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MINI DISK DRIVE

Specification

Mannheim, April 1983
VID/WMS

Spec.Nr. 80307-058
Rev. 01

CONTENTS

1. Product Outline

1-1 Feature

This MDD employs a high performance direct-drive spindle motor, resulting in stability of media rotation and also freedom from maintenance due to the elimination of a driving belt. It also employs a high-speed stepping motor and steel belt drive system, permitting speedier seek-access by the head, and making for improved track positioning accuracy.

1-2 Specifications

1-2-1 Performance

		MDD221
Recording density	per diskette	1M byte
	per track	6.25K byte
Data transfer speed		250K bit/sec
Access time	Track-to-track shift time	3ms MAX
	Seek settling time	20ms MAX
	Average access time	95ms
	Head load waiting time	25ms MAX
	Media rotating speed	300 rpm
	Average rotation waiting time	100ms
	Spindle motor starting time	1S MAX
Recording density (inner periphery)		5922 BPI
Number of tracks		160
Modulation system		FM/MFM
Recommended media		BASF FlexyDisk 5.25"-2/96

Note 1: The waiting time during seek is the track-to-track shift time + seek settling time.

Note 2: The average access time is the average track-to-track shift time + seek settling time.

1-2-2 Boundary Conditions

Operating ambient temperature	5 – 45°C
Temperature during transport	-40 – 62°C
Storage temperature	-22 – 55°C
Relative humidity	20% to 80% (max, wet bulb temperature 29°C, free of dew formation)

1-2-3 Power Source

+5V • ±5% ripple 50 mVp-p and below	TYP 0.8A MAX 1.0A
+12V • ±5% ripple 100 mVp-p and below	TYP 0.8A MAX 1.7A

1-2-4 Machine Dimensions

Width	146 mm
Height	33.5 mm
Depth	221 mm
Weight	1.2 kg

* For details, refer to dimension specifications.

1-2-5 Vibration and Shock

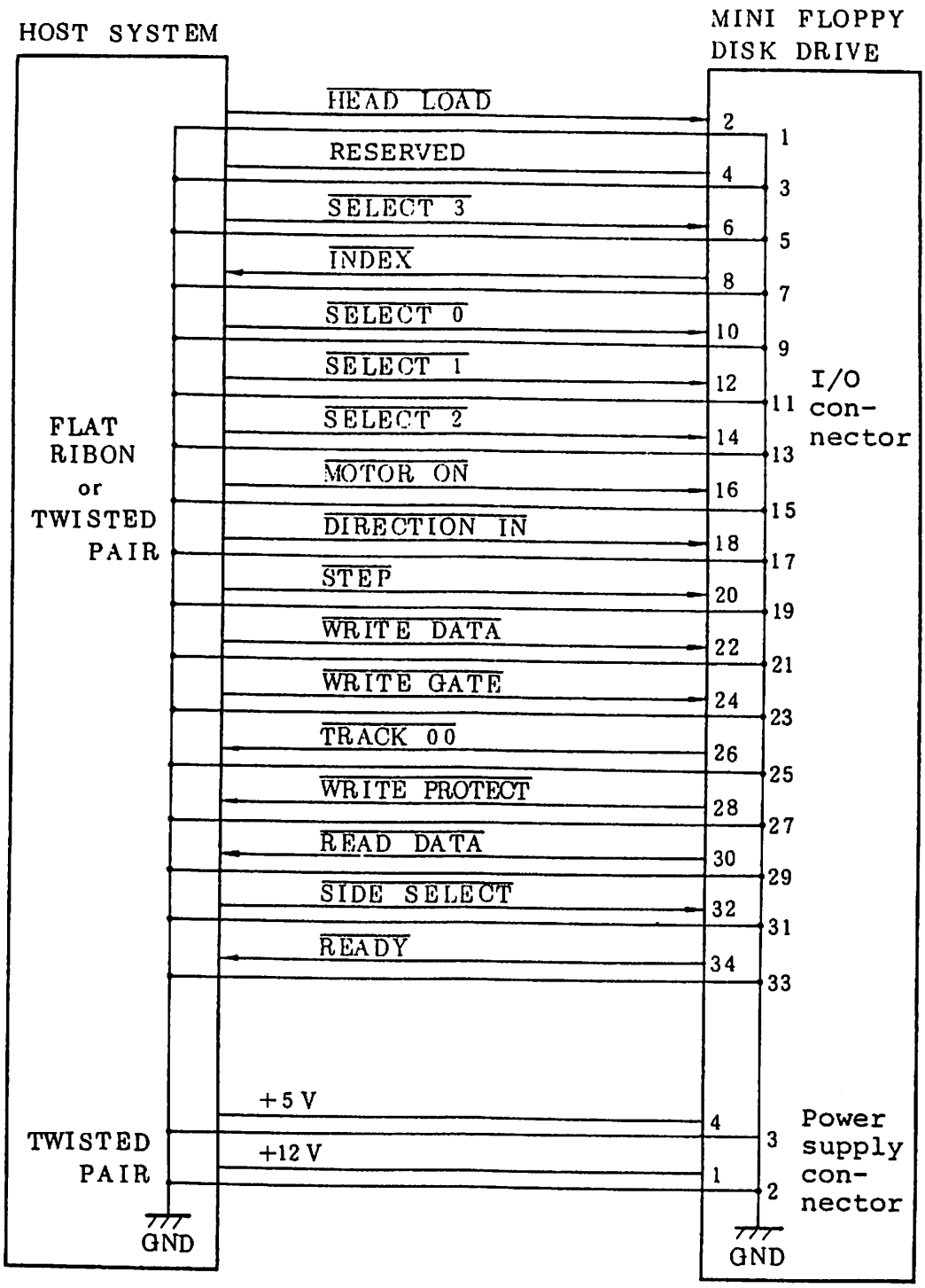
Vibration during operation	1G (5 – 100Hz) X, Y, and Z directions
Vibration during transportation	3G (5 – 100Hz) X, Y, and Z directions (in packed condition)
Shock during transportation	Shall satisfy all specifications when dropped from a height of 100cm in packed condition (in all directions, one corner, three ridgelines, and six planes)

1-2-6 Reliability

MTBF	10,000 POH
MTTR	30 minutes
Unit life	5 years
Soft read error	10^{-9} bits
Hard read error	10^{-12} bits
Seek error	10^{-6} seek operations

2. Interface

2-1 Signal Interface



2-2 Table of Connector Used

Figs. 2-1 and 2-2 are simplified drawings of the connector used on the interface of the MDD. Suitable mating connectors are shown in the table below.

Signal connector	Scotchflex ribbon connector	3463-0000 3463-0001
	Yamaichi connector	FDS-34-12 #1 FDS-34-12 #2
Power supply connector	AMP (housing)	1-480424-0
	AMP (pin) AMP (pin)	170148-2 (AWG18 – 24) 170121-4 (AWG14 – 20)

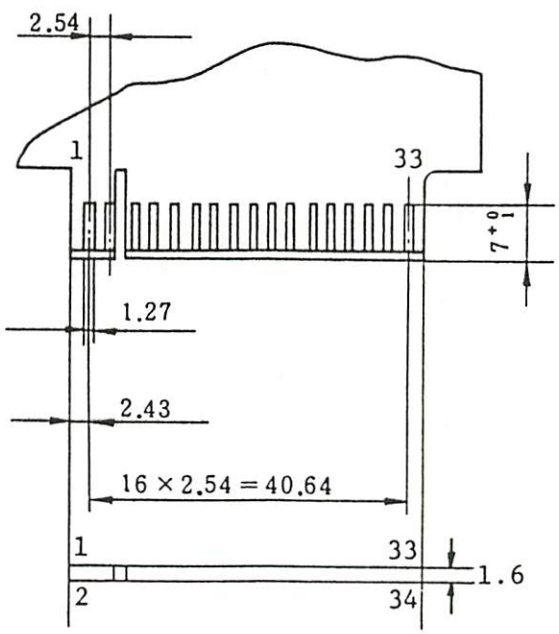
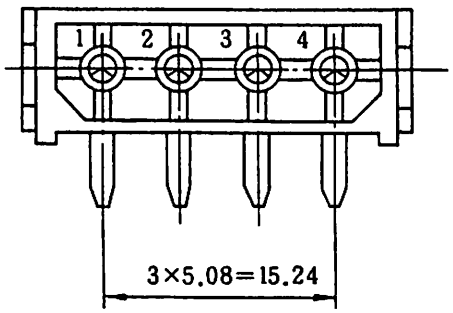


Fig. 2-1 Signal connector



Connector No.

