TONO

COMMUNICATIONS COMPUTER

Θ-7000E

TONO CORPORATION

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

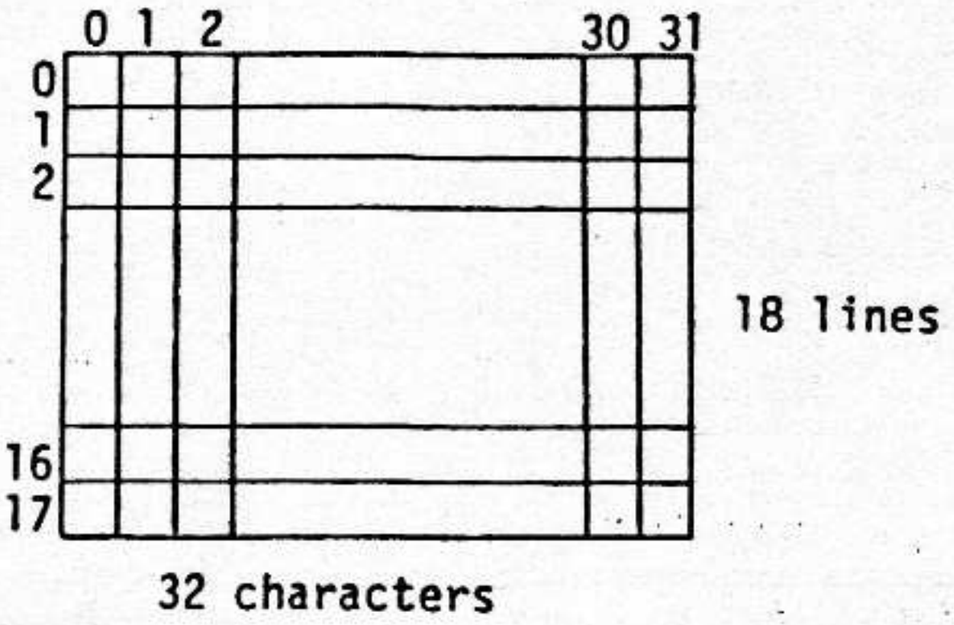
TABLE OF CONTENTS

Chapter 1. OPERATION

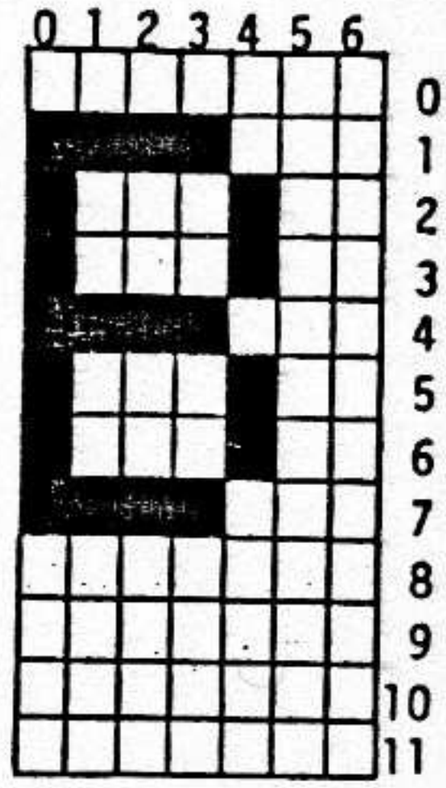
1. The Structure of Screen

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.

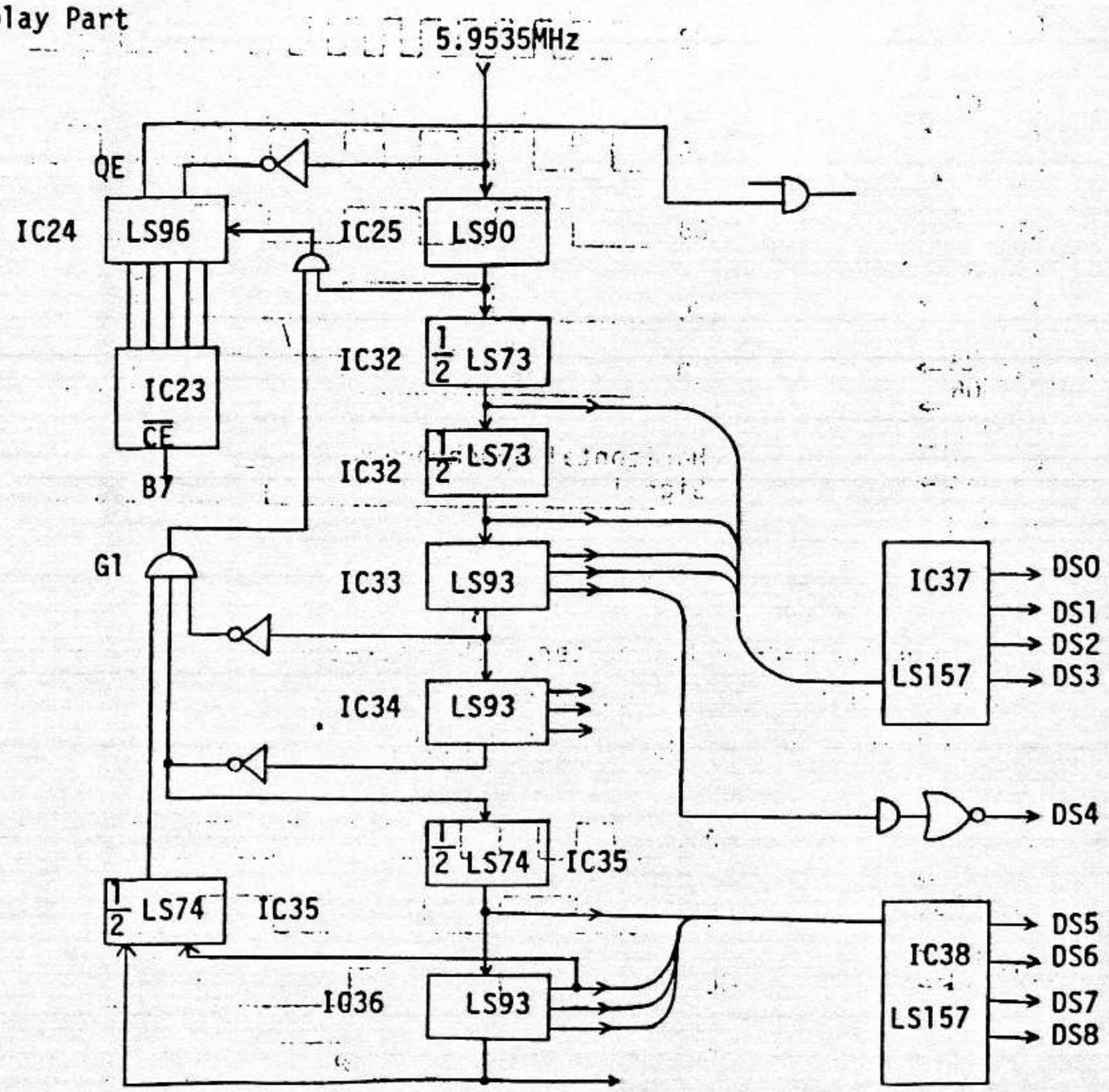
One character consists of 5 x 7 dots. The range of one character is 7 dots wide and 12 dots long.



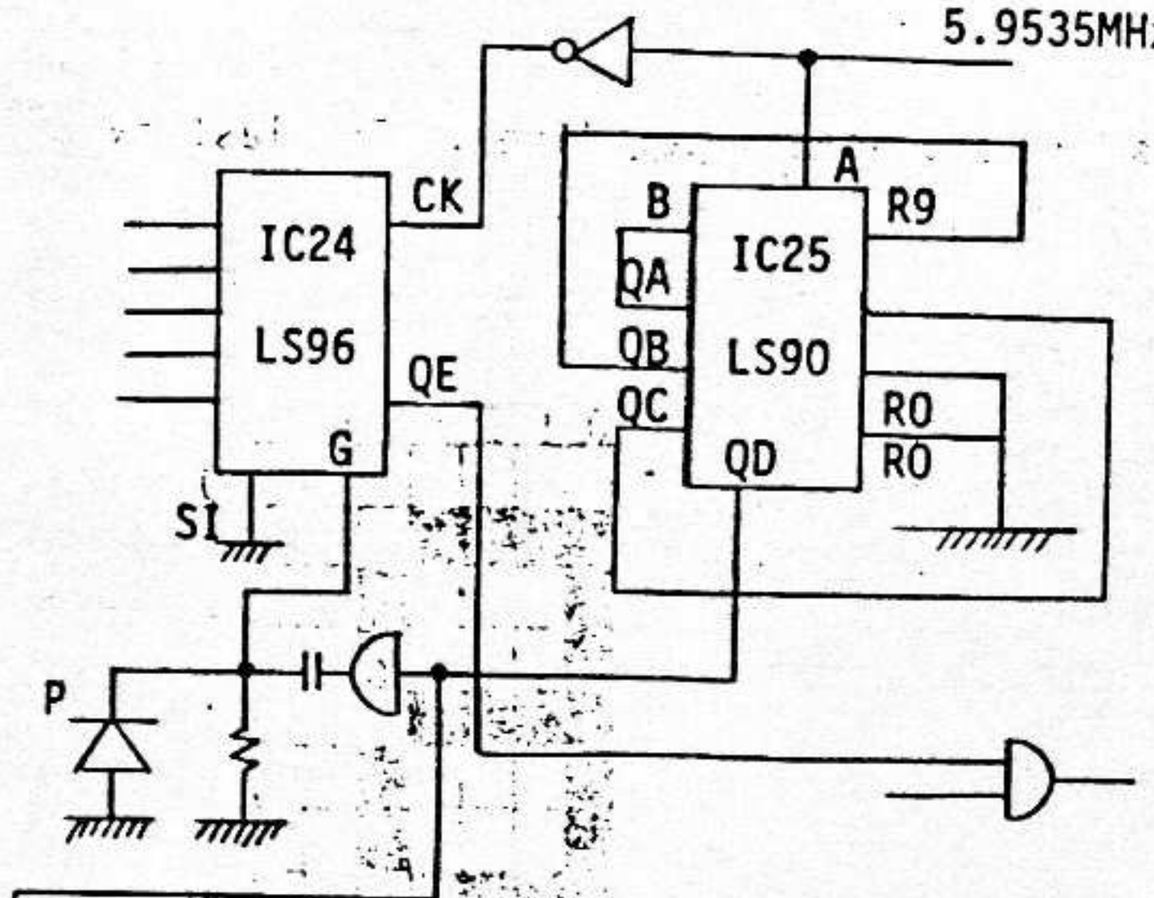
Character

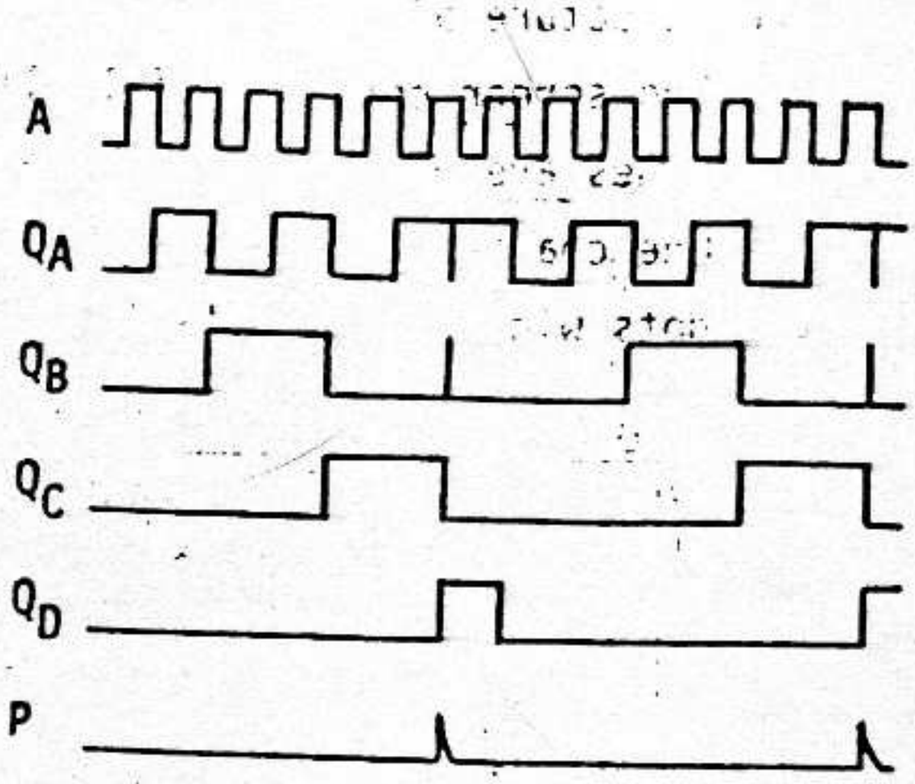


2. Display Part

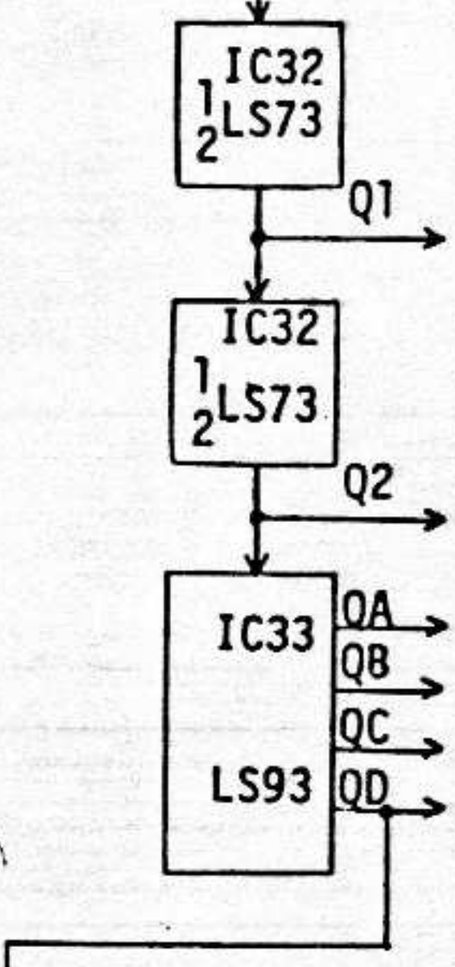


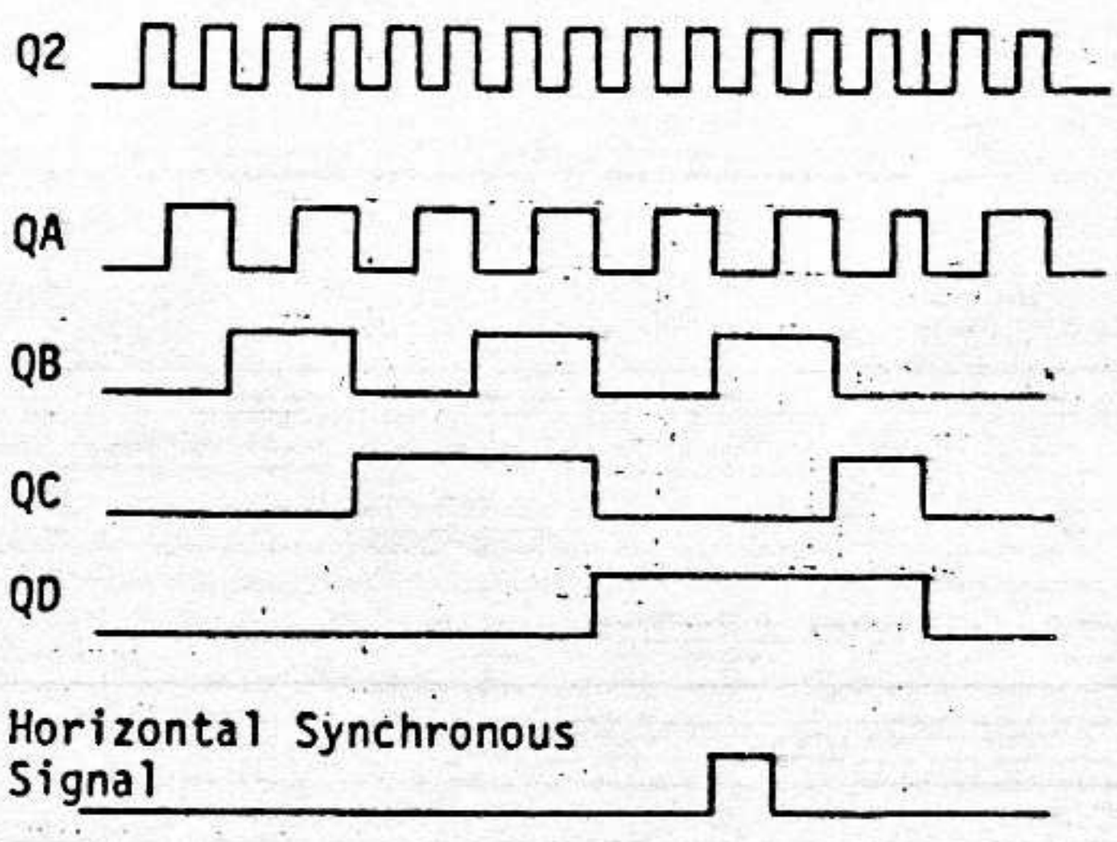
(1) IC25 works as a divide-by-7 counter



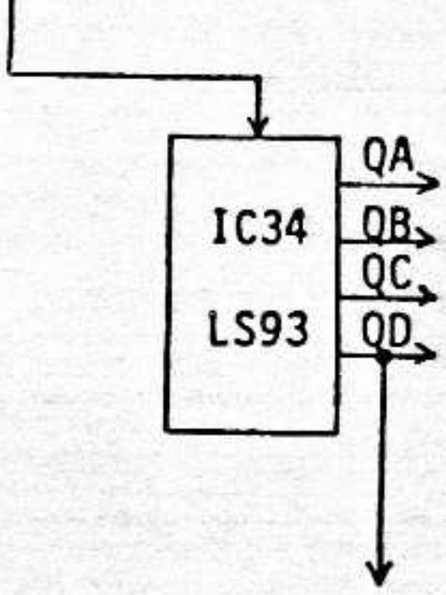


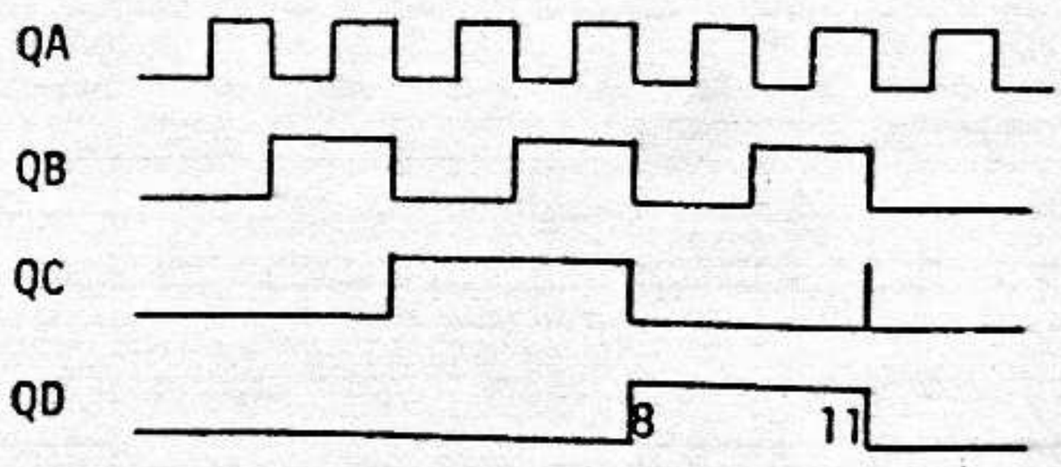
(2) A divide-by-54 counter is composed of IC32 and IC33 to make address of RAM and horizontal synchronous signals.



