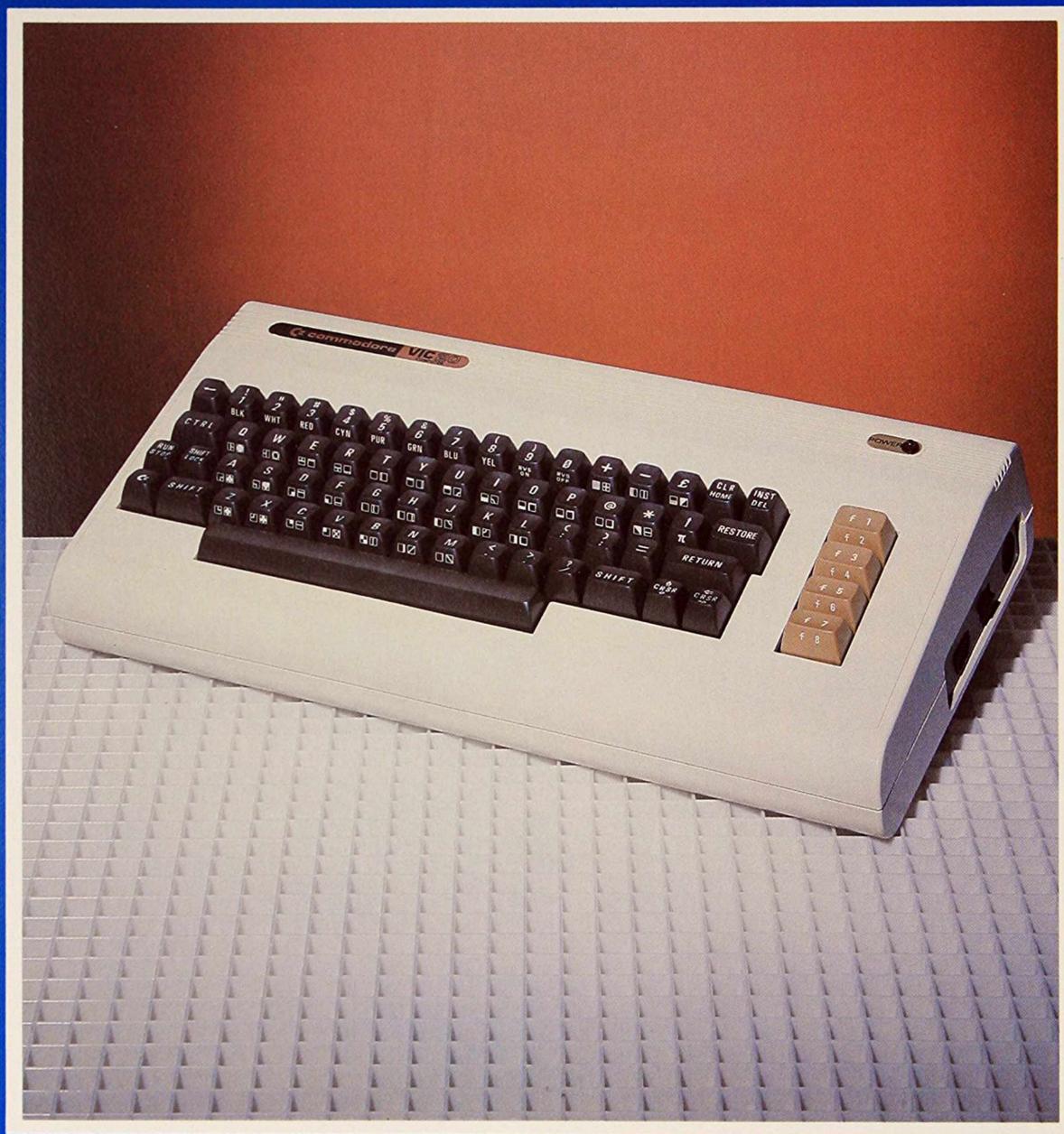


# COMPUTER: COMMODORE® MODEL VIC 20 EARLY VERSION



TECHNICAL SERVICE DATA FOR YOUR COMPUTER

**CABINET REMOVAL**

Remove Phillips screws 1, 2 and 3 from the cabinet bottom. Carefully lift the cabinet top up and back. The keyboard is attached to the cabinet top. Unplug the keyboard and LED power plugs and remove cabinet top. See Figure 1.

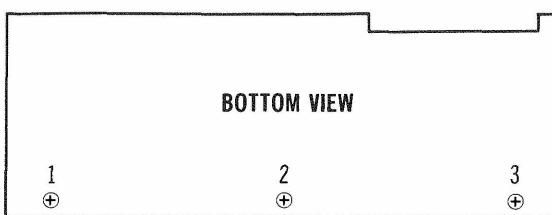


Figure 1

**MAIN BOARD REMOVAL**

Remove Phillips screws 1 thru 7 and lift the Main Board out of the cabinet bottom. To remove the shield, remove Phillips screws 8, 9 and 10 and remove the shield at points A thru G. See Figure 2.

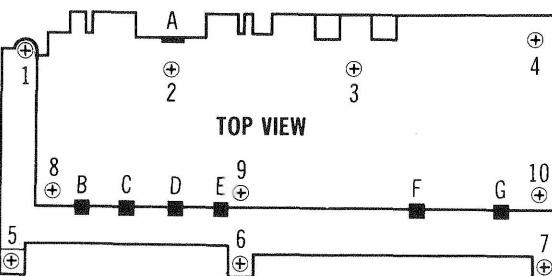


Figure 2

**KEYBOARD REMOVAL**

To remove the keyboard from the cabinet top, remove Phillips screws 1 thru 8 and lift the keyboard out of the cabinet. See Figure 3.

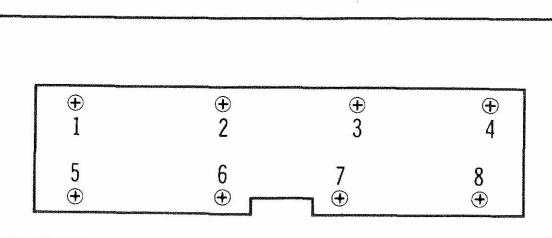


Figure 3

**CC12 COMMODORE MODEL VIC 20 (EARLY VERSION)**

**CC12 COMMODORE MODEL VIC 20 (EARLY VERSION)**

**PRELIMINARY SERVICE CHECKS**

ENCLOSED

**SAFETY PRECAUTIONS**

See page 18.

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

The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guarantee by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of the particular type of replacement part listed.

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## 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  $\mu$ sec. per cm, given with p-p reading at the end of each waveform.

Terminal identification may not be found on unit.

Resistors are 1/2W or less, 5% unless noted.

Value in ( ) used in some versions.

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

Logic Probe Display

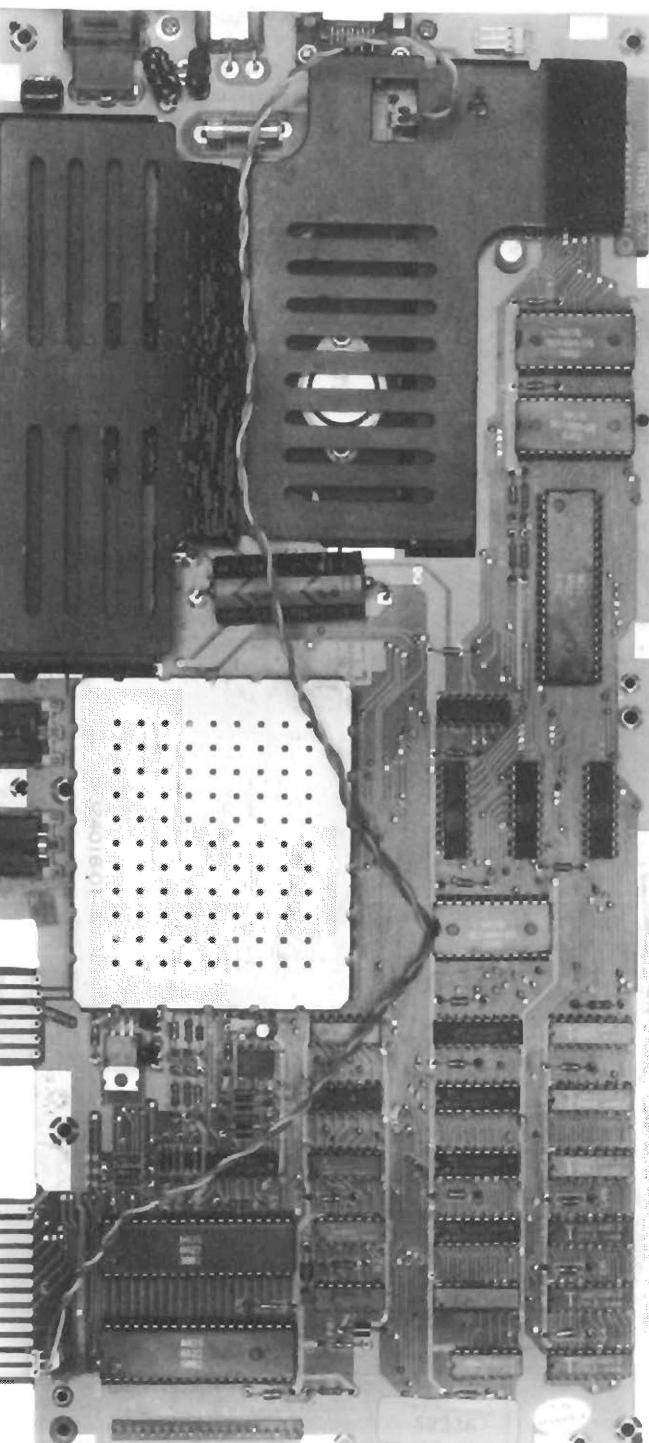
L = Low

H = High

P = Pulse

\* = Open (No lights on)

- (1) Goes low when RESTORE key is pressed.
- (2) Pulses appear while saving a program to cassette tape.
- (3) Pulses appear while loading a program from cassette tape.
- (4) Goes low when cassette recorder is put in Play or Record mode.
- (5) Goes low to turn cassette recorder on.
- (6) Pulses appear when ., 1, 2, CTRL, Q, RUN/STOP, CMD or SPACE key is pressed.
- (7) Pulses appear when 3, 4, W, E, SHIFT LOCK, A, S, LEFT SHIFT or Z key is pressed.
- (8) Pulses appear when 5, 6, T, R, D, F, X or C key is pressed.
- (9) Pulses appear when 7, 8, Y, U, G, H, V or B key is pressed.
- (10) Pulses appear when 7, 9, 0, R, Y, I, O, G, J, K, N or M key is pressed.
- (11) Pulses appear when +, -, P, @, L, :, . or COMMA key is pressed.
- (12) Pulses appear when £, CLR/HOME, \*, ., :, =, / or RIGHT SHIFT key is pressed.
- (13) Pulses appear when INST/DEL, RETURN, CRSR, CRSR, F1, F3, F5, or F7 key is pressed.
- (14) Pulses appear for all keys except RESTORE.



