

# **TOSHIBA**

**DISK PRODUCTS DIVISION**

## **XM-4101B CD-ROM DRIVE PRODUCT SPECIFICATION**

**FEBRUARY 1994  
REV. 01**

**Specifications are subject to change without notice**

**DOCUMENT NUMBER  
11031-C0**

<b>REVISION LEVEL</b>			
<b>DOC. REV. #</b>	<b>JAP. REV. #</b>	<b>DATE</b>	<b>CHANGES</b>
A0	01	9/93	Initial Release
B0	01	1/94	Product identification name changed
C0	01	2/94	FCC "B" #'s added

<b>AGENCY INFORMATION</b>				
	<b>UL</b>	<b>CSA</b>	<b>TUV</b>	<b>FCC "B"</b>
XM-4101B	E145163	LR89911	E9310735	31010/EQU 4-3-5
TXM4101L1	E137439	LR88868	E9372599	31010/EQU 4-3-5

# Contents

1. Introduction .....	1
2. Features .....	2
3. Specifications .....	3
3.1. Performance .....	3
3.2. Environmental Conditions .....	4
3.2.1. Temperature and Humidity .....	4
3.2.2. Dust and Dirt .....	5
3.2.3. Vibration .....	5
3.2.4. Atmospheric Pressure and Altitude .....	5
3.2.5. Shock .....	5
3.3. Installation Conditions .....	5
3.4. Dimensions and Weight .....	5
3.5. Reliability .....	7
3.5.1. Error Rate .....	7
3.5.2. MTBF .....	7
3.5.3. MTTR .....	7
3.5.4. Drive Life .....	7
4. Configuration .....	7
4.1. Electrical Parts .....	7
4.2. Optical Pickup .....	7
4.3. Spindle Motor .....	7
4.4. Feed Motor .....	9
4.5. Eject Motor .....	9
5. Functions .....	9
5.1. CD-ROM Data Configurations .....	9
5.2. Power ON/OFF Timing .....	9
6. Interface .....	9
6.1. Signal Lines .....	9
6.1.1. Signal Line Termination .....	11
6.1.2. Receivers and Drivers .....	11
6.1.3. Connector .....	11
7. Power Requirements .....	11
7.1. Source Voltage .....	11
7.1.1. Spike .....	11
7.1.2. Ripple .....	11
7.2. Current Drain .....	11
7.2.1. Idle .....	11
7.2.2. Continuous Read .....	11
7.2.3. Pause .....	11
7.2.4. Average .....	11

7.2.5. Maximum .....	11
7.2.6. Peak in executing Access .....	11
7.3. Connector .....	16
8. Audio .....	16
8.1. Line Output .....	16
8.1.1. Connector .....	16
8.2. Headphones Output .....	16
8.2.1. Connector .....	17
8.3. Audio Modes .....	17
9. Jumper Setting/Feature Selections .....	18
9.1. SCSI-ID .....	18
9.2. Parity .....	18
9.3. Media Eject Prevention .....	19
9.4. Audio Playback .....	19
9.5. Terminator Power .....	19
9.6. Jumper(Part Number T/E) .....	19
9.7. Recognition of Setting .....	19
10. Busy Indicator .....	20
11. Connections .....	21
11.1. Power Supply Cable .....	21
11.2. Interface Cable .....	21
11.3. Audio Cable .....	21
11.4. Terminators .....	21
12. Maintenance .....	22
12.1. Disc .....	22
12.2. Interface Cable .....	22
13. Safety Standards/Agency Approvals .....	22
14. Electrostatic Discharge .....	22
15. Accessories .....	22
16. Packaging .....	22

## 1. Introduction

This document describes Toshiba's XM-4101B CD-ROM Drive. This drive reads digital data stored on CD-ROM discs at 2 times faster rotational speed.

The CD-ROM disc is single sided and has a 12 cm or 8 cm diameter. It typically contains approximately 600Megabytes or 200Mgegabytes of information respectively.

Compact Discs offer long life and high durability because the disc is read by a LASER, thereby eliminating physical contact with the disc.

A CD-ROM disc can also store other types of information in addition to digital/binary data. It is capable of storing audio information.

The XM-4101B is a new generation drive with highest performances such as 250 millisecond access Time ( mode definition ) , 300 kilobyte per second Sustained Transfer Rate and 45,000 Hour MTBF etc.

This drive supports CD-DA transfer over SCSI function that the host system can read CD audio data.

This drive also supports Photo-CD Multisession disc compatibility and Multi media PC Specification compatibility.

## 2. Features

- (1) One-inch Height Internal 12cm/8cm CD-ROM Disc Drive
- (2) 2X and 1X Rotational Speed
- (3) 250 mS Random Access Time (mode definition)
- (4) 300 kB/s Sustained Data Transfer Rate
- (5) 5V Single Voltage Source
- (6) Photo-CD Multisession Disc Spec compliant
- (7) Multimedia-PC Spec compliant
- (8) Drawer Type Load/Eject
- (9) Electronic Release for Eject by button or by software
- (10) Emergency Eject Feature
- (11) Broader Allowance for Mounting
- (12) Closed Enclosure
- (13) Replaceable Bezel
- (14) Built-in SCSI-2 Interface Controller
- (15) Support 'CD-DA Transfer Over SCSI' Function
- (16) Subcode P Thru W Transfer over SCSI Bus
- (17) Built-in MODE-1 ECC and MODE-2 EDC
- (18) Embedded CD-ROM XA type ECC (in addition to standard type ECC)
- (19) Efficient Data Transmission Throughput via large 64kBytes Buffer Memory and Buffer Algorithm
- (20) Remote SCSI-ID Jumper Block
- (21) Built-in Terminator
- (22) Prevent Media Removal Function by Jumper or by software
- (23) 4X Sampling & Digital Filter for CD Audio
- (24) Low Power Consumption
- (25) 16-Mode Output for CD Audio
- (26) Software Volume Control via SCSI-2 Mode Select Command
- (27) Continuous Rotary Volume Control for Headphones Output
- (28) MTBF 45,000h
- (29) Can be used as an Independent CD Audio Player Disconnected from PC

