MK-180FB SERIES

8-INCH FIXED DISK DRIVES

OEM MANUAL

TOSHIBA

DISK PRODUCTS

MK-180FB SERIES

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OEM MANUAL

TOSHIBA AMERICA, INC.
DISK PRODUCTS DIVISION

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SECTION 1

INTRODUCTION

1.1 PURPOSE OF MANUAL

The purpose of this manual is to describe the MK-180FB Series 8-inch fixed disk drives 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-180FB Series Product Specification (see below) for additional product and interfacing details.

1.2 RELATED DOCUMENTS

Detailed product and interfacing information is given in the MK-180FB Series Product Specification, document number 71R119242.

OEM Manuals are available for the Toshiba products listed below. The MK-180FB is included to indicate how its storage capacity compares to other products available from Toshiba Disk Products Division.

TOSHIBA PRODUCT	MEDIA SIZE	STORAGE TECHNOLOGY	UNFORMATTED CAPACITY (MB)	TYPE OF INTERFACE	DOCUMENT NUMBER
ND-350	3.5	Flexible	0.5 to 1.0	Standard	DF32-01-001
ND-04D	5.25	Flexible	0.5	Standard	DF54-01-002
ND-06D	5.25	Flexible	1.0	Standard	DF54-01-003
ND-08D	5.25	Flexible	0.5 to 1.6	Standard	DF54-01-004
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-150FB	5.25	Winchester	86 to 173	SCSI	DW54-01-010
MK-180FB	8.0	Winchester	83 to 166	SMD	DW80-01-008
MK-280FC	8.0	Winchester	340 to 510	HSMD	DW80-01-009

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

1.3 GENERAL DESCRIPTION

The MK-180FB Series is a family of high-performance, high-capacity 8-inch fixed disk drives. Three Models comprise the MK-180FB Series: MK-182FB (83 MB), MK-184FB (116 MB) and MK-186FB (166 MB).

An industry standard SMD interface provides compatibility with other storage products and commercially available controllers.

Full implementation of the SMD interface allows sequencing of power to all drives in a daisy-chain configuration. This minimizes power supply requirements in multiple disk drive applications.

The positioning system, with rare earth magnet and rotary voice coil actuator, provides 18 millisecond average seek time and 34 millisecond full-stroke seek time.

Up to 664 megabytes of storage can be rack mounted in the same space occupied by one 14-inch disk drive.

Built-in diagnostic and exercising routines with error code display provide a valuable fault isolation capability.

Solenoids automatically lock the spindle and carriage upon power-down. This prevents head and media damage during transit.

An on-board data encoding technique provides NRZ to 2,7 (RLL) code conversion. This encoding technique reduces flux changes per inch and allows utilization of industry proven head and media technology.

Fully supported Data Strobe Offset and Servo Track Offset enhances data recovery algorithms.

To further reduce read channel noise, DC voltages are electrically filtered before being used on the main circuit card, where the read channel is located.

Careful planning in regard to location of components on the circuit cards also contributes to very low levels of read channel noise and enhances data recovery.

All electrically noisy components, such as spindle motor and voice coil motor drivers, are located on a separate circuit card.

SECTION 2

SPECIFICATIONS

2.1 STORAGE CAPABILITY

STORAGE CAPACITY	MK-182FB	MK-184FB	MK-186FB
Unformatted Storage Capacity (20,160 bytes per track)	83.0 MB	116.1 MB	165.9 MB
Storage Capacity (when formatted at 256 bytes X 64 sectors per track)	66.2 MB	92.7 MB	132.4 MB
Number of Disks	3	4	6
Number of Data Read/Write Heads (each Model also has one Servo Head)	5	7	10

2.2 FUNCTIONAL SPECIFICATIONS

SPECIFICATIONS ARE THE SAME FOR ALL MODELS	
Number of Cylinders	823
Recording Density: Tracks per Inch Bits per Inch Flux Changes per Inch	900 TPI 9,000 BPI 6,000 FCI
Recording Method	2,7 (RLL) Code
Data Transfer Rate	9.677 Megabits per Second
Head Recovery Time: Head Change Write to Read Read to Write	24 Microseconds 10 Microseconds 0.3 Microseconds
Seek Time (includes settling): Track to Track Average Full Stroke	4 Milliseconds 18 Milliseconds 34 Milliseconds
Start Time	25 Sec. Typical - 50 Sec. Maximum
Stop Time	20 Sec. Typical - 40 Sec. Maximum
Rotational Speed: Average Latency Time Maximum Latency Time	3,600 RPM ±1% 8.33 Milliseconds 17.10 Milliseconds
Acoustic Noise without a Frame at 3.0 Feet (1 Meter) from Drive	60 dBA Typical

2.3 ENVIRONMENTAL SPECIFICATIONS

SPECIFICATIONS ARE THE SAME FOR ALL MODELS	
Operating Environment:	
Ambient Temperature	41° to 104° F (5° to 40° C)
Temperature Gradient	18° F per Hour (10° C)
Relative Humidity	20 to 80% No Condensation Maximum Wet Bulb 78° F (26° C)
Altitude	-1,000 to 10,000 Feet (-300 to 3,000 Meters)
Vibration (all axis)	0.25 G Peak at 5-200 Hz
Shock (recoverable errors allowed)	2.0 G Peak
Cooling:	
Minimum Air Flow (see Section 6 for fans that are mounted directly on the drive)	7.0 Feet^3 (1.8 Meter^3) Minute
Non-Operating (Unpacked) Environment:	
Ambient Temperature	14° to 122° F (-10° to 50° C)
Temperature Gradient	27° F per Hour (15° C)
Relative Humidity	10 to 80% No Condensation
Altitude	-1,000 to 49,000 Feet (-300 to 15,000 Meters)
Vibration	0.5 G/0.04 Inch (1 MM) at 5-200 Hz
Shock	3.0 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	2 G/0.1 Inch (2.5 MM) at 5-400 Hz
Shock (maximum free drop)	1 Foot (0.3 Meter)
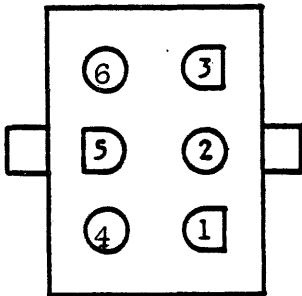
2.4 RELIABILITY CHARACTERISTICS