## CABINET REMOVAL

Remove Phillips screws 1, 2 and 3  
Carefully lift the cabinet top up and off the cabinet bottom. Unplug power plugs and remove cabinet top.

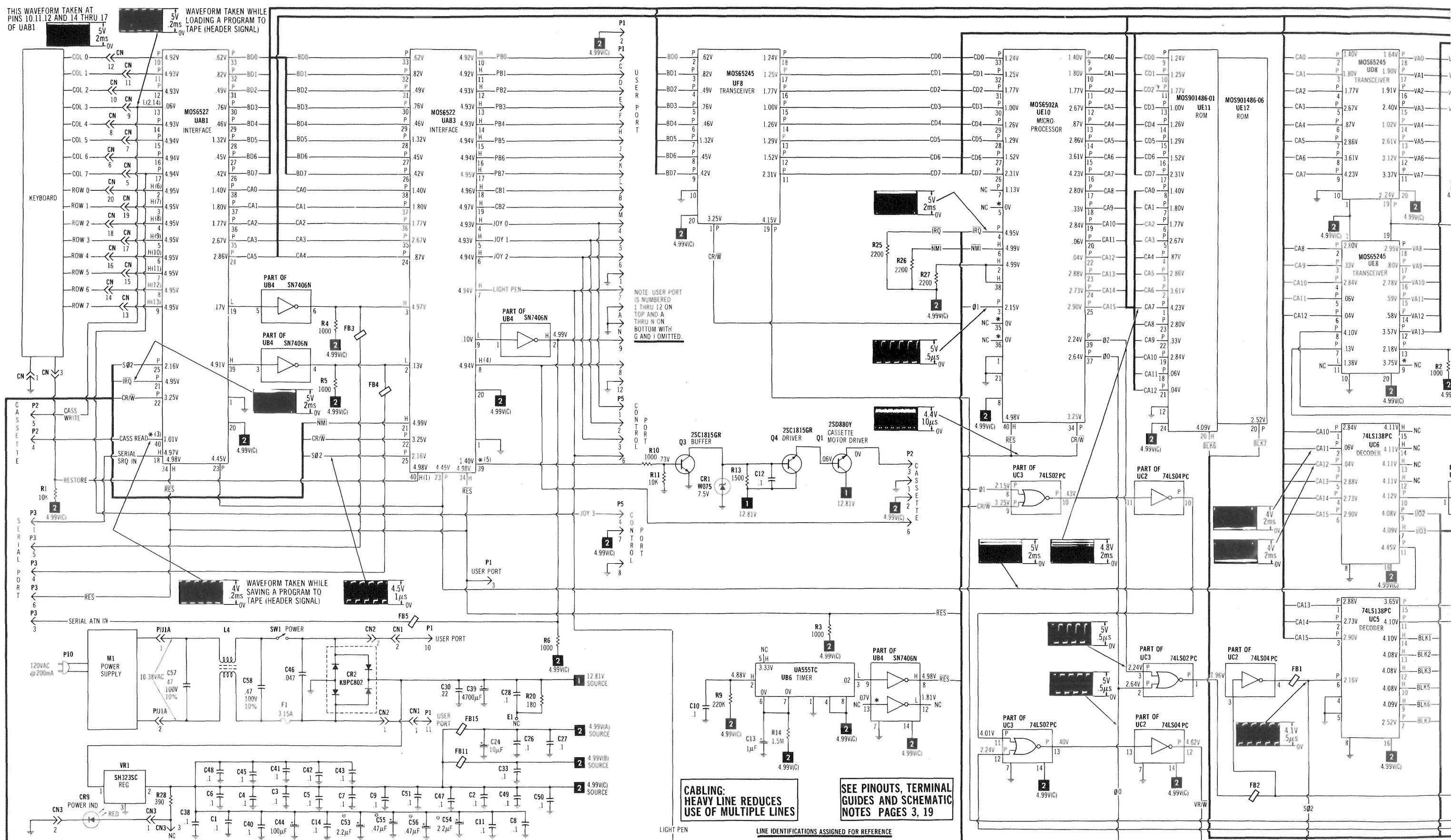
## MAIN BOARD REMOVAL

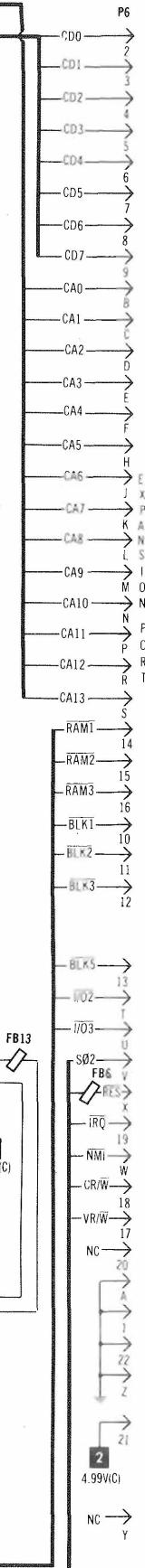
Remove Phillips screws 1 thru 7 and 10 of the cabinet bottom. To remove the keyboard, remove Phillips screws 8, 9 and 10 and remove the keyboard. See Figure 2.

## KEYBOARD REMOVAL

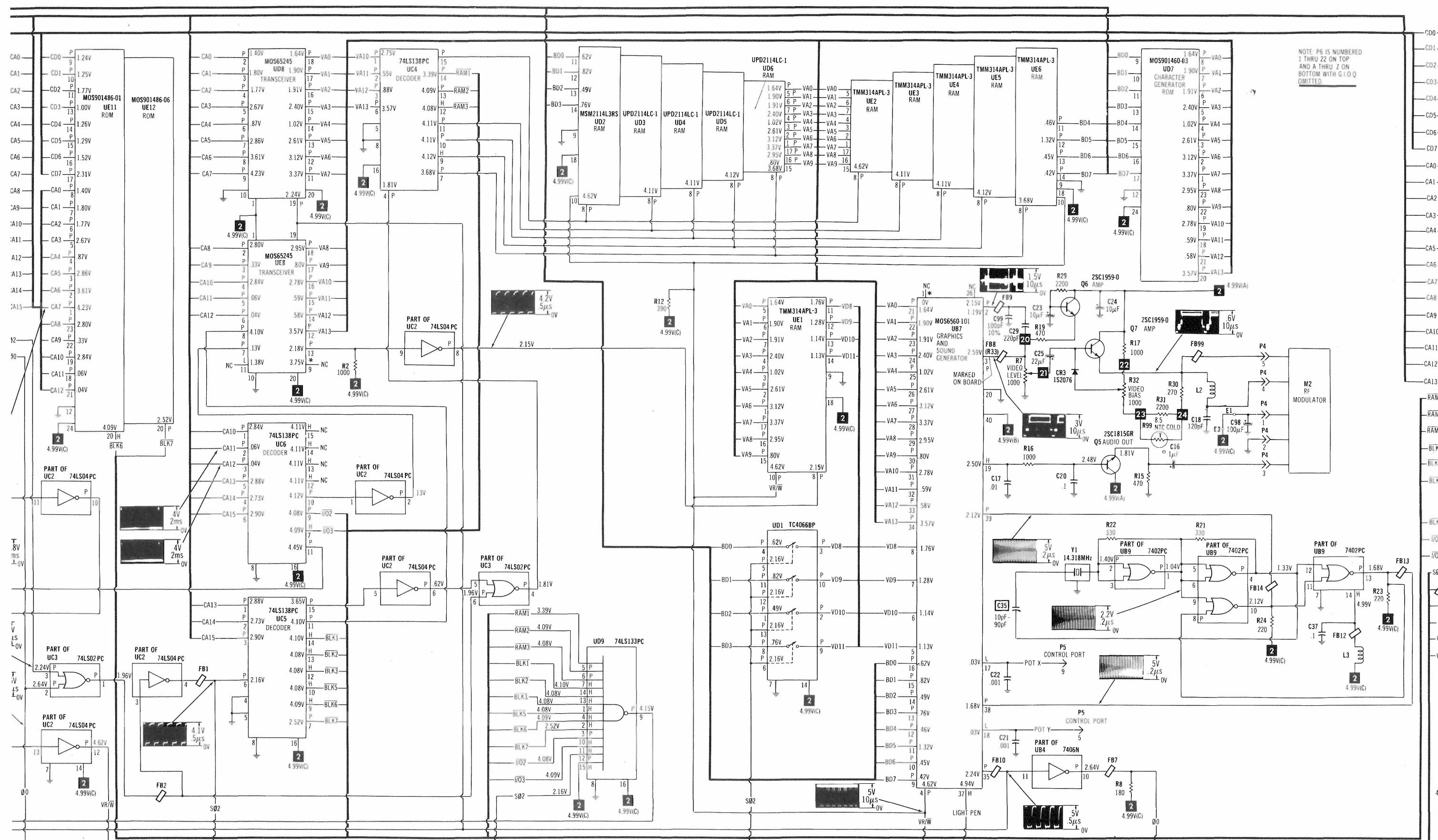
To remove the keyboard from the cabinet, remove Phillips screws 1 thru 8 and lift the keyboard. See Figure 3.

