

# 3.5"MICRO FLOPPY DISK DRIVE

PRELIMINARY  
OEM MANUAL

# CONTENTS

|   |  |    |
|---|--|----|
| 1. PURPOSE .....                          |  | 2  |
| 2. SPECIFICATIONS                         |  |    |
| (1) Performance .....                     |  | 2  |
| (2) DC power requirements .....           |  | 3  |
| (3) Permitted drive orientation .....     |  | 3  |
| (4) Environmental conditions .....        |  | 4  |
| (5) Reliability and maintainability ..... |  | 4  |
| 3. INTERFACE CHARACTERISTICS AND TIMING   |  |    |
| (1) Interface signal diagram .....        |  | 5  |
| (2) Signal level .....                    |  | 6  |
| (3) Input signal description .....        |  | 7  |
| (4) Output signal description .....       |  | 8  |
| (5) Timing chart .....                    |  | 9  |
| 4. PART NAMES AND OPERATION .....         |  | 13 |
| 5. ELECTRICAL CONNECTORS                  |  |    |
| (1) Connectors .....                      |  | 14 |
| (2) Cable and connector .....             |  | 14 |
| (3) Pin assignments .....                 |  | 15 |
| 6. SELECTION OF SHORT PLUG .....          |  | 16 |
| 7. DIMENSIONAL DATA .....                 |  | 17 |

## RECORD OF REVISIONS

| REVISION | DATE      | NOTES          |
|----------|-----------|----------------|
| 1        | Apr. 1984 | Original issue |
|          |           |                |
|          |           |                |
|          |           |                |
|          |           |                |
|          |           |                |
|          |           |                |
|          |           |                |

# 1. PURPOSE

This specification provides the information necessary to interface the micro floppy disk drive to floppy disk controller, and provides the technical specifications for reference in OEM contracts.

## 2. SPECIFICATIONS

### 1) PERFORMANCE

FDA-3400

|                                 |            | AXJA  |       | AXJB    |       | AXKA    |       | AXKB    |       |
|---------------------------------|------------|---|-------|---------|-------|---------|-------|---------|-------|
|                                 |            | TD-35JA   |       | TD-35JB |       | TD-35KA |       | TD-35KB |       |
| Item                            | Type       | FM  | MFM   | FM      | MFM   | FM      | MFM   | FM      | MFM   |
|                                 |            |   |       |         |       |         |       |         |       |
| CAPACITY                        |            |   |       |         |       |         |       |         |       |
| Unformatted per disk            | bytes      | 125 K   | 250 K | 250 K   | 500 K | 250 K   | 500 K | 500 K   | 1 M   |
| Unformatted per track           | bytes      | 3.125K  | 6.25K | 3.125K  | 6.25K | 3.125K  | 6.25K | 3.125K  | 6.25K |
| ACCESS TIME                     |            |   |       |         |       |         |       |         |       |
| Track to track                  | msec       | 6   |       | 6       |       | 3       |       | 3       |       |
| Average access time *1          | msec       | 93  |       | 93      |       | 94      |       | 94      |       |
| Settling time                   | msec       | 15  |       | 15      |       | 15      |       | 15      |       |
| Average latency                 | msec       | 100   |       | 100     |       | 100     |       | 100     |       |
| Motor start time *2             | msec       | 500   |       | 500     |       | 500     |       | 500     |       |
| FUNCTIONAL                      |            |   |       |         |       |         |       |         |       |
| Max.recording density           | BPI        | 4063  | 8126  | 4324    | 8647  | 4094    | 8187  | 4359    | 8717  |
| Data transfer rate              | bits/sec   | 125 K   | 250 K | 125 K   | 250 K | 125 K   | 250 K | 125 K   | 250 K |
| Track density                   | TPI        | 67.5  |       | 67.5    |       | 135     |       | 135     |       |
| Cylinders                       | pcs        | 40  |       | 40      |       | 80      |       | 80      |       |
| Tracks                          | pcs        | 40  |       | 80      |       | 80      |       | 160     |       |
| R/W heads                       | pcs        | 1   |       | 2       |       | 1       |       | 2       |       |
| Rotational speed                | rpm        | 300   |       |         |       |         |       |         |       |
| Dimensions<br>(w/o Front panel) | mm<br>Inch | 101.6(W) × 40.0(H) × 150.0(D)<br>4.0(W) × 1.57(H) 5.91(D) |       |         |       |         |       |         |       |
| Weight                          | g, lbs     | 700 g, 1.54 lbs   |       |         |       |         |       |         |       |
| DC POWER CONSUMPTION            |            |   |       |         |       |         |       |         |       |
| operating                       | W          | 4.5W, Typ   |       |         |       |         |       |         |       |
| stand-by                        | W          | 3.0W, Typ   |       |         |       |         |       |         |       |

Note: \*1 Average access time = 1/3 × (Track No.) × (Track to track time) + (Settling time)

\*2 The lapse of time from output of the MOTOR ON signal until output of the READY signal upon sensing that the motor has reached the specified rotational speed.

## 2) DC POWER REQUIREMENTS

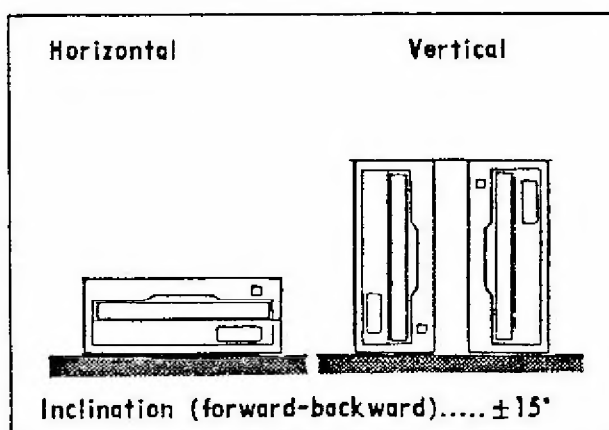
| Item \ status             |                     | Standby *   | Operating * | During motor start-up * |
|---------------------------|---------------------|-------------|-------------|-------------------------|
| DC 12V                    | Tolerance           |             | $\pm 5\%$   |                         |
|                           | Max. ripple         |             | 100mVp-p    |                         |
|                           | Current consumption | 0.13A (typ) | 0.25A (typ) | 0.4A (max)              |
| DC 5V                     | Tolerance           |             | $\pm 5\%$   |                         |
|                           | Max. ripple         |             | 50mVp-p     |                         |
|                           | Current consumption | 0.29A (typ) | 0.30A (typ) | 0.5A (max)              |
| Nominal power consumption |                     | 3.0W (typ)  | 4.5W (typ)  |                         |

Note: \* Standby, Operating, and During motor start-up respectively correspond to the following status:

|                       | Drive motor | Recording disk        | Seek operation |
|-----------------------|-------------|-----------------------|----------------|
| standby               | OFF         | Dismounted or mounted | OFF            |
| Operating             | ON          | Mounted               | ON or OFF      |
| During motor start-up | ON          | Mounted               | OFF            |

## 3) PERMITTED DRIVE ORIENTATION

The drive may be mounted in either a horizontal or vertical position. In the horizontal position the drive must be positioned with the printed circuit board on top. No other restrictions concerning orientation exist.



