

16K RAM Personal Computer

SCHEMATICS and Parts List

- Six different points of the main electronics
- A memory map with I/O System ROM
RTC-A/D
- Test point wave forms
- Key board - controller data
- Color and sound register information
- RS232 expander



I. Memory - I/O Map

A. Pages

0000H	2-4 Kb ROM System I/O	} Page 0
4000H	8-16 Kb Resident System RAM	} Page 1
8000H	16 Kb Expansion RAM	} Page 2
1000H	16 Kb Expansion RAM	} Page 3

B. Page 0 - System ROM - I/O Map

1. Memory Read

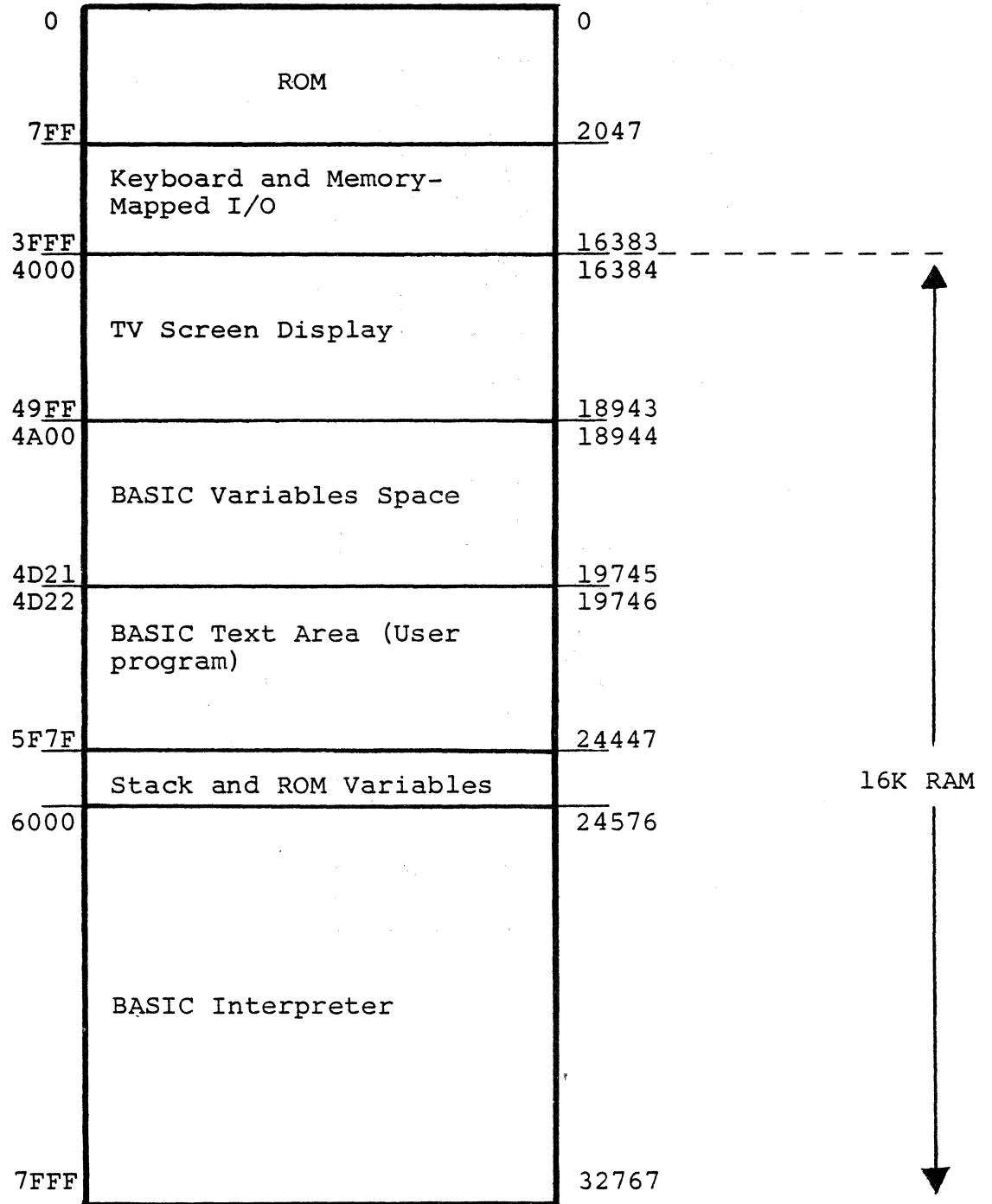
0000H	ROM A
0800H	-----
	ROM B
1000H	Spare

	Spare
2000H	Spare
2800	Spare
3000H	Spare
	RTC-A/D Data
3800H	
	KBD-JSTK Data
4000H	

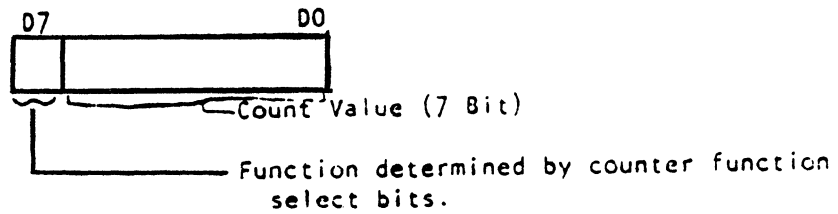
MEMORY MAP

Hexadecimal Addresses

Decimal Addresses



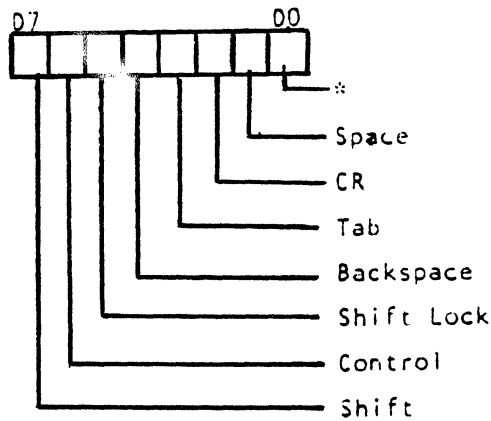
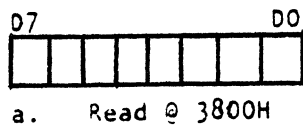
2. RTC - A/D Data (Read @ 3000H)



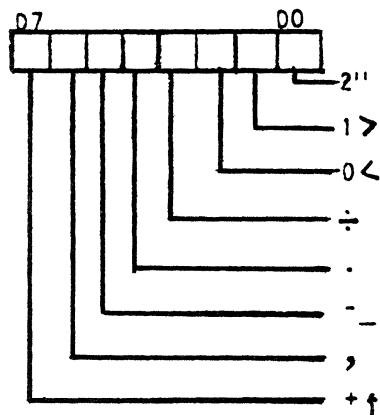
D7 & D6 of misc. output (3000H)

- a. 0 = no tape flux change when D7 & D6 = 00
- 1 = tape flux change when D7 & D6 = 00

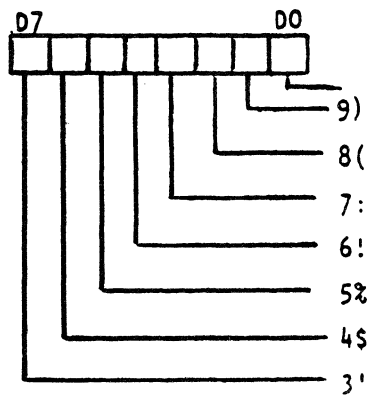
3. Keyboard - Joystick Data (Read @ 3800-3807H)



