ICOM

SERVICE MANUAL

VHF MARINE TRANSCEIVER

IC-M57

Icom Inc.

INTRODUCTION

This service manual describes the latest service information for the **IC-M57** VHF MARINE TRANSCEIVER at the time of publication.

Two versions of the **IC-M57** have been designed. This service manual covers the following versions.

VERSION NO.	VERSION	SYMBOL
#01	U.S.A.	USA
#02	U.S.A.-1	USA-1

To upgrade quality, all electrical and mechanical parts and internal circuits are subject to change without notice or obligation.

DANGER

NEVER connect the transceiver to an AC outlet or to a DC power supply that uses more than 16 V. This will ruin the transceiver.

DO NOT expose the transceiver to rain, snow or any liquids.

DO NOT reverse the polarities of the DC power supply when connecting the transceiver.

DO NOT apply an RF signal of more than 20 dBm (100 mW) to the antenna connector. This could damage the transceiver's front end.

ORDERING PARTS

Be sure to include the following four points when ordering replacement parts:

1. 10-digit order numbers
2. Component part number and name
3. Equipment model name and unit name
4. Quantity required

<SAMPLE ORDER>

1110000540	IC	NJM4558D	PLL UNIT	5 pieces
8810001110	Screw	PH B0 M3 × 6	Chassis	10 pieces

Addresses are provided on the inside back cover for your convenience.

REPAIR NOTES

1. Make sure a problem is internal before disassembling the transceiver.
2. **DO NOT** open the transceiver until the transceiver is disconnected from its power source.
3. **DO NOT** force any of the variable components. Turn them slowly and smoothly.
4. **DO NOT** short any circuits or electronic parts. An insulated tuning tool **MUST** be used for all adjustments.
5. **DO NOT** keep power ON for a long time when the transceiver is defective.
6. **DO NOT** transmit power into a signal generator or a sweep generator.
7. **ALWAYS** connect a 40 dB~50 dB attenuator between the transceiver and a deviation meter or spectrum analyzer when using such test equipment.
8. **READ** the instructions of test equipment thoroughly before connecting equipment to the transceiver.

TABLE OF CONTENTS

SECTION 1 SPECIFICATIONS

■ GENERAL

- Frequency coverage : Transmit: 156.025~157.425 MHz
  Receive: 156.025~163.275 MHz
- Mode : FM (16K0G3E)
- Antenna impedance : 50 Ω (nominal)
- Power supply voltage : 13.8 V DC ± 15 % (negative ground)
- Current drain (at 13.8 V DC) :

Transmit	High (25 W)	6.0 A
	Low (1 W)	1.4 A
Receive	Squelched*	190 mA
	Max. audio output	1.2 A

* When the function display lighting is OFF.

- Usable temperature range : −20 °C~+60 °C (−4 °F~+140 °F)
- Frequency stability : ±0.0005 % (−20 °C~+60 °C; −4 °F~+140 °F)
- Dimensions : 140 (W) × 55 (H) × 155 (D) mm
  5.5 (W) × 2.2 (H) × 6.1 (D) in
  (Projections not included)
- Weight : 1.1 kg (2.4 lbs)

■ TRANSMITTER

- Output power (at 13.8 V DC) : High 25 W
  Low 1 W
- Modulation system : Variable reactance phase modulation
- Max. frequency deviation : ±5 kHz
- Spurious emissions : −70 dB
- Harmonic emissions : −60 dB
- Microphone impedance : 600 Ω
- Noise and hum : −40 dB
- Audio response : +1 dB~−3 dB of +6 dB/octave with 300 Hz~3000 Hz input

■ RECEIVER

- Receive system : Double-conversion superheterodyne
- Intermediate frequencies : 1st 21.8 MHz
  2nd 455 kHz
- Sensitivity : 0.3 μV for 12 dB SINAD
- Squelch sensitivity (threshold) : 0.17 μV
- Adjacent channel selectivity : −70 dB
- Intermodulation rejection : −70 dB
- Spurious response rejection : −70 dB
- Noise and hum : −40 dB
- Audio response : +1 dB~−3 dB of −6 dB/octave with 300 Hz~3000 Hz deviation
- Audio output power : 4 W at 5 % distortion with a 4 Ω load
- Audio output impedance : 4 Ω

All stated specifications are subject to change without notice or obligation.

