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STANDARD SPECIFICATIONS MITSUBISHI 5-1/4-INCH FLEXIBLE DISK DRIVE M4851-1

Member of the Manorex Group

SJ2-G3448A

STANDARD SPECIFICATIONS

MITSUBISHI 5-1/4-INCH FLEXIBLE DISK DRIVE

M4851-1

MITSUBISHI ELECTRIC CORPORATION

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CHAPTER 1 INTRODUCTION

The Mitsubishi M4853-1 provide high capacity and high reliability in a compact configuration, with the industry standard 5-1/4 inch media.

1.1 General Description

1. Half height (41 mm) dimension of conventional model and two M4853-1 units can be fit into the industry standard size for one 5-1/4 inch flexible disk drive.

2. Ejector for the diskette provides ease-of use in the handling the diskette.

3. The soft-touch, circular gimbal-supported magnetic head provides stable contact with the medium.

4. A high-precision stepping motor and steel bands are used in a combination for the magnetic head position mechanism to achieve a fast 3 ms access time between tracks.

5. Compact Brushless D.C. Motor gives maintenance free.

6. Stable media interchangeability by keeping enough window time margin at off-track in a wide range of ambient conditions.

7. Low power consumption can be achieved by a diskette detection function.

8. Dynamic clamping function provides high reliability of diskette centering in order to avoid possible mis-clamping.

1.2 Specifications

1.2.1 Performance specifications (Table 1-1)

Table 1-1 Performance Specifications

	Double Density
Memory capacity	
Unformatted	
Disk	500 kilobytes
Per surface	250 kilobytes
Per track	6.25 kilobytes
Formatted	256 bytes/sector
Disk	327.7 kilobytes (including spare tracks)
Per surface	163.8 kilobytes (including spare tracks)
Per track	4096 bytes = 256 bytes x 16 sectors
Transfer rate	250 kilobits/second
Average latency time	100 ms
Access time	
Track to track	6 ms
Average	103ms (including 6 ms step time and settling time)
Settling time	25 ms
Head loading time	50 ms
Motor starting time	250 ms (READY ON TIME 600ms MAX.)

1.2.2 Functional specifications (Table 1-2)

Table 1-2 Functional Specifications

	Double Density
Recording density	5877, bits per inch
Magnetic flux inversion density	5877 FCI
Encoding method	MFM
Track density	48 tracks per inch
Number of cylinders	40
Number of tracks	80
Number of heads	2
Rotation speed	300 rpm
Rotation period	200 ms
Index	1
Media	Double-sided 48 TPI, standard 5.25-inches diskette

1.2.3 Physical Specifications (Table 1-3)

Table 1-3 Physical Specifications

DC power requirements	
+5 V	+5 V ± 5%, 0.5 A typical
+12 V	+12 V ± 5%, 0.5 A typical
Operating environmental conditions	
Ambient temperature	5°C to 46°C* (41°F to 115°F)
Relative humidity	20% to 80% (Maximum wet bulb temperature: 29°C (85°F))

* In case of stacking drives, care should be necessary. For standard jacket material.

Table 1-3 (cont.)

Non-operating environmental conditions	
Ambient temperature	-20°C to 51°C (-4°F to 125°F)
Relative humidity	5% to 95%
Heat dissipation	8.5 Watts Continuous seek (typical)
	5 Watts Standby (typical)
	4 Watts Motor off (typical)
Physical dimensions	(Except for front panel)
Height	41 mm (1.62 in)
Width	146 mm (5.75 in)
Depth	195 mm (7.7 in)
Front panel dimensions	42 x 148.0 mm (1.65 x 5.83 in)
Weight	1.3 kg (2.9 lbs)

1.2.4 Reliability specifications (Table 1-4)

Table 1-4 Reliability Specifications

MTBF	10,000 POH or more
MTTR	30 minutes
Unit life	5 years or 20,000 energized hours, whichever comes first
Media life	
Insertion	3×10^4 or more
Rotational life	3.5×10^6 pass/track or more
Tap-tap	10^4 on the same spot of a track
Error rate	
Soft read error	10^{-9} bit (Two retries)
Hard read error	10^{-12} bit
Seek error	10^{-6} seek

CHAPTER 2 OPERATION OF MAJOR COMPONENTS

2.1 System Operation

The M4851-1 Flexible Disk Drive consists of a medium rotating mechanism, two read/write heads, an actuator to position the read/write heads on tracks, a solenoid to load the read/write heads on the medium, and electronic circuits to read and write data, and to drive these components.

The rotation mechanism clamps the medium inserted into the drive to the spindle, which is directly coupled to the DC brushless direct-drive motor, and rotates it at 300 rpm. The positioning actuator moves the read/write head over the desired track of the medium. Then, the head loading solenoid loads the read/write head on the medium to read or write data.

2.2 Electronic Circuits

The electronic circuits to drive the individual mechanisms of the M4851-1 are located on a single printed-circuit board, which consists of the following circuits:

- o Line driver and receiver that exchange signals with the host system
- o Drive selection circuit
- o Index detection circuit
- o Head positioning actuator drive circuit
- o Head loading solenoid drive circuit
- o Read/write circuit
- o Write protect circuit
- o Track 00 detection circuit
- o Drive ready detection circuit
- o Head selection circuit
- o In use and panel indicator LED drive circuit

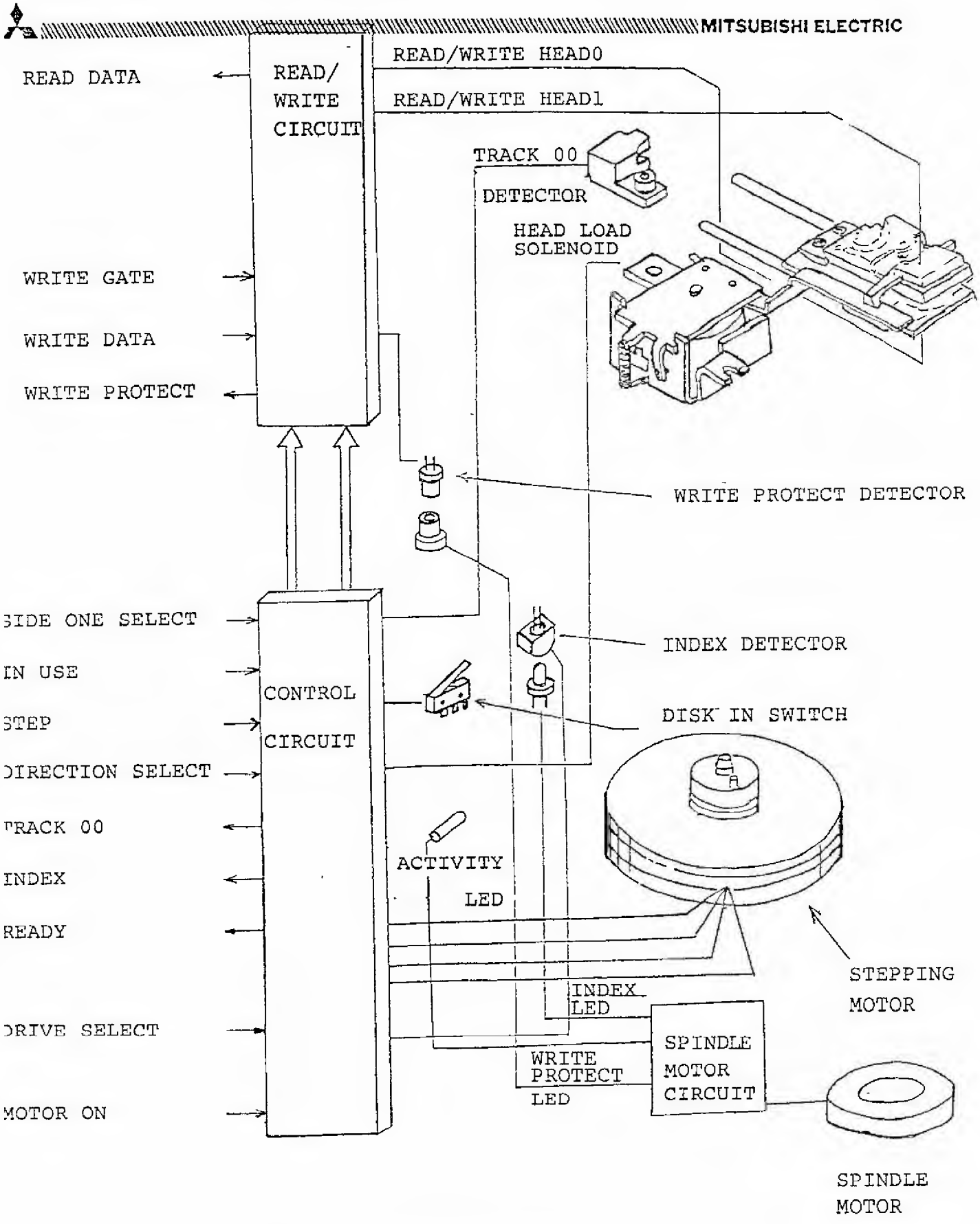


Fig. 1 Functional View

2.3 Rotation Mechanism

The diskette rotation mechanism uses the DC brushless direct-drive motor to directly rotate the spindle at 300 rpm.

2.4 Positioning Mechanism

The positioning mechanism positions the read/write heads as described below.

The head carriage assembly is fastened to the steel band secured around the capstan of a two-phase PM TYPE stepping motor; a 3.6° turn of the stepping motor moves the read/write head one track in the designated direction, thus positioning the read/write head.

This drive system is temperature compensated to minimize read/write head deviations from the disk tracks caused by ambient temperature change.

2.5 Read/Write Heads

The read/write heads are MnZn magnetic ferrite.

Each read/write head has three ferrite head cores, consisting read/write core and erase cores on both sides of the read/write core to erase the space between tracks (tunnel erase).

The two read/write heads, which are located face-to-face with a disk between them, are mounted on compliant, circular gimbal springs so that the heads track the disk with good contact to enable maximum reproduction of the signals from the disk. The high surface tracking ability of the circular gimbal keeps the disk free of stress, and thus improves diskette life.

CHAPTER 3 ELECTRICAL INTERFACE

There are two kinds of electrical interfaces: Signal interface and DC power interface.

The signal interface sends and receives control signals and read/write data between the drive and the host system via the J1/P1 connector.

The DC power interface drives the spindle drive motor of the disk drive, and supplies power to the electronic circuits and the stepping motor which drives the read/write head positioning mechanism via the J2/P2 connector.

The signals and pin arrangement of these two types of interfaces are shown in Tables 3-1 and 3-2.

Table 3-1 DC Power Connector Pin Arrangement (J2/P2)

Source voltage	Pin number	Remarks
+12 V DC	1	
+12 V DC return	2	
+5 V DC return	3	
+5 V DC	4	

Table 3-2 Signal Connector Pin Arrangement (J1/P1)

Signal	Signal Pin Number	Ground Return Pin Number
SPARE	2	1
IN USE	4	3
DRIVE SELECT 3	6	5
INDEX	8	7
DRIVE SELECT 0	10	9
DRIVE SELECT 1	12	11
DRIVE SELECT 2	14	13
MOTOR ON	16	15
DIRECTION SELECT	18	17
STEP	20	19
WRITE DATA	22	21
WRITE GATE	24	23
TRACK 00	26	25
WRITE PROTECT	28	27
READ DATA	30	29
SIDE ONE SELECT	32	31
READY	34	33

3.1 Signal Interface

The signal interface is classified into control signals and data signals. These interface signal lines are all at TTL levels. The meanings and characteristics of the signal levels are as follows:

- o True = Logical "0" = VL 0 V to +0.4 V
  Iin 40 mA maximum
- o False = Logical "1" = VH +2.5 V to +5.25 V
  Iin 0 mA
- o Input impedance = 150 Ohms

3.1.1 Cabling method and input line termination

The drive uses a daisy chain system of cable connections. A single ribbon cable or twisted-pair cable may be fitted with multiple connectors to permit connection of up to four drives.

