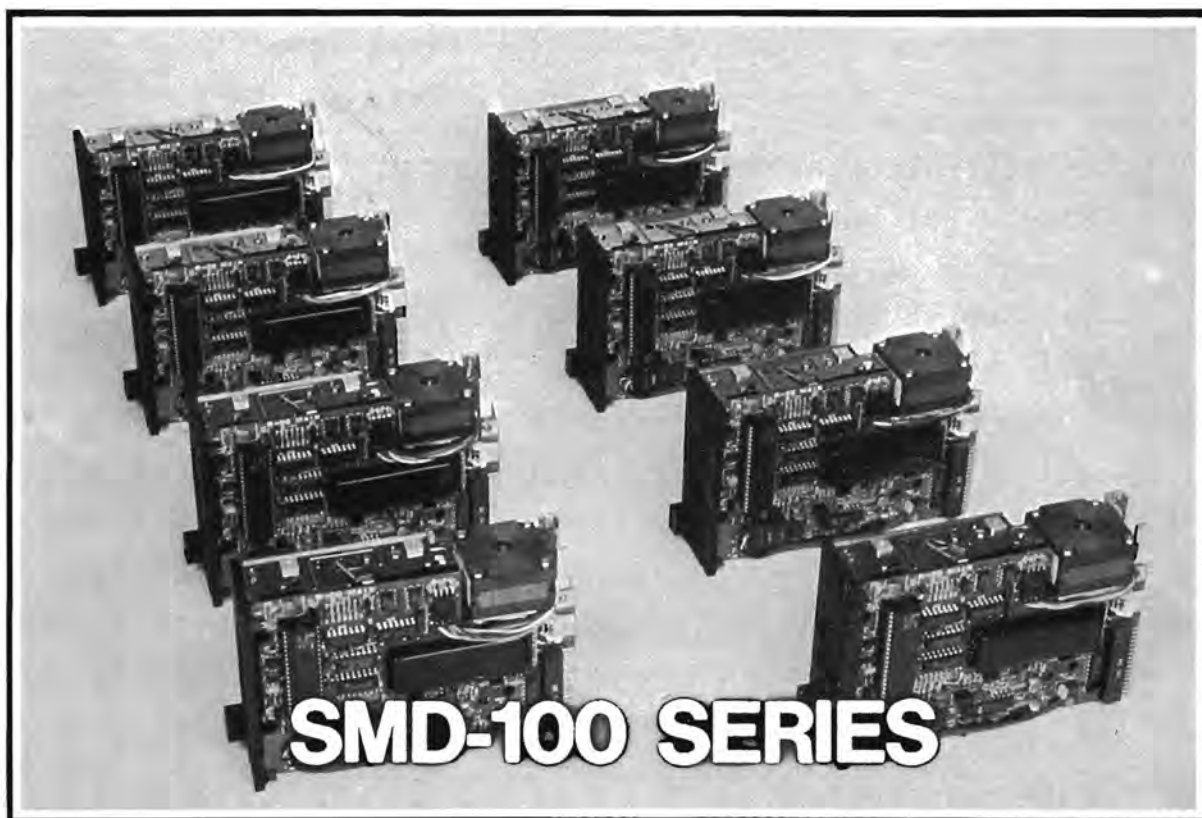


# SPECIFICATIONS FOR FLOPPY DISK DRIVES SMD 100 Normal Power 3 1/2"



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## 1. Scope

This specification applies to SMD-100 series (normal power consumption type) disk drives for 3.5" flexible disks.

## 2. General

SMD-100 series (normal power consumption) drives are flexible disk drives designed to be used as external memories for personal computers, word processors, etc. The features of the SMD-100 series drives are described below.

- (1) Low power consumption: SMD-100 series drives operate on only 2.1W (wait) and 5.2W (read/write) power.
- (2) Memory medium used is 3.5" flexible disk encased in a hard cartridge or equivalent.
- (3) The disks used have a storage capacity of 500K bytes per side (equivalent to a conventional single-sided, double-density 5.25" floppy disk).
- (4) High track density (135 TPI) (SMD-140, 130)
- (5) Use of DC brushless spindle drives assures long, trouble-free service life.
- (6) The head positioning mechanism employs a step motor and a steel band enabling fast (3msec) access between tracks. (SMD-140, 130)
- (7) The interface employed is fully compatible with conventional disk drives, enabling easy replacement.
- (8) The small size and light weight (800g) of the SMD-100 series drives make them ideally suited to a wide variety of applications.

### 3. General Specifications

Model			SMD-140	SMD-130	SMD-120	SMD-110
Memory	Unformatted (Kbytes)	FM	500	250	250	125
		MFM	1,000	500	500	250
Capacity	Formatted (Kbytes) (16 sectors/tracks)	FM	328	164	164	82
		MFM	656	328	328	164
Recording density (BPI)		FM	4,360	4,095	4,325	4,064
		MFM	8,720	8,190	8,650	8,128
Data transfer speed (Kbit /sec)		FM	125		125	
		MFM	250		250	
Track density (TPI)			135		67.5	
Average rotation wait time (msec)			100		100	
Access time (msec)	Between tracks		3		6	
	Average		96		97	
	Settling time		15		15	
Head load time			Without head load mechanism			
Total Number of tracks			160	80	80	40
Inner track radius (mm)	Side 0		24.6875		24.875	
	Side 1		23.1875		23.375	
Outer track radius (mm)	Side 0		39.50		39.50	
	Side 1		38.00		38.00	
Recording methods			FM/MFM			
R/W head			Tunnel erase type			
No. of heads			2	1	2	1
Head positioning method			Step motor			
Spindle motor	Type		Direct drive			
	Start-up time (sec)		1.0		1.0	
	Rotation speed (rpm)		300		300	

Model		SMD-140	SMD-130	SMD-120	SMD-110
Detector	Index detector	Noncontact detection method			
	Track 00 detector	Noncontact detection method			
	Write enable detector	Contact detection method			
	Cartridge set detector	Contact detection method			
Environmental conditions (Operating)		Temperature	5 to 45°C		
		Humidity	20 to 80% RH (non-condensing)		
		Max. wet bulb temperature	29°C		
		Vibration	5 to 60Hz, 0.6G max.		
Environmental conditions (storage and transport)		Temperature	-20 to 65 °C (-40 to 65°C transport)		
		Humidity	95% RH max. (non-condensing)		
		Vibration	5 to 60Hz, 3G max.		
		Shock	50G max.		
Power supply	+12V (+5%)	Wait	60 mA (TYP)		
		R/W	300 mA (TYP)		
		Motor start	850 mA (max.)		
	+5V (+5%)	Wait	280 mA (TYP)		
		R/W	320 mA (TYP)		
			420 mA (max.)		
Power consumption		Wait	2.1 W (TYP)		
		R/W	5.2 W (TYP)		
Outline dimensions		Width	101.6mm		
		Depth	147.5 mm		
		Height	40mm		
Weight		800g			
Designed orientations		Four orientations. (See page 19)			
Installation method		Screw holds on the side and lower panels of the disk drive are used. (See page 22, Outline Dimension Drawing.)			
Applicable disks		3.5" flexible disk. (For details, see page 20.)			



