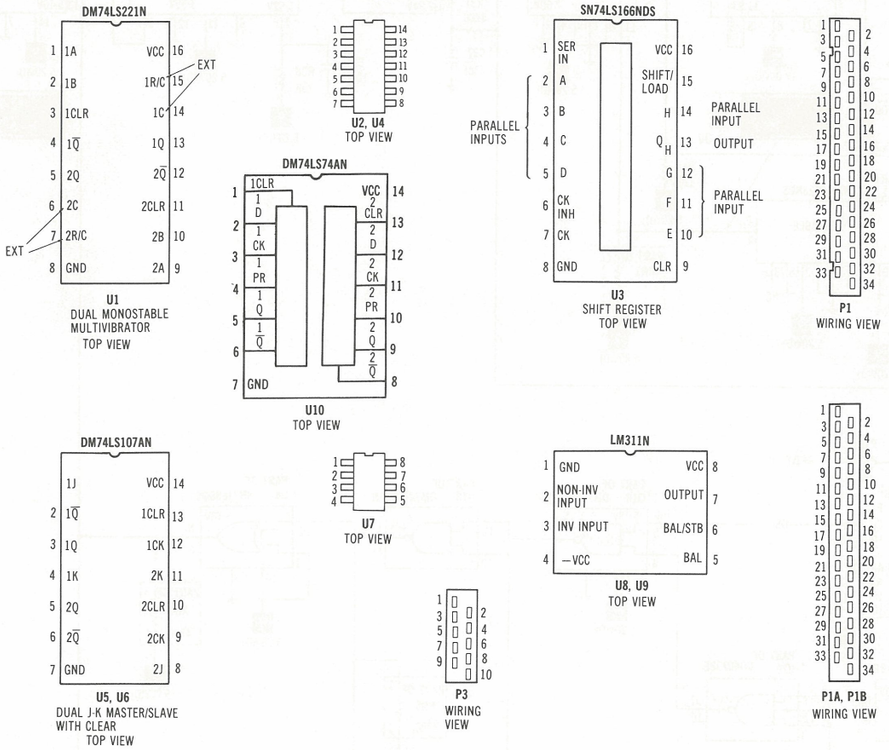
IC PINOUTS & TERMINAL GUIDES

DISK DRIVE BOARDS



SCHEMATIC NOTES

—✕— Circuitry not used in some versions
- - - Circuitry used in some versions
⊖ See parts list
⏚ Ground
Chassis
Item numbers in rectangles appear in the alignment/adjustment instructions.
Supply voltages maintained as shown at input.
Voltages measured with digital meter.
Controls adjusted for normal operation.
Terminal identification may not be found on unit.
Resistors are ½W or less, 5% unless noted.
Value in ( ) used in some versions.
Measurements with switching as shown, unless noted.
Waveforms taken with triggered scope and Sweep/Time switch in Calibrate position, scope input set for DC coupling on "0" reference voltage waveforms. Switch to AC input to view waveforms after DC reference is measured when necessary. Each waveform is 7.5 cm width with DC reference voltage given at the bottom line of each waveform. Time in μsec. per cm, given with p-p reading at the end of each waveform.
Voltages, logic probe readings and waveforms taken while running the following MBASIC™ program. Stepping motor is not operating unless otherwise noted. Disk drive A and disk drive B have same voltage, logic probe reading and waveform unless otherwise indicated.

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

Logic Probe Display
L = Low
H = High
P = Pulse
* = Open (No light On)

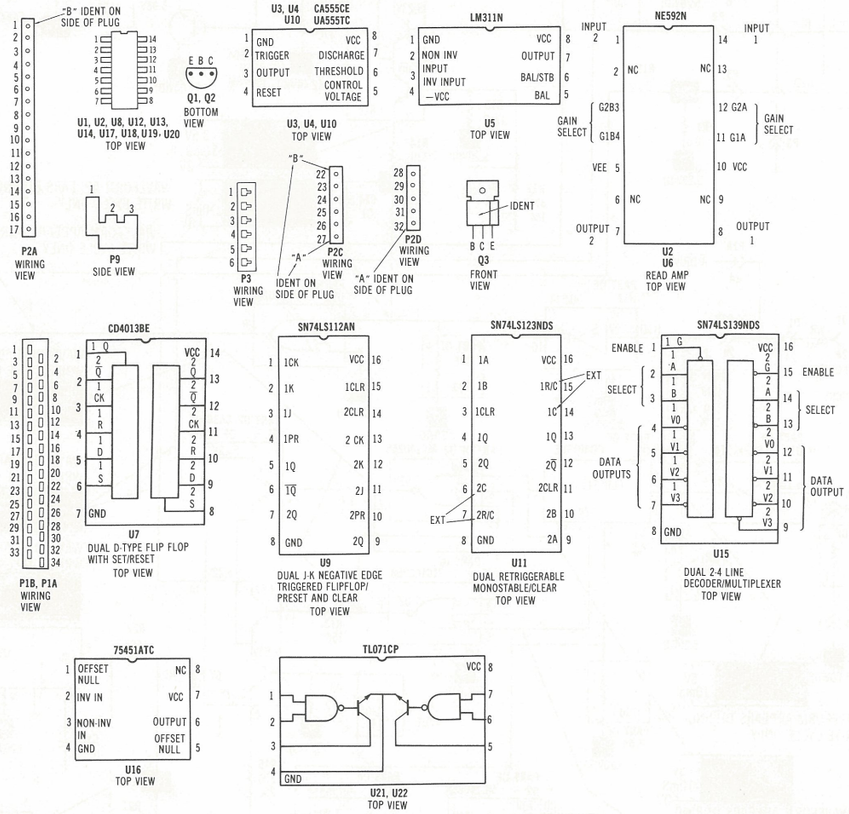
Logic probe readings taken with disk drive running continually.
(1) Probe indicates P when stepping motor is operating.
(2) Probe indicates L when stepping motor is operating.
(3) Probe indicates H when head is moving in, and L when head is moving out from center of diskette.
(4) Probe indicates L when head is moving in, and H when head is moving out from center of diskette.
(5) Probe indicates H if diskette is write protected.
(6) Probe indicates L if diskette is write protected.
(7) Probe indicates H when checking disk drive A.
(8) Probe indicates L when checking disk drive A.
(9) Logic probe readings not taken for IC's U1, U5 and U6 on disk drive board.

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CSCS1-B OSBORNE MODEL OCC1,A

IC PINOUTS & TERMINAL GUIDES

DOUBLE DENSITY BOARD



CSCS1-B OSBORNE MODEL OCC1,A

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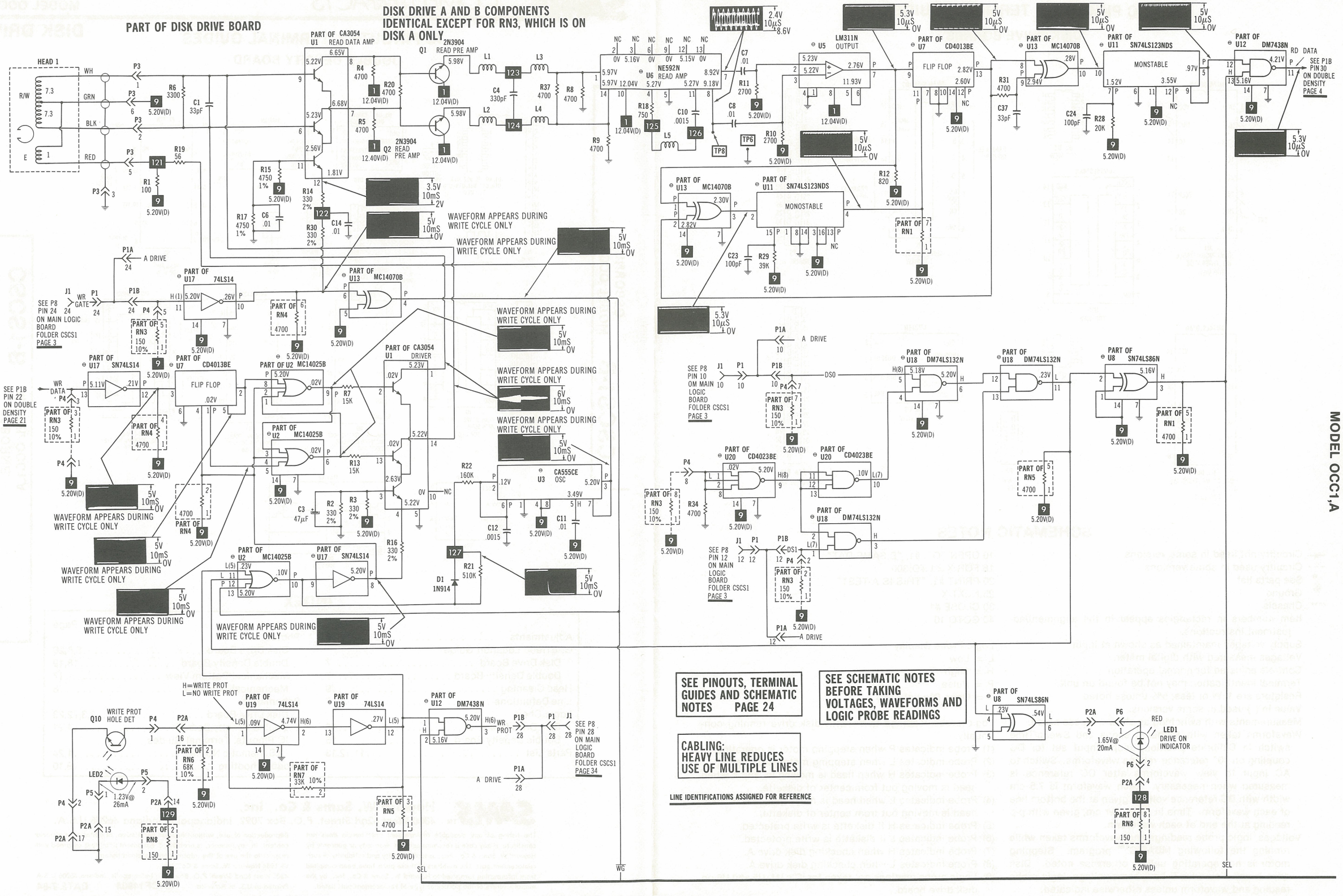
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PART OF DISK DRIVE BOARD