### 3. Specifications

#### 3.1. Performance

(1) Applicable Disc Format	Red-Book, Yellow-Book, CD-ROM XA, Photo-CD, CD-Bridge and CD-I Ready
(2) Data Capacity (Yellow-Book) User Data/Block	2,048 bytes/block (Mode 1) 2,336 bytes/block (Mode 2)
(3) Rotational Speed (CLV)*1	
1X	Approx. 200 to 530 rpm
2X	Approx. 400 to 1,060 rpm
(4) Transfer Rate	
(1 Kbyte=2 <sup>10</sup> byte=1,024 bytes, 1 Mbyte=2 <sup>20</sup> byte=1,048,576 bytes)	
Sustained Block Transfer Rate	75 blocks/s (1X) 150 blocks/s (2X)
Sustained Data Transfer Rate	
(Mode 1)	150 kBytes/s (1X) 300 kBytes/s (2X)
(Mode 2)	171 kBytes/s (1X) 342 kBytes/s (2X)
Burst (SCSI Interface)	1.5 MBytes/s (Async) 4.2 MBytes/s (Sync)
(5) Access Time	
Random Access Time (mode definition)*2	
	385 ms Typ. (1X) 250 ms Typ. (2X)
Average Random Access Time*2	385 ms Typ. (1X) 385 ms Typ. (2X)
Average Full Stroke Access Time*3	
	650 ms Typ. (1X) 1000 ms Typ. (2X)
(6) Spin up Time (Focus Search Time and Disc Motor Start up Time)	
	1.6 s Typ. (1X) 2.7 s Typ. (2X)
(7) Data Buffer Capacity	64 kBytes

\*1: 1X rotational speed is fixed for CD-audio (Red-Book) Format. For the other Formats, 2X or 1X is selectable by command.

\*2: Measured by performing multiple random access which means reads of data blocks over the whole area of the media from 00 min 02s 00 Blk to 60 min 01 Sec 74 Blk more than 3000 times. Includes positioning, setting, and latency time. Mode value stands for most frequent access time. Typ value is for the average drive.

\*3: Measured by performing multiple maximum access which means reads of data blocks from 00 min 02 s 00 Blk to 60 min 01 s 74 Blk more than 100 times. Includes positioning, setting, and latency time. Typ value is for the average drive.

(8) Optical Pickup	Semiconductor Laser and 3-beam System
(9) Disc Motor	DC Motor
(10) Feed Motor	DC Motor
(11) Load/Eject	Electronic Release by DC Motor
(12) Air Flow	Not Required
(13) Acoustic Noise	40 dB(A) MAX at 1 meter
(14) Power Supply	+5V(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 65 °C
(3) Shipping Temperature(Packaged)	-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 deg 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 soft error within 5 retries ---  
5 to 500 Hz  $2.45\text{m/s}^2$  (0.25G)  
excluding resonance point
- (2) Non-operating(1 Oct/min) ---no damage must result---  
5 to 10 Hz 5 mm (p-p)  
10 to 500 Hz  $9.8\text{ m/s}^2$  (0-p) (1G (0-p))
- (3) Shipping(Packaged)(1 Oct/min) ---no damage must result---  
10 to 20 Hz 2 mm (p-p)  
XYZ/30 min each

### 3.2.4. Atmospheric Pressure and Altitude

- (1) Operating 0 to 3000 m
- (2) Shipping 0 to 12000 m

### 3.2.5. Shock

- (1) Operating ---no soft error within 5 retries---  
 $14.7\text{ m/s}^2$  (1.5 G)  
(Half sine wave 11 ms/10s interval)  
---data read recoverable---  
 $98\text{ m/s}^2$  (10 G)  
(Half sine wave 11 ms/10s interval)
- (2) Non-operating(with no CD-Disc mounted) ---no damage must result---  
 $490\text{ m/s}^2$  (50 G)  
(Half sine wave 11 ms)
- (3) Drop(Packaged) ---no damage must result---
  - a. palletized Package 2 drops at 200 mm &  
10 drops at 50 mm (Z)
  - b. Individual Package 0.9 m drops once for each  
6-surfaces, 1-edge and 1-corner

### 3.3. Installation Conditions

Mount the drive within  $45^\circ$  of the horizontal or  $10^\circ$  of the vertical (left or right side down) positions, keeping the Front Bezel Plane vertical.

### 3.4. Dimensions and Weight ---See Figure 1 for details---

- (1) External Dimensions(W x H x D) 146 mm x 25.4 mm x 195 mm  
excluding Bezel area
- (2) Mass (Weight) 0.88 kg (Net)  
12.0 kg (Bulk Packaged)

