

COMPUTER:

RADIO SHACK® TRS-80 MODEL I (LEVEL II)

(INCLUDES COMPUTER MODEL 26-1001,
MONITOR MODEL 26-1201 AND EXPANSION
INTERFACE MODEL 26-1140)



TECHNICAL SERVICE DATA FOR YOUR COMPUTER



MODEL I LEVEL II

EXPANSION INTERFACE

See Folder CSCS3-A

MONITOR

See Folder CSCS3-B

SAFETY PRECAUTIONS

See page 19

PRELIMINARY SERVICE CHECKS

ENCLOSED

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PRELIMINARY SERVICE CHECKS

This data provides the user with a time-saving service tool designed for quick isolation and repair of computer system malfunctions.

Check all interconnecting cables for good connections and correct hookup before making service checks.

Disconnect all external peripherals from the computer system to eliminate possible external malfunctions.

Replacement or repair of Power Supplies, CPU (Main) Board, Expansion Interface Board and Monitor Boards or connectors may be necessary after the malfunction has been isolated.

MISCELLANEOUS ADJUSTMENTS

ROM SELECT SHUNT (Z3) CPU AND KEYBOARD

Rom Select Shunt (Z3) is set up in accordance to whether Level I or Level II Basic ROMs are installed. Use the following chart to determine which pins are shunted.

Z3 PINS	LEVEL I BASIC	LEVEL II BASIC
1-16	Open	Shunted
2-15	Shunted	Shunted
3-14	Open	Shunted
4-13	Shunted	Shunted
5-12	Open	Shunted
6-11	Shunted	Shunted
7-10	Shunted	Shunted
8-9	Open	Shunted

RAM SELECT SHUNT (Z71) CPU AND KEYBOARD

RAM Select Shunt (Z71) is set up in accordance to the amount of RAM memory (4K or 16K) installed on CPU Board. Use the following chart to determine which pins are shunted.

Z71 PINS	4K RAM	16K RAM
1-16	Open	Shunted
2-15	Shunted	Open
3-14	Open	Shunted
4-13	Shunted	Open
5-12	Open	Shunted
6-11	Shunted	Open
7-10	Open	Open
8-9	Open	Open

12V AND 5V ADJUSTMENT CPU AND KEYBOARD

NOTE: Perform 12V adjustment before 5V adjustment.

Connect the input of a DC voltmeter to pin 3 of Regulator IC (Z2). Adjust the 12.0V Adjust Control (R10) for 11.9V.

Connect the input of a DC voltmeter to pin 3 of Regulator IC (Z1). Adjust the 5V Adjust Control (R5) for 5.0V.

12V AND 5V ADJUSTMENT EXPANSION INTERFACE

NOTE: Perform 12V adjustment before 5V adjustment.

Connect the input of a DC voltmeter to pin 3 of Regulator IC (Z20). Adjust the 12V Adjust Control (R7) for 11.9V.

Connect the input of a DC voltmeter to pin 3 of Regulator IC (Z21). Adjust the 5V Adjust Control (R8) for 5.0V.

HORIZONTAL AND VERTICAL CENTERING CPU AND KEYBOARD

Type and run the following Basic program to produce a rectangle on the Monitor screen:

```
10 CLS: FOR X=0 TO 127
20 IF X>47 THEN 40
30 SET (0,X): SET (127,X)
40 SET (X,0): SET (X,47)
50 NEXT X
60 GOTO 60
```

Adjust the Horizontal Center Control (R20) and Vertical Center Control (R21) to center the rectangle on the Monitor screen.

PRELIMINARY SERVICE CHECKS (Continued)

SERVICE CHECKS

SEE INTERCONNECTING DIAGRAM AND PHOTOS TO MATCH THE NUMBER IN THE CIRCLES WITH THOSE IN THE FOLLOWING DATA FOR SERVICE CHECKS TO BE PERFORMED.

1. POWER SUPPLY (CPU BOARD)

- (A) Disconnect the CPU Power Supply Module (PT1) from Connector J1A and check for 18.5VAC between pin 1 and pin 3 and 23.6V between pin 2 and pin 4 of the Power Supply Plug (P1A). If the voltages are missing, replace the Power Supply Module.
- (B) Check for 5.0V at pin 3 of Regulator IC (Z1). If the measurement is not correct, check the adjustment of the 5V Adjust Control (R5).
- (C) Check for 11.9V at pin 3 of Regulator IC (Z2). If the measurement is not correct, check the adjustment of the 12V Adjust Control (R10).

2. COMPUTER DOES NOT COME UP PROPERLY

- (A) See if the ROM Select Shunts (Z3) and RAM Select Shunts (Z71) have been set up properly, see "ROM Select Shunt Z3" section of Miscellaneous Adjustments.
- (B) Check Regulator IC (Z1) and Microprocessor IC (Z40) by substitution.
- (C) Check RAM ICs Z13 thru Z20 by substitution.

3. KEYBOARD

- (A) If only one key is not working properly, clean the key contacts with a spray contact cleaner. If the key is still defective, check for breaks at the key contacts and solder joints. Check the key contacts with an ohm meter.
- (B) If several keys are not working, check the ribbon cable between Keyboard and CPU board for possible open circuits.
- (C) If wrong character appears on the Monitor screen when a key is pressed. Check Character Generator IC (Z29) by substitution.

4. NO VIDEO ON MONITOR

- (A) Check the video cable for broken wires and the Video Connector (J2) for good connection.
- (B) Check the adjustment of the Contrast Control (R102) and Brightness Control (R103) located on the Monitor.

5. VIDEO DISPLAY NOT CENTERED ON MONITOR

- (A) Check the adjustment of the Horizontal Center Control (R20) and Vertical Center Control (R21) on the CPU Board, see "Horizontal and Vertical Centering" section of Miscellaneous Adjustments.

6. VIDEO DISPLAY UNSTABLE

- (A) Check the adjustment of the Horizontal Hold Coil (L4) and Vertical Hold Control (R13B) located on the rear of the Monitor.

7. MONITOR DEAD

- (A) Check Fuses F101 and F103 located inside the Monitor.

8. CASSETTE PORT INOPERATIVE

- (A) Check the Cassette cables for loose or broken wires and also check Connector J3 on CPU Board and Connectors J6, J7 and J8 on Expansion Interface Board for good connections.
- (B) If the Cassette motor will not stop running, turn the Computer Off. Use an ohm meter to check for an open circuit from the center pin at one end of Relay K1 to the center pin at the other end of Relay K1. If the pins are shorted, either Relay K1 contacts are sticking or Diodes CR9 and CR10 are shorted.

9. POWER SUPPLY (EXPANSION INTERFACE)

- (A) Disconnect the Expansion Interface Power Supply Module (PT1) from Connector J9 and check for 19.7VAC between pin 1 and pin 3 and 23.6V DC between pin 2 and pin 4 of the Power Supply Plug (P9). If the voltages are missing, replace the Power Supply Module.
- (B) Check for 11.9V at pin 3 of Regulator IC (Z20). If the measurement is incorrect, check the adjustment of the 12V Adjust Control (R7).
- (C) Check for 5.0V at pin 3 of Regulator IC (Z21). If the measurement is incorrect, check the adjustment of the 5V Adjust Control (R8).

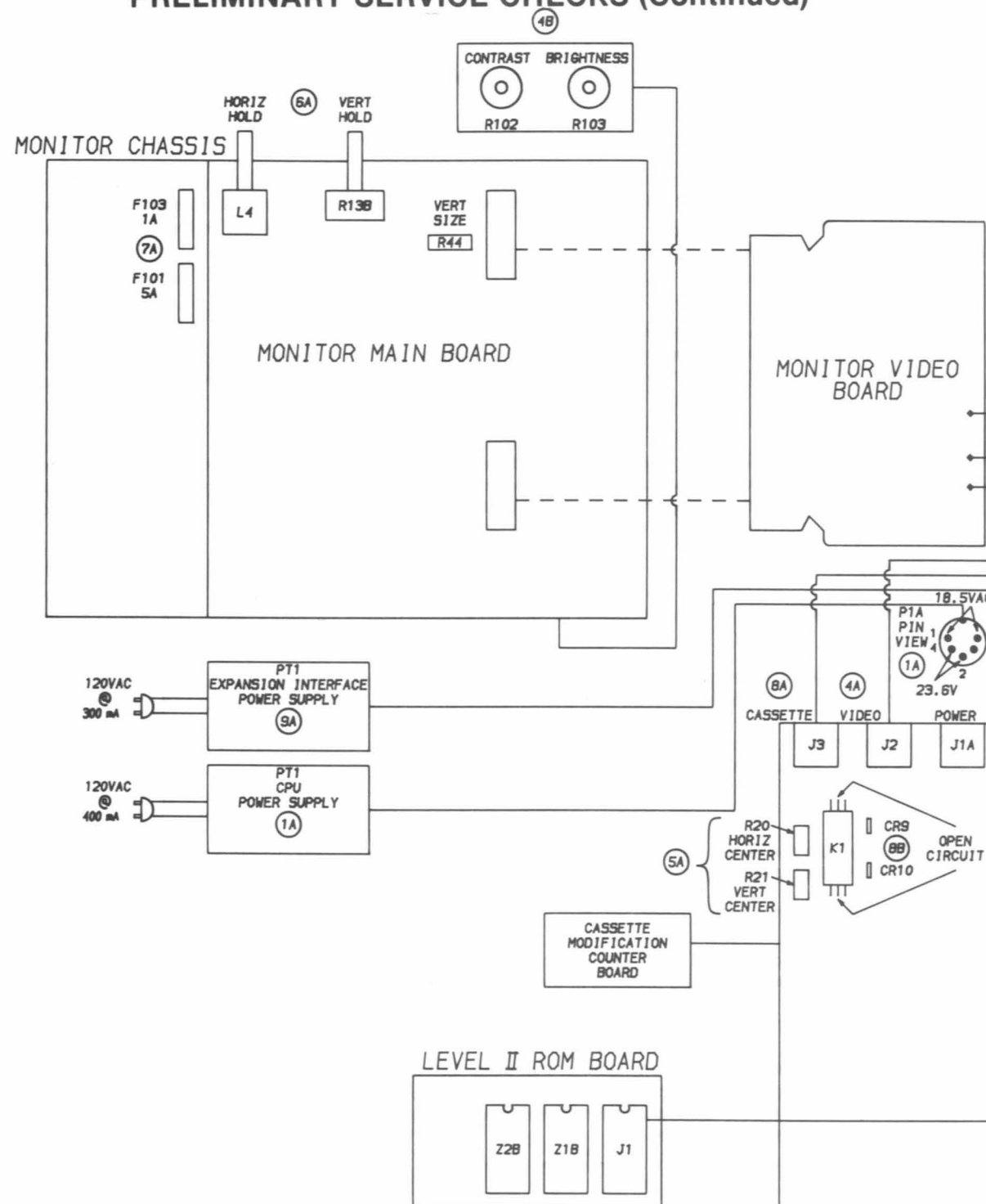
10. DISK DRIVE PORT INOPERATIVE (EXPANSION INTERFACE)

- (A) Check Disk Drive cables for loose or broken wires and Connector J5 for good connections. Clean Connector J5 contacts with a contact cleaner.
- (B) Check Disk Controller IC (Z42) by substitution.

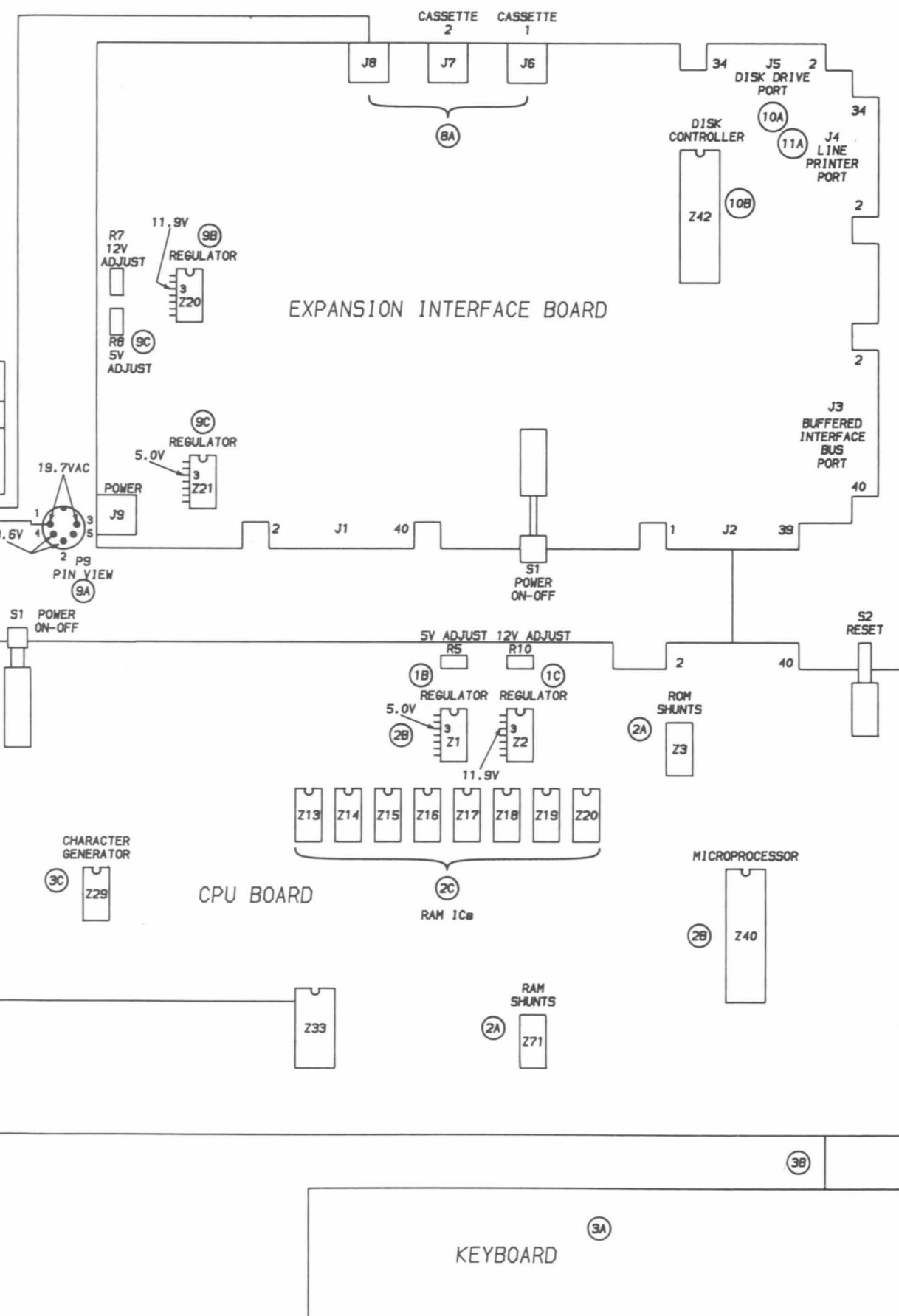
11. LINE PRINTER PORT INOPERATIVE (EXPANSION INTERFACE)

- (A) Check the Line Printer cable for loose or broken wires and Connector J4 for good connections. Clean Connector J4 contacts with a contact cleaner.

PRELIMINARY SERVICE CHECKS (Continued)



PRELIMINARY SERVICE CHECKS (Continued)



INTERCONNECTING DIAGRAM

INTERCONNECTING DIAGRAM

PRELIMINARY SERVICE CHECKS (Continued)

GENERAL OPERATING INSTRUCTIONS

POWER UP (COMPUTER ONLY)

Turn On the Computer. The words "MEM SIZE?" will appear on the Monitor screen. Press the Enter key once. The word "READY" and a prompt character will appear on the Monitor screen. The Computer is now in Basic mode.

POWER UP SEQUENCE (WHEN USING DISK DRIVE)

1. Turn On the Expansion Interface.
2. Turn On the Disk Drives (Terminal Drive 26-1164A, first) and then any other peripherals.
3. Put a diskette (containing DOS, Disk Operating System) into Disk Drive 0. Turn On the Computer. The Computer will automatically boot up from Disk Drive 0. The version of the Disk Operating System will appear on the Monitor screen along with the words "DOS READY" and a prompt character.

NOTE: If an Expansion Interface unit is used without a Disk Drive, hold down Break key when turning On Computer. A double "MEM SIZE?" will appear on Monitor screen. Press Enter key and the word "READY" will appear followed by a prompt character. The Computer is now in Basic mode.

RESET

Press the Break key and the Reset button (on right rear of the Computer) to reset the Computer to Basic mode. If Disk Drives are attached, insert a diskette containing DOS information into Disk Drive 0 and press only the Reset button. This will reboot the Computer from Disk Drive 0.

DISK OPERATING SYSTEM (DOS)

Type DIR and press the Enter key to display a directory of programs that are on the diskette in Disk Drive 0. Type DIR : and the number of the Disk Drive holding the diskette which contains the information desired. Example: Type DIR :2 to list programs on diskette in Disk Drive 2.

To load a program from a diskette, type the name of the program and press the Enter key. Use a colon and the number of the Disk Drive which contains the program to be loaded. If no number is given, the system will assume Disk Drive 0.

NOTE: Basic program will not load from diskette unless the Computer is in the Disk Basic mode.

To get back to the DOS from Disk Basic mode, type

CMD"S" and press the Enter key. Any program in memory will be lost when leaving Basic mode by using "CMD"S".

DISK BASIC

To load Disk Basic into the Computer, boot up on DOS. Insert a diskette containing Disk Basic (usually a part of the DOS diskette) into Disk Drive 0, type BASIC, press the Enter key and follow prompts. To go from Disk Basic mode to DOS, type CMD"S" and press the Enter key. Any program in memory will be lost.

To load a program from a diskette, type LOAD and the program name enclosed in quotes and press the Enter key. To load from a Disk Drive other than Drive 0, add a colon and the Disk Drive number at the end of the program name. Example: LOAD "SAMS:1" for Disk Drive 1.

To save a program onto a diskette in a Disk Drive, type SAVE and the program name in quotes and press the Enter key. To save a program onto a diskette in a Disk Drive other than Disk Drive 0, add a colon and the Disk Drive number at the end of the program name. Example: SAVE "SAMS:1" for Disk Drive 1.

FORMATTING A DISKETTE

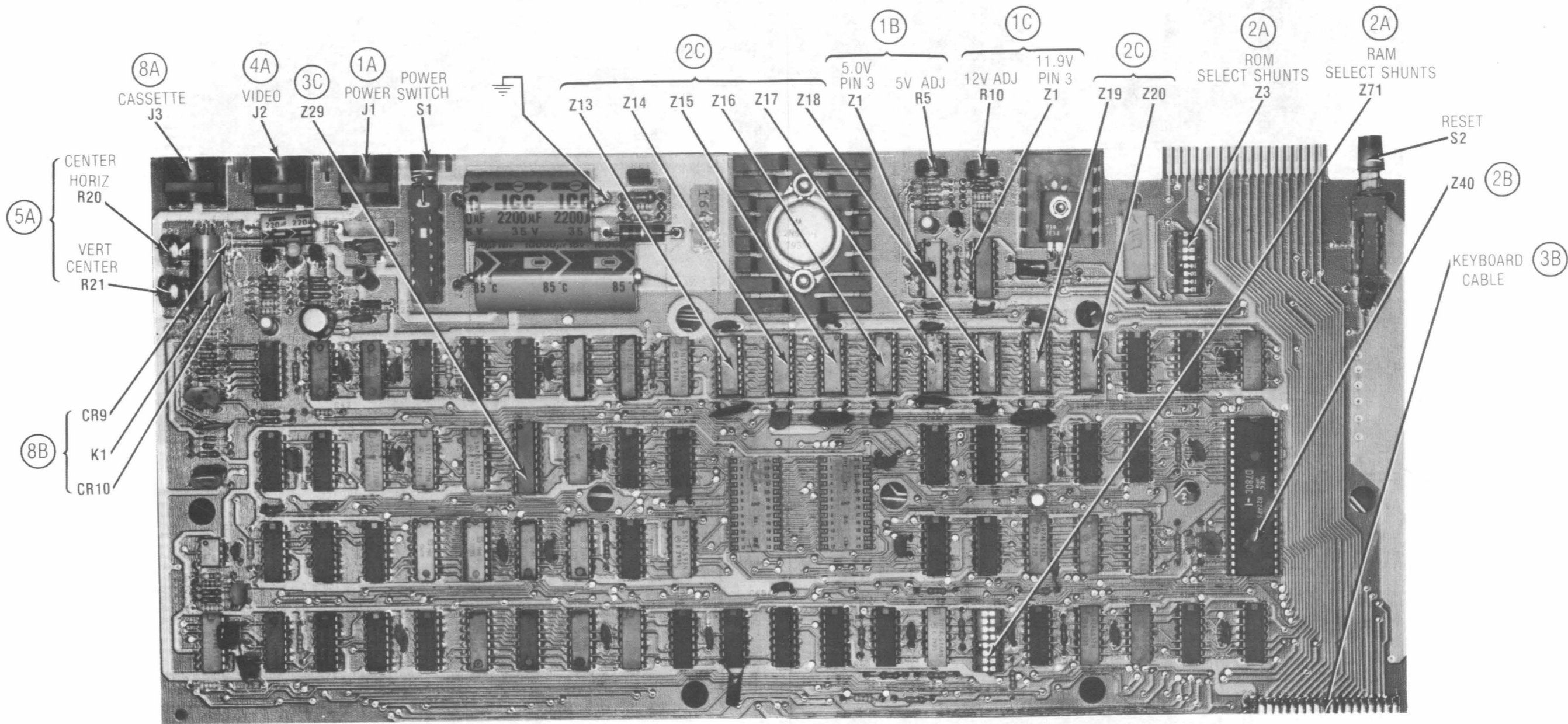
NOTE: This procedure does not copy Disk Operating System sections required for normal disk operations. A diskette thus formatted must be used only with systems containing 2 or more Disk Drives. Use "Back-up" function to format a diskette containing DOS information.

A blank diskette must be formatted before it can be used for saving data. To format a diskette, boot up on DOS, insert a diskette with the format program on it (usually part of the DOS diskette) into the Disk Drive, type FORMAT and press the Enter key. After the program has been loaded, insert a blank diskette into the Disk Drive and follow the instructions on the Monitor screen.

CASSETTE OPERATION

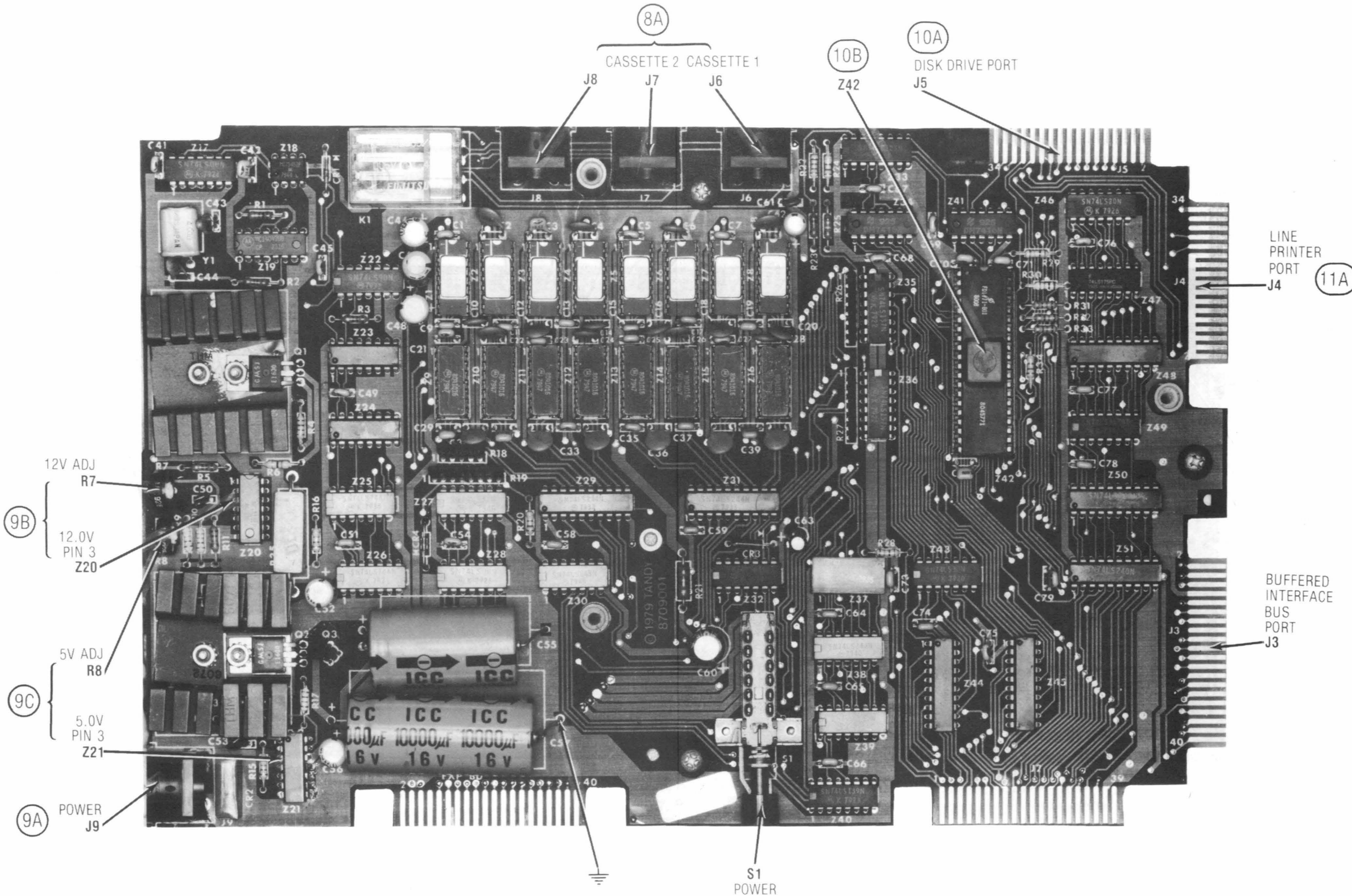
To load a program from tape, type CLOAD (with or without the program name enclosed in quotes), put the Recorder in play mode and press the Enter key. Prompt will indicate when program has been loaded.

To save a program onto tape, save CSAVE (with or without the program name enclosed in quotes), put the Recorder in record mode and press the Enter key. A prompt will indicate when writing has been completed.

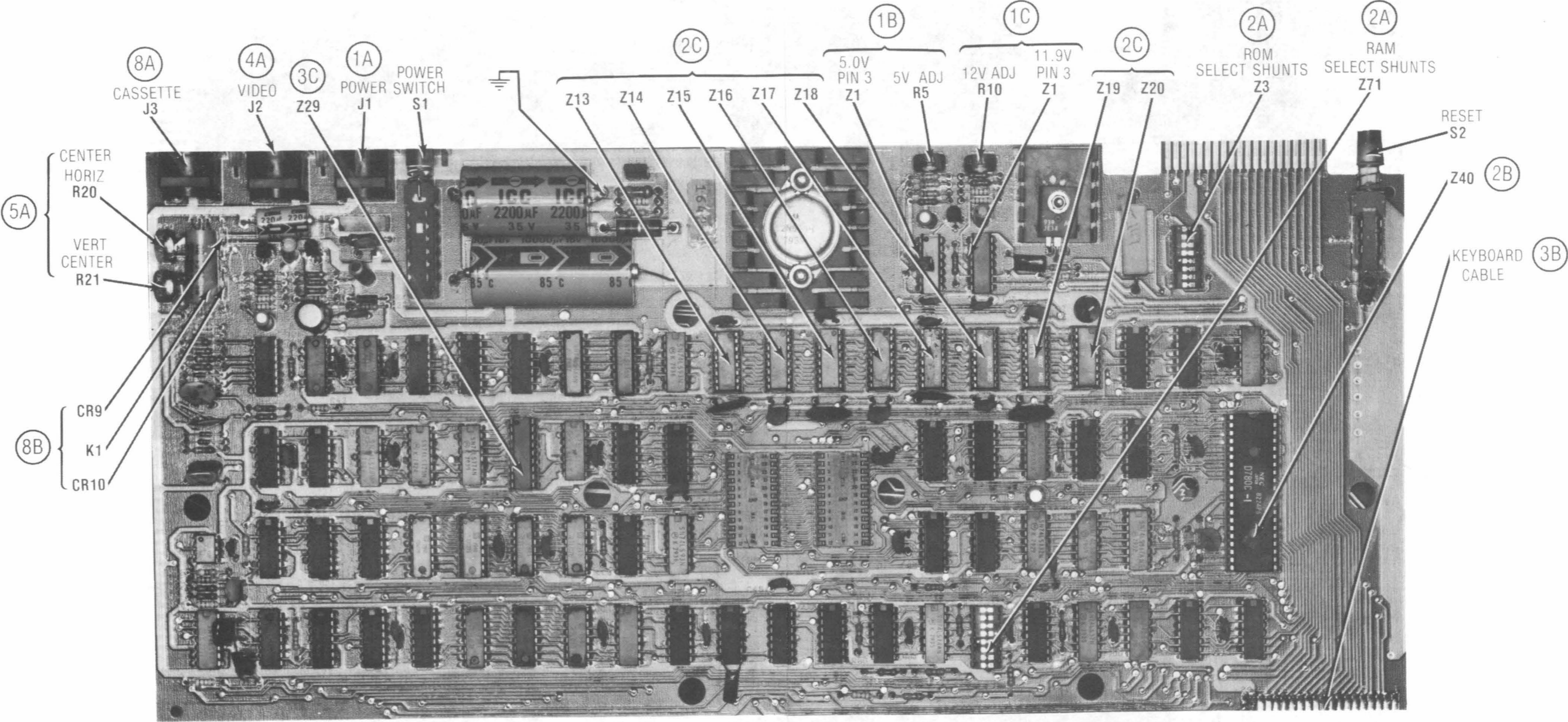


PRELIMINARY SERVICE CHECKS (Continued)

PRELIMINARY SERVICE CHECKS (Continued)



RADIO SHACK TRS-80
MODEL I LEVEL II



CSCS3
RADIO SHACK TRS-80
MODEL I LEVEL II

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.

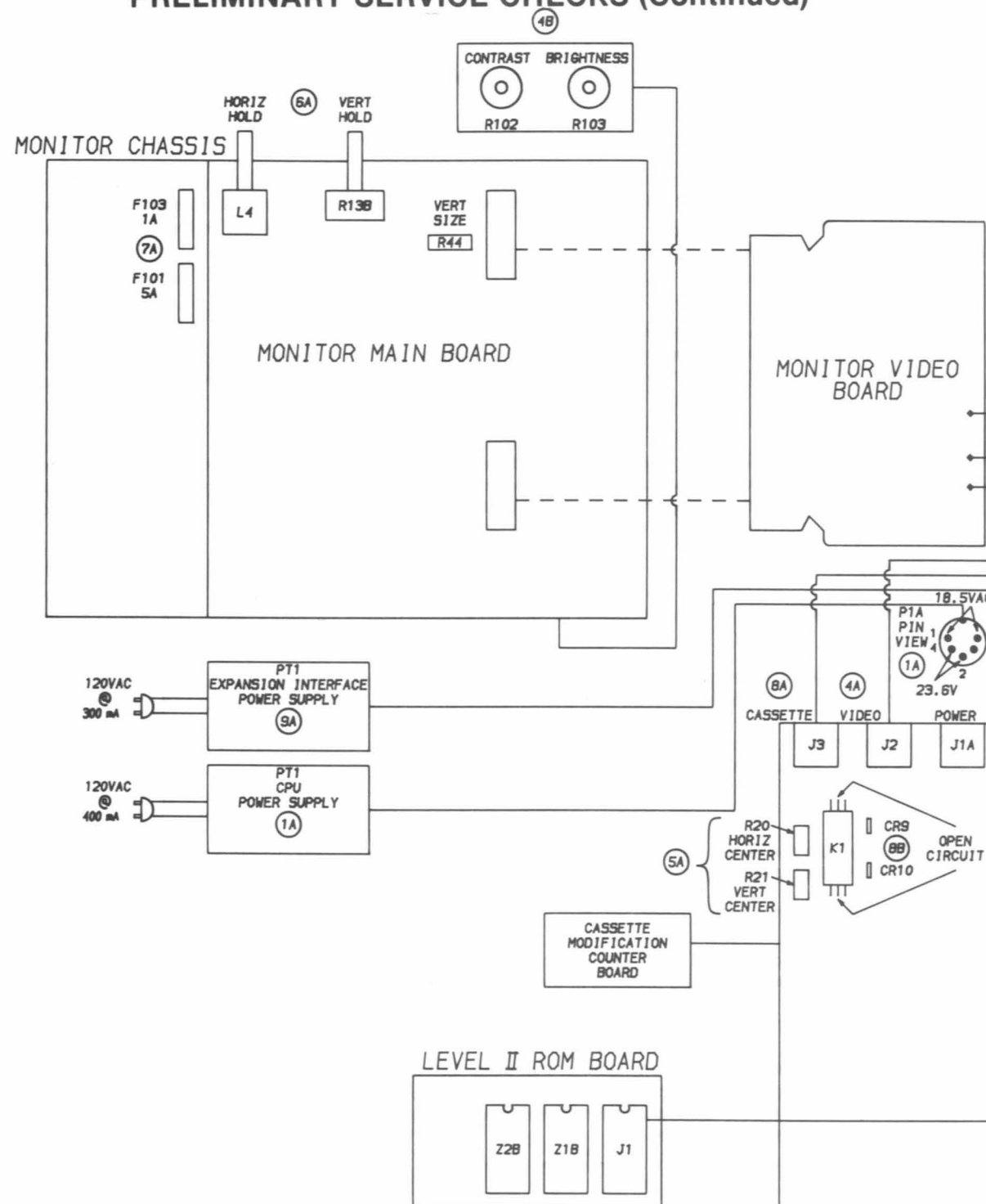
STATIC ELECTRICITY

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.