DISK DRIVE A AND B COMPONENTS IDENTICAL EXCEPT FOR RN3, WHICH IS ON DISK A ONLY



SEE PINOUTS, TERMINAL GUIDES AND SCHEMATIC NOTES PAGE 24

SEE SCHEMATIC NOTES BEFORE TAKING VOLTAGES, WAVEFORMS AND LOGIC PROBE READINGS

CABLING: HEAVY LINE REDUCES USE OF MULTIPLE LINES

LINE IDENTIFICATIONS ASSIGNED FOR REFERENCE

SEE LINE DEFINITIONS ON PAGE 7

OSBORNE MODEL OCC1,A

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PART OF DISK DRIVE BOARD

DISK DRIVE A AND B COMPONENTS IDENTICAL EXCEPT RN 3, WHICH IS ON DISK A ONLY

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SEE LINE DEFINITIONS ON PAGE 7

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DOUBLE DENSITY BOARD

SEE U12, PIN 11 ON DISK DRIVE PAGE 23 — RD DATA — P1B 30 — P1 30 — P1A 30 — A DRIVE

PART OF U1 DM74LS221N MONOSTABLE — C3 47pF 2% — R13 56.2K 1% — R1 56.2K 1%

PART OF U4 DM74LS00N

PART OF U5 DM74LS107AN FLIP FLOP

PART OF U7 LM358N — TP9 — C13 .0033 — R7 510 — D2 (CR2) 1N5228B — 120

U9 LM311N — PART OF U10 DM74LS74AN FLIP FLOP — R10 3010 1% — C14 47pF

PART OF RN4 39K — PART OF RN3 4700 — PART OF RN5 820

R6 11K — 117 — C12 330pF — R8 16K — 1.72V — 118 — R5 DOUBLE DENSITY 10K — 119 — R4 330 2% — R12 4700 2% — R9 9100 2%

J1 — SEE P8 PIN 30 ON MAIN LOGIC BOARD FOLDER CSCS1 PAGE 34 — RD DATA

PART OF U1 DM74LS221N MONOSTABLE — C4 47pF 2% — R2 10K 1%

PART OF U2 DM7438N — P3 — RD DATA → SEE J5 PIN 2 ON MAIN LOGIC BOARD FOLDER CSCS1 PAGE 3

PART OF U7 LM358

U8 LM311N

PART OF U10 DM74LS74AN — PART OF U6 DM74LS107AN FLIP FLOP — PART OF U4 DM74LS00N — PART OF U6 DM74LS107AN FLIP FLOP — RD CLK — P3 → SEE J4 PIN 2 ON MAIN LOGIC BOARD FOLDER CSCS1 PAGE 3