Model		SMD-140	SMD-130	SMD-120	SMD-110
Reliability	MTBF	10,000 POH			
	MTTR	0.5h			
	Designed service life	5 years			
	Software error rate	Less than 1 bit per $10^9$			
	Hardware error rate	Less than 1 bit per $10^{12}$			
	Seek error rate	Less than 1 seek per $10^6$ operations			
	Disk service life	$3 \times 10^6$ passes/track			
Connector	Power supply	AMP 171822-4 or equivalent			
	Signals	JAE PS-34SEO-D4P1-1C/D or equivalent			
Front panel material		ABS resin (Black)			
Safety standard		Conforms to UL standard.			

#### 4. Detailed Specifications

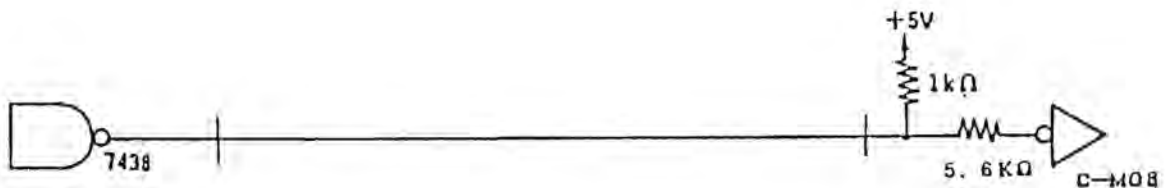
##### 4.1 Configuration of interface signals

The SMD-100 series (low power consumption) flexible disk drives are designed so that a maximum of 4 drives can be connected in a daisy chain configuration. All signal input levels are TTL compatible.

The power supply and interface require +5V and +12 V power.

##### 4.1.1 Electrical specifications of input signals

"Low" = TRUE	$V_{IN}$ : 0V to +0.4V
	$I_{IN}$ : 5mA (TYP)
"High" = FALSE	$V_{IN}$ : +2.5V to +5.25V
	$I_{IN}$ : 0mA (open)



The terminating resistance array is set at the correct direction (mark is inside) in the single line socket on the main unit. For the daisy chain connection, resistance array can be only installed into one of the (four) drives.

The disk drive with the resistance array installed must be charged with current in order to operate any of the drives.

##### 4.1.2 Function of input signals

###### (1) Drive select 0 ~ 3 (DS0 ~ DS3)

A maximum of four SMD-100 series (low power consumption) disk drives can be connected in a daisy chain configuration. Selection of the drive numbers is performed by SS1 of the DIC connector on the main PCB. When this switch is operated, only the signals from the selected drives will be input.

At the position MX, drive is selected no matter what state of drive select signal.



(2) Motor ON (MON)

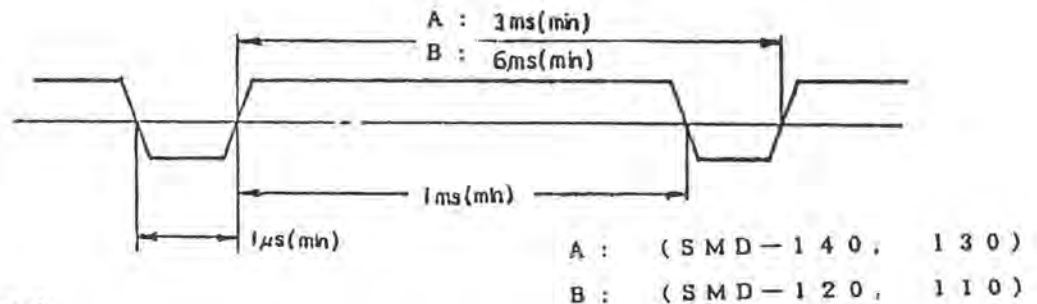
The spindle drive is operated when this signal is low. However, read and write operations are only performed when the read (RDY) signal is low. (If the disk cartridge is not set in the drive, the spindle drive will not operate.) The RDY signal goes low within one second after the MON signal is input when a disk cartridge has been set.

(3) Direction (DRTN)

This signal determines the direction of the movement of the step motor which controls the movement of the read/write heads. When this signal is low, the read/write head will move toward the center of the disk and when it is high, toward the edge of the disk.

(4) Step (STP)

The low pulse of this signal causes the step motor to move in the direction indicated by the DRTN signal. The response step cycle ( $T_s$  min.) is 3ms/track for models 140/130 and 6ms/track for models 120/110. When the write gate signal is low, step is internally inhibited. When the seek direction is reversed, the reverse step pulse must be sent after the last pulse ( $T_s$  min + settling time).



(5) Write gate (WTG)

This signal selects between read and write data. When this signal is low, write data is enabled and when high, read data is enabled.

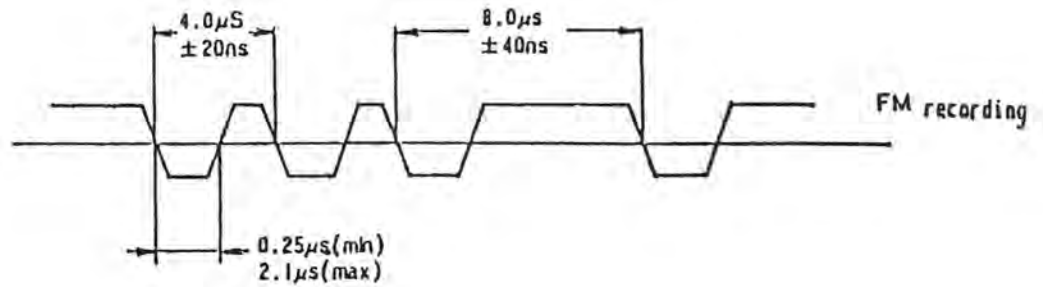
Write operations to a cartridge to which a write enable cover has not been affixed are internally inhibited by the disk drive.

After the WTD signal goes high, there is a 1.3ms erase timing. For this reason the seek or read operation will not begin immediately.

(6) Write data (WTD)

This signal transmits the write data that is being written to the disk.

The fall of this signal from high to low causes the write current flowing through the read/write head to reverse polarity. This signal is operable only when the write gate signal is low.



(7) Side select (SSL)

This signal selects whether the upper or lower read/write head will be used.

"LOW" 0: Side 1 (upper head)

"HIGH" 1: Side 0 (lower head)

NOTE: This signal is used only with models SMD-140/SMD-120.

(8) In use (IUL)

This signal is used to turn the LED on the front panel of the disk drive on and off. When this signal is low, the LED turns on and when it is high, the LED turns off.

This LED is controlled by the drive select signal as the factory-set condition.

