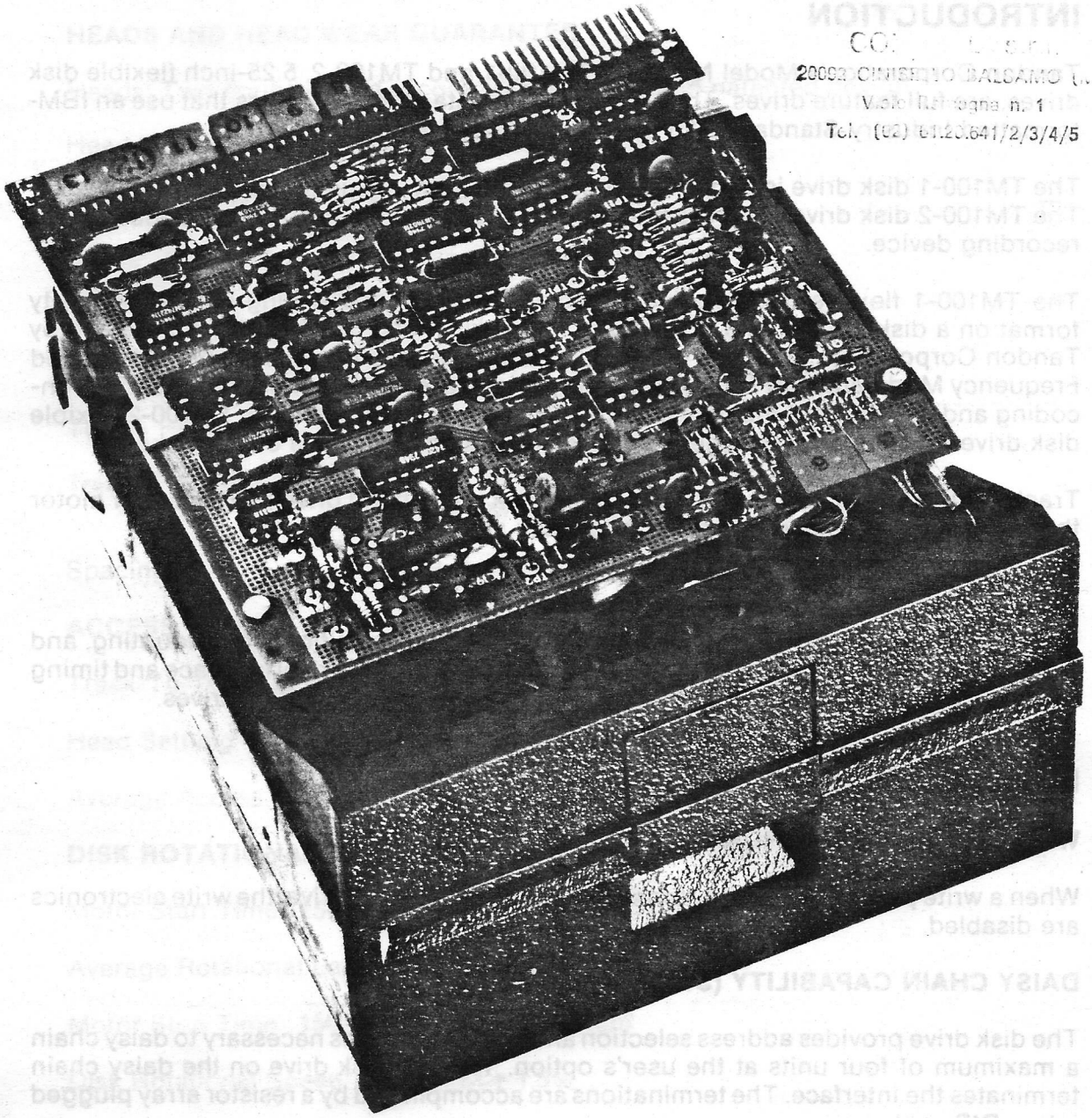


PRODUCT SPECIFICATIONS
MINI SINGLE- AND DOUBLE-SIDED RECORDINGS
FLEXIBLE DISK DRIVES
MODEL NUMBERS TM100-1 AND TM100-2
48 TRACKS PER INCH

1. INTRODUCTION

Tandon Corporation's Model Numbers TM100-1 and TM100-2, 5.25-inch flexible disk drives, are full feature drives. They are compact data storage devices that use an IBM-formatted Industry Standard 5.25-inch (133.44 millimeter) diskette.

The TM100-1 disk drive is a forty-eight tracks per inch, single-sided recording device. The TM100-2 disk drive has the same number of tracks per inch, and is a double-sided recording device.

The TM100-1 flexible disk drive is capable of reading and writing in single-density format on a diskette, using a proprietary read/write head developed and patented by Tandon Corporation. This disk drive has a double density capability when a Modified Frequency Modulated (MFM) or other appropriate recording technique is used. The encoding and decoding of the data is done by the user's controller. The TM100-2 flexible disk drive doubles data storage capabilities by using both sides of the diskette.

Track positioning is accomplished by utilizing a metal band driven by a stepper motor that provides a five millisecond track-to-track step interval.

1.1 SCOPE OF THE DOCUMENT

This product specification contains the major features, specifications, mounting, and power requirements, an interface description, and typical electrical interface and timing characteristics of the TM100-1 and TM100-2, 5.25-inch flexible disk drives.

2. MAJOR FEATURES

2.1 WRITE PROTECT (STANDARD)

When a write protected diskette is inserted in the flexible disk drive, the write electronics are disabled.

2.2 DAISY CHAIN CAPABILITY (STANDARD)

The disk drive provides address selection and gating functions necessary to daisy chain a maximum of four units at the user's option. The last disk drive on the daisy chain terminates the interface. The terminations are accomplished by a resistor array plugged into a DIP socket.

2.3 INTERNAL TRIM ERASE (STANDARD)

The flexible disk drive provides the necessary control signals internally for proper trim erasure of data.

2.4 INDUSTRY STANDARD INTERFACE COMPATIBILITY

The disk drive is compatible with controllers that employ the industry standard interface.

2.5 ACTIVITY INDICATOR (STANDARD)

An activity indicator, located on the front panel, is automatically illuminated when the flexible disk drive is selected.

