SAMSUNG

FDD

OEM MANUAL
SFD-321B

3.5inch DUAL DENSITY
MICRO FLOPPY DISK DRIVE
SPECIFICATIONS

SEMA ELECTRONICS CO.,LTD

XiaLingBei HengKeng Management Area
Liaobu Town Dongguan City
Guangdong Province, China

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1. INTRODUCTION

1.1 Application

This manual shall be applied for SAMSUNG SFD-321B - double side, dual density (option : 3 mode), 3.5 inch micro floppy disk drive (hereinafter referred to as "FDD").

1.2 Disk Used

3.5 inch micro floppy disks (hereinafter referred to as "DISK"), the use of which will be mutually agreed between the customers and SAMSUNG, shall be used.

2. GENERAL SPECIFICATIONS

2.1 Performance

I T E M			LOW DENSITY STANDARD 1MB	HIGH DENSITY STANDARD 2MB	HIGH DENSITY *OPTION* 1.6MB
Capacity (KBytes)	Unformatted	Per Disk	1000	2000	1600
		Per Track	6.25	12.5	10.0
	Formatted	Per Disk (Sector / Track)	655.4 (16)	1310.7 (32)	1065.0 (26)
			737.3 (9)	1474.6 (18)	1228.8 (15)
			819.2 (5)	1638.4 (10)	1310.7 (8)
Recording Density (BPI) -Inner Most Track, side 1			8,717	17,434	14,528
Data Transfer Rate (KBits / sec) -MFM recording			250	500	
Number of Heads			2		
Number of Tracks			160		
Track Density (TPI)			135TPI (5.33 Tracks / mm)		
Drive Motor Specification	Rotational Speed		300 RPM		360 RPM
	LSV		± 1.5 % Max.		
	ISV		± 1.5 % Max.		
	Start Time		500 ms Max.		
Access Time	Track to Track Time		3 ms		
	Head Settling Time		15 ms Max.		
Head 0 / Head 1 Offset			Head 1 is displaced 8 tracks toward the drive spindle direction.		

ITEM		LOW DENSITY STANDARD 1MB	HIGH DENSITY STANDARD 2MB	HIGH DENSITY *OPTION* 1.6MB
Media Operating Force	Inserting	800 gr Max.		
	Ejecting	1300 gr Max.		
Media Ejecting Distance		10 ~ 70 mm		
Acoustic Noise at 50 cm - at 3 ms Step Rate		50 dBA Max.		
Read Bit Shift		1300 ns Max.	650 ns Max.	
1. Measured with Brikon 723B on Track 79 with 0 ns precompensation on both heads.				
Asymmetry		600 ns Max.	300 ns Max.	
1. Measured with Brikon 723B on Track 00 with 0 ns precompensation on both heads.				
Radial Alignment	Both R/W heads must be radially aligned to all tracks within ±0.0200 mm when accessed from either direction. Measurement is to be made at normal voltage and normal environmental condition (23±2 ℃ and 50±5 % RH)			
Azimuth Alignment	±0 ° 18′ Max.			
Index to Data Burst	0 ~ 1300 μs Measurement is to be made from the leading edge of index pulse to the beginning of data burst on Track 40.			
Overwrite Modulation	-26 dB or less at Track 00			

* Read/Write Compensation : 125ns is recommended

2.2 Environmental Conditions

ITEM			SPECIFICATION
Ambient Temperature	Operating (℃)		0 ~ 50
	Storage (℃)		-40 ~ 70
	Transportation (℃)		-40 ~ 70
	Temperature Gradient (℃ / Hr)	Operating	20 Max.
		Non-operating	30 Max.
Relative Humidity (%) *No-condensation	Operating : 29 ℃ Max. wet bulb temp.		20 ~ 80
	Storage : 40 ℃ Max. wet bulb temp.		0 ~ 90
	Transportation : 45 ℃ Max. wet bulb temp.		0 ~ 90
Vibration (30 min. sweep cycle) *Exclude resonant frequency	Operating	5 ~ 100 Hz frequency range	1.5 G Max.
		100~ 200 Hz frequency range	1.0 G Max.
		200~ 600 Hz frequency range	0.5 G Max.
	Transportation : 5 ~ 600 Hz frequency range		3 G Max.
Shock (11 ms half sine wave)	Operating		5 G Max.
	Transportation		100 G Max.

2.3 Reliability

I T E M		SPECIFICATION
M.T.B.F.(Mean time between failures)		20000 power on hours (POH) (25% duty)
M.T.T.R.(Mean time to repair)		30 minutes Max.
Component Life		5 years
Disk Life		3×10^{6} passes per track or more
Disk Insertion		3×10^{4} times or more
Error Rate	Soft Read Error (*1)	1 per 10^{9} bits read
	Hard Read Error (*2)	1 per 10^{12} bits read
	Seek Error (*3)	1 per 10^{6} seeks

<Note>

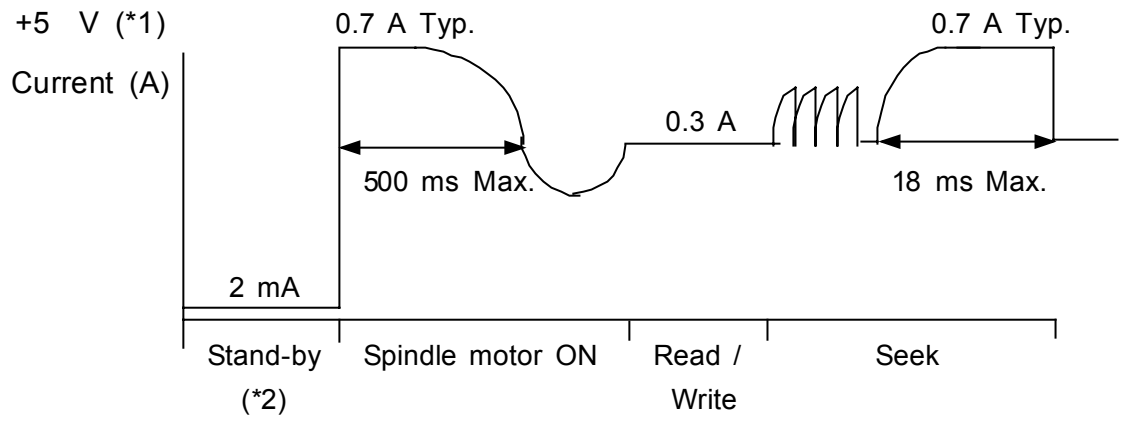
(*1) A soft (recoverable) error is defined as a successful attempt to read a track of data within 3 retries after a read failure.
A read retry is defined as an attempt to read the entire track that a read failure occurred on.

(*2) A hard (non-recoverable) error is defined as a failure to read a track of data within 3 retries after a read failure.

(*3) A seek (access) error is defined as the inability of the drive to seek to a targeted track within 1 retry. An access retry is defined as one recalibration with an attempt to seek to the targeted track.

