

TONO

COMMUNICATIONS COMPUTER

Θ-7000E



TONO CORPORATION

98 MOTOSOJA-MACHI, MAEBASHI-SHI, 371, JAPAN



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Chapter 2. MAINTENANCE

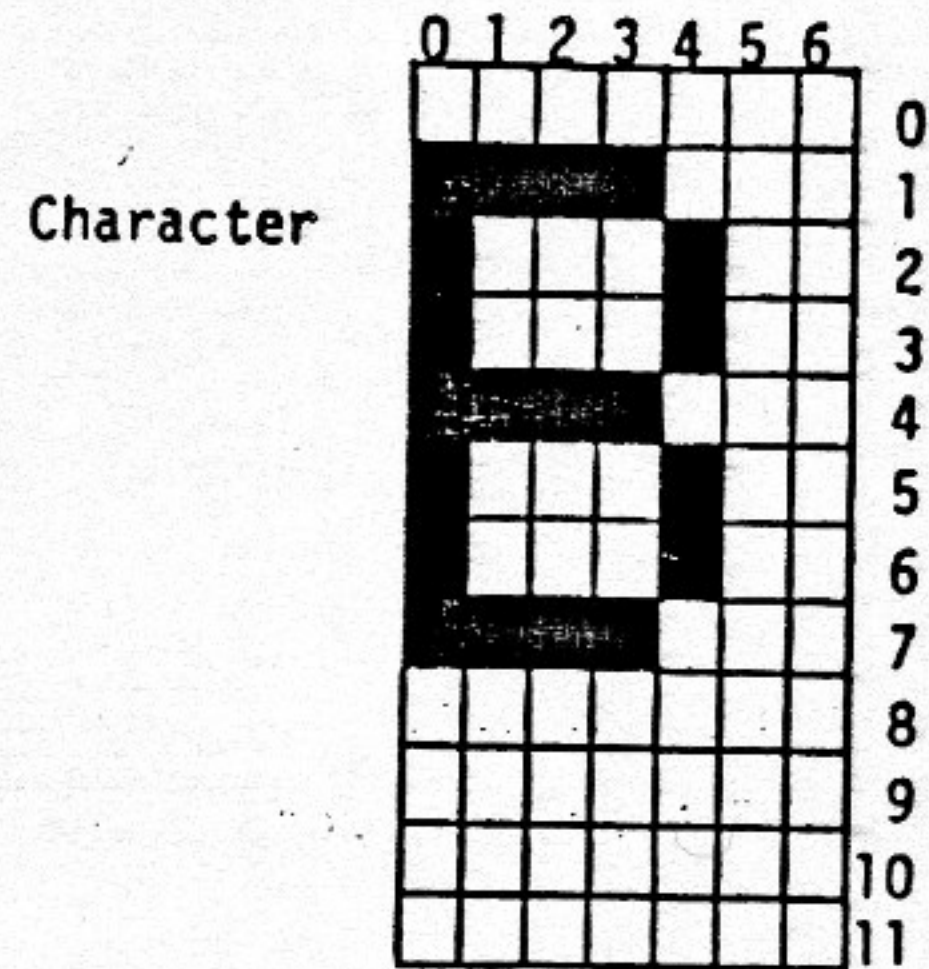
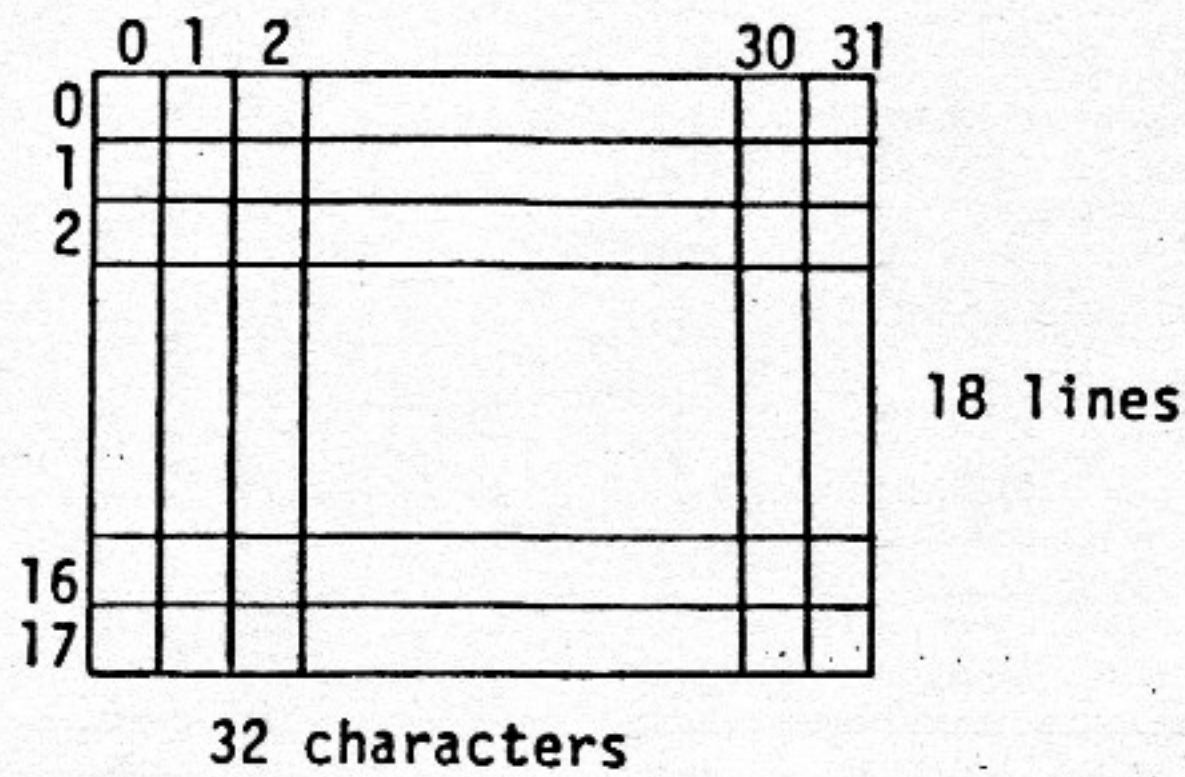
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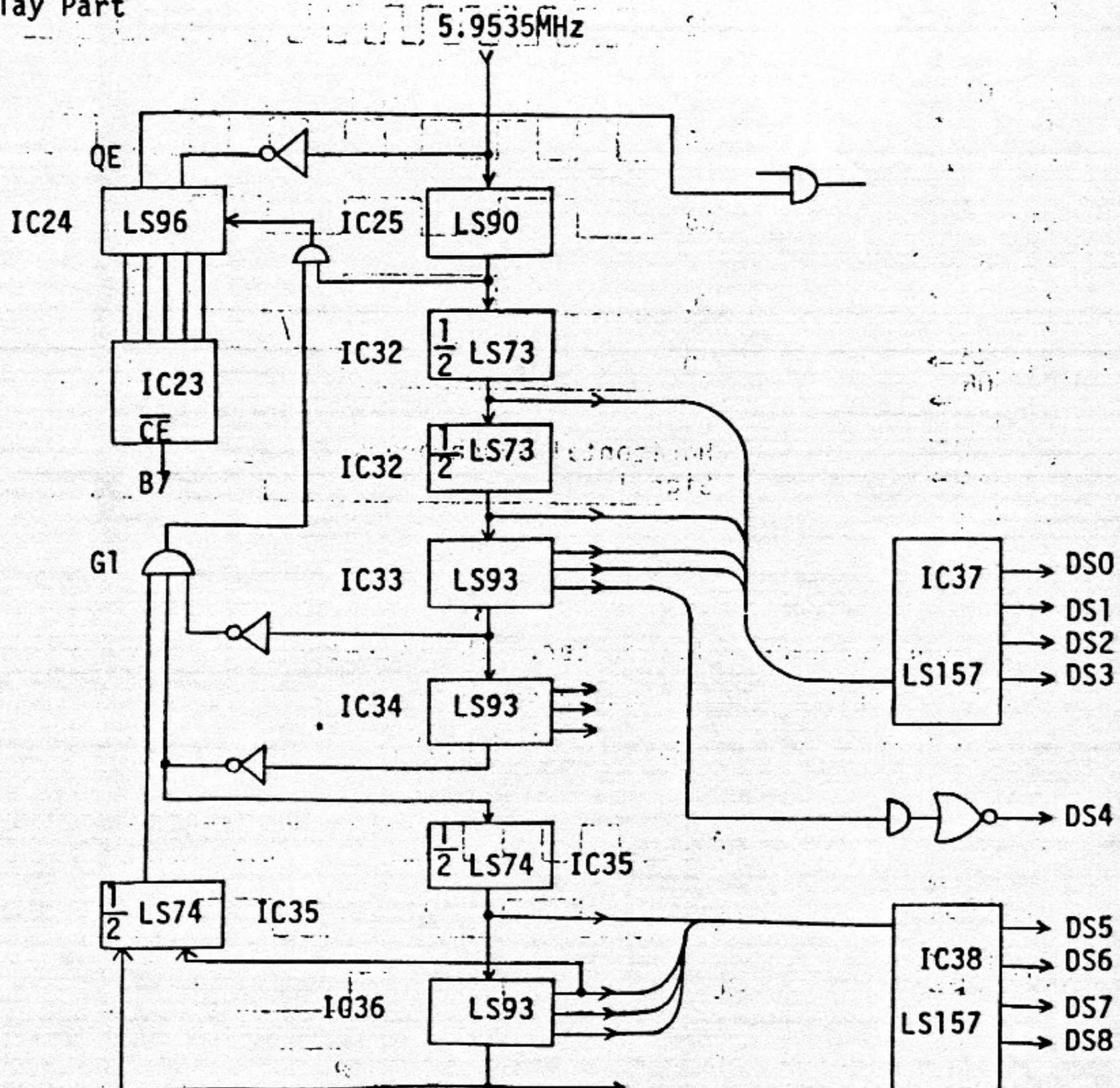
1. The Structure of Screen

The screen consists of 18 lines (32 characters per line). The last two lines are for CMOS RAM, the other 16 lines are NMOS RAM.

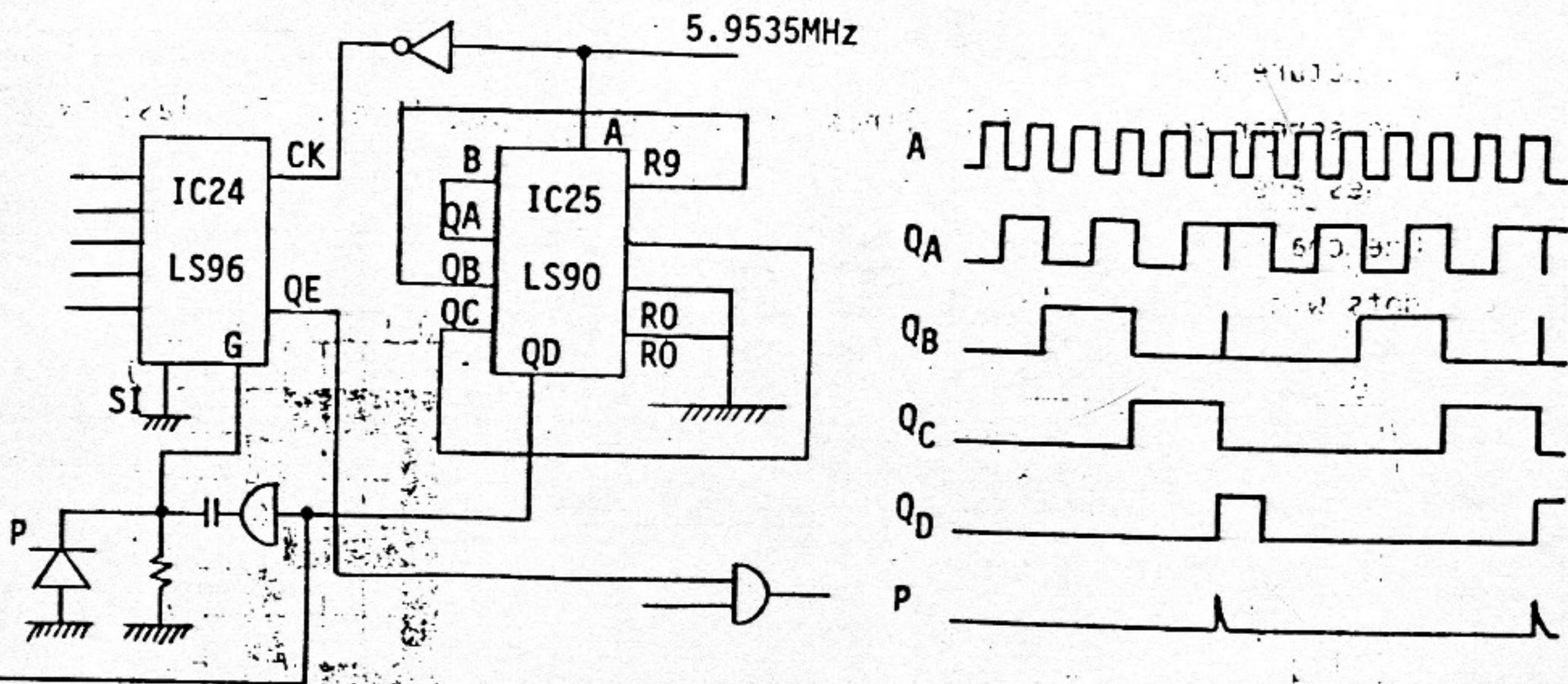
One character consists of 5 x 7 dots. The range of one character is 7 dots wide and 12 dots long.



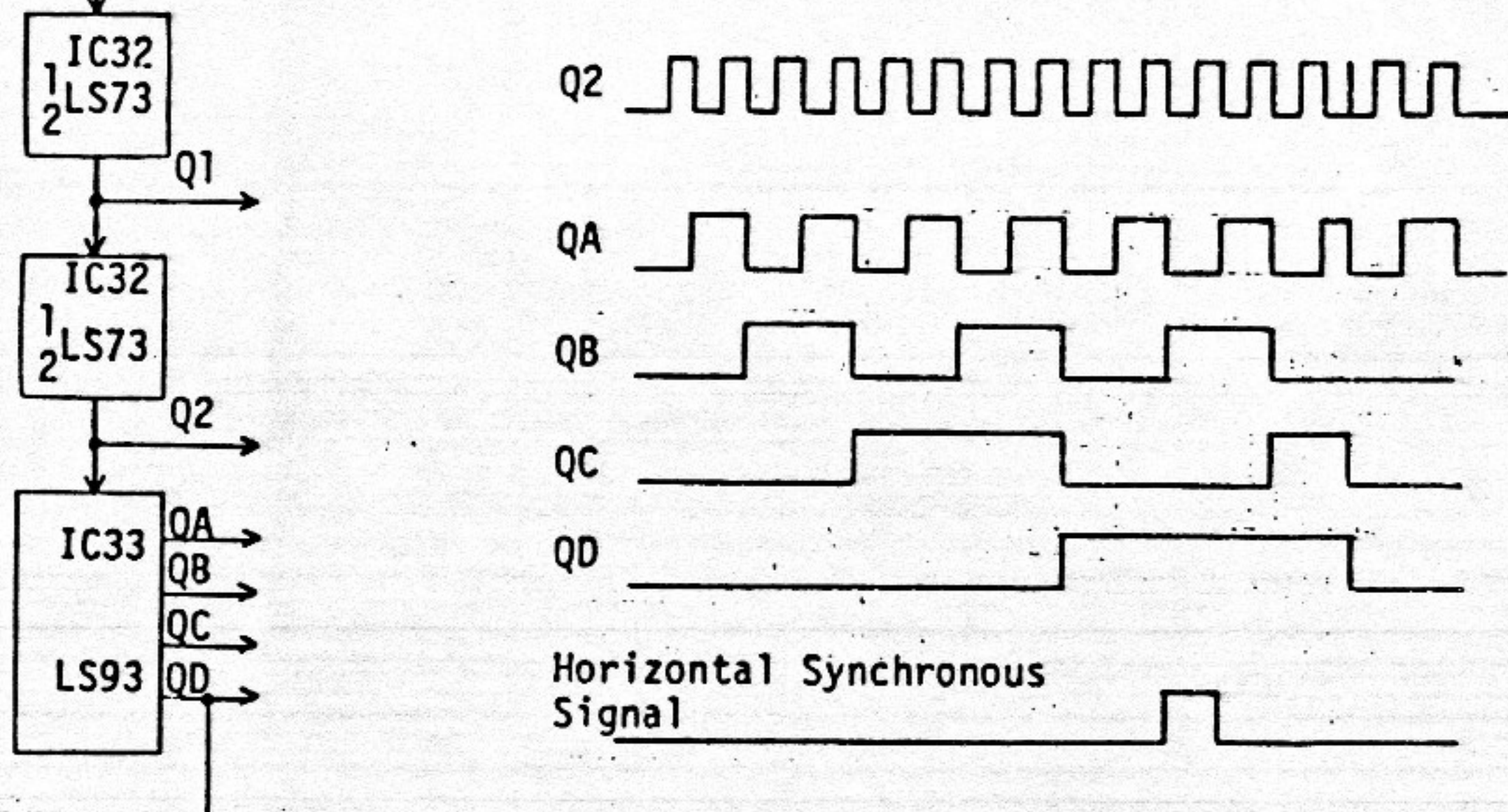
2. Display Part



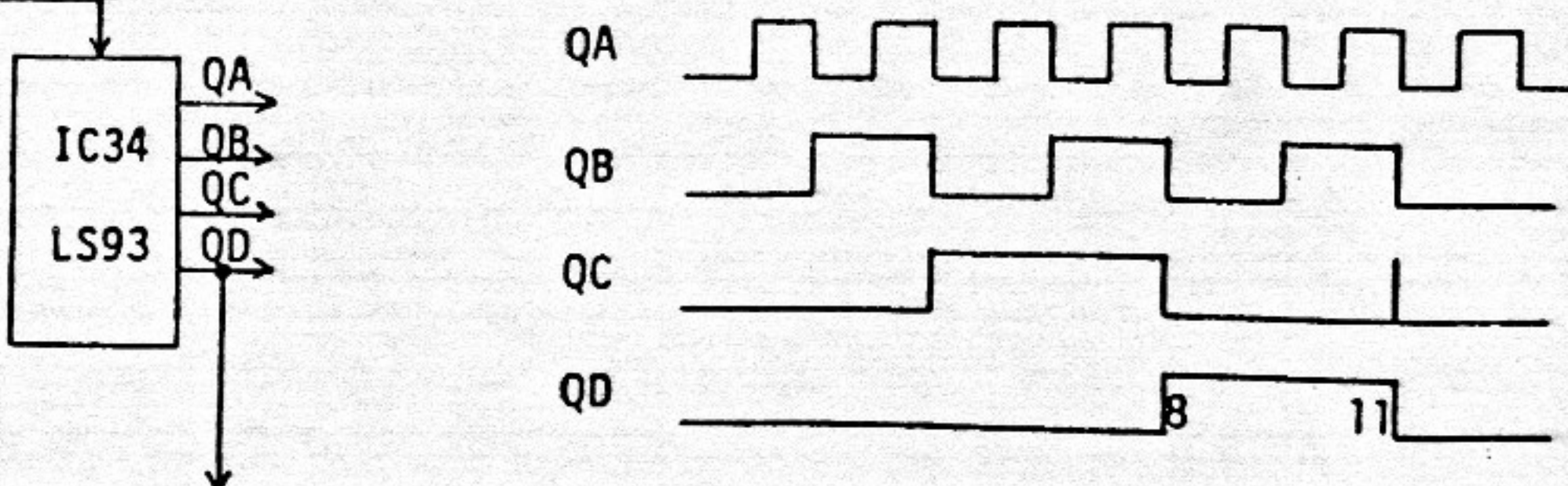
(1) IC25 works as a divide-by-7 counter



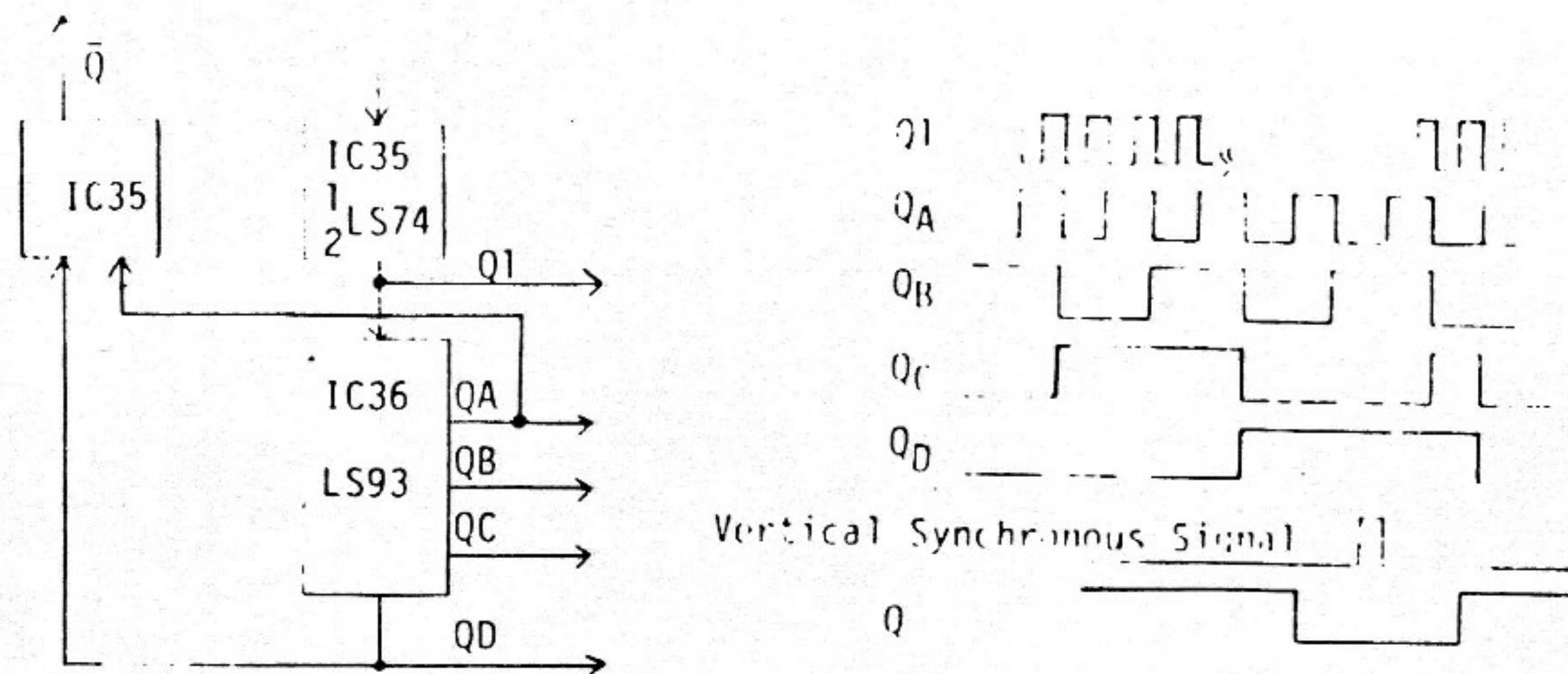
(2) A divide-by-54 counter is composed of IC32 and IC33 to make address of RAM and horizontal synchronous signals.



(3) IC34 is a divided-by-12 counter. This makes Row Address for the character generator. This counter determines the number of lines, 12 lines of one character in longitudinal direction.



(4) A divide-by-26 counter is composed of IC35 and IC36. Address of RAM and vertical synchronous signals are obtained.



2-2. Gates

(1) Gate G1 inhibits latching strobe signal to IC24 for a certain period.