3. PERFORMANCE SPECIFICATIONS

3.1 HEADS AND HEAD WEAR GUARANTEE

Heads: Two double-sided recording heads, Tandon patented design

Head Wear Guarantee: 20,000 media contact hours

3.2 MEDIA AND MEDIA LIFE

Media: 133.4 millimeter (5.25-inch) Industry Standard diskette

Wear Life (For Reference Only): 4×10^6 passes per track

3.3 CAPACITY

Tracks Per Inch:	48 TPI, both models
Tracks Per Drive:	40 for TM100-1 80 for TM100-2, 40 per surface
Spacing:	.529 mm (20.8 milinches), Side 0, both models

3.4 ACCESS TIMES

Track-To-Track: 5 milliseconds

Head Settling Time: 15 milliseconds

Average Access Time, including head settling time: 90 milliseconds

3.5 DISK ROTATIONAL SPEED

Motor Start Time: 250 milliseconds

Average Rotational Latency: 100 milliseconds

Motor Stop Time: 150 milliseconds maximum

Disk Rotational Speed: 300 RPM ± 1.5%

Instantaneous Speed Variation (ISV): ± 3%

3.6 RECORDING CAPACITY AND METHOD

Flux Reversals Per Inch, Inside Track:

5535 FRPI, Side 0, both models
5877 FRPI, Side 1, TM100-2 only

Transfer Rates: 250K BPS

Unformatted Recording Capacity:

2.0 megabits per diskette, unformatted double density, TM100-1
4.0 megabits per diskette, unformatted double density, TM100-2

3.7 ELECTROMAGNETIC CHARACTERISTICS

Tandon Corporation's Model Numbers TM100-1 and TM100-2, 5.25-inch flexible disk drives are designed to minimize electrical interference that is generated internally and propagated through space or on associated conductors.

4. RELIABILITY

4.1 ERROR RATES

Error rates are exclusive of external sources, e.g.: electronics, defective diskettes, contaminated diskettes, etc.

One recoverable error in 10^9 bits read

One non-recoverable error in 10^{12} bits read

One seek error in 10^6 seeks

4.2 MEAN TIME BEFORE FAILURE

MTBF: 8,000 power-on hours

4.3 MEAN TIME TO REPAIR

MTTR: 30 minutes

4.4 PERIODIC MAINTENANCE

Periodic maintenance is not required.

5. ENVIRONMENTAL SPECIFICATIONS

The disk drive meets its operational specifications under the environmental conditions listed below.

5.1 TEMPERATURE

Operating Temperature: 10°C to 44°C (50°F to 112°F)

Storage Temperature: -40°C to 71°C (-40°F to 160°F)

5.2 RELATIVE HUMIDITY

Noncondensing Operating Humidity: 20% to 80%

Noncondensing Nonoperating Humidity: 5% to 95%

5.3 SHIPMENT

When prepared for shipment by Tandon Corporation, the 5.25-inch flexible disk drive will meet the requirements of NSTA Pre-Shipment Test Procedure Project 1A.

5.4 ALTITUDE

304.8 m (500 feet) below sea level to 15,240 m (50,000 feet) above sea level, operating or nonoperating.

6. MECHANICAL SPECIFICATIONS AND MOUNTING

6.1 MECHANICAL SPECIFICATIONS

Height:	85.85 millimeters (3.25 inches)
Width:	149.1 millimeters (5.75 inches)
Length:	203.2 millimeters (8.0 inches), excluding front panel
Weight:	2.04 kilograms (4.5 pounds)

6.2 MOUNTING

The 5.25-inch flexible disk drive may be mounted upright, horizontally or vertically. When mounted horizontally, the large circuit board must be on top.

Four 8-32 tapped mounting holes are provided on the bottom of the disk drive, as are two 8-32 tapped mounting holes on each side of it for attachment to user-supplied mounting brackets (see Figure 1). When mounted in any of the above positions, only two holes per side are required to securely hold the drive in place.

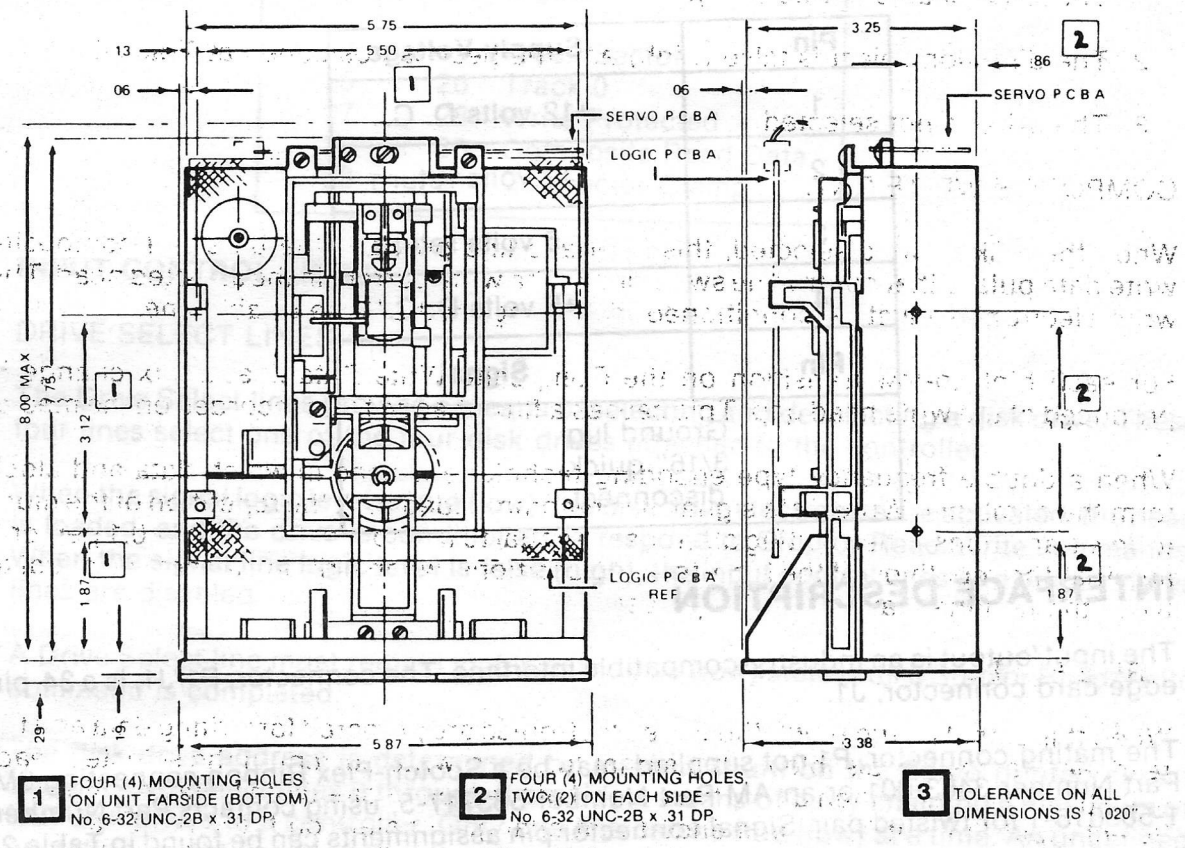


Figure 1

Disk Drive Outline Drawing

7. POWER REQUIREMENTS

7.1 D. C. POWER SEQUENCING

A maximum of one second is required from the time power is applied to the disk drive until the time at which a command can be accepted.

7.2 PRIMARY POWER

+12 V D.C. Power: +12 volts ± 0.6 volt @ 900 mA, average maximum

+ 5 V D. C. Power: +5 volts ± 0.25 volt @ 600 mA, average maximum with less than 100 mv P/P ripple.

