VHF FM TRANSCEIVER

IC-V100

MAINTENANCE MANUAL

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FOREWORD

Thank you for purchase of the **ICOM IC-V100**, the most technologically advanced and sophisticated VHF mobile on the Land Mobile market today.

Utilizing sophisticated computer based technology and ICOM's precision VHF engineering, the **IC-V100** incorporates state-of-the-art design concepts to meet the demanding needs and requirements of the Land Mobile user.

ASSISTANCE

There are seven different versions of the **IC-V100**, including the U.S.A., U.K., and GENERAL models. This maintenance manual is designed to cover every version. Each model is assigned a particular code number as follows:

CODE NO.	VERSION	Band (MHz)	Output Power	Channel Spacing	Deviation
#01	U.S.A.	148 ~ 174	50W	25kHz	±5kHz
#02	U.S.A.	136 ~ 144	50W	25kHz	±5kHz
#03	U.K.	148 ~ 174	50W	12.5kHz	±2.5kHz
#05	General	148 ~ 174	50W	25kHz	±5kHz
#06	General	136 ~ 144	50W	25kHz	±5kHz
#07	General	148 ~ 174	25W	25kHz	±5kHz
#08	General	136 ~ 144	25W	25kHz	±5kHz

Please contact your nearest ICOM Service Center if you require assistance or information regarding the operation and capabilities of the **IC-V100**. Addresses are provided on the title page of this manual.

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SECTION 1 SPECIFICATIONS

GENERAL

Frequency range	:	136 ~ 144MHz (#02, #06, #08 versions) 148 ~ 174MHz (#01, #03, #05, #07 versions)
Number of channels	:	16 channels
Usable temperature	:	−30°C~+60°C
Voltage polarity	:	Negative ground
Quantity of semiconductors	:	ICs: 23 Transistors: 31 FETs: 6 Diodes: 62
Channel spacing	:	25kHz (#01, #02, #05, #06, #07, #08 versions) 12.5kHz (#03 version)
Frequency stability	:	±5ppm (−30°C~+60°C)
Antenna impedance	:	50 ohms
Power supply requirement	:	13.8V DC (±15%)
Current drain	:	Transmit 12A (50W) (#01, #02, #03, #05, #06 versions) 9A (25W) (#07, #08 versions) Receiver Standby: 0.5A AF max. power: 1.2A
Dimensions	:	170mm(W)×50mm(H)×260mm(D)
Weight	:	2.6kg

RECEIVER

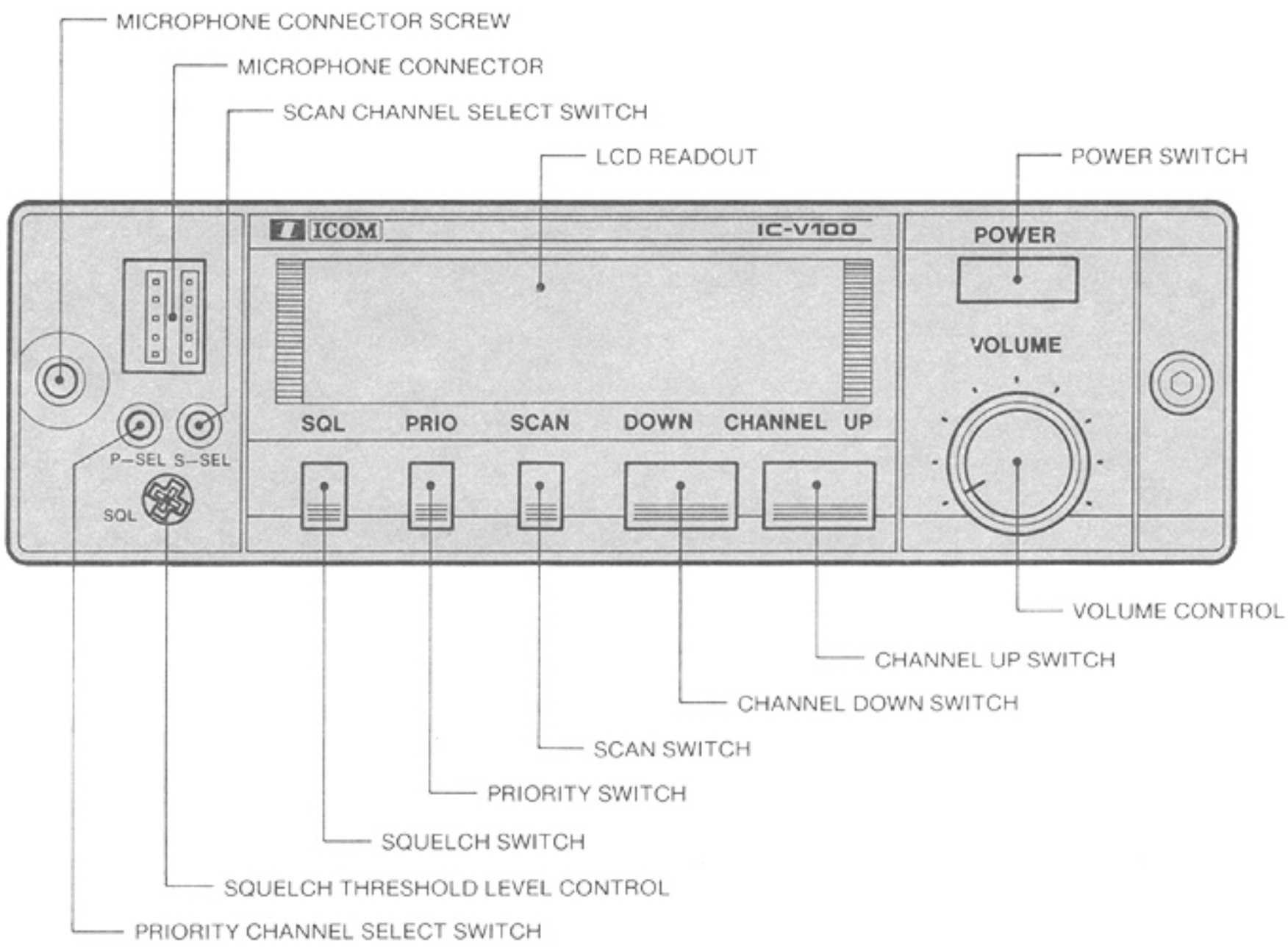
Receiving system	:	Double-conversion superheterodyne
Modulation acceptance	:	16K0F3E
Intermediate frequency	:	1st: 21.8MHz 2nd: 455kHz
Sensitivity	:	Less than 0.35μV for 12dB SINAD
Threshold squelch sensitivity	:	Less than 0.3μV
Spurious & image rejection	:	80dB
Selectivity	:	70dB minimum at adjacent channel
Intermodulation rejection	:	70dB
Audio output power	:	More than 5W at 10% distortion
Audio output impedance	:	4 ohms

TRANSMITTER

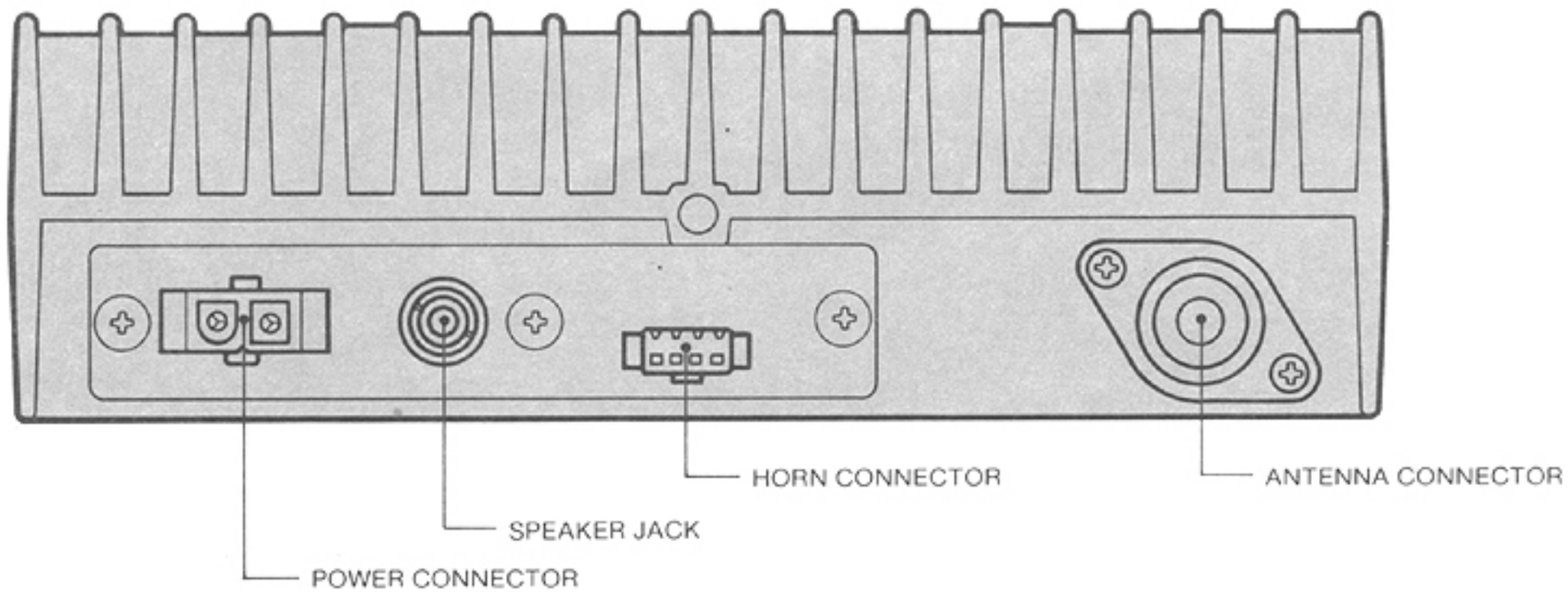
Output power	:	50W (#01, #02, #03, #05, #06 versions) 25W (#07, #08 versions)
Emission mode	:	16K0F3E
Modulation system	:	Variable reactance frequency modulation
Max. frequency deviation	:	±5kHz (#01, #02, #05, #06, #07, #08 versions) ±2.5kHz (#03 version)
Spurious & harmonic emissions	:	More than 70dB below peak power output

SECTION 2 OPERATING CONTROLS

FRONT PANEL

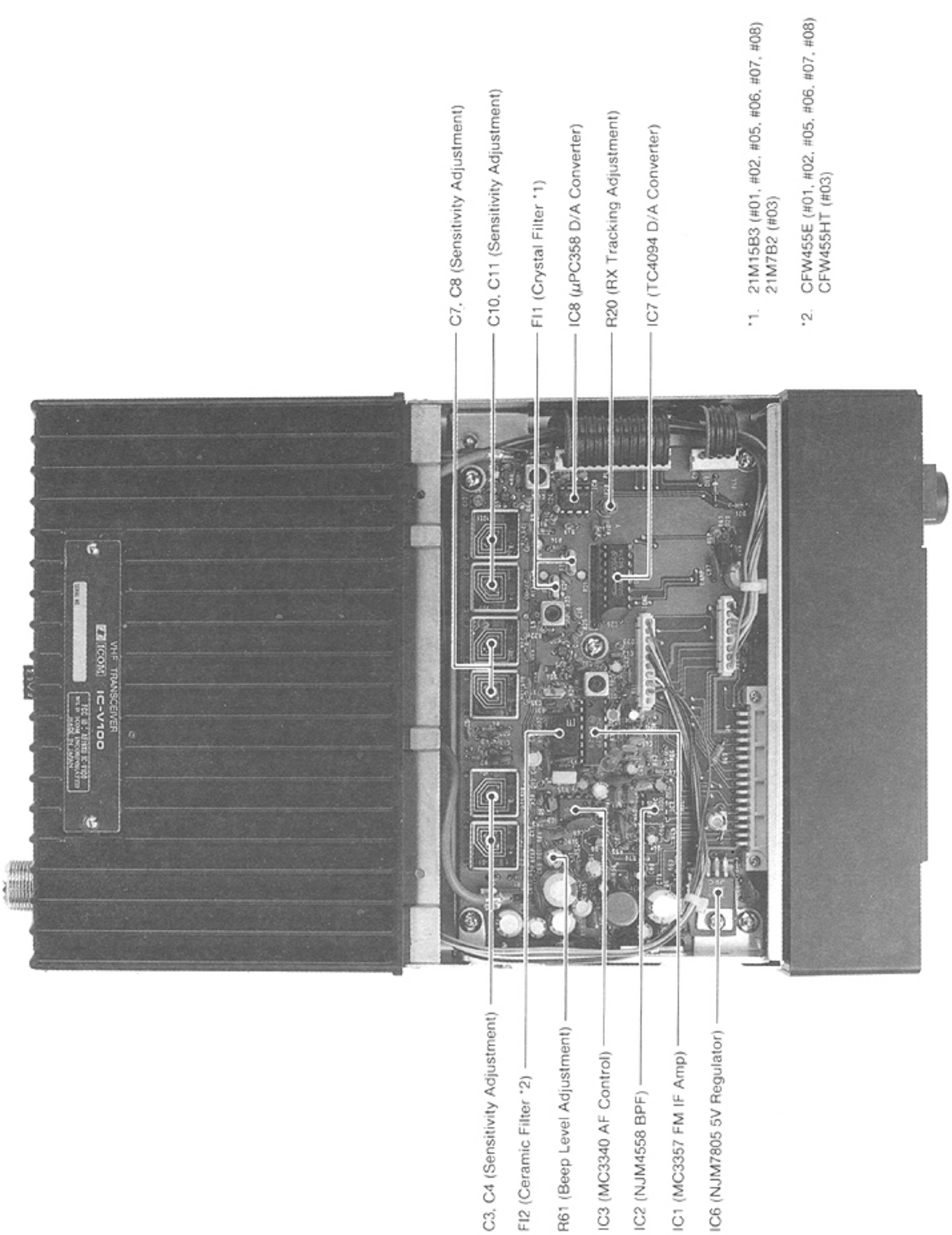


REAR PANEL



SECTION 3 INSIDE VIEWS

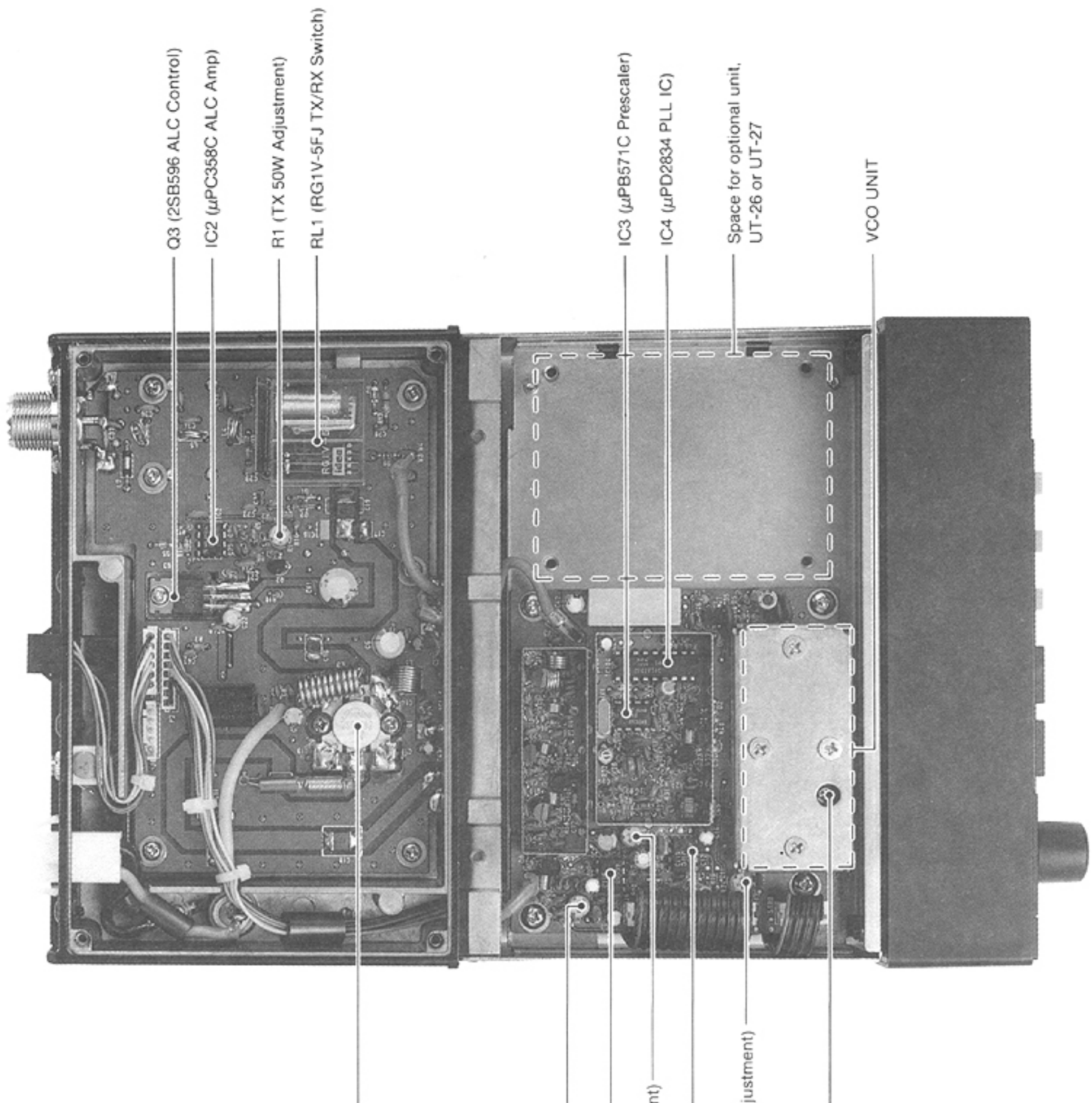
3 - 1 MAIN UNIT



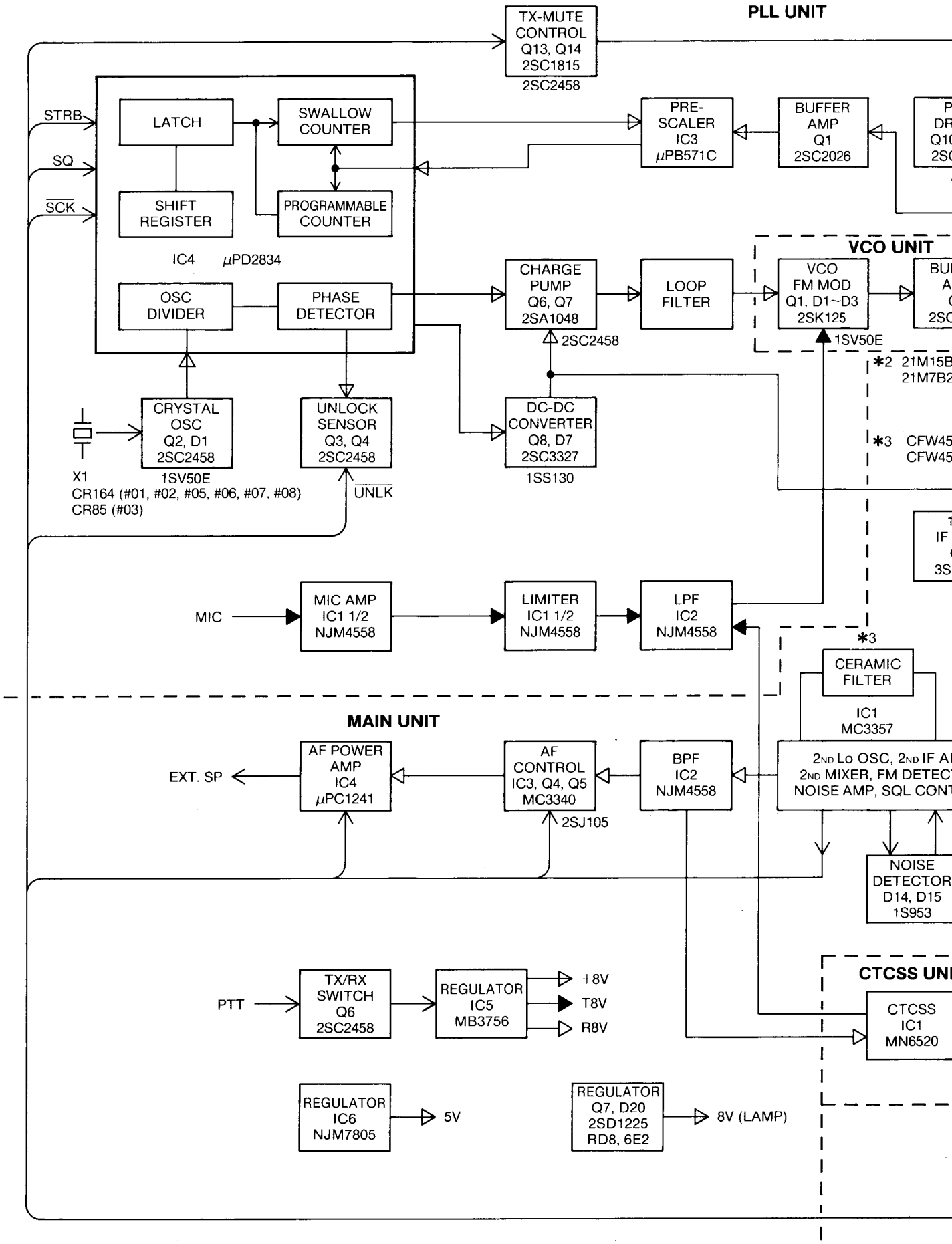
*1. 21M15B3 (#01, #02, #05, #06, #07, #08)
21M7B2 (#03)

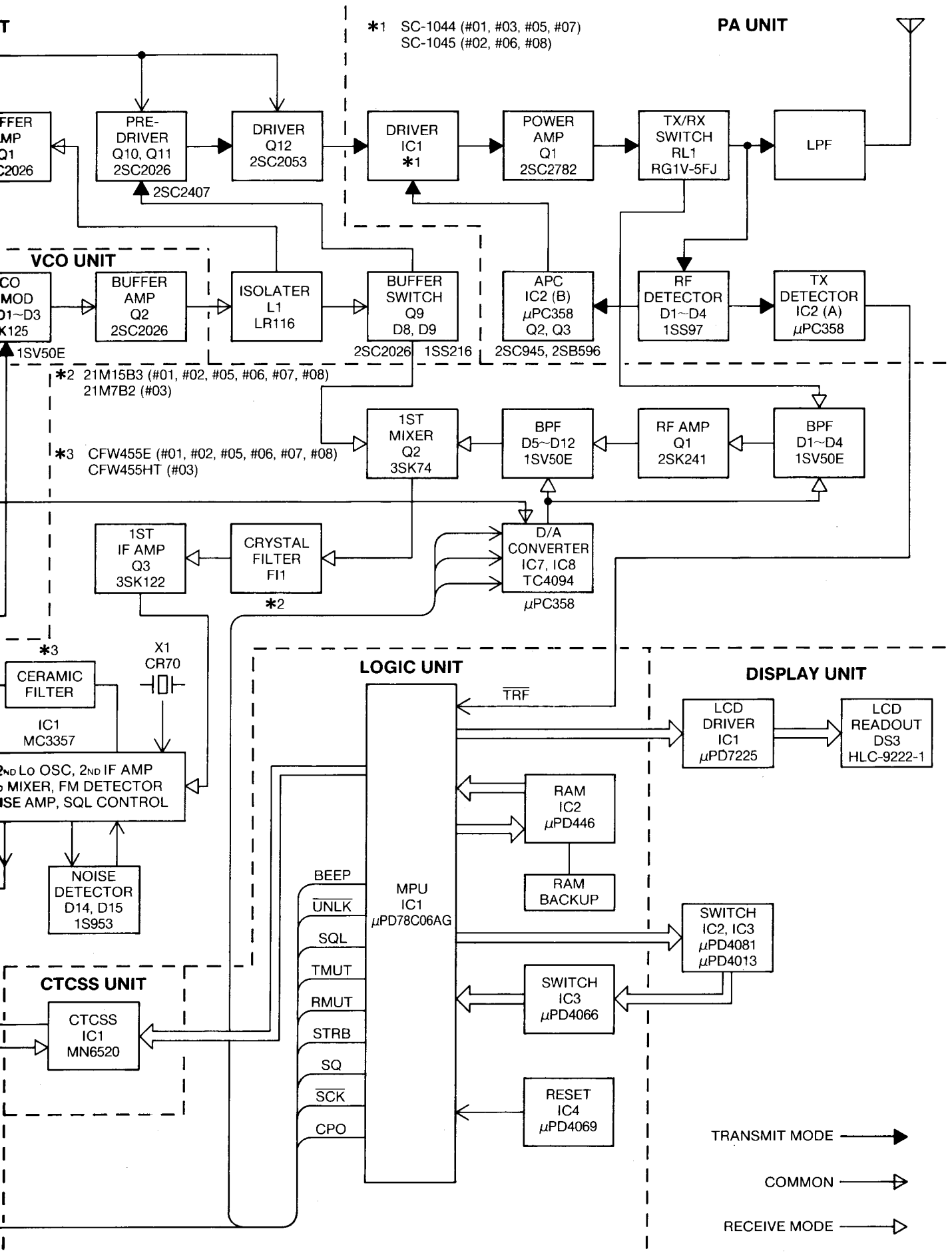
*2. CFW455E (#01, #02, #05, #06, #07, #08)
CFW455HT (#03)

3 - 2 PLL/PA UNITS



SECTION 4 BLOCK DIAGRAM




*1 SC-1044 (#01, #03, #05, #07)
SC-1045 (#02, #06, #08)
PA UNIT
PRE-DRIVER Q10, Q11 2SC2026
DRIVER Q12 2SC2053
DRIVER IC1 *1
POWER AMP Q1 2SC2782
TX/RX SWITCH RL1 RG1V-5FJ
LPF
2SC2407
VCO UNIT
BUFFER AMP Q2 2SC2026
ISOLATER L1 LR116
BUFFER SWITCH Q9 D8, D9
2SC2026 1SS216
APC IC2 (B) μPC358 Q2, Q3
2SC945, 2SB596
RF DETECTOR D1~D4 1SS97
TX DETECTOR IC2 (A) μPC358
1SV50E
*2 21M15B3 (#01, #02, #05, #06, #07, #08)
21M7B2 (#03)
*3 CFW455E (#01, #02, #05, #06, #07, #08)
CFW455HT (#03)
1ST MIXER Q2 3SK74
BPF D5~D12 1SV50E
RF AMP Q1 2SK241
BPF D1~D4 1SV50E
1ST IF AMP Q3 3SK122
CRYSTAL FILTER FI1
*2
D/A CONVERTER IC7, IC8 TC4094
μPC358
*3
X1 CR70
CERAMIC FILTER
IC1 MC3357
2ND LO OSC, 2ND IF AMP
MIXER, FM DETECTOR
NOISE AMP, SQL CONTROL
NOISE DETECTOR D14, D15 1S953
LOGIC UNIT
DISPLAY UNIT
TRF
LCD DRIVER IC1 μPD7225
LCD READOUT DS3 HLC-9222-1
RAM IC2 μPD446
RAM BACKUP
BEEP
UNLK
SQL
TMUT
RMUT
STRB
SQ
SCK
CPO
MPU IC1 μPD78C06AG
SWITCH IC2, IC3 μPD4081 μPD4013
SWITCH IC3 μPD4066
RESET IC4 μPD4069
CTCSS UNIT
CTCSS IC1 MN6520
TRANSMIT MODE
COMMON
RECEIVE MODE

SECTION 5 CIRCUIT DESCRIPTION

5 - 1 RECEIVER CIRCUITS

1. ANTENNA SWITCHING CIRCUIT (PA UNIT)

The reception signals enter from the antenna connector (J3) and pass through the low-pass filter consisting of L4~L6 and C31~C37. The reception signals switched by the transmission/reception switching relay are fed into the main unit J1 through P5.

2. RADIO FREQUENCY AMPLIFIER (MAIN UNIT)

Reception signals fed from J1 are passed through the bandpass filter consisting of D1~D4 and pattern coils to eliminate unnecessary signals from the band.

The signals which have passed through the bandpass filter are amplified by N-channel MOS FET of Q1 for high-gain and low-noise amplification.

The signals amplified by Q1 pass through the bandpass filter consisting of D5~D12 and pattern coils, then enter the 1st gate of the mixer Q2. The local oscillator output from PLL unit is injected into the 2nd gate of this FET. Mixed with this signal they are converted to the 1st intermediate frequency (21.8MHz).

3. INTERMEDIATE FREQUENCY CIRCUIT (MAIN UNIT)

The 1st intermediate frequency converted to 21.8MHz is turned into a necessary band by the crystal filter of FI1 and then amplified by the IF amplifier of Q3. The amplified signals undergo matching with L6 and enter IC1 (PIN 16) of the next stage.

IC1 is an IC chip for FM-IF. The amplifier for the 2nd local oscillator, the 2nd mixer, the limiter amplifier, the quadrature detector and the active filter are collected in one package.

The signal which entered IC1 (PIN 16) is mixed with the 2nd local oscillator of C34, C35, crystal X1 (21.345MHz), and emitted from PIN 3 as the 2nd intermediate frequency of 455kHz. This signal passes through the high-performance ceramic filter of FI2, enters PIN 5, and is detected through the limiter amplifier. The phase delay element (X2) is used in the detection circuit to improve temperature characteristics.

4. AUDIO FREQUENCY AMPLIFICATION CIRCUIT (MAIN UNIT)

The detection output from IC1 (PIN 9) passes through the deemphasis circuits of R36 and C50, and enters the low frequency amplifier of IC2(A). The out-of-band signals are removed from the amplified output by the high-pass filter consisting of IC2(B), and after the volume is controlled by the IC3 electronic volume control, the output is amplified by IC4 to drive the speaker.

5. SQUELCH CIRCUIT

The noise components of more than 20kHz from the detection output are amplified by IC1, then are rectified by D14 and D15. This rectified voltage actuates the squelch trigger circuit of IC1 and makes the squelch control signal enter from PIN 13 to MPU (PIN 15). MPU emits the RMUT (receiver mute) signal and squelches by turning ON/OFF the FET switch of Q5.

Unless there is DOUT output, the RMUT signal is not activated by the squelch control signal only.

Q4 is to remove the channel switching noise generated by scanning, and applies gate voltage to Q8 when the strobe signal is emitted to prevent noise.

5 - 2 TRANSMITTER CIRCUITS

1. MIC AMP CIRCUIT (PLL UNIT)

The audio signal from the microphone, after preemphasis of 6dB/oct at 300Hz~3kHz by C1 and R1, is amplified by IC1(A) and is limiter-amplified by IC1(B). Components over 3kHz of the signal are cut out by the splatter filter of IC2(A) and the expansion of unnecessary bands is inhibited. The signal enters the VCO unit as an FM modulation signal.

2. MODULATION CIRCUIT (VCO UNIT)

The modulation signal is applied to the varicap of D5 and FM modulation is carried out as it enters the gate of Q1 through C4 in the direct modulation system for VCO.

3. DRIVING AMPLIFICATION CIRCUIT (PLL UNIT)

The output resulting from distributing the VCO output via the isolation circuit consisting of L1 and R17~R23 is amplified by Q9. The amplified output is passed through D8 by the diode switch from D8 and D9 during reception, and enters the 1st mixer of Q2.

During transmission, the amplified output above passes through D9, is amplified by the wide-band amplification circuit consisting of Q10, Q11 and Q12, and enters the PA unit from J3.

4. POWER AMPLIFICATION CIRCUIT (PA UNIT)

The transmission output from the PLL unit enters IC1 (PIN 1).

IC1 is an RF power module which can attain 10W with an input of 200mW and can obtain stable output over a broad band. The output from the power module drives the power transistor Q1 of the final stage to attain output of 50W. An impedance conversion circuit is incorporated inside Q1, and by combining this with the use of the strip line, the output becomes broad-band.

5. LOW-PASS FILTER CIRCUIT (PA UNIT)

The output from Q1 passes through the transmission/reception switching relay of RL1, and spurious high harmonics are fully suppressed by the 3-stage low-pass filter consisting of L4~L6 and C31~C37.

Also, SWR is detected by D1~D4, and this voltage is used as the control voltage of ALC and that of the "TX" indicator.

6. ALC CONTROL CIRCUIT (PA UNIT)

The voltage detected by D1~D4 enters the inverting amplifier consisting of IC2(B), changes the bias voltage of Q2 based on the output voltage of IC2(B), and controls the collector voltage of Q3. This voltage enters IC1 (PIN 2) and controls transmission output.

7. TRANSMISSION DISPLAY CIRCUIT (PA UNIT)

IC2(A) is an open loop and used as a comparator. When the detection voltage of SWR enters IC2(A), the output becomes LOW level. This output enters MPU PIN 13 and serves as the control signal of the LCD "TX" indicator.

Even with the transceiver in the transmit mode, the "TX" display is not displayed when SWR voltage is detected.

5 - 3 PLL CIRCUITS

1. VCO CIRCUIT

In this circuit the strip line and the varicap consisting of D1~D4 are adopted to make wide-band oscillation. The junction type FET Q1 performs the oscillation.

The oscillation output is passed through the buffer amplifier of Q2 to improve the C/N (Carrier to Noise ratio) characteristics through C9.

2. PLL CIRCUIT

The VCO output passes through the isolation circuit consisting of R17~R23 and enters the prescaler. The dual modulus prescaler system is adopted in PLL. In this system the object frequency is directly oscillated by the VCO.

The signal which passed through isolation circuit is buffer-amplified by Q1 and is then divided at IC3 and IC4 by N-data from the MPU. The divided signal is then phase detected with the reference oscillator frequency in IC4 and outputs a detector signal from pins 12 and 13.

This output is received at the charge pump circuit of Q6 and Q7 with high power source voltage (+20V), and is applied to the VCO unit as PD (Phase Detector) signal through the loop filter consisting of R44, R45, C35 and C36, to control VCO.

Incidentally, the N-data is the value obtained by dividing the object frequency (transmission frequency during transmission, 1st local oscillator frequency during reception) by the reference frequency.

$$N = \frac{\text{Object frequency}}{\text{Reference frequency}}$$

3. REFERENCE FREQUENCY OSCILLATION CIRCUIT

The oscillator circuit consists of X1, Q2, a thermistor (R28, R30), and the varicap of D1. The oscillation circuit composes a reference oscillation circuit which is highly stable in a wide temperature range. The reference oscillation is divided inside IC4 to attain 12.5kHz.

4. UNLOCK DETECTION CIRCUIT

When PLL is unlocked, IC4 PIN 10 becomes LOW level and the unlock detection circuit consisting of Q3 and Q4 sends the unlock (UNLK) signal to MPU.

With the unlock signal, MPU PIN 31 emits TMUT (Transmit Mute) signal to turn ON Q14 and turn OFF Q13, removing the base bias of Q10~Q13 and thus controlling transmission output.

Also, a part of the frequency obtained when the reference oscillation is divided by IC4 enters the booster circuit consisting of Q8, D7, L4, from Q8, and supplies the high voltage (+20V) to be used in the charge pump and main unit.

5 - 4 DISPLAY UNIT

1. DISPLAY CIRCUIT

For display, the LCD driver is used to drive the LCD by 1/2 duty and 1/2 bias.

The bias voltages are generated by the 5V and resistor divider consisting of R2 and R3. The divided bias voltages are supplied to each terminal of VLC1, VLC2 and VLC3, and the LCD segment is displayed by COM0, COM1, S0~S31.

2. OPERATION CIRCUIT

The SCAN (S5), UP (S6) and DOWN (S7) SWITCHES each control the MPU directly.

PRIORITY SWITCH (S8) displays PRIORITY INDICATOR "O", and makes the MPU take the PRIORITY function by turning Q1 and Q2 ON/OFF through the flip-flop of IC3(A).

As for ON/OFF of the squelch circuit SQUELCH SWITCH (S2) is connected by the flip-flop of IC3(B), and the voltage of SQLV line is lowered by this IC3(A) output to open the squelch circuit. At the same time the monitor terminal (PIN 42) of MPU is turned to LOW level and tone squelch is also turned OFF.

SCAN CHANNEL SELECT SWITCH (S-SEL) and PRIORITY CHANNEL SELECT SWITCH (P-SEL) which are located underneath the mic connector cover, are secondary functions of the MPU when the FUNC switch is pressed. Q3 makes the FUNC terminal on the MPU "LOW".

5 - 5 LOGIC UNIT

This unit consists of the 8-bit CMOS type MPU (μPD78C06AG) and CMOS type RAM (μPD446C), and mainly displays frequency and tone frequency.

1. MPU

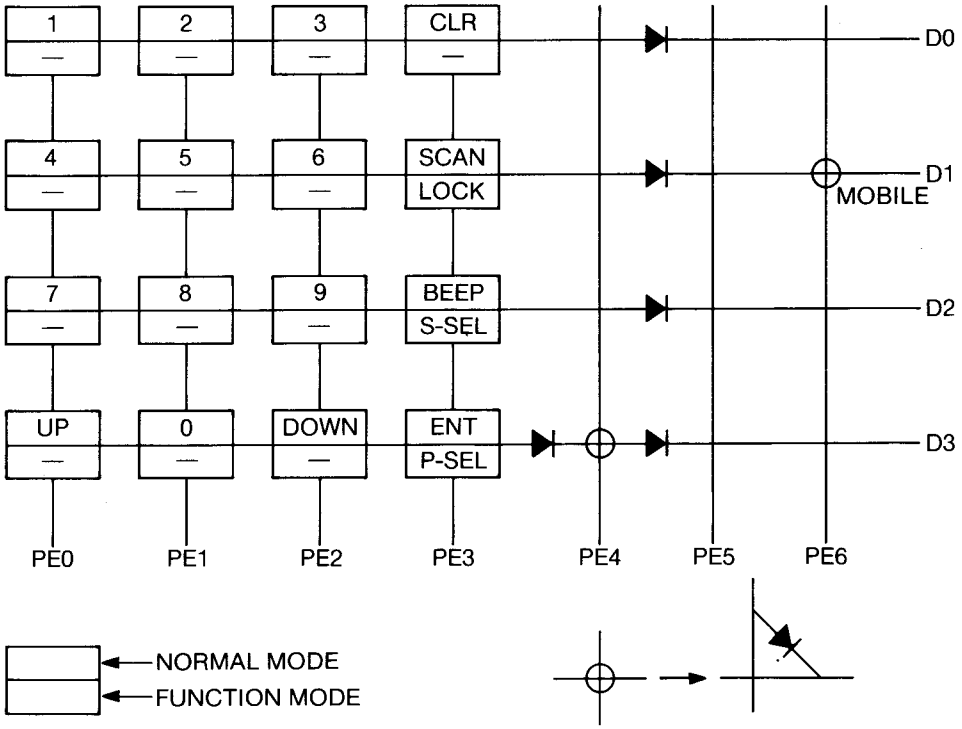
The MPU μPD78C06AG which mainly performs control incorporates a 4K-byte ROM and a 128-byte RAM in the chip.

The ports are distributed as follows.

(1) DATA BUS (DB0~DB7)
This is an 8-bit data bus which performs data exchange with the 2K-byte RAM. Incidentally, DB0~DB3 are also used as matrix input.

(2) ADDRESS BUS
(a) PORT E (PE0~PE15)
This is a 16-bit port which can switch ADDRESS and OUTPUT ports according to the program. PE15 is used for the RAM ENABLE signal and PE0~PE10 for ADDRESS signals. Also, PE14 and PE0~PE3 are used for output signals for MATRIX, whereas PE0 is used for the COMMAND/DATA switching signal of the LCD driver.