#### 4) ENVIRONMENTAL CONDITIONS

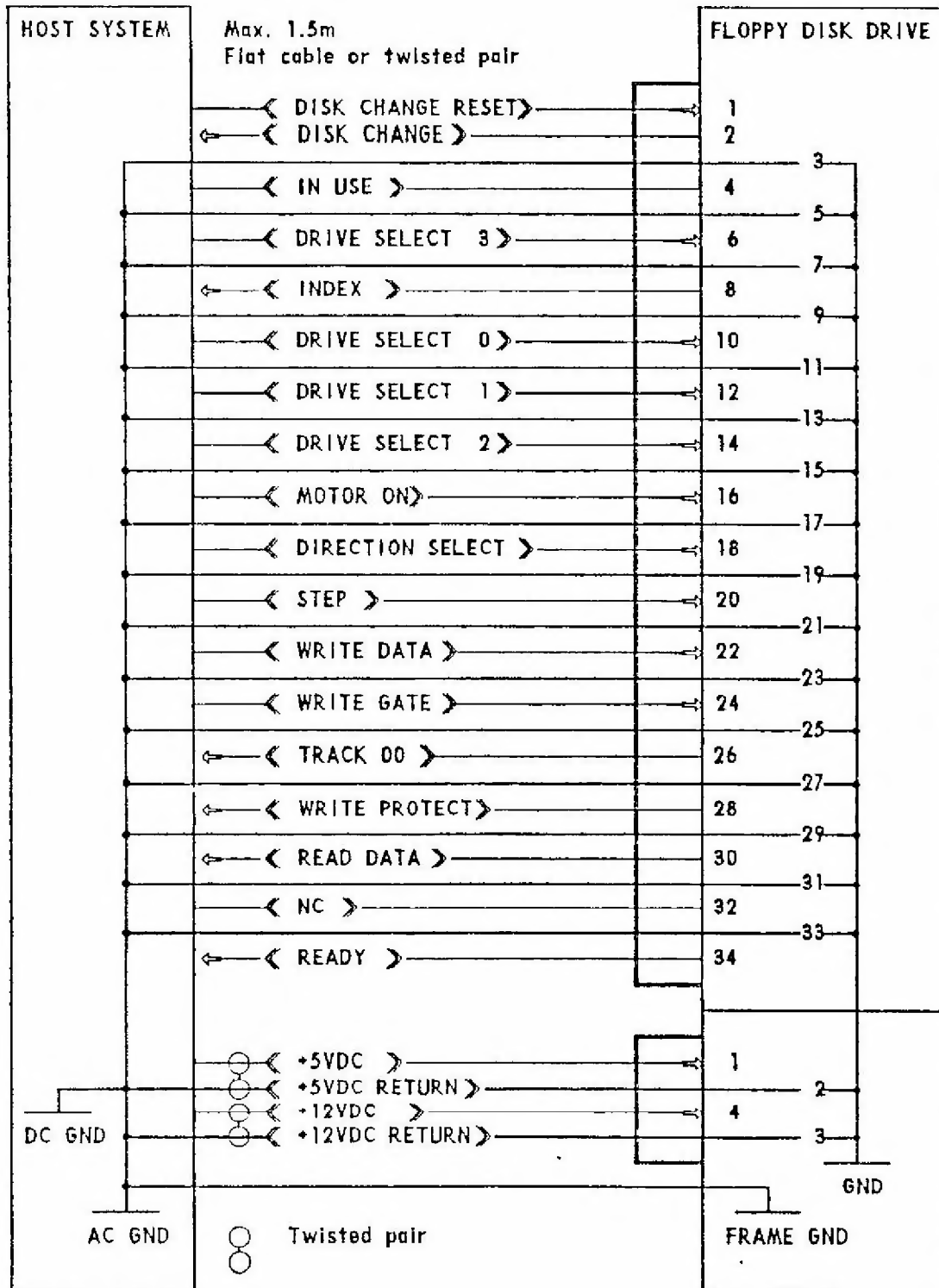
|             |                         |   |
|-------------|-------------------------|---|
| TEMPERATURE | Operating               | 40° F to 115° F (5°C to 45°C)   |
|             | Non-Operating (Storage) | -15° F to 140° F (-20°C to 60°C)  |
|             | Transporting            | -40° F to 140° F (-40°C to 60°C)  |
| HUMIDITY    | Operating               | 20% to 80% relative humidity, with a wet bulb temperature of 85° F (29°C) and no condensation.  |
|             | Non-Operating (Storage) | 5% to 95% relative humidity and no condensation.  |
|             | Transporting            | 8% to 90% relative humidity and no condensation.  |
| VIBRATION   | Operating               | The unit shall perform all read/write operations (no seek) according to specifications, with continuous vibration of less than 0.5G ( $\pm 10\%$ ) from 5Hz to 100Hz (along the x, y, z plane). |
|             | Non-Operating           | The unit when packed for shipment shall withstand $\pm 2G$ from 5Hz to 100Hz along each of the three mutually perpendicular axes.   |
| SHOCK       | Non-Operating           | The unit when unpacked shall withstand 60G.   |

#### 5) RELIABILITY AND MAINTAINABILITY

|                                   |                                |
|-----------------------------------|--------------------------------|
| Preventive Maintenance (PM)       | Not required                   |
| Mean time between failures (MTBF) | 8,000 POH (Power On Hour)      |
| Mean time to repair (MTTR)        | 30 min                         |
| Component life                    | 5 years or 15,000 POH          |
| Disk life                         | $3.0 \times 10^6$ passes/track |
| Disk Interchange                  | 20,000 times                   |
| Soft Read Error                   | 1 per $10^9$ bits read         |
| Hard Read Error                   | 1 per $10^{12}$ bits read      |
| Seek Error                        | 1 per $10^6$ seeks             |

### 3. INTERFACE CHARACTERISTICS AND TIMING

#### 1) INTERFACE SIGNAL DIAGRAM



## 2) SIGNAL LEVEL

The Input signals to the drive unit have the following requirements at the FDD's input terminals:

|              |                   |
|--------------|-------------------|
| Logical Zero | 0.0 V to +0.8 V   |
| Logical One  | +2.0 V to +5.25 V |

