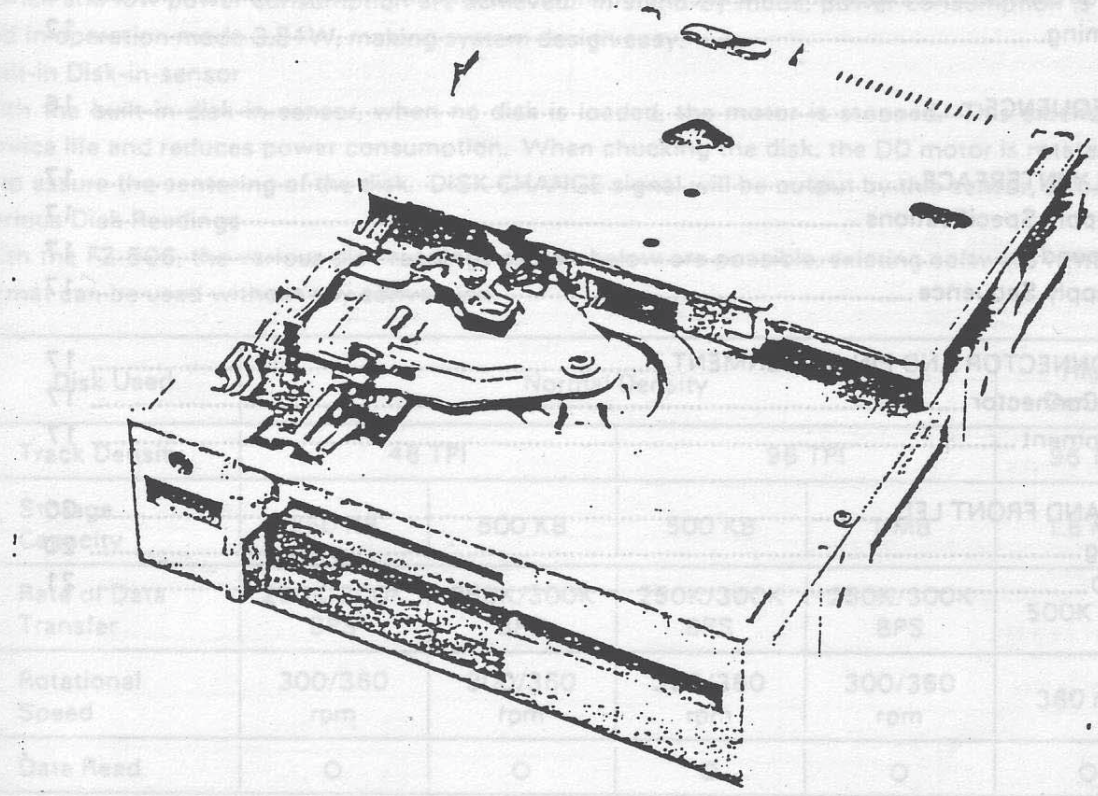
CHINON

5-1/4" FLOPPY DISK DRIVES

SPECIFICATIONS

MODEL: FZ-506 (96 TPI, DOUBLE SIDES, 1.6 MB/1 MB SWITCHABLE)



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1. SCOPE

This specification describes 5-1/4" double-sided 96-TPI minifloppy disk drive (hereafter abbreviated as FDD) CHINON FZ-506.

2. FEATURES

The features of the FZ-506 are as follows:

(1) Large Capacity Up-to 1.6M bytes

The FZ-506 is a double-sided, high-density, double-track type and its capacity is 1.6M bytes, in unformatted mode. The read/write selection of the high density 1.6M bytes, 96 TPI and double density 1M bytes, 96 TPI disk can be carried out by changing either the motor speed (360 rpm/300 rpm) or transfer rate (500K BPS/300K BPS). In addition, as the data retrieval from 250K bytes, 48 TPI disk to 500K bytes, 96 TPI disk is possible, the former software packages can be read.

(2) Pop-up Mechanism

With the newly employed pop-up mechanism, the disk can be loaded/unloaded with ease, preventing mischucking at disk insertion.

(3) Low Power Consumption

As a newly designed LSI (C-MOS chip) is employed in the read/write and control circuits, high performance and low power consumption are achieved. In stand-by mode, power consumption is only 1.59W, and in operation mode 3.81W, making system design easy.

(4) Built-in Disk-in-sensor

With the built-in disk-in-sensor, when no disk is loaded, the motor is stopped. This extends the motor service life and reduces power consumption. When chucking the disk, the DD motor is rotated temporarily to assure the centering of the disk. DISK CHANGE signal will be output by this sensor, also.

(5) Various Disk Readings

With the FZ-506, the various disk readings shown below are possible, existing software written in 48 TPI format can be used without any conversion.

Disk Used	Normal Density				High Density
Track Density	48 TPI		96 TPI		96 TPI
Storage Capacity	250 KB	500 KB	500 KB	1 MB	1.6 MB
Rate of Data Transfer	250K/300K BPS	250K/300K BPS	250K/300K BPS	250K/300K BPS	500K BPS
Rotational Speed	300/360 rpm	300/360 rpm	300/360 rpm	300/360 rpm	360 rpm
Data Read	O	O	O	O	O
Data Write	*O	*O	O	O	O

* Data can be read by this drive, but data can not be read by a head made solely for 48 TPI use.

3. SPECIFICATIONS

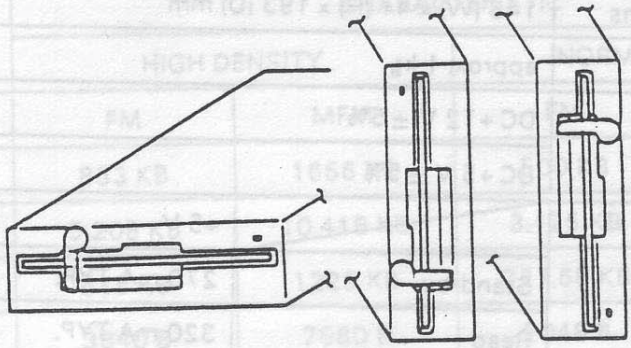
3-1. Specification (1)

Item			CHARACTERISTIC			
			HIGH DENSITY		NORMAL DENSITY	
Recording mode			FM	MFM	FM	MFM
Storage capacity	Unformatted	Per disk	833 KB	1666 KB	500 KB	1000 KB
		Per track	5.208 KB	10.416 KB	3.125 KB	6.25 KB
	Formatted	Per disk	615 KB	1229 KB	327.68 KB	655.36 KB
		Per track	3840 B	7680 B	2048 B	4096 B
		Number of sectors	15		16	
		Per sector	256 B	512 B	128 B	256 B
Recording density			4935 BPI	9870 BPI	2961 BPI	5922 BPI
Rate of data transfer			250K BPS	500K BPS	125K/150K BPS	250K/300K BPS
Access time	Power-on to ready time		0.5 sec or less			
	Single track seek time		3 msec			
	Average access time		94 msec			
	Settling time		15 msec			
	Average latency time		83.3 msec		100 msec/83.3 msec	
Rotation speed			360 rpm		300/360 rpm	
Number of tracks			160			
Number of cylinders			80			
Track density			96 TPI			
Number of heads			2			
Number of index			1			
Radius of track	Outer track	Side 0	57.150 mm			
		Side 1	55.033 mm			
	Inner track	Side 0	36.248 mm			
		Side 1	34.131 mm			

