

144 MHz TRANSCEIVER

IC-271A/E/H

MAINTENANCE MANUAL



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TABLE OF CONTENTS

SECTION	1	SPECIFICATIONS	1-1~1-2
SECTION	2	CONTROL FUNCTIONS	2-1~2-6
SECTION	3	INSIDE VIEWS	3-1~3-4
SECTION	4	BLOCK DIAGRAMS	4-1~4-2
SECTION	5	CIRCUIT DESCRIPTION	5-1~5-15
	5-1	RECEIVER	5-1
	5-2	TRANSMITTER	5-3
	5-3	PLL(HPL)UNIT	5-5
	5-4	LOGIC UNIT	5-6
	5-5	FILTER UNIT	5-13
	5-6	CSS AND DC-DC UNITS	5-14
	5-7	OTHER CIRCUITS	5-15
SECTION	6	MECHANICAL PARTS AND DISASSEMBLY	6-1~6-11
SECTION	7	MAINTENANCE AND ADJUSTMENT	7-1~7-9
	7-1	PREPARATION BEFORE SERVICING	7-1
	7-2	PLL ADJUSTMENT	7-2
	7-3	TRANSMITTER ADJUSTMENT	7-4
	7-4	RECEIVER ADJUSTMENT	7-8
SECTION	8	CIRCUIT DIAGRAMS/VOLTAGE CHARTS ...	8-1~8-14
SECTION	9	BOARD LAYOUTS(IC-271H)	9-1~9-6
SECTION	10	IC SPECIFICATIONS	10-1~10-13
SECTION	11	PARTS LIST	11-1~11-21
SECTION	12	SCHEMATIC DIAGRAMS	SEPARATE
SECTION	13	BOARD LAYOUTS(IC-271A/E)	SEPARATE

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 ± 1.5 kHz in the range of $-10^{\circ}\text{C} \sim +60^{\circ}\text{C}$.

RIT frequency coverage:

± 9.9 kHz from the displayed receive frequency.

Power supply requirements:

13.8V DC $\pm 15\%$ (negative ground)
6A maximum current drain (IC- 271H: 20A maximum)
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:

± 5 kHz

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

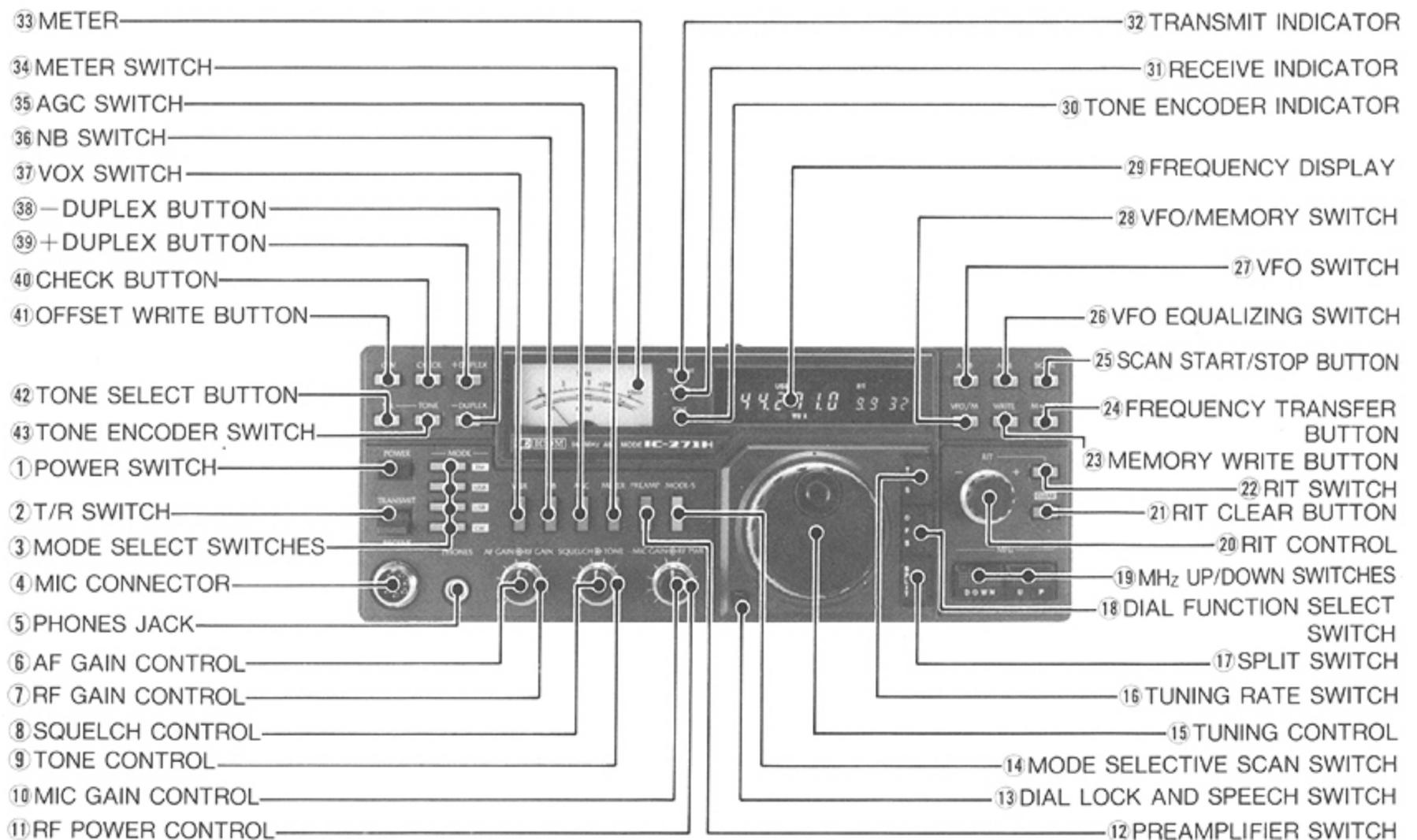
VERSION NUMBER	REFERENCE NAME	FREQUENCY RANGE (MHz)	OUTPUT POWER (W)	RAM UNIT	TO NE ENCODER
#02	EUROPE	144-146	10	#02	NO
#03	USA	143.8-148.2	10	#03	YES
#04	USA	143.8-148.2	25	#03	YES
#05	EUROPE	144-146	25	#02	NO
#06	AUSTRALIA	144-148	10	#06	NO
#07	AUSTRALIA	144-148	25	#06	NO

IC-271H

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

SECTION 2 CONTROL FUNCTIONS

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 function.

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.

⑳ VFO SWITCH

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

㉑ VFO/MEMORY SWITCH

Selects the VFO mode or Memory Channel mode.

㉒ 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.

㉓ TONE ENCODER INDICATOR

Illuminates when the tone encoder is turned ON.

㉔ RECEIVE INDICATOR

Illuminates when the squelch is opened in the receive mode.

㉕ TRANSMIT INDICATOR

Illuminates in the transmit mode.

㉖ 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.

㉗ METER SWITCH

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

㉘ 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.

㉙ 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.

㉚ 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.

㉛ — 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.

㉜ + 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.

㉝ 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.

㉞ OFFSET WRITE BUTTON

Push to display the programmed offset frequency 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.

㉟ TONE SELECT BUTTON

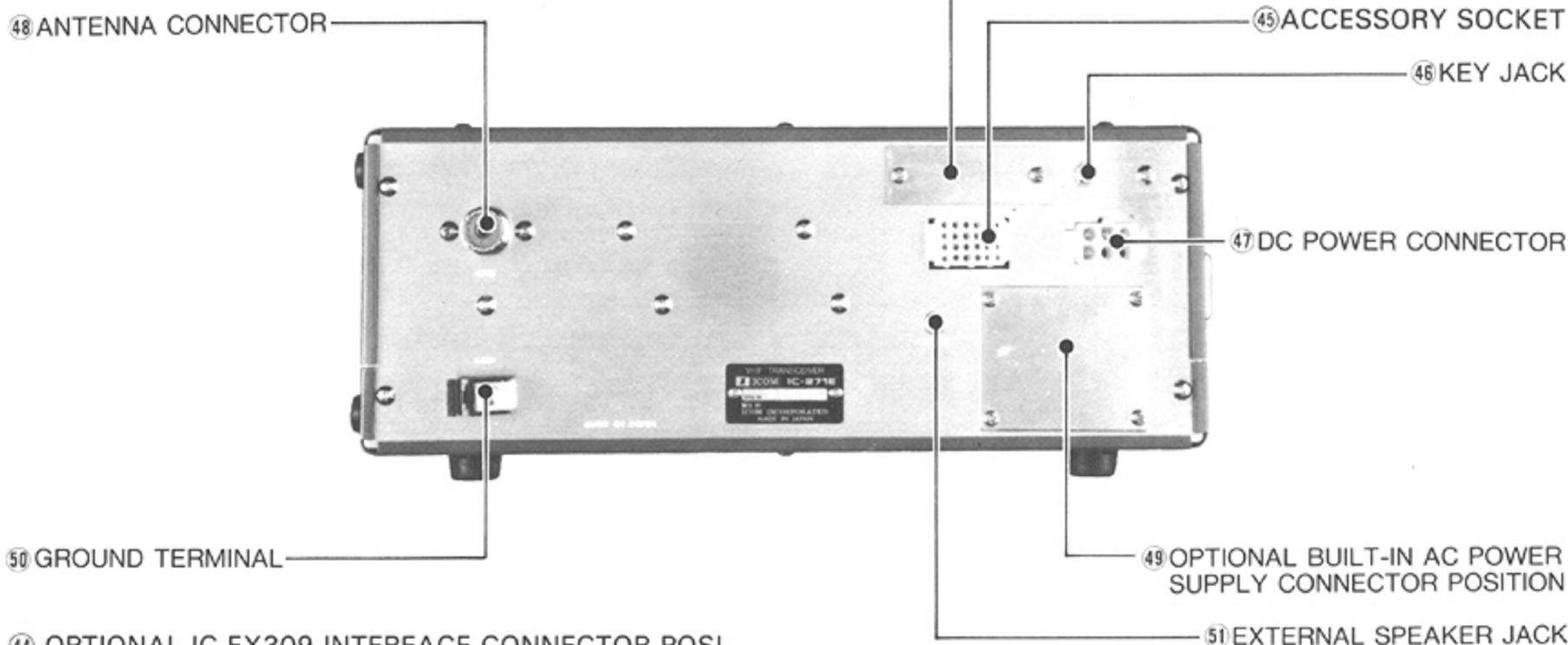
Selects the frequency of the subaudible tone encoder/decoder. While depressed, the currently programmed tone number appears on the FREQUENCY DISPLAY. This number can be reprogrammed by rotating the TUNING CONTROL.

㊱ 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 location.

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.

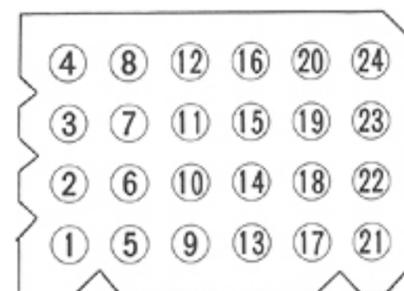
50 GROUND TERMINAL

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.

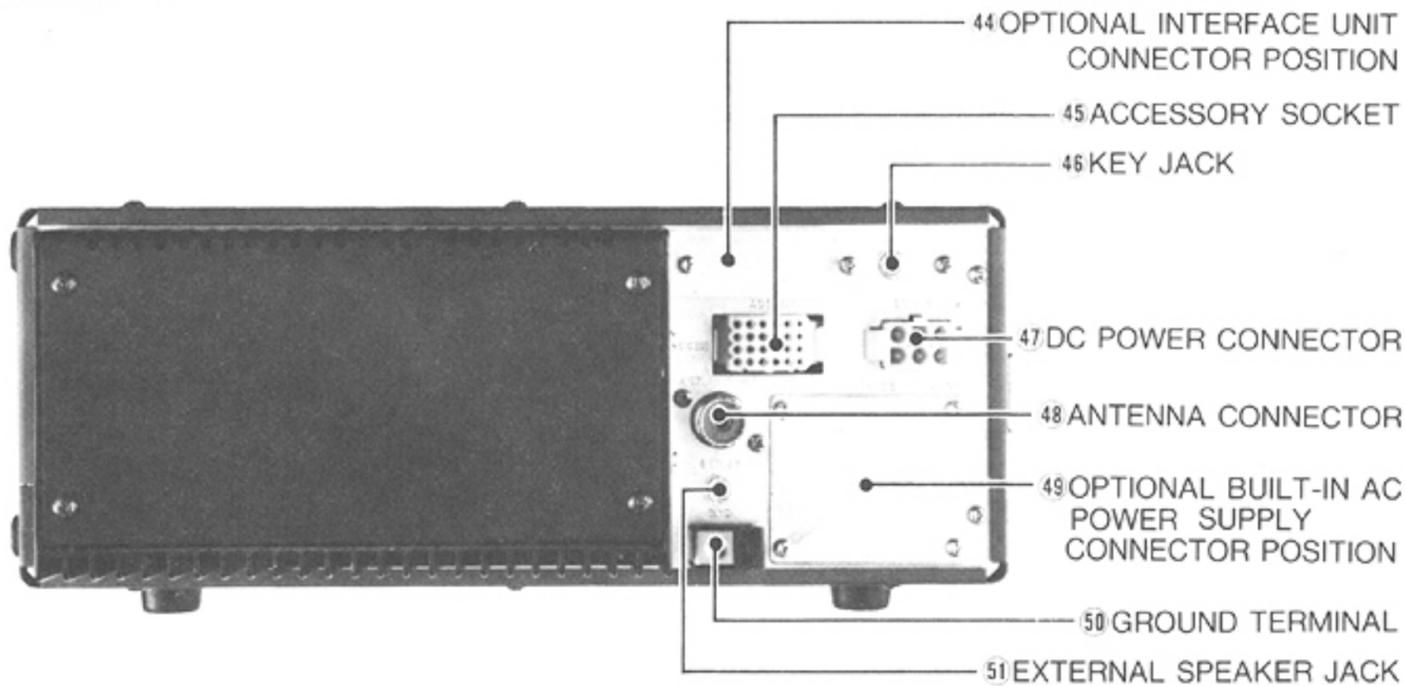
ACCESSORY SOCKET CONNECTIONS



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 transceiver 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)



④④ OPTIONAL IC-EX309 INTERFACE CONNECTOR POSITION

Install the DP-25 connector from the optional interface at this location.

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.

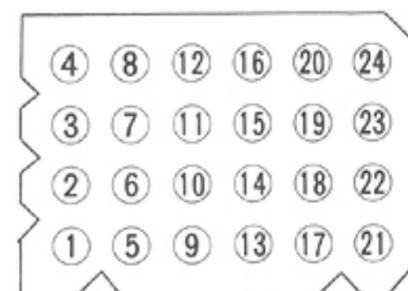
⑤⑩ GROUND TERMINAL

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.

⑤⑪ 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.

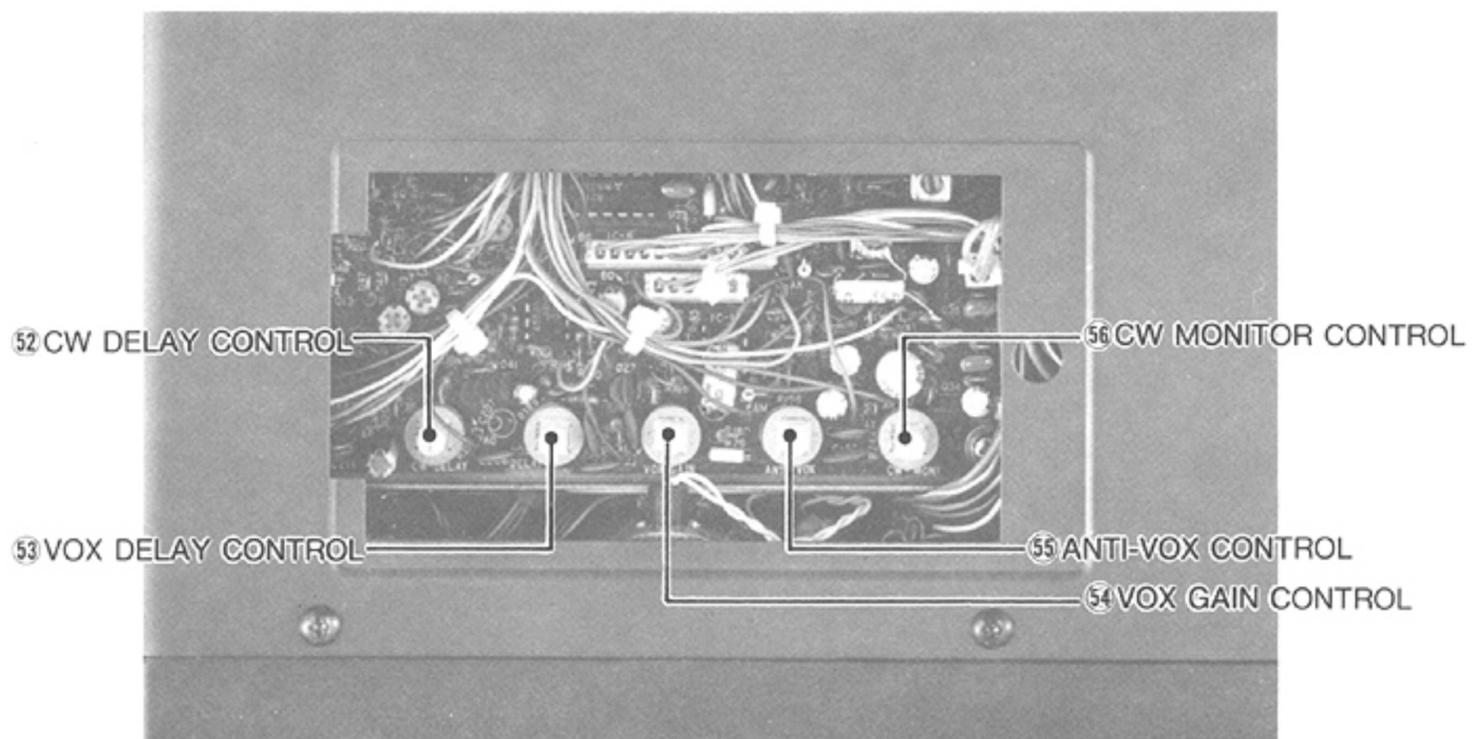
ACCESSORY SOCKET CONNECTIONS



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 transceiver 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

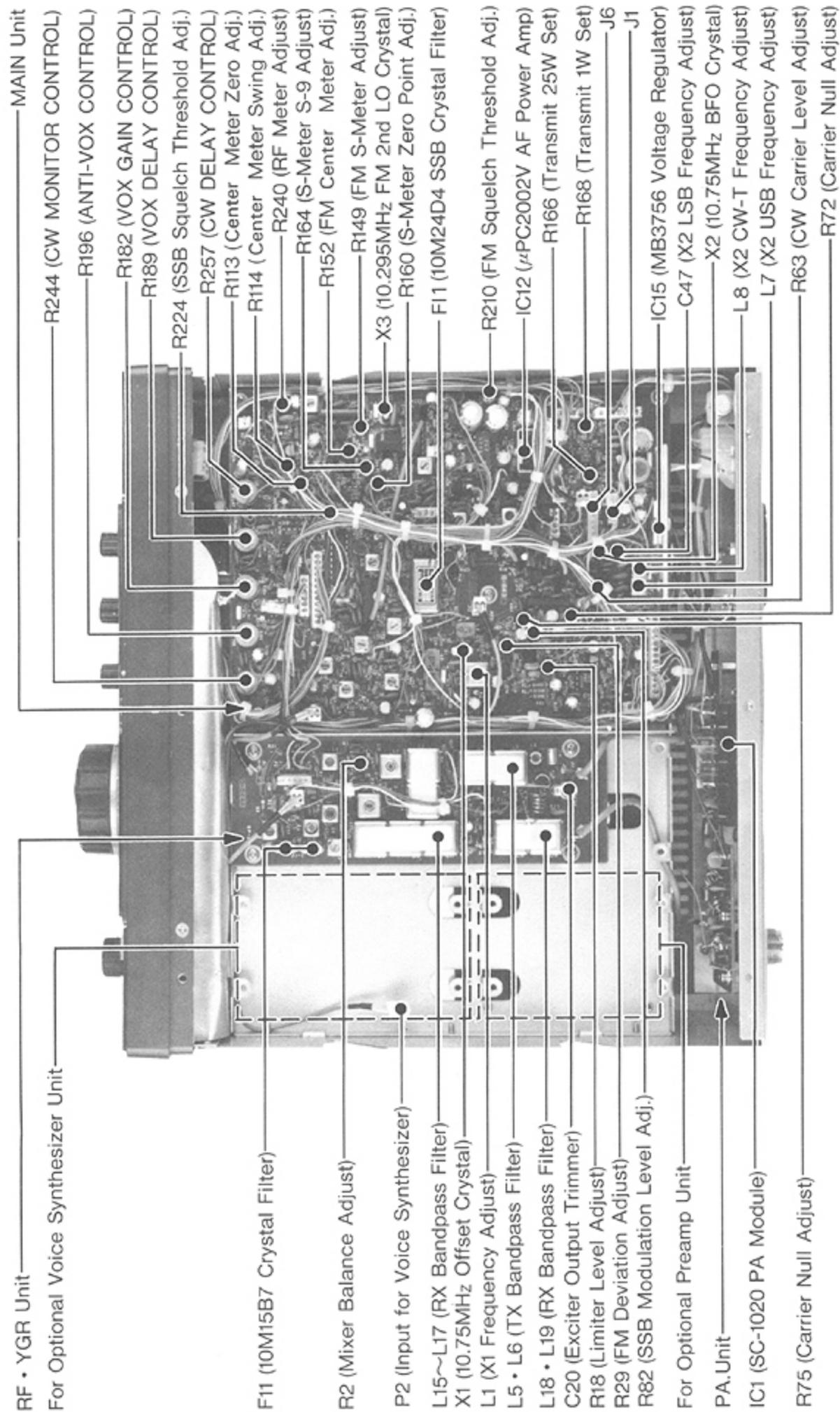
The VOX circuit may sometimes be triggered by audio from the speaker. It is possible to prevent this problem by adjusting the input level to the anti-vox circuit using this control in conjunction with the VOX GAIN CONTROL.

⑤⑥ CW MONITOR(MONI) CONTROL

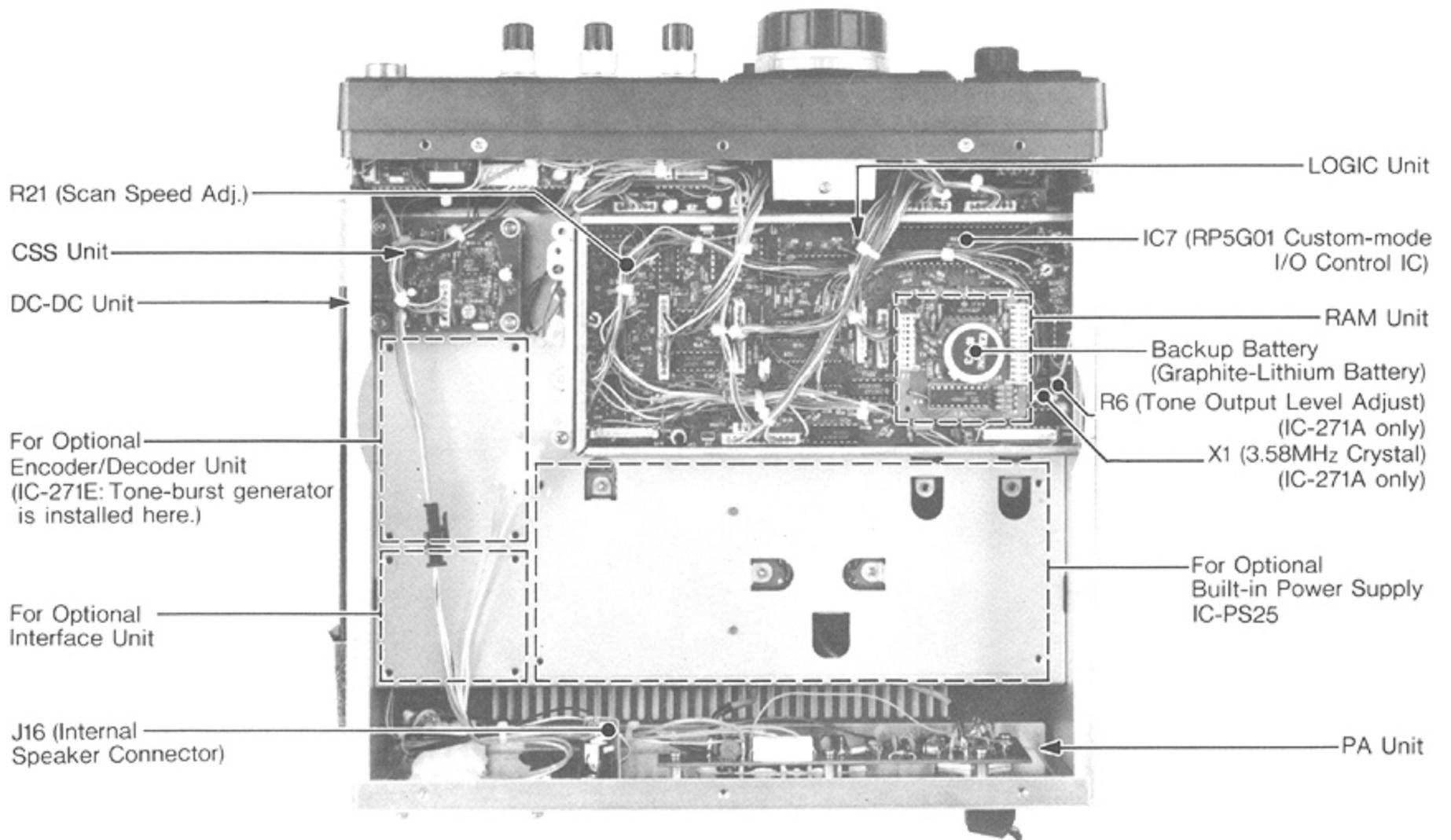
Varies the audio volume of the sidetone monitor when using the CW mode.

SECTION 3 INSIDE VIEWS

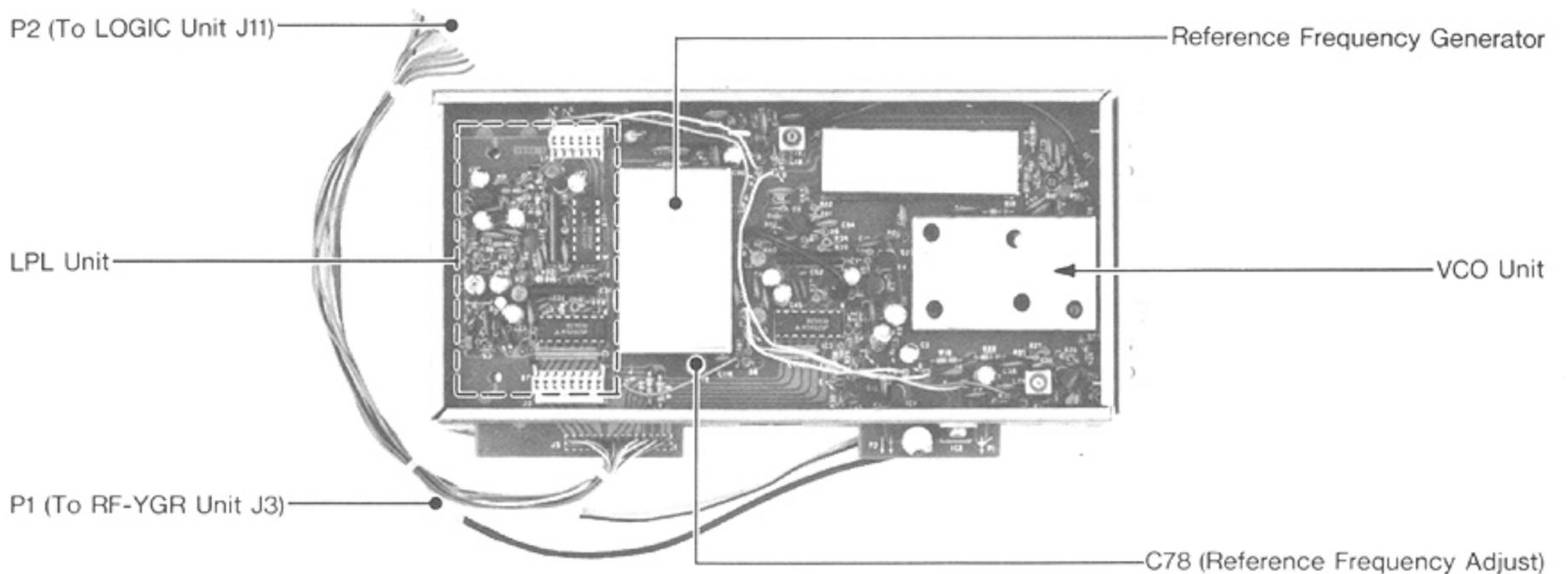
3-1 TOP VIEW (IC-271A/E)



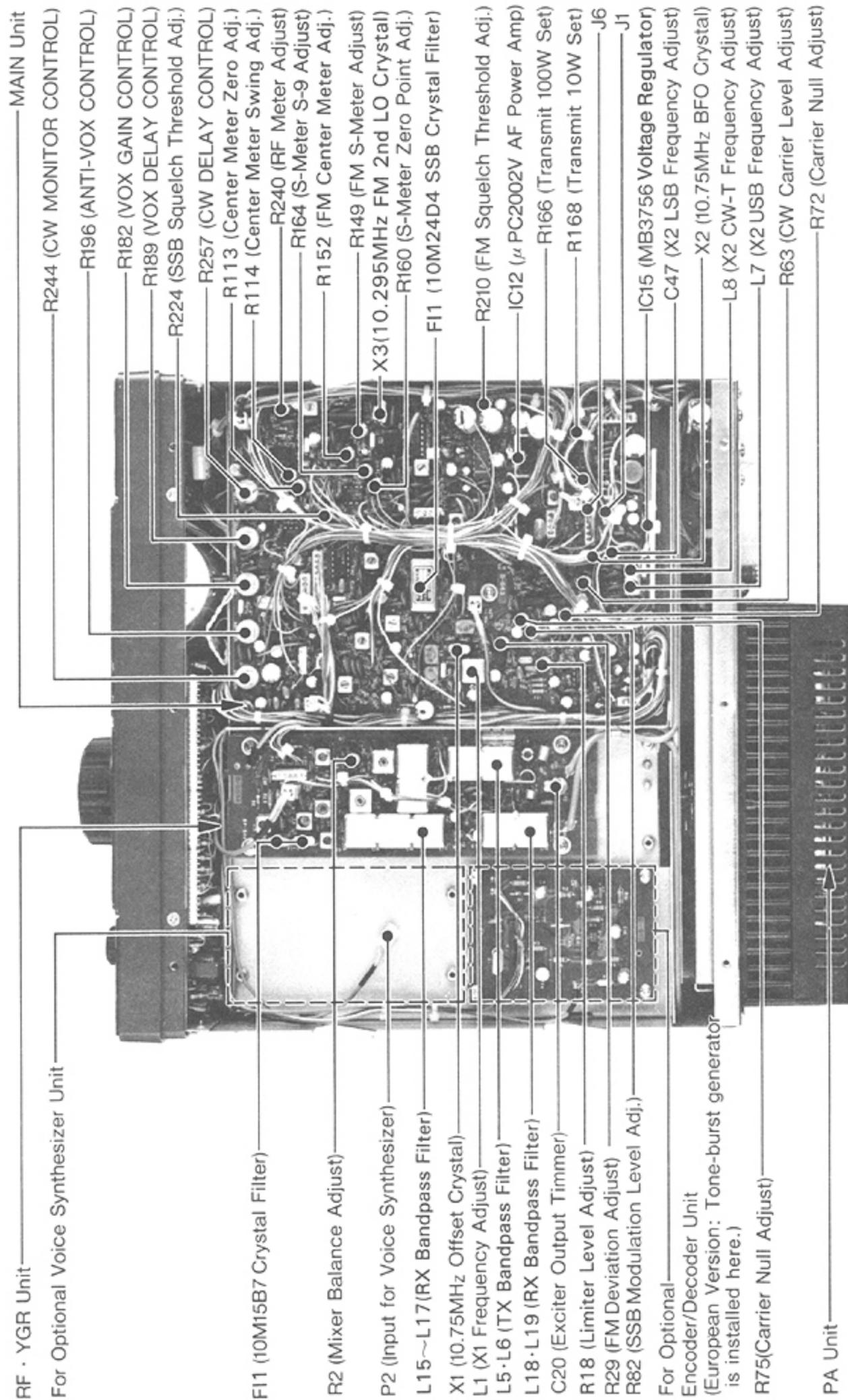
3-2 BOTTOM VIEW (IC-271A/E)



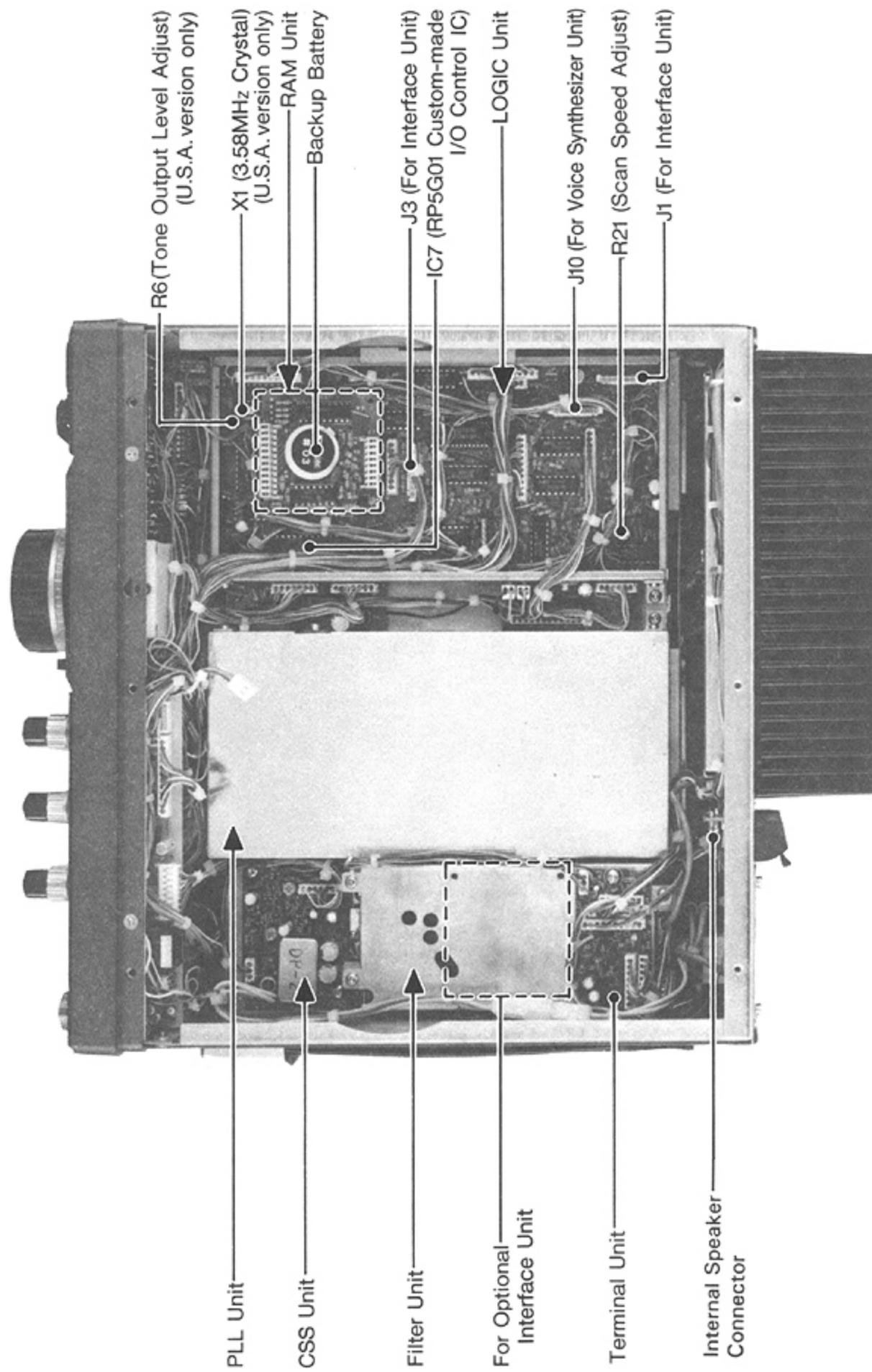
3-3 PLL (HPL) UNIT (located under the LOGIC Unit)

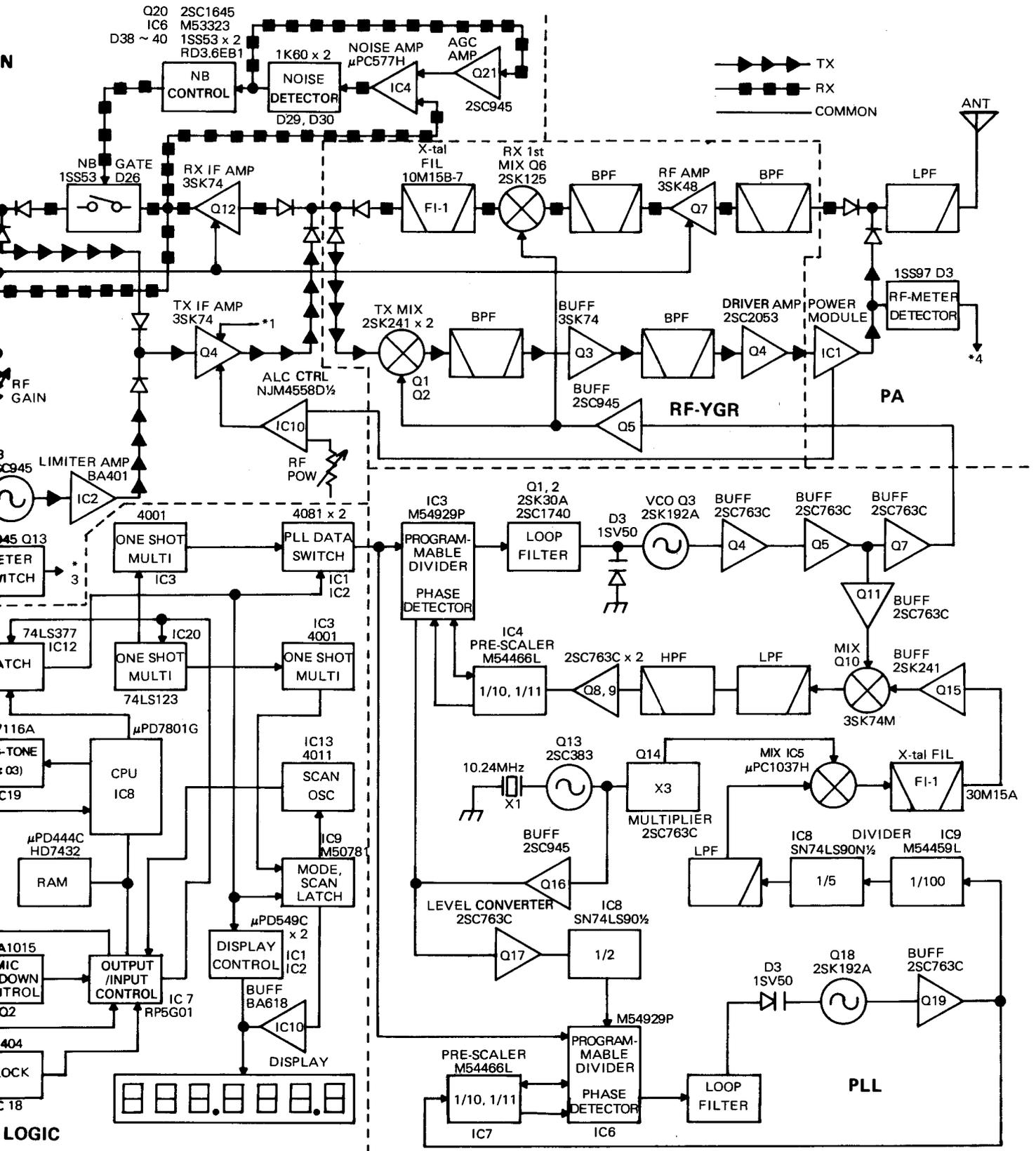


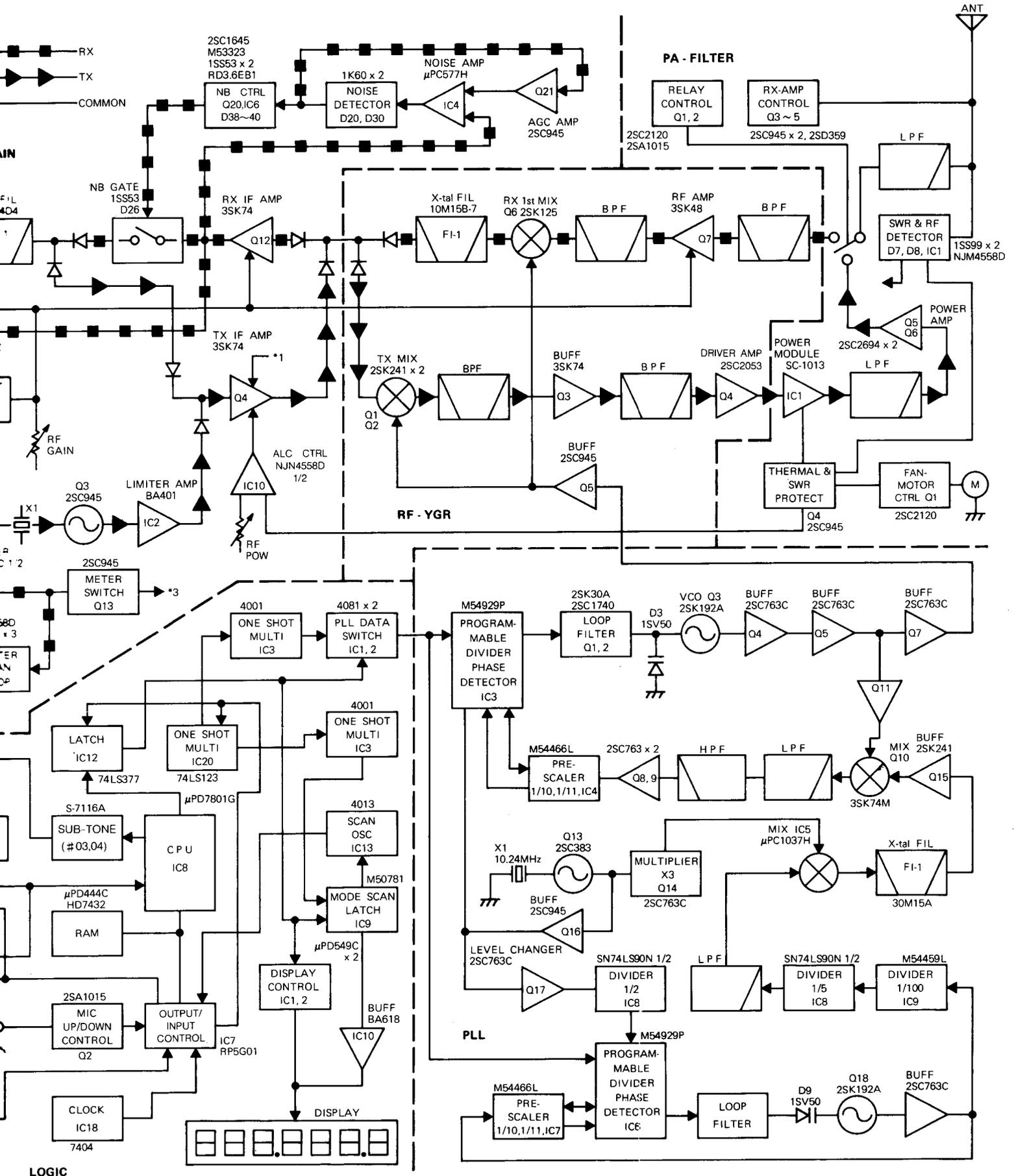
3-4 TOP VIEW (IC-271H)



3-5 BOTTOM VIEW (IC-271H)







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 to 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 IC118 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°C 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°C and 80°C is positioned on the final transistor. When the temperature is 50°C to 80°C, the cooling fan operates at low speed, and when the temperature is 80°C 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°C. 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 chang-

ed 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.