2.4 Power Supply

I T E M		SPECIFICATION	
Required Power		D.C. 5 V ± 10 %	
Allowable Ripple Voltage		100 mV_{p-p} (including spike noise)	
Power Consumption	Operating Mode	Average Current	Average Power
		Typ.	Typ.
	Stand - by	2 mA	10mW
	Read Operation	0.3 A	1.5 W
	Write Operation	0.3 A	1.5 W
	Seek Operation (3 ms)	0.7 A	3.5 W
	Drive Motor Start	0.7 A	3.5 W



<Note>

(*1) Typical values are specified at 5.0 V

(*2) Stand-by : Under the condition that all input lines are inactive.

2.5 Physical Specifications

I T E M		SPECIFICATION
Mechanical Dimension	Width (mm)	101.6
	Height (mm)	25.4
	Depth (mm)	145.0 (without Front Bezel)
Weight (gr)		460.0 typ.
External View		Refer to Fig. 2-1 and Fig. 2-2
Installation Holes		Refer to Fig. 2-1 and Fig. 2-2

PHYSICAL DIMENSIONS

HEIGHT	25.4 MM
WIDTH	101.6 MM
DEPTH	145.0 MM

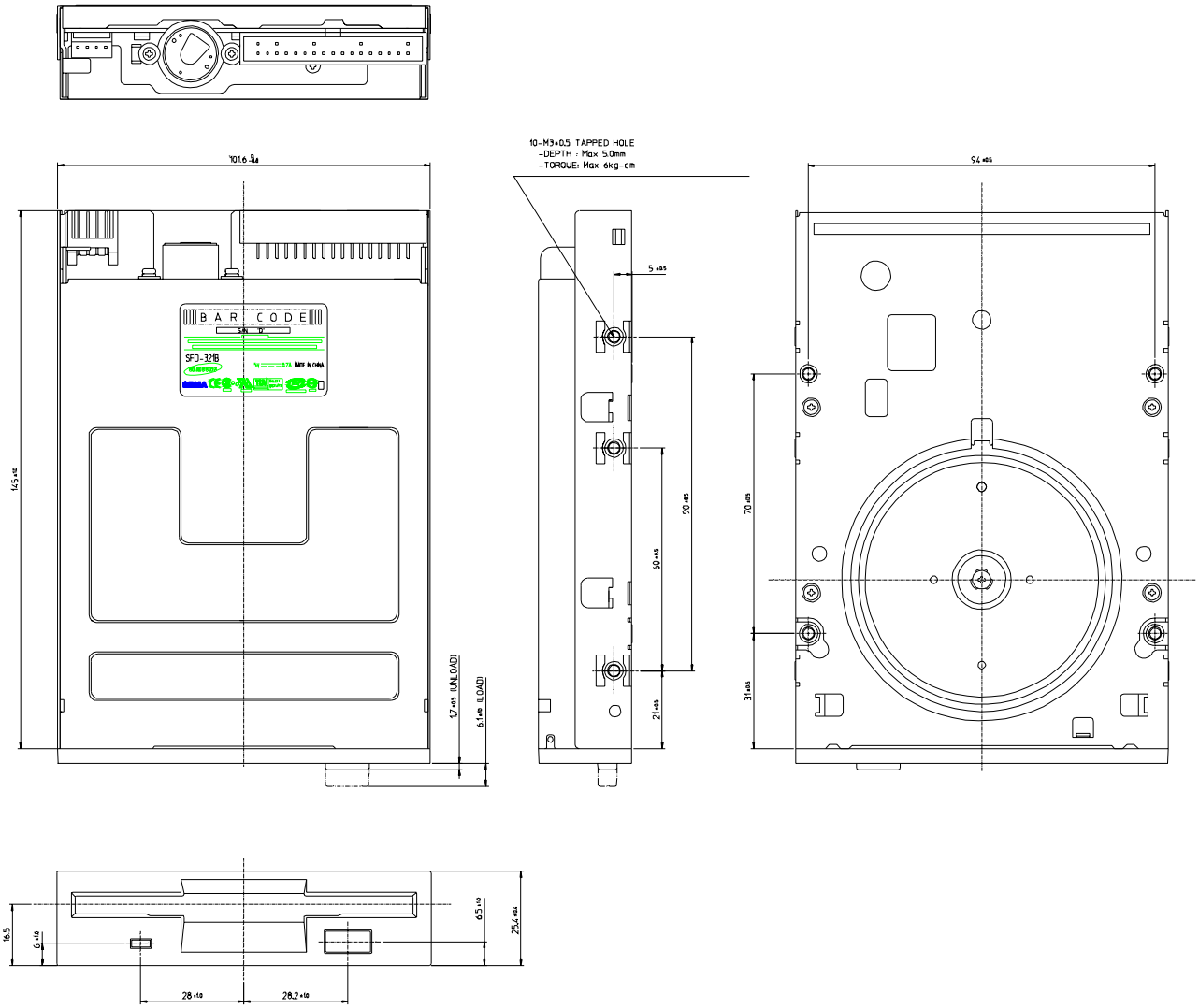


Figure 2-1 Physical Dimensions

PHYSICAL DIMENSIONS

(W/O Bezel type)