3-2. Specification (2)

Item	Specification			
Physical dimensions	146 (W) × 41 (H) × 193 (D) mm			
Weight	approx. 1 kg			
Power supply	DC +12 V ±5%			
	DC +5 V ±5%			
Power consumption		+5 V	+12 V	POWER
	Stand-by	270 mA TYP.	20 mA TYP.	1.59 W TYP.
	Read	320 mA TYP.	160 mA TYP.	3.52 W TYP.
	Write	330 mA TYP.	180 mA TYP.	3.81 W TYP.
	Seek	260 mA TYP.	380 mA TYP.	5.86 W TYP.
	Spindle Motor Starting current (0.5 sec. max.)		900 mA MAX.	
Ripple voltage allowance	DC +12 V	Less than 150 mVp-p (including spike noise)		
	DC +5 V	Less than 100 mVp-p (including spike noise)		
Noise	Less than 55 phons (class A) (separated from the drive by 1 m)			
Cabinet specifications	Front panel	Material: ABS Color: Beige		
	Front lever	Material: ABS Color: Beige		

3-3. Installation Conditions

Item	Specification		
Mounting position	 Horizontal Vertical In horizontal position, the front panel can be raised a maximum of 15°.		
Environment conditions	Temperature	During operation	5 ~ 45°C
		During non-operation	0 ~ 50°C
		During storage	-20 ~ 60°C
	Humidity	During operation	20 ~ 80% RH Maximum wet bulb temperature 29°C
		During non-operation	5 ~ 90% RH No dew condensation
		During storage	8 ~ 90% RH No dew condensation
	Temperature change		15°C/H
Vibration	During operation	Continuous vibration	Amplitude Less than 0.5 mm 5 ~ 25 Hz 0.25G 25 ~ 100 Hz
		Single vibration	Less than 10G (10 ms)
	During non-operation and storage (W/Protect sheet)	Continuous vibration	Amplitude Less than 7 mm 5 ~ 9 Hz 0.5G 9 ~ 100 Hz
		Single vibration	Less than 30G (10 ms)
Drop shock	Fall height in packing State: 70 cm (corner: one time, sides: three times, flat surfaces: six times)		

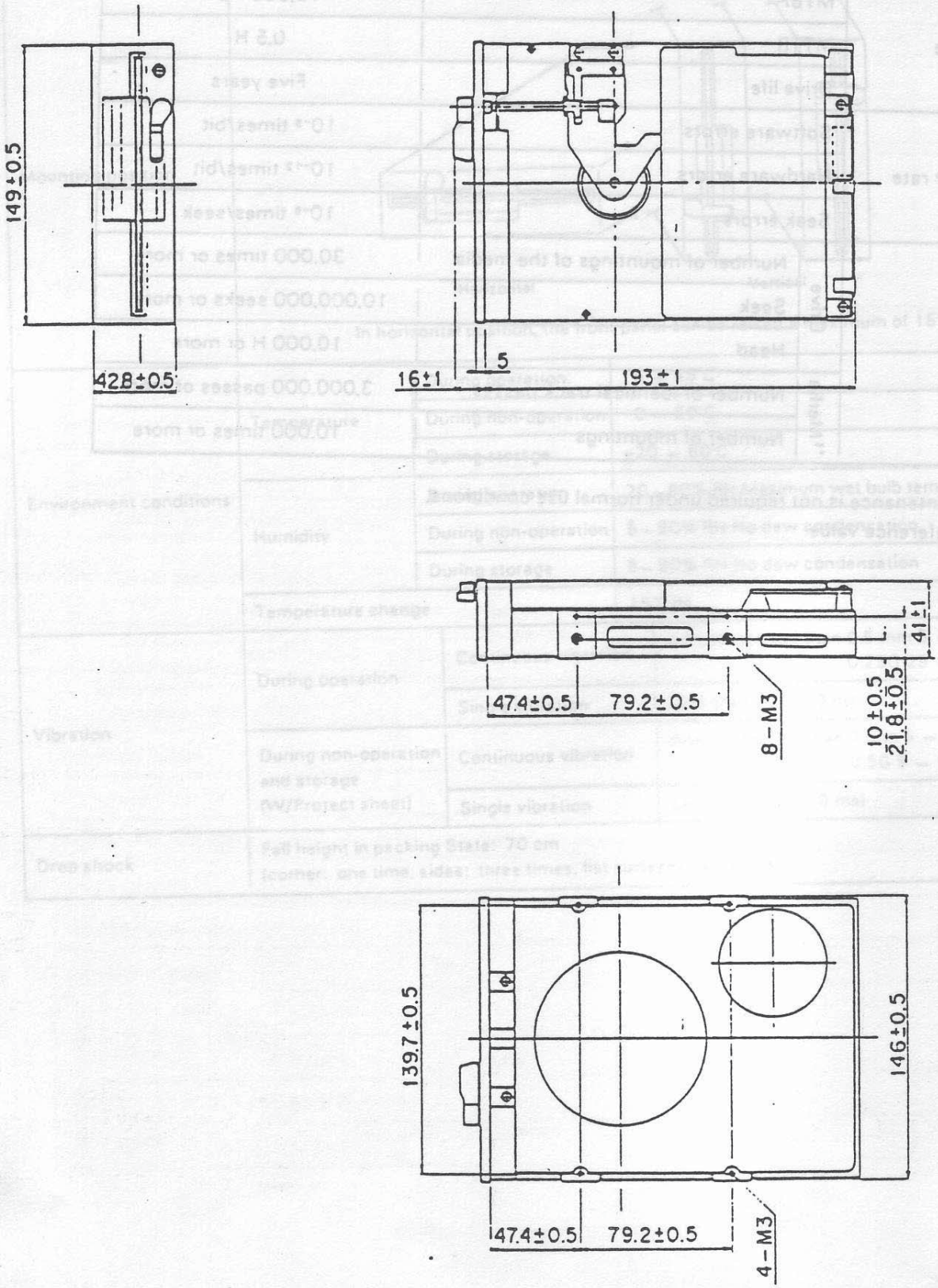
3-4. Reliability

Item			Specification
Drive	MTBF		10,000 POH
	MTTR		0.5 H
	Drive life		Five years
Error rate	Software errors		10^{-9} times/bit
	Hardware errors		10^{-12} times/bit
	Seek errors		10^{-6} times/seek
Life	Drive	Number of mountings of the media	30,000 times or more
		Seek	10,000,000 seeks or more
		Head	10,000 H or more
	*1 Media	Number of identical track passes	3,000,000 passes or more
		Number of mountings	10,000 times or more

* Maintenance is not required under normal use conditions.

*1 Reference value

4. DIMENSIONS



5. INTERFACE SIGNALS

The interface signal has 12 input signal lines and 5 output signal lines. See Fig. 5-1.

5-1. Signal Voltage Levels

The interface signal interfaces with the controller at the TTL level. For all signals, low is true. The I/O signal level into the drives have the following specifications.