## MAIN BOARD SHIELD LOCATION





NOTE: P6 IS NUMBERED  
1 THRU 22 ON TOP  
AND A THRU Z ON  
BOTTOM WITH G.I.Q.  
OMMITTED.



## LINE DEFINITIONS

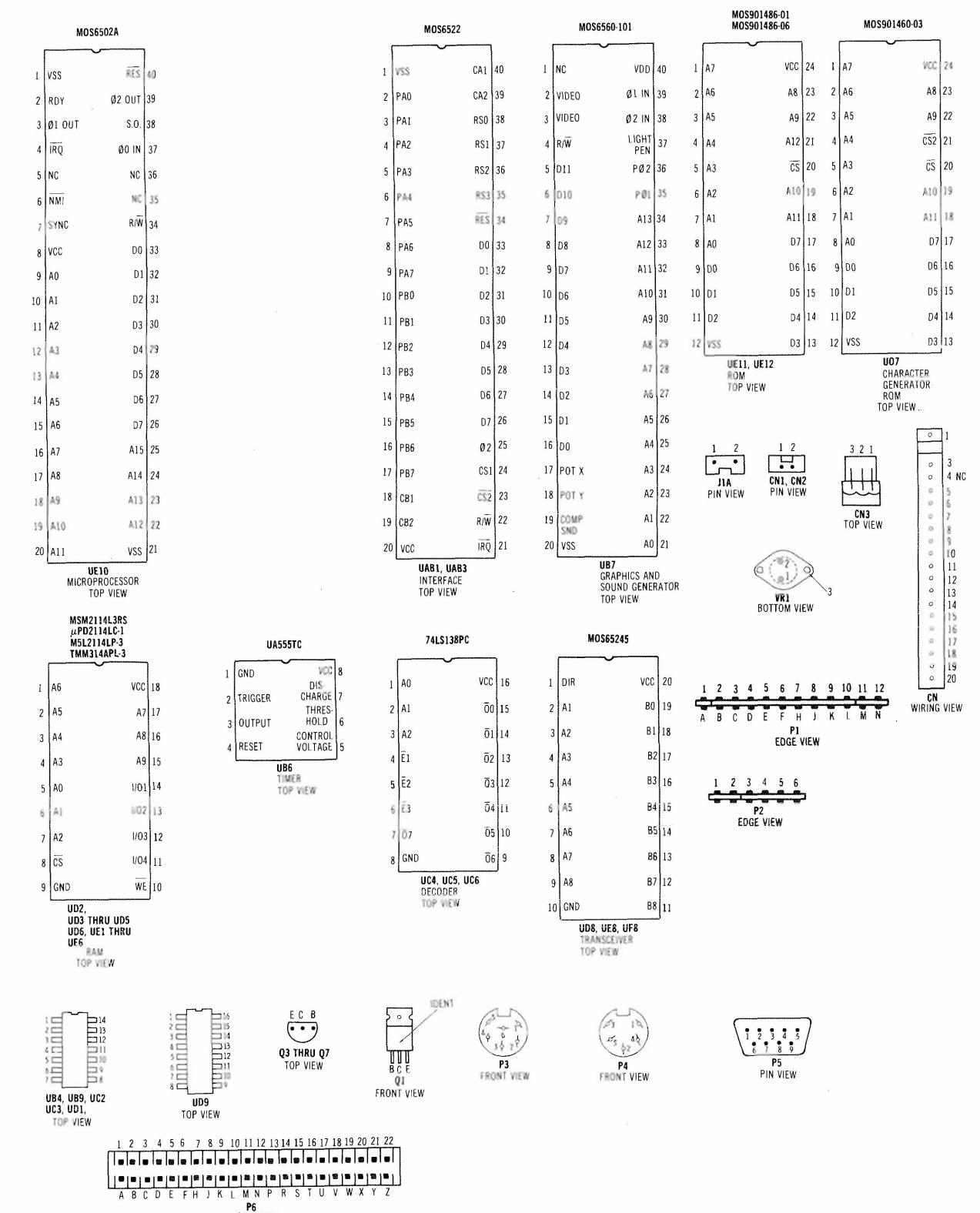
B0 Thru B7	Basic Data Lines
BLK1 Thru BLK7	Memory Blocks
CA0 Thru CA15	Control Address Lines
CASS READ	Cassette Read
CASS WRITE	Cassette Write
CB1, CB2	Port Control Lines
CD0 Thru CD7	Control Data Lines
COL0 Thru COL7	Keyboard Columns
CR/W	Control Read/Write
I/O	Input/Output
IRQ	Interrupt Request
JOY0	Joystick 0
JOY1	Joystick One
JOY2	Joystick Two
JOY3	Joystick Three
LIGHT PEN	Light Pen
NMI	Non-Maskable Interrupt

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

## SAFETY PRECAUTIONS

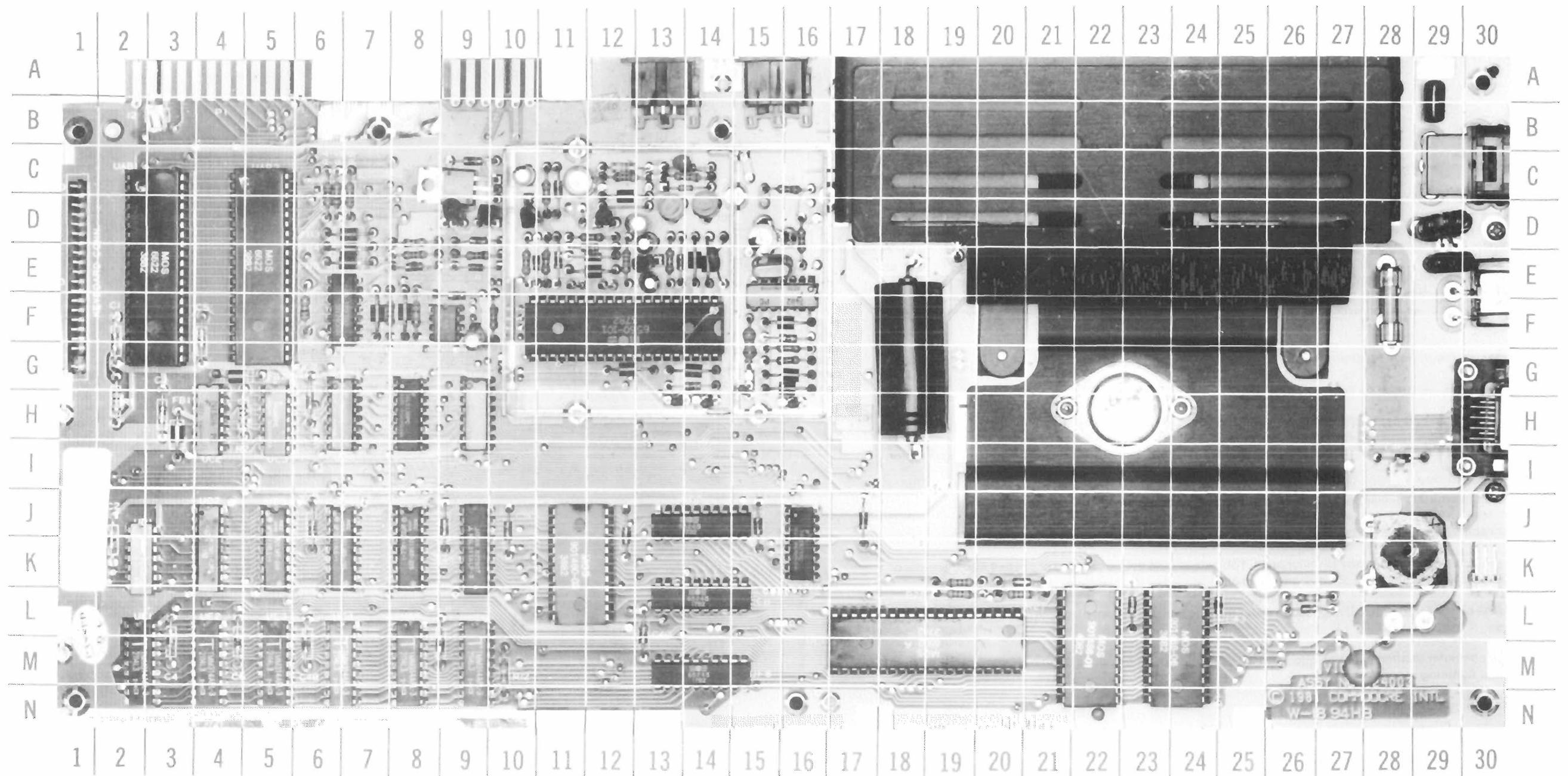
1. Use an isolation transformer for servicing.
2. Maintain AC line voltage at rated input.
3. Remove AC power from the computer before servicing or installing electrostatically sensitive devices. Examples of typical ES devices are integrated circuits and semiconductor "chip" components.
4. Use extreme 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 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 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 to water. If exposed to water turn the unit off. Do not place the computer near possible water sources.
13. Never leave the computer 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.
16. Never use liquids or aerosols directly on the computer. Spray on cloth and then apply to the computer cabinet. Make sure the computer is disconnected from the AC power line.

