NEC COMPUTER

FD1155C

5-1/4" FLOPPY DISK DRIVE

PRODUCT DESCRIPTION

806-520004-1

Rev.6

- NEC PROPRIETARY -

NEC Corporation

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The information in this specification may be subject to change without notice.

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NEC Corporation
Printed in Japan

REV	COMP	DATE	Description
1	0	1984.12.20	
2	0	1985.02.20	Correction
3	1	1985.03.20	Function addition
4	1	1985.04.20	Correction
5	1	1985,6,28	Correction
6	1	1985,8,10	Correction

CONTENTS

1. INTRODUCTION

The FD1155C 5-1/4" floppy disk drive unit uses a 5-1/4" floppy disk as a record medium (medium- hereafter).

The FD1155C 5-1/4" floppy disk drive unit has two different modes.
It can operate not only in the high-density mode which has the same storage capacity as the 8" two-sided double-density-type floppy disk drive unit and enables to use the same controller and system software as those of the 8" two-sided double-density-type floppy drive unit but also in the normal-density mode which enables to use the same functions as those of a two-sided double-density double-track 5-1/4" floppy disk drive unit. Moreover, in the normal-density mode, a medium onto which data is recorded in the two-sided double-density 48 TPI mode can be read.
The rotation speed of the FD1155C 5-1/4" floppy disk unit is as follows.
"Single speed mode" (High-density mode....360rpm, Normal-density mode....360rpm)
"Dual speed mode" (High-density....360rpm, Normal density mode....300rpm)
Either of these modes can be used.

In the FD1155C 5-1/4" floppy disk drive unit, the spindle is direct driven with a brushless DC motor of 300/360 rpm. Power consumption is lowered to approximately 4.8 W, which leads to a heat output reduction.

A full consideration is given on acoustic noise prevention.

The FD1155C 5-1/4" floppy disk drive is abbreviated as FDD in this document.

2. GENERAL SPECIFICATIONS

2.1 DRIVE SPECIFICATIONS

"Single speed mode"

(High-density mode) "Dual speed mode"

No.	Item		Specification	Unit
1	Capacity (MFM/FM)	Unformatted	1.67/0.83	MB
		Formatted (2 Side X 80 CYL)	1065/532 (256 B, 26 SEC)	KB
			1229/614 (512 B, 15 SEC)	
			1311/655 (1024 B, 8 SEC)	
2	Data transfer rate (MFM/FM)		500/250	k-bit/Sec.
3	Mean rotational speed		360	rpm
4	Track		160 (80Track X 2Side)	
5	Maximum bit density		9870	BPI

(Normal-density mode) "Single speed mode"

1	Capacity (MFM/FM)	Unformatted	1.0/0.5	MB
		Formatted	655/328 (256 B, 16 SEC)	KB
2	Data transfer rate (MFM/FM)		300/150	K-bit/Sec.
3	Mean rotational speed		360	rpm
4	Track		160 (80Track X 2Side)	
5	Maximum bit density		5922	BPI

(Normal-density mode) "Dual speed mode"

No.	Item		Specification	Unit
1	Capacity (MFM/FM)	Unformatted	1.0/0.5	MB
		Formatted	655/328 (256 B, 16 SEC)	KB
2	Data transfer rate (MFM/FM)		250/125	K-bit/Sec.
3	Mean rotational speed		300	rpm
4	Track		160 (80Track X 2Side)	
5	Maximum bit density		5922	BPI

(Common specification)

6	Seek time (Track-to-track)		3		ms
7	Seek settling time		15		ms
8	Head load time		35		ms
9	Track density		96		TPI
10	Recording mode		MFM/FM		
11	Start time		800		ms
12	Standard external dimensions (NOTE 1)	Width	41 (428)		mm
		Height	146 (149)		
		Depth	203 (217)		
13	Weight		1.5		kg
14	Operating environment conditions	Temperature	4 to 46		°C
		Humidity	20 to 80		%
		Maximum wet-bulb temperature	29.0 (noncondensing)		°C
15	Power supply	Voltage (V)	Startup current	Steady-state current (NOTE 2)	mA
		+12	390	210	
		+5	460	460	

16	Power dissipation (NOTE 2)		4.8		W
17	Heat output (NOTE 2)		4.1		kcal/H
18	Reliability	MTBF (NOTE 3)	12000 (Under standard use condition)		POH
		MTTR	0.5		H
		Device life	15000 POH or 5 years (Design lifetimes)		
		Retryable error rate	10^{-9} (Not including 2 or less retry attempts)		Times/bit
		Unretryable error rate	10^{-12}		Times/bit
		Seek error rate	10^{-6}		Times/seek
19	Floppy disk lifetimes	Pass number/ track	3.0×10^{6}		
20	Operations medium	High density mode	5-1/4" two-sided high-density floppy disk		
		Normal density mode	5-1/4" two-sided double density double track floppy		
21		Operating	Non-operating (Storage)	Transporting (Packing)	Unit
	Temperature	4 to 46	-20 to 60	- 40 to 65	°C
	Relative himidity	20 to 80	10 to 90	5 to 95	%RH
	Maximum wet-bulb temperature	29	40	45	°C
	Largest temperature gradient	15	30	30	°C/H
	Allowable vibration (Except at resonance point)	0.5 (Less than 100 Hz)	3 (Less than 100 Hz)	3 (Less than 100 Hz)	G
	Allowable shock (Less than 10 ms)	10	15	40	G

NOTE 1: The values in parentheses consider the front lever dimensions.

2: Average value of power consumption taken when FDD is ready.

3: At normal condition of use

(1) Device service (POH) : 8H/day

(2) Actual head load time (R/W time) : 0.5H/day

(3) Head load count : 2400 times/day

(4) Disk insertion/ ejection : 25 times/day

(5) Motor ON/OFF : 100 times/day

(6) Average use time per disk : 2H/day (4 disks/day.drive)

2.2 HEAD TYPE

The tunnel erase type is used for the head of this FDD.

2.3 DRIVE STRUCTURE

The major components of FDD have the following functions:

(1) Base

Constructs the frame.

(2) Spindle motor assembly

Rotates the medium using the DC spindle motor. The medium is fixed to the spindle with a collet.

(3) Head carriage

Contains two magnetic heads. The R/W gap of the side 1 is shifted towards to center by 8 tracks relative to the R/W gap of the side 0.

(4) Step motor

Moves the carriage assembly through the steel band.

(5) Head load assembly

Brings the magnetic head into contact with the medium in Read/Write operations.

(6) Index sensor

A combination of LED (light-emitting diode) and photo transistor, the index sensor detects an index hole on the medium.

(7) Zero track sensor

Optically senses that the magnetic head is at Zero track.

(8) Write protect sensor

Optically senses the presence or absence of a write enable notch on the medium jacket.

(9) Collet holder assembly

The holder has a collet. The holder interlocks with the front lever. When the front lever is closed; the collet positions and secures the medium to the spindle center.

(10) Package

Mounts the electric circuits that controls positioning of magnetic head, Read/Write operations, etc.

(11) Display lamp

A LED is provided for display of the FDD status.

(12) Front panel

Dress panel installed on the device front

2.4 DRIVE OPERATION

After application of DC power to FDD, insertion of a medium into the FDD and closing the front lever cause the medium to rotate. (Be sure that power is supplied before opening or closing the front lever.) FDD becomes ready when the rotational speed of the medium attains the prescribed number of revolutions. About 800 ms is needed to obtain the ready status after closing the front lever.

FDD has disk change detect function. A medium has been changed is sent out to the controller by a disk change signal.

The FDD moves the magnetic head to a target track for positioning according to the STEP pulse and DIRECTION SELECT signals sent from the controller.

FDD brings the magnetic head into contact with the medium by the HEAD LOAD function and selects the desired magnetic head by the SIDE SELECT signal. Now FDD is ready for Read/Write operations.

For a write operation, the FDD converts into a magnetized pattern the WRITE DATA signal which is the serial data sent from the controller and records on the medium.

For a read operation, FDD detects a magnetized pattern recorded on the medium, converts it into serial data, and sends to the controller as a READ DATA signal.

This unit can use both a high-density medium and normal-density medium. But FDD cannot know which medium is loaded, then the mode needs to be set to the high-density mode or normal-density mode in accordance with the medium to be used.

2.5 MEDIUM SPECIFICATIONS

(High-density mode)

No.	Item		Specification
1	Media type		5-1/4" two-sided high-density floppy disk
2	Product name		NEC floppy disk HD
3	Number of disks		1
4	Number of recording surfaces		2
5	Number of tracks/medium	Total	160
6	Jacket size		133.3 x 133.3 mm
7	Operating environment conditions	Temperature	10 to 51.5°C
		Humidity	20 to 80%
		Wet-bulb temperature	29°C or less (noncondensing)
		Temperature gradient	20°C/H or less
		External magnetic field	4000 A/m (50 oersted) or less
		Standing	Leave the media at least 5 minutes in FDD operating environment before use.

(Normal-density mode)

No.	Item		Specification
1	Media type		5-1/4" two-sided double density double track
2	Product name		NEC floppy disk II DD
3	Number of disks		1
4	Number of recording surfaces		2
5	Number of tracks/medium	Total	160
6	Jacket size		133.3 x 133.3 mm
7	Operating environment conditions	Temperature	10 to 51.5°C
		Humidity	20 to 80%
		Wet-bulb temperature	" 29°C or less (noncondensing)
		Temperature gradient	20°C/H or less
		External magnetic field	4000 A/m (50 oersted) or less
		Standing	Leave the media at least 5 minutes in FDD operating environment before use.