The connected drives are multiplex-controlled by drive select lines, and any one of the drives can be accessed.

The cabling method and input line termination are shown in Fig. 3-1. A maximum of seven input signal lines, plus the drive select lines, may be terminated at the disk drive Proper operation of the drives requires termination at or near the drive connected to the end of the interface cable farthest from the host system.

The drive has detachable resistor modules on the printed-circuit board to terminate these input signal lines.

When a drive is shipped from the factory, its terminators are installed on the printed-circuit board.

Keep the terminators connected in the drive that is connected to the end of the interface cable, and disconnect the terminators in all the other drives.

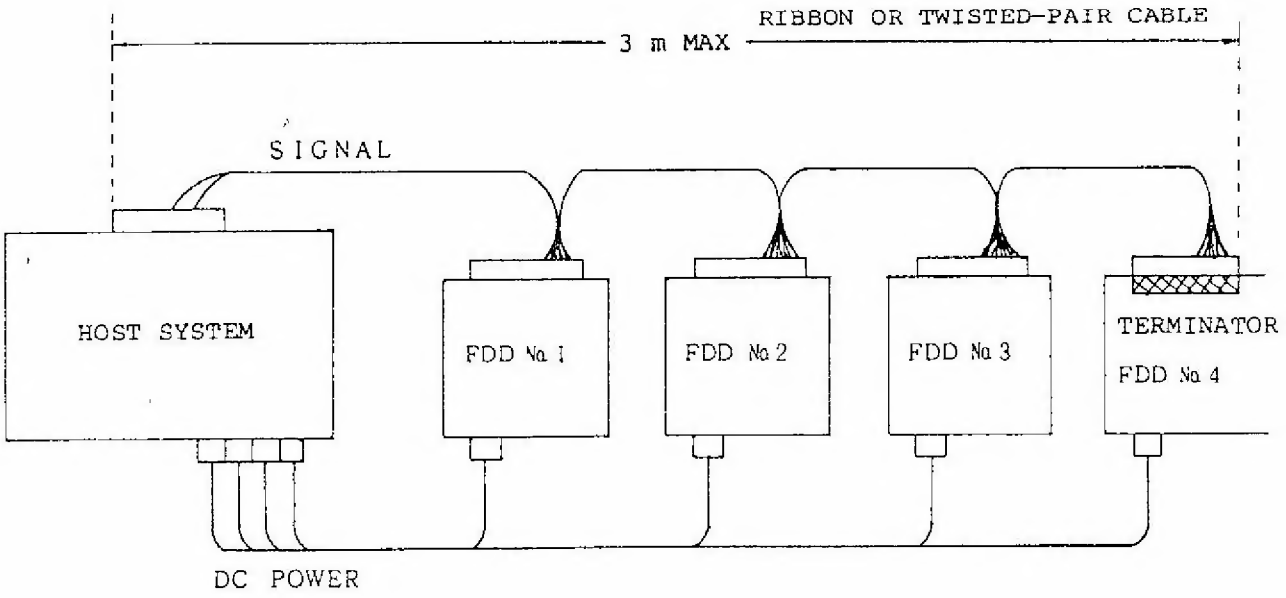


Fig. 3-1 Cabling Method (Sketch)

3.1.2 Line driver and line receiver

The recommended interface line driver and line receiver circuits for the host system and the drives are shown in Fig. 3-2.

It is suggested that a Schmitt trigger circuit with a hysteresis characteristic at the switching level be used for the line receiver to improve the noise resistance of the interface lines.

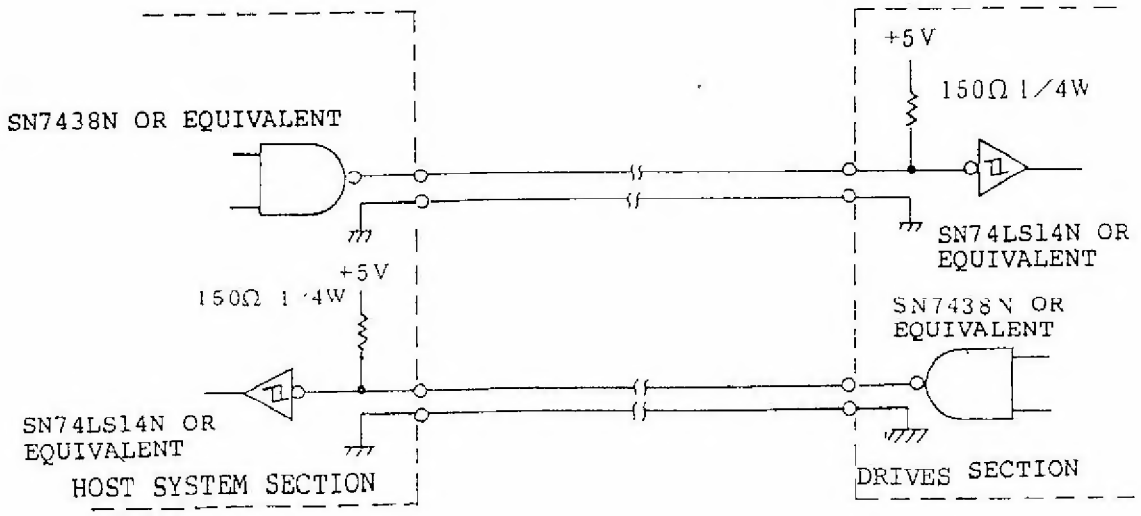


Fig. 3-2 Recommended Line Driver and Line Receiver Circuits

3.1.3 Jumpers

Non-standard modes of operation are available to the customer by using option plugs, and some PCB cut and/or jumpers. When using a plug, installing the option plug on a pair of square pins is a "short" condition, and removing it is an "open". A trace or a soldered wire jumper between two pads is a "Short", and none is a "open"

The specific options are explained below.

1. DS0 to DS3

   When two or more FDDs are connected to the system, jumper one of the four choices to allow the drive to be enabled when the particular select line is taken to a logical "0" condition.

   Only one drive per system may be designated for each drive number. In other words, there can only be one drive "0", etc., in a system.

2. MX

   If only one FDD is in a system, this option may be used to constantly select the drive. It causes to drive to ignore the status of the "DS" lines.

   This jumper must be removed in multi-drive systems.

3. HS

   This plug is installed to cause the heads to load when the drive is selected by DS0 through DS3. This occurs after the drive is "held ready status". Do not install HM or HC or HL with this option.

4. HM

   This plug is installed to cause the heads to load when the Motor on line (P1-16) is brought to a logical "0" level. This occurs after the drive is "held ready status". Do not install HS or HC or HL with this option.

5. HC

   This plug is installed to cause a constant head load condition which occurs after the drive is "held ready status" to allow for proper seating of the floppy disk. Do not install HS or HM or HL with this option.

6. HL

This plug is installed to cause the heads to load when both the drive is selected and the IN USE signal is brought to a logical "0" level. This occurs after the drive is "held ready status". Do not install HS or HM or HC with this option.

7. MS

This plug is installed to cause the spindle motor to turn on and rotate the disk with the input of a logical "0" on the Motor on line, P1-16.

8. MM

This plug is installed to cause the spindle motor to turn on and rotate the disk when the drive is selected by applying a logical "0" on one of the drive select lines, DS0 through DC3.

9. DC, 2S

(1) Condition of both DC and 2S opened enables a "Current status" ready output from the drive. The output goes to a logical "0" when the floppy disk is rotating at proper speed.

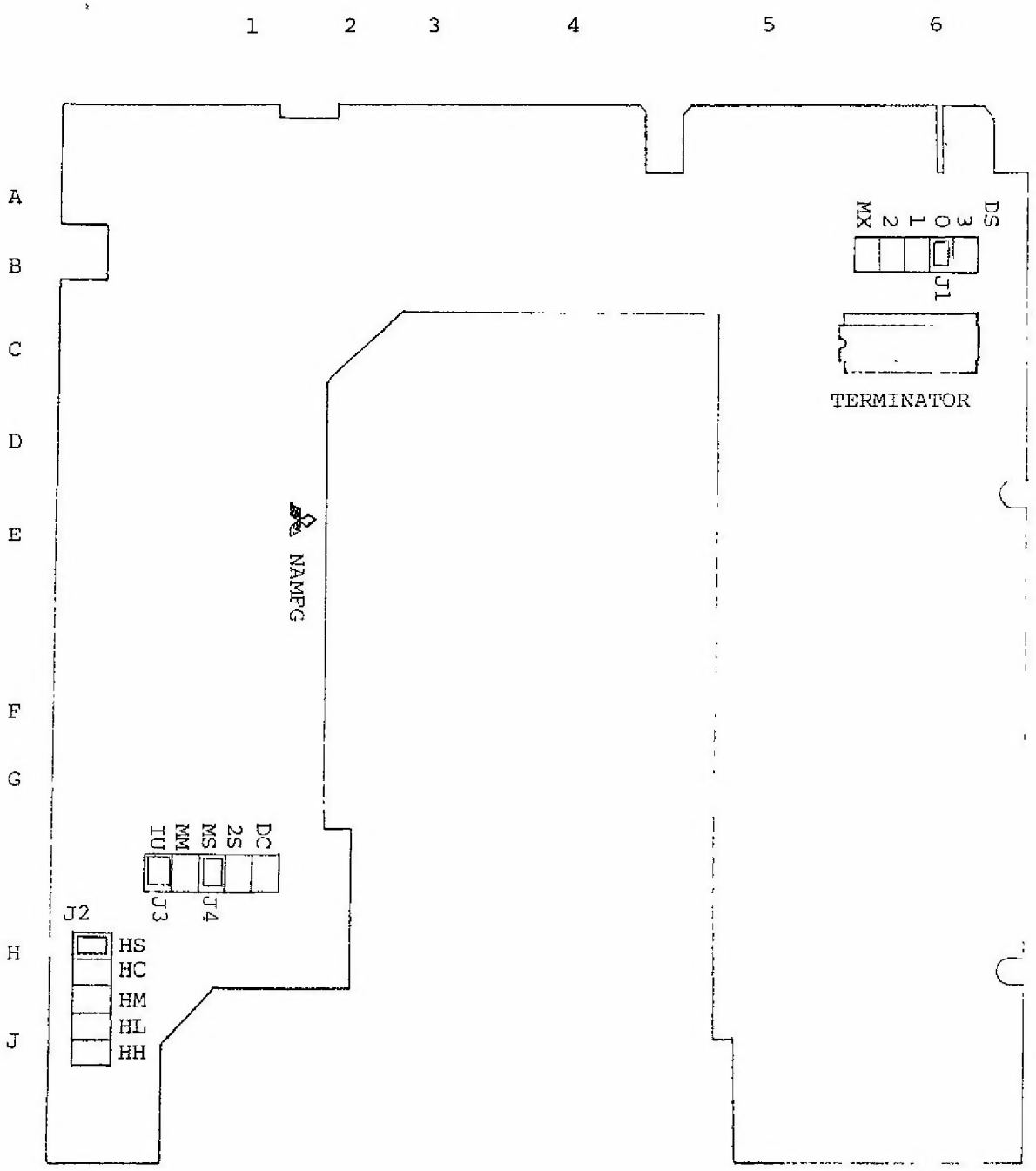
(2) Condition of DC opened and 2S closed enables a "held status" ready output from drive. The output will be a logical "0" when a disk is inserted and correctly clamped in the drive. (Index pulses were detected correctly.) And keep a logical "0" before the disk is ejected even if the spindle motor turn off.

