YD-702D-6238D

Product Specifications

3.5 FLOPPY DISK DRIVE
25.4 mm HEIGHT
2.0/1.0 MB 2 MODE TYPE
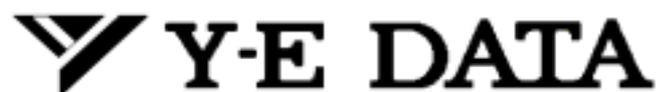
Y-E DATA

This product specification describes the YD-702D series double-sided, 3.5 floppy disk drive for portable applications.

(1) In this manual, the term "drive" refers to the YD-702D series double-sided, 3.5 floppy disk drive. The term "disk" refers to the 3.5 floppy disk.

● This specification may be revised without prior notice.
  Make sure to check the revision number when placing an order.

● Unauthorized duplication of this document is prohibited.

For the usage of this product for High Safety use

This product is assumed for general uses, such as an object for general office work, personal and home use, and is not designed or manufactured supposing for High safety use. Make sure not to use this product without taking measures to ensure the safety required for the high safety use.

High Safety Use means the use that requires extremely high security (see examples), and that accompanies a serious danger for the life and body directly, if security cannot be ensured.
*Nuclear control, airplane flight control, air traffic control, mass transportation operation control, life support, weapon launch control, etc.

The YD-702D-623xD series has been designed for 3.5 (90mm) floppy disk.

1. Full Read/Write Compatibility

The YD-702D series provides total read/write compatibility in both ISO standard 2.0MB (high density 2HD) and 1.0MB(double density 2DD) modes of operation.

2. Supports Two Capacity Modes

The YD-702D-6238D provides for two capacity modes (2.0/1.0MB). Automatic capacity mode switching is performed according to the disk type in the drive. The drive is in 2.0MB mode with high density disk (2HD) and in 1.0MB mode with double density disk (2DD).

3. High Reliability

To guarantee high reliability, the YD-702D-623xD series employs a floating structure so as to increase stiffness and decrease mounting strain caused by improper installation in a host system.
A lead screw stepping motor actuator and new excitation control sequence insure highly accurate heads positioning. In addition, a brushless direct drive motor is used for accuracy and stability in rotational speed.

4. Operation in a Variety of Environments

By equipping the YD-702D series drive with a lead screw head actuator, we have been able to greatly improve resistance to shock and vibration, thereby protecting the magnetic heads and media from the effects of adverse environmental conditions.

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2.1 Performance

Item	2.0MB Mode	1.0MB Mode
Capacity		
●Unformatted	2.0Mbytes	1.0Mbytes
●Formatted		
1)Sectors/Track		16: 655.4kBytes
2)Sectors/Track	18: 1474.6kBytes	9: 737.3kBytes
3)Sectors/Track		5: 819.2kBytes
Recording Density		
(bits/mm){BPI}	686.4{17434}	343.2{8717}
Track Density		
(tracks/mm){TPI}	5.315{135}	5.315{135}
Cylinders	80 Cylinders	80 Cylinders
Tracks	160 Tracks	160 Tracks
Encoding Method	MFM	MFM
Rotational Speed(min^{-1}){RPM}	300	300
Transfer Rate	500 kbits/s	250 kbits/s
Latency(Average)	100 ms	100 ms
Access Time		
●Average	94 ms	94 ms
●Track to Track	3 ms	3 ms
●Settling Time	15 ms	15 ms
●Turn Around Time	4 ms	4 ms
Motor Start Time	0.5 sec	0.5 sec

Table 2.1 Performance

2.2 Physical Specifications

DC Power Requirements	Refer to Table 3.8
Power Consumption	1.5W TYP
Environment	
●Operating	
Temperature	5˚C to 50˚C
Relative Humidity	20% to 80%
Maximum Wet Bulb	29˚C
Vibration	4.9m/s^2{0.5G} (10-500Hz)
Shock	49m/s^2{5G}
	(11ms half-sine wave)
●Non operating	
Temperature	-20˚C to 60˚C
Relative Humidity	No condensation
Vibration	19.6m/s^2{2G}(10-500Hz)
Shock	686.5m/s^2{70G}
	(11ms half-sine wave)
Acoustic noise	45dB(A)MAX(500mm)
	3ms or 6ms seek operation
Mechanical Dimensions	
Width	101.6mm
Height	25.4mm
Depth	148mm
Weight	430g(TYP)
Safety Approvals	UL, CSA, TÜV, CE
Mounting Recommendations	See figure 5.2

Table 2.2 Physical Specifications

2.3 Reliability and Maintenance

MTBF	30,000POH
PM*	None
MTTR	30 minutes
Component Life	5years or 15,000POH
Error Rates	
●Soft Errors	1 per 10^9 bits read
●Hard Errors	1 per 10^{12} bits read
●Seek Errors	1 per 10^6 seek operations

Table 2.3 Reliability

* Preventive maintenance

Note: Non-operating shock and vibration values are the same as above with or without disk in the drive.

The interface consists of two parts: Signal and Power.
Refer to figure 3.6 for all interface connections.

