

TOSHIBA

DISK PRODUCTS

SD-M1302

DVD-ROM DRIVE

PRODUCT SPECIFICATION

August 1999
REV. 1.0

Specifications are subject to change without notice

DOCUMENT NUMBER
12102

Notice

1. This product has no over-current protection circuit.
System should have appropriate over-current protection.
Toshiba Corporation makes no warranty of damages caused by no over-current protection.
2. This has a little possibility of errors.
To prevent damages and injury caused by the above, careful consideration for the safety and integrity should be taken in the system design.
Do not use this product in a system that may cause hazard to human being or material loss caused by the failure, loss of data and/or errors of this product.
3. Do not disassemble or modify this product.
Or, reliability, safety and performance can not be guaranteed.
4. Turn off the system power before mounting/removing this product.
Or, it may cause failure or damage.
5. Because the DC power socket of this product allows insertion of only one side direction, ascertain direction carefully to insert the plug.
6. To build this product in an equipment, handle it only in electrostatically safe environment.
Do not touch connecting terminals directly.
Or, the product may be damaged by electrostatic energy.
7. This product can playback discs based on the formats described in item 3.1.(1). Do not load a disc which is not conformed with those formats such as a shaped disc or a disc with its weight unbalanced excessively.
A very high speed rotation is carried out inside the product, so abnormal vibration and malfunction may occur if disc described above is loaded.
8. When a disc cannot be ejected because of some troubles, etc., turn off the power for the unit and eject the disc using the emergency eject mechanism after passing more than 1 minute.
When the emergency eject is carried out while the power is on or immediately after the power off, the disc may be eject in a rotating status. We do not assure if the disc is damaged by this.
9. When you close the tray, power must not be turned off. If the tray is pushed in with the hand during power off, a breakdown may occur because the mechanism in the product is not in the transit state during power off.
10. This product comes under the regulations of TWA (The Wassenaar Arrangement on Export Controls for Conventional Arms and Dual Use Goods and Technologies).
When exporting the product, an export permission according to the regulations of your country will be required.

11. As for mounting bracket to incorporate this product into an equipment,
- (1) When this product is incorporated into an equipment by using the mounting screw holes in the right and left side planes, the clearance between this product and the mounting bracket is too wide;
 - (2) When this product is incorporated into an equipment by using the mounting screw hole in the bottom, the surface of the mounting bracket is contorted.

If you use such mounting bracket as the above, this product will become deformed, which may cause operation failure. Therefore, it is necessary to take account of the mounting bracket which has the tolerances shown in Fig.1 or whose structure cannot cause this product to deform, as shown in Fig.2

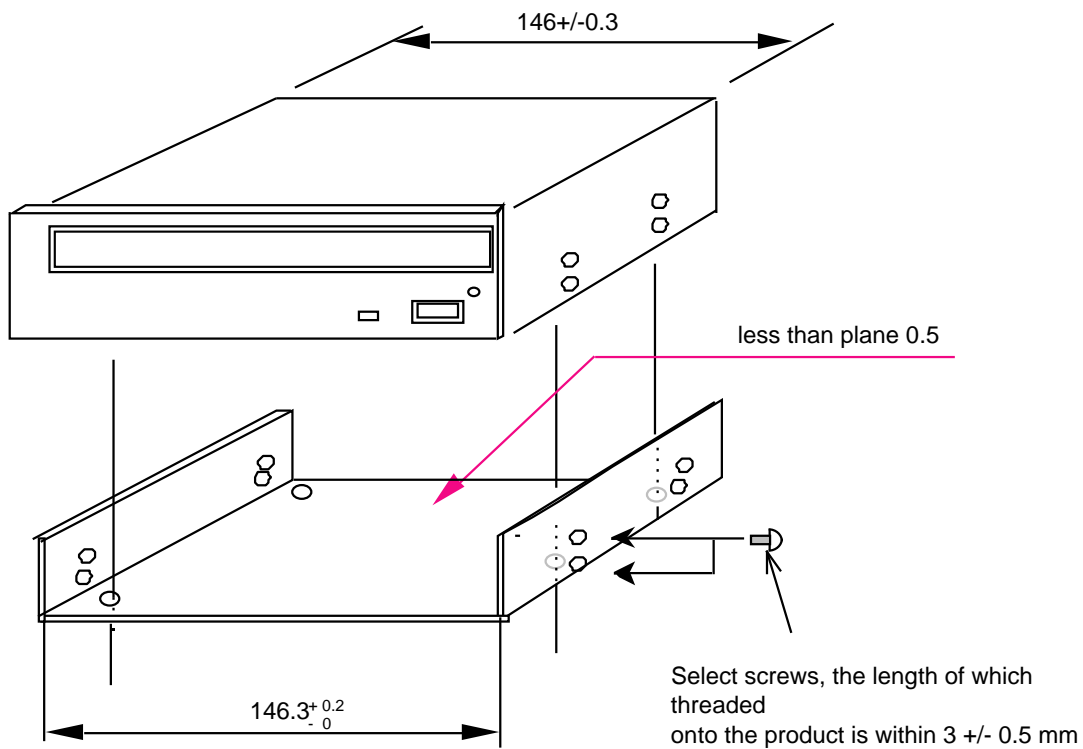


Fig.1

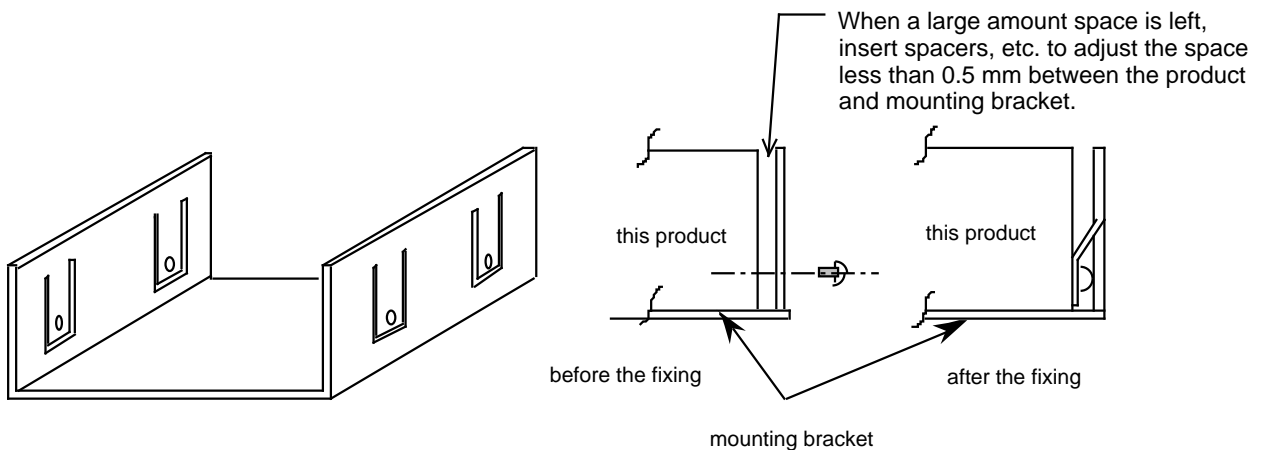


Fig.2

12. When mounting the product on other instrument, take care that the external surface temperature of the product does not exceed 55 °C
13. In the instruction manual of your product, statement described in “ Safety Instruction Manual “ attached to this product, the statement of item 2,7 and 9 above, and other required statements should be mentioned for thorough understanding by the users.

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1. Introduction

This document describes TOSHIBA's SD-M1302 DVD-ROM Drive.

This drive supports DVD CSS (Contents Scramble Systems) Disc.

This drive reads digital data stored on CD-ROM, DVD-ROM and CD audio discs.

DVD-ROM disc spec (DVD-ROM Book) defines 120 mm and 80 mm in diameter, single and dual layers as recording layer structure and single and double sides as recording side.

Maximum storage capacities are 4.38 GBytes and 15.9 GBytes for single layer/single side and dual layer/double side respectively. (1 GByte= 2^{30} Bytes)

Due to these high capacity and high data transfer rate of 1352 KBytes/sec, DVD-ROM discs are capable to store high quality and long duration MPEG-2 moving picture data. (1 KByte= 2^{10} Byte)

This drive reads digital data stored on DVD-ROM discs at maximum 8 times faster rotational speed.

This drive reads digital data stored on CD-ROM discs at maximum 40 times faster rotational speed.

This drive is a new generation drive with highest performance such as 95 ms(DVD)/80 ms(CD) Access Time.

This drive offers long life and durability because the disc is read by a LASER, thereby eliminating physical contact with the disc.

This drive supports SFF-8020i of ATAPI (ATA Packet Interface) spec. and SFF-8090 Ver.3 (Fuji3) of DVD Commands.

This drive shows a highest performance such as 100,000 hour MTBF.

This drive can be used in a vertical position or horizontal position.

This drive adopts RPC-II for its "Standard Specification Model".

Refer to the preaction of the next page for the RPC-II.

Matters to be attended to:

This drive adopts RPC-II for its "Standard Specification Model".

This DVD-ROM Drive adopts RPC-II, the Phase II System of RPC (Regional Playback Control) for "Standard Specification Model", on the basis of a contract with the CSS (Contents Scramble System) organization.

The CSS rule requires that all the products not only DVD-ROM Drives but also PC systems installing DVD-ROM Drives sold from Jan.1, 2000 need to support RPC-II described above.

To playback a DVD-Movie Software with the Regional Code specified by using a DVD-ROM Drive with RPC-II adopted, either the hardware or software used as applications on PC system side is also required to meet RPC-II.

Namely, in the status that a hardware or a software for a DVD-Movie Playback Application planned to use in a PC does not support RPC-II, if the "RPC-II (Standard Specification) Drive" is used in combination, DVD-Movie Softwares with the Regional Code specified (most of DVD-Movie Softwares currently available on the market) cannot be reproduced. So, in such a case, "RPC-I Specifications Supported Model" must be purchased for a while.

