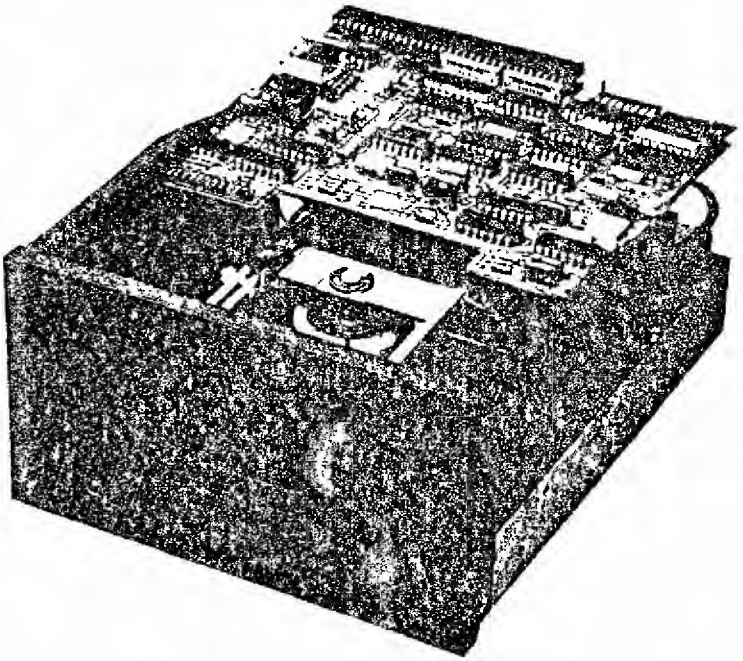
MICRO PERIPHERALS INC.

FLEXIBLE DISK DRIVE

MODEL 51/52

PRODUCT MANUAL



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PROPRIETARY NOTICE

The purpose of this manual is to provide the user of MPI's Model 51/52 Flexible Disk Drives with adequately detailed documentation necessary for efficient installation, operation, maintenance, and ordering of spare parts for the equipment supplied.

Every effort has been made to keep the information contained in this manual current and accurate as of the date of publication or revision. However, no guarantee is given or implied that the manual is error free, or that it is accurate with regard to any particular specification.

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SECTION I

1. INTRODUCTION

1.1 General. This section provides a physical and functional description, and specifications for the Model 51/52 Flexible Disk Drives, manufactured by Micro Peripherals, Inc. In addition to the standard features described, the following additional features are included in all models:

a. "Write Protect" can be used instead as "Disk Installed" indication.

b. When using FM-encoding, an additional board can be plugged on for Data separation.

c Termination of I/O lines can be either 150 ohms or split 220/330 ohms.

1.2 Purpose of equipment. The Model 51/52 Disk Drive is a compact disk memory device designed for random-access data storage, data entry, and data-output applications. Typical applications are intelligent terminal controllers, micro-computers, word processing systems, data communications systems, error logging, micro-program logging, and point-of-sale terminals. Model 51/52 is designed to meet and perform to ANSI specification.

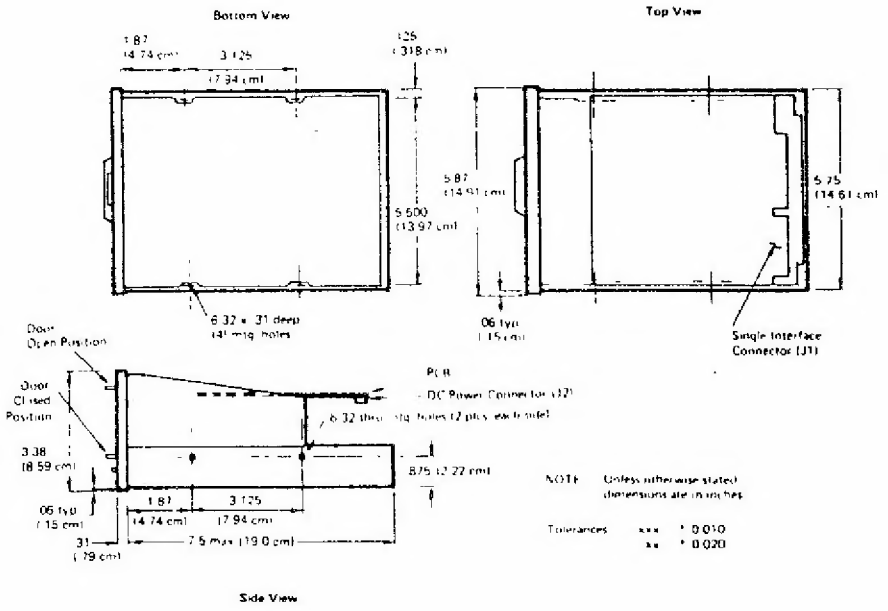


Figure 1-1 Outline and Mounting Dimensions

1.3 Physical description. Model 51/52 can be mounted vertically or horizontally. However, when mounted horizontally, it is recommended that the 51/52 be positioned so that the PCB is on the top side. The mechanical components consist of an aluminum chassis, on which is mounted a spindle (belt-driven by a dc motor); a stepper motor/band combination for positioning the magnetic head assembly; and a cone/clutch assembly for centering and holding the recording media under operation. Access for diskette loading is at the front of the drive. The recording-head assembly is of a glass bonded ferrite/ceramic structure, with lifetime expectancy in excess of 20,000 hours. The electronic circuitry is mounted on a PCB located on top of the drive. Power and interface signals plug directly into this board. The following basic circuits are included:

a. Stepper motor control logic.

b. Read circuit.

c. Write/Erase circuit.

d. Spindle motor speed control.

e. Index; Track 00 and Write Protect sensing.

f. Head load driver.

1.4 Functional description. Model 51/52 is self-contained and requires no operator intervention during operation. The drive consists of a media-rotating system, a head-load and positioning system, and a write/erase and read system. When the

front door is opened, access for inserting the diskette is provided. When inserting the diskette, all positions except in/out are controlled by physical guides internally. Correct in/out is assured by inserting the diskette until a "click" is heard. Closing the front door activates the cone/clutch system which serves two purposes in the following order:

a. Correct centering of the media

b. Clamping the media to the spindle hub.

The spindle hub rotates at a constant speed of 300 rpm by means of a dc motor/tachometer and a reference in a closed-loop system. When in operation, it is important that the head-to-media relationship be controlled. This is accomplished by the head-load system in the following way. The media is pressed against a reference platen which is referenced to the head and the spindle hub; and a pressure pad is loaded against the media on the opposite side of the head with a force of approximately 17gr. The recording head is positioned over the correct track by means of a four-phase stepper motor/band direct-drive mechanism, and its associated electronics. A one-step movement causes a one-track movement. With band positioning, very high step rates can be accomplished with the 51/52 system. When a Write Protected diskette is inserted, the write protect sensor normally disables the write/erase circuits in the drive. When writing, a .013 inches (nominal) data track is recorded, followed by a tunnel erase which trims the track down to .012 inches (nominal). Data recovery electronics include a low-frequency amplifier, a differentiator, a cross-over detector, a digital filter, and a final pulse generator. For FM recording, a data decoder may be added to achieve separated clock and data pulses on the I/O connector.

SPECIFICATIONS

TABLE 1-1

GENERAL

Parameter	Characteristics
Media	ANSI standard 5¼-inch diskette
Number of Tracks	40/51 70/52
Track Density	48 TPI
Start/Stop Time	.5 sec
Rotational Speed	300 rpm ± 1½%
Average latency	100 msec
Head loading time	35 msec
Access time	5 msec, track-to-track
Head settling time	15 msec
Head life	20,000 hours
Media life	3×10^6 passes on single track
Recording method	FM, MFM, M^2FM, GCR
Recording density (FM)	2810/5620 bpi
Flux density	5620 fci max.
Data-transfer rate	125K/250K bits/sec.
Power-up Delay	1 sec
PHYSICAL	
Height	3.25 inches (8.255 cm)
Width	5.75 inches (14.605 cm)
Length	7.5 inches (19 05 cm)
Weight	3 0 pounds (1.36 kg)

POWER REQUIREMENTS

TABLE 1-2

Power	+12 VDC ± 5%, 1.5A
	+5 VDC ± 5%, 0.7A
Typical Power Dissipation	15W Operation
	6W Standby

ENVIRONMENTAL

TABLE 1-3

Parameter	Characteristics
Operating Temperature	40° to 115°F (4.4°C to 46.1°C)
Relative Humidity	20 to 80% (noncondensing)

DATA CAPACITY UNFORMATTED (K BYTES)
TABLE 1-4

Parameter	Single Density (FM)		Double Density (MFM, M^{2}FM)	
	51	52	51	52
Track	3.13	3.13	6.25	6.25
Disk	125	218.8	250	437.5

RECOMMENDED CONNECTORS – P1
TABLE 2-1

TYPE OF CABLE	MANUFACTURER	CONNECTOR P/N	CONTACT P/N
Twisted Pair, 26	AMP	583717-5	1-583616-1
Flat Cable	3M "Scotchflex"	3463 0001	N A

SECTION II

2. INSTALLATION AND CHECKOUT

2.1 Scope. This section provides the information and procedures necessary to place Model 51/52 Flexible Disk Drives into operation.

