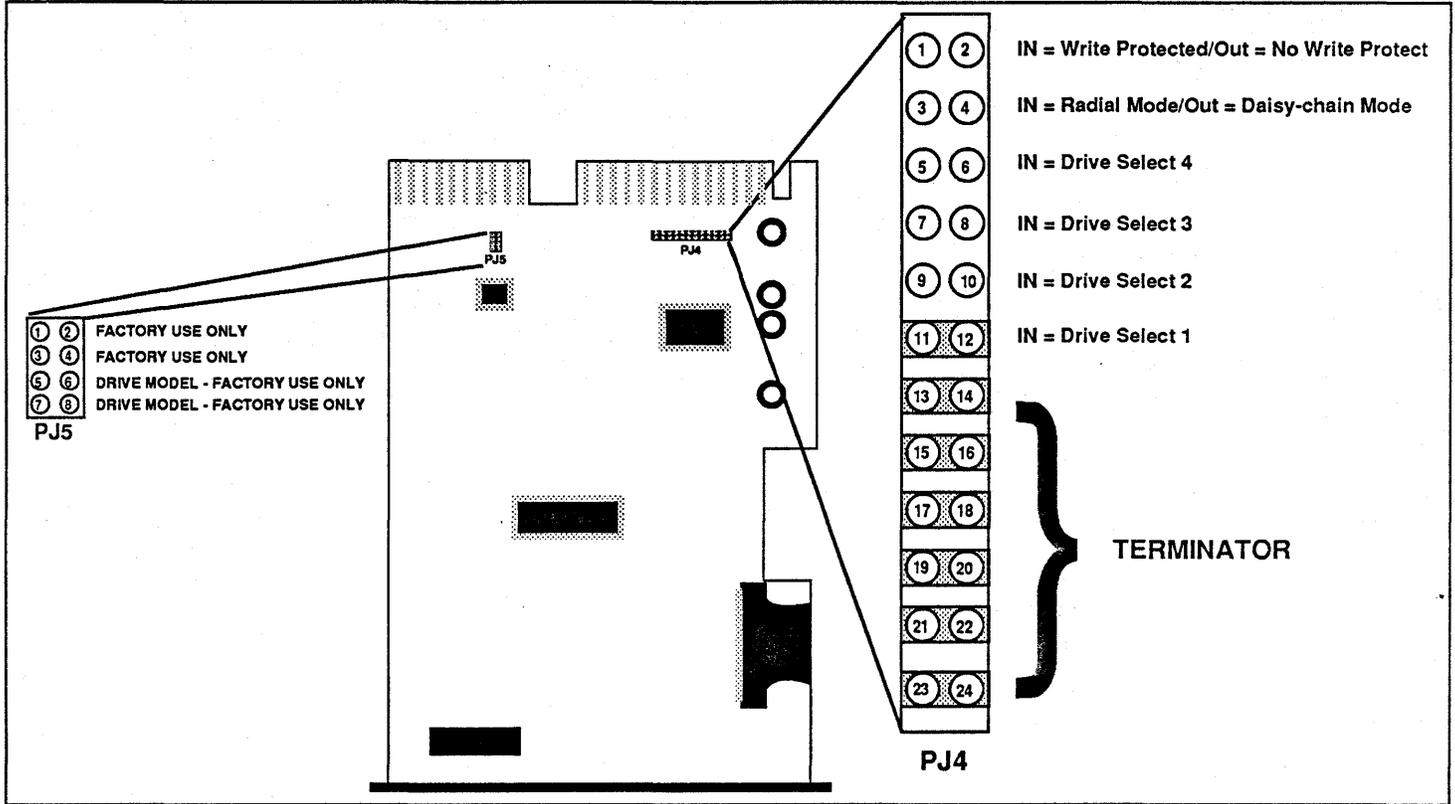| SIGNAL NAME | PIN NUMBERS | | MK-134FA |
	SIGNAL	GROUND	Input means input to drive. Output means output to drive.
HEAD SELECT 2^3	2	1	Input
HEAD SELECT 2^2	4	3	Input
WRITE GATE	6	5	Input
SEEK COMPLETE	8	7	Output
TRACK 00	10	9	Output
WRITE FAULT	12	11	Output
HEAD SELECT 2^0	14	13	Input
RESERVED	16	15	N/A
HEAD SELECT 2^1	18	17	Input
INDEX	20	19	Output
READY	22	21	Output
STEP	24	23	Input
DRIVE SELECT 1	26	25	Input
DRIVE SELECT 2	28	27	Input
DRIVE SELECT 3	30	29	Input
DRIVE SELECT 4	32	33	Input
DIRECTION IN	34	N/A	Input