However, all the drive manufacturers must obey to the deadline specified by the CSS rule saying; all DVD-ROM Drives have to implement Phase II from Jan.1, 2000. So we recommend that you will change your DVD-Movie Playback Hardware or Software to those applicable to the RPC-II as soon as possible and investigate to combine your system with the RPC-II Specification Drives.

Since we determine the drives are of RPC-I or RPC-II when manufacturing at factory and ship, the specification change after shipping is not available in principle. Especially, changing the RPC-II specification drive to the RPC-I is prohibited by the CSS rule.

In the combination of the drive and PC system with RPC-II supported, as far as the Regional Code of a DVD-Movie Software and the code memorized in the RPC-II Specification Drive coincides, the Movie Software is allowed to carry out.

In the RPC-II Specification Drive, the region change by an end user is permitted up to 5 times in total including the initial region set. After change to the fifth region is carried out, the Drive enters Parm State ("no change allowed" status).

The drive with Parm State is permitted up to 4 times of "reinitialization" by a drive manufacturer or a specific service center authorized by the CSS. Since it is considered that the reinitialization is carried out after the completion of the region confirmation through test items in the PC manufacturer's manufacturing line or the completion of drive repair, etc., the number of reinitialization times may vary from 0 (no reinitialization available) to 4 times. So, we recommend that not to disclose the reinitialization process to end users but only to inform the number of region setting times as "end user's direct region setting is available up to 5 times in total."

2. Features

- (1) Internal 12 cm/8 cm DVD/CD/CD-ROM Drive
- (2) 5-1/4 inch Half Height Form Factor
- (3) Fast 95 ms Random Access Time (DVD)
- (4) Fast 80 ms Random Access Time (CD)
- (5) 10,800 KByte/s max. (DVD)/6,000 KByte/s max. (CD) Sustained Transfer Rate (1 KByte = 2¹⁰ Bytes)
- (6) CD Multisession Disc Spec (Photo-CD, CD-EXTRA) compliant
- (7) CD-R and CD-RW Disc Spec. compliant (Read)
- (8) Multimedia PC-3 Spec compliant
- (9) Windows PC98 Spec compliant
- (10) RPC2 Compliant
- (11) Tray Type Electrical Load/Eject
- (12) Emergency Eject
- (13) Slant Angle : Horizontal +/-20° Vertical 0° /10° (side to side): +/-10° (front to rear)
(In vertical mount, only 12 cm disc is applicable)
- (14) Closed Enclosure
- (15) Snap-on Bezel
- (16) PIO Mode-4 ATAPI Drive (Transfer Rate: 16.7 MByte/s)
- (17) DMA: Multiple word DMA transfer mode-2 (Transfer Rate: 16.7 Mbyte/s)
: Ultra DMA mode-2 (Transfer Rate: 33.3 Mbyte/s)
- (18) Subcode P,Q,R-W Transfer over ATAPI (CD)
- (19) CD Text Support
- (20) Built-in Mode-1ECC and Mode-2EDC (DVD/CD-ROM)
- (21) Embedded CD-ROM XA type ECC
- (22) 256 KBytes Data Buffer Capacity
- (23) Media Removal Prevent Function
- (24) CD-DA Transfer Through ATAPI Bus (4-5.7X PCAV)
- (25) 8X Sampling & Digital Filter for CD Audio
- (26) High Speed Audio Playback System
- (27) 16-Mode Output for CD Audio
- (28) Software Volume Control (CD)
- (29) Low Power Consumption (Ave: (CD) 12.8 W, (DVD) 6.1 W, Max : (CD) 13.3 W, (DVD) 7.9 W
Stand-by 0.4 W)
- (30) 100,000 Power on Hours MTBF
- (31) Easy Serviceability

3. Specifications

3.1. Performance

(1) Applicable Disc *1

DVD: DVD-ROM (DVD-5, DVD-9, DVD-10, DVD-18),
DVD-R (read)

CD : CD-DA, CD+(E)G, CD-MIDI, CD-TEXT, CD-ROM,
CD-ROM XA, CD-I, CD-I Bridge (Photo-CD, Video-CD)
Multisession CD (Photo-CD, CD-EXTRA, CD-R,
CD-RW), CD-R (read), CD-RW (read)

(2) Data Capacity

User Data/Block

DVD-ROM: 2,048 Byte/Block

CD-ROM : 2,048 Byte/Block (Mode 1)

2,336 Byte/Block (Mode 2)

Data Capacity/Disc: (1 GB=2³⁰ Byte, 1 MB=2²⁰ Byte, 1 KB=2¹⁰ Byte)

DVD- 5: 4.377 GB (4.700 Billion Byte)

DVD- 9: 7.959 GB (8.545 Billion Byte)

DVD-10: 8.754 GB (9.400 Billion Byte)

DVD-18: 15.917 GB (17.091 Billion Byte)

CD (Mode-1): 656.5 MB (688.4 Million Byte)

CD (Mode-2): 748.8 MB (785.2 Million Byte)

(3) Rotational Speed

DVD : Approx. 4,600 rpm (3.3-8X CAV)

DVD-R : Approx. 1,100-2,800 rpm (2X CLV)

CD : Approx. 8,500 rpm (17.2-40X CAV)

CD-RW: Approx. 4,300 rpm (8.6-20X CAV)

CD Audio, Video-CD: Approx. 1,200 - 2,000 rpm (4-5.7X PCAV)

(4) Transfer Rate

(1 KByte=2¹⁰ Byte=1,024 Bytes, 1 Mbyte=2²⁰ Byte=1,048,576 Bytes)

Sustained Block Transfer Rate

DVD: 2,230-5,400 Block/s

CD : 1,297-3,000 Block/s

Sustained Data Transfer Rate

DVD: 4,460-10,800 KByte/s

CD : Mode 1 2,595-6,000 KByte/s

Mode 2 2,959-6,843 KByte/s

Burst Data Transfer Rate

16.7 MByte/s (PIO Mode 4)

16.7 MByte/s (Multiple word DMA transfer mode-2)

33.3 MByte/s (Ultra DMA)

(5) Access Time	
Average Random Access Time	DVD:*2 95 ms Typ CD:*3 80 ms Typ
Average Random Seek Time	DVD:*4 85 ms Typ CD:*5 75 ms Typ
Average Full Stroke Access Time	DVD:*6 210 ms Typ CD:*7 145 ms Typ

(6) Spin up Time (Focus Search Time and Disc Motor Start up Time)	
	DVD: 1.5 s Typ CD: 1.3 s Typ

(7) Data Buffer Capacity	256 KByte
--------------------------	-----------

*1: All disc written in CD or DVD formats, except CD-DA (audio), require additional specific application software and/or hardware. This drive referred in the specification is capable of reading these data formats. However, in order to run applications that use these formats you must first have the required software and/or hardware.

*2: Measured by performing multiple accesses which means reads of data blocks over whole area of the media from 0 (h) block to 1E7725(h) (4.089 Billion Byte:87 % of total area) block more than 3000 times. Includes positioning, setting, latency time and ECC implementation time (if required).

*3: Measured by performing multiple accesses which means reads of data blocks over whole area of the media from 00 min 02 sec 00 Frame to 60 min 01 sec 74 Frame (552.96 Million Byte:87 % of total area at linear velocity of 1.3 m/s) more than 3000 times. Includes positioning, setting, latency time and ECC implementation time (if required).

*4: Measured by performing multiple seek which means seeks of data block over whole area of the media from 0(h) block to 1E7725(h) block more than 3000 times. Includes positioning, setting time which is same definition as HDD.

*5: Measured by performing multiple seek which means seeks of data block over whole area of the media from 00 min 02 sec 00 Frame to 60 min 01 sec 74 Frame more than 3000 times. Includes positioning, setting time which is same definition as HDD.

*6: Measured by performing maximum accesses which means reads of each data block of 0 (h) Frame and 1E7725(h) Frame alternately more than 100 times. Includes positioning, setting, latency time and ECC implementation time (if required)

*7: Measured by performing maximum accesses which means reads of each data block of 00 min 02 sec 00 Frame and 60 min 01 sec 74 Frame alternately more than 100 times. Includes positioning, setting, latency time and ECC implementation time (if required)

(8) Load/Eject	(a) Electrical Load/Eject (Eject Button) (b) Load/Eject by ATAPI command (c) Emergency Eject
(9) Air Flow	Not Required
(10) Acoustic Noise	45 dB (IEC 179 A weighted at 1 m)
(11) Power Supply	+5 V , +12 V (details in Section 7)

3.2. Environmental Conditions

This drive should be used under the conditions listed below.

3.2.1. Temperature and Humidity

(1) Operating Temperature	5 °C to 50 °C
(2) Storage Temperature	-10 °C to 60 °C
(3) Shipping Temperature	-40 °C to 65 °C
(4) Operating Temperature Gradient	11 °C/hour (max)
(5) Storage Temperature Gradient	20 °C/hour (max)
(6) Shipping Temperature Gradient	20 °C/hour (max)
(7) Operating Humidity	8 % to 80 % (wet bulb 27 °C max)
(8) Storage Humidity	5 % to 95 %
(9) Shipping Humidity	5 % to 95 %
(10) Condensation	In all the above conditions there must be no condensation

3.2.2. Dust and Dirt unspecified

3.2.3. Vibration

(1) Operating (1 Oct/min) -----	no hard error ----	
	10 to 500 Hz 2.45 m/s ² [0.25 G] (0-p)	(excluding resonance point)
(2) Non-operating (1 Oct/min) -----	no damage ----	
	5 to 10 Hz 5 mm (p-p)	
	10 to 500 Hz 9.8 m/s ² [1 G] (0-p)	
(3) Shipping (Packaged) (1 Oct/min) -----	no damage ----	
	10 to 25 Hz 9.8 m/s ² [1G] (0-p)	XYZ/30 min each

3.2.4. Atmospheric Pressure and Altitude

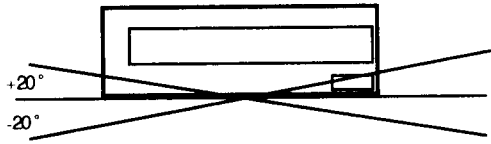
(1) Operating	0 to 3,000 m
(2) Shipping	0 to 12,000 m

