144 MHz TRANSCEIVER

IC-271A/E/H

MAINTENANCE MANUAL

ICOM

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SECTION 1 SPECIFICATIONS

1-1 GENERAL

Number of semiconductors:

	IC- 271A/E	IC- 271H
Transistors	89	112(Australia: 111)
FETs	14	14
ICs(includes CPU)	50	51(Europe: 52) (Australia: 50)
Diodes	160	180(Europe: 182)

Frequency coverage:

U.S.A.	143.8~148.2MHz
Europe	144.0~146.0MHz
Australia	144.0~148.0MHz

Frequency control:
CPU based 10Hz step digital PLL synthesizer.
Independent transmit/receive frequency available on the same band.
32 Memory channels provided.
Programmed Scan, Memory Channel Scan, Mode Selective Scan.

Frequency resolution:
SSB 10Hz steps(automatic shift to 100Hz steps).
FM 5kHz steps.
1kHz tuning steps with TUNING RATE switch depressed.

Frequency readout:
7 digit, 100Hz luminescent display.

Frequency stability:
Within ±1.5kHz in the range of −10℃~+60℃.

RIT frequency coverage:
±9.9kHz from the displayed receive frequency.

Power supply requirements:
13.8V DC ±15% (negative ground)
6A maximum current drain (IC- 271H: 20A maximun)
AC power supply is available for AC operation.

Current drain: (at 13.8V DC)

Transmitting	(IC- 271A/E)	25watts output	Approx. 6.0A
		1 watt output	Approx. 2.0A
	(IC- 271H)	100 watts output	Approx. 18.0A
		10 watts output	Approx. 7.0A
Receiving		At maximum audio output	Approx. 1.4A
		Squelched	Approx. 1.2A

Antenna impedance:
50 ohms unbalanced

Weight:
IC- 271A/E: 5.2kg
IC- 271H :6.9kg

Dimensions:
110(125)mm(H) x 285(300)mm(W) x 275(324)mm(D).
Bracketed values are dimensions of IC- 271H including projections.

1-2 TRANSMITTER

RF output power:	IC- 271A/E	IC- 271H
SSB(A3J):	25W PEP	100W PEP
CW(A1):	25W	100W
Continuously adjustable power:	1W~Max.	10W~Max.

Emission modes:
USB/LSB(A3J), CW(A1), FM(F3)

Modulation system:
SSB: Balanced modulation
FM : Variable reactance frequency modulation

Maximum frequency deviation:
±5kHz

Harmonic output:
More than 60dB below peak power output.

Spurious output:
More than 60dB below peak power output.

Carrier suppression:
More than 40dB below peak power output.

Unwanted sideband:
More than 40dB down with 1000Hz AF input.

Microphone:
600 ohm electret condenser microphone with push- to-talk switch and scanning buttons.

1-3 RECEIVER

Receive system:
SSB, CW: Single conversion superheterodyne
FM : Double conversion superheterodyne

Receive modes:
USB/LSB(A3J), CW(A1), FM(F3)

Intermediate frequencies:
SSB, CW: 10.75MHz
FM : 10.75MHz, 455kHz

Sensitivity:
SSB, CW: Less than 0.5uV for 10dB S+N/N.
FM : Less than 0.3uV for 12dB SINAD.
Less than 0.6uV for 20dB noise quieting.

Squelch sensitivity:
SSB, CW: Less than 0.6uV
FM : Less than 0.4uV

Selectivity:
SSB, CW: More than 2.4kHz at −6dB.
Less than 4.8kHz at −60dB.
FM : More than 15kHz at −6dB.
Less than 30kHz at −60dB.

Spurious response rejection ratio:
More than 60dB.

Audio output power:
More than 2W at 10% distortion with 8 ohm load.

Audio output impedance:
8 ohms

Specifications are approximate and subject to change without notice or obligation.

IC-271 VERSIONS AVAILABLE

This service manual contains information pertaining to the following versions of the IC-271.

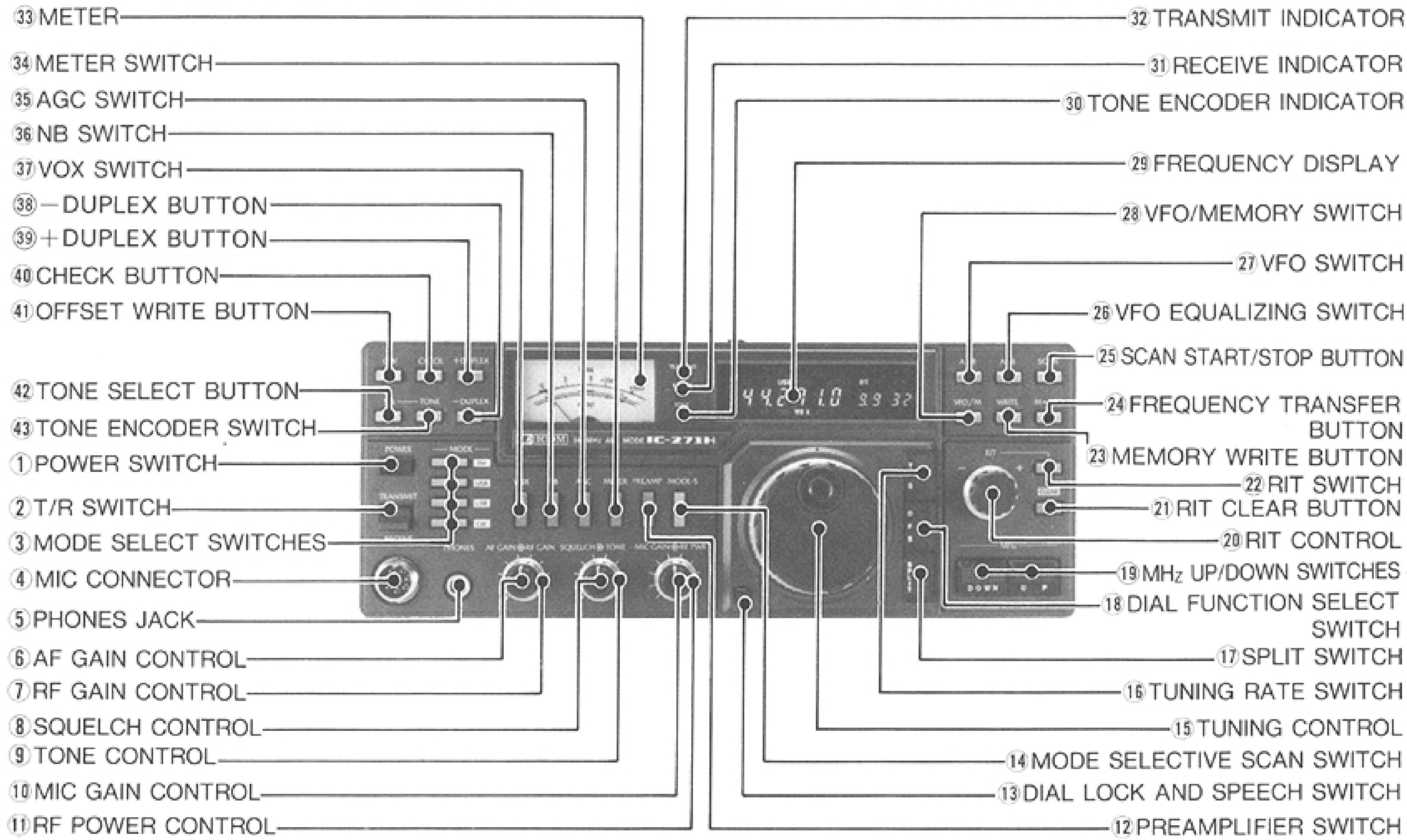
IC-271A/E

VERSION NUMBER	REFERENCE NAME	FREQUENCY RANGE (MHz)	OUTPUT POWER (W)	RAM UNIT	TONE ENCODER
#02	EUROPE	144−146	10	#02	NO
#03	USA	143.8−148.2	10	#03	YES
#04	USA	143.8−148.2	25	#03	YES
#05	EUROPE	144−146	25	#02	NO
#06	AUSTRALIA	144−148	10	#06	NO
#07	AUSTRALIA	144−148	25	#06	NO

IC−271H

VERSION NUMBER	REFERENCE NAME	FREQUENCY RANGE (MHz)	OUTPUT POWER (W)	RAM UNIT	TONE ENCODER
#02	EUROPE	144−146	100	#02	NO
#03	USA	143.8−148.2	100	#03	YES
#04	AUSTRALIA	144−148	100	#06	NO

2-1 FRONT PANEL



① POWER SWITCH

A push- lock switch which controls the input DC power to the IC-271/A/E/H. When the external AC power supply(IC-PS15 or IC-PS30) or optional built-in AC power supply(IC-PS35) is used, the switch also acts as the AC power supply switch. When the switch is pushed in and locked, power is supplied to the set. When the switch is pushed again and released, power is cut to all circuits except the PA UNIT.

② T/R(TRANSMIT/RECEIVE) SWITCH

For manually switching from transmit to receive and vice versa. Set the switch to RECEIVE(down) and the IC-271A/E/H is in the receive mode. Set the switch to TRANSMIT(up) and the radio is in the transmit mode. When using the PTT(push-to-talk) switch on the microphone or the VOX (voice-operated transmit) function, the T/R switch must be in the RECEIVE position.

③ MODE SELECT SWITCHES

Select any one of four operating modes: FM, USB, LSB or CW. Simply push the switch associated with the desired mode of operation.

④ MIC CONNECTOR

Connect the supplied microphone or an optional microphone to this connector.

⑤ PHONES JACK

Accepts a standard 1/4 inch headphone plug. Use headphones with an impedance of 4~16 ohms, and note that stereo headphones may also be used without modification.

⑥ AF GAIN CONTROL

Controls the audio output level in the receive mode. Rotate clockwise to increase the audio level.

⑦ RF GAIN CONTROL

Controls the gain of the receiver RF section. Rotate clockwise to increase the gain. As the control is rotated clockwise, the METER needle rises and only those signals stronger than the level indicated by the needle are audible.

⑧ SQUELCH CONTROL

Sets the squelch threshold level. Rotate completely counterclockwise to turn OFF the squelch function. Rotate clockwise to raise the squelch threshold level.

⑨ TONE CONTROL

Controls the receiver audio tone. Adjust the control for the most intelligible and pleasing audio.

⑩ MIC GAIN CONTROL
Adjusts the transmit modulation level. Rotate clockwise to increase the microphone gain.

⑪ RF POWER CONTROL
The IC-271A/E transmit output power may be varied from 1~25 watts with this control, whereas the IC-271H range is 10~100 watts. Rotate clockwise to increase the power.

⑫ PREAMPLIFIER SWITCH
Turns the optional AG-25 mast-mounted preamplifier ON/OFF.

⑬ DIAL LOCK AND SPEECH SWITCH
Electronically locks the displayed frequency. This eliminates the possibility of accidentally changing the transceiver frequency while operating. Push the switch IN to activate the lock, and push again to cancel the function so you may change the frequency.
Additionally, this switch turns ON the optional speech synthesizer which announces the displayed frequency in English.

⑭ MODE SELECTIVE SCAN SWITCH
When this switch is pushed, only memory channels containing the same operating mode as displayed on the FREQUENCY DISPLAY immediately prior to pushing the switch may be selected by rotating the TUNING CONTROL or using the scan fuction.

⑮ TUNING CONTROL
Rotate clockwise to increase the frequency or memory channel number, and counterclockwise to decrease either of them. The frequency changes by 10Hz in the SSB and CW modes, and by 5kHz(some versions 12.5kHz) in the FM mode. While the 10Hz step tuning rate is selected, rapid rotation of the TUNING CONTROL automatically selects a 100Hz step tuning rate.

This control also resets the offset frequency and the subaudible tone number when used in conjunction with the OFFSET WRITE BUTTON and the TONE SELECT BUTTON, respectively.

⑯ TUNING RATE SWITCH
The operating frequency changes in 1kHz increments in any mode when this switch is pushed IN. Simultaneously, the 100Hz digit on the display clears to "0". When the switch is pushed again and released, the frequency changes according to the description under TUNING CONTROL. This switch allows quick changes of frequency in the SSB and CW modes, and also provides a method of tuning signals in the FM mode which are not on 5kHz multiples.

⑰ SPLIT SWITCH
Selects the relationship of the two VFOs. In the OFF position, one VFO is used for both receive and transmit functions. Push the switch to select "split" operation where one VFO contains the receive frequency and the other VFO contains the transmit frequency.

⑱ DIAL FUNCTION SELECT SWITCH
When operating in the VFO mode, push this switch to lock the displayed operating frequency, and use the TUNING CONTROL to change the displayed memory channel number.

When operating in the Memory Channel mode, push this switch to lock the memory to change the displayed frequency.

⑲ MHz UP/DOWN SWITCHES
Increases or decreases the 1MHz digit in 1MHz steps. Lower digits do not change.

⑳ RIT CONTROL
Shifts the receive frequency 9.9kHz(maximum) on either side of the displayed frequency. Rotate clockwise to raise the receive frequency with 10Hz steps. The 1kHz and 100Hz digits of the new receive frequency appear to the right of the main frequency display. Rotate the control counterclockwise to lower the receive frequency in the same way.

㉑ RIT CLEAR BUTTON
Push this button to clear to "0.0" the new, shifted frequency selected with the RIT control.

㉒ RIT SWITCH
Push this switch once to turn the RIT function ON. At this time, the letters "RIT" and the shifted frequency appear on the FREQUENCY DISPLAY. Push the button again to turn OFF the RIT. Even when the RIT function is turned OFF, the frequency shift is stored. This shift may be used at any time by pushing the RIT switch to turn ON the RIT function.

㉓ MEMORY WRITE BUTTON
Push this button to store the displayed frequency, operating mode and duplex mode in the displayed memory channel.

㉔ FREQUENCY TRANSFER BUTTON
In the VFO mode, the frequency, operating mode and the duplex mode stored in the displayed memory channel are transferred to a selected VFO.

㉕ SCAN START/STOP BUTTON
Starts and stops any of the scan functions. Pushing this button after the scan has halted at a frequency or memory channel causes the scan to resume from the frequency last stopped on, or from the highest memory channel.

㉖ VFO EQUALIZING SWITCH
Instantly stores the frequency, operating mode and the duplex mode of the currently selected VFO in the alternate VFO.

㉗ VFO SWITCH
Selects either VFO A or VFO B for tuning purposes. Each push of this switch selects the VFOs alternately.

㉘ VFO/MEMORY SWITCH
Selects the VFO mode or Memory Channel mode.

㉙ FREQUENCY DISPLAY
Displays the operating frequency, operating mode, duplex mode, selected VFO or memory channel, RIT function and its shifted frequency, and the scan indicator.

㉚ TONE ENCODER INDICATOR
Illuminates when the tone encoder is turned ON.

㉛ RECEIVE INDICATOR
Illuminates when the squelch is opened in the receive mode.

㉜ TRANSMIT INDICATOR
Illuminates in the transmit mode.

㉝ METER
Functions as a relative RF output meter in the transmit mode, and as an S-meter(signal strength meter) in the receive mode. When the meter switch is pushed, the meter functions as a center(discriminator) meter in the FM mode.

㉞ METER SWITCH
Selects the center(discriminator) meter function when pushed IN while in the FM mode.

㉟ AGC(AUTOMATIC GAIN CONTROL) SWITCH
Selects the time constant of the AGC circuit. When this switch is OUT, the AGC voltage releases slowly, suitable for SSB reception. When the switch is pushed IN, the AGC voltage releases quickly, suitable for receiving signals with rapid fading or for CW operation.

㊱ NB(NOISE BLANKER) SWITCH
The noise blanker reduces pulse noise such as that created by automobile ignition systems. Push this switch IN to activate the circuit. Push the switch again and release to turn OFF the circuit.

㊲ VOX SWITCH
Switches the VOX(voice-operated transmit) circuit ON and OFF. In the SSB mode, if the switch is IN(VOX circuit ON), audio from the microphone operates the T/R switch. In the CW mode, semi break-in operation is possible with this switch IN.

㊳ −DUPLEX BUTTON
Push this button to place the IC-271A/E/H in the duplex mode. The transmit frequency is automatically set 600kHz(or any 10kHz in-band multiple) below the displayed receive frequency. Push the button again to turn OFF the function.

㊴ +DUPLEX BUTTON
Push this button to place the IC-271A/E/H in the duplex mode. The transmit frequency is automatically set 600kHz(or any 10kHz in-band multiple) above the displayed receive frequency. Push the button again to turn OFF the function.

㊵ CHECK BUTTON
While this button is depressed, the receive and transmit frequencies are interchanged if the IC-271A/E/H is in the duplex mode.

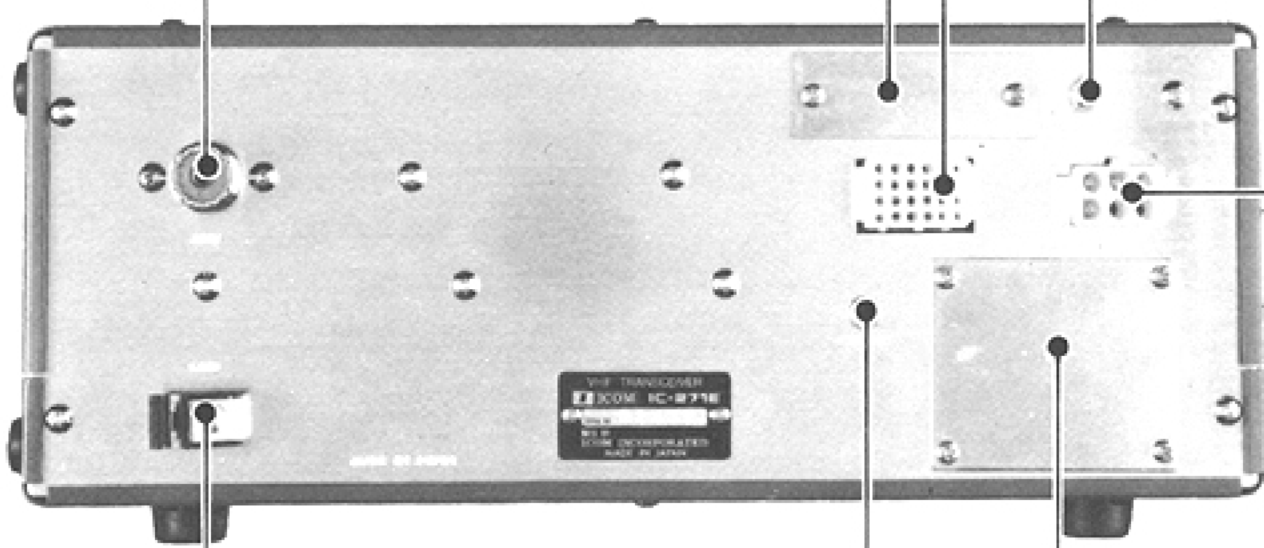
㊶ OFFSET WRITE BUTTON
Push to display the programmed offset frequecy on the FREQUENCY DISPLAY. In the FM mode, while this button is depressed, the offset can be changed in 10kHz steps by rotating the TUNING CONTROL.

㊷ TONE SELECT BUTTON
Selects the frequency of the subaudible tone encoder/decoder. While depressed, the currently programmed tone number appears on the FREQENCY DISPLAY. This number can be reprogrammed by rotating the TUNING CONTROL.

㊸ TONE ENCODER SWITCH
IC-271A/H(U.S.A. version): Turns ON/OFF the built-in subaudible tone encoder or the optional encoder/decoder.

IC-271E/H (European version): Places the transceiver in the transmit mode and actuates the tone-burst generator.

2-2 REAR PANEL CONNECTIONS (IC-271A/E)



㊹ OPTIONAL IC-EX309 INTERFACE CONNECTOR POSITION
Install the DP-25 connector from the optional interface at this locaton.

㊺ ACCESSORY SOCKET
Various functions are available through the accessory socket such as modulation output, receiver output, T/R switching, etc. Refer to the table for detailed pin information.

㊻ KEY JACK
Connect a CW key at this jack for CW operation. Electronic keyers must have a terminal voltage less than 0.4V DC.

㊼ DC POWER CONNECTOR
Connect the DC power cable from the IC-PS15, or other suitable power supply, to this connector.

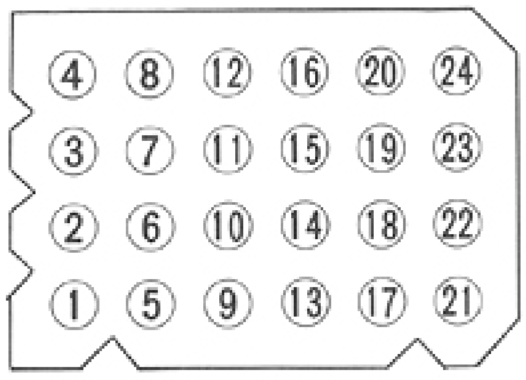
㊽ANTENNA(ANT) CONNECTOR
Connect the antenna to the IC-271A/E/H at this connector. Use a 50 ohm antenna system with a PL-259 connector installed on the feedline.

㊾ OPTIONAL BUILT-IN POWER SUPPLY SOCKET POSITION
Install the AC power socket plate from the optional IC-PS25 internal power supply at this location.

㊿ GROUND TERMINAL
To prevent electrical shock, television interference(TVI), broadcast radio interference(BCI) and other problems, ground the IC-271A/E/H at this terminal. Use the heaviest gauge wire or strap possible, and try to keep the cable run short.

(51)EXTERNAL SPEAKER JACK
Connect an external speaker, if used, here. Use a speaker with an impedance of 8 ohms. The built-in speaker disconnects when an external speaker is used.

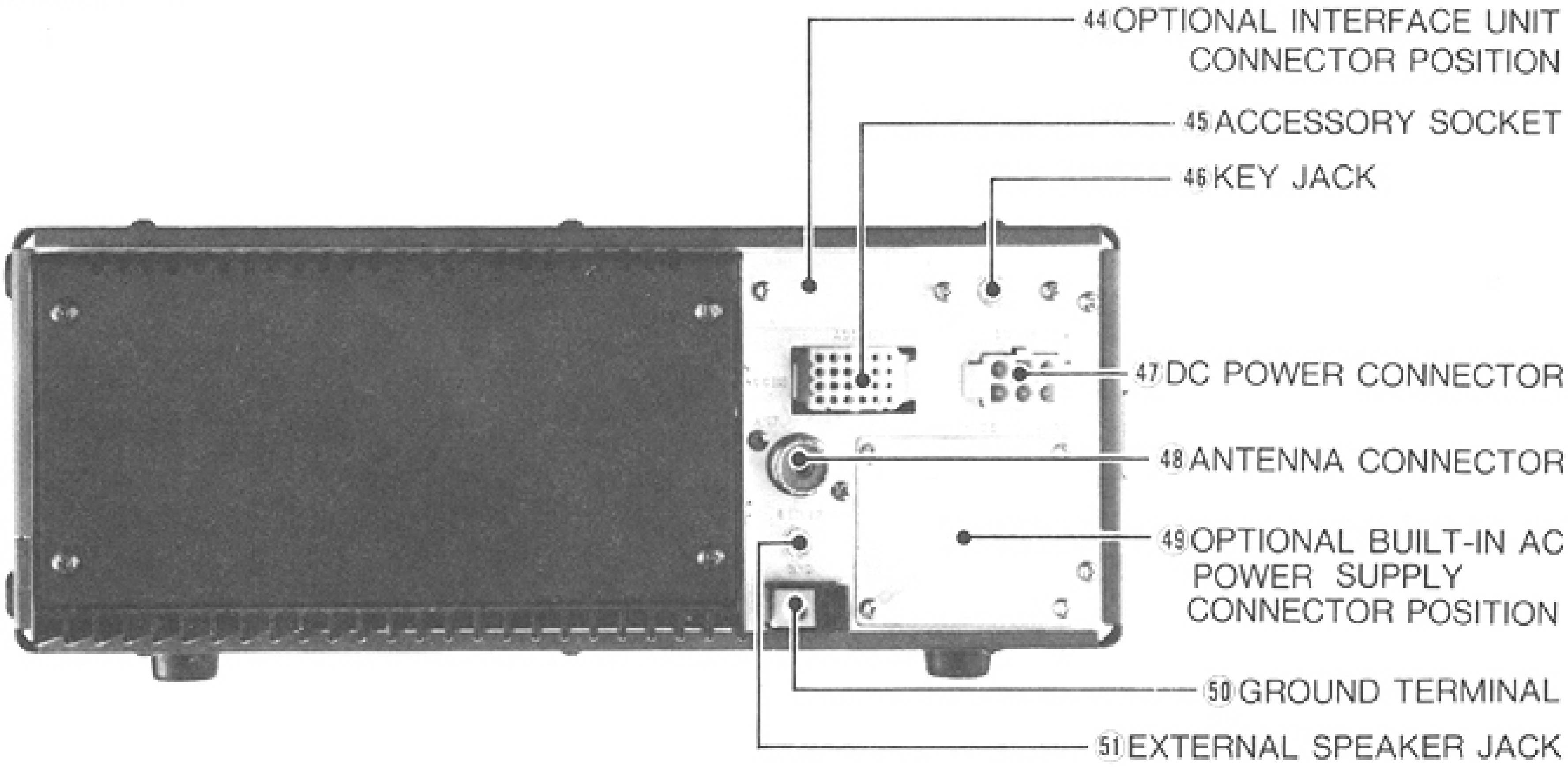
ACCESSORY SOCKET CONNECTIONS



Outside View

PIN NO.	FUNCTION
1	Output from the squelch control stage. (+8V when the squelch is ON.)
2	13.8 volts DC interlocked with the power switch.
3	Connected to the push-to-talk, T/R switch. When grounded, the tranceiver changes to the transmit mode.
4	Output from the receive detector stage. Fixed output regardless of AF output or AF gain.
5	Output from the transmit MIC amplifier stage. (Input for the gain control stage.)
6	8 volts DC output while transmitting.(Maximum output current is 5mA.)
7	Input for external ALC voltage.
8	Ground.
9	No connection.
10	Output of the meter voltage.
11	No connection.
12	Input for external Noise Blanker control voltage.
13	Input for external FM squelch control voltage.
14	Input for external SSB squelch control voltage.
15~24	No connection.

2-2 REAR PANEL CONNECTIONS (IC-271H)



⑭ OPTIONAL IC-EX309 INTERFACE CONNECTOR POSITION
Install the DP-25 connector from the optional interface at this locaton.

㊺ ACCESSORY SOCKET
Various functions are available through the accessory socket such as modulation output, receiver output, T/R switching, etc. Refer to the table for detailed pin information.

㊻ KEY JACK
Connect a CW key at this jack for CW operation. Electronic keyers must have a terminal voltage less than 0.4V DC.

㊼ DC POWER CONNECTOR
Connect the DC power cable from the IC-PS15, or other suitable power supply, to this connector.

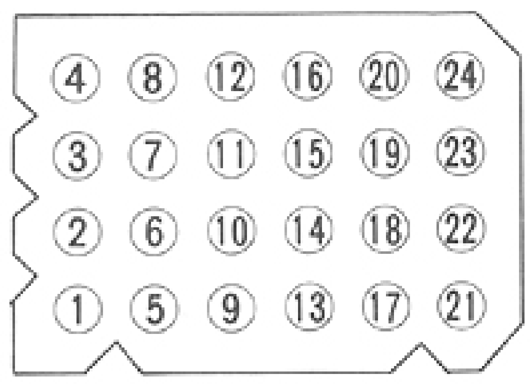
㊽ ANTENNA(ANT) CONNECTOR
Connect the antenna to the IC-271A/E/H at this connector. Use a 50 ohm antenna system with a PL-259 connector installed on the feedline.

㊾ OPTIONAL BUILT-IN POWER SUPPLY SOCKET POSITION
Install the AC power socket plate from the optional IC-PS25 internal power supply at this location.

㊿ GROUND TERMINAL
To prevent electrical shock, television interference(TVI), broadcast radio interference(BCI) and other problems, ground the IC-271A/E/H at this terminal. Use the heaviest gauge wire or strap possible, and try to keep the cable run short.

(51) EXTERNAL SPEAKER JACK
Connect an external speaker, if used, here. Use a speaker with an impedance of 8 ohms. The built-in speaker disconnects when an external speaker is used.

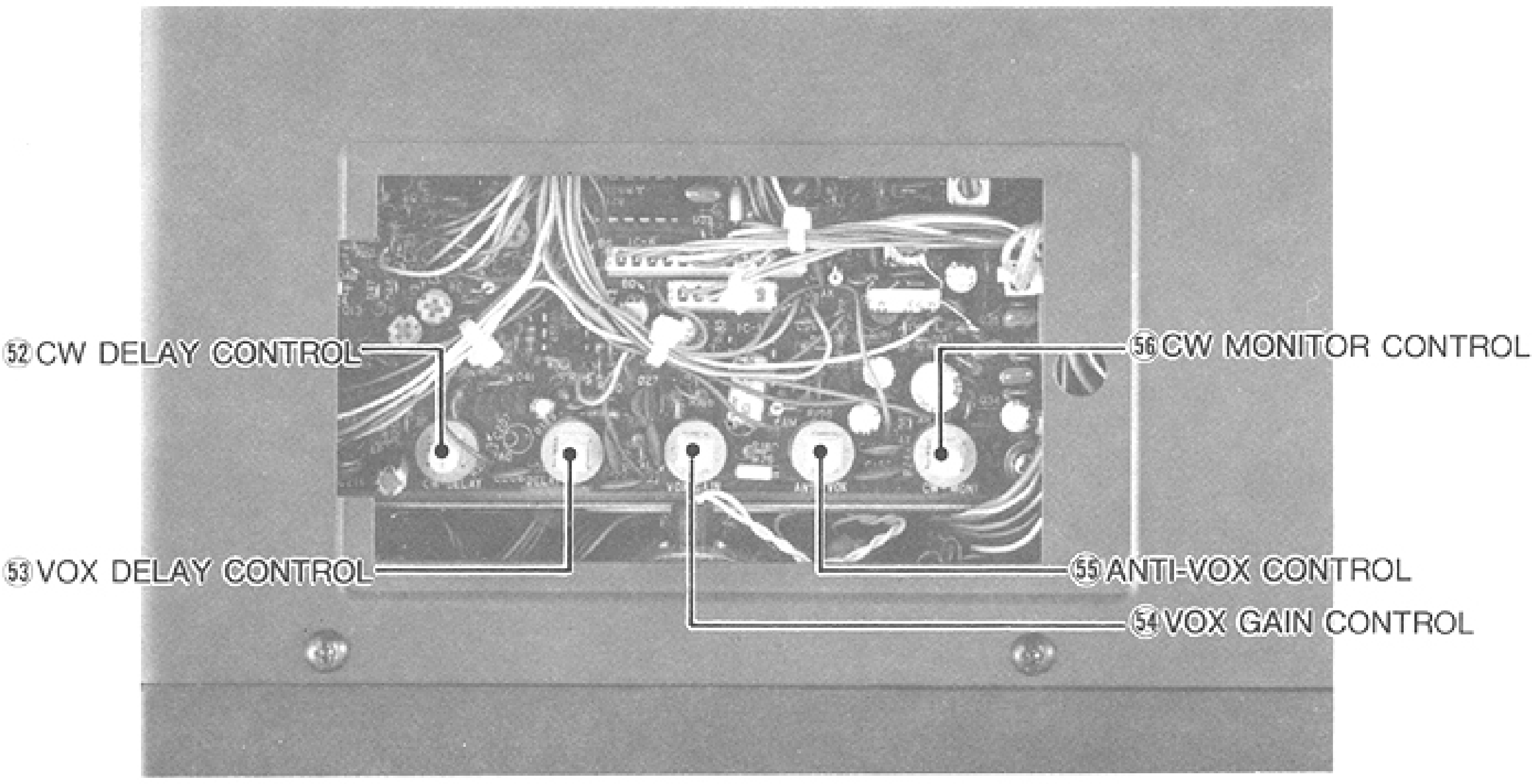
ACCESSORY SOCKET CONNECTIONS



Outside View

PIN NO.	FUNCTION
1	Output from the squelch control stage. (+8V when the squelch is ON.)
2	13.8 volts DC interlocked with the power switch.
3	Connected to the push-to-talk, T/R switch. When grounded, the tranceiver changes to the transmit mode.
4	Output from the receive detector stage. Fixed output regardless of AF output or AF gain.
5	Output from the transmit MIC amplifier stage. (Input for the gain control stage.)
6	8 volts DC output while transmitting.(Maximum output current is 5mA.)
7	Input for external ALC voltage.
8	Ground.
9	No connection.
10	Output of the meter voltage.
11	No connection.
12	Input for external Noise Blanker control voltage.
13	Input for external FM squelch control voltage.
14	Input for external SSB squelch control voltage.
15~24	No connection.

2-4 CONTROLS UNDER THE ACCESS COVER



52 CW DELAY CONTROL

Controls the transmit/receive switching time-delay when using semi break-in operation. Adjust to suit your keying speed. Set the delay to minimum in order to operate near full break-in.

53 VOX DELAY (VOX time constant) CONTROL

Controls the transmit to receive switching time. Adjust it so the transmit to receive switching does not occur during short pauses in normal speech.

54 VOX GAIN CONTROL

Varies the input signal level from the microphone to the VOX circuit. For VOX operation when in the SSB mode, adjust the control so the VOX circuit operates with normal speech.

55 ANTI-VOX CONTROL

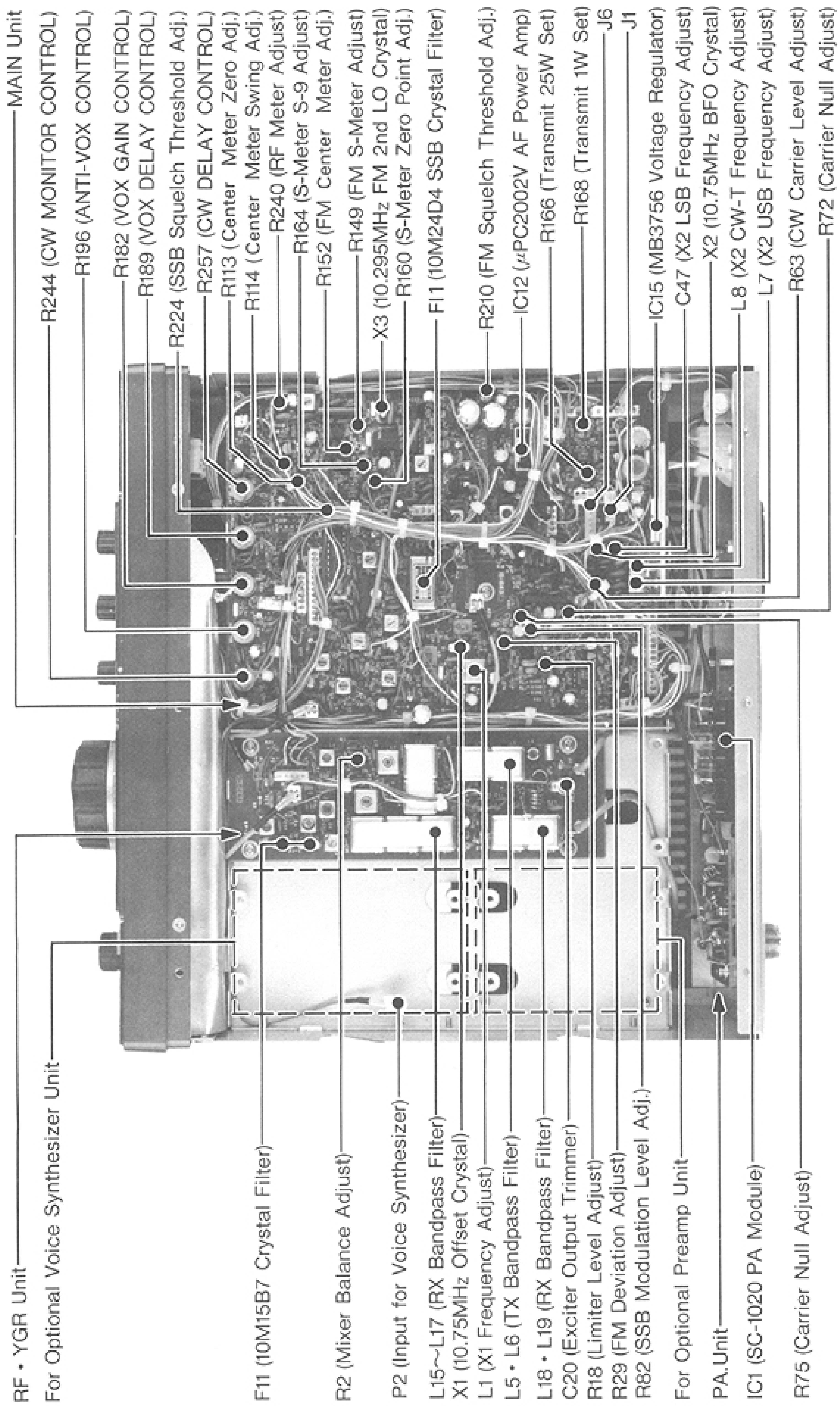
The VOX circuit may sometimes be triggered by audio from the speaker. It is possible to prevent this problem by adjusting the input level to the anti-vox circuit using this control in conjunction with the VOX GAIN CONTROL.

56 CW MONITOR(MONI) CONTROL

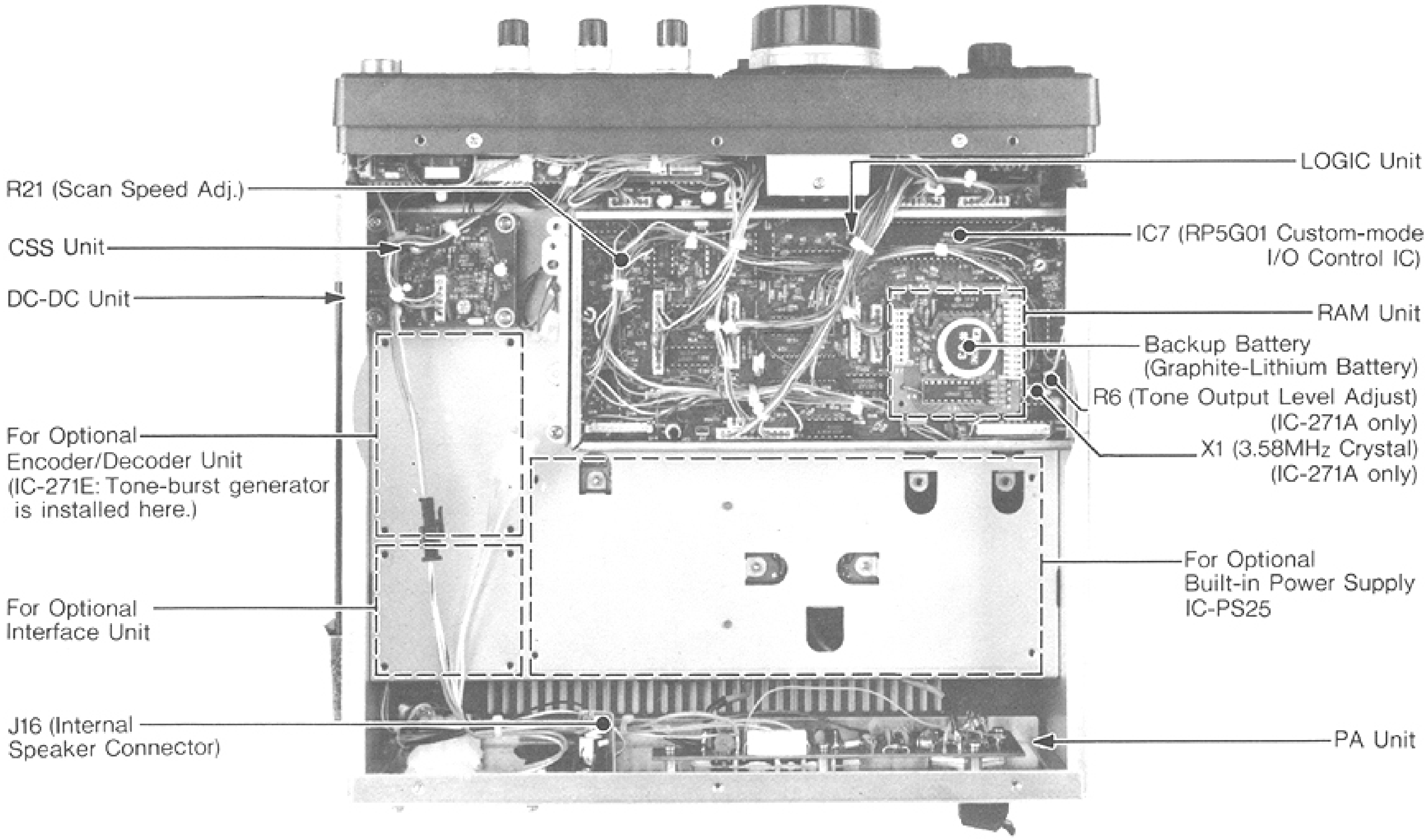
Varies the audio volume of the sidetone monitor when using the CW mode.

SECTION 3 INSIDE VIEWS

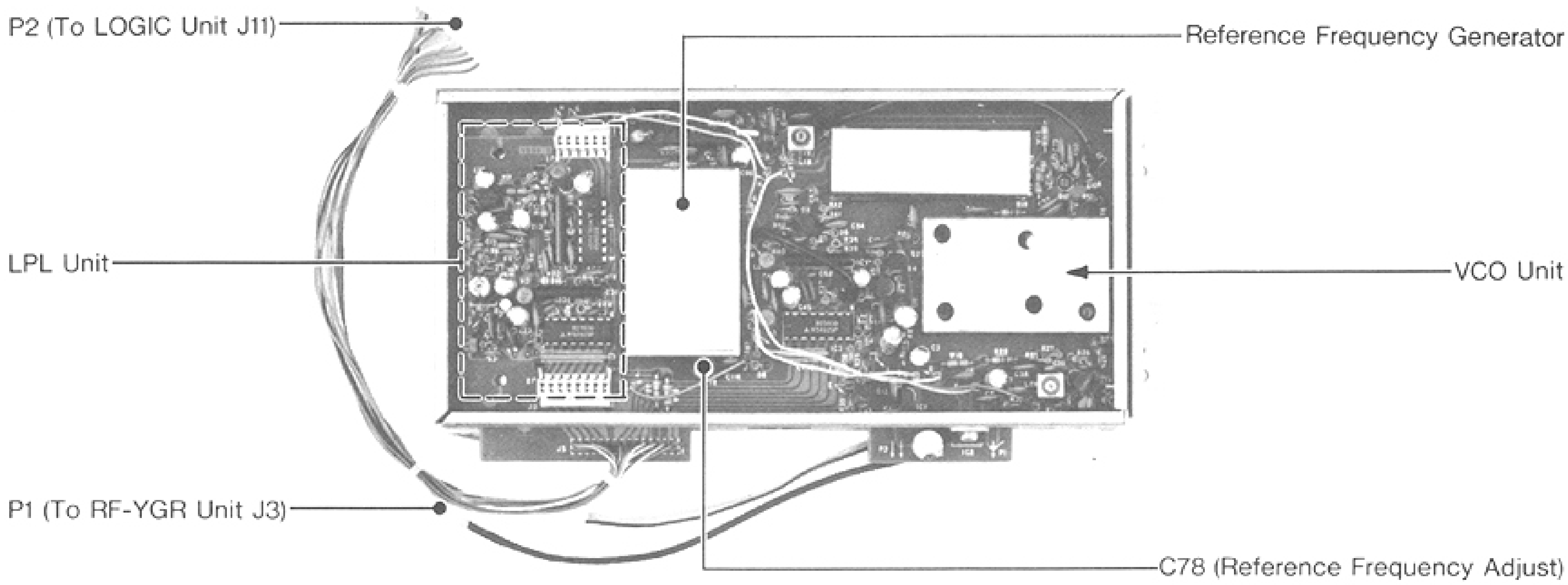
3-1 TOP VIEW (IC-271A/E)



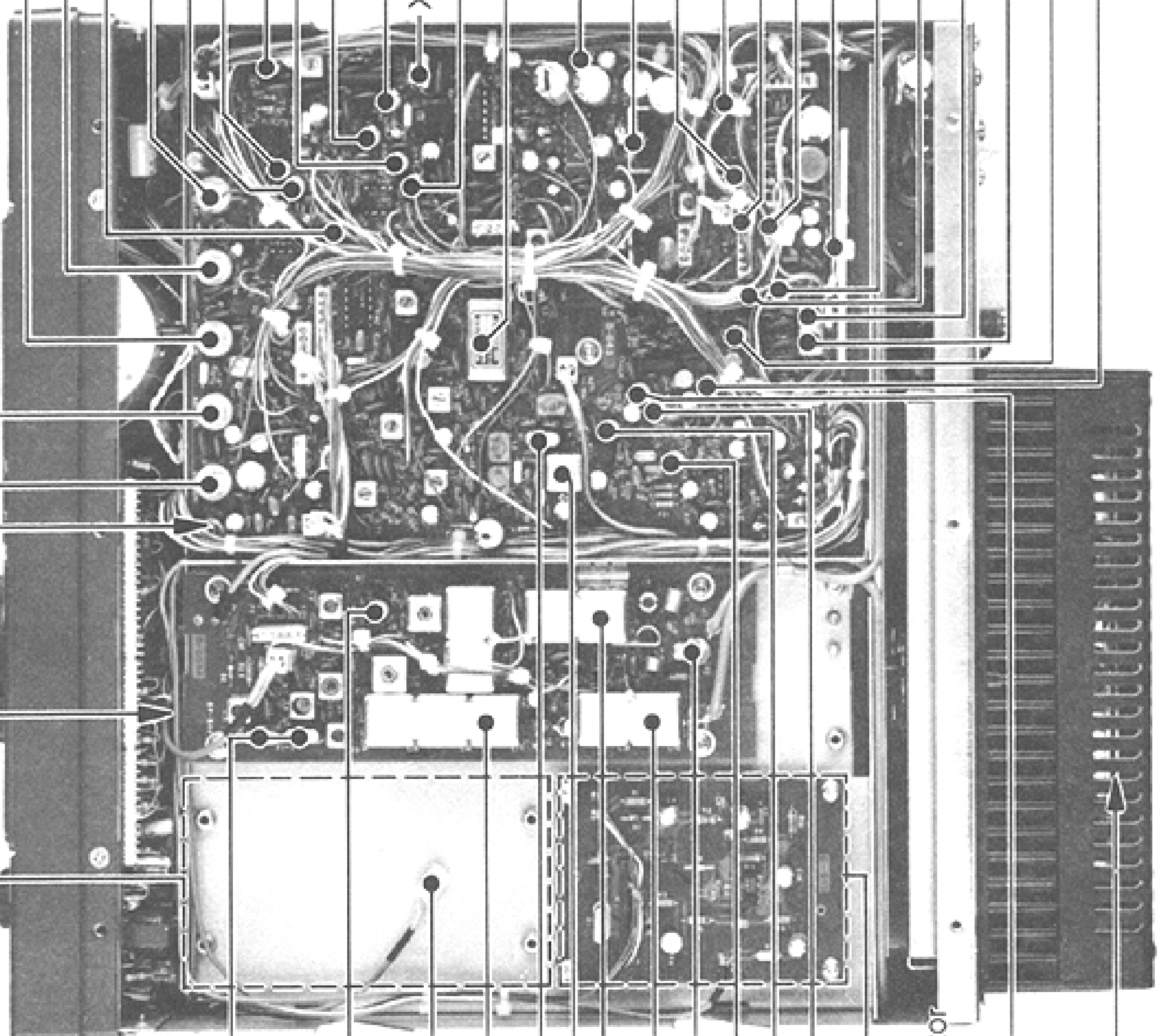
3-2 BOTTOM VIEW (IC-271A/E)



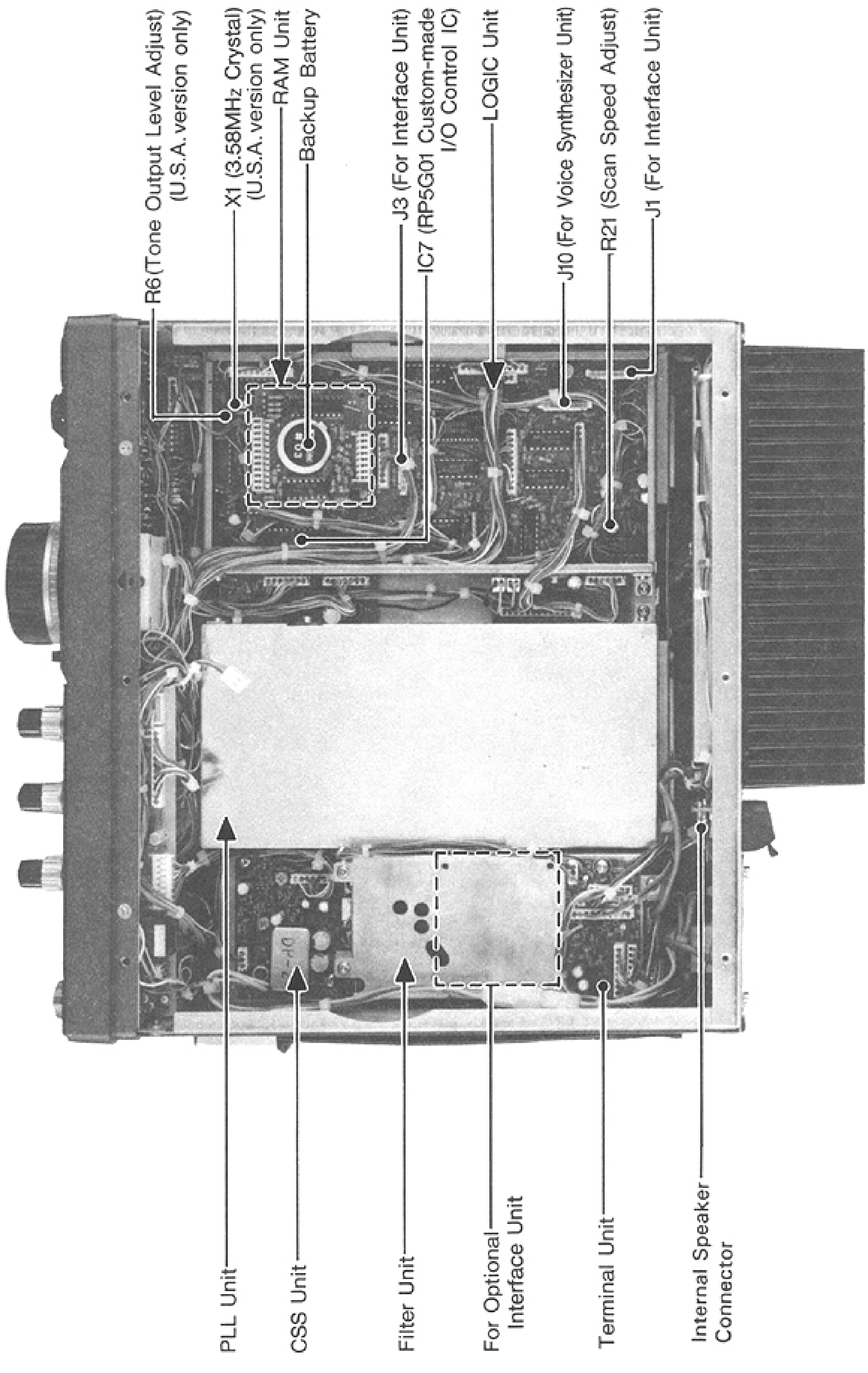
3-3 PLL (HPL) UNIT (located under the LOGIC Unit)



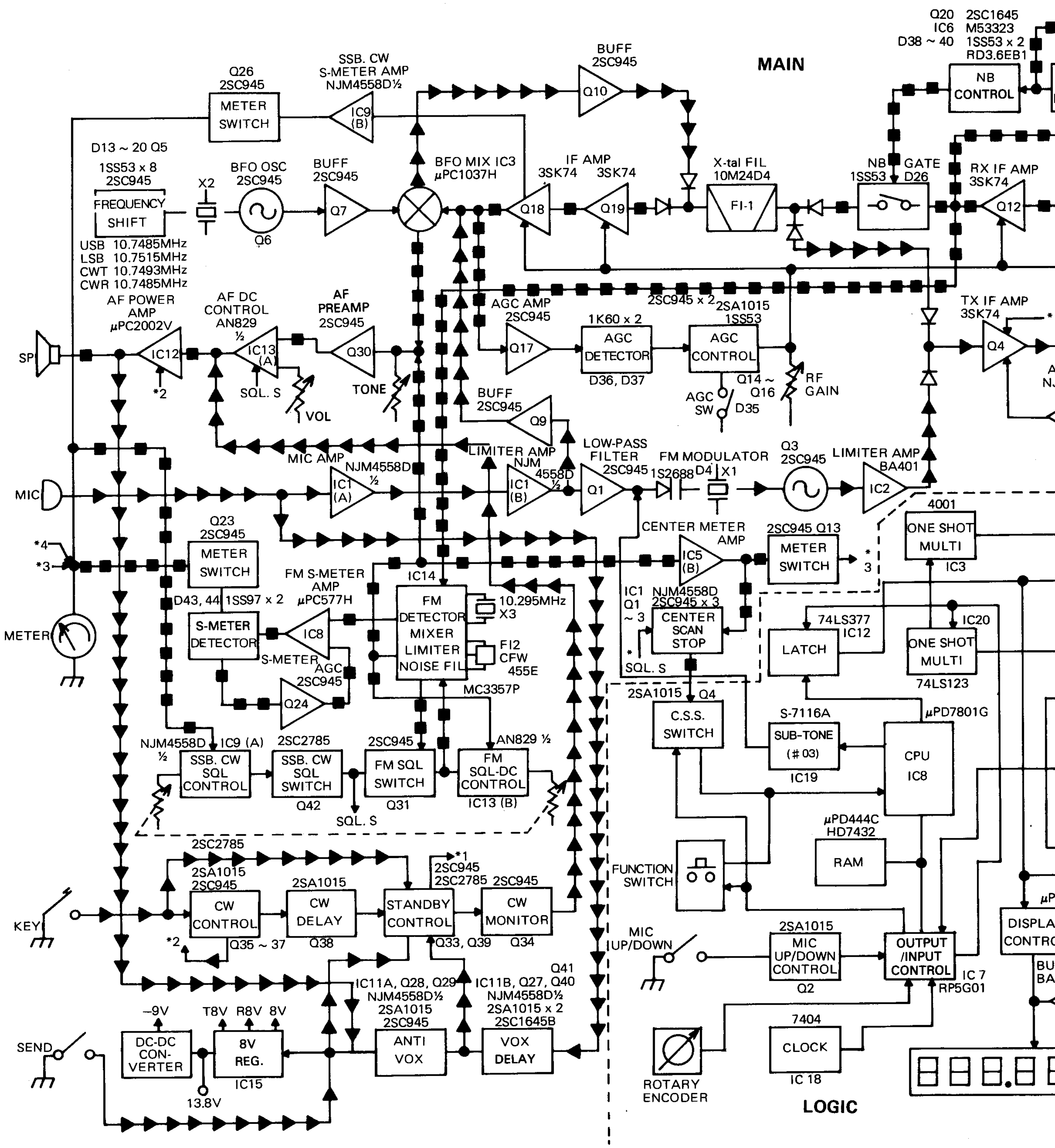
3-4 TOP VIEW (IC-271H)

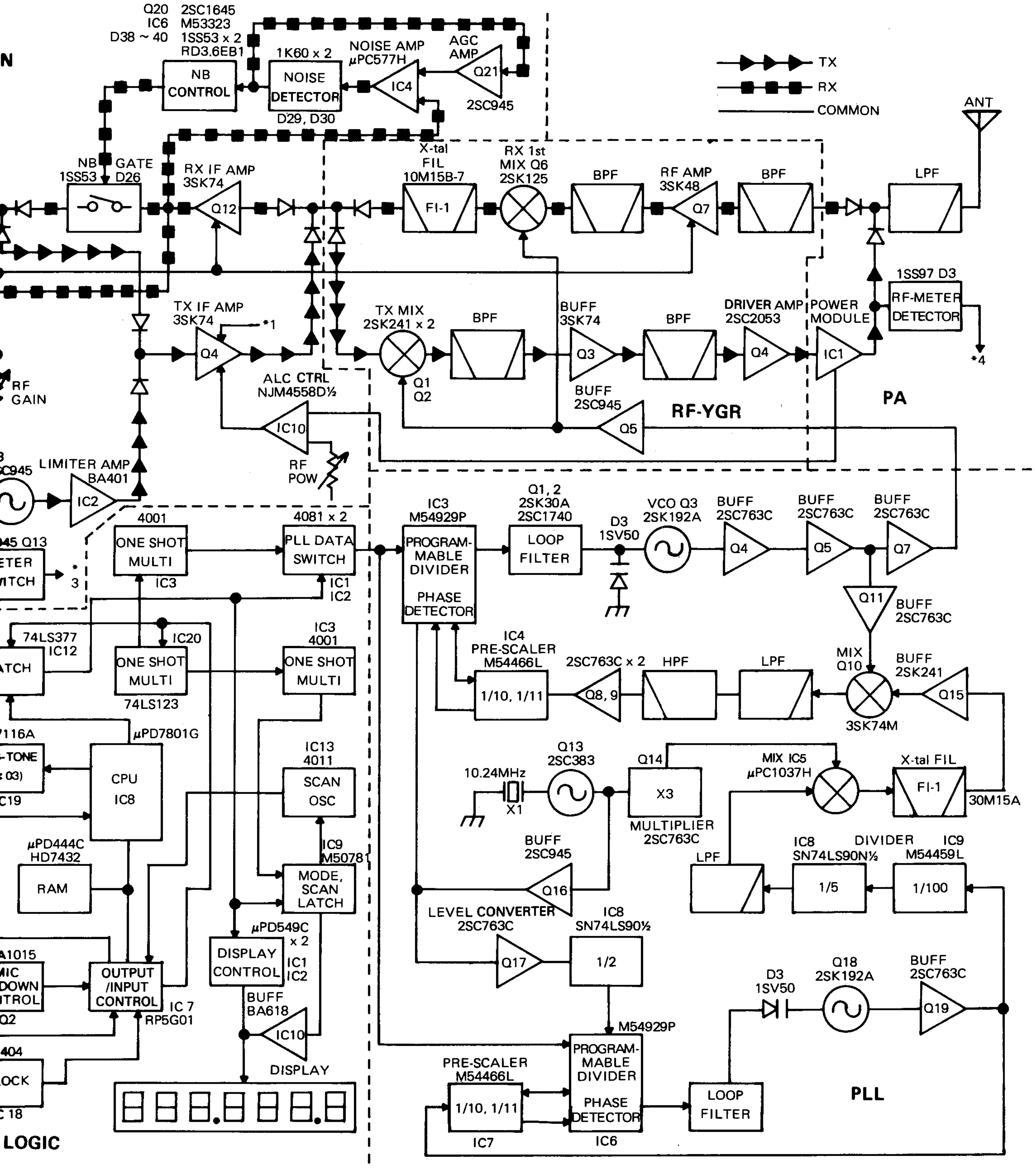


3-5 BOTTOM VIEW (IC-271H)

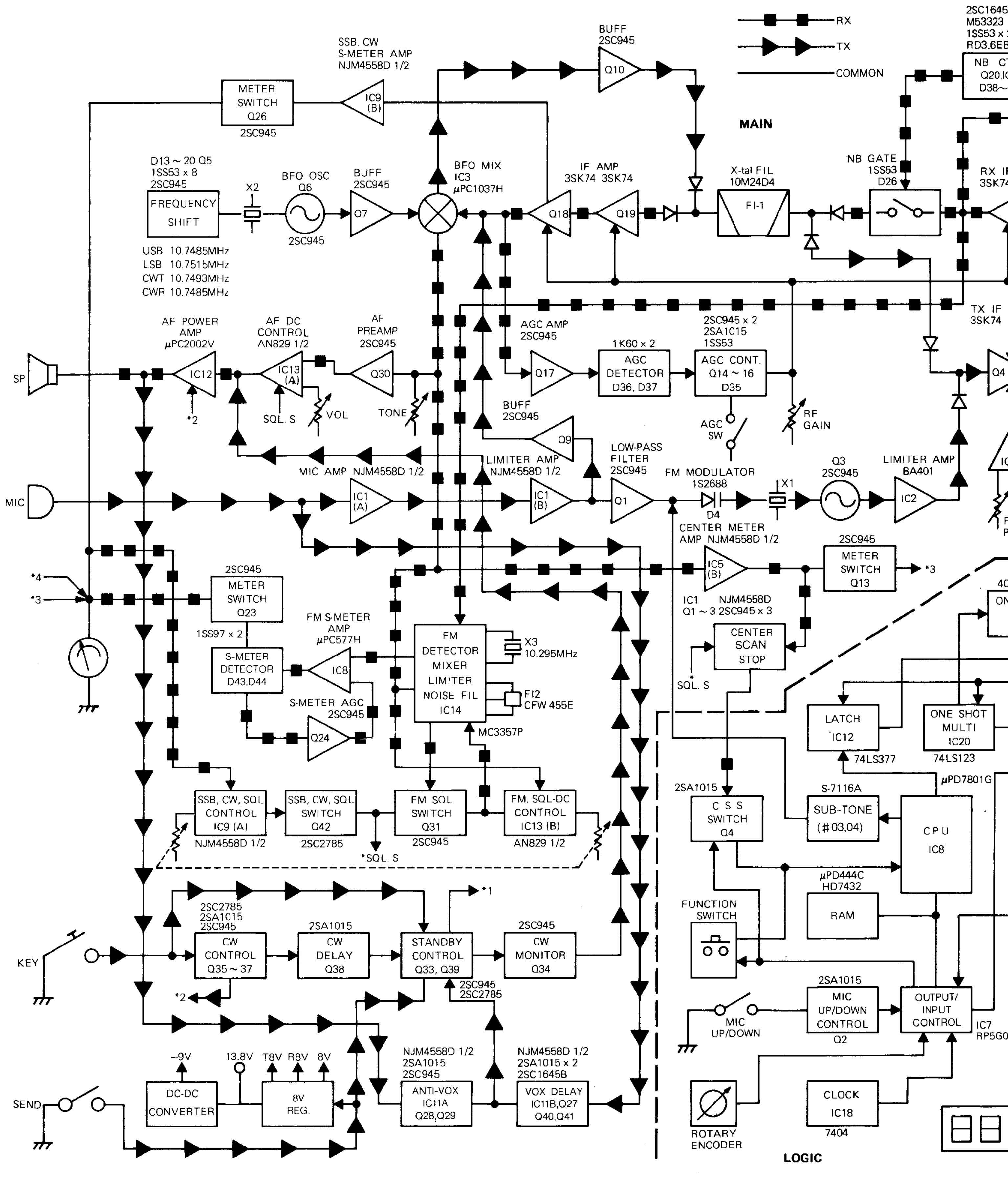


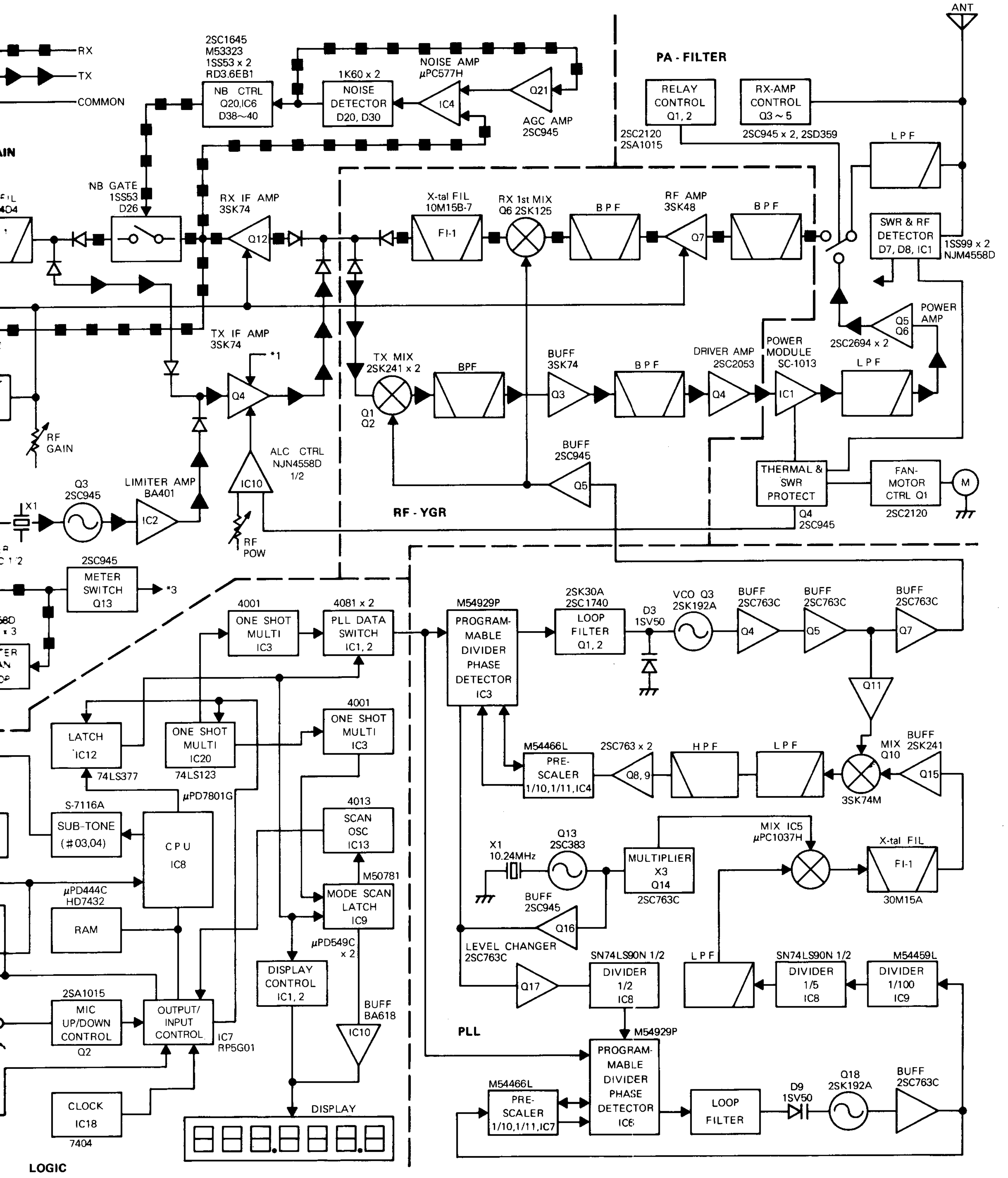
(IC-271A/E)


MAIN
LOGIC
METER SWITCH
Q26 2SC945
SSB. CW S-METER AMP NJM4558D½
BUFF 2SC945
BFO MIX IC3 μPC1037H
IF AMP 3SK74 3SK74
X-tal FIL 10M24D4
FI-1
NB 1SS53
GATE D26
RX IF AMP 3SK74
NB CONTROL
Q20 2SC1645
IC6 M53323
D38 ~ 40 1SS53 x 2
RD3.6EB1
FREQUENCY SHIFT
D13 ~ 20 Q5
1SS53 x 8
2SC945
BFO OSC 2SC945
USB 10.7485MHz
LSB 10.7515MHz
CWT 10.7493MHz
CWR 10.7485MHz
AF POWER AMP μPC2002V
AF DC CONTROL AN829 ½
AF PREAMP 2SC945
TONE
VOL
SQL. S
AGC AMP 2SC945
AGC DETECTOR
1K60 x 2
D36, D37
AGC CONTROL
2SC945 x 2
2SA1015
1SS53
Q14 ~ Q16
RF GAIN
AGC SW
D35
TX IF AMP 3SK74
BUFF 2SC945
MIC AMP NJM4558D ½
LIMITER AMP NJM 4558D ½
LOW-PASS FILTER 2SC945
FM MODULATOR 1S2688 D4 X1
Q3 2SC945
LIMITER AMP BA401
CENTER METER AMP
METER SWITCH
2SC945 Q13
4001
ONE SHOT MULTI
IC3
Q23 2SC945
METER SWITCH
FM S-METER AMP μPC577H
IC14
FM DETECTOR MIXER LIMITER NOISE FIL
10.295MHz X3
FI2 CFW 455E
MC3357P
D43, 44 1SS97 x 2
S-METER DETECTOR
S-METER
AGC 2SC945
IC1 NJM4558D
Q1 2SC945 x 3
~ 3
CENTER SCAN STOP
SQL. S
74LS377 IC12
LATCH
IC20
ONE SHOT MULTI
74LS123
2SA1015 Q4
C.S.S. SWITCH
S-7116A
SUB-TONE (#03)
IC19
μPD7801G
CPU IC8
NJM4558D ½ IC9 (A)
SSB. CW SQL CONTROL
2SC2785
SSB. CW SQL SWITCH
Q42
2SC945
FM SQL SWITCH
Q31
AN829 ½
FM SQL-DC CONTROL
IC13 (B)
μPD444C HD7432
RAM
2SC2785
2SA1015
2SC945
CW CONTROL
Q35 ~ 37
2SA1015
CW DELAY
Q38
2SC945 2SC2785
STANDBY CONTROL
Q33, Q39
2SC945
CW MONITOR
Q34
FUNCTION SWITCH
MIC UP/DOWN
2SA1015
MIC UP/DOWN CONTROL
Q2
OUTPUT /INPUT CONTROL
IC 7 RP5G01
DISPLA CONTRO
IC11A, Q28, Q29
NJM4558D½
2SA1015
2SC945
ANTI VOX
Q41
IC11B, Q27, Q40
NJM4558D½
2SA1015 x 2
2SC1645B
VOX DELAY
-9V
DC-DC CON-VERTER
T8V R8V 8V
8V REG.
IC15
13.8V
ROTARY ENCODER
7404
CLOCK
IC 18
SP
MIC
METER
KEY
SEND



TX
RX
COMMON
Q20 2SC1645
IC6 M53323
D38 ~ 40 1SS53 x 2
RD3.6EB1
NB CONTROL
1K60 x 2
NOISE DETECTOR
D29, D30
NOISE AMP
μPC577H
IC4
AGC AMP
Q21
2SC945
NB GATE
1SS53 D26
RX IF AMP
3SK74
Q12
X-tal FIL
10M15B-7
FI-1
RX 1st MIX Q6
2SK125
BPF
RF AMP
3SK48
Q7
BPF
LPF
ANT
1SS97 D3
RF-METER DETECTOR
*4
TX IF AMP
3SK74
Q4
*1
TX MIX
2SK241 x 2
Q1
Q2
BPF
BUFF
3SK74
Q3
BPF
DRIVER AMP
2SC2053
Q4
POWER MODULE
IC1
BUFF
2SC945
Q5
RF-YGR
PA
RF GAIN
ALC CTRL
NJM4558D½
IC10
RF POW
LIMITER AMP
BA401
IC2
4001
ONE SHOT MULTI
IC3
4081 x 2
PLL DATA SWITCH
IC1
IC2
*3
74LS377
IC12
IC20
ONE SHOT MULTI
74LS123
IC3
4001
ONE SHOT MULTI
μPD7801G
CPU
IC8
IC13
4011
SCAN OSC
IC9
M50781
MODE, SCAN LATCH
μPD444C
HD7432
RAM
μPD549C
x 2
DISPLAY CONTROL
IC1
IC2
OUTPUT /INPUT CONTROL
IC 7
RP5G01
BUFF
BA618
IC10
DISPLAY
LOGIC
IC3
M54929P
PROGRAM-MABLE DIVIDER
PHASE DETECTOR
Q1, 2
2SK30A
2SC1740
LOOP FILTER
D3
1SV50
VCO Q3
2SK192A
BUFF
2SC763C
Q4
BUFF
2SC763C
Q5
BUFF
2SC763C
Q7
Q11
BUFF
2SC763C
IC4
PRE-SCALER
M54466L
1/10, 1/11
2SC763C x 2
Q8, 9
HPF
LPF
MIX
Q10
3SK74M
BUFF
2SK241
Q15
10.24MHz
X1
Q13
2SC383
Q14
X3
MULTIPLIER
2SC763C
MIX IC5
μPC1037H
X-tal FIL
FI-1
30M15A
BUFF
2SC945
Q16
LPF
IC8
SN74LS90N½
1/5
DIVIDER
IC9
M54459L
1/100
LEVEL CONVERTER
2SC763C
Q17
IC8
SN74LS90½
1/2
D3
1SV50
Q18
2SK192A
BUFF
2SC763C
Q19
M54929P
PRE-SCALER
M54466L
1/10, 1/11
IC7
PROGRAM-MABLE DIVIDER
PHASE DETECTOR
IC6
LOOP FILTER
PLL


RX
TX
COMMON
MAIN
LOGIC
METER SWITCH Q26 2SC945
SSB. CW S-METER AMP NJM4558D 1/2
IC9 (B)
BUFF 2SC945
Q10
D13 ~ 20 Q5 1SS53 x 8 2SC945
FREQUENCY SHIFT
X2
BFO OSC Q6 2SC945
BUFF 2SC945 Q7
BFO MIX IC3 μPC1037H
IF AMP 3SK74 3SK74
Q18
Q19
X-tal FIL 10M24D4
FI-1
NB GATE 1SS53 D26
RX IF 3SK74
TX IF 3SK74
USB 10.7485MHz
LSB 10.7515MHz
CWT 10.7493MHz
CWR 10.7485MHz
AF POWER AMP μPC2002V
IC12
AF DC CONTROL AN829 1/2
IC13 (A)
AF PREAMP 2SC945
Q30
SP
SQL. S
VOL
TONE
AGC AMP 2SC945
Q17
1K60 x 2
AGC DETECTOR D36, D37
2SC945 x 2 2SA1015 1SS53
AGC CONT. Q14 ~ 16 D35
AGC SW
RF GAIN
BUFF 2SC945
Q9
MIC AMP NJM4558D 1/2
LIMITER AMP NJM4558D 1/2
IC1 (A)
IC1 (B)
LOW-PASS FILTER 2SC945
Q1
FM MODULATOR 1S2688
D4
X1
Q3 2SC945
LIMITER AMP BA401
IC2
Q4
MIC
CENTER METER AMP NJM4558D 1/2
IC5 (B)
2SC945 METER SWITCH Q13
IC1 NJM4558D Q1 ~ 3 2SC945 x 3
CENTER SCAN STOP
SQL. S
2SC945 METER SWITCH Q23
1SS97 x 2
S-METER DETECTOR D43,D44
FM S-METER AMP μPC577H
IC8
S-METER AGC 2SC945
Q24
FM DETECTOR MIXER LIMITER NOISE FIL IC14
MC3357P
X3 10.295MHz
FI2 CFW 455E
SSB, CW, SQL CONTROL IC9 (A) NJM4558D 1/2
SSB, CW, SQL SWITCH Q42 2SC2785
FM SQL SWITCH Q31 2SC945
FM. SQL-DC CONTROL IC13 (B) AN829 1/2
*SQL. S
*1
*2
*3
*4
2SC2785 2SA1015 2SC945
CW CONTROL Q35 ~ 37
2SA1015 CW DELAY Q38
STANDBY CONTROL Q33, Q39
2SC945 2SC2785
2SC945 CW MONITOR Q34
KEY
-9V
13.8V
T8V
R8V
8V
DC-DC CONVERTER
8V REG.
SEND
NJM4558D 1/2 2SA1015 2SC945
ANTI-VOX IC11A Q28,Q29
NJM4558D 1/2 2SA1015 x 2 2SC1645B
VOX DELAY IC11B,Q27 Q40,Q41
LATCH IC12 74LS377
ONE SHOT MULTI IC20 74LS123
μPD7801G
2SA1015 C S S SWITCH Q4
S-7116A SUB-TONE (#03,04)
CPU IC8
μPD444C HD7432
RAM
FUNCTION SWITCH
MIC UP/DOWN
2SA1015 MIC UP/DOWN CONTROL Q2
OUTPUT/ INPUT CONTROL
IC7
ROTARY ENCODER
CLOCK IC18 7404



RX
TX
COMMON
PA - FILTER
ANT
RELAY CONTROL Q1, 2
RX-AMP CONTROL Q3 ~ 5
2SC2120 2SA1015
2SC945 x 2, 2SD359
LPF
SWR & RF DETECTOR D7, D8, IC1
1SS99 x 2 NJM4558D
POWER AMP
Q5 Q6
2SC2694 x 2
POWER MODULE SC-1013
2SC1645 M53323 1SS53 x 2 RD3.6EB1
NB CTRL Q20, IC6 D38~40
1K60 x 2
NOISE DETECTOR D20, D30
NOISE AMP μPC577H
IC4
Q21
AGC AMP 2SC945
NB GATE 1SS53 D26
RX IF AMP 3SK74
Q12
X-tal FIL 10M15B-7
FI-1
RX 1st MIX Q6 2SK125
BPF
RF AMP 3SK48
Q7
TX IF AMP 3SK74
Q4
*1
TX MIX 2SK241 x 2
Q1 Q2
BUFF 3SK74
Q3
DRIVER AMP 2SC2053
IC1
RF GAIN
ALC CTRL NJN4558D 1/2
IC10
RF POW
BUFF 2SC945
Q5
THERMAL & SWR PROTECT
Q4 2SC945
FAN-MOTOR CTRL Q1
2SC2120
M
RF - YGR
X1
Q3 2SC945
LIMITER AMP BA401
IC2
2SC945
METER SWITCH Q13
*3
4001
ONE SHOT MULTI IC3
4081 x 2
PLL DATA SWITCH IC1, 2
LATCH IC12
74LS377
ONE SHOT MULTI IC20
74LS123
ONE SHOT MULTI IC3
μPD7801G
S-7116A
SUB-TONE (#03,04)
CPU IC8
4013
SCAN OSC IC13
M50781
MODE SCAN LATCH IC9
μPD444C HD7432
RAM
μPD549C x 2
DISPLAY CONTROL IC1, 2
2SA1015
MIC UP/DOWN CONTROL Q2
OUTPUT/INPUT CONTROL
IC7 RP5G01
BUFF BA618
IC10
CLOCK IC18
7404
DISPLAY
LOGIC
M54929P
PROGRAMMABLE DIVIDER PHASE DETECTOR IC3
2SK30A 2SC1740
LOOP FILTER Q1, 2
D3 1SV50
VCO Q3 2SK192A
BUFF 2SC763C
Q4
BUFF 2SC763C
Q5
BUFF 2SC763C
Q7
Q11
M54466L
PRE-SCALER 1/10, 1/11, IC4
2SC763 x 2
Q8, 9
HPF
LPF
MIX Q10
3SK74M
BUFF 2SK241
Q15
X1 10.24MHz
Q13 2SC383
MULTIPLIER X3 Q14
2SC763C
MIX IC5 μPC1037H
X-tal FIL
FI-1
30M15A
BUFF 2SC945
Q16
LEVEL CHANGER 2SC763C
Q17
SN74LS90N 1/2
DIVIDER 1/2 IC8
LPF
SN74LS90N 1/2
DIVIDER 1/5 IC8
M54459L
DIVIDER 1/100 IC9
PLL
M54929P
PROGRAMMABLE DIVIDER PHASE DETECTOR IC6
M54466L
PRE-SCALER 1/10, 1/11, IC7
LOOP FILTER
D9 1SV50
Q18 2SK192A
BUFF 2SC763C

SECTION 5 CIRCUIT DESCRIPTION

5-1 RECEIVER

5-1-1 ANTENNA SWITCHING CIRCUIT (PA UNIT)

Receive signals from the PA UNIT antenna connector(J1) pass to the antenna switching circuit(D1,D2) via the PA UNIT low-pass filter consisting of L2 through L5, C9, C10 and C12 through C17. While receiving, approximately 13.8 volts is applied to the cathode side of D2, thus causing D2 to be reverse-biased and switched OFF. While transmitting, T8V is supplied to D2 from D1 which causes D2 to switch ON. D2 and C11 ground any leakage to protect the receiver.