DATA CABLE

The star-configured Data Cable consists of 10 matched pairs (20-conductors). The 20-position connector recommended for the Data Cable is AMP part number 88373-6, or equivalent. Maximum cable length is 20 feet (6 meters). Data Cable signals are differential signal pairs, with the exception of DRIVE SELECTED which is TTL compatible. Data Cable signals are enabled at all times, regardless of the drive's selected status. Pin assignments for the Data Cable are as follows.

DATA CABLE PIN ASSIGNMENTS

| SIGNAL NAME | PIN NUMBERS | | MK-134FA |
	SIGNAL	GROUND	Input means input to drive. Output means output to drive.
DRIVE SELECTED	1	2	Output
RESERVED	3	4	N/A
RESERVED	5	6	N/A
RESERVED	7	8	N/A
RESERVED	9	10	N/A
GROUND	N/A	11	N/A
GROUND	N/A	12	N/A
+WRITE DATA	13	N/A	Input
-WRITE DATA	14	N/A	Input
GROUND	N/A	15	N/A
GROUND	N/A	16	N/A
+READ DATA	17	N/A	Output
-READ DATA	18	N/A	Output
GROUND	N/A	19	N/A
GROUND	N/A	20	N/A

JUMPER FUNCTIONS

All switches and jumpers must be set **before** applying power to the drive. See the figures below for location of jumpers on the PCB board and what functions they perform.

PJ5	
① ②	FACTORY USE ONLY
③ ④	FACTORY USE ONLY
⑤ ⑥	DRIVE MODEL - FACTORY USE ONLY
⑦ ⑧	DRIVE MODEL - FACTORY USE ONLY

PJ4

- ① ② IN = Write Protected/Out = No Write Protect
- ③ ④ IN = Radial Mode/Out = Daisy-chain Mode
- ⑤ ⑥ IN = Drive Select 4
- ⑦ ⑧ IN = Drive Select 3
- ⑨ ⑩ IN = Drive Select 2
- ⑪ ⑫ IN = Drive Select 1
- ⑬ ⑭
- ⑮ ⑯
- ⑰ ⑱
- ⑲ ⑳
- ㉑ ㉒
- ㉓ ㉔

} TERMINATOR

DRIVE PARAMETERS	MK-134FA
NUMBER OF HEADS	7
NUMBER OF CYLINDERS	733
REDUCED WRITE CURRENT	NOT USED
WRITE PRECOMP CYL	512*
NUMBER OF SECTORS (MFM)	17

* If Cylinder 512 is not available, Cylinder 300 can be used.

Note: On most systems, these parameters are in drive type 14

DRIVE CABLE CONFIGURATION				
BUS CABLE TYPE	DRIVE			
	DRIVE 1	DRIVE 2	DRIVE 3	DRIVE 4
1. Flat (no twist)	DS1	DS2	DS3	DS4(T)
2. Flat (twisted) (PC XT, AT)	DS2	DS2(T)	not used	not used
(T) = Terminator jumpers installed				

TECHNICAL SUPPORT

Should you require any technical support, contact your computer distributor. If your distributor is unable to answer your questions, have them call the Toshiba Disk Products Divisional Office, on your behalf.

Call from in front of the computer. Know as much about your system software and hardware, particularly any non-standard hardware (which may have not been considered by designers). In general, technical support specialists have experience with a particular "wedge" of the computer market, and may not have the background to support your particular application(s). (Many problems are caused by the interaction of two or more products in your compter, not with your computer itself.