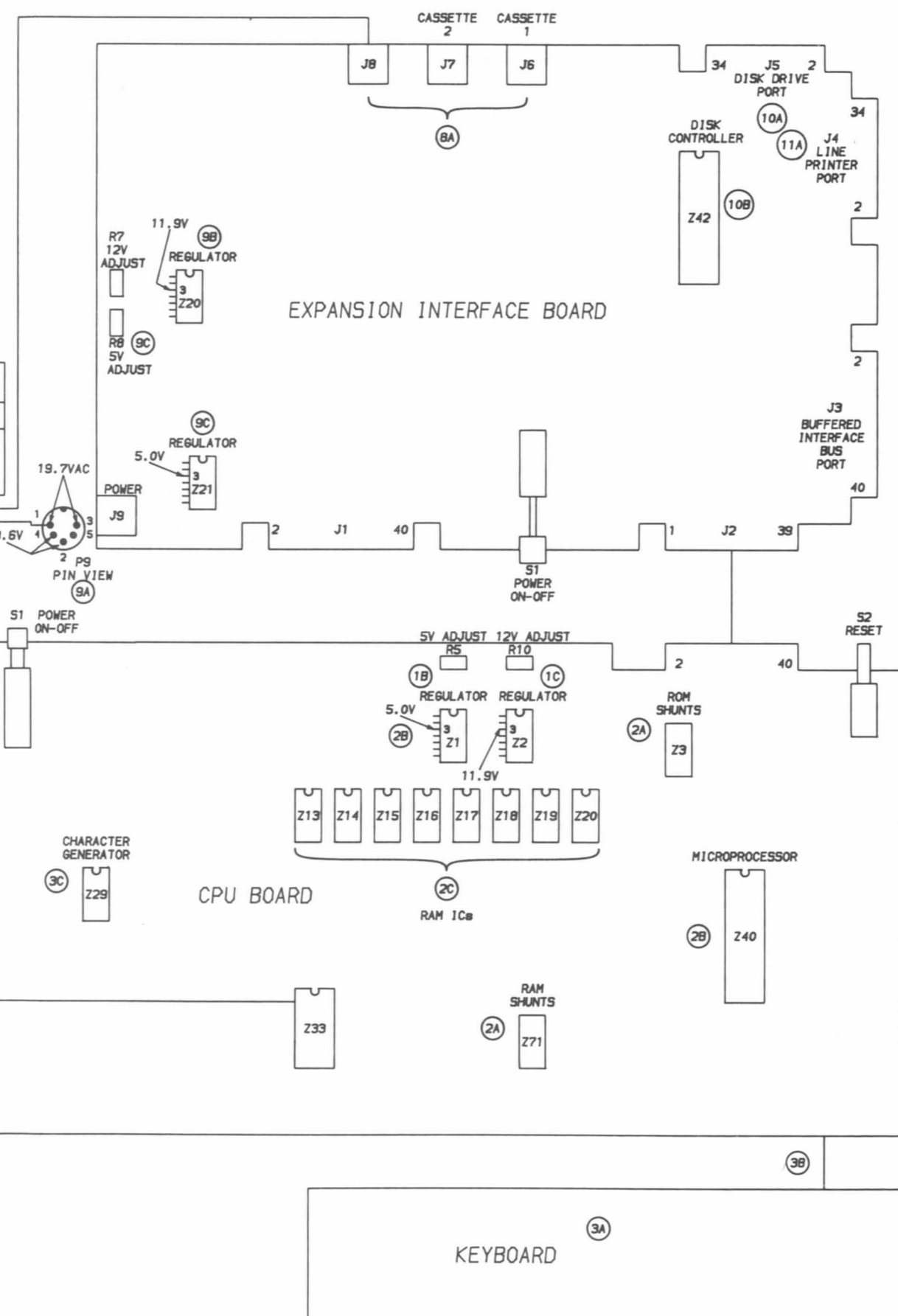
MONITOR

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.

PRELIMINARY SERVICE CHECKS (Continued)



PRELIMINARY SERVICE CHECKS (Continued)



INTERCONNECTING DIAGRAM

INTERCONNECTING DIAGRAM

PRELIMINARY SERVICE CHECKS (Continued)

TEST EQUIPMENT AND TOOLS

TEST EQUIPMENT

Digital Volt/Ohm Meter
Logic Probe

TOOLS

Phillips Screwdriver
Small Screwdriver
Contact Cleaner
Low Voltage Soldering Iron
Desoldering Equipment

PARTS LIST AND DESCRIPTION

CPU BOARD

ITEM	PART NO.	DESCRIPTION
CR9	4800026	Diode, 1N982A
CR10	4800026	Diode, 1N982A
K1	4500001	Relay, Motor Control, 5V
PT1	4000004	Power Supply Module
R5	4750019	Control, 5V Adjust, 1000 Ohms
R10	4750019	Control, 12V Adjust, 1000 Ohms
R20	4750018	Control, Horizontal Center, 100K Ohms
R21	4750018	Control, Vertical Center, 100K Ohms
Z1	3100001	IC, Regulator, MC1723CP
Z2	3100001	IC, Regulator, MC1723CP
Z3	2100041	Shunt, ROM Select
Z13	3108009	IC, RAM, MB8116E
thru Z20	3108003(1)	IC, RAM,
Z29		IC, Character Generator, 8046670
	3108001	IC, Character Generator, MCM6670
Z40		IC, Microprocessor, D780C-1
	3110001	IC, Microprocessor, Z80
Z71	2100041	Shunt, RAM Select

(1) Used in 4K versions

EXPANSION INTERFACE BOARD

ITEM	PART NO.	DESCRIPTION
PT1	4000004	Power Supply Module
R7	4750019	Control, 12V Adjust, 1000 Ohms
R8	4750019	Control, 5V Adjust, 1000 Ohms
Z20	3100001	IC, Regulator, MC1723CP
Z21	3100001	IC, Regulator, MC1723CP
Z42		IC, Disk Controller, FD1771B-01

MONITOR

ITEM	PART NO.	DESCRIPTION
F101	426973	Fuse, 1A @250V, Fast Acting
F103	99328	Fuse, 5A @250V, Fast Acting
L4	141017	Coil Horizontal Hold
R13B	141022	Control, Vertical Hold, 200K Ohms
R102	140980	Control, Contrast, 500 Ohms
R103	140711	Control, Brightness, 200K Ohms

RADIO SHACK TRS-80
MODEL I LEVEL II

DISASSEMBLY INSTRUCTIONS

CABINET REMOVAL CPU AND KEYBOARD

Remove six screws from cabinet bottom. Remove cabinet top and bottom from Keyboard and CPU Board. All components are now accessible for service.

CABINET REMOVAL EXPANSION INTERFACE

Remove six screws from cabinet bottom. Remove cabinet bottom from unit. All components are now accessible for service.

CABINET REMOVAL MONITOR

Remove five screws holding cabinet back and remove back. All components are now accessible for service.



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FORMATTING A DISKETTE

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CASSETTE OPERATION

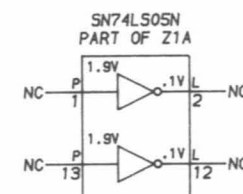
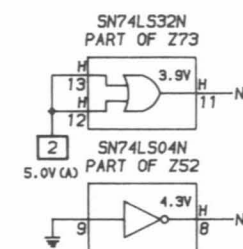
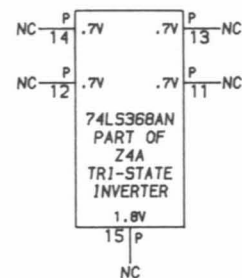
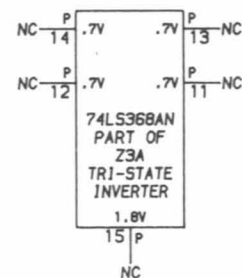
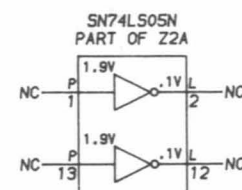
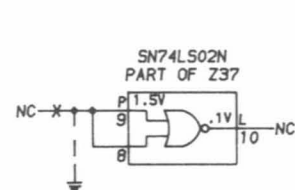
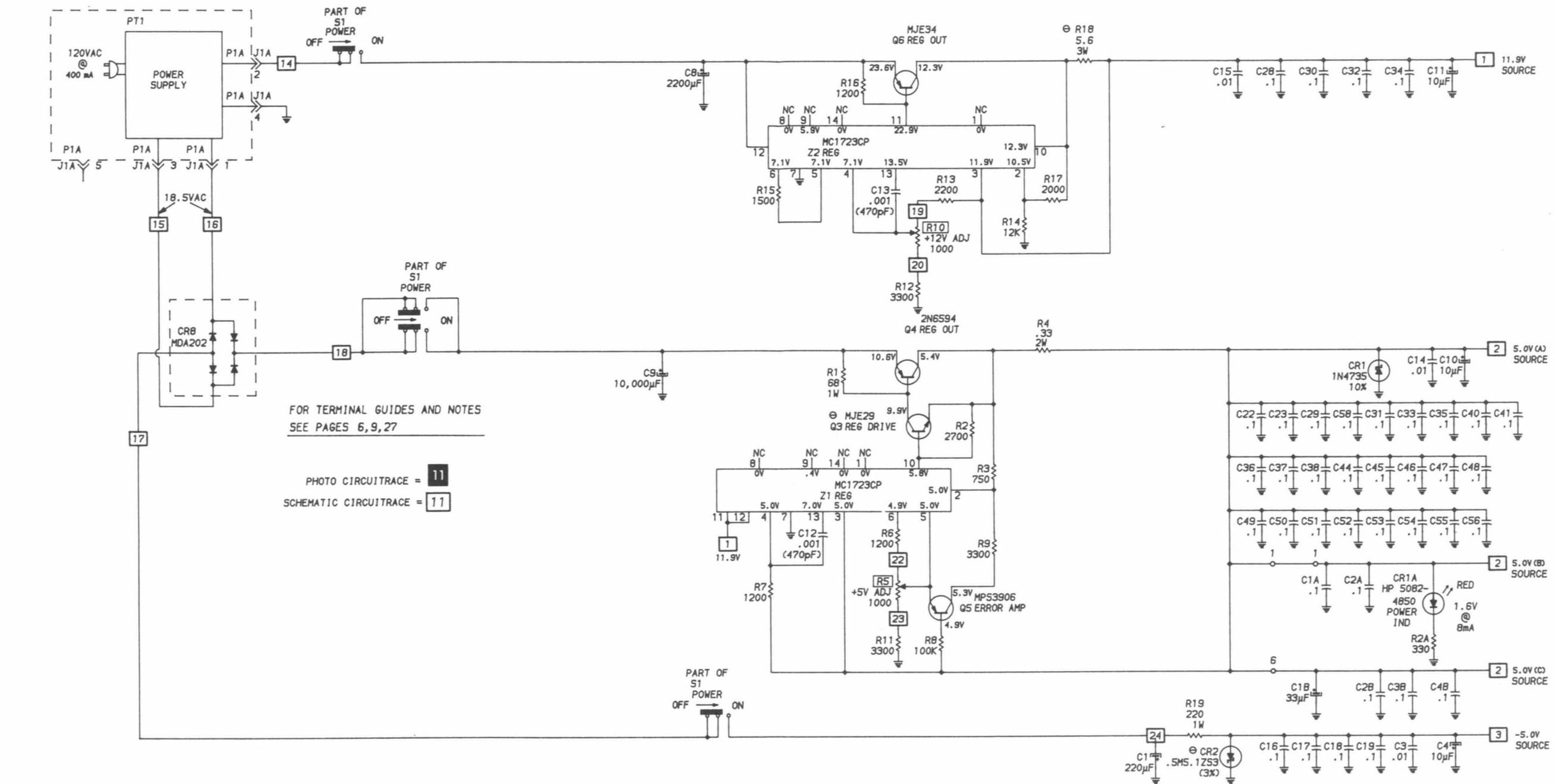
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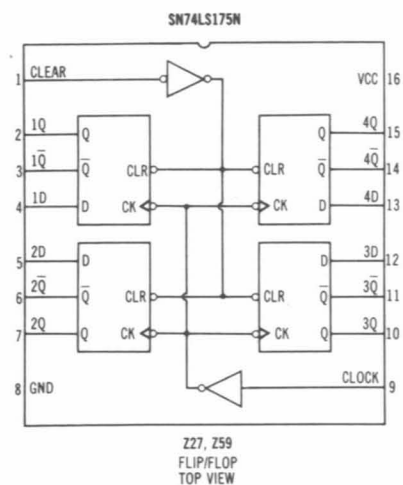
DISASSEMBLY INSTRUCTIONS

CABINET REMOVAL

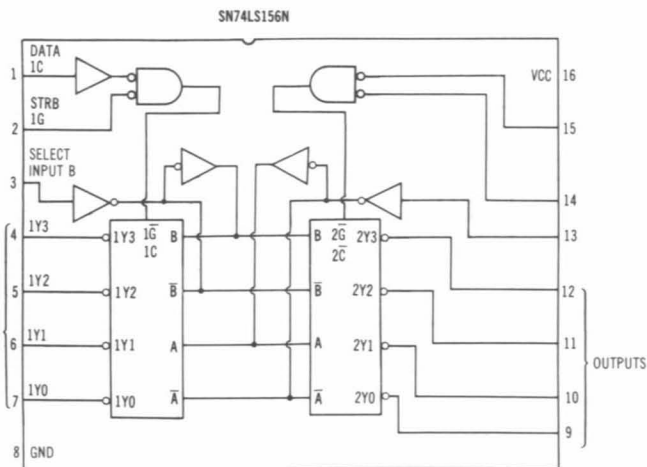
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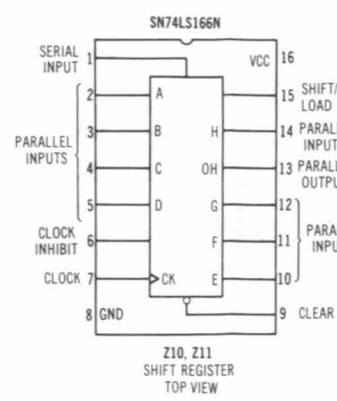
TERMINAL GUIDES & IC PINOUTS



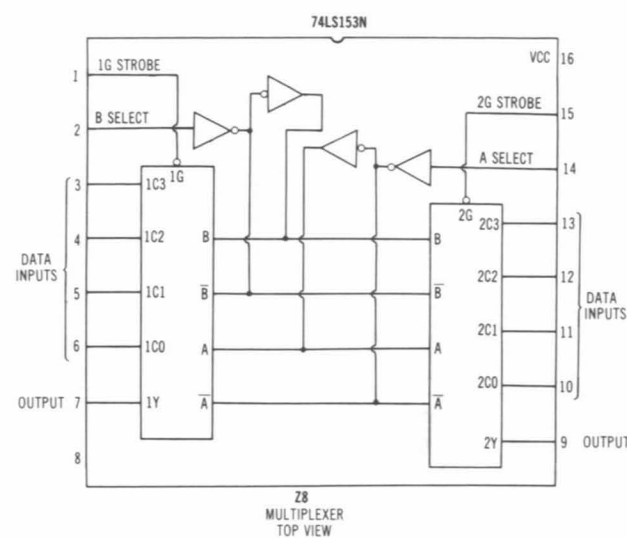
Z27, Z59
FLIP/FLOP
TOP VIEW



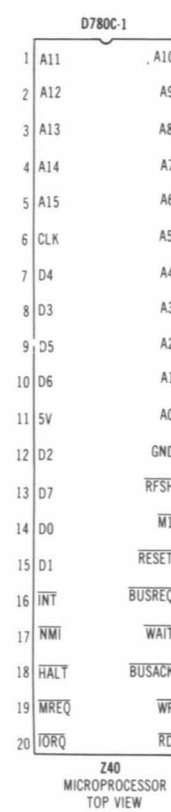
Z21
DECODER
TOP VIEW



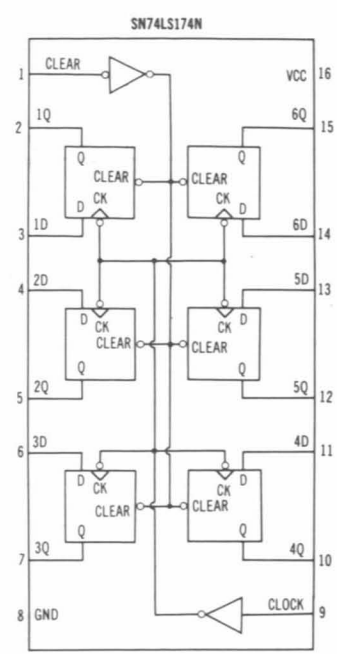
Z10, Z11
SHIFT REGISTER
TOP VIEW



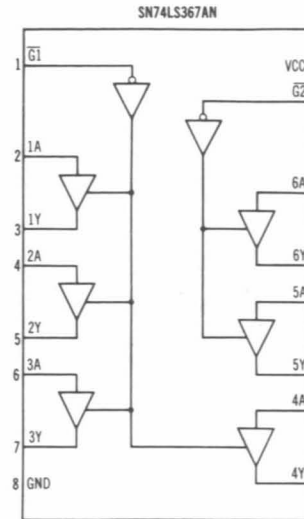
Z8
MULTIPLEXER
TOP VIEW



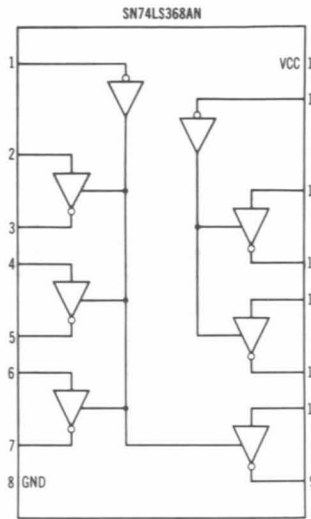
Z40
MICROPROCESSOR
TOP VIEW



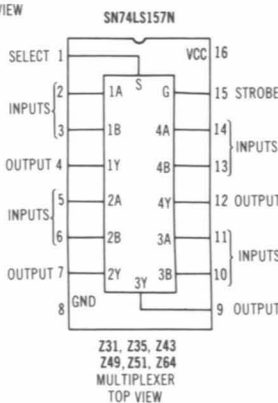
Z28
FLIP/FLOP
TOP VIEW



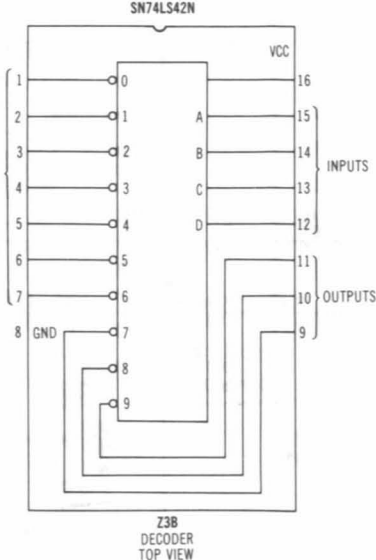
Z22, Z38, Z39, Z44,
Z55, Z60, Z67, Z68,
Z72, Z75, Z76
TRI-STATE BUFFER
TOP VIEW



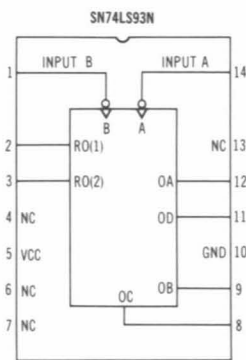
Z3A, Z4A
TRI-STATE INVERTER
TOP VIEW



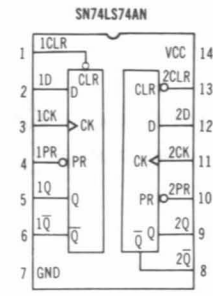
Z31, Z35, Z43
Z49, Z51, Z64
MULTIPLEXER
TOP VIEW



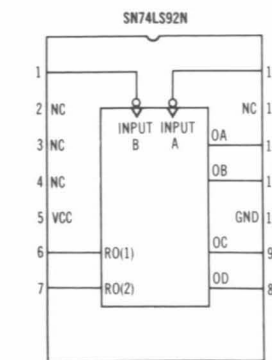
Z3B
DECODER
TOP VIEW



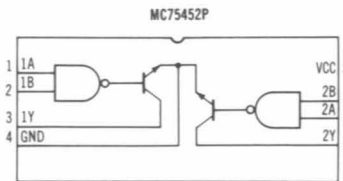
Z12, Z32, Z50, Z65
COUNTER
TOP VIEW



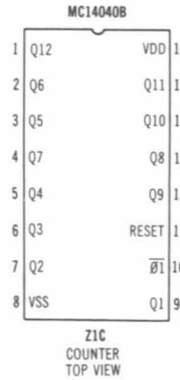
Z7, Z69, Z70
FLIP/FLOP
TOP VIEW



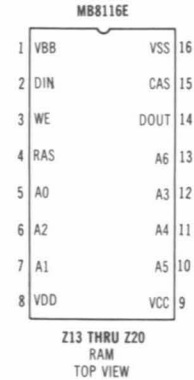
Z56, Z58
DIVIDE BY 6,
DIVIDE BY 12
TOP VIEW



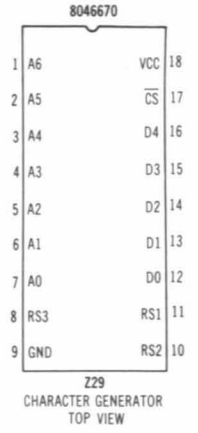
Z41
DRIVER
TOP VIEW



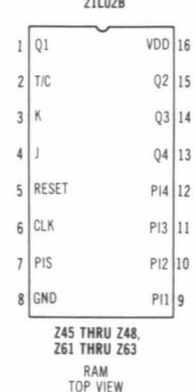
Z1C
COUNTER
TOP VIEW



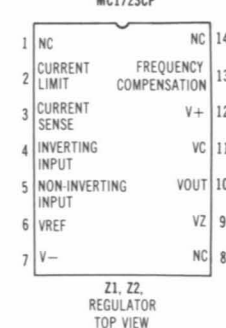
Z13 THRU Z20
RAM
TOP VIEW



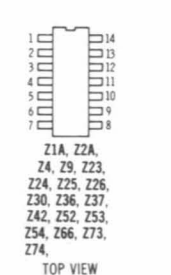
Z29
CHARACTER GENERATOR
TOP VIEW



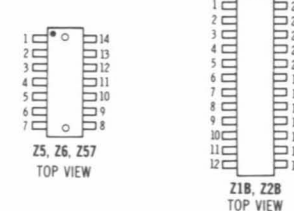
Z45 THRU Z48,
Z61 THRU Z63
RAM
TOP VIEW



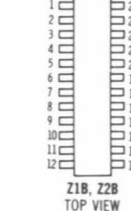
Z1, Z2
REGULATOR
TOP VIEW



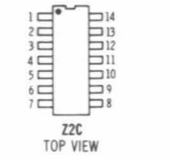
Z1A, Z2A,
Z4, Z9, Z23,
Z30, Z36, Z37,
Z42, Z52, Z53,
Z54, Z66, Z73,
Z74,
TOP VIEW



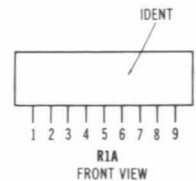
Z5, Z6, Z57
TOP VIEW



Z1B, Z2B
TOP VIEW



Z2C
TOP VIEW



R1A
FRONT VIEW

TROUBLESHOOTING

POWER SUPPLY

Computer is dead. Disconnect the Power Supply (PT1) from the CPU Board. Check for 18.5VAC between pin 1 and pin 3 of Connector J1A and 23.6V between pin 4 and pin 2 of Connector J1A. If the voltages are missing, check the cable and connections at Connector J1A and check for open AC power cord. If the correct voltages are present, reconnect the Power Supply to the CPU Board and turn On the Computer. Check for 5.0V at pin 3 of Regulator IC (Z1), 11.9V at pin 3 of Regulator IC (Z2) and -5.0V at the anode of Zener Diode CR2. If all the voltages are missing, check the Power Switch (S1).

If 5.0V is missing, check the voltages and components associated with Regulator Output Transistor (Q4), Regulator Drive Transistor (Q3), Error Amp Transistor (Q5) and pins 2 thru 7, 10, 11 and 13 of IC Z1. If the 5.0V is incorrect, check the adjustment of the 5V Adjust Control (R5), refer to "Miscellaneous Adjustments".

If the 11.9V is missing, check the voltages and components associated with Regulator Output Transistor (Q6) and pins 2 thru 7, 10, 11 and 13 of IC Z2. If the 11.9V is incorrect, check the adjustment of the 12V Adjust Control (R10).

If the -5.0V is missing, check Resistor (R19), Zener Diode CR2 and check for possible short to ground.

MICROPROCESSOR (CPU) OPERATION

Check the 1.774MHz clock waveform at pin 6 of Microprocessor IC (Z40). If the waveform is missing or off frequency, refer to the "CPU Clock and Divider" section of this Troubleshooting guide.

If the waveform is normal, check the operation of the reset signal at pin 26 of IC Z40. The logic reading at pin 26 should be Low for approximately .1 second when the Computer is turned On and then change to and remain High. If the logic reading is incorrect, check Capacitor C42, Resistor R47 and check ICs Z52 and Z53 by substitution.

If the logic reading at pin 25 of IC Z40 is Low, the data lines (pins 7 thru 10 and 12 thru 15 of IC Z40) and address lines (pins 1 thru 5 and 30 thru 40 of IC Z40) will be disabled. When disabled the logic readings for the data lines are High and the address lines are Open (No lights On). The logic readings at the inputs and outputs of the address line buffers, Tri-State Buffer ICs (Z22, Z38, Z39 and Z55), will also read Open (No lights On). If the logic reading at pin 25 of IC Z40 is Low, check Resistor R58 and check for a possible short to ground. The data and address lines from IC Z40 can be checked by grounding pin 25 of IC Z40 and checking the logic readings for High on the data lines and for Open (No lights On) on the address lines.

If IC Z40 appears to start operating when the computer is turned On and suddenly stops, pulses appear on data lines then suddenly stop, check ROM A/B IC (Z1B) RAM ICs (Z13 thru Z20) by substitution.

CPU CLOCK AND DIVIDER

Verify that the CPU Clock is operating properly by checking for a frequency of 10.6445MHz at pin 6 of IC Z42. If the clock is off frequency, check 10.6445MHz Crystal (Y1) and Capacitor C43. If the clock is not operating, check Crystal Y1, Capacitor C43, Resistors R46 and R52 and check IC Z42 by substitution.

The 10.6445MHz clock is divided by six by the Divide By 6 IC (Z56) to supply the 1.774MHz clock, pin 8 of IC Z56, and fed to pin 6 of Microprocessor IC (Z40). Check for a frequency of 1.774MHz at pin 8 of IC Z56. If the frequency is incorrect or the signal is missing, check the logic reading at pin 6 of IC Z56 for a Low. If the logic reading at pin 6 is High, check Resistor R67 and check IC Z42 by substitution. If the logic reading at pin 6 is Low, check IC Z56 by substitution. Check for pulses at pin 6 of IC Z40. If pulses are missing, check Resistor R64 and check Tri-State Buffer IC (Z72) by substitution.

VIDEO

No video on the Monitor screen. Check the waveform at the emitter of the Video Output Transistor (Q1). If the waveform is normal, check the Video Connector (J2) for good connection and check the video cable.

If the waveform is missing at the emitter of Transistor Q1, check for a video signal at pin 5 of Driver IC (Z41). If the signal is present at pin 5 of IC Z41, check the voltages and components associated with Transistor Q1. If signal is missing at pin 5 of IC Z41, check for a video signal at pin 6 of IC Z41. If the signal is present, check IC Z41 by substitution. If the signal is missing from pin 6 of IC Z41, check the waveform at pin 3 of IC Z30.

If the waveform is present at pin 3 of IC Z30 and the logic reading at pin 2 of IC Z30 is Low, check IC Z30 by substitution. If the logic reading at pin 2 of IC Z30 is High, check the Shift Reg (Register) IC (Z11) by substitution. If the waveform is missing at pin 3 of IC Z30, check the waveform at pin 15 of Shift Reg (Register) IC (Z10) and check for pulses at pins 4, 5, 10, 11 and 12 of IC Z10. If the waveform and pulses are present, check IC Z10 by substitution.

Video display does not operate in the 32 character mode. Type and run the following Basic program and check for pulses at pins 9 and 14 of Flip/Flop IC (Z59).

```
10 OUT 255,8: OUT 255,0: GOTO 10
```

If pulses are missing at pin 9 of IC Z59, check for pulses at pins 9 and 10 of IC Z25. If pulses are missing from pin 9 of IC Z25, check Tri-State Buffer IC (Z22) and ICs Z23 and Z52 by substitution. If pulses are missing from pin 10 of IC Z25, check ICs Z36, Z52 and Z54 by substitution. If pulses are present at pin 9 and 10 of IC Z25, check IC Z25 by substitution.

If pulses are present at pin 9 of IC Z59 and missing at pin 14 of IC Z59, check IC Z59 by substitution. If pulses are present at pin 14 of IC Z59, check Mux (Multiplexer) IC (Z43) by substitution.

TROUBLESHOOTING (Continued)

VIDEO RAM

The following Basic program can be used to check the RAM ICs (Z45 thru Z48 and Z61 thru Z63). The program checks each bit of RAM and displays on the Monitor screen any defective bit found. If a Printer is connected to the Computer, the bad bit message can be sent to the Printer by changing the word PRINT in lines 130 and 150 to the word LPRINT.

VIDEO RAM TEST PROGRAM

```
5 DATA 1, 2, 4, 8, 16, 32, 128
10 Y=6: X=15360: POKE X,64
20 IF (PEEK (X) AND 64)=64 THEN 30 ELSE 150
30 POKE X,160
40 IF (PEEK (X) AND 64)=0 THEN 50 ELSE 150
50 FOR X=15360 TO 16383
60 FOR Y=0 TO 6
70 READ Z: POKE X,Z
80 IF (PEEK (X) AND Z)=Z THEN 90 ELSE 140
90 POKE X,0
100 IF (PEEK (X) AND Z)=0 THEN 110 ELSE 140
110 NEXT Y
120 RESTORE : NEXT X
130 PRINT "MEMORY GOOD" : END
140 IF Y=6 THEN Y=7
150 PRINT "BIT"; Y; "OF MEMORY LOCATION"; X;
    "CHECKS BAD"
160 IF Y=6 THEN 50 ELSE 110
```

The bit number that each RAM IC produces is noted on the schematic. If the program finds a bad bit, check the schematic for the RAM IC that produces that bit and check that RAM IC by substitution.

NOTE: No RAM IC is used for bit 6. Bit 6 is produced by comparing bits 5 and 7 with a NOR Gate IC Z30. If the program indicates bit 6 is bad and bits 5 and 7 are good, check IC Z30 by substitution.

Tri-State Buffer ICs (Z44 and Z60) are used to connect the RAM IC outputs to the data lines. If a bad bit is found and the RAM IC checks good, check the Tri-State Buffer associated with the defective bit by substitution.

VIDEO SYNC

No vertical sync. Check the waveform at pin 11 of Counter IC (Z32). If the waveform is missing, check IC Z32 by substitution. If the waveform is present, check the waveform at pin 8 of IC Z57. If the waveform is missing at pin 8, check the Vertical Center Control (R21), Capacitors C26 and C27 and check IC Z57 by substitution. If the waveform is present at pin 8, check IC Z5 by substitution.

No horizontal sync. Check the waveform at pin 11 of Counter IC (Z50). If the waveform is missing, check IC Z50 by substitution. If the waveform is present, check the waveform at pin 8 of IC Z6. If the waveform is missing at pin 8, check the Horizontal Center Control (R20), Capacitors C20 and C21 and check IC Z6 by substitution. If the waveform is present at pin 8 of IC Z6, check IC Z5 by substitution.

No vertical or horizontal sync. Check the waveforms at pin 8 of IC Z5. If the waveforms are missing, check IC Z5 by substitution. If the waveforms are present, check Resistors R28 and R29 and Sync Amp Transistor (Q2).

KEYBOARD

Keyboard is not functioning. Check the ribbon cable between Keyboard and CPU Board for open circuits. If the ribbon cable checks good, check for pulses at pin 11 of IC Z36. If pulses are missing, check IC Z36 by substitution.

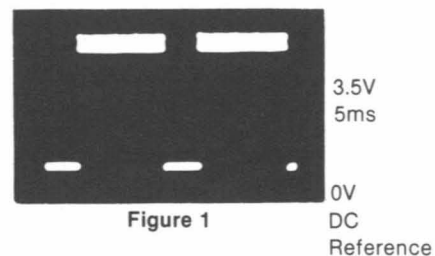
If a group of keys are not functioning, check the pins of ICs Z1A and Z2A and Tri-State Inverter ICs (Z3A and Z4A) connected to the keys not functioning. Also check the ribbon cable for open circuits.

If a single key does not function, check the key contacts with an ohmmeter. If the key is erratic and intermittent in operation, clean the contacts with a spray contact cleaner.

If a wrong character shows up on the Monitor screen when an alpha or numeric key is pressed, check the video RAM, refer to the "Video RAM" section of this Troubleshooting guide and check Flip/Flop IC (Z28) and Character Generator IC (Z29) by substitution.

CASSETTE

Computer will not save programs onto tape or will not turn On the cassette motor. Type and run the following Basic program. The program will produce the waveform shown in Figure 1 at pin 2 of Flip/Flop IC Z59 and will toggle On and Off Motor Control Relay (K1) on the CPU Board and Relay (K1) on the Expansion Interface Board.



```
10 FOR X=1 TO 100
20 OUT 255,3: OUT 255,0
30 NEXT X
40 OUT 255,4: POKE 14308,0
50 FOR X=1 TO 100
60 OUT 255,7: OUT 255,4
70 NEXT X
80 POKE 14308,1: GOTO 10
```

If the Cassette Motor is not switching On, listen for a clicking sound from Relay K1 on the CPU Board. If the Relay is clicking, check Relay K1 contacts with an ohmmeter and check the connections at pins 1 and 3 of Connector J3. If Relay K1 is not clicking, check the logic reading at pin 1 of Driver IC (Z41). The logic reading should be toggling between Low and High. If the logic reading is correct, check for a logic reading that toggles between Low and High at pin 3 of IC Z41. If the logic reading is incorrect at pin 3 of IC Z41, check IC Z41 by substitution. If the logic reading is correct at pin 3, check Relay K1 and Diode CR3. If the reading at pin 1 of IC Z41 is incorrect, check for pulses at pin 9 of Flip/Flop IC (Z59). If pulses are present at pin 9,

TROUBLESHOOTING (Continued)

check IC Z59 by substitution. If pulses are missing at pin 9, check IC Z25 by substitution.

If the Cassette Motor runs all the time, check for sticking relay contacts and check for possible shorted Zener Diodes CR9 and CR10.

If the Computer will not save programs onto tape, check for the waveform shown in Figure 1 at pin 2 of IC Z59. If the waveform is present, check Resistors R53, R54 and R55 and check pin 5 of Connector J3 for good connection. If the waveform is missing at pin 2 of IC Z59, check for pulses at pin 9 of IC Z59. If pulses are missing, check IC Z25 by substitution. If pulses are present at pin 9 of IC Z59, check IC Z59 by substitution.

If the Computer will not load a program from tape, connect a 2V p-p, 1kHz sinewave audio signal to pin 4 of Connector J3. Type and run the following Basic program.

```
10 X = INT(255)
20 PRINT "X = "; X
30 OUT 255,0: GOTO 10
```

The number X that appears on the Monitor screen should be 255 when the 1kHz signal is injected at pin 4 of Connector J3 and 127 with no signal injected. If the numbers are incorrect, check for pulses at pin 10 of IC Z4. If pulses are missing, check the voltages and components associated with pins 1 thru 14 of IC Z4.