(1) Input signal

Low level	0V to +0.40V
High level	+2.40V to +5.25V
Input impedance	150Ω

(2) Output signal

Low level	0V to +0.40V
High level	+5.25V max. (by receiving the end terminator)
Output current (for low level)	48 mA (max.)
Output current (for high level)	250 μA (max.)

5-2. Input Signals

(1) DRIVE SELECT 0 to 3 signal lines

When one of these signal lines goes into low level, the drive corresponding to the signal line is selected and the I/O gate is opened. Up to four drives can be controlled using these four signal lines. The drive corresponding to one of the DRIVE SELECT 0 to 3 signal lines is determined by the position of the short plug in the drive.

(2) MOTOR ON signal line

This line controls the ON/OFF of the spindle motor. When this signal line is set to low level, the spindle motor revolves. When it is set to high level, it stops. 0.5 seconds is the required start up time of the spindle motor. The motor start operation is not executed when no disk is loaded.

This signal operates independently of the DRIVE SELECT signals.

(3) DIRECTION SELECT signal line

This signal determines the direction of movement of the head when a pulse is sent via the STEP signal line. When this signal line is set to low level and the STEP signal pulse is sent, the head moves toward the center of the disk. When it is set to high level and the STEP signal pulse is sent, the head moves away from the center.

The logic level of this signal should be held for at least 1 microsecond after the trailing edge of the STEP pulse.

(4) STEP signal line

This signal line moves the head. With the rise of a single low level pulse, this signal line changes from LOW level to HIGH level and the head moves one track in the direction determined by the DIRECTION SELECT signal.

However, this signal is not accepted when the FDD is in WRITE mode. The head is stabilized 20 ms after the trailing edge of the last STEP pulse, and the FDD is ready for data read/write operation.

(5) WRITE GATE signal line

This signal line specifies drive write and read status. When this signal line is set to low level, write enable status occurs and the data is stored on the disk surface by the WRITE DATA signal. When this signal line is set to high level, read status occurs.

After the writing operation, a period of 1.2 ms is necessary before a valid READ DATA signal appears on the interface.

(6) WRITE DATA signal line

Data written on the disk surface is transferred on this signal line. With the decline of the pulse sent to this signal line (when the signal line changes from the high level to the low level), data is written on the disk surface.

(7) SIDE SELECT signal line

This signal line selects the head.

When this signal line is set to high level, the side 0 head is selected; when it is set to low level, the side 1 head is selected. Side 0 stands for the one-sided medium recording surface.

The selection is completed 100 microseconds after the change of the SIDE SELECT signal line, and read/write becomes possible.

(8) MODE SELECT signal line

This signal status selects either 1.6M Byte mode or 1M Byte mode.

The line can be configured in positive or negative logic by position of short plug.

5-3. Output Signals

(1) INDEX signal line

Whenever the disk rotates once, this signal line outputs a low level pulse indicating the start of the track. A decline of the pulse signal (when this signal line changes from high level to low level) indicates the start of the track. However, the pulse is only output when the disk is inserted.

(2) TRACK 00 signal line

When this signal line is set to low level, the head is located at the track 00 position and the specific phase of the stepping motor is excited.

(3) WRITE PROTECT signal line

When this signal line is set to low level, the inserted disk cannot be written on. This signal line may also be set to low level even when no disk is inserted in the drive. The write function of the drive becomes inoperative when write-inhibited disk is inserted.

(4) READ DATA signal line

This signal line is used for the transfer of the pulse series read from the disk, in which clock pulses and data pulses are mixed. The negative-going edge (the moment of change from high level to low level) of the pulse output at this signal line indicates the readout data (clock and data pulses). (See Page 14.)

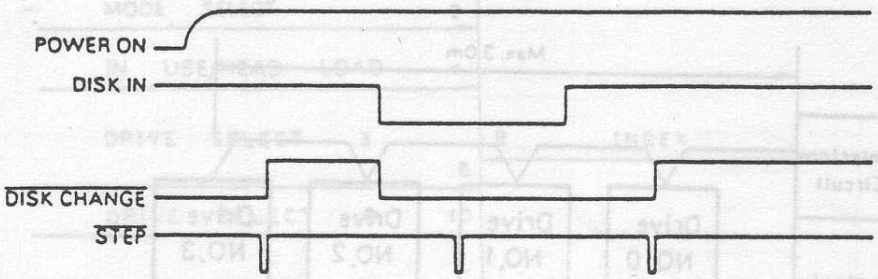
(5) READY signal line

When this output signal line is set to low level, the disk is inserted and the number of disk rotations is fixed.

When the READY signal is ON, read and write operations can be performed on the disk. Immediately after the MOTOR ON signal is turned ON, power is supplied. After the disk is inserted, check that the READY signal is ON before performing write and read operations.

(6) DISK CHANGE signal

This signal line is set to low level by power on or when a disk is ejected, and set to high level by STEP signal input when a disk is loaded.



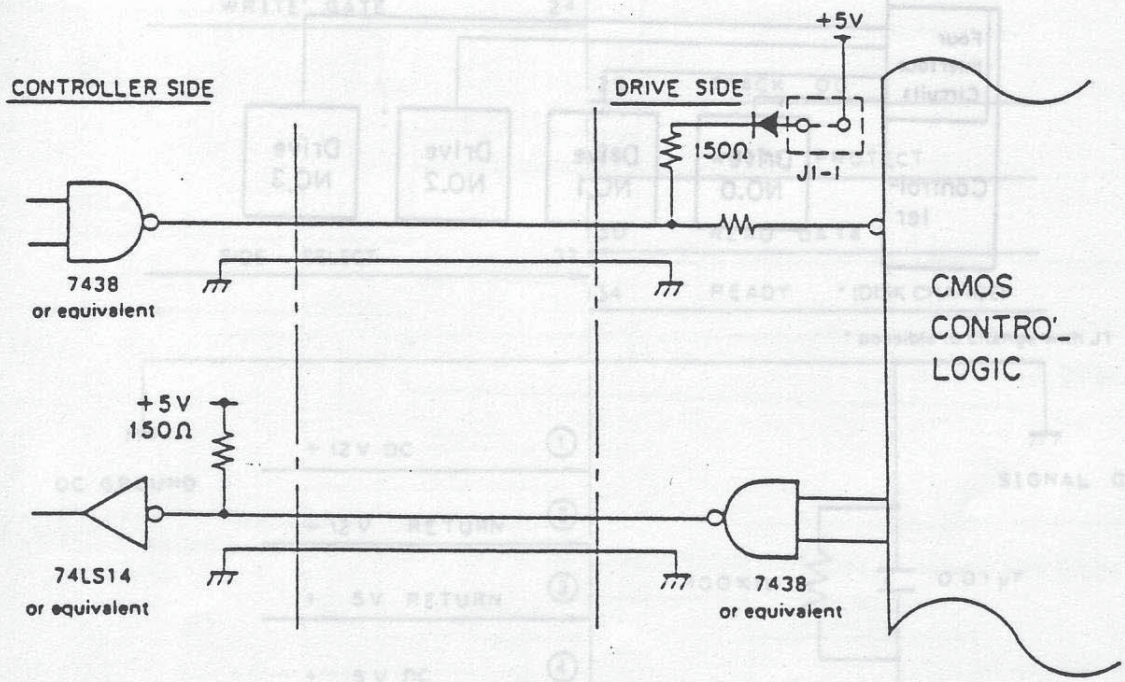
5-4. Input Signal Line Terminator

The FZ-506 is operable with either daisy chain or star chain systems. It is possible to use 4 pcs. Drives by daisy chain. When more than one drives are connected, termination resistors of all drives except the drive at the end of interface cable must be disconnected. (The termination resistors can be disconnected by taking away the short-plug at the connector J1-1) Each of the input signal lines has a 150Ω terminal resistor.

