Servicing Data

OHIO SCIENTIFIC

for

COMPUTER BOARDS 600 & 610

as used in

Challenger Series

SUPERBOARD II
MODEL C1P
MODEL C1PMF

GENERAL SERVICING/SAFETY PRECAUTIONS

Use an isolation transformer for bench servicing.

Maintain line voltage at 120VAC.

Remove power from unit before removing or installing chips.

Use extreme caution when handling printed circuit boards. Ground yourself before handling boards.

Do not use a soldering device which has current flowing in its tip.

Use an isolation (times 10) probe on scope.

Do not remove or install boards or minifloppy with unit turned on.

Install RAM in Chip Enable sequence only.

Caution: *Ground path on the boards is parallel to the B+ path on the opposite side of the board.*

DISASSEMBLY INSTRUCTIONS

Lay unit on a protective surface with top side down.

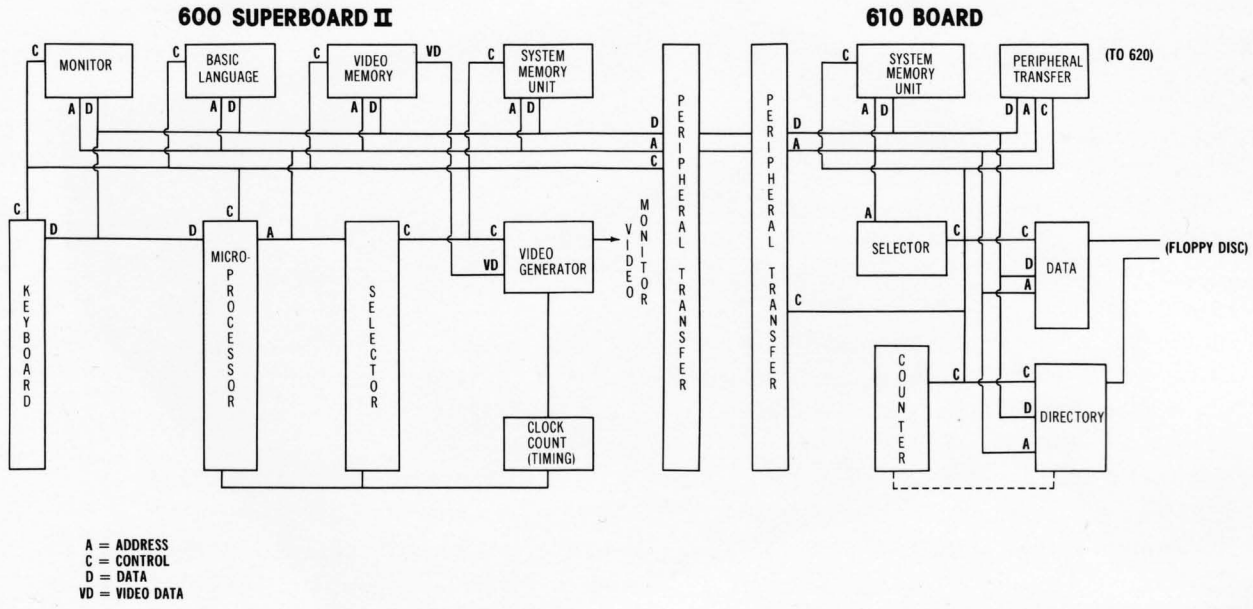
Remove six large screws from cabinet bottom and remove cabinet bottom.

Unplug minifloppy. (Model Challenger C1PMF.)

Remove five screws from Superboard II/600 board.

Lift printed board(s) from unit. Unplug power supply plug(s) and video/cassette connector from Superboard II/600 board.

Remove four screws and spacers to separate boards. (Model Challenger C1PMF only.)



Copyright © 1979 by Howard W. Sams & Co., Inc.

TROUBLESHOOTING GUIDE
COLOR CO-ORDINATED

See schematic for the colors matching those in this guide for circuitry to be checked.

When a portion of a chip function is being referred to for checking, this is indicated by the partial coloring of chip.

PRELIMINARY SETUP

"SHIFT LOCK" key must be depressed before any troubleshooting is attempted.
"BREAK" key must be depressed and then released.
Confirm power supply(s) output of 5V DC.
These steps are necessary before computer will operate.

CRYSTAL OSCILLATOR - 600 BOARD

Connect scope to U58, Pin 8. Waveform should be similar to WAVEFORM 2. This confirms operation of X1 and associated circuitry.

Ø2 CLOCK (OSC.) - 600 BOARD

Connect scope to Pin 39 of U8. Waveform should be similar to WAVEFORM 1. This will check the operation of chip portions associated with this circuitry (U8, U30, U58).

VIDEO SIGNALS - 600 BOARD

To check video and sync pulses generated by the computer and fed to the TV monitor, connect scope to VIDEO JACK (J6). Waveforms should be similar to WAVEFORMS 9 and 10. WAVEFORMS 3 through 8 aid in checking circuits used in video development. See U30 for scope connections.
These steps basically verify operation of circuitry that generates VIDEO and SYNC pulses. Effectively, this will check U30, U59, U60, U61, U65, U69 and parts of U56, U62, and U70.

"BYTES FREE" MEMORY CHECK - 600 & 610 BOARDS

The ram circuitry check is built into the computer, as long as most all other circuitry is working.

To check ram circuitry, follow this procedure:

1. Press "BREAK".
2. Press "C".

Computer will ask "memory size". Ignore the question, press "RETURN".

Computer will ask "terminal width". Ignore the question, press "RETURN".

Computer will display XXXX BYTES free, etc.

If the "BYTES FREE" number does not represent the total number of your system, this will indicate what memory or associated circuitry has failed.

The following chart indicates the byte free count and the chips involved.

To find the defective memory rams or associated circuitry, observe bytes free indication on screen.

Go to the following chart and find the bytes free column to locate associated chips.

EXAMPLE 1: The computer is equipped with MEMORY totaling 19,711 BYTES FREE.

The monitor screen indicates 12,543 bytes free. Go to Chart 12,543. Adjacent chips U23 and U31 are operating properly.

This would indicate, then, that U24 and/or U32 and/or associated circuitry is malfunctioning.

EXAMPLE 2: The computer is equipped with MEMORY totaling 19,711 BYTES FREE.

The monitor screen indicates 12,540 bytes free. Go to chart. 12,540 falls between 11,519 and 12,543.

This indicates U23 and/or U31 and/or associated circuitry is malfunctioning.

NOTE: Chips adjacent to the next higher number of bytes free displayed on the monitor are the most likely defective device(s).

If above steps do not solve failure(s), continue.

CHIP SELECT LINES ($\overline{RS}$(0 thru 7) AND $\overline{CE}$(0 thru 23))

To check chip select lines, bring the computer into machine language mode by depressing "BREAK", then "M". A six-character alpha-numeric display will appear on the monitor. Use the first four characters for the address code as shown charted below. Connect logic probe to chip select line.

Press "." then enter address selected from chart. If operating properly a pulse should be indicated on logic probe when the last character is entered.

RAMS

BYTES FREE	CHIPS OR ASSOCIATED CIRCUITRY	MACHINE ADDRESS NUMBERS	
255	U31 U45	0000-03FF	600 BOARD
1279	U32 U46	0400-07FF	"
2303	U33 U47	0800-0BFF	"
3327	U34 U48	0C00-0FFF	"
.....		4K	
4351	U35 U49	1000-13FF	600 BOARD
5375	U36 U50	1400-17FF	"
6399	U37 U51	1800-1BFF	"
7423	U38 U52	1C00-1FFF	"
.....		8K	
8447	U19 U27	2000-23FF	610 BOARD
9471	U20 U28	2400-27FF	"
10495	U21 U29	2800-2BFF	"
11519	U22 U30	2C00-2FFF	"
12543	U23 U31	3000-33FF	"
13567	U24 U32	3400-37FF	"
14591	U25 U33	3800-3BFF	"
15615	U26 U34	3C00-3FFF	"
.....		16K	
16639	U35 U43	4000-43FF	610 BOARD
17663	U36 U44	4400-47FF	"
18687	U37 U45	4800-4BFF	"
19711	U38 U46	4C00-4FFF	"
.....		20K	
20735	U39 U47	5000-53FF	610 BOARD
21759	U40 U48	5400-57FF	"
22783	U41 U49	5800-5BFF	"
23807	U42 U50	5C00-5FFF	"
24831	U51 U59	6000-63FF	"
25855	U52 U60	6400-67FF	"
26879	U53 U61	6800-6BFF	"
27903	U54 U62	6C00-6FFF	"
28927	U55 U63	7000-73FF	"
29951	U56 U64	7400-77FF	"
30975	U57 U65	7800-7BFF	"
31999	U58 U66	7C00-7FFF	"

MINIFLOPPY SIGNAL CHECK - 610 BOARD

MINIFLOPPY must be in "disk" operating mode by depressing "BREAK" then "D".

To check for the computer pulse required to get the signal "to" and "from", waveforms should be similar to WAVEFORMS 21, 22, 23, and 24.

For computer output data to minifloppy in "directory cycle", check for "grass" as shown in WAVEFORM 25 while in this "directory cycle".

NOTE: This cycle takes place immediately after depressing "BREAK" and then "D".

For proper operation of computer output program data (to minifloppy) with computer in the "disk storage" mode, check for "grass" as shown in WAVEFORM 27.

To check for data from the minifloppy, select program from disk selection shown on monitor.

Select program, depress "RETURN" and check immediately during the selection cycle for "grass" as shown in WAVEFORM 26.

AUDIO CASSETTE/TAPE SIGNAL CHECK - 600 BOARD

Computer circuitry handling signals going to cassette should be similar to WAVEFORMS 16 and 17.

When storing a program going out to tape recorder, see WAVEFORMS 18, 19, and 20.

To confirm signal coming from cassette: while loading a program coming from the cassette, proper operation is indicated by WAVEFORMS 11, 12, 13, 14, and 15. WAVEFORM 15 amplitude will depend on volume control setting of cassette.

MICROPROCESSOR CHIP (CPU) OPERATION - 600 BOARD

If "BREAK" key does not clear screen of random pattern, processor may not be working. Be sure key switch is functioning.

To verify processor is working, a pulse indication taken by scope (set on 1μSec. range) or logic probe at address lines (A0 through A15) at U8 will verify. No signal on an address line will suggest a defective U8 or a problem on that address line.

ROM MONITOR AND ROM BASIC CHIPS OPERATION CHECK

SYMPTOM: "BASIC" mode will not operate as "C" key is depressed and display does not change. The "DISK" mode as well as "MACHINE" mode operate properly. This indicates a problem with ROM BASIC 1, 2, 3 (U9, U10, U11).

