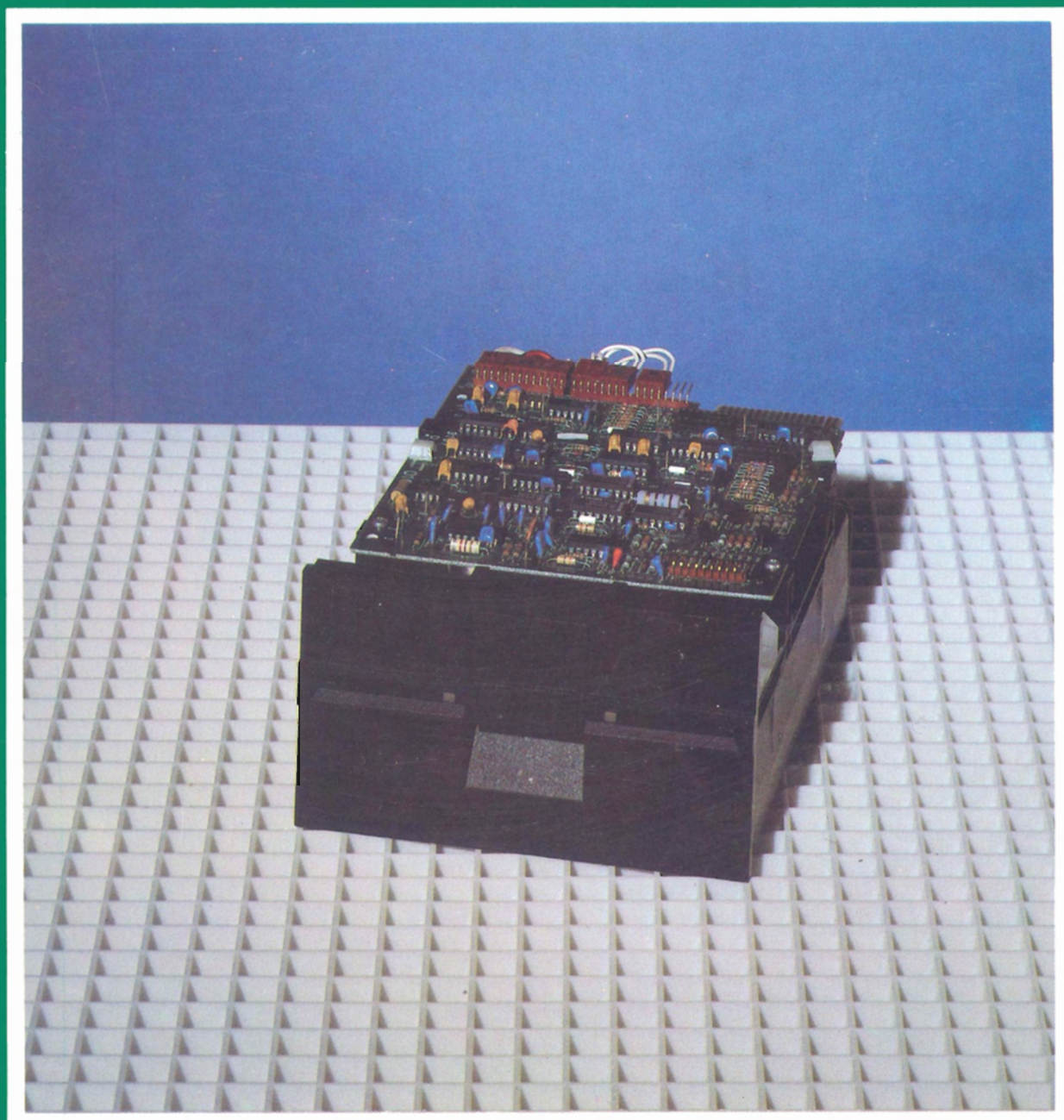


# **DISK DRIVE:** **TANDON®** **MODEL TM100-2/2A**



TECHNICAL SERVICE DATA FOR YOUR DISK DRIVE

## PRELIMINARY SERVICE CHECKS

This data provides the user with a time-saving service tool which is designed for quick isolation and repair of disk drive malfunctions.

Check all interconnecting cables for good connection and correct hook-up before making service checks.

## TEST EQUIPMENT AND TOOLS

### TEST EQUIPMENT

Digital Volt/Ohm Meter  
Logic Probe

### TOOLS

Phillips Screwdriver  
Methyl alcohol or 91% isopropyl alcohol  
Cotton swabs or lint-free cloth  
Spray contact cleaner

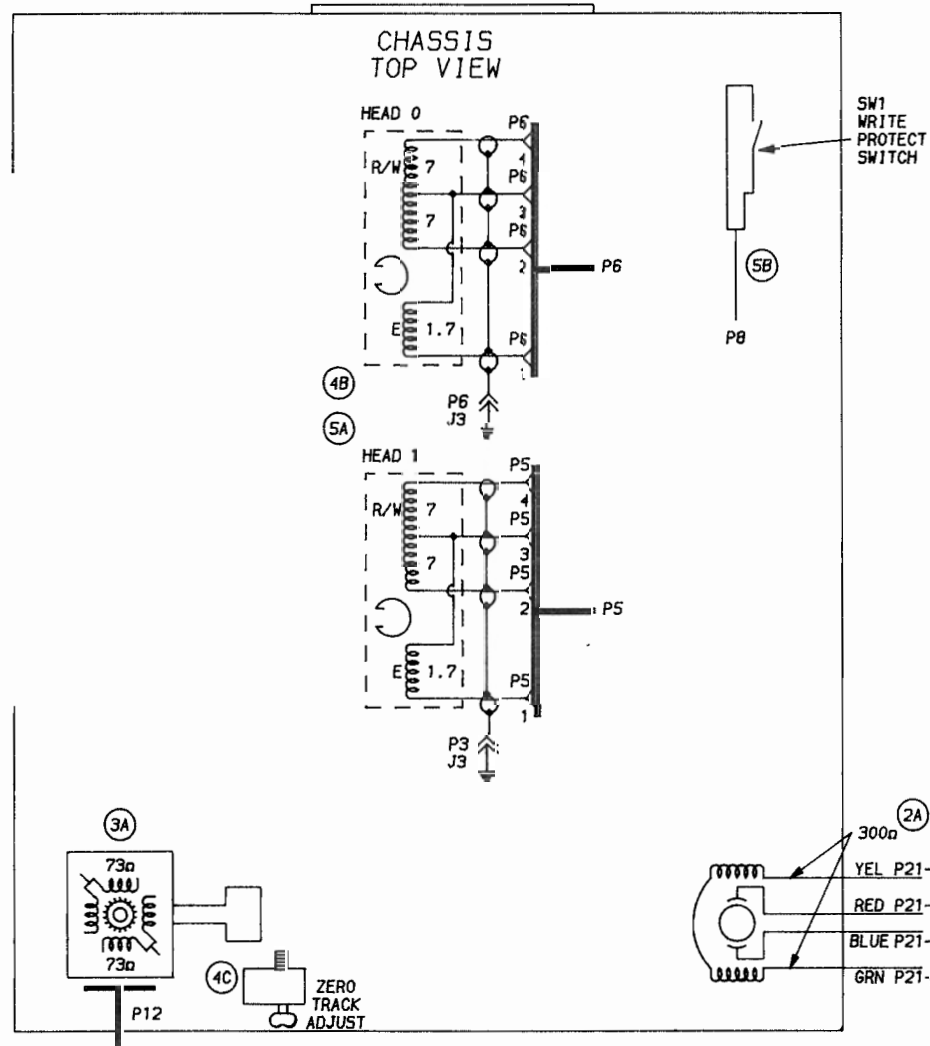
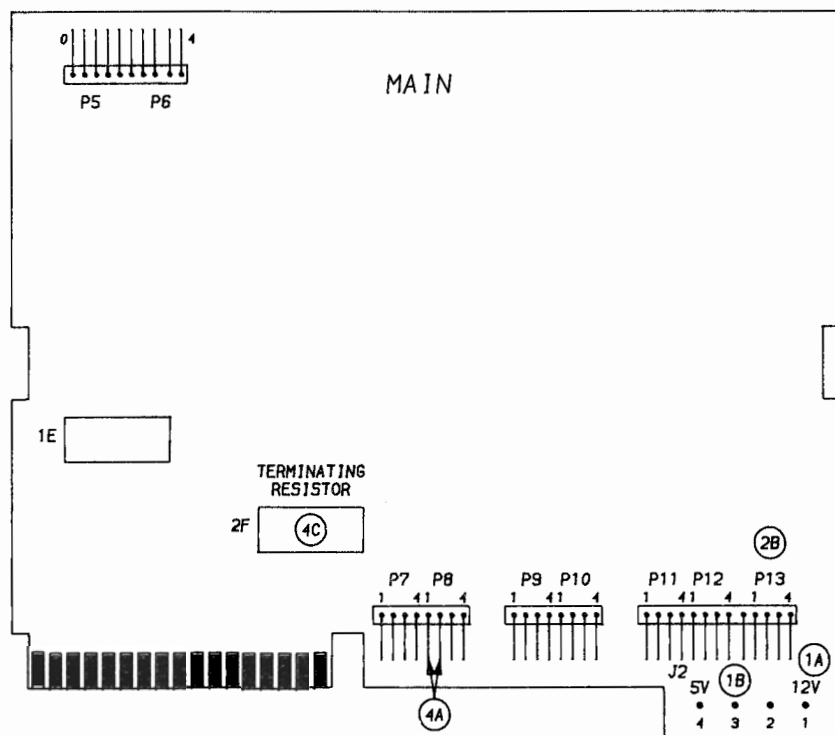
**SAMS™** Howard W. Sams & Co., Inc.  
4300 West 62nd Street, P.O. Box 7092, Indianapolis, Indiana 46206 U.S.A.

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# PRELIMINARY SERVICE CHECKS (Continued)



INTERCONNECTING DIAGRAM

# PRELIMINARY SERVICE CHECKS (Continued)

## SERVICE CHECKS

MATCH THE NUMBERS ON THE INTERCONNECTING DIAGRAM AND PHOTOS WITH THE NUMBERS ON THE SERVICE CHECKS TO BE PERFORMED.

①

### POWER SUPPLY

- (A) Check for 12V at pin 1 of Connector J2.
- (B) Check for 5V at pin 4 of Connector J2.

②

### DISK DRIVE WILL NOT RUN

- (A) Disconnect plug P21 on the Servo board and check for 178 ohms across the Drive Motor winding between pins 1 and 2 (yellow and green) and check for continuity between pins 3 and 4 of plug 21. If open check the Drive Motor by substitution.
- (B) Check for a Low logic reading at pin 1 of Connector P13 on the Main board. If the logic reading is High replace the Main board.
- (C) If the logic reading at Connector P13 checks Low, check the Servo board by substitution.

③

### HEAD POSITION MOTOR (STEPPER MOTOR)

- (A) Check the resistance readings on each winding of the Head Position Motor. Check for 73 ohms between pin 5 and each of the other pins of Connector P12. If resistance is not correct replace the Head Position Motor (M1).
- (B) If the Head Position Motor checks normal, check the Main board by substitution.

④

### WILL NOT READ (SEEK ERROR)

- (A) Check the Spindle Speed Alignment, refer to the Alignment section.
- (B) Clean the heads with a non-abrasive cleaning diskette. If the Disk Drive is a single side drive, use a single side diskette to avoid damaging the head pad.
- (C) If the Disk Drive still will not read check the Track Zero alignment, refer to the Alignment section.
- (D) If the Disk Drive does not read after Aligning Track Zero replace the Disk Drive.