#### 4.1.4 Option functions

By operating the switches on the PCB of the SMD-100 series disk drive it is possible to select the signal that will control the illumination of the LED on the front panel of the drive.

(1) When pin No. 1 (IU) is shorted

The LED is controlled by the in use signal (pin No. J2-4).

(2) When pin No. 2 (ID) is shorted

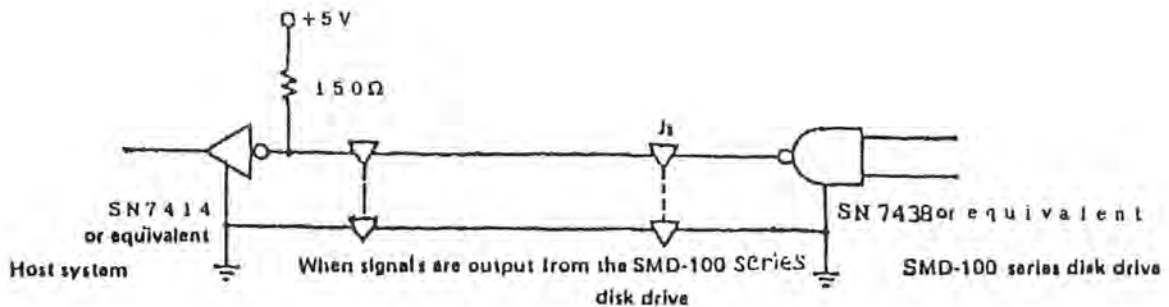
The LED is controlled by the drive select signal.

(3) When pin No. 3 are shorted,

The LED illuminates only when the in use signal, the drive select signal and motor on signal are all active.  
(ID is shorted as the factory-set condition.)

#### 4.1.5 Electrical specifications of the output signals

SN7438(TI) or equivalent is used as the output drive for SMD-100 series disk drives.



"Low" = TRUE

$V_{IN}$ : +0 to +0.4V

$I_{IN}$ : 40mA (MAX)

"High" = FALSE

$V_{IN}$ : +2.5 to +5.25V

$I_{IN}$ : 0mA (open)

#### 4.1.6 Function of the output signals.

(1) Ready (RDY)

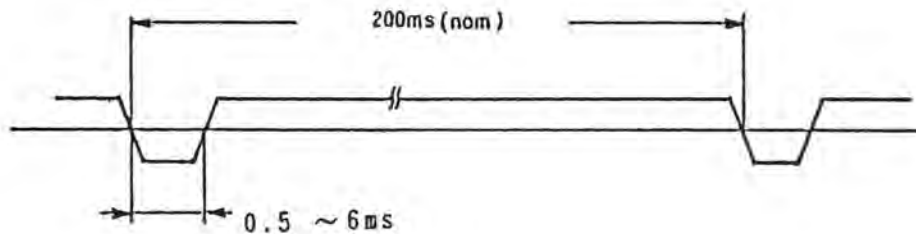
This signal goes low to indicate that the disk cartridge has been correctly set in the drive and is rotating normally. In the SMD-100, a detector is provided to detect the presence of the disk cartridge and to control the ready signal.

(2) Track 00 (TK00)

This signal goes low when the read/write head is in the outermost position on the disk.

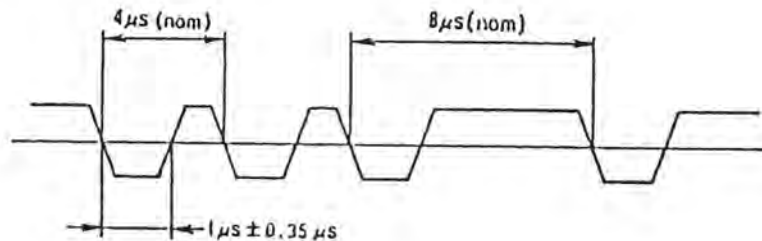
(3) Index (IDX)

One low pulse of this signal is generated for each rotation of the disk. The trailing edge of this pulse shows the beginning of the track.



(4) Read data (RDD)

RDD outputs the bit stream of read data from the read circuit. This signal is normally high and goes low in response to a change in the polarity of the data on the disk.

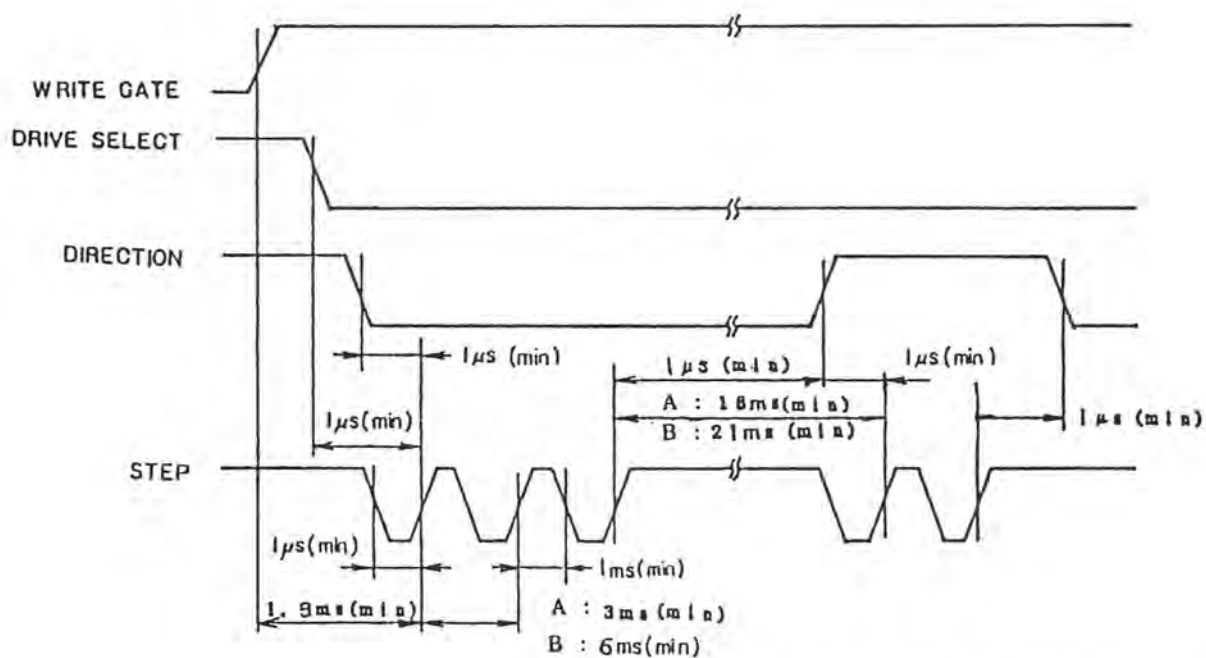


(5) Write enable (WE)

This signal goes low and is sent to the host computer when a disk cartridge with a write enable notch is set in the disk drive.