CHARACTERISTIC	MK-182FB	MK-184FB	MK-186FB
Media Defects:			
Maximum Defects per Cylinder	3	4	5
Maximum Defects per Surface	25	25	25
Maximum Defects per Drive	60	80	120
Maximum Number of Defective Tracks	10	14	20

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	1 in 10^{10} Bits
Unrecoverable	1 in 10^{13} Bits
Seek	1 in 10^7 Seeks
Per Month Usage Factors (Note 1)	150 Power On/Off Cycles 200 Operating Hours 350 Power-On Hours 1.5×10^6 Seeks
Preventive Maintenance	Not Required
Mean Time Between Failures (MTBF) (Note 2)	20,000 Hours
Mean Time To Repair (MTTR)	Less than 0.5 hour for recommended replaceable assemblies. Less than 2 hours for any assembly.
Service Life	5 Years

Note 1   Per month usage factors are average nominals on which MTBF and Service Life are based.

Note 2   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

REQUIREMENTS ARE THE SAME FOR ALL MODELS	
Voltage/Load Current	+5 VDC ±5% / 3.5 Amperes -12 VDC ±5% / 1.5 Amperes +24 VDC ±5% (see below)
Load Current on +24 VDC	Effective 3.6 Amperes RMS 6.8 Amperes Zero-to-Peak Typical 7.2 Amperes Zero-to-Peak Maximum (2 millisecond periods during seek) 5.0 Amperes Typical during Power-On (25 seconds nominal, 50 seconds maximum)

DC Power Connector:
 	
    Plug
 	
    Contact
	AMP Universal Mate-N-Lock
	
	AMP 1-480704-0, or equivalent
	
	AMP 350550-3, or equivalent

Power Plug Pin Assignment: ⑥ ③ ⑤ ② ④ ① (as viewed from rear of drive)	Pin No. Assignment 1 +5 VDC 2 Ground 3 Return for +24 VDC 4 -12 VDC 5 Power Fault* 6 +24 VDC

* Power Fault signal is the open collector output of an SN75452. Power Fault signal goes low (0 VDC) when a power fault, caused by a bad input voltage, is detected by the drive.

2.6 PHYSICAL DIMENSIONS, WEIGHT AND MOUNTING HOLES

Refer to the following diagram. Nominal dimensions and weight of a MK-180FB are:

Height:	5.1 ±0.04 Inches	(130 ±1 Millimeter)
Width:	8.5 ±0.04 Inches	(216 ±1 Millimeter)
Depth:	15.6 ±0.04 Inches	(397±3 Millimeter) without Fan
	17.0 ±0.04 Inches	(430 ±3 Millimeter) with Fan
Weight:	33 Pounds (15 Kilograms)	

Mounting holes are M4 X 0.7
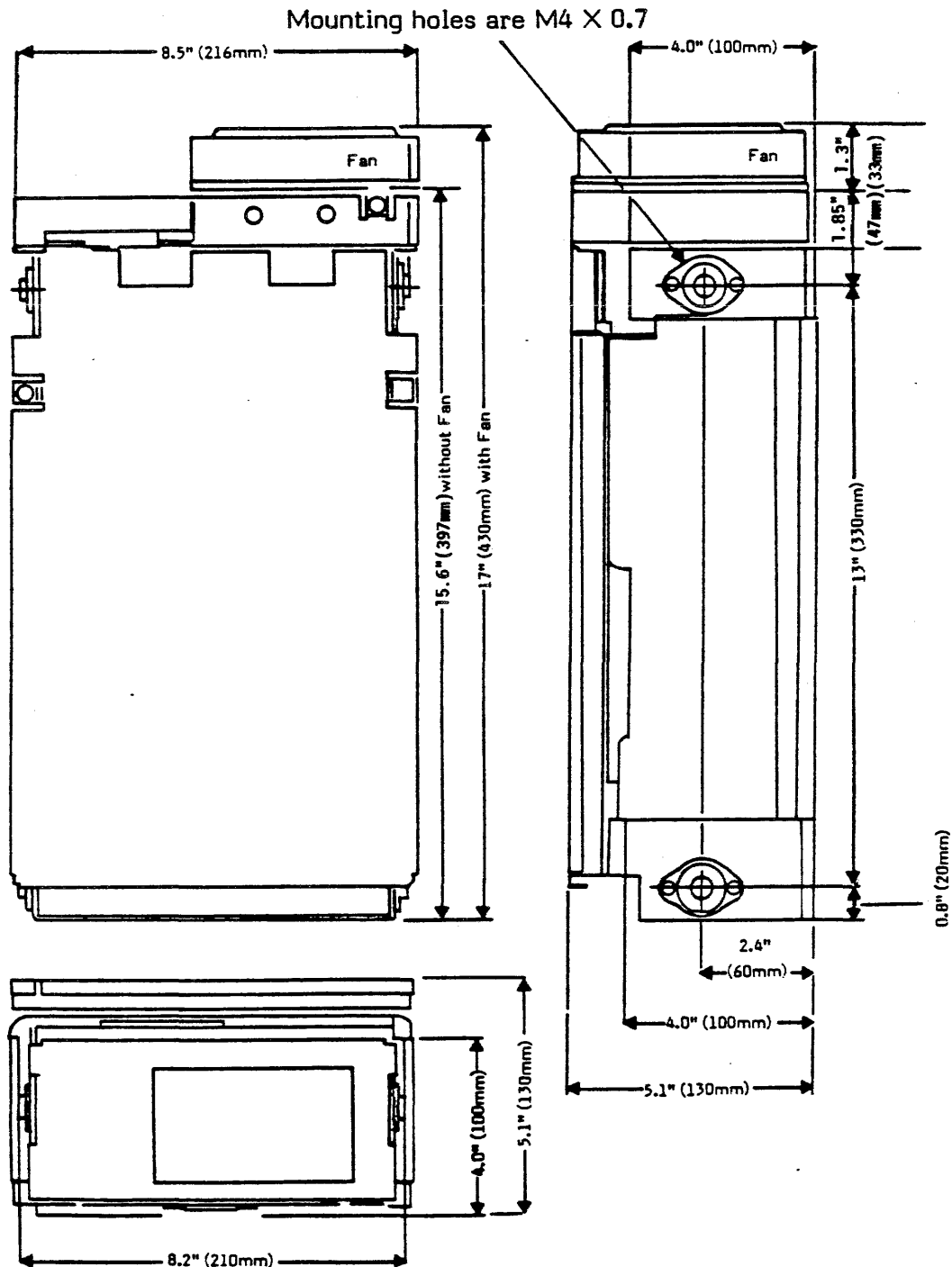
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SECTION 3