5-5. Interface Circuit

(1) Drives-receivers

When recommend the following drivers-receivers.

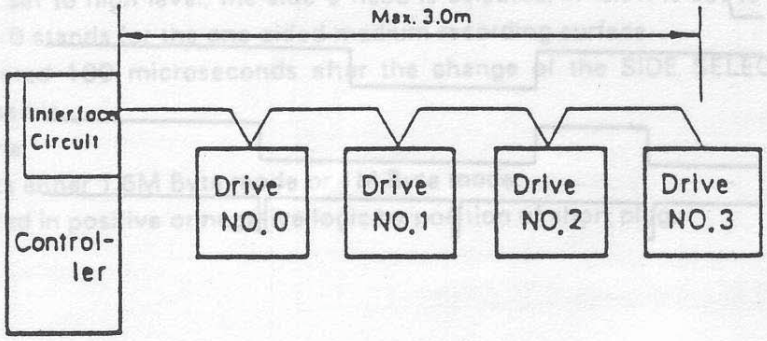


(2) Wire material

Flat cables or twisted pair wires

(3) Wire length

1) Daisy chain system (4 drives max.)



2) Star chain system

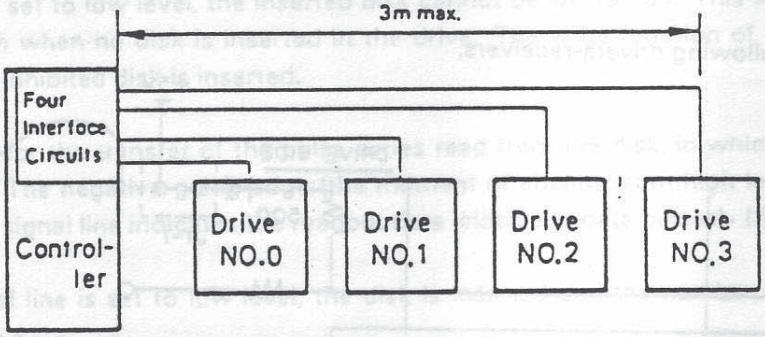
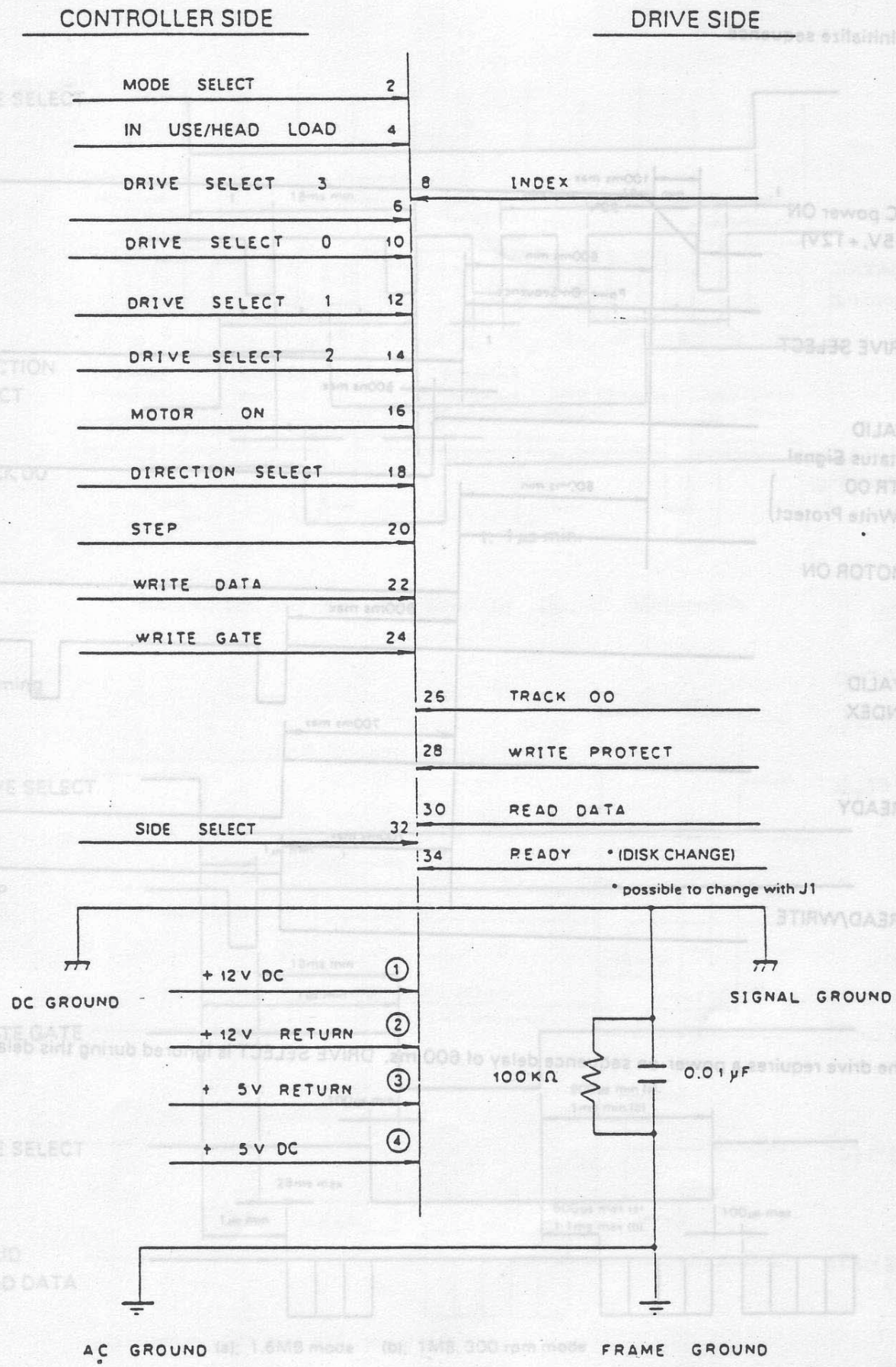
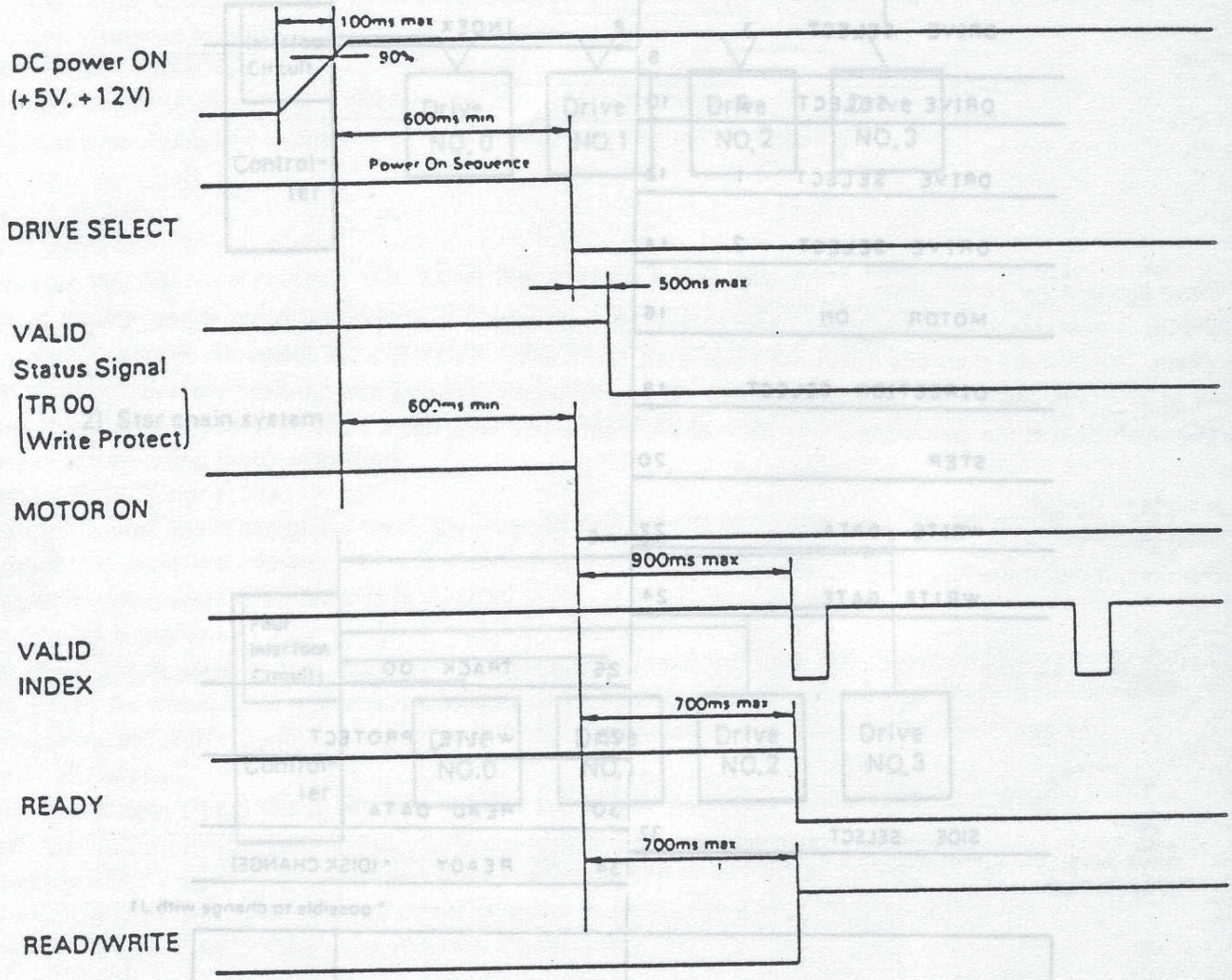