THE MATRIX OF DATA AND ADDRESS BUS

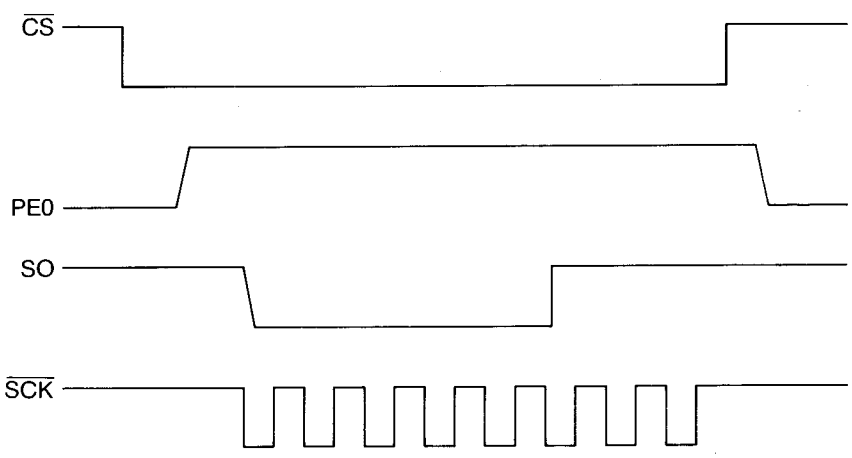


(b) PORT A (PA0~PA7)
This is an 8-bit output port with latch.

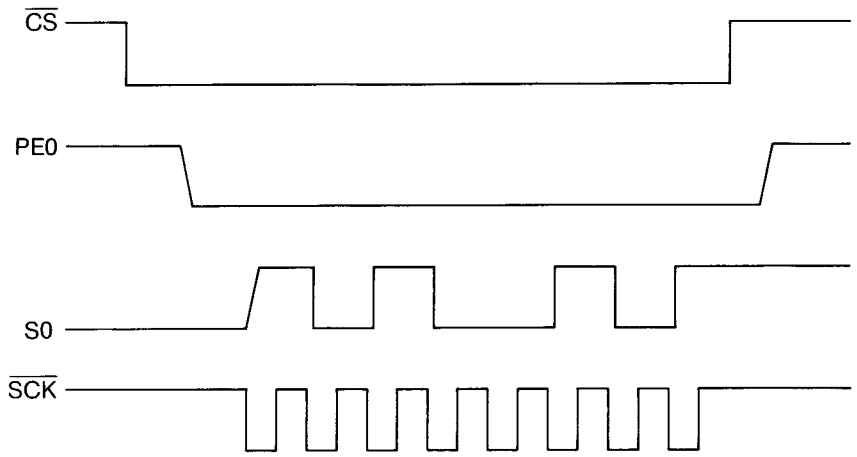
- PA7 (CS)

This is an ENABLE signal, which becomes LOW level when COMMAND/DATA is given.

AT COMMAND TRANSMITTING (CODE 0E, 0H BLINKING ON)



AT DATA TRANSMITTING (DATA 0A, 5H)



• PA4 (TMUT)
When switching from reception to transmission, this terminal becomes HIGH level for approximately 60 milliseconds.

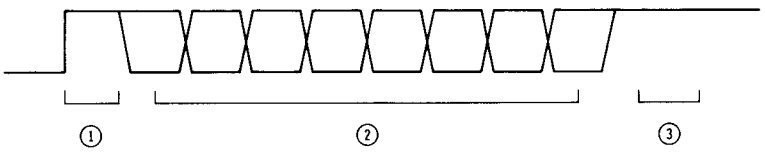
Incidentally, when unlocking in the transmission mode, HIGH level is attained.

• PA3 (RMUT)
When the reception is muted, this port becomes HIGH level.

• PA2 (COPY)
This is a data cloning switch.

• PA1 (COP)
This generates the cloning data.

CLONING DATA CONSTRUCTION



① START bit
② DATA bits
③ STOP bit

• PA0 (STRB)
This outputs the latch signal for the PLL data.

(c) PORT B (PB0~PB7)
This is an 8-bit port which can switch over INPUT/OUTPUT per bit according to the program.

• PB7 ($\overline{\text{MONI}}$)
This is the monitor switch input port.

• PB6 ($\overline{\text{T}}$/R)
This emits the CTCSS transmission/reception switching signal. It becomes LOW level during transmission and HIGH level during reception. When the tone number is 0, these levels are reversed.

• PB5~PB0 (S0~S5)
These generate CTCSS data.

(d) PORT C (PC0~PC5)
This is a 6-bit input port.

• PC5 ($\overline{\text{BUSY}}$)
This is the BUSY signal input port for the LCD driver.

• PC4 ($\overline{\text{FUNC}}$)
This is the function switch input port. If this port's level is LOW when the power is ON, it serves as the reception input of cloning.

• PC3 ($\overline{\text{TRF}}$)
This is the input port for the transmission output indicator.

"TX" INDICATOR appears on the LCD when this port is HIGH level.

• PC2 (SEND)
This is the transmission/reception switching signal input port, which becomes ready for transmission at HIGH level.

• PC1 (SQL)
This is the squelch open signal input port, which becomes HIGH level at OPEN.

• PC0 (UNLK)
This is the PLL unlock signal input port, which attains LOW level during the unlock period.

(e) OTHER PORTS

• INT0

This is the detector signal input port of the CTCSS decoder.

When this port is at HIGH level, it makes the LCD display "CALL".

• INT1

This is the reset signal input port. When the power is turned OFF this port becomes HIGH level, cancels the LCD, initializes each port and enters the standby mode.

• S0

This is the output port of the shift register inside the MPU, and it outputs N-data and LCD COMMAND/DATA.

• $\overline{SCK}$

This is the S0 data output timing signal port. S0 varies at the end of SCK.

• $\overline{RD}$

This outputs the timing signal when reading external memory.

• $\overline{WR}$

This outputs the timing signal when writing external memory.

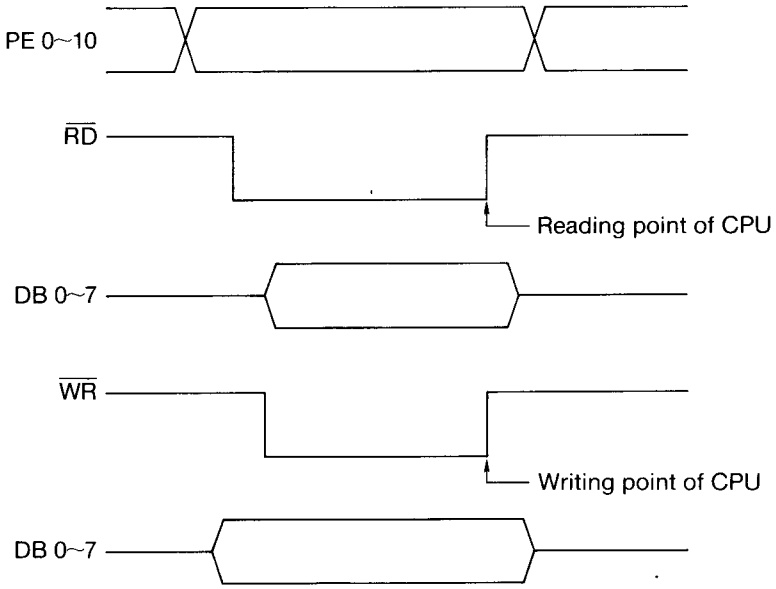
2. RAM

μPD446C is a CMOS 2048-word 8-bit RAM.

This RAM memorizes the channel, priority channel, transmission/reception N-data, tone number, shift frequency, tone data table, etc. in current use.

Reading and/or writing data is performed by the timing signal of RD and/or WR according to the address specified by PE0~PE10 of MPU.

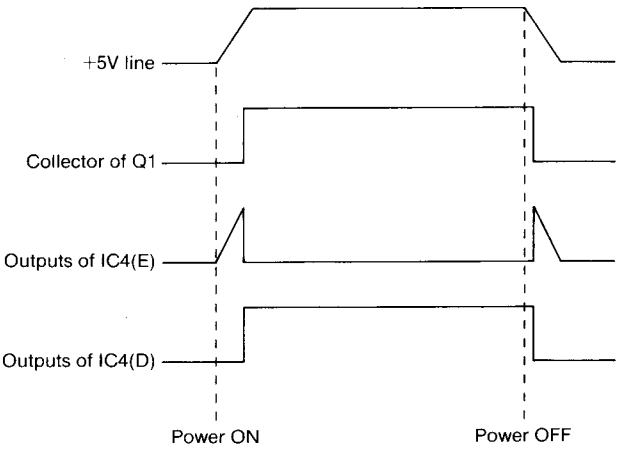
TIMING CHART OF MEMORY READ/WRITE



3. RESET CIRCUIT

When the power is ON, if the voltage of the +5V line rises, Q1 gets turned ON and the collector becomes HIGH level. When the Q1 collector becomes HIGH level, the IC4(E) output becomes LOW level. Then the IC4(D) output level turns from LOW to HIGH and resets the MPU and LCD driver. When the power is OFF, Q1 is OFF and the IC4(E) output becomes HIGH level to make MPU stand by.

RESET TIMING CHART



5 - 6 CTCSS UNIT

IC1 is a programmable CTCSS encoder/decoder. By using crystal for the reference oscillator, high frequency stability is attained and 37 kinds of tone are generated.

To determine the tone frequency, the code corresponding to the tone number is given to S0~S5 and set out by MPU.

The T/R terminal transmits at LOW level and receives at HIGH level by transmission/reception switching of IC1.

When the unit is transmitting, if the tone number is 0, the level becomes HIGH and no tone is output; if the tone number is any other number, the level becomes LOW.

SECTION 6 MECHANICAL PARTS AND DISASSEMBLY

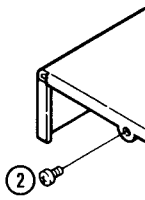
6 - 1 CHASSIS DISASSEMBLY

1. Unscrew and remove the 2 hex socket screws ① from the front panel using the supplied accessory hex wrench. Remove the CONTROL HEAD.

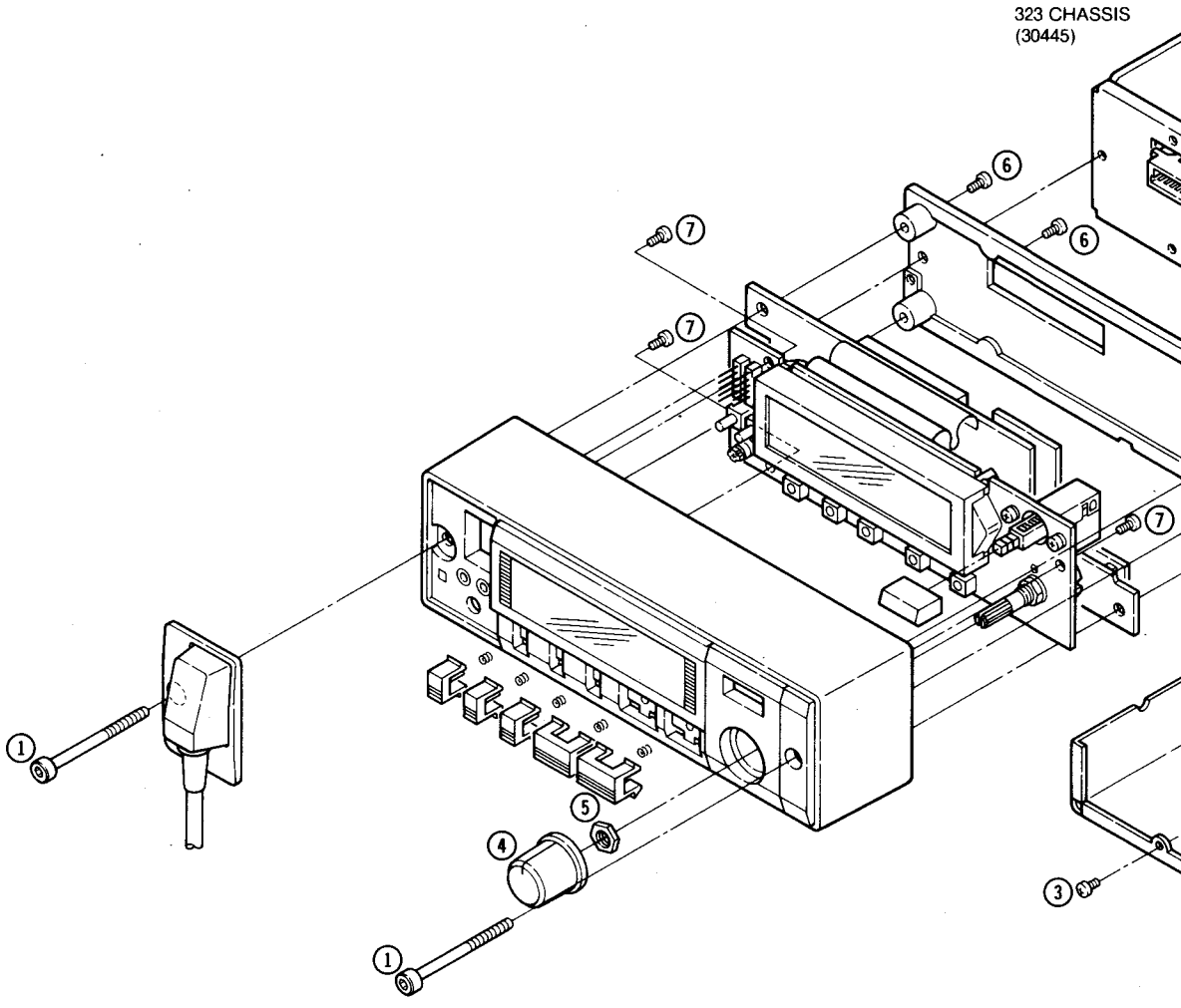
2. Unscrew and remove the 4 screws ② from the top cover and the 4 screws ③ from the bottom cover. Remove the top and bottom cover.

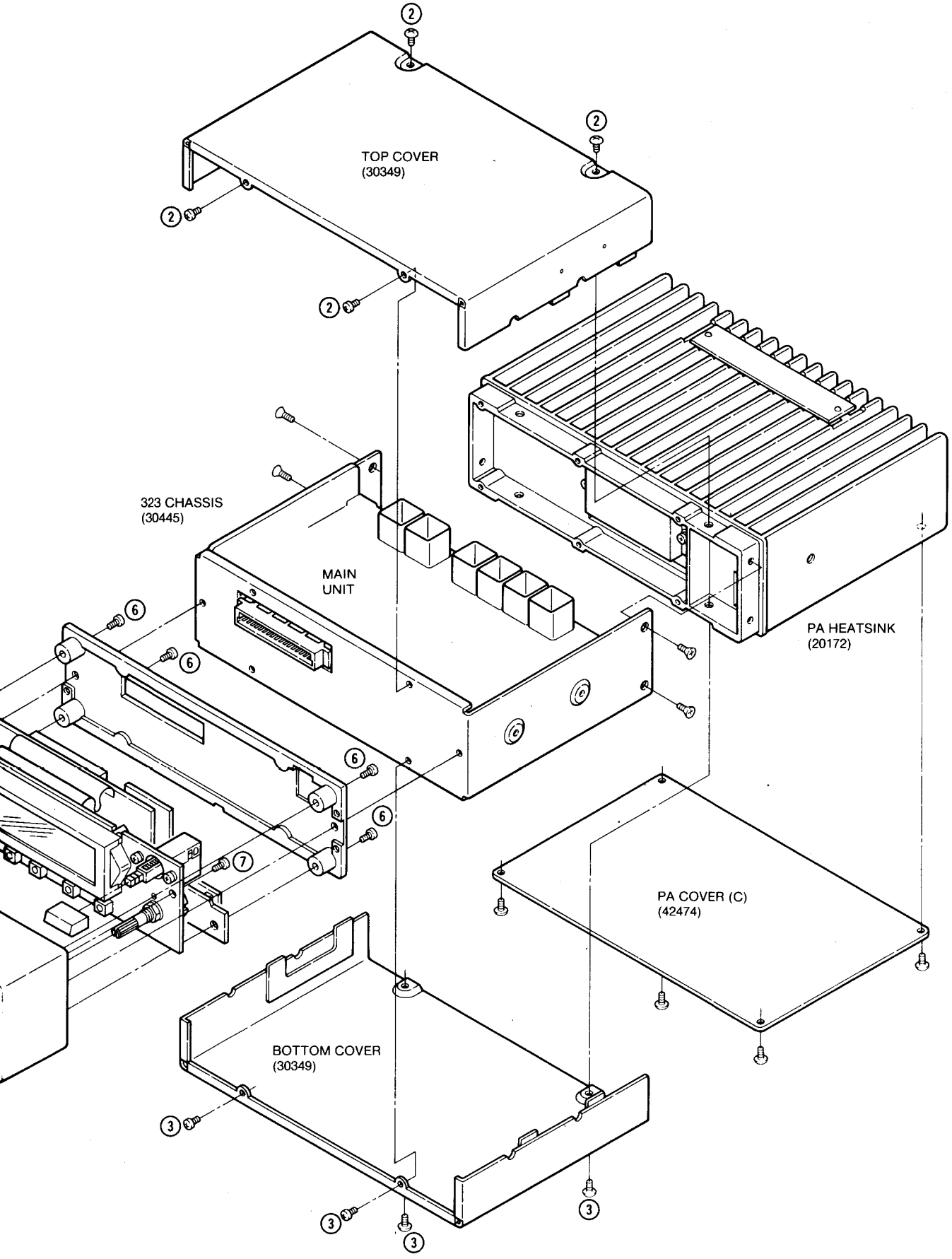
3. Remove the volume control knob ④ and the hex nut ⑤.

4. Unscrew and remove the 4 screws ⑥ from the front cover and the 3 screws ⑦ from the DISPLAY unit. Remove the front panel.

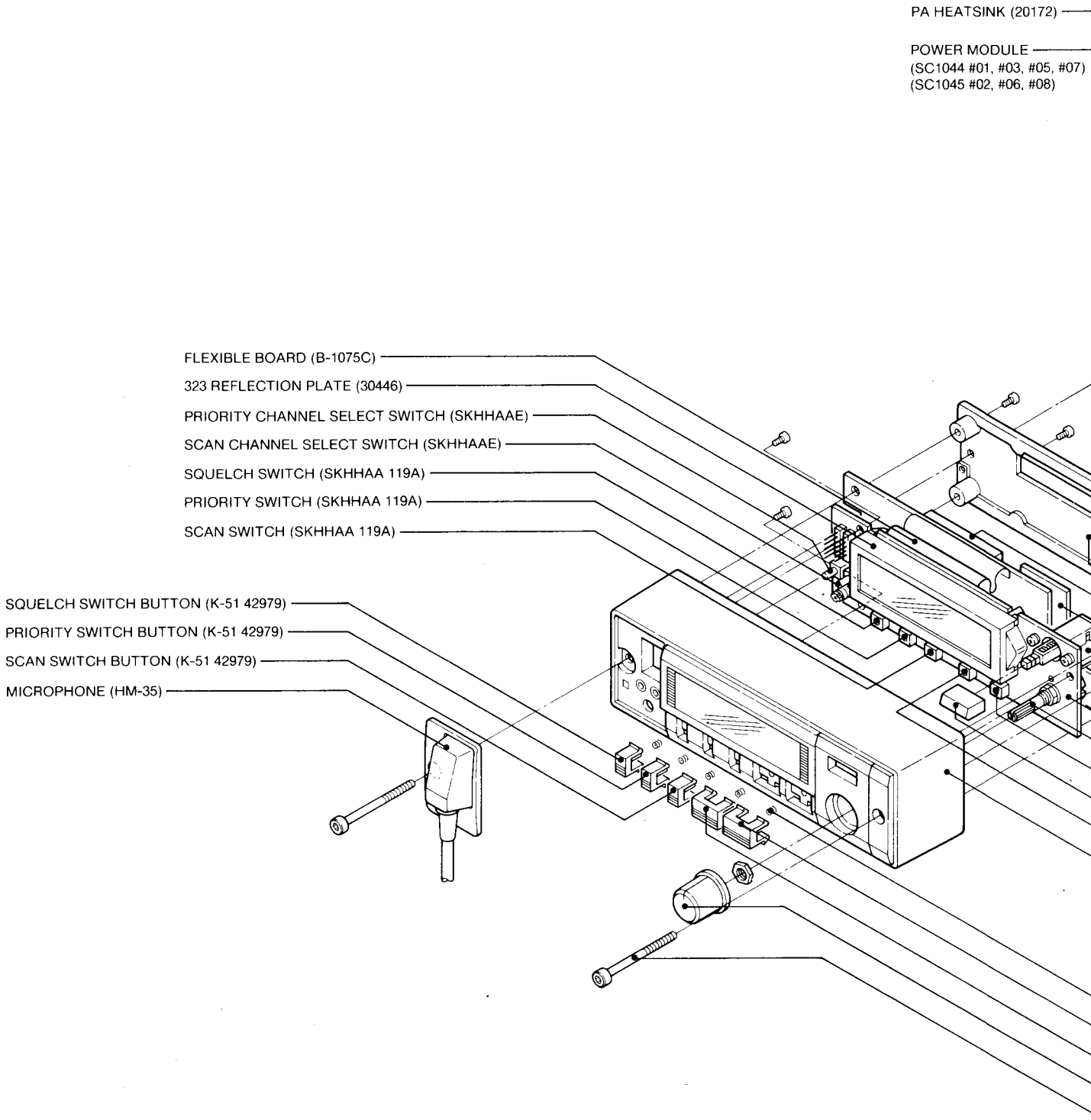


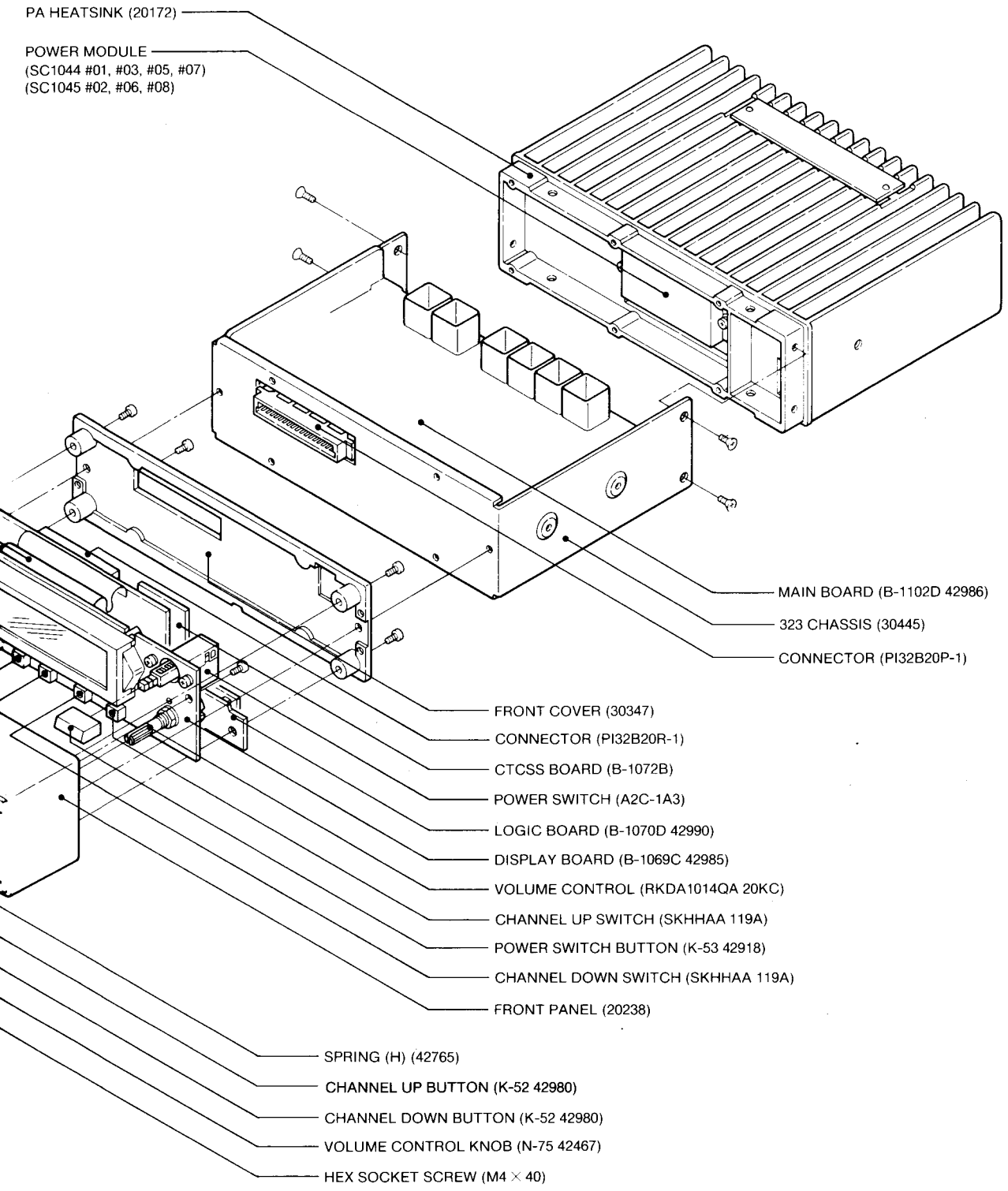
323 CHASSIS
(30445)



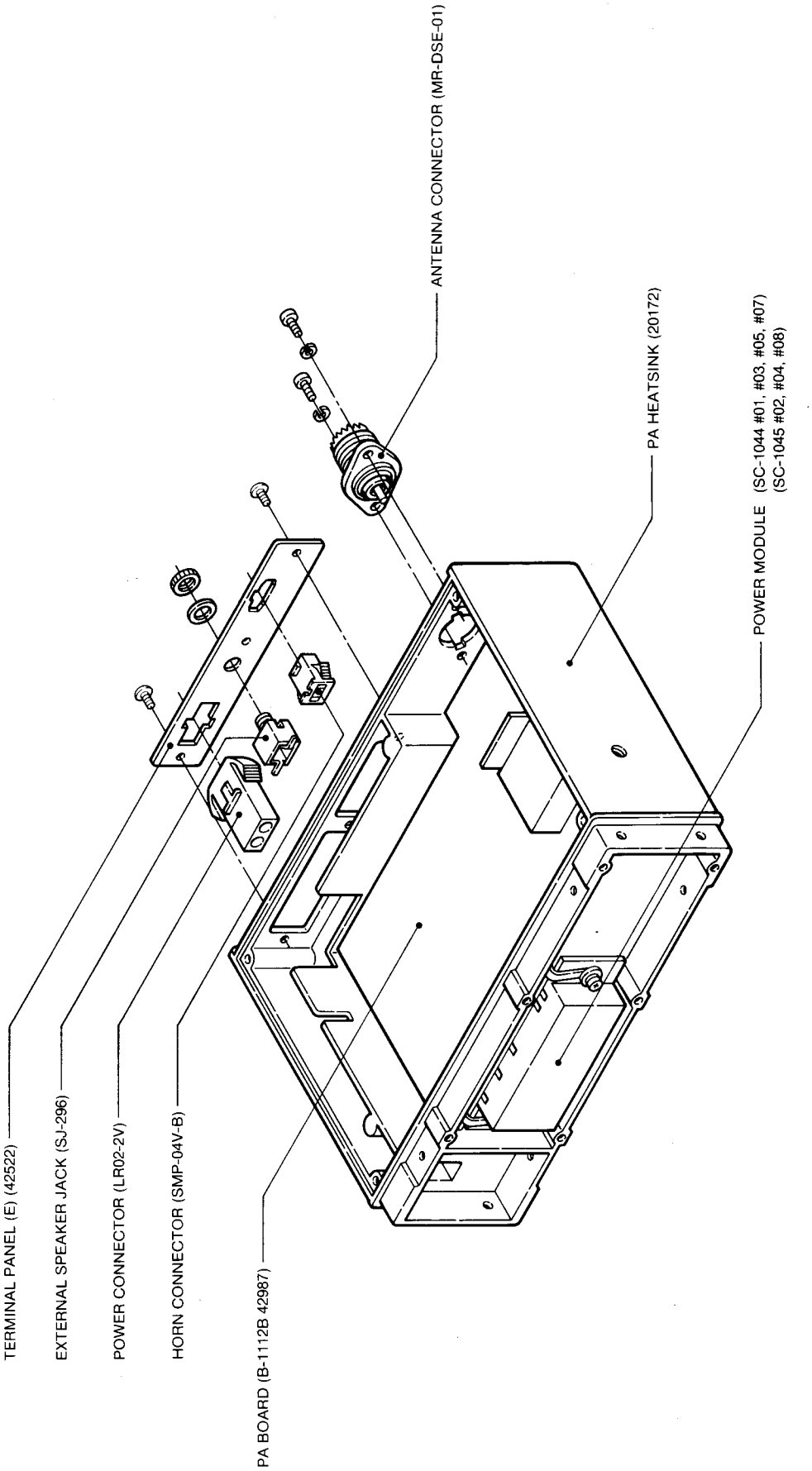

TOP COVER
(30349)
323 CHASSIS
(30445)
MAIN
UNIT
PA HEATSINK
(20172)
PA COVER (C)
(42474)
BOTTOM COVER
(30349)

6 - 2 CONTROL HEAD DISASSEMBLY

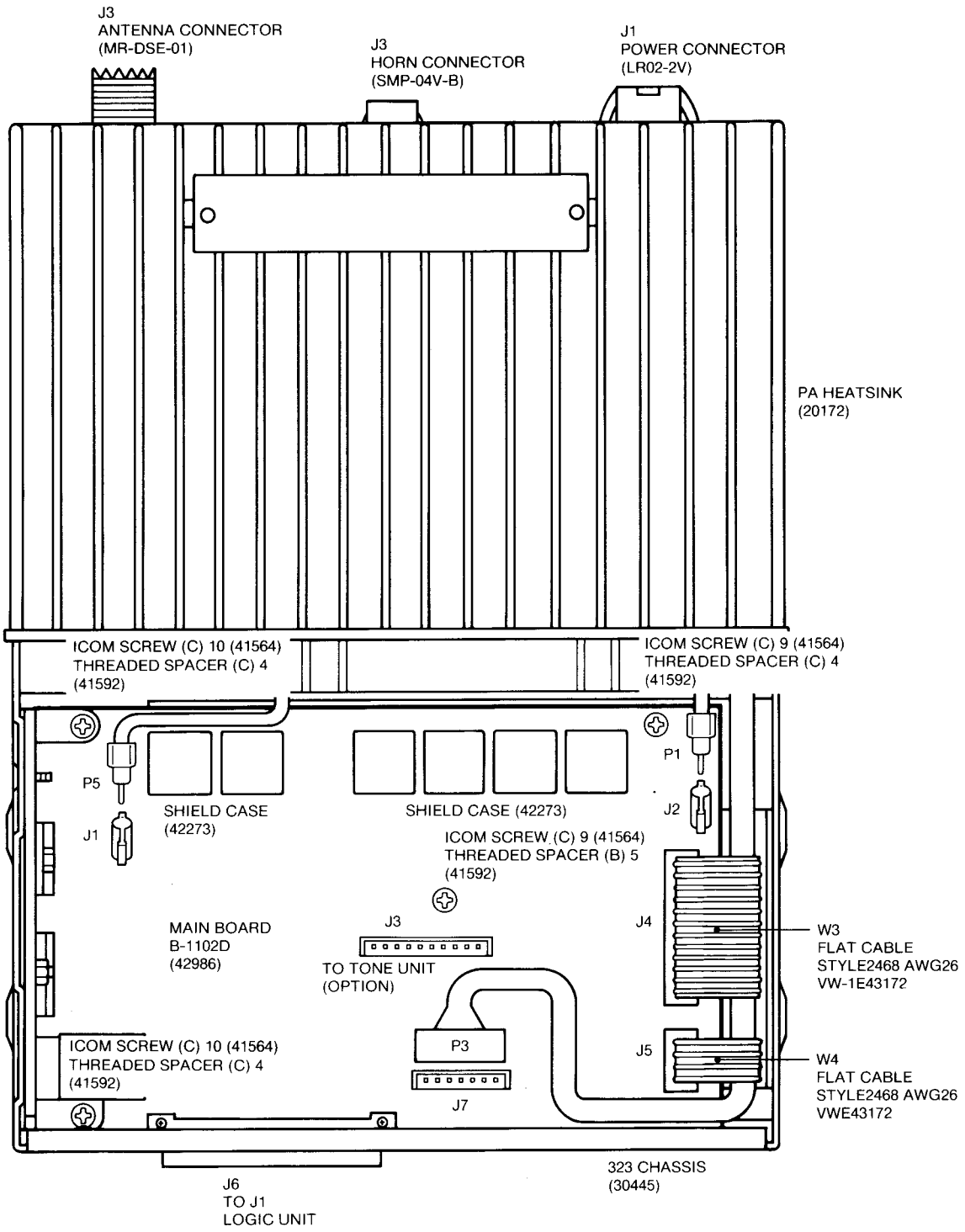



PA HEATSINK (20172)
POWER MODULE
(SC1044 #01, #03, #05, #07)
(SC1045 #02, #06, #08)
MAIN BOARD (B-1102D 42986)
323 CHASSIS (30445)
CONNECTOR (PI32B20P-1)
FRONT COVER (30347)
CONNECTOR (PI32B20R-1)
CTCSS BOARD (B-1072B)
POWER SWITCH (A2C-1A3)
LOGIC BOARD (B-1070D 42990)
DISPLAY BOARD (B-1069C 42985)
VOLUME CONTROL (RKDA1014QA 20KC)
CHANNEL UP SWITCH (SKHHAA 119A)
POWER SWITCH BUTTON (K-53 42918)
CHANNEL DOWN SWITCH (SKHHAA 119A)
FRONT PANEL (20238)
SPRING (H) (42765)
CHANNEL UP BUTTON (K-52 42980)
CHANNEL DOWN BUTTON (K-52 42980)
VOLUME CONTROL KNOB (N-75 42467)
HEX SOCKET SCREW (M4 × 40)

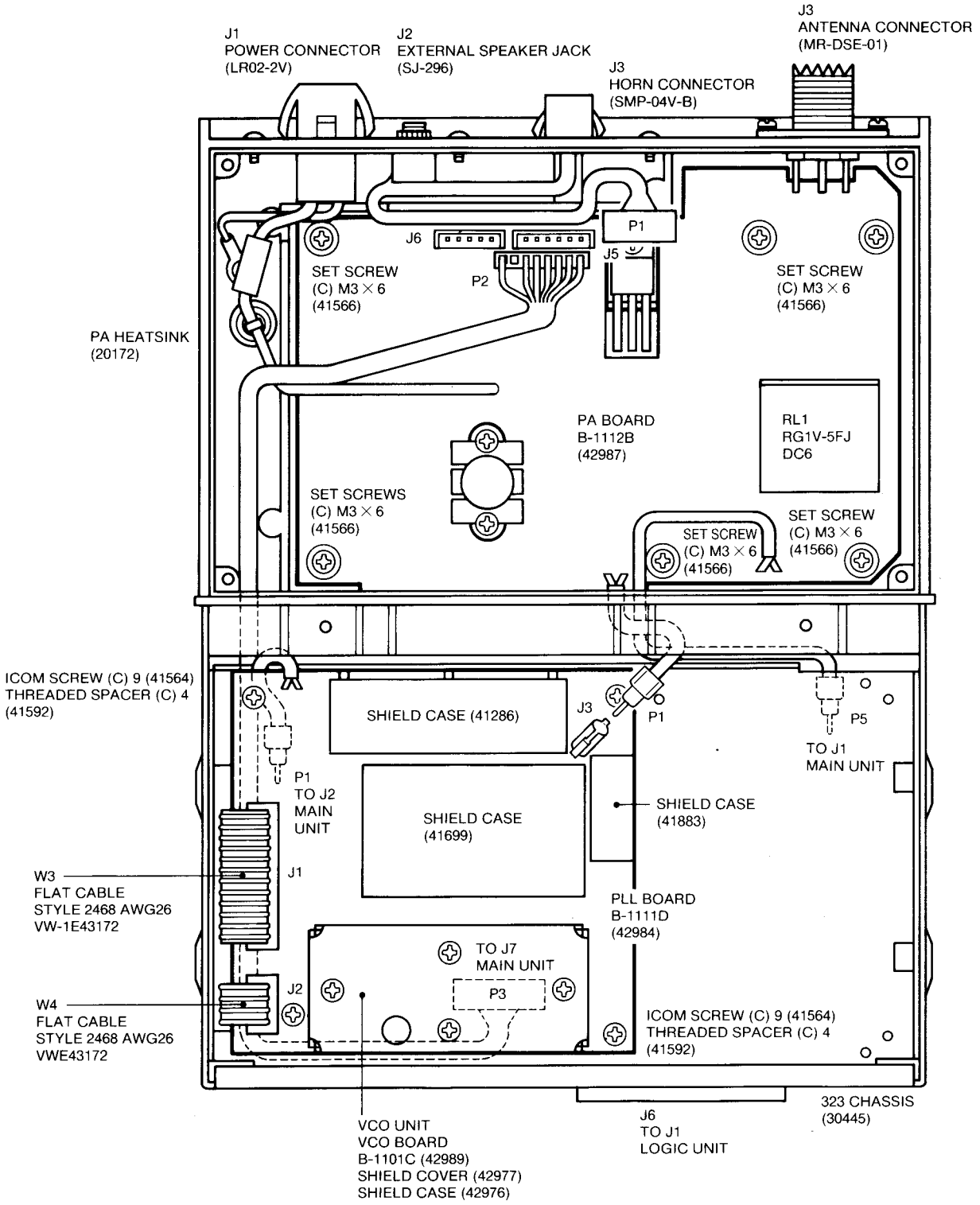
6 - 3 PA UNIT DISASSEMBLY



6 - 4 MAIN UNIT CONNECTOR ASSEMBLY



6 - 5 PLL AND PA UNITS CONNECTOR ASSEMBLY



SECTION 7 MAINTENANCE AND ADJUSTMENT

7 - 1 PREPARATION BEFORE SERVICING

1. Detach the power cable and turn OFF the power switch before performing any work on the transceiver.
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 transceiver. Adjustment procedures and results may differ for each version. Be certain to follow the correct procedure for the transceiver you adjust.
8. Confirm defective operation of the transceiver 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. To remove the transceiver covers, refer to SECTION 6-1.
11. Connect a 13.8V DC external power source to the POWER CONNECTOR.
    Make sure to check the voltage polarity.
12. For the transmission problems, connect a 50Ω 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. Re-check 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 OPERATING FREQUENCY AND TONE NUMBER SET

■ EXTERNAL KEYBOARD CONNECTION

When the transceiver is placed in programming mode while changing the operating frequency, tone number, etc., connect an EX-494 EXTERNAL KEYBOARD.

(1) Remove the 2 hex socket screws from the front panel. Remove the CONTROL HEAD.

(2) Remove the 4 screws from the back of the CONTROL HEAD. Remove the front cover. (Fig 1.)

(3) Plug the connector from an EX-494 EXTERNAL KEYBOARD into J4. (Fig 2.)

(4) Plug the CONTROL HEAD into the main body. (Fig 3.)

