Panasonic

OEM Manual

3-inch
Compact Floppy Disk Drive

EME- 150 / 250   CF

MARCH   1984

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1. General

EME-150 (Single-sided) and EME-250 (Double-sided) are the compact floppy disk drives which drive 3-inch compact floppy disk (80mm wide, 100mm long and 5mm thick) as a new standard system in this field.

The size of these disk drives is 90mm wide, 150mm deep and 35 mm high, and it can be easily rested on your palm. Despite the compact size, EME-150 and EME-250 provide the capacity of 250K and 500K bytes equivalent to 5.25-inch floppy disk drives.

<Features>

Compatible with 5.25 inch disk drives.

Your controller can be used with the compact floppy disk drive as it is because the recording method, data transfer rate and disk rotation speed are the same as those of 5.25-inch floopy disk drives.

Low Power Consumption.

Low Profile and Light in Weight

One-touch loading/ejecting mechanism

A pocket-size compact floppy disk with a hard case and automatic head window shutters.

A one-touch loading mechanism is adopted for loading/ejecting a floppy disk into/from the drive.

Easy to use

1) The media is protected by a rigid hard shell giving increased durability and providing the facility for labelling with a ball point pen.

2) A head window shutter provides protection of the disk surface and is automatically opened and closed when the disk is inserted or withdrawn from the drive.

3) A simple one touch "write protect" mechanism prevents accidental writing on pre-recorded disks.

4) Up to two drives can be connected in daisy chain.

5) An IN USE display lamp is fitted and is controlled by DRIVE SELECT signal.

Long-life and reliable disk

The plastic center hub of the disk increases the reliability and life of the disk.

This feature combined with the internal cleaning liner within the case ensures consistent rotation and perfect alignment with heads.

2. Specification Summary

2.1 Performance

2.1.1 Performance Specifications of EME-150 (Single head)

Encoding Method	FM			MFM		
Recording Capacity (Unformatted)	Single Density			Double Density		
Single side	125K Byte			250K Byte		
Double side	---			---		
Per track	3125 Byte			6250 Byte		
(Formatted)						
Byte/Sector(Byte)	128	256	512	256	512	1024
Sector/Track	16	9	5	16	9	5
Single side(Byte)	82K	92K	102K	164K	184K	204K
Double side(Byte)	164K	184K	205K	328K	369K	410K
Per track(Byte)	2048	2304	2560	4096	4608	5120
Transfer rate	125K bits/sec.			250K bits/sec.		
Latency (average)	100msec.					
Access time						
Track to track	12msec.					
Average	171msec.					
Settling time	15msec.					
Motor start	1.0sec. max.					
Index	1					
Rotational Speed	300rpm					
Max. recording density	4473bpi			8946bpi		
Track density	100tpi					
Number of tracks	40					
Mechanical dimensions						
Height	35mm(1.4")					
Width	90mm(3.5")					
Depth	150mm(5.9")					
Weight	460g					

Table 1-1.

2.1.2 Performance Specifications of EME-250 (Double head)

Encoding Method	FM			MFM		
Recording Capacity (Unformatted)	Single Density			Double Density		
Single side	---			---		
Double side	250K Byte			500K Byte		
Per track	3125 Byte			6250 Byte		
(Formatted)						
Byte/Sector(Byte)	128	256	512	256	512	1024
Sector/Track	16	9	5	16	9	5
Single side(Byte)	82K	92K	102K	164K	184K	204K
Double side(Byte)	164K	184K	205K	328K	369K	410K
Per track(Byte)	2048	2304	2560	4096	4608	5120
Transfer rate	125K bits/sec.			250K bits/sec.		
Latency (average)	100msec.					
Access time						
Track to track	12 msec.					
Average	171 msec.					
Settling time	15 msec.					
Motor start	1.0sec. max.					
Index	1					
Rotational Speed	300rpm					
Max. recording density	4915bpi			9830bpi		
Track density	100tpi					
Number of tracks	80 (40x2)					
Mechanical dimensions						
Height	35 mm (1.4")					
Width	90mm (3.5")					
Depth	150mm (5.9")					
Weight	460 g					

Table 1-2.

2.1.3 Power Requirements

DC Power Supply	Voltage Deviation	Current Consumption	Ripple
+ 5V +12V	± 5% ± 5%	Typ. 0.22 A 0.30 A	50mVp-p Max. 100mVp-p Max.
Power Consumption	2.5W TYP.	<u>Mode</u> . Drive selected . Spindle motor ON . TR00 STOP	

Table 2.

