

# Application Manual

Flexible Disk Storage Drive

**JU-455-5-**

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**Panasonic**

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# SECTION I INTRODUCTION

## 1.1 GENERAL DESCRIPTION

The JU-455-5 is a 5.25 inch half height double-sided, double density minifloppy diskette drive designed for applications which require the combined benefits of compact size, high performance and low power consumption.

The JU-455-5 offers the same basic performance as its predecessors in the JU-455 series. Significant improvements in the reliability and efficiency have been made by integrating the circuits and reducing the number of individual components.

The JU-455-5 contains a band actuator, a DC direct drive spindle motor, bicompliant read/write heads, a track zero detector, a write protect switch, an index detector, read/write electronics and motor speed control electronics.

Typical application for the JU-455 are: word processing systems, entry level micro processor systems, intelligent calculators, storage oscilloscope analyzers, musical synthesizers requiring large memory backup, certifier applications, disk duplicator systems, computer systems and other applications where low cost random access data storage is required.

### Key Features:

- Compact size
- 0.5 Mbyte storage capacity (unformatted)
- 4 ms track to track access time
- Brushless DC direct drive motor
- Low power consumption
- 10,000 hours MTBF
- 125/250 Kbits transfer rate

## 1.2 SPECIFICATION SUMMARY

### 1.2.1 Performance Specifications

Capacity (in bytes)	Single Density (FM)	Double Density (MFM)
Unformatted		
Per Disk	250,000	500,000
Per Surface	125,000	250,000
Per Track	3,125	6,250
Formatted (16 Records/Track)		
Per Disk	163,840	327,680
Per Track	2,048	4,096
Per Sector	128	256
Formatted (10 Records/Track)		
Per Disk	204,800	409,600
Per Track	2,560	5,120
Per Sector	256	512
Transfer Rate	125 kbits/sec	250 kbits/sec
Latency (avg.)	100 msec	100 msec
Access Time		
Track to Track	4 msec	4 msec
Average	53 msec	53 msec
Seattling Time	15 msec	15 msec
Motor Start Time	500 msec	500 msec

### 1.2.2 Functional Specifications

	Single Density	Double Density
Rotational Speed	300 R.P.M.	300 R.P.M..
Recording Density (Track 39, side 1)	2,938 B.P.I.	5,876 B.P.I.
Flux Density (Track 39, side 1)	5,876 F.C.I.	5,876 F.C.I.
Track Density	48 T.P.I.	48 T.P.I.
Cylinders	40	40
Tracks	80	80
Read/Write Heads	2	2
Encoding Method	F.M.	M.F.M
Media Requirements	Double sided/ Double Density/ ANSI SPEC.	

### 1.2.3. Reliability Specifications

M.T.B.F.	10,000 P.O.H.
M.T.T.R.	30 minutes
Component life	15,000 P.O.H. or 5 years
Error Rates	
Soft Error Rate	1 per 10 <sup>9</sup> bits read
Hard Error Rate	1 per 10 <sup>12</sup> bits read
Seek Error	1 per 10 <sup>6</sup> seeks
Media Life	
Number of Passes per Track	3.5 × 10 <sup>6</sup>
Number of Media Clamp	3.0 × 10 <sup>4</sup>

### 1.2.4 Physical Specifications

	Storage	Operating
Environmental Limits		
Ambient Temperature	-8 to 117°F	50 to 115°F
Relative Humidity	1 to 95% RH	20 to 80% RH
Max. Wet Bulb Temp. (Non-Condensing)	85°F	85°F
Vibration	≅ 3 G (5-55 Hz)	≅ 0.5G (5-55 Hz)
Shock 10 mSec	≅ 40 G	≅ 0.5G
Power Supply		
+ 12 V DC:	Voltage Max. Ripple Current	+/- 10 % 100mV p-p 0.9A (Max.) / 0.25 A (typ)
+ 5 V DC:	Voltage Max. Ripple Current	+/- 5% 50 mV p-p 0.6A (Max.) / 0.4 A (typ)
Power Dissipation		
Continuous	5.0 Watts (typical)	
Standby*	1.95 Watts (typical)	

\*Standby: Drive motor off, drive select off, and stepper at reduced current.

Mechanical dimension: (excluding front plate)

Width = 5.75 Inches (146.1 mm)

Height = 1.63 Inches ( 41.5 mm)

Depth = 8.00 Inches (203.2 mm)

Mechanical Dimension: (including front plate)

Width = 5.87 Inches (149.0 mm)

Height = 1.63 Inches ( 41.5 mm)

Depth = 8.15 Inches (207.0 mm)

Weight = 2.87 pounds ( 1.3kg )

### **1.3 FUNCTIONAL CHARACTERISTICS**

The JU-455-5 Consists of read/write and control electronics, drive mechanism, read/write heads, and precision track position mechanism. These components perform the following functions:

- a. Interpret and generate control signals.
- b. Move read/write heads to the desired track.
- c. Read and write data.

The interface signals and their relationship to the internal functions are shown in figure 1-1.

#### **1.3.1 Read/Write Control Electronics**

The electronics package contains:

- a. Index detector circuits
- b. Head positioning driver circuits
- c. Read/Write amplifier and transition detector
- d. Write Protector detector
- e. Drive select circuit
- f. Drive motor control circuit

#### **1.3.2 Drive Mechanism**

The DC drive motor under servo speed control (using an integral tachometer) rotates the spindle motor at 300 RPM through a direct drive system. A collet/spindle assembly provides precision media positioning to ensure data interchange.

#### **1.3.3 Positioning Mechanics**

The read/write head assembly is accurately positioned through the use of a band positioner which is attached to the head carriage assembly. Precise track location is accomplished as the head carriage is moved by the precise discrete rotation of a stepper motor.

#### **1.3.4 Read/Write Heads**

The proprietary heads are a single element ceramic read/write head with tunnel erase elements to provide erased areas between the data tracks. Thus, normal interchange tolerances between media and drives will not degrade the signal to noise ratio, ensuring diskette interchange.

The heads are mounted on a carriage which is located on precision guide rods. The diskette is held in a plane perpendicular to the read/write heads by a platen located on the base casting. This precise registration assures perfect compliance with the read/write heads. The read/write heads are in direct contact with the diskette. The head surface has been designed to obtain maximum signal transfer to and from the magnetic surface of the diskette with minimal head/diskette wear.

#### **1.3.5 Recording Formats**

The formats of the data written on the diskette are totally a function of the host system. The formats can be designed around the user's application (FM or MFM) to take complete advantage of the total available bits that can be written on any one track.

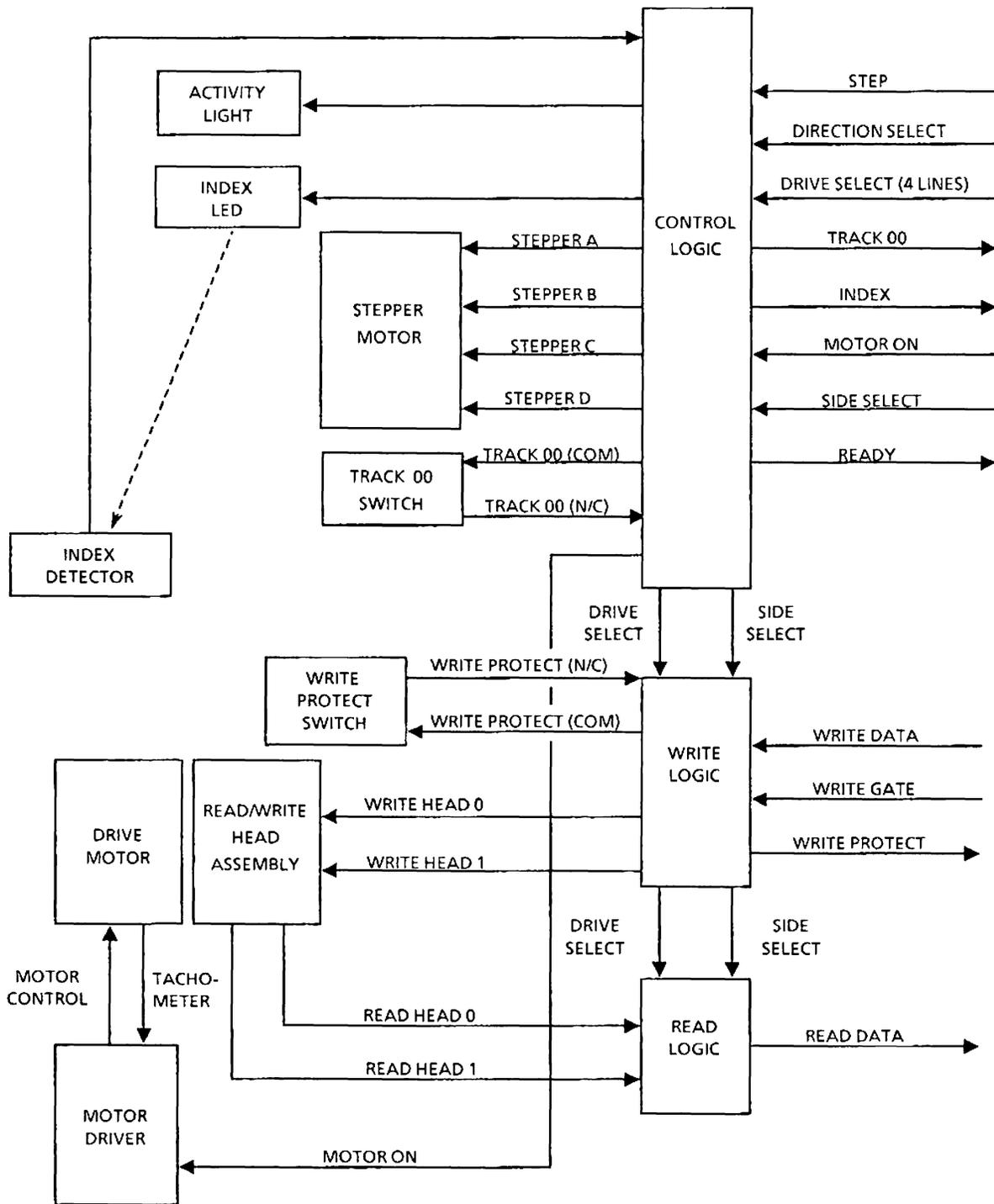


Figure 1-1 FUNCTIONAL DIAGRAM

## SECTION II ELECTRICAL INTERFACE

The following section provides the electrical definition for each line. Figure 2-1 shows all of the interface connections with respect to the host system.