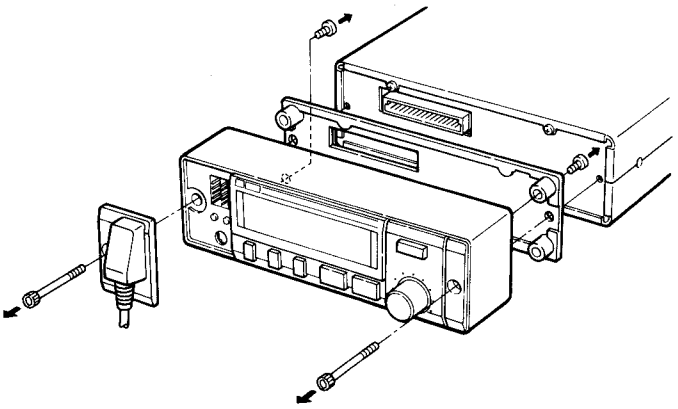


Fig. 1

■ PROGRAMMING

(1) Programming mode

Hold [FUNCTION] [1 T TON] [5 FREQ] [9 TX I] [3] [5 FREQ] [7 SPEC] Release [FUNCTION]

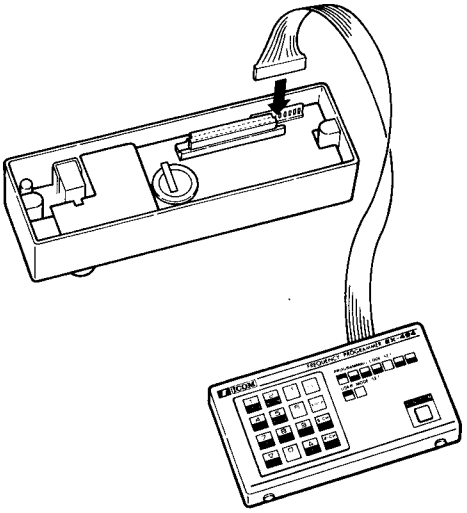


Fig. 2

(2) Operating frequency

Hold [FUNCTION] [5 FREQ] (6 digits) [P-CH ENT] Release [FUNCTION]

(3) Transmit CTCSS tone number

Hold [FUNCTION] [1 T TON] (1 or 2 digits) [P-CH ENT] Release [FUNCTION]

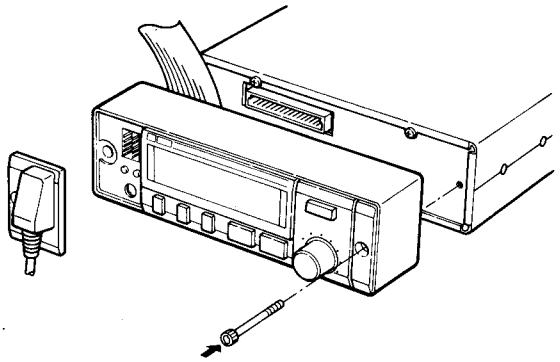
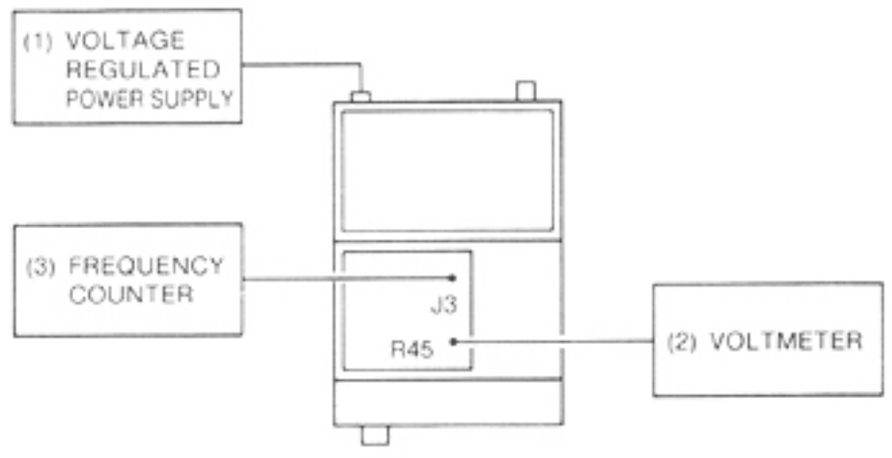


Fig. 3

NOTE: Please consult PROGRAMMING MANUAL for more detailed programming information.

7 - 3 PLL ADJUSTMENT

INSTRUMENTS REQUIRED	CONNECTIONS
(1) VOLTAGE REGULATED POWER SUPPLY • Output voltage : 13.8V DC ±15% • Current capacity : 20A (2) VOLTMETER • Input impedance : 50kΩ/V DC or better (3) FREQUENCY COUNTER • Frequency minimum : At least 170MHz • Accuracy : Better than ±1ppm • Sensitivity : 100mV or better	

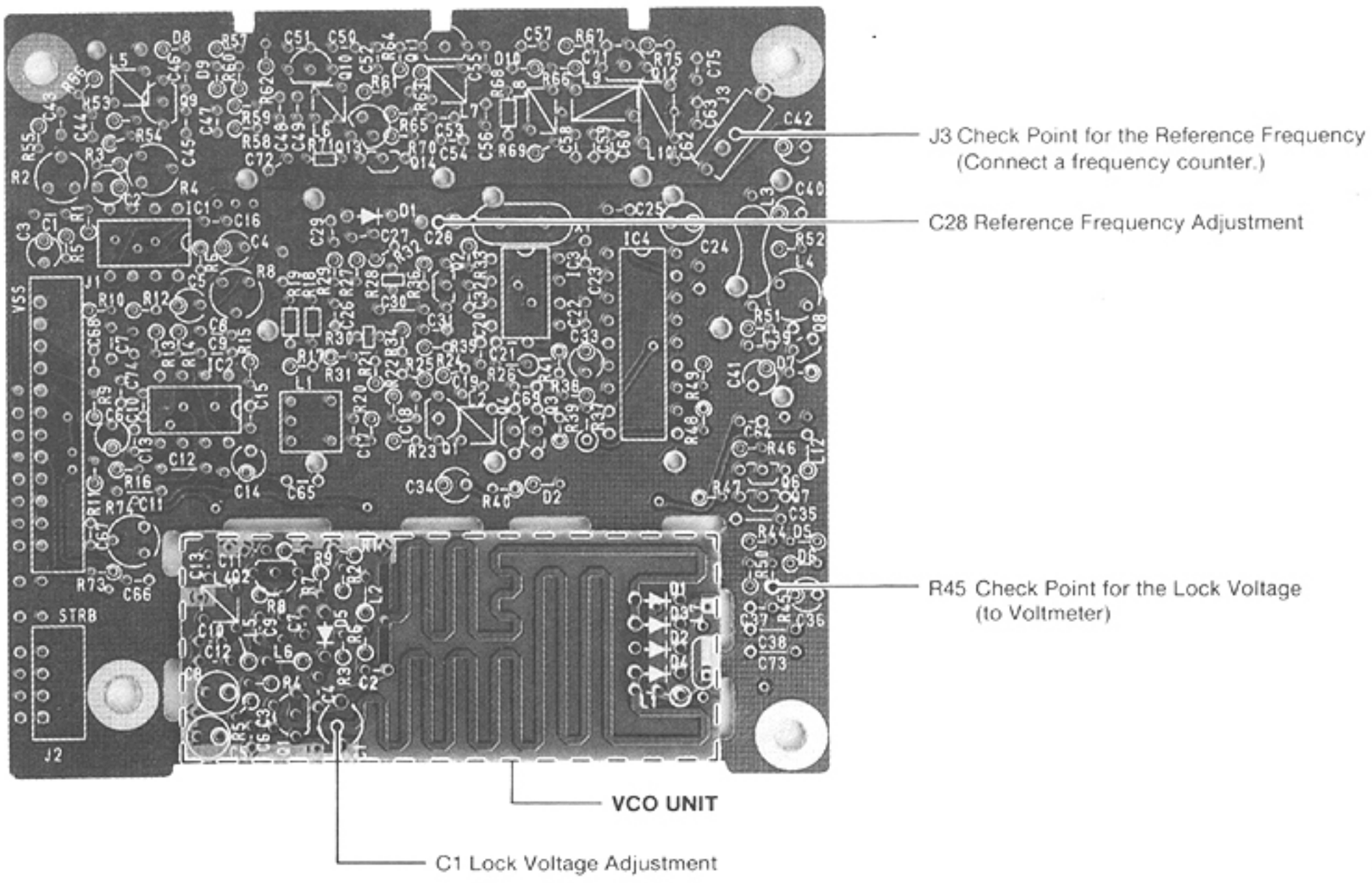
#02, #06, #08 VERSIONS

ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
			UNIT	LOCATION		UNIT	ADJUST
LOCK VOLTAGE	1	• Operating frequency: 136.00MHz • Receive mode	PLL	Connect a voltmeter between R45 and GROUND.	1.5V	VCO	C1
REFERENCE FREQUENCY	1	• Operating frequency: 136.00MHz • Transmit mode	PLL	Connect a frequency counter to J3.	136.0000MHz	PLL	C28

#01, #03, #05, #07 VERSIONS

ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
			UNIT	LOCATION		UNIT	ADJUST
LOCK VOLTAGE	1	• Operating frequency: 148.00MHz • Receive mode	PLL	Connect a voltmeter between R45 and GROUND.	1.5V	VCO	C1
REFERENCE FREQUENCY	1	• Operating frequency: 148.00MHz • Transmit mode	PLL	Connect a frequency counter to J3.	148.0000MHz	PLL	C28

PLL/VCO UNIT



7 - 4 TRANSMITTER ADJUSTMENT

INSTRUMENTS REQUIRED

(1) VOLTAGE REGULATED POWER SUPPLY
- Output voltage : 13.8V DC ±15%
- Current capacity : 20A

(2) RF POWER METER (TERMINATED TYPE)
- Measuring minimum : At least 100W
- Frequency minimum : At least 170MHz
- Impedance : 50Ω
- SWR : Less than 1:1.1

(3) AUDIO GENERATOR
- Output frequency : At least 3000Hz
- Output level : 0 ~ 200mV

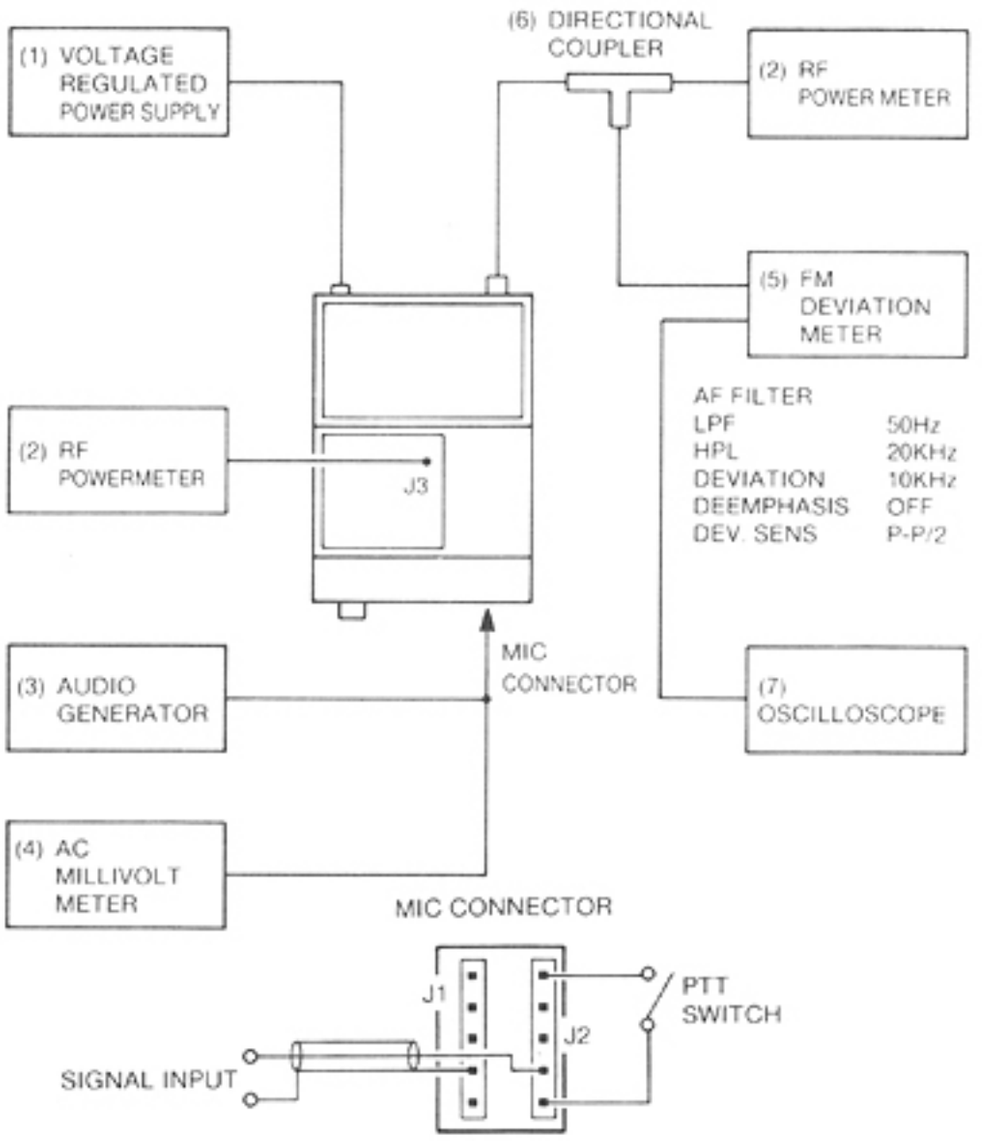
(4) AC MILLIVOLTMETER
- Measuring range : 10mV ~ 3V

(5) FM DEVIATION METER
- Frequency minimum : At least 170MHz
- Measuring range : 0 ~ ±10kHz

(6) DIRECTIONAL COUPLER
- Frequency minimum : At least 170MHz

(7) OSCILLOSCOPE
- Frequency range : DC ~ 5MHz
- Measuring range : 0.01 ~ 10V

CONNECTIONS



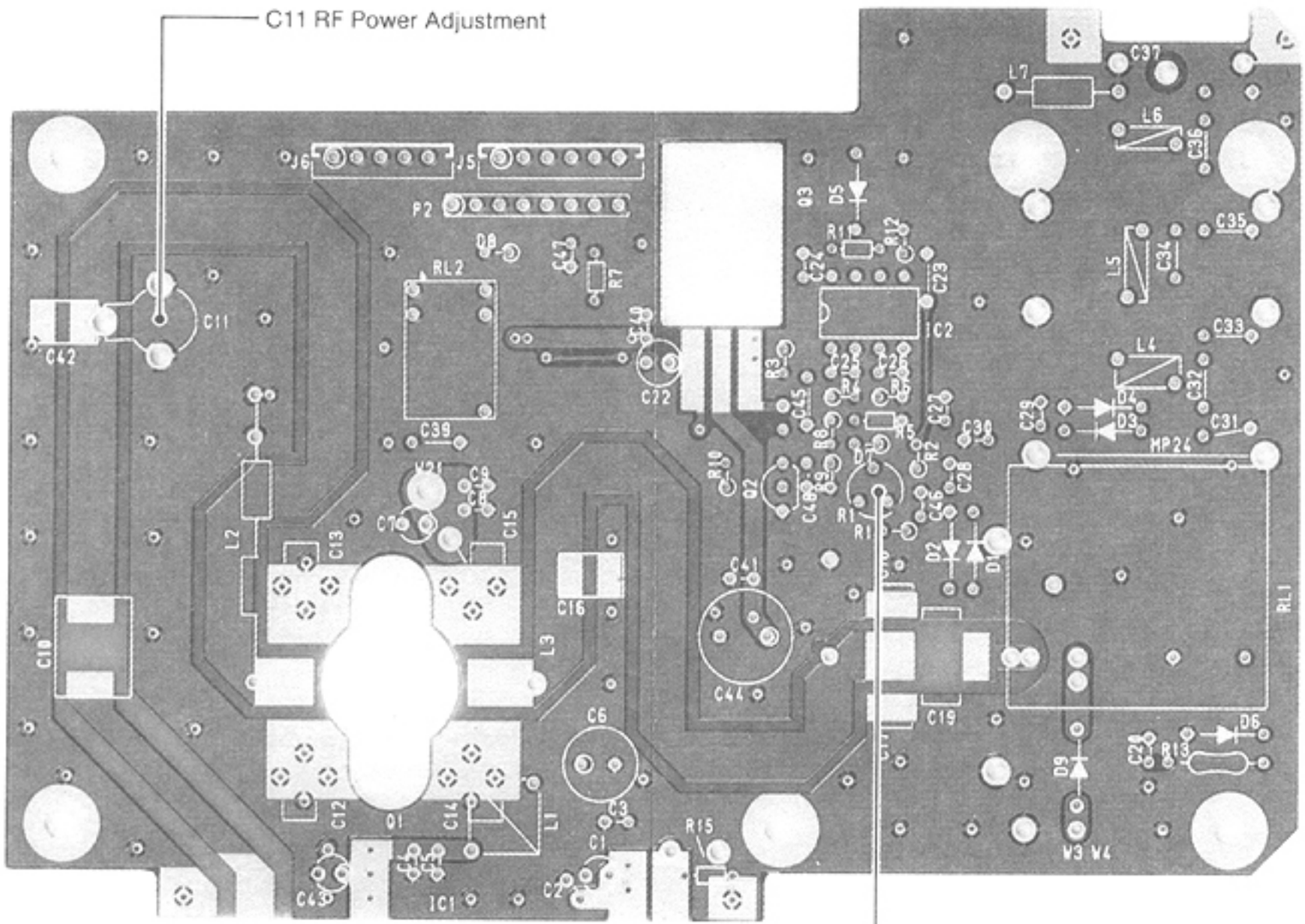
#02, #06, #08 VERSIONS

ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT UNIT	MEASUREMENT LOCATION	VALUE	ADJUSTMENT POINT UNIT	ADJUSTMENT POINT ADJUST
OUTPUT POWER	1	• Operating frequency: 144.00MHz • Transmit mode	PLL	Remove P1 from J3 and connect an RF voltmeter or an RF power meter (50Ω load) to J3.	Greater than 23dBm (200mW)	PLL	Verify
	2	• Turn R1 on the PA unit maximum CCW for applying no ALC. • Connect J3 to P1 on PLL unit.	Rear panel	Connect a power meter to ANTENNA CONNECTOR.	Maximum output (more than 60W)	PA	C11
ALC Ⓐ #02, #06 VERSIONS	1	• Operating frequency: 144.00MHz • Transmit mode	Rear panel	Connect an RF power meter to ANTENNA CONNECTOR.	50W (less than 12A)	PA	R1
		NOTE: Verify the output power in the band (136 ~ 174MHz) 50 ~ 60W. If not, adjust L6, extend or shorten, on the PA unit.					
ALC Ⓑ #08 VERSION	1	• Operating frequency: 144.00MHz • Transmit mode	Rear panel	Connect a power meter to ANTENNA CONNECTOR.	25W (less than 9A)	PA	R1
		NOTE: Verify the output power in the band (136 ~ 174MHz) 22 ~ 28W. If not, adjust L6, extend or shorten, on the PA unit.					
DEVIATION	1	• Operating frequency: 144.00MHz • Apply AF signal 1kHz/5mV to MIC CONNECTOR. • Transmit mode	Rear panel	Connect an oscilloscope to output terminal of the deviation meter.	Make the symmetical wave form.	PLL	R2
	2	• Apply AF signal 1kHz/50mV (20dB up) to MIC CONNECTOR. • Transmit mode		Connect deviation meter to ANTENNA CONNECTOR through the directional coupler.	±4.7kHz	PLL	R8
	3	• Apply AF signal 1kHz/5mV (20dB down) to MIC CONNECTOR. • Transmit mode			±3.5kHz		R4
	4	• Apply AF signal 1kHz/5mV to MIC CONNECTOR. • Transmit mode		Connect a millivoltmeter to the deviation meter.	Record the reading.		
	5	• Apply no signal to MIC CONNECTOR.			Record the reading.		
		NOTE: Verify that the recorded ratio (see STEP 4 and STEP 5) must be greater than 40dB.					
TONE DEVIATION	1	• Operating frequency: 144.00MHz • TONE No.: 01 • Apply no signal to MIC CONNECTOR. • Transmit mode	Rear panel	Connect a deviation meter to ANTENNA CONNECTOR through the the directional coupler.	±0.5kHz	PLL	R74

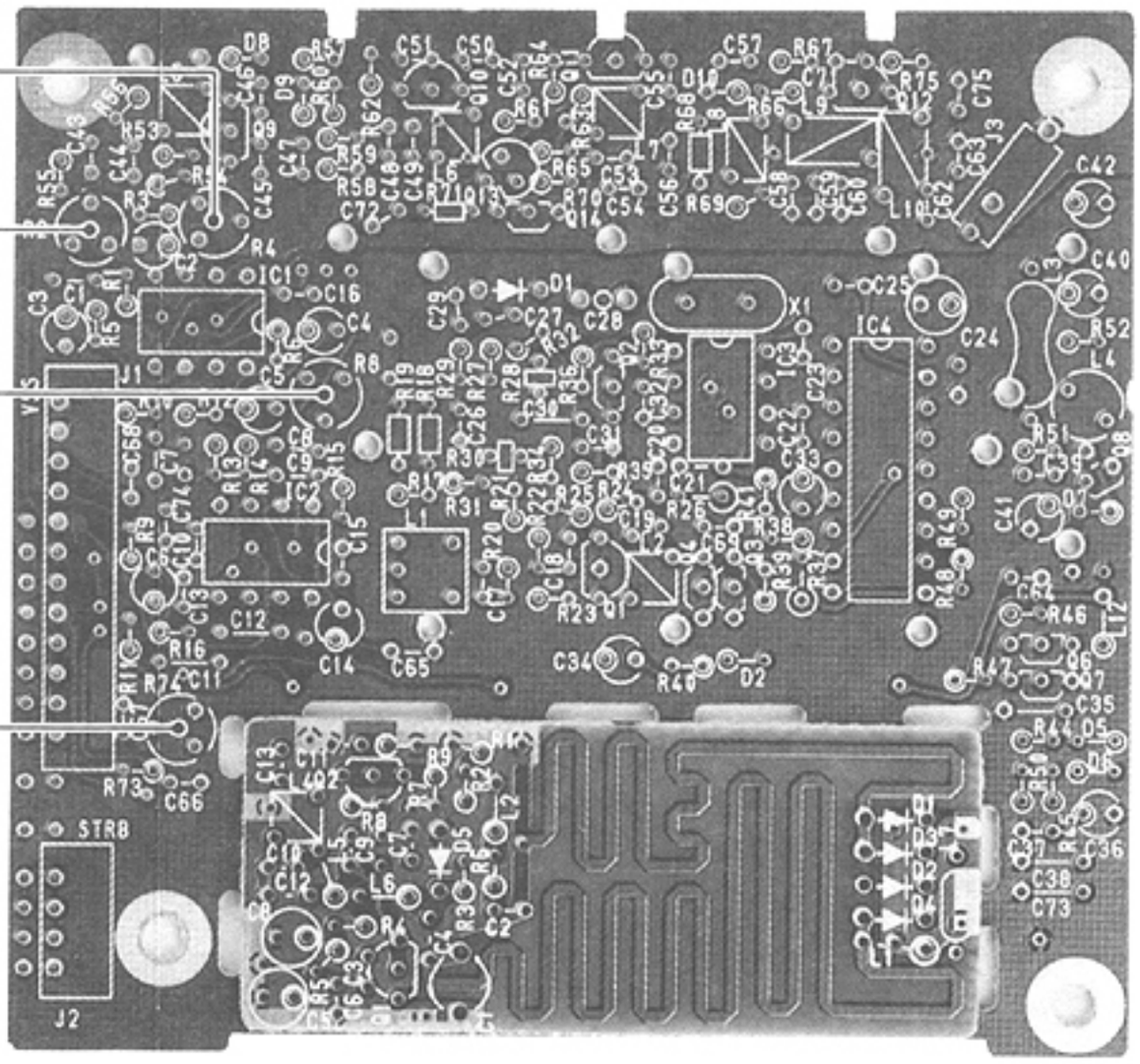
#01, #03, #05, #07 VERSIONS

ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
			UNIT	LOCATION		UNIT	ADJUST
OUTPUT POWER	1	• Operating frequency: 174.00MHz • Transmit mode	PLL	Remove P1 from J3 and connect an RF voltmeter or RF power meter (50Ω load) to J3.	Greater than +23dBm (200mW)	PLL	Verify
	2	• Turn R1 on the PA unit maximum CCW for applying no ALC. • Connect J3 to P1 on PLL unit.	Rear panel	Connect a power meter to ANTENNA CONNECTOR.	Maximum output (more than 60W)	PA	C11
ALC Ⓐ #01, #03 #05 VERSIONS	1	• Operating frequency: 174.00MHz • Transmit mode		Connect a power meter to ANTENNA CONNECTOR.	50W (less than 12A)	PA	R1
		NOTE: Verify the output power in the band (148 ~ 174MHz) 50 ~ 60W. If not, adjust L6, extend or shorten, on the PA unit.					
ALC Ⓑ #07 VERSION	1	• Operating frequency: 174.00MHz • Transmit mode	Rear panel	Connect a power meter to ANTENNA CONNECTOR.	25W (less than 9A)	PA	R1
		NOTE: Verify the output power in the band (148 ~ 174MHz) 22 ~ 28W. If not, adjust L6, extend or shorten, on the PA unit.					
DEVIATION Ⓐ #01, #05 #07 VERSIONS	1	• Operating frequency: 174.00MHz • Apply AF signal 1kHz/5mV to MIC CONNECTOR. • Transmit mode	Rear panel	Connect an oscilloscope to output terminal of the deviation meter.	Make the symmetical wave form.	PLL	R2
	2	• Apply AF signal 1kHz/50mV (20dB up) to MIC CONNECTOR. • Transmit mode		Connect deviation meter to ANTENNA CONNECTOR through directional coupler.	±4.7kHz	PLL	R8
	3	• Apply AF signal 1kHz/5mV (20dB down) to MIC CONNECTOR. • Transmit mode			±3.5kHz		R4
	4	• Apply AF signal 1kHz/5mV to MIC CONNECTOR. • Transmit mode		Connect a millivoltmeter to the deviation meter.	Record the reading.		
	5	• Apply no signal to MIC CONNECTOR.			Record the reading.		
		NOTE: Verify that the recorded ratio (see STEP 4 and STEP 5) must be greater than 40dB.					
Ⓑ #03 VERSION	1	• Operating frequency: 174.00MHz • Apply AF signal 1kHz/5mV to MIC CONNECTOR. • Transmit mode	Rear panel	Connect an oscilloscope to output terminal of the deviation meter.	Make the symmetical wave form.	PLL	R2
	2	• Apply AF signal 1kHz/50mV (20dB up) to MIC CONNECTOR. • Transmit mode		Connect deviation meter to ANTENNA CONNECTOR through directional coupler.	±2.2kHz	PLL	R8
	3	• Apply AF signal 1kHz/5mV (20dB down) to MIC CONNECTOR. • Transmit mode			±1.75kHz		R4
	4	• Apply AF signal 1kHz/5mV to MIC CONNECTOR. • Transmit mode		Connect a millivoltmeter to the deviation meter.	Record the reading.		
	5	• Apply no signal to MIC CONNECTOR.			Record the reading.		
		NOTE: Verify that the recorded ratio (see STEP 4 and STEP 5) must be greater than 40dB.					
TONE DEVIATION Ⓐ #01, #05, #07 VERSIONS	1	• Operating frequency: 174.00MHz • TONE No.: 01 • Apply no signal to MIC CONNECTOR. • Transmit mode	Rear panel	Connect a deviation meter to ANTENNA CONNECTOR through the directional coupler.	±0.5kHz	PLL	R74
Ⓑ #03 VERSION					±0.3kHz	PLL	R74

PA UNIT



PLL UNIT



7 - 5 RECEIVER ADJUSTMENT

INSTRUMENTS REQUIRED

(1) VOLTAGE REGULATED POWER SUPPLY
- Output voltage : 13.8V DC ±15%
- Current capacity : 20A

(2) OSCILLOSCOPE
- Frequency range : DC ~ 5MHz
- Measuring range : 0.01 ~ 10V

(3) AC MILLIVOLTMETER
- Measuring range : 10mV ~ 50V

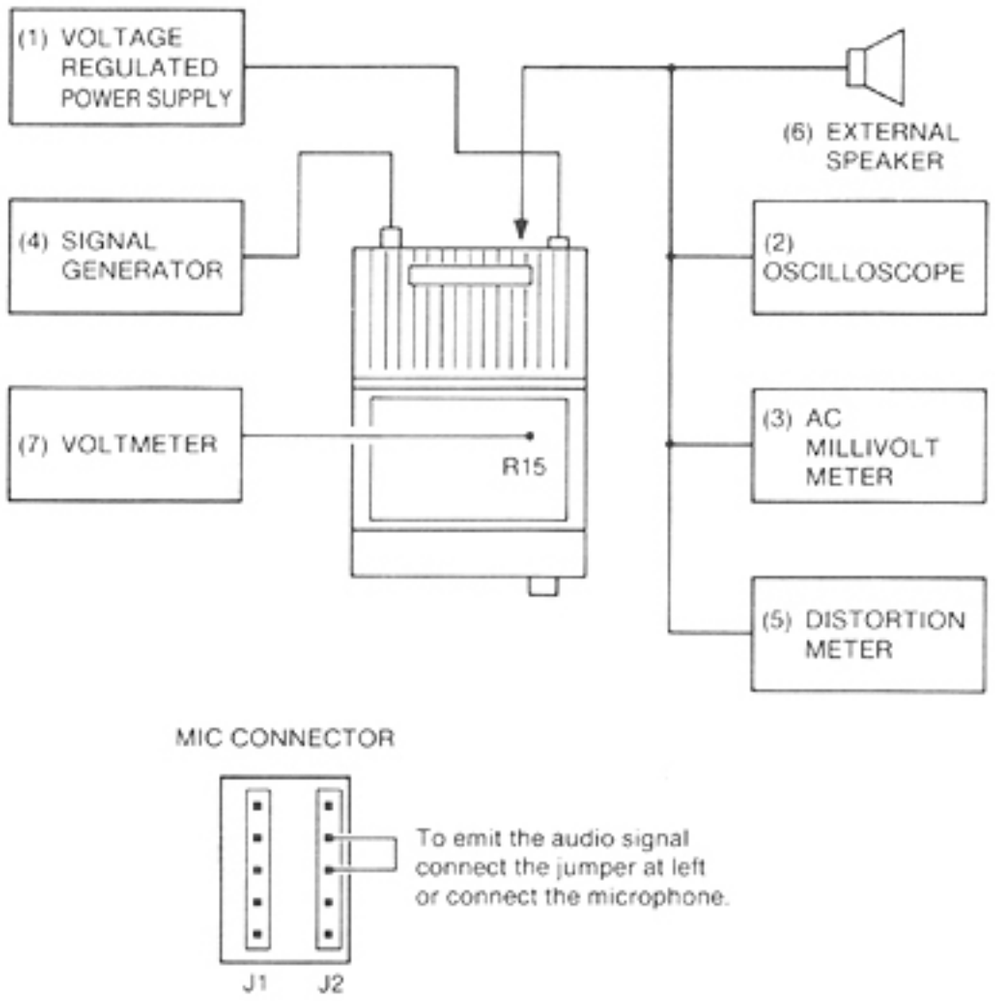
(4) SIGNAL GENERATOR
- Frequency minimum : At least 170MHz
- Output level : 0.1μV ~ 32mV (−127dBm ~ −17dBm)

(5) DISTORTION METER
- Frequency range : 1kHz ±10Hz
- Measuring range : 1% ~ 100%

(6) EXTERNAL SPEAKER
- Impedance : 4Ω

(7) VOLTMETER
- Input impedance : 50kΩ/V DC or better

CONNECTIONS



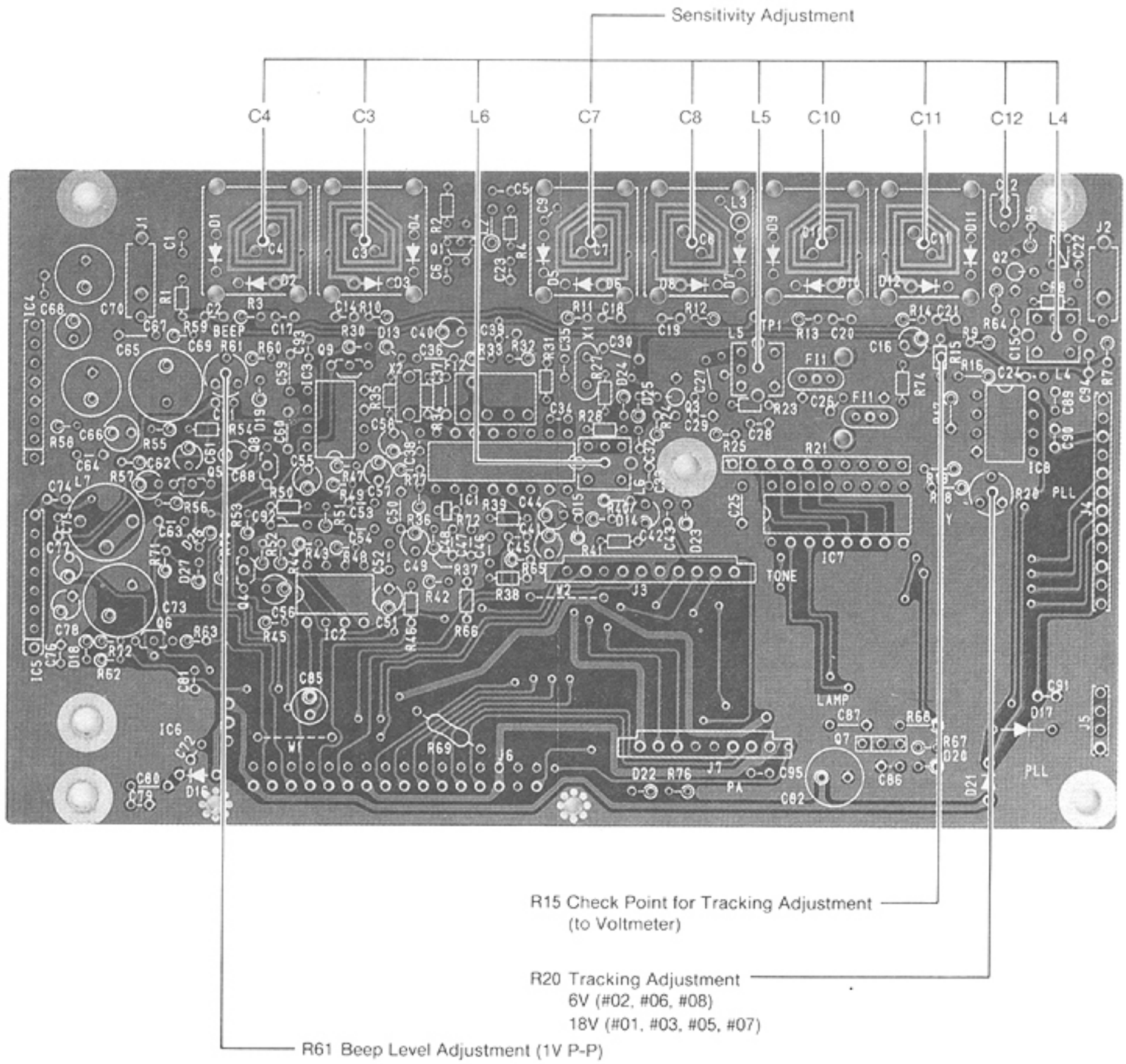
#02, #06, #08 VERSIONS

ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
			UNIT	LOCATION		UNIT	ADJUST
TRACKING	1	• Operating frequency: 136.00MHz	MAIN	Connect a voltmeter to R15.	6V	MAIN	R20
SENSITIVITY	1	• Operating frequency: 144.00MHz • Squelch: OFF (open) • Apply RF signal to ANTENNA CONNECTOR. Level : 0.32μV (−117dBm) Dev. : ±3.5kHz Mod. : 1kHz	Rear panel	Connect a distortion meter to the EXTERNAL SPEAKER JACK with 4Ω load.	Minimum distortion level (Less than 0.35μV for 12dB SINAD)	MAIN	C3, C4 C7, C8 C10 C11 C12 L4, L5 L6
		NOTE: Adjust coils as above for 2 or 3 times.					
BEEP LEVEL	1	• AF VOLUME: minimum • Push and hold the CHANNEL UP/DOWN switch.	Rear panel	Connect an oscilloscope to the EXTERNAL SPEAKER JACK with 4Ω load.	1Vp-p	MAIN	R61
SQUELCH	1	• Operating frequency: 144.00MHz • Apply RF signal to ANTENNA CONNECTOR. Level : 0.28μV (−118dBm) Dev. : ±3.5kHz Mod. : 1kHz • Squelch: ON (closed)	Rear panel	Connect a speaker to the EXTERNAL SPEAKER JACK.	Verify that SQUELCH is closed when turning R11 CW on the DISPLAY UNIT.		
	2				To start point of reception	DIS-PLAY	R11
	3	• Apply no signal to ANTENNA CONNECTOR.			Squelch is closed.		Verify
AF OUTPUT	1	• Apply RF signal to ANTENNA CONNECTOR. Level : 32μV (−77dBm) Dev. : ±3.5kHz Mod. : 1kHz	Rear panel	Connect an AC millivoltmeter to the EXTERNAL SPEAKER JACK with 4Ω load.	Greater than 4.5V at 10% distortion		Verify