If pulses are present at pin 10 of IC Z4 and the cassette modification Counter IC (Z1C) and IC Z2C has been added, check for pulses at pin 9 of IC Z24. If pulses are missing at pin 9, check Diodes CR200 and CR201, Resistor R200 and check ICs Z1C and Z2C by substitution. If pulses are present at pin 9 of IC Z24, check for pulses at pins 8 and 13 of IC Z24 and pins 9 and 10 of IC Z25. If pulses are missing from pin 9 of IC Z25, check Tri-State Buffer IC (Z22), Microprocessor IC (Z40) and ICs Z23 and Z52 by substitution. If pulses are missing at pin 10 of IC Z25, check ICs Z36, Z52 and Z54 by substitution.

If pulses are present at pins 9 and 10 of IC Z25 and missing at pin 13 of IC Z24, check IC Z25 by substitution. If pulses are present at pin 13 of IC Z24 and missing at pin 8 of IC Z24, check IC Z24 by substitution.

If pulses are present at pin 8 of IC Z24, check for pulses at pin 6 of IC Z25. If pulses are present at pin 6 of IC Z25, check Tri-State Buffer IC (Z44) by substitution. If pulses are missing at pin 6 of IC Z25, check for pulses at pin 4 of IC Z25. If pulses are present at pin 4 of IC Z25, check IC Z25 by substitution. If pulses are missing at pin 4 of IC Z25, check ICs Z22, Z23, Z52 and Z40 by substitution.

If Relay K1 on the Expansion Interface Board is not operating, refer to the "Cassette" section of the Troubleshooting guide in the Expansion Interface Folder CSCS3-A.

SCHEMATIC NOTES

- *— Circuitry not used in some versions
 - Circuitry used in some versions
 - ⊖ See parts list
 - ⊕ Ground
- Item numbers in rectangles appear in the alignment/adjustment instructions.
- Supply voltage maintained as shown at input.
- Voltages measured with digital meter.
- Voltages and Waveforms taken with computer in Power Up mode (Main title screen displayed) unless otherwise 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 9 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.
- Terminal identification may not be found on unit.
- Resistors are $\frac{1}{2}\text{W}$ or less, 10% unless noted.
- Value in () used in some versions.

NOTE: Logic probe readings taken with computer in Power Up mode (Main title screen displayed) unless otherwise noted.

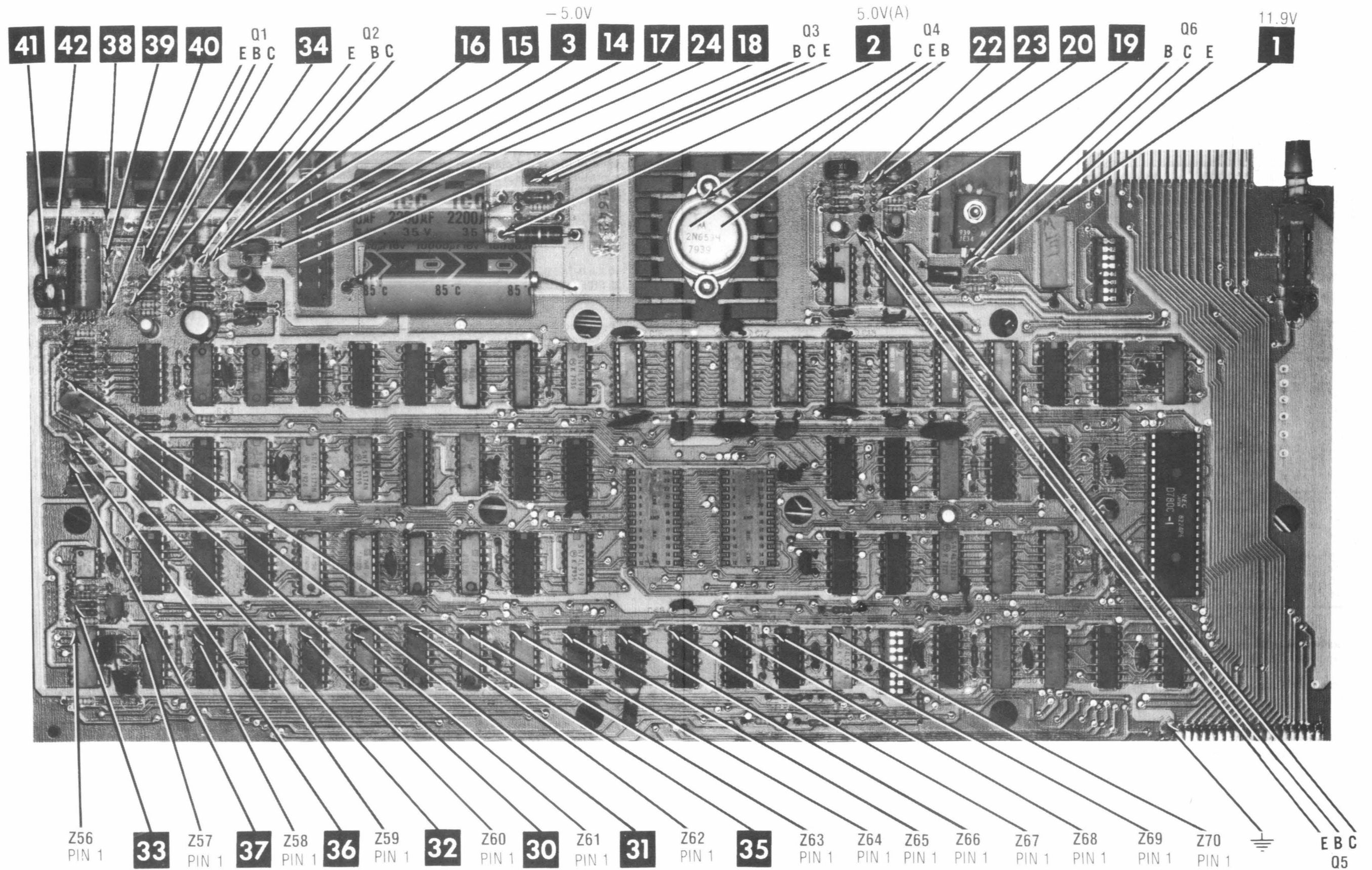
Logic Probe Display

L = Low

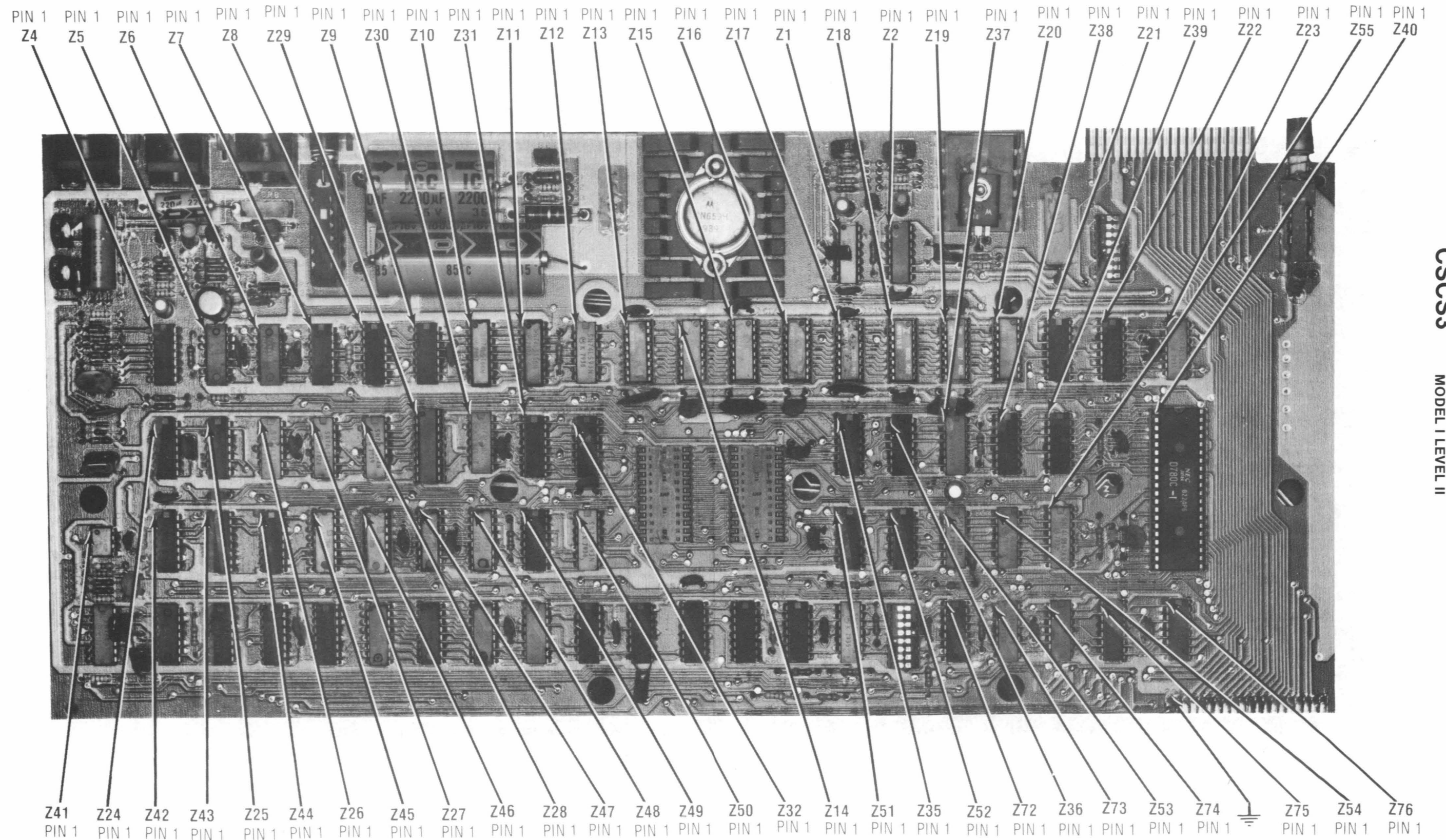
H = High

P = Pulse

* = Open (no light on)

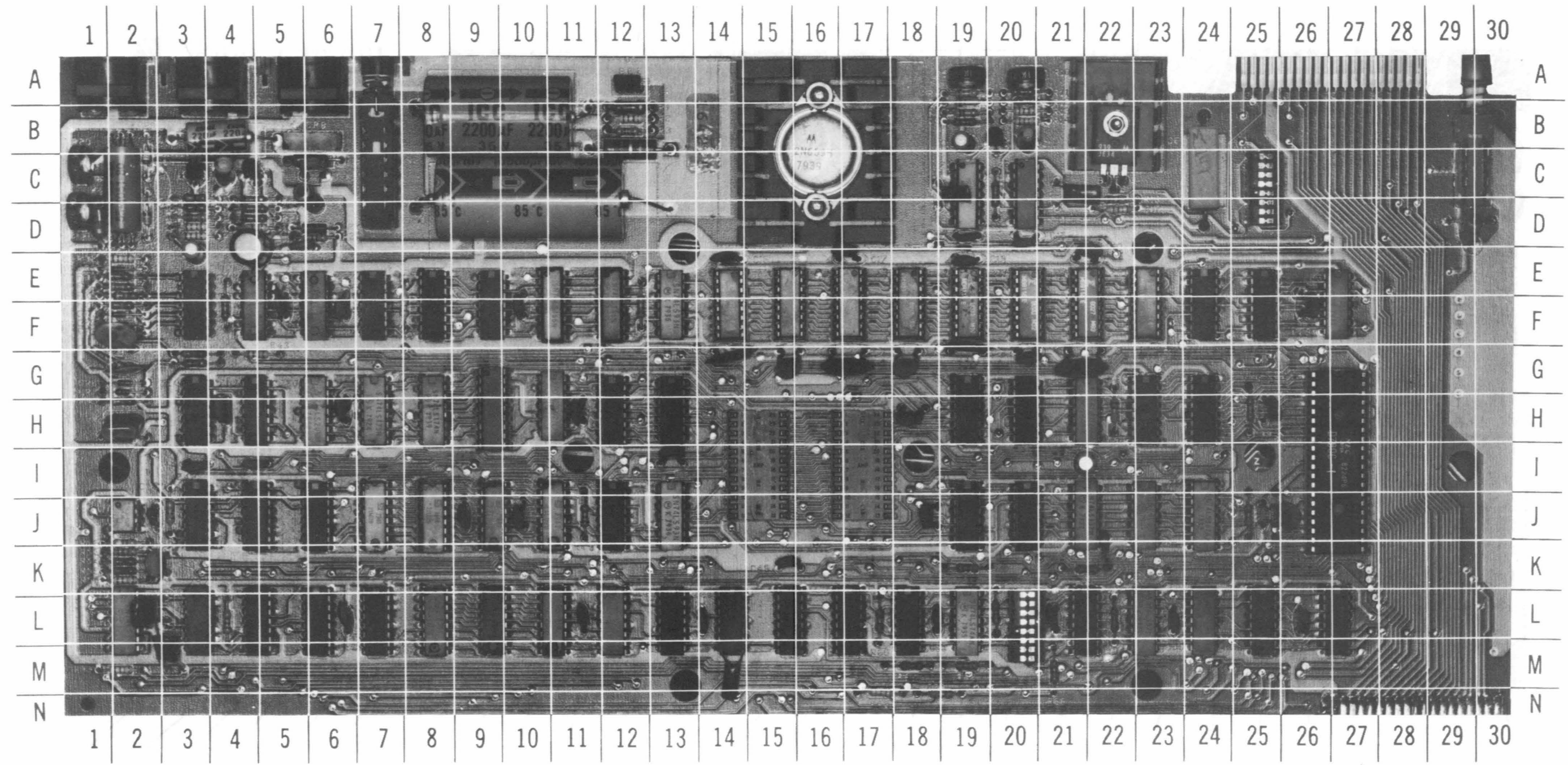


RADIO SHACK TRS-80
MODEL I LEVEL II



CPU BOARD

CPU BOARD

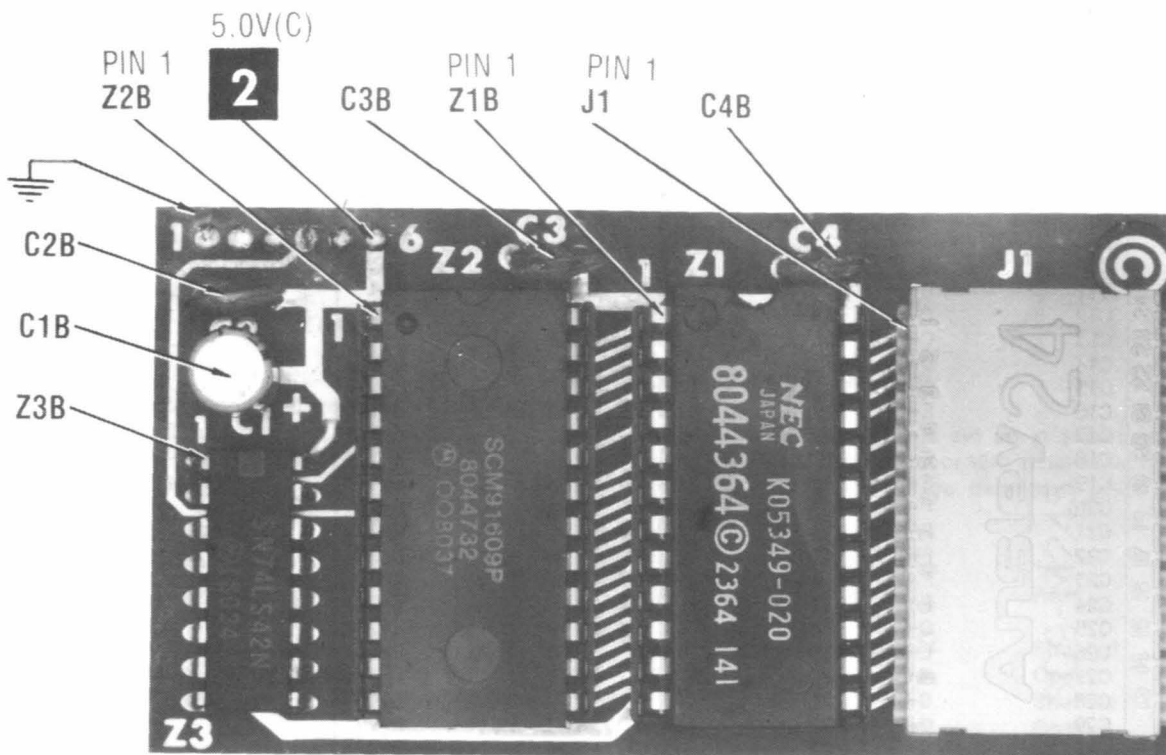


RADIO SHACK TRS-80
MODEL I LEVEL II

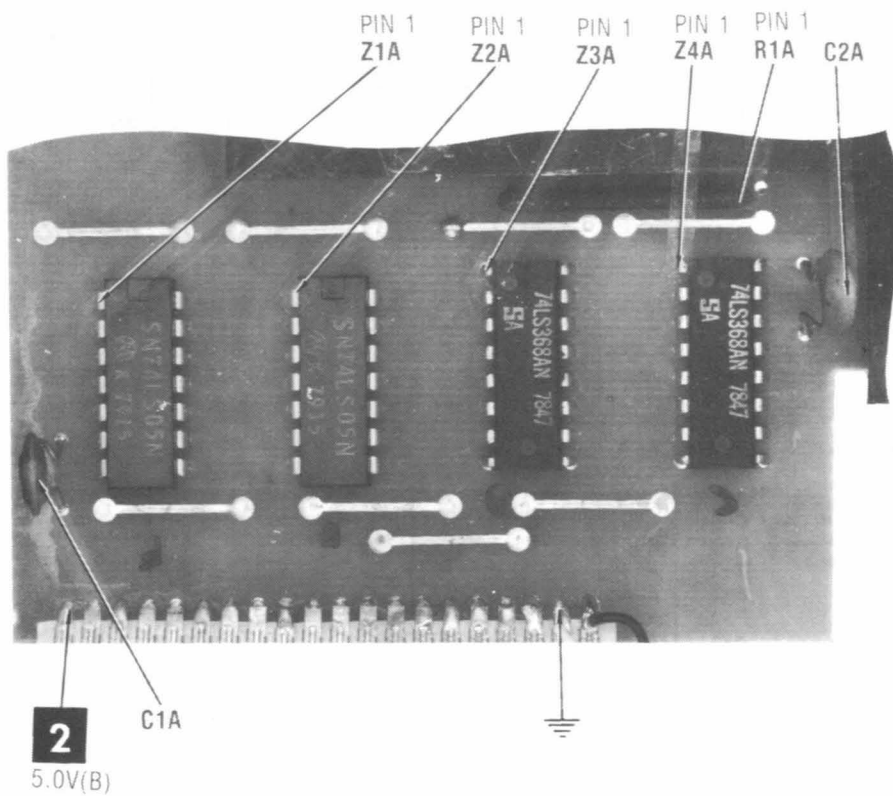
CPU BOARD GridTrace LOCATION GUIDE

C1	B-4	K1	C-2	R67A	D-1	Z70	L-19
C2	C-4	Q1	C-3	R68	N-18	Z71	L-20
C3	C-6	Q2	C-4	R69	N-17	Z72	L-21
C4	C-5	Q3	A-12	S1	B-7	Z73	L-23
C5	D-3	Q4	B-16	S2	B-29	Z74	L-24
C6	D-4	Q5	B-20	Y1	H-2	Z75	L-25
C7	D-5	Q6	B-22	Z1	C-19	Z76	L-27
C8	B-9	R1	B-12	Z2	C-20		
C9	C-9	R2	B-12	Z3	C-25		
C10	B-19	R3	B-12	Z4	E-3		
C11	B-20	R4	B-12	Z5	E-4		
C12	C-19	R5	A-19	Z6	E-6		
C13	C-21	R6	A-19	Z7	E-7		
C14	D-19	R7	A-19	Z8	E-8		
C15	D-20	R8	B-19	Z9	E-9		
C16	E-14	R9	B-19	Z10	E-11		
C17	E-17	R10	A-20	Z11	E-12		
C18	E-19	R11	A-20	Z12	E-13		
C19	E-22	R12	A-20	Z13	E-14		
C20	F-5	R13	B-20	Z14	E-15		
C21	F-6	R14	B-20	Z15	E-17		
C22	F-10	R15	C-20	Z16	E-18		
C23	F-26	R16	D-22	Z17	E-19		
C24	F-2	R17	D-22	Z18	E-20		
C25	G-2	R18	C-24	Z19	E-21		
C26	L-2	R19	C-5	Z20	E-23		
C27	M-3	R20	C-1	Z21	E-24		
C28	G-14	R21	D-1	Z22	E-25		
C29	G-15	R22	C-3	Z23	E-27		
C30	G-17	R23	D-3	Z24	G-3		
C31	G-18	R24	D-3	Z25	G-4		
C32	F-19	R25	D-3	Z26	G-6		
C33	G-20	R26	D-3	Z27	G-7		
C34	G-21	R27	D-4	Z28	G-8		
C35	H-4	R28	D-4	Z29	G-9		
C36	H-6	R29	C-4	Z30	G-10		
C37	H-11	R30	D-4	Z31	G-12		
C38	H-25	R31	D-6	Z32	G-13		
C39	I-3	R32	E-2	Z35	G-19		
C40	I-4	R33	E-2	Z36	G-20		
C41	I-13	R34	E-2	Z37	G-21		
C42	I-21	R35	E-2	Z38	G-23		
C43	J-2	R36	F-2	Z39	G-24		
C44	J-9	R37	F-2	Z40	G-26		
C45	J-10	R38	F-4	Z41	J-2		
C46	J-18	R40	F-12	Z42	I-3		
C47	J-26	R41	G-3	Z43	I-4		
C48	K-2	R42	G-3	Z44	I-6		
C49	K-15	R43	G-4	Z45	I-7		
C50	L-6	R44	M-2	Z46	I-8		
C51	L-11	R45	H-2	Z47	I-9		
C52	L-14	R46	H-2	Z48	I-11		
C53	L-18	R47	H-22	Z49	I-12		
C54	L-21	R48	H-25	Z50	I-13		
C55	L-23	R49	J-11	Z51	I-19		
C56	L-26	R50	J-25	Z52	I-20		
C57	D-29	R51	J-26	Z53	I-21		
C58	H-18	R52	J-2	Z54	I-23		
C59	M-14	R53	K-2	Z55	I-24		
C60	J-22	R54	K-2	Z56	L-2		
CR1	C-9	R55	K-2	Z57	L-3		
CR2	D-6	R56	K-2	Z58	L-4		
CR3	E-2	R57	K-19	Z59	L-6		
CR4	F-2	R58	K-22	Z60	L-7		
CR5	F-2	R59	L-4	Z61	L-8		
CR6	G-2	R60	L-17	Z62	L-9		
CR7	G-2	R61	M-18	Z63	L-11		
CR8	B-6	R62	M-19	Z64	L-12		
CR9	C-2	R63	L-20	Z65	L-13		
CR10	D-2	R64	L-22	Z66	L-14		
J1A	A-6	R65	D-29	Z67	L-15		
J2	A-4	R66	M-21	Z68	L-17		
J3	A-1	R67	J-3	Z69	L-18		

CSCS3
RADIO SHACK TRS-80
MODEL I LEVEL II



LEVEL II ROM BOARD A Howard W. Sams **CIRCUITRACE®** Photo



PARTIAL KEYBOARD A Howard W. Sams **CIRCUITRACE®** Photo

PARTS LIST AND DESCRIPTION

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						ZENITH PART No.
			GENERAL ELECTRIC PART No.	NEW-TONE NTE PART No.	PHILIPS ECG PART No.	RCA PART No.	WORKMAN PART No.		
CR1	1N4735	4800021	GEZD-6.2	NTE137A	ECG137A	SK6V2/137A	WEP154/137	103-Z9008	
CR2	.5M5.1ZS3	4800022	GEZD-5.1	NTE5010A	ECG5010A	SK5A1/5010A	WEP141/5010	103-279-10	
CR3 thru CR7	1N5231	4800002	GEZD-5.1	NTE5010A	ECG5010A	SK5A1/5010A	WEP141/5010	103-279-10	
	1N4148		GE-514	NTE519	ECG519	SK3100/519	WEP925/519	103-131	
CR8	MDA202	4800023	GE-167	NTE167	ECG167	SK3647/167	WEP1052/167	212-Z9001	
CR9, 10	3N255(1)		GE-167	NTE167	ECG167	SK3647/167	WEP1052/167	212-Z9001	
	1N982A	4800026	GEZD-75	NTE5046A	ECG5046A	SK75A/5046A	WEP1452/5046		
CR200, 201	1N982	4800002	GEZD-75	NTE5046A	ECG5046A	SK75A/5046A	WEP1452/5046		
	1N4148		GE-514	NTE519	ECG519	SK3100/519	WEP925/519	103-131	
Q1	MPS3904	4822001	GE-123AP	NTE123AP	ECG123AP	SK3854/123AP	WEP736/123A	121-Z9000A	
Q2	2N3904	4822003	GE-123AP	NTE123AP	ECG123AP	SK3854/123AP	WEP736/123A	121-Z9000A	
Q3	MPS3906	4822003	GE-82	NTE159	ECG159	SK3466/159	WEP62/159	121-Z9003	
	MJE29	4820004	GE-241	NTE196	ECG196	SK3054/196	WEP756/196	121-987-03	
Z1	TIP29		GE-302	NTE291	ECG291	SK3440/291	WEP780/291	121-Z9047	
	TIP29A		GE-302	NTE291	ECG291	SK3440/291	WEP780/291	121-Z9047	
Q4	2N6594	4824003	GE-74	NTE219	ECG219	SK3173/219	WEP760/219	121-Z9058	
Q5	MPS3906	4822003	GE-82	NTE159	ECG159	SK3466/159	WEP62/159	121-Z9003	
Q6	MJE34	4824002	GE-69A	NTE153	ECG153	SK3274/153	WEP746/153	121-988-03	
Z1	MC1723CP	3100001	GE1C-260	NTE9230	ECG9230	SK3165/9230	WEP2331/9230	121-Z9020	
Z1A	SN74LS05N	3102009	74LS05	NTE74LS05	ECG74LS05	SK74LS05		HE-443-818	
Z1B	8044364(3)								
Z1C	MC14040B	3100001	GE-4040	NTE4040B	ECG4040B	SK4040B		HE-443-760	
Z2	MC1723CP	3102009	GE1C-260	NTE9230	ECG9230	SK3165/9230	WEP2331/9230	221-Z9020	
Z2A	SN74LS05N		74LS05	NTE74LS05	ECG74LS05	SK74LS05		HE-443-818	
Z2B	8044732								
Z2C	MC14001B	3102025	GE-4001	NTE4001B	ECG4001B	SK4001B	WEP2272/4001B	905-125	
Z3A	74LS368AN		74LS368A	NTE74LS368	ECG74LS368			HE-443-807	
Z3B	SN74LS42N		74LS42	NTE74LS42	ECG74LS42	SK74LS42		HE-442-71	
Z4	MC3401P	3100002		NTE992	ECG992	SK3688/992		HE-442-71	
	LM3900								
Z4A	74LS368AN	3102025	74LS368	NTE74LS368	ECG74LS368			905-233	
Z5	MM74C00N	3102026		NTE74C00	ECG74C00			905-260	
Z6	MM74C04N	3102027		NTE74C04	ECG74C04			HE-443-730	
	CD4069N(1)			NTE4069	ECG4069	SK4069UB	WEP4069/4069		
Z7	SN74LS74AN	3102015	74LS74A	NTE74LS74A	ECG74LS74A	SK74LS74A			

CSCS3

**RADIO SHACK TRS-80
MODEL I LEVEL II**

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					ZENITH PART No.
			GENERAL ELECTRIC PART No.	NEW-TONE NTE PART No.	PHILIPS ECG PART No.	RCA PART No.	WORKMAN PART No.	
Z8	SN74LS153N	3102019	74LS153	NTE74LS153	ECG74LS153	SK74LS153		HE-443-755
Z9	SN74LS04N	3102008	74LS04	NTE74LS04	ECG74LS04	SK74LS04		HE-443-892
Z10, 11	SN74LS166N	3102021	74LS166		ECG74LS166			
Z12	SN74LS93N	3102017	74LS93	NTE74LS93	ECG74LS93	SK74LS93		
Z13 thru	MB81 16E	3108009		NTE2117	ECG2117			HE-443-904
Z20		3108003(2)						
Z21	SN74LS156N	3102028			ECG74LS156	SK74LS156		
Z22	SN74LS367AN	3102024	74LS367A	NTE74LS367	ECG74LS367	SK74LS367		HE-443-857
Z23	SN74LS32N	3102014	74LS32	NTE74LS32	ECG74LS32	SK74LS32		HE-443-875
Z24	SN74LS132N	3102018	74LS132	NTE74LS132	ECG74LS132			HE-443-879
Z25	SN74LS32N	3102014	74LS32	NTE74LS32	ECG74LS32	SK74LS32		HE-443-875
Z26	SN74LS20N	3102011	74LS20	NTE74LS20	ECG74LS20	SK74LS20		HE-443-798
Z27	SN74LS175N	3102023	74LS175	NTE74LS175	ECG74LS175	SK74LS175		HE-443-752
Z28	SN74LS174N	3102022	74LS174	NTE74LS174	ECG74LS174	SK74LS174		HE-443-879
Z29	8046670							
Z30	MCM6670P	3108001						HE-443-779
Z31	SN74LS02N	3102007	74LS02	NTE74LS02	ECG74LS02	SK74LS02		HE-443-799
Z32	SN74LS157N	3102020	74LS157	NTE74LS157	ECG74LS157	SK74LS157		
	SN74LS93N	3102017	74LS93	NTE74LS93	ECG74LS93	SK74LS93		
Z35	SN74LS157N	3102020	74LS157	NTE74LS157	ECG74LS157	SK74LS157		HE-443-799
Z36	SN74LS32N	3102014	74LS32	NTE74LS32	ECG74LS32	SK74LS32		HE-443-875
Z37	SN74LS02N	3102007	74LS02	NTE74LS02	ECG74LS02	SK74LS02		HE-443-779
Z38, 39	SN74LS367AN	3102024	74LS367A	NTE74LS367	ECG74LS367	SK74LS367		HE-443-857
Z40	D780C-1				ECG3880	SK2880/3880		HE-443-881
Z41	Z80	3110001		NTE75452B	ECG3880	SK2880/3880		HE-443-881
	MC75452P	3106002		NTE75452B	ECG75452B			HE-443-74
	75452				ECG75452B			HE-443-74
Z42	SN74LS04N	3102008	74LS04	NTE74LS04	ECG74LS04	SK74LS04		HE-443-755
Z43	SN74LS157N	3102020	74LS157	NTE74LS157	ECG74LS157	SK74LS157		HE-443-799
Z44	SN74LS367AN	3102024	74LS367A	NTE74LS367	ECG74LS367	SK74LS367		HE-443-857
Z45 thru	21L02B			NTE2102	ECG2102			
Z48	2102AN-4L	3108002		NTE2102	ECG2102			

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					
			GENERAL ELECTRIC PART No.	NEW-TONE NTE PART No.	PHILIPS ECG PART No.	RCA PART No.	WORKMAN PART No.	ZENITH PART No.
Z49	SN74LS157N	3102020	74LS157	NTE74LS157	ECG74LS157	SK74LS157		HE-443-799
Z50	SN74LS93N	3102017	74LS93	NTE74LS93	ECG74LS93	SK74LS93		HE-443-799
Z51	SN74LS157N	3102020	74LS157	NTE74LS157	ECG74LS157	SK74LS157		HE-443-755
Z52	SN74LS04N	3102008	74LS04	NTE74LS04	ECG74LS04	SK74LS04		HE-443-879
Z53	SN74LS132N	3102018	74LS132	NTE74LS132	ECG74LS132			
Z54	SN74LS30N	3102013	74LS30	NTE74LS30	ECG74LS30	SK74LS30		HE-443-732
Z55	SN74LS367AN	3102024	74LS367A	NTE74LS367	ECG74LS367	SK74LS367		HE-443-857
Z56	SN74LS92N	3102016			ECG74LS92			
Z57	MM74C04N	3102027		NTE74C04	ECG74C04			905-233
	CD4069CN(1)			NTE4069	ECG4069	SK4069UB	WEP4069/4069	905-260
Z58	SN74LS92N	3102016			ECG74LS92			
Z59	SN74LS175N	3102023	74LS175	NTE74LS175	ECG74LS175	SK74LS175		HE-443-752
Z60	SN74LS367AN	3102024	74LS367A	NTE74LS367	ECG74LS367	SK74LS367		HE-443-857
Z61 thru	21L02B			NTE2102	ECG2102			
Z63	2102AN-4L	3108002		NTE2102	ECG2102			
Z64	SN74LS157N	3102020	74LS157	NTE74LS157	ECG74LS157	SK74LS157		HE-443-799
Z65	SN74LS93N	3102017	74LS93	NTE74LS93	ECG74LS93	SK74LS93		HE-443-864
Z66	SN74LS11N	3102010	74LS11	NTE74LS11	ECG74LS11	SK74LS11		HE-443-857
Z67, 68	SN74LS367AN	3102024	74LS367A	NTE74LS367	ECG74LS367	SK74LS367		HE-443-750
Z69, 70	SN74LS74AN	3102015	74LS74A	NTE74LS74A	ECG74LS74A	SK74LS74A		
Z72	SN74LS367AN	3102024	74LS367A	NTE74LS367	ECG74LS367	SK74LS367		HE-443-857
Z73	SN74LS32N	3102014	74LS32	NTE74LS32	ECG74LS32	SK74LS32		HE-443-875
Z74	SN74LS00N	3102006	74LS00	NTE74LS00	ECG74LS00	SK74LS00		HE-443-728
Z75, 76	SN74LS367AN	3102024	74LS367A	NTE74LS367	ECG74LS367	SK74LS367		HE-443-857

(1) Number on unit.

(2) Used in 4K versions.

(3) Z6a. 8044732 used in place of 8044364 in early version of Level II.

PARTS LIST AND DESCRIPTION (Continued)

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

CAPACITORS Items not listed are normally available at local distributors.

ITEM No.	RATING	MFGR. PART No.
C20	330 N470 50V 5%	1500062
C24	330 50V 10%	
	220 N220 50V 5%	1500061
	220 50V 10%	

ITEM No.	RATING	MFGR. PART No.
C25	220 N220 50V 5%	1500061
	220 50V 10%	

CONTROLS (All wattages ½ watt, or less, unless listed)

ITEM NO.	FUNCTION	RESISTANCE	MFGR. PART NO.	NOTES
R5	5V Adjust	1000	4750019	
R10	10V Adjust	1000	4750019	
R20	Horiz Center	100K	4750018	
R21	Vert Center	100K	4750018	

RESISTORS (Power and Special)

ITEM No.	RATING	REPLACEMENT DATA		
		MFGR. PART No.	NEW-TONE PART No.	WORKMAN PART No.
R1A R18	Resistor Network (1) 5.6 5% 3W WW	4717003		

(1) Contains nine 4700 10%.