In addition, because the anode side of D1 is at ground level during reception, D1 is reverse-biased and switched OFF, providing good isolation from IC1. While transmitting, T8V keeps D1 turned ON. The receive signals feed via P2 to the RF-YGR UNIT(J4).

5-1-2 RF CIRCUIT(RF-YGR UNIT)

The receive signals supplied from J4 pass through the helical cavity RF bandpass filter(L18,L19) which reduces interference from out-of-band signals. The N-channel dual-gate MOSFET(Q7), which has high-gain, low-noise characteristics, amplifies the signals that pass through the bandpass filter. The receive signals amplified by Q7 are again passed through the three-stage RF bandpass filter(L15,L16,L17), and then input to the gate of the first mixer(Q6). Meanwhile, the local oscillator output from the PLL is amplified by buffer Q5 and then input to the Q6 source. The receive signals mix with the local oscillator signal to produce the first intermediate frequency.

The performance of the first mixer greatly affects the two- and three-signal characteristics as well as the receiver desensitization characteristics in the presence of a strong signal. A high-power, low-noise N-channel junction FET is used in this circuit in order to provide the best performance possible.

While receiving FM, the Q7 second gate receives approximately 4 volts, whereas while receiving SSB and CW, the AGC voltage is applied to this gate.

The crystal mechanical filter(F11) removes out-of-band signals, and the intermediate frequency then passes to the MAIN UNIT.

5-1-3 INTERMEDIATE FREQUENCY CIRCUIT (MAIN UNIT)

(1) FM

The first intermediate frequency from the RF-YGR UNIT passes through J10, and the IF amplifier(Q12) on the MAIN UNIT amplifies the signal. The output from the drain enters the L11 tuned circuit and is then coupled to the FM IF circuit(IC14) via C92. IC14 incorporates the second local oscillator, the second mixer, a limiter amplifier, a quadrature detector and an active filter in a single package. Since the number of externally connected parts is low, the reliability of this stage is high.

The first intermediate frequency enters IC14(pin16) and mixes with the second local oscillator frequency(10.295MHz) generated by crystal X3, C175 and C176 which are connected across pins 1 and 2. The 455kHz second intermediate frequency is then output from pin 3. The signal from pin 3 passes through a high-performance ceramic filter(FI2), enters pin 5, passes through a limiter amplifier, and then exits from pin 7. The L18 quadrature coil and the IC's internal quadrature detector both detect and amplify the output from pin 7. The resulting audio signal(350 millivolts rms) is output from pin 9.

(2)SSB

In the SSB mode, Q12 also amplifies the signal from the RF-YGR UNIT in the same manner as an FM signal. The signal then passes from the Q12 drain through C82 and L9 to the SSB crystal filter(FI1) which has a selectivity of 2.2kHz(−6dB). This signal is amplified by two dual-gate MOSFET IF amplifiers(Q18, Q19) in separate stages since stability and high gain/wide AGC range characteristics are required. L14 and L15 provide added frequency selectivity for further filtering of wideband noise and strong interference.

AGC voltage is also applied to the second gate of each MOSFET in order to expand the AGC range. By applying the AGC voltage, the drop in the source voltage of Q18 is used to control the signal to IC9B(SSB and S-meter amplifier) which provides the output that controls the S-meter movement. R160 is the SSB S5 adjustment and R164 is the full-scale adjustment.

Part of the receive signal is further amplified by the AGC buffer amplifier(Q17), tuned(L13), AGC-rectified(D36, D37) and AGC(DC)-amplified(Q16). Q16 supplies voltages of +8 volts and −9 volts in order tc expand the AGC range. R117, C97 and C98 integrate the voltage from Q16 and the attack time constant is set. The release time constant is set by R19 in the RF-YGR UNIT. The AGC voltage produced is supplied to each stage of the receiver.

The AGC voltage is also supplied from the EF UNIT(front panel) RF GAIN control. If the front panel AGC switch is set to FAST, C97 and R117 are switched OUT and the release time becomes shorter. The EF UNIT supplies +8 volts when the AGC switch is set to FAST. Q14 and Q15 switch ON when the AGC voltage reaches 0.6 volts or more during release, thus speeding up the release time.

The other portion of the receive signal is coupled by C55 into the double-balanced demodulator(IC3). Here it is demodulated by the BFO signal input to pin 7. The demodulated audio signal, coupled by C65, passes to the audio amplifier(Q30).

5-1-4 BFO CIRCUIT(MAIN UNIT)

The BFO circuit consisting of Q5, Q6, Q7 and X2 changes its oscillation frequency depending on the mode selected. The various frequencies are switched by D17, D18, D19, D20 and Q5 in accordance with the position of the function switch on the front panel which connects L7 and L8 in series with crystal X2. In this BFO circuit, the frequencies are generated by Q6, amplified by buffer Q7, coupled through C53 and input to IC3(pin 7). The frequencies for the different modes are:

a) USB : 10.7485MHz
b) LSB : 10.7515MHz
c) CW−R : 10.7485MHz
d) CW−T : 10.7493MHz

5-1-5 NOISE BLANKER CIRCUIT(MAIN UNIT)

The purpose of the noise blanker is to remove pulse noise that interferes with the desired receive signal. The noise blanker functions only while in the SSB mode.

The IF signal from Q12 enters the noise blanker circuit via C88. The noise amplified by IC4, is then rectified by D29 and D30. Part of this rectified signal is amplified by Q21, integrated by C90 and the output from IC14 is held at a constant level as the AGC voltage of the IC. The other part of the rectified signal is supplied to the Q20 base.

When pulse noise is received, Q20 switches ON and the collector drops to ground level, thereby triggering the monostable multivibrator(IC6). R141 switches Q11 ON, D26 switches ON, D27 becomes reverse-biased and the signal to the SSB circuit is blocked. IC7 is a three-terminal regulator used to supply +5 volts to IC6(TTL).

5-1-6 AUDIO AND SQUELCH CIRCUITS (MAIN UNIT)

Q30 amplifies the audio output from IC14(pin 9) and then passes the output to IC13A which is used for DC control of the audio frequency. The output from pin 9 is also supplied to IC13B and used for the DC controlled squelch. Both of these control signals may be controlled externally through use of the ACC socket.

The AF DC control signal feeds to the AF power amplifier(IC12) which raises the level sufficiently to drive the speaker. IC12 is a high-output(2 watts or more with an 8 ohm load), low-distortion audio IC that contains various protection circuits.

The squelch signal controlled by IC13B is again input to IC14(pin 10) which amplifies the portion of the signal greater than 20kHz with an active filter, and then outputs the result from pin 11.

The noise signal is rectified by D60 and D61, and Q31 is switched ON. Because of this, the collector side of Q31 drops virtually to ground level, and D58 causes IC13A(pin 13) also to drop to ground level. The audio signal is blocked by IC13A, therefore the audio output is the same as when the audio volume is set to the minimum level. D58 prevents reverse flow and R210 sets the squelch operating point. Since Q31 prevents any residual noise from IC13A from being output from the speaker during transmission, T8V is applied via D65 and R226, thus switching Q31 ON and dropping the collector side to ground level.

5-1-7 SSB SQUELCH CIRCUIT (MAIN UNIT)

IC9A functions as a comparator. The S-meter signal and the voltage from the squelch control both feed into IC9A. R220, R222, R224 and the squelch control on the front panel divide a fixed 8 volt level and the result is applied to the positive(+) IC9A(pin 3) input terminal. This voltage becomes the comparator's reference voltage. R221 and R223 divide the difference between 8 volts and the S-meter signal voltage, and the result is applied to the negative(−) IC9A(pin 2) input terminal.

Thus, if the voltage at pin 2 is higher than the voltage at pin 3(the input signal exceeds the designated level), pin 1, which is the output terminal, drops from 8 volts to approximately 0V. This causes the cathode side of D62 to drop, Q42 to switch OFF, and the squelch to open. While operating FM, 8 volts is applied to pin 2 of IC9A and pin 1 becomes LOW level, thus preventing the control of Q42.

5-1-8 S-RF Meter CIRCUIT(MAIN UNIT)

While receiving FM, C125 couples the 455kHz output from FI2 to the FM S-meter amplifier(IC8). After IC8 amplifies the signal, it is rectified by D43 and supplied to the meter. Q24 acts as the AGC for the S-meter amplifier.

While receiving SSB, the signal is input to IC9B from the IF amplifier source(Q18) via R164. The signal is amplified by IC9B and then supplied to the meter.

Q23 and Q26 are switching transistors for the S-meter and the center meter during reception.

The chart below lists available controls.

CONTROL	MODE	FUNCTION
R240	Transmit	RF meter adjustment
R149	FM receive	S9 meter adjustment
R152	FM receive	Full-scale meter adjustment
R160	SSB receive	S5 meter adjustment
R164	SSB receive	Full-scale meter adjustment

5-1-9 FM CENTER METER CIRCUIT(MAIN UNIT)

The center meter amplifier(IC5B) receives the signal from IC14 (pin 9) via R206. R109, R112 and R113 divide a fixed +8 volts, and the divided voltage is supplied to IC5B(pin 5).

This reference voltage is compared with the IC14 output voltage and the difference is passed from IC5B(pin 7). Q13 is a switching transistor for the S-meter and the center meter.

Controls available are:

CONTROL	FUNCTION
R113	Center adjustment
R114	Full-scale meter adjustment (set at 75 to 80% of full scale)

5-2 TRANSMITTER

5-2-1 AUDIO AMPLIFIER AND LIMITER CIRCUITS (MAIN UNIT)

The audio signal from the microphone is amplified by IC1A, differentiated by C7 and R12 and input to IC1B. The portion of the audio signal from 300Hz to 3kHz is limiter-amplified with an emphasis of 6dB/octave. Since the output includes high frequency components as well as the desired voice band, the Q1 splatter filter removes frequencies above 3kHz. The signal is then supplied to the varactor diode(D4) for frequency modulation.

When transmitting SSB, R27 and C61 integrate the signal with a deemphasis of 6dB/octave resulting in a signal with a flat response. Q9 is a buffer amplifier which passes its output to the SSB double-balanced modulator(IC3).

(1) FM CIRCUIT

The output from the splatter filter(Q1) varies the capacitance of the varactor diode(D4). The local oscillator frequency(10.75MHz) generated by X1 and Q3 for the FM mode is modulated by the output from D4. The signal is then limiter-amplified by IC2 and supplied to Q4. In addition, a thermistor(R32) is connected to the frequency modulation circuit in order to provide temperature compensation.

R29 sets the required deviation(4.8kHz).

(2) SSB MODULATION/BUFFER AMPLIFIER CIRCUITS

The audio signal amplified by buffer Q9 is input to IC3(pin 5) via R82. Also, a BFO signal corresponding to the mode is input to IC3(pin 7). The modulated DSB signal exits from IC3(pin 5). While transmitting CW, CW-T8V is applied via R70, thus upsetting the balance of IC3, and the BFO signal is output directly. Because R8V is applied to the base of Q5 during reception, CW-T8V is applied only while transmitting.

The output from IC3(pin 2) feeds to Q10 where it is buffer-amplified, and then input to the FI1 crystal filter. FI1 has a selectivity of 2.2kHz(−6dB). The USB, LSB or CW output from the filter passes to Q4.

Controls available are:

CONTROL	FUNCTION
R82	SSB output power
R63	CW output power

5-2-2 BUFFER AMPLIFIER CIRCUIT(MAIN UNIT)

SSB and CW signals pass through D31 and D6 whereas FM signals pass through D5. The signals are then buffer-amplified by Q4 and supplied to the RF-YGR UNIT from J10. Also, the power control voltage is applied to the first gate of Q4 from IC10, thus providing control of the RF power.

5-2-3 VOX CONTROL AND CW BREAK-IN CIRCUITS (MAIN UNIT)

The modulated signal from the microphone, amplified by IC5A, passes through R182 and is then amplified by IC118. The output from IC11B sequentially switches ON Q27, Q41, Q40 and Q39, and places the transceiver in the transmit mode.

If there is no modulated signal and Q27 switches OFF, Q41, Q40 and Q39 remain ON to act as a VOX delay until C148 is discharged by R188 and R189.

Additionally, part of the output of the audio power amplifier(IC12B) is inversion-amplified by IC11A via R196. Q28 and Q29 switch ON, and the modulated signal input to IC11B is muted as anti-VOX. After Q28 switches OFF, the switching OFF of Q29 is delayed by the time constant of R191 and C149.

If the key is closed while the VOX circuit is activated, Q36, Q37, Q38 and Q39 switch ON, and the transceiver enters the transmit mode. When the key is opened Q36 and Q37 switch OFF but Q39 remains ON until C203 discharges. R256 and R257 provide the necessary time constant for the CW delay.

Controls available are:

CONTROL	FUNCTION
R181	VOX gain adjustment
R189	VOX delay adjustment
R196	Anti-VOX adjustment
R257	CW delay adjustment

5-2-4 CW MONITOR CIRCUIT(MAIN UNIT)

When the transceiver is in the CW mode, CW-8V is supplied to the CW monitor circuit(Q34 and Q35). While receiving, CW-8V is applied to the base of Q35 via R241 and R253, Q35 switches ON, and the Q34 phase oscillator stops oscillating.

When the key is closed, Q35 switches OFF and the Q34 phase oscillator begins to oscillate at a frequency of approximately 800Hz. R244 adjusts the level, and C205 couples the signal to the audio power amplifier(IC12) which feeds the speaker for monitoring purposes while CW is being transmitted. A constant 13.8 volts is applied to the audio power amplifier(IC12).

5-2-5 AUTOMATIC LEVEL CONTROL(ALC) CIRCUIT (MAIN UNIT)

The function of the ALC circuit is to provide automatic control of the transmission circuits so the output level remains constant even with fluctuations in the power supply voltage or the antenna load.

The voltages of both terminals of R1 in the PA unit are amplified by IC10 and passed to the first gate of Q4. IC10 is a differential amplifier. The HIGH voltage(13.8 volts) on the fixed side of the ALC detection resistor(R1 in the PA UNIT) is divided by R169, R172, and R168, and is supplied to IC10(pin 6). The PA voltage from the sampling side of this resistor is coupled by R170, divided by R171 and supplied to IC10(pin 5).

When the current flowing to R1 increases, the potential difference between its two terminals rises, and this voltage is supplied to pin 5. As a result, the voltage output from IC10(pin 7) drops. This voltage variation is passed on to the Q4 first gate which regulates the transmitter output.

Controls available are:

CONTROL	FUNCTION
R168	High power adjustment
R166	Low power adjustment

5-2-6 TRANSMITTER MIXER AND BUFFER AMPLIFIER (RF-YGR UNIT)

The transmit signal from the MAIN UNIT is input to a double-balanced mixer composed of L1, L2, Q1 and Q2. At the same time, the local oscillator signal from the PLL is also input after being amplified by buffer Q5. The output resulting from mixing these signals is passed through a helical bandpass filter(L3, L4) and input to the transmit buffer amplifier circuit(Q3). The output, which is amplified by buffer Q3, is passed through another helical bandpass filter(L5, L6), amplified by Q4 and supplied(approximately 200 milliwatts) to the PA UNIT via J1. The double-balanced mixer(Q1, Q2) uses an FET which provides a wide dynamic range and suppresses spurious signals.

5-2-7 POWER AMPLIFIER

This stage raises the 200 milliwatt signal to 25 watts (IC-271H:100 watts).

IC1 amplifies the 200 milliwatts output from the RF-YGR UNIT J1 to approximately 25 watts after which the high harmonics are removed by the low-pass filter L1 through L3, and C11 through C16. Spurious emissions are attenuated 60dB or more below the fundamental frequency. In the IC-271H version, the output is divided to L5 and L6,and input to the Q5 and Q6 bases. After amplification to 50 watts each by the 2SC2694 transistors, the outputs are combined to 100 watts at the strip line on the circuit board.

C24 at the input side matches the 50 ohm output impedance of the low-pass filter and the low impedance of the 2SC2694 input. C29 at the output side is to adjust the output stage for a 50 ohm impedance; it is normally adjusted for an intermediate point in the band.

Since the output of the final amplifier stage has a higher harmonic content(about 30 to 40 dB below the fundamental), the signal passes through another low-pass filter before reaching the antenna jack.

5-2-8 BIAS CIRCUIT(IC-271H)

In the IC-271H, AB-class linear power amplification is performed by the power module(IC1), Q5 and Q6 regardless of the mode. Because AB-class operation is used even in the FM mode, the output obtained contains very few spurious signals.

In order to produce the AB-class output, an idling current of approximately 500mA must be supplied to Q5 and Q6, and a Q3 emitter output of approximately 0.6 to 0.7 volts is obtained by applying the reference voltage from D3 and D4 to the Q3 base.

Q2 uses the T8V line for control so this power supply is applied only while transmitting. Also, the idling current may be varied by using R7.

5-2-9 ALC AND POWER LIMITER(IC-271H)

This transceiver uses the voltage generated by the current consumption of IC1 after it has passed through R20 as its ALC voltage. This voltage is the PA voltage line. If it drops lower than the voltage designated from the high voltage line on the MAIN UNIT, an ALC voltage is generated using the designated voltage as a reference so the output does not exceed the designated level. This circuit also includes a protector for use in the event of high final transistor temperatures or antenna output mismatching.

If the final transistor temperature reaches 80℃ or above, 13.8 volts is output to the PRO line from S1, Q4 switches ON, and the PA voltage line is divided by R12, R14 and R17 so the voltage drops. In other words, the voltage drops below the designated level, the ALC voltage is generated by the MAIN UNIT, and the transmission voltage is lowered to the value designated by R12. In the event of antenna mismatching, 13.8 volts is output to the PRO line from the FILTER UNIT, so the result is the same. Before being shipped from the factory, R12 is adjusted so the output is one-half the maximum level without the protector circuit functioning.

5-2-10 POWER AMPLIFIER COOLING SYSTEM(IC-271H)

Because a maximum output of 100 watts is produced by this stage, a considerable amount of heat is generated during continuous transmission. For this reason, a thermal switch with detection temperatures of 50℃ and 80℃ is positioned on the final transistor. When the temperature is 50℃ to 80℃, the cooling fan operates at low speed, and when the temperature is 80℃ and above, it operates at high speed, thus lowering the transceiver's temperature. Although the fan operates at a slower speed during reception than during transmission, it continues to operate until the thermal switch switches OFF at 50℃. Q1 controls this operation.

5-3 PLL(HPL) UNIT

5-3-1 REFERENCE OSCILLATOR AND LO CIRCUITS

Q13 is a Colpitts oscillator circuit, and it oscillates by using X1(10.24MHz). Q16 amplifies part of this signal which becomes the reference frequency that is input to IC3(pin 12). The other portion of the signal, as the reference frequency for the sub-loop, has its level changed to TTL level by Q17, and is then input to IC8(pin 14) in the sub-loop. Additionally, Q14 triples the oscillator output(10.24MHz) of Q13, spurious signals are removed by the double-tuned circuit of L15 and L16, and the result is input to IC5(pin 7) as the local oscillator signal.

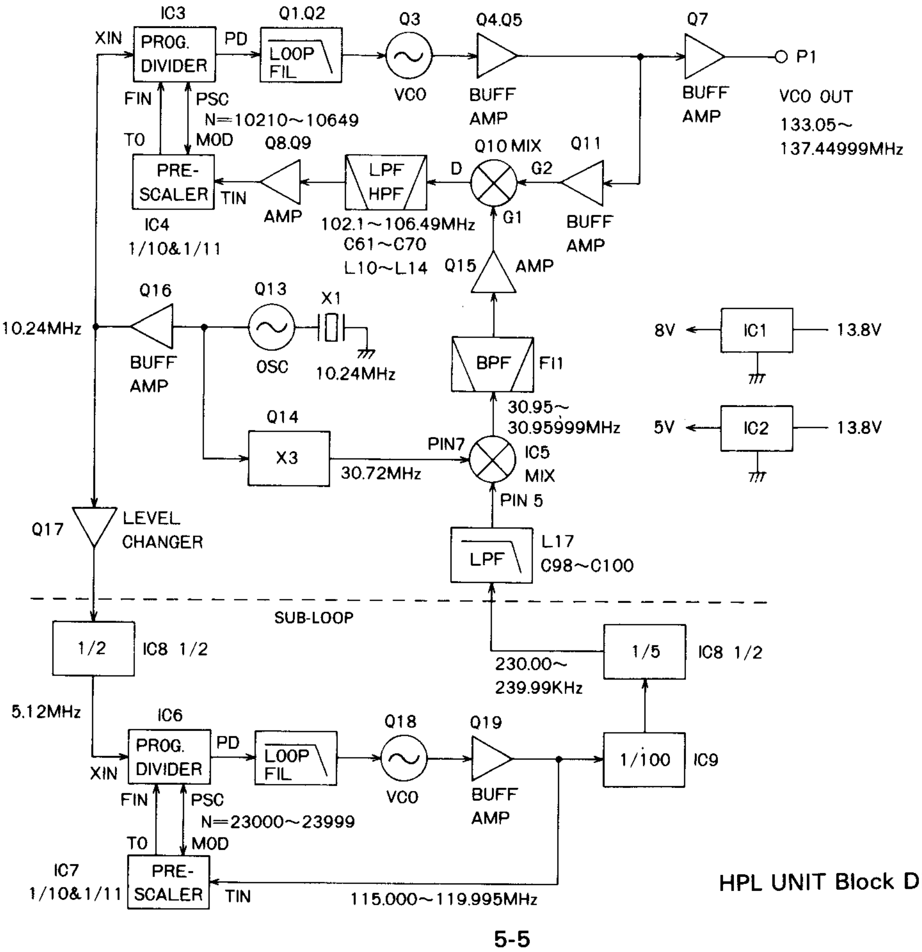
The low-pass filter composed of C98, C99, C100 and L17 removes the unwanted spurious components of the signal(230 to 239.99kHz) from the sub-loop. The signal is then input to IC5(pin 5).

The signal(30.95 to 39.9599MHz) resulting from the mixing at IC5 is passed through the FI1 crystal filter, gets amplified by Q15, and is then applied to the first gate of the Q15 dual-gate FET.

5-3-2 VCO CIRCUIT

The VCO circuit supplies the final local oscillator, and thus this circuit must meet stringent requirements for stability, noise, spurious signals, etc. Therefore, temperature compensation and low-noise semiconductors are employed in this circuit.

Q3 is a Clapp oscillator which oscillates at 129.25 to 139.25MHz. This signal then passes through a buffer amplifier(Q4, Q5) and following this, the signal is processed by the grounded isolation amplifier at the base of Q7. One purpose of this stage is to prevent external load fluctuations from affecting the operation of the VCO circuit.



HPL UNIT Block Diagram

The signal then passes to the RF-YGR UNIT. Part of the Q3 oscillator output passes from the L5 intermediate tap through the Q11 isolation amplifier, and is sent to the Q10 dual-gate FET as the local oscillator signal.

5-3-3 MIXER AMPLIFIER CIRCUIT

Q10 is a compact, high-gain, low-noise dual-gate FET. The signal(30.95 to 39.9599MHz) amplified by Q15 is input to the Q10 first gate. The VCO frequency(129.25 to 139.25MHz) enters the second gate as the local oscillator signal. The difference between these signals is output from the Q10 drain, and the unwanted components are removed by low-pass and high-pass filters composed of L12 through L14, C70, L10, L11, and C61 through C65. Q9 and Q8 then amplify the signal and input the result to IC4.

5-3-4 PRESCALER CIRCUIT

IC4 contains two modular prescalers. The prescaler frequency divider, controlled by the PSC signals from IC3, divides its input frequency by a factor of 10 or 11.

IC3 is a PLL IC which contains a frequency comparator, a programmable divider, a swallow counter and a phase detector.

The reference frequency input to IC3(pin 12) is converted by the N data(10210 to 10649) from the LOGIC UNIT into the reference frequency needed by the IC's internal frequency comparator. Also, the frequency(102.1 to 106.49MHz) input to IC4(pin 4) is divided by IC3's programmable divider and swallow counter and by IC4's prescaler. The two signals are then compared by IC3's internal phase detector and the difference is output from IC3(pin 1) as the PD signal.

IC3 also includes a lock/unlock function. When unlocked, a HIGH signal is output from IC3(pin 8), Q6 and Q12 switch ON, and T8V and the VCO output are no longer sent to the MAIN UNIT.

5-3-5 LOOP FILTER

The PD signal(control voltage) output from IC3(pin 1) is a pulse signal corresponding to the phase difference of the reference frequency input to IC3(pin 12) and the frequency input to IC4(pin 4). The active filter composed of Q1 and Q2 converts this pulse signal to a DC signal, and at the same time also removes any leakage of the original signals or noise components. This active filter also functions to set the lock and unlock times.

In order to lock the frequencies at the upper and lower band edges, D1 and D2 are connected in reverse polarity, thus making possible quick lock and unlock times by not passing the signal through R2. This design also allows for an accurate response to the positive/negative pulses of the PD voltage.

5-3-6 SUB-LOOP CIRCUIT

Q18 is a Clapp oscillator which oscillates at 115.000 to 119.995MHz. The signal is then amplified by buffer Q19 and part of the signal is input via C150 to IC7(pin 4) as the pulse swallow counter input for the LPL UNIT.

IC7 contains two modular prescalers. The PSC signal from IC6 controls the prescaler frequency divider for a division factor of either 10 or 11.

IC6 is a PLL IC which contains a frequency comparator, a programmable divider, a swallow counter and a phase detector.IC6's reference frequency is a 10.24MHz signal which undergoes level conversion by Q17 and which is input to IC8(pin 14).

The reference signal input from IC8(pin 12) to IC6(pin 1) is converted by the N data(23000 to 23999) from the LOGIC UNIT into the reference frequency needed by IC6's internal frequency comparator.

The frequency(115.000 to 119.995MHz) input to IC7(pin 4) is divided by IC6's internal phase detector and the difference is output from IC6(pin 1) as the PD signal.

The passive filter, composed of R89 and C129, converts the PD signal (control voltage) into a DC voltage. This voltage is applied to the anode side of the D9 varactor diode, and controls the Q18 oscillator frequency. Meanwhile, the frequency(115.000 to 119.995MHz) output from the Q19 emitter is input to IC9(pin 4) which contains a frequency divider programmed for a division factor of 100. The output from pin 8 enters IC8(pin 1) which further divides the signal by a factor of 5, and the result(230 to 239.99kHz) of the total division by 500 is input to IC5(pin 5). This signal is then heterodyned with the signal from the main-loop and controlled to 10Hz.

IC8 is a TTL IC which contains divide-by-2 and divide-by-5 circuits. Also, if the sub-loop is not locked, the mute signal is output from IC6(pin 8).

5-4 LOGIC UNIT

This unit includes an 8-bit N-MOS CPU(μPD7801G-114), a C-MOS 40-pin DIP multifunction, custom IC(RP5G01 007) and a C-MOS RAM. The main functions of the LOGIC UNIT are frequency control, mode signal processing, data output to the DISPLAY UNIT and data output to the PLL UNIT.

5-4-1 CPU (CENTRAL PROCESSING UNIT)

The CPU terminal functions are as designated in the diagram.The use of interrupt terminals provide the main dial and remote control with priority processing. Terminals not identified are not used. The LOGIC UNIT allocates all addresses for the internal ROM, external RAM and also any peripheral devices.

5-4-2 CPU INPUT CONTROL CIRCUIT

(1) MULTIFUNCTION, CUSTOM IC

The IC used is a C-MOS 40-pin DIP multifunction, custom circuit(IC7).

Approximately 50kHz square waves produced by the astable multivibrator, consisting of R34 through R37, C22 and the two TTL gates in IC18, are input to the CLOCK terminals(pins 18 and 19).

The TC terminal(pin 21) is for the connection of C14 and R24 which set the auto TS terminal(pin 32) to HIGH when the main sensor is rotated at a speed greater than the designated speed.

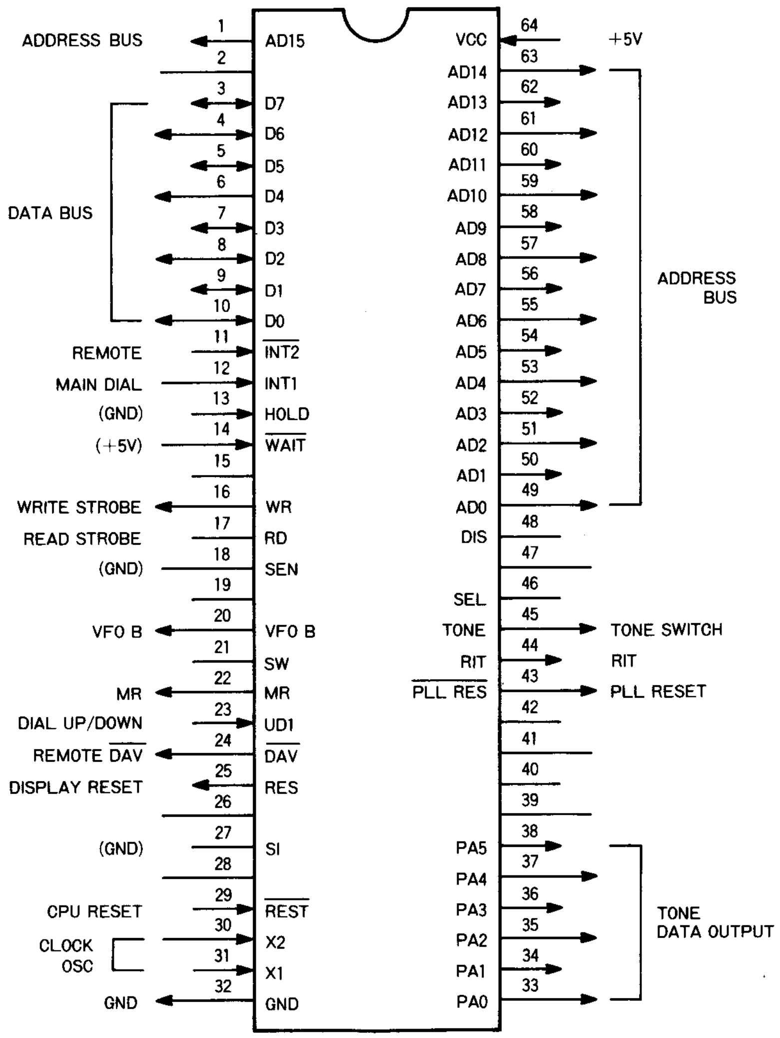
The M1 and M2(GND) terminals(pins 37, 38) are for switching the main sensor's input pulse speed multiplier between 1 and 4. When M1 is HIGH, the multiplier is 1; when M1 is LOW, the multiplier is 4.

The circuit uses a 50-pulse main sensor. In the FM mode, a HIGH is applied from IC9(pin 10) to M1 via D23 and R50 which sets the multiplier to 1(i.e., 50 pulses x 1). In the SSB or CW modes, pin 10 becomes LOW, D23 switches OFF, M1 becomes LOW which sets the speed multiplier to 4(i.e., 50 pulses x 4).

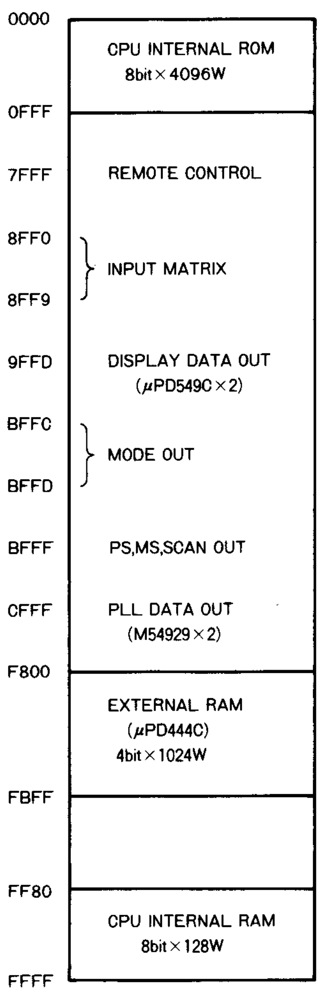
(2) MODE AND FREQUENCY STEP CIRCUITS
The step rates available are 5kHz(FM) and 10Hz(SSB, CW) when the TS switch is ON.

The $Y_7 \rightarrow D_4$, D_5 matrix determines the frequency steps during sensor operation and scanning. The components involved are IC6 and D21. In the FM mode, if the TS switch

CPU Port Allocations



CPU Memory Map



is OFF, the FM mode signal from IC9(pin 10) is input to IC6(pin 13). Also, the Y_7 signal from the TS switch on the front panel is input to pin 12 of the same IC. The Y_7 signal

DFS SW.	TS SW.	VFO/M SW.	MODE SW.	M1	Speed multiplier
OFF	OFF	VFO	FM	Hi	1×
OFF	OFF	VFO	SSB CW	Low	4×
OFF	ON	VFO	FM	Hi	1×
OFF	ON	VFO	SSB CW	Hi	1×
ON	ON	VFO	FM	Low	4×
ON	ON	VFO	SSB CW	Low	4×
OFF	OFF	MEMO	FM	Hi	1×
OFF	OFF	MEMO	SSB CW	Low	4×
OFF	ON	MEMO	FM	Low	4×
OFF	ON	MEMO	SSB CW	Low	4×
ON	ON	MEMO	FM	Hi	1×
ON	ON	MEMO	SSB CW	Hi	1×

output from IC6(pin 11) is input to IC8's(CPU) data bus(D4, D5) via D21, and the step rate is set for either 1 or 5kHz. If the TS switch is ON, the EF UNIT(D18) receives a signal from the $Y_7 \longrightarrow D_4$ matrix, and the step rate is set to 1kHz regardless of the mode.

While operating in the SSB or CW mode, if the TS switch is OFF, IC6(pin 13) becomes LOW, the Y signal is not output from pin 11 and the step rate becomes 10Hz.

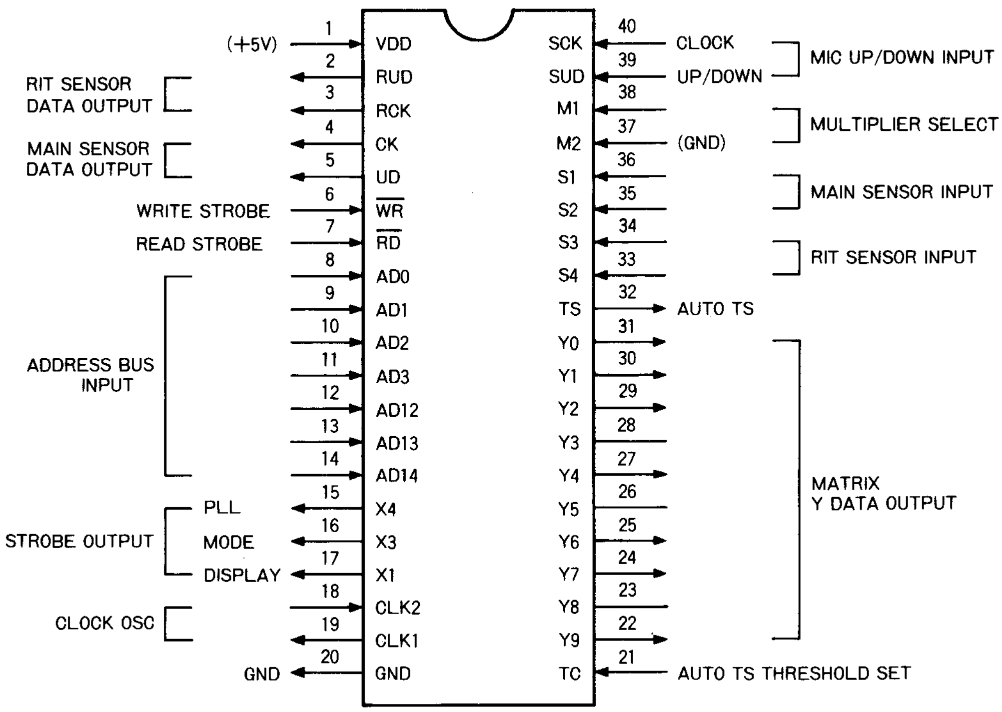
(3)AUTO TUNING RATE(TS), PROGRAM SCAN(PS), MIC UP/DOWN CIRCUITS

The auto TS circuit consists of IC18, IC5 and D18. The FM mode signal is input to IC18(pin 1), the Y_7 signal from the TS switch(OFF) is input to IC5(pin 10), and the auto TS signal and SCK signal(MIC UP/DOWN) from IC7 and the PS signal from IC9 are input to IC5(pin 11). IC18(pin 2) logically determines whether the mode is FM or SSB/CW and becomes HIGH if the mode is SSB or CW.

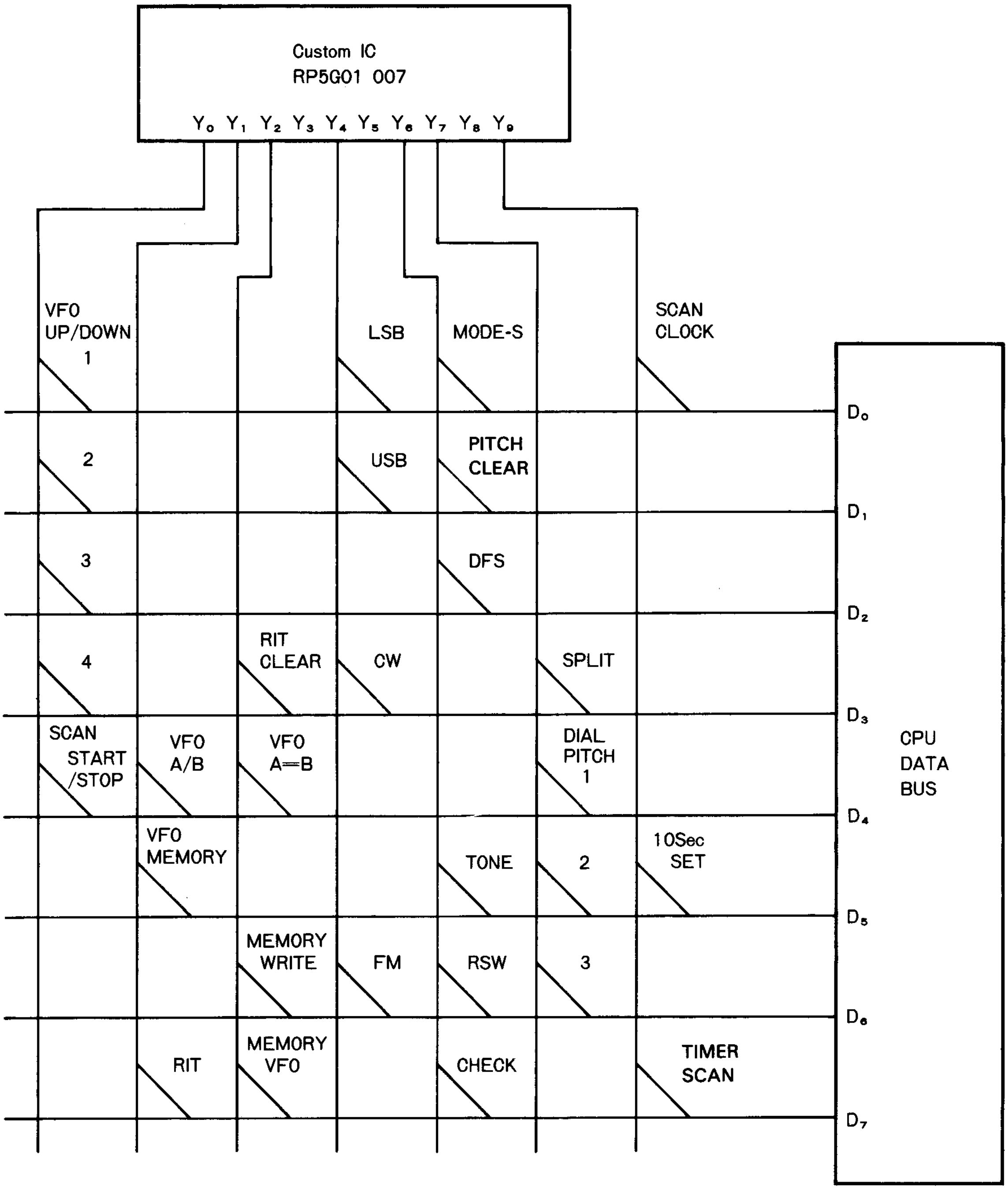
IC5(pin 11) becomes HIGH if the SCK terminal is set to HIGH either by the MIC UP/DOWN signal or the auto TS signal(HIGH during high speed rotation of the sensor) from IC7(pin 32).

During either of the above conditions, the Y signal is output from IC5(pin 8), input to the data bus(D5) by D18 and the step rate is 100Hz.

Input/Output Control IC Port Allocations



5-4-3 MATRIX CIRCUIT



The matrices used in this transceiver and their operation are as stated below.

Matrix Circuit

① Y_0 → D_0(1MHz UP)
→ D_2
→ D_3

Shifts the frequency 1MHz upward.

② Y_0 → D_1(1MHz DOWN)
→ D_2
→ D_3

Shifts the frequency 1MHz downward.

③ $Y_0 \rightarrow D_4$(SCAN START/STOP)
Starts and stops the scan function.

④ $Y_1 \rightarrow D_4$(VFO A/B)
Selects VFO A or B; CPU(pin 20) is HIGH when VFO B is selected.

⑤ $Y_1 \rightarrow D_5$(VFO/MEMORY)
Selects the VFO or memory channel function; CPU(pin 22) is HIGH during memory reading.

⑥ $Y_1 \rightarrow D_7$(RIT)
Selects the RIT function; CPU(pin 44) is HIGH when RIT is selected.

⑦ $Y_2 \rightarrow D_1$(+DUP)
Selects the +DUP function; CPU(pin 40) is HIGH when +DUP is selected.

⑧ $Y_2 \rightarrow D_2$(−DUP)
Selects the −DUP function; CPU(pin 39) is HIGH when −DUP is selected.

⑨ $Y_2 \rightarrow D_3$(RIT CLEAR)
Clears the RIT function.

⑩ $Y_2 \rightarrow D_4$(A=B)
Equalizes the frequencies stored in VFO A and VFO B.

⑪ $Y_2 \rightarrow D_6$(MEMORY WRITE)
Transfers the displayed frequency and mode to a memory channel.

⑫ $Y_2 \rightarrow D_7$(MEMORY VFO)
Transfers the frequency and mode stored in a memory channel to a VFO.

⑬ $Y_4 \rightarrow D_0$(LSB)
Selects the LSB mode; IC9(pin 7) in the LOGIC UNIT is HIGH when LSB is selected.

⑭ $Y_4 \rightarrow D_1$(USB)
Selects the USB mode; IC9(pin 8) in the LOGIC UNIT is HIGH when USB is selected.

⑮ $Y_4 \rightarrow D_3$(CW)
Selects the CW mode; IC9(pin 9) in the LOGIC UNIT is HIGH when CW is selected.

⑯ $Y_4 \rightarrow D_6$(FM)
Selects the FM mode; IC9(pin 10) in the LOGIC UNIT is HIGH when FM is selected.

⑰ $Y_6 \rightarrow D_0$(MODE SEARCH)
Selects the mode search function; only those memory channels containing a frequency with the designated mode are selected by memory scanning or the TUNING CONTROL.

⑱ $Y_6 \rightarrow D_1$(STEP RATE CLEAR)
Clears the step rates as selected with the TUNING RATE switch.

⑲ $Y_6 \rightarrow D_2$(DIAL FUNCTION SELECT)
Selects the various functions of the TUNING CONTROL in conjunction with the DFS switch.

VFO/M \ DFS	OFF	ON
VFO A or VFO B	Frequency up or down.	Displayed memory channel changes.
MEMORY MODE	Memory data and channel number changes.	Frequency up or down.

⑳ $Y_6 \rightarrow D_7$
Sets only the LOGIC UNIT to transmit; used to confirm shifted frequencies and the amount of offset during duplex operation.

㉑ $Y_6 \rightarrow D_5$(TONE)
Selects the optional UT-15 Encoder/CTCSS Tone Unit.

㉒ $Y_6 \rightarrow D_6$(RSW)
Releases the RIT data during transmission and outputs calculated N data. Also functions as a stop signal while scanning is operating.

㉓ $Y_6 \rightarrow D_4$(OW)
Sets the duplex shift width.

㉔ $Y_7 \rightarrow D_3$(SPLIT)
Selects split frequency operation for transmit/receive using VFO A and VFO B.

㉕ $Y_7 \rightarrow D_4$(DIAL STEP RATE/1kHz)
Selects a 1kHz tuning rate.

㉖ $Y_7 \rightarrow D_5$(DIAL STEP RATE/100Hz)
Selects a 100Hz tuning rate.

㉗ $Y_9 \rightarrow D_0$(SCAN CLOCK)
Inputs a clock signal when scanning.

㉘ $Y_9 \rightarrow D_5$(10 SECOND SET)
Timer function for the scan stop periods.

㉙ $Y_9 \rightarrow D_7$(TIMER ON/OFF)
Switches the $Y_6 \rightarrow D_5$ timer ON and OFF.

5-4-4 DISPLAY AND PLL STROBE

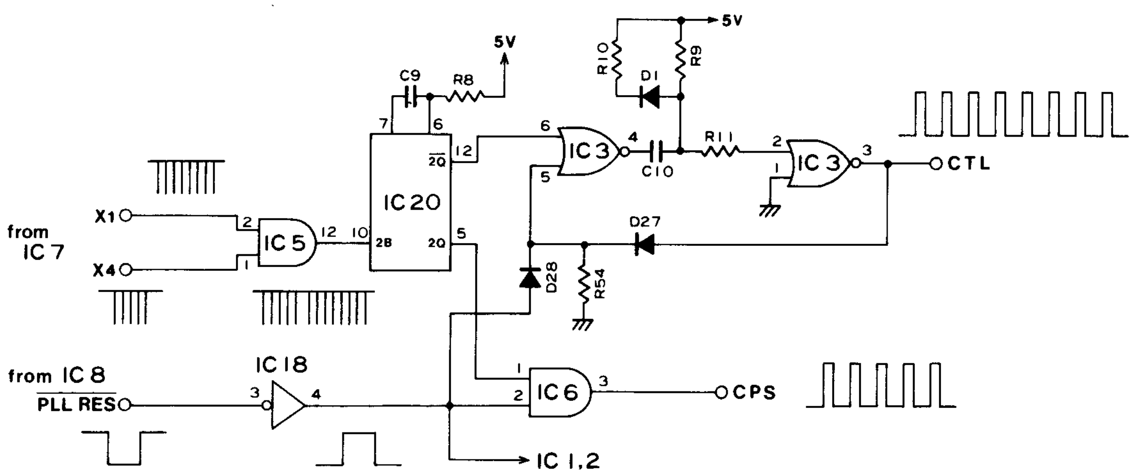
The outputs from IC7(pin 17)(the x1 signal), and IC7(pin 15)(the x4 signal) on the LOGIC UNIT are combined into the PLL and the display strobe signals by an AND gate in IC5. These signals are then input to IC20(pin 6).

IC20 contains a monostable multivibrator which increases the pulse width of the input signal and passes the output from pins 5 and 12 to IC6(pin 1) and IC3(pin 6).

The output from IC8(pin 43), PLL RES, is input to the inverter IC18(pin 3). The output from pin 4 passes to AND gates in IC1 and IC2. When the PLL strobe signal is input to IC6(pin 1), pin 2 of the same IC becomes HIGH.

IC6(pin 2) is HIGH when the PLL data signal is output. For the display strobe signal, pin 2 becomes LOW, D28 switches OFF and IC3(pin 5) is pulled down by R54.

IC3 is a monostable multivibrator with two NOR gates and consists of R9 through R11, C10 and D1. IC3 is triggered by the fall of the signal from IC20(pin 12). At this time, IC3 outputs the DISPLAY UNIT's CTL signal. R8 and C9 at IC20(pins 6 and 7) determine the time constant pulse width.



5-4-5 DISPLAY DATA

The eight-digit data and the eight CTL pulses automatically set the display driver IC(μPD549C). If there are fewer than eight CTL pulses, the transfer mode is in progress and the display is masked. The display data is sent whenever the frequency is changed, the memory channel is changed or if some other operation affecting the display is carried out.

5-4-6 MODE, MEMO, VFO, SCAN AND RIT DISPLAYS

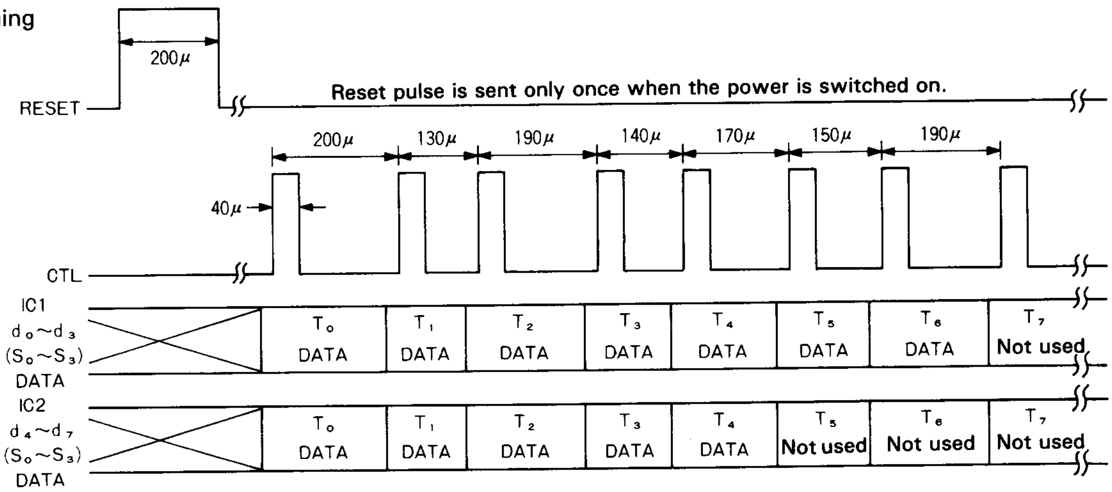
When one of the mode switches(S22 through S25, CW, LSB, USB, FM) or the scan switch(S14) on the front panel is switched ON, the mode signal or scan strobe signal is output from IC7(pin 16) in the LOGIC UNIT to IC20(pin 2)(1B). It is also output to IC4(pin 11)(2CK) and IC4(pin 3)(1CK).

The X3 signal input to IC20(pin 2) has its pulse width increased by the monostable multivibrator and by the time constants of R7 and C8 which are connected to the timing terminals(pins 14, 15). The output from pin 4 passes through IC3's two NOR gates and the monostable multivibrator which includes R29, and then through R31, R47, D7 and C18, and is input to the strobe terminal IC9(pin 6).

The X3 signal is input to the clock input terminals, IC4(pins 3 and 11), by the two D-type flip-flops contained within the IC. In addition, the address data(AD_0, AD_1) from IC8 is also input to pins 12 and 2, and then output from pins 5 and 9 to IC9's port select terminals(S_0, S_1). The data(d_0 through d_3) from IC12 is input to IC9(pins 2, 3, 27, 28). IC9 contains four sets of input/output ports which are used as two sets of latches.

IC9(pin 20) becomes HIGH during program scanning and pin 21 becomes HIGH during memory scanning. Also, pins 10, 9, 8 and 7 become HIGH while the FM, CW, USB or LSB modes are selected, respectively, and these HIGH signals are output as the mode signal. IC10 converts the mode signal into the 8V FM, CW, USB or LSB mode signal, and then supplies this signal to the DISPLAY UNIT and the MAIN UNIT.

Display data timing



IC9(pin 20)(PS) and IC9(pin 21)(MS) make an OR circuit with D8 and D9. When either PS or MS is HIGH, part of the signal is output to the DISPLAY UNIT for the scan display and part is input to IC13(pin 8) for the start of the scanning lock. Next, if the +DUP, −DUP, VFO/M or RIT functions are selected from the front panel(i.e. turned ON), the corresponding terminals of IC8 become HIGH.

When the $Y_1 \rightarrow D_7$ matrix is ON, IC8(pin 44)(RIT terminal) becomes HIGH. This signal is input to inverter IC11(pin 11) and output from IC11(pin 13) as the RIT signal.

This RIT signal is input from R12 in the DISPLAY UNIT to the Q11 base. Also, the 1kHz RIT frequency signal(T_1) from IC2 is input to the emitter. The RIT signal switches and is output to pins 29 and 42 of the display, thus causing RIT and the decimal point to light.

$Y_2 \rightarrow D_1$ and $Y_2 \rightarrow D_2$ are the +DUP and −DUP matrices. When one of these matrices is ON, IC8(pin 40 or 39) becomes HIGH. This signal is input to the NOR gate at pin 2 and the inverter in IC11(pin 6), then input to the DISPLAY UNIT(Q9 and Q10) as the $\overline{+DUP}$ and $\overline{-DUP}$ signals, and finally output to the display.

The $\overline{+DUP}$ signal is also converted to the $\overline{DUP}$ signal by inputting the +DUP and −DUP signals to a NOR gate. In other words, except when IC11(pins 2 and 3) are LOW(no DUP condition), PIN 1 is HIGH, so this $\overline{DUP}$ signal($\overline{+DUP}$ signal) is input from R27 in the EF UNIT to the Q6 base via the DISPLAY UNIT.

When transmitting with the DUP function, Q8 changes from ON to OFF and Q5 changes from OFF to ON. Y_6 is input to D6 via Q5, Q6, D7 and D32. When the $Y_6 \rightarrow D_6$, D_7 matrix is ON, the offset frequency value calculation is performed.

When the $Y_1 \rightarrow D_4$ matrix is ON, IC8(pin 20)(VFO 8 terminal) becomes HIGH. Since IC8 has no VFO A terminal, the VFO signal is input to the NOR gate IC11(pin 8), the MR signal is input to pin 9 and the VFO A signal is supplied from pin 10 to the DISPLAY UNIT.

5-4-7 SCAN CIRCUIT

This circuit is equipped with the MIC UP/DOWN, MS(memory scan) and PS(program scan) functions. The monostable multivibrator composed of IC13, R18 through R23, C23, C24, and Q3 generates the scanning lock; this is input to IC6(pin 5). Also, the Y_9 signal is input to pin 4, and this signal is supplied from pin 6 to D_0 via D12, thus creating the $Y_9 \rightarrow D_0$ matrix. This matrix uses the scanning lock input to cause IC13(pin 8) to become HIGH and start the scan lock operation.

Q3 connects the composite resistance of R21 and R18 to R22 in parallel during MS, thus lowering the scanning lock oscillator frequency.

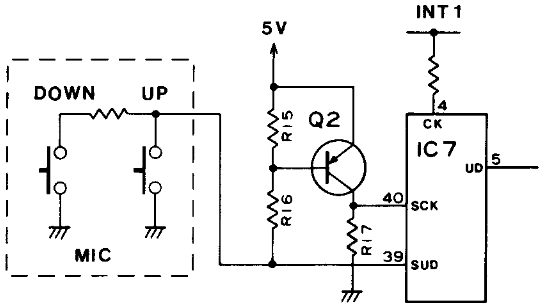
The Q3 base is connected to IC9(pin 21)(MS signal) and IC9(pin 10)(FM signal).

If the receive signal(CSS) is output from the CSS(center scanning stop) during scanning, it is supplied to the Q4 base from the EF UNIT(R24), the $Y_7 \rightarrow D_2$ matrix comes on, and scanning stops for a fixed length of time. This time is determined by a 10-second timer set by D14($Y_9 \rightarrow D_5$) and D13($Y_9 \rightarrow D_7$) in the LOGIC UNIT.

If the main sensor is turned either during scanning or during a temporary stop, the monostable multivibrator composed of IC16, R1 and C1 is triggered by the pulse from IC7(pin 4), and IC16(pin 3)and IC13(pin 1) both become HIGH. This turn causes IC13(pin 4) to also become HIGH and the Y_0 signal input to IC6(pin 9) flows from pin 8 through D16, thus causing the $Y_0 \rightarrow D_4$ matrix to come ON. The $Y_0 \rightarrow D_4$ matrix is the S/S used to start and stop the scanning.

Additionally, IC13(pin 2) is triggerred by the scan signal so scanning does not start or stop even if the main sensor is turned.

5-4-8 MIC UP/DOWN CIRCUIT



● R17 is a pull-down connection.

This circuit consists of Q2 and R15 through R17 connected to the SUD(pin 39) and SCK(pin 40) terminals which are the MIC UP/DOWN terminals on IC7 in the LOGIC UNIT.

When the MIC UP switch is pressed, the SUD terminal becomes LOW, Q2 switches ON, and the SCK terminal becomes HIGH. When the MIC DOWN switch is pressed, the SUD terminal becomes HIGH and exceeds the threshold level of IC7. Q2 switches ON and the SCK terminal becomes HIGH as for the UP function.

If IC7's SUD terminal is LOW and its SCK terminal is HIGH, the pin 5 UD terminal becomes HIGH, the signal from the pin 4 CK terminal is input to IC8(pin 12)(INT1), and the circuit counts up. If the SUD terminal is HIGH, the SCK terminal also becomes HIGH, the UD terminal becomes LOW, and the signal from the CK terminal causes the circuit to count down.

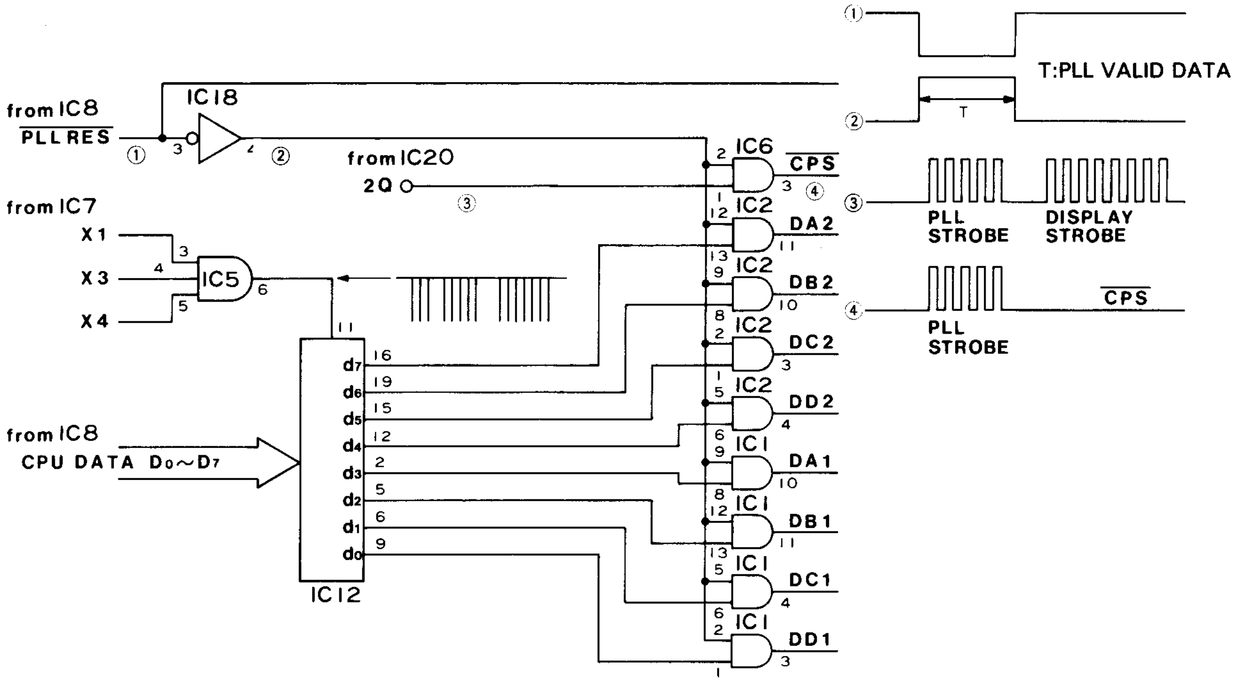
A remote control unit may be externally connected to this unit, thus allowing control of frequency, mode, VFO/M and M▶VFO switching. The circuit composed of IC14, IC15, IC18, D2, D3 and R12 through R14 is for connection of the remote control.

5-4-9 N DATA

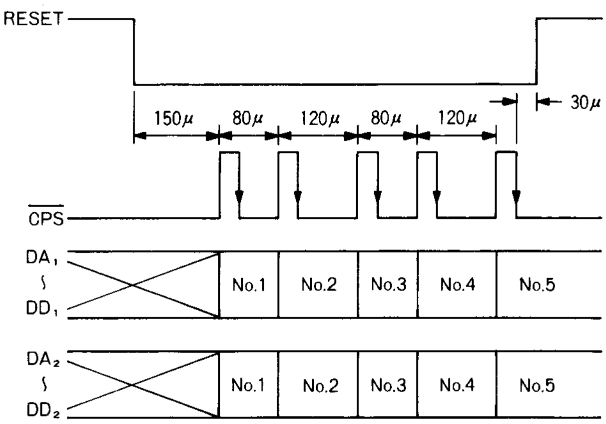
Because the PLL is a two-loop construction, the two-line N data from the LOGIC UNIT is supplied to the PLL system. The data from the data bus(IC8(pins 3 through 10)) uses the eight D-type flip-flops contained in IC12 as latches. The display, PLL, mode and scan strobe signals of IC7(pins 15 through 17)(X1 through X4) are developed by IC5's three-input AND gate and input from pin 6 to the clock input terminal at IC12(pin 11). This latches the sequential data for each strobe.

Because d_0 through d_7 of IC12 are also used by data other than the PLL, IC8(pin 43)(PULL RES) uses the IC18 inverter and the IC1 and IC2 AND gates to open the gate only for the valid time of the PLL data, and the latch data is output from IC12 to the PLL UNIT.

The reset input of IC3 and IC6(M54929P) of the PLL UNIT requires a LOW. Reading is done at the fall of the five N data items and the five CPS pulses, and the data is read sequentially from the least significant digit.



N data output timing



Method for obtaining N data

144.000.0MHz

IC3 side(DA2~DD2)	10230(14400−4170=10230)
IC6 side(DA1~DD1)	23000(000+23000=23000)

145.000.0MHz

IC3 side(DA2~DD2)	10330(14500−4170=10330)
IC6 side(DA1~DD1)	23000(000+23000=23000)

145.999.9MHz

IC3 side(DA2~DD2)	10429(14599−4170=10429)
IC6 side(DA1~DD1)	23990(990+23000=**23990**)

5-4-10 TONE GENERATOR

This set uses IC19 as a tone generator for CTCSS. Pins 5 and 6 of this IC are input terminals for a 3.579545MHz crystal, data PA_0 through PA_5, and a standby terminal. Data PA_0 through PA_5, is supplied from IC8(pins 33 through 38). IC15, IC16, IC18, and Q1 form a standby switch circuit. When IC18(pin 11) becomes LOW, the signal is input to IC16(flip-flop) via a debouncing circuit composed of R45, R41, R3, C3 and IC15, thus forming the ON/OFF switch.

The tone frequency from IC19 is output to the MAIN UNIT. In addition, the data from IC8(pins 33 through 38) is used as the tone SQL data.

5-5 FILTER UNIT(IC-271H)

The FILTER UNIT consists of a low-pass filter, a power control circuit for a preamplifier in direct line with the antenna, RF and SWR detection circuits,etc.

5-5-1 LOW-PASS FILTER
The filter, composed of L1 through L3, C20, C21, and C24 through C28, is a Chebyshev low-pass filter. The filter features a transmission loss of 0.7dB or less within the band range of this transceiver and a cutoff frequency of 180MHz. It attenuates the higher harmonic components by at least 50dB.

5-5-2 RF METER DETECTOR, SWR DETECTOR, PROTECTOR CIRCUITS
Travelling waves and reflected waves are detected by a pass detection circuit composed of D7, D8, D19 and a strip line. The D7 detected output is supplied to the RF meter. Also, the two D7 and D8 detected outputs are compared by IC1A with the voltage designated by R16 and R17. If the reflected wave voltage becomes larger than the travelling wave voltage, IC1(pin 1) changes from HIGH to LOW and pin 7 changes from LOW to HIGH. Because the output of pin 7 is connected to terminal 5 by R6 and D4, it is compared with terminal 6 which is approximately 1 volt while transmitting, and the pin is kept HIGH as long as the transmit mode is maintained. This output from pin 7 becomes the PRO output and controls the multivibrator circuit on the TERMINAL UNIT and the PA output.

The R16 and R17 functions are to designate the operating points for this protector circuit. Because they compare the travelling wave voltages, the protector circuit is operated within a relatively wide power range.

5-5-3 ANTENNA PREAMPLIFIER POWER CONTROL CIRCUIT
An optional antenna preamplifier is available for use with this transceiver, therefore the description of the power supply circuit is included below.

When the PREAMP switch on the front panel is switched ON, 13.8 volts is output to P3(pin 5). This voltage must be switched ON while receiving and OFF while transmitting; the preamplifier has no function while transmitting. This switching action is controlled by Q3 and Q4. Also, Q5 functions to limit the output current of this power supply, so even if the antennna is DC grounded, the Q4 base potential is lowered to protect Q3 from being damaged.

5-5-4 ANTENNA SWITCHING CIRCUIT
A low-loss, coaxial relay is used for switching between transmit and receive. Q1 and Q2 control this relay.

5-6 CSS AND DC-DC UNITS

5-6-1 CSS(CENTER SCANNING STOP) CIRCUIT
The center meter output(CS signal) from the MAIN UNIT which is applied via the EF UNIT(front panel) is first divided by R1 and R2, and then input to IC1A(minus(−) side) and IC1B(plus(+) side) via R3 and R10. Also, the input to IC1A(plus(+) side) and IC1B(minus(−) side) is also divided by R5 and R3, and the reference voltage is determined by R6 and R9.

The operational amplifier output becomes LOW only whenthe CS signal is larger than the reference voltage on either the plus(+) or minus(−) side.

When the output of operational amplifiers A and B becomes LOW because of D2 and D4, the signal is divided by R12 and R13, and Q1 is controlled so it switches OFF. When Q1 switches OFF, Q2 is switched ON by the +8 volt input via R14.

Also, if the SQL is open at this time, the SQLS signal becomes HIGH, Q3 switches ON, and the Q2 collector voltage becomes LOW. This is supplied via C7 and R2 to the LOGIC unit as the CSS signal, and then in turn input as the scanning stop control signal.

SSB, IC1 and Q1 switch OFF, SSB 8V is applied via D7 to the Q2 base and the SQLS signal is output as the scan stop signal. IC1 uses its two built-in operational amplifiers to function as a comparator.

5-6-2 DC-DC CIRCUIT
IC2 is a DC-DC converter for the negative(-) power supply, and it converts 13.8 volts into −9 volts. This −9 volts is input to the EF UNIT(front panel) and the MAIN UNIT, and it is then supplied to the various ALC and AGC circuits.

5-6-3 DISPLAY UNIT
This unit consists of a display, a display driver and a DC-DC converter. The display provides a readout of the frequency, mode, RIT, memory channel and operating mode(VFO, A/B, SCAN) for a rapid indication of the current status of the transceiver functions.

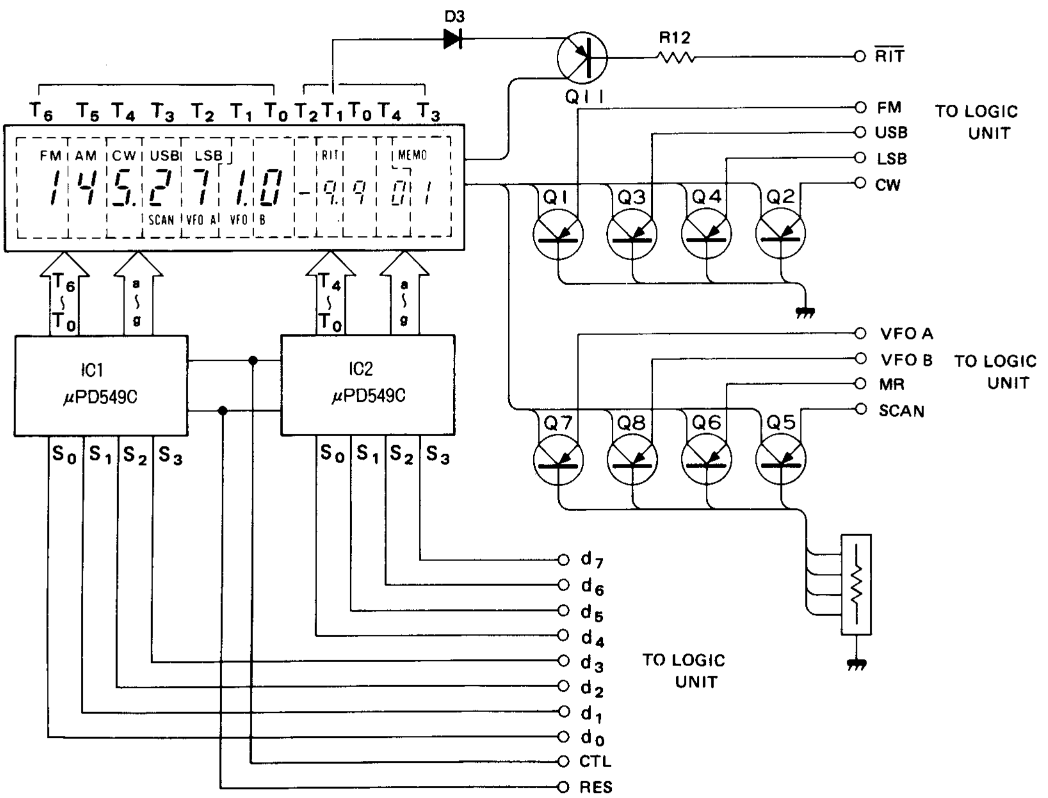
(1) DISPLAY
The fluorescent display(DS1) uses two ICs(IC1 and IC2) to drive its dynamic display. These ICs include such functions as latches, a clock oscillator circuit, a timing counter, a segment decoder, etc. Two externally connected capacitors(C1, C2) determine the timing of the clock oscillator circuit. IC2 is used to display the RIT's changed frequency and the memory channel, and IC1 drives the other display functions.

(2) DC-DC CONVERTER
The DC-DC converter supplies voltages of +5 volts for IC1 and IC2, and −35 volts and 3.5 volts AC for the display. The +5 volts is supplied from the EF UNIT. The DC-DC converter is an inverter composed of Q12, Q13 and T1, and it generates a square wave of approximately 15kHz. The voltages of −5 volts, −35 volts and 3.5 volts AC are obtained from a separate winding wrapped around T1. With the exception of the 3.5 volts AC for the display filament, all the outputs are rectified and converted to DC.

For the −5 volts, the output rectified by D14 is stabilized by R18 and D14, and then supplied to the Vgg of IC1 and IC2.

Q14 through Q16 form a circuit which keeps the display

Display Unit Circuit



dark for approximately 2 seconds from the time the set's power is switched ON until resetting is complete with Q14 functioning as a switch to stop the flow of the −35 volts. Immediately after the set's power is switched ON, Q14 through Q16 are all OFF and the −35 volts is not output. When resetting is complete and the CTL signal from the LOGIC UNIT is supplied, Q16, Q15 and Q14 all switch ON, and the −35 volts is output. Q15 and C10 form a latch circuit to maintain the output of the −35 volts once the circuit is switched ON.

5-7 OTHER CIRCUITS

5-7-1 POWER SUPPLY SWITCHING CIRCUIT (MAIN UNIT)

IC15 is the power supply IC equipped with various protection circuits. An input of 13.8 volts to IC15(pin 2) causes a constant voltage of 8 volts to be output from IC15(pin 1) while T8V is output from IC15(pin 6).

For the switching of R8V and T8V, IC15(pin 5) is connected via D53 to the Q33 collector, the mute voltage is applied to the base from the PLL UNIT, the emitter(transmission line) drops to ground level, D53 and Q33 switch ON, and T8V is output from IC15(pin 8).

When the PLL is not locked, the mute voltage becomes LOW, Q33 switches OFF, and T8V is not output.

5-7-2 TRANSMIT/RECEIVE SWITCHING CIRCUIT (RF-YGR UNIT)

While transmitting, J2 supplies T8V, R1 and D1 switch ON, and the transmit signal from P1 feeds to the double-balanced mixer composed of Q1, Q2, L1 and L2. T8V reverse-biases D2 and it switches OFF. While receiving, J2 supplies R8V, R22 and D2 switch ON, and the first intermediate frequency(10.75MHz) passes to the MAIN UNIT from P1.