HEIGHT 25.4 MM
WIDTH 101.6 MM
DEPTH 145.0 MM

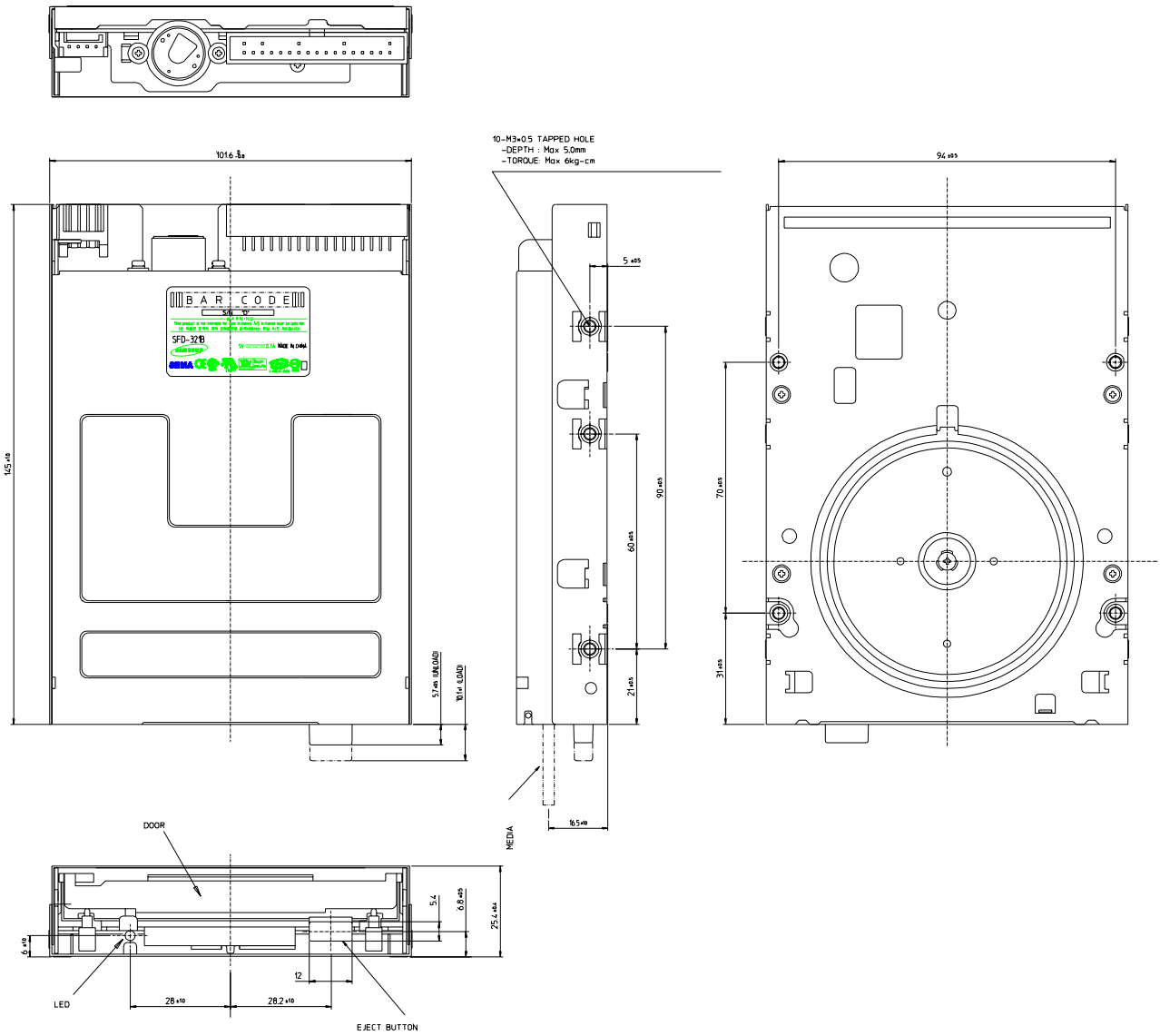
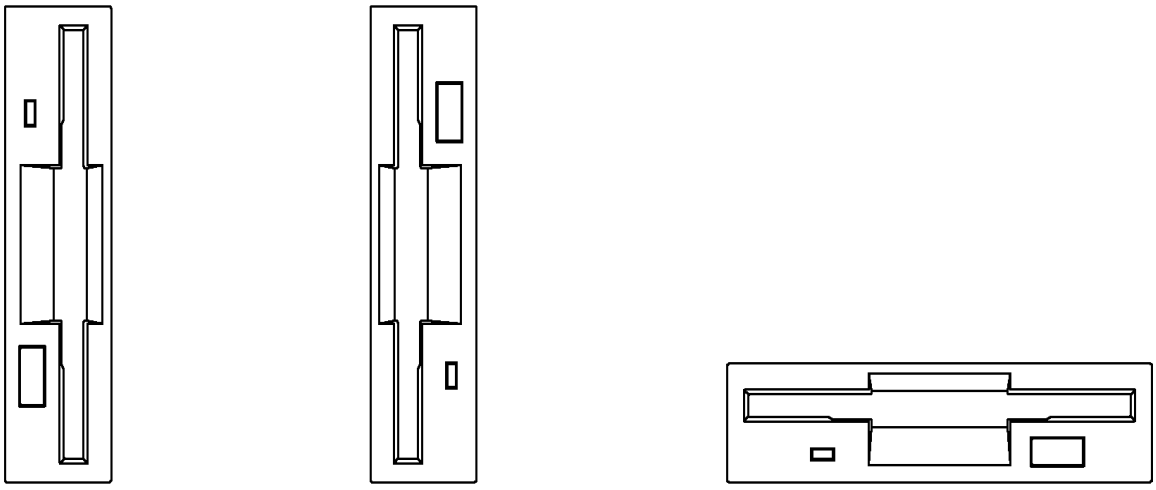


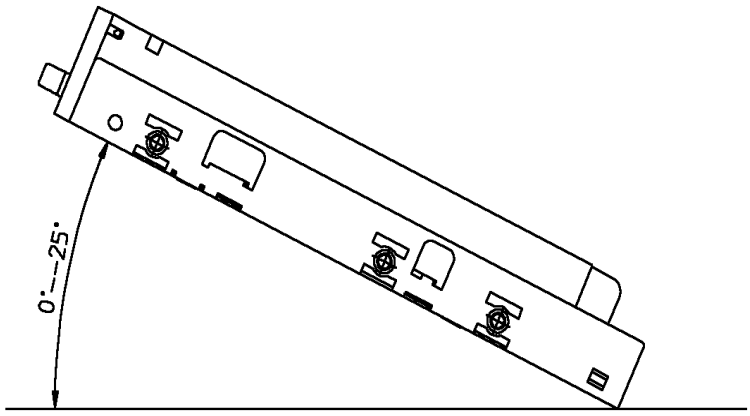
Figure 2-2 Physical Dimensions

3. INSTALLATION

Installation Direction



Vertical Horizontal

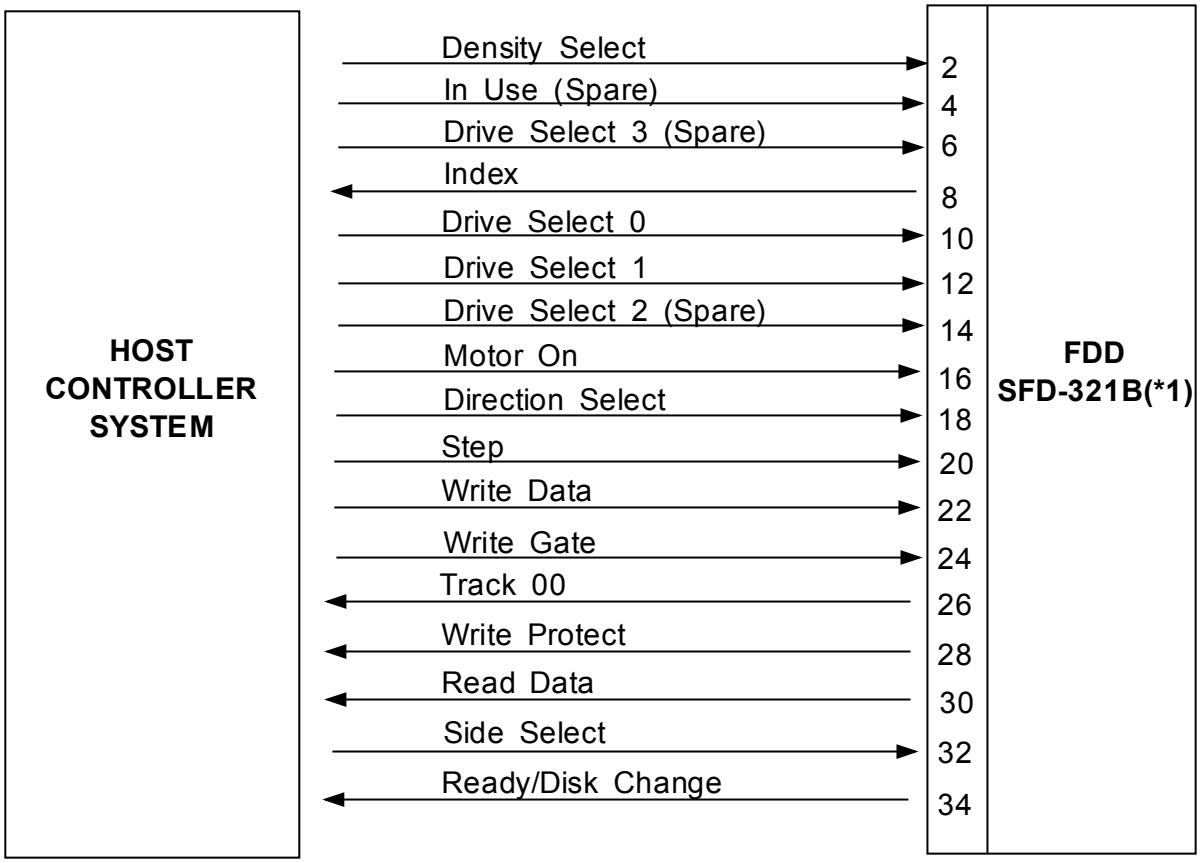


* The other installation directions than the aboves will be considered separately.