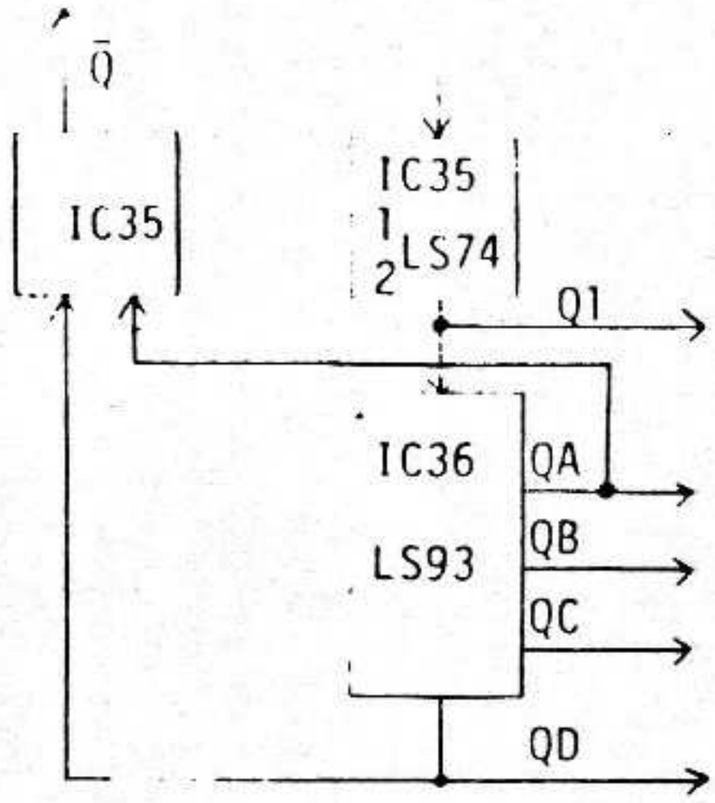


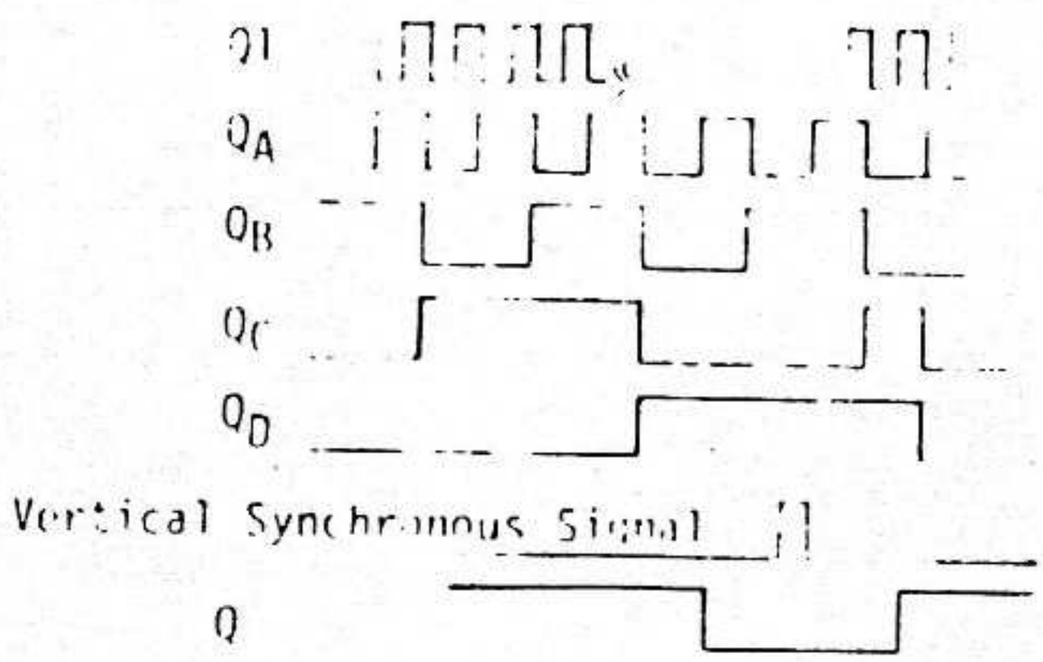
(3) IC34 is a divided-by-12 counter. This makes Row Address for the character generator. This counter determines the number of lines, 12 lines of one character in longitudinal direction.





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





2-2. Gates

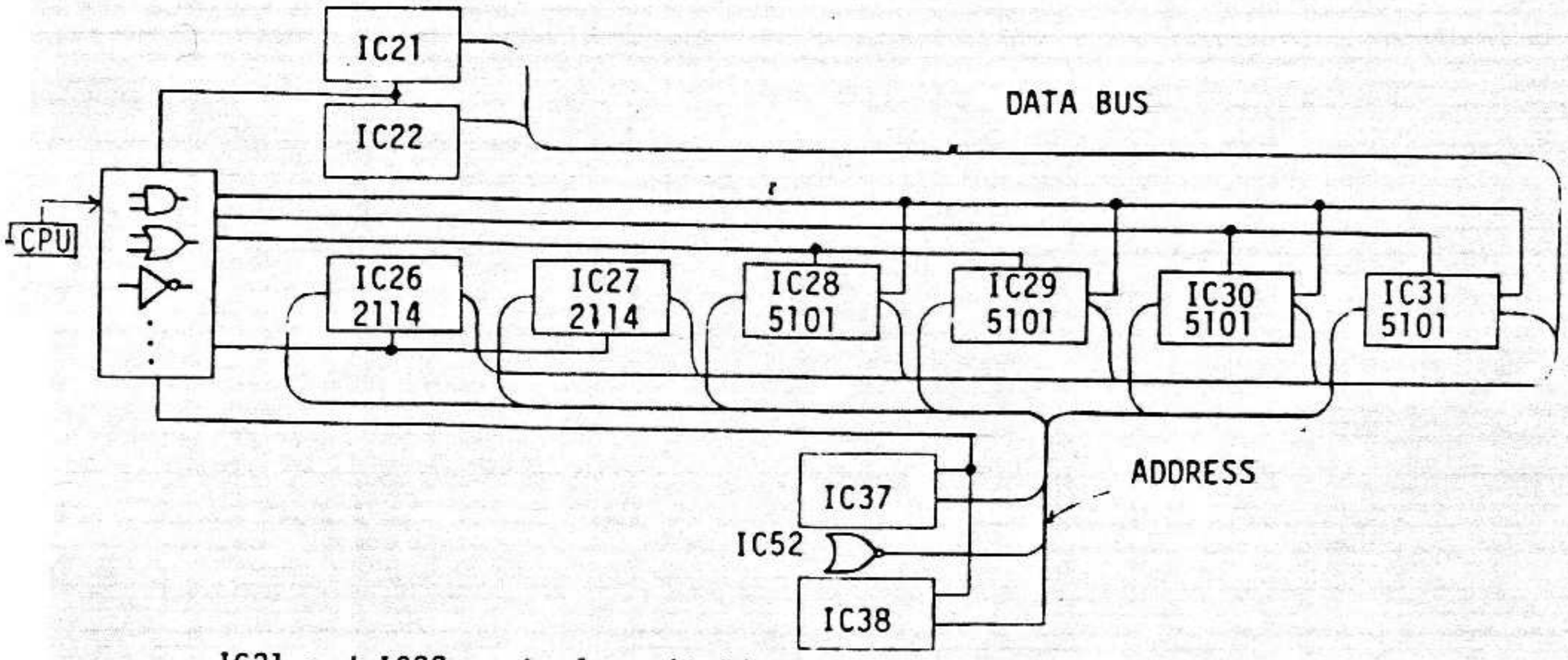
(1) Gate G1 inhibits latching strobe signal to IC24 for a certain period.
- Period from 32 to 53 of divide-by-54 counter
- Period from 8 to 11 of divide-by-12 counter
- Period from 18 to 25 of divide-by-26 counter

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.

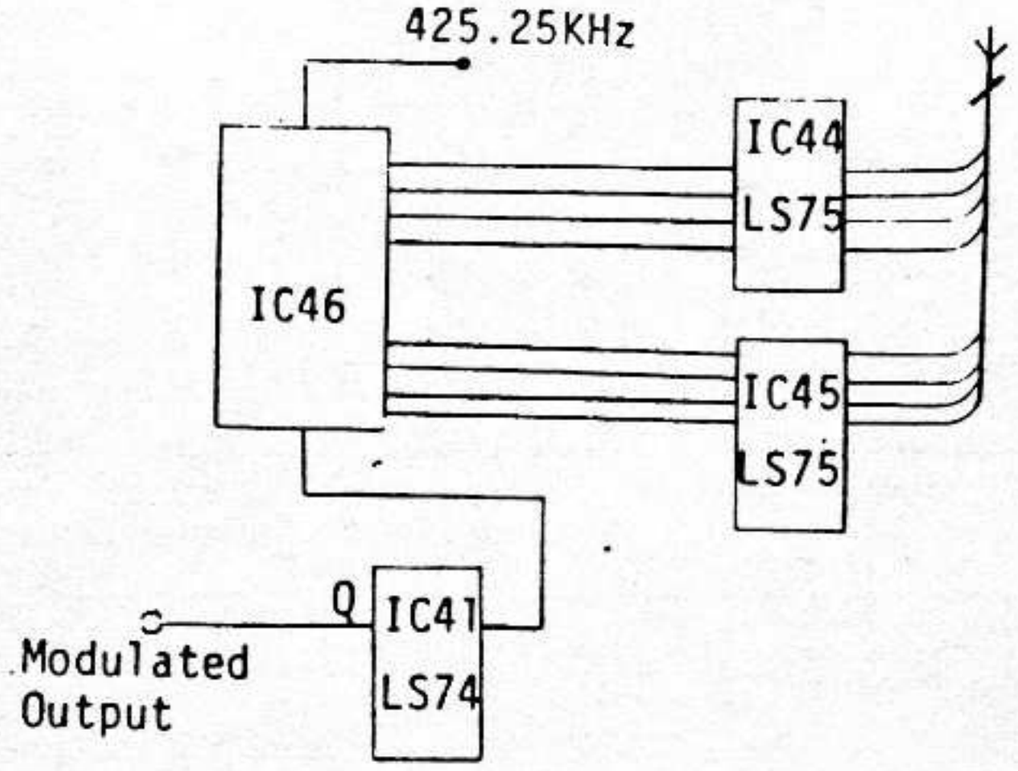
3. RAM Selection

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.

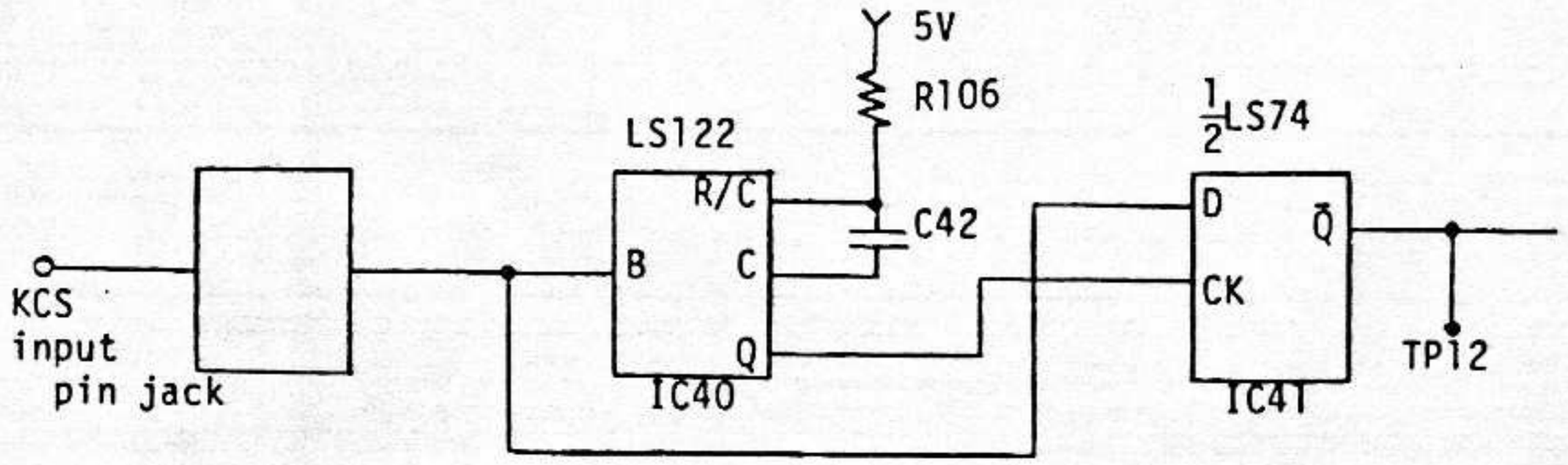
4.Modulation of Output



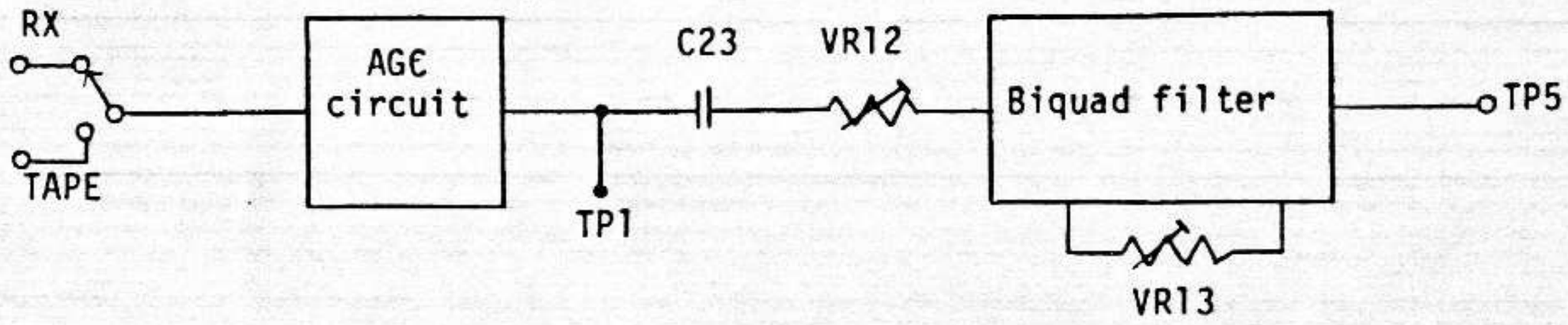
Modulated output can be obtained by dividing clock of 425.25KHz at IC46 and IC41 with the instruction of CPU through IC44 and IC45.

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.

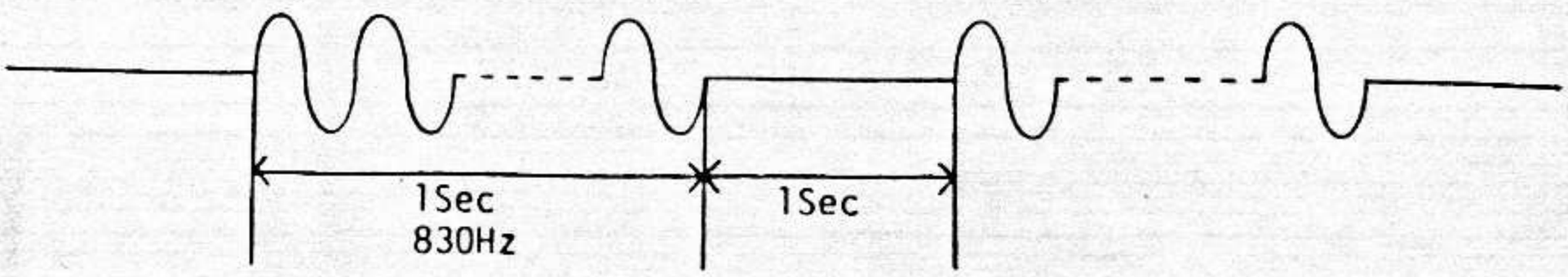


6. About the input part of Biquad Filters



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.

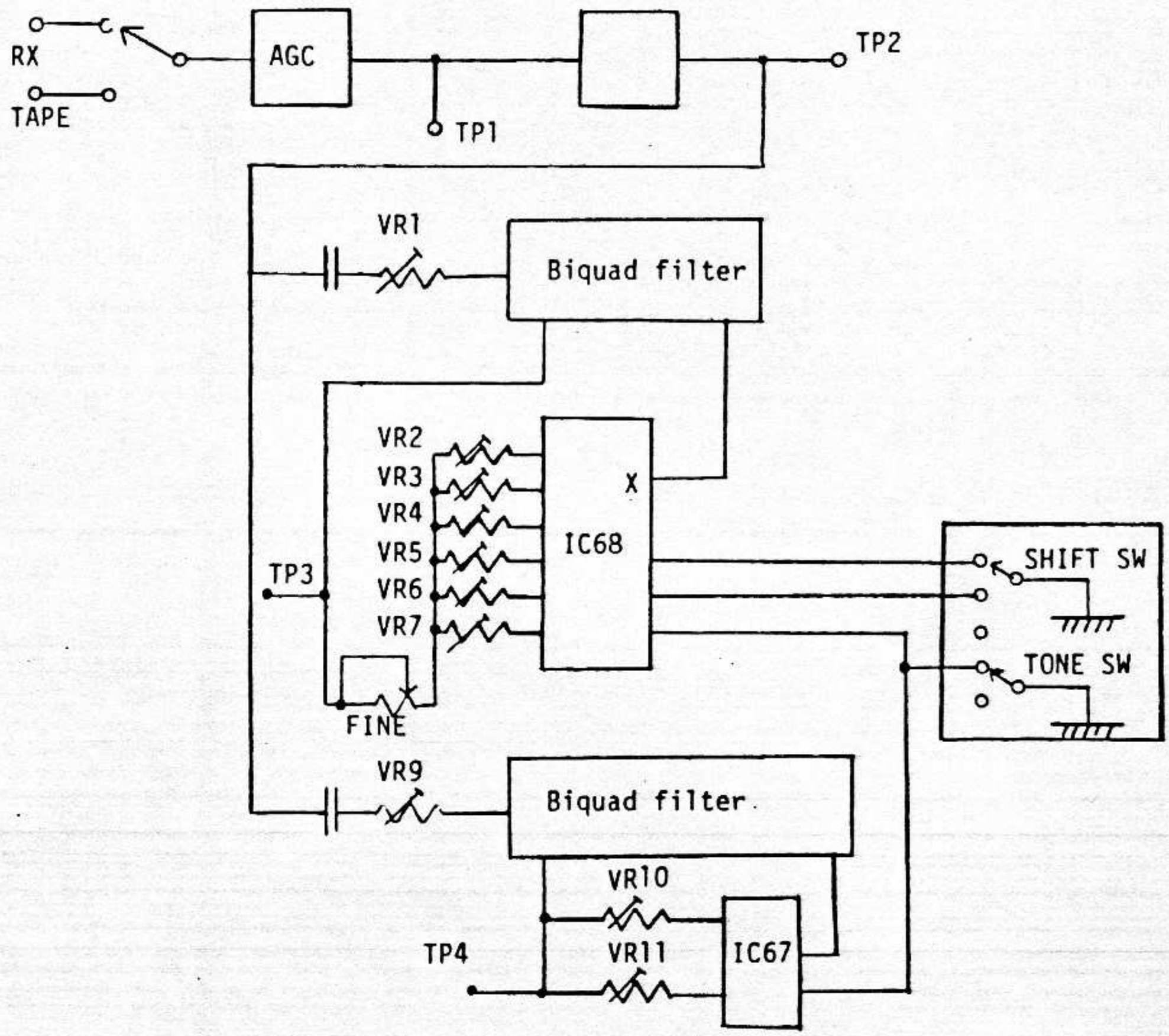


(2) Make the output amplitude of TP5 maximum at VR13. If TP5 is saturated, adjust VR12 to obtain the maximum amplitude without saturation.

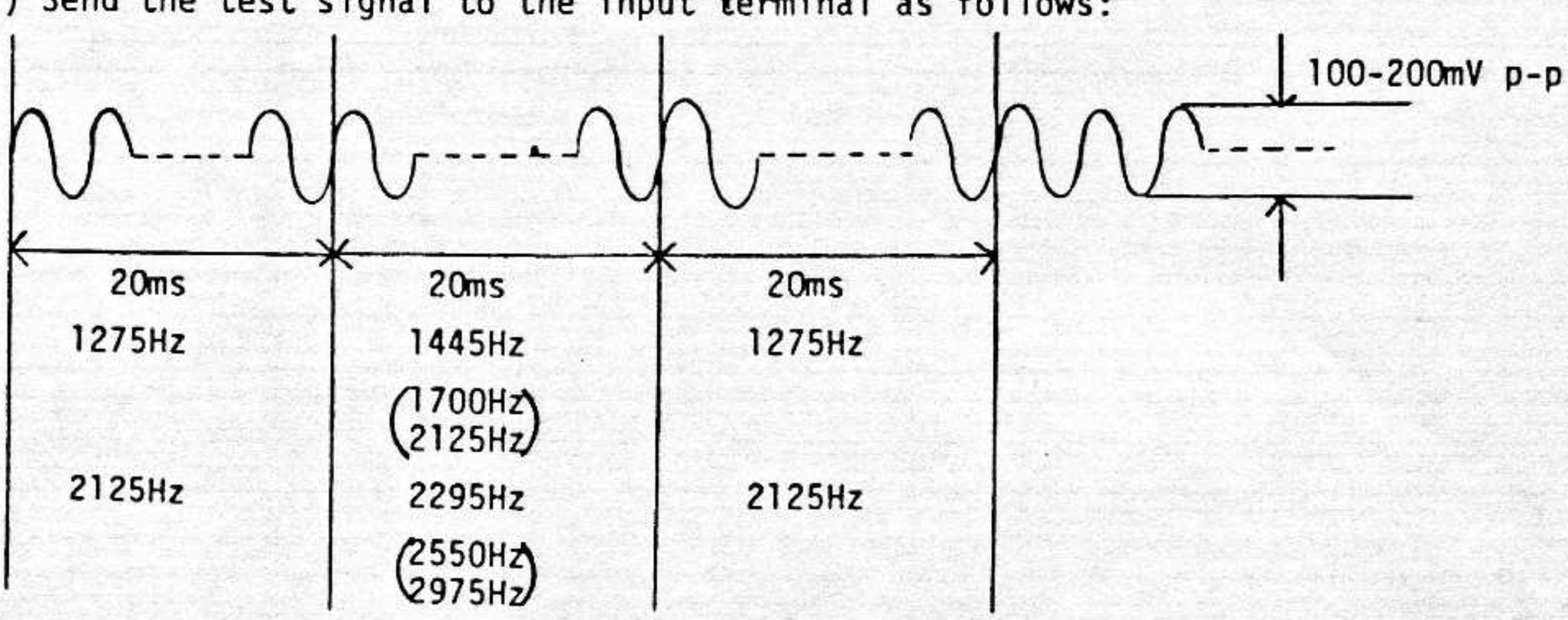
(3) Make the amplitude of TP6 1.4V - 1.8Vp-p at VR12.