2.2 Unpacking. During unpacking, care must be exercised to ensure that all tools are non-magnetic and do not inflict damage to the unit. As the unit is unpacked, inspect it for possible shipping damage. All claims for this type of damage should be filed promptly with the transporter involved. If a claim is filed for damages, save the original packing material. Most packing material may be reuseable if reasonable care is used in unpacking. Unpack the drive as follows:

a. Remove external packing material carefully.

b. Remove the drive from the container.

c. Remove internal packing materials, following instructions provided on the package.

d. Ensure that front access door opens and closes, and that the head-load arm raises when door is opened.

e. Ensure that bezel is secured.

f. Ensure that drive hub manually rotates freely.

g. Ensure that stepper motor/head carriage assembly is not binding at any point, by manually moving carriage back and forth.

2.3 Installation. Due to its small size and light weight, Model 51/52 can be installed or mounted in any convenient location or position. However, the drive must be installed in a location that will prevent the I/O cable from exceeding 10 feet in length. Refer to Figure 1-1 for dimensions and mounting provisions.

2.4 Hardware. The flexible disk drive is a precision device in which certain critical internal alignments must be maintained. Therefore, in keeping with rigid disk requirements, it is important that the mounting hardware does not introduce significant stress on the drive. Any mounting scheme in which the drive is part of the structural integrity of the enclosure is not permitted. Since the disk drive cannot be subjected to significant stress when it is slide mounted, this type of mounting generally satisfies the foregoing requirements. Mounting schemes should allow for adjustable brackets or incorporate resilient members to accommodate tolerances. Mounting schemes involving more than two hard mounting points and a third point should be avoided.

2.5 Dust cover. Since the flexible disk drive is not provided with a dust cover, the design of an enclosure should incorporate a means to prevent direct ingress of loose items, e.g., dust, paper punch waste, etc.

2.6 Cooling. Heat dissipation from a single disk drive is normally 15 watts (40 Btu/Hr). When the drive is mounted so that the components have access to free flow of air, normal convection cooling allows operation over the specified temperature range. When the drive is mounted in a confined environment, air flow may have to be provided to maintain specified air temperatures in the vicinity of the motors, PCB, and the diskette.

2.7 Drive separation. In addition to the cooling requirements specified in Paragraph 2.6., a minimum separation of 25.4 mm (1 inch) between drives is recommended. This is required to avoid electrical interference between the motors on one drive and the magnetic head of another drive. Closer mounting is allowable if a grounded sheet of steel at least 1.52 mm (0.060 inch) thick is interposed between units. However, use of this steel sheet may increase the cooling requirements.

2.8 Input/output cable. The I/O cable is an optional item and is supplied on order. Refer to Table 2-1 for cable connector part number and attachment. The maximum cable length from connector to connector is 10 feet. All inputs and outputs are paired, one line for function, one for ground. Figure 3-11 provides information relative to the connector pin/signal assignments for I/O cable. (MPI P/N 3-06001-001)

2.9 DC power. DC power to the drive is via connector P2/J2, which is located on the non-component side of the PCB near the spindle motor. The drive uses +12V dc and +5V dc. Table 1-2 outlines the voltage and current requirements. The connector is an AMP Mate-N-Lock Part No. 1-480424-0. (MPI P/N 3-06002-001)

2.10 Initial checkout. The following procedure should be used to determine that the Model 51/52 is operational. This procedure assumes that the drive is installed, I/O cable and power are connected, and that the steps in 2.2 have been completed.

a. Apply "Motor On" command and assure that spindle hub rotates in correct direction (clockwise from top of drive).

b. Load the diskette and apply a head-load command to the drive. Check that head-load solenoid actuates and indicator lights on front panel. Select proper device address.

c. Apply stepping and direction commands to the unit. Verify that the actuator steps as commanded.

d. Remove all command signals, turn power off and return diskette to its storage.

SECTION III

3. INTERFACING REQUIREMENTS

3.1 General. Communication between the host system and the Model 51/52 Flexible Disk Drive is established via two connectors. Connector J1 establishes a communication link for all input/output signals. These signals are TTL compatible. Connector J2 provides dc power to the device.

3.2 Input lines. The input control lines have the following electrical specifications:

a. True, Logical Zero = 0V $\pm$ 0.4V @ Iin = 48 ma (max).

b. False, Logical One = +2.5 to +5V (open collector @ Iout = 250 μa max).

3.2.1 Line termination. The signal interface used by Model 51/52 is of the "bus" or "daisy-chain" type. Only one 51/52 unit is logically connected to the interface at any given time. All input signals are terminated directly by a 150 ohm or a 220/330 ohm resistor network. In a daisy-chain configuration, only the last device in the daisy chain should have the terminating network; while in a star configuration, every device should be terminated.

3.2.2 Programmable shunt. The main function of this device is to assign the proper address to the drive in a multi-drive configuration. In addition, it also determines when the head-load solenoid should be activated by using either position 1-14 (with Select) or 7-8 (with Motor On). If position 5-10 is left shorted, the drive is essentially always selected, but the activity light will not come on, and the solenoid will not be activated until the drive position is selected. The programmable shunt is AMP P/N 435704-16 (MPI P/N 1-79600-001). For convenience, the programmable shunt could be replaced by a dip switch, AMP P/N 435166-14 (MPI P/N 1-79601-001). (If dip switch is used, maximum height is exceeded by .150.) The seven lines channeled through the shunt are:

		Designator	Pins
a.	Head Solenoid w/Select	T1	1-14
b.	Drive Select 1	T2	2-13
c.	Drive Select 2	T3	3-12
d.	Drive Select 3	T4	4-11
e.	MUX (Grounded)	T5	5-10
f.	Drive Select 4	T6	6-9
g.	Head Solenoid w/Motor On	T7	7-8

3.2.3 Drive Select 1 to 4. The Select lines provide a means of selecting and deselecting one of the four disk drives attached to the controller. When the signal logic level is true (low), the disk drive electronics are activated, the head is loaded, and the drive is conditioned to respond to step or read/write commands. When the logic level is false (high), the input control lines and output status lines are disabled. A select line must remain stable in the true (low) state until the execution of a step or read/write command is completed. After the desired device is selected, allow a 35 msec delay before initiating a read (see Figure 3-2).

3.2.4 Motor on. This input is provided to extend the life of the dc spindle motor. The motor should be turned off if no activity is required of the Model 51/52 after 10 revolutions of the diskette. A minimum of 0.5 second is required before performing a read or write after a "Motor On" command is transmitted to the device (see Figures 3-2 and 3-4).

3.2.5 Direction select. The direction of motion of the Read/Write head is defined by the state of this input line. A true (low) level defines direction as "IN" towards center of the disk; a false (high) level defines the direction as "OUT" (see Figure 3-1).

3.2.6 Step. Together with the direction line, a single pulse on this input will move the Read/Write head one cylinder in or out, dependent on the state of the direction line. The motion of the head is initiated on the trailing edge of step pulse. A minimum of 0.2 μs pulse width at a maximum frequency of 200 Hz should be maintained to assure step integrity (see Figure 3-1).