3.2.5. Shock

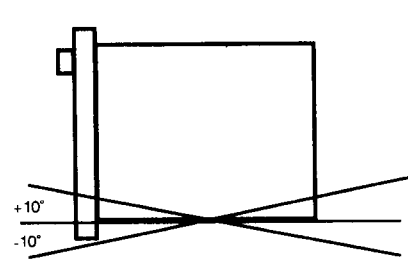
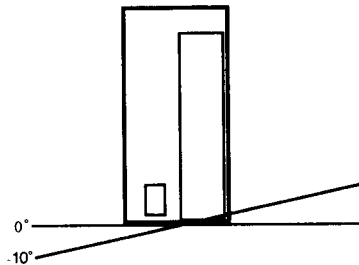
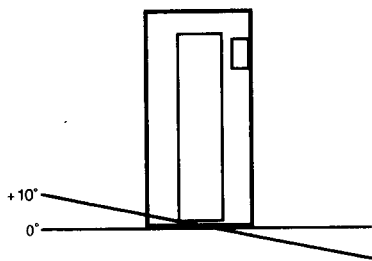
(1) Operating (DVD/CD) -----	no retry -----	
	14.7 m/s ² [1.5 G] (Horizontal)	
	7.8 m/s ² [0.8 G] (Vertical)	
	(Half sine wave 11 ms/10s interval)	
-----	no data loss -----	
	98 m/s ² [10 G]	
	(Half sine wave 11 ms/10s interval)	
(2) Non-operating (with no Disc mounted) -----	no damage ----	
	490 m/s ² [50 G] (Half sine wave 11 ms)	
(3) Drop (Packaged) -----	no damage ----	
(a) Bulk package (15 pcs.)	1 drop at 0.4 m (Bottom side only)	
(b) Bulk package (10 pcs.)	0.6 m drop once for each 6-surfaces, 1-edge and 1-corner	
(c) Individual Package	0.9 m drops once for each	
	6-surfaces, 1-edge and 1-corner	

3.3. Installation Conditions

Mount the drive within 20° of the horizontal positions and within 10° of the vertical positions



a) Horizontal position

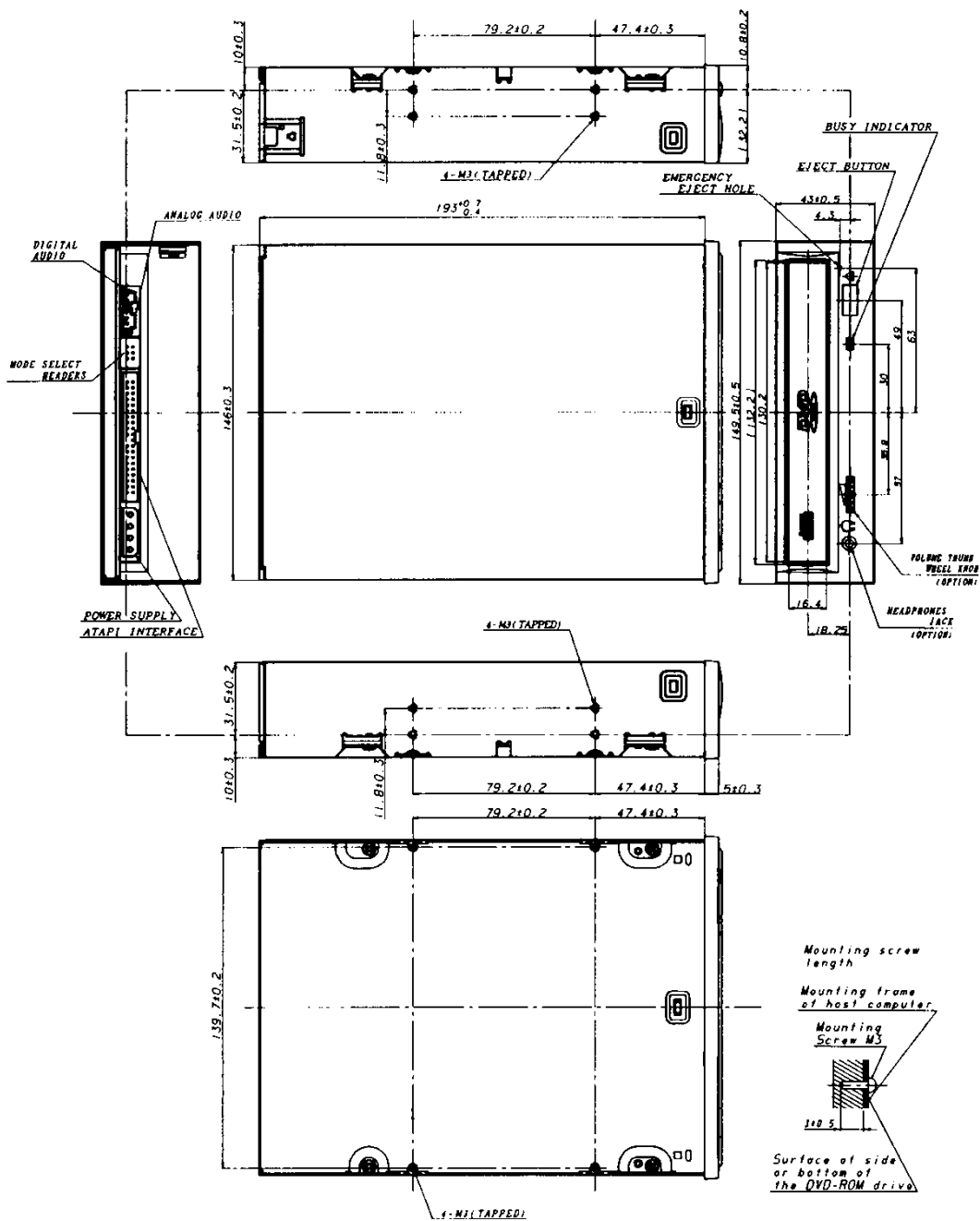


b) Vertical position

Figure 1 Installation position

3.4. Dimension and Mass ---- See Figure 2 for details ----

(1) External Dimensions (W x H x D)	146 mm x 41.5 mm x 193 mm (excluding bezel)
(2) Mass (Weight)	0.87 kg (Net) 1.3 kg (Individual packaged) 10.0 kg (Bulk Packaged 10pcs.) 14.5 kg (Bulk Packaged 15pcs.)



(Unit:mm)

Figure 2 External Dimensions (Unit: mm)

3.5. Reliabilites

3.5.1. Error Rate

(1) Hard Read Error Rate (Byte Error Rate) ----- Allowing 5 Retries(default) -----	
DVD:	10 ⁻¹⁵ Max
CD:	Mode 1:10 ⁻¹⁵ Max
	Mode 2:10 ⁻¹² Max
(2) Seek Error Rate --- Allowing 5 Retries (default)	10 ⁻⁶ Max

3.5.2. MTBF

Assumptions: Power On Hours	100,000 h
On/Off Cycles	5,436 h/year
Number of Access	313 cycles/year
Operating Duty Cycle	600,000 accesses/year
	20 % of Power On Time (Reading/Seeking)

3.5.3. MTTR

0.5 h

3.5.4. Drive Life

	15,000 h or 5 years (earlier one)
(1) Load/Eject	10,000 times or more
(2) Interface connector Attach/Detach	20 times or more
(3) DC Power connector Attach/Detach	20 times or more

4. Configuration

See Figure 3 for details of the configurations

4.1. Electrical Circuits

- (1) Tray Eject Switch and Eject Detection Switch
- (2) Optical Pickup Servo Drive Circuit
- (3) Feed Motor Drive Circuit
- (4) Laser Diode Control Circuit
- (5) 8-16 Modulated data Demodulator, Error Correction Circuit and Disc Motor Control Circuit
Copy Protector Circuit (DVD)
(System Control Circuit, Digital to Analog Converter)
- (6) EFM Demodulator, Error Correction Circuit and DA converter Circuit (CD)
- (7) IDE/ATAPI Control and CD - ROM Error Correction Circuit

4.2. Optical Pickup

:1-Lens and 2-Laser System
Semiconductor Laser and 1-beam System (DVD)
Semiconductor Laser and 3-beam System (CD)