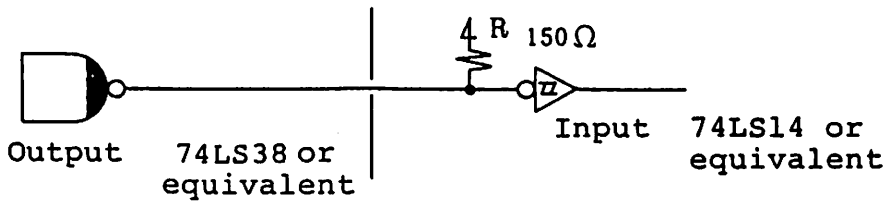
1 ····· +12 V DC
2 ····· +12 V RETURN (GROUND)
3 ····· + 5 V RETURN (GROUND)
4 ····· + 5 V DC

Fig. 2-2 Power supply connector

2-3 Input/Output Interface

2-3-1 Recommended Input/Output Interface

	Negative logic
Logic 0	0.0 – 0.4V (active)
Logic 1	2.5 – 5.25V (inactive)



2-3-2 Input Signal Name

Signal name	Content
Select 1 to 4	It is possible to connect up a maximum of four MDD units in a daisy chain. Set the drive select condition by means of the drive jumper pin. (All units are set to drive select 1 before they leave the factory.) When the select signal of the set drive becomes low level, the drive will go into an active condition.
Motor ON	When this signal becomes low level, the drive motor will rotate. The motor signal alone is not gated by the select signal.
Direction in	When this signal is high level, the head will shift to the outer periphery under the step signal. When it is low level, it will shift to the inner periphery.
Step	This signal is a pulse signal. The head will shift in the direction of the 'direction in' signal under the leading edge (fall) of this pulse. When the write gate is on, internally it goes into an inhibit condition.
Write gate	When this signal is low level, information is registered in the media in accordance with the signal of the write data. Also, the write gate signal functions to cause tunnel erase to take place inside the drive, hence neither side select nor step head unload will take place until 1.2 ms after the write gate has closed.

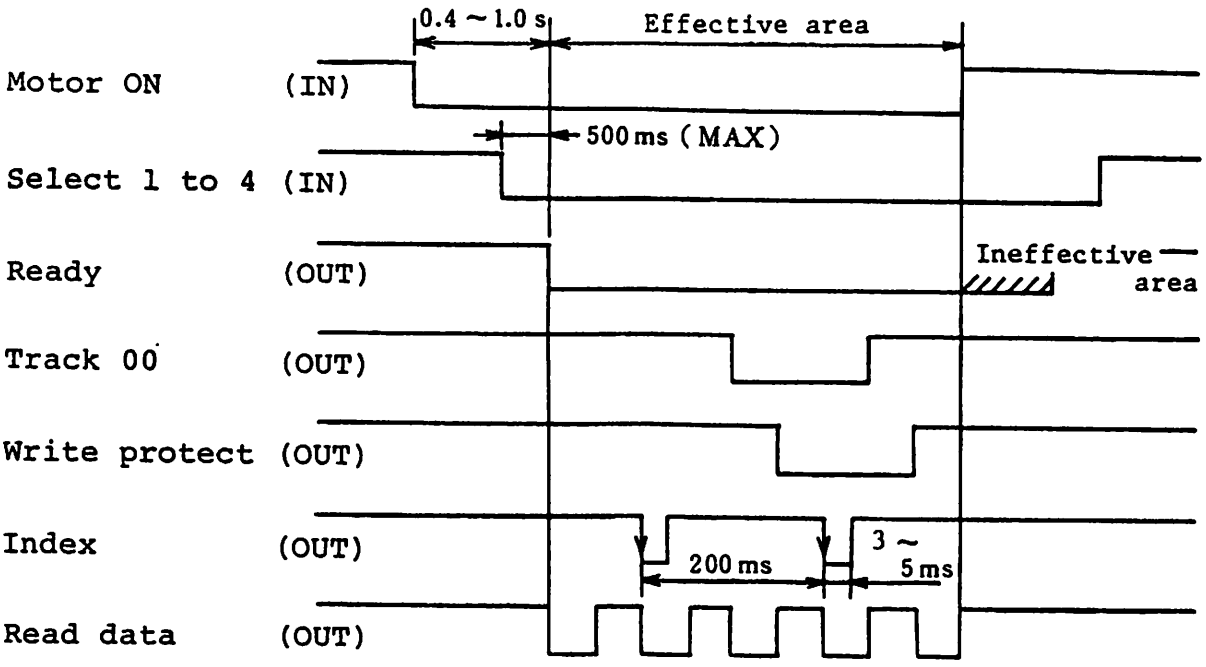
Signal name	Content
Write data	This signal is a pulse signal. Under the leading edge of the pulse (fall), the data will be inverted and information will be registered in the media. Transfer data only when the write gate is low level.
Head load	When this signal becomes low, the head will be loaded. It is also possible to perform head loading by means of the drive selector signal, irrespective of the head load signal. During head load, the indicator LED becomes red and the button is interlocked. For details, see the jumper specifications.
Side selector	This signal is used to select a particular head on a drive employing a double sided head. When it is high level, head 0 is selected, and when it is low level, head 1 is selected.
Ready	After the motor goes on and the media reaches a constant speed of rotation, this signal will go on (low level). After a lapse of 1 second from when the motor goes on, the ready signal is confirmed and R/W operation commences. Then, the indication LED becomes green.
Track 00	This signal is on (low level) when the head is at track 00.

Signal name	Content
Index	This signal goes on (low level) when the index hole of the media is detected. This signal is a 3 to 5 ms pulse signal. The leading edge (fall) of the pulse indicates the commencement of the track/sector. When the media is not inserted, this signal will remain low level.
Read data	This is a readout signal for magnetic inversion on the media. It is a pulse signal, the leading edge (fall) of which is effective.
Write protect	This signal becomes low level when a write-protected media is inserted. Simultaneously, write will be inhibited inside the drive. Write protect takes place by covering the notch in the disk jacket by an opaque label.

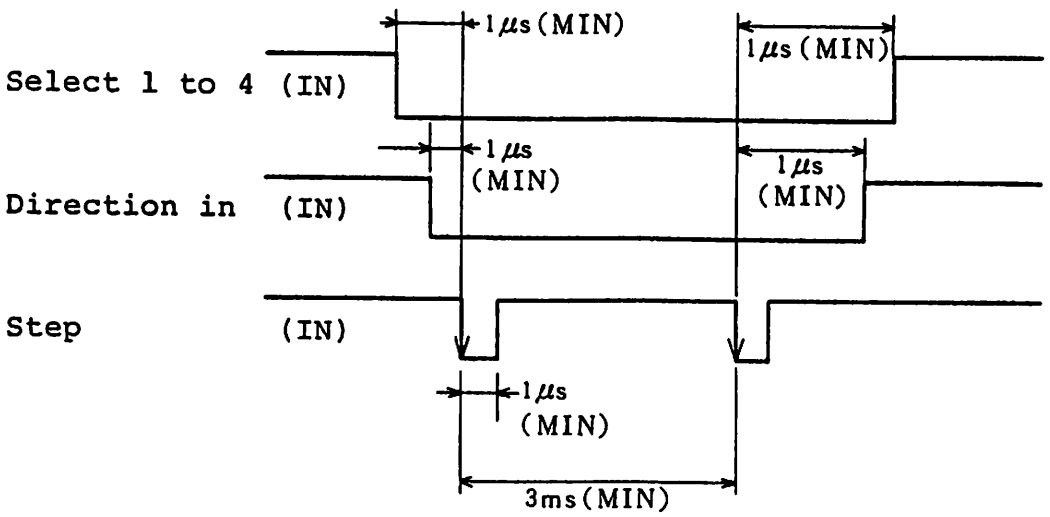
* All output signals are gated by the drive select signal.