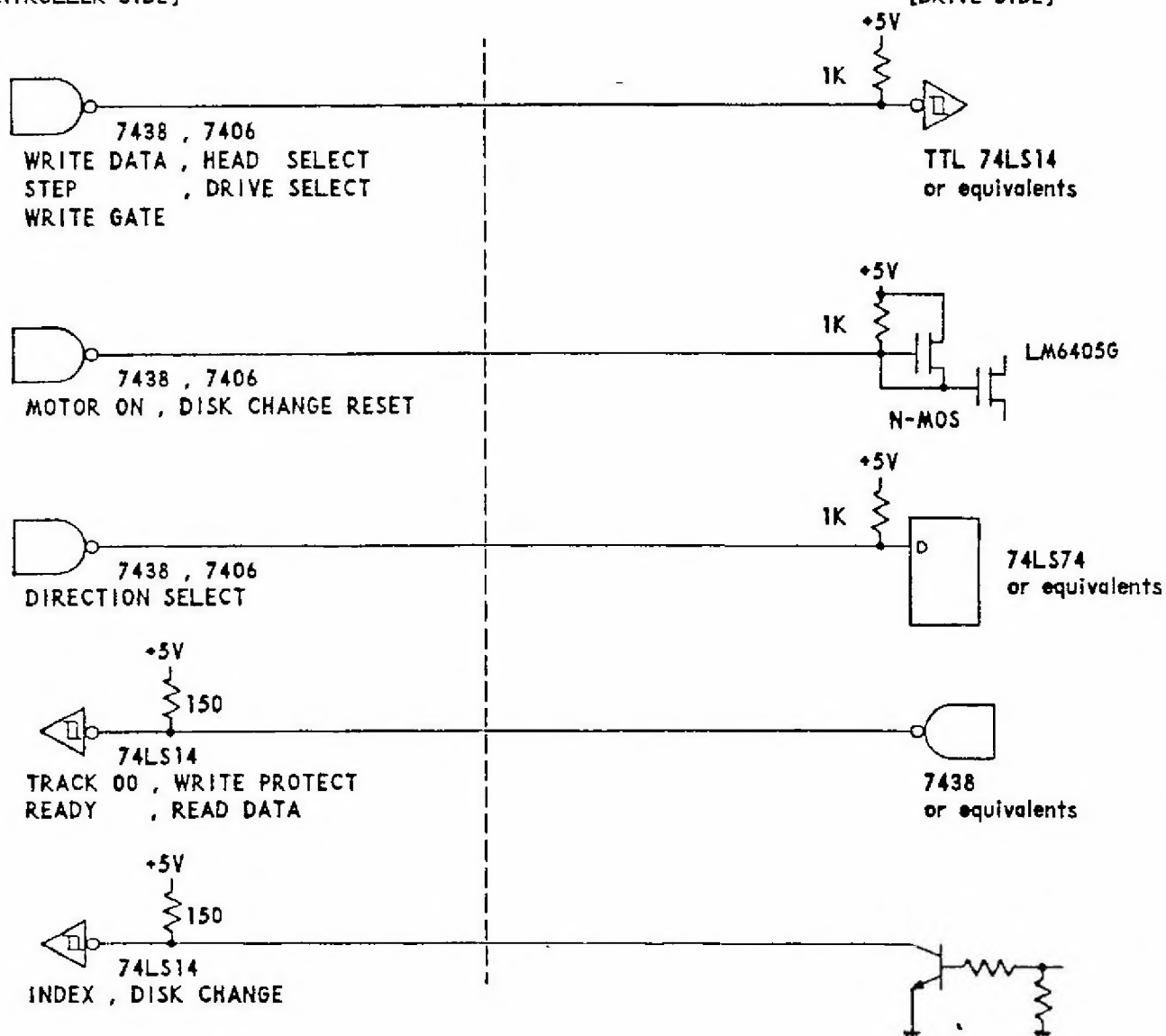
The output signals from the drive unit have the following characteristics:

|                     |                   |
|---------------------|-------------------|
| True = Logical Zero | 0.0 V to +0.4 V   |
| False = Logical One | +2.4 V to +5.25 V |

### INTERFACE CIRCUITRY

[CONTROLLER SIDE]

[DRIVE SIDE]



### 3) INPUT SIGNAL DESCRIPTION

| INPUT SIGNAL                       | DESCRIPTION   |
|------------------------------------|---|
| DRIVE SELECT 0<br>~ DRIVE SELECT 3 | Logical zero on this line selects the designated drive for operation.   |
| MOTOR ON                           | Logical zero on this line causes the drive motor to rotate.   |
| DIRECTION SELECT                   | This line defines the direction of head movement when the step line is activated. Logical one on this line defines the direction as OUT, and when the line is activated the head will move to the outside of the disk. Logical zero on this line defines the direction as IN, and when the step line is activated the head will move to the center of the disk. |
| STEP                               | This line causes the read/write head to move in the direction defined by the DIRECTION SELECT line.<br>The transition from logical one to logical zero initiates the stepping motion.   |
| SIDE SELECT                        | Logical one on this line selects the read/write head 0 for operation; logical zero selects the read/write head 1 for operation.   |
| WRITE GATE                         | This line defines an operation as read or write. Logical zero on this line enables data to be written on the disk; logical one identifies a read operation. And this line control the tunnel erase head.  |
| WRITE DATA                         | This line is used for data that is to be written on the disk. A transition from logical one to logical zero changes the polarity of read/write head current and causes a data bit to be written on the disk. This data line is active when the WRITE GATE and READY signals are logical zero, and the WRITE PROTECT signal is logical one.                      |
| DISK CHANGE RESET                  | This line is used to reset the DISK CHANGE signal. When the disk is inserted, the drive is selected and this line goes to logical zero, the DISK CHANGE goes to logical one.  |