2.6 MEDIUM STRUCTURE

The medium is sealed in a jacket. The layer inside the jacket protect the medium. The medium is provided with a base of polyethelene terephthalate which is, then, coated with suitable magnetic materials. The layer is made of unwoven clothlike materials. The function of the layer is to remove the dust without causing any damage to the medium. In addition, the jacket is made of vinyl chloride sheet.

The jacket has a central window which is for fixing itself onto the spindle, an index window and a head window.

The structure of the medium is shown in Figure 2.1.

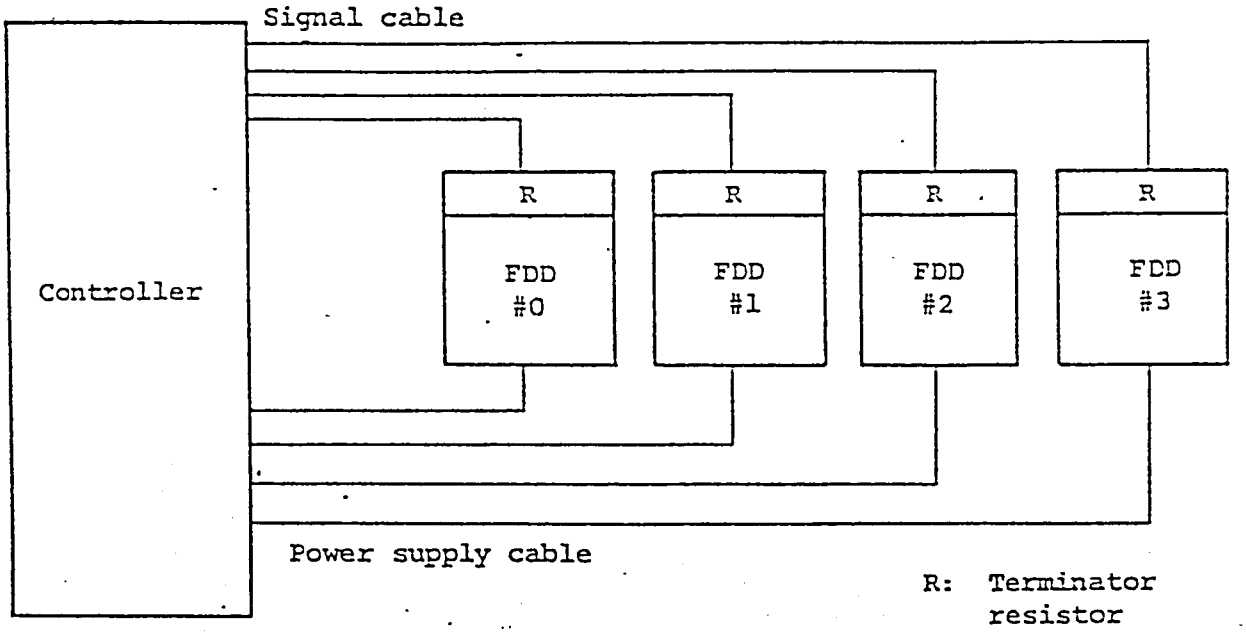
3. INTERFACE

3.1 OUTLINE OF THE INTERFACE

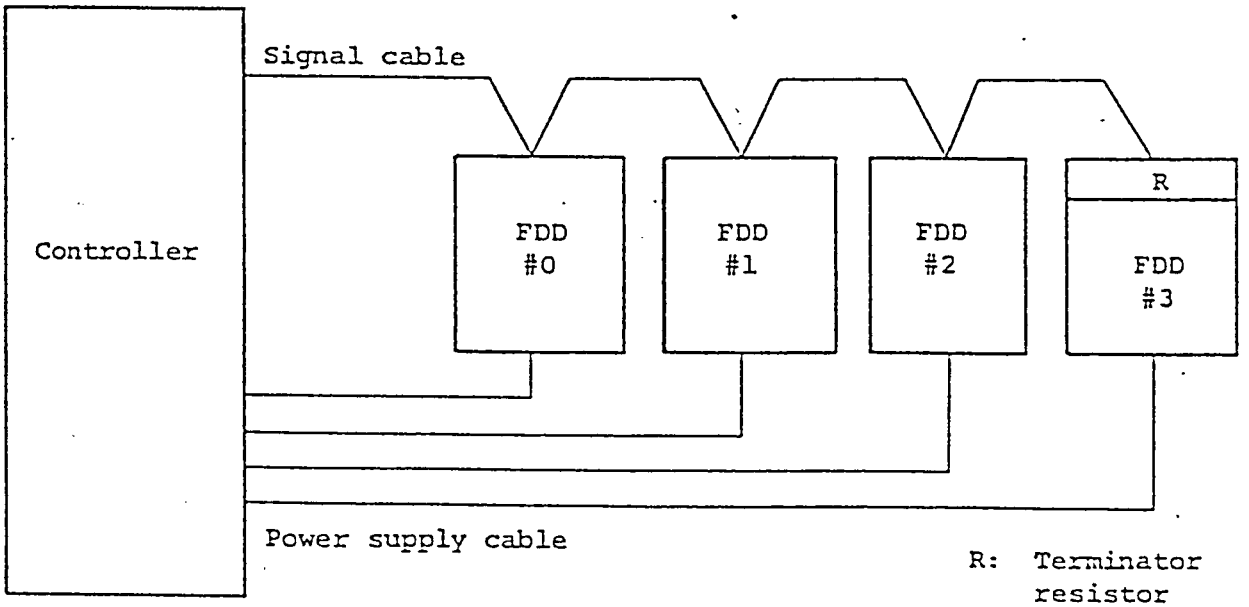
The FDD can be connected to the controller either in parallel or daisy chain connection mode. The number of FDD that can be connected to one controller depends on the capability of the controller. However, in case of daisy chain connection, maximum 4 FDD's can be connected.

In case of parallel connection, a terminal resistor for signal cable must be installed for each FDD. In the daisy chain mode, only the last FDD needs a terminator. The terminal resistor is installed on the PWB of each FDD using an IC socket. Therefore, any unnecessary terminator resistor should be removed.

The basic connection method of FDD and controller is shown in Figure 3.1.



(a) Parallel connection



(b) Daisy chain connection

Figure 3.1 Basic Connection Method

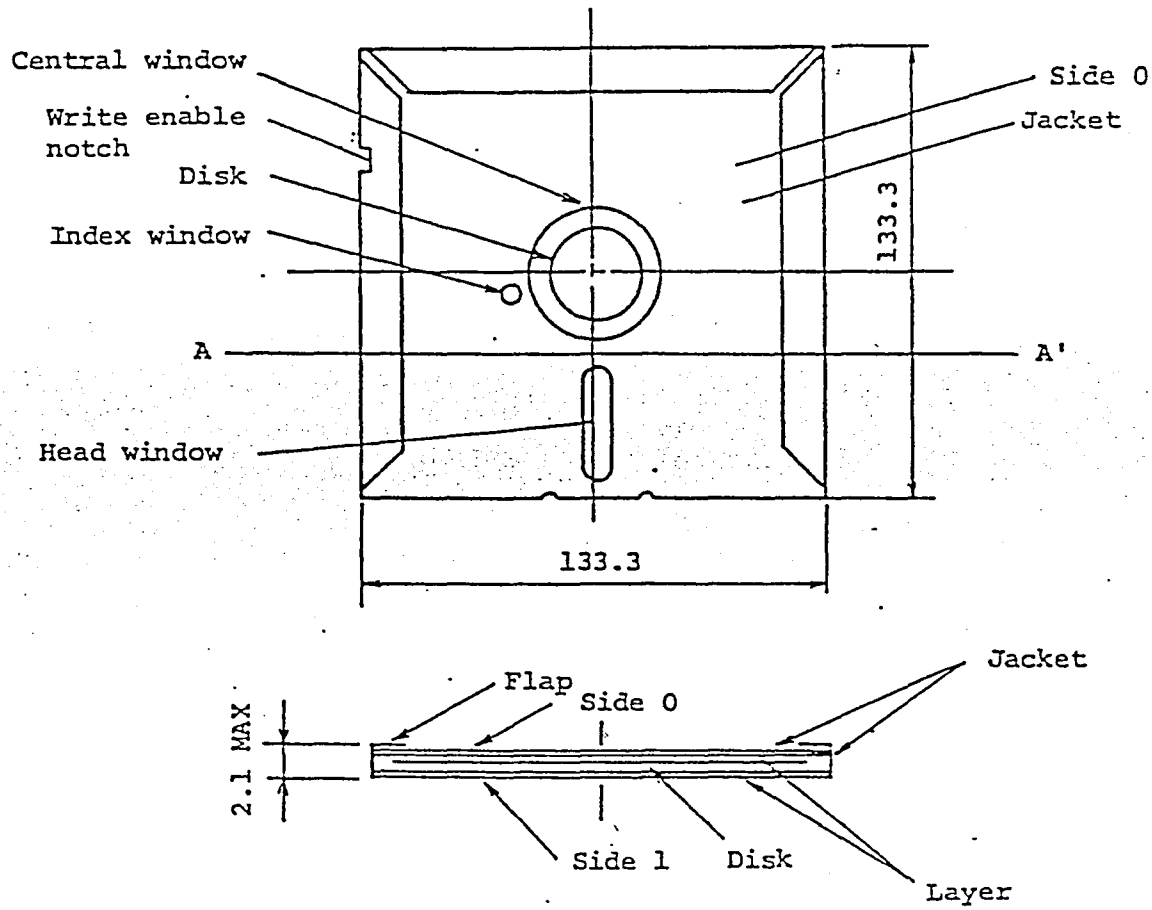


Figure 2.1 Medium Structure

3.2 PHYSICAL SPECIFICATION

The FDD and controller are connected by the "signal connector" and the "power connector", where, the signal connector transmits/receives the control and data signals while the power connector supplies the necessary DC power source.