3.1 Interface Signals

3.1.1 Input signals

The YD-702D has input lines as shown below.
All lines are active (true)when "Low"

(1)	DRIVE SELECT 1
(2)	MOTOR ON
(3)	DIRECTION SELECT
(4)	STEP
(5)	WRITE DATA
(6)	WRITE GATE
(7)	SIDE ONE SELECT

Table 3.1 Input Signals

3.1.1.1 DRIVE SELECT 1

When "DRIVE SELECT 1" is "Low", the in use lamp will light and all input/output signals except "MOTOR ON" will become valid.
If you wish to connect two drives in daisy chained, please refer to "3.1.3.1 Daisy Chain Connection".

3.1.1.2 MOTOR ON

When "MOTOR ON" is "Low" and a disk is inserted into the drive, the spindle motor will start. The spindle motor operates regardless of "DRIVE SELECT 1". However if the disk is removed, the spindle motor will immediately stop.

3.1.1.3 DIRECTION SELECT

This line determines the direction of read/write heads movement when the "STEP" line is pulsed.

"High" level	Out(away from the center of the disk)
"Low" level	In(toward the center of the disk)

Table.3.2 .DIRECTION SELECT

Any change on this line must be done at least 1 usec.before the leading edge of the step pulse, and at least 1 usec. after the trailing edge of the step pulse.
Refer to figure 3.10 for timing.

3.1.1.4 STEP

This signal moves the read/write heads in the direction defined by the "DIRECTION SELECT" signal. The access motion is initiated on each "Low" to "High" level transition, in other words, with the trailing edge of the signal pulse. In a seek operation, an 18 ms delay following the last "STEP" pulse is required for settling time before any read/write operation can be initiated.
After completing a seek operation, minimum 4 ms delay is required before initiating the next seek operation.
Please do not change the interval of step pulse during seek operation. It will be cause of seek error.
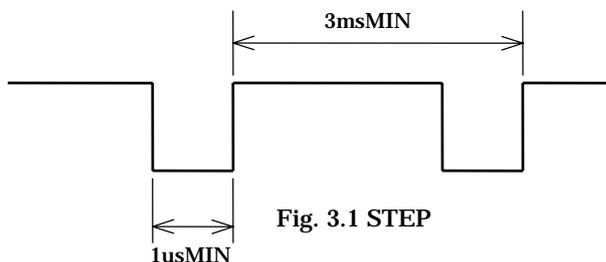Refer to figure 3.10 for timing.

Fig. 3.1 STEP

3.1.1.5 WRITE DATA

The "WRITE DATA" line provides the data to be written on the disk. Each transition from "High" to "Low" on the line causes the current through the read/write heads to be reversed, thereby writing a data bit. This line is enabled when the "WRITE GATE" line is "Low" active.
Refer to figures 3.2 and 3.12 for the timing information.
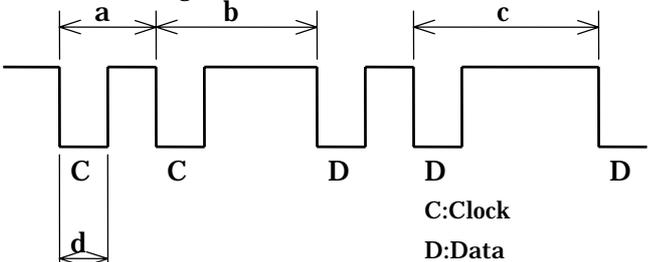
FM Recording

MFM Recording

C:Clock
D:Data
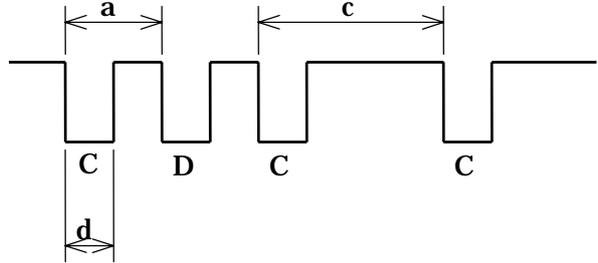
Fig.3.2 WRITE DATA

Notes:
1.

	2.0MB	1.0MB
a	2.00us±10ns	4.00us±20ns
b	3.00us±15ns	6.00us±30ns
c	4.00us±20ns	8.00us±40ns
d	150-1000ns	150-2000ns

2. All timings indicate the values without write pre-compensation.
3. The recommended write pre-compensation value is refer to below:

Capacity	2.0MB	1.0MB
WPC value	125 ns	0-250 ns

4. The recommended condition during read operation is to not input "WRITE DATA".
5. Automatic capacity mode switching is performed according to the disk type in the drive.

3.1.1.6 WRITE GATE

A "Low" active level on this line allows "WRITE DATA" to be written on the disk. A "High" inactive level enables read data logic and stepping logic. Refer to figure 3.12 for the timing information. Activation of "DRIVE SELECT" and "MOTOR ON", changing "SIDE ONE SELECT" and/or activation of "STEP" must be delayed at least the values indicated (see the following READ RECOVERY TIME table 3.3) following deactivation of "WRITE GATE" because the erase heads remain active during this period.