⑤

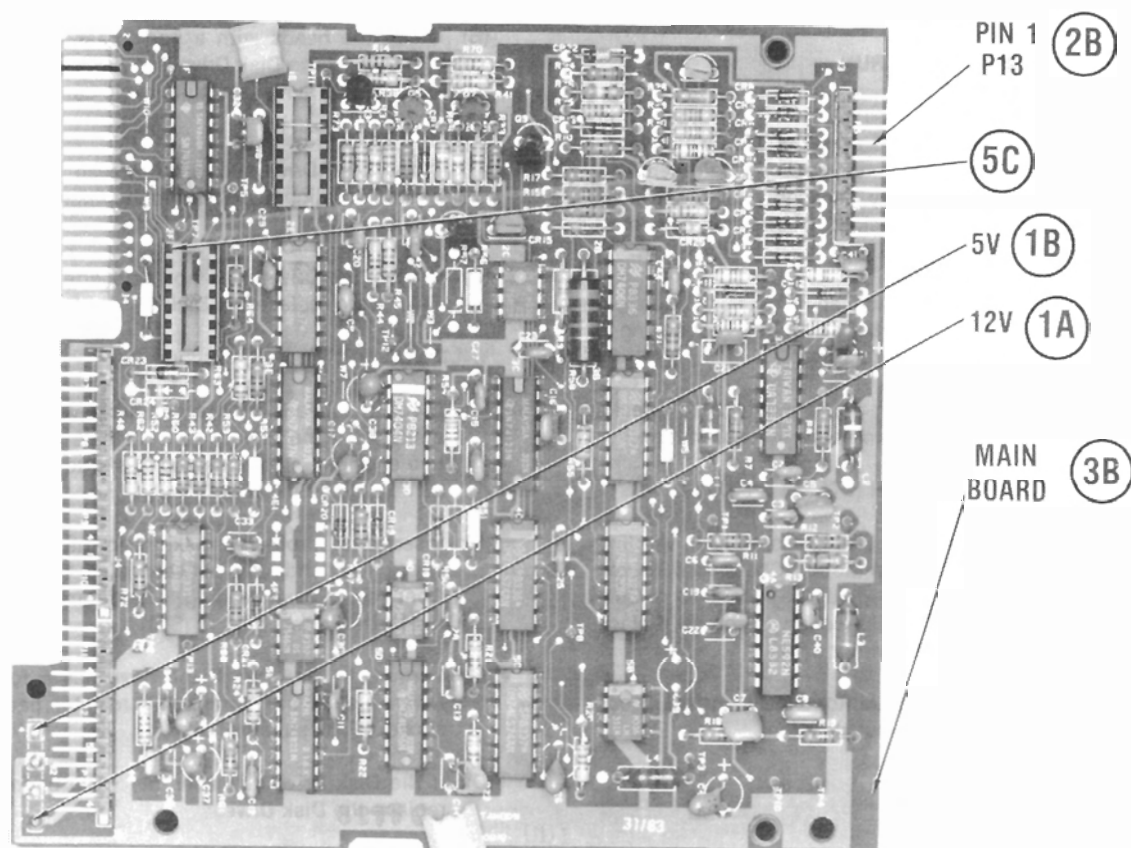
### WILL NOT WRITE

- (A) Clean the heads with a non-abrasive cleaning diskette. If the Disk Drive is a single side drive, use a single side cleaning diskette to avoid damaging the head pad.
- (B) Insert a nonprotected diskette in the drive and check for continuity between pins 1 and 2 of Connector P8. If reading is not correct, check the Write Protect Switch (SW1).
- (C) Format the diskette, if the drive has a format failure check the terminating resistor pack at socket 2F by substitution.
- (D) If the Disk Drive still does not write or format replace the Disk Drive.

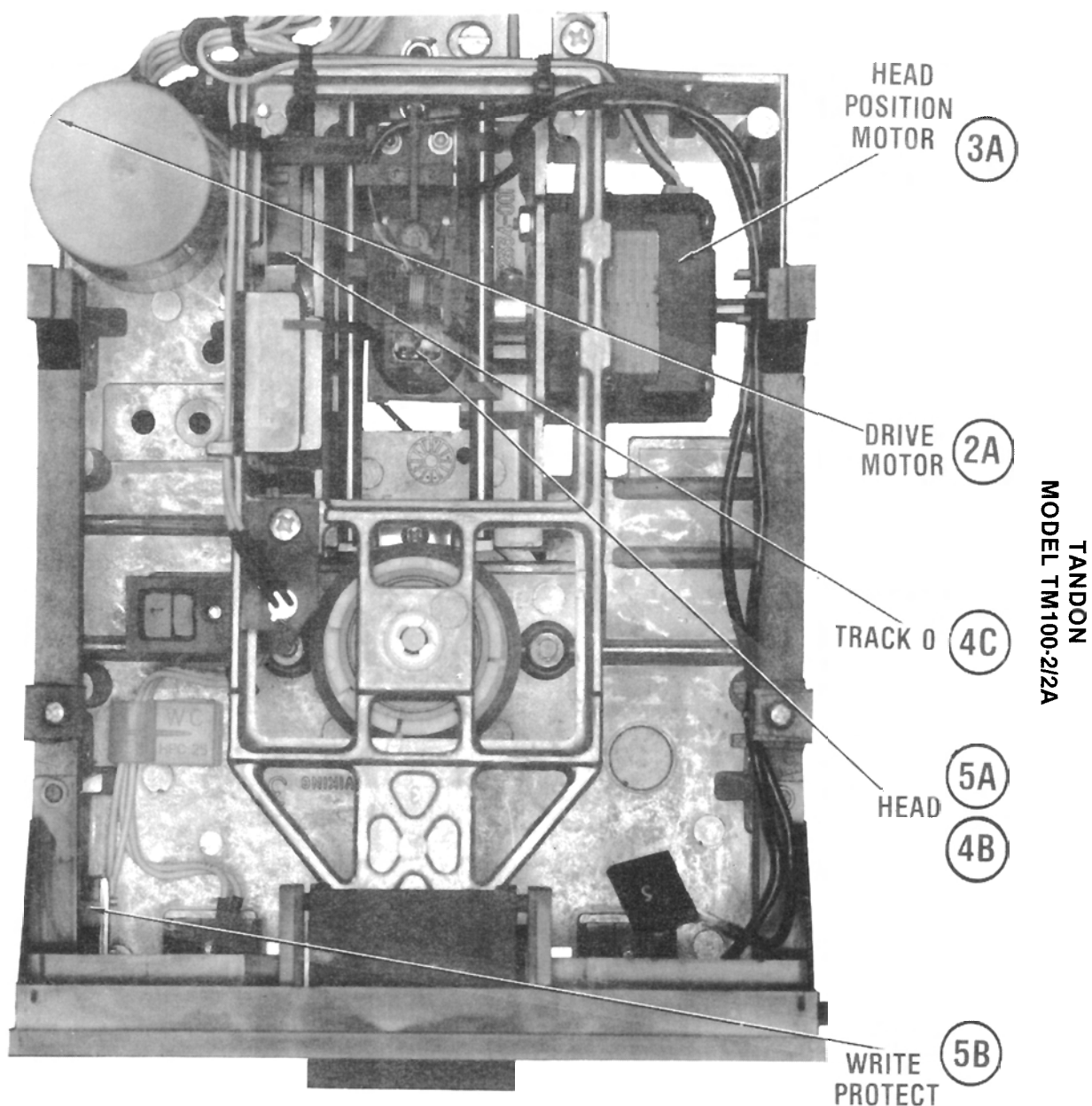
CD8

TANDON  
MODEL TM100-2/2A

## PRELIMINARY SERVICE CHECKS (Continued)



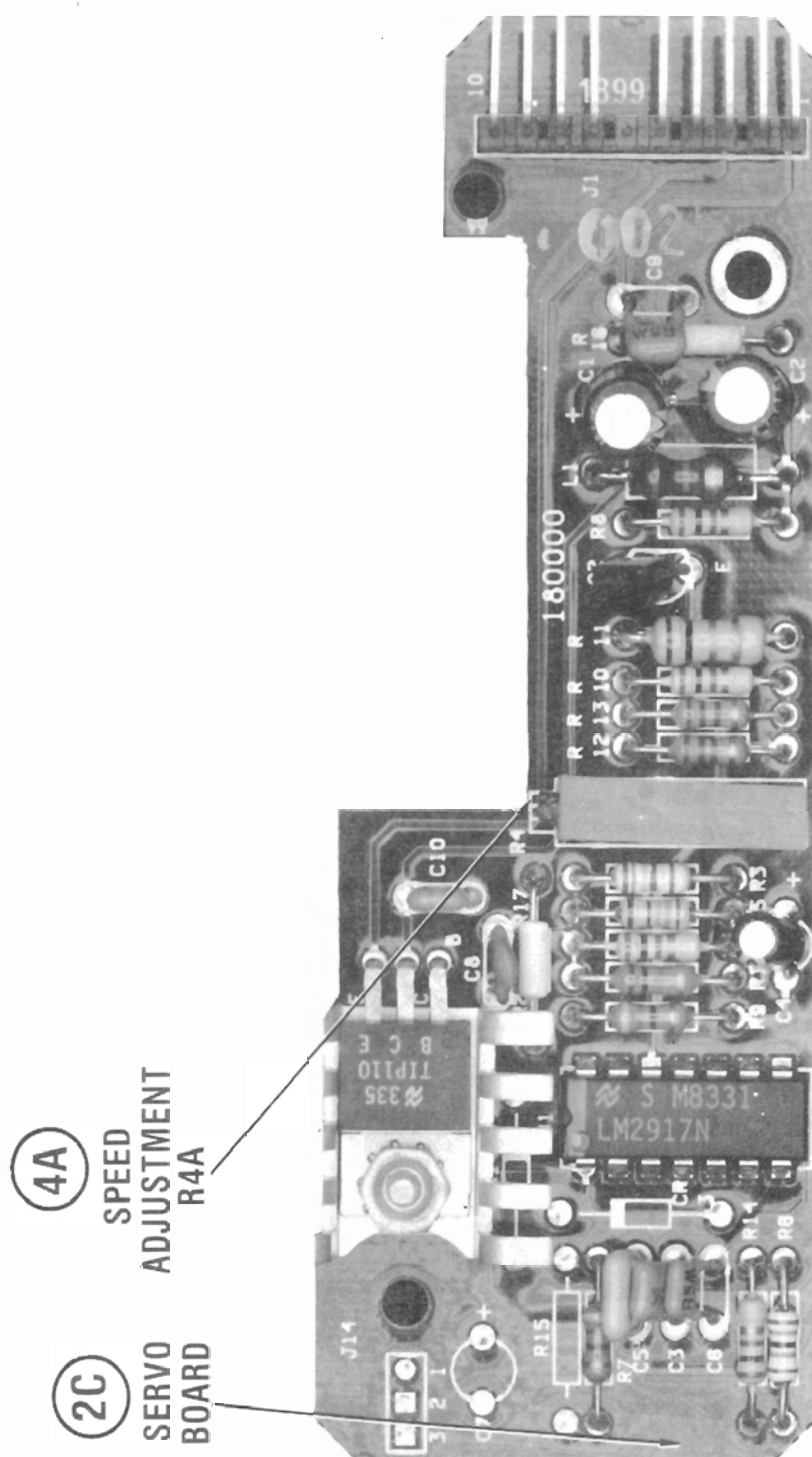
## PRELIMINARY SERVICE CHECKS (Continued)



MECHANICAL-TOP VIEW



## PRELIMINARY SERVICE CHECKS (Continued)



# PRELIMINARY SERVICE CHECKS (Continued)

## ALIGNMENT

### EQUIPMENT REQUIRED

A test program or a Disk Drive Tester is required which will turn On the Disk Drive and step the head to the track specified in the alignment procedures. Use a Dysan Analog Alignment Diskette 224/2A when an Alignment Diskette is specified in the alignment procedures. NOTE: This alignment diskette has only alignment patterns on it and does not contain any alignment programs.

### SPINDLE SPEED ADJUSTMENT

Insert a blank diskette into the Disk Drive and close the door. Turn the Disk Drive on its side so the pattern wheel on the fly wheel is visible. Adjust the Speed Control (R4) until the 60Hz pattern appears to stand still under a 60Hz fluorescent light. If 50Hz fluorescent lighting is used, use the 50Hz pattern on the pattern wheel.

If a Disk Drive Tester is being used, which provides a readout of the speed in rpm, adjust R4 for a speed of  $300\text{rpm} \pm 1.5\%$ .

### TRACK 00 SWITCH ADJUSTMENT AND STOP ADJUSTMENT

Insert the Alignment Diskette into the Disk Drive and close the door. Turn On the Disk Drive and set the head to track 16. Confirm that the head is on track 16 by observing the cats-eye pattern, see the "Radial Head Alignment" in this Alignment guide. If the cats-eye pattern is not correct, perform the Radial Head Alignment.

