SA850/851 Double Sided Diskette Storage Drive

Service Manual

Shugart Associates®

SA850/851 Double Sided Diskette Storage Drive

Service Manual

Theory of Operations

Section 1

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1.0 GENERAL OPERATIONS

The SA850/851 Diskette Drive consists of read/write and control electronics, drive mechanism, read/write heads, track positioning mechanism, and the removable Diskette. These components perform the following functions:

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

The relationship and interface signals for the internal functions of the SA850/851 are shown in Figure 1.

The Head Positioning Actuator positions the read/write heads to the desired track on the Diskette. The Head Load Actuator loads the Diskette against the read/write heads and data may then be recorded or read from the Diskette.

The electronics are packaged on the PCB. The PCB contains:

1. Index Detector Circuits (Sector/Index for SA851).
2. Head Position Actuator Driver
3. Head Load Solenoid Driver
4. Read/Write Amplifier and Transition Detector.
5. Data/Clock Separation Circuits (SA851)
6. Write Protect
7. Drive Ready Detector Circuit
8. Drive Select Circuits
9. Side Select Circuit
10. In Use and Door Lock Circuits

1.1 Head Positioning

The read/write heads are accurately positioned by a Fasflex™ metal band/stepping motor actuator system. A precision stepping motor is used to precisely position the head/carriage assembly through the use of a unique metal band/capstan concept. Each 3.6° rotation of the stepping motor moves the read/write head one track in discrete increments.

1.2 Diskette Drive Spindle

The Diskette drive motor rotates the spindle at 360 rpm through a belt-driven system. 50 or 60 Hz power is accommodated by changing the drive pulley and belt. A registration hub, centered on the face of the spindle, positions the Diskette. A clamp that moves in conjunction with the latch handle fixes the Diskette to the registration hub.

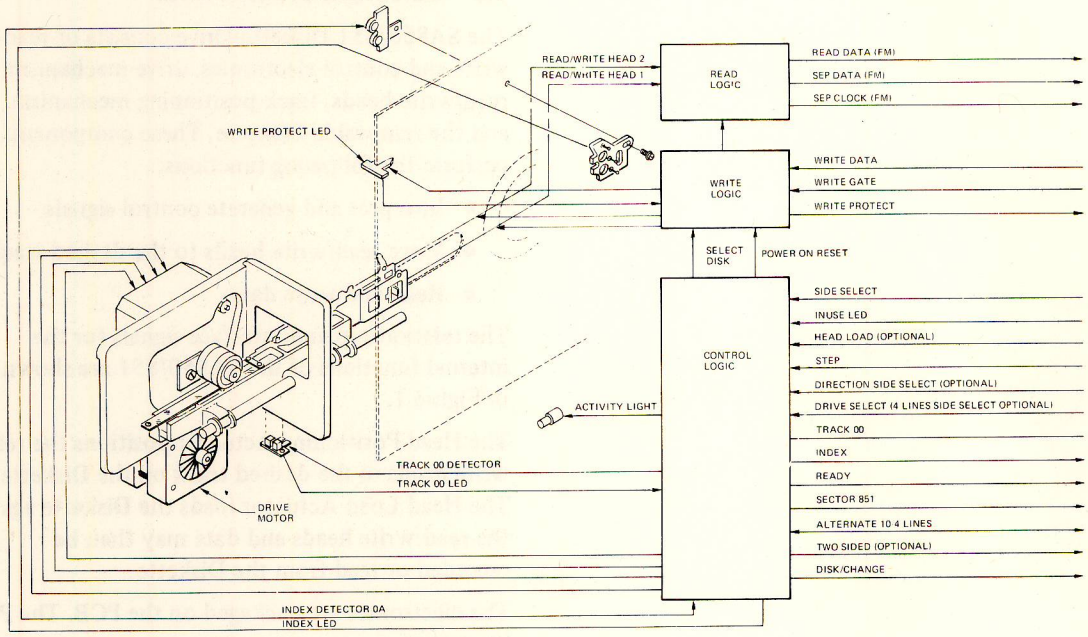


FIGURE 1 SA850/851 FUNCTIONAL DIAGRAM

1.3 Read/Write Heads

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

The read/write heads are mounted on a carriage which is positioned by the Fastflex™ actuator.

The diskette is held in a plane perpendicular to the read/write head by a platen located on the base casting. This precise registration assures perfect compliance with the read/write heads. Both heads are loaded against the diskette by the head load solenoid. The read/write heads are in direct contact with the diskette. The head surface has been designed to obtain maximum signal transfer to and from the magnetic surface of the diskette with minimum head/diskette wear.

2.0 RECORDING FORMAT (SINGLE DENSITY)

2.1 The format of the data recorded on the Diskette is totally a function of the host system. Data is recorded on the diskette using frequency modulation as the recording mode, i.e., each data bit recorded on the diskette has an associated clock bit recorded with it, this is referred to as FM encoding. Data written on and read back from the diskette takes the form as shown in Figure 2. The binary data pattern shown represents a 101.

2.2 Bit Cell

As shown in Figure 3, the clock bits and data bits (if present) are interleaved. By definition, a Bit Cell is the period between the leading edge of one clock bit and the leading edge of the next clock bit.

2.3 Byte

A Byte, when referring to serial data (being written onto or read from the disk drive), is defined as eight (8) consecutive bit cells. The most significant bit cell is defined as bit cell 0 and the least significant bit cell is defined as bit cell 7. When reference is made to a specific data bit (i.e., data bit 3), it is with respect tot he corresponding bit cell (bit cell 3).

During a write operation, bit cell 0 of each byte is transferred to the disk drive first with bit cell 7 being transferred last. Correspondingly, the most significant byte of data is transferred to the disc first and the least significant byte is transferred last.

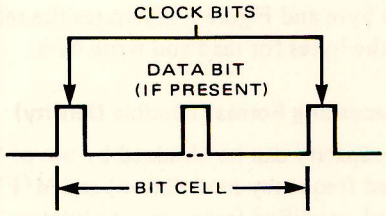


FIGURE 2 DATA PATTERN

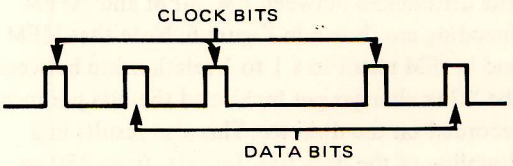


FIGURE 3 BIT CELL

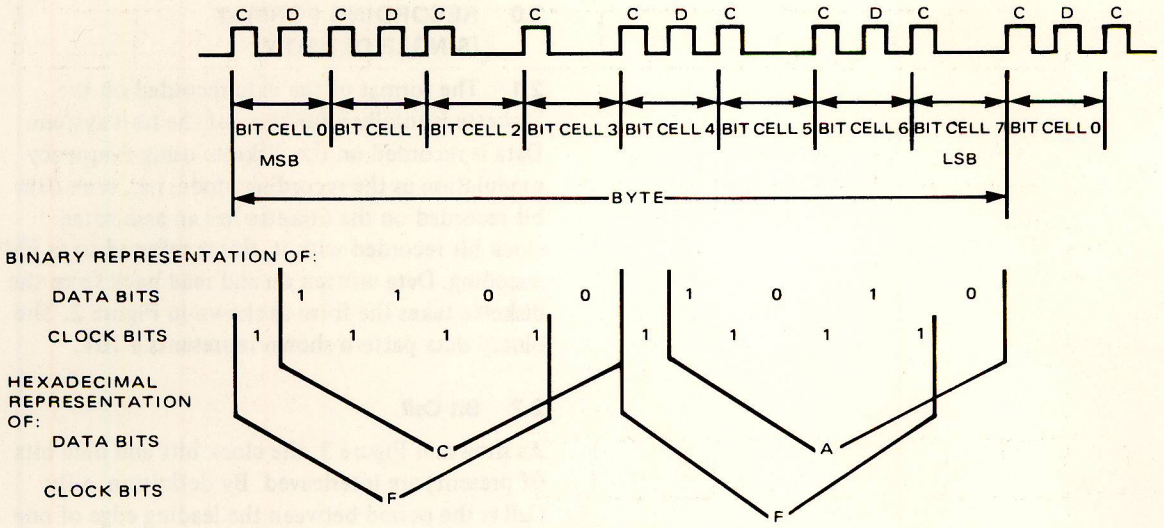


FIGURE 4 BYTE

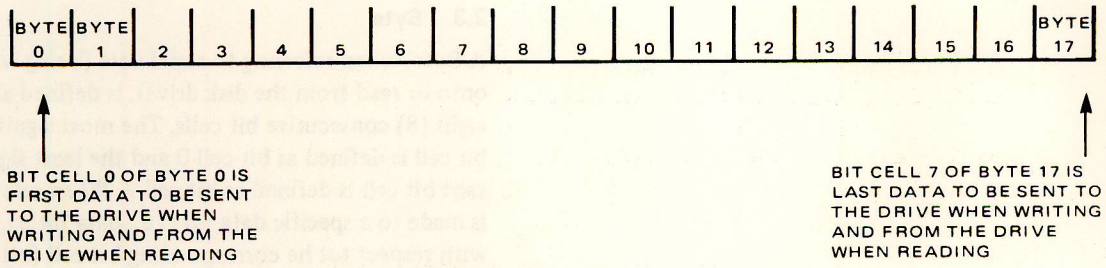


FIGURE 5 DATA BYTES

When data is being read back from the drive, bit cell 0 of each byte will be transferred first with bit cell 7 last. As with reading, the most significant byte will be transferred first from the drive to the user.

Figure 4 illustrates the relationship of the bits within a byte and Figure 5 illustrates the relationship of the bytes for read and write data.

2.4 Recording Format (Double Density)

Double capacity can be obtained by use of MFM (modified frequency modulation) and M^{2}FM (modified, modified frequency modulation) rather than FM (frequency modulation) which is the standard method of encoding data on the diskette.

The differences between FM, MFM and M^{2}FM encoding are shown in Figure 6. Note that MFM and M^{2}FM result in a 1 to 1 relationship between the "flux changes per inch" and the bits per inch recorded on the diskette. This also results in a doubling of the data transfer rate, from 250 to 500 KBS, when compared to FM.

Data error rate performance equal to standard capacity diskettes using FM encoding can be achieved by using:

- The SA850/851 diskette drive with its proprietary ceramic/ferrite read/write head.
- Phase locked loop (VFO) data separator with asymmetrical (60/40) clock and data windows.
- Write precompensation.

Provision of the phase locked loop data separator and write precompensation circuitry is the responsibility of the user of the SA850/851 diskette drive.

Shugart Associates will provide design information, as required, to SA850/851 users who desire to incorporate double capacity diskette drives in their end products.

The bit cell for MFM and M^{2}FM encoded data is one half the duration of the bit cell for FM encoded data. Also, unlike FM, the MFM and M^{2}FM bit cell does not always contain a clock bit at its leading edge. This lack of a clock bit makes data separation more complex. Also, the window size is half the FM window size, which results in less tolerance to bit shift. The only reliable method to

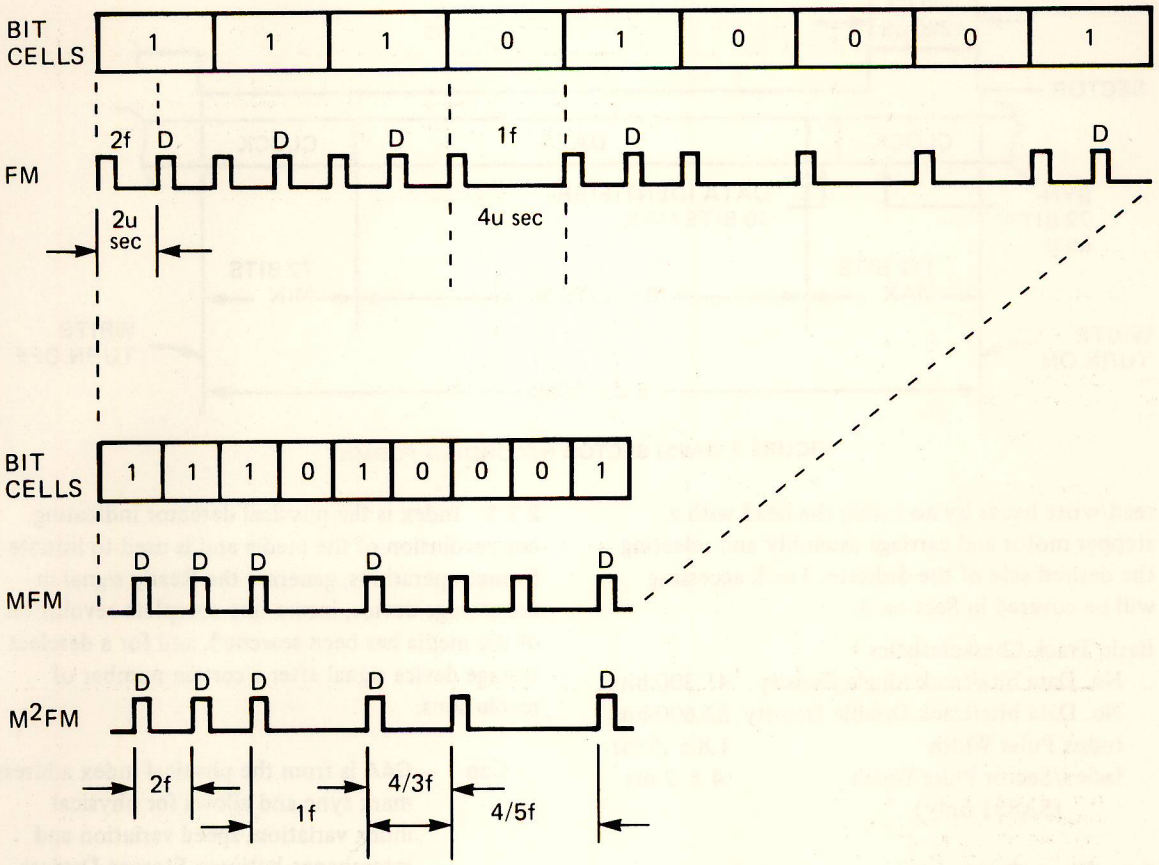


FIGURE 6 FM, MFM AND M²FM ENCODING

separate MFM and M²FM encoded data is through use of a phase locked loop (VFO) type of data separator. The VFO, once synchronized, tracks the data and generates clock and data windows, improving the bit shift tolerance over the conventional "hard" data separators commonly used in FM recording, which use windows of fixed timing.

2.4.1 Rules of Encoding

FM Encoding:

- Write data bits at the center of the bit cell.
- Write clock bits at the leading edge of the bit cell

MFM Encoding:

- Write data bits at the center of the bit cell
- Write clock bits at the leading edge of the bit cell if:
  1) There is not data bit written in the previous bit cell, and
  2) There will be no data bit written in the present bit cell.

M²FM Encoding:

- Write data bits at the center of the bit cell.
- Write clock bits at the leading edge of the bit cell if:
  1) There is no data bit or clock bit written in the previous bit cell, and
  2) There will be no data bit written in the present bit cell.

NOTE: In M²FM/MFM, the write oscillator frequency is doubled, while maintaining the same flux changes per inch as FM. Thus, the bit cell in M²FM/MFM is ½ that in FM. Data transfer rate is also doubled, since a 1 to 1 relationship exists between flux changes per inch and bits per inch (2 to 1 in FM).

2.5 Tracks

The SA850/851 drive is capable of recording up to 154 tracks of data. The tracks are numbered 0-76 for each side. Each track is made available to the

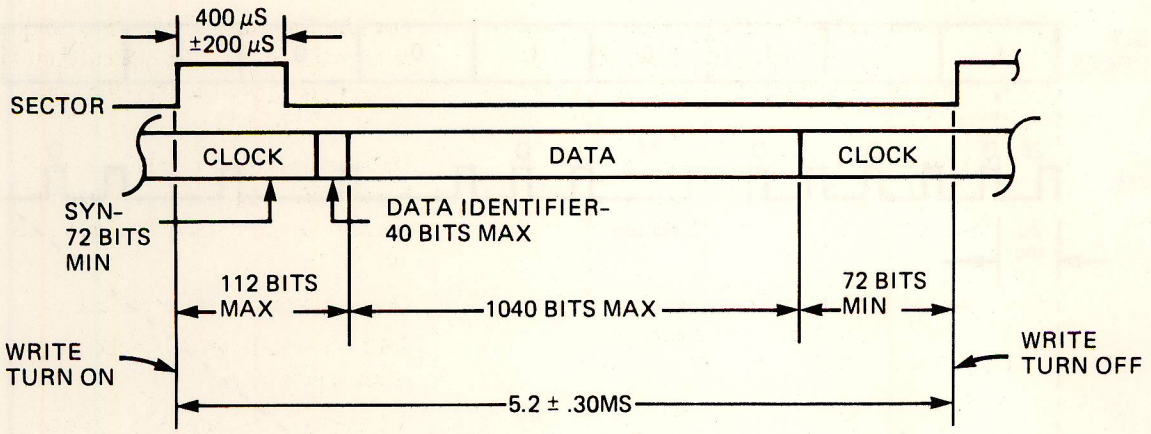


FIGURE 7 SA851 SECTOR RECORDING FORMAT

read/write heads by accessing the head with a stepper motor and carriage assembly and selecting the desired side of the diskette. Track accessing will be covered in Section 3.

Basic Track Characteristics:

No. Data bits/track Single Density	41,300 bits
No. Data bits/track Double Density	82,600 bits
Index Pulse Width	1.8 ± .6 ms
Index/Sector Pulse Width (SA851 only)	.4 ± .2 ms

2.6 Track Format

Tracks may be formatted in numerous ways and is dependent on the using system. The SA850/851 use index and sector recording formats respectively.

2.6.1 Sector Recording Format

In this Format, the using system may record up to 32 sectors (records) per track. Each track is started by a physical index pulse and each sector is started by a physical sector pulse. This type or recording is called hard sectoring. Figure 7 shows a typical Sector Recording Format for 1 of 32 sectors.

2.6.2 Soft Sector Recording Format

In this Format, the using system may record one long record or several smaller records. Each track is started by a physical index pulse and then each record is preceded by a unique recorded identifier. This type of recording is called soft sectoring. Figure 8 shows a soft sector format. (IBM compatible.)

2.7 Typical Track Index Format

Figure 8 shows a track Format, which is IBM compatible, using index Recording Format with soft sectoring.

2.7.1 Index is the physical detector indicating one revolution of the media and is used to initiate format operations, generate the Ready signal in the storage device, insure one complete revolution of the media has been searched, and for a deselect storage device signal after a certain number of revolutions.

Gap 1 – **G4A** is from the physical index address mark sync and allows for physical index variation, speed variation and interchange between Storage Devices.

Sync is a fixed number of bytes for Separator synchronization prior to the address mark. It includes a minimum of two bytes plus worst case Separator sync up requirements.

Index Pre Address Mark (MFM) – Three bytes of C2 with unique clock bits not written per the encode rules. Refer to Figure 18.

Index Address Mark (FM) – is a unique byte to identify the index field and is not written per the encode rules. Refer to Figure 10.

Index Address Mark (MFM) – is one byte of FC and it is written per the encode rules. Refer to Figure 14.

G1 is from index address mark to ID field address mark sync.

ID Field – **Sync** is a fixed number of bytes for Separator synchronization prior to AM. Includes a minimum of two bytes plus worst case Separator sync up requirements.

ID Pre Address Mark (MFM) – Three bytes of A1 with unique clock bits not written per the encode rules. Refer to Figure 18.

ID Address Mark (FM) – is a unique byte to identify the ID field and not written per the encode rules. Refer to Figure 11.

ID Address Mark (MFM) – is one byte of FE and it is written per the encode rules. Refer to Figure 15.

ID – is a four byte address containing track number, head number, record number, and record length.

CRC – is two bytes for cyclic redundacy check.

Gap 2 – **Gap** from IDCRC to data AM sync and allows for speed variation, oscillator variation and erase core clearance of IDCRC bytes prior to write gate turn on for an update write.

Data Field – **Sync** is a fixed number of bytes for Separator synchronization prior to the AM. Includes a minimum of two bytes plus worst case separator sync up requirements.

Pre Data Address Mark (MFM) – Three bytes of A1 with unique clock bits not written per the encode rules. Refer to Figure 19.

Data Address Mark (FM) – is a unique byte to identify the Data Field and it is not written per the encode rules. Refer to Figure 12.

Data Address Mark (MFM) – is one byte of FB or F8 and it is written per the encode rules. Refer to Figures 16 and 17.

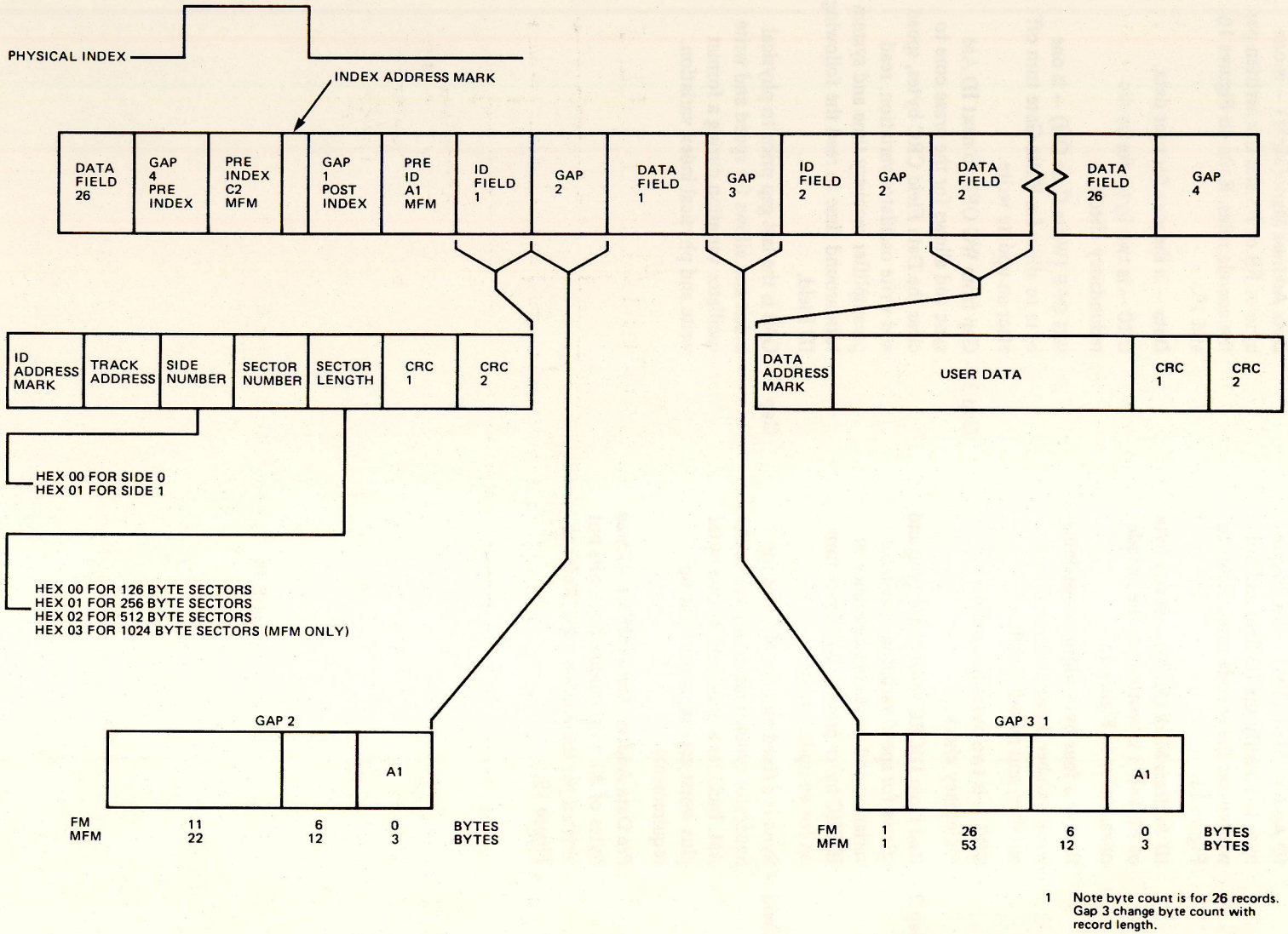
Data – is the area for user data.

CRC – is two bytes for cyclic redundancy check.

WG OFF (Write Gate Off) – is one byte to allow for Write Gate turn off after an update write.

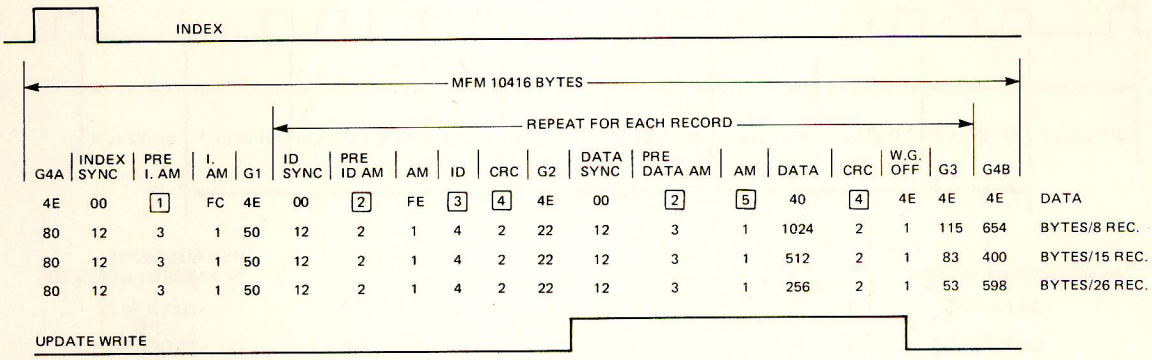
Gap 3 – Gap from WG OFF to next ID AM sync and allows for the erase core to clear the Data Field CRC bytes, speed and write oscillator variation, read preamplifier recovery time and system turn around time to read the following ID Field.

Gap 4 – G4B is the last gap prior to physical index and allows for speed and write oscillator variation during a format write and physical index variation.



1 Note byte count is for 26 records. Gap 3 change byte count with record length.

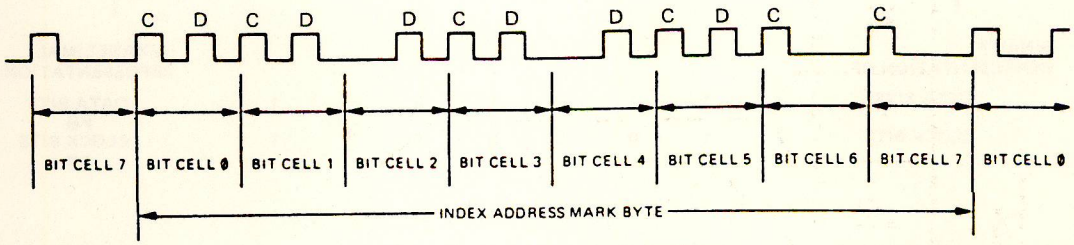
FIGURE 8 TRACK FORMAT



G4A	INDEX SYNC	PRE I. AM	I. AM	G1	ID SYNC	PRE ID AM	AM	ID	CRC	G2	DATA SYNC	PRE DATA AM	AM	DATA	CRC	W.G. OFF	G3	G4B	
4E	00	[1]	FC	4E	00	[2]	FE	[3]	[4]	4E	00	[2]	[5]	40	[4]	4E	4E	4E	DATA
80	12	3	1	50	12	2	1	4	2	22	12	3	1	1024	2	1	115	654	BYTES/8 REC.
80	12	3	1	50	12	2	1	4	2	22	12	3	1	512	2	1	83	400	BYTES/15 REC.
80	12	3	1	50	12	2	1	4	2	22	12	3	1	256	2	1	53	598	BYTES/26 REC.