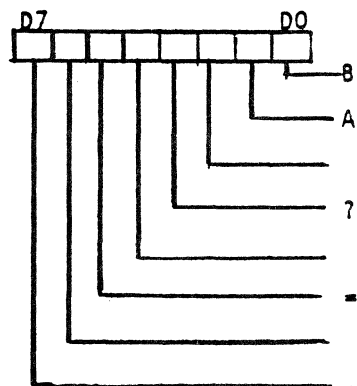
- b. Read @ 3801H



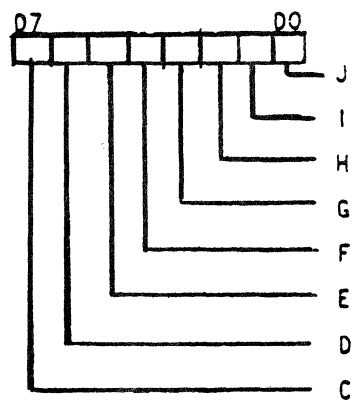
c. Read @ 3802H



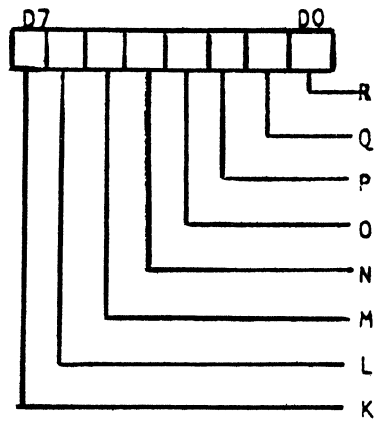
d. Read @ 3803H



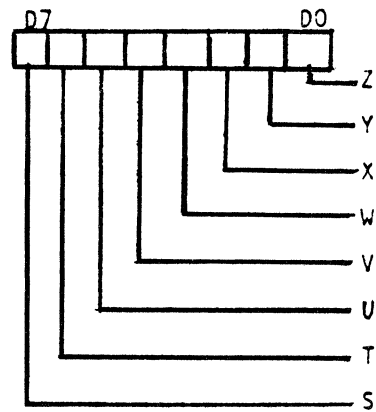
e. Read @ 3804H



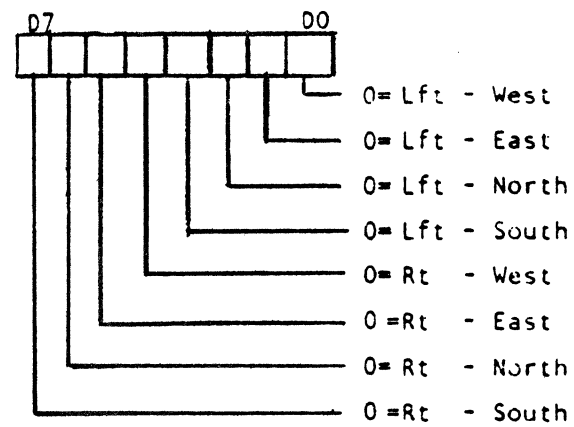
f. Read @ 3805H



g. Read @ 3806H

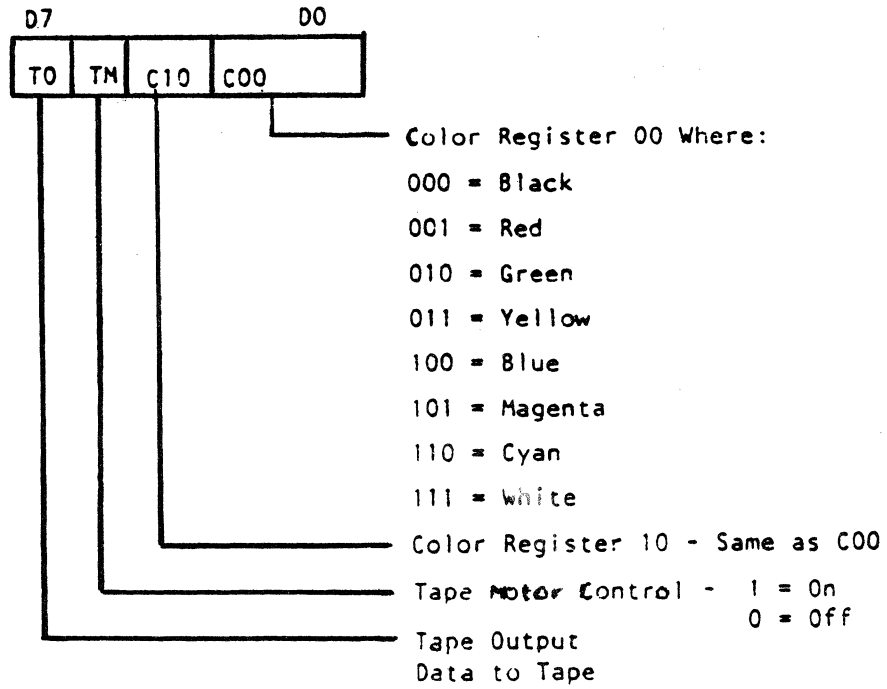


h. Read @ 3807H

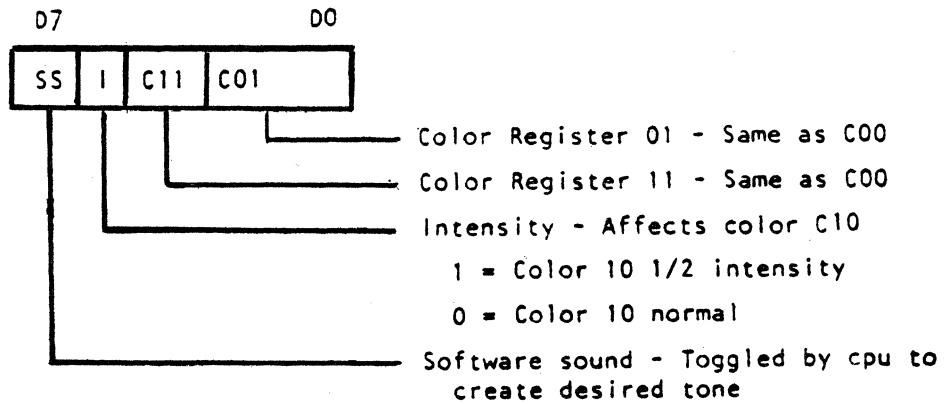


4. Memory Write

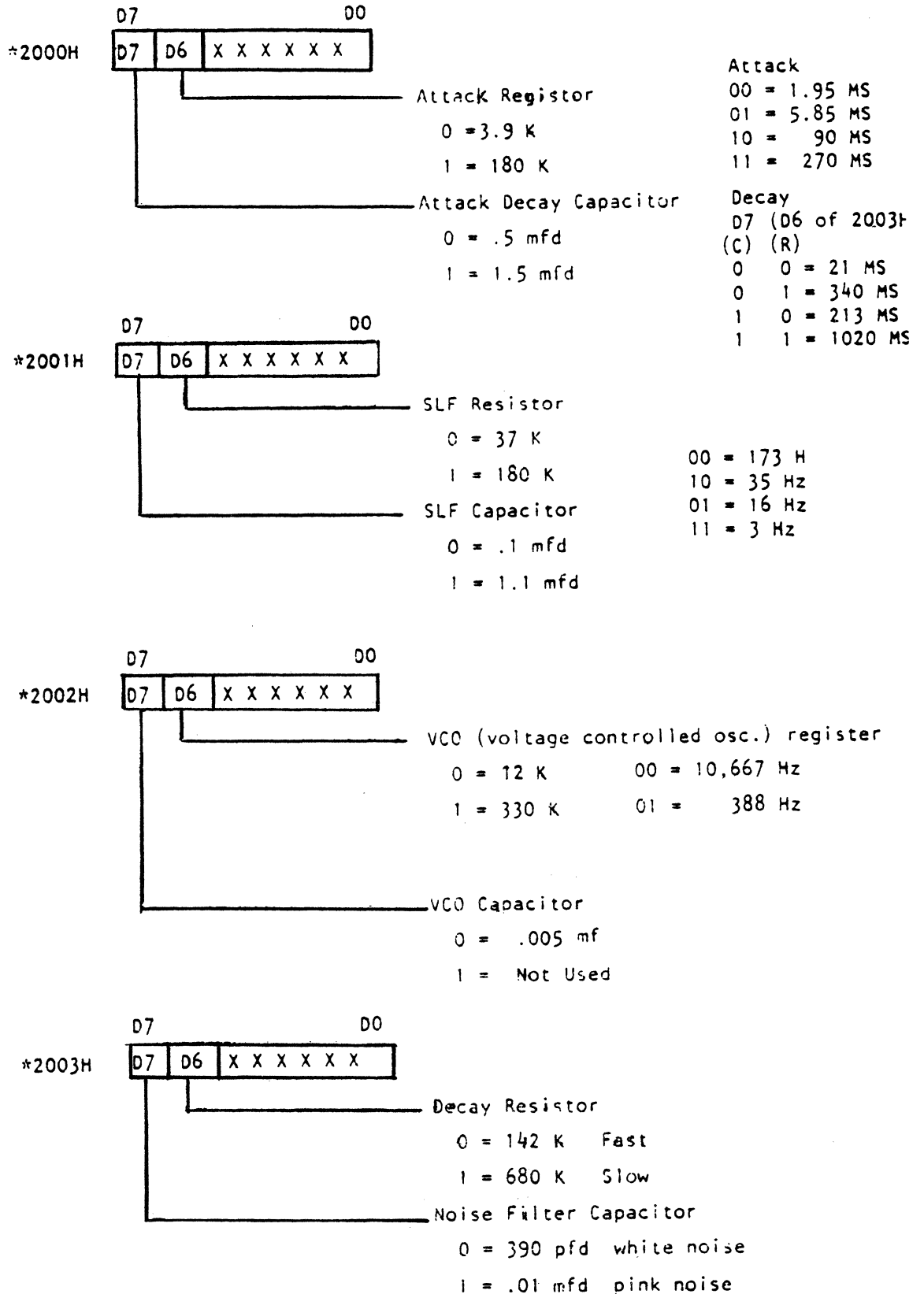
a. Color Register A (1000H)