The signal interface consists of the following two categories:

- a. Control Lines
- b. Data Transfer Lines

All lines in the signal interface are digital in nature and either provides signals to the drive (input), or provide signals to the host (output), by way of the interface connector J1.

The DC power connector, J2, provides + 5V DC and + 12V DC power.

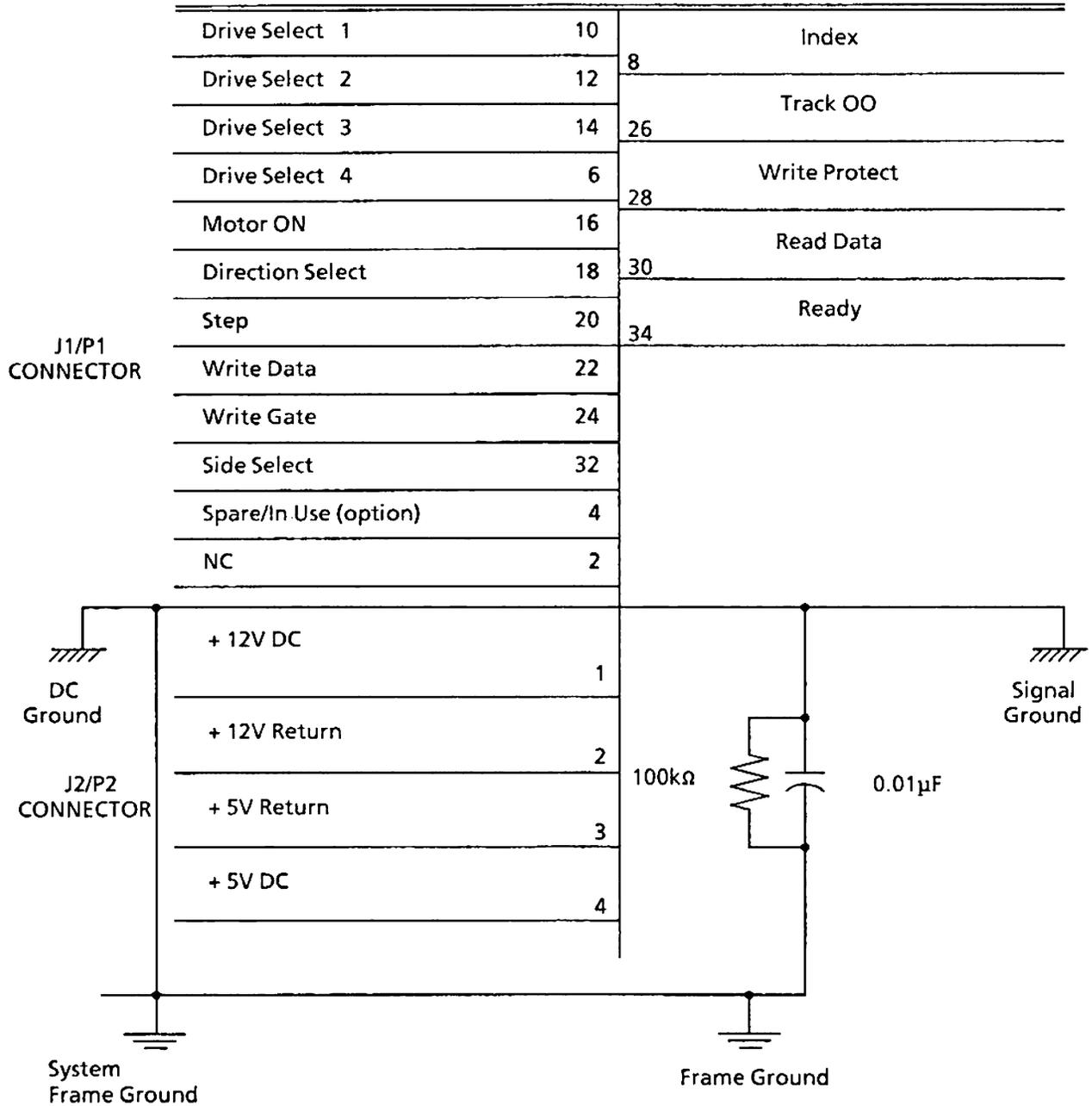


Figure 2-1 INTERFACE CONNECTION

## 2.1 Signal Interface

The JU-455-5 uses the industry standard open collector, low level - true, multiplexed interface convention. The industry standard open-collector, 40 milliamp TTL driver 7438 or equivalent, is used to transmit the I/O signals. The transmitted signals are detected by the hysteresis input inverter, 7414 or equivalent. A 150 ohm pull-up resistor between the signal line and +5 volts is necessary on the receiving PCB. The input of each receiver is terminated through a 150 ohm resistor pack. When using two or more drives on a daisy chain, remove all termination resistor packs except for last drive on daisy chain.

The input signal lines which are not multiplexed are MOTOR ON and IN USE. The input lines have the following electrical specifications. See Figure 2-2 for the recommended circuits.

True = Logical zero =  $V_{in} + 0.0$  to  $+0.4$  Volts

False = Logical one =  $V_{in} + 2.5$  to  $5.25$  Volts

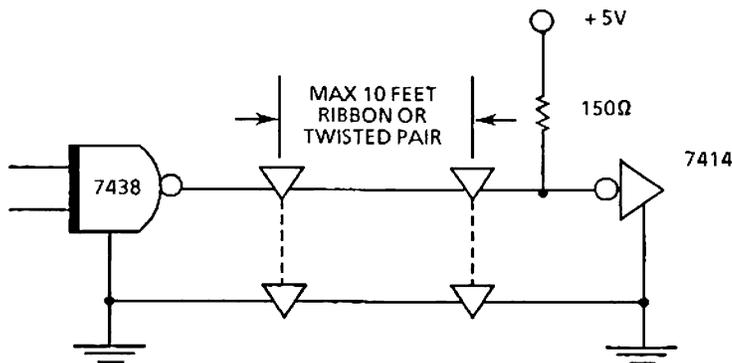


Figure 2-2 INTERFACE SIGNAL DRIVER/RECEIVER

## 2.2 Input Lines

There are twelve active low TTL input lines to the JU-455-5 drive. Individual signal line characteristics are described below.

### 2.2.1 Drive Select 1, 2, 3, or 4 (J1 Pins #10, 12, 14, and 6)

Four separate input lines, drive select 1, drive select 2, drive select 3, and drive select 4 are provided so that in standard configuration (jumper D. S. closed and M. S. open) up to four drives may be multiplexed together in a system and have separate drive select lines. Traces DS1, DS2, DS3, and DS4 have been provided to select which drive select line will activate the interface signals for a unique drive. Drive select, when activated to logical zero level, enable the multiplexed I/O lines.

### 2.2.2 Direction Select (J1 Pin #18)

'Direction select' determines the direction the head-carriage assembly will move when the JU455-5 is properly selected, and when step pulses with the proper timing are sent to the JU-455-5. If 'direction select' is at logic low, the head-carriage assembly will seek toward the center of the diskette, and away from the center when high.

'Direction select' must be stable at its correct logic state for at least 1 microsecond before each occurrence of the trailing edge of the step pulse, as measured at the drive interface connector, J1.

If the drive is not selected or a write operation is in process, 'direction select' is ignored by the JU-455-5.

### 2.2.3 Motor On (J1 Pin #16)

The 'motor on' signal causes the JU-455-5 spindle drive motor to turn on. In standard configuration (jumpers MM closed and MS open), this input signal line when true (logic low), will activate the motor if +5V DC and +12V DC are applied to the drive, whether or not the drive is selected. A minimum delay of 500 milliseconds must be allowed by the host system after activating this line before attempting to read or write, to allow the diskette to attain proper speed.

It is recommended that the spindle drive motor be turned off when the drive has not been selected for 10 revolutions or more. This will extend motor and diskette life and decrease power consumption. Host system workload must be analyzed to determine optimum delay between deselection of the drive and turning off the spindle drive motor.

### 2.2.4 Step (Pin #20)

When the JU-455-5 is properly selected and the trailing edge (a low-to-high transition) of the 'step' signal occurs, the head-carriage assembly will move one track in the direction selected by 'direction select' J1 pin 18.

'Step' and its timing are generated by the host system controller.

First the drive should be selected, then 'direction select' should be set to its correct logic level, then 'step' should be set to a logic low level. A minimum of 1 microsecond later 'step' may make its low-to-high transition (trailing edge of 'step') to initiate head-carriage movement. The minimum allowable time between trailing edges of 'step' is 4 milliseconds. The minimum allowable pulse width for 'step' is 1 microsecond.

Each trailing edge of 'step' is used internal to the drive to latch 'direction select'. Therefore, 'direction select' may be changed immediately after the trailing edge of 'step'.