#### 4.1.7 Timing

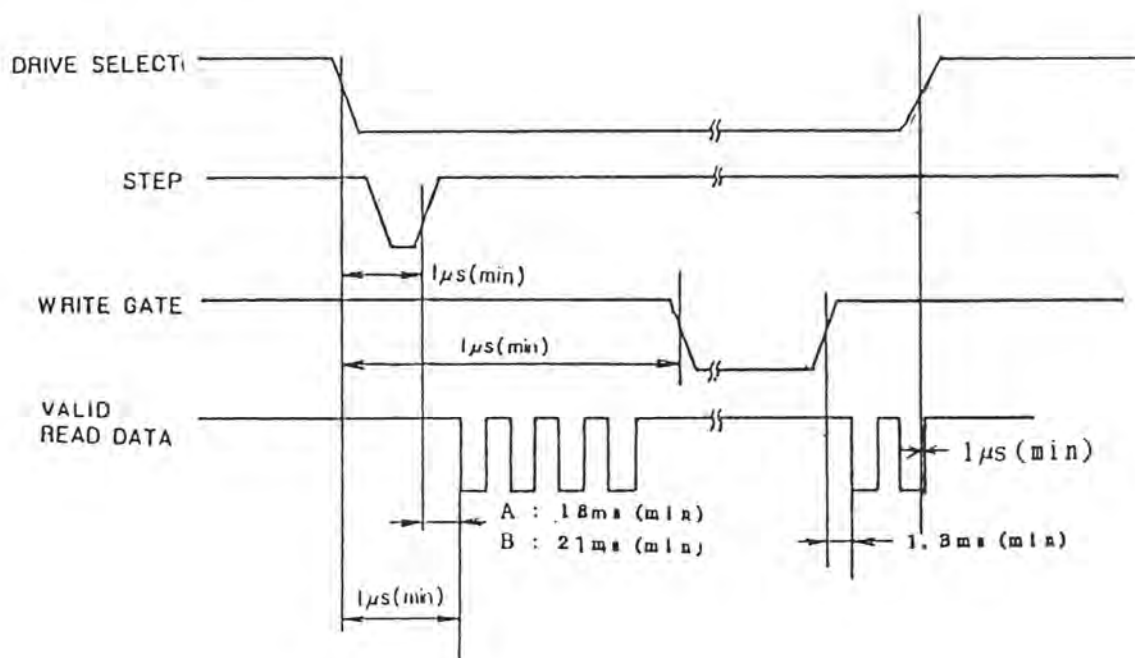
##### (1) Track seek timing



A : (SMD-140, 130)

B : (SMD-120, 110)

##### (2) Read start timing

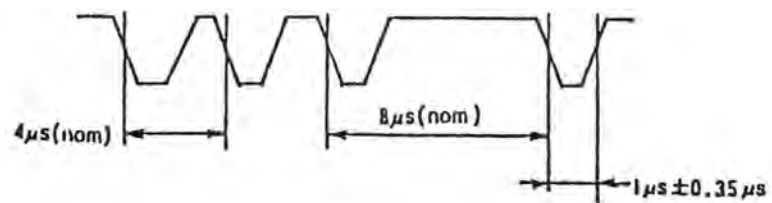


A : (SMD-140, 130)

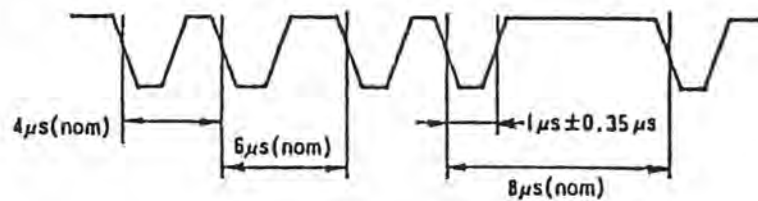
B : (SMD-120, 110)

### (3) Read data timing

For FM



For MFM



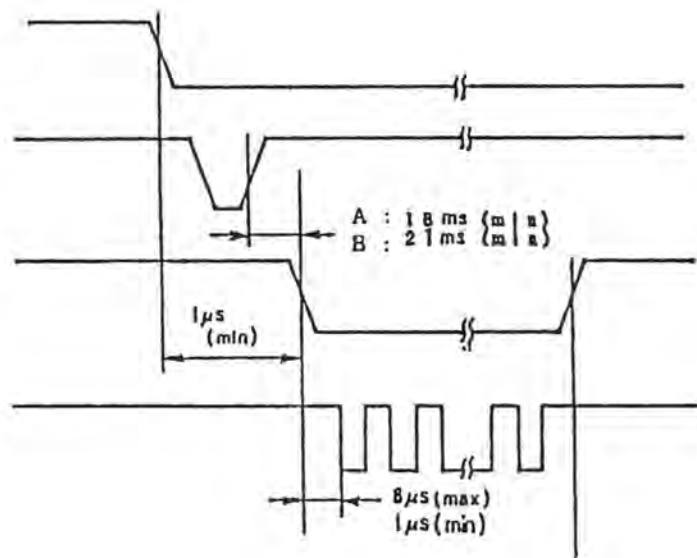
### (4) Write start timing

DRIVE SELECT

STEP

WRITE DATE

WRITE DATA

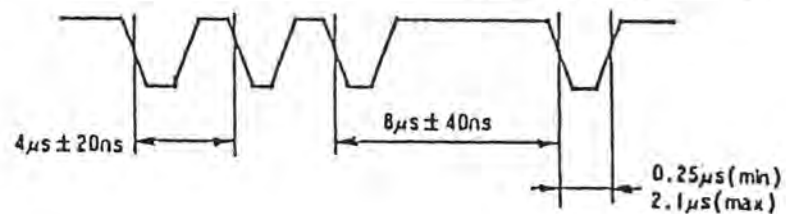


A : (SMD-140, 130)

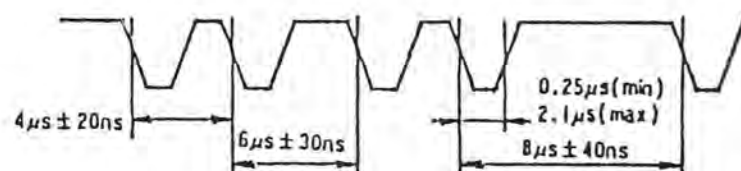
B : (SMD-120, 110)