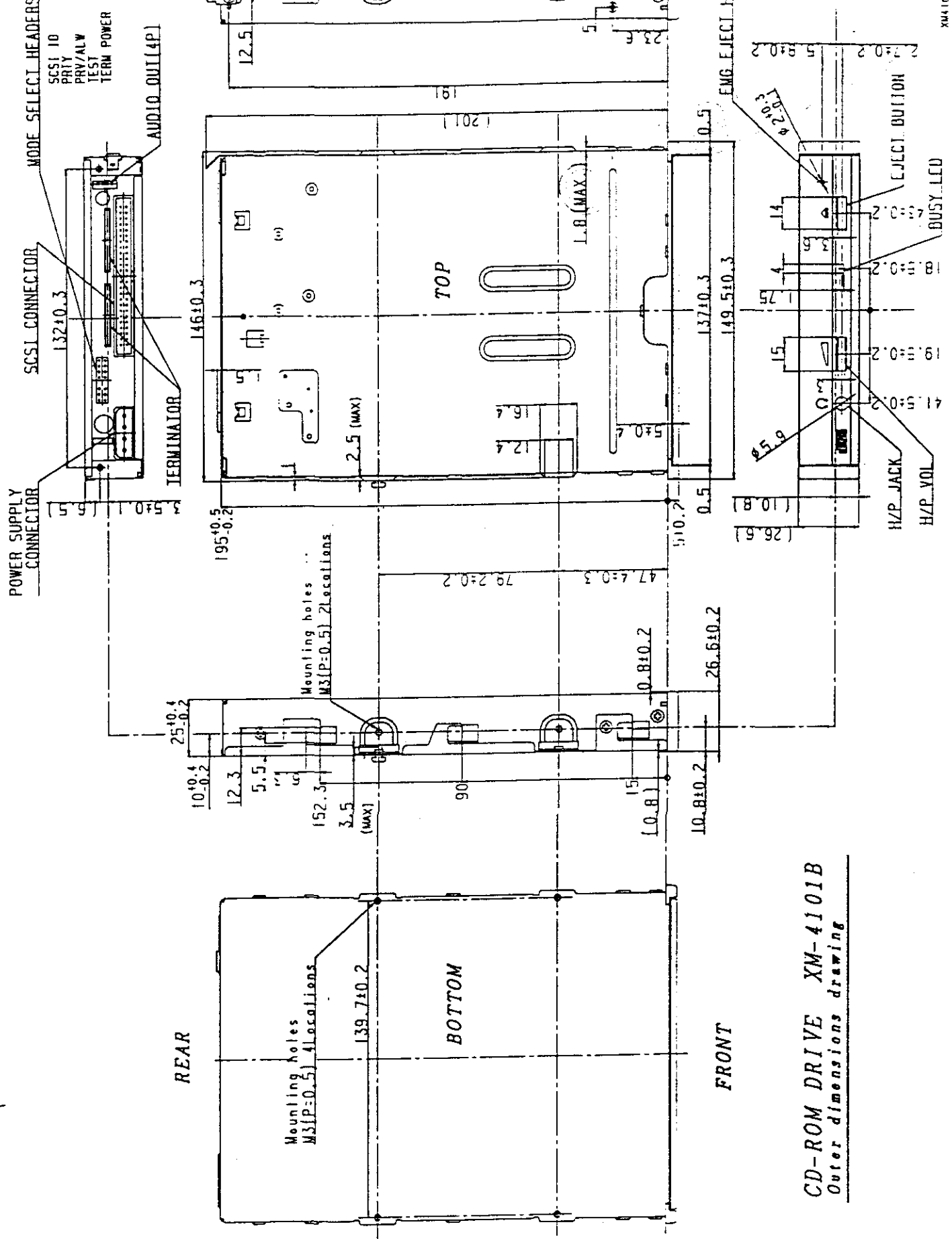


Figure 1 External Dimensions  
(Unit:mm)

### 3.5. Reliability

#### 3.5.1. Error Rate

(1) Hard Read Error Rate(Byte Error Rate) ---Allowing 5 Retries---  
Mode 1:  $10^{-15}$  Max  
Mode 2:  $10^{-12}$  Max

(2) Seek Error Rate ---Allowing 5 Retries---  
 $10^{-6}$  Max

3.5.2. MTBF 45,000 h

3.5.3. MTTR 0.5 h

3.5.4. Drive Life 15,000 h or 5 years(earlier one)

(1) Drawer Load/Eject 10,000 times or more

(2) Interface Connector Attach/Detach  
500 times or more

### 4. Configuration

See Figure 3 for details of the configurations.

#### 4.1. Electrical Circuits

(1) Drawer Eject Switch and Eject Detection Switch

(2) Optical Pickup Servo Control Circuit

(3) Feed Motor Drive Circuit

(4) Laser Diode Control Circuit

(5) EFM Demodulator and CD-ROM Error Correction Circuit

(6) SCSI Interface Control Circuit

(7) System Control Circuit

(8) Digital to Analog Converter

4.2. Optical Pickup Semiconductor Laser and 3-beam System

4.3. Spindle Motor DC Motor



- 4.4. Feed Motor DC Motor with Non-contact Type Velocity sensor
- 4.5. Eject Motor DC Motor

## 5. Functions

### 5.1. CD-ROM Data Configurations

Figure 4 shows how the data is structured in program units.  
1block=1/75 s

### 5.2. Power ON/OFF Timing

Figure 5 shows the initialization sequence.

## 6. Interface

- (1) The interface is based on ANSI standard X3.131-1986SCSI(SCSI-1) and SCSI-2
- (2) 42 types of commands are usable including CD-ROM unique commands.
- (3) The 64 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.
- (5) On command execution, DISCONNECT processing and RECONNECT processing can be specified.
- (6) Command link functions are usable.

### 6.1. Signal Lines

- (1) Logical levels of every Inputs and Outputs are logically false signals.

Input Low = 0.0 to +0.4 V = Logic '1' (true)

Input High = +2.5 V to +5.25 V = Logic '0' (false)

Output Low > 48 mA

Output High = Open collector (high impedance)