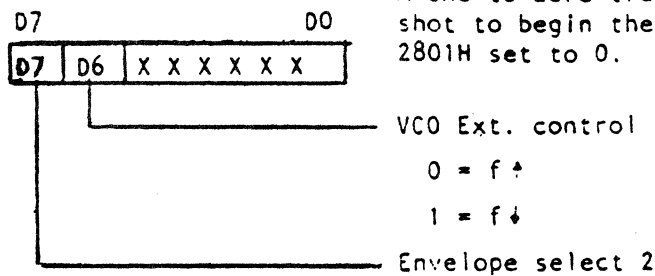
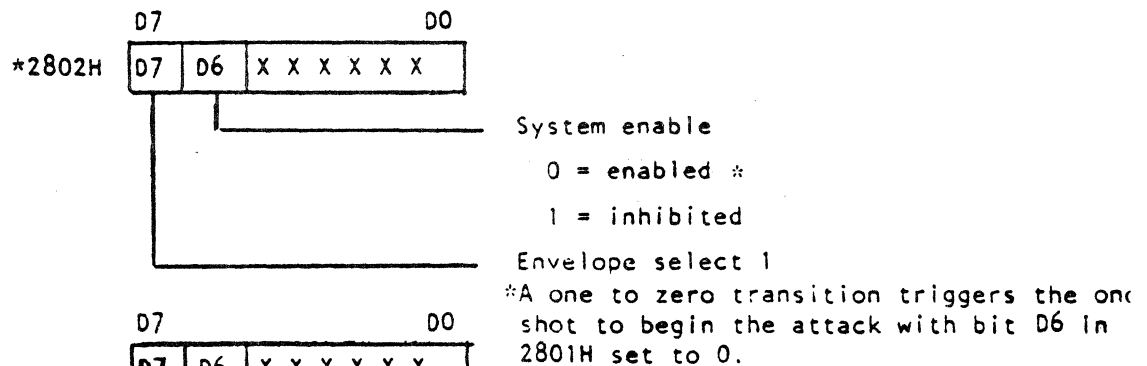
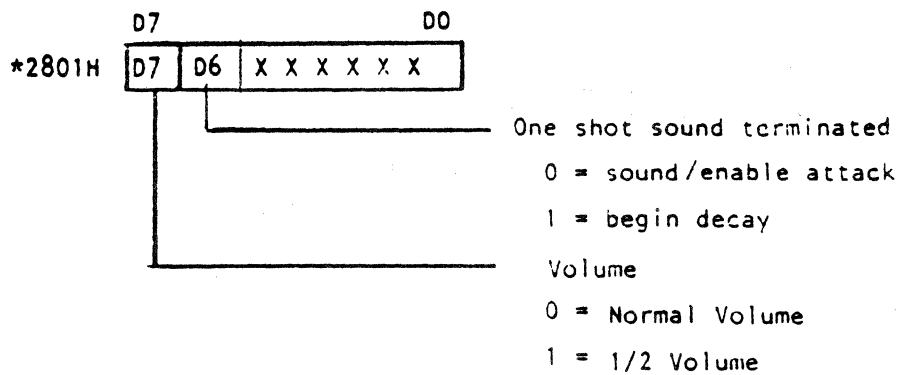
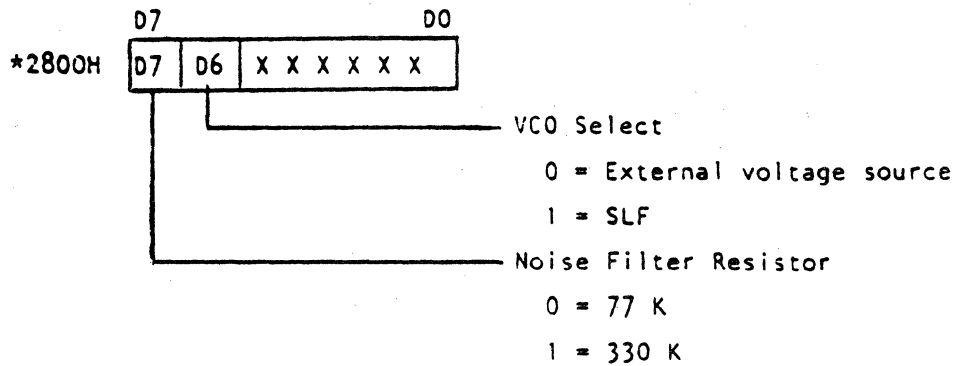
b. Color Register B (1800H)



c. Sound Register A (2000H - 2003)



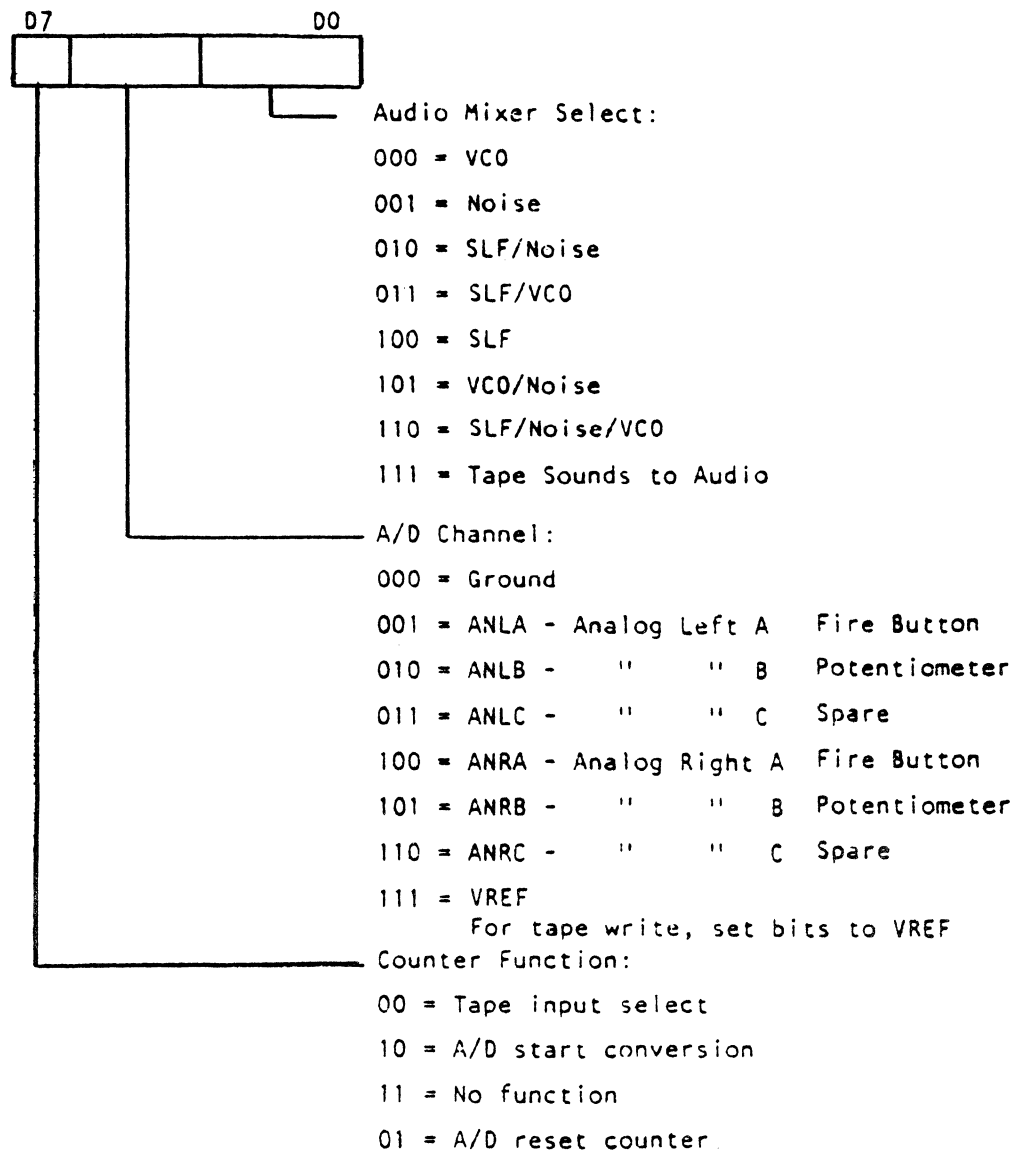
d. Sound Register B (2800H-2803)