If the JU-455-5 flexible disk drive is not properly selected or a write operation is in process, the 'step' pulses from the host system will be ignored.

If 'direction select' is a logic low level and the drive is at the inside track, track 39 and a 'step' pulse is issued by the host system, the head-carriage assembly will attempt to move until stopped by the mechanical safety stop installed on the JU-455-5 flexible disk drive.

Driving the head-carriage assembly of the JU-455-5 flexible disk drive into the safety stops is not recommended. The host system controller should know the position of the head-carriage assembly at all times by reading the sector or track ID address field. In the event that the controller should lose track of the head-carriage assembly's location, it is recommended that 'direction select' be set to a logic high level and single 'step' pulses be issued, one at a time, checking after the proper delay each time for the 'track 00' signal to return to a true state (logic low). In standard configuration, with jumper AR shorted, the head-carriage assembly will step out to Track 00 during the power on procedure.

### 2.2.5 Write Data (J1 Pin #22)

This interface line provides the data to be written on the diskette in the appropriate sector. Each transition from a high logic level to a low logic level on this line causes write current to be reversed through the head. If the drive is not properly selected, a write protected diskette is installed, a seek operation is not complete or the drive has no diskette installed, the write data will be ignored.

### 2.2.6 Write Gate (J1 Pin #24)

A low logic level on this line enables the write current source, provided the drive is selected, diskette used is not write protected and seek operation completed. This will allow data to be written from the write data line.

### 2.2.7 Side Select (J1 Pin#32)

When the JU-455-5 has been selected, 'side select' determines which side of the disk is to be activated. A logic low (true or logic zero) selects side 1; a logic high (false or one) selects side 0.

When switching from one side to another, a 100 micro seconds delay is required before a read or write operation can be initiated. If the drive is not selected or a write operation is in process, 'side select' is ignored by the JU-455-5.

### 2.2.8 In Use (J1 Pin #4)

Using IL jumper option, this line can monitor the activity L.E.D. light.

### 2.2.9 (J1 Pin #2) - Not Used. Reserved for optional use.

## 2.3 Output Lines

The JU-455-5 drive has five active signal lines as output. Each output line is driven by a 7438 open collector output gate. Individual signal line characteristics are described below:

### 2.3.1 Index (J1 Pin #8)

'Index' signal is generated once each revolution of the diskette and indicates the beginning of a track. When the 'index' signal is true, the signal is at logic low level. The 'index' signal pulse width is 1.0 to 10.0 milliseconds.

### 2.3.2 Track 00 (J1 Pin #26)

An active low on this signal line indicates that the read/write head is positioned at track zero (the outermost track).

### 2.3.3 Write Protect (J1 Pin #28)

An active low level on this signal line indicates that a write protected diskette has been installed in the standard configuration with jumper WP shorted. Under normal operation, the drive will inhibit writing when a write protected diskette has been installed.

### 2.3.4 Read Data (J1 Pin #30)

Raw data from the diskette is outputted to the host system in the same form as it was received on the write data line. This includes the data and the clock pulse together. Each flux reversal that is sensed on the diskette produces a transition to active low level.

### 2.3.5 Ready (J1 Pin #34)

Ready informs the controller that a diskette is properly inserted and the drive motor is up to speed. 500 mSec is required for starting the motor and an additional 200 mSec is required for one revolution at the rated speed. Ready is active low, and is available when two index pulses 200 mSec apart are sensed.

## 2.4 Power Interface

The JU-455-5 requires only DC power for operation. DC power to the drive is provided via P2/J2. The two DC voltages, their specifications, and their P2/J2 pin designators are outlined in Table 2-1. The specifications outlined on current requirements are for one drive. The multiple drive systems, the current requirements are a multiple of the maximum current times the number of drives in the system. In addition, Figure 2-3 illustrates the DC power profile.

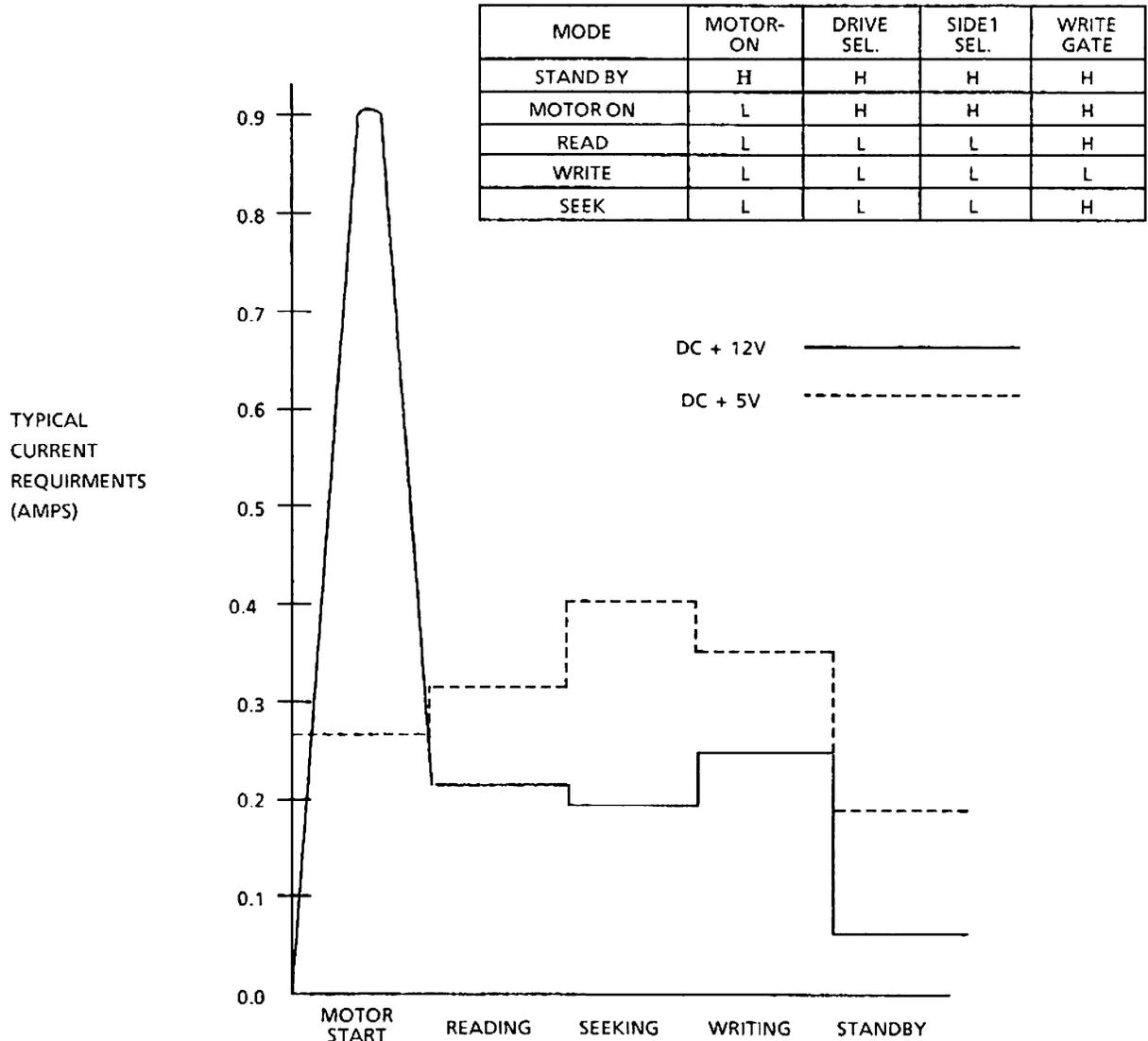


Figure 2-3 DC POWER PROFILE

## 2.5 Frame Ground

Frame ground for the JU-455-5 is provided by a push-on tab terminal, mounted on the rear of the drive directly behind the stepper motor.

When the host system's input power is AC, the JU-455-5 drive frame must be grounded to the third wire safety ground. If the host system is DC powered, the frame ground may be tied to the DC power ground.

## 2.6 System Power and Ground Distribution

To provide optimum performance and noise immunity, extreme care must be used to provide low noise grounds. Independent frame ground wires should run from each JU-455-5 drive and other system components to a single point system frame ground.

The 5 volt and 12 volt return lines should be connected together at the host system, but these DC power supply return lines should be isolated from the system frame (AC) ground. These return lines are isolated from frame ground on the JU455-5 PCB by a 0.01 uF capacitor and 100k ohm resistor in parallel. The network is provided to suppress differential noise between the DC and AC grounds while providing a DC connection.

Grounding for the TTL signal lines between the JU-455-5 PCB logic ground and host system (controller) PCB logic ground should be provided by the 17 signal ground pins of the J1 connector. All odd pins, 1 through 33, should be connected to the controller signal ground plane.

TABLE 2-1 DC POWER REQUIREMENTS

P2/J2 PIN	DC VOLTAGE	TOLERANCE	CURRENT at * OPERATING	CURRENT at STANDBY	MAX RIPPLE
1	+ 12V	± 10% (± 1.2V)	0.25A TYP 0.6A MAX 0.9A PEAK	0.07A TYP 0.1A MAX	100 mV p-p
2	+ 12V Return	**			
3	+ 5V Return	**			
4	+ 5V	± 5% (± 0.25V)	0.4A TYP 0.6A MAX	0.22A TYP 0.35A MAX	50 mV P-P

\* It is exclusive of CURRENT of HEAD LOAD option.

\*\* + 12V and + 5V Ground Returns are tied together at drive PCB.