INSTALLATION

3.1 MOUNTING ORIENTATION

Location of the four mounting holes is shown on the previous page.

There are no mounting restrictions. Recommended mounting orientation is:

Vertically - on either side.

Horizontally - with the circuit card facing upward.

3.2 COOLING

Recommended air flow through the drive is 7.0^3 feet (1.8^3 meters) per minute to ensure cooling.

Section 6.2 provides a list of accessory fans that may be mounted directly on the drive.

3.3 SWITCH OPTIONS

There are four Option switches, as shown in the following drawings. All switches must be set before applying power to the drive.
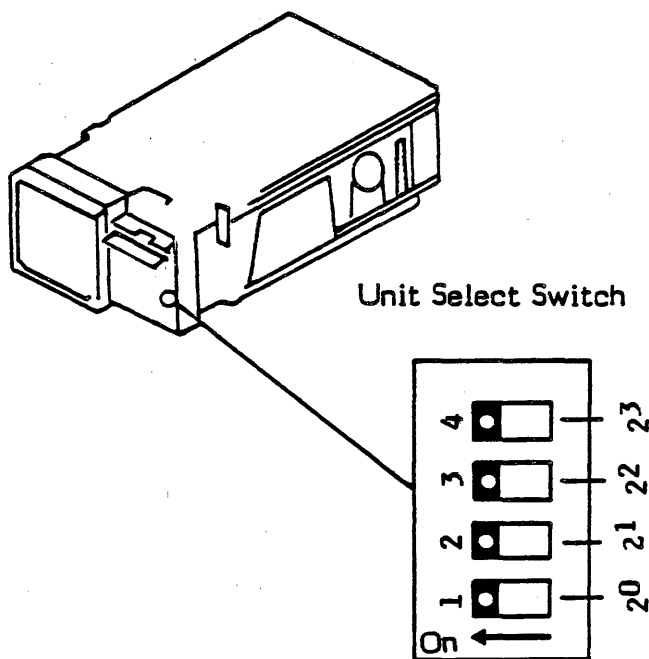
Unit Select Switch

UNIT SELECT SWITCH				
2^3	2^2	2^1	2^0	Unit
On	On	On	On	00
On	On	On	Off	01
On	On	Off	On	02
On	On	Off	Off	03
On	Off	On	On	04
On	Off	On	Off	05
On	Off	Off	On	06
On	Off	Off	Off	07
Off	On	On	On	08
Off	On	On	Off	09
Off	On	Off	On	10
Off	On	Off	Off	11
Off	Off	On	On	12
Off	Off	On	Off	13
Off	Off	Off	On	14
Off	Off	Off	Off	15