Table of Shorting Plugs

Item	Pin Name	Description	Trace Designation	Plug Name
Drive Select	[DS0]	Drive Select 0	* DS: 3 ○○ / 0 [○○] / 1 ○○ / 2 ○○ / MX ○○	J1
	[DS1]	Drive Select 1		
	[DS2]	Drive Select 2		
	[DS3]	Drive Select 3		
	[MX]	Always Drive Select		
Head Load Condition	[HS]	Head Load from DRIVE SELECT signal	HS [○○] / HC ○○ / HM ○○ / HL ○○ / HH ○○	J2
	[HM]	Head Load from MOTOR ON signal		
	[HC]	Always Head Load		
	[HL]	Head Load from IN USE signal		
	HH	(Do not use)		
Motor On Condition	[MS] MM	Motor On from MOTOR ON signal	DC ○○ / 2S ○○ / MS [○○] / MM ○○ / IU [○○]	J4
	MS [MM]	Motor On from DRIVE SELECT signal		
	MS MM	Motor On from MOTOR ON or DRIVE SELECT signal		
	[MS] [MM]	(Do not use)		
Ready Condition	DC 2S	Standard Ready		—
	DC [2S]	Hold Ready		
	[DC] 2S	(Do not use)		
	[DC] [2S]	(Do not use)		
Separate IN USE signal	IU	Separate the IN USE signal from the IN USE LED Condition IN USE LED is activated by only DRIVE SELECT signal.		J3

* Note : [○○] means the plug position when shipped from factory.

Customer Installation Options



Printed-Citcuit Board Trace Location

3.1.4 Input signal lines

The disk drive has 11 input signal lines. Input signals can be classified into two types: One is multiplexed in a multi-drive system; and the other performs a multiplex operation.

The multiplexing signals are as follows:

- o Drive select 0
- o Drive select 1
- o Drive select 2
- o Drive select 3

(1) Drive select 0 to drive select 3

When these drive select lines are at logical "0" level, a multiplexed I/O lines become active to enable read/write operation. These four separate input signal lines, drive select 0 to drive select 3, are provided for connecting four drives to one system and mutually multiplexing them. Jumper pins DS0, DS1, DS2, and DS3 on the printed-circuit board are used to select drives to be made active, corresponding to drive select lines.

DS0 is shorted before shipment from the factory, so this setting must be changed when establishing other select lines.

(2) Side one select

This interface line is used to select which of the two sides of the diskette should be read or written. When this line is at logical "1," the Side 0 head is selected; or when it is at logical "0," the Side 1 head is selected. If the polarity of the side one select signal is reversed, delay read/write operation by more than 100 μs before execution.

Upon completion of a write operation, reverse the polarity of the side one select signal after a delay of 1000 μs. The heads are tunnel erase type, with a physical core gap deviation between the read/write head and the erase heads so with no delay, non-erased areas would be generated on the diskette due to a timing difference between the write data area and the erase area during write operation. This is prevented by delaying the erase current cutoff time of a few hundred microseconds within the disk drive. Therefore, the head select must not be reversed during this delay time. Also, the track access action must not be permitted for 1000 μs.

(3) Direction select

This interface line controls the direction. (inward or outward) in which the read/write head should be moved when a step signal pulse is applied.

If the signal is at logical "1," the read/write head moves from the center of the diskette outward; if it is at logical "0," the head moves inward.

(4) Step

This interface line is a pulse signal for moving the read/write head in the direction defined by the direction select line. The read/write head moves by one track each time a signal pulse is applied to the step line. The step line is normally logical "1," and the step operation starts with the trailing edge of a negative-going pulse (reversal from logical "0" to logical "1").

The direction select line must be reversed more than 1 µs before the trailing edge of the step pulse.

(5) Write gate

When this interface line goes to logical "0," the write driver becomes active and the data given to the write data line is written on the selected side of the diskette. When the interface line goes to logical "1," the write driver becomes inactive to enable the read data logic. The verified read data is obtained 1000 µs (maximum) after the write driver becomes inactive. Refer to CHAPTER 4 for the timing.

(6) Write data

Data to be written on the diskette is sent to this interface line.

This line is normally at logical "1," and reverses the write current at the leading edge of a negative-going data pulse (reversal from logical "1" to logical "0") to write data bits.

This line is enabled when the write gate is at logical "0," Fig. 3-3 shows the write data timing.

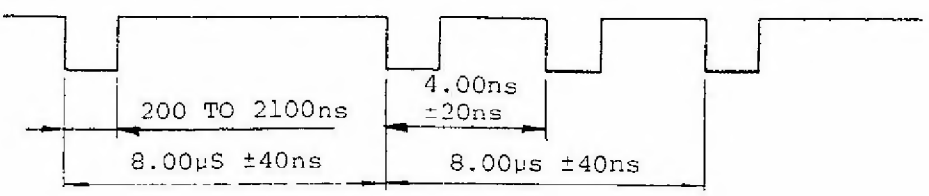


Fig. 3-3 Write Data Timing (FM Encoding)

(7) In use

An LED indicator on the front panel lights when this interface line goes to logical "0." The LED is also lit by the drive select.

(8) Motor on

This interface line starts the spindle motor when it goes to logical "0." The write gate does not go to logical "0" until more than 250 ms after the motor-on line goes logical "0."

The motor-on line goes logical "1" to stop the motor and keep it off while the drive is out of operation, thus prolonging motor life.

3.1.5 Output signal lines

The drive has five standard output signal lines.

(1) Index

This interface line is normally logical "1" but sends a logical "0" output pulse 4 ms wide each time the diskette makes one revolution (200 ms period).

This signal signifies the start of a track on the rotating diskette. The index signal timing is shown in Fig. 3-4.

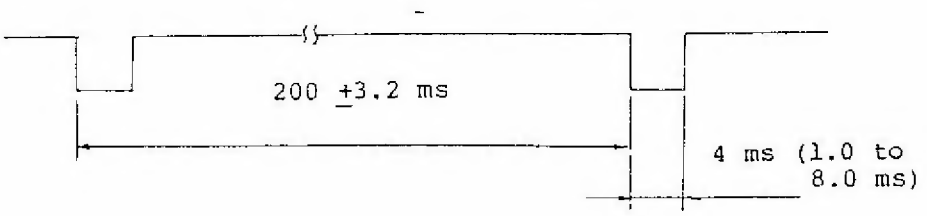


Fig. 3-4 Index Timing

(2) Track 00

When this interface line is at logical "0," it indicates that a read/write head of the selected drive is positioned on track 00. If the output of the selected drive is at logical "1," it indicates that the read/write head is positioned on a track other than track 00.

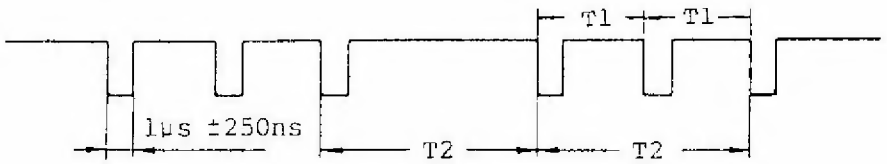
(3) Ready

This interface line is logical "1" when the door is open or no diskette is in the drive. The line goes logical "0" (ready) if an index pulse is detected twice or more when the index hole is correctly detected, and the DC power (+5 V and +12 V) supplied after a diskette is inserted into the drive and the door is closed.

(4) Read data

This interface line reads the data stored on the diskette with the read/write heads, and outputs raw data (combined clock and data signals) converted into pulse signals by an electronic circuit.

The read data line is normally logical "1" but it sends a logical "0" (negative-going) output pulse during a read operation. Fig. 3-5 shows allowable limits on timing variations with the usual diskette and bit shifts.



T_1 = 4.00 µs ±800 ns (Jitter due to rotation variation excluded)

T_2 = 8.00 µs ±1.6 µs (Jitter due to rotation variation excluded)

Fig. 3-5 Read Data Timing (FM Encoding)

(5) Write protect

This interface signal notifies the host system of the insertion of a diskette with a write protect notch into the drive. The signal goes to logical "0" when a write-protected diskette is inserted into the drive. When the signal is at logical "0," write on the diskette is inhibited even if the write gate line becomes active.

3.2 Power Interface

The disk drive requires two types of DC power supplies.

One is +12 V DC, which drives the drive motor to rotate the diskette. It is supplied to the stepping motor and the read/write circuit. The other is +5 V DC, which is used for the logic circuit and the read/write circuit.

NOTE

The index LED is driven by the +12 V DC.

3.2.1 DC power

DC power is supplied via connector J2/P2 on the back of the printed-circuit board. The specifications of the two DC voltages are shown in Table 3-3. The pin arrangement of connector J2/P2 is shown in Table 3-1.

Table 3-3 DC Power Specifications

DC voltage	Voltage variation	Current	Maximum ripple voltage (peak-to-peak)
+5 V DC	±0.25 V (±5%)	0.7 A maximum 0.5 A typical	50 mV
+12 V DC	±0.6 V (±5%)	1.00 A maximum 0.5 A typical at seek	100 mV

CHAPTER 4 FUNCTIONAL OPERATION

4.1 Power On Sequencing

No read/write operation may be performed during the period of 100 ms or more from the start of DC power supply until the control signal stabilizes. And after the period of 600ms from the Motor On, the drive comes to ready.
The read/write head may have been positioned on an incorrect track after switching the DC power on, so before starting a read/write operation, be sure to perform the step out operation until a track 00 signal is output to the interface line, and thus correctly position the read/write head.

4.2 Drive Selection

The disk drive daisy chain cabling system permits connection of multiple drives to a single cable.

These drives are selected when the drive select lines on the drive side become active. Only the drive whose drive select line is active sends and receives signals to and from the host system. The select lines on the drive must have different numbers if two or more drives are connected. If the same number is assigned, an operation error occurs due to interference among the interface output signals of the drives themselves.

4.3 Positioning Operation

The seek operation which moves the read/write head to the desired track selects a direction, inward or outward, depending on the polarity of the direction select signal, and moves the head by the step signal. If access to a track two or more tracks away is required, step pulses are continuously sent until the head moves to the desired track.

Head movement starts with the trailing edge of the step pulse. Fig. 4-1 Shows the operation timing.

4.4 Side One Selection

The read/write heads located on both sides of the diskette are selected by the side one select signal. When the side one select line is high, the Side 0 head is selected. When it is low, the Side 1 head is selected.

4 5 Read Operation

The required timing for read operations is shown in Figs. 4-1 and 3-5. These timing specifications are necessary for accurate read operation.

Two modes of encoding, FM and MFM, are used for the data stored on media. FM is used for single-density read, and MFM for double-density read.

A comparison of the FM and MFM encoding modes is shown in Fig. 4-3.