(4) The central value of TP5 should fall within the range of 1.8V ± 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.

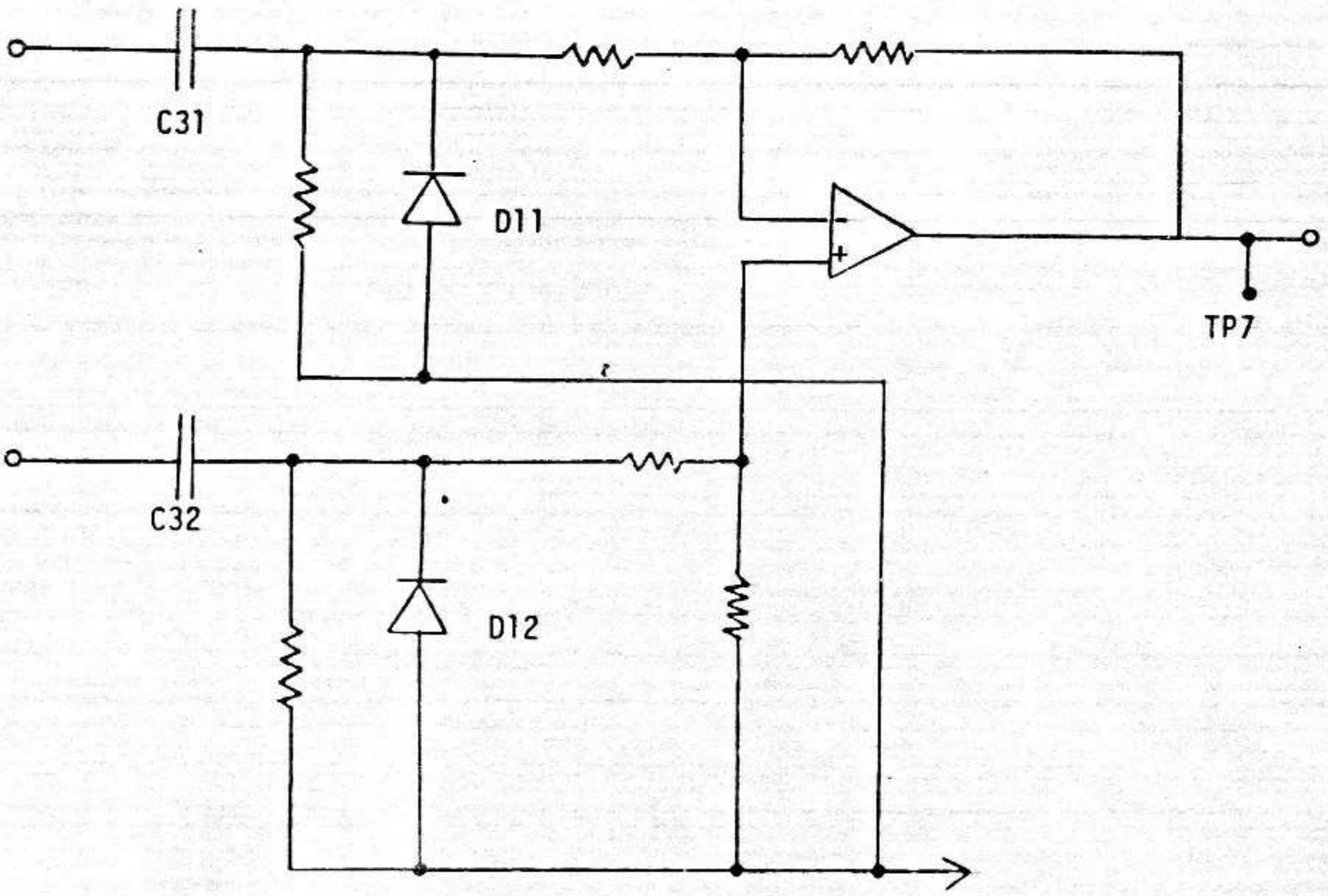
(7) Set SHIFT SW at 425, and send the test signal of 2125Hz and 2550Hz. Adjust VR2 so that TP3 has the maximum amplitude.

(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 ± 0.5V without any strain.

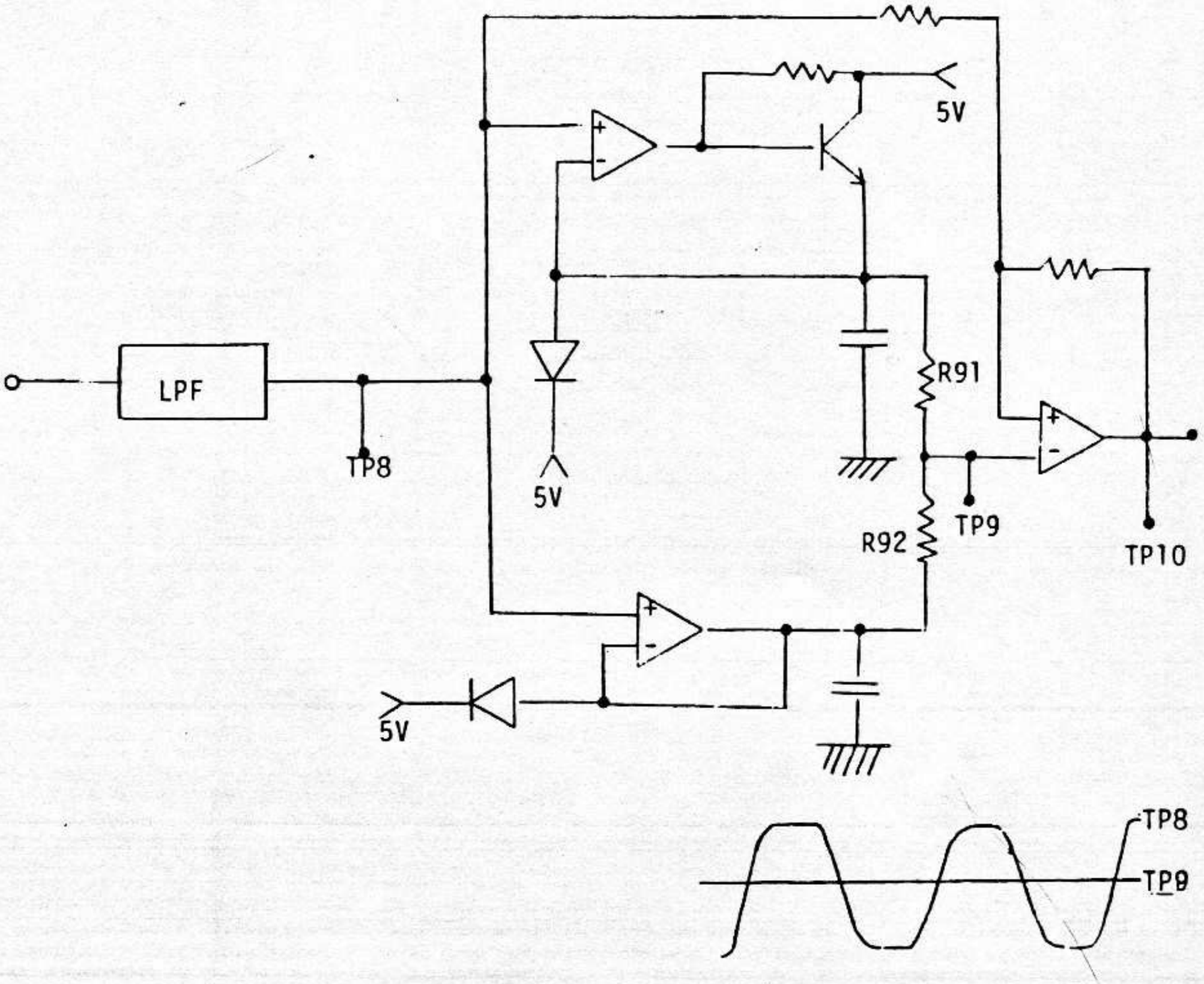
About Adding Circuit

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



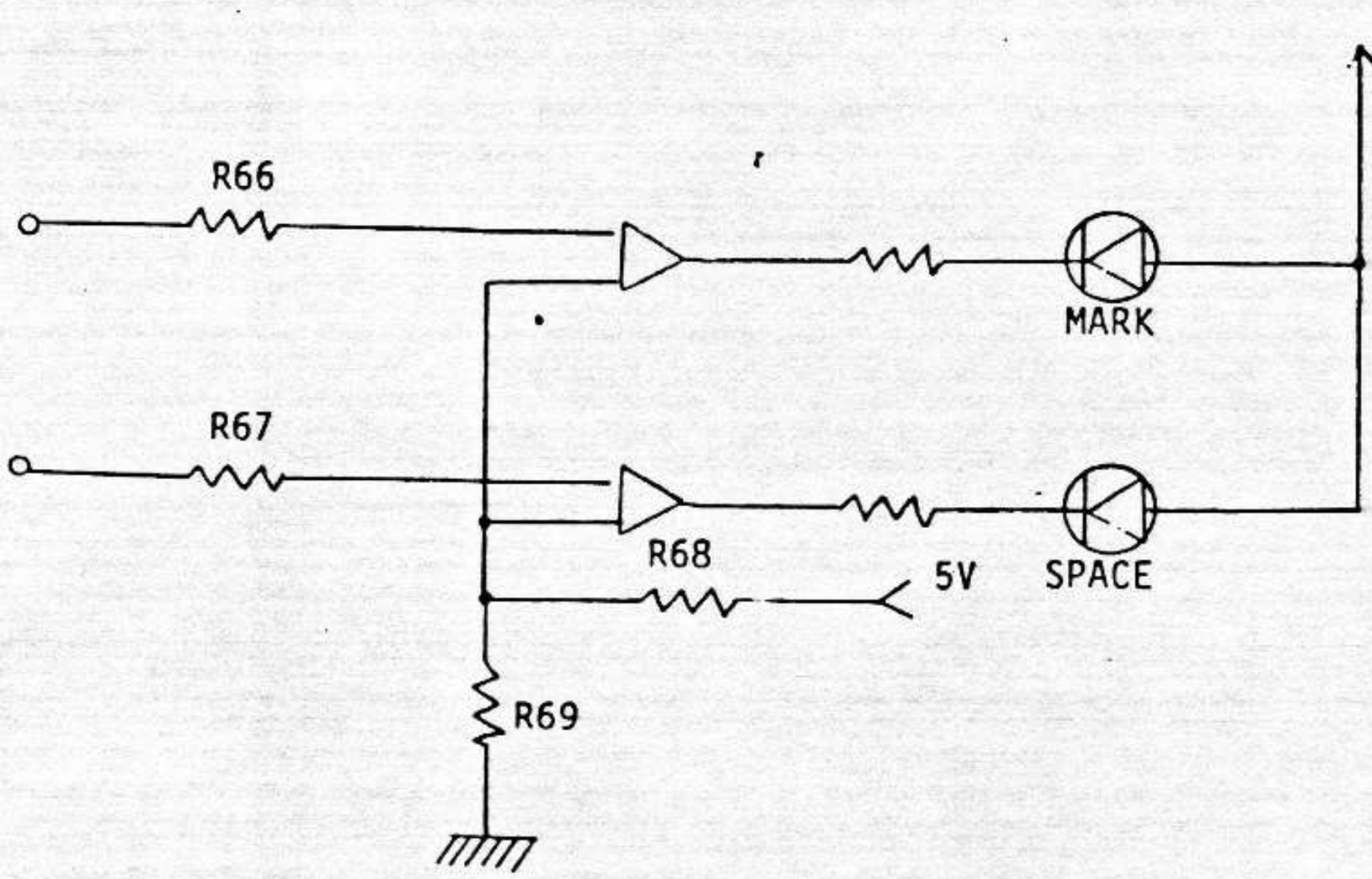
8. About Peak-detector

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

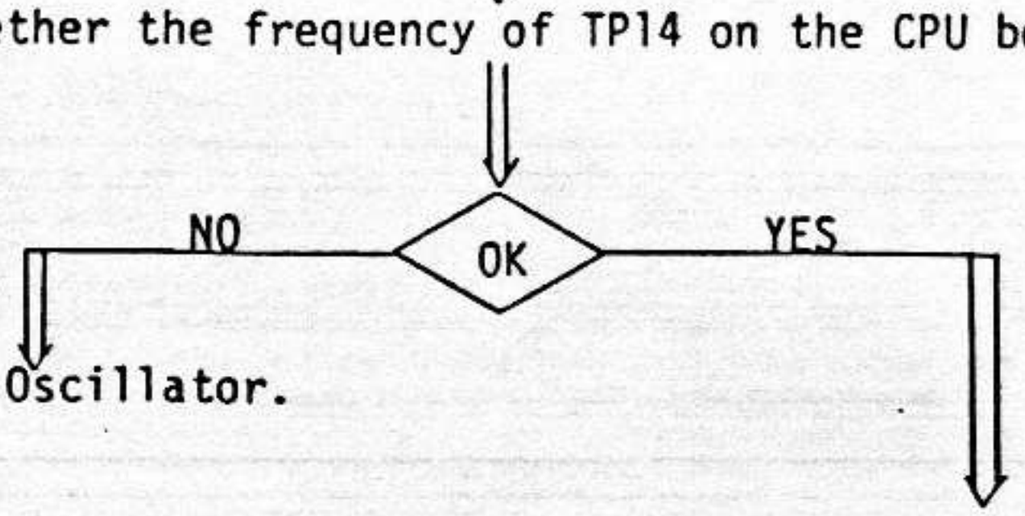
Check the shield cable connecting the Theta-7000E with the antenna of TV Set. If you find no troubles with it, continue to check as follows.

⇓

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:

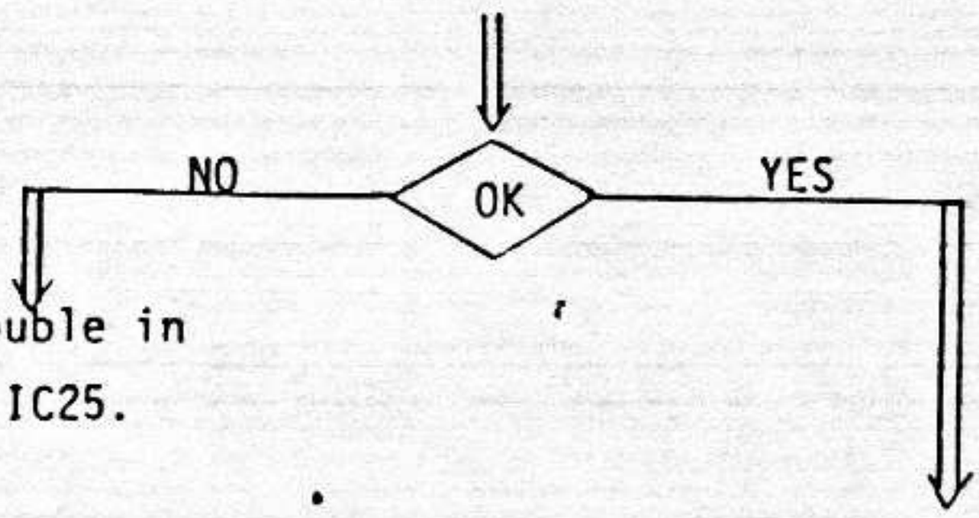
⇓

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



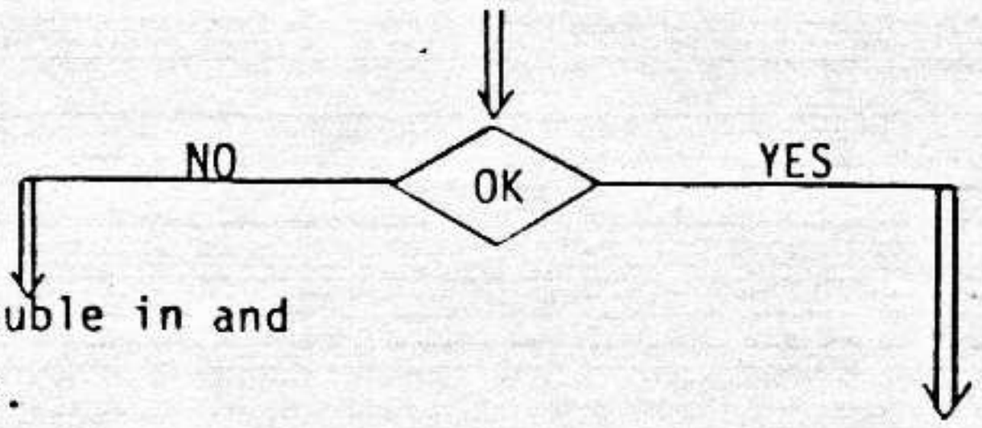
Trouble in Oscillator.

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



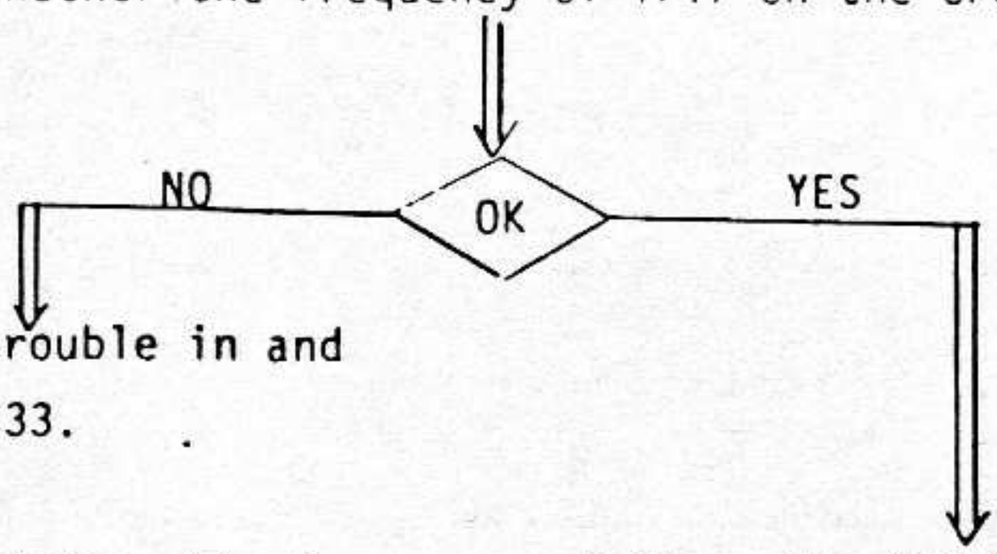
Check a trouble in
and around IC25.

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



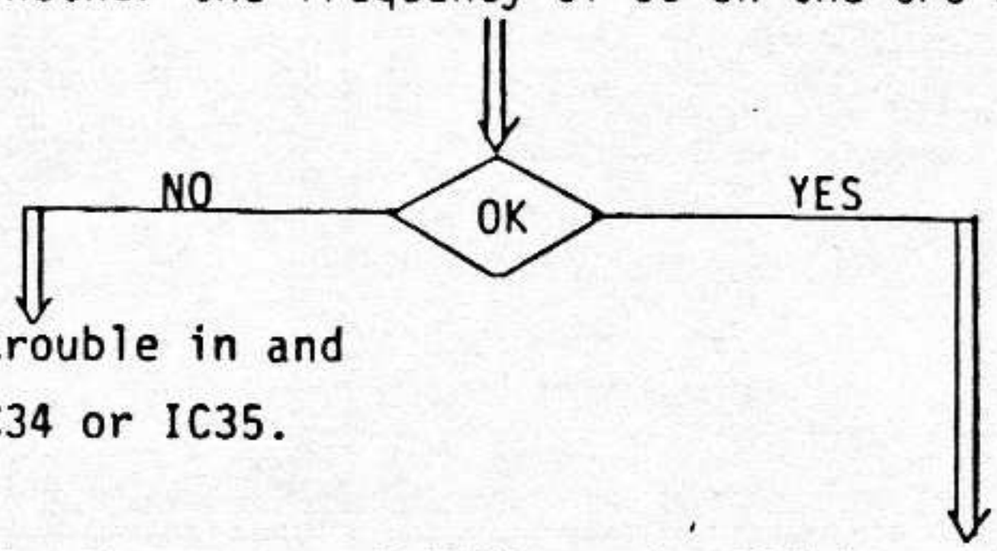
Check a trouble in and
around IC32.