To adjust the Track 00 Switch (SW2), set the head to track 01. Loosen the retaining screw at the base of the Track 00 switch bracket and turn the Track 00 Switch Adjustment Screw Maximum counter-clockwise, see Disk Drive Mechanical Photo, Top View. Turn the screw clockwise until a "click" is heard and then turn the screw clockwise one half turn more. Retighten the Track 00 switch bracket retaining screw.

To adjust the Track 00 Stop Adjustment Screw, connect the input of a scope to TP1 and set the sweep time to  $10\mu\text{s}$  and the voltage range to .5V. Insert the Alignment Diskette and close the door. Turn On the drive and set the head to track 00. A 125kHz sine wave of about .6V peak to peak should appear on the scope. Turn the Track 00 Stop Adjustment Screw clockwise until the amplitude of the 125kHz signal just starts to decrease then turn the screw counter-clockwise 1/2 turn, see Disk Drive Mechanical - Top View Photo. Apply a small amount of cement to the screw to keep it in place.

### RADIAL HEAD ALIGNMENT

Connect the channel A input of a dual trace scope to TP1, channel B input to TP2, the external trigger input to TP7 and connect the scope ground to TP6. Set the scope to add mode with channel B inverted, sweep time to 20ms, AC input, trigger to positive slope and voltage to 2V range. Insert the Alignment Diskette, turn On the Disk Drive and set the head to track 16. Observe the cats-eye pattern, see Figure 1. The lobes should be within 80% of each other. If the lobes are out of tolerance, loosen the two head module retaining screws on the bottom of the Disk Drive and the

one screw on the top next to the Radial Head Alignment screw, see Disk Drive Mechanical - Top View Photo. Turn the Radial Head Alignment Screw until the lobes are within 80% of each other and retighten the three retaining screws.

Move the head to track 40 and back to track 16, then to track 00 and back to track 16, verifying that the lobes are within tolerance when the head is on track 16.

#### EQUAL AMPLITUDE



Figure 1

### INDEX SENSOR ADJUSTMENT

Connect the channel A input of a dual trace scope to TP3, channel B input to TP7 (index pulse) and the scope ground to TP6. Set the scope display to channel A with the voltage range set to 20mV and the sweep time set to  $50\mu\text{s}$ . Set the channel B input to noninverting mode and trigger the scope on channel B with the trigger set to positive slope.

Insert the Alignment Diskette in the Disk Drive and close the door. Turn On the Disk Drive and set the head to track 01. Confirm that the leading edge of the burst occurs  $200\mu\text{s} \pm 50\mu\text{s}$  after the leading edge of the index pulse, see Figure 2. If the index sensor is out of adjustment, loosen the index sensor retaining screw on the bottom of the Disk Drive and use a flat blade screwdriver placed in the slots on the chassis and index sensor to adjust for  $200\mu\text{s} \pm 50\mu\text{s}$ , see Disk Drive Mechanical, Bottom View Photo.

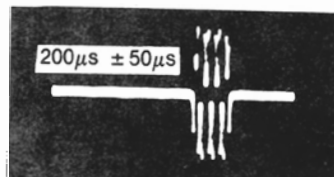


Figure 2

### AZIMUTH CHECK

Connect the channel A input of a dual trace scope to TP1, channel B input to TP2, external trigger input to TP7 and connect the scope ground to TP6. Set the scope to add mode with channel B inverted, sweep time to .5ms, AC input, trigger to positive slope and voltage to .1V range.

Insert the Alignment Diskette, turn On the Disk Drive and set the head to track 34. Confirm that the pattern appears as shown in Figure 3. The amplitude of bursts 1 and 4 must be equal to or less than the amplitudes of bursts 2 and 3.

No adjustment is provided for the head azimuth. If the azimuth is out of tolerance, the head may need replacement.

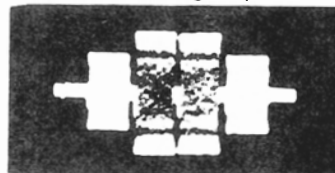


Figure 3



# PRELIMINARY SERVICE CHECKS (Continued)

## PREVENTATIVE MAINTENANCE

### ENVIRONMENT

Computers perform best in a clean, cool area that is below 80 degrees Fahrenheit and free of dust and smoke particles. Even though home Computers are not affected by cigarette smoke as much as commercial Computers are affected, it is better to maintain a smoke-free area around the Computer. Do not block cabinet vents of any of the Computer system; Computer, Monitor, Printer, or other power devices.

### ELECTRICAL POWER

Variations in the line voltage can affect the Computer. Try to avoid these fluctuations by using an AC receptacle that is on a power line not used by appliances or other heavy current demand devices. A power-surge protector, power-line conditioner, or non-interruptible power supply may be needed to cure the problem. **Do not** switch power On and Off frequently.

### KEYBOARD

Liquids spilled into the Keyboard can ruin it. Immediately after a spill occurs, disconnect the Computer power plug from AC power outlet. Then, if circuitry or contacts are contaminated, disassemble the Keyboard and carefully rinse the Keyboard printed circuit board with distilled water and let it dry. Use a cotton swab to clean between the keys. Use a non-abrasive contact cleaner and lint-free wipers on accessible connectors and contacts.

### DISK DRIVES

Clean the read/write heads of the Disk Drives about once a month or after 100 hours usage. Use only an approved head cleaning kit.

Handle carefully to preserve proper disk head alignment. A sudden bump or jolt to the Disk Drives can knock the disk head out of alignment. If the disk drive must be transported, place an old disk in slot and close door during transport.

Store disks in their protective covers and never touch the disk surface. Observe the disk handling precautions usually found on the back of disk protective covers.

### PRINTERS

Carefully vacuum the Printer regularly. Wipe surface areas clean using a light all-purpose cleaner. Do not oil the machine. The oil will collect abrasive grit and dust. The dust will act as a blanket. This can cause components to overheat and fail.

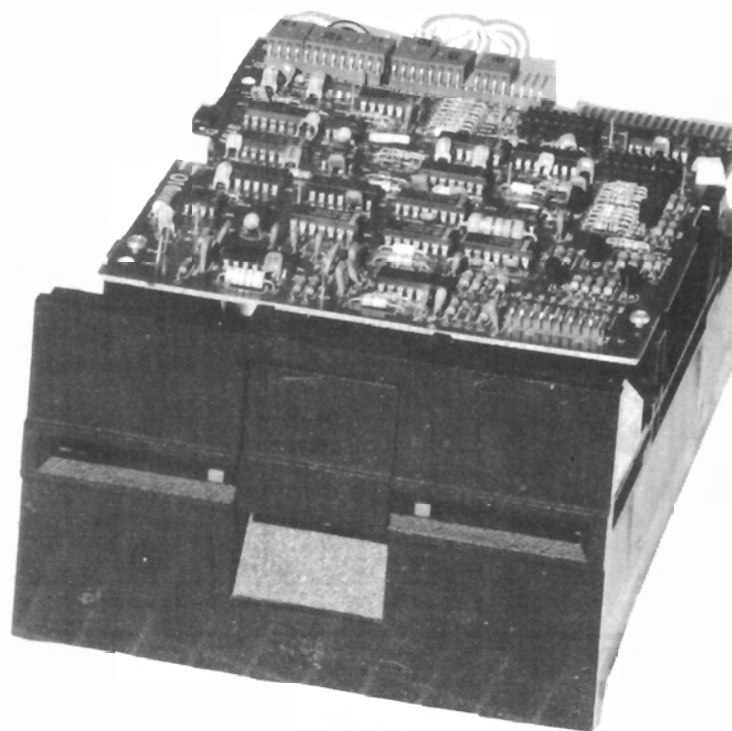
### STATIC ELECTRICITY

Static electricity discharge can affect the Computer. In order to minimize the possibility, use anti-static mats, sprays, tools and materials, and maintain good humidity in the Computer environment.

### MONITOR

Use an isolation transformer with any Monitor that does not come as part of the system since some Monitors use a HOT chassis (chassis connected to one side of the AC line). The face of the Monitor should never be left on for long periods of time at high brightness level except when pattern is being changed periodically. Use caution when cleaning anti-glare screens, to preserve the glare-reduction feature.

TANDON  
MODEL TM100-2/2A  
CD8



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MODEL TM100-2/2A

## PRELIMINARY SERVICE CHECKS

ENCLOSED

## SAFETY PRECAUTIONS

See page 21.

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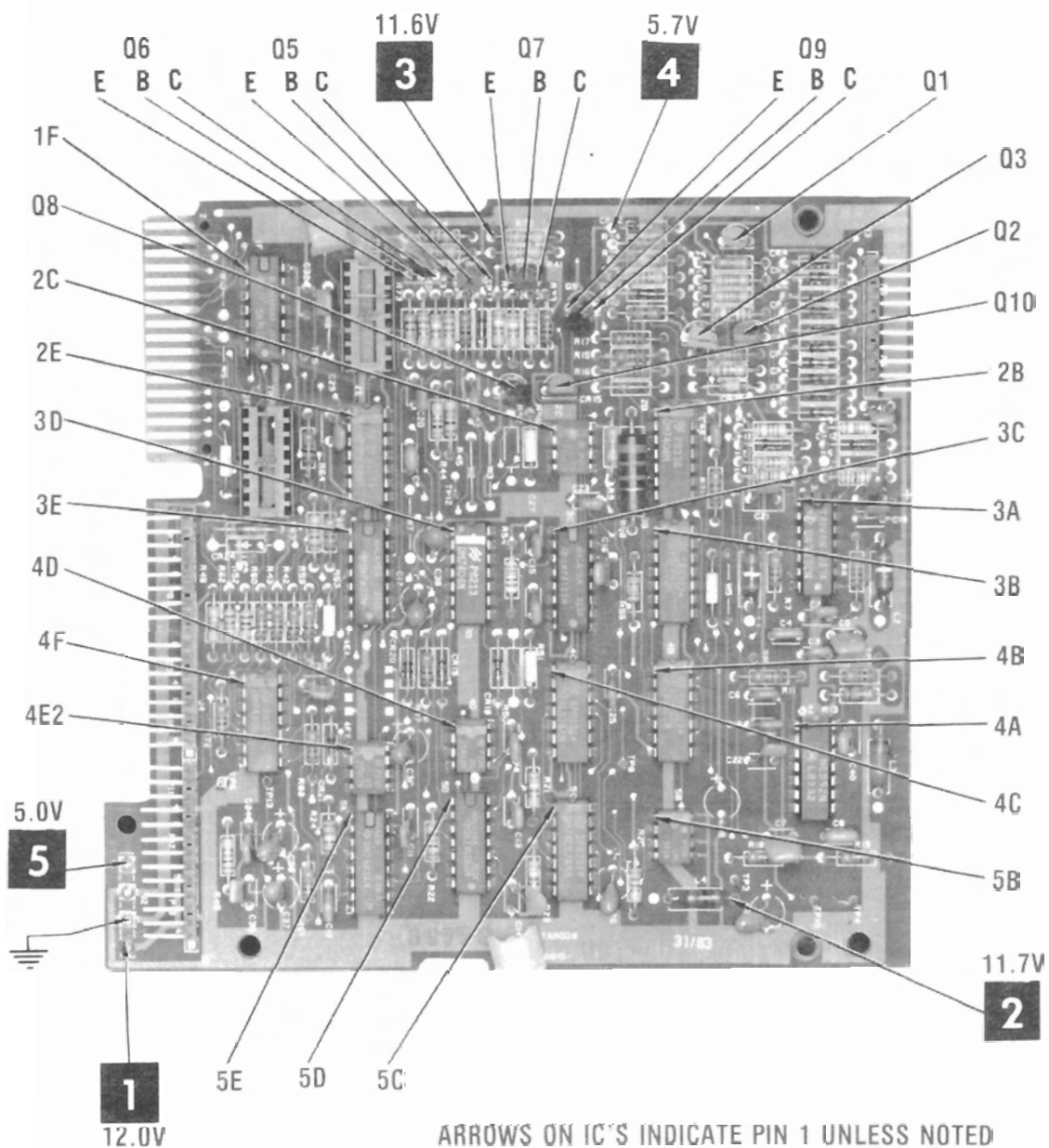
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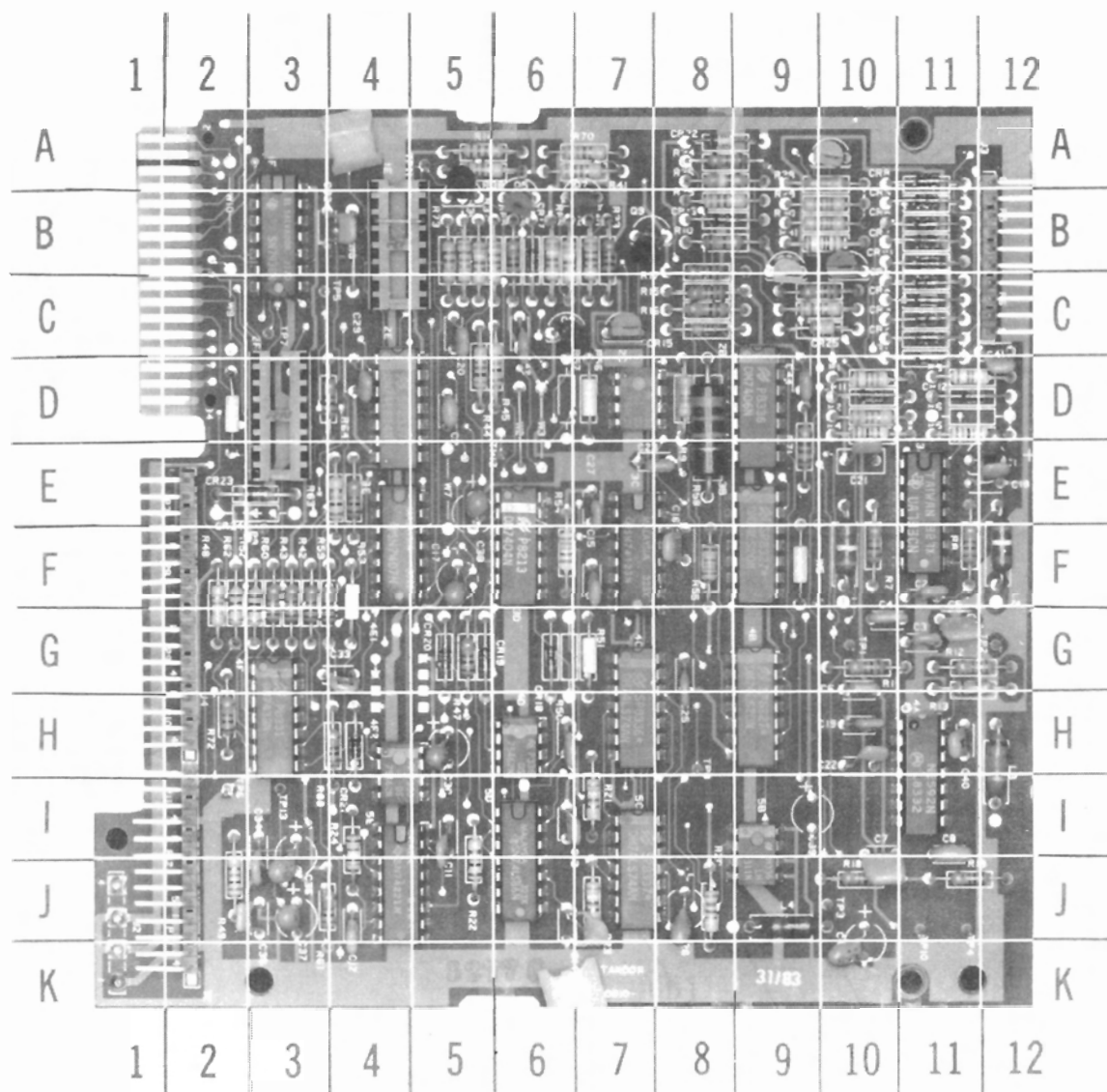
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**CD8**  
TANDON  
MODEL TM100-2/2A