2-4 Timing Chart

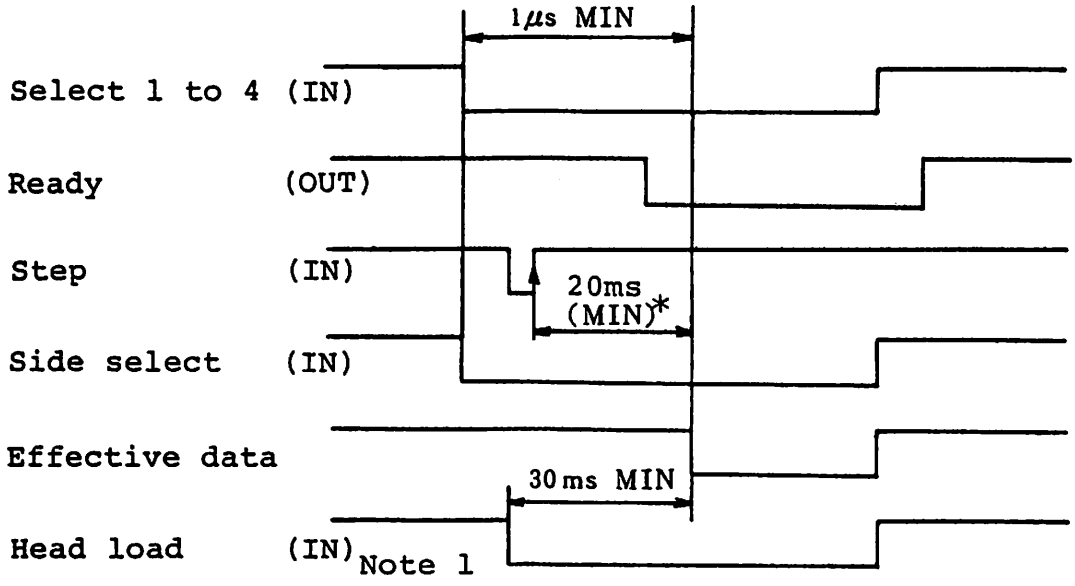
2-4-1 Ready Signal Timing



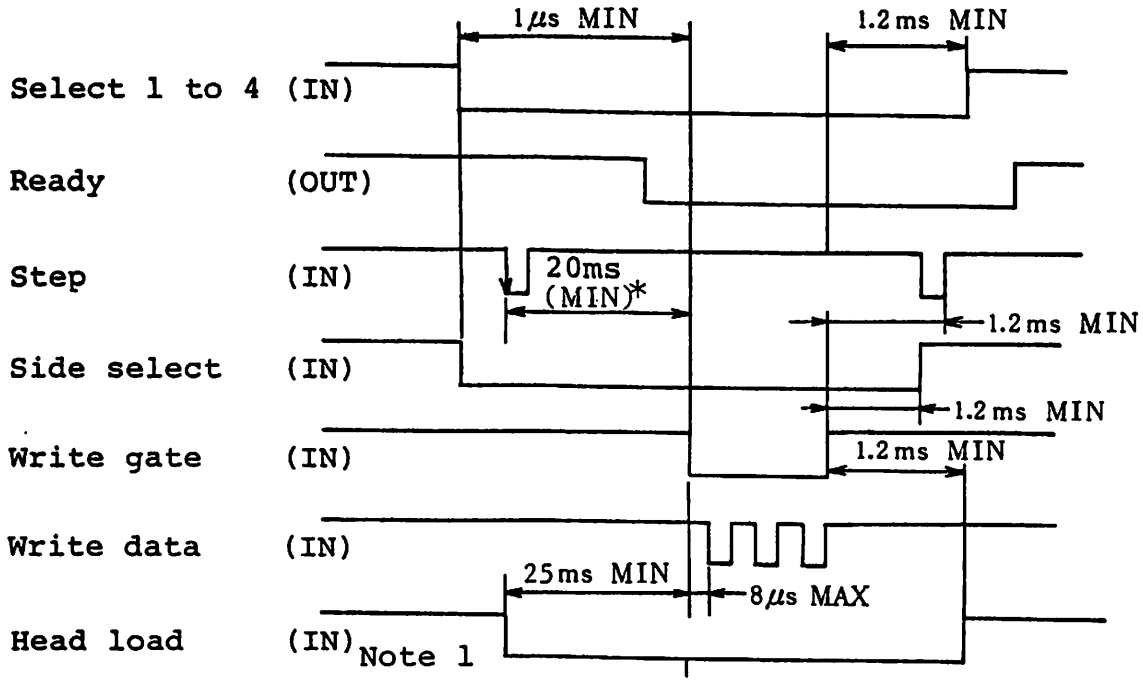
2-4-2 Step Signal Timing



2-4-3 Readout Timing

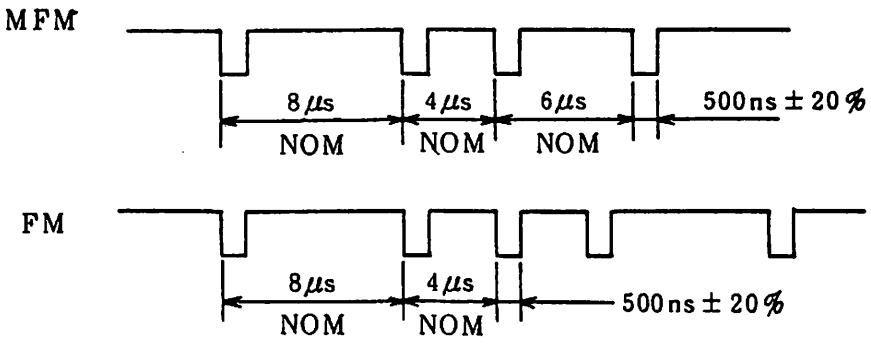


2-4-4 Write Timing

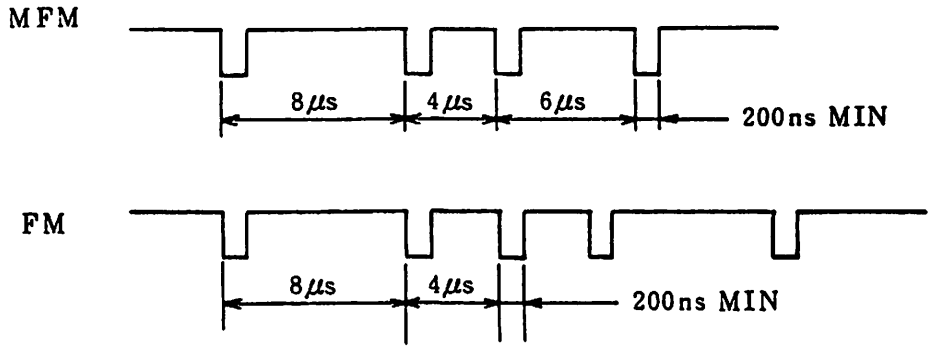


Note 1: The necessary head load waiting time is 25ms from the commencement of actual head loading. (For example, 25ms from 'select on' when head loading by 'select' signal.)