SYMPTOM: "BASIC", "DISK", AND "MACHINE" modes not functioning. This indicates a problem with one or more of these chips and/or associated circuitry;

ROM MONITOR (U13)
ROM BASIC 4 (U12)
MICROPROCESSOR (CPU-U8)
RAMS (U31 AND/OR U45)

600 BOARD PARTS LIST AND DESCRIPTION

(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.	MALLORY PART No.	RAYTHEON PART No.	RCA PART No.	SYLVANIA PART No.	THORDARSON PART No.	WORKMAN PART No.	ZENITH PART No.
D1-D10	1N914	Q-1N914	GE-514	PTC214	REN 177	SK3100/519	ECG519	TM519	WEP925/519	103-131
D15	1N4001	Q-1N4001	GE-504A	1N4001	REN 116	SK3312	ECG116	TM116	WEP156	212-76-02
D16	1N914		GE-514	PTC214	REN 177	SK3100/519	ECG519	TM519	WEP925/519	103-131
D17-D20	1N914		GE-514	PTC214	REN 177	SK3100/519	ECG519	TM519	WEP925/519	103-131
Q1										
Q2										
U2-U3	SN74LS75N	IC-74LS75				SK74LS75	ECG74LS75	TM74LS75		
U4-U5	74125N						ECG74125	TM74125		
	74LS125	IC-74LS125					ECG74125	TM74125		
U6-U7	MC8T28P	IC-8T28								
U8	6502	IC-6502								
U9	BASIC 1	IC-BASIC 1								
U10	BASIC 2	IC-BASIC 2								
U11	BASIC 3	IC-BASIC 3								
U12	BASIC 4	IC-BASIC 4								
U13	SYN600	IC-SYN600								
	2316B									
	2716(1)									
U14	S6850P	IC-6850								
U15	74LS02N	IC-74LS02				SK74LS02	ECG74LS02	TM74LS02	WEP7402/7402	
U16	74LS04PC	IC-74LS04				SK74LS04	ECG74LS04	TM74LS04		221-Z9076
U17	SN74LS139N	IC-74LS139								
U18	74LS04PC	IC-74LS04	GE-7404			SK74LS04	ECG74LS04	TM74LS04		221-Z9076
U19	SN74LS20J	IC-74LS20				SK74LS20	ECG74LS20	TM74LS20		
U20	SN74LS138N	IC-74LS138				SK74LS138	ECG74LS138	TM74LS138		
U21	74LS04PC	IC-74LS04				SK74LS04	ECG74LS04	TM74LS04		
U22-U23	74LS138N	IC-74LS138				SK74LS138	ECG74LS138	TM74LS138		
U24-U25	MC8T28P	IC-8T28								
U29	7492		GE-7492			SK7492	ECG7492	TM7492		
	74LS92									
U30	74163N						ECG74163	TM74163		
	74LS163	IC-74LS163				SK74LS163	ECG74LS163A	TM74LS163A		
U31-U40	L2114-550	IC-L2114-550								
U41	CARGENV1.0	IC-CARGEN								
U42	SN74LS165N	IC-74LS165					ECG74165	TM74165		
U43	7408N	IC-7408	GE-7408			SK7408	ECG7408	TM7408	WEP7408/7408	
U44		PROTO								
U45-U52	L2114-550	IC-L2114-550								
U53-U55	74LS157N	IC-74LS157				SK74LS157	ECG74LS157	TM74LS157		
U56	SN74LS20J	IC-74LS20				SK74LS20	ECG74LS20	TM74LS20		
U57	74LS163N	IC-74LS163				SK74LS163	ECG74LS163A	TM74LS163		
U58	DM7400N	IC-7400	GE-7400		REN 7400	SK74LS00	ECG7400	TM7400	WEP7400/7400	221-Z9075
	74LS00					SK74LS00	ECG74LS00	TM74LS00	WEP7400/7400	
U59-U61	74163N	IC-74LS163					ECG74163	TM74163		
	74LS163					SK74LS163	ECG74LS163A	TM74LS163A		
U62	F5404DM									
	7404		GE-7404			SK7404	ECG7404	TM7404		221-Z9076
U63	SN7474N	IC-74LS74	GE-7474		REN 7474	SK7474	ECG7474	TM7474	WEP7474/7474	
	74LS74					SK74LS74	ECG74LS74A	TM74LS74A		
U64	SNC5476J									
	7476		GE-7476			SK7476	ECG7476	TM7476	WEP7476/7476	
	74LS76									
U65	SN74123N	IC-74123	GE-74123		REN 74123	SK74123	ECG74123	TM74123		221-Z9086
	74LS123					SK74LS123	ECG74LS123	TM74LS123		
U66	CA3130S	IC-3130				SK3568				
U67	7414					SK7414	ECG7414	TM7414		
	74LS14					SK74LS14	ECG74LS14	TM74LS14		
U68	7417						ECG7417	TM7417		
	74LS17									
U69	SN74123N	IC-74123	GE-74123		REN 74123	SK74123	ECG74123	TM74123		221-Z9086
	74LS123					SK74LS123	ECG74LS123	TM74123		
U70	7403N	IC-7403					ECG7403	TM7403		
	74LS03					SK74LS03	ECG74LS03	TM74LS03		
	JOY STICK & SOUND									
	1N914		GE-514	PTC214	REN 177	SK3100/519	ECG519	TM519	WEP925/519	103-131

(1) Used in some versions.

ELECTROLYTIC CAPACITORS

ITEM No.	RATING	REPLACEMENT DATA				
		MFGR. PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
					Q-LINE	GENERAL LINE
C5	47 16V 33	C-506	WBR50-25 WBR35-50	TT25X50A TT15X30A	QE1-353 QE1-309	TVA-1206 TVA-1205.1

600 BOARD PARTS LIST AND DESCRIPTION (CONTINUED)

(When ordering parts, state Model, Part Number, and Description.)

CAPACITORS

ITEM No.	RATING	MFGR. PART No.	REPLACEMENT DATA			
			CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
					Q-LINE	GENERAL LINE
C6	150pF 5%	C-151	CD15FD151J03	SX315	QW1-31	MWA-151
C7	.001 100V 10%	C-102	CD19FD102J03	SX210	QW1-51	MWC-102
C8	.1 50V 10%	C-104	WMF05P1	EWF05010		431P1049R5
C9	68pF 5%	C-680	CD15ED680J03	SX468	QW1-23	MWA-680
C10	.01 100V 10%	C-103	WMF1S1	EWF1A110	QF1-91	1PB-S10
C11	.1 50V 10%	C-104	WMF05P1	EWF05010		431P1049R5
C12	.001 100V 10%	C-102	CD19FD102J03	SX210	QW1-51	MWC-102
C13	.01 100V 10%	C-103	WMF1S1	EWF1A110	QF1-91	1PB-S10
C21	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C22	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C23	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C24	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C25	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C26	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C27	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C28	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C29	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C30	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C32	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C33	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C35	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C36	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C37	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C38	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C39	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C40	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C41	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C42	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C43	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C44	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C45	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C46	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C47	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C48	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C49	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C50	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C51	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C52	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C53	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C54	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C55	.001 100V 10%	C-102				
C56	.1 10V		MGP1	MAG1201	QC1-223	HY-360
C57	27pF 1KV 10%	C-270				
C58	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C59	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360

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

ITEM No.	FUNCTION	RESISTANCE	REPLACEMENT DATA		
			MFGR. PART No.	MALLORY PART No.	TRW PART No.
R57	Duration (Tape Pulse)	10K	RP-103		
R58	Video	5000	RP-502		

RESISTORS

ITEM No.	RATING	REPLACEMENT DATA	
		MFGR. PART No.	WORKMAN PART No.
R1	4700 1/4W 5%	R1-472	22-1112
R2	4700 1/4W 5%	R1-472	22-1112
R3	4700 1/4W 5%	R1-472	22-1112
R4	4700 1/4W 5%	R1-472	22-1112
R5	4700 1/4W 5%	R1-472	22-1112
R6	4700 1/4W 5%	R1-472	22-1112
R7	4700 1/4W 5%	R1-472	22-1112
R8	4700 1/4W 5%	R1-472	22-1112
R9	220 1/4W 5%	R1-221	22-1080
R10	4700 1/4W 5%	R1-472	22-1112
R11	4700 1/4W 5%	R1-472	22-1112
R12	4700 1/4W 5%	R1-472	22-1112
R32	1000 1/4W 5%	R1-102	22-1096
R33	10K 1/4W 5%	R1-103	22-1120
R34	10K 1/4W 5%	R1-103	22-1120
R35	470 1/4W 5%	R1-471	22-1088
R36	470 1/4W 5%	R1-471	22-1088
R37	10K 1/4W 5%	R1-103	22-1120
R38	220 1/4W 5%	R1-221	22-1080
R39	390 1/4W 5%	R1-391	22-1086
R40	220 1/4W 5%	R1-221	22-1080
R41	390 1/4W 5%	R1-391	22-1086
R42	220 1/4W 5%	R1-221	22-1080
R43	390 1/4W 5%	R1-391	22-1086
R44	220 1/4W 5%	R1-221	22-1080
R45	390 1/4W 5%	R1-391	22-1086
R46	220 1/4W 5%	R1-221	22-1080

ITEM No.	RATING	REPLACEMENT DATA	
		MFGR. PART No.	WORKMAN PART No.
R47	390 1/4W 5%	R1-391	22-1086
R48	220 1/4W 5%	R1-221	22-1080
R49	390 1/4W 5%	R1-391	22-1086
R50	15K 1/4W 5%	R1-153	22-1124
	10K 1/4W 5%	R1-103	22-1120
R51	220 1/4W 5%	R1-221	22-1080
R52	1000 1/4W 5%	R1-102	22-1096
R53	10K 1/4W 5%	R1-103	22-1120
R54	1000 1/4W 5%	R1-102	22-1096
R55	10K 1/4W 5%	R1-103	22-1120
R56	100K 1/4W 5%	R1-104	22-1144
R59	1000 1/4W 5%	R1-102	22-1096
R60	470 1/4W 5%	R1-471	22-1088
R61	220 1/4W 5%	R1-221	22-1080
R62	4700 1/4W 5%	R1-472	22-1112
R62A	100 1/4W 5%	R1-101	22-1072
R63	10K 1/4W 5%	R1-103	22-1120
R64	10K 1/4W 5%	R1-103	22-1120
R65	470 1/4W 5%	R1-471	22-1088
R66	10K 1/4W 5%	R1-103	22-1120
R67			
R68			
R69			
R70			
R71			
R72	1000 1/4W 5%	R1-102	22-1096
R73	220 1/4W 5%	R1-221	22-1080
R74	390 1/4W 5%	R1-391	22-1086

600 BOARD PARTS LIST AND DESCRIPTION (CONTINUED)

(When ordering parts, state Model, Part Number, and Description.)

FUSE DEVICES

ITEM No.	DESCRIPTION	REPLACEMENT DATA						
		PART No.		BUSS PART No.		LITTELFUSE PART No.		WORKMAN PART No.
		DEVICE	HOLDER	DEVICE	HOLDER	DEVICE	HOLDER	DEVICE
F1	5A 250V Quick-acting	F-005	HW-FH2	MTH-5	1A1907-02	312005	102068	FG5-2

MISCELLANEOUS

ITEM No.	PART NAME	PART No.	NOTES
D21	LED (1)		
J1	Connector	SC-40FI	Expansion Connector
J2	Connector	SC-12FM	
J3	Connector	SC-12FM	
J4	Connector	SC-12FM	
J5	Plug	SC-1MTM	DC Power
J6	Jack		Video Output
J7	Jack		Audio Tape Input
J8	Jack		Audio Tape Output
M1	Motor		Blower
P9	AC Line Cord		
SW1 thru			
SW51	Switch		Main Keyboard
SW52	Switch		Shift Lock
SW53	Switch		Break
SW54	Switch		Power
X1	Crystal	X-395	3.932160MHz

(1) May not be used in Challenger C1P, C1PMF.