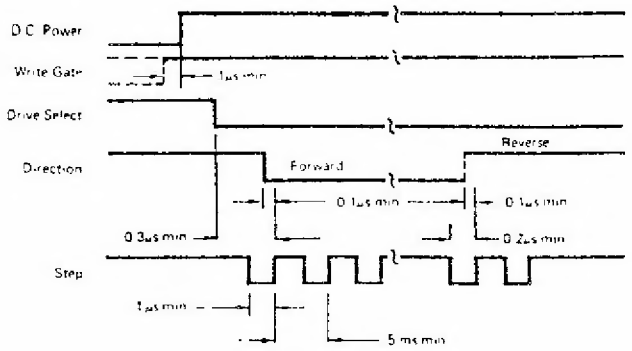


Figure 3-1 Track Access Timing

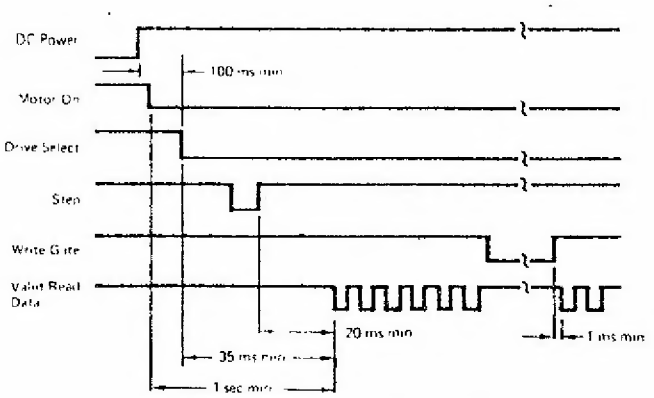


Figure 3-2 Read Initiate Timing

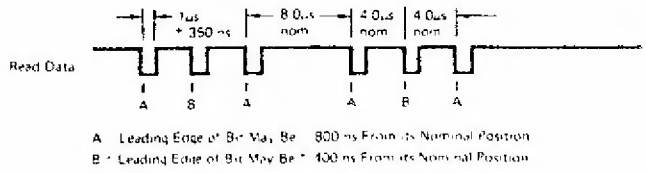


Figure 3-3 Read Signal Timing

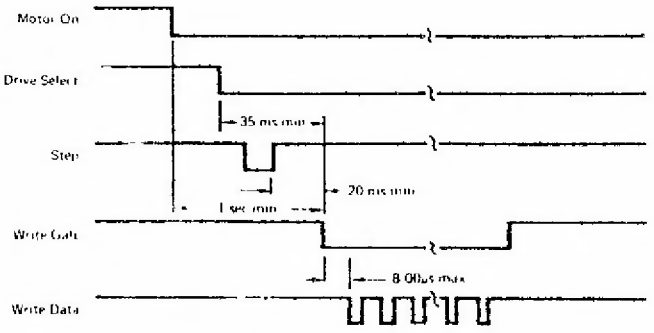


Figure 3-4 Write Initiate Timing

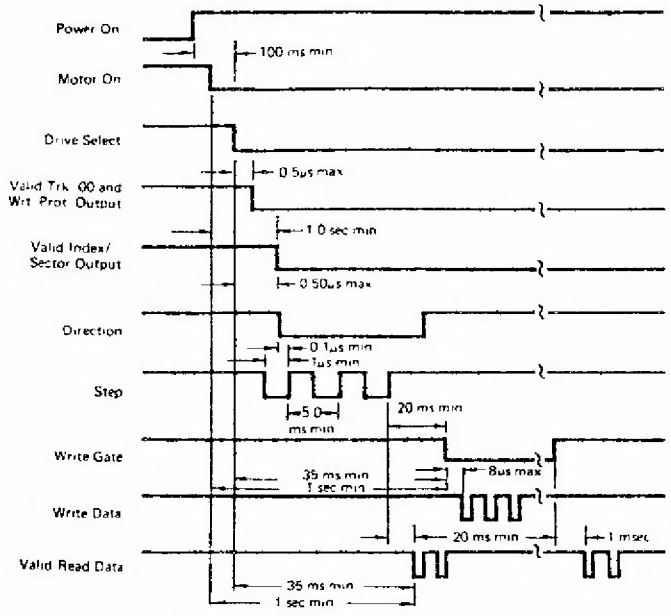


Figure 3-6 General Control and Data Timing Requirements (Head Load Solenoid is Activated with Drive Select)

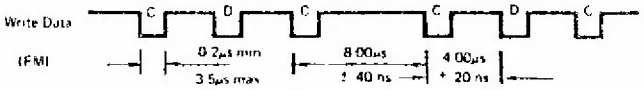


Figure 3-5 Write Data Timing

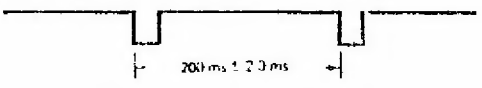


Figure 3-7 Index Sector Timing (soft sector)

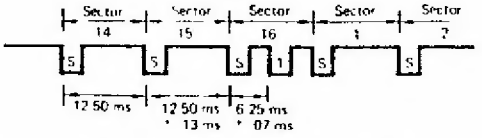


Figure 3-8 Index Sector Timing (hard sector)

3.2.7 Write gate. When true, this input line permits writing of data. When inactive, it permits transmitting data to the controller. Allow a minimum of 1 msec after dropping write gate before expecting valid Read Data (see Figures 3-4 and 3-6).

3.2.8 Write data. This input, in conjunction with the write gate input, provides data to be written on the diskette. The frequency of the write oscillator should be held within 0.1% with a pulse width of a minimum of 0.2 μsec and maximum of 3.5 μsec. The frequency is dependent upon the encoding scheme used and the density option exercised (see Figures 3-4 and 3-5). It is recommended that the first leading edge of Write Data occurs no sooner than 4 μsec and no later than 8 μsec after leading edge of Write Gate. The same recommendation exists for the last Write Data and trailing edge of Write Gate.

3.2.9 Side select. This input is used to select either the upper or lower head. A 35 msec delay should be allowed for the read amp to recover after a head select event occurs. Only then will valid data be present. (For Model 51, this line should always be high.)

3.2.10 In use (optional feature). This line is connected to a driver which could be used for an indicator light, or a solenoid for latching the front door.

3.3 Output lines. The control output signals are driven with an open-collector output stage capable of sinking a maximum of 48 ma at logical zero as true state with maximum voltage of 0.4V measured at the driver. When the line driver is in a logical one or false state, the collector cutoff current is a maximum of 250 μa.

3.3.1 Track 00. This output, when true, indicates that the Read/Write heads are located over Track 00.

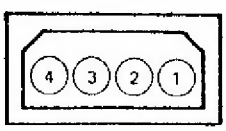
3.3.2 Index/sector. Once every revolution, a pulse is transmitted to the controller indicating the beginning of a track, but only if a single hole diskette is used. If multi-hole media is used in conjunction with the index, sector pulses (10, 16) will also be transmitted to the host system. Leading edge of sector to leading edge of index is 6.25 msec ± .07 msec for 16-sector media (see Figures 3-7 and 3-8).

3.3.3 Write protect. This interface signal is provided by the drive to give the user an indication that a write protected or read-only diskette has been installed. This output is false when the diskette is not write protected. This line may easily be used as a Disk Installed Indicator, if only write protected disks are used.

3.3.4 Read data. This output represents digitized data as detected by the drive electronics. Information transmitted will be in the encoding scheme used. Pulse width of both clock and data bits will be 1 μsec ± 350 nsec. Maximum bit shift for a clock is ± 800 nsec while that for data is ± 400 nsec from their nominal bit positions (see Figure 3-3). The leading edge of each Read Data pulse represents the true position of the flux transition on the recording media.

3.4 Connector J2. The dc power connector is located on the non-component side of the printed circuit board. The recommended mating connector is AMP P/N 1-480424-0 using AMP pins P/N 60619-1.

3.5 Connector J1. Connection to J1 is through a 34-pin PCB edge connector. Even numbered pins are located on the component side while odd numbered pins are located on the solder side. A key slot is provided between pins 4 and 6. The recommended connector is 3M Scotchflex P/N 3463-001, or AMP P/N 583717-5 using AMP contacts P/N 1-583616-1.



Pin 1 +12V DC
Pin 2 12V Return
Pin 3 5V Return
Pin 4 +5V DC

Figure 3-9 DC Power Connector, J2

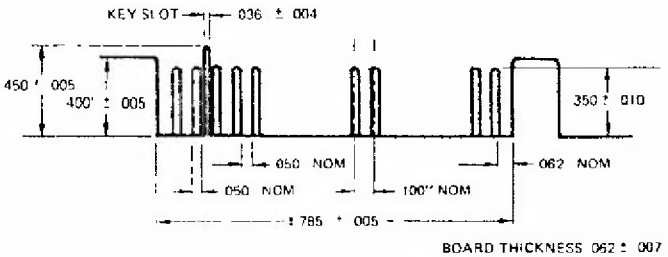
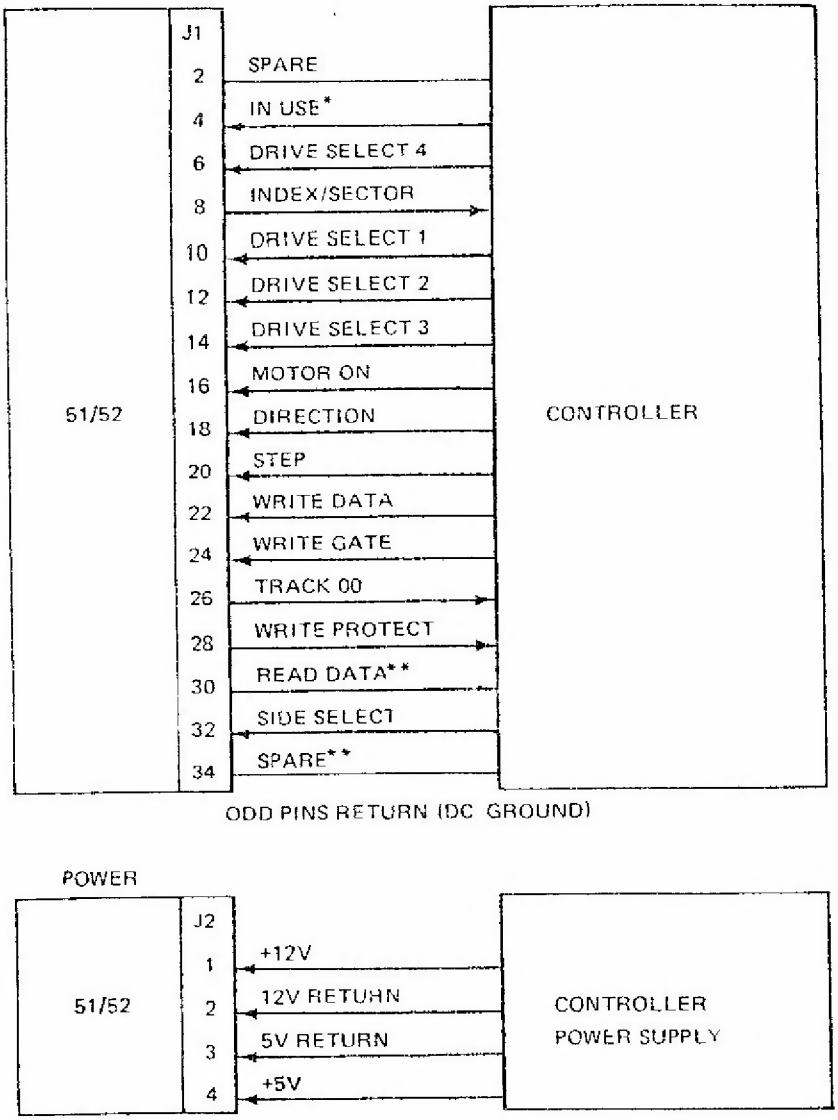