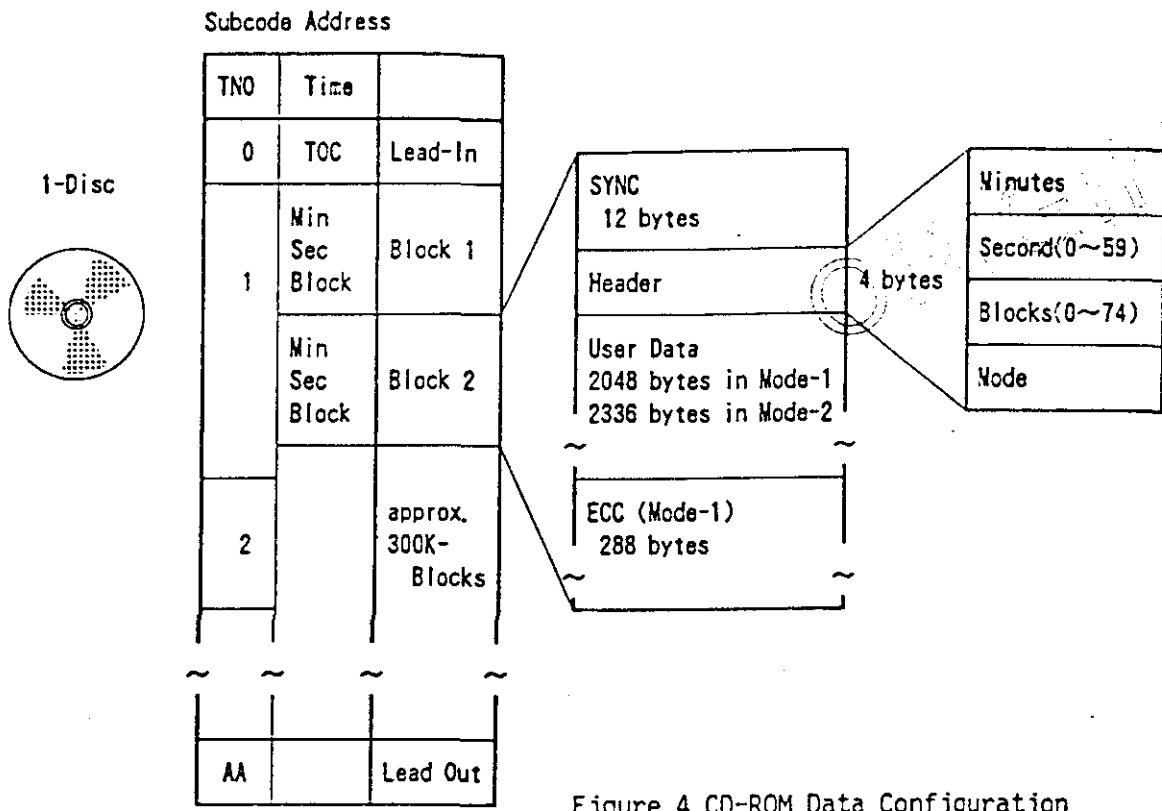


Figure 4 CD-ROM Data Configuration

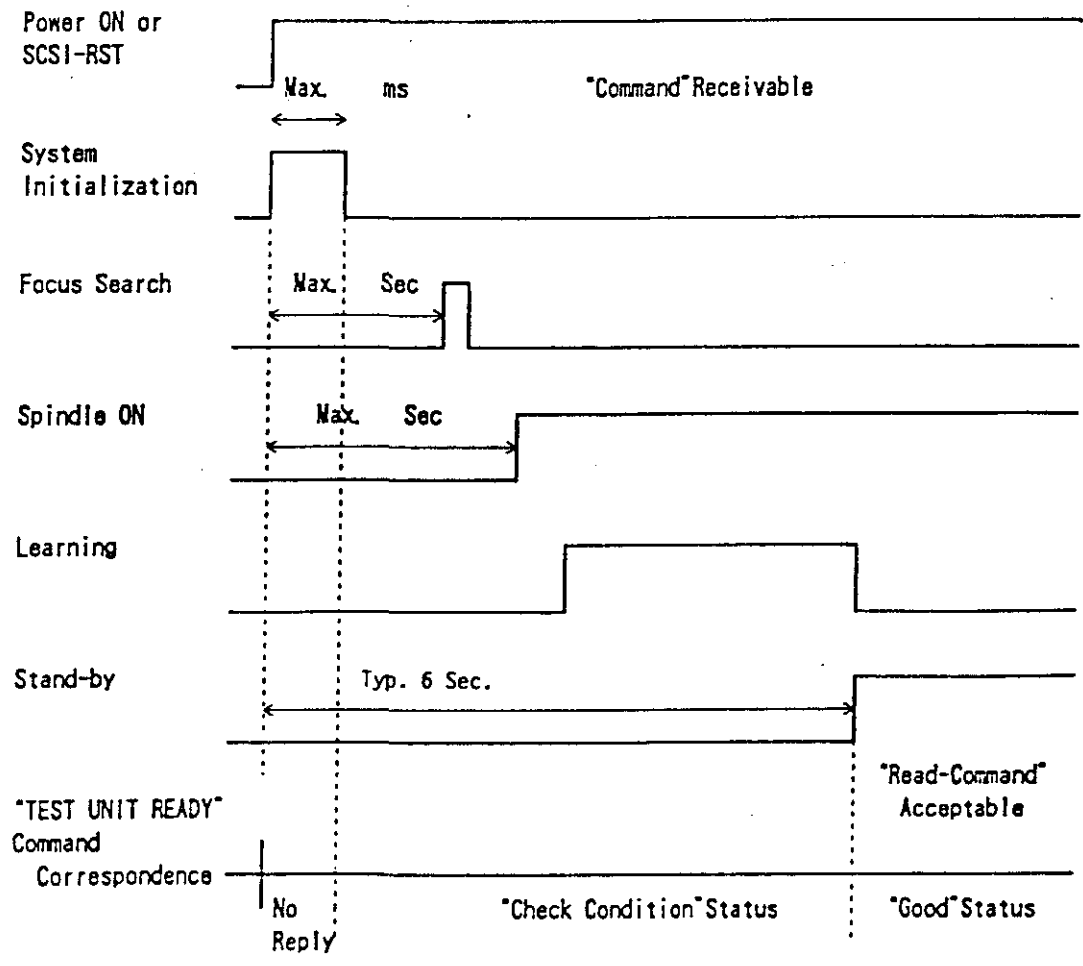


Figure 5 Initialization Sequence

- (2) The terminator power line has a protector inside of the drive to protect the power supply.  
This is shown in Figure 6.

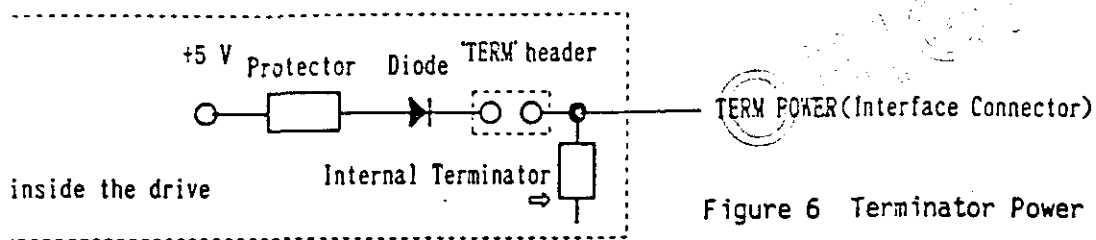


Figure 6 Terminator Power

### 6.1.1 Signal Line Termination

Figure 7 shows the method for daisy chain connection and Figure 8 shows the method for radial connection.

Always connect the terminator for SCSI interface because of the open collector configuration output drive.

Also be sure to attach the frame ground for grounding with the host system.

### 6.1.2. Receivers and Drivers

Figure 10 shows the connector and Figure 11 shows the interface pin assignments.

### 6.1.3. Connector

Figure 9 shows the connector and Figure 11 shows the interface pin assignments.