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



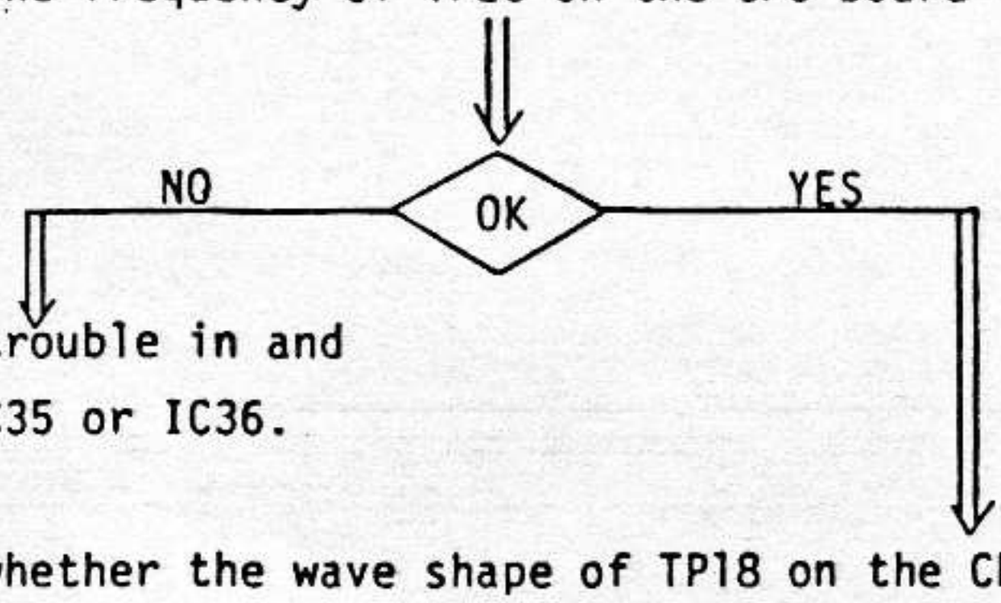
Check a trouble in and
around IC33.

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



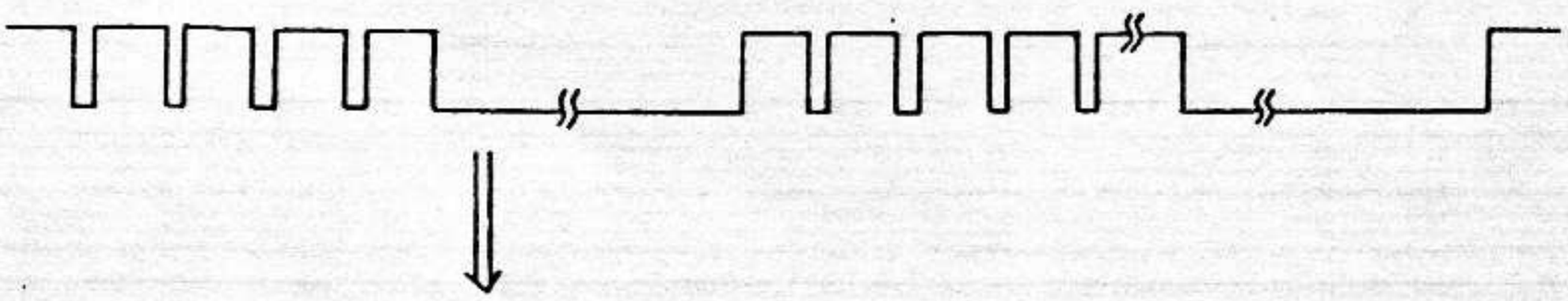
Check a trouble in and
around IC34 or IC35.

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



Check a trouble in and
around IC35 or IC36.

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



Check a trouble in and
around IC52.

Trouble in VHF circuit.

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

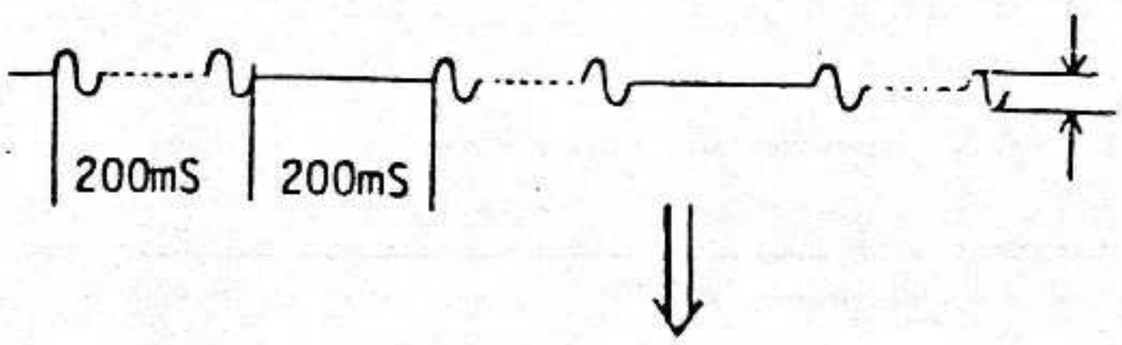
Check the source cord connector, etc.
Check the lead wires (Red & Black) and the source cord connector.

check the fuse.

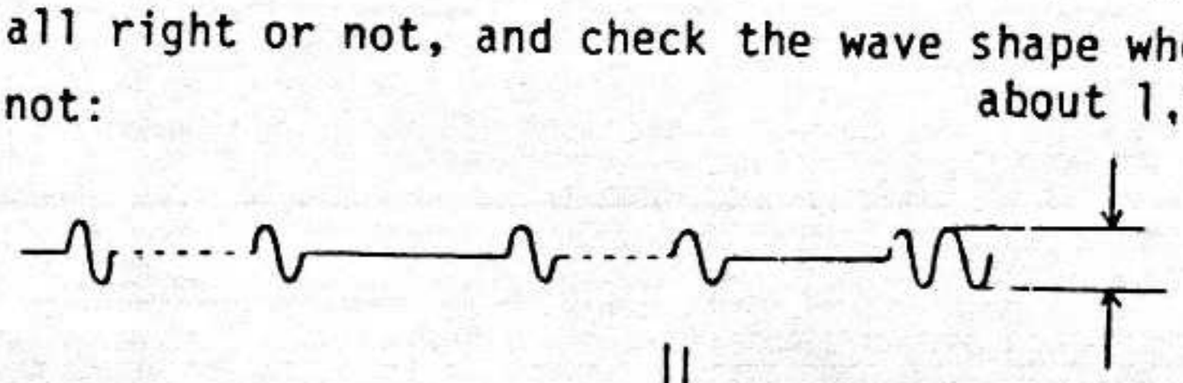
Check the grounding of the CPU board and check whether the 5V line has voltage of 5V.
If there is no trouble, check the power source parts including regulator IC on the radiator.

(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.

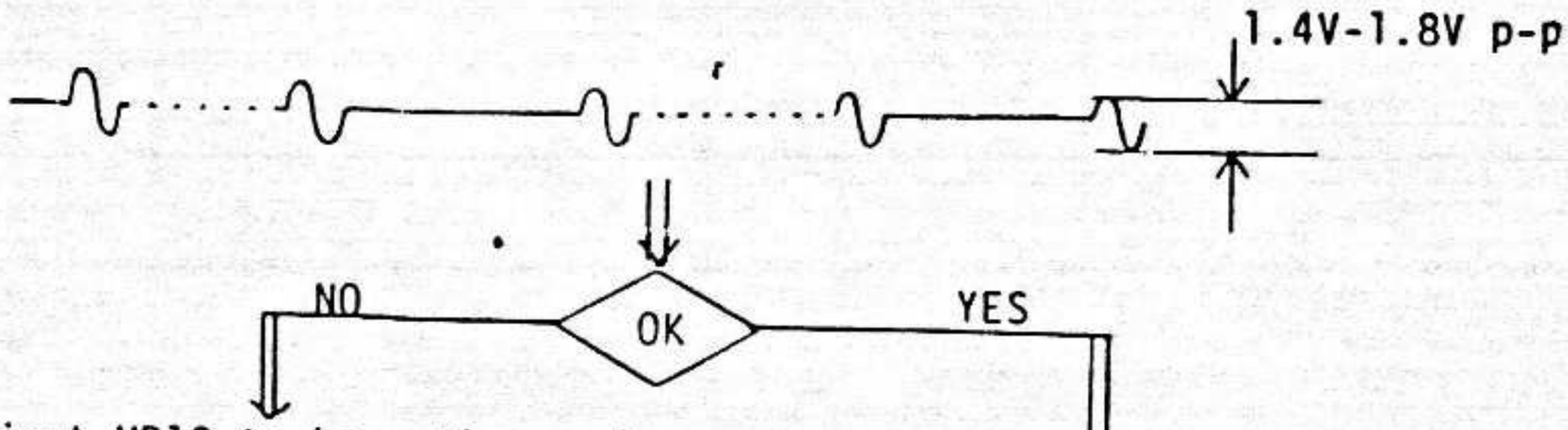


Confirm by TP1 whether audio input from RX pin jack on the back panel is all right or not, and check the wave shape whether it is as follows or not:



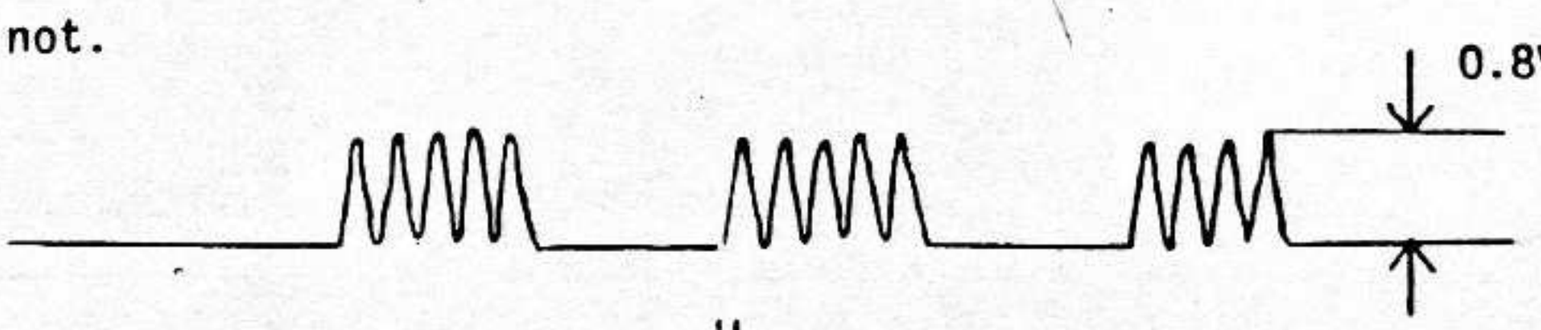
Check before TP1.

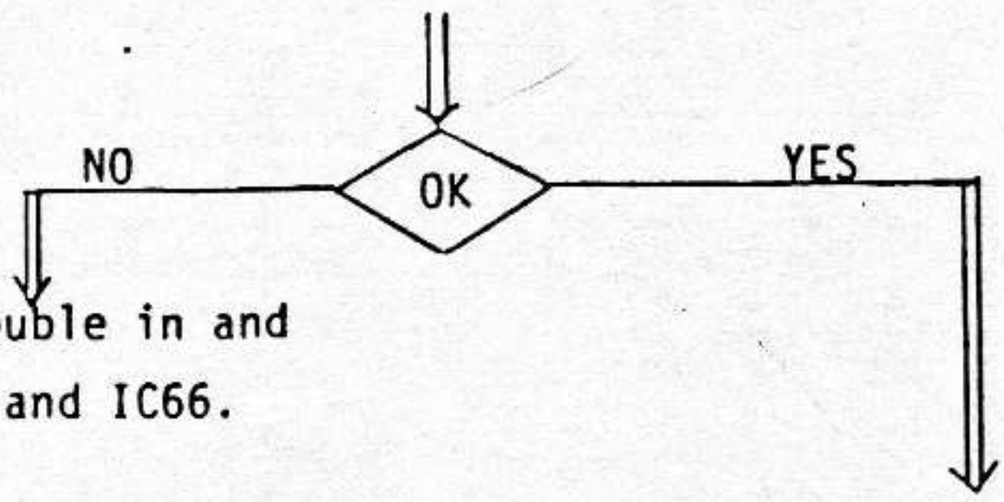
Check whether the wave shape of TP5 on the CPU board is as follows or not.



Adjust VR13 to have the maximum amplitude.
Adjust VR12 to be 1.4-1.8Vp-p at the TP5.
If you gain no adjusting success, check around IC4.

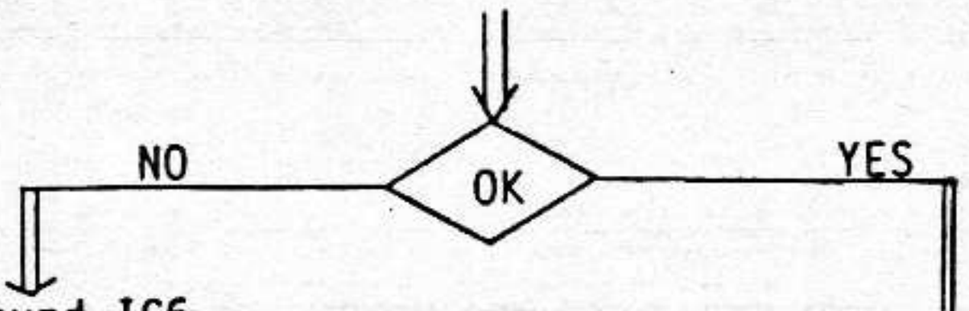
Check whether the wave shape of TP7 on the CPU board is as follows or not.





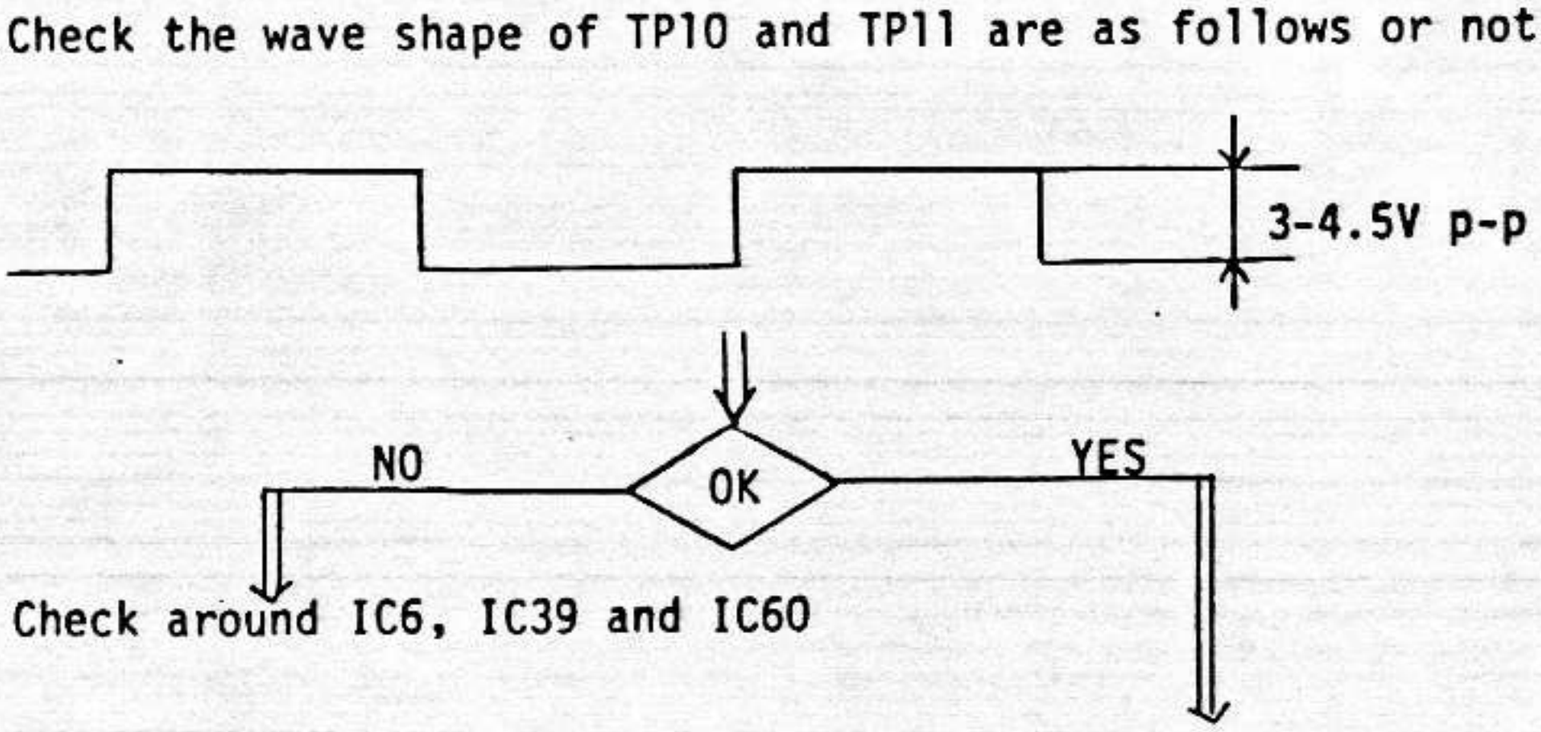
Check a trouble in and around IC2 and IC66.

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



Check around IC6.

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

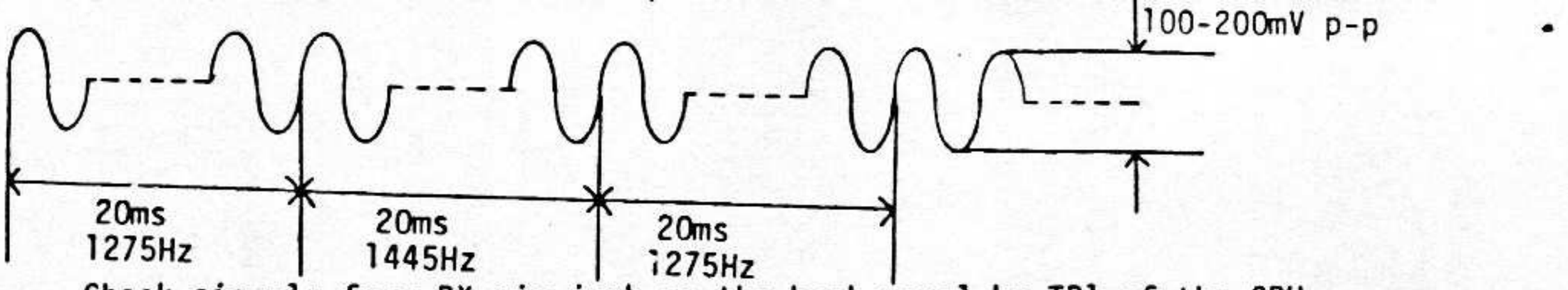


Check around IC6, IC39 and IC60

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

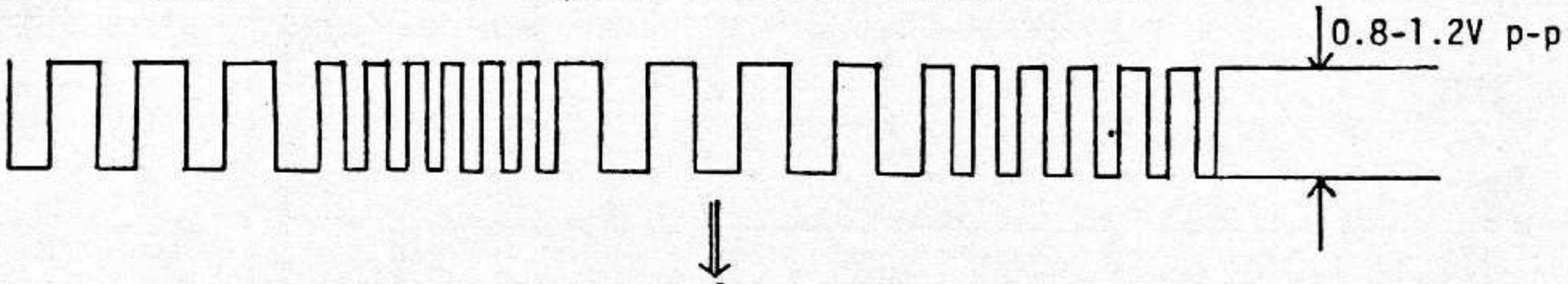
Send audio signals as follows from RX pin jack on the back panel.
AF INPUT switch should be at the RX side at this time.
SHIFT switch on the front panel should be at 170 and TONE switch should be at LOW.