On = Fault Clear

On = Write Protect

On = Remote
Off = Local

On = On Line
Off = Test Mode

Test Push Button

On = 0, Off = 1

SECTOR SWITCH

Note: Option Switch Number 7 sets Sectors per Track Mode (when On) and Bytes per Sector Mode (when Off).
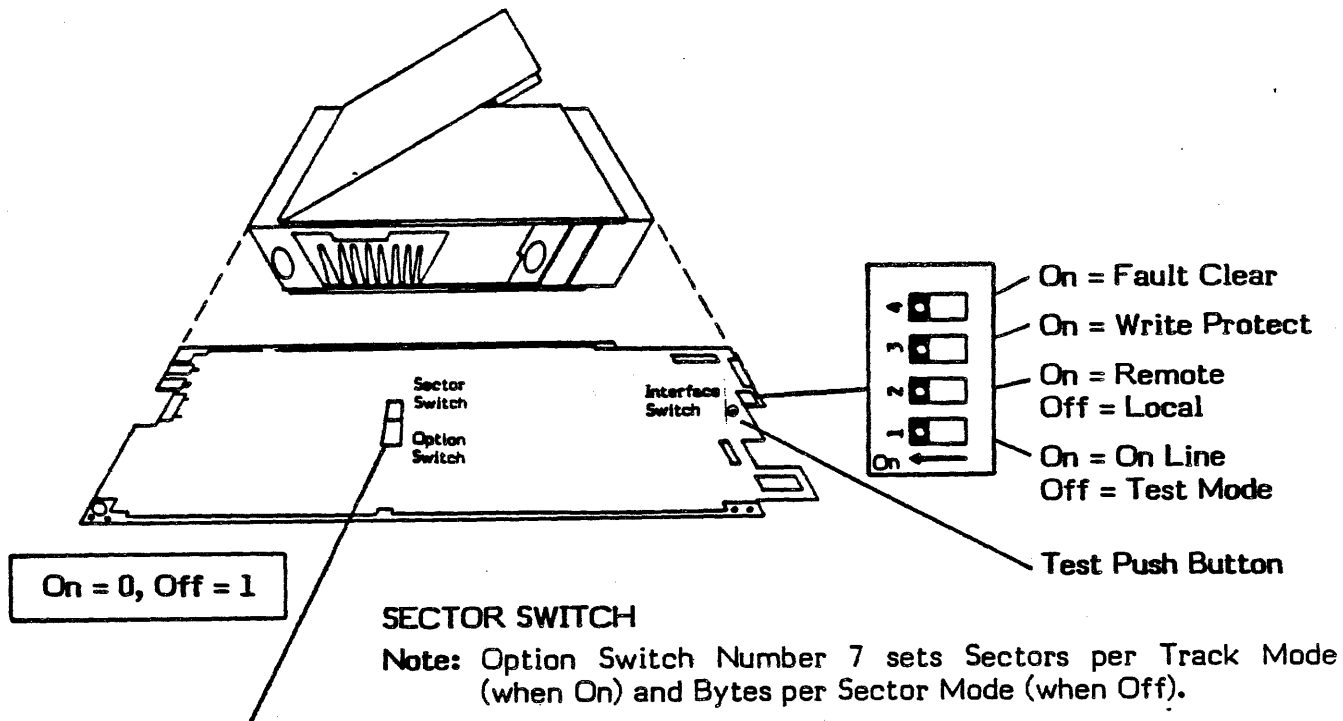
Sectors per Track (CMD) Mode	Bytes per Sector (SMD) Mode
Ignored	On = Last Sector longer
Ignored	2^8 Bytes per Sector
On = Last Sector longer	2^7 Bytes per Sector
2^6 Sectors per Track	2^6 Bytes per Sector
2^5 Sectors per Track	2^5 Bytes per Sector
2^4 Sectors per Track	2^4 Bytes per Sector
2^3 Sectors per Track	2^3 Bytes per Sector
2^2 Sectors per Track	2^2 Bytes per Sector
2^1 Sectors per Track	2^1 Bytes per Sector
2^0 Sectors per Track	2^0 Bytes per Sector

OPTION SWITCH

On = (CMD) Edge Mode; Off = (SMD) Latch and Enable Mode

On = Sectors per Track Mode; Off = Bytes per Sector Mode

On = Head Addresses 0-9; Off = Head Addresses 0-3

On = CMD Mode; Off = SMD Mode

Switch Number				
4	3	2	1	Description
On	On	Off	On	Model MK-182FB
On	Off	On	On	Model MK-184FB
On	Off	Off	On	Model MK-186FB
Off	Off	On	On	Random Seek Test*
Off	Off	On	Off	Full Stroke Seek Test*

* Push the Test Button when the drive is Off Line to enter Test Mode

3.4 ADDITIONAL INFORMATION ON INTERFACE SWITCH SETTINGS

Fault Clear   Off to On transfer of this switch - resets a Fault condition.

Write Protect   On - prohibits writing on the drive.

                       Off - allows writing on the drive.

Remote/Local   On - allows Pick and Hold to sequence power to all drives in a daisy-chain configuration.

                       Off - allows all drives in a daisy-chain configuration to receive power at same time.

On Line/Test   On - allows the host to control the drive.

                       Off - allows Off Line (Local) operations.

3.5 ADDITIONAL INFORMATION ON OPTION SWITCH SETTINGS

Switch 8   On = (CMD) Edge Mode - UNIT SELECTED changes with each positive transition of the UNIT SELECT TAG signal.

                   Off = (SMD) Latch and Enable Mode - UNIT SELECTED goes true with the positive transition of the UNIT SELECT TAG signal and goes false when the UNIT SELECT TAG signal goes low.

Switch 7   On = Sectors per Track Mode - switches 1 through 7 on the Sector Switch determine the number of sectors on each track.

                   Off = Bytes per Sector Mode - switches 1 through 9 on the Sector Switch determine the number of bytes in each sector.

Switch 6   On = allows selection of Head Addresses 0-9.

                   Off = allows selection of Head Addresses 0-3.

Switch 5   On = (CMD) ON CYLINDER and SEEK END become false on leading and trailing edges of an OFFSET Command.

                   Off = (SMD) ON CYLINDER and SEEK END become false only with the leading edge of an OFFSET Command.

Switch 4 through Switch 1   See the Table on the previous page. Switch settings that are not shown are invalid.

3.6 ADDITIONAL INFORMATION ON SECTOR SWITCH SETTINGS

See paragraph 3.6.1 for Sectors per Track Mode information.

See paragraph 3.6.2 for Bytes per Sector Mode information.

3.6.1 Number of Sectors per Track Mode

The following assumes familiarity with Data Format concepts given in Section 5.

Option Switch position 7 is set On to select Number of Sectors per Track Mode.

Example: Desired number of sectors per track = 65.

Switches 1 through 7 are set to a binary value that is one (1) less than the desired number of sectors per track.

With 65 desired sectors per track, a binary value of 64 (65 minus 1) is set in Sector Switches 1 through 7, as shown in the following Table.