Fig. 5-1 Interface with the controller and host system



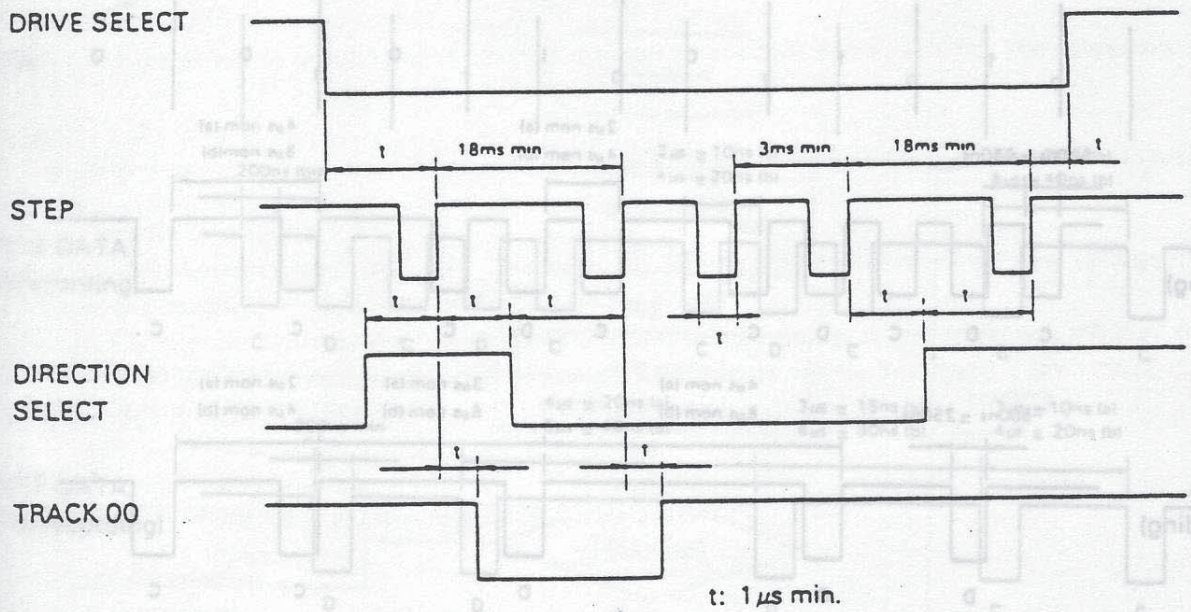
5-6. Signal Timing

(1) Initialize sequence

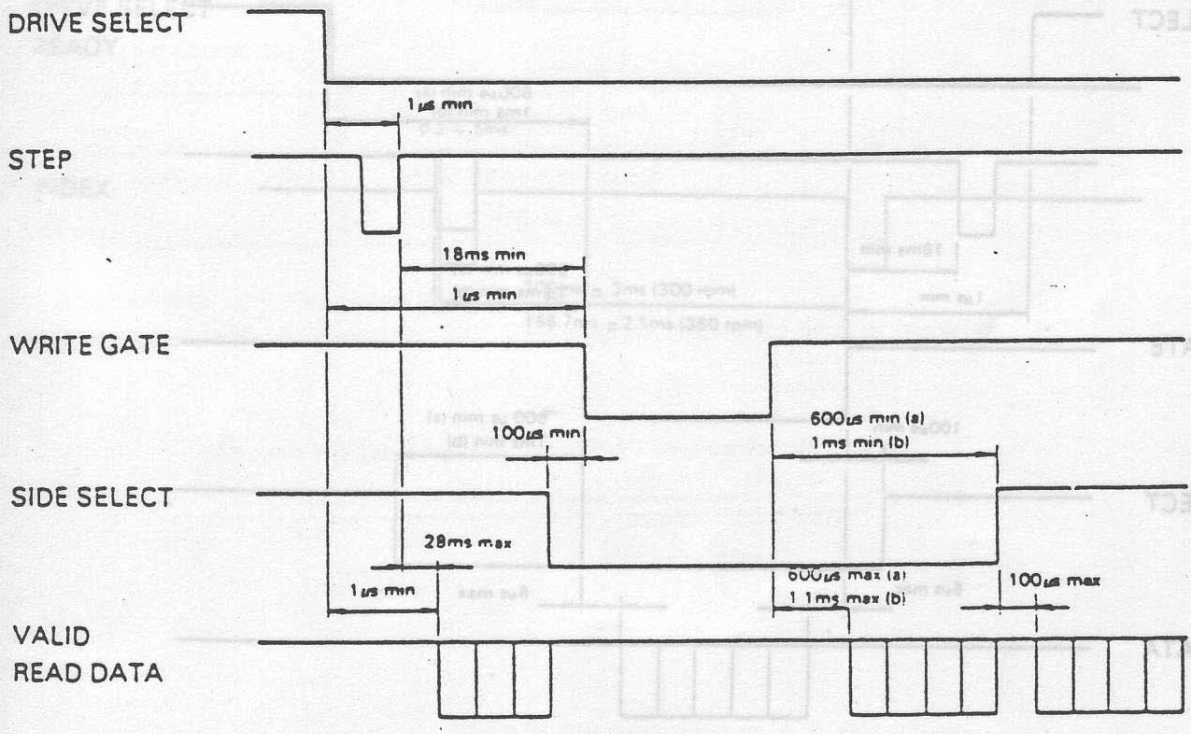


The drive requires a power-on sequence delay of 600 ms. DRIVE SELECT is ignored during this delay time.