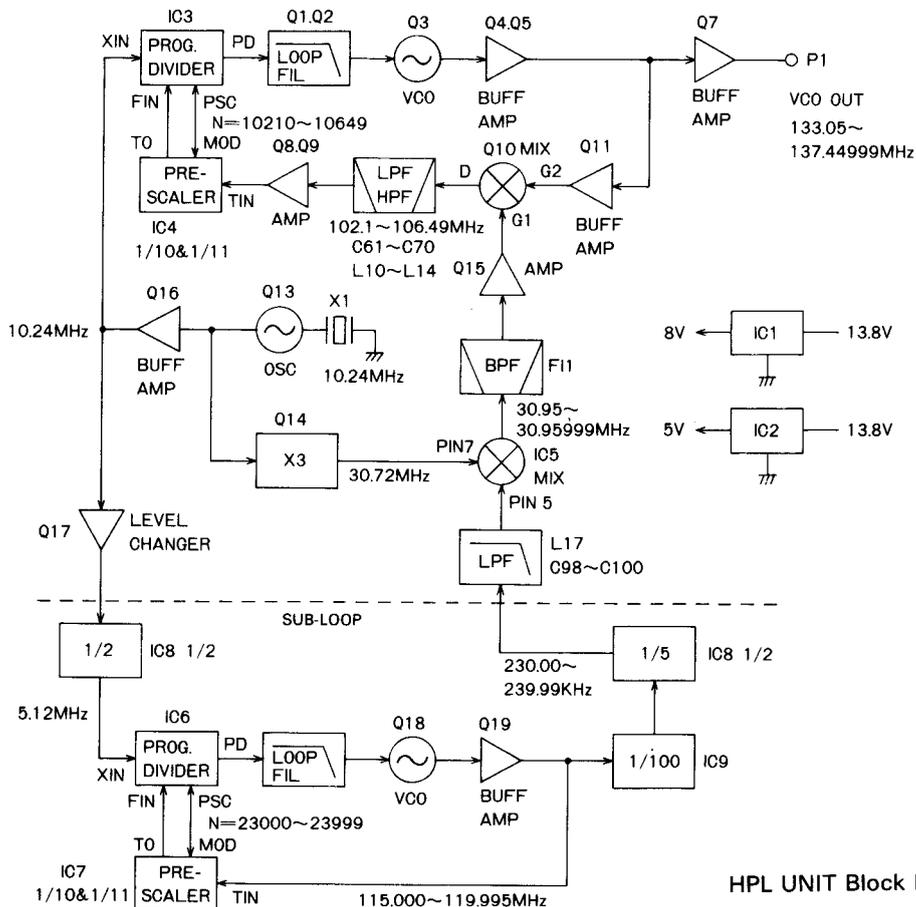
The low-pass filter composed of C98, C99, C100 and L17 removes the unwanted spurious components of the signal(230 to 239.99kHz) from the sub-loop. The signal is then input to IC5(pin 5).

The signal(30.95 to 39.9599MHz) resulting from the mixing at IC5 is passed through the F11 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(μ PD7801G-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.

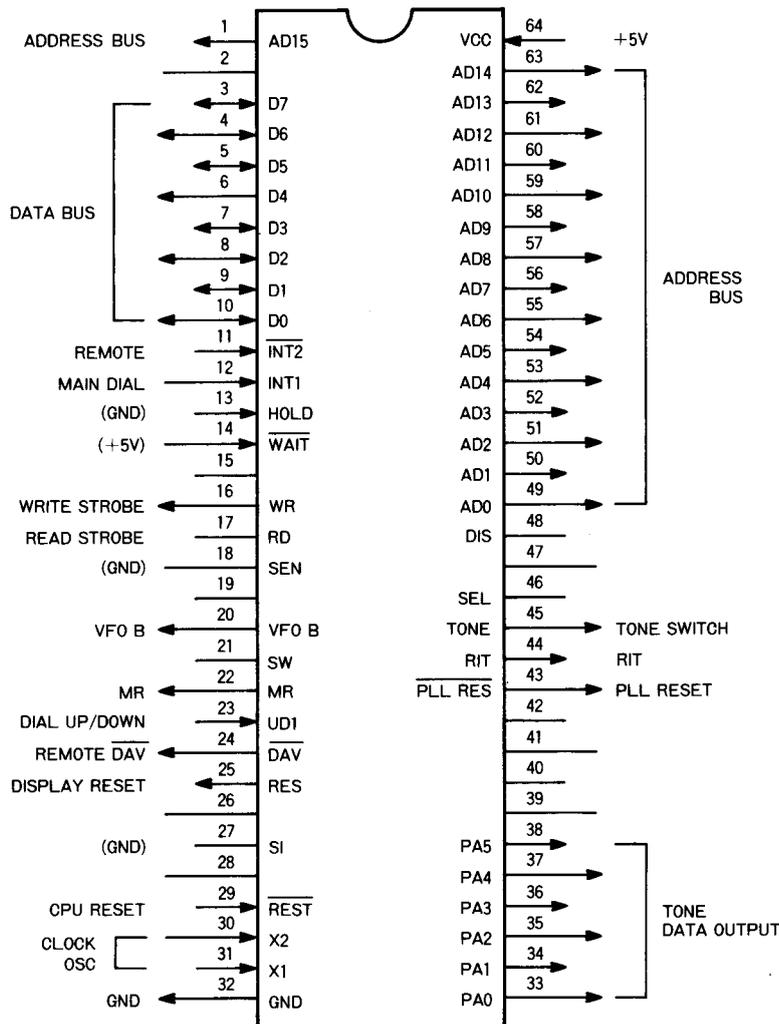
The circuit uses a 50-pulse main sensor. In the FM mode, a HIGH is applied from IC9(pin 10) to M1 via D23 and R50 which sets the multiplier to 1(i.e., 50 pulses x 1). In the SSB or CW modes, pin 10 becomes LOW, D23 switches OFF, M1 becomes LOW which sets the speed multiplier to 4(i.e., 50 pulses x 4).

(2) MODE AND FREQUENCY STEP CIRCUITS

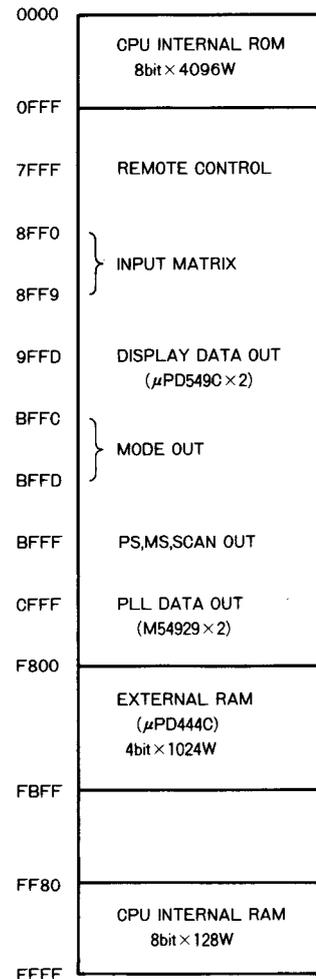
The step rates available are 5kHz(FM) and 10Hz(SSB, CW) when the TS switch is ON.

The Y₇→D₄, D₅ 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 Y₇ signal from the TS switch on the front panel is input to pin 12 of the same IC. The Y₇ 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 Y₇→D₄ 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.

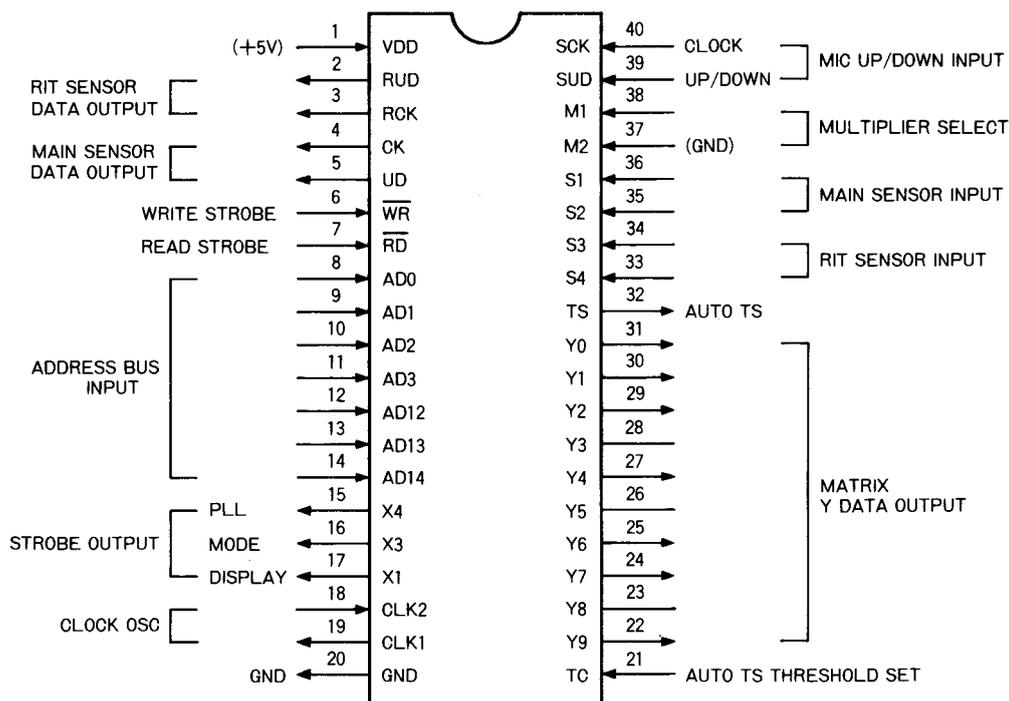
(3)AUTO TUNING RATE(TS), PROGRAM SCAN(PS), MIC UP/DOWN CIRCUITS

The auto TS circuit consists of IC18, IC5 and D18. The FM mode signal is input to IC18(pin 1), the Y₇ 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.

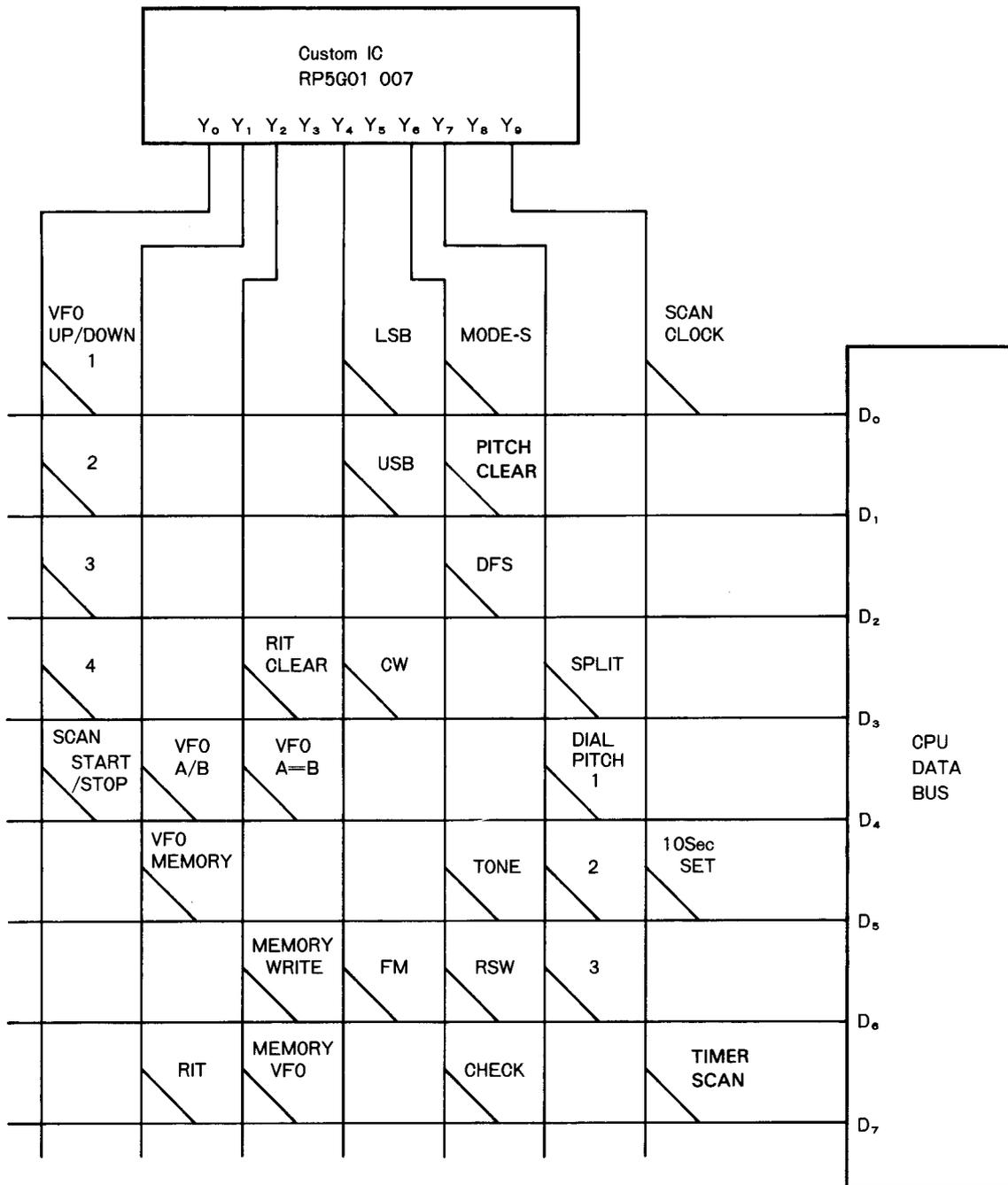
IC5(pin 11) becomes HIGH if the SCK terminal is set to HIGH either by the MIC UP/DOWN signal or the auto TS signal(HIGH during high speed rotation of the sensor) from IC7(pin 32).

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

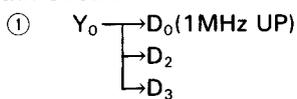


5-4-3 MATRIX CIRCUIT

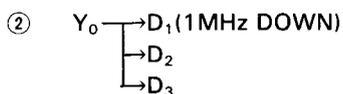


The matrices used in this transceiver and their operation are as stated below.

Matrix Circuit



Shifts the frequency 1MHz upward.



Shifts the frequency 1MHz downward.

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

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

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

⑥ $Y_1 \rightarrow D_7(\text{RIT})$
 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.
- 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).

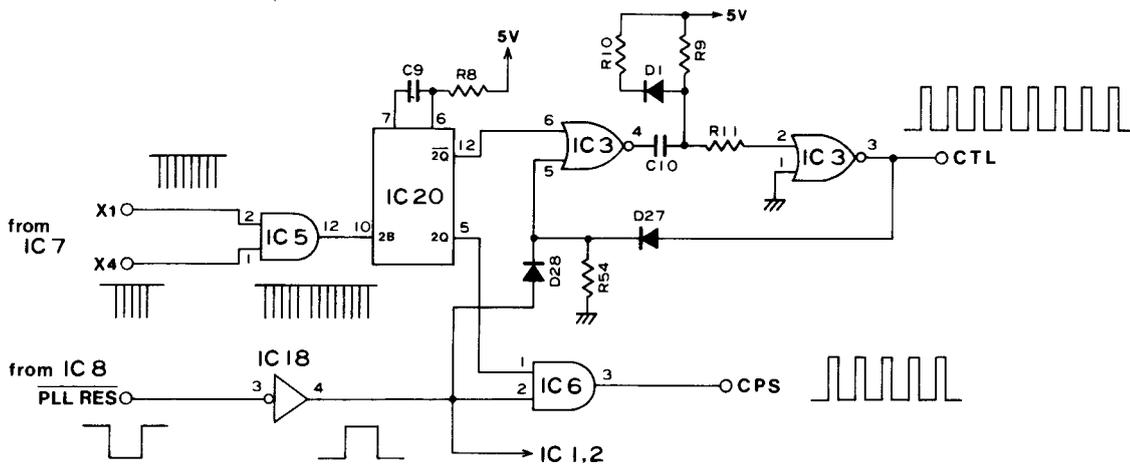
IC20 contains a monostable multivibrator which increases the pulse width of the input signal and passes the output from pins 5 and 12 to IC6(pin 1) and IC3(pin 6).

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.

DFS	OFF	ON
VFO/M		
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.



5-4-5 DISPLAY DATA

The eight-digit data and the eight CTL pulses automatically set the display driver IC (μ PD549C). 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).

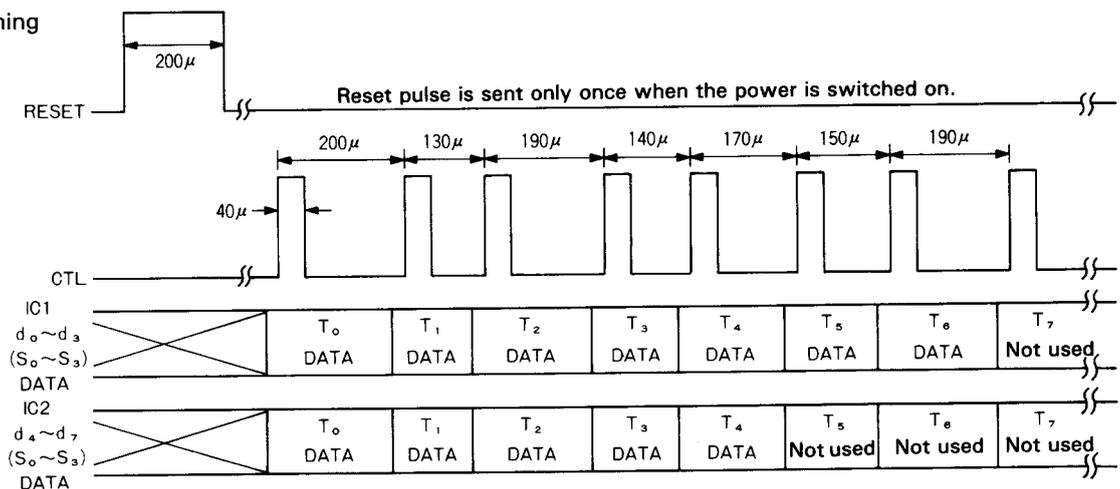
The X3 signal input to IC20 (pin 2) has its pulse width increased by the monostable multivibrator and by the time constants of R7 and C8 which are connected to the timing terminals (pins 14, 15). The output from pin 4 passes

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 (AD₀, AD₁) from IC8 is also input to pins 12 and 2, and then output from pins 5 and 9 to IC9's port select terminals (S₀, S₁). The data (d₀ through d₃) 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 +DUP and -DUP signals, and finally output to the display.

The +DUP signal is also converted to the $\overline{\text{DUP}}$ 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 $\overline{\text{DUP}}$ signal(+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 $Y_6 \rightarrow D_6$, D7 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.

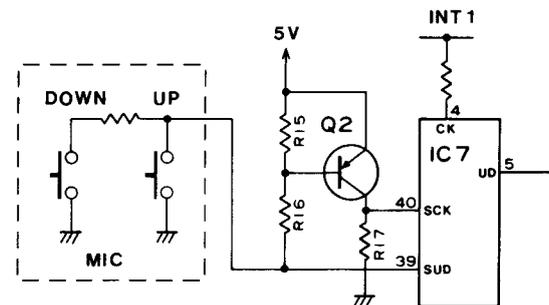
The Q3 base is connected to IC9(pin 21)(MS signal) and IC9(pin 10)(FM signal).

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 triggered 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,

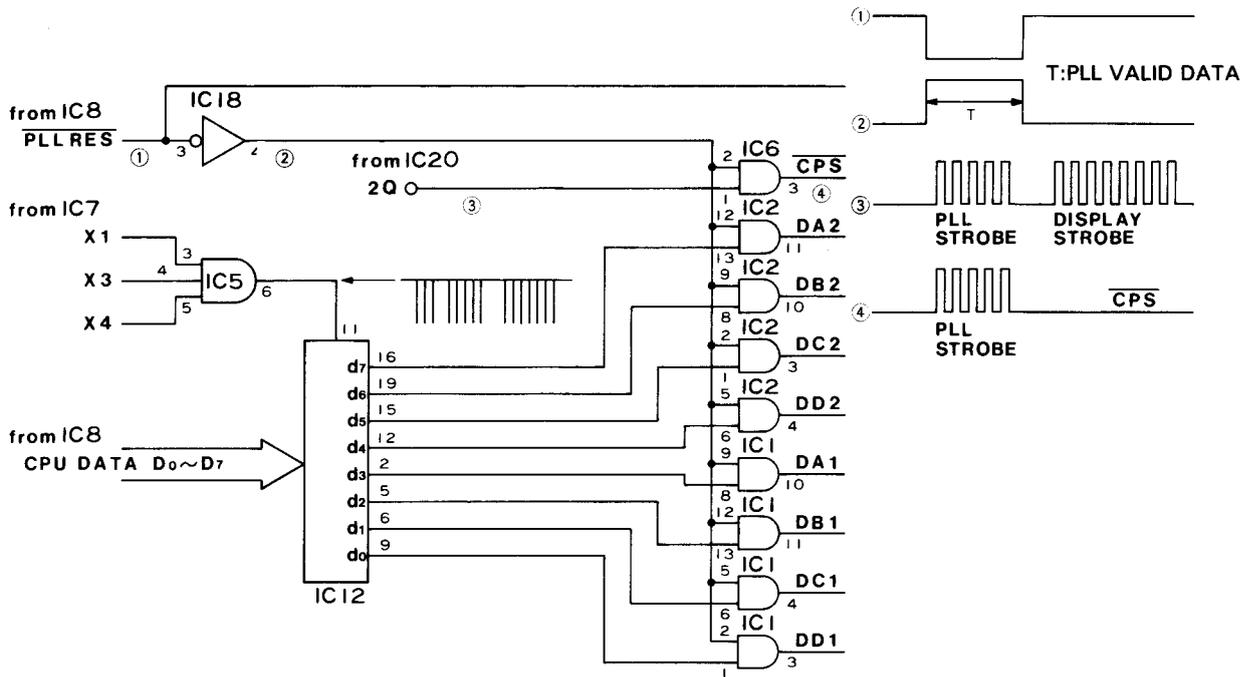
IC15, IC18, D2, D3 and R12 through R14 is for connection of the remote control.

5-4-9 N DATA

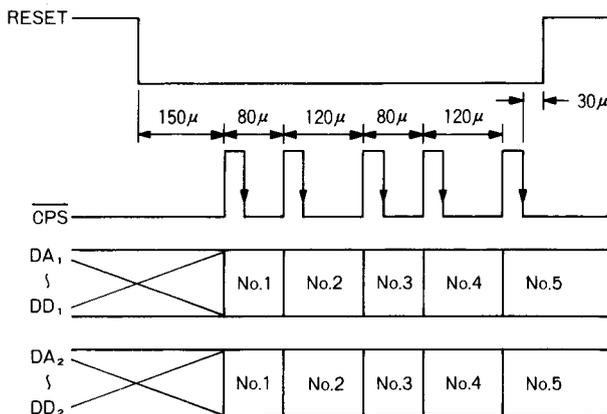
Because the PLL is a two-loop construction, the two-line N data from the LOGIC UNIT is supplied to the PLL system. The data from the data bus(IC8(pins 3 through 10)) uses the eight D-type flip-flops contained in IC12 as latches. The display, PLL, mode and scan strobe signals of IC7(pins 15 through 17)(X1 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 d₀ through d₇ 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 PA₀ through PA₅, and a standby terminal. Data PA₀ through PA₅, 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 antenna 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 when the 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.

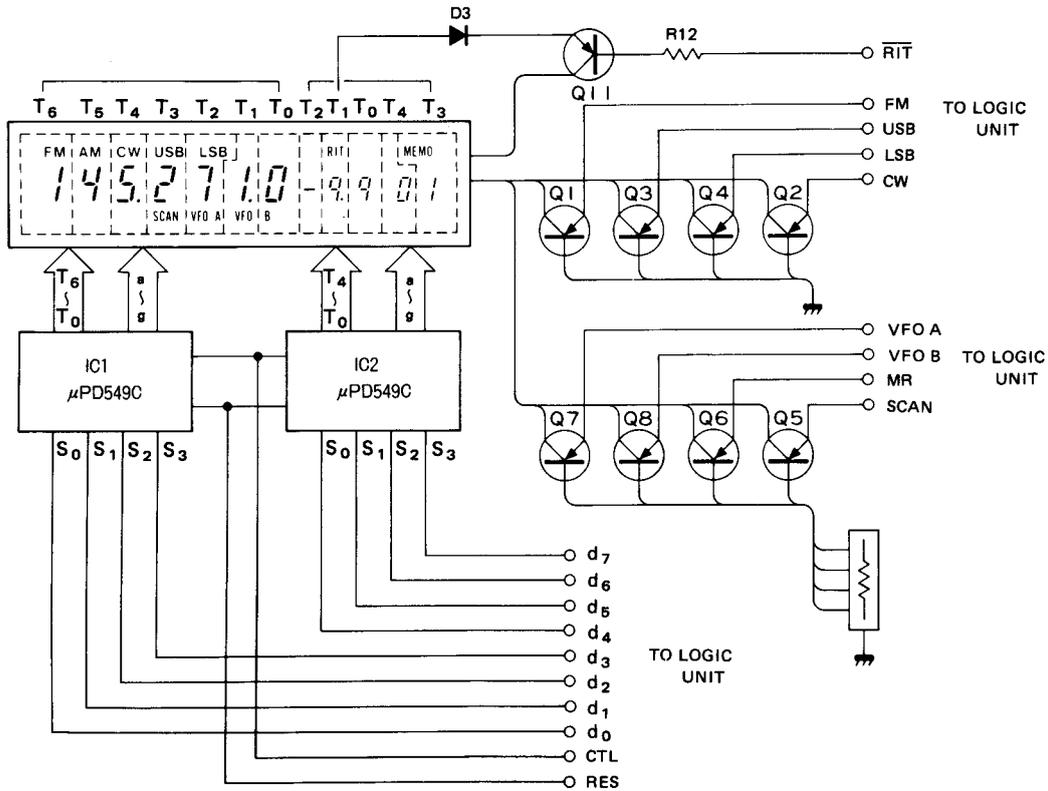
(2) DC-DC CONVERTER

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.

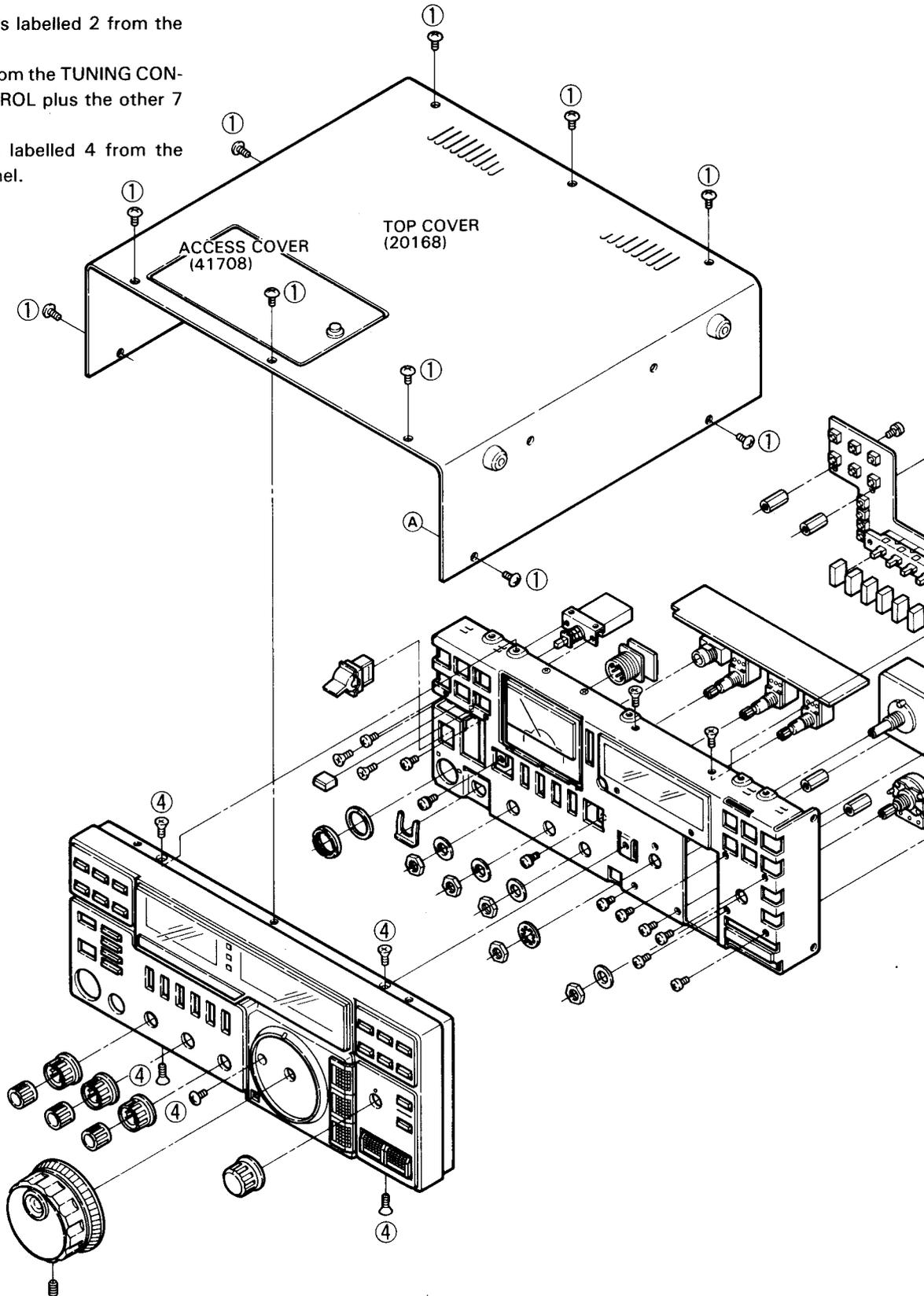
Also, this circuit board includes a multivibrator circuit which uses the squelch lamp to indicate protector operation.

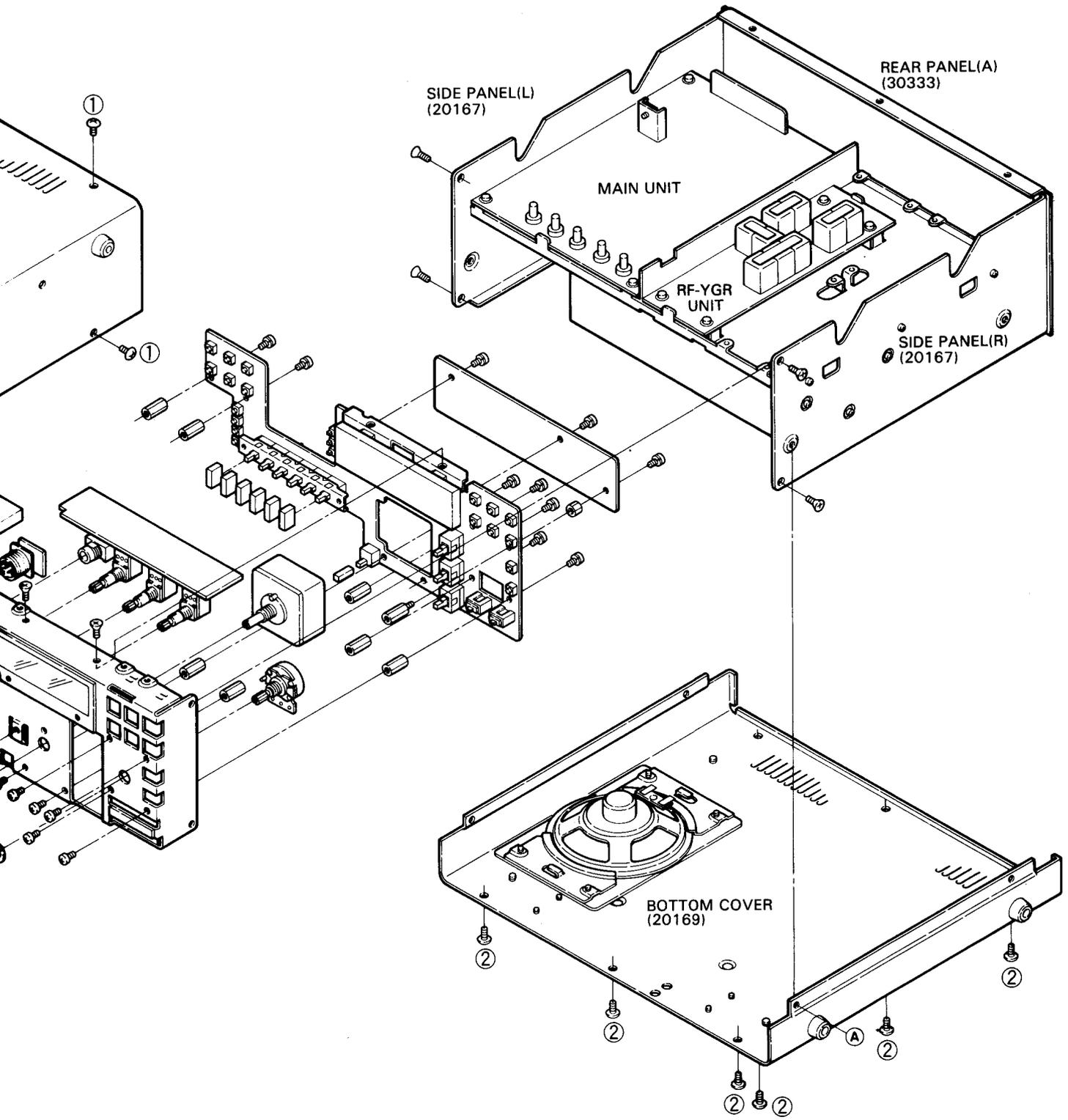
The protector signal output is applied via R6 to the Q3 base and, while transmitting only, the voltage from the T8V line is applied to the multivibrator circuit(Q1, Q2). The voltage switched by Q2 is output to the SQLS line, and the squelch lamp flashes ON and OFF to indicate the protector circuit is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

SECTION 6 MECHANICAL PARTS AND DISASSEMBLY

FRAME DISASSEMBLY (IC-271A/E)

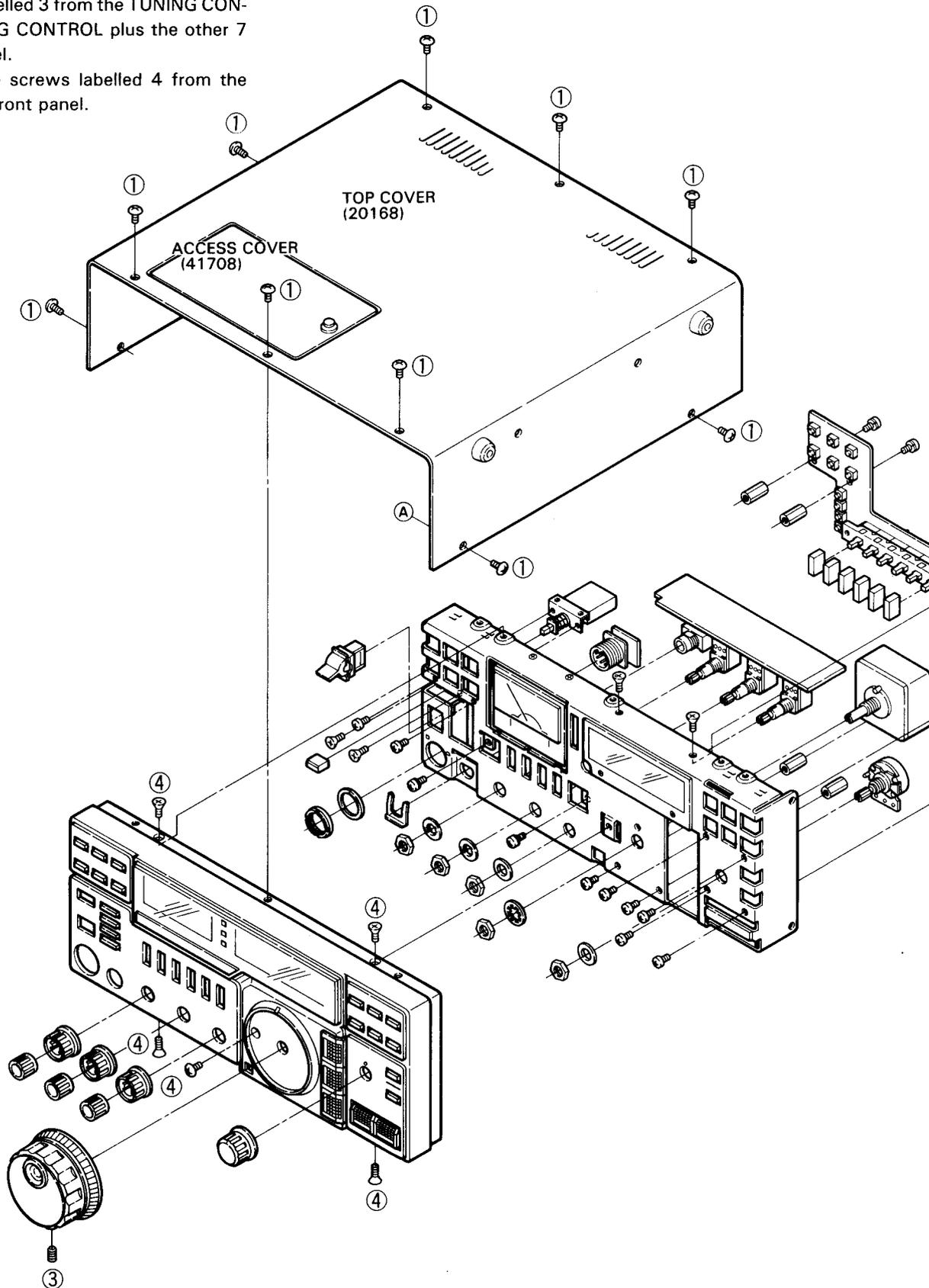
1. Unscrew and remove the 10 screws labelled 1 from the top cover. Remove the cover.
2. Unscrew and remove the 6 screws labelled 2 from the bottom cover. Remove the cover.
3. Remove the hex screw labelled 3 from the TUNING CONTROL. Pull off the TUNING CONTROL plus the other 7 knobs from the front panel.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