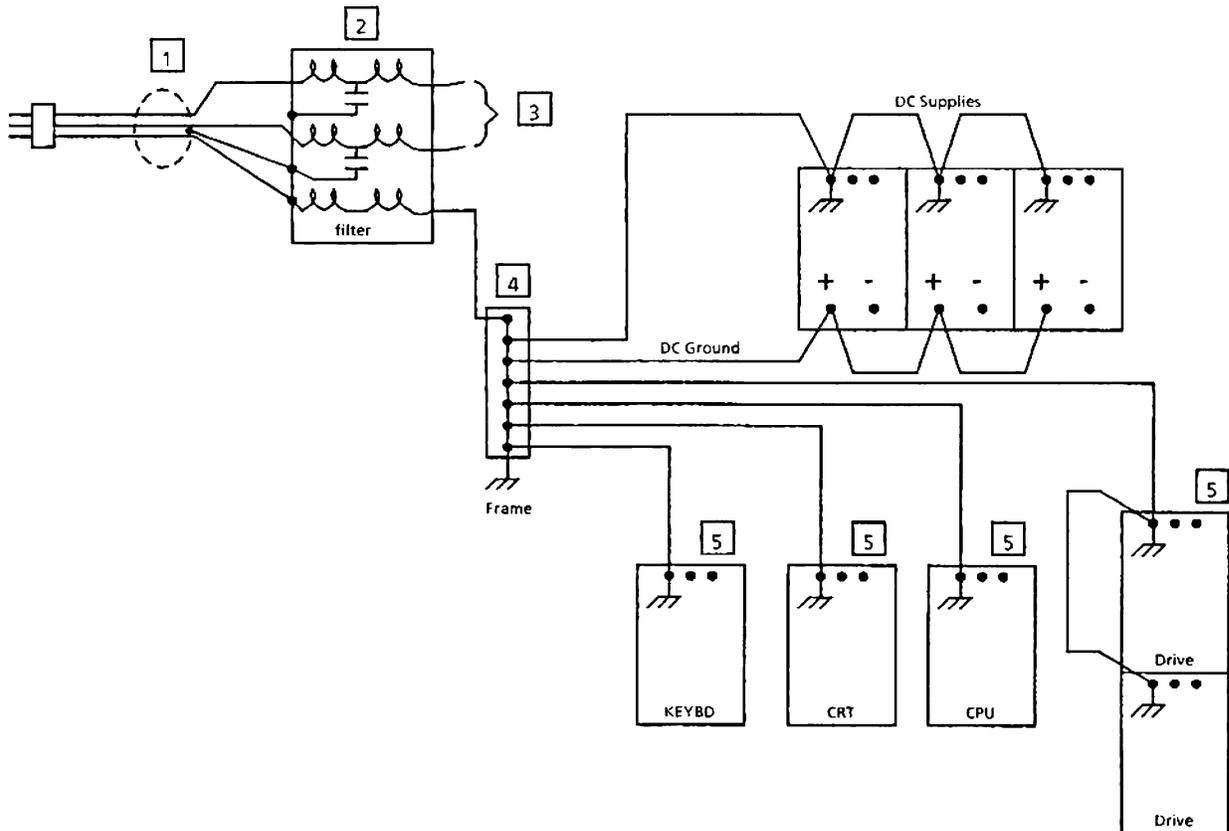


Figure 2-4 RECOMMENDED POWER AND GROUND DISTRIBUTION

**NOTE:**

1. Shield power cable- Should be only one and tied to ground at filter end only.
2. Line filter- Isolated from frame with system ground filtered.
3. AC distribution- Twisted pair cable including ground wire (as shown in 5 places) . Wire size large enough to maintain less than 25 mV/ft drop.
4. AC ground TB- Only one connection to frame for all DC grounds and one AC ground.
5. DC distribution- Separate twisted pair cable from each device to the DC supplies (as shown in four places). Wire size large enough to maintain less than 10 mV/ft drop.

**2.7 Functional Operations**

**2.7.1 Power Sequencing**

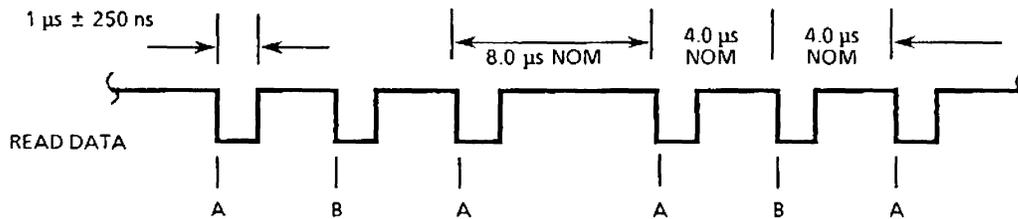
Applying DC power to the drive can be done in any sequence. However, during power up, the WRITE GATE line must be held inactive or at a high level. This will prevent possible 'glitching' of the media. After application of DC power, a 500 millisecond delay should be introduced before any operation is performed.

### 2.7.2 Read Operation

Reading data from the drive is accomplished by:

- Activating the DRIVE SELECT line.
- Selecting the head.
- WRITE GATE being inactive.

The timing requirements for the read operation is shown in Figure 2-5.



- A = LEADING EDGE OF BIT MAY BE  $\pm 800 \text{ ns}$  FROM ITS NOMINAL POSITION.  
B = LEADING EDGE OF BIT MAY BE  $\pm 400 \text{ ns}$  FROM ITS NOMINAL POSITION.

Figure 2-5 READ DATA TIMING (FM ENCODING)

### 2.7.3 Write Operation

Writing data to the drive is accomplished by:

- Activating the DRIVE SELECT line.
- Selecting the head.
- Activating the WRITE GATE line.
- Pulsing the WRITE DATA line with the data to be written.

The timing specifications for the write data pulse are shown in Figure 2-6. Write data encoding can be FM or MFM.

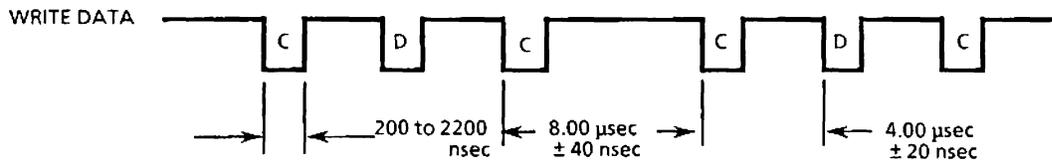


Figure 2-6 WRITE DATA TIMING (FM ENCODING)

## SECTION III ERROR RECOVERY

### 3.1 WRITE ERROR

If an error occurs during a write operation, it will be detected on the next revolution by doing a read operation (commonly called a "write check"). To correct the error, another write and write check operation must be done. If the write operation is not successful after ten attempts have been made, a read operation should be attempted on another track. This is done to determine if the media or the drive is failing. If the error still persists, the disk should be considered defective and discarded.

### 3.2 READ ERROR

Most errors that occur will be "soft" errors. Soft errors are usually caused by the following:

- a. Airborne contaminants passing between the read/write head and the disk. The contaminants will generally be removed by the cartridge self-cleaning wiper.
- b. Random electrical noise which usually lasts for a few microseconds.
- c. Small defects in the written data and/or track not detected during the write operation which may cause a soft error during a read.

The following procedure is recommended to recover from errors:

- a. Reread the track ten times or until such time as the data is recovered.
- b. If data is not recovered after using step "a." access the head to the adjacent track in the same direction it was moved previously. Return to the desired track.
- c. Repeat step "a."
- d. If data is not recovered, the error is not recoverable.

### 3.3 SEEK ERROR

Seek errors are detected by reading the ID field after the seek is completed. The ID field contains the track address. If a seek error is detected, the host system should issue a recalibrate operation (step out until the TRACK 00 line goes active) and seek back to the original track.

## SECTION IV CUSTOMER INSTALLABLE OPTIONS

### 4.1 Pluggable/Trace Options

The JU-455-5 can be modified by the user to suit individual needs. These modifications can be implemented by adding, changing, or deleting connections. These changes can be accomplished by the use of a shorting plug (See Table 4-1) or by shorting a trace (See Table 4-2).

Option shorting Plug: 0.100 inch centers, Honda Part Number Z-252.

Table 4-1

Plug Jumper	Description	Shipped from Factory (JU455-5AAG)	
		Open	Short
DS1	Drive Select 1		X
DS2, 3, 4	Drive Select 2, 3, 4	X	
MX	Constant Drive Select Use in a single drive system (only)	X	
DS	Enables Drive Select in a multi drive system		X
MS	Enables drive motor with drive select	X	
MM	Enables Drive Motor with Motor On		X
RY	Ready Signal		X
RD	Enable True Ready		X
SW	Door Switch	X	
RR	Ready Enable from True Ready or Door Switch	X	
DR	Ready Enable from drive select		X
WP	Write Protect		X

Table 4-2

Wire Jumper	Description	Shipped from Factory (JU455-5AAG)	
		Open	Short
N	Not An Option	X	
HD	Not An Option		X
IL	In Use LED from In Use	X	
DL	In Use LED from Drive Select		X
HL	Head Load with In Use (not used)	X	
HM	Head Load with Motor On (not used)	X	
HS	Head Load with Drive Select (not used)	X	
HH	Head Load with DS & HL	X	
48	Not An Option	X	
96	Not An Option		X
AR	Auto Recalibrate to Track 00		X
NR	No Auto Recalibrate to Trk 00	X	

## 4.2 Jumper Options

### 4.2.1 DL/IL Jumper

DL	IL	IN USE LED
OPEN	CLOSED	In use LED is a direct function of "IN USE" line only of J1 I/O.
CLOSED	OPEN	In use LED is a direct function of "DRIVE SELECT" line only of I/O.