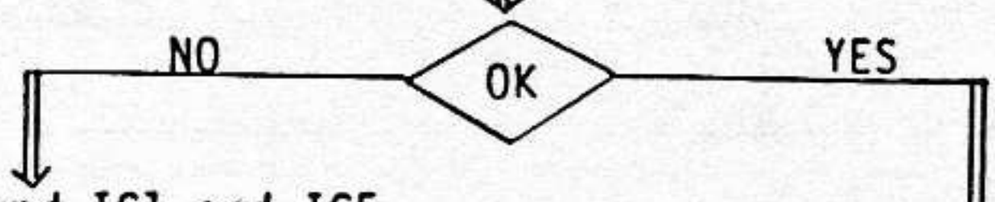


Check signals from RX pin jack on the back panel by TP1 of the CPU board.

⇓

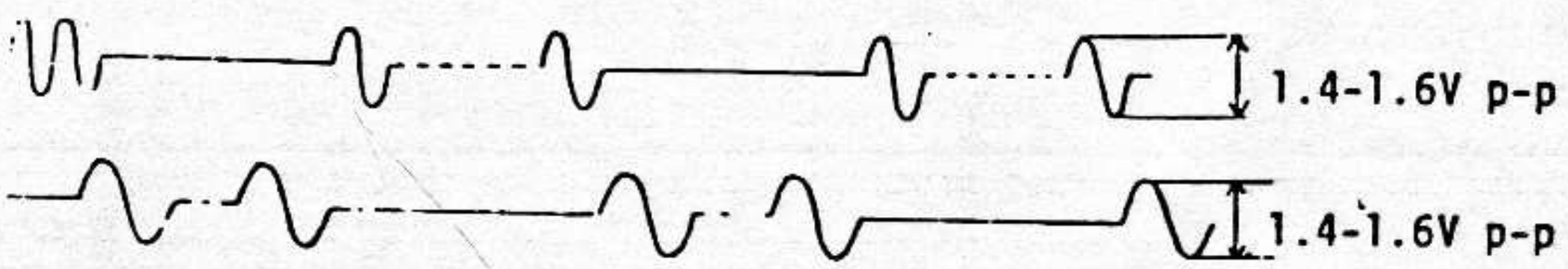
Check if the wave shape of TP2 is as follows or not.

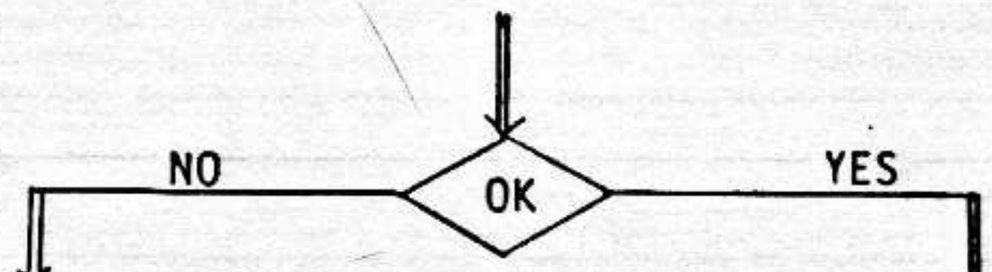




Check around IC1 and IC5.

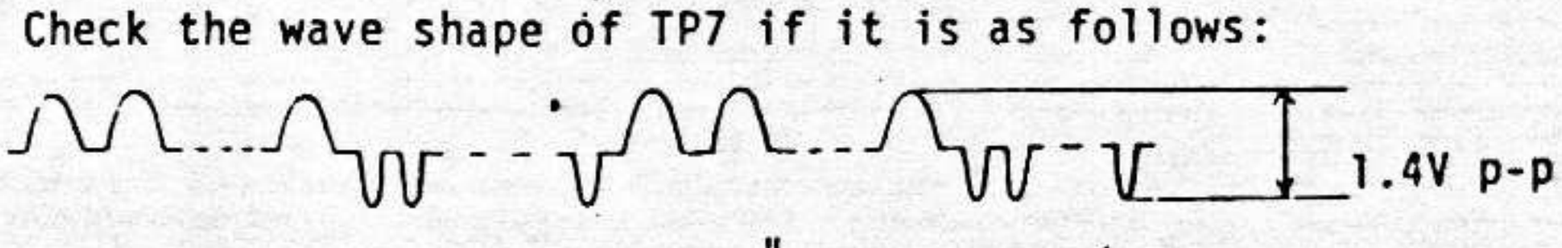
Check if the wave shape of TP3 (TP4) is as follows:

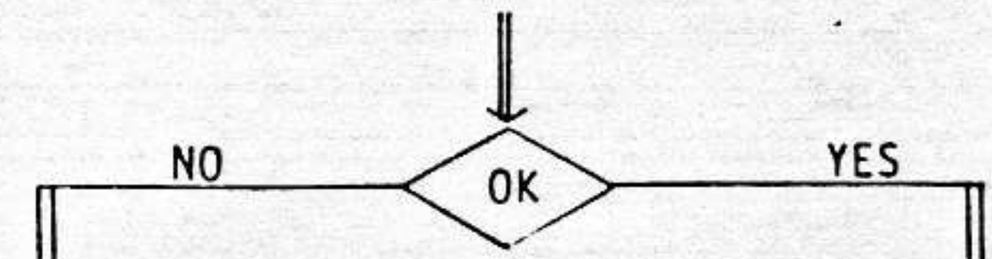




Adjust VR7 (VR11) to have the maximum amplitude:
Adjust VR1 (VR9) to have 1.4 - 1.6Vp-p.
Check around IC2 and IC3.

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



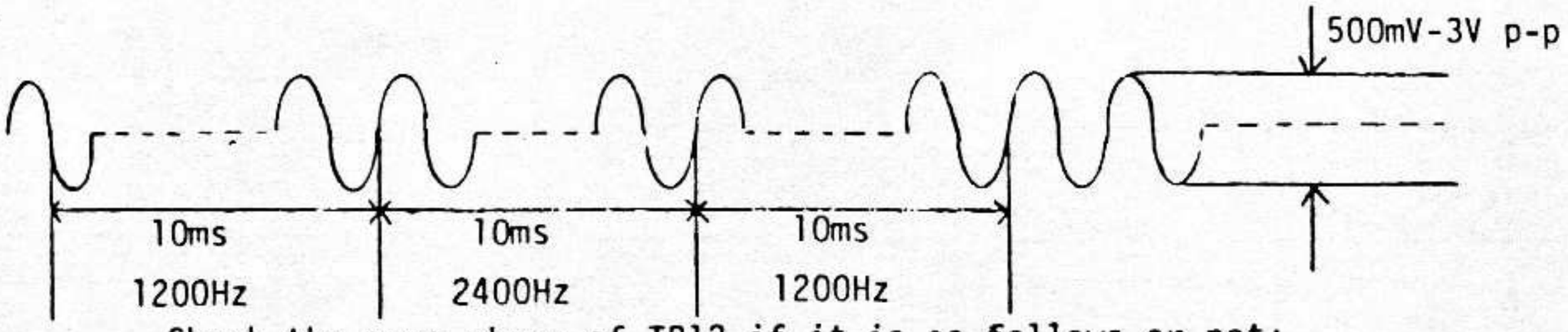


Check around IC2 and IC66.

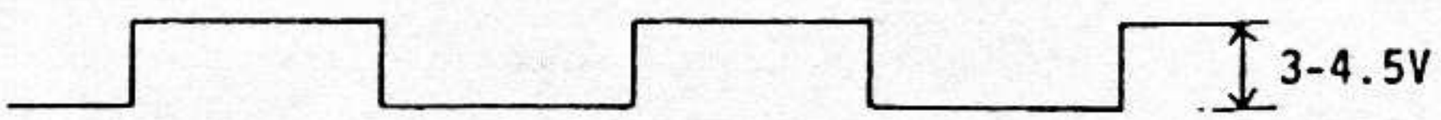
Try checking in the same way as in CW mode.

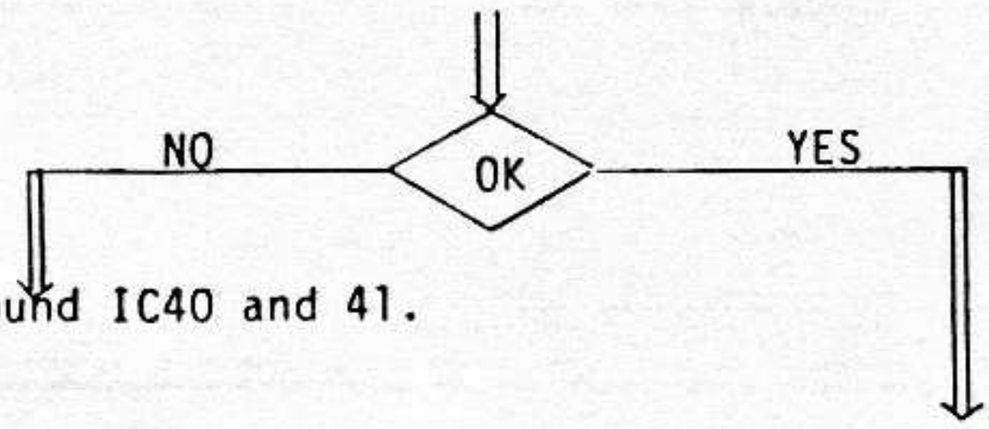
(5) How to check when the receiving in ASCII mode is impossible

Send audio signals as follows from KCS pin jack on the back panel.
ASCII MODEM switch should be at KCS.



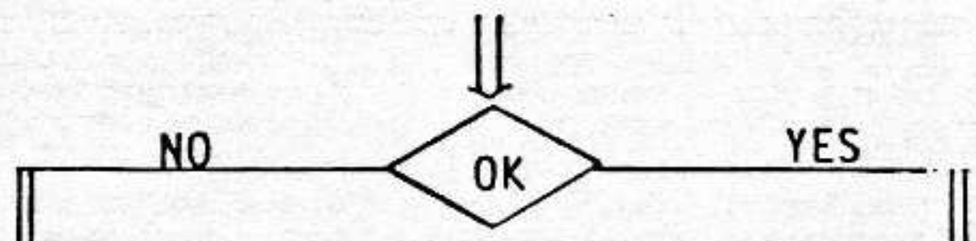
Check the wave shape of TP12 if it is as follows or not:





Check around IC40 and 41.

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

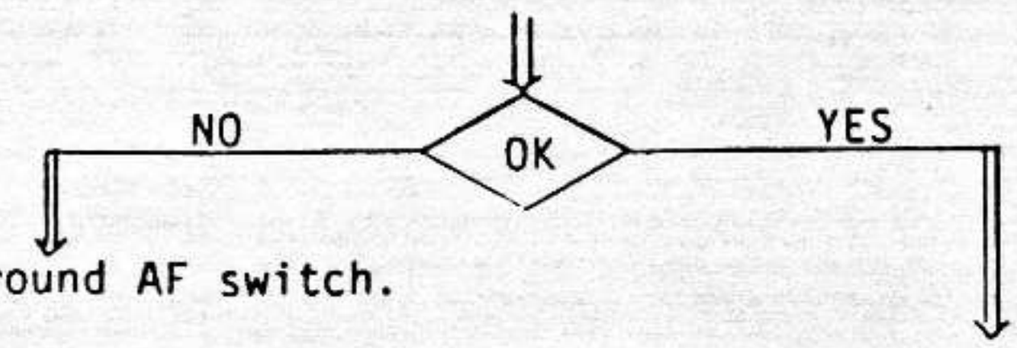


Check ASCII MODEM switch, INPUT switch
and SENSE switch.
Check IC39 and IC60.

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

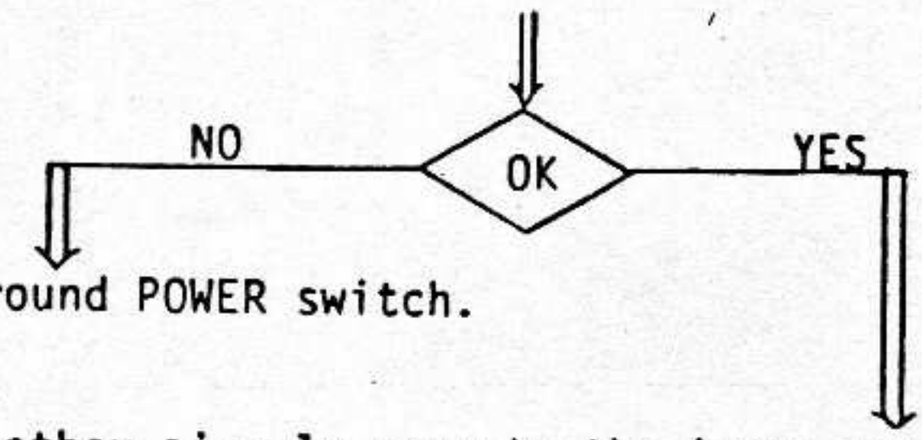
(6) How to check when the receiving sound or the transmitting sound from a speaker is not heard.

Check AF switch on the front panel.



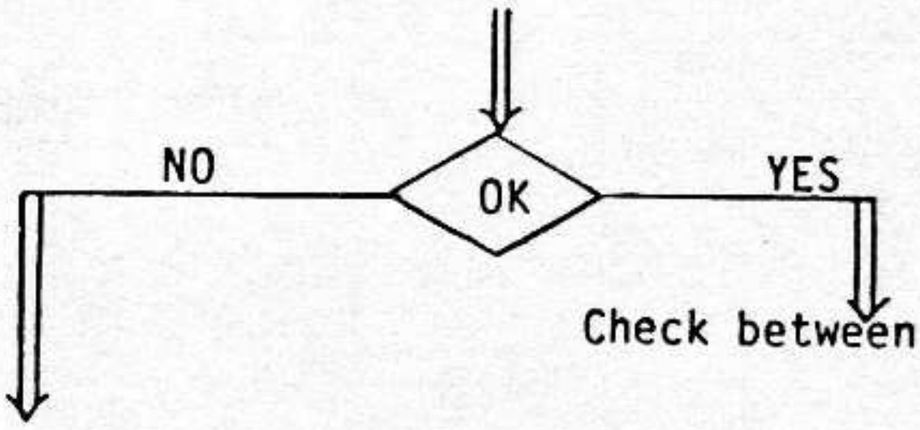
Check around AF switch.

Check POWER switch on the front panel.



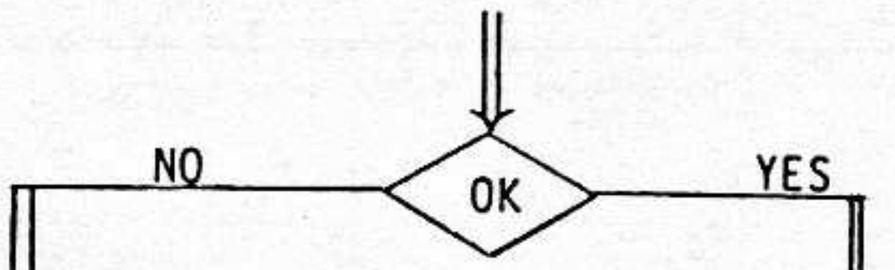
Check around POWER switch.

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



Check between VOL and a speaker.

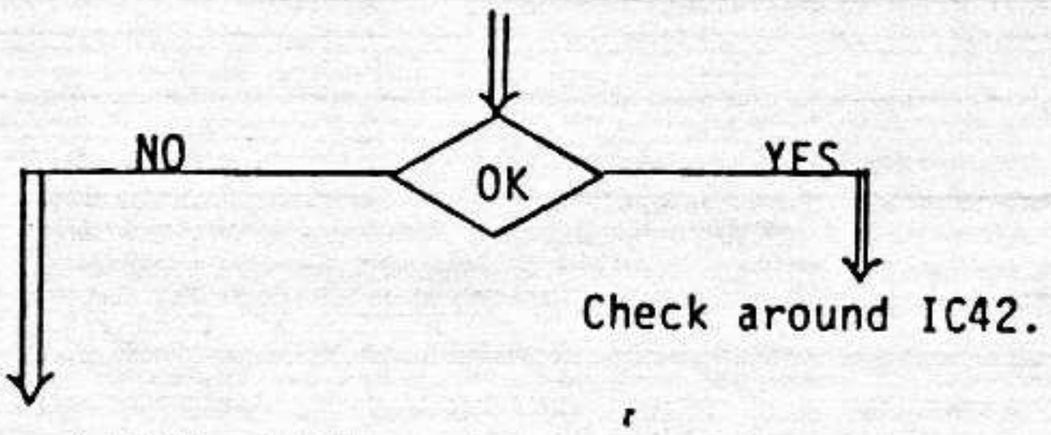
Check whether signals come to the 3rd pin of IC42 in the case of trouble in receiving.



Check around IC3.

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.



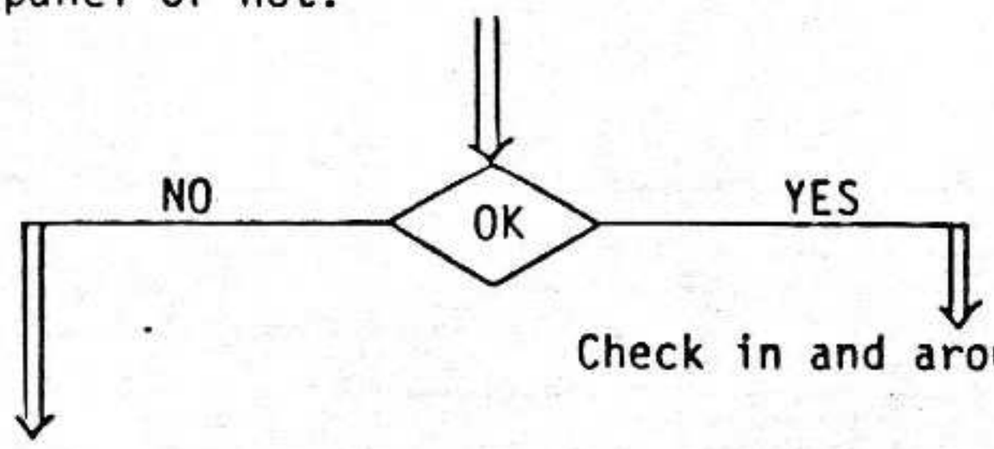
Check around IC42.

Check around IC41, IC61 and IC46.

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

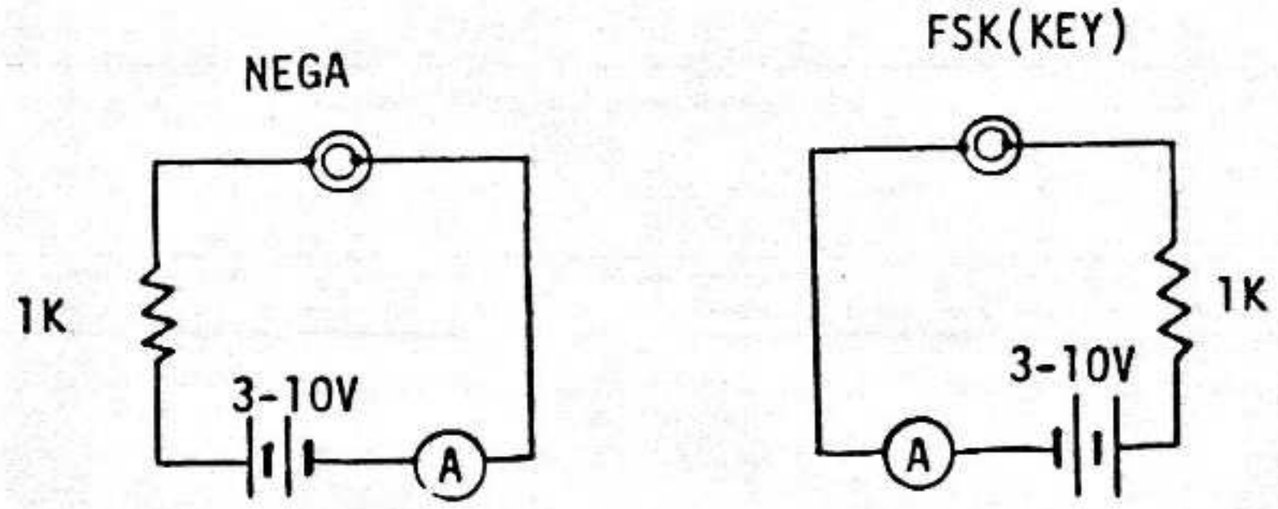
Check around AFSK OUT pin jack.