### (5) Write data timing

For FM



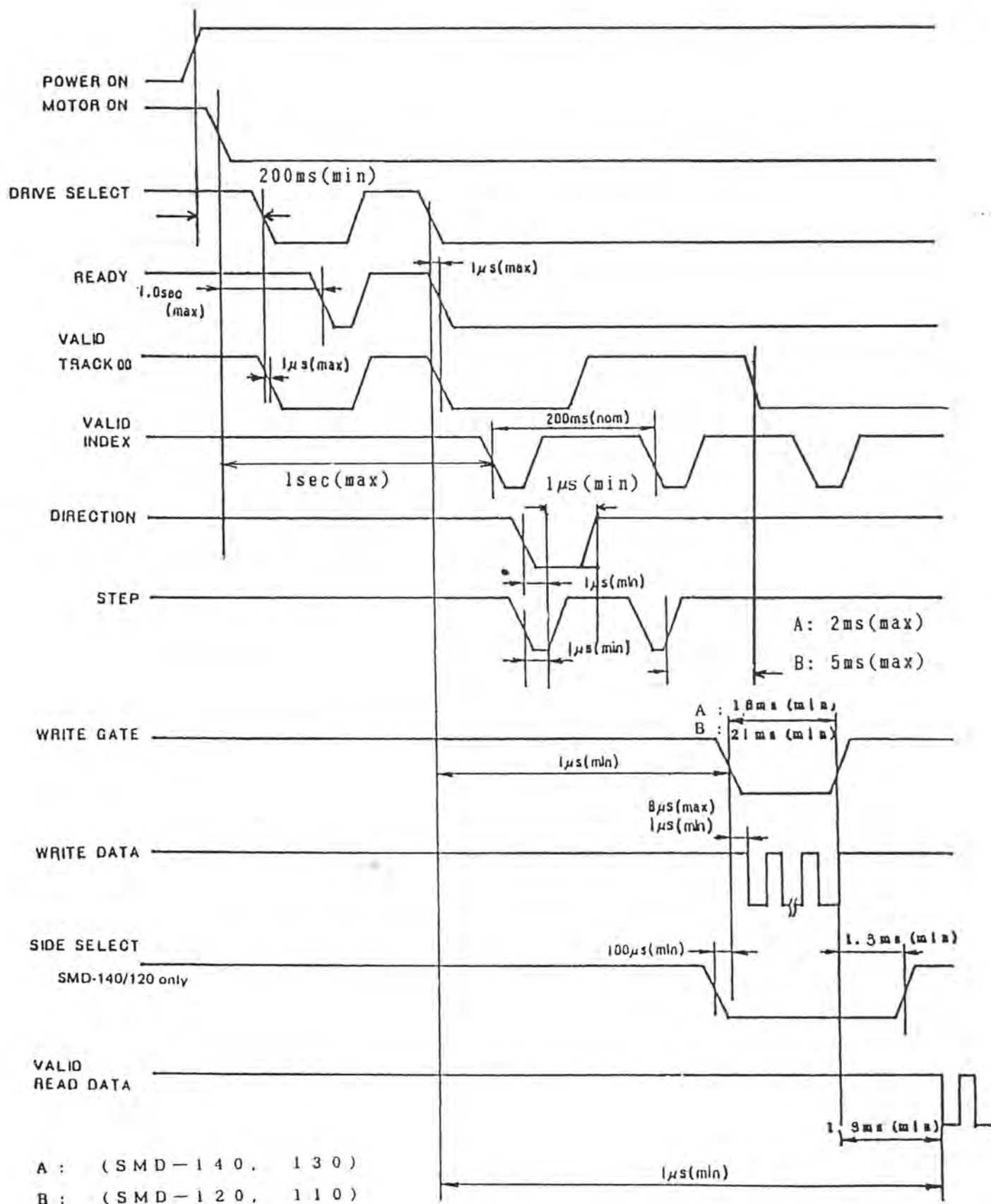
For MFM





# (6) Control data timing

When the disk cartridge has been set and the initial track position is 00.



## 4.2 Power supply interface

### 4.2.1 Power supply specifications (main PCB connector J1)

Voltage	Ripple voltage
$+12V \pm 5\%$	250 mV p-p max.
$+5V \pm 5\%$	100 mV p-p max.

NOTE: Power supply voltage is that at power supply connector J1 of the main PCB.

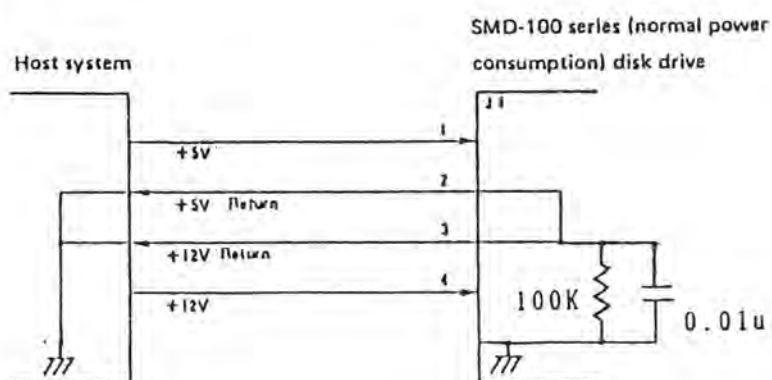
### 4.2.2 Connectors

SMD-100 series (normal power consumption) disk drives are connected the host system using two different connectors.

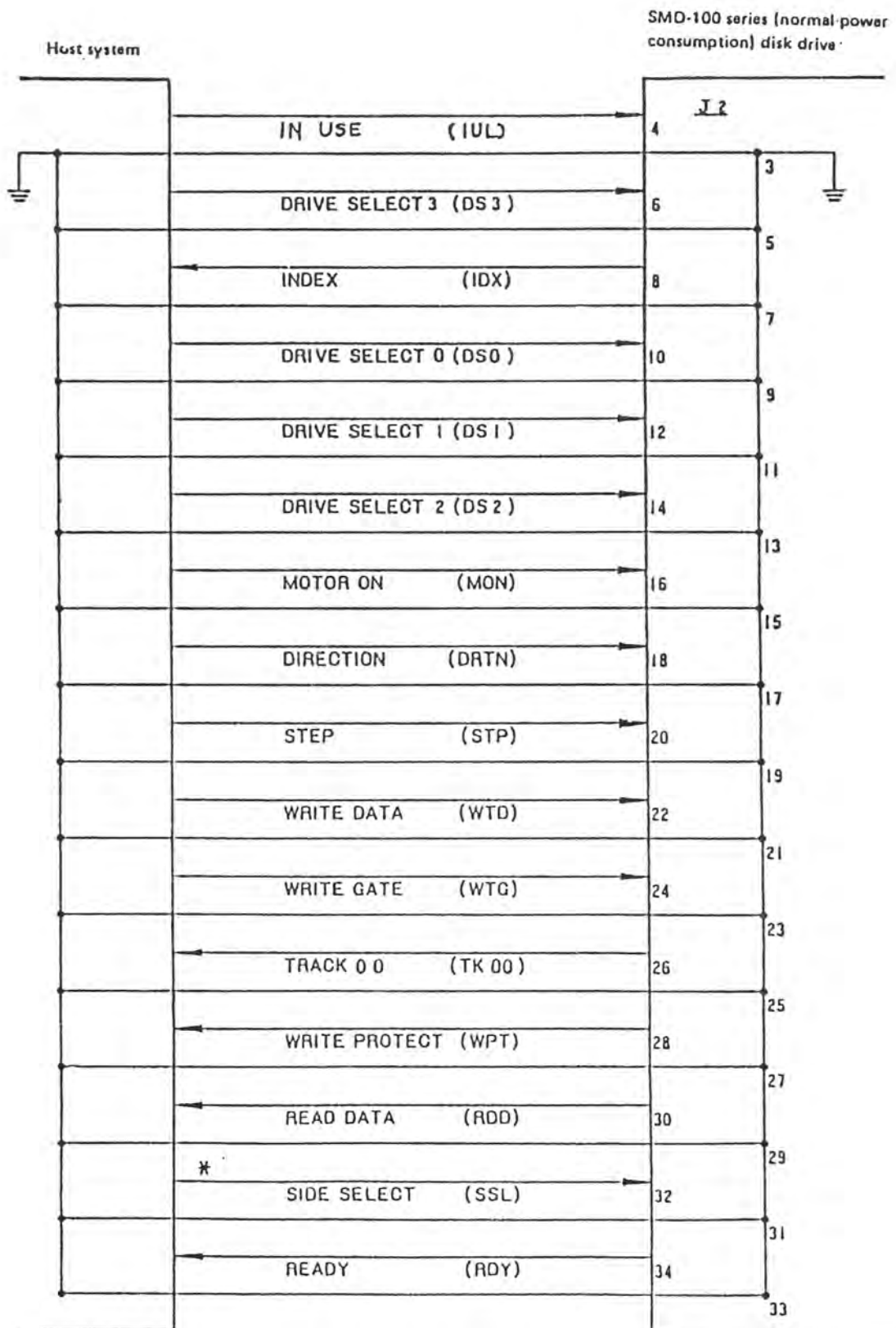
Power is supplied by a power line connected to connectors P1 and J1.