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. 8528 (Solid) Available in 13 Colors 8522 (Stranded) Available in 13 Colors

610 BOARD PARTS LIST AND DESCRIPTION

(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.	MALLORY PART No.	RAYTHEON PART No.	RCA PART No.	SYLVANIA PART No.	THORDARSON PART No.	WORKMAN PART No.	ZENITH PART No.
U1-U3	N8T95N 8T95									
U4	SN7417N 7417						ECG7417 ECG7417	TM7417 TM7417		
U5	F-7404PC 74LS04		GE-7404			SK7404 SK74LS04	ECG7404 ECG74LS04	TM7404 TM74LS04		221-Z9076
U6	54LS02DM 54LS02									
U7	74LS10PC 74LS10					SK74LS10 SK74LS10	ECG74LS10 ECG74LS10	TM74LS10 TM74LS10		
U8	74LS20PC 74LS20					SK74LS20 SK74LS20	ECG74LS20 ECG74LS20	TM74LS20 TM74LS20		
U9-U11	74LS390PC 74LS390									
U12	74LS93N 74LS93					SK74LS93 SK74LS93	ECG74LS93 ECG74LS93	TM74LS93 TM74LS93		
U13-U14	MC8T28P 8T28									
U15-U18	74S138PC 74LS138					SK74LS138 SK74LS138	ECG74LS93 ECG74LS93	TM74LS93 TM74LS93		
U19-U66	L2114-550									
U67	74LS00N 74LS00					SK74LS00 SK74LS00	ECG74LS00 ECG74LS00	TM74LS00 TM74LS00		
U68	SN74123N 74LS123		GE-74123		REN 74123	SK74123 SK74LS123	ECG74123 ECG74LS123	TM74123 TM74LS123		221-Z9086
U69	74LS04PC 74LS04					SK74LS04 SK74LS04	ECG74LS04 ECG74LS04	TM74LS04 TM74LS04		
U70	SN74123N 74LS123		GE-74123		REN 74123	SK74123 SK74LS123	ECG74123 ECG74LS123	TM74123 TM74LS123		221-Z9086
U71	MC6850P 6850									
U72	S6821P 6821									
U73-U75	SN7417N 7417						ECG7417 ECG7417	TM7417 TM7417		

610 BOARD PARTS LIST AND DESCRIPTION (CONTINUED)

(When ordering parts, state Model, Part Number, and Description.)

ELECTROLYTIC CAPACITORS

ITEM No.	RATING	REPLACEMENT DATA				
		MFGR. PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
					Q-LINE	GENERAL LINE
C44	50 25V	C-506	WBR50-25	TT25X50A	QE1-353	TVA-1206
	33		WBR35-50	TT15X30A	QE1-309	TVA-1205.1
C46	50 25V	C-506	WBR50-25	TT25X50A	QE1-353	TVA-1206
	33		WBR35-50	TT15X30A	QE1-309	TVA-1205.1

CAPACITORS

ITEM No.	RATING	MFGR. PART No.	REPLACEMENT DATA			
			CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
					Q-LINE	GENERAL LINE
C1	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C2	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C3	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C4	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C5	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C6	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C7	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C8	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C9	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C10	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C11	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C12	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C13	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C14	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C15	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C16	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C17	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C18	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C19	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C20	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C21	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C22	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C23	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C24	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C25	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C26	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C27	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C28	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C29	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C30	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C31	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C32	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C33	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C34	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C35	150pF 5%	C-151	CD15FD151J03	SX315	QW1-31	MWA-151
C36	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C37	.001 100V 10%	C-102	DPMS6D1	EWF1A210	QF1-1	1PB-D10
C38	150pF 5%	C-151	CD15FD151J03	SX315	QW1-31	MWA-151
C39	.001 100V 10%	C-102	DPMS6D1	EWF1A210	QF1-1	1PB-D10
C40	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C41	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C42	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360
C43	.1 10V	CB-10410	MGP1	MAG1201	QC1-223	HY-360

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

ITEM No.	FUNCTION	RESISTANCE	REPLACEMENT DATA		
			MFGR. PART No.	MALLORY PART No.	TRW PART No.
R9	TX Data	10K	RP-103		
R10	RX Clock	10K	RP-103		
R18	TX Clock	10K	RP-103		
R19	RX Data	10K	RP-103		

RESISTORS

ITEM No.	RATING	REPLACEMENT DATA	
		MFGR. PART No.	WORKMAN PART No.
R1	220 1/4W 5%	R1-221	22-1080
R2	220 1/4W 5%	R1-221	22-1080
R3	220 1/4W 5%	R1-221	22-1080
R4	390 1/4W 5%	R1-391	22-1086
R5	390 1/4W 5%	R1-391	22-1086
R6	390 1/4W 5%	R1-391	22-1086
R8	1000 1/4W 5%	R1-102	22-1096
R11	220 1/4W 5%	R1-221	22-1080
R12	390 1/4W 5%	R1-391	22-1086
R13	1000 1/4W 5%	R1-102	22-1096
R14	1000 1/4W 5%	R1-102	22-1096
R15	1000 1/4W 5%	R1-102	22-1096
R16	220 1/4W 5%	R1-221	22-1080
R17	390 1/4W 5%	R1-391	22-1086
R20	18K 1/4W 5%	R1-183	22-1126
R21	220 1/4W 5%	R1-221	22-1080
R22	390 1/4W 5%	R1-391	22-1086
R23	220 1/4W 5%	R1-221	22-1080
R24	390 1/4W 5%	R1-391	22-1086
R25	220 1/4W 5%	R1-221	22-1080

ITEM No.	RATING	REPLACEMENT DATA	
		MFGR. PART No.	WORKMAN PART No.
R26	390 1/4W 5%	R1-391	22-1086
R27	220 1/4W 5%	R1-221	22-1080
R28	390 1/4W 5%	R1-391	22-1086
R29	220 1/4W 5%	R1-221	22-1080
R30	390 1/4W 5%	R1-391	22-1086
R31	220 1/4W 5%	R1-221	22-1080
R32	390 1/4W 5%	R1-391	22-1086
R33	220 1/4W 5%	R1-221	22-1080
R34	390 1/4W 5%	R1-391	22-1086
R35	470 1/4W 5%	R1-471	22-1088
R36	470 1/4W 5%	R1-471	22-1088
R37	470 1/4W 5%	R1-471	22-1088
R38	470 1/4W 5%	R1-471	22-1088
R39	470 1/4W 5%	R1-471	22-1088
R40	470 1/4W 5%	R1-471	22-1088
R41	470 1/4W 5%	R1-471	22-1088
R42	4700 1/4W 5%	R1-472	22-1112
R43	470 1/4W 5%	R1-471	22-1088
R44	470 1/4W 5%	R1-471	22-1088
R45	470 1/4W 5%	R1-471	22-1088

610 BOARD PARTS LIST AND DESCRIPTION (CONTINUED)

(When ordering parts, state Model, Part Number, and Description.)

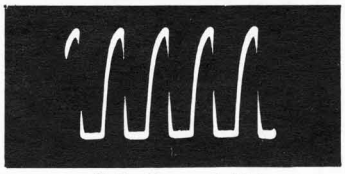
MISCELLANEOUS

ITEM No.	PART NAME	PART No.	NOTES
J1	Socket	SC-40FI	
J2	Socket	SC-40FI	
J3	Plug	SC-12MM	(2 used)
J4	Connector	SC-1MTM	2 Pin DC
	IC Socket	SC-14FI	14 Pin
	IC Socket	SC-16FI	16 Pin
	IC Socket	SC-18FI	18 Pin
	IC Socket	SC-24FI	24 Pin
	IC Socket	SC-40FI	40 Pin

WIRING DATA

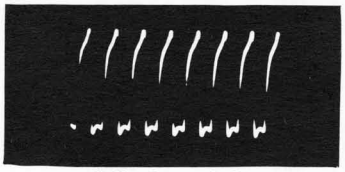
Shielded Hook-up Wire	Use BELDEN No.	8401 or 8421 (Single-Conductor) 8208 (Two-Conductor)
General-use Unshielded Hook-up Wire	Use BELDEN No.	8528 (Solid) Available in 13 Colors 8522 (Stranded) Available in 13 Colors