## 7. Power Requirements

7.1. Source Voltage	+5V +5%, -5% (Operating)	
	+5V +8%, -5% (Start up)	
7.1.1 Spike	50 mV (0-P) Max	
7.1.2 Ripple	50 mV (0-P) Max	
7.2. Current Drain (Typical value)	---excluding 'Term Power' current---	
7.2.1. Idle(Laser off, Motor off)	0.29A	
7.2.2. Continuous Read(Data/Audio)	0.38A / 0.44A	(1X/2X)
7.2.3. Pause(Laser on, Motor on)	0.39A / 0.44A	(1X/2X)
7.2.4. Average(20% Random Access)	0.45A / 0.49A	(1X/2X)
7.2.5. Maximum(100% Random Access)	0.55A / 0.66A	(1X/2X)
7.2.6. Peak in executing Access	0.95A / 1.0A	(1X/2X)

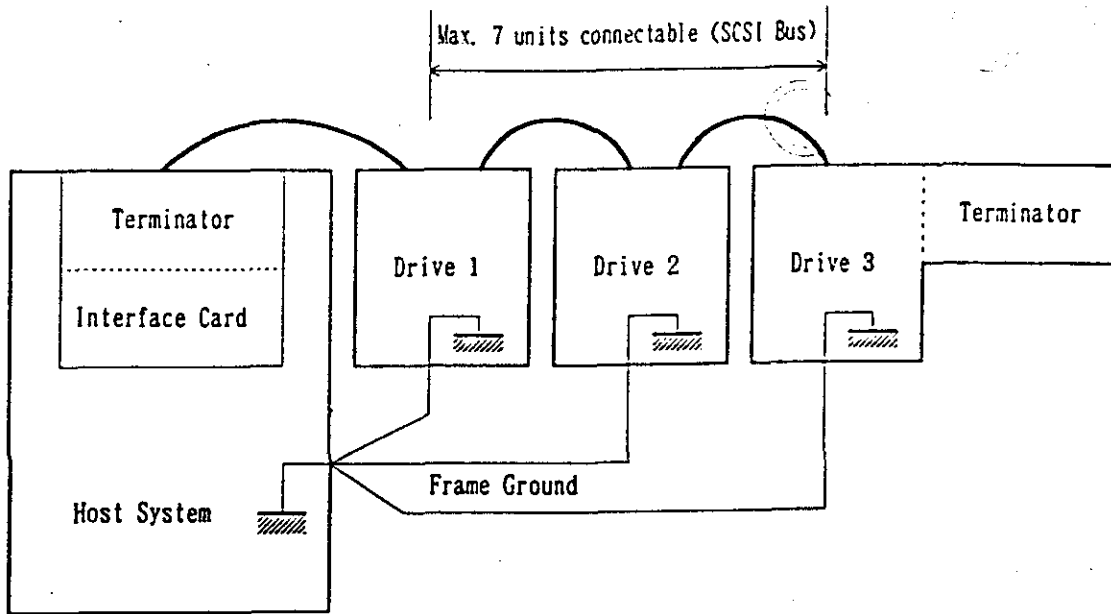


Figure 7 Daisy Chain Connection

---Disconnect the Internal Terminators from the drive if XM-4101Bs are used as Drive 1 and/or Drive 2.---