Capacity	2.0MB	1.0MB
RRT MIN	650 us	1000 us

Table 3.3 Read Recovery Time

3.1.1.7 SIDE ONE SELECT

This line defines which side of a two sided disk will be used for reading or writing. A "High" level on this line selects the read/write head on side 0 surface on the disk. A "Low" level on this line selects the read/write head on the side 1 surface. When switching heads, a 100 usec. delay is required before any read or write operation can be initiated.

3.1.2 Output signals

Output signals are shown below. All lines are active when the "DRIVE SELECT" signal is "Low".

> (1)TRACK 00
> (2)INDEX
> (3)WRITE PROTECT
> (4)READ DATA
> (5)DISK CHANGE

Table 3.5 Output Signals

3.1.2.1 TRACK 00

A "Low" active level on this line indicates that the read/write heads are positioned at track 00(the outermost track). The line goes "High" inactive when the heads are positioned elsewhere. Refer to Fig.3.9 for the timing information.

3.1.2.2 INDEX

One index pulse is output at each revolution of the disk when the drive is ready to read/write. Normally this signal is at "High" level, and makes the transition to "Low" level when a pulse is generated. This signal is inhibited to output during seek and not ready. The controller should detect "INDEX" with the leading edge of the transition rather than with the signal level.
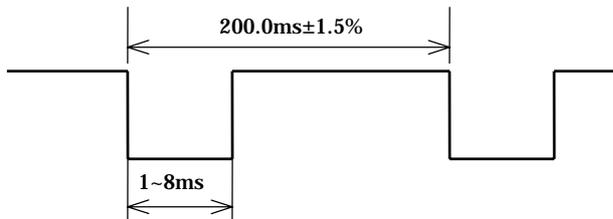

Fig.3.4 INDEX

3.1.2.3 WRITE PROTECT

A "Low" active level on this line indicates that a disk with a write protect notch is loaded. During normal operation the drive will prevent writing when a protected disk has been inserted.

3.1.2.4 READ DATA

This line provides the "READ DATA"(clock and data together) as detected by the drive electronics. Normally this signal is "High" level and becomes "Low" level for each flux reversal. The transition from "High" to "Low" level should be used for separation of data bits from read data. This signal is inhibited to output during seek and not ready. The different value between the leading edge of each bit pulse and its nominal position is below note 2. Timing characteristics are shown in figure 3.11.

FM Recording

MFM Recording

C:Clock
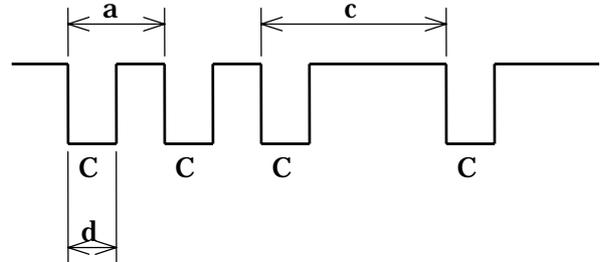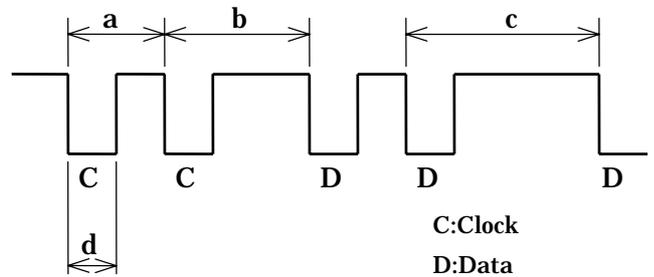
D:Data

Fig.3.5 READ DATA

Notes:
1.

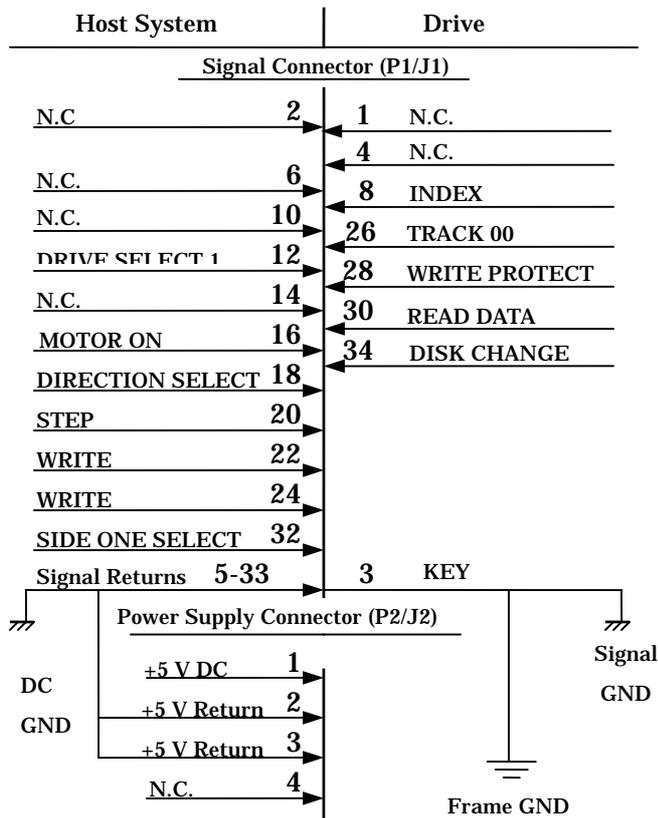|	2.0MB	1.0MB
a	2.00us NOM	4.00us NOM.
b	3.00us NOM.	6.00us NOM.
c	4.00us NOM.	8.00us NOM.
d	125-1200ns	125-2100ns

2.