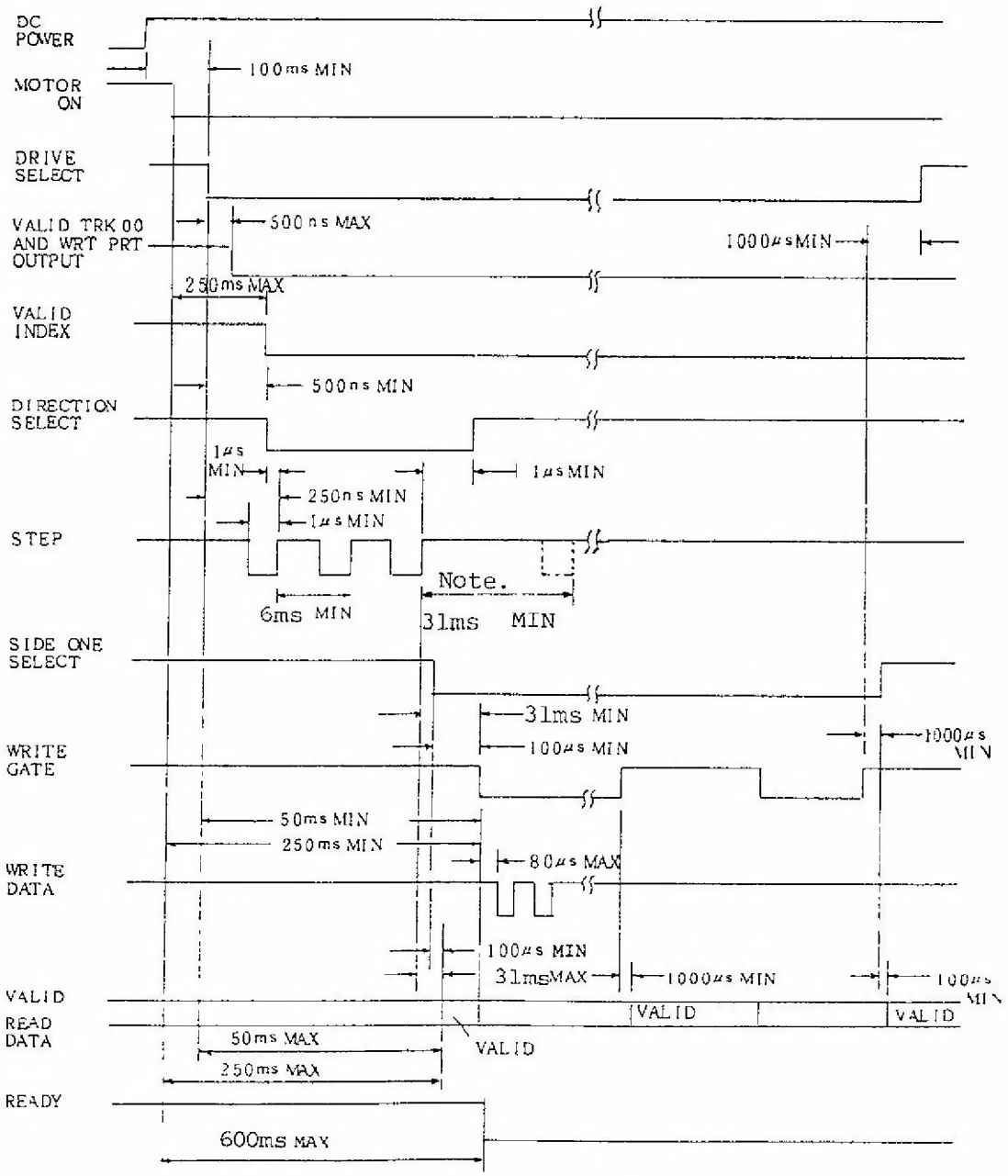
4.6 Write Operation

The requiring timing for write operation is shown in Fig. 3-3.

These timing specifications must be strictly observed to ensure an accurate write operation.

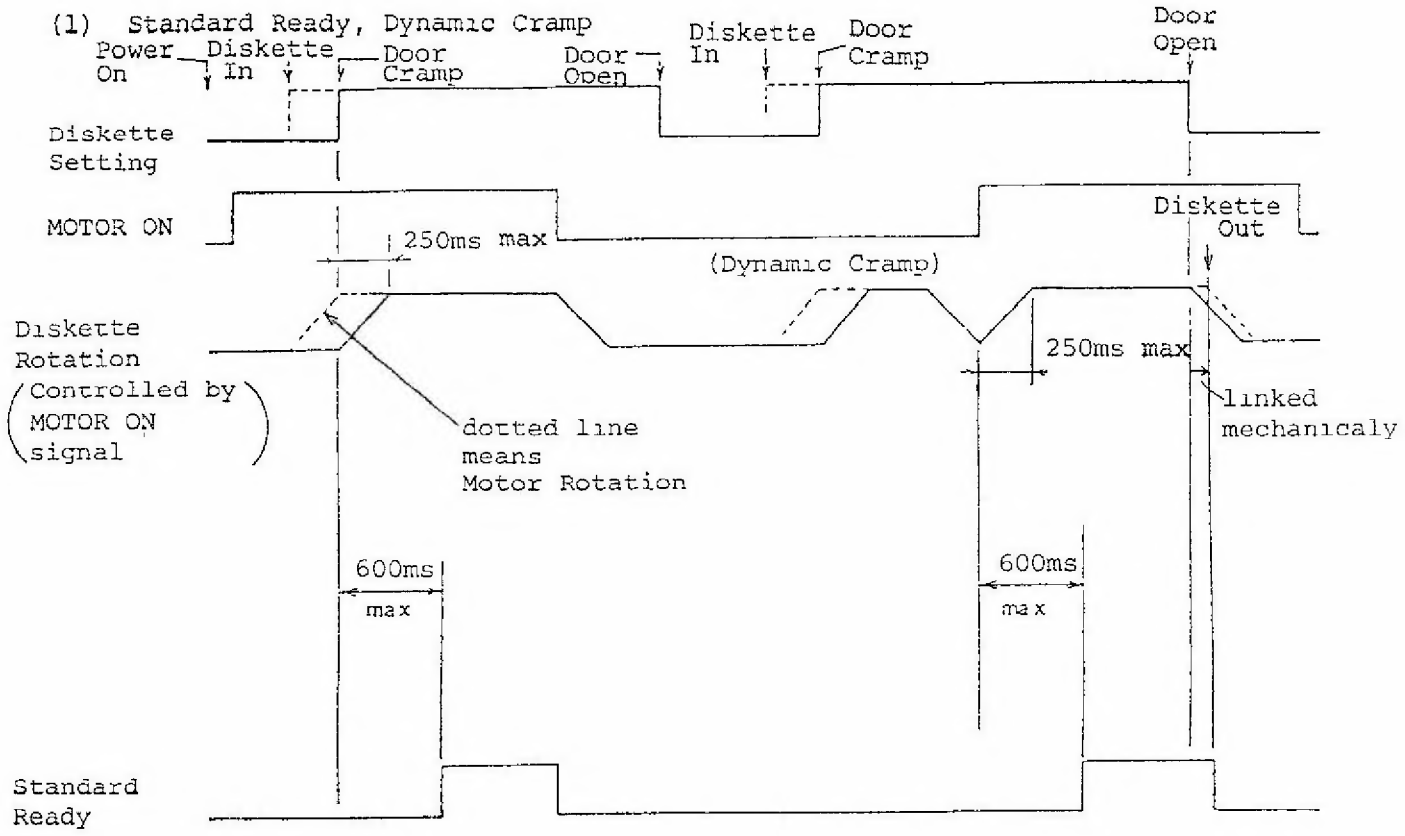
Write data can be encoded by either FM or MFM. The disk drive has good contact stability of the read/write heads on the medium and employs high-performance read/write heads, so no precompensation is necessary for correcting the peak shift effect when writing data in the MFM mode (double density).

In case of applying write precompensation, smaller compensation is recommended such as 250ns or smaller.



Note : When reversing direction, issue a next step pulse after more than 31ms from the step pulse before inversion.

Fig. 4-1 Control and Data Timing



(2) Held Ready, Dynamic Cramp

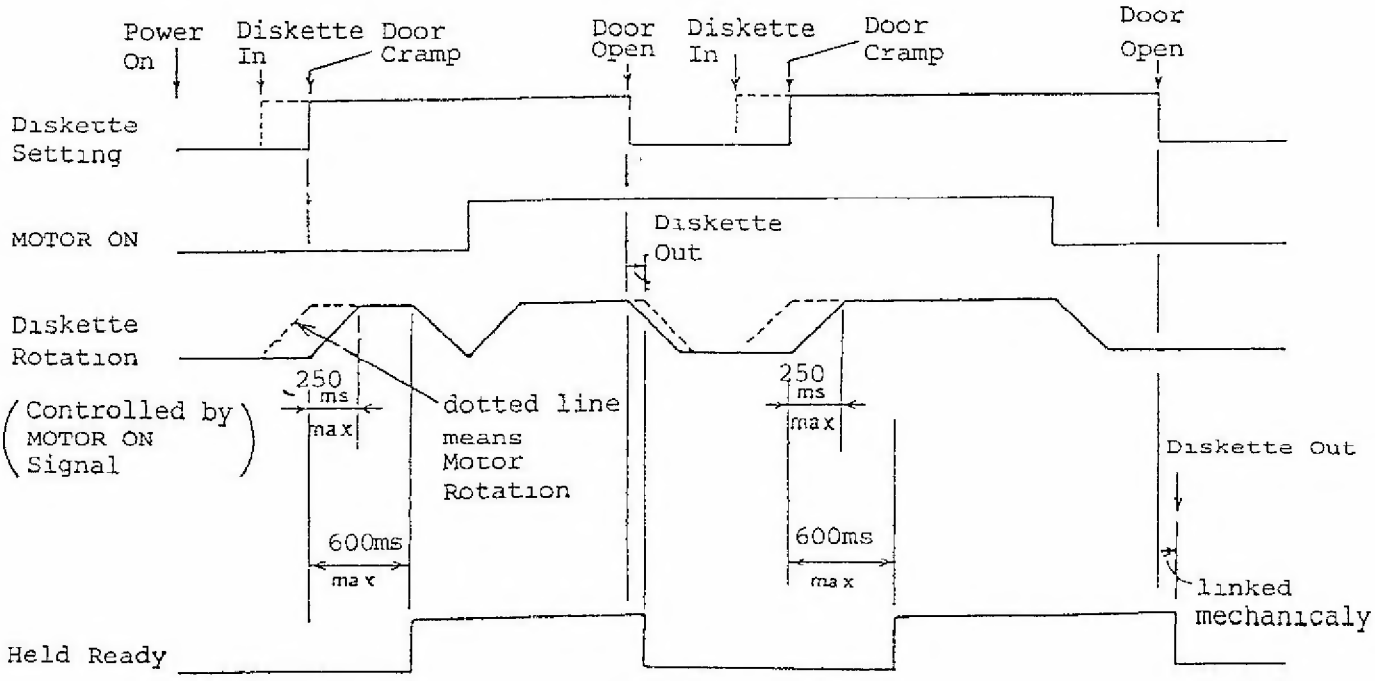


Fig. 4-2 Ready and Dynamic Cramp Timing

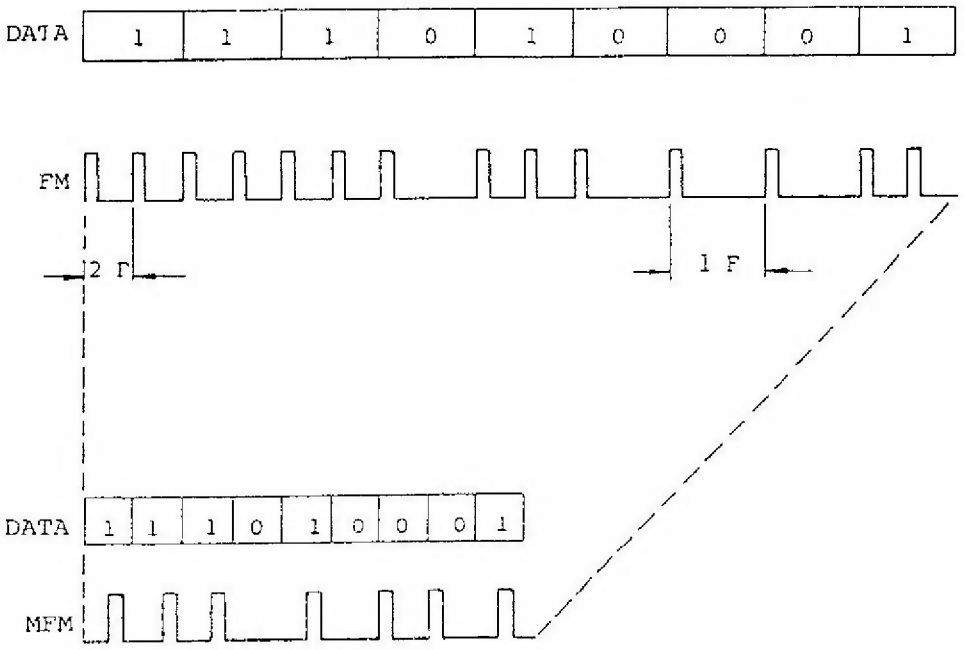


Fig. 4-3 Comparison of FM and MFM Encoding Systems

CHAPTER 5 PHYSICAL INTERFACE

Electronic interfaces between the disk drive and the host system are accomplished with three connectors. Connector J1 is for the signal interfaces, connector J2 for the DC power supplies, and connector J5 for frame grounding. The connectors used for the disk drive and recommended mating connectors are described below.