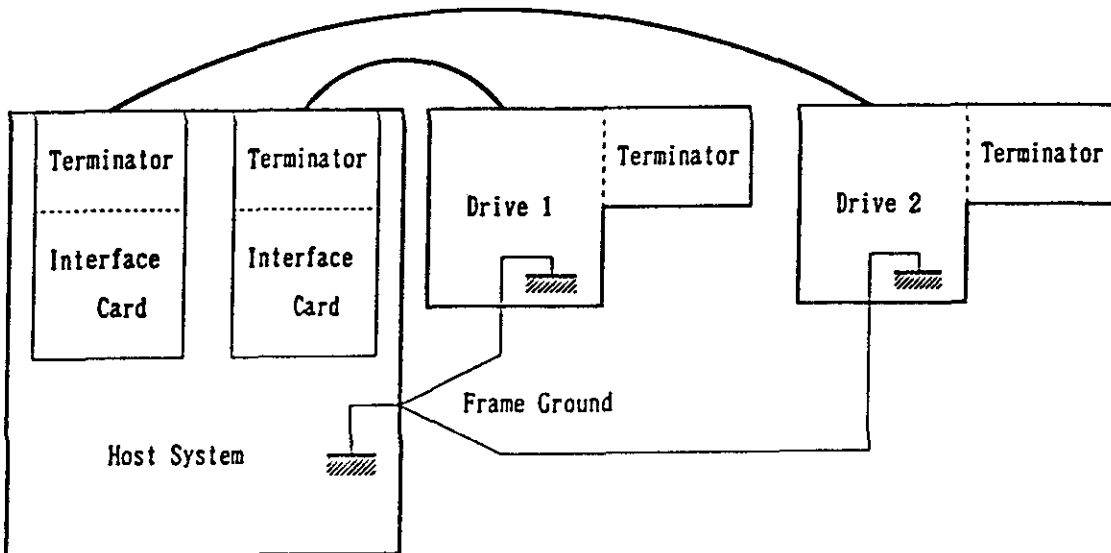


Figure 8 Radial Connection

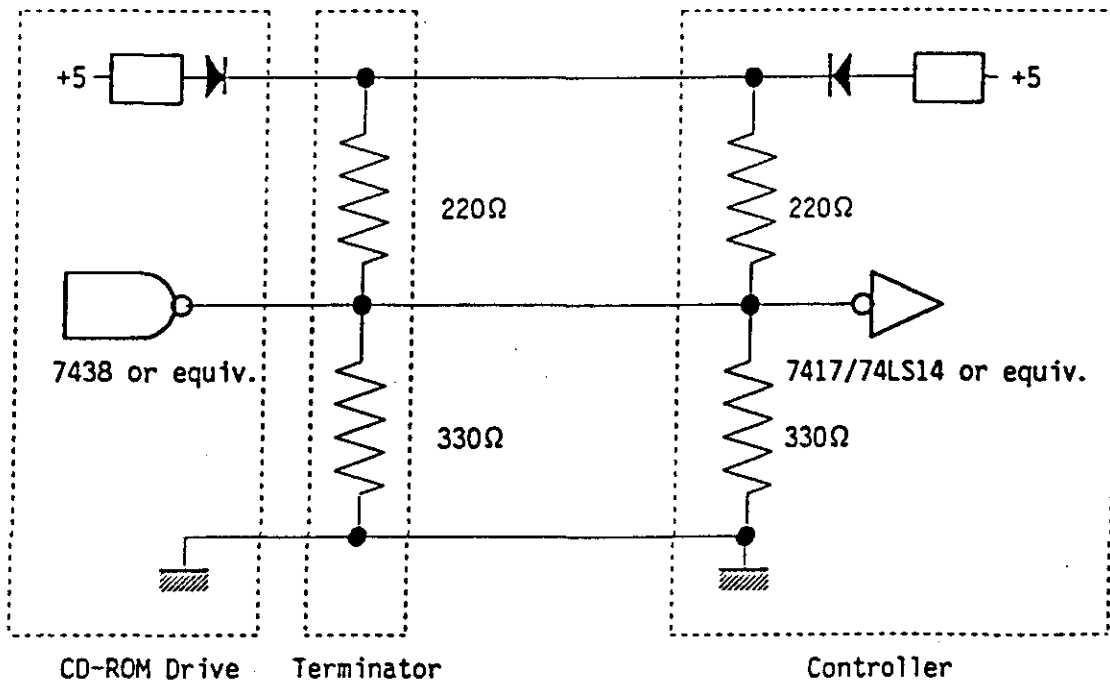
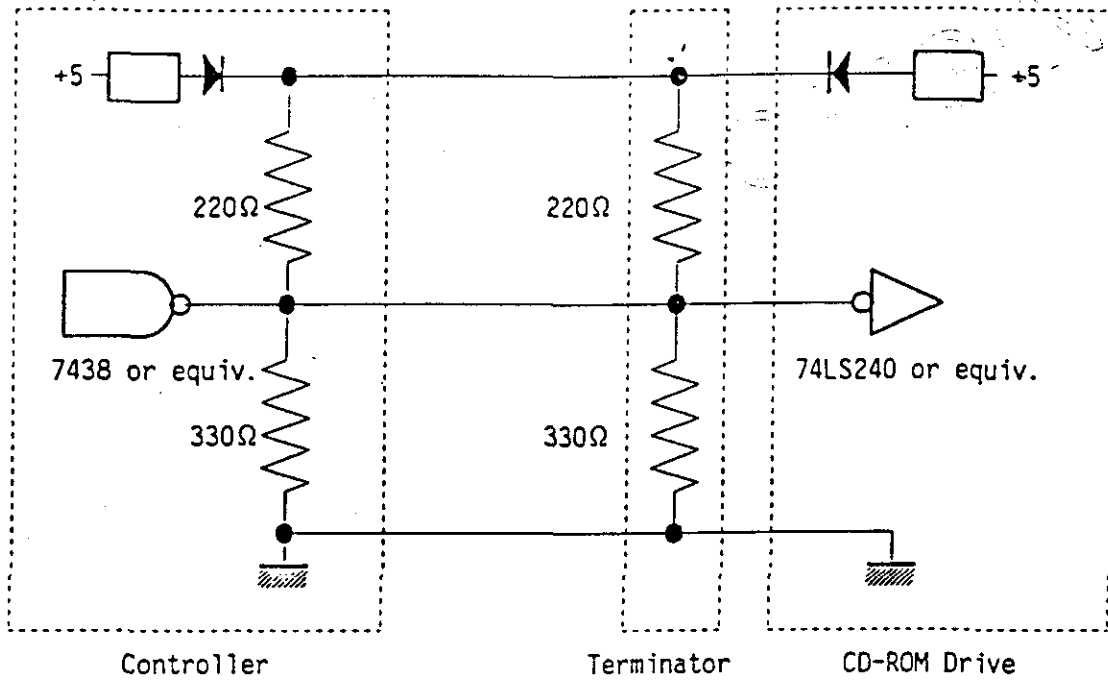


Figure 9 Receivers and Drivers

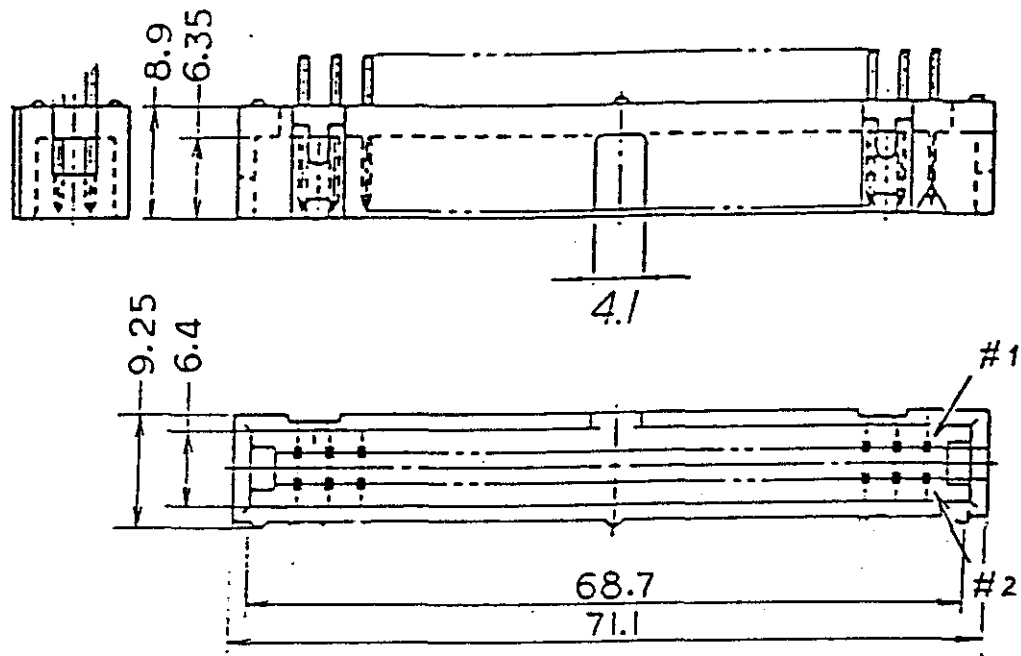


Figure 10 Interface Connector

PIN No	SIGNAL NAME	PIN No	SIGNAL NAME
2	-DB0	1	GND
4	-DB1	3	"
6	-DB2	5	"
8	-DB3	7	"
10	-DB4	9	"
12	-DB5	11	"
14	-DB6	13	"
16	-DB7	15	"
18	-DBP	17	"
20	GND	19	"
22	GND	21	"
24	GND	23	"
26	TERMPower (+5V)	25	NO CONNECTION
28	GND	27	GND
30	GND	29	"
32	-ATN	31	"
34	GND	33	"
36	-BSY	35	"
38	-ACK	37	"
40	-RST	39	"
42	-MSG	39	"
44	-SEL	41	"
46	-C/D	43	"
48	-REQ	45	"
50	-I/O	49	"

Figure 11 Interface Connector Pin Assignment

### 7.3. Connector

Figure 12 shows the external appearance of the Power Supply Connector. Use Dupont Electronics P/N 68946-001 or equivalent.