7.3 D. C. CONNECTOR

D. C. power is supplied to the 5.25-inch flexible disk drive through a four-pin AMP connector, Part Number 350211-1, connected to the printed circuit board (J3). The mating connector, not supplied, is AMP Part Number 1-480424-0, using AMP contact Part Number 60619-1. Pin assignments are found in Table 1.

The chassis should be connected to earth ground to ensure proper operation.

Table 1

D. C. Power Connector Pin Assignments, P3, J3

Pin	Supply Voltage
1	+12 volts D. C.
2	12 volts return
3	5 volts return
4	+5 volts D. C.
Pin	**Signal**
Ground lug 3/16" quick disconnect	

8. INTERFACE DESCRIPTION

The input/output is an industry-compatible interface. The connector, P1/J1, is a 34-pin edge card connector, J1.

The mating connector, P1 not supplied, may be a Scotch-Flex Ribbon connecting 3M Part Number 3463-001 or an AM Part Number 583717-5, using contacts Part Number 1-583616-1 for twisted pair. Signal connector pin assignments can be found in Table 2.

Table 2

Drive Interface Lines and Pin Connectors

Input Control Lines (Controller-To-Disk-Drive)		
Ground	**Pin**	**Signal**
1	2	Connector Clamp
3	4	Spare
5	6	Drive Select 3
9	10	Drive Select 0
11	12	Drive Select 1
13	14	Drive Select 2
15	16	Motor On
17	18	Direction Select
19	20	Step
21	22	Composite Write Data
23	24	Write Enable
31	32	Side One Select
Output Status Lines (Disk Drive-To-Controller)		
Ground	**Pin**	**Signal**
7	8	Index/Sector
25	26	Track 0
27	28	Write Protected
29	30	Composite Read Data
33	34	Connector Clamp

8.1 INPUT CONTROL LINES

8.1.1 DRIVE SELECT LINES

The Drive Select lines provide a means of selecting and deselecting a disk drive. These four lines select 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 Stop or Read/Write commands. When the signal line logic level is false (high), the input control lines and output status lines are disabled.

A Drive Select line must remain stable in the true (low) state until a Step or Read/Write command is completed.

The disk drive address is determined by a select shunt on the Servo printed circuit board. Drive Select lines 0 through 3 provide a means of daisy chaining a maximum of four disk drives to a controller. Only one line can be true (low) at a time. An undefined operation might result if two or more Drive Select lines are in the true (low) state simultaneously.

8.1.2 MOTOR ON

When this signal is true (low), the drive motor accelerates to its nominal speed of 300 RPM, and stabilizes at this speed in less than 250 milliseconds. When the signal line logic level goes false (high), the disk drive decelerates to a stop in less than 150 milliseconds. This signal is not gated with select.

8.1.3 DIRECTION SELECT AND STEP LINES (TWO LINES)

When the disk drive is selected, a true (low) pulse with a time duration greater than one (1) microsecond but less than two (2) milliseconds on the Step line initiates the access motion. The direction of motion is determined by the logic state of the Direction Select line when a step pulse is issued. The motion is toward the center of the disk if the Direction Select line is in the true (low) state when a step pulse is issued. The direction of motion is away from the center of the disk if the Direction Select line is in the false (high) state when a step pulse is issued.

To ensure proper positioning, the Direction Select line should be stable at least one (1) microsecond prior to issuing a corresponding step pulse, and remain true (low) for one (1) microsecond after the step pulse.

The access motion is initiated on the trailing edge of the step pulse. The time period between consecutive trailing edges of step pulses should be at least five (5) milliseconds.

The drive electronics ignore step pulses when one of three conditions exists:

1. The write enable is true (low).
2. The direction select is false (high) and the head is positioned at Track 0.
3. The drive is not selected.

8.1.4 COMPOSITE WRITE DATA

When the disk drive is selected, this interface line provides the bit serial composite write data pulses that control the switching of the write current in the selected head. The write electronics must be conditioned for writing by the Write Enable line.

For each high-to-low transition on the Composite Write Data line, a flux change is produced at the write head gap. This causes a flux change to be recorded on the media.

When a double-frequency type encoding technique is used in which data and clock form the combined Write Data signal, it is recommended that: the repetition of the high-to-low transitions, when writing all zeros, be equal to the nominal data rate ± 0.1 percent, and that the repetition of the high-to-low transitions, when writing all ones, be equal to twice the nominal data rate ± 0.1 percent.

8.1.5 WRITE ENABLE

When this signal is true (low), the write electronics are prepared for writing data and the read electronics are disabled. This signal turns on write current in the selected read/write head. Data is written under the control of the Composite Write Data and Side One Select input lines. It is recommended that changes of state on the Write Enable line occur before the first write data pulse. When the Write Enable line is false (high), all write electronics are disabled.

When a write-protected diskette is installed in a drive, the write electronics are disabled irrespective of the state of the Write Enable or Side One Select lines.

8.1.6 SIDE ONE SELECT (TM100-2 ONLY)

The Side One Select interface line defines which side of a two-sided diskette is used for information transfer.

A false (high) level on this line selects the read/write head on the Side Zero surface of the diskette. A true (low) level on this line selects the read/write head on the Side One surface of the diskette.

8.2 OUTPUT STATUS LINES

8.2.1 INDEX/SECTOR

The Index/Sector signal is a composite of the index pulse and sector signals.

An index pulse is provided once every revolution, 200 milliseconds nominal, to indicate the beginning of a track to the controller. The leading edge of this signal must always be used to ensure timing accuracy. The Index/Sector line remains in the true (low) state for the duration of the index/sector pulse, which is nominally 3.5 milliseconds.

The Index/Sector signal portion appears only when using hard-sectored diskettes.

8.2.2 TRACK 0

When the disk drive is selected, the Track 0 interface signal indicates to the controller that the read/write head is positioned on Track 0. The Track 0 signal remains true (low) until the head is moved away from Track 0.

8.2.3 WRITE PROTECTED

When the Write Protected line goes true (low), the diskette is write protected and the write electronics are disabled. It is recommended that the controller not issue a Write command when the Write Protect signal is true (low).

When the Write Protected line is false (high), both write electronics and write operations are enabled.

8.2.4 COMPOSITE READ DATA

This interface line transmits the readback data to the controller when the drive is selected. It provides a pulse for each flux transition detected and recorded on the diskette. The Composite Read Data output line goes true (low) for a duration of 1 ± .25 microseconds for each flux change recorded on the diskette.

The leading edge of the Composite Read Data output pulse represents the true position of the flux transitions on the diskette's surface.

9. TYPICAL INTERFACE CHARACTERISTICS

Lines between the controller and the disk drive have the following characteristics:

True = V_{out} +0.4 volt maximum at I_{out} = 48 mA maximum

False = V_{out} +2.4 volts minimum open collector at I_{out}

= 250 mA maximum

Figure 2 contains the characteristics of the electrical interface. Figure 3 contains the control and data timing requirements for Tandon's Model Numbers TM100-1 and TM100-2.