Figure 3-10 J1 Connector Dimensions



* In use may be configured as Door Lock or Activity Light.

** With the optional Data Separator installed, Pin 30 is Separate Clock and Pin 34 is Separate Data.

Figure 3-11 Interface Signals -- 51/52

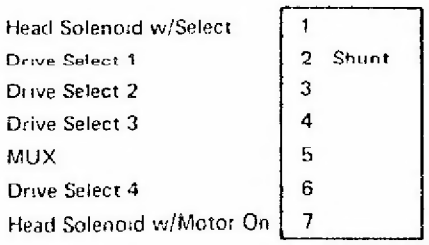


Figure 3-12 Shunt Configuration

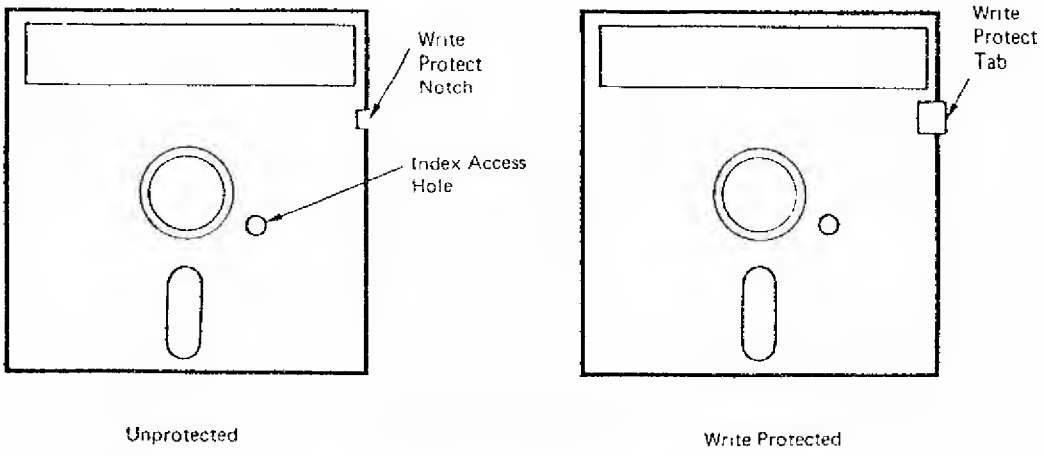


Figure 3-13 Write Protect Option

SECTION IV

4. OPERATION

4.1 General. The Model 51/52 Flexible Disk Drive is under direct control of the interface and power sources. No special start-up procedures are necessary.

4.2 Operating instructions. Secure both power and I/O connectors prior to disk loading.

4.2.1 Flexible diskette loading.

a. Apply dc power to drive.

b. Open drive door by pushing door latch button.

c. Remove diskette from its storage envelope and insert in the drive. The index hole must be on the left side of the jacket and the label on the right towards the door. Push the diskette forward until a "click" is heard. (See Figure 4-1).

d. Close door by pushing door down until latch secures the door.

4.2.2 Flexible diskette removal.

a. Open the drive door by pushing door latch button. The flexible diskette will automatically be ejected to a position where it can be easily removed.

b. Always store the diskette in its storage envelope in order to maintain the highest data integrity.

c. Close drive door.

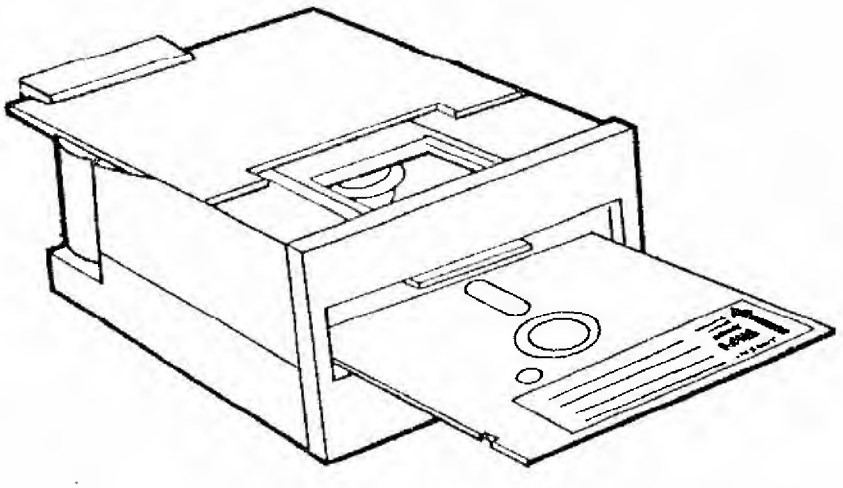


Figure 4-1 Diskette Orientation

4.3 Diskette handling recommendations. Since the recorded diskette contains vital information, reasonable care should be exercised in its handling. Longer diskette life and trouble-free operation will result if the following recommendations are followed:

a. Do not use a writing device which deposits flakes (i.e., lead or grease pencils) when writing on a diskette jacket label.

b. Do not fasten paper clips to diskette jacket edges.

c. Do not touch diskette surface exposed by jacket slot.

d. Do not clean diskette in any manner.

e. Keep diskette away from magnetic field and from ferro-magnetic materials that may be magnetized.

f. Return diskette to envelope when removed from drive.

g. Protect diskette from liquids, dust and metallic substances at all times.

h. Do not exceed the following storage environmental conditions:

Temperature:	50°F to 125°F (10°C to 51°C)
Relative Humidity:	8 to 80%
Maximum Wet Bulb:	85°F (29.4°C)

i. Diskette should be stored when not in use.

SECTION V

5. THEORY OF OPERATION

5.1 General. This section describes the operation of Model 51/52 Flexible Disk Drives. Basic functions of the flexible disk drive are to record and read digital data on a diskette, and to receive and generate control signals necessary for completion of the Read/Write functions.

NOTE:

There is no difference between the PCB for Model 51 (single head) and the PCB for Model 52 (dual head).