* Envelope Select

ES2	ES1	
0	0	= VCO
0	1	= One Shot
1	0	= Mixer Only
1	1	= VCO With Alternating Cycles

e. Miscellaneous Output Register (3000H)



A/D Conversion Sequence of Events

- 1) out D7, D6 = 01, A/D Sel, Reset
- 2) wait 40 μ S
- 3) out D7, D6 = 10, A/D Sel, Release, Reset
- 4) wait, 240 μ S
- 5) read counter
 - 0 = 0.0V
 - 255 = 11.95V

f. Memory Write

0000H	Spare
	Spare
1000H	Color 0/1
1800	Color 2/3
2000H	Sound 0
2800	Sound 1
3000H	Misc.
3800	Spare
4000H	

5. Page 1 - System RAM

- a. Video RAM
- b. Program RAM
- c. Optional Program RAM

4000H	2560 Bytes Video Memory	}	8 Kb Basic System RAM
499F			
49A0	5632 Bytes Program Memory	}	8 Kb Optional System RAM
5000H			
6000H	8 Kb Optional Program Memory	}	32 Kb Expansion Memory
7000H			
8000H			
C000H			
FFFFH			

CONT

TP Locations

TP (25)

IC 26, pin 9

IC 34, pin 11

TP (26)

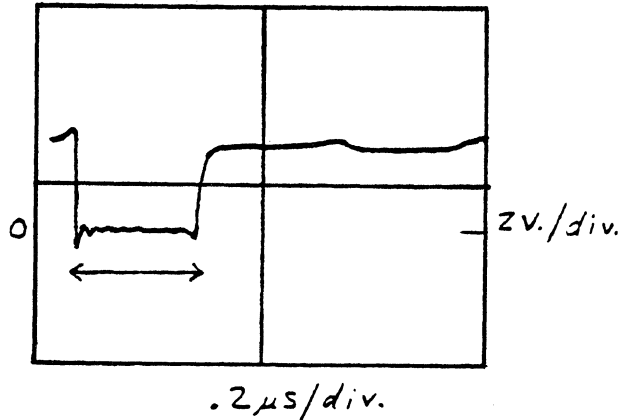
IC 25, pin 7

IC 32, pins 1, 19

TP (27)

IC 25, pin 9

IC 30, pin 1



Amplitude: ≈ 5 volt

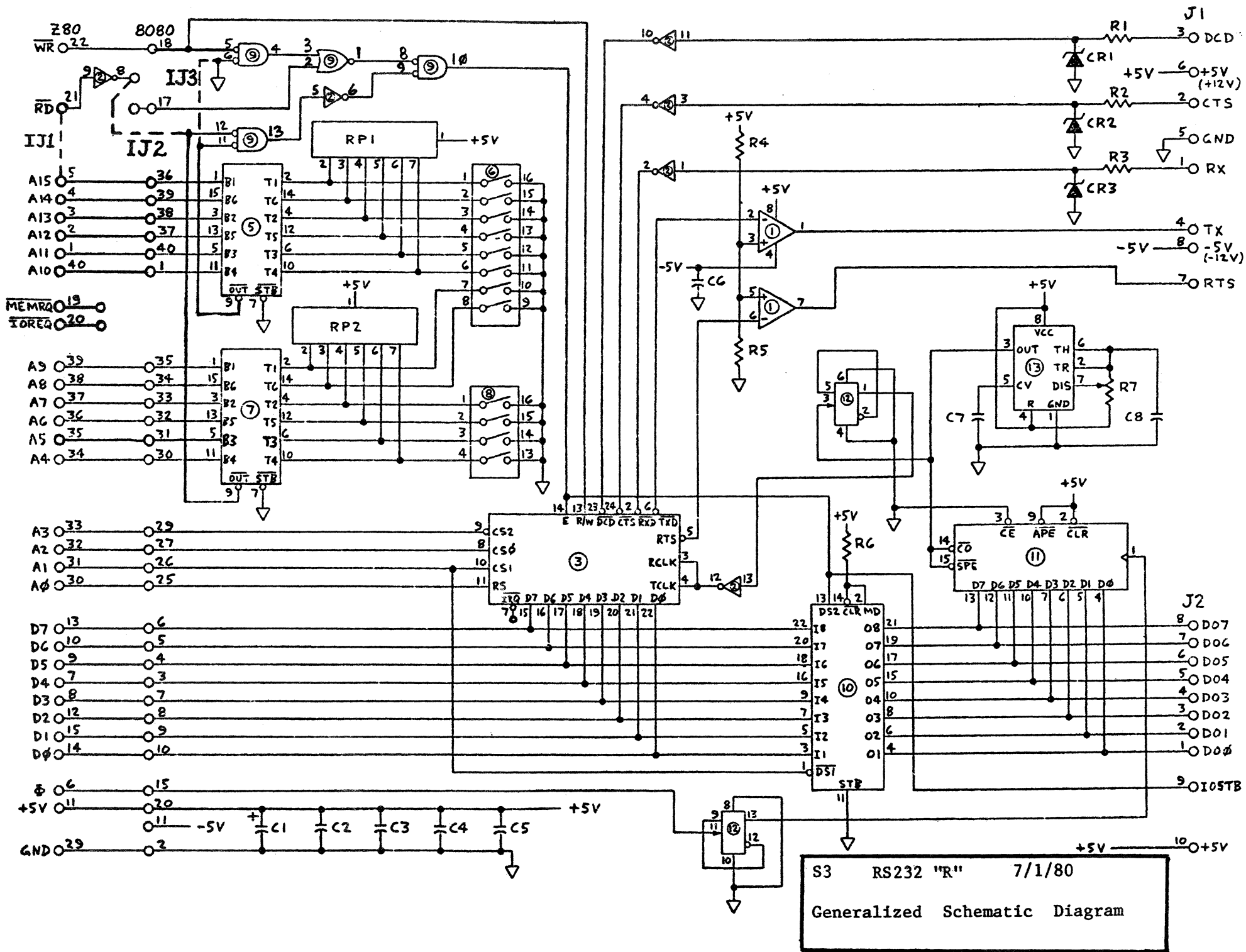
Pulse width: $\approx .5\mu s$

Definition: -

one write
strobe; two
read strobes



All waveforms were measured on a properly working unit with: DEPRESS L TO LOAD TAPE in white characters on a blue background on the television screen.