2-4-5 Read Data (OUT)



2-4-6 Write Data (IN)

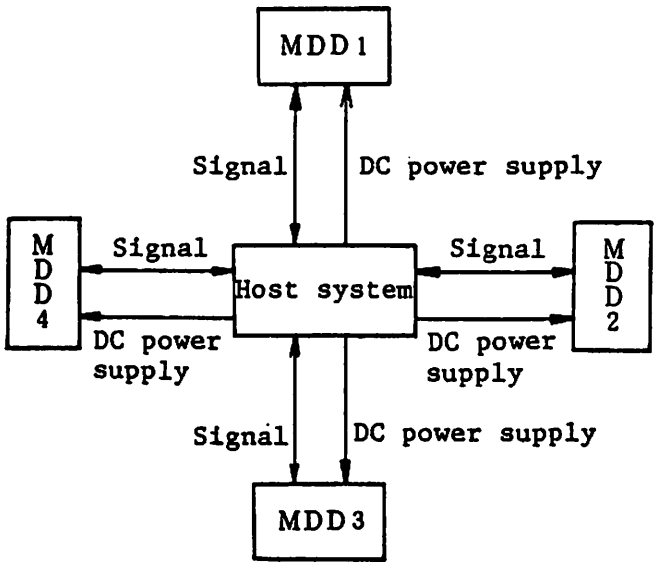


Use a write clock accuracy of ±0.5% (4μs±20ns).
Normally, write pre-compensation is not necessary.
If it is necessary on account of the system, use it only from the center track in the peripheral direction.

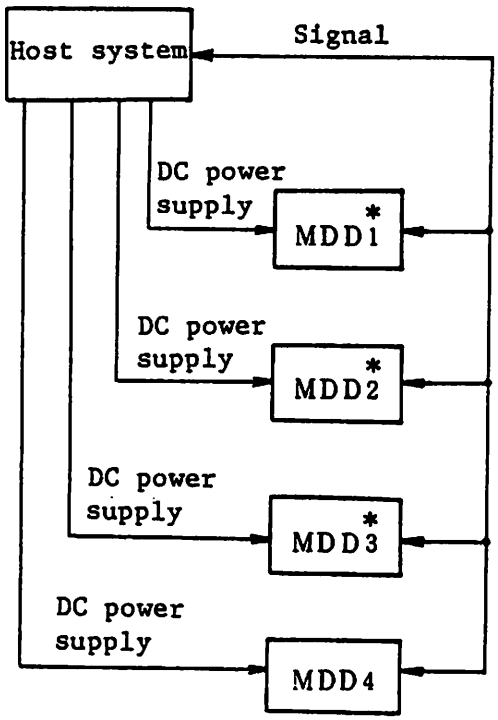
2-5 Multiple Drive Connection System

When connecting several MDD units to a host system, either a radial connecting method or a daisy chain connecting method is used.

When using the daisy chain connecting method, it is necessary to remove all pull-up resistors (resistor arrays) except that on the last MDD unit.



Radial connection



* Remove resistor arrays.

Daisy chain connection

3. Description of Functions

3-1 Overall Block Diagram

The main components of the MDD are a spindle motor (DD motor), stepping motor, head assembly, main PCB, and other drive components.

3-2 Circuit Block Diagram

Apart from the control circuit of the spindle motor, the entire MDD circuit is on the main PCB.

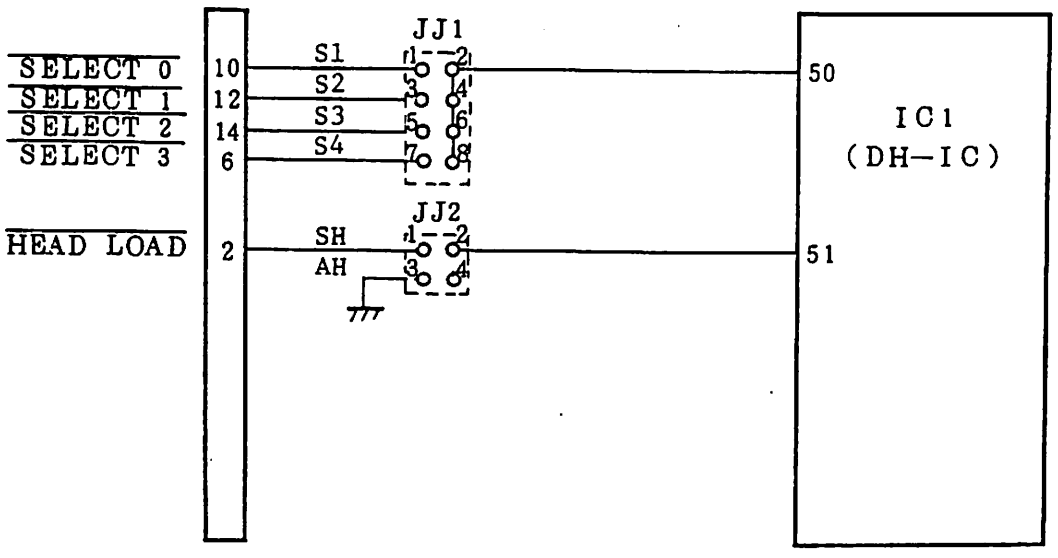
3-3 Jumper Functions

Table 3-1 shows the jumper selection for the MDD.
The way in which the jumpers are set at the factory is indicated on the unit.
If the unit is returned for repair, etc., we will redeliver it with the jumpers set to the initial factory specifications.
Set the jumpers according to whether drive select is to be performed using select '1' or '2', and also whether head loading is to be performed by means of a head load signal or during ready.

Function	Content	JJ1				JJ2	
		S1	S2	S3	S4	SH	AH
	Jumper mode at factory before shipment	o	x	x	x	o	x
Drive select	Drive select 1	o	x	x	x		
	" 2	x	o	x	x		
	" 3	x	x	o	x		
	" 4	x	x	x	o		
Head load selection	Head loading takes place under head loading signal					o	x
	Head loading takes place during drive select					x	o

Table 3-1 Jumper selection table

3-4 Arrangement of Jumper Pins



TEAC(R)

FD-35F
MICRO FLEXIBLE DISK DRIVE
SPECIFICATION

TABLE OF CONTENTS

1-1. APPLICATION

This SPECIFICATION provides a description for the TEAC FD-35F, 3.5 inch double sided 135tpi micro flexible disk drive (hereinafter referred to as the FDD).

1-2. DISK

3.5 inch, micro flexible disks which are mutually agreed between the customer and TEAC.

1-3. PHYSICAL SPECIFICATION

(1) Width: 101.6mm (4.00 in), Max.

(2) Height: 40mm (1.575 in), Max.

(3) Depth: 135mm (5.315 in), Nom.
(excludes projections of interface connectors)

(4) Weight: Less than 750g (1.65 lbs)

(5) External view: See Fig.101.

(6) Cooling: Natural air cooling

(7) Mounting: Mounting for the following directions are acceptable.

(a) Front loading, mounted vertically with eject button at right side.

(b) Front loading, mounted horizontally with indicator up. Do not mount horizontally with spindle motor up.