MISCELLANEOUS

ITEM No.	PART NAME	MFGR. PART No.	NOTES
CR1A	LED	2400025	Power, Red (1.6V @ 8mA) Motor Control
K1	Relay	4500001	
PT1	Power Supply	4000004	Power Reset Key
S1	Switch	5102008	
S2	Switch	5102009	
SW47 thru SW99	Switch		
Y1	Crystal	2300004	10.6445MHz
Z1	Shunt	2100041	
Z71	Shunt	2100041	CPU Keyboard
	Keyboard	5100013	
	P.C. Board	1700069	
	P.C. Board	1700070	

CABINET & CABINET PARTS (When ordering specify model, chassis & color)

WIRING DATA

Shielded Hook-up Wire	Use BELDEN No. 8401 or 8421 (Single-Conductor) 8208 (Two-Conductor)
General-use Unshielded Hook-up Wire	Use BELDEN No. 8529 (Solid) Available in 13 Colors 8522 (Stranded) Available in 13 Colors

SAFETY PRECAUTIONS

1. Use an isolation transformer for servicing.
2. Maintain AC line voltage at rated input.
3. Remove AC power from the computer system 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, floppy disk drives, printers, or other peripherals with computer system AC power On.
8. Do not use freon-propelled sprays. These can generate electrical charges sufficient to damage semiconductor devices.
9. Periodically examine the AC power cord for damaged or cracked insulation.
10. The computer system cabinet is equipped with vents to prevent heat build-up. Never block, cover, or obstruct these vents.
11. 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.
12. Never expose the computer system to water. If exposed to water turn the unit Off. Do not place the computer system near possible water sources.
13. Never leave the computer system unattended or plugged into the AC outlet for long periods of time. Remove AC plug from AC outlet during lightning storms.
14. Do not allow anything to rest on AC power cord.
15. Unplug AC power cord from outlet before cleaning computer system.
16. Never use liquids or aerosols directly on the computer system. Spray on cloth and then apply to the computer system cabinet. Make sure the computer system is disconnected from the AC power line.

RADIO SHACK TRS-80
MODEL I LEVEL II

LINE DEFINITIONS

A0 Thru A15 Address Lines
 BIT 0 Thru BIT 7
 CAS Column Address Strobe
 CHAIN
 CLOCK Clock
 CTR Counter
 D0 Thru D7 Data Lines
 ENABLE Enable
 HALT Halt
 HDRV Horizontal Drive
 HI High
 IN Input
 INT Interrupt
 INTAK Interrupt Acknowledge
 IORQ Input/Output Request
 KR0 Thru KR7 Keyboard Row Lines
 KYBD Keyboard
 L1, L2, L4, L8
 LATCH Latch
 LB0 Thru LB5
 MD0 Thru MD7 Memory Data Lines
 MI
 MODSEL Mode Select

MREQ Memory Request
 MUX Multiplex
 OUT Output
 RAM Random Access Memory
 RAS Row Address Strobe
 RD Read
 ROM Read Only Memory
 ROM B Read Only Memory B
 SHIFT Shift
 SYNC Sync
 SYSRES System Reset
 TEST Test
 VCLR Vertical Clear
 VDRV Vertical Drive
 VID Video
 WAIT Wait
 WR Write
 ZD0 Thru ZD7
 ZIORQ
 ZMREQ
 ZRD
 ZWR

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

MISCELLANEOUS ADJUSTMENTS

12V AND 5V ADJUSTMENT

NOTE: Perform 12V adjustment before 5V adjustment.

Connect the input of a DC voltmeter to pin 3 of Regulator IC (Z2). Adjust the 12.0V Adjust Control (R10) for 11.9V.

Connect the input of a DC voltmeter to pin 3 of Regulator IC (Z1). Adjust the 5V Adjust Control (R5) for 5.0V.

HORIZONTAL AND VERTICAL CENTERING

Type and run the following Basic program to produce a rectangle on the Monitor screen:

```
10 CLS: FOR X=0 TO 127
20 IF X>47 THEN 40
30 SET (0,X): SET (127,X)
40 SET (X,0): SET (X,47)
50 NEXT X
60 GOTO 60
```

Adjust the Horizontal Center Control (R20) and Vertical Center Control (R21) to center the rectangle on the Monitor screen.

ROM SELECT SHUNT (Z3)

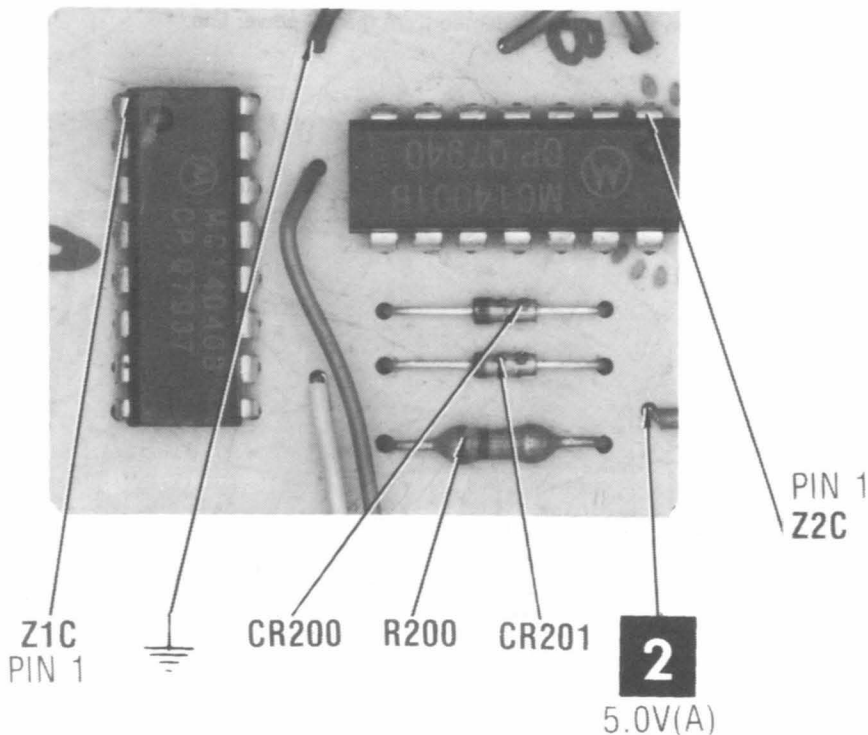
Rom Select Shunt (Z3) is set up in accordance to whether Level I or Level II Basic ROMs are installed. Use the following chart to determine which pins are shunted.

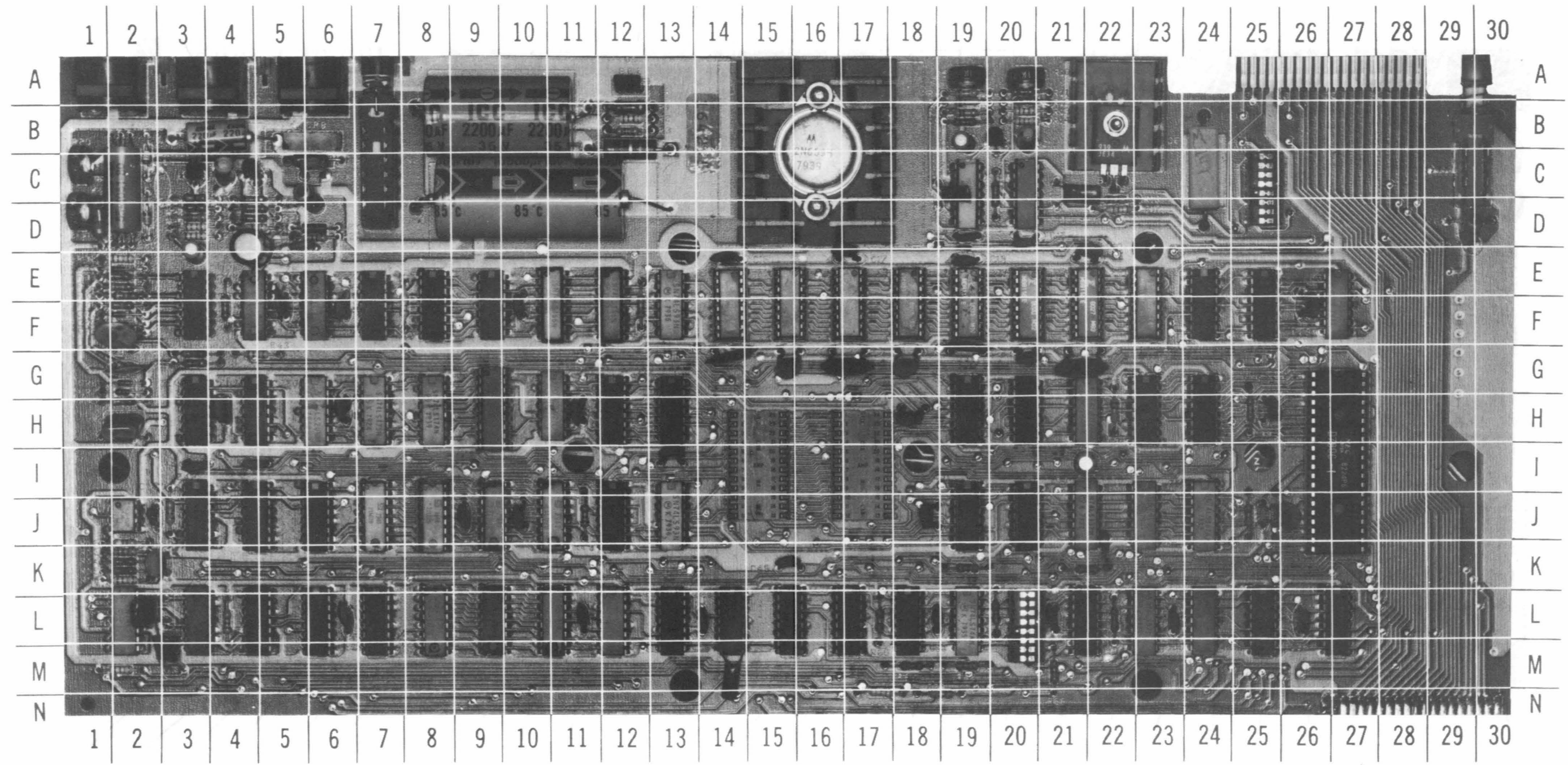
Z3 PINS	LEVEL I BASIC	LEVEL II BASIC
1-16	Open	Shunted
2-15	Shunted	Shunted
3-14	Open	Shunted
4-13	Shunted	Shunted
5-12	Open	Shunted
6-11	Shunted	Shunted
7-10	Shunted	Shunted
8-9	Open	Shunted

RAM SELECT SHUNT (Z71)

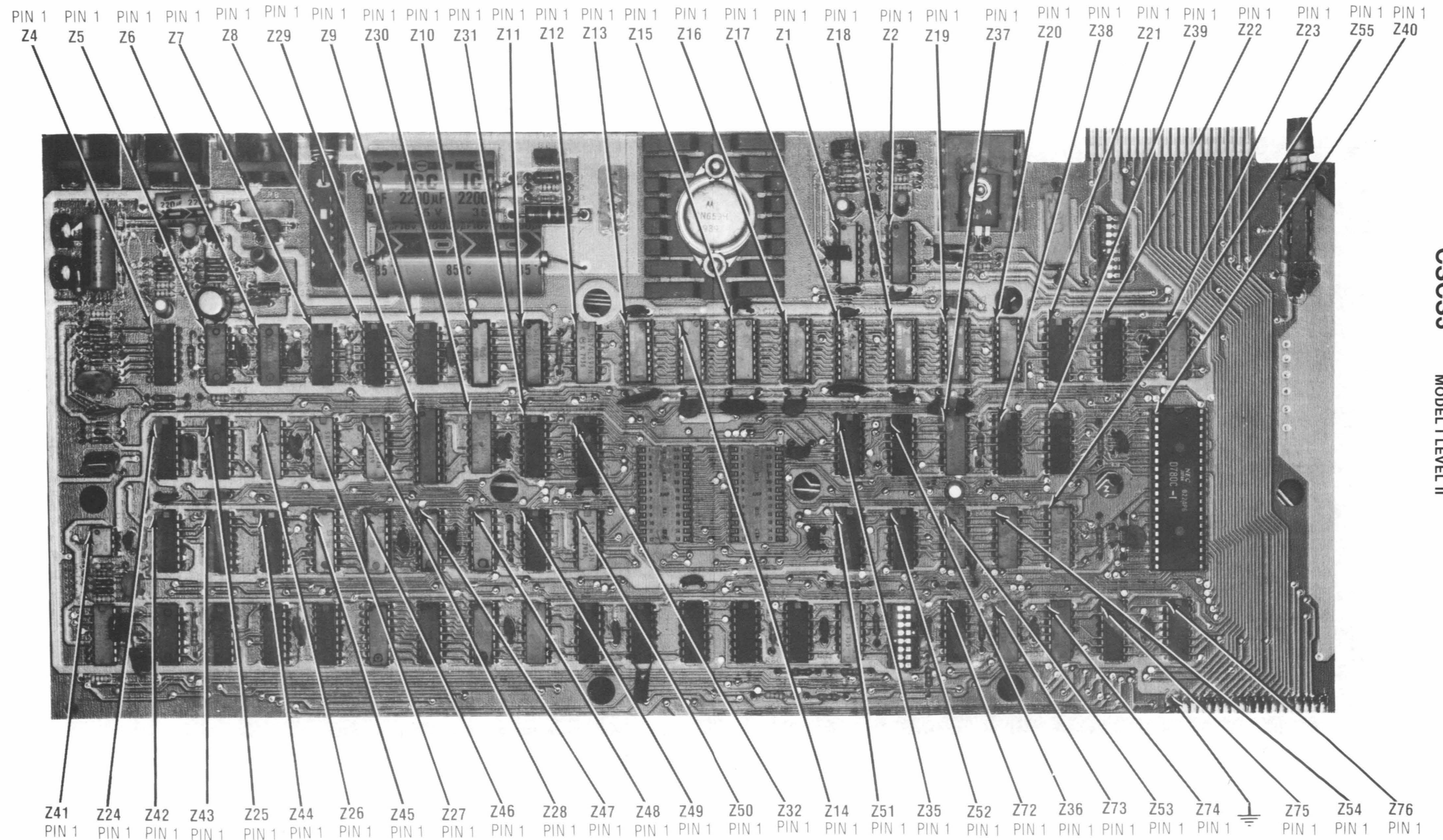
RAM Select Shunt (Z71) is set up in accordance to the amount of RAM memory (4K or 16K) installed on CPU Board. Use the following chart to determine which pins are shunted.

Z71 PINS	4K RAM	16K RAM
1-16	Open	Shunted
2-15	Shunted	Open
3-14	Open	Shunted
4-13	Shunted	Open
5-12	Open	Shunted
6-11	Shunted	Open
7-10	Open	Open
8-9	Open	Open



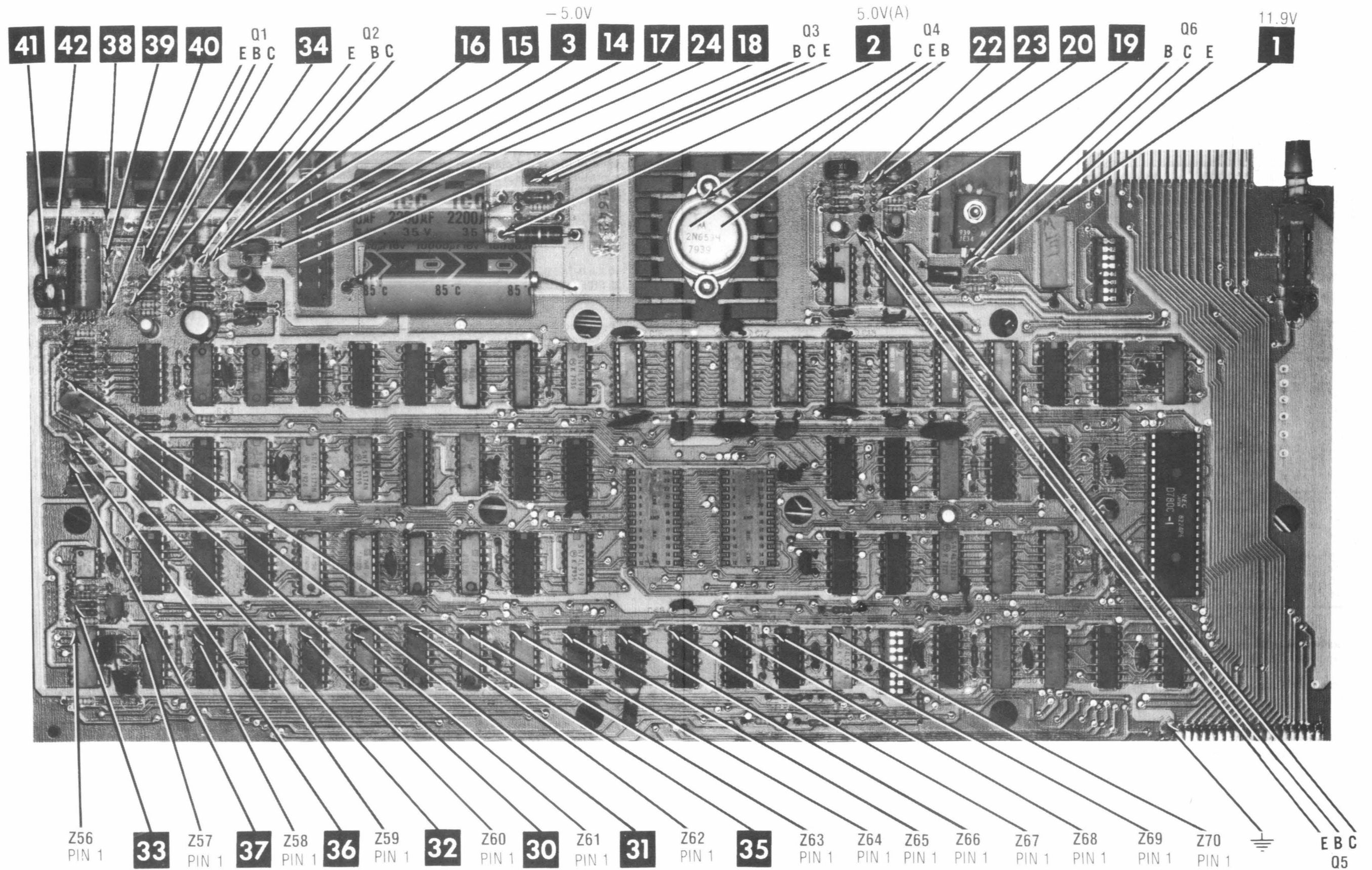


RADIO SHACK TRS-80
MODEL I LEVEL II



CPU BOARD

CPU BOARD



RADIO SHACK TRS-80
MODEL I LEVEL II

LOGIC CHART

PIN NO.	IC Z1	IC Z1A	PIN NO.	IC Z1B	PIN NO.	IC Z1B	PIN NO.	IC Z1C	IC Z2	IC Z2A	PIN NO.	IC Z2B	PIN NO.	IC Z2B
1 2 3 4	(1)	P L P L	1 2 3 4	P P P P	13 14 15 16	P P P P	1 2 3 4	L L L L	(1)	P L P L	1 2 3 4	P P P P	13 14 15 16	P P P P
5 6 7 8		P L L L	5 6 7 8	P P P P	17 18 19 20	P P L P	5 6 7 8	L L L L		P L L L	5 6 7 8	P P P P	17 18 19 20	P P L H
9 10 11 12		P L P L	9 10 11 12	P P P L	21 22 23 24	P P P H	9 10 11 12	L P H L		P L P L	9 10 11 12	P P P L	21 22 23 24	H P P H
13 14		P H					13 14 15 16	L L L H		P H				
PIN NO.	IC Z2C	IC Z3A	IC Z3B	IC Z4	IC Z4A	IC Z5	IC Z6	IC Z7	IC Z8	IC Z9	IC Z10	IC Z11	IC Z12	IC Z13
1 2 3 4	H L L H	P H P H	P H H H	L L L P	P H P H	P P P P	P P P P	H L P H	L P P P	L H P P	L L L P	L L L P	P P P P	P P P P
5 6 7 8	L L L L	P H P L	H H H L	P L L L	P H P L	P P L P	P P L P	L H L H	P P P L	L H L P	P L P L	P L P L	H P P P	P P P H
9 10 11 12	L H L H	P H P P	H P P P	P H L L	P H P P	P P P P	P P P P	H L L L	P P P P	P H L H	H P P P	H P P P	P L P P	H P P P
13 14 15 16	L H	P P P H	L L P H	L H	P P P H	P H	P H	L H	P P L H	L H	P L P H	L P H H	P P	P P P L

Logic probe readings taken with computer turned On, no keys pressed, unless otherwise noted.

Logic Probe Display

L = Low

H = High

P = Pulse

* = Open (No light On)

(1) Logic readings not taken

LOGIC CHART (Continued)

PIN NO.	IC Z14	IC Z15	IC Z16	IC Z17	IC Z18	IC Z19	IC Z20	IC Z21	IC Z22	IC Z23	IC Z24	IC Z25	IC Z26	IC Z27
1	P	P	P	P	P	P	P	P	P	P	P	L	P	H
2	P	P	P	P	P	P	P	P	H	H	P	L	P	H
3	P	P	P	P	P	P	P	P	H	H	P	L	P	L
4	P	P	P	P	P	P	P	P	P	P	L	H	L	H
5	P	P	P	P	P	P	P	H	P	P	L	H	P	P
6	P	P	P	P	P	P	P	H	P	P	L	H	P	P
7	P	P	P	P	P	P	P	H	P	L	L	L	L	P
8	H	H	H	H	H	H	H	L	L	H	L	H	P	L
9	H	H	H	H	H	H	H	P	H	P	H	H	P	P
10	P	P	P	P	P	P	P	P	H	P	H	H	P	P
11	P	P	P	P	P	P	P	P	P	P	H	L	P	P
12	P	P	P	P	P	P	P	P	P	P	L	L	P	P
13	P	P	P	P	P	P	P	P	P	P	H	L	P	P
14	P	P	P	P	P	P	P	P	P	H	H	H	H	P
15	P	P	P	P	P	P	P	P	P					P
16	L	L	L	L	L	L	L	H	H					H
PIN NO.	IC Z28	IC Z29	IC Z30	IC Z31	IC Z32	IC Z35	IC Z36	IC Z37	IC Z38	IC Z39	PIN NO.	IC Z40	PIN NO.	IC Z40
1	H	P	P	H	P	P	P	H	L	L	1	P	21	P
2	P	P	L	P	P	P	H	L	L	P	2	P	22	P
3	P	P	P	P	P	P	H	L	L	P	3	P	23	H
4	P	P	H	P	*	P	P	P	P	P	4	P	24	H
5	P	P	L	P	H	P	P	P	P	P	5	L	25	H
6	P	P	L	P	*	P	P	P	P	P	6	P	26	H
7	P	P	L	P	*	P	P	L	P	P	7	P	27	P
8	L	P	P	L	P	L	H	P	L	L	8	P	28	P
9	P	L	P	P	P	P	H	P	L	P	9	P	29	L
10	P	P	P	P	L	P	P	L	L	P	10	P	30	P
11	P	P	P	P	P	P	P	L	L	P	11	H	31	P
12	P	P	P	P	P	P	P	L	L	P	12	P	32	P
13	P	P	P	P	*	P	L	H	H	P	13	P	33	P
14	P	P	H	P	P	P	H			P	14	P	34	P
15	P	P		L		L				L	15	P	35	P
16	H	P		H		H				H	16	L	36	P
17		L									17	H	37	P
18		H									18	H	38	P
											19	P	39	P
											20	H	40	L

RADIO SHACK TRS-80
MODEL I LEVEL II

Logic probe readings taken with computer turned On, no keys pressed, unless otherwise noted.

Logic Probe Display

L = Low

H = High

P = Pulse

* = Open (No light On)

LOGIC CHART (Continued)

PIN NO.	IC Z41	IC Z42	IC Z43	IC Z44	IC Z45	IC Z46	IC Z47	IC Z48	IC Z49	IC Z50	IC Z51	IC Z52	IC Z53	IC Z54
1	L	P	H	H	P	P	P	P	H	P	P	L	H	P
2	L	P	P	P	P	P	P	P	P	P	P	H	H	P
3	H	P	P	P	H	H	H	H	P	P	L	H	L	P
4	L	P	P	P	P	P	P	P	P	*	P	L	L	P
5	P	P	L	P	P	P	P	P	P	H	P	P	P	P
6	P	P	P	P	P	P	P	P	H	*	P	P	P	P
7	P	L	P	P	P	P	P	P	H	*	P	L	L	L
8	H	L	L	L	P	P	P	P	L	P	L	H	P	H
9		H	P	P	L	L	L	L	P	P	P	L	P	*
10		H	P	P	L	L	H	L	P	L	P	L	L	*
11		L	P	P	P	P	P	P	P	P	P	L	L	P
12		H	P	L	P	P	P	P	H	P	H	P	L	P
13		L	P	P	L	L	L	L	H	*	P	P	H	*
14		H	P	H	P	P	P	P	L	P	L	H	H	H
15			L	H	P	P	P	P						
16			H	H	P	P	P	P						

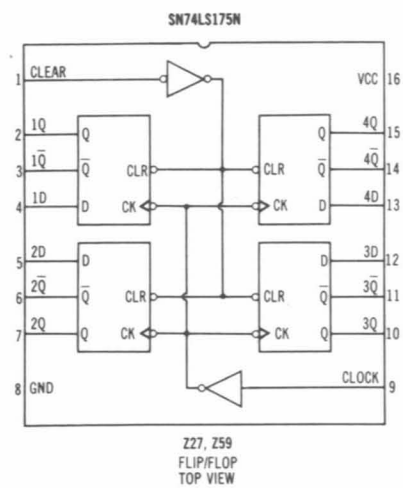
PIN NO.	IC Z55	IC Z56	IC Z57	IC Z58	IC Z59	IC Z60	IC Z61	IC Z62	IC Z63	IC Z64	IC Z65	IC Z66	IC Z67	IC Z68
1	P	P	P	P	H	H	P	P	P	H	P	P	P	P
2	P	*	P	*	L	L	P	P	P	P	L	P	P	P
3	P	*	P	*	H	P	H	H	H	P	*	P	P	P
4	P	*	P	*	P	P	P	P	P	P		P	P	P
5	P	H	P	H	P	P	P	P	P	P	H	P	P	P
6	P	L	P	L	H	P	P	P	P	P	*	P	P	P
7	P	L	P	L	L	L	P	P	P	L	*	P	P	L
8	L	P	P	P	L	L	P	P	P			L	L	L
9	P	P	P	P	H	P	L	L	L	P	P	P	P	P
10	P	L	P	L	L	P	H	L	L	P	L	P	P	L
11	P	P	P	P	H	L	P	P	P	P	P	P	L	L
12	P	H	P	P	P	L	P	P	L	P	P	P	L	L
13	P	*	P	*	P	L	L	L	L	P	*	P	P	P
14	P	H	H	P	H	L	L	P	P	P		H	P	L
15	L				L	L	P	P	P	L			H	H
16	H				H	H	P	P	P	H			H	H

PIN NO.	IC Z69	IC Z70	IC Z72	IC Z73	IC Z74	IC Z75	IC Z76
1	P	P	L	H	P	P	P
2	P	P	P	P	P	P	P
3	P	P	P	H	P	P	P
4	H	H	P	L	P	P	P
5	P	P	P	P	P	P	P
6	P	P	L	P	P	P	P
7	L	L	L	L	L	L	L
8	P	P	L	P	P	P	L
9	P	P	P	P	P	P	P
10	H	H	P	H	H	P	P
11	P	P	P	H	P	P	P
12	P	P	P	H	P	P	P
13	P	H	L	H	P	P	P
14	H	H	L	H	H	P	P
15			L			P	P
16			L			H	H

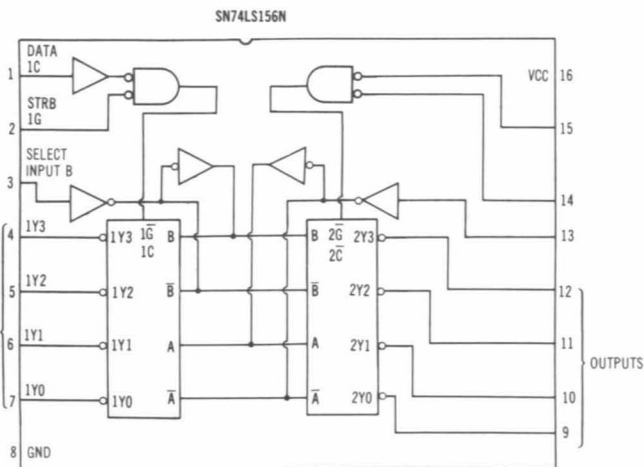
Logic probe readings taken with computer turned On, no keys pressed, unless otherwise noted.

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

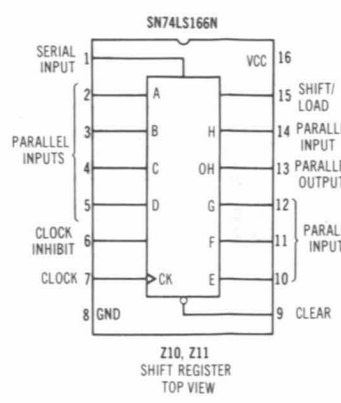
TERMINAL GUIDES & IC PINOUTS



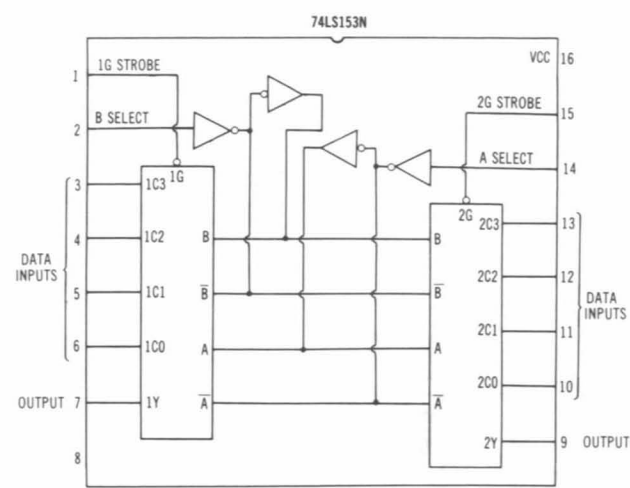
Z27, Z59
FLIP/FLOP
TOP VIEW



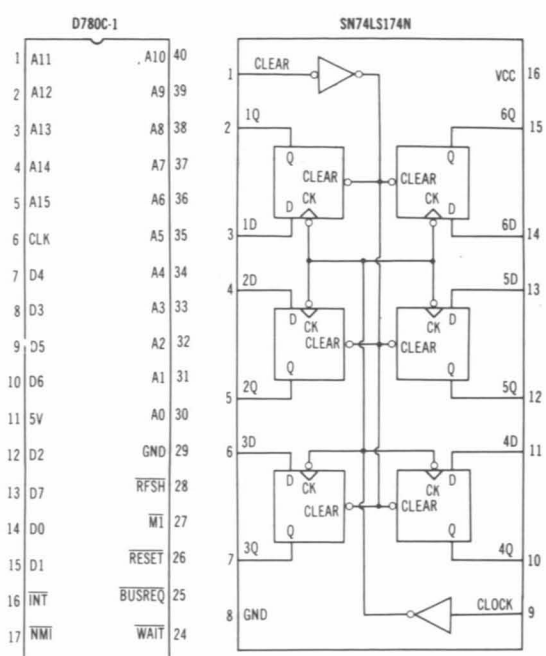
Z21
DECODER
TOP VIEW



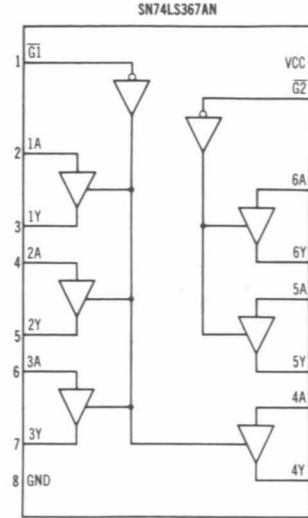
Z10, Z11
SHIFT REGISTER
TOP VIEW



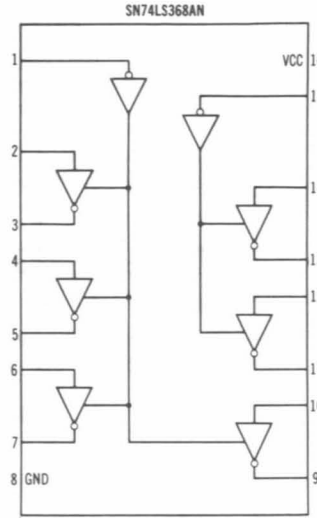
Z8
MULTIPLEXER
TOP VIEW



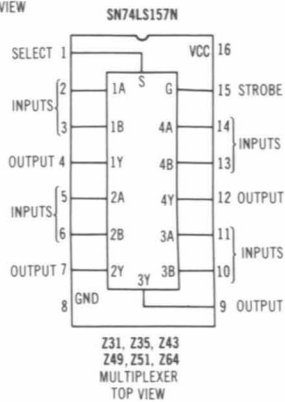
Z28
FLIP/FLOP
TOP VIEW



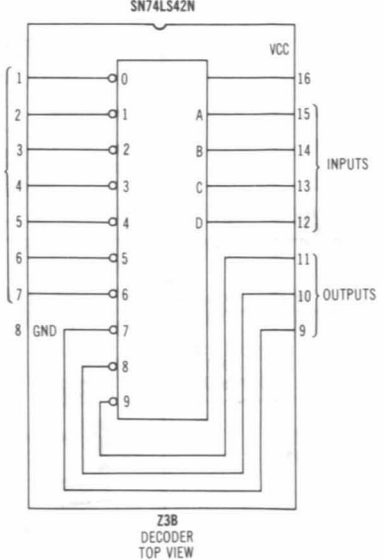
Z22, Z38, Z39, Z44,
Z55, Z60, Z67, Z68,
Z72, Z75, Z76
TRI-STATE BUFFER
TOP VIEW