<u>Mode</u>   <u>Power Consumption</u>

1. Drive selected

    Spindle motor OFF   1 2 V   0.06A   TYP.

    TR00 STOP   5 V   0.22A   TYP.

2. Drive selected

    Spindle motor ON   1 2 V   0.12A   TYP.

    TR00 STOP   5 V   0.22A   TYP.

3. Drive selected

    Spindle motor ON   1 2 V   0.30A   TYP.

    TR00 ↔ TR39 Serial seeks 5 V   0.15A   TYP.

    (Step Rate msec.)

2.1.4 Environmental Requirements

Operational

The following shall be applied to the drive in operation as described in Table 3.

Temperature Range: 5°C to 46°C
Humidity Range   : 20% to 80% RH without condensation
Maximum Wet Bulb : 29°C

Table 3. Operational Environments

Non-Operational

In non-operation situation such as during shipping or storage, the following requirements shall be applied to the drive as described in Table 4.

Temperature Range: -25°C to 60°C
Humidity Range   : 5% to 95% RH without condensation
Maximum Wet Bulb : 29°C max. (No condensation)

Table 4. Non-Operational Environments

2.2 Reliability

Reliability requirements for the 3" floppy disk drive shall be as follows:

MTBF	8000 POH *
MTTR	30 minutes
Drive life	5 years
Media life (Rotating)	3×10^6 (Passes per Track)
Insertion	10,000
Error Rates	
Soft Error Rate	1 per 10^9 bits
Hard Error Rate	1 per 10^{12} bits
Seek Error Rate	1 per 10^6 seeks.

Table 5.

* Typical operating time of the spindle motor is 25% of POH.

3. Electrical Interface

3.1 Signal Interface Allocation

The assignment of interface signals shall be as shown in Figure 1. The function of each line, signal levels and connectors required are indicated in the following sections.

Controller

Flat cable or twisted pair wire
EME-150 and EME-250 of 0.75m
long max.

Drive

INDEX — 2

DRIVE SELECT 0 → 4

DRIVE SELECT 1 → 6

MOTOR ON → 8

DIRECTION SELECT → 10   J1

STEP → 12

WRITE DATA → 14

WRITE GATE → 16

TRACK 00 ← 18

WRITE PROTECT ← 20

READ DATA ← 22

SIDE 1 SELECT (EME-250 ONLY) ※ → 24

NOT USED 26

SIGNAL RETURN
1, 3, 5, ... 25

DC GND

+12V DC → 1

+12V RETURN 2

+5V DC → 4   J2

+5V RETURN 3

DC GND

AC GND

FRAME
GND
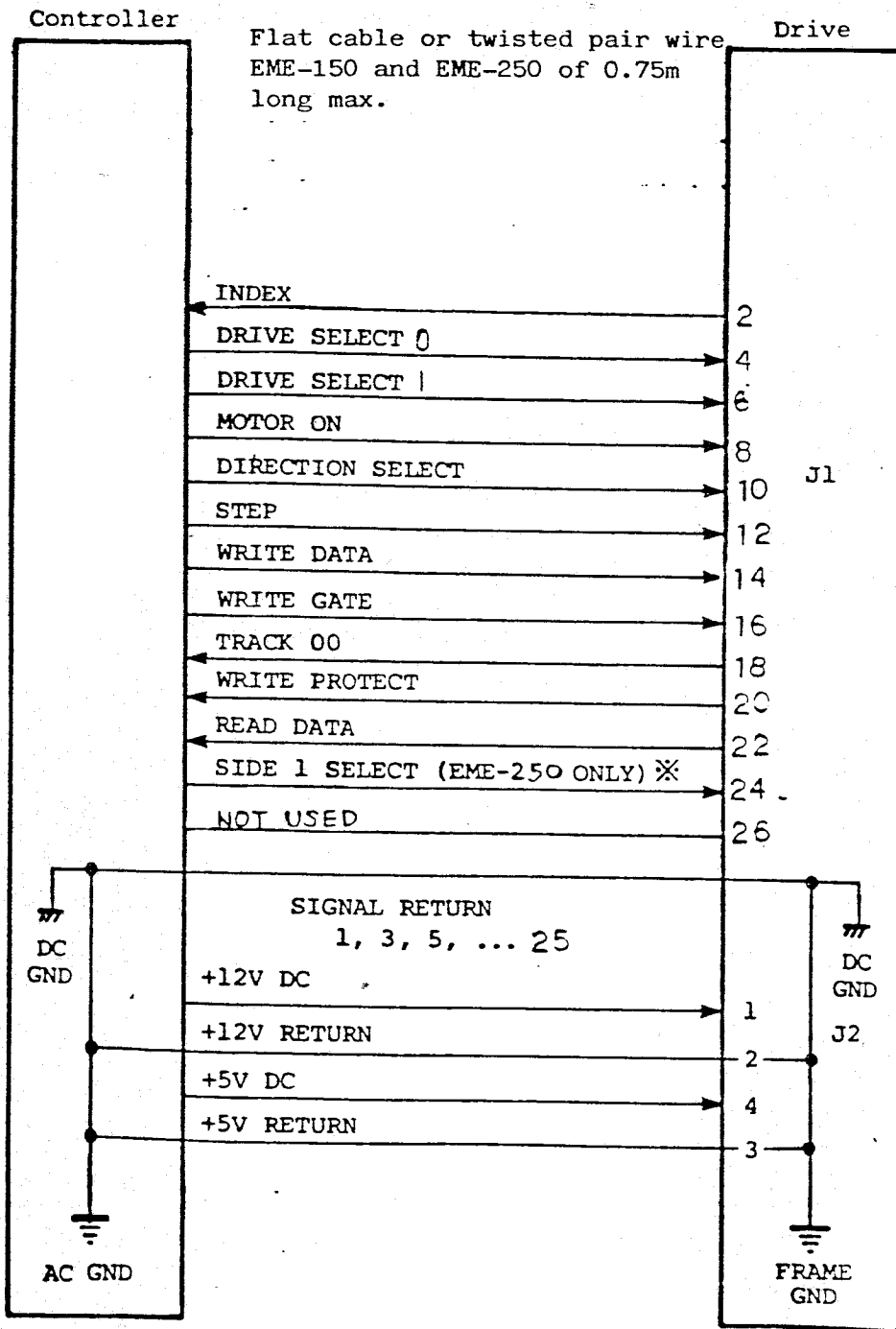
※ On SIDE 1 SELECT, EME-150 will be NO USE.