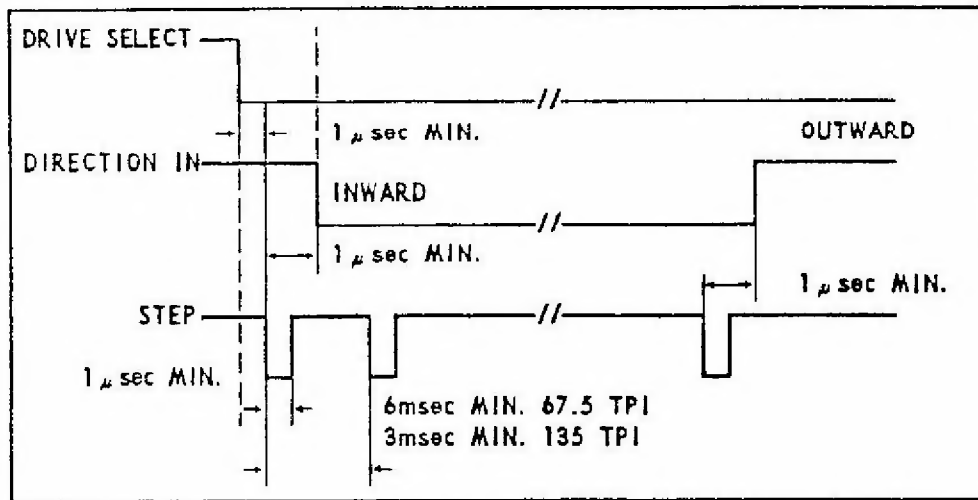


#### 4) OUTPUT SIGNAL DESCRIPTION

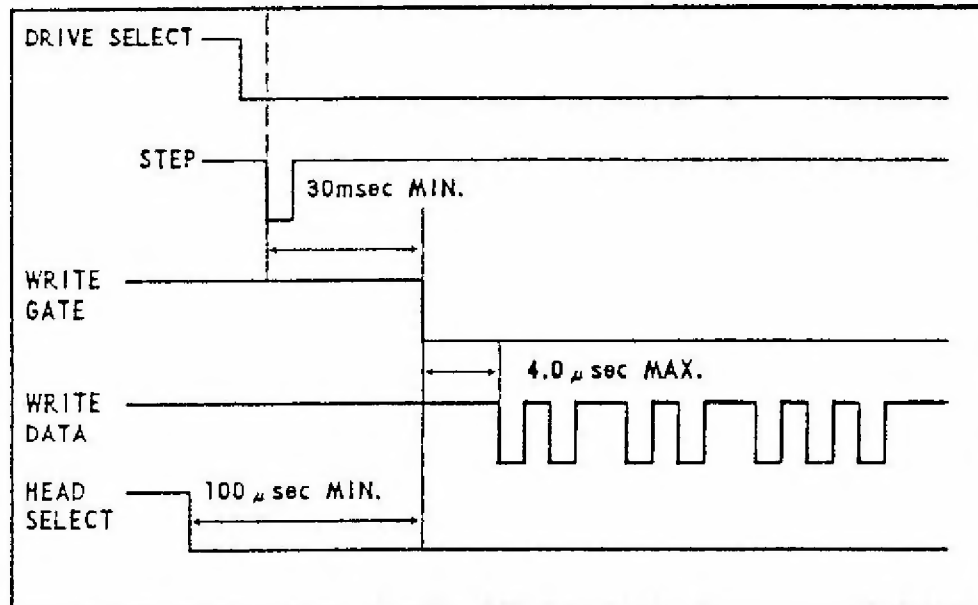
| OUTPUT SIGNAL | DESCRIPTION   |
|---------------|---|
| INDEX         | This line is used to indicate a reference position on a track. The line is usually a logical one; it becomes logical zero when the drive senses the index hole. The trailing edge of the signal should be used to determine position. This line becomes logical one when the drive is not selected.                                       |
| READY         | This line is logical zero when<br>a) disk is inserted<br>and<br>b) motor is rotating<br>and<br>drive unit is selected<br>At all other times this line is logical one.   |
| TRACK 00      | This line indicates that read/write head located at track 00 (the outer most track). Logical zero on this line indicates the head is located at track 00. Logical one indicates the read/write head is not at track 00.   |
| READ DATA     | This line provides unseparated data (data and clock combined). The line is normally logical one, and becomes logical zero when data is read.  |
| WRITE PROTECT | This line indicates that a disk is write protected. Logical zero on this line indicates a write protected disk is inserted in the drive. Logical one on this line indicates data may be written on the disk. If no disk is inserted in the drive, logical zero appears on this line. If the drive not selected, this line is logical one. |
| DISK CHANGE   | This line is used to monitor if disk has been changed. This line goes to logical zero when the disk is ejected from the drive and stays logical zero until DISK CHANGE RESET is applied.<br>The drive should be selected to monitor its DISK CHANGE.  |