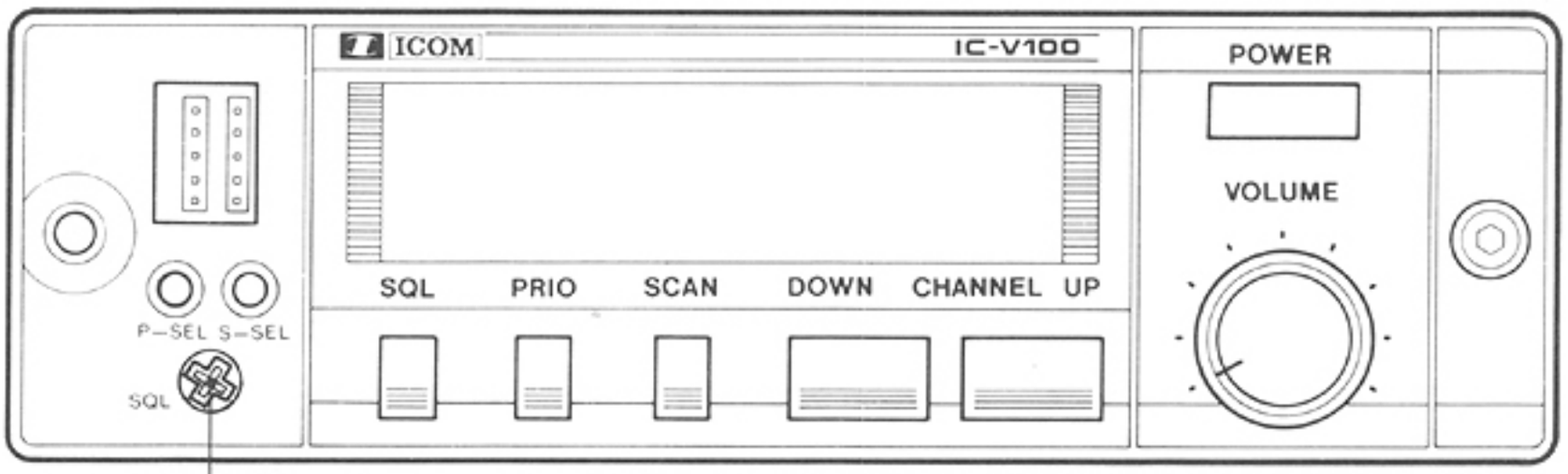
#01, #03, #05, #07 VERSIONS

ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
			UNIT	LOCATION		UNIT	ADJUST
TRACKING	1	• Operating frequency: 174.00MHz	MAIN	Connect a voltmeter to R15.	18V	MAIN	R20
SENSITIVITY Ⓐ #01, #05, #07 VERSIONS	1	• Operating frequency: 174.00MHz • Squelch: OFF (open) • Apply RF signal to ANTENNA CONNECTOR. Level : 0.32μV (−117dBm) Dev. : ±3.5kHz Mod. : 1kHz	Rear panel	Connect a distortion meter to the EXTERNAL SPEAKER JACK with 4Ω load.	Minimum distortion level (Less than 0.35μV for 12dB SINAD)	MAIN	C3, C4, C7, C8, C10, C11, C12, L4, L5, L6,
		NOTE: Adjust coils as above for 2 or 3 times.					
SENSITIVITY Ⓑ #03 VERSION	1	• Operating frequency: 174.00MHz • Squelch: OFF (open) • Apply RF signal to ANTENNA CONNECTOR. Level : 0.32μV (−117dBm) Dev. : ±3.5kHz Mod. : 1kHz	Rear panel	Connect a distortion meter to the EXTERNAL SPEAKER JACK with 4Ω load.	Minimum distortion level (Less than 0.35μV for 12dB SINAD)	MAIN	C3, C4, C7, C8, C10, C11, C12, L4, L5, L6,
		NOTE: Adjust coils as above for 2 or 3 times.					
BEEP LEVEL	1	• AF VOLUME: minimum • Push and hold CHANNEL UP/DOWN switch.	Rear panel	Connect an oscilloscope to EXTERNAL SPEAKER JACK with 4Ω load.	1Vp-p	MAIN	R61
SQUELCH	1	• Operating frequency: 174.00MHz • Apply RF signal to ANTENNA CONNECTOR. Level : 0.28μV (−118dBm) Dev. : ±3.5kHz Mod. : 1kHz • Squelch: ON (closed)	Rear panel	Connect a speaker to the EXTERNAL SPEAKER JACK.	Verify squelch to close when turn R11 C.W. on the DISPLAY unit.		
	2				To start point of reception	DIS-PLAY	R11
	3	• Apply no signal to ANTENNA CONNECTOR.			Squelch is closed.		Verify
AF OUTPUT Ⓐ #01, #05, #07 VERSIONS	1	• Apply RF signal to ANTENNA CONNECTOR. Level : 32μV (−77dBm) Dev. : ±3.5kHz Mod. : 1kHz	Rear panel	Connect an AC millivoltmeter to the EXTERNAL SPEAKER JACK with 4Ω load.	Greater than 4.5V at 10% distortion		Verify
AF OUTPUT Ⓑ #03 VERSION	1	• Apply RF signal to ANTENNA CONNECTOR. Level : 32μV (−77dBm) Dev. : ±1.75kHz Mod. : 1kHz	Rear panel	Connect an AC millivoltmeter to the EXTERNAL SPEAKER JACK with 4Ω load.	Greater than 4.5V at 10% distortion		Verify

MAIN UNIT

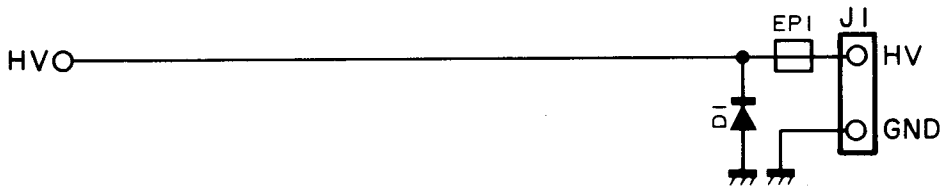


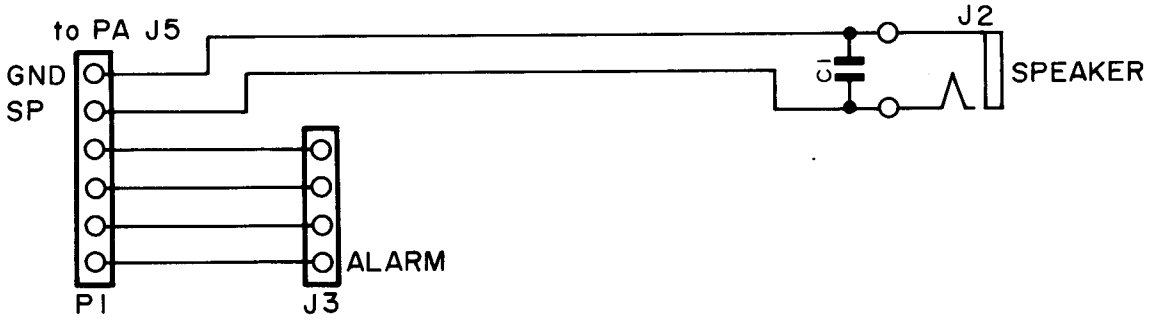
DISPLAY UNIT

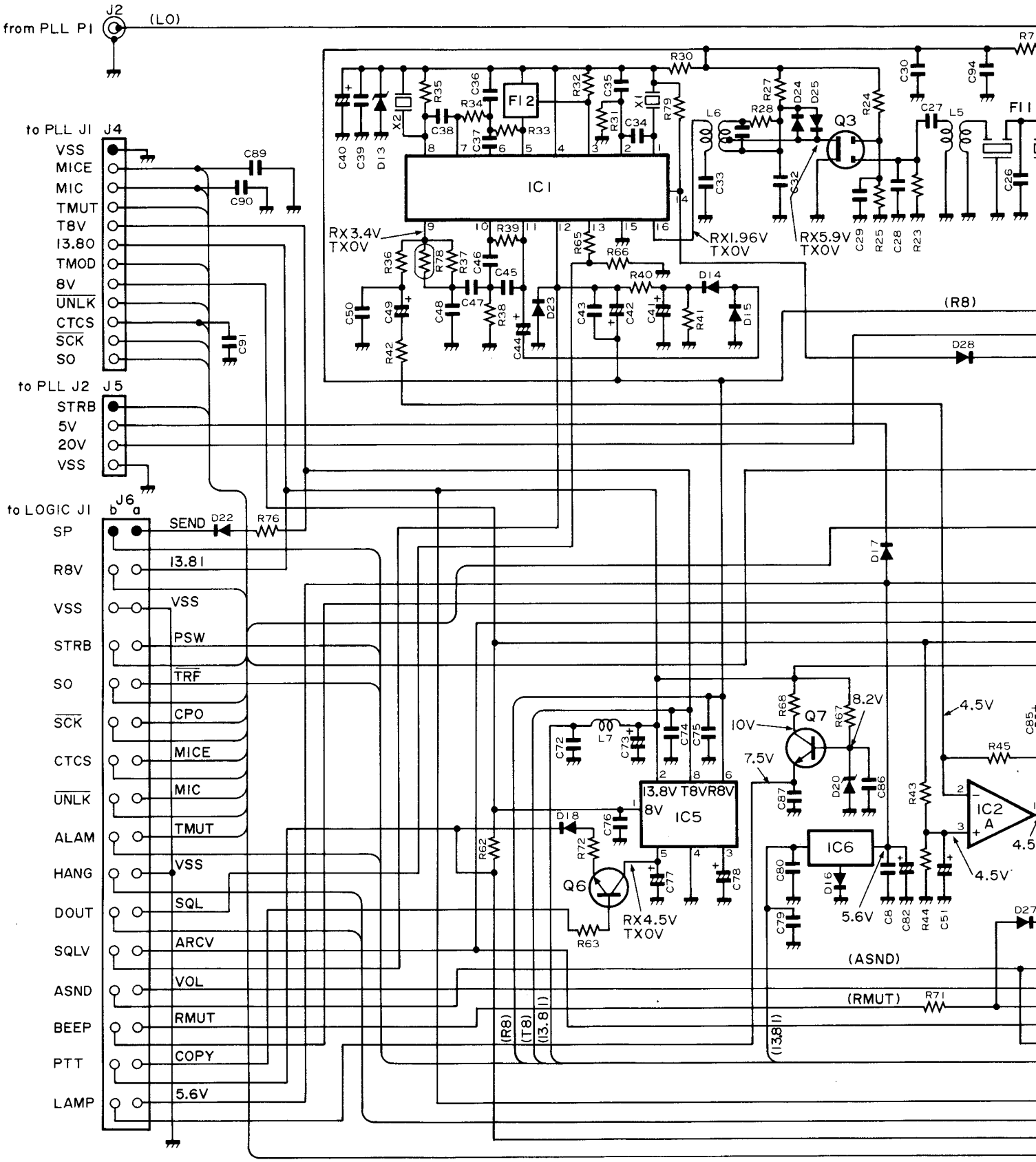


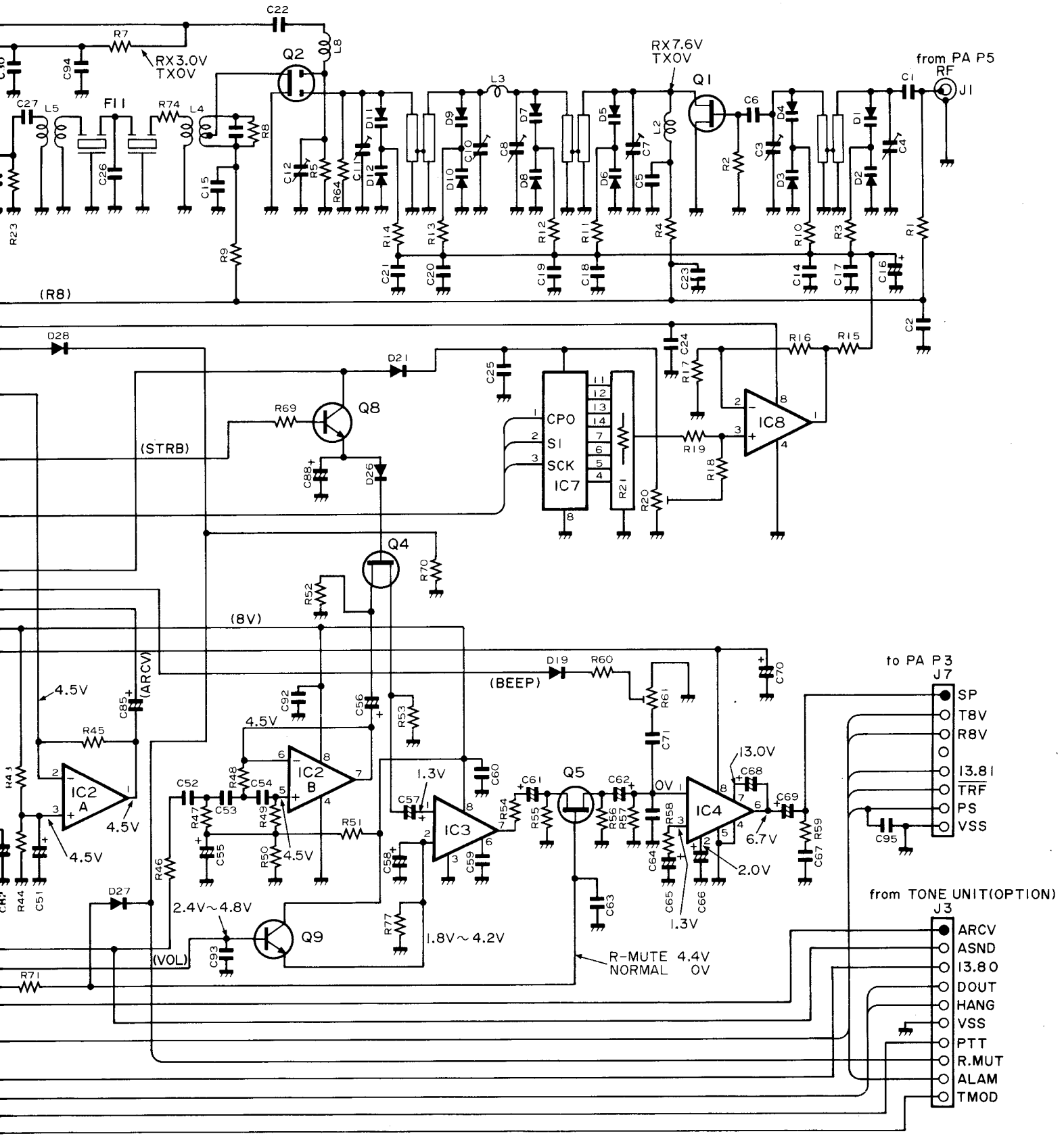
SECTION 8 VOLTAGE (CIRCUIT) DIAGRAMS

8 - 1 EF UNIT

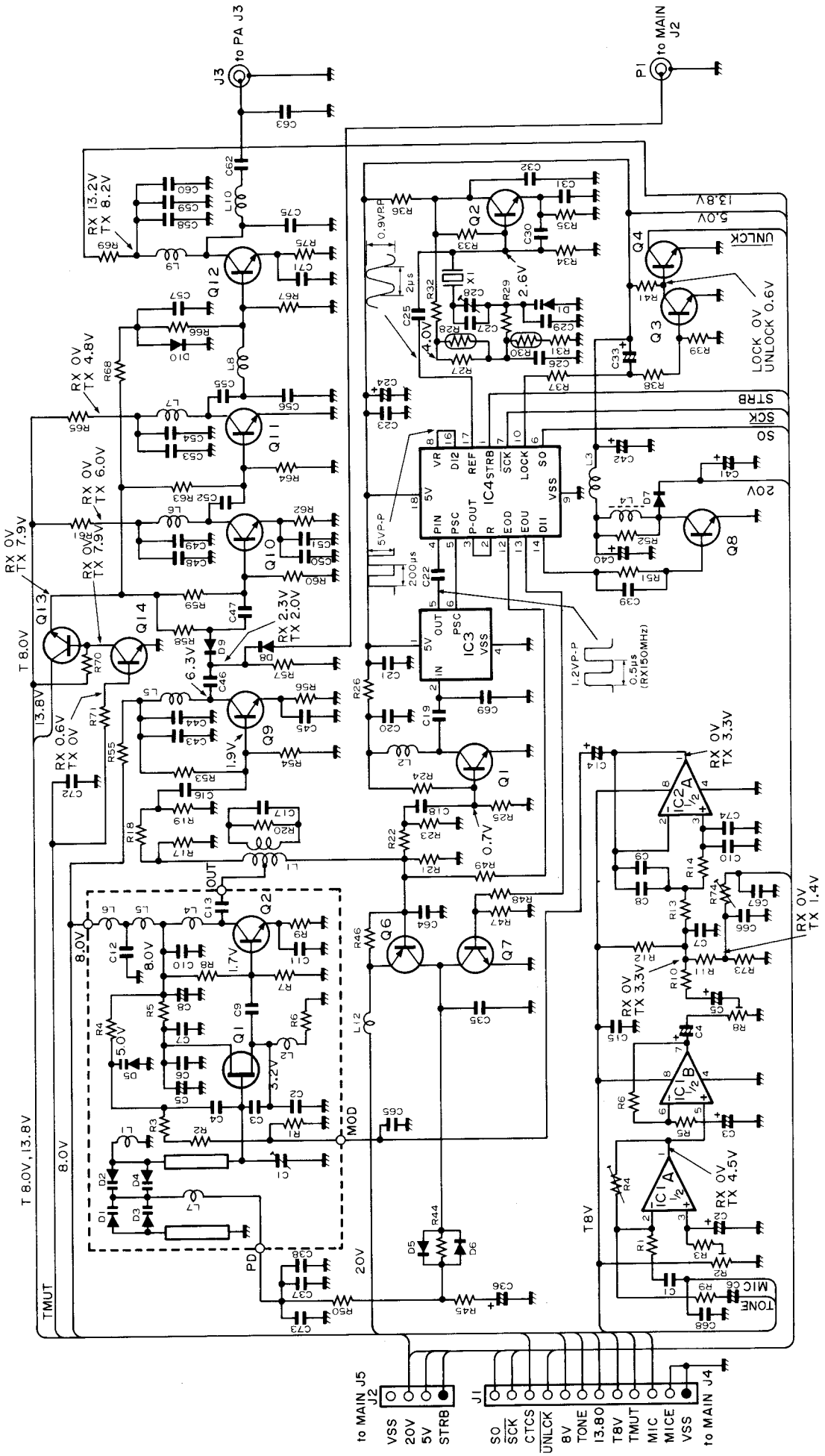




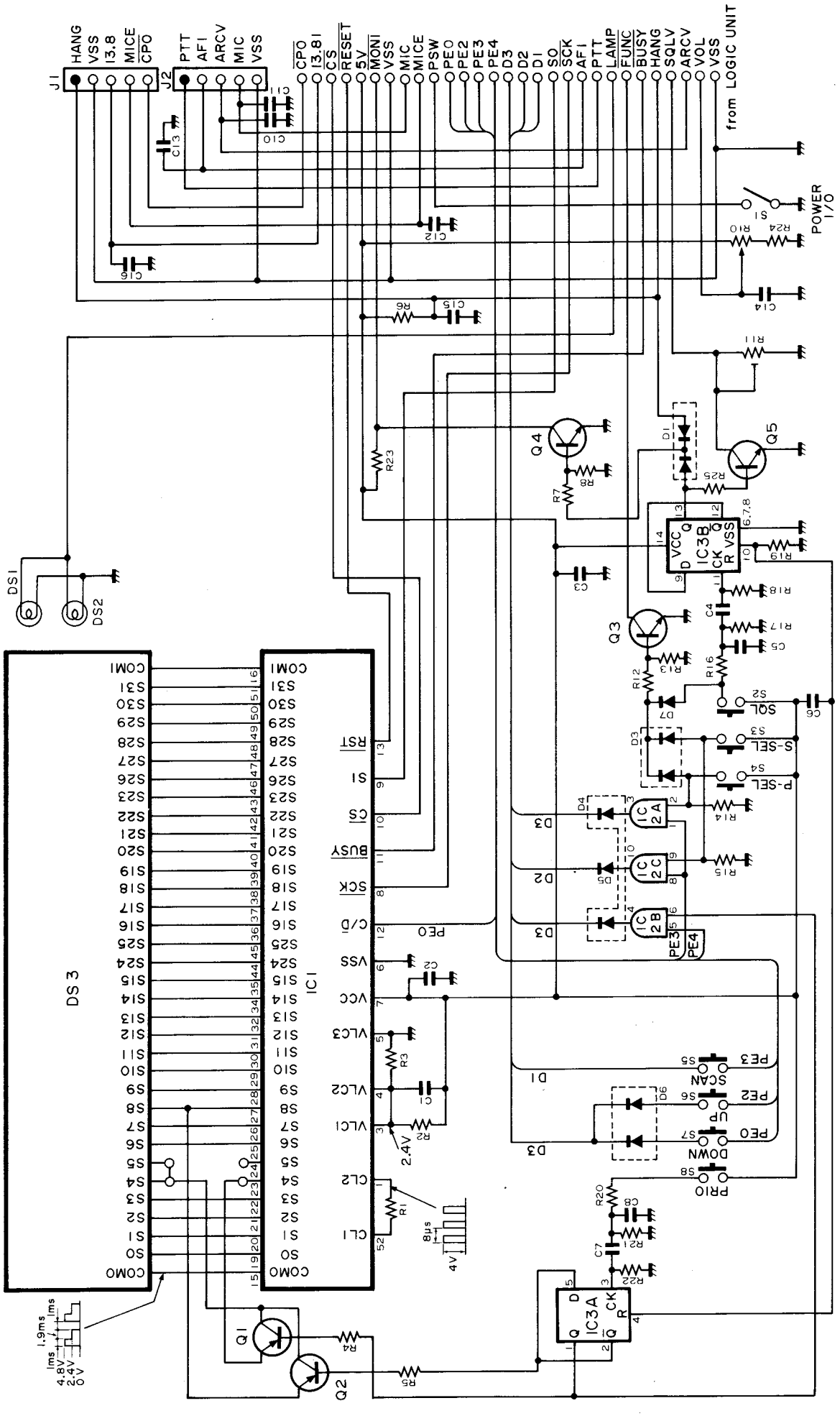

from PLL PI
J2
(LO)
to PLL JI J4
VSS
MICE
MIC
TMUT
T8V
13.8O
TMOD
8V
UNLK
CTCS
SCK
SO
to PLL J2 J5
STRB
5V
20V
VSS
to LOGIC JI J6
SP
R8V
VSS
STRB
SO
SCK
CTCS
UNLK
ALAM
HANG
DOUT
SQLV
ASND
BEEP
PTT
LAMP
SEND
13.8I
VSS
PSW
TRF
CPO
MICE
MIC
TMUT
VSS
SQL
ARCV
VOL
RMUT
COPY
5.6V
IC1
IC2 A
IC5
IC6
Q3
Q6
Q7
RX3.4V TXOV
RXI.96V TXOV
RX5.9V TXOV
RX4.5V TXOV
10V
7.5V
8.2V
4.5V
5.6V
(R8)
(T8)
(13.8I)
(ASND)
(RMUT)

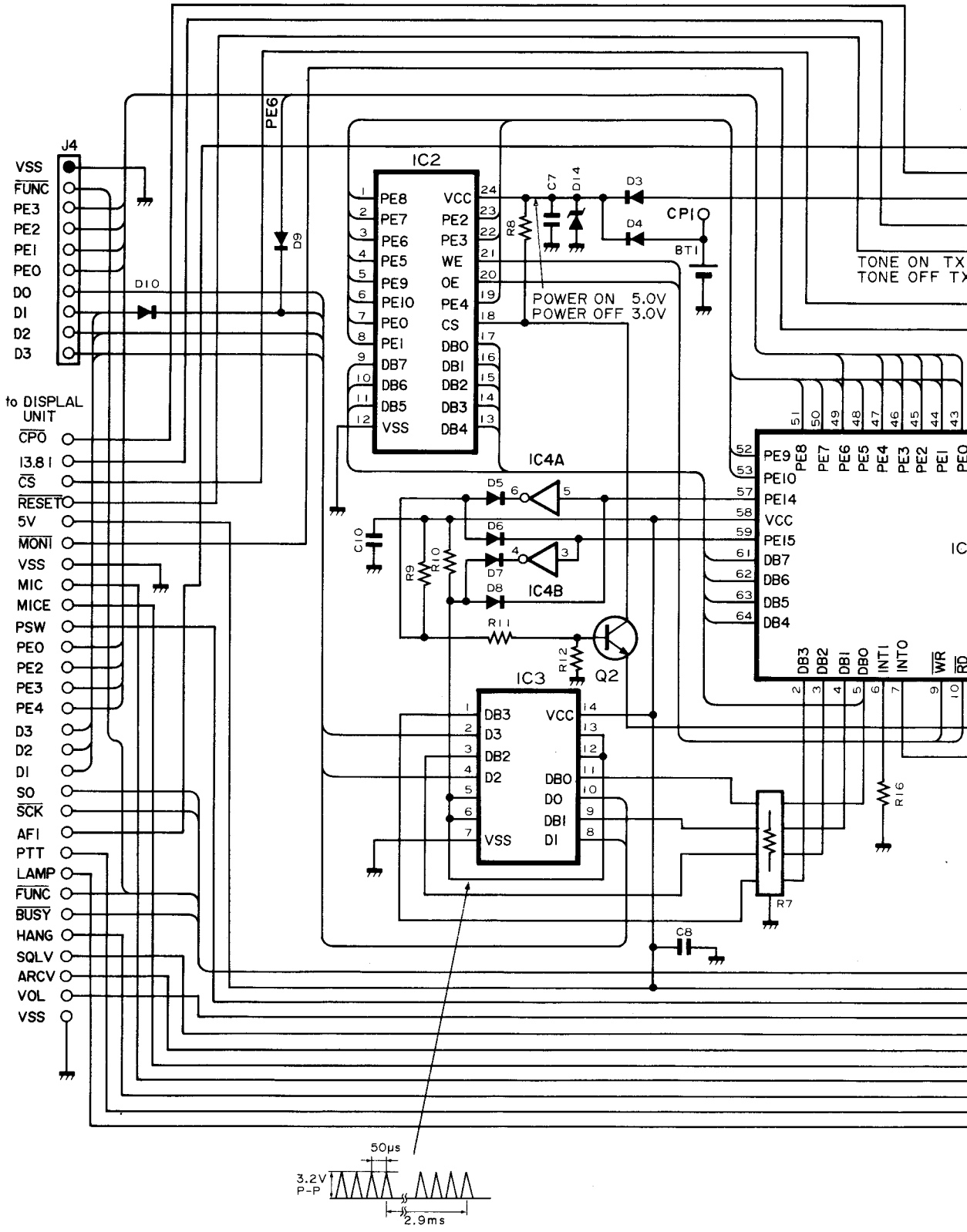

RX3.0V
TX0V
RX7.6V
TX0V
from PA P5
RF
J1
Q1
Q2
F11
L3
L8
(R8)
D28
D21
Q8
R69
(STRB)
CPO
SI
SCK
IC7
IC8
R19
R18
R20
R21
Q4
R70
R52
(8V)
4.5V
(ARCV)
IC2
A
IC2
B
4.5V
4.5V
4.5V
1.3V
IC3
D19
R60
(BEEP)
Q5
0V
IC4
13.0V
6.7V
2.0V
1.3V
to PA P3
J7
SP
T8V
R8V
13.81
TRF
PS
VSS
from TONE UNIT(OPTION)
J3
ARCV
ASND
13.80
DOUT
HANG
VSS
PTT
R.MUT
ALAM
TMOD
D27
2.4V~4.8V
Q9
(VOL)
1.8V~4.2V
R-MUTE 4.4V
NORMAL 0V

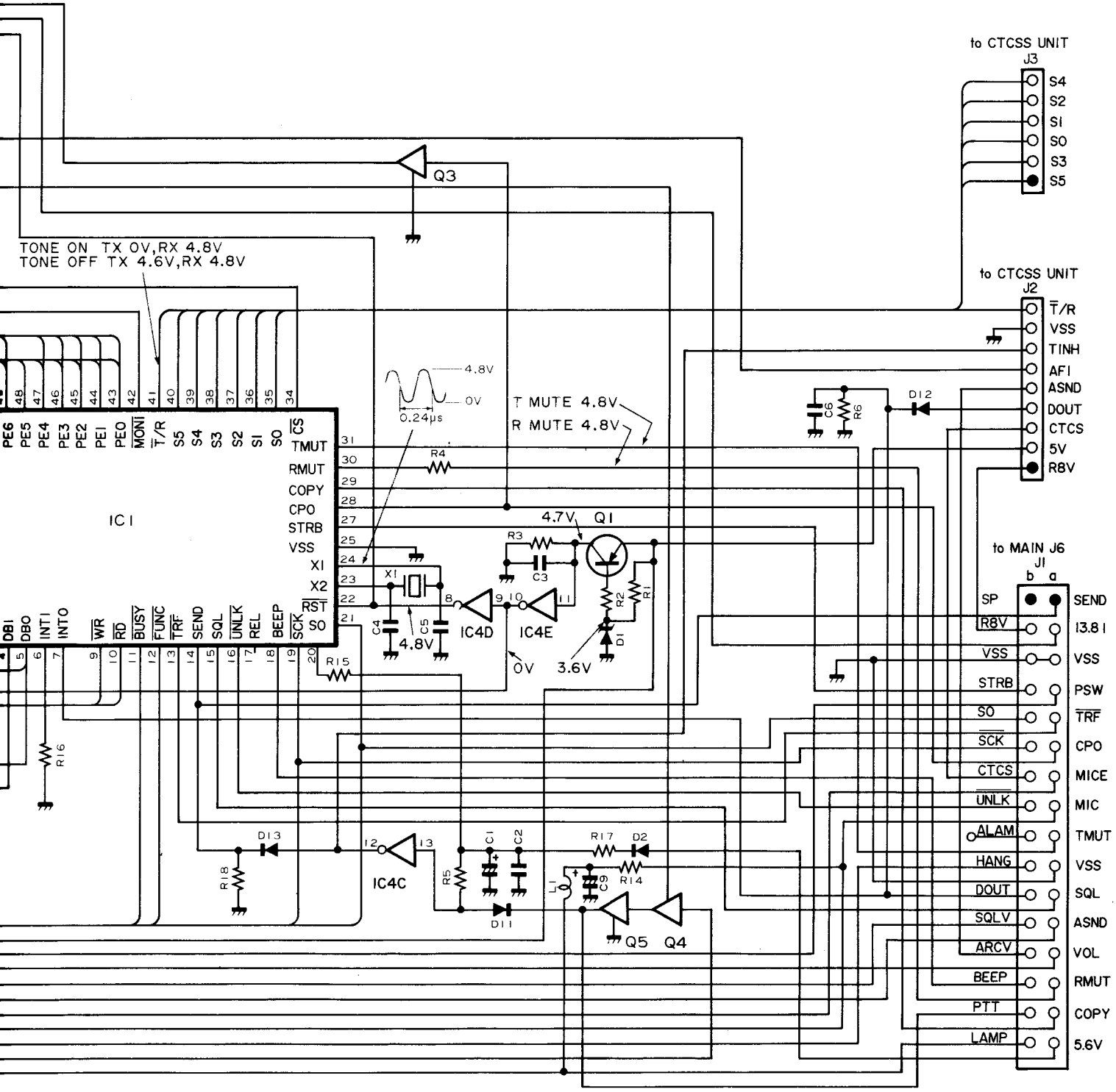
8 - 3 PLL/VCO UNIT



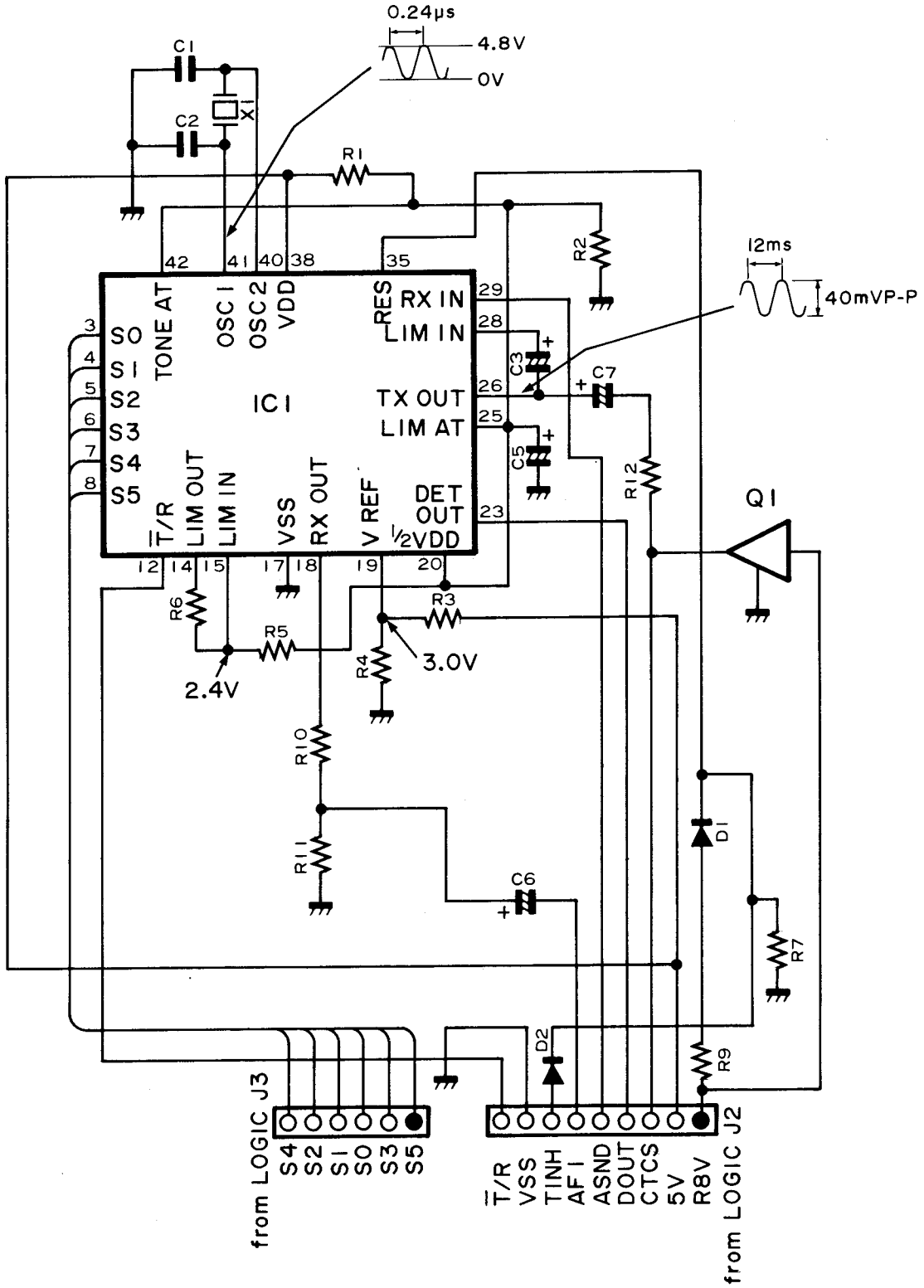
8 - 4 DISPLAY UNIT



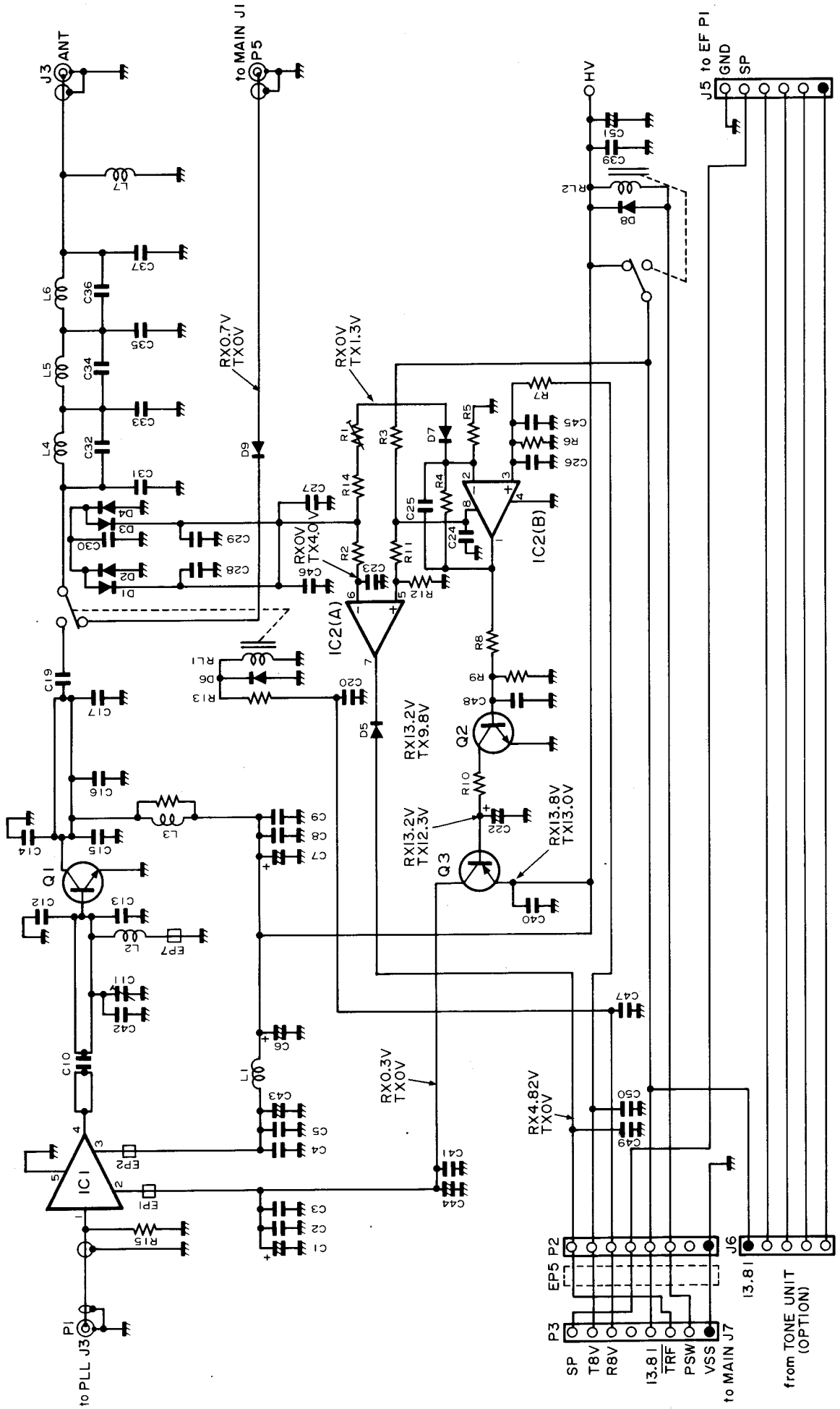

J4
VSS
FUNC
PE3
PE2
PE1
PE0
DO
DI
D2
D3
to DISPLAL UNIT
CPO
13.8 I
CS
RESET
5V
MONI
VSS
MIC
MICE
PSW
PE0
PE2
PE3
PE4
D3
D2
DI
SO
SCK
AFI
PTT
LAMP
FUNC
BUSY
HANG
SQLV
ARCV
VOL
VSS
PE6
D9
D10
IC2
PE8
PE7
PE6
PE5
PE9
PE10
PE0
PE1
DB7
DB6
DB5
VSS
VCC
PE2
PE3
WE
OE
PE4
CS
DB0
DB1
DB2
DB3
DB4
C7
D14
D3
D4
R8
CP10
BT1
POWER ON 5.0V
POWER OFF 3.0V
TONE ON TX
TONE OFF TX
IC4A
D5
D6
D7
D8
IC4B
C10
R9
R10
R11
R12
Q2
IC3
DB3
D3
DB2
D2
VSS
VCC
DBO
DO
DB1
DI
R7
C8
R16
PE9
PE10
PE14
VCC
PE15
DB7
DB6
DB5
DB4
INT1
INT0
WR
RD
50µs
3.2V P-P
2.9ms


to CTCSS UNIT
J3
S4
S2
S1
S0
S3
S5
Q3
TONE ON TX 0V,RX 4.8V
TONE OFF TX 4.6V,RX 4.8V
to CTCSS UNIT
J2
T/R
VSS
TINH
AFI
ASND
DOUT
CTCS
5V
R8V
4.8V
0V
0.24μs
T MUTE 4.8V
R MUTE 4.8V
D12
C6
R6
IC1
TMUT
RMUT
COPY
CPO
STRB
VSS
XI
X2
RST
SO
R4
4.7V
Q1
R3
C3
X1
C4
C5
4.8V
IC4D
IC4E
R2
R1
D1
3.6V
0V
R15
R16
to MAIN J6
J1
b
a
SP
SEND
R8V
13.8 I
VSS
VSS
STRB
PSW
SO
TRF
SCK
CPO
CTCS
MICE
UNLK
MIC
ALAM
TMUT
HANG
VSS
DOUT
SQL
SQLV
ASND
ARCV
VOL
BEEP
RMUT
PTT
COPY
LAMP
5.6V
D13
R18
IC4C
R5
C1
C2
D11
R17
D2
R14
L1
C9
Q5
Q4