PART OF RN1 820 — PART OF RN2 150

D DEN — P3 — SEE J5 PIN 3 ON MAIN LOGIC BOARD FOLDER CSCS1 PAGE 34

WAVEFORM TAKEN WITH DISK DRIVE RUNNING WITHOUT A DISKETTE IN DISK DRIVE

SEE J4 PIN 3 ON MAIN LOGIC BOARD FOLDER CSCS1 PAGE 3 — P3 — NC

P2 — P2 — P2

SEE P8 PIN 22 ON MAIN LOGIC BOARD FOLDER CSCS1 PAGE 3 — J1 — WR DATA

SN74LS166NDS SHIFT REGISTER U3

SEE P8 PIN 16 ON MAIN LOGIC BOARD FOLDER CSCS1 PAGE 3 — J1 — CPU CLK

SEE P8 PIN 6 ON MAIN LOGIC BOARD FOLDER CSCS1 PAGE 3 — J1 — EARLY

SEE P8 PIN 34 ON MAIN LOGIC BOARD FOLDER CSCS1 PAGE 3 — J1 — LATE

PART OF U2 DM7438N — PART OF U2 DM7438N — PART OF U2 DM7438N

SEE P8 PINS 5,7, 9, 19, 27, 29, 31, 33, 1 AND 3 ON MAIN LOGIC BOARD FOLDER CSCS1 PAGE 3

SEE U17 PIN 13 ON DISK DRIVE PAGE 2 — WR DATA — A DRIVE

SEE SCHEMATIC NOTES BEFORE TAKING VOLTAGES, WAVEFORMS AND LOGIC PROBE READINGS

SEE PINOUTS, TERMINAL GUIDES AND SCHEMATIC NOTES PAGES 1,24

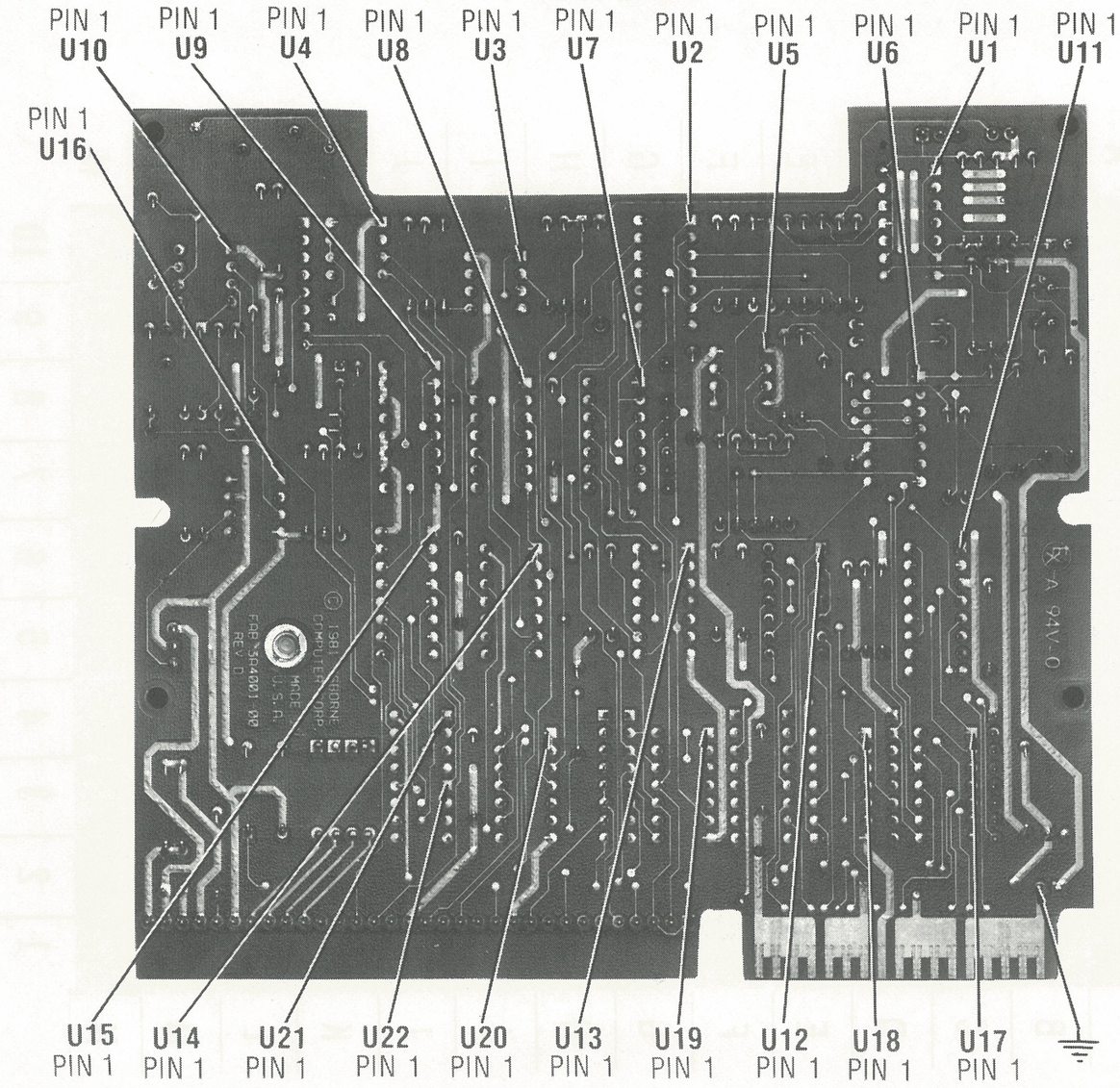
CABLING: HEAVY LINE REDUCES USE OF MULTIPLE LINES

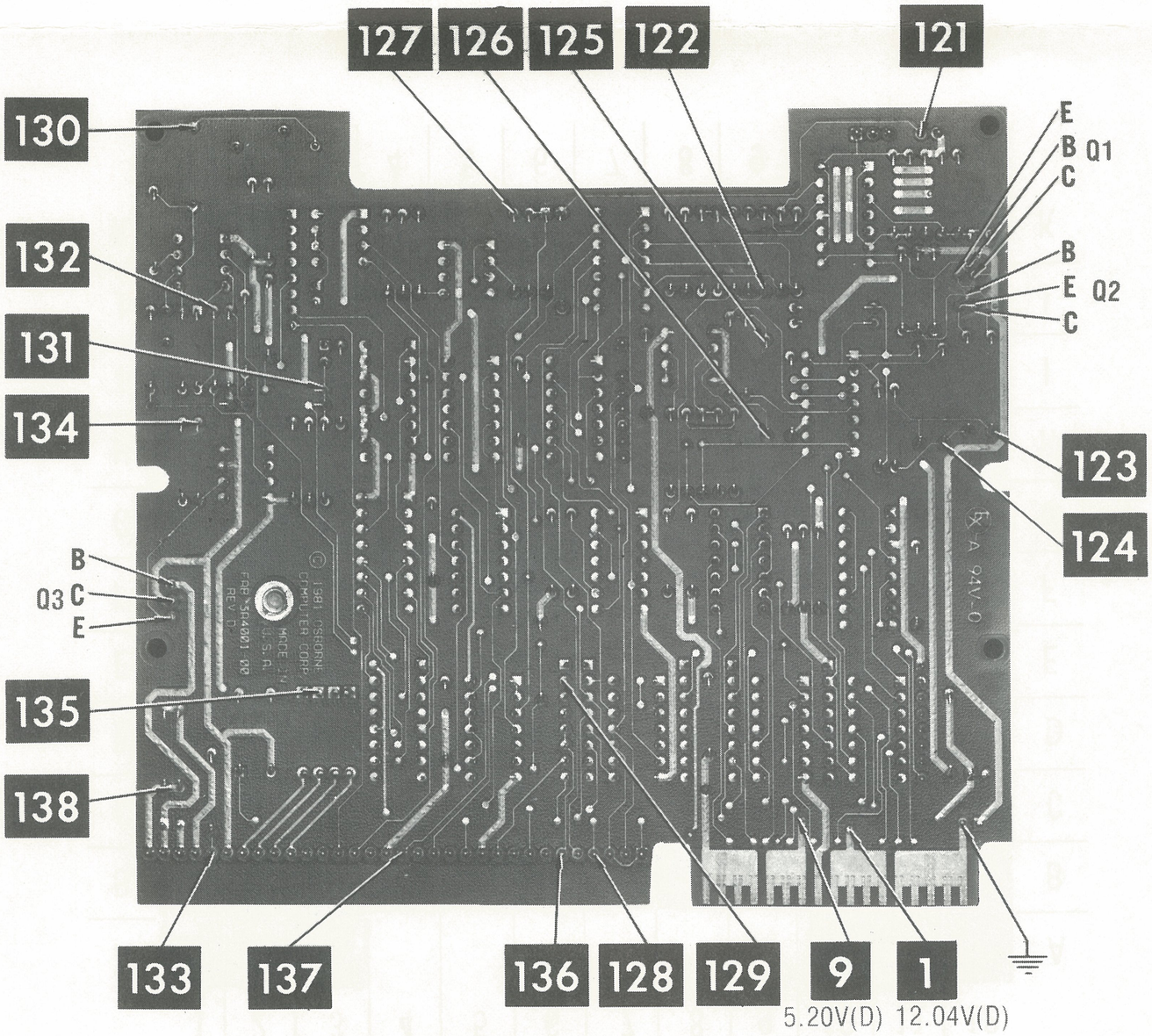
LINE IDENTIFICATIONS ASSIGNED FOR REFERENCE

DISK DRIVE

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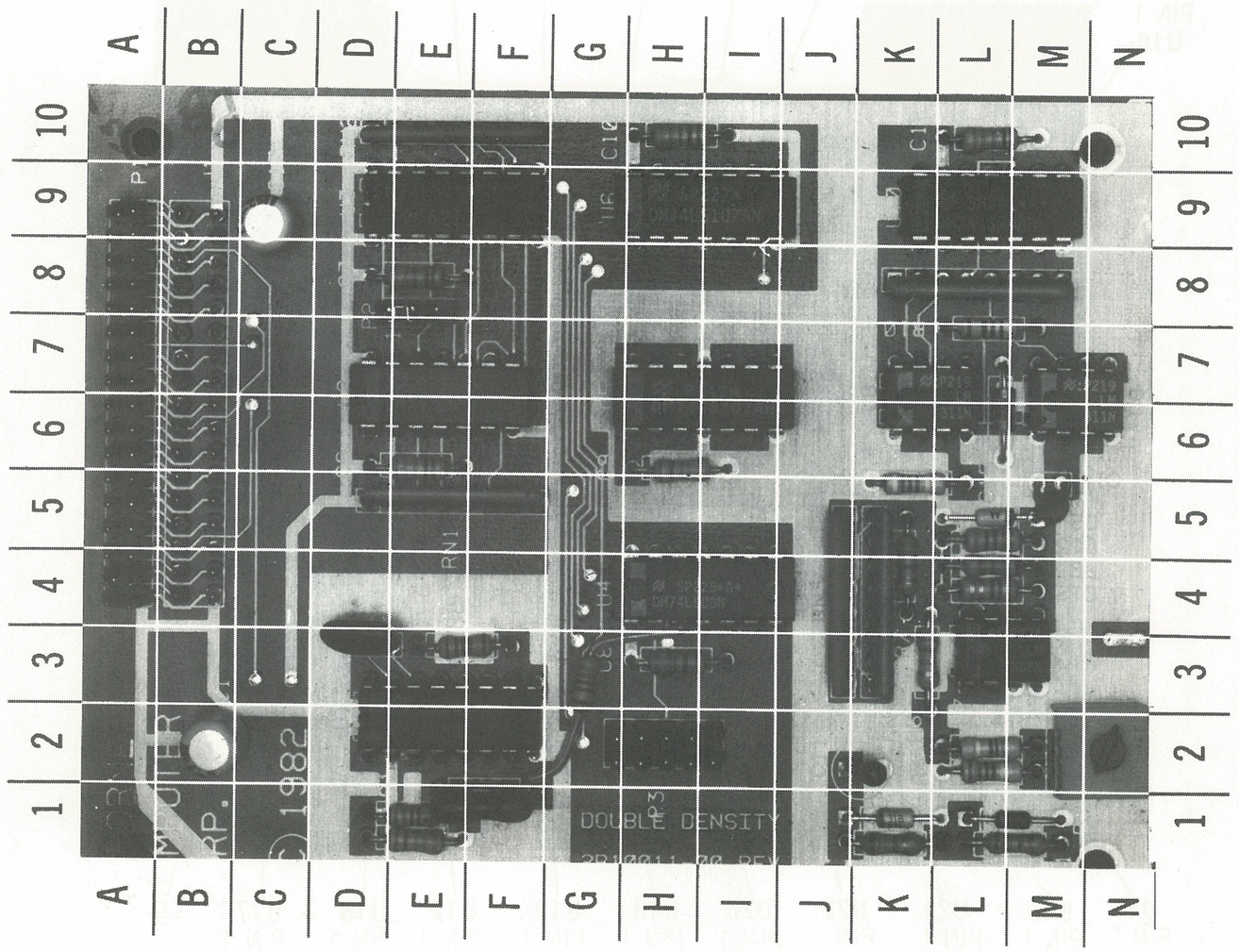
SEE LINE DEFINITIONS ON PAGE 7