5-7-3 TERMINAL CIRCUIT BOARD(IC-271H)

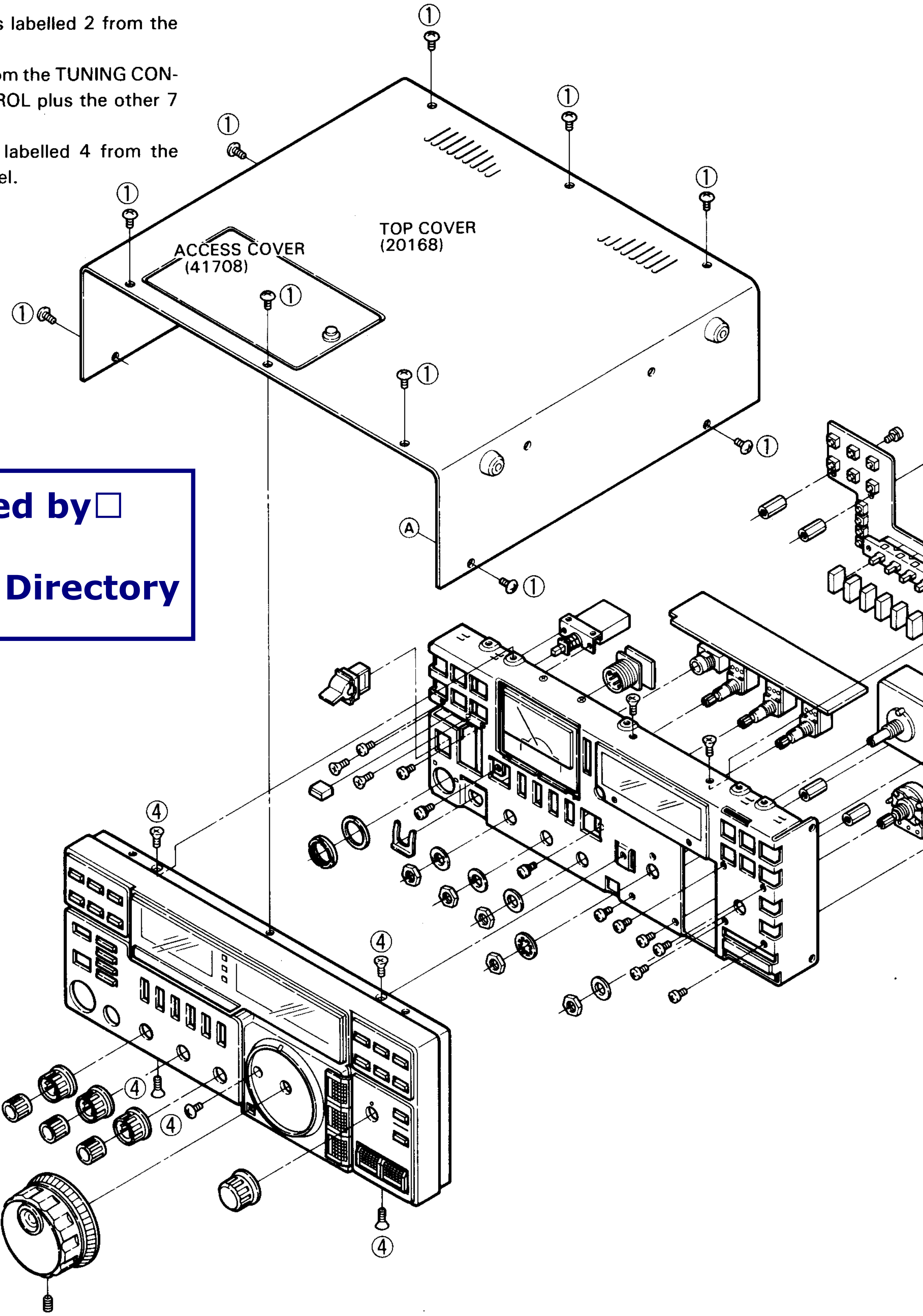
This circuit board is the interface that connects the MAIN UNIT, FILTER UNIT, PA UNIT and ACC UNIT. It functions as a relay for the signal line exchange and voltage/current supply required by the various circuit boards.

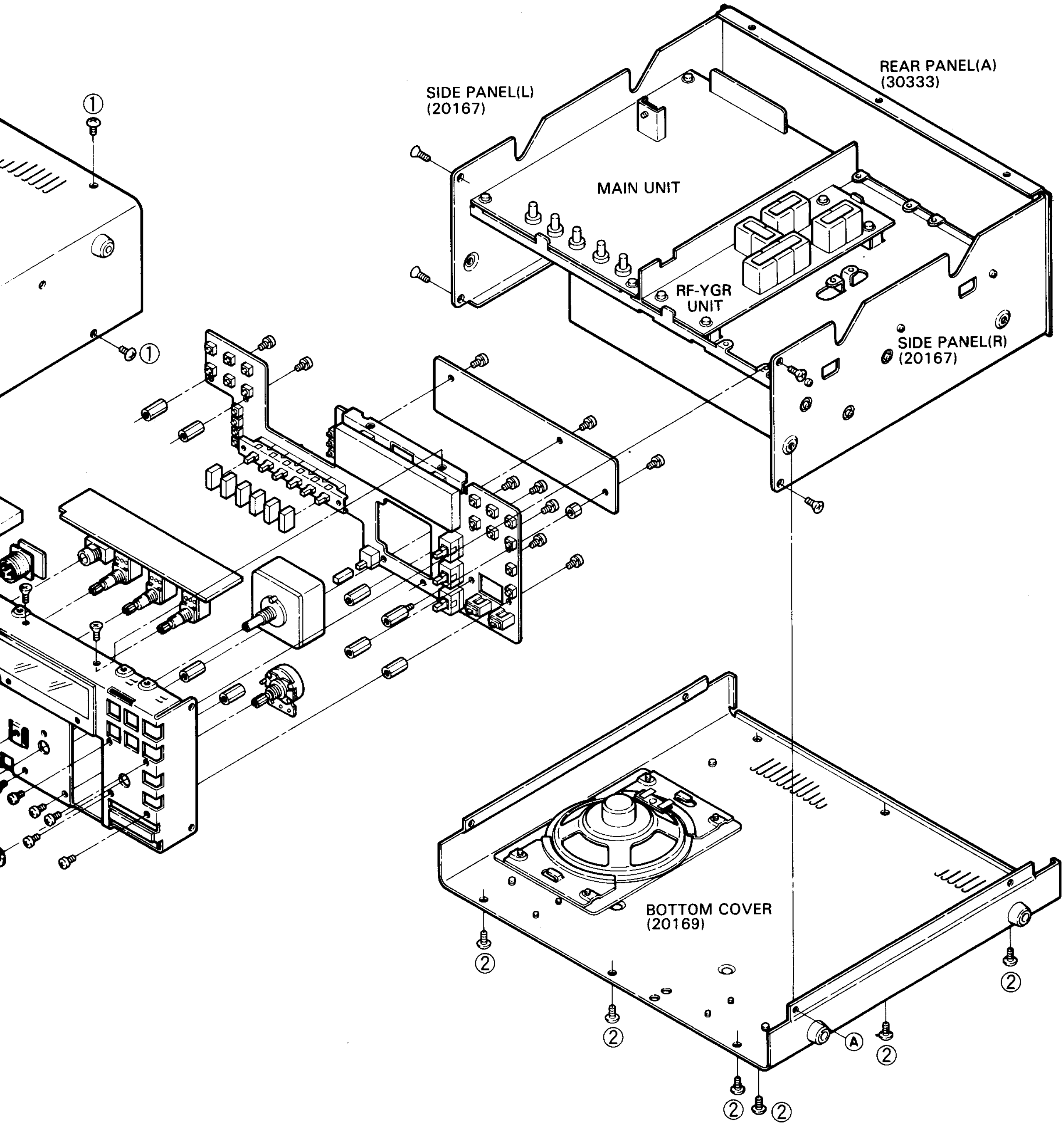
Also, this circuit board includes a multivibrator circuit which uses the squelch lamp to indicate protector operation.

The protector signal output is applied via R6 to the Q3 base and, while transmitting only, the voltage from the T8V line is applied to the multivibrator circuit(Q1, Q2). The voltage switched by Q2 is output to the SQLS line, and the squelch lamp flashes ON and OFF to indicate the protector circuit is operating.

FRAME DISASSEMBLY (IC-271A/E)

1. Unscrew and remove the 10 screws labelled 1 from the top cover. Remove the cover.
2. Unscrew and remove the 6 screws labelled 2 from the bottom cover. Remove the cover.
3. Remove the hex screw labelled 3 from the TUNING CONTROL. Pull off the TUNING CONTROL plus the other 7 knobs from the front panel.
4. Unscrew and remove the screws labelled 4 from the front panel. Remove the front panel.

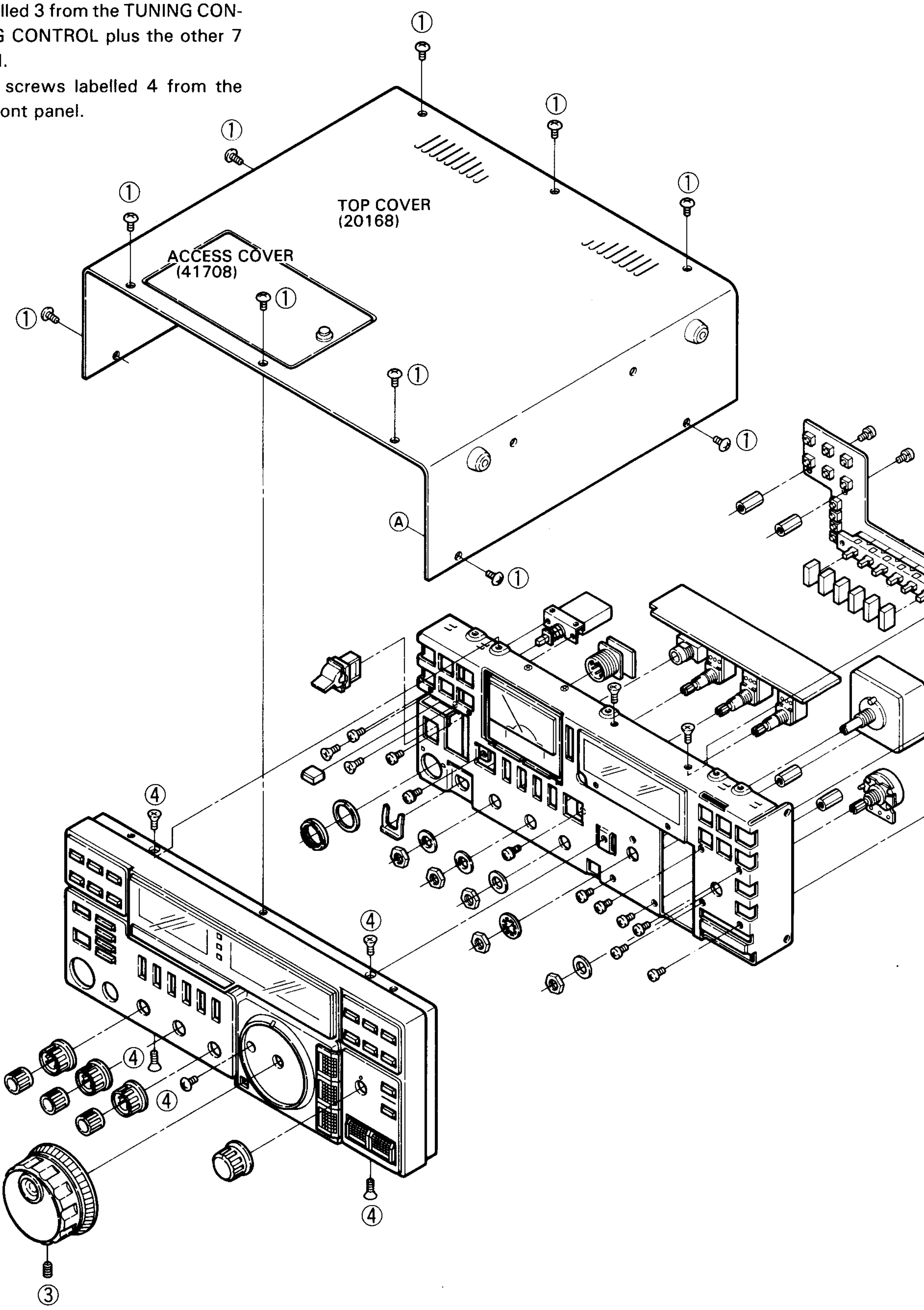


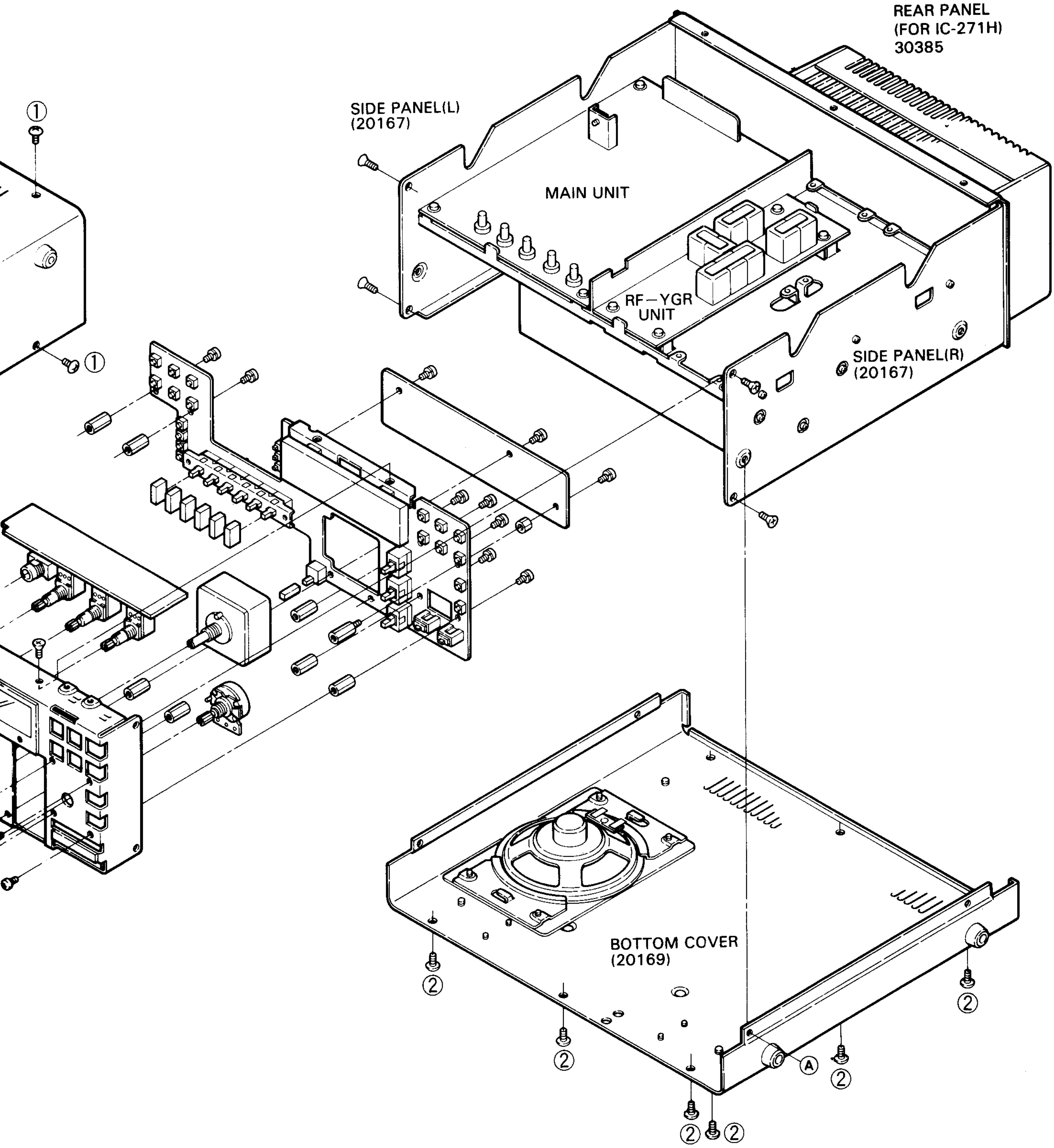


SIDE PANEL(L)
(20167)
REAR PANEL(A)
(30333)
MAIN UNIT
RF-YGR
UNIT
SIDE PANEL(R)
(20167)
BOTTOM COVER
(20169)
①
①
②
②
②
②
②
②
②
Ⓐ

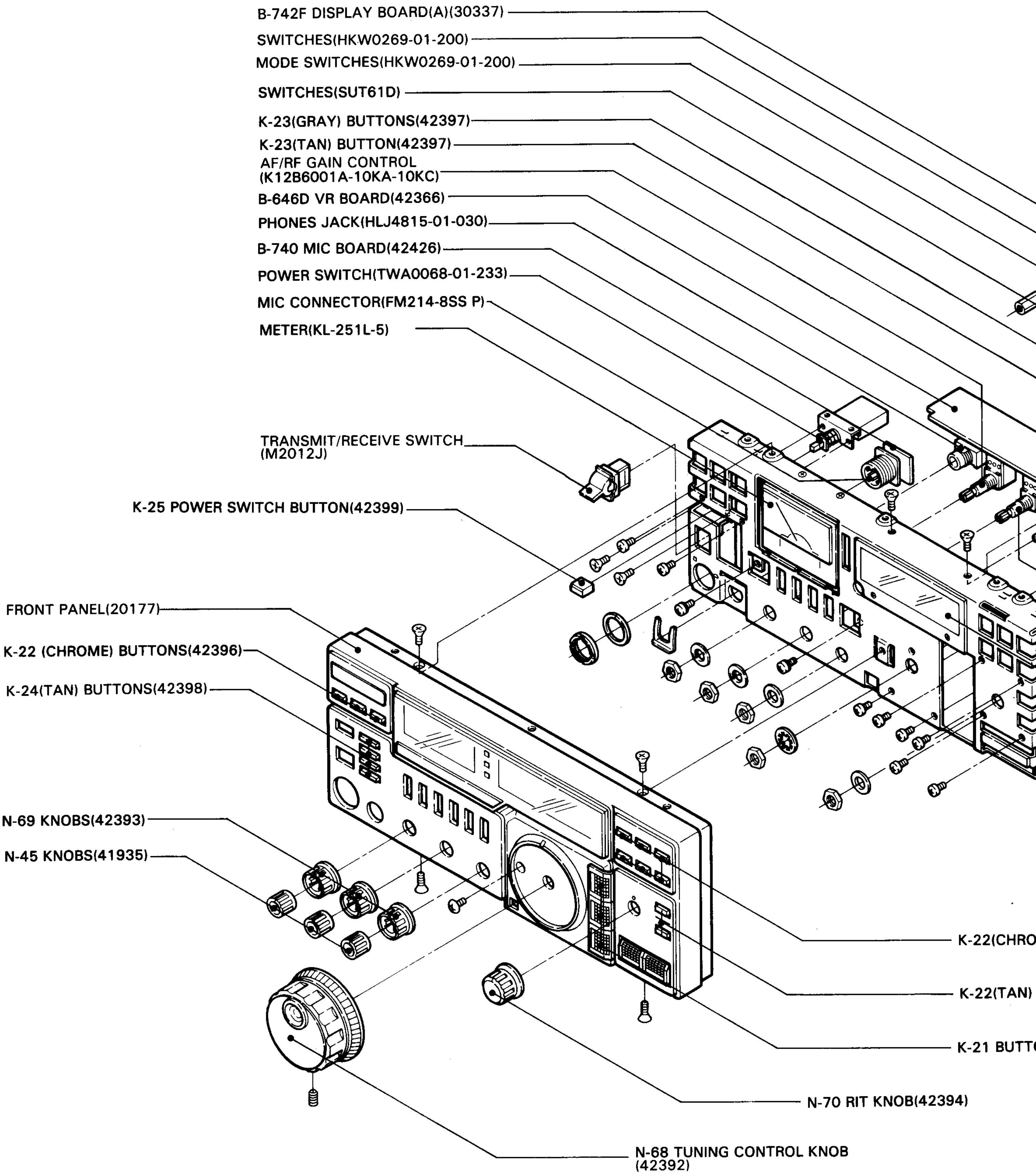
FRAME DISASSEMBLY (IC-271H)

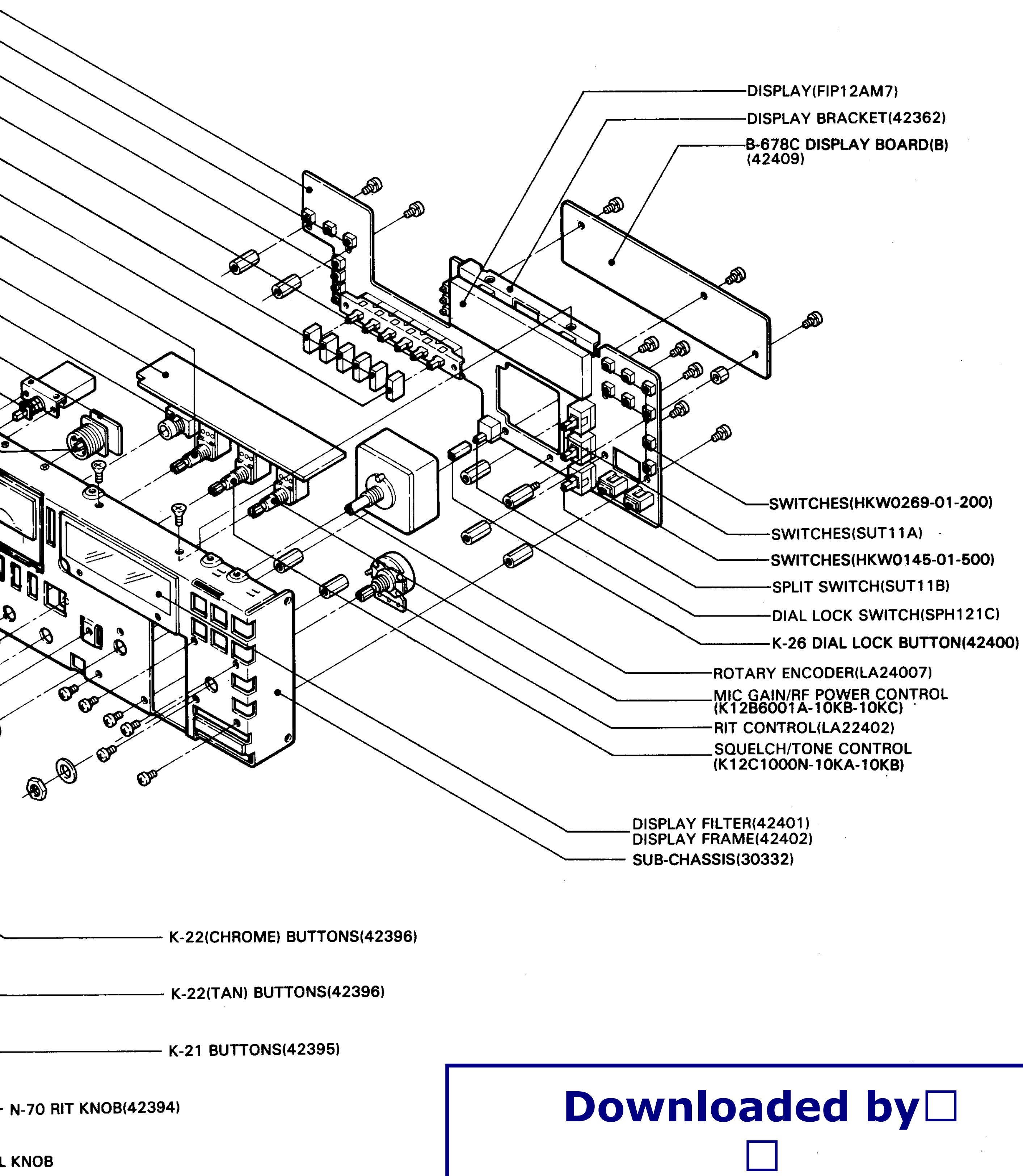
1. Unscrew and remove the 10 screws labelled 1 from the top cover. Remove the cover.
2. Unscrew and remove the 6 screws labelled 2 from the bottom cover. Remove the cover.
3. Remove the hex screw labelled 3 from the TUNING CONTROL. Pull off the TUNING CONTROL plus the other 7 knobs from the front panel.
4. Unscrew and remove the screws labelled 4 from the front panel. Remove the front panel.



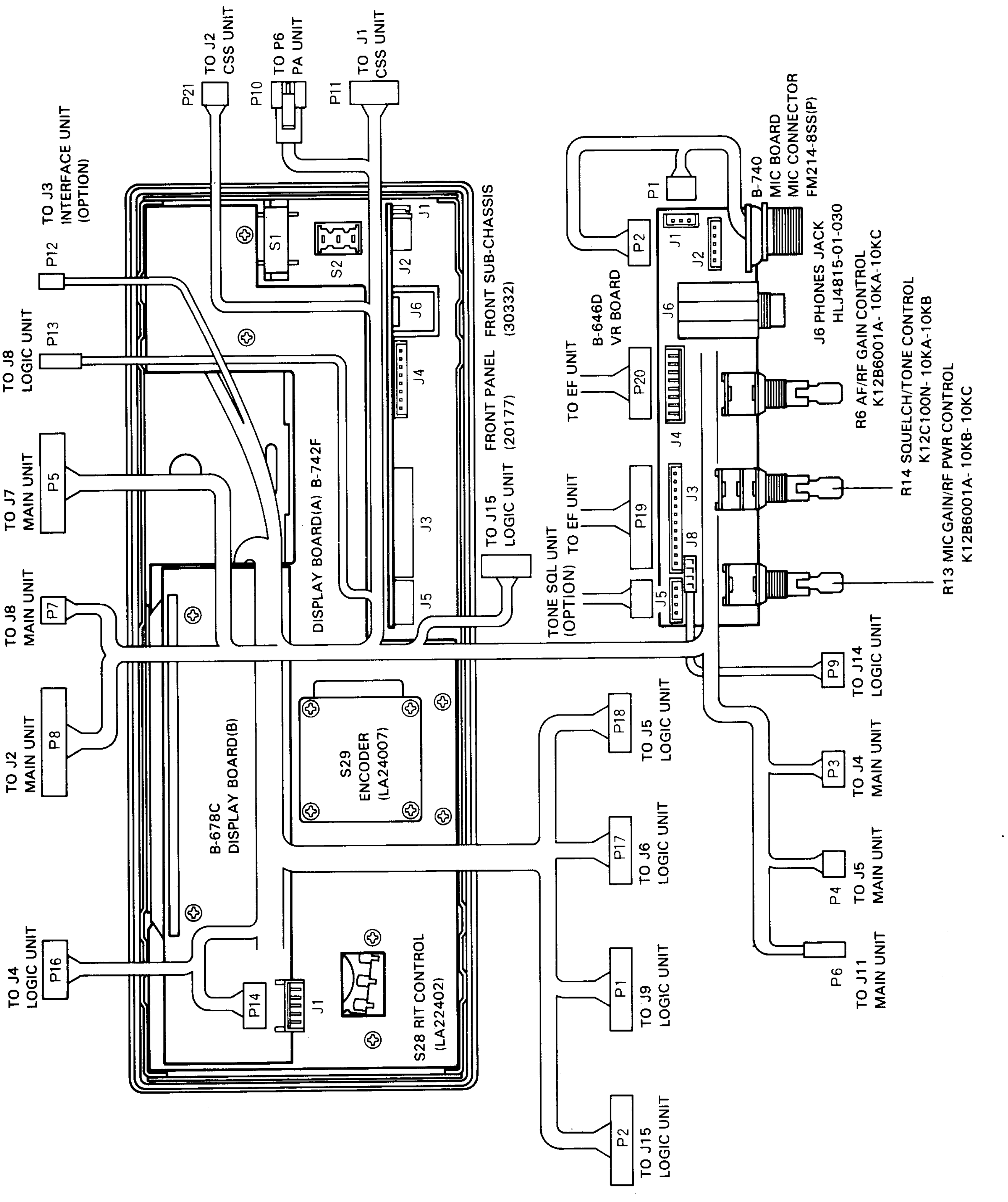

REAR PANEL
(FOR IC-271H)
30385
SIDE PANEL(L)
(20167)
①
MAIN UNIT
RF-YGR
UNIT
①
SIDE PANEL(R)
(20167)
BOTTOM COVER
(20169)
②
②
②
Ⓐ
②
②
②

FRONT PANEL DISASSEMBLY

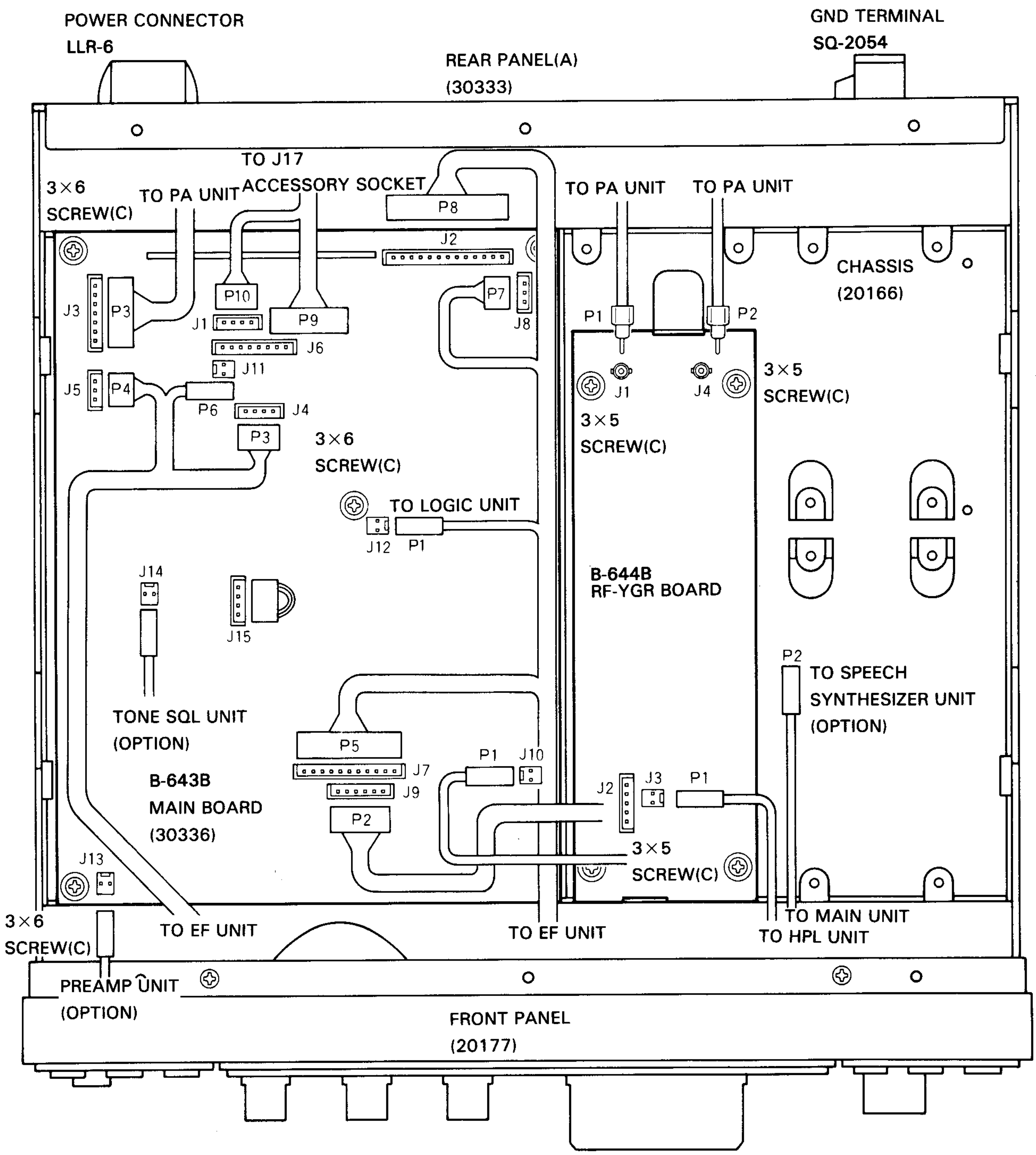



DISPLAY(FIP12AM7)
DISPLAY BRACKET(42362)
B-678C DISPLAY BOARD(B)
(42409)
SWITCHES(HKW0269-01-200)
SWITCHES(SUT11A)
SWITCHES(HKW0145-01-500)
SPLIT SWITCH(SUT11B)
DIAL LOCK SWITCH(SPH121C)
K-26 DIAL LOCK BUTTON(42400)
ROTARY ENCODER(LA24007)
MIC GAIN/RF POWER CONTROL
(K12B6001A-10KB-10KC)
RIT CONTROL(LA22402)
SQUELCH/TONE CONTROL
(K12C1000N-10KA-10KB)
DISPLAY FILTER(42401)
DISPLAY FRAME(42402)
SUB-CHASSIS(30332)
K-22(CHROME) BUTTONS(42396)
K-22(TAN) BUTTONS(42396)
K-21 BUTTONS(42395)
N-70 RIT KNOB(42394)
L KNOB

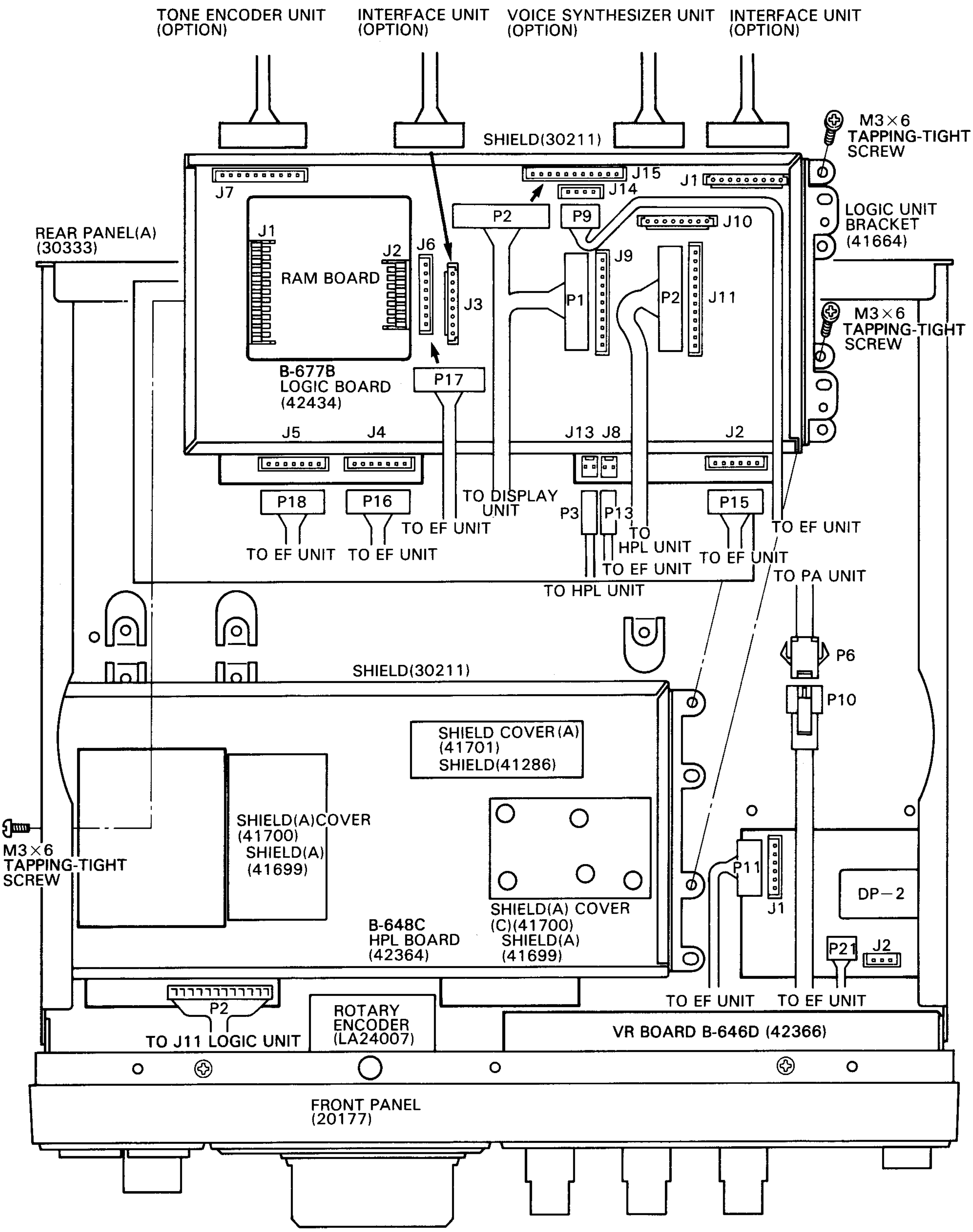
FRONT SUB-CHASSIS CONNECTOR ASSEMBLY



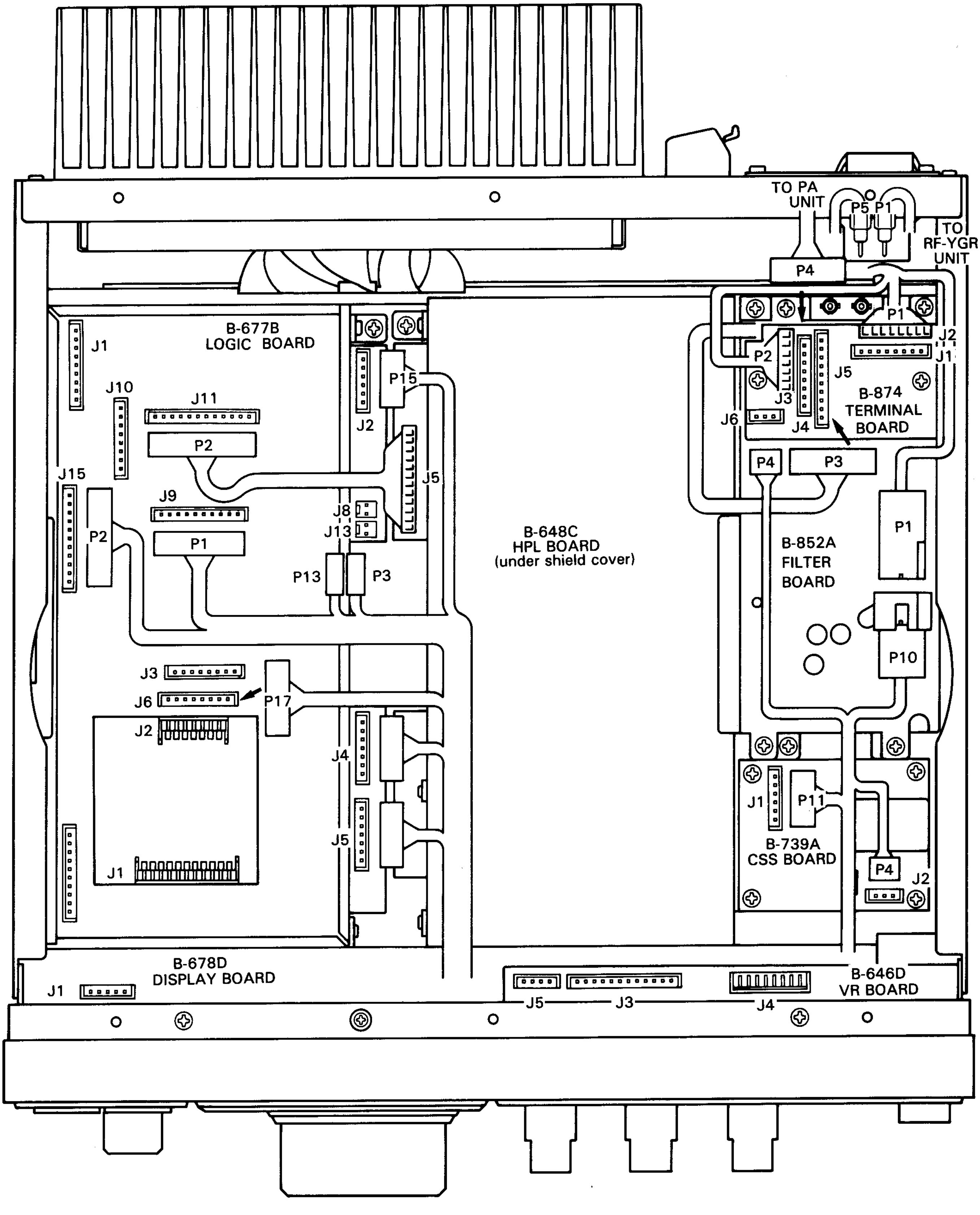
MAIN BOARD CONNECTOR ASSEMBLY (IC-271A/E)



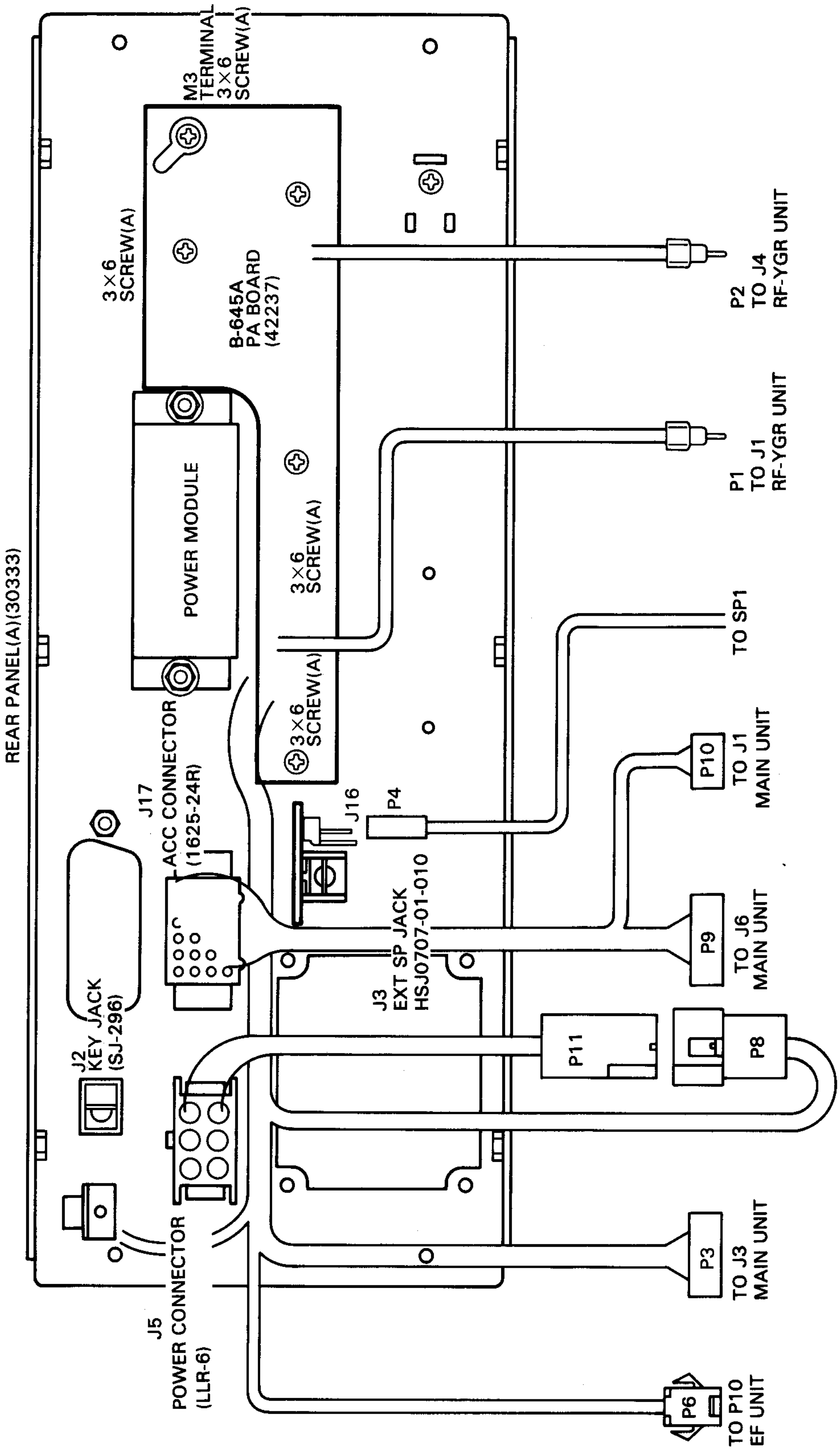
LOGIC/PLL BOARD CONNECTOR ASSEMBLIES (IC-271A/E)



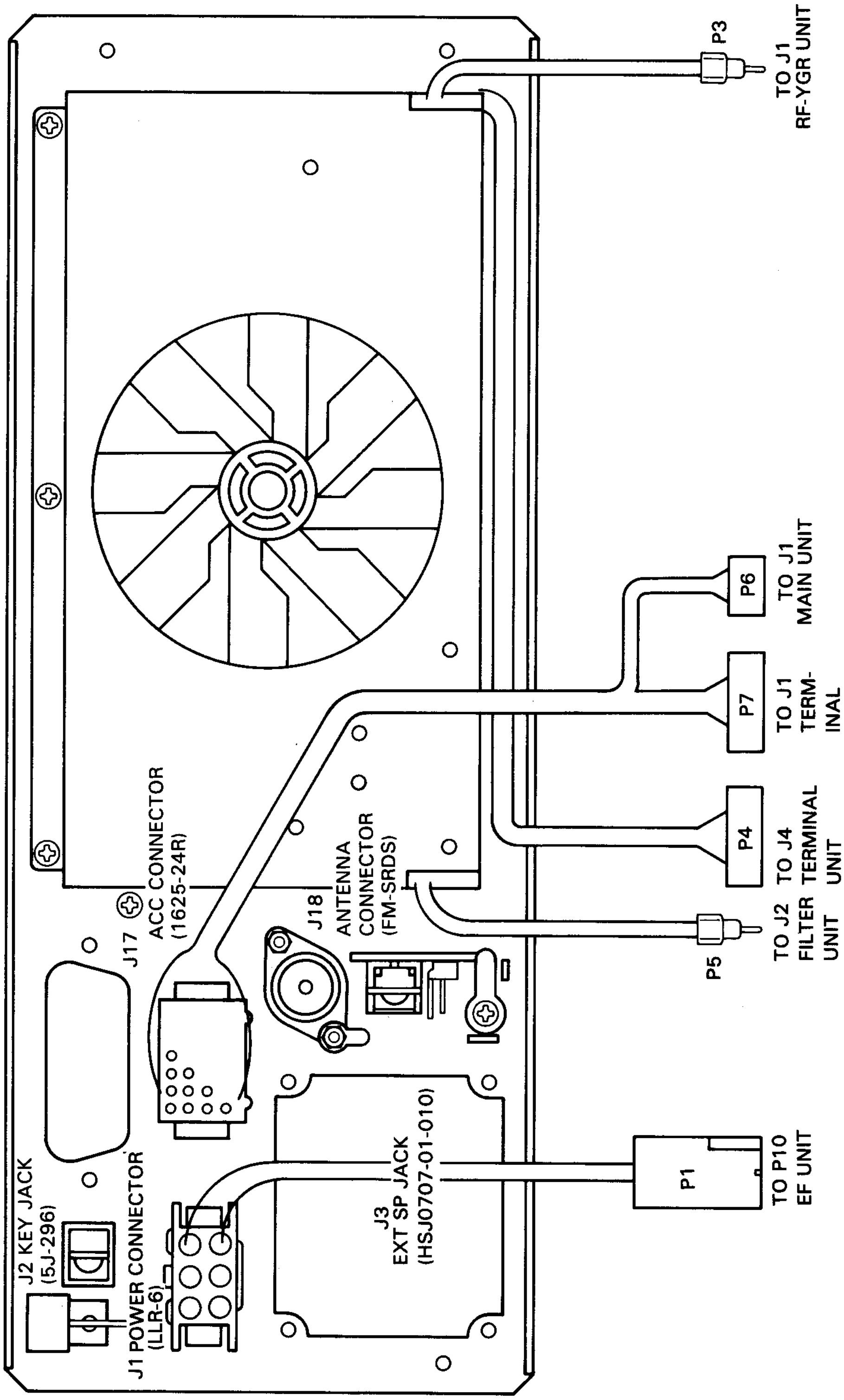
LOGIC/PLL BOARD CONNECTOR ASSEMBLIES (IC-271H)



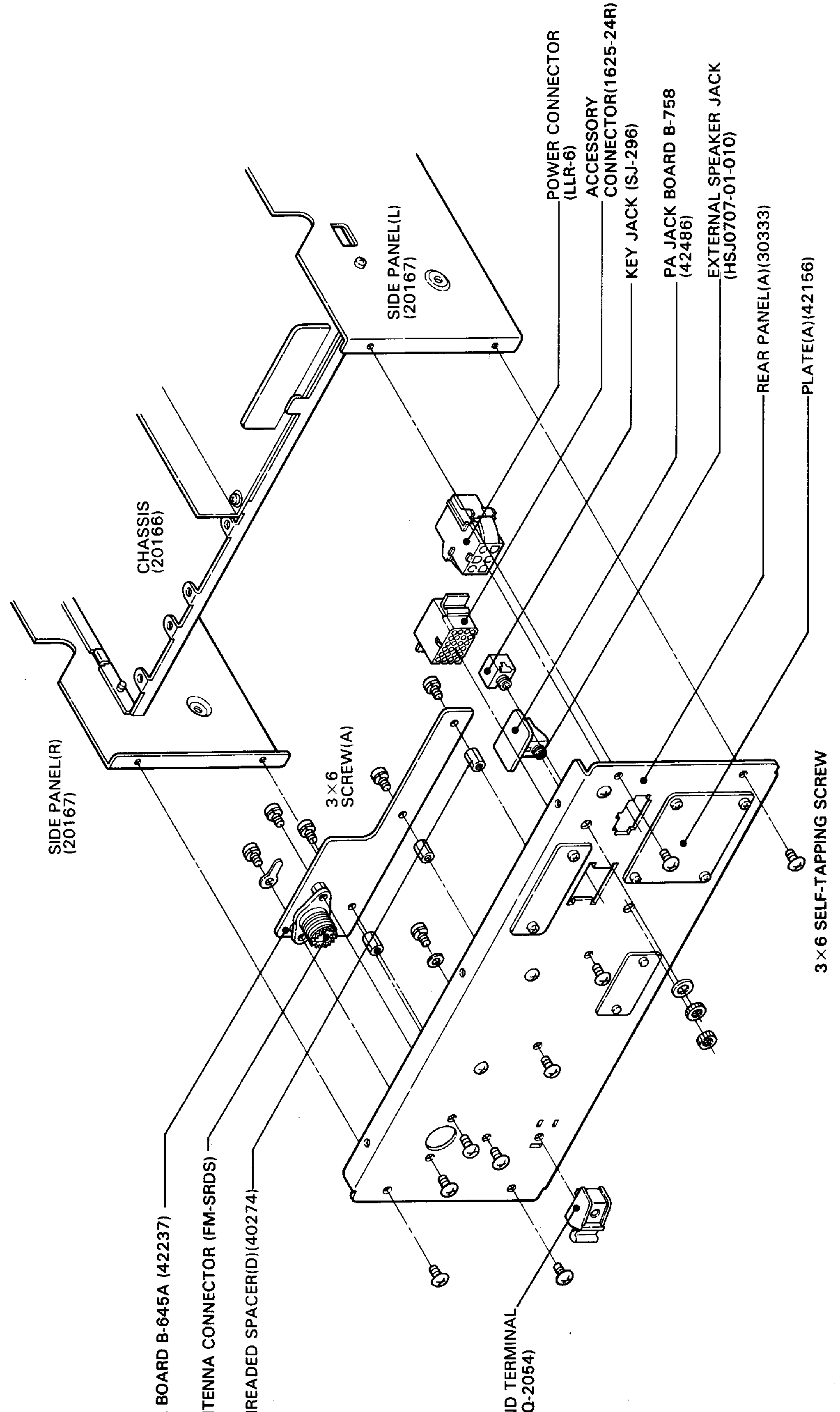
REAR PANEL CONNECTOR ASSEMBLY (IC-271A/E)



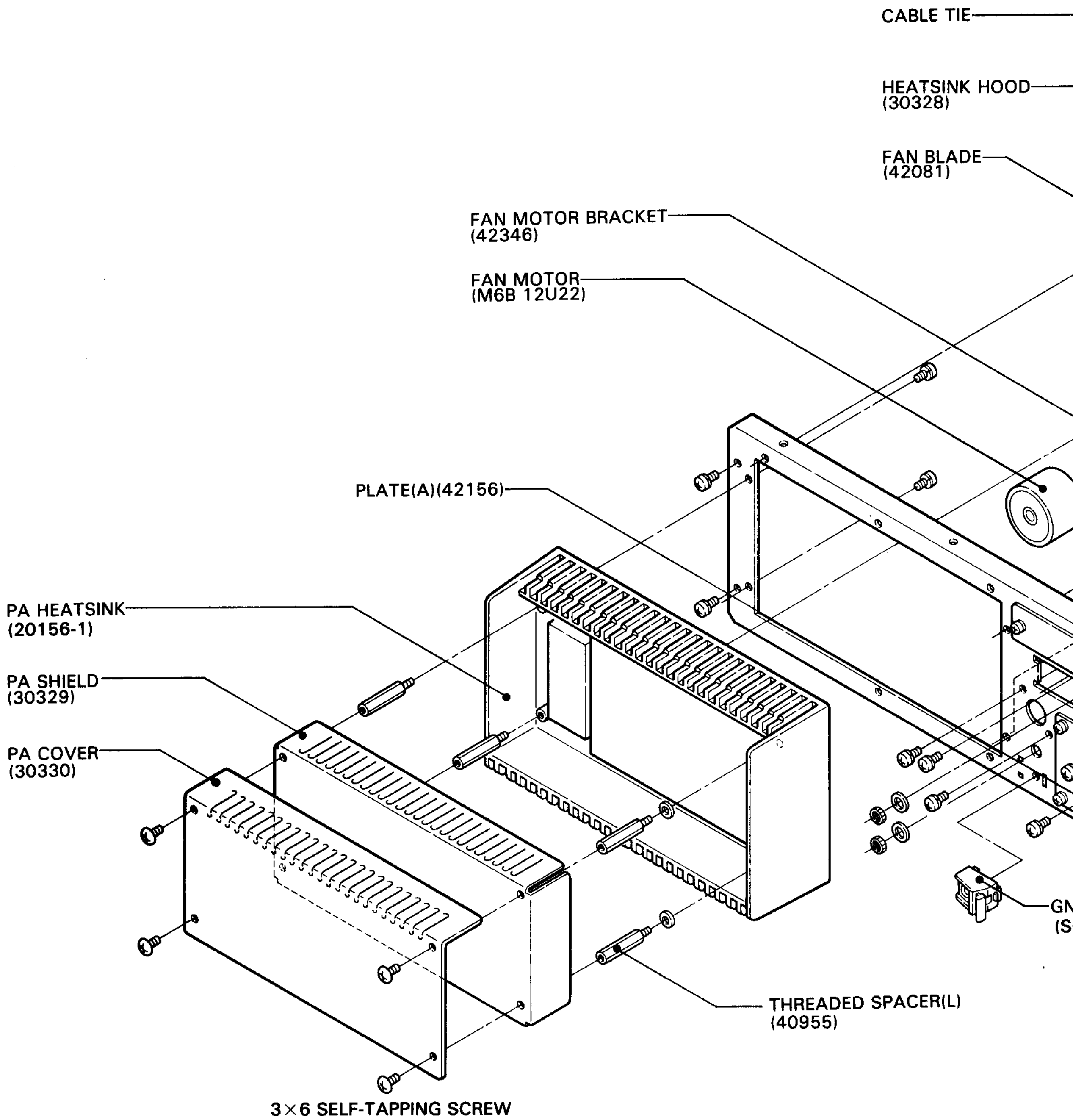
REAR PANEL CONNECTOR ASSEMBLY (IC-271H)

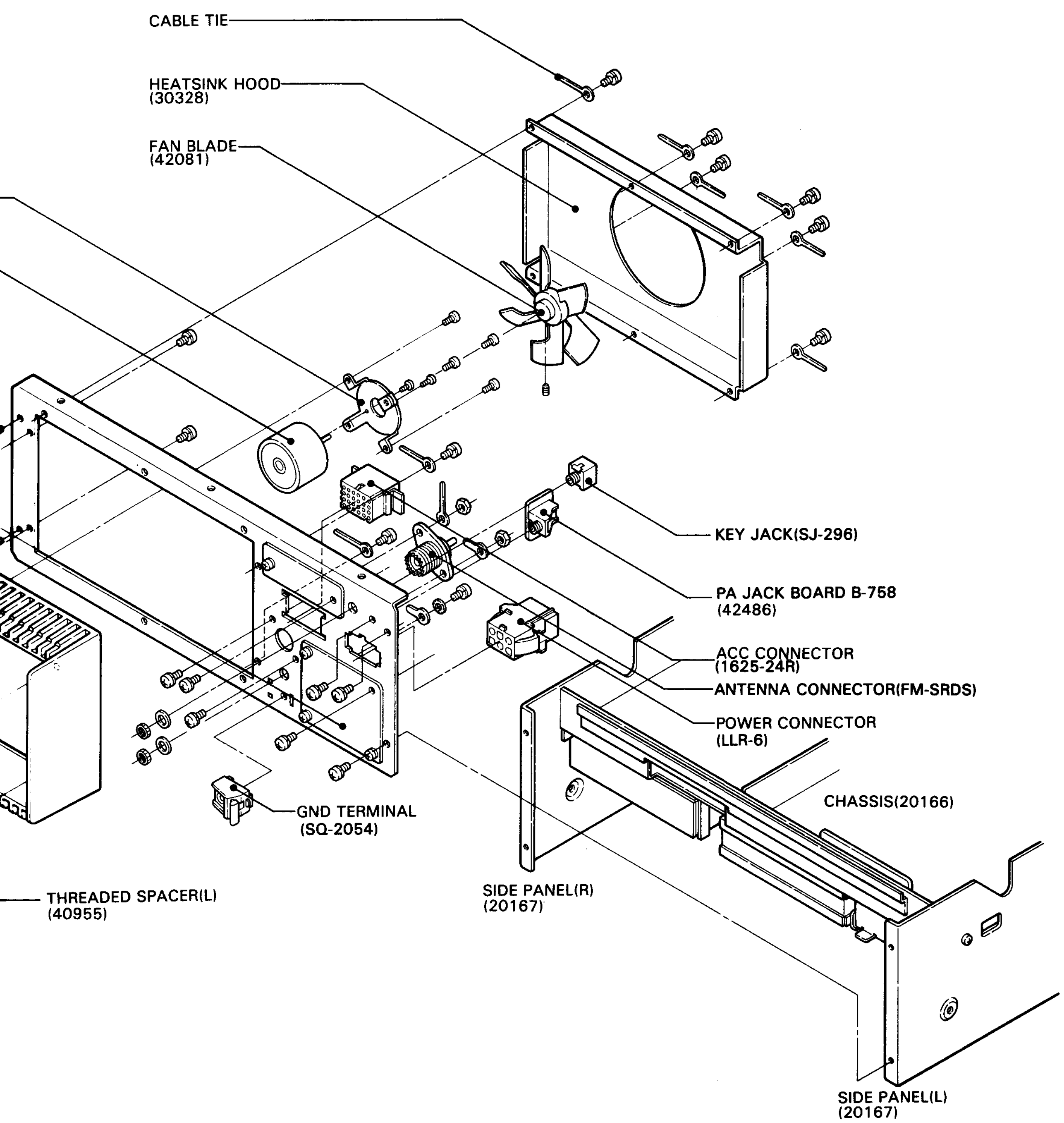


REAR PANEL PARTS DISASSEMBLY (IC-271A/E)



REAR PANEL PARTS DISASSEMBLY (IC-271H)




CABLE TIE
HEATSINK HOOD
(30328)
FAN BLADE
(42081)
KEY JACK(SJ-296)
PA JACK BOARD B-758
(42486)
ACC CONNECTOR
(1625-24R)
ANTENNA CONNECTOR(FM-SRDS)
POWER CONNECTOR
(LLR-6)
CHASSIS(20166)
GND TERMINAL
(SQ-2054)
THREADED SPACER(L)
(40955)
SIDE PANEL(R)
(20167)
SIDE PANEL(L)
(20167)

SECTION 7 MAINTENANCE AND ADJUSTMENT

7-1 PREPARATION BEFORE SERVICING

1. Detach the power cord and turn off the power switch before performing any work on the radio.

2. Do not short circuit components while making adjustments.

3. Use an insulated tuning tool for all adjustments.

4. Do not force any of the variable components. Tune them slowly and smoothly.

5. Follow the instructions exactly. If an indicated result is not obtained, repeat the instruction until the correct result is obtained.

6. Check the condition of connectors, solder joints and screws when adjustments are complete. Confirm that components do not touch each other.

7. There are different versions of this radio. Adjustment procedures and results may differ for each version. Be certain to follow the correct procedure for the radio you have.

8. Confirm defective operation of the radio first when checking an out-of-service unit. Verify that external sources do not cause the problem.

9. Use the correct tools and test equipment.

10. Remove the transceiver case as shown in SECTION 6-1.

11. Attach a 13. 8 volt DC external power source to the power supply connector. Be sure to check the polarity.

12. For transmission problems, attach a dummy load to the antenna connector. For reception problems, attach an antenna or signal generator to the antenna connector. Do not transmit into the signal generator.

13. Recheck for the suspected malfunction with the power switch on.

14. Check the defective circuit. Measure the DC voltages of the collector, base and emitter of each transistor.

7−2 PLL ADJUSTMENT

INSTRUMENTS REQUIRED

(1) VOLTAGE REGULATED POWER SUPPLY
- OUTPUT VOLTAGE : DC 13.8V
- CURRENT CAPACITY : 20A

(2) OSCILLOSCOPE
- FREQUENCY RANGE : DC−50MHz
- MEASURING RANGE : 0.01−10V

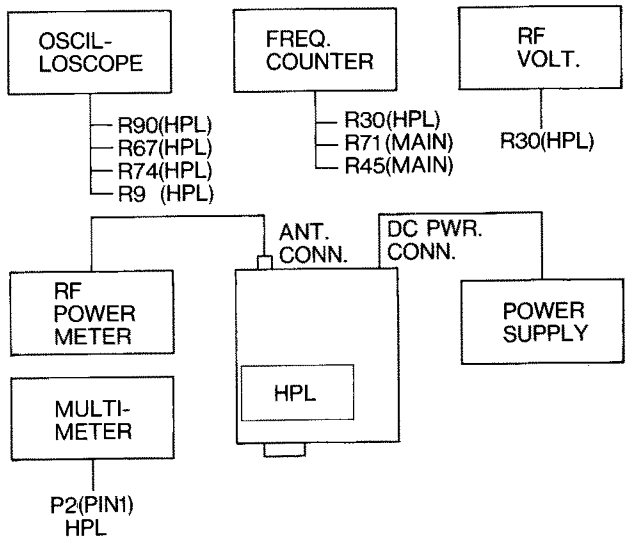
(3) FREQUENCY COUNTER
- FREQUENCY RANGE : 0.1−180MHz
- ACCURACY : BETTER THAN ±1PPM
- SENSITIVITY : 100mV OR BETTER

(4) RF POWER METER(TERMINATED)
- MEASURING RANGE : 100W
- FREQUENCY RANGE : 140−150MHz
- IMPEDANCE : 50 OHMS
- SWR : LESS THAN 1.1

(5) RF VOLTMETER
- FREQUENCY RANGE : 0.1−180MHz
- MEASURING RANGE : 0.001−10V

(6) MULTIMETER
- INPUT IMPEDANCE : 50kOHMS/VOLT OR BETTER

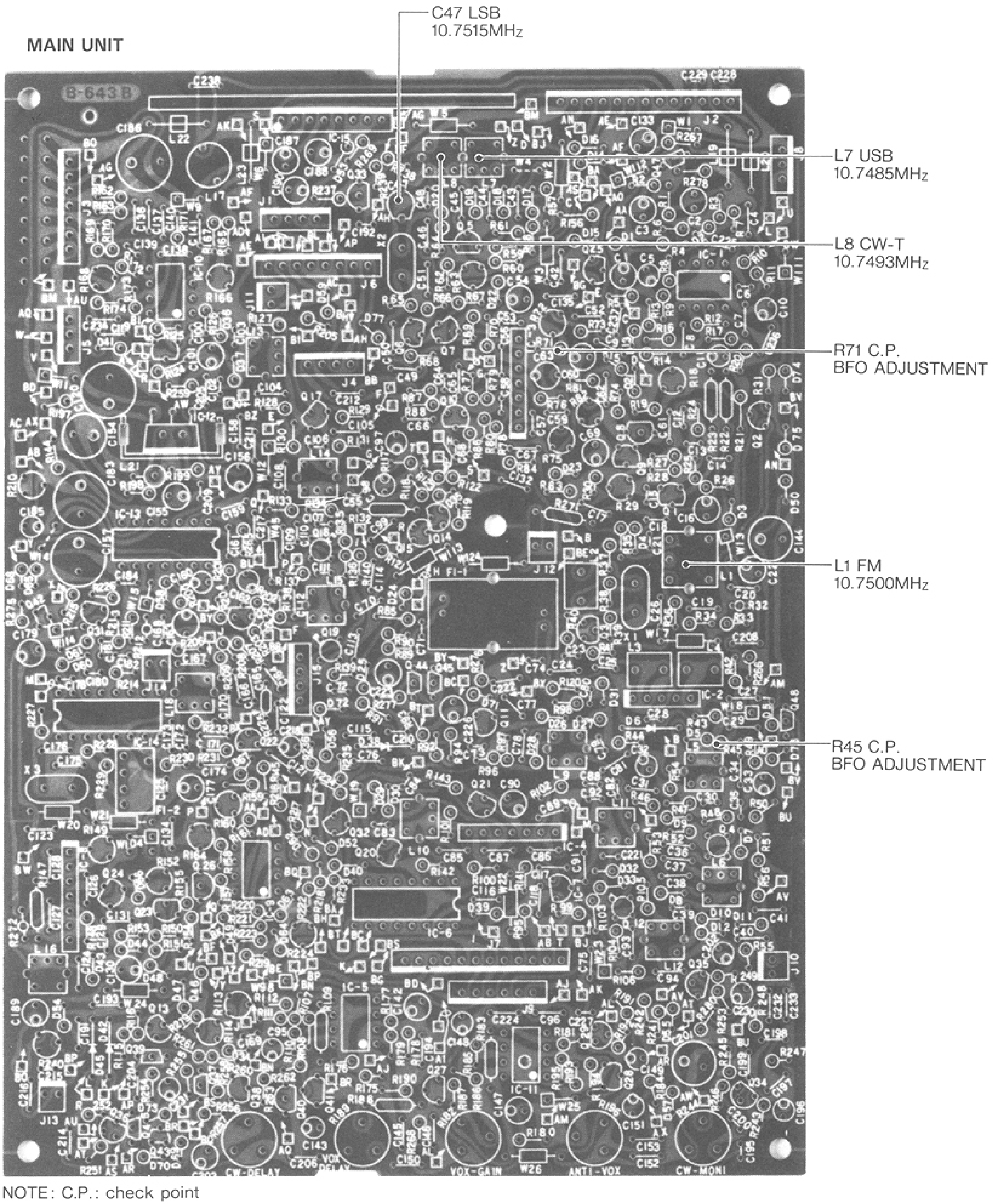
CONNECTIONS



ADJUSTMENT		ADJUSTMENT CONDITIONS	UNIT	MEASUREMENT LOCATION	VALUE	UNIT	ADJUST
SUB-LOOP LOCK VOLTAGE	1	● Display freq.: 145.0000(0)MHz ● Mode :FM	HPL	Connect an oscilloscope to R90.	3V	HPL	L21
	2	● Display freq.: 144.9984(9)MHz ● Mode :USB			1.6V approx.		Verify
PLL LO OUTPUT LEVEL	1	● Display freq.: 145.0000(0)MHz ● Mode :FM	HPL	Connect an oscilloscope to R67.	Maximum output: 300mV$_{p\text{-}p}$	HPL	L15,L16
SUB-LOOP OUT-PUT VOLTAGE	1	● Display freq.: 145.0000(0)MHz	HPL	Connect an oscilloscope to R74.	Maximum output: 250mV$_{p\text{-}p}$	HPL	L18
HPL LOCK VOLTAGE	1	● Display freq.: 145.0000(0)MHz ● Mode:FM	HPL	Connect an oscilloscope to R9.	3.5V±0.2V	HPL	C16
	2	● Display freq.:144.0000−145.9999MHz			Within range 1V−7V.		Verify
VCO OUTPUT LEVEL	1	● Display freq.: 145.0000(0)MHz ● Mode:FM	HPL	Connect an RF voltmeter to R30.	Maximum output: 1V rms approx.	HPL	L5,L6
VCO OUTPUT FREQUENCY	1	● Display freq.: 145.0000(0)MHz ● Mode:FM	HPL	Connect a frequency counter to R30.	134.2500 MHz	HPL	C78
MUTE VOLTAGE	1	● PLL locked.	HPL	Connect a multimeter to P2(pin1).	Locked: 4.2V	HPL	Verify
	2	● PLL unlocked.			Unlocked 0V		

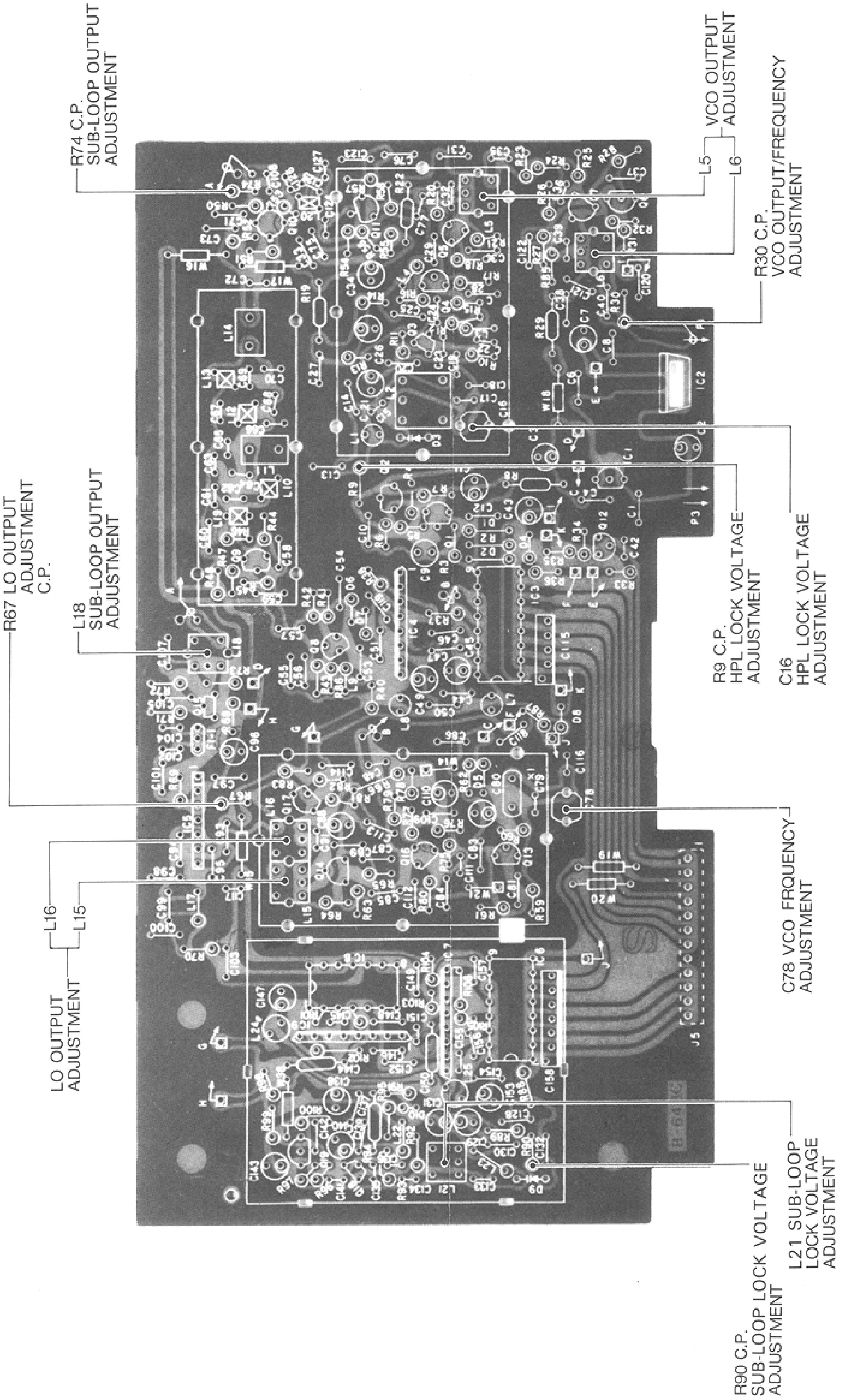
ADJUSTMENT		ADJUSTMENT CONDITIONS	UNIT	MEASUREMENT LOCATION	VALUE	UNIT	ADJUST
BFO FREQUENCY	1	● Display freq.: 145.0000MHz ● Mode:LSB ● Receive	MAIN	Connect a frequency counter to R71.	10.7515 MHz	MAIN	C47
	2	● Mode:CW ● Transmit			10.7493 MHz		L8
	3	● Mode:USB ● Receive			10.7485 MHz		L7
	4	● Mode:CW ● Receive			10.7485 MHz		Verify
	5	● Mode:FM ● Transmit		Connect a frequency counter to R45	10.7500 MHz		L1

MAIN UNIT



NOTE: C.P.: check point

HPL UNIT


R74 C.P.
SUB-LOOP OUTPUT
ADJUSTMENT
L5
L6
VCO OUTPUT
ADJUSTMENT
R30 C.P.
VCO OUTPUT/FREQUENCY
ADJUSTMENT
R67 LO OUTPUT
ADJUSTMENT
C.P.
L18
SUB-LOOP OUTPUT
ADJUSTMENT
R9 C.P.
HPL LOCK VOLTAGE
ADJUSTMENT
C16
HPL LOCK VOLTAGE
ADJUSTMENT
C78 VCO FRQUENCY
ADJUSTMENT
L16
L15
LO OUTPUT
ADJUSTMENT
R90 C.P.
SUB-LOOP LOCK VOLTAGE
ADJUSTMENT
L21 SUB-LOOP
LOCK VOLTAGE
ADJUSTMENT

7–3 TRANSMITTER ADJUSTMENT

INSTRUMENTS REQUIRED

(1) VOLTAGE REGULATED POWER SUPPLY
- OUTPUT VOLTAGE : DC 13.8V
- CURRENT CAPACITY : 20A

(2) RF POWER METER(TERMINATED)
- MEASURING RANGE : 100W
- FREQUENCY RANGE : 140–150MHz
- IMPEDANCE : 50 OHMS
- SWR : LESS THAN 1.1

(3) FM DEVIATION METER
- FREQUENCY RANGE : 140–180MHz
- MEASURING RANGE : 0–±10kHz

(4) DIRECTIONAL COUPLER
- FREQUENCY RANGE : 140–180MHz

(5) AF OSCILLATOR
- OUTPUT FREQUENCY : 200–3000Hz
- OUTPUT VOLTAGE : 0–300mV

(6) AC MILLIVOLTMETER
- MEASURING RANGE : 0.001–3V

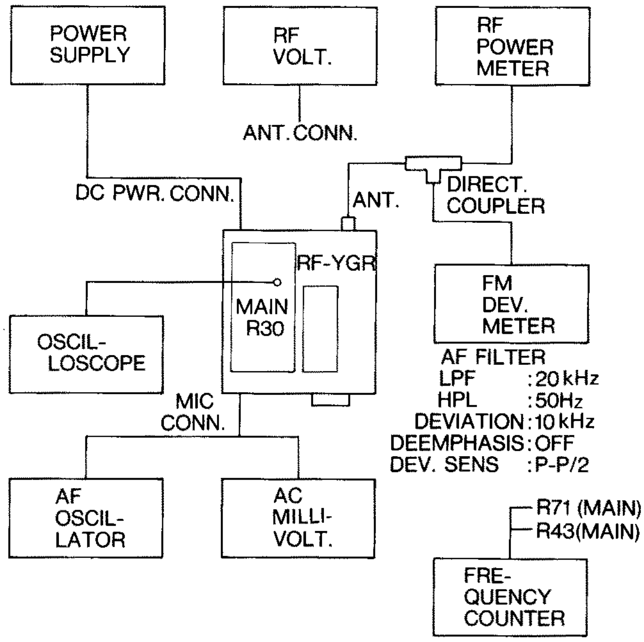
(7) RF VOLTMETER
- FREQUENCY RANGE : 0.1–180MHz
- MEASURING RANGE : 0.001–10V

(8) OSCILLOSCOPE
- FREQUENCY RANGE : DC–50MHz
- MEASURING RANGE : 0.01–10V

(9) FREQUENCY COUNTER
- FREQUENCY RANGE : 0.1–180MHz
- ACCURACY : BETTER THAN ±1PPM
- SENSITIVITY : 100mV OR BETTER

(10) MISMATCH TERMINATIONS
- SWR : 3:1, 2:1

CONNECTIONS

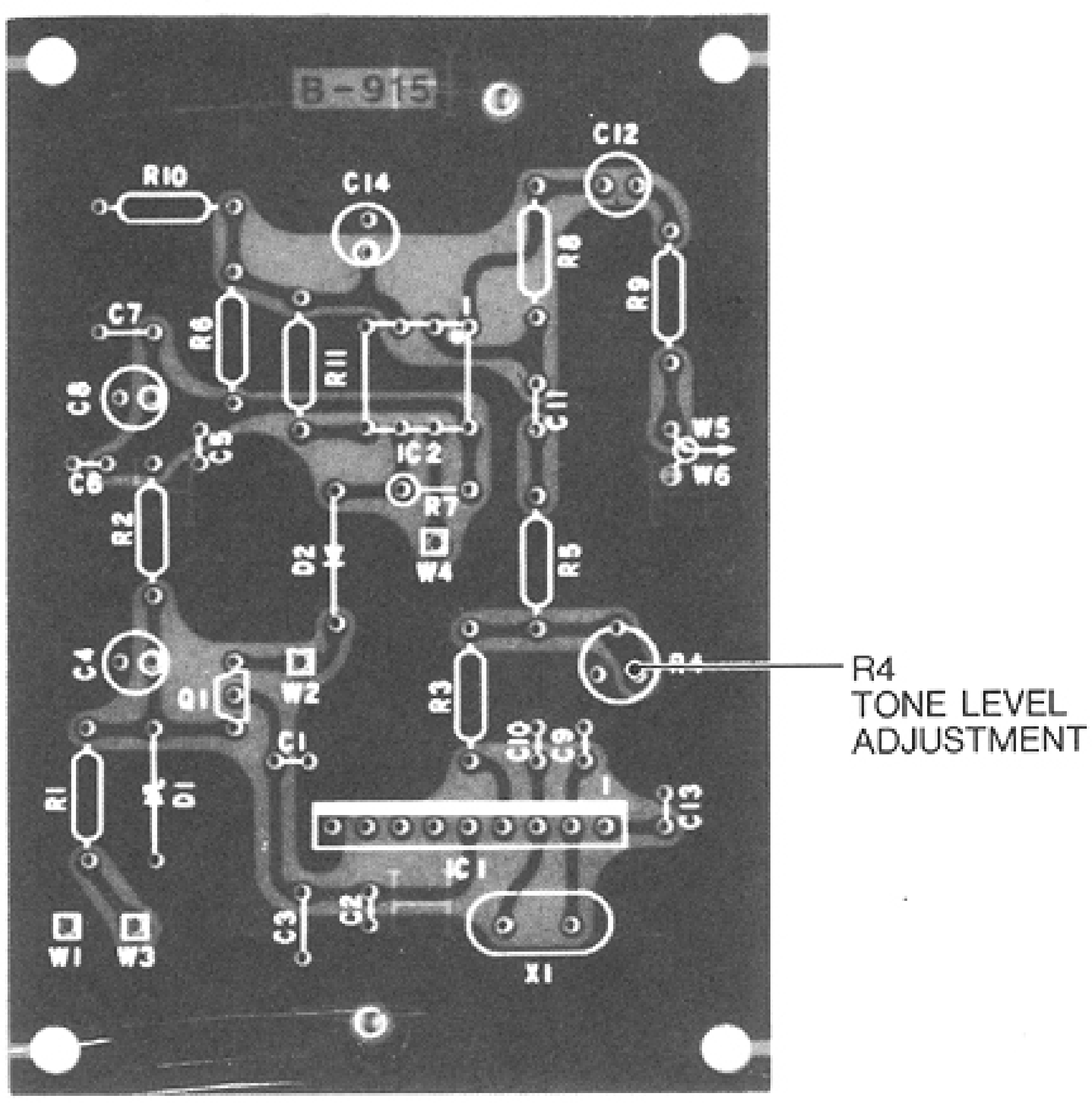


ADJUSTMENT		ADJUSTMENT CONDITIONS	UNIT	MEASUREMENT LOCATION	VALUE	UNIT	ADJUST
BFO	1	● Mode:LSB ● Receive	MAIN	Connect a frequency counter to R71.	10.75150 MHz	MAIN	C47
	2	● Mode:CW			10.74930 MHz		L8
	3	● Mode:USB			10.74850 MHz		L7
	4	● Mode:CW			10.74850 MHz		Verify
	5	● Transmit			10.74930 MHz		
	6	● Mode:FM ● Disconnect microphone.		Connect a frequency counter to R43.	10.750MHz		L1

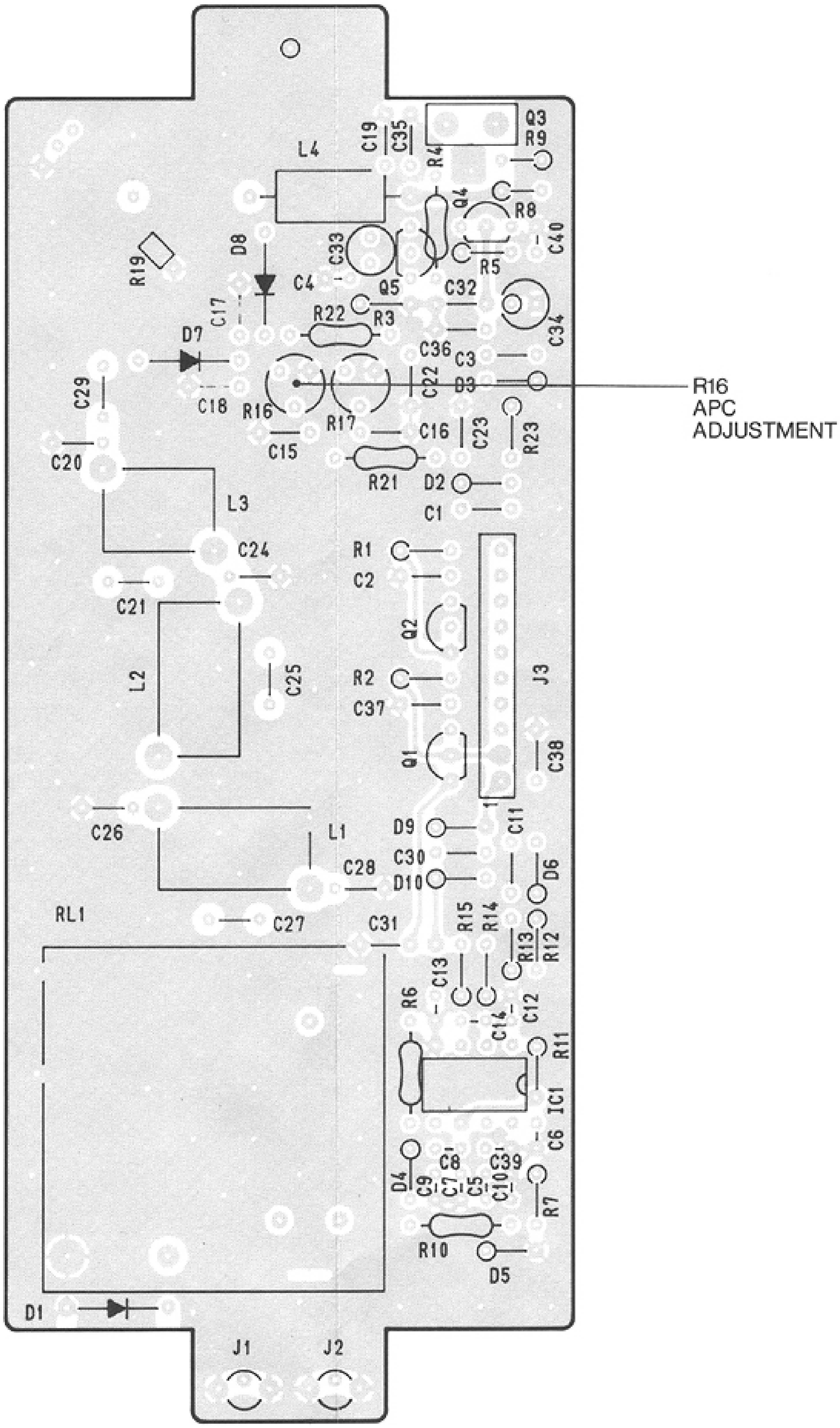
ADJUSTMENT		ADJUSTMENT CONDITIONS	UNIT	MEASUREMENT LOCATION	VALUE	UNIT	ADJUST
OUTPUT POWER a)IC-271A/E	1	● Display freq.: 145.0000MHz (U.S.A./Aust.: 146.0000MHz) ● Mode:FM ● Transmit ● Short R162 and R163 on the MAIN unit.(PAV,HV lines)	REAR PANEL	Connect a power meter to the antenna connector.	Maximum output. (More than 30W)	MAIN RF-YGR	L5,L6 L1,C20
	2	● RF POWER CONTROL: max. clockwise ● Remove short installed in step 1.			28W	MAIN	R168
	3	● RF POWER CONTROL: max. counterclockwise			1W		R166
	NOTE:Repeat steps 2 and 3 several times.						
b)IC-271H	1	● Display freq.: 145.0000MHz (U.S.A./Aust.: 146.0000MHz) ● Mode:FM ● Transmit ● Short R162 and R163 on the MAIN unit.(PAV,HV lines)	REAR PANEL	Connect a power meter to the antenna connector.	Maximum output.	MAIN RF-YGR PA	L5,L6 L1,C20 C24,C29
	2	● Mode:CW			Same power as step 1.	MAIN	R63
	3	● Remove the short installed in step 1.			100W with total current less than 16A		R168
	4	● RF POWER CONTROL: max. counterclockwise			10W		R166
	NOTE:Repeat steps 3 and 4 several times.						
RF METER	1	● Display freq.: 145.0000MHz ● Mode:FM ● RF POWER CONTROL: max. clockwise	FRONT PANEL	RF METER	80% of full scale deflection.	MAIN	R240
SSB POWER SET	1	● Mode:LSB or USB ● RF POWER CONTROL: max. clockwise ● MIC GAIN CONTROL: Center ● Apply audio input, (1.5kHz, 2mV)	REAR PANEL	Connect a power meter to the antenna connector.	80W		R82
	2	● Increase input level to 20mV.			More than 95W.		Verify
CARRIER BALANCE	1	● Display freq:145.0000MHz	REAR PANEL	Connect an RF voltmeter to the antenna connector.	Minimum output voltage.	MAIN	R72,R75
FM DEVIATION	1	● Display freq:145.0000MHz ● Mode:FM ● MIC GAIN CONTROL: Center ● Apply AF input (1.5kHz/2mV) to the MIC INPUT.	MAIN	Connect an oscilloscope to R30.	Symmetrical response about the horizontal base line.	MAIN	R18
	2	● Increase AF input by 20dB.(1kHz/20mV)	REAR PANEL	Connect a deviation meter to the antenna connector.	±4.8kHz		R29
	3	● Decrease AF input by 20dB.(1kHz/2mV)			±3.4kHz		Verify
SUBAUDIBLE TONE	1	● Mode:FM ● TONE SWITCH:ON ● Mic input:none ● Select each tone from 1 through 38. ● Transmit	REAR PANEL	Connect a deviation meter to the antenna connector using an attenuator.	±0.5 to ±0.7kHz deviation	LOGIC	R57

ADJUSTMENT		ADJUSTMENT CONDITIONS	UNIT	MEASUREMENT LOCATION	VALUE	UNIT	ADJUST
TONE LEVEL	1	● Mode:FM ● TONE SWITCH:ON ● Mic input:none ● Transmit	REAR PANEL	Connect a deviation meter to the antenna connector using an attenuator.	±3.5kHz deviation	TONE	R4
APC (IC-271H)	1	● Mode:FM ● RF POWER CONTROL: max.clockwise ● R16,R17 on FILTER UNIT: max.counterclockwise ● No antenna or dummy load connected to the antenna connector.	FILTER	Measure voltages at P3 pins 7 and 10.	2.5V		Verify
	2	● Connect a 3:1 mismatching termination to the antenna connector. ● Transmit	FRONT PANEL	Receive LED.	Turn counter-clockwise slowly until the receive LED begins flashing.	FILTER	R16
	NOTE:Once the LED begins flashing, the protector circuit must be reset by changing to the receive mode.						
	3	● Connect a 2:1 mismatching termination to the antenna connector. ● Transmit	FRONT PANEL	Receive LED.	Protecter circuit should not activate.		
	4	● Mode:FM ● Transmit with no load connected to make the protection circuit operate.			LED flashes when protector operates.		
	NOTE:Change to USB mode before connecting the power meter in step 5 to eliminate the risk of RF burns.						
	5	● Mode:FM ● RF POWER CONTROL: max. clockwise	REAR PANEL	Connect a power meter to the antenna connector.	50W	PA	R12
FAN MOTOR (IC-271H)	1	● Mode:FM	PA	Connect a multimeter between S2 and ground.	Receive:4V Transmit: 6V		Verify
	NOTE:Check that fan rotation speed increases in the transmit condition.						
	2	● Short the S1 and S2 terminals.	PA	Connect a multimeter between S2 and ground.	Receive:5V Transmit: 7V		Verify
	NOTE:Check that fan rotation speed increases in the transmit condition.						