# MAIN BOARD GridTrace LOCATION GUIDE

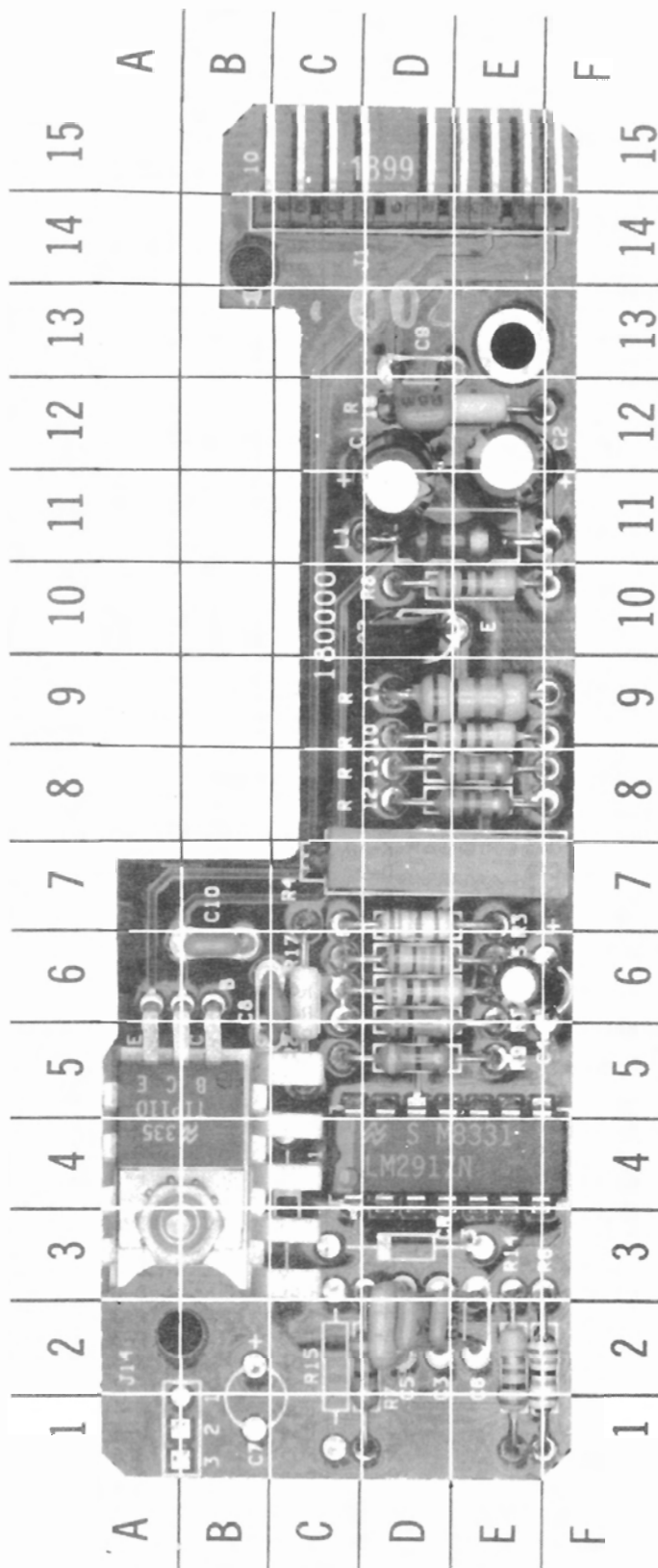
C1	E-12	Q6	A-5	TP3	J-10
C2	F-11	Q7	B-7	TP6	I-2
C3	G-11	Q8	C-6	TP7	C-3
C4	G-10	Q9	B-7	W1	D-2
C5	G-11	Q10	C-7	W4	F-9
C6	G-10	R1	D-10	W6	F-4
C7	J-10	R2	D-10	1E	B-4
C8	I-11	R3	D-11	1F	B-3
C9	D-5	R4	D-10	2B	D-9
C11	I-5	R5	D-11	2C	D-7
C12	J-4	R7	F-10	2E	D-4
C13	I-6	R8	F-11	3A	E-11
C14	J-7	R9	D-8	3B	E-9
C15	F-7	R10	B-8	3C	E-7
C16	F-8	R11	G-11	3D	E-6
C17	F-5	R12	G-11	3E	E-4
C18	E-12	R13	G-11	4A	H-11
C19	H-10	R14	A-5	4B	H-9
C20	C-5	R15	C-8	4C	H-7
C21	E-10	R16	C-8	4D	H-6
C22	H-10	R17	B-8	4E2	H-4
C23	E-8	R18	J-10	4F	H-3
C25	G-8	R19	J-11	5B	I-9
C26	J-8	R20	J-8	5C	J-7
C27	E-7	R21	I-7	5D	J-6
C28	H-6	R22	J-5	5E	J-4
C29	D-4	R23	J-7		
C30	H-5	R24	I-4		
C32	B-4	R25	B-8		
C33	G-4	R26	A-8		
C34	J-3	R27	C-10		
C35	J-2	R28	A-10		
C36	J-3	R29	B-10		
C37	J-3	R30	B-10		
C38	E-5	R31	B-10		
C40	H-11	R33	B-7		
C41	D-12	R34	A-8		
C42	C-6	R35	C-10		
C43	K-10	R36	B-5		
C44	D-9	R37	B-5		
CR1	D-11	R38	A-5		
CR2	C-11	R39	B-6		
CR3	C-11	R40	B-7		
CR4	C-11	R41	A-7		
CR5	C-11	R42	F-3		
CR6	B-11	R43	F-3		
CR7	B-11	R44	D-5		
CR8	A-11	R45	D-6		
CR9	B-11	R47	G-5		
CR10	B-11	R48	F-2		
CR11	D-10	R49	J-2		
CR12	D-11	R51	G-7		
CR13	B-8	R52	F-3		
CR15	C-8	R53	E-4		
CR17	B-6	R54	F-6		
CR18	G-6	R55	F-8		
CR19	G-5	R56	D-7		
CR20	G-5	R58	D-8		
CR21	H-4	R59	F-3		
CR22	A-8	R60	F-3		
CR23	E-3	R61	J-3		
CR25	C-10	R62	F-2		
J1	B-2	R63	E-4		
J2	J-1	R64	D-4		
J3	B-12	R65	B-6		
J4	G-2	R66	B-6		
L1	F-10	R68	H-4		
L2	F-12	R69	B-6		
L3	H-12	R70	A-7		
L4	J-9	R71	E-9		
Q1	A-10	R72	H-2		
Q2	B-10	R73	B-5		
Q3	B-9	TP1	G-10		
Q5	B-6	TP2	G-12		

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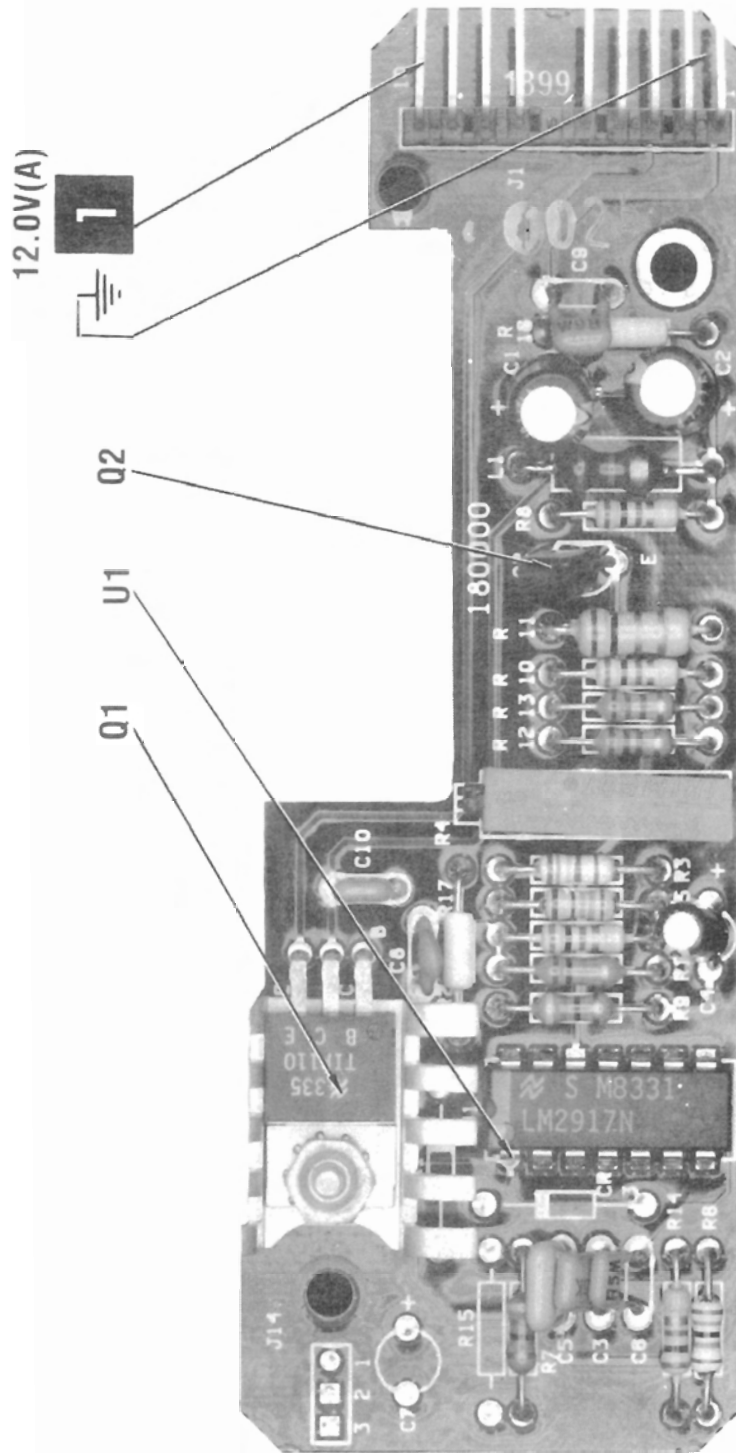