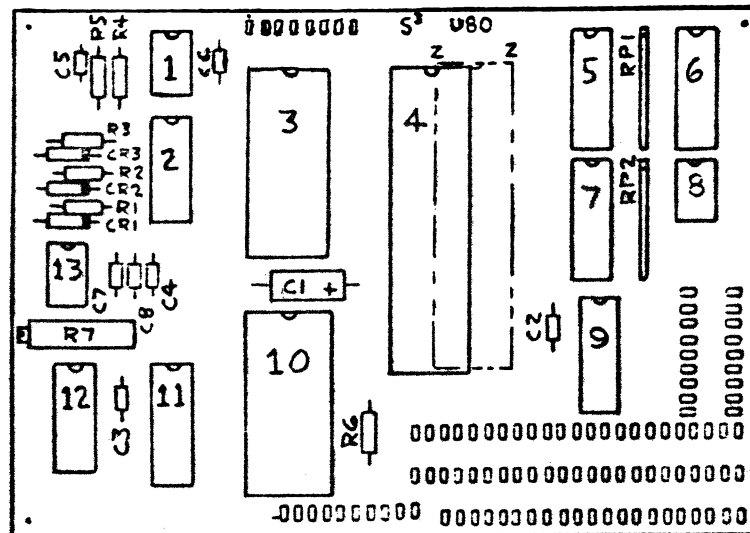


S3 RS232 "R" 7/1/80
 Generalized Schematic Diagram

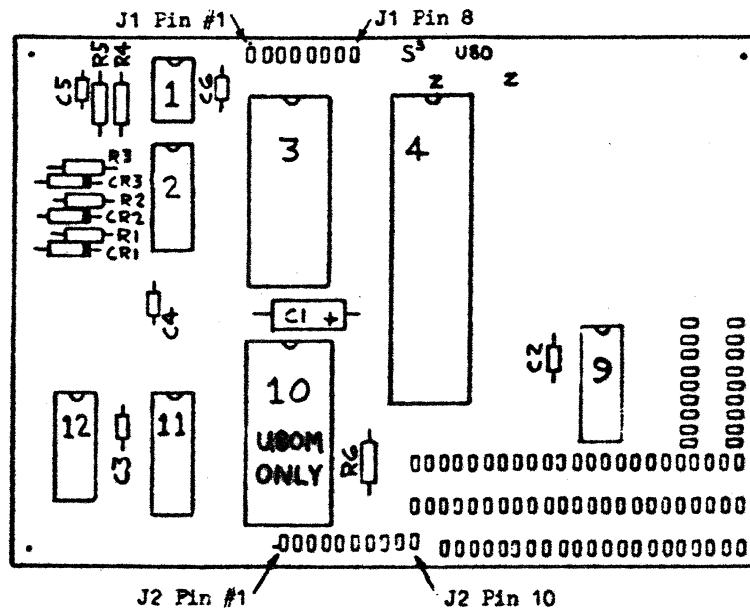
GENERALIZED RS232 "R" ASSEMBLY DRAWING

RS2321 "R" GENERALIZED PARTS LIST

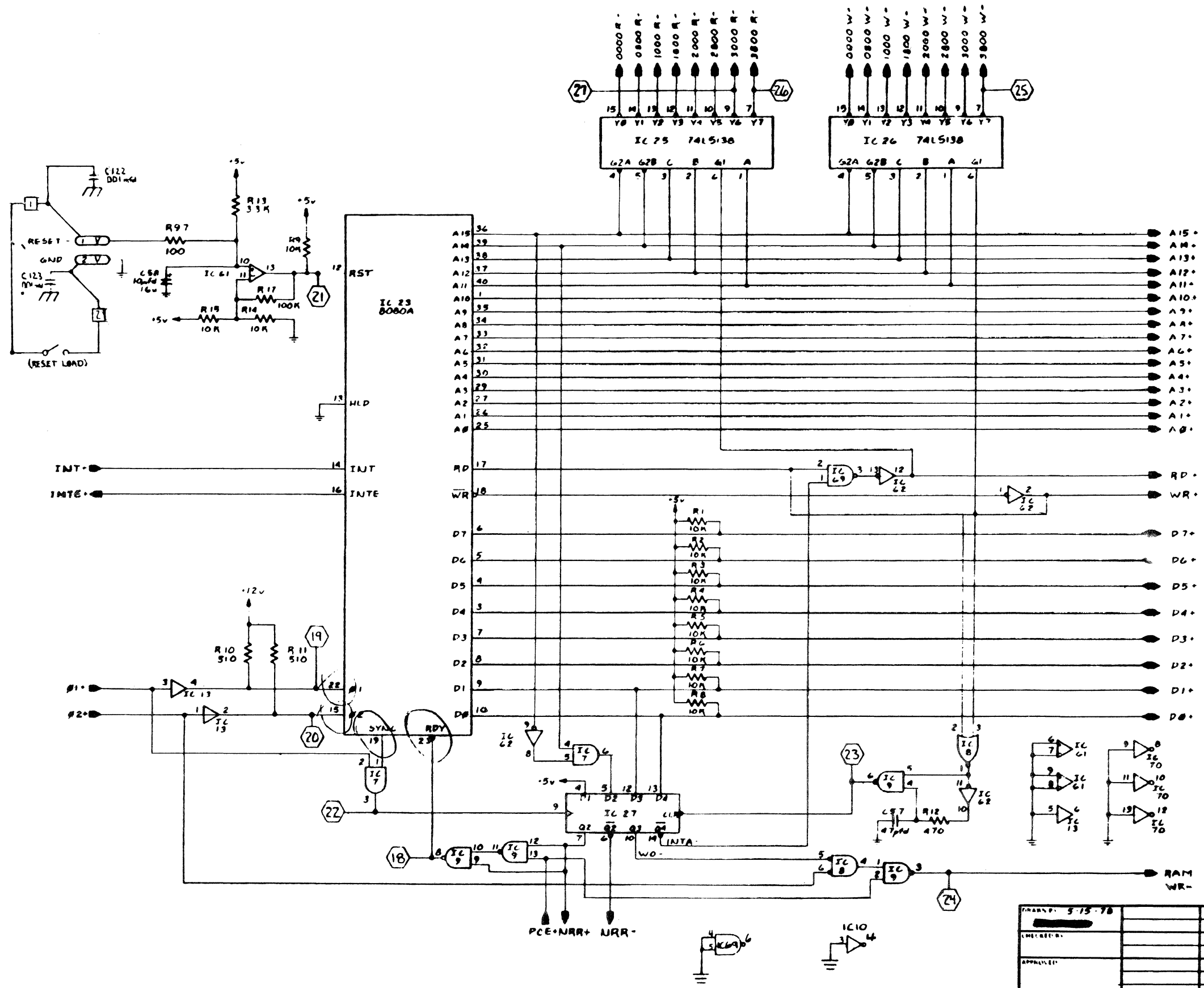
LOC.	QUAN.	PART NO./DISC.
IC1	1	LM358
IC2	1	74LS04
IC3	1	MC6850
IC4 or 4Z	1	40 DIP W/W Socket
IC5,7	2	8131
IC6,8	2	DIP Switch
IC9	1	74LS02
IC10	1	8212
IC11	1	40103
IC12	1	4013
IC13	1	555
RP1,2	2	10 kohm, 8 SIP
R1,2,3,4,5	5	5.1 kohm
R6	1	10 kohm
R7	1	10 to 50 kohm pot.
CR1,2,3	3	5.1V Zener Diode
C1	1	10uf, 15V Elect. Cap.
C2,3,4,5,6	5	.01 to .1 uf Cer. Cap.
C7,8	2	Determined by use



RS232 "R" ASSEMBLY DRAWING



REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED
1	REL. FOR PROD.		