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3.1.1 Input Signals

EME-150 and EME-250 shall require the following input signals which are active at "LOW" level:

(1) DRIVE SELECT 0 to 1

(2) MOTOR ON

(3) DIRECTION SELECT

(4) STEP

(5) WRITE GATE

(6) WRITE DATA

(8) SIDE 1 SELECT

These signals have the following electrical specifications.

LOW level	ACTIVE	0V to 0.4V
HIGH level	NO ACTIVE	2.5V to 5.25V
Input impedance		1KΩ to pull up to 5V

Table 6. Input Signal Voltage Level

(1) DRIVE SELECT 0 to 1

Up to two drives can be connected in daisy chain by setting the switch   on the printed circuit board.The switch   DS 0 to 1 correspond to DRIVE SELECT 0 to .
For example, the drive which short-circuits DS1 can send/receive a data signal only with DRIVE SELECT 1="LOW".

(2) MOTOR ON

The disk drive motor can be activated when this signal is at "LOW" level.
1.0 second is required from the activation until read/write operation.

(3) DIRECTION SELECT

The signal can determine the moving direction of the head when the step pulse is input. The head moves as follows when the step pulse is input:

HIGH level	OUT direction (away from the center of the disk)
LOW level	IN direction (toward the center of the disk)

Table 7. Step Direction Select Signal

The direction selection shall be made at least 1μs (min.) before the trailing edge of the step pulse, and held for 1μs (min.) from the trailing edge of the step pulse.
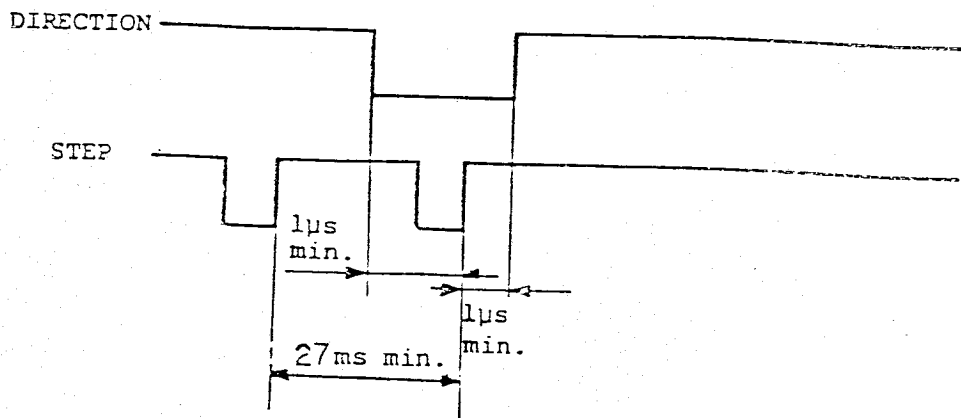
Figure 2. Step Direction Select Signal Timing