8 - 6 CTCSS UNIT

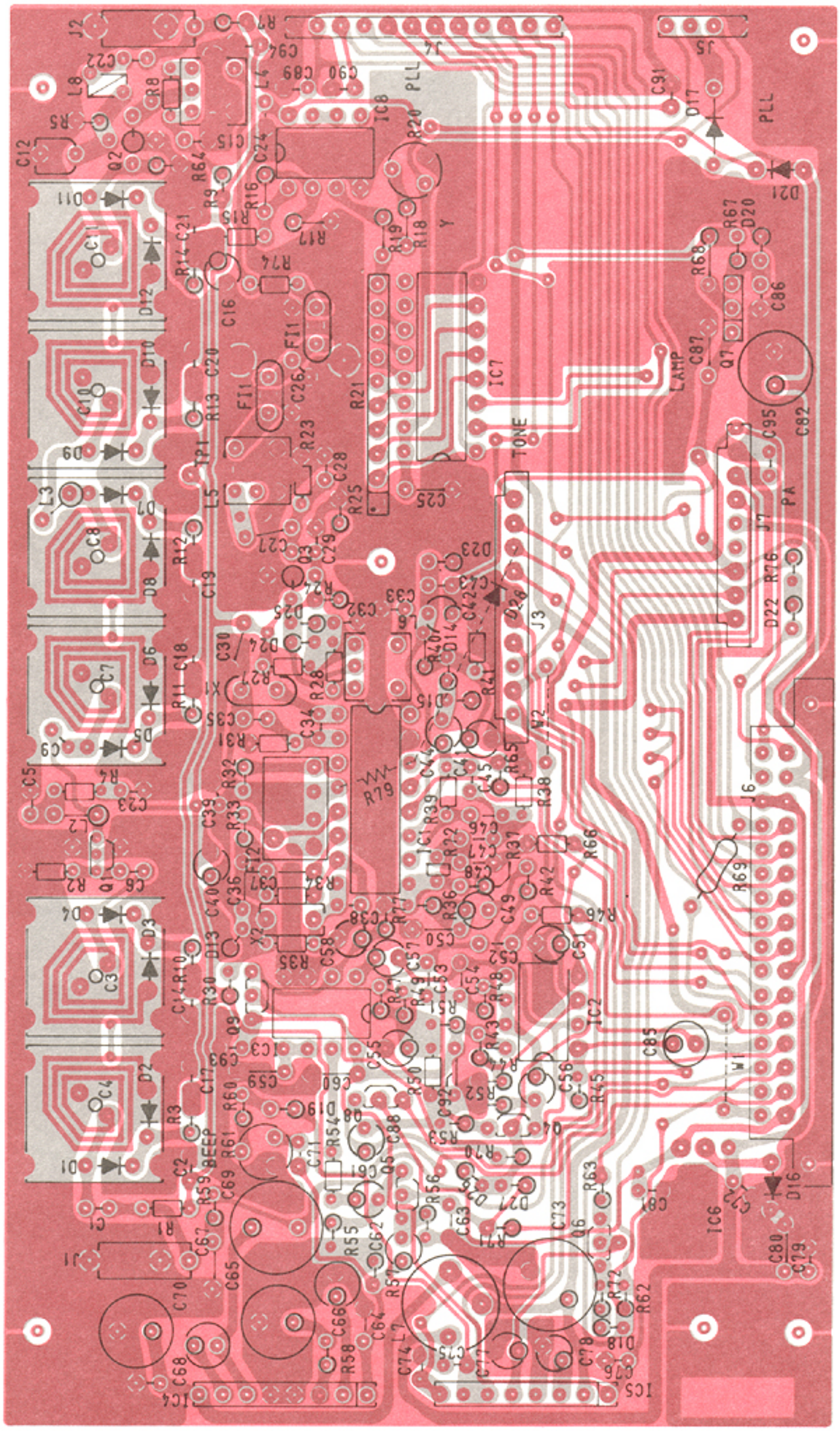


8 - 7 PA UNIT

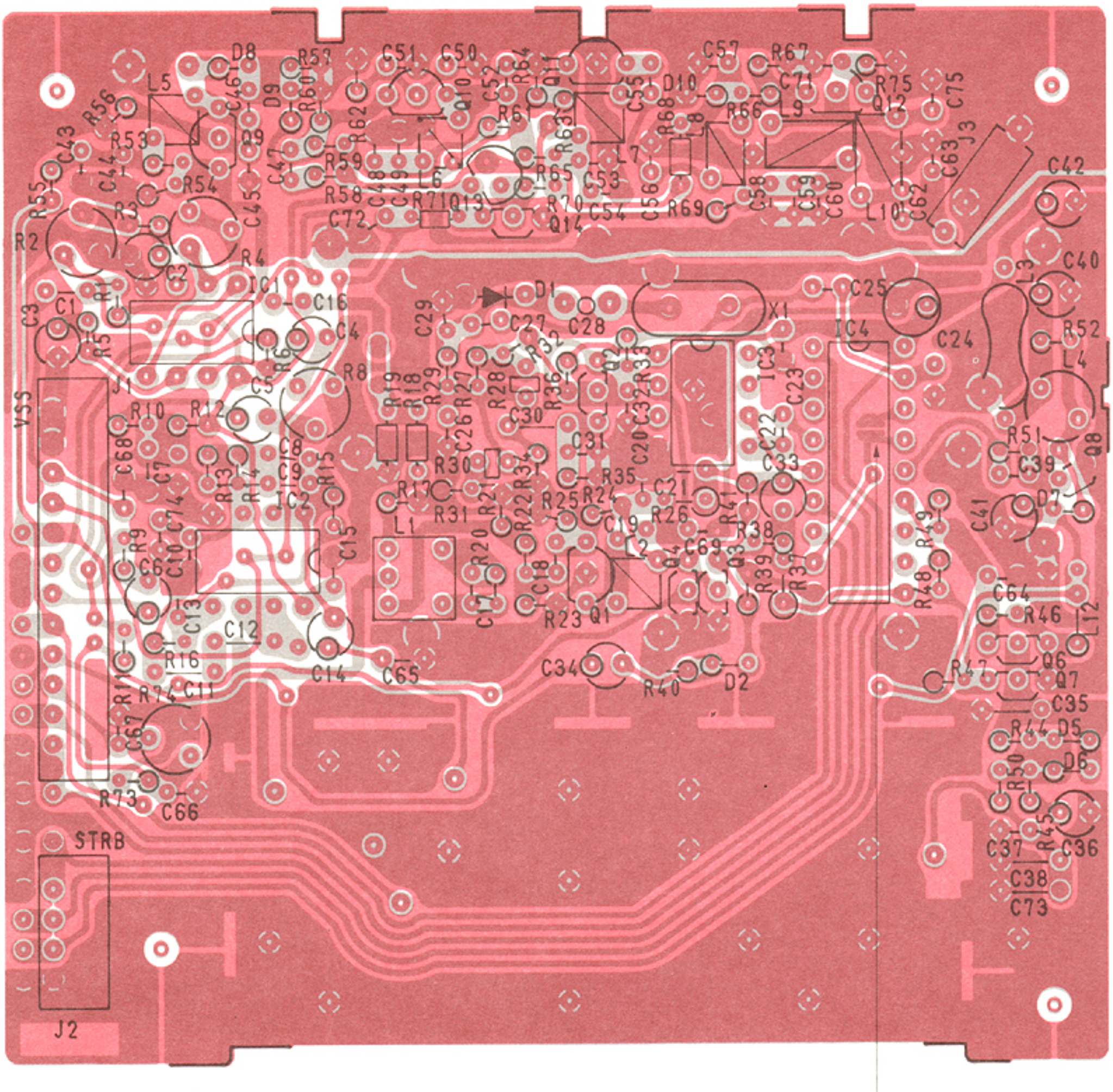

J3 ANT
to MAIN J1 P5
J5 to EF P1
GND
SP
HV
L7
C37
L6
C36
C35
L5
C34
C33
L4
C32
C31
D4
D3
D2
D1
C30
C29
C28
C19
C17
C16
C14
C15
Q1
C12
C13
L2
EP7
C11
C42
C10
C6
L1
C43
C5
C4
EP2
EP1
IC1
C3
C2
C1
R15
P1
to PLL J3
RX0.7V TX0V
D9
RL1
D6
R13
C20
D5
RX0V TX4.0V
C46
C27
R14
C23
R2
RX0V TX1.3V
R1
R3
D7
R5
R7
C45
R6
C26
C25
R4
C24
R11
R12
IC2(A)
IC2(B)
R8
R9
C48
Q2
RX13.2V TX9.8V
R10
C22
RX13.2V TX12.3V
Q3
RX13.8V TX13.0V
C40
C47
RX0.3V TX0V
RX4.82V TX0V
C50
C49
C41
C44
C51
C39
RL2
D8
J6
EP5 P2
P3
SP
T8V
R8V
13.8 I
TRF
PSW
VSS
to MAIN J7
13.8 I
from TONE UNIT (OPTION)

SECTION 9 BOARD LAYOUTS

9 - 1 MAIN UNIT



9 - 2 PLL UNIT



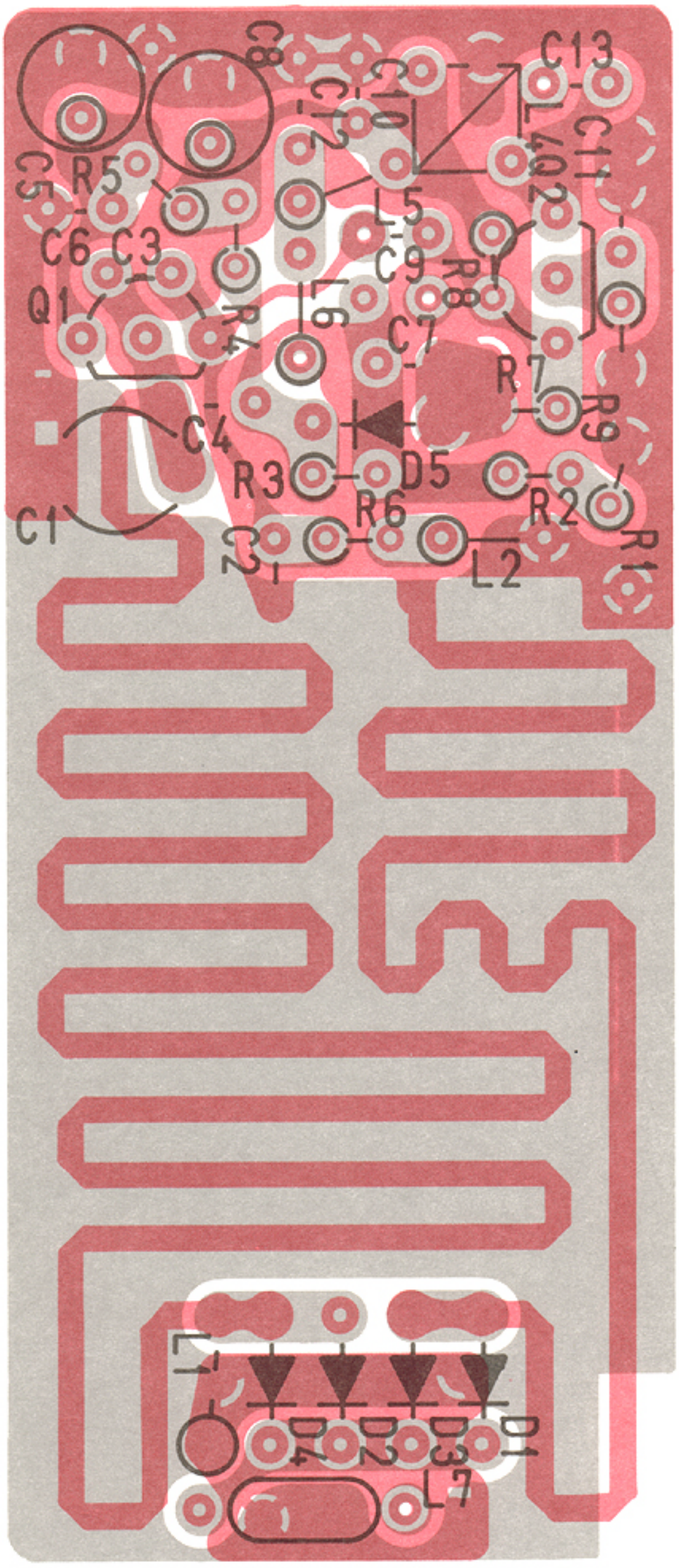
U.K. VERSION ONLY:

*1 Cut this pattern.

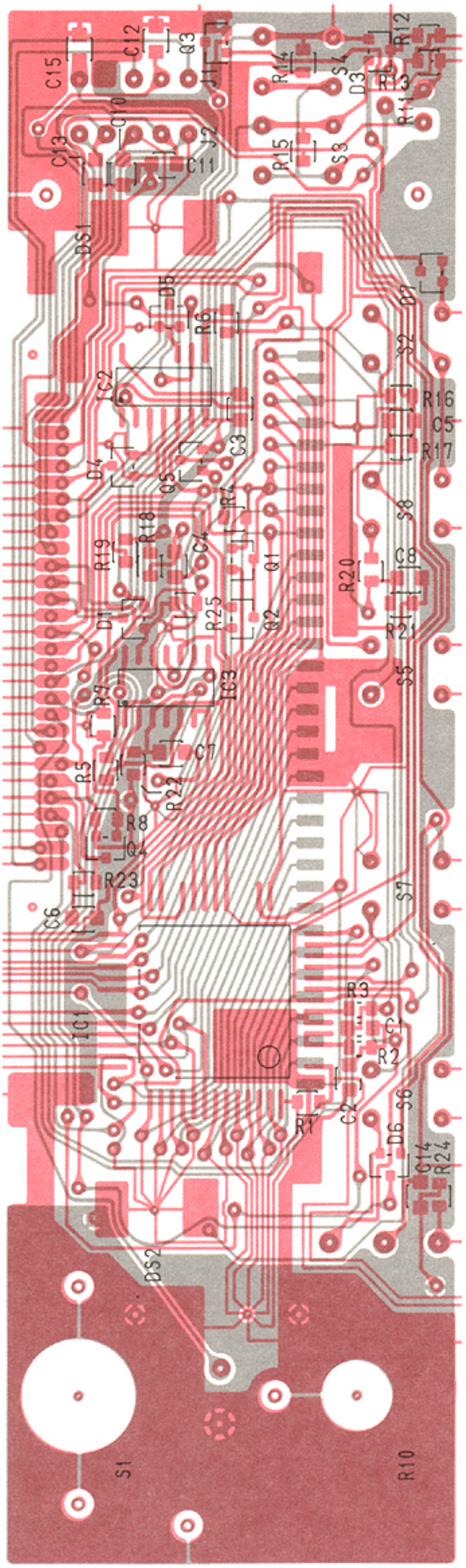
*2 Solder these traces.

Bottom view
(Soldering side)

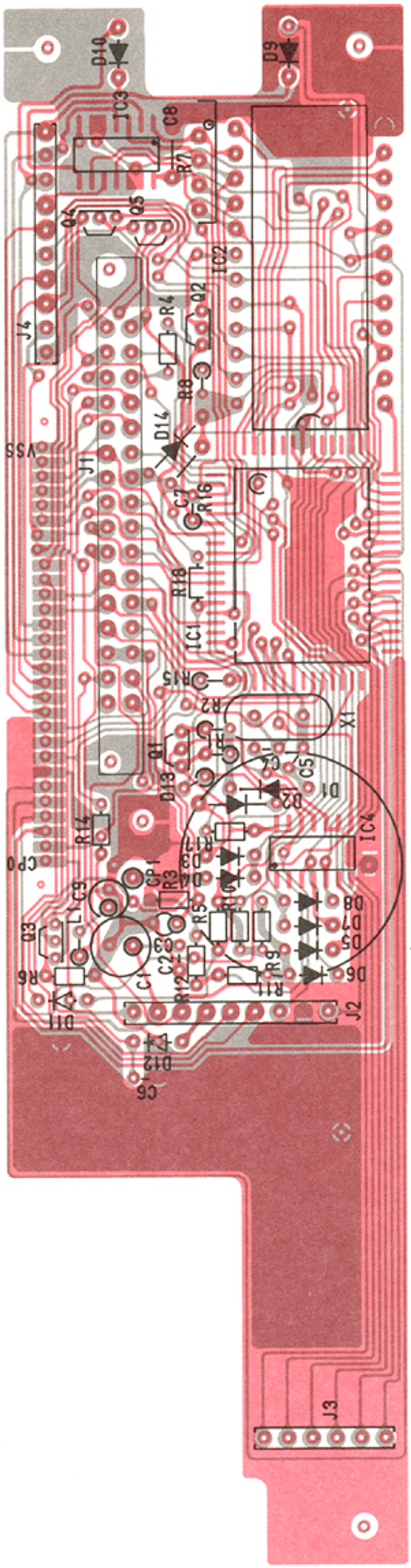
9 - 3 VCO UNIT


C8
C12
C13
C5
R5
L4
C14
C10
C11
L5
C6
C3
C9
R8
Q1
R4
L6
C7
R7
R9
C4
R3
D5
R2
R6
C1
R1
L2
L7

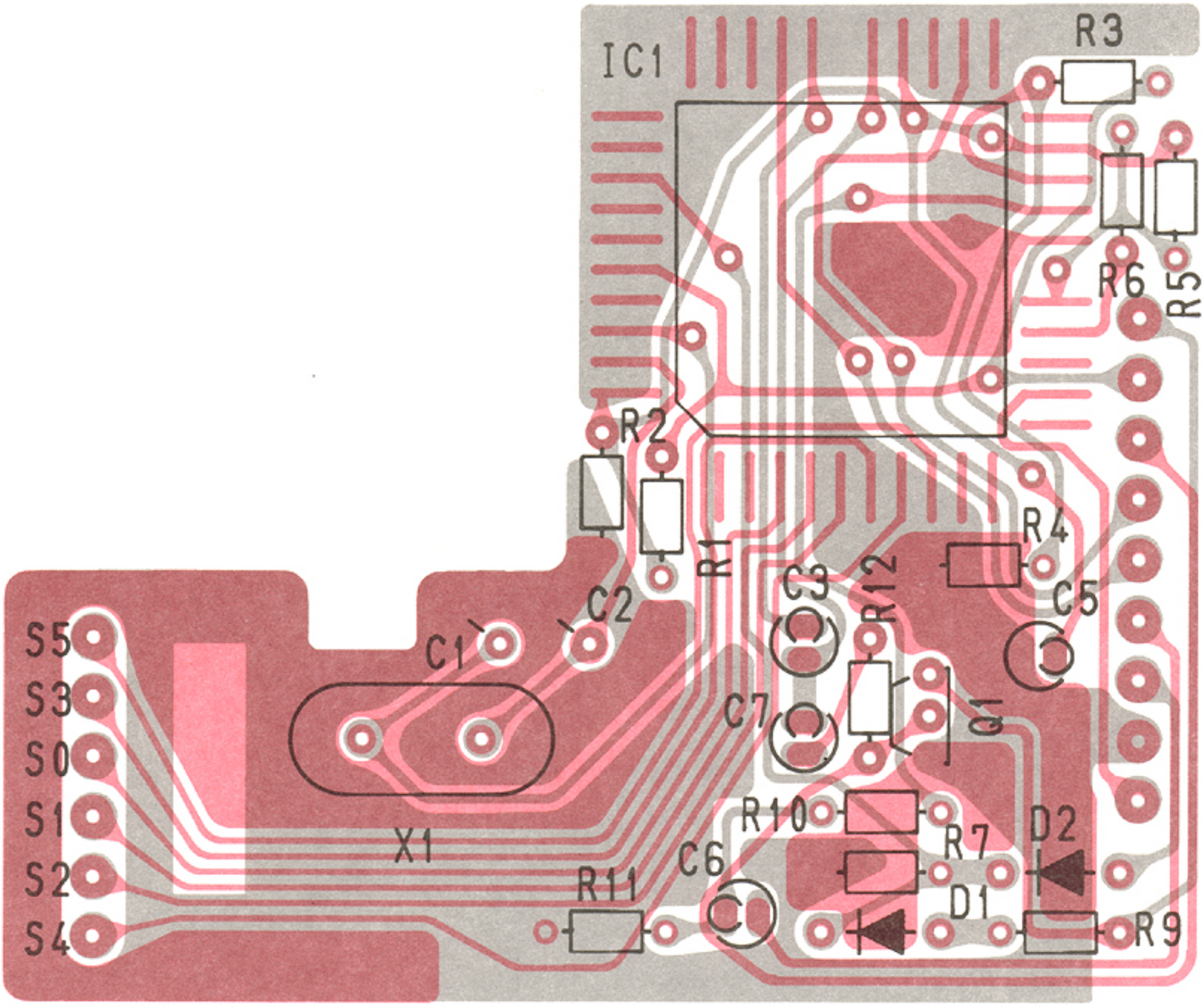
9 - 4 DISPLAY UNIT



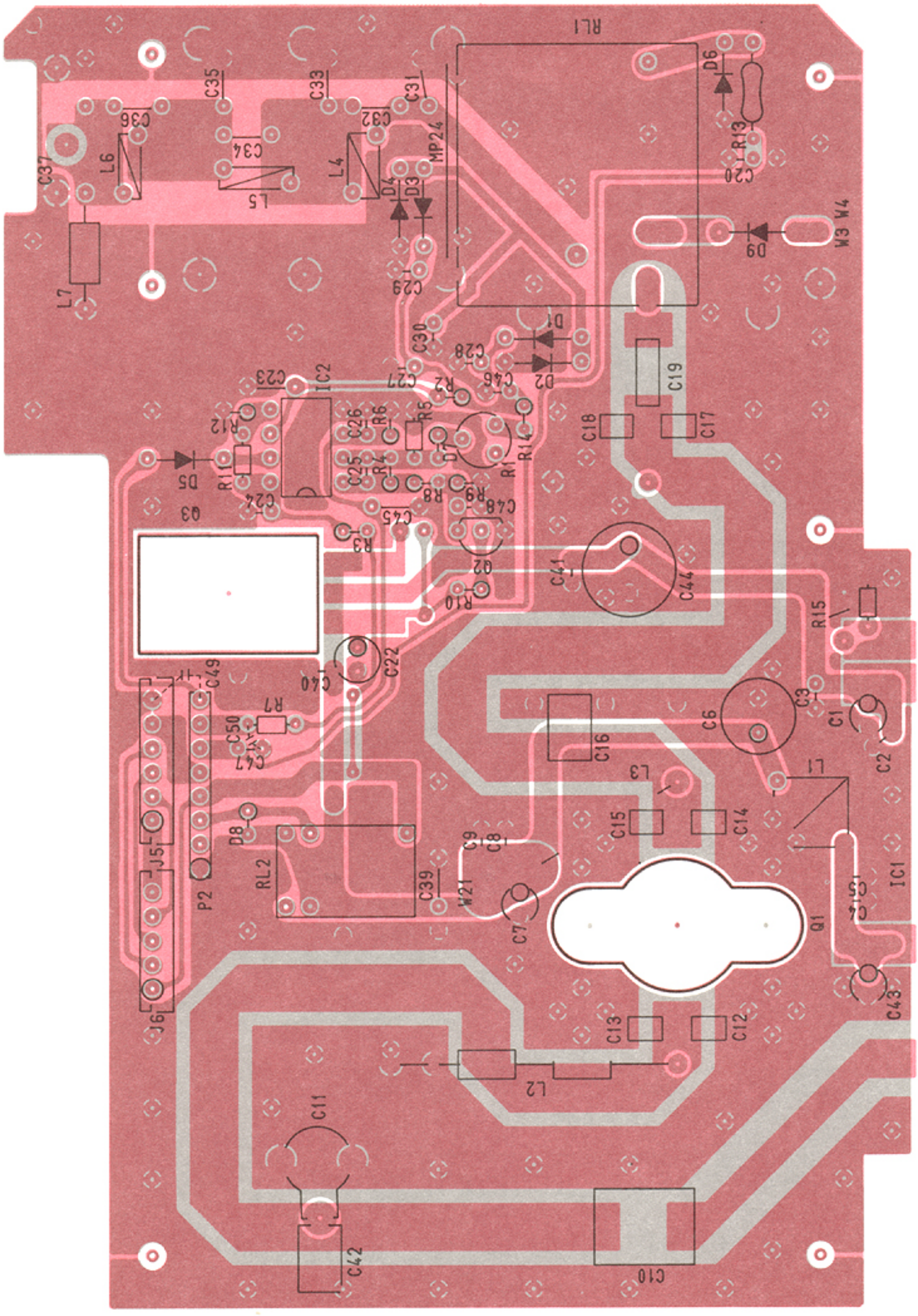
9 - 5 LOGIC UNIT



9 - 6 CTCSS UNIT



9 - 7 PA UNIT


RL1
D6
C35
C33
C31
C36
C32
C34
L6
L4
MP24
C37
L5
D4
D3
R13
C20
W3 W4
D9
L7
C29
D1
C30
C28
C23
IC2
C27
R2
C46
D2
C19
C26
R6
R5
R12
C18
C17
R14
D7
R1
C25
R4
R8
R9
C48
D5
R11
C24
Q3
C45
R3
Q2
C41
C44
R10
R15
C22
C40
C49
C3
C6
C1
R7
C50
C47
C16
C2
D8
C15
C14
L3
L1
J5
C9
C8
IC1
RL2
C39
W21
C7
Q1
C53
J6
P2
C43
C13
C12
L2
C11
C42
C10

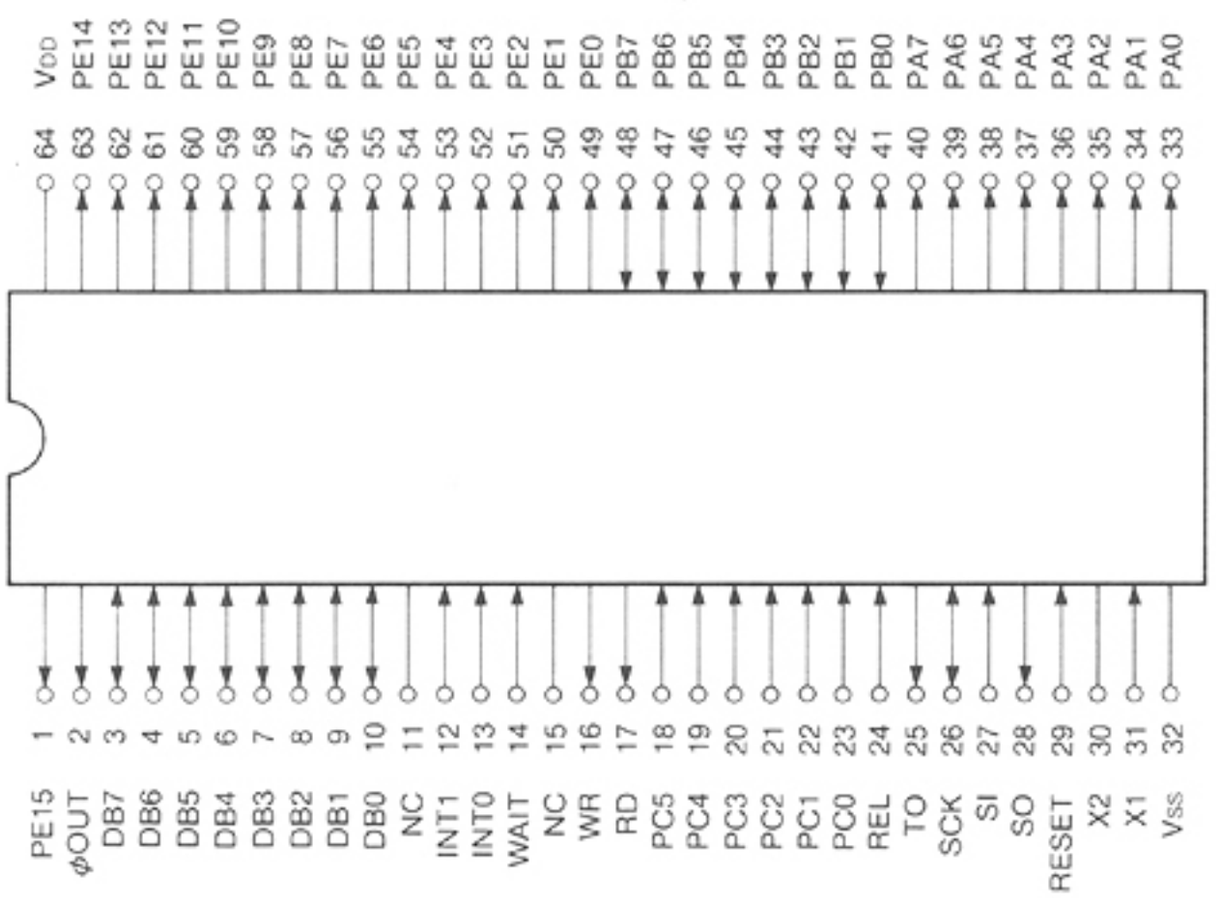
SECTION 10 IC SPECIFICATIONS

μPD78C06AG (MPU)

MAXIMUM RATINGS (Ta = 25° C)

DESCRIPTION	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{DD}	−0.3 ~ 7.0	V
Input And Output Voltage	V_T	−0.3 ~ Vcc+0.3	V
Output Current (High level)	I_{OH}	−5	mA
Output Current (Low level)	I_{OL}	43.5	mA
Operating Temperature	T_{OPR}	−40 ~ +85	°C
Storage Temperature	T_{STG}	−65 ~ +150	°C

PIN CONNECTION

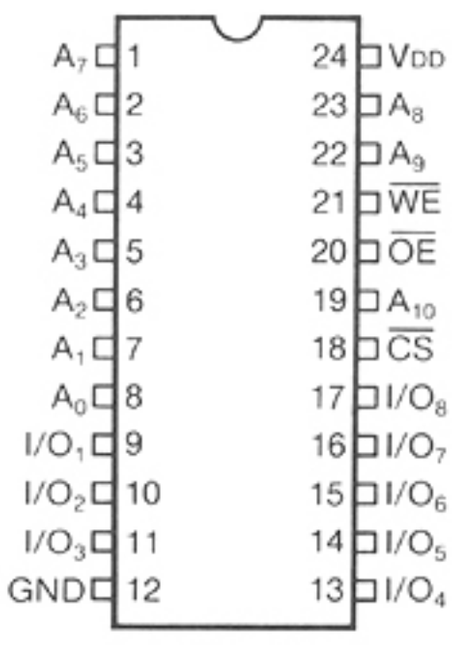


μPD446 (16384 BIT STATIC CMOS RAM)

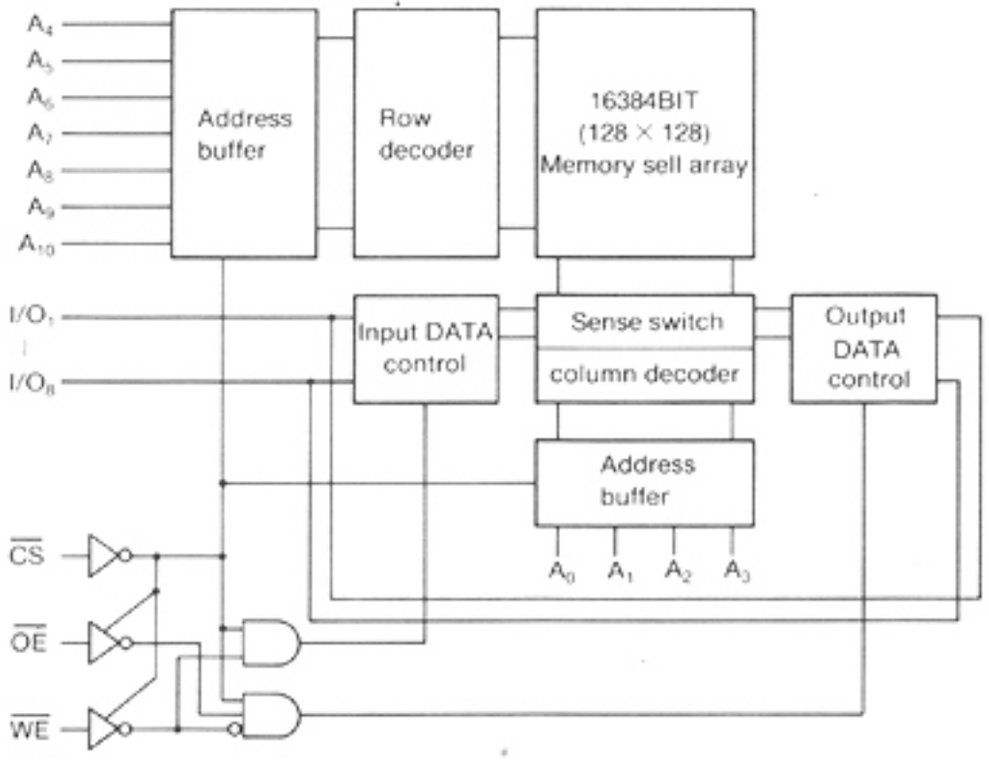
MAXIMUM RATINGS (Ta = 25° C)

DESCRIPTION	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{DD}	7.0	V
Input And Output Voltage	V_T	−0.3 ~ Vcc+0.3	V
Operating Temperature	T_{OPR}	−40 ~ +85	°C
Storage Temperature	T_{STG}	−55 ~ +125	°C

PIN CONNECTION



BLOCK DIAGRAM

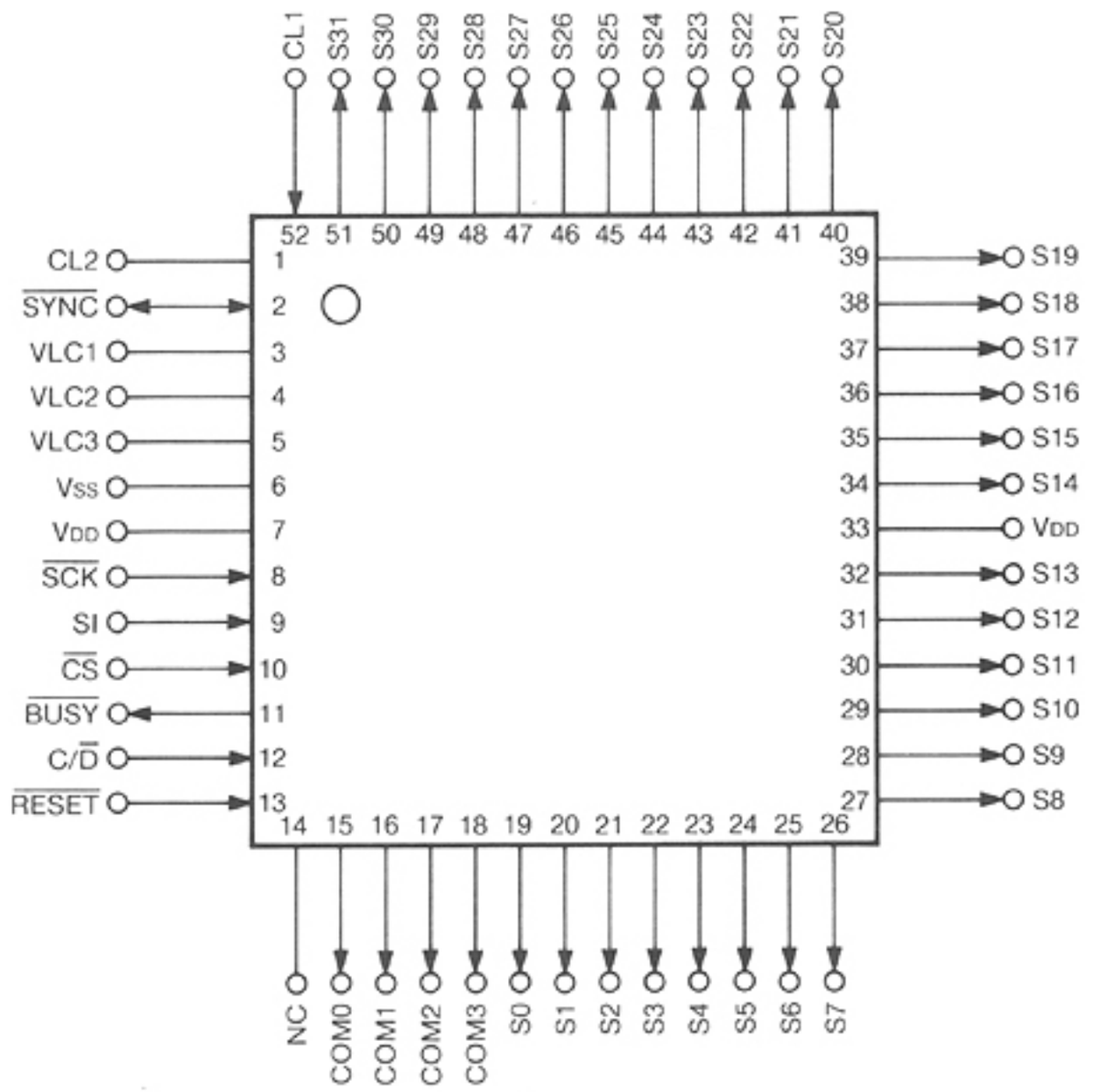


μPD7225G (PROGRAMMABLE LCD DRIVER)

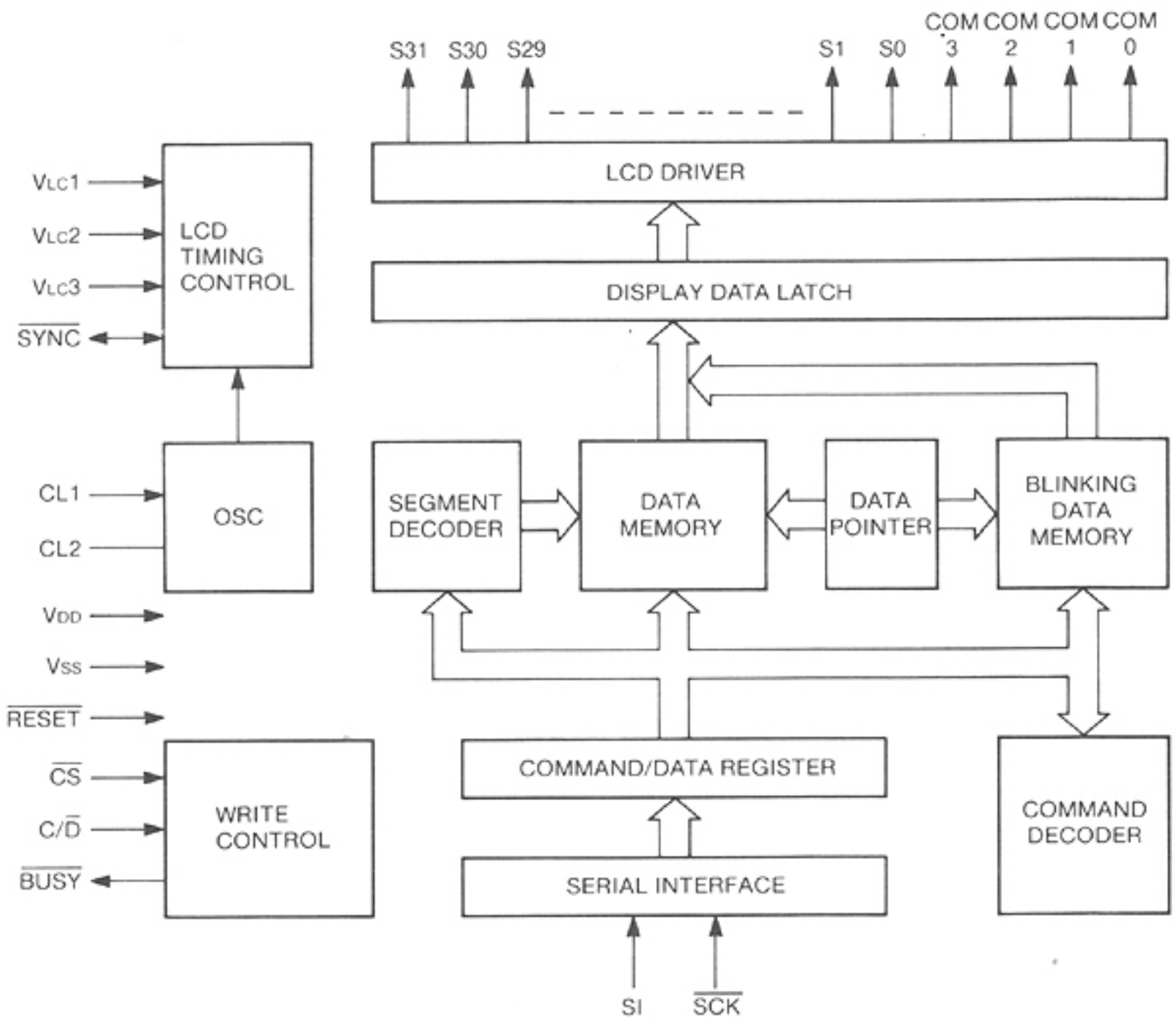
MAXIMUM RATINGS (Ta = 25° C)