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



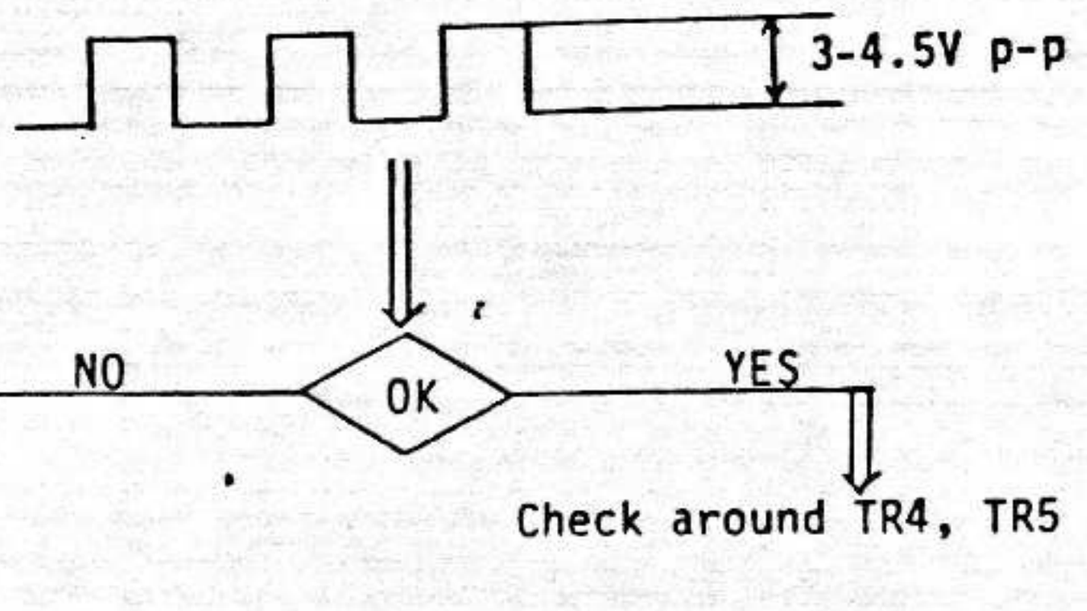
(8) How to check when the keying is impossible in CW(POSI, NEGA) and FSK

Check as illustrated below:

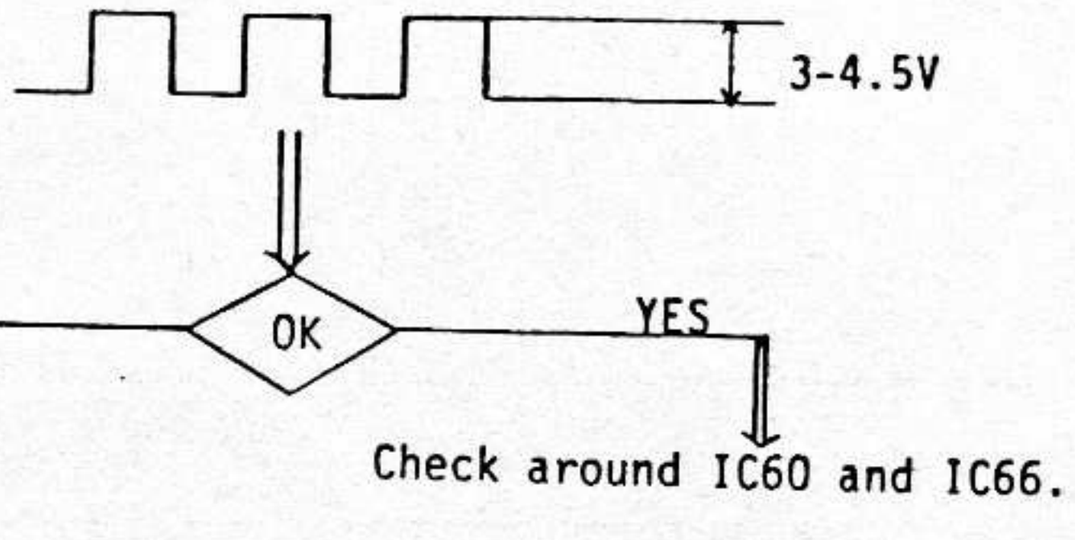


Check whether the current is on the ammeter when you push the keys.

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



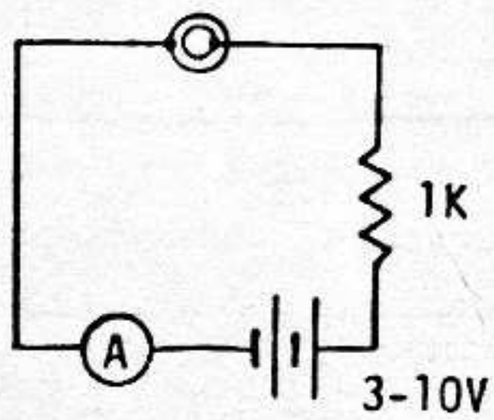
Check whether the signal as follows comes to the 3rd or 4th pin of IC66.



(9) How to check ID and REMOTE pin jack

Connect with the pin jack as follows. Check if the currecnt 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 MOTORALA 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	Volume Control	V16L4N-KC25-5KB
VR15	"	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		
IR 1,2	Transistor	2SC1815-ō
3	"	2SA949
4-7	"	2SC2610
8	"	2SC1815-ō
9	"	2SC1923
10	"	2SC1815-ō
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

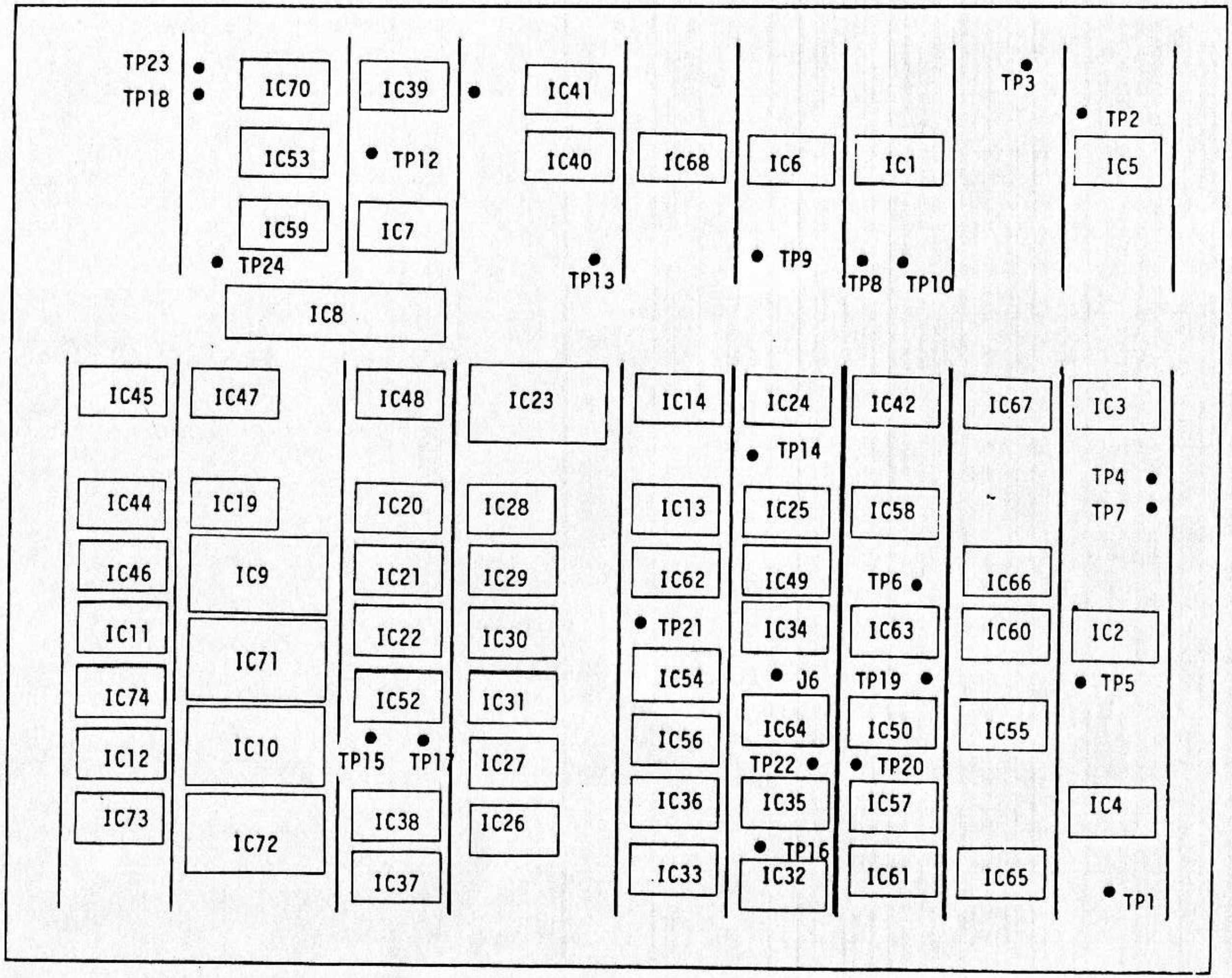


FIG. 1. IC layout

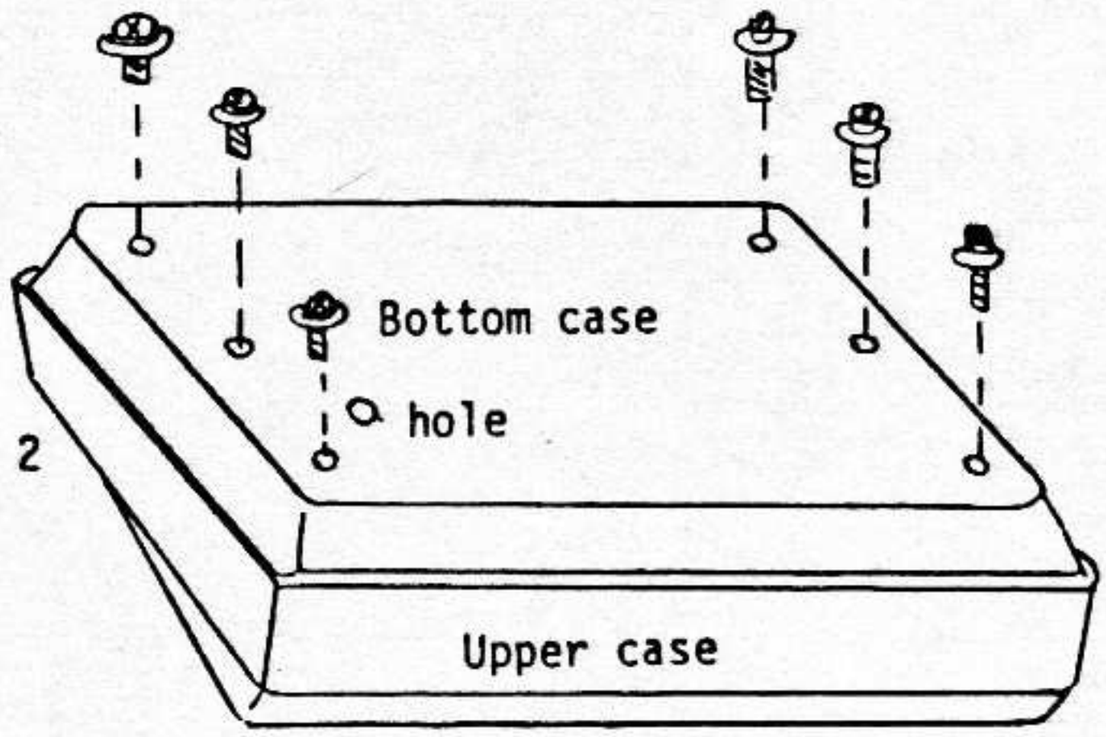


Fig. 2

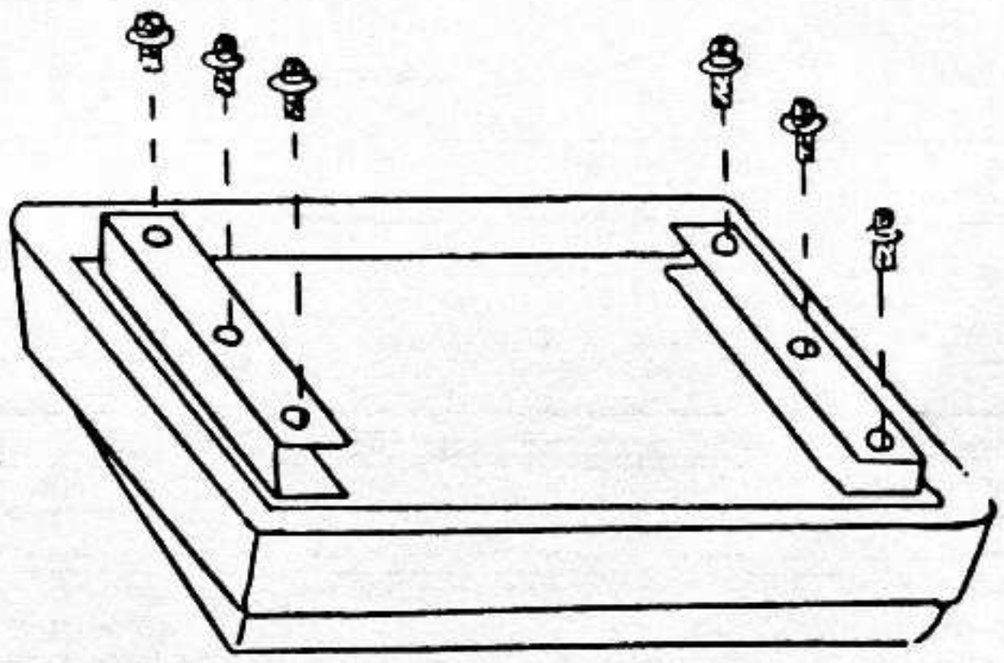
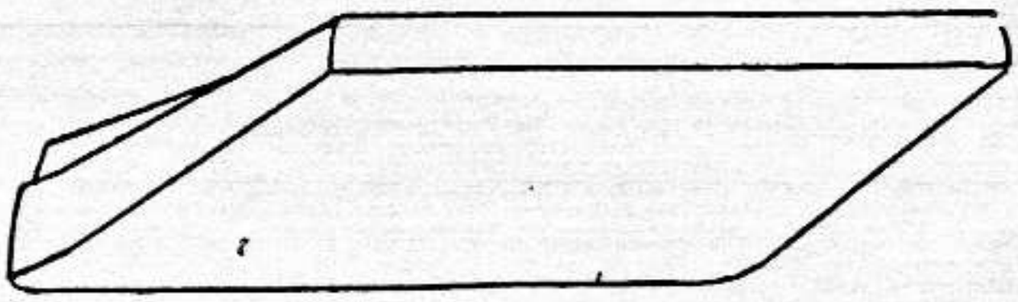


Fig. 3



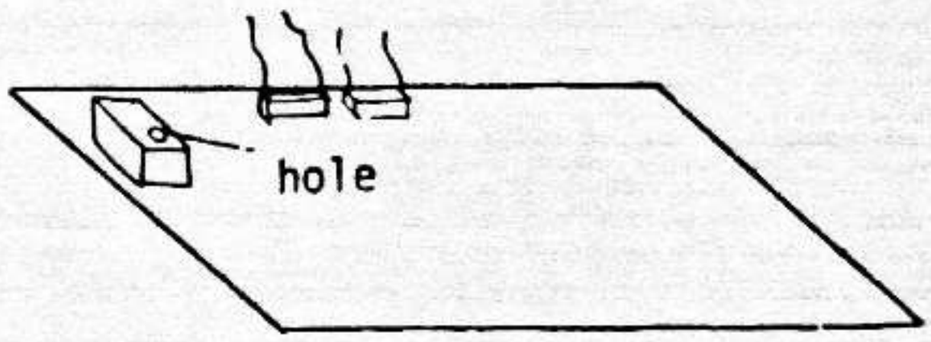
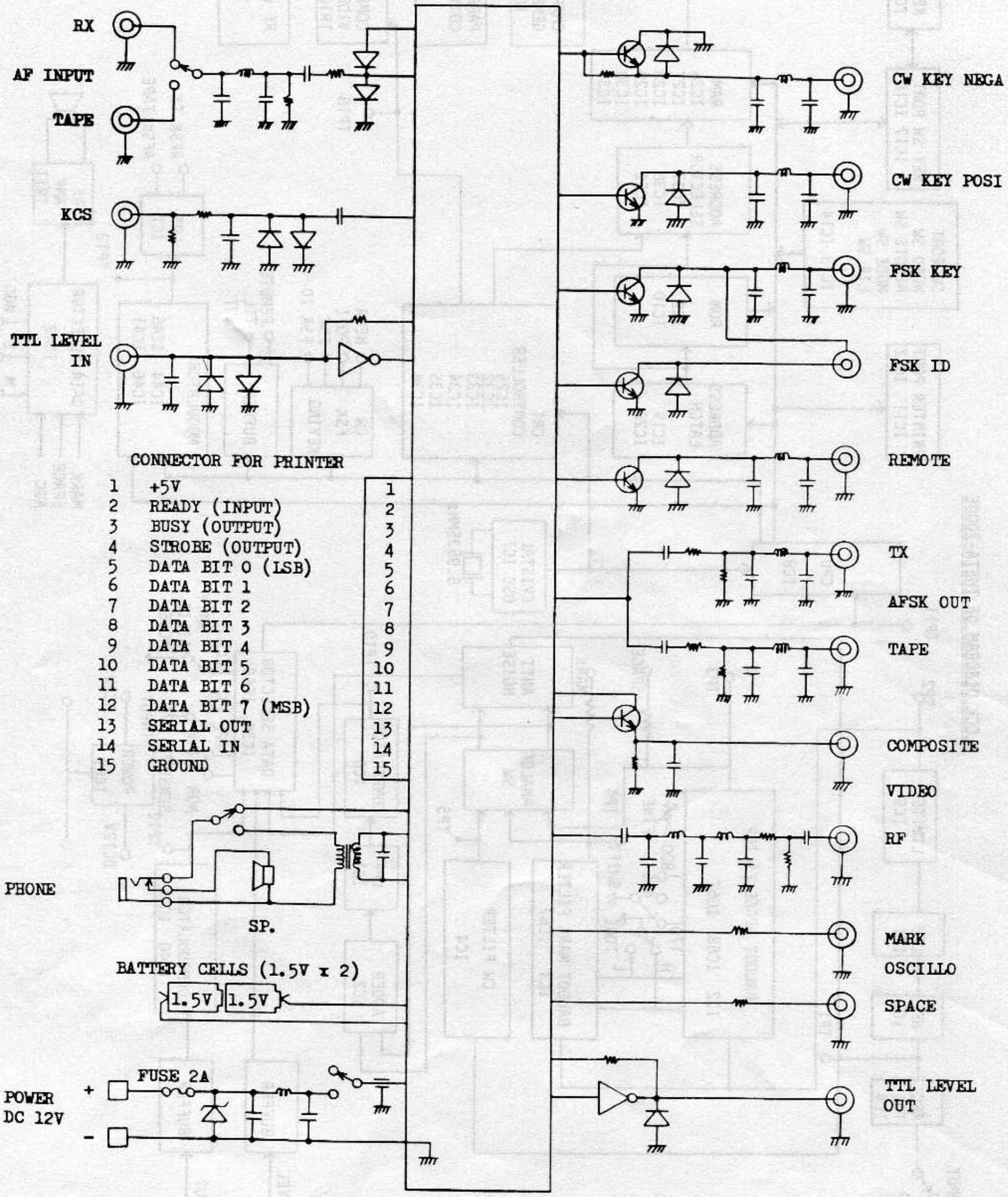
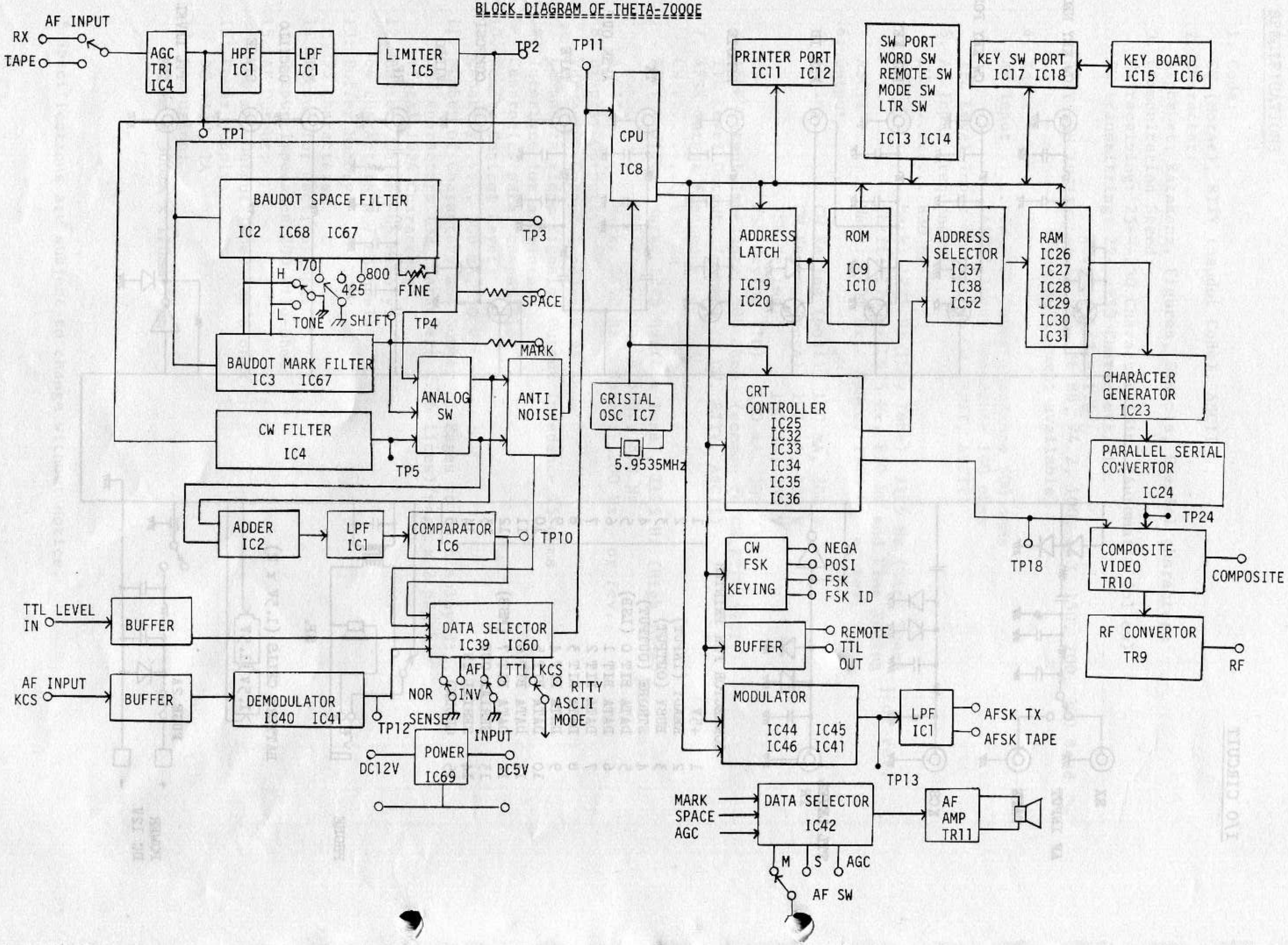