In addition, a faston terminal can be used as the frame ground of the drive.

An outline of connector locations is shown in Figure 3.2.

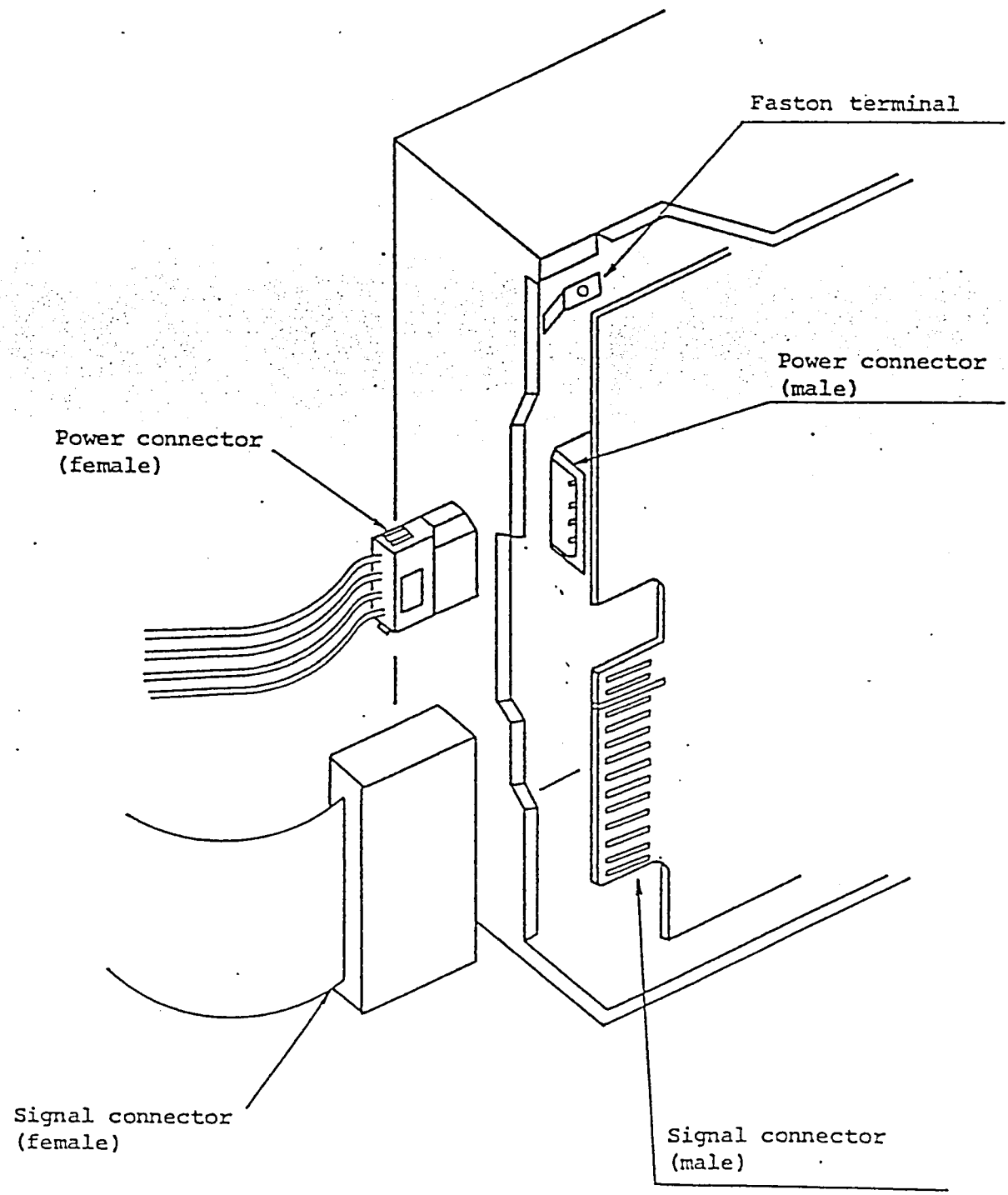
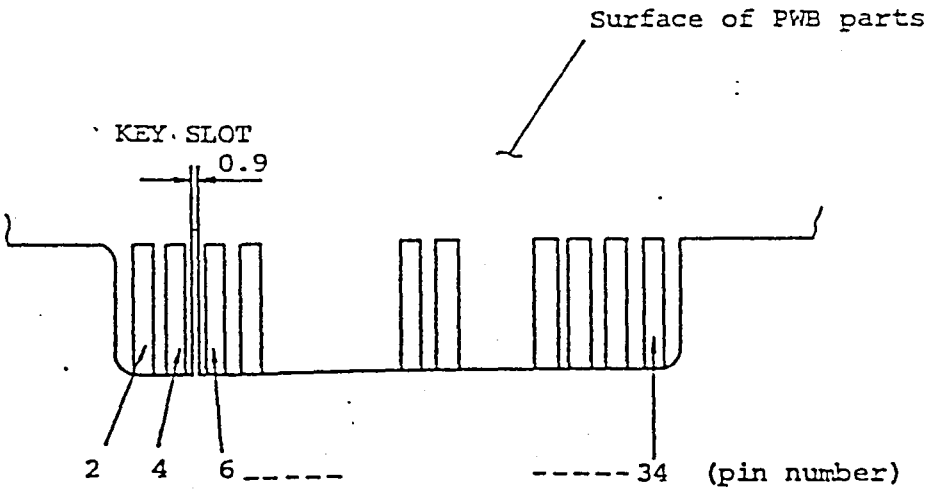


Figure 3.2 An Outline of Connector Locations

3.2.1 SIGNAL TYPE AND PIN ASSIGNMENT

The physical pin numbers for the FD1155 signal connector and pin assignment of signals are as follows:



Physical pin numbers for signal connector
(View of connector from part surface)

The soldering surface has odd-number pins (GND)

	Signal name	I/O	Pin number	Pin number	Signal name
*1	HIGH/NORMAL DENSITY	Input signal	2	1	GND
*2	HEAD LOAD/IN USE	Input signal	4	3	GND
	DRIVE SELECT 3	Input signal	6	5	GND
	INDEX	Output signal	8	7	GND
	DRIVE SELECT 0	Input signal	10	9	GND
	DRIVE SELECT 1	Input signal	12	11	GND
	DRIVE SELECT 2	Input signal	14	13	GND
	MOTOR ON	Input signal	16	15	GND
	DIRECTION SELECT	Input signal	18	17	GND
	STEP	Input signal	20	19	GND
	WRITE DATA	Input signal	22	21	GND
	WRITE GATE	Input signal	24	23	GND
	TRACK 00	Output signal	26	25	GND
	WRITE PROTECT	Output signal	28	27	GND
	READ DATA	Output signal	30	29	GND
	SIDE SELECT	Input signal	32	31	GND
*2	DISK CHANGE/READY	Output signal	34	33	GND

*1 Logical High/Low is changeable by the Jumper plug.

*2 Changeable by the jumper plug.

3.2.2 POWER TYPES AND PIN ASSIGNMENT

The physical pin numbers for the power connector and the power pin assignment are as follows:

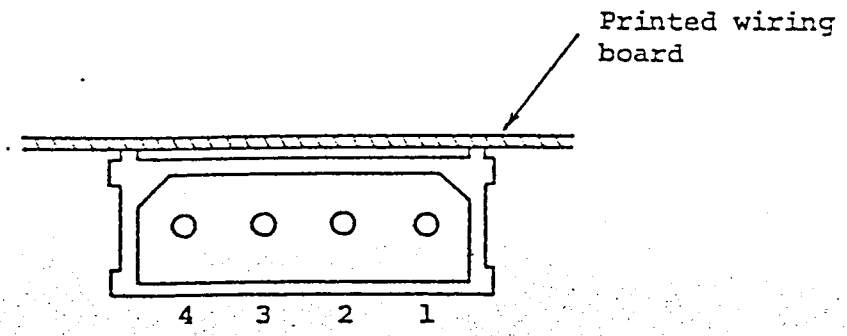


Figure 3.3 Physical Pin Numbers for Power Connector

Table 3.1 Power Assignment

Pin number	Power
1	+12 V DC
2	GND
3	GND
4	+5 V DC

3.2.3 CONNECTOR MODELS

The following connectors are recommended. Their equivalents are also applicable.