CSCS1-B
OSBORNE
MODEL OCC1,A

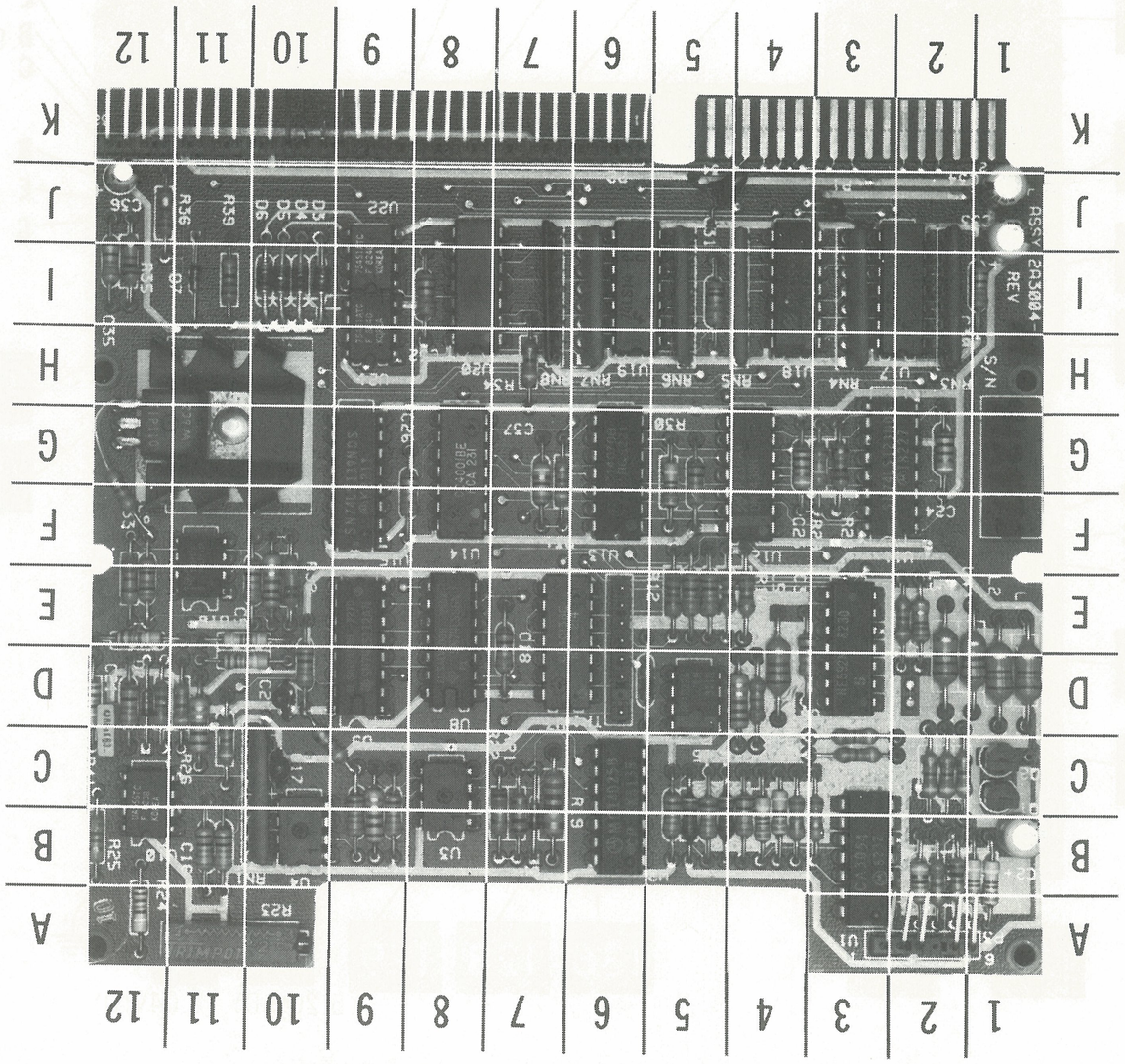
OSBORNE
MODEL OCC1,A



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DOUBLE DENSITY BOARD

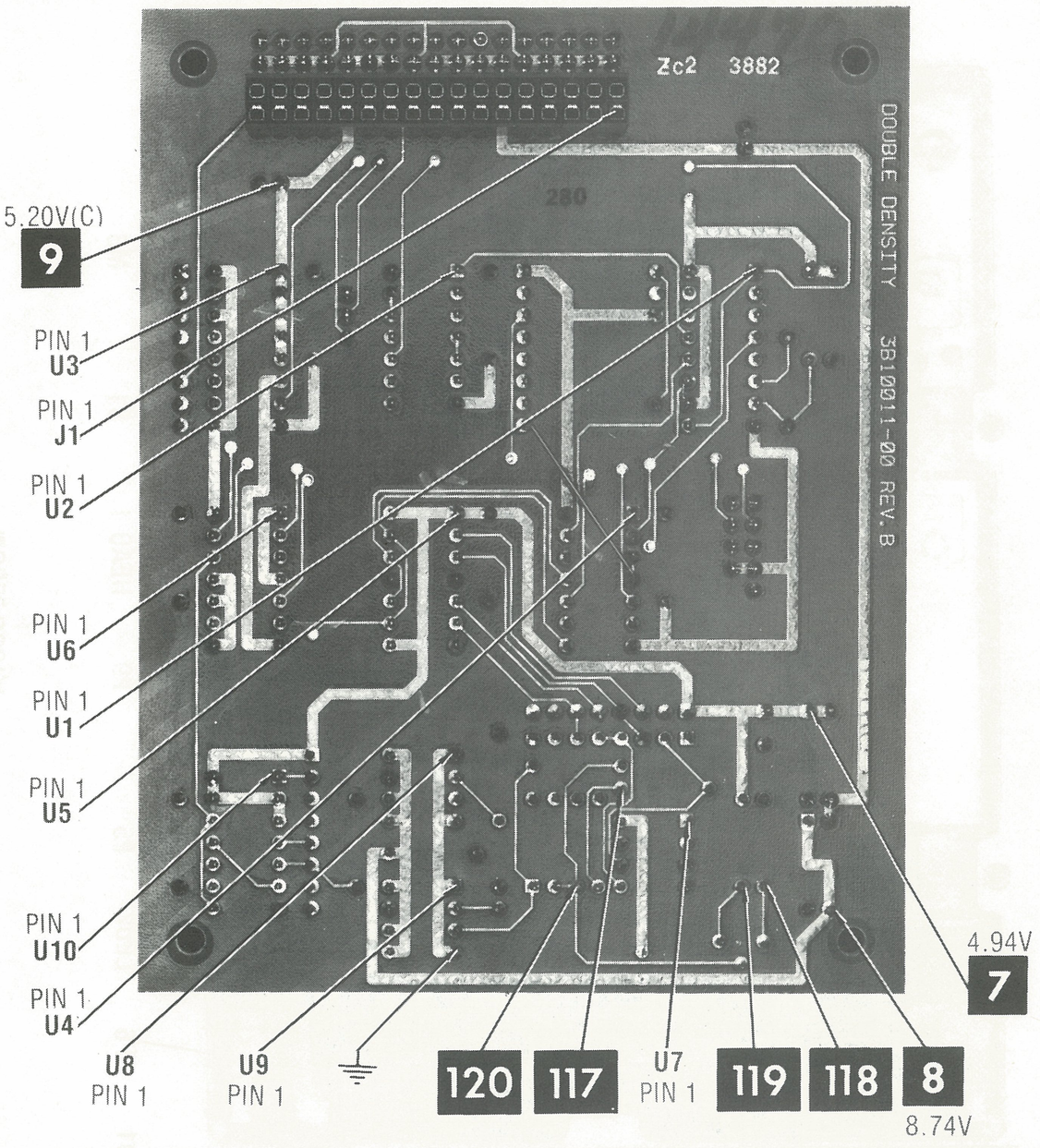
19



A Howard W. Sams GRIDTRACE™ Photo

DISK DRIVE BOARD

6



DOUBLE DENSITY BOARD A Howard W. Sams CIRCUITRACE® Photo

DISK DRIVE BOARD GridTrace LOCATION GUIDE

C1	B-2	C29	E-12	P2D	K-12	R24	A-12	RN8	I-7
C2	B-1	C30	I-1	P3	A-2	R25	B-12	TP4	D-6
C3	D-4	C31	I-5	Q1	C-1	R26	D-11	TP5	E-6
C4	E-2	C32	I-8	Q2	C-1	R27	C-11	TP6	E-6
C5	E-10	C33	J-1	Q3	G-11	R28	G-3	TP8	E-6
C6	B-5	C34	J-1	R1	B-2	R29	G-3	U1	B-3
C7	E-5	C35	I-12	R2	B-1	R30	G-5	U2	B-6
C8	E-5	C36	J-12	R3	B-1	R31	G-7	U3	C-8
C9	B-5	C37	G-7	R4	C-2	R32	E-10	U4	B-10
C10	D-4	C38	I-1	R5	C-2	R33	E-12	U5	D-5
C11	B-9	C50	J-3	R6	B-2	R34	H-7	U6	D-3
C12	B-9	C51	J-5	R7	B-3	R35	I-12	U7	D-7
C13	B-11	D1	B-7	R8	C-3	R36	J-12	U8	D-8
C14	B-4	D2	D-12	R9	C-3	R37	E-2	U9	D-9
C15	B-9	D3	I-10	R10	E-4	R38	D-12	U10	B-12
C16	B-11	D4	I-10	R11	E-4	R39	I-10	U11	G-3
C17	C-10	D5	I-10	R12	E-5	R41	D-12	U12	G-4
C18	D-7	D6	I-10	R13	B-4	R42	E-12	U13	G-6
C19	D-10	D7	I-11	R14	B-4	R43	E-11	U14	G-8
C20	D-11	L1	D-1	R15	B-5	R44	D-11	U15	G-9
C21	C-12	L2	D-1	R16	B-4	R51	F-12	U16	E-11
C22	D-12	L3	D-2	R17	B-5	R52	C-10	U17	I-2
C23	D-4	L4	D-1	R18	D-4	RN1	C-10	U18	I-4
C24	G-2	L5	D-4	R19	C-7	RN3	I-2	U19	I-6
C25	G-5	P1	K-3	R20	C-2	RN4	I-3	U20	I-8
C26	F-9	P2A	K-7	R21	B-7	RN5	I-4	U21	H-9
C27	D-10	P2B	K-10	R22	B-7	RN6	I-5	U22	I-9
C28	E-10	P2C	K-11	R23	A-11	RN7	I-6		