TECHNICAL SUPPORT NUMBERS
Cambridge, MA ----- 617/354-6720   Dallas, TX ------ 214/991-5979
San Jose, CA -------- 408/452-8179   Irvine, CA ------- 714/455-0407

3.4.6 Jumper Selections (Phase II Drive)

FACTORY SELECTION	PIN NUMBERS		SIGNAL NAME	DEFINITION
OUT	1	2	WRPRTCT	Write Protect
OUT	3	4	DRVSEL	Radial Mode
OUT	5	6	DRVSEL4	Drive Select 4
OUT	7	8	DRVSEL3	Drive Select 3
OUT	9	10	DRVSEL2	Drive Select 2
IN	11	12	DRVSEL1	Drive Select 1
IN	13	14	WRTGT	Terminator
IN	15	16	HDSEL0	Terminator
IN	17	18	HDSEL1	Terminator
IN	19	20	HDSEL2	Terminator
IN	21	22	STEP	Terminator
IN	23	24	DIRCT	Terminator

Table 7 — Connector PJ4 Jumper Selections

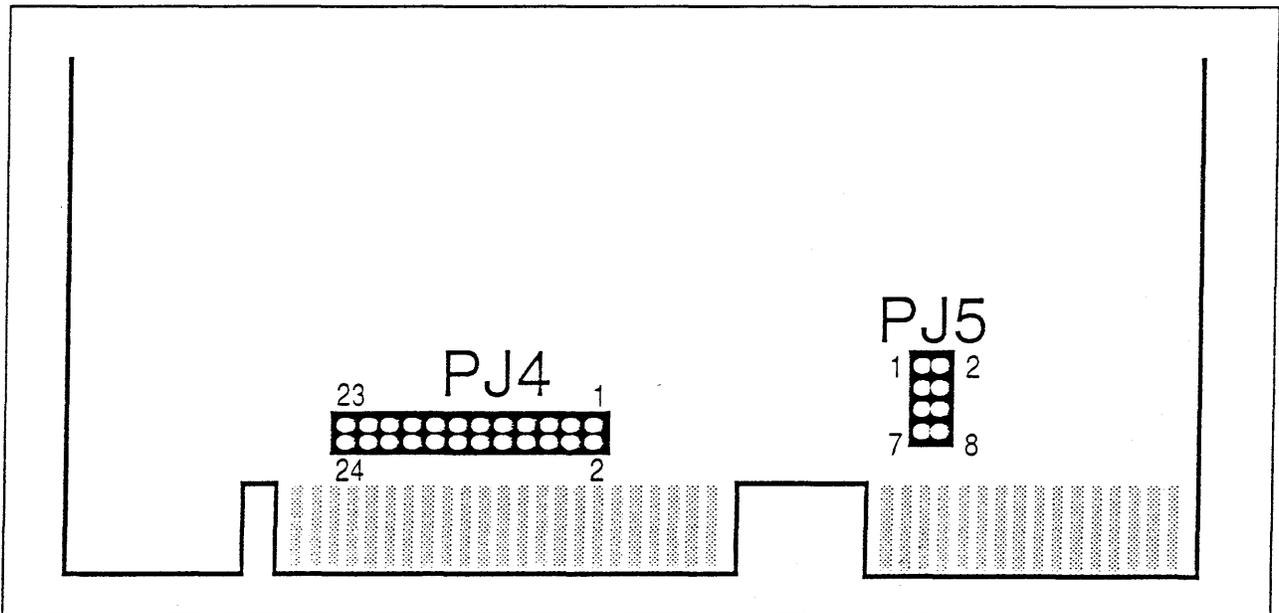| FACTORY SELECTION	PIN NUMBERS		SIGNAL NAME	DEFINITION
OUT	1	2	SWITCH3	Factory Use Only
OUT	3	4	SWITCH2	Factory Use Only
OUT	5	6	SWITCH1	Factory Use Only
IN	7	8	SWITCH0	Factory Use Only

Table 7A — Connector PJ5 Jumper Selections

Figure 3A — MK-134 PCB (Phase 2)