**Note:** DS/IS: Wire jumper option.

### 4.2.2 MS/MM Jumper (See Figure 4-1)

MS	MM	SPINDLE MOTOR
OPEN	CLOSED	Spindle motor is a function of "MOTOR ON" line of J1 I/O. Motor is turned on when there is a logical "Low" on "MOTOR ON" signal.
CLOSED	OPEN	Spindle motor is not a function of "MOTOR ON" line, instead the motor is turned on when the drive is settled.

**Note:** MS/MM: Plug jumper option.

### 4.2.3 MX/DS Jumper

MX	DS	DRIVE SELECTION
OPEN	CLOSED	Drive is selected when "DRIVE SELECT" line of J1 I/O interface is low.
CLOSED	OPEN	Drive is always selected irrespective of any logic level on "DRIVE SELECT" line of J1 I/O interface.

**Note:** MX/DS: Plug jumper option.

### 4.2.4 +WP Jumper

+ WP	WRITE PROTECT
CLOSED	An active low level on this signal line (J1 #28) indicated that write protected diskette has been installed.
OPEN	An active high level on this signal line (J1 #28) indicated that write protected diskette has been installed.

**Note:** + WP: Wire Jumper option.

### 4.2.5 RY Jumper: (see figure 4-2)

CLOSED	Used with RD, SW, RR, and DR combination.
OPEN	Special applications - IBM AT. *

With RY shorted:

- RD and DR shorted: - Ready as a function of internal ready and drive select.
- SW and DR shorted: - Ready as a function of door handle and drive select.
- SW and RR shorted: - Ready as a function of door handle only.

\* IBM is the registered trademark of International Business Machines; IBM Corp.

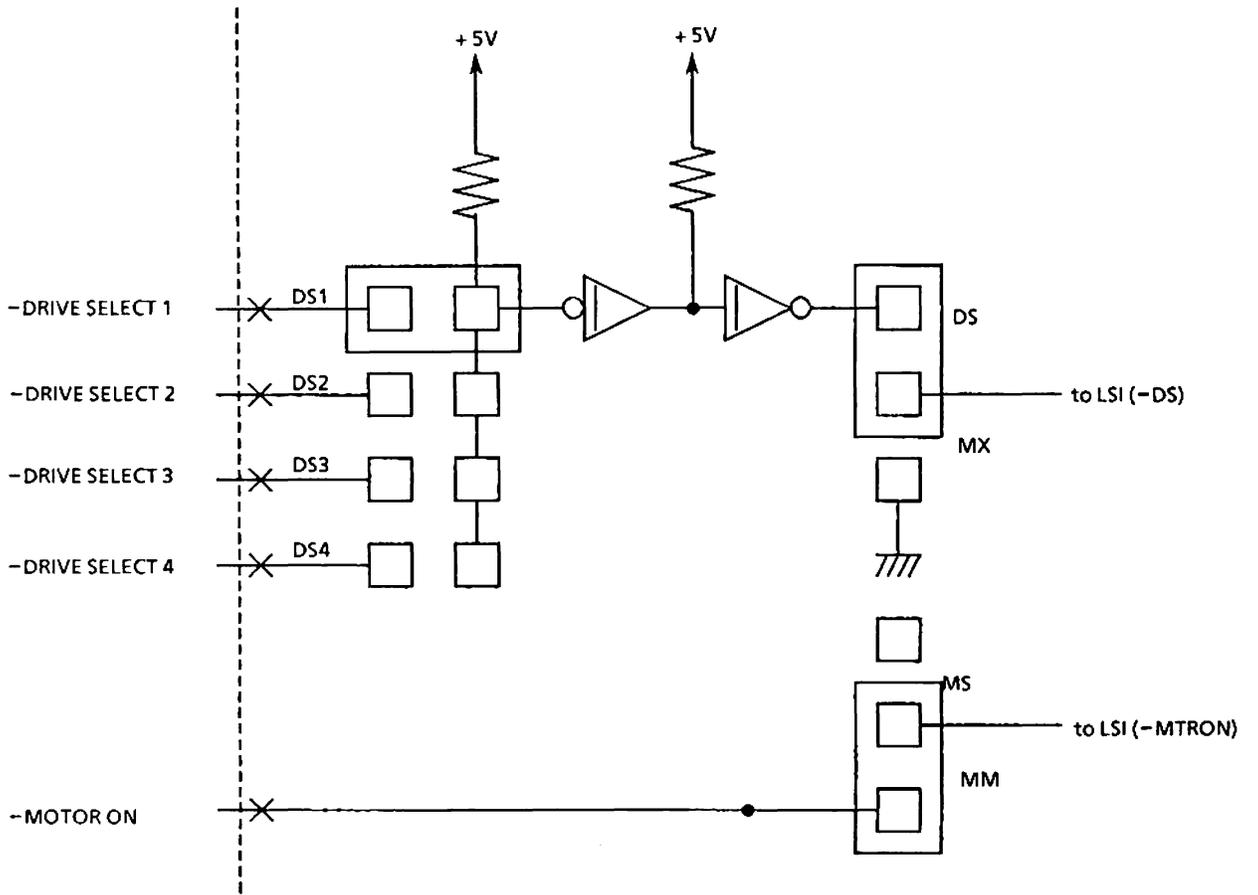


Figure 4-1 JUMPER CONFIGURATION FOR DRIVE SELECT & MOTOR CONTROL

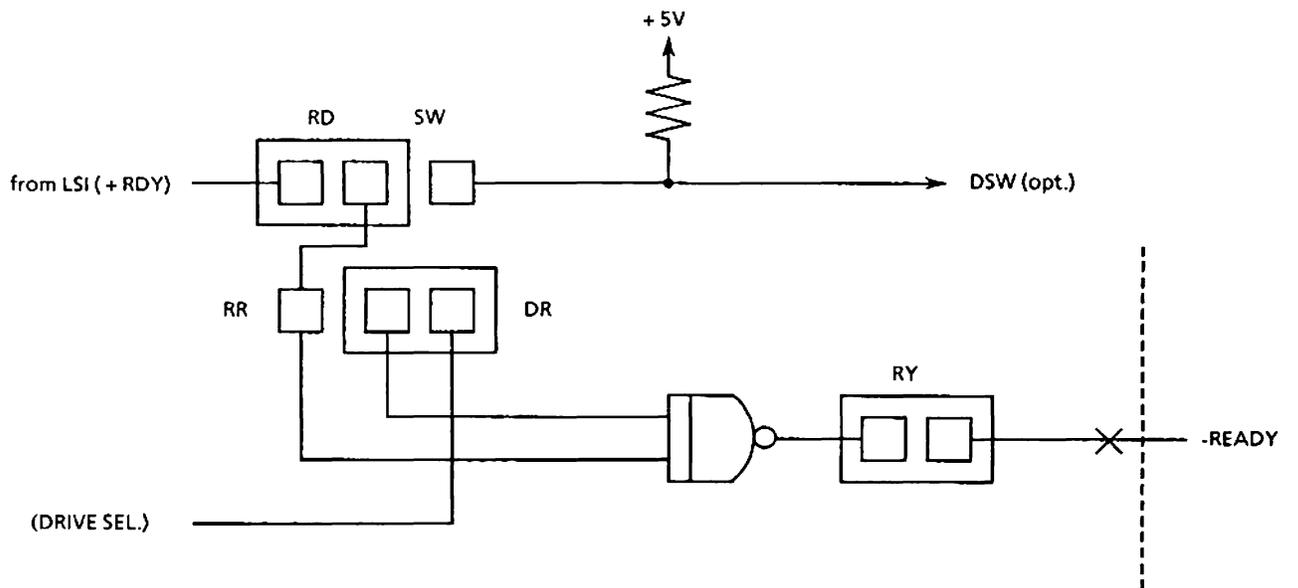


Figure 4-2 JUMPER CONFIGURATION FOR READY

## **SECTION V OPERATION PROCEDURES AND PRECAUTIONS**

### **5.1 POWER ON PROCEDURE**

The DC power supply can be turned on in any order. The write gate signal should be held at high level, however, so that the power on action does not cause illegal writing. An interval of 500 ms is necessary between power-on time and operation start time.

### **5.2 DRIVE SELECTION**

The drive is selected when the drive select signal goes to low level.

### **5.3 DRIVE MOTOR TURN-ON**

Throughout data reading and writing, the drive motor must rotate at a constant speed. The drive motor is activated when the motor on signal is set at low level, and requires 0.5 second to reach constant speed. When the motor on signal changes to high level, the drive motor stops in about 4 seconds. When the write-protect detector detects a change point due to insertion or removal of the diskette, the drive motor rotates for 10 seconds.