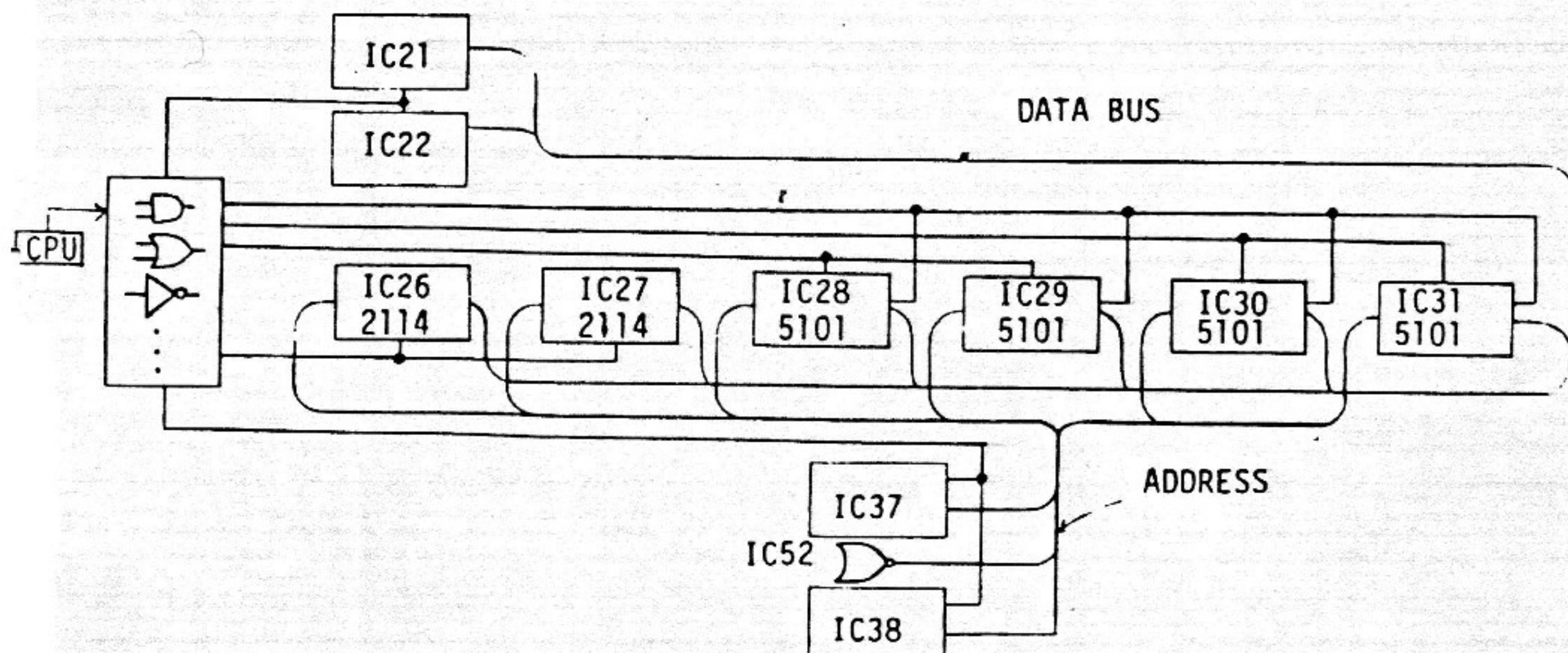
- Period from 32 to 53 of divide-by-54 counter
- Period from 8 to 11 of divide-by-12 counter
- Period from 18 to 25 of divide-by-26 counter

Within these periods, IC24 does not latch data. As SI of IC24 is L level, output QE of IC24 is also L level.

(2) Cursor is displayed when B7 of RAM is H level. With B7 at H level IC23 is not selected, and so outputs $\bar{O}1$ -- $\bar{O}5$ are all in HIZ state, which displayed cursor on the screen.

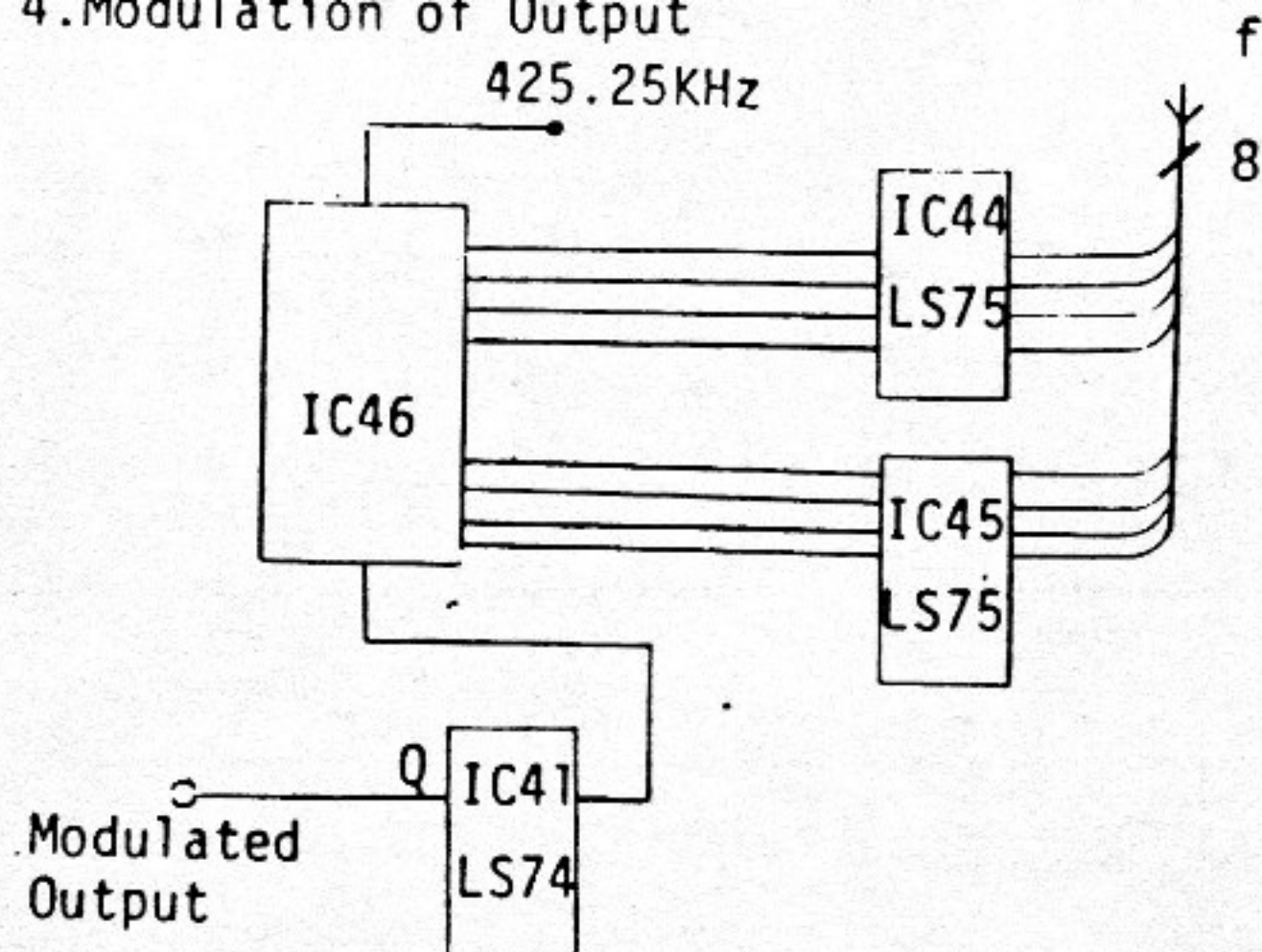
3. RAM Selection

Usually Address is given to RAM by the counters through IC37, IC52, IC38. Only when a message is being written in or read out, Address and Data bus are given with an instruction of CPU.



IC21 and IC22 controls switching of Data bus, and IC 37, IC52 and IC 38 controls switching of Address.

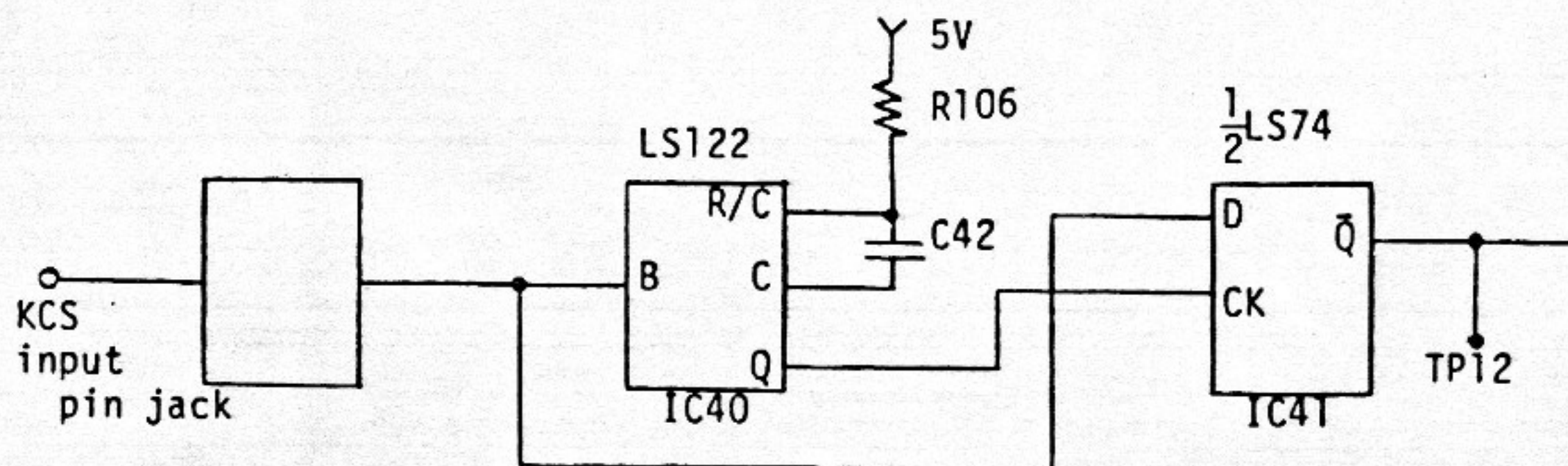




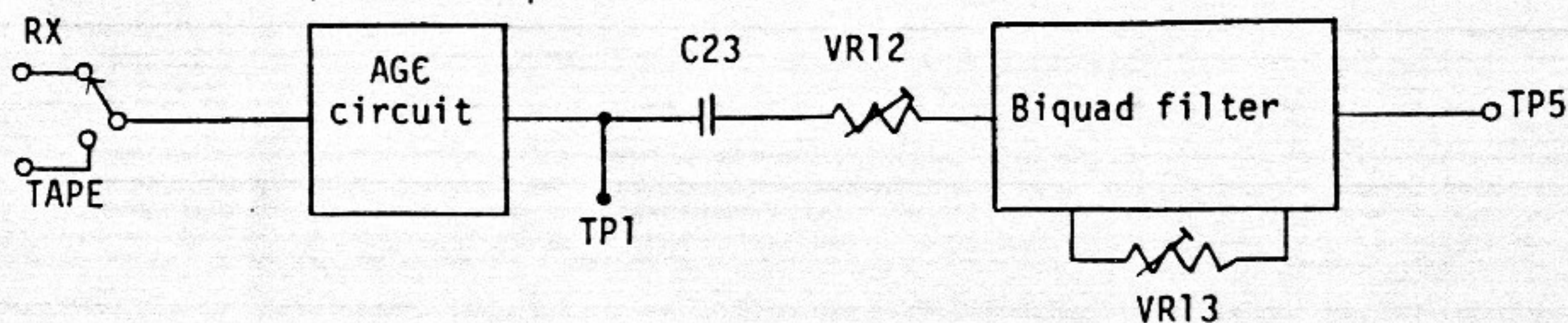
Modulated output can be obtained by dividing clock of 425.25KHz at IC46 and IC41 with the instruction of CPU through IC44 and IC45.

5. Demodulation of KCS Input

In the case of ASCII, modulated signals of 2400Hz and 1200Hz are sent in. Put a sine wave of 1400-1600Hz from the input terminal to obtain random pulse from TP12. Output probability of H level and of L level is almost the same. For the input over 1600Hz the output of TP12 is L level, and for the input under 1400Hz the output is H level.

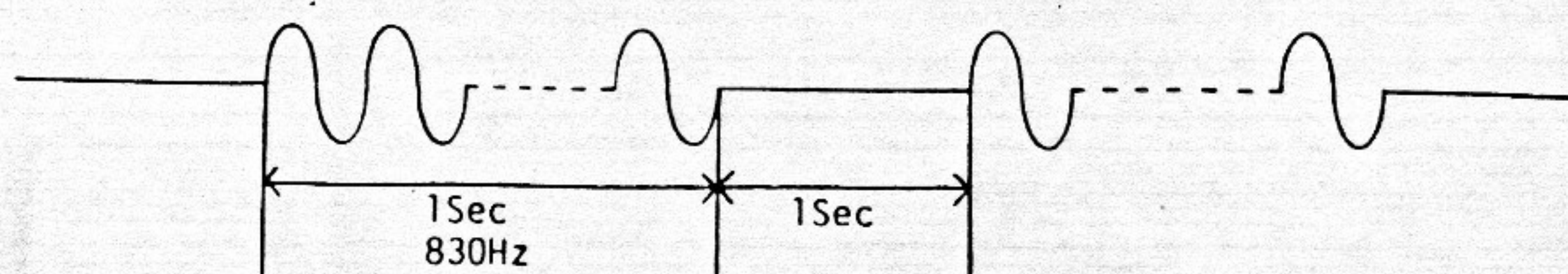


6. About the input part of Biquad Filters



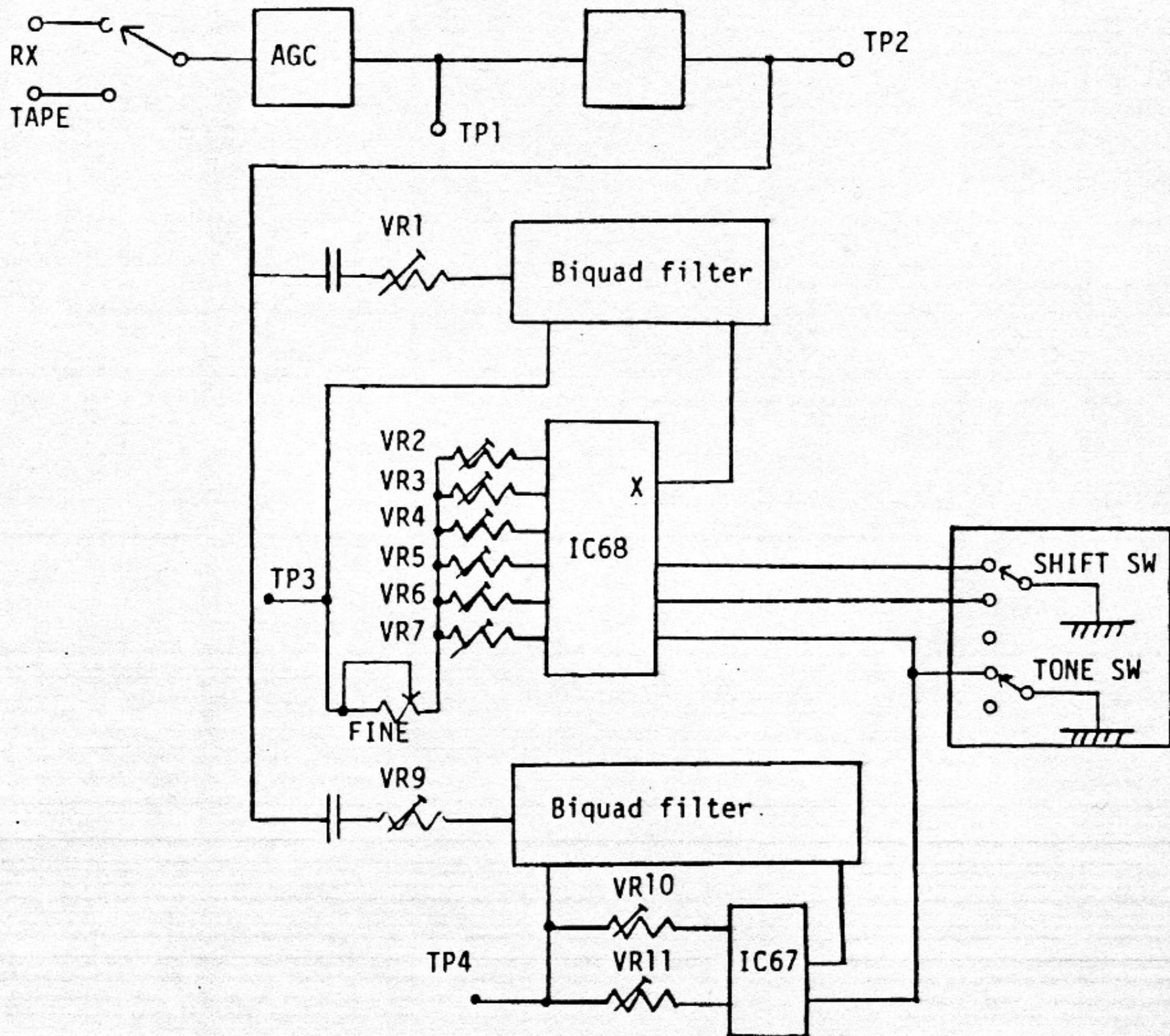
6-1. Adjustment of Biquad Filter for CW'

(1) Put the following sine wave into RX pin jack, and set AF INPUT switch to RX. Test signal consists of intermittent sine waves of 830Hz. Amplitude of test signal should be over 100mV that enables regular function of AGC.

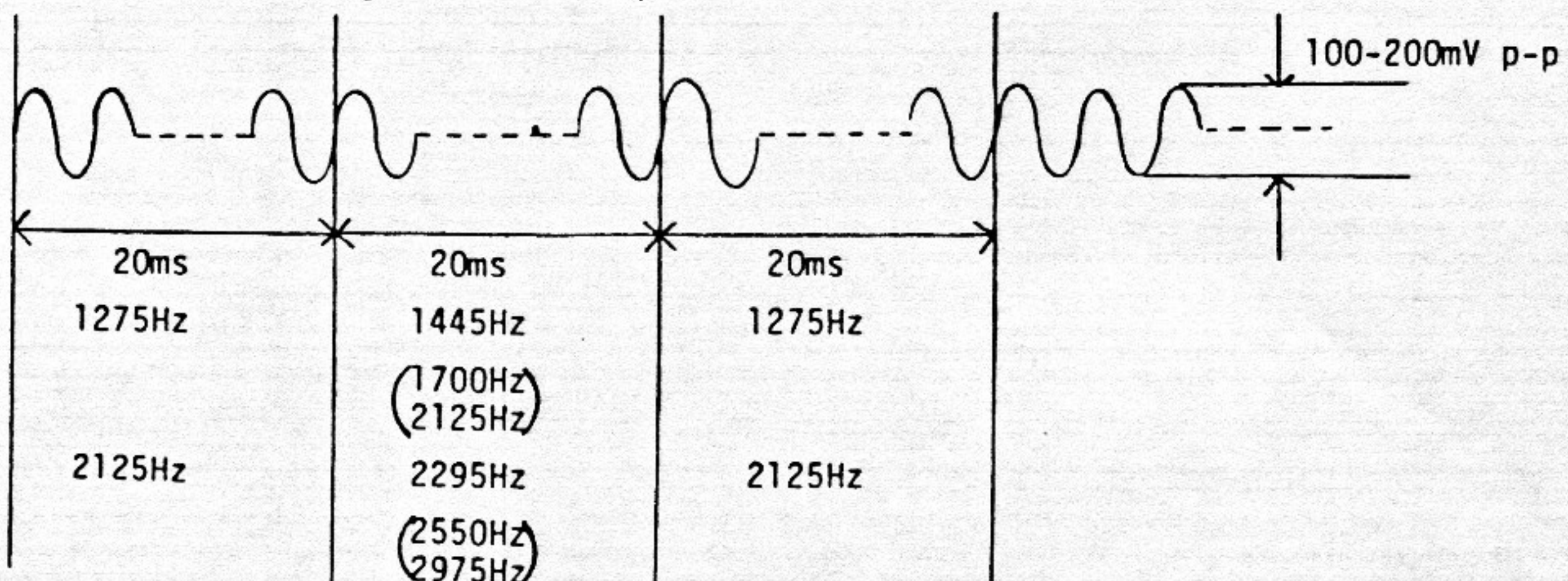


- (2) Make the output amplitude of TP5 maximum at VR13. If TP5 is saturated, adjust VR12 to obtain the maximum amplitude without saturation.
- (3) Make the amplitude of TP6 1.4V - 1.8Vp-p at VR12.
- (4) The central value of TP5 should fall within the range of $1.8V \pm 0.5V$ without distortion at peak.

6-2. Adjustment of Biquad Filter for BAUDOT



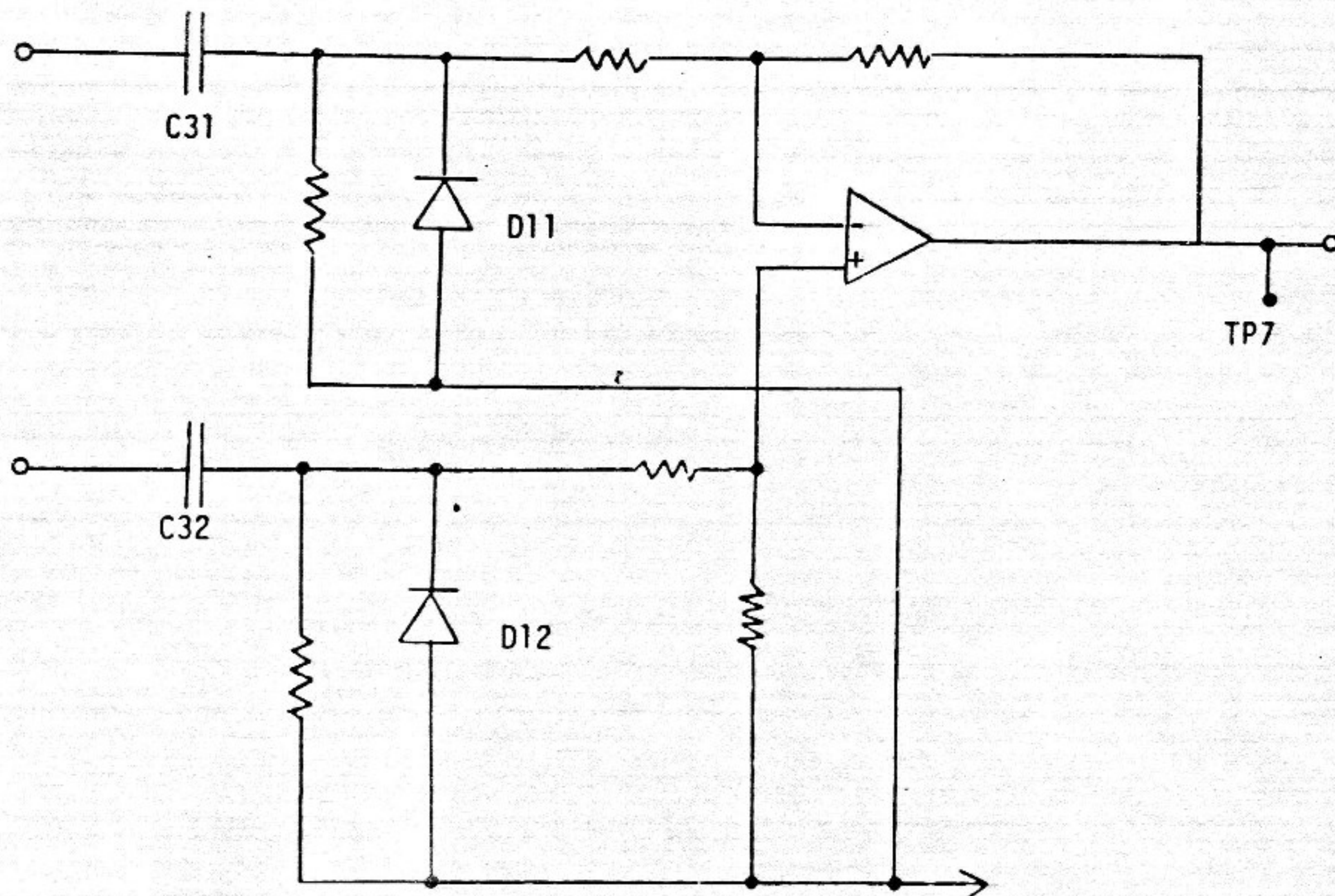
(1) Send the test signal to the input terminal as follows:



- (2) Send the test signal of 1275Hz and 1445Hz into RX pin jack, and set SHIFT SW at 170 and TONE SW at LOW. Adjust VR11 so that TP4 has the maximum amplitude. Make the amplitude of TP4 1.4 - 1.6Vp-p at VR9. Fix FINE tuning control at the central value and make amplitude of TP3 maximum at VR7.
- (3) Send the test signal of 1275Hz and 1700Hz into RX pin jack, set SHIFT SW at 425 and adjust VR5 to have the maximum amplitude.
- (4) Send the test signal of 1275Hz and 2125Hz into RX pin jack, set SHIFT SW at 850 and adjust VR6 to have the maximum amplitude.
- (5) Send the test signal of 1275Hz and 1700Hz into RX pin jack, set SHIFT SW at 425 and adjust VR1 to make TP3 have the maximum amplitude.
- (6) Set TONE SW at High and SHIFT SW at 170, and send the test signal of 2125Hz and 2295Hz. Adjust VR10 so that TP4 has the maximum amplitude. And adjust VR4 so that TP3 has the maximum amplitude.
- (7) Set SHIFT SW at 425, and send the test signal of 2125Hz and 2550Hz. Adjust VR2 so that TP3 has the maximum amplitude.
- (8) Set SHIFT SW at 850, and send the test signal of 2125Hz and 2975Hz. Adjust VR3 so that TP3 has the maximum amplitude.
- (9) Make the central value of TP3 and TP4 fall within the range of $1.8V \pm 0.5V$ without any strain.