Waveform 1



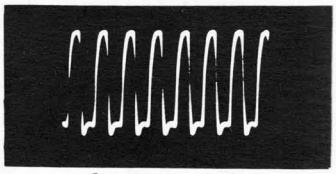
0.5μSec 4.0V

Waveform 2



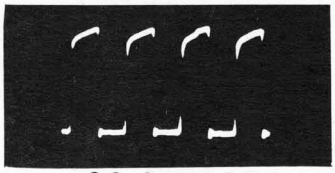
0.2μSec 3.0V

Waveform 3



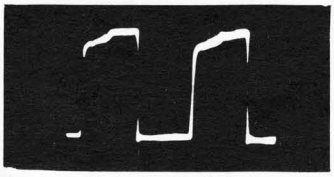
0.2μSec 4.0V

Waveform 4



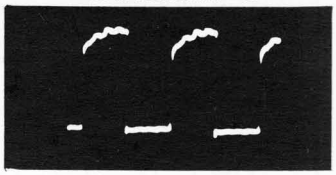
0.2μSec 4.0V

Waveform 5



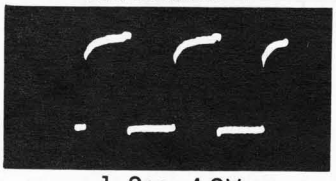
0.2μSec 4.0V

Waveform 6



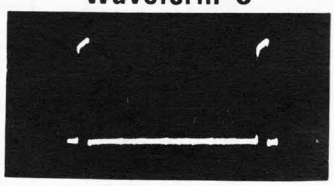
0.5μSec 4.0V

Waveform 7



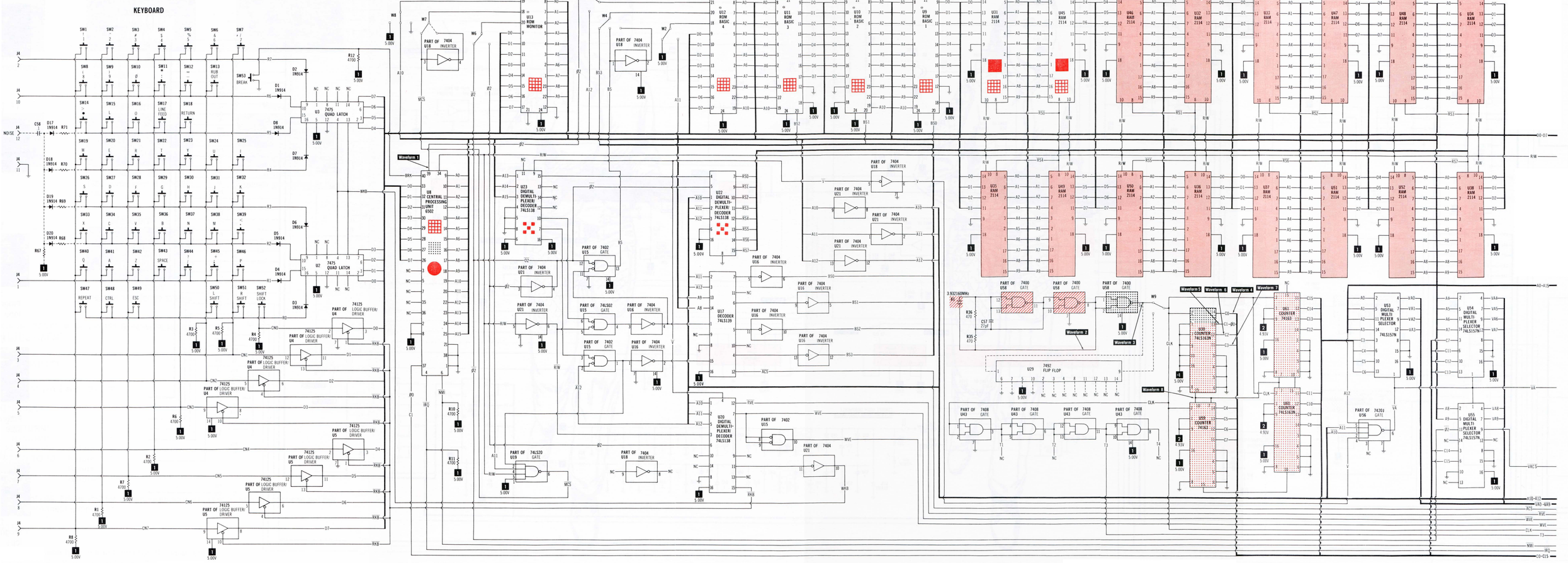
1μSec 4.0V

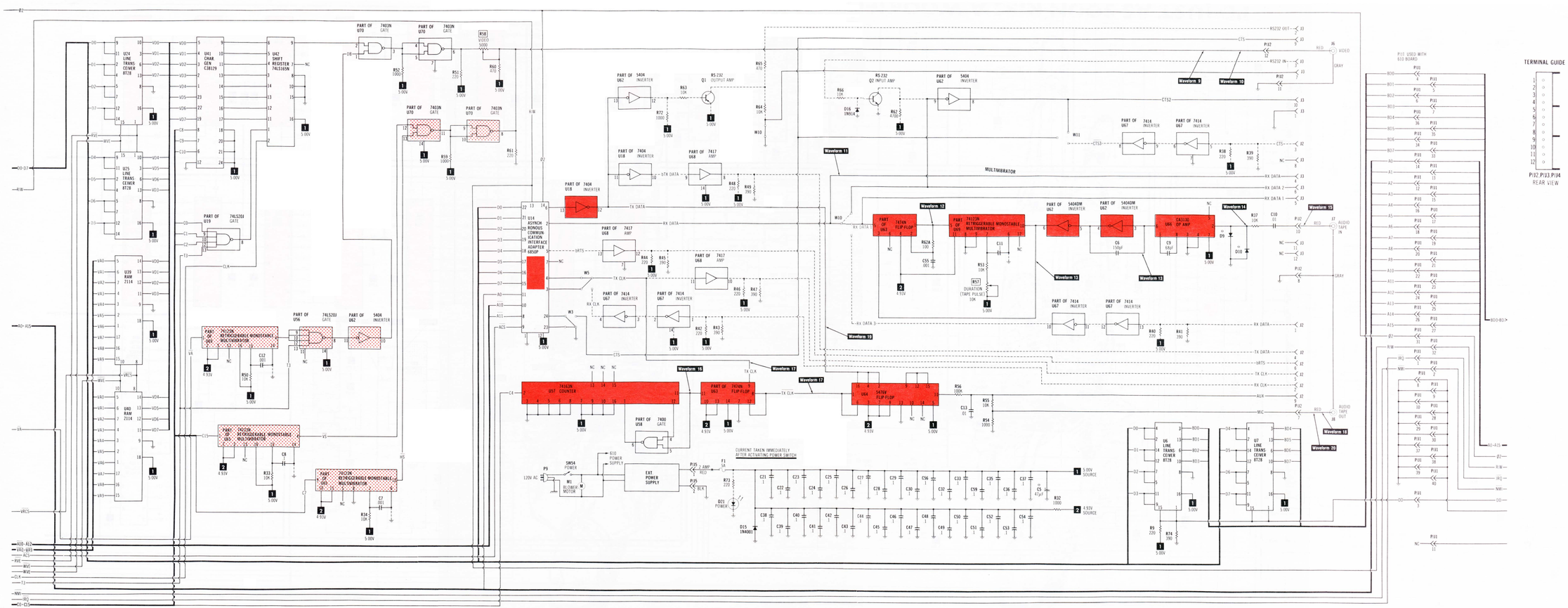
Waveform 8



0.5μSec 4.0V

WAVEFORMS TAKEN IN "BASIC" MODE UNLESS OTHERWISE INDICATED


KEYBOARD
SW1
SW2
SW3
SW4
SW5
SW6
SW7
SW8
SW9
SW10
SW11
SW12
SW13
SW14
SW15
SW16
SW17
SW18
SW19
SW20
SW21
SW22
SW23
SW24
SW25
SW26
SW27
SW28
SW29
SW30
SW31
SW32
SW33
SW34
SW35
SW36
SW37
SW38
SW39
SW40
SW41
SW42
SW43
SW44
SW45
SW46
SW47
SW48
SW49
SW50
SW51
SW52
SW53
BREAK
RUB OUT
LINE FEED
RETURN
REPEAT
CTRL
ESC
SPACE
L SHIFT
R SHIFT
SHIFT LOCK
D1 1N914
D2 1N914
D3 1N914
D4 1N914
D5 1N914
D6 1N914
D7 1N914
D8 1N914
D17 1N914
D18 1N914
D19 1N914
D20 1N914
U3 7475 QUAD LATCH
U2 7475 QUAD LATCH
U4 74125 LOGIC BUFFER/ DRIVER
U5 74125 LOGIC BUFFER/ DRIVER
U13 ROM MONITOR
U12 ROM BASIC 4
U11 ROM BASIC 3
U10 ROM BASIC 2
U9 ROM BASIC 1
U8 CENTRAL PROCESSING UNIT 6502
U22 DIGITAL DEMULTI-PLEXER/ DECODER 74LS138
U23 DIGITAL DEMULTI-PLEXER/ DECODER 74LS138
U17 DECODER 74LS139
U20 DIGITAL DEMULTI-PLEXER/ DECODER 74LS138
U31 RAM 2114
U32 RAM 2114
U33 RAM 2114
U34 RAM 2114
U35 RAM 2114
U36 RAM 2114
U37 RAM 2114
U38 RAM 2114
U45 RAM 2114
U46 RAM 2114
U47 RAM 2114
U48 RAM 2114
U49 RAM 2114
U50 RAM 2114
U51 RAM 2114
U52 RAM 2114
U29 7492 FLIP FLOP
U30 COUNTER 74LS163
U50 COUNTER 74LS163
U53 COUNTER 74163
U53 DIGITAL MULTI PLEXER SELECTOR 74LS157N
U54 DIGITAL MULTI PLEXER SELECTOR 74LS157N
U55 DIGITAL MULTI PLEXER SELECTOR 74LS157N
3.932160MHz
Waveform 1
Waveform 2
Waveform 3
Waveform 4
Waveform 5
Waveform 6
Waveform 7
Waveform 8
D0-D7
R/W
A0-A15
VA0-VA9
VA
VRCS
RES
IRQ
NMI
NOISE
SUPERBOARD II/600 BOARD
FOR COLOR KEYED TROUBLESHOOTING SEE PAGES 1, 2 & 3
FOR SCHEMATIC LEGEND AND NOTES SEE INSIDE REAR COVER
SUPERBOARD II/600 BOARD



SUPERBOARD II/600 BOARD

13

FOR COLOR KEYED TROUBLESHOOTING SEE PAGES 1, 2 & 3

FOR SCHEMATIC LEGEND AND NOTES SEE INSIDE REAR COVER

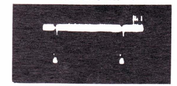
14

SUPERBOARD II/600 BOARD

15

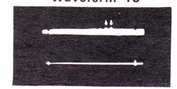
WAVEFORMS TAKEN IN "BASIC" MODE UNLESS OTHERWISE INDICATED

Waveform 9



10μSec 2.0V

Waveform 10

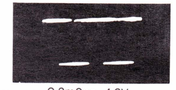


2mSec 2.0V

Waveform 11

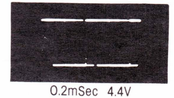
5mSec 4.2V
Program transferred from tape

Waveform 12



0.2mSec 4.2V
Program transferred from tape

Waveform 13

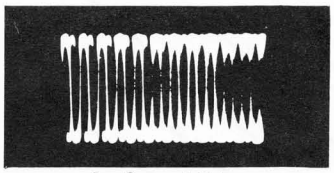


0.2mSec 4.4V
Program transferred from tape

SUPERBOARD II/600 BOARD

16

Waveform 14

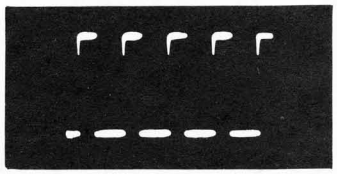


1mSec 1.1V
Program transferred from tape

Waveform 15

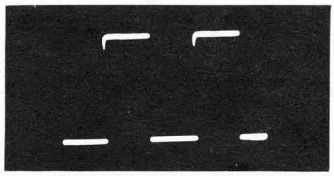
1mSec 5.0V
Amplitude dependant on tape volume
Program transferred from tape

Waveform 16



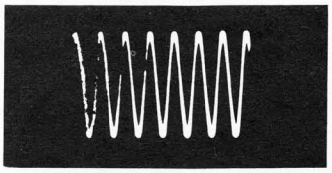
50μSec 4.0V

Waveform 17



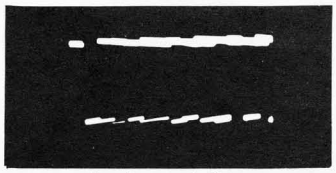
50μSec 4.0V

Waveform 18



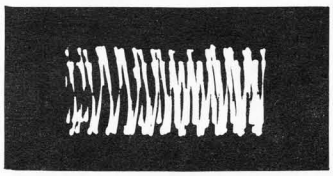
0.5mSec 30mV
Tape mode prior to program storage

Waveform 19



5mSec 4.2V
Program transferred to tape

Waveform 20



1mSec 30mV
Program transferred to tape

WAVEFORMS TAKEN IN "BASIC" MODE UNLESS OTHERWISE INDICATED

ELECTRICAL ADJUSTMENT

R57 DURATION (TAPE PULSE)