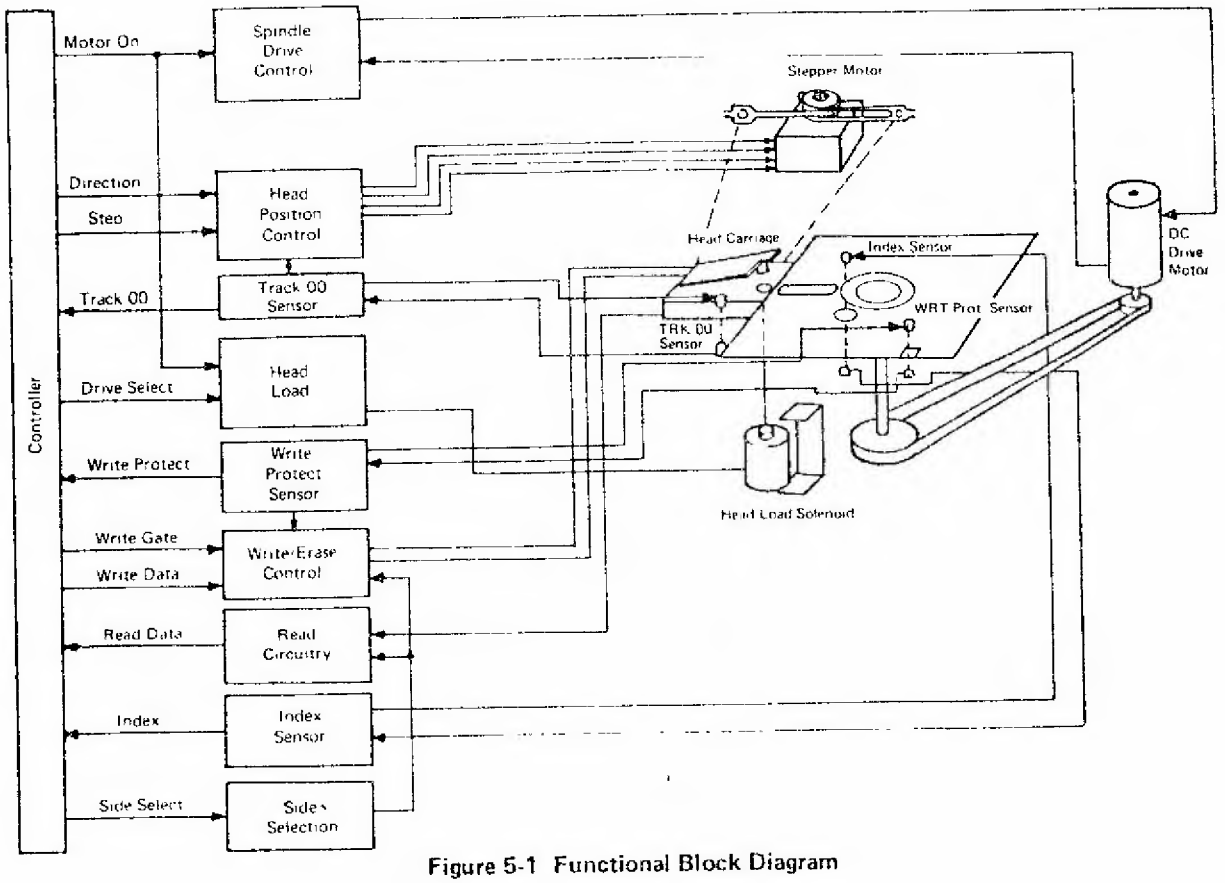


Figure 5-1 Functional Block Diagram

5.2 Mechanical and electrical. Figure 5-1 shows a functional block diagram of the mechanical and electrical groups included in the disk drive, as follows:

a. Spindle drive control.
b. Head load mechanism.
c. Track 00 sensor.
d. Head positioning control.
e. Write Protect sensor.
f. Write/Erase control.
g. Read circuitry.
h. Index sensor.
i. Side selection

Figures 5-2, 5-3 and 5-4 show electrical block diagrams for reference in this section.

5.3 Diskette spindle drive. The spindle is rotated, via a belt, by a dc motor/ac tachometer combination. The electronics for speed control takes timing information from the tachometer (a), compares this with a reference timer (b), and generates a driving voltage for the motor proportional to the difference between (a) and (b). When the Motor On interface line is true, the control circuit allows the motor to come up to speed. The circuit also includes a portion which disables the motor drive in case of no tachometer output for approximately 150 msec (i.e., binding spindle or motor). The diskette is held on the spindle hub by a clamping mechanism which actuates in conjunction with the front door.

5.4 Head load mechanism. The head load mechanism consists of a head solenoid and a head solenoid driver. The interface logic may be connected to energize the solenoid via Direct Select or Motor On (see Section III). Activating the solenoid causes the diskette to be pressed against a fixed platen and a spring-loaded load arm with a felt pad opposite the head, to press the media against the head. This load arm is lifted when the front access door is opened regardless of the state of the solenoid

5.5 Track 00. The Track 00 sensor consists of a photo detector with the shutter on the head carriage, and circuits for converting to proper I/O levels. In conjunction with head-positioning logic, the sensor generates a low true level on the Track 00 interface line when the head is positioned at Track 00. This also inhibits the stepper-motor circuitry from responding to any "Step Out" command.

5.6 Head positioning control. This consists of a four-phase stepper-motor/pulley-band combination for conversion of rotational to linear motion. The band is attached to the head carriage and control logic necessary for proper motion response according to user commands. The stepper motor operates in a two-phase On Mode. One step on the motor equals a one track linear motion of the head. Thus, high accuracy and high step rates are achieved by the 51/52 series. The correct phases on for Track 00 is 4 & 1. To move the head toward the center of the diskette, with Direction line high, the correct phase sequence is:

TRACK 00	PHASE 4 & 1
TRACK 01	PHASE 1 & 2
TRACK 02	PHASE 2 & 3
TRACK 03	PHASE 3 & 4
TRACK 04	PHASE 4 & 1

5.7 Write protect sensor. This is a set of photo sensors positioned on opposite sides of the Write Protect notch in the diskette. If light from the LED is allowed to hit the photo-transistor, a false level on the interface line will be produced. If a Write Protected diskette is installed, the light beam is stopped and the Write Protect line will go true, thus also disabling the current sources for Write/Erase Control.

5.8 Index sensor. This is a set of photo sensors positioned on opposite sides of the index hole in the diskette, using the hole in the media as a shutter. When the lightbeam from the LED passes through the hole and hits the photo transistor, it will turn on and, through a shaping circuit, generate a true level on the Index Interface line. Location of the photo transistor is adjustable.

5.9 Data recording and retrieving. The drive uses a tunnel-erase head. The erase gap follows the Write/Read gap, and erases the edges of the written track to provide a guard band between tracks to allow for positioning tolerances. The electronics consist of a Write Current source, Steering Circuit, Erase driver, Read amplifier, differentiator, cross-over detector, pulse generator, and a Side Select circuit.

5.9.1 Data recording. When recording digital data, current passes through the winding on the Write/Read core and sets up a flux field across the Write/Read gap. This orients the iron-oxide particles on the diskette surface underneath the gap to the same polarity. The direction of the flux field is a function of the polarity of the Write current. Data are written by reversing the current in the head. Each flux reversal represents a data bit. The head in the drive uses a center-tapped Write/

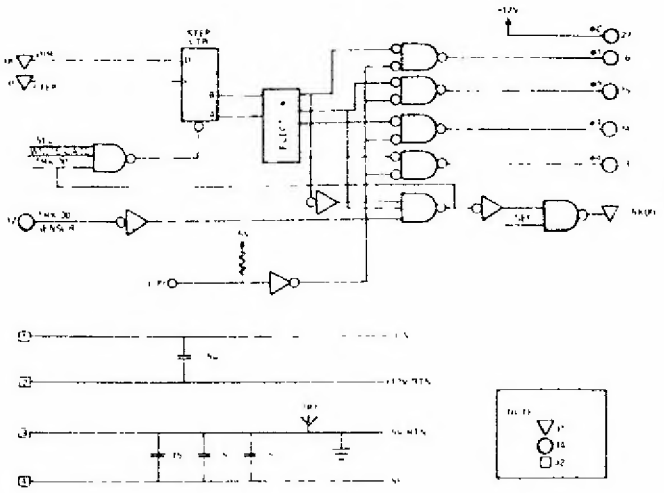


Figure 5-2 Stepper Motor Logic

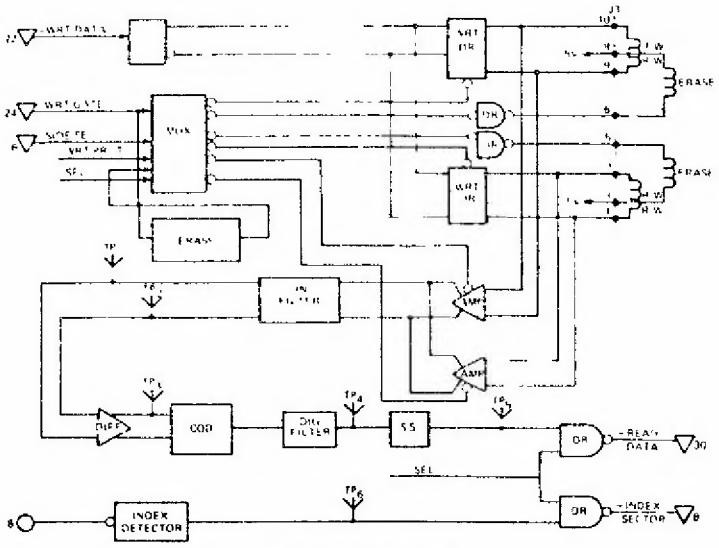


Figure 5-3 Read/Write Logic

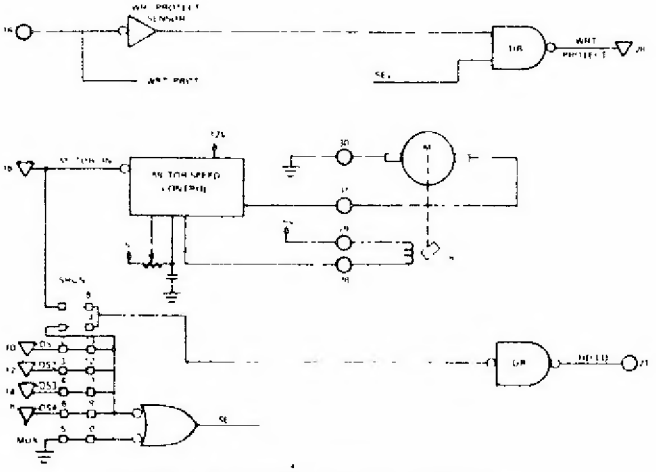


Figure 5-4 Drive Motor Control Logic

Read winding, where the current reversal is accomplished by steering the current through one or the other of the two halves of the winding. Figure 5-5 shows the basic recording technique. The following conditions must be established by the user system before recording can begin:

a. Spindle speed must be stabilized. This condition will exist 0.5 sec after Motor On command is issued.

b. Head/Media must be stabilized subsequent to Head Load command. This requires 35 msec.

c. Head must be settled subsequent to Step command. This requires 20 msec (5 msec for motion, and 15 msec for settling).