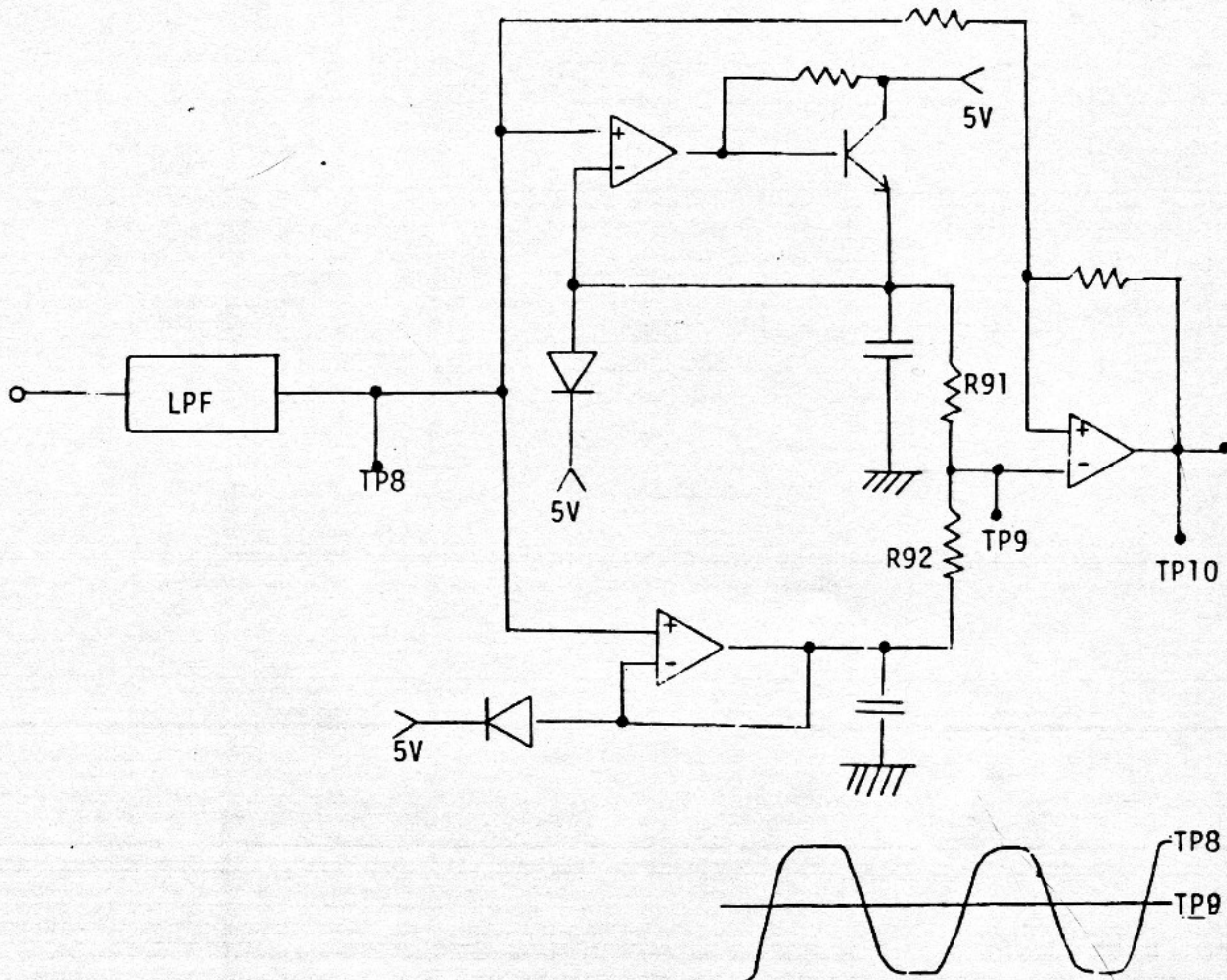
About Adding Circuit

Outputs from the Biquad Filters are sent into the following Adding Circuit. Output of TP7 should not be saturated excessively.



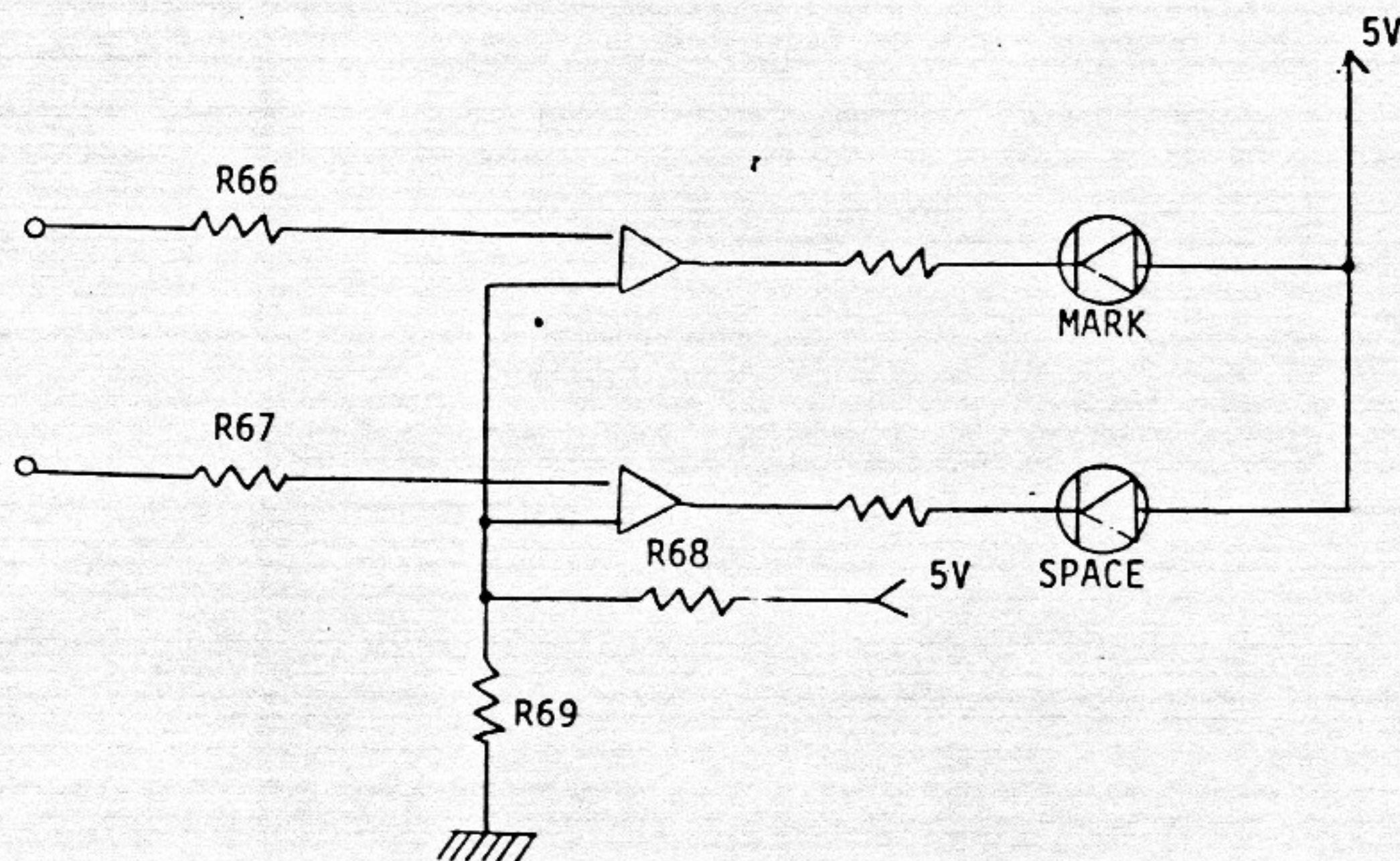
8. About Peak-detector

Output of Adding Circuit goes to low pass filter which cut-off frequency is 70 Hz. R91 and R92 make reference voltage for the Voltage Comparater.



9. About MARK and SPACE LED

LED lights when output from each Biquad Filter is more than 1.0 Vp-p.



- * Turn off the power supply and take the Theta-7000E partially apart as instructed in the following figures 2 to 4.
- * Please consult case by case the following Trouble Flow Chart, Schematic or Parts Layout Pattern.

[Trouble Flow Chart]

(1) How to check when the message cannot be displayed well on the screen

Check the shield cable connecting the Theta-7000E with the antenna of TV Set. If you find no troubles with it, continue to check as follows.

Tune the trimmer capacitor through the hole of the bottom plate or of the shield box. If you gain no adjusting success, examine further as follows:

Confirm whether the frequency of TP14 on the CPU board is 5.9535MHz or not.

NO
OK
YES
Trouble in Oscillator.

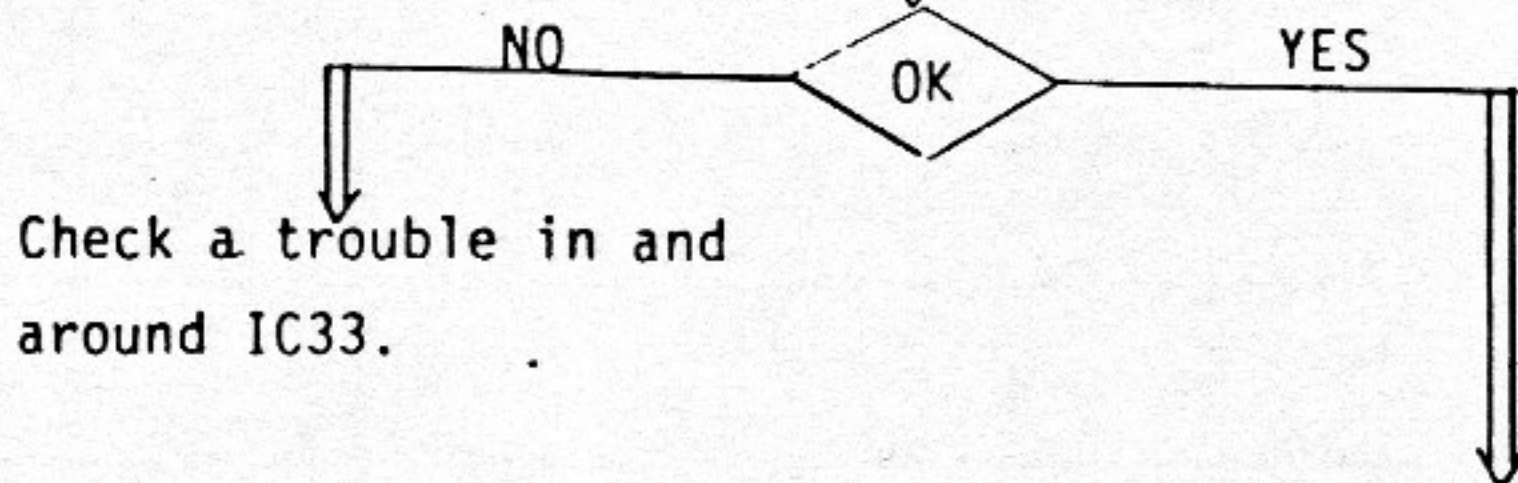
Confirm whether the frequency of TP16 on the CPU board is 850.5KHz or not.

NO
OK
YES
Check a trouble in and around IC25.

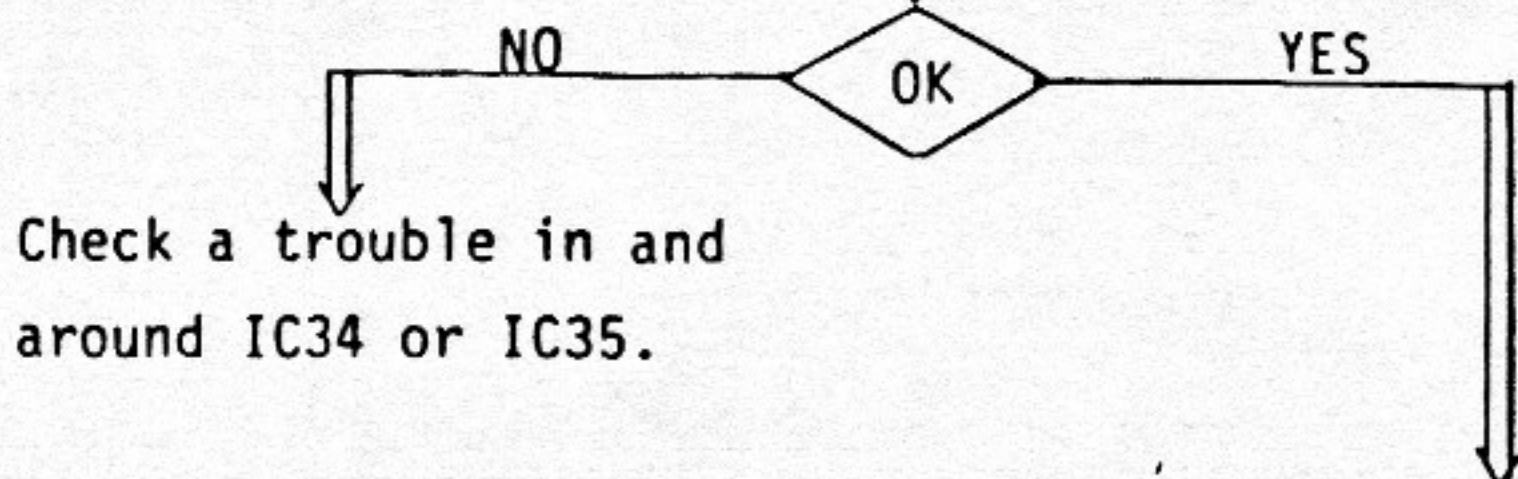
Confirm whether the frequency of TP15 on the CPU board is 425.25KHz or not.

NO
OK
YES
Check a trouble in and around IC32.

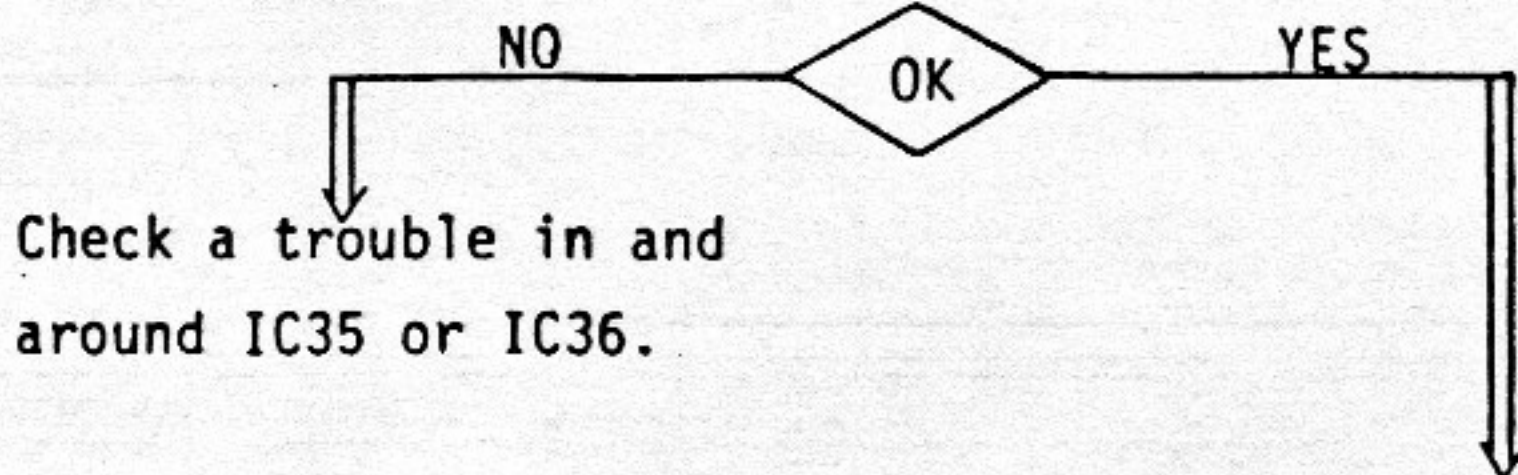
Confirm whether the frequency of TP17 on the CPU board is 15750Hz or not.



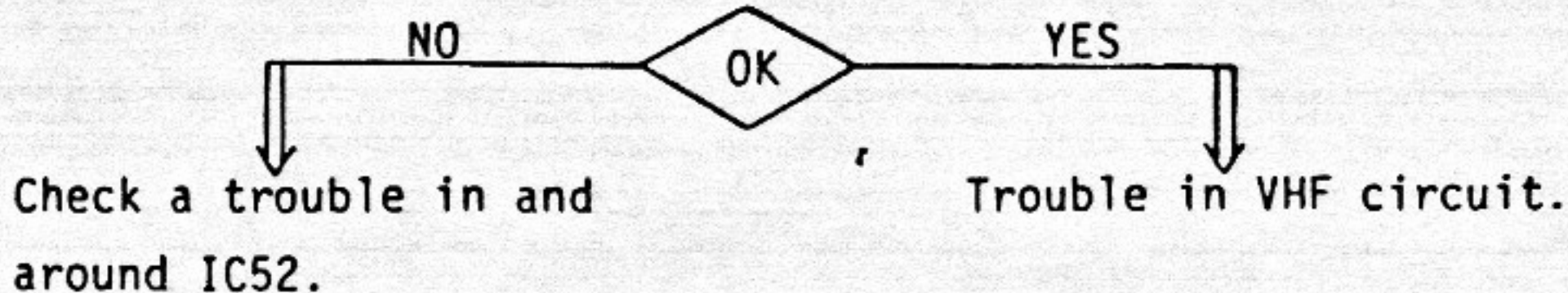
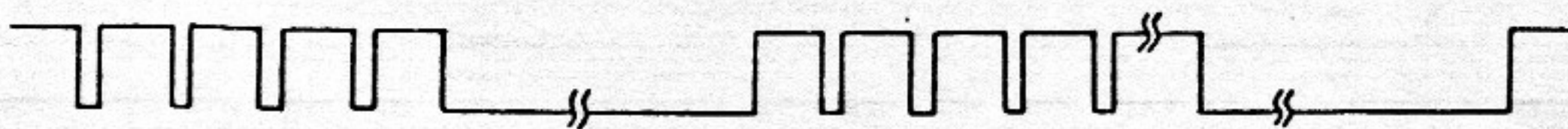
Confirm whether the frequency of J6 on the CPU board is 1312.5Hz or not.



Confirm the frequency of TP20 on the CPU board is 50.5Hz or not.



Confirm whether the wave shape of TP18 on the CPU board is as follows:



(2) How to check when power source has some trouble

Check the source cord connector, etc.
Check the lead wires (Red & Black) and the source cord connector.

check the fuse.

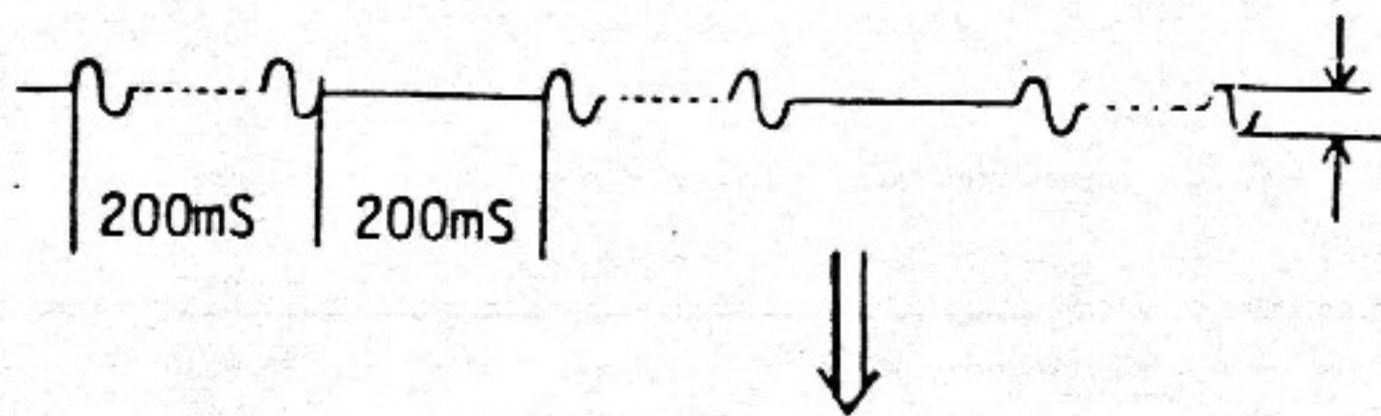
Check the grounding of the CPU board and check whether the 5V line has voltage of 5V.

If there is no trouble, check the power source parts including regulator IC on the radiator.

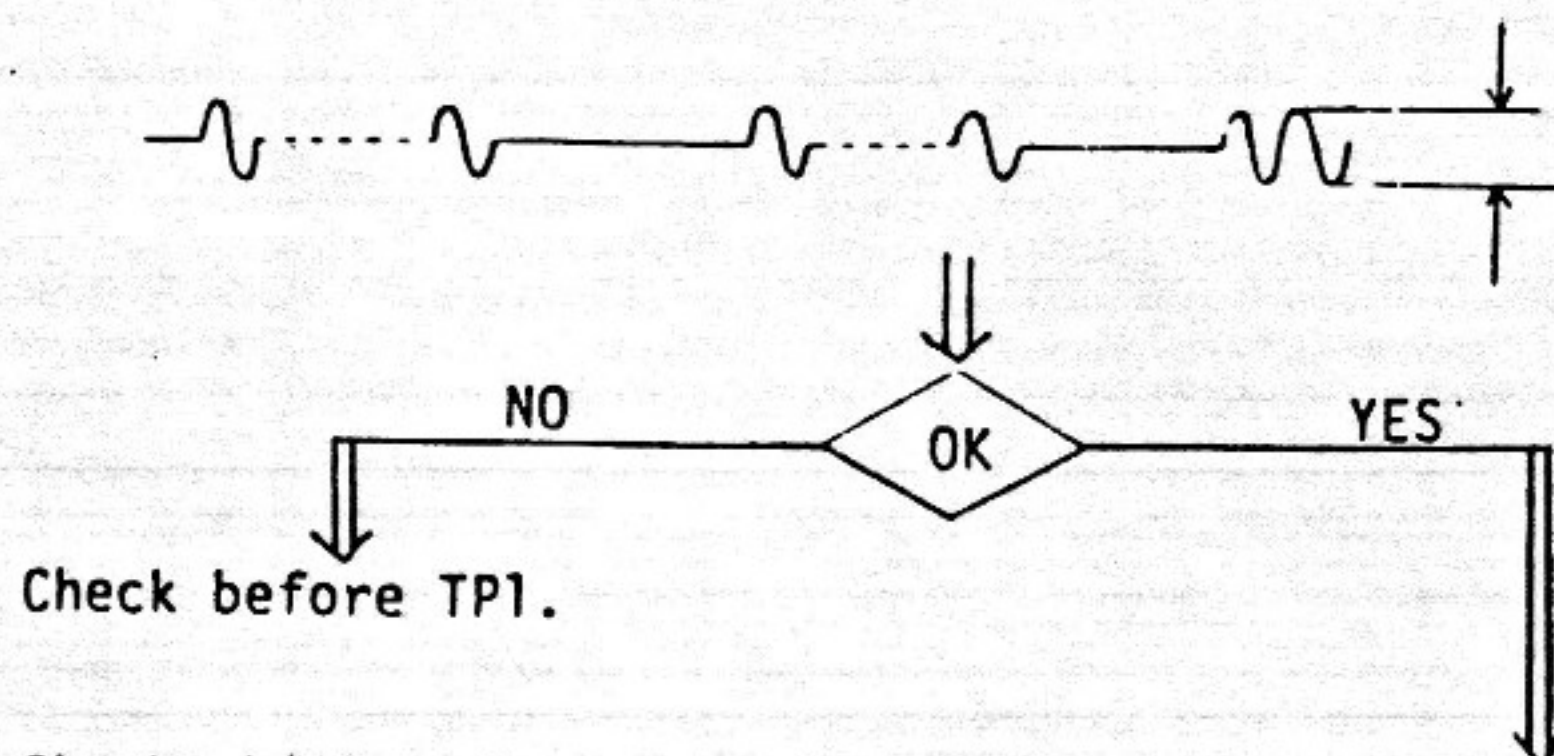
(3) How to check when the receiving in CW mode is impossible

Send audio signals into the Theta-7000E as follows through RX pin jack on the back panel