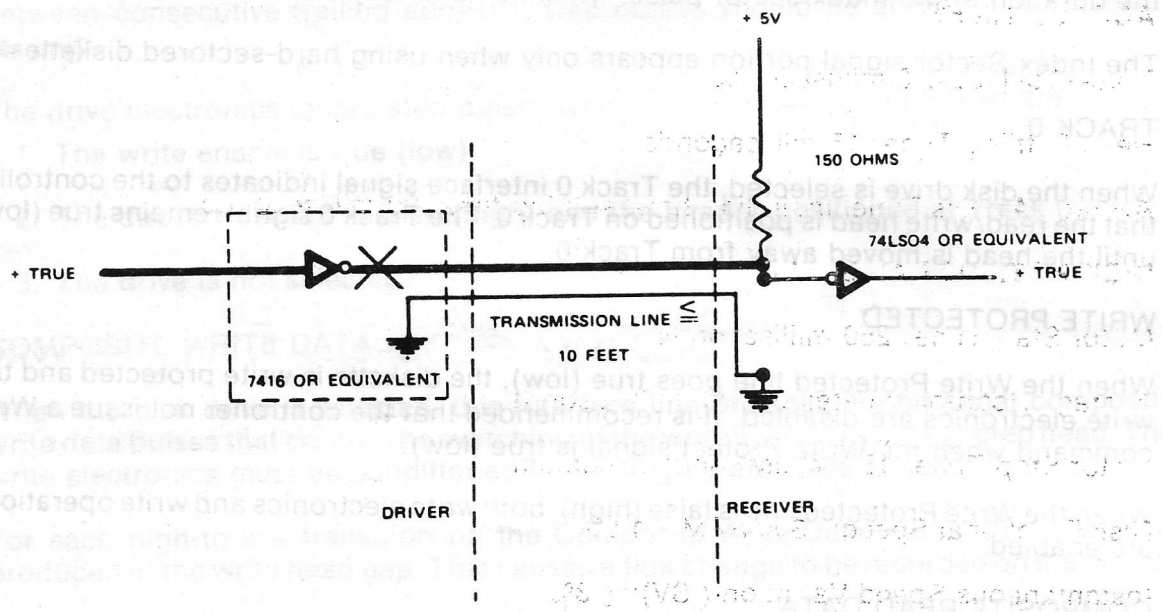


FIGURE 2
ELECTRICAL INTERFACE CHARACTERISTICS

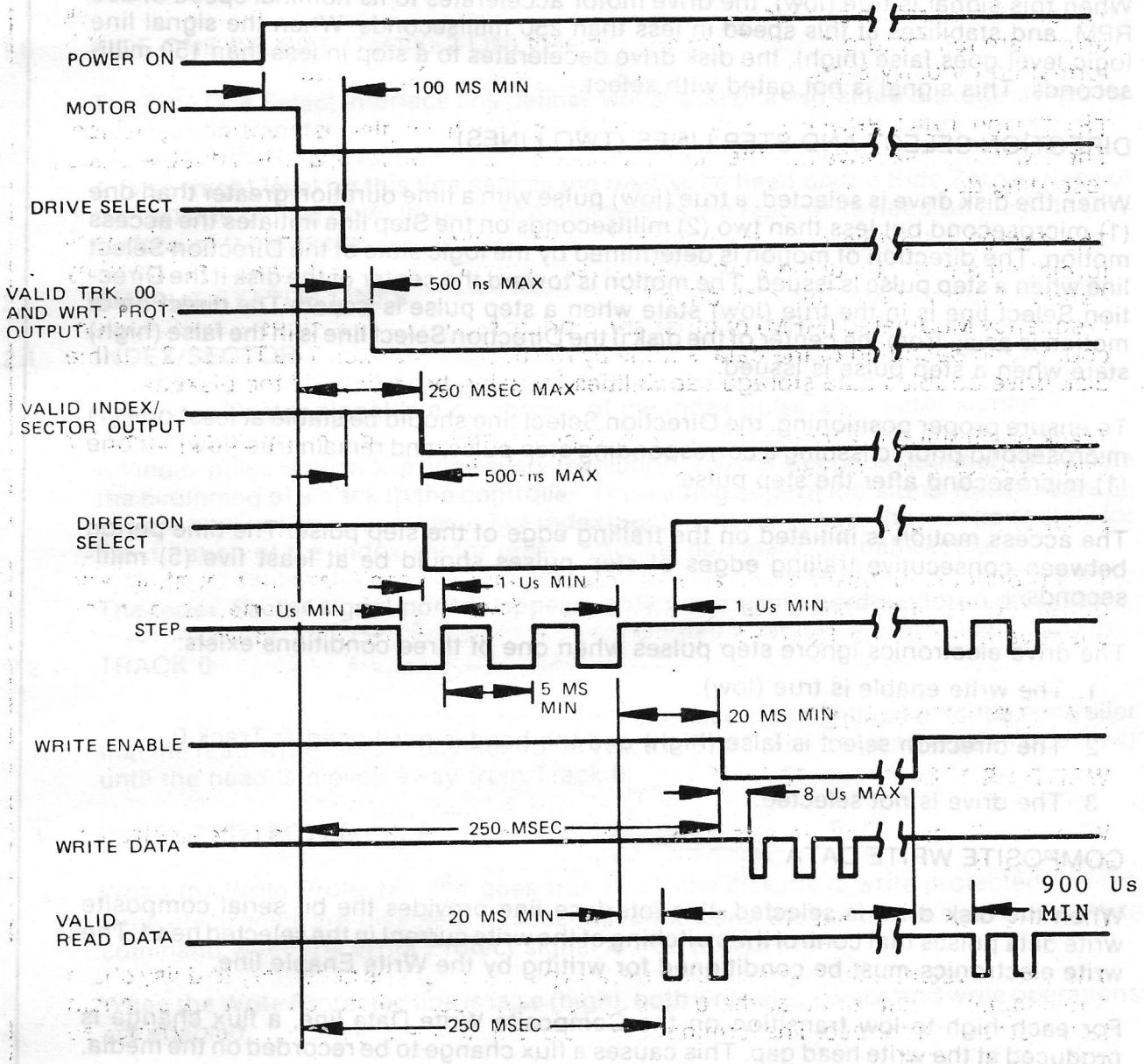
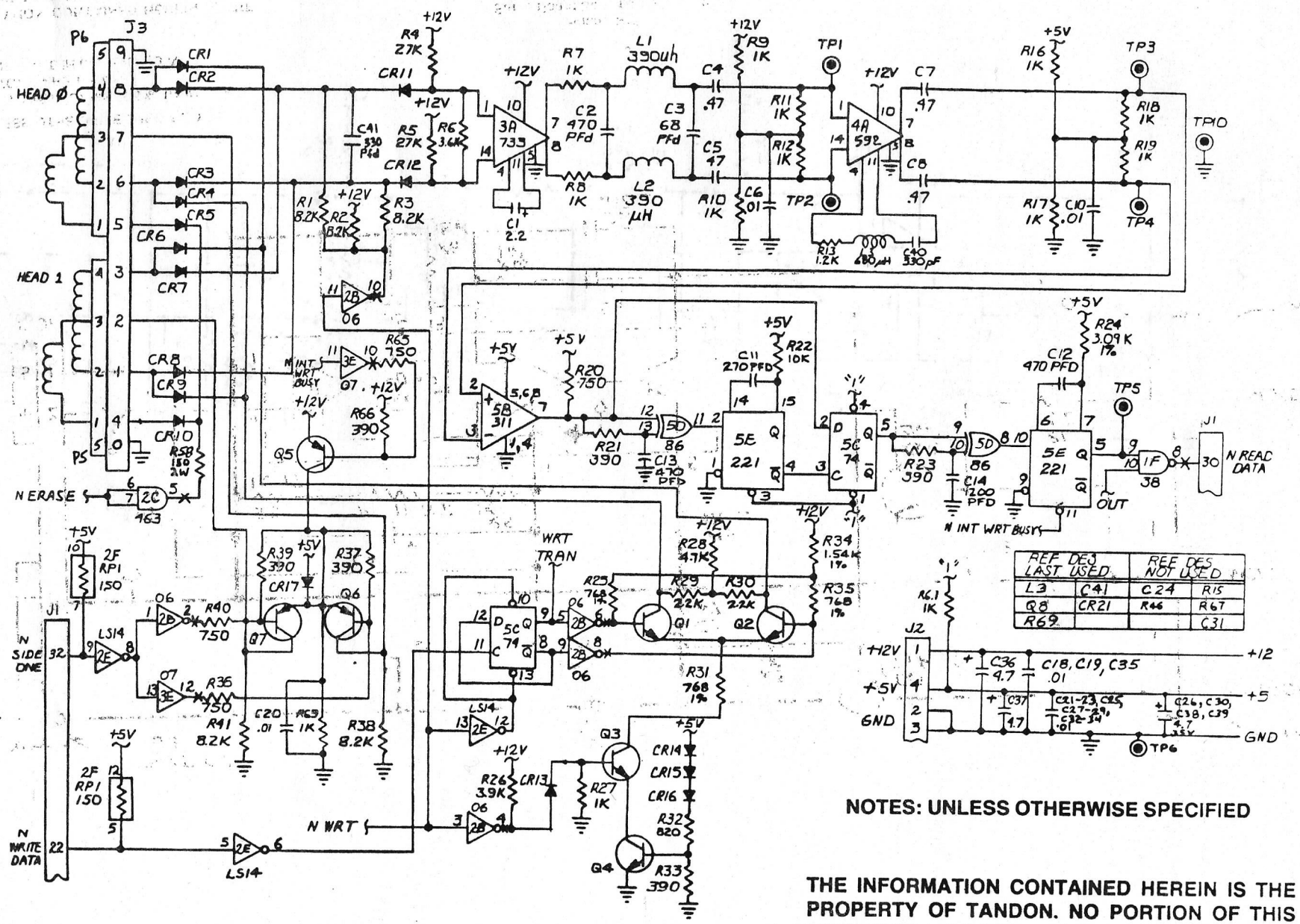