PIN #1 : NC  
PIN #2 : GND  
PIN #3 : +5V return  
PIN #4 : +5V

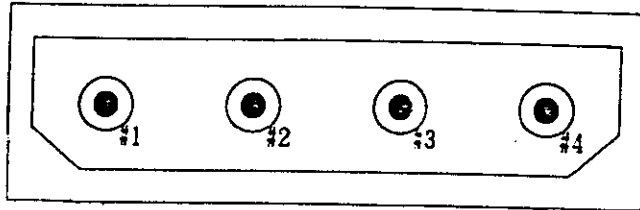


Figure 12 Power Supply Connector

## 8. Audio

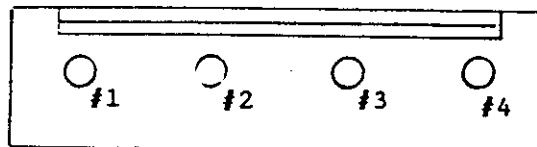
8.1. Line Output ---in case of the attenuator is set at 0 dB by the command---

(1) Output Level	0.9 V (rms Typ)
(2) Type	Unbalanced
(3) Load Impedance	10 k $\Omega$ min.
(4) Frequency Response	20 Hz to 20kHz +-3dB
(5) Distortion	0.02% Max.(at 1 kHz w/20 kHz LPF)
(6) Signal to Noise Ratio	84 dB Typ (IEC 179 A-weighted)

### 8.1.1. Connector

4P connector(MOLEX 5045-04A or equivalent)

PIN #1 : L  
PIN #2 : GND  
PIN #3 : GND  
PIN #4 : R



## 8.2. Headphones Output

---in case of the attenuator is set at 0dB by the command---

- (1) Output Level                      0.925 V (rms Typ)
- (2) Level Adjust Controller      Continuous Type(Thumb Wheel Knob)
- (3) Load Impedance                100  $\Omega$  (Nominal)

### 8.2.1 Connector

3.5 mm diam. Stereo Headphone Jack

## 8.3. Audio Modes

- (1) 16 Modes including 'Stereo', 'Lch Mono', 'Rch Mono' and 'Mute' are selectable by command.  
Default mode is 'Stereo'.
- (2) 16 Steps of attenuation level for the Audio Output(both Line Out and Headphones Out together) is selectable by command.  
Default level is -12 dB.

## 9. Jumper Setting/Feature Selections

Set up of SCSI-ID number, Parity Check function, Eject Button Inhibit function and CD-Audio Playback mode etc. are available by shorting these Headers.

ID1	ID2	ID4	PRTY	PRV/ALW	TEST	TERW
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Figure 13 Mode Select Headers

### 9.1. SCSI-ID (ID1, ID2, ID4)

This 3 bit binary header sets the SCSI-ID number. When setting numbers, follow the application software instructions.

Header	LSB			MSB
	ID1	ID2	ID4	
0	O	O	O	
1	S	O	O	
2	O	S	O	
3	S	S	O	
4	O	O	S	
5	S	O	S	
6	O	S	S	
7	S	S	S	

O :open    S :short

### 9.2. Parity (PRTY)

To enhance data bus reliability, set this Header to 'S' to activate the parity bit check function on SCSI data bus.

This setting cannot be used if no parity generation function is provided on the I/F card.

Header	Description
O	The drive does not check parity although the output data is issued the parity bit.
S	The drive checks parity, and also the output data is issued the parity bit.

O :open    S :short

### 9.3. Media Eject Prevention (PRV/ALW)

This Header Setting enables or disables the eject function.

Header	Description
O	Allow the Drawer eject.
S	Prevent the Drawer eject. Eject Button is ignored.

O :open S :short

### 9.4. Audio Playback (TEST)

This Header Setting selects the drive operation between normal CD-ROM and CD-Audio player mode.

When 'S' is selected, command from the host computer is ignored. Also CD-Audio disc or audio tracks in CD-ROM disc is playable by the command when the Header is set for 'O'.

Header	Description
O	Normal operation mode to connect the host computer.
S	(ID1, ID2, ID4 and PRTY Headers should be set for O ) CD-Audio disc playback mode. Allows repeated play from beginning of the program area up to the last when the disc is loaded. Pushing the Eject Button for shorter than 1 sec. allows proceeding to beginning of the next track number but not acceptable during access. Pushing the Button more than 2 sec. stops playing and ejects the Drawer.

O :open S :short

### 9.5. Terminator Power (TERM)

This Header Setting selects termination power(+5 V) Shared/None mode.

Header	Description
O	No termination power is supplied from the drive.
S	Termination power is supplied to the internal terminator and also supplied to the other peripherals through SCSI Interface Connector (Pin No.26).

O :open S :short

### 9.6. Jumper (Part Number T/E)

Use P/N HIF3GA-2.54SP made by Hirose Electric Co.,(Hirose USA) or equivalent.

### 9.7. Recognition of Setting

As the Setting Recognition performed only right after power On, turn power Off and then power On again whenever change is made.

10. Busy Indicator

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

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

(2-1) Turns Off when the drive in the 'Data Read' or 'Stand-by' status.



Figure 14 Data Read or Stand-by

(2-2) Continuously Off when no disc is mounted.

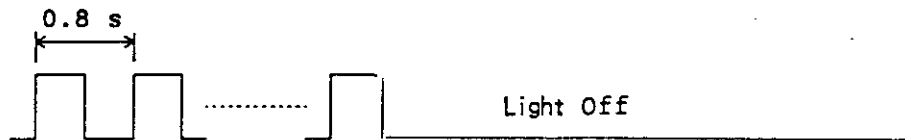


Figure 15 Media Problem

(2-3) Still blinking at 3.2s intervals when cleaning for disc or optics in the drive is required.

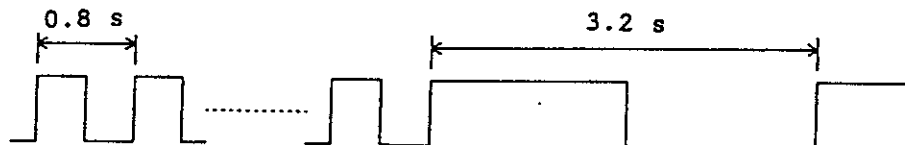


Figure 16 Maintenance Required

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

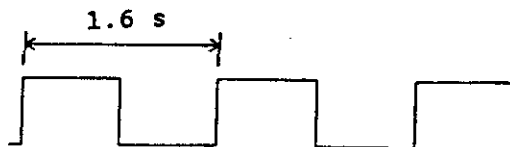


Figure 17 CD-Audio Playback

(3) When performing 'Data Access' Busy Indicator keep turn On, and then start blinking at 0.2s intervals during 'Data Transfer'.