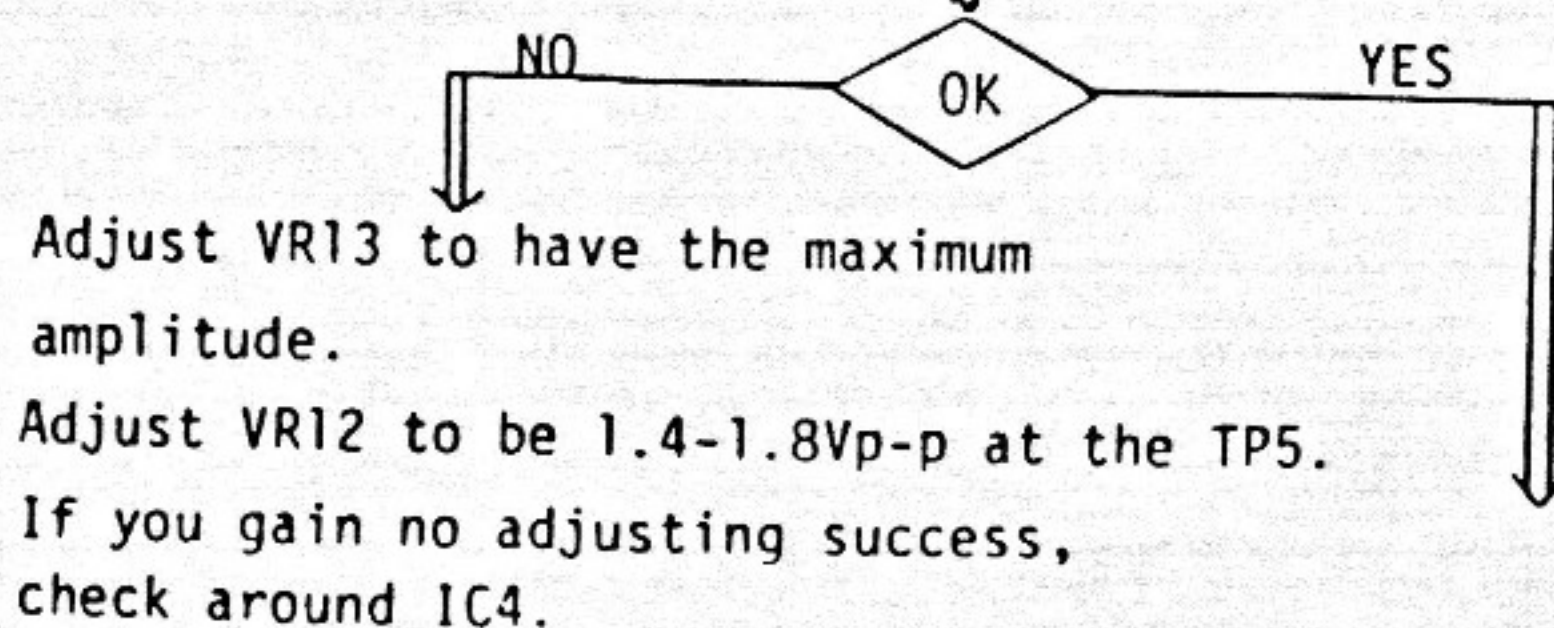
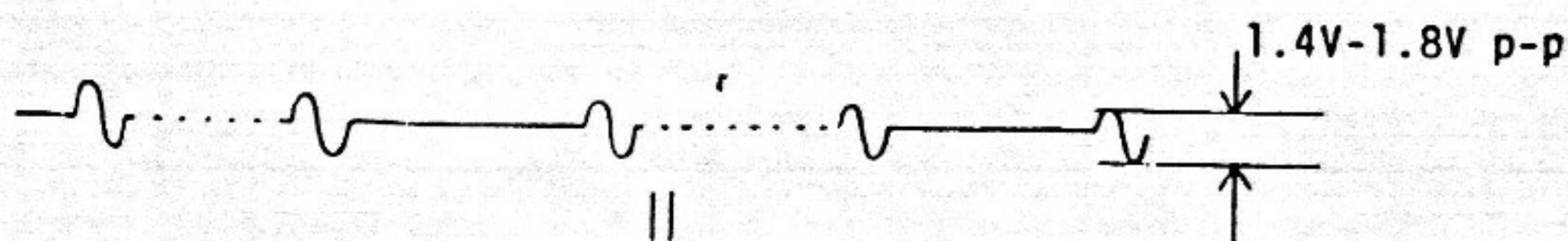
AF INPUT switch should be at the RX side at this moment.



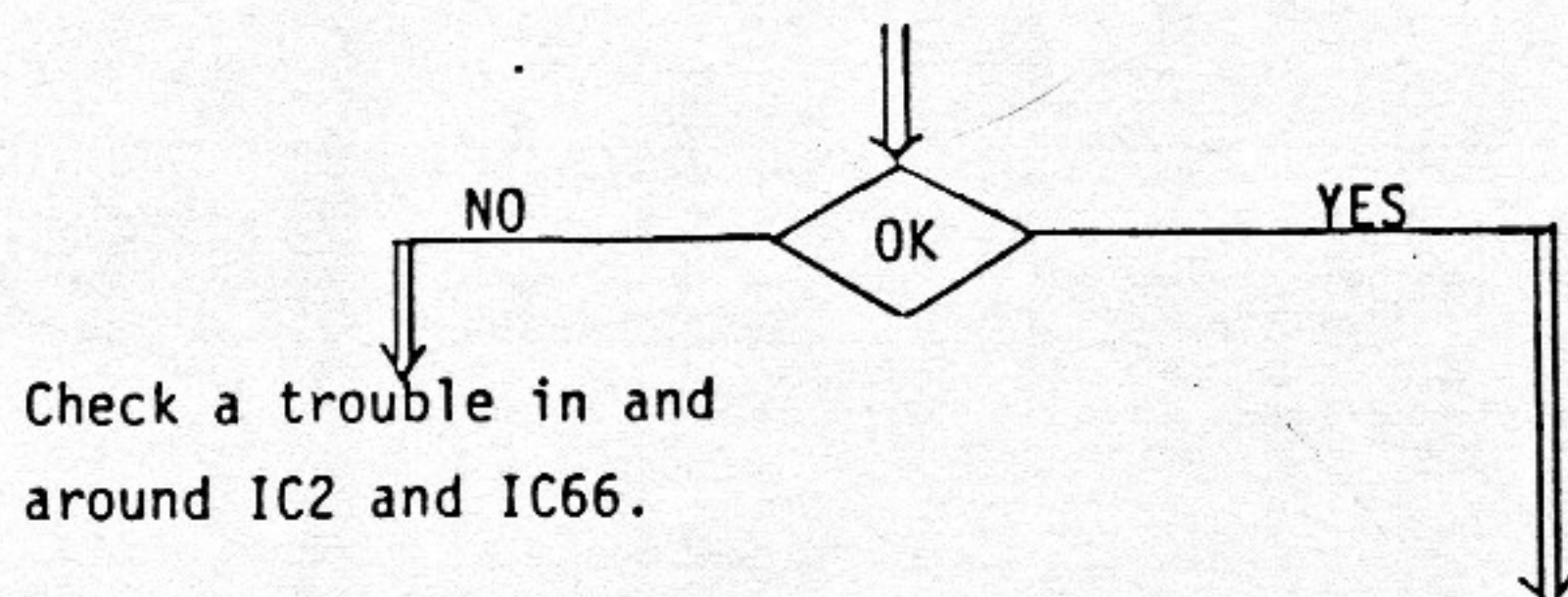
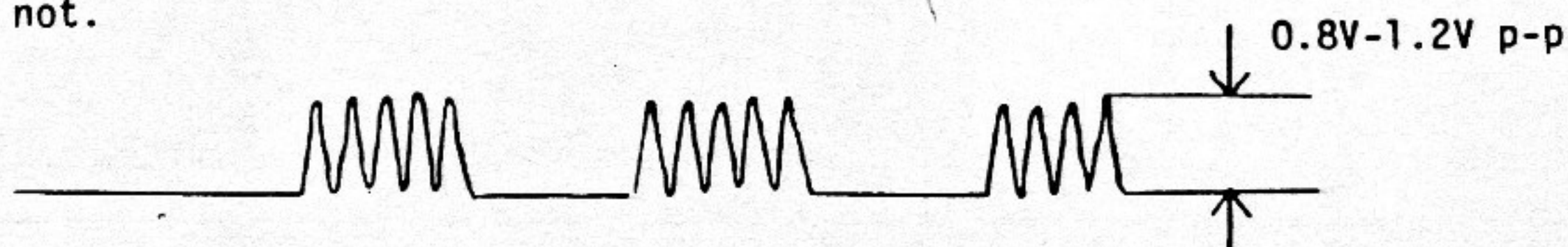
Confirm by TP1 whether audio input from RX pin jack on the back panel is all right or not, and check the wave shape whether it is as follows or not:
about 1.8Vp-p



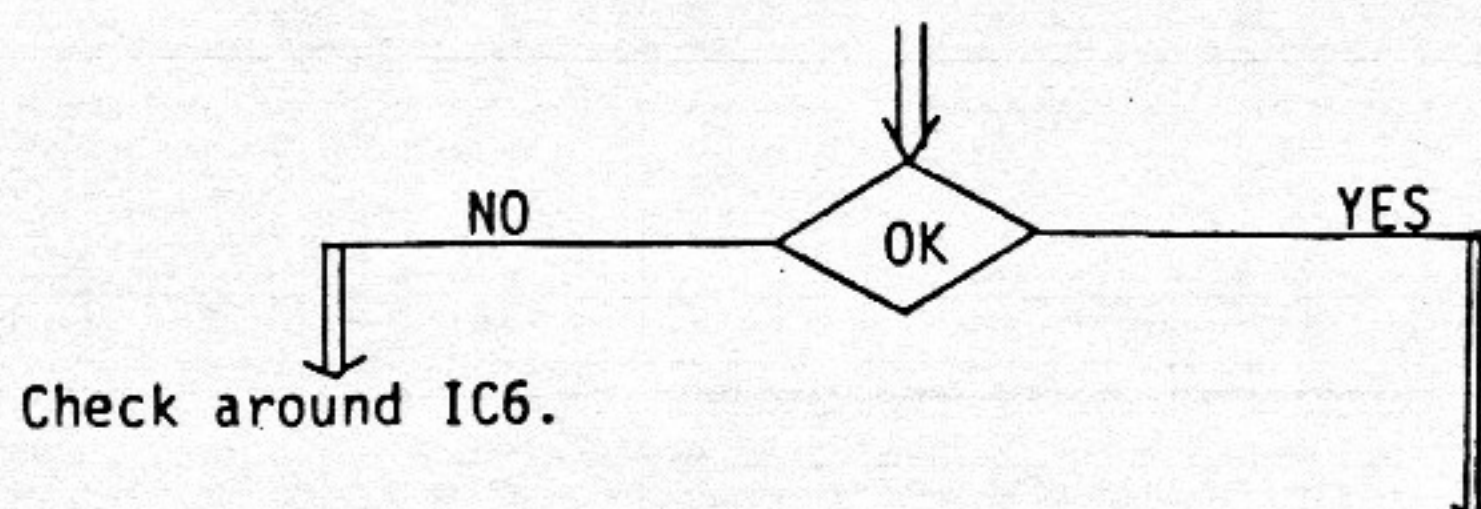
Check whether the wave shape of TP5 on the CPU board is as follows or not.



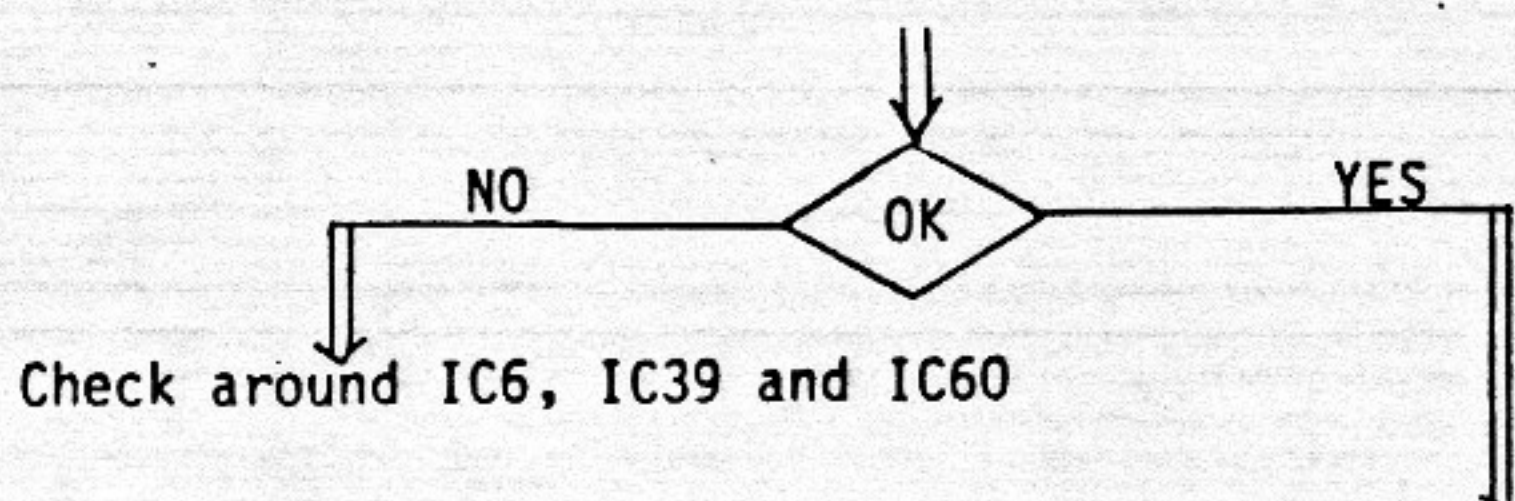
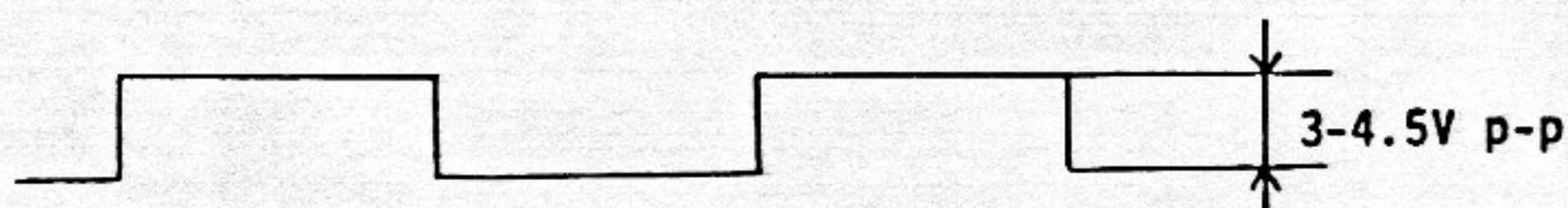
Check whether the wave shape of TP7 on the CPU board is as follows or not.



Check whether the voltage level of TP9 is the center of the voltage level of TP8.



Check the wave shape of TP10 and TP11 are as follows or not.



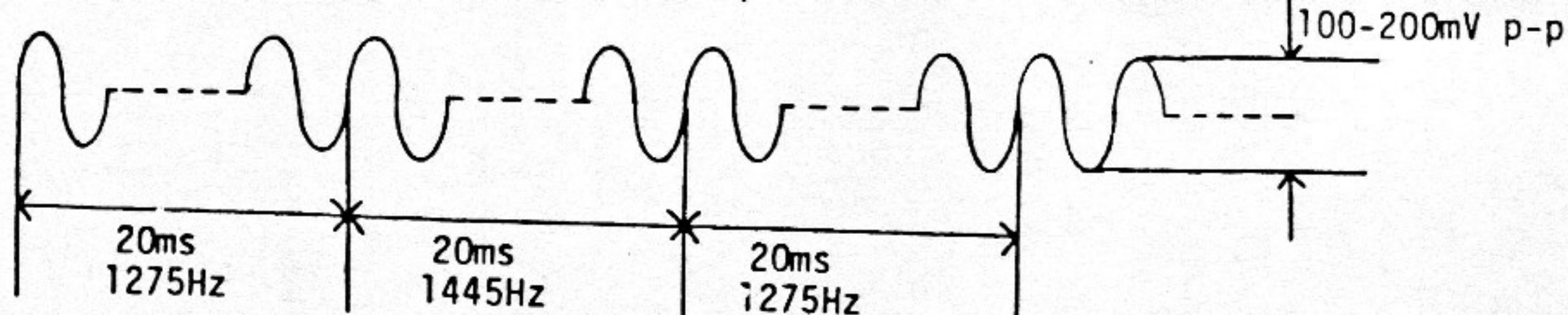
Troubles are judged to exist at any other parts than the above-mentioned parts.

(4) How to check when the receiving in BAUDOT mode is impossible

Send audio signals as follows from RX pin jack on the back panel.

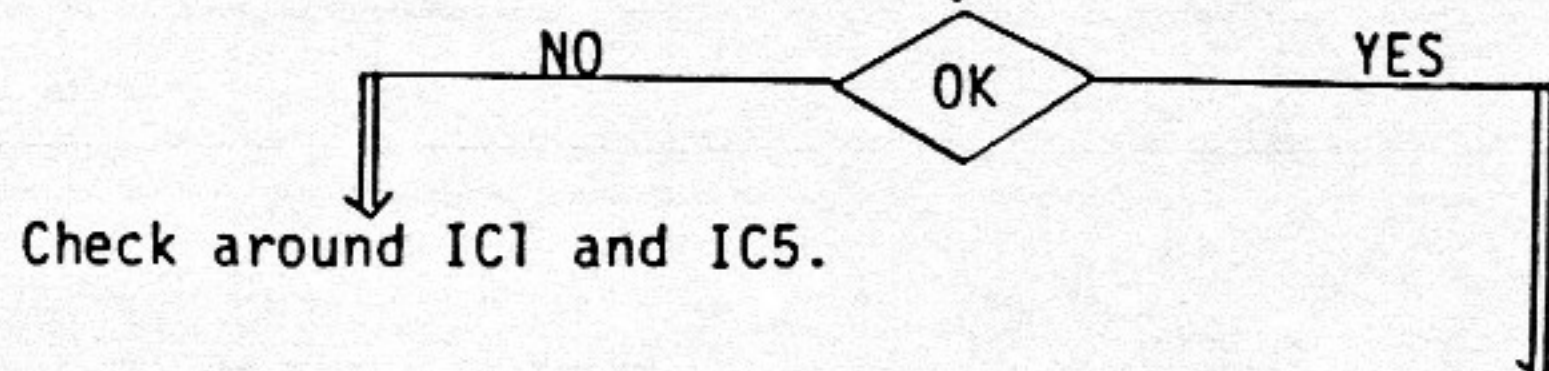
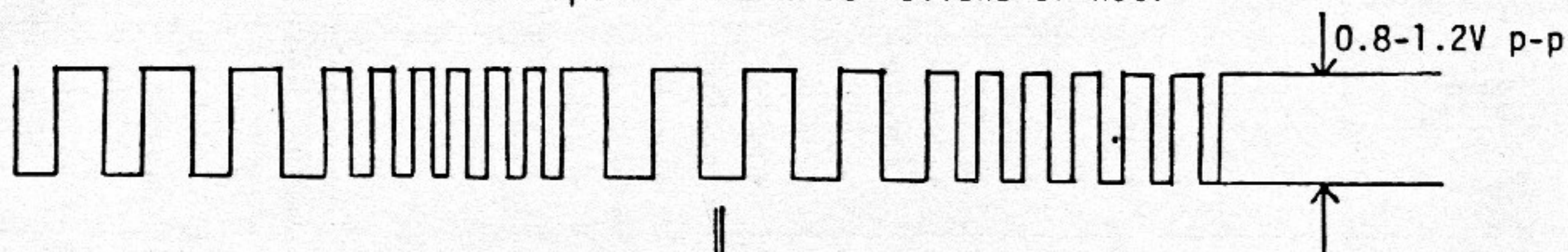
AF INPUT switch should be at the RX side at this time.

SHIFT switch on the front panel should be at 170 and TONE switch should be at LOW.

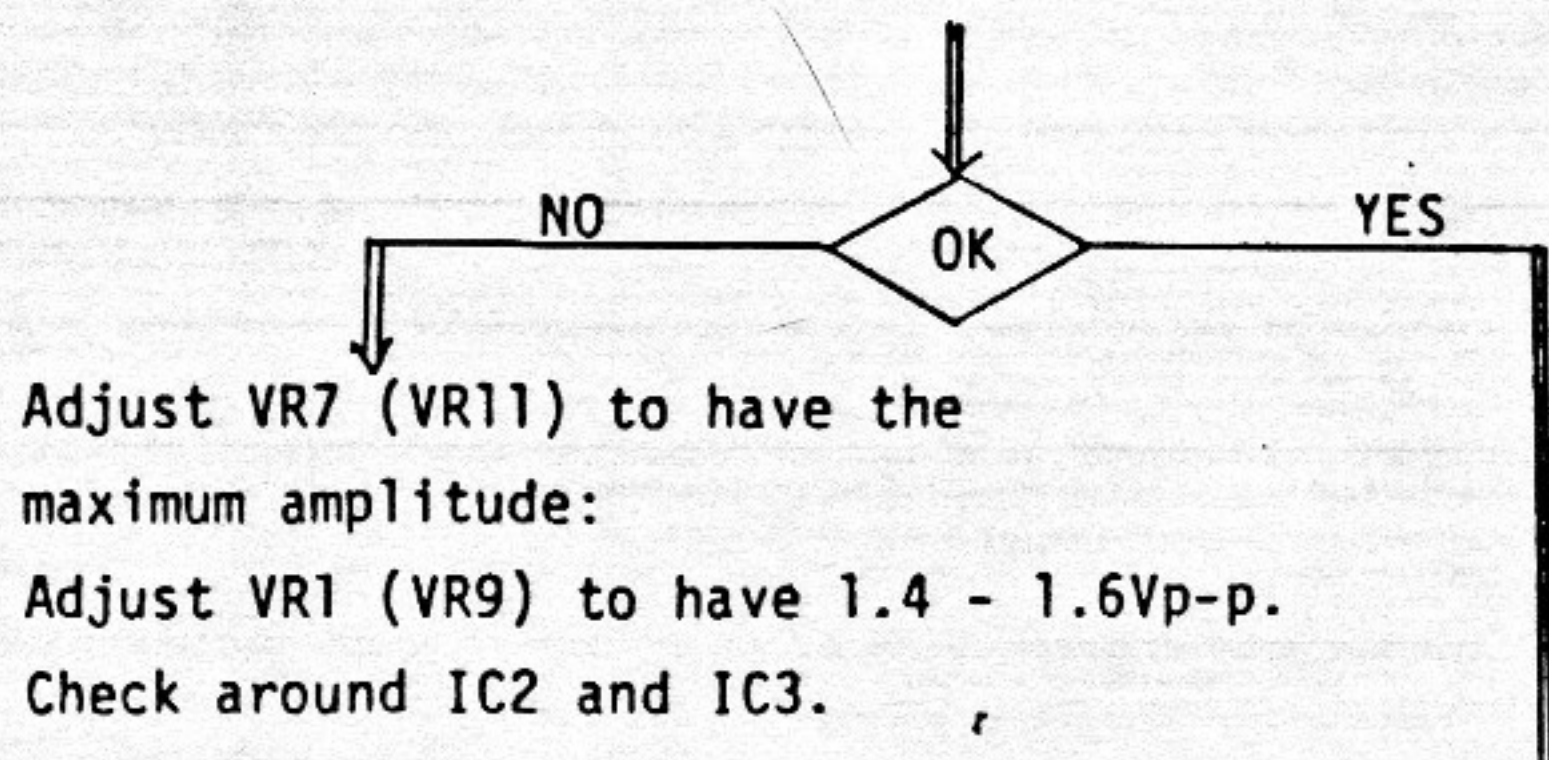
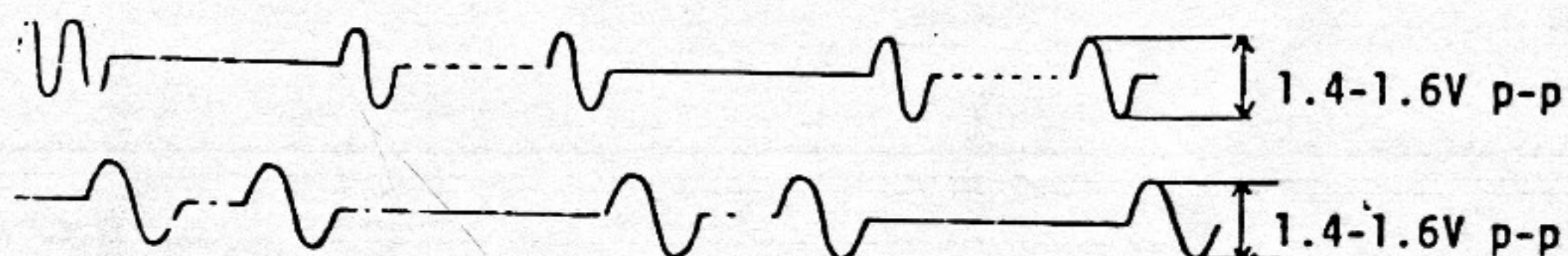


Check signals from RX pin jack on the back panel by TP1 of the CPU board.