## IC PINOUTS &amp; TERMINAL GUIDES



### MAIN BOARD GridTrace LOCATION GUIDE

C1	F-2	C18	C-14	C39	F-18	C56	H-13	FB4	E-7	L4	D-29	R3	F-6	R20	C-11	UAB3	E-5	UD7	K-11
C2	K-2	C20	E-11	C40	L-13	C57	A-29	FB5	E-7	P1	A-4	R4	C-6	R21	C-16	UB4	F-7	UD8	J-14
C3	H-3	C21	E-12	C41	K-20	C58	E-29	FB6	F-7	P2	A-9	R5	C-6	R22	D-16	UB6	F-9	UD9	K-16
C4	M-3	C22	E-11	C42	L-23	C98	C-11	FB7	F-8	P3	A-13	R6	C-7	R23	G-16	UB7	F-12	UE1	M-2
C5	F-4	C23	E-13	C43	L-25	C99	E-14	FB8	E-14	P4	A-15	R7	D-13	R24	G-16	UB9	F-16	UE2	M-4
C6	M-4	C24	D-13	C44	K-26	CN	E-1	FB9	E-14	P5	H-30	R8	F-7	R25	L-19	UC2	H-4	UE3	M-5
C7	H-6	C25	D-13	C45	L-26	CN1	B-3	FB10	G-12	P6	A-23	R9	F-8	R26	K-19	UC3	H-5	UE4	M-7
C8	J-6	C26	E-12	C46	I-28	CN2	I-28	FB11	G-14	Q1	C-9	R10	D-8	R27	L-20	UC4	H-7	UE5	M-8
C9	E-8	C27	E-12	C47	C-9	CN3	K-30	FB12	F-16	Q2	H-23	R11	E-8	R28	L-26	UC5	H-8	UE6	M-9
C10	F-9	C28	C-11	C48	M-6	CR1	E-9	FB13	G-16	Q3	D-9	R12	M-10	R29	E-12	UC6	UE8	UE10	L-14
C11	M-9	C29	E-13	C49	J-9	CR2	K-28	FB14	G-16	Q4	D-9	R13	E-9	R30	C-12	UD1	UE10	UE12	M-18
C12	D-9	C30	M-27	C50	J-15	CR3	C-14	FB15	E-12	Q5	D-10	R14	F-10	R31	C-14	UD2	K-2	K-4	M-22
C13	F-9	C33	G-14	C51	J-17	F1	F-28	FB99	C-12	Q6	E-13	R15	E-10	R32	D-14	UD3	K-5	UE11	M-24
C14	J-10	C35	D-15	C53	G-15	FB1	H-3	J1A	C-30	Q7	D-12	R16	E-11	R99	C-13	UD4	K-7	UE12	M-26
C16	C-10	C37	F-16	C54	H-14	FB2	G-4	L2	C-12	R1	H-2	R17	D-12	SW1	E-30	UD5	K-8	UF8	M-14
C17	E-11	C38	J-12	C55	H-16	FB3	D-7	L3	F-15	R2	H-4	R19	E-13	UAB1	E-3	UD6	K-9	Y1	E-15



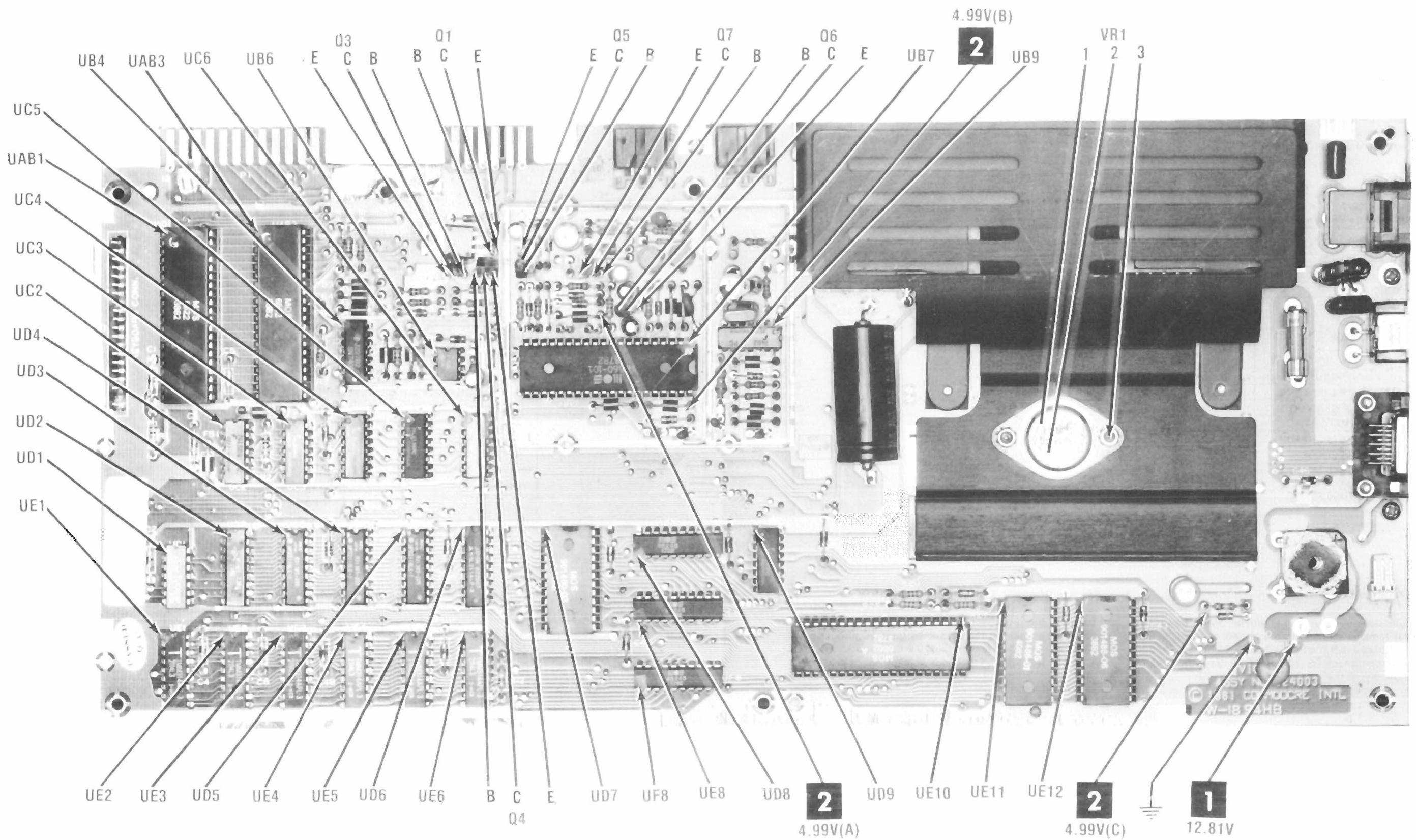
MAIN BOARD

A Howard W. Sams GRIDTRACE™ Photo

COMMODORE  
MODEL VIC 20 (EARLY VERSION)

MAIN BOARD

**CC12** COMMODORE  
MODEL VIC 20 (EARLY VERSION)



ARROWS ON IC'S INDICATE PIN 1 UNLESS NOTED.

## GENERAL OPERATING INSTRUCTIONS

### POWER UP

When the computer is turned On, it will come up ready to program in Commodore Basic. See "Cassette Operation" for instructions on loading and saving programs. To run a program after it is loaded, type RUN and press the RETURN key. To stop a program press the RUN/STOP key. Pressing the RUN/STOP key and RESTORE key at the same time will stop the program and reset the computer to the start condition, without losing the program.

### CASSETTE OPERATION

Plug the Datasette cassette recorder into the six pin edge connector on the rear of the computer. Note: A regular cassette tape recorder will not work on the VIC 20. To load a program, type LOAD, press the RETURN key and follow the instructions displayed on the Monitor screen. To save a program, type SAVE, press the RETURN key and follow the instructions displayed on the screen.

## TEST EQUIPMENT

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

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

## TROUBLESHOOTING

### POWER SUPPLY

Computer does not power up at turn-on. While Power Supply (M1) remains plugged into a known good AC source, carefully disconnect the Power Supply Plug (P1A) from the computer and check for 10.38V AC at the output of the Power Supply. If the voltage is missing, replace the Power Supply. If the voltage is present, check for 4.99V at Source 2.

If 4.99V is missing at Source 2, check Regulator IC (VR1), and check for possible shorts to ground.

Datasette cassette motor does not run. While Power Supply (M1) remains plugged into a known good AC source, carefully disconnect the Power Supply Plug P1A from the computer and check for 10.38 VAC at Plug P1A. If the voltage is missing, replace the Power Supply. If 10.38 VAC is present, check for 12.81V at Source 1.