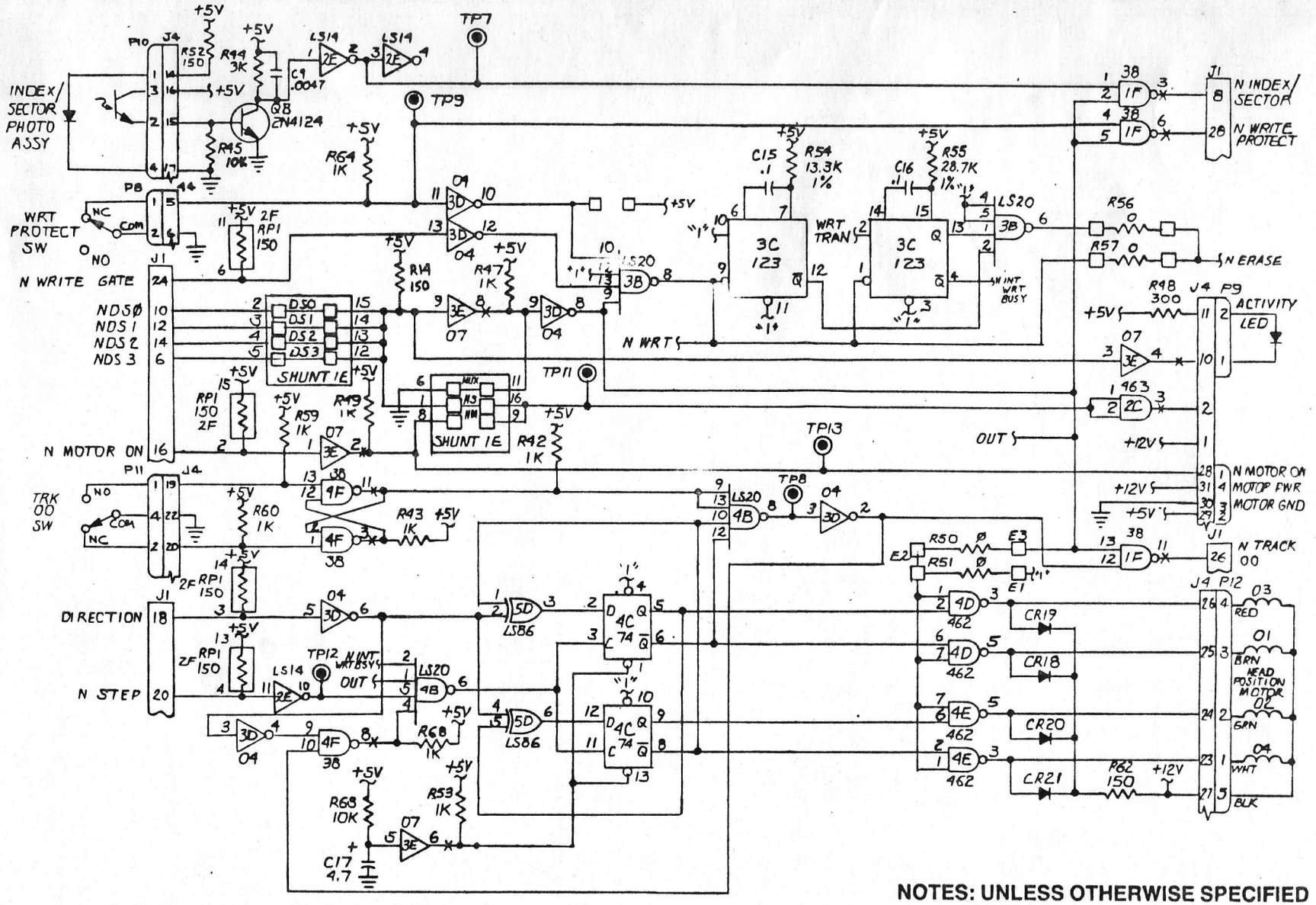
Figure 3

Control and Data Timing Requirements



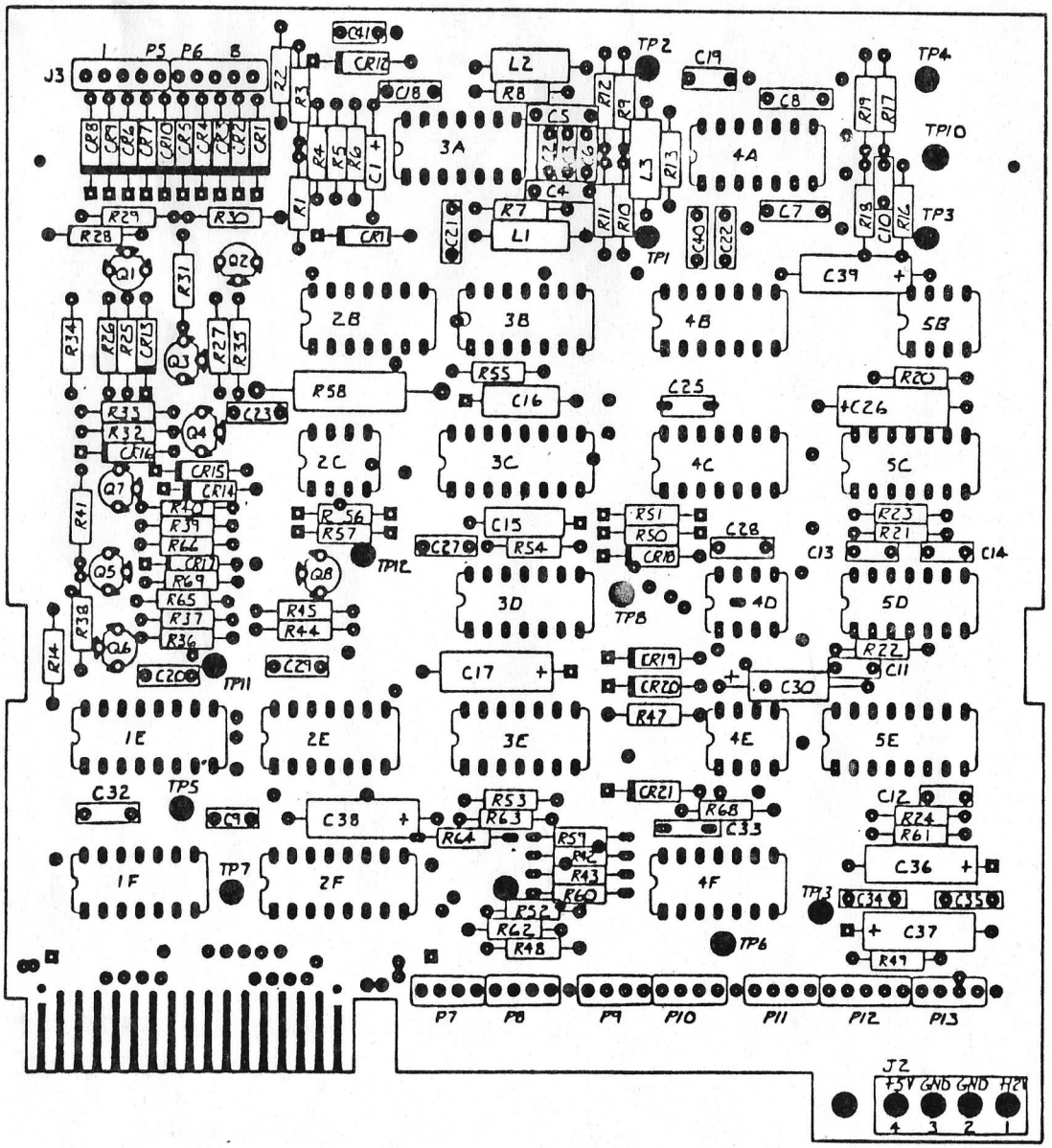
LOGIC SCHEMATIC

NOTES: UNLESS OTHERWISE SPECIFIED



NOTES: UNLESS OTHERWISE SPECIFIED