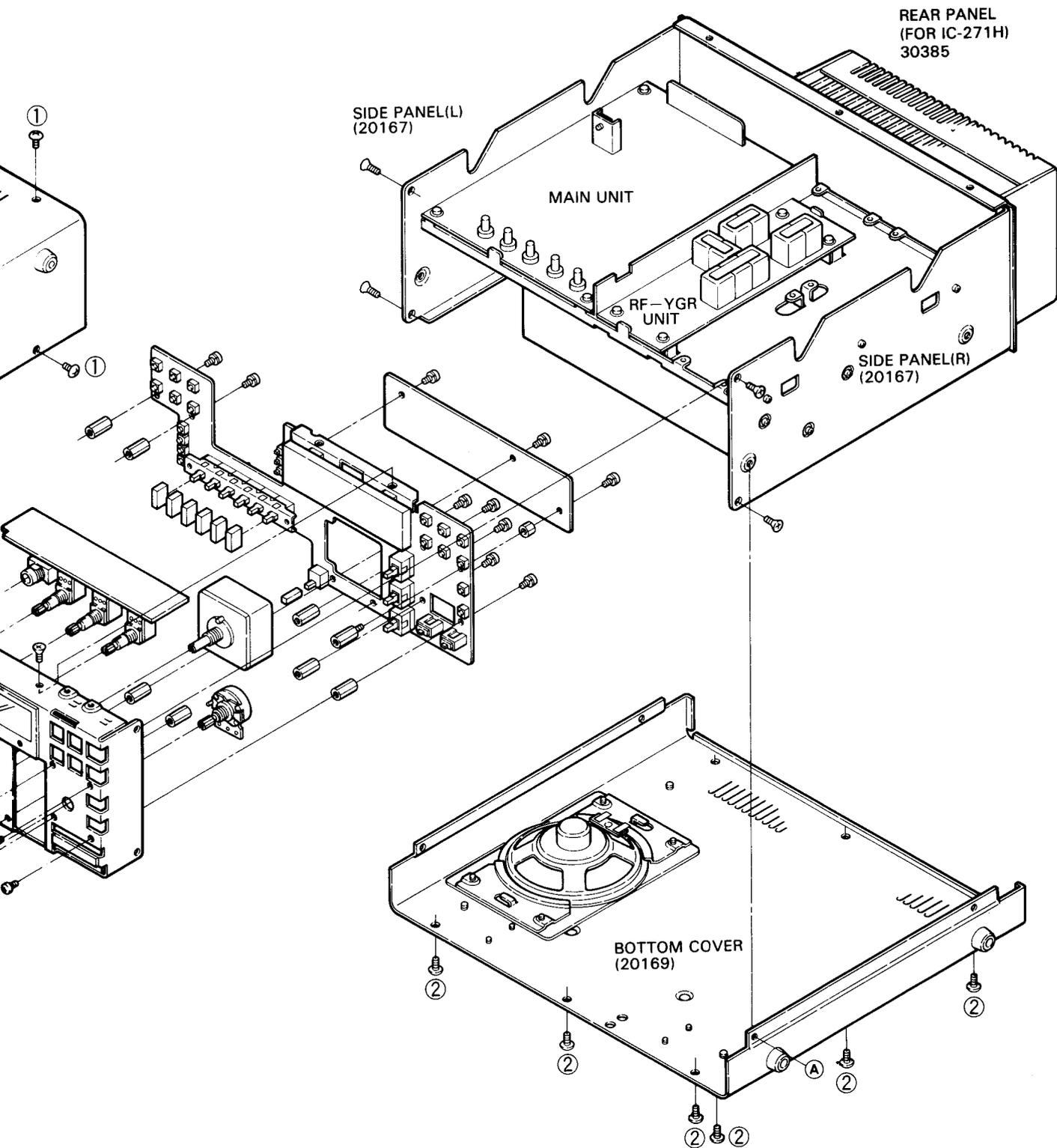




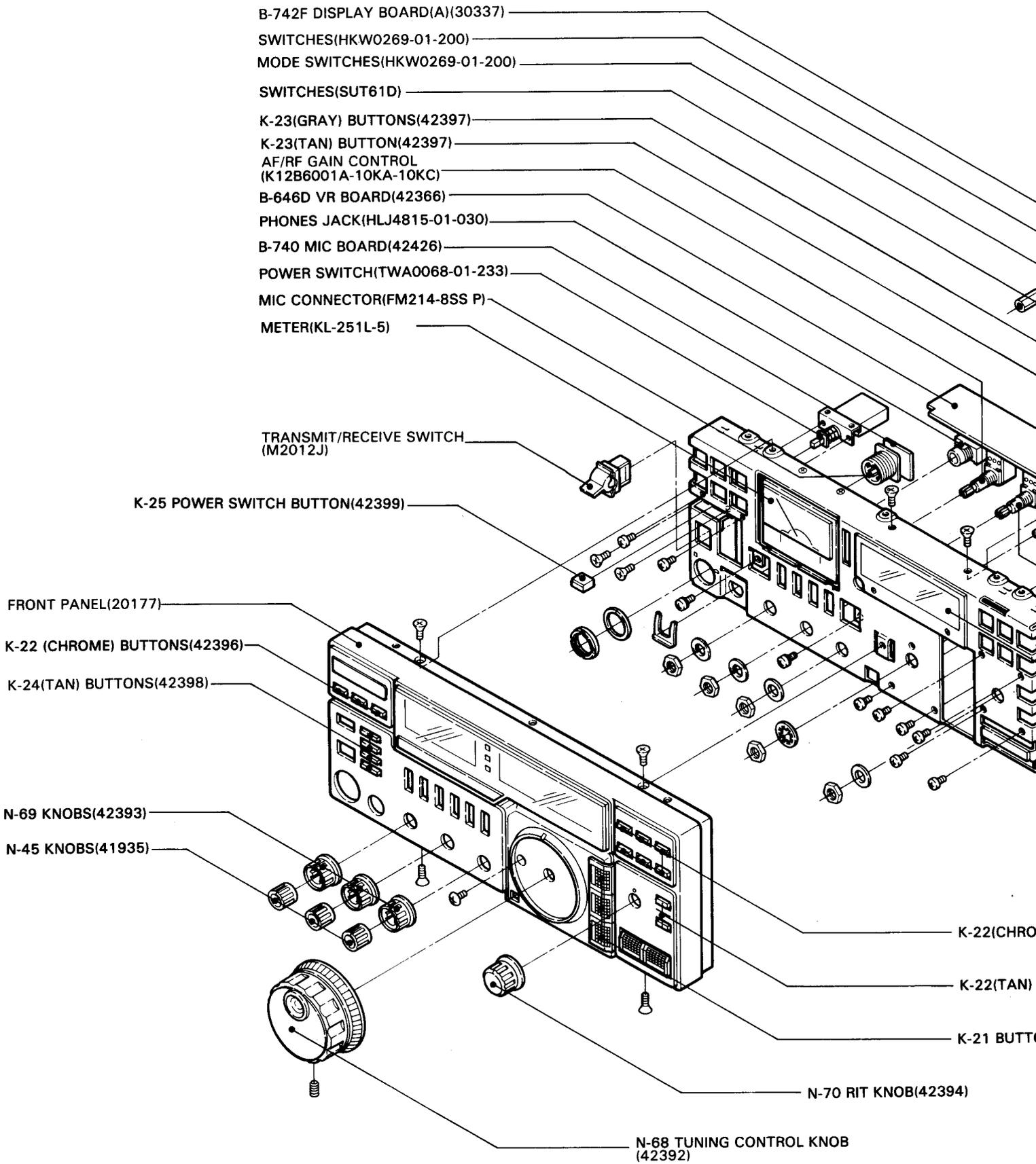
FRAME DISASSEMBLY (IC-271H)

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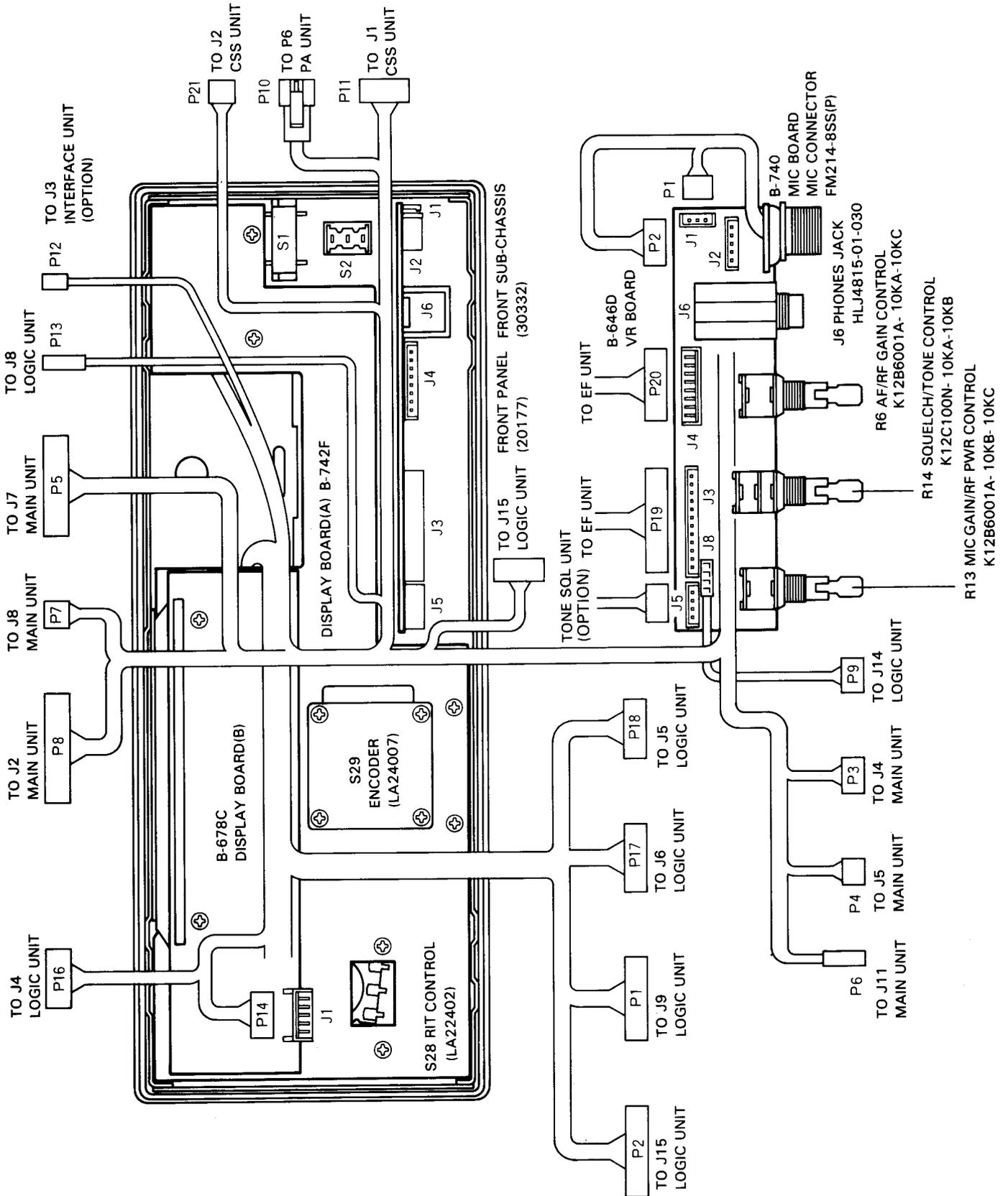




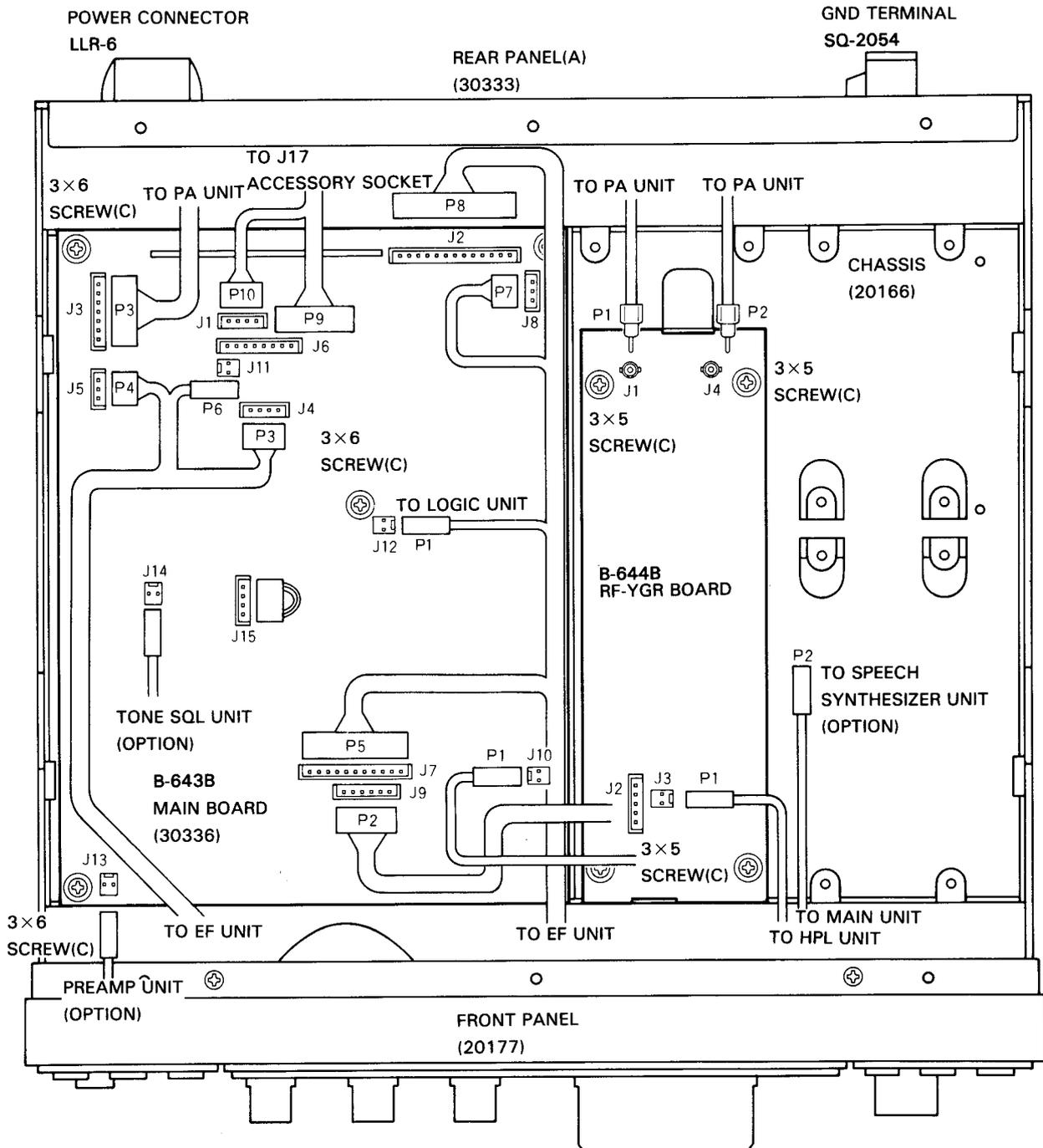
FRONT PANEL DISASSEMBLY



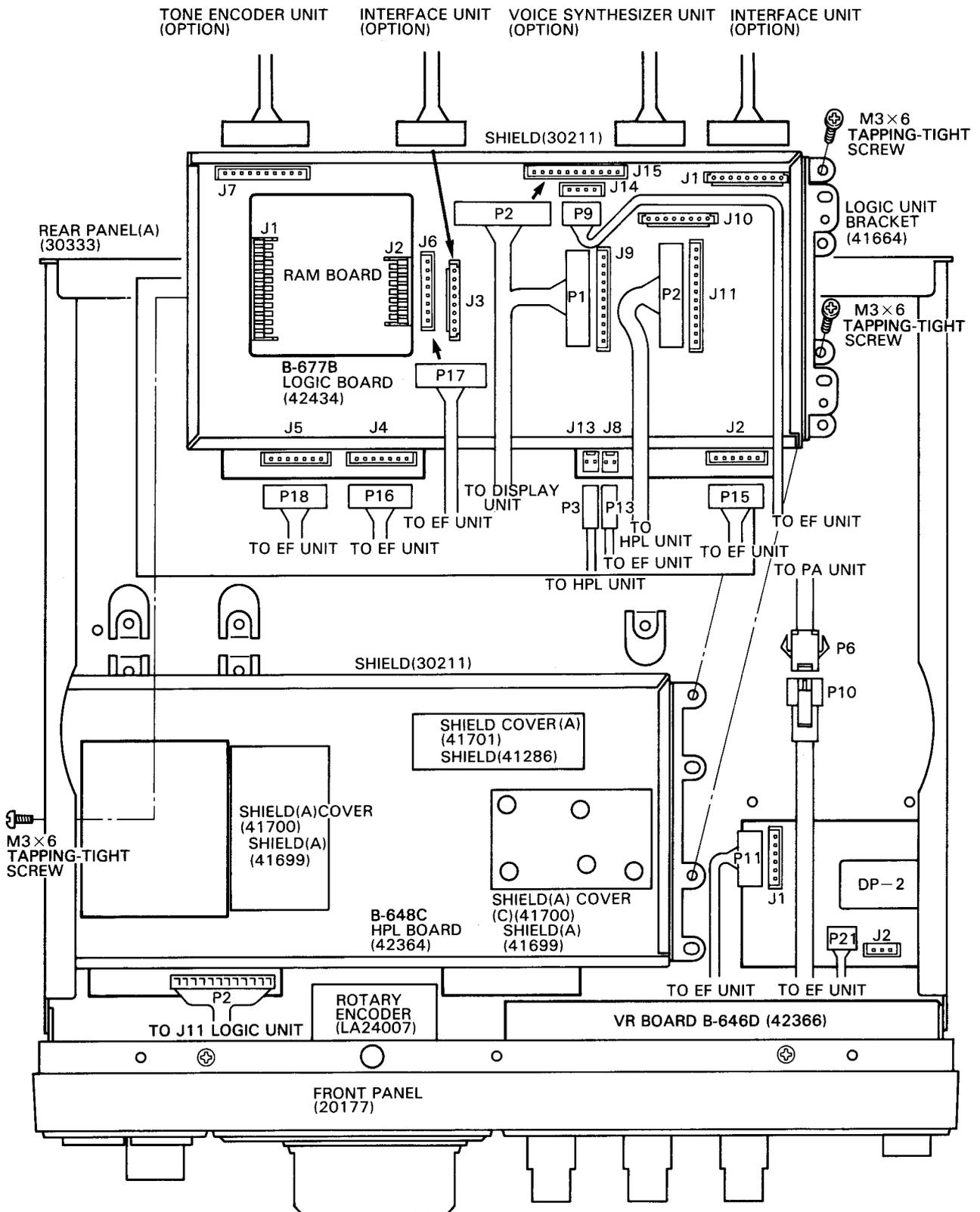
FRONT SUB-CHASSIS CONNECTOR ASSEMBLY



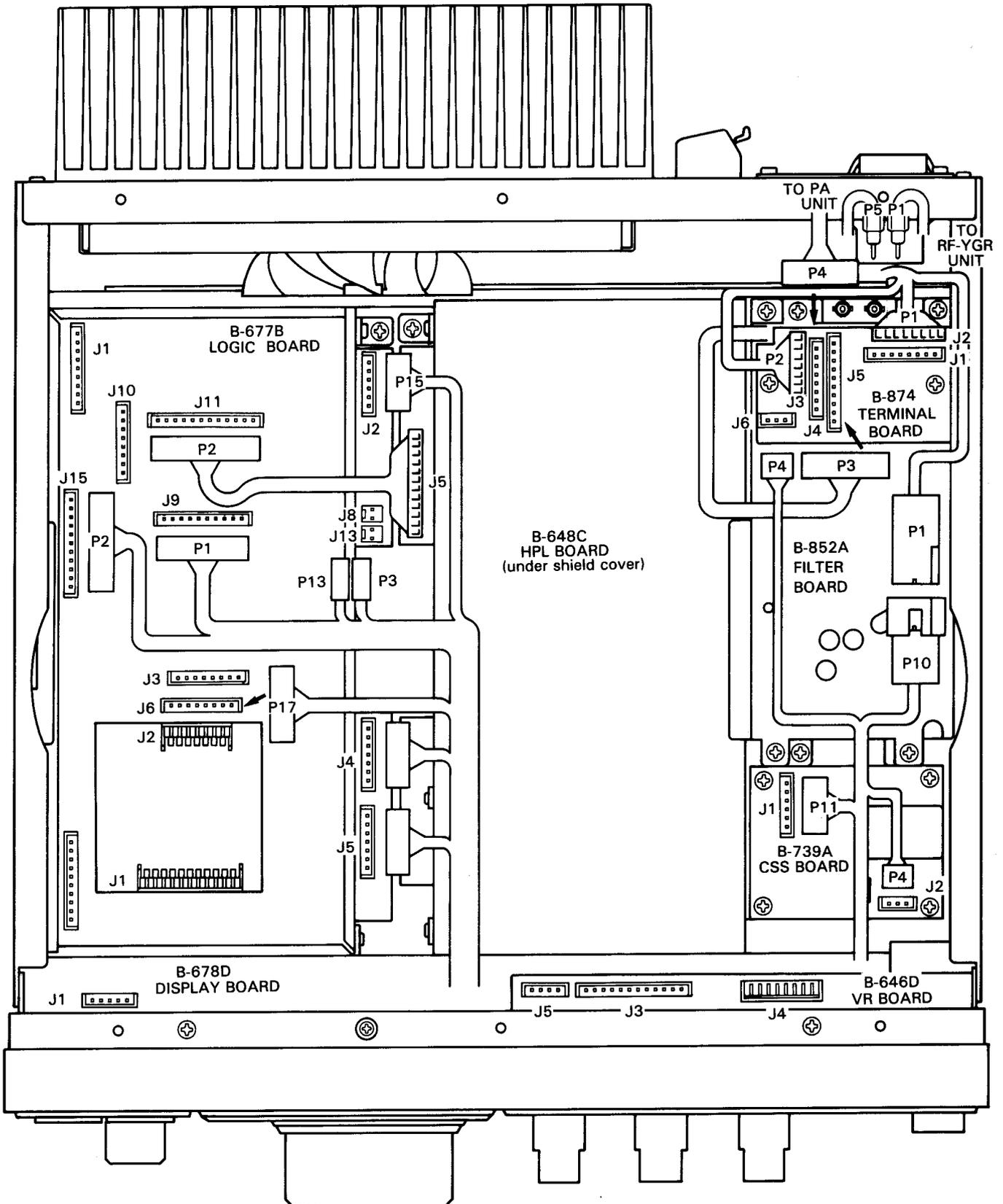
MAIN BOARD CONNECTOR ASSEMBLY (IC-271A/E)



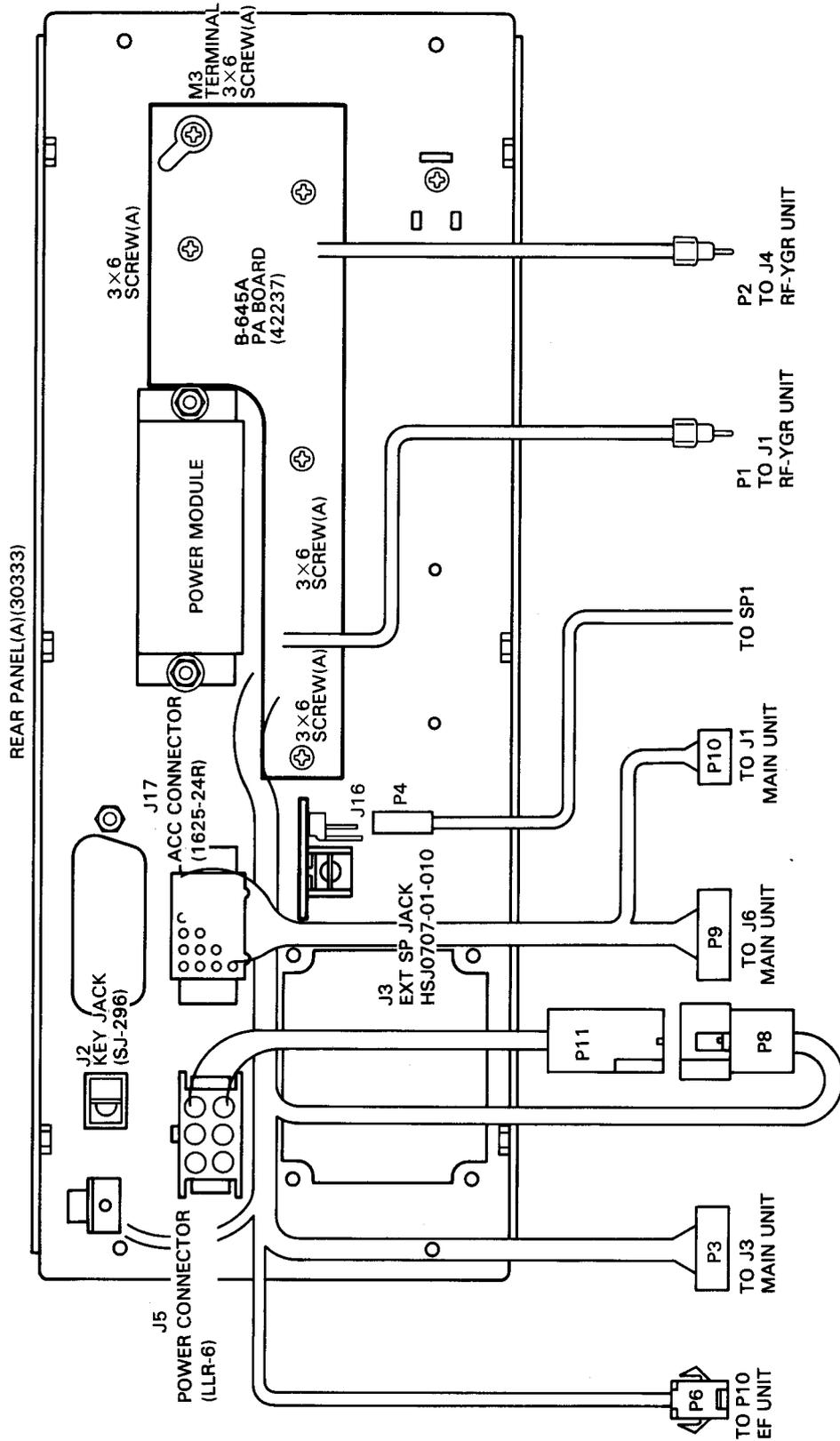
LOGIC/PLL BOARD CONNECTOR ASSEMBLIES (IC-271A/E)



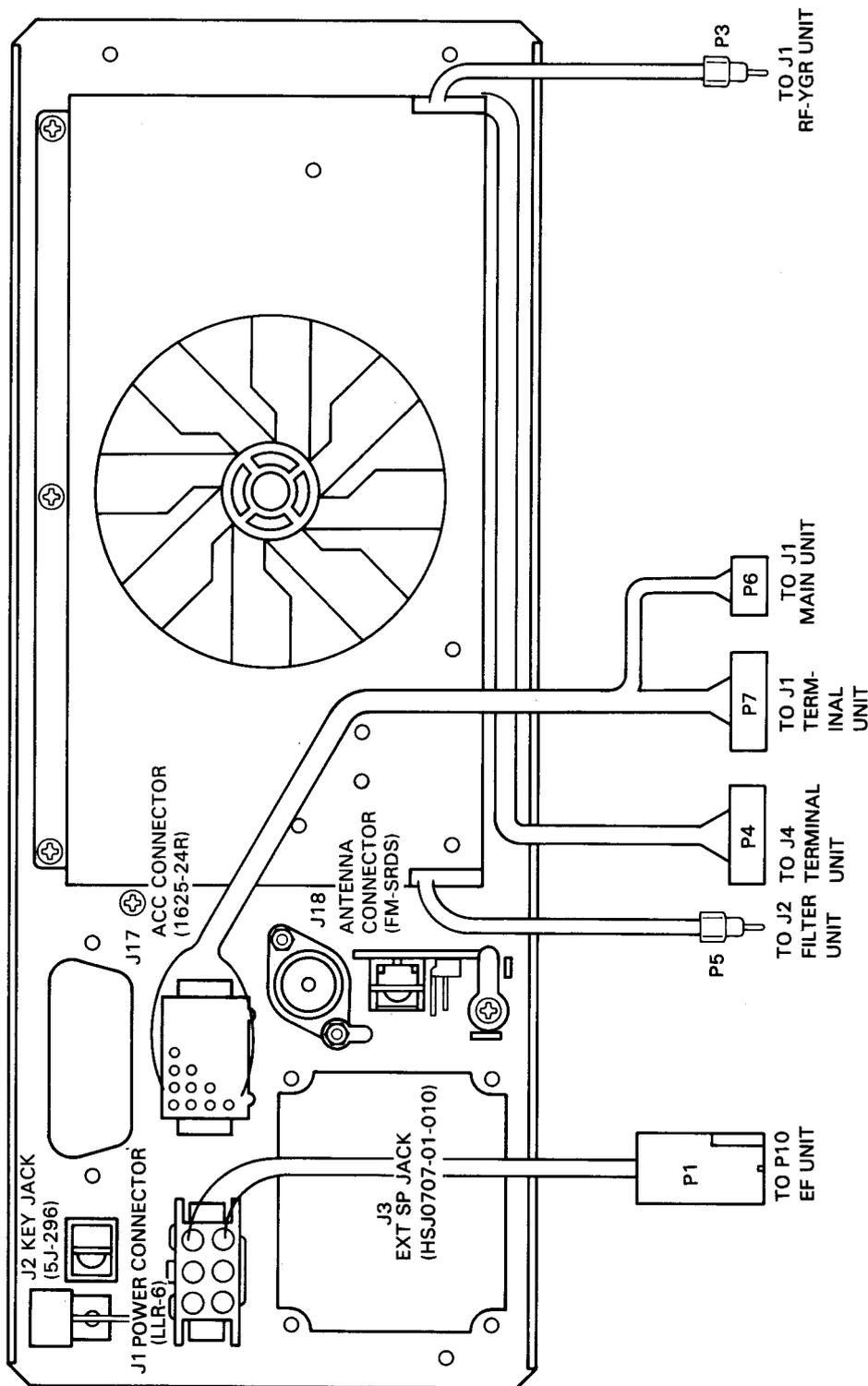
LOGIC/PLL BOARD CONNECTOR ASSEMBLIES (IC-271H)



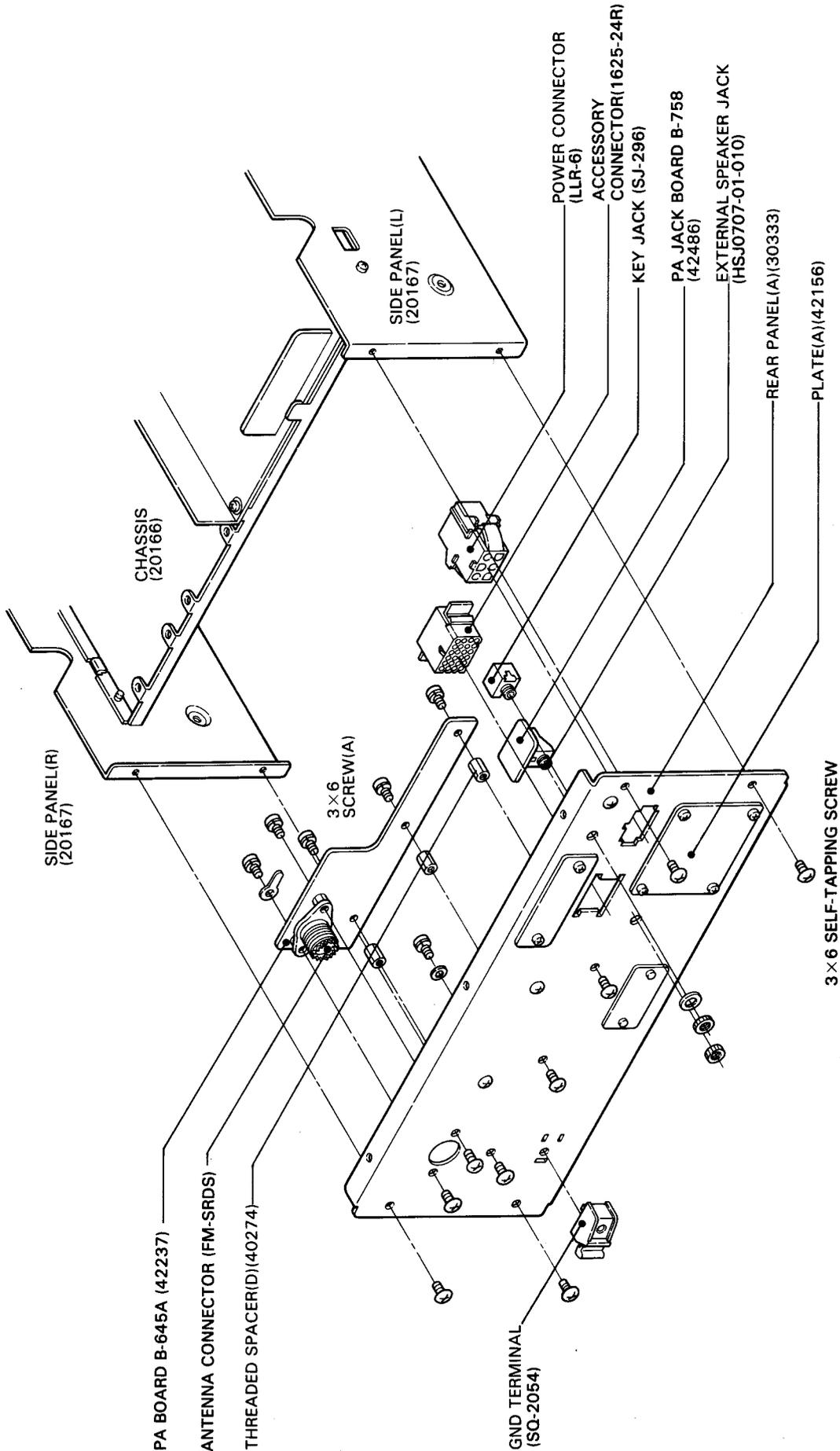
REAR PANEL CONNECTOR ASSEMBLY (IC-271A/E)



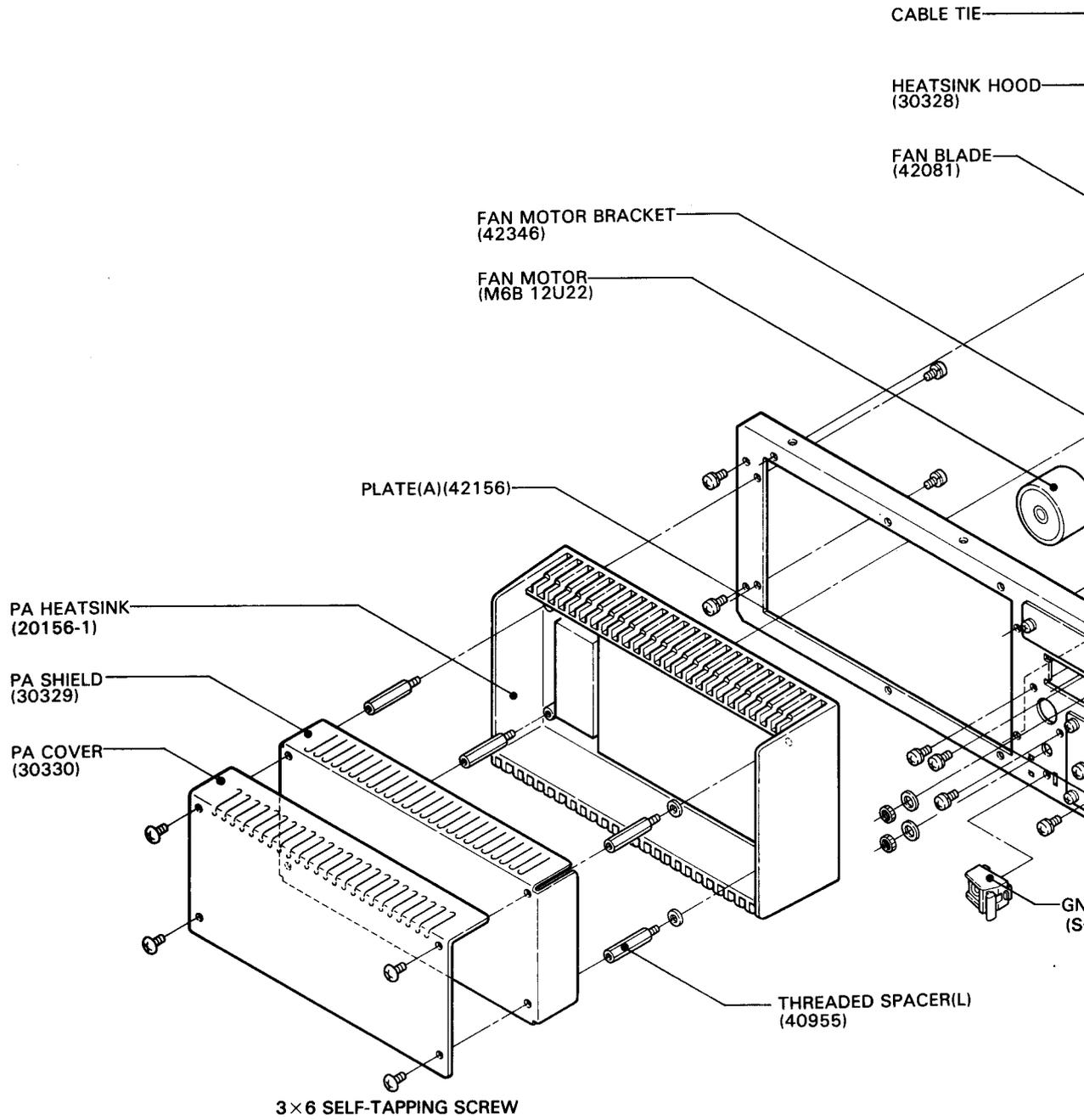
REAR PANEL CONNECTOR ASSEMBLY (IC-271H)

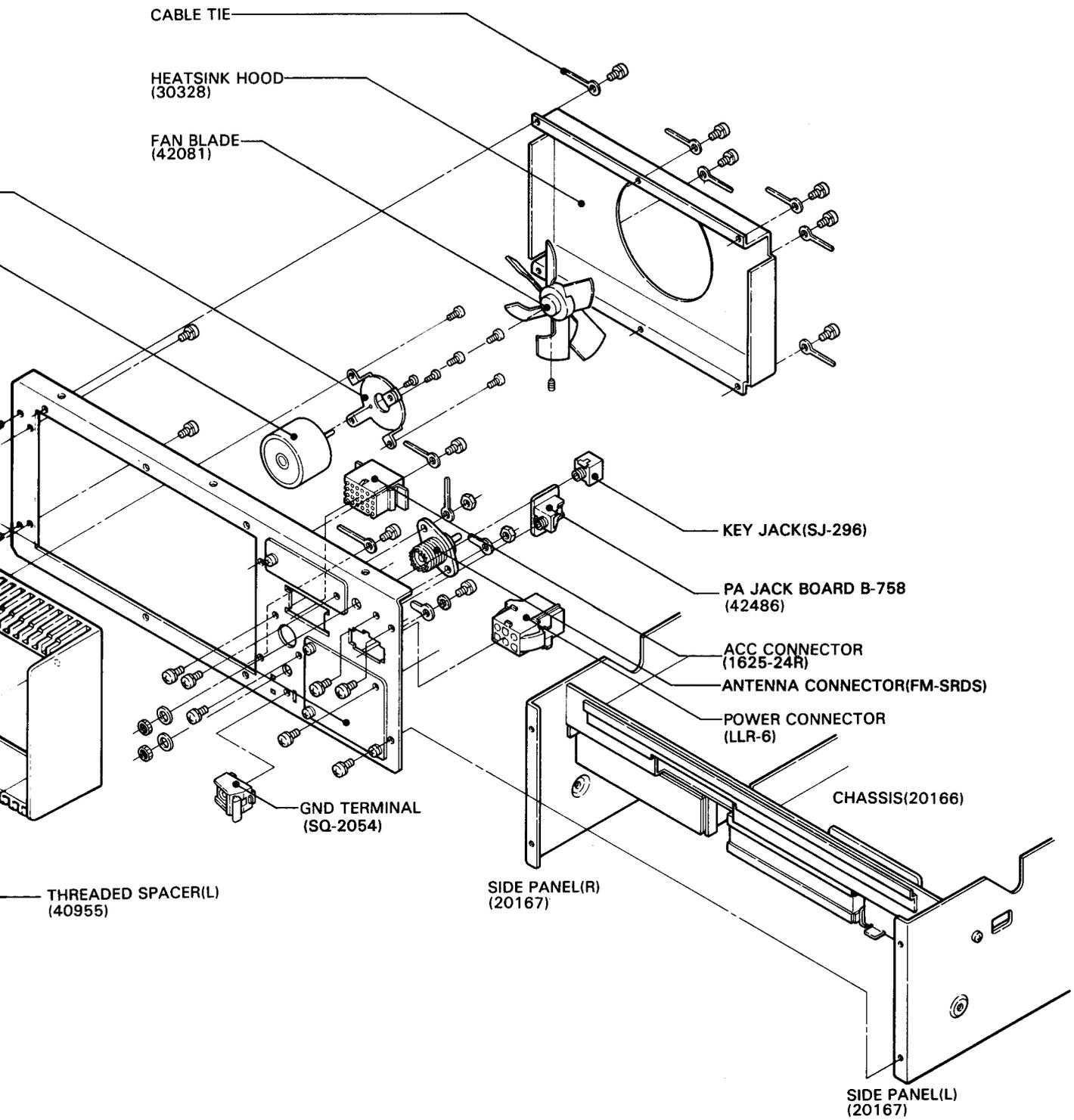


REAR PANEL PARTS DISASSEMBLY (IC-271A/E)



REAR PANEL PARTS DISASSEMBLY (IC-271H)