Figure 3-1 Installation

4. ELECTRICAL INTERFACE

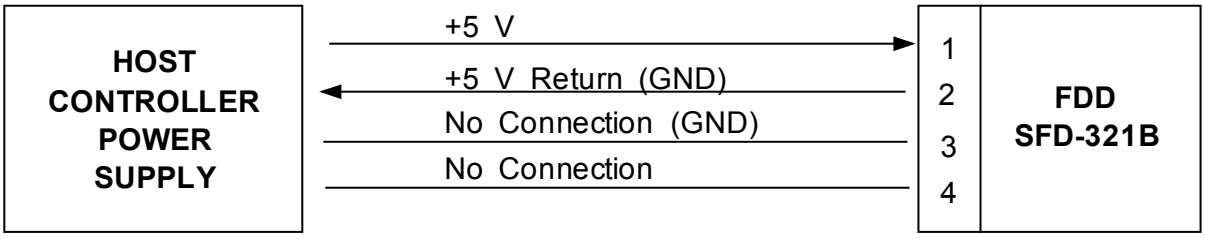
4.1 Signal Interface



<Note>

(*1) All odd numbers : GND

4.2 Power Interface



4.3 Interface Connectors

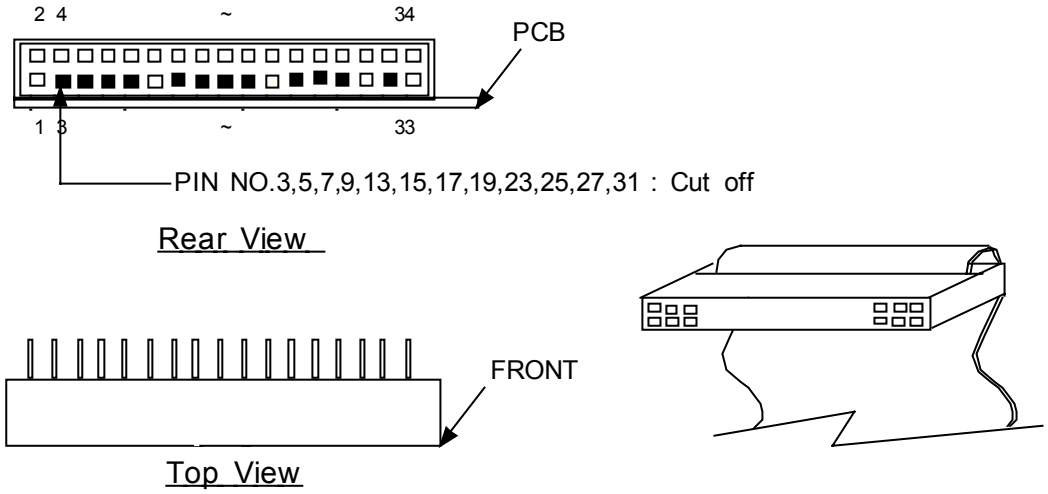
4.3.1 Signal Interface Connector

Side	Connector
FDD	HIROSE P/N 5003-001-7347 or equivalent (*1)
HOST (Connector)	3M NO. 7934 or equivalent
HOST (Cable)	3M 3365/34 or equivalent (*2)

<Note>

(*1) 33 pins, 2.54 pitch (Pin #3,5,7,9,13,15,17,19,23,25,27,31 : cut off)
Wall Type

(*2) Cable length : 1m (3.3 feet) Max.

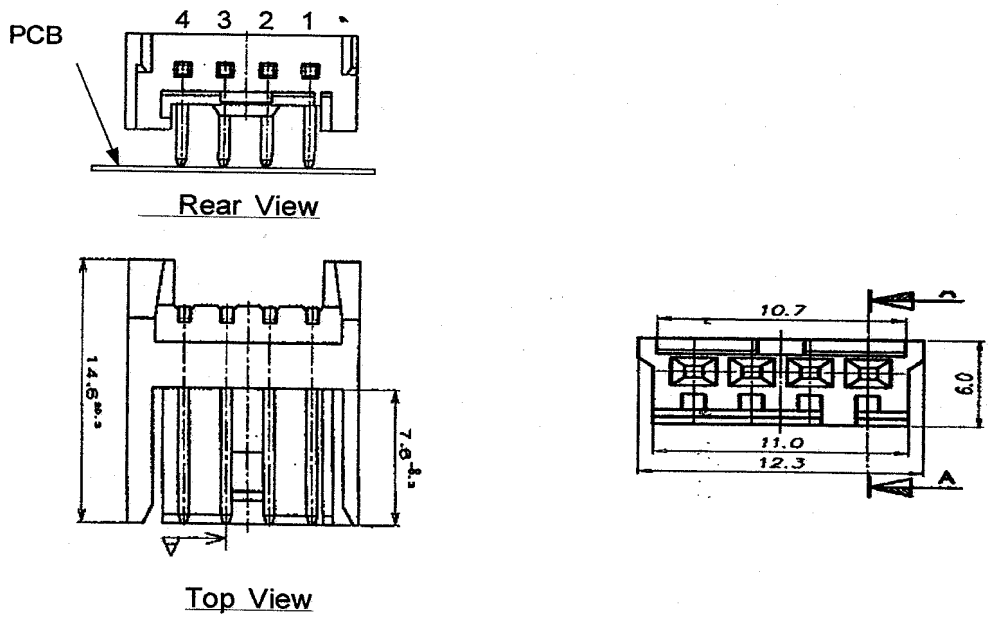


< Signal Interface Connector (FDD) > < Cable Side Connector (HOST) >

Fig 4-1. Signal Interface Connector and Cable Side Connector

4.3.2 Power Interface Connector

Side	Connector
FDD	ELCO P/N 9251-004-000-809 or equivalent
HOST (Connector)	AMP 171822-4 or equivalent
HOST (Cable)	AWG #20-26