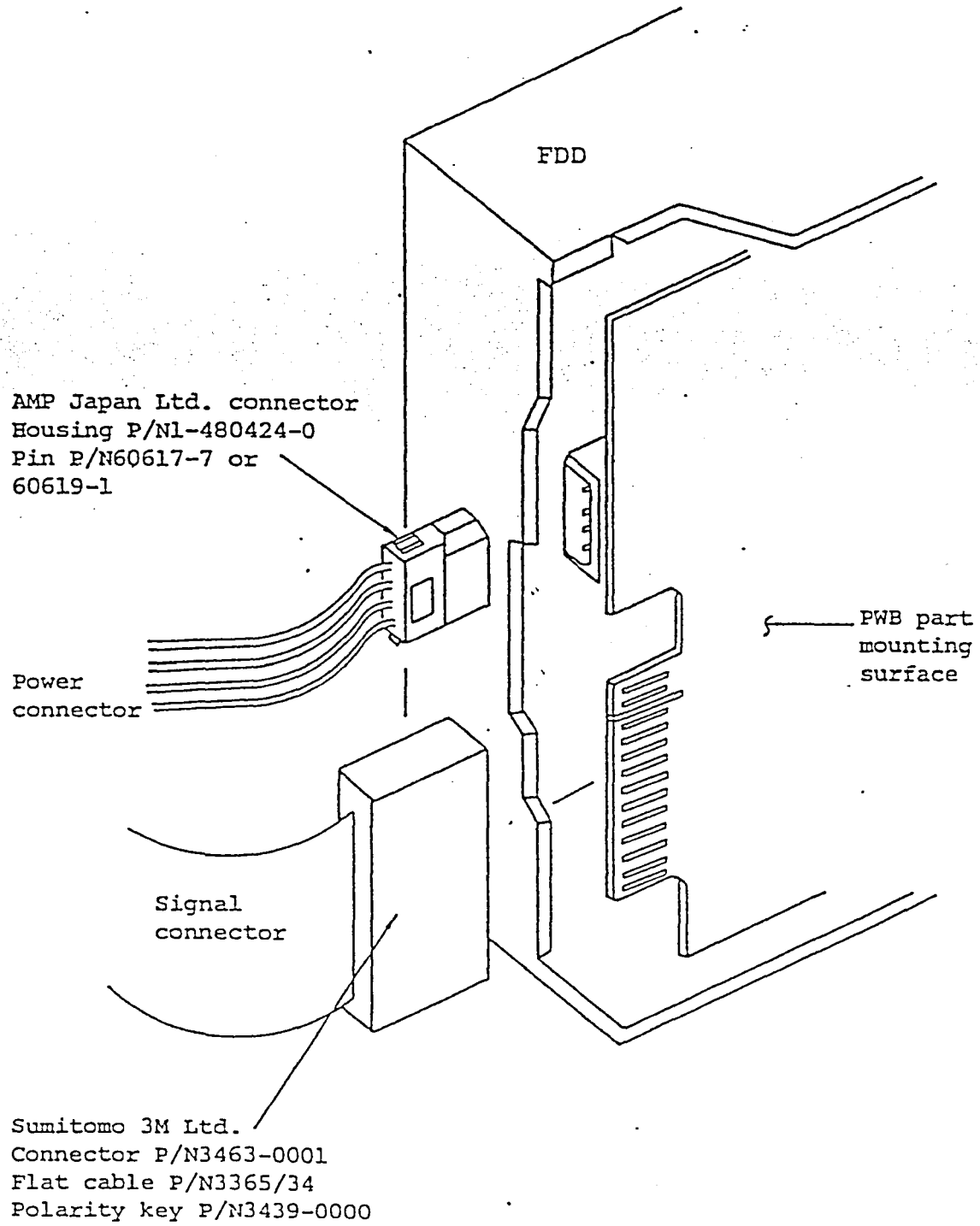


Figure 3.4 Connector Locations and Model Numbers of Recommended Products

3.3 ELECTRICAL SPECIFICATIONS

3.3.1 SIGNAL LEVEL

All input/output signals are transferred in the TTL level with the following electrical characteristics.

TRUE = Logical "0" (LOW level)	0 to +0.4 V
FALSE = Logical "1" (HIGH level)	+2.5 to +5.25 V

3.3.2 DRIVER/RECEIVER

The driver circuit which outputs signals from FDD to the controller is an open collector output circuit capable of obtaining the sink current of maximum 40 mA in low level. The receiver circuit which receives signals being transferred from the controller to FDD is a Schmitt trigger gate terminating with a resistance of 330Ω.

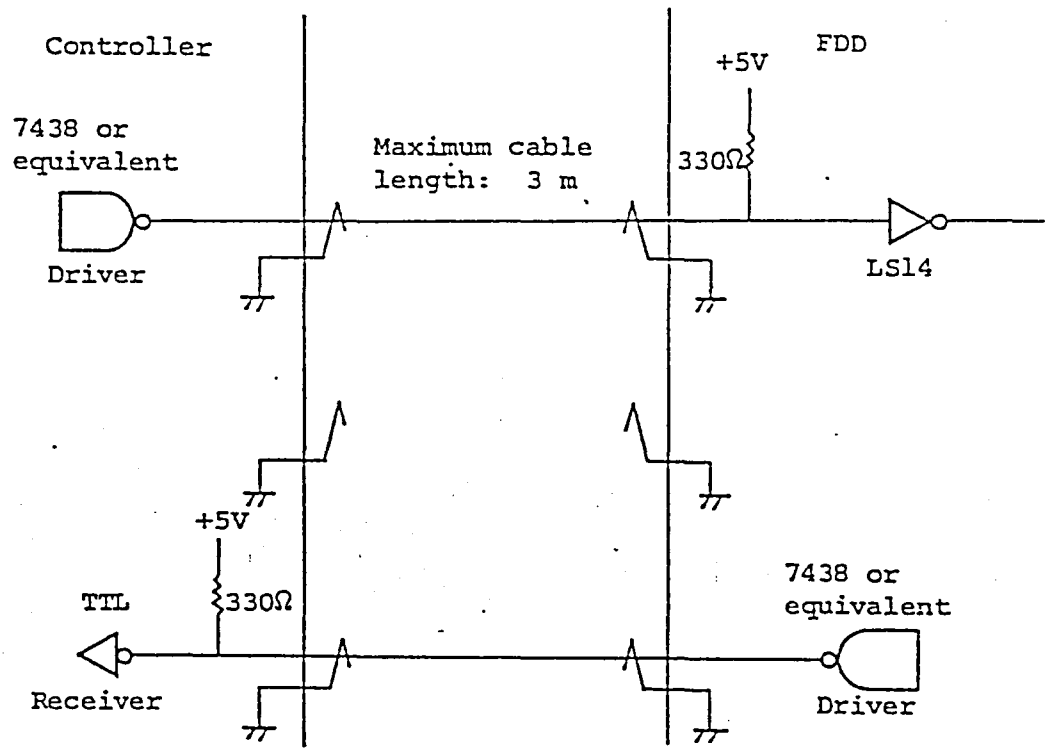


Figure 3.5 An Example of Driver/Receiver Circuit

3.4 EXPLANATION OF INPUT SIGNALS

3.4.1 DRIVE SELECT (DS0 to 3)

DRIVE SELECT 0 TO 3 are signals for selecting a specified FDD. Setting one of DS0 to DS3 to LOW level selects the corresponding FDD, which makes effective the input/output lines.

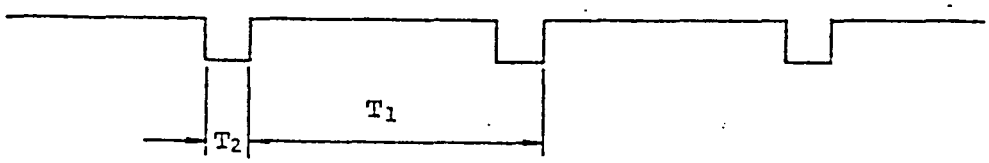
FDD is specified by shorting one of the DX selection plugs 0 to 3 on the package.

3.4.2 HEAD LOAD (HDL)

When FDD is READY (see Section 3.5.3), setting this signal to LOW level causes the magnetic head to touch the medium surface.

3.4.3 STEP (STP)

Pulse signal which moves the magnetic head in the direction specified by the direction select signal. The head begins moving at the rising from LOW to HIGH level of this signal. The magnetic head moves over as many cylinders as the number of input pulses. Figure 3.6 shows the pulse timing conditions.



T_1: 3 ms min.

T_2: 0.8 µs ∿ 2 ms

Figure 3.6 STEP Pulse Specification

3.4.4 DIRECTION SELECT (DIR)

Signal instructing the direction of magnetic head movement. The HIGH level indicates the direction toward the outer tracks and the LOW level indicates the inner tracks.

This signal must be switched definitely 0.8µs before the trailing edge of the STEP signal.

3.4.5 SIDE SELECT (SSL)

Signal selecting one of the heads used for write or read. The HIGH level selects the magnetic head on the side "0" of the medium and the LOW level the side "1".

This signal must be switched 100µs before starting the Read/Write operation.

3.4.6 WRITE GATE (WGT)

This signal writes data when at LOW level and reads data when at HIGH level. Do not turn off the HEAD LOAD signal, switch the SIDE SELECT signal, or start positioning, for T time after this signal has gone to HIGH level.

during T time

"Single speed mode" and high-density mode : T=600µs
"Single speed mode" and normal-density mode: T=600µs
"Dual speed mode" and high-density mode : T=600µs
"Dual speed mode" and normal-density mode : T=1000µs

3.4.7 WRITE DATA (WDT)

Pulse signal that supplies data to be written to the medium. Every time the signal changes from HIGH to LOW level, the current flowing in the magnetic head changes direction, which changes the direction of magnetization on the medium. Figure 3.7 and Figure 3.8 show the WRITE DATA specification of high-/normal-density mode each.