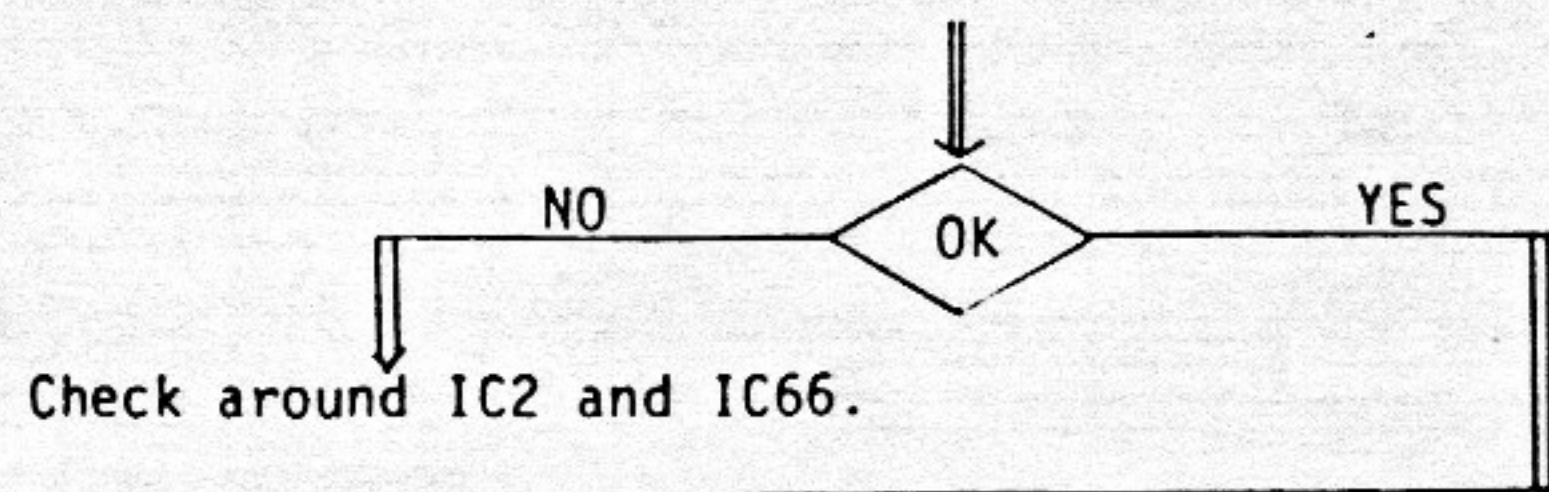
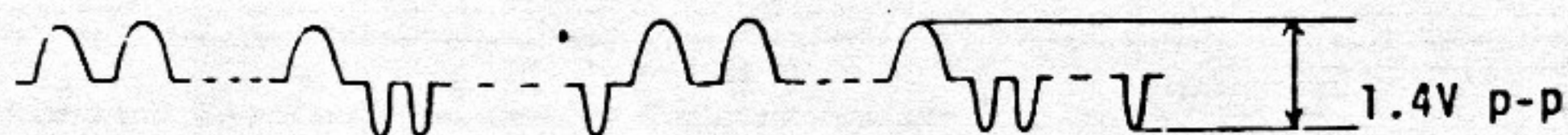
Check if the wave shape of TP2 is as follows or not.



Check if the wave shape of TP3 (TP4) is as follows:



Check the wave shape of TP7 if it is as follows:

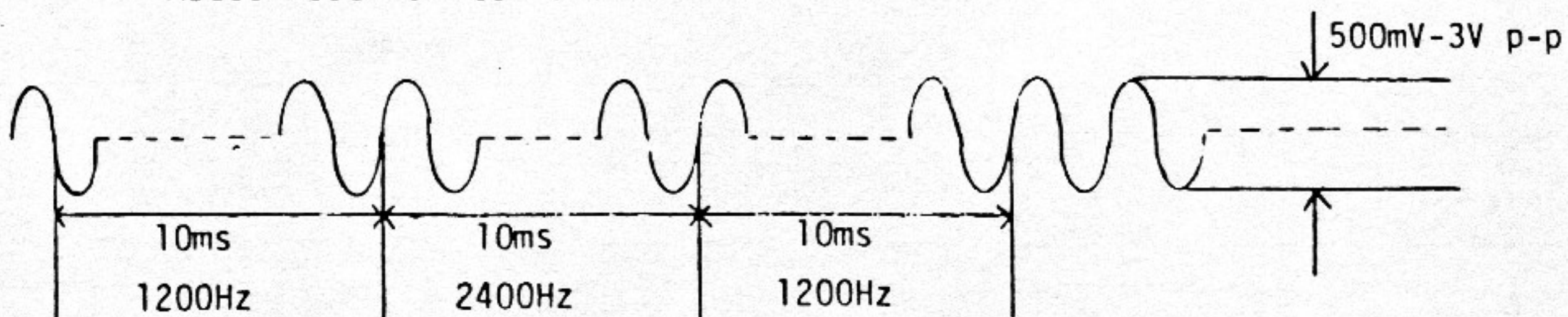


Try checking in the same way as in CW mode.

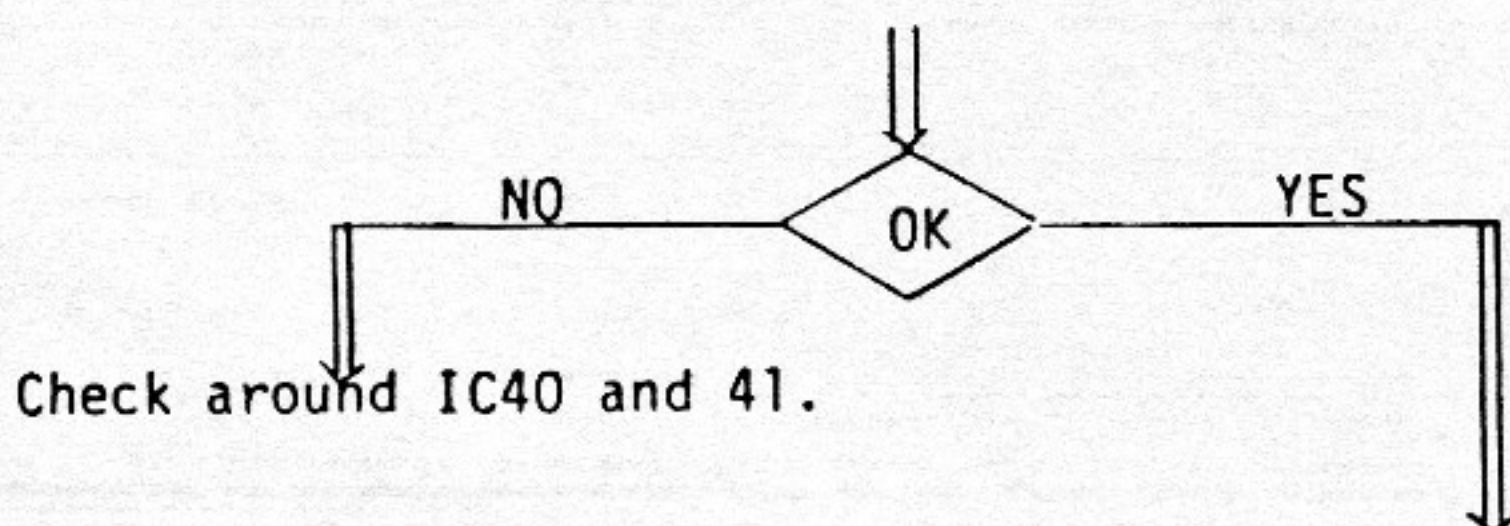
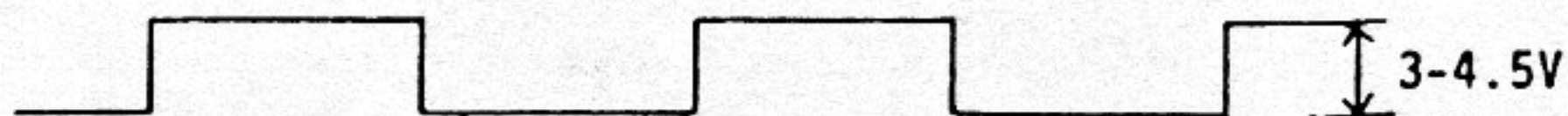
(5) How to check when the receiving in ASCII mode is impossible

Send audio signals as follows from KCS pin jack on the back panel.

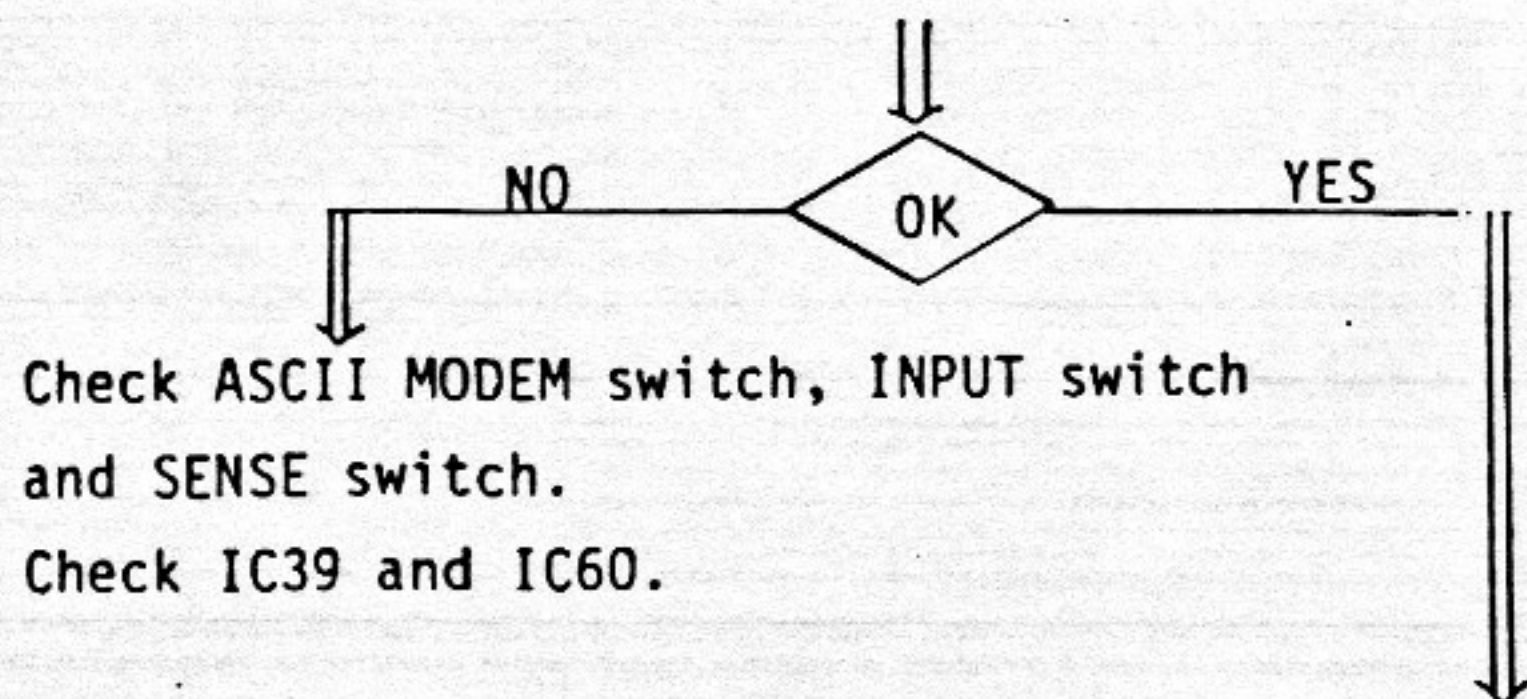
ASCII MODEM switch should be at KCS.



Check the wave shape of TP12 if it is as follows or not:



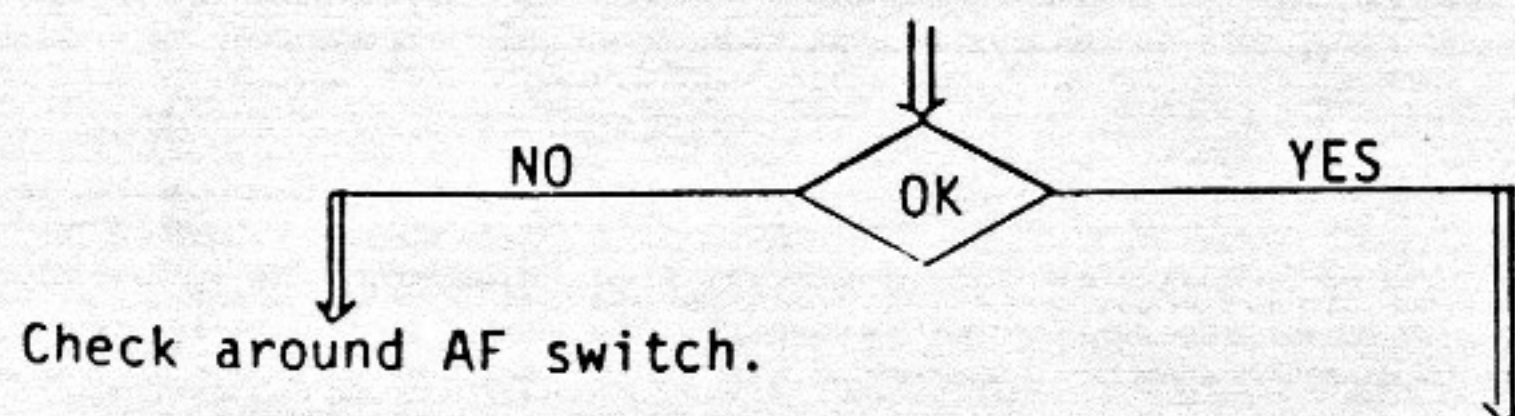
Confirm that the wave shape of TP11 is the same as that of TP12 or the inverse.



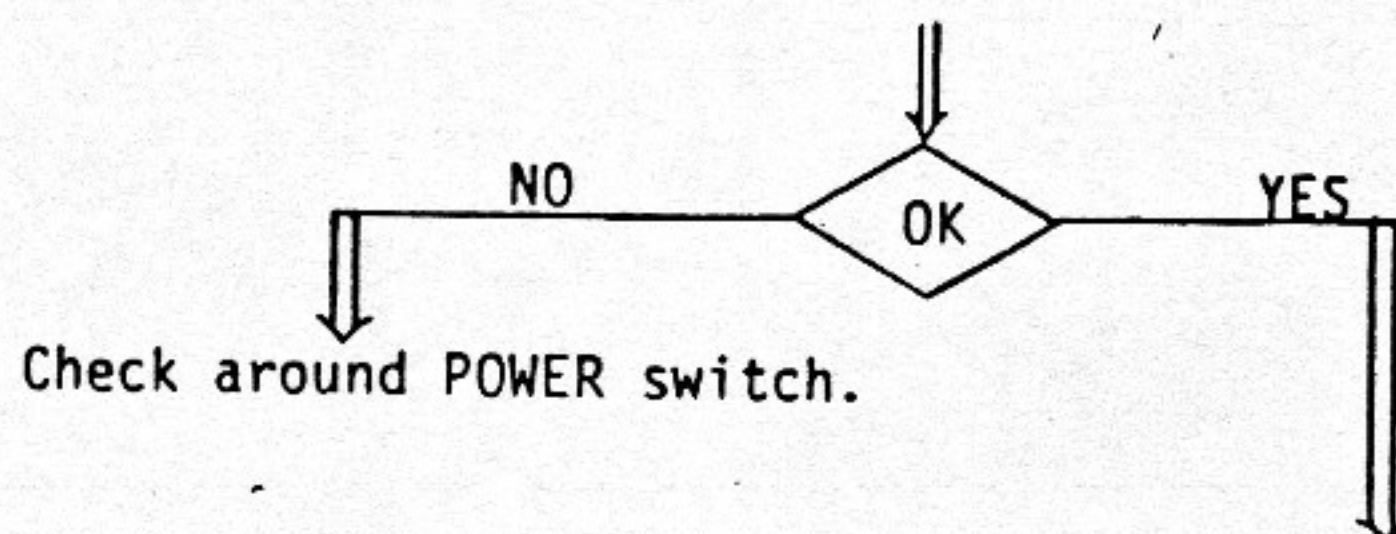
Trouble is judged to exist in any other parts than the parts above mentioned.

(6) How to check when the receiving sound or the transmitting sound from a speaker is not heard.

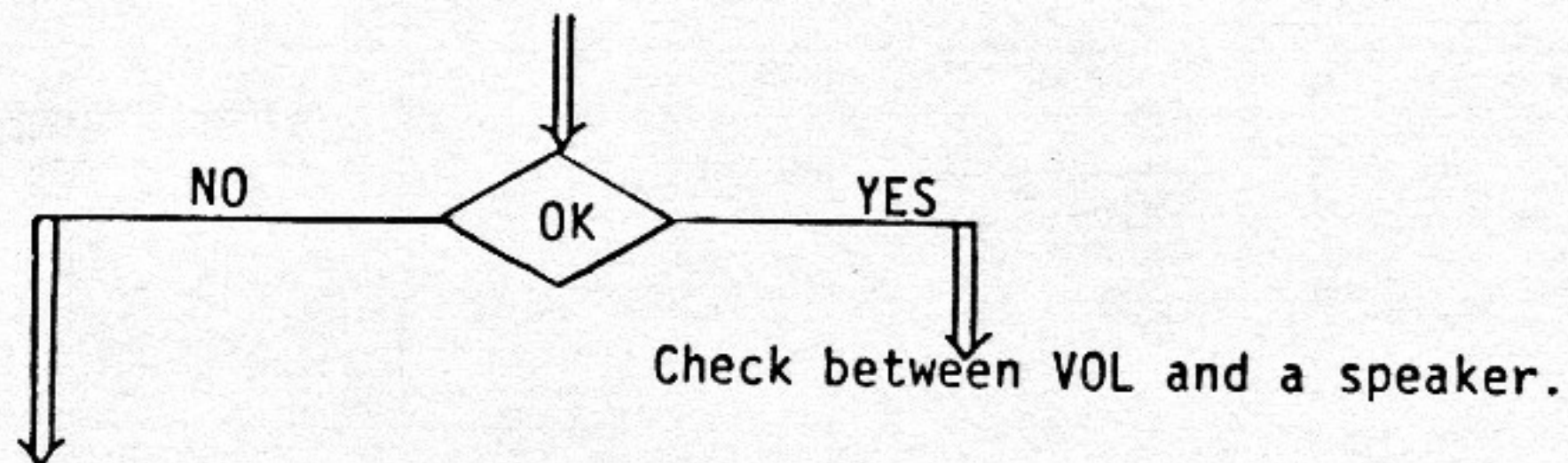
Check AF switch on the front panel.



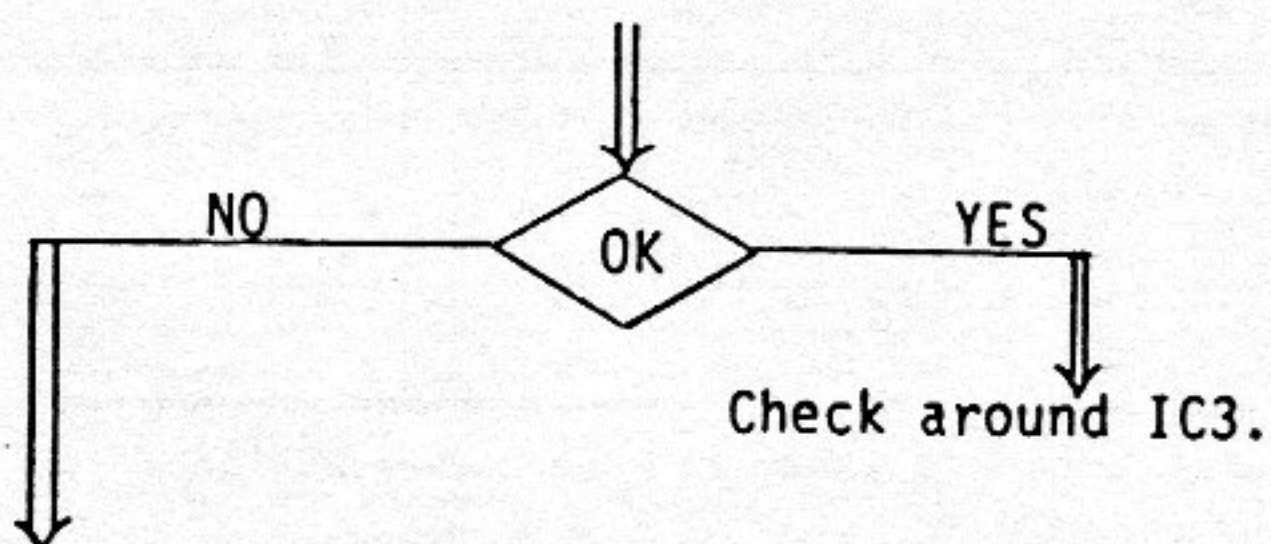
Check POWER switch on the front panel.



Check whether signals come to the input side of VOL on the front panel.

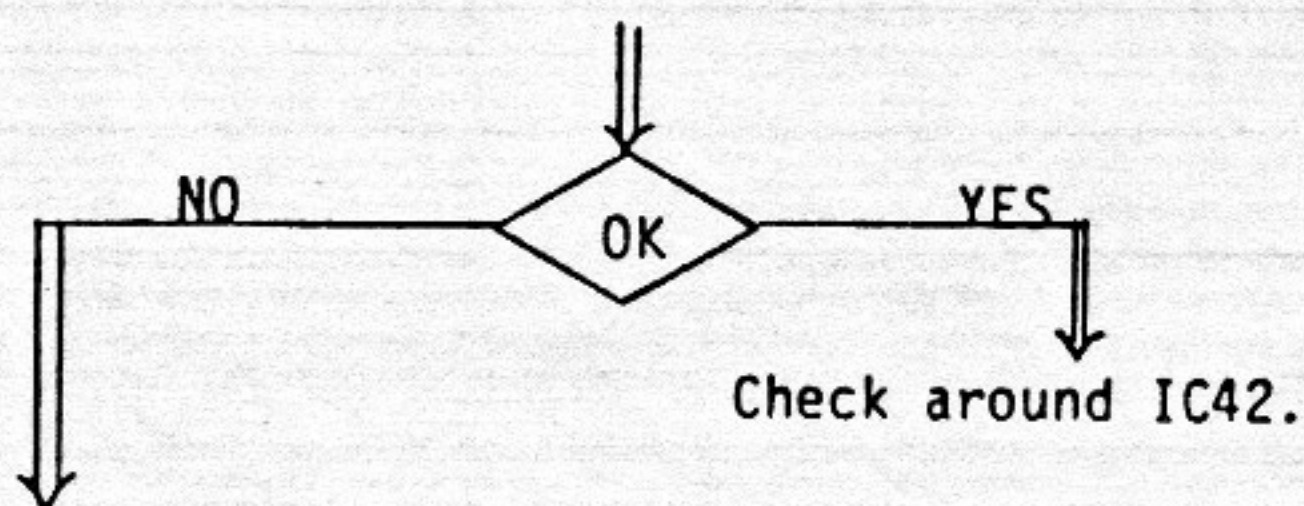


Check whether signals come to the 3rd pin of IC42 in the case of trouble in receiving.



Check IC42 or around AF switch on the front panel.

In the case of trouble in transmitting, check whether signals come to the 2nd, 4th, 12th, 15th pins of IC42.