SECTION 7 MAINTENANCE AND ADJUSTMENT**7-1 PREPARATION BEFORE SERVICING**

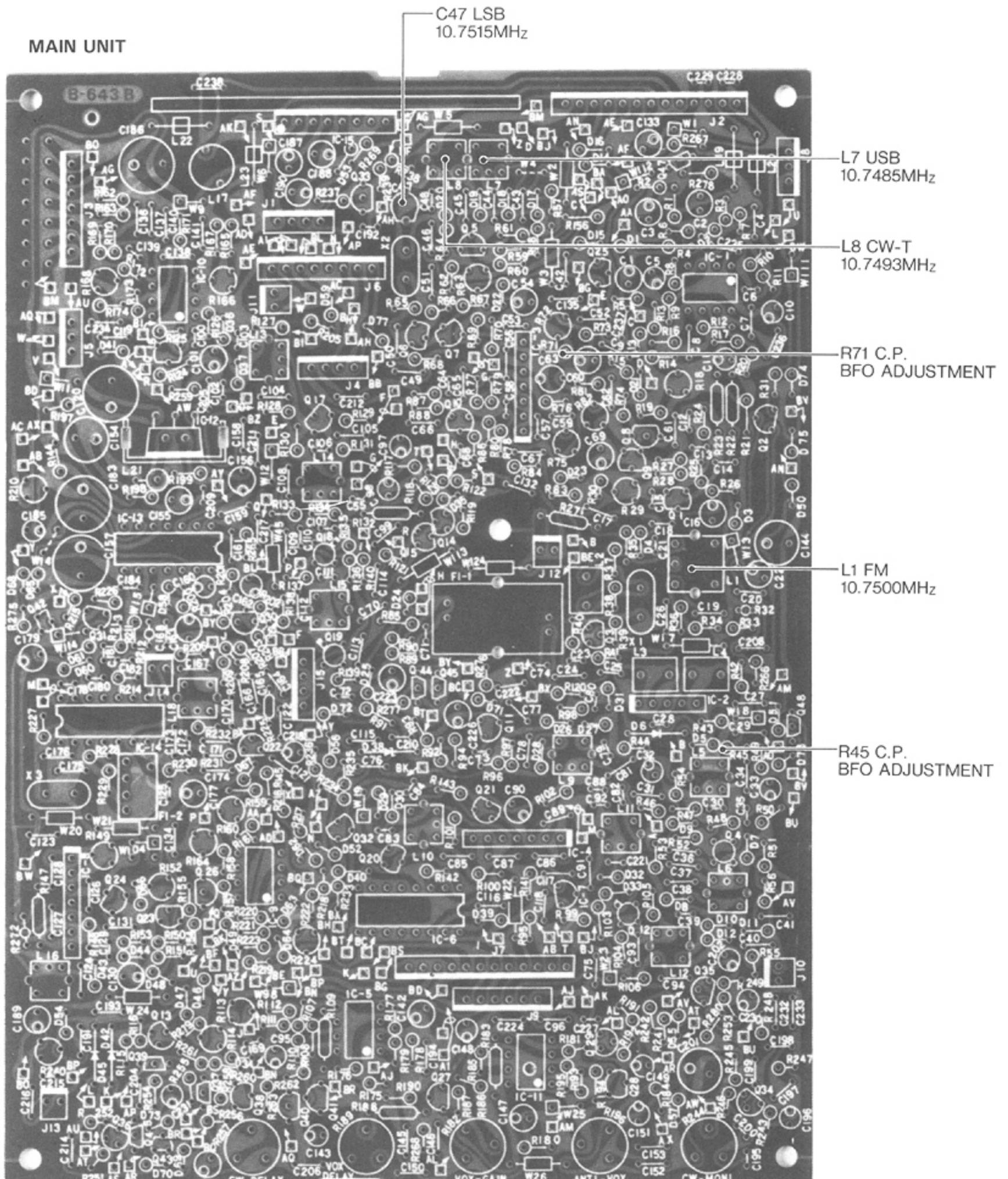
1. Detach the power cord and turn off the power switch before performing any work on the radio.
2. Do not short circuit components while making adjustments.
3. Use an insulated tuning tool for all adjustments.
4. Do not force any of the variable components. Tune them slowly and smoothly.
5. Follow the 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	CONNECTIONS
<p>(1) VOLTAGE REGULATED POWER SUPPLY</p> <ul style="list-style-type: none"> • OUTPUT VOLTAGE : DC 13.8V • CURRENT CAPACITY : 20A <p>(2) OSCILLOSCOPE</p> <ul style="list-style-type: none"> • FREQUENCY RANGE : DC-50MHz • MEASURING RANGE : 0.01-10V <p>(3) FREQUENCY COUNTER</p> <ul style="list-style-type: none"> • FREQUENCY RANGE : 0.1-180MHz • ACCURACY : BETTER THAN ± 1PPM • SENSITIVITY : 100mV OR BETTER <p>(4) RF POWER METER(TERMINATED)</p> <ul style="list-style-type: none"> • MEASURING RANGE : 100W • FREQUENCY RANGE : 140-150MHz • IMPEDANCE : 50 OHMS • SWR : LESS THAN 1.1 <p>(5) RF VOLTMETER</p> <ul style="list-style-type: none"> • FREQUENCY RANGE : 0.1-180MHz • MEASURING RANGE : 0.001-10V <p>(6) MULTIMETER</p> <ul style="list-style-type: none"> • INPUT IMPEDANCE : 50kOHMS/VOLT OR BETTER 	

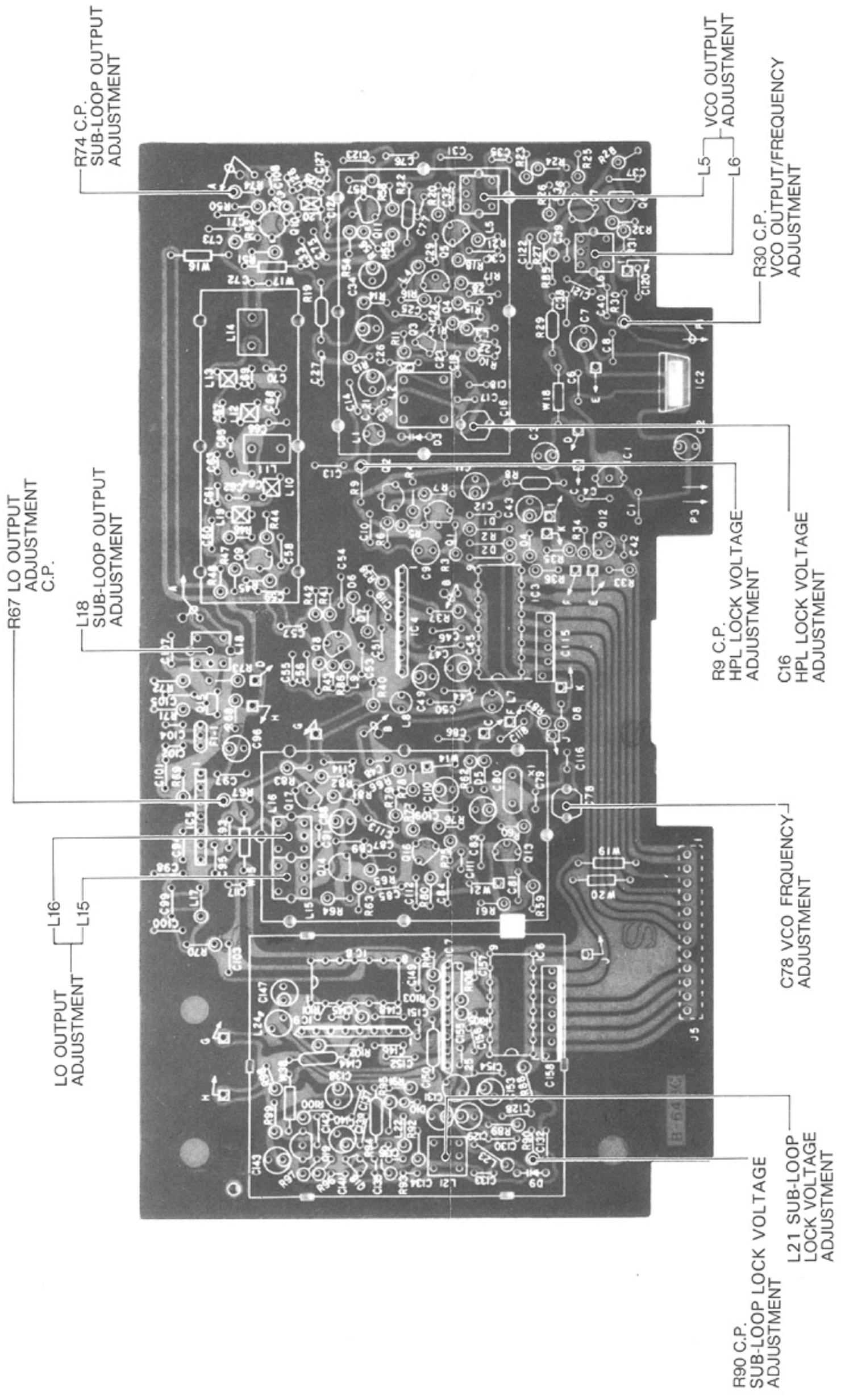
ADJUSTMENT	ADJUSTMENT CONDITIONS	UNIT	MEASUREMENT LOCATION	VALUE	UNIT	ADJUST
SUB-LOOP LOCK VOLTAGE	1 ● Display freq.: 145.0000(0)MHz ● Mode :FM	HPL	Connect an oscilloscope to R90.	3V	HPL	L21
	2 ● Display freq.: 144.9984(9)MHz ● Mode :USB			1.6V approx.		
PLL LO OUTPUT LEVEL	1 ● Display freq.: 145.0000(0)MHz ● Mode :FM	HPL	Connect an oscilloscope to R67.	Maximum output: 300mV _{p-p}	HPL	L15,L16
SUB-LOOP OUTPUT VOLTAGE	1 ● Display freq.: 145.0000(0)MHz	HPL	Connect an oscilloscope to R74.	Maximum output: 250mV _{p-p}	HPL	L18
HPL LOCK VOLTAGE	1 ● Display freq.: 145.0000(0)MHz ● Mode:FM	HPL	Connect an oscilloscope to R9.	3.5V \pm 0.2V	HPL	C16
	2 ● Display freq.:144.0000-145.9999MHz			Within range 1V-7V.		
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	MAIN	Connect a frequency counter to R71.	10.7515 MHz	MAIN	C47
	2 ● Mode:LSB ● Receive			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	



NOTE: C.P.: check point

HPL UNIT



7-3 TRANSMITTER ADJUSTMENT

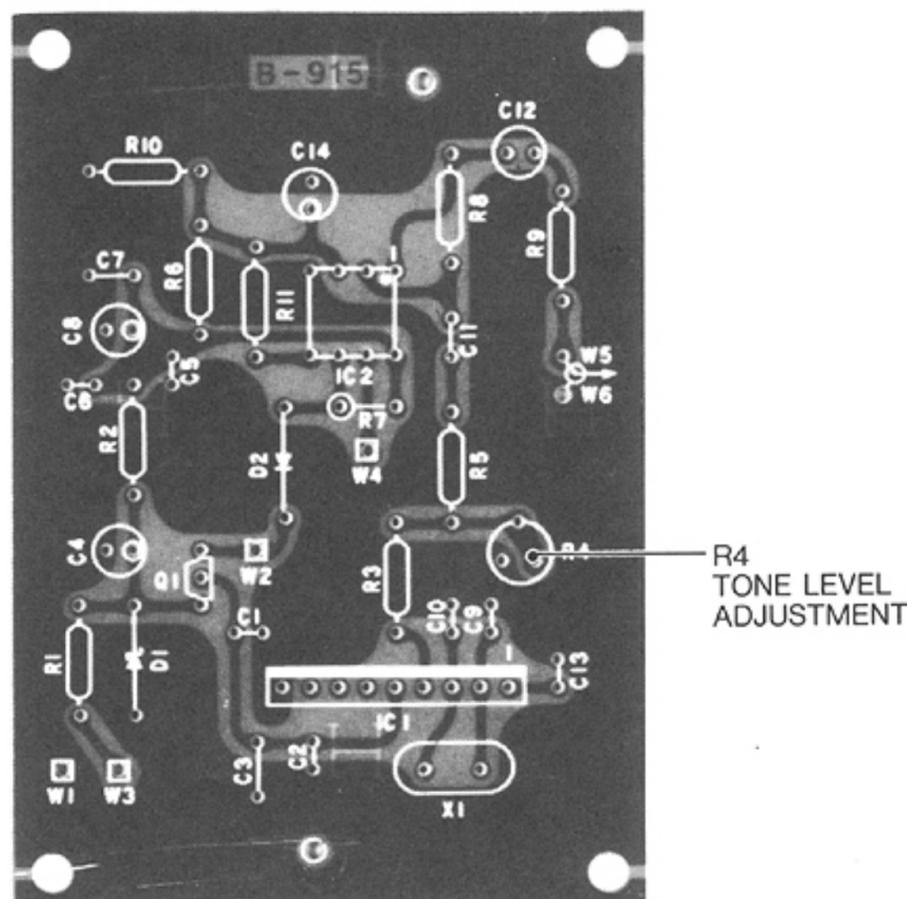
INSTRUMENTS REQUIRED	CONNECTIONS
<p>(1) VOLTAGE REGULATED POWER SUPPLY</p> <ul style="list-style-type: none"> • OUTPUT VOLTAGE : DC 13.8V • CURRENT CAPACITY : 20A <p>(2) RF POWER METER(TERMINATED)</p> <ul style="list-style-type: none"> • MEASURING RANGE : 100W • FREQUENCY RANGE : 140-150MHz • IMPEDANCE : 50 OHMS • SWR : LESS THAN 1.1 <p>(3) FM DEVIATION METER</p> <ul style="list-style-type: none"> • FREQUENCY RANGE : 140-180MHz • MEASURING RANGE : 0-±10kHz <p>(4) DIRECTIONAL COUPLER</p> <ul style="list-style-type: none"> • FREQUENCY RANGE : 140-180MHz <p>(5) AF OSCILLATOR</p> <ul style="list-style-type: none"> • OUTPUT FREQUENCY : 200-3000Hz • OUTPUT VOLTAGE : 0-300mV <p>(6) AC MILLIVOLTMETER</p> <ul style="list-style-type: none"> • MEASURING RANGE : 0.001-3V <p>(7) RF VOLTMETER</p> <ul style="list-style-type: none"> • FREQUENCY RANGE : 0.1-180MHz • MEASURING RANGE : 0.001-10V <p>(8) OSCILLOSCOPE</p> <ul style="list-style-type: none"> • FREQUENCY RANGE : DC-50MHz • MEASURING RANGE : 0.01-10V <p>(9) FREQUENCY COUNTER</p> <ul style="list-style-type: none"> • FREQUENCY RANGE : 0.1-180MHz • ACCURACY : BETTER THAN ±1PPM • SENSITIVITY : 100mV OR BETTER <p>(10) MISMATCH TERMINATIONS</p> <ul style="list-style-type: none"> • SWR : 3:1, 2:1 	

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	

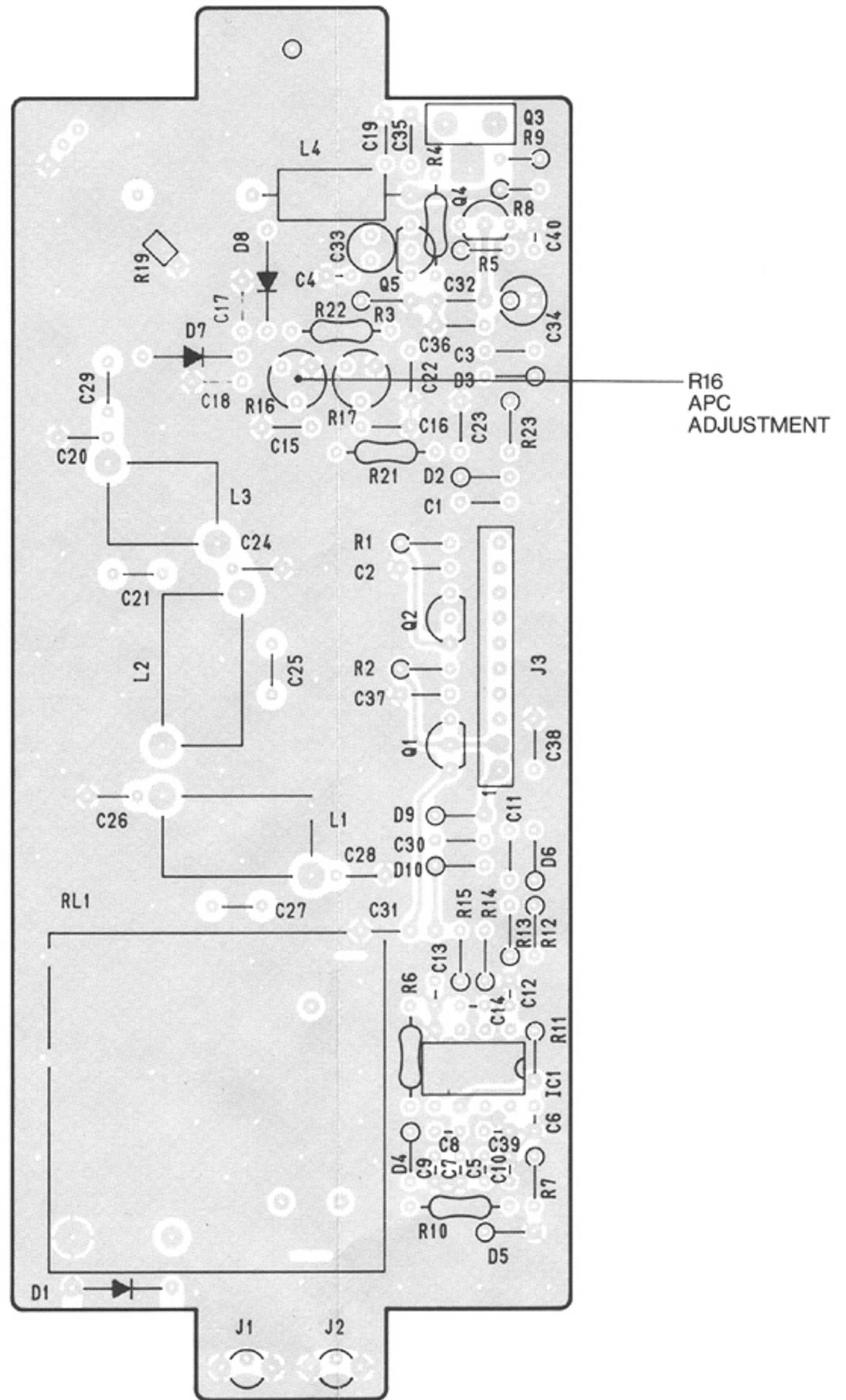
ADJUSTMENT		ADJUSTMENT CONDITIONS	UNIT	MEASUREMENT LOCATION	VALUE	UNIT	ADJUST		
OUTPUT POWER a)IC-271A/E	1	<ul style="list-style-type: none"> ● Display freq.: 145.0000MHz (U.S.A./Aust.: 146.0000MHz) ● Mode:FM ● Transmit ● Short R162 and R163 on the MAIN unit.(PAV,HV lines) 	REAR PANEL	Connect a power meter to the antenna connector.	Maximum output. (More than 30W)	MAIN RF-YGR	L5,L6 L1,C20		
	2	<ul style="list-style-type: none"> ● RF POWER CONTROL: max. clockwise ● Remove short installed in step 1. 					28W	MAIN	R168
	3	<ul style="list-style-type: none"> ● RF POWER CONTROL: max. counterclockwise 					1W		R166
NOTE:Repeat steps 2 and 3 several times.									
b)IC-271H	1	<ul style="list-style-type: none"> ● 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	<ul style="list-style-type: none"> ● Mode:CW 					Same power as step 1.	MAIN	R63
	3	<ul style="list-style-type: none"> ● Remove the short installed in step 1. 					100W with total current less than 16A		R168
	4	<ul style="list-style-type: none"> ● RF POWER CONTROL: max. counterclockwise 					10W		R166
NOTE:Repeat steps 3 and 4 several times.									
RF METER	1	<ul style="list-style-type: none"> ● 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	<ul style="list-style-type: none"> ● 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	<ul style="list-style-type: none"> ● Increase input level to 20mV. 			More than 95W.		Verify		
CARRIER BALANCE	1	<ul style="list-style-type: none"> ● Display freq:145.0000MHz 	REAR PANEL	Connect an RF voltmeter to the antenna connector.	Minimum output voltage.	MAIN	R72,R75		
FM DEVIATION	1	<ul style="list-style-type: none"> ● 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	<ul style="list-style-type: none"> ● Increase AF input by 20dB.(1kHz/20mV) 	REAR PANEL	Connect a deviation meter to the antenna connector.	±4.8kHz		R29		
	3	<ul style="list-style-type: none"> ● Decrease AF input by 20dB.(1kHz/2mV) 			±3.4kHz		Verify		
SUBAUDIBLE TONE	1	<ul style="list-style-type: none"> ● 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 <ul style="list-style-type: none"> ● Mode:FM ● TONE SWITCH:ON ● Mic input:none ● Transmit 	REAR PANEL	Connect a deviation meter to the antenna connector using an attenuator.	$\pm 3.5\text{kHz}$ deviation	TONE	R4	
APC (IC-271H)	1 <ul style="list-style-type: none"> ● 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 <ul style="list-style-type: none"> ● Connect a 3:1 mismatching termination to the antenna connector. ● Transmit 	FRONT PANEL	Receive LED.	Turn counterclockwise 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 <ul style="list-style-type: none"> ● Connect a 2:1 mismatching termination to the antenna connector. ● Transmit 	FRONT PANEL	Receive LED.	Protector circuit should not activate.			
	4 <ul style="list-style-type: none"> ● 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 <ul style="list-style-type: none"> ● 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 <ul style="list-style-type: none"> ● 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 <ul style="list-style-type: none"> ● 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.							

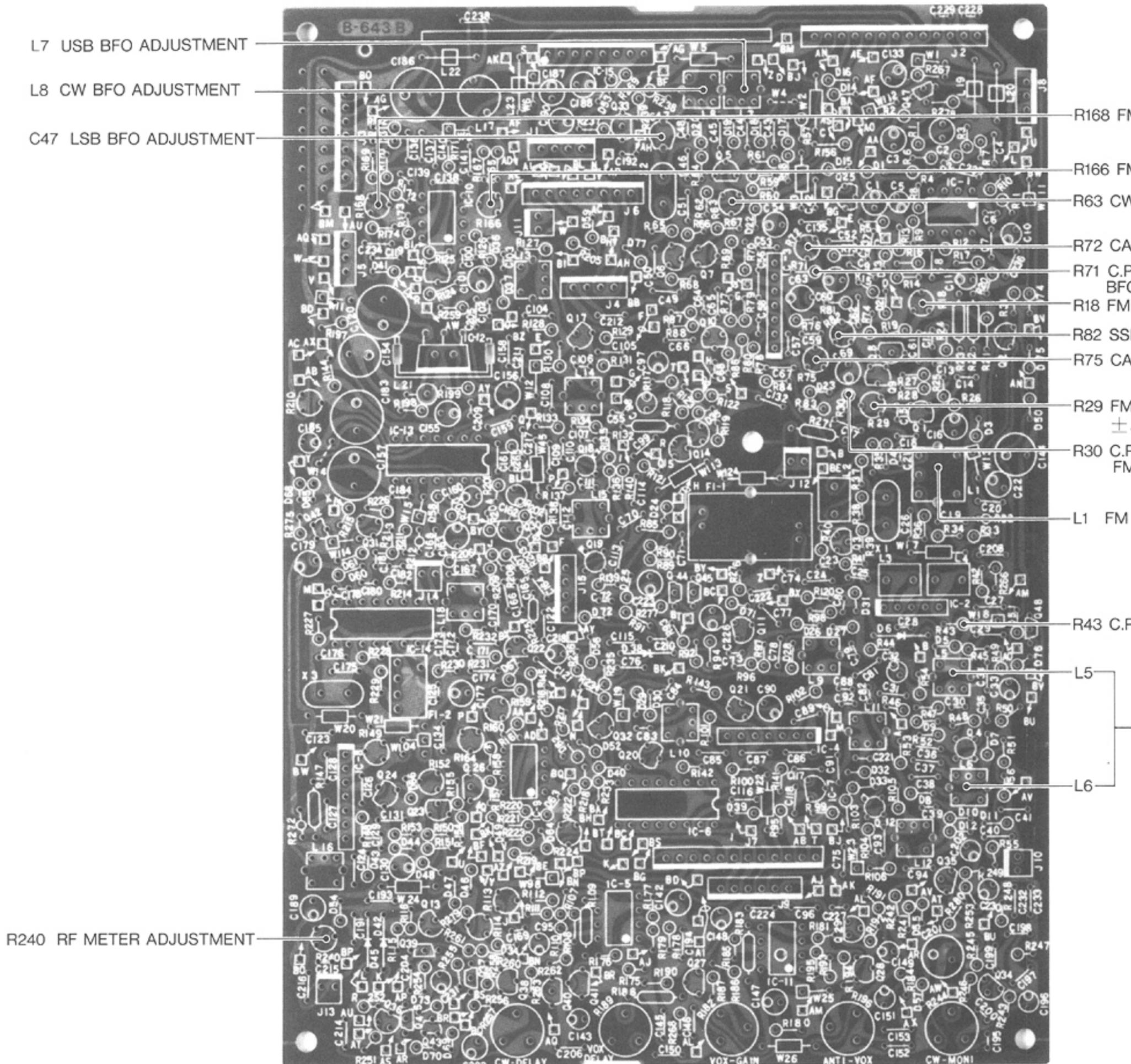
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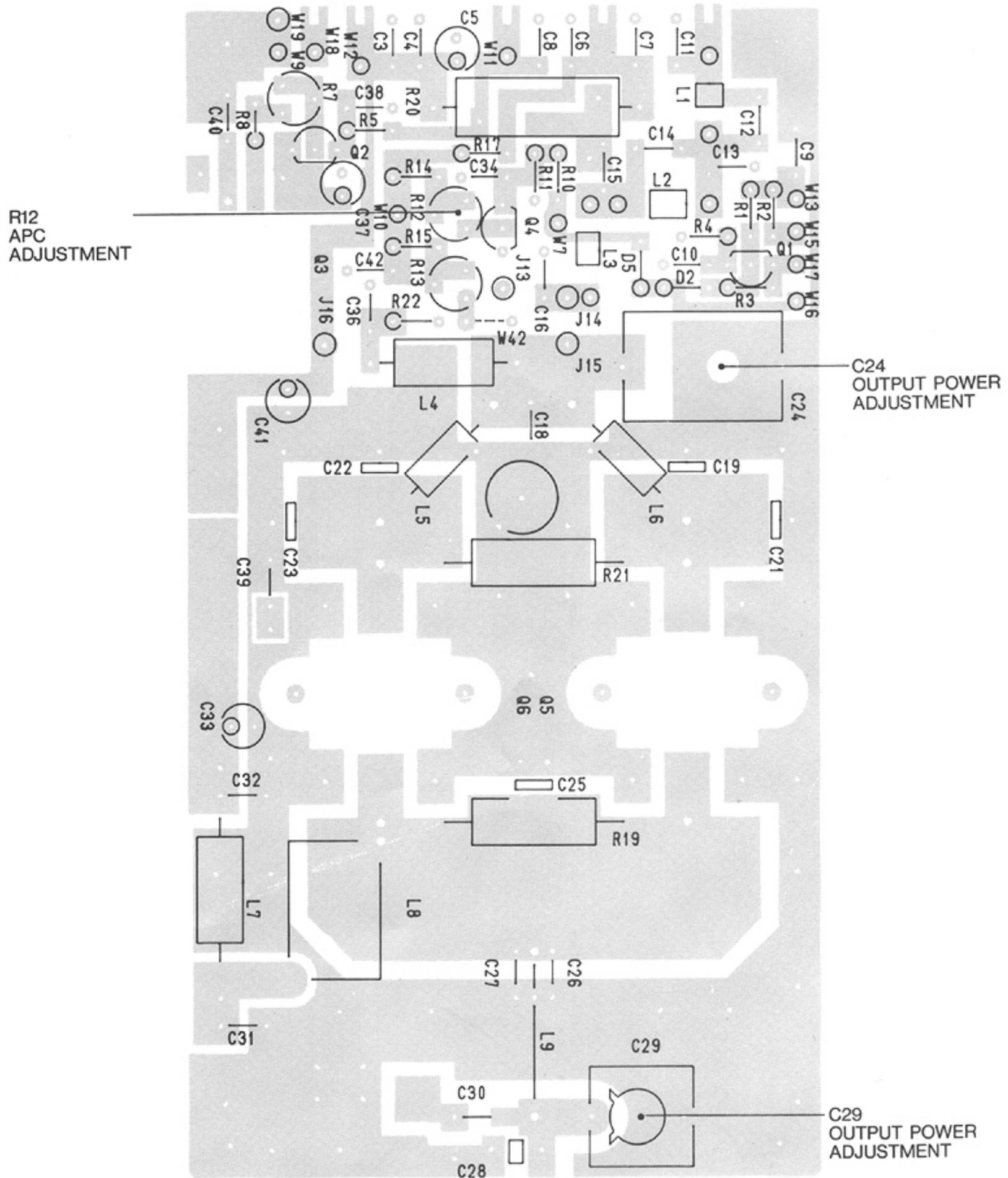
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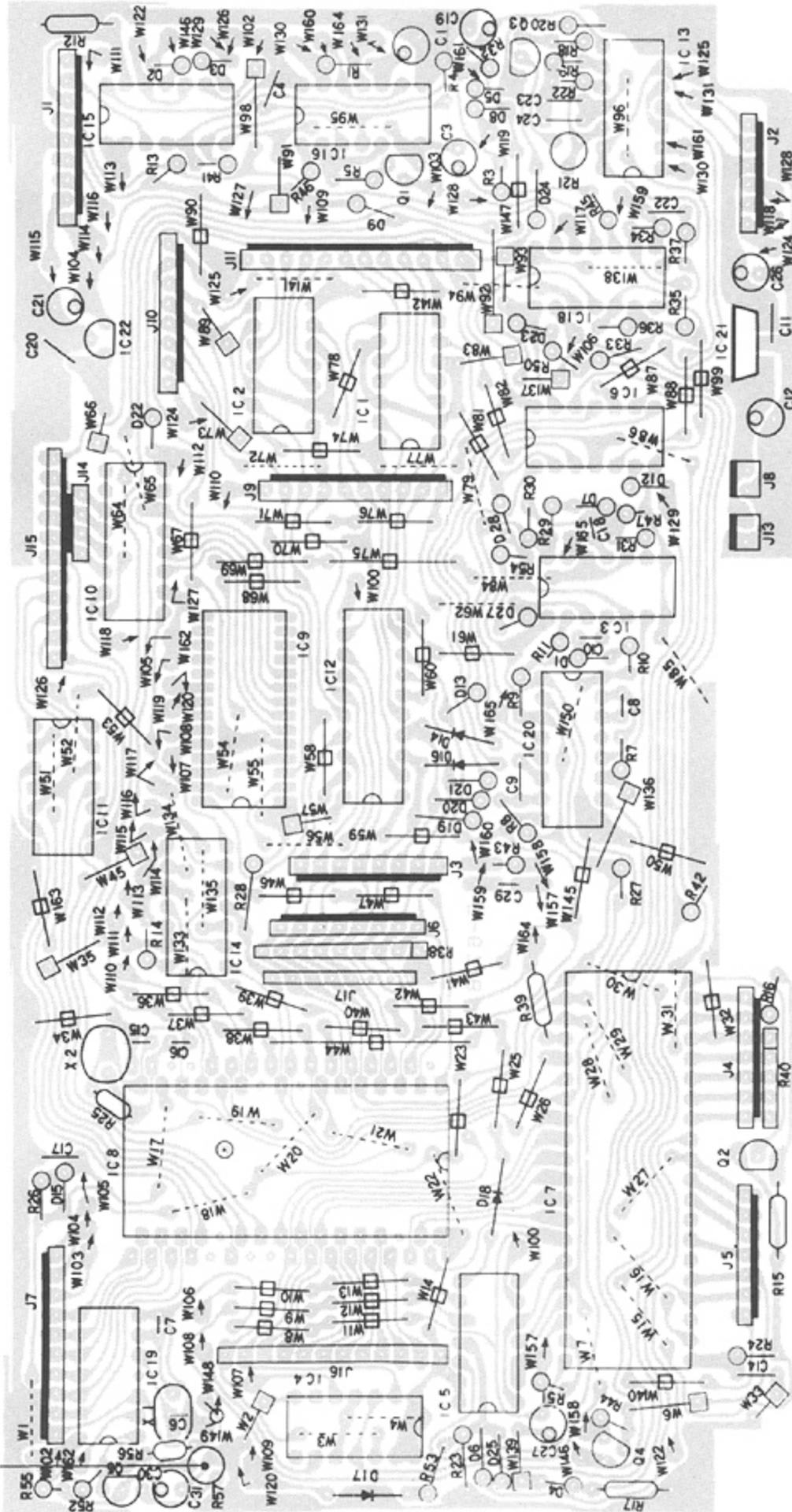
MAIN UNIT



PA UNIT(IC-271H)



LOGIC UNIT



R57
SUBAUDIBLE TONE LEVEL
ADJUSTMENT

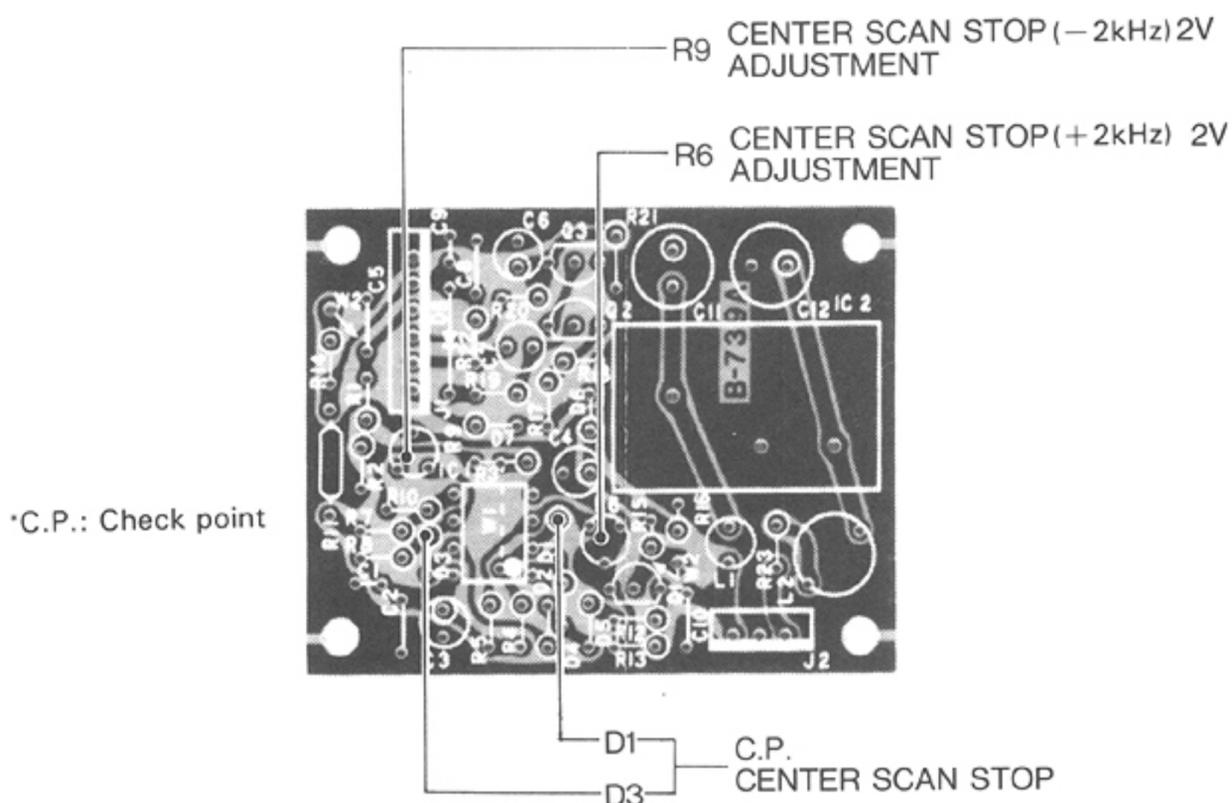
7-4 RECEIVER ADJUSTMENT

INSTRUMENTS REQUIRED	CONNECTIONS
<p>(1) VOLTAGE REGULATED POWER SUPPLY</p> <ul style="list-style-type: none"> • OUTPUT VOLTAGE : DC 13.8V • CURRENT CAPACITY : 20A <p>(2) SIGNAL GENERATOR(SSG)</p> <ul style="list-style-type: none"> • FREQUENCY RANGE : 0.1 – 180MHz • OUTPUT VOLTAGE : –20 TO +90dB(0dB = 1μV) <p>(3) AC MILLIVOLTMETER</p> <ul style="list-style-type: none"> • MEASURING RANGE : 0.001 – 3V <p>(4) EXTERNAL SPEAKER</p> <ul style="list-style-type: none"> • IMPEDANCE : 8 OHMS <p>(5) OSCILLOSCOPE</p> <ul style="list-style-type: none"> • FREQUENCY RANGE : DC – 50MHz • MEASURING RANGE : 0.01 – 10V <p>(6) MULTIMETER</p> <ul style="list-style-type: none"> • INPUT IMPEDANCE : 50kOHMS/V OR BETTER 	

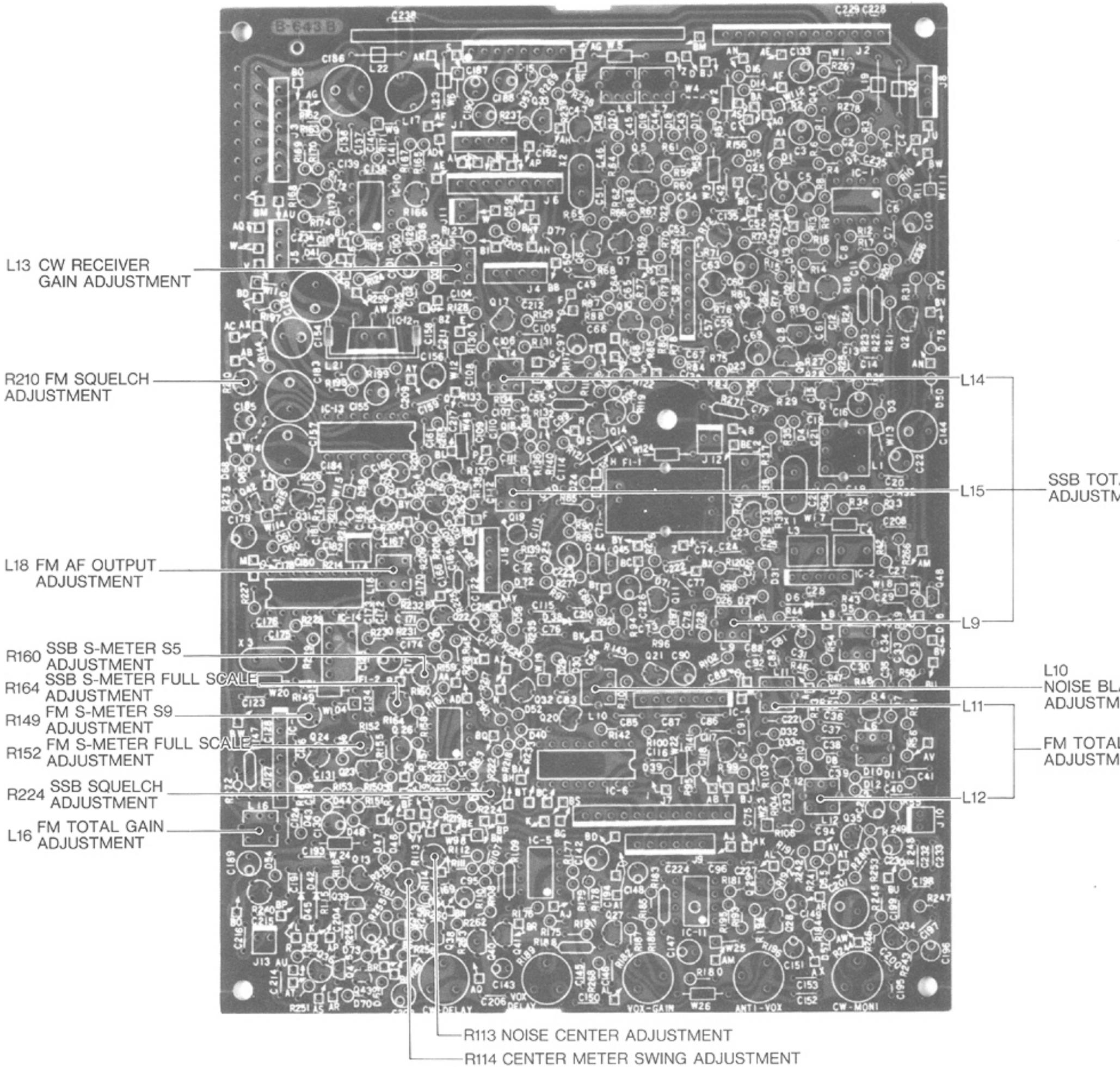
ADJUSTMENT	ADJUSTMENT CONDITIONS	UNIT	MEASUREMENT LOCATION	VALUE	UNIT	ADJUST			
RECEIVER GAIN a)FM	1	<ul style="list-style-type: none"> ● Display freq.: 145.0000MHz ● Mode:FM ● TONE CONTROL: max. clockwise ● RF GAIN CONTROL: max. clockwise ● SQUELCH CONTROL: max. counterclockwise ● RIT:OFF ● AGC:FAST ● NB:OFF ● Apply RF input (145.0000MHz, 10dBμ(–97dBm), ±3.5kHz deviation with 1kHz modulation) 	FRONT PANEL	S-METER	Maximum reading.	RF-YGR	L10,L11, L12,L13		
	2	<ul style="list-style-type: none"> ● Increase RF Level to 0dBμ(–107dBm). 				MAIN	L16		
	3	<ul style="list-style-type: none"> ● Remove the RF input signal. 	REAR PANEL			Connect AF millivoltmeter to the external jack.	Maximum AF output.		L18
	4	<ul style="list-style-type: none"> ● 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	<ul style="list-style-type: none"> ● 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	<ul style="list-style-type: none"> ● 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	<ul style="list-style-type: none"> ● 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(1 μ V)	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 40dB μ , \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 (-10dB μ (-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 b)USB	1	● Mode:FM ● SQUELCH CONTROL: 9 o'clock	FRONT PANEL	RECEIVE INDICATOR	RECEIVE INDICATOR not lit.	MAIN	R210
	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