(c) Mounting angle in items (a) and (b) should be less than 15° with

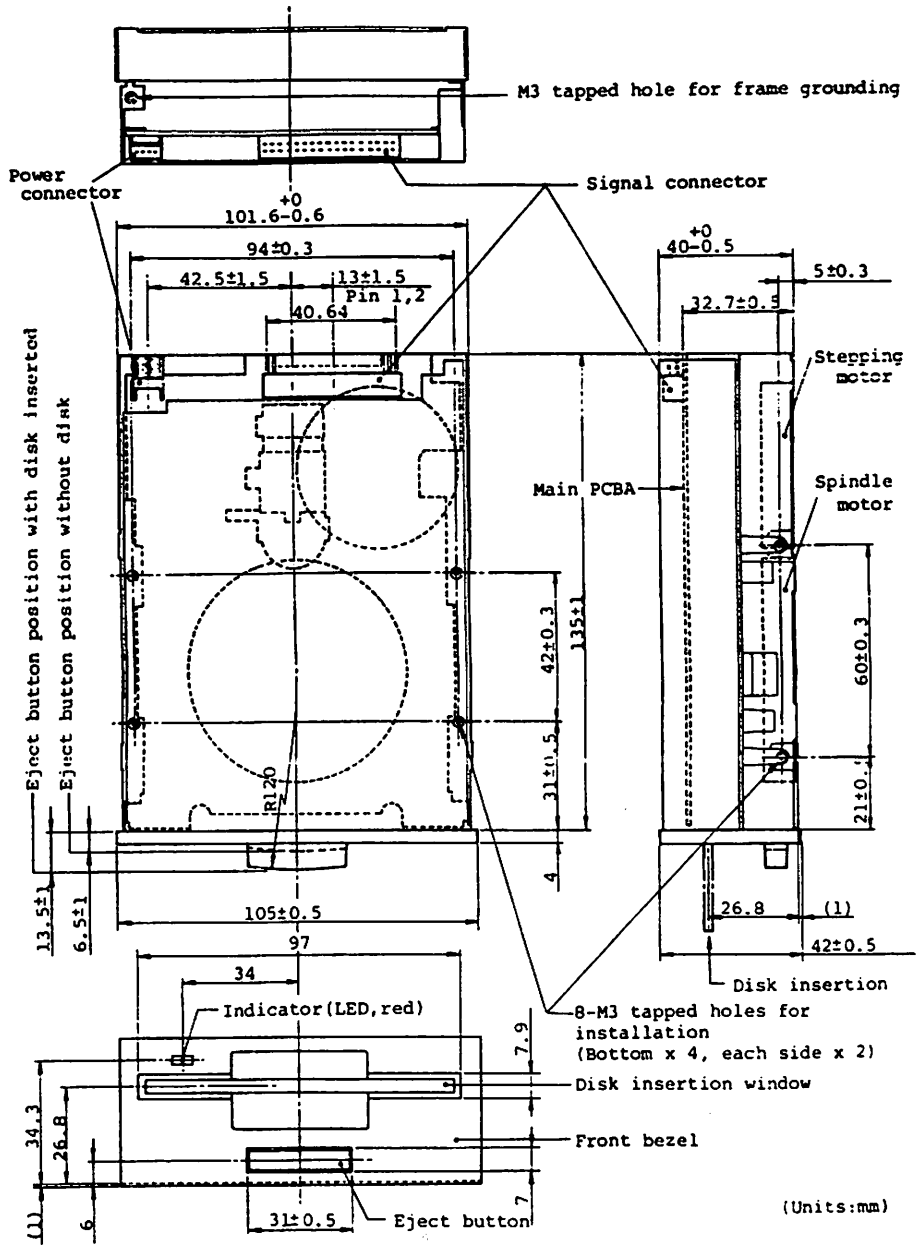
front bezel up.

Note: As to the most appropriate mounting condition and mounting for other directions than the above will be considered separately.

(8) Installation: With installation holes on the side frame or on the bottom frame of the FDD (see Fig.101).

(9) Material of frame: Aluminum diecast

(10) Material of front bezel: PPHOX (Xyron) or ABS
Standard color: Beige



(Fig.101) External view

1-4. REQUIRED POWER

The following specifications are applicable at the power connector of the FDD.

(1) DC+12V

(a) Voltage tolerance: ±10%

(b) Allowable ripple voltage: Less than 200mVp-p (including spike noise)

(c) Operating current consumption

Average at read/write: 110mA (Typ.), 210mA (Max.)
Average at seek: 225mA (Typ.), 290mA (Max.)
Peak at spindle motor start: 330mA (Max.) within 400msec

(d) Waiting current consumption
(at spindle motor off and seek stop): 40mA (Typ.), 60mA (Max.)

(2) DC+5V

(a) Voltage tolerance: ±5%

(b) Allowable ripple voltage: Less than 100mVp-p (including spike noise)

(c) Operating current consumption

Average at read/write: 200mA (Typ.), 260mA (Max.)
Average at seek: 160mA (Typ.), 210mA (Max.)

(d) Waiting current consumption
(at spindle motor off and seek stop): 180mA (Typ.), 240mA (Max.)

(3) Power consumption

(a) Operating power consumption

Average at read/write: 2.32W (Typ.), 3.82W (Max.)
Average at seek: 3.50W (Typ.), 4,53W (Max.)

(b) Waiting power consumption
(at spindle motor off and seek stop): 1.38W (Typ.), 1.92W (Max.)

(4) Power voltage rise time: 1 ∿ 100msec (0 ∿ 90%)

(5) Power reset time in FDD: Less than 500msec after power on

Note: In the above reset time after power on, the FDD might not respond correctly to a control command from the host system.

(6) Power on sequence: Not specified.

(7) Protection against power on and off

(a) In the transient period when the +5V power is lower than 3.4V, the FDD is protected against miswriting and miserasing whatever the state of input signals are.

(b) Except for the condition of item (a), the FDD is protected against miswriting and miserasing in any conditions (including long rise time of the power voltage) as long as the WRITE GATE input signal does not become TRUE.

(c) In any cases, the FDD causes no hung-up condition which is not recovered by a control command from the host system.

1-6. OPERATIONAL CHARACTERISTICS

(1) Data capacity

Recording method			FM	MFM
Data transfer rate (K bits/sec)			125	250
Tracks/disk			160	160
Innermost track bit density (bpi)			4,359(Side 1)	8,717(Side 1)
Innermost track flux density (frpi)			8,717(Side 1)	8,717(Side 1)
Data capacity	Unformatted	K bytes/track	3,125	6.25
		K bytes/disk	500	1,000
	Formatted (16 sectors /track)	K bytes/sector	0.128	0.256
		K bytes/track	2.048	4.096
		K bytes/disk	327.68	655.36

(Table 101) Data capacity

(2) Disk rotation mechanism

(a) Spindle motor: Direct DC brushless motor
(b) Spindle motor speed: 300rpm
(c) Motor servo method: Frequency servo by AC tachometer
(d) Motor/spindle connection: Motor shaft direct
(e) Disk speed: 300rpm
Long term speed variation (LSV): Less than ±1.5%
Instantaneous speed variation (ISV): Less than ±2%
(f) Start time: Less than 400msec
(g) Average latency: 100msec

(3) Index

(a) Number of index: 1 per disk revolution
(b) Detection method: Rotor detection of spindle motor by Hall IC.
(c) Detection cycle: 200msec ±1.5%

(d) Index burst detection timing error: Less than ±400μs, with specified test disk.

(4) Track construction

(a) Track density: 135tpi (track pitch: 187.5μm, Nom.)
(b) Number of cylinders: 80 cylinders
(c) Number of tracks: 80 tracks/surface, 160 tracks/disk
(d) Outermost track radius (track 00): Side 0 39.500mm (1.5551 in)
Side 1 38.000mm (1.4961 in)
(e) Innermost track radius (track 79): Side 0 24.6875mm (0.9719 in)
Side 1 23.1875mm (0.9129 in)
(f) Positioning error: Less than ±15μm, with specified test disk
(Track 40, 23±2°C, 45~55%RH)

(5) Magnetic head

(a) Magnetic head: Gimball supported read/write head with tunnel erase, 2 sets
(b) Effective track width after tunnel erase:
0.115 ± 0.010mm (0.0045 ± 0.0004 in)
(c) Read/write-erase gap spacing: 0.70 ± 0.05mm (0.0272 ± 0.0020 in)
(d) Read/write gap azimuth error: 0° ± 30', with specified test disk

(6) Track seek mechanism

(a) Head positioning mechanism: Stepping motor and steel belt
(b) Stepping motor: 4-phase, 200 steps per revolution
(c) Stepping motor drive: 1 step per track
(d) Track 00 and innermost stopper: Mechanical moving stopper of head carriage
(e) Track 00 detection method: LED and photo-transistor
(f) Track to track time: Use 3msec, Min.
(g) Settling time: 15msec, Max. (excludes track to track time)

(h) Average track access time: 94msec (includes settling time)

(7) Head load mechanism: Not equipped
(The FDD becomes head load condition whenever a disk is installed)

(8) File protect mechanism: Detection of transparent write enable hole by LED and photo transistor

(9) Window margin (shipping): More than 600nsec, with specified test disk, MFM method, analogue PLO separator, and zero write pre-compensation.