# SERVO BOARD GridTrace LOCATION GUIDE

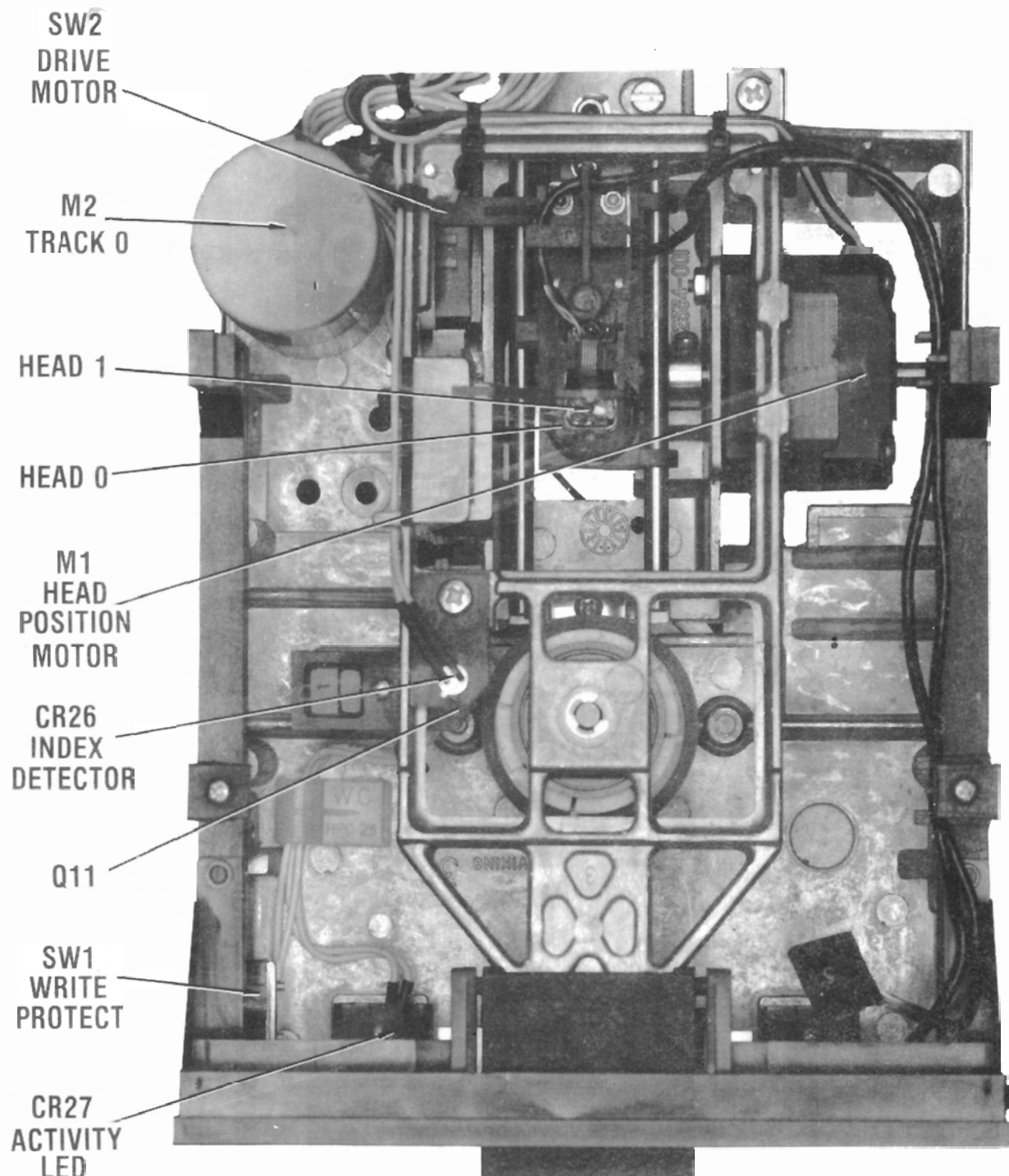
C1A	D-11	R3A	D-7
C2A	E-12	R4A	D-7
C3A	D-2	R5A	D-6
C4A	E-6	R6A	F-2
C5A	D-2	R7A	D-2
C6A	E-2	R8A	E-10
C8A	C-6	R9A	D-5
C9A	D-12	R10A	E-9
C10A	B-6	R11A	E-9
J1A	D-14	R12A	E-8
L1A	D-11	R13A	E-8
Q1A	A-5	R14A	E-2
Q2A	D-10	R16A	E-12
R1A	D-5	R17A	C-6
R2A	D-6	U1	D-4



**CD8** TANDON  
MODEL TM100-2/2A



ARROWS ON IC'S INDICATE PIN 1 UNLESS NOTED



**MECHANICAL-TOP VIEW**

## PARTS LIST AND DESCRIPTION

When ordering parts, state Model, Part Number, and Description

### SEMICONDUCTORS (Select replacement transistor for best results)

ITEM No.	TYPE No.	MFR. PART No.	REPLACEMENT DATA					
			NOTES	NTE PART No.	ECG PART No.	RCA PART No.	WORKMAN PART No.	ZENITH PART No.
1F	SN7438N			NTE7438	ECG7438	SK7438		HE-443-77
2B	DM7406N			NTE7406	ECG7406	SK7406		HE-443-698
2C	DS75463N							
2E	DM74LS14N			NTE74LS14	ECG74LS14	SK74LS14		HE-443-872
3A	UA733CN			NTE927D	ECG927D	SK7617/927D		
3B	DM74LS20N			NTE74LS20	ECG74LS20	SK74LS20		HE-443-798
3C	SN74123N			NTE74123	ECG74123	SK74123		221-Z9086
3D	DM7404N			NTE7404	ECG7404	SK7404		221-Z9076
3E	SN7407N			NTE7407	ECG7407	SK7407		HE-443-1020
4A	NE592N			NTE927D	ECG927D	SK7617/927D		
4B	DM74LS20N			NTE74LS20	ECG74LS20	SK74LS20		HE-443-798
4C	DM74LS74AN			NTE74LS74A	ECG74LS74A	SK74LS74A		HE-443-730
4D	DS75462N							
4E2	DS75462N							
4F	DM7438N			NTE7438	ECG7438	SK7438		HE-443-77
5B	LM311N			NTE922M	ECG922M	SK3668/922M		HE-442-75
5C	DM74LS74AN			NTE74LS74A	ECG74LS74A	SK74LS74A		HE-443-730
5D	SN74LS86N			NTE74LS86	ECG74LS86	SK74LS86		HE-443-891
5E	SN74221N			NTE74221	ECG74221			
CR1 Thru CR13	1N4446			NTE519	ECG519	SK3100/519	WEP925/519	103-131
OR15	1N5226C			NTE5005A	ECG5005A	SK3A3/5005A	WEP1405/5005	103-131
CR17 Thru CR21	1N4446			NTE519	ECG519	SK3100/519	WEP925/519	
CR22	1N5234B			NTE5013A	ECG5013A	SK6A2/5013A	WEP1414/5013	103-Z9008
CR23	1N4003			NTE116	ECG116	SK3311	WEP156	212-76-02
CR25	1N5230B			NTE5009A	ECG5009A	SK4A7/5009A	WEP1409/5009	103-279-09
Q1	2N4124			NTE123AP	ECG123AP	SK3854/123AP	WEP736/123A	121-Z9000A
Q1A	TIP110			NTE261	ECG261	SK3180/263	WEP261/261	121-Z9085
Q2	2N4124			NTE123AP	ECG123AP	SK3854/123AP	WEP736/123A	121-Z9000A
Q2A	2N4124			NTE123AP	ECG123AP	SK3854/123AP	WEP736/123A	121-Z9000A

**CD8**  
TANDON  
MODEL TM100-212A

6 PARTS LIST AND DESCRIPTION (Continued)

When ordering parts, state Model, Part Number, and Description

SEMICONDUCTORS (Select replacement transistor for best results)

ITEM No.	TYPE No.	MFG. PART No.	REPLACEMENT DATA					
			NOTES	NTE PART No.	ECG PART No.	RCA PART No.	WORKMAN PART No.	ZENITH PART No.
Q3 Thru Q7	2N4124			NTE123AP	ECG123AP	SK3854/123AP	WEP736/123A	121-Z9000A
	NTE159			ECG159	SK3466/159	WEP62/159	121-Z9003	
	NTE123AP			ECG123AP	SK3854/123AP	WEP736/123A	121-Z9000A	
	NTE159			ECG159	SK3466/159	WEP62/159	121-Z9003	
Q10 U1	2N4124 LM2917N			NTE123AP NTE995	ECG123AP ECG995	SK3854/123AP SK9209/995	WEP736/123A	121-Z9000A

## PARTS LIST AND DESCRIPTION (Continued)

When ordering parts, state Model, Part Number, and Description

### ELECTROLYTIC CAPACITORS

ITEM No.	RATING	MFGR. PART No.
C1	.68uF 35V	(1)
C17	2.2uF	
C26	4.7uF 16V	
C30	4.7uF 16V	

ITEM No.	RATING	MFGR. PART No.
C36 thru C38	4.7uF 16V	(1)
C39	4.7uF 16V	
C43	4.7uF 16V	

(1) Used in some versions.

### CAPACITORS

ITEM No.	RATING	MFGR. PART No.
C3	68 NPO 10%	(1)

(1) Used in some versions.

### RESISTORS (Power and Special)

ITEM No.	RATING	REPLACEMENT DATA		
		MFGR. PART No.	NTE PART No.	WORKMAN PART No.
R1	4750 1% 1/4W Carbon Film			
R3	8200 1% (1)			
	4750 1% 1/4W Carbon Film			
	8200 1% (1)			
R4,R5	15K 1% 1/4W Carbon Film			
	27K 1% (1)			
R24	3090 1% 1/4W Metal Film			
R25	768 1% (1)			
R31	1000 1% 1/4W Carbon Film			
	768 1% (1)			
R34	1540 1% (1)			
R35	768 1% (1)			
R54	13.3K 1% 1/4W Carbon Film			
R55	28.7K 1% 1/4W Metal Film			
R3A	1540 1% 1/4W Carbon Film			
	1000 1% (1)			
R5A	2670 1% 1/4W Carbon Film			
	1000 1% (1)			
R6A	150K 1% 1/4W Carbon Film			
RP1-2F	Resistor Network (2)			

TANDON  
MODEL TM100-2/2A

(1) Used in some versions.

(2) Contains eight (8 ea.) 150.

### CONTROLS (All wattages 1/2 watt, or less, unless listed)

ITEM NO.	FUNCTION	RESISTANCE	MFGR. PART NO.	NOTES
R4A	Speed Adjust	1000	3006P-1-102 (1)	

(1) Number on unit.