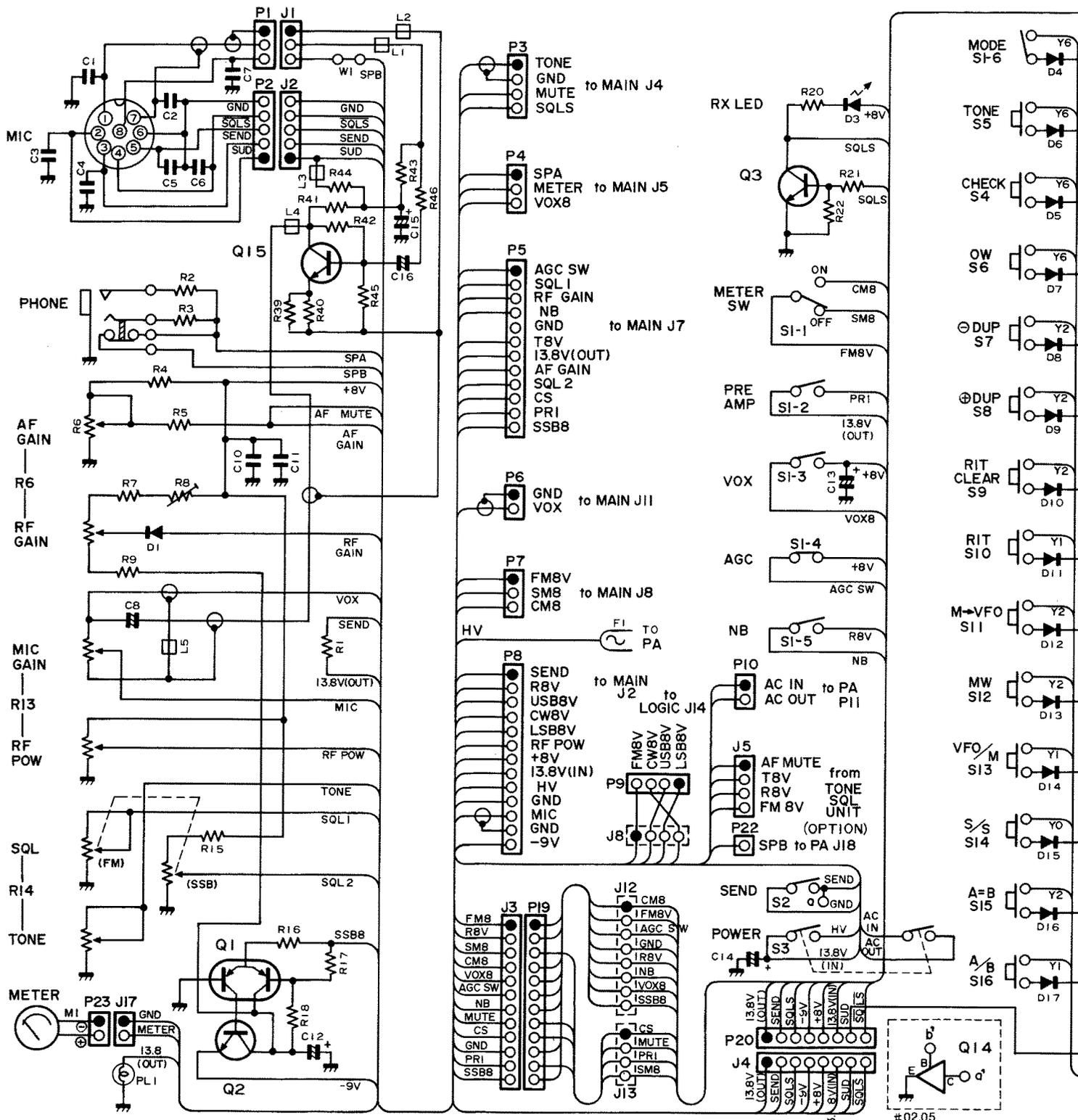


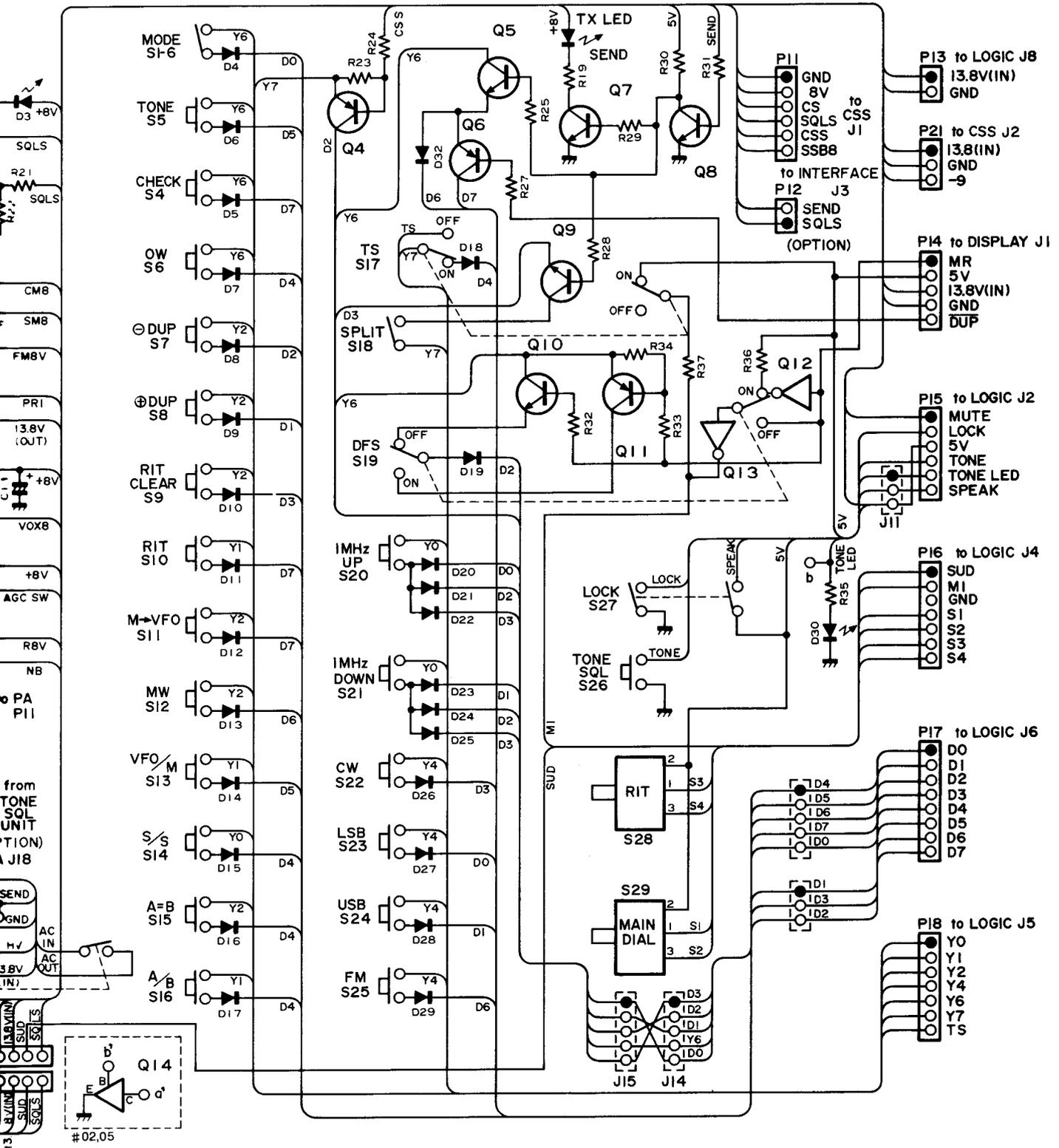
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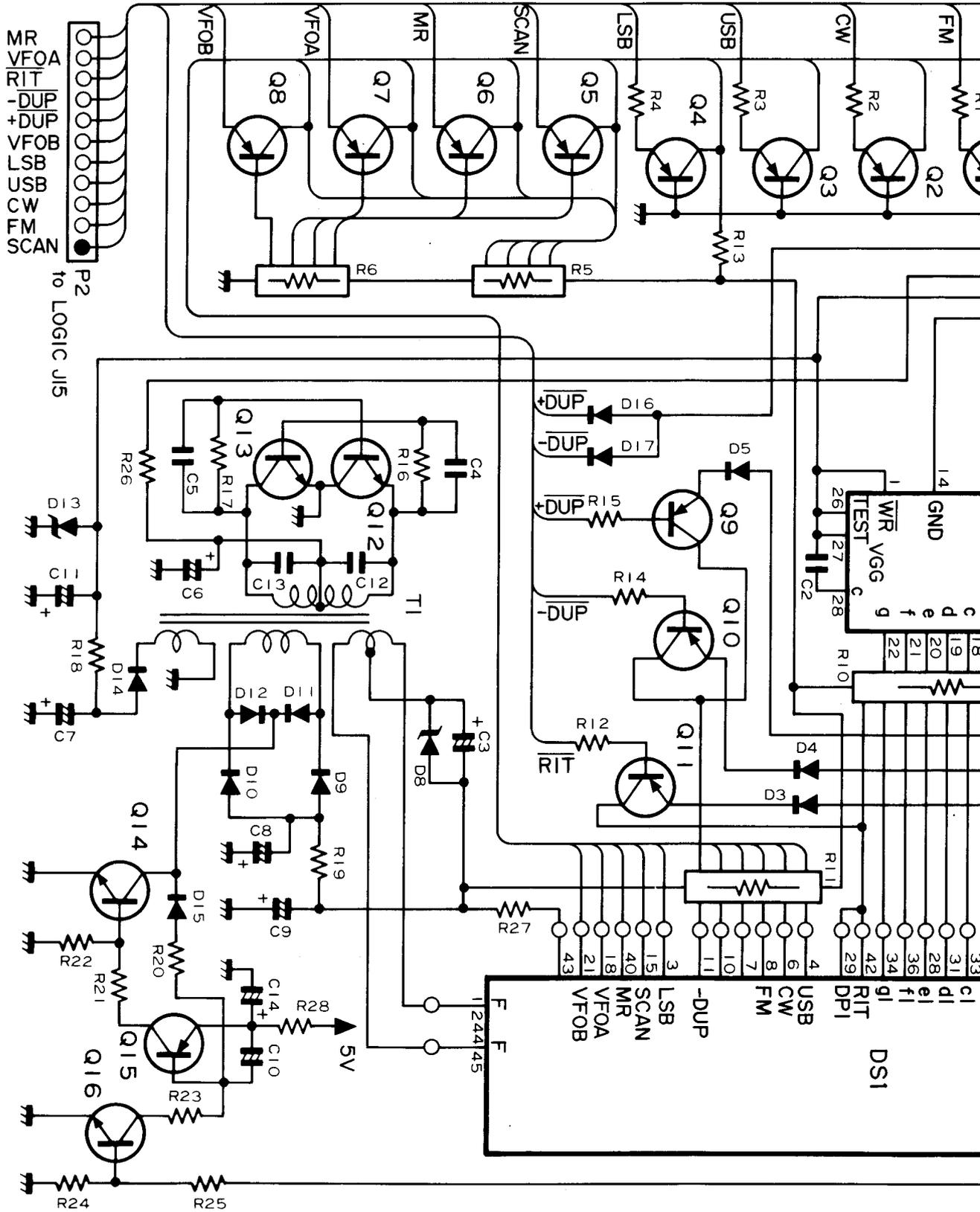
SECTION 8 CIRCUIT DIAGRAMS/VOLTAGE CHARTS

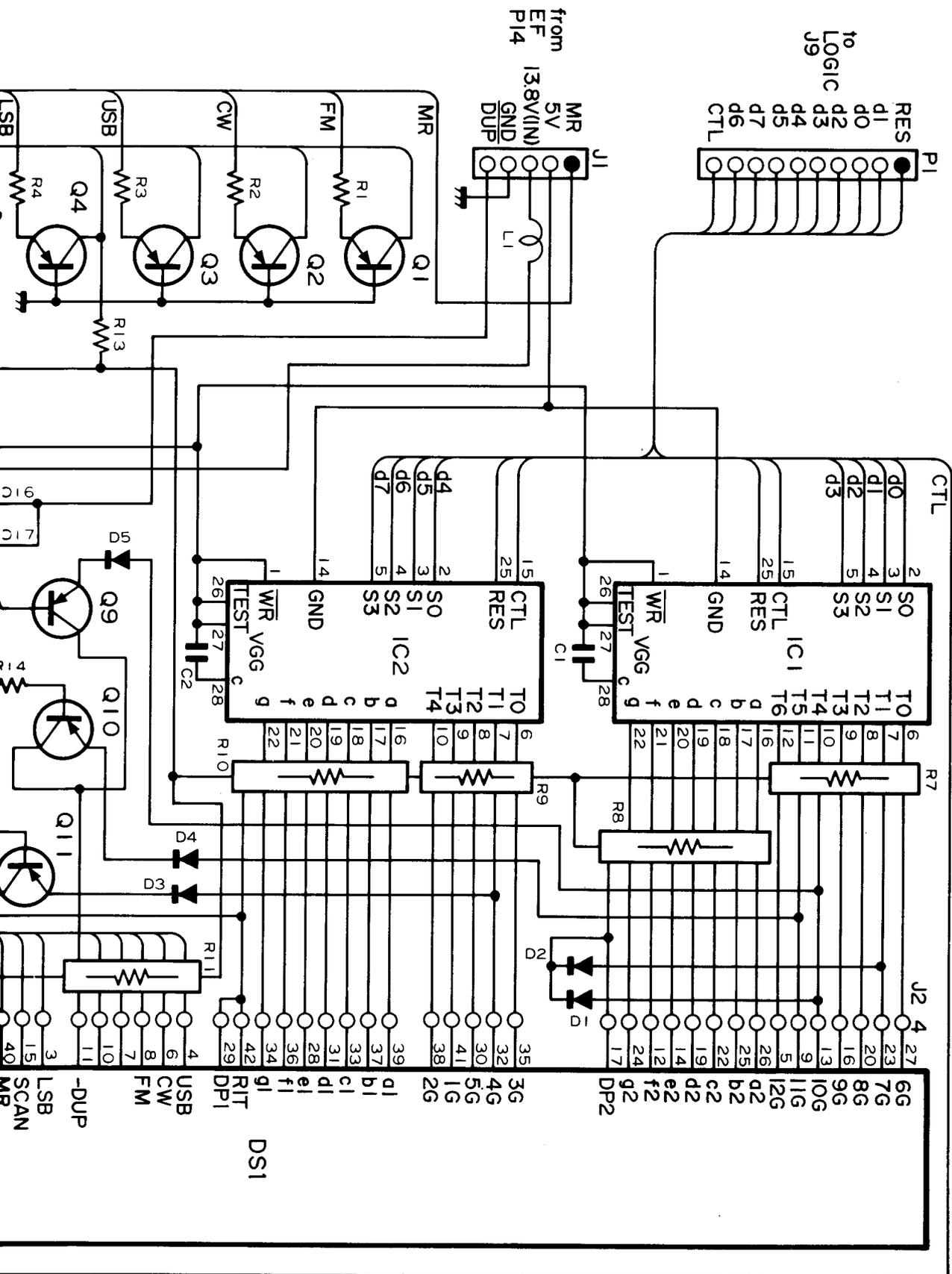
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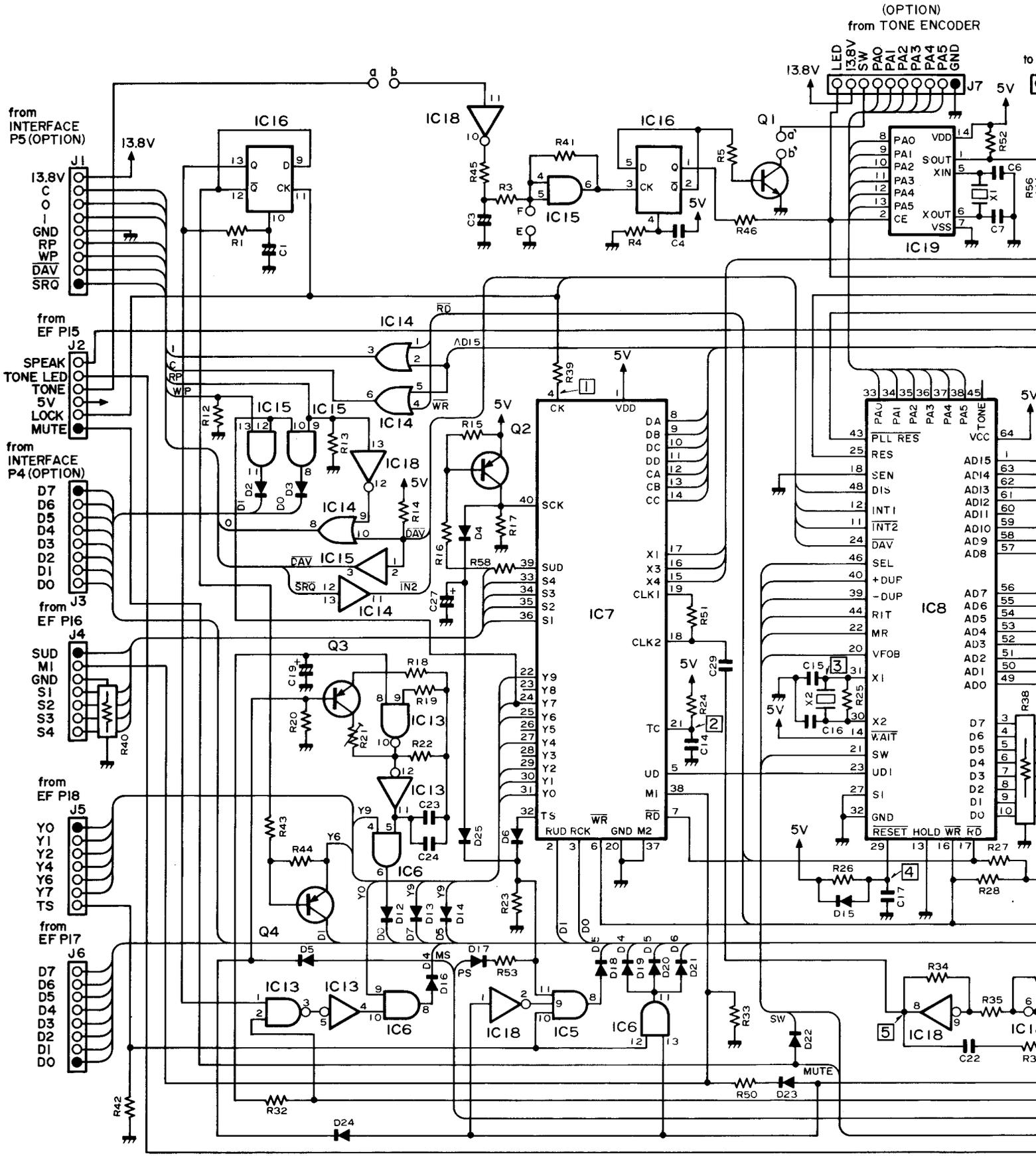


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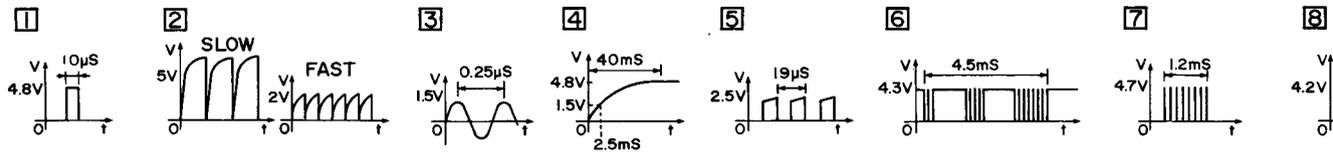




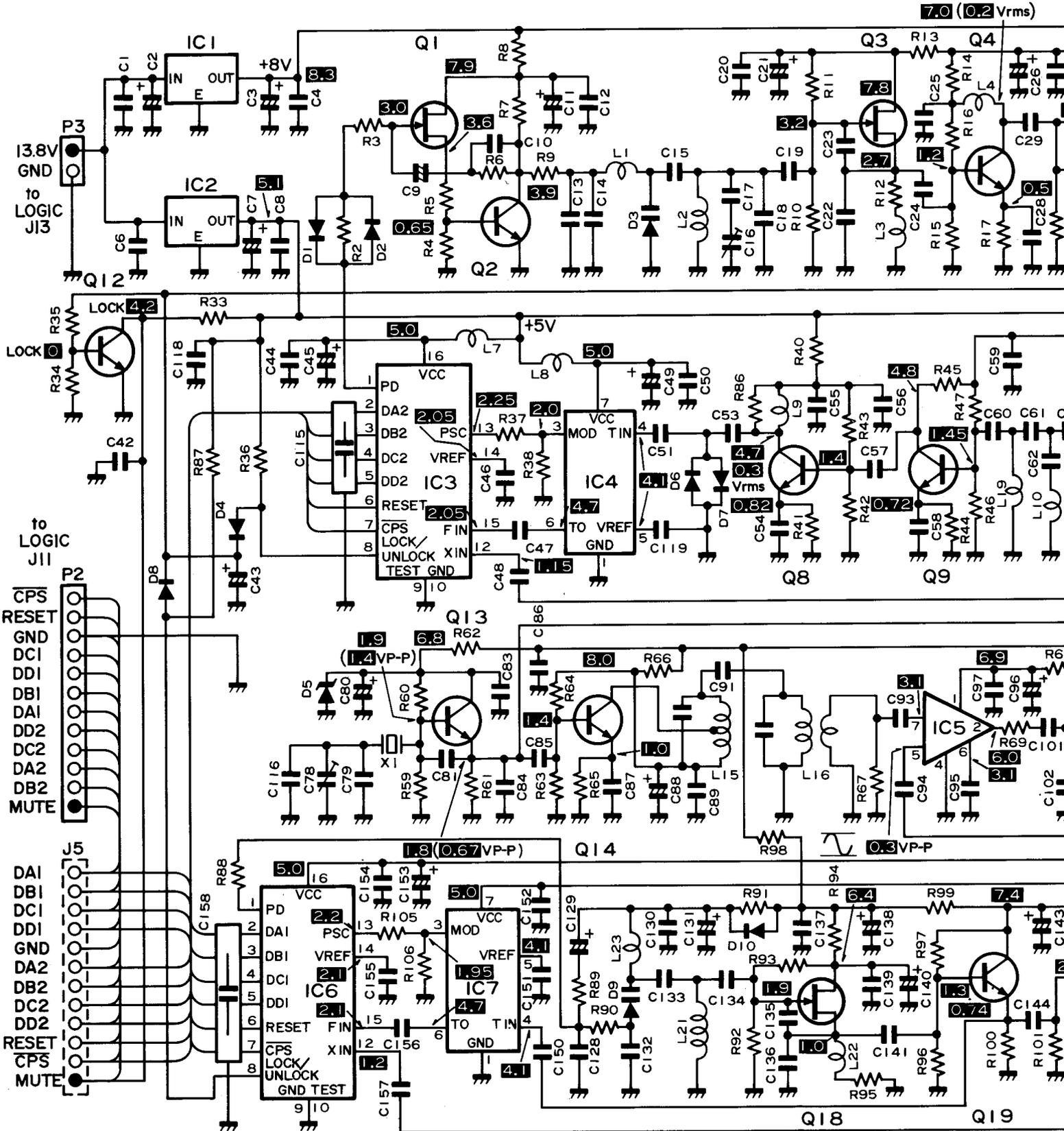
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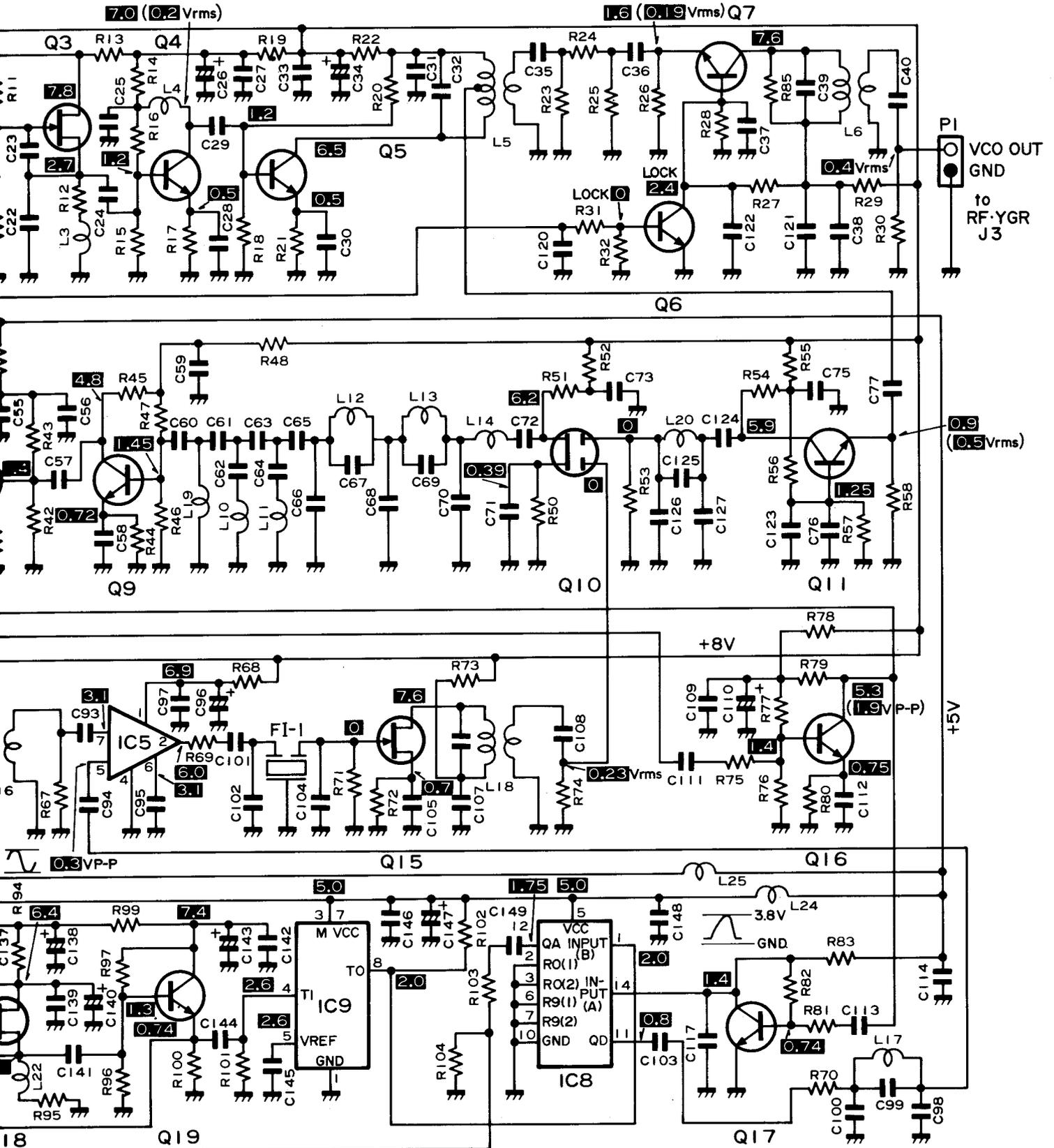


(OPTION)
from TONE ENCODER

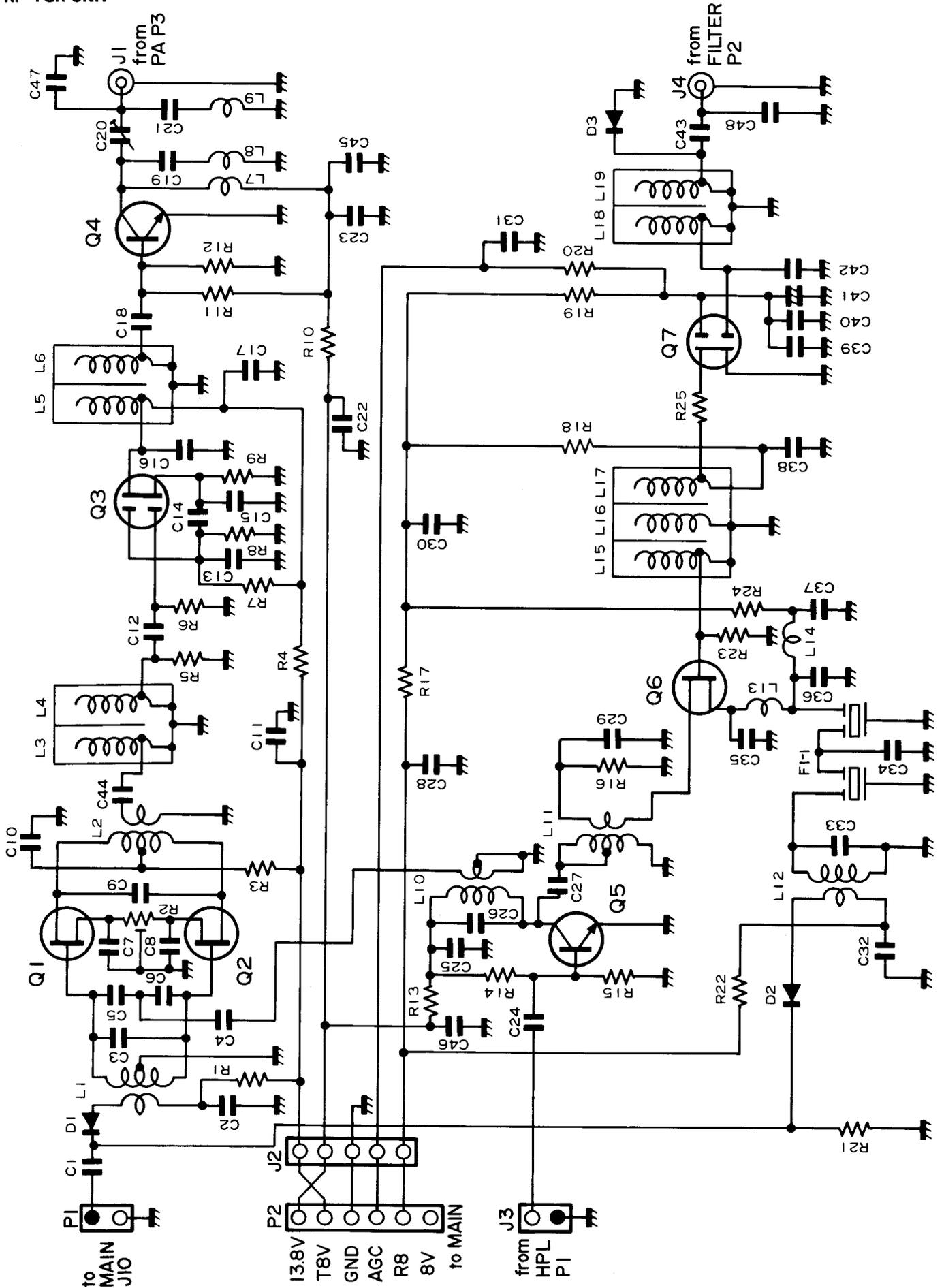


HPL UNIT

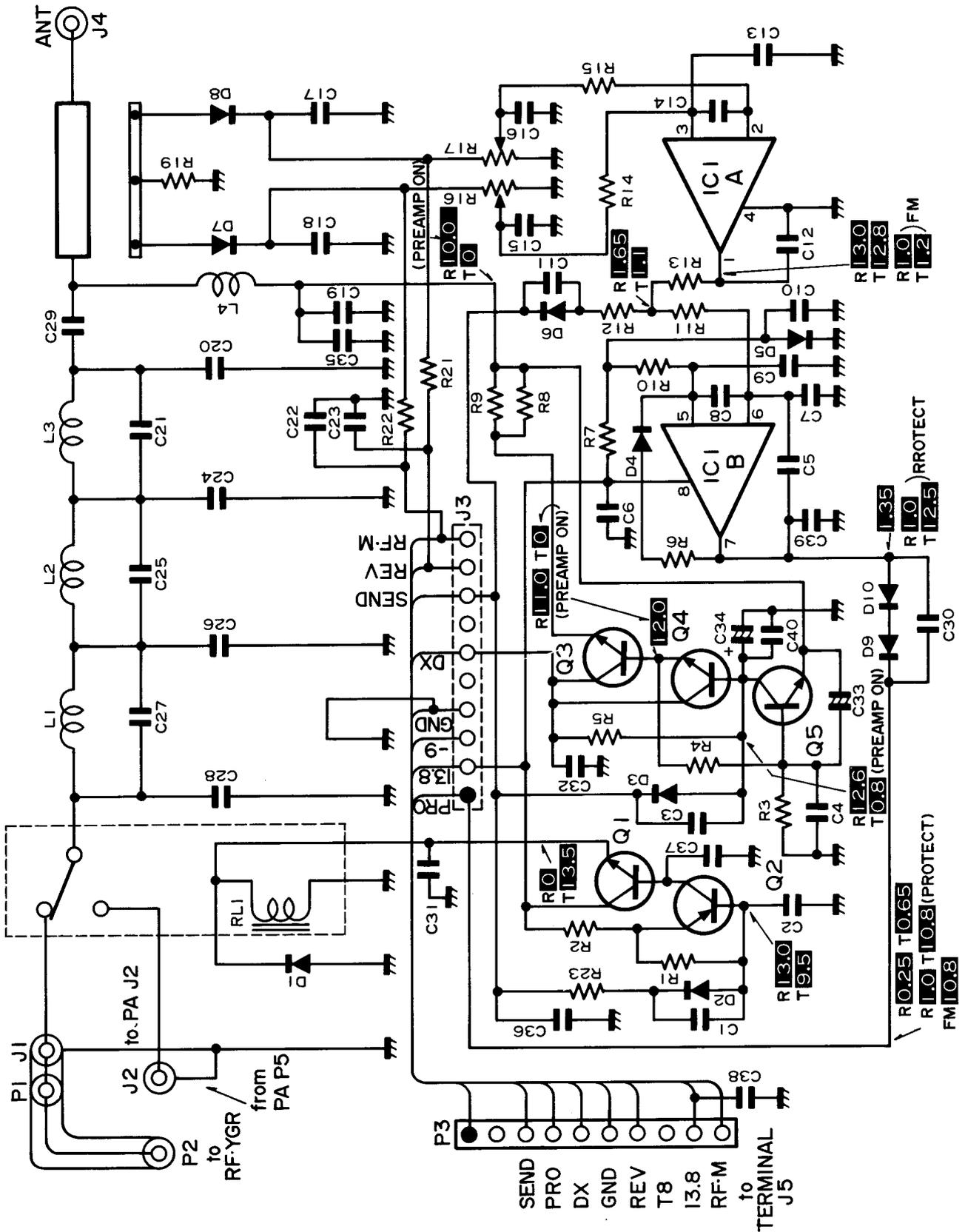




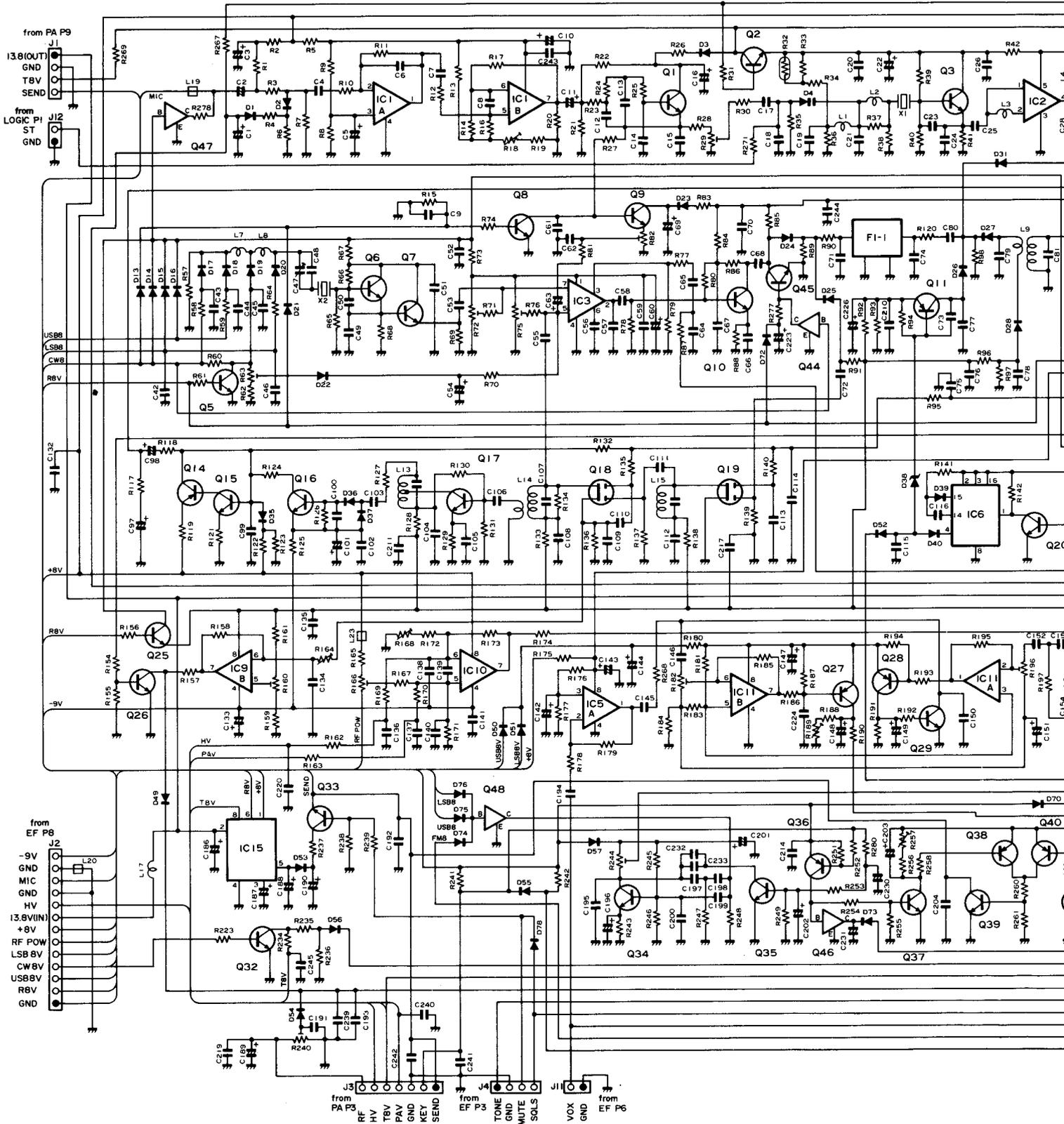
RF-YGR UNIT

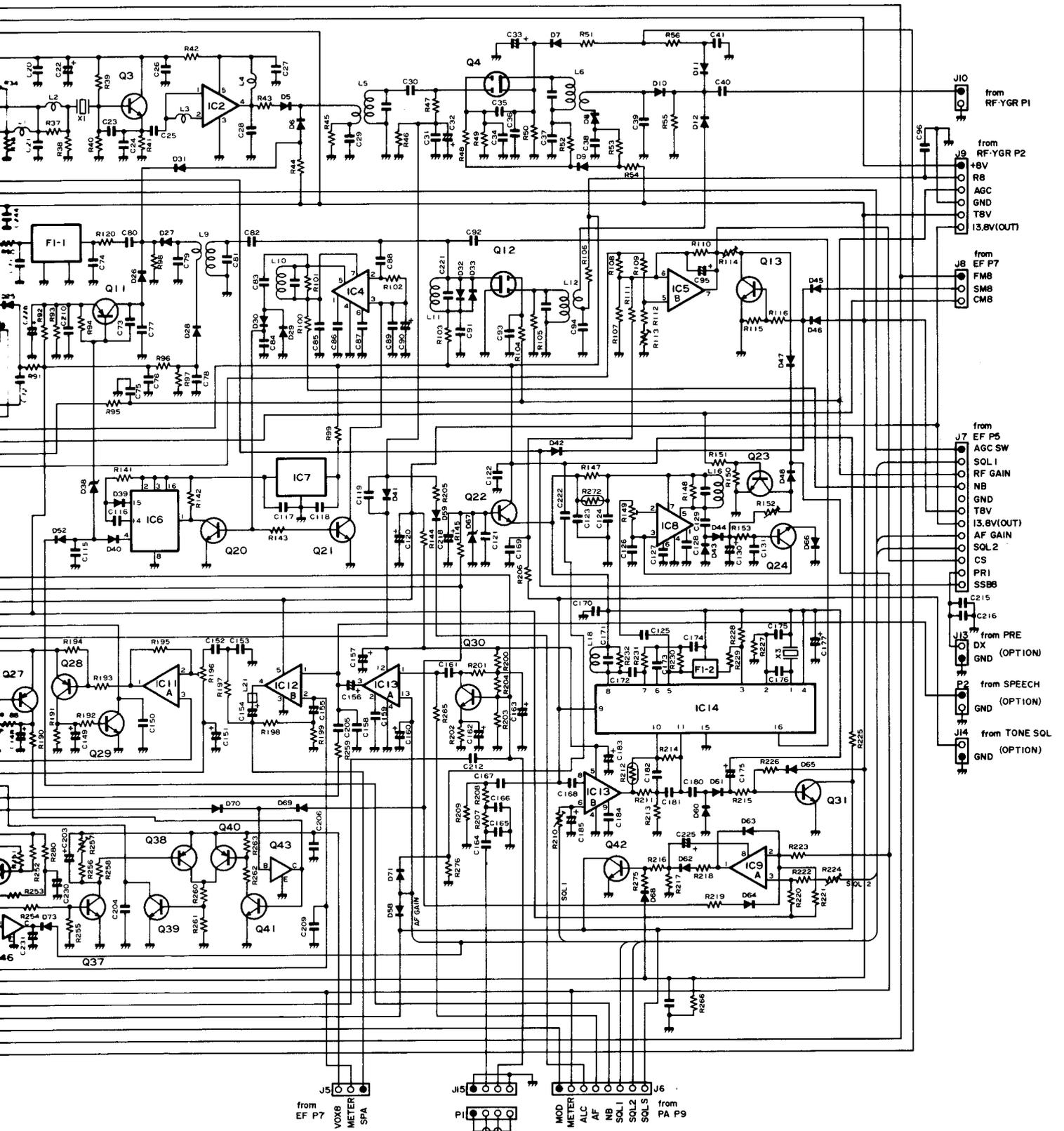


FILTER UNIT(IC-271H)