(4) STEP

This signal shall shift the head by one track by
one pulse in the direction specified by the DIREC-
TION SELECT signal when the drive is selected.
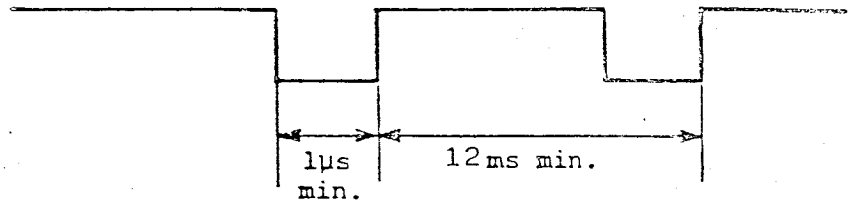The pulse interval must be 12 ms or more.

```
STEP  ‾‾‾‾‾‾‾‾‾‾|___|‾‾‾‾‾‾‾‾‾|_|‾‾‾‾‾‾‾‾‾‾

                |←→|←————————→|
                 1µs   12 ms min.
                 min.
```

Figure 3. Step Signal

(5) WRITE GATE

Setting this signal at "LOW" level, the drive
shall write data on the disk with WRITE PROTECT
"OFF" and INDEX period at 200ms+/-2.5%. While the
signal is "LOW", the step signal shall not be acc-
epted. Keep the DRIVE SELECT and MOTOR ON signals
active because the erase head operates for 1.3ms
(EME-250) or 1.7ms (EME-150) from the trailing
edge of the WRITE GATE.

(6) WRITE DATA

This enables the head to write data on the disk.
Each transition from "HIGH" to "LOW" causes the
current through the READ/WRITE head to be reversed
thereby writing a data bit. This writing can be
performed with the WRITE GATE and INDEX period at
200ms+/-2.5%, and the WRITE PROTECT of CFD cartrige
"OFF", and DRIVE SELECT "ON".
Refer to Figure 6. for timing.

(7) SIDE 1 SELECT (EME-250)

At "HIGH" level this signal selects SIDE 0 and at "LOW" level SIDE 1.

3.1.2 Output Signals

EME-150 and EME-250 shall have the following output signals which are active at "LOW" level:

(1) TRACK 00
(2) INDEX
(3) WRITE PROTECT
(4) READ DATA

These signals have the following power requirements.

LOW level	ACTIVE	0 to 0.4V (-10 mA)
HIGH level	NO ACTIVE	2.5V to 5.25V (+250 μA)
		Open collector output

Table 8. Output Signal Voltage Level

All the output signals are at "HIGH" level when the drive is not selected.

(1) TRACK 00

This signal at "LOW" level indicates that the READ/WRITE head is on the track 00.

(2) INDEX

This is produced each time the index hole is detected by the sensor.
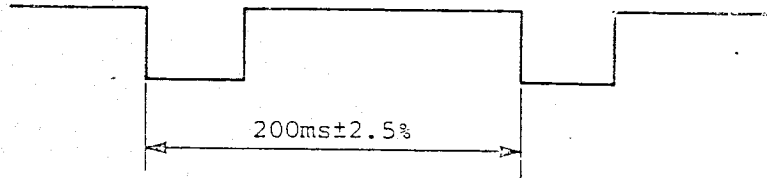

Figure 4.   Index Signal

Detection of the INDEX signal shall be made with the leading edge, not with the level.
The signal is at "LOW" level when no CFD cartridge is in the drive.

(3) WRITE PROTECT

This indicates that the write protection of the loaded surface is set.

(4) READ DATA

This provides the "RAW READ" comprising of clock and data bit pulses read by the drive circuit.
The signal is output at every detection of data on the disk.