## PARTS LIST AND DESCRIPTION (Continued)

When ordering parts, state Model, Part Number, and Description

### COILS (RF-IF)

ITEM No.	FUNCTION	MFGR. PART No.
L1	Peaking (390uH)	
L2	Peaking (390uH)	
L3	Peaking (680uH)	
L4	RF Choke	

ITEM No.	FUNCTION	MFGR. PART No.
L1A	SERVO BOARD RF Choke	

### MISCELLANEOUS

ITEM No.	PART NAME	MFGR. PART No.	NOTES
CR26	LED		Index Detector
CR27	LED		Activity, Red
Head 0	Read/Write Head		
Head 1	Read/Write Head		
M1	Motor		Head Position
M2	Motor		Drive
SW1	Switch		Write Protect
SW2	Switch		Track 0

### WIRING DATA

General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8529 (Solid) Available in 13 Colors  
8522 (Stranded) Available in 13 Colors  
Low-loss Shielded Lead (Interconnections). Use BELDEN No. 8401 or 8421

### LINE DEFINITIONS

A0 Thru A9 ..... Address Lines  
AEN ..... Address Enable  
CLK ..... Clock  
CLR ..... Clear  
CPI ..... Clock Pulse  
D0 Thru D7 ..... Data Lines  
DACK ..... Direct Memory Address Acknowledge  
DACK & TC ..... Direct Memory Address Acknowledge  
DACK 2 ..... Direct Memory Address Acknowledge Two  
DIR (A & B) ..... Direction (Disk Drive A and B)  
DIR (C & D) ..... Direction (Disk Drive C and D)  
DMA ..... Direct Memory Address  
DRIVE SELECT (A) ..... Drive Select (Disk Drive A)  
DRIVE SELECT (B) ..... Drive Select (Disk Drive B)  
DRIVE SELECT (C) ..... Drive Select (Disk Drive C)  
DRIVE SELECT (D) ..... Drive Select (Disk Drive D)  
DRQ2 ..... Data Request Two  
ENABLE DRIVE (C & D) ..... Enable Drive (Disk Drive C and D)  
ERASE ..... Erase  
HM  
INDEX ..... Index  
INDEX (A & B) ..... Index (Disk Drive A and B)  
INDEX (C & D) ..... Index (Disk Drive C and D)  
INT WRT BUSY ..... Interrupt Write Busy  
INIT ..... Initialize  
IOR ..... Input/Output Read  
IOW ..... Input/Output Write  
IRQ ..... Interrupt Request  
MOTOR ENABLE (A) ..... Motor Enable (Disk Drive A)  
MOTOR ENABLE (B) ..... Motor Enable (Disk Drive B)  
MOTOR ENABLE (C) ..... Motor Enable (Disk Drive C)  
MOTOR ENABLE (D) ..... Motor Enable (Disk Drive D)

MOTOR ON ..... Motor On  
MR ..... Memory Read  
OUT ..... Output  
READ DATA ..... Read Data  
READ DATA (A & B) ..... Read Data (Disk Drive A and B)  
READ DATA (C & D) ..... Read Data (Disk Drive C and D)  
RESET ..... Reset  
SEEK ..... Seek  
SELECT HEAD 1(A & B) Select Head One(Disk Drive A and B)  
SELECT HEAD 1(C & D) Select Head One(Disk Drive C and D)  
S0 ..... Side 0  
S1 ..... Side One  
STEP (A & B) ..... Step (Disk Drive A and B)  
STEP (C & D) ..... Step (Disk Drive C and D)  
TC  
TRACK 0 ..... Track 0  
TRACK 0 (A & B) ..... Track 0 (Disk Drive A and B)  
TRACK 0 (C & D) ..... Track 0 (Disk Drive C and D)  
VCO SYNC ..... Voltage Controlled Oscillator Sync  
WR DATA (A & B) ..... Write Data (Disk Drive A and B)  
WR DATA (C & D) ..... Write Data (Disk Drive C and D)  
WRITE ..... Write  
WRITE DATA 00  
WRITE DATA 01  
WRITE GATE (A & B) ..... Write Gate (Disk Drive A and B)  
WRITE GATE (C & D) ..... Write Gate (Disk Drive C and D)  
WRITE PROTECT ..... Write Protect  
WRITE PROTECT (A & B) ..... Write Protect (Disk Drive A and B)  
WRITE PROTECT (C & D) ..... Write Protect (Disk Drive C and D)  
WRT TRAN  
2MHz ..... Clock Frequency  
16MHz ..... System Clock

# ALIGNMENT

## EQUIPMENT REQUIRED

A test program or a Disk Drive Tester is required which will turn On the Disk Drive and step the head to the track specified in the alignment procedures. Use a Dysan Analog Alignment Diskette 224/2A when an Alignment Diskette is specified in the alignment procedures. NOTE: This alignment diskette has only alignment patterns on it and does not contain any alignment programs.

## SPINDLE SPEED ADJUSTMENT

Insert a blank diskette into the Disk Drive and close the door. Turn the Disk Drive on its side so the pattern wheel on the fly wheel is visible. Adjust the Speed Control (R4) until the 60Hz pattern appears to stand still under a 60Hz fluorescent light. If 50Hz fluorescent lighting is used, use the 50Hz pattern on the pattern wheel.

If a Disk Drive Tester is being used, which provides a readout of the speed in rpm, adjust R4 for a speed of  $300\text{rpm} \pm 1.5\%$ .

## TRACK 00 SWITCH ADJUSTMENT AND STOP ADJUSTMENT

Insert the Alignment Diskette into the Disk Drive and close the door. Turn On the Disk Drive and set the head to track 16. Confirm that the head is on track 16 by observing the cats-eye pattern, see the "Radial Head Alignment" in this Alignment guide. If the cats-eye pattern is not correct, perform the Radial Head Alignment.

To adjust the Track 00 Switch (SW2), set the head to track 01. Loosen the retaining screw at the base of the Track 00 switch bracket and turn the Track 00 Switch Adjustment Screw Maximum counter-clockwise, see Disk Drive Mechanical Photo, Top View. Turn the screw clockwise until a "click" is heard and then turn the screw clockwise one half turn more. Retighten the Track 00 switch bracket retaining screw.

To adjust the Track 00 Stop Adjustment Screw, connect the input of a scope to TP1 and set the sweep time to  $10\mu\text{s}$  and the voltage range to .5V. Insert the Alignment Diskette and close the door. Turn On the drive and set the head to track 00. A 125kHz sine wave of about .6V peak to peak should appear on the scope. Turn the Track 00 Stop Adjustment Screw clockwise until the amplitude of the 125kHz signal just starts to decrease then turn the screw counterclockwise 1/2 turn, see Disk Drive Mechanical - Top View Photo. Apply a small amount of cement to the screw to keep it in place.

## RADIAL HEAD ALIGNMENT

Connect the channel A input of a dual trace scope to TP1, channel B input to TP2, the external trigger input to TP7 and connect the scope ground to TP6. Set the scope to add mode with channel B inverted, sweep time to 20ms, AC input, trigger to positive slope and voltage to .2V range. Insert the Alignment Diskette, turn On the Disk Drive and set the head to track 16. Observe the cats-eye pattern, see Figure 1. The lobes should be within 80% of each other. If the lobes are out of tolerance, loosen the two head module retaining screws on the bottom of the Disk Drive and the

one screw on the top next to the Radial Head Alignment screw, see Disk Drive Mechanical - Top View Photo. Turn the Radial Head Alignment Screw until the lobes are within 80% of each other and retighten the three retaining screws.

Move the head to track 40 and back to track 16, then to track 00 and back to track 16, verifying that the lobes are within tolerance when the head is on track 16.

EQUAL AMPLITUDE



Figure 1

## INDEX SENSOR ADJUSTMENT

Connect the channel A input of a dual trace scope to TP3, channel B input to TP7 (index pulse) and the scope ground to TP6. Set the scope display to channel A with the voltage range set to 20mV and the sweep time set to  $50\mu\text{s}$ . Set the channel B input to noninverting mode and trigger the scope on channel B with the trigger set to positive slope.

Insert the Alignment Diskette in the Disk Drive and close the door. Turn On the Disk Drive and set the head to track 01. Confirm that the leading edge of the burst occurs  $200\mu\text{s} \pm 50\mu\text{s}$  after the leading edge of the index pulse, see Figure 2. If the index sensor is out of adjustment, loosen the index sensor retaining screw on the bottom of the Disk Drive and use a flat blade screwdriver placed in the slots on the chassis and index sensor to adjust for  $200\mu\text{s} \pm 50\mu\text{s}$ , see Disk Drive Mechanical, Bottom View Photo.

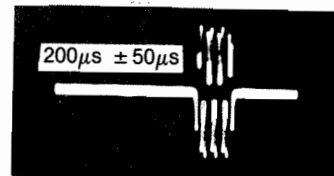


Figure 2

## AZIMUTH CHECK

Connect the channel A input of a dual trace scope to TP1, channel B input to TP2, external trigger input to TP7 and connect the scope ground to TP6. Set the scope to add mode with channel B inverted, sweep time to .5ms, AC input, trigger to positive slope and voltage to .1V range.

Insert the Alignment Diskette, turn On the Disk Drive and set the head to track 34. Confirm that the pattern appears as shown in Figure 3. The amplitude of bursts 1 and 4 must be equal to or less than the amplitudes of bursts 2 and 3.

No adjustment is provided for the head azimuth. If the azimuth is out of tolerance, the head may need replacement.

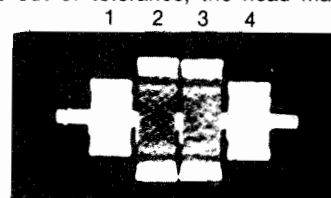


Figure 3

## TEST EQUIPMENT

Test Equipment listed by Manufacturer illustrates typical or equivalent equipment used by SAMS' Engineers to obtain measurements and is compatible with most types used by field service technicians.

### TEST EQUIPMENT (COMPUTERFACTS)

Equipment Name	B & K Precision Equipment No.	Sencore Equipment No.	Simpson Equipment No.
OSCILLOSCOPE	1570A,1590A,1596	SC61	454
LOGIC PROBE	DP51		
LOGIC PULSER	DP101		
DIGITAL VOM	2830	DVM37,DVM56,SC61	463,467,470,474,467E
ANALOG VOM	277		260-7,160,165, 260-6XL,260-7P, 260-6XLP
ISOLATION TRANSFORMER	TR110,1604,1653,1655	PR57	
FREQUENCY COUNTER	1803,1805	FC71,SC61	710
COLOR BAR GENERATOR	1211A,1248,1251,1260	CG25,VA62	431
RGB GENERATOR	1260		
FUNCTION GENERATOR	3020		420A,420D
HI-VOLTAGE PROBE VOM/DMM Accessory probes	HV-44	HP200	248 00168,00411,00749
TEMPERATURE PROBE	TP-28		IR-10,00760,00758; 383,389,388
CRT ANALYZER	467,470	CR70	

## TROUBLESHOOTING

NOTE: An IBM PC Computer was used to operate the Disk Drive. If a different Computer is used it may be necessary to modify the test programs.

### TEST SETUP

Connect the defective Disk Drive as Disk Drive B. Use Disk Drive A to load any alignment or test program needed to check the defective Disk Drive.

WARNING: it is possible for a defective Disk Drive to write on or erase information on a diskette, even if the diskette is write protected. Check the Disk Drive by first using a diskette that has programs that have been backed up on another diskette. Do not leave the alignment diskette in the drive while checking voltages and waveforms unless specified in the alignment procedures. The test equipment may cause the Disk Drive circuits to erase sections of the alignment diskette even if the diskette is write protected.

### DIRECT OPERATION OF DISK DRIVE

The following Basic program will make Disk Drive B run continuously in the read mode with HEAD 0 On. To make Disk Drive A run continuously, in line number 80 change the number 37 (2nd number) to number 20.

```

10 DEF SEG = 0
20 DEF USR = 40000
30 FOR X = 40000 TO 40007
40 READ Y
50 POKE X, Y
60 NEXT X
70 A = USR(0)
80 DATA 176,37,186,242,3,238,235,253

```

### DISK DRIVE WILL NOT RUN

Check for 12V at pin 1 of Connector J2 and 5V at pin 4 of Connector J2. Type in and run the Basic program given in the "Direct Operation of Disk Drive" section of this troubleshooting guide. Check for a Low logic reading at pin 16 of Connector J1. Check for a Low logic reading at pin 1 of Connector P13. If the reading is not Low, check IC2B by substitution. If the logic reading checks Low at pin 1 of Connector P13 check voltages, waveforms and components associated with Motor Drive Transistors (Q1A and Q2A), Frequency to Voltage Converter IC (U1) on the Servo board and check Drive Motor (M2).