The above conditions may be overlapped. It is recommended that the first Write Data command be within 4 to 8 μs after Write Gate goes true, and the last Write Data be within 4 to 8 μs of Write Gate going flase. The Erase Circuit enables the erase current 430 μs after Write Gate goes true, and disables 850 μs after Write Gate goes false. These time relationships are optimized for proper erasure on both inner and outer tracks.

5.9.2 Data retrieving. The Read electronics consists of the following:

a. Read amplifier.

b. Linear filter.

c. Differentiator.

d. Cross-over detector.

e. Digital filter.

f. Pulse shaper.

Several conditions must be established by the user system before Reading can begin. The same conditions applicable to recording must be met. Additionally, if the previous operation was writing, 1 msec must be allowed after termination of Write Gate to allow for erase and circuit-settling time. Figure 5-6 shows wave forms in the Read sequence. The head generates a wave form with peaks corresponding to the flux transients. This is amplified, fed through a low-pass filter, and then differentiated to make the peaks occur at zero cross-over. This signal is next fed to the cross-over detector, which generates a pulse for each cross-over. These pulses are fed through a digital filter, which removes false pulses. Finally, the pulse shaper generates a 1 μs pulse corresponding to each flux transient. This composite Read Data is sent to the user via the Read Data interface line.

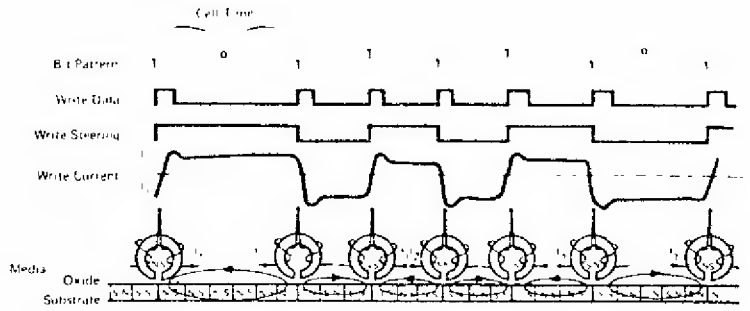


Figure 5-5 Basic Recording Technique

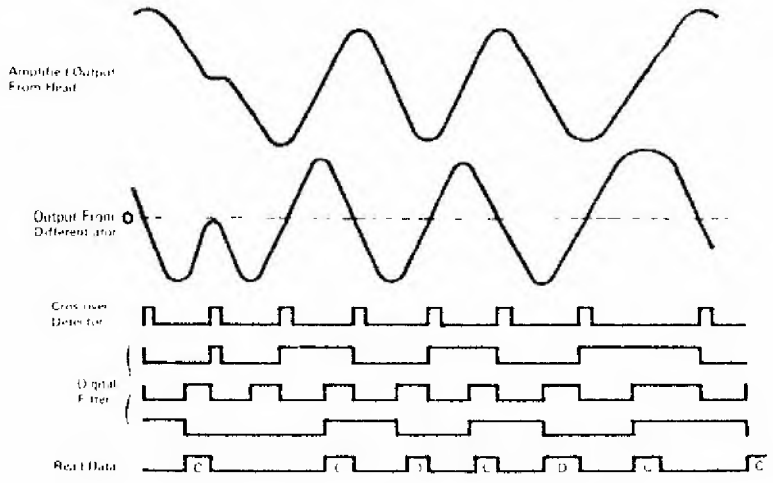


Figure 5-6 Wave Forms in Read Sequence

SECTION VI

6. ERROR RECOVERY

6.1 Seek errors. Unless the stepping rate of 5 msec is exceeded, seek errors rarely occur. However, in the case of a seek error, recalibration of track location is achieved by issuing repetitive Step and Direction Out commands to the drive until the Track 00 status is received.

6.2 Write errors. In order to assure data integrity, a Read after Write should always occur. If the data cannot be recovered on the first Read after Write operation, the Track/Sector should be rewritten and read again. If the data cannot be successfully read within four Write/Read retries, it is recommended that the track be labelled defective, and a different track (sector) assigned. If more than two tracks prove defective, discard the diskette.

6.3 Read errors. If the read after write scheme is followed as described in the previous paragraph, only soft errors are most likely to occur. A soft error is defined as a read error which can be recovered in less than 10 re-tries. However, if the read error cannot be recovered within 10 re-tries, step the carriage one step away from the track in the same direction previously moved and then step back. If the data cannot be recovered, the error is not recoverable.

SECTION VII

7. MAINTENANCE

7.1 General. The only recommended maintenance, which will ensure optimum performance, is periodic cleaning of the Read/Write head(s) and inspection of the load pad. In case repair is necessary, the following paragraphs describe required adjustment procedures:

7.2 Cleaning read/write head. Inspect the load pad (or top head) for excessive oxide, using a dental mirror.

CAUTION

DO NOT MOVE THE UPPER ARM ANY FURTHER THAN IS ALLOWED BY THE DOOR IN ITS OPEN POSITION.

To clean the heads, use a lint-free cloth or cotton swab moistened with 91% Isopropyl alcohol. Wipe the head(s) carefully to remove all accumulated oxide and dirt. Dry the head(s) using a lint-free cloth. (Order MPI Kit P/N 1-86000-001.)

7.3 Adjustment procedures. The following adjustments are required if the parts are being changed due to malfunction. It is recommended, in order to ensure data commonality between drives, that a master alignment diskette be kept, and that each alignment be verified to the master.

7.3.1 Radial-track alignment.

a. Apply necessary power and I/O controls to the drive for recalibration to Track 00.

b. Insert a CE alignment diskette (MPI Part No. 1-42000-001) and close the door.

c. Synch oscilloscope on leading edge on TP6. Connect two probes to TP1-TP2. Set the scope to 50mV/cm, ac coupled, channel A and B added, with B inverted, 200ms/div. Attach ground probes to TP7.

d. Load head and apply 16 stepping pulses, with Direction low. The carriage should be located around Track 16. The proper phase relation of stepper motor should be: phase 4 and phase 1, 0V; phase 2 and 3, +12V.

e. With power on, loosen the setscrew in the stepper pulley and position the pulley so that the cat's-eye appears on the scope with equal amplitude. Secure the pulley with 2 in.-lbs. torque. Command a return to zero and step back out to Track 16 to verify proper alignment.

7.3.2 Index-to-data alignment.

a. Verify radial alignment (see 7.3.1) and then move the head to Track 01.

b. Set oscilloscope to 50 μs/div.

c. The index sensor clamp screws are located at the bottom of the drive Loosen the screws and slide the sensor such that the scope picture shows a data pattern starting 200 ± 50 μs from the leading edge of index.

d. Tighten the screws carefully, so no variations in the scope reading occur.

7.3.3 Track 00 sensor alignment.

a. Apply necessary power and I/O control to the drive and load head.

b. Connect oscilloscope to J4-12; set trigger to internal/auto.

c. Loosen the two screws and adjust for the conditions in d. and e.

d. When the carriage is located over Track 00, 01, and 02, J4-12 should be on 0.5 volts (max).

e. Command step-in to Track 03. J4-12 should go high (+4.0 volts min).

f. Tighten the screws.

7.3.4 Speed control.

a. Apply necessary power and I/0 control and load head.

b. Insert diskette and close door.

c. Turn the drive on its side to get access to the strobe mounted on the spindle pulley. Adjust R28 until a stable picture is appearing from the strobe.

7.3.5 Track 00 end stop.

a. Apply power and I/0 control and load head.

b. Command seek to Track 00.

c. Adjust setscrew located on the left-hand boss in the rear of the drive to approximately 0.010 inch from the end of the carriage. Command maximum track seek, then return to zero. Assure that carriage does not hit the end stop.