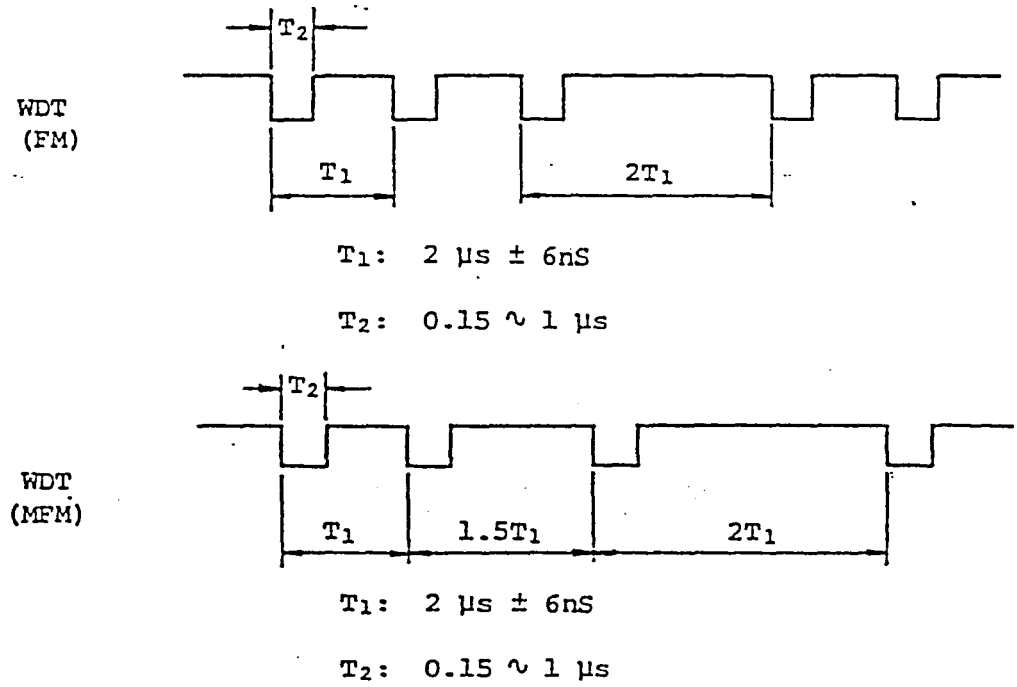
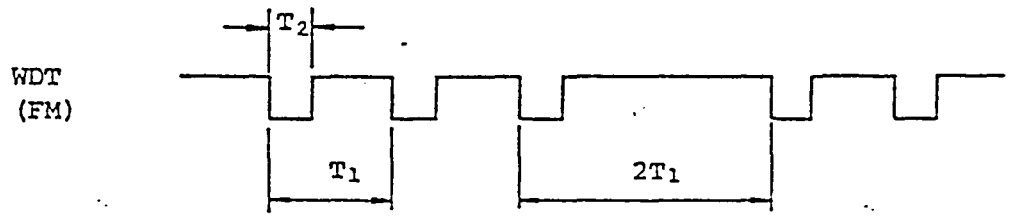
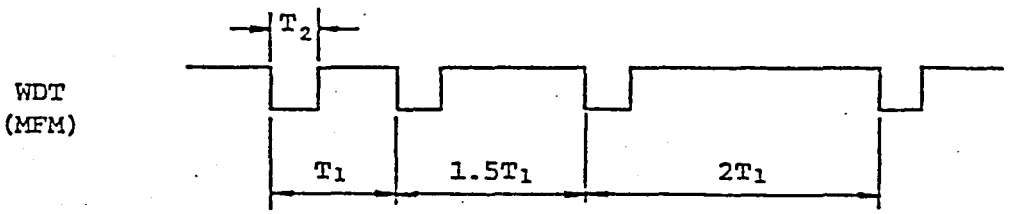


Figure 3.7 WRITE DATA Pulse Specification (High-density mode)



"Single speed mode" : T_1=3.33 μS±10nS, T_2=0.15∿1μS

"Dual speed mode" : T_1=4 μS±12nS, T_2=0.15∿1μS



"Single speed mode" : T_1=3.33 μS±10nS, T_2=0.15∿1μS

"Dual speed mode" : T_1=4 μS±12nS, T_2=0.15∿1μS

Figure 3.8 WRITE DATA Pulse Specification (Normal-density mode)

3.4.8 MOTOR ON (MON)

The spindle motor can be rotated by setting this signal to LOW level if the medium is mounted.

3.4.9 HIGH/NORMAL DENSIRY

The HIGH/NORMAL DENSITY is a level signal for switching FDD's record densities. If short plug "DEN" is 1 and FDD detects the HIGH level of this signal, the high-density mode is set. If FDD detects the LOW level, the normal-density mode is set.

If short plug "DEN" is 2 and FDD detects the LOW level of this signal, the high-density mode is set, and if FDD detects the HIGH level, the normal-density mode is set.

If short plug "DEN" is open to both 1, 2 and 3, the normal-density mode is set irrespective of the level of this signal.

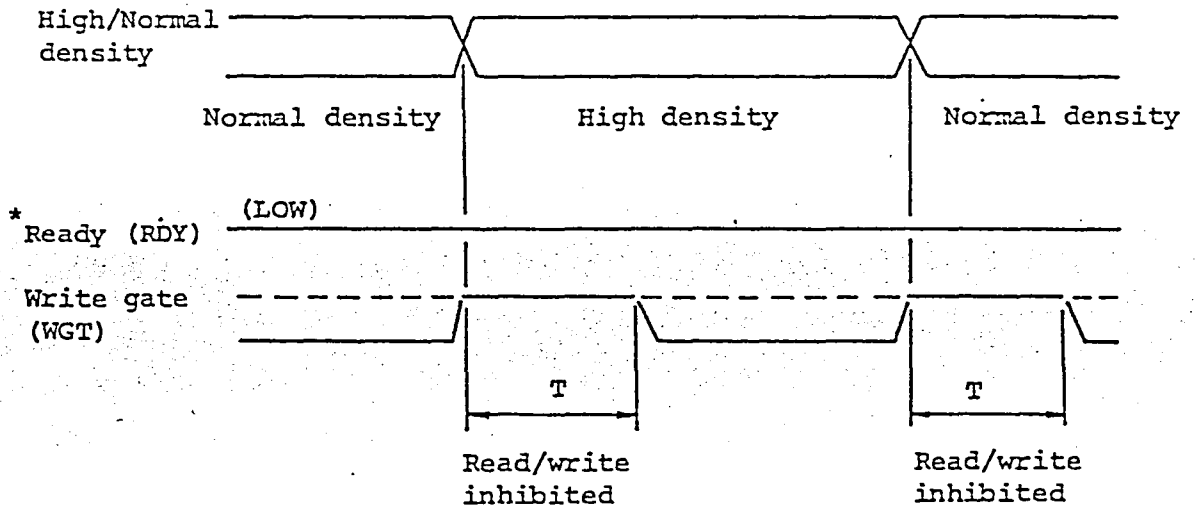
If short plug "DEN" is 3, the high-density mode is set irrespective of the level of this signal.

In a normal-density mode and "single speed mode" (short plug "HDE" is 1) a spindle motor rotation is 360rpm. A data transfer speed is 300/150 kbit/sec (MFM/FM).

In a normal-density mode and "dual speed mode" (short plug "HDE" is 2) a spindle motor rotation is 300rpm. A data transfer speed is 250/125 kbit/sec (MFM/FM).

In a high-density mode it is always 360rpm.

Since in a "dual speed mode" the rotation changes according to the high/normal-density signal level, latency until the rotation is stable after the density signal is changed is necessary. (Refer to Figure 3.9)



*: A ready signal is valid only in case of jumper plug "DCG" is 1.

For "single speed mode", T=20 μs

For "dual speed mode", T=400ms

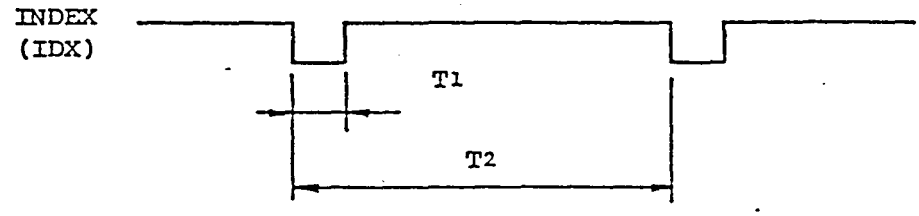
Figure 3.9 HIGH/NORMAL DENSITY switching timing

3.5 EXPLANATION OF OUTPUT SIGNALS

3.5.1 INDEX (IDX)

Signal for indicating the origin on the medium. This is output onece every revolution. Figure 3.10 shows the output pulse specification.

The leading edge of the pulse is used as a reference.



A rotation is 300rpm : T1=1∿8mS, T2=200±3 mS

360rpm : T1=1∿6mS, T2=166.7±2.5mS

Figure 3.10 INDEX Pulse Specification

3.5.2 TRACK 00 (TK0)

When at LOW level, this signal indicates that the heads are on track "00".

This signal is generated by the signal from the track 00 sensor and the excitation phase of the step motor.

3.5.3 READY (RDY)/DISK CHANGE (DCG)

READY

Signal indicating that FDD is ready to operate. This signal goes to LOW level, when the FDD is selected, if the following conditions are satisfied:

(i) "DCG" is 1.

(ii) DC power is supplied.

(iii) A medium is mounted.

(iv) The rotational speed of the medium has reached 90% of the specification.

DISK CHANGE

This is a signal which changes by the insertion and ejection of a medium. The controller can know that the medium has been changed by sending this signal when Jumper Plug "DCG" is 2. DISK CHANGE (DCG) is set (LOW level) when the medium is ejected and reset by step pulse (STP).