DESCRIPTION	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{DD}	−0.3 ~ 7.0	V
Input Voltage	V_{IN}	−0.3 ~ V_{DD}+0.3	V
Output Voltage	V_{OUT}	−0.3 ~ V_{DD}+0.3	V
Operating Temperature	T_{OPR}	−10 ~ +70	°C
Storage Temperature	T_{STG}	−65 ~ +150	°C

PIN CONNECTION



BLOCK DIAGRAM

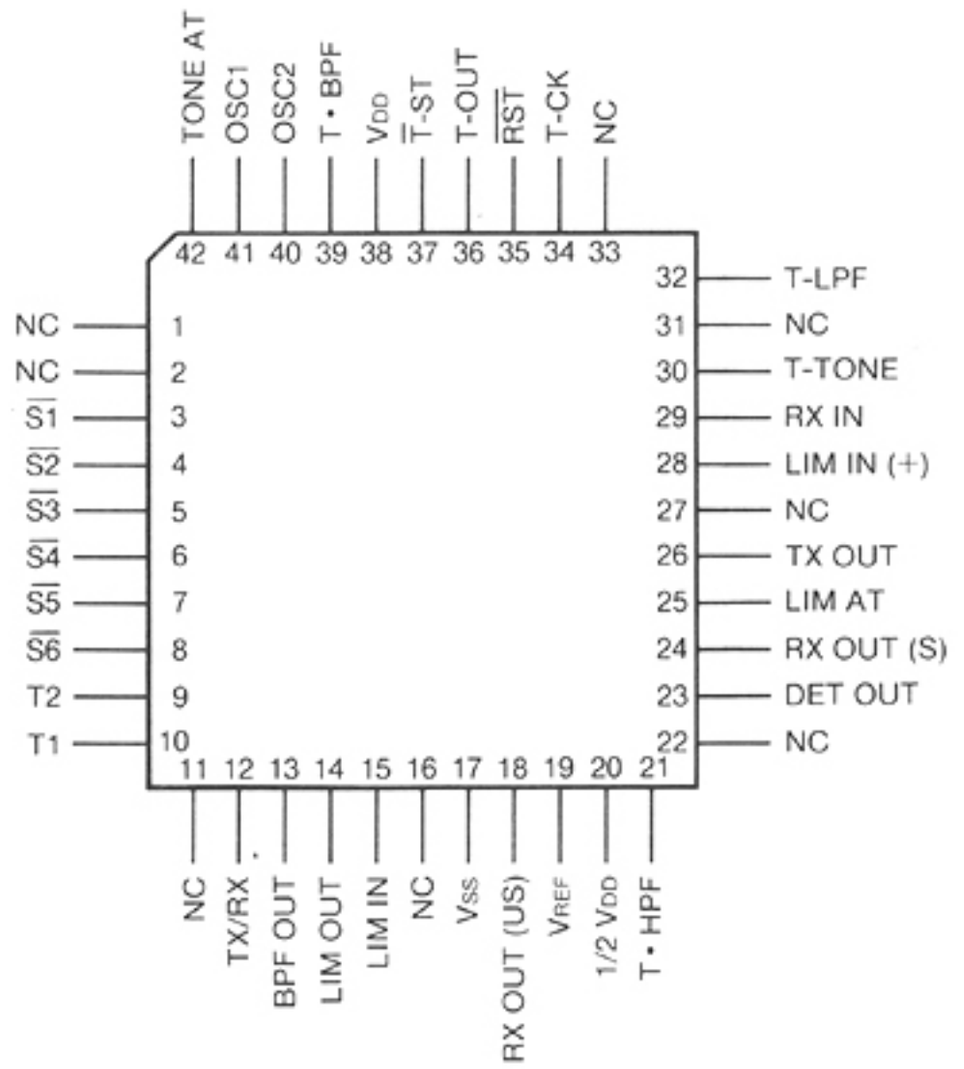


MN6520 (CTCSS ENCODER/DECODER)

MAXIMUM RATINGS (Ta = 25° C)

DESCRIPTION	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{DD}	−0.2 ~ 7.0	V
Input And Output Voltage	V_T	−0.2 ~ V_{DD}+0.2	V
Power Dissipation	P_D	100	mW
Operating Temperature	T_{OPR}	−20 ~ +70	°C
Storage Temperature	T_{STG}	−55 ~ +100	°C

PIN CONNECTION

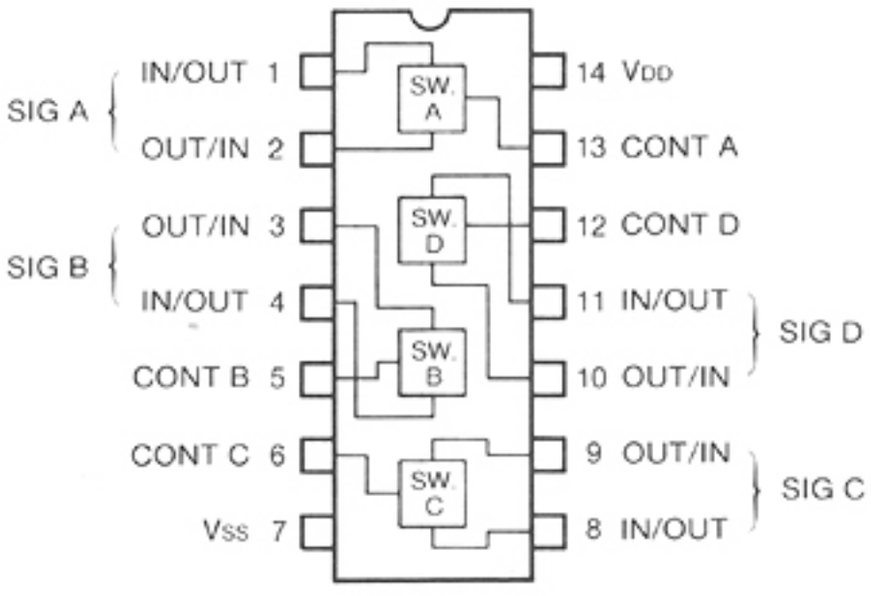


μPD4066BG (QUAD BILATERAL SWITCH)

MAXIMUM RATINGS (Ta = 25° C)

DESCRIPTION	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{DD}	−0.5 ~ 20	V
Input Voltage	V_{IN}	−0.5 ~ V_{DD}+0.5	V
Input Current	I_{IN}	10	mA
Permissible Dissipation	P_D	200	mW
Operating Temperature	T_{OPR}	−40 ~ +85	°C
Storage Temperature	T_{STR}	−65 ~ +125	°C

PIN CONNECTION

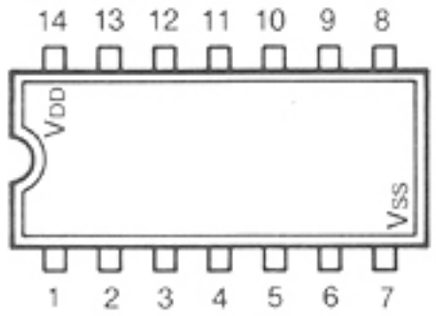


μPD4013BG (DUAL D-TYPE FLIP-FLOP)
μPD4081BG (QUAD 2-INPUT AND GATE)

MAXIMUM RATINGS (Ta = 25° C)

DESCRIPTION	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{DD}	−0.5 ~ 20	V
Input Voltage	V_{IN}	−0.5 ~ V_{DD}+0.5	V
Input Current	I_{IN}	10	mA
Power Dissipation	P_D	200	mW
Operating Temperature	T_{OPR}	−40 ~ +85	°C
Storage Temperature	T_{STG}	−65 ~ +125	°C

PIN CONNECTION

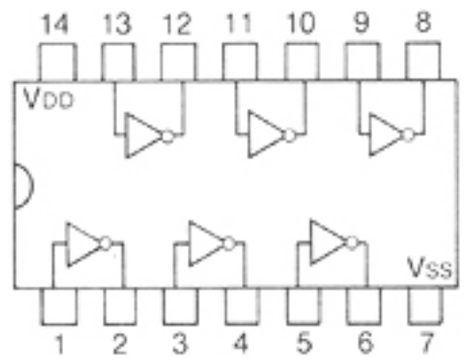


μPD4069UBG (HEX INVERTER)

MAXIMUM RATINGS (Ta = 25° C)

DESCRIPTION	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{DD}	V_{SS}−0.5 ~ V_{SS}+20	V
Input And Output Voltage	V_T	V_{SS}−0.5 ~ V_{CC}+0.5	V
Input Current	I_{IN}	±10	mA
Permissible Dissipation	P_D	300	mW
Storage Temperature	T_{STG}	−65 ~ +150	°C

PIN CONNECTION

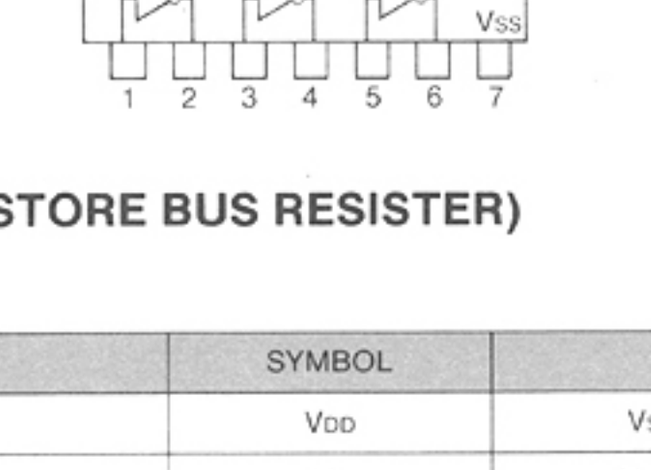


TC4094BP (8-STAGE AND STORE BUS RESISTER)

MAXIMUM RATINGS (Ta = 25° C)

DESCRIPTION	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{DD}	V_{SS}−0.5 ~ V_{SS}+20	V
Input And Output Voltage	V_T	V_{SS}−0.5 ~ V_{DD}+0.5	V
Input Current	I_{IN}	±10	mA
Power Dissipation	P_D	300	mW
Operating Temperature	T_{OPR}	−40 ~ +85	°C
Storage Temperature	T_{STG}	−65 ~ +150	°C

PIN CONNECTION

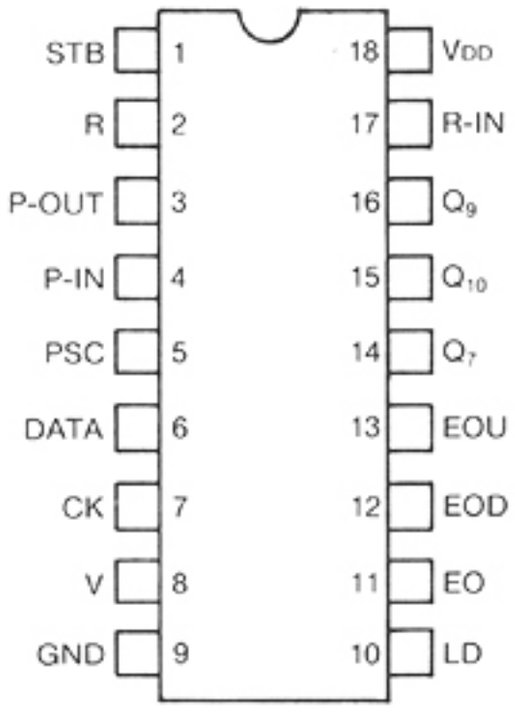


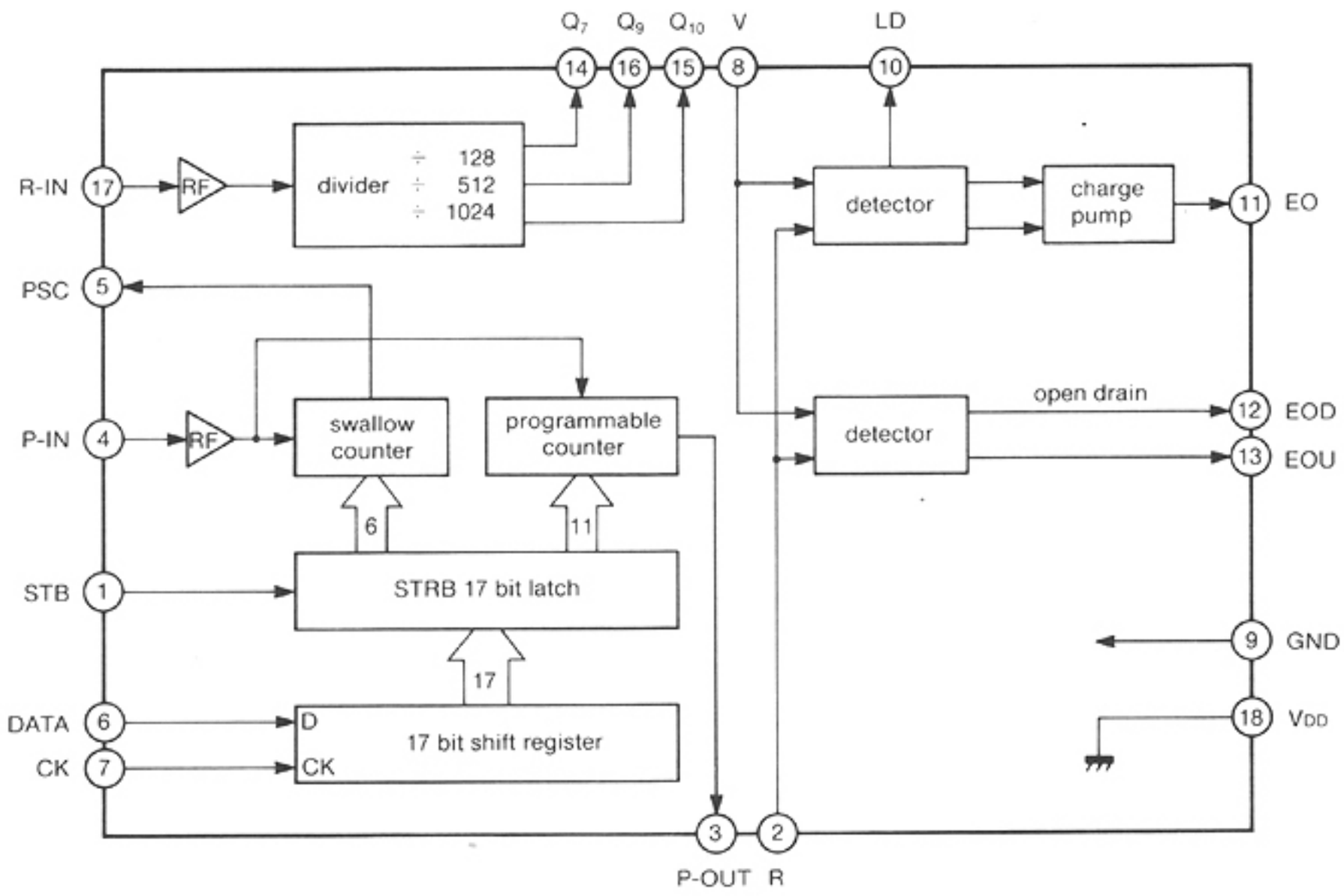
μPD2834C (PLL FREQUENCY SYNTHESIZER)

MAXIMUM RATINGS (Ta = 25° C)

DESCRIPTION	SYMBOL	RATINGS	UNIT	REMARKS
Supply Voltage	V_{DD}	−0.3 ~ +7.0	V	
Input Voltage	V_{IN}	−0.5 ~ +V_{DD}+0.5	V	
Output Voltage	V_{OUT}	−0.5 ~ +V_{DD}+0.5	V	
Output Voltage	V_{OUT}	−0.5 ~ +V_{DD}+3.0	V	EOU pins only
Operating Temperature	T_{OPR}	−40 ~ +85	°C	
Storage Temperature	T_{STR}	−65 ~ +150	°C	

PIN CONNECTION



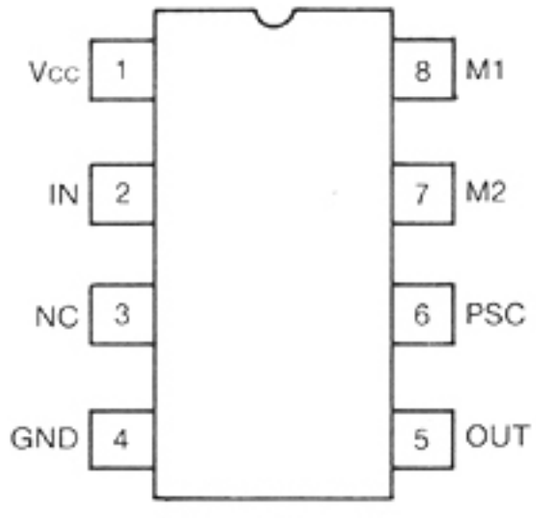


μPB571C (LOW POWER PRESCALER)

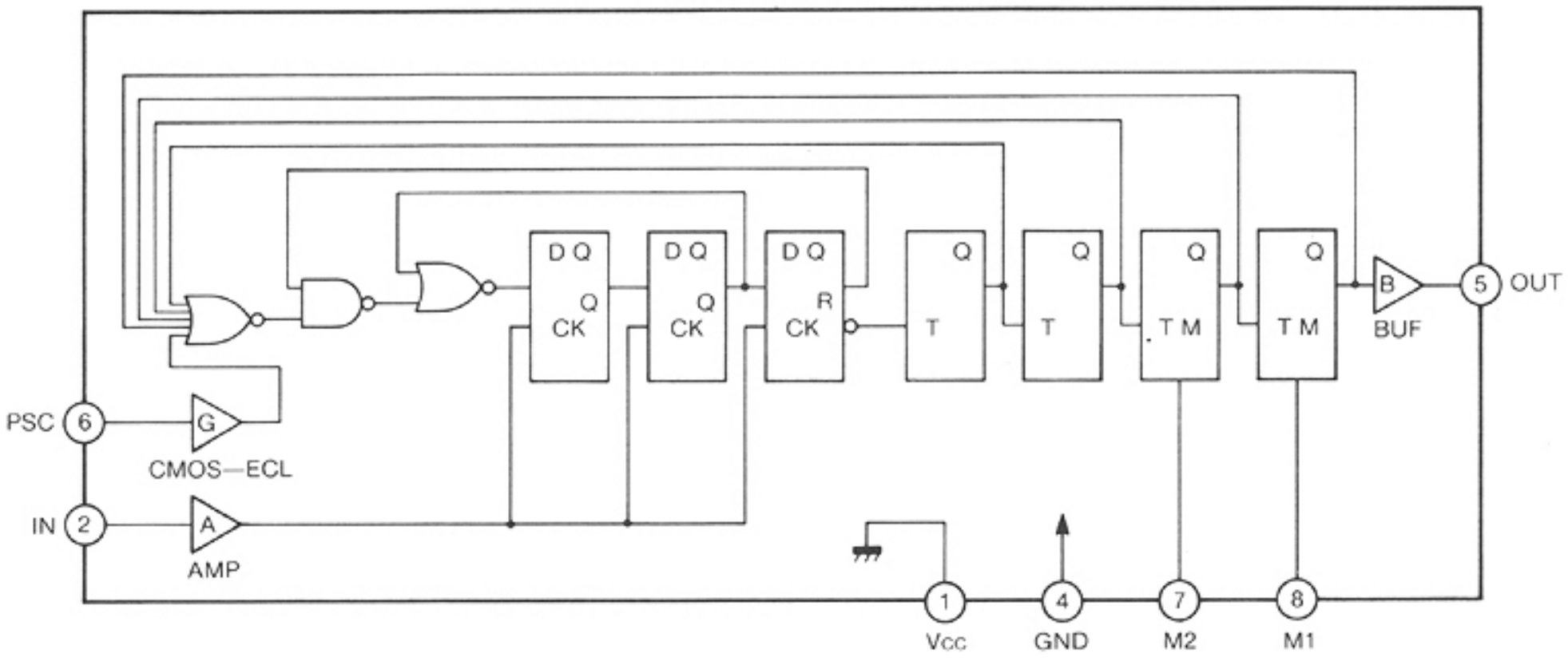
MAXIMUM RATINGS (Ta = 25° C)

DESCRIPTION	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{CC}	−0.5 ~ +6.0	V
Input Voltage	V_{IN}	−0.5 ~ +V_{CC}+0.5	V
Output Current	I_O	−10	mA
Storage Temperature	T_{STG}	−55 ~ +125	°C

PIN CONNECTION



BLOCK DIAGRAM



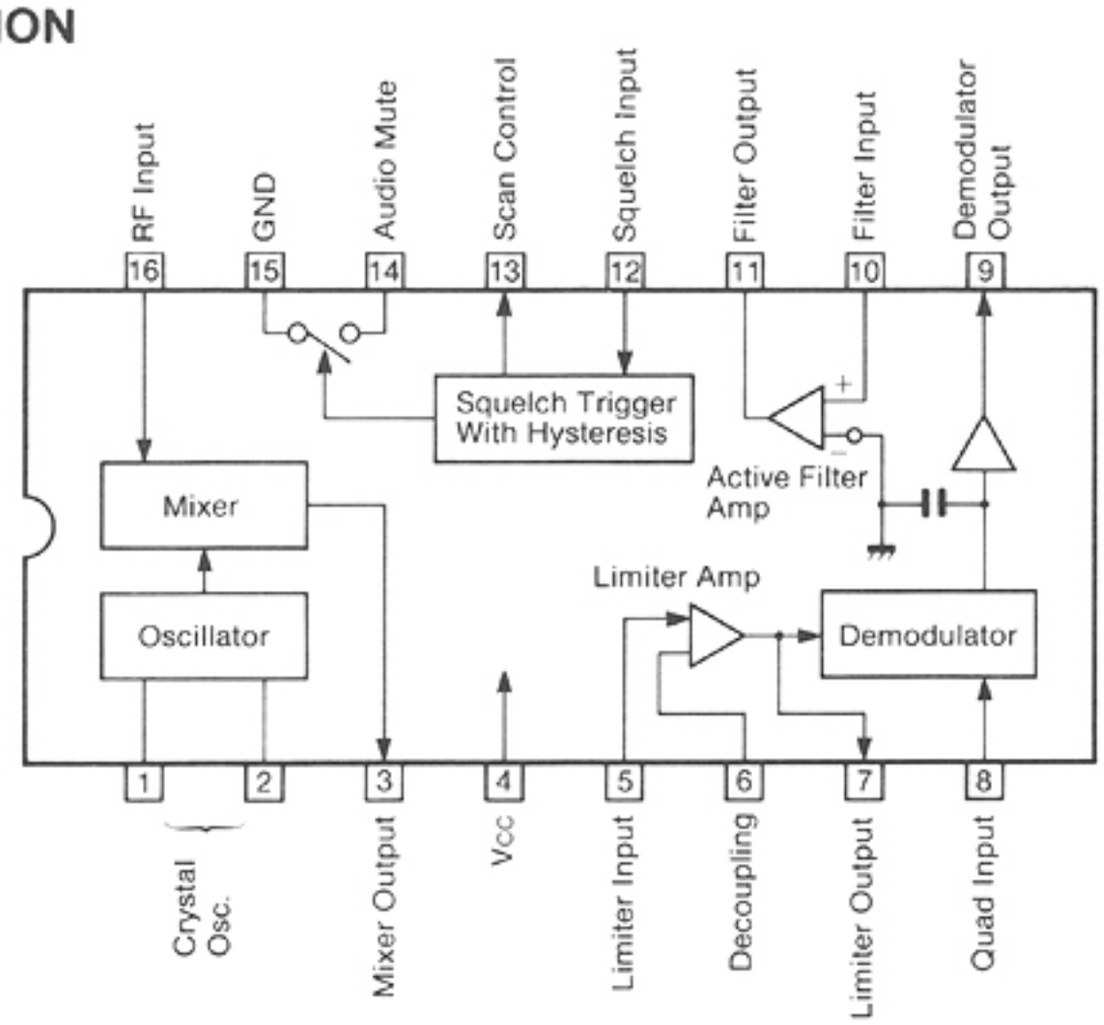
when M1 and M2 are Hi (Vcc), FF is equal to buffer.

MC3357 (LOW POWER FM IF)

MAXIMUM RATINGS (Ta = 25° C)

DESCRIPTION	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{CC} (max)	12	V
Operating Supply Voltage	V_{CC}	4 or 8	V
Detector Input Voltage	—	1.0	V
Input Voltage ($V_{CC} \geqslant$ 6.0 Volts)	V_{IN}	1.0	V
Mute Function	V_{OM}	−0.5 5.0	V
Junction Temperature	T_J	150	°C
Operating Ambient Temperature Range	T_A	−30 +70	°C
Storage Temperature Range	T_{STG}	−65 +150	°C

PIN CONNECTION



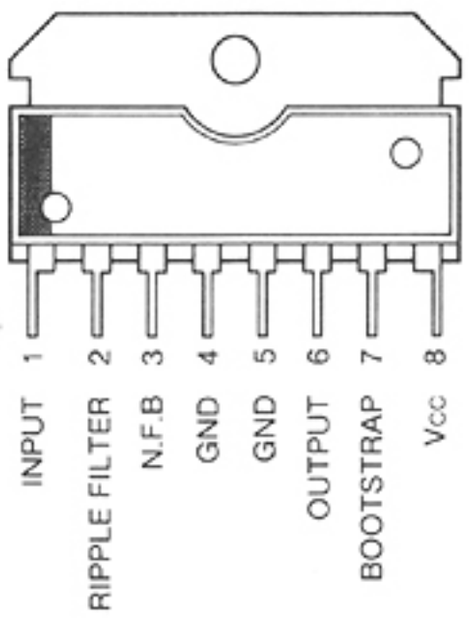
μPC1241H (AUDIO POWER AMPLIFIER)

MAXIMUM RATINGS (Ta = 25° C)

DESCRIPTION	SYMBOL	RATINGS	UNIT
Supply Voltage (Surge)	V_{CC} 1 (200mS)	50	V
Power Supply Voltage (No Signal)	V_{CC} 2	25	V
Power Supply Voltage (Operation)	V_{CC} 3	18*	V
Circuitry Current	I_{CC} (peak)	4.5	A
Operating Temperature	T_{OPR}	−30 ~ +75*	°C
Storage Temperature	T_{STG}	−55 ~ +150	°C

*With 100mm × 100mm × 1mm aluminum heat sink.

PIN CONNECTION



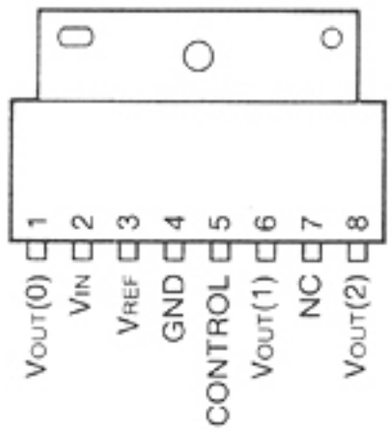
MB3756 (VOLTAGE REGULATOR)

MAXIMUM RATINGS (Ta = 25°C)

DESCRIPTION	SYMBOL	RATINGS	UNIT
Input Voltage	V_{IN}	18	V
Power Dissipation	P_D	1 *1	W
		4 *2	W
Operating Temperature	T_{OPR}	−30 ~ +80	°C
Storage Temperature	T_{STG}	−55 ~ +150	°C

*1 : No Heat Sink $T_A \leqslant 70°C$
*2 : Infinite Heat Sink $T_C \leqslant 70°C$

PIN CONNECTION

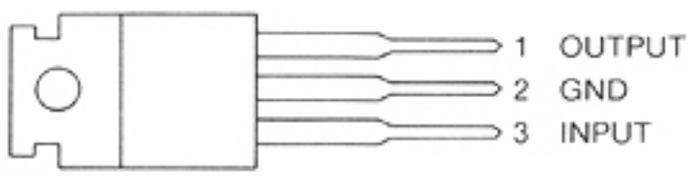


NJM7805 (3-TERMINAL 5V REGULATOR)

MAXIMUM RATINGS (Ta = 25°C)

DESCRIPTION	SYMBOL	RATINGS	UNIT
Input Voltage	V_{IN}	35	V
Power Dissipation	P_D	16 ($T_C \leqslant 45°C$)	W
Operating Temperature	T_{OPR}	−30 ~ +75	°C
Storage Temperature	T_{STG}	−40 ~ +125	°C

PIN CONNECTION

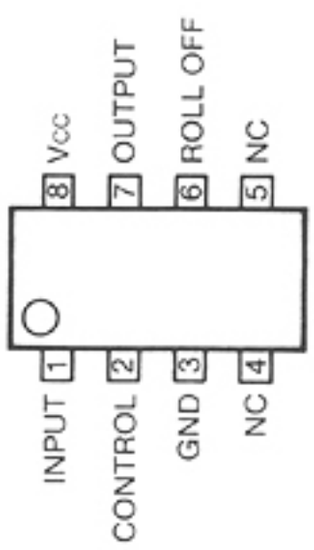


MC3340 (ELECTRONIC ATTENUATOR)

MAXIMUM RATINGS (Ta = 25°C)

DESCRIPTION	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{CC}	20	V
Power Dissipation	P_D	1.2	W
Operating Temperature	T_{OPR}	0 ~ +75	°C

PIN CONNECTION



NJM4558D (DUAL LOW NOISE AMPLIFIER)

MAXIMUM RATINGS (Ta = 25° C)

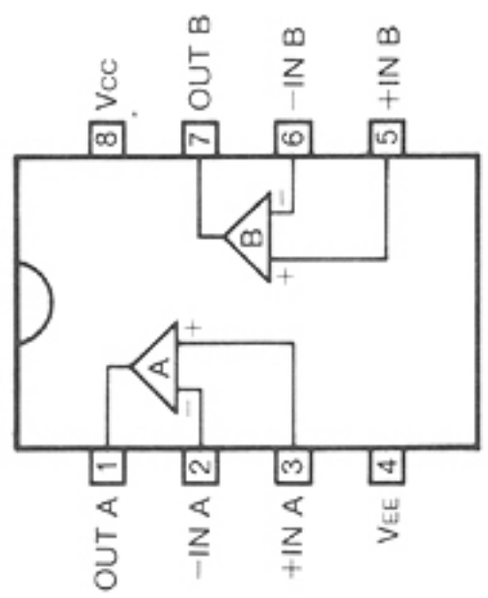
DESCRIPTION	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{CC}	±18	V
Input Voltage	V_{IN}	±15	V
Operating Temperature	T_{OPR}	−20～+75	°C
Storage Temperature	T_{STG}	−40～+125	°C

μPC358C (DUAL DRIVER)

MAXIMUM RATINGS (Ta = 25° C)

DESCRIPTION	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{CC}	32	V
Drive Input Voltage	DV_{IN}	±36	V
Input Voltage	V_{IN}	−0.3～+32	V
Permissible Dissipation	P_D	350	mW
Operating Temperature	T_{OPR}	0～+70	°C
Storage Temperature	T_{STG}	−55～+125	°C

NJM4558D/μPC358C PIN CONNECTION

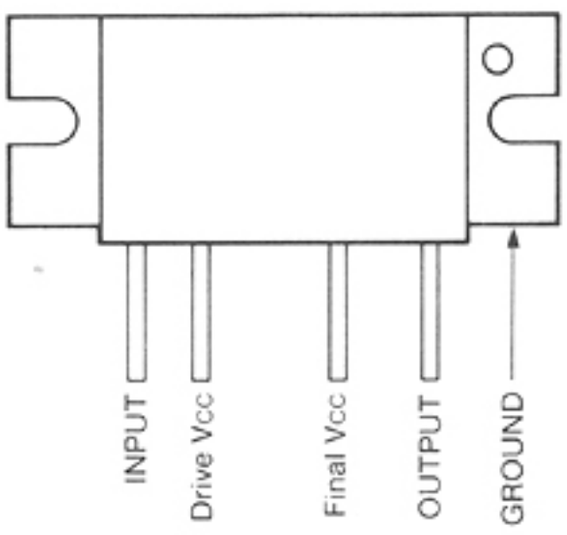


SC-1044 (VHF POWER AMPLIFIER MODULE 145～175MHz)
SC-1045 (VHF POWER AMPLIFIER MODULE 133～145MHz)

MAXIMUM RATINGS (Ta = 25° C)

DESCRIPTION	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{CC}	17	V
Input Power	P_{IN}	1.2	W
Output Power	P_{OUT}	20	W
Operating Temperature	T_{OPR}	−30～+110	°C
Storage Temperature	T_{STG}	−40～+110	°C

PIN CONNECTION



SECTION 11 PARTS LIST

[EF] UNIT

REF. NO.	DESCRIPTION	PART NO.
D1	DIODE	15CD11
C1	CERAMIC	0.0047 50V
J1	CONNECTOR	LR02-2V
J2	CONNECTOR	SJ-296
J3	CONNECTOR	SMP-04V-B
P1	CONNECTOR	TL25H-06-B1
EP1	BEAD CORE	FSQH070RN

[MAIN] UNIT

REF. NO.	DESCRIPTION	PART NO.
IC1	IC	MC3357P
IC2	IC	NJM4558D
IC3	IC	MC3340P
IC4	IC	μPC1241H
IC5	IC	MB3756
IC6	IC	NJM7805
IC7	IC	TC4094BP
IC8	IC	μPC358C
Q1	FET	2SK241GR
Q2	FET	3SK74M
Q3	FET	3SK122K
Q4	FET	2SJ105Y
Q5	FET	2SJ105Y
Q6	TRANSISTOR	2SC2458GR
Q7	TRANSISTOR	2SD1225MR
Q8	TRANSISTOR	2SC2458GR
Q9	TRANSISTOR	2SC2458GR
D1	VARICAP	1SV50E
D2	VARICAP	1SV50E
D3	VARICAP	1SV50E
D4	VARICAP	1SV50E
D5	VARICAP	1SV50E
D6	VARICAP	1SV50E
D7	VARICAP	1SV50E
D8	VARICAP	1SV50E
D9	VARICAP	1SV50E
D10	VARICAP	1SV50E
D11	VARICAP	1SV50E
D12	VARICAP	1SV50E
D13	ZENER	RD6.2E B2
D14	DIODE	1S953
D15	DIODE	1S953
D16	DIODE	1SS133
D17	DIODE	1SS53
D18	DIODE	1SS133
D19	DIODE	1SS133
D20	ZENER	RD6.8E B2
D21	DIODE	1SS133
D22	DIODE	1SS133

[MAIN] UNIT

REF. NO.	DESCRIPTION	PART NO.
D23	DIODE	1SS133
D24	DIODE	1SS99
D25	DIODE	1SS99
D26	DIODE	1SS133
D27	DIODE	1SS133
D28	DIODE	1SS133
FI1	CRYSTAL FIL	21M15B3 (#01, #02, #05, #06, #07, #08)
FI1	CRYSTAL FIL	21M7B2 (#03)
FI2	CERAMIC FIL	CFW455E (#01, #02, #05, #06, #07, #08)
FI2	CERAMIC FIL	CFW455HT (#03)
X1	CRYSTAL	CR70
X2	DISCRIMINATOR	CDB455C7A
L2	COIL	LW-25
L3	COIL	LAL03NA R56M
L4	COIL	LS-297
L5	COIL	LS-298
L6	COIL	LS-297
L7	COIL	LW-15
L8	COIL	LA-234

R1	RESISTOR	4.7K	R20
R2	RESISTOR	47K	R20
R3	RESISTOR	100K	ELR20
R4	RESISTOR	100	R20
R5	RESISTOR	47K	ELR20
R7	RESISTOR	2.2K	ELR20
R8	RESISTOR	2.2K	R20
R9	RESISTOR	100	ELR20
R10	RESISTOR	100K	ELR20
R11	RESISTOR	100K	ELR20
R12	RESISTOR	100K	ELR20
R13	RESISTOR	100K	ELR20
R14	RESISTOR	100K	ELR20
R15	RESISTOR	10K	R20
R16	RESISTOR	500K	CRB25FX
R17	RESISTOR	100K	CRB25FX
R18	RESISTOR	480K	CRB25FX
R19	RESISTOR	480K	CRB25FX
R20	TRIMMER	10K	RHM0A1408A
R21	ARRAY	RKM10L103FX	
R23	RESISTOR	470K	R20
R24	RESISTOR	100K	ELR20
R25	RESISTOR	120K	ELR20
R27	RESISTOR	100	R20
R28	RESISTOR	10K	R20
R30	RESISTOR	220	ELR20
R31	RESISTOR	47K	R20
R32	RESISTOR	1.5K	ELR20 (#01, #02, #05, #06, #07, #08)
R32	RESISTOR	2.2K	ELR20 (#03)
R33	RESISTOR	1.5K	ELR20 (#01, #02, #05, #06, #07, #08)

[MAIN] UNIT

REF. NO.	DESCRIPTION	PART NO.	
R33	RESISTOR	2.2K	ELR20 (#03)
R34	RESISTOR	47K	R20
R35	RESISTOR	1.5K	R20
R36	RESISTOR	15K	ELR20
R37	RESISTOR	2.2K	ELR20
R38	RESISTOR	2.2K	R20
R39	RESISTOR	330K	R20
R40	RESISTOR	2.2K	ELR20
R41	RESISTOR	22K	R20
R42	RESISTOR	10K	ELR20
R43	RESISTOR	8.2K	ELR20
R44	RESISTOR	10K	ELR20
R45	RESISTOR	33K	ELR20 (#01, #02, #05, #06, #07, #08)
R45	RESISTOR	68K	ELR20 (#03)
R46	RESISTOR	6.8K	R20
R47	RESISTOR	33K	ELR20
R48	RESISTOR	8.2K	ELR20
R49	RESISTOR	560K	ELR20
R50	RESISTOR	10K	R20
R51	RESISTOR	8.2K	ELR20
R52	RESISTOR	1M	ELR20
R53	RESISTOR	1M	ELR20
R54	RESISTOR	18K	R20
R55	RESISTOR	1M	ELR20
R56	RESISTOR	1M	ELR20
R57	RESISTOR	4.7K	ELR20
R58	RESISTOR	100	ELR20
R59	RESISTOR	1	ELR20
R60	RESISTOR	1M	ELR20
R61	TRIMMER	47K	RHB0CS42BA
R62	RESISTOR	47K	ELR20
R63	RESISTOR	47K	ELR20
R64	RESISTOR	47K	ELR20
R65	RESISTOR	1K	ELR20
R66	RESISTOR	10K	R20
R67	RESISTOR	1K	ELR20
R68	RESISTOR	33	R50X
R69	RESISTOR	47K	R20
R70	RESISTOR	1M	ELR20
R71	RESISTOR	470K	ELR20
R72	RESISTOR	470	ELR20
R74	RESISTOR	560	R20
R76	RESISTOR	12K	ELR20
R77	RESISTOR	2.2K	ELR20
R78	THERMISTOR	33D28	
R79	RESISTOR	470K	R20
C1	CERAMIC	5P	50V
C2	CERAMIC	0.001	50V
C3	TRIMMER	10P	ECR-GA010D30
C4	TRIMMER	10P	ECR-GA010D30
C5	CERAMIC	0.001	50V
C6	CERAMIC	8P	50V
C7	TRIMMER	10P	ECR-GA010D30
C8	TRIMMER	10P	ECR-GA010D30
C9	CERAMIC	0.001	50V
C10	TRIMMER	10P	ECR-GA010D30
C11	TRIMMER	10P	ECR-GA010D30
C12	TRIMMER	20P	CV38D2001
C14	CERAMIC	0.001	50V
C15	CERAMIC	0.001	50V
C16	ELECTROLYTIC	0.1	50V MS7
C17	CERAMIC	0.001	50V