3.1.3   Drive/Receive Circuits

This drive shall use LSTTL(74LS14)equivalent as an
input line receiver and TTL 7438 or equivalent as an
output driver.
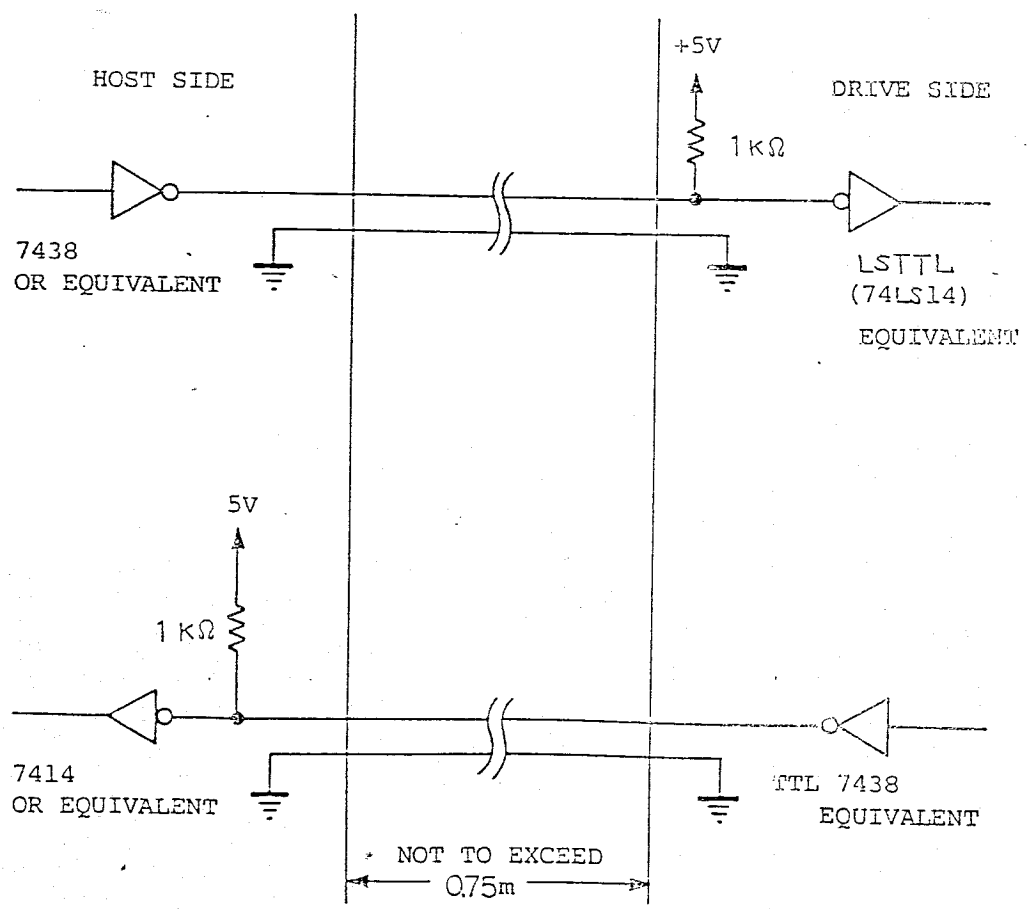
Figure 5 indicates the recommended interface circuits.
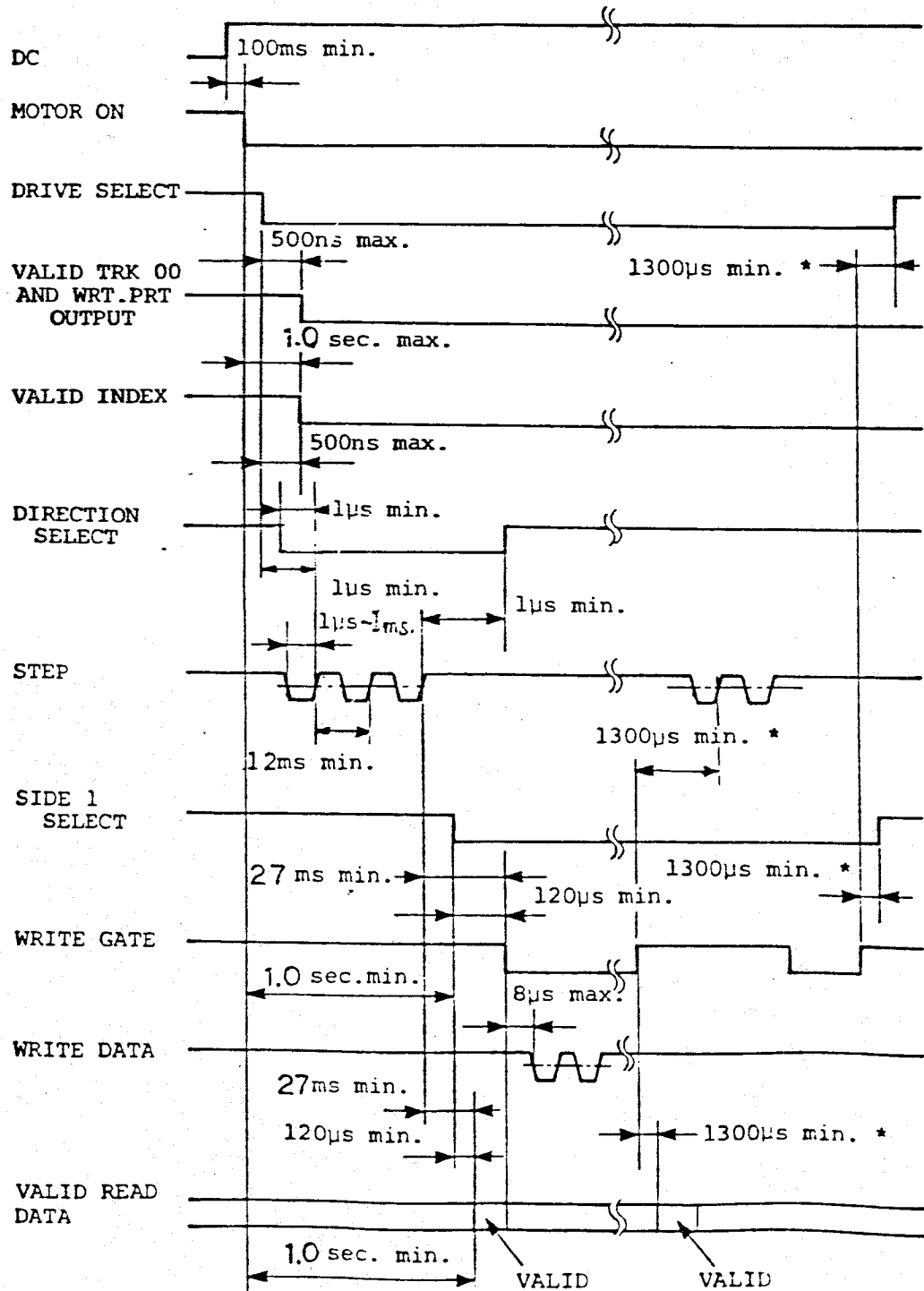