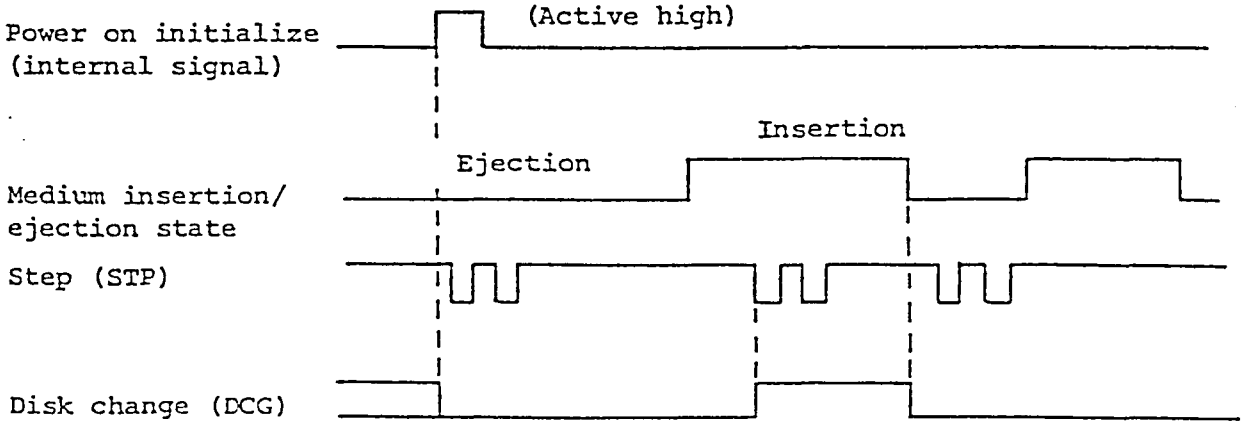
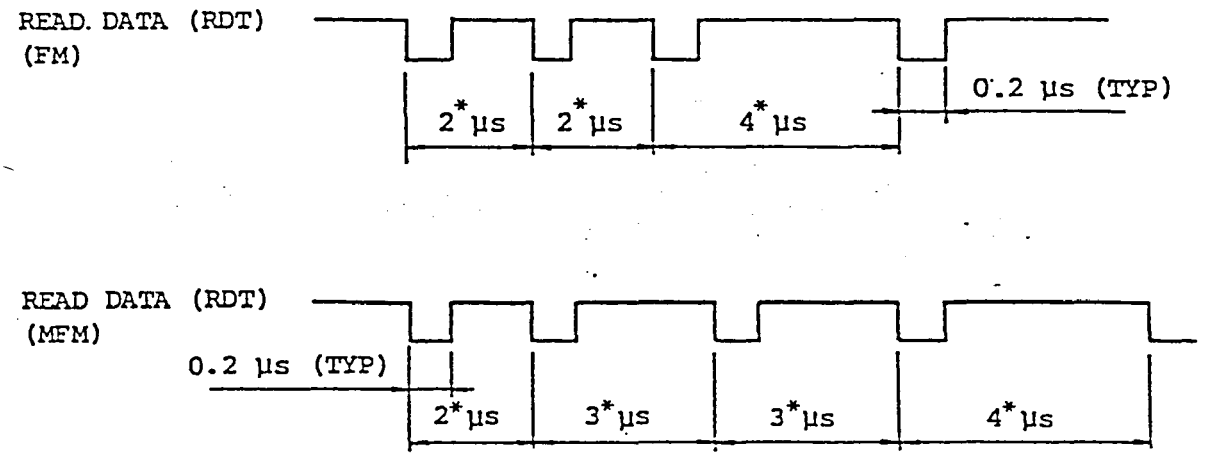


Figure 3.11 DISK CHANGE Signal Specification

3.5.4 READ DATA (RDT)

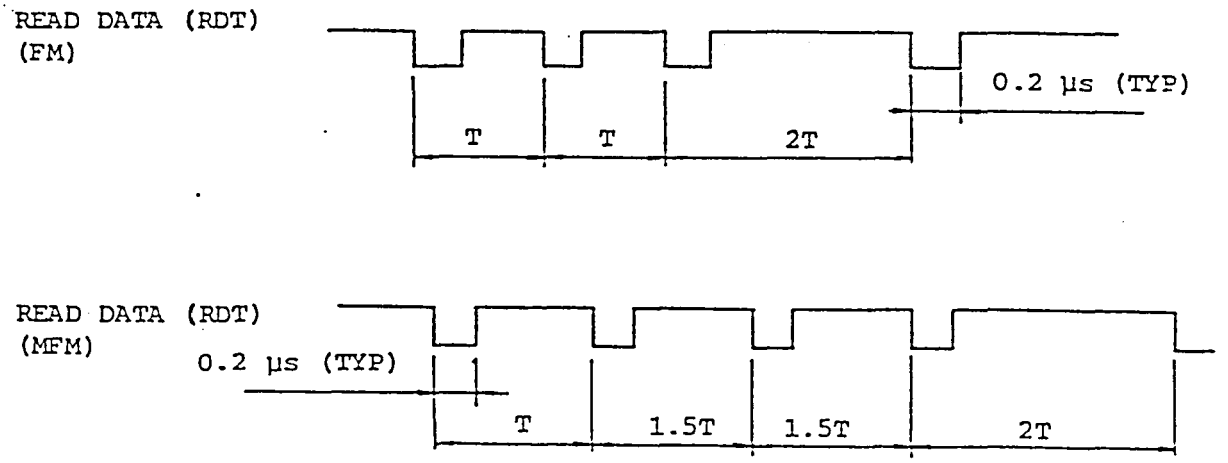
Data read from a medium which is shaped into a pulse string.

Figure 3.12 and Figure 3.13 show the READ DATA signal obtained when normally recorded information is read.



*Typical

Figure 3.12 READ DATA Signal Specification (High-density mode)



"Single speed mode" : T=3.33µS(TYP)

"Dual speed mode" : T=4 µS(TYP)

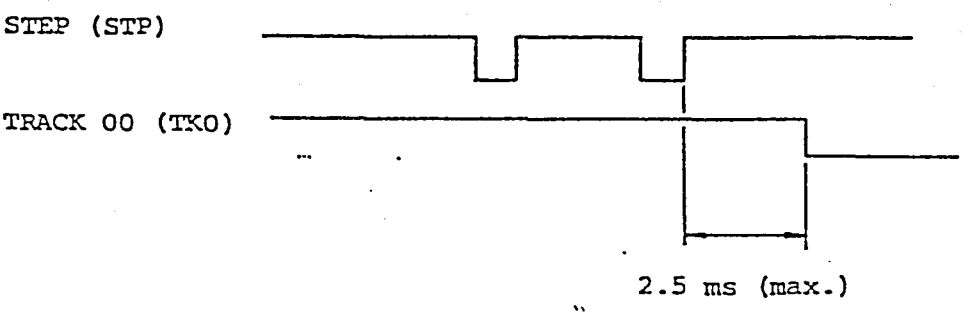
Figure 3.13 READ DATA Signal Specification (Normal-density mode)

3.5.5 WRITE PROTECT (PRT)

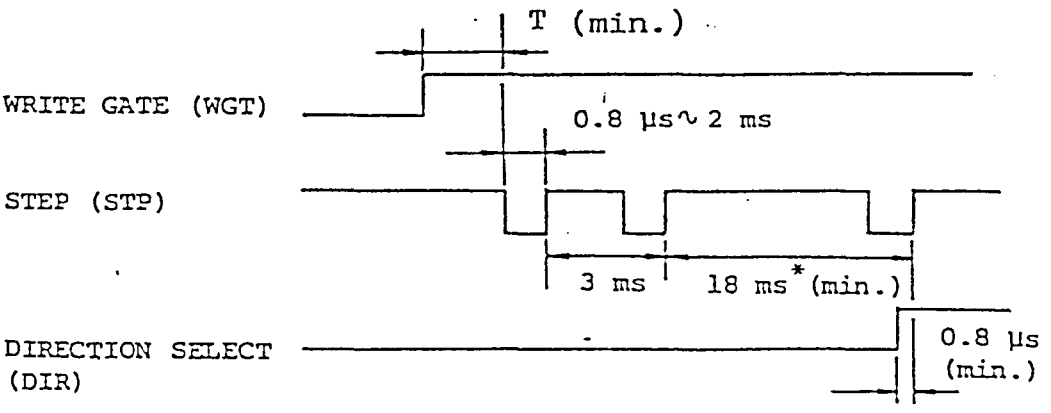
This signal goes to LOW level if a medium with a write enable notch covered according to ISO standard is inserted, which puts FDD in the write-disabled status.

3.6 INTERFACE SIGNAL TIMING

3.6.1 STEP AND TRACK 00



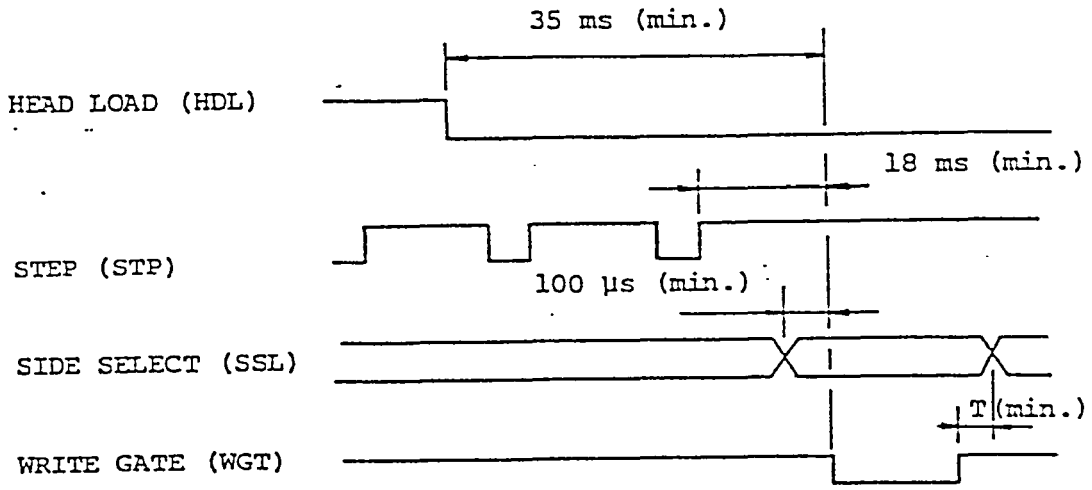
3.6.2 ACCESS TIMING



"Single speed mode" and high-density mode : T= 600µs
"Single speed mode" and normal-density mode: T= 600µs
"Dual speed mode" and high-density mode : T= 600µs
"Dual speed mode" and normal-density mode : T=1000µs