### HEAD POSITION MOTOR

Head Position Motor (M1) is not operating properly. Check the resistance readings (73 ohms) on each motor winding and check Plug P12 for good connections. Use a Disk Drive test program which will step the head back and forth or connect the Disk Drive to a Disk Drive Tester that can step the head. Use a test mode that will step the head back and forth continuously and check for pulses at pins 2, 3, 5, and 6 of IC 4D and IC 4E. If the pulses are present at pins 2 and 6 of IC 4D and missing at pins 3 and 5, check IC 4D by substitution and check Diodes CR18 and CR19. If the pulses are present at pins 2 and 6 of IC 4E and missing at pins 3 and 5, check IC 4E by substitution and check Diodes CR20 and CR21. If the pulses are missing at pins 2 and 6 of ICs 4D and 4E, check for pulses at pins 2, 3, 11 and 12 of Flip/Flop IC (4C). If pulses are present and pin 1 of IC 4C reads a logic high, check IC 4C by substitution.

If the pulses are missing at pin 3 of IC 4C, check the logic probe readings on pins 1, 2, 4 and 5 of IC 4B. If the readings are correct, check IC 4B by substitution. If the pulses are missing at pin 5 of IC 4B, check for pulses at pin 11 of IC 2E. If pulses are present, check IC 2E by substitution.

## TROUBLESHOOTING (Continued)

### HEAD CLEANING

Use a non-abrasive cleaning diskette to clean the heads. If the Disk Drive is a single sided drive, use a single sided cleaning diskette to avoid damaging the head pad.

### WILL NOT READ

Type in and run the program given in the "Direct Operation of Disk Drive" section of this Troubleshooting guide to make the Disk Drive run continuously in the read mode. To verify that the Disk Drive is operating in the read mode, check for a low logic reading at pin 10 of IC 2B.

If the reading at pin 10 of IC 2B is not low, check for a high logic reading at pin 11 of IC 2B. If the reading is high, check IC 2B by substitution. If the reading is not high, check for a low logic reading at pin 13 of IC 3B. If the reading is low and the logic reading is high at pins 9, 10 and 12 of IC 3B, check IC 3B by substitution. If pin 13 of IC 3B does not read low, check for a high logic reading at pin 13 of IC 3D. If the reading is high, check IC 3D by substitution. If the reading is not high, check the cable and connectors going to the Disk Drive Adapter. If the cables and connectors are normal, check for a low logic reading at pin 15 of Driver IC (U7). If the reading is low, check IC U7 by substitution. If the reading is not low, check Control IC (U6) by substitution.

If the reading at pin 10 of IC 2B is low put a diskette into the Disk Drive and close the Disk Drive door. The diskette should be filled with programs to insure that the head will continually read information. Check the waveforms at pins 1 and 14 of Diff Amp IC (4A). If the waveforms are missing, check the voltages and components associated with pins 1, 4, 5, 7, 8, 10, 11 and 14 of Diff Amp IC (3A). Check Diodes CR2, CR3, CR11 and CR12 and the resistance of the heads. A problem in the head switching circuit, Switch Transistors (Q6 and Q8), may affect the read circuits. If the problem appears to be in the head switching circuit, see the "Disk Drive Will Not Switch Sides" section of this Troubleshooting guide. If the waveforms are good at pins 1 and 14 of IC 4A, check the waveforms at pins 2 and 3 of IC 5B. If the waveforms are missing, check the voltages and components associated with pins 4, 5, 7, 8, 10 and 11 of IC 4A. If the waveforms are normal, check the waveform at pin 7 of IC 5B while opening and closing the Disk Drive door. A noticeable shift in the waveform pulses should occur. If no change occurs, check IC 5B by substitution.

**NOTE:** The waveforms shown at pin 12 of IC 5D and pin 4 of Multivibrator IC (5E) should be present even when the disk drive is not running. If the waveforms are missing, check Capacitor C11 and Resistor R22 and check Multivibrator IC (5C) and ICs 5D and 5E by substitution. If the waveforms are normal, check the waveform at pin 5 of IC 5E. If the waveform is missing and there are pulses at pin 10 of IC 5E, check Capacitors C12 and Resistor R24 and check IC 5E by substitution. If the waveform is present, check for pulses at pin 8 of IC (1F). If the pulses are missing and the logic reading is high at pin 10 of IC 1F, check IC 1F by substitution.

### WILL NOT WRITE

Verify that the write protect circuit is functioning properly by inserting a diskette that is not write protected into the Disk Drive and check for a high logic reading at pin 10 of IC (3B). If the reading is not high, see the "Write Protect Does Not Function" section of this Troubleshooting guide.

If the write protect circuit is functioning, type and run the Basic program given in the "Erase Head" section of this Troubleshooting guide. Check for pulses at pin 8 of IC 3B. If the pulses are missing, check for pulses at pin 13 of IC 3B and check for high logic readings at pins 9 and 12 of IC 3B. If the readings are correct, check IC 3B by substitution. If the pulses are missing at pin 13 of IC 3B, check for pulses at pin 13 of IC 3D. If pulses are normal, check IC 3D by substitution.

If pulses are present at pin 8 of IC 3B, check for pulses at pin 4 of IC 2B. If the pulses are missing, check IC 2B by substitution. If pulses are present, check for pulses at the collector of Switch Transistor (Q3). If the pulses are missing, check the voltages and components associated with Write Amp Transistors (Q1 and Q2) and Transistor Q3. If pulses are normal, check for pulses at pin 12 of IC 2E. If the pulses are missing, check IC 2E by substitution. If pulses are present, check for pulses at pin 6 of IC 2E. If the pulses are missing, check for pulses at pin 5 of IC 2E. If pulses are present, check IC 2E by substitution.

If pulses are present at pin 6 of IC 2E, check for pulses at pins 8 and 9 of Flip/Flop IC (5C). If the pulses are missing, check IC 5C by substitution. If pulses are present, check for pulses at pins 6 and 8 of IC 2B. If the pulses are missing, check IC 2B by substitution. If pulses are normal, check the waveforms at the collectors of Transistors Q1 and Q2. If the waveforms are missing, check the voltages and components associated with Transistors Q1 and Q2. Check the connections at Plugs P5 and P6. Check the resistances of the heads and operation of the Switch Transistors (Q6 and Q7), see the "Disk Drive Will Not Switch Sides" section of this Troubleshooting guide.

### WRITE PROTECT DOES NOT FUNCTION

If a write protected diskette is being written on, insert a write protected diskette into the Disk Drive, close the door, and check for a low logic reading at pin 10 of IC 3B on the Disk Drive Board. If the reading is low, check IC 3B by substitution. If the reading is not low, check for a high logic reading at pin 11 of IC 3D. If the reading is high, check IC 3D by substitution. If the reading is not high, check the Write Protect Switch (SW1) and the connections at Plug P8 and Resistor R64.

If the error message "the diskette is write protected" is displayed on the Monitor screen when the diskette being used is not write protected, use the Basic program given in the "Direct Operation of Disk Drive" section of this Troubleshooting guide to keep the Disk Drive running continuously. Insert a diskette that is not write protected into the drive, close the door and check for a high logic reading at pin 6 of IC 1F. If the reading is not high and pin 4 of IC 1F reads low and pin 5 of IC 1F reads high, check IC 1F by substitution. If the reading on pin 4 of IC 1F is incorrect, check the Write Protect Switch (SW1) and the connections at Plug P8.

## TROUBLESHOOTING (Continued)

### DISK DRIVE WILL NOT SWITCH SIDES

NOTE: The diskette used in the Disk Drive must be one that was formatted for double sided use. To verify that the Disk Drive is switching sides, type in and run the Basic program given in the "Erase Head" section of this Troubleshooting guide. Check for pulses at pins 2 and 7 of Jack J3 on the Disk Drive Board. If the pulses are missing, check for pulses at pin 2 of IC 2B and pin 12 of IC 3E. If pulses are present at ICs 2B and 3E, check the voltages and components associated with Switch Transistors (Q6 and Q7). If the pulses are missing at pin 2 of IC 2B, check for pulses at pin 1 of IC 2B. If pulses are present, check IC 2B by substitution. If the pulses are missing at pin 12 of IC 3E and present at pin 13 of IC 3E, check IC 3E by substitution. If the pulses are missing at pin 13 of IC 3E, check for pulses at pin 32 of Jack J1. If pulses are present, check IC 2E by substitution.

### ERASE HEAD

Verify that the erase heads are not open by checking the erase head resistance at pins 2 to 4 of Plug J3 for HEAD 1 and pins 5 to 7 of Plug J3 for HEAD 0. Type in and run the following program.

```
10 OPEN "B:SAMS.DAT" FOR OUTPUT AS #1
20 FOR X = 1 TO 300
30 PRINT #1, "THIS IS A TEST"
40 NEXT X
50 CLOSE #1
60 GOTO 10
```

With the program running, check for pulses at pin 5 of IC 2C. If pulses are present, check Diodes CR5 and CR10 and Resistor R58. NOTE: If the write protect or side select cir-

cuits are not working properly they may affect the operation of the erase head circuit. See the "Write Protect Does Not Function" and "Disk Drive Will Not Switch Sides" sections of this Troubleshooting guide, if the erase head circuits seem to be operating normally.

If the pulses are missing at pin 5 of IC 2C, check for pulses at pin 6 of IC 2C. If pulses are present, check IC 2C by substitution. If the pulses are missing, check for pulses at pins 1 and 2 of IC 3B. If pulses are present and pins 4 and 5 of IC 3B read a logic high, check IC 3B by substitution. If the pulses are missing, check for pulses at pin 9 of Flip/Flop IC (3C). If pulses are normal, check Capacitors C15 and C16, Resistor R54 and R55 and check IC 3C by substitution. If the pulses are missing, check for pulses at pin 13 of IC 3B. If pulses are present and pins 9, 10 and 12 of IC 3B read a logic high, check IC 3B by substitution. If the pulses are missing, check for pulses at pin 24 of Jack J1. If pulses are present, check IC 3D by substitution.