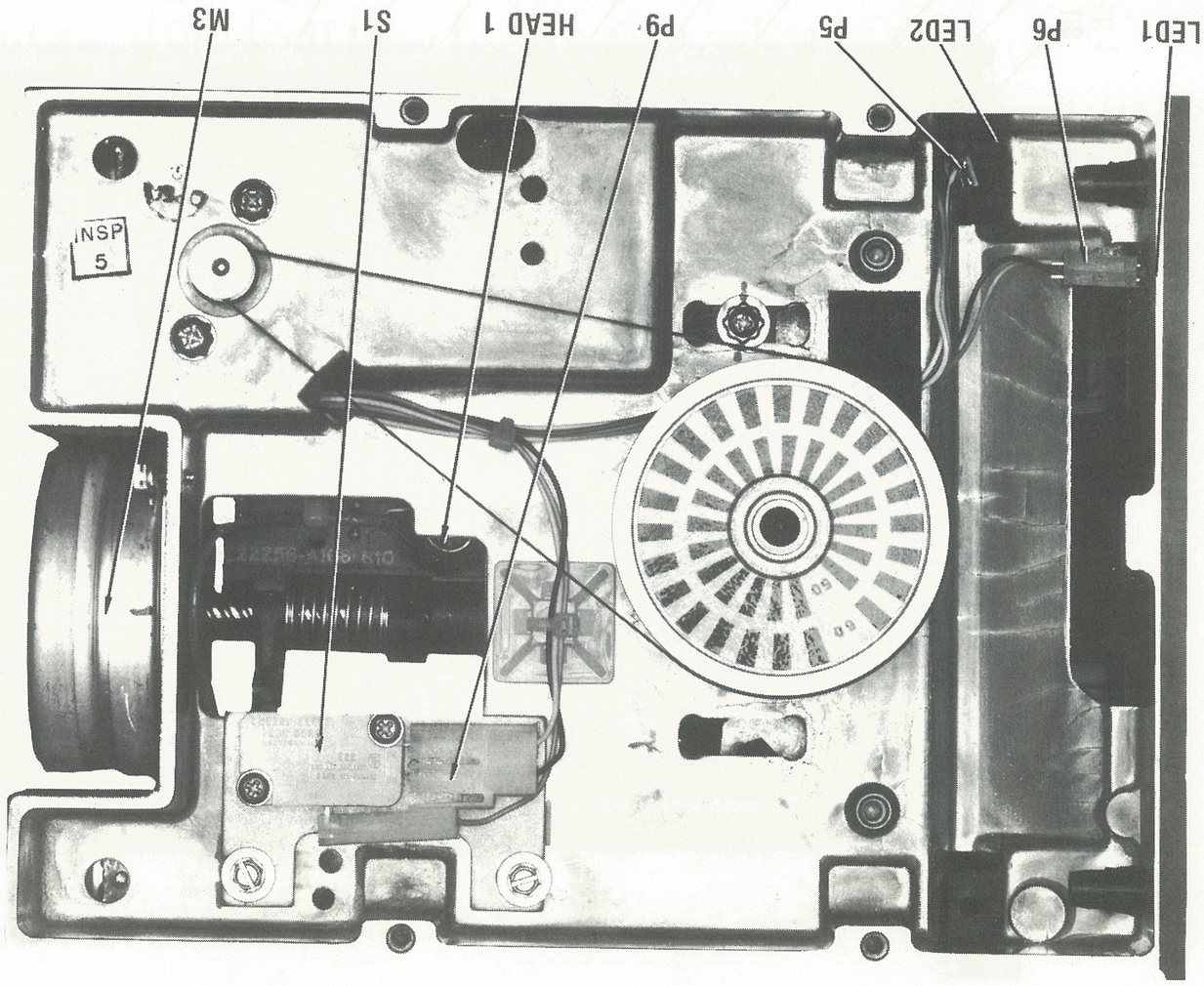
DOUBLE DENSITY BOARD GridTrace LOCATION GUIDE

C1	B-2	C12	L-4	P2	E-8	R9	K-5	U1	E-2
C2	E-1	C13	L-5	P3	H-2	R10	L-7	U2	E-6
C3	F-1	C14	M-5	R1	E-1	R11	M-1	U3	E-9
C4	D-3	C15	L-6	R2	E-3	R12	L-2	U4	H-4
C6	E-6	C16	L-10	R3	K-1	R13	G-3	U5	H-7
C7	E-8	C17	C-9	R4	L-2	RN1	E-5	U6	H-9
C8	H-3	D1	K-1	R5	N-2	RN2	E-10	U7	L-3
C9	H-6	D2	L-5	R6	K-3	RN3	J-4	U8	K-7
C10	H-10	D3	M-1	R7	K-4	RN4	K-4	U9	M-6
C11	K-2	P1	A-7	R8	L-4	RN5	L-8	U10	L-9

LINE DEFINITIONS

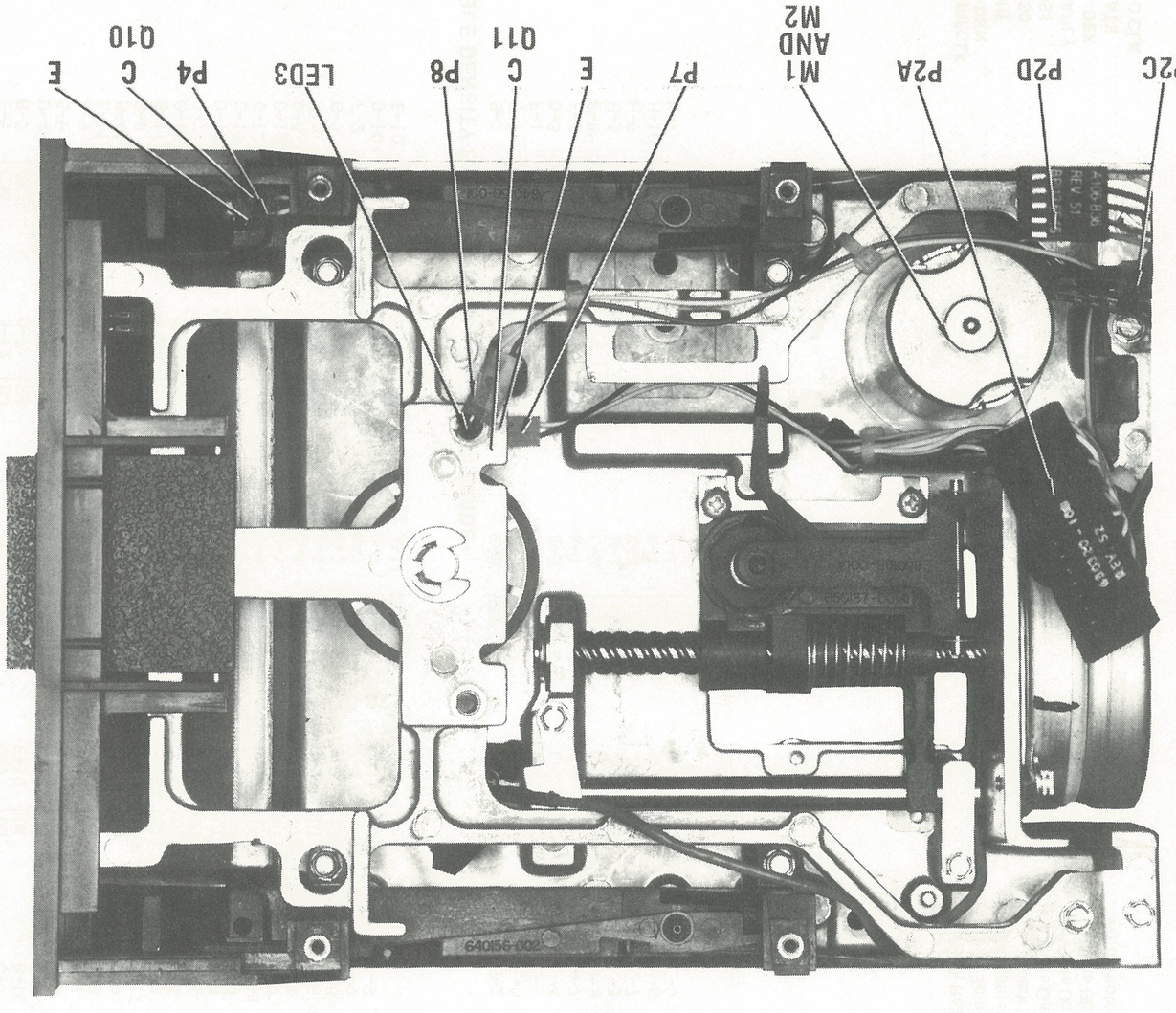
CPU CLK ..... 4MHz Clock
D DEN ..... Double Density Disk
DIR ..... Head Movement Direction
DS0 ..... Disk Select 0(B)
DS1 ..... Disk Select One(A)
EARLY ..... Early
INDEX ..... Index
LATE ..... Late
RD CLK ..... Read Clock
RD DATA ..... Disk Read
SEL ..... Select
STEP ..... Head Movement
TRACK 00 ..... Track 00
WG ..... Write Gate
WR DATA ..... Write Data
WR GATE ..... Write Gate
WR PROT ..... Write Protect

Any Bar above alphabetical or numerical combination indicates line active in a low (0) state.