1-7. RELIABILITY

(1) MTBF: 10,000 power on hours or more (for typical usage)

(2) MTTR: 30 minutes

(3) Design component life: 5 years

(4) Disk life: 3×10^6 passes/track or more

(5) Disk insertion: 3×10^4 times or more

(6) Preventive maintenance: Not required (for typical usage)

(7) Error rates

(a) Soft read error: 1 per 10^9 bits
(b) Hard read error: 1 per 10^{12} bits
(c) Seek error: 1 per 10^6 seeks

(8) Security standard: Complying with UL, CSA

1-8. SIGNAL INTERFACE

Four FDDs, Max. can be connected to one FDD controller by daisy chaining.

1-8-1. Electrical Characteristics

(1) Interface driver/receiver: See Fig.102.

(2) Electrical characteristics

(a) Input signals

Receiver: 74LS series TTL or equivalent
LOW level (TRUE): 0V ∿ 0.5V
HIGH level (FALSE): 2.5V ∿ 5.25V
LOW level input current
DRIVE SELECT signal line: -12mA, Max. (including pull-up resistor)
Other input signal lines: -6mA, Max. (including pull-up resistor)
HIGH level input current: 50μA, Max.

(b) Output signals

Driver: 74LS240 (3-STATE) or equivalent
LOW level (TRUE): 0V ∿ 0.4V
HIGH level (FALSE): 5.25V, Max.
(depending on host side terminator)
LOW level sink current capability: 12mA, Max.
(24mA, Max. for 0.5V LOW level)
HIGH impedance state (not in DRIVE SELECT condition)
Leakage current: ±20μA, Max.

(3) Input pull-up resistor

Following pull-up resistor (unremovable) is provided in all the input

signal lines at the FDD side.

Pull-up resistor value: 1KΩ±5%

(4) Host side interface driver: Totempole type or open collector type TTL or equivalent

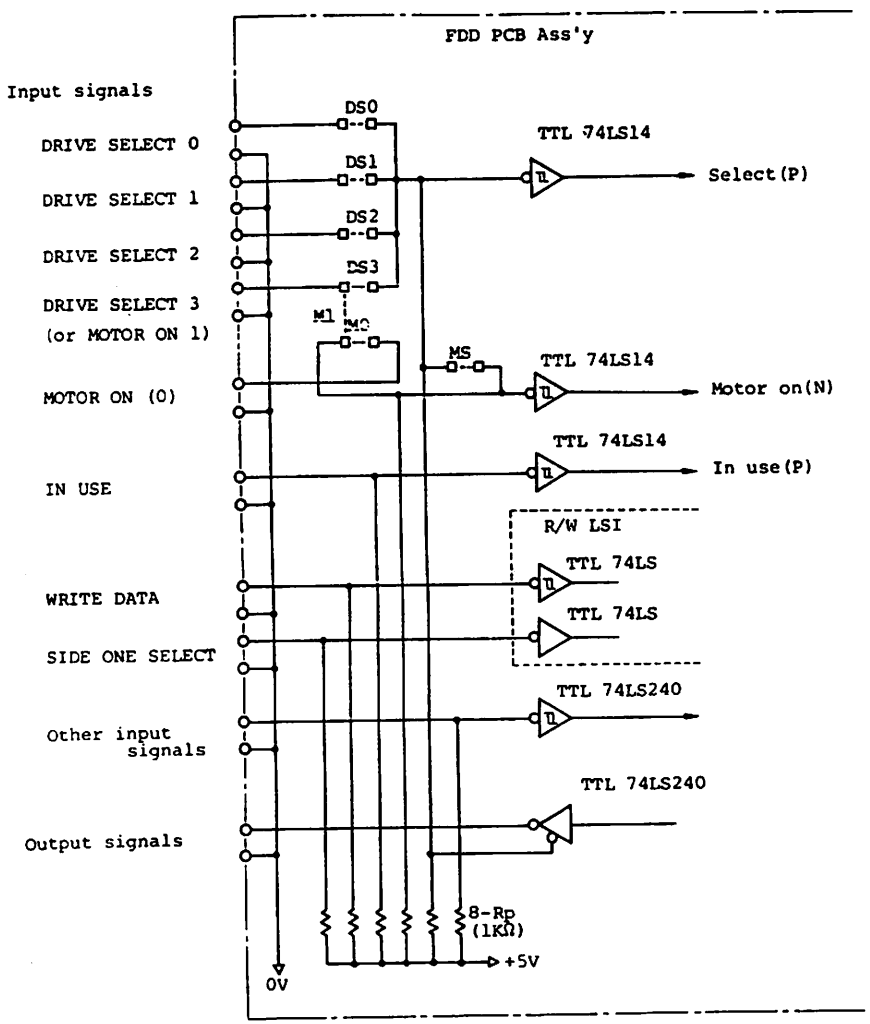
(5) Host driver output current capability in multiplex connection

Following output current capability is required:
Current value in item (2)-(a) x Number of FDDs connected
(For example, when four FDDs are connected, the expression is -6x4 = -24mA, Max. However, for the DRIVE SELECT line, only -12mA is required when multiple FDDs are connected.)

(6) Host side interface receiver: TTL, CMOS, HCMOS, or equivalent

It is recommended to pull-up the interface line by 1KΩ, approx. at the host end.

Note: Total input current of the host side receiver including the pull-up resistor should be less than the FDD side LOW level sink current capability in the previous item (2)-(b).



Note: SIDE ONE SELECT signal is used only for double sided FDD.

(Fig.102) FDD signal interface circuit

1-8-2. Signal Interface Connector and Cable

(1) Signal interface connector

(a) FDD side connector: Fujitsu, P/N FCN-725P034-AU/0
or Japan Aviation Electronics, P/N PS-34PE-D4LT1-PN1
or equivalent

(b) Pin numbers and pin pitch: 2.54mm (0.1 in) pitch, 34 pins block headder
(17 pins double rows, even number pins are upper side of the FDD)

(c) Connector external view: See Fig.103.

(d) Connector location: See Fig.101.

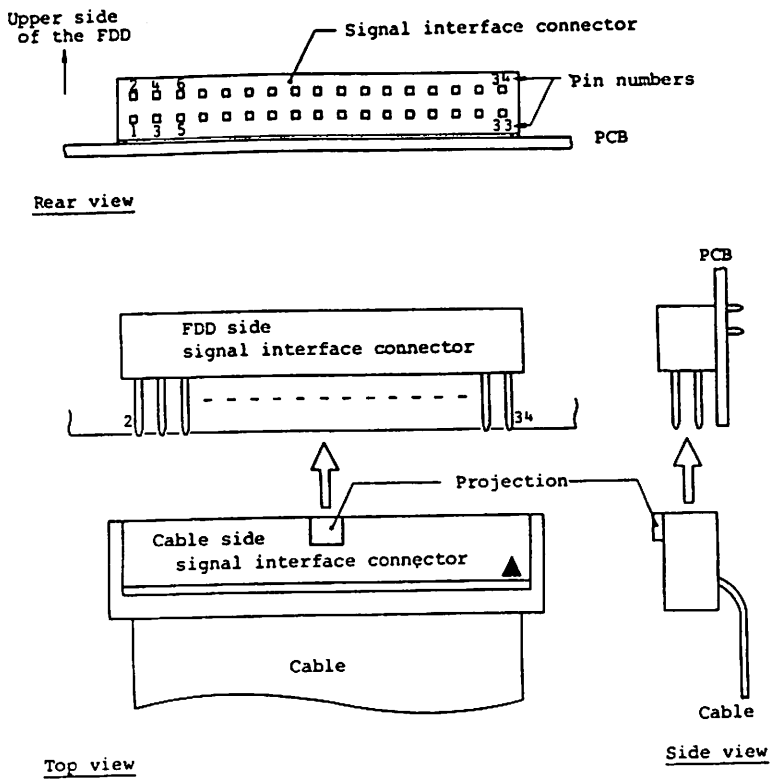
(e) Interface connection: See Table 102.