< Power Interface Connector (FDD) > < Cable Side Connector (HOST) >

Fig 4-2. Power Interface Connector and Cable Side Connector

5. SIGNAL CHARACTERISTICS

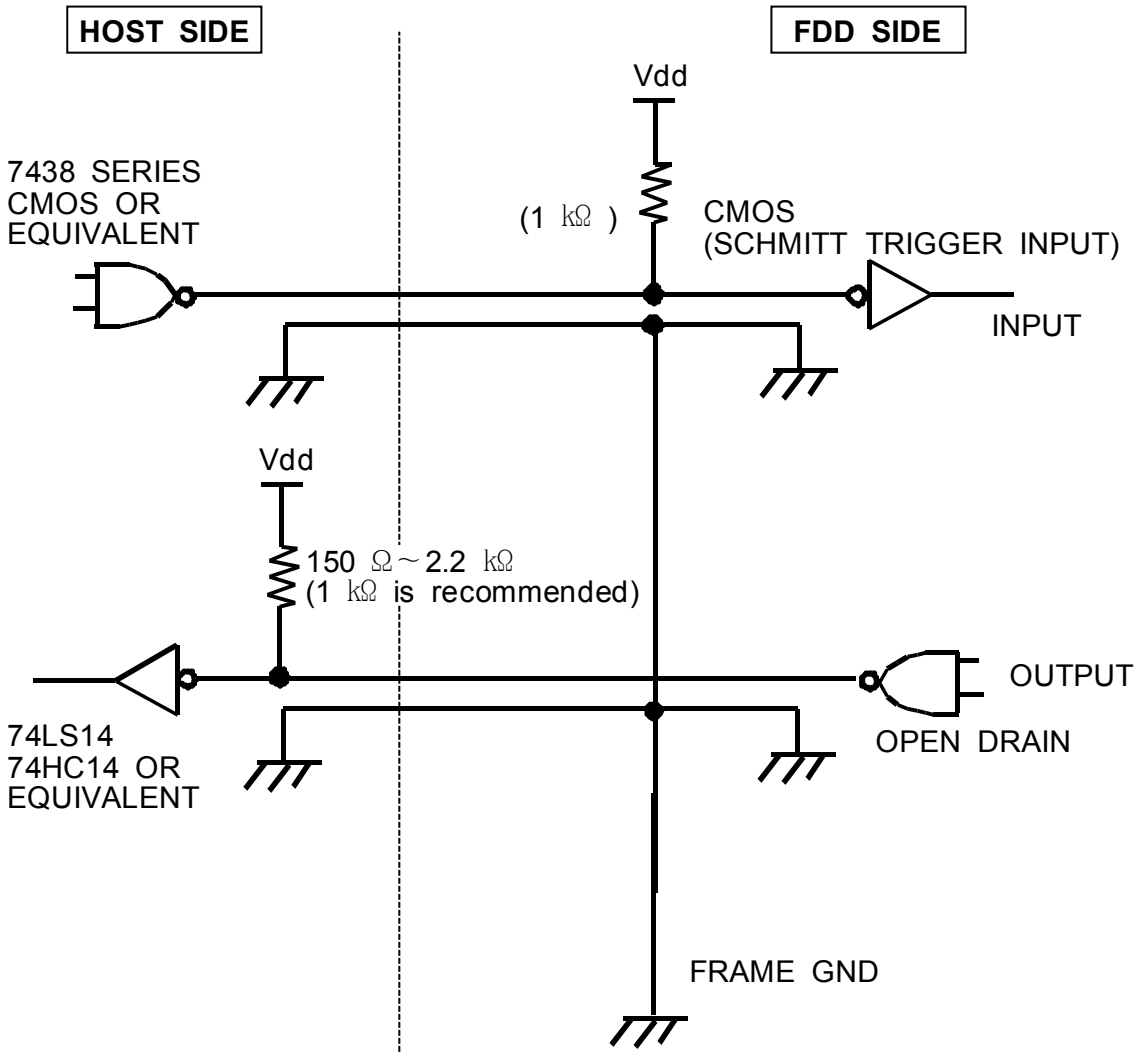
5.1 Signal Level

Signal Logic	Input Level	Output Level (*1)
Low (True)	0.9 V Max.	0.4 V Max.
High (False)	2.2 V Min.	2.4 V Min.

<Note>

(*1) "LOW" level Max. sink current is 48 mA.

5.2 Recommended Interface Circuit



5.3 Input Signals

5.3.1 Density Select

This siganl is used to distinguish between 1.6MB and 2MB Mode.
The interface pin No.2 can be used as Density Select Input signal by attaching 0 Ω resistor onto "OPA" short plug when the High density media is inserted. The "HIGH" level designates 2MB Mode and the "LOW" level designates 1.6MB Mode. FDD can tell whether the inserted media is high or Low density by checking the signal coming from mechanical switch which detects the density selecting hole on the media.

Type	Contents
2 Mode (2.0 / 1.0MB) (Non-connection of "OPA")	Automatic Switching 2.0MB : If High density media is inserted. 1.0MB : If Low density media is inserted.
3 Mode (2.0 / 1.6 / 1.0MB) (Connection of "OPA")	Automatic Switching with "Density Select" 2.0MB : If High density media is inserted with "Density Select" is "HIGH". 1.6MB : If High density media is inserted with "Density Select" is "LOW". 1.0MB : If Low density media is inserted "Density Select" is not available.

5.3.2 Drive Select 0 and 1

Two trace plugs on the PCB, DS0 and DS1 are provided to select which Drive Select line will activate the interface signals for a unique drive in the daisy chain connection up to two drive units. Drive Select, when activated logical "LOW", enables all the I/O lines except Motor On line.
This signal also controls the lightening of In-Use LED.

5.3.3 Motor On

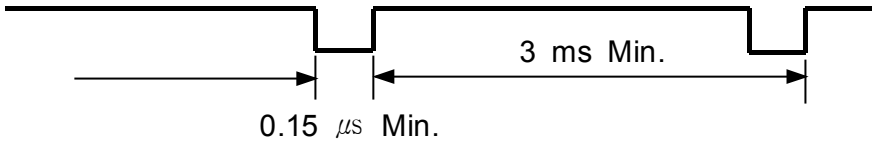
Logical "LOW" level of this signal makes the spindle motor be turned on. The motor reaches to the rated rotational speed within 500 ms after this signal changes to "LOW".
This input signal is ignored when no disk is installed.

5.3.4 Direction Select

This signal specifies the moving direction of the R/W head when the Step input is activated.
Logical "LOW" level : the direction to the inner tracks of a disk.
"HIGH" level : the direction to the outer tracks of a disk.

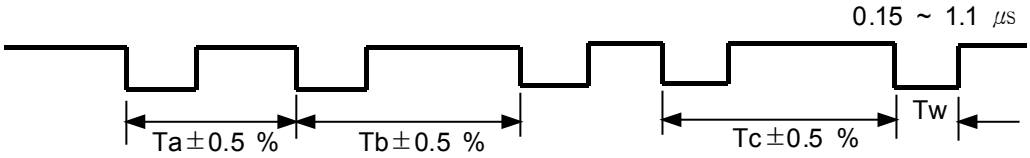
5.3.5 Step

This is a control signal to move the R/W head, and the head starts moving at the rising edge of the Step signal.



5.3.6 Write Data(MFM)

Each time this signal changes from "HIGH" level to "LOW" level, the direction of the current flowing into the R/W head is reversed, and the data bit is written on the disk.