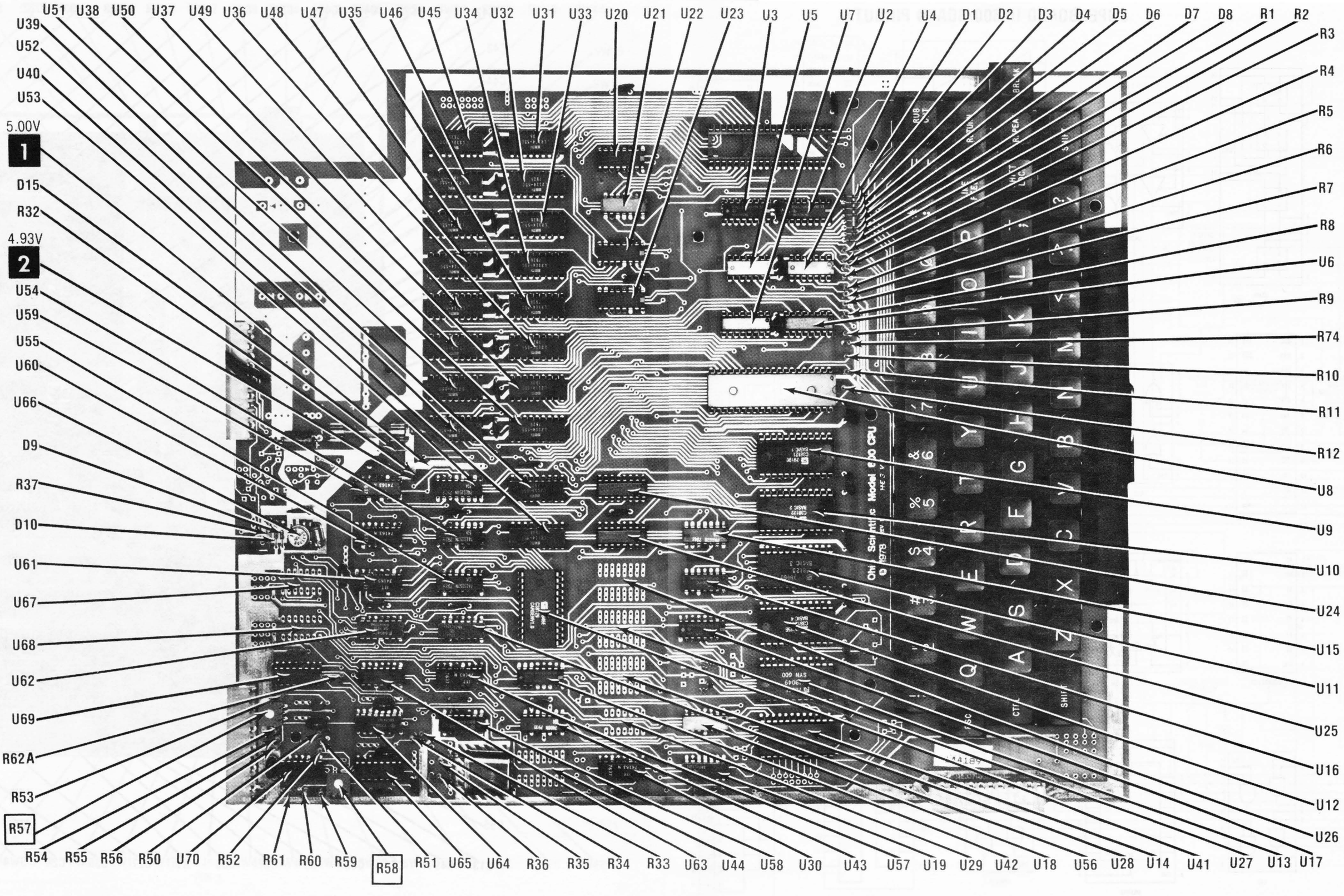
Connect jumper between pin 9 and 10 of J2.

Press	"RESET"	
Press	"C"	
Press	"RETURN"	
Press	"RETURN"	
Type	10 PRINT "U";	Return
Type	20 GO TO 10	Return
Type	SAVE	Return
Type	RUN	Return

Input of scope to pin 5 of U69. Adjust R57 for a positive pulse width of at least 500 μ seconds but not over 640 μ seconds. Disconnect jumper.

R58 VIDEO (MONITOR)

Place computer into basic and type in a full monitor of characters.
Adjust R58 for best contrast but do not allow unit to lose sync.

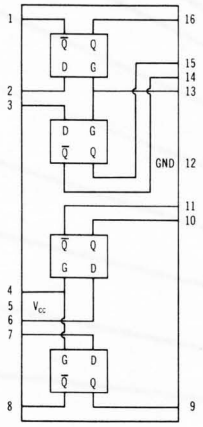


SUPERBOARD II/600 BOARD

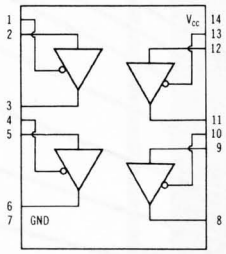
A Howard W. Sams CIRCUITRACE® Photo

SUPERBOARD II/600 BOARD

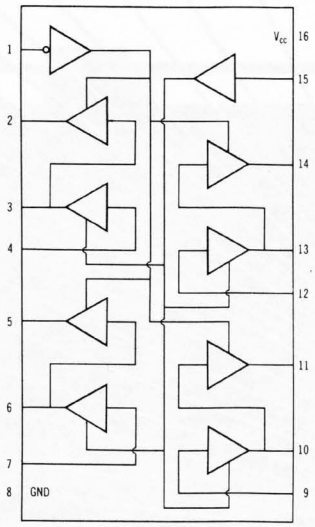
SUPERBOARD II/600 BOARD PINOUTS



U2,U3

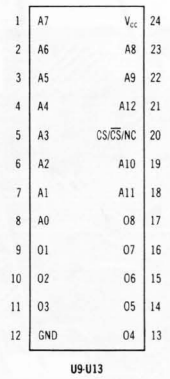


U4,U5

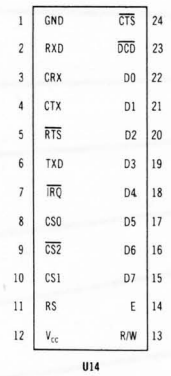


U6,U7,U24,U25

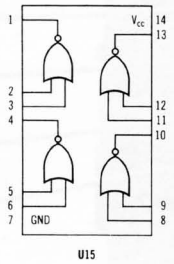
U8



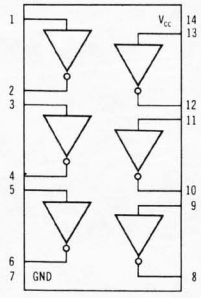
U9-U13



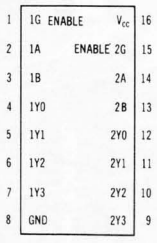
U14



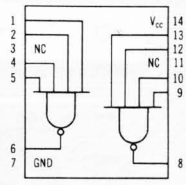
U15



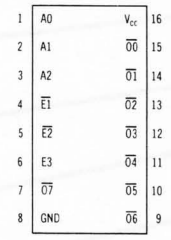
U16,U18,U21,U62



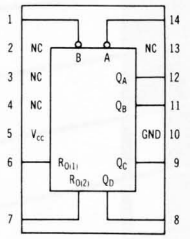
U17



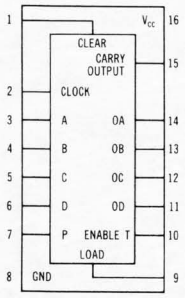
U19,U56



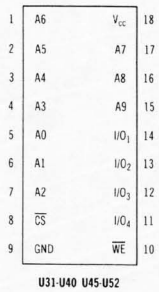
U20,U22,U23



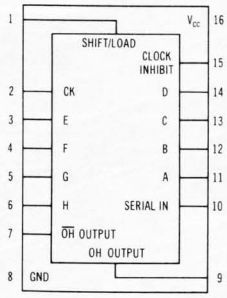
U29



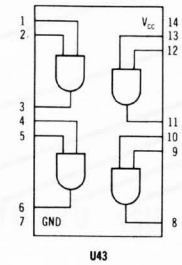
U30,U57,U59-U61



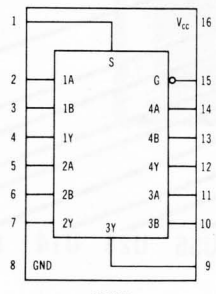
U31-U40 U45-U52



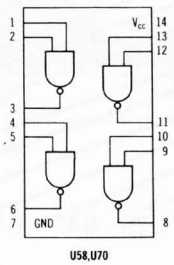
U42



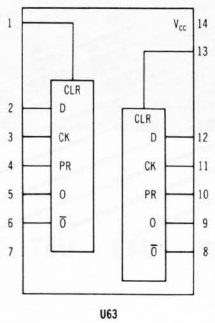
U43



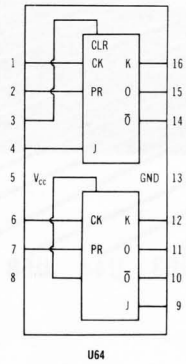
U53-U55



U58,U70



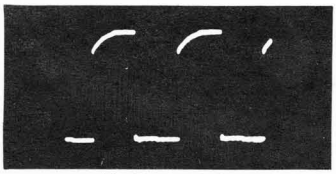
U63



U64

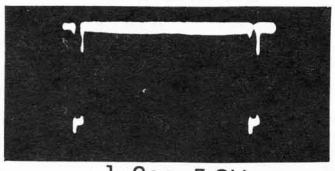
PINOUTS CONTINUED ON PAGE 34

Waveform 21



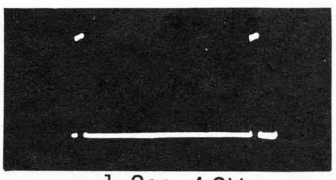
2μSec 4.0V

Waveform 22



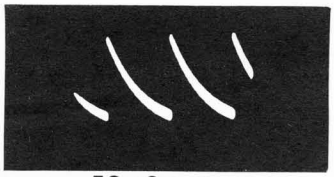
1μSec 5.0V

Waveform 23



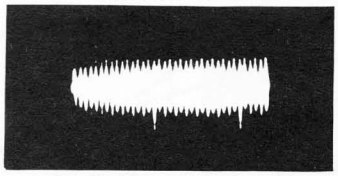
1μSec 4.0V

Waveform 24



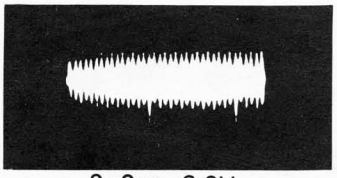
50mSec 150mV

Waveform 25



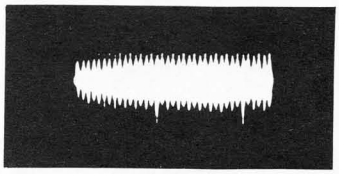
2μSec 0.3V
During directory cycle

Waveform 26



2μSec 0.3V
Program transferred from disk

Waveform 27



2μSec 0.3V
Program transferred to disk

WAVEFORMS TAKEN IN "DISK" MODE UNLESS OTHERWISE INDICATED

ELECTRICAL ADJUSTMENT

R18 TX CLOCK

Remove floppy-disk cable (J3). Input of scope to pin 13 of U68. Adjust R18 for a positive pulse width of 400nSec ± 50nSec. Reconnect J3.