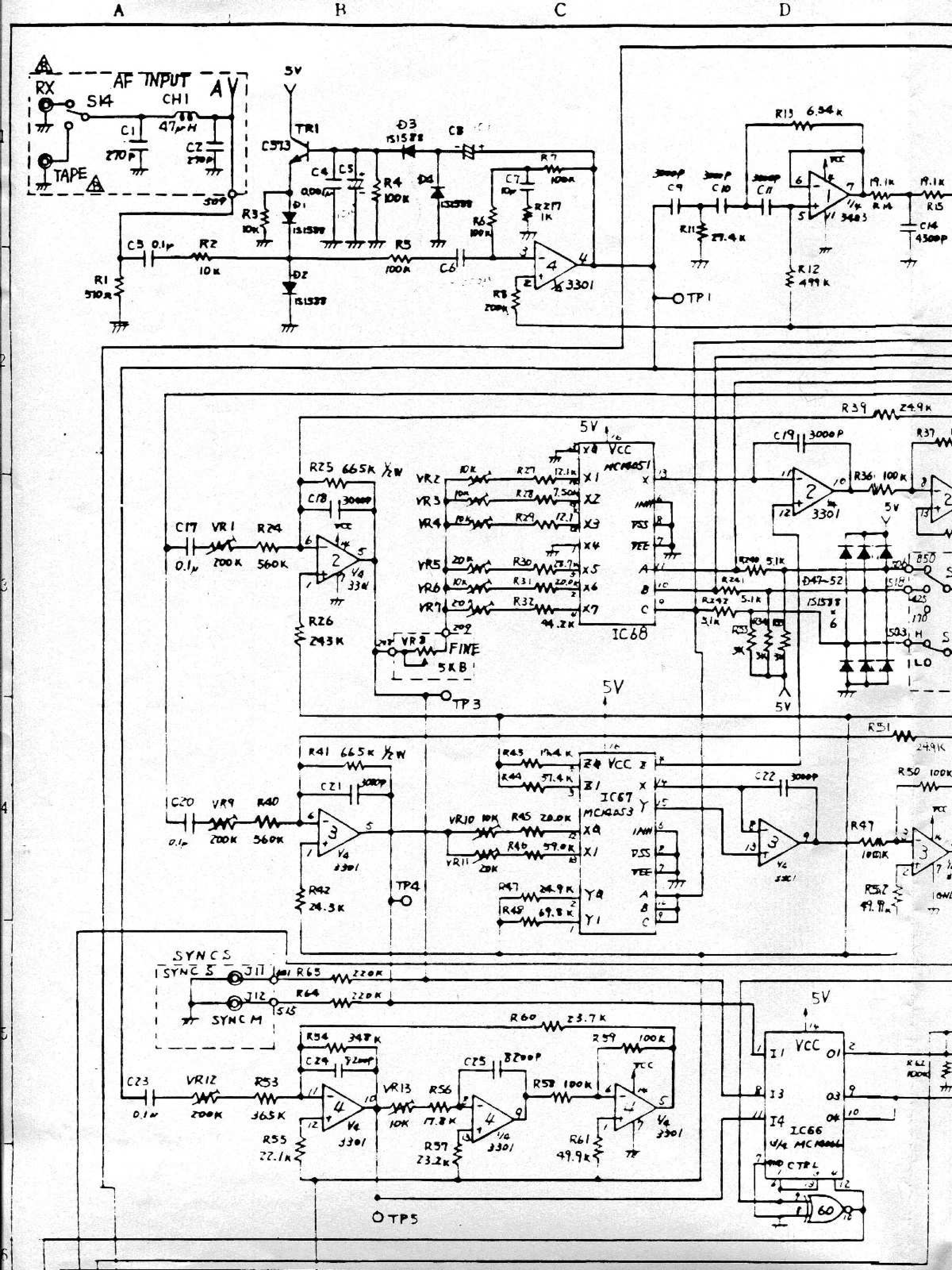
Fig. 4

I/O CIRCUIT

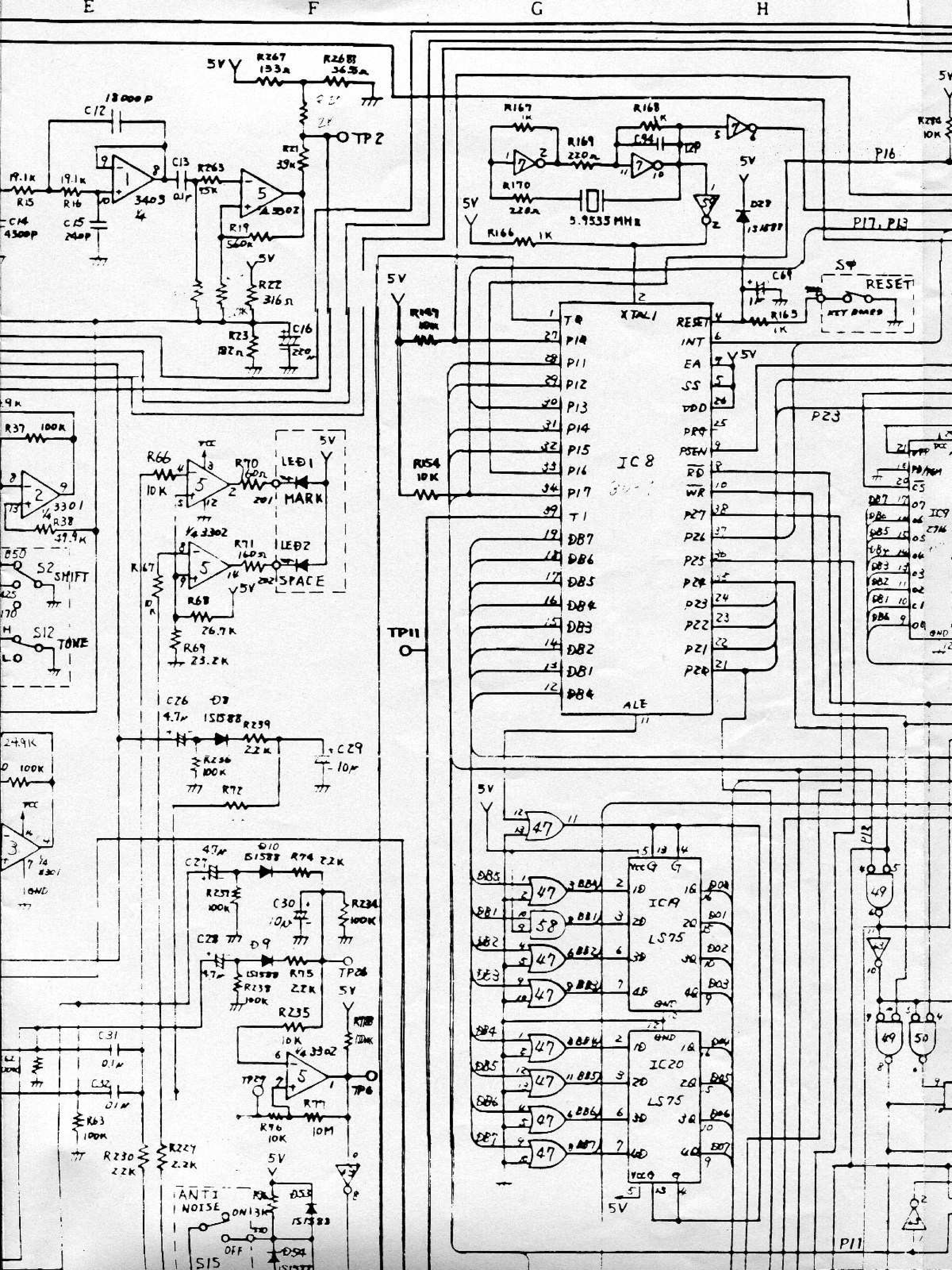

RX
AF INPUT
TAPE
KCS
TTL LEVEL IN
CONNECTOR FOR PRINTER
1 +5V
2 READY (INPUT)
3 BUSY (OUTPUT)
4 STROBE (OUTPUT)
5 DATA BIT 0 (LSB)
6 DATA BIT 1
7 DATA BIT 2
8 DATA BIT 3
9 DATA BIT 4
10 DATA BIT 5
11 DATA BIT 6
12 DATA BIT 7 (MSB)
13 SERIAL OUT
14 SERIAL IN
15 GROUND
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
PHONE
SP.
BATTERY CELLS (1.5V x 2)
1.5V 1.5V
FUSE 2A
POWER DC 12V
+
-
CW KEY NEGA
CW KEY POSI
FSK KEY
FSK ID
REMOTE
TX
AFSK OUT
TAPE
COMPOSITE VIDEO
RF
MARK OSCILLO
SPACE
TTL LEVEL OUT

BLOCK DIAGRAM OF THETA-7000E

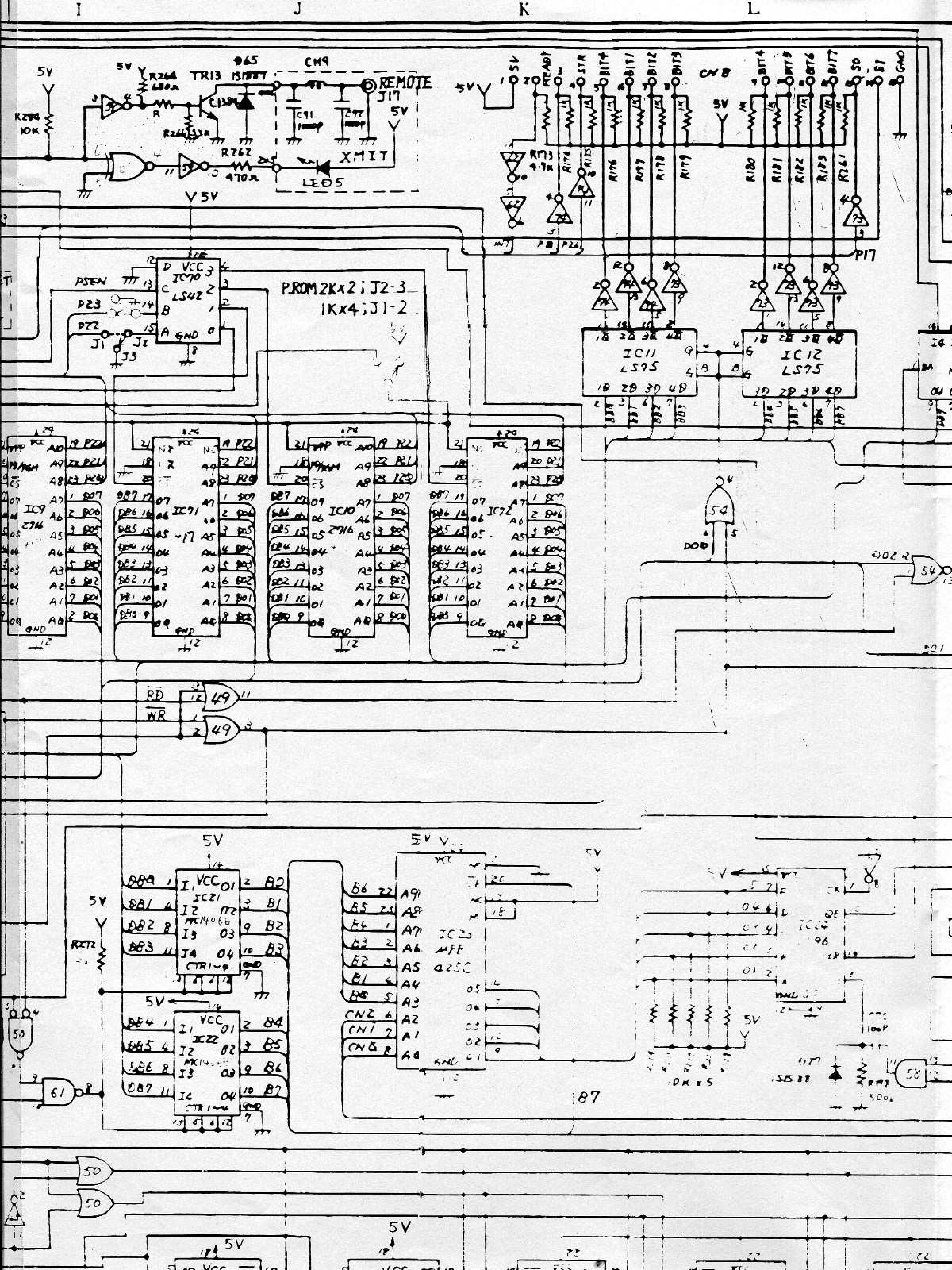




A
B
C
D
AF INPUT
RX
S14
CH1
47μH
C1
270P
C2
270P
TAPE
509
5V
TR1
C573
D3
1S1588
C8
C4
0.001μ
C5
R4
100K
D4
D1
1S1588
R3
10K
C3 0.1μ
R2
10K
R5
100K
C6
R1
510Ω
D2
1S1588
R7
100K
C7
R217
1K
R6
100K
R8
200K
3301
TP1
R13 6.34K
C9
C10
C11
3000P
R11
27.4K
R12
499K
3403
R14
19.1K
R15
C14
4300P
R39 24.9K
C19 3000P
R37
R36 100K
5V
MC14051
IC68
R25 665K 1/2W
C18
C17
VR1
R24
0.1μ
200K
560K
R26
243K
VR2
VR3
VR4
VR5
VR6
VR7
R27
R28
R29
R30
R31
R32
12.1K
7.50K
12.1
23.7K
20.0K
44.2K
209
VR8
FINE
5KB
TP3
R240 5.1K
R241
R242 5.1K
D47~52
1S1588
6
850
518
425
170
503
H
LO
R51
24.9K
R41 665K 1/2W
C21
C20
VR9
R40
200K
560K
3301
R42
24.3K
TP4
VR10 10K
R45 20.0K
VR11
20K
R46 59.0K
R43 17.4K
R44 57.4K
IC67
MC14053
R47 24.9K
R48 69.8K
C22 3000P
R50 100K
R47
100K
R52
49.9K
SYNCS
SYNC S
J11
R65 220K
J12
R64 220K
515
SYNC M
R60 23.7K
R54 348K
C24
C25 8200P
R59 100K
C23
VR12
R53
0.1μ
200K
365K
VR13
R56
10K
17.8K
R58 100K
R55
22.1K
R57
23.2K
R61
49.9K
3301
TP5
5V
IC66
CTRL
60

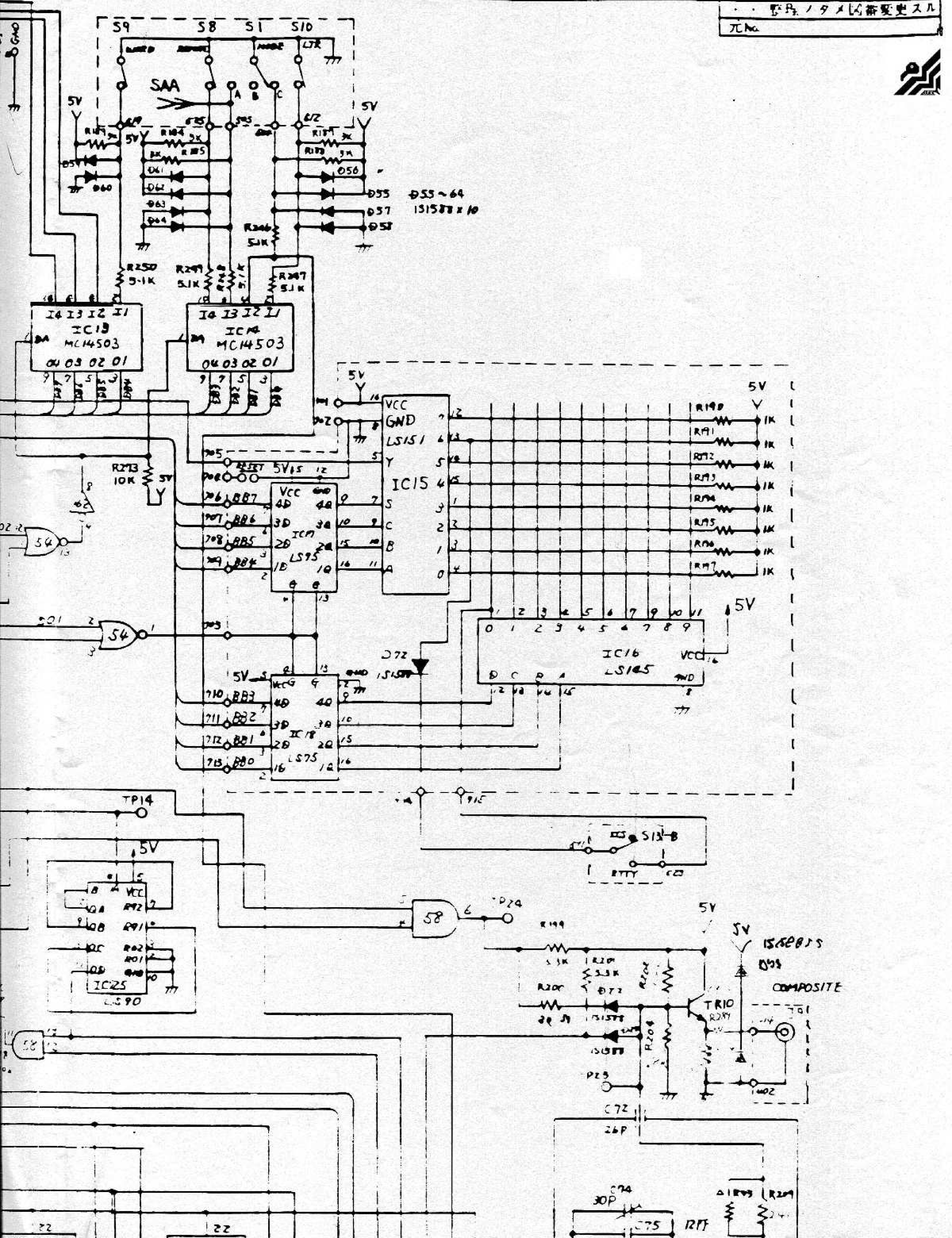


E
F
G
H
5V
R267
133Ω
R268
365Ω
C12
18000P
TP2
R21
39K
R15
19.1K
R16
19.1K
3403
1/4
C13
0.1μ
R263
15K
4302
C14
4300P
C15
240P
R19
560K
R22
316Ω
R23
182Ω
C16
220μ
R167
1K
R168
1K
R169
220Ω
C94
12P
R170
220Ω
5.9535 MHz
R166
1K
D27
1S1588
P16
P17, P13
C69
1μ
S9
RESET
KEY BOARD
R163
1K
R270
10K
R149
10K
R154
10K
XTAL1
T0
P10
P11
P12
P13
P14
P15
P16
P17
T1
DB7
DB6
DB5
DB4
DB3
DB2
DB1
DB0
IC8
RESET
INT
EA
SS
VDD
PRG
PSEN
RD
WR
P27
P26
P25
P24
P23
P22
P21
P20
ALE
P23
IC9
2716
CS
GND
R37
100K
R38
39.9K
3301
S2
SHIFT
S12
TONE
LO
R66
10K
R70
160Ω
LED1
MARK
1/4 3302
R71
160Ω
LED2
SPACE
R67
R68
26.7K
R69
23.2K
TP11
C26
4.7μ
D8
1S1588
R239
22K
C29
10μ
R236
100K
R72
24.9K
100K
C27
4.7μ
D10
1S1588
R74
22K
R237
100K
C30
10μ
R234
100K
C28
4.7μ
D9
1S1588
R75
22K
R238
100K
TP26
R235
10K
1/4 3302
R178
100K
TP27
TP6
R76
10K
R77
10M
C31
0.1μ
C32
0.1μ
R63
100K
R230
22K
R229
2.2K
ANTI NOISE
ON
OFF
S15
D53
1S1588
D54
47
58
IC19
LS75
IC20
LS75
DB0
DB1
DB2
DB3
DB4
DB5
DB6
DB7
49
50
P12
P11