[MAIN] UNIT

REF. NO.	DESCRIPTION	PART NO.	
C18	CERAMIC	0.001	50V
C19	CERAMIC	0.001	50V
C20	CERAMIC	0.001	50V
C21	CERAMIC	0.001	50V
C22	CERAMIC	36P	50V
C23	CERAMIC	0.001	50V
C24	BARRIER LAYER	0.01	25V
C25	BARRIER LAYER	0.1	16V
C26	CERAMIC	7P	50V (#01, #02, #05, #06, #07, #08)
C26	CERAMIC	15P	50V (#03)
C27	CERAMIC	180P	50V
C28	CERAMIC	62P	50V
C29	CERAMIC	0.001	50V
C30	CERAMIC	0.0047	50V
C32	CERAMIC	0.001	50V
C33	CERAMIC	0.001	50V
C34	CERAMIC	120P	50V
C35	CERAMIC	68P	50V
C36	BARRIER LAYER	0.1	16V
C37	BARRIER LAYER	0.1	16V
C38	CERAMIC	82P	50V
C39	CERAMIC	0.001	50V
C40	ELECTROLYTIC	10	16V
C41	ELECTROLYTIC	0.47	50V MS7
C42	ELECTROLYTIC	2.2	50V MS7
C43	CERAMIC	0.001	50V
C44	ELECTROLYTIC	0.1	50V RC2
C45	CERAMIC	33P	50V
C46	MYLAR	0.001	50V (#01, #02, #05, #06, #07, #08)
C46	MYLAR	0.0022	50V (#03)
C47	MYLAR	0.001	50V (#01, #02, #05, #06, #07, #08)
C47	MYLAR	0.0022	50V (#03)
C48	MYLAR	0.001	50V
C49	ELECTROLYTIC	0.1	50V MS7
C50	BARRIER LAYER	0.1	16V
C51	ELECTROLYTIC	0.22	50V MS7
C52	MYLAR	0.01	50V
C53	MYLAR	0.01	50V
C54	MYLAR	0.01	50V
C55	ELECTROLYTIC	0.22	50V MS7
C56	ELECTROLYTIC	0.1	50V MS7
C57	ELECTROLYTIC	1	50V
C58	ELECTROLYTIC	2.2	50V MS7
C59	CERAMIC	0.0047	50V
C60	BARRIER LAYER	0.1	16V
C61	ELECTROLYTIC	0.47	50V
C62	ELECTROLYTIC	0.47	50V MS7
C63	BARRIER LAYER	0.01	25V
C64	MYLAR	0.01	50V
C65	ELECTROLYTIC	220	10V
C66	ELECTROLYTIC	47	16V
C67	BARRIER LAYER	0.1	16V
C68	ELECTROLYTIC	47	16V
C69	ELECTROLYTIC	470	16V
C70	ELECTROLYTIC	100	16V
C71	BARRIER LAYER	0.01	25V
C72	CERAMIC	0.001	50V
C73	ELECTROLYTIC	470	16V
C74	CERAMIC	0.001	50V
C75	CERAMIC	0.001	50V
C76	CERAMIC	0.001	50V

[MAIN] UNIT

REF. NO.	DESCRIPTION	PART NO.	
C77	ELECTROLYTIC	47	10V
C78	ELECTROLYTIC	4.7	25V
C79	CERAMIC	0.001	50V
C80	BARRIER LAYER	0.1	16V
C81	CERAMIC	0.001	50V
C82	ELECTROLYTIC	470	6.3V
C85	ELECTROLYTIC	1	50V
C86	CERAMIC	0.001	50V
C87	BARRIER LAYER	0.1	16V
C88	ELECTROLYTIC	0.1	50V MS7
C89	CERAMIC	0.001	50V
C90	CERAMIC	0.001	50V
C91	CERAMIC	0.001	50V
C92	BARRIER LAYER	0.1	16V
C93	CERAMIC	0.001	50V
C94	CERAMIC	0.001	50V
C95	CERAMIC	0.001	50V
J1	CONNECTOR	TMP-J01X-A1	
J2	CONNECTOR	TMP-J01X-A1	
J3	CONNECTOR	TL25P-10-V1	
J4	CONNECTOR	5494-12C	
J5	CONNECTOR	5494-04C	
J6	CONNECTOR	PI32B20P-1	
J7	CONNECTOR	TL25P-08-V1	
EP1	MAIN P.C.B.	B-1102D	
W1	JUMPER	JPW-02A	
W3	FLAT CABLE	STYLE2468 AWG26 VW-1 E43172	
W4	FLAT CABLE	STYLE2468 AWG26 VW E43172	

[PLL] UNIT

REF. NO.	DESCRIPTION	PART NO.	
IC1	IC	NJM4558D	
IC2	IC	NJM4558D	
IC3	IC	μPB571C	
IC4	IC	μPD2834C	
Q1	TRANSISTOR	2SC2026	
Q2	TRANSISTOR	2SC2458GR	
Q3	TRANSISTOR	2SC2458GR	
Q4	TRANSISTOR	2SC2458GR	
Q6	TRANSISTOR	2SA1048GR	
Q7	TRANSISTOR	2SC2458GR	
Q8	TRANSISTOR	2SC3327	
Q9	TRANSISTOR	2SC2026	
Q10	TRANSISTOR	2SC2026	
Q11	TRANSISTOR	2SC2407	
Q12	TRANSISTOR	2SC2053	
Q13	TRANSISTOR	2SC1815Y	
Q14	TRANSISTOR	2SC2458GR	
D1	VARICAP	1SV50E(1)	
D5	DIODE	1SS133	
D6	DIODE	1SS133	
D7	DIODE	1SS130	
D8	DIODE	1SS216	
D9	DIODE	1SS216	
D10	DIODE	1SS211	
X1	CRYSTAL	CR164 (#01, #02, #05, #06, #07, #08)	
X1	CRYSTAL	CR85 (#03)	
L1	COIL	LR-116	
L2	COIL	LA-237	
L3	COIL	LAL04NA 102K	
L4	COIL	LW-30	
L5	COIL	LA-237	
L6	COIL	LA-236	
L7	COIL	LA-235	
L8	COIL	LA-244	
L9	COIL	LA-254	
L10	COIL	LA-254	
L12	COIL	LAL03NA 101K	
R1	RESISTOR	4.7K	ELR20
R2	TRIMMER	10K	RHB0C1431A
R3	RESISTOR	1.2K	ELR20
R4	TRIMMER	100K	RHB0C151XA
R5	RESISTOR	4.7K	ELR20
R6	RESISTOR	470K	ELR20
R8	TRIMMER	4.7K	RHB0CS32UA
R9	RESISTOR	4.7K	ELR20
R10	RESISTOR	270K	ELR20
R11	RESISTOR	47K	ELR20
R12	RESISTOR	120K	ELR20
R13	RESISTOR	39K	ELR20
R14	RESISTOR	39K	ELR20
R17	RESISTOR	330K	ELR20
R18	RESISTOR	22	R20
R19	RESISTOR	330	R20
R20	RESISTOR	10	ELR20
R21	RESISTOR	150	ELR20
R22	RESISTOR	33	ELR20
R23	RESISTOR	150	ELR20
R24	RESISTOR	3.3K	ELR20

[PLL] UNIT

REF. NO.	DESCRIPTION	PART NO.	
R25	RESISTOR	1.5K	ELR20
R26	RESISTOR	330	ELR20
R27	RESISTOR	2.2K	ELR20
R28	THERMISTOR	33D28	
R29	RESISTOR	10K	ELR20
R30	THERMISTOR	33D28	
R31	RESISTOR	15K	ELR20
R32	RESISTOR	6.8K	ELR20
R33	RESISTOR	120K	ELR20
R34	RESISTOR	68K	ELR20
R35	RESISTOR	2.2K	ELR20
R36	RESISTOR	100	ELR20
R37	RESISTOR	120K	ELR20
R38	RESISTOR	33K	ELR20
R39	RESISTOR	39K	ELR20
R41	RESISTOR	470K	ELR20
R44	RESISTOR	1K	ELR20
R45	RESISTOR	390	ELR20
R46	RESISTOR	10K	ELR20
R47	RESISTOR	33K	ELR20
R48	RESISTOR	100K	ELR20
R49	RESISTOR	100K	ELR20
R50	RESISTOR	10K	ELR20
R51	RESISTOR	4.7K	ELR20
R52	RESISTOR	10K	ELR20
R53	RESISTOR	3.3K	ELR20
R54	RESISTOR	1.5K	ELR20
R55	RESISTOR	100	ELR20
R56	RESISTOR	220	ELR20
R57	RESISTOR	1K	ELR20
R58	RESISTOR	2.2K	ELR20
R59	RESISTOR	3.3K	ELR20
R60	RESISTOR	1.8K	ELR20
R61	RESISTOR	100	ELR20
R62	RESISTOR	150	ELR20
R63	RESISTOR	15K	ELR20
R64	RESISTOR	2.2K	ELR20
R65	RESISTOR	27	ELR20
R66	RESISTOR	100	ELR20
R67	RESISTOR	1K	ELR20
R68	RESISTOR	1K	R20
R69	RESISTOR	68	R50X
R70	RESISTOR	1K	ELR20
R71	RESISTOR	47K	R20
R73	RESISTOR	33K	ELR20
R74	TRIMMER	220K	RHB0CJ501A
R75	RESISTOR	18	ELR20
C1	MYLAR	0.01	50V
C2	ELECTROLYTIC	10	16V RC2
C3	ELECTROLYTIC	0.1	50V RC2
C4	ELECTROLYTIC	2.2	50V
C5	ELECTROLYTIC	4.7	25V
C6	ELECTROLYTIC	4.7	25V RC2
C7	MYLAR	0.0022	50V
C8	MYLAR	0.001	50V
C9	MYLAR	0.01	50V
C10	CERAMIC	120P	RAU04SA 121J 50V
C14	ELECTROLYTIC	1	50V RC2
C16	CERAMIC	0.001	50V
C17	CERAMIC	47P	50V
C18	CERAMIC	8P	50V
C19	CERAMIC	8P	50V

[PLL] UNIT

REF. NO.	DESCRIPTION	PART NO.	
C20	CERAMIC	0.001	50V
C21	CERAMIC	0.001	50V
C22	CERAMIC	0.001	50V
C23	CERAMIC	0.001	50V
C24	ELECTROLYTIC	47	6.3V RC2
C25	CERAMIC	0.001	50V
C26	CERAMIC	0.001	50V
C27	CERAMIC	27P	50V CH
C28	TRIMMER	20P	ECRGA020E30
C29	CERAMIC	4P	50V CH
C30	CERAMIC	220P	50V
C31	CERAMIC	100P	50V
C32	BARRIER LAYER	0.01	25V
C33	ELECTROLYTIC	4.7	25V RC2
C35	BARRIER LAYER	0.1	16V
C36	ELECTROLYTIC	22	25V RC2
C37	BARRIER LAYER	0.01	25V
C38	BARRIER LAYER	0.1	16V
C39	CERAMIC	0.001	50V
C40	ELECTROLYTIC	47	6.3V RC2
C41	ELECTROLYTIC	3.3	50V RC2
C42	ELECTROLYTIC	47	6.3V RC2
C43	CERAMIC	470P	50V
C44	CERAMIC	0.001	50V
C45	CERAMIC	470P	50V
C46	CERAMIC	24P	50
C47	CERAMIC	8P	50V
C48	CERAMIC	0.001	50V
C49	CERAMIC	470P	50V
C50	CERAMIC	470P	50V
C51	CERAMIC	0.001	50V
C52	CERAMIC	15P	50V
C53	CERAMIC	0.001	50V
C54	CERAMIC	470P	50V
C55	CERAMIC	8P	50V
C56	CERAMIC	4P	50V
C57	CERAMIC	470P	50V
C58	CERAMIC	0.001	50V
C59	CERAMIC	470P	50V
C60	CERAMIC	470P	50V
C62	CERAMIC	10P	50V
C63	CERAMIC	12P	50V
C64	CERAMIC	100P	50V
C65	MYLAR	0.0047	50V
C66	CERAMIC	0.001	50V
C67	CERAMIC	0.001	50V
C68	CERAMIC	0.001	50V
C69	CERAMIC	7P	50V
C71	CERAMIC	0.001	50V
C72	CERAMIC	0.001	50V
C73	BARRIER LAYER	0.1	16V
C74	CERAMIC	10P	50V
C75	CERAMIC	2P	50V
J1	CONNECTOR	5494-12C	
J2	CONNECTOR	5494-04C	
J3	CONNECTOR	TMP-J01X-A1	
P1	CONNECTOR	TMP-P01X-A1	
EP1	PLL P.C.B.	B-1111D	

[VCO] UNIT

REF. NO.	DESCRIPTION	PART NO.	
Q1	FET	2SK125	
Q2	TRANSISTOR	2SC2026	
D1	VARICAP	1SV50E(1)	
D2	VARICAP	1SV50E(1)	
D3	VARICAP	1SV50E(1)	
D4	VARICAP	1SV50E(1)	
D5	VARICAP	1SV50E(1)	
L1	COIL	LAL03NA 5R6M	
L2	COIL	LAN03NA 1R8M	
L4	COIL	LA-237	
L5	COIL	LAL03NA 3R3M	
L6	COIL	LAL03NA 3R3M	
L7	COIL	LAL03NA 3R3M	
R1	RESISTOR	680K	ELR20
R2	RESISTOR	47K	ELR20
R3	RESISTOR	4.7K	ELR20
R4	RESISTOR	330K	ELR20
R5	RESISTOR	10	ELR20
R6	RESISTOR	1K	ELR20
R7	RESISTOR	4.7K	ELR20
R8	RESISTOR	5.6K	ELR20
R9	RESISTOR	22	ELR20
C1	TRIMMER	20P	CV05D2001
C2	CERAMIC	4P	50V
C3	CERAMIC	4P	50V
C4	CERAMIC	3P	50V
C5	ELECTROLYTIC	10	16V RC3
C6	CERAMIC	0.001	50V
C7	CERAMIC	0.001	50V
C8	ELECTROLYTIC	22	16V RC3
C9	CERAMIC	3P	50V
C10	CERAMIC	0.001	50V
C11	CERAMIC	0.001	50V
C12	CERAMIC	0.001	50V
C13	CERAMIC	5P	50V
C14	CERAMIC	0.001	50V
EP1	VCO P.C.B.	B-1101C	

[DISPLAY] UNIT

REF. NO.	DESCRIPTION	PART NO.	
IC1	IC	μPD7225G	
IC2	IC	μPD4081BG	
IC3	IC	μPD4013BG	
Q1	TRANSISTOR	2SA1162Y	
Q2	TRANSISTOR	2SA1162Y	
Q3	TRANSISTOR	2SC2712Y	
Q4	TRANSISTOR	2SC2712Y	
Q5	TRANSISTOR	2SC2712Y	
D1	DIODE	1SS184	
D3	DIODE	1SS184	
D4	DIODE	1SS184	
D5	DIODE	1SS184	
D6	DIODE	1SS184	
D7	DIODE	1SS184	
R1	CHIP	180K	MCR10
R2	CHIP	15K	MCR10
R3	CHIP	15K	MCR10
R4	CHIP	100K	MCR10
R5	CHIP	100K	MCR10
R6	CHIP	47K	MCR10
R7	CHIP	47K	MCR10
R8	CHIP	47K	MCR10
R10	VARIABLE	20KC	RKDA1014QA
R11	TRIMMER	47K	RHB0CS42BA
R12	CHIP	47K	MCR10
R13	CHIP	47K	MCR10
R14	CHIP	47K	MCR10
R15	CHIP	47K	MCR10
R16	CHIP	150	MCR10
R17	CHIP	1M	MCR10
R18	CHIP	10K	MCR10
R19	CHIP	1M	MCR10
R20	CHIP	150	MCR10
R21	CHIP	1M	MCR10
R22	CHIP	10K	MCR10
R23	CHIP	47K	MCR10
R24	CHIP	18K	MCR10
R25	CHIP	47K	MCR10
C1	MONOLITHIC	0.001	GRM40
C2	MONOLITHIC	0.001	GRM40
C3	MONOLITHIC	0.01	GRM40 F
C4	MONOLITHIC	0.001	GRM40
C5	MONOLITHIC	0.01	GRM40 F
C6	MONOLITHIC	0.01	GRM40 F
C7	MONOLITHIC	0.001	GRM40
C8	MONOLITHIC	0.01	GRM40 F
C10	MONOLITHIC	0.001	GRM40
C11	MONOLITHIC	0.001	GRM40
C12	MONOLITHIC	0.001	GRM40
C13	MONOLITHIC	0.001	GRM40
C14	MONOLITHIC	0.001	GRM40
C15	MONOLITHIC	0.1	GRM40 F
C16	CERAMIC	0.001	50V
J1	CONNECTOR	SB-5P-HVQ-CA	
J2	CONNECTOR	SB-5P-HVQ-CA	
DS1	LAMP	BQ031-22403A	
DS2	LAMP	BQ031-22403A	
DS3	LCD	HLC-9222-1	

[DISPLAY] UNIT

REF. NO.	DESCRIPTION	PART NO.
S1	SWITCH	A2C-1A3 (POWER)
S2	SWITCH	SKHHAA 119A (SQL)
S3	SWITCH	SKHHAE (S-SEL)
S4	SWITCH	SKHHAE (P-SEL)
S5	SWITCH	SKHHAA 119A (SCAN)
S6	SWITCH	SKHHAA 119A (UP)
S7	SWITCH	SKHHAA 119A (DOWN)
S8	SWITCH	SKHHAA 119A (PRIO)
EP1	DISPLAY P.C.B.	B-1069C
EP2	FLEXIBLE P.C.B.	B-1075C
EP3	ZEBRA	SRCN-323
W1	JUMPER	JPW-02A
W2	JUMPER	JPW-02A
W3	JUMPER	JPW-02A
W4	JUMPER	JPW-02A
W5	JUMPER	JPW-02A

[LOGIC] UNIT

REF. NO.	DESCRIPTION	PART NO.
IC1	IC	μPD78C06AG
IC2	IC	μPD446C
IC3	IC	μPD4066BG
IC4	IC	μPD4069UBG
Q1	TRANSISTOR	2SA1048Y
Q2	TRANSISTOR	2SC2458GR
Q3	TRANSISTOR	2SC3399
Q4	TRANSISTOR	2SA1345
Q5	TRANSISTOR	2SC3399
D1	ZENER	RD5.1E B2
D2	DIODE	1S953
D3	DIODE	1SS133
D4	DIODE	1SS133
D5	DIODE	1SS133
D6	DIODE	1SS133
D7	DIODE	1SS133
D8	DIODE	1SS133
D9	DIODE	1SS133
D10	DIODE	1SS133
D11	DIODE	1SS133
D12	DIODE	1SS133
D13	DIODE	1SS133
D14	ZENER	RD6.2E B2
X1	CRYSTAL	CR63
L1	COIL	LAL03NA 101K
R1	RESISTOR	15K ELR20
R2	RESISTOR	180K ELR20
R3	RESISTOR	22K R20
R4	RESISTOR	33K R20
R5	RESISTOR	47K R20
R6	RESISTOR	100K R20
R7	ARRAY	RM4 10K

[LOGIC] UNIT

REF. NO.	DESCRIPTION	PART NO.
R8	RESISTOR	47K R20
R9	RESISTOR	47K R20
R10	RESISTOR	47K R20
R11	RESISTOR	47K R20
R12	RESISTOR	1M R20
R14	RESISTOR	1K R20
R15	RESISTOR	47K ELR20
R16	RESISTOR	22K ELR20
R17	RESISTOR	10 R20
R18	RESISTOR	18K R20
C1	ELECTROLYTIC	100 10V MS7
C2	BARRIER LAYER	0.01 25V
C3	BARRIER LAYER	0.01 25V
C4	CERAMIC	18P 50V
C5	CERAMIC	18P 50V
C6	CERAMIC	0.001 50V
C7	BARRIER LAYER	0.1 16V
C8	BARRIER LAYER	0.1 16V
C9	ELECTROLYTIC	10 16V MS7
C10	BARRIER LAYER	0.1V 16V
CP1	CHECK POINT	RT-01T-1.0B
J1	CONNECTOR	PI32B20R-1
J2	CONNECTOR	9B-SQ
J3	CONNECTOR	6B-SQ
J4	CONNECTOR	B10B-EH-S
BT1	LITIHUM	BR2325-1HC
EP1	LOGIC P.C.B.	B-1070D
W2	JUMPER	JPW-02A

[CTCSS] UNIT

REF. NO.	DESCRIPTION	PART NO.
IC1	IC	MN6520
Q1	TRANSISTOR	2SC3399
D1	DIODE	1SS133
D2	DIODE	1SS133
X1	CRYSTAL	RF-4A3FACNKD
R1	RESISTOR	10K R20
R2	RESISTOR	10K R20
R3	RESISTOR	15K R20
R4	RESISTOR	10K R20
R5	RESISTOR	2.2K R20
R6	RESISTOR	150K R20
R7	RESISTOR	18K R20
R9	RESISTOR	12K R20
R10	RESISTOR	10K R20
R11	RESISTOR	18K R20
R12	RESISTOR	1K R20

[CTCSS] UNIT

REF. NO.	DESCRIPTION	PART NO.	
C1	CERAMIC	18P	50V
C2	CERAMIC	18P	50V
C3	ELECTROLYTIC	0.1	50V MS5
C5	ELECTROLYTIC	47	6.3V MS5
C6	ELECTROLYTIC	10	16V MS5
C7	ELECTROLYTIC	0.1	50V MS5
EP1	CTCSS P.C.B.	B-1072C	

[PA] UNIT

REF. NO.	DESCRIPTION	PART NO.	
IC1	IC	SC1044 (#01, #03, #05, #07)	
IC1	IC	SC1045 (#02, #06, #08)	
IC2	IC	μPC358C	
Q1	TRANSISTOR	2SC2782	
Q2	TRANSISTOR	2SC945P	
Q3	TRANSISTOR	2SB596Y	
D1	DIODE	1SS97	
D2	DIODE	1SS97	
D3	DIODE	1SS97	
D4	DIODE	1SS97	
D5	DIODE	1SS53	
D6	DIODE	1SS53	
D7	DIODE	1SS53	
D8	DIODE	1SS53	
D9	DIODE	MI301	
L1	COIL	LA-268	
L2	COIL	LW-32	
L3	COIL	LW-31A	
L4	COIL	LA-262	
L5	COIL	LA-252	
L6	COIL	LA-252	
L7	COIL	LW-19	
R1	TRIMMER	100K	RHB0C151XA
R2	RESISTOR	56K	ELR20
R3	RESISTOR	100	ELR20
R4	RESISTOR	120K	ELR20
R5	RESISTOR	27K	R20
R6	RESISTOR	12K	ELR20
R7	RESISTOR	68K	R20
R8	RESISTOR	12K	ELR20
R9	RESISTOR	5.6K	ELR20
R10	RESISTOR	1.2K	ELR20
R11	RESISTOR	39K	R20
R12	RESISTOR	8.2K	ELR20 (#01, #02, #03, #05, #06)
R12	RESISTOR	5.6K	ELR20 (#07, #08)
R13	RESISTOR	47	R25
R14	RESISTOR	15K	ELR20
R15	RESISTOR	150	R20
C1	ELECTROLYTIC	10	16V MS7
C2	CERAMIC	470P	50V
C3	CERAMIC	0.001	50V
C4	CERAMIC	470P	50V
C5	CERAMIC	0.001	50V

[PA] UNIT

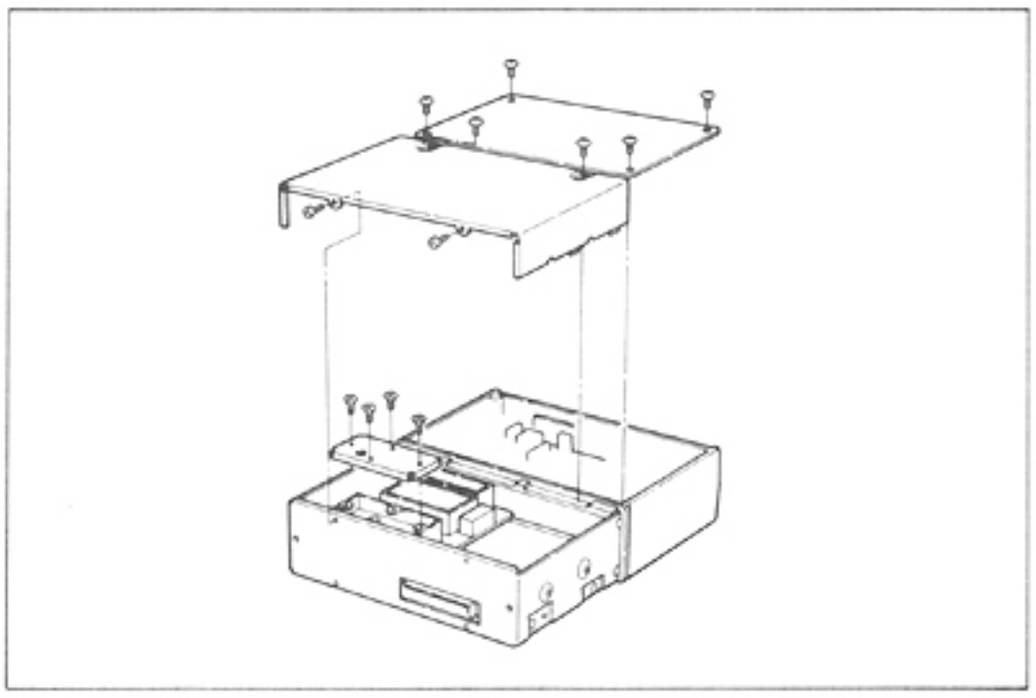
REF. NO.	DESCRIPTION	PART NO.	
C6	ELECTROLYTIC	100	16V
C7	ELECTROLYTIC	10	16V
C8	CERAMIC	470P	50V
C9	CERAMIC	0.001	50V
C10	MONOLITHIC	UC55 2H 5000J	
C11	TRIMMER	10P	VCT81C121A
C12	MONOLITHIC	UC34 2H 2250F	
C13	MONOLITHIC	UC34 2H 2250F	
C14	MONOLITHIC	UC34 2H 2250F	
C15	MONOLITHIC	UC34 2H 2250F	
C16	MONOLITHIC	UC34 2H 1000J	
C17	MONOLITHIC	UC23 2H 0400J	(#01, #03, #05, #07)
C17	MONOLITHIC	UC23 2H 0560J	(#02, #06, #08)
C19	MONOLITHIC	UC55 2H 5000J	
C20	CERAMIC	0.001	50V
C22	ELECTROLYTIC	33	16V
C23	CERAMIC	220P	50V
C24	BARRIER LAYER	0.01	25V
C25	BARRIER LAYER	0.01	25V
C26	CERAMIC	0.001	50V
C27	CERAMIC	0.001	50V
C28	CERAMIC	470P	50V
C29	CERAMIC	470P	50V
C30	CERAMIC	12P	50V CH
C31	CERAMIC	22P	500V
C32	CERAMIC	6P	500V
C33	CERAMIC	39P	500V
C34	CERAMIC	5P	500V
C35	CERAMIC	33P	500V
C36	CERAMIC	8P	500V
C37	CERAMIC	15P	500V
C39	BARRIER LAYER	0.1	16V
C40	CERAMIC	0.001	50V
C41	CERAMIC	0.001	50V
C42	MONOLITHIC	UC23 2H 0400J	
C43	ELECTROLYTIC	4.7	25V MS7
C44	ELECTROLYTIC	220	16V
C45	CERAMIC	220P	50V
C46	CERAMIC	0.001	50V
C47	CERAMIC	0.001	50V
C48	BARRIER LAYER	0.01	25V
C49	CERAMIC	0.001	50V
C50	CERAMIC	0.001	50V
C51	ELECTROLYTIC	1000	16V
RL1	RELAY	RG1V-5FJ DC6	
RL2	RELAY	MZ 12HG	
J3	CONNECTOR	MR-DSE-01	
J5	CONNECTOR	TL25P-06-V1	
J6	CONNECTOR	TL25P-05-V1	
P1	CONNECTOR	TMP-P01X-A1	
P2	CONNECTOR	TLB-P08H-A1	
P3	CONNECTOR	TL25H-08-B1	
P5	CONNECTOR	TMP-P01X-A1	
EP6	PA P.C.B.	B-1112B	
EP1	BEAD CORE	DL2-OP2.6-3-1.2H	
EP2	BEAD CORE	DL2-OP2.6-3-1.2H	
EP5	BEAD CORE	FSQH090RN	

SECTION 12 OPTIONS INSTALLATION

12 - 1 UT-26 2-TONE DECODER UNIT

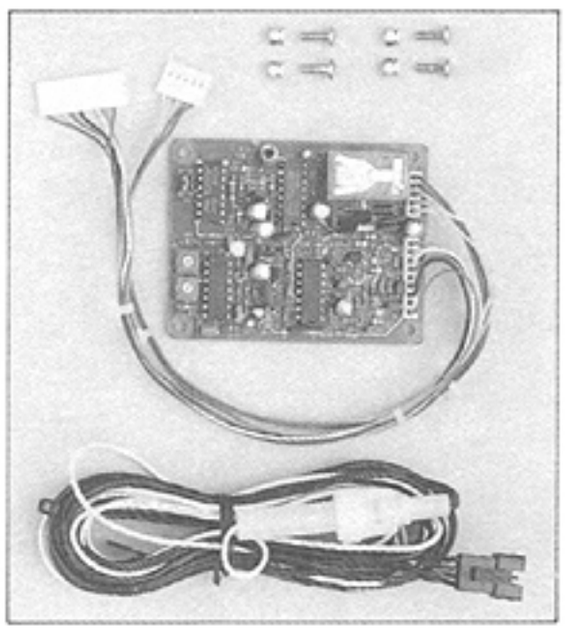
Use this option with the IC-V100 mobile transceiver for interference-free communication with other stations equipped with a 2-Tone system.

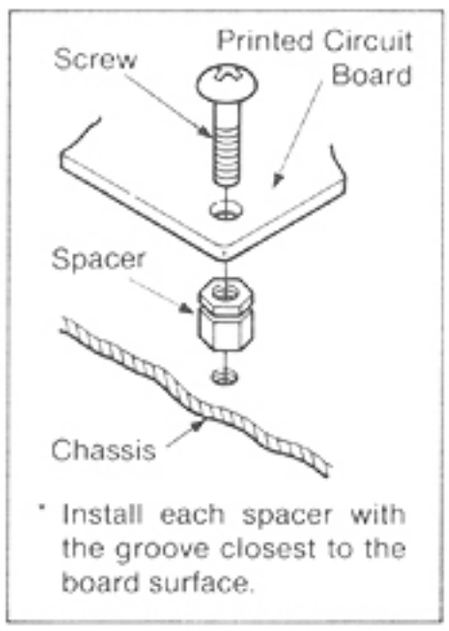
To obtain maximum performance, please study these instructions carefully before attempting installation and use of the UT-26. In addition, refer to the transceiver's PROGRAMMING MANUAL.



• INSTALLATION PREPARATION

[UNPACKING]





[COVER REMOVAL]

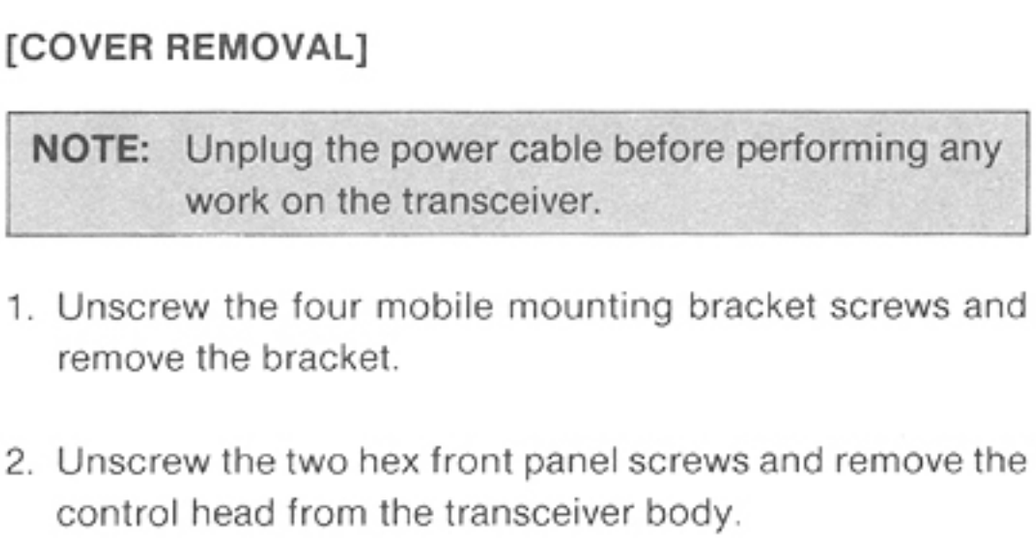
NOTE: Unplug the power cable before performing any work on the transceiver.

1. Unscrew the four mobile mounting bracket screws and remove the bracket.

2. Unscrew the two hex front panel screws and remove the control head from the transceiver body.

3. Unscrew the cover screws and remove the top and bottom covers.

4. Unscrew the PA unit screws and remove the PA cover.



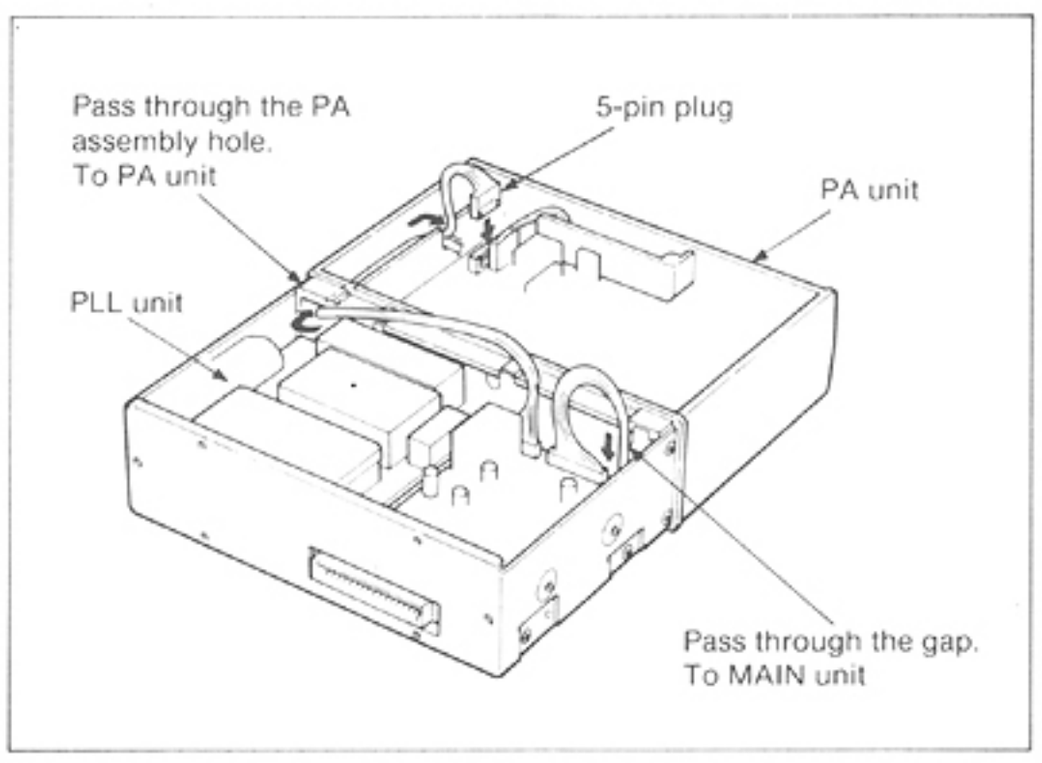
• UNIT INSTALLATION

1. Orient the circuit board correctly as shown in the diagram and tighten the four screws.

2. Connect the 5-pin plug (J6) on the PA unit.

   Pass the plug through the PA assembly rectangular opening as shown.

3. Connect the 10-pin plug to J3 on the MAIN unit. The cable harness must be passed through the gap between the PA assembly and the MAIN chassis as shown.



• PROGRAMMING

NOTE: Programming must be done by following the procedures below completely. An oscilloscope, frequency counter and audio generator are required.

In addition, the UT-26 has been preset for code number "13" in Group 1 at the factory.

[SETTING THE FIRST DIGIT OF THE CODE NUMBER]

1. Locate jumper connector J3 on the UT-26 unit and change the connection as follows.

Jumper connector	Position
J3	A—B→C—D

2. Connect a 100mV rms or greater signal from the audio generator across pin B on jumper connector J3 and ground using alligator clips. Adjust the generator using the frequency counter to the frequency of the first digit of the desired code number according to the frequency chart.

3. Connect the oscilloscope to CP1 on the UT-26 unit.

4. Adjust R2 for the maximum output level on the oscilloscope. The output level should be more than 1Vp-p.

[SETTING THE SECOND DIGIT OF THE CODE NUMBER]

1. Locate jumper connector J4 on the UT-26 unit and change the connection as follows.

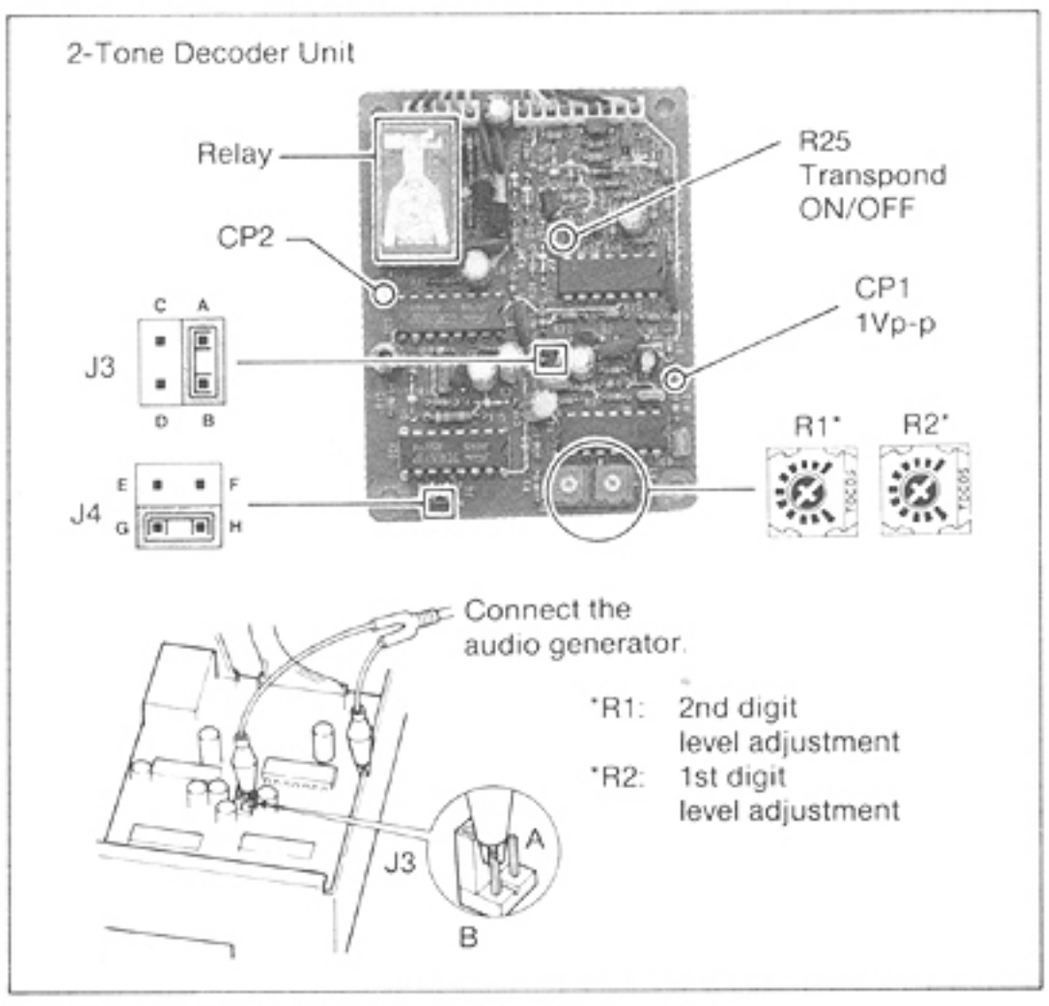
Jumper connector	Position
J4	G—H→E—F

2. Connect the audio generator as above with the same output level and adjust the generator to the frequency of the second digit of the desired code number.