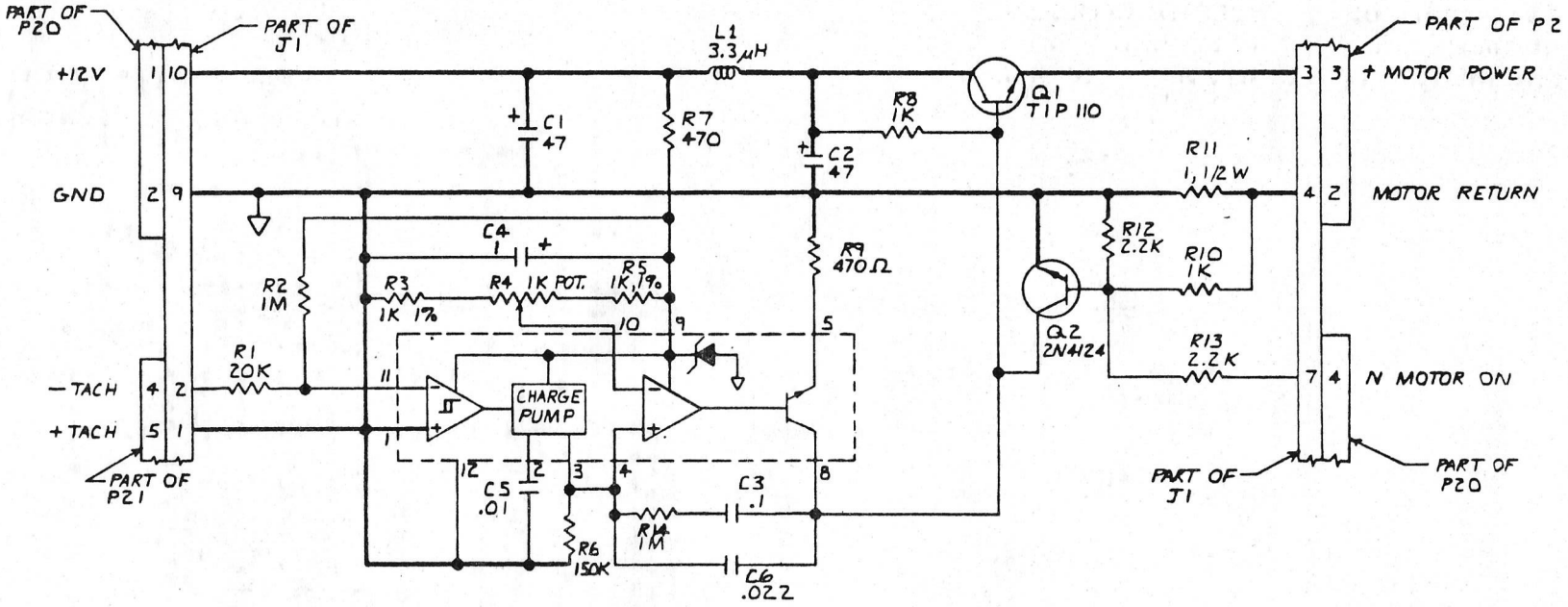
1. ALL RESISTORS ARE IN OHMS, 1/4 W, 5%
2. ALL CAPS ARE IN uFD.
3. ALL DIODES ARE IN 4446.
4. ALL TRANSISTORS NPN ARE 2n4124 & PNP ARE 2N4125.