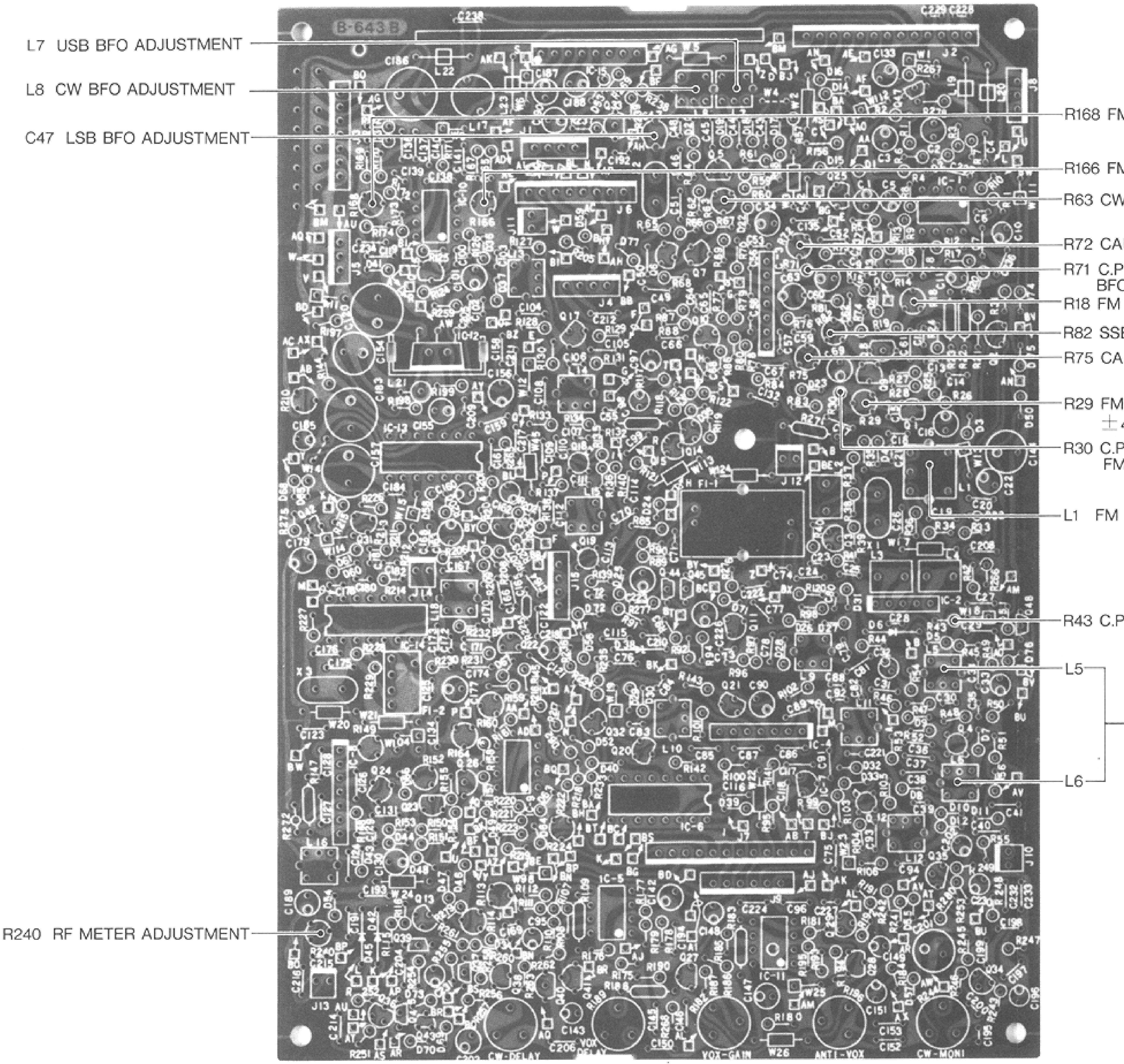
TONE UNIT



FILTER UNIT (IC-271H)

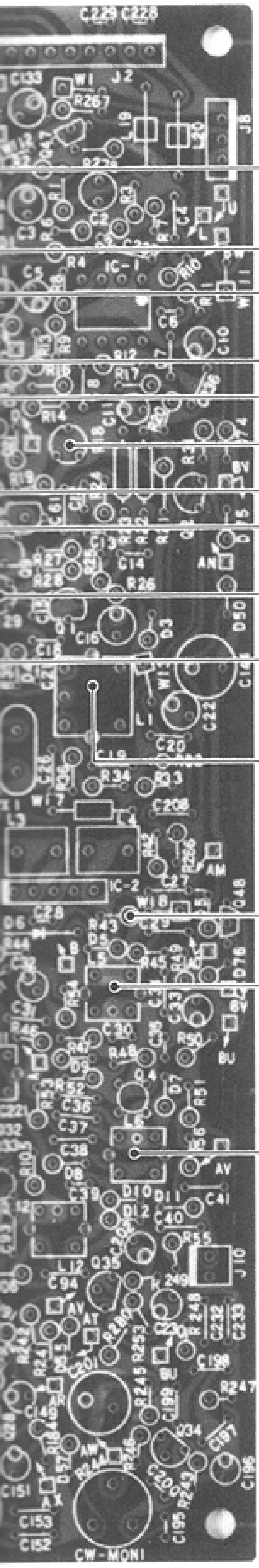


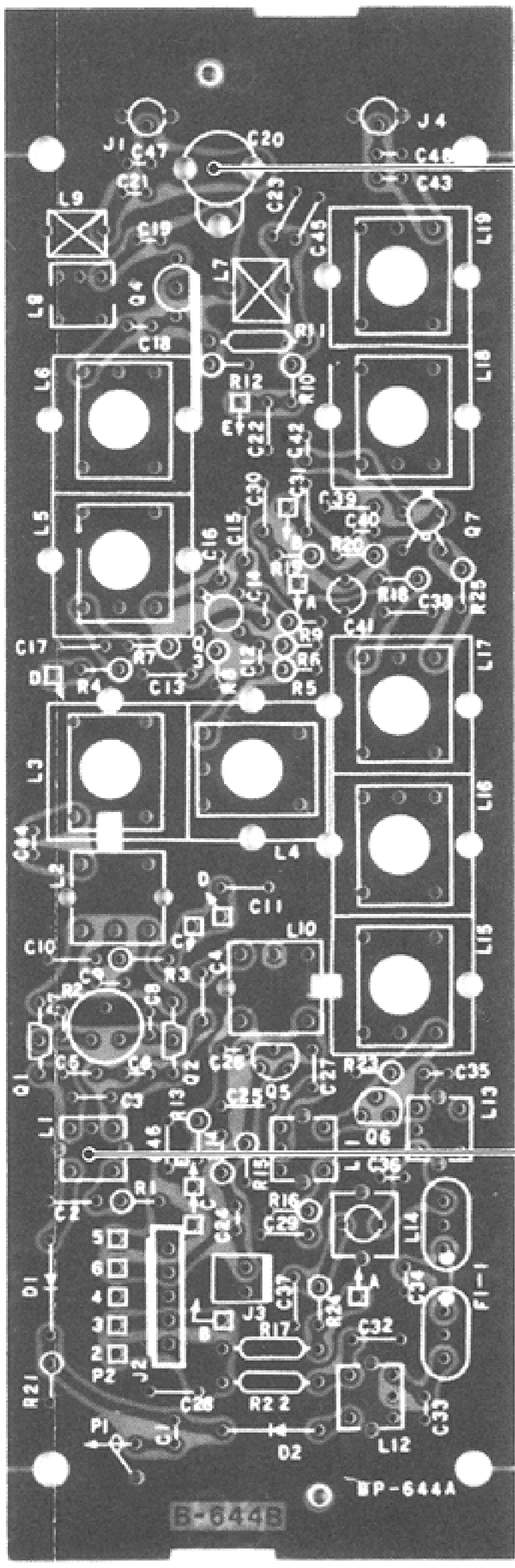
MAIN UNIT



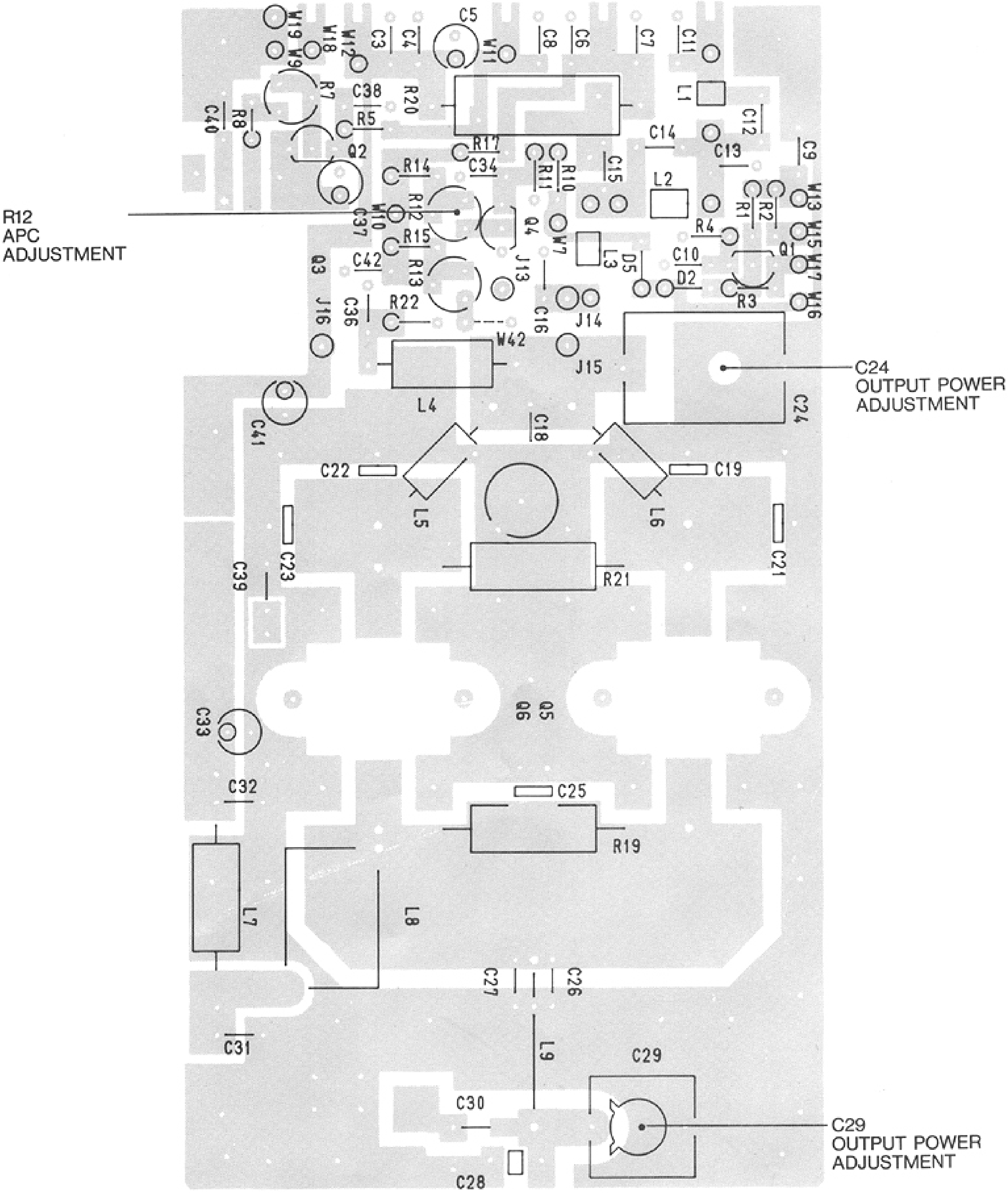
L7 USB BFO ADJUSTMENT
L8 CW BFO ADJUSTMENT
C47 LSB BFO ADJUSTMENT
R240 RF METER ADJUSTMENT
R168 FM
R166 FM
R63 CW
R72 CA
R71 C.P
BFO
R18 FM
R82 SSB
R75 CA
R29 FM
R30 C.P
FM
L1 FM
R43 C.P
L5
L6
CW-DELAY
VOX-GAIN
ANTI-VOX
CW-MONI

RF·YGR UNIT

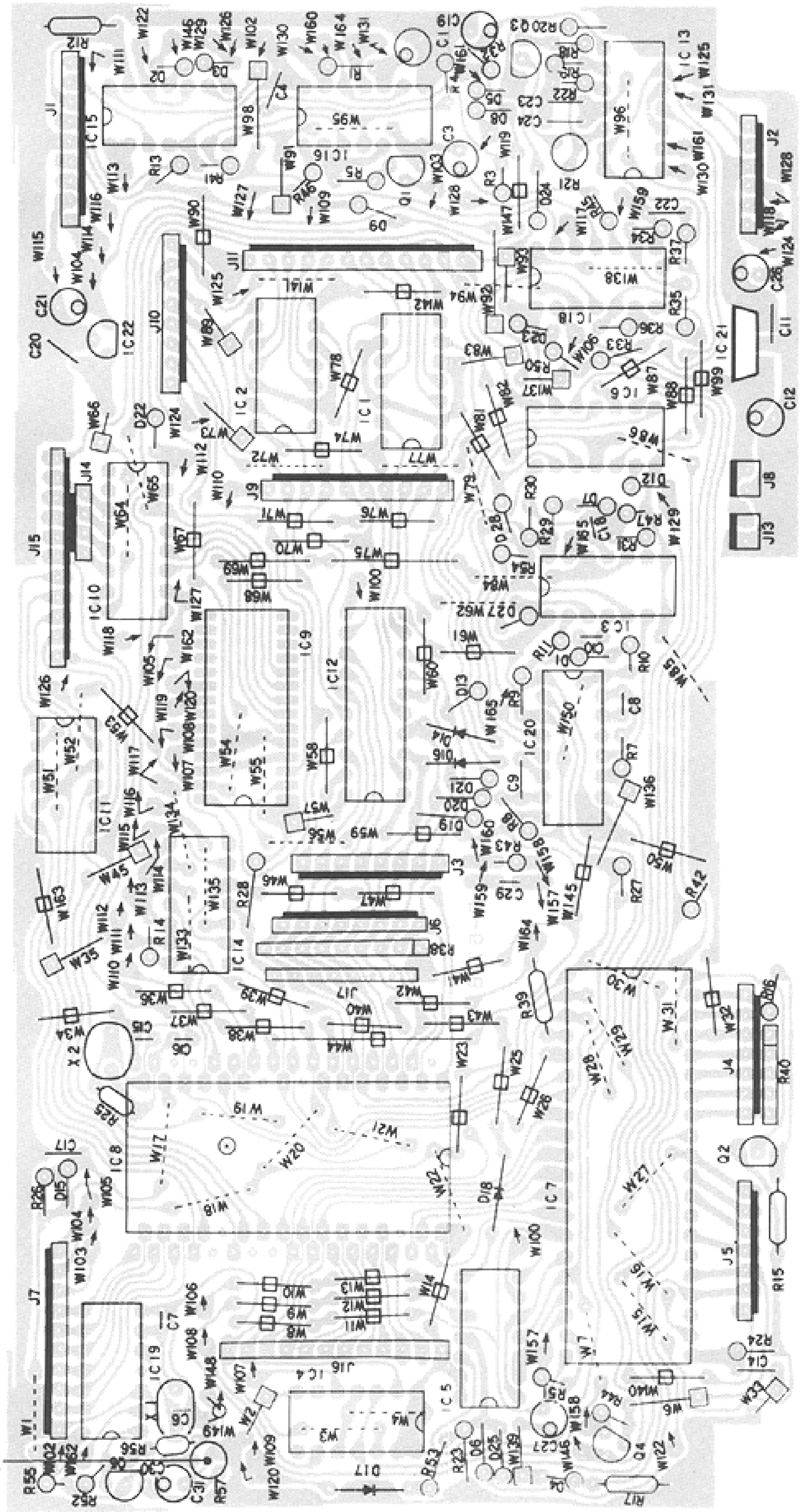

R168 FM ALC ADJUSTMENT (HIGH)
R166 FM ALC ADJUSTMENT (LOW)
R63 CW ALC ADJUSTMENT
R72 CARRIER BALANCE ADJUSTMENT
R71 C.P.
BFO ADJUSTMENT
R18 FM MOD ADJUSTMENT
R82 SSB ALC ADJUSTMENT
R75 CARRIER BALANCE ADJUSTMENT
R29 FM DEVIATION ADJUSTMENT
±4.8kHz
R30 C.P.
FM DEVIATION ADJUSTMENT
L1 FM BFO ADJUSTMENT
R43 C.P. BFO ADJUSTMENT
L5
FM OUTPUT ADJUSTMENT
L6
CW-MONI


FM OUTPUT
C20 ADJUSTMENT
FM OUTPUT
L1 ADJUSTMENT
B-644B
BP-644A

PA UNIT(IC-271H)

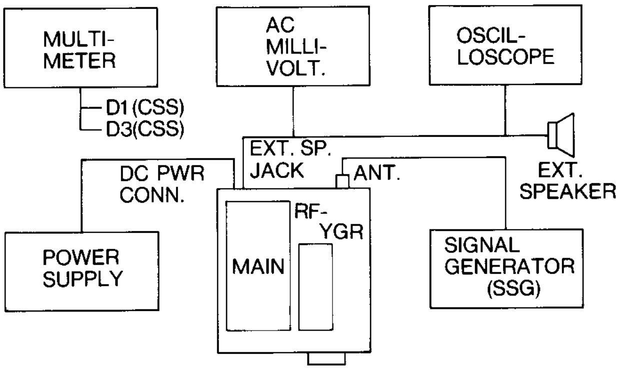


LOGIC UNIT



R57
SUBAUDIBLE TONE LEVEL
ADJUSTMENT

7–4 RECEIVER ADJUSTMENT

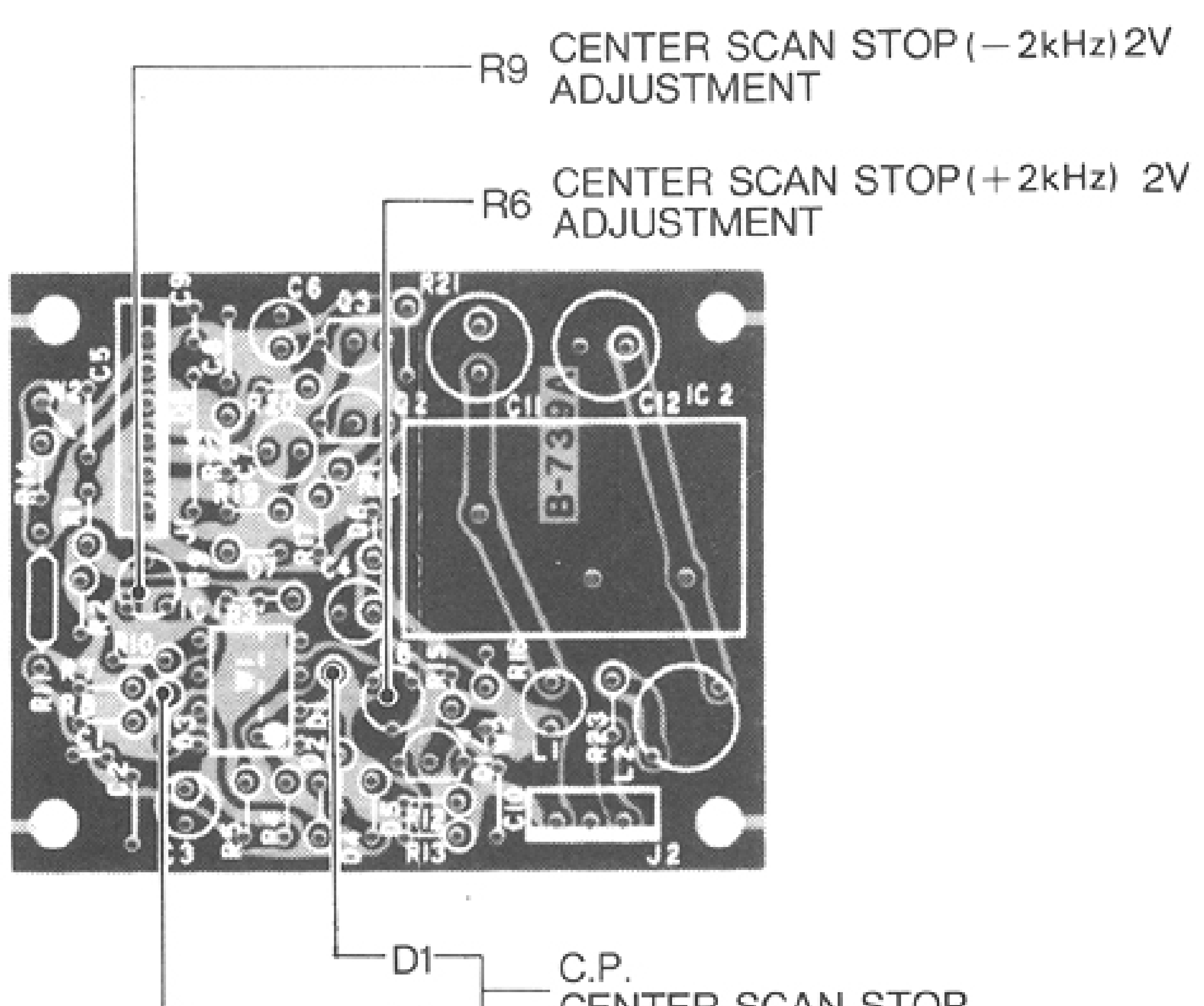
INSTRUMENTS REQUIRED	CONNECTIONS
(1) VOLTAGE REGULATED POWER SUPPLY • OUTPUT VOLTAGE : DC 13.8V • CURRENT CAPACITY : 20A (2) SIGNAL GENERATOR(SSG) • FREQUENCY RANGE : 0.1–180MHz • OUTPUT VOLTAGE : –20 TO +90dB(0dB=1μV) (3) AC MILLIVOLTMETER • MEASURING RANGE : 0.001–3V (4) EXTERNAL SPEAKER • IMPEDANCE : 8 OHMS (5) OSCILLOSCOPE • FREQUENCY RANGE : DC–50MHz • MEASURING RANGE : 0.01–10V (6) MULTIMETER • INPUT IMPEDANCE : 50kOHMS/V OR BETTER	

ADJUSTMENT		ADJUSTMENT CONDITIONS	UNIT	MEASUREMENT LOCATION	VALUE	UNIT	ADJUST
RECEIVER GAIN a)FM	1	●Display freq.: 145.0000MHz ●Mode:FM ●TONE CONTROL: max. clockwise ●RF GAIN CONTROL: max. clockwise ●SQUELCH CONTROL: max. counterclockwise ●RIT:OFF ●AGC:FAST ●NB:OFF ●Apply RF input (145.0000MHz, 10dBμ(–97dBm), ±3.5kHz deviation with 1kHz modulation)	FRONT PANEL	S-METER	Maximum reading.	RF-YGR MAIN	L10,L11, L12,L13 L11,L12
	2	●Increase RF Level to 0dBμ(–107dBm).				MAIN	L16
	3	●Remove the RF input signal.	REAR PANEL	Connect AF millivoltmeter to the external jack.	Maximum AF output.		L18
b)SSB	4	●Mode:USB ●Apply RF input (–20dBμ(–127dBm)with no modulation)					L9,L14, L15
	NOTE:If coils L15–L19 in the RF helical cavity are adjusted without proper test equipment, the RF bandwidth adjustment may be misaligned. Contact your local ICOM Authorized Service Center for help. Repeat steps 1 through 4 several times.						
c)CW	5	●Mode:CW	REAR PANEL	Connect a millivoltmeter to the external jack.	Maximum output.	MAIN	L15
	6		FRONT PANEL	S-METER	Maximum reading.		L13
S-METER a)FM	1	●Display freq.: 145.0000MHz ●Mode:FM ●Apply RF input (10dBμ(–97dBm),±3.5kHz deviation, with 1kHz modulation.)	FRONT PANEL	S-METER	S9	MAIN	R149
	2	●Apply RF input (40dBμ(–67dBm))			S9+60dB (full scale)		R152

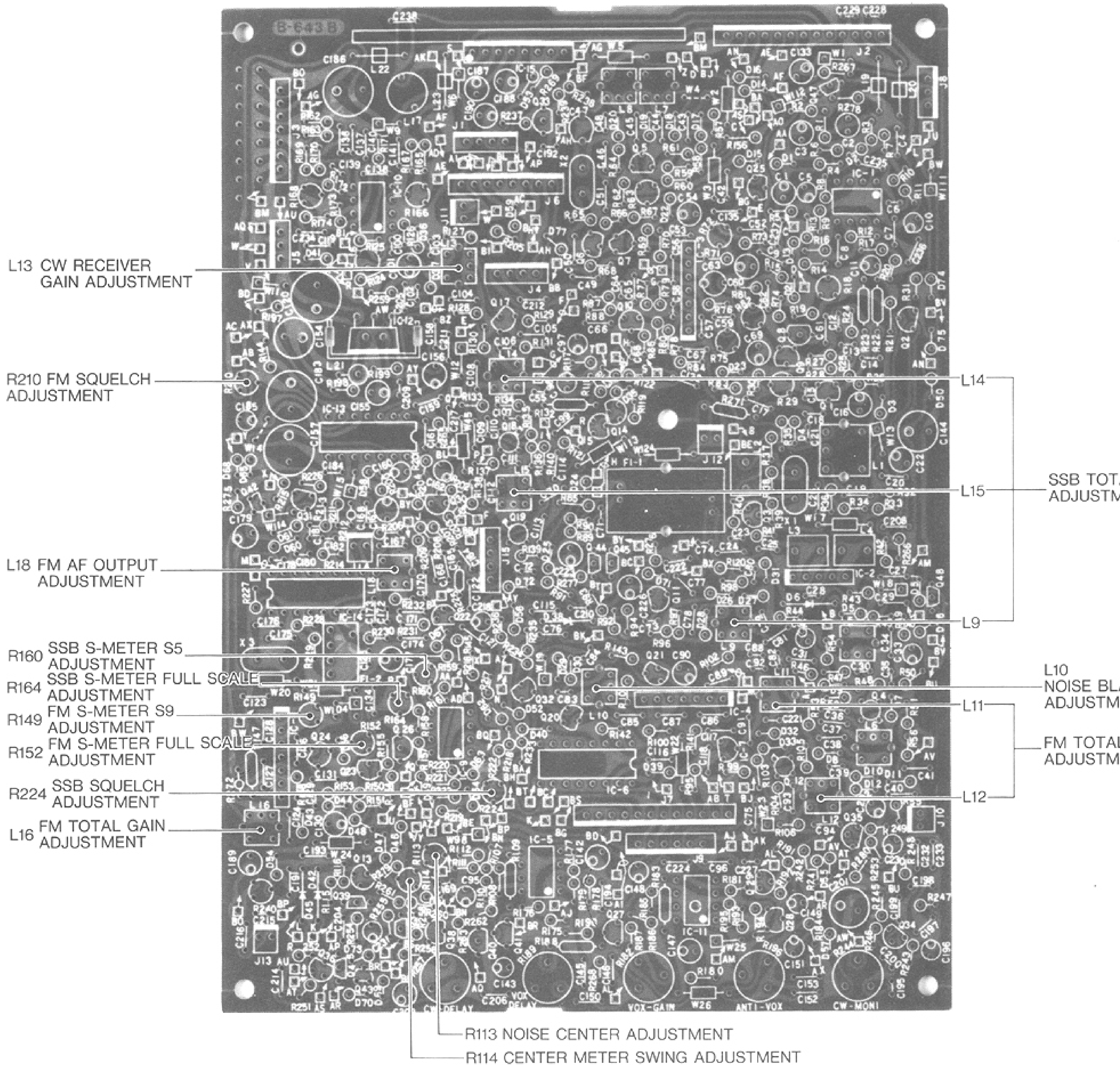
ADJUSTMENT		ADJUSTMENT CONDITIONS	UNIT	MEASUREMENT LOCATION	VALUE	UNIT	ADJUST
b)SSB	3	●Mode:USB ●Apply RF input(1μV)	FRONT PANEL	S-METER	S5	MAIN	R160
	4	●Apply RF input(1mV).			S9+60dB (full scale)		R164
	NOTE:Repeat steps 1 through 4 several times.						
FM CENTER METER	1	●Display freq.: 145.0000MHz ●Mode:FM	FRONT PANEL	CENTER METER	Center	MAIN	R113
	2	●Apply RF input 40dBμ, $\pm$3.5kHz deviation, with 1kHz modulation). Adjust SSG frequency for a maximum CENTER METER indication in the + direction.			80% of full scale.		R114
	NOTE:Repeat steps 1 and 2 several times.						
CENTER SCAN STOP	1	●Display freq.: 145.0020MHz ●Mode:FM ●TS:ON ●Apply RF input (−10dBμ(−117dBm), $\pm$3.5kHz deviation, with 1kHz modulation).	CSS	Connect a multimeter to the cathode of D4.	2V	CSS	R6
	2	●Display freq.: 145.0030MHz			7V		Verify
	3	●Display freq.: 144.9980MHz		Connect a multimeter to the cathode of D3.	2V		R9
	4	●Display freq.: 144.9970MHz			7V		Verify
SQUELCH a)FM	1	●Mode:FM ●SQUELCH CONTROL: 9 o'clock	FRONT PANEL	RECEIVE INDICATOR	RECEIVE INDICATOR not lit.	MAIN	R210
b)USB	2	●Mode:USB					R224
RF GAIN	1	●RF GAIN CONTROL: 9 o'clock	FRONT PANEL	S-METER	Full scale.	VR	R8
NOISE BLANKER	1	●Display freq.: 145.0000MHz ●Mode:USB ●NB:ON ●Apply pulsed noise to the antenna jack.	FRONT PANEL	S-METER	Minimum indication.	MAIN	L10

CSS UNIT

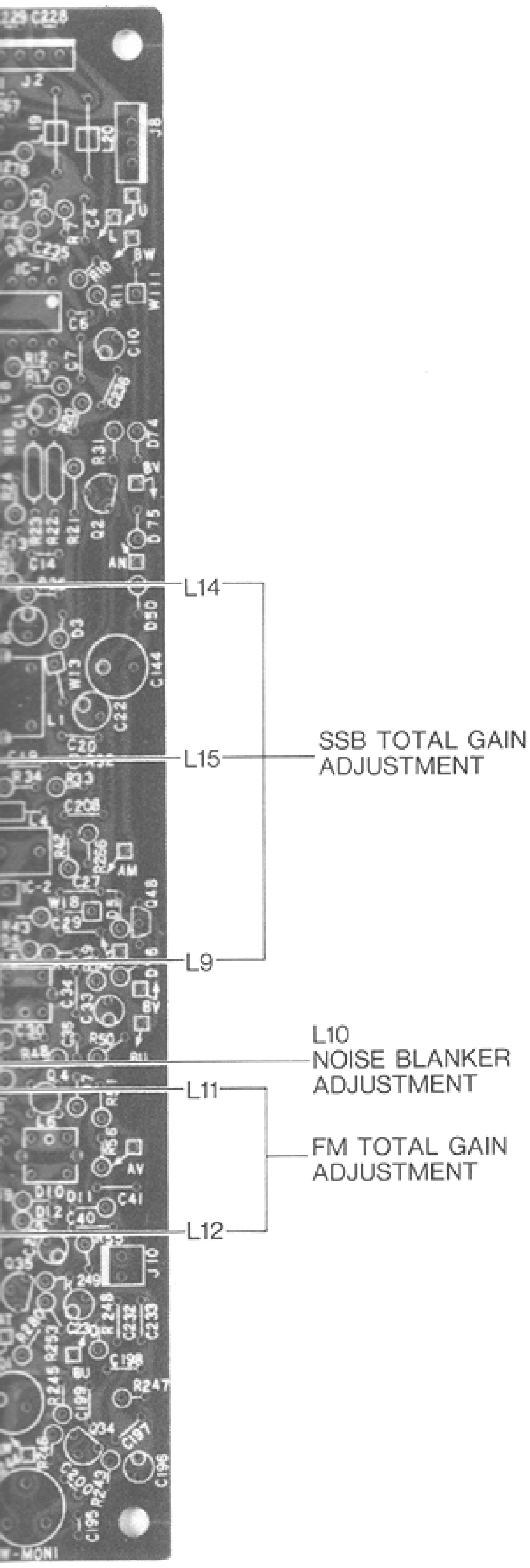
*C.P.: Check point



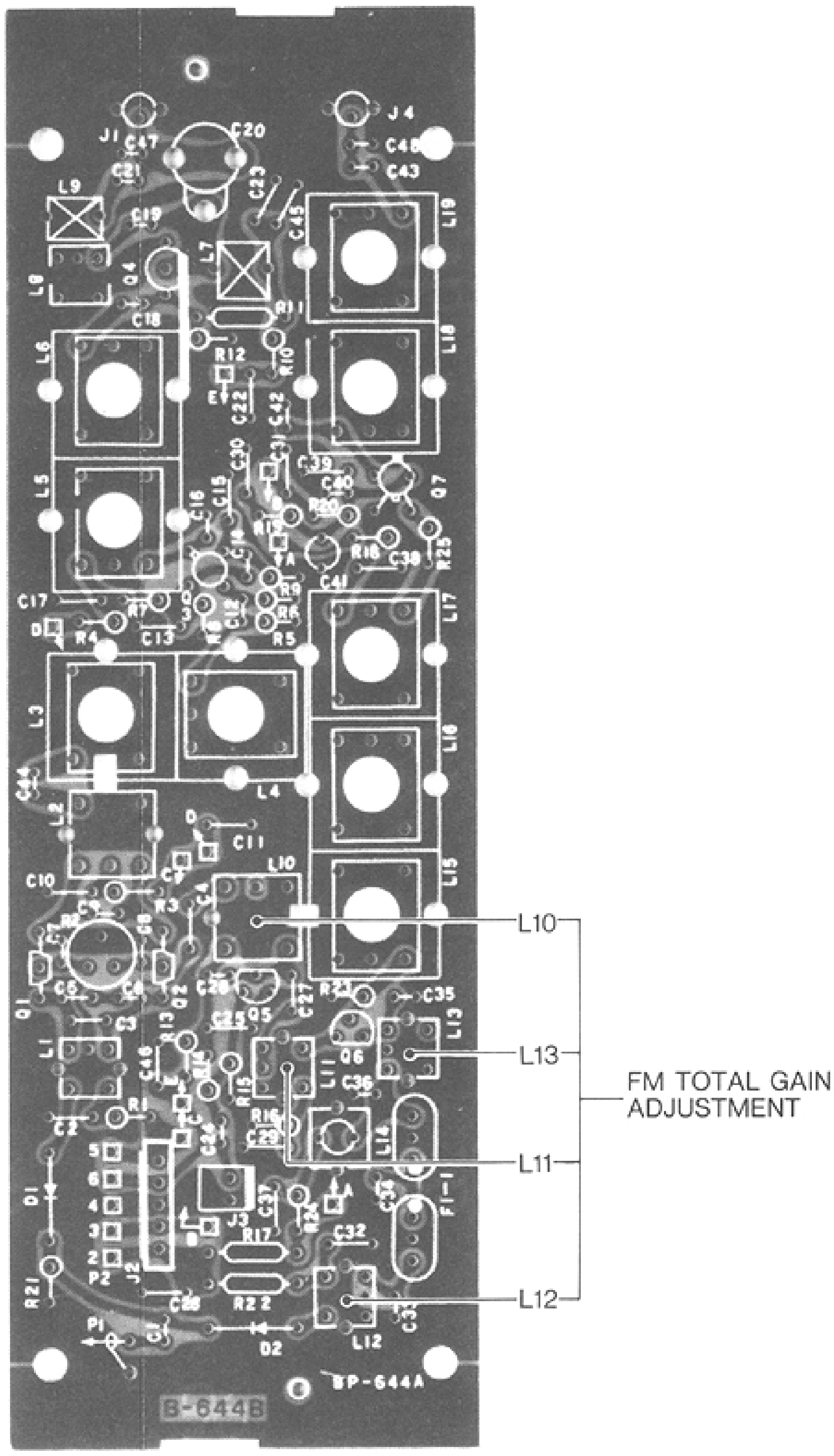
MAIN UNIT



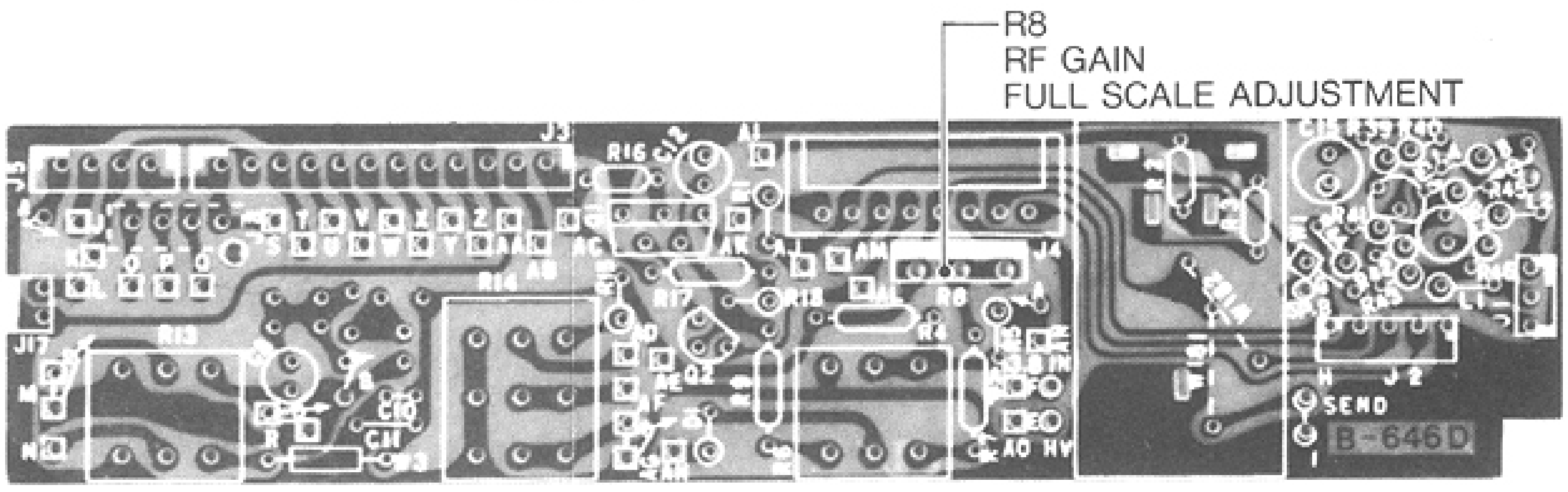
L13 CW RECEIVER GAIN ADJUSTMENT
R210 FM SQUELCH ADJUSTMENT
L18 FM AF OUTPUT ADJUSTMENT
R160 SSB S-METER S5 ADJUSTMENT
R164 SSB S-METER FULL SCALE ADJUSTMENT
R149 FM S-METER S9 ADJUSTMENT
R152 FM S-METER FULL SCALE ADJUSTMENT
R224 SSB SQUELCH ADJUSTMENT
L16 FM TOTAL GAIN ADJUSTMENT
L14
L15
L9
SSB TOT ADJUSTM
L10 NOISE BL ADJUSTM
L11
L12
FM TOTAL ADJUSTM
R113 NOISE CENTER ADJUSTMENT
R114 CENTER METER SWING ADJUSTMENT



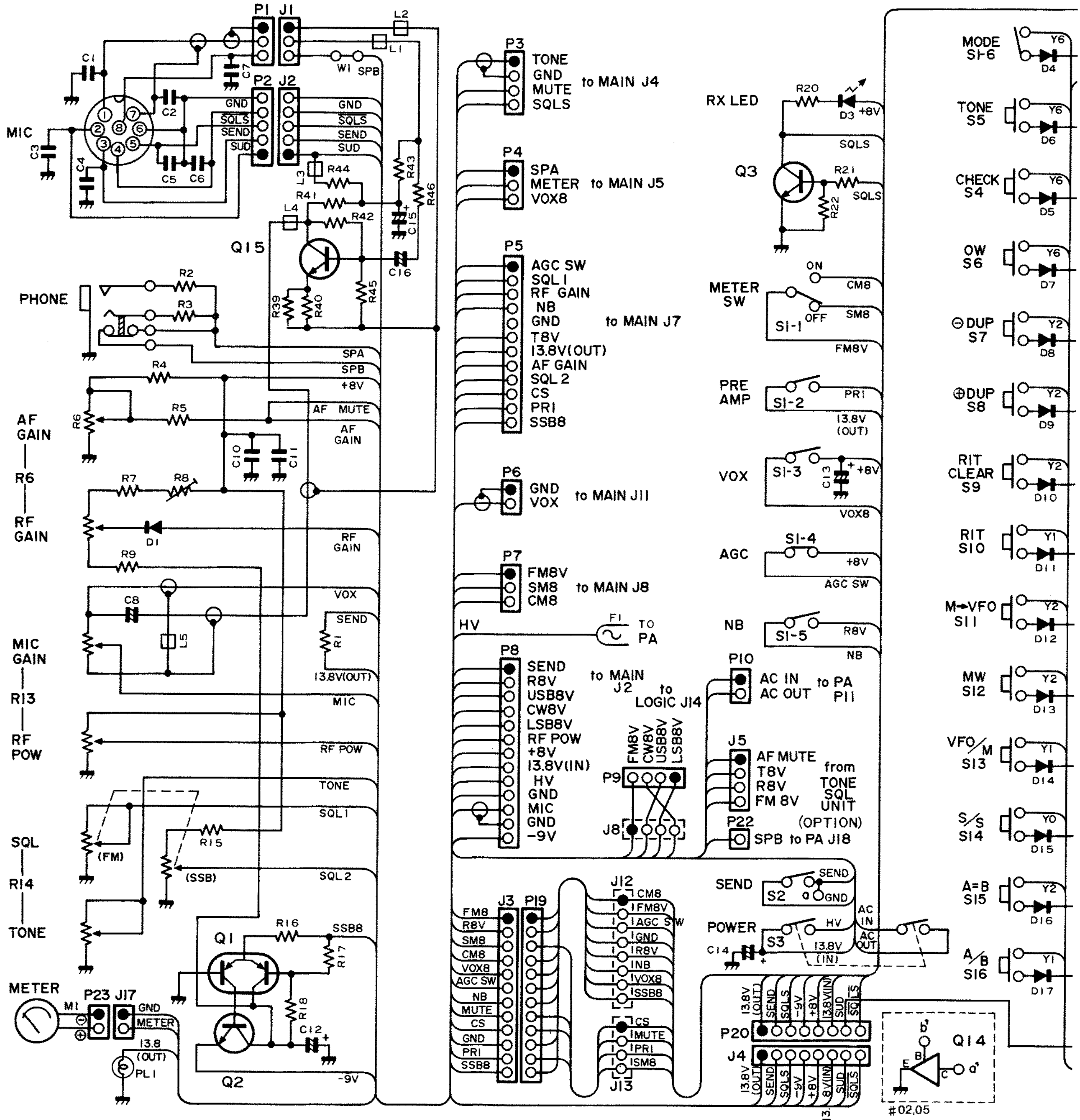
RF•YGR UNIT

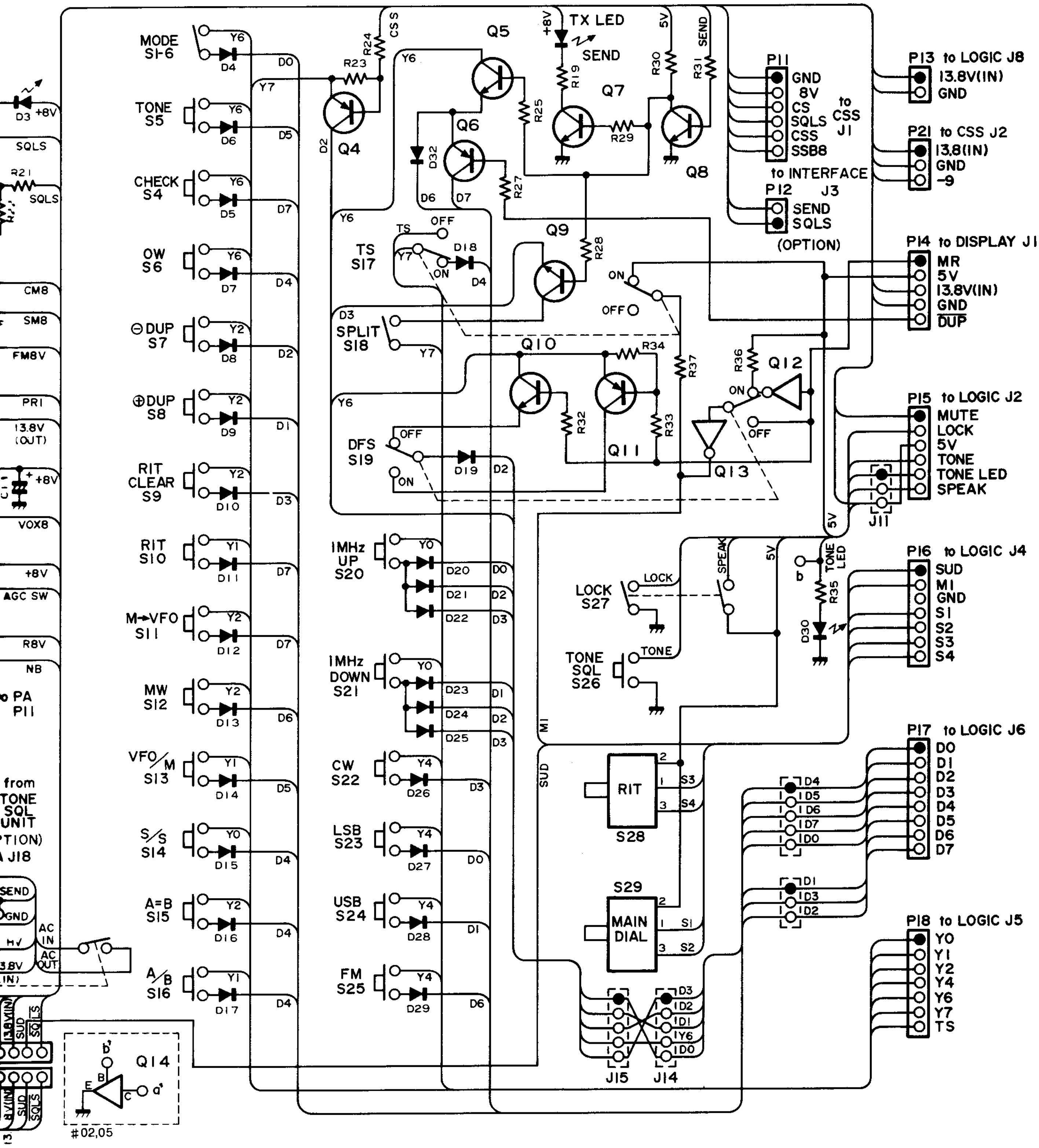


VR UNIT

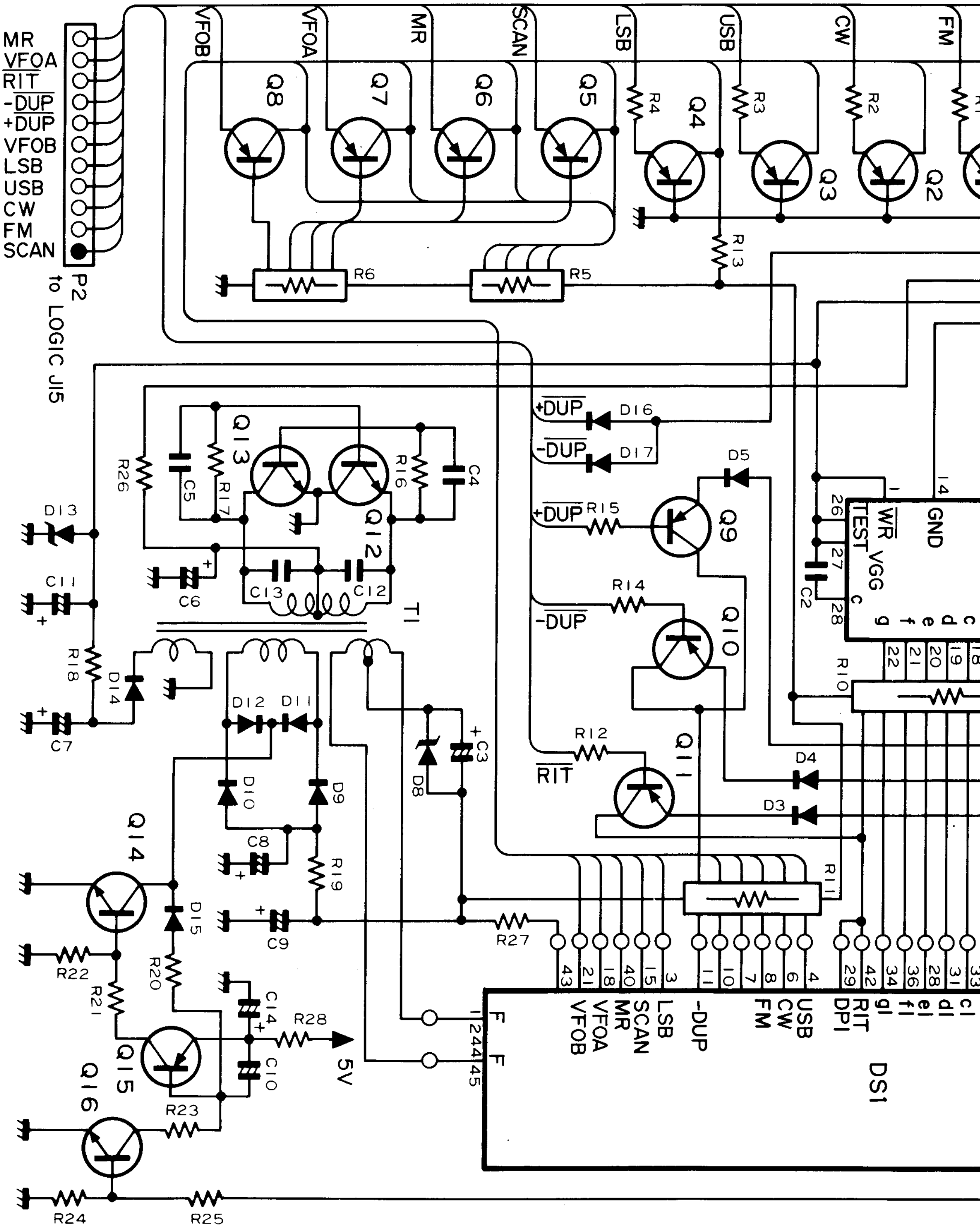


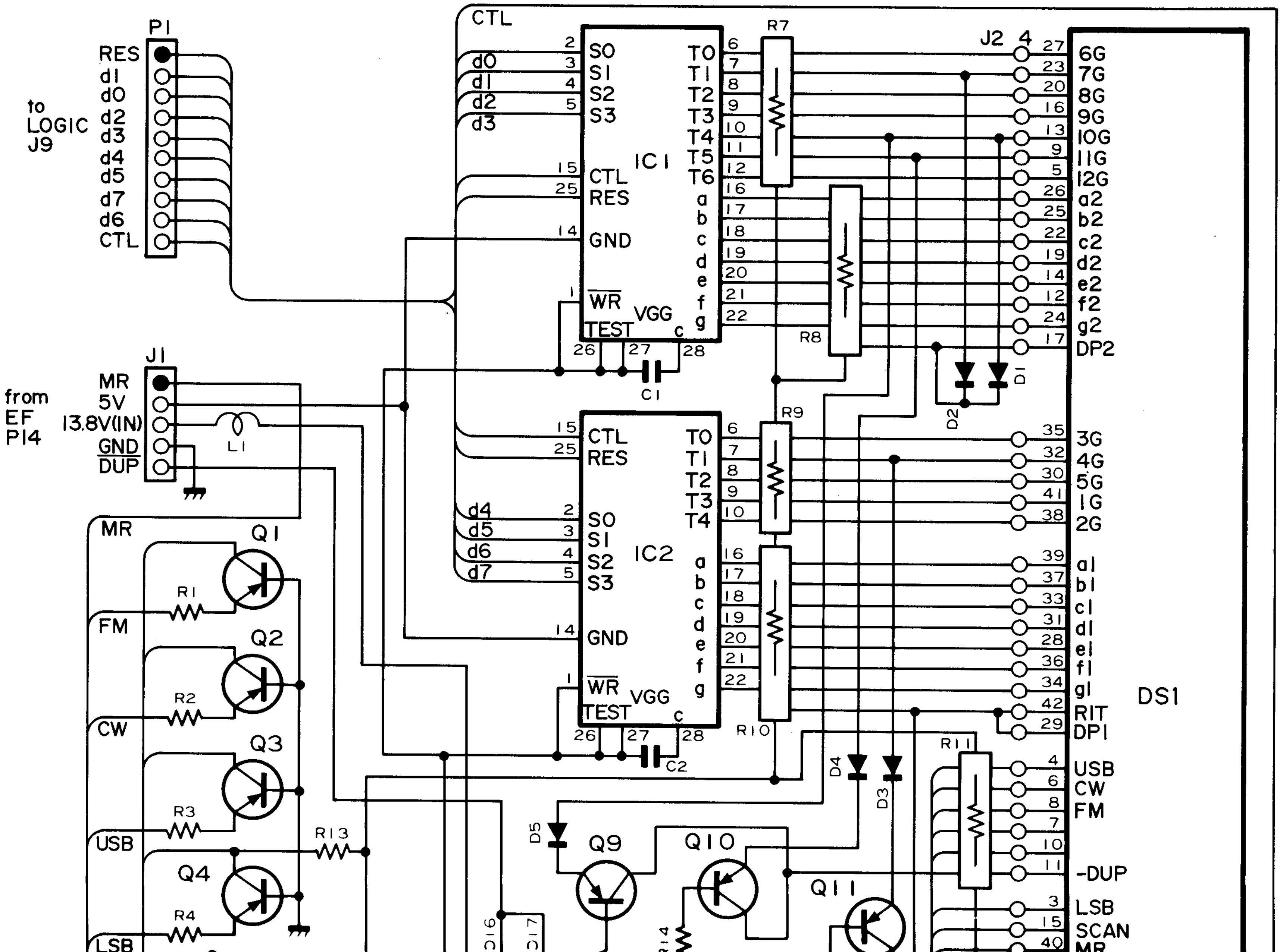
EF UNIT


MIC
PHONE
AF GAIN
R6
RF GAIN
MIC GAIN
R13
RF POW
SQL
R14
TONE
METER
P1 J1
P2 J2
Q15
Q1
Q2
P23 J17
TONE
GND
MUTE
SQLS
to MAIN J4
SPA
METER
VOX8
to MAIN J5
AGC SW
SQL 1
RF GAIN
NB
GND
T8V
13.8V(OUT)
AF GAIN
SQL 2
CS
PRI
SSB8
to MAIN J7
GND
VOX
to MAIN J11
FM8V
SM8
CM8
to MAIN J8
HV
TO PA
SEND
R8V
USB8V
CW8V
LSB8V
RF POW
+8V
13.8V(IN)
HV
GND
MIC
GND
-9V
to MAIN J2
to LOGIC J14
RX LED
Q3
METER SW
PRE AMP
VOX
AGC
NB
AC IN
AC OUT
to PA P11
AF MUTE
T8V
R8V
FM 8V
from TONE SQL UNIT (OPTION)
SPB to PA J18
SEND
POWER
MODE S1-6
TONE S5
CHECK S4
OW S6
⊖DUP S7
⊕DUP S8
RIT CLEAR S9
RIT S10
M→VFO S11
MW S12
VFO/M S13
S/S S14
A=B S15
A/B S16
Q14
#02,05


MODE S1-6
TONE S5
CHECK S4
OW S6
⊖DUP S7
⊕DUP S8
RIT CLEAR S9
RIT S10
M→VFO S11
MW S12
VFO/M S13
S/S S14
A=B S15
A/B S16
TS S17
SPLIT S18
DFS S19
1MHz UP S20
1MHz DOWN S21
CW S22
LSB S23
USB S24
FM S25
TONE SQL S26
LOCK S27
RIT S28
MAIN DIAL S29
TX LED
SEND
Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14
P11 GND 8V CS SQLS CSS SSB8 to CSS J1
to INTERFACE J3
P12 SEND SQLS (OPTION)
P13 to LOGIC J8 13.8V(IN) GND
P21 to CSS J2 13.8(IN) GND -9
P14 to DISPLAY J1 MR 5V 13.8V(IN) GND DUP
P15 to LOGIC J2 MUTE LOCK 5V TONE TONE LED SPEAK
J11
P16 to LOGIC J4 SUD M1 GND S1 S2 S3 S4
P17 to LOGIC J6 D0 D1 D2 D3 D4 D5 D6 D7
P18 to LOGIC J5 Y0 Y1 Y2 Y4 Y6 Y7 TS
J15 J14
SQLS CM8 SM8 FM8V PR1 13.8V (OUT) VOX8 +8V AGC SW R8V NB
to PA P11
from TONE SQL UNIT (OPTION)
AC IN AC OUT
#02,05

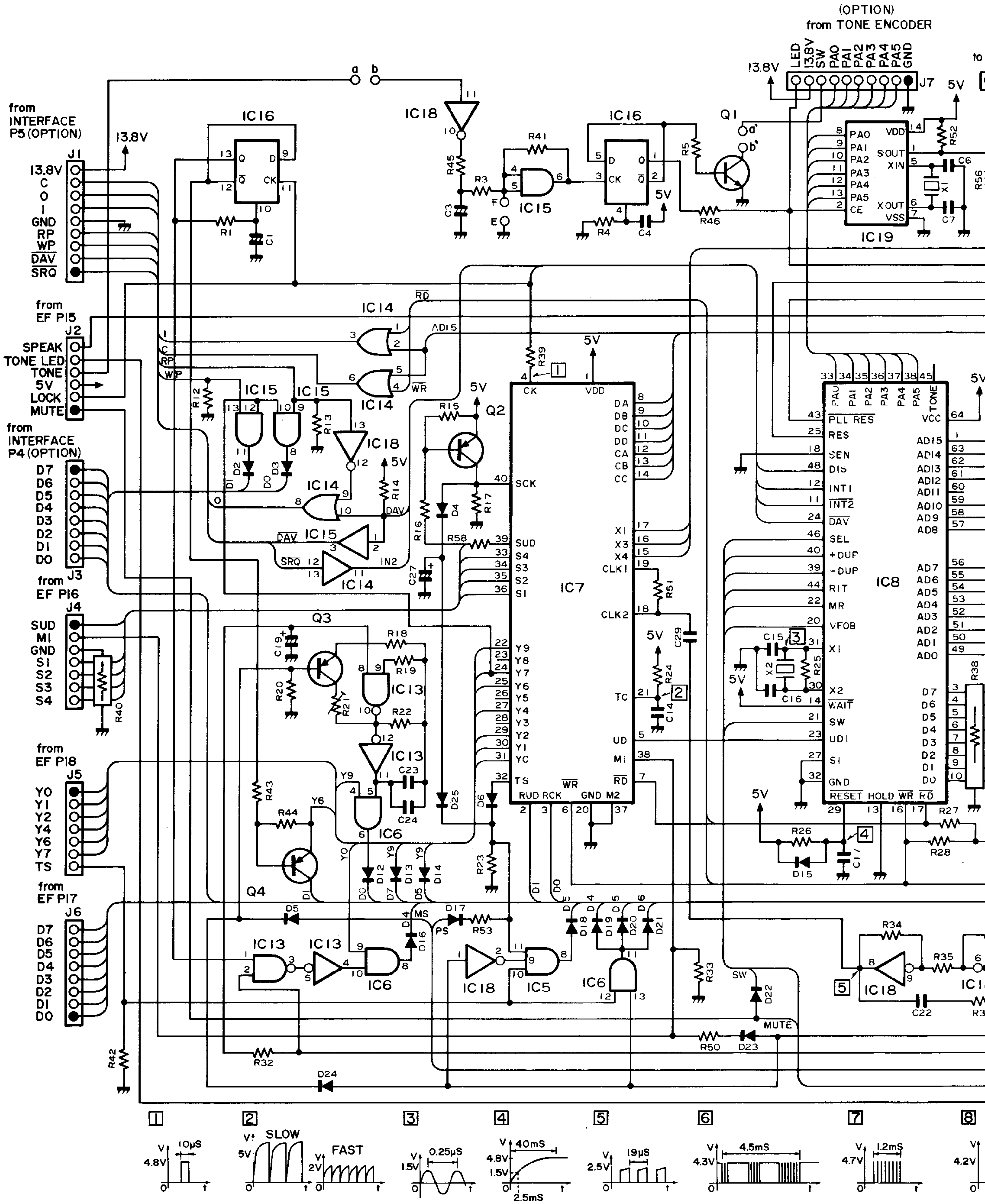
DISPLAY UNIT

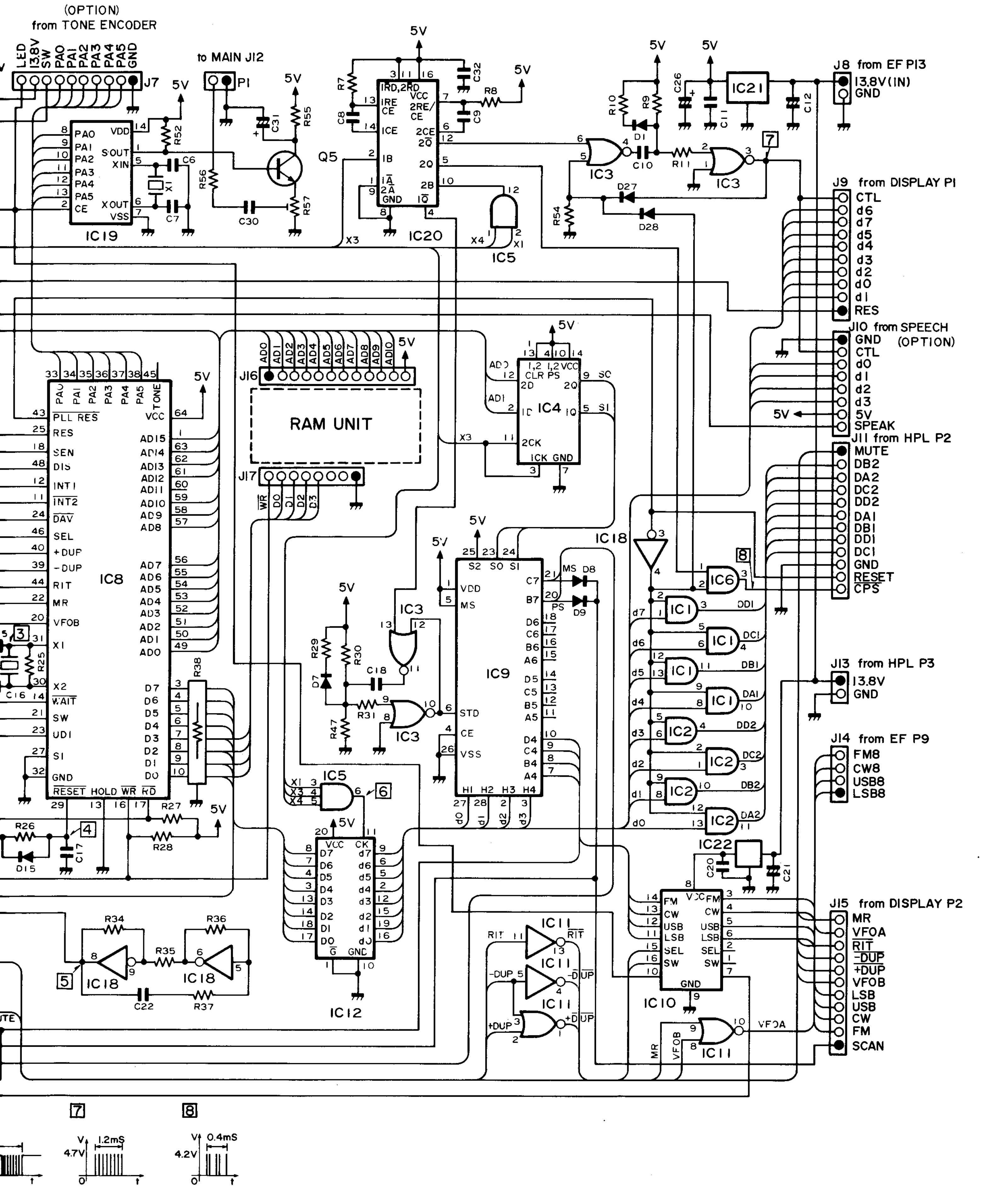




to
LOGIC
J9
P1
RES
d1
d0
d2
d3
d4
d5
d7
d6
CTL
from
EF
P14
J1
MR
5V
13.8V(IN)
GND
DUP
L1
IC1
IC2
S0
S1
S2
S3
CTL
RES
GND
WR
TEST
VGG
T0
T1
T2
T3
T4
T5
T6
a
b
c
d
e
f
g
R7
R8
R9
R10
R11
R13
R14
C1
C2
D1
D2
D3
D4
D5
Q1
Q2
Q3
Q4
Q9
Q10
Q11
R1
R2
R3
R4
MR
FM
CW
USB
LSB
J2
DS1
6G
7G
8G
9G
10G
11G
12G
a2
b2
c2
d2
e2
f2
g2
DP2
3G
4G
5G
1G
2G
a1
b1
c1
d1
e1
f1
g1
RIT
DP1
USB
CW
FM
-DUP
LSB
SCAN
MR