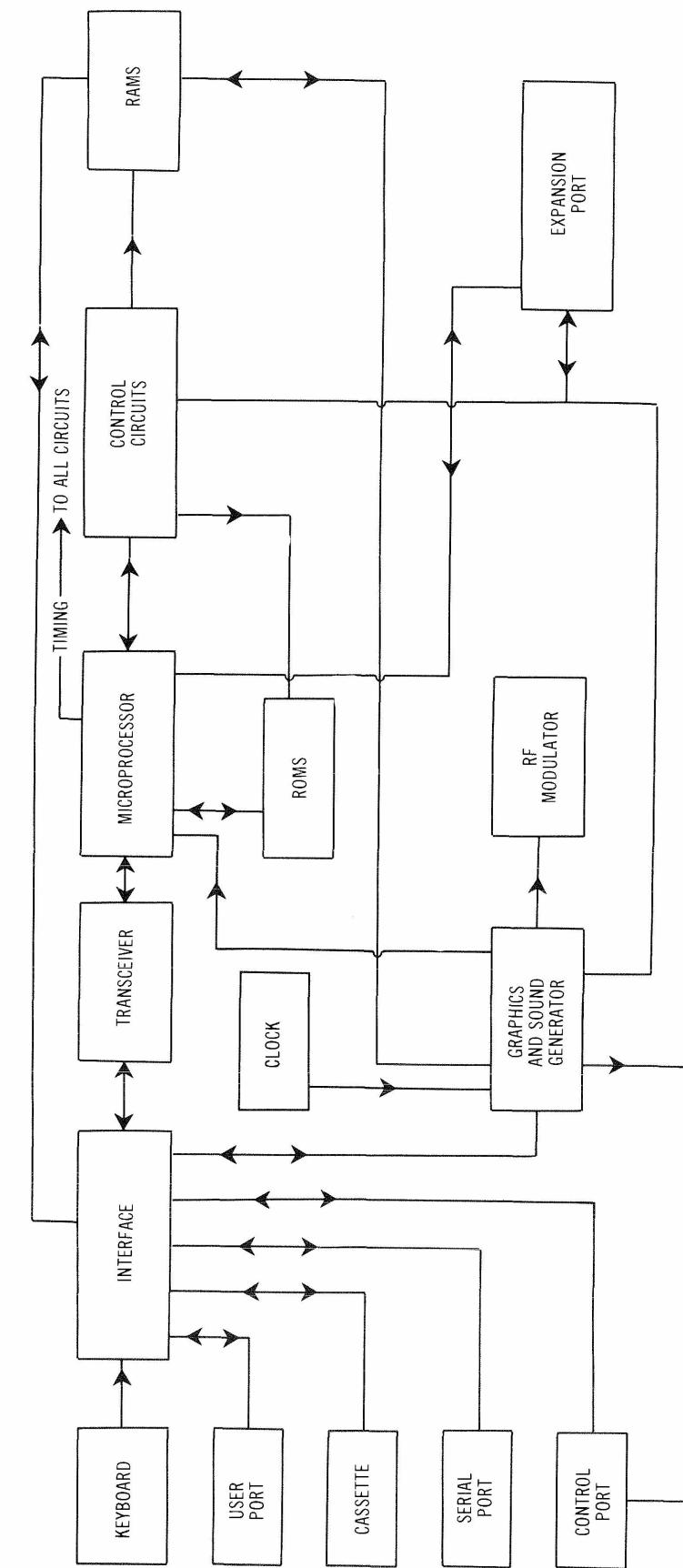
If 12.81V is missing at Source 1, check the Bridge Rectifier (CR2), Line Filter (L4), Fuse F1T 1A and On-Off Switch (SW1). If 12.81V is present, check for 4.99V at Source 2 and check Regulator IC (VR1). Refer to the "Cassette Save and Load" section of this Troubleshooting guide.

### MICROPROCESSOR CHIP (CPU) OPERATION

To verify the processor is working, use a logic probe to check for pulses on the data lines (pins 26 thru 33 of IC UE10) and the address lines (pins 9 thru 20 and 22 thru 25 of IC UE10). If the processor is not working, check pin 40 of IC UE10 with the logic probe while the computer is turned Off and then On again.

The probe should read low for about two seconds after turn-on, then read high to reset the processor. If the probe reading is incorrect, check the voltages and components associated with the Reset IC (UB6). If the reading is correct, check for pulses on pin 4 and a high indication on pin 6 of IC UE10.

Should the reading on pin 4 of IC UAB1 or the reading on pin 6 of IC UAB3 be incorrect, check each IC by substituting a good IC. Check for pulses on pin 34 of IC UE10 and check the voltages on pins 2, 8 and 38 of IC UE10. Check the clock waveforms at pins 37 and 39 of IC UE10.



## LOGIC (Continued)

PIN NO.	IC UB9	IC UC2	IC UC3	IC UC4	IC UC5	IC UC6	IC UD1	IC UD2	IC UD3	IC UD4	IC UD5	IC UD6	IC UD7	IC UD8	IC UD9
1	P	P	P	P	P	P	P	P	P	P	P	P	H	H	
2	P	P	P	P	P	P	P	P	P	P	P	P	H	H	
3	P	P	P	P	P	P	P	P	P	P	P	P	P	P	
4	P	P	P	P	L	P	P	P	P	P	P	P	P	H	
5	P	P	P	P	L	L	P	P	P	P	P	P	P	P	P
6	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
7	L	L	L	P	P	H	L	P	P	P	P	P	P	P	H
8	P	P	P	L	L	L	P	P	P	P	P	P	P	P	L
9	P	P	P	H	H	P	P	L	L	L	L	P	P	P	P
10	P	P	P	P	H	P	P	P	P	P	P	P	L	P	H
11	P	P	P	P	P	P	P	P	P	P	P	P	P	P	H
12	P	P	P	H	H	H	P	P	P	P	P	P	L	P	P
13	P	P	P	P	H	H	H	P	P	P	P	P	P	P	H
14	H	H	H	P	H	H	H	P	P	P	P	P	P	P	H
15				P	P	H	H	P	P	P	P	P	P	P	H
16				H	H	H	H	P	P	P	P	P	P	P	H
17								P	P	P	P	P	P	P	
18								H	H	H	H	P	P	P	
19												P	P	P	
20												P	P	P	
21													P		
22													P		
23													P		
24													H		

PIN NO.	IC UE1	IC UE2	IC UE3	IC UE4	IC UE5	IC UE6	IC UE8	PIN NO.	IC UE10	PIN NO.	IC UE10	PIN NO.	IC UE11	IC UE12	IC UF8
1	P	P	P	P	P	P	H	1	L	21	L	1	P	P	P
2	P	P	P	P	P	P	P	2	H	22	P	2	P	P	P
3	P	P	P	P	P	P	P	3	P	23	P	3	P	P	P
4	P	P	P	P	P	P	P	4	P	24	P	4	P	P	P
5	P	P	P	P	P	P	P	5	*	25	P	5	P	P	P
6	P	P	P	P	P	P	P	6	H	26	P	6	P	P	P
7	P	P	P	P	P	P	P	7	P	27	P	7	P	P	P
8	P	P	P	P	P	P	P	8	H	28	P	8	P	P	P
9	L	L	L	L	L	L	*	9	P	29	P	9	P	P	P
10	P	P	P	P	P	P	L	10	P	30	P	10	P	P	L
11	P	P	P	P	P	P	P	11	P	31	P	11	P	P	P
12	P	P	P	P	P	P	P	12	P	32	P	12	L	L	P
13	P	P	P	P	P	P	P	13	P	33	P	13	P	P	P
14	P	P	P	P	P	P	P	14	P	34	P	14	P	P	P
15	P	P	P	P	P	P	P	15	P	35	*	15	P	P	P
16	P	P	P	P	P	P	P	16	P	36	*	16	P	P	P
17	P	P	P	P	P	P	P	17	P	37	P	17	P	P	P
18	H	H	H	H	H	H	H	18	P	38	H	18	P	P	P
19								19	P	39	P	19	P	P	P
20								20	P	40	H	20	H	P	H
												21	P	P	
												22	P	P	
												23	P	P	
												24	H	H	

Logic Probe Display

L = Low

H = High

P = Pulse

\* = Open (No light On)

## TROUBLESHOOTING (Continued)

## CRYSTAL OSCILLATOR

Verify that the crystal oscillator is operating by checking the waveform on pin 39 of IC UB7. Also, check for a frequency of 14.3181MHz with a frequency counter connected to pin 2 of IC UB9.

```

10 FOR X=1 TO 15
20 POKE 36878,X
30 FOR Y=36874 TO 36877
40 POKE Y,222
50 FOR T=1 TO 300: NEXT T
60 POKE Y,0
70 NEXT Y:NEXT X

```

## KEYBOARD

Keyboard is not working. Check the waveforms at pins 10, 11, 12 and 14 thru 17 of IC UAB1. If any of the waveforms are missing, check IC UAB1 by substituting a good IC. If the waveforms are good, check the operation of the keyboard. Using a Logic Probe, check the readings on pins 2 thru 9 and pin 13 of IC UAB1. See "Logic Chart".

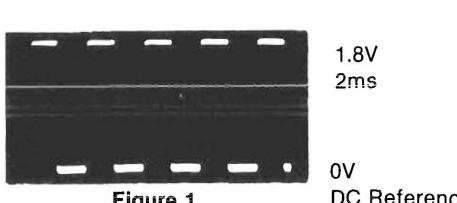
For incorrect readings, check the keyboard connector and check the switches on the keyboard with an ohmmeter. If the readings are good, check IC UAB1 by substituting a good IC.

## RESTORE

RESTORE key is not working. Check for 0V on pin 40 of IC UAB3 when the RESTORE key is pressed. If the voltage does not drop to 0V, check the pin 3 connection on the keyboard connector and check the RESTORE key switch with an ohmmeter. If the voltage checks good, check IC UAB3 by substituting a good IC.

## JOYSTICK

Joystick is not working properly. Check the voltages on those pins associated with the particular joystick position as it is activated. See chart below. The voltage should go from about 5V to less than .5V.



If any voltage is not correct, check the joystick switches and Plug P5. Also, check IC UAB1 or UAB3 by substituting a good IC.

If the voltages are correct, check IC UAB1 or UAB3 by substituting a good IC.

Check the operation of the joystick by loading and running a program that uses the joystick or type, enter and run the following program.

```

10 POKE 37139,0
20 POKE 37154,0
30 X=PEEK(37137)
40 Y=PEEK(37152)
50 PRINT "X=";X,"Y=";Y
60 FOR T=1 TO 400: NEXT T
70 GOTO 30

```

The numbers for X and Y that appear on the monitor screen should be the same as those shown in the chart below for the appropriate joystick position.

## TROUBLESHOOTING (Continued)

JOYSTICK POSITION	X	Y
CENTER	254	255
UP	250	255
DOWN	246	255
LEFT	238	255
RIGHT	254	127
BUTTON	222	255

NOTE: Other numbers will appear if two switches on the joystick are closed at the same time.

### PADDLES

Buttons on the paddles do not work. Check the voltages on pin 6 of IC UAB3 and pin 17 of IC UAB1 while the appropriate button is being pressed. The voltage should go from 5V to 0V when the button is pressed. If the voltage does not change, check the button switches and pins 3, 4 and 8 at Plug P5 for good connection. If the voltages are good, check IC's UAB1 and UAB3 by substituting good IC's.