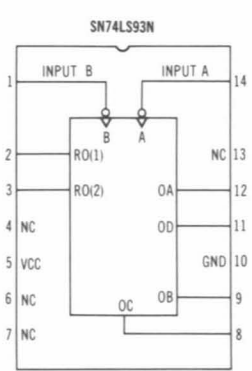
Z3A, Z4A
TRI-STATE INVERTER
TOP VIEW



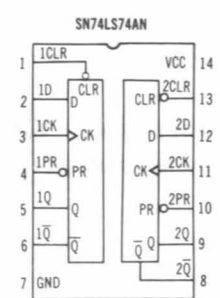
Z31, Z35, Z43
Z49, Z51, Z64
MULTIPLEXER
TOP VIEW



Z3B
DECODER
TOP VIEW

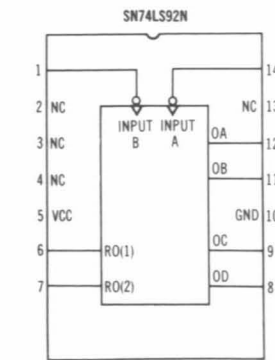


Z12, Z32, Z50, Z65
COUNTER
TOP VIEW

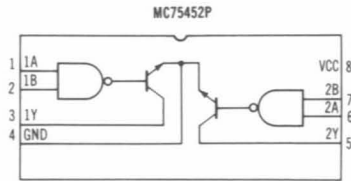


Z7, Z69, Z70
FLIP/FLOP
TOP VIEW

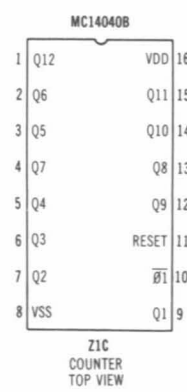
Z40
MICROPROCESSOR
TOP VIEW



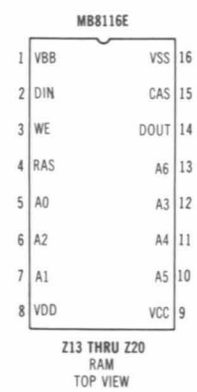
Z56, Z58
DIVIDE BY 6,
DIVIDE BY 12
TOP VIEW



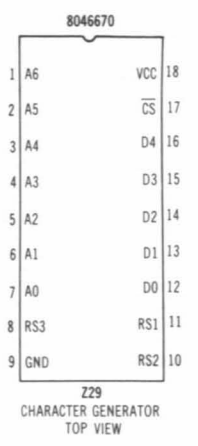
Z41
DRIVER
TOP VIEW



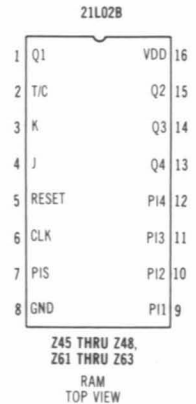
Z1C
COUNTER
TOP VIEW



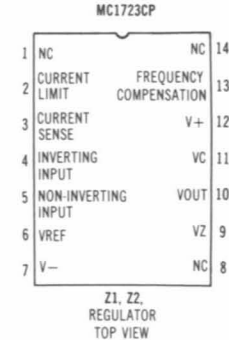
Z13 THRU Z20
RAM
TOP VIEW



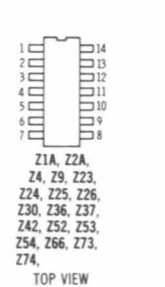
Z29
CHARACTER GENERATOR
TOP VIEW



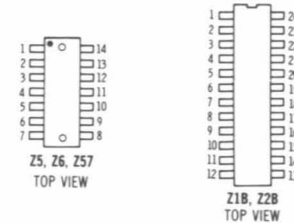
Z45 THRU Z48,
Z61 THRU Z63
RAM
TOP VIEW



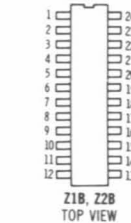
Z1, Z2
REGULATOR
TOP VIEW



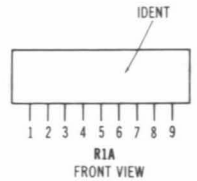
Z1A, Z2A,
Z4, Z9, Z23,
Z30, Z36, Z37,
Z42, Z52, Z53,
Z54, Z66, Z73,
Z74,
TOP VIEW



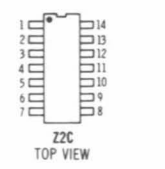
Z5, Z6, Z57
TOP VIEW



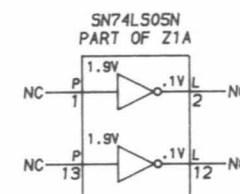
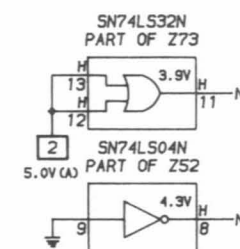
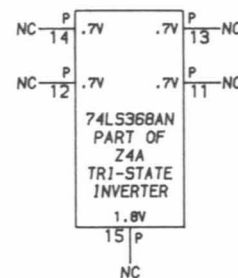
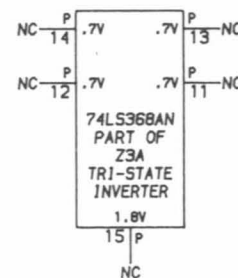
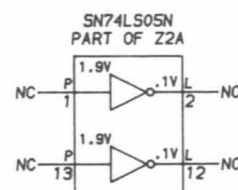
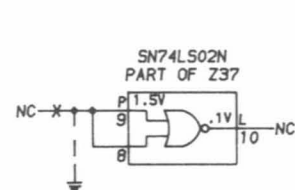
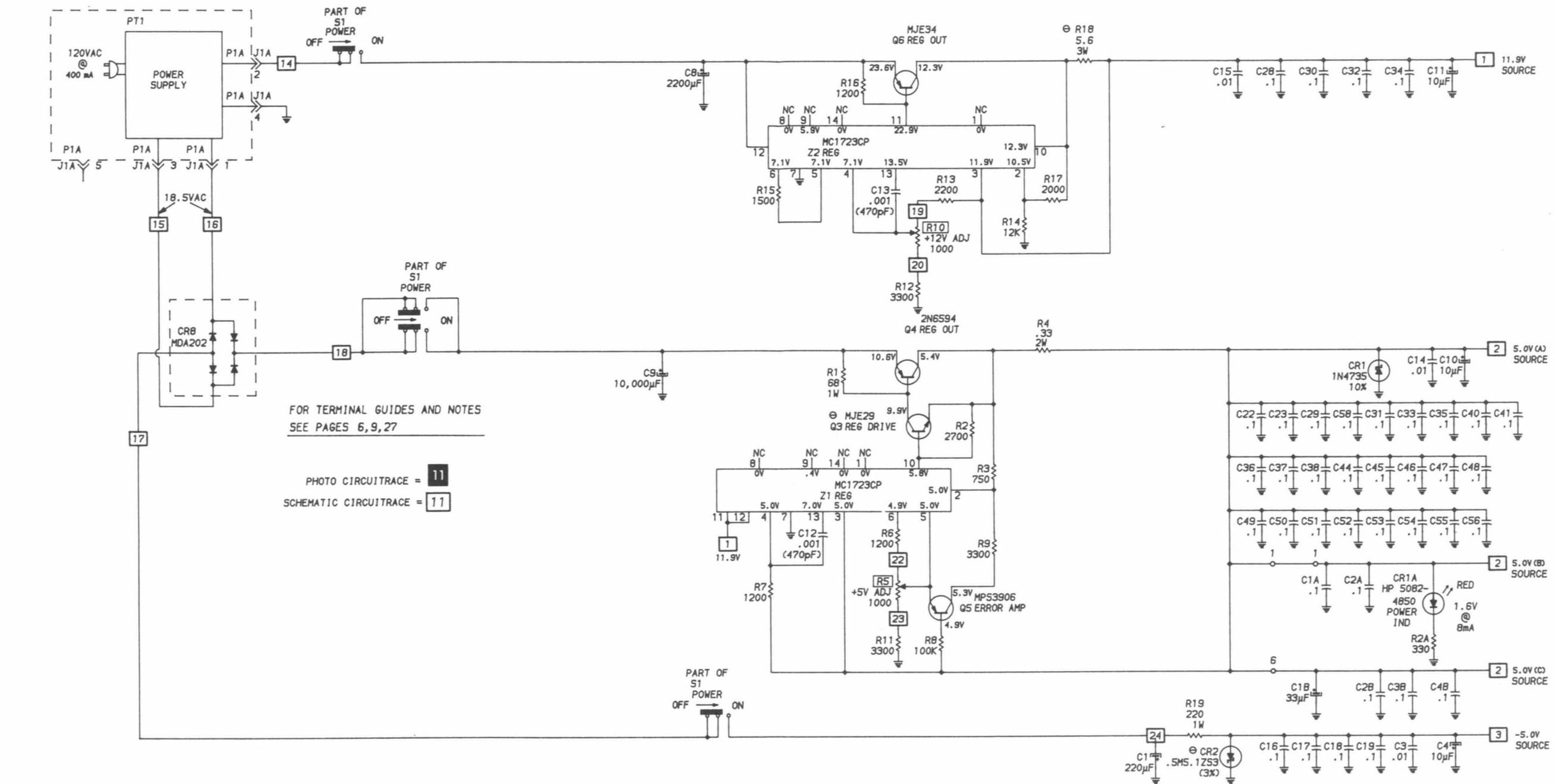
Z1B, Z2B
TOP VIEW



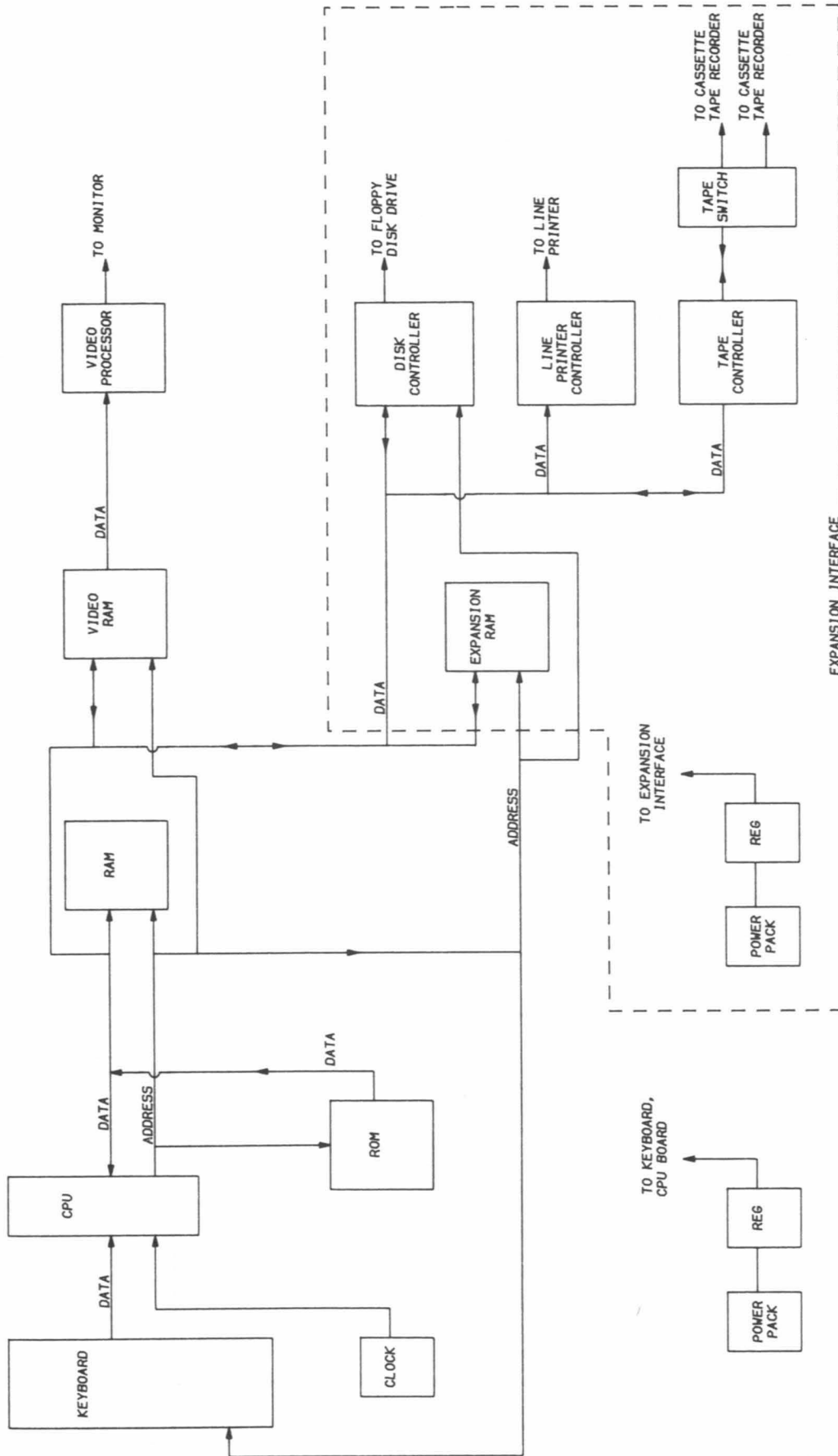
R1A
FRONT VIEW



Z2C
TOP VIEW



RADIO SHACK TRS-80 MODEL I LEVEL II



BLOCK DIAGRAM

KEYBOARD, CPU BOARD

See Folder CSCS3

SAFETY PRECAUTIONS

See pages, 4, 5.

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Howard W. Sams & Co., Inc.

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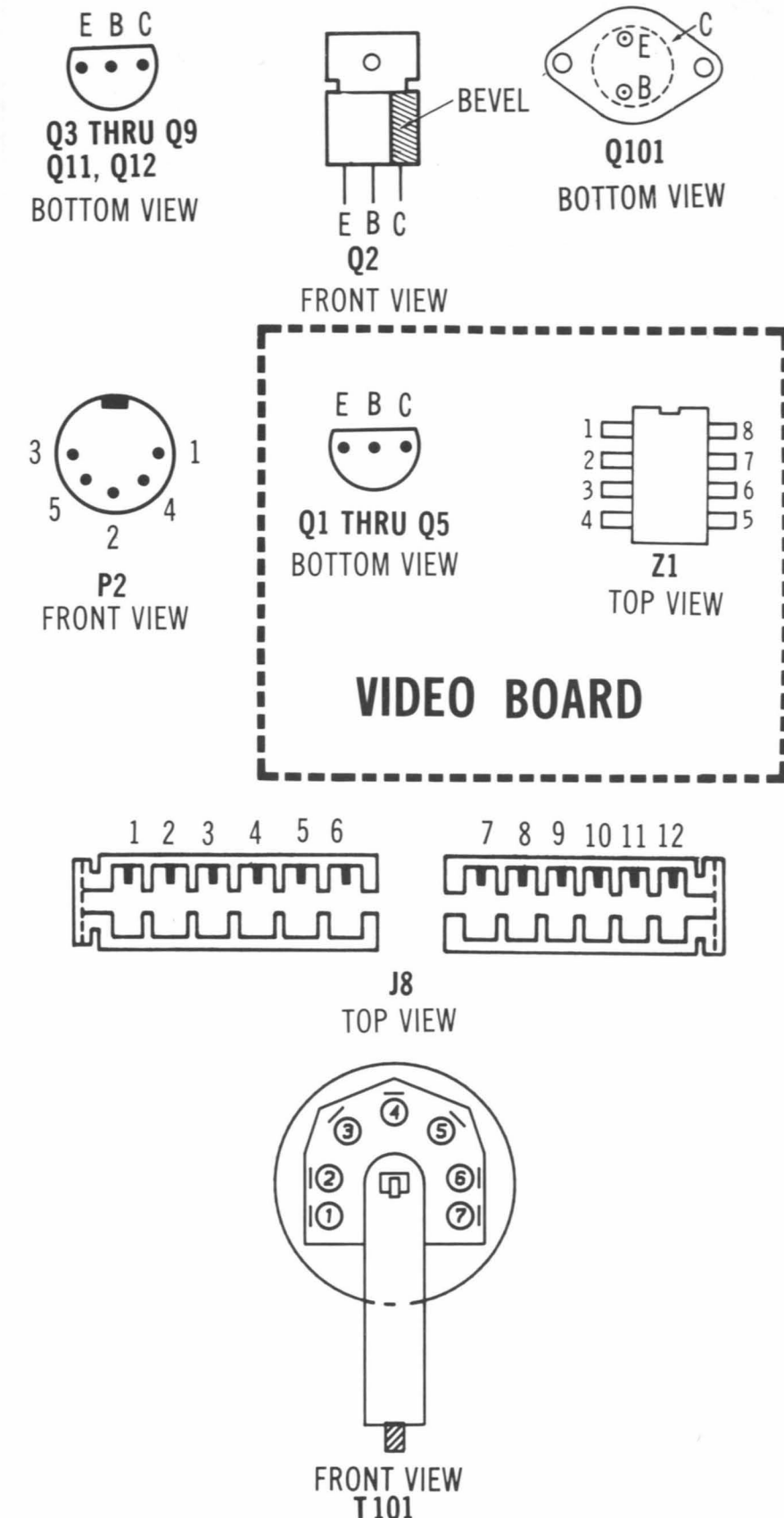
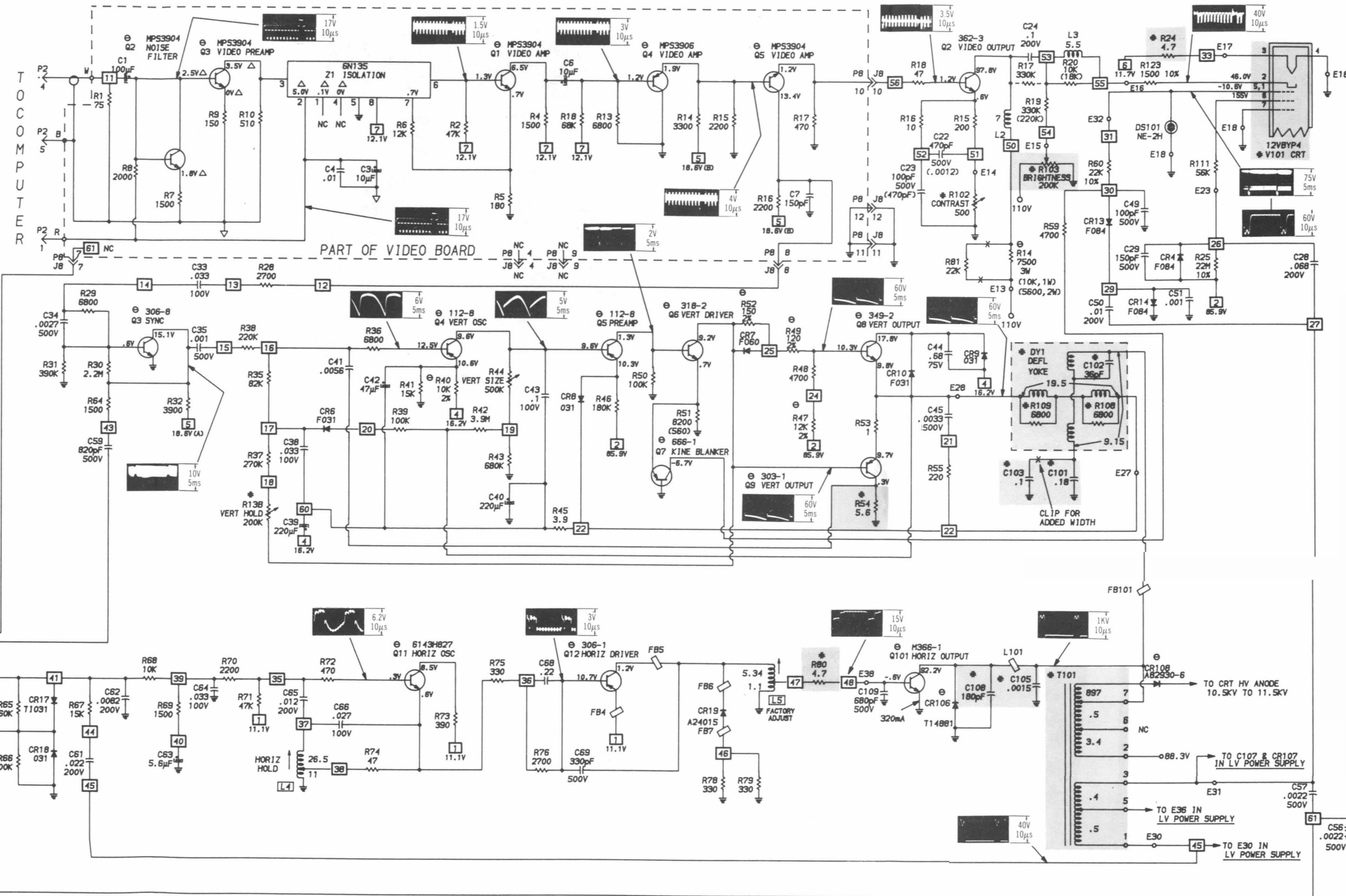
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85CC14942

DATE 2-85

PHOTO CIRCUITRACE = 11
SCHEMATIC CIRCUITRACE = 11



**RADIO SHACK TRS-80
MODEL I LEVEL II**



SAFETY PRECAUTIONS

NOTE: Before servicing this chassis, read and follow these precautions and the "Product Safety Notice".

Before returning any instrument to the customer a safety check of the entire Video Display Monitor should be made. The service technician must be sure that no protective device built into the instrument by the manufacturer has become defective or inadvertently defeated during servicing.

1. Comply with all caution and safety related notes located on or inside the receiver cabinet and on the monitor chassis or picture tube.

2. **WARNING:** Alterations of the design or circuitry of this video display monitor should not be made.

Any design alterations or additions such as, but not limited to, circuit modifications, auxiliary speaker jacks, switches, grounding, active or passive circuitry, etc may alter the safety characteristics of this instrument and potentially create a hazardous situation for the user. Any design alterations or additions will void the manufacturer's warranty and will further relieve the manufacturer of responsibility for personal injury or property damage resulting therefrom.

3. **HOT CHASSIS WARNING:** The chassis of some video display monitors are connected to one side of the AC supply. "Hot" chassis equipment in which the chassis is solidly connected to one side of the AC line cord may be serviced without using an isolation transformer if the power plug is inserted so that the chassis is connected to the grounded side of the AC supply. Check with an AC voltmeter to see if a potential exists between the chassis and a known earth ground. A zero or very low AC reading should be obtained. If a significant reading is obtained, reverse the power plug and recheck for a zero or low meter reading.

Some chassis have a secondary ground system in addition to the main chassis ground. The secondary ground is **NON-ISOLATED** in respect to the power line. The two ground systems are separated by insulating material which must not be defeated or altered in any way. Other chassis have an 85V RMS potential from chassis to earth ground, regardless of the polarity of the AC supply. Service on these types of chassis should only be performed with an isolation transformer inserted in the power line between the receiver and the AC supply for protection of both personnel and test equipment.

4. Observe the original correct lead dress. Extra precaution should be taken to assure proper lead dress in the following areas: (a) near sharp edges, (b) AC supply area, (c) high voltage area, (d) video input wiring. Insure that wires or components do not touch thermally hot parts. Inspect for pinched, out-of-place, or damaged wiring in all areas.
5. Components that indicate evidence of overheating should be replaced.

6. **WARNING:** The picture tube in this monitor employs integral implosion protection. Replace with a tube of the same type number for continued safety. Do not remove, install or handle the picture tube in any manner unless shatterproof goggles are worn. People not so equipped should be kept away while picture tubes are handled. Keep picture tube away from the body while handling. On "In-Line" type picture tubes, the deflection yoke is an integral part of the picture tube and is permanently attached. Do not attempt to remove "permanently attached" yoke from CRT because of possible tube breakage and hazard to the servicer.

7. Protective shields are provided on this chassis for the protection of both the service technician and the customer. Protective shields removed for servicing convenience must be correctly re-installed and **ANY MISSING SHIELDS MUST BE REPLACED. DO NOT OPERATE THIS INSTRUMENT WITHOUT THE PROTECTIVE SHIELDS IN POSITION AND PROPERLY SECURED.**

8. When replacing a chassis in the cabinet, always be certain that all the protective devices are put back in place, such as: non-metallic control knobs, insulating fish papers, adjustment and compartment covers/shields, isolation resistor capacitor networks, etc.

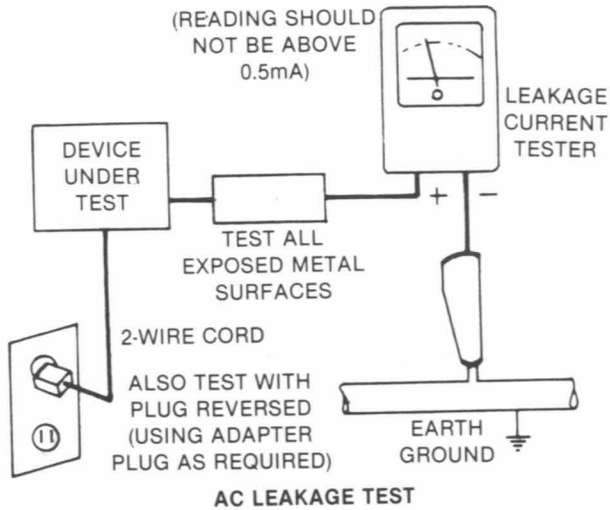
9. **VIDEO INPUT COLD CHECK**

With the AC plug removed from the 120VAC source, place a jumper across the two plug prongs. Turn the instrument AC switch on. Using an ohmmeter, connect one lead to the jumpered AC plug and touch the other lead to each exposed coaxial connector. The resistance measured should not be less than 20 megohms. Any resistance value below this range indicates an abnormality which requires corrective action. Repeat the test with the AC switch in the OFF position.

10. **LEAKAGE CURRENT HOT CHECK (ON COMPLETE ASSEMBLED INSTRUMENT)**

Plug the AC line cord directly into a 120 VAC outlet (do not use an isolation transformer for this check). Use a Leakage Current Tester or a metering system which complies with American National Standards Institute (ANSI C101.1 "Leakage Current for Appliances") and Underwriters Laboratories (UL) 1410, (50.7). Measure for current with the AC switch "on" and repeat with the AC switch "off" from all exposed metal parts of the cabinet (plugs, jacks, handle bracket, metal cabinet, screwheads, metal overlays, control shafts, etc.) to a known earth ground (waterpipe, conduit, etc); particularly any exposed metal part having a return path to the chassis. Any current measured must not exceed 0.5 milliamp. Reverse plug in the AC outlet and repeat test. **ANY MEASUREMENTS NOT WITHIN THE LIMITS OUTLINED ABOVE ARE INDICATIVE OF A POTENTIAL SHOCK HAZARD AND CORRECTIVE ACTION MUST BE TAKEN BEFORE RETURNING THE INSTRUMENT TO THE CUSTOMER.**

SAFETY PRECAUTIONS (Continued)



11. X-RADIATION AND HIGH VOLTAGE LIMITS

The primary source of potential x-radiation in solid state video display monitors is the picture tube. The picture tube is specially constructed to prohibit x-radiation emissions. For continued x-radiation protection, the replacement tube must be the same type as the original. The shields and mounting hardware for picture tubes have an x-radiation protection function and must be properly in place.

High voltage must be checked each time any service is required that involves B+, horizontal deflection or high voltage. Where used, x-radiation Protection Circuits (may also be referred to as horizontal disable or

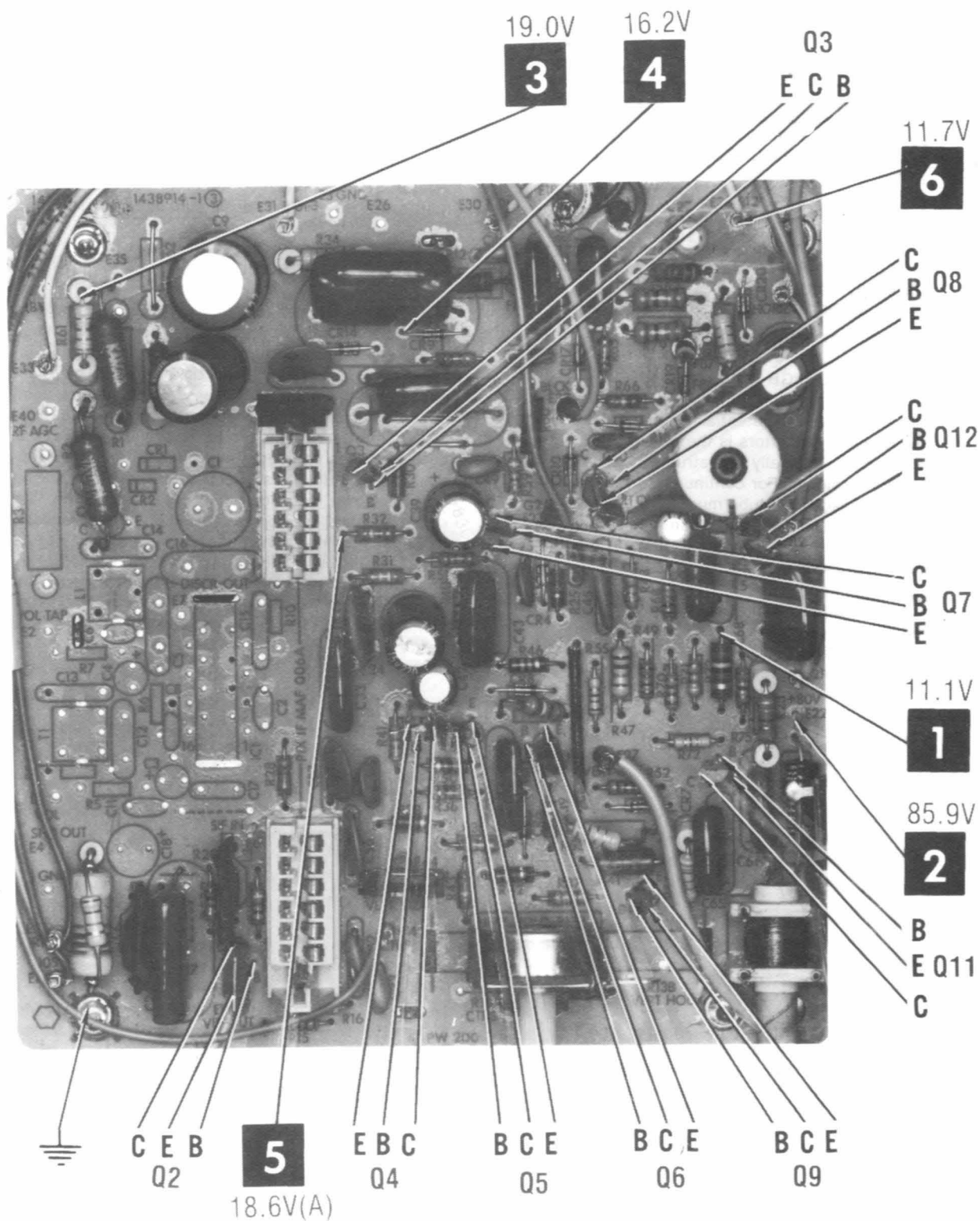
hold-down) must be checked for proper operation each time the x-radiation Protection Circuit is serviced. Refer to the Technician x-radiation warning note on the Chassis Schematic in the Basic Service Data and Instrument Labels for specific high voltage limits of each chassis and, where used, x-radiation Protection Circuits specifications.

High voltage is maintained within specified limits by the use of close tolerance safety related components and adjustments in the high voltage circuit. If high voltage exceeds specified limits, check each component specified on the chassis schematic diagram and take necessary corrective action.

12. PRODUCT SAFETY NOTICE

Many electrical and mechanical parts in television sets have special safety-related characteristics. These characteristics are often not evident from visual inspection nor can the protection afforded by them necessarily be obtained by using replacement components rated for higher voltage, wattage, etc. Replacement parts which have these special safety characteristics are identified in this Data and its Supplements and Bulletins. Electrical components having such features are identified by shading on the schematics and by # on the Parts List in this Data and its Supplements and Bulletins. The use of a substitute replacement which does not have the same safety characteristics as the recommended replacement part shown in the Parts List in this Data and its Supplements and Bulletins, may create shock, fire, or other hazards.