NOTES: UNLESS OTHERWISE SPECIFIED

1. COMPONENT HEIGHT NOT TO EXCEED .35 ABOVE P.C. BOARD.

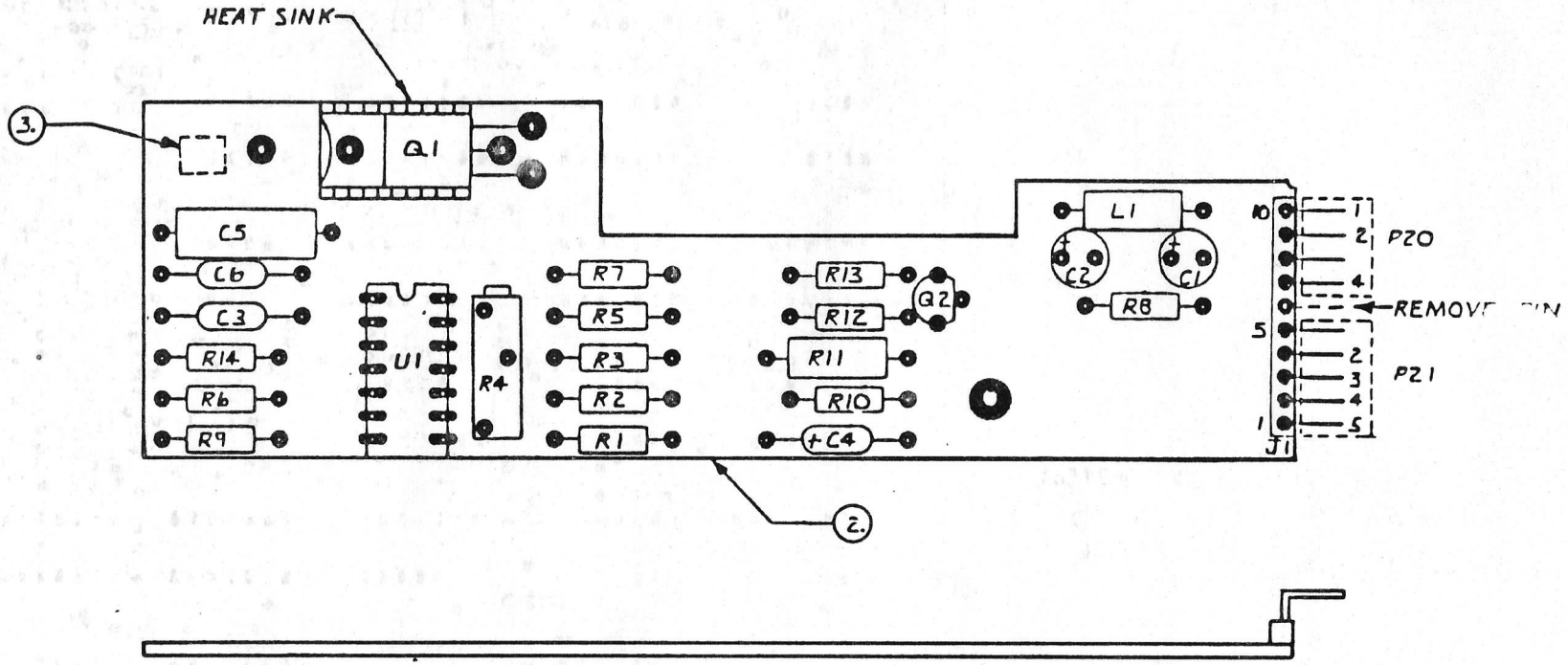
LOGIC PCBA ASSEMBLY DRAWING



NOTES: UNLESS OTHERWISE SPECIFIED

1. RESISTORS ARE IN OHMS, ±5%, 1/4 W.
2. 1% RESISTORS ARE 1/8 W.
3. CAPACITORS ARE IN uF, ±20%, 35 V.

SERVO PCBA, LINEAR



NOTES: UNLESS OTHERWISE SPECIFIED

1. ASSEMBLE PER STANDARD MANUFACTURING METHODS.
2. THIS ASSEMBLY SHALL BE MADE FROM PCB DETAIL 178901-001, REVISION A.