3. Connect the oscilloscope as above.

4. Adjust R1 to the maximum output level on the oscilloscope. The output level should be more than 1Vp-p.

5. Return the J3 and J4 jumper connectors to the A—B and G—H positions respectively.



[STANDARD GROUPS FOR 2-TONE SEQUENTIAL SIGNALLING]

CODE NO.	Group 1	Group 2	Group 3	Group 4	Group 5
0	330.5	569.1	1092.4	321.7	553.9
1	349.0	600.9	288.5	339.6	584.8
2	368.5	634.5	296.5	358.6	617.4
3	389.0	669.9	304.7	378.6	651.9
4	410.8	707.3	313.0	399.8	688.3
5	433.7	746.8	953.7	422.1	726.8
6	457.9	788.5	979.9	445.7	767.4
7	483.5	832.5	1006.9	470.5	810.2
8	510.5	879.0	1034.7	496.8	855.5
9	539.0	928.1	1063.2	524.6	903.2
DG	569.1	979.9	569.1	569.1	979.9

(Unit: Hz)

[FUNCTION CHECKS WITH ANOTHER TRANSCEIVER]

NOTE: The function checks require another transceiver with a 2-Tone encoder installed. Check the following functions thoroughly before re-assembly.

1. The "CALL" indicator lights up while decoding is in progress.

2. The relay and transpond function work after decoding is completed. The transpond function works for about 2 seconds.

3. The transpond signal is modulated by a single tone.

4. The "CALL" indicator goes OFF after pushing the PTT switch.

[TRANSCEIVER PROGRAMMING]

1. After installation of the UT-26 and when all of the previous programming is completed, the IC-V100 must have the 2-Tone decoder function programmed on a particular channel.

2. Transceiver programming requires the optional EX-494 External Keyboard. See your transceiver's PROGRAMMING MANUAL SECTIONS 1-5 and 1-6 for further instructions.

• OTHER FUNCTIONS

[TRANSPOND FUNCTION]

The transpond function for confirmation of a communication link between the calling and called station is available and may be activated or deactivated.

1. The UT-26 is shipped from the factory with the transpond function activated. Signals received with the correct code number will cause the IC-V100 to transmit a 2 second tone back to the calling station if an operator does not reply to the incoming call.

2. To deactivate this function, cut the lead of R25 (47k ohms) on the UT-26 and R22 (47k ohms) on UT-27. Now, no transpond tone will be transmitted. To reactivate the function at a later date, solder the two ends of the cut lead together.

[HORN-HONK FUNCTION]

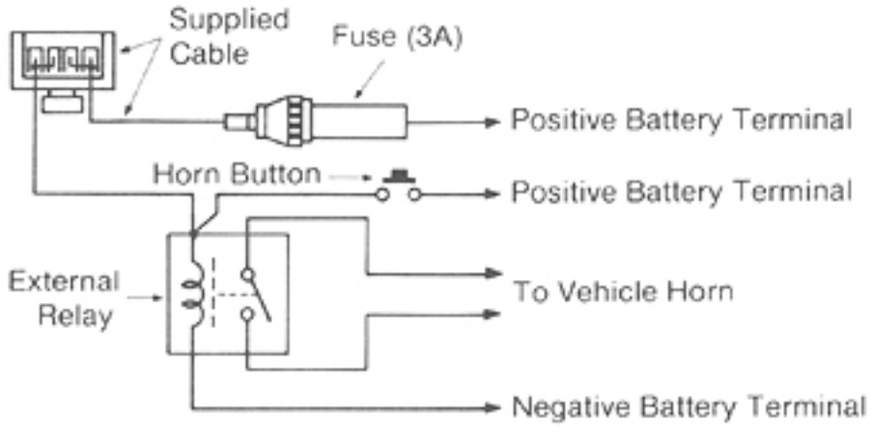
When a signal with a correct code number is decoded by the UT-26 or UT-27, the transceiver alerts the operator through a signalling device, such as an automobile horn. This is useful when the operator is away from the operating position.

1. Connect the supplied cable to the HORN CONNECTOR on the rear panel of the transceiver. Connect this cable to your chosen signalling device.

2. Refer to the sample connection on the opposite side of this sheet.

• HORN-HONK SAMPLE CONNECTION

> **NOTE:** Maximum ratings of the UT-26 and UT-27 relays are 28V and 3A. **DO NOT** connect any device with a voltage or current requirement that exceeds these ratings. If the vehicle does not have a horn relay, an intermediate relay must be installed.



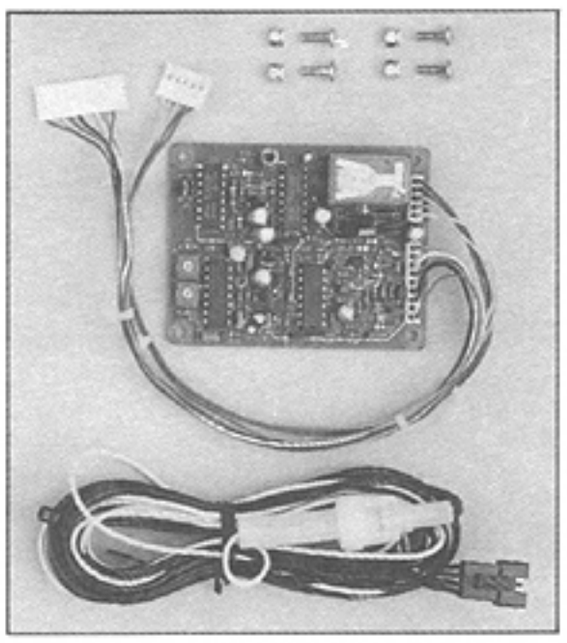
12 - 2 UT-27 2805Hz DECODER UNIT

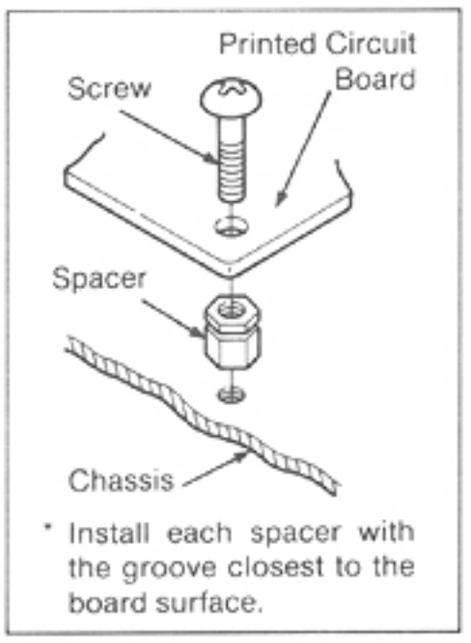
Use this option with the IC-V100 mobile transceiver for interference-free communication with other stations equipped with a 2805Hz tone system.

To obtain maximum performance, please study these instructions carefully before attempting installation and use of the UT-27. In addition, refer to the transceiver's PROGRAMMING MANUAL.

• INSTALLATION PREPARATION

[UNPACKING]





[COVER REMOVAL]

> **NOTE:** Unplug the power cable before performing any work on the transceiver.

1. Unscrew the four mobile mounting bracket screws and remove the bracket.

2. Unscrew the two hex front panel screws and remove the control head from the transceiver body.

3. Unscrew the cover screws and remove the top and bottom covers.

4. Unscrew the PA unit screws and remove the PA cover.

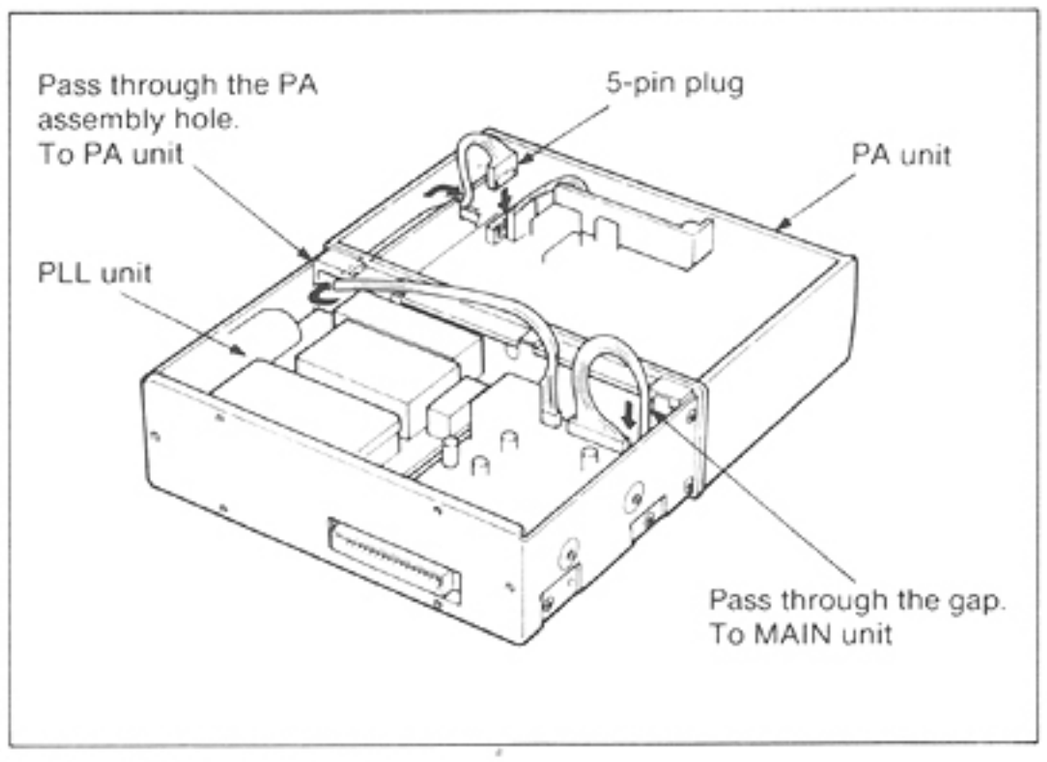
• UNIT INSTALLATION

1. Orient the circuit board correctly as shown in the diagram and tighten the four screws.

2. Connect the 5-pin plug to J6 on the PA unit.

   Pass the plug through the PA assembly rectangular opening as shown.

3. Connect the 10-pin plug to J3 on the MAIN unit. The cable harness must be passed through the gap between the PA assembly and the MAIN chassis as shown.



• PROGRAMMING

NOTE: The following procedures set the code number, the data select programming and the transceiver programming.

[CODE NUMBER PROGRAMMING]

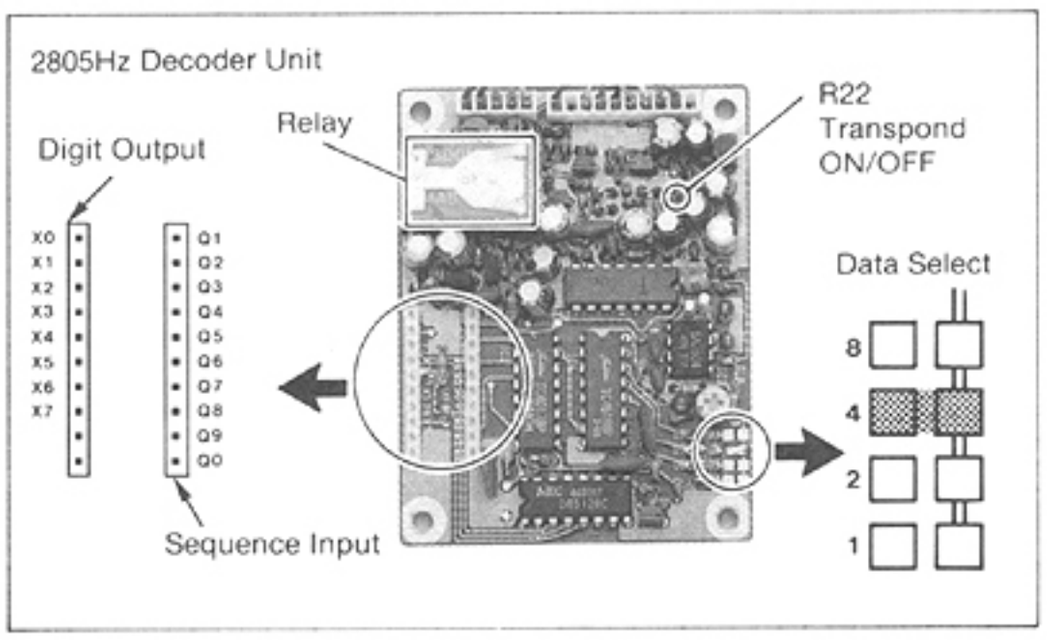
1. Use supplied wire jumpers to connect the Digit output (J3) terminals to the Sequence input (J4) terminals to program the desired code number. The code number may be up to 8 digits in length. Solder the connections.

2. The first digit of the code number is allocated to X0, the second digit to X1, the third digit to X2, etc. on the Digit output jack (J3). The pins on the Sequence input jack (J4) refer to the numerical value of each digit; Q1 is "1", Q2 is "2", Q3 is "3", etc. See the diagrams for sample programming.

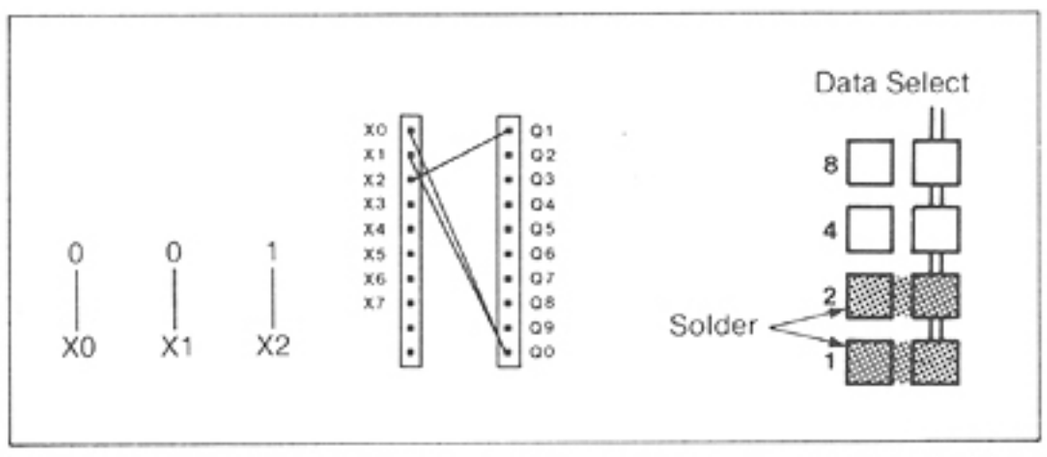
[DATA SELECT PROGRAMMING]

1. Programming is performed by soldering the appropriate printed circuit board traces adjacent to diodes D5 through D8. Solder quickly to avoid damaging the diodes by excessive heat.

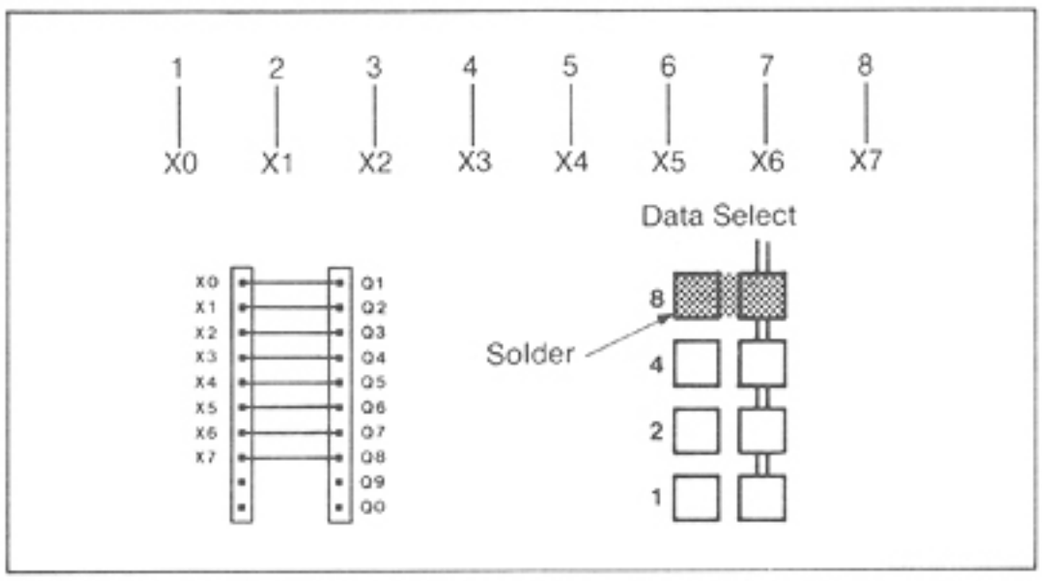
2. The data select programming is the total number of digits in the code number. The four traces represent "1", "2", "4" and "8". For example, if the code number desired has 3 digits, solder both traces "1" and "2" (i.e., 1 + 2 = 3).



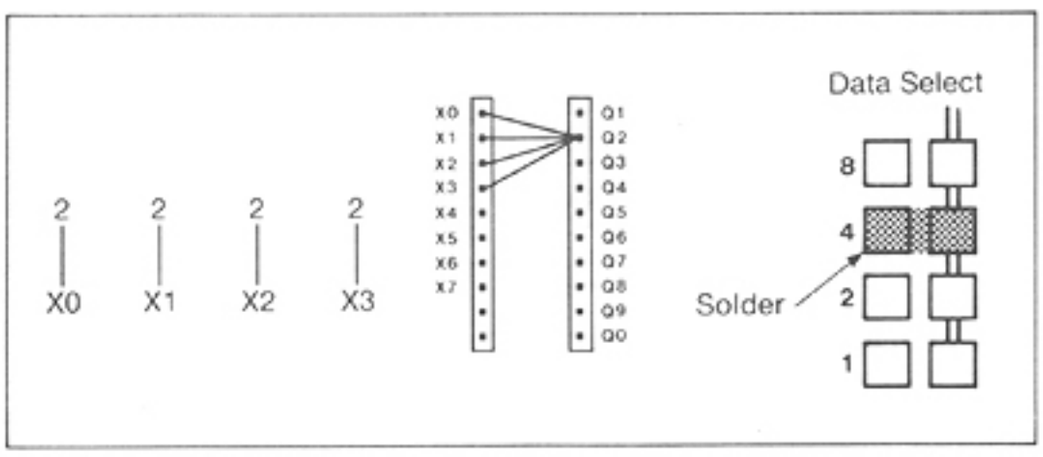
[EXAMPLE 1] Programming the code number "001".



[EXAMPLE 2] Programming the code number "12345678".



[EXAMPLE 3] Programming the code number "2222".



[TRANSCEIVER PROGRAMMING]

1. After installation of the UT-27 and when all of the previous programming is completed, the IC-V100 must have the 2805Hz decoder function programmed on a particular channel.

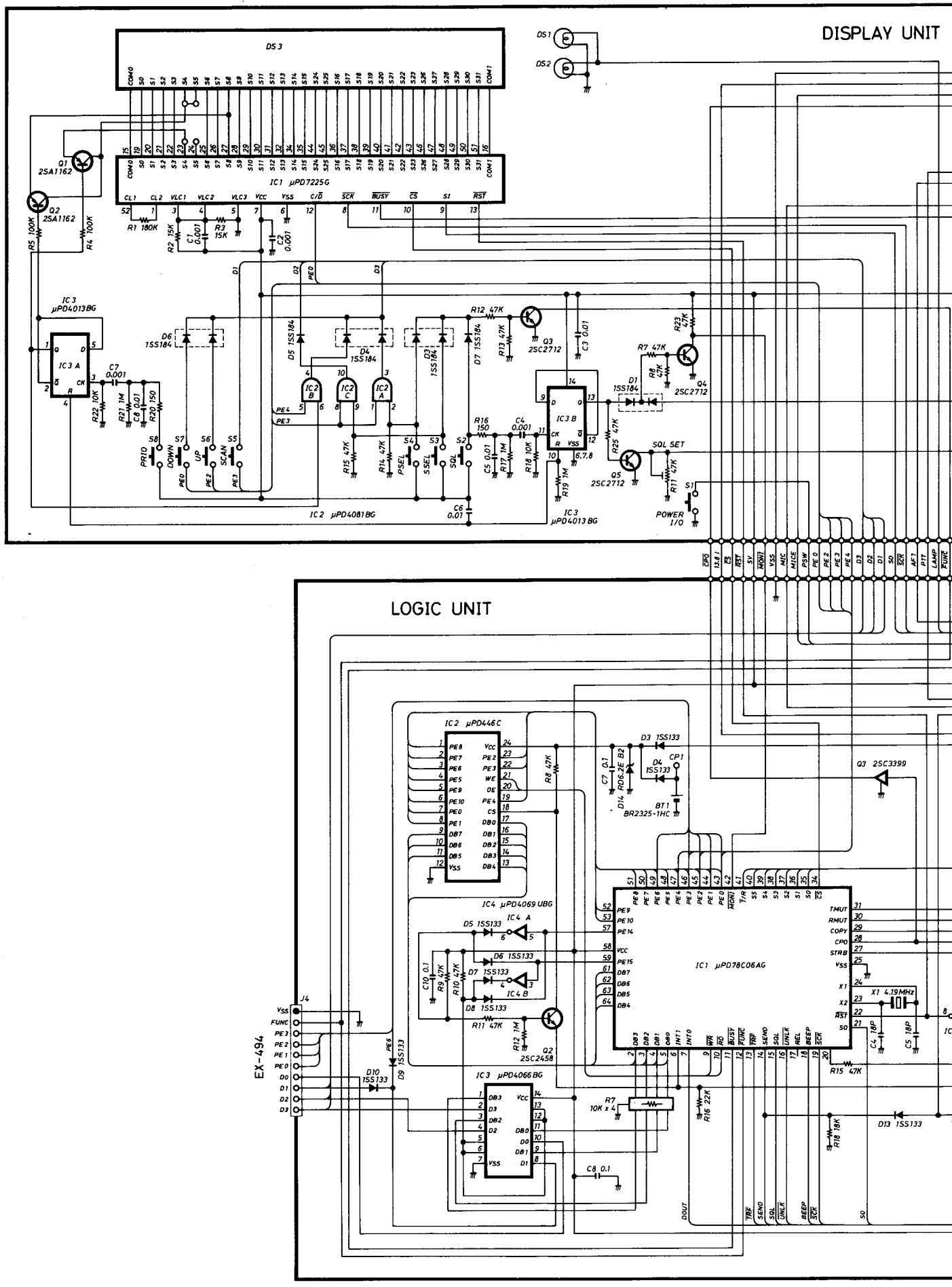
2. Transceiver programming requires the optional EX-494 External Keyboard. See your transceiver PROGRAMMING MANUAL SECTIONS 1-5 and 1-6 for further instructions.

• OTHER FUNCTIONS

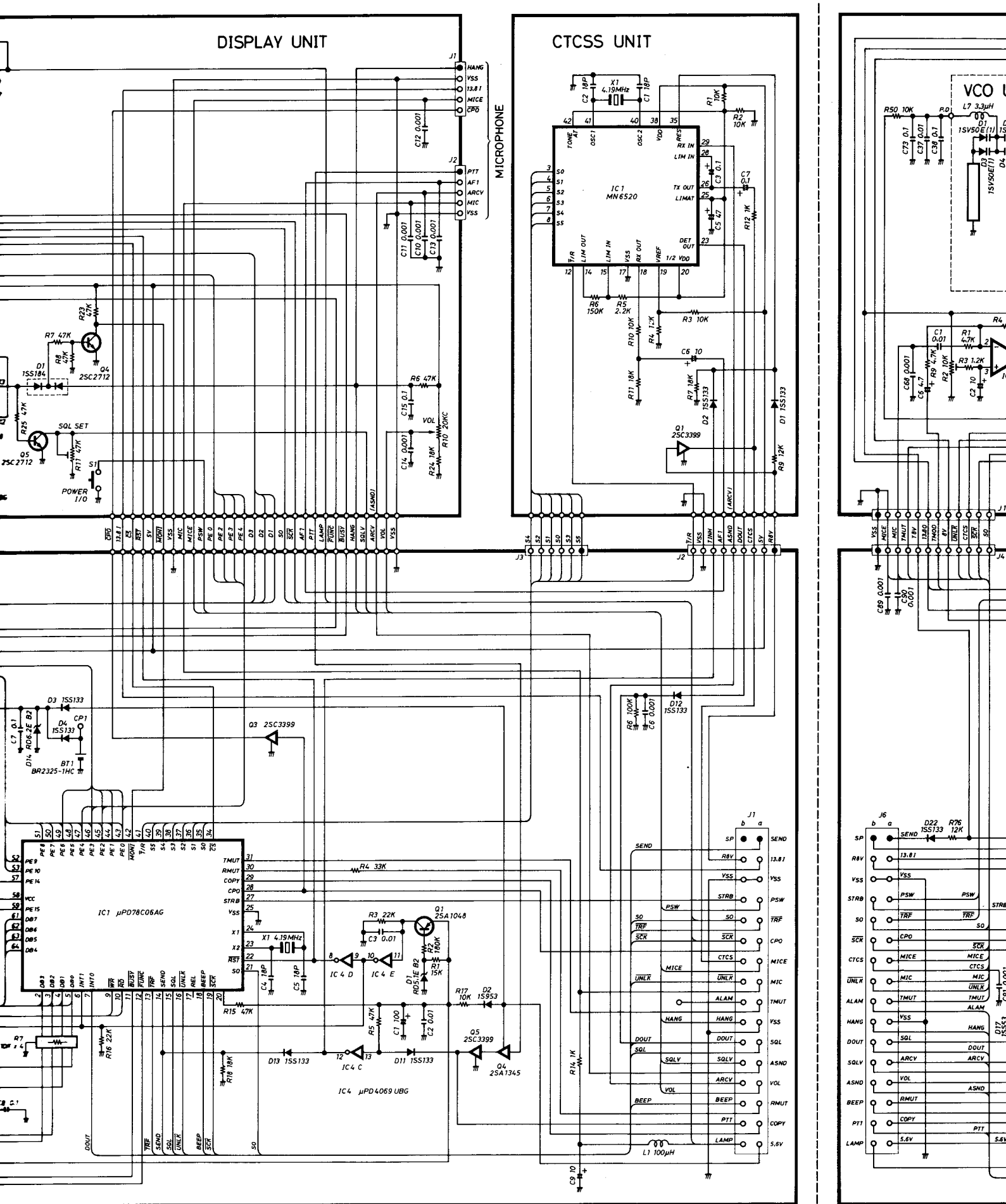
[TRANSPOND FUNCTION]
[HORN-HONK FUNCTION]

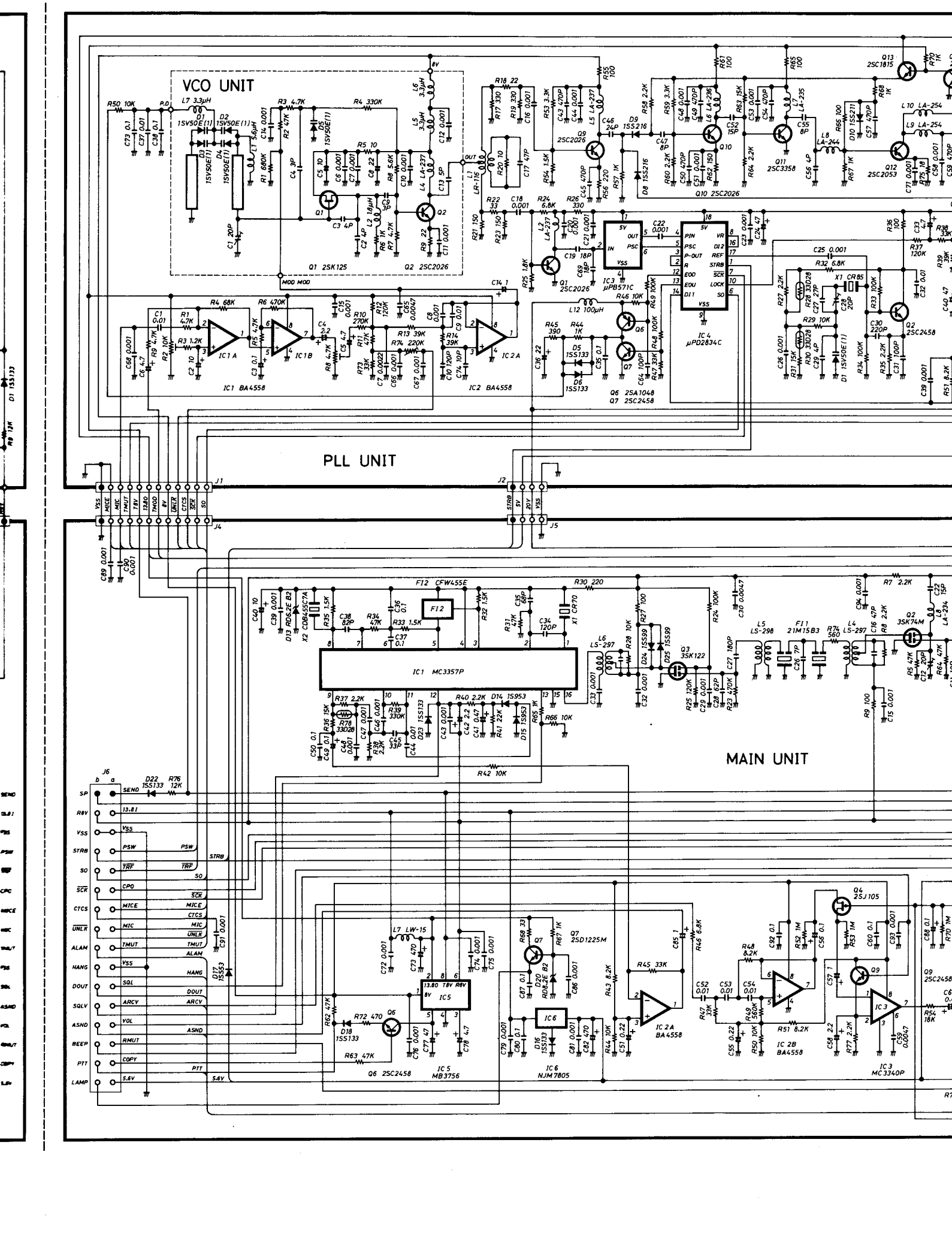
Refer to page 12-2 for explanations of the TRANSPOND and HORN-HONK functions.

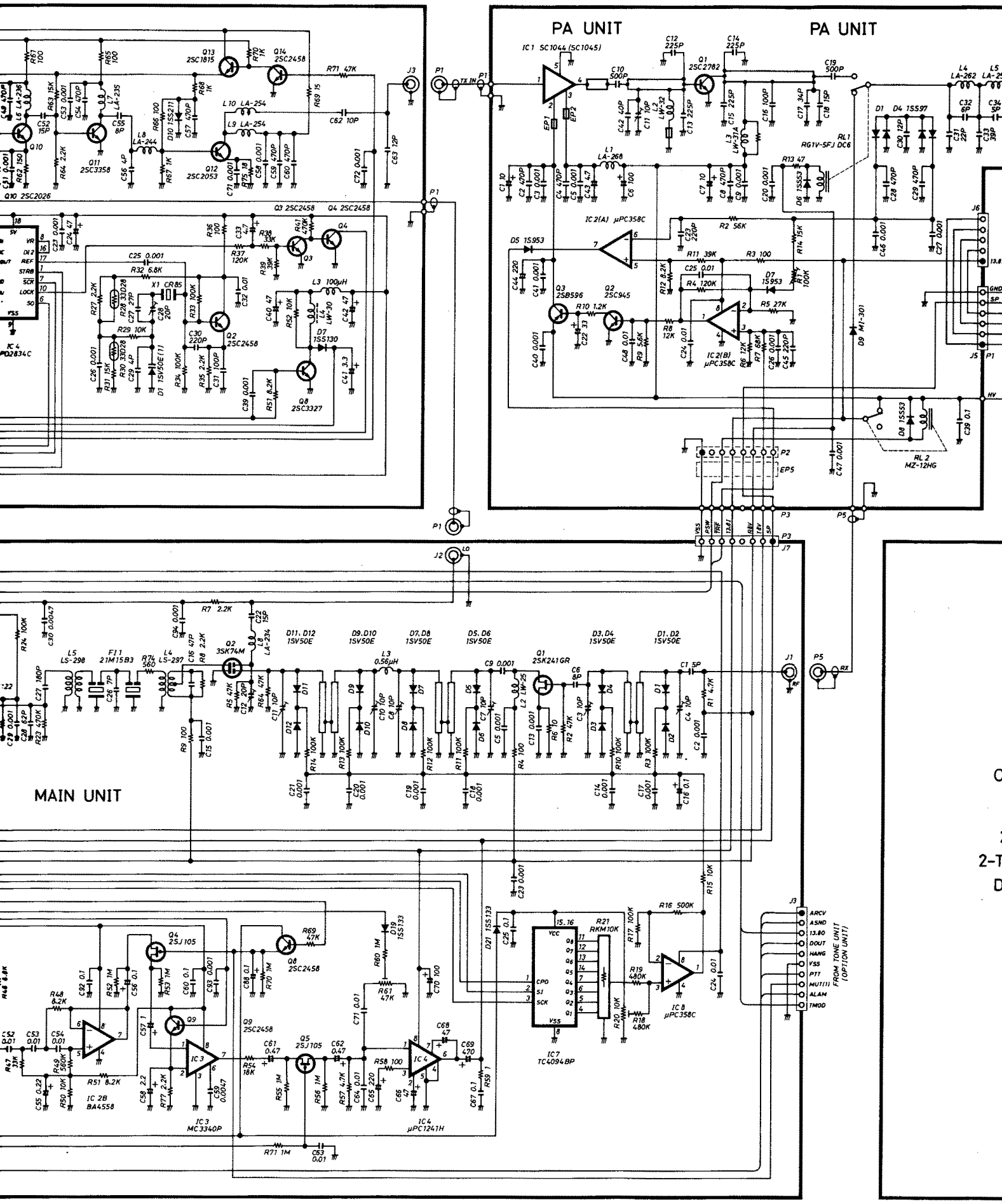
IC-V100 SCHEMATIC DIAG

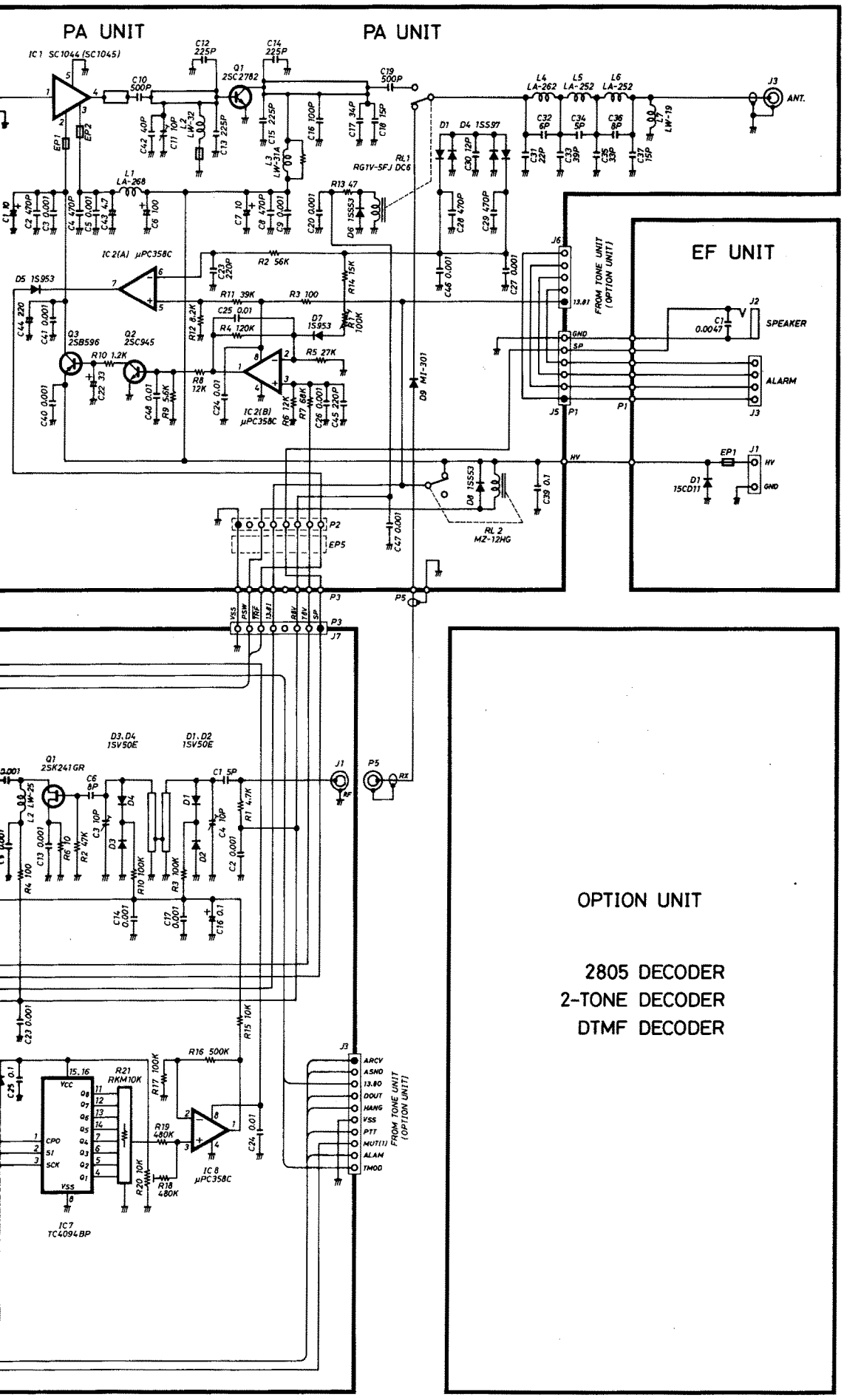


EMATIC DIAGRAM




VCO UNIT
PLL UNIT
MAIN UNIT
IC1 BA4558
IC2 BA4558
IC3 μPB571C
IC4 μPD2834C
IC1 MC3357P
IC5 MB3756
IC6 NJM7805
IC2A BA4558
IC2B BA4558
IC3 MC3340P
Q1 2SK125
Q2 2SC2026
Q6 2SA1048
Q7 2SC2458
Q10 2SC2026
Q11 2SC3358
Q12 2SC2053
Q13 2SC1815
Q3 3SK122
Q4 2SJ105
Q5 2SD1225M
Q6 2SC2458
Q7 2SD1225M
Q9 2SC2458
J1
J2
J4
J5
J6





To upgrade quality, some components may be subject to change without notice.