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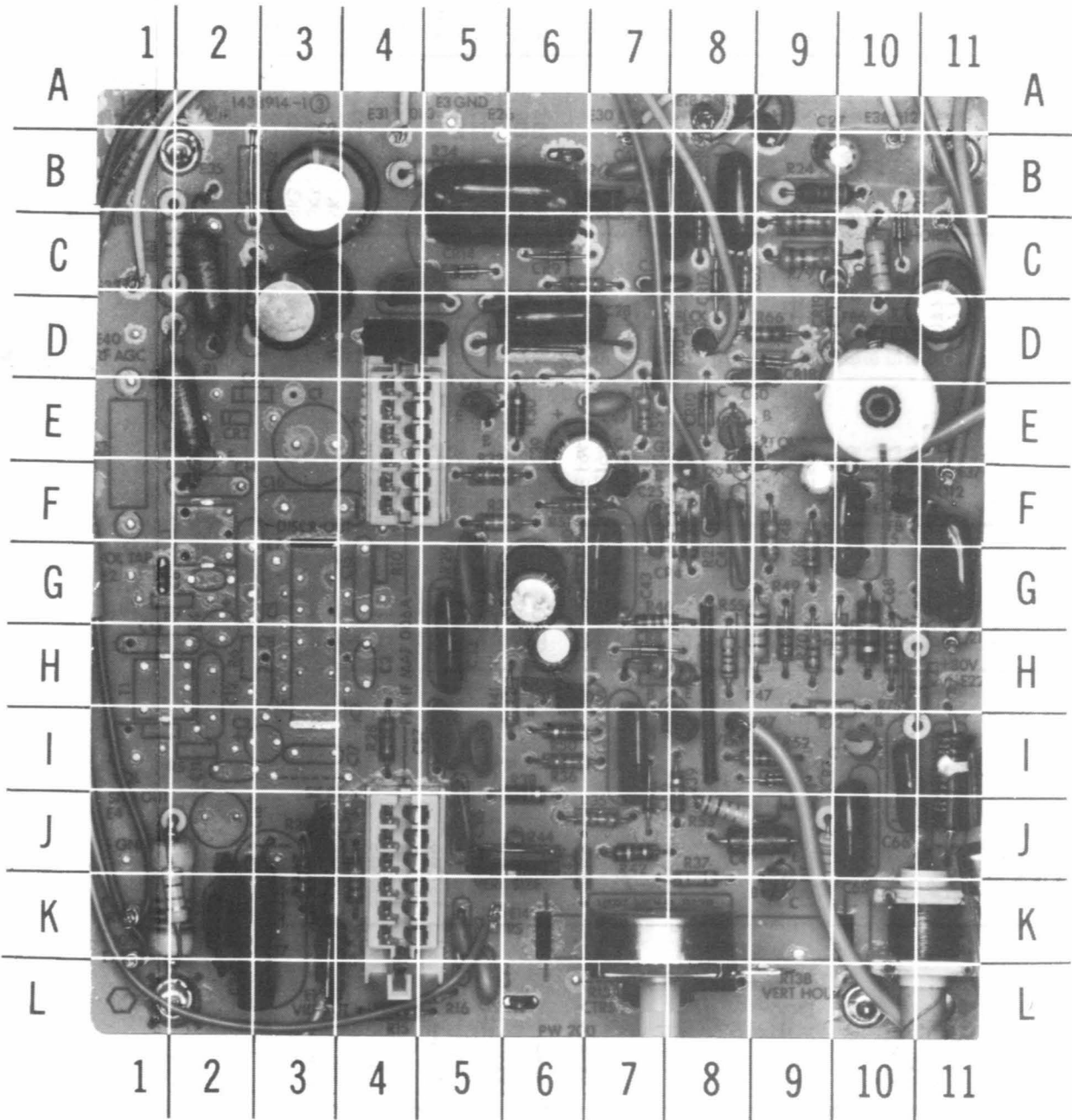


MAIN BOARD

A Howard W. Sams **CIRCUITRACE** Photo

MAIN BOARD GridTrace LOCATION GUIDE

C9	B-3	C34	G-5	C49	E-7	C65	J-10	CR12	B-7	L3	J-3
C10	D-3	C35	I-5	C50	D-4	C66	I-10	CR13	D-6	L4	K-11
C22	K-5	C38	I-7	C51	D-5	C68	F-11	CR14	C-5	L5	E-10
C23	L-5	C39	E-6	C56	J-6	C69	E-10	CR17	C-8	Q2	K-3
C24	K-3	C40	G-6	C57	I-5	C70	D-11	CR18	D-9	Q3	E-5
C25	F-7	C41	J-9	C59	C-7	CR4	F-8	CR19	D-9	Q4	H-6
C26	I-11	C42	H-6	C60	D-8	CR6	J-7	CR20	C-10	Q5	H-6
C27	B-10	C43	G-7	C61	B-7	CR7	I-9	FB1	B-7	Q6	I-8
C28	D-6	C44	B-5	C62	B-8	CR8	H-7	FB4	E-10	Q7	F-7
C29	F-8	C45	F-8	C63	F-9	CR9	C-6	FB5	F-10	Q8	E-8
C33	H-5	C48	B-7	C64	F-10	CR10	E-8	FB6	D-9	Q9	K-9
								FB7	C-9	Q11	I-10
								L2	K-2	Q12	F-10



L3	J-3
L4	K-11
L5	E-10
Q2	K-3
Q3	E-5
Q4	H-6
Q5	H-6
Q6	I-8
Q7	F-7
Q8	E-8
Q9	K-9
Q11	I-10
Q12	F-10
R1	C-2
R2	E-2
R9	C-2
R13B	K-7
R14	K-1
R15	L-4
R16	L-4
R18	K-4
R19	K-2
R20	K-3
R23	H-10
R24	B-9
R25	F-8
R28	I-4
R29	G-5
R30	E-6
R31	F-5
R32	F-5
R34	B-5
R35	J-7
R36	I-6
R37	J-8
R38	J-6
R39	I-8
R40	G-6
R41	H-6
R42	J-7
R43	J-6
R44	J-6
R45	H-7
R46	G-7
R47	H-9
R48	F-9
R49	H-9
R50	I-6
R51	F-6
R52	I-9
R53	J-8
R54	J-9
R55	H-8
R59	E-7
R60	D-7
R61	C-2
R64	C-6
R65	C-8
R66	D-9
R67	C-8
R68	G-9
R69	F-10
R70	H-9
R71	H-10
R72	H-9
R73	H-10
R74	J-11
R75	H-10
R76	F-11
R77	D-10
R78	C-9
R79	C-9
R80	C-10
R81	K-2

CSCS3-B

RADIO SHACK TRS-80
MODEL I LEVEL II

PARTS LIST AND DESCRIPTION

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

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	TYPE No.	MFR. PART No.	REPLACEMENT DATA					
			GENERAL ELECTRIC PART No.	NEW-TONE NTE PART No.	PHILIPS ECG PART No.	RCA PART No.	WORKMAN PART No.	ZENITH PART No.
CR4	F084	139706	GE-300	NTE177	ECG177	SK9091/177	WEP1062/177	103-131
CR6	F031	119597	GE-300	NTE177	ECG177	SK9091/177	WEP1062/177	103-131
CR7	F060	119597	GE-300	NTE177	ECG177	SK9091/177	WEP1062/177	103-131
CR8,9	O31	119597	GE-300	NTE177	ECG177	SK9091/177	WEP1062/177	103-131
CR10	F031	119597	GE-300	NTE177	ECG177	SK9091/177	WEP1062/177	103-131
CR12	A-231	138173	GE-511	NTE552	ECG552	SK3130	WEP172/506	103-287
CR13,14	F084	139706	GE-300	NTE177	ECG177	SK9091/177	WEP1062/177	103-131
CR17	T1031	119597	GE-300	NTE177	ECG177	SK9091/177	WEP1062/177	103-131
CR18	O31	119597	GE-300	NTE177	ECG177	SK9091/177	WEP1062/177	103-131
CR19	A24015	119597	GE-300	NTE177	ECG177	SK9091/177	WEP1062/177	103-131
CR20	F046	139706	GE-300	NTE177	ECG177	SK9091/177	WEP1062/177	103-131
CR101	RC185-6	141489	GE-510	NTE125	ECG125	SK5010/117A	WEP170/125	212-Z9000
CR106	T14881 (3)	140972	GE-511	NTE558	ECG558	SK9000/552	WEP172/506	103-287
CR107	M132	138173	GE-511	NTE552	ECG552	SK3130	WEP172/506	103-287
CR108	A82930-6 (1)	(2)						
Q2	362-3	141295	GE-27	NTE171	ECG171	SK3201/171	WEP702/171	121-822
	7362-3		GE-27	NTE171	ECG171	SK3201/171	WEP702/171	121-822
Q3	306-8	141330	GE-123AP	NTE123AP	ECG123AP	SK3854/123AP	WEP736/123A	121-Z9000A
Q4,5	7306-1		GE-123AP	NTE123AP	ECG123AP	SK3854/123AP	WEP736/123A	121-Z9000A
	112-8		GE-82	NTE159	ECG159	SK3466/159	WEP62/159	121-Z9003
	1112-8	132830	GE-82	NTE159	ECG159	SK3466/159	WEP62/159	121-Z9003
Q6	318-2		GE-220	NTE194	ECG194	SK3479	WEP64/194	121-881
	7318-2	139268	GE-220	NTE194	ECG194	SK3479	WEP64/194	121-881
Q7	666-1		GE-82	NTE159	ECG159	SK3466/159	WEP62/159	121-Z9003
	3666-1	137155	GE-82	NTE159	ECG159	SK3466/159	WEP62/159	121-Z9003
Q8	349-2		GE-123AP	NTE123AP	ECG123AP	SK3854/123AP	WEP736/123A	121-Z9000A
	7349-2	141008	GE-123AP	NTE123AP	ECG123AP	SK3854/123AP	WEP736/123A	121-Z9000A
Q9	303-1		GE-82	NTE159	ECG159	SK3466/159	WEP62/159	121-Z9003
	7303-1	137340	GE-82	NTE159	ECG159	SK3466/159	WEP62/159	121-Z9003
Q11	6143H827		GE-123AP	NTE123AP	ECG123AP	SK3854/123AP	WEP736/123A	121-Z9000A
	3614-3	137875	GE-123AP	NTE123AP	ECG123AP	SK3854/123AP	WEP736/123A	121-Z9000A
Q12	306-1		GE-82	NTE159	ECG159	SK3466/159	WEP62/159	121-Z9003
	7303-1	137340	GE-82	NTE159	ECG159	SK3466/159	WEP62/159	121-Z9003
	M366-1		GE-38	NTE165	ECG165	SK3115/165	WEP740B/165	121-1029
Q101	7366-1	140976	GE-38	NTE165	ECG165	SK3115/165	WEP740B/165	121-1029

PARTS LIST AND DESCRIPTION (Continued)

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

SEMICONDUCTORS (Select replacement for best results) (cont)

ITEM No.	TYPE No.	MFR. PART No.	REPLACEMENT DATA					
			GENERAL ELECTRIC PART No.	NEW-TONE NTE PART No.	PHILIPS ECG PART No.	RCA PART No.	WORKMAN PART No.	ZENITH PART No.
CR1	VIDEO BOARD		GEZD-12	NTE5021A	ECG5021A	SK12A/5021A	WEP1423/5021	103-279-21
Q1 thru		4800037	GEZD-12	NTE142A	ECG142A	SK12V/142A	WEP1112/142	103-Z9003
Q3		4822001	GE-123AP	NTE123AP	ECG123AP	SK3854/123AP	WEP736/123A	121-Z9000A
Q4		4822003	GE-123AP	NTE123AP	ECG123AP	SK3854/123AP	WEP736/123A	121-Z9000A
		4822003	GE-82	NTE159	ECG159	SK3466/159	WEP62/159	121-Z9003
		2N3906	GE-82	NTE159	ECG159	SK3466/159	WEP62/159	121-Z9003
Q5		4822001	GE-123AP	NTE123AP	ECG123AP	SK3854/123AP	WEP736/123A	121-Z9000A
Z1		3106001	GE-123AP	NTE123AP	ECG123AP	SK3854/123AP	WEP736/123A	121-Z9000A

- (1) Number on unit.
 (2) Part of Horiz Output Transformer T101 Part No. 140995.
 (3) May be part of Q101 in some versions.

WIRING DATA

High Voltage Lead	Use BELDEN No. 8869 (17 KV)
Shielded Hook-up Wire	Use BELDEN No. 8401 or 8421 (Single-Conductor)
General-use Unshielded Hook-up Wire	8208 (Two-Conductor)
	8529 (Solid) Available in 13 Colors
	8522 (Stranded) Available in 13 Colors

CSCS3-B

RADIO SHACK TRS-80
MODEL I LEVEL II

PARTS LIST AND DESCRIPTION (Continued)

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

ELECTROLYTIC CAPACITORS

ITEM No.	RATING	MFGR. PART No.
# C113A B	200 175V 250 175V	140969

ITEM No.	RATING	MFGR. PART No.

Items numbers not listed are normally available at local distributors.

For SAFETY use only equivalent replacement part.

CAPACITORS

ITEM No.	RATING	MFGR. PART No.
# C101	.18 200V 10%	139318
# C102	36 N750 5%	142023
# C103	.1 200V 10%	242290

ITEM No.	RATING	MFGR. PART No.
# C105	.0015 1.2KV	141496
# C108	180	143029
# C110	.1 125VAC	133343

Items numbers not listed are normally available at local distributors.

For SAFETY use only equivalent replacement part.

CONTROLS (All wattages ½ watt, or less, unless listed)

ITEM NO.	FUNCTION	RESISTANCE	MFGR. PART NO.	NOTES
# R13B	Vert Hold	200K	141022	
R44	Vert Size	500K	1473351-2(1) 138145	
# R102	Contrast	500	1473359-27(1) 140980	
# R103	Brightness	200K	1472242-43(1) 140711	

For SAFETY use only equivalent replacement part.

(1) Number on unit.

PARTS LIST AND DESCRIPTION (Continued)

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

RESISTORS (Power and Special)

ITEM No.	RATING	REPLACEMENT DATA		
		MFGR. PART No.	NEW-TONE PART No.	WORKMAN PART No.
# R1	75 5% 2W Metal Oxide	832075	2W075	22-2224
# R2	75 5% 2W Metal Oxide	832075	2W075	
# R9	10 5% 1/2W Metal Oxide	830010	HW010	
# R14	7500 5% 3W Metal Oxide			
	10K 1W		1W310	22-3120
	5600 5% 2W	832256	2W256	22-4114
# R23	470 5% 1/2W Metal Oxide	830147	HW147	22-2237
# R24	4.7 5% 1/2W Metal Oxide	140986	HW407	22-2040
# R34	56 5% 1/2W Carbon Film	830056	HW056	22-2066
# R40	10K 2% 1/4W Carbon Film		QW310	22-2253
# R47	12K 2% 1/2W Carbon Film		HW312	
	12K 5% 1/2W Carbon Film	132855	HW312	22-2122
# R49	120 2% 1/4W Carbon Film		QW112	22-2230
# R52	150 2% 1/4W Carbon Film		QW115	22-2231
# R54	5.6 5% 1/2W Carbon Film	143031	HW5D6	22-2042
# R61	3.3 5% 1/2W Carbon Film	139324	HW3D3	22-2036
# R77	10 5% 1/2W Metal Oxide	830010	HW010	22-2048
# R80	4.7 5% 1/2W Carbon Film	140986	HW4D7	22-2040
# R108	6800 5% 1/2W Carbon Film	993151-249	HW268	22-2116
# R109	6800 5% 1/2W Carbon Film	993151-249	HW268	22-2116
# R112	22 5% 10W WW	143030	10W022	
		945312-109(1)		
# R114	130 5% 7W WW	209895		
		945311-128(1)		
# R118	2200 5% 10W WW	249398	10W222	
		945312-157(1)		
	2000 10W			24-4093
# R121	130 5% 7W WW	209895		
		945311-128(1)		
	VIDEO BOARD			
R12	200 10% 5W WW	4717002		24-3070

For SAFETY use only equivalent replacement part.
(1) Number on unit.

RADIO SHACK TRS-80
MODEL I LEVEL II

COILS (RF-IF)

ITEM No.	FUNCTION	MFGR. PART No.
L2	RF Choke	109946

ITEM No.	FUNCTION	MFGR. PART No.
L3	Peak ing	130131

COILS & TRANSFORMERS (Sweep Circuits)

ITEM No.	FUNCTION	REPLACEMENT DATA		
		MFGR. PART No.	OTHER IDENTIFICATION	THORDARSON PART No.
# DY1	Yoke Horiz 4.6mH		1463734-504	
	90° Vert 51mH	143045	1463734-503	
L4	Horiz Hold	141017		
L5	Horiz Driver	141021		
# T101	Horiz Output	(1)	1465914-503	
		140995(1)	1465914-501	

For SAFETY use only equivalent replacement part.
(1) Includes CR108.

PARTS LIST AND DESCRIPTION (Continued)

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

FUSE DEVICES

ITEM NO.	DESCRIPTION	MFGR. PART NO.		NOTES
		DEVICE	HOLDER	
# F101	1A @ 250V Fast-Acting	426973		
# F102	5A @ 250V Fast-Acting Pigtail	99328		

For SAFETY use only equivalent replacement part.

MISCELLANEOUS

ITEM No.	PART NAME	MFGR. PART No.	NOTES
DS101	Neon Lamp	122608	NE-2H
FB1	Ferrite Bead	119971	
FB4	Ferrite Bead	128456	
FB5	Ferrite Bead	128456	
FB6	Ferrite Bead	128456	
FB7	Ferrite Bead	128456	
FB101	Ferrite Bead	138013	
L101	Ferrite Bead	143038	AC, Polarized Power
# P101	Power Cord	142453	
# S101	Switch	142639	AC Power Cord CRT Mounting Main Video CRT
# V101	CRT	12VBYP4	
	CRT	12VBNP4	
	Bracket	141006	
	Cushion	132272	
	P.C. Board	143035	
	P.C. Board	1700065	
	Socket	143036	

For SAFETY use only equivalent replacement part.

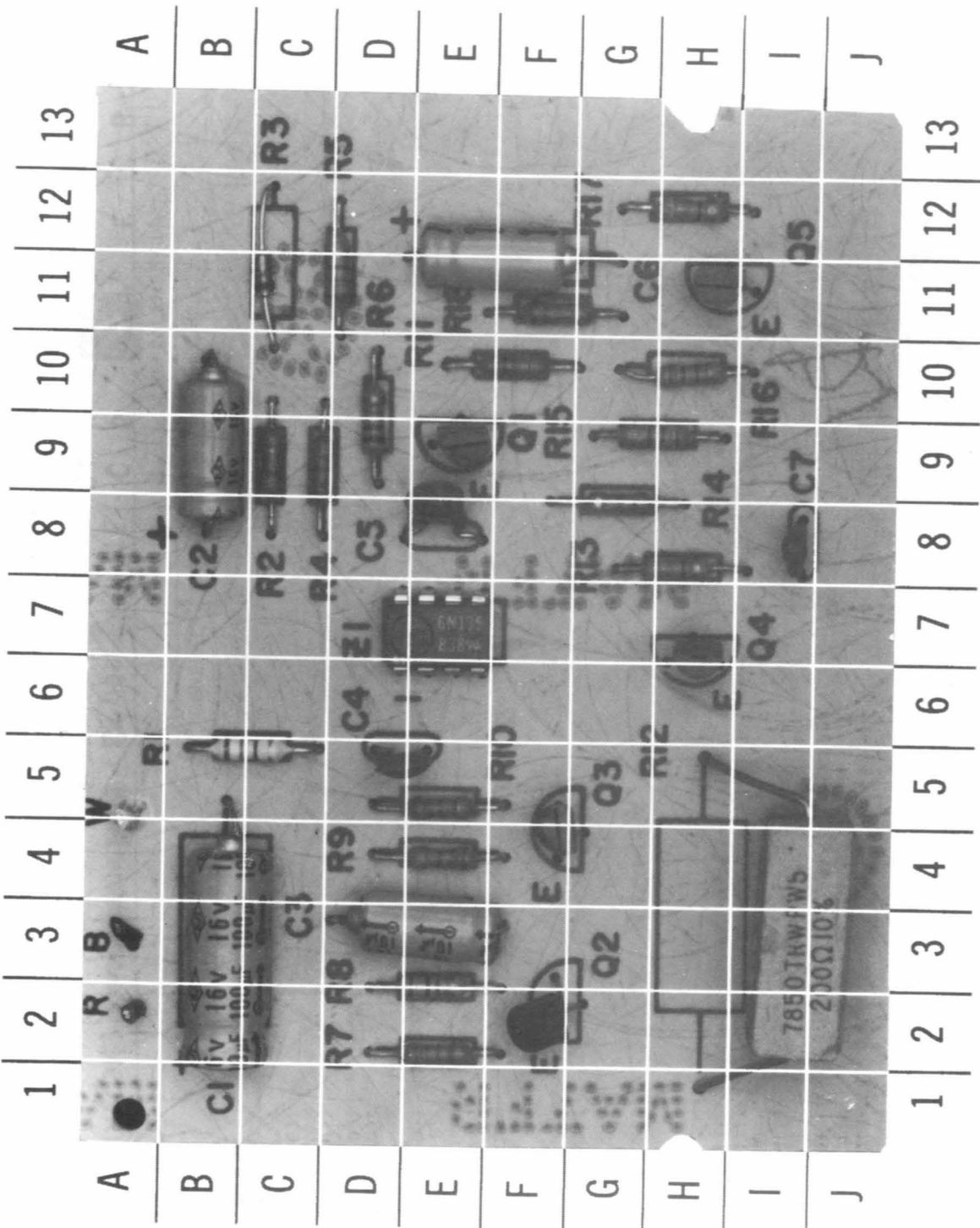
CABINET & CABINET PARTS (When ordering specify model, chassis & color)

ITEM	PART No.	ITEM	PART No.
Cabinet Back	141856	# Knob-Brightness, Contrast	136347
Cabinet Front Mask	142312	# Knob-Horiz Hold	124313
Button-Power	140783		

For SAFETY use only equivalent replacement part.



VIDEO BOARD



VIDEO BOARD
GridTrace

LOCATION GUIDE

C1	B-3
C2	B-9
C3	E-3
C4	D-5
C5	E-8
C6	E-11
C7	I-8
CR1	C-11
Q1	E-9
Q2	F-2
Q3	F-4
Q4	H-7
Q5	H-11
R1	C-5
R2	C-9
R4	C-9
R5	B-5
R6	D-9
R7	E-2
R8	E-2
R9	E-4
R10	E-5
R11	F-10
R12	I-3
R13	H-8
R14	G-8
R15	G-9
R16	H-10
R17	H-12
R18	F-11
Z1	E-7

TROUBLESHOOTING AID

Note: Waveforms taken with triggered scope, Bar-Sweep generator. Schematic voltages measured with digital meter, no signal. Controls adjusted for normal operation.

PICTURE

NO PIC, NO RASTER: Check for AC power supply and sources generated from Horizontal Output Transformer (T101). Refer to "Troubleshooting" Power Supply and Horizontal circuits.

NO PIC, HAS RASTER: Refer to "Troubleshooting" Video circuit.

LOW OR EXCESSIVE BRIGHTNESS: Check Video and Luminance circuits. Refer to "Troubleshooting" Video circuit.

SWEEP

NO RASTER: Check HV rectifier, Part of Horizontal Output Transformer (T101). Refer to "Troubleshooting" Horizontal circuit.

NO VERT DEFLECTION: Refer to "Troubleshooting" Vertical circuit.

POOR VERT LIN OR FOLDOVER: Refer to "Troubleshooting" Vertical circuit.

POOR HORIZ LIN OR FOLDOVER: Refer to "Troubleshooting" Horizontal circuit.

NARROW PICTURE: Refer to "Troubleshooting" Horizontal circuit.

VERT OFF FREQUENCY: Refer to "Troubleshooting" Vertical circuit.

HORIZ OFF FREQUENCY: Refer to "Troubleshooting" Horizontal circuit.

SYNC

NO VERT/HORIZ SYNC: Refer to "Troubleshooting" Sync circuit.

Note: Make sure that the problem is in the Monitor and not in the Computer. If the Monochrome Adapter fails, the Monitor will lose raster, or sync, or both, according to whichever signal is missing from the Computer to Monitor.

TROUBLESHOOTING

POWER SUPPLY

Check AC Fuses (F101 and F102) and if open, check Diode CR101, and Capacitor C110. If Fuses F101 and F102 are good, check for 133V at cathode of Diode CR101. If 133V is missing, check Resistor R112 and Power Switch (S101). Check for 88.3V at pin 2 of Horizontal Output Transformer (T101), if missing, check Resistors R121 and R114. Check the voltages developed from Transformer T101. Check for 19.0V at junction of Resistors R9 and R61, 16.2V at junction of Capacitor C44 and Electrolytic C39, 18.6V at junction of Resistors R9 and R32, 11.7V at pin 5 of Transformer T101. If any of the voltages are incorrect, check components associated with that voltage.

HORIZONTAL

Check the Horizontal Output Transistor (Q101). If good, check the waveform at base of Horizontal Oscillator Transistor (Q11). If waveform is missing, check voltages, waveforms and components associated with Transistor Q11. Check waveform at base of Transistor Q101 and if missing, check the voltages, waveforms and components associated with Horizontal Driver Transistor (Q12). If readings at Transistor Q12 are good, check Diodes CR106 and CR108 and

Horizontal Output Transformer (T101). Check the voltages developed by Transformer T101, which may be loading down the horizontal circuit.

For horizontal linearity or foldover problems, check Capacitors C108, C105, C101, C102 and C103 and the Deflection Yoke (DY1).

VERTICAL

Inject a vertical signal at base of Vertical Oscillator Transistor (Q4) and check for vertical deflection on the CRT. If no vertical deflection is noted, inject the vertical signal to the base of Vertical Driver Transistor (Q6). If vertical deflection returns, check voltages and components associated with Transistor Q4 and Preamp Transistor Q5. If vertical deflection does not return, check Transistor Q6, Kine Blanker Transistor (Q7), Vertical Output Transistors (Q8 and Q9), Deflection Yoke (DY1) and associated components.

For poor vertical linearity or foldover problems, check Diodes CR6 thru CR10, Electrolytics C39, C40 and C42 and Capacitors C41 and C45. Refer to the "Resistance Measurements Chart" and check for possible changes in feedback and bias circuitry resistances.

TROUBLESHOOTING (Continued)

VIDEO

Inject a video signal to base of Video Amp Transistor (Q4) on the Video Board. Check waveform at base of Video Output Transistor (Q2) on the Main Board. If waveform is missing, check voltages, waveforms and components associated with Video Amp Transistors (Q1 and Q4 and pins 5 thru 8 of Isolation IC (Z1) on the Video Board. If the waveform is present at base of Transistor Q2 on Main Board, check Transistor Q2, the CRT and components associated with the cathode of the CRT.

No video with Computer connected to Connector P2. Check for 5.0V at pin 2 of IC Z1. This voltage is supplied by the Computer and if missing, check Computer. Check the Video Board by substitution or check Noise Filter Transistor (Q2), Video Preamp Transistor (Q3) and IC Z1 and associated components on the Video Board.

SYNC

No vertical or horizontal sync. Check voltages and waveforms at base and collector of Sync Separator Transistor (Q3).

No vertical sync. Check waveform at base of Vertical Oscillator (Q4). Check Vertical Hold Control (R13B) and associated components.

No horizontal sync. Check waveforms at Diodes CR17 and CR18. Check the Horizontal Hold Coil (L4) and associated circuitry.

RESISTANCE MEASUREMENTS

MEASUREMENTS TAKEN WITH LOW POWER OHMS METER														
ITEM	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9	PIN 10	PIN 11	PIN 12	PIN 13	PIN 14
V101	INF	730K	FIL	FIL	INF	INF	0							
VIDEO BOARD														
Z1	INF	INF	500K	INF	0	47K	12K	630						
ITEM	E	B	C		ITEM	E	B	C		ITEM	E	B	C	
Q2	200	516	1.5M		Q8	1.6M	325K	INF		VIDEO BOARD				
Q3	0	330K	3959		Q9	1.6M	316K	5		Q1	182	47K	2109	
Q4	6000	870K	1M		Q11	57	INF	550K (1)		Q2	INF	INF	INF	
Q5	550K	1M	114K		Q12	INF	3021	7		Q3	800K (1)	INF	580K	
Q6	8285	114K	355K		Q101	0	6	INF		Q4	1327	6170	0	
Q7	8285	0	INF							Q5	469	1326	2290	

(1) Reading may vary according to the condition of the electrolytic in the circuit.

SCHEMATIC NOTES

For SAFETY use only equivalent replacement part, see parts list.

—*— Circuitry not used in some versions

--- Circuitry used in some versions

⊖ See parts list

⊕ Ground

⏏ Chassis

Waveforms and voltages are taken from ground, unless noted otherwise.

Item numbers in rectangles appear in the alignment/adjustment instructions.

Supply voltages maintained as shown at input.

Voltages measured with digital meter, no signal.

Controls adjusted for normal operation.

Terminal identification may not be found on unit.

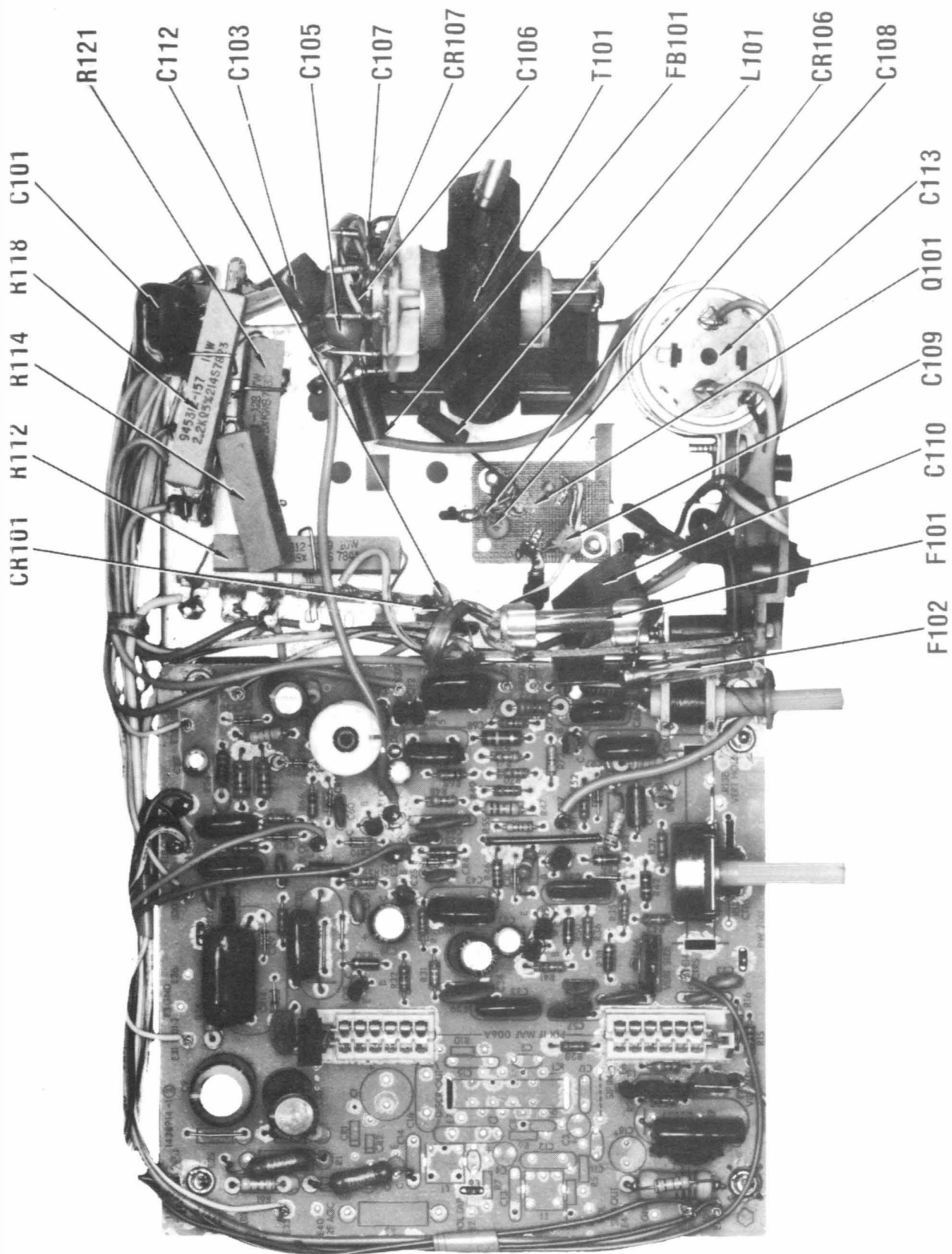
Capacitors are 50 volts or less, 5% unless noted.

Electrolytic capacitors are 50 volts or less, 20% unless noted.

Resistors are ½W or less, 5% unless noted.

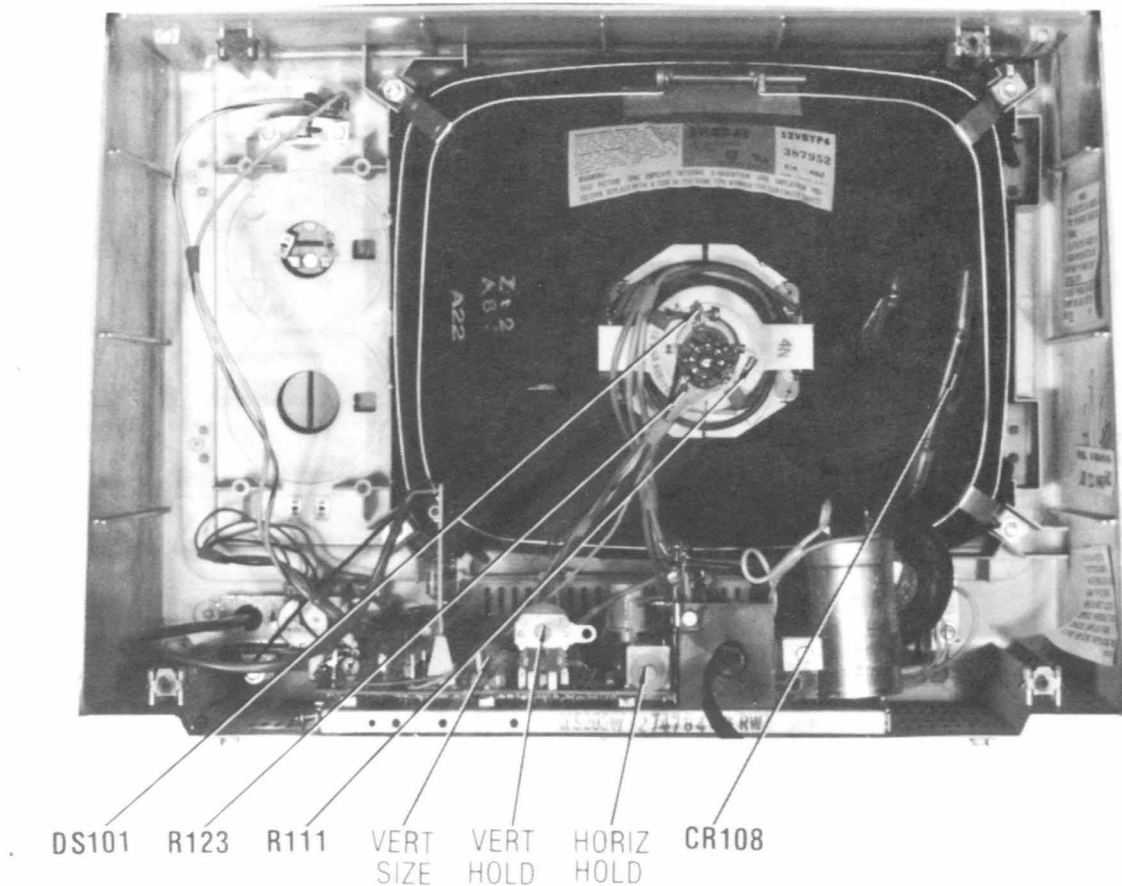
Value in () used in some versions.

Measurements with switching as shown, unless noted.



RADIO SHACK TRS-80
MODEL I LEVEL II

CHASSIS-TOP VIEW



CABINET-REAR VIEW

DISASSEMBLY INSTRUCTIONS

CHASSIS REMOVAL

Remove five screws holding cabinet back and remove back. Disconnect CRT socket, HV anode and ground wires. Loosen and remove CRT neck assembly and remove main chassis from cabinet. Remove knobs from cabinet front. Remove two screws holding control bracket to cabinet front and remove bracket.

CRT REMOVAL

Follow "Chassis Removal" procedure and lay set facedown on a soft protective surface. Remove four screws holding CRT to cabinet front and lift CRT out of cabinet. **Do not** lift CRT by the neck.

SERVICING IN THE FIELD

CRT IMPLOSION PROTECTION AND CLEANING

Implosion protection is an integral part of the picture tube, cleaning accomplished without CRT removal.

FUSE DEVICES

A 5-amp and 1-amp fuse are used for AC line protection. (See Placement Chart.)

HORIZONTAL OSCILLATOR

Adjustment of the horizontal hold is accomplished by the proper setting of the horizontal hold coil. (See photo, Cabinet-Rear View.)

CENTERING

Centering is accomplished by proper adjustment of two magnetic rings located on the yoke rear cover.