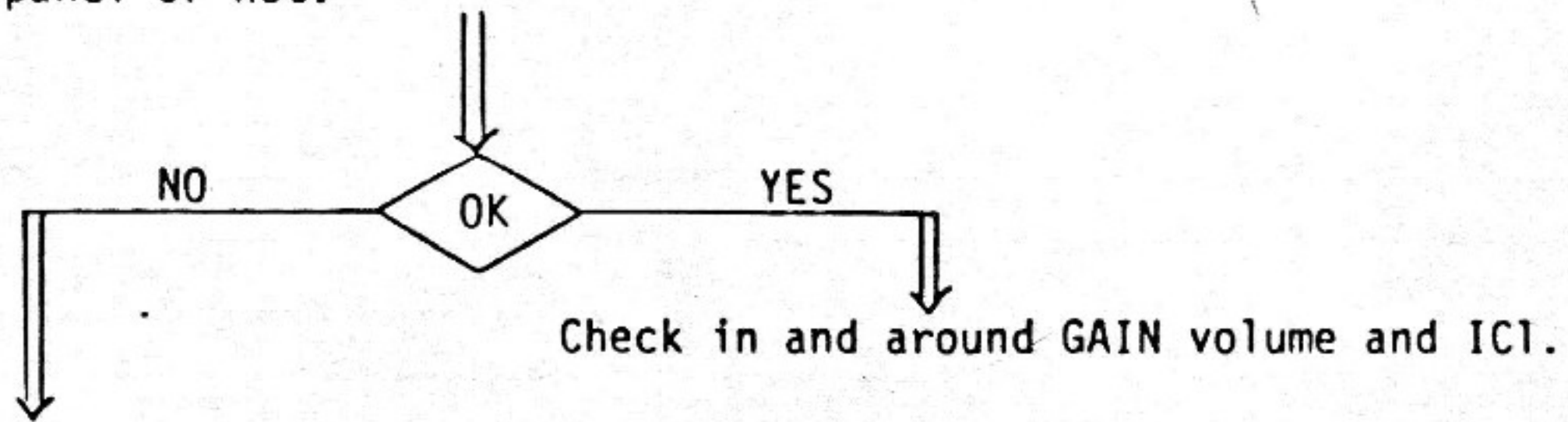


Check around IC41, IC61 and IC46.

(7) How to check when no signals come from AFSK OUT pin jack on the back panel

Check around AFSK OUT pin jack.

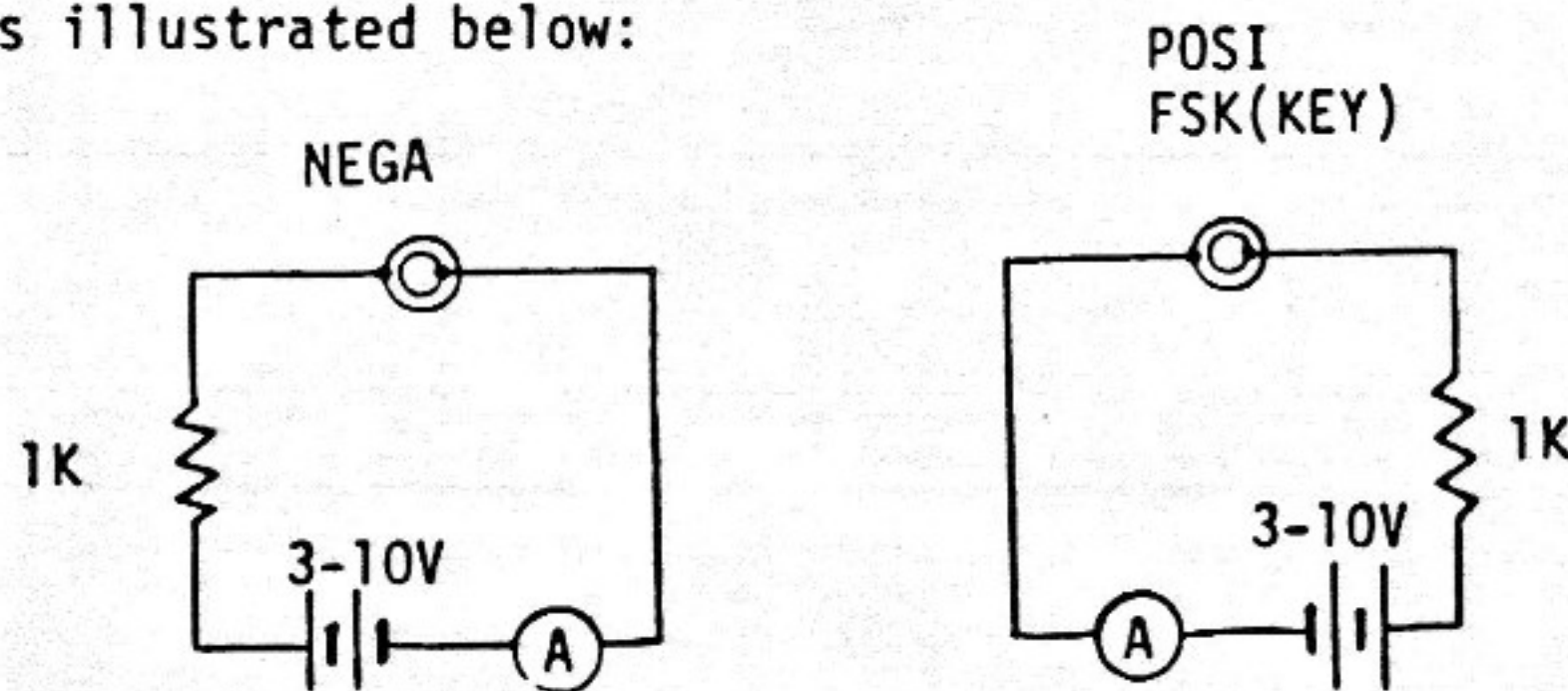
Confirm whether signals come to the input side of the volume of GAIN on the back panel or not.



Check around IC41, IC61 and IC46.

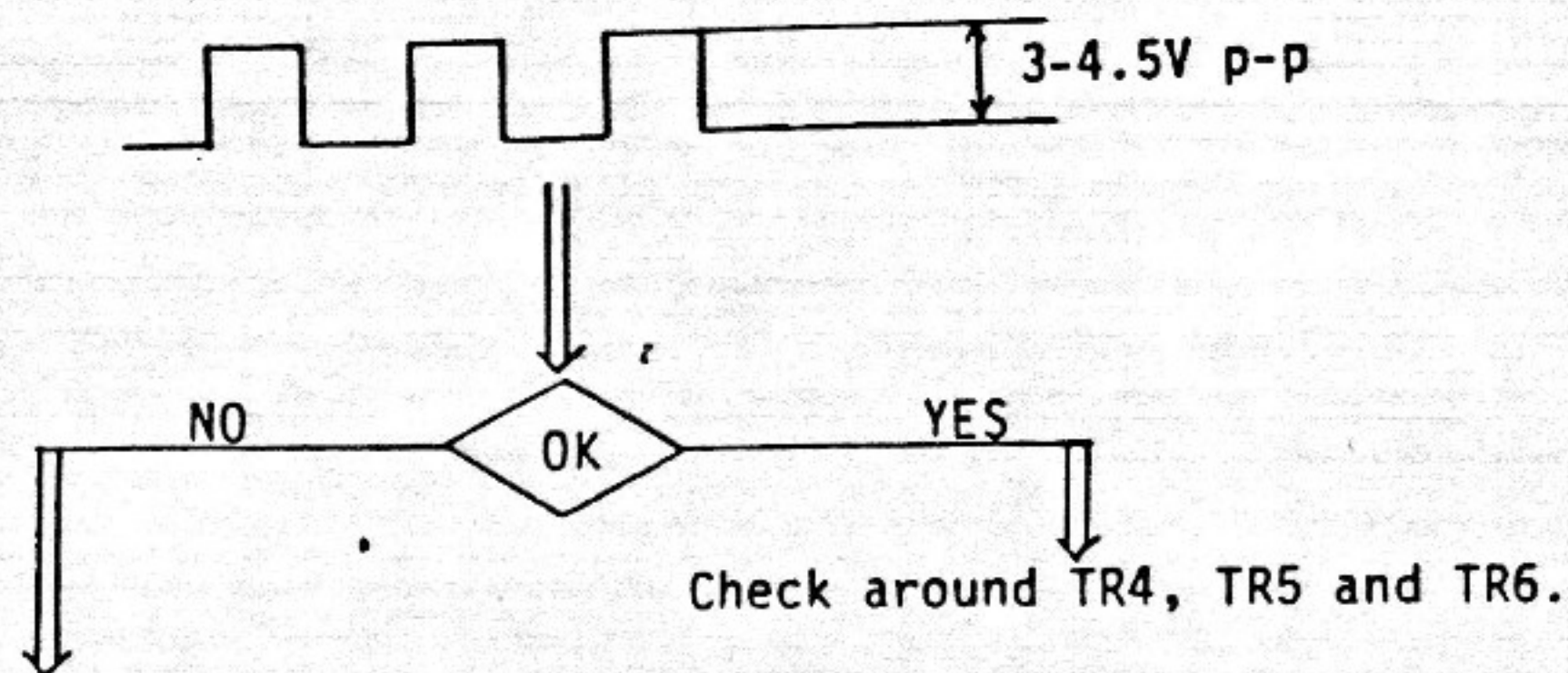
(8) How to check when the keying is impossible in CW(POSI, NEGA) and FSK

Check as illustrated below:



Check whether the current is on the ammeter when you push the keys.

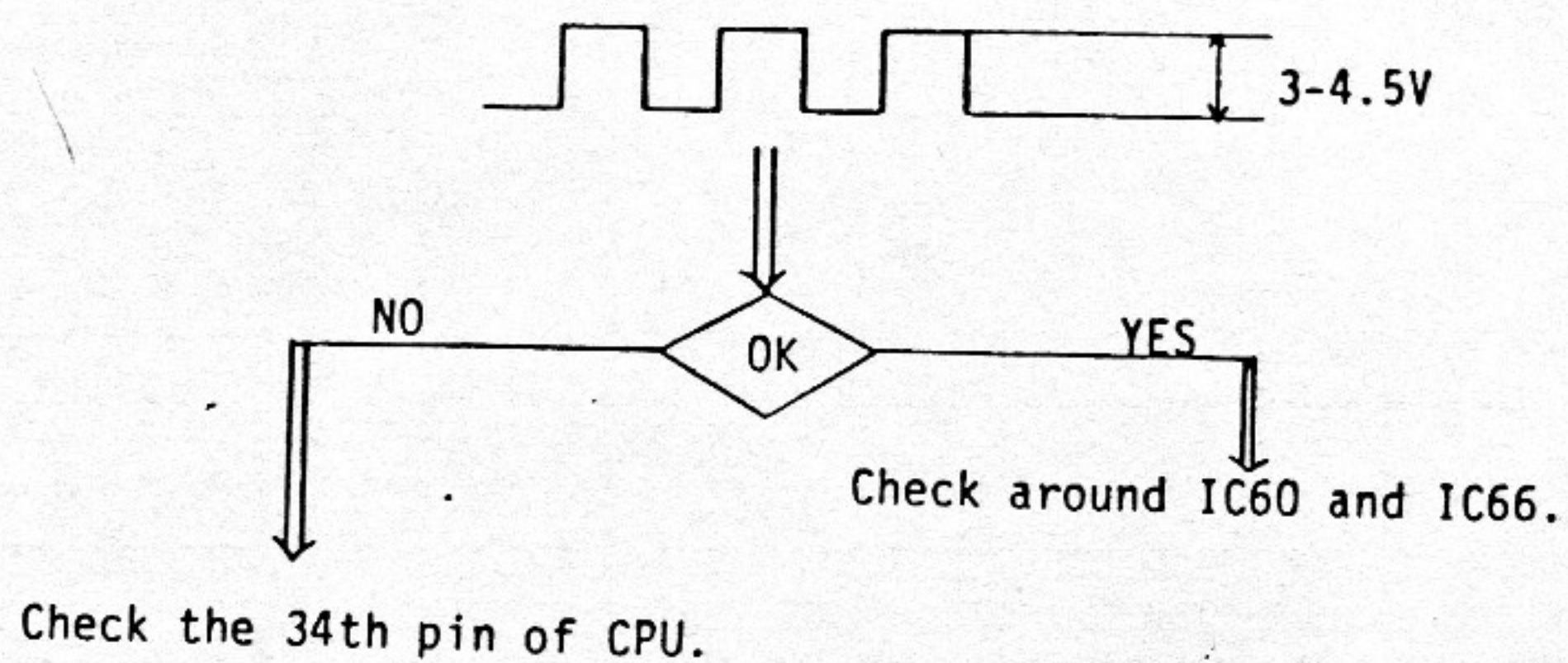
Check around the MODE switch on the front panel. Check whether the signal as follows comes at TP19.



Check around IC60, IC66 and IC65.

Check whether the signal as follows comes to the 3rd or 4th pin of IC66.

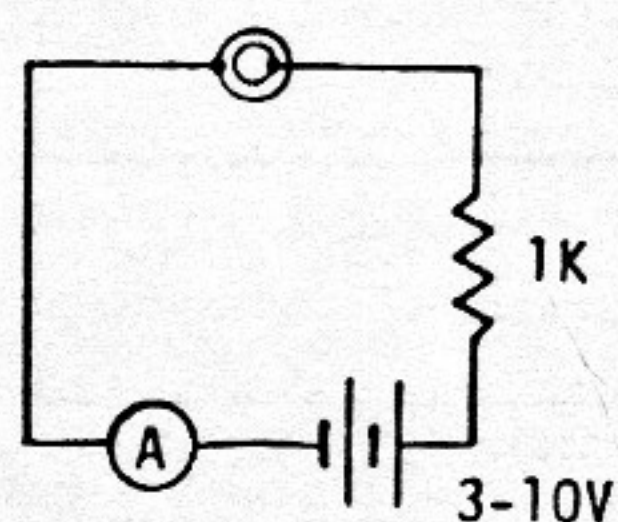




(9) How to check ID and REMOTE pin jack

Connect with the pin jack as follows. Check if the current is on with the instruction of the keyboard **SHIFT I** or **SHIFT X**

ID and REMOTE



SPARE PARTS LIST

IC				
Code No.	Name of the Part	Manu- facturer	Part No.	
IC 1	OP amp.	NEC	μPC324C	*
2-4	"	MOTOROLA	MC3301P	
5,6	"	"	MC3302P	
7	TTL	HITACHI	HD74LS04P	*
8	CPU	NEC	D8039LC	*
9,10	EE-PROM	mitsubishi	M5L2716K	*
11,12	TTL	"	M74LS75P	*
13,14	C MOS	TOSHIBA	TC5012BP or MOTOROLA MC14503BCP	
15	TTL	TI	SN74LS151N	*
16	"	"	SN74LS145N	*
17,18	"	MITSUBISHI	M74LS75P	*
19,20	"	"	"	*
21,22	C MOS	MOTOROLA	MC14066BCP or MC14016BCP	*
23	4K bit Bipolar PROM	NEC	μPB425	
24	TTL	MITSUBISHI	M74LS96P	*
25	"	TI	SN74LS90	
26,27	Static RAM (N-ch)	NEC	μPD2114LC	*
28-31	Static RAM (C MOS)	MITSUBISHI	M5L5101LP-1	*
32	TTL	HITACHI	HD74LS73P	*
33,34	"	TI	SN74LS93N	
35	"	HITACHI	HD74LS74AP	*
36	"	TI	SN74LS93N	
37,38	"	HITACHI	HD74LS157P	*
39	"	MITSUBISHI	M74LS151P	*
40	"	TI	SN74LS122N	*
41	"	HITACHI	HD74LS74AP	*
42	C MOS	MOTOROLA	MC14051BCP	*
43	-----	-----	-----	-----
44,45	TTL	MITSUBISHI	M74LS75P	*
46	C MOS	MOTOROLA	MC14569B	
47-50	TTL	MITSUBISHI	M74LS32P	*
51	-----	-----	-----	-----
52	TTL	MITSUBISHI	M74LS51P	*
53	C MOS	HITACHI	HD14001BP	*
54,55	TTL	MITSUBISHI	M74LS02P	*
56	"	TI	SN74LS11W	*
57,58	"	"	SN74LS08N	*
59	"	"	SN74LS05N	*
60	C MOS	MOTOROLA	MC14077BCP	*
61	TTL	TI	SN74LS00N	*
62-64	"	HITACHI	HD74LS04P	*
65	"	TI	SN74LS05N	*
66	C MOS	MOTOROLA	MC14066BCP or MC14016BCP	*
67	"	"	MC14053BCP	*
68	"	"	MC14051BCP	*
69	Voltage Regulator	NEC	μPC14305H	
70	TTL	HITACHI	HD74LS42P	*
71,72	-----	-----	-----	-----
73,74	TTL	HITACHI	HD7405P	*
				NOTE: * or equivalent

Code No.	Name of the Part	Part No.
DIODE		
D1-4	Diode	1S1588
8-10	"	"
11,12	"	1N60
13-17	"	1S1588
18	Zener Diode	RD18EC
19-21	Diode	W03C
22-25	"	1S1588
26	Zener Diode	RD3.3EB
27-40	Diode	1S1588
41	-----	-----
42-64	"	1S1588
65	"	W03C
70,71	"	1S1588
72	"	1S1588
73,74	"	1S1588
LED1-5	LED	AR5134S
VARIABLE RESISTOR		
VR8 VR15	Volume Control "	V16L4N-KC25-5KB V16L4N-KC25-5KA
CHOKING COIL		
CH1-6	Choking Coil	ELQ-S470KB
7	"	1H4R7
8	Inductance	SL0609-471K
9	Choking Coil	ELQ-S470KB
OTHER PARTS		
SP	Speaker	66P15-34
X1	Quartz Crystal	5.9535 MHz
T	Matching Transformer	27910A
L1	Oscillating Coil	IFT-61S10-H
L2,3	Low Pass Filter	(4026) L-1S6-B
70E-P3-4009B	Heat Sink	A1050P t=3
70E-P3-4038B	Shield Case	C2801P-O t=0.4
70E-P3-4040B	Shield Case Cover	"
R56-0950	Keyboard Switch	KBD-863M
Mini Bus	Mini Bus	NC58-08
	"	NC5852-05

Code No.	Name of the Part	Part No.
TRANSISTOR		
TR 1,2	Transistor	2SC1815-5
3	"	2SA949
4-7	"	2SC2610
8	"	2SC1815-5
9	"	2SC1923
10	"	2SC1815-5
11	"	2SC1384
12	"	2SA1015-Y
13	"	2SC1384
CONNECTOR		
CN 1	Connector Plug	M36-04-30-114P
2	"	M36-12-30-114P
3	"	M36-02-30-114P
4,5	"	TDK-25-26PA
6	"	S-Q 3063
7	"	M36-15-30-114P
8	"	AE-705B-00
9	"	M36-15-30-134P
10	"	M36-04-30-114P
11	"	M36-10-30-114P
12,13	"	M36-17-30-114P
14	"	M36-12-30-114P
CN 1	Connector Socket	M36-04-0000SA
2	"	M36-12-0000SA
3	"	M36-02-0000SA
4,5	"	TDK-25-0000SA
6	"	-----
7	"	M36-15-0000SA
8	"	-----
9	"	M36-15-0000SA
10	"	M36-04-0000SA
11	"	M36-10-0000SA
12,13	"	M36-17-0000SA
14	"	M36-12-0000SA
-----	24P IC Socket	DICA-24A-T1
-----	40P IC Socket	DICA-40A-T1
SWITCH		
S 1,2	Lever Switch	A88S-3005
3-5	"	A88S-3003
6	"	A88S-3005
7	Power Toggle Switch	8V2012-M
8-10	Lever Switch	A88S-3003
11	-----	-----
12-15	Lever Switch	A88S-3003