4.3. Spindle Motor

Brushless DC Motor

4.4. Feed Motor

DC Motor

4.5. Tray Load/Eject Motor

DC Motor

DVD-ROM DRIVE MODEL SD-M1302 BLOCK DIAGRAM

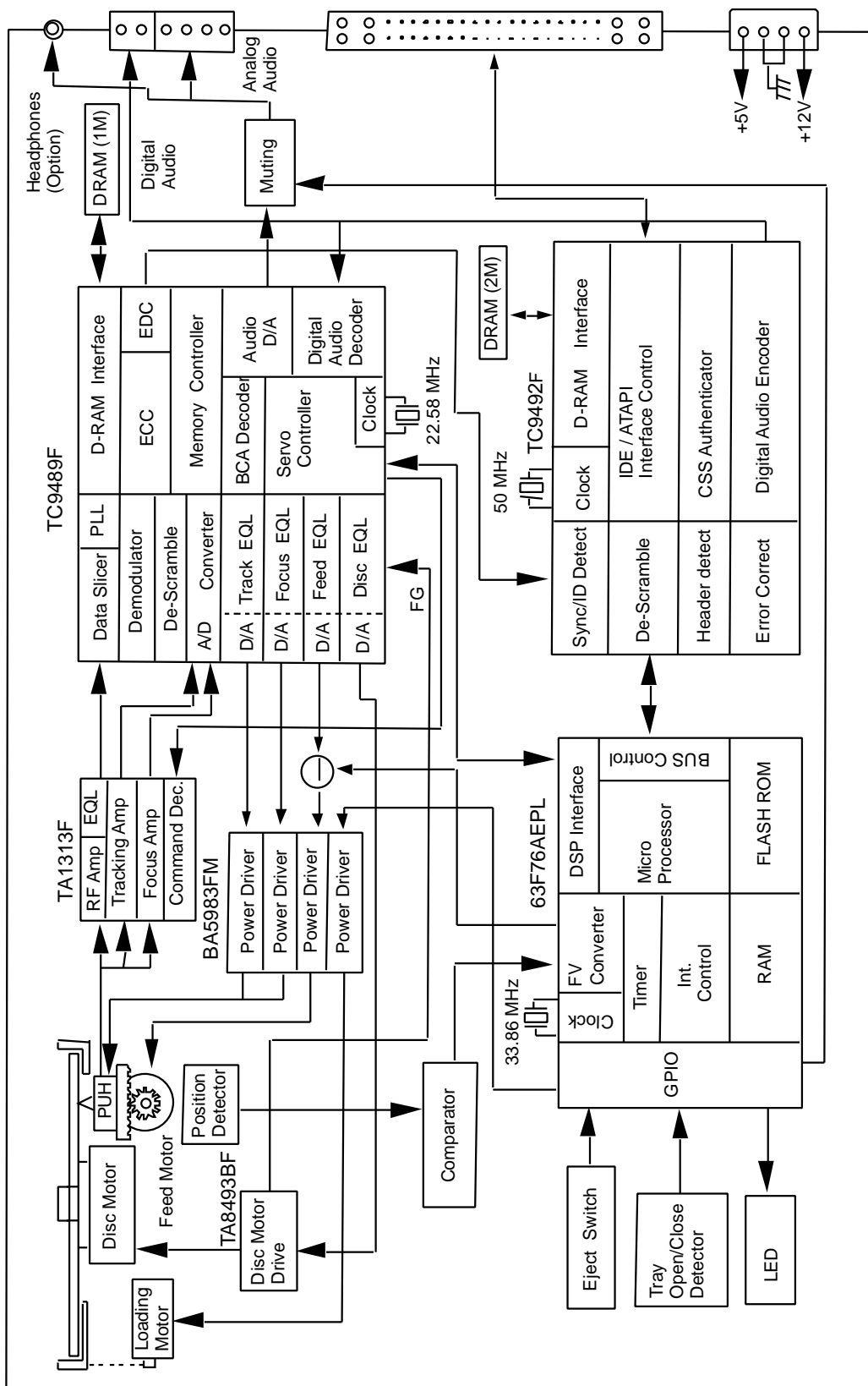


Figure 3 Configuration

5.Functions

5.1. Disc Data Configurations

5.1.1. DVD-ROM Data Configurations

Figure 4 shows how data is constructed in the case of dual layer/parallel track data DVD disc. The DVD spec defines the single layer, the dual layer/opposite and parallel track disc, that the DVD-ROM drive supports. For details refer to DVD Book Part 1.

1 block=1/676 s

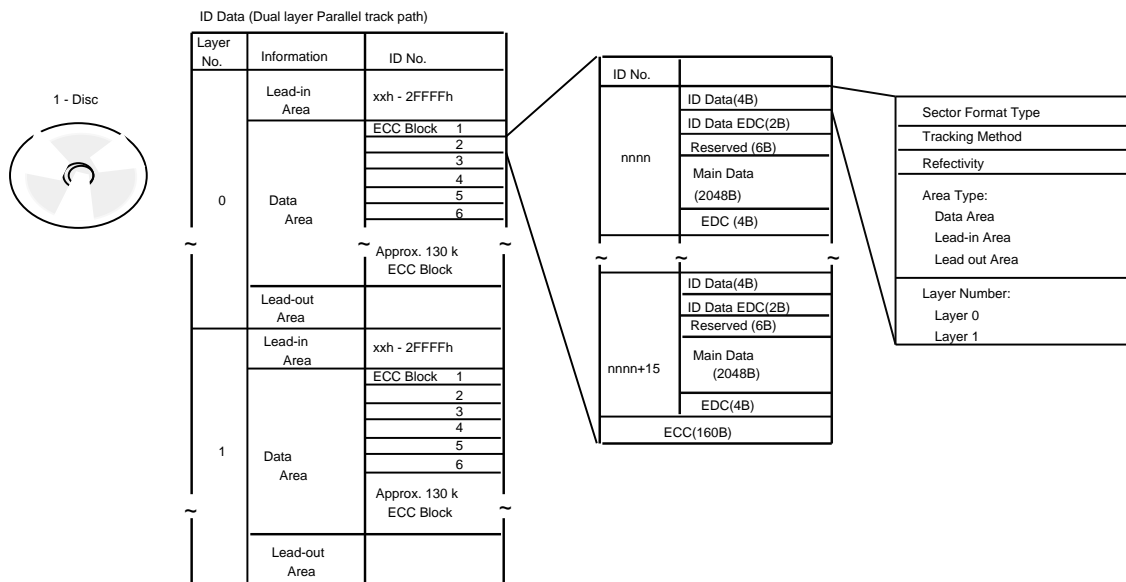


Figure 4 DVD-ROM Disc Data Configuration

5.1.2. CD-ROM Data Configurations

Figure 5 shows how the data is structured in program units

1 block=1/75 s

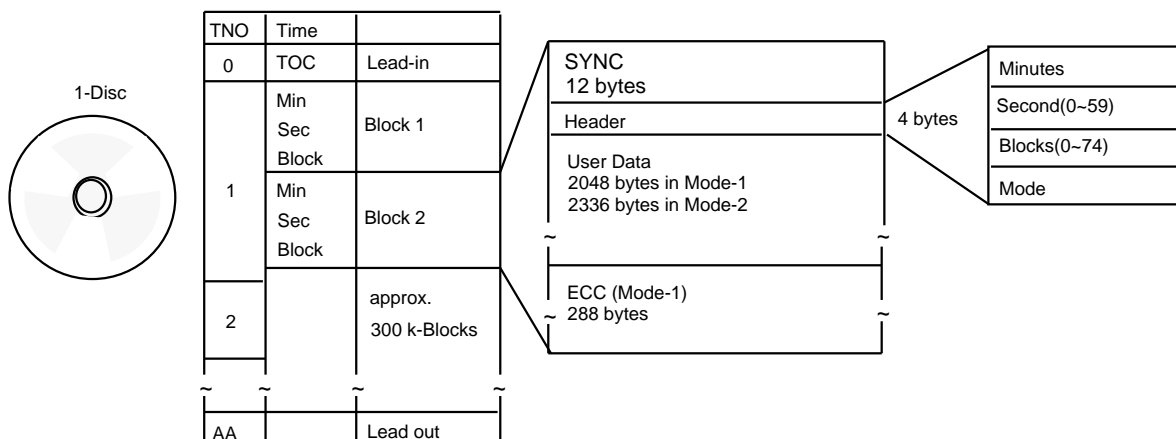


Figure 5 CD-ROM Disc Data Configuration

5.2. Power ON/OFF Timing

Figure 6 shows the initialization sequence

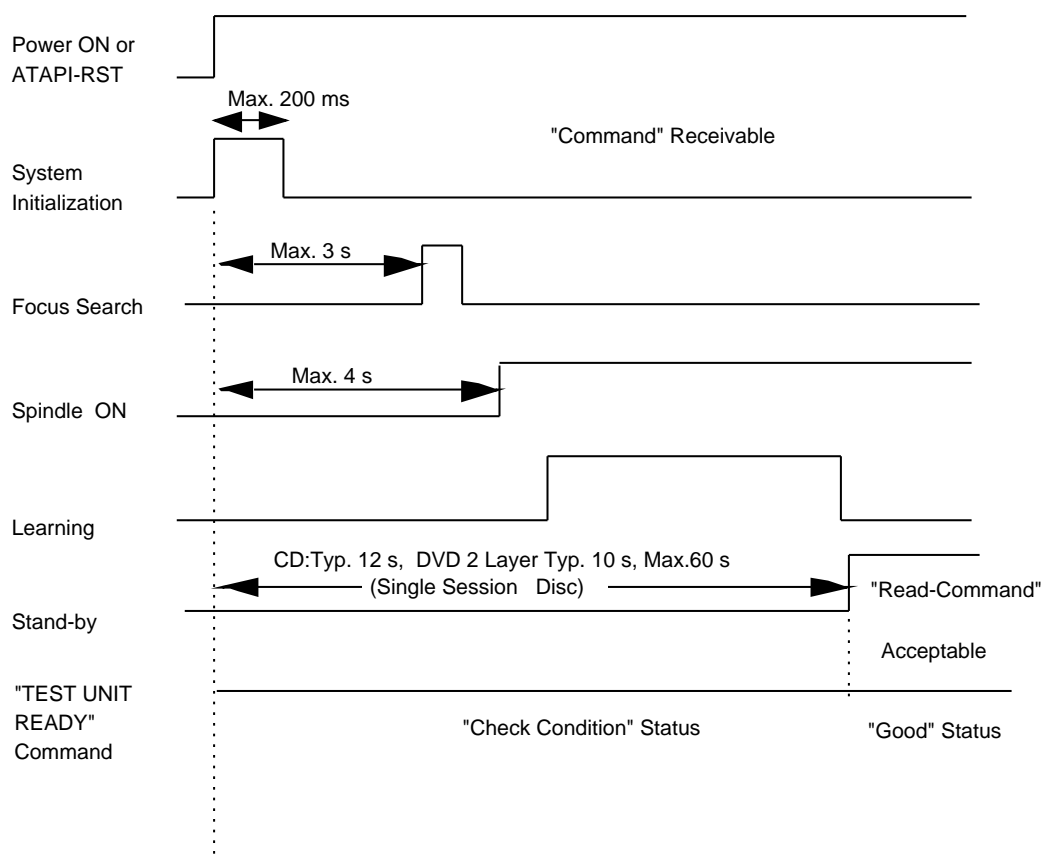


Figure 6 Initialization Sequence

6. Interface

- (1) The interface is based on X3T10/2008D Revision 6 (dated Oct. 26,1995) , SFF-8020i (Small Form Factor Committee Specification of ATA-Packet Interface for CD-ROMs) Revision2.6 (Nov. 27, 1995), SFF-8090 Ver. 3 Revision 1.00 ('99-2-10) and X3T13/D96153 Revision 4 (Mar. 18, 1997).
- (2) 56 (ATAPI, ATA) commands are usable.
- (3) The 256 KByte data buffer handles both high speed and low speed data transmission.
- (4) The largest block size on playback is 2,647 Bytes.
The data length for each block is changeable by command.