R9 TX DATA

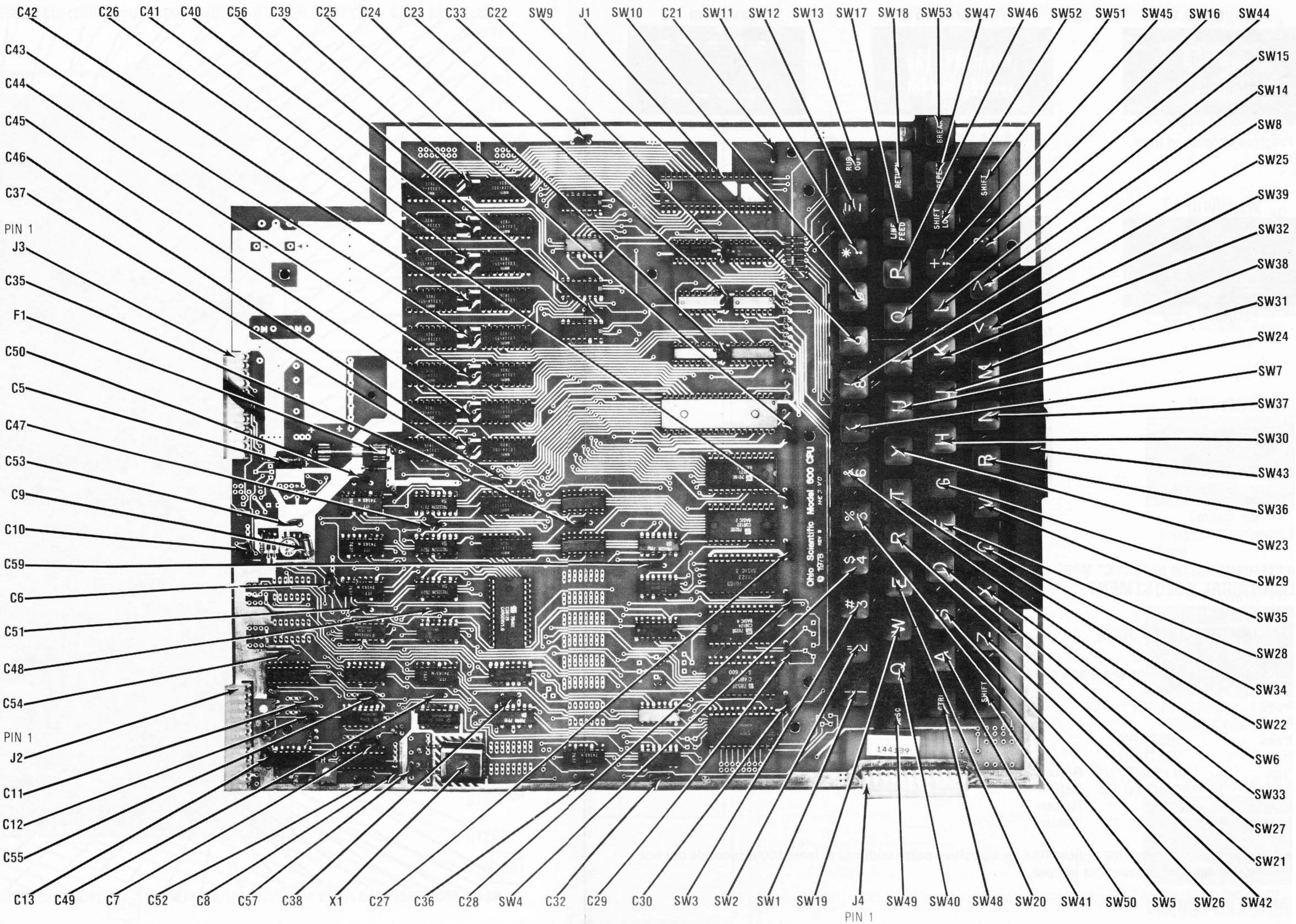
Remove floppy-disk cable (J3). Input of scope to pin 12 of U68. Adjust R9 for a negative pulse width of 400nSec ± 50nSec. Reconnect J3.

R10 RX CLOCK

Remove floppy-disk cable (J3). Connect a jumper from pin 9 of J3 to pin 10 of J3. Input of scope to pin 5 of U70. Adjust R10 for a positive pulse width of 1μSec. Remove jumper and reconnect J3.

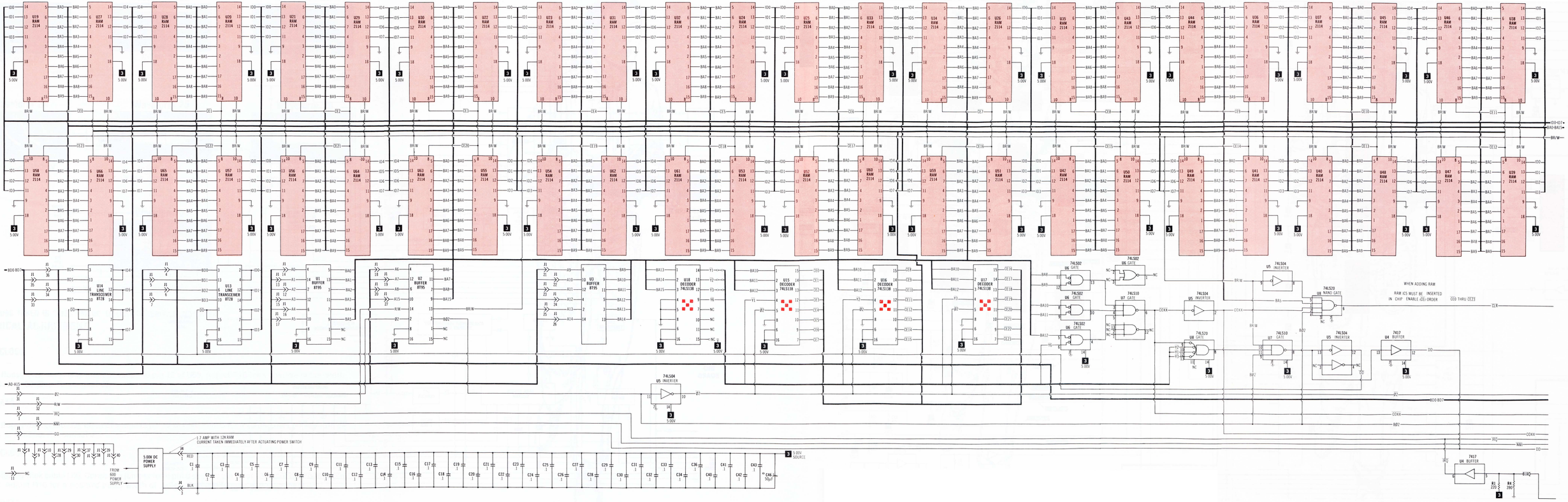
R19 RX DATA

Remove floppy-disk cable (J3). Connect a jumper from pin 9 of J3 to pin 11 of J3. Input of scope to pin 4 of U70. Adjust R19 for a negative pulse width of 6μ Sec. Remove jumper and reconnect J3.