■ VHF MARINE CHANNEL LIST

Inter national channel	U.S.A. channel	Frequency (MHz)		Transmit output power
		Transmit	Receive	
01	–	156.050	160.650	25 W & 1 W
01A	01A	165.050	156.050	25 W & 1 W
02	–	156.100	160.700	25 W & 1 W
02A	02A	156.100	156.100	25 W & 1 W
03	–	156.150	160.750	25 W & 1 W
03A	03A	156.150	156.150	25 W & 1 W
04	–	156.200	160.800	25 W & 1 W
04A	04A	156.200	156.200	25 W & 1 W
05	–	156.250	160.850	25 W & 1 W
05A	05A	156.250	156.250	25 W & 1 W
06	06	156.300	156.300	25 W & 1 W
07	–	156.350	160.950	25 W & 1 W
07A	07A	156.350	156.350	25 W & 1 W
08	08	156.400	156.400	25 W & 1 W
09	09	156.450	156.450	25 W & 1 W
10	10	156.500	156.500	25 W & 1 W
11	11	156.550	156.550	25 W & 1 W
12	12	156.600	156.600	25 W & 1 W
13	13	156.650	156.650	25 W & 1 W *1
14	14	156.700	156.700	25 W & 1 W
15	15	156.750	156.750	1 W only *2
16	16	156.800	156.800	25 W & 1 W
17	17	156.850	156.850	1 W only
18	–	156.900	161.500	25 W & 1 W
18A	18A	156.900	156.900	25 W & 1 W
19	–	156.950	161.550	25 W & 1 W
19A	19A	156.950	156.950	25 W & 1 W
20	20	157.000	161.600	25 W & 1 W
20A	20A	157.000	157.000	25 W & 1 W
21	–	157.050	161.650	25 W & 1 W
21A	21A	157.050	157.050	25 W & 1 W
22	–	157.100	161.700	25 W & 1 W
22A	22A	157.100	157.100	25 W & 1 W
23	–	157.150	161.750	25 W & 1 W
23A	23A	157.150	157.150	25 W & 1 W
24	24	157.200	161.800	25 W & 1 W
25	25	157.250	161.850	25 W & 1 W
26	26	157.300	161.900	25 W & 1 W
27	27	157.350	161.950	25 W & 1 W
28	28	157.400	162.000	25 W & 1 W
60	–	156.025	160.625	25 W & 1 W
60A	60A	156.025	156.025	25 W & 1 W
61	–	156.075	160.675	25 W & 1 W
61A	61A	156.075	156.075	25 W & 1 W
62	–	156.125	160.725	25 W & 1 W
62A	62A	156.125	156.125	25 W & 1 W
63	–	156.175	160.775	25 W & 1 W
63A	63A	156.175	156.175	25 W & 1 W
64	–	156.225	160.825	25 W & 1 W
64A	64A	156.225	156.225	25 W & 1 W