Switch Settings for 65 Sectors per Track Mode							
Switch Position Number **Binary Value of Switches**	**7** **64**	**6** **32**	**5** **16**	**4** **8**	**3** **4**	**2** **2**	**1** **1**
Binary Value for 64	Off	On	On	On	On	On	On

With 65 sectors per track, and with most sectors per track, there is a remainder of bytes. This remainder is determined by dividing 20,160 (number of bytes stored per track) by the desired number of sectors per track:

$$20,160 \text{ divided by } 65 = 310.154$$

The whole number (310) indicates the number of data and overhead bytes that will be recorded in each sector. A remainder of 10 bytes, which is 20,160 minus (65 X 310), will exist at the end of each track.

If Switch 8 is On, any remaining bytes will be recorded in the last sector. In this example, the first 64 sectors will have 310 bytes each and the last sector will have 320 bytes (310 plus the remaining 10 bytes).

If Switch 8 is Off, any remaining bytes will be recorded as the last sector. In this example, there will be 65 sectors with 310 bytes each and an additional short sector containing 10 bytes (only the remainder).

Switches 9 and 10 are ignored in Sectors per Track Mode.

Other Common Switch Settings for Sectors per Track Mode							
Switch Position Number **Binary Value of Switches**	**7** **64**	**6** **32**	**5** **16**	**4** **8**	**3** **4**	**2** **2**	**1** **1**
"0" for 1 Sector per Track **"31" for 32 Sectors per Track** **"32" for 33 Sectors per Track** **"63" for 64 Sectors per Track**	On On On On	On On Off Off	On Off On Off	On Off On Off	On Off On Off	On Off On Off	On Off On Off

3.6.2 Number of Bytes per Sector Mode

The following assumes familiarity with Data Format concepts given in Section 5.

Option Switch position 7 is set Off to select Number of Bytes per Sector Mode.

Example: Desired number of data and overhead bytes per sector = 310.

Divide 310 by 1.5 = 206.66... and round upward to 207.

Dividing (the desired number of data and overhead bytes per sector) by 1.5 translates clock pulses, used internally by the 2,7 (RLL) code, into bytes.

Set the binary value 207 into Sector Switches 1 through 9.

Switch Settings for Binary Value 207									
Switch Position **Binary Value**	9 256	8 128	7 64	6 32	5 16	4 8	3 4	2 2	1 1
Binary 207	On	Off	Off	On	On	Off	Off	Off	Off

With 310 bytes per sector, and with most other values, there is a remainder of bytes. This remainder is determined by dividing 20,160 (number of bytes stored per track) by the desired number of bytes per sector:

20,160 divided by 310 = 65.03

The whole number (65) indicates the number of sectors that will be recorded on each track. A remainder of 10 bytes, which is 20,160 minus (65 X 310), will exist at the end of each track.

If Switch 10 is On, any remaining bytes will be recorded in the last sector. In this example, the first 64 sectors will have 310 bytes each and the last sector will have 320 bytes (310 plus the remaining 10 bytes).

If Switch 10 is Off, any remaining bytes will be recorded as the last sector. In this example, there will be 310 bytes in the first 65 Sectors and an additional short sector containing 10 bytes (only the remainder).

Other Binary Value Switch Settings									
Switch Position **Binary Value**	9 256	8 128	7 64	6 32	5 16	4 8	3 4	2 2	1 1
Binary 385 * **Binary 131** **	Off On	Off Off	On On	On On	On On	On On	On On	On Off	Off Off

  * Binary 385 is 512 data and 65 overhead bytes (512 + 65/1.5 = 384.67).

 ** Binary 131 is 128 data and 68 overhead bytes (128 + 68/1.5 = 130.667).

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SECTION 4

INTERFACE

4.1 CABLE "A" CONTROL

Cable "A," the daisy-chained Control Cable, is a 30 twisted pair flat cable (60-conductors). Cable "A" is available from Toshiba as an option (see Section 6).

Cable "A" is: SPECTRA-STRIP Part Number 3CT-6028-7B-05-100, or equivalent.

60 Position Connector for Cable "A" is: BERG 65043-007, or equivalent.

Connector Contacts (Inserts) are: BERG 48048, or equivalent.

Cable "A" signals are differential signal pairs, except POWER SEQUENCE PICK and POWER SEQUENCE HOLD.

Cable "A" signals are enabled by the UNIT SELECTED signal, except the UNIT SELECT TAG and UNIT SELECT 2^X signals.

BUSY signal (Pins 21 and 51) is used only with Dual Port Units.

Pins 30 and 60 are spares.

Pin assignments for Cable "A" are given on page 4-2.

4.2 CABLE "B" DATA

Cable "B," the star-configured Data Cable, is a 13 twisted pair flat cable (26-conductors). Cable "B" is available from Toshiba as an option (see Section 6).

Cable "B" is: 3M Part Number 3M 3476-26 - 28 AWG with Ground Plane and Drain wire, or equivalent.

26 Position Connector for Cable "B" is: 3M 3399-3000, or equivalent.

Connector Pull Tab is: 3M 3490-2, or equivalent.

Cable "B" signals are differential signal pairs.

Cable "B" signals are not enabled by the UNIT SELECTED signal.

Pin assignments for Cable "B" are given on page 4-3.