Paddles do not work. Check the paddle inputs by connecting a 100K ohm resistor from pin 5 to pin 7 of Plug P5 and another 100K ohm resistor from pin 9 to pin 7 of Plug P5. Then, check for the waveform shown in Figure 2 at pins 17 and 18 of IC UB7.

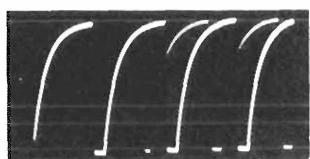


Figure 2

If the waveforms are good, check the paddles. Also, check for good connections at pins 5, 7 and 9 of Plug P5. If the waveforms are missing, check IC UB7 by substitution.

Datasette is a trademark of Commodore Business Machines, Inc.

## ADJUSTMENTS

### VIDEO LEVEL

Connect the input of a scope to pin 5 of Socket P4 and adjust the Video Level Control (R7) for a video level of .6V peak to peak.

### 14MHz OSCILLATOR

Connect the input of a frequency counter to pin 2 of IC UB9 and adjust the 14MHz Oscillator Trimmer for a frequency of 14.31818MHz.

### CASSETTE SAVE AND LOAD

Computer will not save a program to cassette tape. Check the waveform on pin 13 of IC UAB1 while saving a program to tape. If the waveform is missing, check IC UAB1 by substituting a good IC. If the waveform is present, check the connections at pin 5 of Plug P2.

Computer will not load a program from cassette tape. Check the waveform on pin 40 of IC UAB1 while loading a program from tape. If the waveform is present at pin 40, check IC UAB1 by substituting a good IC. If the waveform is missing at pin 40, check the connection at pin 4 of Plug P2.

Datasette cassette motor will not start when the cassette recorder is put in Play or Record mode. Check the voltage on pin 8 of IC UAB3. The voltage on pin 8 should go from 5V to 0V when the recorder is put in Play or Record mode. If the voltage on pin 8 does not change, check the connection at pin 6 of Plug 2. If the voltage on pin 8 is good, check the voltage on pin 39 of IC UAB3.

The voltage on pin 39 should read about .05V when the recorder is put in Play or Record mode. If the voltage on pin 39 is incorrect, check IC UAB3 by substituting a good IC. If the voltage on pin 39 is good, check the voltages and components associated with Transistors Q1, Q3 and Q4. See the following chart for voltages with the recorder in Play or Record mode and the motor running. If 12.81V is missing from the collector of Transistor Q4, refer to the "Power Supply" section of this Troubleshooting guide.

	E	B	C
Q1	5.6V	7.3V	12.81V
Q3	0V	.05V	6.86V
Q4	6.24V	6.86V	12.81V

Note: Voltages measured with Datasette cassette recorder in Play or Record mode, motor running.

## LOGIC

PIN NO.	IC UAB1	PIN NO.	IC UAB1	PIN NO.	IC UAB3	PIN NO.	IC UAB3	PIN NO.	IC UB4	IC UB6	PIN NO.	IC UB7	PIN NO.	IC UB7
1	L	21	P	1	L	21	H	1	L	L	1	*	21	P
2	H(6)	22	P	2	L	22	P	2	H	H	2	P	22	P
3	H(7)	23	P	3	H	23	P	3	H	L	3	P	23	P
4	H(8)	24	P	4	H	24	P	4	L	H	4	P	24	P
5	H(9)	25	P	5	H	25	P	5	L	H	5	P	25	P
6	H(10)	26	P	6	H	26	P	6	L	L	6	P	26	P
7	H(11)	27	P	7	H	27	P	7	H	L	7	P	27	P
8	H(12)	28	P	8	H(4)	28	P	8	H	H	8	P	28	P
9	H(13)	29	P	9	L	29	P	9	L	P	9	P	29	P
10	P	30	P	10	H	30	P	10	P	P	10	P	30	P
11	P	31	P	11	H	31	P	11	P	P	11	P	31	P
12	P	32	P	12	H	32	P	12	L		12	P	32	P
13	L(2,14)	33	P	13	H	33	P	13	*		13	P	33	P
14	P	34	H	14	H	34	H	14	H		14	P	34	P
15	P	35	P	15	H	35	P				15	P	35	P
16	P	36	P	16	H	36	P				16	P	36	P
17	P	37	P	17	H	37	P				17	L	37	H
18	H	38	P	18	H	38	P				18	L	38	P
19	L	39	H	19	H	39	*	(5)			19	H	39	P
20	H	40	*	(3)	20	H	40	H(1)			20	L	40	H

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

### Logic Probe Display

L = Low

H = High

P = Pulse

\* = Open (No lights on)

- (1) Goes low when RESTORE key is pressed.
- (2) Pulses appear while saving a program to cassette tape.
- (3) Pulses appear while loading a program from cassette tape.
- (4) Goes low when cassette recorder is put in Play or Record mode.
- (5) Goes low to turn cassette recorder on.

(6) Pulses appear when -, 1, 2, CTRL, Q, RUN/STOP, CMD or SPACE key is pressed.

(7) Pulses appear when 3, 4, W, E, SHIFT LOCK, A, S, LEFT SHIFT or Z key is pressed.

(8) Pulses appear when 5, 6, T, R, D, F, X or C key is pressed.

(9) Pulses appear when 7, 8, Y, U, G, H, V or B key is pressed.

(10) Pulses appear when 7, 9, 0, R, Y, I, O, G, J, K, N or M key is pressed.

(11) Pulses appear when +, -, P, @, L, :, . or COMMA key is pressed.

(12) Pulses appear when £, CLR/HOME, \*, !, ;, =, / or RIGHT SHIFT key is pressed.

(13) Pulses appear when INST/DEL, RETURN, CRSR, CRSR, F1, F3, F5, or F7 is pressed.

(14) Pulses appear for all keys except RESTORE.

## PARTS LIST AND DESCRIPTION (Continued)

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

### MISCELLANEOUS

ITEM No.	PART NAME	MFGR. PART No.	NOTES
CR9	LED Ferrite Bead		
FB1 thru FB7	Ferrite Bead		
FB9 thru FB15	Ferrite Bead		
FB99	Power Supply On/Off		
M1	RF Modulator		
M2	Cord		
P10	Switch		
SW1	Crystal		
Y1	Antenna Switch		
	Keyboard		
		P/N251052-02	
			AC Power On/Off 14.31818MHz Computer-TV
		904778-01	

### FUSE DEVICES

ITEM NO.	DESCRIPTION	MFGR. PART NO.		NOTES
		DEVICE	HOLDER	
F1	3.15A @ 250V Fast-Acting			

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

### PARTS LIST AND DESCRIPTION

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

### SEMICONDUCTORS (Select replacement for best results)

ITEM No.	TYPE No.	MFGR. PART No.	GENERAL ELECTRIC PART No.	NTE PART No.	ECG PART No.	RCA PART No.	REPLACEMENT DATA	WORKMAN PART No.	ZENITH PART No.
CR1	W075	KBPC802	GEZD-7.5	NTE5015A	ECG5015A	SK7A5/5015A	WEP1416/5015	103-Z9002	
CR2	1S2076	1S2076		NTE5313	ECG5313	SK3986/5313	WEP925/519	103-131	
CR3	2SD880Y	2SD880Y		NTE519	ECG519	SK3100/519	WEP745/152	121-987-03	
Q1				NTE152	ECG152	SK3440/291			
Q3 thru Q5	2SC1815GR	2SC1815GR	GE-514	NTE85	ECG85	SK3124A/289A	WEP66/199	121-Z9065	
Q6,7	2SC1959-0	2SC1959-0	GE-62	NTE85	ECG85	SK9229/85	WEP910/289	921-1114	
UAB1	MOS6522	MOS6522	GE-210	NTE85					
UAB3	MOS6522	MOS6522							
UB4	SN7406N	SN7406N	GE-7406	NTE7406	ECG7406	SK7406/95M	WEP2119/95M	HE-443-698	
UB6	UA555TC	UA555TC	GE1C-269	NTE955M	ECG955M	SK3564/95M	WEP2119/95M	221-Z9042	
UB7	MOS6560-101	MOS6560-101							
UB9	7402PC	7402PC	GE-7402	NTE7402	ECG7402	SK7402	WEP7402/7402	HE-443-46	
UC2	74LS04PC	74LS04PC	74LS04	NTE74LS04	ECG74LS04	SK74LS04		HE-443-155	
UC3	74LS02PC	74LS02PC	GE-66A	NTE74LS02	ECG74LS02	SK74LS02		HE-443-779	
UC4 thru UC6	74LS138PC	74LS138PC	GE-210	NTE74LS138	ECG74LS138	SK74LS138		HE-443-877	
UD1	TC4066BP	TC4066BP	GE-7406	NTE4066B	ECG4066B	SK4066B	WEP4066B/4066B	905-369	
UD2	MSM2114LRS	MSM2114LRS	GE1C-269	NTE2114	ECG2114	SK2214/2114		HE-443-764	
UD3 thru UD5	uPD2114LC-1	uPD2114LC-1	GE-7406	NTE2114	ECG2114	SK2214/2114			
UD6	M5L2114LP-3	M5L2114LP-3	74LS133	NTE74LS133	ECG74LS133	SK74LS133			
UD7	MOS901460-03	MOS901460-03							
UD8	MOS65245	MOS65245							
UD9	74LS133PC	74LS133PC							
UE1 thru UE6	TMM314APL-3	TMM314APL-3							
UE8	MOS65245	MOS65245							
UE10	MOS6502A	MOS6502A							
				NTE6502	ECG6502				

## PARTS LIST AND DESCRIPTION (Continued)

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

### SEMICONDUCTORS (Select replacement for best results)

ITEM No.	TYPE No.	MFGR. PART No.	REPLACEMENT DATA				
			GENERAL ELECTRIC PART No.	NTE PART No.	ECG PART No.	RCA PART No.	WORKMAN PART No.
UE11	MOS901486-01						
UE12	MOS901486-06						
UF8	MOS65245						
VR1	SH323SC						

### WIRING DATA

General - use Unshielded Hook-up Wire ••••• Use BELDEN No. 8529 (Solid) Available in 13 Colors

8522 (Stranded) Available in 13 Colors

## PARTS LIST AND DESCRIPTION (Continued)

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

### ELECTROLYTIC CAPACITORS Items Not Listed Are Normally Available At Local Distributors.

ITEM No.	RATING	MFGR. PART No.
C13	1 50V 10%	
C16	1 50V 10%	
C53	2.2 1%	

ITEM No.	RATING	MFGR. PART No.
C54	2.2 1%	
C55	.47 3%	
C56	.47 3%	

### CAPACITORS Items Not Listed Are Normally Available At Local Distributors.

ITEM No.	RATING	MFGR. PART No.
C35	10-90pF Trimmer	

ITEM No.	RATING	MFGR. PART No.