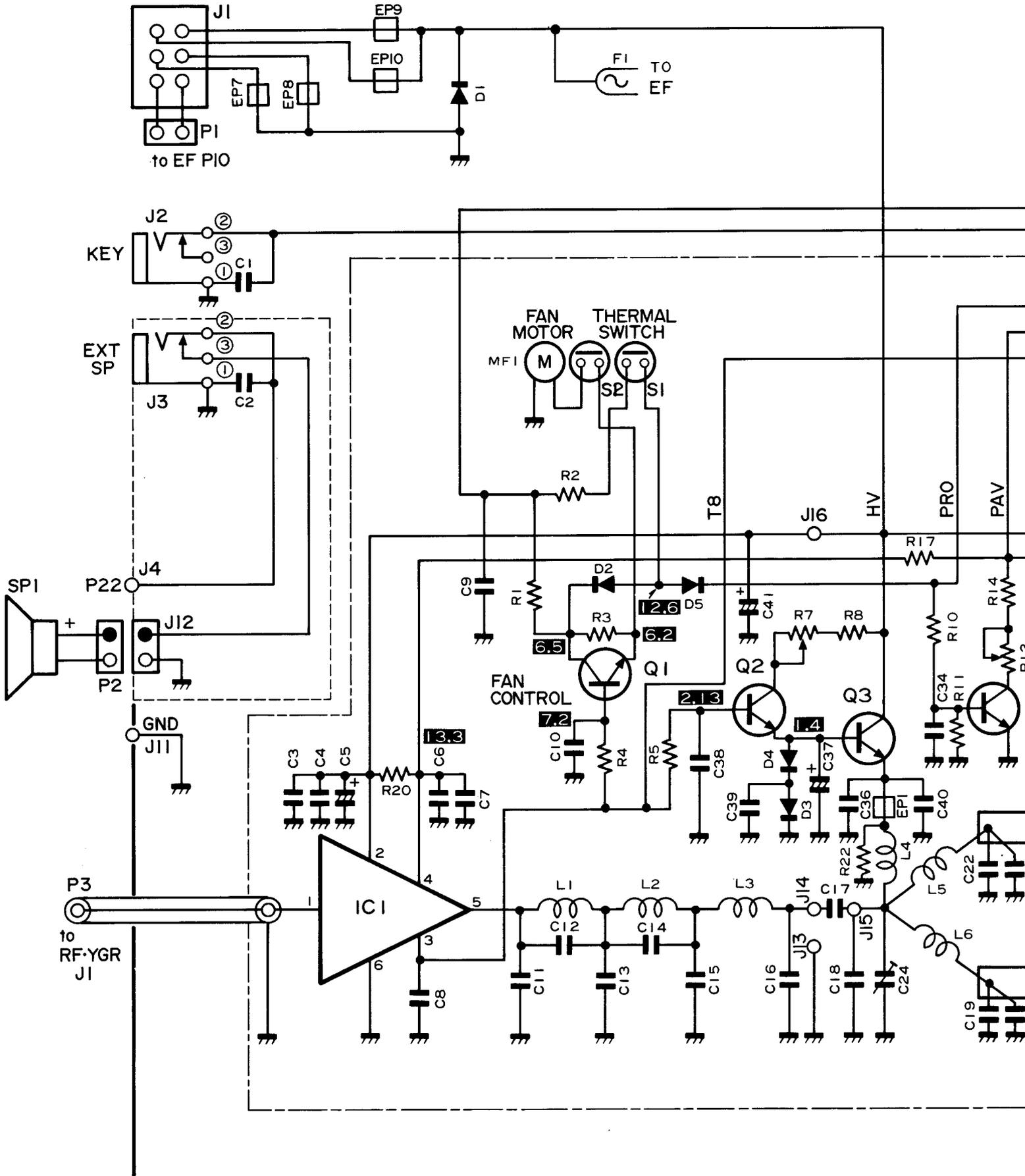


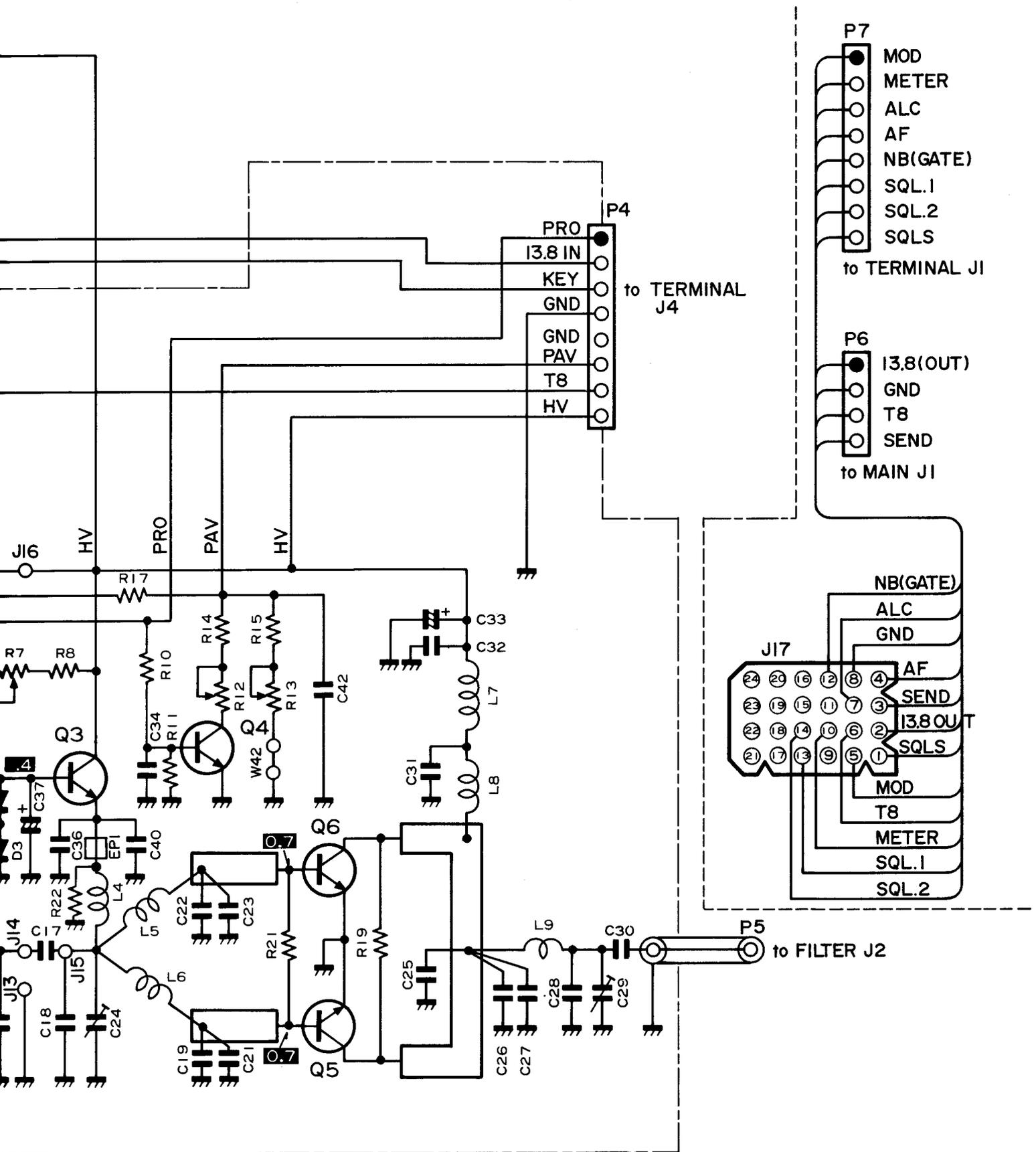
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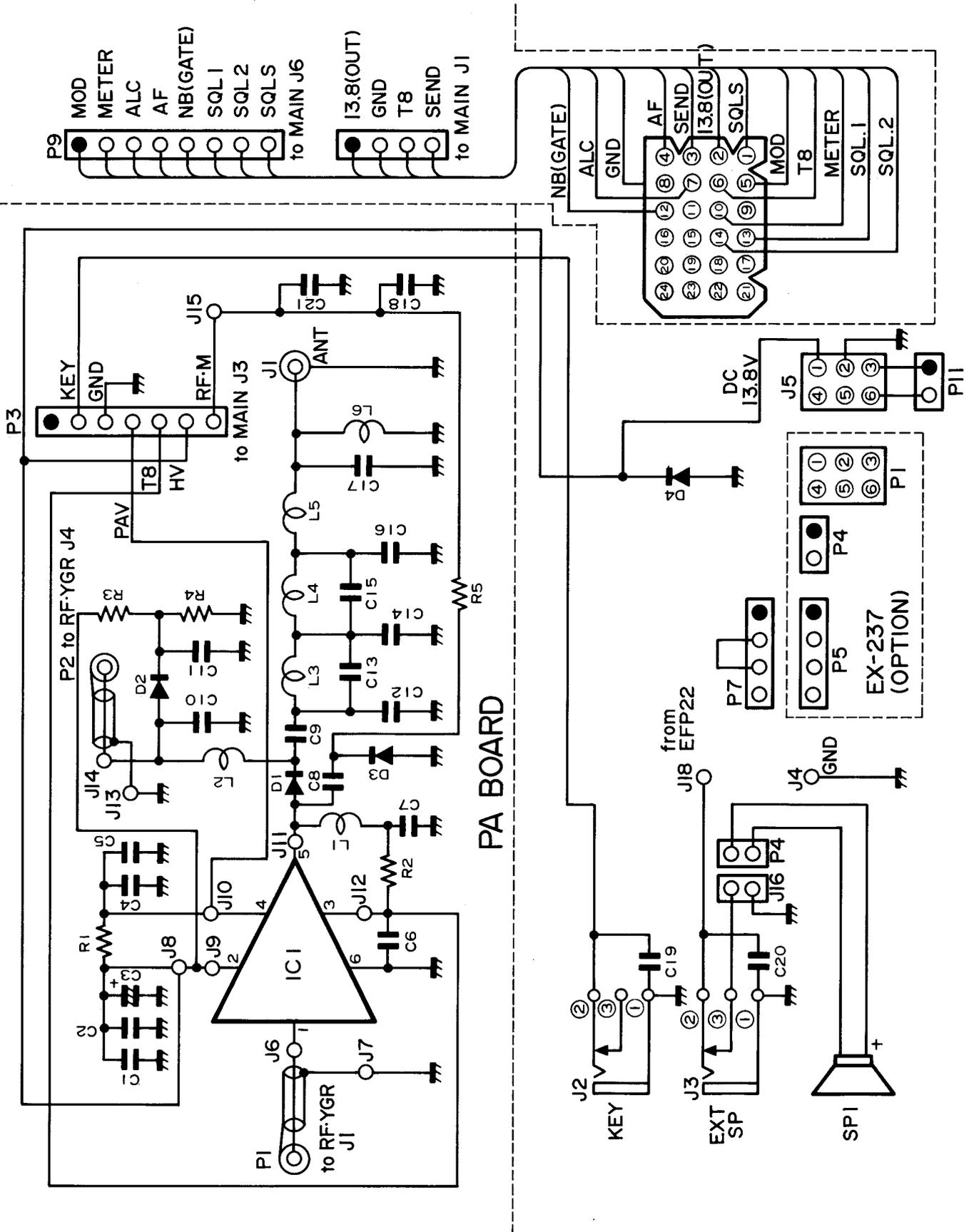


PA UNIT(IC-271H)

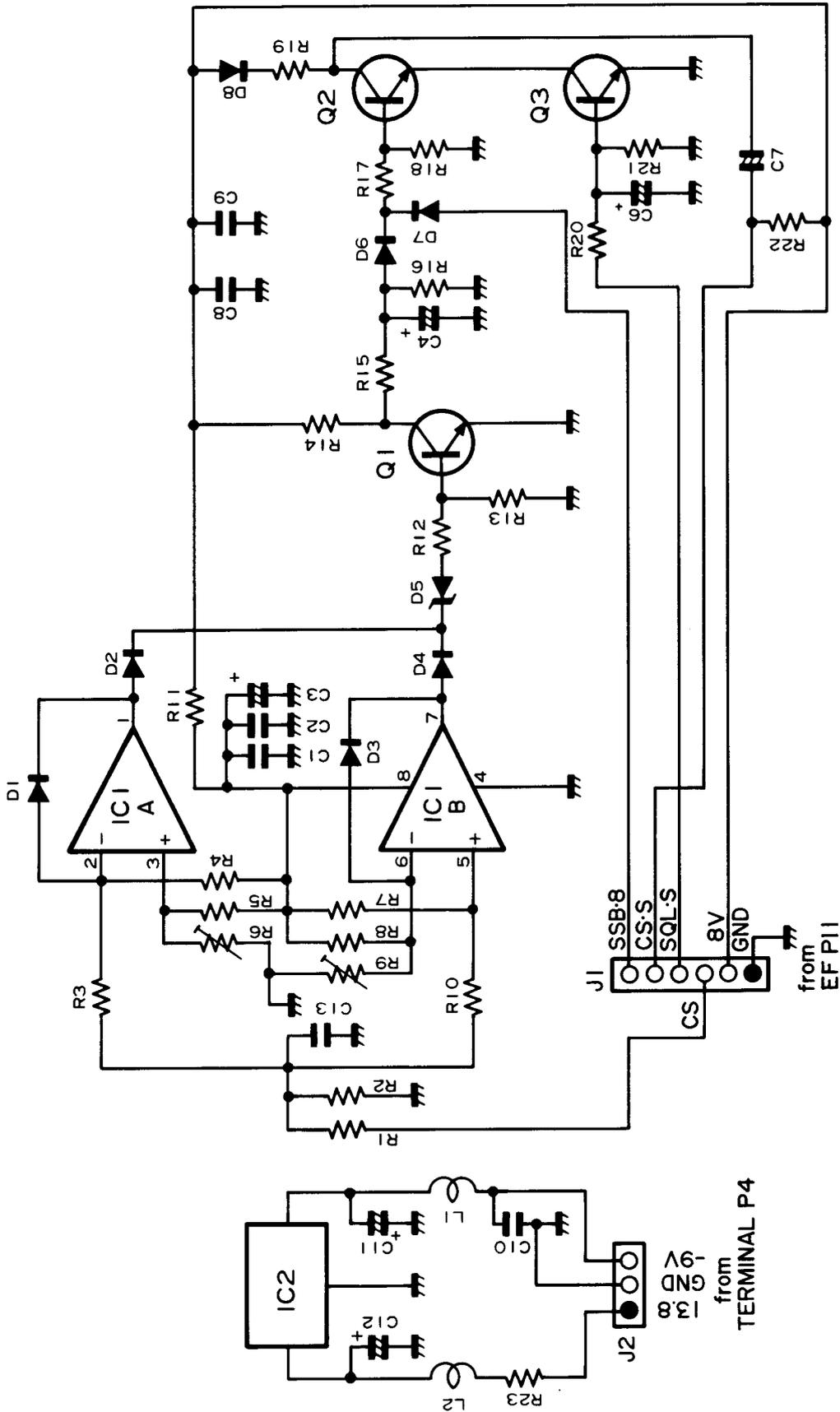




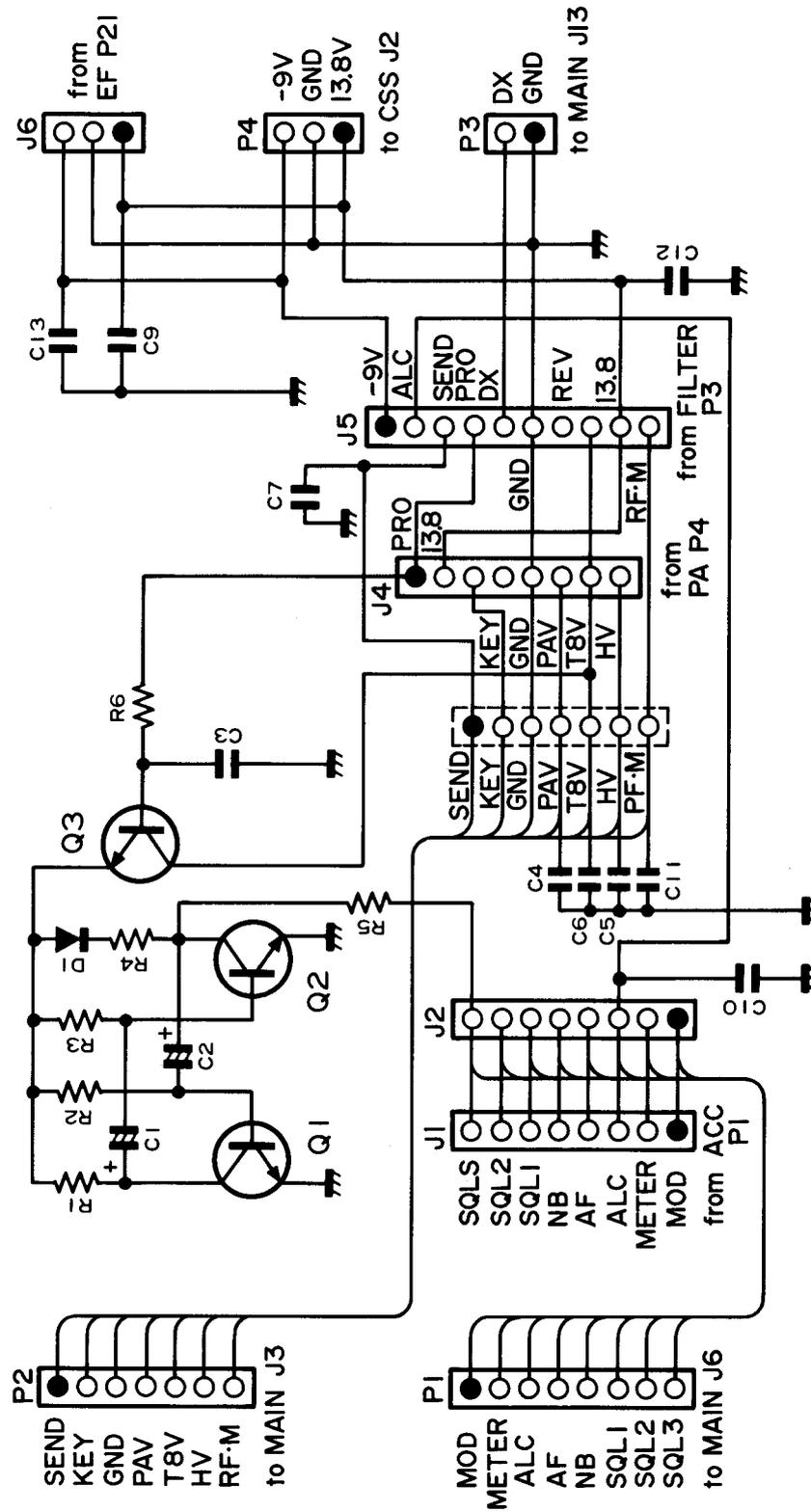
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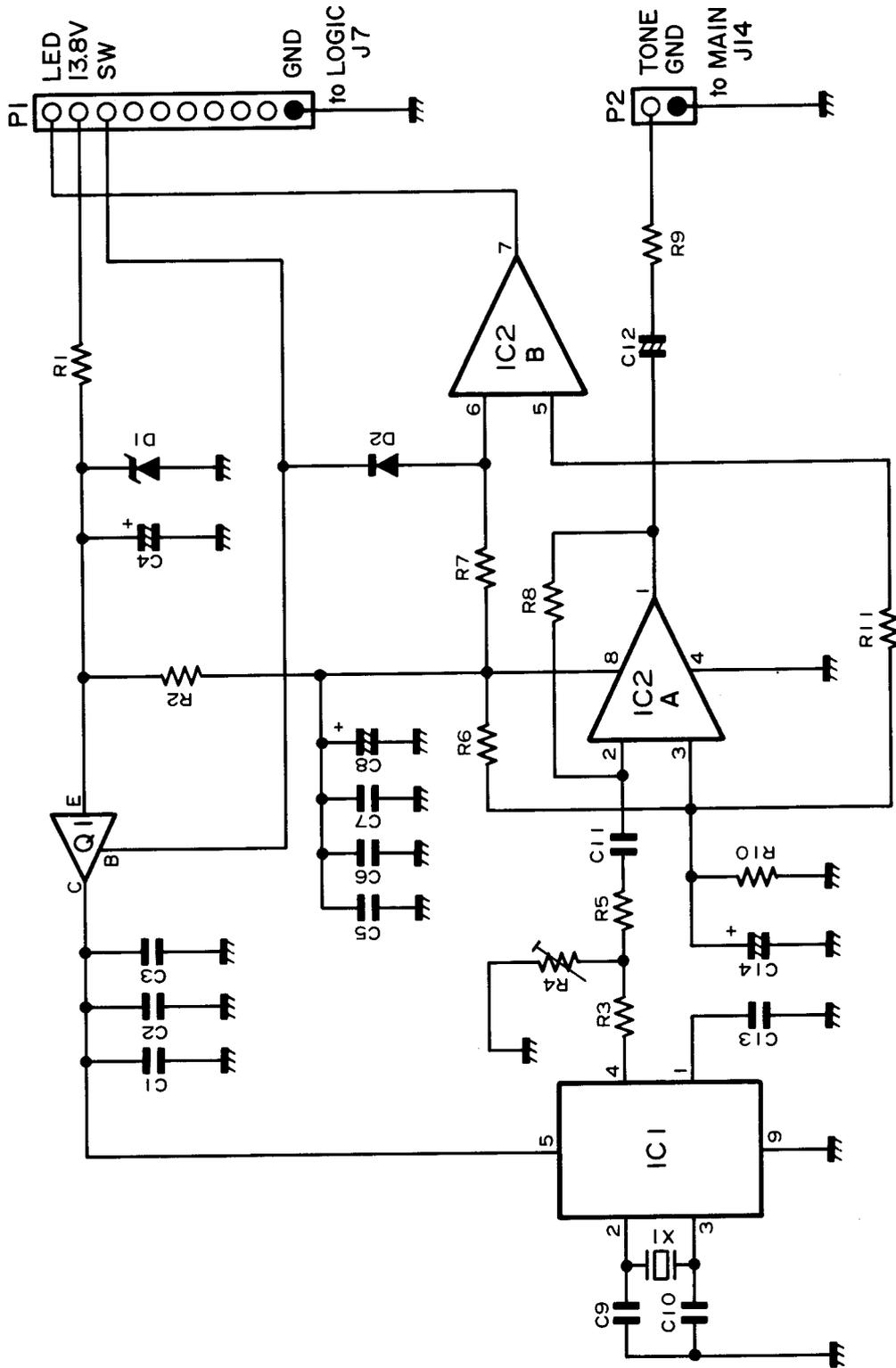
CSS UNIT



TERMINAL UNIT (IC-271H)



TONE UNIT(#02.05)



TRANSISTOR VOLTAGE CHART

DC Voltage by 50KΩ-V multimeter

UNIT	NO.	TRANSMIT				RECEIVE				REMARK
		BASE or GATE1	GATE2	COLLEC- TOR or DRAIN	EMITTER or SOURCE	BASE or GATE1	GATE2	COLLEC- TOR or DRAIN	EMITTER OR SOURCE	
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

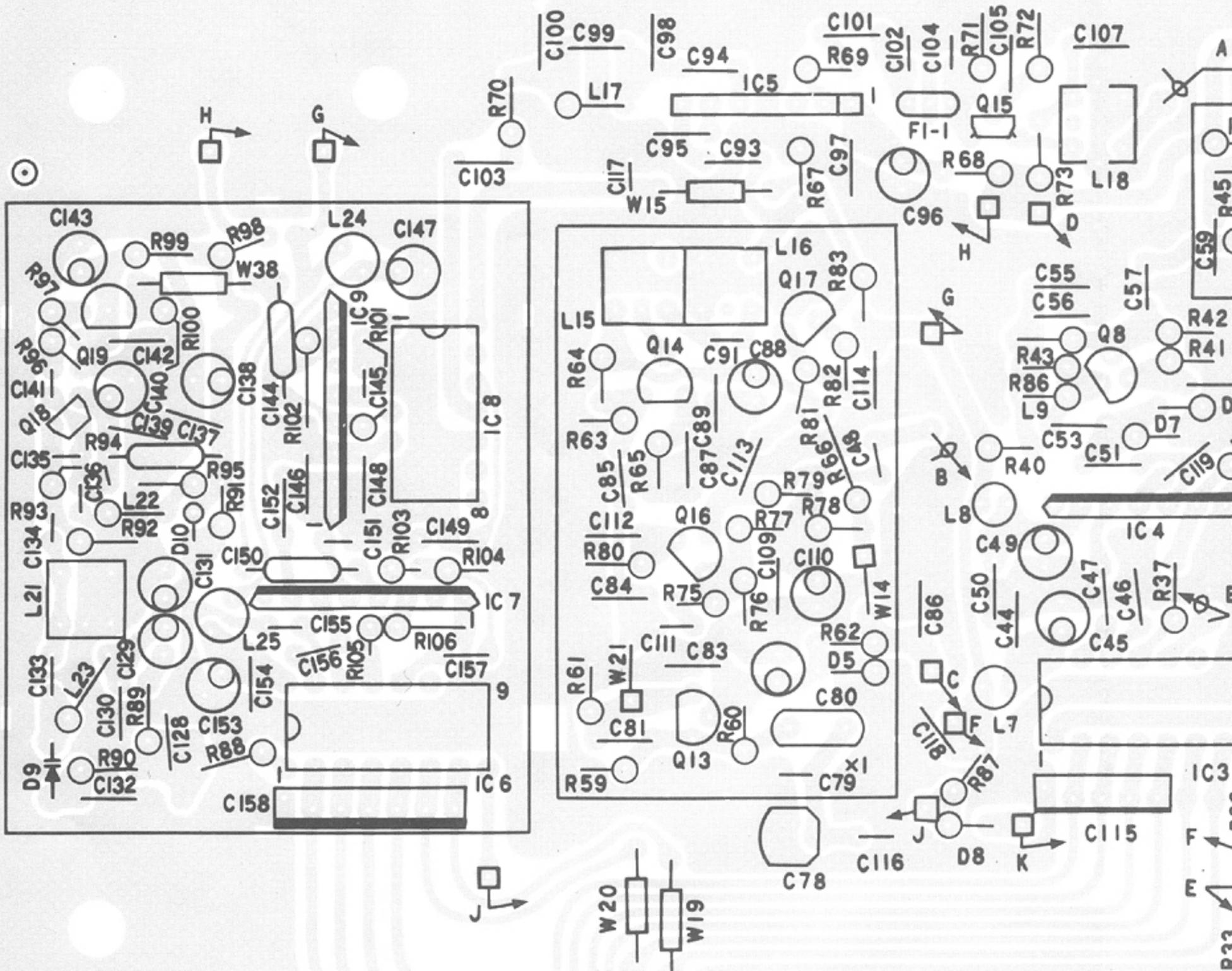
DC Voltage by 50KΩ-V multimeter

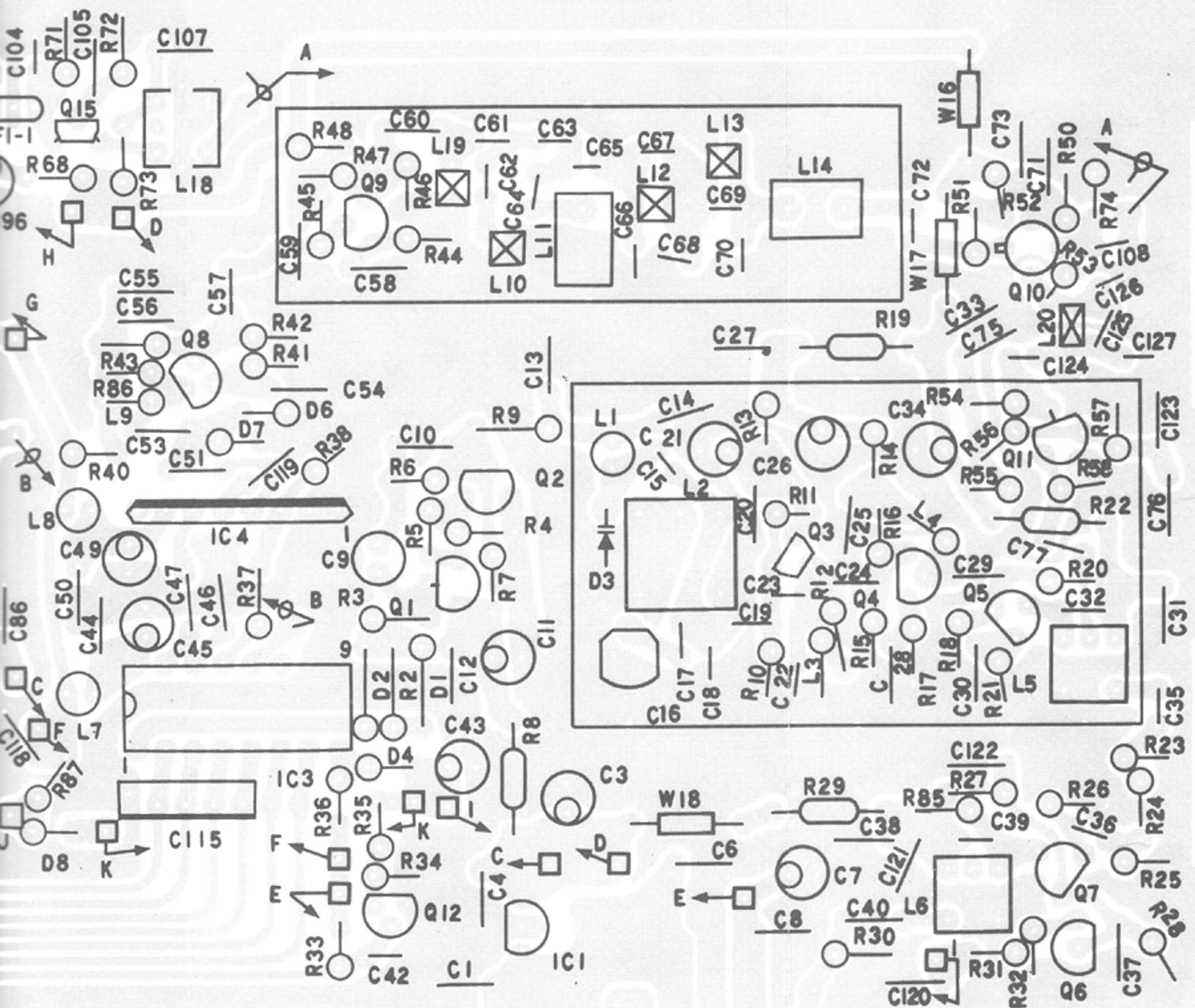
IC VOLTAGE CHART

UNIT	NO.		PIN NO.																REMARK	
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		
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	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	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	-0.1											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	0	0	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	5.2	0	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											
PA	IC1	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												

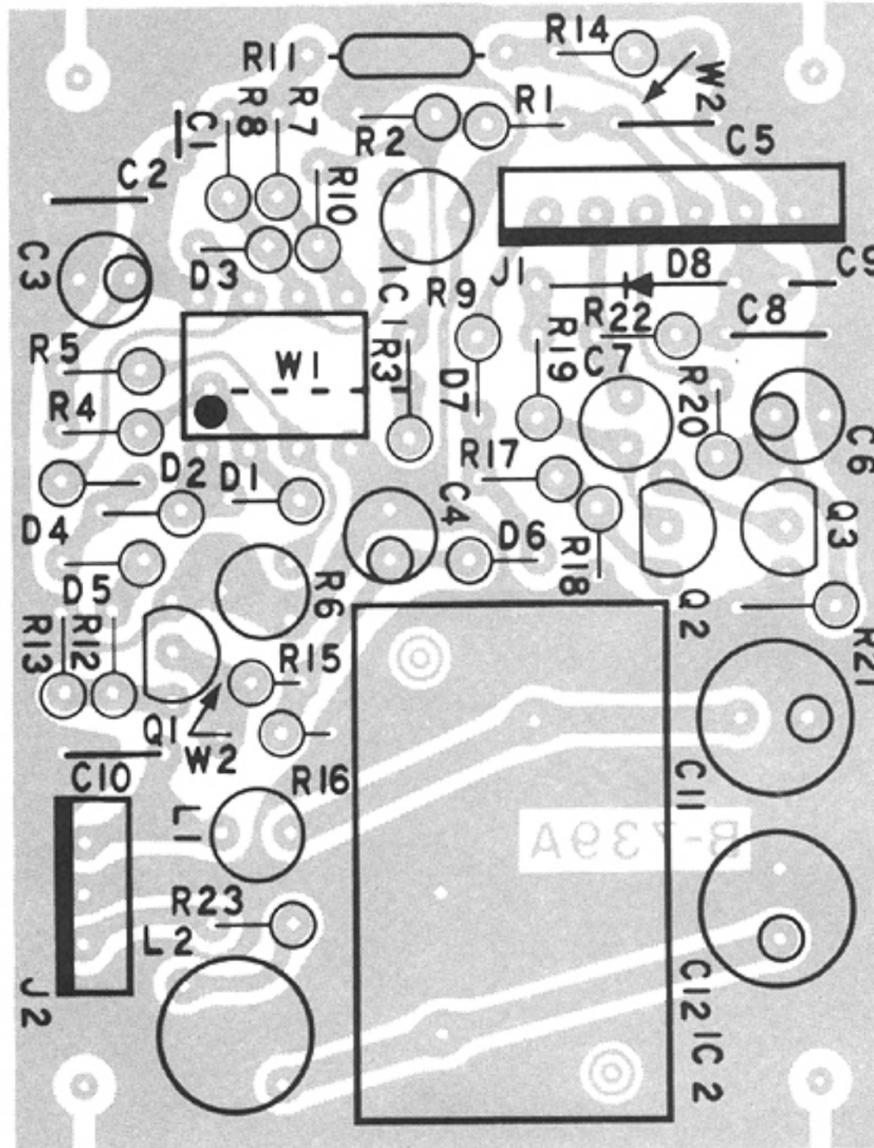
SECTION 9 BOARD LAYOUTS (IC-271H)

HPL UNIT

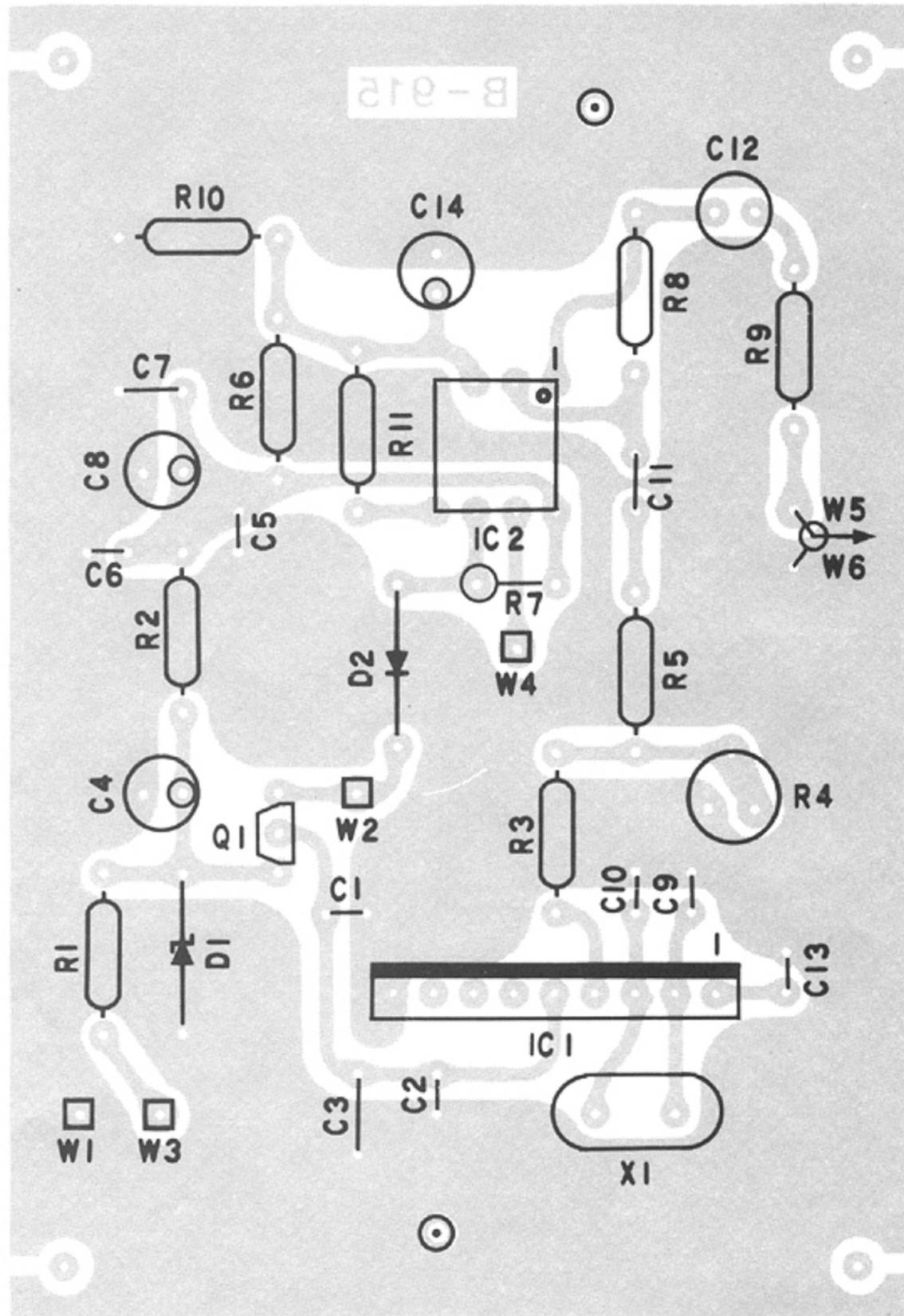




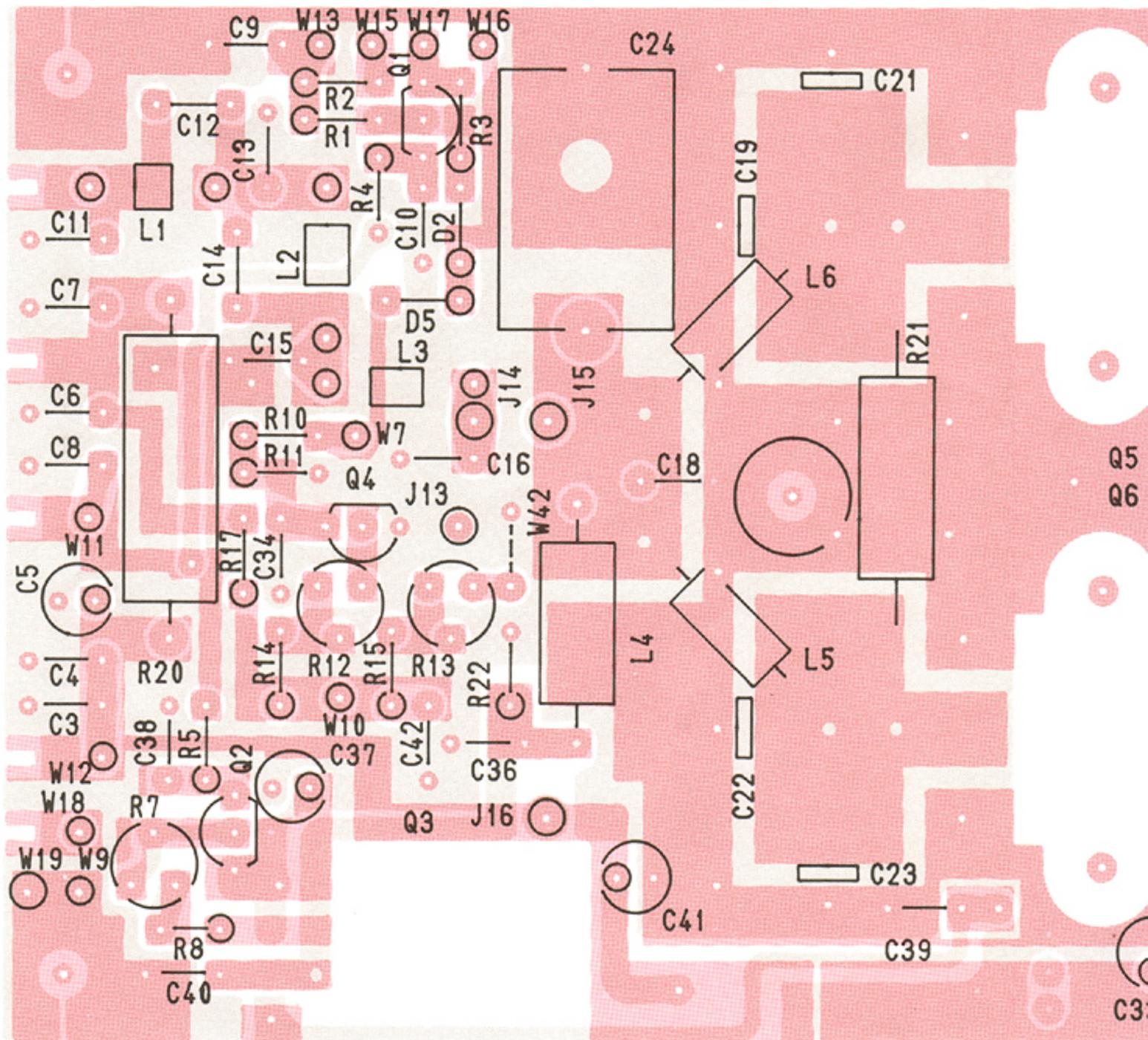
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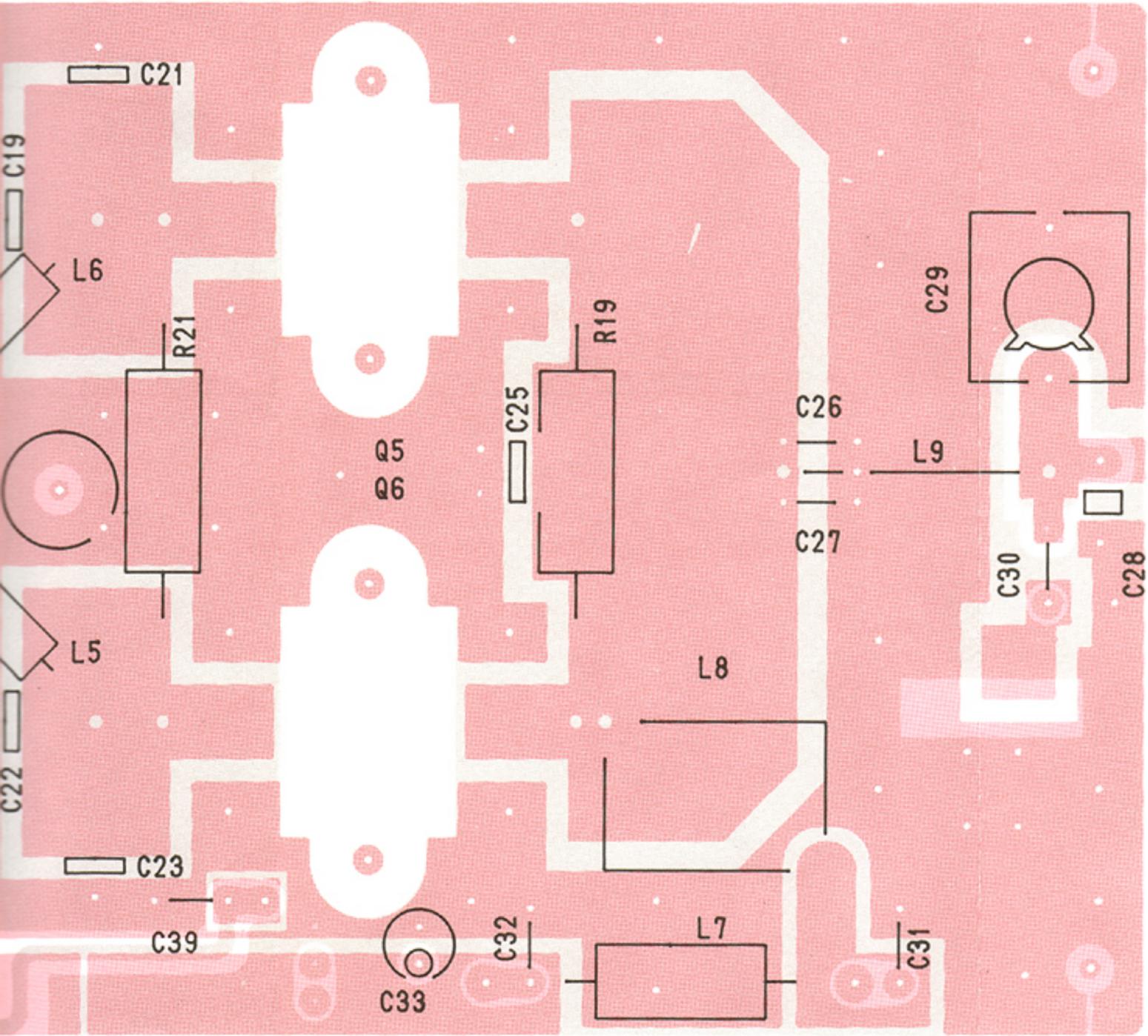