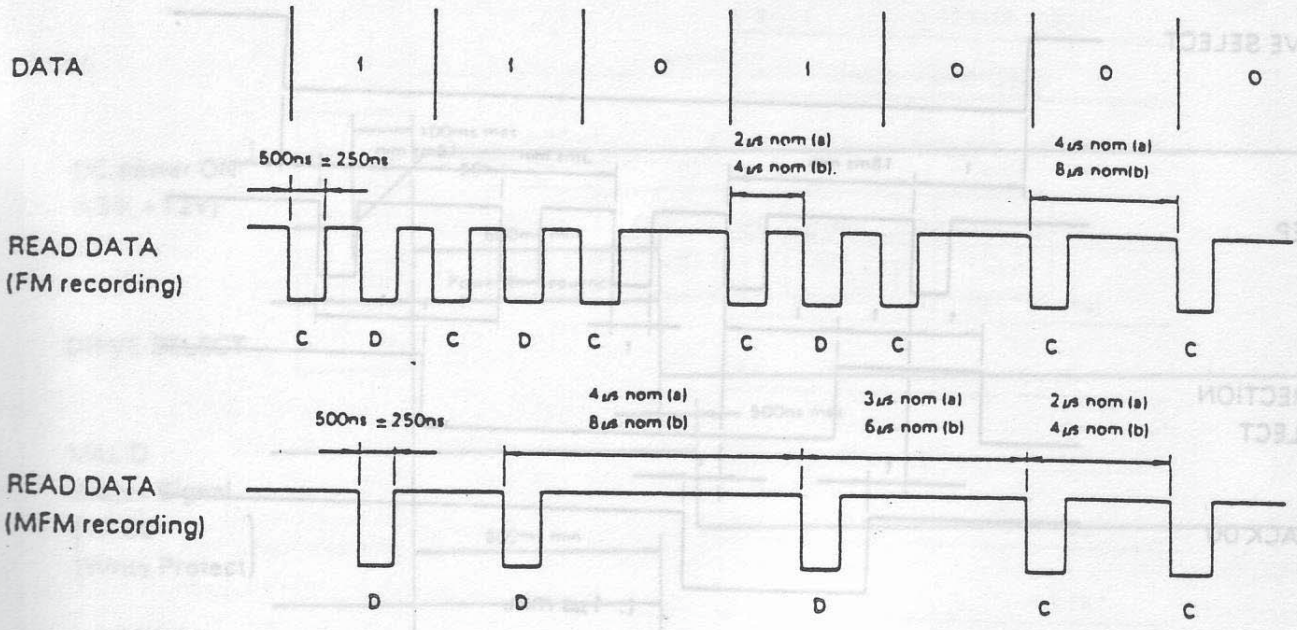
(2) Access timing



(3) Read timing

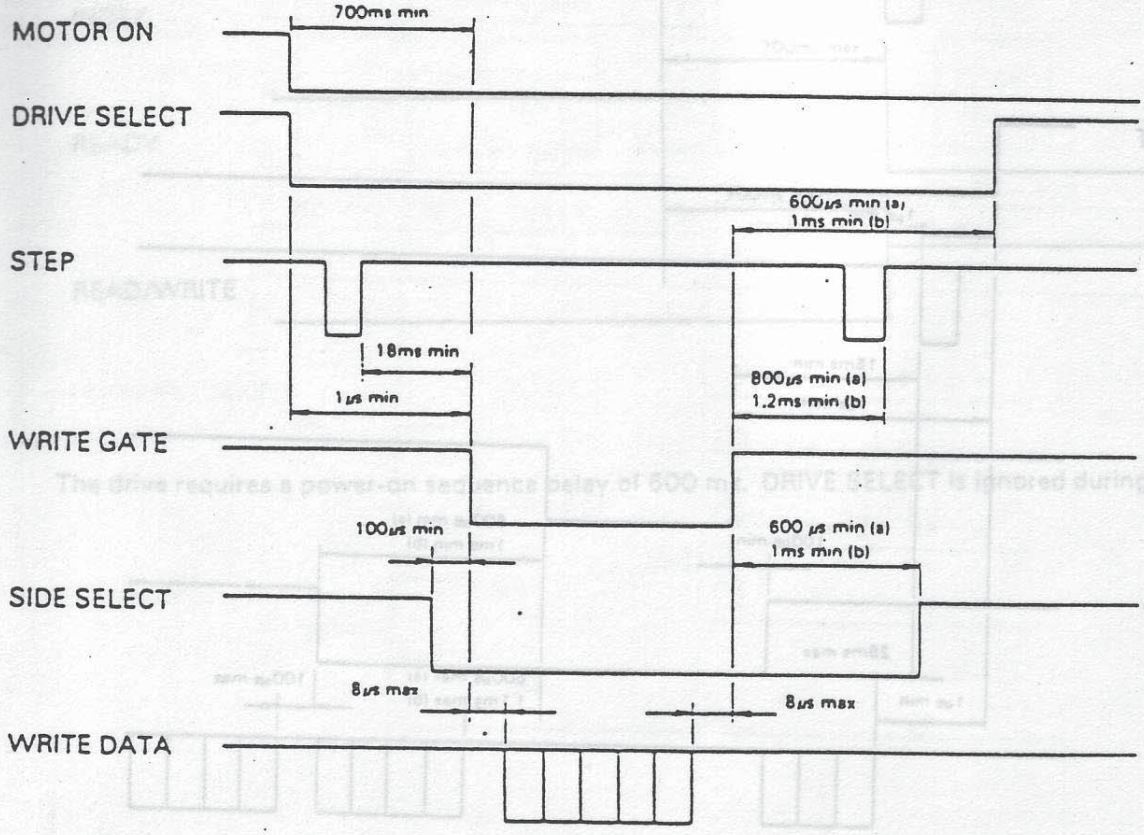


(4) READ DATA timing



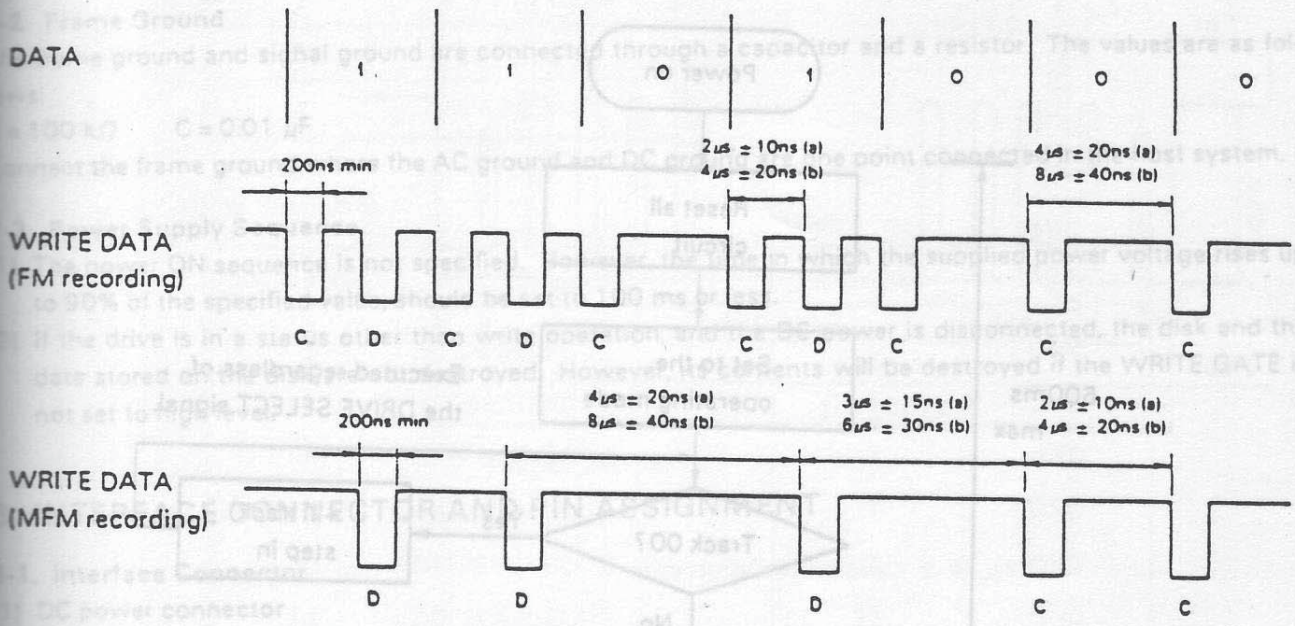
C: Clock D: Data (a): 1.6MB mode (b): 1MB, 300 rpm mode

(5) Write timing



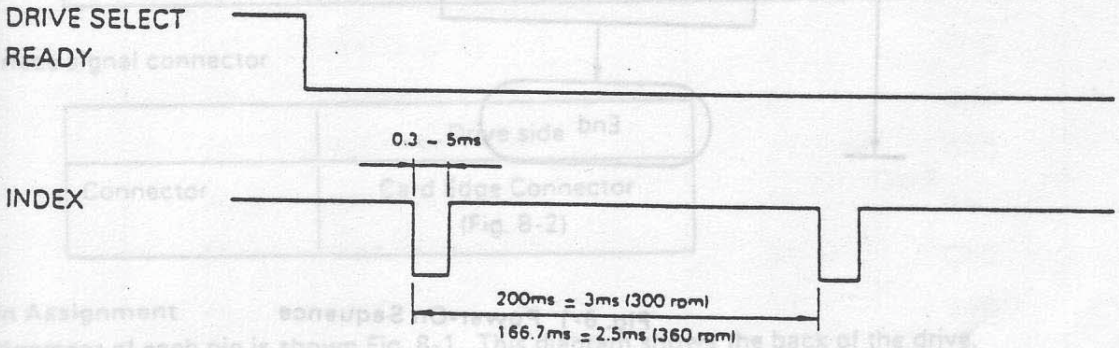
(a): 1.6MB mode (b): 1MB, 300 rpm mode

(6) WRITE DATA timing



C: Clock D: Data (a): 1.6MB mode (b): 1MB, 300 rpm mode

(7) INDEX timing