6.1. I/O cable

Table1 shows the cable parameters.

	Min	Max
Cable length		0.46 m
Driver IoL sink current for 5 V operation	12 mA	
Driver IoL sink current for 3.5 V operation	8 mA	
Driver IoH sink current		-400 μ A
Driver capacitive loading		25 pF

Table 1 Cable parameters

6.2.Signal summary

The physical interface consists of single ended TTL compatible receivers and drivers communicating through a 40P-connector as shown in Figure 12 "Interface connector".

6.2.1. Signal Specification

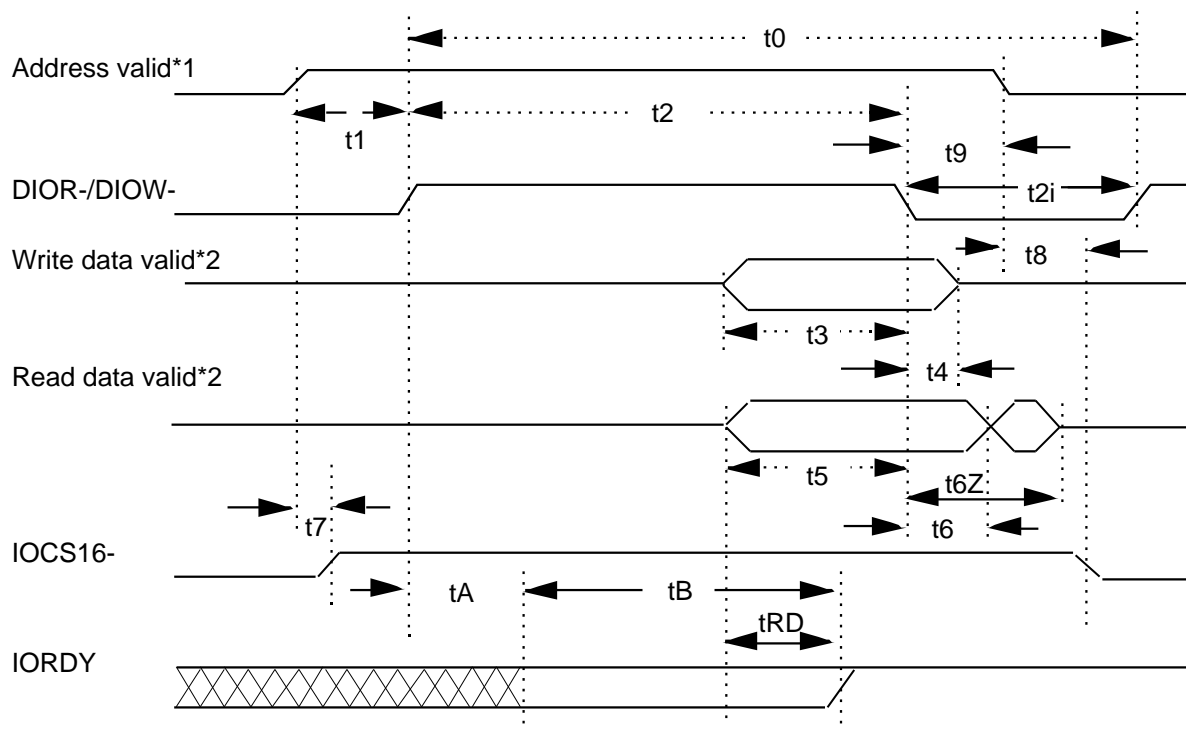
Figure 7 shows the Signal Specifications

Sig. Name	Type	Receivers/Drivers Characteristics without External pullup Resistor				NOTE	
			Min	Max	Condition		
HD0 - HD15 /DASP /PDIAG		VOH	Voltage Output High	V _{dd} -0.4 V		Bidirectional Rx=infinity Rs1=0 OHM Rs2=33 OHM HD0-HD15 Rx=10 kOHM Rs1=0 OHM Rs2=0 OHM /PDIAG, /DASP	
		VOL	Voltage Output Low		0.4 V		IOL=12 mA
		VIH	Input HIGH Voltage	2.0 V			TTL
		VIL	Input LOW Voltage		0.8 V		TTL
		ILI	Input leakage Current	-30 μA	-150 μA		Pullup Resistor(Ri)
		IOL	Driver sink current	12 mA			
		ILO	Output Leakage Current	-30 μA	-150 μA		Pullup Resistor(Ri)
		CI	Input Capacitance		8 pF		
		CO	Output Capacitance		8 pF		
		/IOCS16		VOL	Voltage Output Low		
IOL	Driver sink current			24 mA			
ILO	Output Leakage Current			-30 μA	-150 μA	Pullup Resistor(Ri)	
CO	Output Capacitance				8 pF		
IORDY		VOH	Voltage Output High	2.4 V		Rs=22 OHM	
		VOL	Voltage Output Low		0.4 V		IOL=24 mA
		IOL	Driver sink current	24 mA			
		ILO	Output Leakage Current	-10 μA	10 μA		
		CO	Output Capacitance		8 pF		
/HDRQ /INTRQ		VOH	Voltage Output High	V _{dd} -0.4 V		Rs=22 OHM /INTRQ /HDRQ	
		VOL	Voltage Output Low		0.4 V		IOL=12 mA
		IOL	Driver sink current	12 mA			
		ILO	Output Leakage Current	-10 μA	10 μA		
		CO	Output Capacitance		8 pF		
/HWR /HRD HA0 - HA2 /HCS1/HCS3 /HDAK		VIH	Input HIGH Voltage	2.0 V		Rx=infinity Rs=82 OHM /HWR, /HA0-2, /HDAK Rx=infinity Rs=470 OHM /HRD Rx=10 kOHM Rs=220 OHM /HCS1,/HCS3	
		VIL	Input LOW Voltage		0.8 V		TTL
		ILI	Input leakage Current	-30 μA	-150 μA		Pullup Resistor(Ri)
		CI	Input Capacitance		8 pF		
RESET		VIH	Input HIGH Voltage	3.5 V			
		VIL	Input LOW Voltage		1.5 V		
		ILI	Input leakage Current	-30 μA	-150 μA		Pullup Resistor(Ri)
		CI	Input Capacitance		8 pF		

Figure 7 Signal Specifications

6.2.2. Timing of Host Interface (PIO)

Figure 8 shows the Host Interface Timings.



*1:Device Address consists of signals CS0-, CS1-, and DA2-0

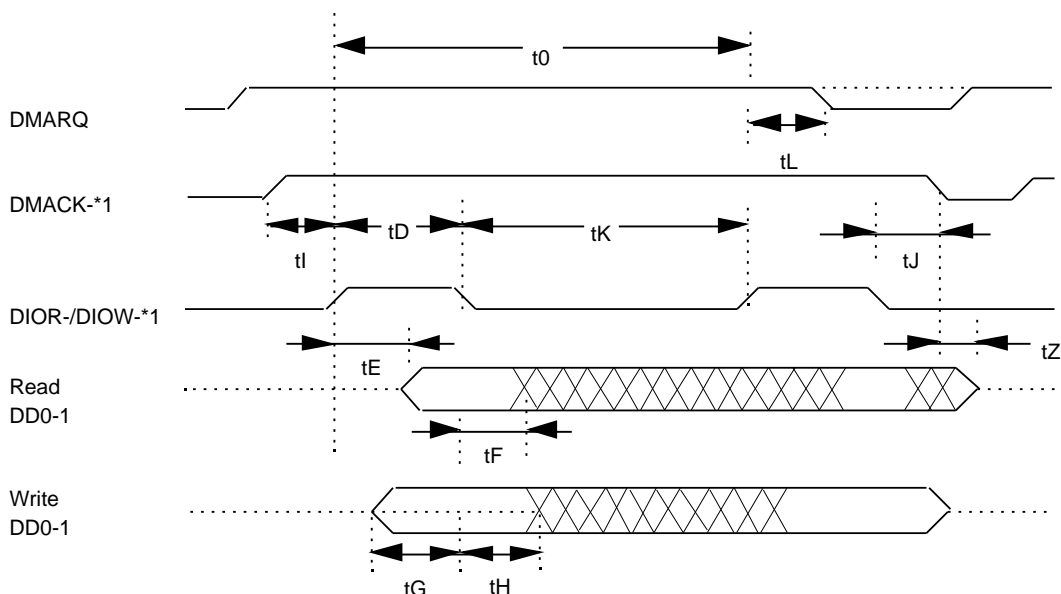
*2:Data consists of DD0-15 (16-bit) or DD0-7 (8-bit)

	PIO timing parameters	min(ns)	max(ns)	Min Time (ns)	Max Time (ns)
t0	Cycle time			120	
t1	Address valid to DIOR-/DIOW-setup			25	
t2	DIOR-/DIOW- pulse wide			70	
t2i	DIOR-/DIOW- recovery time			25	
t3	DIOW- data setup			20	
t4	DIOW- data hold			10	
t5	DIOR- data setup			20	
t6	DIOR- data hold			5	
t6Z	DIOR- data tristate				30
t7	Addr valid to IOCS16- assertion				30
t8	Addr valid to IOCS16- negation				30
t9	DIOR-/DIOW- to address valid hold			10	
tRD	Read Data Valid to IORDY active			0	
tA	IORDY setup time				35
tB	IORDY pulse wide				1250