Capacity	2.0MB	1.0MB
Difference	±350ns	±700ns

3.1.2.5 DISK CHANGE

The "DISK CHANGE" signal indicates that the disk has been removed. This signal becomes "Low" after power has been applied to the drive and the disk has been removed. This signal remains active until the following conditions have satisfied:
 (1) A disk is correctly inserted;
 (2) A drive has been selected and a step pulse has been applied.

Host System | Drive

Signal Connector (P1/J1)

N.C	2	1	N.C.
		4	N.C.
N.C.	6	8	INDEX
N.C.	10	26	TRACK 00
DRIVE SELECT 1	12	28	WRITE PROTECT
N.C.	14	30	READ DATA
MOTOR ON	16	34	DISK CHANGE
DIRECTION SELECT	18		
STEP	20		
WRITE	22		
WRITE	24		
SIDE ONE SELECT	32		
Signal Returns	5-33	3	KEY

Power Supply Connector (P2/J2)

+5 V DC	1	
+5 V Return	2	
+5 V Return	3	
N.C.	4	

DC GND

Signal GND

Frame GND

Notes:
(1) Main frame and connector fittings have been shorted. Refer to "4.1.3 Frame Ground" for details.

Fig.3.6 Interface Connection

3.1.3 Interface Circuits

The YD-702D series uses open collector drivers as output line drivers, and TTL level gates as input line receivers. The input of each receiver is terminated in 1 k ohms pulled up to Vcc (+5V). Input/output circuit electrical specifications are as shown below.

Inactive	"High"Level	2.2 V to Vcc
Active	"Low" Level	0 to 0.8 V
Input Impedance		1 k ohms pulled up to Vcc

Table 3.6 Input Circuit Electrical Specifications

Inactive	"High"Level	Open
Active	"Low" Level	0 to 0.4V Sink current: 38mA MAX

Table 3.7 Output Circuit Electrical Specifications

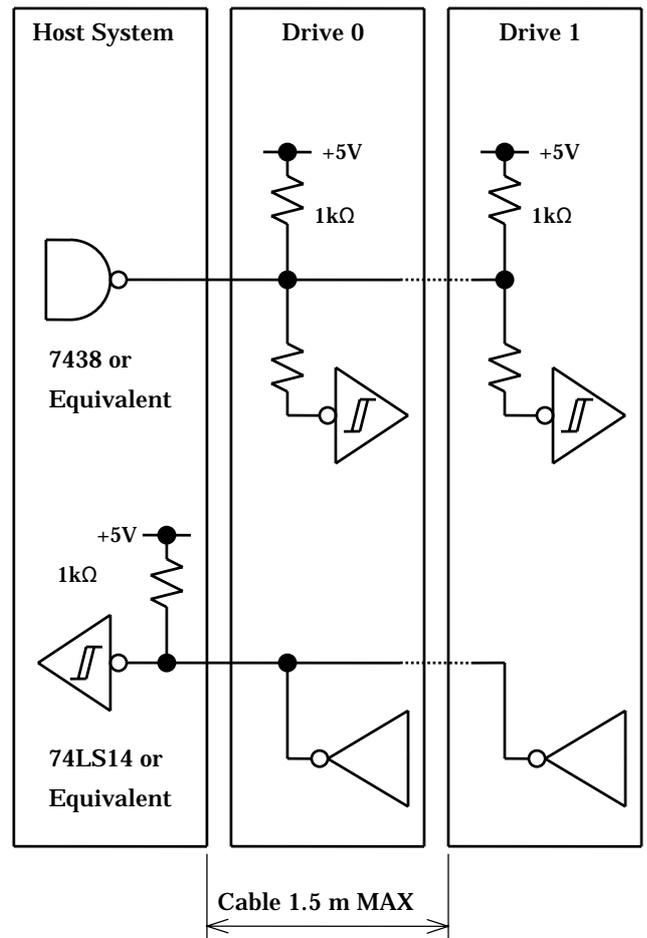The illustration below shows the recommended controller interface circuit.

Fig.3.7 Interface Circuit

3.1.3.1 Daisy Chain Connection

When using two drives connected in a daisy chain, it is inadvisable to leave any of them unpowered. Each drive should receive power from the host system.
And further, the drives have to be connected to the system with the exclusive flat cable shown below.