6. POWER-ON SEQUENCE

Recalibration of the head position is performed during the power-on sequence of the FDD. Fig. 6-1 shows the power-on sequence.

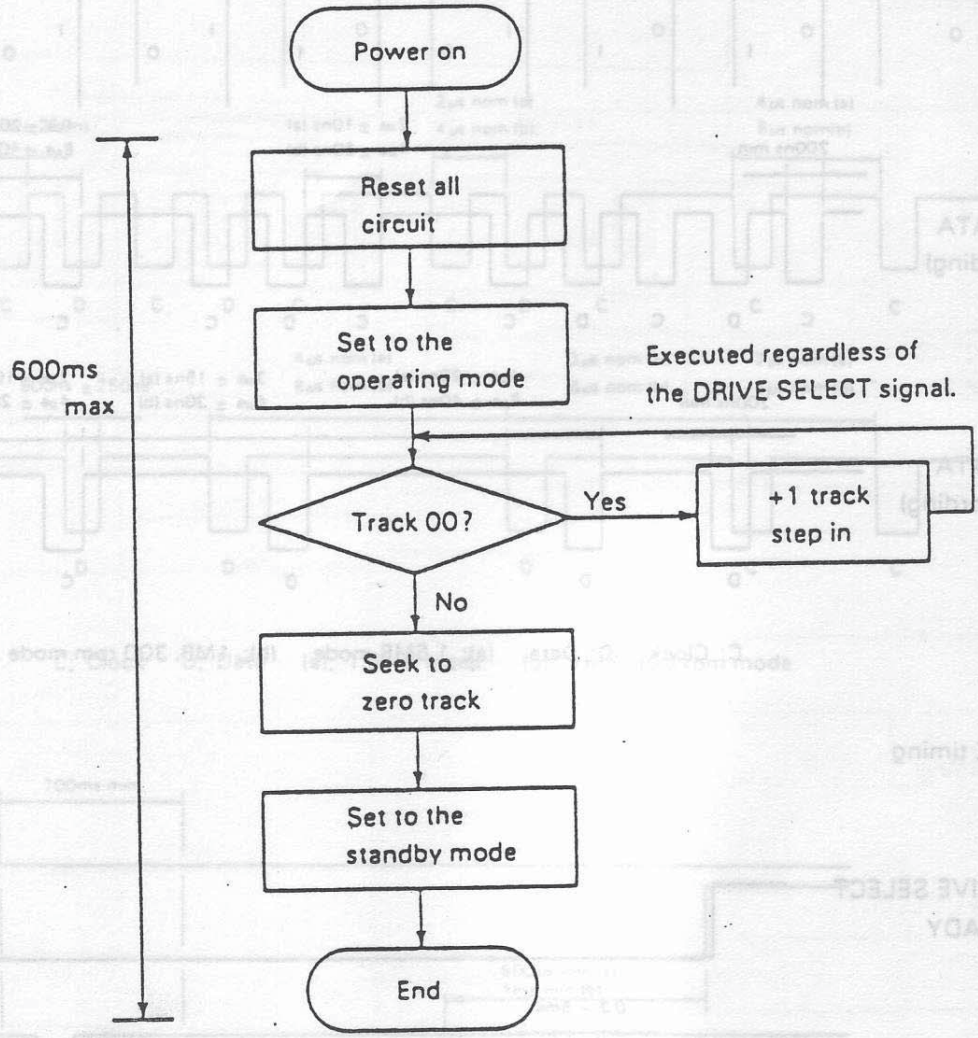


Fig. 6-1 Power-On Sequence

7. POWER SUPPLY INTERFACE

7-1. Power Supply Specifications

The DC power (+12V, +5V) shown in Specification (2) of Section 3-2 is required by the power supply. There are four power lines (+12V, +5V, and the two return lines).