MECHANICAL-BOTTOM VIEW

17



MECHANICAL-TOP VIEW

8

LOGIC (DISK DRIVE BOARD)

PIN NO.	IC U1	IC U2	IC U3	IC U4	IC U5	IC U6	IC U7	IC U8	IC U9	IC U10	IC U11	IC U12	IC U13	IC U14	IC U15
1	(9)	P	L	L	(9)	(9)	P	H	L(1)	L	L	L(5)	P	L	L
2		P	P	H			P	L	L(4)	P	P	H	P	L	L(1)
3		P	P	L(1)			P	H	L(4)	P	H	H(6)	P	H	L(1)
4		P	H	H			P	L	H	H	P	L	P	L	H(1)
5		P	H	H			P	L	L(1)	H	P	H	H	H	H(1)
6		P	P	L			L	L	L(1)	P	L	H	P	H(3)	H(1)
7		L	P	L			L	L	H(1)	P	P	L	L	L	H(1)
8		P	H	H			L	L(4)	L	H	L	P	P	H	L
9		P					P	H(1)	L(1)		P	H	P	H(1)	H
10		P					L	H(3)	H		P	P	P	L	H
11		L(5)					P	L(1)	H		H	P	H	L(1)	H
12		L					P	L(1)	H		P	P	L	H(1)	H
13		P					P	L(1)	L(1)		P	H	H	L	L(1)
14		H					H	H	H		L	H	H	H	L(1)
15									H		P				H
16									H		H				H

PIN NO.	IC U16	IC U17	IC U18	IC U19	IC U20	IC U21	IC U22
1	L	H	L(7)	L(5)	L(7)	H	H(1)
2	H	L	H(8)	H(6)	L	H(1)	H
3	H	H(1)	H	H	P	H(1)	L(1)
4	L	L(1)	L(7)	L	H	L	L
5	L	L(4)	H(8)	H	L(1)	P	P
6	H	H(3)	H	P	H(1)	H(1)	H(1)
7	H	L	L	L	L	H	H
8	*	P	P	P	L	H	H
9		P	P	P	H(8)		
10		P	H	H	L(7)		
11		H(1)	L	L	H(8)		
12		P	H	L(5)	H(8)		
13		P	H	H(6)	H(8)		
14		H	H	H	H		
15							
16							

NOTE: Logic probe readings taken while running the following MBASIC™ program. Stepping motor is not operating unless otherwise noted. Disk drive A and disk drive B have same logic probe reading unless otherwise indicated.

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

Logic Probe Display
L = Low
H = High
P = Pulse
* = Open (No light On)

Logic probe readings taken with disk drive running continually.
(1) Probe indicates P when stepping motor is operating.
(3) Probe indicates H when head is moving in, and L when head is moving out from center of diskette.
(4) Probe indicates L when head is moving in, and H when head is moving out from center of diskette.
(5) Probe indicates H if diskette is write protected.
(6) Probe indicates L if diskette is write protected.
(7) Probe indicates H when checking disk drive A.
(8) Probe indicates L when checking disk drive A.
(9) Logic probe readings not taken for IC's U1, U5 and U6 on disk drive board.

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HEAD CLEANING

Use 97% isopropyl alcohol, head cleaning fluid or head cleaning diskette to clean the disk drive head.

TROUBLESHOOTING

NOTE: Components referred to are on disk drive board unless otherwise indicated.

PRELIMINARY DISK DRIVE CHECK

Clean the disk drive head, see "Head Cleaning" section.

Check the cable connectors on the disk drive boards, double density board and main logic board.

Check the ground connections on all the shields.

Interference from the horizontal circuits in the internal monitor can cause disk drive problems. Disconnect the internal monitor at Plug P9 on the main logic board, see Folder CSCS1. Connect an external monitor to Plug P5 on the main logic board. If the problem clears up, check the shields on the internal monitor and check the internal monitor operation.

Check the alignment of the disk drive, see the "Adjustment" section.

A plug in Resistor Network RN3 is used in disk drive A to program it as disk drive A. Check the Resistor Network RN3 for good connection.

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 disk drive while checking voltages and waveforms unless specified in the alignment procedures. The test equipment may make the disk drive circuits erase sections of the alignment diskette even when the diskette is write protected.

MAKING DISK DRIVE RUN CONTINUALLY

To make the disk drive run continually, perform the following boot up procedure. Press the RETURN key for disk drive A or SHIFT " (Quote) keys for disk drive B, without a diskette in the disk drive.

Perform the following if it is necessary to run the disk drive continually with a diskette in the disk drive. Connect a jumper from pin 8 (for disk drive A) or pin 10 (for disk drive B) of IC UA9 to ground, see main logic board in Folder CSCS1. The disk drive will run continually in the read mode.

DISK DRIVE WILL NOT RUN

Disk drive will not run. Connect a jumper from pin 8 (for disk drive A) or pin 10 (for disk drive B) of IC UA9 to ground, see main logic board in Folder CSCS1. The Drive On Indicator LED (LED 3) should come On and the motor should start running. If the disk drive starts running, check IC's UA9 and UC15 on the main logic board by substitution. If the disk drive does not start running, check the connections at pins 10 and 12 of Plug P1, check for 5.20V at pin 8 of Oscillator IC (U10) and 12.04V at the collector of Motor Drive Transistor (Q3).

If 5.20V or 12.04V is missing, check the connections at Plug P1, pins 11, 13, 15 and 17 for 12.04V and pins 21, 23 and 25 for 5.20V. If the connections are good, refer to the "Power Supply" section of the Troubleshooting guide in Folder CSCS1.

If the connections and source voltages are good, check the logic probe readings at pins 1 thru 6 and 11, 12 and 13 of IC U18, pins 1, 9 and 10 of IC U20 and pins 1 thru 6 of IC U8. The logic probe readings shown are for disk drive B. Use the following chart for disk drive A logic probe readings that are different from disk drive B.

IC	PIN	LOGIC PROBE READING	IC	PIN	LOGIC PROBE READING
U18	1	H	U20	1	H
U18	2	L	U20	9	L
U18	4	H	U20	10	H
U18	5	L	U20	11	L
			U20	12	L
			U20	13	L

If any of the logic probe readings are not correct, check the IC's involved by substitution. If the logic probe readings are good, check for pulses at pin 3 of IC U10. If the pulses are missing, check the voltages and components associated with pins 1 thru 8 of IC U10 and pins 8, 9, and 10 of IC U18. If the pulses are present, check the voltages and components associated with pins 2, 3, 4, 6 and 7 of IC U16, Transistor Q3 and check the disk drive Spindle Motor (M1).

The disk drive Spindle Motor is not running at the correct speed. Check the adjustment of the Spindle Speed Control (R23). If Control R23 has no effect, check the voltages, waveforms and components associated with pins 1 thru 8 of IC U10, pins 8, 9 and 10 of IC U18, and check Diode D7 and the motor feedback signal at pin 28 of Plug P2D.

WILL NOT READ

Disk drive will not read. To make the disk drive run continuously, connect a jumper from pin 8 (for disk drive A) or pin 10 (for disk drive B) of IC UA9 to ground, see main logic board in Folder CSCS1. Check for 1.81V at pin 12 of Read Data Amp IC (U1). If the voltage is not correct, check for a Low logic probe reading on pin 10 of IC U17. If pin 10 reads Low, check the voltages and components associated with pins 6 thru 9, 11 and 12 of IC U1. If pin 10 of IC U17 reads High, check for a High logic probe reading on pin 11 of IC U17. If pin 11 reads High, check IC U17 by substitution. If pin 11 of IC U17 reads Low, check IC's UA10 and UB7 by substitution, see main logic board in Folder CSCS1.

If the voltage on pin 12 of IC U1 is correct, put a diskette in the disk drive and close the drive door. The diskette should be full with programs to insure that the head will be reading information. Check the waveforms at pins 7 and 8 of the Read Amp IC (U6). If the waveforms are missing, check the voltages and components associated with the Read Pre Amp Transistors (Q1 and Q2), pins 1, 4, 5, 7, 8, 10 and 14 of the Read Amp IC (U6) and check the disk drive head. If the waveforms on pins 7 and 8 of IC U6 are good, check the waveform on pin 10 of IC U13. If the waveform is missing, check the voltages, waveforms and components associated with pins 1 thru 8 of the output IC (U5), pins 1, 2, 3, 8, 9, 10 of IC U13, pins 8 thru 11 and 13 of IC U7 and pins 1 thru 4, 14 and 15 of IC U11.

NOTE: The waveforms shown on IC's U5, U7, U11 and U13 will appear even when the disk drive is not running. There should be a noticeable shift in the waveform pulses when the disk drive door is opened and closed while the disk drive is running with a diskette inserted.

If the waveform is good on pin 10 of IC U13, check for a waveform on pin 5 of IC U11. If the waveform is missing, check the voltages and components associated with pins 5, 6, 7, 9, 10 and 11 of IC U11. If the waveform on pin 5 of IC U11 is good, check the waveform on pin 11 of IC U12. If the waveform is missing, check IC U12 by substitution.

If the waveform is good at pin 11 of IC U12, check for pulses at pin 27 of the Floppy Disk Controller IC (UB7), see main logic board in Folder CSCS1. If the pulses are missing, check the logic probe readings on pins 1 thru 4, 13, 14 and 15 of IC U1 and pins 1, 2 and 3 of IC U2 on the double density board.

If pulses are present at pin 27 of IC UB7, check the waveform on pin 26 of IC UB7. If the waveform is missing, check the waveforms and logic probe readings on IC's U4 thru U10 on the double density board. If the waveform on pin 26 of IC UB7 is good, check IC UB7 by substitution.