MEASUREMENT POINT

IC1	74LS00	7	14			
IC67	4069	7			14	
IC65	7905					
IC63	7805					
IC61	LM3202	12	3			
IC59	2N316E	12	24			
IC57	LM1889	5				
IC55	74LS153	8	16			
IC53	74LS374	10	20			
IC51	74LS175	8	16			
IC49	4115	16	9	8	1	
IC47	4115	16	4	8	1	
IC45	4115	16	9	8	1	
IC43	4115	16	7	8	1	
IC41	74LS153	8	16			
IC39	74LS153	8	16			
IC37	74LS256	8	16			
IC35	74477	2	15			
IC33	74LS373	7	14			
IC31	74LS138	8	16			
IC29	74970B	5	14			
IC27	74LS175	8	16			
IC25	74LS138	8	16			
IC23	8080A	2	20	28	11	
IC21	74LS279	8	16			
IC19	74LS373	7	14			
IC17	74LS373	7	14			
IC15	74LS45	8	16			
IC13	7407	7	14			
IC11	74LS04	7	14			
IC9	74LS00	7	14			
IC7	74LS08	7	14			
IC5	74LS32	7	14			
IC3	74LS10	7	14			
IC1	74LS11	7	14			
REF	TYPE	GND	+5	+12	-5	+B

IC70	7406	7	14			
IC68	4081	7			14	
IC66	74LS374	10	20			
IC64	7812					
IC62	74LS04	7	14			
IC60	LF356	7			4	
IC58	236E	12	24			
IC56	74LS153	8	16			
IC54	74LS374	10	20			
IC52	74LS153	8	16			
IC50	74LS374	10	20			
IC48	4115	16	7	8	1	
IC46	4115	16	9	8	1	
IC44	4115	16	9	8	1	
IC42	4115	16	9	8	1	
IC40	74LS153	8	16			
IC38	74LS153	8	16			
IC36	74LS256	8	16			
IC34	74LS374	10	20			
IC32	74LS47	10	20			
IC30	74LS373	10	20			
IC28	74LS153	8	16			
IC26	74LS138	8	16			
IC24	74LS74	7	14			
IC22	74LS138	8	16			
IC20	74LS74	7	14			
IC18	74LS73	7	14			
IC16	74LS92	10	5			
IC14	7406	7	14			
IC12	74LS08	7	14			
IC10	74LS04	7	14			
IC8	74LS02	7	14			
IC6	74LS00	7	14			
IC4	74LS10	7	14			
IC2	74LS20	7	14			
REF	TYPE	GND	+5	+12	-5	+B

DATE: 5-15-78

DESIGNED BY: _____

APPROVED BY: _____

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE AS SHOWN

3 PLACE DEC : _____

3 PLACE DEC : _____

INTERNAL

10-0010 5-0094

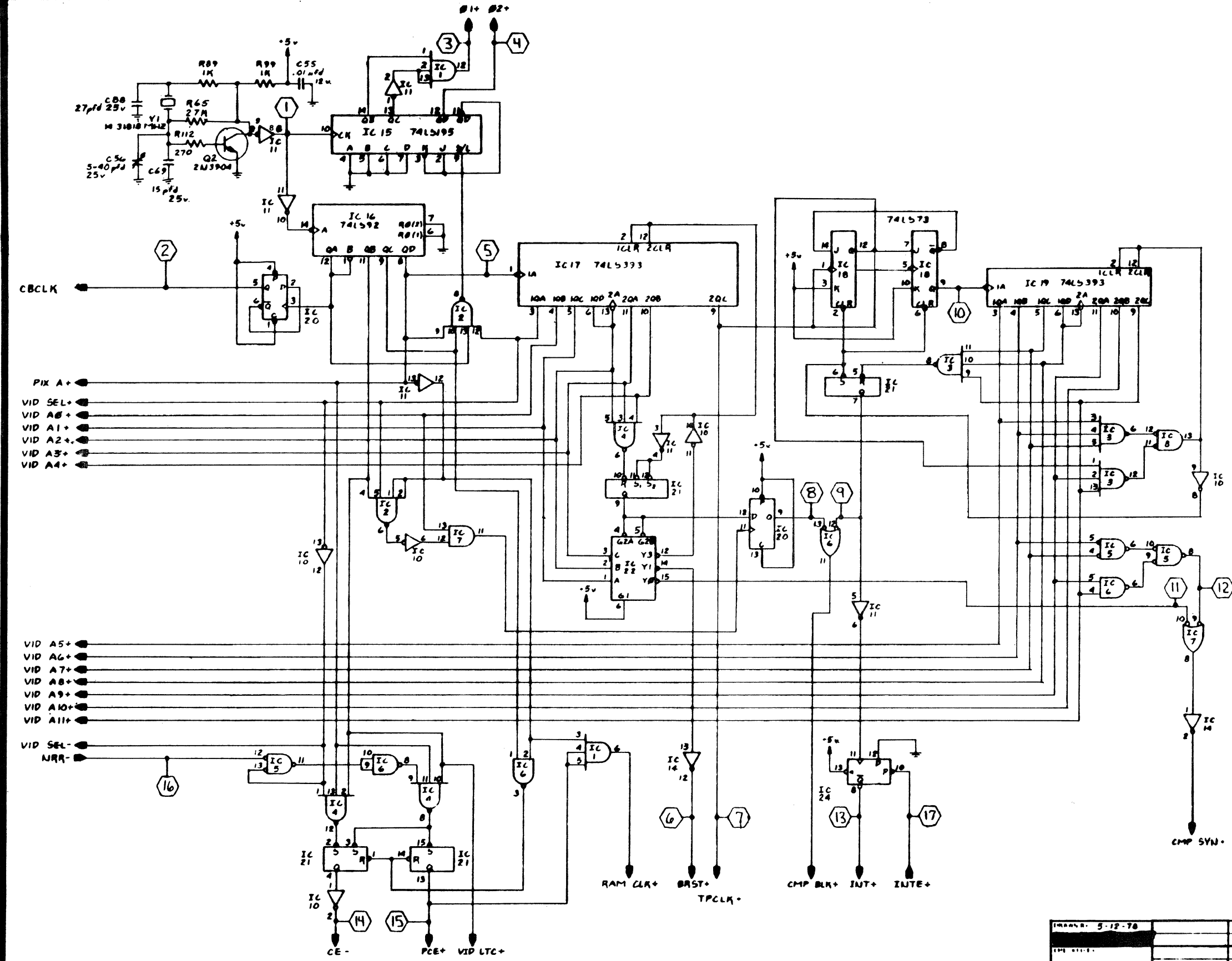
USED ON: _____

REV: _____

16K RAM COMPUTER
MAIN ELECTRONICS SCHEMATIC
MODEL "R"