7-2. Frame Ground

The frame ground and signal ground are connected through a capacitor and a resistor. The values are as follows:

$R = 100\ k\Omega$ $C = 0.01\ \mu F$

Connect the frame ground where the AC ground and DC ground are one point connected in the host system.

7-3. Power Supply Sequence

(1) The power ON sequence is not specified. However, the time in which the supplied power voltage rises up to 90% of the specified value, should be set to 100 ms or less.

(2) If the drive is in a status other than write operation, and the DC power is disconnected, the disk and the data stored on the disk are not destroyed. However, its contents will be destroyed if the WRITE GATE is not set to high level.

8. INTERFACE CONNECTOR AND PIN ASSIGNMENT

8-1. Interface Connector

(1) DC power connector

	Drive side	Host side
Connector/housing	AMP 172349-1 or equivalent	AMP 1-480424-0 or equivalent
Pin	——	AMP 60619-1 or equivalent

(2) Interface signal connector

	Drive side
Connector	Card Edge Connector (Fig. 8-2)

8-2. Pin Assignment

The assignment of each pin is shown Fig. 8-1. This diagram shows the back of the drive.

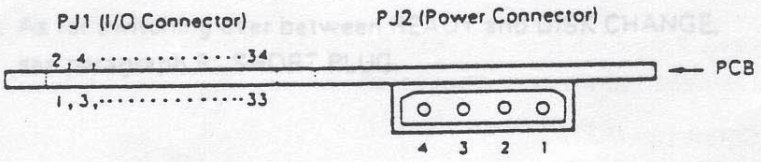


Fig. 8-1 Pin Assignment

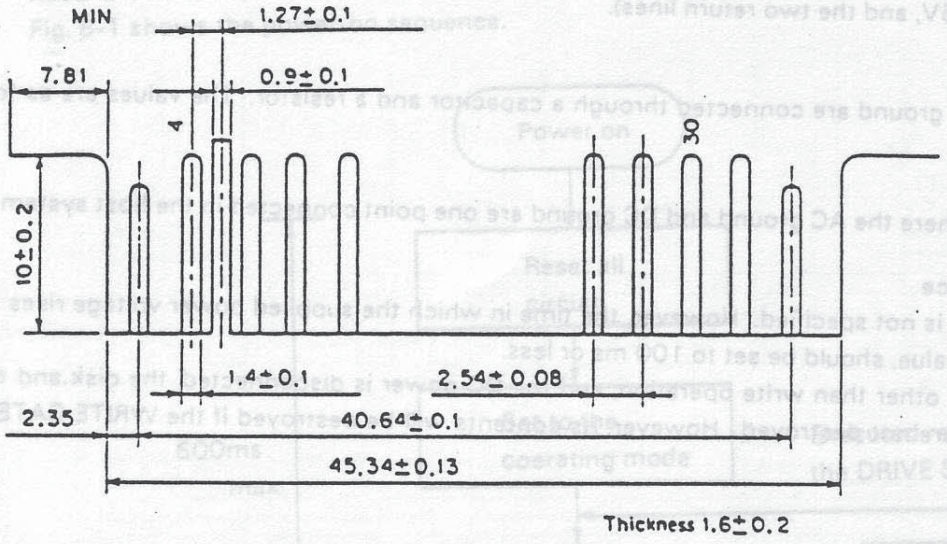


Fig. 8-2 Card Edge Connector

1) DC Power connector

Pin number	Signal
1	+12V DC
2	+12V RETURN
3	+5V RETURN
4	+5V DC

2) Interface signal connector

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

GND: SIGNAL GROUND

*1: "HEAD LOAD" is optional.

*2: As for switching over between READY and DISK CHANGE, see paragraph 9: SHORT PLUG.

9. SHORT PLUG AND FRONT LED

9-1. Short Plug

The assignment of each pin is shown Fig. 9-1.

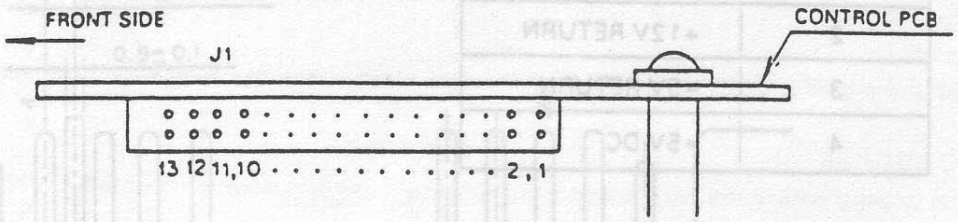


Fig. 9-1 Short Plug

This diagram shows the side of the drive.

CHINON FZ-506 high density 1.6 MB to 1 MB switchable floppy disk drive can be configured in several modes of operation using "SHORT-PLUGS" according to the table below.

Mode descriptions	Connector "J1"												
	1	2	3	4	5	6	7	8	9	10	11	12	13
1.6 MB to 1 MB variable speed switchable using Pin ≠ 2 as change-over signal input													
Pin ≠ 2: High = 1.6 MB (360 rpm)/Low = 1 MB (300 rpm)	O	O	-	-	-	O	-	O	-	O	-	O	-
*1 Pin ≠ 2: High = 1 MB (300 rpm)/Low = 1.6 MB (360 rpm)	O	O	-	-	-	O	-	O	-	-	O	O	-
1.6 MB to 1 MB switchable at 360 rpm, IBM PC/AT compatible, Pin ≠ 2 as change-over input													
Pin ≠ 2: High = 1.6 MB (360 rpm)/Low = 1 MB (360 rpm)	O	-	O	-	-	O	-	-	-	O	-	-	O
1.6 MB 360 rpm non-switchable (Disregards pin ≠ 2 signal)	O	O	-	-	-	O	-	O	-	-	-	O	-

*1: The short-plug is factory set at this position.

12: READY
13: DISK CHANGE
"O" = Position closed
"-" = Position open

Note: Position 1 through 5 of the "J1" are designated as follows.

POS. 1: Connect the termination resistors when closed
POS. 2: Configure the drive as "DRIVE 0" when closed
POS. 3: Configure the drive as "DRIVE 1" when closed
POS. 4: Configure the drive as "DRIVE 2" when closed
POS. 5: Configure the drive as "DRIVE 3" when closed

Note: Only one of the positions 2 through 5 of "J1" can be closed. Above example demonstrates in the case of "DRIVE 0" and the termination resistors connected.

PIN ≠ 2: Card-Edge Connector (PJ1)-2

9-2. Front LED

The front LED lights when the DRIVE SELECT signal selected by the short plug is set to low level.