SERVO PCBA, LINEAR

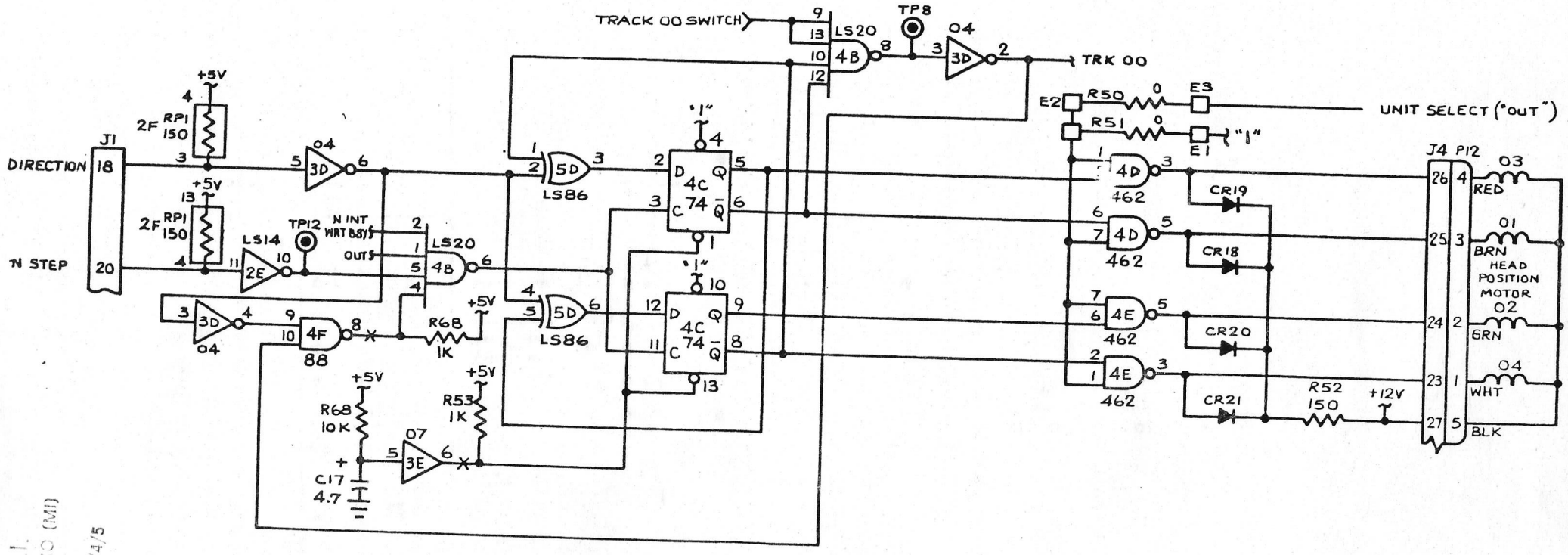


Figure 3-5
Direction and Step Lines Schematic Diagram

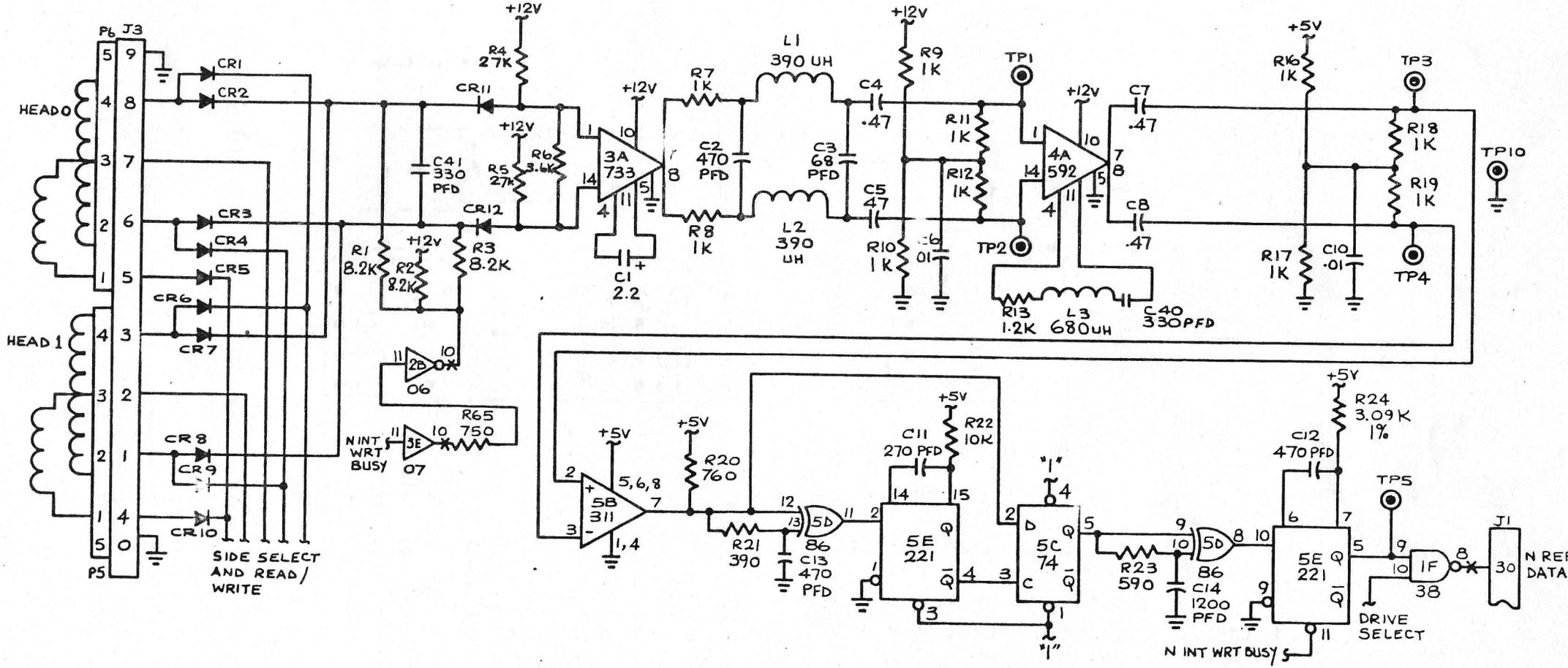
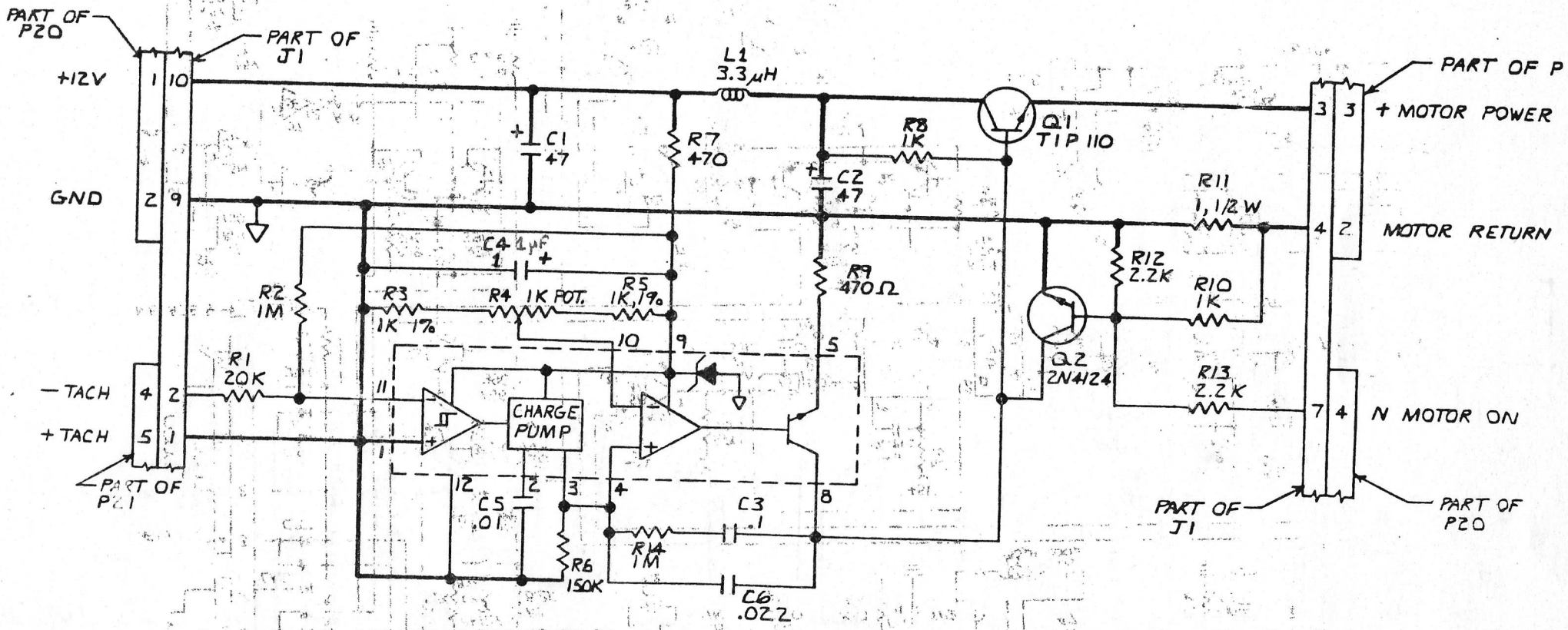


Figure 3-13
Read Data Schematic Diagram



NOTES: UNLESS OTHERWISE SPECIFIED

1. RESISTORS ARE IN OHMS, ±5%, 1/4 W.
2. 1% RESISTORS ARE 1/8 W.
3. CAPACITORS ARE IN uF, ±20%, 35V.

Figure 3-16
Servo Board Schematic Diagram