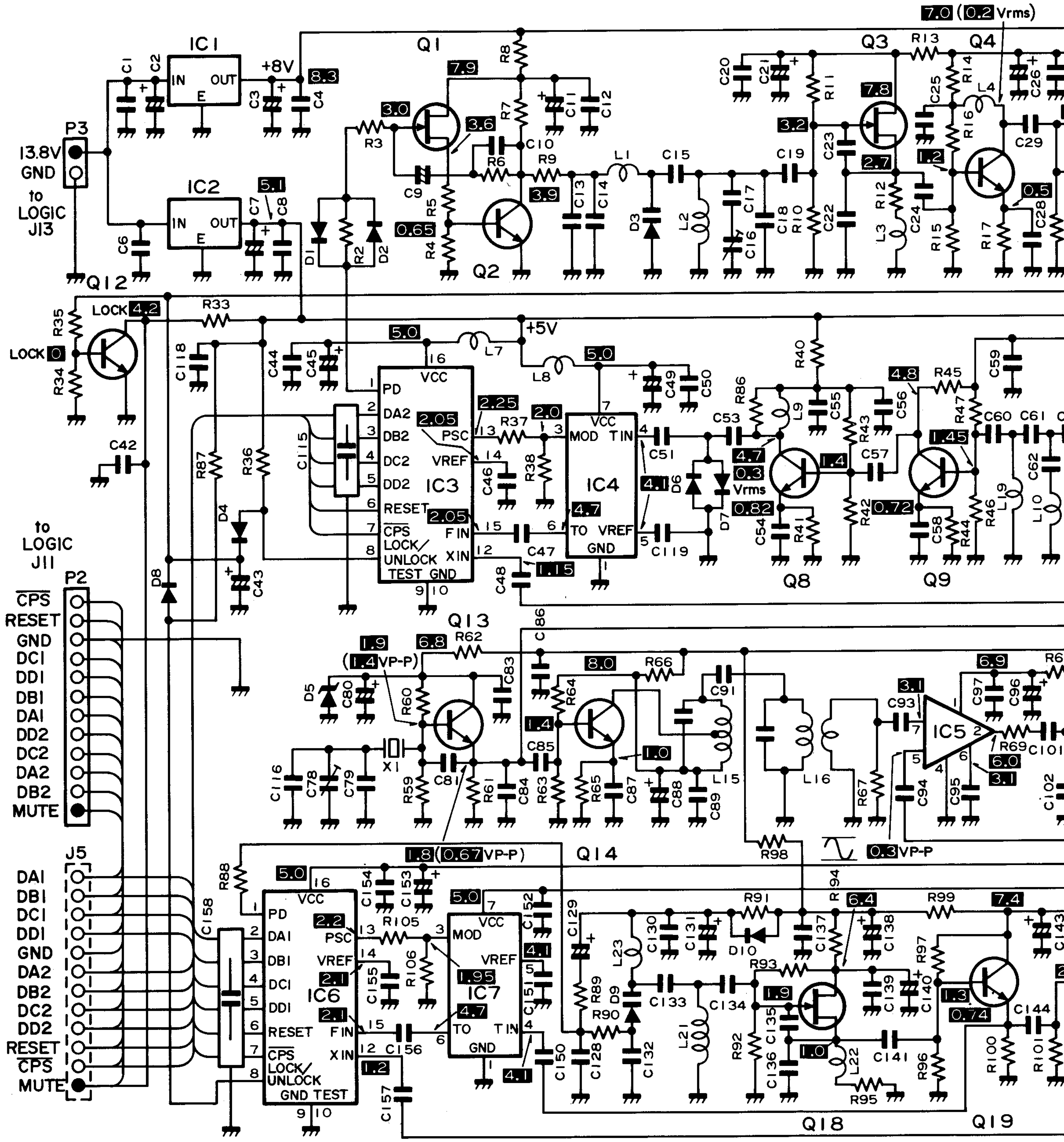
LOGIC UNIT

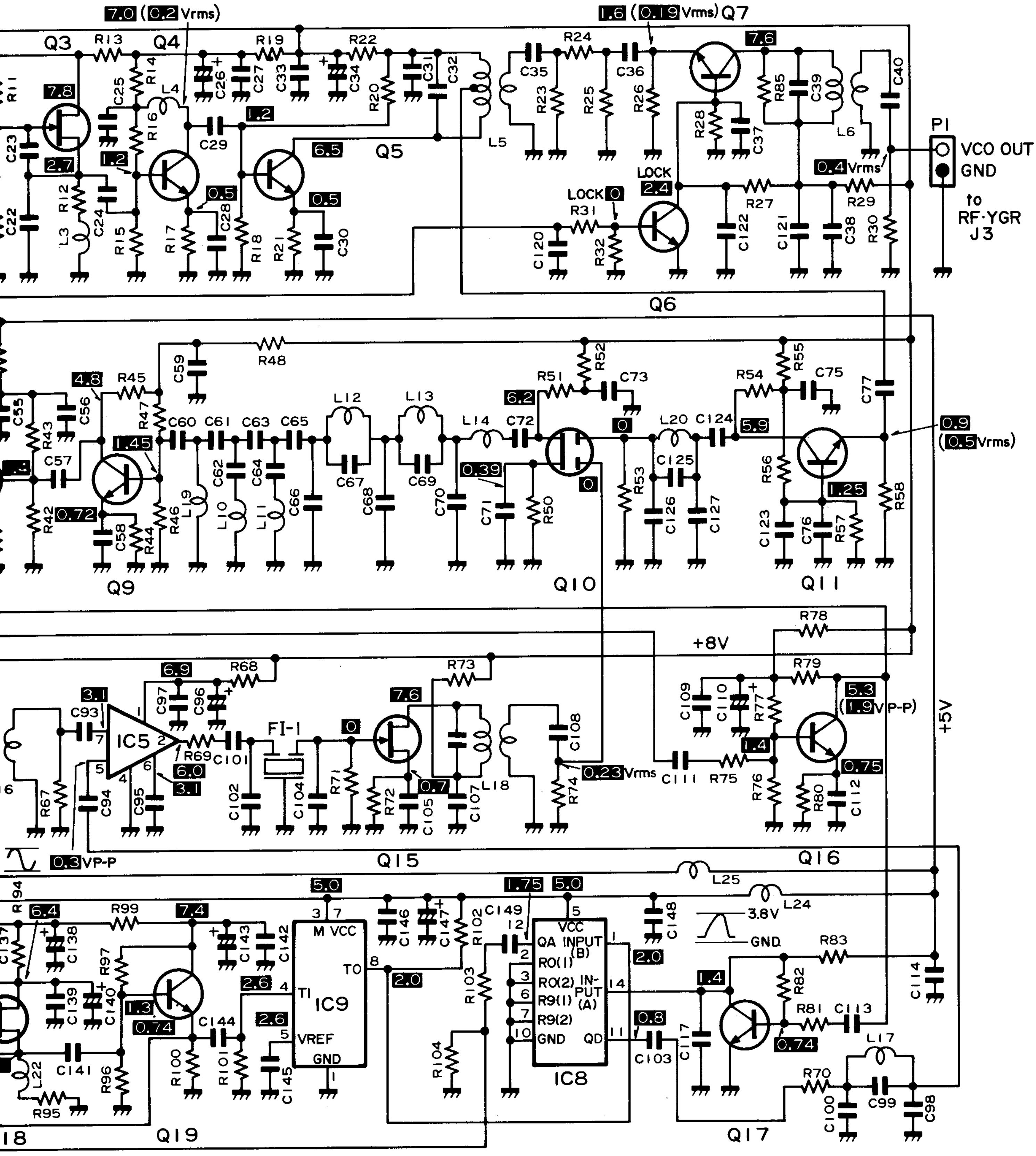




(OPTION)
from TONE ENCODER
LED 13.8V SW PA0 PA1 PA2 PA3 PA4 PA5 GND
J7
to MAIN J12
P1
5V
IC19
Q5
IC20
IC5
IC3
IC21
J8 from EF P13
13.8V (IN)
GND
J9 from DISPLAY P1
CTL
d6
d7
d5
d4
d3
d2
d0
d1
RES
J10 from SPEECH (OPTION)
GND
CTL
d0
d1
d2
d3
5V
SPEAK
J11 from HPL P2
MUTE
DB2
DA2
DC2
DD2
DA1
DB1
DD1
DC1
GND
RESET
CPS
J16
RAM UNIT
J17
IC4
IC8
IC9
IC18
IC6
IC1
IC2
J13 from HPL P3
13.8V
GND
J14 from EF P9
FM8
CW8
USB8
LSB8
IC22
IC12
IC11
IC10
J15 from DISPLAY P2
MR
VFOA
RIT
-DUP
+DUP
VFOB
LSB
USB
CW
FM
SCAN
7
4.7V
1.2mS
8
4.2V
0.4mS

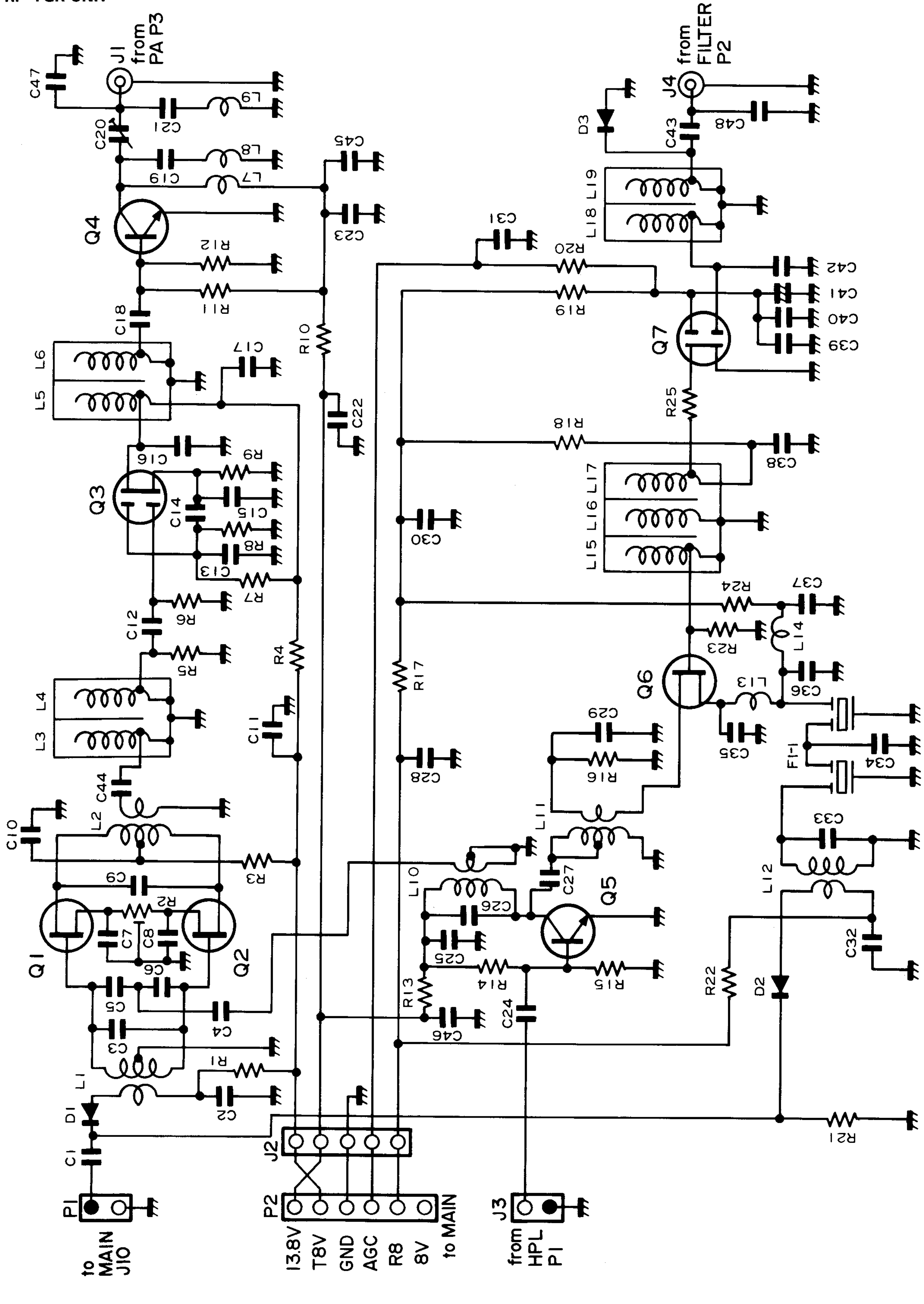
HPL UNIT


7.0 (0.2 Vrms)
IC1
IN OUT
E
+8V
8.3
Q1
7.9
3.0
3.6
Q3
Q4
7.8
3.2
2.7
1.2
0.5
P3
13.8V
GND
to LOGIC J13
IC2
5.1
0.65
3.9
Q2
Q12
LOCK 4.2
LOCK 0
+5V
5.0
IC3
PD
DA2
DB2
DC2
DD2
RESET
CPS
LOCK/ UNLOCK
TEST GND
VCC
PSC
VREF
F IN
X IN
2.25
2.05
2.0
1.15
IC4
MOD
TIN
TO
VREF
GND
4.7
4.1
4.8
1.45
1.4
0.3 Vrms
0.82
0.72
Q8
Q9
to LOGIC J11
P2
CPS
RESET
GND
DC1
DD1
DB1
DA1
DD2
DC2
DA2
DB2
MUTE
Q13
1.9
6.8
(1.4 VP-P)
8.0
1.4
1.0
6.9
3.1
6.0
IC5
1.8 (0.67 VP-P)
Q14
0.3 VP-P
J5
DA1
DB1
DC1
DD1
GND
DA2
DB2
DC2
DD2
RESET
CPS
MUTE
IC6
IC7
2.2
2.1
1.95
1.2
6.4
7.4
1.3
0.74
Q18
Q19



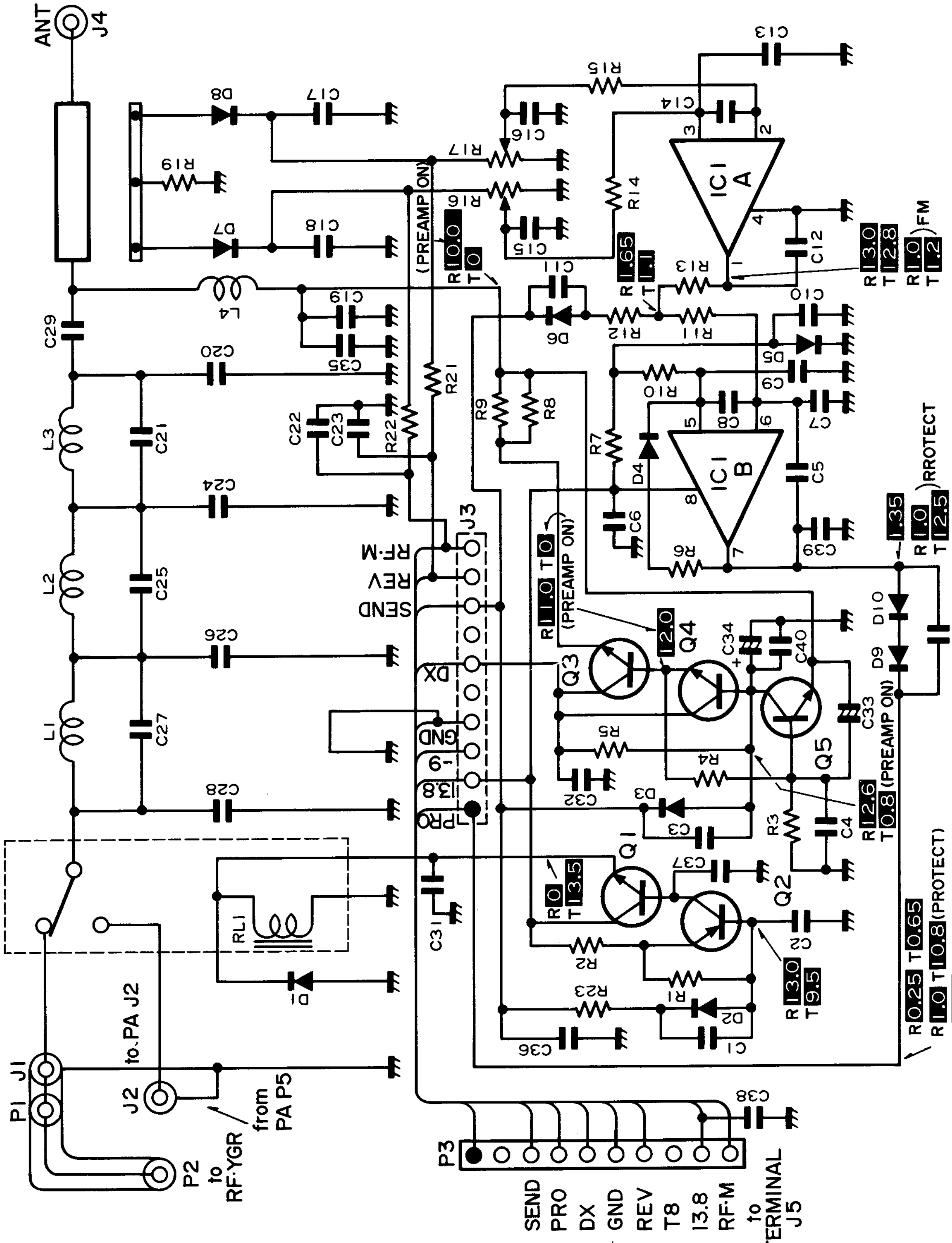
7.0 (0.2 Vrms)
1.6 (0.19 Vrms) Q7
Q3
Q4
Q5
Q6
7.8
2.7
1.2
6.5
0.5
7.6
LOCK 0
LOCK 2.4
0.4 Vrms
P1
VCO OUT
GND
to
RF·YGR
J3
4.8
1.45
0.72
6.2
0.39
0
5.9
0.9
(0.5 Vrms)
1.25
Q9
Q10
Q11
+8V
+5V
3.1
6.9
IC5
6.0
FI-1
7.6
0.7
0.23 Vrms
5.3
(1.9 VP-P)
1.4
0.75
0.3 VP-P
Q15
Q16
5.0
1.75
6.4
7.4
M VCC
TO
TI
IC9
VREF
GND
2.6
2.0
1.3
0.74
VCC
QA INPUT (B)
R0(1)
R0(2)
R9(1)
R9(2)
IN-PUT (A)
QD
IC8
0.8
3.8V
GND
Q17
Q18
Q19

RF·YGR UNIT

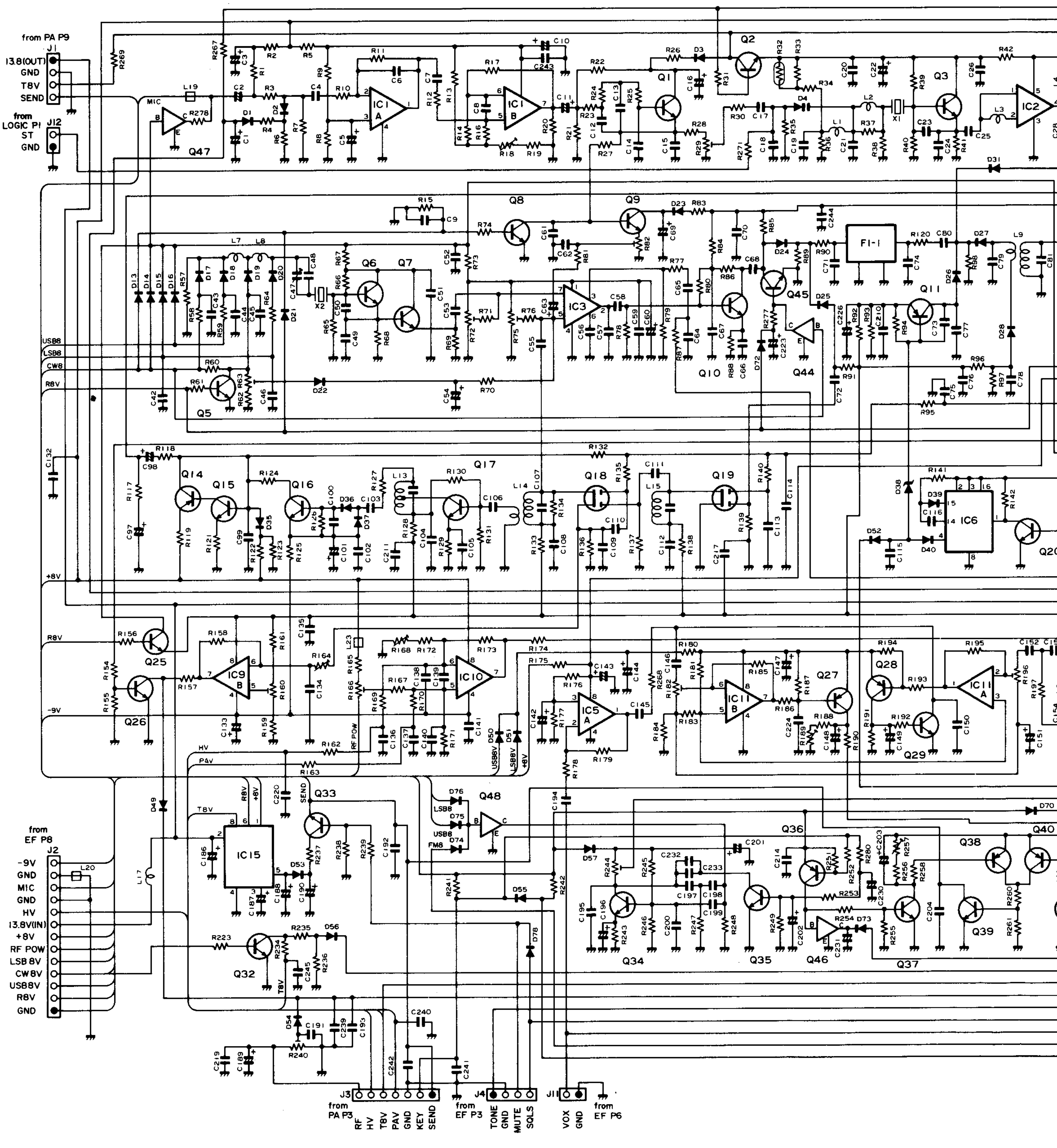


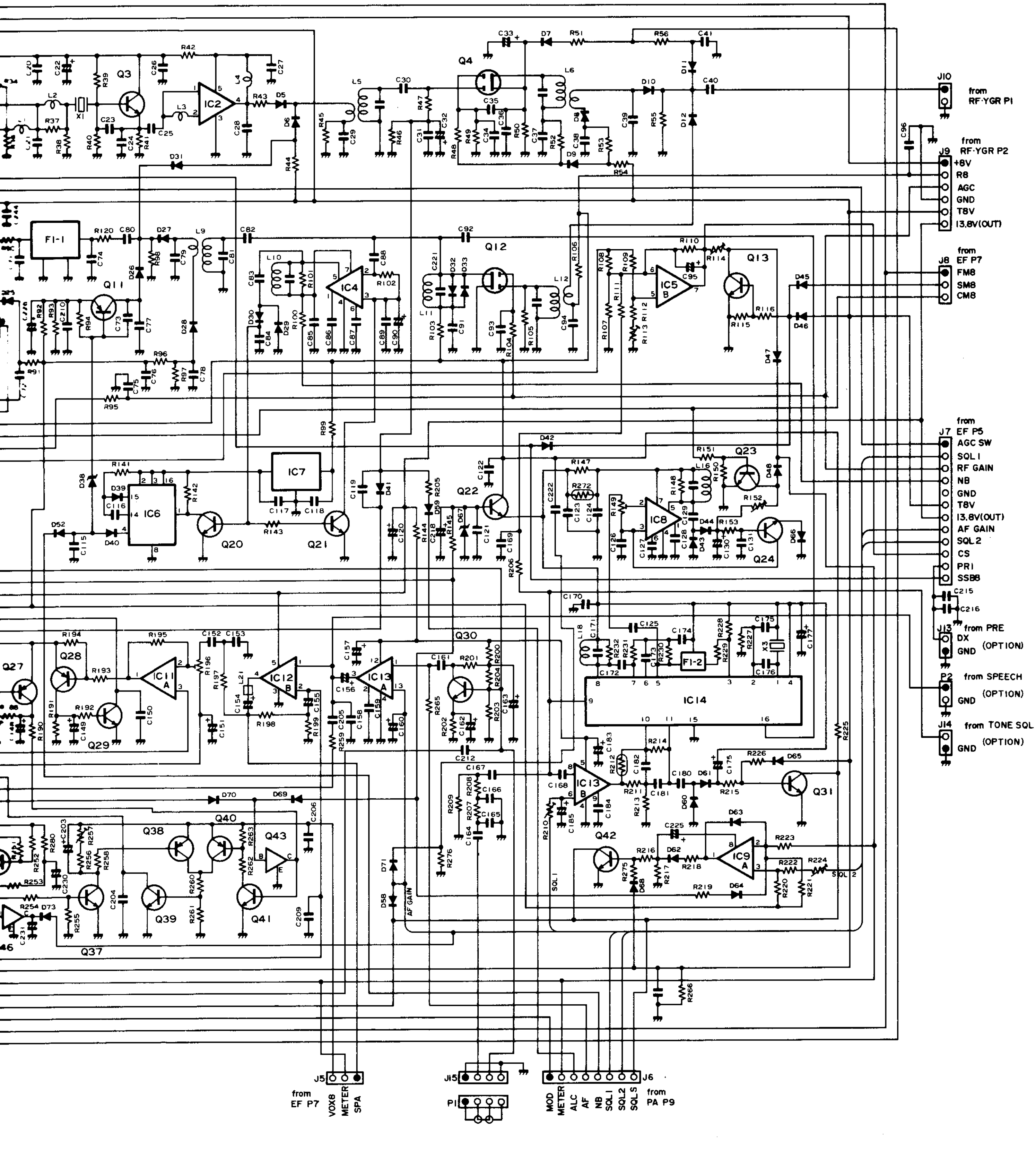
J1
from
PA P3
J4
from
FILTER
P2
P1
to
MAIN
J10
J2
P2
13.8V
T8V
GND
AGC
R8
8V
to MAIN
J3
from
HPL
P1
Q1
Q2
Q3
Q4
Q5
Q6
Q7
D1
D2
D3
FI-1
L1
L2
L3
L4
L5
L6
L7
L8
L9
L10
L11
L12
L13
L14
L15 L16 L17
L18 L19
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
R15
R16
R17
R18
R19
R20
R21
R22
R23
R24
R25
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
C13
C14
C15
C16
C17
C18
C19
C20
C21
C22
C23
C24
C25
C26
C27
C28
C29
C30
C31
C32
C33
C34
C35
C36
C37
C38
C39
C40
C41
C42
C43
C44
C45
C46
C47
C48

FILTER UNIT(IC-271H)

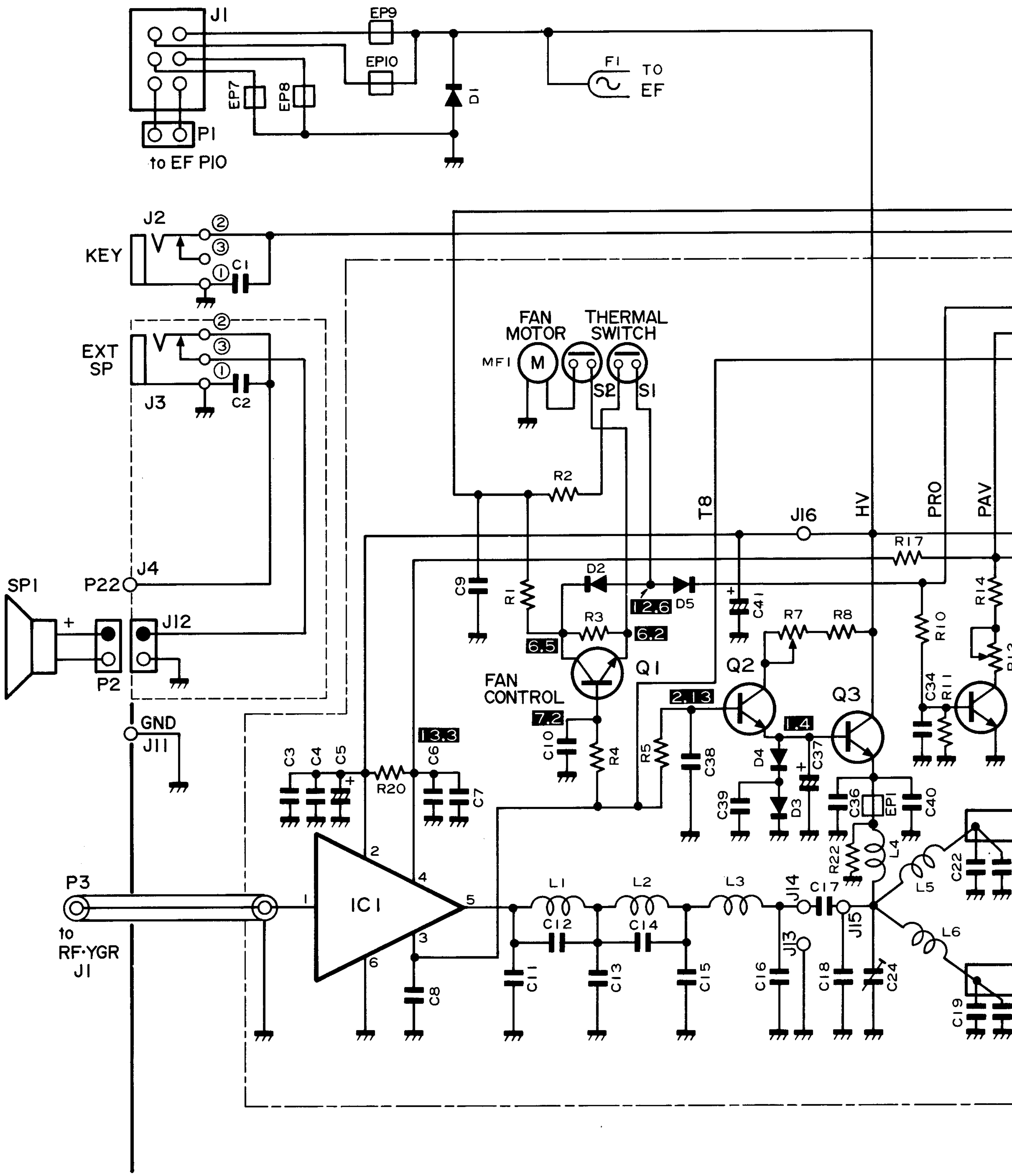


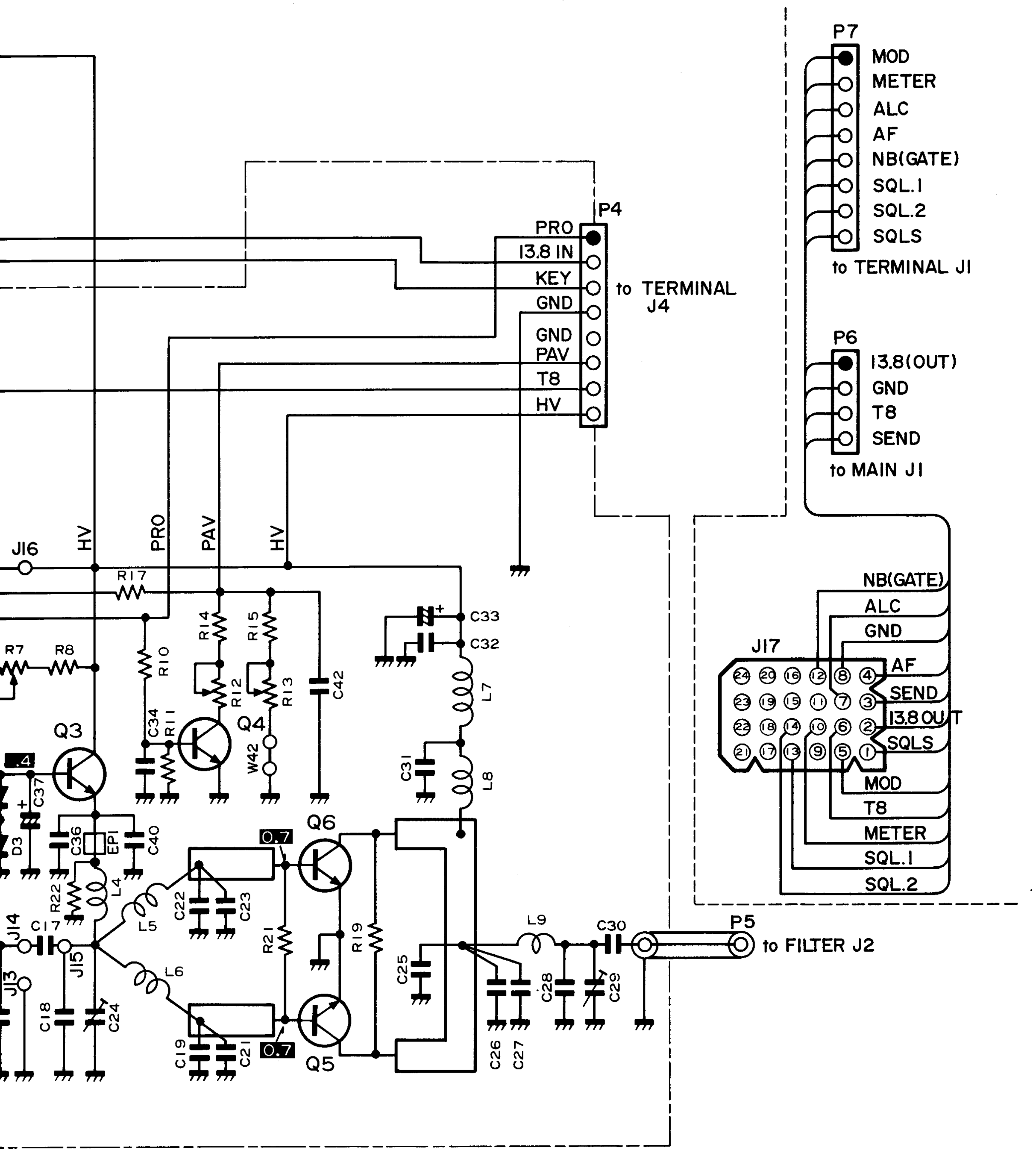
MAIN UNIT




J10 from RF·YGR P1
J9 from RF·YGR P2
+8V
R8
AGC
GND
T8V
13.8V(OUT)
J8 from EF P7
FM8
SM8
CM8
J7 from EF P5
AGC SW
SQL1
RF GAIN
NB
GND
T8V
13.8V(OUT)
AF GAIN
SQL2
CS
PRI
SSB8
J13 from PRE
DX
GND (OPTION)
P2 from SPEECH
GND (OPTION)
J14 from TONE SQL
GND (OPTION)
J5 from EF P7
VOX8
METER
SPA
J15
P1
J6 from PA P9
MOD
METER
ALC
AF
NB
SQL1
SQL2
SQLS

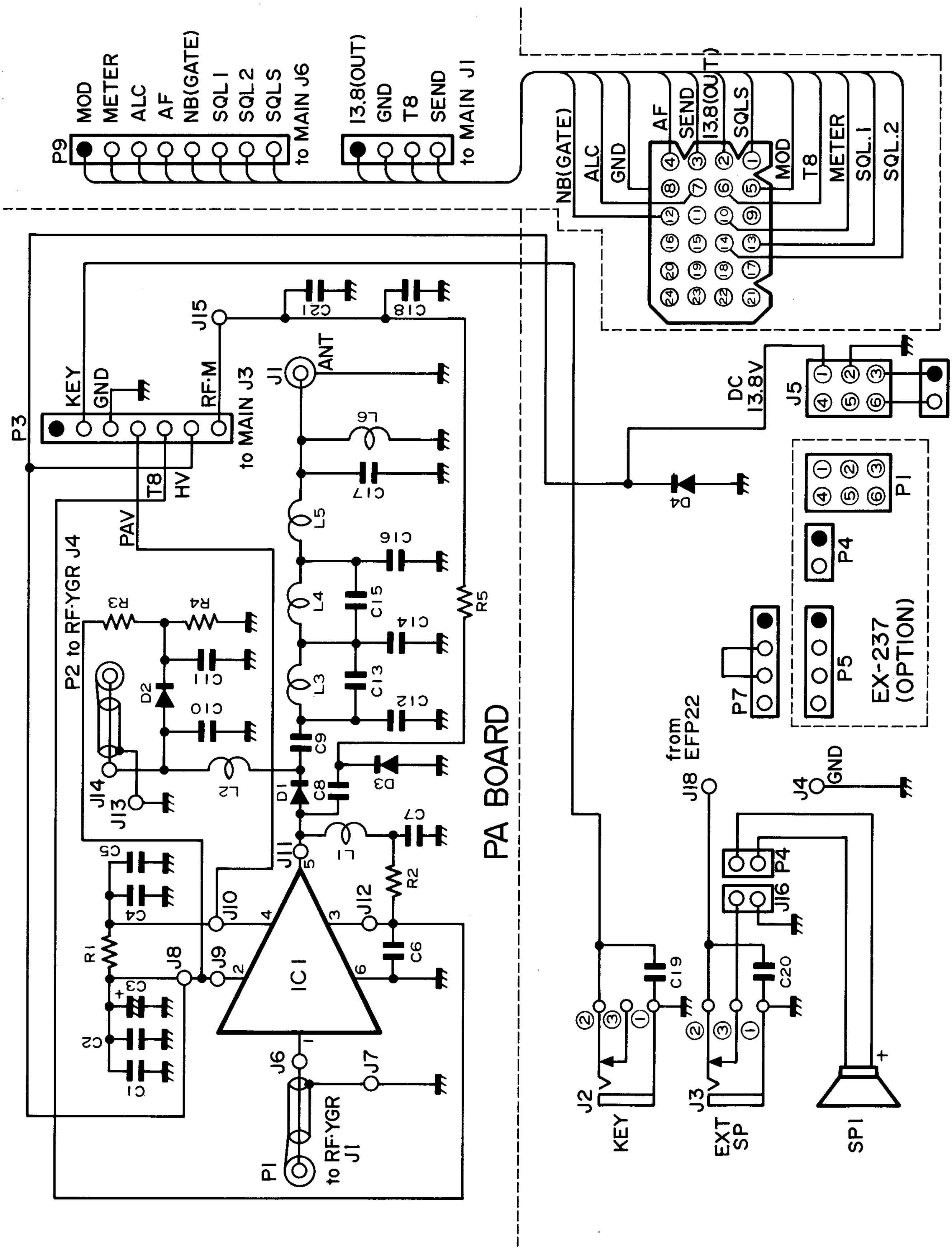
PA UNIT(IC-271H)



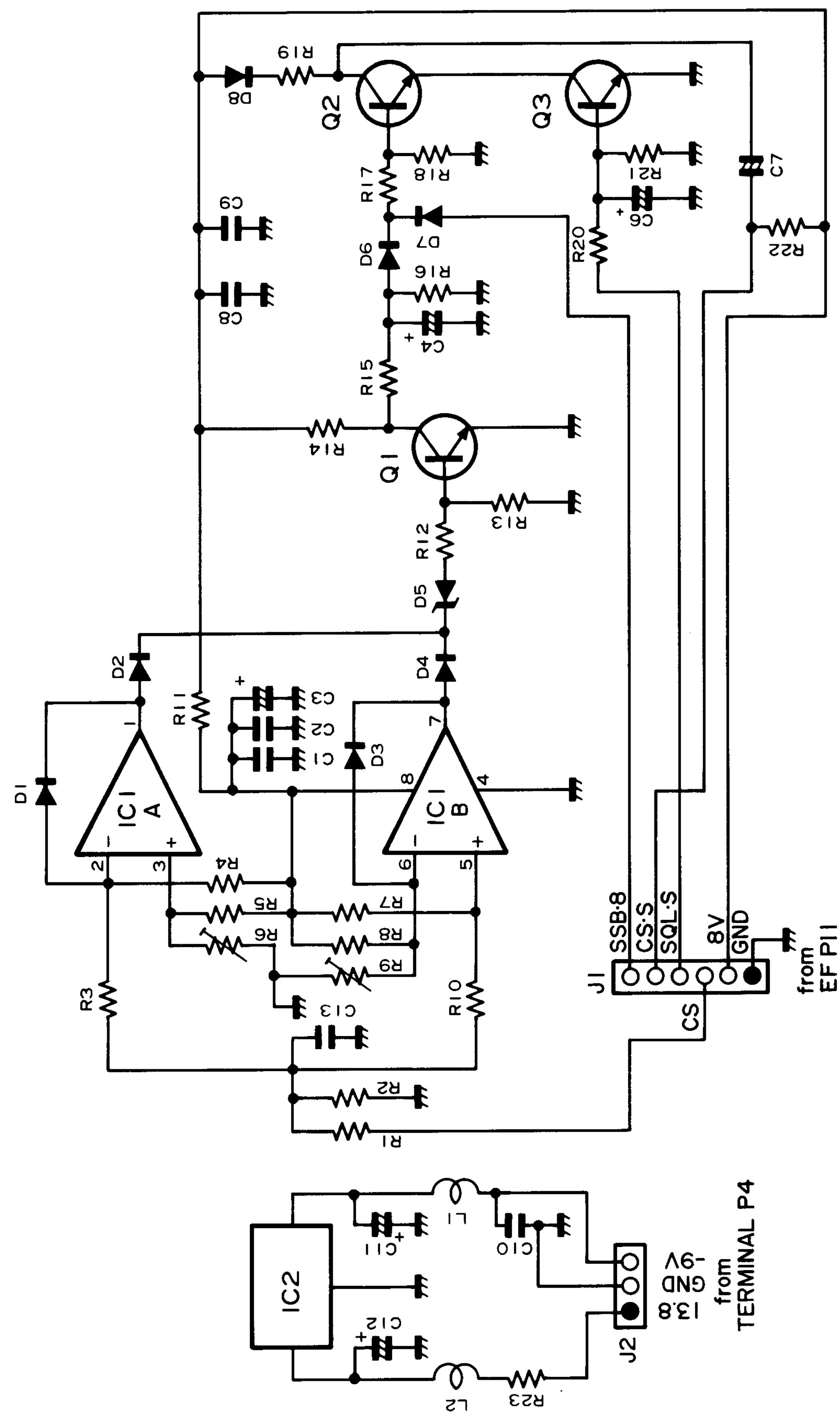


P7
MOD
METER
ALC
AF
NB(GATE)
SQL.1
SQL.2
SQLS
to TERMINAL J1
P4
PRO
13.8 IN
KEY
GND
GND
PAV
T8
HV
to TERMINAL J4
P6
13.8(OUT)
GND
T8
SEND
to MAIN J1
J16
HV
PRO
PAV
HV
R17
R7
R8
R10
R14
R15
R12
R13
C42
C33
C32
L7
Q3
Q4
C34
R11
W42
C31
L8
.4
C37
D3
C36
EP1
C40
0.7
Q6
R22
L4
L5
C22
C23
R21
R19
C25
J14
C17
J15
J13
L6
C18
C24
C19
C21
0.7
Q5
L9
C30
P5
to FILTER J2
C26
C27
C28
C29
J17
NB(GATE)
ALC
GND
AF
SEND
13.8 OUT
SQLS
MOD
T8
METER
SQL.1
SQL.2

PA UNIT (IC-271A/E)

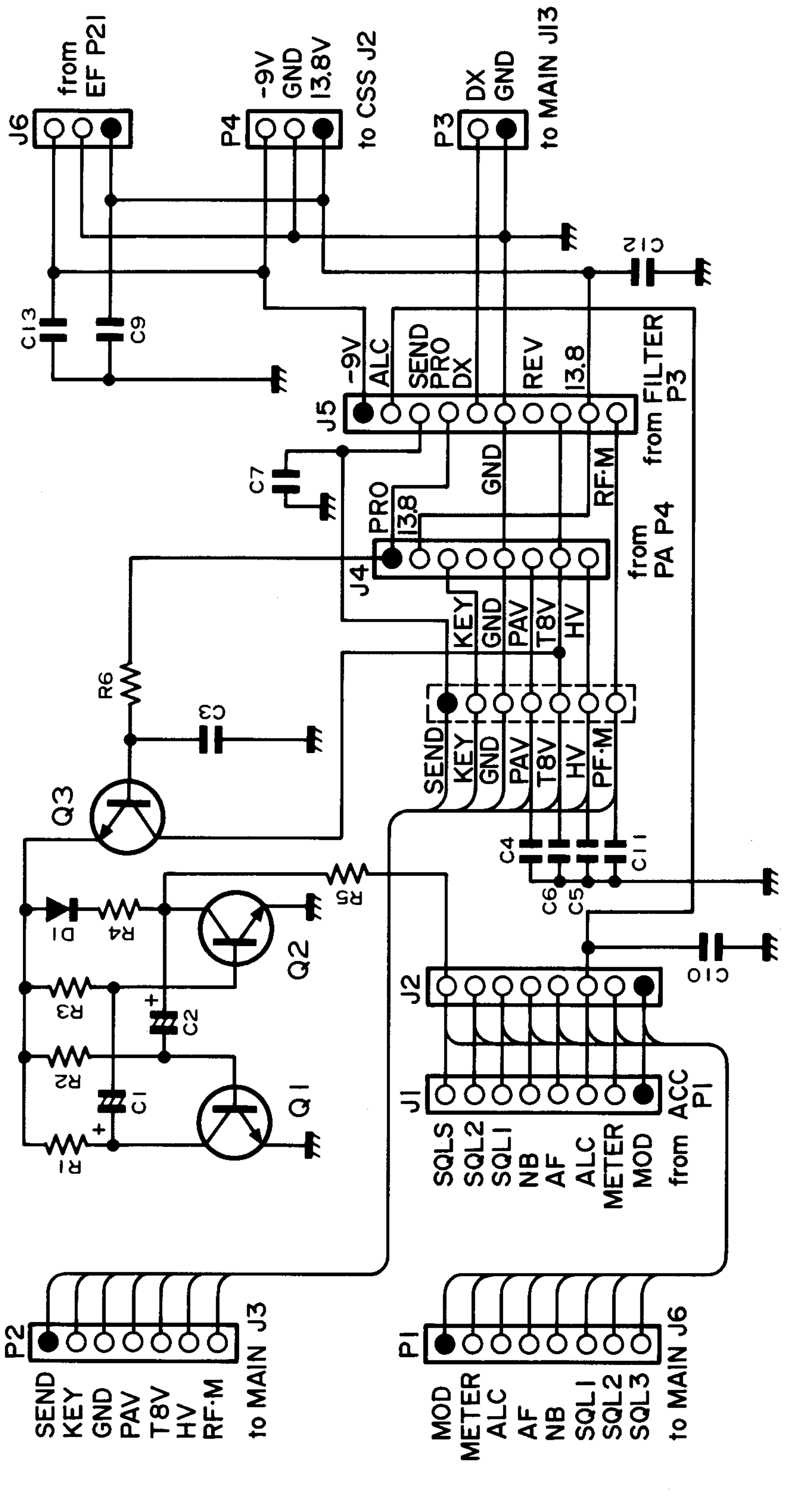


CSS UNIT

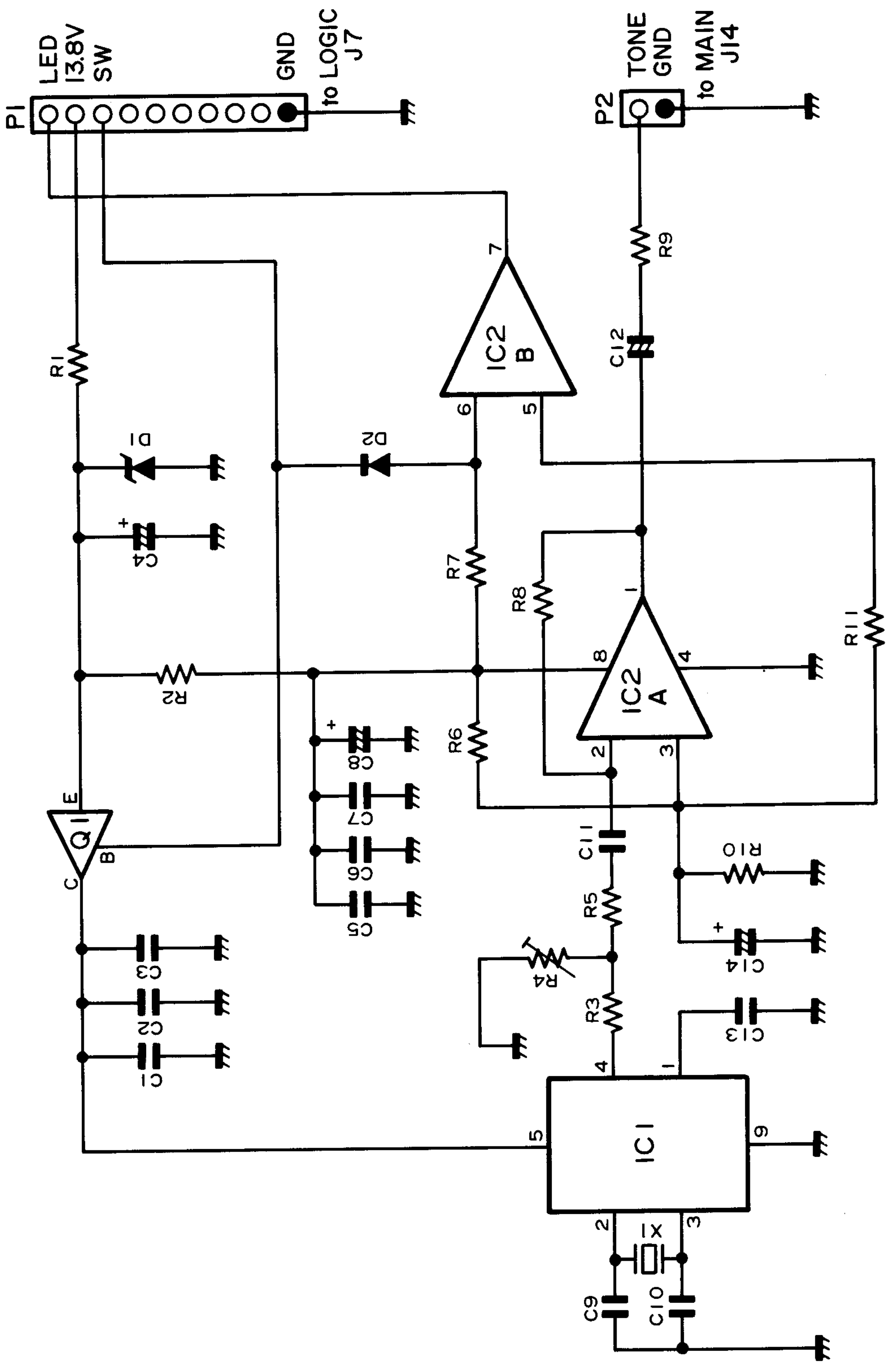


Q1
Q2
Q3
IC1 A
IC1 B
IC2
D1
D2
D3
D4
D5
D6
D7
D8
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
R15
R16
R17
R18
R19
R20
R21
R22
R23
C1
C2
C3
C4
C6
C7
C8
C9
C10
C11
C12
C13
L1
L2
J1
SSB·8
CS·S
SQL·S
8V
GND
from EF P11
CS
J2
13.8
GND
-9V
from TERMINAL P4

TERMINAL UNIT (IC-271H)



TONE UNIT(#02,05)



TRANSISTOR VOLTAGE CHART

DC Voltage by 50KΩ-V multimeter

UNIT	NO.	TRANSMIT BASE or GATE1	TRANSMIT GATE2	TRANSMIT COLLEC-TOR or DRAIN	TRANSMIT EMITTER or SOURCE	RECEIVE BASE or GATE1	RECEIVE GATE2	RECEIVE COLLEC-TOR or DRAIN	RECEIVE EMITTER OR SOURCE	REMARK
MAIN	Q1	4.3		7.0	3.9	0.025		0.115	0	ALL MODE
	Q2	7.6		7.9	7.0	1.33		0.66	0.66	FM
	Q3	3.6		7.0	3.0	0.17		0.66	0	FM
	Q4	−0.45	3.2	7.0	0.35	−0.45	0	0.06	0.05	FM
	Q5	0.01		5.2	GND	0.68		0.04	GND	CW
	Q6	3.2		6.6	3.0	3.2		6.6	3.0	SSB
	Q7	3.0		6.6	3.0	3.0		6.6	3.0	SSB
	Q8	0		3.7	GND	0.7		0	GND	USB
	Q9	3.7		6.8	3.1	0		0	0	USB
	Q10	2.4		6.2	1.7	0		0.05	0	USB
	Q11	0		0	0	5.0		0	4.8	SSB
	Q12	0	2.4	0	GND	0	2.6	5.2	GND	ALL MODE
	Q13	0.6		0	GND	0.6		0	GND	FM METER SW OFF
	Q14	4.0		4.0	3.7	4.3		4.3	4.0	FM
	Q15	4.0		3.7	3.7	4.3		4.1	4.1	FM
	Q16	−8.2		1.0	−8.8	−8.2		1.1	−8.8	FM
	Q17	0		−0.08	0	0.92		6.4	1.5	SSB
	Q18	0	2.6	0	0	0	2.8	6.3	0.66	SSB
	Q19	0	2.6	0	GND	0	2.8	6.0	GND	SSB
	Q20	0		0	GND	0		4.6	GND	SSB
	Q21	0		0	GND	0.03		1.85	GND	SSB NB ON
	Q22	1.35		0.63	0.63	6.4		8.0	5.8	FM
	Q23	0.6		0	GND	0.6		0	GND	FM METER SW ON
	Q24	0		0	GND	0		1.0	GND	FM
	Q25	0		7.0	0	7.2		7.0	6.5	SSB
	Q26	0.6		0	GND	0.6		0	GND	FM METER SW OFF
	Q27	6.5		0	7.0	6.5		0	7.0	USB LSB VOX ON
	Q28	6.5		0	7.0	6.5		0	7.0	USB LSB VOX ON
	Q29	0		0	GND	0		0	GND	USB LSB VOX ON
	Q30	1.3		4.8	0.95	1.3		4.8	0.95	ALL MODE
	Q31	0.65		0	GND	0.07		5.2	GND	FM SQL OPEN
	Q32	0.6		0.05	GND	0.6		0	GND	CW
	Q33	0.6		0	0	4.6		4.1	13.8	ALL MODE
	Q34	1.2		5.3	0.65	1.2		5.3	0.65	CW KEY DOWN
	Q35	0		0	GND	0		0	GND	CW KEY DOWN
	Q36	7.1		7.9	7.9	7.1		7.9	7.9	CW KEY DOWN
	Q37	0.65		0	0	0.65		0	0	CW KEY DOWN
	Q38	0		0	0	0		0	0	USB LSB VOX ON
	Q39	0		0	GND	0		13.0	0	USB LSB VOX ON
	Q40	0		0		0		0		USB LSB VOX ON
	Q41	0		0	GND	0		0	GND	USB LSB VOX ON
	Q42	0.65		0	GND	0.01		5.4	GND	SSB SQL OPEN
RF-YGR	Q1	0		7.6	0.45	0		0.03	0.03	FM
	Q2	0		7.6	0.45	0		0.03	0.03	FM
	Q3	0	3.4	7.4	0.42	0	0	0.03	0.01	FM
	Q4	0.7		10.4	GND	0.7		10.4	GND	FM
	Q5	0.6		7.6	GND	0.6		7.6	GND	FM
	Q6	0		0.3	0.3	0		7.0	3.0	FM
	Q7	0	2.8	0.2	GND	0	2.8	7.2	GND	FM
CSS	Q1	0.6		0.04	GND	0.6		0.04	GND	SSB SQL OPEN
	Q2	3.0		6.8	2.7	0.6		0.03	0.02	SSB SQL OPEN
	Q3	0		6.8	GND	2.3		0.02	GND	SSB SQL OPEN

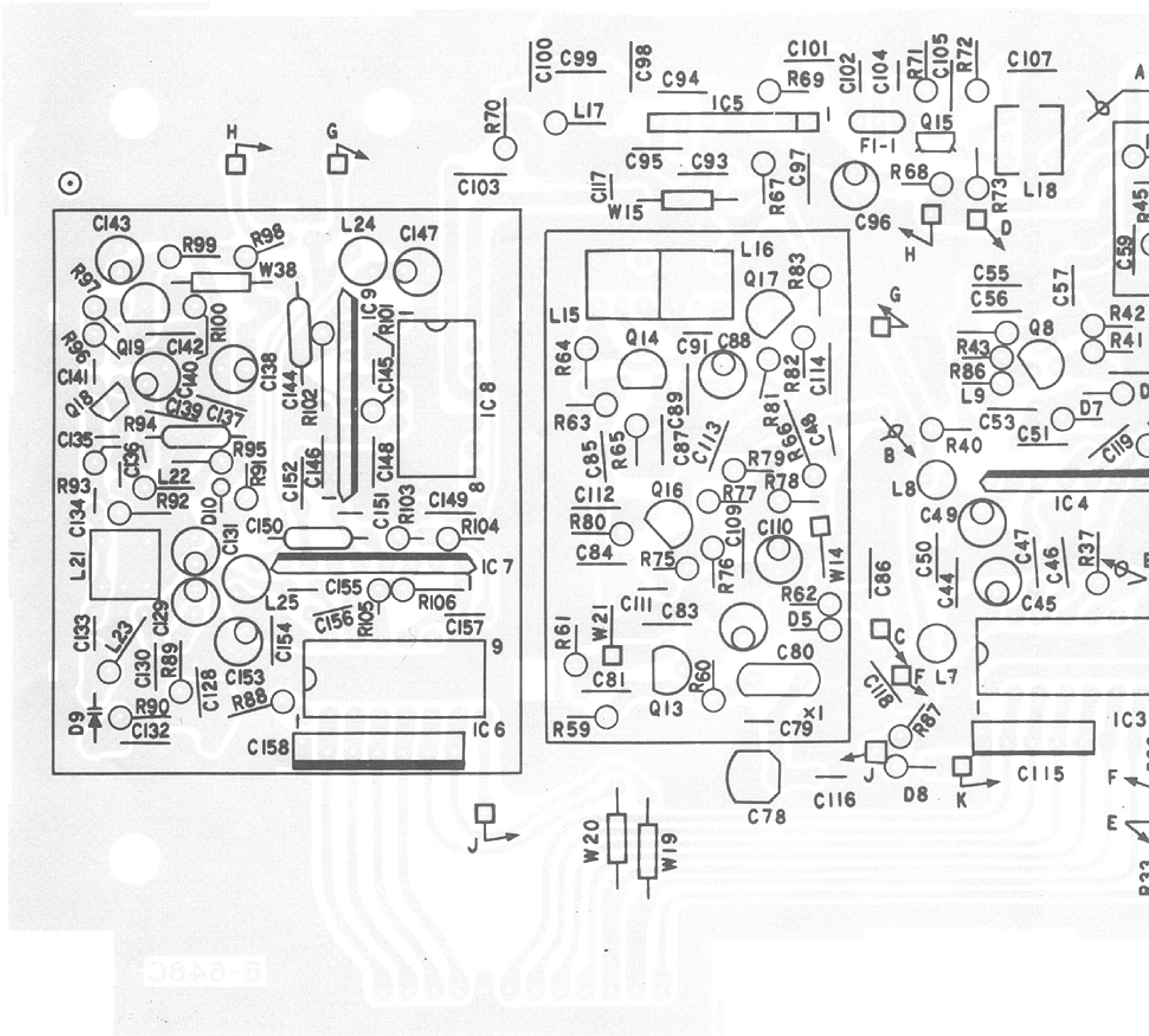
NOTE : All measurements made with:
A)No audio input to the microphone and
B)P2 from the PA UNIT connected to J4 on the RF-YGR UNIT

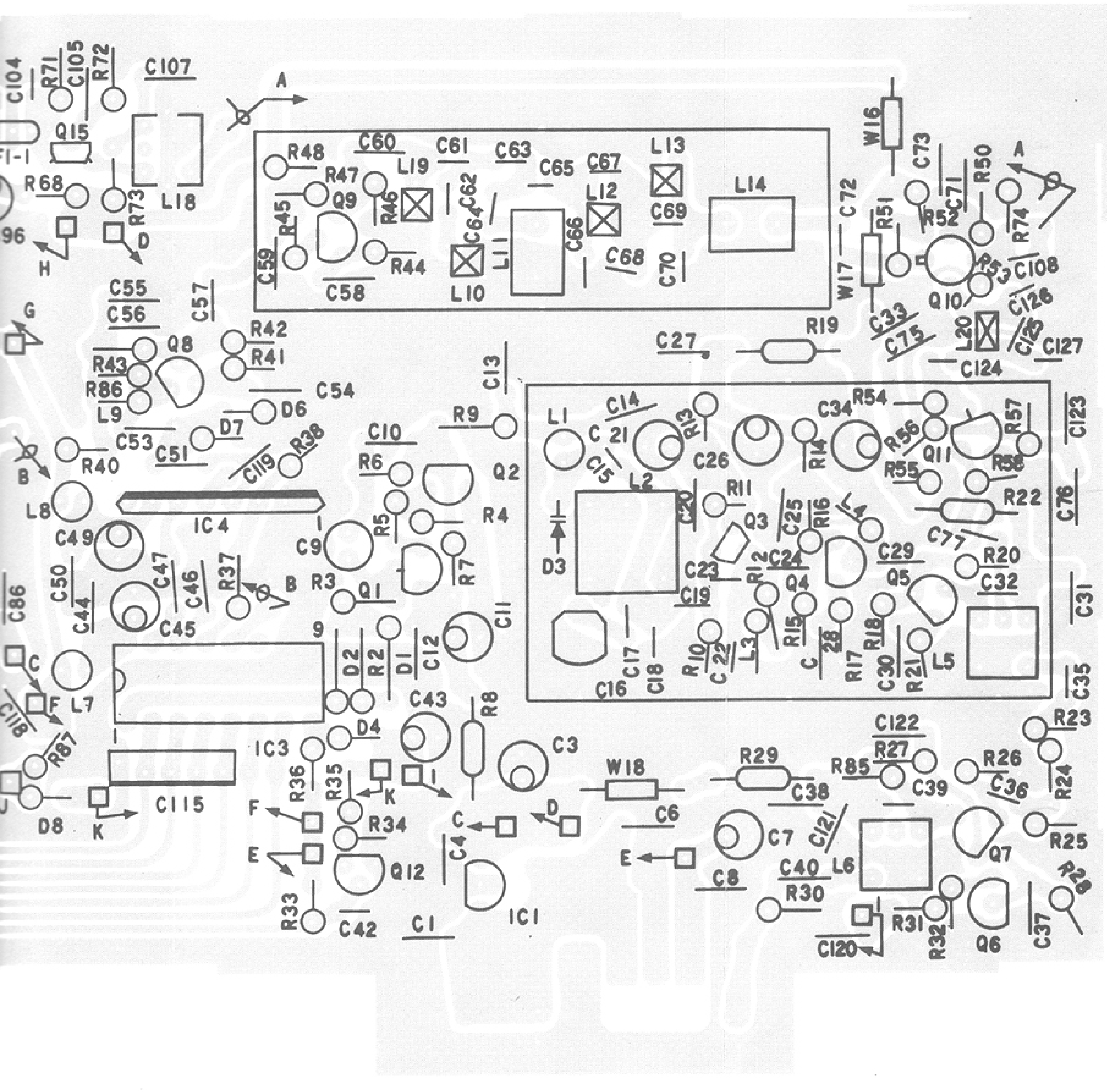
IC VOLTAGE CHART

DC Voltage by 50KΩ-V multimeter

UNIT	NO.		PIN NO. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	REMARK
MAIN	IC1	TRANSMIT	4.0	4.0	4.0	GND	3.2	3.4	3.8	7.5									ALL MODE
		RECEIVE	4.0	4.0	4.0	GND	3.2	3.4	3.8	7.4									
	IC2	TRANSMIT	1.4	1.4	GND	5.0	5.0												FM
		RECEIVE	0.7	0.7	GND	0.7	0.7												
	IC3	TRANSMIT	6.2	5.5	4.8	GND	2.7	2.7	2.7										SSB
		RECEIVE	6.2	5.5	4.8	GND	2.7	2.7	2.7										
	IC4	TRANSMIT	0	0	0	GND	0.01	0	0.01										SSB NB ON
		RECEIVE	5.0	1.7	1.9	GND	6.7	2.9	6.7										
	IC5	TRANSMIT	4.2	4.2	4.2	GND	2.8	2.9	7.0	7.8									ALL MODE
		RECEIVE	4.2	4.2	4.2	GND	2.8	3.0	4.6	7.8									
	IC6	TRANSMIT	0	0	0	0	0	0	0	GND	0	0	0	0	0	0	0	0	ALL MODE
		RECEIVE	4.6	4.8	4.8	3.5	3.4	1.7	0.6	GND	1.6	1.1	1.7	0.1	0.1	1.7	1.4	4.8	
	IC7	TRANSMIT	0	GND	0														ALL MODE
		RECEIVE	7.0	GND	4.8														
	IC8	TRANSMIT	0.1	0	0	GND	0.6	0	0.6										FM
		RECEIVE	3.0	1.0	1.0	GND	3.8	1.5	3.8										
	IC9	TRANSMIT	0	0	0	−9.5	0	0	0	−0.1									SSB
		RECEIVE	0.9	0.4	0.4	−9.5	0.6	0.6	0.4	6.5									
	IC10	TRANSMIT	7.4	0	0	−9.5	4.0	4.0	−2.3	8.0									ALL MODE
		RECEIVE	7.4	0	0	−9.5	4.0	4.0	−2.3	8.0									
	IC11	TRANSMIT	4.8	3.8	3.5	GND	3.5	3.4	5.6	6.2									USB LSB
		RECEIVE	4.8	3.8	3.5	GND	3.5	3.4	5.6	6.2									
	IC12	TRANSMIT	0.3	0.7	GND	6.0	13.0												ALL MODE
		RECEIVE	0.3	0.7	GND	6.0	13.0												
	IC13	TRANSMIT	1.1	5.2	4.6	GND	8.6	2.6	0	1.1	5.2	4.2	0	8.6	0.6	0			ALL MODE
		RECEIVE	1.1	5.2	4.6	GND	8.5	2.6	0	1.1	5.2	4.2	0	8.5	1.1	0			
	IC14	TRANSMIT	0.3	0	0.6	0.6	0	0	0	0.6	1.7	0	0	0	0	0	GND	0.2	FM
		RECEIVE	5.5	5.2	4.9	5.7	0.7	0.9	1.0	5.7	3.1	2.0	2.0	0	5.2	0	GND	2.0	
	IC15	TRANSMIT	8.0	13.0	8.0	GND	1.2	0.6	0	8.0									ALL MODE
		RECEIVE	8.0	13.0	8.0	GND	1.7	8.0	0	0.7									
CSS	IC1	TRANSMIT	2.9	2.7	2.4	GND	2.7	3.0	7.1	7.8									SSB SQL OPEN
		RECEIVE	2.9	2.7	2.4	GND	2.7	3.0	7.1	7.8									
	IC2	TRANSMIT	13.0	GND	−9.5														
		RECEIVE	13.0	GND	−9.5														
PA	IC1	TRANSMIT	0	13.8	7.9	13.0	5.3	GND											FM
		RECEIVE	0	13.8	0.04	13.0	0.04	GND											

HPL UNIT





C104
R71
C105
R72
C107
Q15
A
R48
C60
C61
C63
C65
C67
L13
L14
W16
C73
R50
A
R68
R47
L19
C62
L12
C69
C72
R51
C71
R74
R73
L18
R45
Q9
R46
C64
L11
C66
R52
96
H
D
C59
R44
L10
C68
C70
W17
R53
C108
C58
Q10
C126
C55
C56
C57
G
R42
Q8
R41
C13
C27
R19
C33
C75
L20
C125
C127
R43
R86
L9
C54
C124
D6
C14
R13
C34
R54
C123
D7
R9
L1
C21
R56
R57
C53
C10
C15
C26
R14
Q11
R40
R38
C51
C119
R6
L2
R55
R58
Q2
B
R11
C76
L8
R4
C20
R16
R22
IC4
R5
Q3
C25
L4
C49
C9
D3
C77
R7
C23
C24
C29
R20
C47
C46
R37
B
R3
R12
Q4
Q5
C32
C50
Q1
C31
C86
C44
C45
C19
C11
9
R15
R18
C12
C17
R10
C22
L3
C
28
L5
C
L7
D2
R2
D1
C18
R17
C30
R21
C35
F
C16
C43
R8
C118
D4
C122
R23
R87
IC3
C3
R29
R27
R26
R85
R24
W18
C39
C36
C38
R36
R35
I
K
C115
C6
C121
R25
D8
F
C
D
C7
K
R34
Q7
E
C4
E
C8
C40
L6
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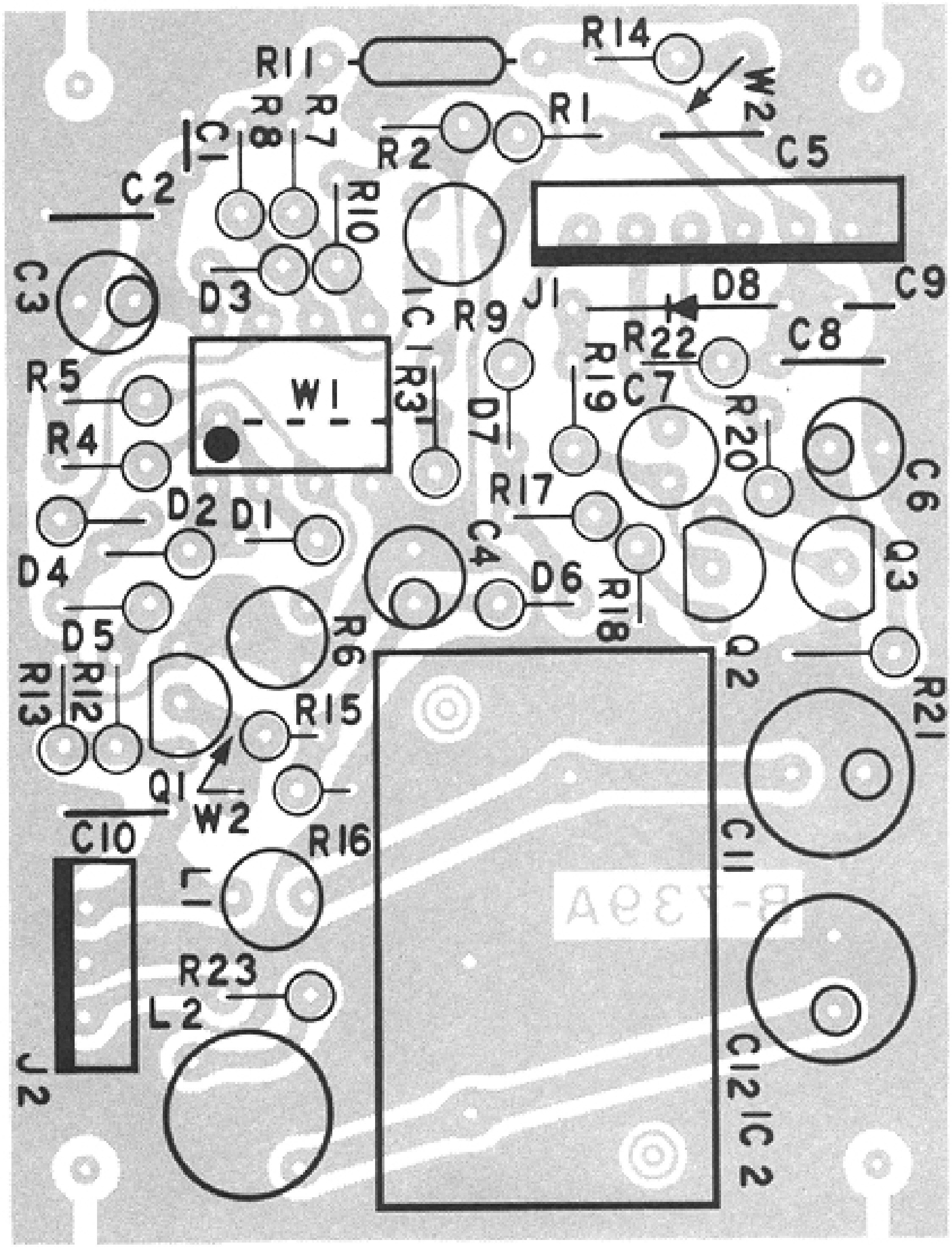
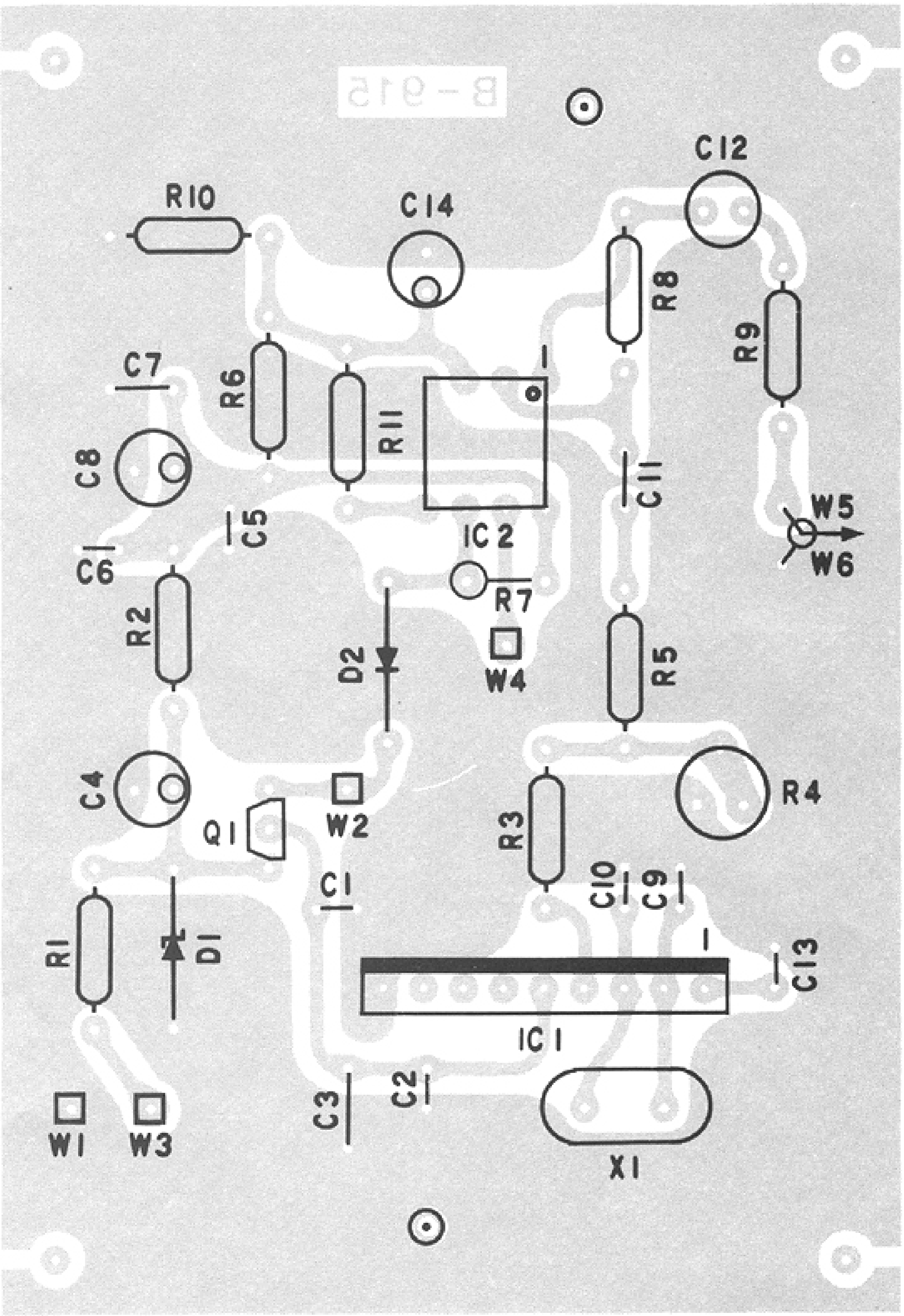
R30
R33
C42
C1
IC1
R31
R32
C37
Q6
C120