### **5.4 PRECAUTIONS**

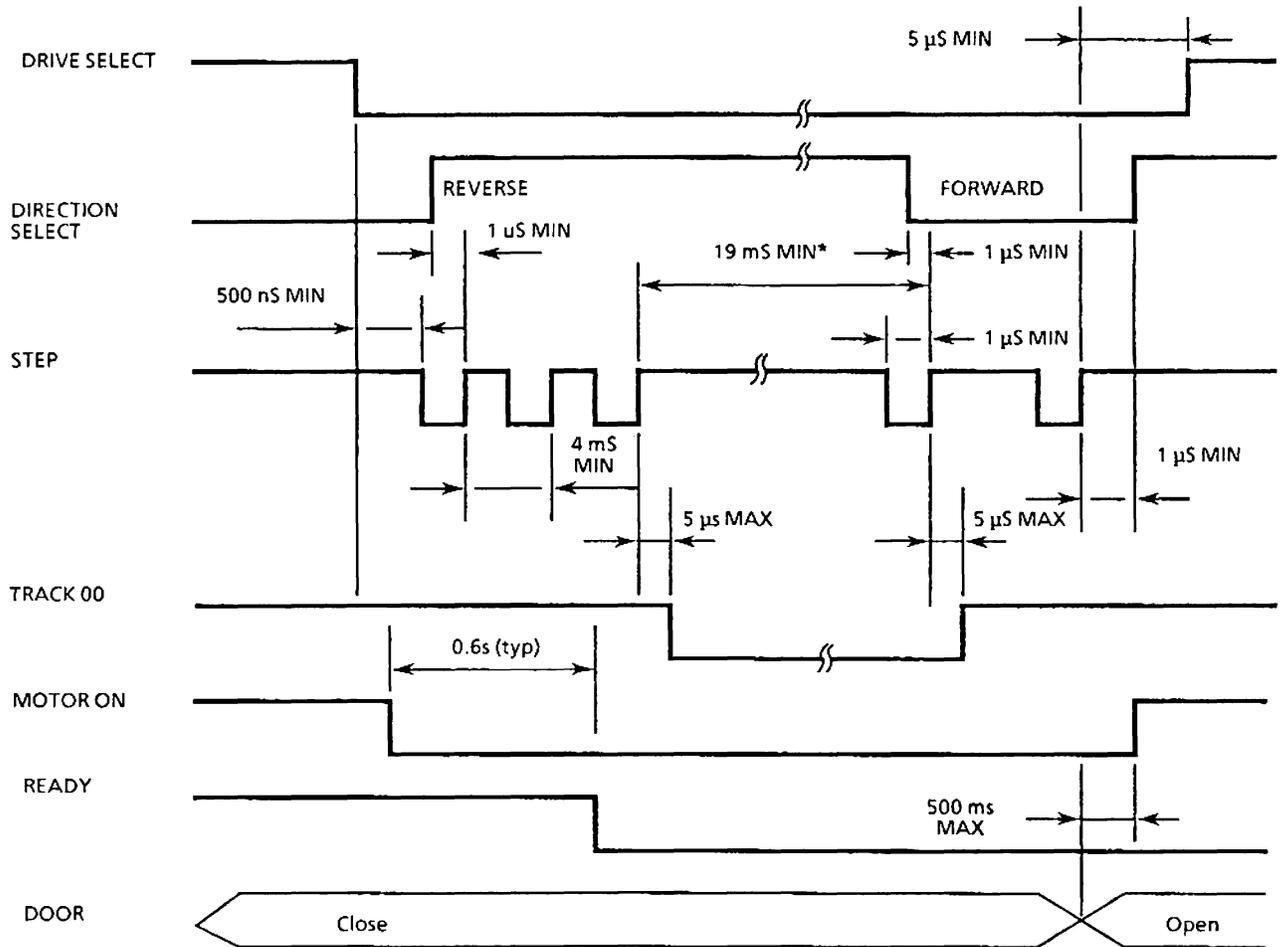
- 1) Upon installation, pay close attention to reducing the ambient electrical noise, such as the noise from the power supply or CRT.
- 2) JU-455-5 automatically rotates the spindle motor for about 10 seconds, when a diskette is inserted, for better clamping accuracy. This also prevents the diskette from being damaged upon clamping. For full use of this feature, turn power on before inserting a diskette, then clamp the diskette within 10 seconds after insertion.

## SECTION VI TIMING DIAGRAM

The step, read, write and general control timings are given on the following pages.

Note: **MIN** = The minimum amount of time (or longer) the controller must wait for the execution of the next operation.

**MAX** = The maximum amount of time required by the drive to complete on operation. The maximum amount of time delay allowed by the controller for next operation: i.e. The controller must execute (start to stop) on operation within the maximum limit amount of time.



\*NOTE: Turn around time is  $19\ \text{ms}$  (MIN) when direction is changed.