(f) Host side (cable side) matched connector:
Fujitsu, P/N FCN-747B034-AU/0 (closed end) or -AU/B(daisy chain)
or Japan Aviation Electronics, P/N PS-34SEN-D4P1-1C (closed end)
or -1D (daisy chain)
or equivalent

Note: Use a polarizing type with a projection on the center of the housing for a cable side connector to avoid wrong connection. (See Fig.103).
In such a polarizing connector, ▽ mark of the connector housing shows pin number 34.

(2) Signal interface cable

Maximum cable length: 1.5m
(For the multiplex connection by daisy chaining, the total cable length should be less than 1.5m).



(Fig.103) Signal interface connector external view

Signals	Directions	Terminal Nos.	
		Signals	0V
RESERVED		2	1
IN USE (or MOTOR ON 2)	Input	4	3
DRIVE SELECT 3 (or MOTOR ON 1)	Input	6	5
INDEX	Output	8	7
DRIVE SELECT 0	Input	10	9
DRIVE SELECT 1	Input	12	11
DRIVE SELECT 2	Input	14	13
MOTOR ON (0)	Input	16	15
DIRECTION SELECT	Input	18	17
STEP	Input	20	19
WRITE DATA	Input	22	21
WRITE GATE	Input	24	23
TRACK 00	Output	26	25
WRITE PROTECT	Output	28	27
READ DATA	Output	30	29
SIDE ONE SELECT	Input	32	31
READY	Output	34	33

Note: SIDE ONE SELECT signal is used only for double sided FDD.

(Table 102) Signal interface connections

1-8-3. Input/Output Signals

In the following, input signals are those transmitted to the FDD while output signals are those transmitted from the FDD.
LOW level of the signals is TRUE.

(1) DRIVE SELECT 0 ∿ 3 input signals

(a) Signals of four lines to select a specific FDD for operation in multiplex control by daisy chaining.
(b) Only the DRIVE SELECT signal of the same number as of on-state strap among DS0 ∿ DS3 straps is effective.
(c) Input signals except for the MOTOR ON and IN USE, and all the output signals can be effective when this signal is effectively received.
(d) The time required to make each input or output signal effective after this signal becomes TRUE is 0.5μsec, Max. including delay time through the interface cable.
(e) When the DRIVE SELECT signal of the same number as of on-state strap among DS0 ∿ 3 straps becomes TRUE, the front bezel indicator turns on.
(f) Refer to item 1-12-2 as to the rotating condition of the spindle motor related to this signal.

(2) MOTOR ON input signal

(a) Level signal to rotate the spindle motor.
(b) The spindle motor reaches to the rated rotational speed within 400msec after this signal becomes TRUE and data read and data write operations are enabled.
(c) This signal becomes ineffective when no disk is inserted.
(d) Refer to item 1-12-2 as to the rotating condition of the spindle motor by other input signals.

(3) DIRECTION SELECT input signal

(3) DIRECTION SELECT input signal

(a) Level signal to define the moving direction of the head when the STEP line is pulsed.
(b) Step-out (moving away from the center of the disk) is defined as HIGH level of this signal. Conversely, step-in (moving toward the center of the disk) is defined as LOW level of this signal.
(c) This signal should be input according to the timing in Fig.104.

(4) STEP input signal

(a) Negative pulse signal to move the head. The pulse width should be more than 0.8μsec and the head moves one track space per one pulse.
(b) The access motion (head seek operation) is initiated at the trailing edge of the pulse and completes within 18msec after starting the access including the settling time. For the successive access motion in the same direction, the pulses should be input with the space of more than 3msec, while the pulses should be input with the space of more than 18msec for a direction change.
(c) This signal becomes ineffective when the WRITE PROTECT signal is FALSE and the WRITE GATE signal is TRUE.
Also this signal becomes ineffective when the TRACK 00 signal is TRUE and the DIRECTION SELECT signal is HIGH level (step-out).
(d) This signal should be input according to the timing in Fig.104.

(5) WRITE GATE input signal

(a) Level signal to erase the written data and to enable the writing of new data.
(b) This signal becomes ineffective when the WRITE PROTECT signal is TRUE.
(c) This signal shall be made TRUE after satisfying all of the following conditions.
i) More than 400msec after the start of the spindle motor.
Or the FDD is in ready state (refer to item (13)).

ii) More than 18msec after the effective receival of the final STEP pulse.

iii) More than 100μsec after the level change of the SIDE ONE SELECT signal.

(d) None of the following operations shall be done for at least 1.2msec after this signal is changed to FALSE.

i) Stop the spindle motor.

ii) Make the DRIVE SELECT signal FALSE.

iii) Start the head access motion by the STEP pulse.

iv) Change the level of the SIDE ONE SELECT signal.

(6) WRITE DATA input signal

(a) Negative pulse signal to designate the contents of the data to be written on the disk. The pulse width should be 0.15μsec through 2.5μsec and the leading edge of the pulse is used.

(b) This signal becomes ineffective when one of the following conditions is satisfied.

i) The WRITE GATE signal is FALSE.

ii) The WRITE PROTECT signal is TRUE.

(c) This signal should be input according to the timing in Fig.106.

(7) SIDE ONE SELECT input signal

(a) Level signal to designate which side of a double sided disk is used for reading or writing.

(b) When this signal is HIGH level, the magnetic head on the side 0 surface (lower side) of the disk is selected, while the magnetic head on the side 1 surface (upper side) is selected when this signal is LOW level.

(c) The READ DATA signal on a selected surface becomes valid more than 100μsec after the change of this signal level.

(d) Write operation (the WRITE GATE signal TRUE) on a selected surface shall be started more than 100μsec after the change of this signal level.

(e) When the other side of the disk is selected after the completion of a write operation, the level of this signal shall be switched more than 1.2msec after making the WRITE GATE signal FALSE.

(8) IN USE input signal

(a) Level signal to indicate that all of the daisy chained FDDs are in use condition under the control of the host system.

(b) While this signal is TRUE, the front bezel indicator turns on.

(9) TRACK 00 output signal

(a) Level signal to indicate that the head is on track 00 (the outermost track).

(b) This signal becomes valid more than 2.8msec, Max. after the effective receival of the STEP pulse.

(c) When this signal is TRUE, the head is on the track 00.

(10) INDEX output signal

(a) Negative pulse signal to indicate the start point of the track formatting and one index pulse per one disk revolution is output.

(b) This signal will be output in a correct timing more than 400msec after the start of the spindle motor with disk installed.

(c) Fig.105 shows the timing of this signal. Leading edge of the pulse shall be used as the reference.

(11) READ DATA output signal

(a) Negative pulse signal for the read data from the disk composing clock bits and data bits together.

(b) Fig.107 shows the timing of this signal. Leading edge of the pulse shall be used as the reference.

(c) This signal becomes valid when all of the following conditions are satisfied.

i) More than 400msec after the start of the spindle motor.
Or the FDD is in ready state (refer to item (13)).
ii) More than 18msec after the effective receival of the final STEP pulse.
iii) More than 1.2msec after the WRITE GATE signal becomes FALSE.
iv) More than 100μsec after the level change of the SIDE ONE SELECT signal.