5.1 Signal Connectors

J1 is a card-edge type, 34-pin (for both sides, or 17 pins for a single side) connector with even-numbered pins (2, 4, to 34) on the parts side and odd-numbered pins (1, 3, to 33) on the soldered side.

A key slot is provided between pins 4 and 6 for the polarity reversal prevention.

The dimensions of J1 are shown in Fig. 5-1.

Recommended P1 connectors that mate with J1 are shown in Tables 5-1 and 5-2.

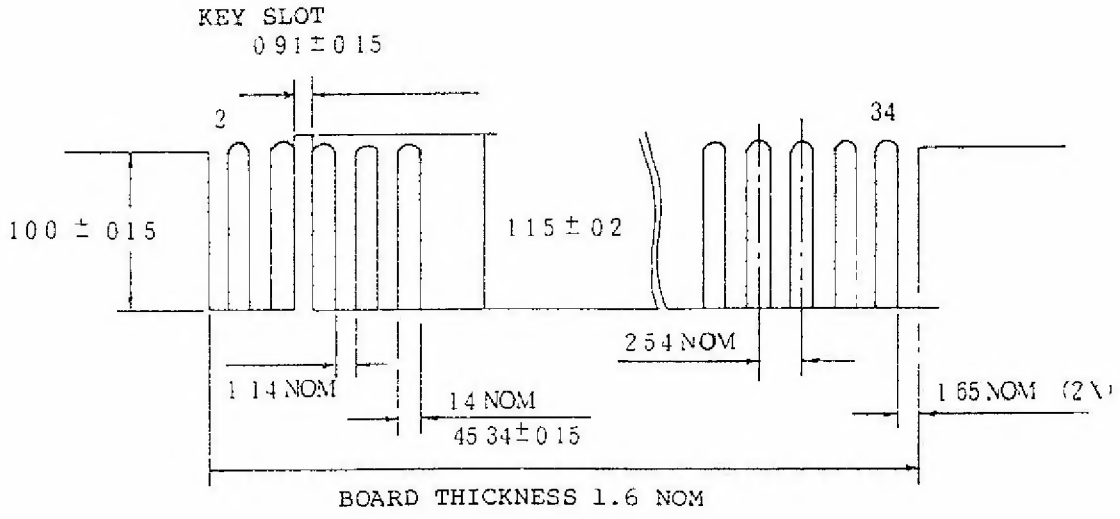


Fig. 5-1 Connector J1 Dimensions (mm) and Pin Numbers

Table 5-1 Connectors for Twisted-Pair Cable (P1)

Parts	Crimp Type	Solder Type
	AMP P/N	AMP P/N
Housing	583717-5	583717-5
Contact	1-583616-1	583854-3
Polarity key	583274-1	583274-1
Crimping tool	90268-1	-
Extraction tool	91073-1	91073-1
Twisted-pair cable (3 m max.)	AWG 26	AWG 26

Table 5-2 Connector for Flat Cable (P1)

Parts		3M P/N
Connector		3463-0001
Polarity key		3439-0000
Crimping tools	Press	3440
	Locator plate	3443-11
	Platen	3442-3
Flat cable (3 m max.)		3365/34

5.2 DC Power Connector (J2/P2)

J2 is a four-pin DC power connector made by AMP, located on the back of the printed-circuit board. Pin 4 on connector J2 is located closest to J1/P1; the arrangement of the pins as viewed from the side is shown in Fig. 5-2. Pin numbers are shown on the parts side.

The connectors on the drive side and cable side are shown in Table 5-3.

Table 5-3 DC Power Connectors

Parts	P2 (Cable Side)	J2 (Drive Side)
	AMP P/N	AMP P/N
Housing	1-480424-0	172349-1
Contact (4 pins)	60619-1	-
Crimp tool	90124-2	-
Extraction tool	1-305183-2	-
Cable (3 m max.)	AWG 18	-

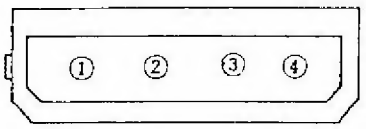


Fig. 5-2 Connector J2

5.3 Frame Ground Connector (J5/P5)

FASTON Terminal	Crimp Terminal
AMP P/N 60920-1	AMP P/N 60972-1

5.4 Interface Connector Physical Location

Fig. 5-3 shows the physical locations of the interface connectors.

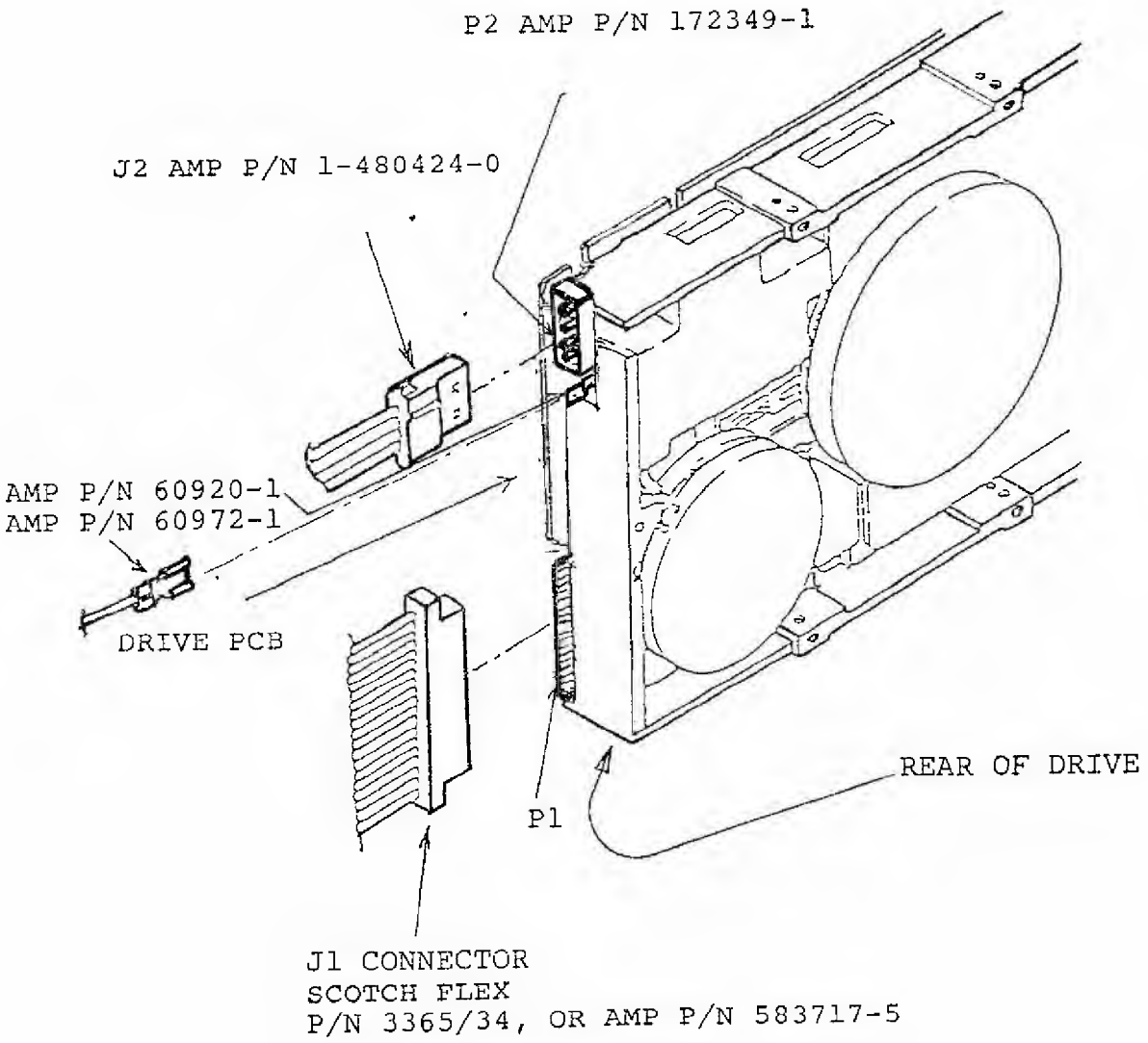


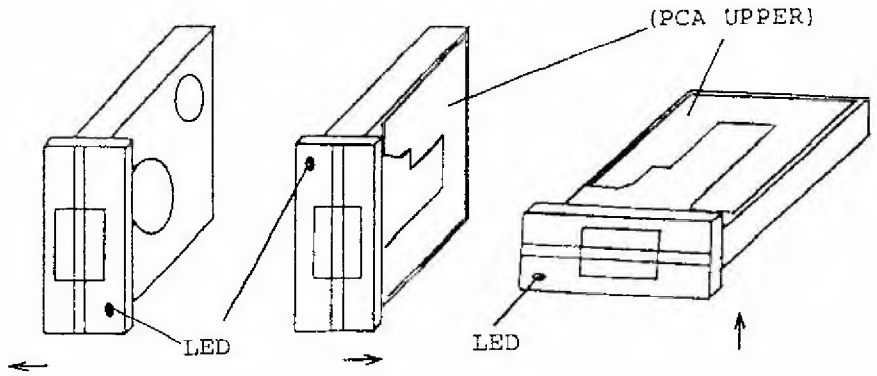
Fig. 5-3 Location of Interface Connectors

CHAPTER 6 DRIVE PHYSICAL SPECIFICATIONS

6.1 Installation Direction

Install the Mini Flexible disk drive in the directions shown in Fig. 6-1.

The slant mount should be within 10 degrees.



(Door open to left) (Door open to right) (Door open to upward)

Fig. 6-1 Disk Drive Installation Directions

6.2 Dimensions of disk drive

See Fig. 6-2.

6.3 Dimensions of Front Panel

See Fig. 6-3.