Figure 6-1 STEP TIMING

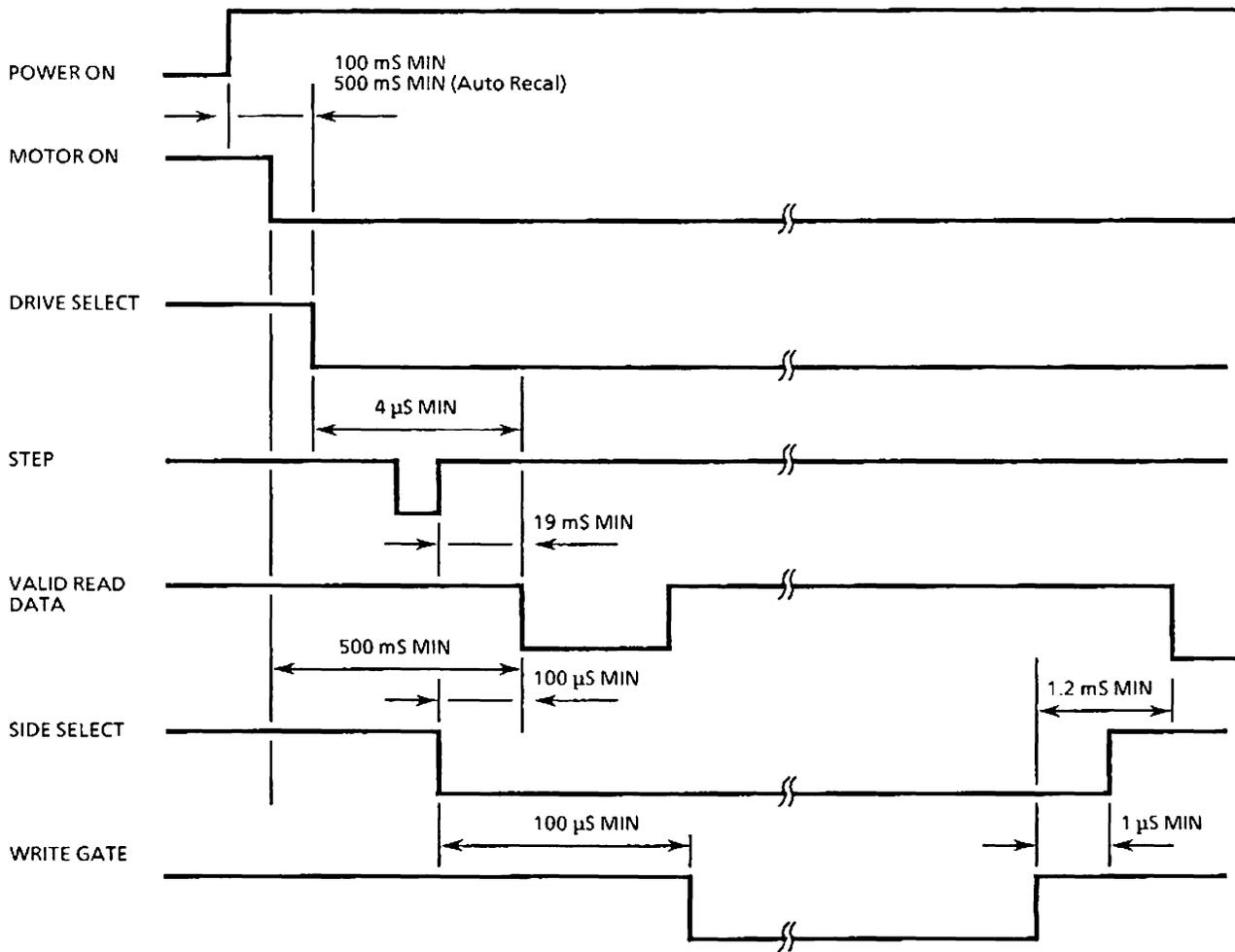


Figure 6-2 READ INITIATE TIMING

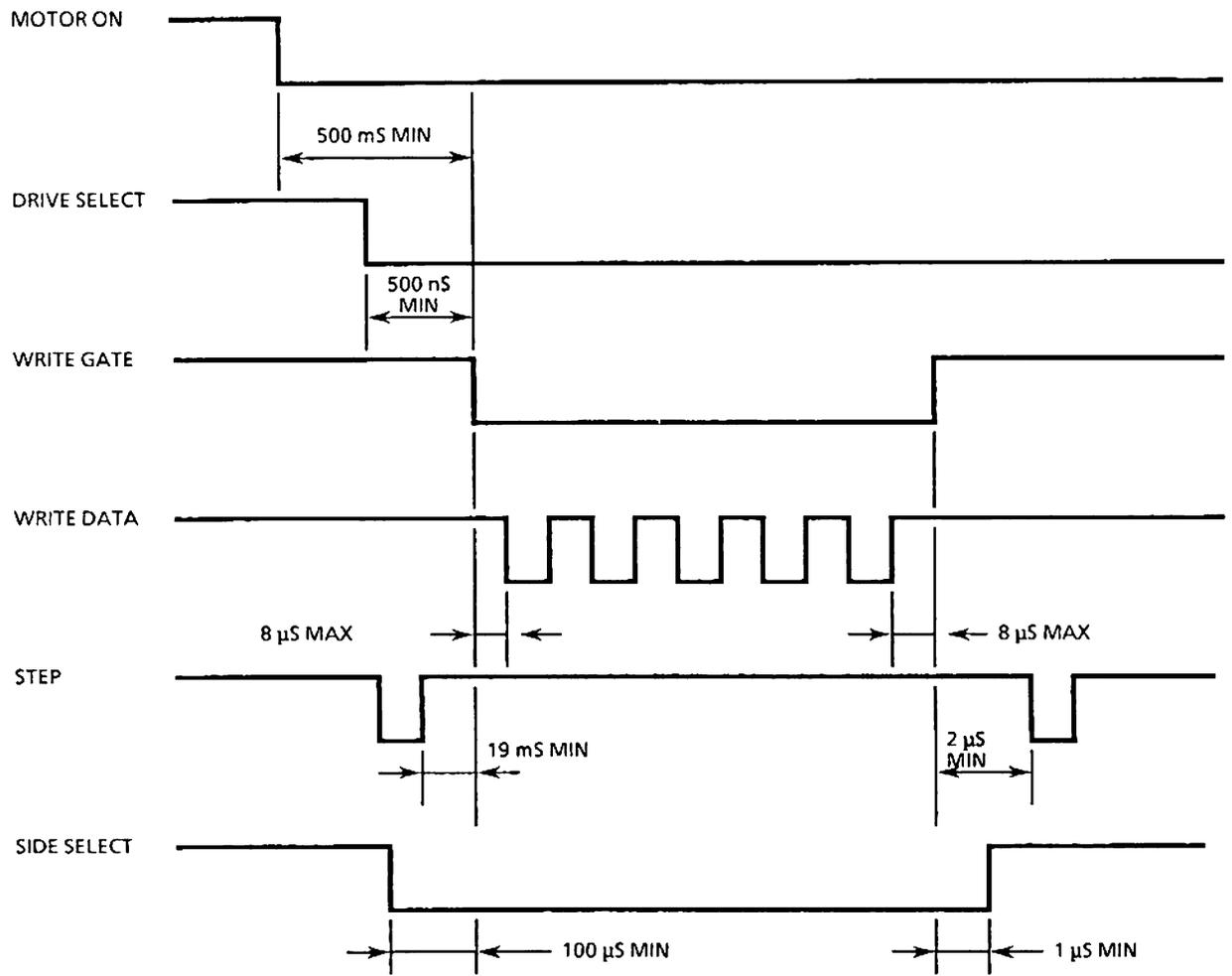


Figure 6-3 WRITE INITIATE TIMING

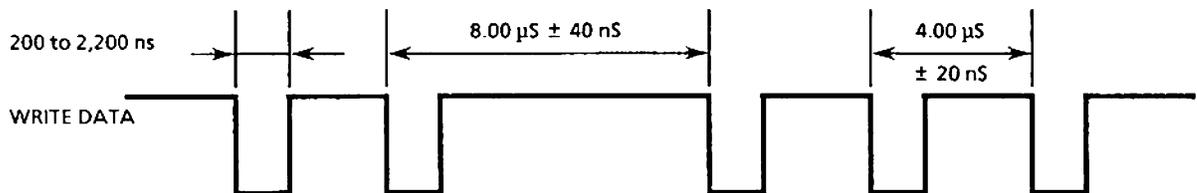
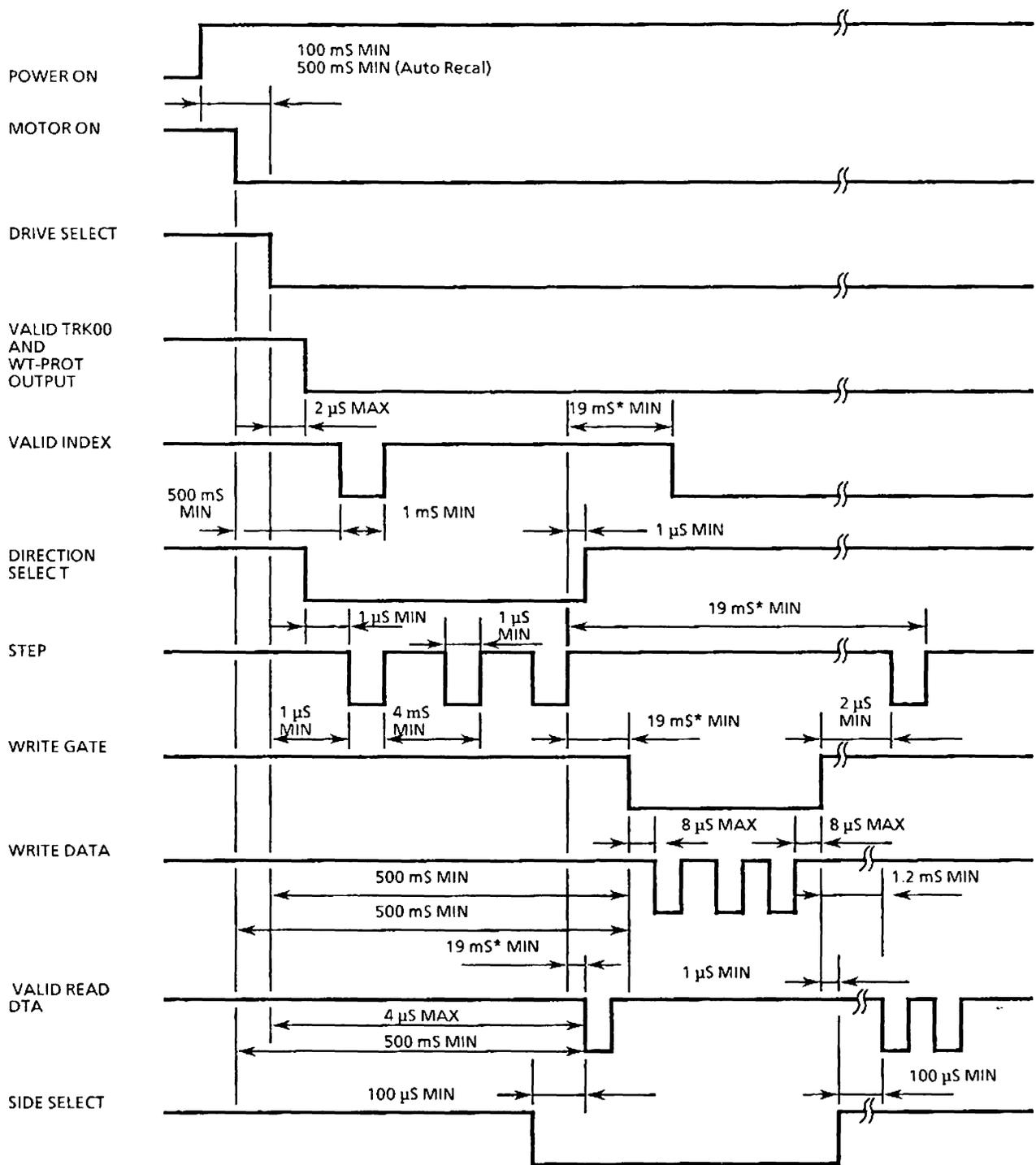


Figure 6-4 WRITE DATA TIMING



\*Seek settle time is 19 mS MIN.

Figure 6-5 GENERAL CONTROL AND DATA TIMING

## SECTION VII PHYSICAL SPECIFICATION

The electrical interface between the JU-455-5 and the host system is via three connectors. The first connector, J1, provides all of the TTL level I/O control signals for the host system and the drive. The second connector J2, provides D.C. power for the drive from the host system. The third connector, a push on tab terminal, provides a frame ground for the drive. See Figure 7-1 for connector locations.

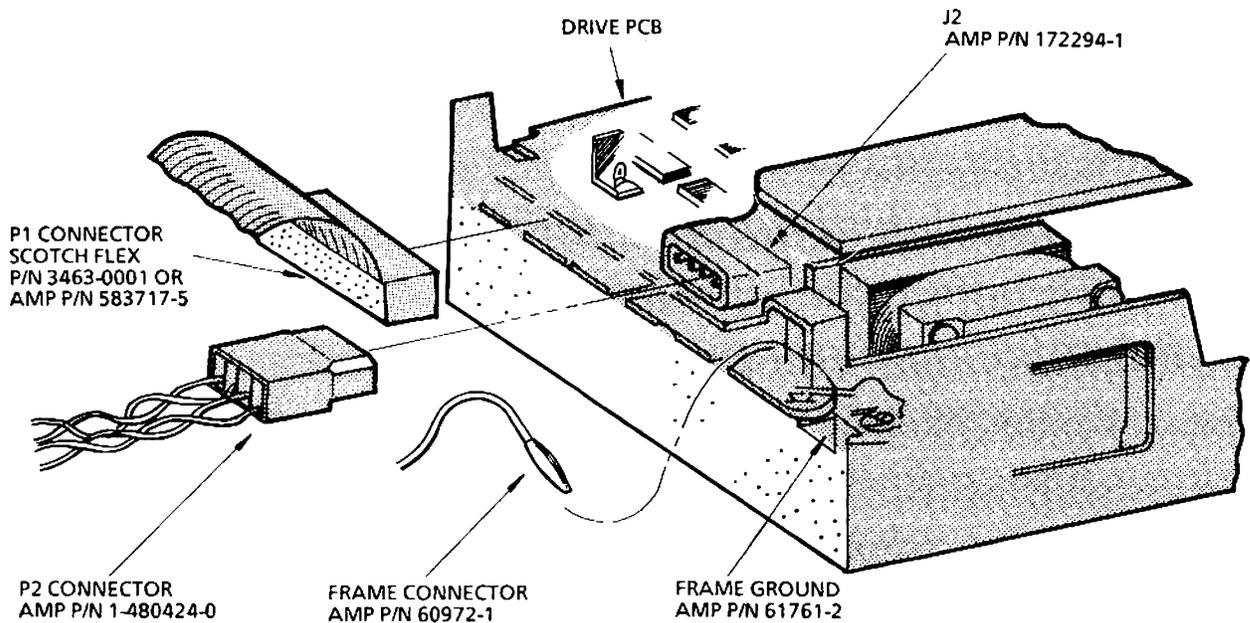


Figure 7-1 INTERFACE CONNECTORS LOCATIONS

## 7.1 J1 CONNECTOR (SIGNAL)

Connection to J1 is through a 34 pin P.C.B. edge connector. The dimensions for this connector are shown below. The pins are numbered 1 through 34 with the even numbered pins containing the control and data signals and the odd pins being ground. A key slot is provided between pins 4 and 6 for optional keying.