### DISK INDEX DETECTOR

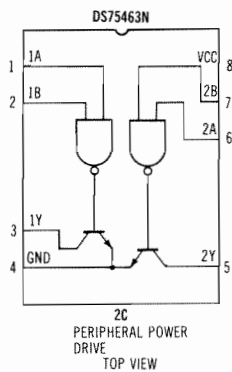
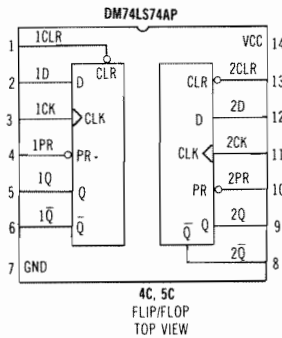
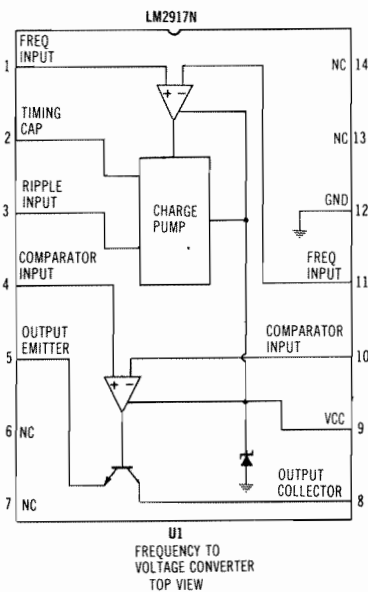
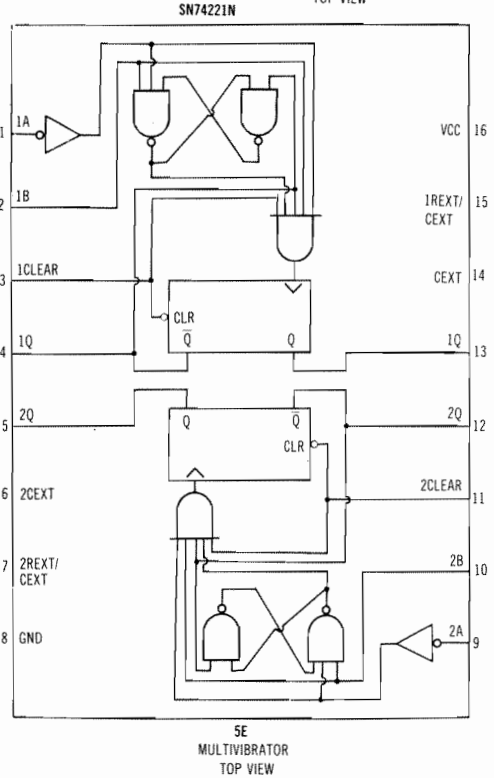
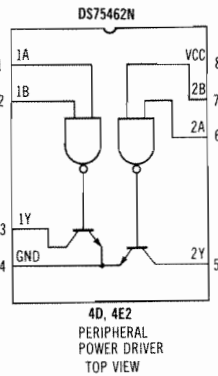
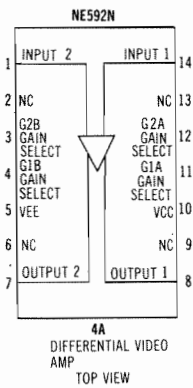
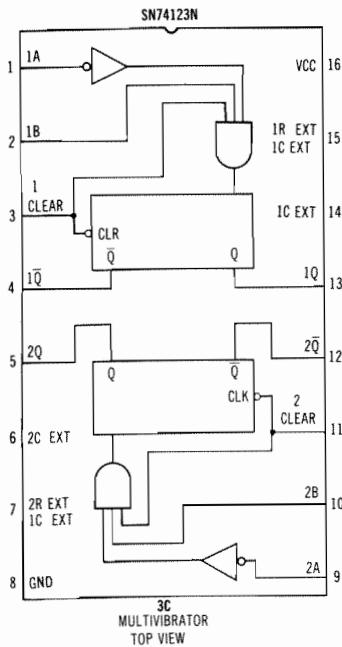
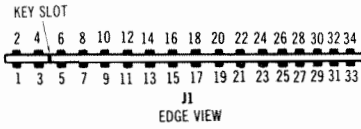
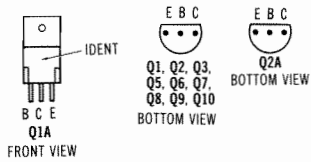
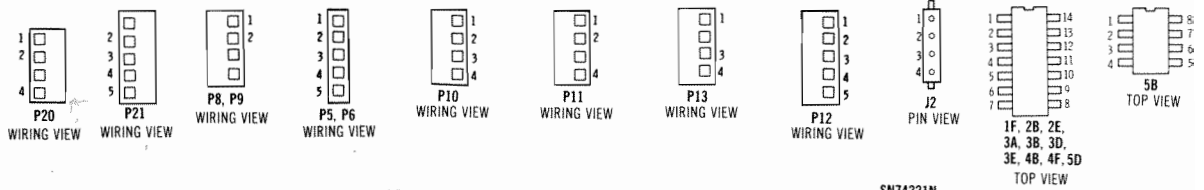
Check for pulses at pin 2 of IC 2E on the Disk Drive Board while the Disk Drive is running with a diskette inserted and door closed. If the pulses are missing, check for pulses at pin 1 of IC 2E. If the pulses are present, check IC 2E by substitution. If the pulses are missing, use a scope to check for .75V peak to peak pulses at the base of Switch Transistor (Q8). If the correct pulses are present, check Transistor Q8, Capacitor C9 and Resistors R44 and R45. If the correct pulses are missing, check the Index Detector Diode (CR26), Amp Transistor (Q11) and the connections at Plug P10.

If pulses are present at pin 2 of IC 2E, check for pulses at pin 3 of IC 1F. If the pulses are missing and pin 2 of IC 1F reads a logic high, check IC 1F by substitution.





# IC PINOUTS & TERMINAL GUIDES



## LOGIC CHART

PIN NO.	IC 1F	IC 2B	IC 2C	IC 2E	IC 3B	IC 3C	IC 3D	IC 3E	
1	P	P	*	P	P	P	H(1)	*	
2	H	P	*	P	P	P	L(3)	*(2)	
3	P	P	*	*	*	H	L(4)	L	
4	L(6)	P	L	L	H	P	H(5)	L	
5	H	P	P	P	H	P	H(5)	H	
6	H	P	P	P	P	*	L(4)	H	
7	L	L	P	L	L	*	L	L	
8	P	P	H	P	P	L	H	L	
9	P	P		P	H	P	L	L	
10	H	P		L(2)	H(7)	H	H(7)	P	
11	H(1)	P		H(2)	*	H	L(6)	P	
12	L(3)	L		P	H	P	P	P	
13	H	H		P	P	P	P	P	
14	H	H		H	H	* * H	H	H	

PIN NO.	IC 4B	IC 4C	IC 4D	IC 4E2	IC 4F	IC 5B	IC 5C	IC 5D	IC 5E
1	H	H	H	H	L(3)	L	H	H(5)	L
2	P	H(5)	L(2)	H(5)	L(3)		P	L(4)	P
3	*	H(2)	H(2)	L(4)	H(1)		P	H(5)	H
4	H(4)	H	L	L	H	L	H	L(4)	P
5	L(2)	L(2)	L(2)	H(5)	L		P	L(2)	P
6	H(2)	H(2)	H(2)	L(4)	H		P	L(2)	P
7	L	L	H	H	L	P	L	L	P
8	H(1)	H(5)	H	H	H(4)	(8)	P	P	L
9	L(3)	L(4)			H(5)		P	P	L
10	H(5)	H			L(3)		P	P	P
11	*	H(2)			L(3)		P	P	P
12	H(2)	L(2)			H(1)		P	P	P
13	L(3)	H			H(1)		P	P	P
14	H	H			H		H	H	H
15									
16									

Logic Probe Display

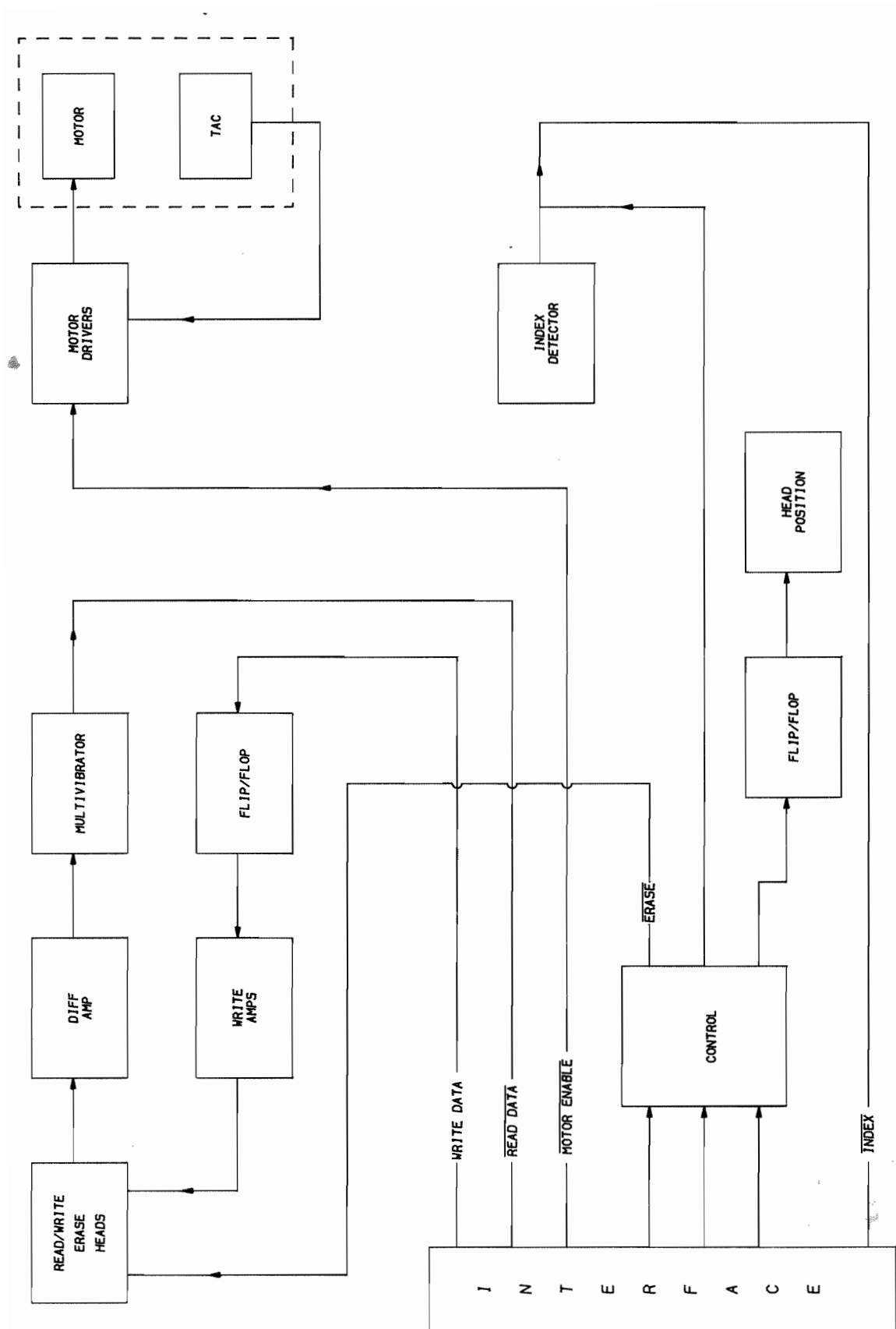
L = Low

H = High

P = Pulse

\* = Open (No light On)

- (1) Probe indicates L when Head is on track 00 and H when off track 00.
- (2) Probe indicates P when Head Position Motor is operating.
- (3) Probe indicates H when Head is on track 00 and L when off track 00.
- (4) Probe indicates H when Head is moving in and L when Head is moving out from center of diskette.
- (5) Probe indicates L when Head is moving in and H when Head is moving out from center of diskette.
- (6) Probe indicates H if diskette is write protected.
- (7) Probe indicates L if diskette is write protected.



**BLOCK DIAGRAM**

## SAFETY PRECAUTIONS

1. Use an isolation transformer for servicing.
2. Maintain AC line voltage at rated input.
3. Remove AC power from the Disk Drive before servicing or installing electrostatically sensitive devices. Examples of typical ES devices are integrated circuits and semiconductor "chip" components.
4. Use extreme caution when handling the printed circuit boards. Some semiconductor devices can be damaged easily by static electricity. Drain off any electrostatic charge on your body by touching a known earth ground. Wear a commercially available discharging wrist strap device. This should be removed prior to applying power to the unit under test.
5. Use a grounded-tip, low voltage soldering iron.
6. Use an isolation (times 10) probe on scope.
7. Do not remove or install boards with AC power On.
8. Do not use freon-propelled sprays. These can generate electrical charges sufficient to damage semiconductor devices.
9. This Disk Drive is equipped with a grounded three-pronged AC plug. This plug must fit into a grounded AC power outlet. Do not defeat the AC plug safety feature.
10. Periodically examine the AC power cord for damaged or cracked insulation.
11. The Disk Drive cabinet is equipped with vents to prevent heat build-up. Never block, cover, or obstruct these vents.
12. Instructions should be given, especially to children, that objects should not be dropped or pushed into the vents of the cabinet. This could cause shock or equipment damage.
13. Never expose the Disk Drive to water. If exposed to water turn the unit off. Do not place the Disk Drive near possible water sources.
14. Never leave the Disk Drive unattended or plugged into the AC outlet for long periods of time. Remove AC plug from AC outlet during lightning storms.
15. Do not allow anything to rest on AC power cord.
16. Unplug AC power cord from outlet before cleaning Disk Drive.
17. Never use liquids or aerosols directly on the Disk Drive. Spray on cloth and then apply to the Disk Drive cabinet. Make sure the Disk Drive is disconnected from the AC power line.