Figure 5.

3.1.4. Timing

DC

100ms min.

MOTOR ON

DRIVE SELECT

500ns max.

VALID TRK 00
AND WRT.PRT
OUTPUT

1300µs min. *

1.0 sec. max.

VALID INDEX

500ns max.

DIRECTION
SELECT

1µs min.

1µs min.

1µs min.

1µs~1ms.

STEP

1300µs min. *

12ms min.

SIDE 1
SELECT

27 ms min.

1300µs min. *

120µs min.

WRITE GATE

1.0 sec.min.

8µs max.

WRITE DATA

27ms min.

120µs min.

1300µs min. *

VALID READ
DATA

1.0 sec. min.

VALID   VALID

* in case of EME-150 change to 1700µs min.

Figure 6.

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3.2 Power Interface

The drive requires both DC 5V and DC 12V for its operation. Supply each power to P2/J2 connector. The specifications of supply voltages and the pin arrangement of connector are as follows:

J2 Pin No.	Voltage	Tolerance	Ripple
1	DC +12V		
2	+12V RETURN	±5%	100mVp-p
3	+ 5V RETURN		
4	DC +5V	±5%	50mVp-p

Table 9.
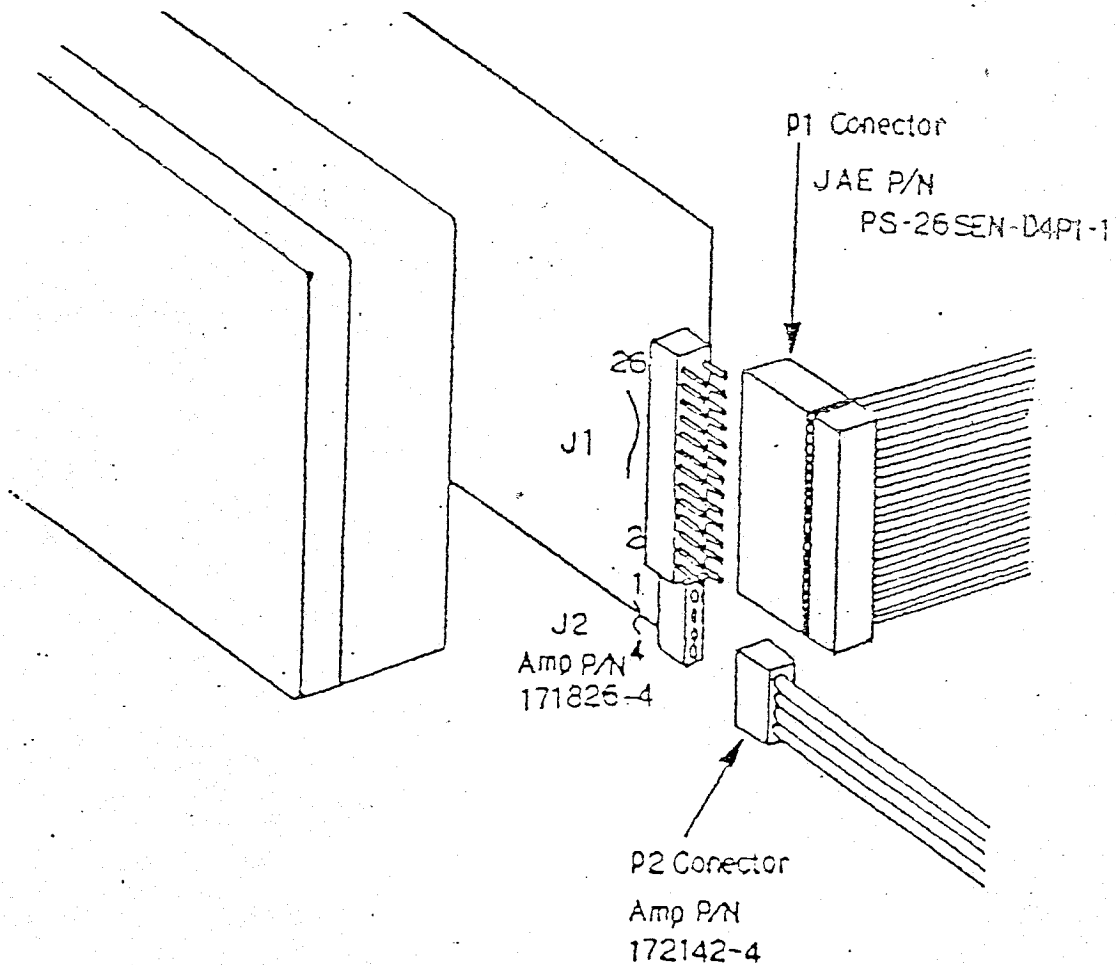
Figure 7.   Interface Connectors-Mechanical
Location Diagram

4. Mechanical Interface

The electrical interface between the drive and the host system is via a couple of connectors. J1 provides the signal interface and J2 the power.

Figure 7 shows the connector position.

4.1 J1/P1 Connector

The connection to J1 connector is through a 26-pin connector. The pc board side has even numbers and the opposite side odd numbers.

The recommended P1 connectors are shown below.

Manufacturer	Connector P/N
JAE	PS-26SEN-D4P1-1
HIROSE	HIF3-26D-254R

4.2 J2/P2 Connector

J2 connector uses a 4-pin AMP P/N 171826-4.

The recommended P2 connectors are shown below.