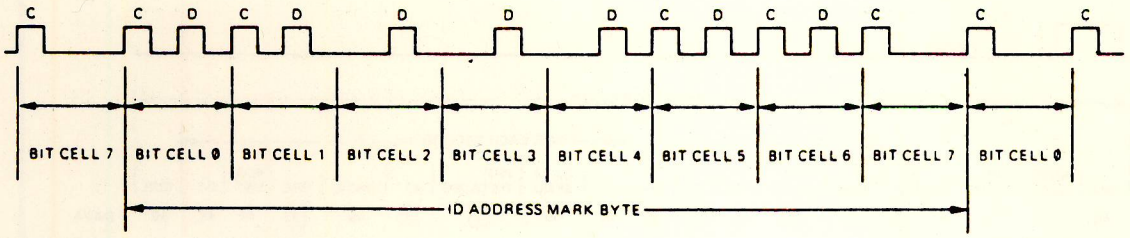
[1] 3 bytes C2 with unique clock pattern 14
[2] 3 bytes A1 with unique clock pattern 0A
[3] Track number, head number, sector, record length
[4] Generated by CRC generator which should be equivalent to CCITT VH1
[5] 1 byte of FB or F8

FIGURE 9 MFM TRACK FORMAT COMPARISON



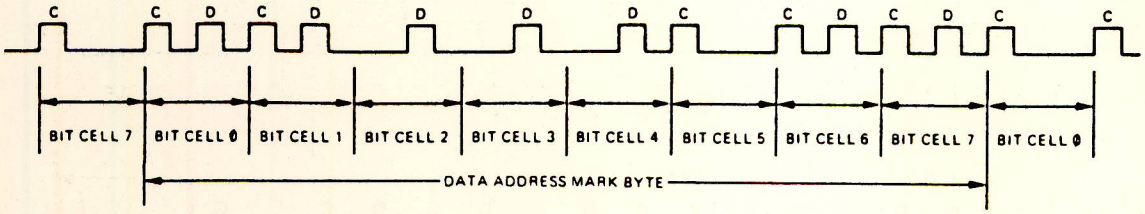
BINARY REPRESENTATION OF:									HEXADECIMAL REPRESENTATION OF:
DATA BITS	1	1	1	1	1	1	0	0	DATA BITS FC
CLOCK BITS	1	1	0	1	0	1	1	1	CLOCK BITS D7

FIGURE 10 INDEX ADDRESS MARK FM



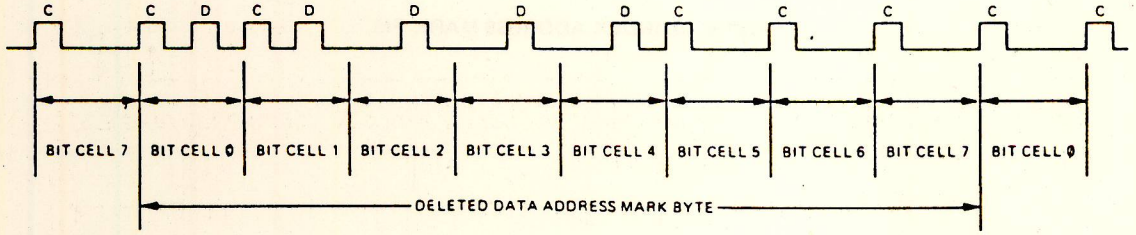
BINARY REPRESENTATION OF:									HEXADECIMAL REPRESENTATION OF:
DATA BITS	1	1	1	1	1	1	1	0	DATA BITS FE
CLOCK BITS	1	1	0	0	0	1	1	1	CLOCK BITS C7

FIGURE 11 ID ADDRESS MARK FM



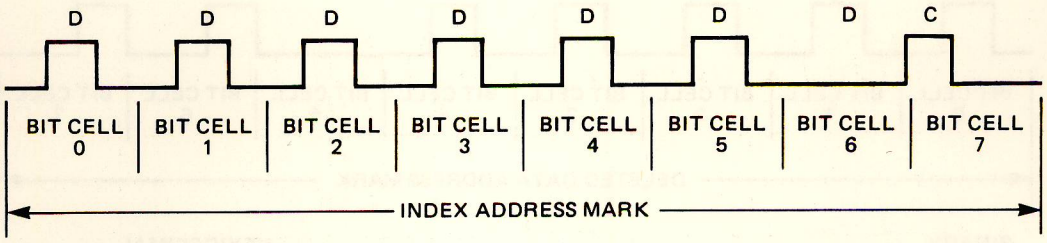
BINARY REPRESENTATION OF:									HEXADECIMAL REPRESENTATION OF:
DATA BITS	1	1	1	1	1	0	1	1	DATA BITS FB
CLOCK BITS	1	1	0	0	0	1	1	1	CLOCK BITS C7

FIGURE 12 DATA ADDRESS MARK FM



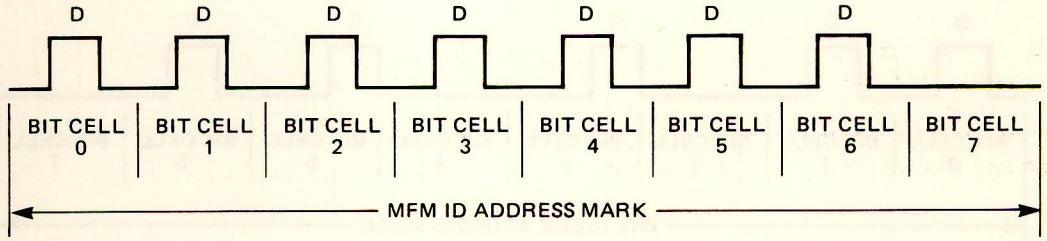
BINARY REPRESENTATION OF:									HEXADECIMAL REPRESENTATION OF:
DATA BITS	1	1	1	1	1	0	0	0	DATA BITS F8
CLOCK BITS	1	1	0	0	0	1	1	1	CLOCK BITS C7

FIGURE 13 DELETED DATA ADDRESS MARK FM



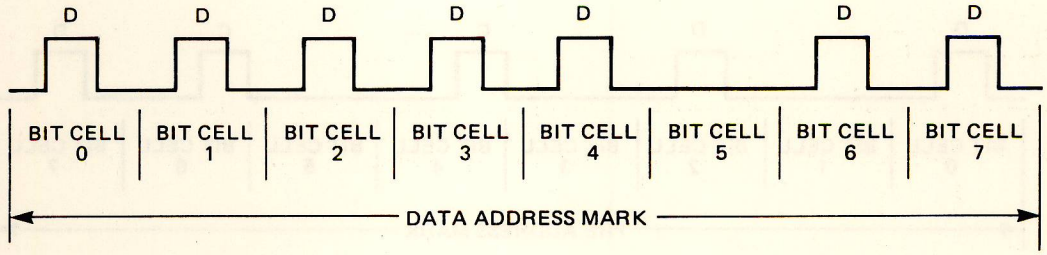
BINARY REPRESENTATION OF:									HEXADECIMAL REPRESENTATION OF:
DATA BITS	1	1	1	1	1	1	1	0	FC
CLOCK BITS			0	0	0			1	01

FIGURE 14 MFM INDEX ADDRESS MARK



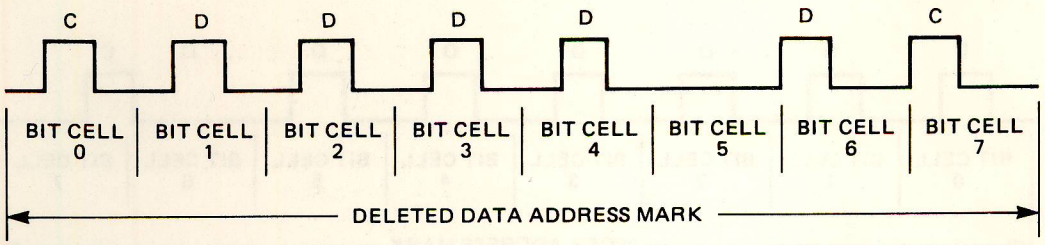
BINARY REPRESENTATION OF:									HEXADECIMAL REPRESENTATION OF:
DATA BITS	1	1	1	1	1	1	1	0	FE
CLOCK BITS	0	0	0	0	0	0	0	0	00

FIGURE 15 MFM ID ADDRESS MARK



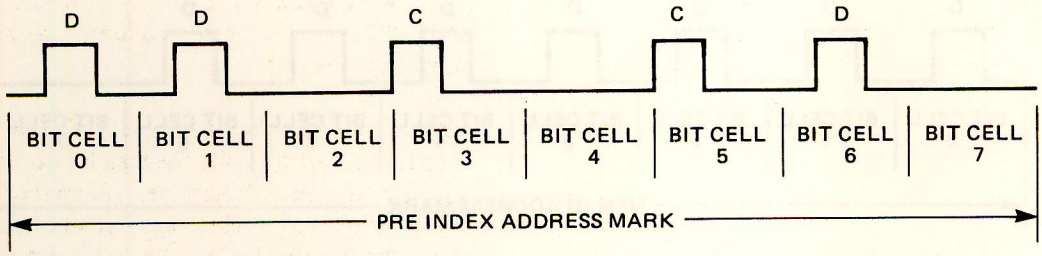
BINARY REPRESENTATION OF:									HEXIDECIMAL REPRESENTATION OF:
DATA BITS	1	1	1	1	1	0	1	1	FB
CLOCK BITS	0	0	0	0	0	0	0	0	00

FIGURE 16 MFM DATA ADDRESS MARK



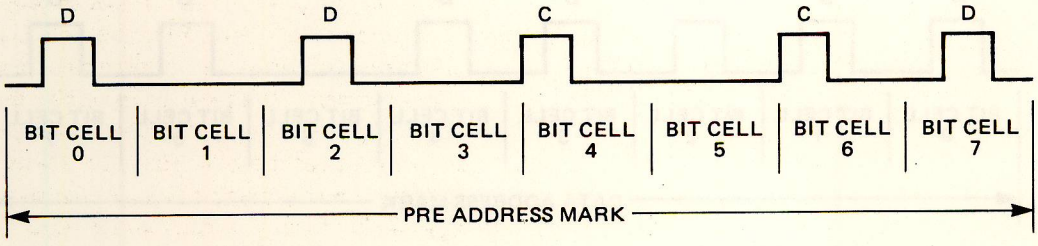
BINARY REPRESENTATION OF:									HEXIDECIMAL REPRESENTATION OF:
DATA BITS	1	1	1	1	1	0	0	0	F8
CLOCK BITS	0	0	0	0	0	0	1	1	03

FIGURE 17 MFM DELETED DATA ADDRESS MARK



BINARY REPRESENTATION OF:									HEXIDECIMAL REPRESENTATION OF:
DATA BITS	1	1	0	0	0	0	1	0	C2
CLOCK BITS	0	0	0	1	0	1	0	0	14

FIGURE 18 MFM INDEX PRE ADDRESS MARK



BINARY REPRESENTATION OF:									HEXIDECIMAL REPRESENTATION OF:
DATA BITS	1	0	1	0	0	0	0	1	A1
CLOCK BITS	0	0	0	0	1	0	1	0	0A

FIGURE 19 MFM PRE ID/DATA ADDRESS MARK

3.0 TRACK ACCESSING

- Carriage Actuator Motor
- Actuator Control Logic
- Reverse Seek
- Forward Seek
- Track 00 Flag

3.1 Seeking the read/write heads from one track to another is accomplished by selecting the desired direction utilizing the Direction Select interface line, loading the read/write heads, and then pulsing the Step line. Multiple track accessing is accomplished by repeated pulsing of the Step line until the desired track has been reached. Each pulse on the Step line will cause the read/write heads to move one track either in or out depending on the Direction Select line.

3.2 The Carriage Actuator Motor used on the SA850/851 is a four phase, 3.6 degree, permanent magnet stepper motor.

3.2.1 There are four stator poles with four teeth per pole extending axially the length of the rotor. The rotor contains 25 teeth per half, spaced 14.4 degrees apart, with each being displaced one tooth pitch relative to each other. The rotor is permanently magnetized with one gear (half) being the north pole and the other the south pole. The four winding per phase are those which when energized will magnetize the poles causing the rotor to move ¼ of a gear tooth pitch or 1 step.

3.3 Actuator Control Logic (Figure 20)

3.3.1 Power On Reset

The Step Counter (FF A and FF B) is a modified Gray Code counter that counts 0, 1, 3 and 2. At power on, the Step Counter is reset causing the not outputs to be active. When the door is closed and the heads loaded the not outputs actuate the 1 and 4 drivers. With these drivers active the position zero windings are excited causing the rotor to align as shown in Figure 21. (Note, depending on the previous state of the stator windings, the heads may move up to two tracks).

3.3.2 Forward Seek

- Seek forward five tracks.
- Assuming:

  Present position of the read/write heads to be track 00.

Direct Select at a minus level (from the host system).

Write Gate inactive.

Five Step pulses to be received (from the host system).

Step Counter reset (drivers 1 and 4 active).

Minus Direction Select is inverted and becomes +Direction Select. Since the Step Counter is reset (low), a high is at one input of Exclusive OR A and a low at Exclusive OR B. +Direction Select is high and inverts both signals present at Exclusive OR's A and B, causing the input to FFB to be high.

When the first Step pulse is sent tot he control logic, it is anded with -Read Gate and then clocks FFA off and FFB on. This enables drivers 1 and 3 causing the Actuator Motor to move 3.6° in a clockwise direction, which in turn moves the carriage assembly one track towards the center of the diskette. Figure 22 (Track 01, Count 1).

With FFA off and FFB on, a low is presented to Exclusive OR A and B allowing +Direction Select to pass to both FFS. Upon receipt of the next Step pulse both FFS are clocked on, enabling drivers 2 and 3. Figure 23 (Track 02, Count 3).

With both FFS on a low is at Exclusive OR A and a high at Exclusive OR B which presents +Direction Select to FFA. The next Step pulse clocks FFA on and FFB off enabling drivers 2 and 4. Figure 24 (Track 03, Count 2).

This process is continued until the host system stops sending step pulses at Track 05. At that time FFA is off and FFB on enabling drivers 1 and 3. Figure 22 (Count 1).

3.3.3 Reverse Seek

- Seek in a reverse direction five tracks.
- Assuming:

  Present position of the read/write heads to be track 05. Direction Select at a positive level (from the host system).

  Write Gate inactive.

  Five step pulses to be received.

  FFA is off and FFB is on, drivers 1 and 3 active.

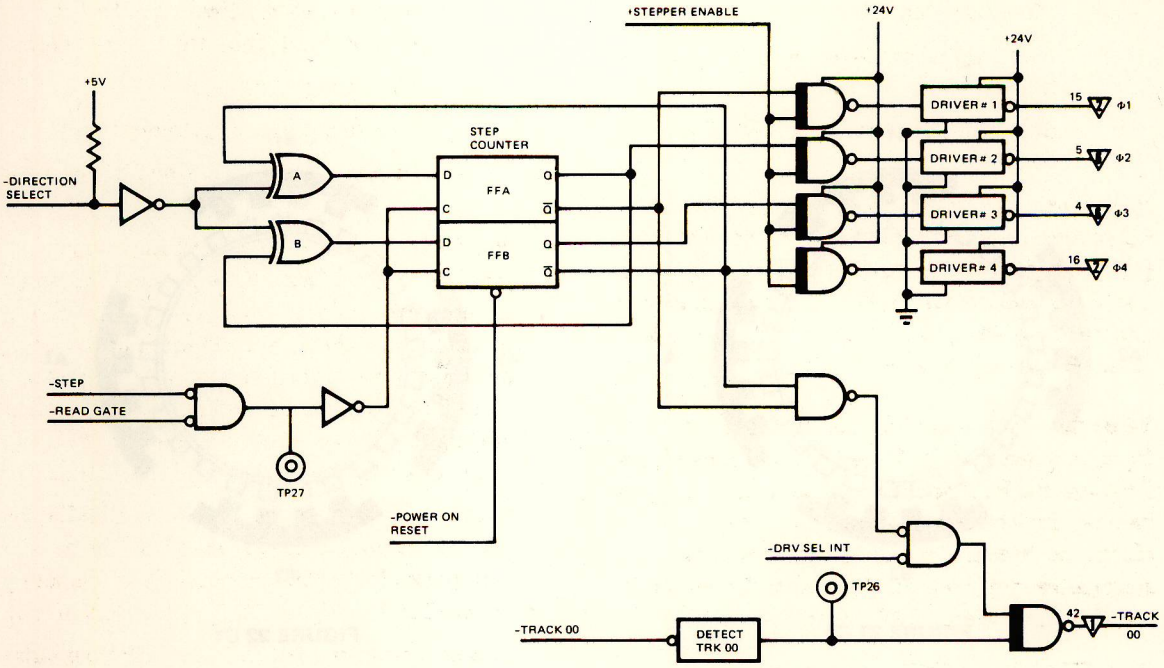
Plus Direction Select is inverted and becomes -Direction Select. With FFA off and FFB on lows are presented to Exclusive ORs A and B. With the first step pulse the FFS are clocked off enabling the 1 and 4 drivers causing the actuator motor to move 3.6 degrees in a counter-clockwise direction, moving the carriage one track towards the outside of the diskette. Figure 21 (Track 04, Count 0).

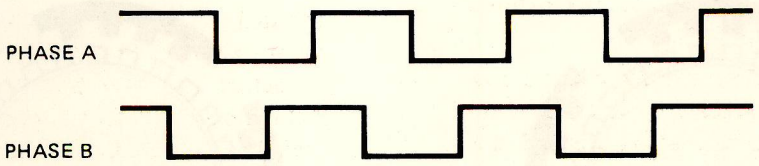
With both FFS off a high is presented to Exclusive OR A and a low to Exclusive OR B. The next Step pulse clocks FFA on and FFB off enabling drivers 2 and 4. Figure 24 (Track 03, Count 2).

This process continues until the fifth Step pulse. With lows at the Exclusive ORs, and FF's are clocked off enabling drivers 1 and 4. Figure 20, Track 00, Count 0).

3.4 Track Zero Indicator

Track 00 Pin 42 is provided to the host system to indicate the read/write heads are at track zero. The Track Zero Flag on the carriage assembly is adjusted so that the flag covers the photo transistor at track one. When FF A and B are clocked off the actuator moves to track zero, the Q outputs and Drive Select Internal are anded together and then ANDed with the Track Zero detect to send the Track Zero indication to the host system (Figure 20).





TRACK	00	01	02	03	04	05	06	07	08	09	10	11
STEP COUNT	0	1	3	2	0	1	3	2	0	1	3	2

FIGURE 20 ACTIVATOR CONTROL LOGIC

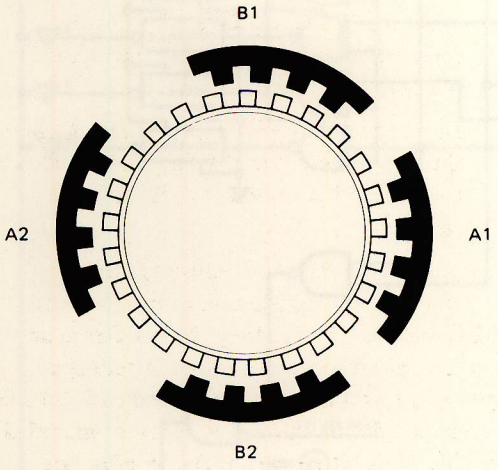


FIGURE 21 C0

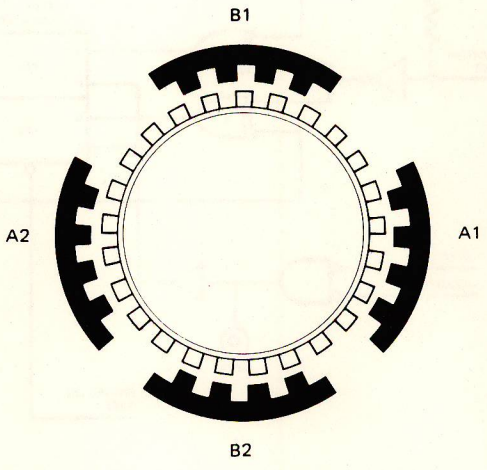


FIGURE 22 C1

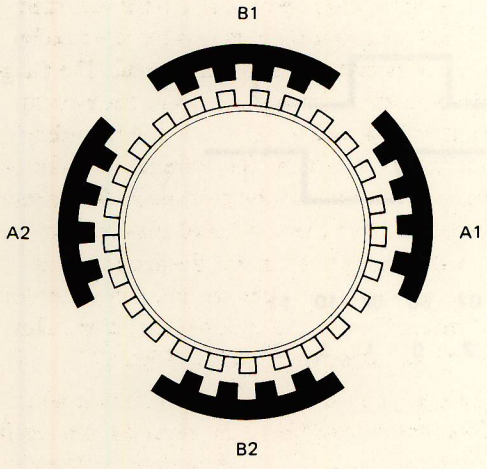


FIGURE 23 C3

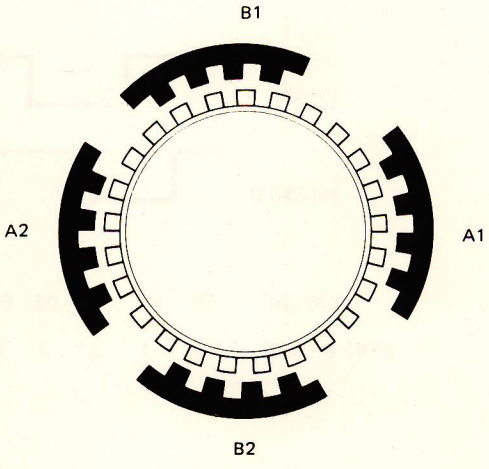


FIGURE 24 C2

4.0 READ-WRITE OPERATIONS

- SA850/851 uses double frequency NRZI recording method.
- The read/write heads are similar to a ring with a gap and a coil wound at some point on the ring.
- During a write operation, a bit is recorded when the flux direction in the ring is reversed by rapidly reversing the current in the coil.
- During a read operation, a bit is read when the flux direction in the ring is reversed as a result of a flux reversal on the diskette surface.

4.1 The SA850/851 drive uses the double-frequency (2F) horizontal non return to zero (NRZI) method of recording. Double frequency is the term given to the recording system that inserts a clock bit at the beginning of each bit cell time thereby doubling the frequency of recorded bits. This clock bit, as well as the data bit, are provided by the using system. See Figure 25.

4.2 The read/write heads are similar to a ring with a gap and a coil wound some point on the ring. When current flows through the coil, the flux induced in the ring fringes at the gap. As the diskette recording surface passes by the gap, the fringe flux magnetizes the surface in a horizontal direction. See Figure 26.

4.3 During a write operation, a bit is recorded when the flux direction in the ring is reversed by rapidly reversing the current in the coil. The fringe flux is reversed in the gap and hence the portion of the flux flowing through the oxide recording surface is reversed. If the flux reversal is instantaneous in comparison to the motion of the diskette, it can be seen that the portion of the diskette surface that just passed under the gap is magnetized in one direction while the portion under the gap is magnetized in the opposite direction. This flux reversal represents a bit. See Figure 27.

4.4 During a read operation, a bit is read when the flux direction in the ring is reversed as a result of a flux reversal on the diskette surface. The gap first passes over an area that is magnetized in one direction, and a constant flux flows through the ring coil. The coil registers no output voltage at this point. When a flux transition passes under the gap, the flux flowing through the ring and coil will make a 180° reversal. This means that the flux reversal in the coil will cause a voltage output pulse. See Figure 28.

4.5 Figure 29 shows the 1F and 2F recording flux transitions with pulse relationship.

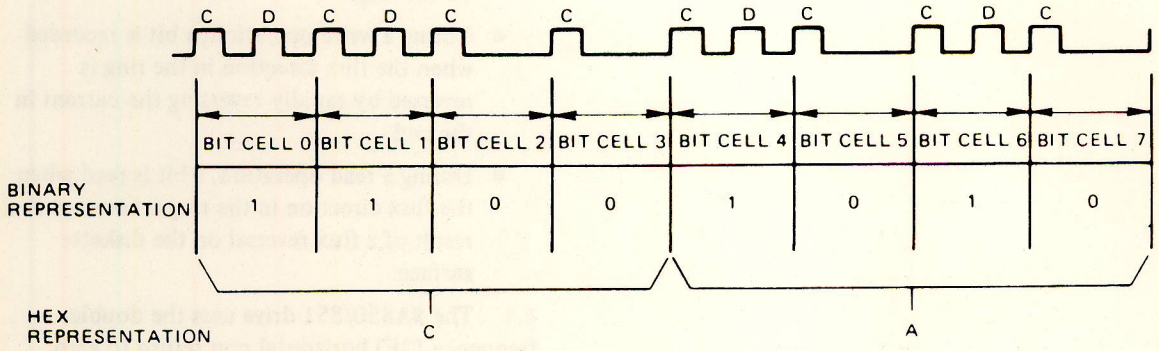


FIGURE 25 BYTE

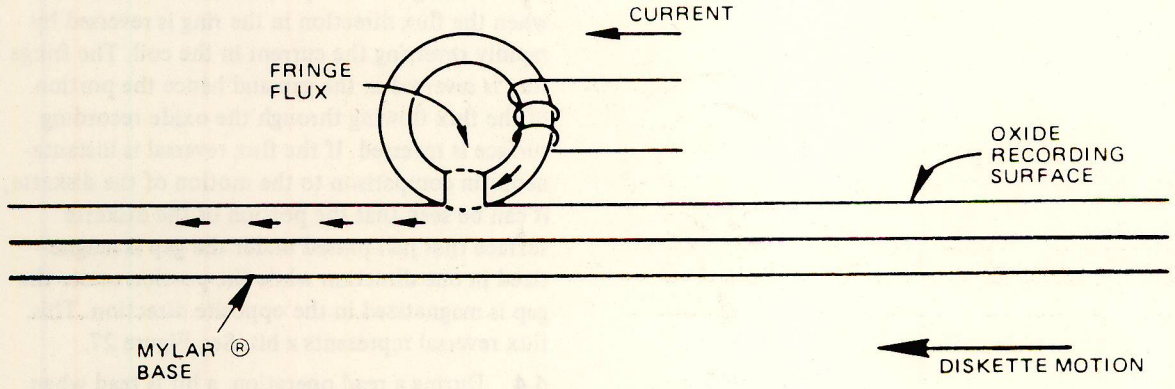


FIGURE 26 BASIC R/W HEAD

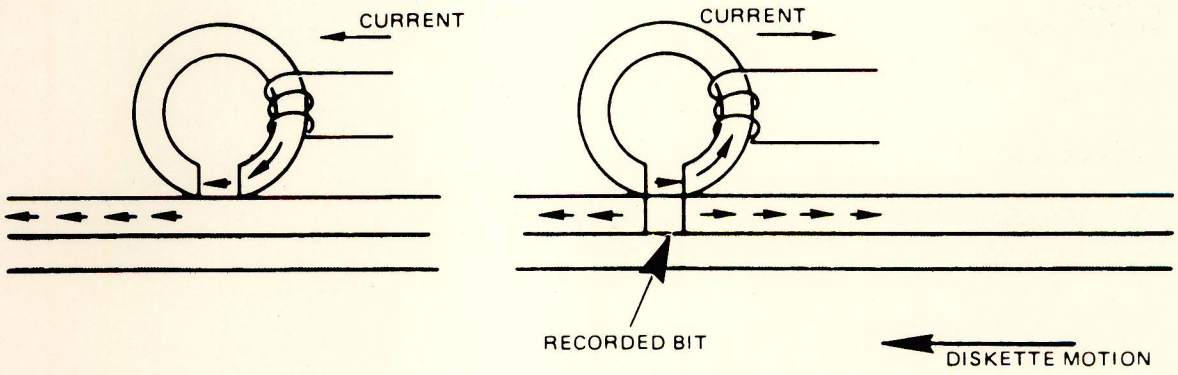


FIGURE 27 RECORDED BIT

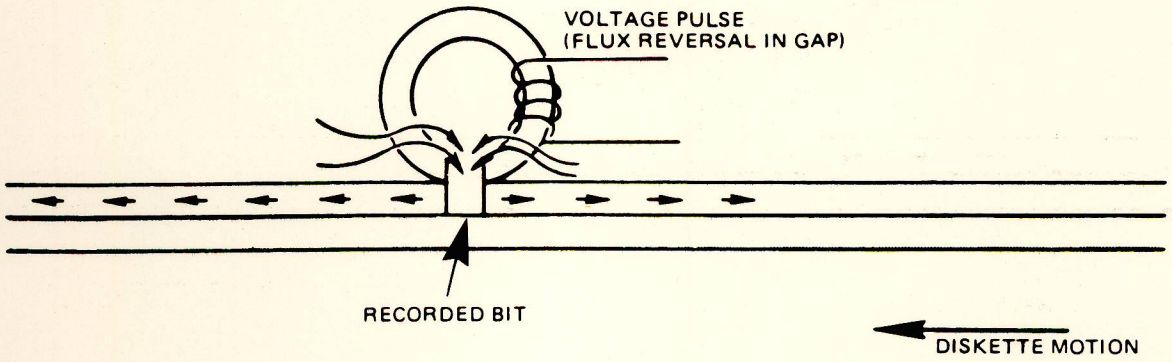


FIGURE 28 READING A BIT

5.0 READ/WRITE HEAD

- The read/write heads contain three coils each.
- When writing, the head erases the outer edges of the track to insure there is erased areas between adjacent tracks.

5.1 Each of the read/write heads contain three coils. Two read-write coils are wound on a single core, center tapped and one erase coil is wound on a yoke that spans the track being written. The read-write and erase coils are connected as shown on Figure 30.

5.2 On a write operation, the erase coil is energized. This causes the outer edges of the track to be trim erased so as the track being recorded will not exceed the .012" track width. The trim erasing allows for minor deviations in read/write head current so as one track is recorded, it will not "splash over" to adjacent tracks.

5.3 Each bit written will be directed to alternate read/write coils, thus causing a change in the direction of current flow through the read/write head. This will cause a change in the flux pattern for each bit. The current through either of the read/write coils will cause the old data to be erased as new data is recorded.

5.4 On a read operation, as the direction of flux changes on the diskette surface as it passes under the gap, current will be induced into one of the windings of the read/write head. This will result in a voltage output pulse. When the next data bit passes under the gap, another flux change in the recording surface takes place. This will cause current to be induced in the other coil causing another voltage output pulse.