Figure 8 Host Interface Timing

6.2.3. Timing of Host Interface (DMA Multi)

Figure 9 shows the Host Interface DMA multi word Timings



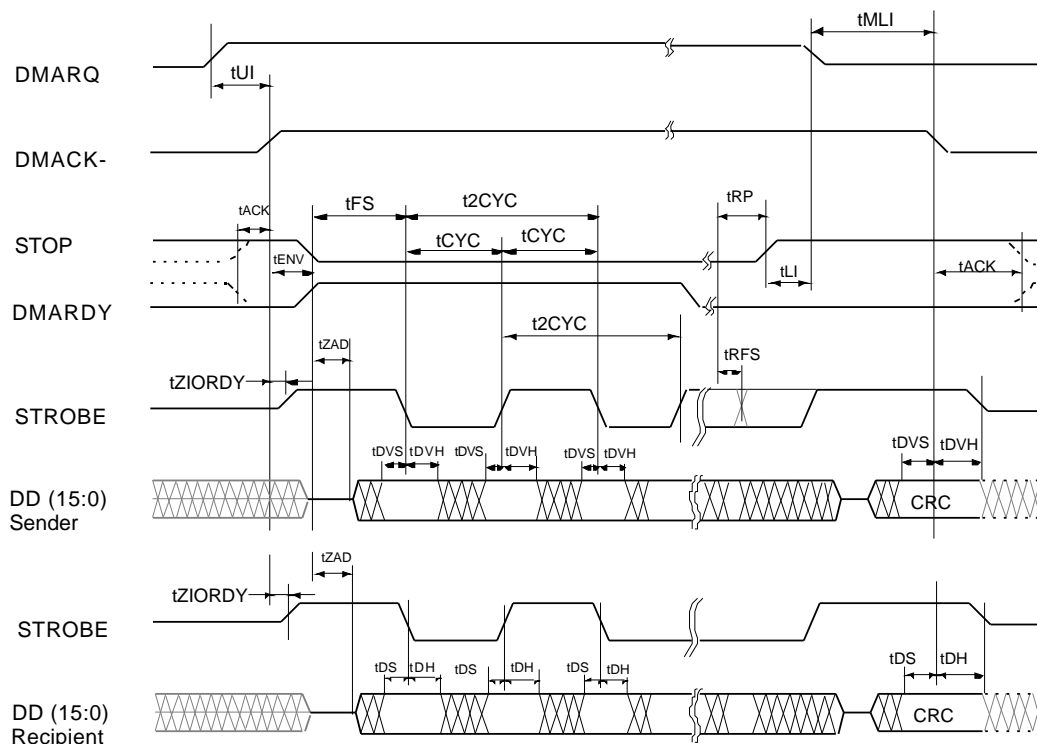
*1: In all timing diagrams, the low line indicator negated, and the upper line indicators asserted.

	Multi word DMA timing parameters min(ns) max(ns)	Min time (ns)	Max time (ns)
t0	Cycle time	120	
tC	DMACK to DMREQ delay		---
tD	DIOR-/DIOW- 16-bit	70	
tE	DIOR- data access		---
tF	DIOR- data hold	5	
tZ	DMACK- to tristate		25
tG	DIOR/DIOW- data setup	20	
tH	DIOW- data hold	10	
tI	DMACK to DIOR-/DIOW- setup	0	
tJ	DIOR-/DIOW- to DMACK hold	5	
tKr	DIOR- negated pulse width	25	
tKw	DIOW- negated pulse width	25	
tLr	DIOR- to DMREQ delay		35
tLw	DIOR- to DMREQ delay		35

Figure 9 Host Interface Timing (DMA Multi)

6.2.4. Timing of Host Interface (Ultra DMA)

Figure 13 shows the Host Interface Ultra DMA word Timings



In all timing diagrams, the low line indicator negated, and the upper line indicators asserted.

	Ultra DMA Mode 2 timing parameters	min (ns)	max (ns)	Min time (ns)	Max time (ns)
t2CYC	Typical Sustained Average Cycle time			120	
	Two cycle time (from rising edge to next rising edge of from falling edge to next falling edge of STROBE)			117	
tCYC	Cycle time allowing			55	
tDVS	Data valid Setup time			34	
tDVH	Data valid Hold time			6	
tUI	Unlimited Interlock time			0	
tACK	Setup and Hold Time for DMACK-			20	
tENV	Envelope time			20	70
tZAD	Minimum Delay time for Driver			0	
tZORDY	Minimum time for DMACK-			20	
tFS	First STROBE time			0	170
tRFS	Ready-to-Final STROBE time				50
tRP	Ready-to-Pause time			100	
tLI	Limited Interlock time			0	150
tMLI	Interlock with minimum			20	
tDS	Data setup time (at recipient)			7	
tDH	Data hold time (at recipient)			5	

Figure 10 Host Interface Timing (Ultra DMA)

6.3. Connector

Figure 11 shows the mixture connector (Interface/Power supply)

Table 2 shows Interface connector pin assignment.

power supply connector

- PIN #1 : 12 V
- PIN #2 : GND
- PIN #3 : GND
- PIN #4 : +5 V

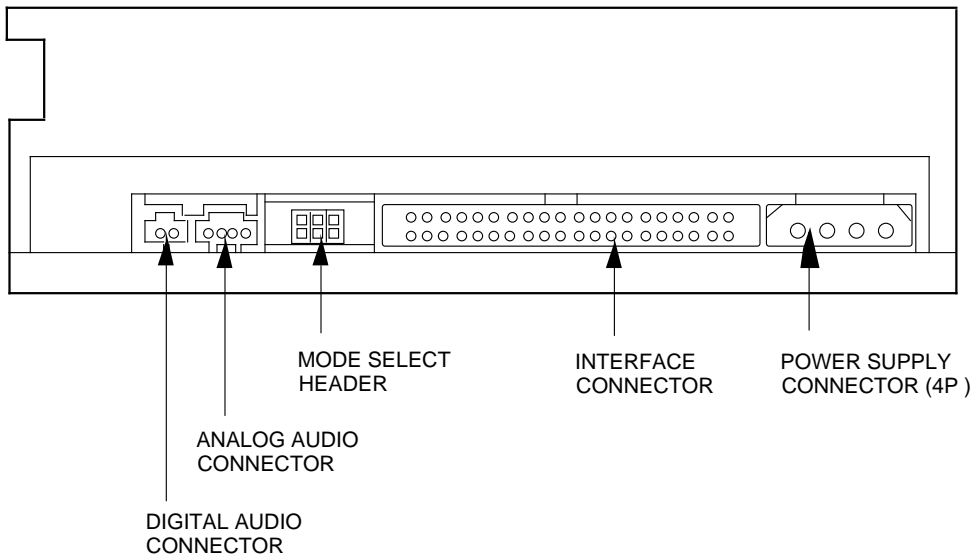
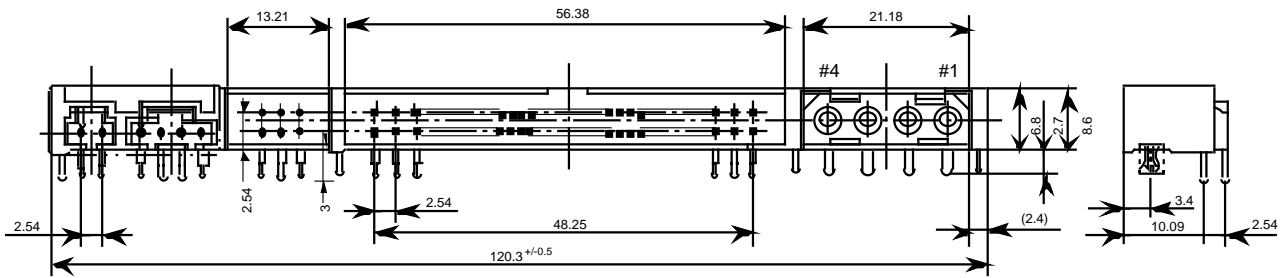


Figure 11

PIN NO.	I/O	SIGNAL NAME	HOST SIGNAL NAME
1	I	Reset -	Host Reset
2	-	GND	
3	I/O	HD7	Host Data Bus BIT 7
4	I/O	HD8	Host Data Bus BIT 8
5	I/O	HD6	Host Data Bus BIT 6
6	I/O	HD9	Host Data Bus BIT 9
7	I/O	HD5	Host Data Bus BIT 5
8	I/O	HD10	Host Data Bus BIT 10
9	I/O	HD4	Host Data Bus BIT 4
10	I/O	HD11	Host Data Bus BIT 11
11	I/O	HD3	Host Data Bus BIT 3
12	I/O	HD12	Host Data Bus BIT 12
13	I/O	HD2	Host Data Bus BIT 2
14	I/O	HD13	Host Data Bus BIT 13
15	I/O	HD1	Host Data Bus BIT 1
16	I/O	HD14	Host Data Bus BIT 14
17	I/O	HD0	Host Data Bus BIT 0
18	I/O	HD15	Host Data Bus BIT 15
19	-	GND	
20	-	(KEYPIN)	
21	O	HDRQ	DMA Request
22	-	GND	
23	I	HWR-,STOP	Host I/O Write
24	-	GND	
25	I	HRD-, HDMARDY-HSTROBE	Host I/O Read
26	-	GND	
27	O	IORDY, DDMARDY-DSTROBE	I/O Channel Ready
28	-	CSEL	Cable Select
29	I	HDAK-	DMA Acknowledge
30	-	GND	
31	O	INTRQ	Host Interrupt Request
32	O	IOCS16-	Host 16 BIT I/O
33	I	HA1	Host Address Bus BIT 1
34	I/O	PDIAG-	Passed Diagnostics
35	I	HA0	Host Address Bus BIT 0
36	I	HA2	Host Address Bus BIT 2
37	I	HCS1-	Host CHIP Select 0
38	I	HCS3-	Host CHIP Select 1
39	I/O	DASP-	Drive Active/Drive 1 Present
40	-	GND	

Table 2 Interface Connector PIN Assignment

6.4. Support Command List

ATAPI Packet Command for DVD-ROM Devices

No	OP Code	Command Description
1	00h	Test Unit Ready
2	01h	Rezero
3	03h	Request Sense
4	12h	Inquiry
5	1Bh	Start Stop Unit
6	1Ch	Receive Diagnostics Results
7	1Dh	Send Diagnostic
8	1Eh	Prevent / Allow Medium Removal
9	23h	Read Format Capacities
10	25h	Read C / DVD Capacity
11	28h	Read (10)
12	2Bh	Seek
13	42h	Read Subchannel
14	43h	Read TOC / PMA / ATIP
15	44h	Read Header
16	45h	Play Audio (10)
17	46h	Get Configuration
18	47h	Play Audio MSF
19	49h	Play Audio Track Relative (10)
20	4Ah	Get Event Status Notification
21	4Bh	Pause / Resume
22	4Eh	Stop Play / Scan
23	51h	Read disc Information
24	52h	Read Track / Rzone Information
25	55h	Mode Select (10)
26	5Ah	Mode Sense (10)
27	A2h	Send Event
28	A3h	Send Key
29	A4h	Report Key
30	A5h	Play Audio (12)
31	A7h	Set Read Ahead
32	A8h	Read (12)
33	A9h	Play Audio Track Relative (12)
34	ACh	Get Performance
35	ADh	Read DVD Structure
36	B6h	Set Streaming
37	B9h	Read CD MSF
38	BAh	Scan
39	BBh	Set CD Speed
40	BDh	Mechanism Status
41	BEh	Read CD