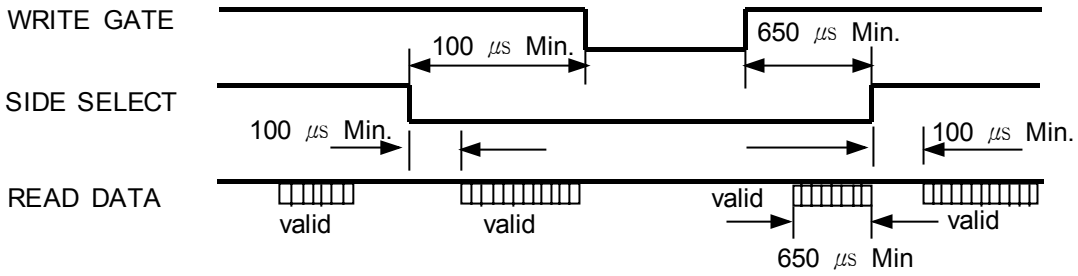
Density Mode		Ta (μs) (Typ.)	Tb (μs) (Typ.)	Tc (μs) (Typ.)
Density	Transfer Rate			
1.0MB	250 kbps	4	6	8
1.6MB	500 kbps	2	3	4
2.0MB	500 kbps	2	3	4

5.3.7 Write Gate

"LOW" level of this signal enables the write data to be written on the disk provided that the drive is selected, disk used is not write protected and seek operation is completed.
When this signal changes to "HIGH" level, the read or seek operation becomes possible.

5.3.8 Side Select

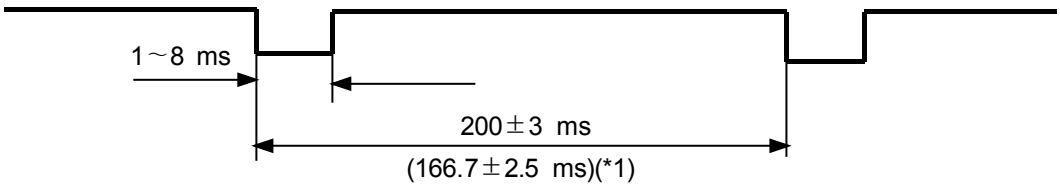
This signal selects the side of Heads.
Logical "HIGH" level : the lower side (side 0) of Heads
"LOW " level : the upper side (side 1) of Heads



5.4 Output Signals

5.4.1 Index

This is a pulse signal output to indicate the start of the track, and it outputs at every revolution of the disk.
This output signal is activated when only the drive is in Ready state.



<Note>

(*1) The value in parenthsis is for 360 rpm (1.6MB Mode) rotation speed.

5.4.2 Track 00

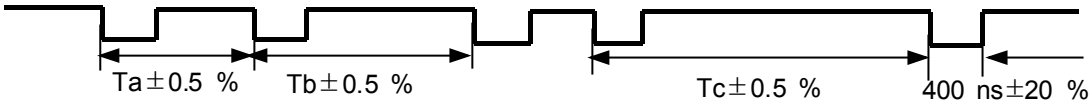
"LOW" level of this signal indicates the head is on Track 00 position and stepping motor is at the specified position respectively.

5.4.3 Write Protect

When a write-protected disk is inserted, this signal becomes "LOW" and the data on the disk is protected from mis-erasing and the write operation is inhibited.

5.4.4 Read Data (MFM)

Read Data read out from the disk is transferred to the host system in the same form as it was received on the Write Data line. Each flux reversal sensed on the disk produces the only transition from "HIGH" level to "LOW" level. For the seperation of the clock bits from the data, the leading edge of a change from "HIGH" to "LOW" level is used.



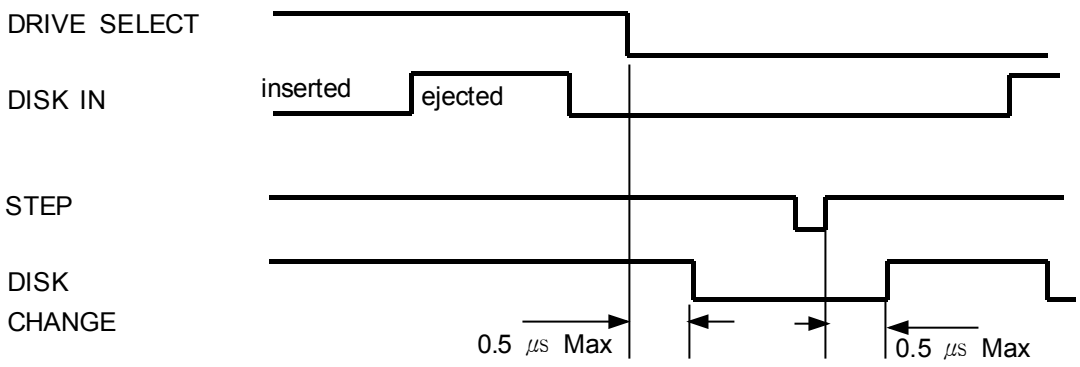
Density Mode		Ta (μs) (Typ.)	Tb (μs) (Typ.)	Tc (μs) (Typ.)
Density	Transfer Rate			
1.0MB	250 kbps	4	6	8
1.6MB	500 kbps	2	3	4
2.0MB	500 kbps	2	3	4

5.4.5 Disk Change / Ready

By selecting proper trace plugs, this signal line (pin #34) can be used for Ready or Disk Change line.

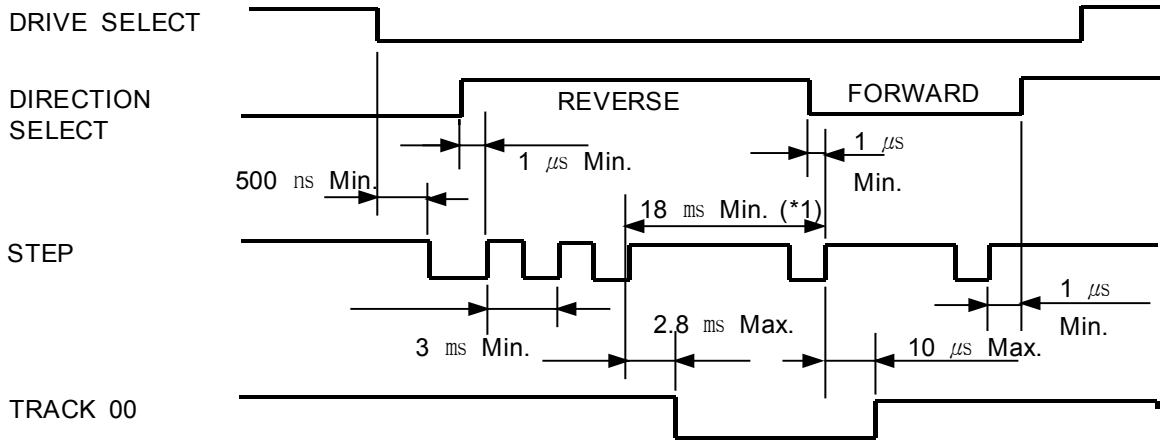
-. Ready
This line becomes active "LOW" when the drive is selected, a disk is clamped and the spindle motor is up to speed.
(after counting at least two Index pulses)
Otherwise this line goes logical "HIGH" level.

-. Disk Change
This line is active "LOW" unless disk is clamped and a Step pulse is received when the drive is selected.