4.3 CABLE "A" PIN ASSIGNMENTS

| SIGNAL NAME | PIN NUMBERS | | MK-180FB |
	LOW*	HIGH*	
UNIT SELECT TAG – – –	22	52	Input
UNIT SELECT 2^0 – – –	23	53	Input
UNIT SELECT 2^1 – – –	24	54	Input
UNIT SELECT 2^2 – – –	26	56	Input
UNIT SELECT 2^3 – – –	27	57	Input
TAG 1 – – – – – – –	1	31	Input
TAG 2 – – – – – – –	2	32	Input
TAG 3 – – – – – – –	3	33	Input
BIT 0 – – – – – – –	4	34	Input
BIT 1 – – – – – – –	5	35	Input
BIT 2 – – – – – – –	6	36	Input
BIT 3 – – – – – – –	7	37	Input
BIT 4 – – – – – – –	8	38	Input
BIT 5 – – – – – – –	9	39	Input
BIT 6 – – – – – – –	10	40	Input
BIT 7 – – – – – – –	11	41	Input
BIT 8 – – – – – – –	12	42	Input
BIT 9 – – – – – – –	13	43	Input
OPEN CABLE DETECTION –	14	44	Input
FAULT – – – – – – –	15	45	Output
SEEK ERROR – – – – –	16	46	Output
ON-CYLINDER – – – –	17	47	Output
INDEX – – – – – – –	18	48	Output
READY – – – – – – –	19	49	Output
ADDRESS MARK FOUND –	20	50	Output
BUSY** – – – – – –	21	51	Output
WRITE PROTECTED – – –	28	58	Output
POWER SEQUENCE PICK***	29	N/A	Input
POWER SEQUENCE HOLD***	59	N/A	Input
SPARE – – – – – – –	30	60	N/A

* LOW and HIGH refer to differential pairs.

** BUSY is used only with Dual Port Units.

*** Power sequencing is enabled by grounding pins 29 and 59 on the first drive.

4.4 CABLE "B" PIN ASSIGNMENTS

SIGNAL NAME	PIN NUMBERS		MK-180FB
	LOW*	HIGH*	
GROUND - - - - - -	1	N/A	N/A
SERVO CLOCK - - - -	2	14	Output
GROUND - - - - - -	15	N/A	N/A
READ DATA - - - - -	3	16	Output
GROUND - - - - - -	4	N/A	N/A
READ CLOCK - - - -	5	17	Output
GROUND - - - - - -	18	N/A	N/A
WRITE CLOCK - - - -	6	19	Input
GROUND - - - - - -	7	N/A	N/A
WRITE DATA - - - - -	8	20	Input
GROUND - - - - - -	21	N/A	N/A
UNIT SELECTED - - - -	22	9	Output
GROUND - - - - - -	11	N/A	N/A
SEEK END - - - - - -	10	23	Output
INDEX MARK - - - - -	12	24	Output
GROUND - - - - - -	25	N/A	N/A
SECTOR MARKS - - - -	13	26	Output

* LOW and HIGH refers to differential pairs.

4.5 CONTROL TAG FORMAT

Address and control functions are transferred via the ten (10) Bit lines, and the significance of the information on these lines is indicated by one of the Tag lines.

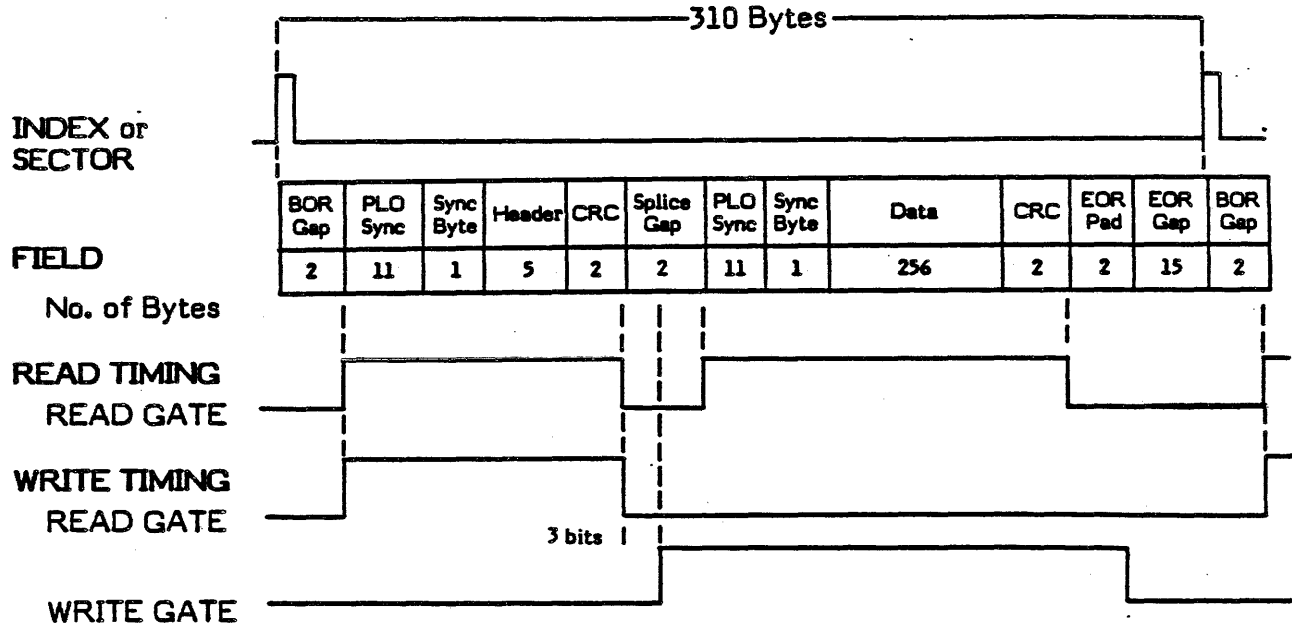| BUS BIT	TAG 1	TAG 2	TAG 3	UNIT SELECT TAG
9	Cylinder 2^9	Head 2^9	Release*	Priority Select*
8	Cylinder 2^8	Head 2^8	Data Strobe Late	N/A
7	Cylinder 2^7	Head 2^7	Data Strobe Early	N/A
6	Cylinder 2^6	Head 2^6	Return to Cylinder 00	N/A
5	Cylinder 2^5	Head 2^5	Address Mark Enable	N/A
4	Cylinder 2^4	Head 2^4	Fault Clear	N/A
3	Cylinder 2^3	Head 2^3	Negative Servo Offset	N/A
2	Cylinder 2^2	Head 2^2	Positive Servo Offset	N/A
1	Cylinder 2^1	Head 2^1	Read Gate	N/A
0	Cylinder 2^0	Head 2^0	Write Gate	N/A