(12) WRITE PROTECT output signal

(a) Level signal which indicates that the write enable hole of the disk is masked.
(b) When this signal is TRUE, the data on the disk are protected from erasing and writing of new data is inhibited.

(13) READY output signal

(a) Level signal to indicate that the FDD is in ready state.
(b) The FDD becomes ready state when all of the following conditions are satisfied.
i) The FDD is powered on.
ii) A disk is installed.
iii) The spindle motor rotates at more than 50% of the rated speed.
iv) Two INDEX pulses have been counted after item iii) is satisfied.
(c) Required time for this signal to become TRUE after the start of the spindle motor is less than 800msec.
However, the disk reaches to the rated rotational speed within 400msec after the start of the spindle motor and data read and data write operations can be started before the change of the READY signal to TRUE.
(d) If a spindle motor rotation command is made FALSE, this signal is also changed to FALSE immediately.

Note: Treatment of not used signals:

If some of the provided input/output signals are not necessary for your application, keep them open or connect appropriate pull-up resistor (1KΩ, approx. for the FDD output signal) at the host side.

1-9. POWER INTERFACE

Refer to item 1-4 for electrical power requirements.

(1) Power interface connector

(a) FDD side connector: AMP, P/N 171826-4 (natural color)
or equivalent

(b) Pin numbers: 4 pins

(c) Protection method for mis-connection: Mechanical protection by the shape of the connector housing.

(d) Connector external view: See Fig.108.

(e) Connector location: See Fig.101.

(f) Power interface connections: See Table 103.

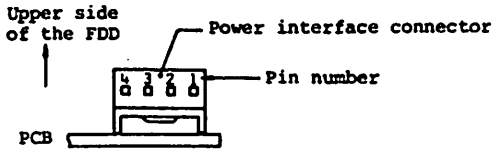
(g) Cable side matched connector: AMP, P/N 171822-4 (natural color)
or equivalent
matched pin: AMP P/N 170204-2 (AWG #20~26, loose piece)
or P/N 170262-2 (AWG #20~26, strip form)
or equivalent

(2) Power cable

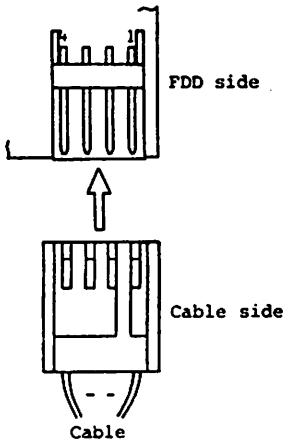
Any appropriate cables taking the maximum power consumption of the FDD will be acceptable.

Power voltage	Pin numbers
DC +5V	1
0V	2
0V	3
DC +12V	4

(Table 103) Power interface connections



Rear view



Top view

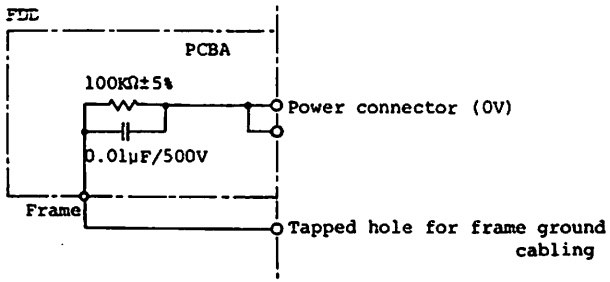
(Fig.109) Power intervace connector external view

1-10. FRAME GROUNDING

(1) Frame ground is coupled to DC 0V by 0.01μF// 100KΩ.

(2) Insulation resistance between the frame and DC 0V is more than 80KΩ at DC 150V.

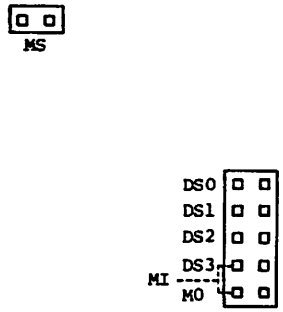
(3) If frame grounding by other cabling method is required, use M3 tapped hole at the rear side of the FDD. (See Fig.101).



(Fig.109) Frame ground internal connection

1-11. STRAPS

All the straps are mounted on the main PCBA of the FDD. Insertion of a short bar onto the post pin of 0.64mm x 0.64mm (0.025 in) is defined as the on-state of the strap.



(Fig.110) Assignment of straps

(1) Straps setting at shipment

The FDD is shipped with the following straps set to on-state:

DS0, MO

(2) DS0 ∿ DS3 straps

(a) In the multiplex control by daisy chaining, these straps designate the address of the FDD.

(b) By the combination with the DRIVE SELECT 0 ∿ 3 signals (refer to Fig.102 and item 1-8-3 (1)), four addresses of 0 through 3 can be designated. Never designate more than 2 FDDs to a same address.

(c) Refer to item 1-12-2 as to the relation between these straps (DRIVE SELECT signals) and the rotating condition of the spindle motor.

(3) M0, M1, MS straps

(a) Straps to designate the rotating condition of the spindle motor.

(b) M0 and M1 straps are used to select the interface line (interface pin) of the MOTOR ON signal. Refer to Fig.102.

i) In a typical usage, set the M0 strap on in all the daisy chained FDDs.
In this application, the MOTOR ON (0) signal (pin No.16) has the same function as that for the conventional standard 5.25 inch FDD.

ii) If two FDDs are daisy chained, and if it is better to set the rotating condition of the spindle motor independent of the DRIVE SELECT signal for your application, use M1 strap.
In this application, the DRIVE SELECT 3 signal (pin No.6) is used as the MOTOR ON 1 signal (M1 strap is on).

(c) MS strap is used to rotate the spindle motor by the DRIVE SELECT 0 ∿ 3 signals. Refer to Fig.102.
In this application, usually set the M0 and M1 straps to off-state. However, if M0 strap is also set to on-state, the spindle motor will rotate by the ORed condition of the DRIVE SELECT signal and the MOTOR ON (0) signal.

(d) Refer to item 1-12-2 as to the details of the spindle motor rotating condition. Five rotating conditions in Table 104 are offered for selection using these three straps.

1-12. SETTING OF OPERATIONAL CONDITION

1-12-1. Front Bezel Indicator

Front bezel indicator turns on when either of the following conditions is satisfied.

(a) While the DRIVE SELECT signal selected by the DS0 ∿ 3 straps is TRUE.

(b) While the IN USE signal is TRUE.

1-12-2. Spindle Motor

Five rotating condition in Table 104 are offered for selection using four straps of M0, M1, M2 and MS.

Selection	Straps			Rotating conditions
	M0	M1	MS	
1	ON	-	-	MOTOR ON (0)
2	-	ON	-	MOTOR ON 1 (DRIVE SELECT 3)
3	-	-	ON	DRIVE SELECT 0∿3
4	ON	-	ON	MOTOR ON 0 + DRIVE SELECT 0∿3
5	-	ON	ON	MOTOR ON 1 + DRIVE SELECT 0∿2

Note: "-" mark indicates the off-state of the strap.

(Table 104) Spindle motor rotating conditions

(1) Selection No.1

While a disk is installed and the MOTOR ON (0) signal is TRUE, the spindle motor rotates.

(2) Selection No.2

While a disk is installed and the MOTOR ON 1 signal is TRUE, the spindle motor rotates.
Since the MOTOR ON 1 signal and the DRIVE SELECT 3 signal use the same interface signal line, it is impossible to set the DS3 strap on at the same time.

(3) Selection No.3

While a disk is installed and the DRIVE SELECT signal selected by the DS0 ∿ DS3 straps is TRUE, the spindle motor rotates.

(4) Selection No.4

When the selection No.1 and/or the selection No.4 is satisfied, the spindle motor rotates.

(5) Selection No.5

When the selection No.2 and/or the selection No.4 is satisfied, the spindle motor rotates.