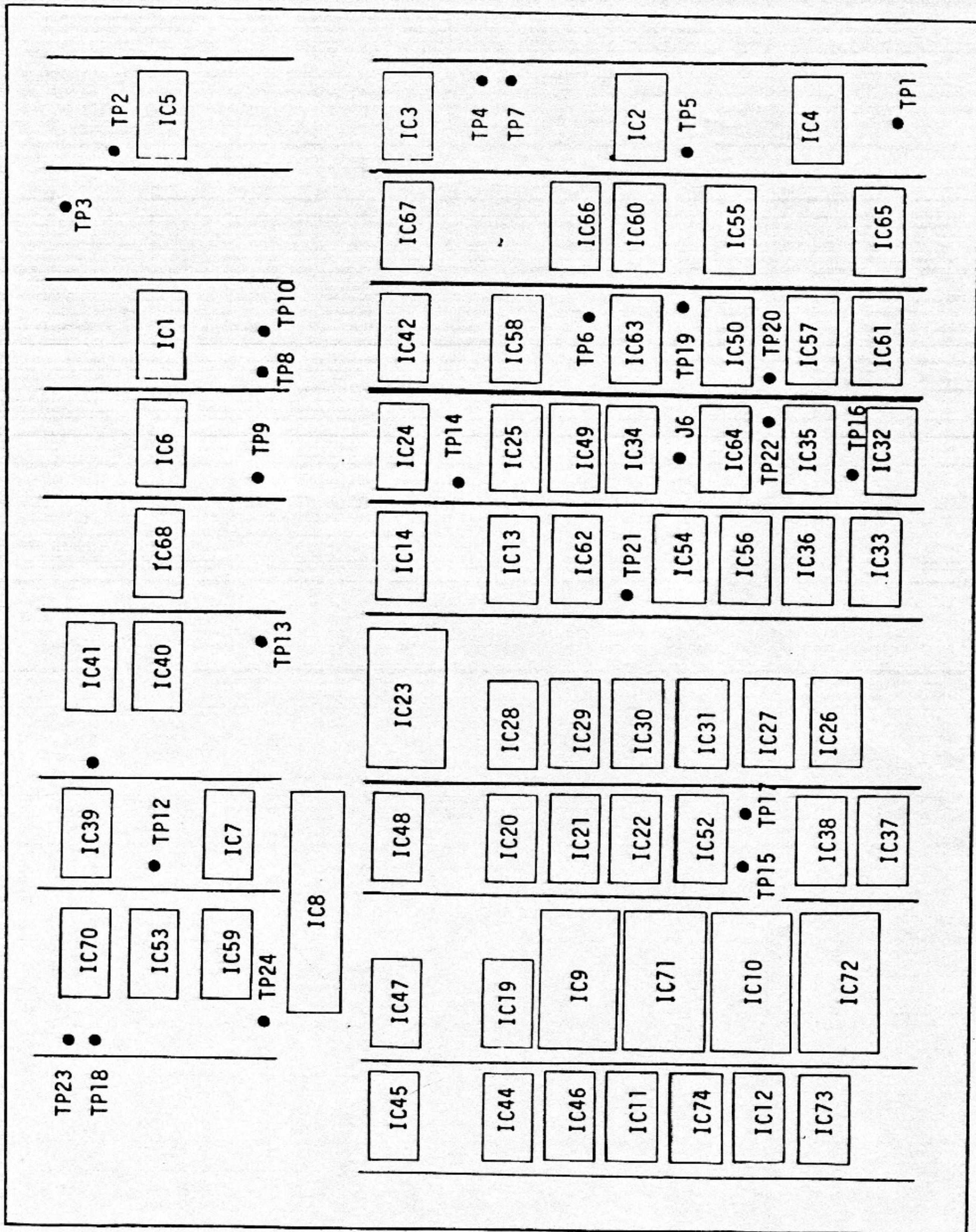
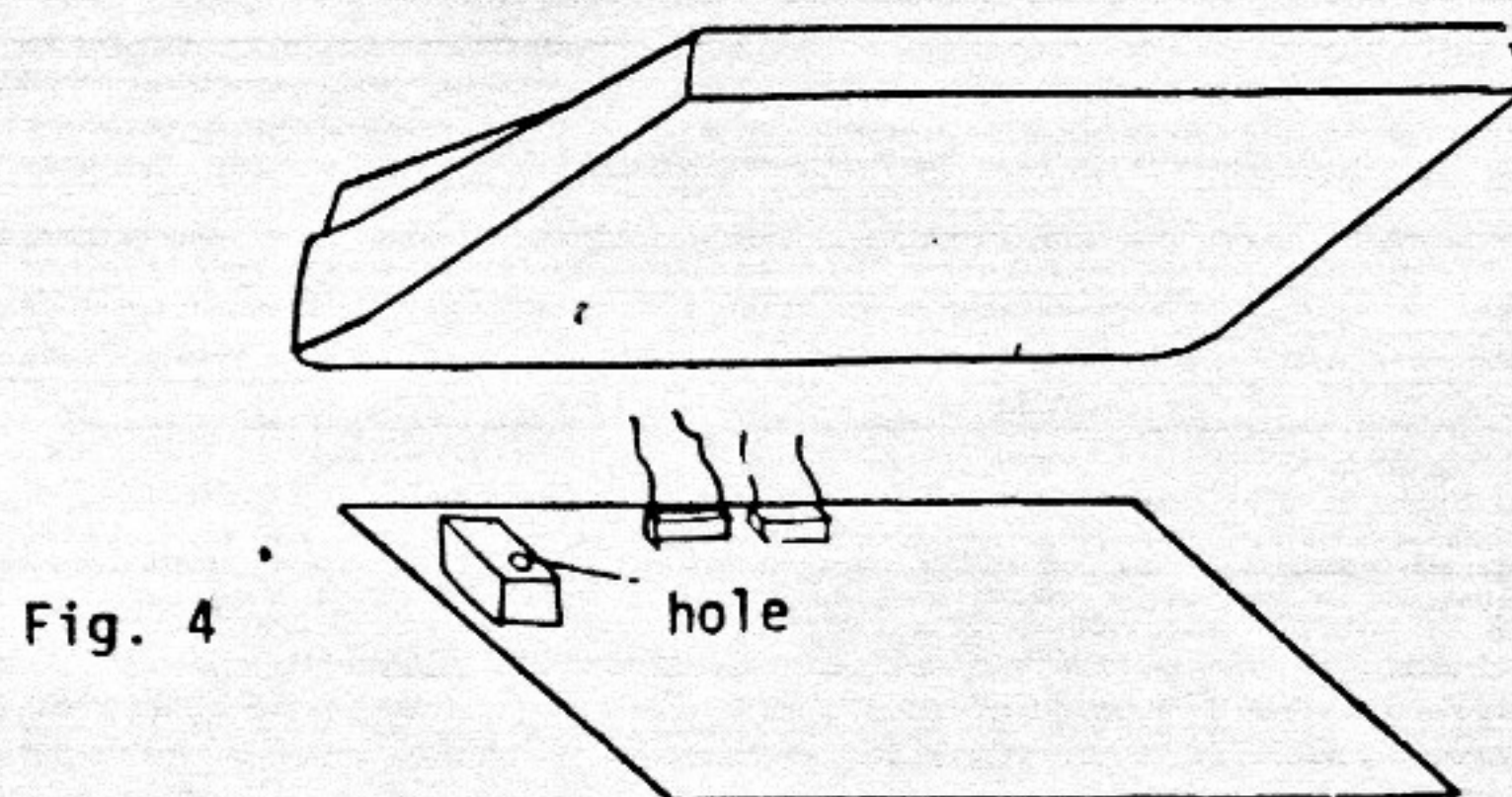
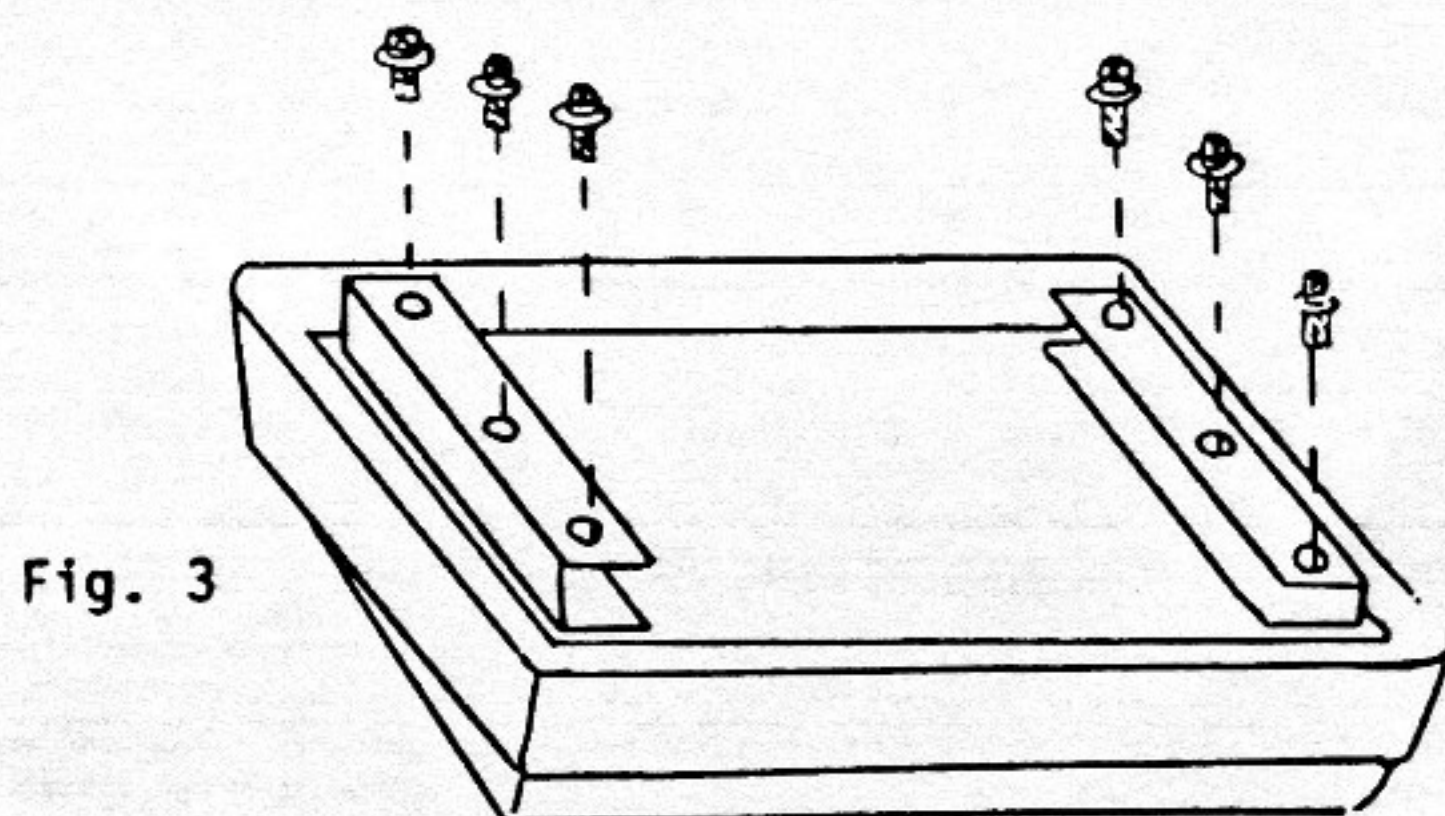
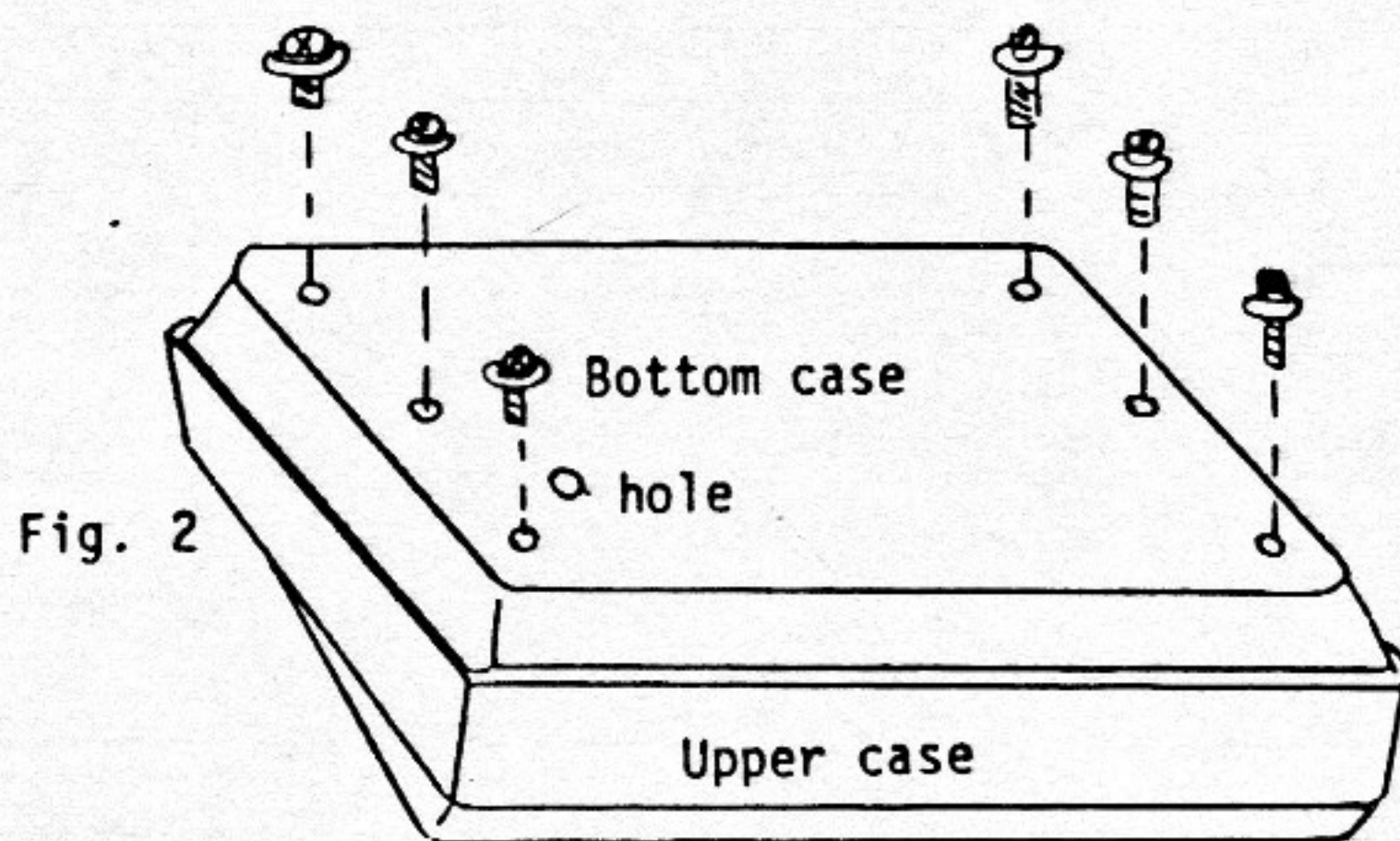
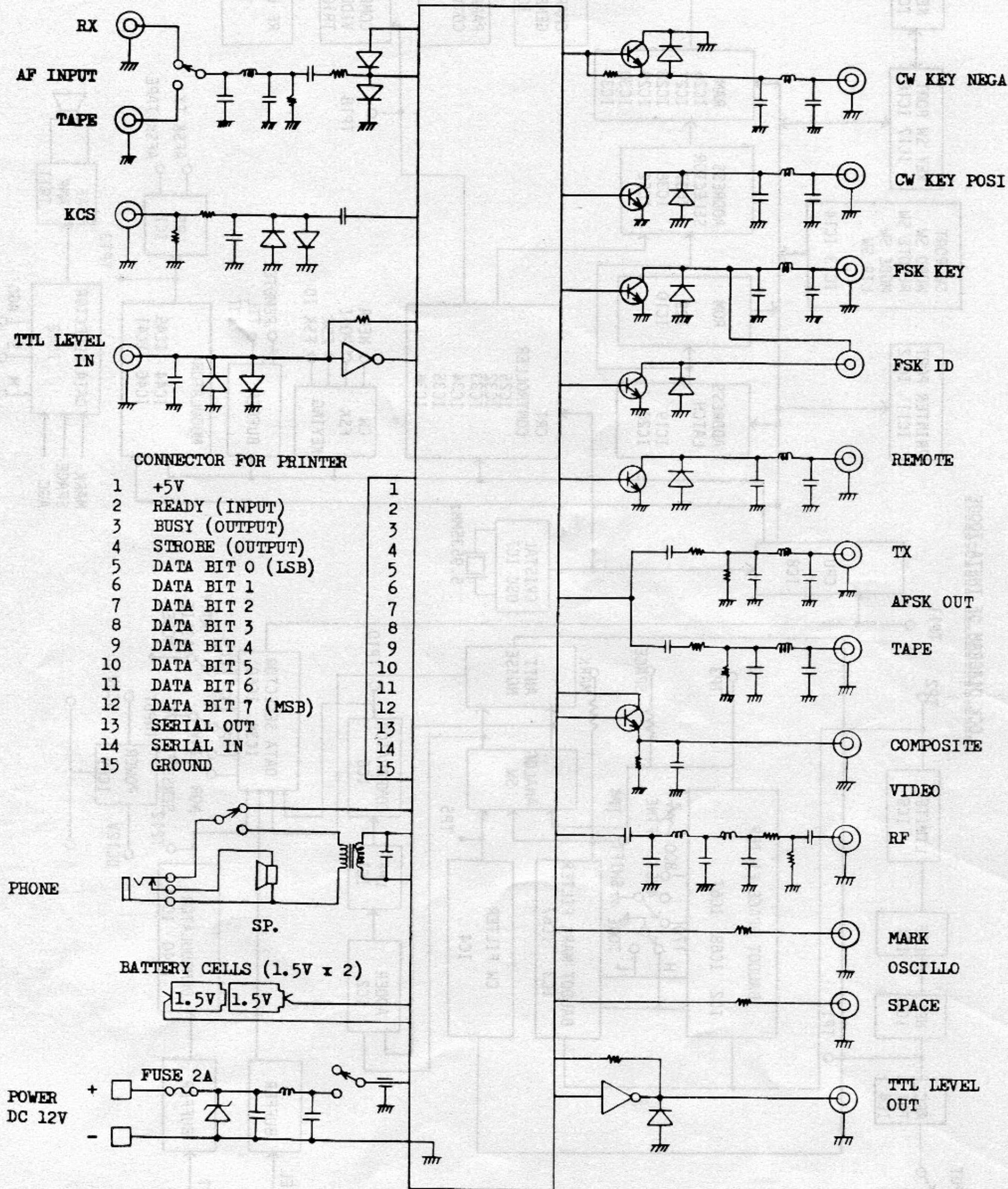