WILL NOT WRITE

Disk Drive will not write. Check the waveform at pin 8 of IC U17. The circuit is in write mode while the pulse is low. If the waveform is missing, refer to the "Write Protect" section of this Troubleshooting guide. If the waveform is good, run the Disk Drive Program in Folder CSCS1 and check for pulses at pin 31 of the Floppy Disk Controller IC (UB7), see main logic board in Folder CSCS1. If the pulses are missing, check IC UB7 by substitution. If the pulses are present, check for pulses at pin 13 of IC U17. If the pulses are missing, check the connections at pin 22 of plugs P1 and P8 and check IC UA10, see main logic board in Folder CSCS1, IC U2 and Shift Register IC (U3) on the double density board.

If pulses are present at pin 13 of IC U17, check the waveforms on pins 1 and 2 of IC U7. If the waveforms are missing, check IC U7 by substitution. If the waveforms are good, check the waveforms at pins 1 and 14 of the Driver IC (U1). If the waveforms are missing, check the disk drive head and check IC's U1 and U2 by substitution.

WRITE PROTECT

Write protect is not working. Check the logic probe reading at pin 1 of IC U19 while sliding a diskette in and out of the disk drive. If the logic probe reading does not change, check the Write Protect Hole Sensor LED (LED2) and Write Protect Hole Detector Transistor (Q10), pin 1 to 2 of Resistor Network RN8 and check the connections of LED2, Transistor Q10 and pins 14 thru 17 of Plug P2A.

If the logic probe reading is correct at pin 1 of IC U19, check the logic probe readings at pins 12 and 13 of IC U19, pins 1 and 3 of IC U12 and pin 11 of IC U2 while sliding the diskette in and out of the disk drive. If any of the readings do not change, check the IC's involved by substitution.

STEPPING MOTOR

Stepping Motor (M3) does not operate. Check for 12.04V at pin 27 of Plug P2C. If 12.04V is missing, refer to the "Power Supply" section of the Troubleshooting Guide in Folder CSCS1, while running the Disk Drive Program in Folder CSCS1. Check for pulses at pin 20 of Plug P1. If the pulses are missing, check for pulses at pin 15 of the Floppy Disk Controller IC (UB7), see main logic board in Folder CSCS1. If pulses are missing at IC UB7, check IC UB7 by substitution. If pulses are present at pin 15 of IC UB7, check IC UA10 by substitution, see main logic board in Folder CSCS1. If pulses are present at pin 20 of Plug P1, check for pulses at pin 11 of IC U14. If pulses are missing, check IC's U14, U17 and U20 by substitution.

Check the waveform at pin 2 of IC U14. If the waveform is missing, check IC's U8 and U9 by substitution. If the waveform is good, check the waveform at pin 3 of IC U4. If the waveform is missing, check the voltages and components on pins 1 thru 8 of IC U4. If the waveform is good, check the waveforms at pins 2 and 3 of IC U15. If the waveforms are missing, check IC U9 by substitution. If the waveforms are good, check IC's U15, U21 and U22 by substitution and check Diodes D3 thru D6 and Motor M3.

DISK INDEX DETECTOR

Verify the disk index hole detector circuit is functioning by checking the waveform at pin 8 of IC U12 while the disk drive is running with a diskette inserted. If the waveform is missing, check the Index Hole Sensor LED (LED3) and Index Hole Detector (Q11) and check IC's U19 and U12.

INDEX SENSOR TIMING ADJUSTMENT

Connect the channel A input of a scope to TP8 and the channel B input to TP5. Connect the scope ground to TP6. Set the channel A V/cm to .5V and the channel B V/cm to 5V. Trigger the scope on channel B with the trigger set to positive slope, normal mode, and set the time base to 50μs. Insert an alignment diskette in the disk drive. Use the Drive Select function of the Drive Exercise program to select the disk drive being tested, then use the Seek Track function to select track 01.

Check for a time delay of 200μs ± 50μs from the start of the sweep to the first data pulse. See Figure 3. If the timing is out of tolerance, loosen the mounting screw holding the Index Hole Sensor (LED3) on the bottom of the disk drive and slide the sensor until the timing is within tolerance. Retighten the screw and recheck the timing.

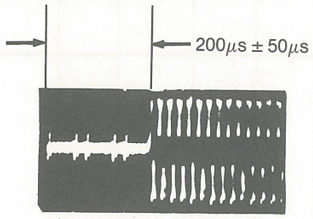


Figure 3

RADIAL HEAD ALIGNMENT ADJUSTMENT

Connect the channel A input of a scope to TP8 and the channel B input to TP5. Connect the scope ground to TP6. Set the channel A V/cm to 100mV and the channel B V/cm to 2V. Set the trigger to channel B normal mode and set the time base to 20ms. Display channel A only. Insert an alignment diskette in the disk drive being adjusted. Use the Drive Select function of the Drive Exercise program to select the disk drive being adjusted. Use the Seek Track function to step to track 16.

Loosen the two 3/32 inch Allen screws holding the Stepping Motor (M3) and rotate the motor until the two lobes have the same amplitude and shape. See Figure 4. Retighten the screws and recheck the adjustment by stepping to track 39 and back to track 16, then step to track 00 and back to track 16. The lobes should be almost equal when stepping to track 16 from either direction. Recheck the "Track 00 Switch" and "Track 00/39 Stop" Adjustments after performing this adjustment.

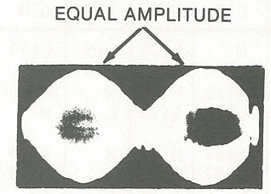


Figure 4

LOGIC (DOUBLE DENSITY BOARD)

PIN NO.	IC U1	IC U2	IC U3	IC U4	IC U5	IC U6	IC U7	IC U8	IC U9	IC U10
1	P	P	H	H	H	H	L	L	L	P
2	H	H	H	P	P	H	L	H	P	H
3	H	P	H	H	P	L	L	P	P	H
4	P	P	H	H	L	H	L	L	L	P
5	P	P	H	P	P	P	P	H	H	P
6	P	P	L	P	P	P	P	H	H	P
7	P	L	P	L	L	L	P	P	P	L
8	L	P	L	P	H	H	H	H	H	P
9	P	P	H	P	P	P				P
10	H	P	P	H	P	H				H
11	H	P	P	P	L	H				P
12	P	P	P	P	P	P				P
13	P	P	P	P	P	P				H
14	P	H	H	H	H	H				H
15	P		P							
16	H		H							

NOTE: Logic probe readings taken while running the following MBASIC™ program. Stepping motor is not operating unless otherwise noted. Disk drive A and disk drive B have same logic probe reading unless otherwise indicated.

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

Logic Probe Display
L = Low
H = High
P = Pulse

Logic probe readings taken with disk drive running continually.

MBASIC is a trademark of Microsoft Corporation.

ADJUSTMENTS

DIAGNOSTIC DISKETTE

An Osborne Diagnostic diskette was used to perform the disk drive alignment along with an alignment diskette. The diagnostic diskette is available from:

Osborne Computer Corporation
26500 Corporate Ave.
Hayward, CA 94545

Diagnostic diskette Part Number 3D01002-00

To use the Diagnostic diskette, insert the diskette into disk drive A and press the RETURN key. The diskette will boot up and a menu will be displayed on the monitor screen. Press the P key for the Drive Exercise program.

To use the Drive Exercise program, follow the instructions on the monitor screen. To get back to the main menu, press the CTRL and C keys at the same time.

If the computer is in CP/M® with the A> on the monitor screen, type MENU and press the RETURN key to load the diagnostic program.

NOTE: Some early versions of the diagnostic program may use the word DISK instead of MENU to load the program.

SPINDLE SPEED ADJUSTMENT

Insert a diskette in the disk drive being adjusted. Close the drive door and use the Drive Select function of the Drive Exercise program to select the disk drive being adjusted. Select the Driver Timer function of the Drive Exercise program. Adjust the Spindle Speed Control (R23) for a time of 200ms ± 10ms.

To adjust the speed without the alignment program, insert a blank diskette in the disk drive. Set the disk drive on its side with the strobe wheel visible. Press the RETURN key to start disk drive A or the SHIFT " (Quote) keys to start disk drive B. Use the outside pattern when 60 cycle lighting is used or the inside pattern with 50 cycle lighting. Adjust the Spindle Speed Control (R23) until one strobe line rotates clockwise 90 degrees during a five second interval.

TRACK 00/39 STOP ADJUSTMENT

Unplug the head connector (P3) from the board. Remove four Phillips screws holding the board to the disk drive chassis. Lift the board up to gain access to the track 00/39 stop, being careful not to short the bottom of the board against the disk drive chassis. Use the Seek Track function of the Drive Exercise program to put the head on track 00. Check for a MINIMUM clearance of 0.10 inch ± .005 inch between the track 00 stop and the post on the frame. See Figure 1.

Set the head on track 39 and verify a MINIMUM clearance of 0.10 inch ± .005 inch between the track 39 stop and the post. See Figure 1. Loosen two Phillips mounting screws for adjustment, retighten screws and recheck clearance.