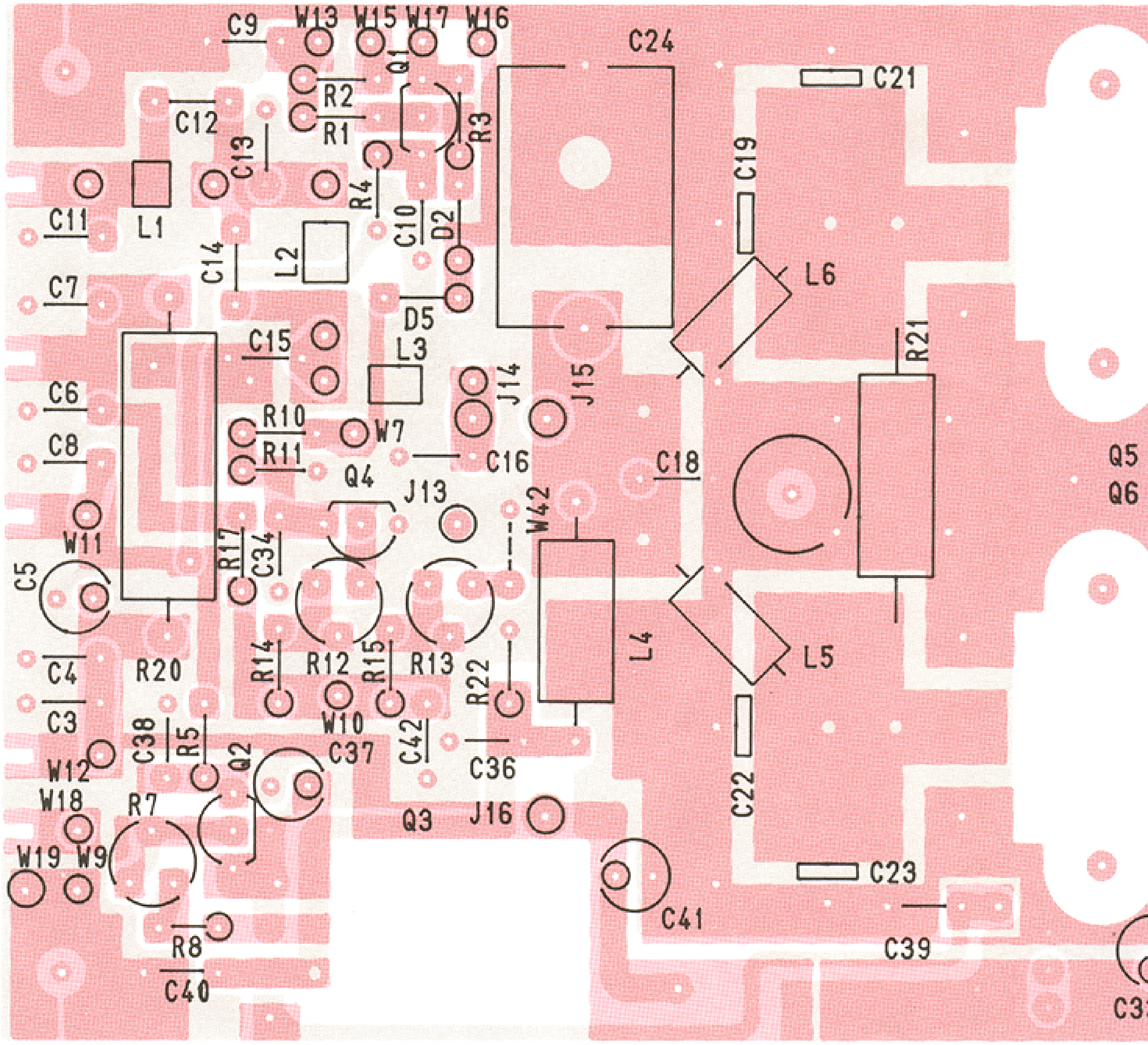
CSS UNIT

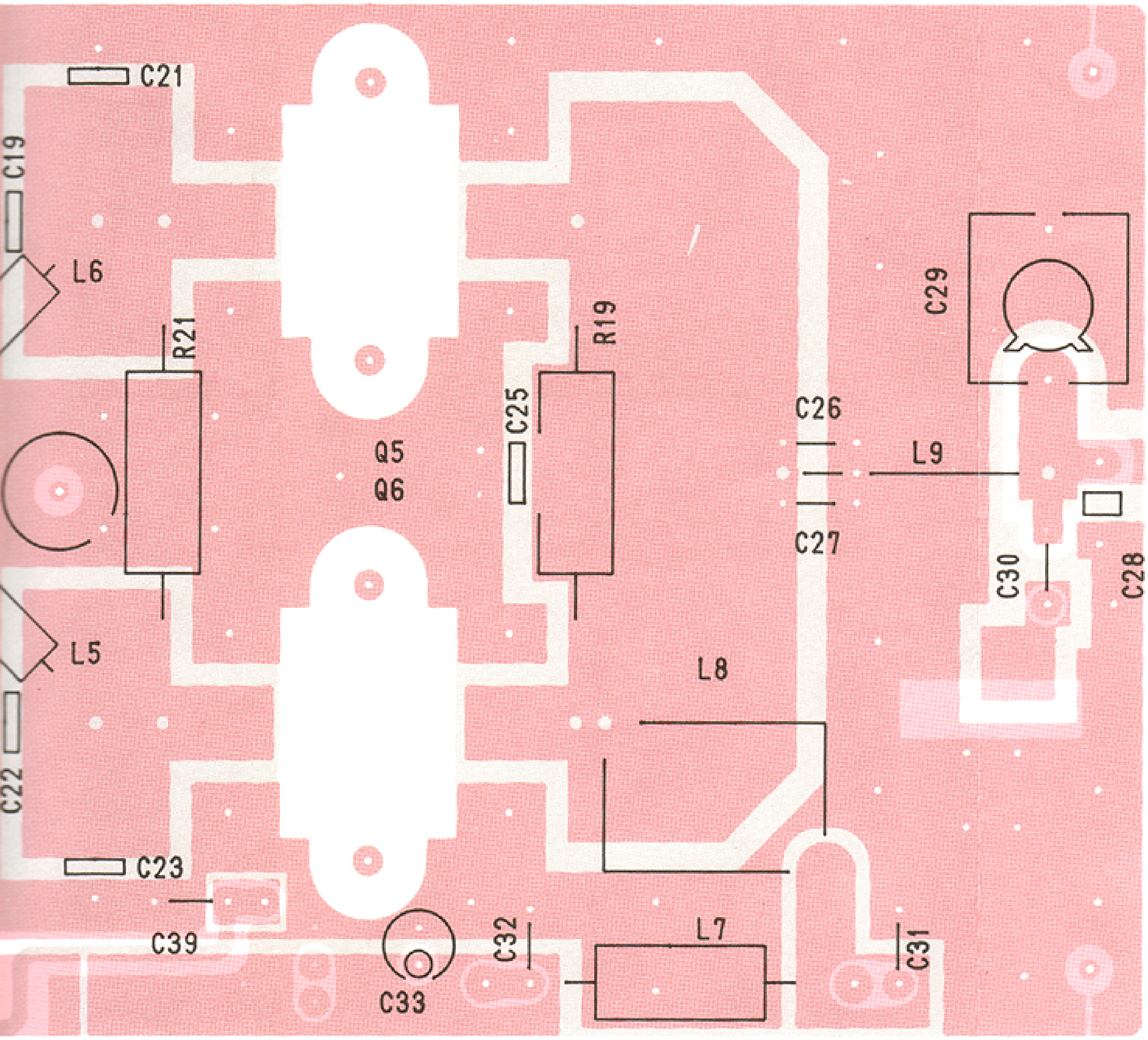

R11
R14
W2
R8
R7
R1
C1
R2
C5
C2
R10
C3
D3
IC1
R9
J1
D8
C9
R22
C8
R5
W1
R3
R19
C7
D7
R20
R4
C6
D2
D1
R17
D4
C4
D6
Q3
R18
D5
R6
Q2
R13
R12
R15
R21
Q1
W2
C10
R16
C11
L1
B-739A
R23
L2
C12
IC2
J2

TONE UNIT

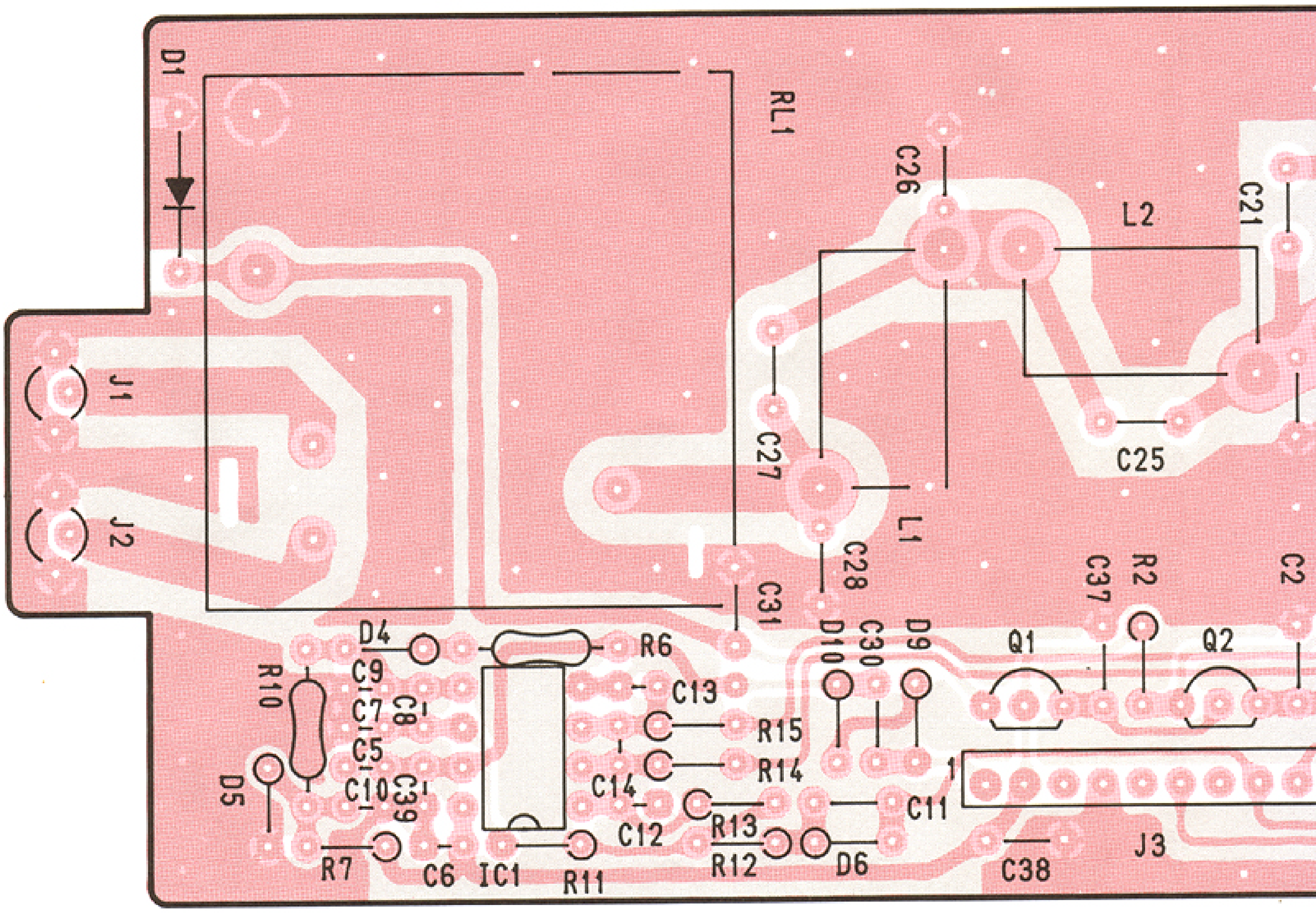

B-915
R10
C14
C12
R8
R9
C7
R6
R11
C8
C11
W5
W6
C5
IC2
C6
R7
R2
D2
W4
R5
C4
W2
R4
Q1
R3
C1
C10
C9
R1
D1
C13
IC1
C3
C2
W1
W3
X1

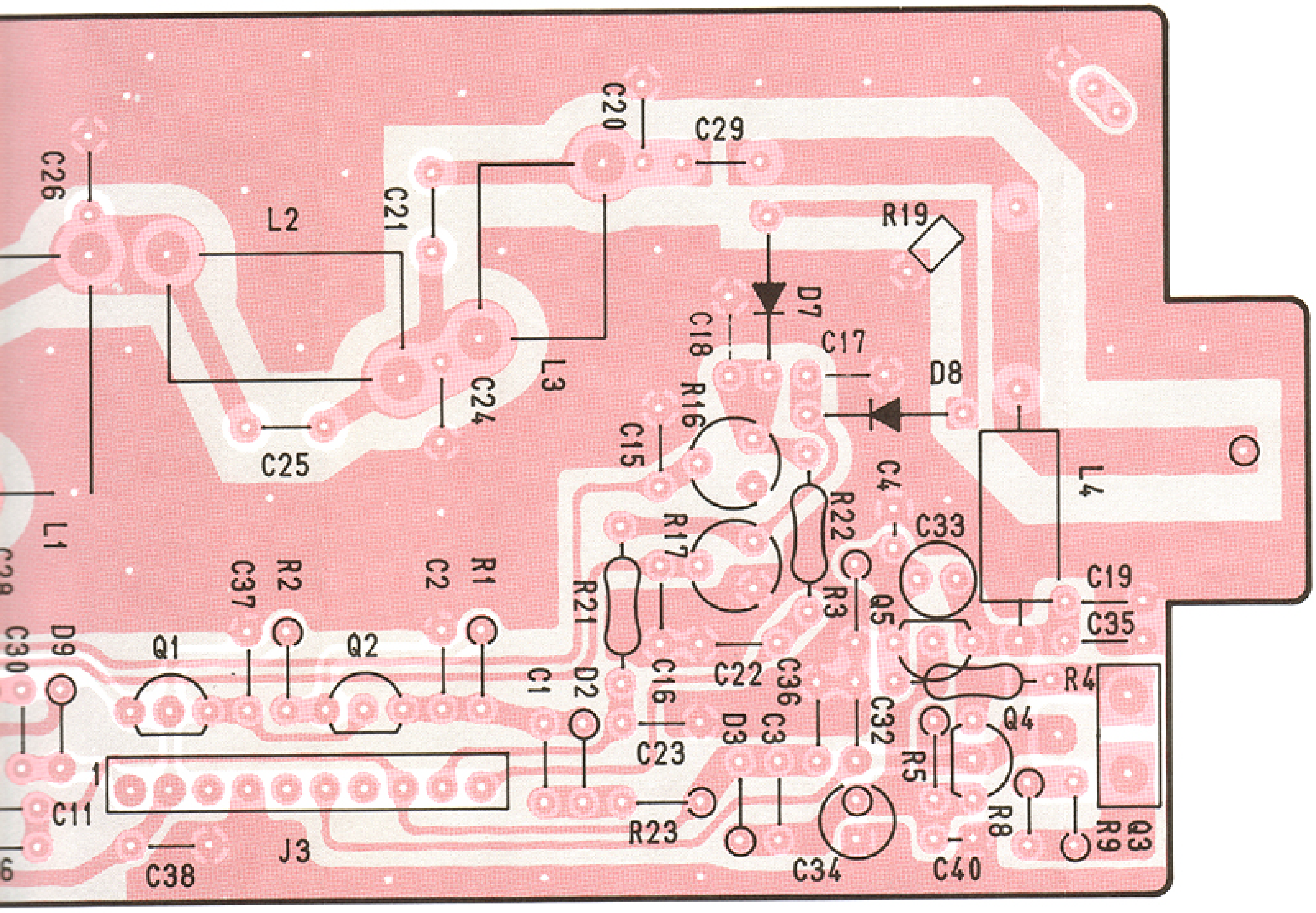
PA UNIT (IC-271H)



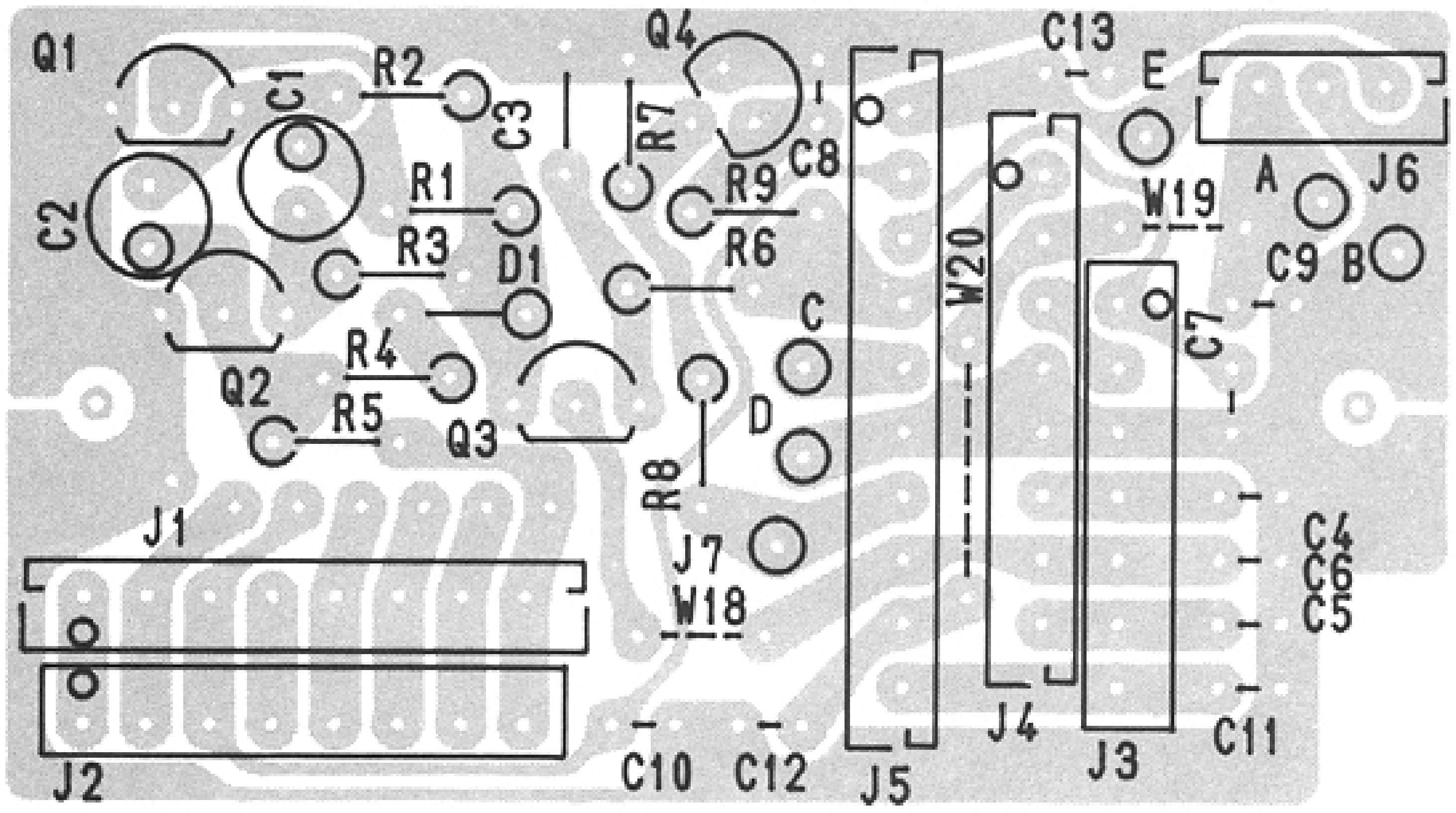

C21
C19
L6
R21
R19
C25
Q5
Q6
C26
L9
C27
C29
C30
C28
L5
L8
C22
C23
C39
C33
C32
L7
C31

FILTER UNIT (IC-271H)




C26
L2
C21
C20
C29
R19
D7
C18
C17
D8
L3
C24
C25
R16
C15
C4
C33
L4
L1
R22
R17
R21
R3
Q5
C19
C35
C37
R2
C2
R1
Q1
Q2
D9
C30
C1
D2
C16
C22
C36
C32
R4
Q4
D3
C3
C23
R5
R8
1
C11
J3
C38
R23
C34
C40
R9
Q3

TERMINAL UNIT (IC-271H)



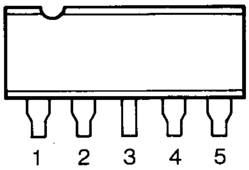
SECTION 10 IC SPECIFICATIONS

BA401 (FM/IF LIMITER)

MAXIMUM RATINGS

DESCRIPTION	SYMBOL	RATING	UNIT
SUPPLY VOLTAGE	V_{CC}	15	V
OUTPUT VOLTAGE	V_{OUT}	24	V
INPUT VOLTAGE	V_{IN}	±3	V
OPERATING TEMPERATURE	T_{OPR}	−25～+75	℃
STORAGE TEMPERATURE	T_{STG}	−55～+125	℃

PIN CONNECTIONS



PIN	FUNCTION
1	INPUT
2	BIAS
3	GND
4	OUTPUT
5	V_{CC}

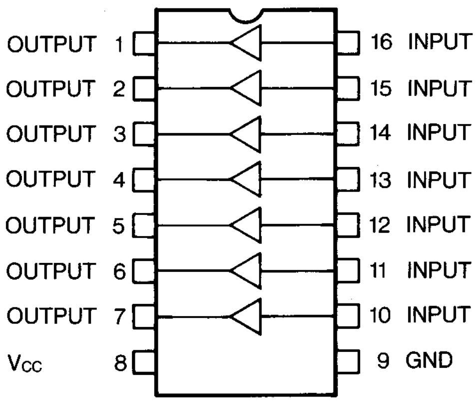
BA618 (LED DRIVER)

MAXIMUM RATINGS

DESCRIPTION	SYMBOL	RATING	UNIT
SUPPLY VOLTAGE	V_{CC}	16	V
POWER DISSIPATION	P_O	500※	mW
OPERATING TEMPERATURE	T_{OPR}	−20～+75	℃
STORAGE TEMPERATURE	T_{STG}	−55～+125	℃
DRIVE CURRENT	I_{OUT}	100	mA
INPUT VOLTAGE	V_{IN}	−0.5～16	V

※Ta=25℃(Rating degraded by 5mW for each 1℃ increase in Ta.)

BLOCK DIAGRAM/PIN CONNECTIONS

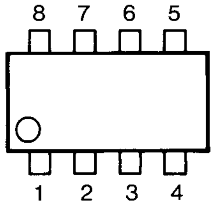


NJM4558D(DUAL LOW NOISE AMP)

MAXIMUM RATINGS(Ta=25℃)

DESCRIPTION	SYMBOL	RATING	UNIT
SUPPLY VOLTAGE	V_{DD}	±18	V
INPUT VOLTAGE	V_{IN}	±15	V
OPERATING TEMPERATURE	T_{OPR}	−20～+75	℃
STORAGE TEMPERATURE	T_{STG}	−40～+125	℃

PIN CONNECTIONS



PIN	FUNCTION	PIN	FUNCTION
1	A OUTPUT	5	B+INPUT
2	A−INPUT	6	B−INPUT
3	A+INPUT	7	B OUTPUT
4	V_{CC}	8	V_{CC}

MB-3756(VOLTAGE REGULATOR)

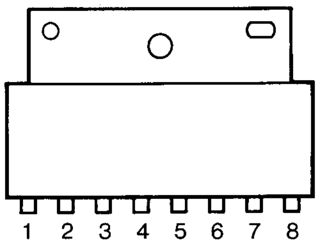
MAXIMUM RATINGS(Ta=25℃)

DESCRIPTION	SYMBOL	RATING	UNIT
INPUT VOLTAGE	V_{IN}	18	V
POWER DISSIPATION	P_D	1※1	W
		4※2	W
OPERATING TEMPERATURE	T_{OPR}	−20～+75	℃
STORAGE TEMPERATURE	T_{STG}	−55～+125	℃

※1:NO Heat Sink $T_A \leqq 70$

※2:Infinite Heat Sink $T_C \leqq 70$℃

PIN CONNECTIONS



PIN	FUNCTION	PIN	FUNCTION
1	$V_{OUT}(0)$	5	CONTROL
2	V_{IN}	6	$V_{OUT}(1)$
3	V_{REF}	7	NC
4	GROUND	8	$V_{OUT}(2)$

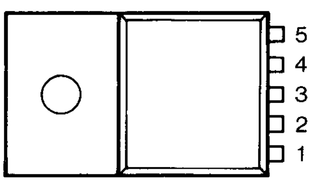
μPC2002(5.4W AUDIO POWER AMP.)

MAXIMUM RATINGS(Ta=25℃)

DESCRIPTION	SYMBOL	RATING	UNIT
PEAK SUPPLY VOLTAGE	$V_{CC}1$(50ms)	40	V
SUPPLY VOLTAGE(QUIESCENT)	$V_{CC}2$	28	V
SUPPLY VOLTAGE(OPERATIONAL)	$V_{CC}3$	18	V
OUTPUT PEAK CURRENT(REPETITIVE)	I_{CC} (PEAK)1	3.5	A
OUTPUT PEAK CURRENT(NON-REPETITIVE)	I_{CC} (PEAK)2	4.5	A
POWER DISSIPATION	P_D	15※1	W
OPERATING TEMPERATURE	T_{OPR}	−30～+75	℃
STORAGE TEMPERATURE	T_{STG}	−40～+150	℃

※1:T_C=90℃

PIN CONNECTIONS



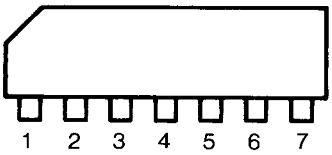
PIN	FUNCTION
1	NON-INVERTING INPUT
2	INVERTING INPUT
3	GROUND
4	OUTPUT
5	V_{CC}+

μPC577H(FM-IF AMPLIFIER)

MAXIMUM RATINGS(Ta=25℃)

DESCRIPTION	SYMBOL	RATING	UNIT
SUPPLY VOLTAGE	V_{CC}	15	V
INPUT VOLTAGE	V_{IN}	± 3.0	V
POWER DISSIPATION	P_D	300	mW
OPERATING TEMPERATURE	T_{OPR}	$-20 \sim +75$	℃
STORAGE TEMPERATURE	T_{STG}	$-40 \sim +125$	℃

PIN CONNECTIONS



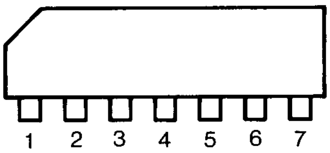
PIN	FUNCTION	PIN	FUNCTION
1	BYPASS CAPACITOR AND STABILIZ-ED VOLTAGE	5	OUTPUT
2	INPUT HIGH	6	BYPASS CAPACITOR
3	INPUT LOW	7	V_{CC}
4	GROUND		

μPC1037H(DOUBLE-BALANCED MODULATOR)

MAXIMUM RATINGS

DESCRIPTION	SYMBOL	RATING	UNIT
SUPPLY VOLATGE	V_{CC}	9	V
POWER DISSIPATION	P_D	270	mW
OPERATING TEMPERATURE	T_{OPR}	$-30 \sim +75$	℃
STORAGE TEMPERATURE	T_{STG}	$-40 \sim +125$	℃

PIN CONNECTIONS



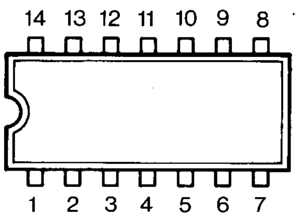
PIN	FUNCTION	PIN	FUNCTION
1	V_{CC}	5	SIGNAL INPUT
2	OUTPUT1	6	BYPASS
3	OUTPUT2	7	CARRIER INPUT
4	GND		

AN829(DUAL ATTENUATOR)

MAXIMUM RATINGS

DESCRIPTION	SYMBOL	RATING	UNIT
SUPPLY VOLTAGE	V_{CC}	18	V
INPUT CONTROL VOLTAGE	V_C	$0 \sim 6$	V
POWER DISSIPATION	P_D	450	mW
OPERATING TEMPERATURE	T_{OPR}	$-20 \sim +75$	℃
STORAGE TEMPERATURE	T_{STG}	$-55 \sim +150$	℃

PIN CONNECTIONS

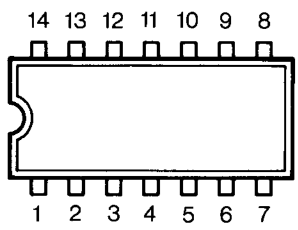


TC4001(QUAD 2-INPUT NOR GATE)
TC4011(QUAD 2-INPUT POSITIVE NAND GATE)
TC4013(DUAL D-TYPE FLIP FLOP)
TC4081(QUAD 2-INPUT POSITIVE AND GATE)

MAXIMUM RATINGS

DESCRIPTION	SYMBOL	RATING	UNIT
SUPPLY VOLTAGE	V_{DD}	$V_{SS}-0.5\sim V_{SS}+20$	V
INPUT VOLTAGE	V_{IN}	$V_{SS}-0.5\sim V_{DD}+0.5$	V
OUTPUT VOLTAGE	V_{OUT}	$V_{SS}-0.5\sim V_{DD}+0.5$	V
INPUT CURRENT	I_{IN}	±10	mA
POWER DISSIPATION	P_D	300	mW
STORAGE TEMPERATURE	T_{STG}	$-65\sim+150$	℃

PIN CONNECTIONS



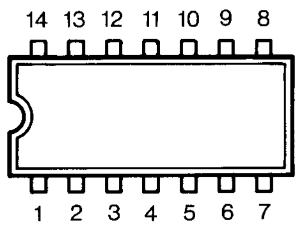
SN74LS02N(QUADRUPLE 2-INPUT POSTIVE NOR GATE)
SN74LS08N(QUADRUPLE 2-INPUT POSITIVE AND GATE)
SN74LS11N(TRIPLE 3-INPUT POSITIVE AND GATE)
SN74LS74N(DUAL D-TYPE POSITIVE EDGE-TRIGGERED FLIP FLOP WITH SET AND RESET)
SN7404(HEX INVERTERS)
SN7408(QUADRUPLE 2-INPUT POSITIVE AND GATE)
SN7432(QUADRUPLE 2-INPUT POSITIVE OR GATE)

MAXIMUM RATINGS

DESCRIPTION	SYMBOL	RATING	UNIT
SUPPLY VOLTAGE	V_{CC}	$-0.5\sim+7$	V
INPUT VOLTAGE	V_{IN}	$-0.5\sim+15$	V
OUTPUT VOLTAGE※	V_{OUT}	$-0.5\sim V_{CC}$	V
OPERATING TEMPERATURE	T_{OPR}	$-20\sim+75$	℃
STORAGE TEMPERATURE	T_{STG}	$-65\sim+150$	℃

※When the output is HIGH.

PIN CONNECTIONS



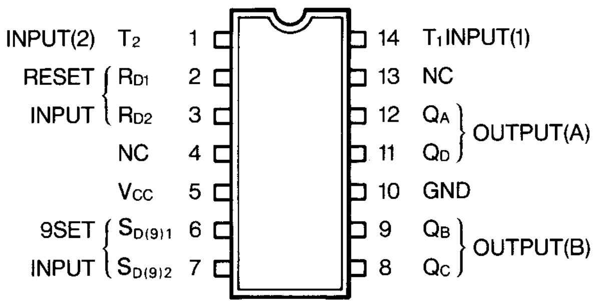
SN74LS90N (DECODE COUNTER)

MAXIMUM RATINGS

DESCRIPTION	SYMBOL	RATING	UNIT
SUPPLY VOLTAGE	V_{CC}	$-0.5\sim+7$	V
INPUT VOLTAGE ※1	V_{IN}	$-0.5\sim+5.5$	V
※2	V_{IN}	$-0.5\sim+15$	
OUTPUT VOLTAGE	V_{OUT}	$-0.5\sim V_{CC}$	V
OPERATING TEMPERATURE	T_{OPR}	$-20\sim+75$	℃
STORAGE TEMPERATURE	T_{STG}	$-65\sim+150$	℃

※1 Inputs $T_1 \cdot T_2$ ※2 Inputs $R_{D1}, R_{D2}, S_{D(9)1}, S_{D(9)2}$

PIN CONNECTIONS



SN74LS123N (DUAL RETRIGGERABLE MONOSTABLE MULTIVIBRATOR WITH RESET)
SN74LS377N (OCTAL POSITIVE EDGE–TRIGGERED D–TYPE FLIP FLOP WITH ENABLE)

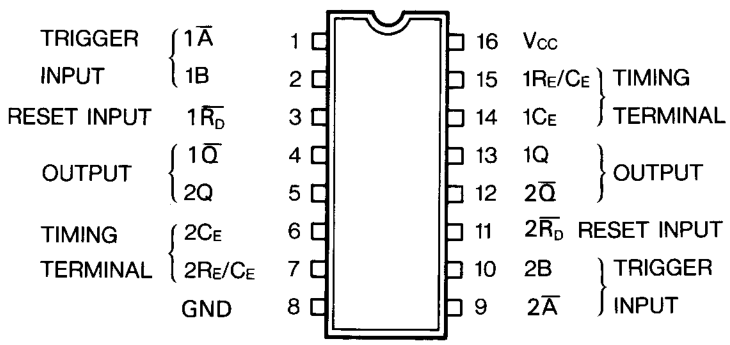
MAXIMUM RATINGS

DESCRIPTION	SYMBOL	RATING	UNIT
SUPPLY VOLTAGE	V_{CC}	$-0.5\sim+7$	V
INPUT VOLTAGE	V_{IN}	$-0.5\sim+15$	V
OUTPUT VOLTAGE※	V_{OUT}	$-0.5\sim V_{CC}$	V
OPERATING TEMPERATURE	T_{OPR}	$-20\sim+75$	℃
STORAGE TEMPERATORE	T_{STG}	$-65\sim+150$	℃

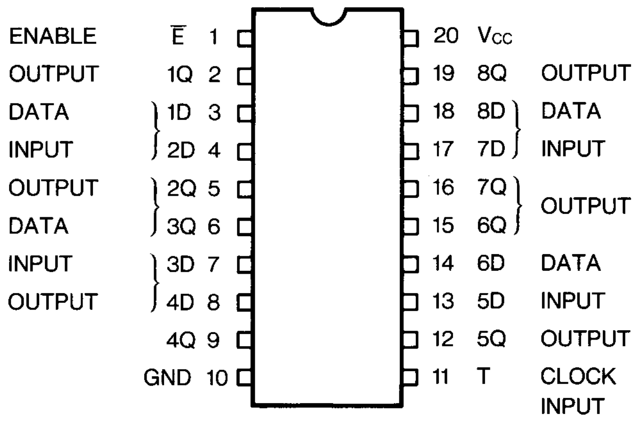
※When the output is HIGH.

PIN CONNECTIONS

(SN74LS123N)



(SN74LS377N)

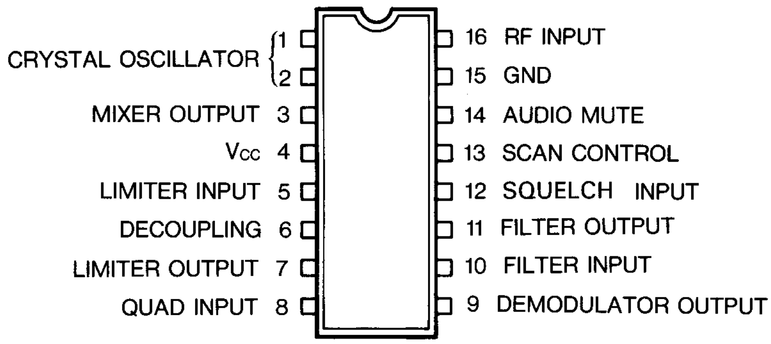


MC-3357 (LOW POWER FM IF)

MAXIMUM RATINGS

DESCRIPTION	SYMBOL	RATING	UNIT
SUPPLY VOLTAGE	V_{CC}	12	V
SUPPLY VOLTAGE	V_{CC}	4~8	V
INPUT VOLTAGE	V_{IN}	1.0	V_{RMS}
OPERATING TEMPERATURE	T_{OPR}	−30~+70	℃
STORAGE TEMPERATURE	T_{STG}	−65~+150	℃

PIN CONNECTIONS

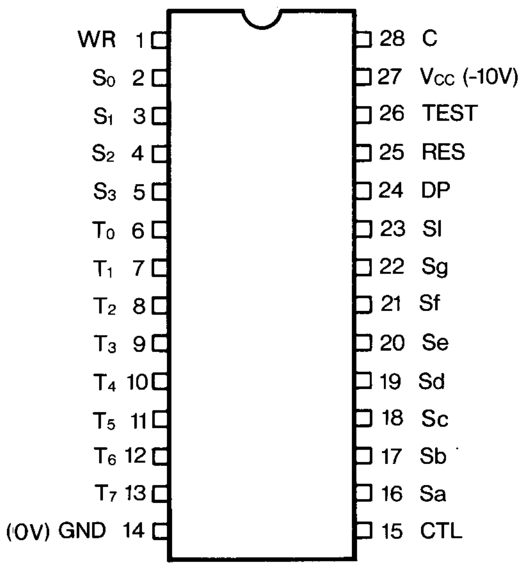


μPD549C (PROGRAMMABLE DISPLAY CONTROLLER)

MAXIMUM RATINGS

DESCRIPTION	SYMBOL	RATING	UNIT
SUPPLY VOLTAGE	V_{GG}	−15~+0.3	V
INPUT VOLTAGE	V_{IN}	−20~+0.3	V
OUTPUT VOLTAGE	V_{OUT}	−42~+0.3	V
OPERATING TEMPERATURE	T_{OPR}	−10~+70	℃
STORAGE TEMPERATURE	T_{STG}	−40~+125	℃

PIN CONNECTIONS

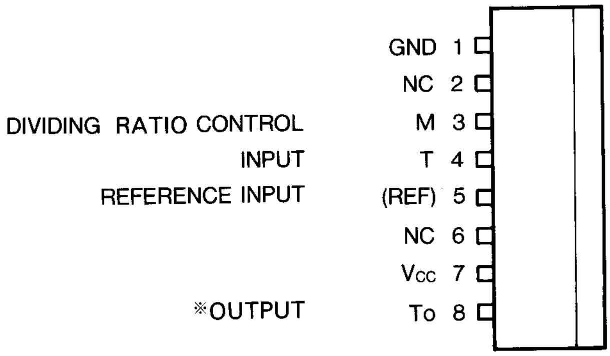


M54459L(1/20,1/100 HIGH SPEED DIVIDER)

MAXIMUM RATINGS

DESCRIPTION	SYMBOL	RATING	UNIT
SUPPLY VOLTAGE	V_{CC}	7	V
INPUT VOLTAGE	V_{IN}	2.5	V
OUTPUT VOLTAGE	V_{OUT}	5.5	V
POWER DISSIPATION	P_D	1.33	W
OPERATING TEMPERATURE	T_{OPR}	−10～+75	℃
STORAGE TEMPERATURE	T_{STG}	−55～+125	℃

PIN CONNECTIONS



Dividing ratio vs. input level.

M	L	H
DIVIDING RATIO	1/20	1/100

※Open collector output

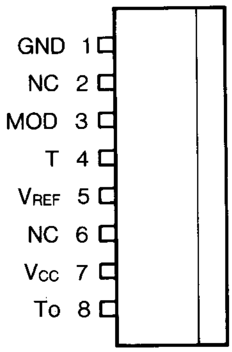
M54466L(1/10,1/11 DIVIDER)

MAXIMUM RATINGS

DESCRIPTION	SYMBOL	RATING	UNIT
SUPPLY VOLTAGE	V_{CC}	−0.5～7	V
INPUT VOLTAGE	V_{IN}	2	V
OUTPUT VOLTAGE	V_{OUT}	3	V
POWER DISSIPATION	P_D	500※	mW
OPERATING TEMPERATURE	T_{OPR}	−20～+75	℃
STORAGE TEMPERATURE	T_{STG}	−40～+125	℃

※Ta=75℃

PIN CONNECTIONS

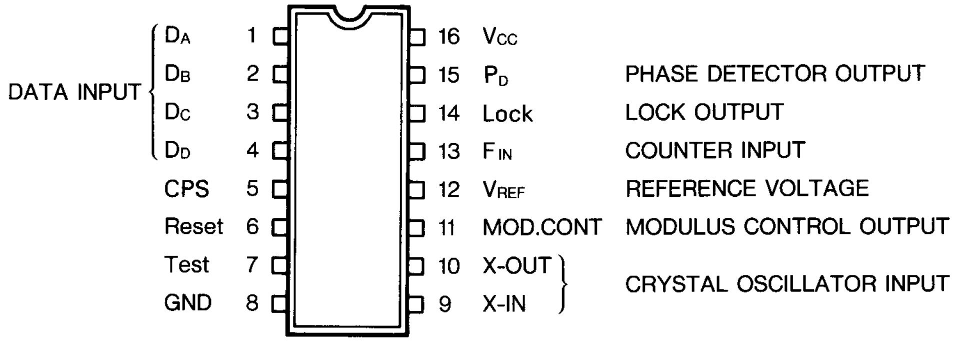


M54929P(DUAL MODULUS PLL IC)

MAXIMUM RATINGS

DESCRIPTION	SYMBOL	RATING	UNIT
SUPPLY VOLTAGE	V_{CC}	$-0.5 \sim 6$	V
INPUT VOLTAGE	V_{IN}	$-0.5 \sim 6$	V
OUTPUT VOLTAGE	V_{OUT}	V_{CC}	V
POWER DISSIPATION	P_D	600	mW
OPERATING TEMPERATURE	T_{OPR}	$-20 \sim +75$	℃
STORAGE TEMPERATURE	T_{STG}	$-40 \sim +125$	℃

PIN CONNECTIONS

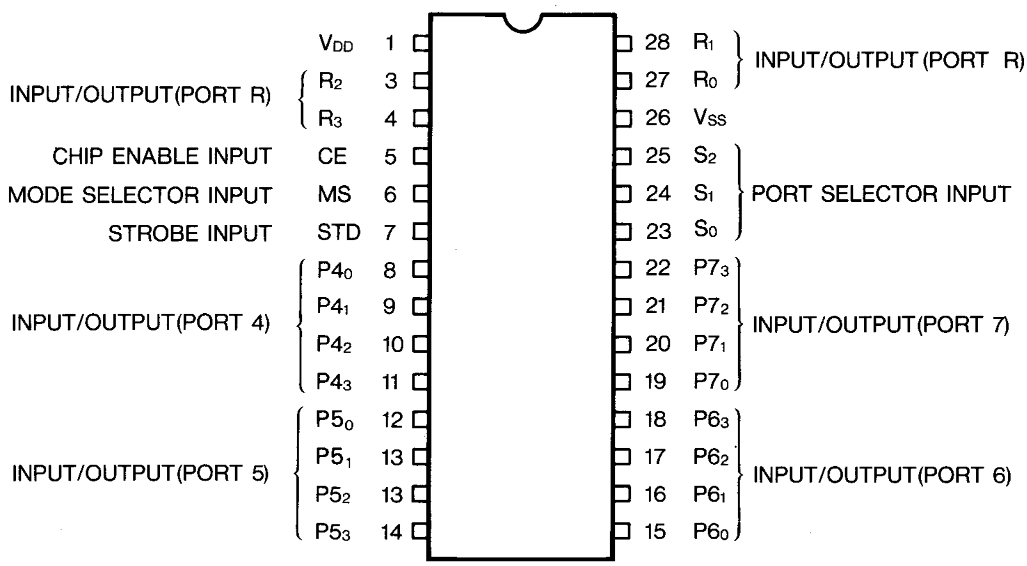


M50781SP (INPUT/OUTPUT EXPANDER)

MAXIMUM RATINGS

DESCRIPTION	SYMBOL	RATING	UNIT
SUPPLY VOLTAGE	V_{DD}	$-0.3 \sim 15$	V
INPUT VOLTAGE	V_{IN}	$V_{SS}-0.3 \sim V_{DD}+0.3$	V
OUTPUT VOLTAGE	V_{OUT}	$V_{SS}-0.3 \sim V_{DD}+0.3$	V
POWER DISSIPATION	P_D	600	mW
OPERATING TEMPERATURE	T_{OPR}	$-10 \sim +70$	℃
STORAGE TEMPERATURE	T_{STG}	$-40 \sim +125$	℃

PIN CONNECTIONS

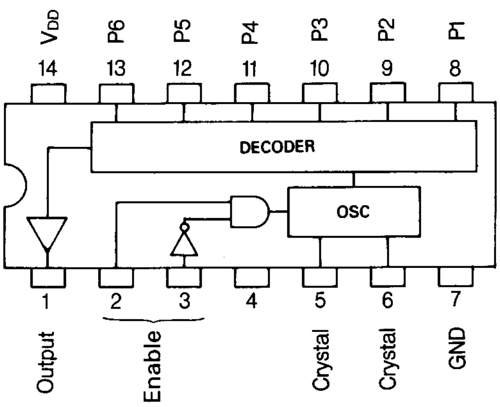


S-7116A(PROGRAMMABLE TONE GENERATOR)

MAXIMUM RATINGS

DESCRIPTION	SYMBOL	RATING	UNIT
SUPPLY VOLTAGE	V_{DD}	12	V
OPERATING TEMPERATURE	T_{OPR}	−25～+70	℃

PIN CONNECTIONS



PROGRAMMING TABLE

Tone freq.	P1	P2	P3	P4	P5	P6	Tone freq.	P1	P2	P3	P4	P5	P6	Tone freq.	P1	P2	P3	P4	P5	P6
67.0	1						136.5	1		1		1		500	1	1	1			1
71.9		1					141.3		1	1		1		600				1		1
74.4	1	1					146.2	1	1	1		1		700	1			1		1
77.0			1				151.4				1	1		800		1		1		1
79.7	1		1				156.7	1			1	1		900	1	1		1		1
82.5		1	1				162.2		1		1	1		1000			1	1		1
85.4	1	1	1				167.9	1	1		1	1		1600	1		1	1		1
88.5				1			173.8			1	1	1		1700		1	1	1		1
91.5	1			1			179.9	1		1	1	1		1750	1	1	1	1		1
94.8		1		1			186.2		1	1	1	1		1800					1	1
97.4	1	1		1			192.8	1	1	1	1	1		1300	1				1	1
100.0			1	1			203.5						1	2000		1			1	1
103.5	1		1	1			210.7	1					1	2200	1	1			1	1
107.2		1	1	1			218.1		1				1	2975			1		1	1
110.9	1	1	1	1			225.7	1	1				1	2550	1		1		1	1
114.8					1		233.6			1			1	2295		1	1		1	1
118.8	1				1		241.8	1		1			1	2125	1	1	1		1	1
123.0		1			1		250.3		1	1			1	1275				1	1	1
127.3	1	1			1									1445	1			1	1	1
131.8			1		1															

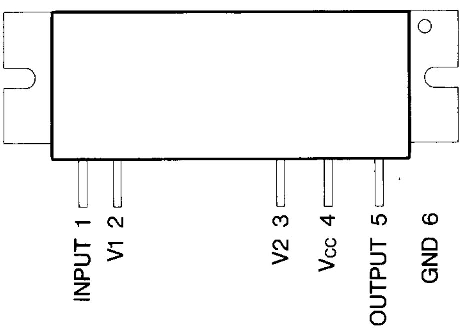
NOTE) 1 :V_{DD}
Blank :Ground or Open
Crystal frequency :3.579545MHz

SC-1013(10W VHF RF POWER AMPLIFIER)
SC-1020(25W VHF RF POWER AMPLIFIER)

MAXIMUM RATINGS

DESCRIPTION	SYMBOL	RATING		UNIT
		SC-1013	SC-1020	
SUPPLY VOLTAGE	V_{CC}	17	17	V
INPUT POWER	P_{IN}	0.3	0.5	W
OUTPUT POWER	P_{OUT}	19	40	W
OPERATING TEMPERATURE	T_{OPR}	−30～+110		℃

PIN CONNECTIONS

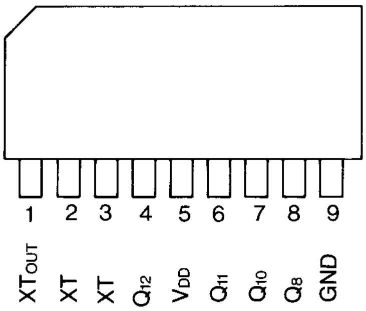


TC5082P(OSCILLATOR AND 12 STAGE DIVIDER)

MAXIMUM RATINGS

DESCRIPTION	SYMBOL	RATING	UNIT
SUPPLY VOLTAGE	V_{DD}	10	V
INPUT VOLTAGE	V_{IN}	$-0.3 \sim V_{DD} \sim +0.3$	V
OPERATING TEMPERATURE	T_{OPR}	$-30 \sim +75$	℃
STORAGE TEMPERATURE	T_{STG}	$-55 \sim +125$	℃

PIN CONNECTIONS



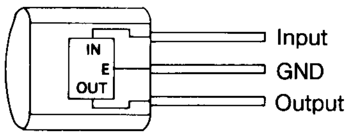
PIN NO.	8	7	6	4	1
PIN NAME	Q_8	Q_{10}	Q_{11}	Q_{12}	XT_{OUT}
DIVISION RATIO	1/256	1/1024	1/2048	1/4096	1/1

78L05AC(3-TERMINAL POSITIVE VOLTAGE REGULATOR)

MAXIMUM RATINGS

DESCRIPTION	SYMBOL	RATING	UNIT
INPUT VOLTAGE	V_{IN}	30	V
OUTPUT VOLTAGE	V_{OUT}	5.25	V
POWER DISSIPATION	P_D	500	mW
OPERATING TEMPERATURE	T_{OPR}	$-30 \sim +75$	℃
STORAGE TEMPERATURE	T_{STG}	$-40 \sim +125$	℃

PIN CONNECTIONS



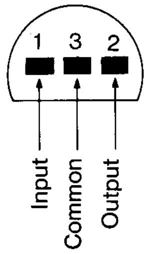
μA78L82AC(3-TERMINAL POSITIVE VOLTAGE REGULATOR)

MAXIMUM RATINGS

DESCRIPTION	SYMBOL	RATING	UNIT
INPUT VOLTAGE	V_{IN}	14	V
OUTPUT VOLTAGE	V_{OUT}	8.2	V
POWER DISSIPATION	P_D	Internally limited	—
OPERATING TEMPERATURE	T_{OPR}	0～+150	℃
STORAGE TEMPERATURE	T_{STG}	−55～+150	℃

PIN CONNECTIONS

(Bottom View)

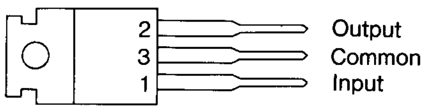


μA78M05C(3-TERMINAL POSITIVE VOLTAGE REGULATOR)

MAXIMUM RATINGS

DESCRIPTION	SYMBOL	RATING	UNIT
INPUT VOLTAGE	V_{IN}	10	V
OUTPUT VOLTAGE	V_{OUT}	5	V
POWER DISSIPATION	P_D	Internally limited	—
OPERATING TEMPERATURE	T_{OPR}	0～+150	℃
STORAGE TEMPERATURE	T_{STG}	−55～+150	℃

PIN CONNECTIONS



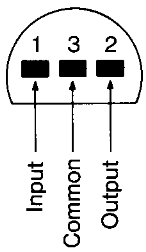
TA78L009AP(3-TERMINAL POSITIVE VOLTAGE REGULATOR)

MAXIMUM RATINGS

DESCRIPTION	SYMBOL	RATING	UNIT
INPUT VOLTAGE	V_{IN}	15	V
OUTPUT VOLTAGE	V_{OUT}	9.36	V
POWER DISSIPATION	P_D	800	mW
OPERATING TEMPERATURE	T_{OPR}	−30～+75	℃
STORAGE TEMPERATURE	T_{STG}	−55～+150	℃

PIN CONNECTIONS

(Bottom View)



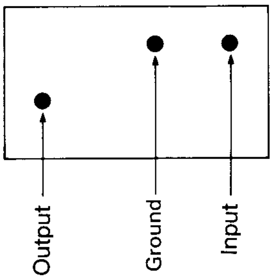
DP-2(DC-DC CONVERTER)

MAXIMUM RATINGS

DESCRIPTION	SYMBOL	RATING	UNIT
INPUT VOLTAGE	V_{IN}	+10~+18	V
OUTPUT VOLTAGE	V_{OUT}	10.16	V
OUTPUT CURRENT	I_O	100	mA

PIN CONNECTIONS

(Bottom View)

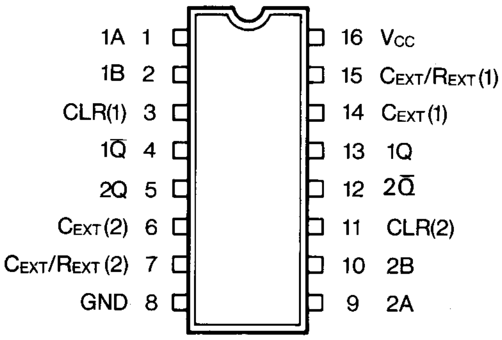


M53323P(RETRIGGERABLE MONOSTABLE MULTIVIBRATOR)

MAXIMUM RATINGS

DESCRIPTION	SYMBOL	RATING	UNIT
SUPPLY VOLTAGE	V_{CC}	5.25	V
HIGH-LEVEL INPUT VOLTAGE	V_{IH}	2(minimum)	V
LOW-LEVEL INPUT VOLTAGE	V_{IL}	0.8	V
HIGH-LEVEL OUTPUT VOLTAGE	V_{OH}	3.5	V
LOW-LEVEL OUTPUT VOLTAGE	V_{OL}	0.5	V
OPERATING TEMPERATURE	T_{OPR}	0~70	℃

PIN CONNECTIONS



FUNCTION TABLE

INPUTS			OUTPUTS	
CLEAR	A	B	Q	$\overline{Q}$
L	X	X	L	H
X	H	X	L	H
X	X	L	L	H
H	L	↑	⎍	⊔
H	↓	H	⎍	⊔
↑	L	H	⎍	⊔

SECTION 11 PARTS LIST

EF UNIT

REF.NO.	DESCRIPTION	PART NO.
Q1	Transistor	2SA798
Q2	Transistor	2SC945P
Q3	Transistor	2SC945P
Q4	Transistor	2SA1015Y
Q5	Transistor	2SC945P
Q6	Transistor	2SA1015Y
Q7	Transistor	2SC945P
Q8	Transistor	2SC945P
Q9	Transistor	2SC945P
Q10	Transistor	2SC945P
Q11	Transistor	2SA1015Y
Q12	Transistor	2SC3399
Q13	Transistor	2SC3399
Q14	Transistor #02,05	2SC3402
Q15	Transistor	2SC1571G
D1	Diode	1SS53
D2	LED	SLB-22UR5
D3	LED	SLB-22GG5
D4	Diode	1SS53
D5	Diode	1SS53
D6	Diode	1SS53
D7	Diode	1SS53
D8	Diode	1SS53
D9	Diode	1SS53
D10	Diode	1SS53
D11	Diode	1SS53
D12	Diode	1SS53
D13	Diode	1SS53
D14	Diode	1SS53
D15	Diode	1SS53
D16	Diode	1SS53
D17	Diode	1SS53
D18	Diode	1SS53
D19	Diode	1SS53
D20	Diode	1SS53
D21	Diode	1SS53
D22	Diode	1SS53
D23	Diode	1SS53
D24	Diode	1SS53
D25	Diode	1SS53
D26	Diode	1SS53
D27	Diode	1SS53
D28	Diode	1SS53
D29	Diode	1SS53
D30	LED	SLB-22YY5
D32	Diode	1SS53
L1	Choke	BTO1RN1-A61
L2	Choke	BTO1RN1-A61
L4	Choke	BTO1RN1-A61

EF UNIT

REF.NO.	DESCRIPTION	PART NO.
M1	Meter	KL-251L-5
R1	Resistor	4.7K ELR25
R2	Resistor	100 R10
R3	Resistor	100 R10
R4	Resistor	47K R25
R5	Resistor	3.9K ELR25
R6	Variable	K12B6001A-10KA,10KC
R7	Resistor	3.3 R25
R8	Trimmer	20K-B FR-10
R9	Resistor	10K R25
R13	Variable	K12B6001A-10KA,10KC
R14	Variable	K13C1000N- 10KA,10KB,500B
R15	Resistor	22K ELR25
R16	Resistor	4.7K R10
R17	Resistor	3.3K R25
R18	Resistor	2.2K ELR25
R19	Resistor	1K R10
R20	Resistor	1K R10
R21	Resistor	47K R25
R22	Resistor	27K ELR25
R23	Resistor	47K ELR25
R24	Resistor	47K R25
R25	Resistor	47K ELR25
R27	Resistor	47K ELR25
R28	Resistor	47K ELR25
R29	Resistor	47K ELR25
R30	Resistor	10K R25
R31	Resistor	47K R25
R32	Resistor	47K ELR25
R33	Resistor	47K ELR25
R34	Resistor	47K ELR25
R35	Resistor	1K R10
R36	Resistor	47K ELR10
R37	Resistor	47K ELR10
R39	Resistor	1.8K ELR10
R40	Resistor	10K R10
R41	Resistor	1K ELR10
R42	Resistor	10K ELR10
R43	Resistor	1K ELR10
R44	Resistor	100 R25
R45	Resistor	4.7K ELR10
R46	Resistor	1K ELR10
C1	Ceramic	0.001 50V
C2	Ceramic	0.001 50V
C3	Ceramic	0.001 50V
C4	Ceramic	0.001 50V
C5	Ceramic	0.001 50V
C6	Ceramic	0.001 50V

EF UNIT

REF.NO.	DESCRIPTION	PART NO.
C7	Ceramic	0.001 50V
C8	Electrolytic	1μ(BP) 50V
C10	Ceramic	0.001 50V
C11	Ceramic	0.0047 50V
C12	Electrolytic	10μ 16V
C13	Electrolytic	33μ 10V
C14	Electrolytic	470μ 16V
C15	Electrolytic	100μ 10V
C16	Electrolytic	1μ(BP) 50V
P1	Connector	TSL-P03H-A1 (IC-271H: EHR-03)
P2	Connector	TSL-P05H-A1 (IC-271H: EHR-05)
P3	Connector	TL-25H-04-B1 (IC-271H: EHR-04)
P4	Connector	TL-25H-03-B1 (IC-271H: EHR-03)
P5	Connector	TL-25H-12-B1 (IC-271H: EHR-12)
P6	Connector	5250-02
P7	Connector	TL-25H-03-B1 (IC-271H: EHR-03)
P8	Connector	TL025H-13-B1 (IC-271H: EHR-13)
P9	Connector	TL-25H-04-B1 (IC-271H: EHR-04)
P10	Connector	1545P-1
P11	Connector	TL-25H-06-B1 (IC-271H: EHR-06)
P12	Connector	TL-25H-02-B1
P13	Connector	5250-02
P14	Connector	TL-25H-05-B1 (IC-271H: EHR-05)
P15	Connector	TL-25H-06-B1 (IC-271H: EHR-06)
P16	Connector	TL-25H-07-B1 (IC-271H: EHR-07)
P17	Connector	TL-25H-08-B1 (IC-271H: EHR-08)
P18	Connector	TL-25H-07-B1 (IC-271H: EHR-07)
P19	Connector	TSL-P12H-A1 (IC-271H: EHR-12)
P20	Connector	TSL-P12H-A1 (IC-271H: EHR-08)
P21	Connector	TL-25H-03-B1 (IC-271H: EHR-03)
P22	Connector	001T4100
P23	Connector	EHR-02
J1	Connector	TSL-P03P-A1 (IC-271H: B03B-EH)
J2	Connector	TSL-P05P-A1 (IC-271H: B05B-EH)
J3	Connector	TSL-P12P-A1 (IC-271H: B12B-EH)
J4	Connector	TSL-25P-08-L1 (IC-271H: S08B-EH)
J5	Connector	TSL-P04P-A1 (IC-271H: B04B-EH)
J6	Connector	HLJ4815-01-030

EF UNIT

REF.NO.	DESCRIPTION	PART NO.
J7	Connector	FM214-8SS(P)
J8	Connector	TLB-P04H-B1
J9	Connector	TLB-P05H-B1
J10	Connector	TLB-P03H-B1
J11	Connector	TLB-P03H-B1
J12	Connector	TLB-P03H-B1
J13	Connector	TLB-P04H-B1
J14	Connector	TLB-P05H-B1
J15	Connector	TLB-P05H-B1
J17	Connector	B02B-EH
S1	SW	SUT61D
S2	SW	M2012J
S3	SW	TWA0068-01-233
S4	SW	HKW0269-01-200
S5	SW	HKW0269-01-200
S6	SW	HKW0269-01-200
S7	SW	HKW0269-01-200
S8	SW	HKW0269-01-200
S9	SW	HKW0269-01-200
S10	SW	HKW0269-01-200
S11	SW	HKW0269-01-200
S12	SW	HKW0269-01-200
S13	SW	HKW0269-01-200
S14	SW	HKW0269-01-200
S15	SW	HKW0269-01-200
S16	SW	HKW0269-01-200
S17	SW	SUT11A
S18	SW	SUT11B
S19	SW	SUT11A
S20	SW	HKW0145-01-220
S21	SW	HKW0145-01-220
S22	SW	HKW0269-01-200
S23	SW	HKW0269-01-200
S24	SW	HKW0269-01-200
S25	SW	HKW0269-01-200
S26	SW	HKW0269-01-200
S27	SW	SPH121C
S28	Rotary enc.	LA22402
S29	Rotary enc.	LA24007
	VR P.C.B.	
B1	P.C.B.	B-646E
	Display P.C.B.	
B2	Display P.C.B.	B-649F
	Mic P.C.B.	
B3	Mic P.C.B.	B-740
PL1	Lamp	BQ044-3258A
	Ferrite Beads	Ri3.7-5.1-1.4-2D1
F1	Fuse Holder	TFH-S30 (IC-271H)
W1	Jumper	JPW02H
W3	Jumper	JPW02A
W119	Jumper	JPW02A

EF UNIT

REF.NO.	DESCRIPTION	PART NO.
W121	Jumper	JPW02A
W122	Jumper	JPW02H
W123	Jumper	JPS-1041-4
W124	Jumper	JPW02A
W125	Jumper	JPW02A
W126	Jumper	JPW02A
W127	Jumper	JPW02A
W128	Jumper	JPS-1041-4
W129	Jumper	JPW02A
W130	Jumper	JPW02A
W136	Jumper	JPS-1041-2
W139	Jumper	JPS-1041-4
W140	Jumper	JPS-1041-4
W141	Jumper	JPS-1041-4
W143	Jumper	JPW02A
W145	Jumper	JPW02A
W146	Jumper	JPW02A
W147	Jumper	JPW02A
W148	Jumper	JPW02H
W150	Jumper	JPS-1041-4
W151	Jumper	JPW02A
W152	Jumper	JPW02A
W164	Jumper	JPS-1041-4
W166	Jumper	JPW02H
W167	Jumper	JPS-1041-4
W168	Jumper	JPS-1041-4
W169	Jumper	JPS-1041-4
W170	Jumper	JPS-1041-4
W171	Jumper	JPS-1041-4
W172	Jumper	JPS-1041-4
W182	Jumper	JPS-1041-4
W185	Jumper	JPS-1041-4
W186	Jumper	JPS-1041-4 #02
W187	Jumper	JPS-1041-4 #02
W188	Jumper	JPS-1041-4 #02
W189	Jumper	JPS-1041-4 #02
W190	Jumper	JPS-1041-4
W191	Jumper	JPS-1041-4
W192	Jumper	JPS-1041-2
W196	Jumper	JPS-1041-4
W210	Jumper	JPS-1041-2

DISPLAY UNIT

REF.NO.	DESCRIPTION	PART NO.
IC1	IC	μPD549C
IC2	IC	μPD549C
Q1	Transistor	2SA1015Y
Q2	Transistor	2SA1015Y
Q3	Transistor	2SA1015Y
Q4	Transistor	2SA1015Y
Q5	Transistor	2SA1015Y
Q6	Transistor	2SA1015Y
Q7	Transistor	2SA1015Y
Q8	Transistor	2SA1015Y
Q9	Transistor	2SA1015Y
Q10	Transistor	2SA1015Y
Q11	Transistor	2SA1015Y
Q12	Transistor	2SC1214C
Q13	Transistor	2SC1214C
Q14	Transistor	2SC1214C
Q15	Transistor	2SA1015Y
Q16	Transistor	2SC2785EF
D1	Diode	1SS55
D2	Diode	1SS55
D3	Diode	1SS55
D4	Diode	1SS55
D5	Diode	1SS55
D7	Diode	1SS55
D8	Zener	XZ-051 (IC-271H: RD5.1EB2)
D9	Diode	1SS55
D10	Diode	1SS55
D11	Diode	1SS55
D12	Diode	1SS55
D13	Zener	XZ-051 (IC-271H: RD5.1EB2)
D14	Diode	1SS55
D15	Diode	1SS55
T1	Transformer	TO-9
L1	Choke	LW-12
R1	Resistor	1K ELR25
R2	Resistor	1K ELR25
R3	Resistor	1K ELR25
R4	Resistor	1K ELR25
R5	Array	47K RM4
R6	Array	47K RM4
R7	Array	47K RM7
R8	Array	47K RM8
R9	Array	47K RM5
R10	Array	47K RM8
R11	Array	47K RM6
R12	Resistor	47K ELR25
R13	Resistor	47K ELR25
R14	Resistor	47K ELR25
R15	Resistor	47K ELR25
R16	Resistor	3.3K ELR25 (IC-271H: 2.2K ELR25)
R17	Resistor	3.3K ELR25 (IC-271H: 2.2K ELR25)

DISPLAY UNIT

REF.NO.	DESCRIPTION	PART NO.	
R18	Resistor	100	ELR25
R19	Resistor	47	ELR25
R20	Resistor	10K	ELR25
R21	Resistor	2.2K	ELR25
R22	Resistor	2.2K	ELR25
R23	Resistor	1K	ELR25
R24	Resistor	47K	ELR25
R25	Resistor	47K	ELR25
R26	Resistor	2.2K	ELR25
R27	Resistor	47K	ELR25
R28	Resistor	2.2K	ELR25
C1	Ceramic	0.001	50V
C2	Ceramic	0.001	50V
C3	Electrolytic	3.3μ	50V
C4	Ceramic	330P	50V
C5	Ceramic	330P	50V
C6	Electrolytic	47μ	16V
C7	Electrolytic	10μ	16V
C8	Electrolytic	4.7μ	50V
C9	Electrolytic	4.7μ	50V
C10	Electrolytic	0.47μ (BP)	50V
C11	Electrolytic	10μ	16V
C12	Ceramic	0.0047	50V
C13	Ceramic	0.0047	50V
C14	Electrolytic	10μ	16V
DS1	FLD	FIP12AM7	
P1	Connector	TL-25H-10-B1 (IC-271H: EHR-10)	
P2	Connector	TL-25H-10-B1 (IC-271H: EHR-11)	
J1	Connector	TL-25P-05-L1 (IC-271H: S05B-EH-S)	
J2	Connector	SB20P-HVQ-28	
J3	Connector	SB20P-HVQ-28	
J4	Connector	SB20P-HVQ-28	
B1	P.C.B.	B-678D(DISPLAY)	
B2	P.C.B.	B-742F	

LOGIC UNIT

REF.NO.	DESCRIPTION	PART NO.	
IC1	IC	4081	
IC2	IC	4081	
IC3	IC	4001	
IC4	IC	74LS74	
IC5	IC	74LS11	
IC6	IC	74LS08	
IC7	IC	RP5G01-007	
IC8	IC	μPD7801G114	
IC9	IC	M50781SP	
IC10	IC	BA618	
IC11	IC	74LS02	
IC12	IC	74LS377	
IC13	IC	4011	
IC14	IC	7432	
IC15	IC	7408	
IC16	IC	4013	
IC18	IC	7404	
IC19	IC	S-7116A #03,#04 (IC-271H)	
IC20	IC	74LS123	
IC21	IC	μA78M05C	
IC22	IC	TA78L009AP	
Q1	Transistor	2SC945P #03, 04, 06, 07	
Q2	Transistor	2SA1015 Y	
Q3	Transistor	2SA1015 Y	
Q4	Transistor	2SA1015 Y	
Q5	Transistor	2SC945 P #03, 04	
D1	Diode	1SS53	
D2	Diode	1SS53	
D3	Diode	1SS53	
D4	Diode	1SS53	
D5	Diode	1SS53	
D6	Diode	1SS53	
D7	Diode	1SS53	
D8	Diode	1SS53	
D9	Diode	1SS53	
D12	Diode	1SS53	
D13	Diode	1SS53	
D14	Diode	1SS53	
D15	Diode	1SS53	
D16	Diode	1SS53	
D17	Diode	1SS53	
D18	Diode	1SS53	
D19	Diode	1SS53	
D20	Diode	1SS53	
D23	Diode	1SS53	
D24	Diode	1SS53	
D25	Diode	1SS53	
D27	Diode	1SS53	
D28	Diode	1SS53	
X1	Xtal	3.5795MHZ #03, 04	
X2	Ceralock	CSA4.00MT	
R1	Resistor	47K	ELR25
R3	Resistor	100 #03, 04, 06, 07	ELR25

LOGIC UNIT

REF.NO.	DESCRIPTION	PART NO.
R4	Resistor	RD25UC ELR25
		#02, 05
R4	Resistor	560K ELR25
		#03, 04, 06, 07
R5	Resistor	47K ELR25
		#03, 04, 06, 07
R7	Resistor	47K ELR25
R8	Resistor	150K ELR25
R9	Resistor	68K ELR25
R10	Resistor	470 ELR25
R11	Resistor	10K ELR25
R12	Resistor	4.7K R25
R13	Resistor	4.7K ELR25
R14	Resistor	4.7K ELR25
R15	Resistor	47K R25
R16	Resistor	390 ELR25
R17	Resistor	407K R25
R18	Resistor	100K ELR25
R19	Resistor	3.3M ELR25
R20	Resistor	1M ELR25
R21	Resistor	1M H0651A
R22	Resistor	1.8M ELR25
R23	Resistor	2.7K ELR25
R24	Resistor	56K ELR25
R25	Resistor	1M R10
R26	Resistor	1M ELR25
R27	Resistor	47K ELR25
R28	Resistor	47K ELR25
R29	Resistor	470 ELR25
R30	Resistor	10K ELR25
R31	Resistor	10K ELR25
R32	Resistor	47K ELR25
R33	Resistor	100K ELR25
R34	Resistor	680 ELR25
R35	Resistor	220 ELR25
R36	Resistor	680 ELR25
R37	Resistor	220 ELR25
R38	Array	4.7K RM-8
R39	Resistor	47K R25
R40	Array	100K RM-4
R41	Resistor	470 ELR25
		#03, 04, 06, 07
R42	Resistor	2.2K ELR25
R43	Resistor	47K ELR25
R44	Resistor	47K ELR25
R45	Resistor	100 ELR25
		#03,04,06,07
R46	Resistor	3.3 ELR25
		#03,04,06,07
R47	Resistor	27K ELR25
R50	Resistor	47K ELR25
R51	Resistor	10M ERC-14GJ
R52	Resistor	47K ELR10
		#03,04
R53	Resistor	1.2K ELR25
R54	Resistor	47K ELR25
R55	Resistor	100 ELR10
		#03,04
R56	Resistor	5.6K R10
		#03,04
R57	Resistor	2.2K H0651A
		#03,04
R58	Resistor	47K R20

LOGIC UNIT

REF.NO.	DESCRIPTION	PART NO.
C1	Electrolytic	47μ 16V
C3	Electrolytic	47μ 16V
		#03,04,06,07
C4	Ceramic	0.01FZ 50V
		#03,04,06,07
C6	Ceramic	22P 50V
		#03,04
C7	Ceramic	22P 50V
		#03,04
C8	Ceramic	100P 50V
C9	Ceramic	220P 50V
C10	Ceramic	0.001 50V
C11	Barrier Lay	0.1 16V
C12	Electrolytic	47μ 16V
C14	Barrier Lay	0.1 16V
C15	Ceramic	30P 50V
C16	Ceramic	30P 50V
C17	Barrier Lay	0.1 16V
C18	Ceramic	0.001 50V
C19	Electrolytic	47μ 25V
C20	Barrier Lay	0.1 16V
C21	Electrolytic	47μ 16V
C22	Barrier Lay	0.015 25V
C23	Barrier Lay	0.01 16V
C24	Barrier Lay	0.01 16V
C26	Electrolytic	100μ 10V
C27	Electrolytic	47μ 10V
C29	Ceramic	0.001 50V
C30	Mylar	0.022 50V
		#03,04
C31	Electrolytic	47μ 10V
		#03
C32	Barrier Lay	0.1 16V
C33	Ceramic	120 50V
		(IC-271A/E)
J1	Connector	TL-25P-09-V1
J2	Connector	B06B-EH-S
J3	Connector	TL-25P-08-V1
J4	Connector	B07B-EH-S
J5	Connector	B07B-EH-S
J6	Connector	B08B-EH-S
J7	Connector	B10B-EH-S
J8	Connector	5045-02A
J9	Connector	B10B-EH-S
J10	Connector	TL-25P-08-V1
J11	Connector	B12B-EH-S
J13	Connector	5045-02A
J14	Connector	B04B-EH-S
J15	Connector	B11B-EH-S
J16	Connector	3022-12B
J17	Connector	3022-08B
P1	Connector	5250-02
		#03,04
EP1	P.C.B.	B-677B(LOGIC)
MP1		SHIELD CASE
MP2		UNIT ANGLE MOUNT

LOGIC UNIT

REF.NO.	DESCRIPTION	PART NO.
W7	Jumper	JPW02A
W10	Jumper	1PS-1041-4
W11	Jumper	1PS-1041-4
W16	Jumper	1PS-1041-4
W17	Jumper	1PS-1041-4
W18	Jumper	1PS-1041-4
W20	Jumper	1PS-1041-4
W21	Jumper	1PS-1041-4
W23	Jumper	1PS-1041-4
W24	Jumper	1PS-1041-4
W26	Jumper	1PS-1041-4
W27	Jumper	1PS-1041-4
W28	Jumper	1PS-1041-4
W29	Jumper	1PS-1041-4
W30	Jumper	1PS-1041-4
W31	Jumper	1PS-1041-4
W32	Jumper	JPW02A

HPL UNIT

REF.NO.	DESCRIPTION	PART NO.
IC1	IC	μA78L82AC
IC2	IC	μA78M05C
IC3	IC	M54929P
IC4	IC	M54466L
IC5	IC	μPC1037H
IC6	IC	M54929P
IC7	IC	M54466L
IC8	IC	SN74LS90N
IC9	IC	M54459L
Q1	FET	2SK30A-GR
Q2	Transistor	2SC1740-LNR
Q3	FET	2SK192A-GR
Q4	Transistor	2SC763C
Q5	Transistor	2SC763C
Q6	Transistor	2SC945P
Q7	Transistor	2SC763C
Q8	Transistor	2SC763C
Q9	Transistor	2SC763C
Q10	FET	3SK74M
Q11	Transistor	2SC763C
Q12	Transistor	2SC945P
Q13	Transistor	2SC383-TM
Q14	Transistor	2SC763C
Q15	FET	2SK241GR
Q16	Transistor	2SC945P
Q17	Transistor	2SC763C
Q18	FET	2SK192A-GR
Q19	Transistor	2SC763C
D1	Diode	1S953
D2	Diode	1S953
D3	Varicap	4SV50(1)E
D4	Diode	1SS53
D5	Zener	XZ-068 (IC-271H: RD6.8EB3)
D6	Diode	1SS53
D7	Diode	1SS53
D8	Diode	1SS53
D9	Varicap	1SV50(1)E
D10	Diode	1SS53
FI1	Xtal Fil	30M15A
X1	Xtal	CR-22(10.24MHz)
L1	Choke	1R2(FL type)
L2	Coil	LB-132
L3	Choke	LW-19
L4	Choke	LW-19
L5	Coil	LS-145
L6	Coil	LS-145
L7	Choke	101(FL type)
L8	Choke	101(FL type)
L9	Choke	LW-17
L10	Coil	LA-236
L11	Coil	R15(LB-4 type)
L12	Coil	LA-236
L13	Coil	LA-235
L14	Coil	R10(LB-4 type)

HPL UNIT

REF.NO.	DESCRIPTION	PART NO.	
L15	Coil	LS-162	
L16	Coil	LS-162	
L17	Coil	331K(LAL04NA)	
L18	Coil	LA-162	
L19	Coil	LA-236	
L20	Coil	LS-234	
L21	Coil	LB-161	
L22	Choke	LW-19	
L23	Choke	LW-19	
L24	Choke	101(FL type)	
L25	Choke	101(FL type)	
R2	Resistor	10K	ELR25
R3	Resistor	2.7K	ELR25
R4	Resistor	330	ELR25
R5	Resistor	1.5K	ELR25
R6	Resistor	5.6K	ELR25
R7	Resistor	1.5K	ELR25
R8	Resistor	100	R25
R9	Resistor	10K	R25
R10	Resistor	470K	ELR25
R11	Resistor	470K	ELR25
R12	Resistor	220	ELR25
R13	Resistor	100	ELR25
R14	Resistor	220	ELR25
R15	Resistor	1.2K	ELR25
R16	Resistor	5.6K	ELR25
R17	Resistor	100	ELR25
R18	Resistor	1.2K	ELR25
R19	Resistor	100	R25
R20	Resistor	5.6K	ELR25
R21	Resistor	100	ELR25
R22	Resistor	220	R25
R23	Resistor	100	ELR25
R24	Resistor	68	ELR25
R25	Resistor	100	ELR25
R26	Resistor	220	ELR25
R27	Resistor	10K	ELR25
R28	Resistor	5.6K	ELR25
R29	Resistor	100	R25
R30	Resistor	56	ELR25
R31	Resistor	22K	ELR25
R32	Resistor	47K	ELR25
R33	Resistor	10K	ELR25
R34	Resistor	47K	ELR25
R35	Resistor	22K	ELR25
R36	Resistor	10K	ELR25
R37	Resistor	390	ELR25
R38	Resistor	2.7K	ELR25
R40	Resistor	100	ELR25
R41	Resistor	270	ELR25
R42	Resistor	10K	ELR25
R43	Resistor	18K	ELR25
R44	Resistor	220	ELR25
R45	Resistor	1K	ELR25
R46	Resistor	5.6K	ELR25
R47	Resistor	22K	ELR25
R48	Resistor	100	ELR25
R50	Resistor	47	ELR20
		(IC-271H: 270 ELR25)	
R51	Resistor	470	ELR25