TONE UNIT

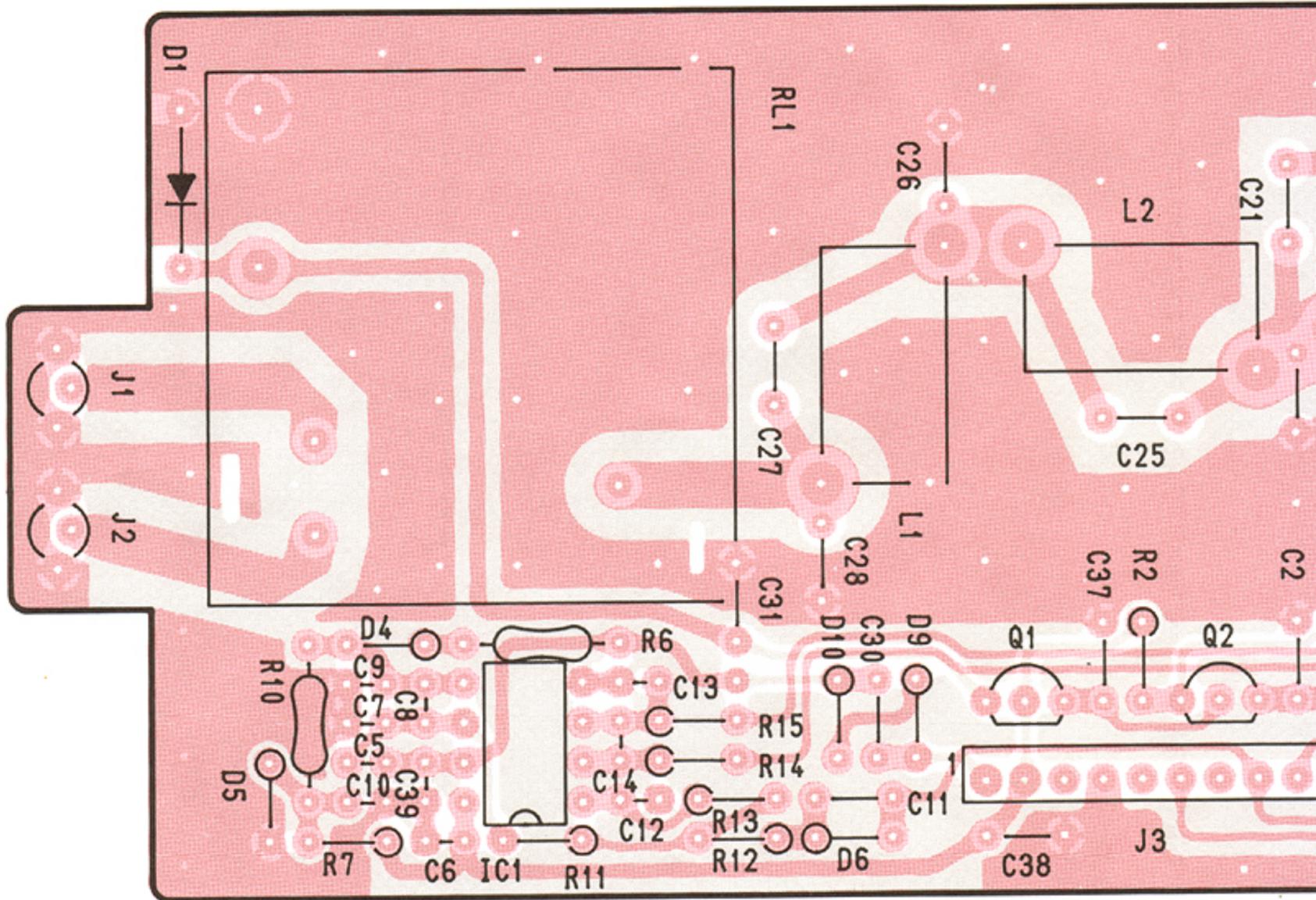


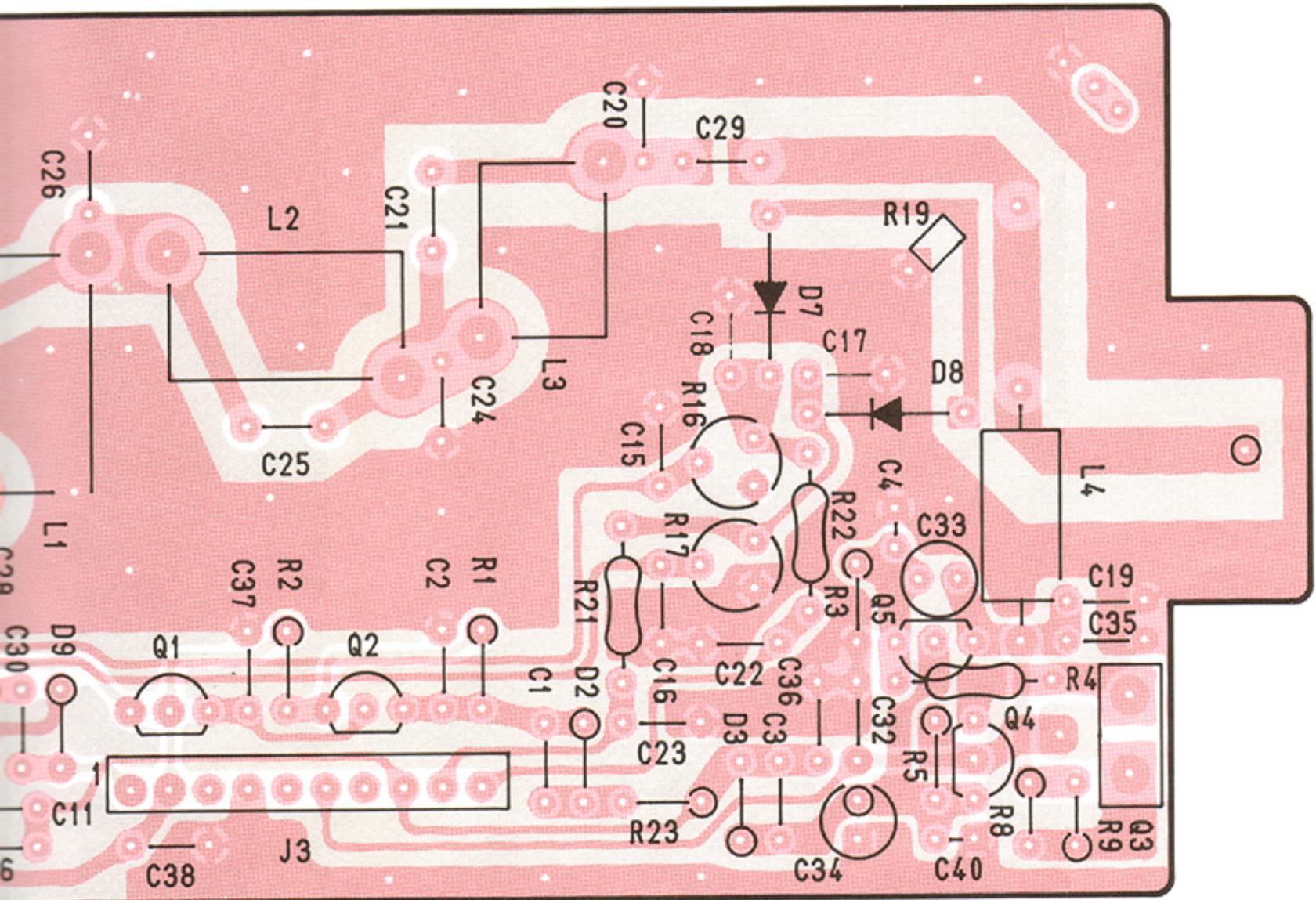
PA UNIT (IC-271H)



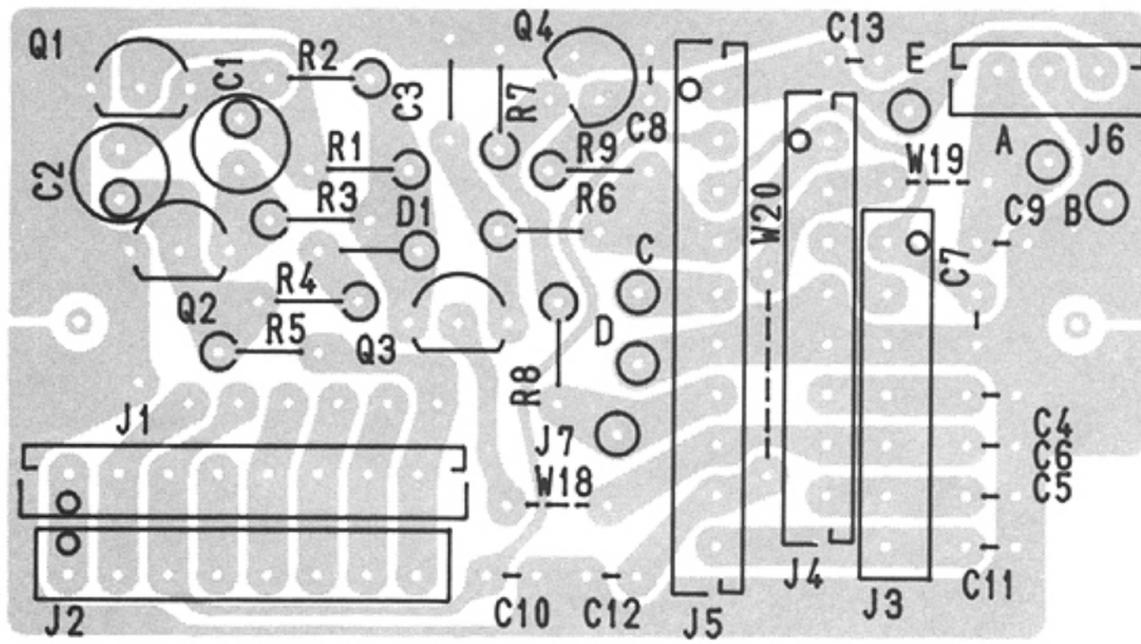


FILTER UNIT (IC-271H)





TERMINAL UNIT (IC-271H)



SECTION 10 IC SPECIFICATIONS

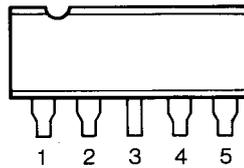
IC	FUNCTION	PAGE
BA401	FM/IF LIMITER	10-2
BA618	LED DRIVER	10-2
NJM4558D	DUAL LOW NOISE AMPLIFIER	10-3
MB-3756	VOLTAGE REGULATOR	10-3
μ PC2002	5.4W AUDIO POWER AMPLIFIER	10-3
μ PC577H	FM IF AMPLIFIER	10-4
μ PC1037H	DOUBLE-BALANCED MODULATOR	10-4
AN829	DUAL ATTENUATOR	10-4
TC4001	QUAD 2-INPUT POSITIVE NOR GATE	10-5
TC4011	QUAD 2-INPUT POSITIVE NAND GATE	10-5
TC4013	DUAL D-TYPE FLIP FLOP	10-5
TC4081	QUAD 2-INPUT POSITIVE AND GATE	10-5
SN74LS02N	QUAD 2-INPUT POSITIVE NOR GATE	10-5
SN74LS08N	QUAD 2-INPUT POSITIVE AND GATE	10-5
SN74LS11N	TRIPLE 3-INPUT POSITIVE AND GATE	10-5
SN74LS74N	DUAL D-TYPE POSITIVE FLIP FLOP	10-5
SN7404	HEX INVERTER	10-5
SN7408	QUAD 2-INPUT POSITIVE AND GATE	10-5
SN7432	QUAD 2-INPUT POSITIVE OR GATE	10-5
SN74LS90N	DECODE COUNTER	10-6
SN74LS123N	DUAL MONOSTABLE MULTIVIBRATOR	10-6
SN74LS377N	OCTAL POSITIVE D-TYPE FLIP FLOP	10-6
MC-3357	LOW POWER FM IF	10-7
μ PD549C	PROGRAMMABLE DISPLAY CONTROLLER	10-7
M54459L	1/20,1/100 HIGH SPEED DIVIDER	10-8
M54466L	1/10,1/11 DIVIDER	10-8
M54929P	DUAL MODULUS PLL IC	10-9
M50781SP	INPUT/OUTPUT EXPANDER	10-9
S-7116A	PROGRAMMABLE TONE GENERATOR	10-10
SC-1013	10W VHF RF POWER AMPLIFIER	10-10
SC-1020	25W VHF RF POWER AMPLIFIER	10-10
TC5082P	OSCILLATOR AND 12 STAGE DIVIDER	10-11
78L05AC	3-TERMINAL VOLTAGE REGULATOR	10-11
μ A78L82AC	3-TERMINAL VOLTAGE REGULATOR	10-12
μ A78M05C	3-TERMINAL VOLTAGE REGULATOR	10-12
TA78L009AP	3-TERMINAL VOLTAGE REGULATOR	10-12
DP-2	DC-DC CONVERTER	10-13
M53323P	MONOSTABLE MULTIVIBRATOR	10-13

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	°C
STORAGE TEMPERATURE	T_{STG}	-55~+125	°C

PIN CONNECTIONS



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

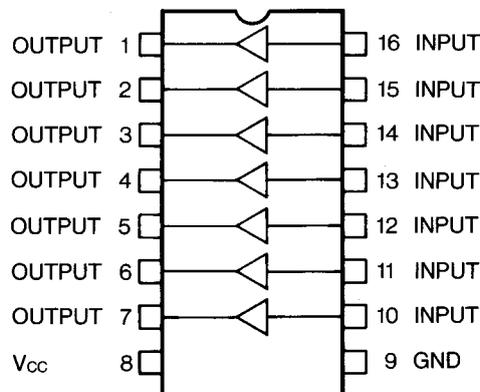
BA618 (LED DRIVER)

MAXIMUM RATINGS

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

* $T_a=25^\circ\text{C}$ (Rating degraded by 5mW for each 1°C increase in T_a .)

BLOCK DIAGRAM/PIN CONNECTIONS

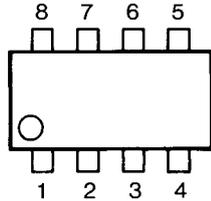


NJM4558D(DUAL LOW NOISE AMP)

MAXIMUM RATINGS(Ta=25°C)

DESCRIPTION	SYMBOL	RATING	UNIT
SUPPLY VOLTAGE	V _{DD}	±18	V
INPUT VOLTAGE	V _{IN}	±15	V
OPERATING TEMPERATURE	T _{OPR}	-20~+75	°C
STORAGE TEMPERATURE	T _{STG}	-40~+125	°C

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)

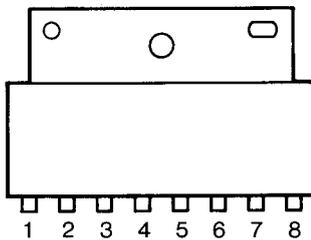
MAXIMUM RATINGS(Ta=25°C)

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	°C
STORAGE TEMPERATURE	T _{STG}	-55~+125	°C

※1:NO Heat Sink T_A ≤ 70

※2:Infinite Heat Sink T_C ≤ 70°C

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)}

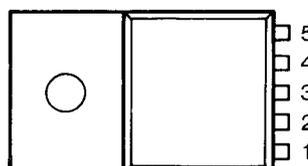
μPC2002(5.4W AUDIO POWER AMP.)

MAXIMUM RATINGS(Ta=25°C)

DESCRIPTION	SYMBOL	RATING	UNIT
PEAK SUPPLY VOLTAGE	V _{CC1} (50ms)	40	V
SUPPLY VOLTAGE(QUIESCENT)	V _{CC2}	28	V
SUPPLY VOLTAGE(OPERATIONAL)	V _{CC3}	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	°C
STORAGE TEMPERATURE	T _{STG}	-40~+150	°C

※1:T_C = 90°C

PIN CONNECTIONS

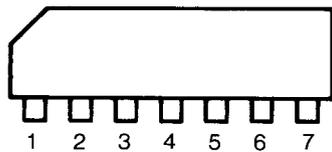


PIN	FUNCTION
1	NON-INVERTING INPUT
2	INVERTING INPUT
3	GROUND
4	OUTPUT
5	V _{CC+}

μPC577H(FM-IF AMPLIFIER)
 MAXIMUM RATINGS(Ta=25°C)

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~+75	°C
STORAGE TEMPERATURE	T _{STG}	-40~+125	°C

PIN CONNECTIONS

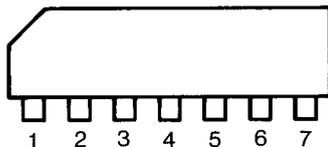


PIN	FUNCTION	PIN	FUNCTION
1	BYPASS CAPACITOR AND STABILIZED VOLTAGE	5	OUTPUT
2	INPUT HIGH	6	BYPASS CAPACITOR
3	INPUT LOW	7	V _{CC}
4	GROUND		

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~+75	°C
STORAGE TEMPERATURE	T _{STG}	-40~+125	°C

PIN CONNECTIONS

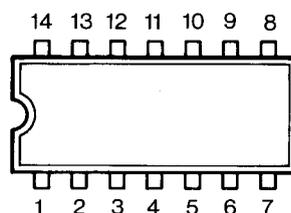


PIN	FUNCTION	PIN	FUNCTION
1	V _{CC}	5	SIGNAL INPUT
2	OUTPUT1	6	BYPASS
3	OUTPUT2	7	CARRIER INPUT
4	GND		

AN829(DUAL ATTENUATOR)
 MAXIMUM RATINGS

DESCRIPTION	SYMBOL	RATING	UNIT
SUPPLY VOLTAGE	V _{CC}	18	V
INPUT CONTROL VOLTAGE	V _C	0~6	V
POWER DISSIPATION	P _D	450	mW
OPERATING TEMPERATURE	T _{OPR}	-20~+75	°C
STORAGE TEMPERATURE	T _{STG}	-55~+150	°C

PIN CONNECTIONS

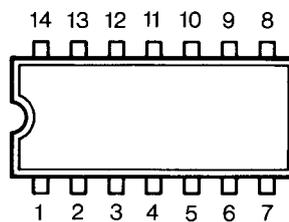


TC4001(QUAD 2-INPUT NOR GATE)
 TC4011(QUAD 2-INPUT POSITIVE NAND GATE)
 TC4013(DUAL D-TYPE FLIP FLOP)
 TC4081(QUAD 2-INPUT POSITIVE AND GATE)

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}	$-65\sim +150$	$^{\circ}C$

PIN CONNECTIONS



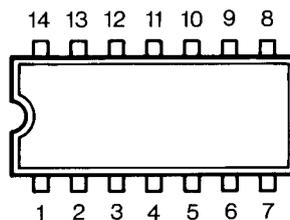
SN74LS02N(QUADRUPLE 2-INPUT POSITIVE NOR GATE)
 SN74LS08N(QUADRUPLE 2-INPUT POSITIVE AND GATE)
 SN74LS11N(TRIPLE 3-INPUT POSITIVE AND GATE)
 SN74LS74N(DUAL D-TYPE POSITIVE EDGE-TRIGGERED FLIP FLOP WITH SET AND RESET)
 SN7404(HEX INVERTERS)
 SN7408(QUADRUPLE 2-INPUT POSITIVE AND GATE)
 SN7432(QUADRUPLE 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}	$-20\sim +75$	$^{\circ}C$
STORAGE TEMPERATURE	T_{STG}	$-65\sim +150$	$^{\circ}C$

※When the output is HIGH.

PIN CONNECTIONS



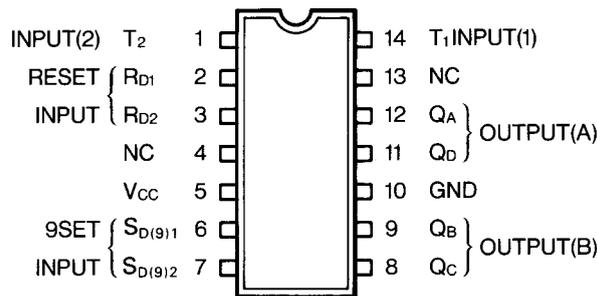
SN74LS90N (DECODE COUNTER)

MAXIMUM RATINGS

DESCRIPTION	SYMBOL	RATING	UNIT
SUPPLY VOLTAGE	V_{CC}	-0.5~+7	V
INPUT VOLTAGE ^{※1}	V_{IN}	-0.5~+5.5	V
	V_{IN}	-0.5~+15	
OUTPUT VOLTAGE	V_{OUT}	-0.5~ V_{CC}	V
OPERATING TEMPERATURE	T_{OPR}	-20~+75	°C
STORAGE TEMPERATURE	T_{STG}	-65~+150	°C

※1 Inputs T_1, 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)

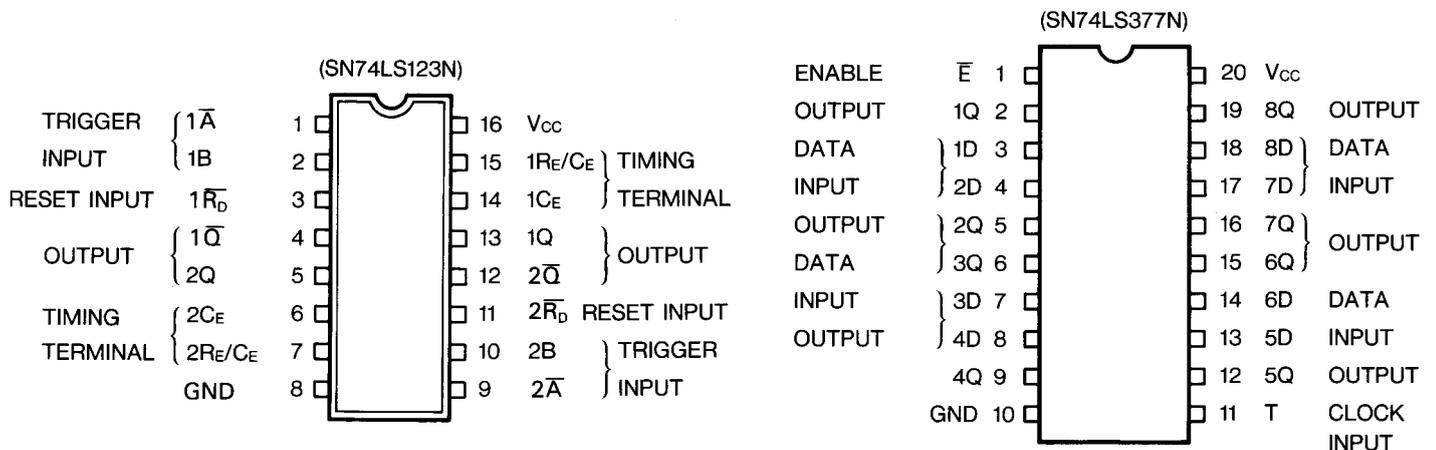
SN74LS377N (OCTAL POSITIVE EDGE-TRIGGERED D-TYPE FLIP FLOP WITH ENABLE)

MAXIMUM RATINGS

DESCRIPTION	SYMBOL	RATING	UNIT
SUPPLY VOLTAGE	V_{CC}	-0.5~+7	V
INPUT VOLTAGE	V_{IN}	-0.5~+15	V
OUTPUT VOLTAGE*	V_{OUT}	-0.5~ V_{CC}	V
OPERATING TEMPERATURE	T_{OPR}	-20~+75	°C
STORAGE TEMPERATURE	T_{STG}	-65~+150	°C

※When the output is HIGH.

PIN CONNECTIONS

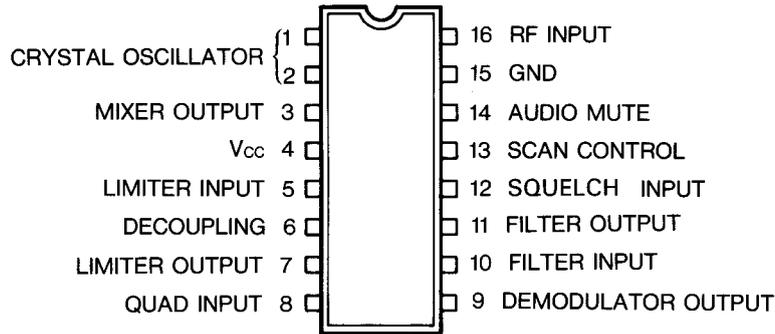


MC-3357 (LOW POWER FM IF)

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	°C
STORAGE TEMPERATURE	T_{STG}	-65~+150	°C

PIN CONNECTIONS

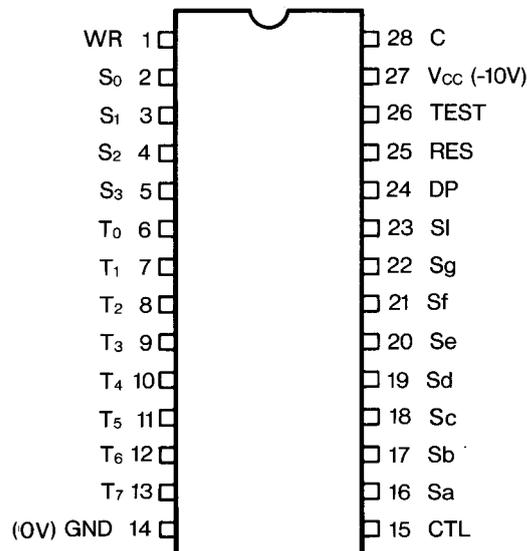


μPD549C (PROGRAMMABLE DISPLAY CONTROLLER)

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	°C
STORAGE TEMPERATURE	T_{STG}	-40~+125	°C

PIN CONNECTIONS

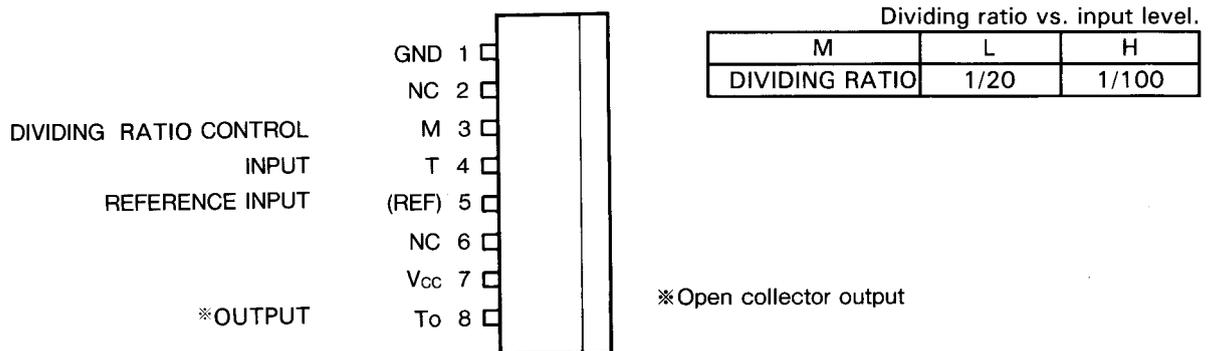


M54459L(1/20,1/100 HIGH SPEED DIVIDER)

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	°C
STORAGE TEMPERATURE	T_{STG}	-55~+125	°C

PIN CONNECTIONS



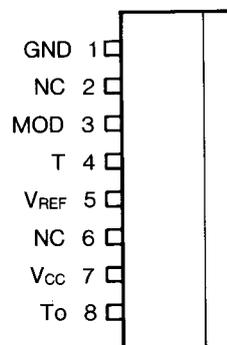
M54466L(1/10,1/11 DIVIDER)

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	°C
STORAGE TEMPERATURE	T_{STG}	-40~+125	°C

※ $T_a=75^{\circ}C$

PIN CONNECTIONS

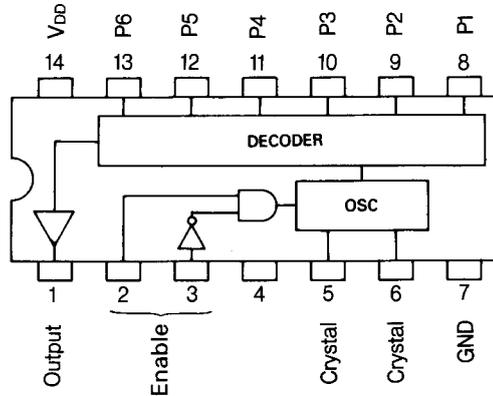


S-7116A(PROGRAMMABLE TONE GENERATOR)

MAXIMUM RATINGS

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

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								1	1445	1			1	1	1
131.8			1		1															

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

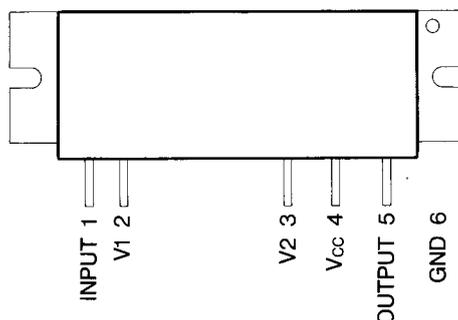
SC-1013(10W VHF RF POWER AMPLIFIER)

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		°C

PIN CONNECTIONS

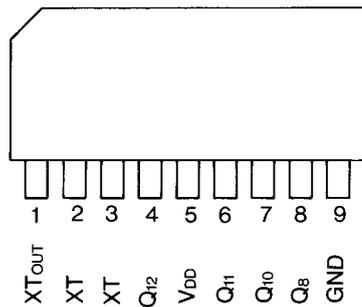


TC5082P(OSCILLATOR AND 12 STAGE DIVIDER)

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}	$-30 \sim +75$	°C
STORAGE TEMPERATURE	T_{STG}	$-55 \sim +125$	°C

PIN CONNECTIONS



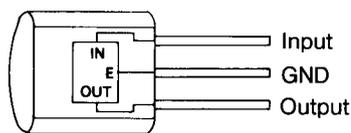
PIN NO.	8	7	6	4	1
PIN NAME	Q_8	Q_{10}	Q_{11}	Q_{12}	XT_{OUT}
DIVISION RATIO	1/256	1/1024	1/2048	1/4096	1/1

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}	$-30 \sim +75$	°C
STORAGE TEMPERATURE	T_{STG}	$-40 \sim +125$	°C

PIN CONNECTIONS



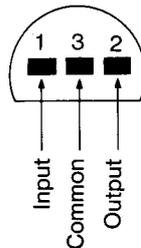
μA78L82AC(3-TERMINAL POSITIVE VOLTAGE REGULATOR)

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	°C
STORAGE TEMPERATURE	T_{STG}	-55~+150	°C

PIN CONNECTIONS

(Bottom View)

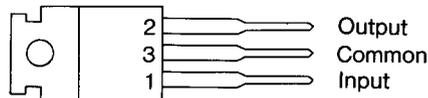


μA78M05C(3-TERMINAL POSITIVE VOLTAGE REGULATOR)

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	°C
STORAGE TEMPERATURE	T_{STG}	-55~+150	°C

PIN CONNECTIONS



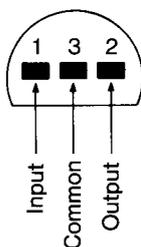
TA78L009AP(3-TERMINAL POSITIVE VOLTAGE REGULATOR)

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	°C
STORAGE TEMPERATURE	T_{STG}	-55~+150	°C

PIN CONNECTIONS

(Bottom View)



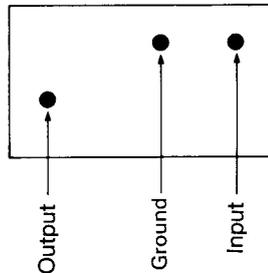
DP-2(DC-DC CONVERTER)

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)

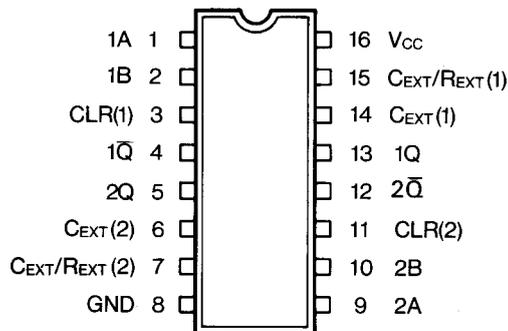


M53323P(RETRIGGERABLE MONOSTABLE MULTIVIBRATOR)

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	°C

PIN CONNECTIONS



FUNCTION TABLE

CLEAR	INPUTS		OUTPUTS	
	A	B	Q	\bar{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	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	1 μ (BP) 50V
C10	Ceramic	0.001 50V
C11	Ceramic	0.0047 50V
C12	Electrolytic	10 μ 16V
C13	Electrolytic	33 μ 10V
C14	Electrolytic	470 μ 16V
C15	Electrolytic	100 μ 10V
C16	Electrolytic	1 μ (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
B1	VR P.C.B. P.C.B.	B-646E
B2	Display P.C.B. Display P.C.B.	B-649F
B3	Mic P.C.B. Mic P.C.B.	B-740
PL1	Lamp	BQ044-3258A
F1	Ferrite Beads Fuse Holder	Ri3.7-5.1-1.4-2D1 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	μ PD549C
IC2	IC	μ PD549C
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	3.3 μ	50V
C4	Ceramic	330P	50V
C5	Ceramic	330P	50V
C6	Electrolytic	47 μ	16V
C7	Electrolytic	10 μ	16V
C8	Electrolytic	4.7 μ	50V
C9	Electrolytic	4.7 μ	50V
C10	Electrolytic	0.47 μ (BP)	50V
C11	Electrolytic	10 μ	16V
C12	Ceramic	0.0047	50V
C13	Ceramic	0.0047	50V
C14	Electrolytic	10 μ	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	μ PD7801G114	
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	μ A78M05C	
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	ELR25
		#03, 04, 06, 07	

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	47 μ 16V
C3	Electrolytic	47 μ 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	47 μ 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	47 μ 25V
C20	Barrier Lay	0.1 16V
C21	Electrolytic	47 μ 16V
C22	Barrier Lay	0.015 25V
C23	Barrier Lay	0.01 16V
C24	Barrier Lay	0.01 16V
C26	Electrolytic	100 μ 10V
C27	Electrolytic	47 μ 10V
C29	Ceramic	0.001 50V
C30	Mylar	0.022 50V #03,04
C31	Electrolytic	47 μ 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	μ A78L82AC
IC2	IC	μ A78M05C
IC3	IC	M54929P
IC4	IC	M54466L
IC5	IC	μ PC1037H
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(LALO4NA)	
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	100 μ	16V
C3	Electrolytic	10 μ	16V
C4	Ceramic	0.0047	50V
C6	Ceramic	0.0047	50V
C7	Electrolytic	10 μ	16V