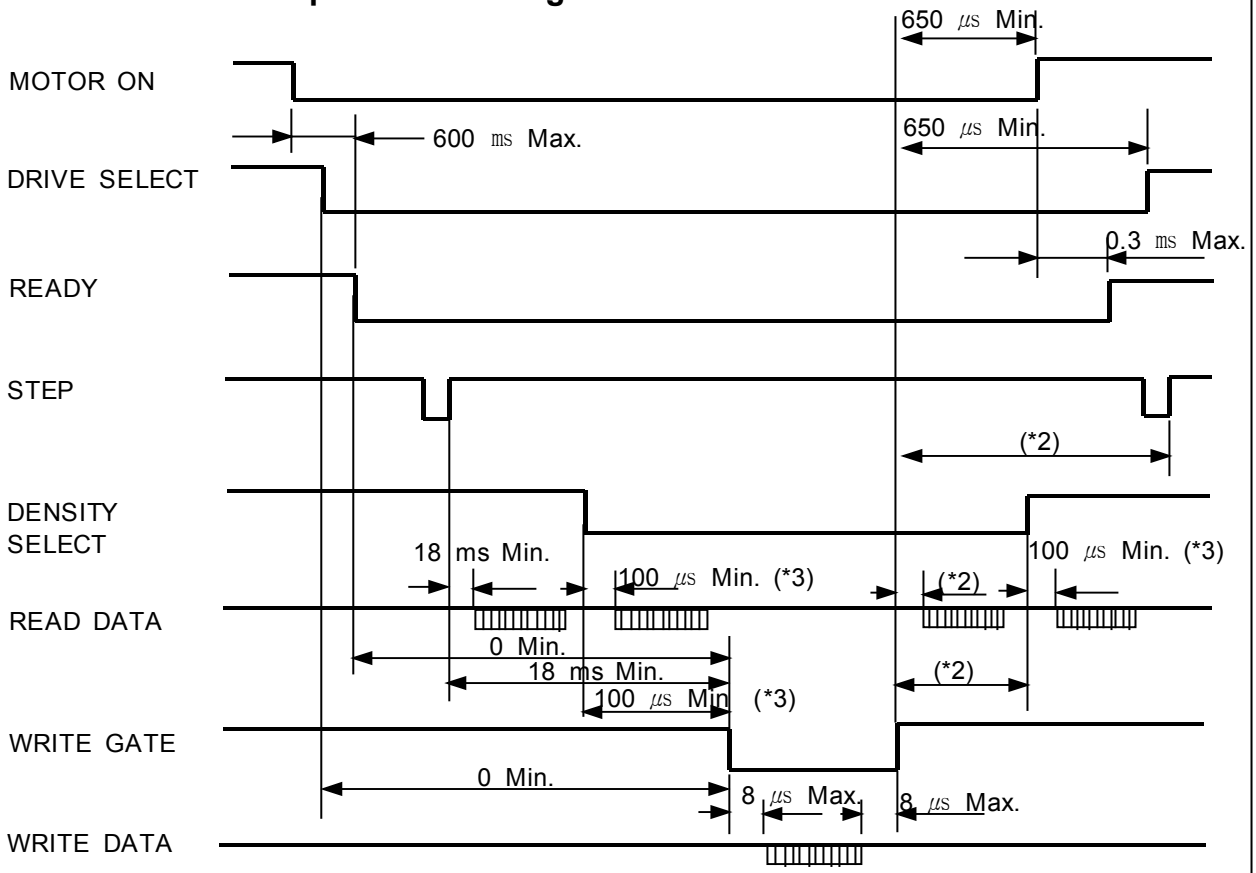


6. TIMING DIAGRAM

6.1 Seek Operation Timing



6.2 Read / Write Operation Timing



<Note>

(*1) Turn Around Time is 18 ms Min. when Direction is changed.

(*2) 750μs Min. (including 100 μs Side Select timing)

(*3) When spindle motor speed is changed (300 rpm ↔ 360 rpm) this value is 500 ms Min.

7. SAFETY STANDARDS

This drive is approved by the followings;

. CE
. CSA
. UL
. TUV
. MIC
. BSMI
. FCC

8. PACKAGING DESCRIPTION

8.1 Label Description

8.1.1 Serial Number Label Marking

BAR CODE
FBT6 S1ARB00001

F	B	T	6	S	1	A	L	B	00001
①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩

① Product name : "F" → FDD
② Model name : "B" → SFD-321B
③ Revision name (Major)
④ Revision name (Minor)
⑤ Production division : "S" → SEMA ELECTRONICS CO.,LTD
⑥ Production site

Marking	1	2
Production site	China factory (SEMA China)	Outside supplier (OEM)

⑦ Production line : "A" → A-Line, "B" ~ "Z"
⑧ Year of manufacturing

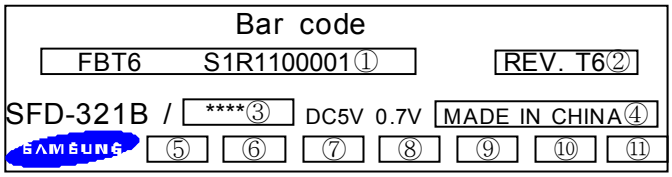
Year	2001	2002	2003	2004	2005	2006	2007
Marking	M	N	P	Q	R	S	T

⑨ Month of manufacturing

Month	Marking	Month	Marking	Month	Marking	Month	Marking
1	1	4	4	7	7	10	A
2	2	5	5	8	8	11	B
3	3	6	6	9	9	12	C

⑩ Consecutive number

8.1.2 Label Description

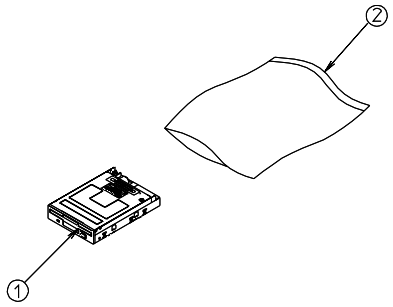


① Serial number
② Revision
③ Buyer name
④ Production site
⑤ CE marking
⑥ CSA marking
⑦ UL marking
⑧ TUV marking
⑨ MIC marking (for only domestic)
⑩ BSMI marking
⑪ Label manufacturer identification