HPL UNIT

REF.NO.	DESCRIPTION	PART NO.	
R52	Resistor	1K	ELR25
R53	Resistor	1K	R25
R54	Resistor	470	ELR25
R55	Resistor	100	ELR25
R56	Resistor	22K	ELR25
R57	Resistor	5.6K	ELR25
R58	Resistor	220	ELR25
R59	Resistor	47K	ELR25
R60	Resistor	100K	ELR25
R61	Resistor	2.2K	ELR25
R62	Resistor	220	ELR25
R63	Resistor	4.7K	ELR25
R64	Resistor	22K	ELR25
R65	Resistor	1K	ELR25
R66	Resistor	220	ELR25
R67	Resistor	47	R25
R68	Resistor	100	ELR25
R69	Resistor	100	ELR25
R70	Resistor	4.7K	ELR25
R71	Resistor	330	ELR25
R72	Resistor	220	ELR25
R73	Resistor	220	ELR25
R74	Resistor	330	R25
R75	Resistor	1K	ELR25
R76	Resistor	4.7K	ELR25
R77	Resistor	22K	ELR25
R78	Resistor	100	ELR25
R79	Resistor	1K	ELR25
R80	Resistor	270	ELR25
R81	Resistor	1K	ELR25
R82	Resistor	15K	ELR25
R83	Resistor	1K	ELR25
R85	Resistor	1.8K	ELR25
R86	Resistor	150	ELR25
R87	Resistor	10K	ELR25
R88	Resistor	1K	ELR25
R89	Resistor	10K	ELR25
R90	Resistor	8.2K	R25
R91	Resistor	100K	ELR25
R92	Resistor	470K	ELR25
R93	Resistor	470K	ELR25
R94	Resistor	330	R25
R95	Resistor	150	ELR25
R96	Resistor	1.2K	ELR25
R97	Resistor	5.6K	ELR25
R98	Resistor	100	ELR25
R99	Resistor	100	ELR25
R100	Resistor	330K	ELR25
R101	Resistor	47K	ELR25
R102	Resistor	4.7K	ELR25
R103	Resistor	2.2K	ELR10
R104	Resistor	2.7K	ELR10
R105	Resistor	390K	ELR10
R106	Resistor	2.7K	ELR25
C1	Ceramic	0.0047	50V
C2	Electrolytic	100μ	16V
C3	Electrolytic	10μ	16V
C4	Ceramic	0.0047	50V
C6	Ceramic	0.0047	50V
C7	Electrolytic	10μ	16V

HPL UNIT

REF.NO.	DESCRIPTION	PART NO.
C8	Ceramic	0.0047 50V
C9	Electrolytic	1μ(BP) 50V
C10	Barrier Lay	0.047 25V
C11	Electrolytic	100μ 10V
C12	Barrier Lay	0.047 25V
C13	Ceramic	0.0047 50V
C14	Barrier Lay	0.1 16V
C15	Ceramic	15(SH) 50V
C16	Trimmer	6P(CTZ51A)
C17	Ceramic	3P(UJ) 50V #03,04,06,07
C17	Ceramic	3P(TH) 50V #02,05
C18	Ceramic	3P(UJ) 50V #03,04,06,07
C18	Ceramic	3P(TH) 50V #02,05
C19	Ceramic	10P(CH) 50V
C20	Ceramic	0.0047 50V
C21	Electrolytic	47μ 10V
C22	Ceramic	3P(CH) 50V
C23	Ceramic	3P(CH) 50V
C24	Ceramic	1P(CH) 50V
C25	Ceramic	0.0047 50V
C26	Electrolytic	100μ 10V
C27	Ceramic	0.0047 50V
C28	Ceramic	0.0047 50V
C29	Ceramic	47P 50V
C30	Ceramic	0.0047 50V
C31	Ceramic	0.0047 50V
C32	Ceramic	3P 50V
C33	Ceramic	0.0047 50V
C34	Electrolytic	100μ 10V
C35	Ceramic	15P 50V
C36	Ceramic	0.001 50V
C37	Ceramic	0.0047 50V
C38	Ceramic	0.0047 50V
C39	Ceramic	5P 50V
C40	Ceramic	0.0047 50V
C42	Ceramic	0.001 50V
C43	Electrolytic	0.47μ 50V
C44	Ceramic	0.0047 50V
C45	Electrolytic	47μ 10V
C46	Barrier Lay	0.1 25V
C47	Barrier Lay	0.1 25V
C48	Ceramic	100P 50V
C49	Electrolytic	47μ 10V
C50	Ceramic	0.0047 50V
C51	Ceramic	0.0047 50V
C53	Ceramic	0.0047 50V
C54	Ceramic	0.0047 50V
C55	Ceramic	0.0047 50V
C56	Ceramic	220P 50V
C57	Ceramic	15P 50V
C58	Ceramic	0.0047 50V
C59	Ceramic	220P 50V
C60	Ceramic	0.0047 50V
C61	Ceramic	24P 50V
C62	Ceramic	82P 50V
C63	Ceramic	18P 50V
C64	Ceramic	62P 50V
C65	Ceramic	33P 50V
C66	Ceramic	30P 50V
C67	Ceramic	18P 50V

HPL UNIT

REF.NO.	DESCRIPTION	PART NO.
C68	Ceramic	36P 50V
C69	Ceramic	20P 50V
C70	Ceramic	36P 50V
C71	Ceramic	0.0047 50V
C72	Ceramic	0.001 50V
C73	Ceramic	0.0047 50V
C75	Ceramic	0.0047 50V
C76	Ceramic	220P 50V
C77	Ceramic	5P 50V
C78	Ceramic	10P(CTZ51C)
C79	Dip Mica	22P
C80	Electrolytic	10μ 16V
C81	Ceramic	100P(CH)50V
C83	Ceramic	0.0047 50V
C84	Dip Mica	220P
C85	Ceramic	0.0047 50V
C86	Ceramic	0.0047 50V
C87	Ceramic	0.0047 50V
C88	Electrolytic	10μ 16V
C89	Ceramic	0.0047 50V
C91	Ceramic	1P 50V
C93	Ceramic	0.0047 50V
C94	Barrier Lay	0.1 16V
C95	Ceramic	0.0047 50V
C96	Electrolytic	10μ 16V
C97	Ceramic	0.0047 50V
C98	Ceramic	0.0022 50V
C99	Ceramic	220P 50V
C100	Ceramic	0.0022 50V
C101	Ceramic	0.0047 50V
C102	Ceramic	6P 50V
C103	Barrier Lay	0.1 16V
C104	Ceramic	6P 50V
C105	Ceramic	0.0047 50V
C107	Ceramic	0.0047 50V
C108	Ceramic	0.001 50V
C109	Ceramic	0.0047 50V
C110	Electrolytic	10μ 16V
C111	Ceramic	0.001 50V
C112	Ceramic	0.0047 50V
C113	Ceramic	0.0047 50V
C114	Ceramic	0.0047 50V
C115	C-Array	B5RC0123(471MX4)
C116	Dip Mica	22P
C117	Ceramic	10P 50V
C118	Ceramic	220P 50V
C119	Ceramic	0.0047 50V
C120	Ceramic	220P 50V
C121	Ceramic	220P 50V
C122	Ceramic	220P 50V
C123	Ceramic	220P 50V
C124	Ceramic	0.001 50V
C125	Ceramic	6P 50V
C126	Ceramic	20P 50V
C127	Ceramic	20P 50V
C128	Barrier Lay	0.047 25V
C129	Electrolytic	0.22μ 50V
C130	Ceramic	0.0047 50V
C131	Electrolytic	47μ 10V
C132	Ceramic	0.0022 50V
C133	Ceramic	39P(UJ) 50V
C134	Ceramic	22P 50V
C135	Ceramic	4P 50V
C136	Ceramic	4P 50V

HPL UNIT

REF.NO.	DESCRIPTION	PART NO.	
C137	Ceramic	0.0047	50V
C138	Electrolytic	47μ	10V
C139	Ceramic	0.0047	50V
C140	Electrolytic	47μ	10V
C141	Ceramic	1P	50V
C142	Ceramic	0.0047	50V
C143	Electrolytic	47μ	10V
C144	Cylinder	47P	UP125
C145	Ceramic	0.001	50V
C146	Ceramic	0.0047	50V
C147	Electrolytic	47μ	10V
C148	Ceramic	0.0047	50V
C149	Ceramic	0.0047	50V
C150	Cylinder	0.01	UP125
C151	Ceramic	0.001	50V
C152	Ceramic	0.0047	50V
C153	Electrolytic	47μ	10V
C154	Ceramic	0.0047	50V
C155	Barrier Lay	0.01	25V
C156	Barrier Lay	0.01	25V
C157	Barrier Lay	0.01	25V
C158	C-Array	B7ZC0717(471MX6)	
P1	Connector	5250-02	
P2	Connector	TL-25H-12-B1	
		(IC-271H: EHR-12)	
P3	Connector	5250-02	
J5	Connector	TLB-12H-B1	
B1	HPL P.C.B.	B-648B(HPL)	
		(IC-271H: B-648C(HPL)	

RF.YGR UNIT

REF.NO.	DESCRIPTION	PART NO.	
Q1	FET	2SK241-Y	
Q2	FET	2SK241-Y	
Q3	FET	3SK741-K	
Q4	Transistor	2SC2053	
Q5	Transistor	2SC945(P or K)	
Q6	FET	2SK125	
Q7	FET	3SK48	
D1	Diode	1SS53	
D2	Diode	1SS53	
D3	Diode	1SS99	
		(IC-271A/E)	
FI1	MC	10M15B-7	
L1	Coil	LS-164	
L2	Coil	LS-64	
L3	Coil	LB-50A	
L4	Coil	LB-34A	
L5	Coil	LB-83	
L6	Coil	LB-83	
L7	Coil	LA-93	
L8	Coil	LB-82	
L9	Coil	LA-106	
L10	Coil	LS-156	
L11	Coil	LS-211	
L12	Coil	LS-164	
L13	Coil	LS-154	
L14	Choke	100(L4 type)	
L15	Coil	LB-34A	
L16	Coil	LB-1-1A	
L17	Coil	LB-34A	
L18	Coil	LB-34A	
L19	Coil	LB-50A	
R1	Resistor	2.2K	ELR25
R2	Trimmer	1K	H0651A
R3	Resistor	100	ELR25
R4	Resistor	47	ELR25
R5	Resistor	2.2K	ELR25
R6	Resistor	100K	ELR25
R7	Resistor	100K	ELR25
R8	Resistor	100K	ELR25
R9	Resistor	47	ELR25
R10	Resistor	47	ELR25
R11	Resistor	4.7K	R25
R12	Resistor	470	R25
R13	Resistor	220	ELR25
R14	Resistor	10K	ELR25
R15	Resistor	1K	ELR25
R16	Resistor	1K	ELR25
R17	Resistor	47	R25
R18	Resistor	100	ELR25
R19	Resistor	10M	ELR25
R20	Resistor	1K	ELR25
R21	Resistor	2.2K	ELR25
R22	Resistor	2.2K	ELR25
R23	Resistor	3.3K	ELR25
R24	Resistor	220	ELR25
R25	Resistor	47	ELR25

RF.YGR UNIT

REF.NO.	DESCRIPTION	PART NO.	
C1	Ceramic	0.001	50V
C2	Ceramic	0.0047	50V
C3	Ceramic	100P	50V
C4	Ceramic	0.001	50V
C5	Ceramic	33P	50V
C6	Ceramic	33P	50V
C7	Ceramic	0.001	50V
C8	Ceramic	0.001	50V
C9	Ceramic	7P(CH)	50V
C10	Ceramic	0.0047	50V
C11	Ceramic	0.0047	50V
C12	Ceramic	100P	50V
C13	Ceramic	220P	50V
C14	Ceramic	0.001	50V
C15	Ceramic	0.0047	50V
C16	Ceramic	22P	50V
C17	Ceramic	220P	50V
C18	Ceramic	100P	50V
C19	Ceramic	1P	50V
C20	Trimmer	10P	CVE10-41
C21	Ceramic	10P	50V
C22	Ceramic	0.0047	50V
C23	Ceramic	0.0047	50V
C24	Ceramic	47P	50V
C25	Ceramic	0.0047	50V
C26	Ceramic	10P	50V
C27	Ceramic	5P(CH)	50V
C28	Ceramic	0.0047	50V
C29	Barrier Lay	0.047	25V
C30	Ceramic	0.0047	50V
C31	Ceramic	0.0047	50V
C32	Ceramic	0.0047	50V
C33	Ceramic	120P	50V
C34	Ceramic	2P	50V
C35	Ceramic	120P	50V
C36	Ceramic	100P	50V
C37	Ceramic	0.0047	50V
C38	Ceramic	220P	50V
C39	Ceramic	0.0047	50V
C40	Ceramic	0.001	50V
C41	Electrolytic	1μ(BP)	50V
C42	Ceramic	2P	50V
		#02,03,04	
C43	Ceramic	0.001	50V
C44	Ceramic	43P	50V
C45	Ceramic	220P	50V
C46	Ceramic	220P	50V
C47	Ceramic	5P	50V
		(IC-271A/E)	
C48	Ceramic	15P	50V
B1	PCBoard	B-644B	
J1	Connector	TMP-J01X-V1	
J2	Connector	TL-25P-05-V1	
		(IC-271H: B05B-EH-S)	
J3	Connector	5045-02A	
J4	Connector	TMP-J01X-V1	
P1	Connector	5250-02	
P2	Connector	IC-25H-06-B1	
		(IC-271H: EHR-06)	

FILTER UNIT:IC-271H

REF.NO.	DESCRIPTION	PART NO.	
IC1	IC	4558D	
Q1	Transistor	2SC2120	
Q2	Transistor	2SA1015Y	
Q3	Transistor	2SD359	
Q4	Transistor	2SC945P	
Q5	Transistor	2SC945P	
D1	Diode	IN4002	
D2	Diode	1SS53	
D3	Diode	1SS53	
D4	Diode	1SS53	
D5	Diode	1SS53	
D6	Diode	1SS53	
D7	Diode	1SS99	
D8	Diode	1SS99	
D9	Diode	1SS53	
D10	Diode	1SS53	
L1	Coil	LA-177	
L2	Coil	LA-177	
L3	Coil	LA-176	
L4	Coil	LW-9	
R1	Resistor	10K	ELR25
R2	Resistor	4.7K	ELR25
R3	Resistor	1.5K	ELR25
R4	Resistor	470	ELR25
R5	Resistor	1K	ELR25
R6	Resistor	220K	ELR25
R7	Resistor	10K	ELR25
R8	Resistor	10	ELR25
R9	Resistor	10	ELR25
R10	Resistor	100K	R25
R11	Resistor	470K	ELR25
R12	Resistor	33K	ELR25
R13	Resistor	470K	ELR25
R14	Resistor	470K	ELR25
R15	Resistor	470K	ELR25
R16	Trimmer	220K	H0651A
R17	Trimmer	220K	H0651A
R19	TIP	MCR18	33
R21	Resistor	56	R25
R22	Resistor	56	R25
R23	Resistor	33K	ELR25
C1	Ceramic	220P	50V
C2	Ceramic	220P	50V
C3	Ceramic	220P	50V
C4	Ceramic	0.001	50V
C5	Ceramic	0.001	50V
C6	Ceramic	0.001	50V
C7	Ceramic	0.001	50V
C8	Ceramic	0.001	50V
C9	Ceramic	0.001	50V

FILTER UNIT

REF.NO.	DESCRIPTION	PART NO.
C10	Ceramic	0.001 50V
C11	Ceramic	220P 50V
C12	Ceramic	0.001 50V
C13	Ceramic	0.001 50V
C14	Ceramic	0.001 50V
C15	Ceramic	220P 50V
C16	Ceramic	220P 50V
C17	Ceramic	220P 50V
C18	Ceramic	220P 50V
C19	Ceramic	220P 50V
C20	Ceramic	12P 500V
C21	Ceramic	10P 50V
C22	Ceramic	220P 50V
C23	Ceramic	220P 50V
C24	Ceramic	30P 50V
C25	Ceramic	3P 50V
C26	Ceramic	33P 50V
C27	Ceramic	0.5P 50V
C28	Ceramic	18 50V
C29	Ceramic	0.01 50V
C30	Ceramic	220P 50V
C31	Ceramic	220P 50V
C32	Ceramic	0.0047 50V
C33	Electrolytic	1μ50V(BP type)
C34	Electrolytic	2.2μ 50V
C35	Barrier Lay	0.047 50V
C36	Ceramic	220P 50V
C37	Ceramic	220P 50V
C38	Ceramic	220P 50V
C39	Ceramic	0.001 50V
C40	Ceramic	0.001 50V
RL1	Relay	CX-442
J1	Connector	TMP-j01X-V2
J2	Connector	TMP-j01X-V2
J3	Connector	TLB-P10H-B1
J4	Connector	MR-DS-P
P1	Connector	
P2	Connector	
P3	Connector	EHR-10
EP1	PC Board	B-852A(FILTER)
MP1	Filter	CASE
MP2	Filter	CASE COVER
MP3	Filter	CASE COVER(BOTTOM)
MP4	Screw/washer	(A) M3x5
MP5	Nut	M3
MP6	Screw/washer	(A) M3x8
MP7	Grommet	B307D
MP8	Mica	P103KA
MP9	Filter Sections	
MP10	Ground Spring	

MAIN UNIT

REF.NO.	DESCRIPTION	PART NO.
IC1	IC	4558D
IC2	IC	BA401
IC3	IC	μPC1037H
IC4	IC	μPC577H
IC5	IC	4558D
IC6	IC	M53323P
IC7	IC	78L05AC
IC8	IC	μPC577H
IC9	IC	4558D
IC10	IC	4558D
IC11	IC	4558D
IC12	IC	μPC2002V
IC13	IC	AN829
IC14	IC	MC3357P
IC15	IC	MB3756
Q1	Transistor	2SC945(Q,P,K)
Q2	Transistor	2SC945(Q,P,K)
Q3	Transistor	2SC945P
Q4	FET	3SK74K
Q5	Transistor	2SC945(Q,P,K)
Q6	Transistor	2SC945P
Q7	Transistor	2SC945P
Q8	Transistor	2SC945(Q,P,K)
Q9	Transistor	2SC945P
Q10	Transistor	2SC945P
Q11	Transistor	2SA1015
Q12	FET	3SK74M
Q13	Transistor	2SC945(Q,P,K)
Q14	Transistor	2SA1015
Q15	Transistor	2SC945(P,K)
Q16	Transistor	2SC945(P,K)
Q17	Transistor	2SC945P
Q18	FET	3SK74K
Q19	FET	3SK74M
Q20	Transistor	2SC1645B
Q21	Transistor	2SC945P
Q22	Transistor	2SC945(Q,P,K)
Q23	Transistor	2SC945(Q,P,K)
Q24	Transistor	2SC945P
Q25	Transistor	2SC945(Q,P,K)
Q26	Transistor	2SC945(Q,P,K)
Q27	Transistor	2SA1015
Q28	Transistor	2SA1015
Q29	Transistor	2SC945(P,K)
Q30	Transistor	2SC945P
Q31	Transistor	2SC945Q
Q32	Transistor	2SC945(Q,P,K)
Q33	Transistor	2SC945P
Q34	Transistor	2SC945(Q,P,K)
Q35	Transistor	2SC945(Q,P,K)
Q36	Transistor	2SA1015
Q37	Transistor	2SC2785(FE,EF,JF,HF,KF)
Q38	Transistor	2SA1015
Q39	Transistor	2SC2785(FE,EF,KF)
Q40	Transistor	2SA1015
Q41	Transistor	2SC1645B
Q42	Transistor	2SC2785(FE,EF,JF,HF,KF)
Q43	Transistor	2SC3399
Q44	Transistor	2SC3399
Q45	Transistor	2SC2785(FE,EF,JF,HF,KF)
Q46	Transistor	2SC3399
Q47	Transistor	2SC3399
Q48	Transistor	2SC3399

MAIN UNIT

REF.NO.	DESCRIPTION	PART NO.
D1	Diode	1SS53
D2	Diode	1SS53
D3	Diode	1SS53
D4	Varicap	1S2688-ES
D5	Diode	1SS53
D6	Diode	1SS53
D7	Diode	1SS53
D8	Diode	1SS53
D9	Diode	1SS53
D10	Diode	1SS53
D11	Diode	1SS53
D12	Diode	1SS53
D13	Diode	1SS53
D14	Diode	1SS53
D15	Diode	1SS53
D16	Diode	1SS53
D17	Diode	1SS53
D18	Diode	1SS53
D19	Diode	1SS53
D20	Diode	1SS53
D21	Diode	1SS53
D22	Diode	1SS53
D23	Diode	1SS53
D24	Diode	1SS53
D25	Diode	1SS53
D26	Diode	1SS53
D27	Diode	1SS53
D28	Diode	1SS53
D29	Diode	1N60(1K60)
D30	Diode	1N60(1K60)
D31	Diode	1SS53
D32	Diode	1SS53
D33	Diode	1SS53
D35	Diode	1SS53
D36	Diode	1N60(1K60)
D37	Diode	1N60(1K60)
D38	Zener	RD3.6EB1
D39	Diode	1SS53
D40	Diode	1SS53
D41	Diode	1SS53
D42	Diode	1SS53
D43	Diode	1SS97
D44	Diode	1SS97
D45	Diode	1SS53
D46	Diode	1SS53
D47	Diode	1SS53
D48	Diode	1SS53
D49	Diode	1SS53
D50	Diode	1SS53
D51	Diode	1SS53
D52	Diode	1SS53
D53	Diode	1SS53
D54	Diode	1SS99
D55	Diode	1SS53
D56	Diode	1SS53
D57	Diode	1SS53
D58	Diode	1SS53
D59	Diode	1SS53
D60	Diode	1S953
D61	Diode	1SS97
D62	Diode	1SS53
D63	Diode	1SS53
D64	Diode	1SS53
D65	Diode	1SS53

MAIN UNIT

REF.NO.	DESCRIPTION	PART NO.
D66	Diode	1SS53
D67	Zener	RD6.8EB3
D68	Diode	1SS53
D69	Diode	1SS53
D70	Diode	1SS53
D71	Diode	1SS53
D72	Diode	1SS53
D73	Diode	1SS53
D74	Diode	1SS53
D75	Diode	1SS53
D76	Diode	1SS53
D77	Diode	1SS53
D78	Diode	1SS53
FI1	MC	10M24D4
FI2	Ceramic	CFW-455E
X1	Xtal	10.750MHz(HC18/U)
X2	Xtal	10.7515MHz(HC18/U)
X3	Xtal	10.295MHz(HC43/U)
L1	Coil	LS-80
L2	Choke	100 (LB-4)
L3	Choke	100 (LB-4)
L4	Choke	100 (LB-4)
L5	Coil	LS-66A
L6	Coil	LS-66A
L7	Coil	LS-149A
L8	Coil	LS-150A
L9	Coil	LS-97
L10	Coil	LS-66A
L11	Coil	LS-66
L12	Coil	LS-66A
L13	Coil	LS-66A
L14	Coil	LS-110A
L15	Coil	LS-151
L16	Coil	LS-121A
L17	Choke	LW-15
L18	Coil	LS-121
L19	Choke	BT01RN1-A61
L20	Choke	BT01RN1-A61
L21	Choke	BT01RN1-A61
L22	Choke	BT01RN1-A61
L23	Choke	BT01RN1-A61
R1	Resistor	6.8K ELR25
R2	Resistor	100 ELR25
R3	Resistor	4.7K ELR25
R4	Resistor	2.2K ELR25
R5	Resistor	47 ELR25
R6	Resistor	820 ELR25
R7	Resistor	4.7K ELR25
R8	Resistor	4.7K ELR25
R9	Resistor	3.9K ELR25
R10	Resistor	2.7K ELR25
R11	Resistor	120K ELR25
R12	Resistor	1K ELR25

MAIN UNIT

REF.NO.	DESCRIPTION	PART NO.	
R13	Resistor	820	ELR25
R14	Resistor	12K	ELR25
R15	Resistor	4.7K	ELR25
R16	Resistor	22K	ELR25
R17	Resistor	560K	ELR25
R18	Trimmer	1K	H0651A
R19	Resistor	470	ELR25
R20	Resistor	10K	ELR25
R21	Resistor	47K	ELR25
R22	Resistor	22k	R25
R23	Resistor	5.6K	R25
R24	Resistor	5.6K	ELR25
R25	Resistor	5.6K	ELR25
R26	Resistor	47	ELR25
R27	Resistor	10K	ELR25
R28	Resistor	1K	ELR25
R29	Trimmer	470	H0651A
R30	Resistor	2.2K	R25
R31	Resistor	10K	ELR25
R32	Thermistor	23D29	
R33	Resistor	47K	ELR25
R34	Resistor	33K	ELR25
R35	Resistor	470K	ELR25
R36	Resistor	4.7K	ELR25
R37	Resistor	2.2K	ELR25
R38	Resistor	22K	ELR25
R39	Resistor	22K	ELR25
R40	Resistor	27K	ELR25
R41	Resistor	1K	ELR25
R42	Resistor	470	ELR25
R43	Resistor	1K	R25
R44	Resistor	4.7K	ELR25
R45	Resistor	2.2K	ELR25
R46	Resistor	10K	ELR25
R47	Resistor	100K	ELR25
R48	Resistor	100K	ELR25
R49	Resistor	100K	ELR25
R50	Resistor	1K	ELR25
R51	Resistor	470	ELR25
R52	Resistor	100	ELR25
R53	Resistor	2.2K	ELR25
R54	Resistor	100	ELR25
R55	Resistor	1K	ELR25
R56	Resistor	470	ELR25
R57	Resistor	1K	ELR25
R58	Resistor	1K	ELR25
R59	Resistor	1K	ELR25
R60	Resistor	1K	ELR25
R61	Resistor	10K	ELR25
R62	Resistor	4.7	ELR25
R63	Trimmer	4.7K	H0651A
R64	Resistor	6.8	ELR25
R65	Resistor	10K	ELR25
R66	Resistor	10K	ELR25
R67	Resistor	100	ELR25
R68	Resistor	2.2K	ELR25
R69	Resistor	1K	ELR25
R70	Resistor	10K	ELR25
R71	Resistor	10K	R25
R72	Trimmer	10K	H0651A
R73	Resistor	47	ELR25
R74	Resistor	2.2K	ELR25
R75	Trimmer	10K	H0651A
R76	Resistor	100K	ELR25

MAIN UNIT

REF.NO.	DESCRIPTION	PART NO.	
R77	Resistor	407K	ELR25
R78	Resistor	2.2K	ELR25
R79	Resistor	10K	ELR25
R80	Resistor	4.7K	ELR25
R81	Resistor	3.3K	ELR25
	(IC-271H:	12K	ELR25)
R82	Trimmer	1K	H0651A
R83	Resistor	100	ELR25
R84	Resistor	100	ELR25
R85	Resistor	4.7K	ELR25
R86	Resistor	330	ELR25
R87	Resistor	1K	ELR25
R88	Resistor	470	ELR25
R89	Resistor	1K	ELR25
R90	Resistor	150	ELR25
R91	Resistor	4.7K	ELR25
R92	Resistor	100	ELR25
R93	Resistor	330	ELR25
R94	Resistor	22K	ELR25
R95	Resistor	1K	ELR25
R96	Resistor	2.2K	ELR25
R97	Resistor	2.2K	ELR25
R98	Resistor	1K	ELR25
R99	Resistor	22	ELR25
R100	Resistor	100	ELR25
R101	Resistor	10K	ELR25
R102	Resistor	100	ELR25
R103	Resistor	220	ELR25
R104	Resistor	100K	ELR25
R105	Resistor	1.2K	ELR25
		#02~07	
R106	Resistor	1K	ELR25
R107	Resistor	47K	ELR25
R108	Resistor	100K	ELR25
R109	Resistor	100K	R25
R110	Resistor	47K	ELR25
R111	Resistor	47K	ELR25
R112	Resistor	27K	ELR25
R113	Trimmer	47K	H0651A
R114	Trimmer	47K	H0651A
R115	Resistor	27K	ELR25
R116	Resistor	47K	ELR25
R117	Resistor	100K	ELR25
R118	Resistor	10K	ELR25
R119	Resistor	1M	ELR25
R120	Resistor	150	ELR25
R121	Resistor	3.3M	ELR25
R123	Resistor	10K	ELR25
R124	Resistor	10K	ELR25
R125	Resistor	1K	ELR25
R126	Resistor	330	ELR25
R127	Resistor	100K	ELR25
R128	Resistor	470	ELR25
R129	Resistor	100	ELR25
R130	Resistor	680	ELR25
R131	Resistor	15K	ELR25
R132	Resistor	4.7K	ELR25
R133	Resistor	1K	ELR25
R134	Resistor	47	ELR25
R134	Resistor	10K	ELR25
R135	Resistor	10K	ELR25
R136	Resistor	150	ELR25
R137	Resistor	2.2K	ELR25
R138	Resistor	47	ELR25

MAIN UNIT

REF.NO.	DESCRIPTION	PART NO.	
R139	Resistor	330	ELR25
R140	Resistor	10K	ELR25
R141	Resistor	22K	ELR25
R142	Resistor	10K	ELR25
R143	Resistor	47K	ELR25
R144	Resistor	330	ELR25
R145	Resistor	2.7K	ELR25
R147	Resistor	330	R25
R148	Resistor	10K	ELR25
R149	Trimmer	1K	H0651A
R150	Resistor	27K	ELR25
R151	Resistor	47K	ELR25
R152	Trimmer	1K	H0651A
R153	Resistor	100K	ELR25
R154	Resistor	47K	ELR25
R155	Resistor	22K	ELR25
R156	Resistor	2.2K	ELR25
R157	Resistor	10K	ELR25
R158	Resistor	220K	ELR25
R159	Resistor	1K	ELR25
R160	Trimmer	1K	H0651A
R161	Resistor	15K	ELR25
R162	Resistor	1K	R25
R163	Resistor	1K	ELR25
R164	Trimmer	47K	H0651A
R165	Resistor	33K	ELR25
		(IC-271A/E)	
R166	Trimmer	47K	H0651A
R167	Resistor	390K	ELR25
R168	Trimmer	4.7K	H0651A
R169	Resistor	47K	ELR25
R170	Resistor	47K	ELR25
R171	Resistor	22K	ELR25
R172	Resistor	20K	ELR25
R173	Resistor	1M	ELR25
R174	Resistor	10K	ELR25
R175	Resistor	47	ELR25
R176	Resistor	3.9K	ELR25
R177	Resistor	4.7K	ELR25
R178	Resistor	2.2K	ELR25
R179	Resistor	100K	ELR25
R180	Resistor	100	ELR25
R181	Resistor	22K	ELR25
R182	Trimmer	10K-B	H1051C
R183	Resistor	1.8K	R25
R184	Resistor	22K	ELR25
R185	Resistor	470K	ELR25
R186	Resistor	10K	ELR25
R187	Resistor	22K	ELR25
R188	Resistor	5.6K	ELR25
R189	Trimmer	100K-B	H1051C
R190	Resistor	22K	ELR25
R191	Resistor	2.2K	ELR25
R192	Resistor	1K	ELR25
R193	Resistor	10K	ELR25
R194	Resistor	22K	ELR25
R195	Resistor	82K	ELR25
R196	Trimmer	10K-B	H1051C
R197	Resistor	10K	ELR25
R198	Resistor	220	ELR25
R199	Resistor	4.7	ELR25
R200	Resistor	470	ELR25
R201	Resistor	3.3K	ELR25
R202	Resistor	1K	ELR10

MAIN UNIT

REF.NO.	DESCRIPTION	PART NO.	
R203	Resistor	39K	ELR10
R204	Resistor	150K	ELR25
R205	Resistor	1K	ELR25
R206	Resistor	10K	ELR25
R208	Resistor	120K	ELR25
R209	Resistor	120K	ELR25
R210	Resistor	3.3K	ELR25
R210	Trimmer	33K	H0651A
R211	Resistor	2.2K	ELR25
R212	Thermistor	33D28	
R213	Resistor	2.2K	ELR25
R214	Resistor	33K	ELR25
R215	Resistor	1K	ELR25
R216	Resistor	10K	ELR25
R217	Resistor	100K	ELR25
R218	Resistor	470K	ELR25
R219	Resistor	1.8M	ELR25
R220	Resistor	1.8M	ELR25
R221	Resistor	1.8M	ELR25
R222	Resistor	390K	ELR25
R223	Resistor	470K	ELR25
R224	Trimmer	100K	H0651A
R225	Resistor	10K	R10
R226	Resistor	10K	ELR25
R227	Resistor	47K	ELR25
R228	Resistor	4.7K	ELR25
R229	Resistor	1K	R20
R230	Resistor	2.2K	ELR25
R231	Resistor	47K	ELR25
R232	Resistor	39K	ELR25
R233	Resistor	47K	ELR25
R234	Resistor	4.7K	ELR25
R235	Resistor	4.7K	ELR25
R236	Resistor	10K	ELR25
R237	Resistor	12K	ELR25
R238	Resistor	47K	ELR25
R239	Resistor	47K	ELR25
R240	Trimmer	100K	H0651A
R241	Resistor	1K	ELR25
R242	Resistor	2.2K	ELR25
R243	Resistor	330	ELR25
R244	Trimmer	1K-B	H0651C
R245	Resistor	22K	ELR25
R246	Resistor	4.7K	ELR25
R247	Resistor	4.7K	ELR25
R248	Resistor	4.7K	ELR25
R249	Resistor	22K	ELR25
R251	Resistor	22K	ELR25
R252	Resistor	1K	ELR25
R253	Resistor	47K	ELR25
R254	Resistor	10K	ELR25
R255	Resistor	2.2K	ELR25
R256	Resistor	1.8K	ELR25
R257	Trimmer	10K-B	H0651C
R258	Resistor	4.7K	ELR25
R259	Resistor	22K	ELR25
R260	Resistor	10K	ELR25
R261	Resistor	2.2K	ELR25
R262	Resistor	1K	ELR25
R263	Resistor	22K	ELR25
R265	Resistor	2.2K	ELR25
R266	Resistor	2.2K	ELR25
R267	Resistor	47	ELR25
R268	Resistor	100	ELR25

MAIN UNIT

REF.NO.	DESCRIPTION	PART NO.	
R269	Resistor	470	ELR25
R271	Resistor	10K	ELR25
R272	Thermistor	33D28	
R275	Resistor	10K	ELR25
R276	Resistor	3.3M	ELR25
R277	Resistor	10K	ELR25
R278	Resistor	1.5K	ELR25
R280	Resistor	33K	ELR25
R281	Resistor	560	R20
		(IC-271H)	
R282	Resistor	1.8K	ELR25
		(IC-271H)	
C1	Electrolytic	47μ	10V
C2	Electrolytic	1μ(BP)	50V
C3	Electrolytic	10μ	16V
C4	Barrier Lay	0.1	16V
C5	Electrolytic	10μ	16V(RC2)
C6	Ceramic	470P	50V
C7	Ceramic	0.0047	50V
C8	Ceramic	220P	50V
C9	Barrier Lay	0.047	25V
C10	Electrolytic	10μ	16V(RC2)
C11	Electrolytic	0.47μ	50V(RC2)
C12	Mylar	0.01	50V
C13	Mylar	0.01	50V
C14	Mylar	0.0027	50V
C15	Ceramic	100P	50V
C16	Electrolytic	10μ	16V
C17	Barrier Lay	0.1	16V
C18	Mylar	0.001	50V
C19	Ceramic	0.0047	50V
C20	Ceramic	0.0047	50V
C21	Ceramic	5P(CH)	50V
C22	Electrolytic	10μ	16V
C23	Ceramic	100P(YL)	50V
C24	Ceramic	200P(XL)	50V
C25	Ceramic	0.001	50V
C26	Ceramic	0.0047	50V
C27	Ceramic	0.0047	50V
C28	Ceramic	100P	50V
C29	Ceramic	0.0047	50V
C30	Ceramic	47P	50V
C31	Ceramic	0.0047	50V
C32	Electrolytic	3.3μ	50V(RC2)
C33	Electrolytic	4.7μ	25V(RC2)
C34	Barrier Lay	0.047	25V
C35	Ceramic	0.001	50V
C36	Barrier Lay	0.047	25V
C37	Barrier Lay	0.047	25V
C38	Barrier Lay	0.047	25V
C39	Ceramic	100P	50V
C40	Ceramic	220P	50V
C41	Ceramic	0.0047	50V
C42	Barrier Lay	0.047	25V
C43	Barrier Lay	0.047	25V
C44	Barrier Lay	0.047	25V
C45	Barrier Lay	0.047	25V
C46	Barrier Lay	0.047	25V
C47	Trimmer	CV05E3001	30P
C48	Ceramic	33P(CH)	50V

MAIN UNIT

REF.NO.	DESCRIPTION	PART NO.	
C49	Dip Mica	150P	50V
C50	Ceramic	150(XL)	50V
C51	Barrier Lay	0.1	16V
C52	Barrier Lay	0.047	25V
C53	Ceramic	47P	50V
C54	Electrolytic	0.47μ	50V
C55	Ceramic	10P	50V
C56	Barrier Lay	0.047	25V
C57	Ceramic	100P	50V
C58	Ceramic	100P	50V
C59	Ceramic	0.001	50V
C60	Electrolytic	47μ	10V
C61	Mylar	0.033	50V
C62	Ceramic	0.0047	50V
C63	Electrolytic	1μ	50V
C64	Mylar	0.001	50V
C65	Barrier Lay	0.1	16V
C66	Barrier Lay	0.047	25V
C67	Barrier Lay	0.047	25V
C68	Ceramic	0.001	50V
C69	Electrolytic	10μ	16V
C70	Ceramic	0.0047	50V
C71	Ceramic	15P	50V
C72	Ceramic	0.001	50V
C73	Ceramic	470P	50V
C74	Ceramic	15P	50V
C75	Barrier Lay	0.047	25V
C76	Barrier Lay	0.047	25V
C77	Ceramic	0.0047	50V
C78	Ceramic	0.0047	50V
C79	Ceramic	47P	50V
C80	Ceramic	0.001	50V
C81	Ceramic	220P	50V
C82	Ceramic	5P	50V
C83	Ceramic	68P	50V
C84	Ceramic	0.001	50V
C85	Barrier Lay	0.1	16V
C86	Barrier Lay	0.047	25V
C87	Barrier Lay	0.047	25V
C88	Ceramic	10P	50V
C89	Barrier Lay	0.047	25V
C90	Electrolytic	22μ	16V
C91	Barrier Lay	0.047	25V
C92	Ceramic	5P	50V
C93	Barrier Lay	0.1	16V
C94	Ceramic	0.0047	50V
C95	Electrolytic	0.47μ(RC2)	
C96	Ceramic	0.0047	50V
C97	Electrolytic	0.1μ(RC2)50V	
C98	Electrolytic	4.7μ(RC2)50V	
C99	Barrier Lay	0.047	25V
C100	Ceramic	470P	50V
C101	Electrolytic	10μ	16V
C102	Barrier Lay	0.047	25V
C103	Ceramic	47P	50V
C104	Barrier Lay	0.047	25V
C105	Barrier Lay	0.047	25V
C106	Ceramic	47P	50V
C107	Ceramic	27P	50V
C108	Barrier Lay	0.047	25V
C109	Barrier Lay	0.047	25V
C110	Ceramic	0.001	50V
C111	Ceramic	47P	50V
C112	Barrier Lay	0.047	25V

MAIN UNIT

REF.NO.	DESCRIPTION	PART NO.
C113	Barrier Lay	0.047 25V
C114	Barrier Lay	0.0047 25V
C115	Ceramic	0.0047 50V
C116	Mylar	0.022 50V
C117	Barrier Lay	0.1 16V
C118	Barrier Lay	0.1 16V
C119	Ceramic	0.0047 50V
C120	Electrolytic	470μ 16V
C121	Ceramic	0.0047 50V
C122	Ceramic	0.0047 50V
C123	Ceramic	0.0047 50V
C124	Barrier Lay	0.047 25V
C125	Ceramic	10P(CH) 50V
C126	Barrier Lay	0.1 16V
C127	Barrier Lay	0.047 25V
C128	Barrier Lay	0.047 25V
C129	Ceramic	0.001 50V
C130	Electrolytic	2.2μ 50V
C131	Barrier Lay	0.1 16V
C132	Ceramic	0.0047 50V
C133	Electrolytic	10μ 16V
C134	Ceramic	220P 50V
C135	Ceramic	0.0047 50V
C136	Ceramic	0.0047 50V
C137	Ceramic	0.0047 50V
C138	Ceramic	220P 50V
C139	Ceramic	0.001 50V
C140	Ceramic	220P 50V
C141	Barrier Lay	0.1 16V
C142	Electrolytic	0.47μ 50V
C143	Electrolytic	10μ 16V(RC2)
C144	Electrolytic	220μ 10V
C145	Barrier Lay	0.1 16V
C146	Barrier Lay	0.1 16V
C147	Electrolytic	100μ 10V
C148	Electrolytic	10μ 16V
C149	Electrolytic	1μ 50V(RC2)
C150	Ceramic	0.0047 50V
C151	Electrolytic	0.47μ 50V(RC2)
C152	Barrier Lay	0.047 25V
C153	Ceramic	0.0047 50V
C154	Electrolytic	220μ 10V
C155	Electrolytic	100μ 10V
C156	Electrolytic	0.047μ 50V
C157	Electrolytic	220μ 16V
C158	Ceramic	0.0047 50V
C159	Barrier Lay	0.1 50V
C160	Electrolytic	0.47μ 50V(RC2)
C161	Barrier Lay	0.047 25V
C162	Electrolytic	47μ 25V(RC2)
C163	Electrolytic	10μ 16V
C164	Barrier Lay	0.047 25V
C165	Barrier Lay	0.047 25V
C166	Ceramic	0.0022 50V
C167	Barrier Lay	0.1 16V
C168	Ceramic	470P 50V
C169	Ceramic	0.001 50V
C170	Ceramic	0.0047 50V
C171	Ceramic	120P(SH)50V
C172	Ceramic	10P 50V
C173	Barrier Lay	0.1 16V
C174	Barrier Lay	0.1 16V
C175	Dip Mica	200P 50V
C176	Ceramic	82P(CH) 50V

MAIN UNIT

REF.NO.	DESCRIPTION	PART NO.
C177	Electrolytic	4.7μ 50V
C179	Electrolytic	2.2μ 50V
C180	Ceramic	0.001 50V
C181	Ceramic	0.001 50V
C182	Ceramic	470P 50V
C183	Electrolytic	470μ 16V
C184	Ceramic	0.001 50V
C185	Electrolytic	0.47μ 50V(RC2)
C186	Electrolytic	470μ 16V
C187	Electrolytic	47μ 10V
C188	Electrolytic	0.47μ 50V
C189	Electrolytic	2.2μ 50V
C190	Electrolytic	1μ 50V
C191	Ceramic	0.0047 50V
C192	Ceramic	0.001 50V
C193	Ceramic	0.0047 50V
C194	Barrier Lay	0.047 25V
C195	Ceramic	0.001 50V
C195	Electrolytic	10μ 16V(RC2)
C197	Mylar	0.022 50V
C198	Mylar	0.022 50V
C199	Mylar	0.022 50V
C200	Ceramic	47P 50V
C201	Electrolytic	220μ 10V
C202	Electrolytic	2.2μ 50V(RC2)
C203	Electrolytic	33μ 16V
C204	Ceramic	0.0047 50V
C205	Barrier Lay	0.1 16V
C206	Ceramic	0.0047 50V
C208	Ceramic	0.0047 50V
C209	Ceramic	0.001 50V
C210	Mylar	0.0047 50V
C211	Barrier Lay	0.047 25V
C212	Mylar	0.015 50V
C214	Ceramic	0.0047 50V
C215	Ceramic	100P 50V
C216	Ceramic	0.0047 50V
C217	Barrier Lay	0.047 25V
C218	Electrolytic	4.7μ 25V(RC2)
C219	Ceramic	0.0047 50V
	(IC-271H:	220P 50V)
C220	Ceramic	0.0047 50V
	(IC-271H:	220P 50V)
C221	Ceramic	82P 50V
C222	Barrier Lay	0.1 16V
C223	Electrolytic	1μ 50V(RC2)
C224	Barrier Lay	0.1 16V
C225	Electrolytic	2.2μ 50V(RC2)
C226	Electrolytic	47μ 10V
C230	Electrolytic	0.47μ 50V(RC2)
C231	Electrolytic	3.3μ 50V(RC2)
C232	Barrier Lay	0.1 16V
C233	Barrier Lay	0.1 16V
C234	Ceramic	220P 50V(IC-271H)
C235	Ceramic	220P 50V(IC-271H)
C236	Ceramic	220P 50V(IC-271H)
C237	Barrier Lay	0.047 25V(IC-271H)
C238	Ceramic	220P 50V
C239	Ceramic	0.0047 50V
	(IC-271H:	220P 50V)

MAIN UNIT

REF.NO.	DESCRIPTION	PART NO.
C240	Ceramic	0.0047 50V
	(IC-271H:	220P 50V)
C241	Ceramic	0.0047 50V
	(IC-271H:	220P 50V)
C242	Ceramic	0.0047 50V
	(IC-271H:	220P 50V)
C243	Ceramic	220P 50V
C244	Ceramic	0.0047 50V
C245	Ceramic	0.0047 50V
C250	Electrolytic	10V-16V-MS5
		(IC-271A/E)
P1	Connector	TL-25H-04-B1
		(IC-271H: EHR-04)
P2	Connector	TL-25H-02-B1
J1	Connector	TL-25P-04-V1
		(IC-271H: B04B-EH-S)
J2	Connector	TL-25P-13-V1
		(IC-271H: B13B-EH-S)
J3	Connector	TL-25P-07-V1
		(IC-271H: B07B-EH-S)
J4	Connector	TL-25P-04-V1
		(IC-271H: B04B-EH-S)
J5	Connector	TL-25P-03-V1
		(IC-271H: B03B-EH-S)
J6	Connector	TL-25P-08-V1
		(IC-271H: B08B-EH-S)
J7	Connector	TL-25P-12-V1
		(IC-271H: B12B-EH-S)
J8	Connector	TL-25P-03-V1
		(IC-271H: B03B-EH-S)
J9	Connector	TL-25P-06-V1
		(IC-271H: B06B-EH-S)
J10	Connector	5045-02A
J11	Connector	5045-02A
J12	Connector	5045-02A
J13	Connector	5045-02A
J14	Connector	5045-02A
J15	Connector	TL-25P-04-V1
		(IC-271H: B04B-EH-S)
B1	P.C.B.	B643C(MAIN)
W1	Jumper	JPW02H
W2	Jumper	JPW02A
W3	Jumper	JPW02A
W5	Jumper	JPW02A
W6	Jumper	JPW02H
W9	Jumper	JPW02H
W11	Jumper	JPW02H
W12	Jumper	JPW02H
W13	Jumper	JPW02H
W15	Jumper	JPW02H
W17	Jumper	JPW02A
W18	Jumper	JPW02H
W19	Jumper	JPW02H

MAIN UNIT

REF.NO.	DESCRIPTION	PART NO.
W20	Jumper	JPW02A
W21	Jumper	JPW02A
W22	Jumper	JPW02A
W23	Jumper	JPW02H
W24	Jumper	JPW02A
W25	Jumper	JPW02H
W26	Jumper	JPW02A
W45	Jumper	JPW02A
W98	Jumper	JPW02H
W104	Jumper	JPW02H
W108	Jumper	JPW02A
W109	Jumper	JPW02H
W111	Jumper	JPW02H
W112	Jumper	JPW02H
W113	Jumper	JPW02A
W114	Jumper	JPW02H
W124	Jumper	JPW02A
W126	Jumper	JPW02H
		(IC-271A/E)
W132	Jumper	JPW02H

PA UNIT: IC-271H

REF.NO.	DESCRIPTION	PART NO.	
IC1	IC	SC-1013	
Q1	Transistor	2SC2120Y	
Q2	Transistor	2SC945P	
Q3	Transistor	2SD235Y	
Q4	Transistor	2SC945P	
Q5	Transistor	2SC2694	
Q6	Transistor	2SC2694	
D1	Diode	15CD11	
D2	Diode	1N4002	
D3	Diode	MV5	
D4	Diode	MV5	
D5	Diode	1SS53	
L1	Coil	LA-72	
L2	Coil	LA-9	
L3	Coil	LA-76	
L4	Coil	LW-9	
L5	Coil	LA-178	
L6	Coil	LA-178	
L7	Coil	LW-28	
L8	Coil	LA-179	
L9	Coil	LA-180	
R1	Resistor	100	ELR25
R2	Resistor	22	ELR25
R3	Resistor	120	ELR25
R4	Resistor	2.2K	ELR25
R5	Resistor	10K	ELR25
R7	Trimmer	3.3K	H0651A
R8	Resistor	100	ELR25
R10	Resistor	10K	ELR25
R11	Resistor	4.7K	ELR25
R12	Trimmer	10K	H0651A
R13	Trimmer	10K	H0651A
R14	Resistor	1K	ELR25
R15	Resistor	1K	ELR25
R17	Resistor	47	1/2W
R18	Resistor	USE L7	
R19	Resistor	R1J10	1W
R20	Resistor	0.33	RGB2
R21	Resistor	R1J10	1W
R22	Resistor	33	R25
C1	Ceramic	0.0047	50V
C2	Ceramic	0.0047	50V
C3	Ceramic	220P	50V
C4	Barrier Lay	0.1	16V
C5	Electrolytic	22μ	25V
C6	Ceramic	220P	50V
C7	Barrier Lay	0.1	16V
C8	Ceramic	220P	50V
C9	Barrier Lay	0.047	25V
C10	Ceramic	220P	50V

PA UNIT: IC-271H

REF.NO.	DESCRIPTION	PART NO.	
C11	Ceramic	39P	500V
C12	Ceramic	3P	500V
C13	Ceramic	33P	500V
C14	Ceramic	2P	500V
C15	Ceramic	33P	500V
C16	Ceramic	15P	500V
C17	Ceramic	120P	50V
C18	Ceramic	10P	500V
C19	Monolithic	135P	500V
C21	Monolithic	140P	500V
C22	Monolithic	135P	500V
C23	Monolithic	140P	500V(UC34 type)
C24	Trimmer	70P	TYPE(C)
C25	Monolithic	200P	UC342H2000J
C26	Ceramic	30P	500V
C27	Ceramic	39P	500V
C28	Monolithic	47P	500V(UC23 type)
C29	Trimmer	15P	15P(TMC-210SLD)
C30	Ceramic	27P	1KV DE0705SL
C31	Barrier Lay	0.047	25V
C32	Barrier Lay	0.047	25V
C33	Electrolytic	4.7μ	25V
C34	Ceramic	220P	50V
C36	Ceramic	220P	50V
C37	Electrolytic	47μ	10V
C38	Ceramic	220P	50V
C39	Ceramic	220P	50V
C40	Ceramic	220P	50V
C41	Electrolytic	47μ	25V
C42	Ceramic	220P	50V
J1	Connector	LLR-6	
J2	Connector	SJ-296	
J3	Connector	HSJ0707-01-010	
J4	Connector	RT-01T-1.0B	
J11	Connector	SQ-2054	
J12	Connector	5045-02A	
J13	Connector	RT-10T-1.3B	
J14	Connector	RT-10T-1.3B	
J15	Connector	RT-10T-1.3B	
J16	Connector	RT-10T-1.3B	
J17	Connector	1646-24R	
J18	Connector	MR-DS-P	
P1	Connector	1545R-1	
P2	Connector	5250-02	
P3	Connector		
P4	Connector	EHR-08	
P5	Connector		
P6	Connector	EHR-04	
P7	Connector	EHR-08	
F1	FUSE	3A	
S1	Thermal	OHD-80M	
S2	Thermal	OHD-50M	
SP1	Speaker	C065K1210810	

PA UNIT:IC-271H

REF.NO.	DESCRIPTION	PART NO.
MF1	DC Motor	M6B12U22
EP1	Ferrite beads	FSQH050RN
EP2	PC Board	B-851C(PA)
EP3		P103K
EP4		B312D
EP5		59TC4772
EP6	PC Board	B-758B(JACK)
EP7	Ferrite beads	FSQH070RN
EP8	Ferrite beads	FSQH070RN
EP9	Ferrite beads	FSQH070RN
EP10	Ferrite beads	FSQH070RN
W42	Jumper	JPW02H

PA UNIT: IC-271A/E

REF.NO.	DESCRIPTION	PART NO.
IC	IC	SC-1013 #02,03,06
IC	IC	SC-1010 #04,05,07
D1	Diode	MI402
D2	Diode	MI402
D3	Diode	1SS97
D4	Diode	15CD11
L1	Coil	LW-10
L2	Coil	LA-2
L3	Coil	LA-71
L4	Coil	LA-9
L5	Coil	LA-76
L6	Choke	LW-19
R1	Resistor	0.15 RGB3(3W) #04,05,07
R1	Resistor	0.33 RGB3(2W) #02,03,06
R2	Resistor	220 ELR25
R3	Resistor	1.5K R25
R4	Resistor	220 R25
R5	Resistor	47K R25 #04,05,07
R5	Resistor	33K R25 #02,03,06
C1	Ceramic	220P 50V
C2	Barrier Lay	0.1 16V
C3	Electrolytic	22μ 16V
C4	Barrier Lay	0.1 16V
C5	Ceramic	220P 50V
C6	Ceramic	220P 50V
C7	Ceramic	0.0047 50V
C8	Ceramic	0.5P 500V
C9	Ceramic	0.001 500V
C10	Ceramic	15P 50V
C11	Ceramic	150P 50V
C12	Ceramic	39P 500V
C13	Ceramic	3P 500V
C14	Ceramic	33P 500V
C15	Ceramic	2P 500V
C16	Ceramic	33P 500V
C17	Ceramic	15P 500V
C18	Ceramic	0.0047 50V
C19	Ceramic	0.0047 50V
C20	Ceramic	0.0047 50V
C21	Ceramic	220P 50V

PA UNIT: IC-271A/E

REF.NO.	DESCRIPTION	PART NO.
P1	Connector	
P2	Connector	
P3	Connector	TL-25H-07-B1
P4	Connector	5250-02
P7	Connector	SMP-04V-B
P9	Connector	TL-25H-08-B1
P10	Connector	TL-25H-04-B1
P11	Connector	1545R-1
J1	Connector	FM-MRDS
J2	Connector	SJ-296
J3	Connector	HSJ0707-01-010
J4	Connector	SQ-2054
J5	Connector	LLR-6
J6	Connector	RT-01T-1.0B
J7	Connector	RT-01T-1.0B
J8	Connector	RT-01T-1.0B
J9	Connector	RT-01T-1.0B
J10	Connector	RT-01T-1.0B
J11	Connector	RT-01T-1.0B
J12	Connector	RT-01T-1.0B
J13	Connector	RT-01T-1.0B
J14	Connector	RT-01T-1.0B
J15	Connector	RT-01T-1.0B
J16	Connector	5045-02A
J17	Connector	1625-24R
J18	Connector	RT-01T-1.0B
SP1	Speaker	090A21
B1	P.C.B.	B-645A
B2	P.C.B.	B-758B

CSS UNIT

REF.NO.	DESCRIPTION	PART NO.	
IC1	IC	4558D	
IC2	IC	DP-2	
Q1	Transistor	2SC945(Q,P,K)	
Q2	Transistor	2SC945(Q,P,K)	
Q3	Transistor	2SC945(Q,P,K)	
D1	Diode	1SS53	
D2	Diode	1SS53	
D3	Diode	1SS53	
D4	Diode	1SS53	
D5	Zener	WZ036 (IC-271H:RD3.6EB1)	
D6	Diode	1SS53	
D7	Diode	1SS53	
D8	Diode	1SS53	
R1	Resistor	47K	ELR25
R2	Resistor	47K	ELR25
R3	Resistor	470K	ELR25
R4	Resistor	1.8M	ELR25
R5	Resistor	470K	ELR25
R6	Trimmer	1M	ELR25
R7	Resistor	1.8M	ELR25
R8	Resistor	470K	ELR25
R9	Trimmer	1M	H0651A
R10	Resistor	470K	ELR25
R11	Resistor	47	R25
R12	Resistor	47K	ELR25
R13	Resistor	10K	ELR25
R14	Resistor	10K	ELR25
R15	Resistor	15K	ELR10
R16	Resistor	12K	ELR10
R17	Resistor	47K	ELR25
R18	Resistor	47K	ELR25
R19	Resistor	47K	ELR25
R20	Resistor	47K	ELR25
R21	Resistor	27K	ELR25
R22	Resistor	47K	ELR25
R23	Resistor	4.7	ELR25
C1	Ceramic	0.001	50V
C2	Ceramic	0.0047	50V
C3	Electrolytic	10μ	16V
C4	Electrolytic	10μ	16V
C6	Electrolytic	10μ	16V
C7	Electrolytic	1μ(BP)	50V
C8	Ceramic	0.0047	50V
C9	Ceramic	0.001	50V
C10	Barrier Lay	0.1	16V
C11	Electrolytic	100μ	16V
C12	Electrolytic	100μ	16V
C13	Barrier Lay	0.1	16V
J1	Connector	B06B-EH-S	
J2	Connector	B03B-EH-S	
B1	P.C.B.	B-739A	
L1	Choke	102(FL-4H)	
L2	Choke	LW-12	

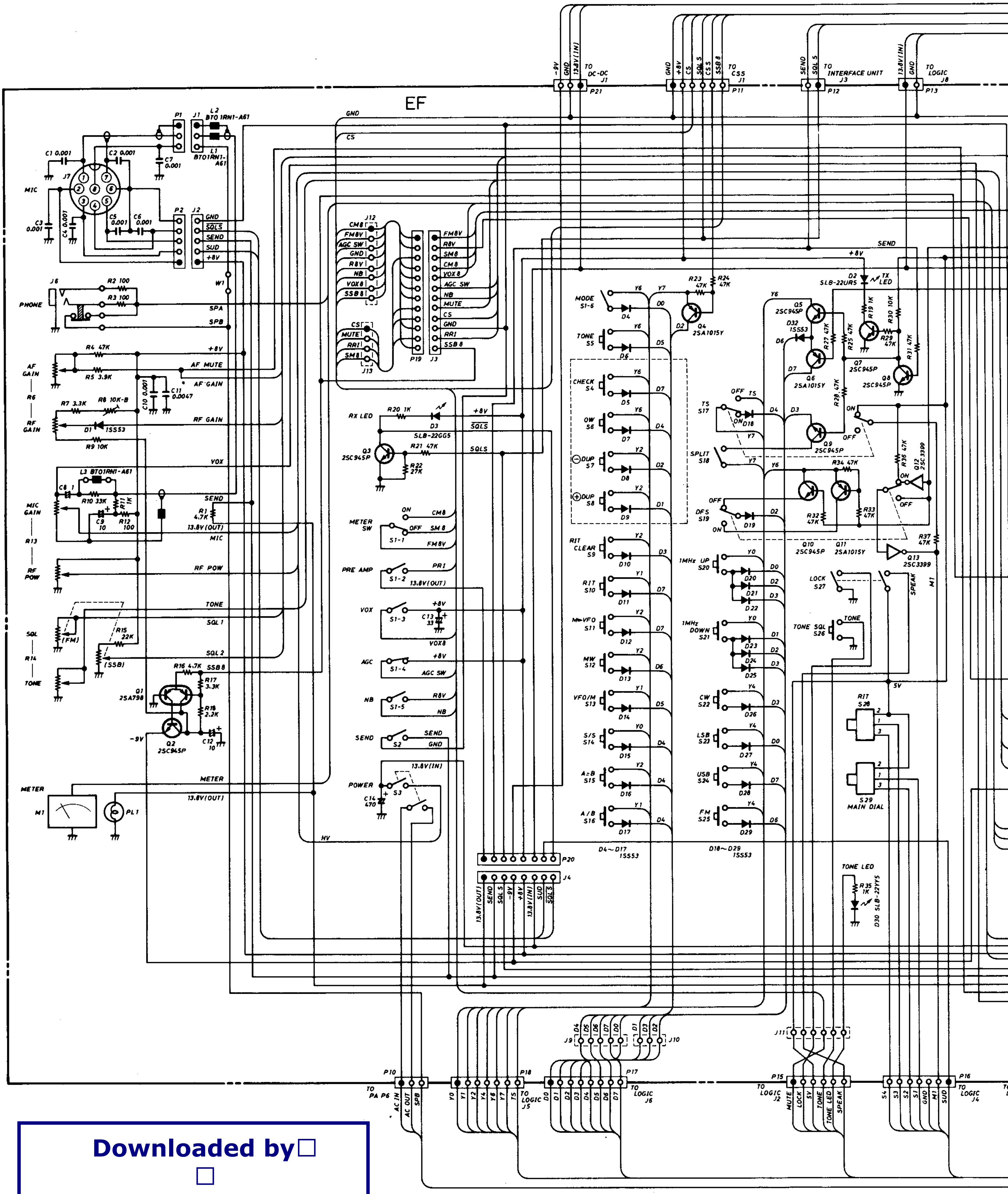
TERMINAL UNIT

REF.NO.	DESCRIPTION	PART NO.
Q1	Transistor	2SC945P
Q2	Transistor	2SC945P
Q3	Transistor	2SC945P
D1	Diode	1SS53
R1	Resistor	4.7K ELR25
R2	Resistor	100K ELR25
R3	Resistor	100K ELR25
R4	Resistor	4.7K ELR25
R5	Resistor	4.7K ELR25
R6	Resistor	4.7K ELR25
C1	Electrolytic	4.7μ 25V
C2	Electrolytic	4.7μ 25V
C3	Ceramic	220P 50V
C4	Ceramic	0.001 50V
C5	Ceramic	0.001 50V
C6	Ceramic	0.001 50V
C7	Ceramic	0.001 50V
C9	Ceramic	0.001 50V
C10	Ceramic	0.001 50V
C11	Ceramic	0.001 50V
C12	Ceramic	0.001 50V
C13	Ceramic	0.001 50V
C14	Ceramic	0.0047 50V
J1	Connector	B08B-EH-S
J2	Connector	TLB-P08H-B1
J3	Connector	TLB-P07H-B1
J4	Connector	B08B-EH-S
J5	Connector	B10B-EH-S
J6	Connector	B03B-EH-S
P1	Connector	EHR-08
P2	Connector	EHR-07
P3	Connector	5250-02
P4	Connector	EHR-03
EP1	P.C.B.	B-874 (TERMINAL)
W18	Jumper	JPW02H
W19	Jumper	JPW02H
W20	Jumper	IPS-1041-4

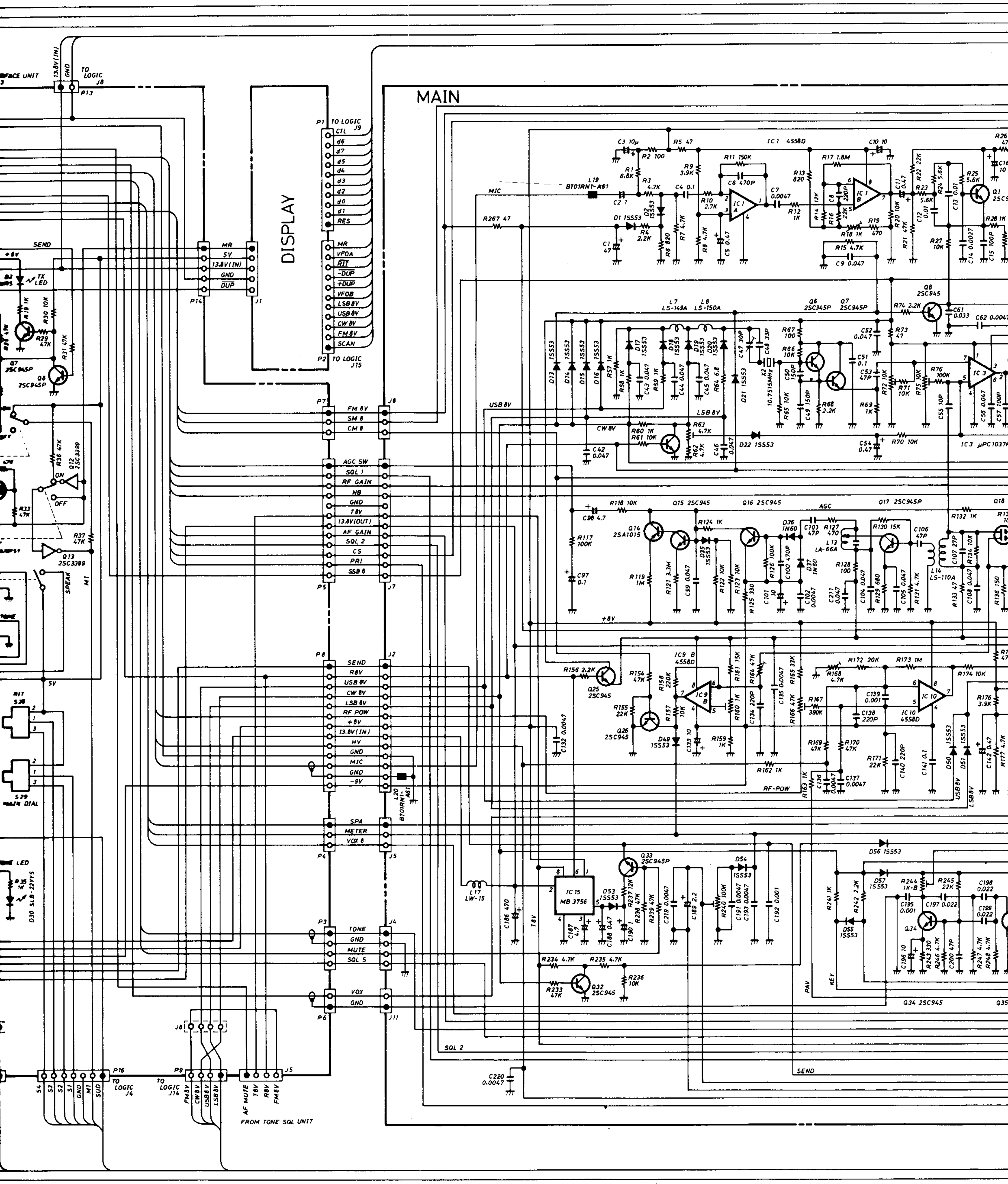
TONE UNIT:#02,05

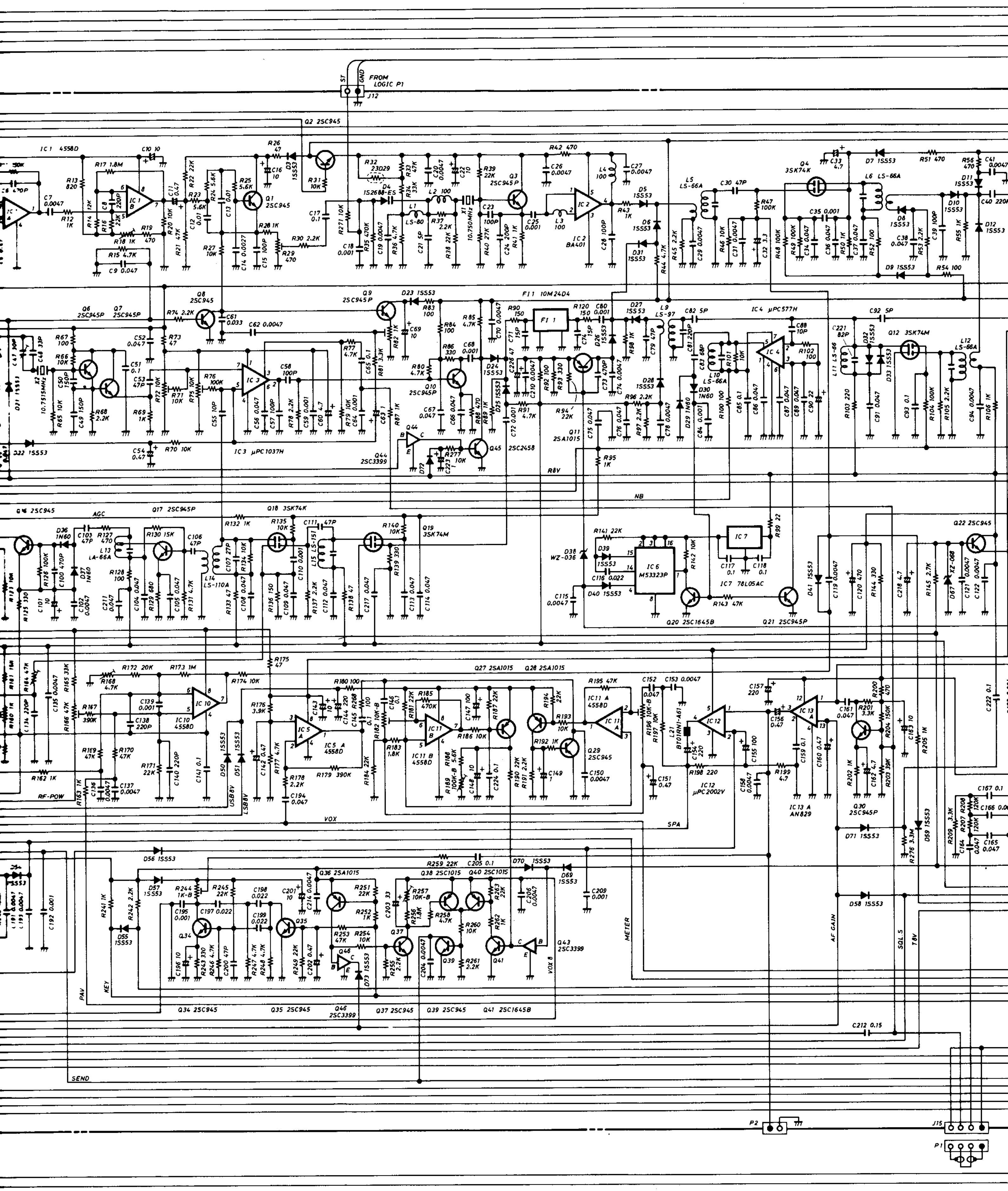
REF.NO.	DESCRIPTION	PART NO.
IC1	IC	TC5082P-G
IC2	IC	NJM4558D
Q1	Transistor	2SA1348
D1	Zener	RD8.2EB3
D2	Diode	1SS53
X1	Xtal	7.168MHZ(HC43/U)
R1	Resistor	330 R25
R2	Resistor	47 R25
R3	Resistor	3.3K R25
R4	Trimmer	1K EVN-5AC
R5	Resistor	47K R25
R6	Resistor	3.9K R25
R7	Resistor	1.8M ELR25
R8	Resistor	220K R25
R9	Resistor	JPW02A
R10	Resistor	4.7k R25
R11	Resistor	1.8M R25
C1	Ceramic	47P 50V
C2	Ceramic	0.001 50V
C3	Ceramic	0.0047 50V
C4	Electrolytic	10μ 16V
C5	Ceramic	47P 50V
C6	Ceramic	0.001 50V
C7	Ceramic	0.0047 50V
C8	Electrolytic	10μ 16V
C9	Ceramic	12P 50V
C10	Ceramic	12P 50V
C11	Mylar	0.0047 50V
C12	Electrolytic	4.7μ(BP) 25V
C13	Ceramic	15P 50V
C14	Electrolytic	0.47μ 50V
P1	Connector	EHR-10
P2	Connector	5250-02
EP1	P.C.B.	B-915

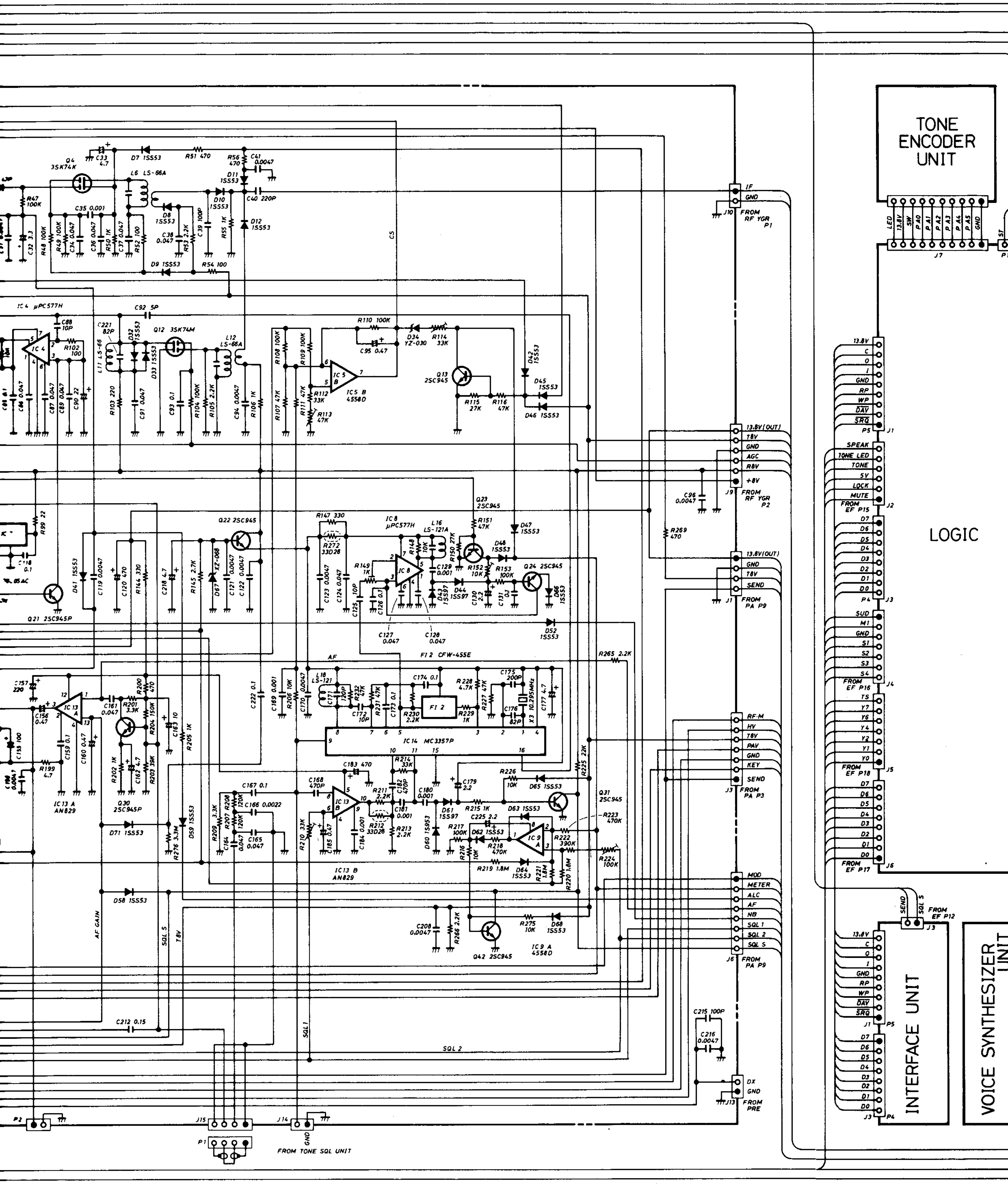
IC-271A/E SCHEMAT



CHEMATIC DIAGRAM







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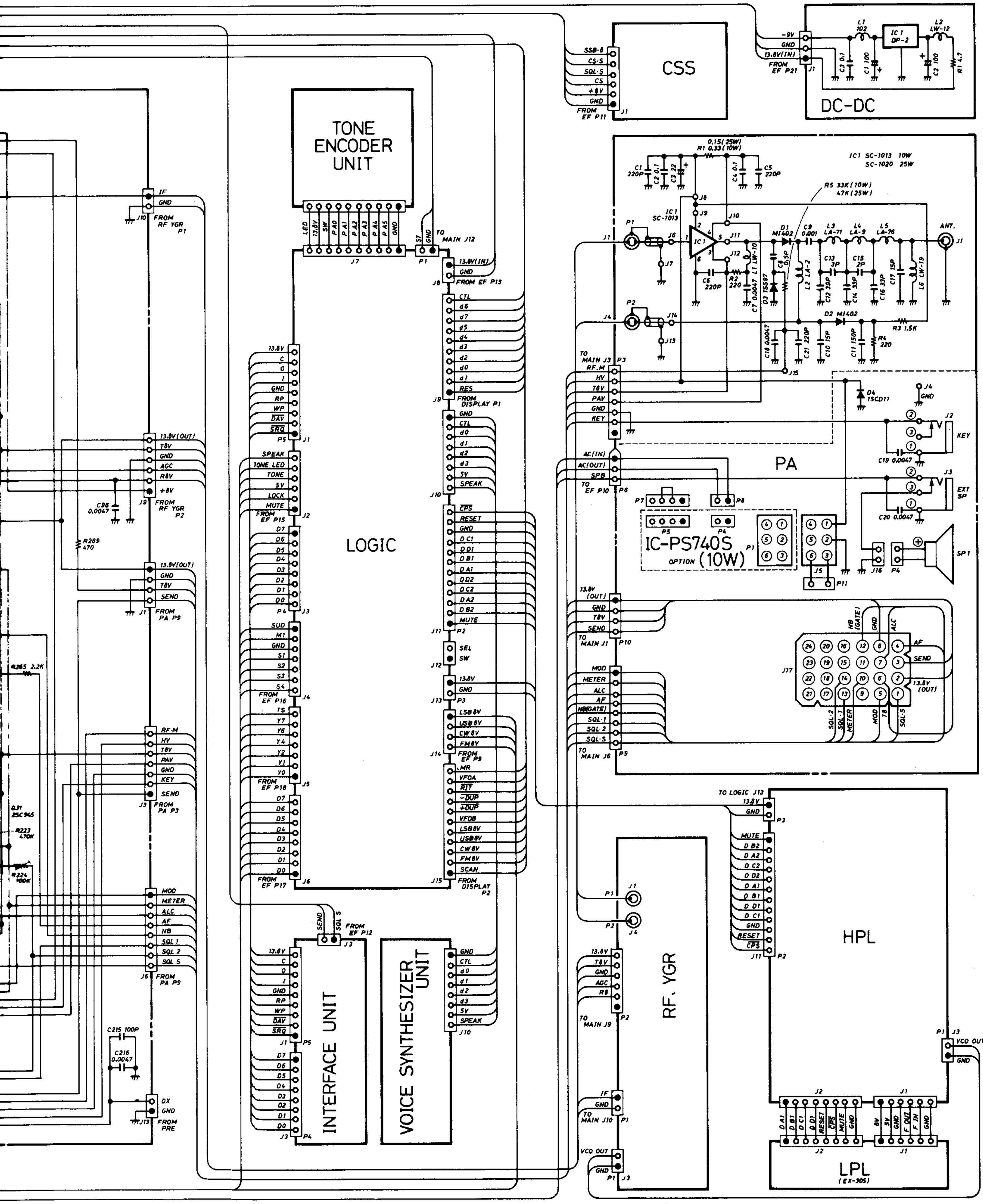

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Some components subject to change for an improvement without notice.