CRYSTAL 14.3 8180 MHZ

REVISIONS			
LTG	DESCRIPTION	DATE	APPROVED
	REL FOR PROE		

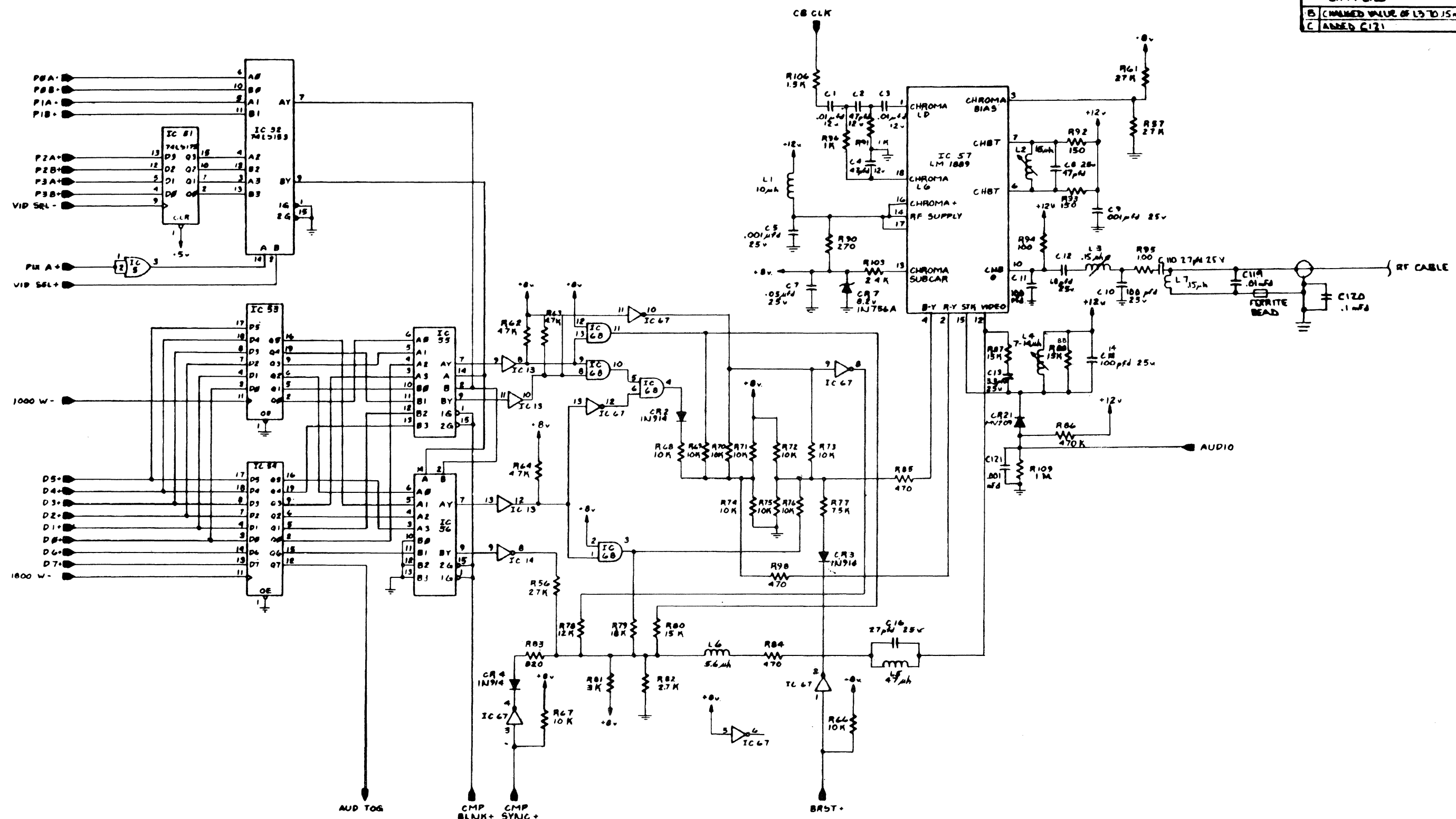


1.32345

MEASUREMENT POINTS

DATE: 5-12-78	DESIGN OTHER NAME	
DESIGNER:	SPECIFIED TOLERANCES	
APPROVED:	AND IN SERIES	
	3 PLACE DEC :	
	3 PLACE DEC :	
	INTERNAL	
	PROJECT	16K RAM COMPUTER MAIN ELECTRONICS SCHEMATIC MODEL "R"
10-0010	5-0094	
USED ON	THIS REV	
APPROVED	DATE	
D	DRAWING NO 13 0168	SHEET 2

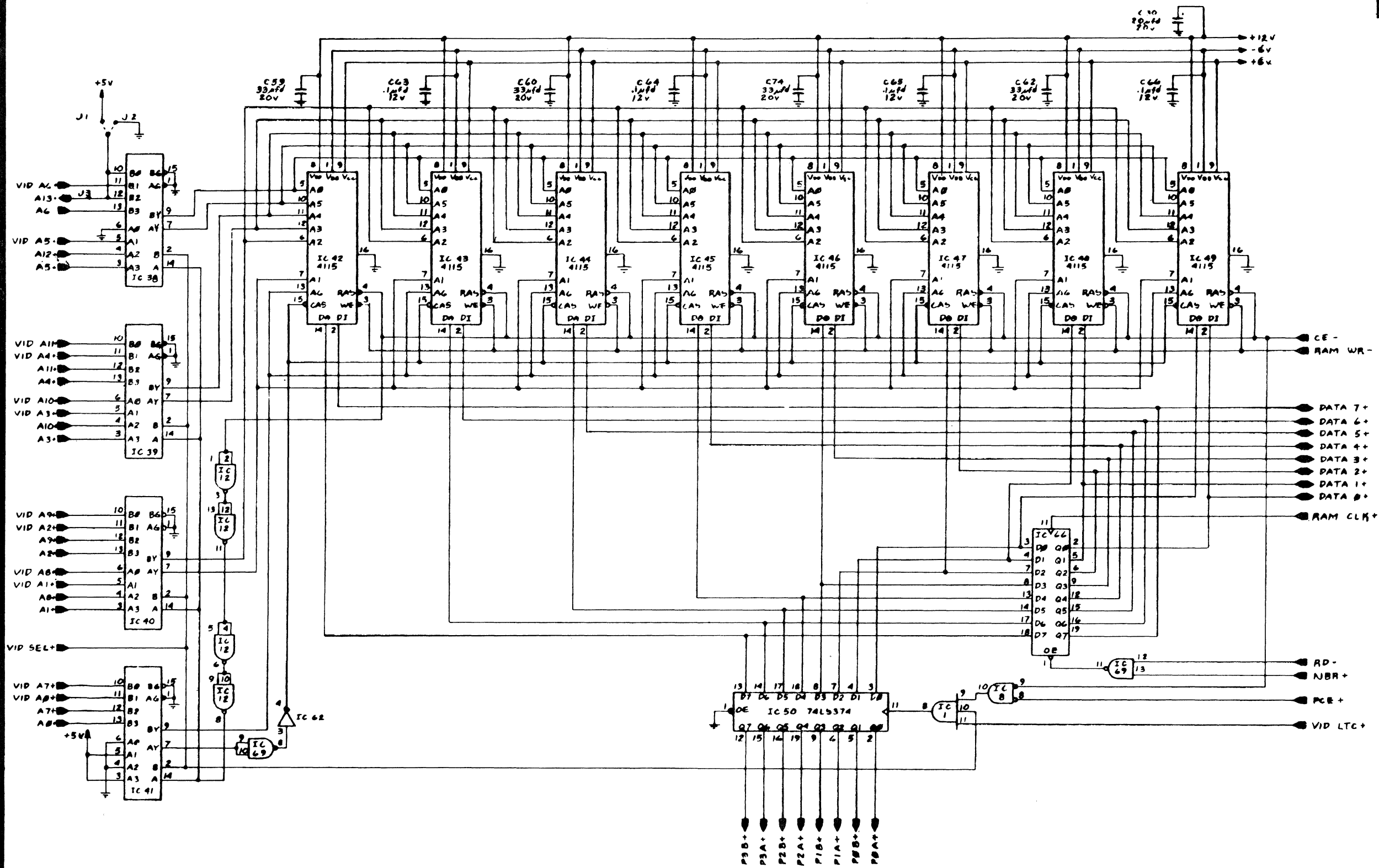
REVISIONS		
LTB	DESCRIPTION	DATE
	REL FOR PROD	
A	CHANGED C10 (C11 TO 100 pF) & ADDED R87 & R88	8-29-78
	C11 & C120	
B	CHANGED VALUE OF L3 TO 15 μH	8-28-78
C	ADDED C121	9-11-78



DRAWN BY	8-17-78	CHK'D BY		WHEN OTHER THAN SPECIFIED TOLERANCES ARE IN FIGURES
MAILED BY		APPROVED		1 PLACE DEC. 1 3 PLACE DEC. 1
DATE		DATE		BAYERNAL
10-0010	5-0094	FIGURE		MAIN ELECTRONICS SCHEMATIC MODEL R
USED ON	REF. NO.	FIGURE		D
APPLICATION		FIGURE		ISSUED ON 13-0168 SHEET 3 C