## 5) TIMING CHART

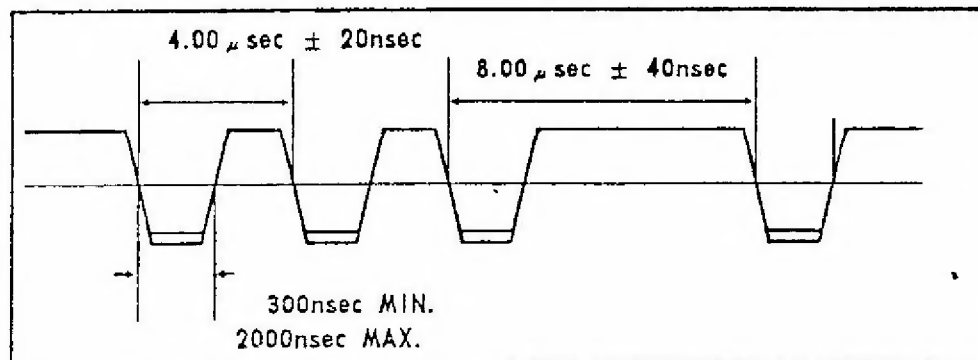
### (1) TRACK ACCESS TIMING



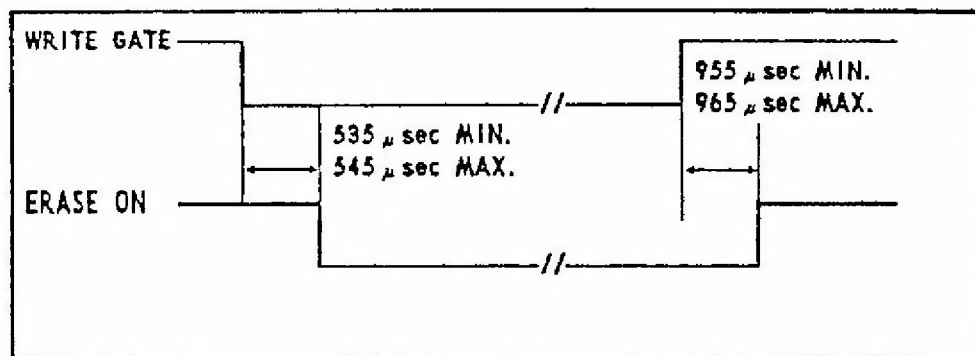
### (2) WRITE INITIATE TIMING



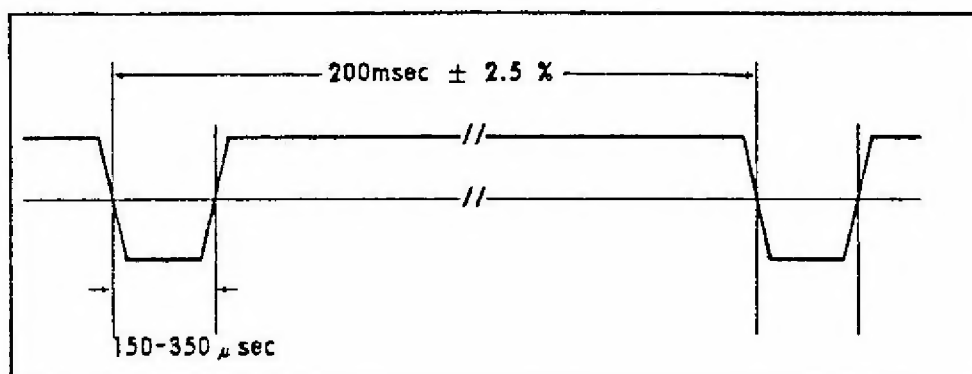
### (3) WRITE DATA TIMING



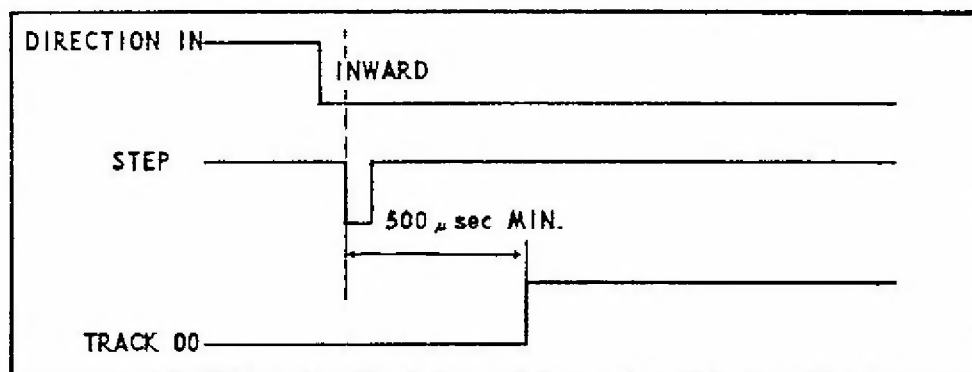
(4) ERASE ON AND OFF TIMING



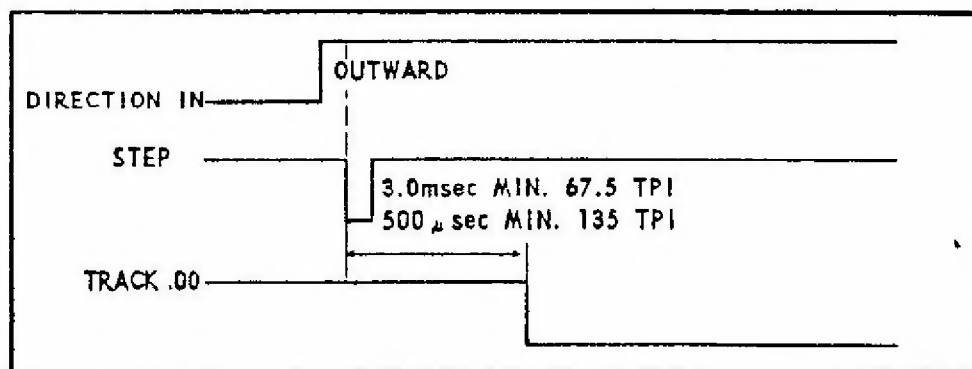
(5) INDEX MARK TIMING



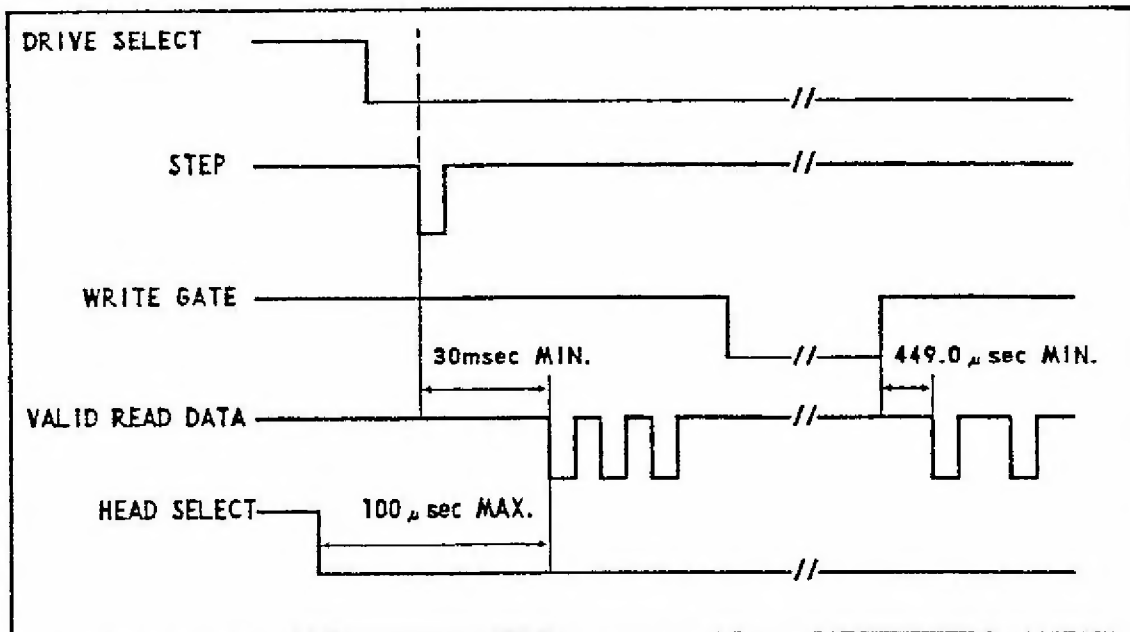
(6) TRACK 00 TIMING WHEN STEP IN



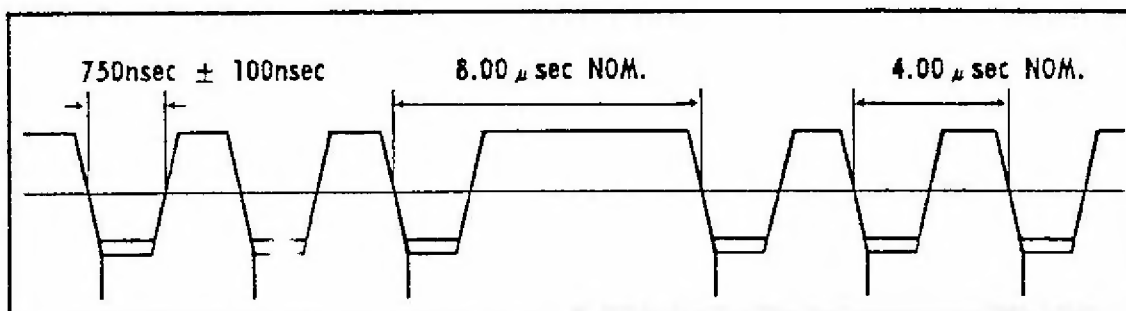
(7) TRACK 00 TIMING WHEN STEP OUT



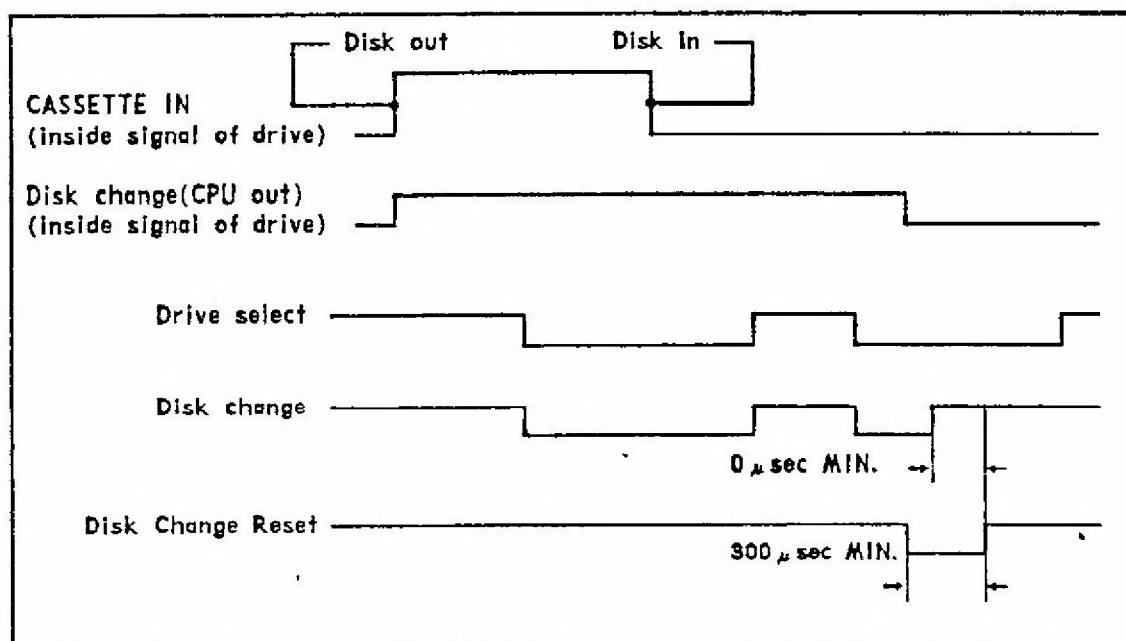
# (8) READ INITIATE TIMING



# (9) READ DATA TIMING

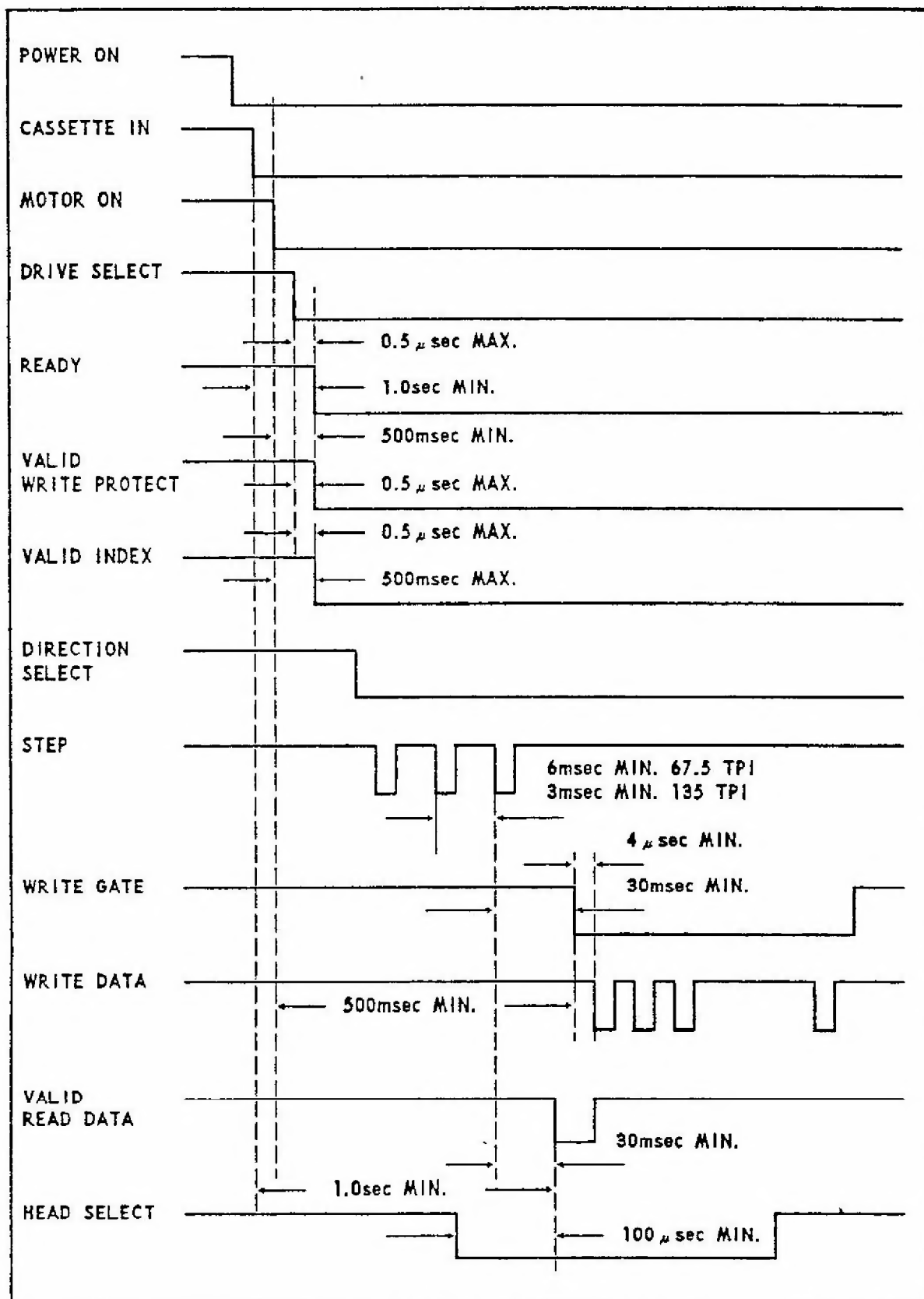


# (10) DISK CHANGE AND DISK CHANGE RESET TIMING



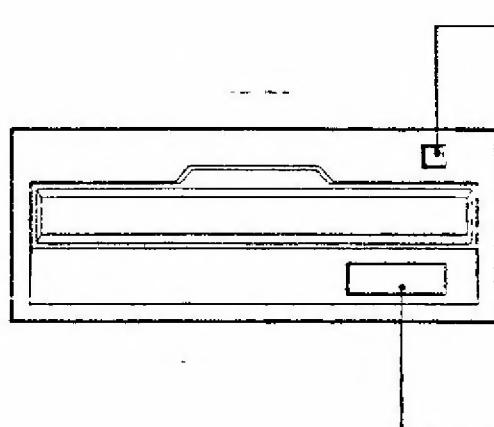
# (11) INTERFACE TIMING

The timing relationship for host/drive interface signal.



## 4. PART NAMES AND OPERATION

### 1) FRONT PANEL



#### IN USE INDICATOR

The In use Indicator indicates that a disk is in the unit and head is loaded.

#### EJECT BUTTON

The eject button is used to remove a disk cartridge from the unit. Depression of the eject button causes the disk cartridge in the unit to be ejected.