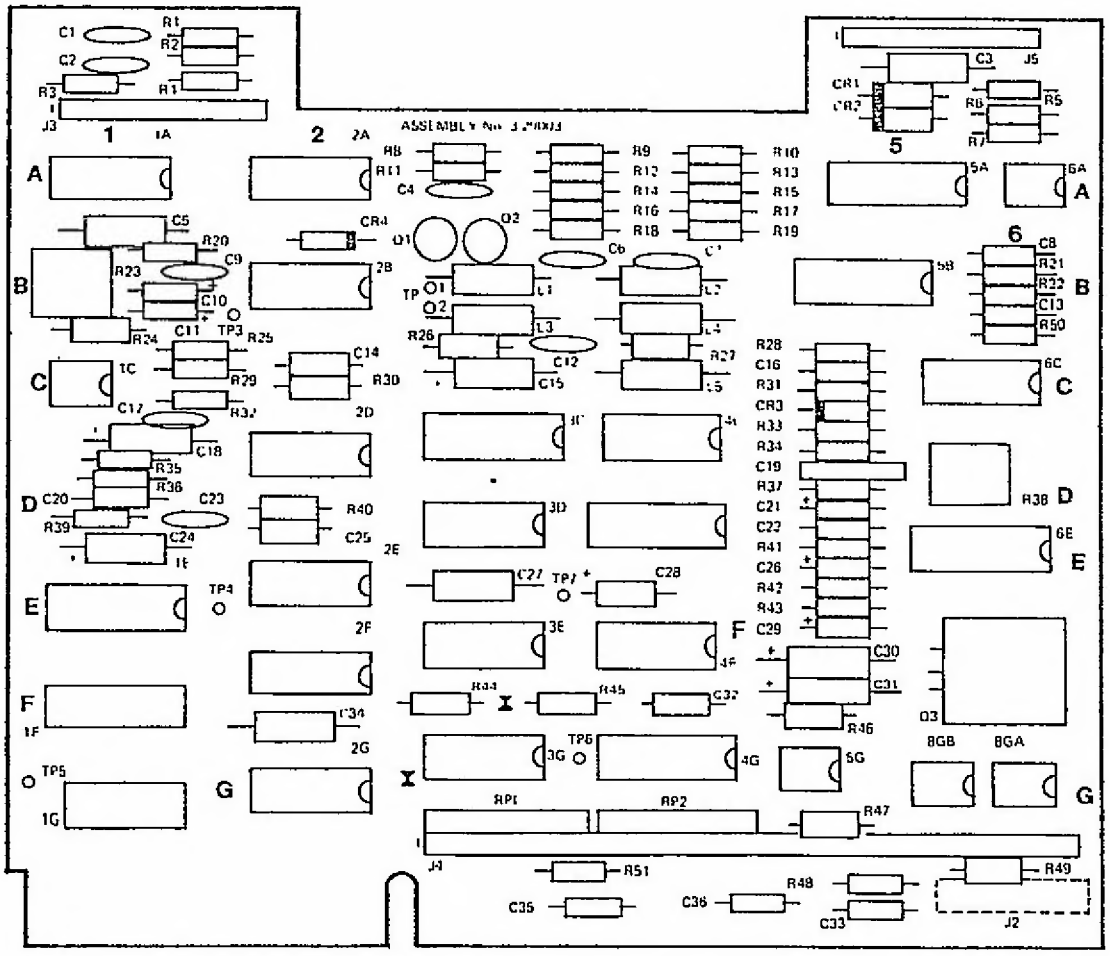


Figure 7-1 Component Location

ERRATA SHEET FOR MODEL 51/52 PRODUCT MANUAL

The following are changes that have been made in the MPI Manual:

1. Page 3, Section II 2.7 Drive separation. Entire paragraph to be deleted.

2. Page 3, Section II 2.8 Input/output cable. First sentence to be deleted. At end of paragraph MPI P/N 3-06001-001 to be deleted.

3. Page 4, Section III,3.2.2 Programmable shunt. Line 6 to be changed to read: by a dip switch, AMP P/N 4-35626-4 (MPI P/N 1-79601-001).

4. Page 4, Section III, 3.2.4 Motor on. Line 2 now to read: no activity is required of the Model 51/52 after 10 revolutions of the diskette. A minimum of 1.0 second is required...

5. Page 6, Section III, 3.2.9 Side select. Line 1 now to read: This input is used to select either the upper or lower head. A 35μ/sec delay should be allowed for the...

6. Page 13,Section VII, 7.2 Cleaning read/write head. Delete line 4, last sentence. (Order MPI Kit P/N 1-86000-001.)

7. Page 13, Section 7.3.1 Radial-track alignment. Line b is now to read; Insert a CE alignment diskette (MPI Part No. 1-01011- 200 double/MPI Part No. 1-01011- 100 single.)

8. Page 14, Section VII, 7.3.4 Speed control. Line c. now to read: Turn the drive on its side to get access to the strobe mounted on the spindle pulley. Adjust R38 until a stable picture is appearing from the strobe.

9. Page 14, Section VII, Diagram. (Change has been made in right G6 area, circut designator 8G8 has been changed to 6GB and circut designator 8GA has been changed to 6GA).