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

ITEM NO.	FUNCTION	RESISTANCE	MFGR. PART NO.	NOTES
R7	Video Level	1000		
R32	Video Bias	1000		

### COILS (RF-IF)

ITEM No.	FUNCTION	MFGR. PART No.
L2	Peaking RF Choke	
L3		

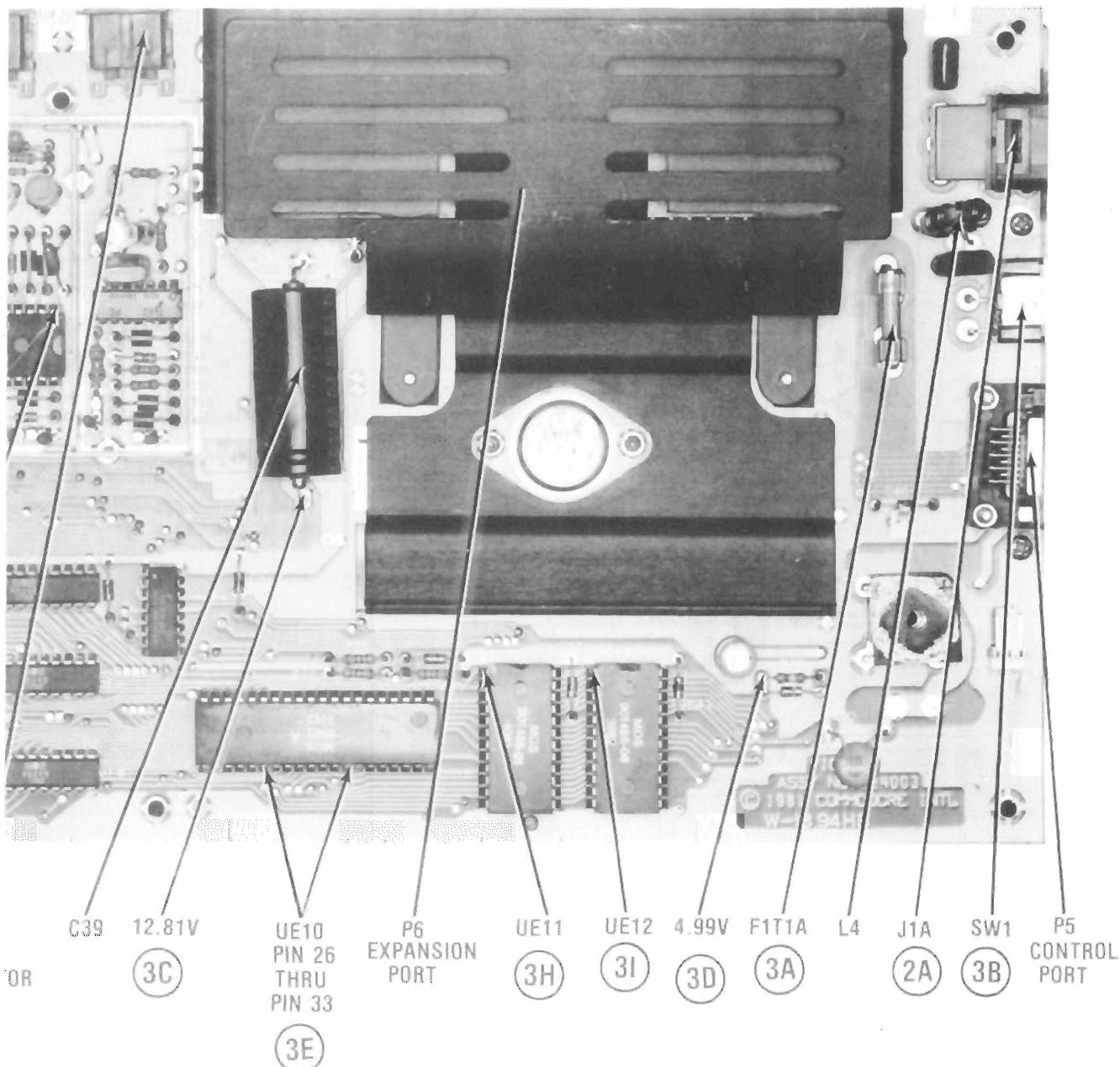
ITEM No.	FUNCTION	MFGR. PART No.
L4	Line Filter	

continued)

## PRELIMINARY SERVICE CHECKS (Continued)

**SAMS** COMPUTERFACTS™

COMMODORE  
MODEL VIC 20 (EARLY VERSION)



MAIN BOARD

CC12 COMMODORE MODEL VIC 20 (EARLY VERSION)

## PRELIMINARY SERVICE CHECKS

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

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

Disconnect all peripherals except the monitor from the computer to eliminate possible external malfunctions. However, problems involving the interaction between computer and a peripheral will require the connection of the device for voltage and logic readings.

Replacement or repair of the keyboard, main board, RF Modulator, or components may be necessary after the malfunction has been isolated.

## GENERAL OPERATING INSTRUCTIONS

### POWER UP

When the computer is turned On, it will come up ready to program in Commodore Basic.

See "Cassette Operation" for instructions on loading and saving programs.

To run a program, type RUN and press the RETURN key.

To stop a program, press the RUN/STOP key.

Press the RUN/STOP key and RESTORE key at the same time to stop the program and reset the computer to the start condition, without losing the program.

### CASSETTE OPERATION

Plug a Datasette cassette recorder into the six pin edge connector on the rear of the computer. Note: A regular cassette tape recorder will not work on the VIC 20.

To load a program, type LOAD, press the RETURN key and follow the instructions displayed on the Monitor screen.

To save a program, type SAVE, press the RETURN key and follow the instructions displayed on the screen.

Datasette is a trademark of Commodore Business Machines, Inc.

**SAMS**™

Howard W. Sams & Co., Inc.

4300 West 62nd Street, P.O. Box 7092, Indianapolis, Indiana 46206 U.S.A.

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CC12 COMMODORE

MODEL VIC 20 (EARLY VERSION)

PRE

This da  
which puter nCheck  
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functio

GENI

**POWER UP**

When the computer is turned

See "Cassette Operation" for

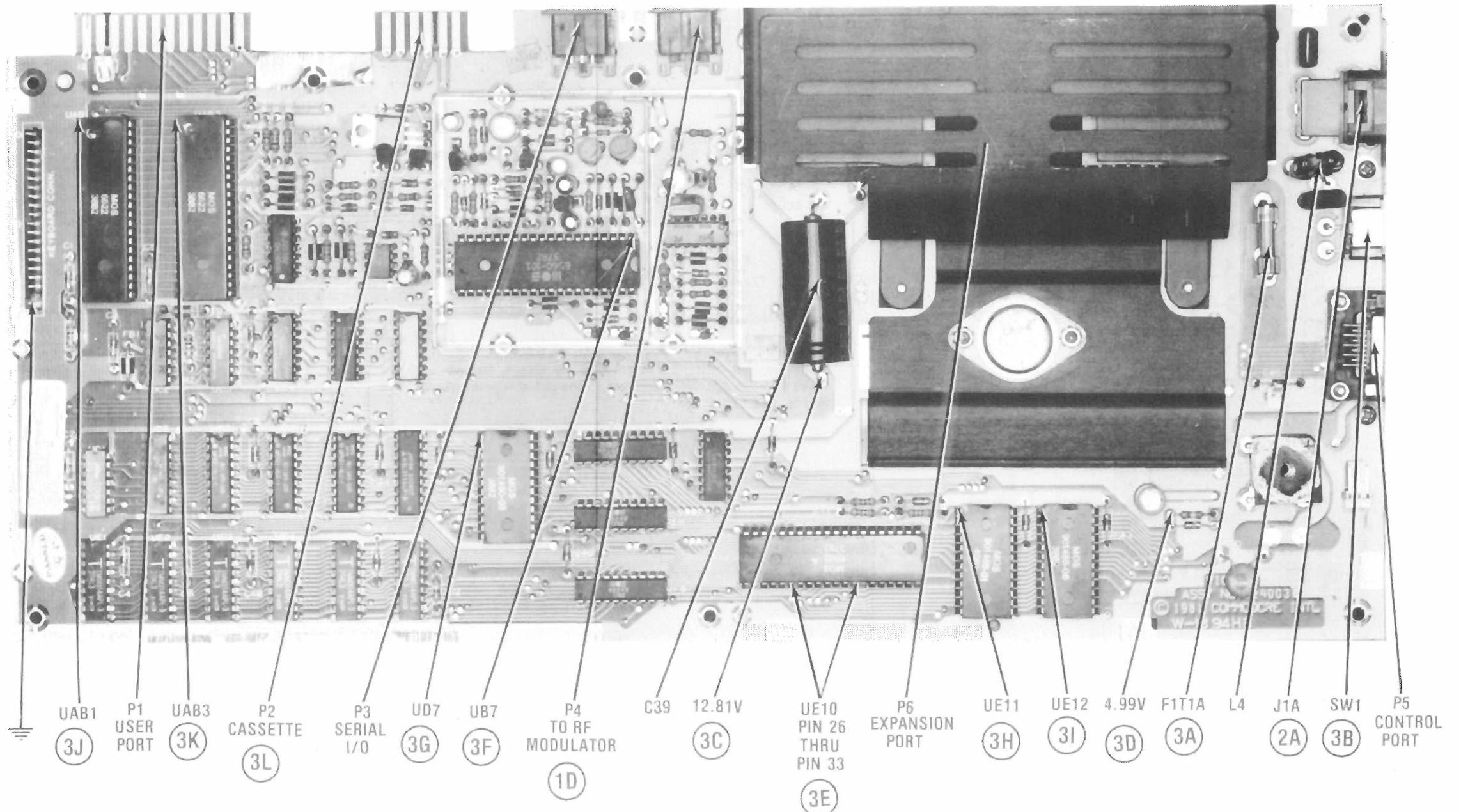
To run a program, type RUN :

To stop a program, press the

Press the RUN/STOP key and  
to the start condition, without**CASSETTE OPERATION**Plug a Datasette cassette re  
regular cassette tape recordsTo load a program, type LOAD  
screen.