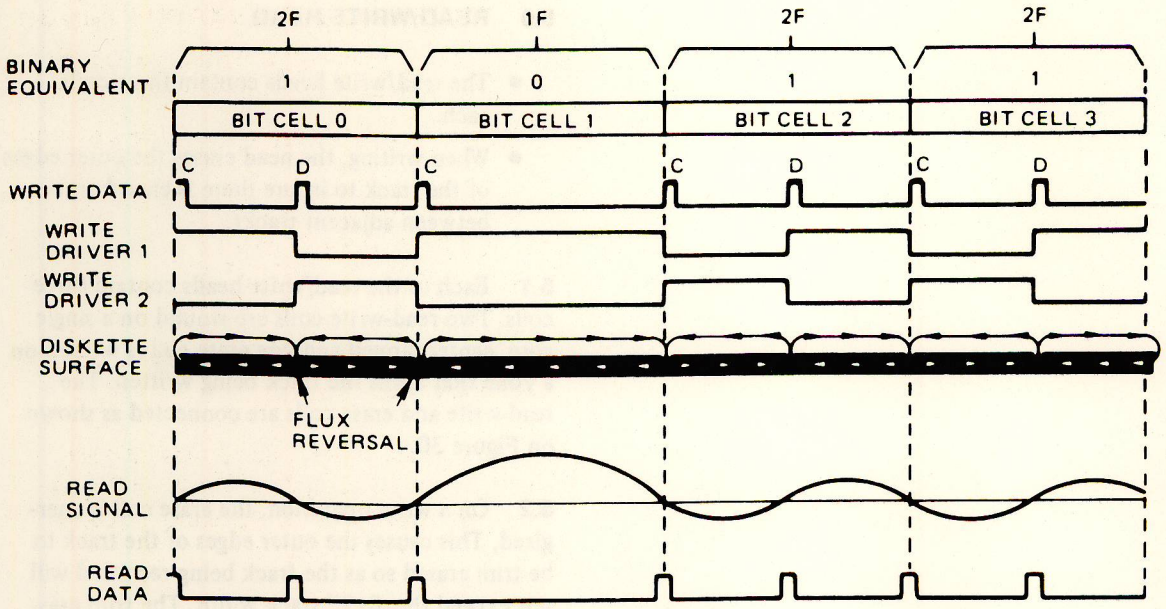


FIGURE 29 1F AND 2F RECORDING FLUX AND PULSE RELATIONSHIP

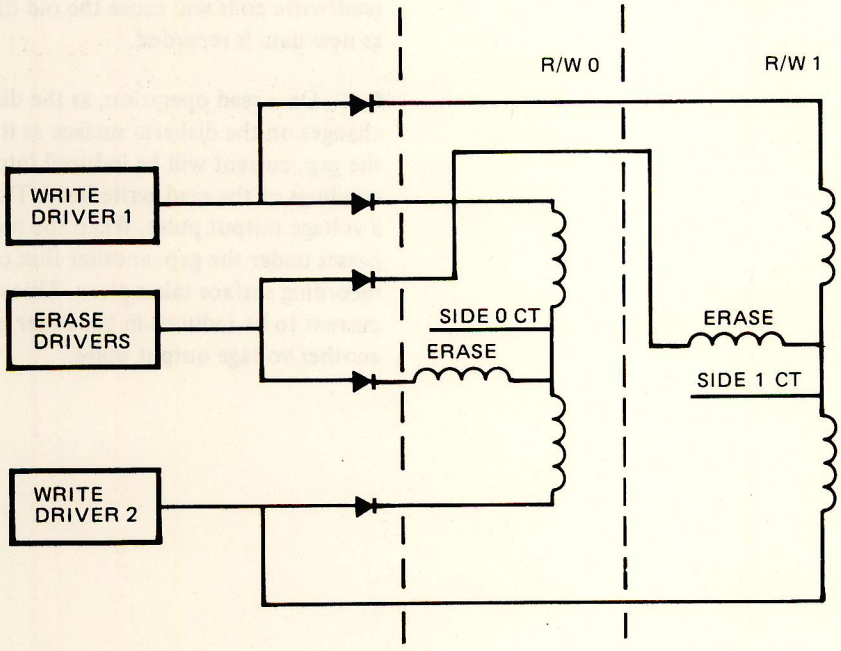


FIGURE 30 READ/WRITE HEADS

6.0 WRITE CIRCUIT OPERATION (Figure 31)

- The binary connected Write Data Trigger flips with each pulse on the Write Data line.
- The Write Data Trigger alternately drives one or the other of the Write Drivers.
- Write Gate allows write current to flow to the Write Driver circuits.
- Write Current sensed allows Erase Coil current.
- Heads are selected by grounding the appropriate center tap.

6.1 Write data pulses (clock & data bits) are supplied by the using system. The Write Trigger "flips" with each pulse. The Q and $\overline{Q}$ outputs are fed to alternate Write Drivers.

6.2 Write Gate, from using system, and not Write Protect, are anded together to provide write current.

6.3 The output of one of the Write Drivers allows write current to flow through one-half of the read/write coil of each head. When the Write Data Trigger flips, the other Write Driver provides the write current to the other half one the read/write coils.

6.4 When write current is sensed flowing to the Write Drivers, a single is generated to provide trimmer erase coil current.

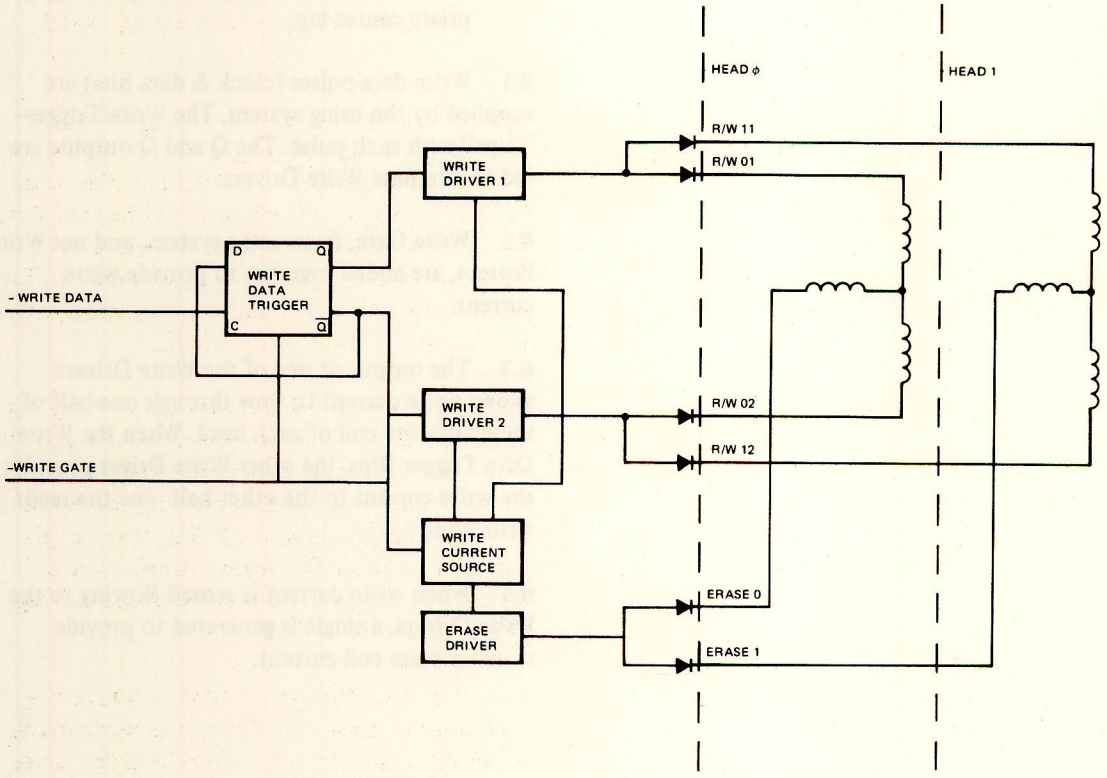


FIGURE 31 WRITE CIRCUIT FUNCTIONAL DIAGRAM

7.0 READ CIRCUIT OPERATION (Figure 32)

- Duration of all read operations is under control of the using system.
- When the heads are loaded, the read signal amplitude becomes active and is fed to the amplifier.
- As long as the heads are loaded and write gate is not active, the read signal is amplified and shaped, the square wave signals are sent to the host system.
- The data separator separates the read data into clock pulses and data pulses (SA851 only)

7.1 When the using system requires data from the diskette drive, the using system must first load the heads and select the side. With loading of the heads and write gate being inactive, the read signal is fed to the amplifier section of the read circuit. After amplification, the read signal is fed to a filter where noise spikes are removed. The read signal is then fed to the differential amplifier.

7.2 Since a pulse occurs at least once every 4 μs and when data bits are present once every 2 μs, the frequency of the read data varies. The read signal amplitude decreases as the frequency increases. Note the signals on Figure 30. The differential amplifier will amplify the read signals to even levels and make square waves out of the read signals (sine waves).

7.3 The data separator (SA851 only) is a single time constant separator, that is, the clock and data pulses must fall within pre-specified time frames or windows.

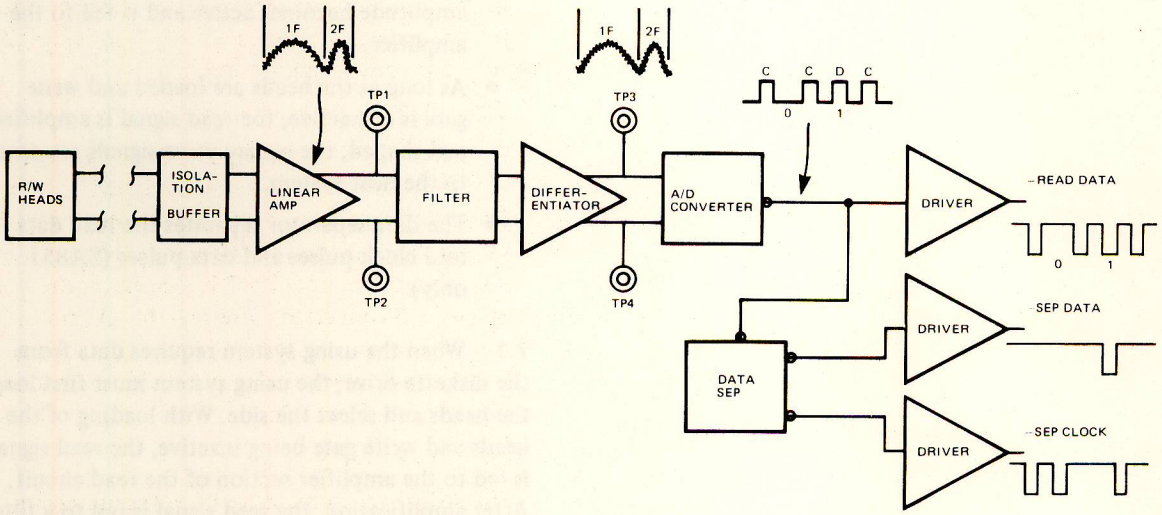


FIGURE 32 READ CIRCUIT FUNCTIONAL DIAGRAM

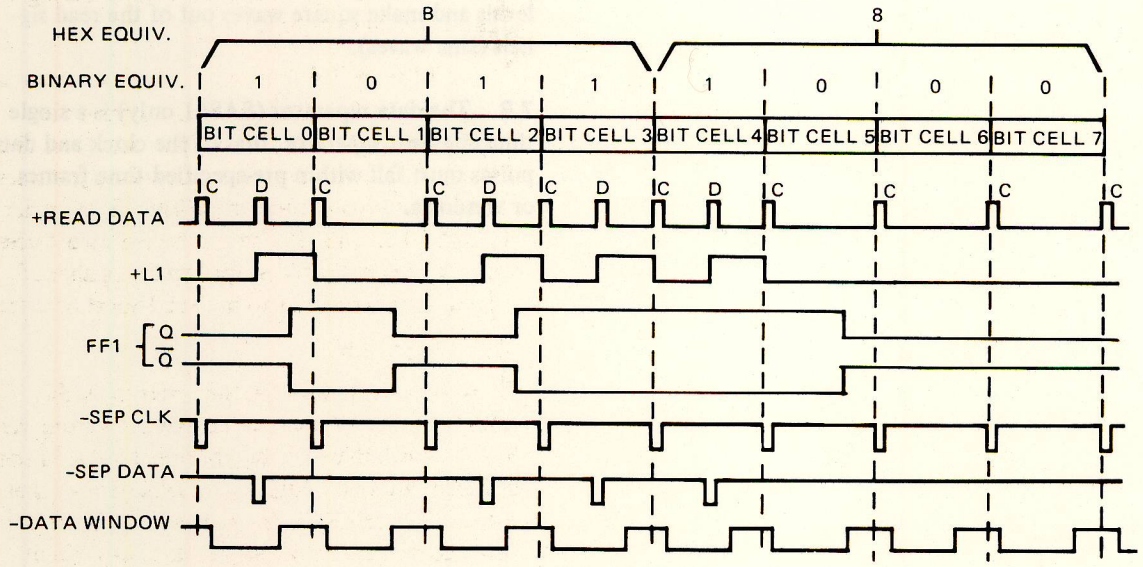


FIGURE 33 DATA SEPARATION TIMING DIAGRAM

8.0 INTERFACE

The Electrical interface between the SA850/851 drive and the host system is via three connectors. The first connector, J1, provides the signal interface; the second connector, J5, provides the DC power; and the third connector, J4, provides the AC power and frame ground.

8.1 J1/P1 Connector

Connection to J1 is through a 50 pin PCB edge card connector. The pins are numbered 1 through 50 with the even numbered pins on the component side of the PCB and the odd numbered pins on the non-component side. Pin 2 is located on the end of the PCB connector closest to the AC motor capacitor and is labeled 2. A key slot is provided between pins 4 and 6 for optional connector keying. Refer to Figure 34.

8.2 AC Power

The AC power to the drive is via the connector P4/J4 located to the rear of the drive and below the AC motor capacitor. The P4/J4 pin designations are outlined below for standard as well as optional AC power.

8.3 DC Power

DC power to the drive is via connector P5/J5 located on non-component side of PCB near the P4 connector. The three DC voltages and their specifications along with their P5/J5 pin designators, are outlined below.

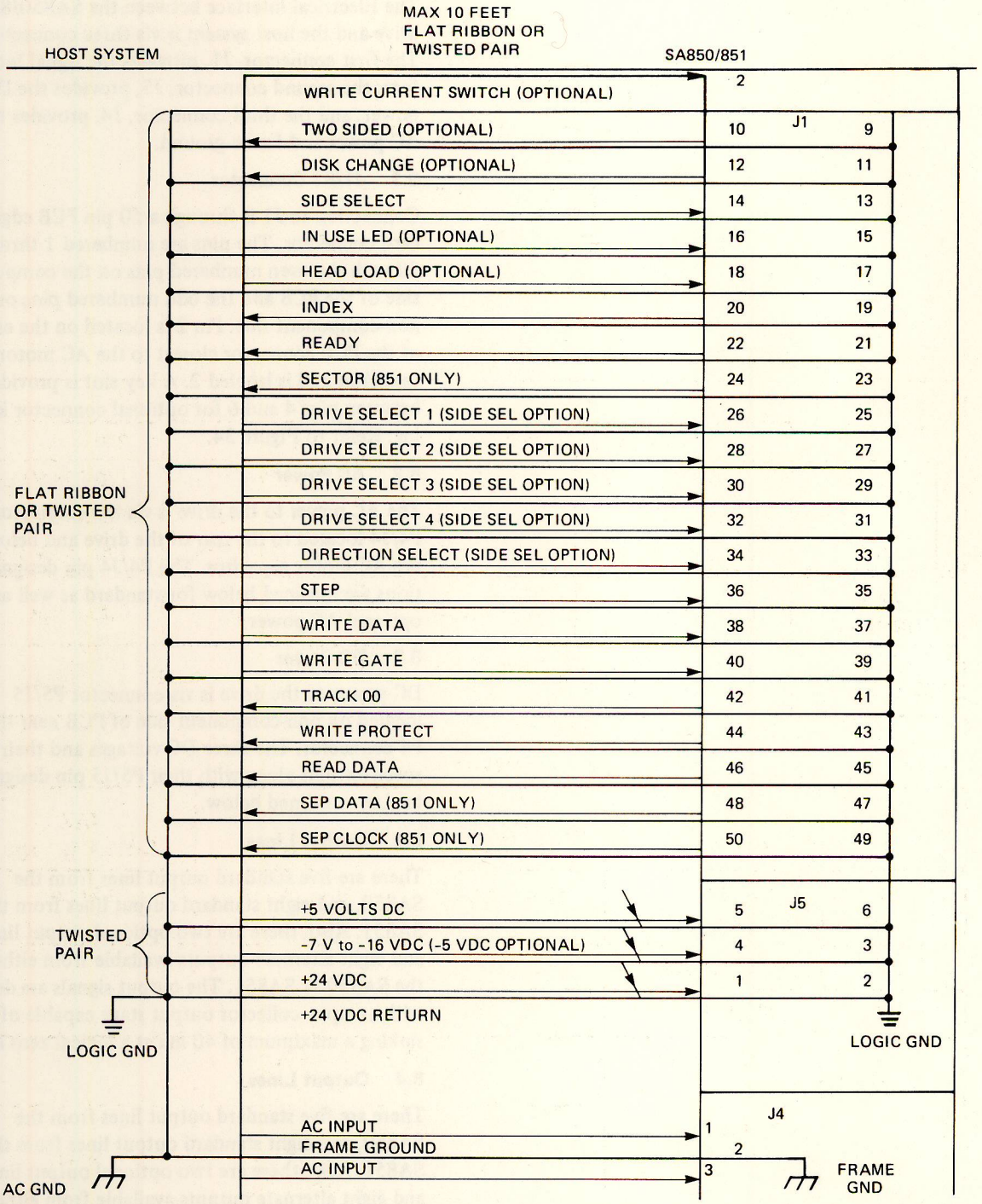
8.4 Output Lines

There are five standard output lines from the SA850, and eight standard output lines from the SA851. Also, there are two optional output lines and eight alternate outputs available from either the SA850 or SA851. The output signals are driven with an open collector output stage capable of sinking a maximum of 40 ma at a logical zero level

8.4 Output Lines

There are five standard output lines from the SA850, and eight standard output lines from the SA851. Also, there are two optional output lines and eight alternate outputs available from either the SA850 or SA851. The output signals are driven with an open collector output stage capable of sinking a maximum of 40 ma at a logical zero level or true state with a maximum voltage of 0.4V measured at the driver. When the line driver is in a logical one or false state, the driver is off and the collector current is a maximum of 250 microamperes.

Refer to Figure 35 for the recommended circuit.



NOTE: Not shown are the Alternate I/O connections. The connections for these lines are on pins 4, 6 and 8. Signal return for these lines are on pins 1, 3, 5 and 7, respectively. Reference section 7 of the 850/851 OEM Manual for uses of these lines.

FIGURE 34 INTERFACE CONNECTIONS

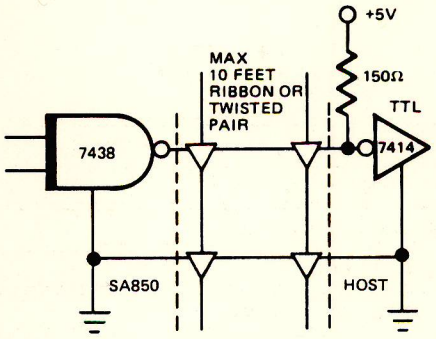


FIGURE 35

FIGURE 36

P4 PIN	60 Hz		50 Hz	
	115V (Standard)	208/230V	110V	220V
1	85-127 VAC	170-253 VAC	85-127 VAC	170-253 VAC
2	Frame Gnd	Frame Gnd	Frame Gnd	Frame Gnd
3	85-127 V Rtn	170-253 V Rtn	85-127 V Rtn	170-253 V Rtn
MAX CURRENT	0.35 Amps	0.23 Amps	0.35 Amps	0.23 Amps
FREQ TOLERANCE	±0.5 Hz		±0.5 Hz	

FIGURE 37

P5 PIN	DC VOLTAGE	TOLERANCE	CURRENT	MAX RIPPLE (p to p)
1	+24 VDC	±2.4 VDC	0.8 A Max* 0.65 A Typ	100 mv
2	+24V Return			
3	-5V Return			
4	-7 to -16 VDC		0.1 A Max 0.07 A Typ	
	Optional -5.0	+0.25 VDC	0.07 A Max 0.05 A Typ	50 mv
5	+5 VDC	±0.25 VDC	1.1 A Max 1.0 A Typ	50 mv
6	+5 V Return			

*If either customer installable option described in sections 7.1 and 7.3 of the OEM manual are used, the current requirement for the +24 VDC is a multiple of the maximum +24V current times the number of drives on the line.

Maintenance Manual

Section 2

Table of Contents

List of Illustrations

1.0 MAINTENANCE FEATURES

1.1 Alignment Diskette

The SA120-1 Alignment Diskette is used for alignment of the SA850/851. The following adjustments can be made using the SA120-1. Adjustments are checked on head zero (inside head).

1. R/W Head radial alignment using track 38.
2. Index Photo-Detector Adjustment using tracks 01 and 76.
3. Track 00 is recorded with standard IBM 3740 format.
4. TK 75 has 1f + 2f signal.

Caution should be exercised in using the SA120-1 Alignment Diskette. Tracks 00, 01, 36, 37, 38, 39, 40, 75, and 76 should not be written on. To do so will destroy pre-recorded tracks.

1.2 SA809 Exerciser

The SA809 Exerciser is built on a PCB whose dimensions are 8" x 8". The exerciser PCB can be used in a stand alone mode or it can be built into a test station or used in a tester for field service.

The Exerciser is designed to enable the user to make all adjustments and check outs required on the SA850/851 drives, when used with the SA120 Alignment Diskette.

The exerciser has no intelligent data handling capabilities but can write both 1f and 2f frequencies. The exerciser can enable read in the drive to allow checking of read back signals.

Refer to Section 6 for illustration.

1.3 Special Tools

The following special tools are available for performing maintenance on the SA850/851.

Description	Part Number
Alignment Diskette	SA120-1
Cartridge Guide Adj. Tool	50377-1
Exerciser	50619-0
Spanner Wrench	50752-0
Bail Adjustment Gauge	50383-0

2.0 DIAGNOSTIC TECHNIQUES

2.1 Introduction

Incorrect operating procedures, faulty programming, damaged diskettes, and "soft errors" created by airborne contaminants, random electrical noise, and other external causes can produce errors falsely attributed to drive failure or misadjustment.

Unless visual inspection of the drive discloses an obvious misalignment or broken part, attempt to repeat the fault with the original diskette, then attempt to duplicate fault on second diskette.

2.2 "Soft Error" Detection and Correction

Soft errors are usually caused by:

1. Airborne contaminants that pass between the read/write head and the disk. Usually these contaminants can be removed by the diskette self-cleaning wiper.
2. Random electrical noise that usually lasts for a few μsec.
3. Small defects in the written data and/or track not detected during the write operation that may cause a soft error during a read.

The following procedures are recommended to recover from the above mentioned soft errors:

1. Reread the track ten (10) times or until such time as the data is recovered.
2. If data is not recovered after using step 1, access the head to the adjacent track in the same direction previously moved, then return to the desired track.
3. Repeat Step 1.
4. If data is not recovered, the error is not recoverable.

2.3 Write Error

If an error occurs during a write operation, it will be detected on the next revolution by doing a read operation, commonly called a "write check." To correct the error, another write and write check operation must be done. If the write operation is not successful after ten (10) attempts have been made, a read operation should be attempted on another track to determine if the media or the drive is failing. If the error still persists the diskette should be replaced and the above procedure repeated. If the failure still exists, consider the drive defective. If the failure disappears, consider the original diskette defective and discard it.

2.4 Read Error

Most errors that occur will be "soft" errors. In these cases, performing an error recovery procedure will recover the data.

2.5 Seek Error

1. Actuator malfunction.

To recover from a seek error recalibrate to track 00 and perform another seek to the original track.

2.6 Test Points 850/851*

1. Read data signal
2. Read data signal
3. Read data (differentiated)
4. Read data (differentiated)
5. Signal ground
6. Signal ground
7. Signal ground
8. Signal ground
9. Signal ground
11. + Head load
12. - Index and 851 sector pulses (single sided disc)
13. - Index and 851 sector pulses (double sided disc)
16. + Read data
17. - Data seperator timing (long data window)
18. - Data seperator timing (short data window)
25. + Write protect
26. + Detect track 00
27. + Gsted step pulses
I. - Seperated index (interface)
R. - Ready (interface)
S. - Seperated sector 851 (interface)

*NOTE: An unmarked +5V test point is located at 5H on the trace to J5 pin 5.

2.7 Connectors

2.7.1 J1/P1 provide the signal interface to the host system. The pin designations are as listed below.

2. Write Current Switch (optional)
4. Alternate I/O
6. Alternate I/O
8. Alternate I/O
10. Two Sided (optional)
12. Disk Change (optional)
14. Side Select
16. In Use (optional)
18. Head Load (optional)
20. Index
22. Ready
24. Sector (851 only)
26. Drive Select 1 (or Side Select Option)
28. Drive Select 2 (or Side Select Option)
30. Drive Select 3 (or Side Select Option)
32. Drive Select 4 (or Side Select Option)
34. Direction Select (or Side Select Option)
36. Step
38. Write Data
40. Write Gate
42. Track 00
44. Write Protect
46. Read Data
48. FM Sep Data (851 only)
50. FM Sep Clock (851 only)

NOTE: All odd numbered pins are ground.

2.7.2 J2/P2 provide control signals and power to the Head Load Actuator, the Head Position actuator dropping resistors, In Use LED and Door Lock solenoid and the detector subassemblies. The pin designators are as listed below:

A. Key
B. + In Use LED
C. + Track 00 LED
D. + Write Protect LED
E. + Index LED
F. + Door Closed
H. - Door Closed
J. Not Used
K. - Door Locked
L. - Track Zero
M. + Write Protect Det.
N. + Index/Sector 0 Det.
P. + Index/Sector 1 Det.
R. Key
S. (+A1) (-A2)
T. (+B1) (-B2)
U. - Head Load
1. Key
2. Ground
3. Ground
4. Ground
5. Ground
6. Ground
7. Not Used
8. Not Used
9. +24V Door Lock
10. +5V Track 0 Det.
11. +5V Write Protect
12. +5V Index (0 & 1) Det.
13. Not Used
14. Not Used
15. +A
16. +B
17. +24V Head Load

2.7.3 J3/P3 provides to interface to the Read/Write coils and the trim erase coil of the magnetic recording heads. The pins are listed below:

1. + Read/Write 01
2. - Side 0 Center Tap
3. + Read/Write 02
4. + Erase 0
5. + Erase 1
6. + Read/Write 12
7. - Side 1 Center Tap
8. + Read/Write 11

2.7.4 J4/P4 provide AC power and ground as listed below:

1. - AC Motor Power A
2. - Frame Ground
3. - AC Motor Power B

2.7.5 J5/P5 provide DC power and ground as listed below:

1. + 24 Volts DC
2. + 24 Volt Ground Return
3. - 5 Volt Ground
4. - 7V to -16V DC (-5VDC Optional)
5. + 5 Volts DC
6. + 5 Volts Ground Return

2.7.6 J6/P6 provide power to the Head Positioning actuator as listed below:

1. (-B2) (+B1)
2. Key
3. (+A1) (-A2)
4. (+B2) (-B1)
5. (-A1) (+A2)

3.0 PREVENTIVE MAINTENANCE

3.1 Introduction

The prime objective of any preventive maintenance activity is to provide maximum machine availability to the user. Every preventive maintenance operation should assist in realizing this objective. Unless a preventive maintenance operation cuts machine downtime, it is unnecessary.

Visual inspection is the first step in every scheduled maintenance operation. Always look for corrosion, dirt, wear, binds, and loose connections. Noticing these items during PM may save downtime later.

Remember, do not do more than recommended preventive maintenance on equipment that is operating satisfactorily.

3.2 Preventive Maintenance Procedures

Details of preventive maintenance operations are listed in Table 1. During normal preventive maintenance, perform only those operations listed on the chart for that preventive maintenance period. Details on adjustments and service checks can be found in the maintenance manual. Observe all safety procedures.

3.3 Cleanliness

Cleanliness cannot be overemphasized in maintaining the SA850/851. Do not lubricate the SA 850/851; oil will allow dust and dirt to accumulate. To prevent damage the read/write heads should not be cleaned or touched.

3.4 Cautions

The heads should never touch each other. Whenever removing or installing the heads insure a clean piece of lens tissue is inserted between the heads to prevent them from touching.

a. Never open the cartridge guide access without first unloading the heads from the load bail. (Section 4.3.)

b. Insure the up stop is in proper adjustment so the diskette will clear the heads when it is inserted. (Section 4.6.2.)

c. Make sure the door lock is functioning properly so as not to remove a diskette while the heads are loaded.

d. The Read/Write heads are factory aligned with a four track offset. Loosening the head mounting screw will destroy the alignment and the actuator assembly will have to be returned to the factory for alignment.