KEYBOARD, CPU BOARD

See Folder CSCS3

PRELIMINARY SERVICE CHECKS

ENCLOSED

SAFETY PRECAUTIONS

See page 9.

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SAMSTM Howard W. Sams & Co., Inc.

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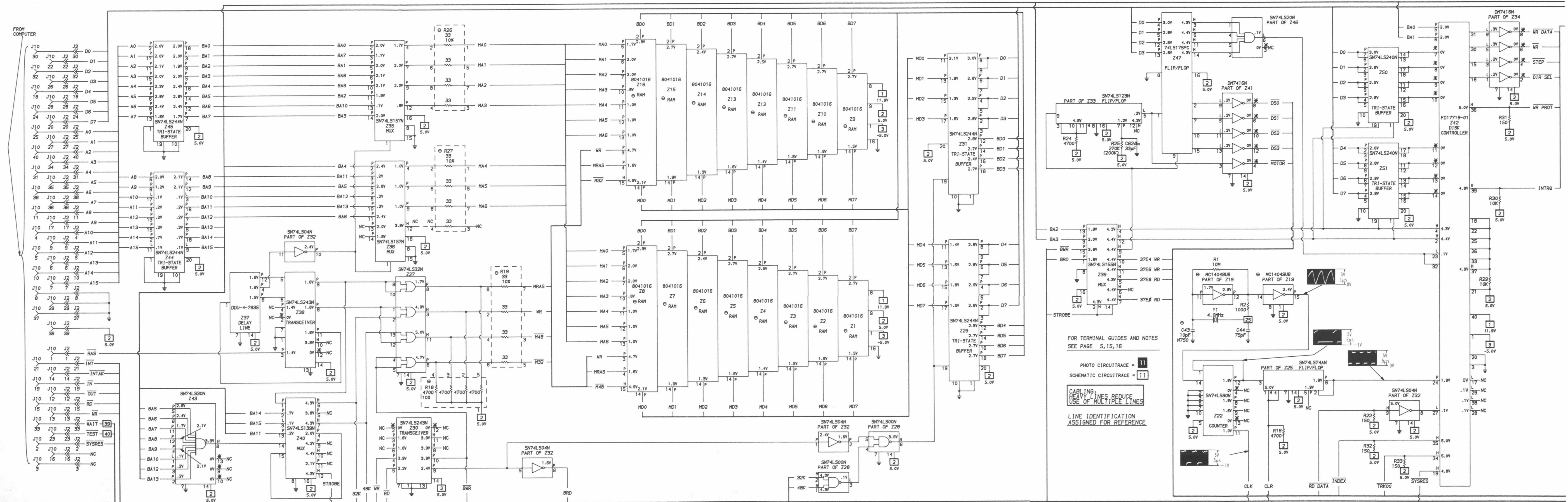
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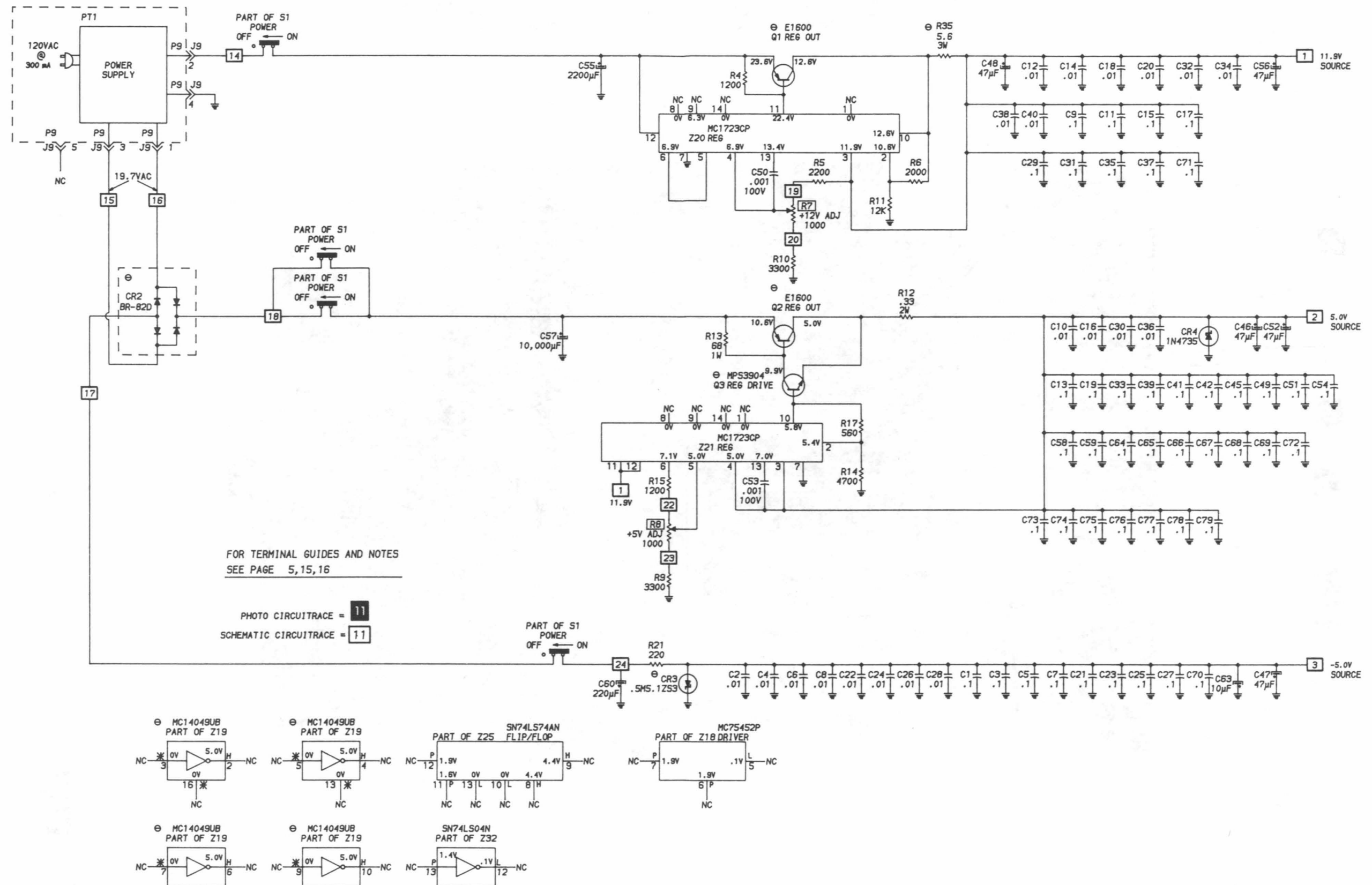
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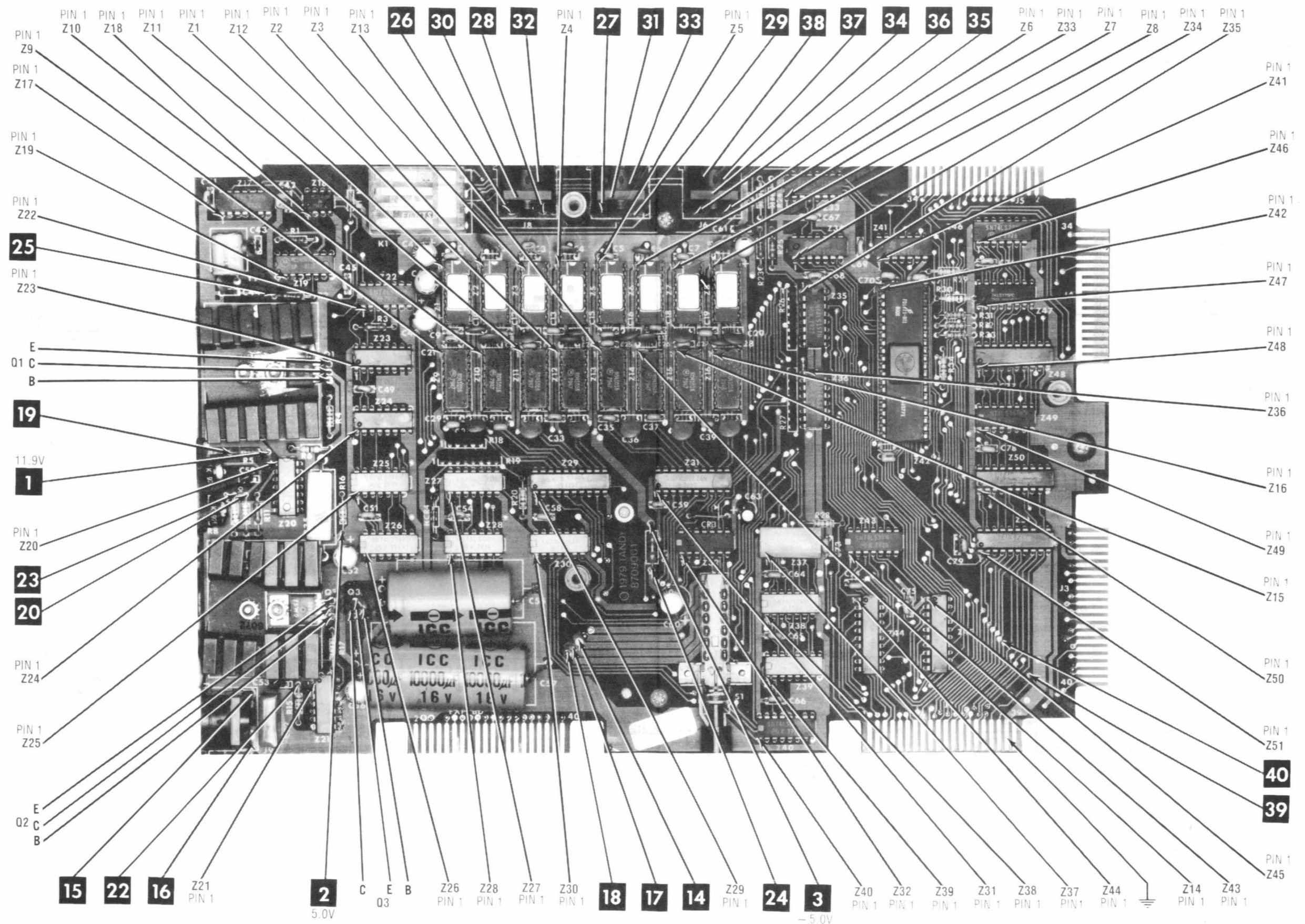
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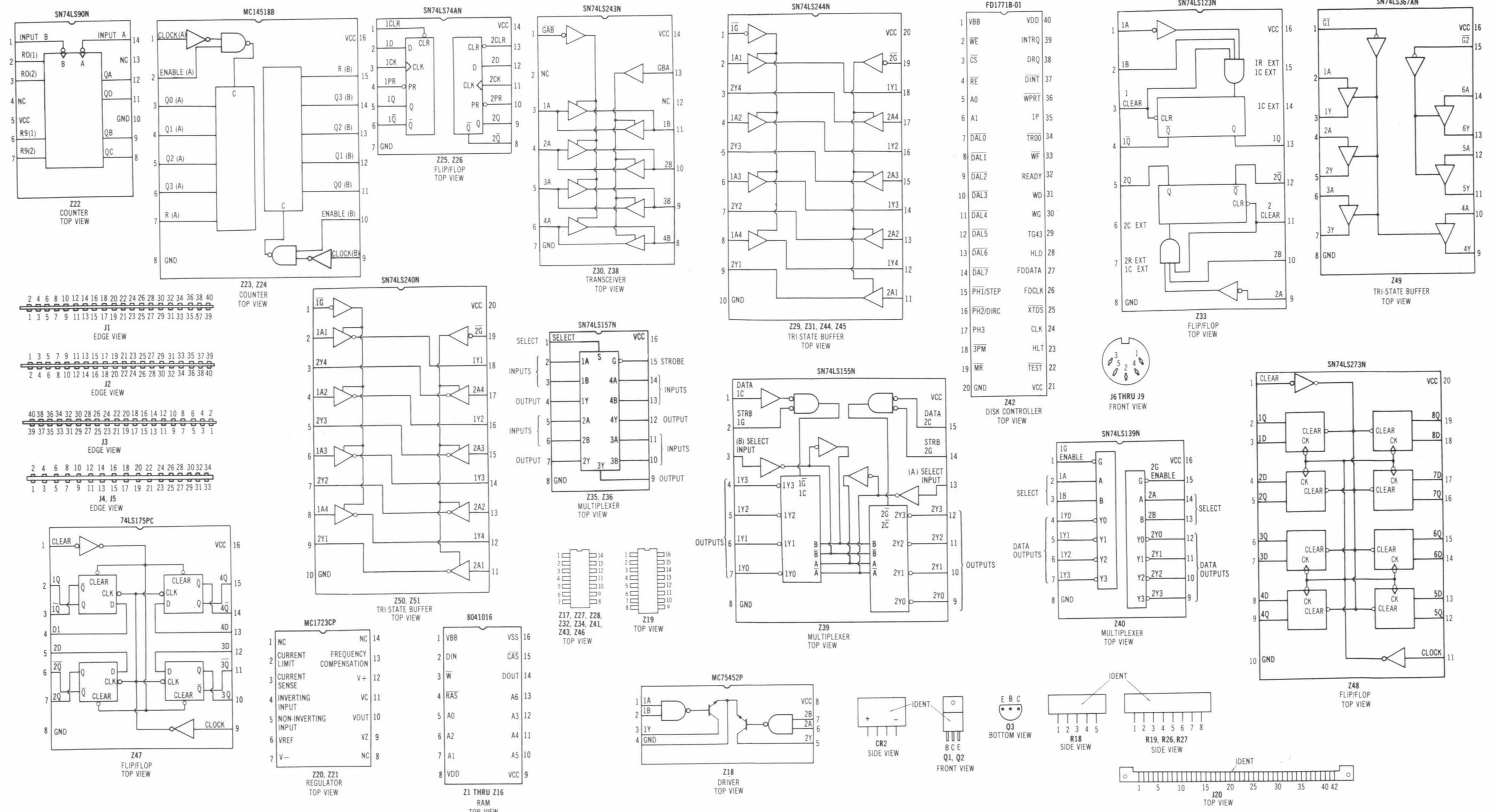
RADIO SHACK TRS-80
MODEL I LEVEL II

EXPANSION INTERFACE BOARD

A Howard W. Sams CIRCUITRACE Photo

EXPANSION INTERFACE BOARD

IC PINOUTS & TERMINAL GUIDES



CSCS-3-A

RADIO SHACK TRS-80
MODEL I LEVEL II

MISCELLANEOUS ADJUSTMENTS

12V AND 5V ADJUSTMENT

NOTE: Perform 12V adjustment before 5V adjustment.

Connect the input of a DC voltmeter to pin 3 of Regulator IC (Z20). Adjust the 12V Adjust Control (R7) for 11.9V.

Connect the input of a DC voltmeter to pin 3 of Regulator IC (Z21). Adjust the 5V Adjust Control (R8) for 5.0V.

LOGIC CHART

PIN NO.	IC Z1	IC Z2	IC Z3	IC Z4	IC Z5	IC Z6	IC Z7	IC Z8	IC Z9	IC Z10	IC Z11	IC Z12	IC Z13	IC Z14
1	L	L	L	L	L	L	L	L	L	L	L	L	L	L
2	P	P	P	P	P	P	P	P	P	P	P	P	P	P
3	P	P	P	P	P	P	P	P	P	P	P	P	P	P
4	P	P	P	P	P	P	P	P	P	P	P	P	P	P
5	P	P	P	P	P	P	P	P	P	P	P	P	P	P
6	P	P	P	P	P	P	P	P	P	P	P	P	P	P
7	P	P	P	P	P	P	P	P	P	P	P	P	P	P
8	H	H	H	H	H	H	H	H	H	H	H	H	H	H
9	H	H	H	H	H	H	H	H	H	H	H	H	H	H
10	P	P	P	P	P	P	P	P	P	P	P	P	P	P
11	P	P	P	P	P	P	P	P	P	P	P	P	P	P
12	P	P	P	P	P	P	P	P	P	P	P	P	P	P
13	P	P	P	P	P	P	P	P	P	P	P	P	P	P
14	P	P	P	P	P	P	P	P	P	P	P	P	P	P
15	H	H	H	H	H	H	H	H	H	H	H	H	H	H
16	L	L	L	L	L	L	L	L	L	L	L	L	L	L
PIN NO.	IC Z15	IC Z16	IC Z17	IC Z18	IC Z19	IC Z20	IC Z21	IC Z22	IC Z23	IC Z24	IC Z25	IC Z26	IC Z27	IC Z28
1	L	L	P	H	H	(1)	(1)	P	L	L	H	H	P	H
2	P	P	L	H	H			L	P	L	P	L	H	H
3	P	P	H	L	*			L	P	P	P	P	H	L
4	P	P	H	L	H			*	P	P	H	H	P	L
5	P	P	L	L	*			H	P	P	P	L	P	P
6	P	P	H	P	H			L	P	L	P	H	P	H
7	P	P	L	P	*			L	L	L	L	L	L	L
8	H	H	L	H	L			P	L	L	H	L	P	P
9	H	H	H		*			P	L	L	H	H	P	P
10	P	P	H		H			L	P	L	L	L	P	P
11	P	P	H		P			P	P	P	P	H	H	P
12	P	P	H		P			P	P	P	P	L	P	P
13	P	P	L		*			*	P	P	L	H	H	P
14	P	P	H		P			P	P	L	H	H	H	H
15	H	H			P			L	L					
16	L	L			*			H	H					

NOTE: Logic probe readings taken with computer turned On, no keys pressed, unless otherwise noted.

Logic Probe Display

L = Low

H = High

P = Pulse

* = Open (No light On)

(1) Logic readings not taken.

LOGIC CHART (Continued)

PIN NO.	IC Z29	IC Z30	IC Z31	IC Z32	IC Z33	IC Z34	IC Z35	IC Z36	IC Z37	IC Z38	IC Z39	IC Z40	IC Z41
1	L	L *	L	P	L	L *	P	P	(1)	L *	P	P	P
2	P	*	P	P	H	L	P	P		P	H	P	P
3	P	P	P	H	H	L	P	P		P	P	L	L
4	P	P	P	L	H	*	P	P		P	H	P	*
5	P	P	P	P	L	L *	P	P		P	H	P	L *
6	P	P	P	P	L	L *	P	P		P	H	P	L *
7	P	L	P	L	L	L *	P	P		P	H	P	L *
8	P	H	P	L	L	L *	P	P		P	H	P	L *
9	P	P	P	H	H	L	P	P		P	H	P	L *
10	L	P	L	P	H	L	P	P		P	H	P	L *
11	P	H *	P	P	H	L	P	P		H *	H	P	L *
12	P	*	P	L	H	L	P	H		*	H	P	L *
13	P	L	P	P	L	H	L	P		L	P	P	L
14	P	H	P	H	L	H	P	L		H	P	P	H
15	P		P	P	L		L	L			P	P	H
16	P		P	P	H		H	H			P	P	H
17	P		P										
18	P		P										
19	H		H										
20	H		H										

PIN NO.	IC Z42	PIN NO.	IC Z42	PIN NO.	IC Z43	IC Z44	IC Z45	IC Z46	IC Z47	IC Z48	IC Z49	IC Z50	IC Z51
1	L	21	H	1	L	L	L	H	L	H	H	H	H
2	H	22	H	2	P	P	P	H	L	L	P	P	P
3	L	23	L	3	P	L	P	*	H	P	P	P	P
4	H	24	P	4	P	P	P	H	P	P	P	P	P
5	P	25	H	5	P	P	P	H	P	L	P	P	P
6	P	26	H	6	P	P	P	L	H	L	P	P	P
7	*	27	L	7	L	P	P	L	L	L	P	P	P
8	*	28	L	8	H	P	P	P	L	L	P	P	P
9	*	29	L	9	*	L	P	P	H	L	P	P	P
10	*	30	L	10	*	L	L	P	L	L	H	L	*
11	*	31	L	11	P	L	L	P	H	H	P	P	*
12	*	32	L	12	P	P	P	P	P	H	H	H	*
13	*	33	H	13	*	P	P	P	P	P	P	H	*
14	*	34	H	14	H	P	P	P	H	H	H	H	*
15	L	35	H	15		P	P	P	L	L	H	H	*
16	L	36	H	16		P	P	P	H	H	H	H	*
17	L	37	H	17		L	P	P		P	P	*	*
18	H	38	L	18		P	P	L		P	P	*	*
19	H	39	H	19		L	P	L		H	H	H	H
20	L	40	H	20		H	H	H					

NOTE: Logic probe readings taken with computer turned On, no keys pressed, unless otherwise noted.

Logic Probe Display

L = Low

H = High

P = Pulse

* = Open (No light On)

(1) Logic readings not taken.

DISASSEMBLY INSTRUCTIONS

CABINET REMOVAL

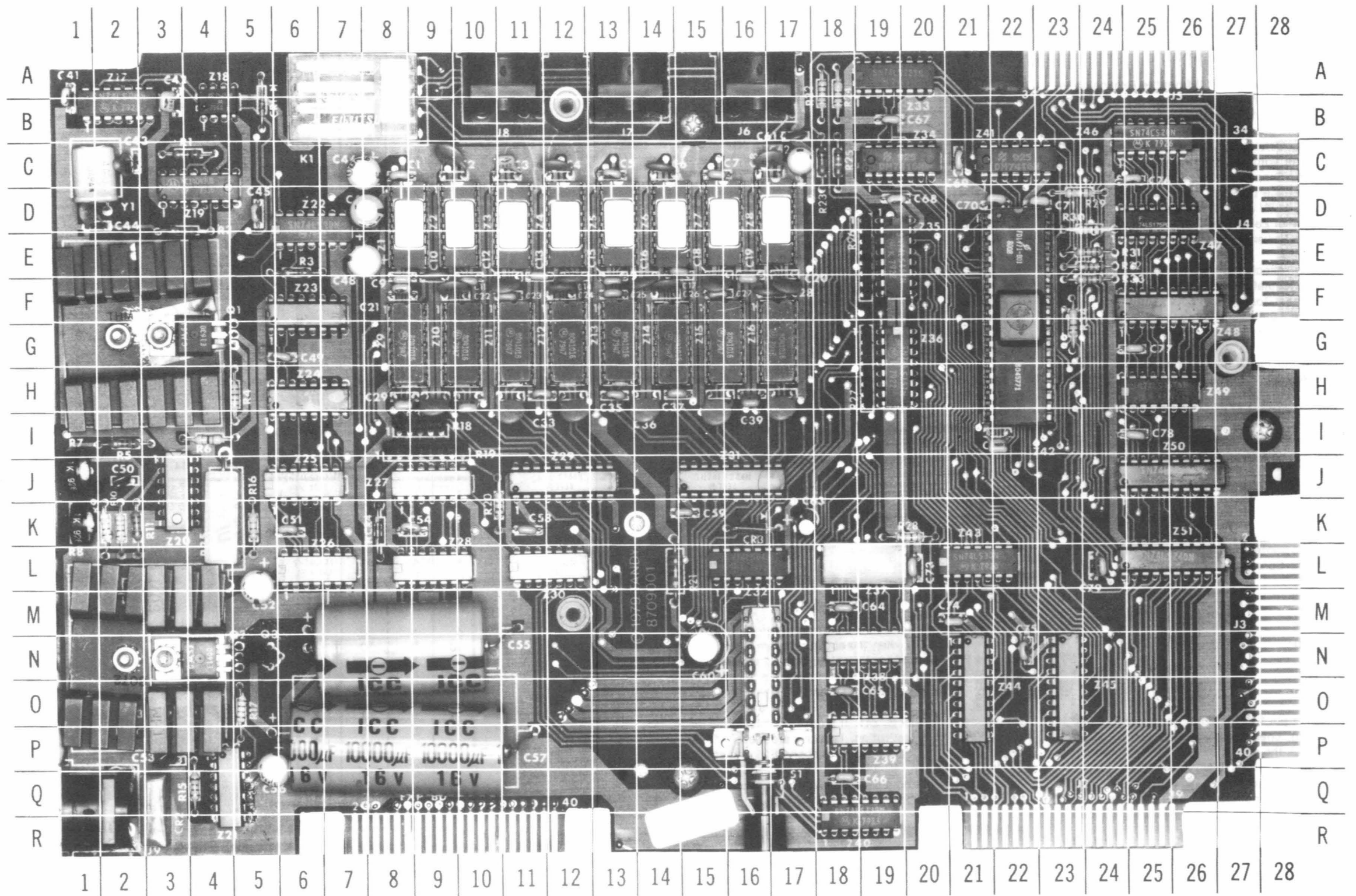
Remove six screws from cabinet bottom. Remove cabinet bottom from unit. All components are now accessible for service.

CSCS-3-A

**RADIO SHACK TRS-80
MODEL I LEVEL II**

EXPANSION INTERFACE BOARD
GridTrace
LOCATION GUIDE

C1	C-8
C2	C-9
C3	C-11
C4	C-12
C5	C-13
C6	C-14
C7	C-15
C8	C-17
C9	F-8
C10	E-9
C11	F-10
C12	F-11
C13	E-11
C14	F-12
C15	F-13
C16	F-14
C17	E-15
C18	F-15
C19	F-16
C20	F-17
C21	F-8
C22	F-9
C23	F-11
C24	F-12
C25	F-13
C26	F-14
C27	F-15
C28	F-17
C29	H-8
C30	H-9
C31	H-10
C32	H-11
C33	H-11
C34	H-12
C35	H-13
C36	H-14
C37	H-14
C38	H-15
C39	H-16
C40	H-17
C41	A-1
C42	B-3
C43	C-2
C44	D-1
C45	D-5
C46	C-7
C47	D-7
C48	E-7
C49	G-6
C50	J-2
C51	K-6
C52	L-5
C53	D-3
C54	K-9
C55	N-8
C56	P-5
C57	P-8
C58	K-11
C59	K-15
C60	N-15
C61	B-17
C62	C-17
C63	K-17
C64	M-18
C65	O-18
C66	Q-18
C67	B-19
C68	D-19
C69	C-21
C70	D-22
C71	D-23
C72	I-22
C73	L-20



EXPANSION INTERFACE BOARD

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C74	M-21	J8	A-11	R7	J-1	R19	I-9	R31	E-24	Z7	D-16	Z19	D-4	Z31	J-16	Z42	F-22
C75	N-22	J9	Q-1	R8	K-1	R20	K-10	R32	E-24	Z8	D-17	Z20	J-3	Z32	L-16	Z43	L-21
C76	C-25	K1	B-7	R9	K-2	R21	L-14	R33	F-24	Z9	G-8	Z21	Q-4	Z33	A-19	Z44	O-21
C77	G-25	Q1	G-4	R10	K-2	R22	A-18	R34	G-23	Z10	G-10	Z22	D-6	Z34	C-19	Z45	O-23
C78	I-25	Q2	N-4	R11	M-3	R23	C-18	R35	K-4	Z11	G-11	Z23	F-6	Z35	E-19	Z46	B-25
C79	L-24	Q3	N-5	R12	O-3	R24	A-18	Y1	C-1	Z12	G-12	Z24	H-6	Z36	G-19	Z47	D-25
CR1	B-5	R1	C-4	R13	P-3	R25	C-18	Z1	D-9	Z13	G-13	Z25	J-6	Z37	L-19	Z48	F-25
CR2	Q-3	R2	D-3	R14	Q-4	R26	E-19	Z2	D-10	Z14	G-14	Z26	L-6	Z38	N-19	Z49	H-25
CR3	K-16	R3	E-6	R15	K-5	R27	H-19	Z3	D-11	Z15	G-15	Z27	J-9	Z39	P-19	Z50	J-25
CR4	K-8	R4	H-5	R16	O-5	R28	K-20	Z4	D-12	Z16	G-17	Z28	L-9	Z40	R-18	Z51	L-25
J6	A-16	R5	I-2	R17	I-9	R30	D-24	Z5	D-13	Z17	A-2	Z29	J-12	Z41	C-22		
J7	A-13	R6	I-4	R18			E-24	Z6	D-14	Z18	B-4	Z30	L-12				

EXPANSION INTERFACE BOARD

RADIO SHACK TRS-80
MODEL I LEVEL II

SAFETY PRECAUTIONS

1. Use an isolation transformer for servicing.
2. Maintain AC line voltage at rated input.
3. Remove AC power from the computer system 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, floppy disk drives, printers, or other peripherals with computer system AC power On.
8. Do not use freon-propelled sprays. These can generate electrical charges sufficient to damage semiconductor devices.
9. Periodically examine the AC power cord for damaged or cracked insulation.
10. The computer system cabinet is equipped with vents to prevent heat build-up. Never block, cover, or obstruct these vents.
11. 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.
12. Never expose the computer system to water. If exposed to water turn the unit Off. Do not place the computer system near possible water sources.
13. Never leave the computer system unattended or plugged into the AC outlet for long periods of time. Remove AC plug from AC outlet during lightning storms.
14. Do not allow anything to rest on AC power cord.
15. Unplug AC power cord from outlet before cleaning computer system.
16. Never use liquids or aerosols directly on the computer system. Spray on cloth and then apply to the computer system cabinet. Make sure the computer system is disconnected from the AC power line.

CSCS-3-A

**RADIO SHACK TRS-80
MODEL I LEVEL II**

PARTS LIST AND DESCRIPTION

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					
			GENERAL ELECTRIC PART No.	NEW-TONE NTE PART No.	PHILIPS ECG PART No.	RCA PART No.	WORKMAN PART No.	ZENITH PART No.
CR1	1N4148	4800002	GE-514	NTE519	ECG519	SK3100/519	WEP925/519	103-131
CR2	BR-82D		GE-167	NTE167	ECG167	SK3647/167	WEP1052/167	212-Z9001
CR3	MDA202	4800023	GE-167	NTE167	ECG167	SK3647/167	WEP1052/167	212-Z9001
	•5M5, 1Z53		GEZD-5.1	NTE5010A	ECG5010A	SK5A1/5010A	WEP1411/5010	103-279-10
CR4	1N5231	4800022	GEZD-5.1	NTE5010A	ECG5010A	SK5A1/5010A	WEP1411/5010	103-279-10
	T4446							
Q1, 2	1N4735	4800021	GEZD-6.2	NTE137A	ECG137A	SK6V2/137A	WEP1154/137	103-Z9008
	E1600							
Q3	MJE2955		GE-56	NTE183	ECG183	SK3189A/183	WEP748/183	
	MPS3904		GE-123AP	NTE123AP	ECG123AP	SK3854/123AP	WEP736/123A	121-Z9000A
	2N3904	4822001	GE-123AP	NTE123AP	ECG123AP	SK3854/123AP	WEP736/123A	121-Z9000A
Z1 thru								
Z16	8041016							
Z17	MK4116							
Z18	SN74LS00N	3102006	74LS00	NTE2117	ECG2117	SK74LS00		HE-443-904
Z19	MC75452P	3106002		NTE74LS00	ECG74LS00			HE-443-728
	MC14049UB		GE-4049	NTE75452B	ECG75452B			HE-443-74
	4049B		GE-4049	NTE4049	ECG4049	SK4049UB		221-Z9074
				NTE4049	ECG4049	SK4049UB		221-Z9074
Z20, 21	MC1723CP	3100001	GE1C-260	NTE923D	ECG923D	SK3165/923D	WEP2331/923D	221-Z9020
Z22	SN74LS90N		74LS90	NTE74LS90	ECG74LS90	SK74LS90		
Z23, 24	MC145188		GE-4518	NTE45188	ECG45188	SK45188		HE-443-737
Z25, 26	SN74LS74AN	3102015	74LS74A	NTE74LS74A	ECG74LS74A	SK74LS74A		HE-443-730
Z27	SN74LS32N	3102014	74LS32	NTE74LS32	ECG74LS32	SK74LS32		HE-443-875
Z28	SN74LS00N							
Z29	SN74LS244N	3102006	74LS00	NTE74LS00	ECG74LS00	SK74LS00		HE-443-728
Z30	SN74LS243N		74LS244	NTE74LS244	ECG74LS244	SK74LS244		HE-443-791
Z31	SN74LS244N		74LS244	NTE74LS243	ECG74LS243	SK74LS243		HE-443-839
Z32	SN74LS04N	3102008	74LS04	NTE74LS04	ECG74LS04	SK74LS244		HE-443-791
				NTE74LS04	ECG74LS04	SK74LS04		HE-443-755
Z33	SN74LS123N		74LS123	NTE74LS123	ECG74LS123	SK74LS123		HE-443-942
Z34	DM7416N		GE-7416	NTE7416	ECG7416	SK7416		HE-443-73
Z35, 36	SN74LS157N	3102020	74LS157	NTE74LS157	ECG74LS157	SK74LS157		HE-443-799
Z38	SN74LS243N			NTE74LS243	ECG74LS243	SK74LS243		HE-443-839
Z39	SN74LS155N			NTE74LS155	ECG74LS155	SK74LS155		HE-443-782

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.	MFGR. PART No.	REPLACEMENT DATA					
			GENERAL ELECTRIC PART No.	NEW-TONE NTE PART No.	PHILIPS ECG PART No.	RCA PART No.	WORKMAN PART No.	ZENITH PART No.
Z40	SN74LS139N		74LS139	NTE74LS139	ECG74LS139	SK74LS139		HE-443-73
Z41	DM7416N		GE-7416	NTE7416	ECG7416	SK7416		
Z42	FD1771B-01							HE-443-732
Z43	SN74LS30N		74LS30	NTE74LS30	ECG74LS30	SK74LS30		HE-443-791
Z44, 45	SN74LS244N	3102013	74LS244	NTE74LS244	ECG74LS244	SK74LS244		
Z46	SN74LS20N		74LS20	NTE74LS20	ECG74LS20	SK74LS20		HE-443-798
Z47	74LS175PC	3102023	74LS175	NTE74LS175	ECG74LS175	SK74LS175		HE-443-752
Z48	SN74LS273N		74LS273	NTE74LS273	ECG74LS273	SK74LS273		HE-443-805
Z49	SN74LS367AN	3102024	74LS367A	NTE74LS367	ECG74LS367	SK74LS367		HE-443-857
Z50, 51	SN74LS240N		74LS240	NTE74LS240	ECG74LS240	SK74LS240		HE-443-754

CAPACITORS Items not listed are normally available at local distributors.

ITEM No.	RATING	MFGR. PART No.	ITEM No.	RATING	MFGR. PART No.
C43	10pF N750 50V				

PARTS LIST AND DESCRIPTION (Continued)

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

CONTROLS (All wattages ½ watt, or less, unless listed)

ITEM NO.	FUNCTION	RESISTANCE	MFGR. PART NO.	NOTES
R7 R8	+12V Adjust +5V Adjust	1000 1000	4750019 4750019	

RESISTORS (Power and Special)

ITEM No.	RATING	REPLACEMENT DATA		
		MFGR. PART No.	NEW-TONE PART No.	WORKMAN PART No.
R18 R19 R26 R27 R35	Resistor Network (1) Resistor Network (2) Resistor Network (2) Resistor Network (2) 5.6 5% 3W WW	4717003		

(1) Contains four 4700, 10%.