ATA Command for ATAPI DVD-ROM Devices

No.	OP Code	Command Description
-	00h	Nop
1	08h	ATAPI Soft Reset
2	20/21h	Read Sector (s)
3	90h	Execute Drive Diagnostics
4	A0h	ATAPI Packet Command
5	A1h	ATAPI Identify Device
6	E0h	Standby Immediate
7	E1h	Idle Immediate
8	E2h	Standby
9	E3h	Idle
10	E5h	Check Power Mode
11	E6h	Sleep
12	ECh	ATA Identify Device
13	EFh	Set Feature

7. Power Requirements

7.1. Source Voltage +5 V +/-5 % (Operating) +12 V +/-5 % (Operating)
+/-8 % (Start up) +/-8 % (Start up)

7.1.1. Spike 100 mV (p-p) Max.

7.1.2. Ripple 100 mV (p-p) Max.

7.2. Current Drain (Typical value)

	+5 V	+12 V
7.2.1. Sleep	50 mA (DVD/CD)	3 mA (DVD/CD)

7.2.2 Standby (Laser off, Motor off)	80 mA (DVD/CD)	3 mA (DVD/CD)
--------------------------------------	----------------	---------------

7.2.3. Continuous Read (Data/Audio)	560 mA (DVD) 510D mA (CD)	270 mA (DVD) 800 mA (CD)
-------------------------------------	------------------------------	-----------------------------

7.2.4. Idle (Laser on, Motor on)	410 mA (DVD) 360 mA (CD)	110 mA (DVD) 160 mA (CD)
----------------------------------	-----------------------------	-----------------------------

7.2.5. Average (20% Random Access)	520 mA (DVD) 480 mA (CD)	290 mA (DVD) 870 mA (CD)
------------------------------------	-----------------------------	-----------------------------

7.2.6. Maximum (100% Random Access)	540 mA (DVD) 500 mA (CD)	430 mA (DVD) 900 mA (CD)
-------------------------------------	-----------------------------	-----------------------------

7.2.7. Peak in executing Access (Exclude Spike Current)	650 mA (DVD) 550 mA (CD)	880 mA (DVD) 1,450 mA (CD)
--	-----------------------------	-------------------------------

*Spike: Less than 1 ms of duration

8.CD Audio (Test condition: Ordinary temperature)

8.1. Analog Out --- in case of the attenuator is set at 0 dB by the command ---

- | | |
|---------------------------|-------------------------------------|
| (1) Output Level | 0.76 V (rms Typ) |
| (2) Type | Unbalanced |
| (3) Load Impedance | 47 kOHM min |
| (4) Frequency Response | 20 Hz to 20 kHz +/-3 dB |
| (5) Distortion | 0.04 % Max. (at 1 kHz w/20 kHz LPF) |
| (6) Signal to Noise Ratio | 80 dB Typ (IEC 179 A-weighted) |

8.2. Digital Out

- | | |
|--------------------|------------|
| (1) Output Level | 0.65 V p-p |
| (2) Type | Unbalanced |
| (3) Load Impedance | 75 OHM |

8.3. Connector

4P connector and 2P connector (Use matching housing, Part No. 70066, made by Molex Corporation or equivalent.)

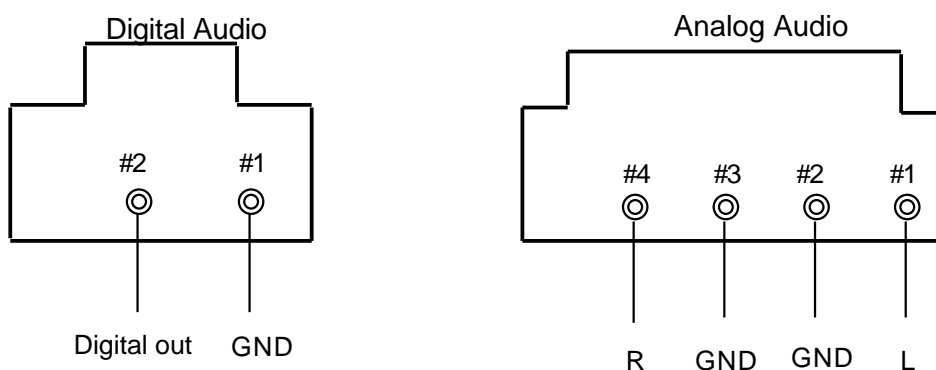


Figure 12

8.4. Audio Modes

- (1) 16 Modes including 'Stereo', 'Lch Mono', 'Rch Mono' and 'Mute' are selectable by command. Default mode is 'Stereo'. Audio out is automatically muted in the digital data area and seek state.
- (2) 16 Steps of attenuation level for the Audio Output is selectable by command. Default level is 0 dB.

8.5. Headphones Output (Option).....in case of the attenuator set at 0 dB by the command.....

- | | |
|-----------------------------|------------------------------------|
| (1) Output Level | 0.72 V (rms Typ) |
| (2) Level Adjust Controller | Continuous Type (Thumb Wheel Knob) |
| (1) Load Impedances | 100 OHM (Nominal) |

8.5.1. Connector

3.5 mm dia. Stereo Headphones Jack.

9. Device Configuration Jumper

9.1. Device configuration jumper (MODE SELECT)

The device configuration jumper is a 6-pin, right angle and header (Molex P/N70203 or equivalent) with three marked positions.

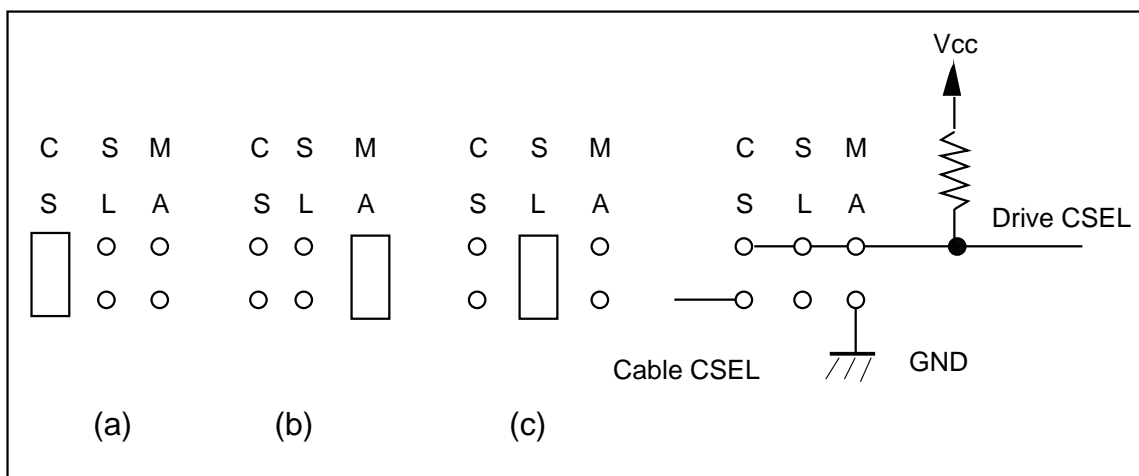


Figure 13

(a) Use CS (CSEL)

The device shall use the host interface signal CSEL to configure the device.

(b) MA (Master): Default Position

The device shall use for the Master.
Default Mode is 'MA'.

(c) SL (Slave)

The device shall use for the Slave.

10. Busy Indicator

The LED of Front Bezel indicates the drive status. (Busy Indicator)

(1) After Tray is closed, Busy Indicator start blinking at 0.8 s intervals, and then -----

(1-1) Turns off when the drive in the 'Idle' status.

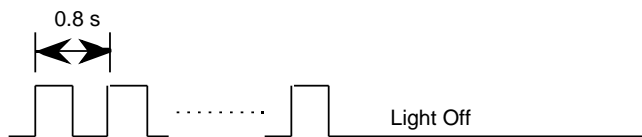


Figure 14 Idle

(1-2) Continuously off when no disc is mounted.

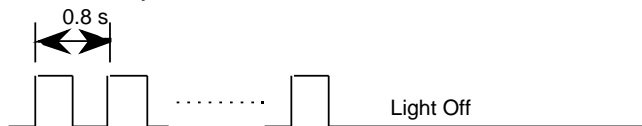


Figure 15 No disc

(1-3) Continuously on when media has problem

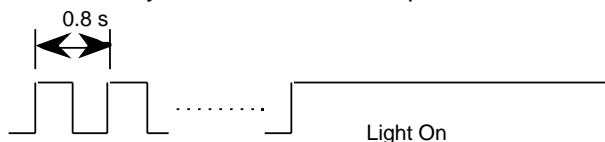


Figure 16 Media Problem

(2) When playing an audio track, Busy Indicator is blinking at 1.6 s intervals.

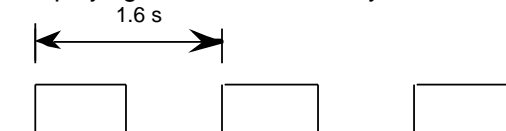


Figure 17 CD-Audio playback

(3) When performing 'Data Access' and during 'Data Transfer' Busy Indicator keeps turn On.