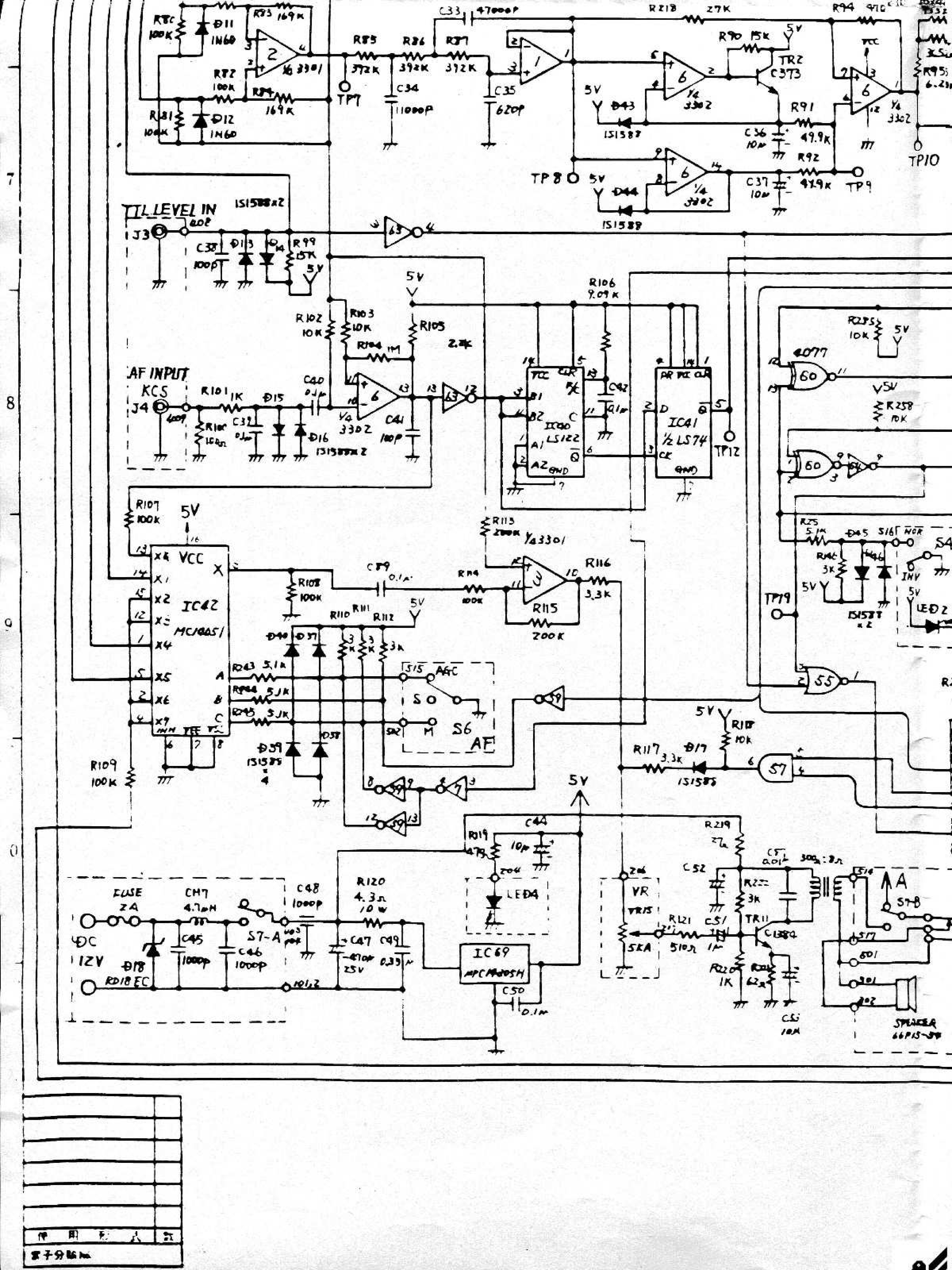


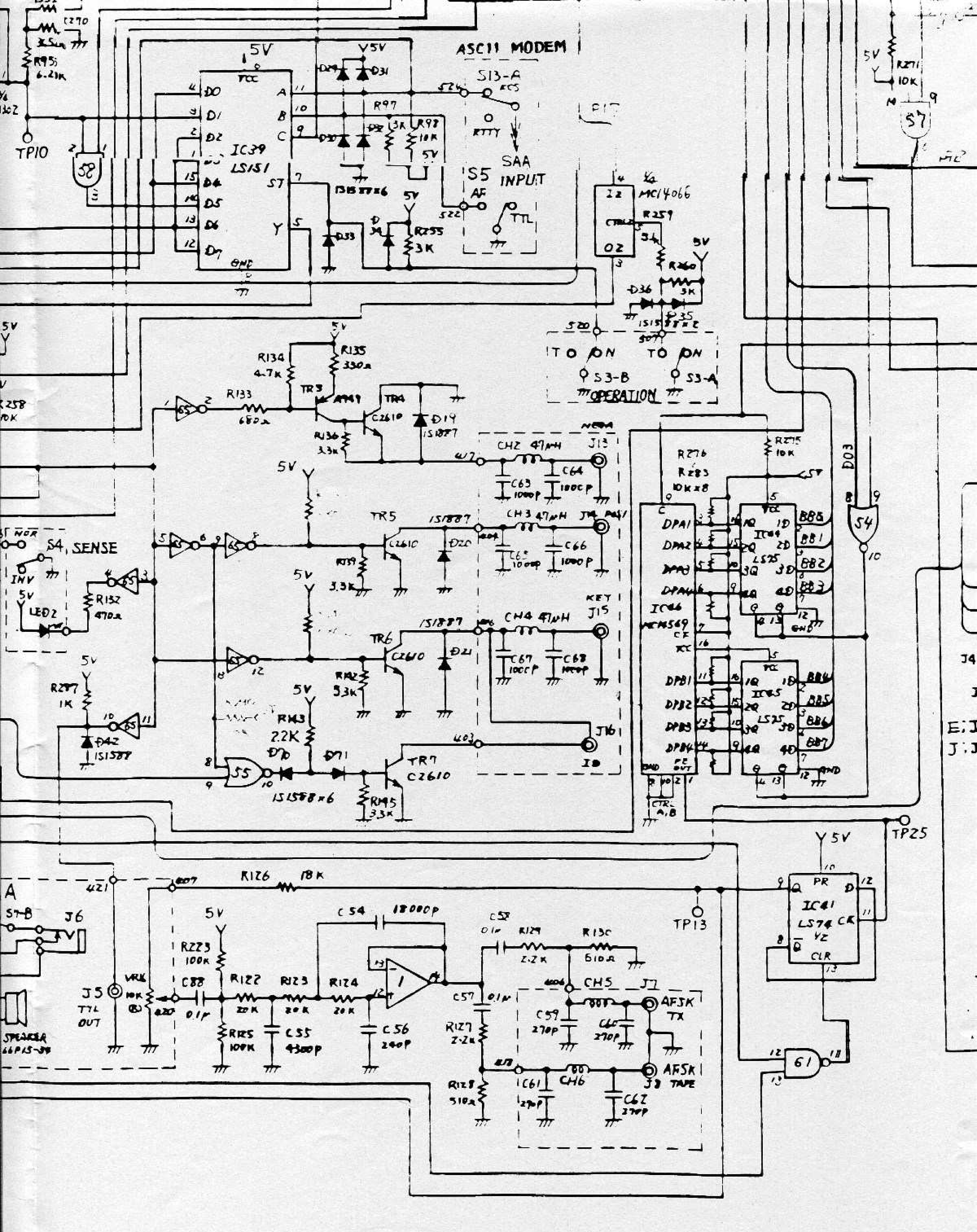
I
J
K
L
5V
R284 10K
R264 680Ω
TR13
D65 1S1887
CH9
REMOTE J17
C91
C92
R
R262 470Ω
XMIT
LED5
V5V
CN8
READY
STR
BIT0
BIT1
BIT2
BIT3
BIT4
BIT5
BIT6
BIT7
S0
S1
GND
R173 4.7K
R174
R175
R176
R177
R178
R179
R180
R181
R182
R183
R261
P17
IC11 LS75
IC12 LS75
PSEN
P23
P22
J1
J2
J3
IC70 LS42
PROM 2Kx2 ; J2-3
1Kx4 ; J1-2
IC9 2716
IC71
IC10 2716
IC72
GND
RD
WR
49
54
DO0
DO2
50
61
IC21 MC14066
IC22
CTR1~4
IC23
5V
87

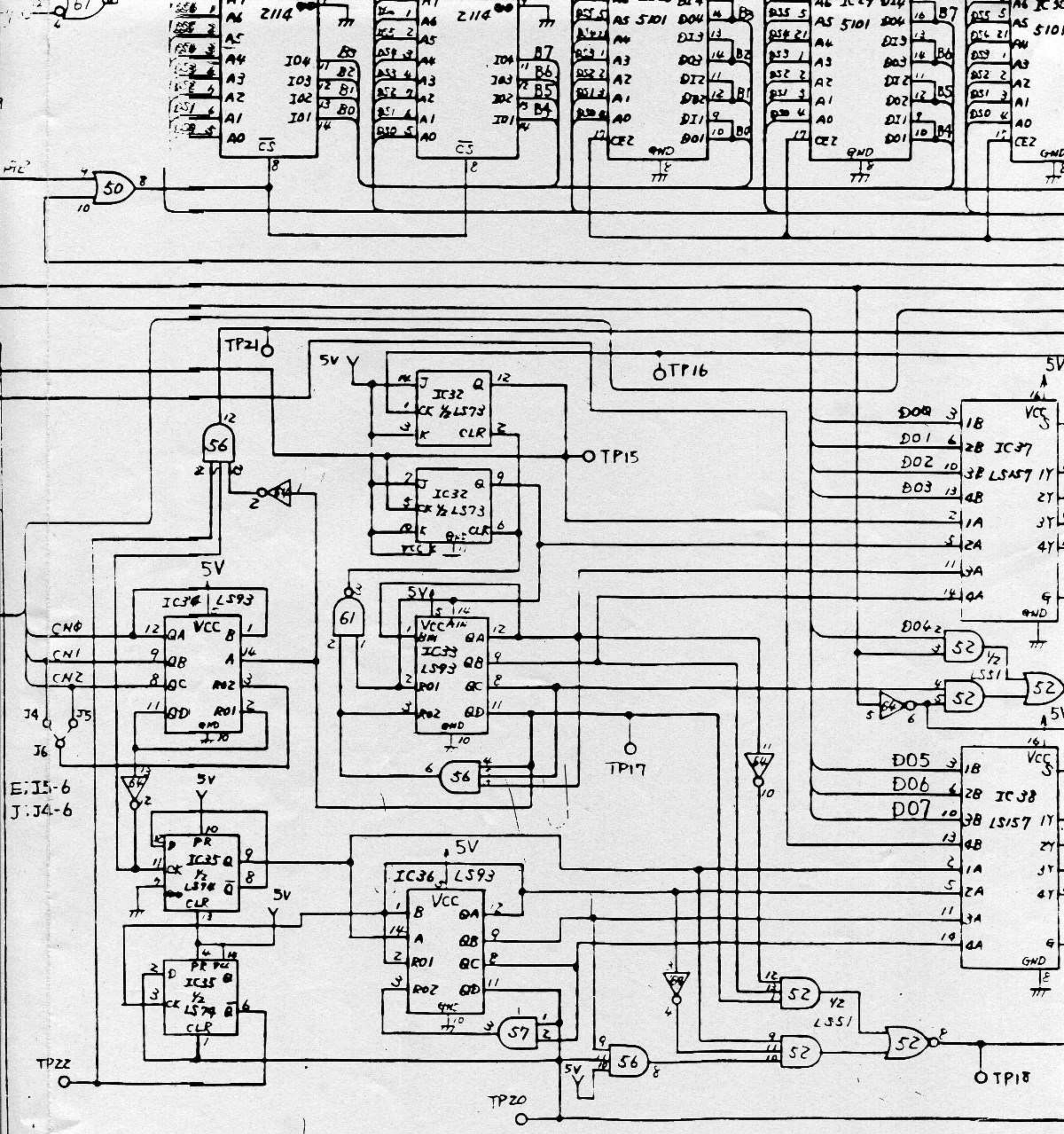
M N O P

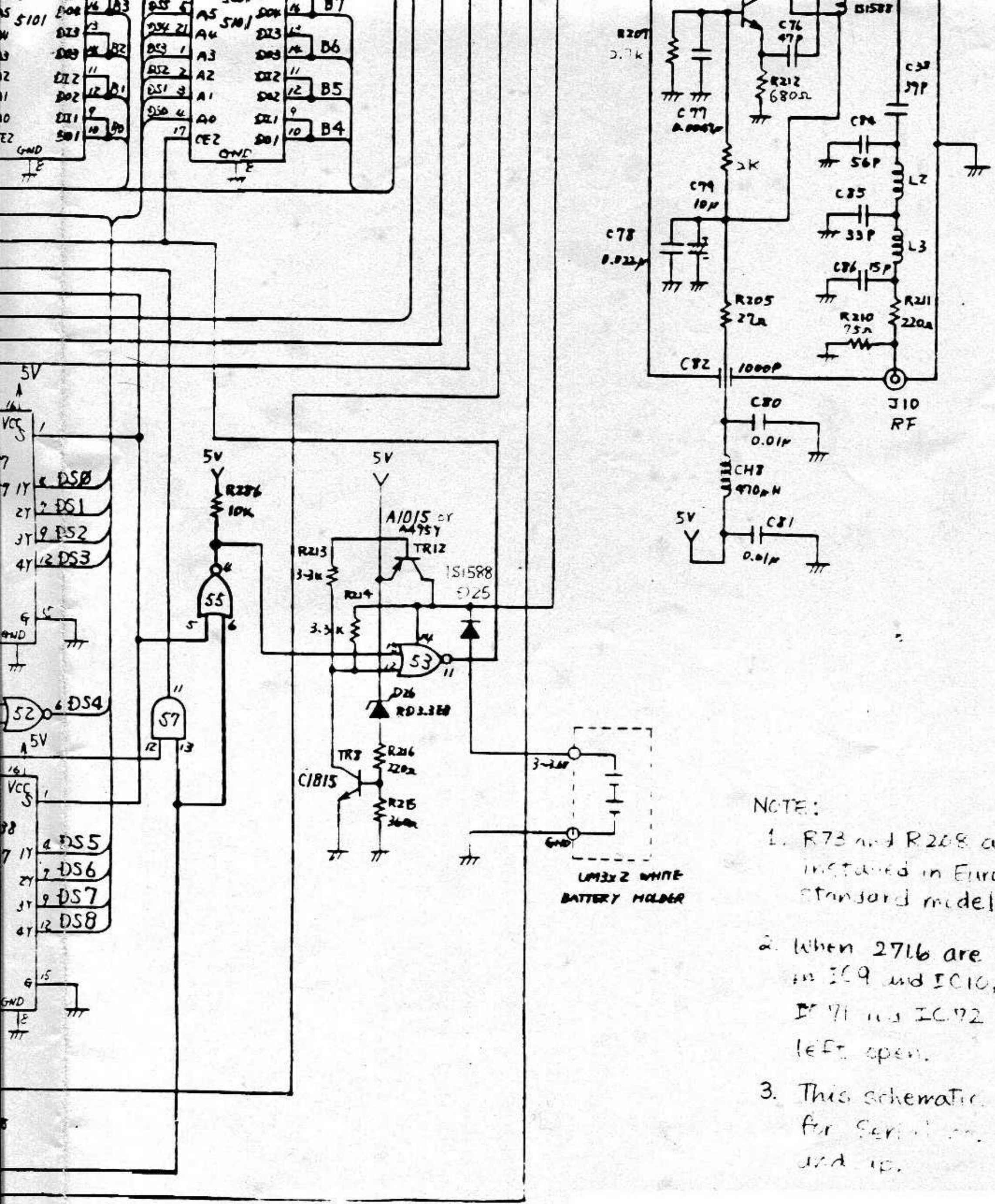


S9 S8 S1 S10
SAA
5V
D55~64
1S1588 x 10
R250 5.1K
R249 5.1K
R247 5.1K
R246 5.1K
IC13 MC14503
IC14 MC14503
IC15 LS151
IC17 LS75
IC18 LS75
IC16 LS145
R273 10K
R190 R191 R192 R193 R194 R195 R196 R197
1K
TP14
IC25 LS90
58
54
S13-B
RTTY
COMPOSITE
TR10
C72 26P
30P
C75


TTL LEVEL IN
J3
AF INPUT
KCS
J4
IC42
MC14051
IC41
½ LS74
LS122
TP7
TP8
TP9
TP10
TP12
TP19
TR2
C373
TR11
C1384
IC69
LED4
LED2
VR
VR15
5KA
FUSE
2A
CH7
4.7mH
S7-A
S7-B
S6
AF
AGC
S4
NOR
INV
DC
12V
D18
RD18EC
R120
4.3Ω
10W
SPEAKER
1S1588×2
1S1588
1/4 3302
1/4 3301
4077
5V


ASCII MODEM
5V
IC39
LS151
D0
D1
D2
D4
D5
D6
D7
A
B
C
ST
Y
GND
VCC
TP10
R95
6.2K
52
D29
D31
D30
D32
D33
D34
R97
3K
R98
10K
1S1587×6
R255
3K
S13-A
RTTY
SAA
INPUT
S5
AF
TTL
MC14066
R259
R260
3K
D36
D35
S3-B
S3-A
TO
ON
OPERATION
R134
4.7K
R135
330Ω
R133
680Ω
TR3
TR4
C2610
D19
1S1887
R136
3.3K
CH2 47μH
J13
C63
1000P
C64
1000P
TR5
D20
R139
3.3K
CH3 47μH
C65
1000P
C66
1000P
S4
SENSE
INV
LED2
R132
470Ω
TR6
D21
R142
3.3K
CH4 47μH
KEY
J15
C67
1000P
C68
1000P
R277
1K
D42
1S1588
R143
2.2K
D70
D71
55
1S1588×6
TR7
C2610
R145
3.3K
J16
R276
R283
10K×8
R275
10K
IC64
LS25
IC65
IC66
DPA1
DPA2
DPA3
DPA4
DPB1
DPB2
DPB3
DPB4
1Q
2Q
3Q
4Q
1D
2D
3D
4D
BB0
BB1
BB2
BB3
BB4
BB5
BB6
BB7
GND
CTRL
A,B
D03
54
57
R271
10K
TP25
IC41
LS74
1/2
PR
CK
CLR
61
TP13
J4
E:J
J:J
R126
18K
J6
J5
TTL
OUT
SPEAKER
VR6
10K
C88
0.1μ
R223
100K
R125
100K
R122
20K
R123
20K
R124
20K
C55
4300P
C56
240P
C54
18000P
C58
0.1μ
R129
2.2K
R130
510Ω
C57
0.1μ
R127
2.2K
R128
510Ω
CH5
CH6
J7
AFSK
TX
J8
TAPE
C59
270P
C60
270P
C61
270P
C62
270P


2114
IC32 ½ LS73
IC37 LS157
IC38 LS157
IC35 ½ LS74
IC33 LS193
IC36 LS193
5101
TP21
TP16
TP15
TP17
TP18
TP20
TP22
5V
GND
56
50
61
64
52
57
J4
J5
J6
E: I5-6
J: J4-6



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 for THETA-7000E