(2) Contains four 33, 10%.

MISCELLANEOUS

ITEM No.	PART NAME	MFGR. PART No.	NOTES
K1	Relay	FRL-4140005/04CT (1)	Motor Control, 5V 42 Ohms
PT1	Power Supply	4000004	
S1	Switch		AC Power On-Off
Y1	Crystal		4.0MHz
Z37	Delay Line P.C. Board	DDU-4-7835(1) 8709001	Expansion Interface

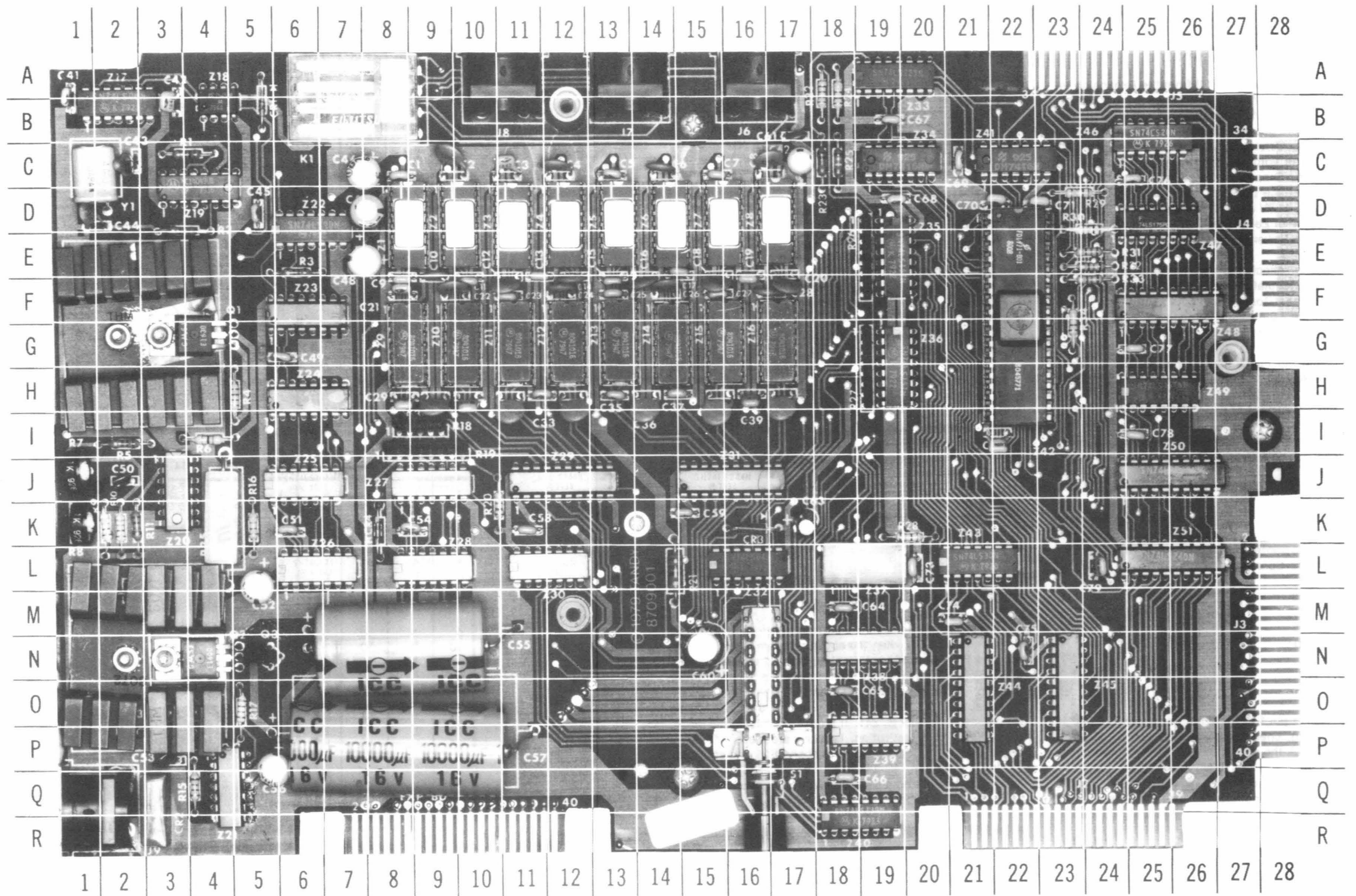
(1) Number on unit.

CABINET & CABINET PARTS (When ordering specify model, chassis & color)

ITEM	PART No.	ITEM	PART No.
Cabinet, Top Cabinet, Bottom		Cover, Power Supply Compartment Cover, Expansion Compartment	

EXPANSION INTERFACE
BOARD GridTrace
LOCATION GUIDE

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C5	C-13
C6	C-14
C7	C-15
C8	C-17
C9	F-8
C10	E-9
C11	F-10
C12	F-11
C13	E-11
C14	F-12
C15	F-13
C16	F-14
C17	E-15
C18	F-15
C19	F-16
C20	F-17
C21	F-8
C22	F-9
C23	F-11
C24	F-12
C25	F-13
C26	F-14
C27	F-15
C28	F-17
C29	H-8
C30	H-9
C31	H-10
C32	H-11
C33	H-11
C34	H-12
C35	H-13
C36	H-14
C37	H-14
C38	H-15
C39	H-16
C40	H-17
C41	A-1
C42	B-3
C43	C-2
C44	D-1
C45	D-5
C46	C-7
C47	D-7
C48	E-7
C49	G-6
C50	J-2
C51	K-6
C52	L-5
C53	D-3
C54	K-9
C55	N-8
C56	P-5
C57	P-8
C58	K-11
C59	K-15
C60	N-15
C61	B-17
C62	C-17
C63	K-17
C64	M-18
C65	O-18
C66	Q-18
C67	B-19
C68	D-19
C69	C-21
C70	D-22
C71	D-23
C72	I-22
C73	L-20



EXPANSION INTERFACE BOARD

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C74	M-21	J8	A-11	R7	J-1	R19	I-9	R31	E-24	Z7	D-16	Z19	D-4	Z31	J-16	Z42	F-22
C75	N-22	J9	Q-1	R8	K-1	R20	K-10	R32	E-24	Z8	D-17	Z20	J-3	Z32	L-16	Z43	L-21
C76	C-25	K1	B-7	R9	K-2	R21	L-14	R33	F-24	Z9	G-8	Z21	Q-4	Z33	A-19	Z44	O-21
C77	G-25	Q1	G-4	R10	K-2	R22	A-18	R34	G-23	Z10	G-10	Z22	D-6	Z34	C-19	Z45	O-23
C78	I-25	Q2	N-4	R11	M-3	R23	C-18	R35	K-4	Z11	G-11	Z23	F-6	Z35	E-19	Z46	B-25
C79	L-24	Q3	N-5	R12	O-3	R24	A-18	Y1	C-1	Z12	G-12	Z24	H-6	Z36	G-19	Z47	D-25
CR1	B-5	R1	C-4	R13	P-3	R25	C-18	Z1	D-9	Z13	G-13	Z25	J-6	Z37	L-19	Z48	F-25
CR2	Q-3	R2	D-3	R14	Q-4	R26	E-19	Z2	D-10	Z14	G-14	Z26	L-6	Z38	N-19	Z49	H-25
CR3	K-16	R3	E-6	R15	K-5	R27	H-19	Z3	D-11	Z15	G-15	Z27	J-9	Z39	P-19	Z50	J-25
CR4	K-8	R4	H-5	R16	O-5	R28	K-20	Z4	D-12	Z16	G-17	Z28	L-9	Z40	R-18	Z51	L-25
J6	A-16	R5	I-2	R17	I-9	R29	D-24	Z5	D-13	Z17	A-2	Z29	J-12	Z41	C-22		
J7	A-13	R6	I-4	R18		R30	E-24	Z6	D-14	Z18	B-4	Z30	L-12				

EXPANSION INTERFACE BOARD

TROUBLESHOOTING

POWER SUPPLY

Disconnect the Power Supply (PT1) from the Expansion Interface Board and check for 19.7VAC between pin 1 and pin 3 of Connector J9 and 23.6V between pin 2 and pin 4 of Connector J9. If the voltages are missing, check the cable and connections at the Connector J9 and check for open AC power cord. If the voltages are present, reconnect the Power Supply to the Expansion Interface Board and turn On the Expansion Interface Board. Check for 5.0V at pin 3 of Regulator IC (Z21), 11.9V at pin 3 of Regulator IC (Z20) and -5.0V at the anode of Zener Diode CR3. If all voltages are missing, check the Power Switch (S1).

If 5.0V is missing, check the voltages and components associated with Regulator Output Transistor (Q2) and Regulator Drive Transistor (Q3) and pins 2 thru 7, 10, 11 and 13 of IC Z21. If the 5.0V source is incorrect, check the adjustment of the 5V Adjust Control (R8).

If the 11.9V is missing, check the voltages and components associated with Regulator Output Transistor (Q1) and pins 2 thru 7, 10, 11 and 13 of IC Z20. If the 11.9V source is incorrect, check the adjustment of the 12V Adjust Control (R7).

If the 5.0V is missing, check Resistor R21, Zener Diode CR3 and check for a possible short to ground.

LINE PRINTER

If the Line Printer Connector (J4) is not operating, type and run the following Basic program and use the following procedure to check the printer interface circuits. NOTE: Do not connect a printer to Connector J4.

```
10 FOR Y = 1 TO 50
20 POKE 14312,0
30 POKE 14312,255
40 X = PEEK(14312)
50 NEXT Y
60 PRINT "X = "; X
70 GOTO 10
```

Check for pulses at pin 1 of the Tri-State Buffer IC (Z49). If pulses are missing, check MUX (Multiplexer) IC (Z39) by substitution. Check the operation of IC Z49 by grounding, one at a time, pins 2, 4, 6 and 10 and observe the number X that appears on the Monitor screen. Use the following chart to determine the correct number for each pin. The number X should equal 255 when none of the pins are grounded.

Pin 2 of Z49	X = 239
Pin 4 of Z49	X = 223
Pin 6 of Z49	X = 191
Pin 10 of Z49	X = 127

If any number is incorrect, check IC Z49 by substitution. Check for pulses at pin 11 of the Flip/Flop IC (Z48) and check for the waveform shown in Figure 2 at pins 2, 5, 6, 9, 12, 15, 16 and 19 of IC Z48. If any waveform is missing at IC Z48, check IC Z48 by substitution. If pulses are missing at pin 11 of IC Z48, check IC Z39 by substitution. Check for pulses at pin 4 of Flip/Flop IC (Z33). The pulses should have a width of 2 μ s. If the pulses are missing or the width is incorrect, check Capacitor C61, Resistors R23 and R24 and check Flip/Flop IC Z33 by substitution.

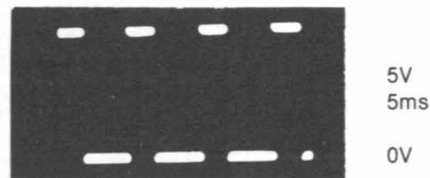


Figure 2

DISK DRIVE

If the Disk Drive Port (J5) is not operating, check for a 1MHz clock signal at pin 24 of the Disk Controller IC (Z42). If the clock is off frequency, check the 4.0MHz Crystal (Y1), Capacitors C43 and C44 and Resistors R1 and R2. If the clock signal is missing at pin 24, check the waveform at pin 3 of Flip/Flop IC (Z25). If the waveform is present at pin 3, check IC Z25 by substitution. If the waveform is missing at pin 3, check the waveform at pin 14 of Counter IC (Z22). If the waveform is present at pin 14, check IC Z22 by substitution. If the waveform is missing at pin 14, check IC Z19 by substitution. Check Crystal Y1, Capacitors C43 and C44 and Resistors R1 and R2. If the clock signal is good at pin 24 of IC Z42, type and run the following Basic program and check for pulses at pins 4, 5, 7, 9 and 11 of Mux (Multiplexer) IC (Z39).

```
10 FOR X = 14304 TO 14316 STEP 4
20 Y = PEEK(X): POKE X,255
30 NEXT X
40 GOTO 10
```

If pulses are missing at any of the pins specified on IC Z39, check IC Z39 by substitution.

The Disk Drive Motor and the LED on the front of the Disk Drive should be On when the above program is running. If the Disk Drive Motor is not running, check the logic reading at pin 5 of Flip/Flop IC (Z33) for a High (while the program is running). If the logic reading at pin 5 is High, check IC Z41 by substitution. If the logic reading at pin 5 is Low, check for pulses at pin 9 of IC Z41. If pulses are missing at pin 9, check IC Z39 by substitution. If pulses are present at pin 9, check Capacitor C62, Resistors R24 and R25 and check IC Z33 by substitution. IC Z33 is a timer that keeps the Disk Drive running for about 3 seconds after a pulse is received at pin 9 of IC Z33.

If the LED on the Disk Drive is not On when the program is running, check for a High logic reading at pin 2 of Flip/Flop IC (Z47) for Drive 0, pin 7 of IC Z47 for Drive 1, pin 10 of IC Z47 for Drive 2 or pin 15 of IC Z47 for Drive 3. If the reading is correct, check IC Z41 by substitution. If the reading is incorrect, check IC Z47 by substitution.

If the Disk Drive is not reading, writing or the Head Stepping Motor is not running and the above circuit checks are good, check ICs Z32, Z34, Z42 and Tri-State Buffer ICs (Z50 and Z51) by substitution.

The operation of pins 34, 35 and 36 of IC Z42 can be checked by running the following Basic program and noting the value of the number X that appears on the Monitor screen when a jumper is connected from ground to one of the pins.

TROUBLESHOOTING (Continued)

NOTE: Turn Off the Computer and disconnect all disk drives from Drive Connector (J3).

```
10 POKE 14304,255: X = PEEK(14316)
20 PRINT "X = ";X
30 FOR T = 1 TO 400: NEXT T
40 GOTO 10
```

Pin 34 of Z42 grounded X = 4
Pin 35 of Z42 grounded X = 2
Pin 36 of Z42 grounded X = 64
Pins 34, 35 and 36 not grounded X = 0

CASSETTE

If Motor Control Relay (K1) is not operating, check for pulses at pins 3 and 4 of IC Z32. If pulses are missing at pin 3, check Mux (Multiplexer) IC (Z39) by substitution. If pulses are present at pin 3 and missing at pin 4 of IC Z32, check IC Z32 by substitution.

If pulses are present at pin 4 of IC Z32, check for a logic reading that toggles between Low and High at pins 1 and 3 of Driver IC (Z18). If the logic reading on pin 1 is incorrect, check IC Z17 by substitution. If the logic reading is good on pin 1 and wrong on pin 3 of IC Z18, check IC Z18 by substitution. If the logic reading is good at pin 3 of IC Z18, check Relay K1 and Diode CR1.

LINE DEFINITIONS

A0 Thru A15 Address Lines
BA0 Thru BA15 Buffered Address Lines
BD0 Thru BD7 Buffered Data Lines
BRD Buffered Read
BWR Buffered Write
CASSIN Cassette Input
CASSOUT Cassette Output
CLK Clock
CLR Clear
D0 Thru D7 Data Lines
DIR SEL Direction Select
DS0 Thru DS3 Data Select
EN1, EN2 Enable
IN Input
INT Interrupt
INDEX Index Pulse
INTRQ Interrupt Request
INTAK Interrupt Acknowledge
M32 Column Address Strobe for 32K Memory
M48 Column Address Strobe for 48K Memory
MA0 Thru MA6 Memory Address Lines
MD0 Thru MD7 Memory Data Lines

MOTOR Disk Motor On Line
MRAS Memory Address Signal
OUT Output
RAS Row Address Strobe
RD Read
RD DATA Read Data
STEP R/W Head Movement Pulse
STROBE Data Strobe Clocking Pulse
SYSRES System Reset
TEST Test
TRK 00 Track 0
WAIT Wait
WR Write
WR DATA Write Data
WR PROT Write Protect
32K Dynamic RAM
37EO RD Memory Address Signal to Interrupt Logic
37E4 WR Memory Address Signal
37E6 WR Memory Address Signal
37E8 RD Memory Address Signal to Printer Logic
48K Dynamic RAM

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

SCHEMATIC NOTES

- ✱ Circuitry not used in some versions
- Circuitry used in some versions
- ⊕ See parts list
- ⊕ Ground
- ⊕ Chassis
- ▽ Common tie point

Waveforms and voltages taken from ground, unless noted otherwise.

Voltages, Waveforms and Logic probe readings taken with computer turned On, no keys pressed, unless otherwise 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 cm. width with DC reference voltage given at the bottom line of each waveform.

Time in μ sec. per cm, given with p-p reading at the end of each waveform.

Item numbers in rectangles appear in the alignment/adjustment instructions.

Supply voltages maintained as shown at input.

Voltages measured with digital meter, no signal.

Controls adjusted for normal operation.

Terminal identification may not be found on unit.

Capacitors are 50 volts or less, 10% unless noted.

Electrolytic capacitors are 50 volts or less, 20% unless noted.

Resistors are $\frac{1}{2}$ W or less, 5% unless noted.

Value in () used in some versions.

Measurements with switching as shown, unless noted.

Logic Probe Display

L = Low

H = High

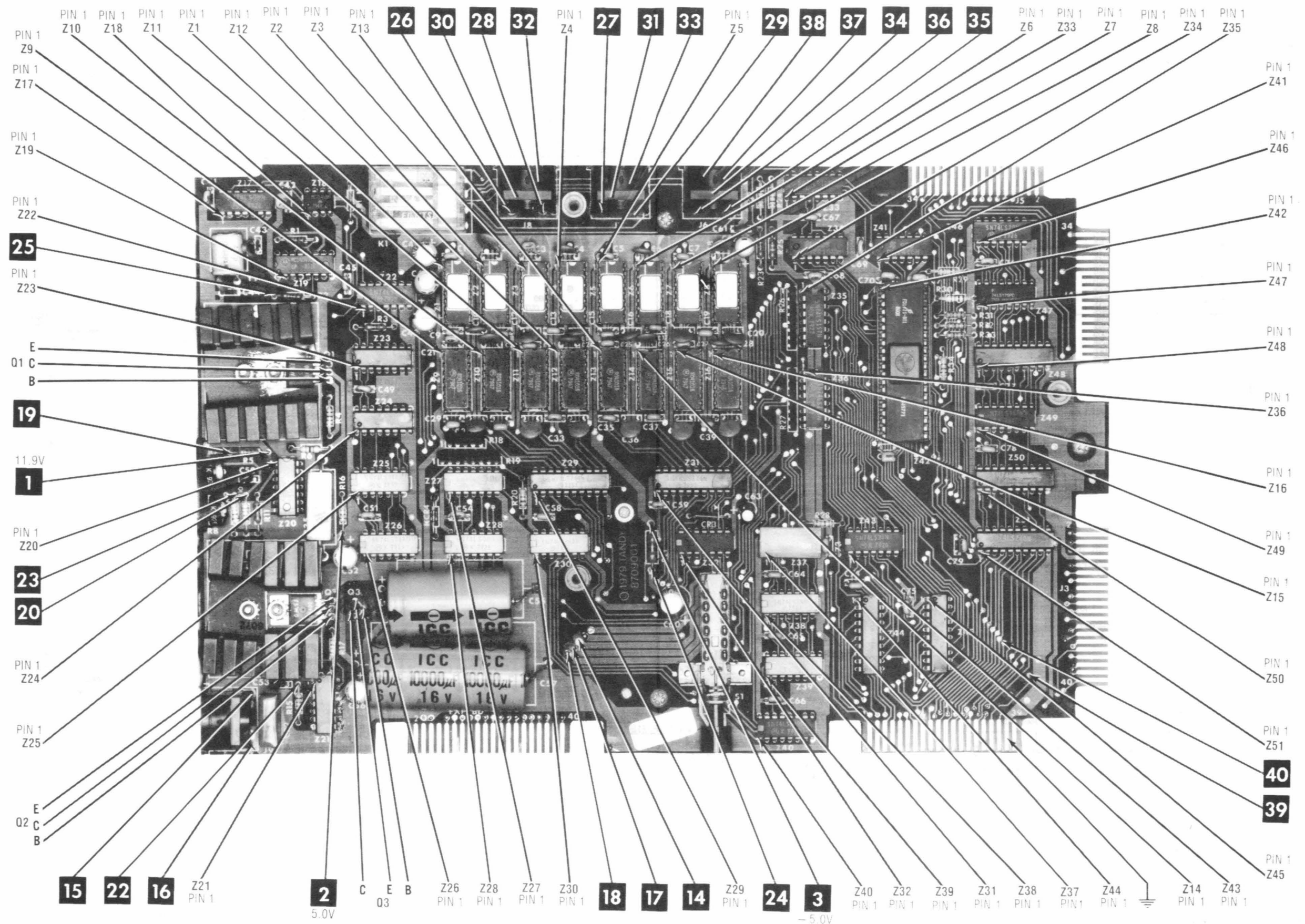
P = Pulse

* = Open (No light On)

(1) Logic readings not taken.

CSCS3-A
RADIO SHACK TRS-80
MODEL I LEVEL II



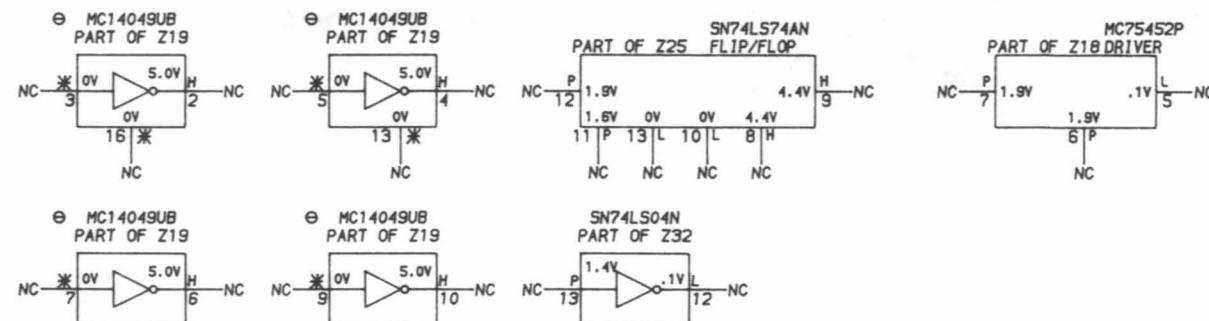
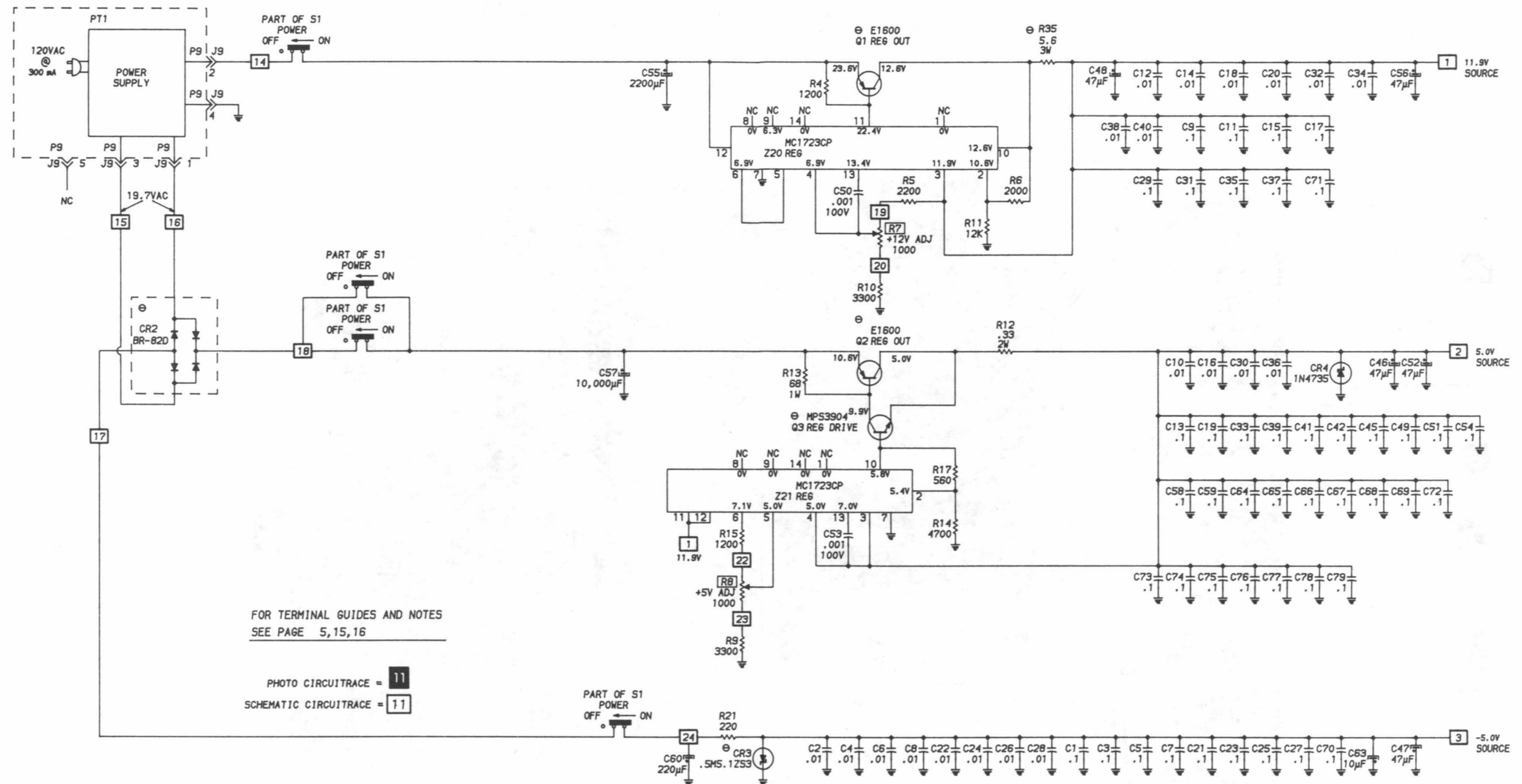


RADIO SHACK TRS-80
MODEL I LEVEL II

EXPANSION INTERFACE BOARD

A Howard W. Sams CIRCUITRACE Photo

EXPANSION INTERFACE BOARD





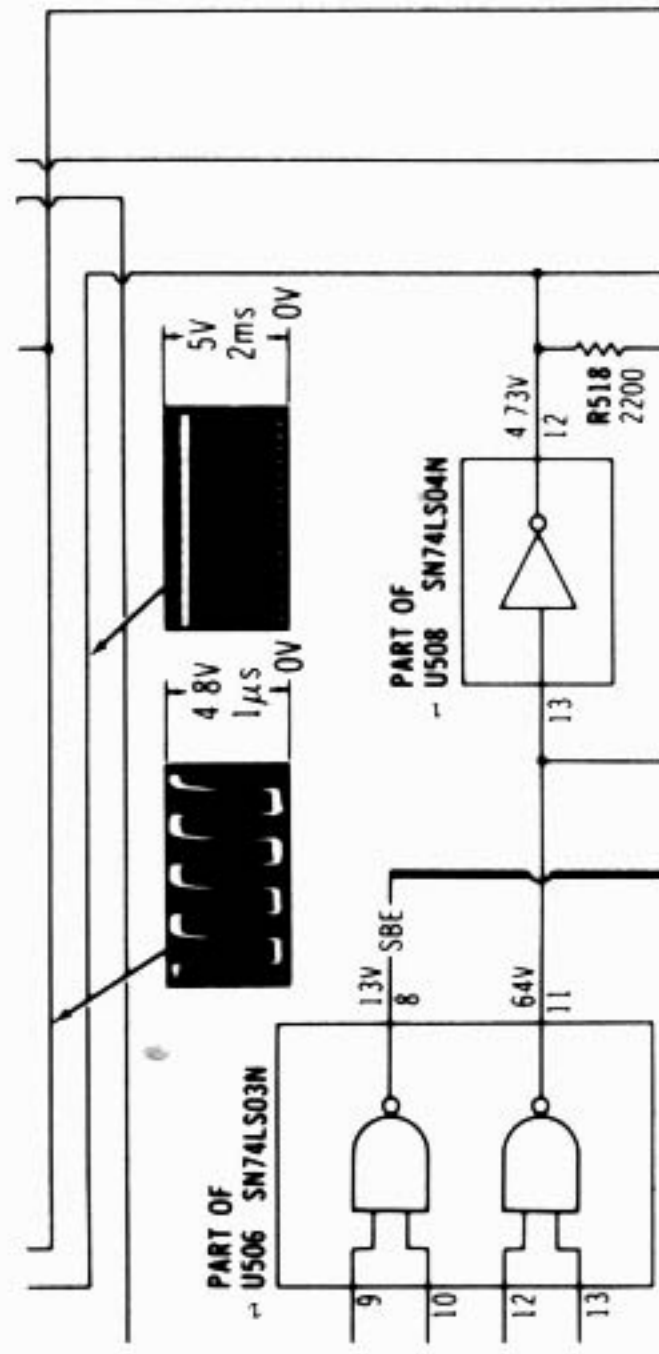


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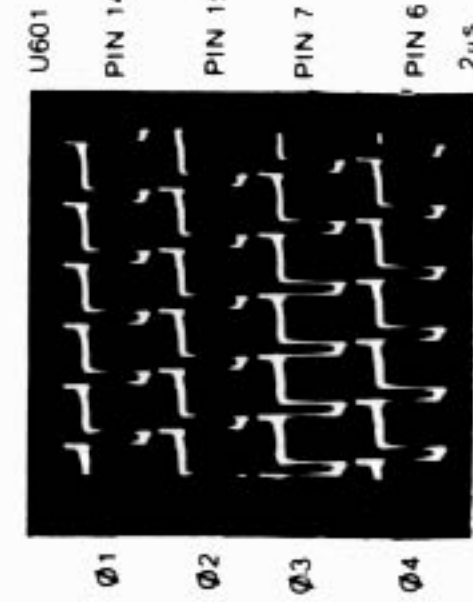


- Step by Step Troubleshooting guides the technician through the necessary procedures to quickly locate the problem.

TROUBLESHOOTING

MICROPROCESSOR CHIP (CPU) OPERATION

Verify the processor is functioning by checking the signals on the address lines (pins 10 thru 24 of IC U600) and the data lines (pins 41 thru 56) using a logic probe or a scope. If a logic probe is used, refer to the "Logic Chart" for the correct readings. If a scope is used, the waveforms on the address lines (except pins 22 and 23 which have no signal in Power Up mode) should be similar to Figure 1. The waveforms on the data lines should be similar to Figure 2.

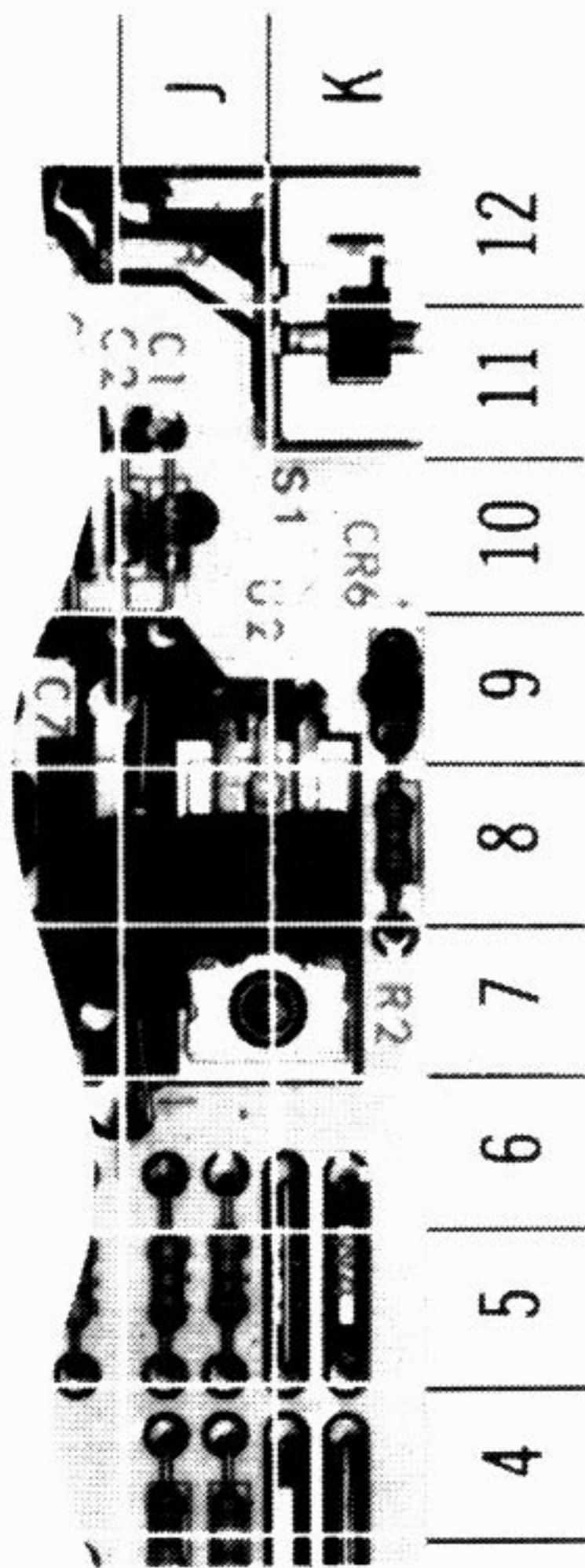


- Logic Chart containing logic probe readings to isolate defective circuitry and components.

LOGIC

PIN NO.	IC U100	PIN NO.	IC U100	PIN NO.	IC U102	* IC U103	IC U104	IC U105	IC U106	IC U107	IC U108	IC U109
1	P	21	P	1	L	L	L	L	L	L	L	L
2	P	22	P	2	P	P	P	P	P	P	P	P
3	P	23	P	3	H	H	H	H	H	H	H	H

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SEMICONDUCTORS (Select replacement for best results)

ITEM No.	TYPE No.	MFR PART No.	REPLACEMENT DATA					
			EGG PART No.	GENERAL ELECTRIC PART No.	MOTOROLA PART No.	NTE PART No.	RCA PART No.	WORKMAN PART No.
D102	1S553	1149-2576	ECG519	GE-514	1N4935	NTE519	SK9091/177	WEP925/519
D103	1N60FM	1149-2527	ECG109	1N60	1N4004	NTE109	SK3088	WEP134/109
D201	1N4004GP	1201-4205	ECG116	GE-504A	1N4004	NTE116	SK3312	WEP157
D503	1S553	1149-2576	ECG519	GE-514	1N4935	NTE519	SK9091/177	WEP925/519

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