Flat cable from No. 10 through No. 16 must be twisted for a daisy chain connection.
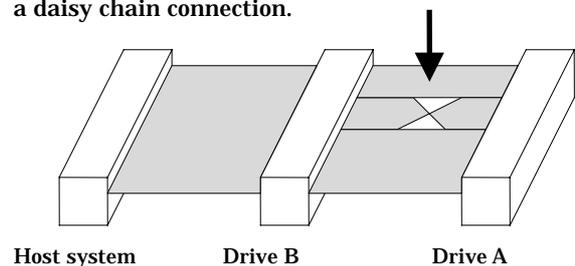

Host system   Drive B   Drive A

Fig. 3.8 Flat Cable

3.1.3.2 Host System Terminal Resistor

Because the line driver of the drive is an open collector output, please use a terminal resistor on the host system side.
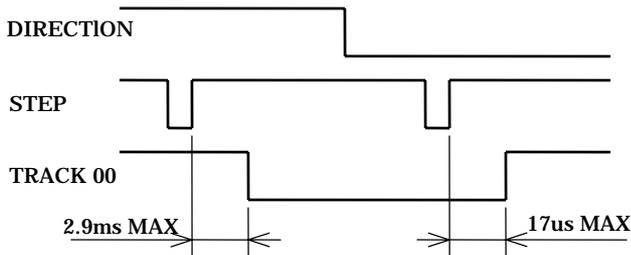
3.1.4 Timing
3.1.4.1 Track 00 Timing

Fig.3.9 Track 00 Timing

3.1.4.2 Seek Timing

In order to reduce the peak current, we recommended that no seek operation be performed for 0.2 seconds after motor start. Figure 3.10 shows the preferred timing.
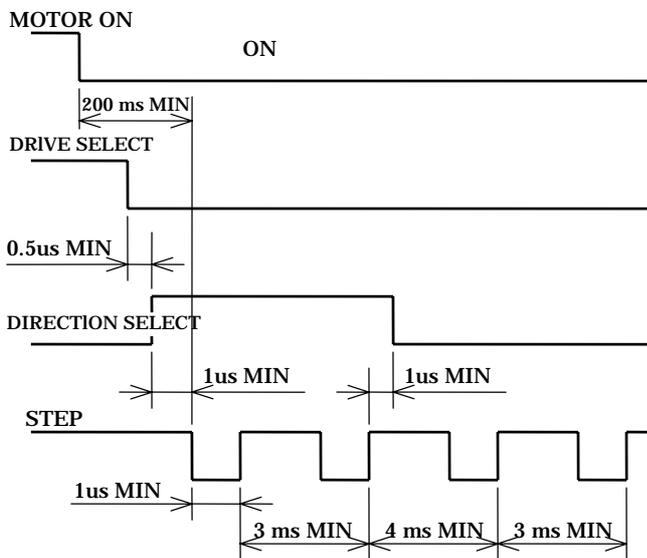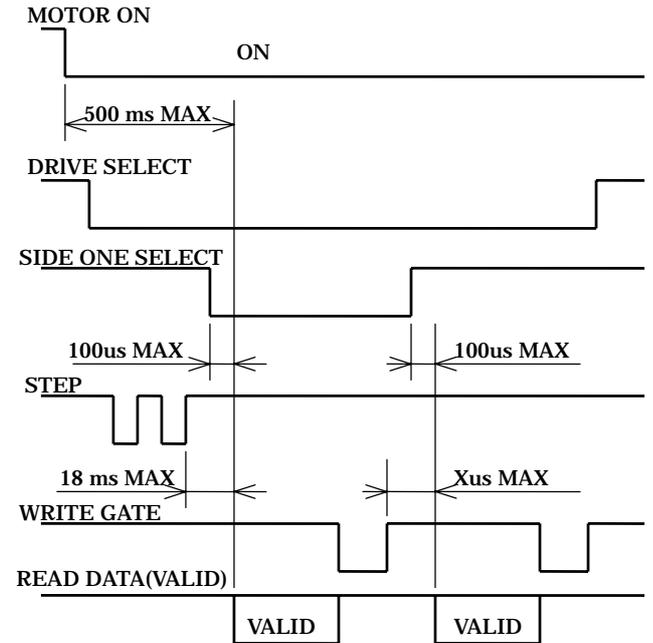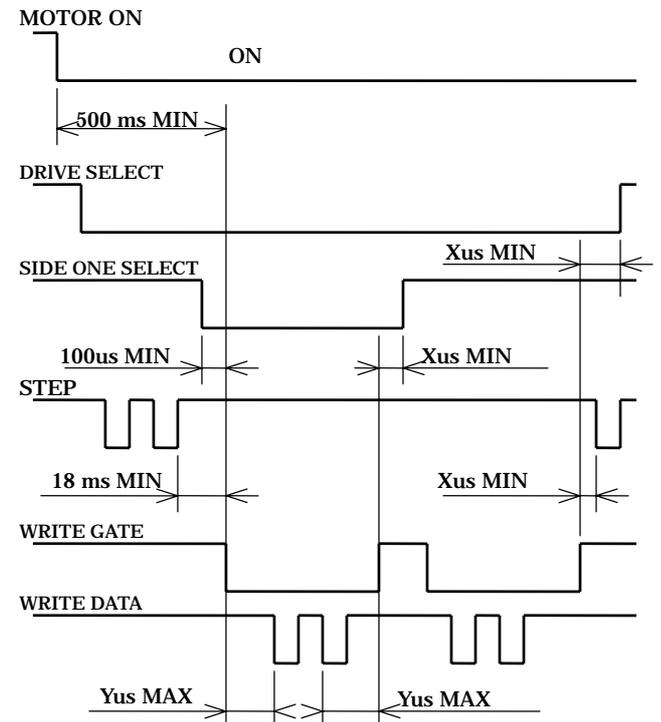