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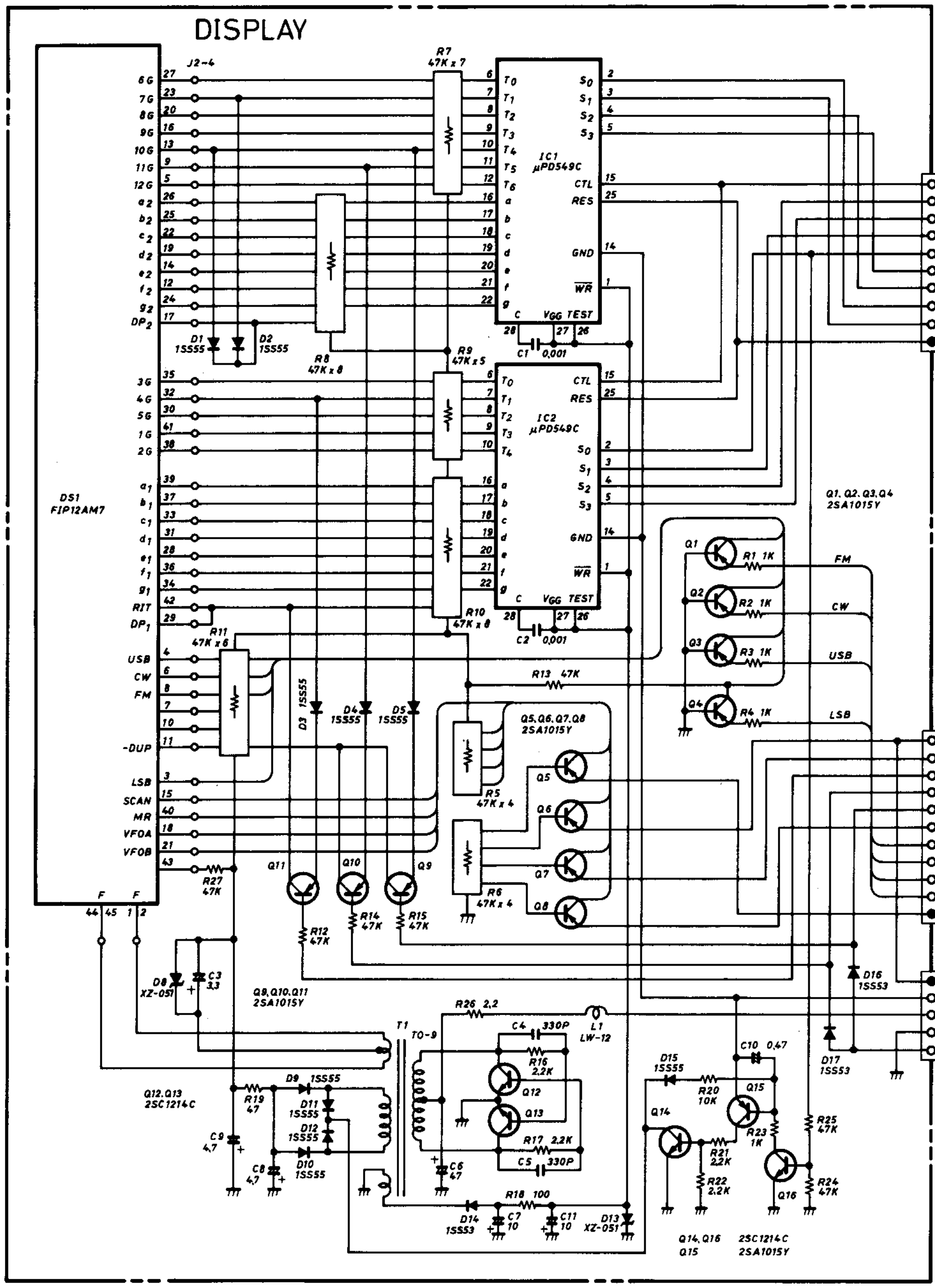
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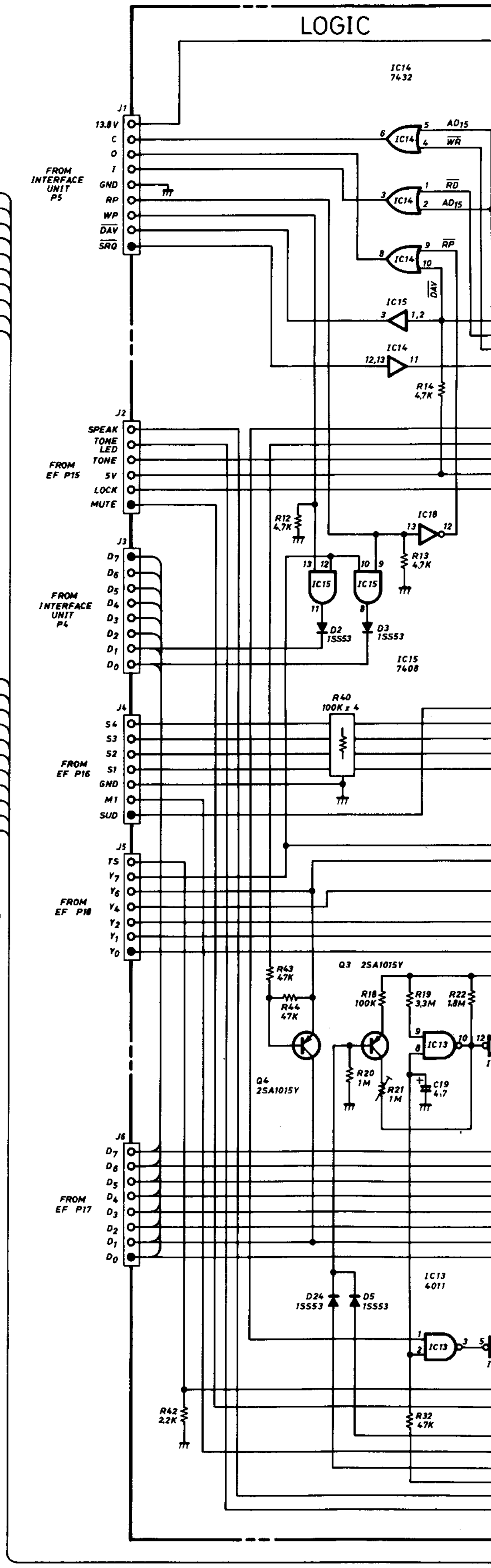
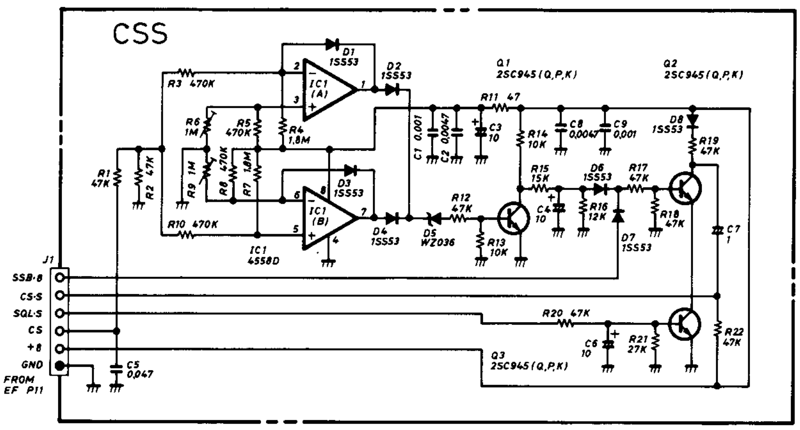
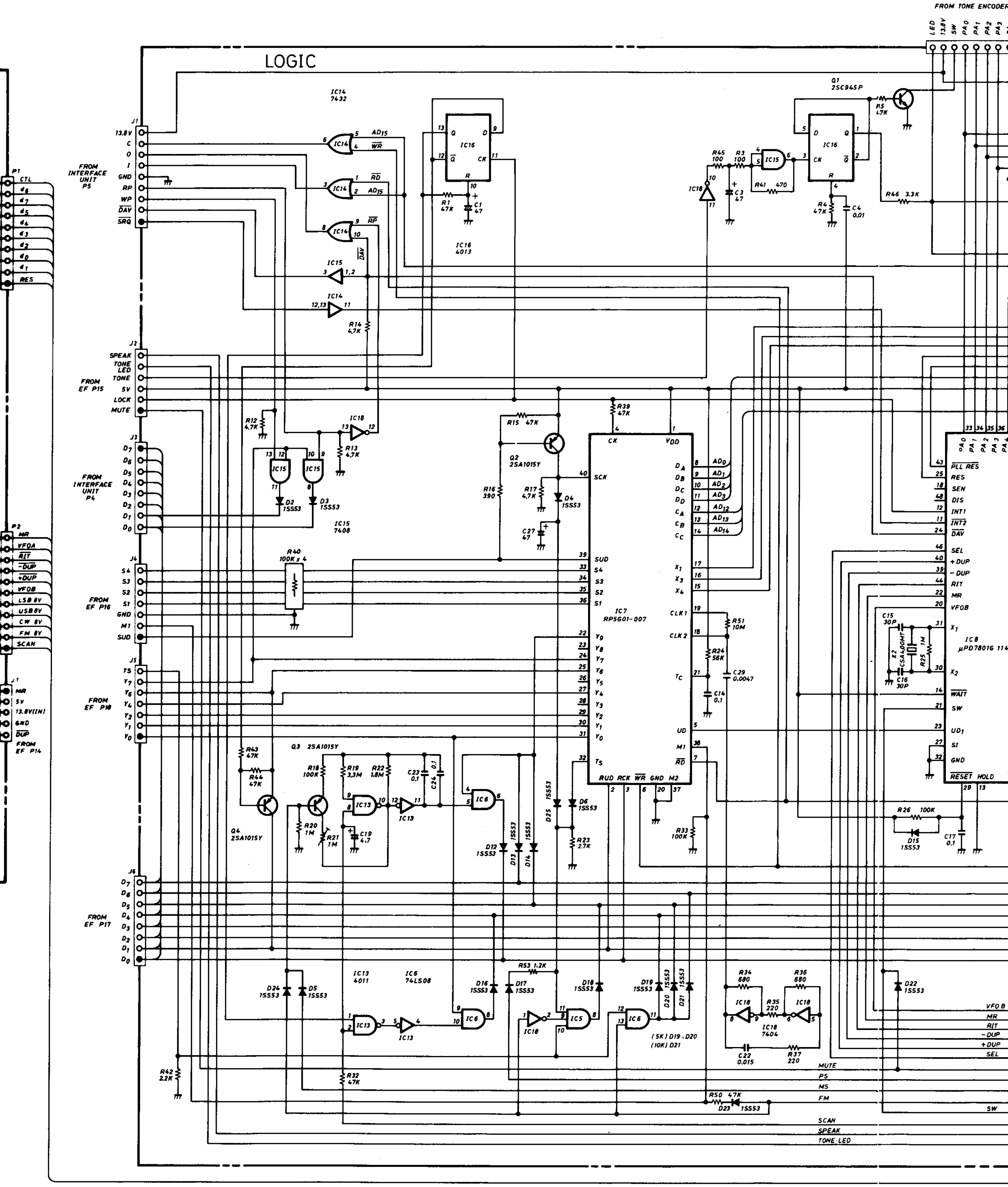
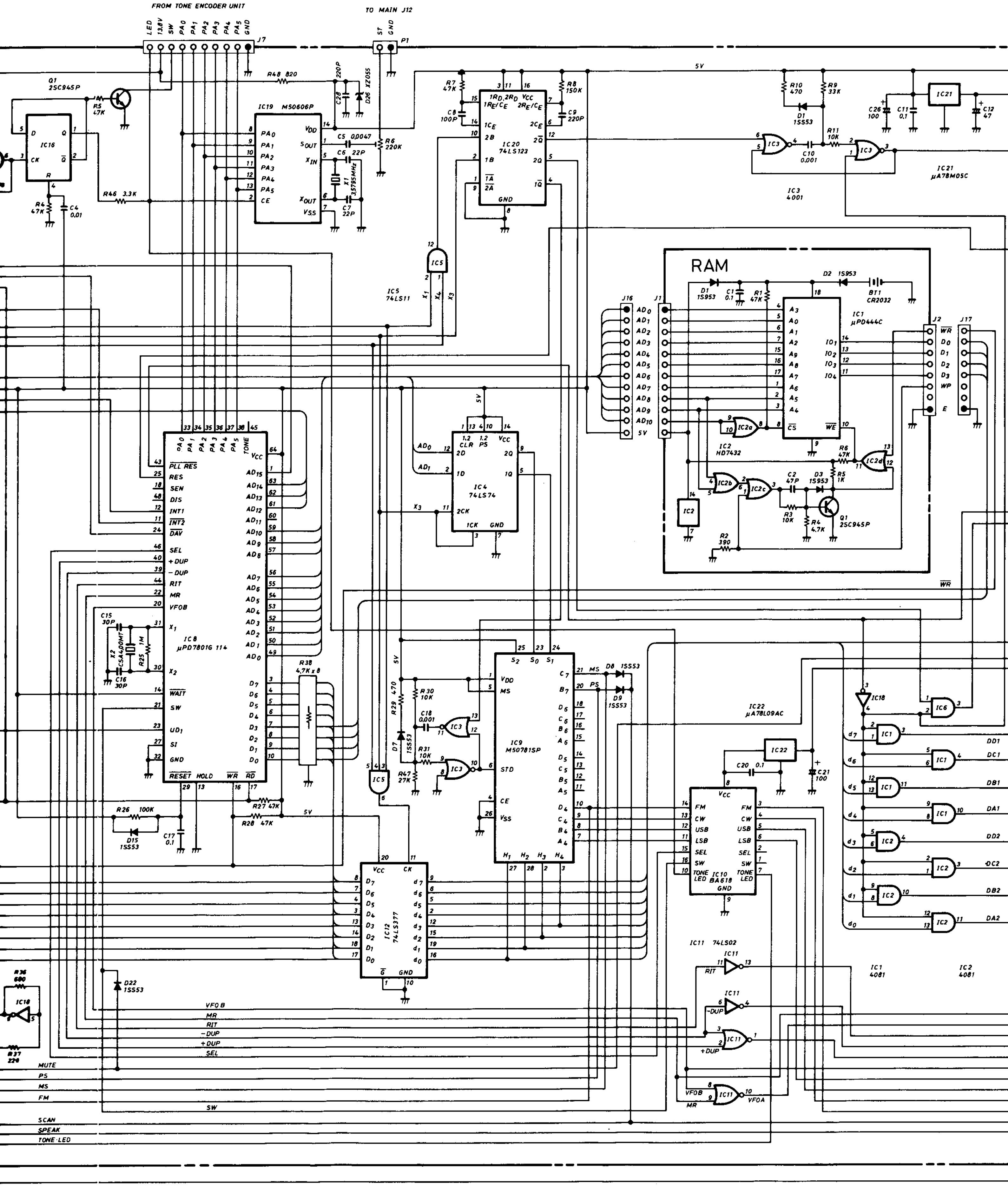
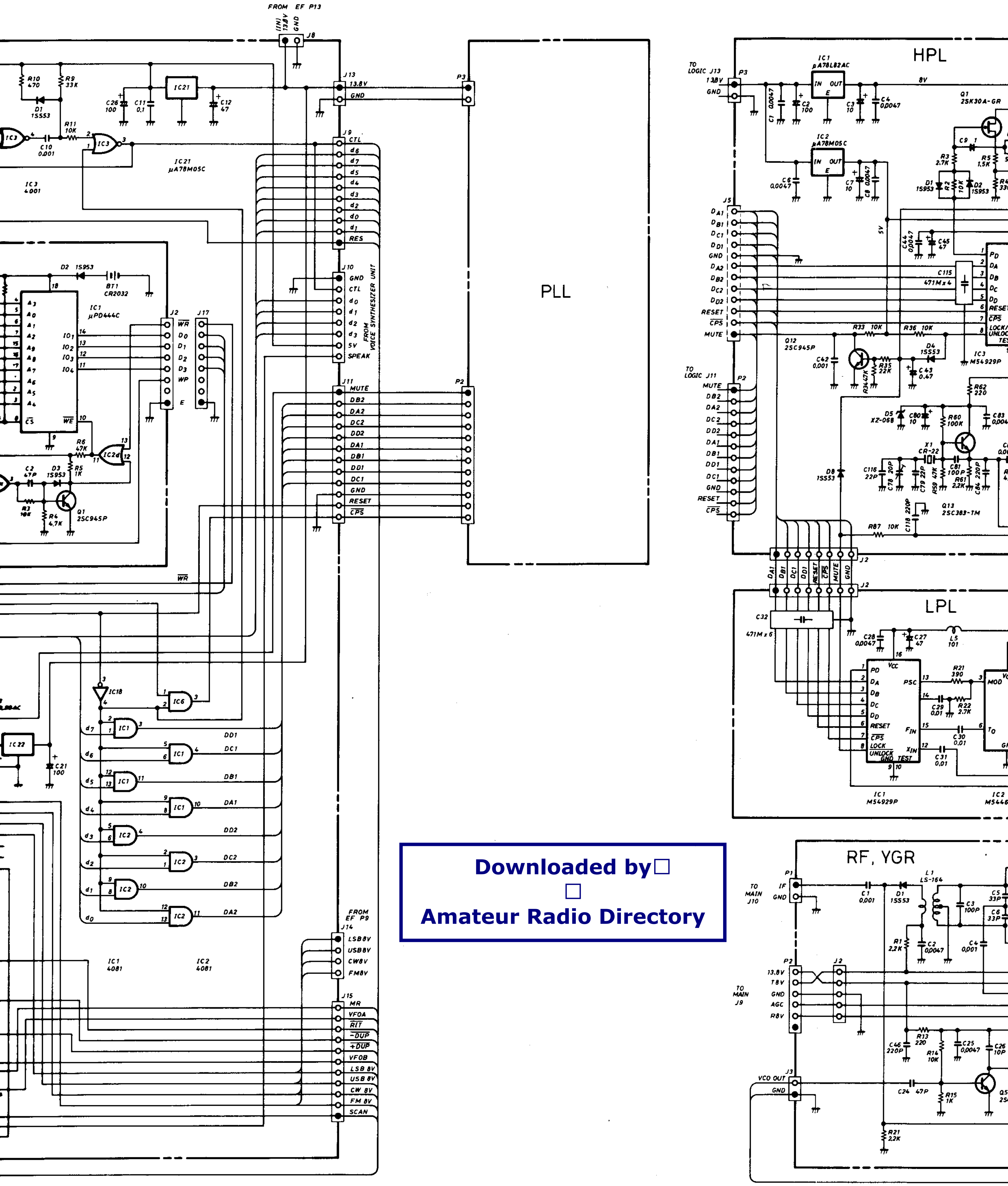
DS1
FIP12AM7
IC1
μPD549C
IC2
μPD549C
R7 47K x 7
R8 47K x 8
R9 47K x 5
R10 47K x 8
R11 47K x 6
Q1, Q2, Q3, Q4
2SA1015Y
Q5, Q6, Q7, Q8
2SA1015Y
Q9, Q10, Q11
2SA1015Y
Q12, Q13
2SC1214C
Q14, Q16
Q15
2SC1214C
2SA1015Y
T1
TO-9
L1
LW-12
P1
CTL
RES
P2
MR
VFOA
RIT
VFOB
LSB 8V
USB 8V
CW 8V
FM 8V
SCAN
J1
MR
5V
13.8V(IN)
GND
DUP
FROM EF P14

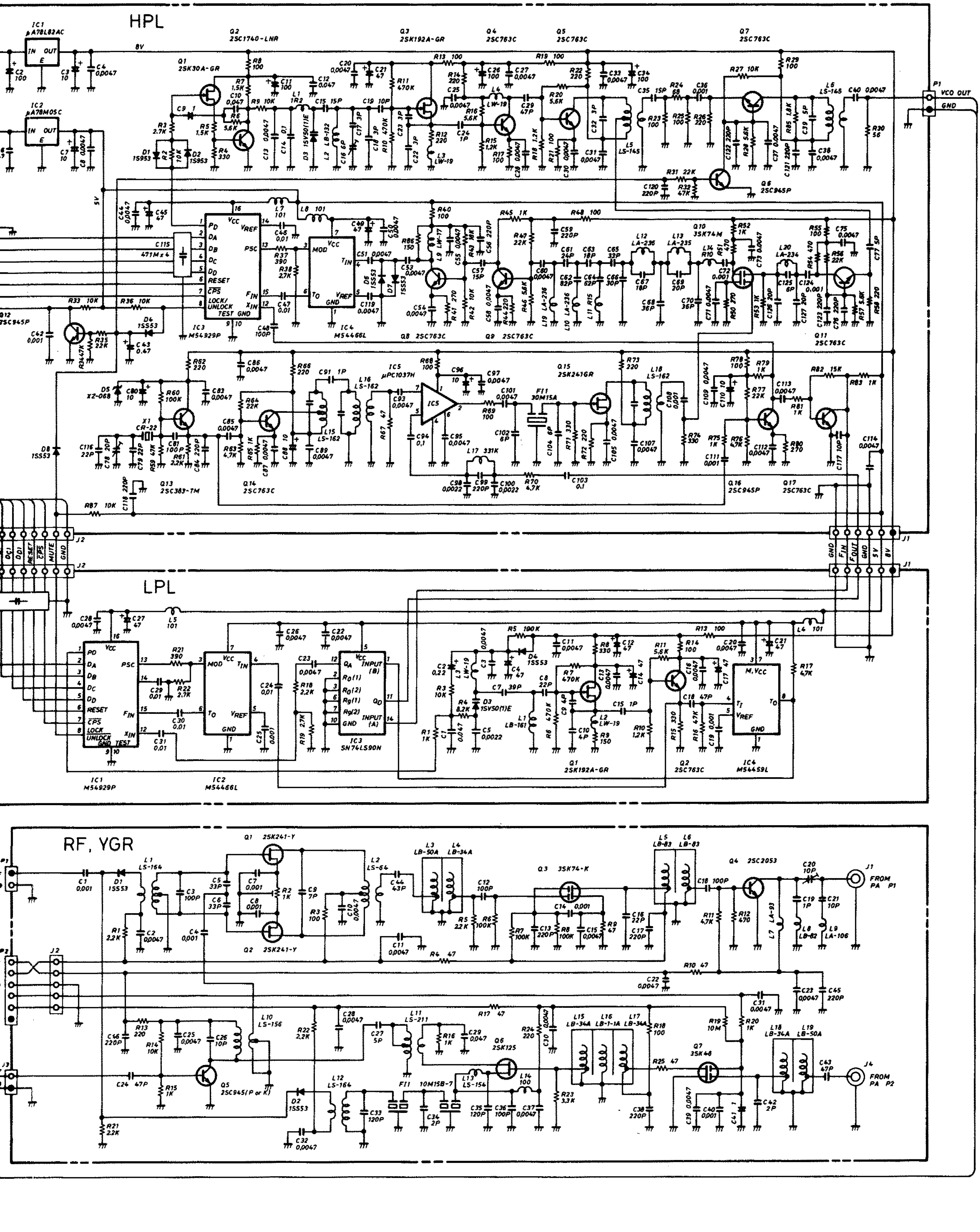

LOGIC
IC14
7432
J1
13.8V
GND
RP
WP
DAV
SRQ
FROM INTERFACE UNIT P5
J2
SPEAK
TONE LED
TONE
5V
LOCK
MUTE
FROM EF P15
J3
FROM INTERFACE UNIT P4
IC15
7408
IC18
R40
100K x 4
J4
S4
S3
S2
S1
GND
M1
SUD
FROM EF P16
J5
TS
FROM EF P18
Q3 2SA1015Y
Q4
2SA1015Y
J6
FROM EF P17
IC13
4011


CSS
IC1
4558D
Q1
2SC945(Q,P,K)
Q2
2SC945(Q,P,K)
Q3
2SC945(Q,P,K)
J1
SSB·8
CS·S
SQL·S
CS
+8
GND
FROM EF P11

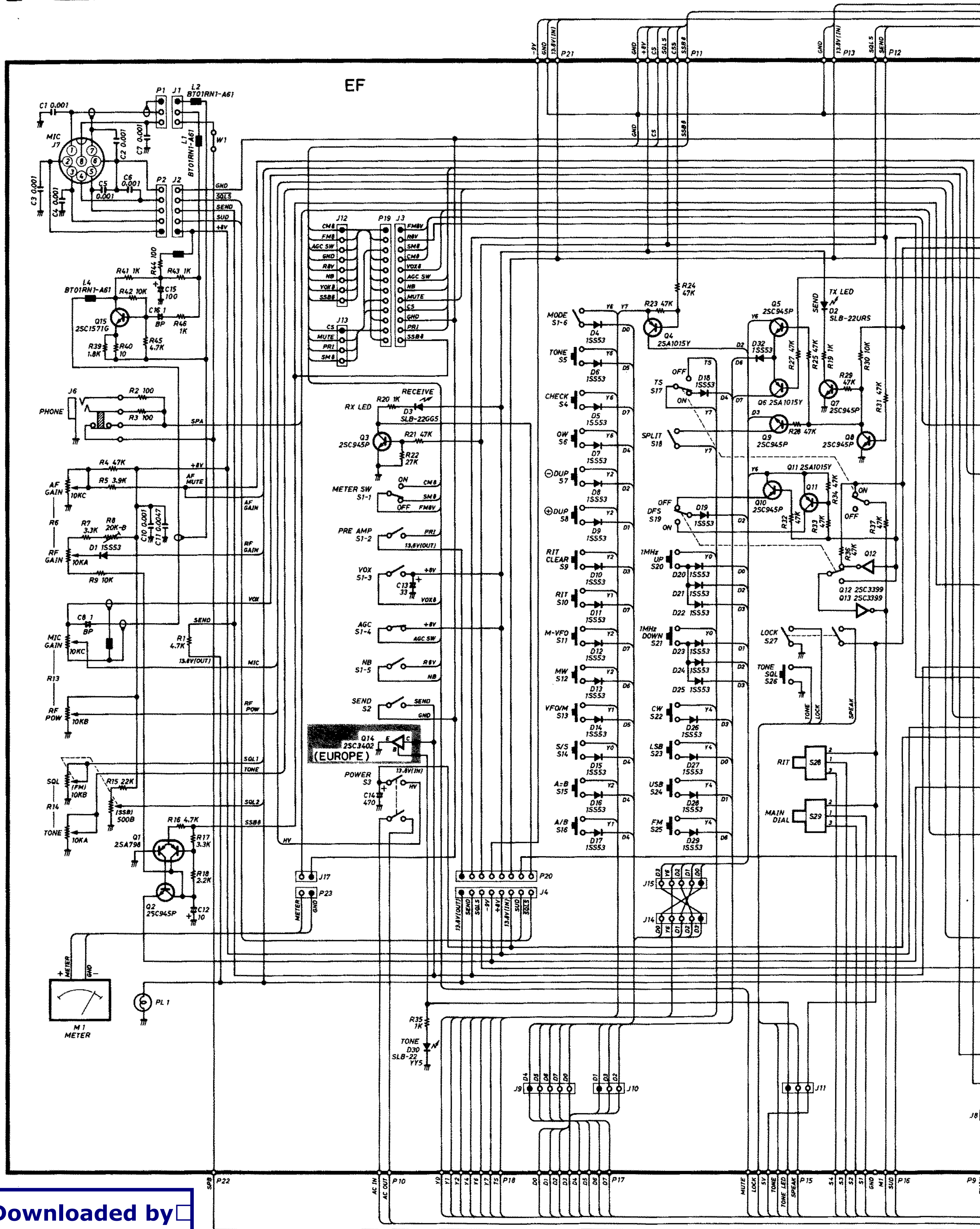

LOGIC
FROM TONE ENCODER
FROM INTERFACE UNIT P5
FROM EF P15
FROM INTERFACE UNIT P4
FROM EF P16
FROM EF P18
FROM EF P14
FROM EF P17
IC14 7432
IC16 4013
IC15 7408
IC7 RP5G01-007
IC8 μPD7801G 114
IC13 4011
IC6 74LS08
IC18 7404
Q1 2SC945P
Q2 2SA1015Y
Q3 2SA1015Y
Q4 2SA1015Y
(5K) D19, D20
(10K) D21
MUTE
PS
MS
FM
SCAN
SPEAK
TONE-LED
SW


FROM TONE ENCODER UNIT
LED 13.8V SW PA0 PA1 PA2 PA3 PA4 PA5 GND
J7
TO MAIN J12
ST GND
P1
5V
Q1 2SC945P
R5 47K
IC16
R4 47K
C4 0.01
R48 820
R46 3.3K
220P
C28
D26 XZ055
IC19 M50606P
C5 0.0047
R6 220K
C6 22P
X1 3.5795MHz
C7 22P
R7 47K
C8 100P
IC20 74LS123
R8 150K
C9 220P
R10 470
R9 33K
D1 1SS53
R11 10K
C10 0.001
IC3 4001
C26 100
C11 0.1
IC21
C12 47
IC21 μA78M05C
IC5 74LS11
RAM
D1 1S953
C1 0.1
R1 47K
D2 1S953
BT1 CR2032
IC1 μPD444C
J16
J1
J2
J17
IC2 HD7432
R6 47K
C2 47P
D3 1S953
R5 1K
R3 10K
R4 4.7K
Q1 2SC945P
R2 390
IC4 74LS74
IC8 μPD7801G 114
C15 30P
X2 CSA4.00MT
R25 1M
C16 30P
R38 4.7K x 8
R26 100K
D15 1SS53
C17 0.1
R27 47K
R28 47K
R30 10K
R29 470
C18 0.001
D7 1SS53
R31 10K
R47 27K
IC9 M50781SP
D8 1SS53
D9 1SS53
IC12 74LS377
IC22 μA78L09AC
C20 0.1
C21 100
IC10 BA618
IC18
IC6
IC11 74LS02
IC1 4081
IC2 4081
D22 1SS53
R36 680
R37 220
VFO B
MR
RIT
−DUP
+DUP
SEL
MUTE
PS
MS
FM
SW
SCAN
SPEAK
TONE·LED
DD1 DC1 DB1 DA1 DD2 DC2 DB2 DA2
VFOA
WR

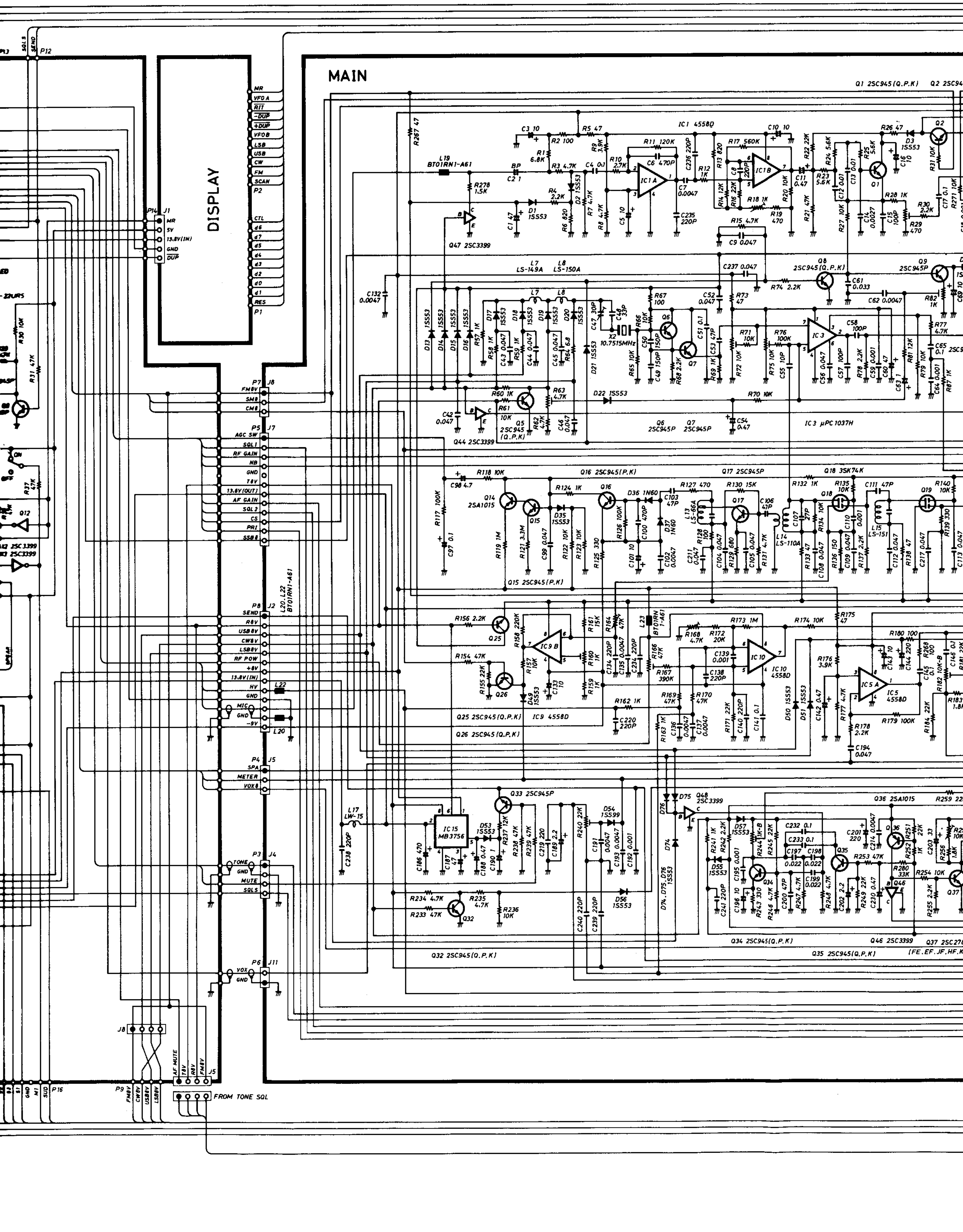

PLL
HPL
LPL
RF, YGR


HPL
IC1 μA78L82AC
IC2 μA78M05C
IC3 M54929P
IC4 M54466L
IC5 μPC1037H
Q1 2SK30A-GR
Q2 2SC1740-LNR
Q3 2SK192A-GR
Q4 2SC763C
Q5 2SC763C
Q6 2SC945P
Q7 2SC763C
Q8 2SC763C
Q9 2SC763C
Q10 3SK74M
Q11 2SC763C
Q13 2SC383-TM
Q14 2SC763C
Q15 2SK241GR
Q16 2SC945P
Q17 2SC763C
VCO OUT
GND
LPL
IC1 M54929P
IC2 M54466L
IC3 SN74LS90N
IC4 M54459L
Q1 2SK192A-GR
Q2 2SC763C
RF, YGR
Q1 2SK241-Y
Q2 2SK241-Y
Q3 3SK74-K
Q4 2SC2053
Q5 2SC945(P or K)
Q6 2SK125
Q7 3SK48
FROM PA P1
FROM PA P2

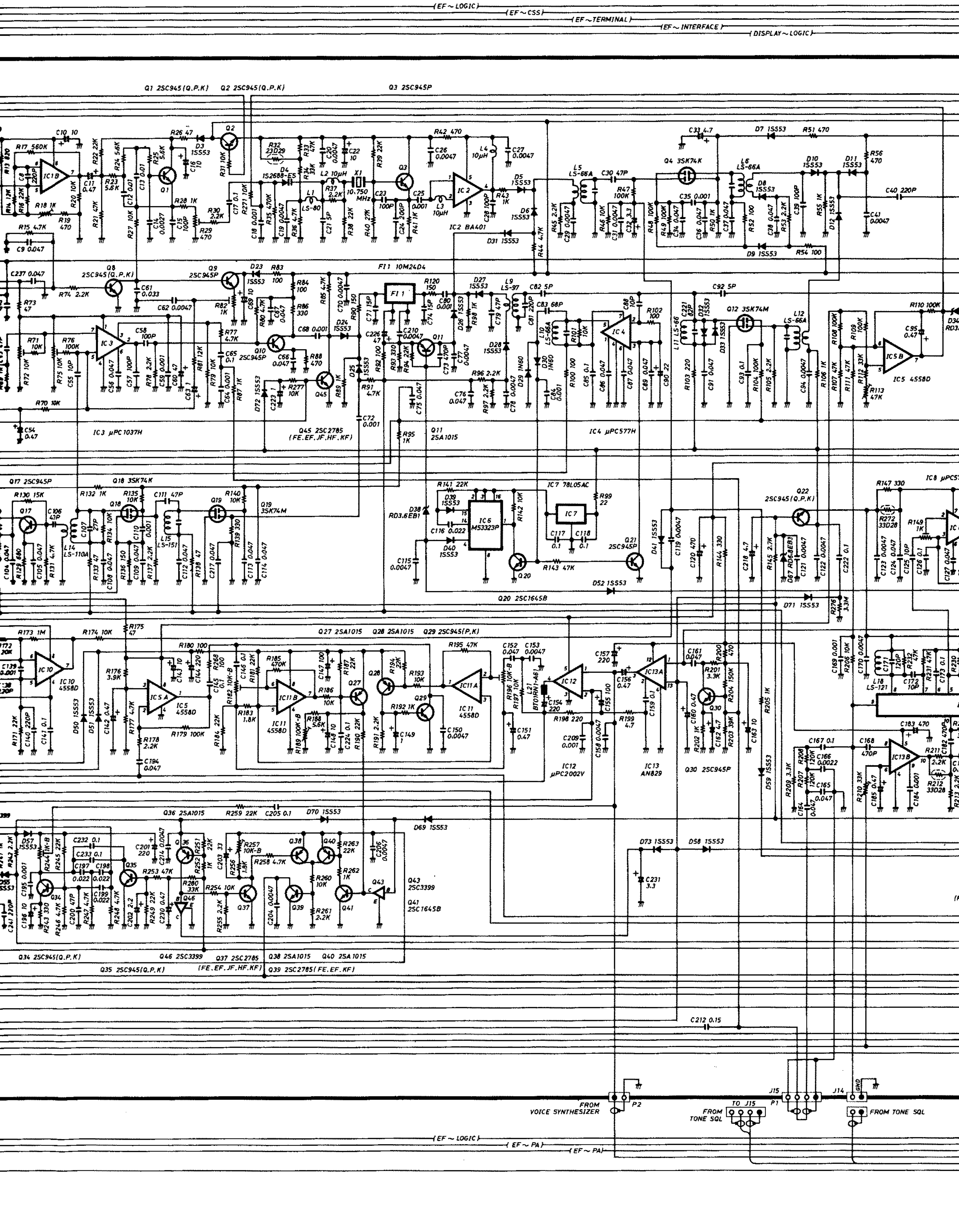
IC-271H SCHEMATIC DIAGRA



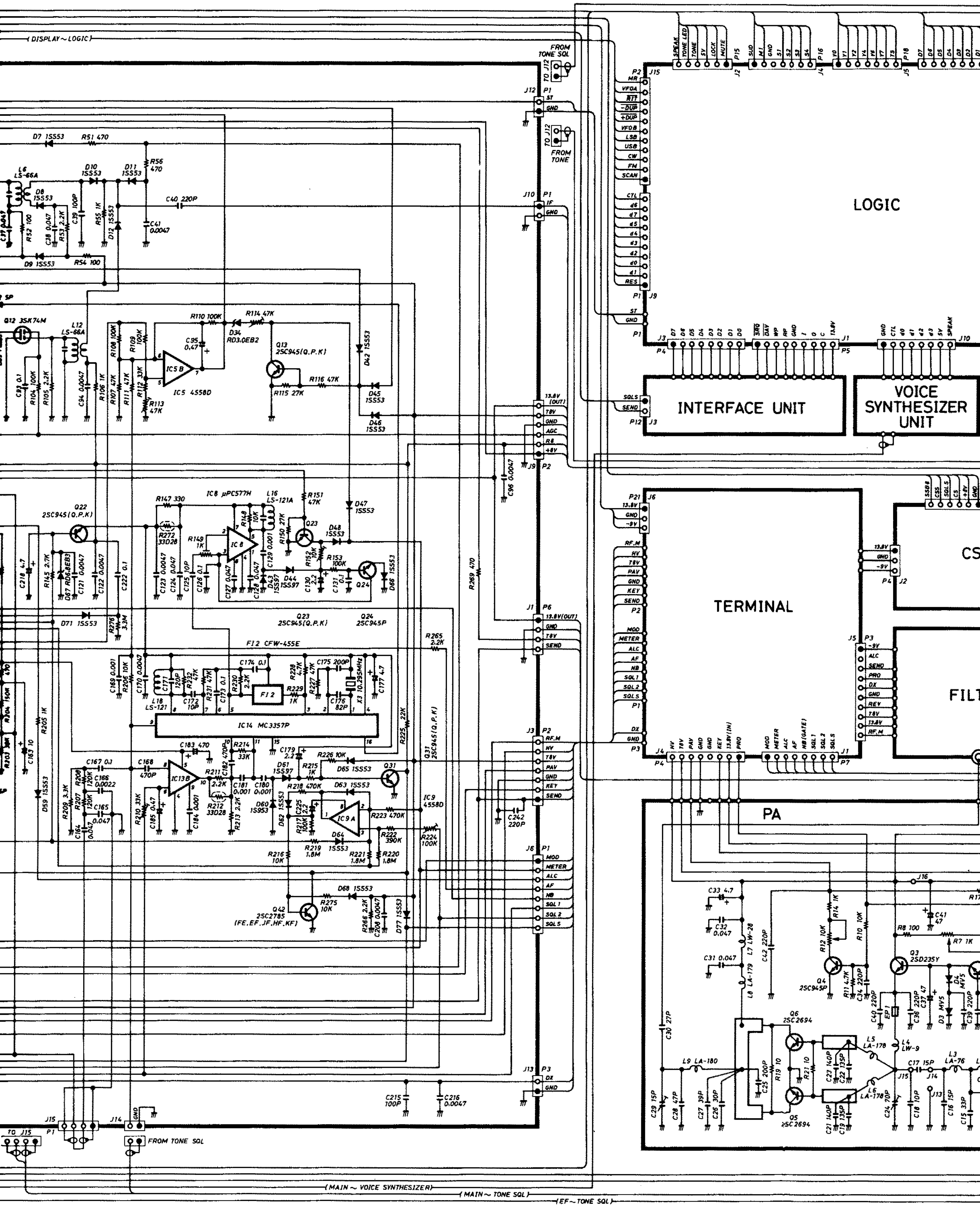
AGRAM

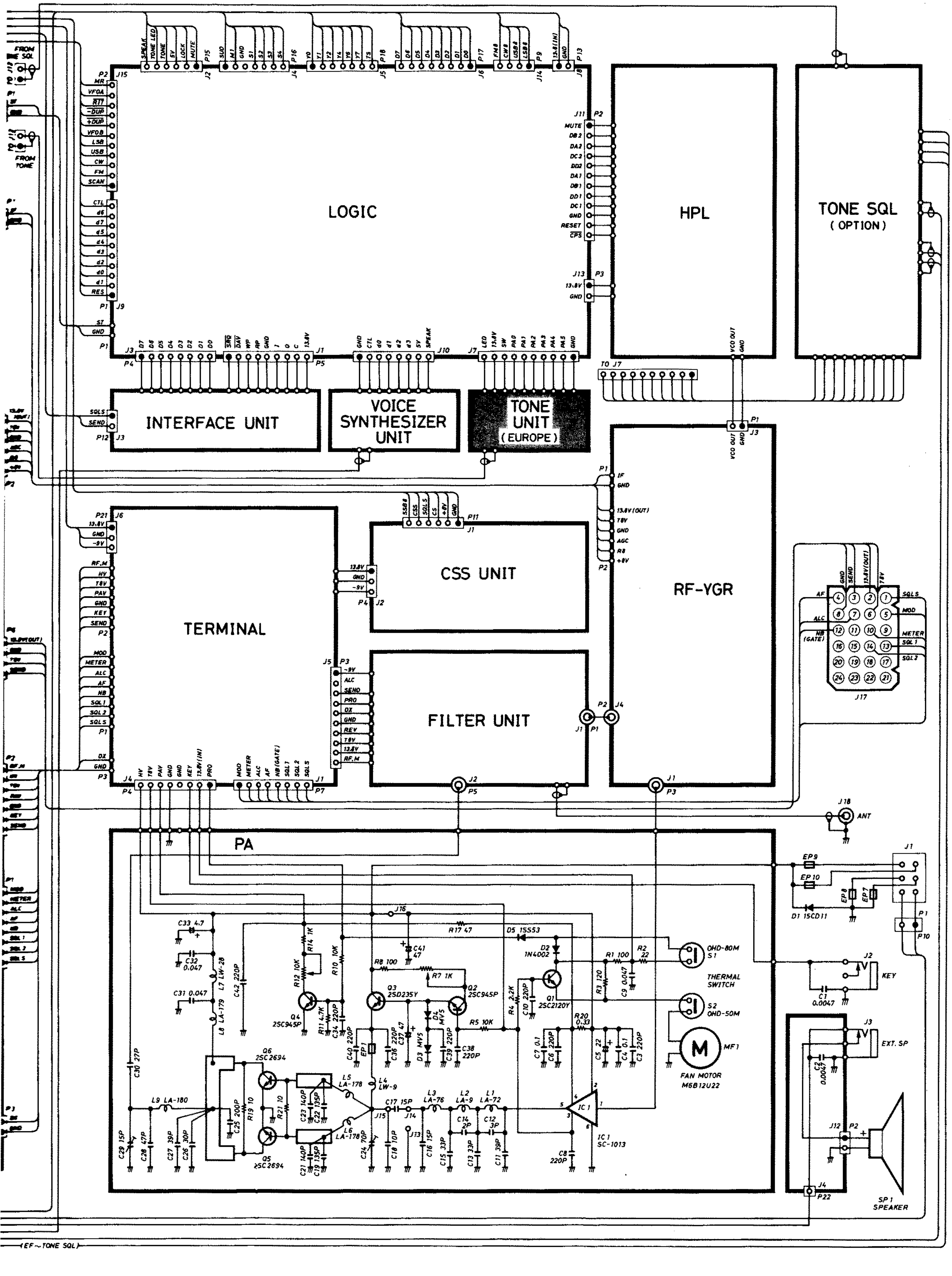


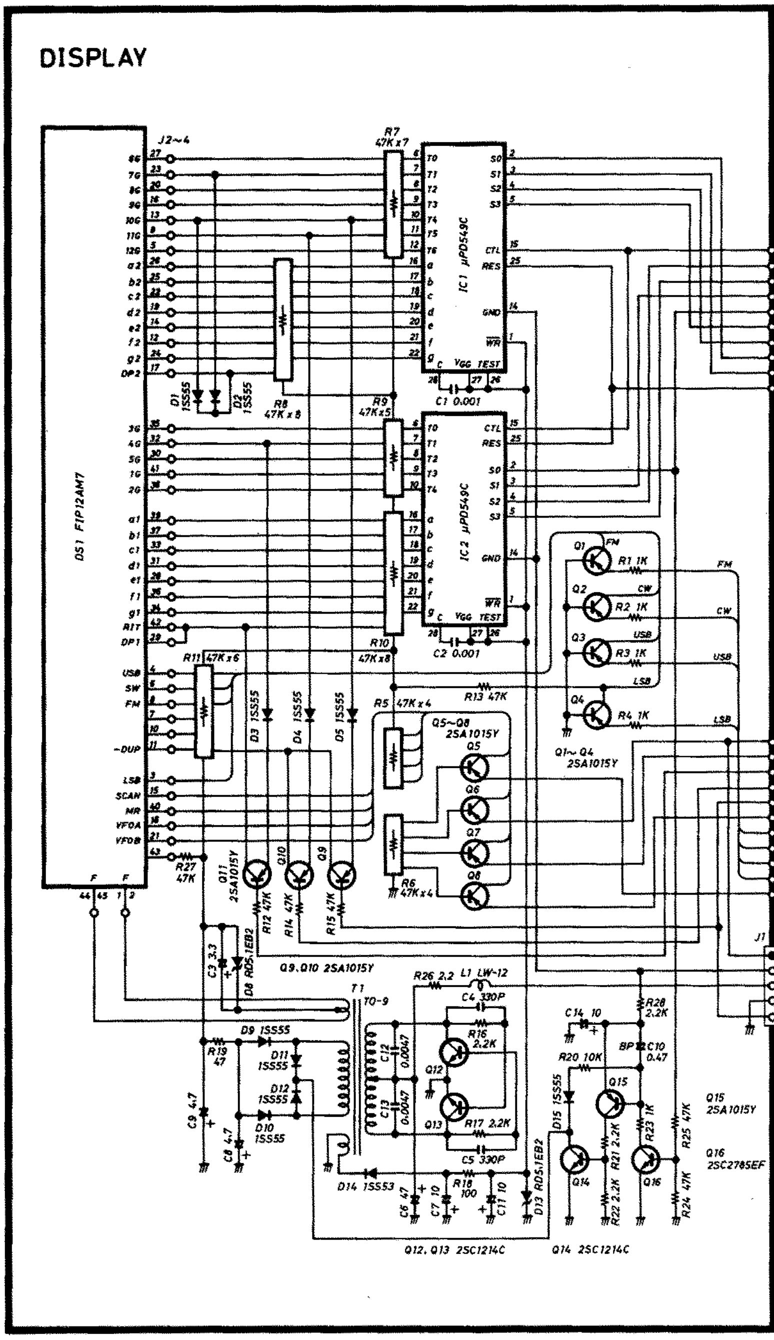
MAIN
DISPLAY
IC1 4558D
IC3 μPC1037H
IC9 4558D
IC10 4558D
IC5 4558D
IC15 MB3756
Q47 2SC3399
Q44 2SC3399
Q6 2SC945P
Q7 2SC945P
Q14 2SA1015
Q16 2SC945(P.K)
Q17 2SC945P
Q18 3SK74K
Q25 2SC945(Q.P.K)
Q26 2SC945(Q.P.K)
Q32 2SC945(Q.P.K)
Q33 2SC945P
Q34 2SC945(Q.P.K)
Q35 2SC945(Q.P.K)
Q36 2SA1015
Q46 2SC3399
Q48 2SC3399
X2 10.7515MHz
FROM TONE SQL

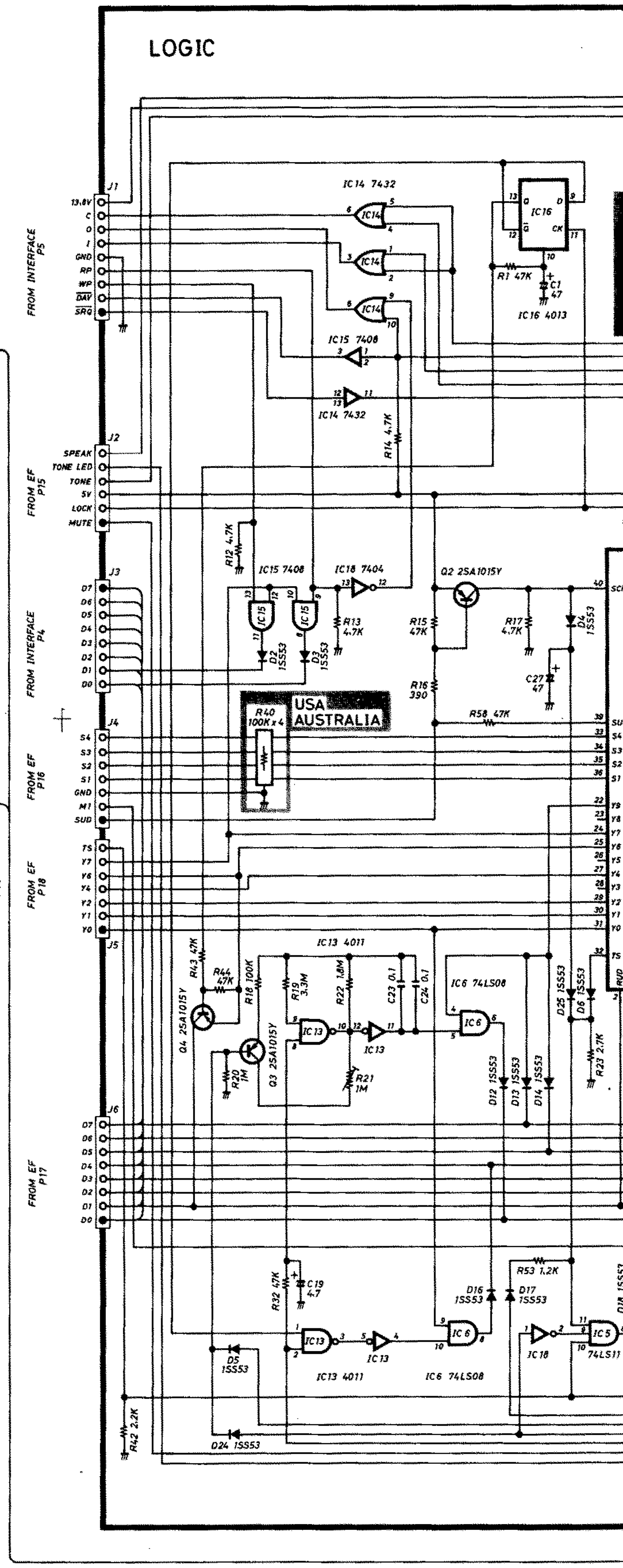


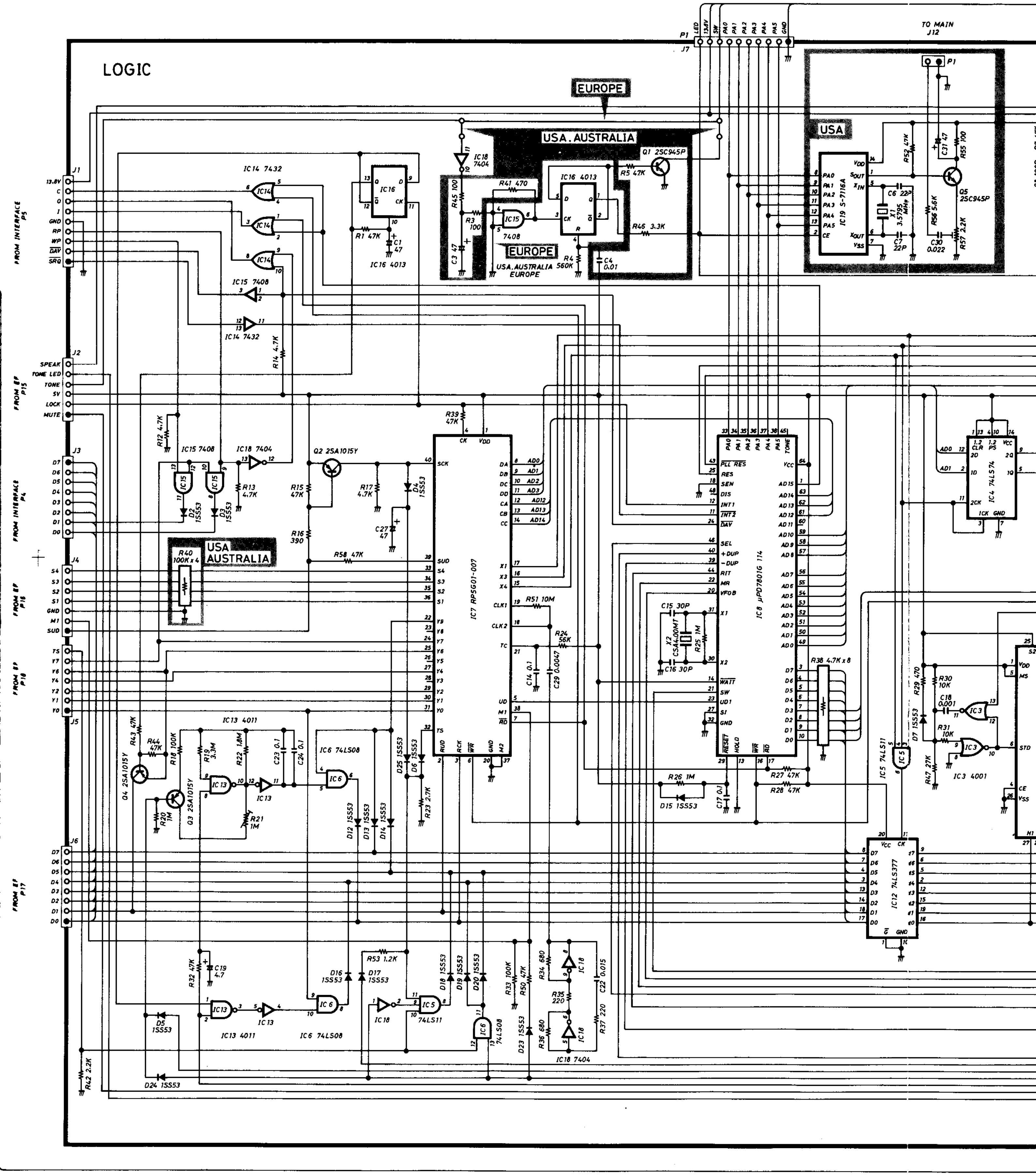
(EF ~ LOGIC)
(EF ~ CSS)
(EF ~ TERMINAL)
(EF ~ INTERFACE)
(DISPLAY ~ LOGIC)
Q1 2SC945(Q.P.K)
Q2 2SC945(Q.P.K)
Q3 2SC945P
Q4 3SK74K
IC2 BA401
FI1 10M24D4
Q8 2SC945(Q.P.K)
Q9 2SC945P
Q10 2SC945P
Q12 3SK74M
IC5 4558D
IC3 µPC1037H
Q45 2SC2785 (FE.EF.JF.HF.KF)
Q11 2SA1015
IC4 µPC577H
Q17 2SC945P
Q18 3SK74K
Q19 3SK74M
IC7 78L05AC
IC6 M53323P
Q22 2SC945(Q.P.K)
Q21 2SC945P
Q20 2SC1645B
IC8 µPC5
IC10 4558D
IC5 4558D
Q27 2SA1015
Q28 2SA1015
Q29 2SC945(P.K)
IC11 4558D
IC12 µPC2002V
IC13 AN829
Q30 2SC945P
L21 BT01RN1-A61
Q36 2SA1015
Q43 2SC3399
Q41 2SC1645B
Q34 2SC945(Q.P.K)
Q35 2SC945(Q.P.K)
Q46 2SC3399
Q37 2SC2785 (FE.EF.JF.HF.KF)
Q38 2SA1015
Q40 2SA1015
Q39 2SC2785(FE.EF.KF)
C212 0.15
FROM VOICE SYNTHESIZER
P2
FROM TONE SQL
TO J15
J15
P1
J14
FROM TONE SQL
(EF ~ LOGIC)
(EF ~ PA)
(EF ~ PA)

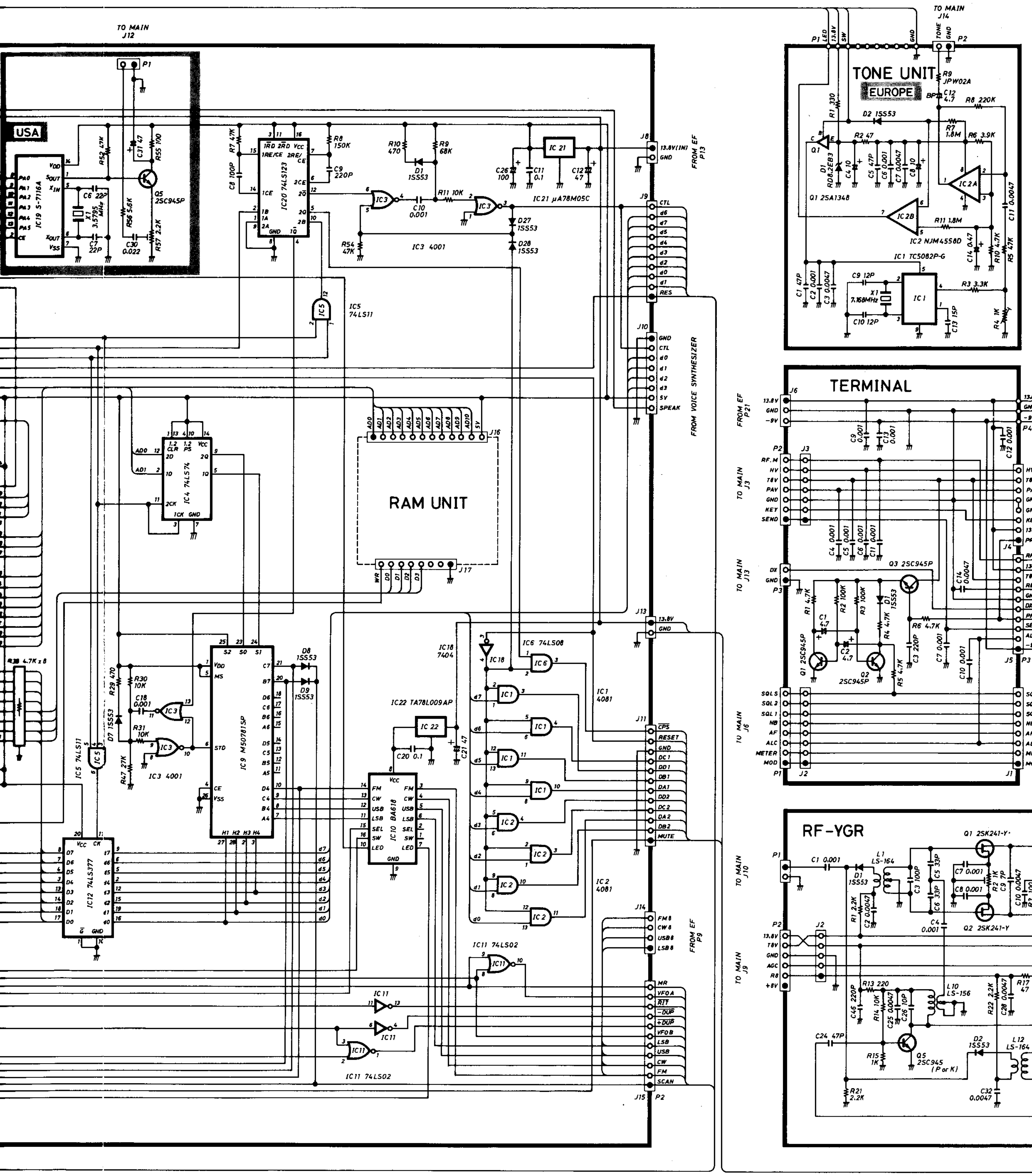

LOGIC
INTERFACE UNIT
VOICE SYNTHESIZER UNIT
TERMINAL
PA
DISPLAY ~ LOGIC
MAIN ~ VOICE SYNTHESIZER
MAIN ~ TONE SQL
EF ~ TONE SQL
FROM TONE SQL
IC5 4558D
IC8 μPC577H
IC14 MC3357P
IC9 4558D
FI2 CFW-455E

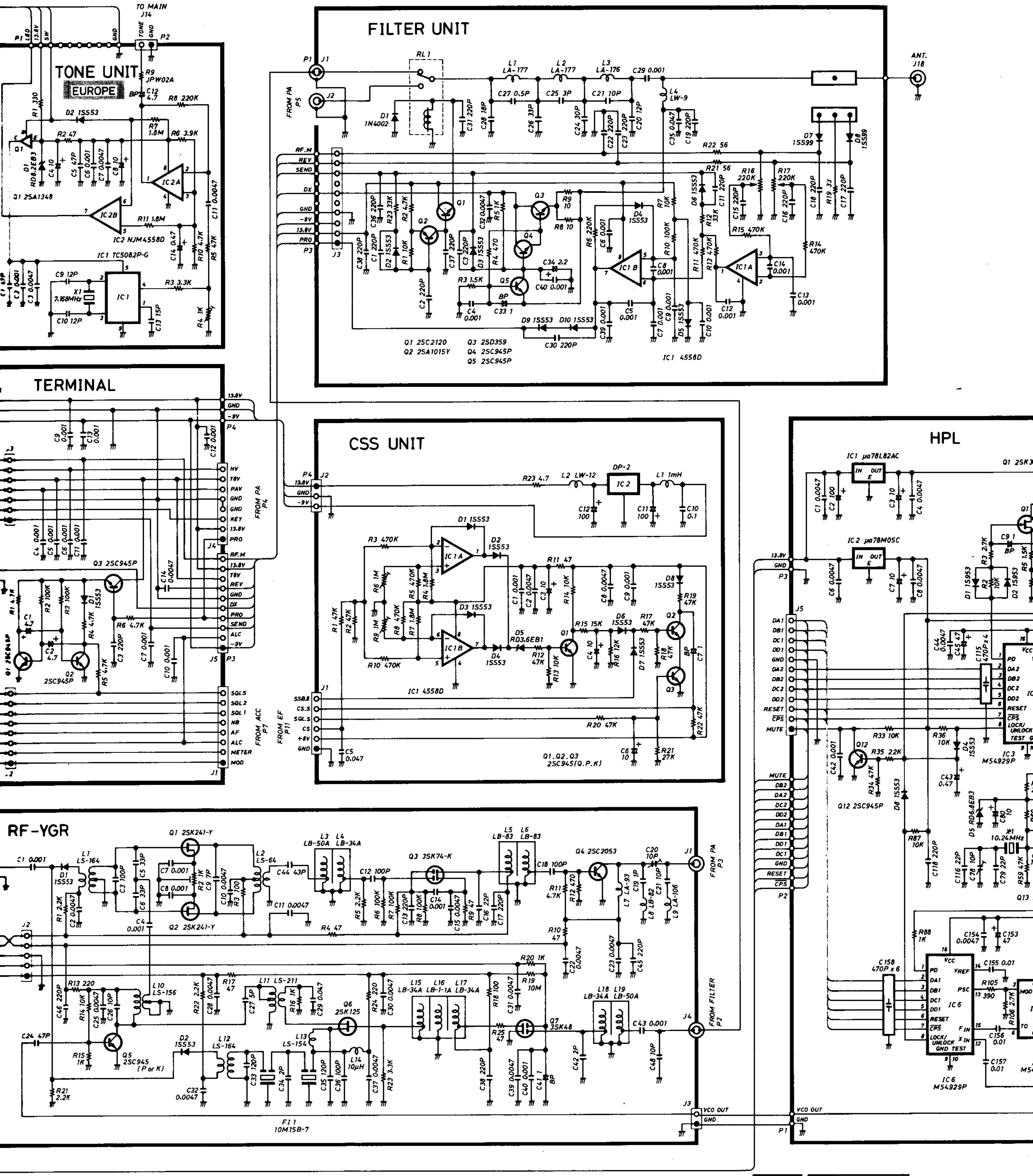

LOGIC
HPL
TONE SQL
(OPTION)
INTERFACE UNIT
VOICE
SYNTHESIZER
UNIT
TONE
UNIT
(EUROPE)
TERMINAL
CSS UNIT
FILTER UNIT
RF-YGR
PA
FROM SQL
FROM TONE
TO J7
J17
J18
ANT
THERMAL
SWITCH
OHD-80M
S1
S2
OHD-50M
MF1
FAN MOTOR
M6B12U22
KEY
EXT. SP
SP1
SPEAKER
D1 1SCD11
IC1
SC-1013
Q1
2SC2120Y
Q2
2SC945P
Q3
2SD235Y
Q4
2SC945P
Q5
2SC2694
Q6
2SC2694
D2
1N4002
D5 1SS53
(EF~TONE SQL)


DISPLAY
DS1 FIP12AM7
IC1 μPD549C
IC2 μPD549C
Q1~Q4 2SA1015Y
Q5~Q8 2SA1015Y
Q9, Q10 2SA1015Y
Q11 2SA1015Y
Q12, Q13 2SC1214C
Q14 2SC1214C
Q15 2SA1015Y
Q16 2SC2785EF
T1 TQ-9
L1 LW-12
FROM EF P14

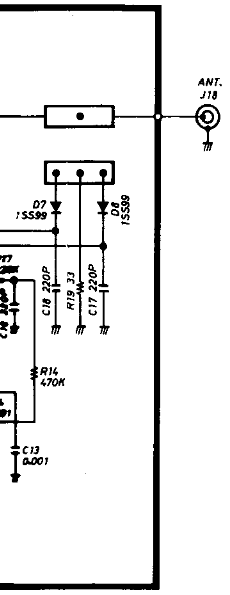

LOGIC
FROM INTERFACE P5
FROM EF P15
FROM INTERFACE P4
FROM EF P16
FROM EF P18
FROM EF P17
IC14 7432
IC15 7408
IC16 4013
IC18 7404
IC13 4011
IC6 74LS08
Q2 2SA1015Y
Q3 2SA1015Y
Q4 2SA1015Y
USA
AUSTRALIA

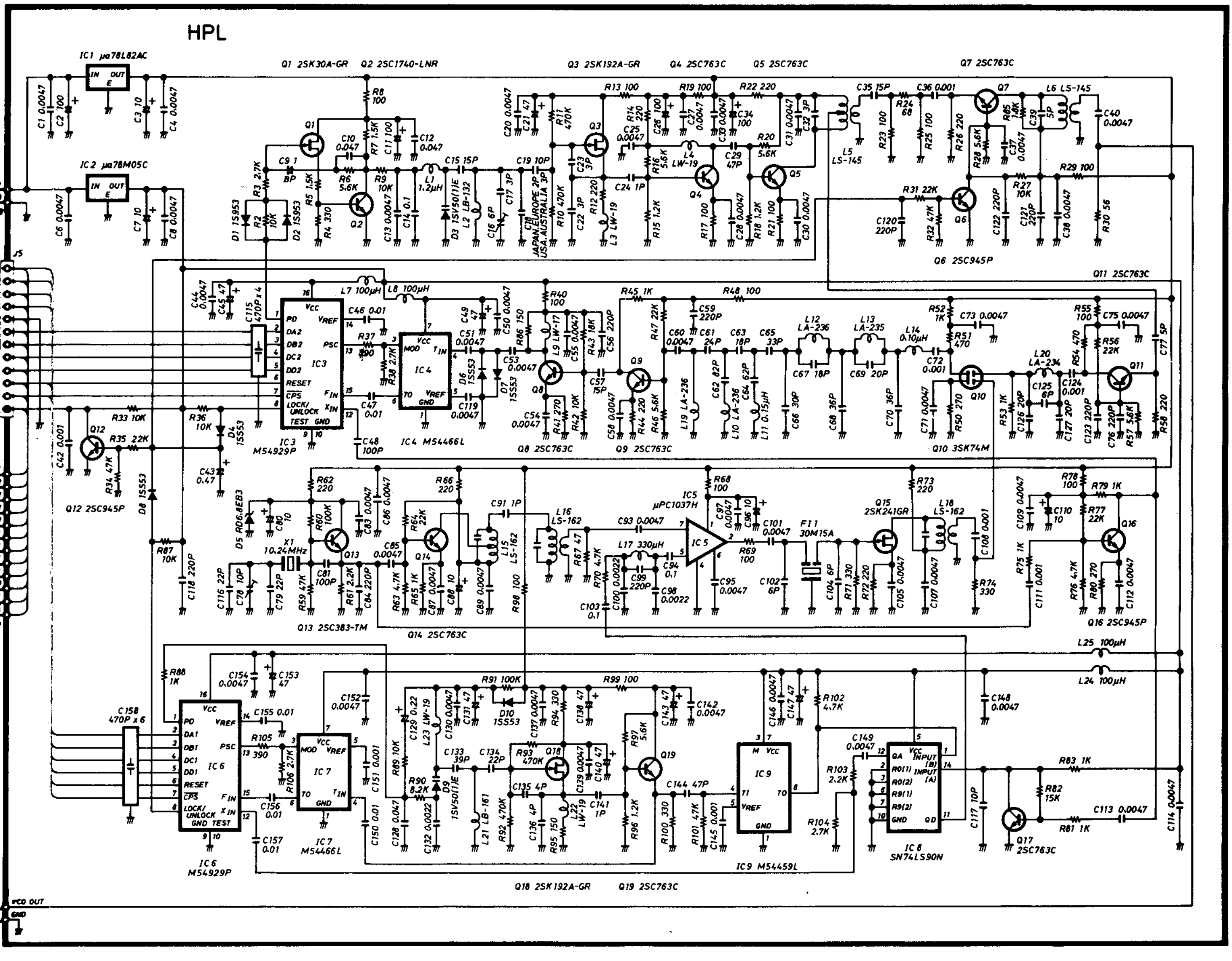

LOGIC
TO MAIN
J12
EUROPE
USA.AUSTRALIA
USA
USA
AUSTRALIA
USA.AUSTRALIA
EUROPE
FROM INTERFACE P5
FROM EF P15
FROM INTERFACE P4
FROM EF P16
FROM EF P18
FROM EF P17
IC7 RP5G01-007
IC8 μPD7801G 114
IC19 S-7116A
IC12 74LS377
IC4 74LS74
IC3 4001
IC14 7432
IC15 7408
IC16 4013
IC18 7404
IC13 4011
IC6 74LS08
IC5 74LS11
Q1 2SC945P
Q2 2SA1015Y
Q3 2SA1015Y
Q4 2SA1015Y
Q5 2SC945P


USA
RAM UNIT
TONE UNIT
EUROPE
TERMINAL
RF-YGR
FROM VOICE SYNTHESIZER


TONE UNIT
EUROPE
TO MAIN J14
FILTER UNIT
ANT. J18
FROM PA P5
TERMINAL
FROM PA P4
FROM ACC P7
CSS UNIT
FROM EF P11
HPL
RF-YGR
FROM PA P3
FROM FILTER P2
VCO OUT

ICOM ICOM


ANT.
J18
D7 1SS99
D8 1SS99
C18 220P
R19 33
C17 220P
R14 470K
C13 0.001


HPL
IC1 μa78L82AC
IC2 μa78M05C
Q1 2SK30A-GR
Q2 2SC1740-LNR
Q3 2SK192A-GR
Q4 2SC763C
Q5 2SC763C
Q6 2SC945P
Q7 2SC763C
Q8 2SC763C
Q9 2SC763C
Q10 3SK74M
Q11 2SC763C
Q12 2SC945P
Q13 2SC383-TM
Q14 2SC763C
Q15 2SK241GR
Q16 2SC945P
Q17 2SC763C
Q18 2SK192A-GR
Q19 2SC763C
IC3 M54929P
IC4 M54466L
IC5 μPC1037H
IC6 M54929P
IC7 M54466L
IC8 SN74LS90N
IC9 M54459L
X1 10.24MHz
F11 30M15A
JAPAN,EUROPE 2P
USA,AUSTRALIA 3P
VCO OUT
GND