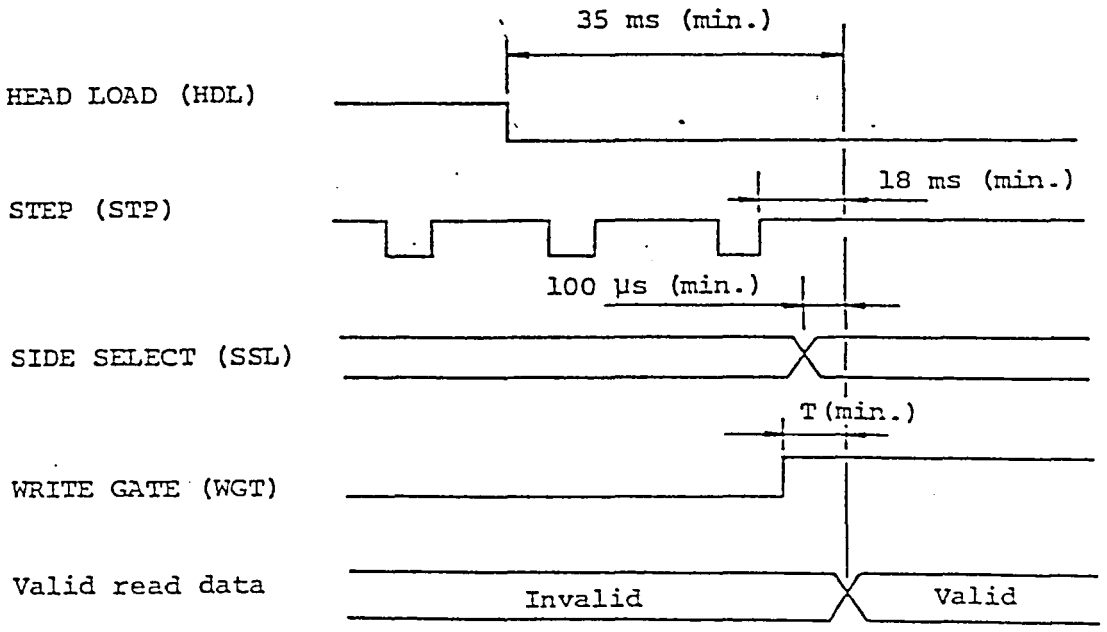
* An interval at least 18 ms required between step pulses when the direction changes.

3.6.3 WRITE TIMING



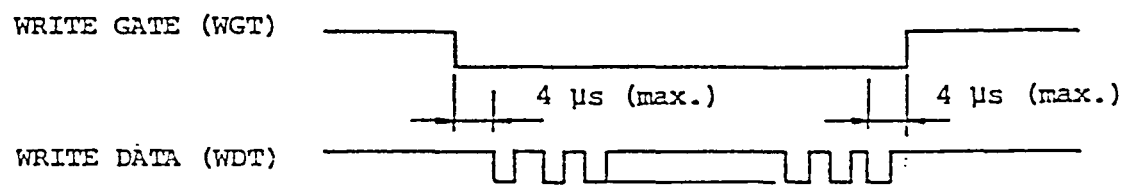
"Single speed mode" and high-density mode : T=600µs
"Single speed mode" and normal-density mode: T=600µs
"Dual speed mode" and high-density mode : T=600µs
"Dual speed mode" and normal-density mode : T=1000µs

3.6.4 READ TIMING

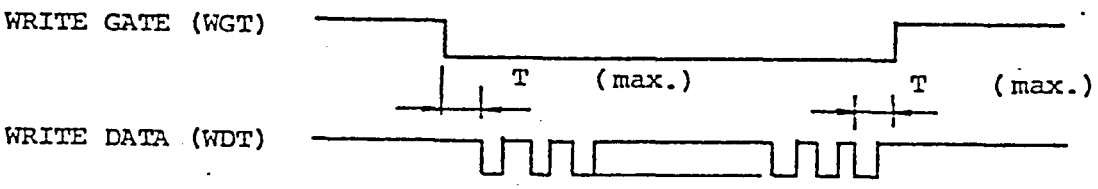


"Single speed mode" and high-density mode : T=600µs
"Single speed mode" and normal-density mode: T=600µs
"Dual speed mode" and high-density mode : T=600µs
"Dual speed mode" and normal-density mode" :T=1000µs

3.6.5 WRITE DATA TIMING



(High-density mode)



"Single speed mode" : T=6.67µs
"Dual speed mode" : T=8 µs

(Normal-density mode)

3.6.6 DRIVE SELECT AND OUTPUT SIGNAL TIMING

The drive control and status signals become effective 500ns after that the DRIVE SELECT line is selected.

3.7 POWER SUPPLY INTERFACE

3.7.1 INPUT POWER SPECIFICATIONS

Table 3.2 lists the DC power specifications for FDD. A sequence for each DC power is not needed.

Table 3.2 Input Power Specifications

Item		+12 V power	+5 V power
Voltage		+12 V ±5%	+5 V ±5%
Current	Startup	390 mA	460 mA
	Steady-state	210 mA	460 mA
Ripple voltage (NOTE 1)		200 mVp-p or less	100 mVp-p or less

NOTE 1: This includes the spike voltage.

4. OPERATING PROCEDURES

The basic operating procedures for FDD include the power on/off, medium setting and removal.

4.1 SETTING A MEDIUM

(1) Turn on DC power.

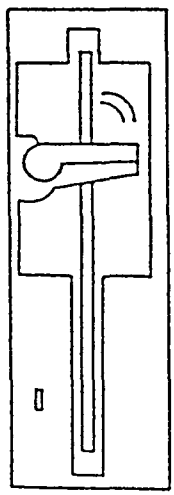
(2) Insert a medium slowly from the drive port until it hits the stopper.

(3) Close the front lever (see Figure (a) below.)

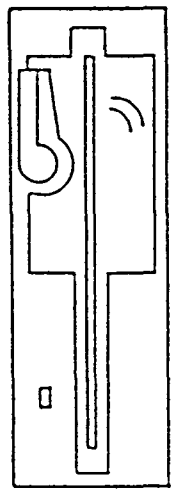
4.2 REMOVING THE MEDIUM

(1) Make sure the write/read operation of FDD has finished.

(2) Open the front lever (see Figure (b) below), pick up the medium with your fingers slowly.



(a)



(b)

(3) Place the medium in the envelope and store in a storage box.

4.3 DISPLAY LAMP

The display lamps indicate the FDD status. Lamp conditions are selectable by plug setting.

The selectable lamp conditions are:

(1) The HEAD LOAD signal is selected.

(2) With the condition (1) satisfied, the DRIVE SELECT signal corresponding to the FDD is also selected.

(3) The DRIVE SELECT signal for the FDD is selected.

(4) FDD is READY.

(5) With the condition (4) satisfied, the DRIVE SELECT signal corresponding to the FDD is also selected.

5. OPTIONAL FUNCTIONS

The head load, motor on, and display lamp conditions can be selected by changing the plug positions on the printed wiring board. The plugs are initially set at positions marked with an asterisk.

(1) Head load

Head load condition	Plug position	
	HS	USE
READY & DRIVE SELECT & HEAD LOAD	1	1
READY & DRIVE SELECT	1	2
READY & HEAD LOAD	2	1
READY	2	2 *

(2) Motor on

Motor on condition	Plug position
	MON
DRIVE SELECT	3
HEAD LOAD	2
MOTOR ON	1 *

(3) Display lamp

Display lamp condition	Plug position	
	USE	LED
HEAD LOAD	1	1 and 4
HEAD LOAD & DRIVE SELECT	1	1 and 5
DRIVE SELECT	-	2 and 4
READY	-	3 and 4
READY & DRIVE SELECT	-	3 and 5
DRIVE SELECT	-	2 and 5 *

"-" indicates that the plug position is allowed mounting on any position.

(4) Density switching

Record density	HIGH/NORMAL DENSITY signal	Plug position
		DEN
High density	H level	1 *
Normal density	L level	
Normal density	H level	2
High density	L level	
High density	H level	3
High density	L level	
Normal density	H level	Open
Normal density	L level	

(5) Rotation change

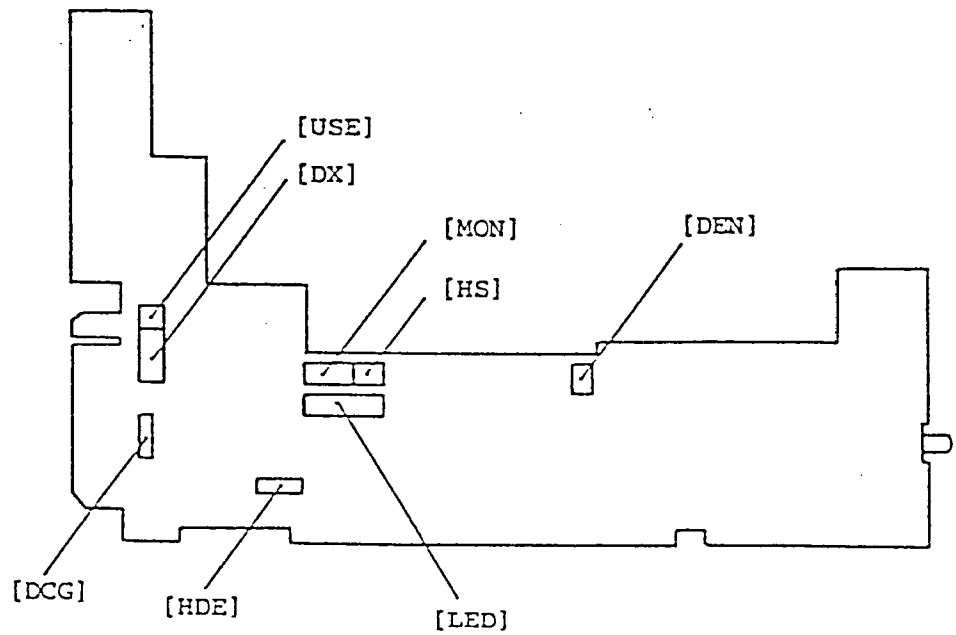
Rotation in a normal-density mode	Plug position
	HDE
360rpm ("single speed mode")	1 *
300rpm ("dual speed mode")	2

NOTE : A rotation in a high-density mode is 360rpm for both short plug "HDE"=1 and 2.