To save a program, type SAVE

Dataset

**CC12 COMMODORE MODEL VIC 20 (EARLY VERSION)****MAIN BOARD****MAIN BOARD**

## **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 RF MODULATOR CHECK

- (A) Turn On computer and verify that the power indicator LED is lit. Note: If the power indicator is not lit, see "Power Supply Check" section.
  - (B) Verify that the channel select switch is set for the same channel as the monitor, channel 3 or 4.
  - (C) Verify that the antenna switch is in the Computer position.
  - (D) Check for bad connections, and improper hook up at the monitor and at the computer.
  - (E) If the computer still does not come up when turned On, check the RF Modulator (M2) by substitution.

## 2 POWER SUPPLY CHECK

- (A) Connect Power Supply (M1) to 120VAC. Check for 10.38VAC between pins of the power connector (J1A). If the voltages are incorrect, or not present, replace the power supply.

**3 MAIN BOARD**

- (A) Check Fuse F1T1A.
  - (B) Check Power Switch with an ohmmeter
  - (C) Check for 12.81V at Capacitor C39.
  - (D) Check for 4.99V at R28.

## **REPLACEMENT PARTS**

ITEM	PART NO.	DESCRIPTION
C39		Electrolytic Capacitor 4700 $\mu$ F, 16V
F1T1A		Fuse, 1A @ 250V, Fast Acting
M1	902502-02	Power Supply. Input 117VAC, 47-63Hz, 40W, Output 10VAC 30VA
M2		RF Modulator
R28		Resistor, 390 ohms
SW1		Switch, Power
UAB1		IC, Interface, MOS6522
UAB3		IC, Interface, MOS6522
UB7		IC, Graphics and Sound Generator, MOS6560-101
UD7		IC, Character Generator ROM MOS901460-03
UE10		IC, Microprocessor, MOS6502A
UE11		IC, ROM, MOS901486-01
UE12		IC, ROM, MOS901486-06

Substitute the keyboard or locate to  
clean the contacts with switch cleaner

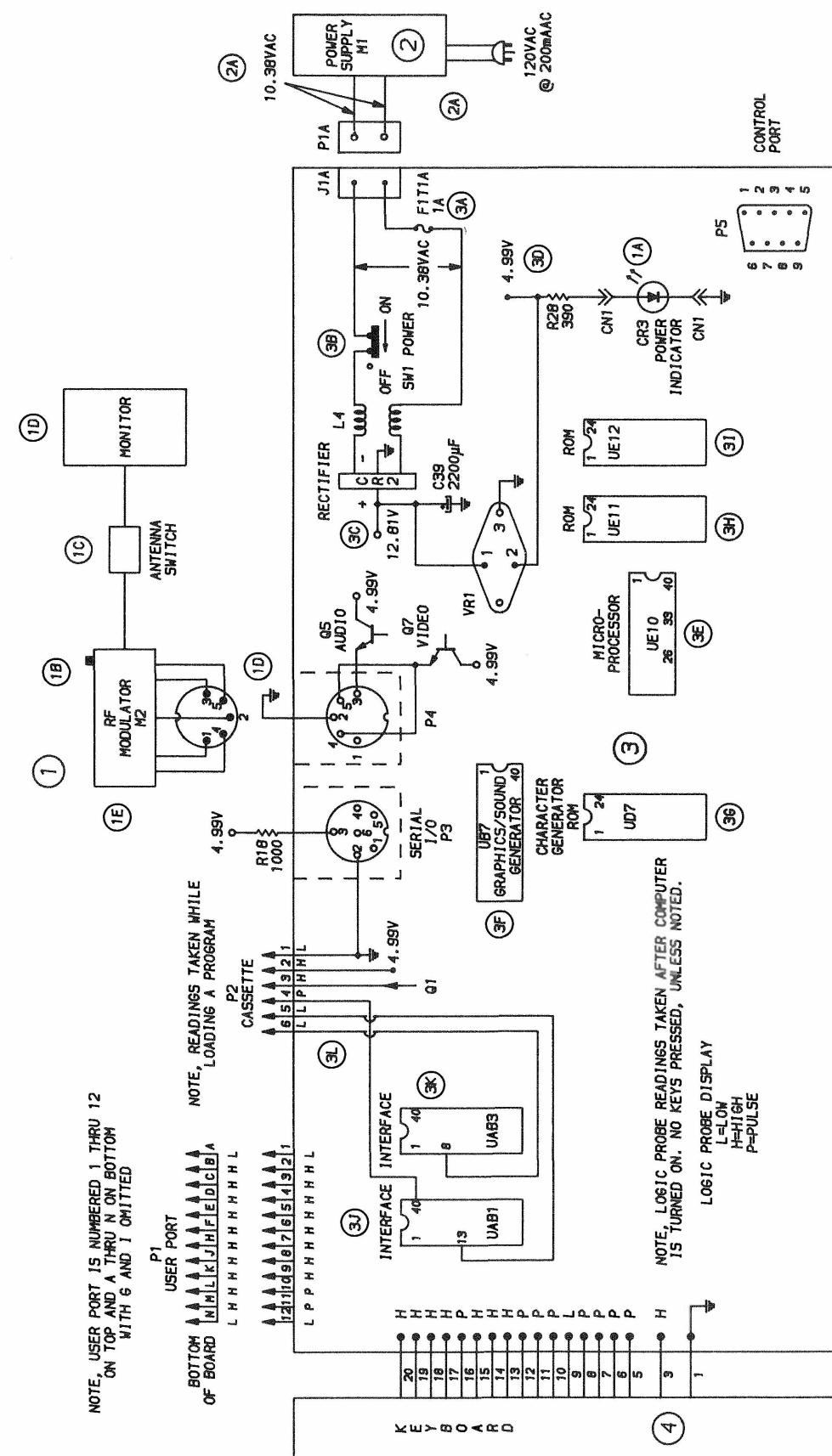
## TEST EQUIPMENT AND TOOL

Digital Volt/Ohm Meter  
Logic Probe

TOOLS

Phillips Screwdriver  
Small Screwdriver  
Soldering Iron  
Switch Cleaner

## **PRELIMINARY SERVICE CHECKS (Continued)**



## **INTERCONNECTING DIAGRAM**

## IMINARY SER

DISASSEMI

## CABINET REMOVAL

Remove Phillips screws 1, 2 and 3 from the cabinet bottom. Carefully lift the cabinet top up and back. The keyboard is attached to the cabinet top. Unplug the keyboard and power plugs and remove cabinet top. See Figure 1.

## **MAIN BOARD REMOVAL**

Remove Phillips screws 1 thru 7 and lift the Main Board of the cabinet bottom. To remove the shield, remove Phillips screws 8, 9 and 10 and remove the shield at point G thru G. See Figure 2.

#### **KEYBOARD REMOVAL**

To remove the keyboard from the cabinet top, remove the Phillips screws 1 thru 8 and lift the keyboard out of the cabinet. See Figure 3.

## E CHECKS (Continued)

### CHECKS

HOTOS TO MATCH THE NUMBER IN THE DATA FOR SERVICE CHECKS TO BE PER-

- (E) Computer does not power up when turned On. Check for pulses on pins 26 thru 33 of the Microprocessor IC (UE10). If the pulses are not present, check IC UE10 by substitution.
- (F) No video (dark screen) or sound. Check the Graphics and Sound Generator ROM IC (UB7) by substitution.
- (G) Screen comes up with black flashing squares appearing instead of characters. Check the Character Generator ROM IC (UD7) by substitution.
- (H) Screen displays only the blue border and no information. Check ROM IC (UE11) by substitution.
- (I) Screen display is snow only. Check ROM IC (UE12) by substitution.
- (J) Keyboard does not operate, or the computer will not save or load a program to or from cassette. Check Interface IC (UAB1) by substitution.
- (K) RUN/STOP and RESTORE keys do not operate when pushed at the same time, or the cassette motor won't run to save or load a program. Check Interface IC (UAB3) by substitution.
- (L) Datasette cassette fails to operate. Check the logic readings at P2. Readings taken while loading a program.

### KEYBOARD

Substitute the keyboard or locate the bad key and clean the contacts with switch cleaner.

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## TEST EQUIPMENT AND TOOLS

### TEST EQUIPMENT

Digital Volt/Ohm Meter  
Logic Probe

### TOOLS

Phillips Screwdriver  
Small Screwdriver  
Soldering Iron  
Switch Cleaner

## PRELIMINARY SERVICE CHECKS (Continued)

## PRELIMINARY SERVICE CHECKS (Continued)

### DISASSEMBLY INSTRUCTIONS