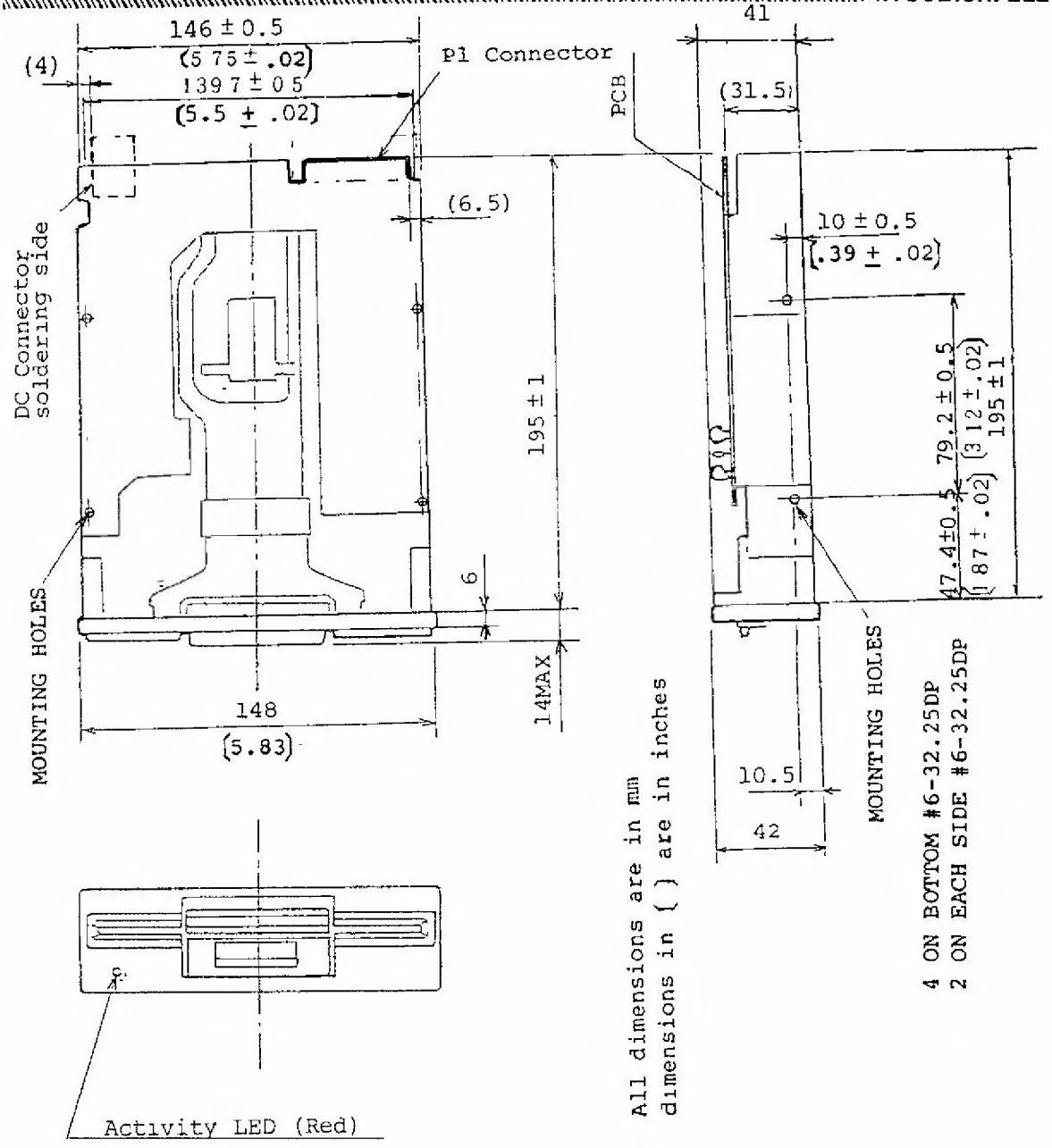


Fig. 6-2 Disk Drive Dimensions

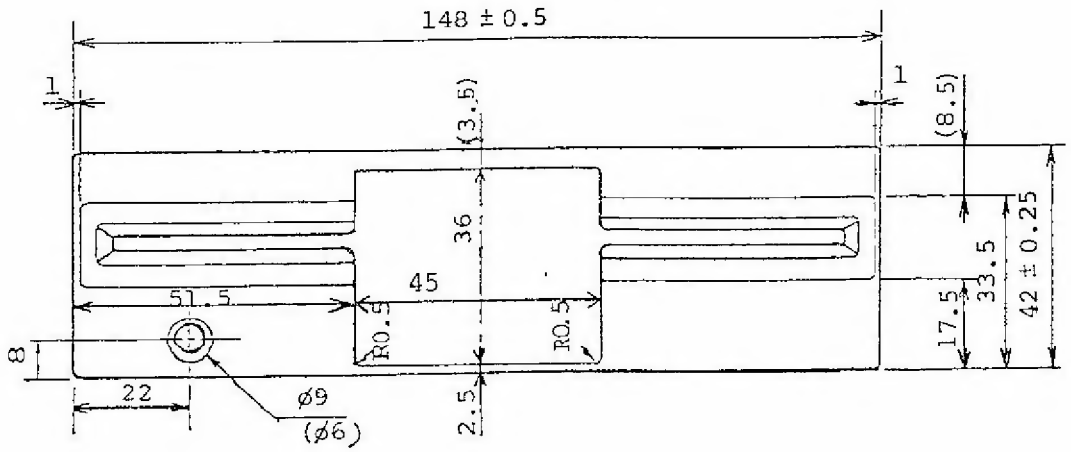


Fig. 6-3 Front Panel Dimensions

CHAPTER 7 ERROR DETECTION AND CORRECTION

This chapter describes the general cause analysis and corrective procedures to be followed in the event that data errors occur.

7.1 Write Errors

If an error occurs during a write operation, it can be detected by performing a read operation on the diskette rotation immediately following the write operation. This is generally called a write check, which is an effective means of preventing write errors. It is recommended, therefore, that a write check be made without fail.

If a write error occurs, repeat the write operation and conduct a write check. If data cannot be correctly written even after the write operation is repeated about ten times, perform a read operation on another track to determine whether the data can be read correctly. If so, a specific track of the diskette is defective. If data cannot be correctly read on the other track, the drive is assumed to have some trouble. If the diskette is defective, replace it.

7.2 Read Errors

Most data errors that occur are soft errors. If a read error occurs, repeat the read operation to recover the data.

The following are possible main causes of soft errors:

- Dust is caught between the read/write head and diskette causing a temporary fault in head contact. Such dust is generally removed by the self-cleaning wiper of the jacket, and the data is recovered by the next re-read operation. If read/write is continued for a long time in a very dusty environment, however, hard errors can result from a damaged diskette surface.

- Random electrical noise ranging in time from a few microseconds to a few milliseconds can also cause read errors. Spike noise generated by a switching regulator, particularly one that has short switching intervals, deteriorates the signal-to-noise ratio, and increases the number of re-read operations for data recovery. It is necessary, therefore, to make an adequate check on the noise levels of the DC power supplies to the drive and frame grounding.

- Written data or diskettes may have so small a defect as cannot be detected by a data check during write operation.

- Fingerprints or other foreign matter on a written diskette can also cause a temporary error. If foreign matters is left on a

written diskette for a long time, it can adhere to the diskette, possibly causing a hard error.

It is recommended that the following read operations be performed to correct these soft errors:

- Step 1: Repeat the read operation about ten times until the data is recovered.
- Step 2: If the data cannot be recovered by Step 1, move the head to other track, the opposite direction of the previous track position before the designated track, and then return the head to the original position.
- Step 3: Repeat an operation similar to Step 1.
- Step 4: If the data cannot be recovered, take the error as a hard error.

CHAPTER 8 RESHIPMENT PRECAUTIONS

When reshipping the drive, make sure the protection sheet for transportation is in place in the drive, and open the door.

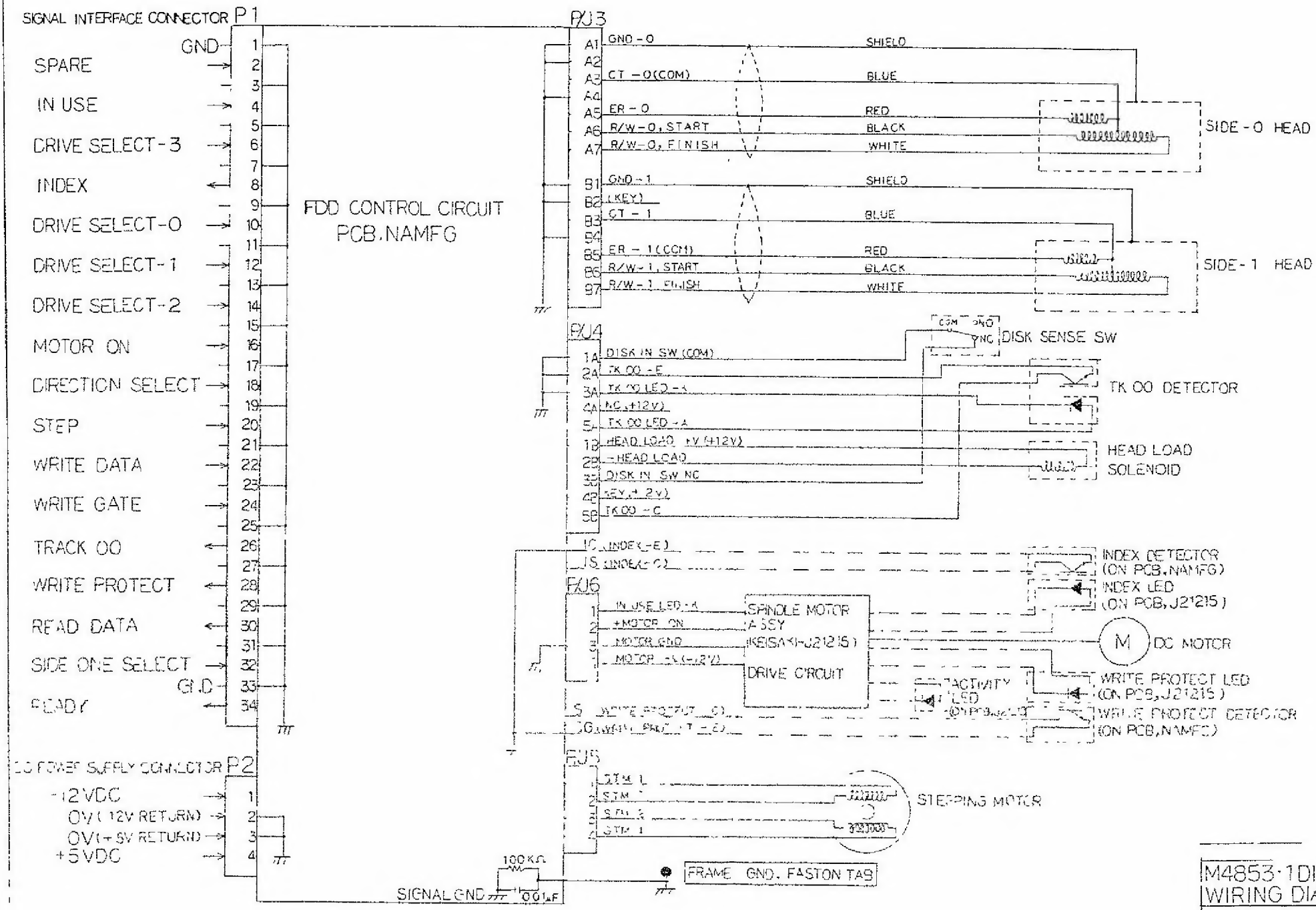
M4853-1 DISK DRIVE SCHEMATICS AND LOGIC MANUAL