UNIT	FREQ MONTHS	CLEAN	OBSERVE
Read/Write Heads	N/A	No maintenance required	Do not touch or clean
Actuator band, capstain and shaft	12	Clean all oil, dust, and dirt only if necessary	
Belt	12		Frayed or weakened areas
Base	12	Clean base	Inspect for loose screws connectors, and switches
Read/Write Head	12		Check for proper alignment

FIGURE 1 PM PROCEDURES

4.0 REMOVALS, ADJUSTMENTS

NOTE: Read the entire procedure before attempting a removal and/or adjustment.

4.1 Motor Drive

4.1.1 Drive Motor Assembly: Removal and Installation

a. Extract 3 contacts to disconnect motor from AC connector (J4).

b. Loosen two screws holding capacitor clamp to the base. Remove rubber boot and disconnect motor leads from capacitor.

c. Remove connectors from PCB and remove PCB.

d. Remove belt from drive pulley.

e. Remove 4 screws holding the motor to the base casting and remove motor.

4.1.2 Motor Drive Pulley

a. Remove connectors from PCB and remove PCB.

b. Remove belt from drive pulley.

c. Loosen set screw and remove pulley.

d. Reverse procedure for installation.

NOTE: When installing a new pulley, the drive pulley must be aligned with the spindle pulley so that the belt tracks correctly.

4.2 Head Cover Shield Removal

a. Loosen the two screws holding cover to the guide opening assembly.

b. Slide cover back toward drive and remove the cover.

4.3 Cartridge Guide Access

a. Remove head cover shield (Section 4.2).

b. Position head to approximately track 00 by turning the actuator shaft.

c. Open cartridge guide by pressing pushbar on front of drive.

d. Carefully hold the moveable arm assembly (head 1, outside head) with one finger while pushing the head load bail up and back to allow the tab on the head load arm to clear the load arm. (Figure 2.)
CAUTION: Be sure the bail clears the arm before releasing the bail.

e. Insert a clean piece of lens tissue between the heads to prevent them from touching each

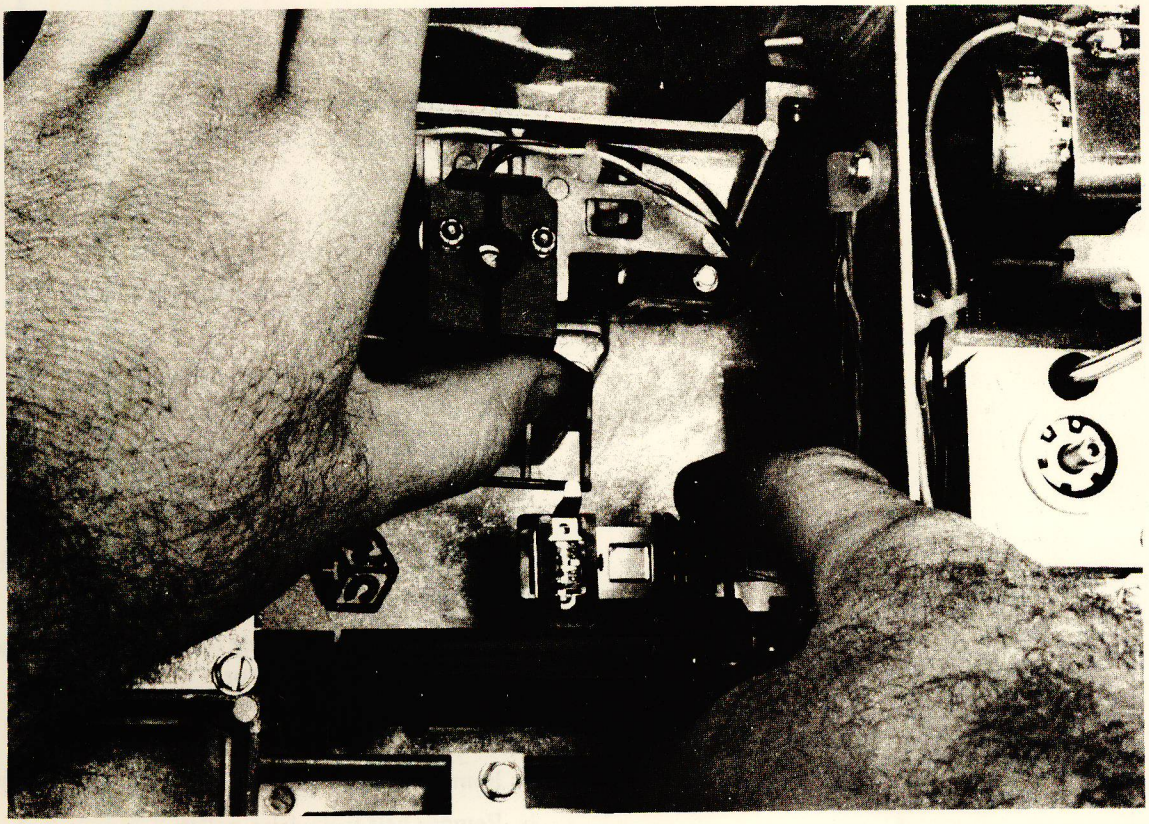


FIGURE 2 BAIL UNLOADING

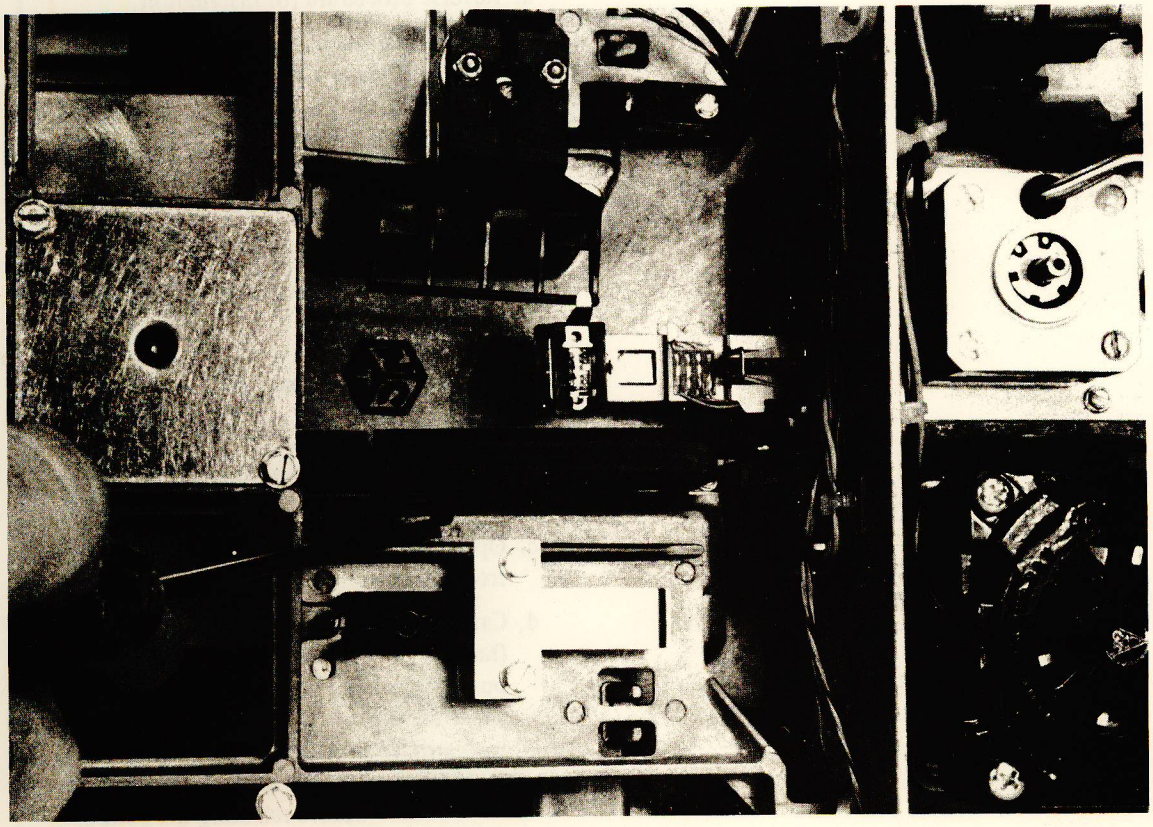


FIGURE 3 CARTRIDGE GUIDE ACCESS

other and gently lower the moveable head arm assembly.

f. Loosen the two screws holding the cartridge to door latch plate.
CAUTION: Insure the head load arm is off the load bail first.

g. Release safety catch on guide open assembly by pressing it towards the back of the drive. (Figure 3.)

h. Swing cartridge guide out.

i. To restore the cartridge guide to its normal position reverse the procedure and adjust per Section 4.9.2.

4.4 Sector/Index LED Assembly: Removal and Installation.

a. Disconnect the wires to LED terminals (solder joints).

b. Remove the screw holding the LED assembly to the cartridge guide.

c. Reverse the procedure for installation.

d. Check index timing and readjust if necessary. Refer to Section 4.7.2.

4.5 Write Protect Detector

4.5.1 Write Protect Detector: Removal and Installation

a. Remove connectors from PCB and remove PCB.

b. Extract wires from P2 connector, pins 4, D, 11, and M.

c. Remove cable clamps.

d. Remove head cover shield (Section 4.2).

e. Remove screw holding the detector bracket and remove assembly.

f. Reverse procedure for reinstalling. Connect the wires to P2 by the following: Red to (4), Black to (D), White to (11), and Gray to (M).

4.5.2 Write Protect Detector Adjustment

a. Insert a diskette into drive. Write protect notch or hole must be open.

b. Set oscilloscope to AUTO sweep, 2V/div. and monitor TP25.

c. Loosen screw on detector assembly and adjust until maximum amplitude is achieved. Tighten screw. Be sure the detector assembly is not to far forward as to restrict the diskette when it is inserted.

4.6 Head Load Actuator Assembly

4.6.1 Head Load Actuator: Removal and Installation

a. Remove head cover shield (Section 4.2).

b. Extract wires from P2 connector pins 17 and U.

c. Swing out the cartridge to guide assembly (Section 4.3).

d. Remove screw holding the actuator to the cartridge guide.

e. Install damper assembly and head load assembly onto the cartridge guide as shown in Figure 4. Do not tighten the mount screw at this time.

f. Bias the bail assembly in the direction shown in Figure 4 and align the bail parallel to the edge of the cartridge guide.

g. Tighten solenoid mount screw.

h. Adjust the damper lever location as specified in Figure 5 by loosening the damper adjustment screw. Retighten screw after adjustment.

i. Re-engage cartridge guide with spring loaded cam follower (Figure 3).

j. Engage solenoid bail with head arm lift tab by raising cartridge guide and bail away to clear the lift tab (Figure 2). Care must be taken to avoid damage to the head arm.

k. Perform step 4.9.2.

l. Reposition and tighten the limiter.

m. Perform step 4.6.2.

4.6.2 Head Load Actuator Adjustment (Refer to Figures 6, 7 and 8)

Preliminary Bail Upstop Setting:

Note: Actuator adjustments should always be checked after the Head/Actuator assembly is replaced.

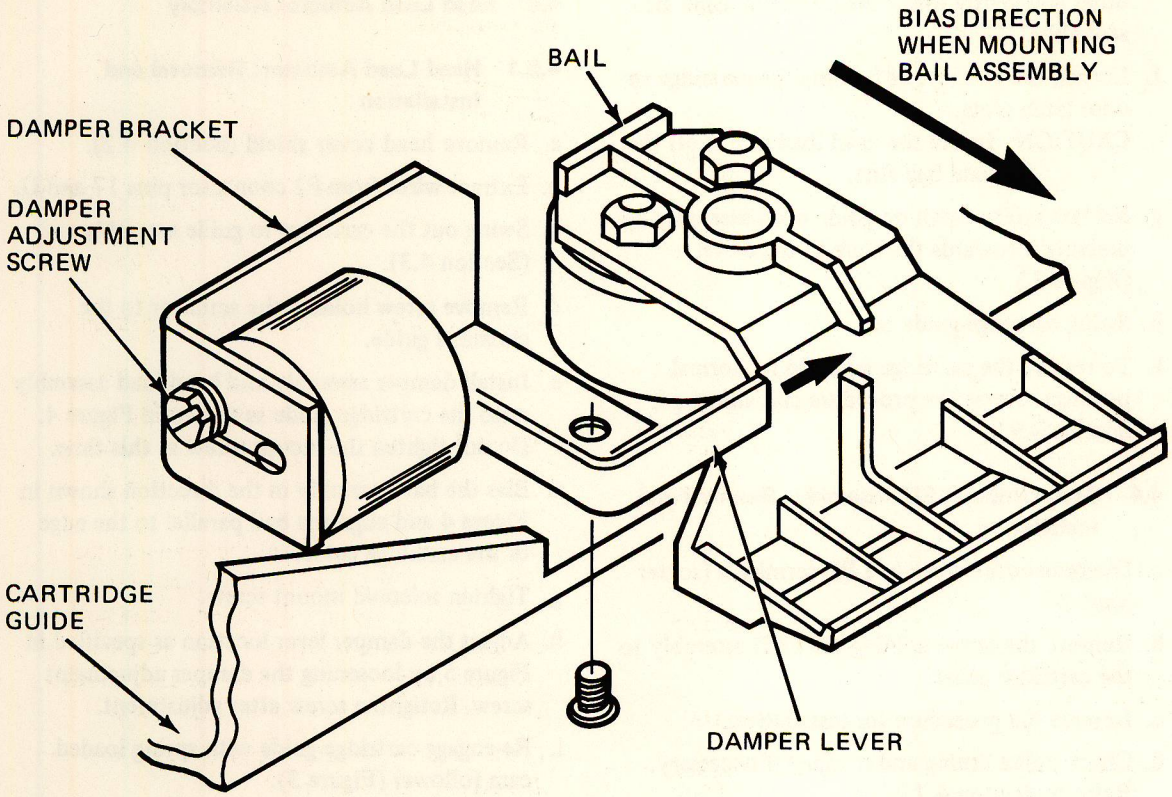


FIGURE 4 DAMPER AND HEAD LOAD POSITIONING

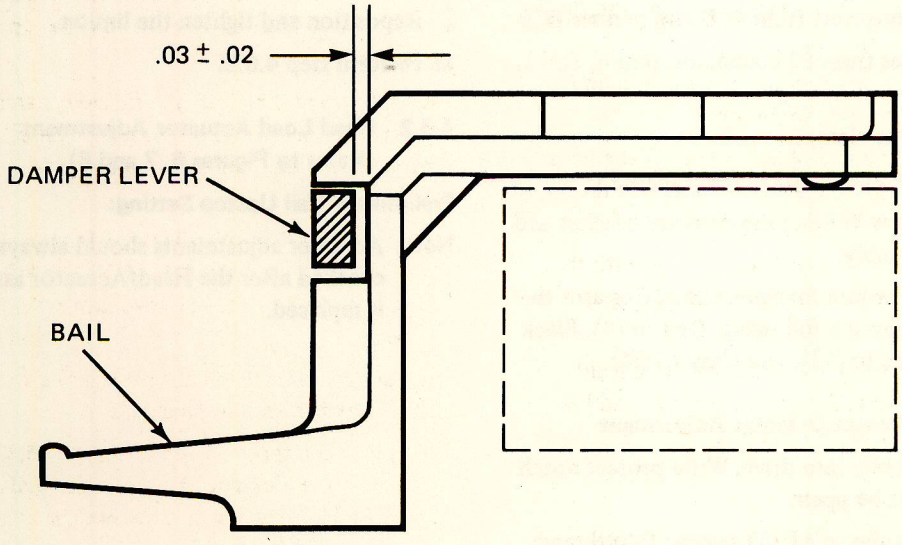


FIGURE 5 DAMPER LEVER LOCATION

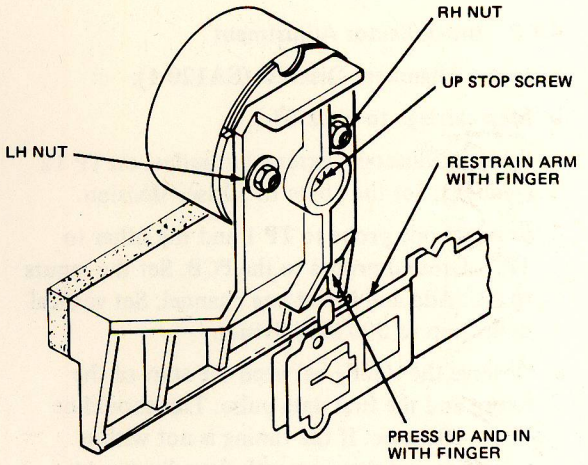


FIGURE 6 HEAD LOAD ACTUATOR ADJUSTMENT

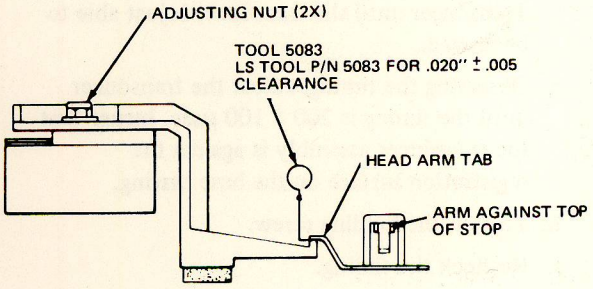


FIGURE 7 HEAD LOAD ACTUATOR ADJUSTMENT

a. Manually position the head assembly to the track 76 limit of its travel by rotating the shaft of the stepper motor.

b. Make sure that the door is fully opened and resting against the foam bumper.

c. Using the 50383-0 tool loop end, lift the load arm tab until the actuating arm reaches the limit of it's travel.

d. Rotate the upstop adjustment screw until the bail contacts and supports the actuating arm at it's travel limit.

Note: The 50383-0 tool is used as a lifting aid – *it should not be between* the bail and load arm tab during this adjustment.

Final Bail Upstop Adjustment:

e. Manually position the head assembly to the track 0 limit of it's travel by rotating the shaft of the stepper motor.

f. Slowly and carefully insert a diskette while closing the door to the point where the diskette has just enough clearance to be slipped into the drive.

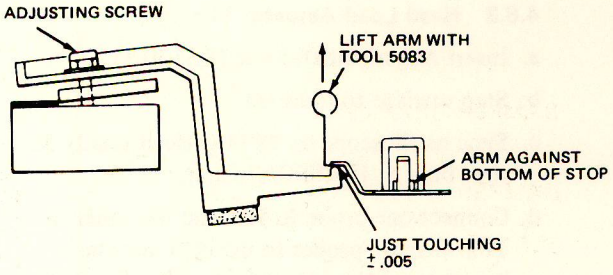


FIGURE 8 HEAD LOAD ACTUATOR ADJUSTMENT

g. Make sure there is sufficient clearance between the diskette and the actuating head (approximately 1/16") as the disk passes the actuating head to it's fully seated position with the ejector cocked.

h. If there is contact between the head and the diskette, or if there is insufficient clearance, rotate the bail upstop adjustment screw counter clockwise to obtain the specified clearance. Recheck as in Figure 6. Under no circumstances should the diskette touch the side 1 head.

i. Close the door and check to make sure that the diskette rotates properly.

j. Open the door and manually move the head actuator assembly from track 76. The load arm tab should overlap the bail at all positions.

Bail Downstop Adjustment:

k. Turn on DC power, insert a diskette, close the door, and enable drive select in order to load the head.

l. Seek to track 0 and adjust the right hand downstop nut for .020" + .005" - .000" between the bail and the load arm tab. (Figure 8.)

m. Seek to track 76 and adjust the left hand downstop nut for .020" + .005" - .000" between the bail and the load arm tab. (Figure 8.)

n. Return to track 0 and check to make sure the .020" setting has not changed.

NOTE: The tool is made of .020" thick wire. The clearance between the bail and load arm tab is supposed to be .020" + .005" - .000". In other words, the 50383-0 tool should *"just"* fit between the bail and the load arm tab without either part moving as the tool is inserted.

4.6.3 Head Load Actuator Timing

a. Insert Alignment Diskette (SA120-1).

b. Step carriage to track 00.

c. Sync oscilloscope on TP11 (+Head Load). Set time base to 10MSEC/division.

d. Connect one probe to TP1 and the other to TP2. Ground probes to the PCB. Set the inputs to add and invert one input. Set vertical deflection to 100MV/division.

e. Energize the Head Load solenoid and observe the read signal on the oscilloscope. The signal must be at 50% of full amplitude by 35Msec. Refer to Figure 9.

f. If this is not met, continue on with the procedure.

g. Check adjustments outlined in paragraph 4.6.2.

h. If item "g" is correct, adjust up stop screw (Refer to Figure 8) clockwise until timing is met.

NOTE: Not to exceed ¼ turn.

4.7 Index/Sector Photo Transistor Assembly

4.7.1 Index/Sector Photo Transistor Assembly: Removal and Installation

a. Disconnect P2 connector from PCB.

b. Remove wires from Door Closed switch ORG Common, Grey N/C, and Red N/O. Extract wires from P2 connector Pins 12 BLK, N GREEN, P BRN, 6 ORG, F GREY, and H RED.

c. Remove the cable clamp holding wires for detector.

d. Remove screw holding detector to the base plate and remove assembly.

e. To install reverse procedure.

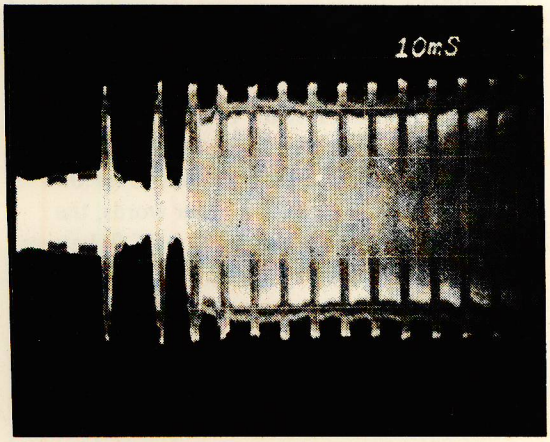


FIGURE 9 HEAD LOAD TIMING

4.7.2 Index/Sector Adjustment

a. Insert Alignment Diskette (SA120-1).

b. Step carriage to track 01.

c. Sync oscilloscope, external negative, on TP 12 (-Index). Set time base to 50μsec/division.

d. Connect one probe to TP 1 and the other to TP 2. Ground probes to the PCB. Set the inputs to AC. Add and invert one channel. Set vertical deflection to 500 MV/division.

e. Observe the timing between the start of the sweep and the first data pulse. This should be 200 ± 100 μsec. If the timing is not within tolerance, continue on with the adjustment. Refer to Figure 10.

f. Loosen the holding screw in the Index Transducer until the transducer is just able to be moved.

g. Observing the timing, adjust the transducer until the timing is 200 ± 100 μsec. Insure that the transducer assembly is against the registration surface on the base casting.

h. Tighten the holding screw.

i. Recheck the timing.

j. Seek to track 76 and reverify that the timing is 200 ± 100 μsec.

4.8 Spindle Assembly

a. Remove head cover shield (Section 4.2).

b. Switch out cartridge guide (Section 4.3).

c. Remove drive belt.

d. Remove the nut and 2 spring washers holding the spindle pulley. The Spanner Wrench 50752 may be used to hold spindle.

CAUTION: The pre-loaded rear bearing may fly out when spindle pulley is removed.

e. Withdraw spindle hub from opposite side of baseplate.

f. Reverse the procedure for installation.

g. Tighten nut to 20 in./lbs., insuring that the spring washers are compressed. Add a drop of LOCTITE #290 to the threads.

4.8.1 Clamp Hub Removal

a. Remove hub clamp plate.

b. Remove clamp hub and spring.

c. To install, reverse the procedure. No adjustment necessary.

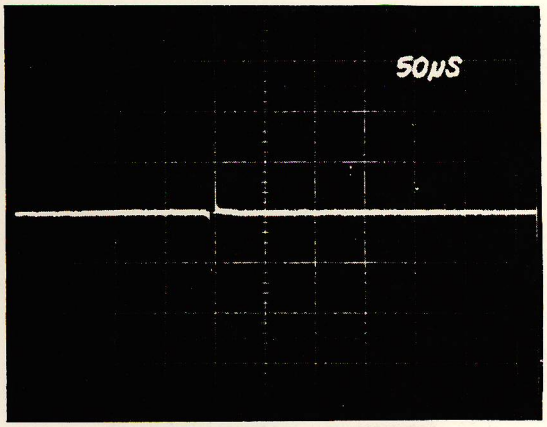


FIGURE 10 INDEX TIMING

4.9 Cartridge Guide

4.9.1 Cartridge Guide Removal

a. Perform steps 4.3, 4.4, 4.5 and 4.6.1.

b. Loosen cartridge guide stop.

c. Remove E-ring from pivot shaft.

d. Remove pivot shaft.

e. Tilt the cartridge guide slightly, and remove it from the upper pivot.

f. To install the cartridge guide, reverse the procedure.

g. Perform steps 4.5.2 and 4.6.2.

4.9.2 Cartridge Guide Adjustment

a. Insert the shoulder screw (tool P/N 50377-1) through the adjustment hole in the cartridge guide and screw completely into the base casting (hand tight).

b. Move the handle into the latched position and hold lightly against the latch.

c. Tighten two screws holding the cartridge guide to the latch plate.

d. Remove the tool and check to determine if the flange on the clamp hub clears the cartridge guide when the spindle is rotating. If the clamp hub rubs on the cartridge guide, repeat the adjustment procedure.

e. Adjust the cartridge guide stop so that it is within .005 inch of the base casting.

f. Check index alignment (Section 4.7.2).

g. Insert diskette, close and open door, then check for proper operation.

4.10 Head Amplitude Check

These checks are only valid when writing and reading back as described below. If the amplitude is below the minimum specified, before re-writing and re-checking, insure that the diskette is not "worn" or otherwise shows evidence of damage on either side. Insure head load down stop is properly adjusted (Section 4.6.2).

a. Install good media.

b. Select the drive and step to TK 76.

c. Sync the oscilloscope on TP-12 (-Index) for single sided diskettes, TP 13 for double sided diskettes, connect one probe on TP-2 and one on TP-1, on the drive PCB. Ground the probes to the PCB and invert one input. Set volts per division to 50mv and time base to 20 Msec per division.

d. Write the entire track with 2F signal (all one's).

e. The average minimum read back amplitude peak to peak, should be 110 millivolts.

If the output is below minimum and different media is tried and the output is still low, it will be necessary to install a new head and actuator assembly.

4.10.1 Head Actuator Assembly; Removal and Installation

a. Remove the connectors and the PCB.

b. Remove cable clamp holding R/W head cable on PCB side of drive.

c. Remove the grommet from the cable bracket on head side.

d. Unload heads (Refer to Section 4.3, Steps D & E).

e. Remove the two screws holding actuator assembly to the base casting.

f. Carefully remove heads and actuator assembly from the drive. Take care as not to snag the heads, load arms, or read/write head cable on the casting.

g. To install, procede as follows:

(1) Hold assembly at a slight angle towards you when installing (approximately 15° CCW viewed from rear).

(2) Rotate actuator into position against the ledge while simultaneously lifting the arm tab with the bail so that the heads are separated and the protective paper between them falls free.

(3) Position the actuator casting firmly and squarely against the ledge on the base casting and secure with two screws and washers (install the locating screw nearest the ledge first).

4.10.2 Head Radial Alignment

NOTE: The actuator assembly is aligned at the factory and adjustment is not normally required after replacing a head and actuator assembly. If after checking and the lobes are within 70% of each other, alignment is not recommended.

a. Insert Alignment Diskette (SA120-1).

NOTE: Alignment diskette should be at room conditions for at least 20 minutes before alignment checks.

b. Step the heads to track 38.

c. Sync the oscilloscope, external negative, on TP 12 (-Index). Set the time base to 20 Msec per division. This will display over one revolution.

d. Connect one probe to TP 1 and the other to TP 2. Ground the probes to the PCB. Set the inputs to AC, Add and invert one channel. Set the vertical deflection to 100MV/division.

e. The amplitude of the two lobes must be within 70% of each other. If the lobes do not fall within this specification continue on with the procedure (Refer to Figure 11).

f. Loosen the two mounting screws, which hold the motor plate to the support bracket (Refer to Figure 12).

g. Move the plate, by rotating the eccentric adjusting nut.