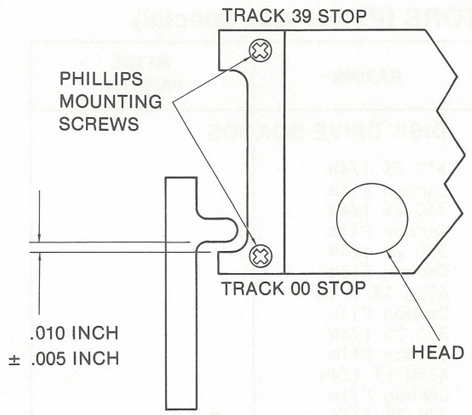


Figure 1

TRACK 00 SWITCH ADJUSTMENT

Connect the input of a scope to TP4 and scope ground to TP6. Set the V/cm to 5V/Div, the trigger to positive slope, normal mode, and the time base to 10ms. Select the Alternate Track function of the Drive Exercise program and alternate the head between tracks 00 and 01. Check the positive portion of the waveform for 20ms ± 5ms width and the negative portion for 30ms ± 5ms width. See Figure 2.

If the waveform is not within tolerance, loosen the two track 00 switch mounting screws on the bottom of the disk drive. Slide the switch until the waveform is within tolerance. Retighten the screws and recheck the waveform.

Alternate the head between tracks 01 and 02 and verify that there is no signal. Use the Seek Track function to set the head on track 01, then use the Alternate Track function to alternate between tracks 01 and 02.

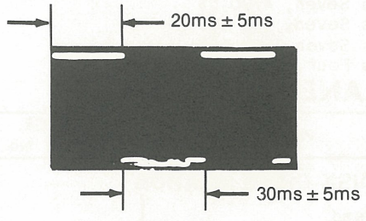


Figure 2

DOUBLE DENSITY ADJUSTMENT

Connect the input of a scope to TP9 on the double density board. Set the scope to DC at 1 V/div., Auto trigger and time base of 10ms. Boot up the Diagnostic diskette, then remove the diskette and insert blank double density disketes. Press the O key to get the Confidence Test. Press the D key for the Double Density Test. Press the P key to get the Pre-Test function. When the test program comes to the Seek/Write/Read/Verify portion of the test, adjust Double Density Adjust Control (R5) for a voltage level of 3.50V ± .5V on the scope. NOTE: It will be about 4 minutes before the test program starts the Seek/Write/Read/Verify test.

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PARTS LIST AND DESCRIPTION

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

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	TYPE No.	MFGR. PART No.
	DISK DRIVE BOARDS	
D1,2	1N914	
D3 thru D6	1N4001	
D7	1N914	
Q1,2	2N3904	
Q3 Q10 Q11	TIP110	
U1	CA3054	
U2	MC14025B 4025B	
U3,4	CA555CE 555	
U5	LM311N 311	
U6	NE592N NE592	
U7	CD4013BE 4013B	
U8	SN74LS86N LS86N	
U9	SN74LS112AN LS112	
U10	UA555TC 555	
U11	SN74LS123NDS LS123	
U12	DM7438N 7438	
U13	MC14070B 4070B	
U14	CD4001BE 4001B	
U15	SN74LS139NDS LS139	
U16	TL071CP TL091	
U17	74LS14 LS14	
U18	DM74LS132N LS132	
U19	74LS14 LS14	
U20	CD4023BE 4023B	
U21,22	75451ATC 75451	
	DOUBLE DENSITY BOARD	
D1	1N5231B	
D2	1N5227 1N5228B	
D3	1N5238	
U1	DM74LS221N LS221	
U2	DM7438N 7438	
U3	SN74LS166NDS LS166	
U4	DM74LS00N LS00	
U5,6	DM74LS107AN LS107	
U7	LM358N LM358	
U8,9	LM311N LM311	
U10	DM74LS74AN LS74	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING	MFGR. PART No.
	DISK DRIVE BOARDS	
C2	47 10V 20%	
C17	2.2 16V	
C27	.33 35V	
C33	47 10V 20%	
C34	22 16V 20%	
C36	4.7 25V 20%	
C50	.1 35V	
C51	.1 35V	
	DOUBLE DENSITY BOARD	
C1	22 16V 20%	
C11	1 35V	
C17	47 10V 20%	

CAPACITORS

ITEM No.	RATING	MFGR. PART No.
	DISK DRIVE BOARDS	
C1	33 50V 5%	
C3	.01 25V	
C4	330 50V 10%	
C5	.01 25V	
C6	.01 25V	
C7	.01 25V	
C8	.01 25V	
C9	.01 25V	
C10	.0015 50V 10%	
C11	.01 25V	
C12	.0015 50V 10%	
C13	.01 25V	
C14	.01 25V	
C15	.01 25V	
C16	.01 25V	
C18	.01 25V	
C19	.01 25V	
C20	.0015 50V 10%	
C21	.068 63V 10%	
C22	.01 25V	
C23	100 50V 5%	
C24	100 50V 5%	
C25	.01 25V	
C26	.01 25V	

ITEM No.	RATING	MFGR. PART No.
C28	.0015 50V 10%	
C29	.01 25V	
C30	.01 25V	
C31	.01 25V	
C32	.01 25V	
C35	.01 25V	
C37	33 50V 5%	
C38	.1 50V	
	DOUBLE DENSITY BOARD	
C2	.01 50V	
C3	47 500V 2% 47 50V 1%	
C4	47 50V 2% 47 50V 1%	
C6	.01 50V	
C7	.01 50V	
C8	.01 50V	
C9	.01 50V	
C10	.01 50V	
C12	330 50V 10%	
C13	.0033 NPO 50V	
C14	47 N750 50V	
C15	.1 50V	
C16	.01 50V	

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

ITEM NO.	FUNCTION	RESISTANCE	MFGR. PART NO.	NOTES
	DISK DRIVE BOARDS			
R23	Spindle Speed	20K	3006P-1-203(1)	
	DOUBLE DENSITY BOARD			
R5	Double Density Adjust	10K	0108246/63P103(1)	

(1) Number on unit.

COILS (RF-IF)

ITEM No.	FUNCTION	MFGR. PART No.
	DISK DRIVE BOARDS	
L1	Peaking	
L2	Peaking	

ITEM No.	FUNCTION	MFGR. PART No.
L3	Peaking	
L4	Peaking	
L5	Peaking	

RESISTORS (Power and Special)

ITEM No.	RATING	MFGR. PART No.
	DISK DRIVE BOARDS	
R2	330 2% 1/4W Carbon Film	
R3	330 2% 1/4W Carbon Film	
R14	330 2% 1/4W Carbon Film	
R15	4750 1% 1/4W Carbon Film	
R16	330 2% 1/4W Carbon Film	
R17	4750 1% 1/4W Carbon Film	
R24	22K 2% 1/4W Carbon Film	
R30	330 2% 1/4W Carbon Film	
R41	22K 2% 1/4W Carbon Film	
R42	15K 2% 1/4W Carbon Film	
R43	9100 2% 1/4W Carbon Film	
R44	22K 2% 1/4W Carbon Film	
RN1	Resistor Network (2)	
RN3	Resistor Network (1) (3)	
RN4	Resistor Network (2)	
RN5	Resistor Network (2)	
RN6	Resistor Network (4)	
RN7	Resistor Network (5)	

(1) Used in Disk Drive A only
(2) Contains Seven, 4700 5%
(3) Contains Seven, 150 10%
(4) Contains Seven, 68K 10%
(5) Contains Four, 33K 10%

ITEM No.	RATING	MFGR. PART No.
RN8	Resistor Network (6)	
	DOUBLE DENSITY BOARD	
R1	56.2K 1% 1/4W Carbon Film 56.2K 2% 1/4W Carbon Film	
R2	10K 1% 1/4W Carbon Film 10K 2% 1/4W Carbon Film	
R4	330 2% 1/4W Carbon Film	
R9	9100 2% 1/4W Carbon Film	
R10	3010 1% 1/4W Carbon Film	
R12	4700 2% 1/4W Carbon Film	
R13	56.2K 1% 1/4W Carbon Film 56.2K 2% 1/4W Carbon Film	
RN1	Resistor Network (7)	
RN2	Resistor Network (8)	
RN3	Resistor Network (9)	
RN4	Resistor Network (10)	
RN5	Resistor Network (7)	

(6) Contains Seven, 150 1/4W 5%
(7) Contains Seven, 820
(8) Contains Seven, 150 10%
(9) Contains Seven, 4700 10%
(10) Contains Four, 39K 2%

MISCELLANEOUS

ITEM No.	PART NAME	MFGR. PART No.	NOTES
	DISK DRIVE BOARDS		
HEAD 1	Head		R/W E
LED 1	LED		Drive On Indicator, Red (1.65V @ 20mA)
LED 2	LED		Write Protect Hole Sensor (1.23V @ 26mA)
LED 3	LED		Index Hole Sensor (1.43V @ 50mA)
M1	Motor		Spindle
M2	Tach		Spindle
M3	Motor		Stepping
S1	Switch		Track 00 Sensor
	Belt		Drive
	Disk Drive A		Model FDD100-5, Serial No. 9009355A
	Disk Drive B		Model FDD100-5, Serial No. 9011985A
	P.C. Board		Disk Drive A, S/N412470 Rev. M
	P.C. Board		Disk Drive B, S/N416701 Rev. M
	DOUBLE DENSITY BOARD		
	P.C. Board		Double Density, Serial No. 14470 Top, 2B10011-00 Rev. B Bottom, 3B10011-00 Rev. B