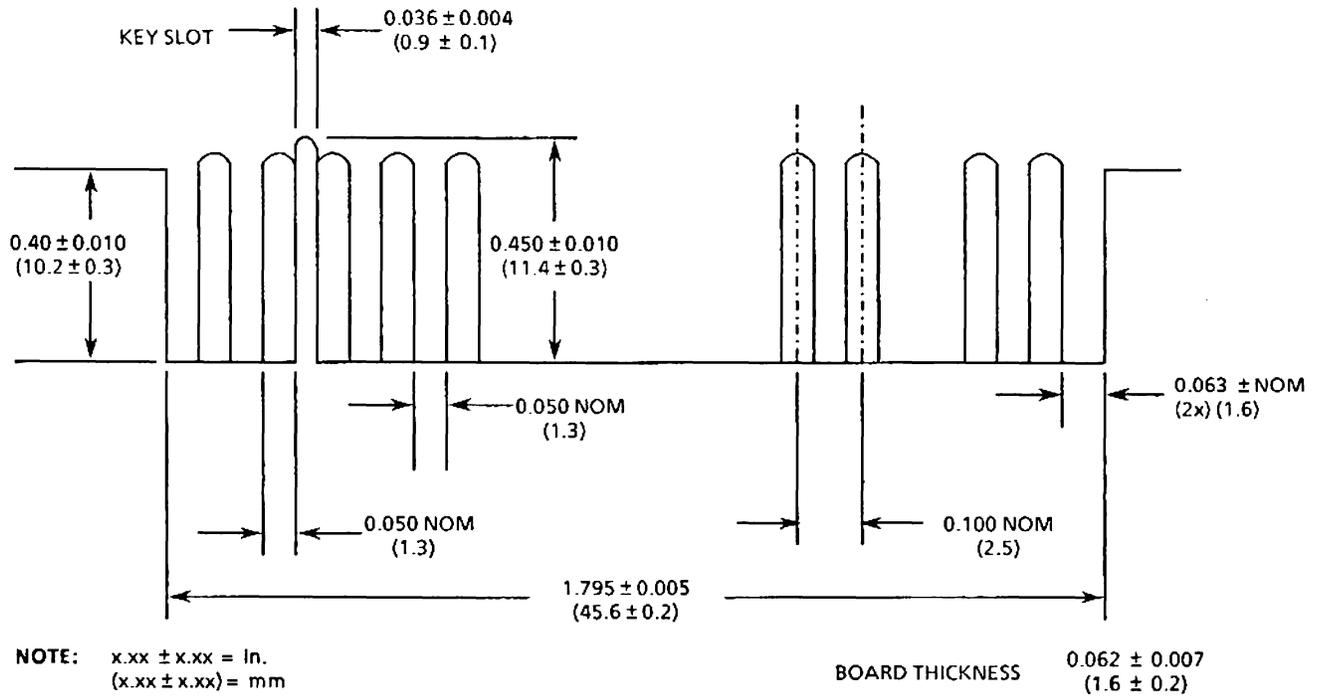


Figure 7-2 J1 CONNECTOR DIMENSIONS

## 7.2 J2 CONNECTOR (POWER)

The D.C. power connector, J2, is located in the rear of the drive. J2 is a four pin AMP connector P/N 172294-1. The recommended mating connector is AMP P/N 1-480424-0 utilizing AMP pins P/N 60619-1.

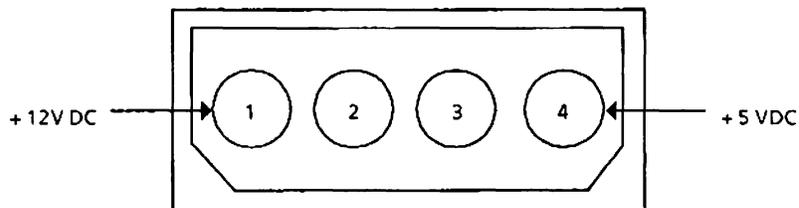


Figure 7-3 J2 CONNECTOR

### 7.3 FRAME GROUNDING

#### CAUTION

The drive must be frame grounded to the host system to ensure proper operation. If the frame of the drive is not fastened directly to the frame of the host system with a good AC ground, a wire from the system AC ground must be connected to drive. For this purpose, a faston tab is provided on the drive in the rear. The tab is an AMP P/N 61761-2 and its mating connector is AMP P/N 60972-1

### 7.4 DESCRIPTION OF THE TEST POINTS (T.P.)

T.P. 1 & T.P. 2	:	Differential Analog Read Data Signal
T.P. 7 (Wire)	:	Index
T.P. 8	:	Track Zero
T.P. 12 (Wire)	:	Step
T.P. 6 (Wire)	:	Digital Read Data
T.P. 5, T.P. 10	:	Ground

### 7.5 MOUNTING

The JU-455-5 is capable of being mounted in any of the following positions.

1. Front Loading - mounted vertical with door opening left or right.  
- mounted horizontal with PBC up.

#### CAUTION

Do not mount the JU-455-5 horizontally with the PCB down and Top Loading (mounted upright). Such a configuration could cause damage to the drive.

The mounting hardware for the bottom and side holes is to be #3 metric.

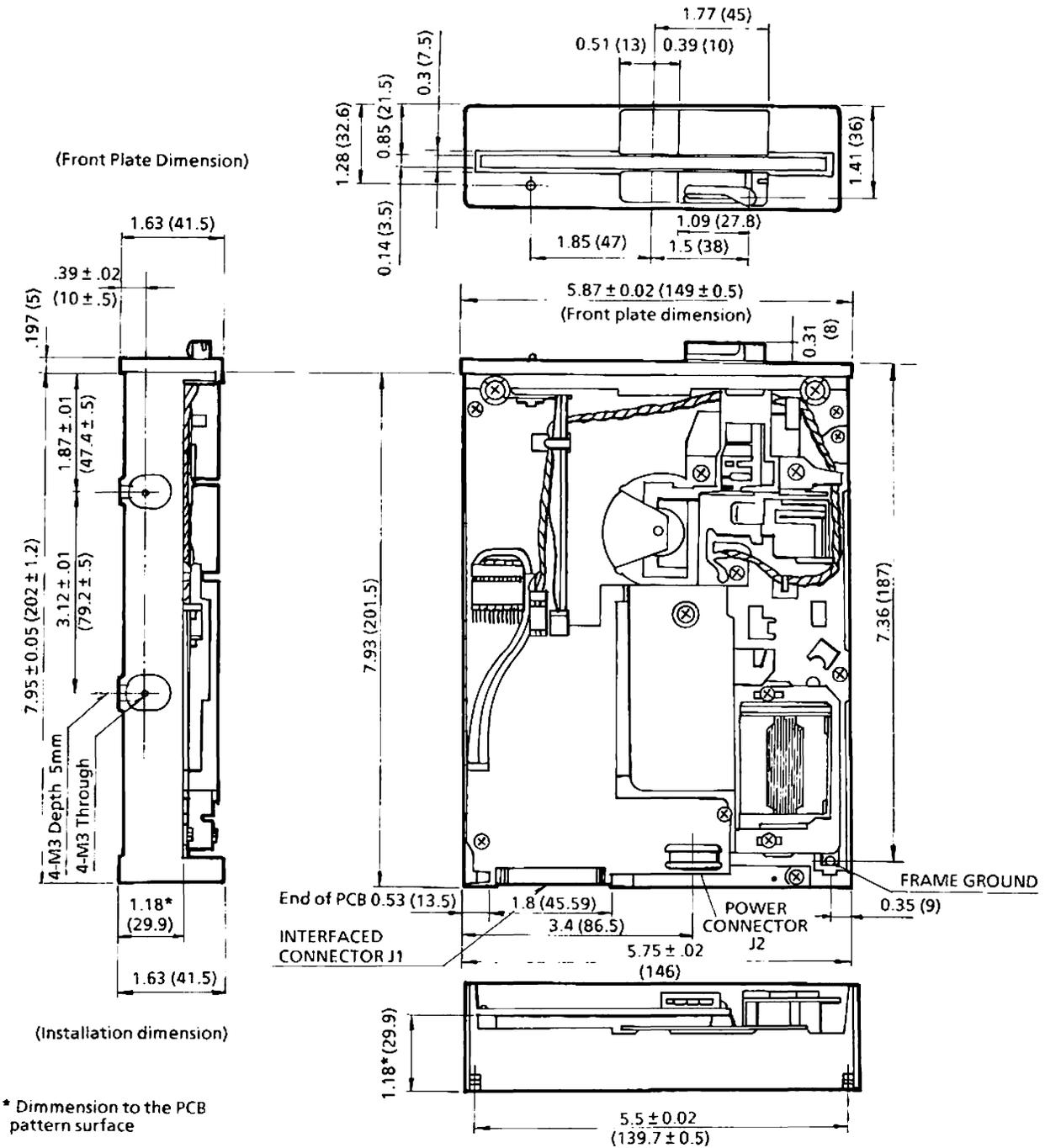


Figure 7-4 MECHANICAL DIMENSIONS