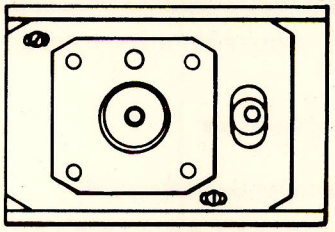


FIGURE 12 HEAD RADIAL ALIGNMENT

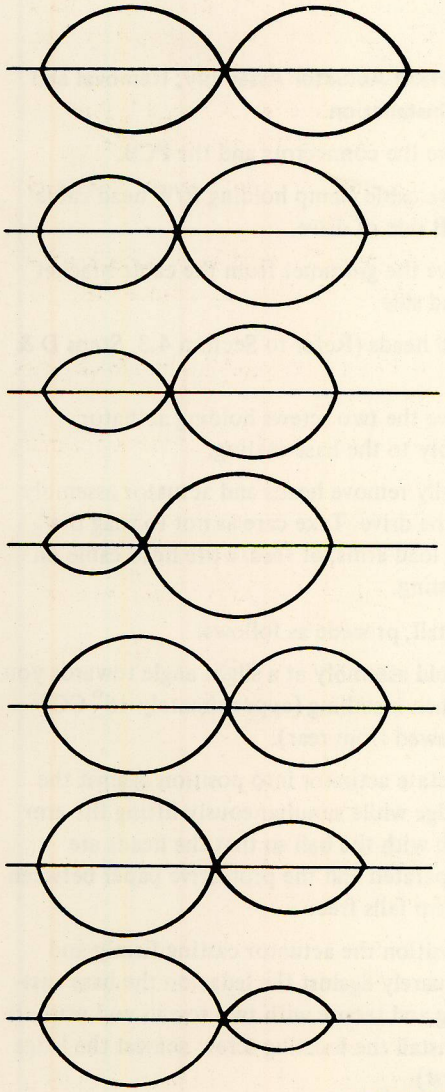


FIGURE 11 HEAD RADIAL ALIGNMENT

h. When the lobes are of an equal amplitude, tighten the motor plate mounting screws (Refer to Figure 12).

i. Check the adjustment by stepping off track and returning. Check in both directions and re-adjust as required.

j. Whenever the Head Radial Alignment has been adjusted the Track 00 detector adjustment must be checked. (Section 4.11.2.)

4.10.3 Read/Write Heads Azimuth Check

The azimuth is not field adjustable. If, after performing this check the waveform on the oscilloscope is not within ± 18' replace the Head Actuator Assembly.

a. Install Alignment Diskette SA120-1. Select the drive and step to track 76.

b. Sync the scope external negative on TP12, set time base to .5 MSec per division.

c. Connect one probe to TP1 and the other to TP2. Invert one channel and ground the probes to TP 5 & 6. Set the inputs to AC, ADD, and 50 MV per division.

d. Compare waveform to figure 13. If not within the range shown replace the Head Actuator Assembly 4.10.1

4.11 Track 00 Detector: Removal and Installation

a. Remove head cover shield (Section 4.2).

b. Swing cartridge guide open (Section 4.3).

c. Manually rotate stepper shaft and move carriage to track 77.

d. Remove screw holding bracket to base casting and remove bracket and detector.

e. Remove PCB connector and remove PCB.

f. Extract cable from P2 connector; Pin 3 BRN, C BLACK, O ORANGE, and L RED.

g. Remove cable clamps and remove Detector assembly.

h. To install, reverse the procedure.

i. Adjust according to Section 4.11.2.

4.11.1 Track 00/76 Stop Adjustment

a. Not field adjustable.

4.11.2 Track 00 Detector Assembly Adjustment

a. Check head radial alignment and adjust if necessary before making this adjustment.

b. Insert diskette.

c. Connect oscilloscope probe to TP 26. Set vertical deflection of 1 v/division and sweep to continuous.

d. Step carriage to track 01. TP 26 should be high (+5 volts).

e. If TP 26 is not high, loosen screw holding Track 00 detector assembly and move the assembly toward the spindle until TP 26 goes high.

f. Step carriage to track 02. TP 26 should go low. Adjust the detector assembly towards the actuator assembly if not low.

g. Check the adjustment by stepping the heads between tracks 01 and 02, observing that TP 26 is low at track 02 and high at track 01. A perfect adjustment is if you have a square wave on a scope.

4.12 Front Plate Assembly Removal

a. Insert the cartridge guide adjustment tool (P/N 50377-1) through the adjustment hold in the cartridge guide and screw completely into the base hold casting (hand tight).

b. Remove the door lock wires from P2. Pins 2-black, B-brown, 9-blue, and K-purple.

c. Remove the cable clamp holding the door lock wires.

d. Remove the two allen head screws holding the handle to the front plate and remove the handle.

e. Remove the four screws holding the front plate to the base casting.

f. Remove two screws holding door lock assembly to the front plate.

g. Remove two allen head screws holding the In Use LED to the door lock assembly.

h. Grasp both ends of the push button and bow outwards to remove LED.

i. Reverse procedure to install.

j. Check Index adjustment (Section 4.7.2).

4.13 Door Lock Solenoid and In Use LED Assembly Removal

a. Perform steps 4.12.a through 4.12.h.

b. Remove door lock assembly.

c. Reverse procedure to install new assembly.

d. Adjustment of the door lock should not be necessary. If it has to be, the gap between the armature tab and the latch should be .015 ± .010. This adjustment can be made by loosening the two screws on the armature.

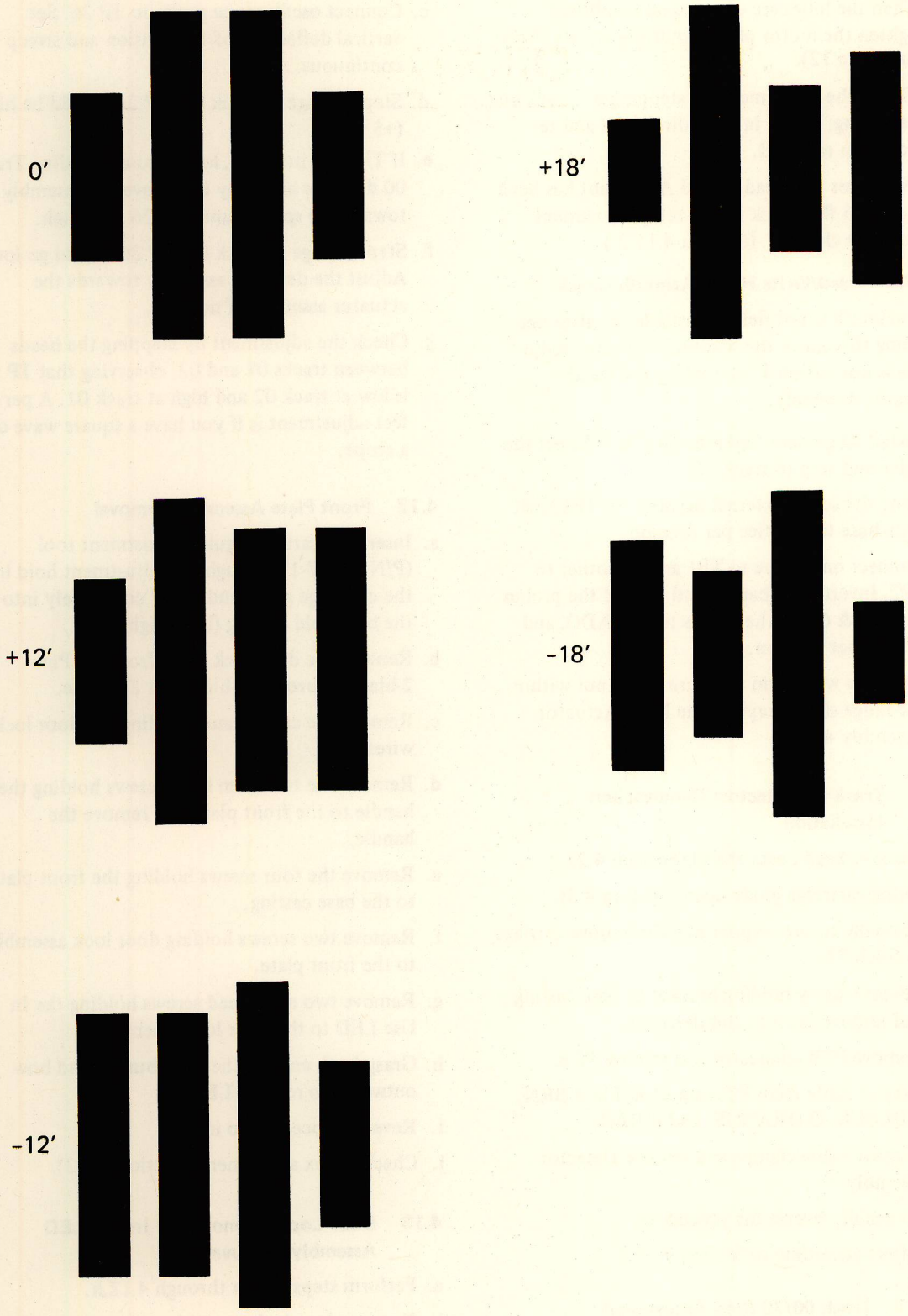
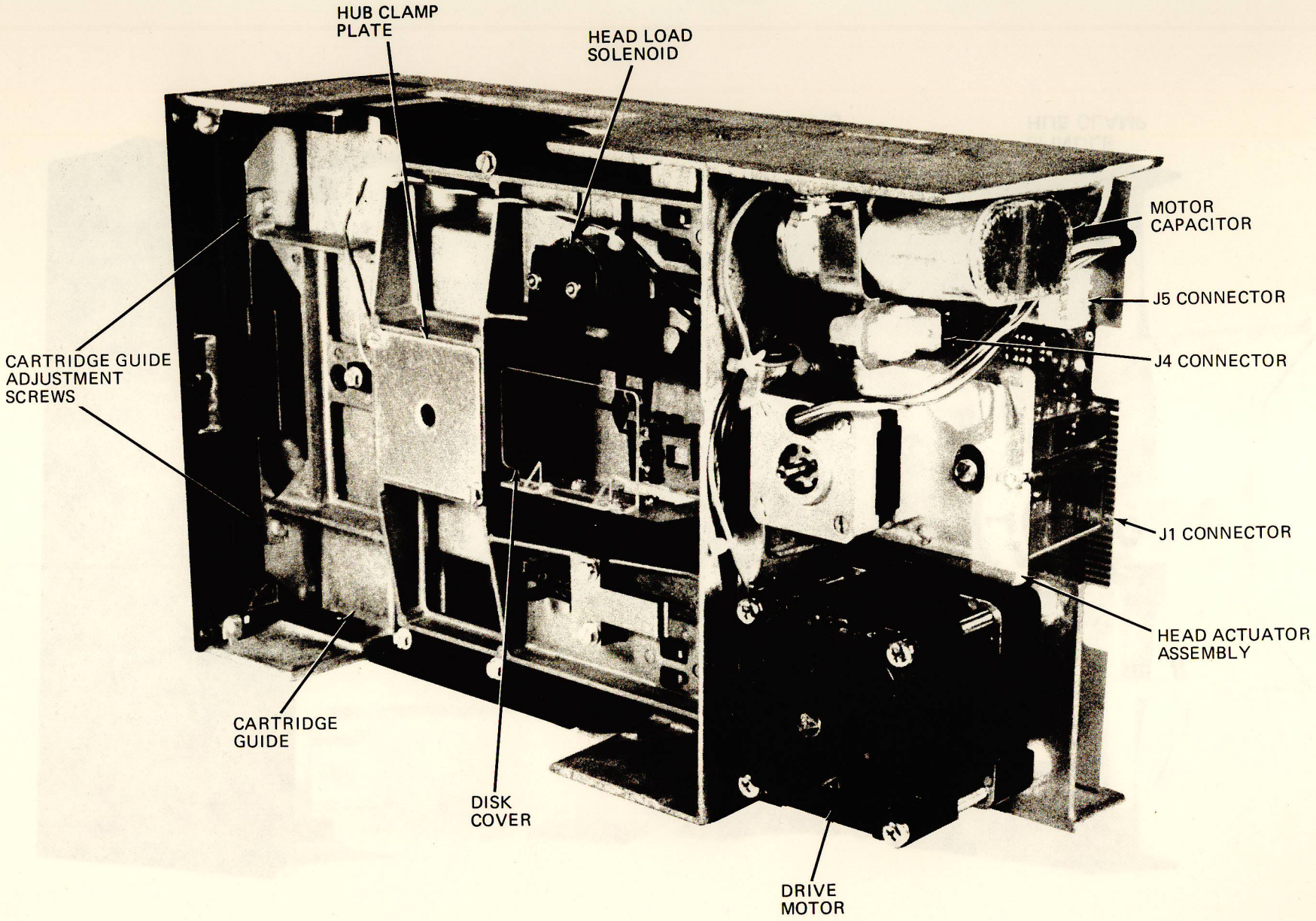
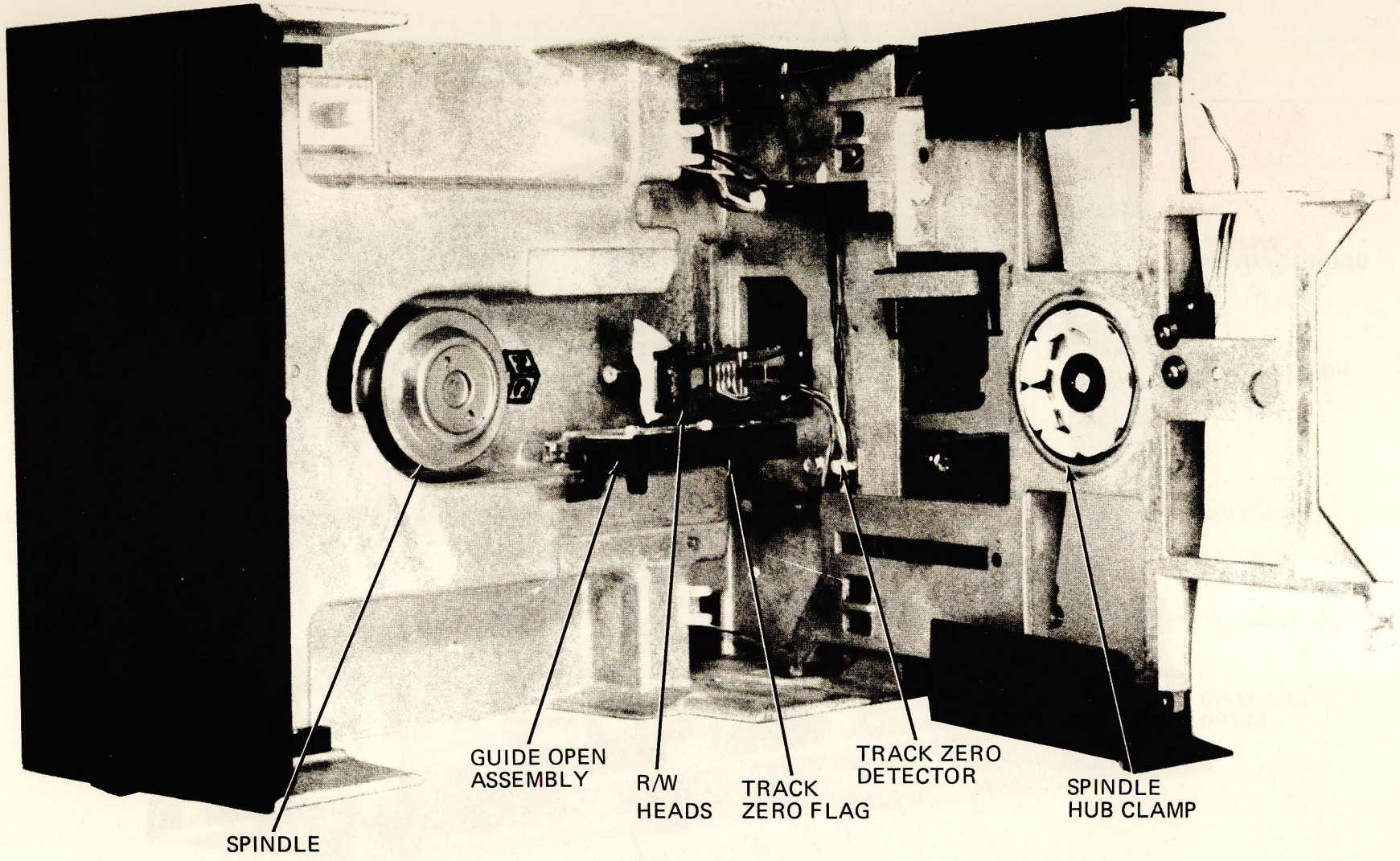
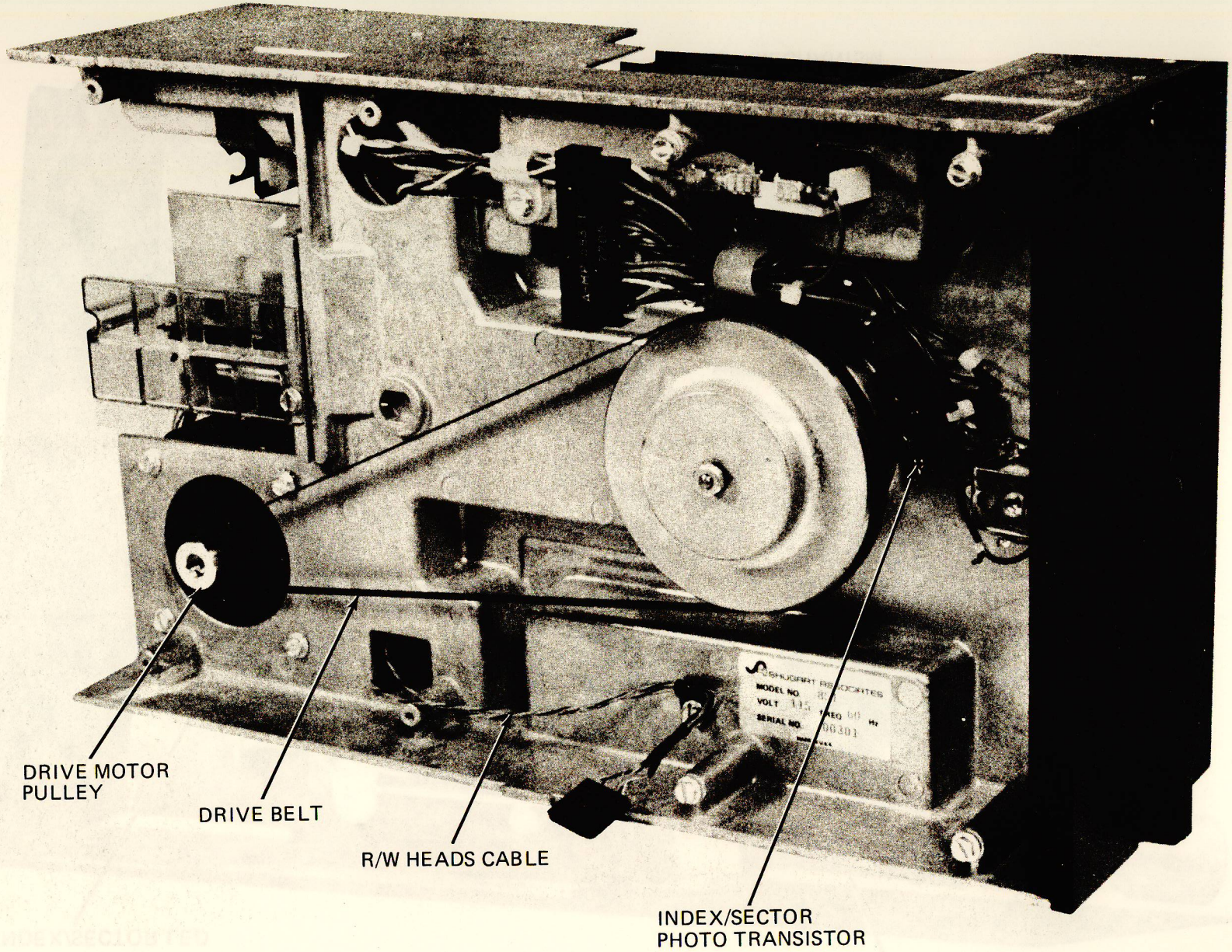


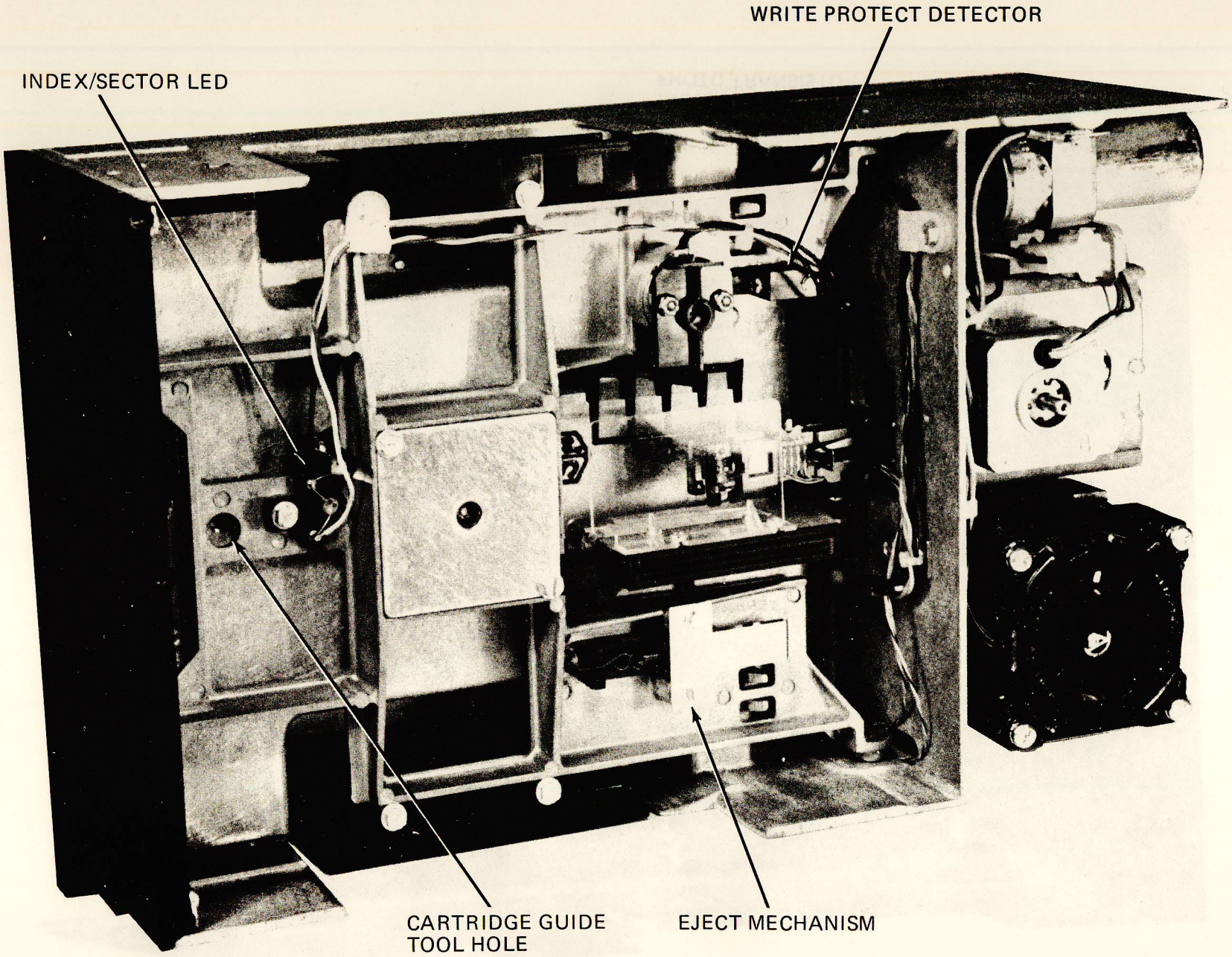
FIGURE 13 AZIMUTH BURST PATTERNS

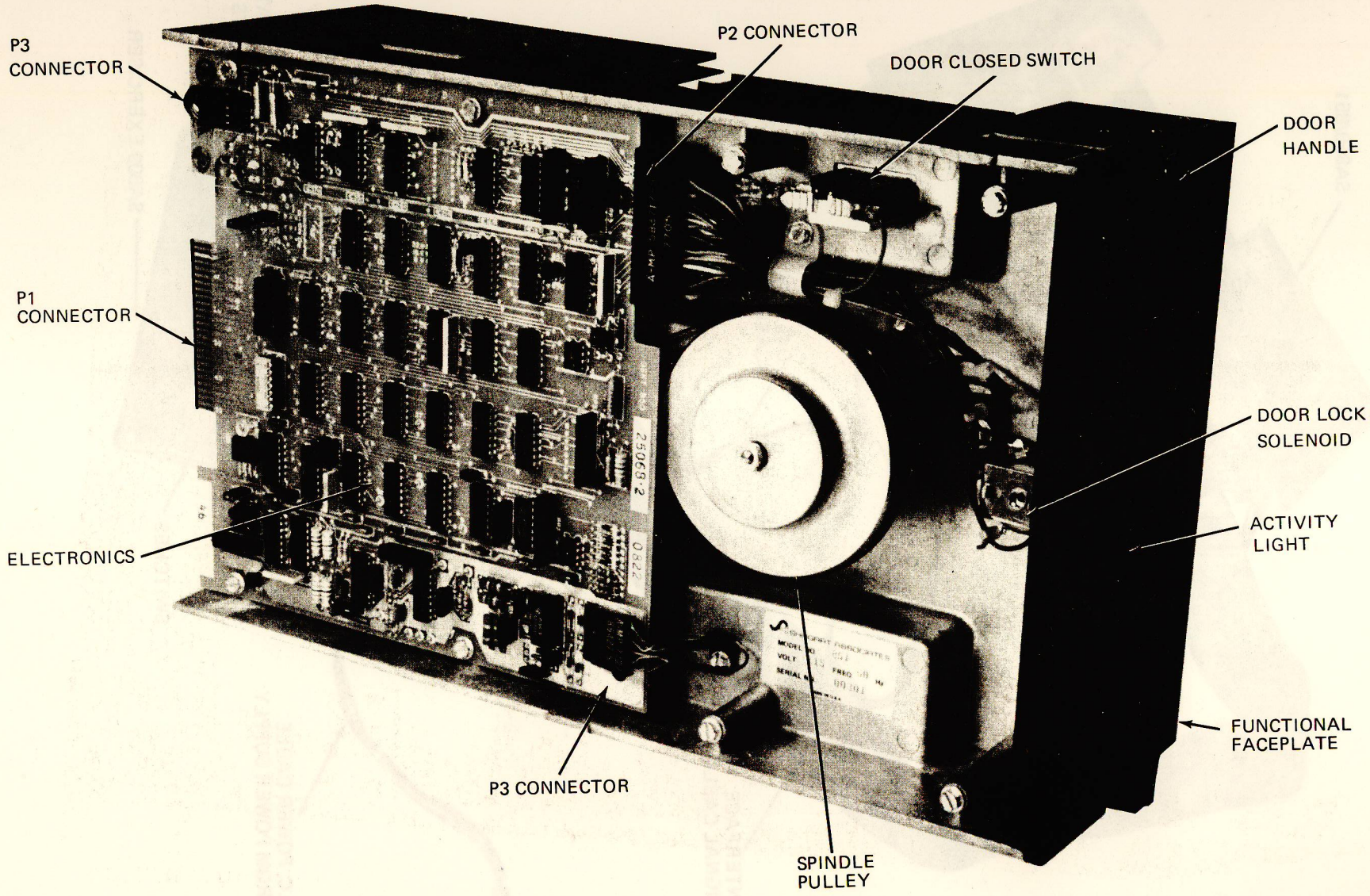
Physical Locations

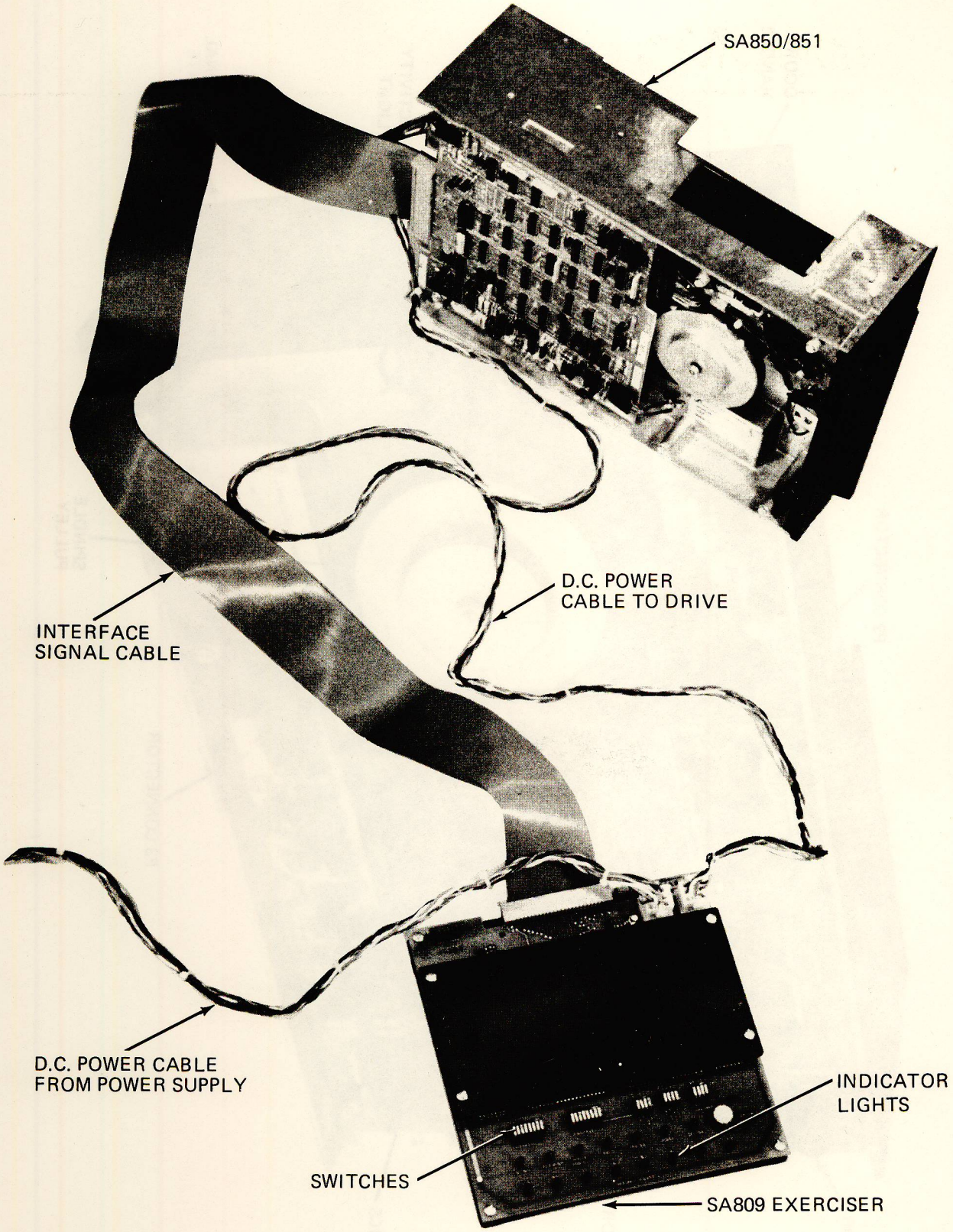

HUB CLAMP PLATE
HEAD LOAD SOLENOID
MOTOR CAPACITOR
J5 CONNECTOR
J4 CONNECTOR
CARTRIDGE GUIDE ADJUSTMENT SCREWS
J1 CONNECTOR
HEAD ACTUATOR ASSEMBLY
CARTRIDGE GUIDE
DISK COVER
DRIVE MOTOR