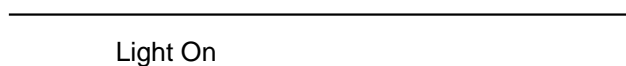


Figure 18 Data Access and Data Transfer

11.Connection

11.1. Power Supply Cable

(1) Housing	AMP JAPAN P/N 1-480424-0 or equivalent
(2) Contact	AMP JAPAN P/N 170148-2 or equivalent
(3) Cable Length	AWG 28 Max. 2 m

11.2. Interface Cable

(1) Connector	ATAPI specification
(2) Cable	40 core type
Specific Impedance	100 OHM +/-10 % (without shield)
Length	Max. of 0.46 m for total ATAPI bus length

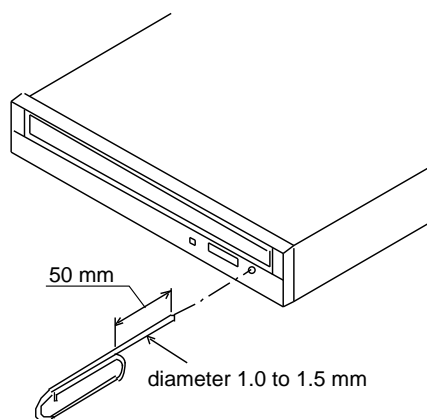
11.3. Audio Cable

(1) Capacitance	Unbalanced and shielded
(2) Length	Less than 1000 pF Max. 3 m

12.Emergency Eject

Execute following procedure only in the case of emergency (Tray will not eject and disc can not be removed although pressing Eject Button).

- (1) Turn the drive supplying power off.
- (2) Insert solid bar (like paper clip) into Emergency Eject hole and push as shown in Fig.20. Then Tray will be ejected.
- (3) After removed the disc, gently push Tray to close.



Figurer 19 Insert the bar

13. Safety Standards/Agency Approvals

(1) Safety	EN60950 UL 1950 CAN/CSA-22.2 No.950
(2) Laser	FDA CFR21, EN60825
(3) CE	EN50081-1 : 1992 [Residential, commercial & light industry] EN55022 : 1998 [Class B] EN55024 : 1998 [Information technology equipment-Immunity characteristics - Limits and methods of measurement] EN61000-4-2+A1 : 1995+1998 [CD:4 kV, ID: 4 kV, AD:8 kV] EN61000-4-3 : 1996 [3 V/m, 80-1000 MHz, 1 kHz 80 % AM] EN61000-4-4 : 1995 [AC-line: 1 kV, f: 5 kHz, Polarity: +/-] EN61000-4-5 : 1995 [AC-line: 1 kV/2 kV, Polarity: +/-] EN61000-4-6 : 1996 [3 V, 0.15-80 MHz, 80 % AM] EN61000-4-8 : 1993 [3 A/m, 50 Hz] EN61000-4-11 : 1994 [30 % 25, >95 % 0.5/250]
(4) EMI (Model with Headphones Jack)	FCC 15J-B

14. Electrostatic Discharge

Standard	IEC801-2
(1) Operating	8 kV or less
(2) Damage including	15 kV or more

15. Accessories

1-Short Jumper
(installed in'MA' header)
1-Safety Instruction Manual

16. Packaging

(1) 15 unit in a bulk package	24 bulk packs on one pallet. *All transportation is allowed with pallet. (Transportation with bulk package is not allowed.)
(2) 10 unit in a bulk package	28 bulk packs on one pallet. (Transportation with bulk package is allowed.)

17. CE Declaration of conformity

Please refer to attached Annex 1.

TOSHIBA

TOSHIBA EUROPE GMBH

EU-Declaration of Conformity

Product: DVD-ROM Drive

Manufacturer(s): Toshiba Corporation
1-1, Shibaura 1-chome, Minato-ku, Tokyo 105-8001 Japan

See page 2 for other locations

Model: SD-M1302

Options: None

Toshiba declares that the above mentioned product(s) with or without the listed options comply to the EU-Directives and standards as listed on page 2.

Last two digits of the year in which the CE mark affixed : 98

Responsible for CE-marking: Toshiba Europe GmbH

Signed by: Mr. H.Nonaka, President of Toshiba Europe GmbH

Place: D-41460 Neuss

Date: July 07, 1999

Signature: _____

This declaration certifies compliance with the listed directives, but does not constitute an assurance of characteristics.

The safety information in the supplied product documentation must be observed.

Document No.:	YEA-R058	Page:	1 of 2
[History if issue]	Issued : Jun. 28, 1999		
	Revision A :	Ref.:	
	Revision B :	Ref.:	
	Revision C :	Ref.:	
	Revision D :	Ref.:	

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 TELEFON: (02131) 158-01
 TELFAX : (02131) 158-341

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Annex 1

EU-Declaration of Conformity

ED-Directive	Related Standard	Issue	Level/Test condition
899/336/EEC (EMC Directive)	EMC-emission: EN50081-1 EN55022 EN55024	1992 1998 1998	Residential, commercial & light industry Class B Information technology equipment-immunity characteristics-Limits and methods of measurement
	EN61000-4-2+A1 EN61000-4-3	1995 +1998 1996	CD: 4 kV, ID: 4 kV, AD: 8 kV 3 V/m, 80-1000 MHz, 1 kHz 80 % AM
	EN61000-4-4	1995	AC-line: 1 kV, f: 5 kHz, Polarity: +/-
	EN61000-4-5	1995	AC-line: 1 kV/2 kV, Polarity: +/-
	EN61000-4-6	1996	3 V, 0.15-80 MHz, 80 % AM
	EN61000-4-8	1993	3 A/m, 50 Hz
	EN61000-4-11	1994	30 % 25, >95 % 0.5/250

Product/Options	Model	Related EU-Directive 89/336/EEC
DVD-ROM Drive	SD-M1302	X

Manufacturer(s) Location	Address
Toshiba Multi Media Devices Co, Ltd Toshiba Misawa Media Devices Co, Ltd EMS Corp. Hokuto Communication Industrial Co., Ltd. Yuzawa Denshi Kogyo Co., Ltd. Tsugaru Technica Co., Ltd. Emusu Itayanagi Co., Ltd. Toshiba Information Equipment (Philippines) Inc Integrated Microelectronic Inc. EMS Kizukuri Corp. EMS Fukaura Co., Ltd	19 Minase, Fukihata Goshogawara-shi, Aomori 037-0003 Japan 3-31-2779, Minami-cho, Misawa-shi, Aomori-ken 033-0036 Japan 4-5 Shoubu, Ubayachi Goshogawara-shi, Aomori 037-0015 Japan 207 Aza Koamon, Rokugo, Rokugo-machi, Senboku-gun, Akita 019-1404 Japan 257 Nakano Yuzawa-shi, Akita 012-0041 Japan 81-87 Iwai, Aiuchi, Shiura-machi, Kitatsugaru-gun, Aomori, 037-0401 Japan 13-10, Matsumoto, Tsuji, Itayanagi, Kita-Tyugaru-gun, Aomori, 038-3645 Japan 103 East Main Avenue Extension, Special Export Processing Zone, Laguna Technopark, Binan, Laguna Philippines North Science Avenue Laguna Techno Park Inc. Binan, Laguna Philippines 1-2 Aza-Miyazaki, Kizukuri-machi, Nishi-Tugaru-gun Aomori 038-3157 Japan 24-1 Aza Azumazawa, Ohaza Fukaura, Fukaura-machi, Nishi-Tsugaru-gun, Aomori, 037-0401 Japan

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Page: 2 of 2
Revision: -----

Deviation List

Page	Item	Rev # 0.5	Rev # 1.0
1	1. Introduction	This drive is new generation drive... .. as 105 ms (DVD)/ 80 ms (CD)...	This drive is new generation drive... .. as 95 ms (DVD)/ 80 ms (CD)...
3	2. Features	(2) Fast 105 ms..... (3) Fast 95 ms Random Access Time (DVD) (25) 4X Sampling (29) Low Power Consumption (Ave: (CD) TBD W, (DVD) TBD W, Max : (CD) TBD W, (DVD) TBD W Stand-by TBD W)	(2) Fast 95 ms..... (3) Fast 80 ms Access Access Time (CD) (25) 8X Sampling (29) Low Power Consumption (Ave: (CD) 12.8 W, (DVD) 6.1 W, Max : (CD) 13.3 W, (DVD) 7.9 W Stand-by 0.4 W)
5	(5) Access Time Average Random Access Time	DVD: 105 ms	DVD: 95 ms
2	Figure 2	-----	All of change
16	6.2.4. Timing of...(Ultra DMA)	-----	All of change
20	7.2. Current Drain 7.2.1. Sleep 7.2.2 Standby 7.2.3. Continuous Read 7.2.4. Idle 7.2.5. Average 7.2.6. Maximum 7.2.7. Peak in	+5V +12V TBD mA (DVD/CD) TBD mA (DVD/CD) TBD mA (DVD/CD) TBD mA (DVD/CD) TBD mA (DVD) TBD mA (DVD) TBD mA (CD) TBD mA (CD) TBD mA (DVD) TBD mA (DVD) TBD mA (CD) TBD mA (CD) TBD mA (DVD) TBD mA (DVD) TBD mA (CD) TBD mA (CD) TBD mA (DVD) TBD mA (DVD) TBD mA (CD) TBD mA (CD) TBD mA (DVD) TBD mA (DVD) TBD mA (CD) TBD mA (CD) TBD mA (DVD) TBD mA (DVD) TBD mA (CD) TBD mA (CD)	+5V +12V 50 mA (DVD/CD) 3 mA (DVD/CD) 80 mA (DVD/CD) 3 mA (DVD/CD) 560 mA (DVD) 270 mA (DVD) 510 mA (CD) 800 mA (CD) 410 mA (DVD) 110 mA (DVD) 360 mA (CD) 160 mA (CD) 520 mA (DVD) 290 mA (DVD) 480 mA (CD) 870 mA (CD) 540 mA (DVD) 430 mA (DVD)) 500 mA (CD) 900 mA (CD) 650 mA (DVD) 880 mA (DVD) 550 mA (CD) 1,450 mA (CD)
25	13. Safety standard..... (4) CE (TENTATIVE)	Tentative	Non-Tentative
26	Annex 1	Tentative	Non-Tentative
27	EU-Declaration of Conformity	Tentative	Non-Tentative