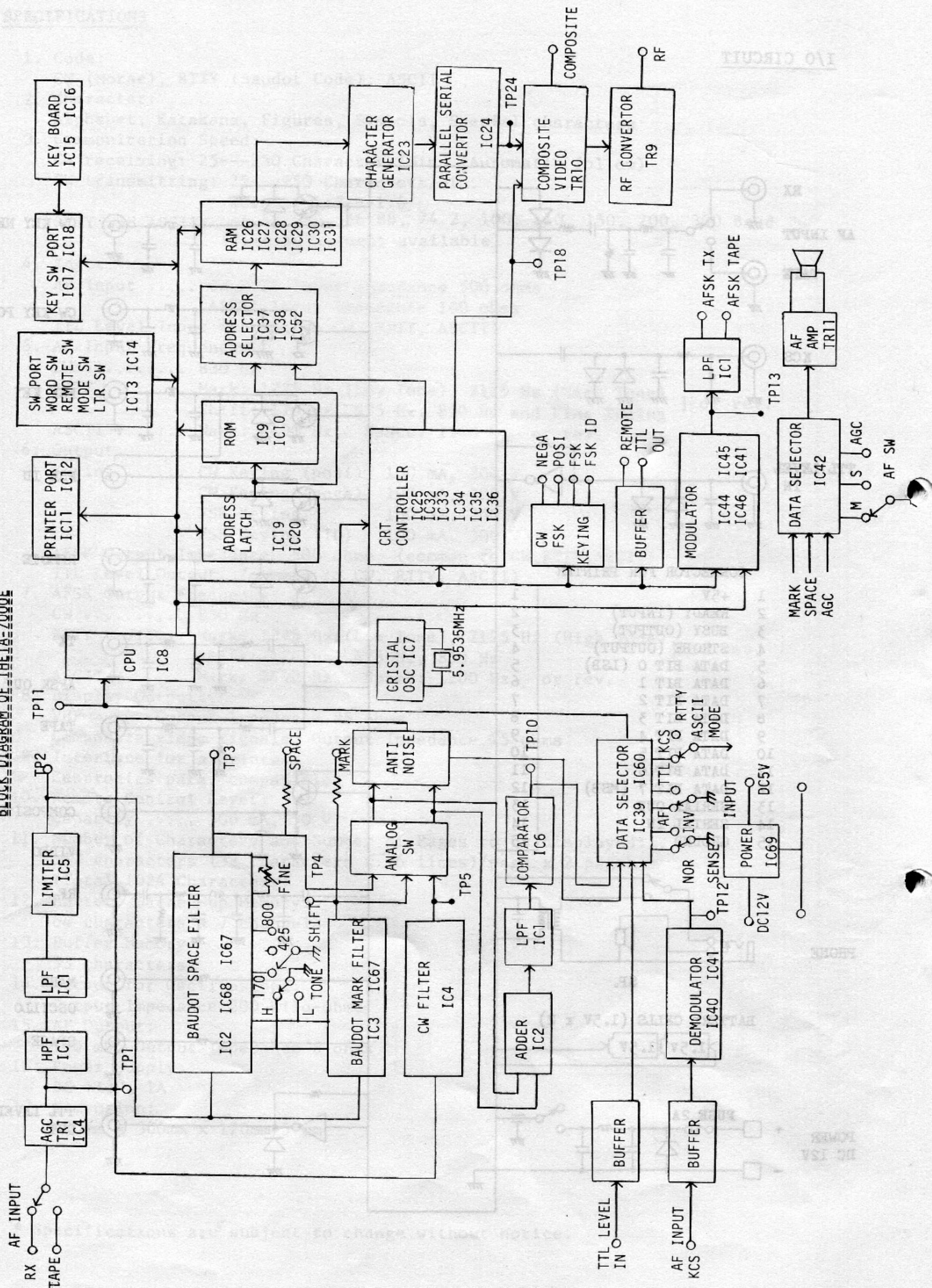
FIG. 1. IC layout

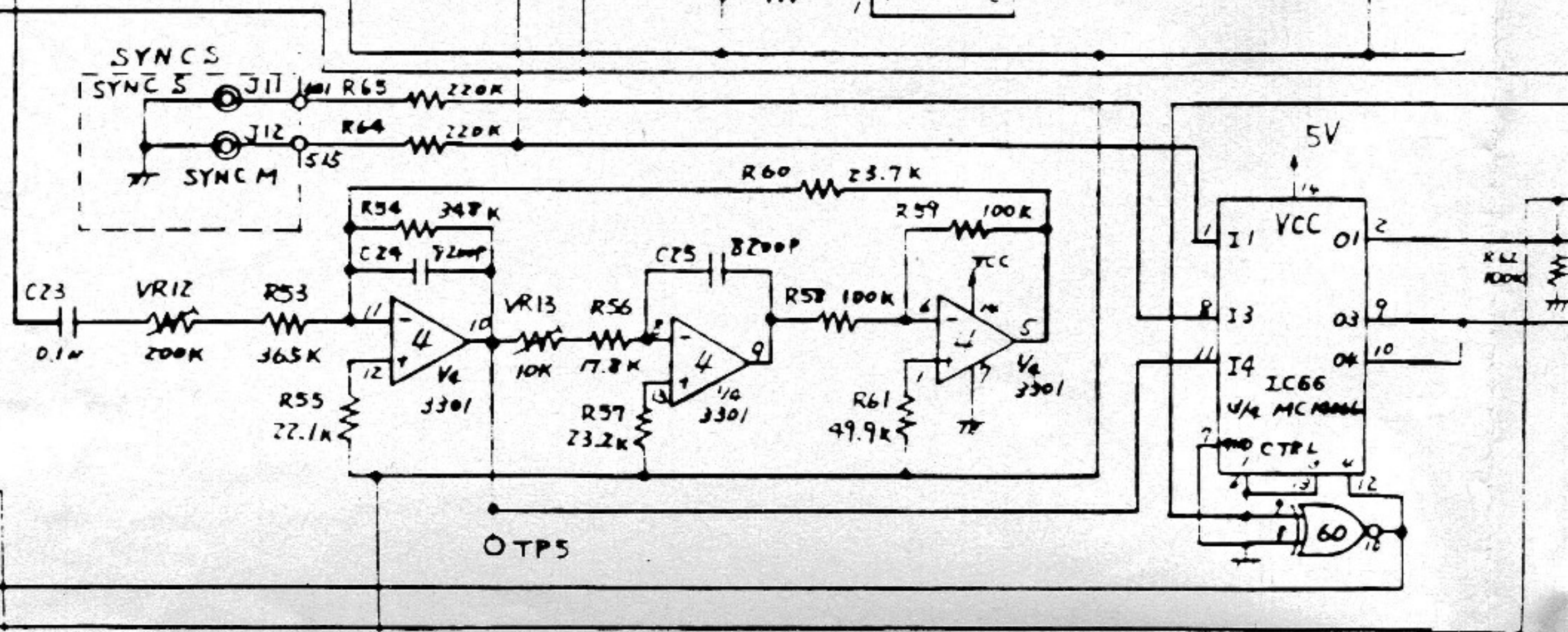


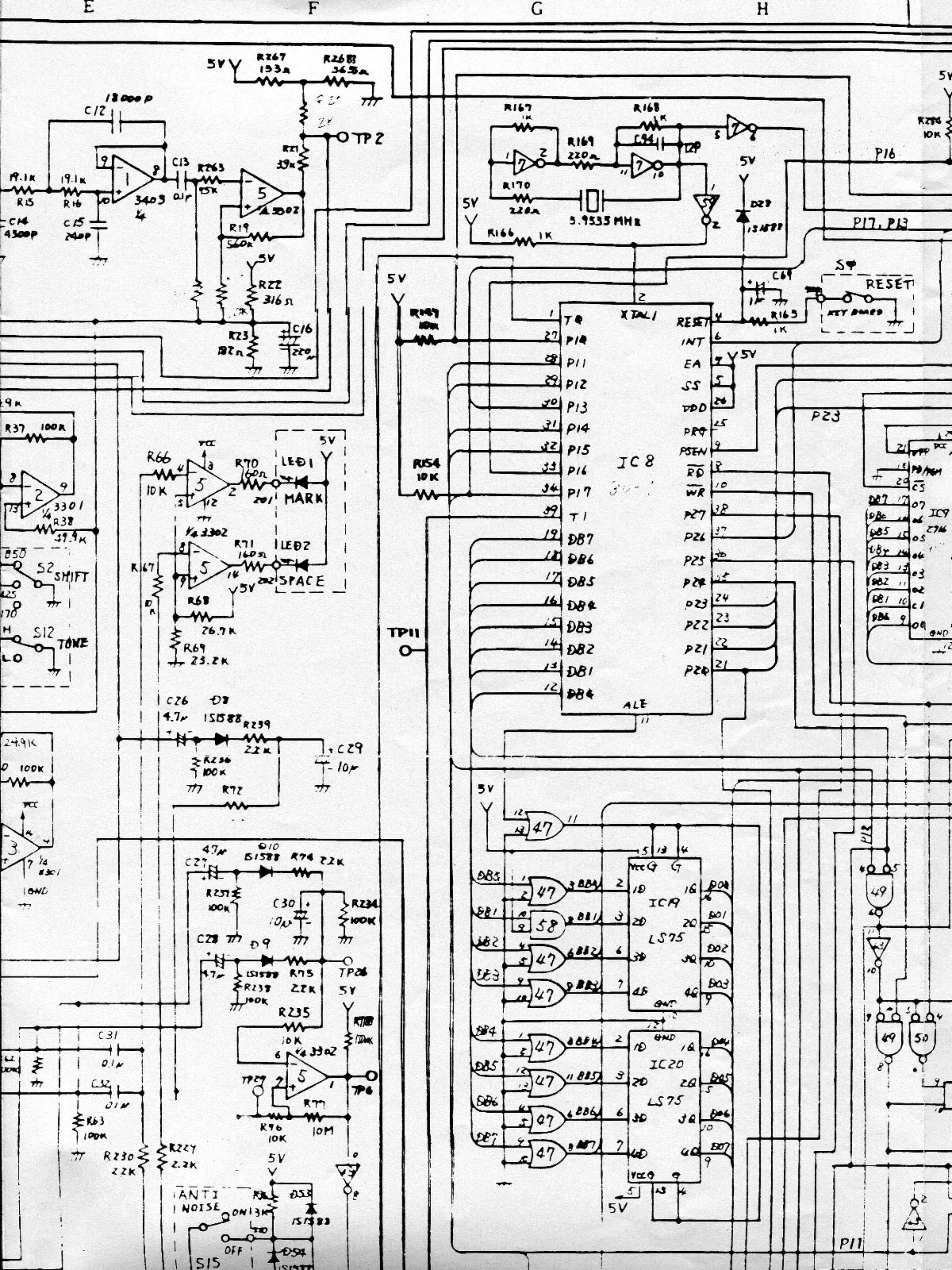
I/O CIRCUIT

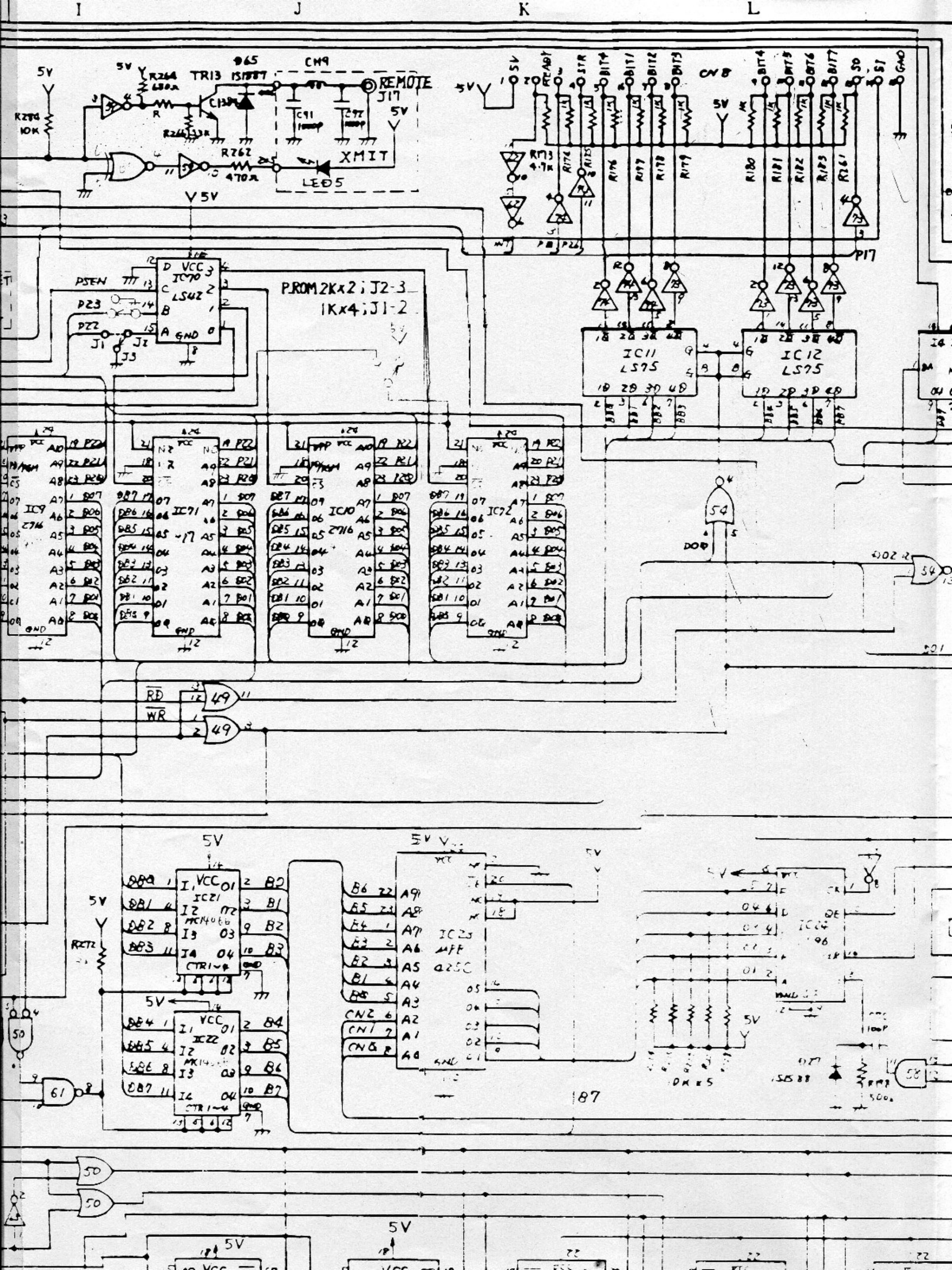


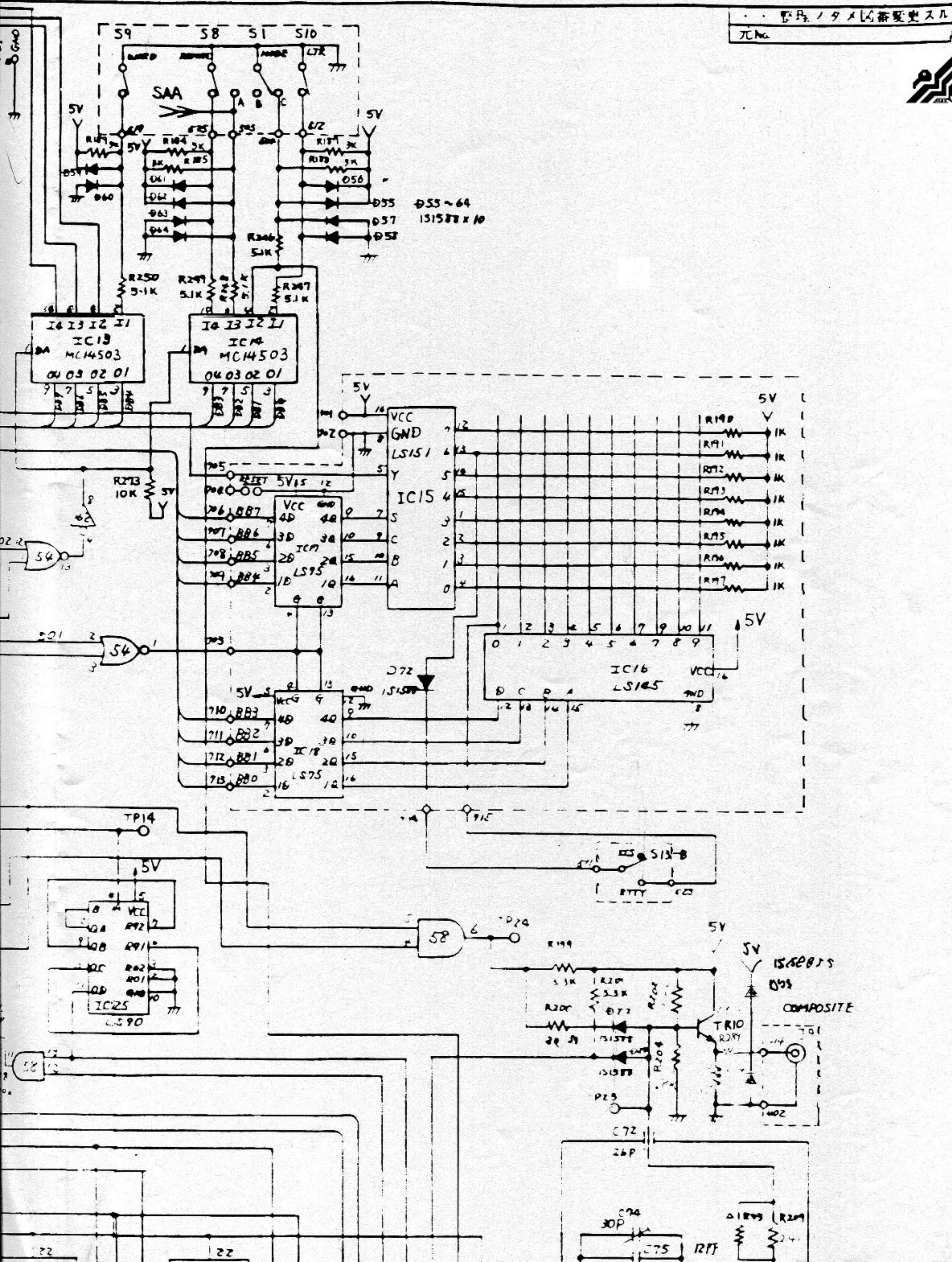
BLOCK DIAGRAM OF THE IA-2000E

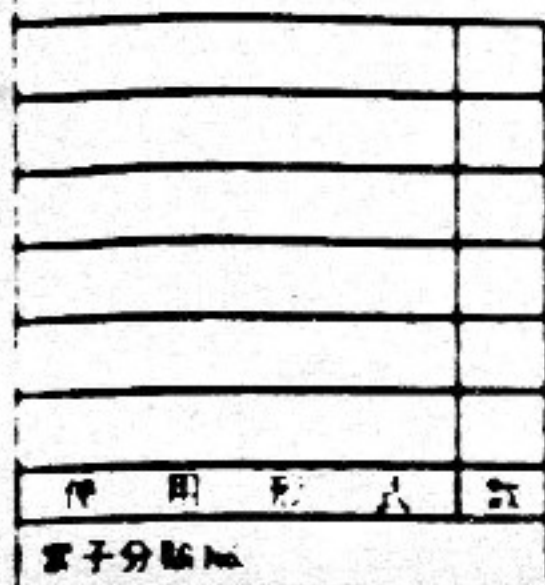


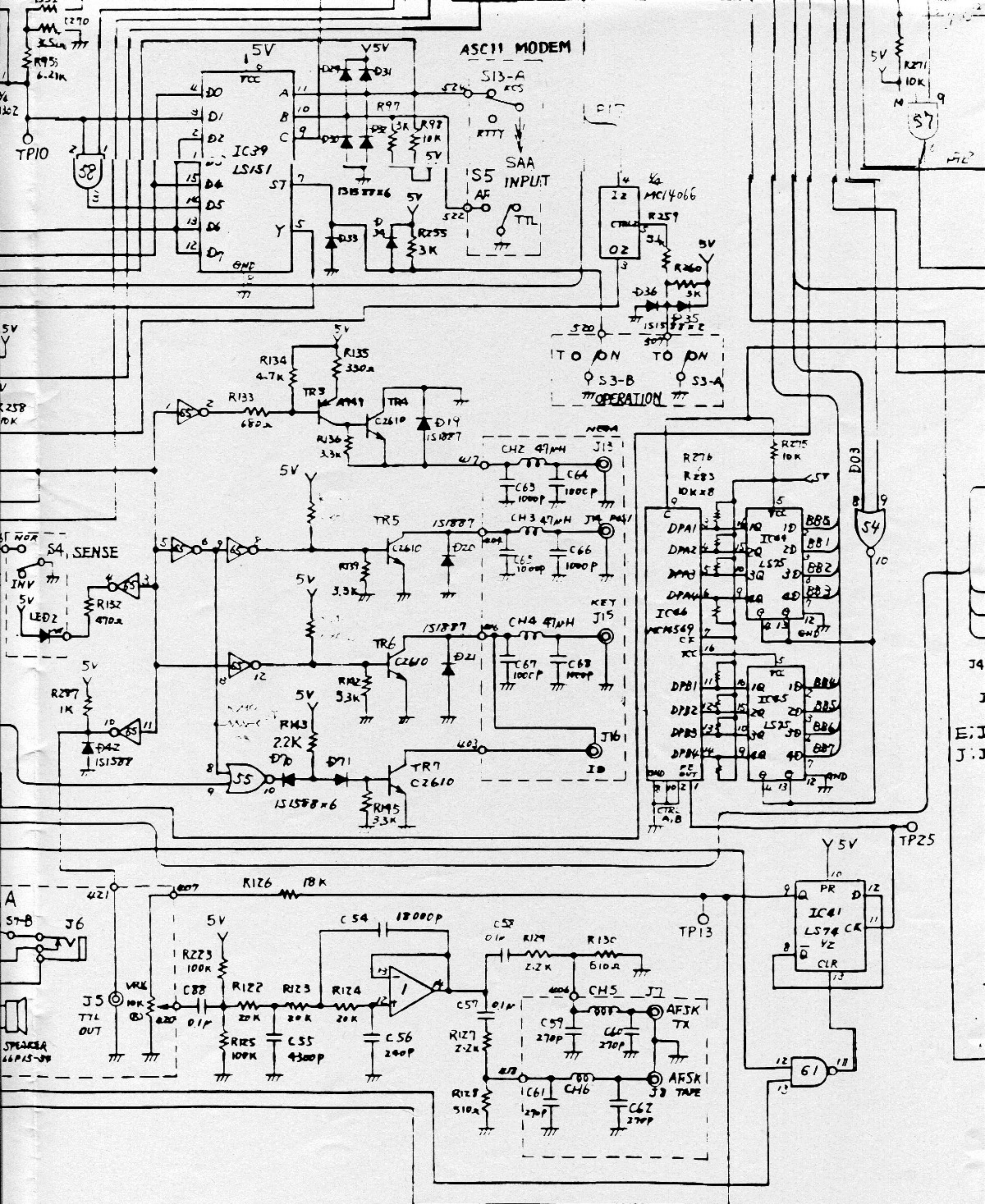


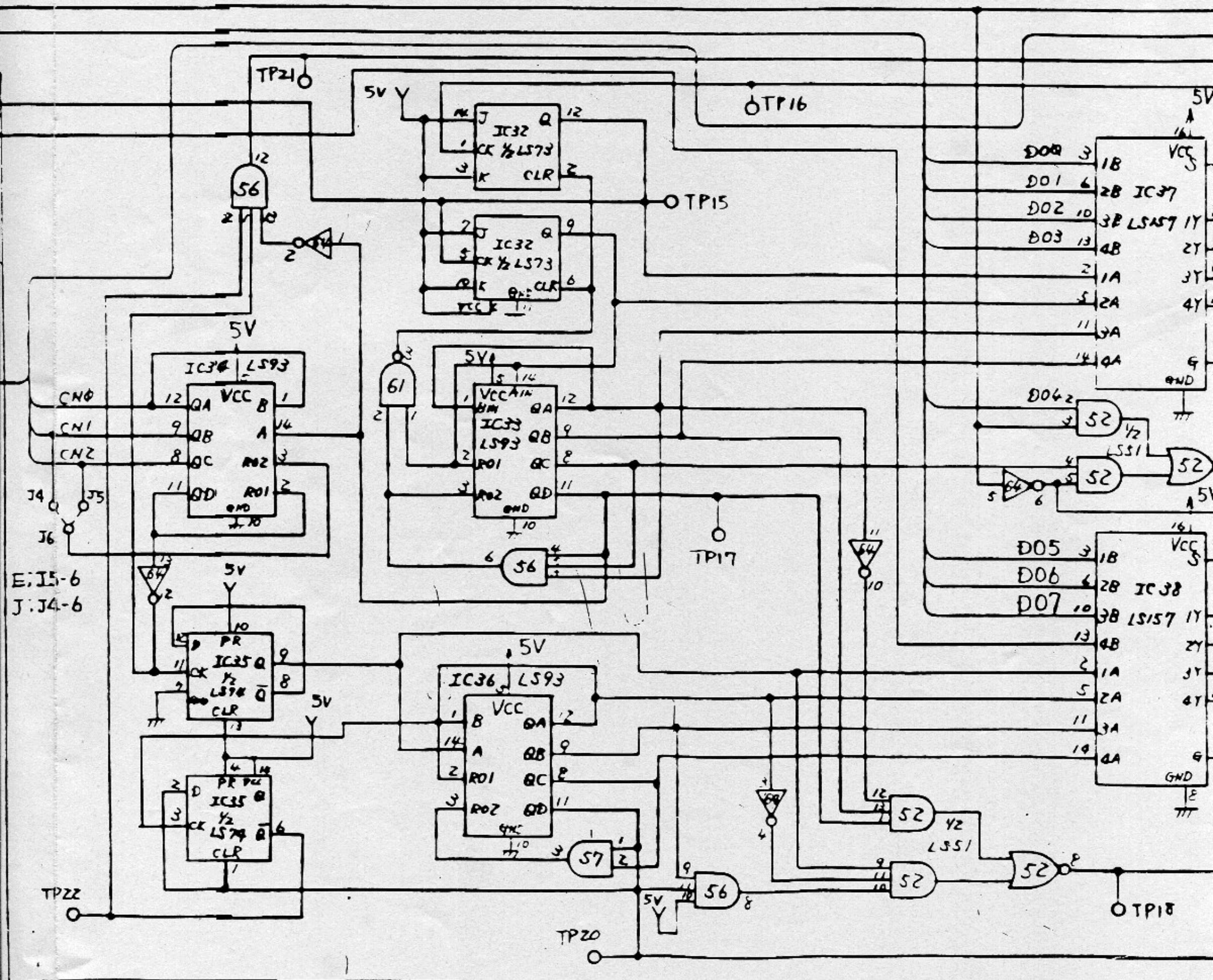
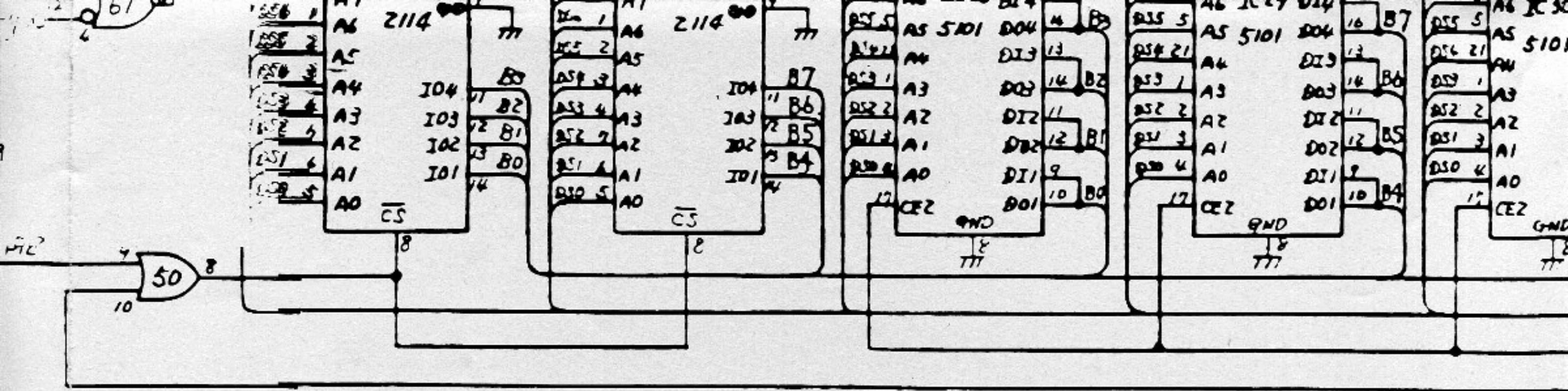


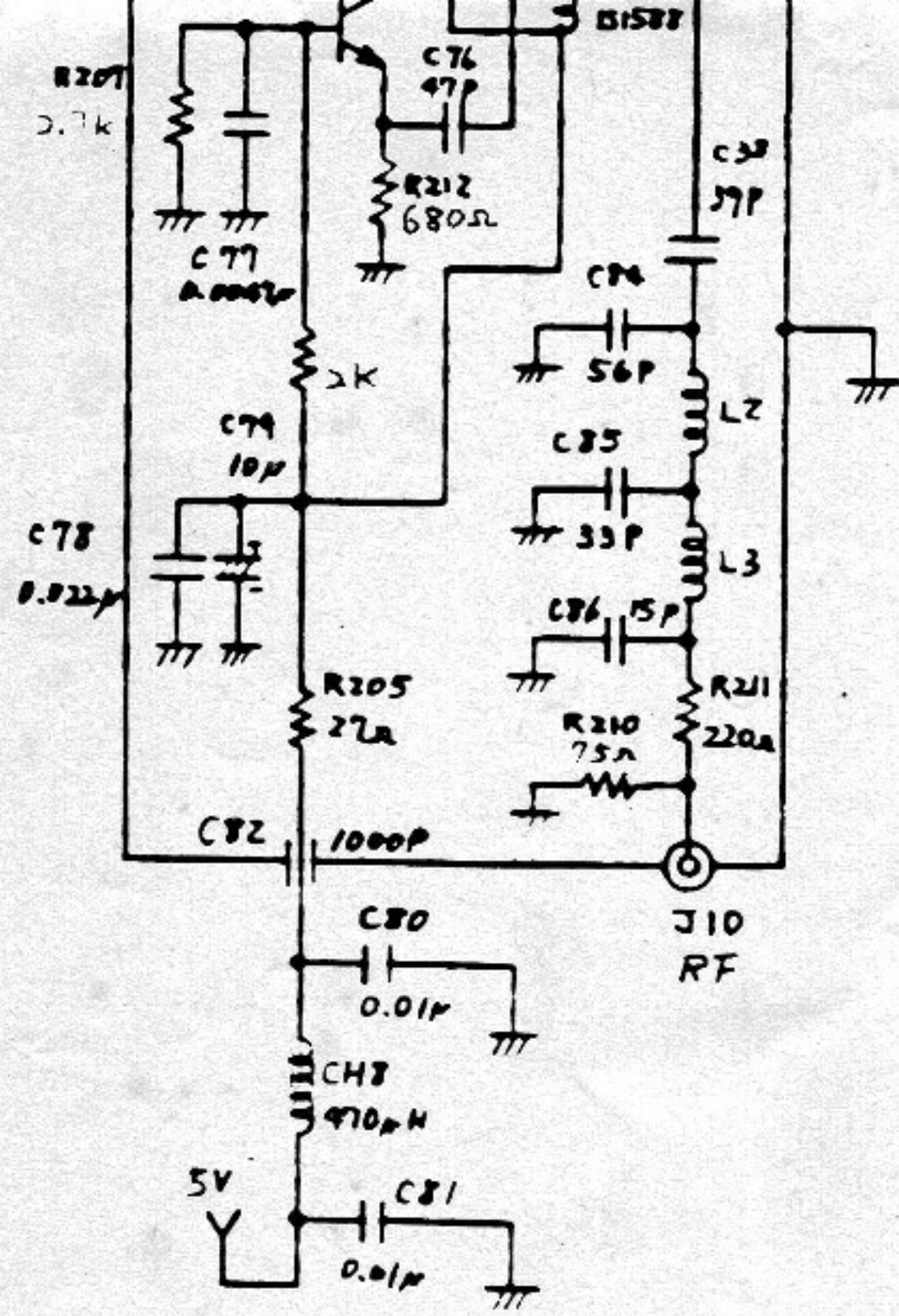
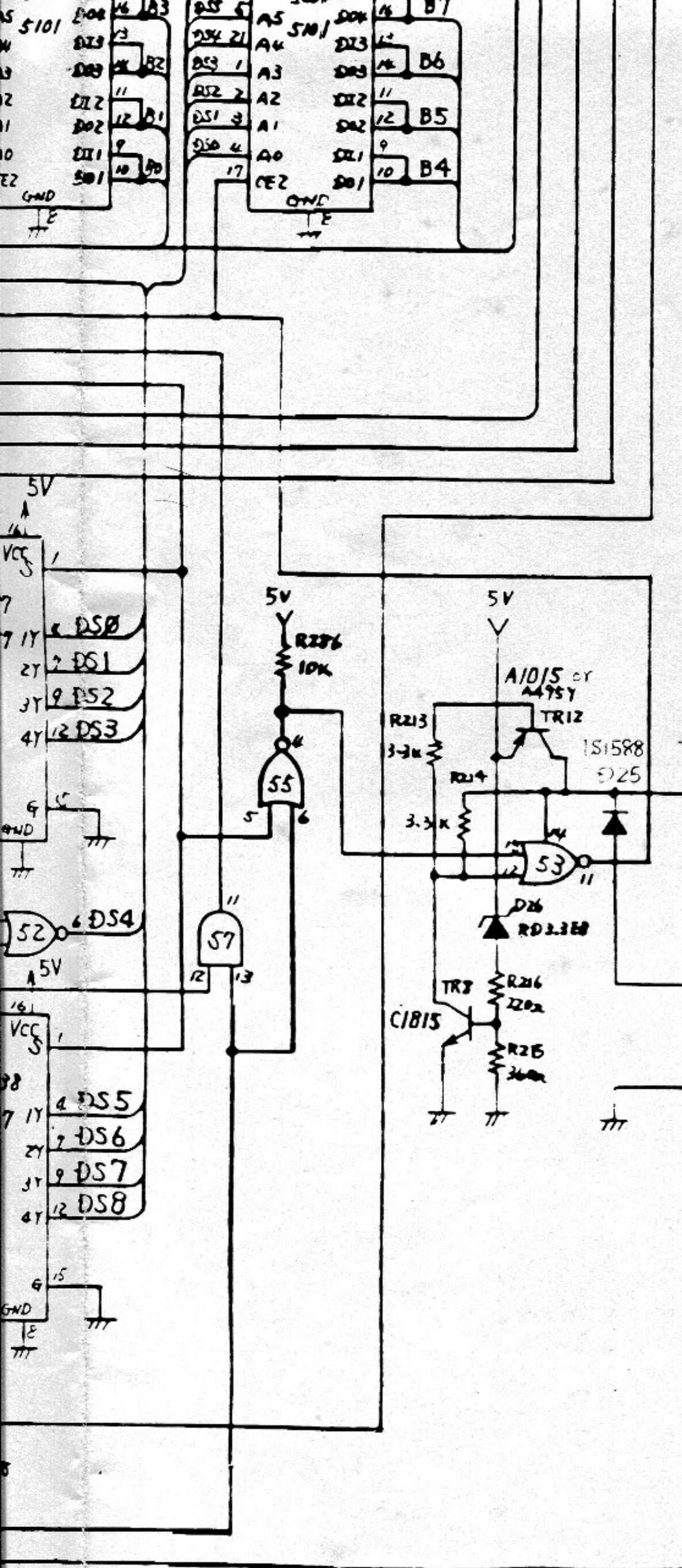












NOTE:

1. R73 and R208 are not installed in European standard model.
2. When 2716 are used in IC9 and IC10, IC71 and IC72 are left open.
3. This schematic is for Serial no. 921000 and up.

TONO

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THETA-7000E