Manufacturer	Connector P/N	Contact P/N
AMP	172142-4	170355-1

Table 11. Recommended P2 Connector

5. Mounting and Drive Dimensions

Mounting Recommendations

See Figure   .
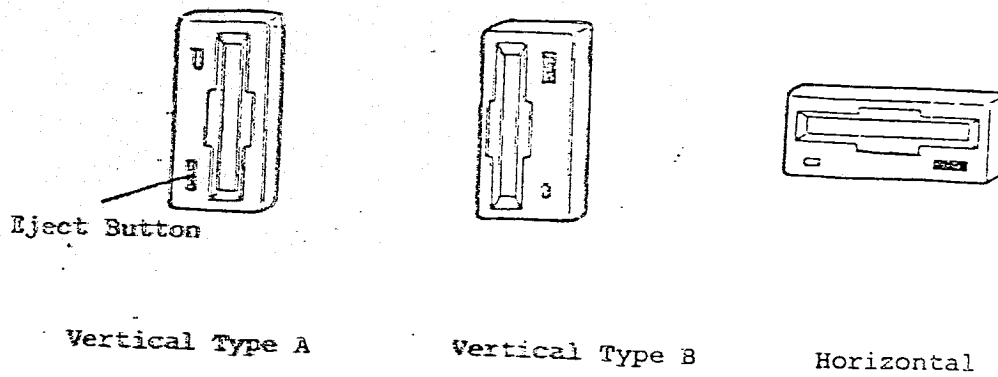
Eject Button

Vertical Type A   Vertical Type B   Horizontal
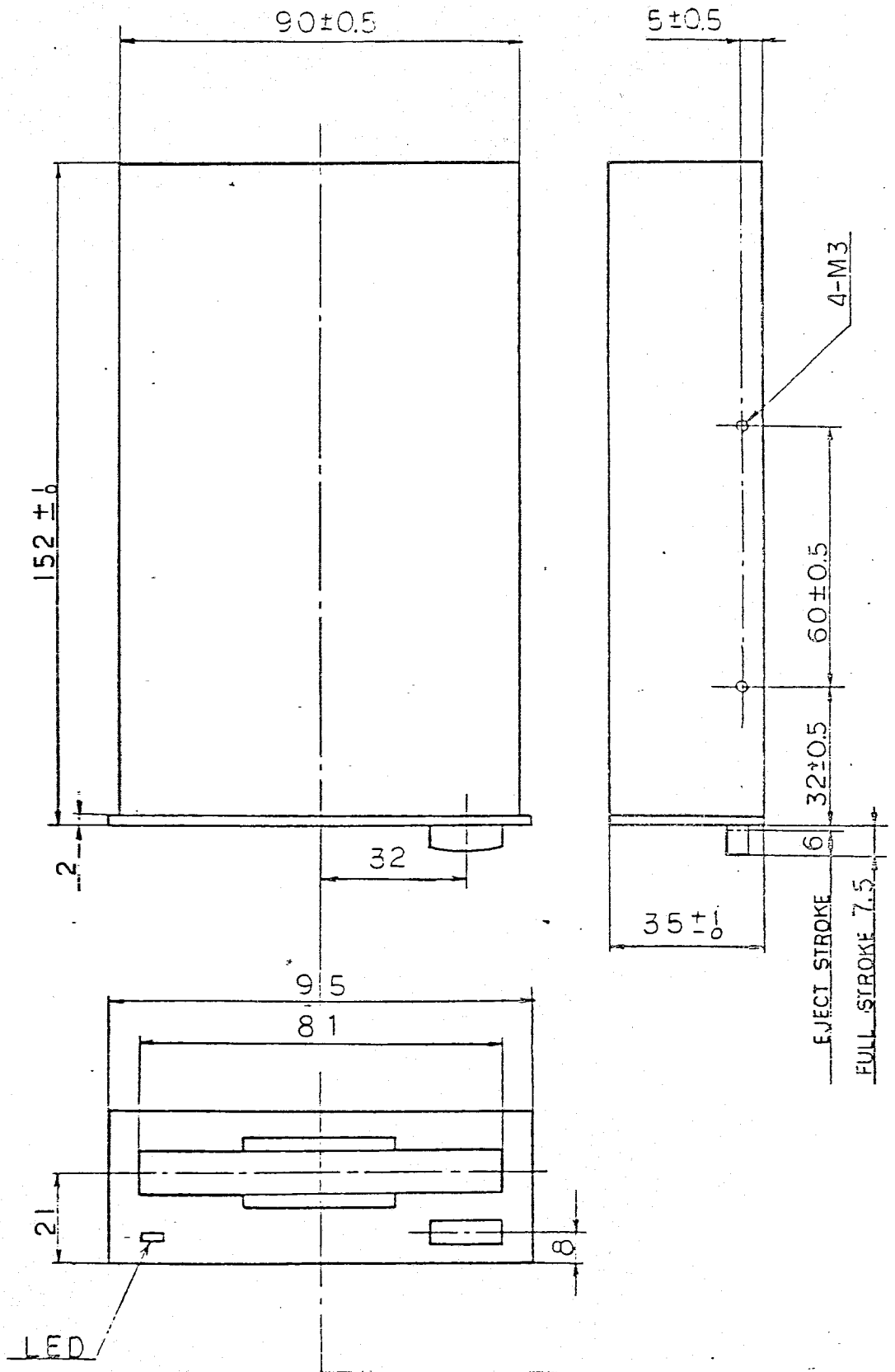
Figure 8 . Installation Direction

Figure 9.   Outside Dimensions

5. Precautions for Installation

5.1 Set the rise time of the +5V power supply to 300 ms or less for the rising rates between 10 and 90%.

5.2 In installation, keep the drive as far away as possible from noise sources such as switching regulator, CRT monitor and others or take a shielding measure for them against noise.

5.3 When using a flat cable for the wiring material, observe the following rules:

   In case of the daisy chain connection,
   Total wire length ≤ 0.75m

   Characteristic impedance: 90 to 110Ω

5.4 When you install two drives close together or install drive(s) in a sealed enclosure, installation of heat radiation holes is recommended to avoid excessive temperature increase mainly due to heat generation of the spindle motor.

5.5 When mounting on the framework, make sure that the framework contact with the drive chassis only at the area of the mounting holes, and that the movable part of the drive mechanism is free from the framework.

5.6 In installation, insulate between drive chassis and framework from view point of error rate and noise characteristics.