Usable for M4851-1

Sheet Title		Page	Revision
M4853-1	DISK DRIVE WIRING DIAGRAM	2/6	A
M4853-1	PCB NAMFG SCHEMATIC	3/6	A
M4853-1	PCB NAMFG PARTS LOCATION DIAGRAM	4/6	A
M4853-1	SPINDLE MOTOR ASSY SCHEMATIC (NAME: E2SLR36 or TS3400N2E13)	5/6 · 6/6	A

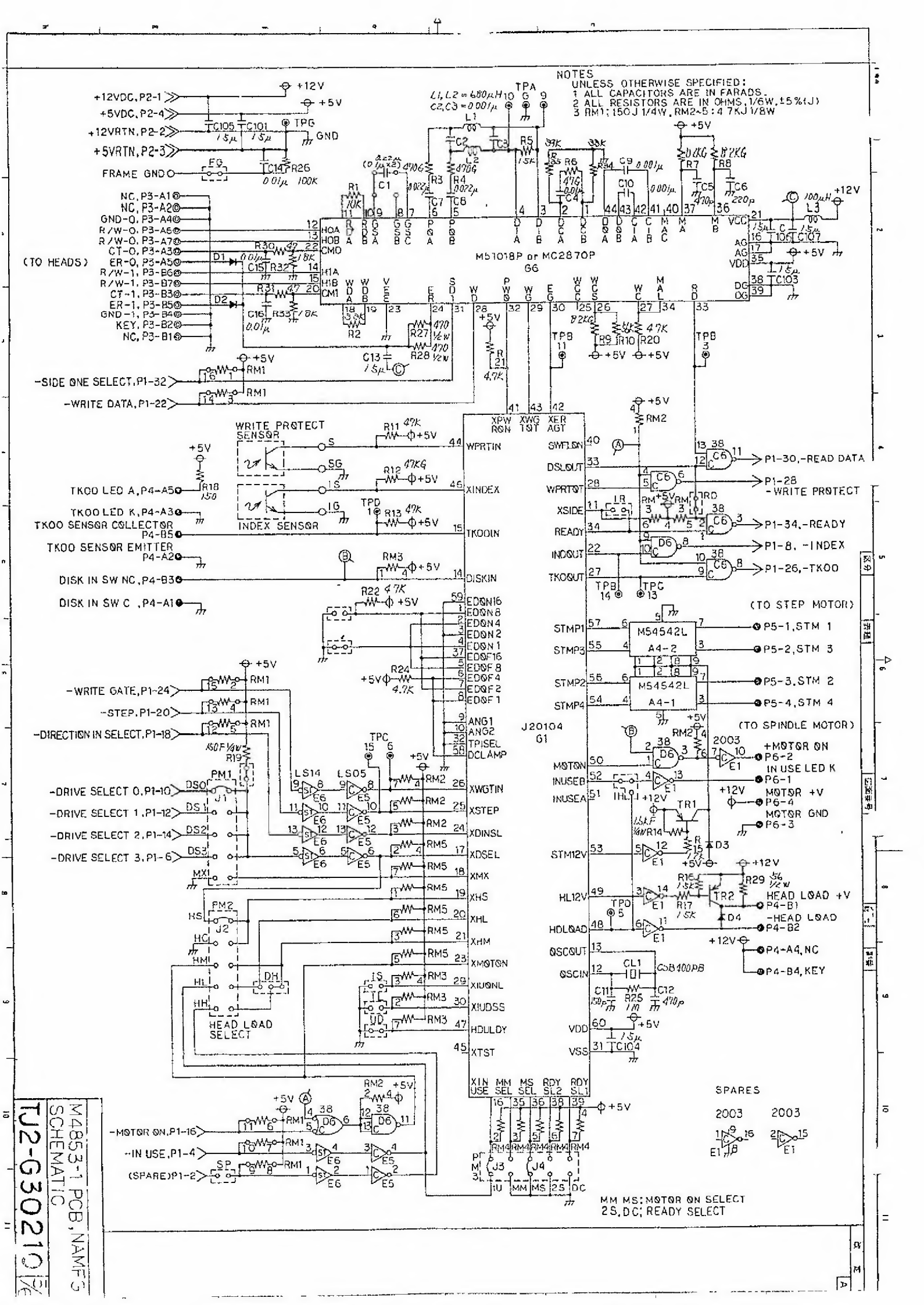
MITSUBISHI ELECTRIC CORPORATION

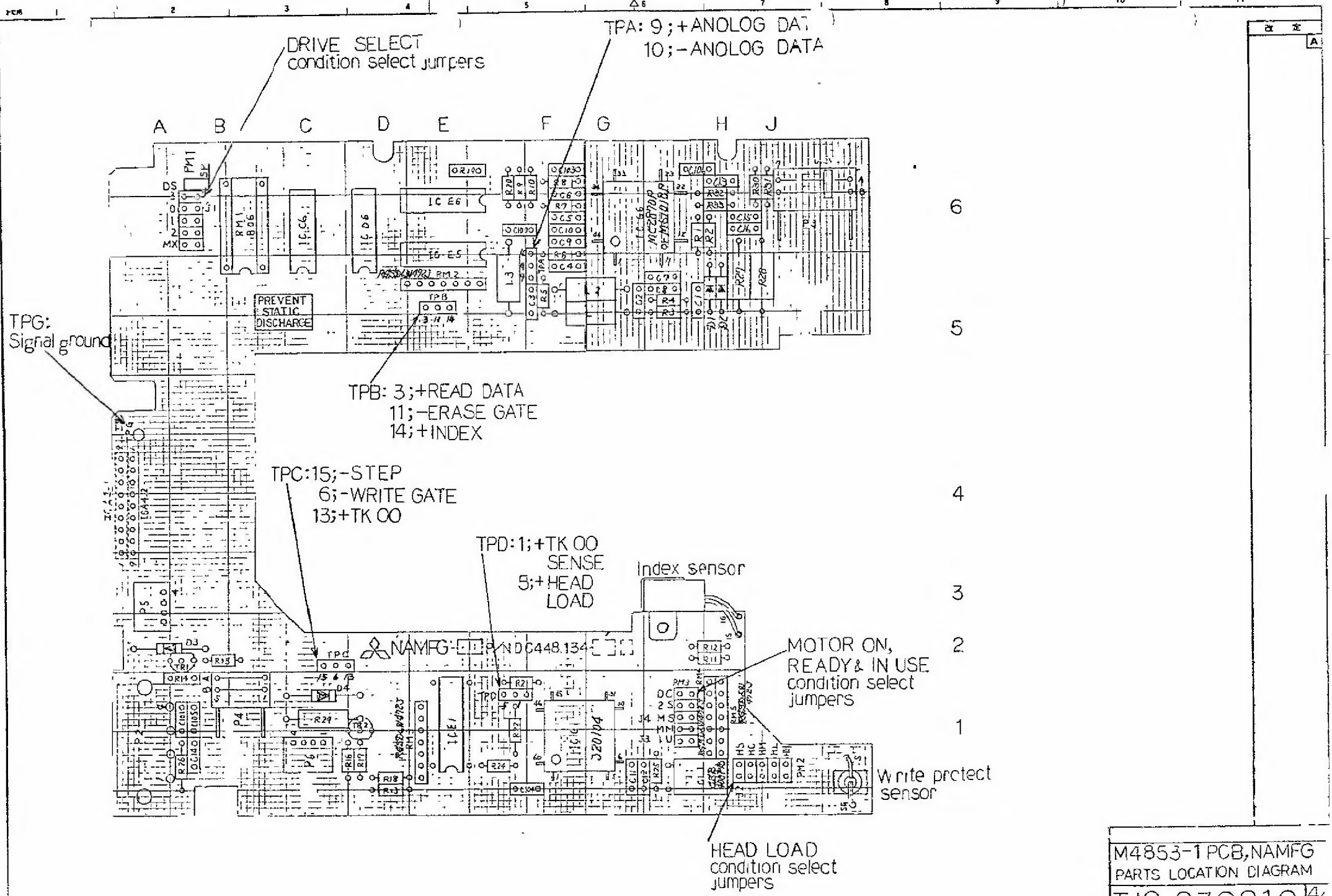
TJ2-G30210A



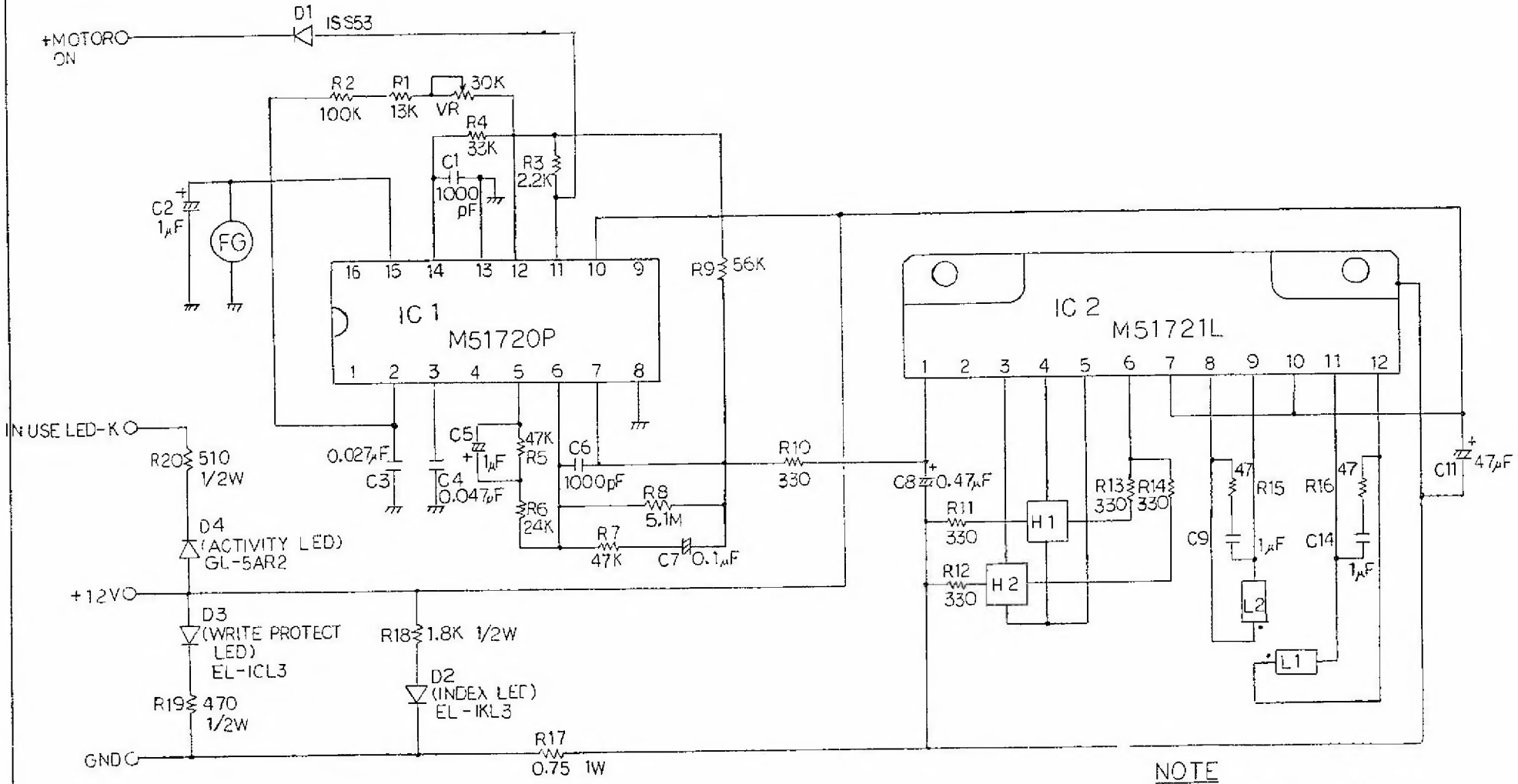
M4853-1 DISK DRIVE WIRING DIAGRAM

TJ2-G30210


NOTES
UNLESS OTHERWISE SPECIFIED:
1 ALL CAPACITORS ARE IN FARADS.
2 ALL RESISTORS ARE IN OHMS, 1/6W, ±5%(J)
3 RM1; 150J 1/4W, RM2~5 : 4.7KJ 1/8W
+12VDC, P2-1
+5VDC, P2-4
+12VRTN, P2-2
+5VRTN, P2-3
FRAME GND
GND
(TO HEADS)
M51018P or MC2870P
G6
-SIDE ONE SELECT, P1-32
-WRITE DATA, P1-22
WRITE PROTECT SENSOR
INDEX SENSOR
TK00 LED A, P4-A5
TK00 LED K, P4-A3
TK00 SENSOR COLLECTOR P4-B5
TK00 SENSOR EMITTER P4-A2
DISK IN SW NC, P4-B3
DISK IN SW C, P4-A1
-WRITE GATE, P1-24
-STEP, P1-20
-DIRECTION IN SELECT, P1-18
-DRIVE SELECT 0, P1-10
-DRIVE SELECT 1, P1-12
-DRIVE SELECT 2, P1-14
-DRIVE SELECT 3, P1-6
HEAD LOAD SELECT
-MOTOR ON, P1-16