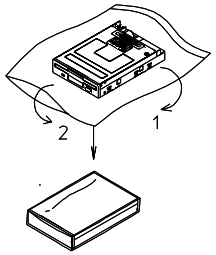
SEMA ELECTRONICS CO.,LTD

Packaging Method

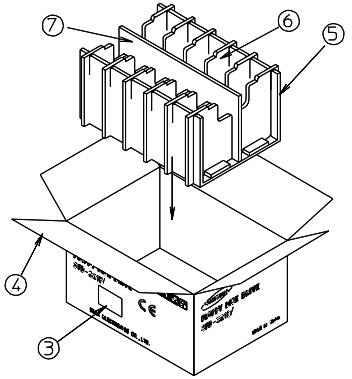
Process Chart



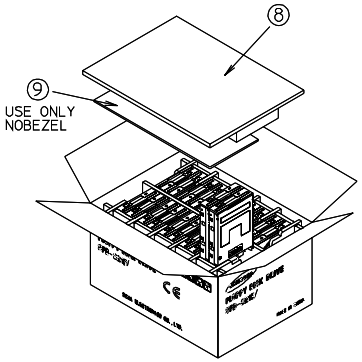
Method 1



Method 2

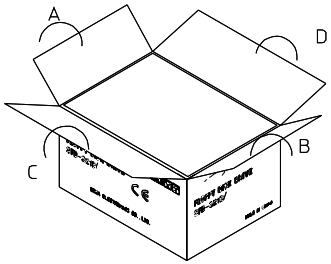


Method 3

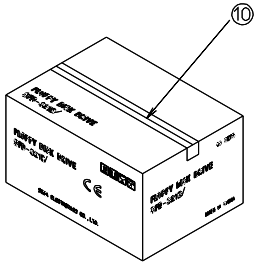


Method 4

Process Chart



Method 5



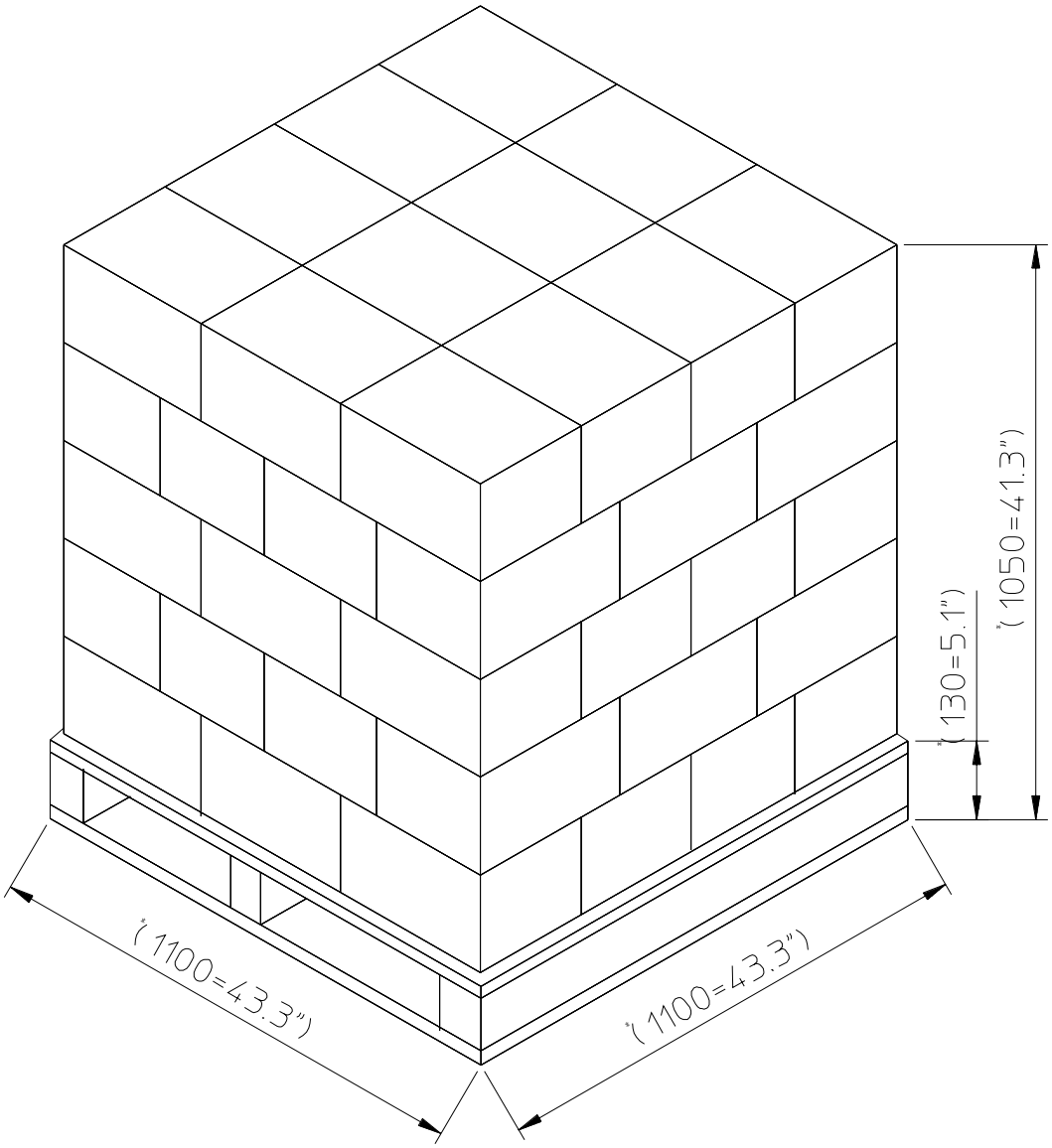
Method 6

NO	ITEM	CODE NO	Q'TY
1	3.5FDD	SFD-321B	24pcs
2	PACKING-BAG	BE69-00108A	24pcs
3	LABEL-STICKER	BE68-00101A	1pcs
4	PACKING-BOX		1pcs
5	CARTON PAD		1pcs
6	CROSS PAD (A)		6pcs
7	CROSS PAD (B)		1pcs
8	GUIDE PAD (A)		1pcs
9	GUIDE PAD (B)		1pcs
10	TAPE-MASKING	0203-002073	1300mm

Q'TY	24 PCS / 1 BOX
WEIGHT	10.6 Kg / 1 BOX
SIZE	349 x 257 x 180

NOTE)

1. Q'TY --> per 1 BOX
2. SIZE --> Inside dimension



Q'TY	1440pcs/pallet (12 carton/5layer)	
WEIGHT	653 kg/pallet (APPROX)	
PALLET SIZE	(1100) * (1100) * (130)	
1 PALLET SIZE	(1100) * (1100) * (1050)	
TOTAL Q'TY	20ft CONTAINER (2330*5885*2240)	28,800 pcs
	40ft CONTAINER (2330*11930*2240)	57,600 pcs

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9. OPTION SELECTION

FDD can be modified for different functions than the standard specification. These modifications should be implemented by the factory according to the request of the customers.

9.1 Trace Options

By putting a chip-resistor onto a proper trace, FDD can be used for the following different functions.

Trace Name	Description
DS0 DS1	Activate Drive Select 0 line Activate Drive Select 1 line
DC RDY	Activate Disk Change Signal Activate Ready Signal
OPA OPB (*1)	For 3 Mode usage For 1.6MB usage

<Note>

(*1) Both "OPA" and "OPB" open : 2 Mode (1MB / 2MB)
"OPB" is connected and "OPA" is open : 2 Mode (1MB / 1.6MB)
"OPA" is connected and "OPB" is open : 3 Mode (1MB / 1.6MB / 2MB)

9.2 Other Options (Buyer Selection)

The colors of In-Use LED, Front-Panel, the value of the termination resistors and the shape of button can be modified by customers' request.

9.2.1 Mode

☐	2 Mode (1MB / 2MB)
☐	3 Mode (1MB / 1.6MB / 2MB)

9.2.2 The Selection of Bezel Type

☐	With Bezel
☐	Without Bezel

9.2.3 The Color of Bezel, Button

☐	Black
☐	Ivory
☐	Gray
Color Number	_____ (Fill in this blank)

9.2.4 The Selection of LED Color

☐	Green
☐	Red
☐	Amber

11. GENERAL COMMENT