See diagram on pg. 2

ERRATA SHEET DIAGRAM

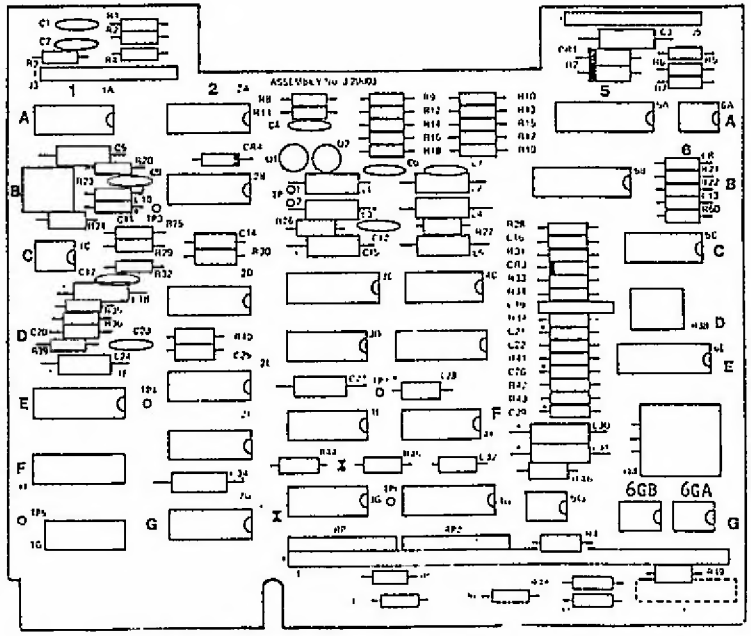
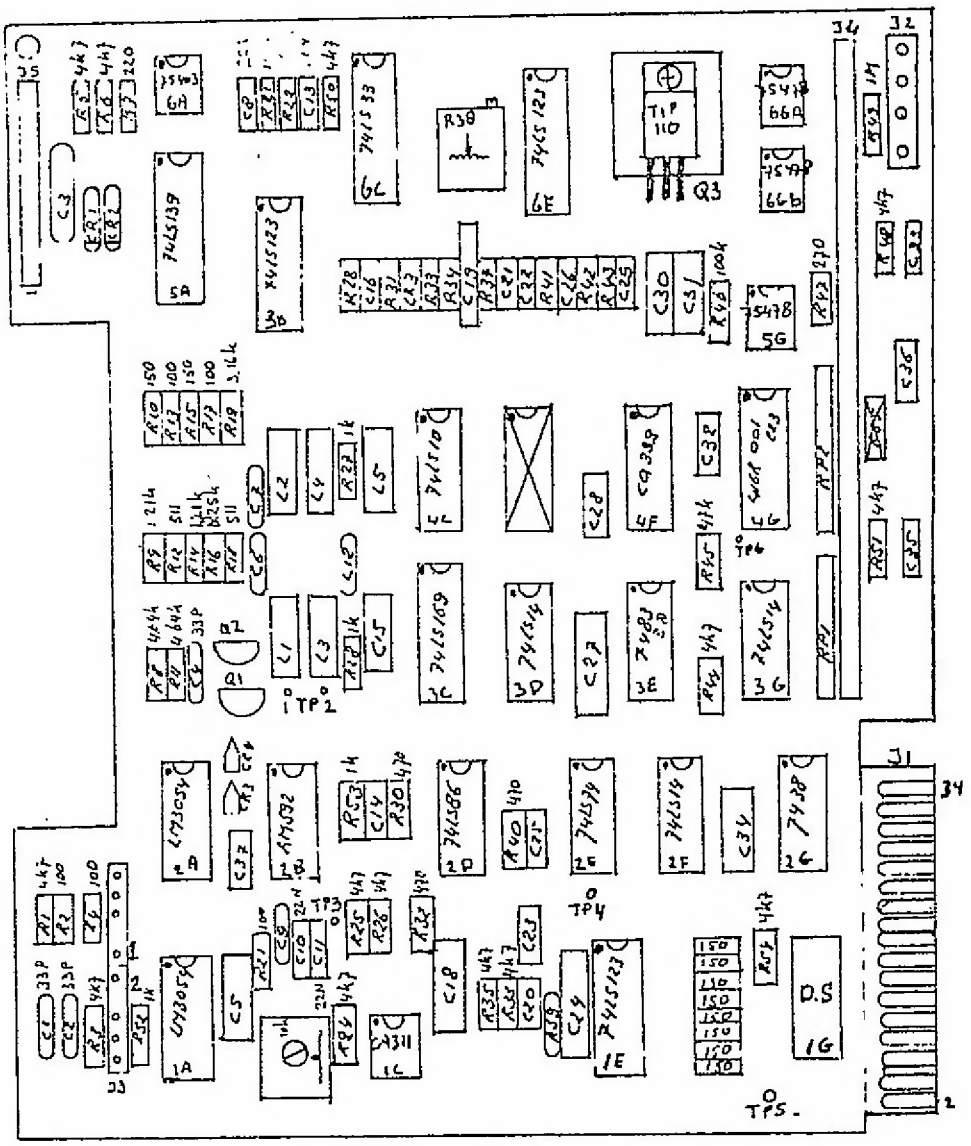
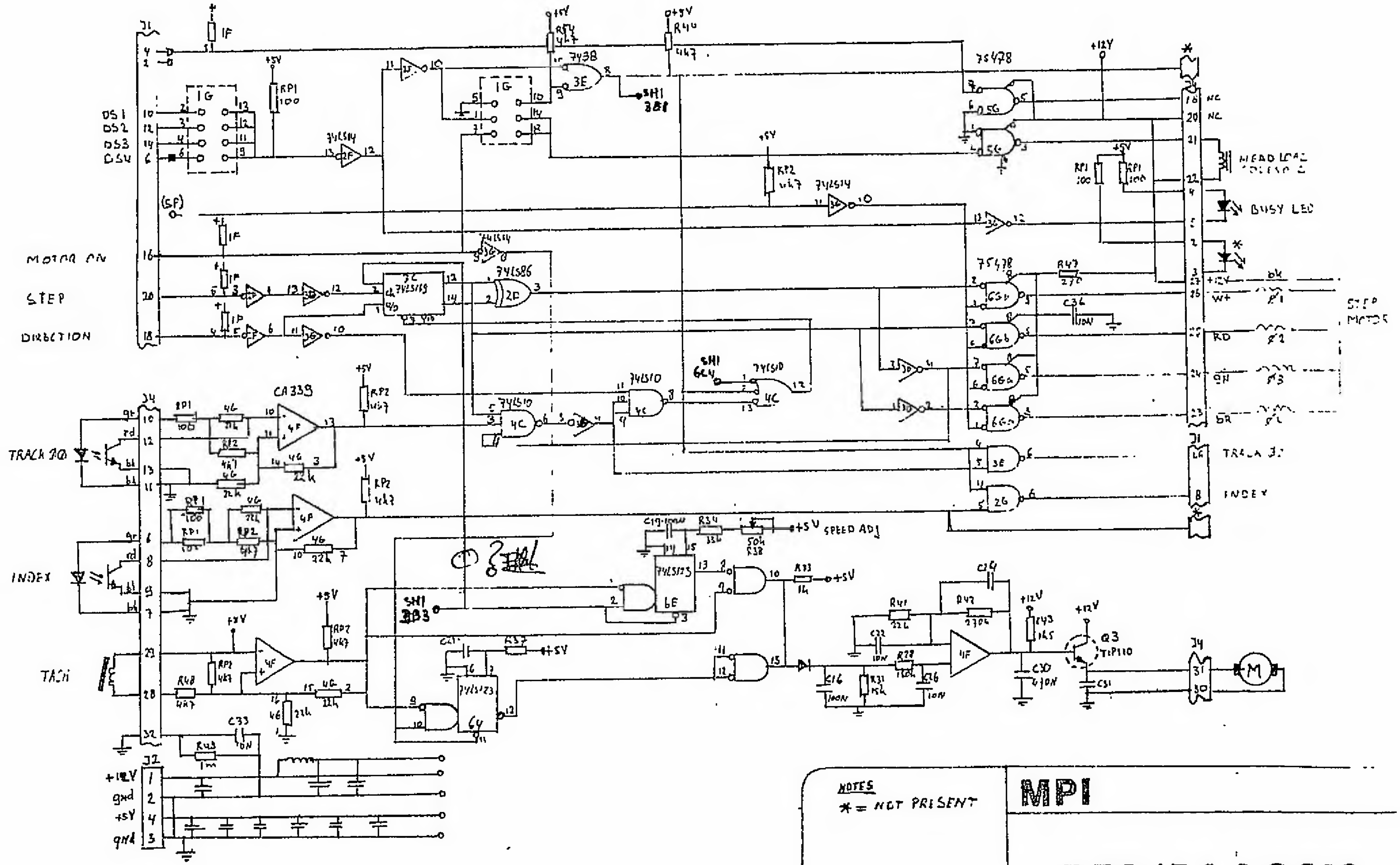


Figure 7-1 Component Location

MPI B52 PCB LAYOUT

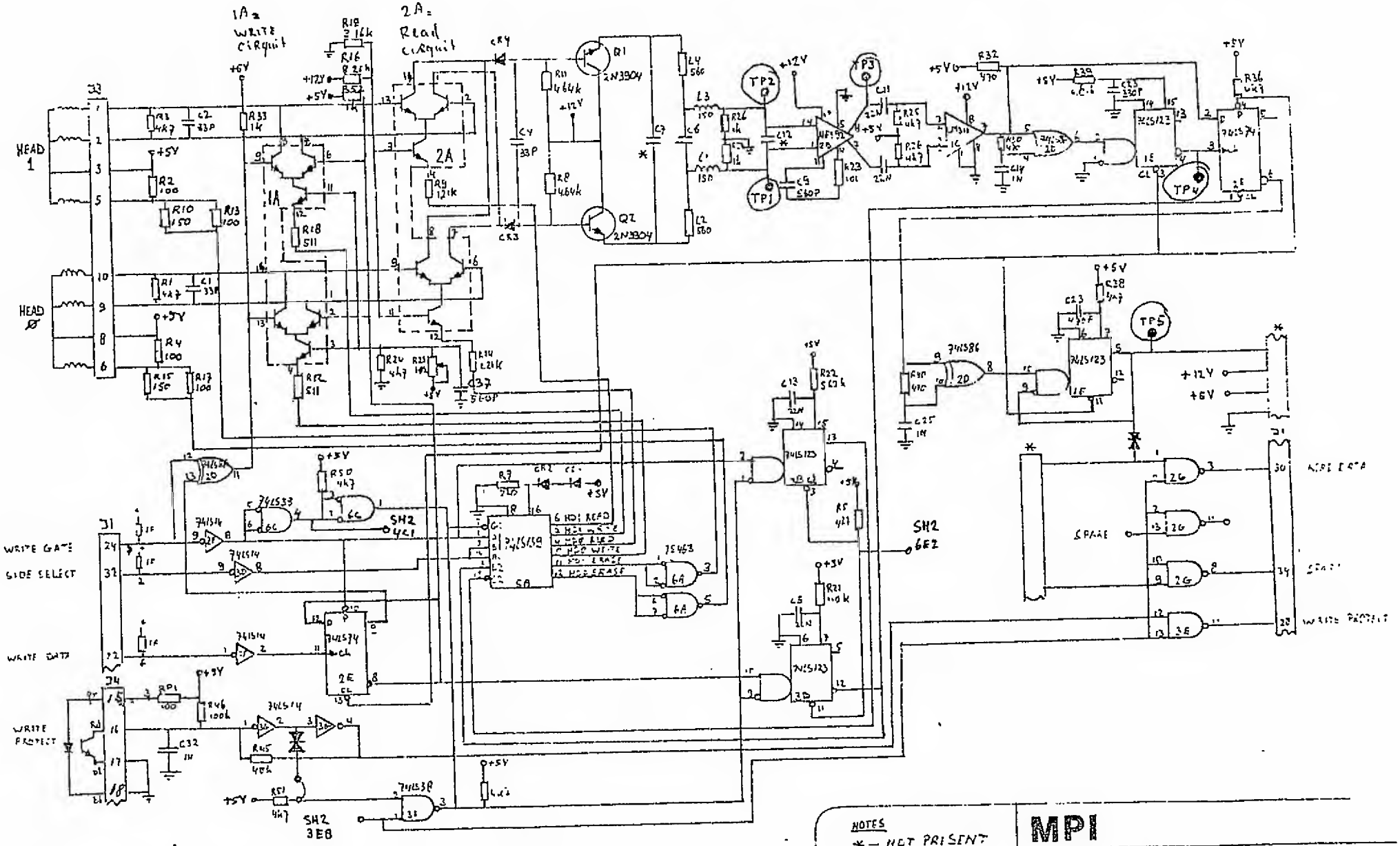




NOTES
* = NOT PRESENT

MPI

B52/51 LOGIC


1A = WRITE CIRquit
2A = Read CIRquit
HEAD 1
HEAD Ø
WRITE GATE
SIDE SELECT
WRITE DATA
WRITE PROTECT
SH2 4C1
SH2 6E2
SH2 3E8
SPARE
INDEX
WRITE PROTECT
NOTES
* = NOT PRESENT
MPI
B52/51 LOGIC