* Only with Dual Port Option.
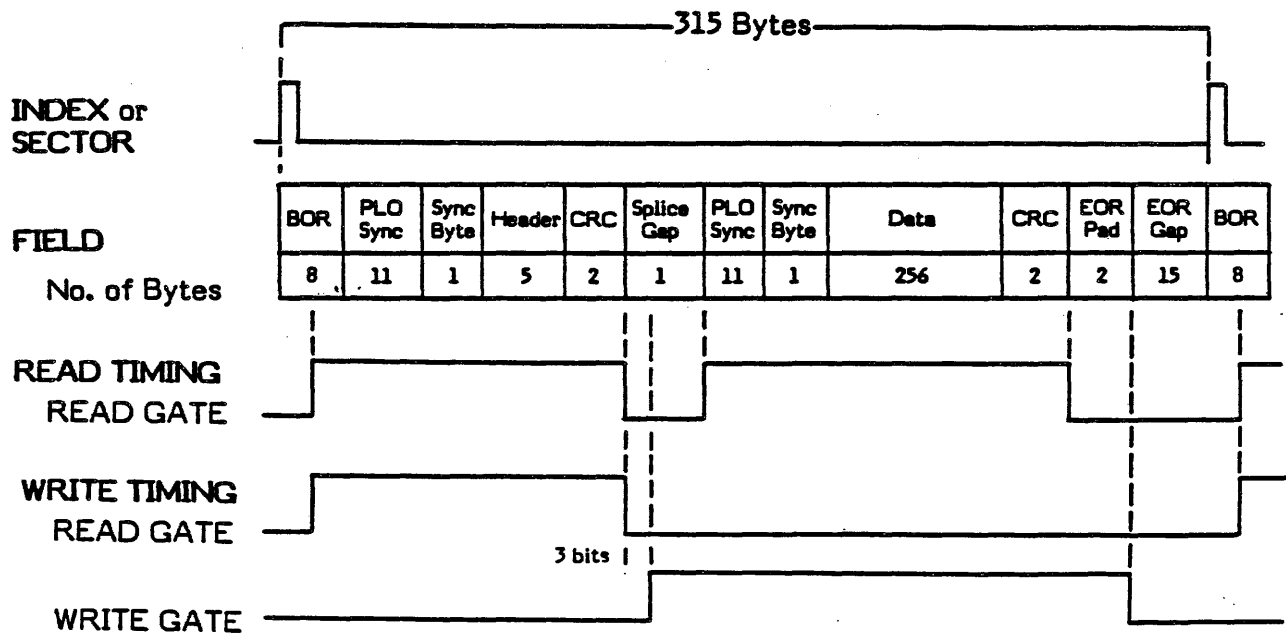
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DATA FORMATS

5.1 HARD SECTOR FORMATS

Refer to page 3-4 for information on setting the Sector Switches. The following format shows 65 Sectors per Track. Each sector has 310 bytes.

BOR Gap	PLO Sync	Sync Byte	Header	CRC	Splice Gap	PLO Sync	Sync Byte	Data	CRC	EOR Pad	EOR Gap	BOR Gap
2	11	1	5	2	2	11	1	256	2	2	15	2

INDEX or SECTOR — 310 Bytes

FIELD / No. of Bytes

READ TIMING / READ GATE

WRITE TIMING / READ GATE

WRITE GATE — 3 bits

The following format shows 64 Sectors per Track. Each sector has 315 bytes.

BOR	PLO Sync	Sync Byte	Header	CRC	Splice Gap	PLO Sync	Sync Byte	Data	CRC	EOR Pad	EOR Gap	BOR
8	11	1	5	2	1	11	1	256	2	2	15	8

INDEX or SECTOR — 315 Bytes

FIELD / No. of Bytes

READ TIMING / READ GATE

WRITE TIMING / READ GATE

WRITE GATE — 3 bits

5.2 SOFT SECTOR FORMATS

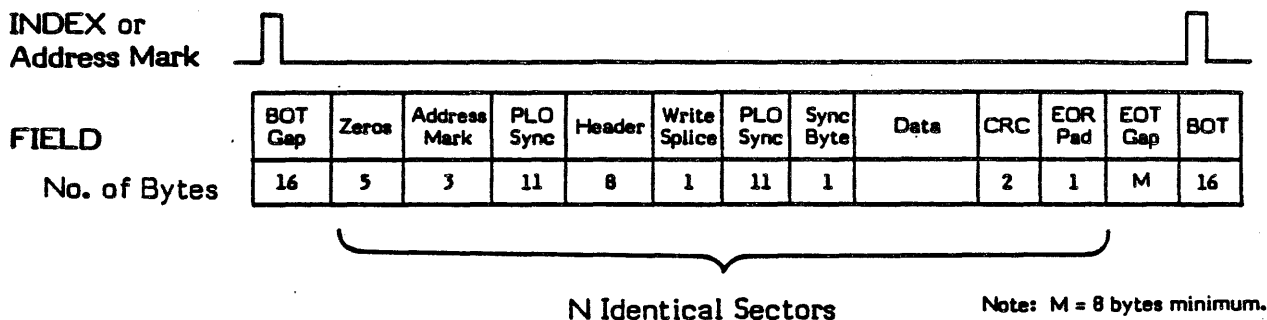Refer to page 3-5 for information on setting the Sector Switches. The following format shows a typical Soft Sector Format. Each sector has the same number of bytes.