SPINDLE
GUIDE OPEN ASSEMBLY
R/W HEADS
TRACK ZERO FLAG
TRACK ZERO DETECTOR
SPINDLE HUB CLAMP

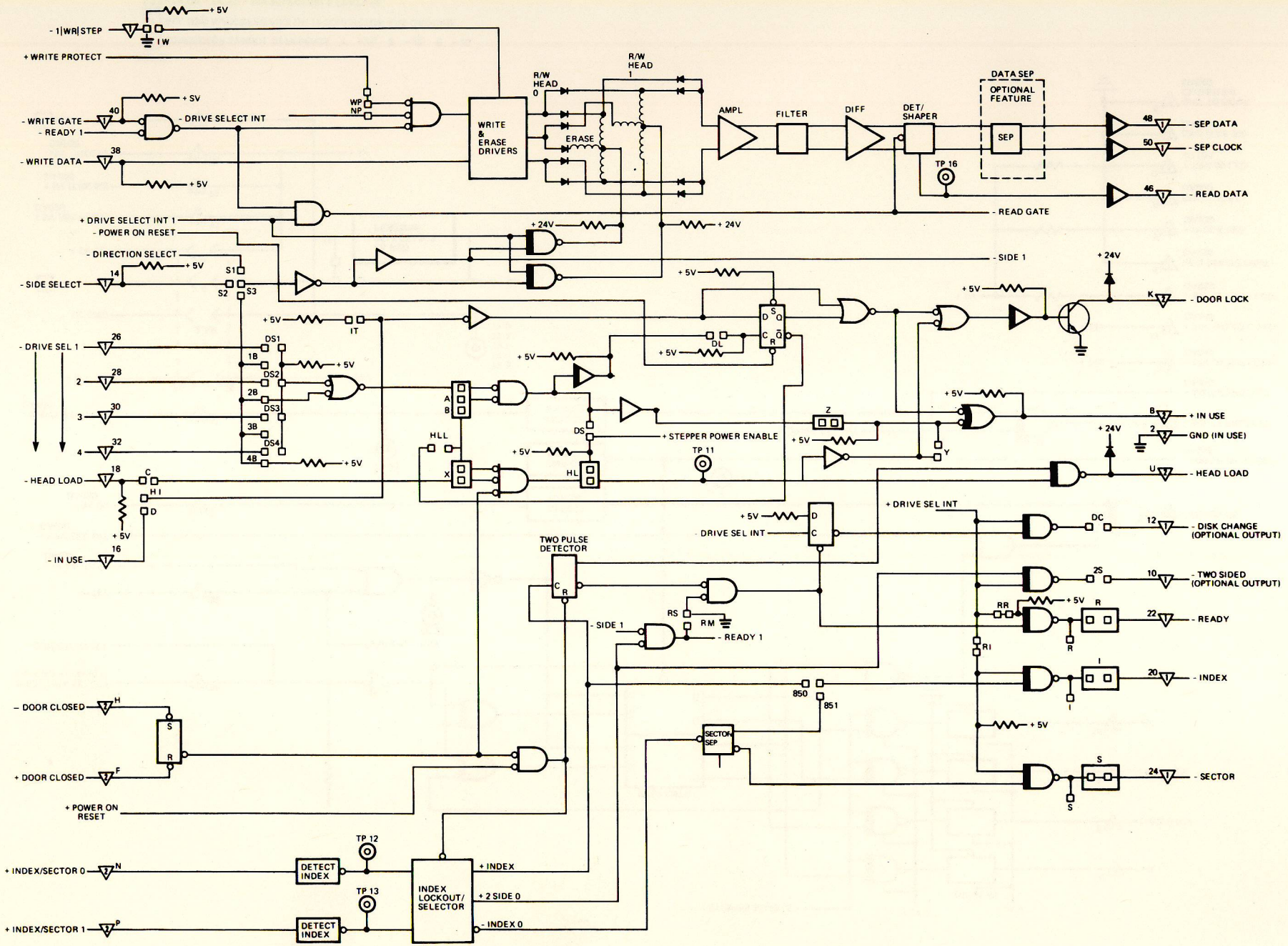

DRIVE MOTOR
PULLEY
DRIVE BELT
R/W HEADS CABLE
INDEX/SECTOR
PHOTO TRANSISTOR

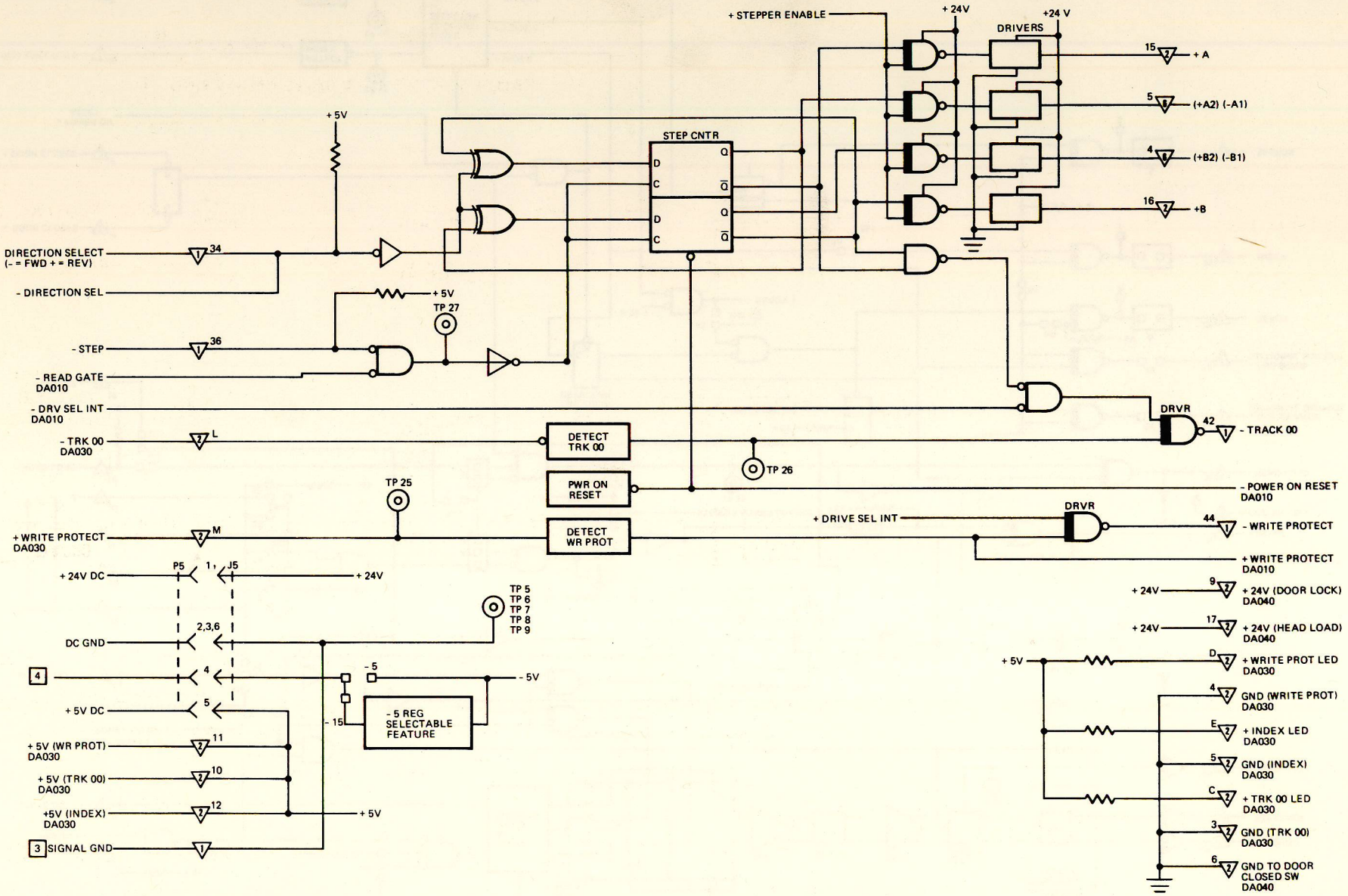

WRITE PROTECT DETECTOR
INDEX/SECTOR LED
CARTRIDGE GUIDE
TOOL HOLE
EJECT MECHANISM


P3
CONNECTOR
P2 CONNECTOR
DOOR CLOSED SWITCH
DOOR
HANDLE
P1
CONNECTOR
DOOR LOCK
SOLENOID
ACTIVITY
LIGHT
ELECTRONICS
FUNCTIONAL
FACEPLATE
P3 CONNECTOR
SPINDLE
PULLEY


SA850/851
INTERFACE
SIGNAL CABLE
D.C. POWER
CABLE TO DRIVE
D.C. POWER CABLE
FROM POWER SUPPLY
INDICATOR
LIGHTS
SWITCHES
SA809 EXERCISER

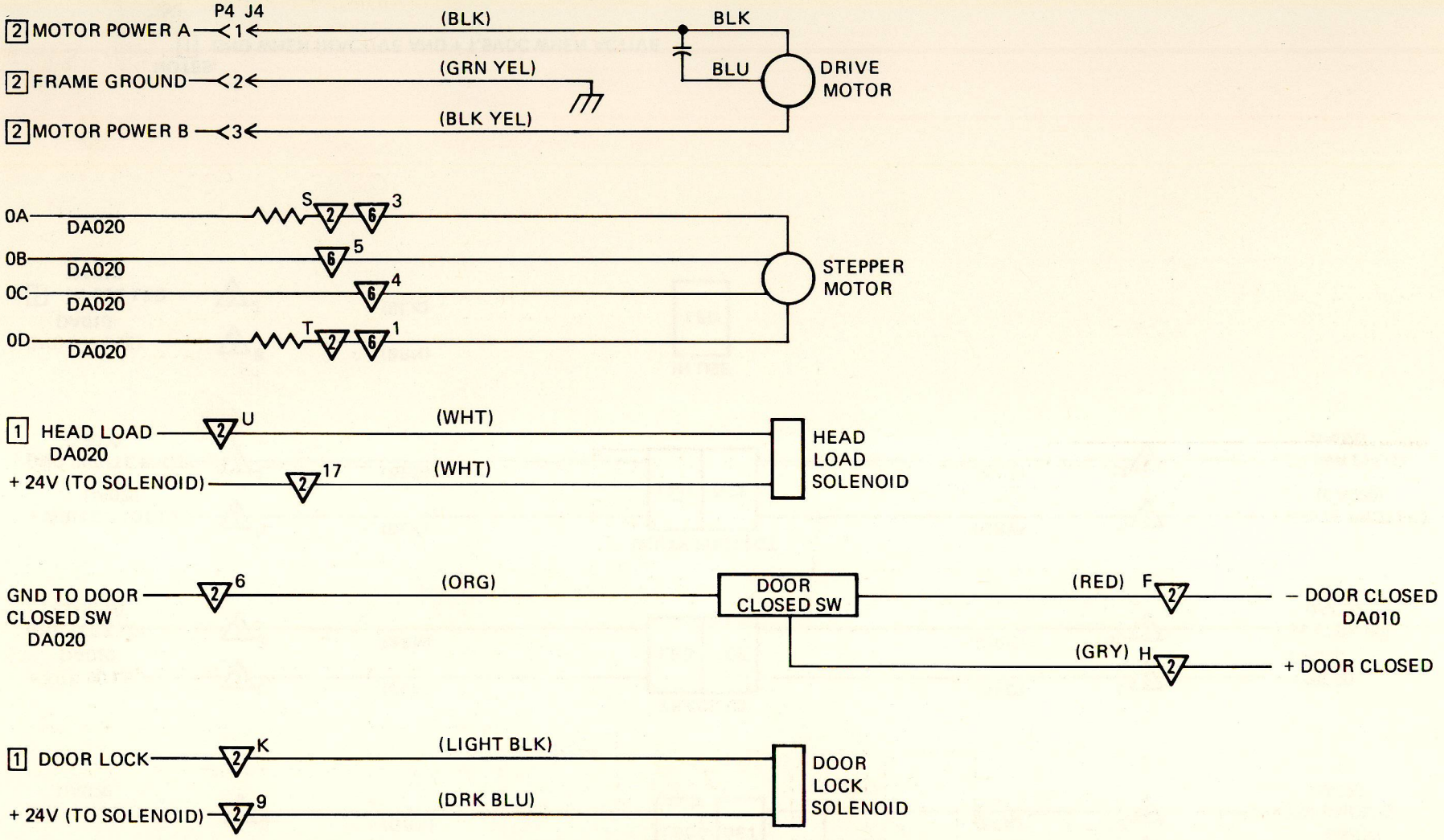
Logic Manual


+ 5V
- 1|WR|STEP
1W
+ WRITE PROTECT
WP
NP
- WRITE GATE
- READY 1
40
- DRIVE SELECT INT
- WRITE DATA
38
WRITE & ERASE DRIVERS
R/W HEAD 0
R/W HEAD 1
ERASE
AMPL
FILTER
DIFF
DET/ SHAPER
DATA SEP
OPTIONAL FEATURE
SEP
TP 16
48
- SEP DATA
50
- SEP CLOCK
46
- READ DATA
- READ GATE
+ DRIVE SELECT INT 1
- POWER ON RESET
+ 24V
- DIRECTION SELECT
- SIDE SELECT
14
S1
S2
S3
- SIDE 1
IT
DL
K
- DOOR LOCK
- DRIVE SEL 1
26
28
30
32
DS1
DS2
DS3
DS4
1B
2B
3B
4B
A
B
HLL
HL
DS
+ STEPPER POWER ENABLE
TP 11
Z
Y
8
+ IN USE
2
GND (IN USE)
U
- HEAD LOAD
18
C
HI
D
16
- IN USE
+ DRIVE SEL INT
- DRIVE SEL INT
DC
12
- DISK CHANGE (OPTIONAL OUTPUT)
TWO PULSE DETECTOR
2S
10
- TWO SIDED (OPTIONAL OUTPUT)
RS
RM
RR
R
22
- READY
- READY 1
RI
I
20
- INDEX
850
851
SECTOR SEP
S
24
- SECTOR
- DOOR CLOSED
H
+ DOOR CLOSED
F
+ POWER ON RESET
TP 12
TP 13
+ INDEX/SECTOR 0
N
+ INDEX/SECTOR 1
P
DETECT INDEX
INDEX LOCKOUT/ SELECTOR
+ INDEX
+ 2 SIDE 0
- INDEX 0



NOTES

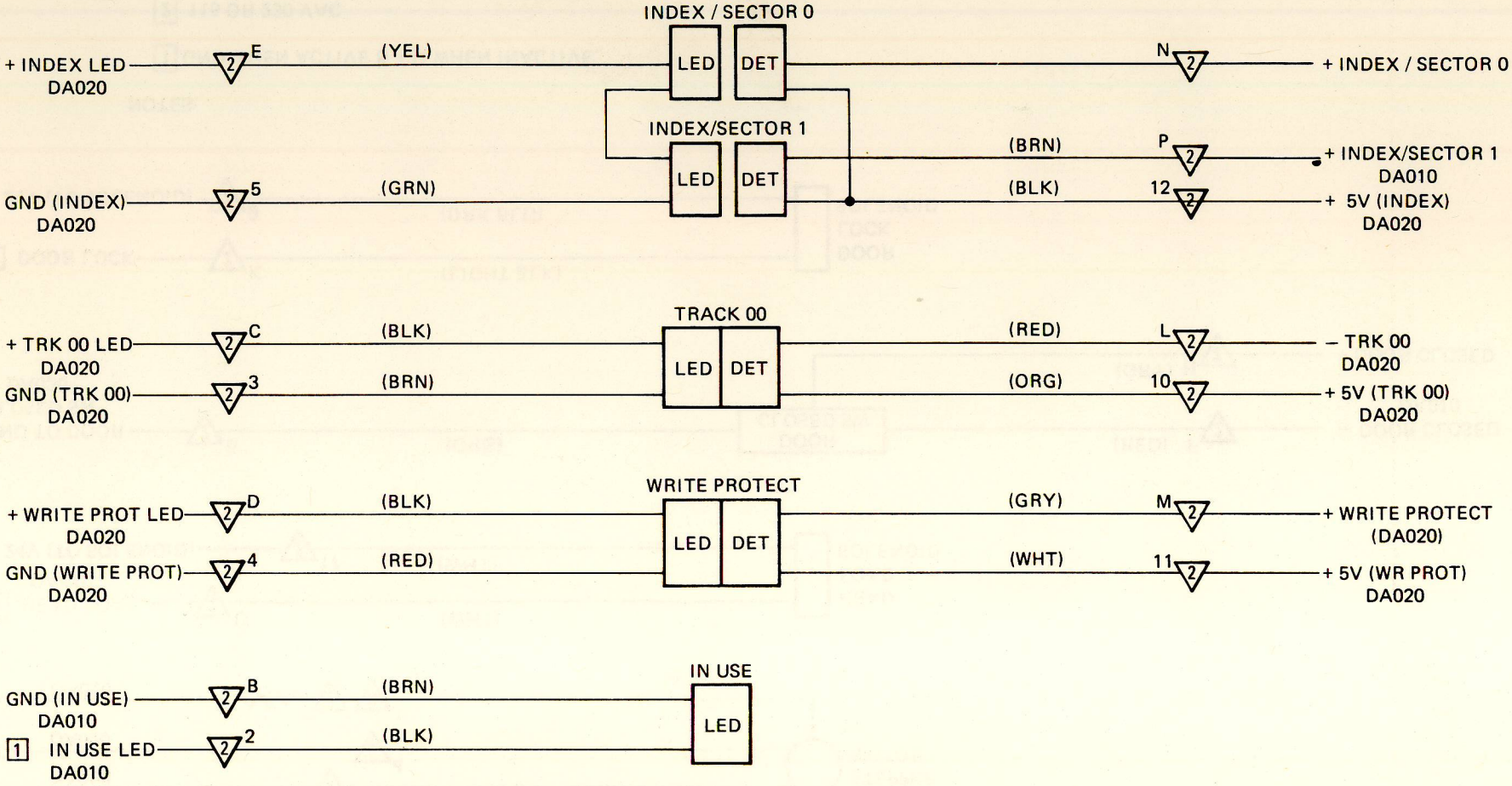
1. CONNECTOR SYMBOL REFERENCE 1 = J1, 2 = J2, 5 = J5.
2. ALL ODD NUMBERED PINS ON J1 CONNECTOR ARE GROUND.
3. - 5V OR - 7V TO - 16V SELECTABLE FEATURE.



NOTES:

1 GND WHEN ACTIVE & +24 WHEN INACTIVE.

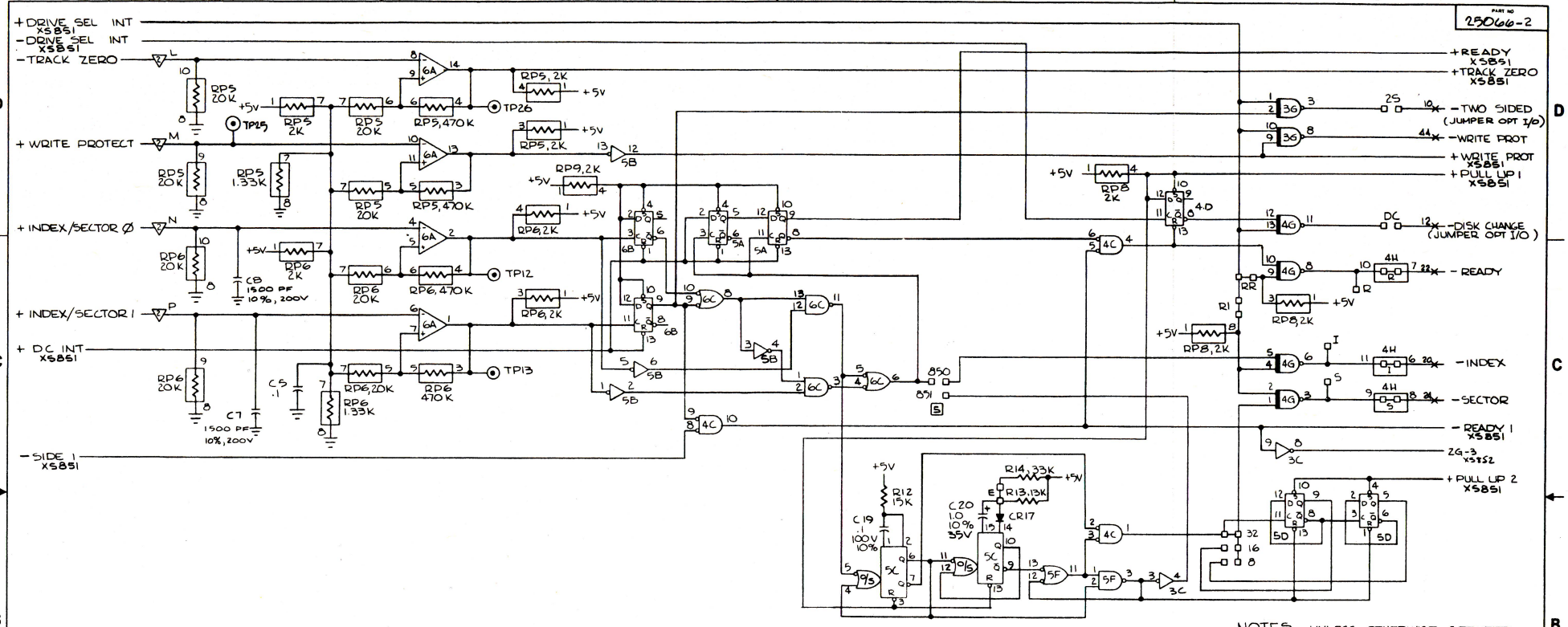
2 115 OR 230 VAC

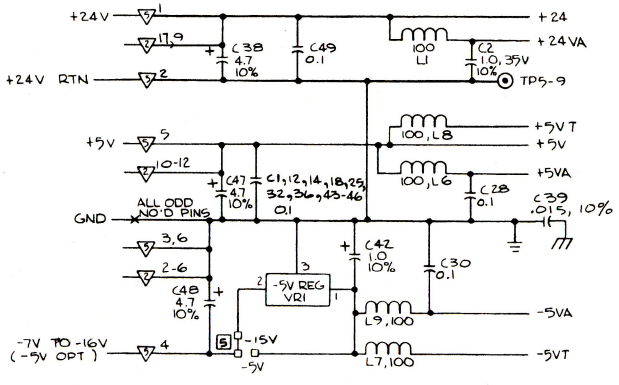


NOTES:

[1] GND WHEN INACTIVE AND + 1.5VDC WHEN ACTIVE

Schematics





TYPE	POSITION	UNUSED ELEMENTS	VCC (PIN)	GRD (PIN)
7400	6C,2E,3F,5F,1G	2E4	14	7
7402	4C,3E			
7404	5B,3C,4E,5E	4E2		
7407	2C,2H	2H45, 2C3		
7427	4F			
7438	3G, 4G	3G,4		
7486	5E			
7474	5A,4B,6B,2D, 3D,5D,6E,2F	2F1 4D	14	7
7545ZP	2A,4A		8	4
8T20	F		—	8
9602	5C,2G,1H		16	8
LM339	6A		3	12
NE592	1D		—	—
ZQT2222	1A,3B		—	—
ZQT2905	2B		—	—
ULN2074B	6G		—	—
UPH407	6F		14	7

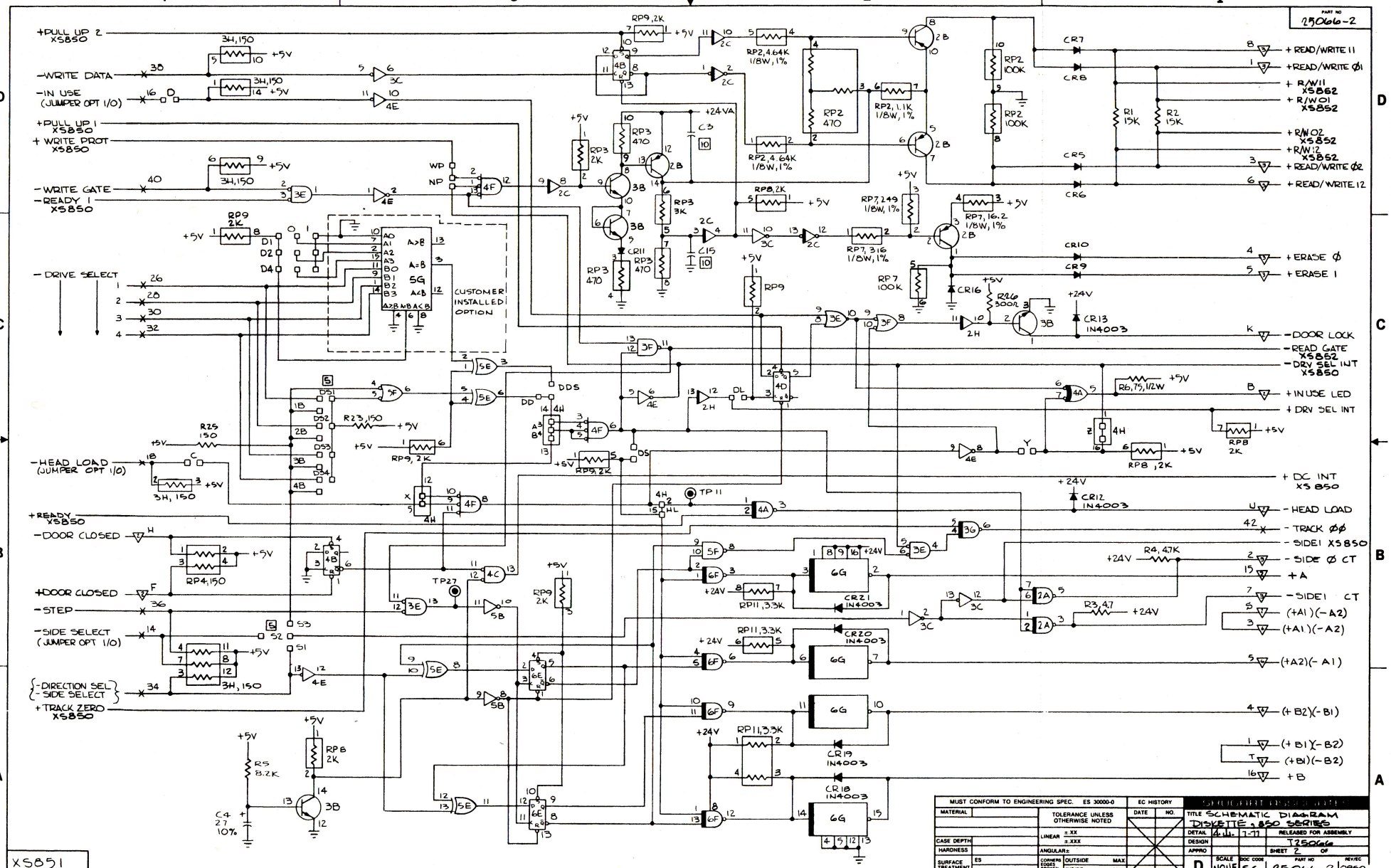
REFERENCE DESIGNATIONS	
LAST USED	NOT USED
CR21	
C49	6,13,16,21,26,35,37,38
L9	
R27	
RP12	
TP27	10,14,15,19-24

NOTES, UNLESS OTHERWISE SPECIFIED;
1. ALL CAPACITORS ARE IN MICROFARADS, 50V, +80, -20%.
2. ALL DIODES IN IN4148.
3. ALL INDUCTORS ARE MICROHENRY'S, 10%.
4. ALL RESISTORS ARE IN OHMS, 1/4 ± 5%.
5. SHORTING PLUG INSTALLED.
6. CONNECTOR SYMBOL REFRENCE: (-X-) = J1, (-X-) = J2, (-X-) = J3, (-X-) = J5, (-X-) = J6.
7. INDICATES CUT-TRACE OPTION.
8. INDICATES JUMPER OPTION.
9. INDICATES SHUNT JUMP/CUT TRACE OPT.
10. COMPONENT NOT INSTALLED
11. INDICATES RESISTOR PACK.