SUPERBOARD II/600 BOARD

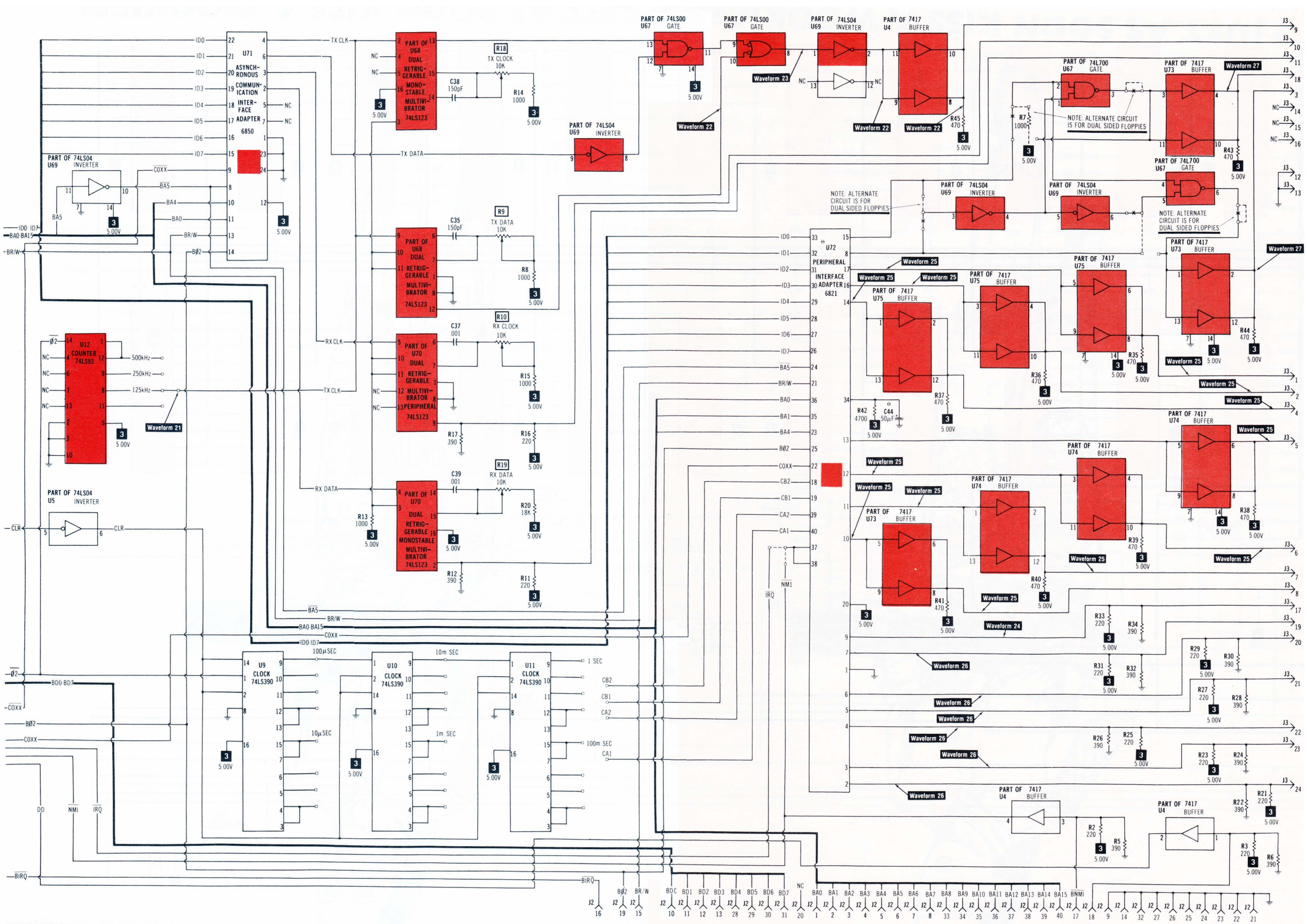
SUPERBOARD II/600 BOARD



A PHOTOFACT STANDARD NOTATION SCHEMATIC
WITH CIRCUITRACE
© Howard W. Sams & Co., Inc. 1979

FOR COLOR KEYED TROUBLESHOOTING SEE PAGES 1, 2 & 3

FOR SCHEMATIC LEGEND AND NOTES SEE INSIDE REAR COVER



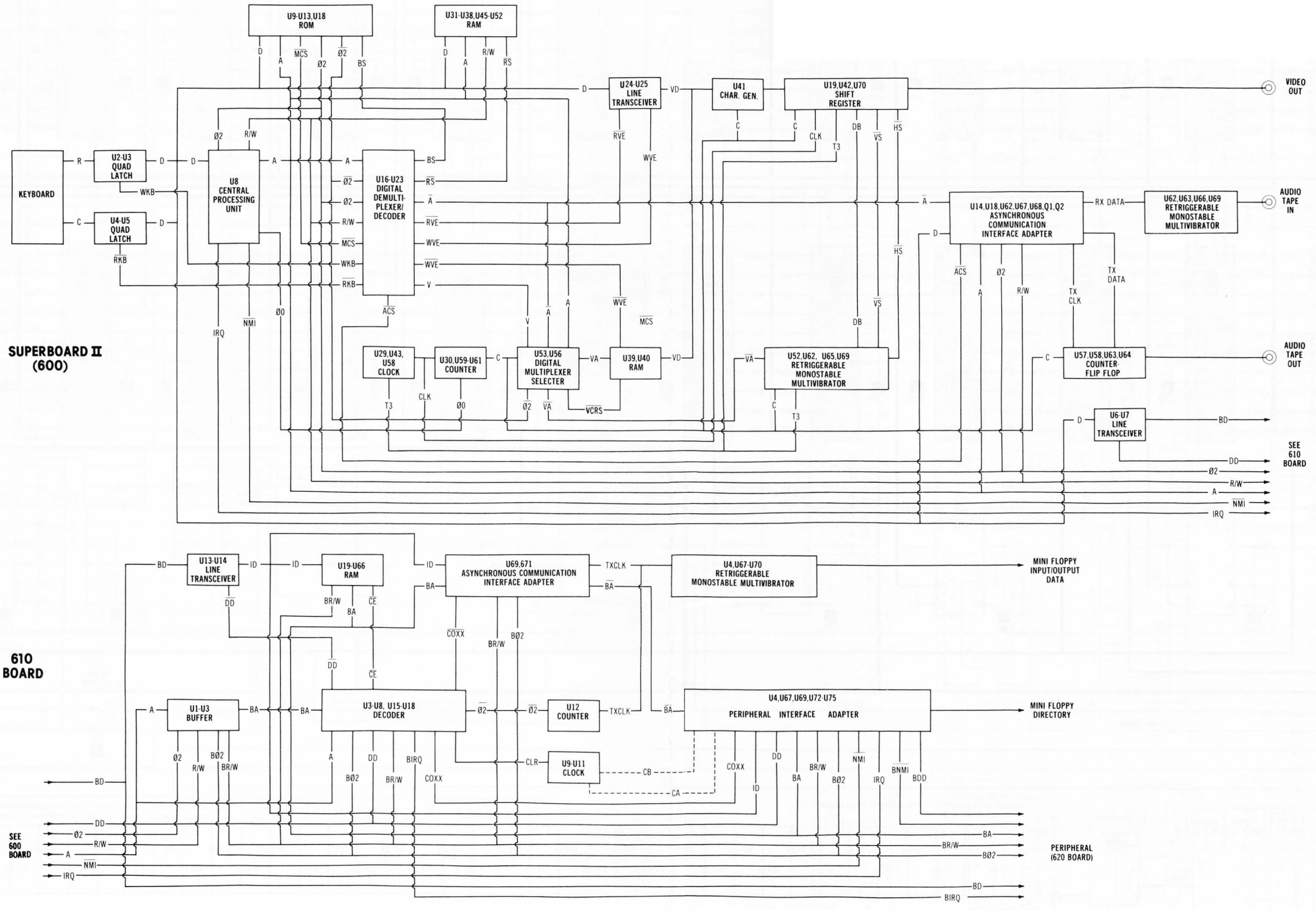
A PHOTOFACT STANDARD NOTATION SCHEMATIC WITH CIRCUITRACE®

© Howard W. Sams & Co., Inc. 1979

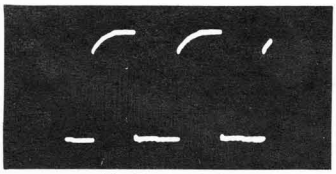
610 BOARD

FOR SCHEMATIC LEGEND AND NOTES SEE INSIDE REAR COVER
FOR COLOR KEYED TROUBLESHOOTING SEE PAGES 1, 2 & 3

610 BOARD

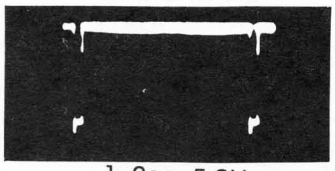

SUPERBOARD II
(600)
KEYBOARD
U2-U3 QUAD LATCH
U4-U5 QUAD LATCH
U8 CENTRAL PROCESSING UNIT
U9-U13,U18 ROM
U31-U38,U45-U52 RAM
U16-U23 DIGITAL DEMULTI-PLEXER/ DECODER
U24-U25 LINE TRANSCEIVER
U41 CHAR. GEN.
U19,U42,U70 SHIFT REGISTER
VIDEO OUT
U14,U18,U62,U67,U68,Q1,Q2 ASYNCHRONOUS COMMUNICATION INTERFACE ADAPTER
U62,U63,U66,U69 RETRIGGERABLE MONOSTABLE MULTIVIBRATOR
AUDIO TAPE IN
U29,U43, U58 CLOCK
U30,U59-U61 COUNTER
U53,U56 DIGITAL MULTIPLEXER SELECTER
U39,U40 RAM
U52,U62, U65,U69 RETRIGGERABLE MONOSTABLE MULTIVIBRATOR
U57,U58,U63,U64 COUNTER-FLIP FLOP
AUDIO TAPE OUT
U6-U7 LINE TRANSCEIVER
SEE 610 BOARD
610 BOARD
U13-U14 LINE TRANSCEIVER
U19-U66 RAM
U69,671 ASYNCHRONOUS COMMUNICATION INTERFACE ADAPTER
U4,U67-U70 RETRIGGERABLE MONOSTABLE MULTIVIBRATOR
MINI FLOPPY INPUT/OUTPUT DATA
U1-U3 BUFFER
U3-U8, U15-U18 DECODER
U12 COUNTER
U9-U11 CLOCK
U4,U67,U69,U72-U75 PERIPHERAL INTERFACE ADAPTER
MINI FLOPPY DIRECTORY
SEE 600 BOARD
PERIPHERAL (620 BOARD)

Waveform 21



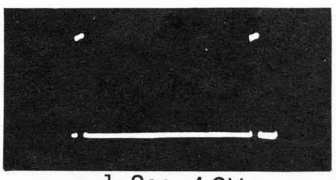
2μSec 4.0V

Waveform 22



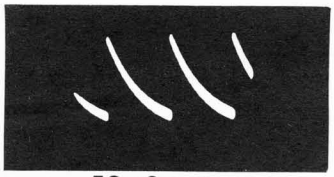
1μSec 5.0V

Waveform 23



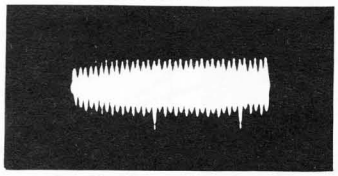
1μSec 4.0V

Waveform 24



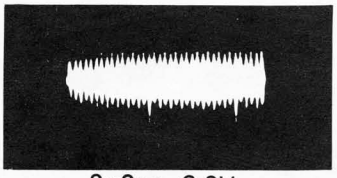
50mSec 150mV

Waveform 25



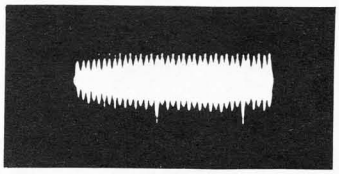
2μSec 0.3V
During directory cycle

Waveform 26



2μSec 0.3V
Program transferred from disk

Waveform 27



2μSec 0.3V
Program transferred to disk

WAVEFORMS TAKEN IN "DISK" MODE UNLESS OTHERWISE INDICATED

ELECTRICAL ADJUSTMENT

R18 TX CLOCK

Remove floppy-disk cable (J3). Input of scope to pin 13 of U68. Adjust R18 for a positive pulse width of 400nSec ± 50nSec. Reconnect J3.

R9 TX DATA

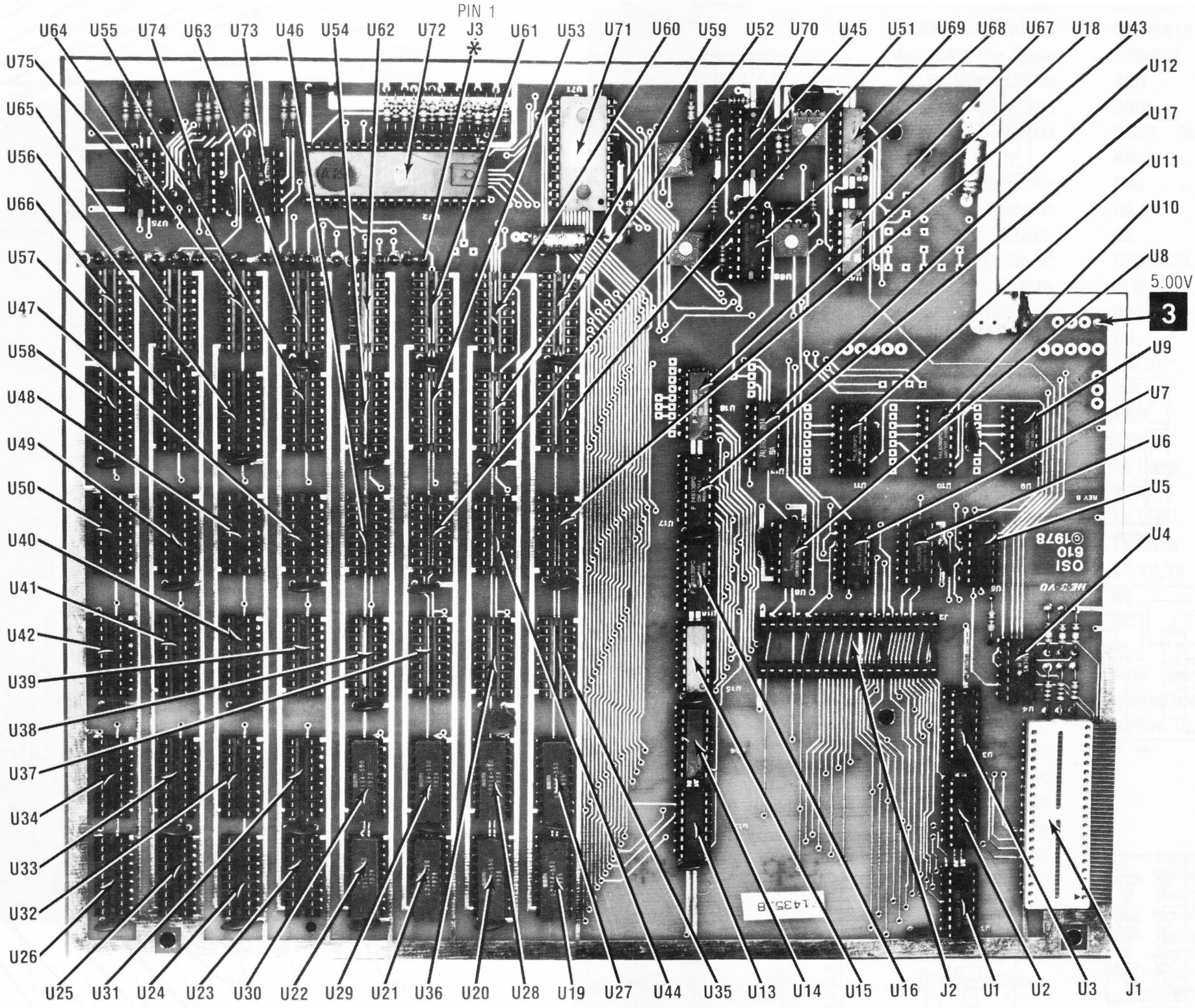
Remove floppy-disk cable (J3). Input of scope to pin 12 of U68. Adjust R9 for a negative pulse width of 400nSec ± 50nSec. Reconnect J3.