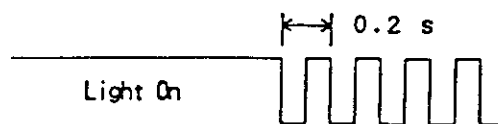


Figure 18 Data Access and Data Transfer

## 11. Connections

### 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	AGW 18 to 20 Max. 2 meters

### 11.2. Interface Cable

(1) Connector	SCSI standard
(2) Cable Specific Impedance Length	50 core type 100 Ohm $\pm$ 10% (without shield) Max. of 6 m for total SCSI bus length

### 11.3. Audio Cable

Unbalanced and shielded

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

### 11.4. Terminators

2-Standard 11-Pin Terminator with Pull-Tab.

See Figure 19 for details.

(1) Pull up resistor	220 Ohm $\pm$ 5 %
(2) Pull down resistor	330 Ohm $\pm$ 5 %
(3) Rated Power( $T_a = 70^\circ\text{C}$ )	125 mW
(4) Maximum Rated Voltage	100 V
(5) Operating Free-Air Temperature	-55 to +125 $^\circ\text{C}$

## 12. Maintenance

In case of Figure 16 (Page 20), cleaning for disc or optics in the drive is required.

### 12.1. Disc

Try to avoid touching the read area (underside) of the disc as dirt and smears will degrade the disc accessing speed.  
If the disc is dirty, wipe it with a soft cloth.

### 12.2. Optical Pickup

A dirty Optical Pickup will also degrade the access time.  
When the Pickup is dirty, gently wipe the objective lens of the Pickup.

## 13. Safety Standards/Agency Approvals

- |            |                                       |
|------------|---------------------------------------|
| (1) Safety | IEC 950<br>UL 1950<br>CSA 22.2 No.950 |
| (2) Laser  | FDA 21, IEC Pub 825                   |
| (3) EMI    | FCC 15J-B<br>Based upon VDE 0878      |

## 14. Electrostatic Discharge

- |                      | Standard | IEC 801-2      |
|----------------------|----------|----------------|
| (1) Operating        |          | 2.8 KV or less |
| (2) Damage including |          | 15 KV or more  |

## 15. Accessories

- 1-Instruction Manual
- 2-Terminators(installed)
- 4-Short Jumper(installed in 'TERM'header and GND to GND)

## 16. Packaging

- 10 units in a Bulk Pack
- 24 Bulk Packs on one Pallet.

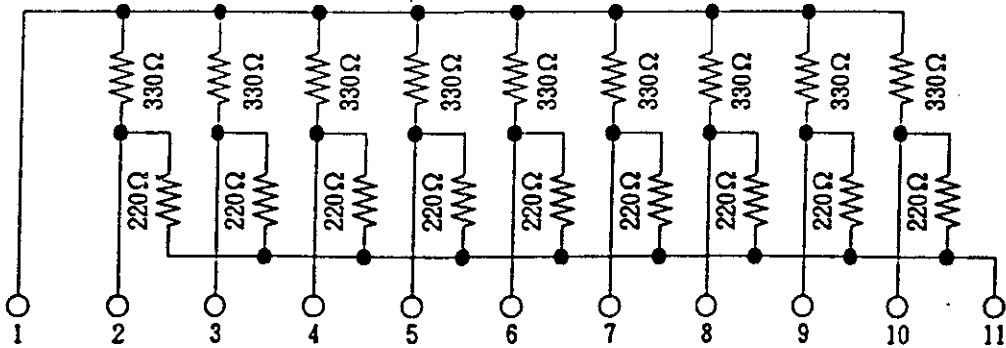
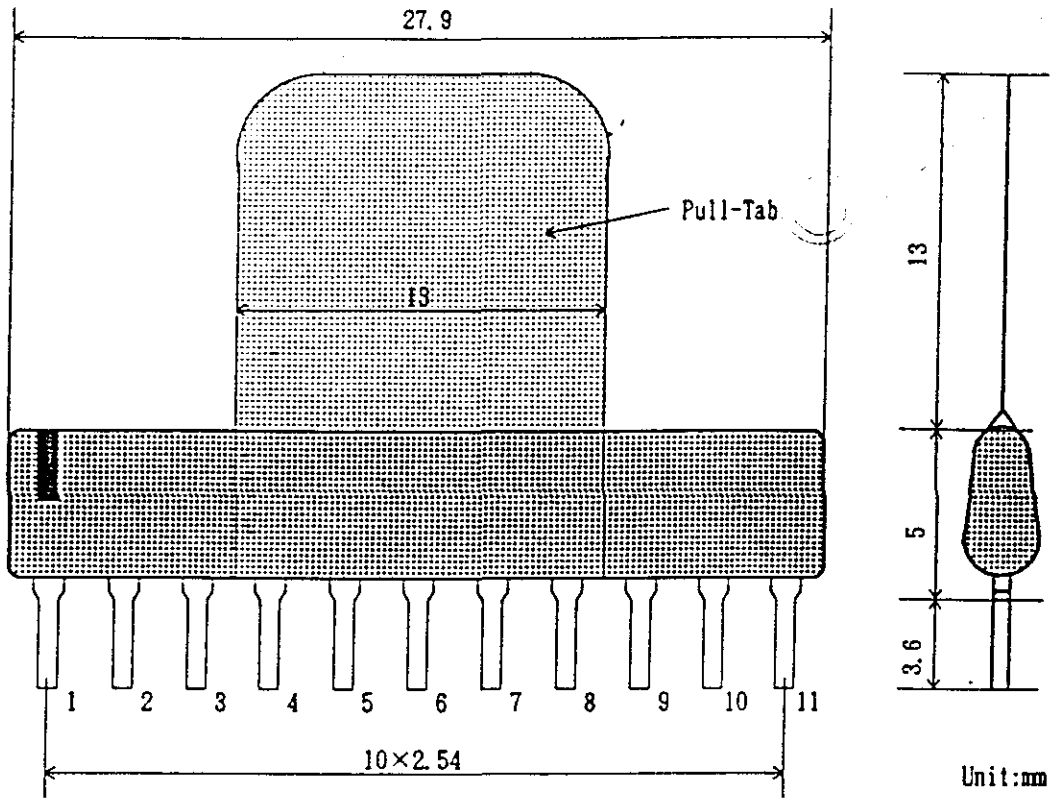


Figure 19 Terminator