INDEX or Address Mark													

FIELD	BOT Gap	Zeros	Address Mark	PLO Sync	Header	Write Splice	PLO Sync	Sync Byte	Data	CRC	EOR Pad	EOT Gap	BOT
No. of Bytes	16	5	3	11	8	1	11	1		2	1	M	16

N Identical Sectors

Note: M = 8 bytes minimum.

Sector length with 64 sectors:

$$\text{Bytes per Sector} = \frac{20{,}160 \text{ (bytes per track)} - 26 \text{ bytes (BOT + EOT)}}{64 \text{ (sectors per track)}} = 315.594$$

Overhead and data bytes = 314 (total bytes in sector)

Overhead bytes = 43 (total of all fields in each sector, excluding the data field)

Data field bytes = 271 bytes (314 minus 43 overhead bytes)

EOT Gap = 46 bytes, which is 20,160 - (18 bytes in BOT) - (64 X 314)

Number of Sectors with 256 data bytes and 43 overhead bytes per sector:

256 data bytes + 43 overhead bytes = 299 bytes per sector

$$\text{Sectors per Track} = \frac{20{,}160 \text{ (bytes per track)} - 26 \text{ bytes (BOT + EOT)}}{299 \text{ (bytes per sector)}} = 67.333$$

EOT Gap = 109 bytes, which is 20,160 - (18 bytes in BOT) - (67 X 299)

5.3 DEFINITION OF ABBREVIATIONS

BOR = Beginning of Record

BOT = Beginning of Track
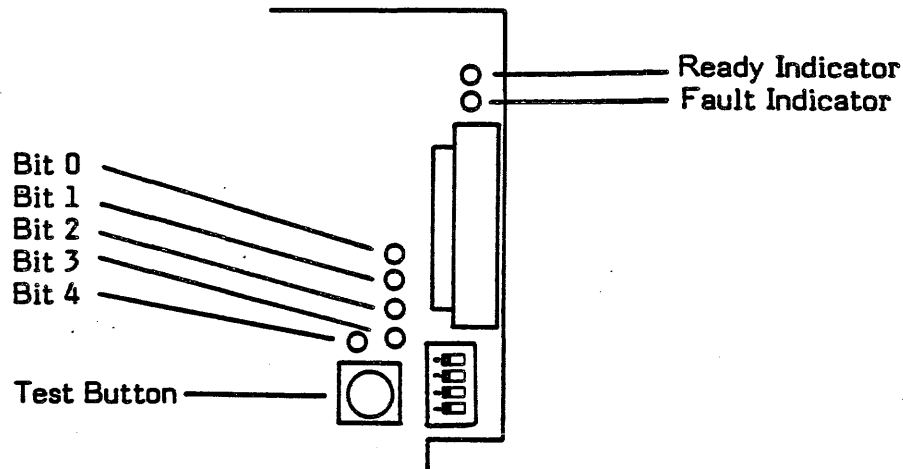
CRC = Cyclic Redundancy Check

EOR = End of Record

EOT = End of Track

PLO = Phase Lock Oscillator

SECTION 6

MAINTENANCE CONSIDERATIONS

6.1 LED DISPLAY

To read Status Codes, set Off-Line mode and press the Test Button. The last Status Code stored will be displayed. Up to 16 Status Codes may be stored.

In On-Line mode, the LED's indicate:

Bit 4 - Status Code being stored
Bit 3 - Drive is seeking
Bit 2 - Drive is returning to Track 00
Bit 1 - Track Offset being performed
Bit 0 - Not used On-Line

Blinking LED's indicate:
(Bit 4 is MSB)

01 - General diagnostic test error
03 - Servo diagnostic test error
07 - Power Supply fault
0F - Unsuccessful retry

In Off-Line mode, when the Test Button is pressed, the LED's indicate:

00 -	Unused	10 -	Unused
01 -	Spindle speed fault	11 -	On-Track time-out
02 -	No Servo track	12 -	First return to Track 00 time-out
03 -	Unused	13 -	Unused
04 -	Seek time-out	14 -	Unused
05 -	Return to Track 00 time-out	15 -	Unused
06 -	Out of data zone	16 -	Unused
07 -	Non-existent cylinder address	17 -	Voltage fault at start
08 -	Overheated actuator	18 -	Voltage fault during operations
09 -	Unused	19 -	No AGC error at landing zone
0A -	Servo settling time-out	1A -	No servo track after head load
0B -	Servo AGC error	1B -	AGC error after head load
0C -	On-Track error	1C -	Spindle did not start
0D -	First seek time-out	1D -	Stage 1 Spindle time-out
0E -	Unused	1E -	Stage 2 Spindle time-out
0F -	Unused	1F -	End of stored Status Codes

6.2 ACCESSORIES AND OPTIONS

The accessories and options listed below are not normally included with the drive but may be purchased from Toshiba America, Inc.

DESCRIPTION	PART NUMBER
10-foot (3-meter) Interface Cable "A" with drive connector	62M303897G
10-foot (3-meter) Interface Cable "B" with drive connector	62M304211G
Power Supply Assembly	APS0436A
6-foot (2-meter) DC Power Cable with DC Fan connector	CBL0032A
Rack Mounting Tray	CAB0062A
Operator Control/Maintenance Panel	ADP0436A
Dual Port Access Option	ADP0657A
Interface Terminator Assembly*	ADP0626A
24 VDC Cooling Fan with connector*	ADP0663A

* Standard feature supplied on all drives that may be deleted or ordered separately by the customer.

6.3 EQUIPMENT MAINTENANCE

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

6.3.1 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 6.3.3 for instructions) at the customer's expense, inclusive of shipping and insurance costs.

6.3.2 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 6.3.3 for instructions) at the customer's expense, inclusive of shipping and insurance costs.

6.3.3 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
2441 Michelle Drive
Tustin, CA 92680

(714) 669-5221