R10 RX CLOCK

Remove floppy-disk cable (J3). Connect a jumper from pin 9 of J3 to pin 10 of J3. Input of scope to pin 5 of U70. Adjust R10 for a positive pulse width of 1μSec. Remove jumper and reconnect J3.

R19 RX DATA

Remove floppy-disk cable (J3). Connect a jumper from pin 9 of J3 to pin 11 of J3. Input of scope to pin 4 of U70. Adjust R19 for a negative pulse width of 6μ Sec. Remove jumper and reconnect J3.

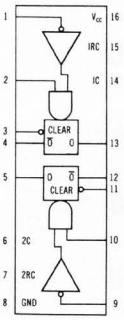


* LOCATED ON OTHER SIDE OF BOARD

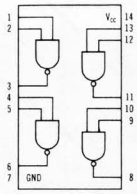
610 BOARD

A Howard W. Sams CIRCUITRACE® Photo

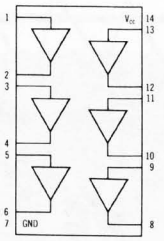
SUPERBOARD II/600 BOARD PINOUTS (CONTINUED)



U65,U69

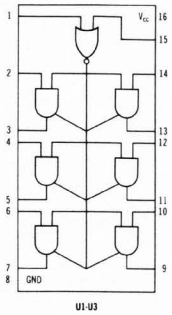


U67

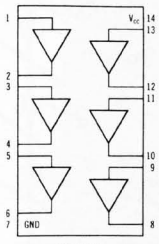


U68

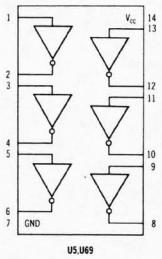
610 BOARD PINOUTS



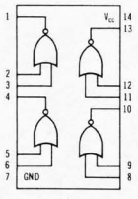
U1-U3



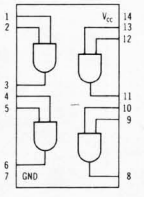
U4,U73-U75



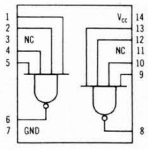
U5,U69



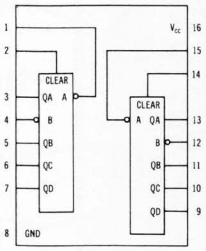
U6



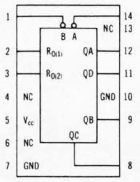
U7



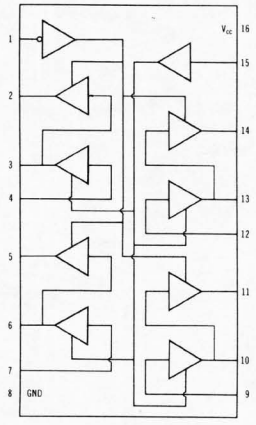
U8



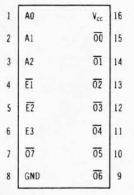
U9-U11



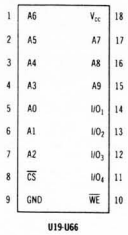
U12



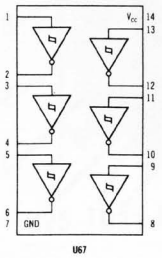
U13,U14



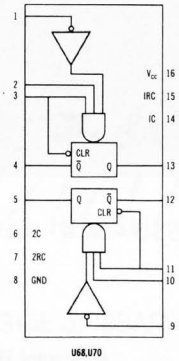
U15-U18



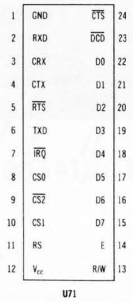
U19-U66



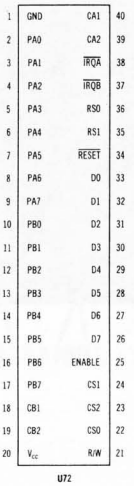
U67



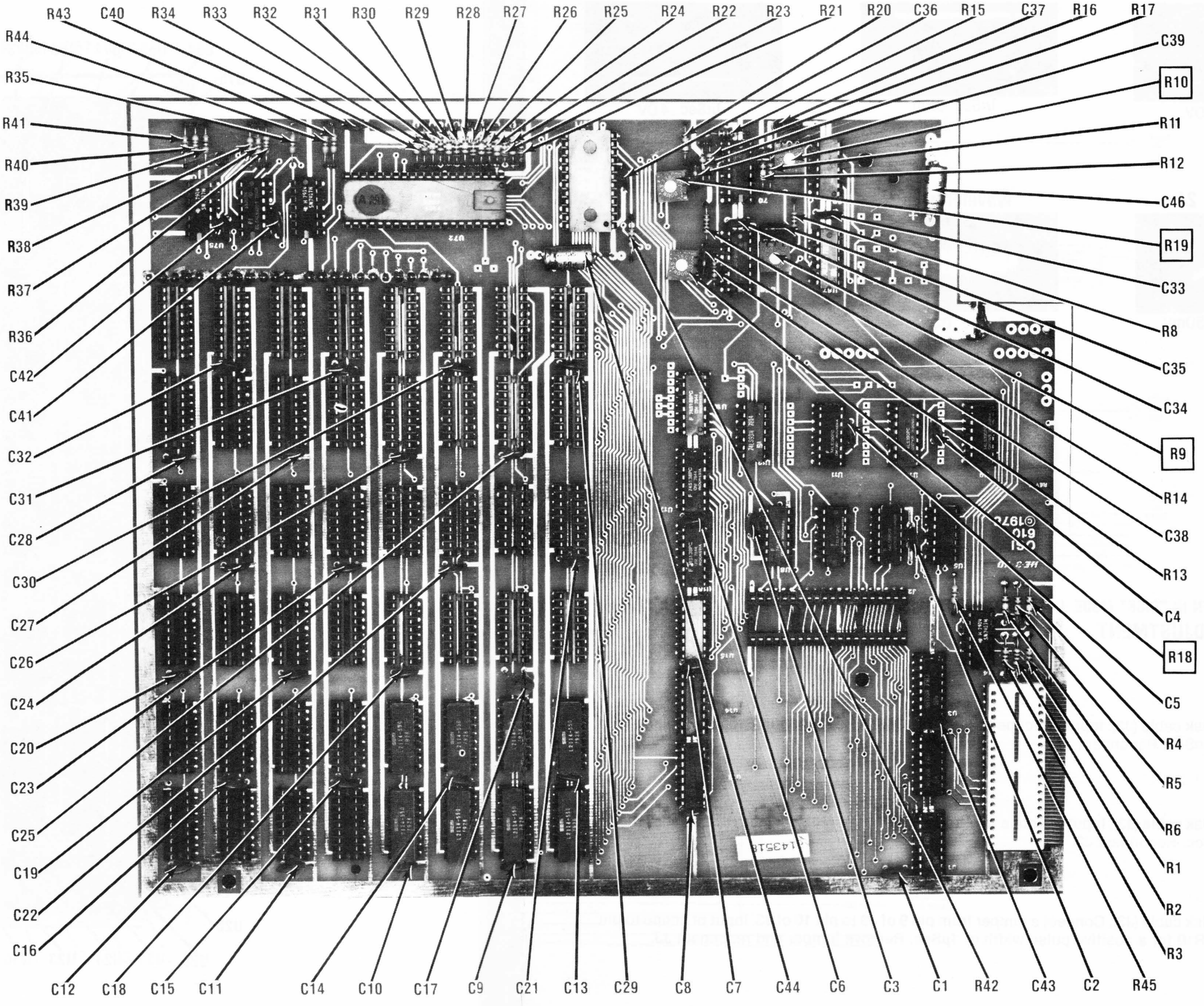
U68,U70



U71



U72



610 BOARD

610 BOARD

LEGEND FOR 600 BOARD SCHEMATIC

A0-A15 . . . . . Address
ACS . . . . . ACIA Chip Select
AUX . . . . . Auxiliary for Tape
AD0-BD7 . . . . . Buffered Data
bRTS . . . . . Transmit Data
BS . . . . . Basic Rom Select
BS0-BS3
CN0-CN7 . . . . . Column
C0-C15 . . . . . Count
CLK . . . . . Clock
CTS . . . . . Clear to Send
D . . . . . Data
DB . . . . . Video Data Blanking
DD . . . . . Data Direct
HS . . . . . Horizontal Sync.
IRQ . . . . . Interrupt Request
MIC . . . . . Microphone for Tape
MCS . . . . . Monitor Chip Select
VRCS . . . . . Video RAM Chip Select
NMI . . . . . Non-maskable Chip Select
R . . . . . Row
RKB . . . . . Read Keyboard
RS0-RS7 . . . . . Ram Select
RVE . . . . . Read Video Enable
R/W . . . . . Read/Write
RX CLK . . . . . Receive Clock
RX DATA . . . . . Receive Data
T1-T4 . . . . . Time (Clock) Delays
TX CLK . . . . . Transmit Clock
TX DATA . . . . . Transmit Data
V . . . . . Video
VA . . . . . Video Address
VD . . . . . Video Data
VS . . . . . Vertical Sync.
WKB . . . . . Write Keyboard
WVE . . . . . Write Video Enable
Ø0 . . . . . Microprocessor Clock In
Ø2 . . . . . Phase Two
NC . . . . . No Connection

Any $\overline{\text{Bar}}$ above any alphabetical or numerical combination indicates line active in a low (0) state.

LEGEND FOR 610 BOARD SCHEMATIC

A0-A15 . . . . . Address
BA0-BA15 . . . . . Buffered Address
BD0-BD7 . . . . . Buffered Data
BDD . . . . . Buffered Data Direct
BIRQ . . . . . Buffered Interrupt Request
BNMI . . Buffered Non-maskable Interrupt
BR/W . . . . . Buffered Read/Write
BØ2 . . . . . Buffered Phase 2
CA . . . . . Clocked
CB . . . . . Clocked
CE0-CE23 . . . . Chip Enable To The Ram(s)
CLR . . . . . Clear Real Time Clock
COXX . . . . . Address COXX Select
DD . . . . . Data Direct
ID0-ID7 . . . . . Internal Data
IRQ . . . . . Interrupt Request
NMI . . . . . Non-maskable Interrupt
RX CLK . . . . . Receive Clock
RX DATA . . . . . Receive Data
R/W . . . . . Read/Write
TX CLK . . . . . Transmit Clock
TX DATA . . . . . Transmit Data
Y1-Y3,Y6 . . . . . Upper Memory Decode
Ø2 . . . . . Phase 2
NC . . . . . No Connection

Any $\overline{\text{Bar}}$ above any alphabetical or numerical combination indicates line active in a low (0) state.

SCHEMATIC NOTES

—x— Circuitry not used in some versions.
– – – Circuitry used in some versions.
※ Nominal value
⏚ Ground
Chassis
⊖ See parts list
Item numbers in rectangles appear in the alignment/adjustment instructions.
Supply voltage maintained as shown in input.
Voltages measured with digital meter.
Terminal identification may not be found on unit.
Resistors are ¼W or less, 5% unless noted.
Value in ( ) used in some versions.

OHIO SCIENTIFIC
1333 S. Chillicothe Road
Aurora, Ohio 44202

$7.95

TM-100