Fig.3.10 Seek Timing

3.1.4.3 Read Timing

Note:

Capacity	2.0MB	1.0MB
X us MIN	650 us	1000 us

Fig.3.11 Read Timing

3.1.4.4 Write Timing

Note:

Capacity	2.0MB	1.0MB
X us MIN	650 us	1000 us
Y us MAX	4 us	8 us

Fig.3.12 Write Timing

3.2 Power Interface

3.2.1 Power Supply Specifications

Voltage		Operating Mode	TYP(mA)	MAX(mA)
+5VDC ±10% (Ripple: 100 mVp-p MAX)		Standby	3	5
		Read	300	400
		Write	300	400
		Seek	600	750
	Peak	Motor Start	880	960
		Seek	880	960

Table 3.8 Power Supply Specifications

Notes:

(1) "MAX" values reflect measurement taken at maximum voltage; "TYP" values reflect measurement taken at nominal voltage.

(2) "Standby" refers to the state where all input signals are inactive.

(3) "Read" and "Write" refer to the state where the heads are at track 40, side 1 and the In Use Lamp is on.

(4) "Seek" refers to the average current with the drive continuously seeking at 3 ms and the spindle motor rotating.

(5) When the spindle motor starts, "Motor Start" current will continue for approximately 200 ms.

(6) Peak current of "Seek" refers to the state of maximum seek current when the spindle motor is rotating and the heads are stepping at 6 ms.

The above specifications must be met when voltages are measured at power connector on PWB.
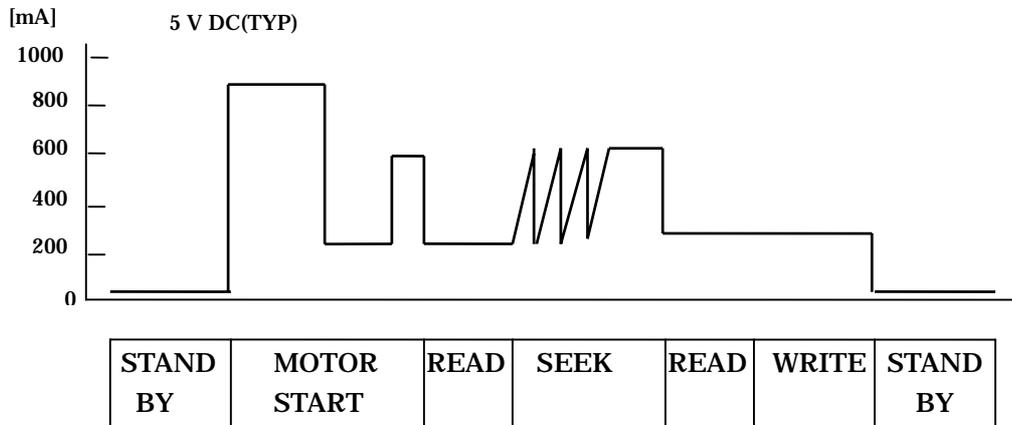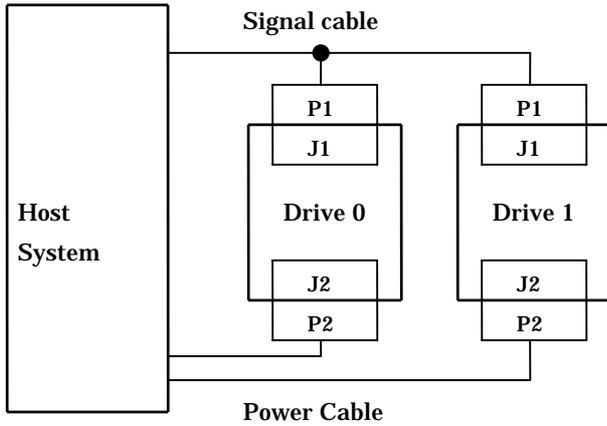
3.2.2 Current Waveform

Fig 3.13 Current Waveform

The connection with the host system is made with two connectors, signal connector P1/J1 and power connector P2/J2. Figure 4.1 shows the cable connections.
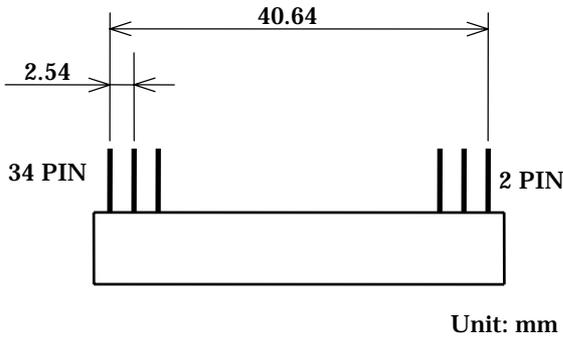

Fig.4.1 Cable Connections

4.1 Connector and Cable

4.1.1 Signal Connector and cable (J1/P1)

4.1.1.1 Connector(J1)

The J1 connector is a 34 pin male connector (JAE:PS-34PE-D4LT1-P1 or equivalent) located at the rear of the drive. The row of pins closest to the PWB are the odd numbered pins. Refer to figure 4.2 for the J1 connector dimensions.