(6) Disk change/ready

Disk change/ready signal output condition	Plug position
	DCG
Ready signal	1
Disk change signal	2 *

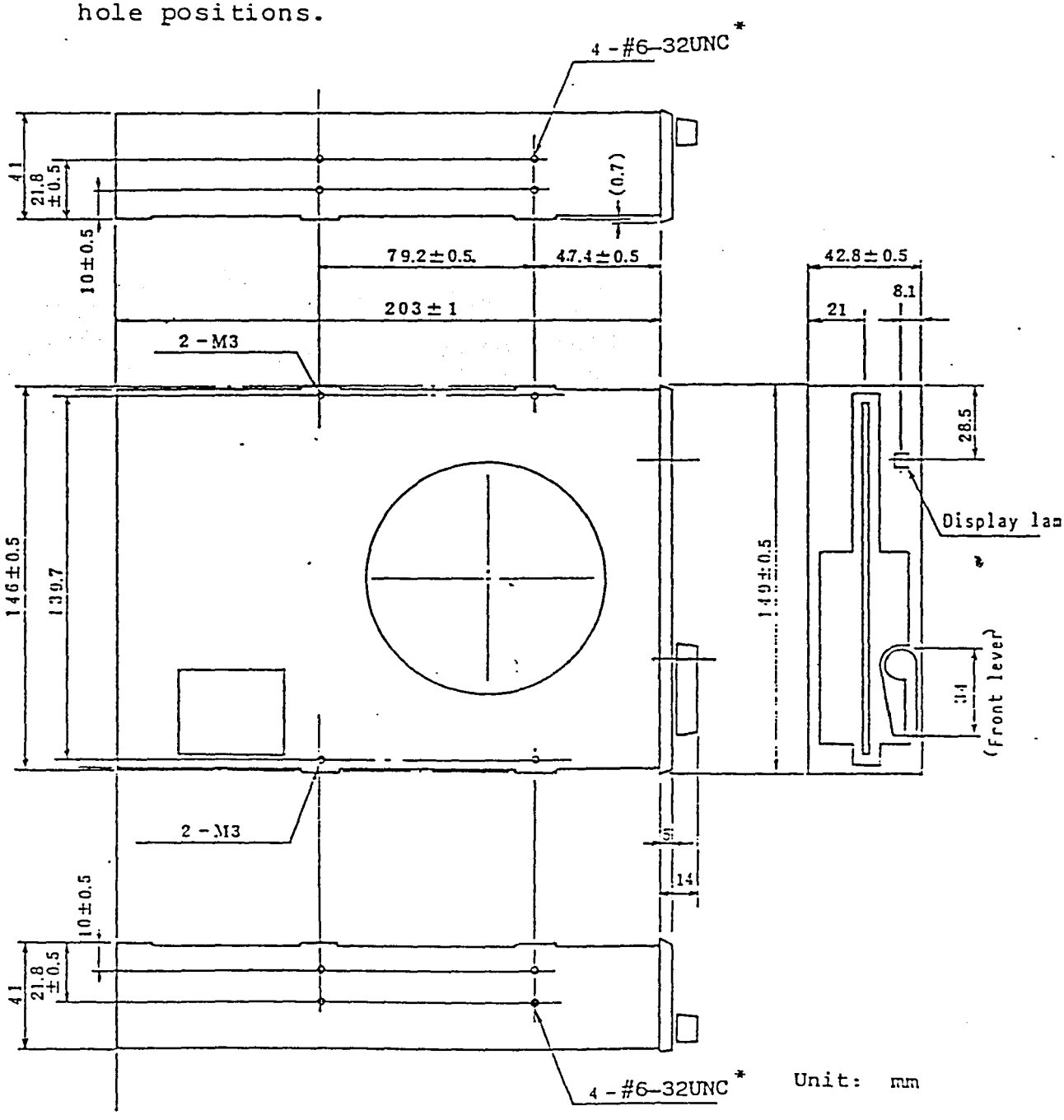
[option plug position on PWB]



6. EXTERNAL SHAPE AND INSTALLATION

6.1 EXTERNAL SHAPE AND FITTING HOLE POSITIONS

Figure 6.1 shows the external shape and fitting hole positions.



As for the fitting holes marked "*",metric screw size M3 will be provided as an option.

Figure 6.1 External Shape and Fitting Hole Positions

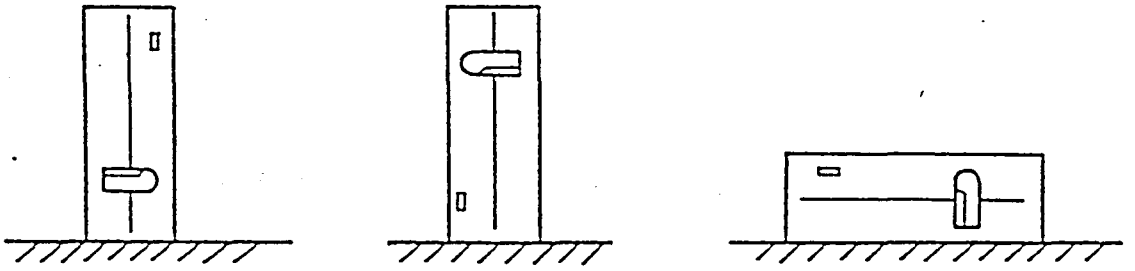
6.2 INSTALLATION

FDD may be installed in the following manners:

(a) Vertical (with front lever down)

(b) Vertical (with front lever up)

(c) Horizontal

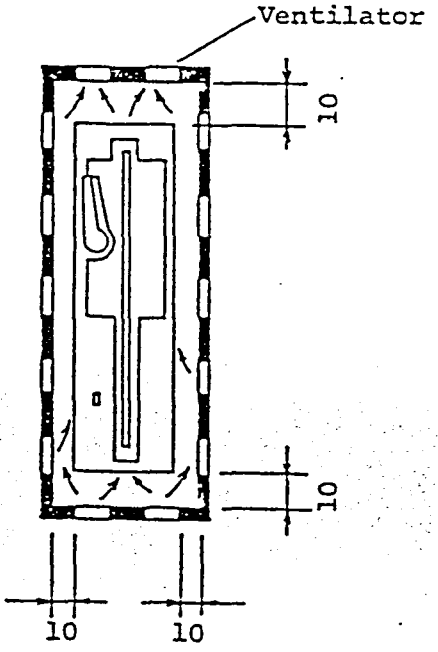


(a) (b) (c)

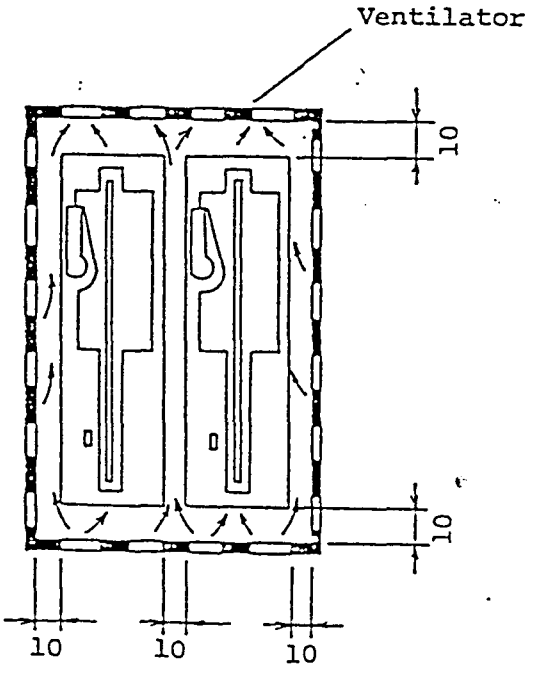
Consider the location of FDD in the system, so that it may be protected against the noise from CRT, power supply, etc., especially when installing it inside CRT.

6.3 RECOMMENDED AIR FLOW

(1) Installing one FDD



(2) Installing two FDDs



NOTE 1: Appropriate cooling is required if the ambient temperature around FDD rises considerably.

3.4.9 HIGH/NORMAL DENSIRY

The HIGH/NORMAL DENSITY is a level signal for switching FDD's record densities. If short plug "DEN" is 1 and FDD detects the HIGH level of this signal, the high-density mode is set. If FDD detects the LOW level, the normal-density mode is set.

If short plug "DEN" is 2 and FDD detects the LOW level of this signal, the high-density mode is set, and if FDD detects the HIGH level, the normal-density mode is set.

If short plug "DEN" is open to both 1, 2 and 3, the normal-density mode is set irrespective of the level of this signal.

If short plug "DEN" is 3, the high-density mode is set irrespective of the level of this signal.

In a normal-density mode and "single speed mode" (short plug "HDE" is 1) a spindle motor rotation is 360rpm. A data transfer speed is 300/150 kbit/sec (MFM/FM).
In a normal-density mode and "dual speed mode" (short plug "HDE" is 2) a spindle motor rotation is 300rpm. A data transfer speed is 250/125 kbit/sec (MFM/FM).
In a high-density mode it is always 360rpm.