### 2) OPERATION

#### 1. DISK CARTRIDGE EJECT MECHANISM

SANYO's fail-safe eject mechanism prevents damage to disk or drive by ejecting the Micro Floppy Disk in the event it is improperly inserted.

#### 2. DISK CARTRIDGE INSERTION

Do not apply any force to a disk cartridge. With metal center hub downwards, insert the disk, shutter edge first, into the disk drive. When the Motor on signal is logical "0", the disk cartridge is in the drive, the motor will rotate; motor rotation stops only when disk cartridge is removed from the drive. The Micro Floppy Disk drive is now ready for operation. Operation of Micro Floppy Disk does not require any extra handling (such as removal and reinsertion).

#### 3. DISK CARTRIDGE REMOVAL

Depress eject button to remove disk cartridge. Do not depress eject button if In use Indicator is illuminated.

### \*\*\* DISK PRECAUTIONS \*\*\*\*

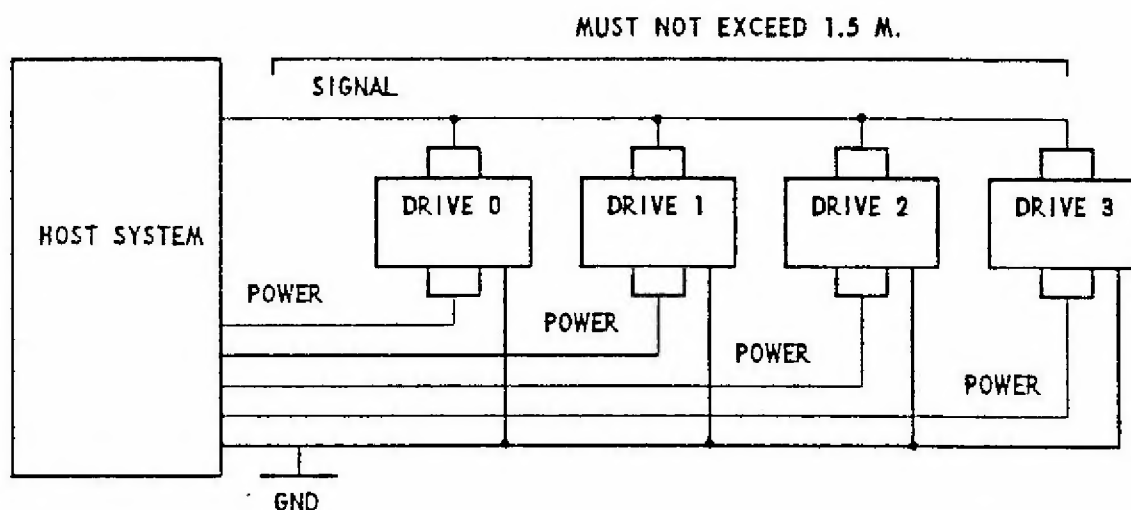
The following precautions will assure full disk life and maximum data integrity;

- 1) When handling disk, do not touch exposed disk surface itself.
- 2) Keep disks away from magnetic materials.
- 3) Do not expose disks to excessive heat or direct sunlight.
- 4) Never attempt to clean disk surface.