MUST CONFORM TO ENGINEERING SPEC. ES 30000-0		EC HISTORY		SHUGART CORPORATION
MATERIAL	TOLERANCE UNLESS OTHERWISE NOTED	DATE	NO.	TITLE SCHEMATIC DIAGRAM DISKETTE, 850 SERIES
	LINEAR ±.XX	7-77	0822	
CASE DEPTH	±.XXX	10/77	0843	DETAIL 4 of 4 7-77 RELEASED FOR ASSEMBLY
HARDNESS	ANGULAR ±	11/14	0850	DESIGN T25066
SURFACE TREATMENT ES	CORNERS CODES BROKEN OUTSIDE MAX / INSIDE MAX			APPRO SHEET 3 OF 3
				D SCALE NONE DOC CODE SC PART NO 25066-2 REV&C 0850

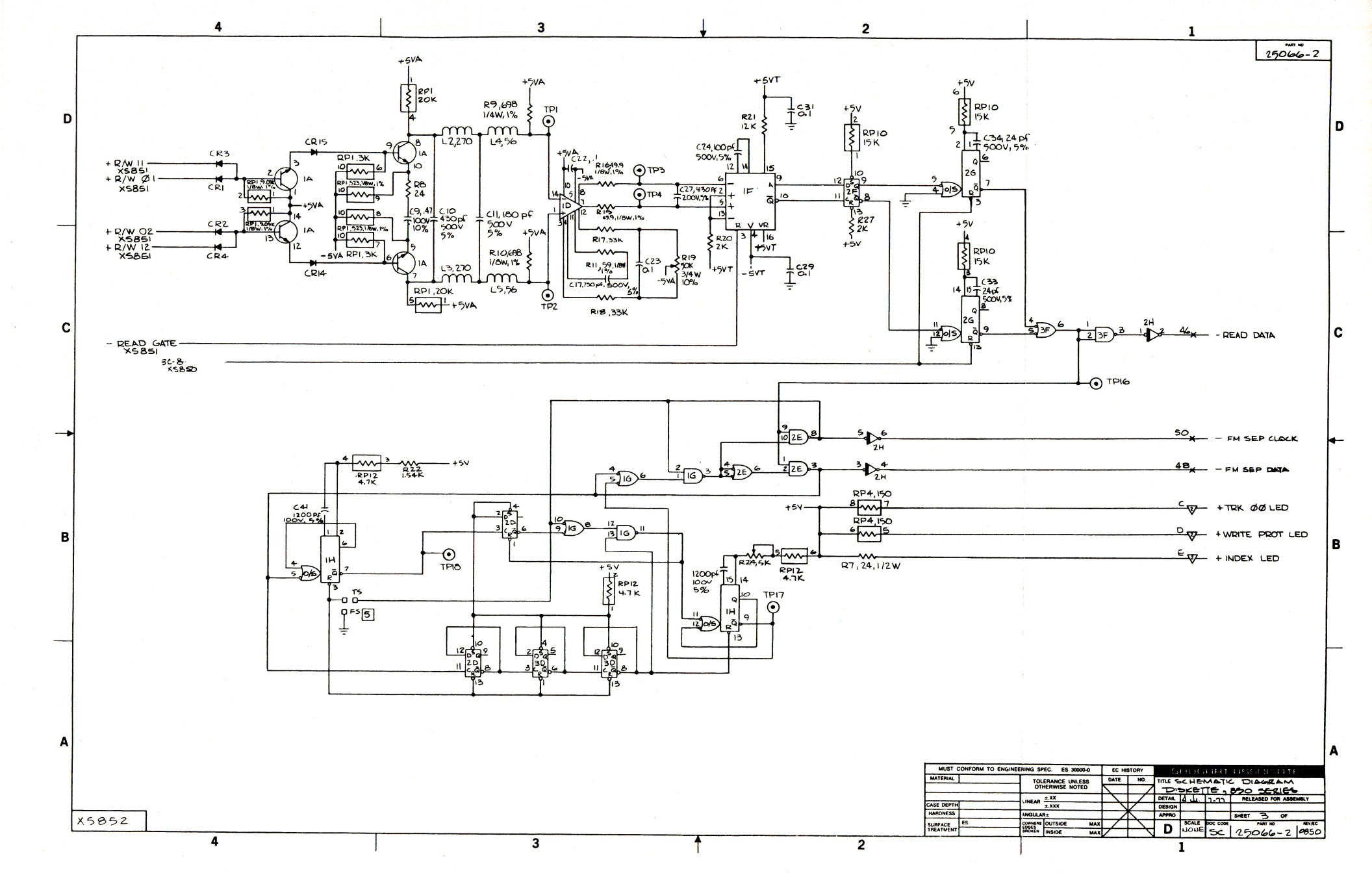
PART NO 25066-2

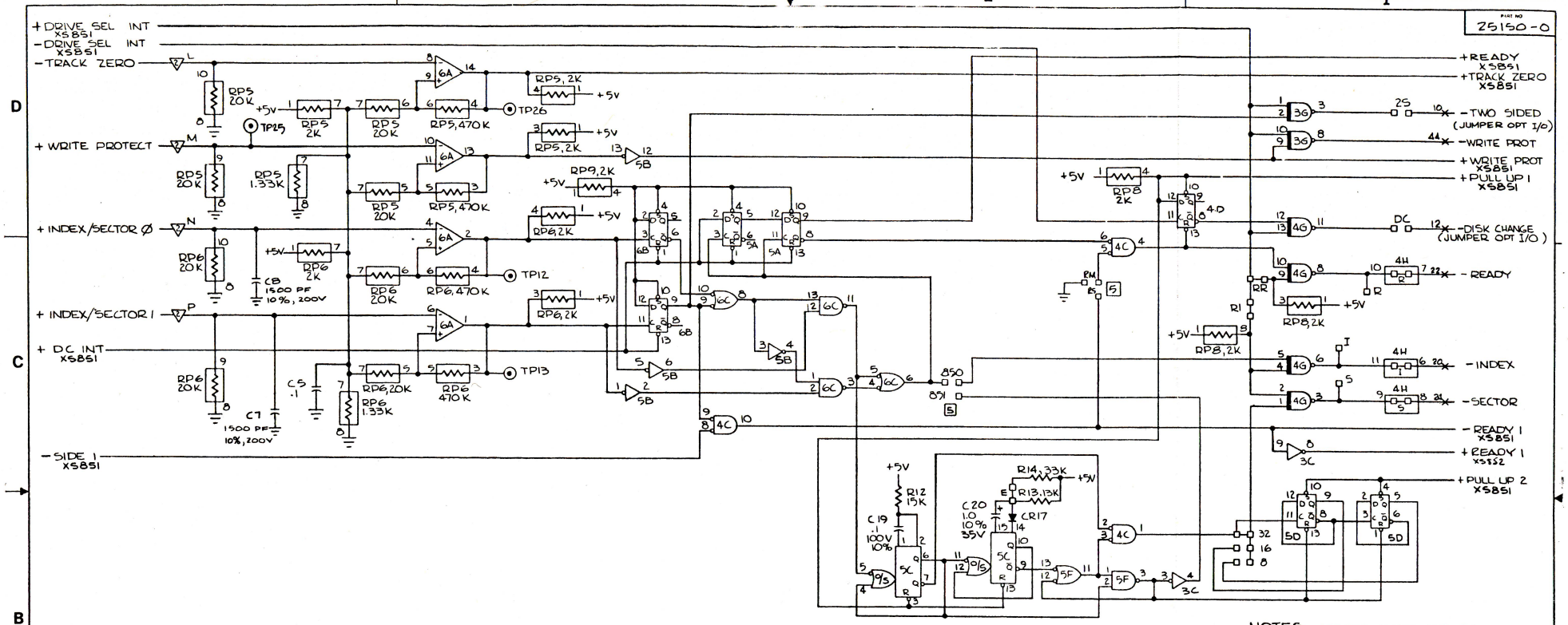
XS850



MUST CONFORM TO ENGINEERING SPEC. ES 30000-0		EC HISTORY		SHUGART CORPORATION	
MATERIAL	TOLERANCE UNLESS OTHERWISE NOTED	DATE	NO.	TITLE SCHEMATIC DIAGRAM DISKETTE, 850 SERIES	
	LINEAR ±.XX ±.XXX			DETAIL 4-11-77	RELEASED FOR ASSEMBLY
CASE DEPTH				DESIGN	T250666
HARDNESS	ANGULAR±			APPRO	SHEET 2 OF
SURFACE TREATMENT ES	CORNERS TOOLS BROKEN OUTSIDE MAX INSIDE MAX			D SCALE NONE DOC CODE SC PART NO 250066-2 REV/EC 0850	

PART NO 250066-2


PART NO 25066-2
+ R/W 11 XS851
+ R/W Ø1 XS851
+ R/W Ø2 XS851
+ R/W 12 XS851
- READ GATE XS851
3C-8 XS850
- READ DATA
TP16
50 - FM SEP CLOCK
48 - FM SEP DATA
C + TRK ØØ LED
D + WRITE PROT LED
E + INDEX LED
+5VA
+5V
+5VT
-5VA
-5VT
TP1
TP2
TP3
TP4
TP10
TP17
RP1 20K
RP1,3K
RP1,20K
RP10 15K
RP12 4.7K
RP4,150
R9,698 1/4W,1%
R10,698 1/8W,1%
R16,499 1/8W,1%
R15 499,1/8W,1%
R17,33K
R18,33K
R19 50K 3/4W 10%
R20 2K
R21 12K
R22 1.54K
R24,5K
R27 2K
R7,24,1/2W
L2,270
L3,270
L4,56
L5,56
C10 430pf 500V 5%
C11,180 pf 500V 5%
C23 0.1
C29 0.1
C31 0.1
C33 24pf 500V,5%
C34,24 pf 500V, 5%
C41 1200pf 100V, 5%
CR1
CR2
CR3
CR4
CR14
CR15
TS
FS 5
XS852
MUST CONFORM TO ENGINEERING SPEC. ES 30000-0
EC HISTORY
DATE
NO.
MATERIAL
TOLERANCE UNLESS OTHERWISE NOTED
LINEAR ±.XX ±.XXX
ANGULAR ±
CASE DEPTH
HARDNESS
SURFACE TREATMENT ES
CORNERS EDGES BROKEN OUTSIDE MAX INSIDE MAX
TITLE SCHEMATIC DIAGRAM DISKETTE, 850 SERIES
DETAIL
DESIGN
APPRO
RELEASED FOR ASSEMBLY
SHEET 3 OF
D
SCALE NONE
DOC CODE SC
PART NO 25066-2
REV/EC 0850



TYPE	POSITION	UNUSED ELEMENTS	VCC (PIN)	GRD (PIN)
7400	6C, 2E, 3F, 5F, 1G	2E4	14	7
7402	4C, 3E		1	1
7404	5B, 3C, 4E, 5E			
7407	2C, 2H	2H4,5		
7427	4F			
7438	3G, 4G	3G,4		
7486	5E			
7474	5A, 4B, 6B, 2D, 3D, 5D, 6E, 2F	2F1 4D	14	7
75462	2A, 4A		8	4
8T20	F		—	8
9602	5C, 2G, 1H		16	8
LM339	6A		3	12
NE592	1D		—	—
ZQT2222	1A, 3B		—	—
ZQT2907	2B		—	—
ULN2074B	6G		—	—
UPH407	6F		14	7

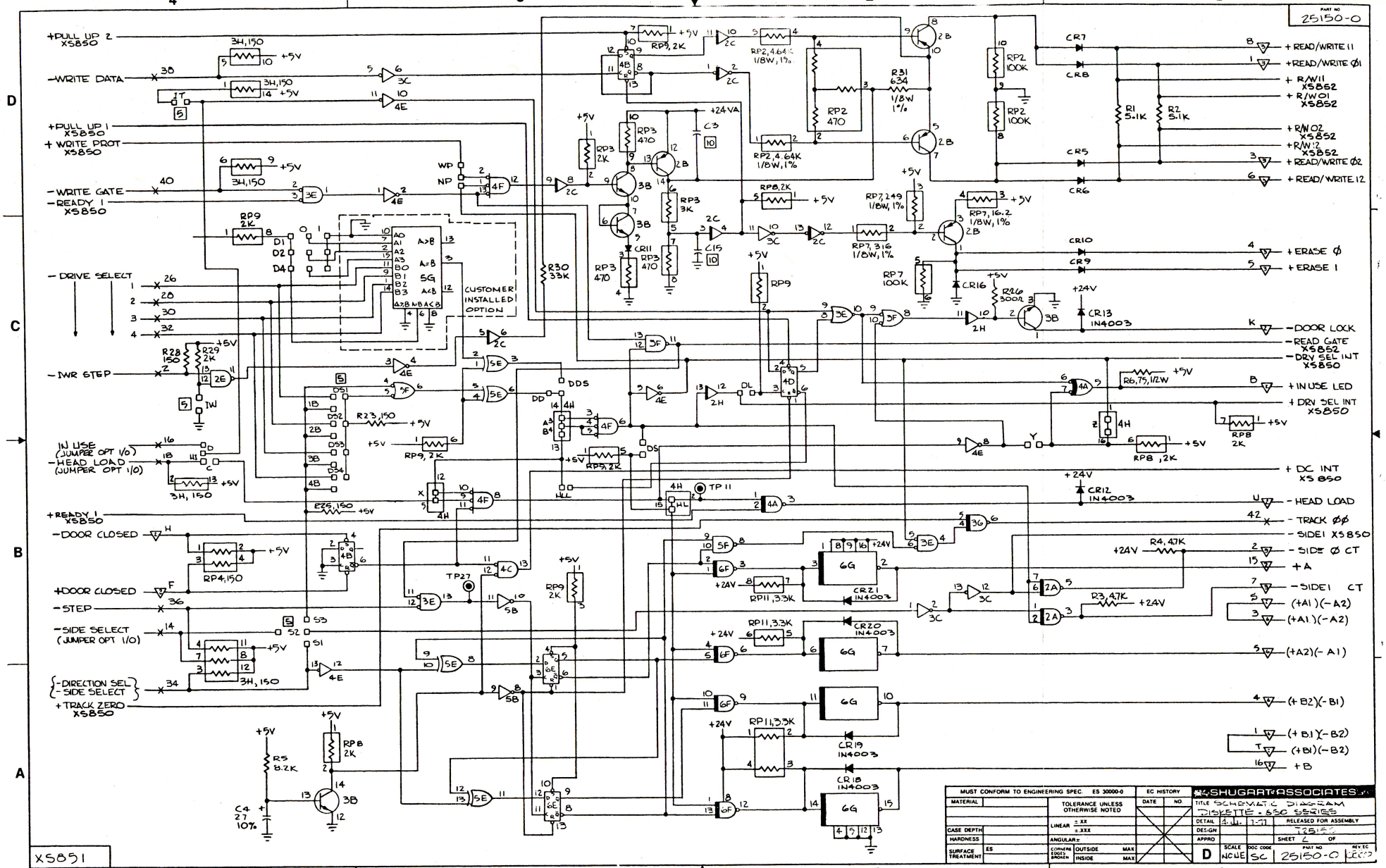
REFERENCE DESIGNATIONS	
LAST USED	NOT USED
CR21	
C49	6,13,16,21,26,35,37,315
L9	
R31	
RP12	
TP27	10,14,15,19-24

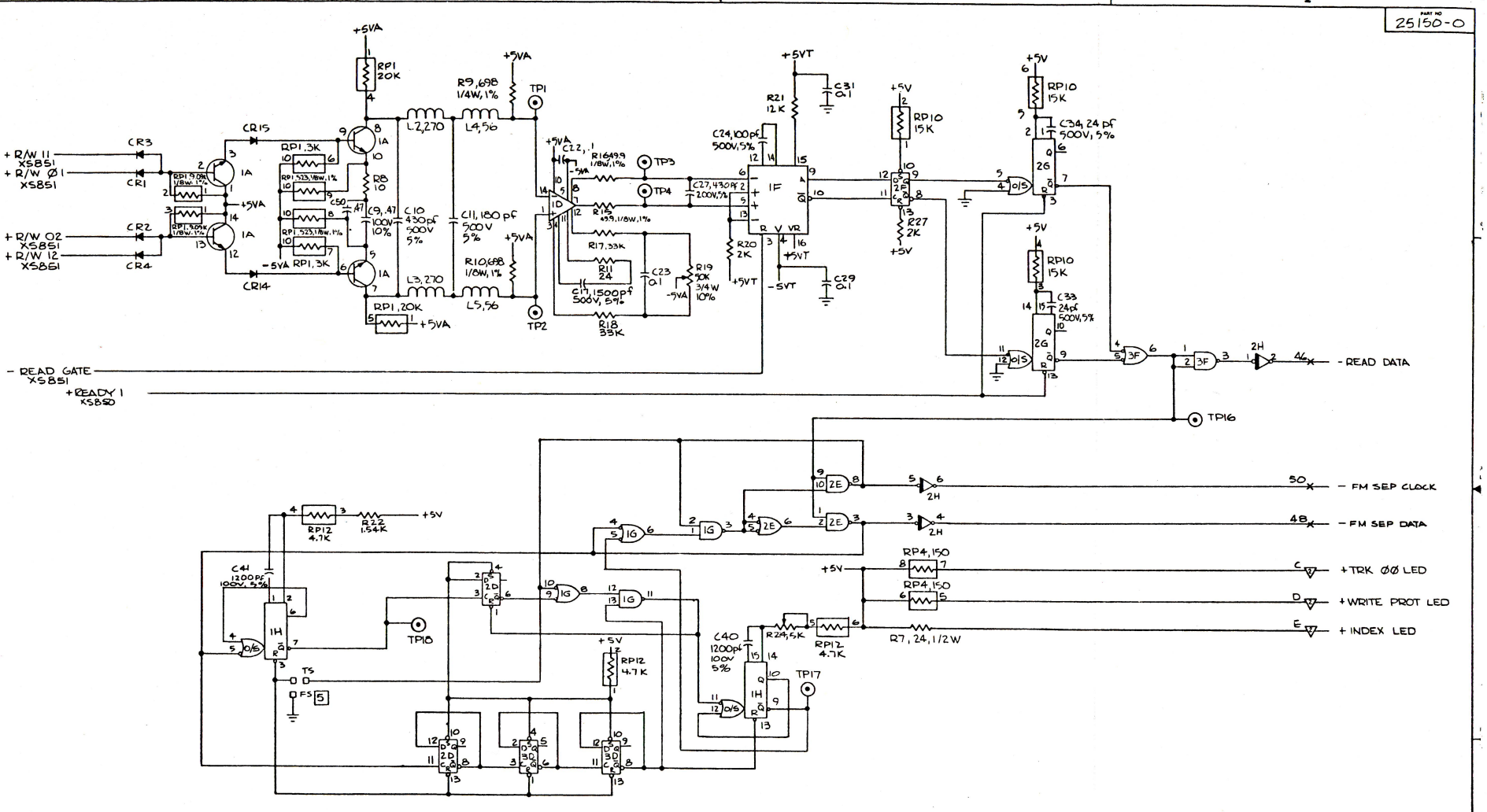
NOTES, UNLESS OTHERWISE SPECIFIED;

1. ALL CAPACITORS ARE IN MICROFARADS, 50V, +80, -20%.
2. ALL DIODES IN IN4148.
3. ALL INDUCTORS ARE MICROHENRY'S, 10%.
4. ALL RESISTORS ARE IN OHMS, 1/4 ± 5%.
5. SHORTING PLUG INSTALLED.
6. CONNECTOR SYMBOL REFRENCE: (-X-) = J1, (-X-) = J2, (-X-) = J3, (-X-) = J5, (-X-) = J6.
7. INDICATES CUT-TRACE OPTION.
8. INDICATES JUMPER OPTION.
9. INDICATES SHUNT JUMP/CUT TRACE OPT.
10. COMPONENT NOT INSTALLED
11. INDICATES RESISTOR PACK.

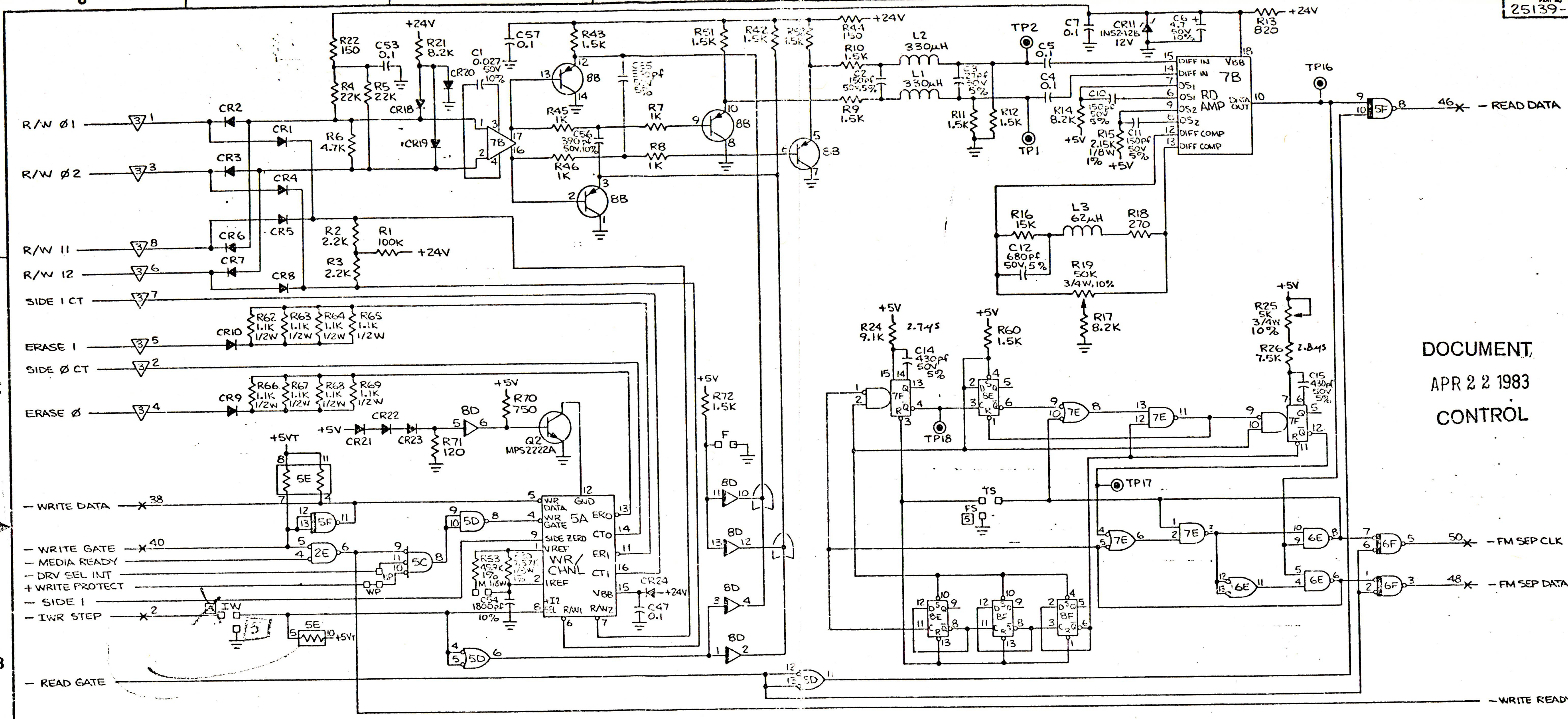
MUST CONFORM TO ENGINEERING SPEC ES 30000-0		EC HISTORY		SHUGART ASSOCIATES	
MATERIAL	TOLERANCE UNLESS OTHERWISE NOTED	DATE	NO.	TITLE SCHEMATIC DIAGRAM DISKETTE + BSO SERIES	
	LINEAR ±.XX ±.XXX	2-78		DETAIL D.L. 7-77	RELEASED FOR ASSEMBLY
CASE DEPTH				DESIGN	25150-0
HARDNESS	ANGULAR ±			APPRO	SHEET OF 3
SURFACE TREATMENT ES	CORNERS EDGES BROKEN OUTSIDE MAX INSIDE MAX			D SCALE NONE	DOC CODE SC PART NO 25150-0 REV/EC

XS850

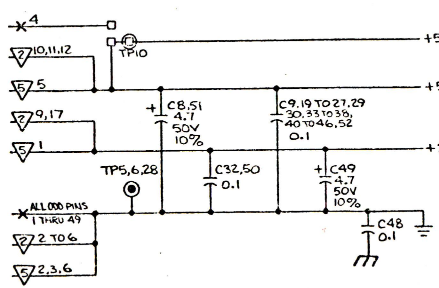

+PULL UP 2 XS850
-WRITE DATA
+PULL UP 1 XS850
+WRITE PROT XS850
-WRITE GATE
-READY 1 XS850
-DRIVE SELECT
-IWR STEP
IN USE (JUMPER OPT 1/0)
-HEAD LOAD (JUMPER OPT 1/0)
+READY 1 XS850
-DOOR CLOSED
+DOOR CLOSED
-STEP
-SIDE SELECT (JUMPER OPT 1/0)
-DIRECTION SEL
-SIDE SELECT
+TRACK ZERO XS850
CUSTOMER INSTALLED OPTION
DDS
WP
NP
+24VA
+READ/WRITE 11
+READ/WRITE Ø1
+R/W11 XS852
+R/W01 XS852
+R/W02 XS852
+R/W12 XS852
+READ/WRITE Ø2
+READ/WRITE 12
+ERASE Ø
+ERASE 1
-DOOR LOCK
-READ GATE XS852
-DRV SEL INT XS850
+IN USE LED
+DRV SEL INT XS850
+DC INT XS 850
-HEAD LOAD
-TRACK ØØ
-SIDE1 XS850
-SIDE Ø CT
+A
-SIDE1 CT
(+A1)(-A2)
(+A2)(-A1)
(+B2)(-B1)
(+B1)(-B2)
+B
SHUGART ASSOCIATES
TITLE SCHEMATIC DIAGRAM DISKETTE - 850 SERIES
PART NO 25150-0
XS851



PART NO	25150-0
MATERIAL	
TOLERANCE UNLESS OTHERWISE NOTED	LINEAR ±.XX, ±.XXX; ANGULAR ±; CORNERS EDGES BROKEN OUTSIDE MAX, INSIDE MAX
CASE DEPTH	
HARDNESS	
SURFACE TREATMENT	ES
MUST CONFORM TO ENGINEERING SPEC.	ES 30000-0
EC HISTORY	DATE / NO.
SHUGART ASSOCIATES	
TITLE	SCHEMATIC DIAGRAM DISKETTE 850 SERIES
DETAIL	4 OF 4
DESIGN	
APPRO	
RELEASED FOR ASSEMBLY	
SHEET	3 OF
SIZE	D
SCALE	NONE
FSC CODE	5K
PART NO	25150-0
REV/EC	C853
	XS852



DOCUMENT
APR 2 2 1983
CONTROL



TYPE	POSITION	UNUSED ELEMENTS	+5V (PIN)	GND (PIN)
7400	2D,4D,5D,6E	6E1	14	7
7402	3C		14	7
7404	3B,4C	3B1,2,4,6	14	7
7407	8D		14	7
7427	5C		14	7
7432	2E		14	7
7438	3F,5F		14	7
7474	4B,1D,3D,3E,8E,8F		14	7
7486	1E		14	7
74L00	7E		14	7
74LS14	4E		14	7
74LS221	2C,7F		16	8
75453B	6F		8	4
75462	3A,4A		8	4
16270-1	5A		10	3
16278-0	7B		11	5
LM339	2B		3	12
RPK,150Ω	5E		–	–
SHUNT	4F		–	–
TPQ3906	8B		–	–
ULN2074B	1B		–	–
UHP407	1C		14	–

NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL CAPACITORS ARE IN MICROFARADS, 50V, +80, -20%.
2. ALL DIODES ARE IN4148.
3. ALL INDUCTORS ARE IN MICROHENRYS, ±10%.
4. ALL RESISTORS ARE IN OHMS, 1/4 W, ± 5%.
5. [5] SHORTING PLUGS INSTALLED.
6. CONNECTOR SYMBOL REFERENCE: ✳=J1, ▽=J2, ③=J3, ④=J4, ⑤=J5 & ⑥=J6.
7. -□-□- INDICATES CUT-TRACE OPTION.
8. -□-□- INDICATES JUMPER OPTION.
9. INDICATES SHUNT JUMP/CUT-TRACE OPTION.
10. [10] COMPONENT NOT INSTALLED.
11. INDICATES RESISTOR PACK
12. [12] JUMPER OPTION "850/851" IS AS FOLLOWS:
ASSEMBLY 25140-0 - 850
ASSEMBLY 25141-0 - 851

REFERENCE DESIGNATIONS

LAST USED	NOT USED
C57	C13
CR24	
L3	
Q2	
R72	R23,49
TP29	TP 3,4,7,8,9,14, 15,19 TO 24

USED ON ASSEMBLY
25140-0
25141-0

WAS

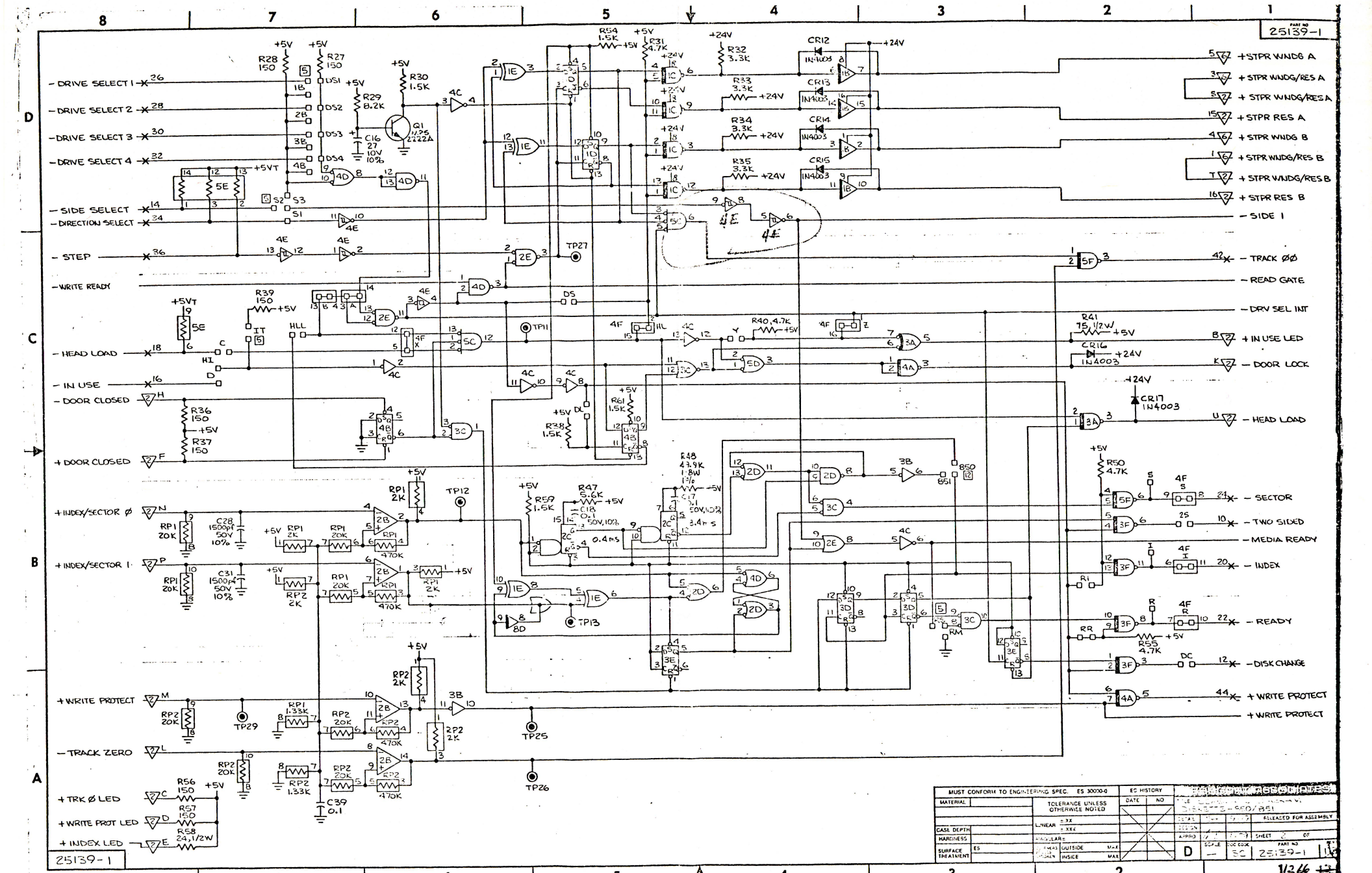
MUST CONFORM TO ENGINEERING SPEC. ES 30000-0

TOLERANCE UNLESS OTHERWISE NOTED

RELEASED FOR ASSEMBLY

D — 5C 25139-1

25139-1


PART NO 25139-1
- DRIVE SELECT 1
- DRIVE SELECT 2
- DRIVE SELECT 3
- DRIVE SELECT 4
- SIDE SELECT
- DIRECTION SELECT
- STEP
- WRITE READY
- HEAD LOAD
- IN USE
- DOOR CLOSED
+ DOOR CLOSED
+ INDEX/SECTOR Ø
+ INDEX/SECTOR 1
+ WRITE PROTECT
- TRACK ZERO
+ TRK Ø LED
+ WRITE PROT LED
+ INDEX LED
+ STPR WNDG A
+ STPR WNDG/RES A
+ STPR WNDG/RES A
+ STPR RES A
+ STPR WNDG B
+ STPR WNDG/RES B
+ STPR WNDG/RES B
+ STPR RES B
- SIDE 1
- TRACK ØØ
- READ GATE
- DRV SEL INT
+ IN USE LED
- DOOR LOCK
- HEAD LOAD
- SECTOR
- TWO SIDED
- MEDIA READY
- INDEX
- READY
- DISK CHANGE
+ WRITE PROTECT
+ WRITE PROTECT
+5V
+24V
+5VT
TP11
TP12
TP13
TP25
TP26
TP27
TP29
CR12 IN4003
CR13 IN4003
CR14 IN4003
CR15 IN4003
CR16 IN4003
CR17 IN4003
R28 150
R27 150
R30 1.5K
R29 8.2K
C16 27 10V 10%
Q1 2N2222A
R54 1.5K
R31 4.7K
R32 3.3K
R33 3.3K
R34 3.3K
R35 3.3K
R39 150
R36 150
R37 150
R38 1.5K
R61 1.5K
R59 1.5K
R47 5.6K
R48 43.9K 1.8W 1%
R40, 4.7K
R41 75 1/2W
R50 4.7K
R55 4.7K
R56 150
R57 150
R58 24, 1/2W
RP1 2K
RP2 2K
RP1 20K
RP2 20K
RP1 1.33K
RP2 1.33K
RP1 470K
RP2 470K
C28 1500pf 50V 10%
C31 1500pf 50V 10%
C39 0.1
C17 .01 50V, 10%
C18 .01 50V, 10%
0.4ms
3.4ms
MUST CONFORM TO ENGINEERING SPEC. ES 30000-0
MATERIAL
TOLERANCE UNLESS OTHERWISE NOTED
LINEAR ± .XX ± .XXX
ANGULAR ±
CASE DEPTH
HARDNESS
SURFACE TREATMENT ES
EC HISTORY
DATE NO
RELEASED FOR ASSEMBLY
SCALE —
SIZE D
SHEET OF
PART NO 25139-1
25139-1

Illustrated Parts Catalog

Section 3

DESCRIPTION

General

The Illustrated Parts Catalog is arranged so that the figures precede the parts listings and will be on the opposite page.

The drive assembly is contained on a single page. Sub assemblies will be separated by a solid line and are broken down on this page.

Quantity Per Assembly

The quantity listed is the quantity used on the assembly.

Numerical Index

The numerical index lists all parts in part number sequence and is cross referenced to the figure and reference number.

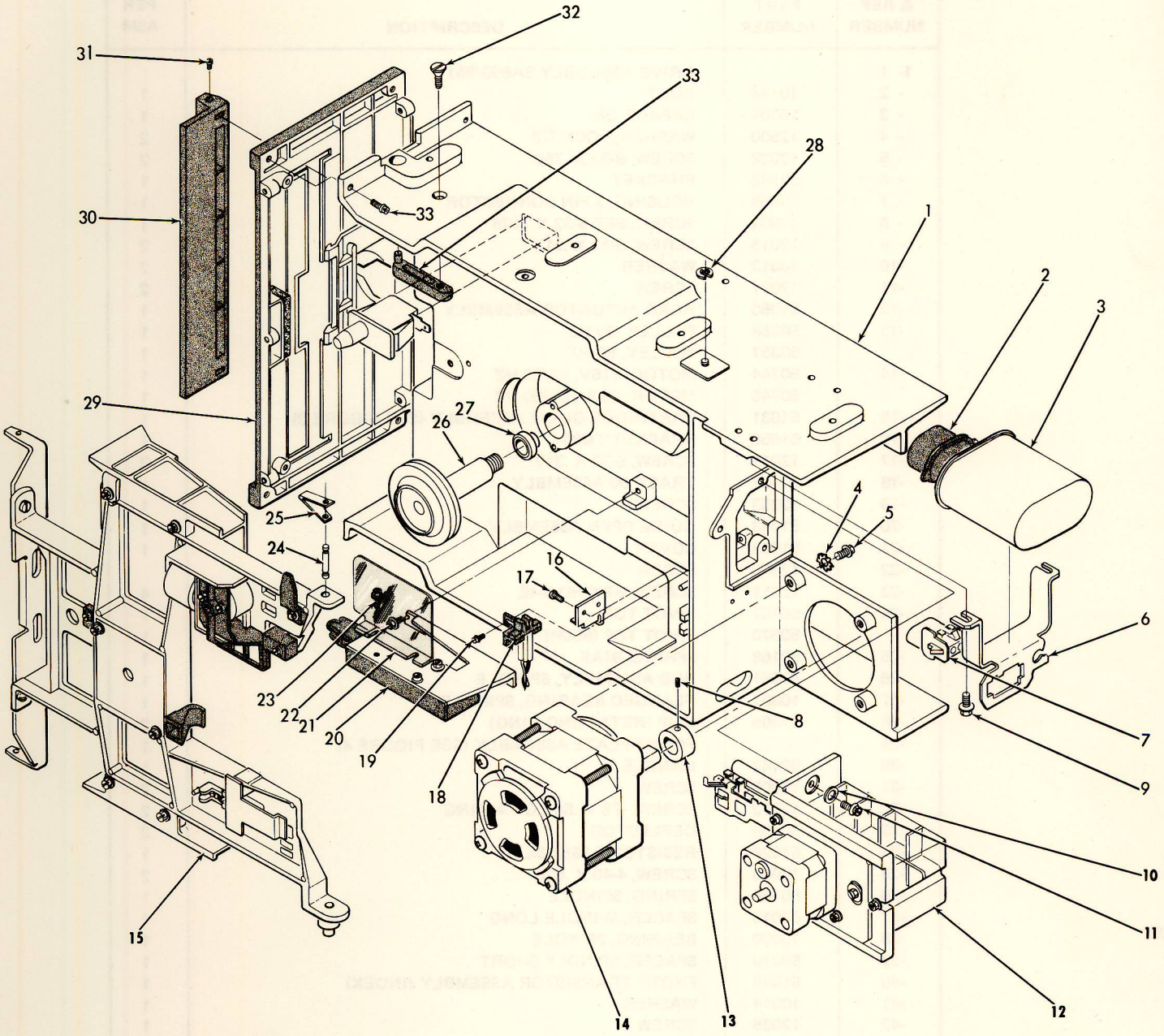


Figure 1 (1 of 2)

FIGURE & REF NUMBER	PART NUMBER	DESCRIPTION	QTY PER ASM
1- 1		DRIVE ASSEMBLY SA850/851	
- 2	10148	BOOT	1
- 3	15004	CAPACITOR	1
- 4	12500	WASHER, LOCK #8	2
- 5	12028	SCREW, 8-32 X .750	2
- 6	50746	BRACKET	1
- 7	15669	HOUSING, 3 PIN CONNECTOR	1
- 8	11904	SCREW, SET 6-32 X .125	1
- 9	12015	SCREW, 8-32 X .312	2
-10	10013	WASHER	2
-11	12027	SCREW	2
-12	51050	HEAD ACTUATOR ASSEMBLY	1
-13	50358	PULLEY, 60 HZ	1
	50357	PULLEY, 50 HZ	1
-14	50744	MOTOR, 115V, 50/60 HZ	1
	50745	MOTOR, 230V, 50/60 HZ	1
-15	51031	CARTRIDGE GUIDE ASSEMBLY (SEE FIGURE 3)	1
-16	51056	BRACKET TK00	1
-17	12013	SCREW, 6-32 X .312	2
-18	51027	TRACK 00 ASSEMBLY	1
-19	12053	SCREW	1
-20	51063	GUIDE OPEN ASSEMBLY	1
-21	51058	COVER	1
-22	12053	SCREW	
-23	12011	SCREW, HEX HD 4-40	4
-24	50167	PIVOT TOP	1
	50670	PIVOT TOP (850R)	1
-25	50168	SPRING, BIAS	1
-26	50561	HUB ASSEMBLY, SPINDLE	1
-27	10801	FLANGED BEARING, SPINDLE	1
-28	11305	CLIP (RETAINING RING)	2
-29		FRONT PLATE ASSEMBLY (SEE FIGURE 4)	1
-30	50142	HANDLE	1
-31	11905	SCREW	2
-32	12032	SCREW, #8 X .50 LG TAPPING	2
-33	50559	DEFLECTOR	2
-34	51028	RESISTOR ASSEMBLY	1
-35	12026	SCREW, 4-40 X .625	2
-36	50166	SPRING, SPINDLE	1
-37	50018	SPACER, SPINDLE LONG	1
-38	10800	BEARING, SPINDLE	1
-39	50019	SPACER, SPINDLE SHORT	1
-40	51046	PHOTO TRANSISTOR ASSEMBLY (INDEX)	1
-41	10014	WASHER	1
-42	12036	SCREW	1
-43	50016	PULLEY SPINDLE	1
-44	12509	WASHER, SPRING, #8	2
-45	10025	NUT 8-32	1
-46	12015	SCREW, 4-40 X .250	1
-47	10378	CABLE CLAMP 1/8"	1
-48	50445	BELT, 60 HZ	1
	50446	BELT, 50 HZ	1

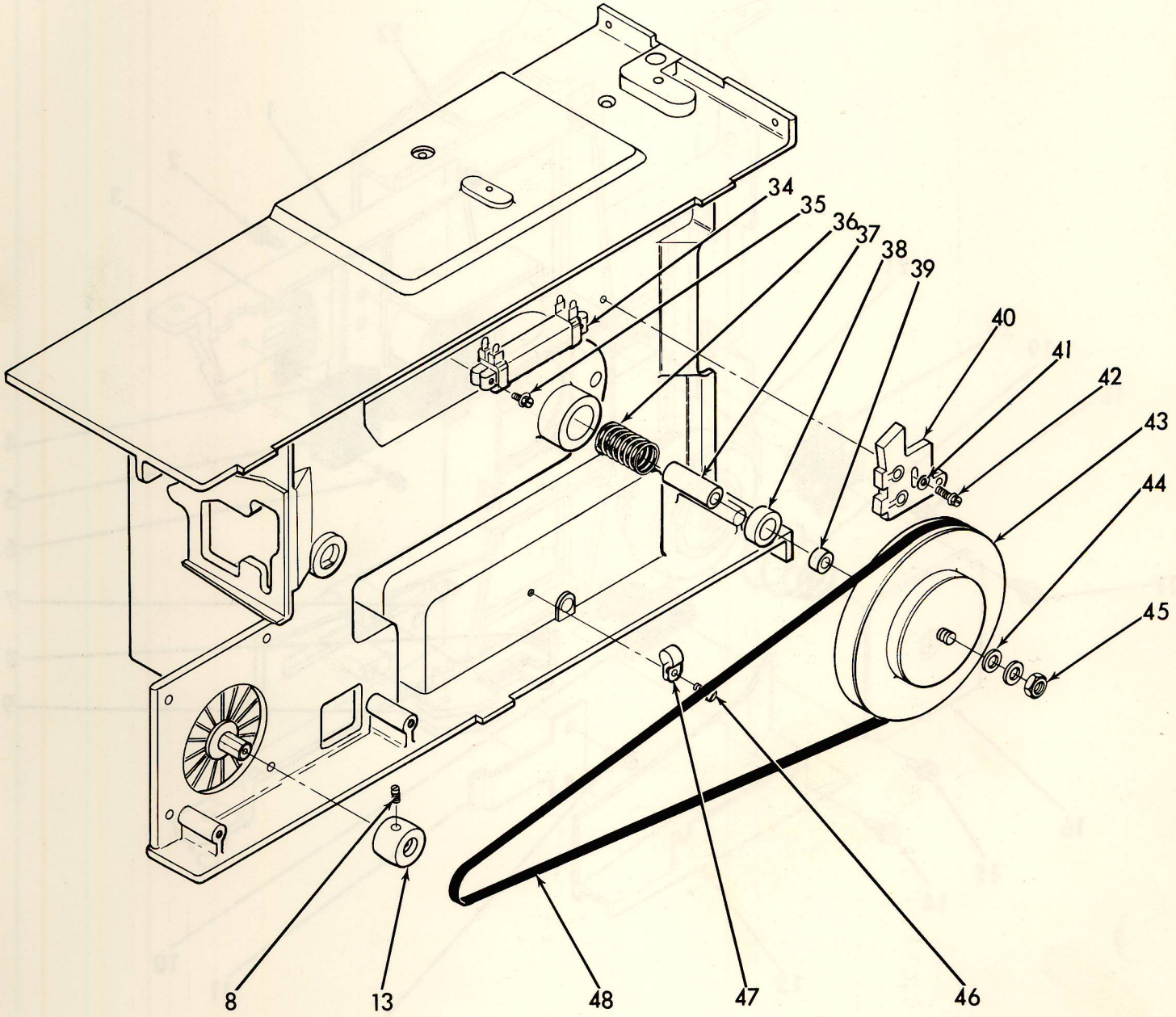


Figure 1 (2 of 2)

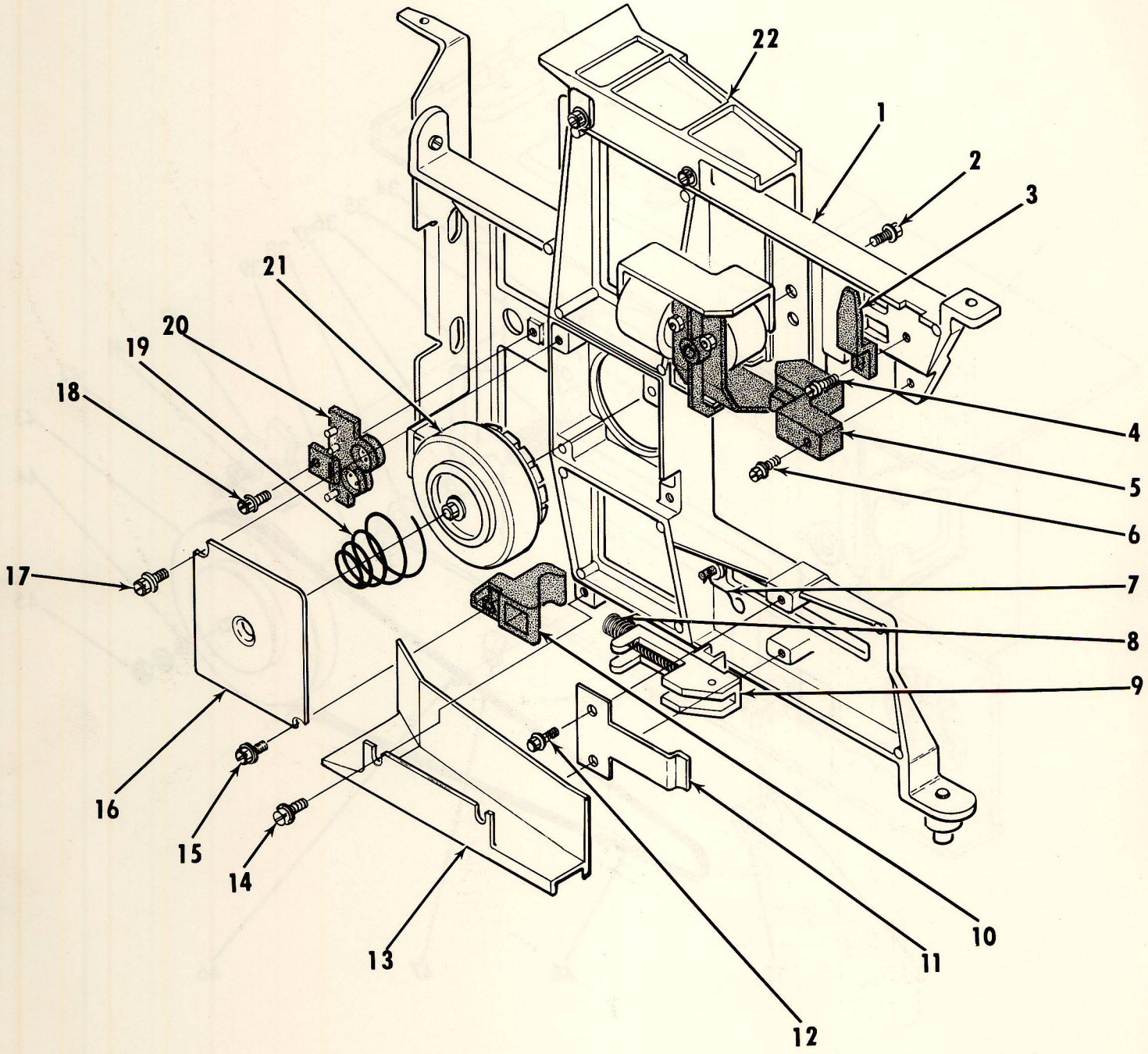


Figure 2

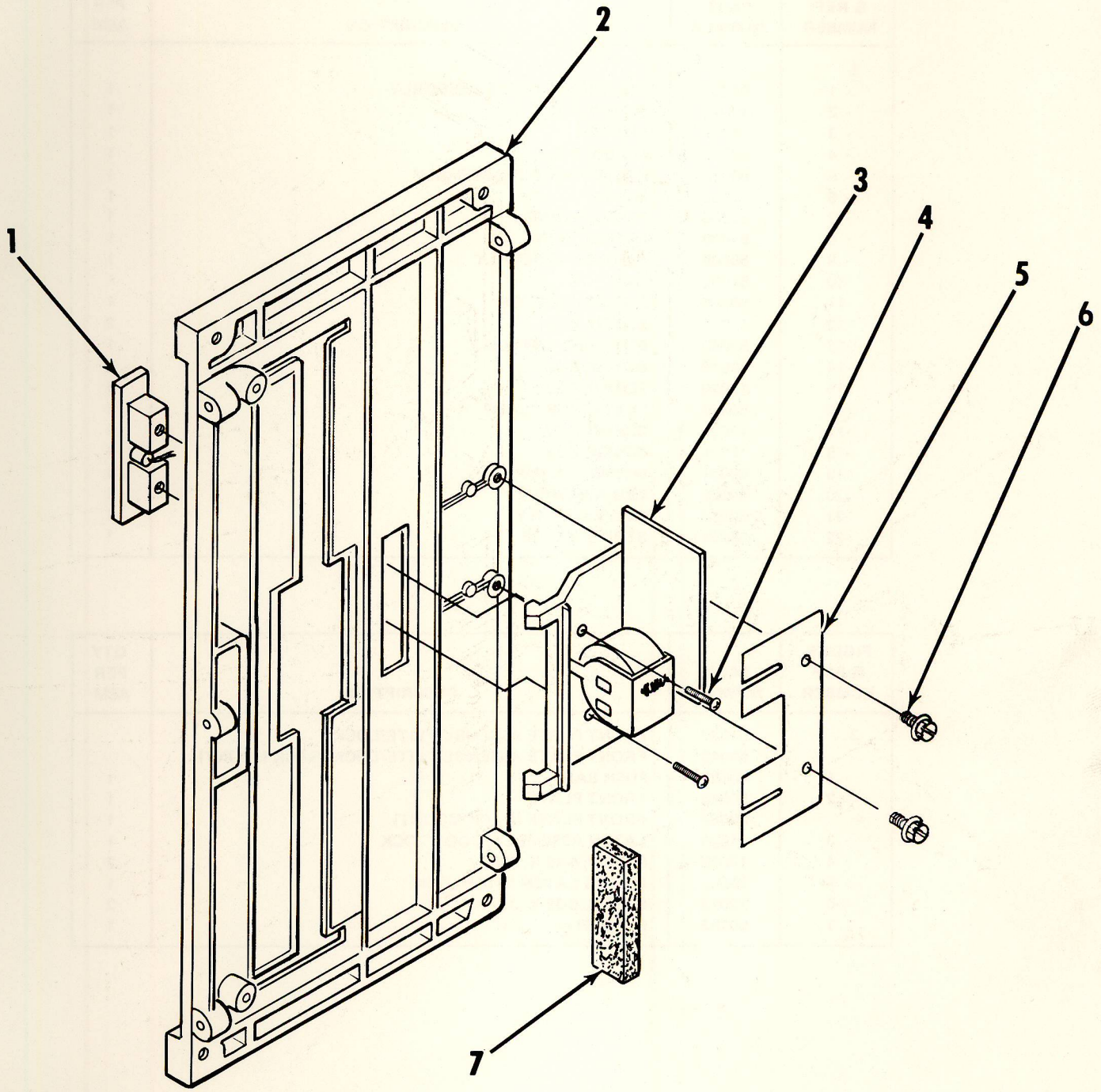


Figure 3

FIGURE & REF NUMBER	PART NUMBER	DESCRIPTION	QTY PER ASM
2			
- 1	51031	CARTRIDGE GUIDE ASSEMBLY	1
- 2	12013	SCREW, 6-32	1
- 3	51075	LIMITER	1
- 4	12020	SCREW, 8-32	1
- 5	50313	WRITE PROTECT ASSEMBLY	1
- 6	12026	SCREW	1
- 7	50556	HOOK, SPRING	1
- 8	51059	SPRING, SLIDE	1
- 9	50609	EJECTOR ASSEMBLY	1
-10	51055	CAM	1
-11	50555	SPRING, EJECTOR	1
-12	12015	SCREW, 8-32	2
-13	51062	STRIPPER, BOTTOM	1
-14	12016	SCREW, 8-32	2
-15	12020	SCREW, 8-32	1
-16	50546	PLATE, HUB CLAMP	1
-17	12020	SCREW, 8-32	1
-18	12016	SCREW, 8-32	1
-19	50031	SPRING, CLAMP	1
-20	51029	LED ASSEMBLY	1
-21	50254	HUB ASSEMBLY	1
-22	51061	STRIPPER, TOP	1

FIGURE & REF NUMBER	PART NUMBER	DESCRIPTION	QTY PER ASM
3	51037	FRONT PLATE ASSEMBLY LITE/LOCK	
	51043	FRONT PLATE ASSEMBLY LITE/LOCK (RACK MOUNT)	
- 1	50587	PUSH BAR	1
- 2	50349	FRONT PLATE	1
	50667	FRONT PLATE (RACK MOUNT)	1
- 3	51038	LATCH ASSEMBLY, DOOR LOCK	1
- 4	12035	SCREW, 4-40 X .250	2
- 5	50691	SPRING LATCH INTERLOCK	1
- 6	12013	SCREW, 6-32 X .312	2
- 7	50183	BUMPER	1

PART NUMBER	FIG. & REF. NUMBER
10013	1-10
10014	1-41
10025	1-45
10148	1-2
10378	1-47
10800	1-38
10801	1-27
11305	1-28
11904	1-8
11905	1-31
12011	1-23
12013	1-17
	2-2
	3-6
12015	1-9
	1-46
	2-12
12016	2-14
	2-18
12020	2-4
	2-15
	2-17
12026	1-35
	2-6
12027	1-11
12028	1-5
12032	1-32
12035	3-4
12036	1-42
12053	1-19
	1-22
12500	1-4
12509	1-44
15004	1-3
15669	1-7
50016	1-43
50018	1-37
50019	1-39
50031	2-19
50142	1-30

PART NUMBER	FIG. & REF. NUMBER
50166	1-36
50167	1-24
50168	1-25
50183	3-7
50254	2-21
50313	2-5
50349	3-2
50357	1-13
50358	1-13
50445	1-14
50446	1-48
50546	2-16
50555	2-11
50556	2-7
50559	1-33
50561	1-26
50587	3-1
50609	2-9
50667	3-2
50670	1-24
50691	3-5
50744	1-14
50745	1-14
50746	1-6
51027	1-18
51028	1-34
51029	2-20
51031	2-1
51038	3-3
51046	1-40
51050	1-12
51055	2-10
51056	1-16
51058	1-21
51059	2-8
51061	2-22
51062	2-13
51063	1-20
51075	2-3

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