Unit: mm

Fig.4.2 J1 Connector Dimensions

4.1.1.2 Flat Cable Connector(P1)

P1 is a mating connector which connects J1 and the flat cable of the host system.

Recommended connector: 3M 3414-6500xx

Cable: 3M 3365/34(1.5 m MAX)

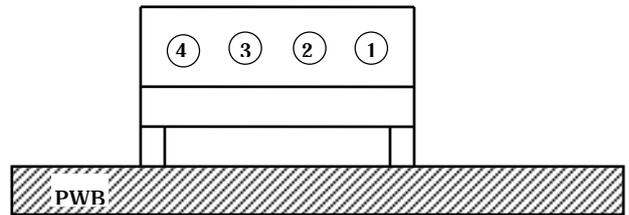### 4.1.2 DC Power Connector and Cable (J2/P2)

The J2 connector is a four pin male connector (AMP:171826-4 or equivalent) located at the rear of the drive.

Recommended components:
Receptacle(4 pin): AMP 171822-4
Contact: AMP 170262-1
Cable: AWG20

Fig.4.3 J2 Connector Position

4.1.3 Frame Ground

The internal circuit ground on the PWB has been connected with the frame for shielding purposes. The frame ground of the system will be connected to the signal ground through the drive when the drive is installed into the system.

4.2 Connector Pin Assignments

4.2.1. Signal Connector Pin Assignments

Return Pin#	Signal Pin#	Signal name
	1	N.C.
	2	N.C.
(3)	4	N.C.
5	6	N.C.
7	8	INDEX
9	10	N.C.
11	12	DRIVE SELECT 1
13	14	N.C.
15	16	MOTOR ON
17	18	DIRECTION SELECT
19	20	STEP
21	22	WRITE DATA
23	24	WRITE GATE
25	26	TRACK 00
27	28	WRITE PROTECT
29	30	READ DATA
31	32	SIDE ONE SELECT
33	34	DISK CHANGE

Table 4.1 Signal Connector Pins

Note:(3)is used as a key pin.

4.2.2 DC Power Connector Pin Assignments

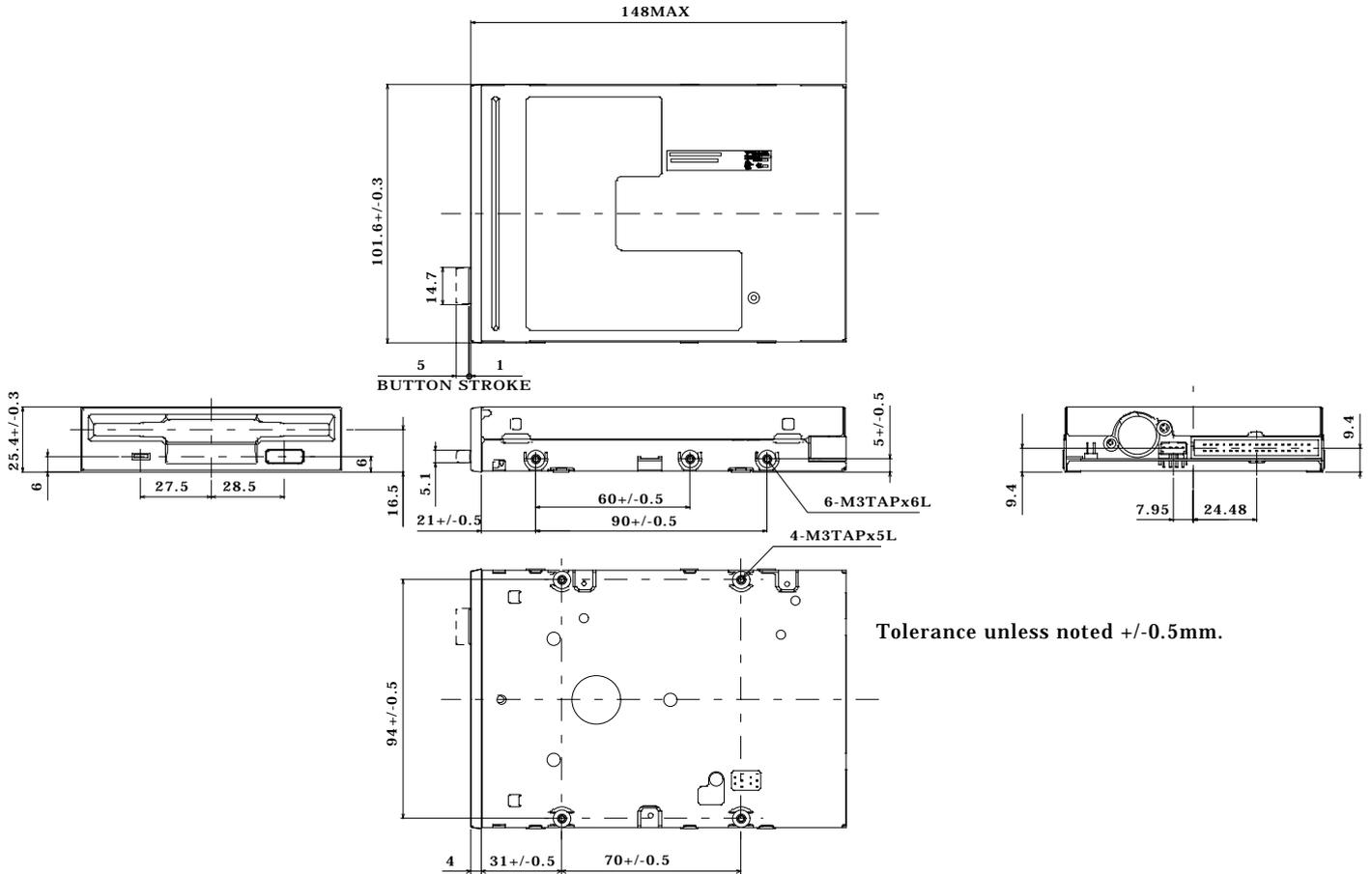| Pin #	Name
1	5V DC
2	5V RETURN
3	5V RETURN
4	NO CONNECTION