This may result in damage to disk or drive head.

## 5. ELECTRICAL CONNECTORS

### 1) CONNECTORS



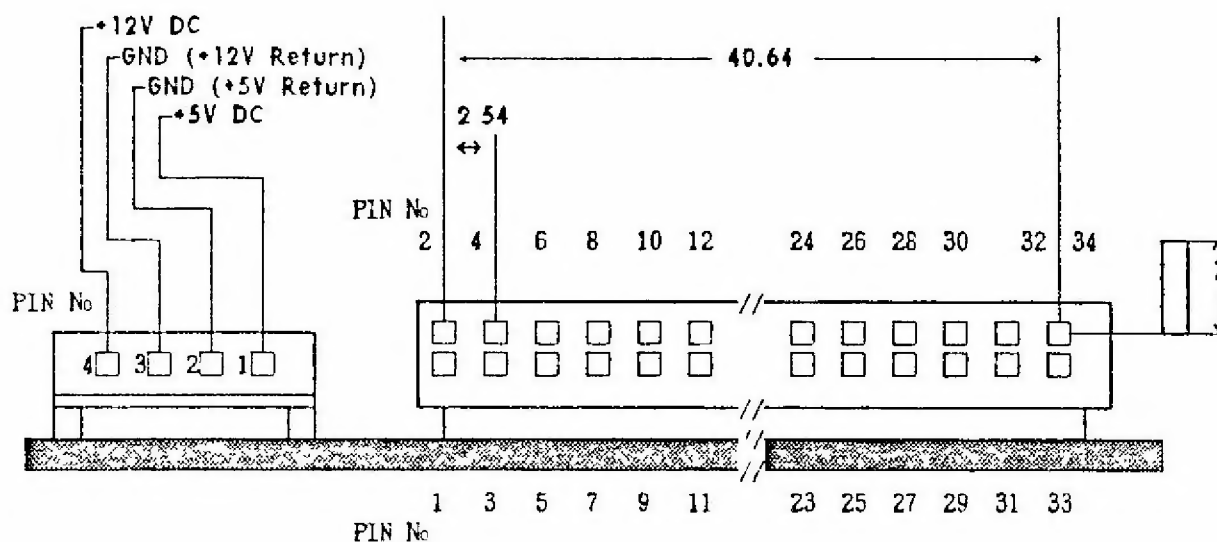
(PHYSICAL INTERCONNECTION FOR DAISY CHAIN APPLICATION)

### 2) CABLE AND CONNECTOR

|            | Cable                            |                | Cable-side connector                            | Drive-side connector  |
|------------|----------------------------------|----------------|---|-----------------------|
| cable name | type                             | length         | Producer and part No.                           | Producer and part No. |
| signal     | Flat cable<br>AWG #28 or above   | 1.5 m<br>(max) |   | JAE PS-34PE-D4LT1-PN1 |
|            | Twisted pair<br>AWG #28 or above |                | JAE PS-34SEN-D4P1-1C                            |                       |
| DC power   | AWG #20 or above                 |                | AMP<br>Housing : 171822-4<br>Contact : 108-5118 | AMP 171826-4          |
| Ground     | AWG #16 or above                 |                | AMP 61697-1                                     | AMP 170001-3          |

### 3) PIN ASSIGNMENTS

※ Rear view of drive



(DC POWER CONNECTOR)

(SIGNAL CONNECTOR)

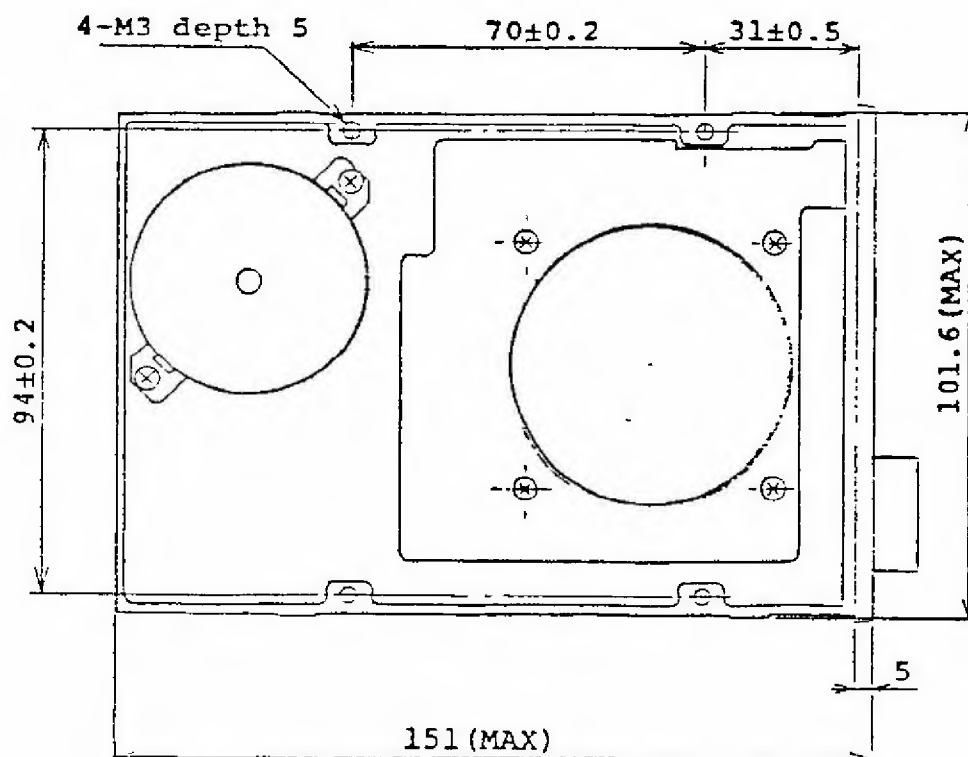
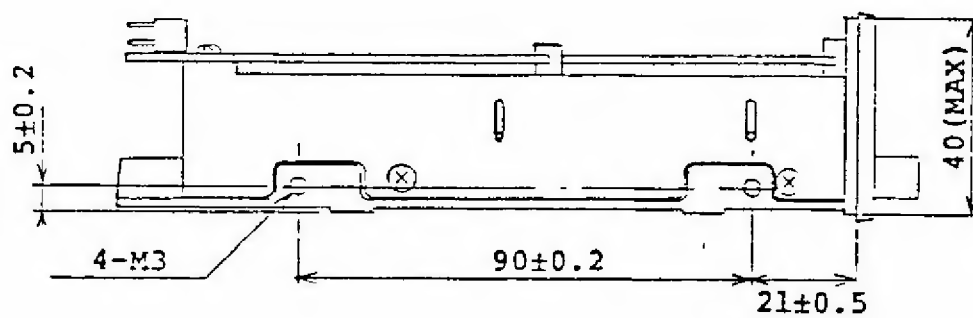
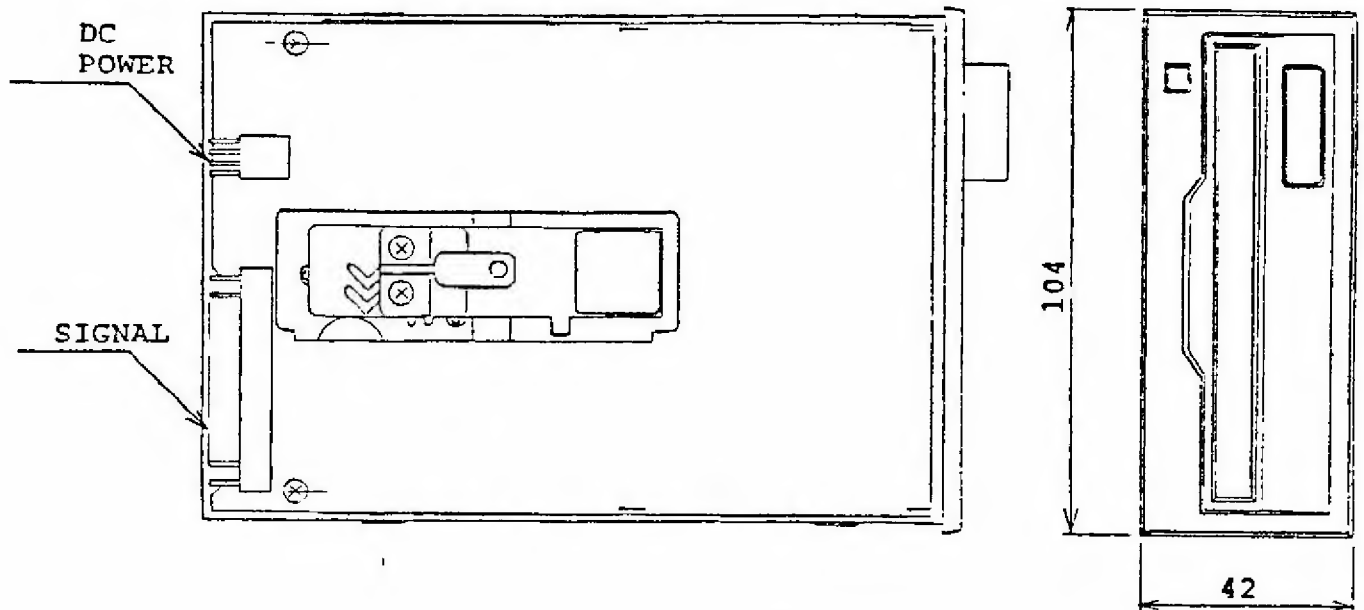
SIGNAL CONNECTOR