Signal communication is performed by connectors P1 and J2.

#### <Power supply line>



# <Signal lines>



\* SMD-140/120 only

#### 4.2.3 State of wait

SED-100 series (normal power consumption) is switched to power-save mode(state of wait) by Moter-ON signal (J2).

#### 4.2.4 Connectors

For connectors, we recommend the following:

Power supply connector P1.	RECEPTACLE	AMP	171822-4
	CONTACT PIN	AMP	170262-1
Signal connector P2			PS-34SEO-D4P1-1C (Closed tipe)
			PS-34SEO-D4P1-1D (Daisy tipe)

#### 4.3 Installation



Horizontal installation  
(the PCB side must be up)



Button-side  
down installation



Button-side  
up installation

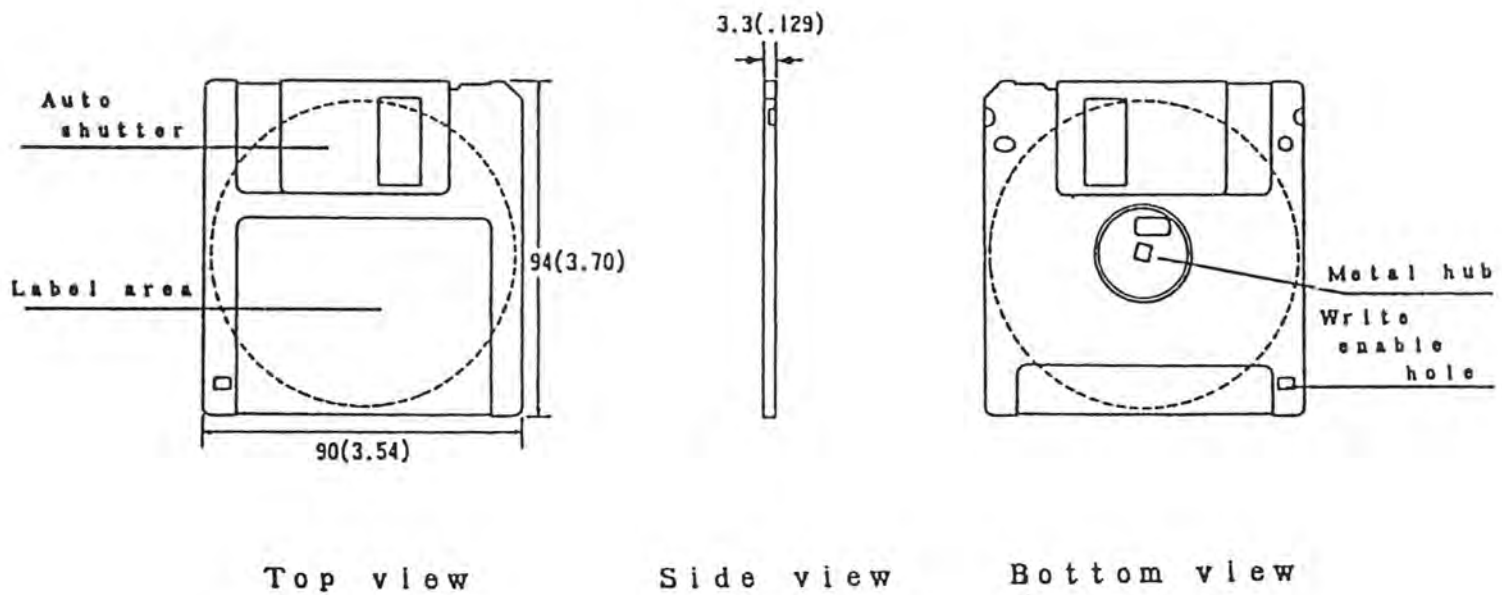


Inclined installation

(0~30°)