12/10/78

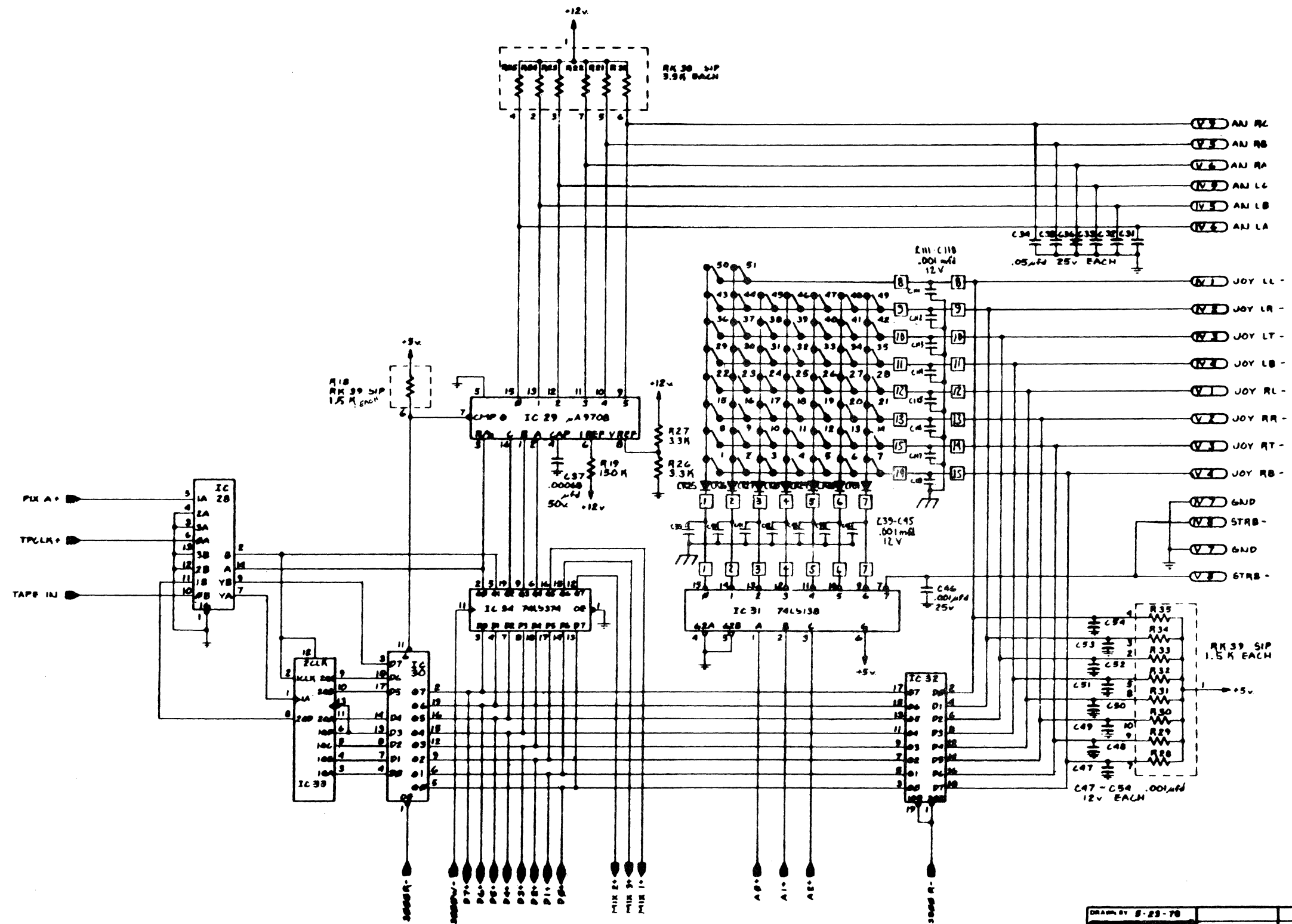
REVISIONS			
LTG	DESCRIPTION	DATE	APPROVED
	REL. FOR PROD.		



DRAWN BY: 5-22-78 CHECKED BY: APPROVED BY:	UNLESS OTHERWISE SPECIFIED TOLERANCES ARE IN INCHES 1 PLACE DEC : 2 PLACE DEC : 3 PLACE DEC : 10-0010 USED ON: 5-0094 APPROVED:	16K RAM COMPUTER MAIN ELECTRONICS SCHEMATIC MODEL "R" D 15-0168 SHEET 4
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JUL 78

REVISION		
LTN	DESCRIPTION	DATE
1	REL FOR PROR	7 18 78

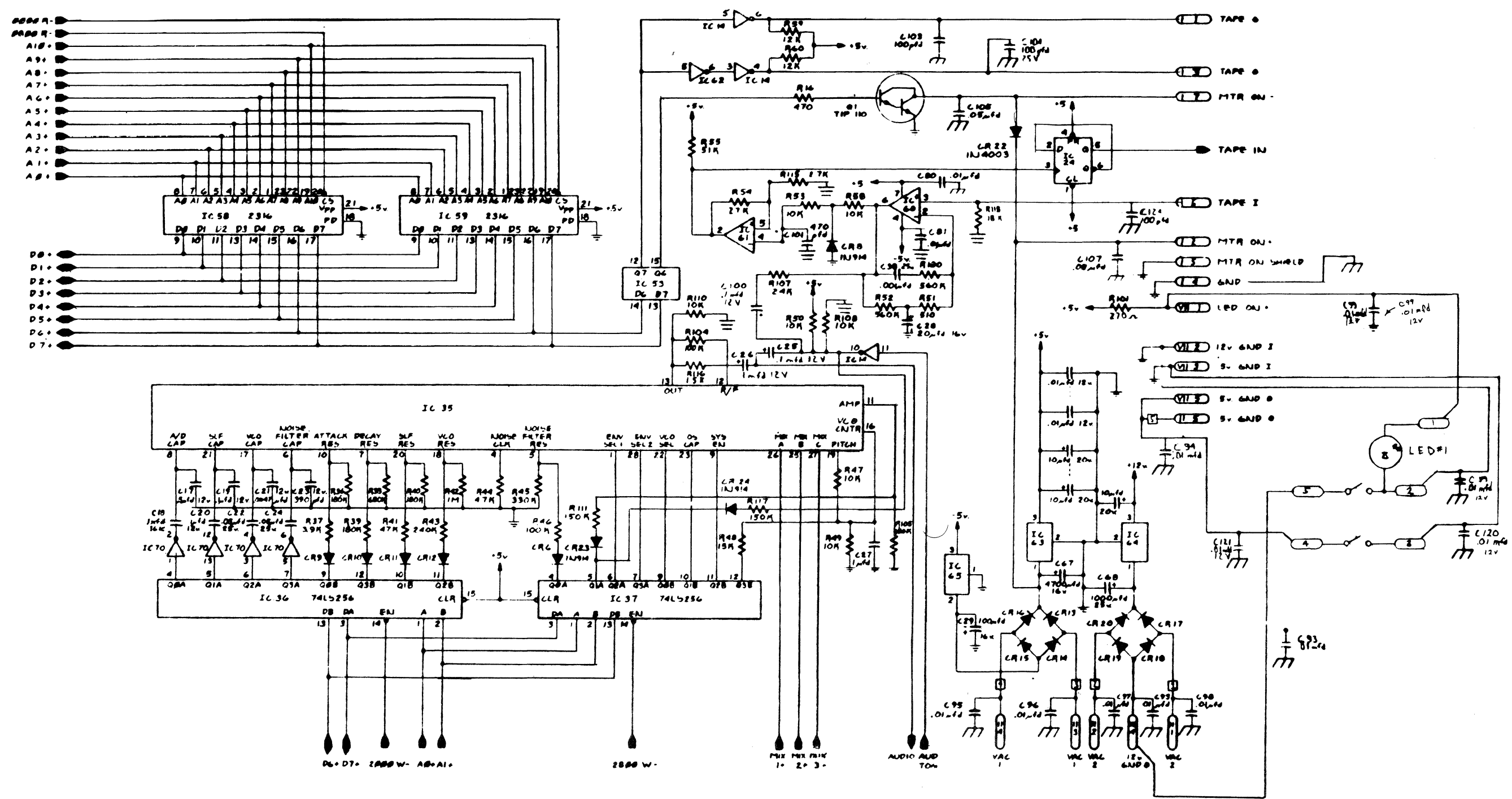


GND ON MAIN BOARD
 GND ON INTERCONNECT BOARD

DRAWN BY: S-23-78 CHECKED BY: APPROVED:	UNLESS OTHERWISE SPECIFIED TOLERANCES ARE AS SHOWN 3 PLANE DOC 1 3 PLANE DOC 2 DATUM: 10-0010 5-0094 MADE ON:	16K RAM COMPUTER MAIN ELECTRONICS SCHEMATIC MODEL "A" DRAWING NO: 13-06A SHEET 5
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W/1179

REV	DESCRIPTION	DATE	APPROVED
	REL. FOR PROD.		
A	C20 CHANGED TO 10M FROM 1.0M	9-1-78	
B	DELETE 2 ND C45 CHANGE C123 TO C126 ALSO C118 TO C127 ALS. C-120 TO C-127		
C			



⊥ GROUND ON MAIN BOARD
 ≡ GROUND ON INTERCONNECT BD

DESIGNED BY	5-28-78	DESIGNED BY	
DRAWN BY		DRAWN BY	
CHECKED BY		CHECKED BY	
DATE		DATE	
REV		REV	
10-0010 5-0094 13-0168 SHEET 6			

16 K RAM COMPUTER
 MAW ELECTRONICS SCHEMATICS
 MODEL "R"

wid?

**PROTECTO
ENTERPRIZES**

BOX 502, FRANKLIN PARK, IL. 60131
Phone 312/ 382-5244