| Pin No | Description       | Pin No. | Description      |
|--------|-------------------|---------|------------------|
| 1      | Disk Change Reset | 2       | Disk Change      |
| 3      | E                 | 4       | In Use           |
| 5      | E                 | 6       | Drive Select 3   |
| 7      | E                 | 8       | Index            |
| 9      | E                 | 10      | Drive Select 0   |
| 11     | E                 | 12      | Drive Select 1   |
| 13     | E                 | 14      | Drive Select 2   |
| 15     | E                 | 16      | Motor ON         |
| 17     | E                 | 18      | Direction Select |
| 19     | E                 | 20      | Step             |
| 21     | E                 | 22      | Write Data       |
| 23     | E                 | 24      | Write Gate       |
| 25     | E                 | 26      | Track 00         |
| 27     | E                 | 28      | Write Protect    |
| 29     | E                 | 30      | Read Data        |
| 31     | E                 | 32      | Side Select      |
| 33     | E                 | 34      | Ready            |



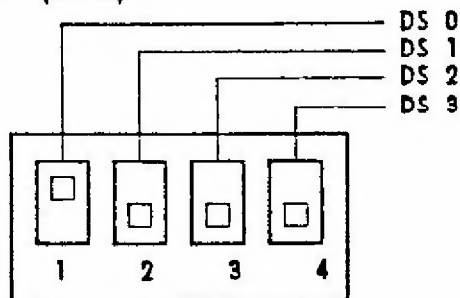
# 7.DIMENSIONAL DATA

(unit:mm)



## 6. SELECTION OF SHORT PLUG

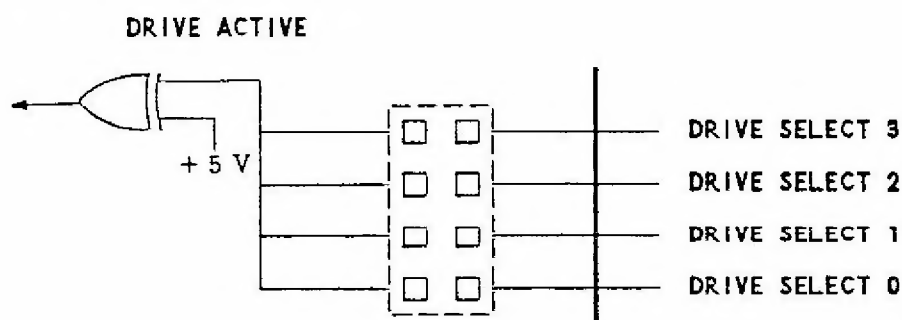
### 1) SHORT PRUG (SW 1)



### 2) FUNCTION OF SHORT PRUG

| SHORT PLUG |          | FUNCTION  |
|------------|----------|---|
| SETTING    | OPEN     |   |
| DS 0       | DS 1,2,3 | Logical zero on DRIVE SELECT 0 line selects the designated drive for operation. |
| DS 1       | DS 0,2,3 | Logical zero on DRIVE SELECT 1 line selects the designated drive for operation. |
| DS 2       | DS 0,1,3 | Logical zero on DRIVE SELECT 2 line selects the designated drive for operation. |
| DS 3       | DS 0,1,2 | Logical zero on DRIVE SELECT 3 line selects the designated drive for operation. |

### 3) SHORT PLUG CONNECTION



Note : Drive select short plug, located on the printed circuit board, is used to designated drive in a daisy chain application.

The micro floppy disk drive is shipped from the factory designated as drive "0".

RE: AX-KB

SPARE PARTS

- 1. L5: 470uH..... 100pcs.
- 2. L6: 470uH
- 3.R57: 1.8Kohm .. 70 "
- 4. L3: 100uH .... 70 "
- 5.C28: 820pF .... 70 "
- 6. PC Board ..... 1pce.

MODEL AX-KB

HOW TO CHANGE THE PARTS ON PCB:

|         | <u>OLD</u>       |   | <u>NEW</u>       |
|---------|------------------|---|------------------|
| L 5 ,   | 6 8 0 $\mu$ H    | → | 4 7 0 $\mu$ H    |
| L 6 ;   | 6 8 0 $\mu$ H    | → | 4 7 0 $\mu$ H    |
| R 5 7 ; | 2 . 2 K $\Omega$ | → | 1 . 8 K $\Omega$ |
| L 3 ;   | 4 7 $\mu$ H      | → | 1 0 0 $\mu$ H    |
| C 2 8 ; | 3 3 0 p F        | → | 8 2 0 p F        |
| C ;     | 3 3 p F          | → | D E L E T E      |