-IN USE, P1-4
(SPARE) P1-2
P1-30, -READ DATA
P1-28 -WRITE PROTECT
P1-34, -READY
P1-8, -INDEX
P1-26, -TK00
(TO STEP MOTOR)
P5-1, STM 1
P5-2, STM 3
P5-3, STM 2
P5-4, STM 4
(TO SPINDLE MOTOR)
+MOTOR ON P6-2
IN USE LED K P6-1
MOTOR +V P6-4
MOTOR GND P6-3
HEAD LOAD +V P4-B1
-HEAD LOAD P4-B2
P4-A4, NC
P4-B4, KEY
J20104 G1
SPARES
MM MS: MOTOR ON SELECT
2S, DC; READY SELECT
M4853-1 PCB, NAMFG SCHEMATIC
TJ2-G30210



M4853-1 PCB, NAMFG
PARTS LOCATION DIAGRAM
TJ2-G30210 4/6



NOTE

UNIT: ohms for Resisters

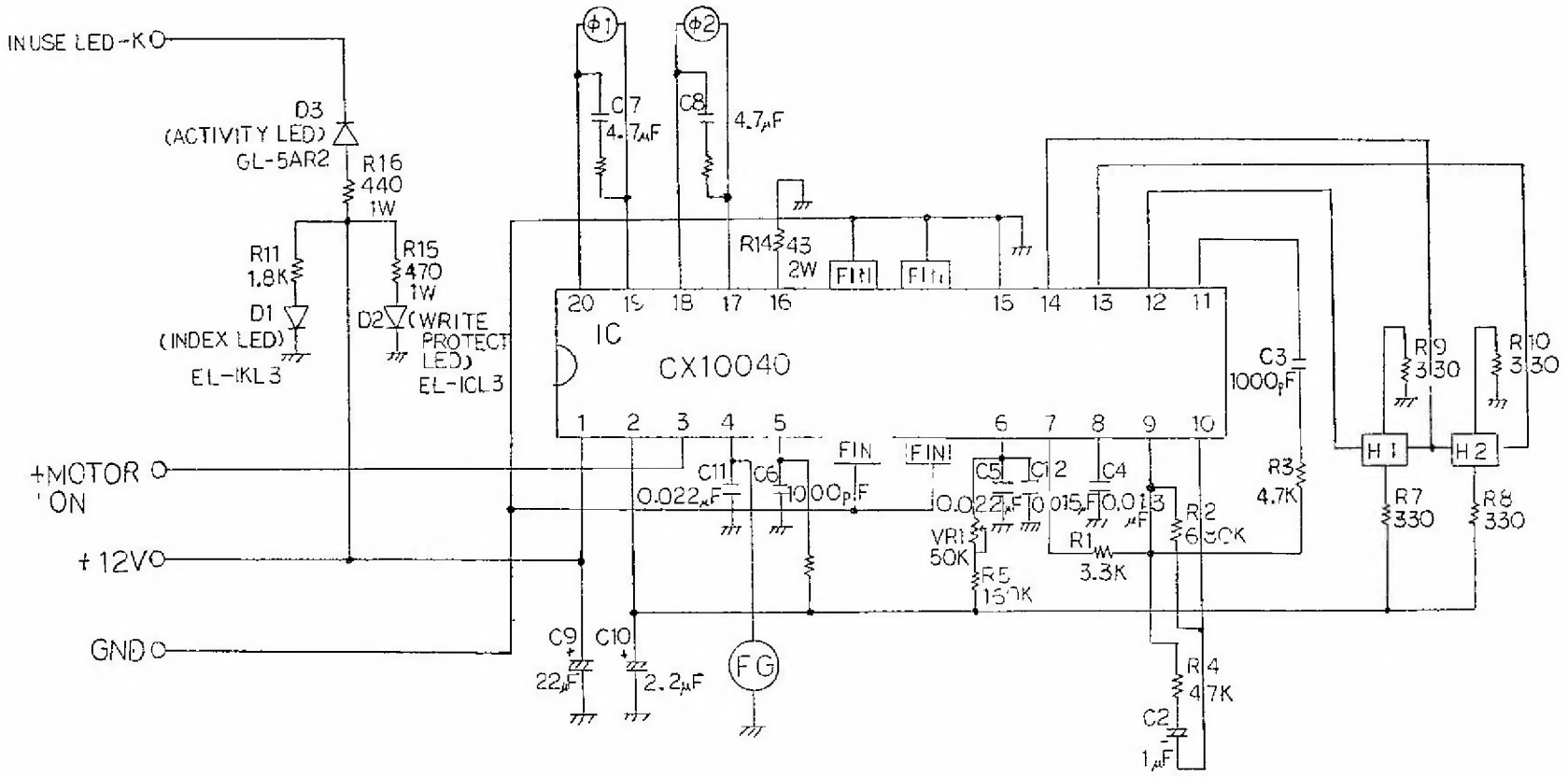
Rotation speed: 300 RPM

NAME

E2SLR36

M4853-1 SPINDLE MOTOR ASSY SCHEMATIC

TJ2-G30210



NOTE

UNIT : ohms for Resisters

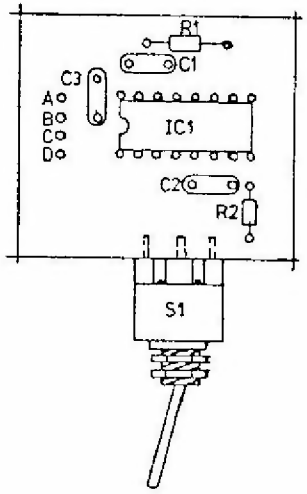
Rotation Speed : 300RPM

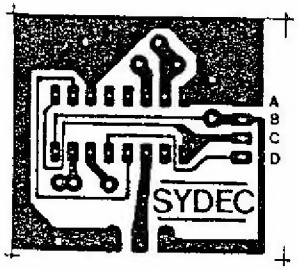
NAME

TS3400N2E13

M4853-1 SPINDLE MOTOR ASSY SCHEMATIC

TJ2-G30210

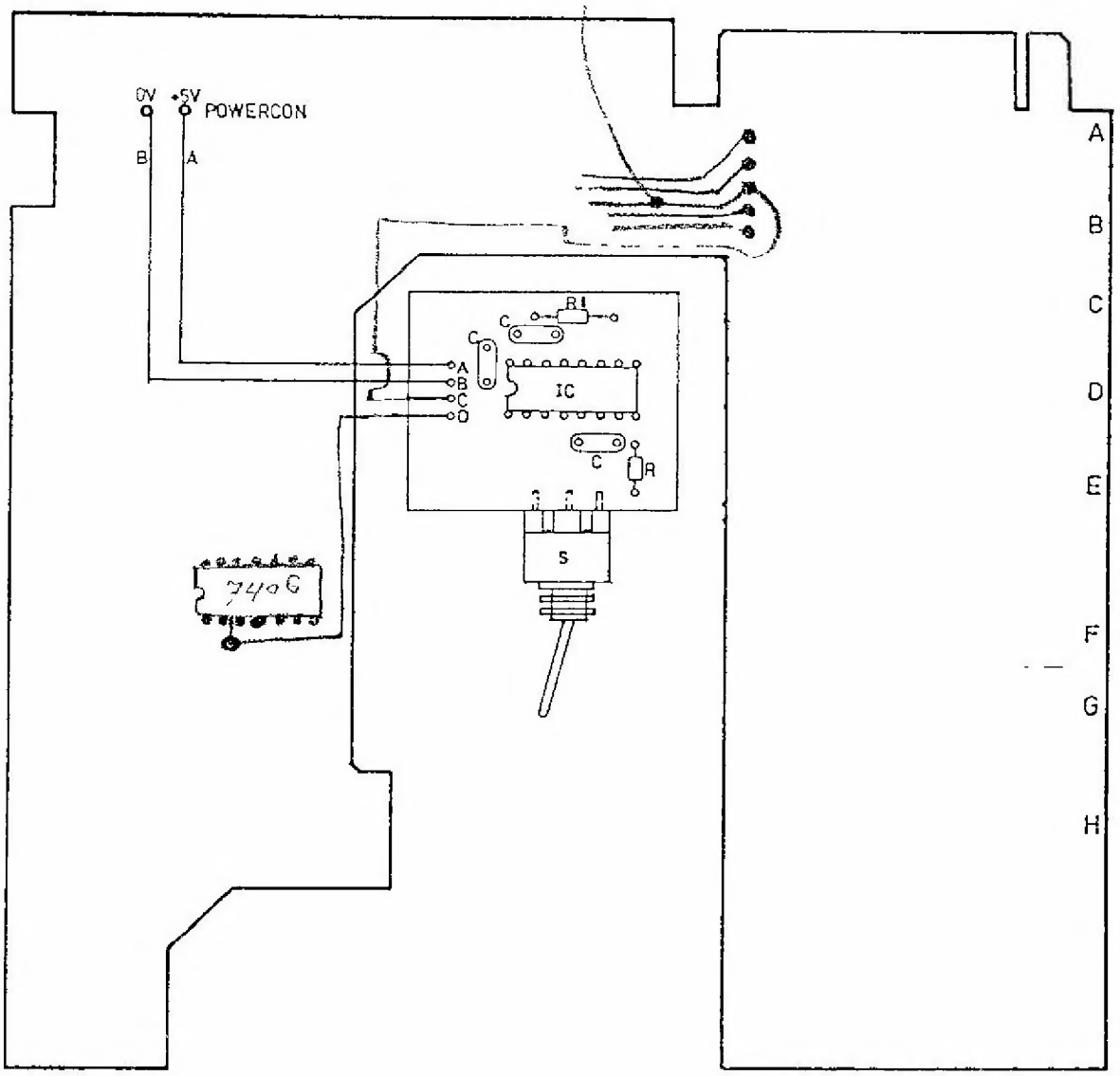




A = +5V
B = 0V
C = IN
D = UIT

IC1 = 74LS123
C1 t/m C3 = 100nF
R1 = 120K
R2 = 86K

Doorverbinden



MODIFICATIE 40/80 TRACK SCHAKELAAR

op een aantal printjes is weerstand
R1 220k [illegible]
echt 120k zijn [illegible]