## 5. 3.5" Flexible Disks

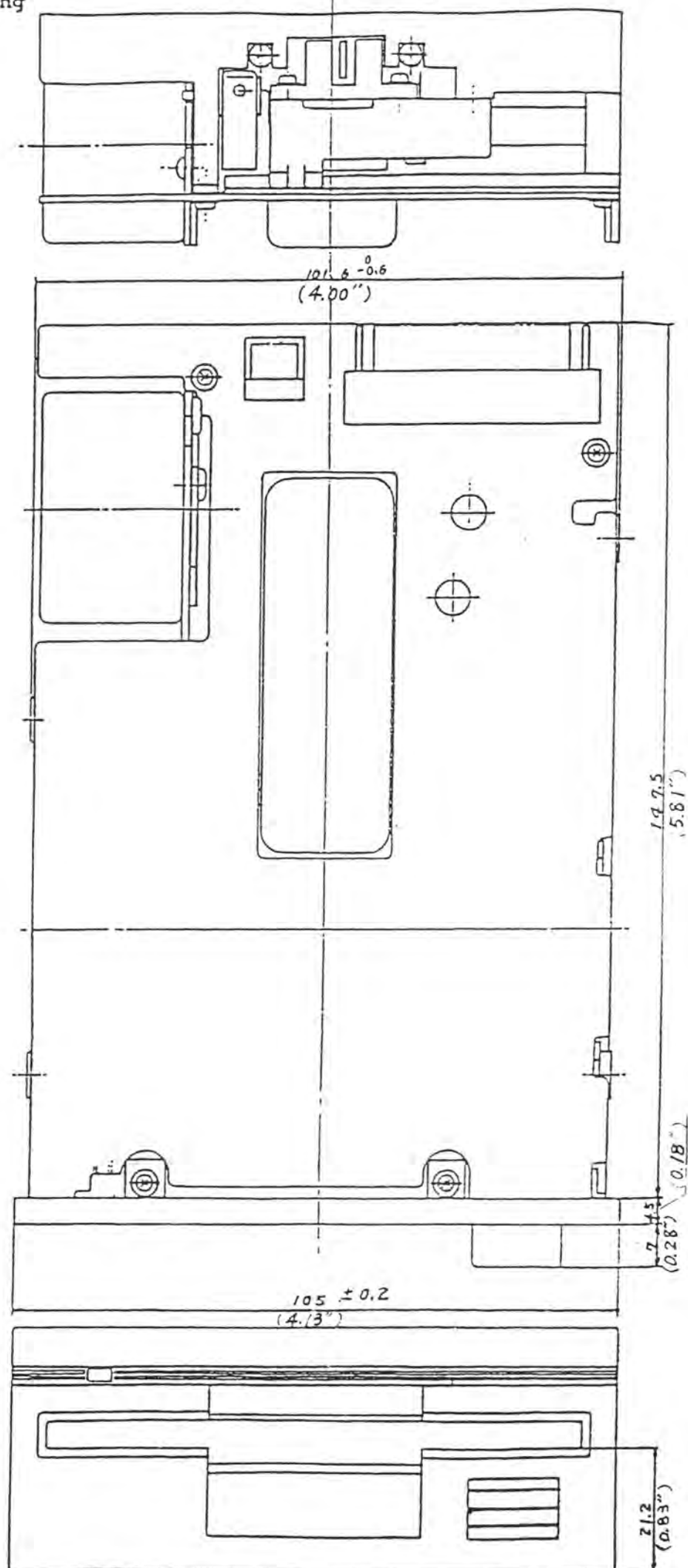
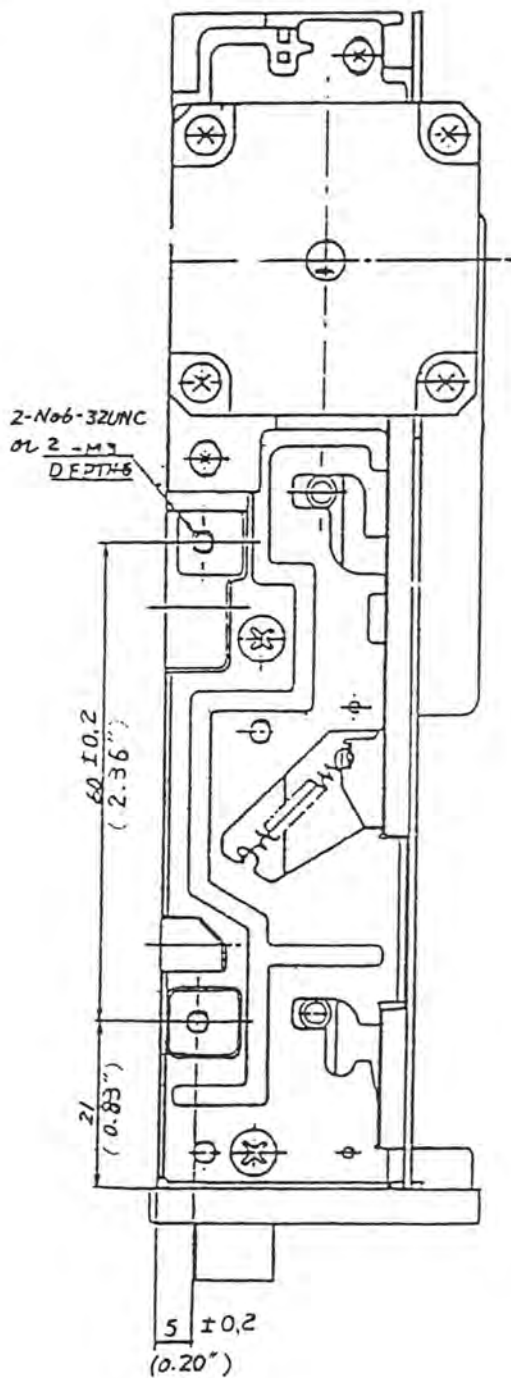
### 5.1 Appearance



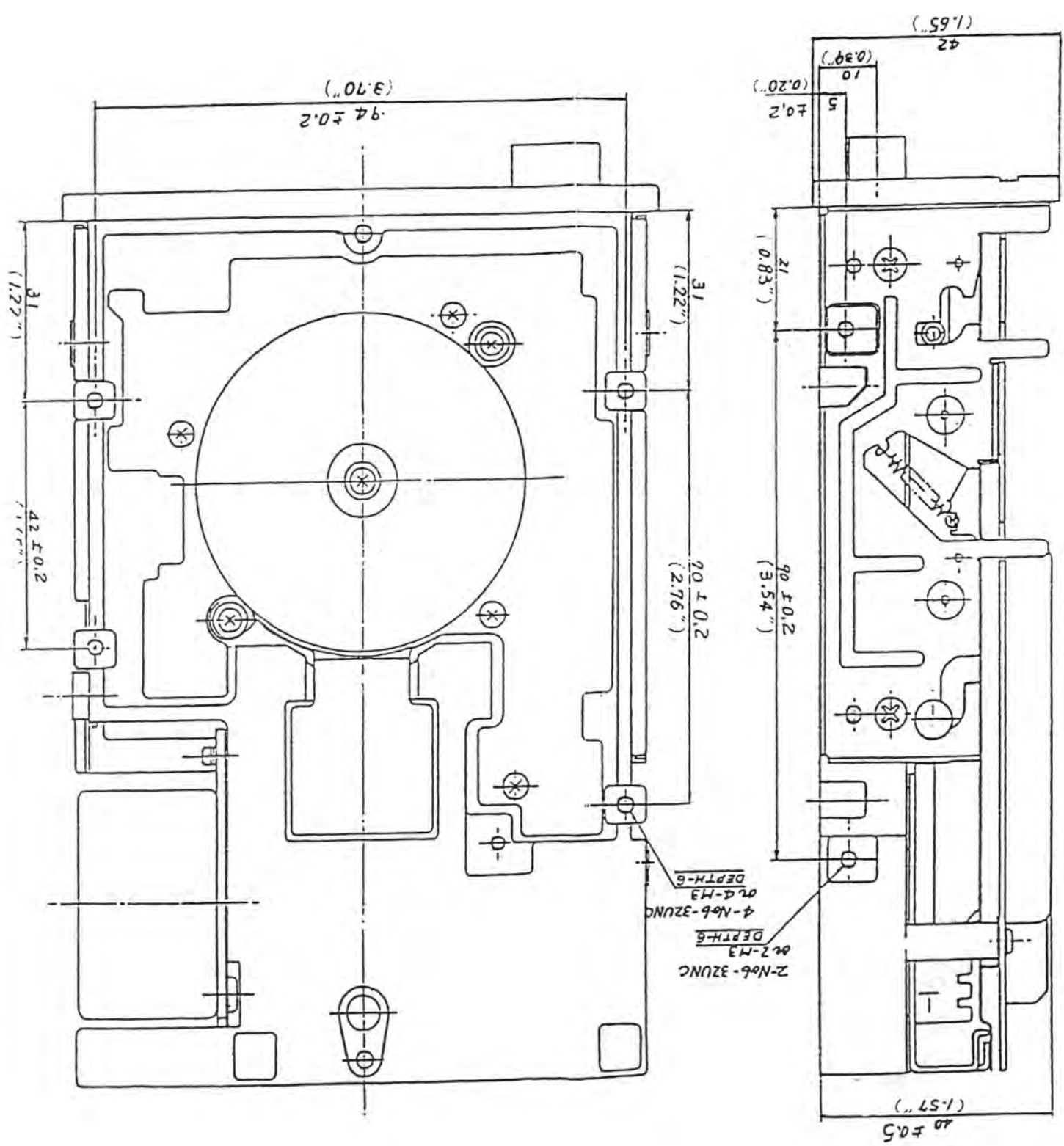
### 5.2 Rec·om·mend·a·ble medium.