HPL UNIT

REF.NO.	DESCRIPTION	PART NO.
C8	Ceramic	0.0047 50V
C9	Electrolytic	1 μ (BP) 50V
C10	Barrier Lay	0.047 25V
C11	Electrolytic	100 μ 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	47 μ 10V
C22	Ceramic	3P(CH) 50V
C23	Ceramic	3P(CH) 50V
C24	Ceramic	1P(CH) 50V
C25	Ceramic	0.0047 50V
C26	Electrolytic	100 μ 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	100 μ 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	0.47 μ 50V
C44	Ceramic	0.0047 50V
C45	Electrolytic	47 μ 10V
C46	Barrier Lay	0.1 25V
C47	Barrier Lay	0.1 25V
C48	Ceramic	100P 50V
C49	Electrolytic	47 μ 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	10 μ 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	10 μ 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	10 μ 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	10 μ 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	0.22 μ 50V
C130	Ceramic	0.0047 50V
C131	Electrolytic	47 μ 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	47 μ 10V
C139	Ceramic	0.0047 50V
C140	Electrolytic	47 μ 10V
C141	Ceramic	1P 50V
C142	Ceramic	0.0047 50V
C143	Electrolytic	47 μ 10V
C144	Cylinder	47P UP125
C145	Ceramic	0.001 50V
C146	Ceramic	0.0047 50V
C147	Electrolytic	47 μ 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	47 μ 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	1 μ (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	1 μ 50V(BP type)
C34	Electrolytic	2.2 μ 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	μ PC1037H
IC4	IC	μ PC577H
IC5	IC	4558D
IC6	IC	M53323P
IC7	IC	78L05AC
IC8	IC	μ PC577H
IC9	IC	4558D
IC10	IC	4558D
IC11	IC	4558D
IC12	IC	μ PC2002V
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
F11	MC	10M24D4
F12	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	47 μ	10V
C2	Electrolytic	1 μ (BP)	50V
C3	Electrolytic	10 μ	16V
C4	Barrier Lay	0.1	16V
C5	Electrolytic	10 μ	16V(RC2)
C6	Ceramic	470P	50V
C7	Ceramic	0.0047	50V
C8	Ceramic	220P	50V
C9	Barrier Lay	0.047	25V
C10	Electrolytic	10 μ	16V(RC2)
C11	Electrolytic	0.47 μ	50V(RC2)
C12	Mylar	0.01	50V
C13	Mylar	0.01	50V
C14	Mylar	0.0027	50V
C15	Ceramic	100P	50V
C16	Electrolytic	10 μ	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	10 μ	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	3.3 μ	50V(RC2)
C33	Electrolytic	4.7 μ	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	0.47 μ	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	47 μ	10V
C61	Mylar	0.033	50V
C62	Ceramic	0.0047	50V
C63	Electrolytic	1 μ	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	10 μ	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	22 μ	16V
C91	Barrier Lay	0.047	25V
C92	Ceramic	5P	50V
C93	Barrier Lay	0.1	16V
C94	Ceramic	0.0047	50V
C95	Electrolytic	0.47 μ (RC2)	
C96	Ceramic	0.0047	50V
C97	Electrolytic	0.1 μ (RC2)	50V
C98	Electrolytic	4.7 μ (RC2)	50V
C99	Barrier Lay	0.047	25V
C100	Ceramic	470P	50V
C101	Electrolytic	10 μ	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	470 μ	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	2.2 μ	50V
C131	Barrier Lay	0.1	16V
C132	Ceramic	0.0047	50V
C133	Electrolytic	10 μ	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	0.47 μ	50V
C143	Electrolytic	10 μ	16V(RC2)
C144	Electrolytic	220 μ	10V
C145	Barrier Lay	0.1	16V
C146	Barrier Lay	0.1	16V
C147	Electrolytic	100 μ	10V
C148	Electrolytic	10 μ	16V
C149	Electrolytic	1 μ	50V(RC2)
C150	Ceramic	0.0047	50V
C151	Electrolytic	0.47 μ	50V(RC2)
C152	Barrier Lay	0.047	25V
C153	Ceramic	0.0047	50V
C154	Electrolytic	220 μ	10V
C155	Electrolytic	100 μ	10V
C156	Electrolytic	0.047 μ	50V
C157	Electrolytic	220 μ	16V
C158	Ceramic	0.0047	50V
C159	Barrier Lay	0.1	50V
C160	Electrolytic	0.47 μ	50V(RC2)
C161	Barrier Lay	0.047	25V
C162	Electrolytic	47 μ	25V(RC2)
C163	Electrolytic	10 μ	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	4.7 μ	50V
C179	Electrolytic	2.2 μ	50V
C180	Ceramic	0.001	50V
C181	Ceramic	0.001	50V
C182	Ceramic	470P	50V
C183	Electrolytic	470 μ	16V
C184	Ceramic	0.001	50V
C185	Electrolytic	0.47 μ	50V(RC2)
C186	Electrolytic	470 μ	16V
C187	Electrolytic	47 μ	10V
C188	Electrolytic	0.47 μ	50V
C189	Electrolytic	2.2 μ	50V
C190	Electrolytic	1 μ	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	10 μ	16V(RC2)
C197	Mylar	0.022	50V
C198	Mylar	0.022	50V
C199	Mylar	0.022	50V
C200	Ceramic	47P	50V
C201	Electrolytic	220 μ	10V
C202	Electrolytic	2.2 μ	50V(RC2)
C203	Electrolytic	33 μ	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	4.7 μ	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	1 μ	50V(RC2)
C224	Barrier Lay	0.1	16V
C225	Electrolytic	2.2 μ	50V(RC2)
C226	Electrolytic	47 μ	10V
C230	Electrolytic	0.47 μ	50V(RC2)
C231	Electrolytic	3.3 μ	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 (IC-271H:	0.0047 50V 220P 50V)
C241	Ceramic (IC-271H:	0.0047 50V 220P 50V)
C242	Ceramic (IC-271H:	0.0047 50V 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	22 μ	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	4.7 μ	25V
C34	Ceramic	220P	50V
C36	Ceramic	220P	50V
C37	Electrolytic	47 μ	10V
C38	Ceramic	220P	50V
C39	Ceramic	220P	50V
C40	Ceramic	220P	50V
C41	Electrolytic	47 μ	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	22 μ 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	10 μ 16V
C4	Electrolytic	10 μ 16V
C6	Electrolytic	10 μ 16V
C7	Electrolytic	1 μ (BP) 50V
C8	Ceramic	0.0047 50V
C9	Ceramic	0.001 50V
C10	Barrier Lay	0.1 16V
C11	Electrolytic	100 μ 16V
C12	Electrolytic	100 μ 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

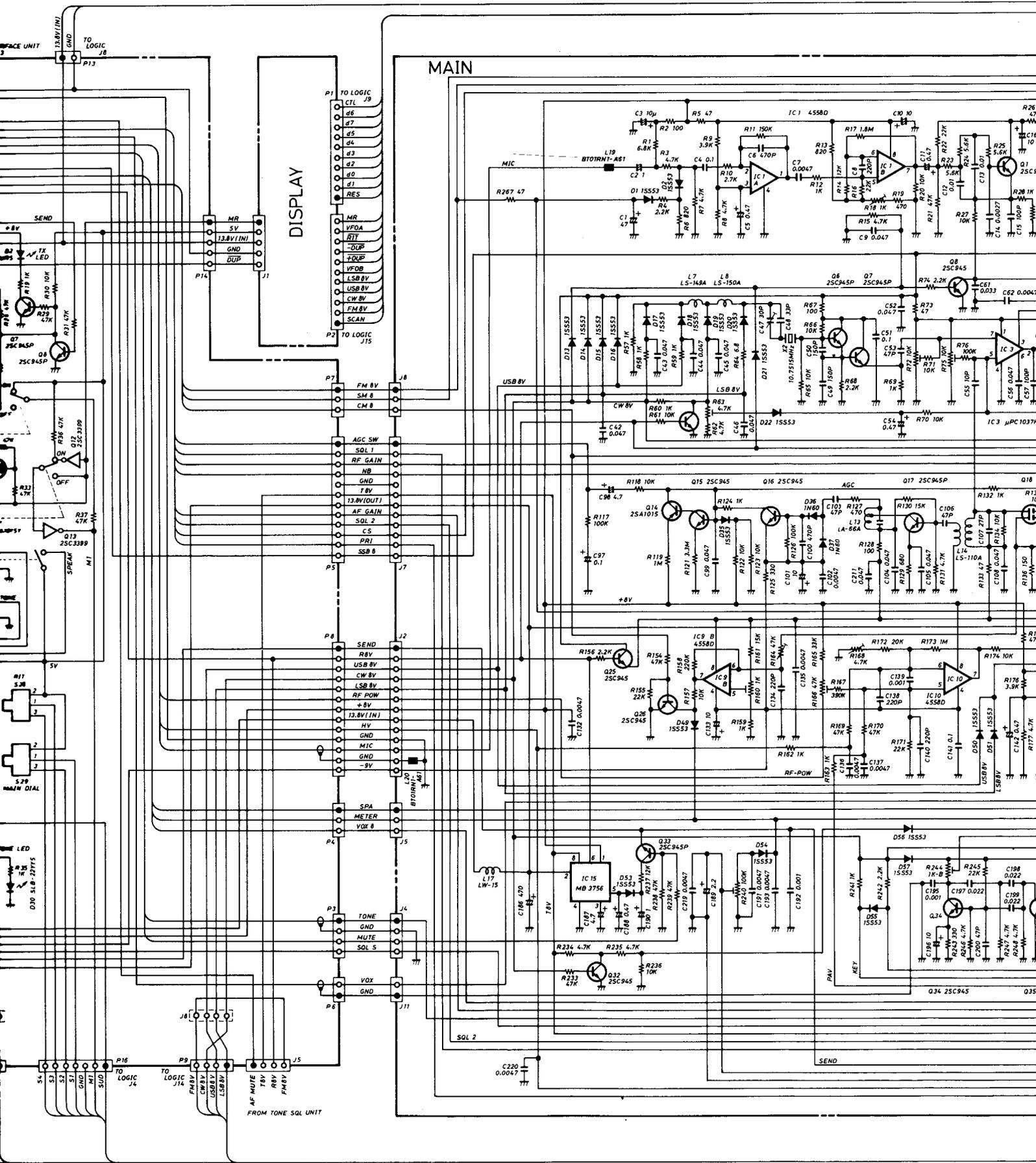
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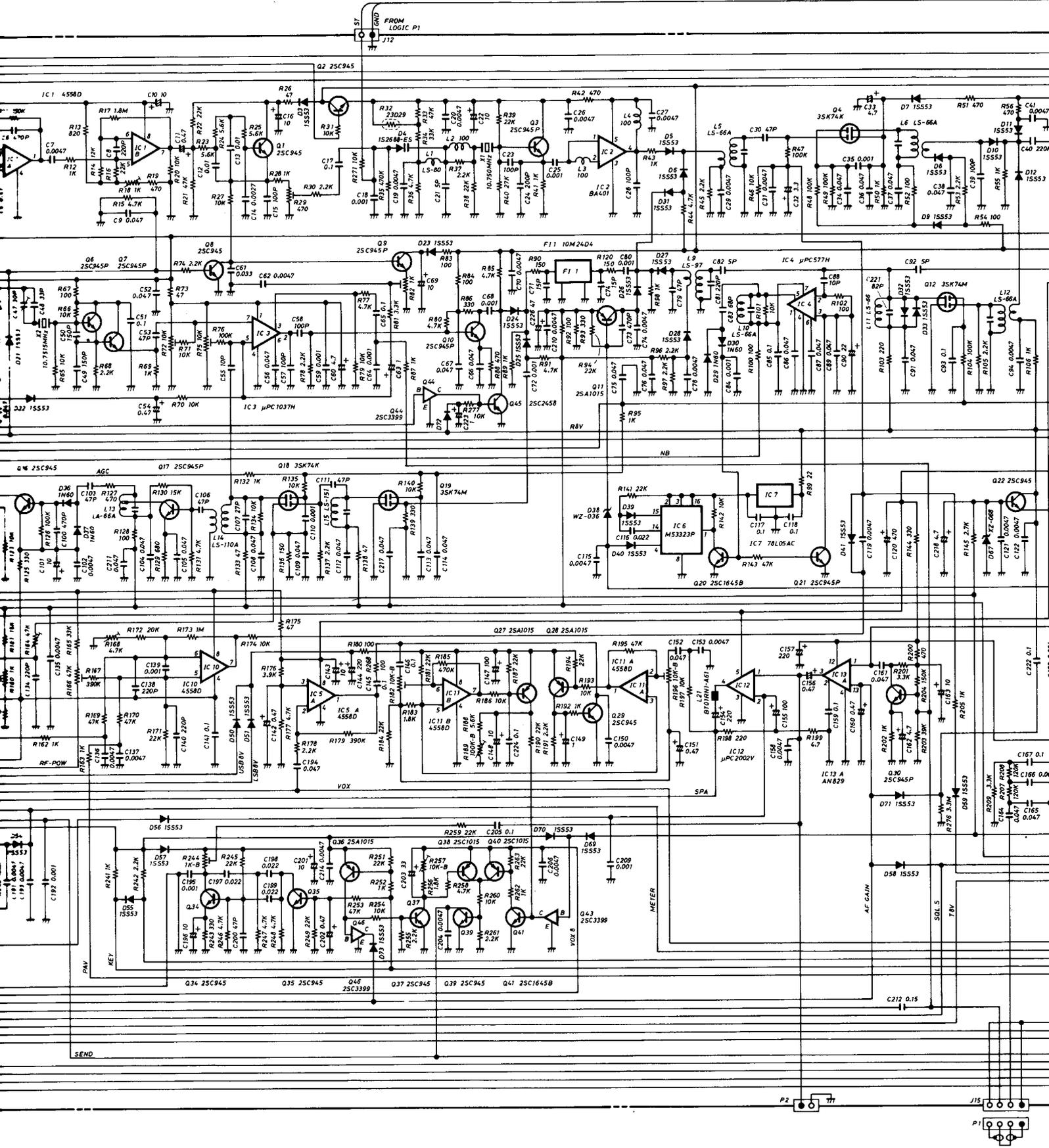
REF.NO.	DESCRIPTION	PART NO.	
Q1	Transistor	2SC945P	
Q2	Transistor	2SC945P	
Q3	Transistor	2SC945P	
D1	Diode	1SS53	
R1	Resistor	4.7K	ELR25
R2	Resistor	100K	ELR25
R3	Resistor	100K	ELR25
R4	Resistor	4.7K	ELR25
R5	Resistor	4.7K	ELR25
R6	Resistor	4.7K	ELR25
C1	Electrolytic	4.7 μ	25V
C2	Electrolytic	4.7 μ	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	

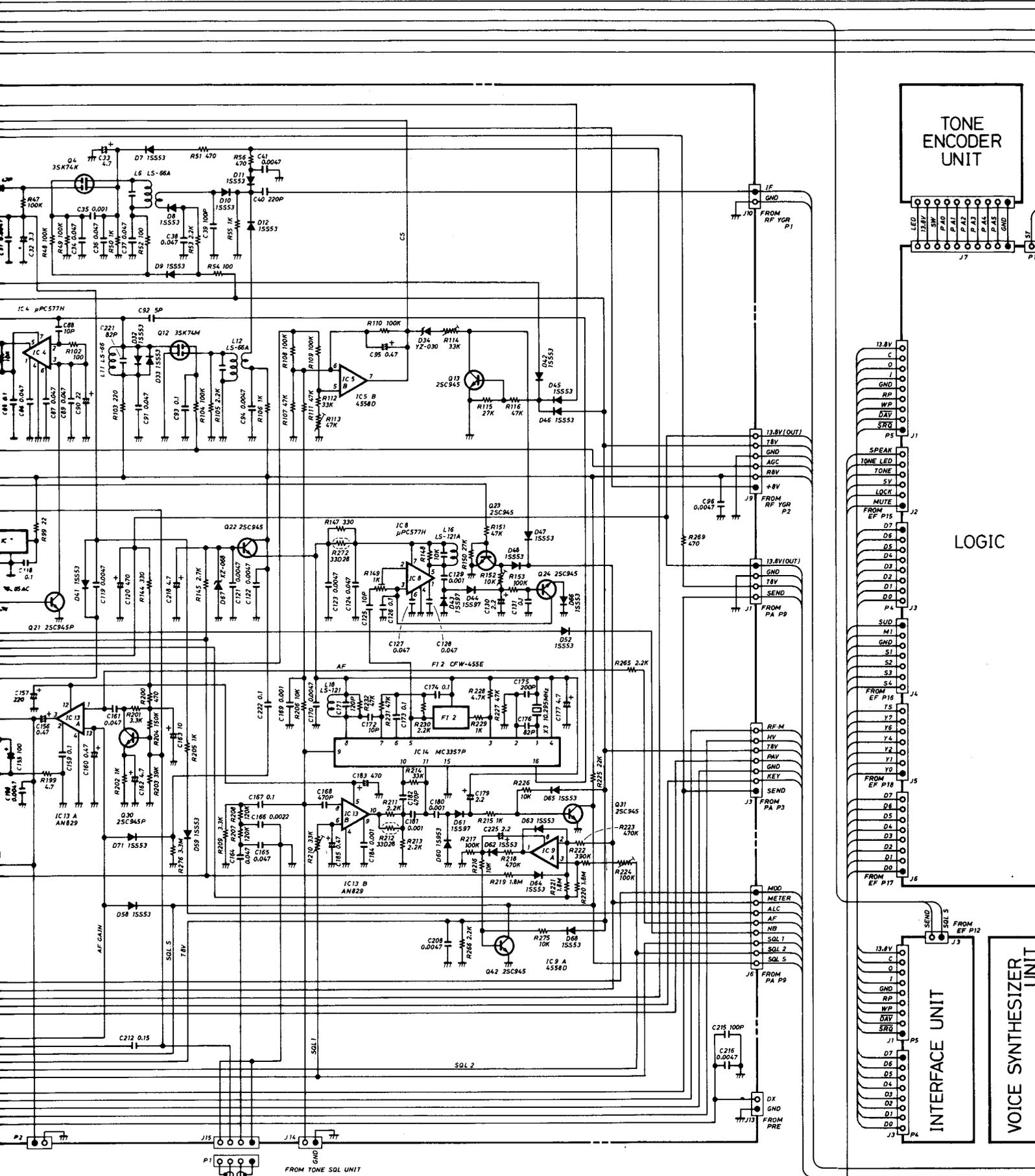
TONE UNIT:#02,05

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	10 μ	16V
C5	Ceramic	47P	50V
C6	Ceramic	0.001	50V
C7	Ceramic	0.0047	50V
C8	Electrolytic	10 μ	16V
C9	Ceramic	12P	50V
C10	Ceramic	12P	50V
C11	Mylar	0.0047	50V
C12	Electrolytic	4.7 μ (BP)	25V
C13	Ceramic	15P	50V
C14	Electrolytic	0.47 μ	50V
P1	Connector	EHR-10	
P2	Connector	5250-02	
EP1	P.C.B.	B-915	

SCHEMATIC DIAGRAM







tone ENCODER UNIT

13.8V
LED
SH
P4
P4
P4
P4
P4
P4
P4
P4
GND

J7

LOGIC

13.8V
C
D
GND
RP
WP
DXT
SRG
P5

J1

SPEAK
TONE LED
TONE
RBV
5V
LOCK
MUTE
FROM EF P15

J2

D7
D6
D5
D4
D3
D2
D1
D0
P4

J3

SUD
M1
GND
S1
S2
S3
S4
FROM EF P16

J4

T5
T7
T8
Y4
Y2
Y1
Y0
FROM EF P18

J5

D7
D6
D5
D4
D3
D2
D1
D0
FROM EF P17

J6

INTERFACE UNIT

13.8V
C
D
GND
RP
WP
DXT
SRG
P5

J1

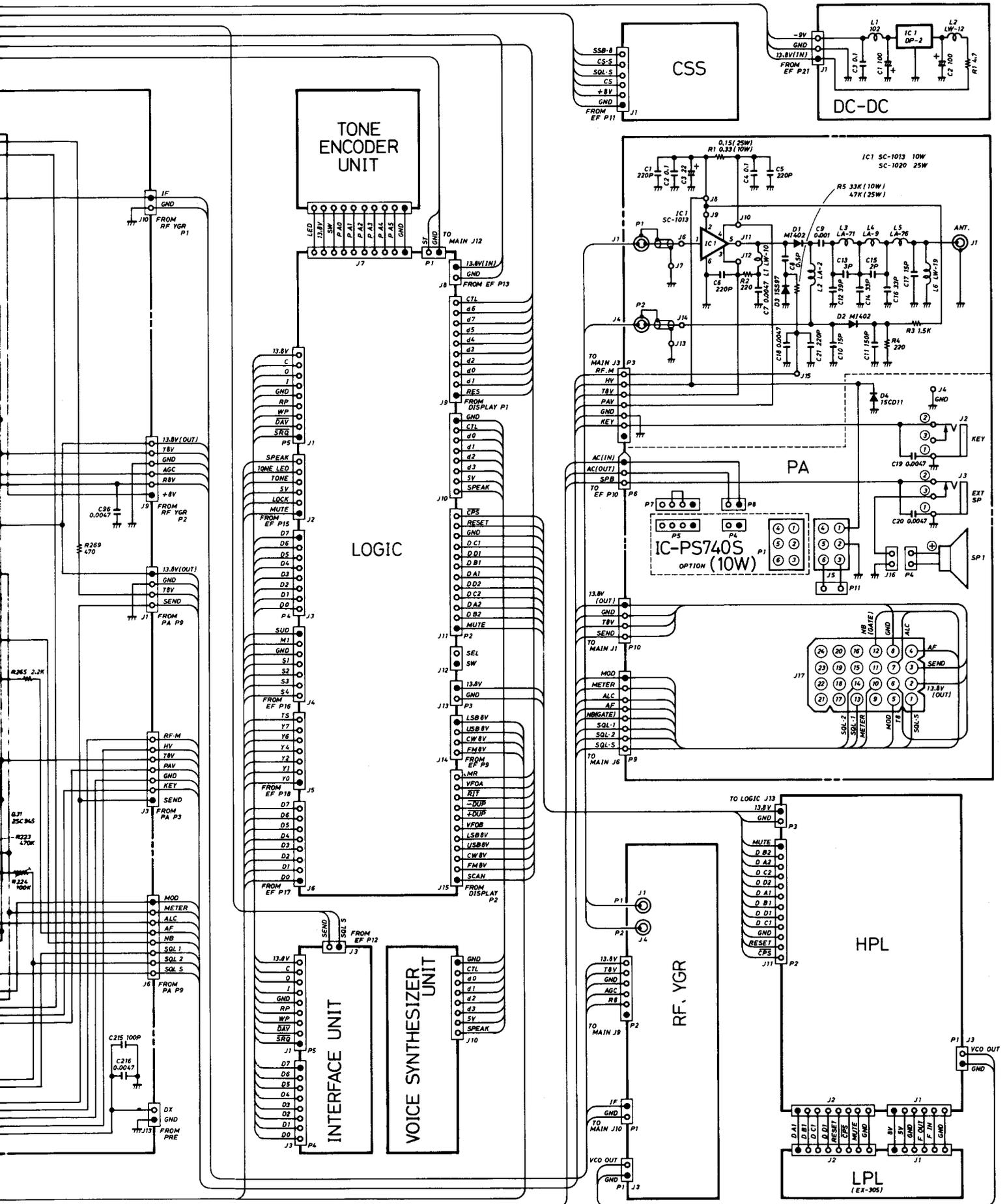
D6
D5
D4
D3
D2
D1
D0
J3

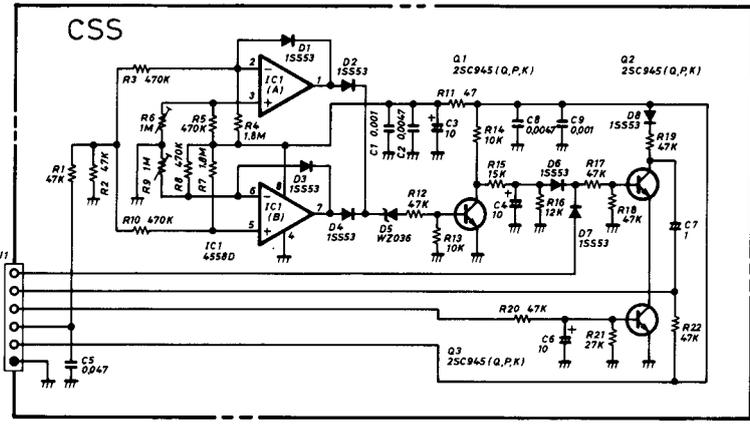
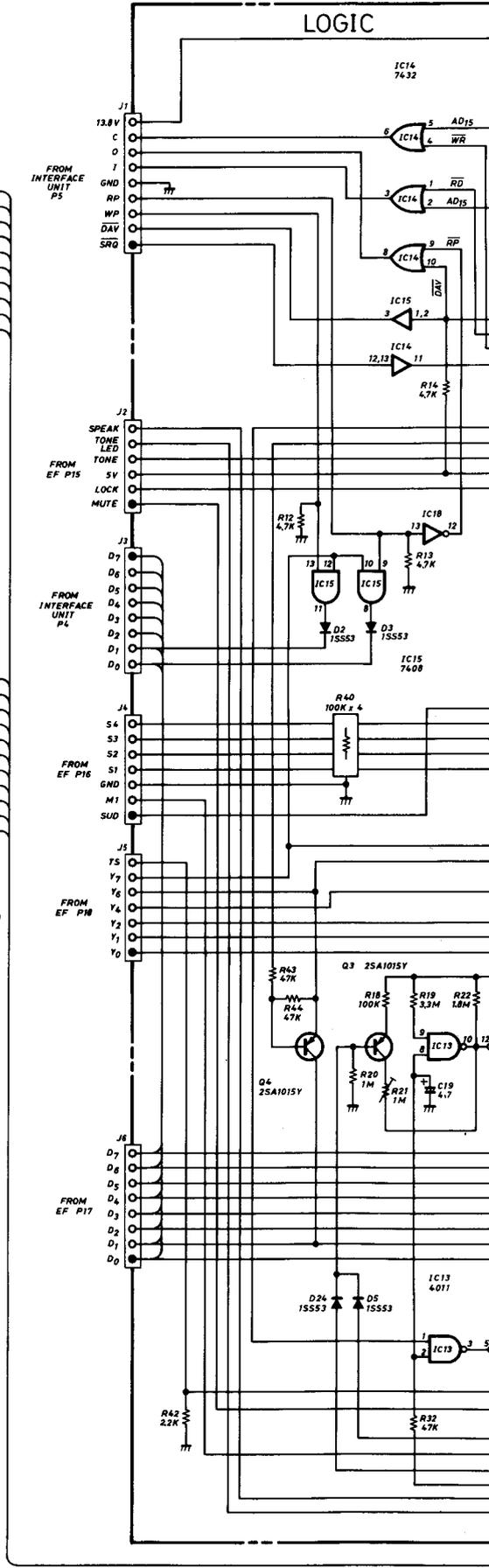
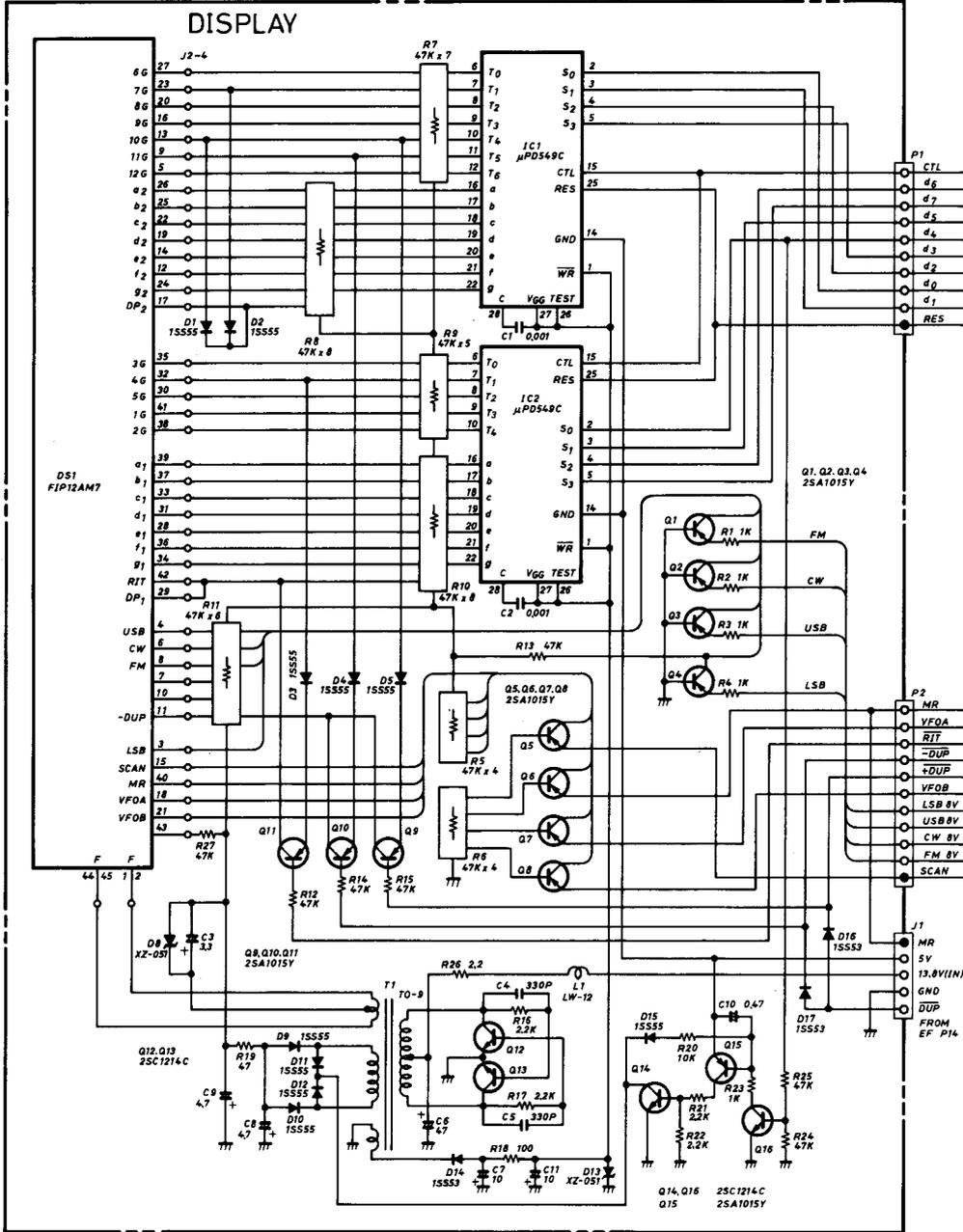
P4

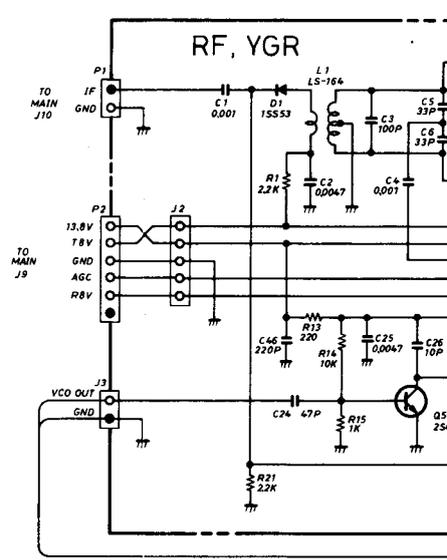
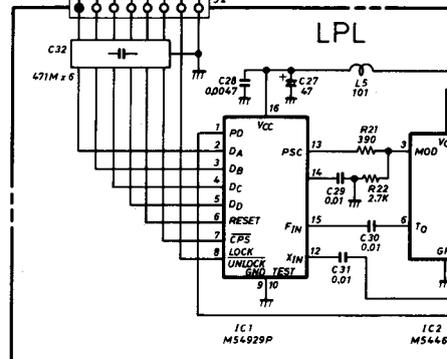
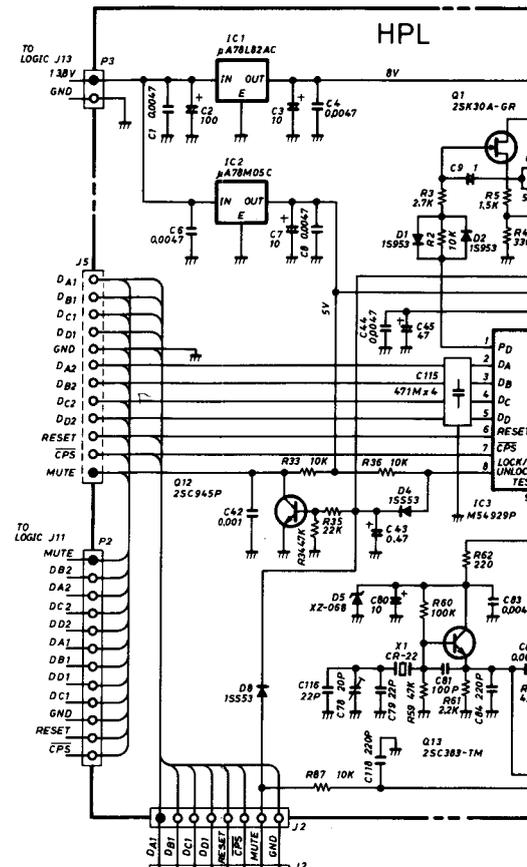
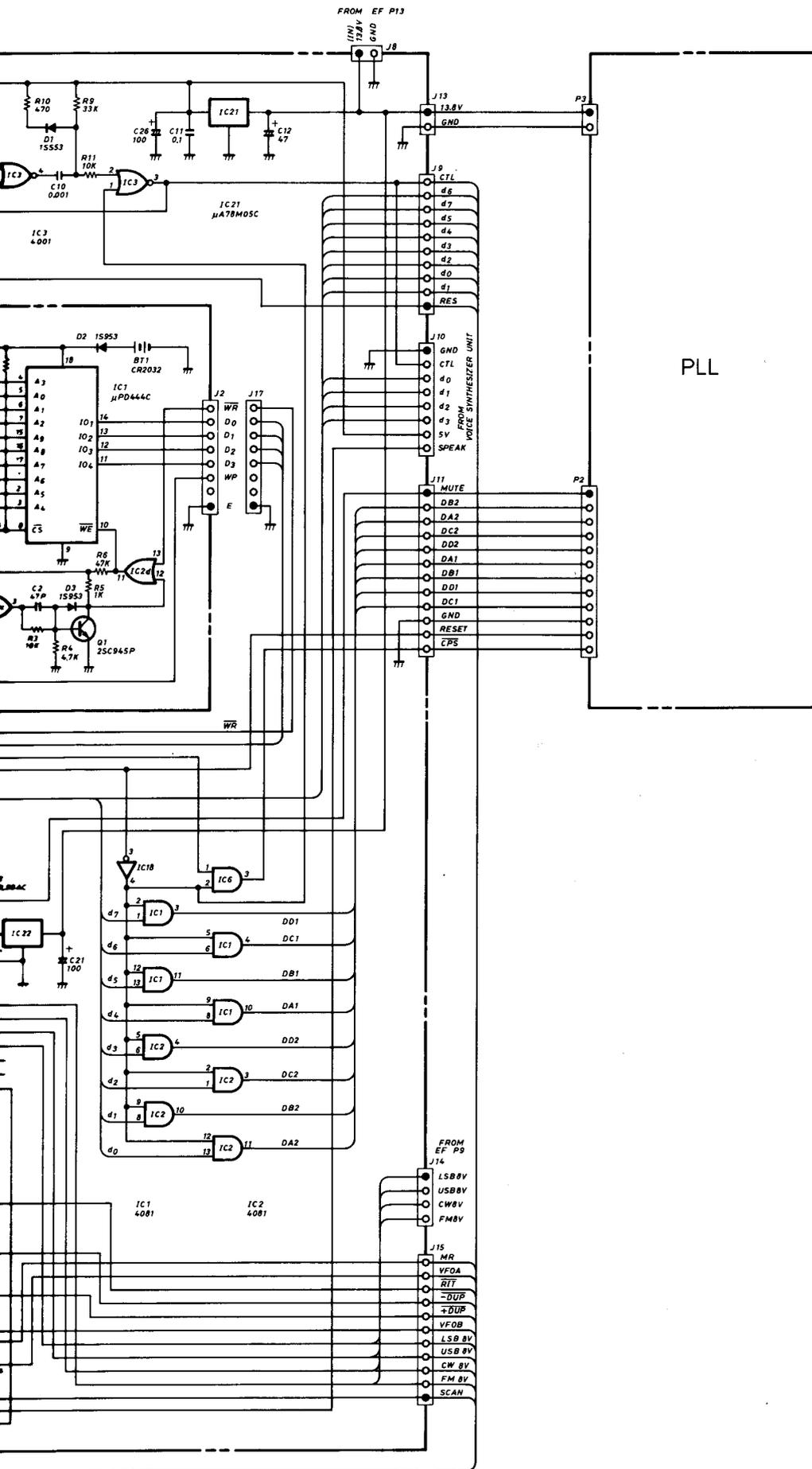
VOICE SYNTHESIZER UNIT

SEND
SQL 5
FROM EF P12

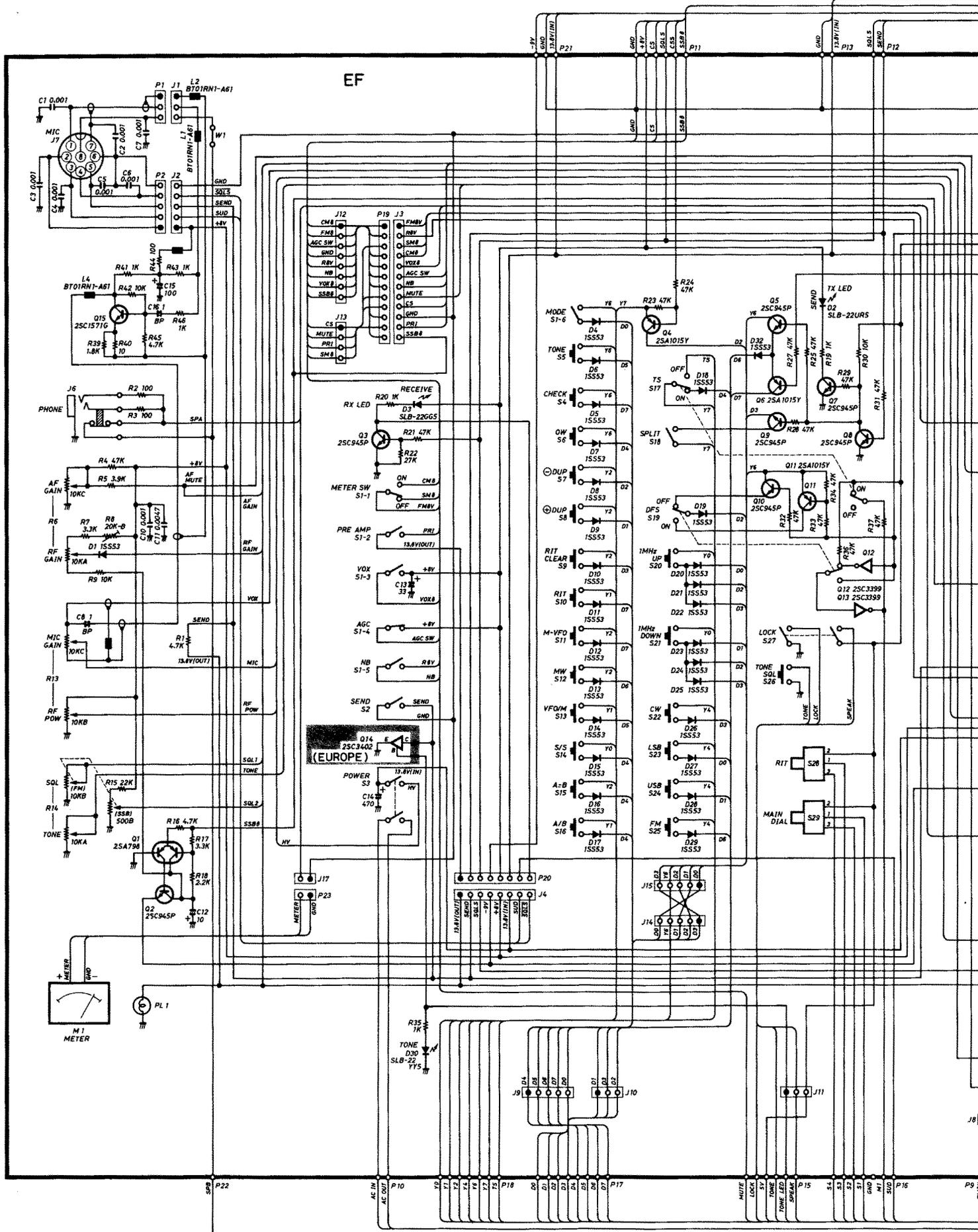
J3



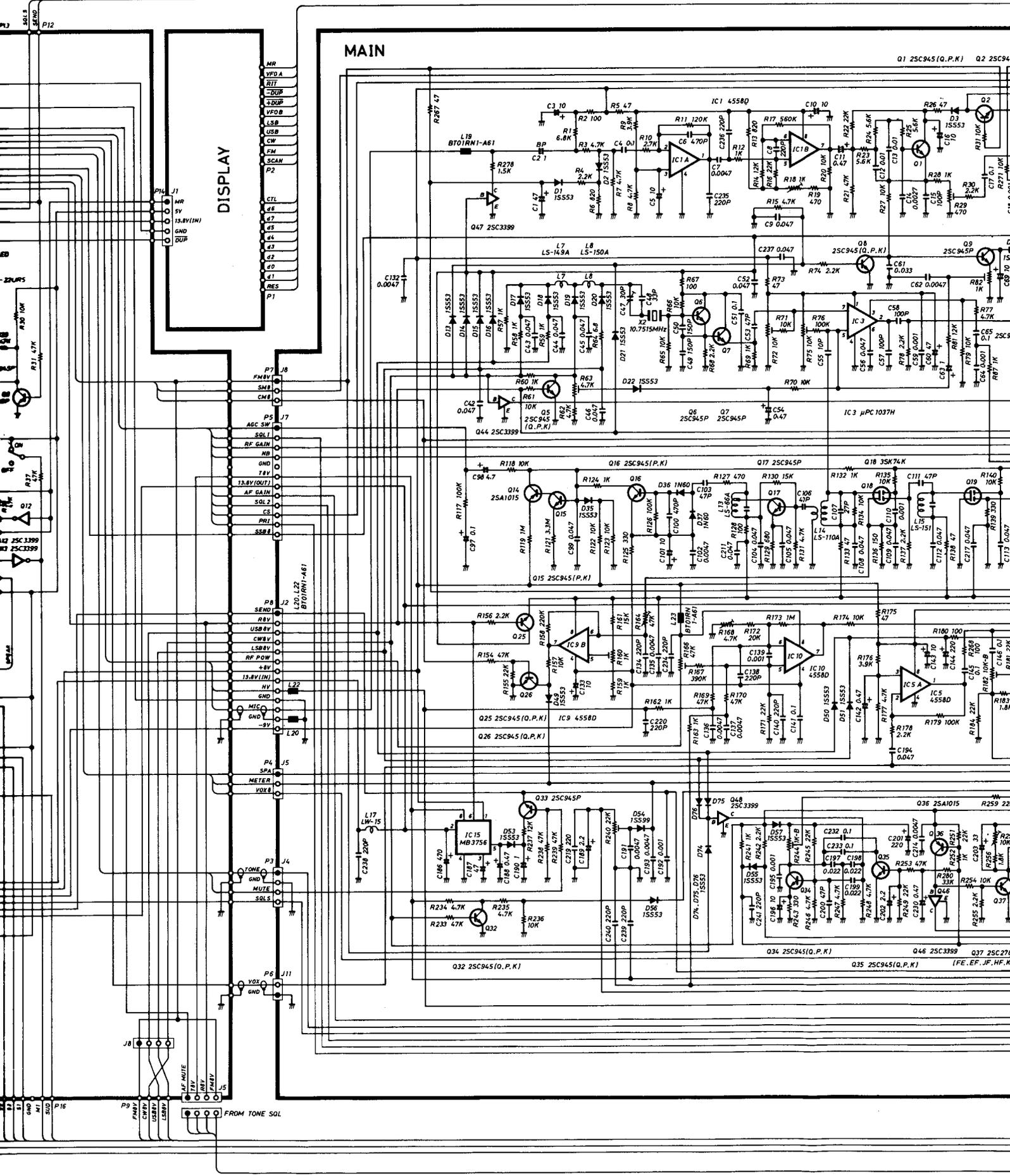




IC-271H SCHEMATIC DIAGRAM



AGRAM



(EF ~ LOGIC) (EF ~ CSS) (EF ~ TERMINAL) (EF ~ INTERFACE) (DISPLAY ~ LOGIC)