Table 4.2 Power Supply Connector Pins

4.3 Terminators

All input lines on the drive are terminated with non-removable resistors of 1 k ohms. Terminator resistance values are changed with the number of connected drives, with one drive: 1 k ohms, and two drives: 500 ohms.
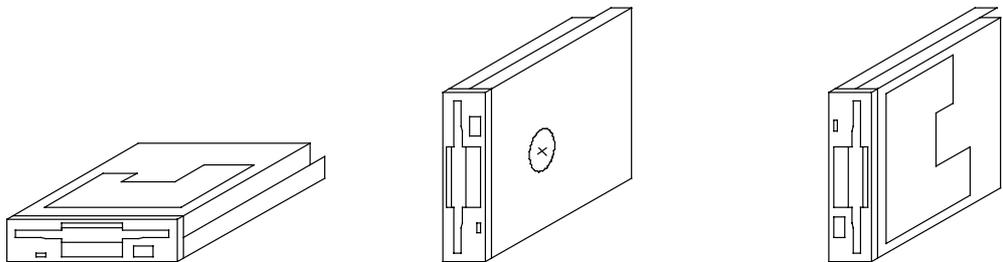
The color for the front is as follow:
Ivory (Munsell 6Y8.5/0.5 equivalent)
In use lamp(LED) color is green.

YD-702D DIMENSIONS

148MAX

101.6+/-0.3

14.7

5 | 1

BUTTON STROKE

25.4+/-0.3

27.5 | 28.5

6

6

16.5

5.1

21+/-0.5

60+/-0.5

90+/-0.5

5+/-0.5

6-M3TAPx6L

4-M3TAPx5L

9.4

9.4

7.95 | 24.48

94+/-0.5

4 | 31+/-0.5 | 70+/-0.5

Tolerance unless noted +/-0.5mm.

Fig.5.1 Mechanical Dimensions

Recommended angle of the drive when the drive is installed is less than +30 degrees.
Fig.5.2 Recommended Mounting

5.1 Caution on Mounting

1) Mounting screws should be tightened by 0.5 ~ 0.6Nm{5 ~ 6 kgf•cm} in torque.
2) Mounting bracket is recommended not to make contact with the drive except the mounting spots, and should not be designed that any portion on the drive except the mounting spots is pressed and/or crushed.
3) Recommended to fasten the drive at 3 mounting spots with screws (4 spots available).
4) Mounting bracket should be provided structure to absorb strain.
5) The drive should be separated or shielded from noise sources.

Do not strain the drive. Do not install the drive in large electromagnetic fields.
Otherwise, failure may result.

5.2 Caution on handling

1) Strong vibration and shock can damage the drive. It may cause an error. Do not use or store the drive under such conditions.
2) We recommend handling the drive on side frame, portion of mounting spots, of the drive as well as possible. If you handle like pressing the top or the bottom of the drive, it may cause damage of heads and PWB.
3) Do not disassemble the drive by yourself because of an adjusted product. If you do so, we can not assure you of adjusted accuracy.

Chapter 6. Other Functional Characteristics

6.1 Standby Mode

The YD-702D includes standby mode to reduce the load on the host system power supply when the drive is not actually in use. When the spindle motor stops, power to the read/write and spindle motor control systems is cut off, and power to the stepper is cut off when the stepper is not seeking.

6.2 Mask Function

"READ DATA" and "INDEX" signals are inhibited to output during seek (includes 18 ms MAX after the last step pulse) and not ready (500 ms MAX after motor start).

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