5.2.1 SONY - - - - OM-D4440 (double-sided)  
OM-D3440 (single-sided)

# 6. Outline Dimension Drawing







## 7. Notes on Use of Drives

### 7-1 Power supply

7-1-1 Two power sources of 12V and 5V are required.

The sequence, however, is not specified.

7-1-2 The rise time of power supply affects the power on or reset operation of the internal circuit. Therefore, the 90% rise time of the 5V power source must be 100ms or less.

The diskette is protected at power on and power off, but the write gate signal should not be allowed to become active.

7-1-3 When the motor on signal becomes semi-active, the standby mode is switched on and the operation of the R/W circuit is stopped.

7-1-4 With a normal type, the power supply capacity becomes maximum at the spindle motor start with 12V system and at the maximum write action with the 5V system.

### 7-2 Interface

7-2-1 The signal system is interchangeable with the conventional 5.25" system.  
The connector, however, is in compliance in design with SONY's 3.5" drive.

#### 7-2-2 Daisy chain

Up to four daisy chain connection is possible. The terminating resistance array is set for all the drives at the shipment from the factory. Remove all the arrays on the same cable except for the one on the end drive.

Selection for each drive, which is done by a short plug, should be made carefully without repetition.

### 7-2-3 Specification change

The lighting condition of the IN USE LED can be changed by means of a short plug. Use it in a desired setting position.

### 7-3 Error rate

The error rate of the specifications is the value with the faultless diskette.

Well chosen diskettes must be subjected to the error rate test.

### 7-4 Caution

The drive design has taken into consideration the external noise of CRT, etc. However, do not use it too close to the CRT without perfect shielding; otherwise, the Read/Write capability of the drive will be deteriorated.

### 7-5 Installation of drive

7-5-1 Install the drive securely, using the four screw holes (M3, P0.5, 6 DEEP) on the drive side or the four screw holes (M3, P0.5, 6 DEEP) on the drive bottom.

7-5-2 Since the tolerance of the intervals of the installation screw holes is  $\pm 0.2\text{mm}$ , ample care must be exercised in ensuring the positional accuracy and bore accuracy.

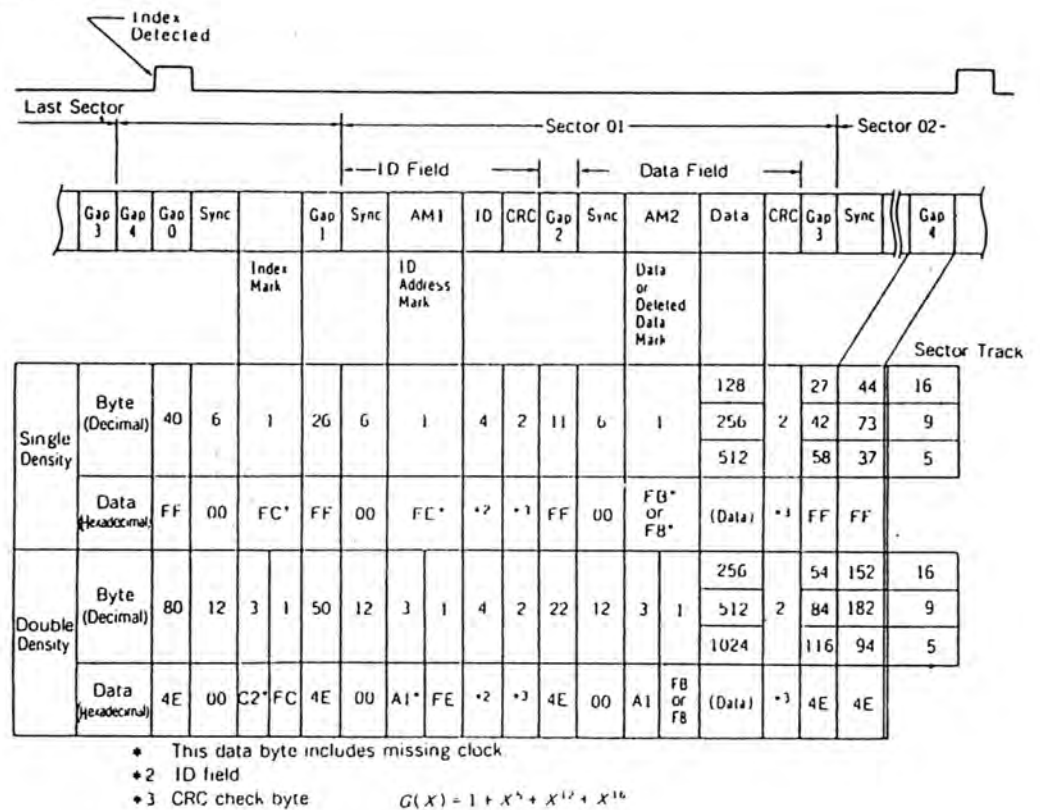
### 7-6 Heat generation

Relative positions must be designed with such care that the ambient temperature of the drive becomes the operating temperature of the specifications. The upper limit temperature must be strictly observed particularly about the diskette.

## 8. Format

The IBM format or the ISO format is recommended.

### 8-1 IBM Track Format



### 8-2 ISO Disk Format