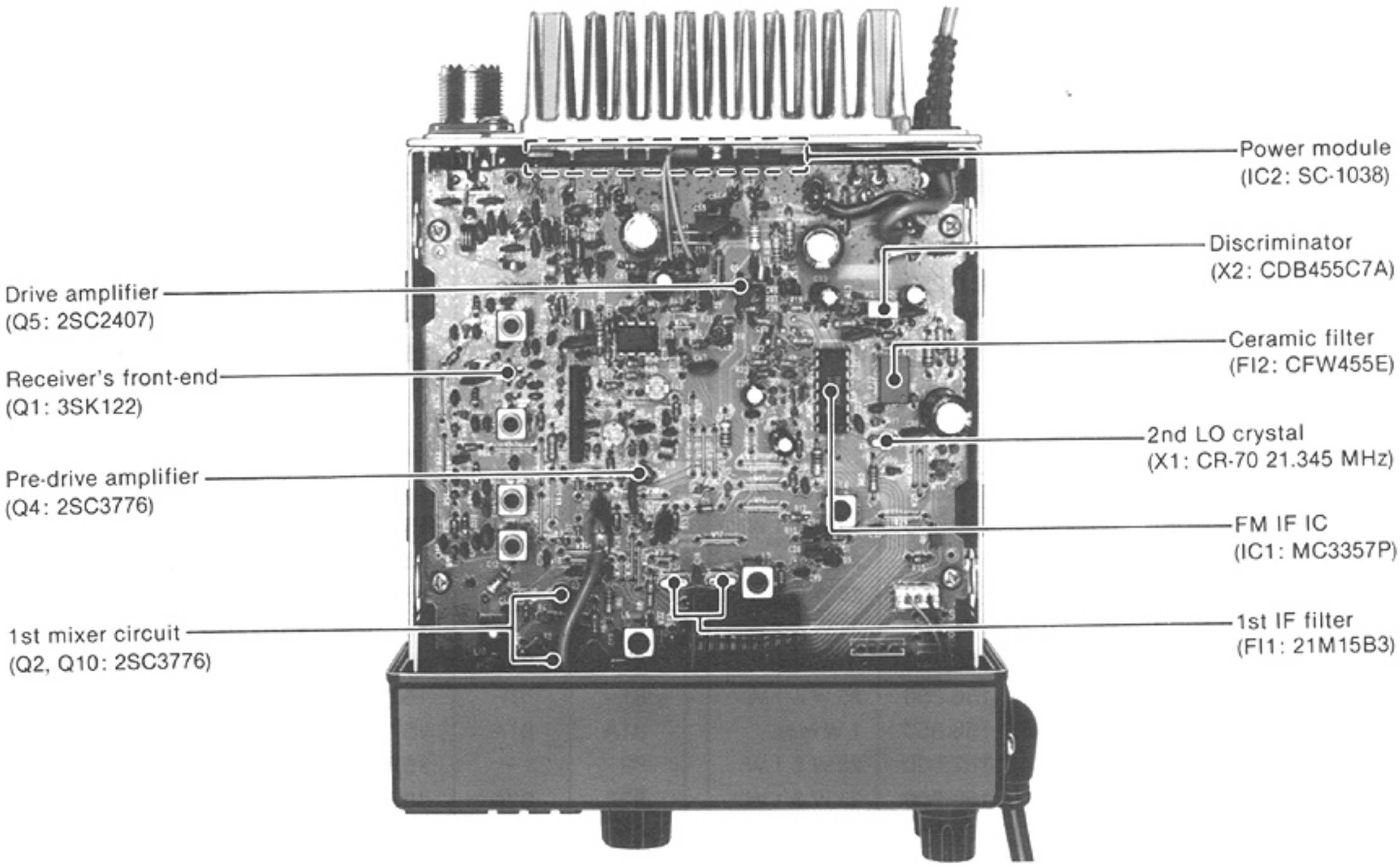
Inter national channel	U.S.A. channel	Frequency (MHz)		Transmit output power
		Transmit	Receive	
65	–	156.275	160.875	25 W & 1 W
65A	65A	156.275	156.275	25 W & 1 W
66	–	156.325	160.925	25 W & 1 W
66A	66A	156.325	156.325	25 W & 1 W
67	67	156.375	156.375	25 W & 1 W *1
68	68	156.425	156.425	25 W & 1 W
69	69	156.475	156.475	25 W & 1 W
70	70	156.525	156.525	1 W only
71	71	156.575	156.575	25 W & 1 W
72	72	156.625	156.625	25 W & 1 W
73	73	156.675	156.675	25 W & 1 W
74	74	156.725	156.725	25 W & 1 W
75	–	- - - - -	- - - - -	Guard
76	–	- - - - -	- - - - -	Guard
77	77	156.875	156.875	25 W & 1 W
78	–	156.925	161.525	25 W & 1 W
78A	78A	156.925	156.925	25 W & 1 W
79	–	156.975	161.575	25 W & 1 W
79A	79A	156.975	156.975	25 W & 1 W
80	–	157.025	161.625	25 W & 1 W
80A	80A	157.025	157.025	25 W & 1 W
81	81	157.075	161.675	25 W & 1 W
81A	81A	157.075	157.075	25 W & 1 W
82	–	157.125	161.725	25 W & 1 W
82A	82A	157.025	157.125	25 W & 1 W
83	–	157.175	161.775	25 W & 1 W
83A	83A	157.175	157.175	25 W & 1 W
84	84	157.225	161.825	25 W & 1 W
84A	–	157.225	157.225	25 W & 1 W
85	85	157.275	161.875	25 W & 1 W
85A	–	157.275	157.275	25 W & 1 W
86	86	157.325	161.925	25 W & 1 W
86A	86A	157.325	157.325	25 W & 1 W
87	87	157.375	161.975	25 W & 1 W
87A	–	157.375	157.375	25 W & 1 W
88	88	157.425	162.025	25 W & 1 W
88A	88A	157.425	157.425	25 W & 1 W

Weather channel	Receive frequency (MHz)	Comment
1	162.550	RX only
2	162.400	RX only
3	162.475	RX only
4	162.425	RX only
5	162.450	RX only
6	162.500	RX only
7	162.525	RX only
8	161.650	RX only
9	161.775	RX only
10	163.275	RX only

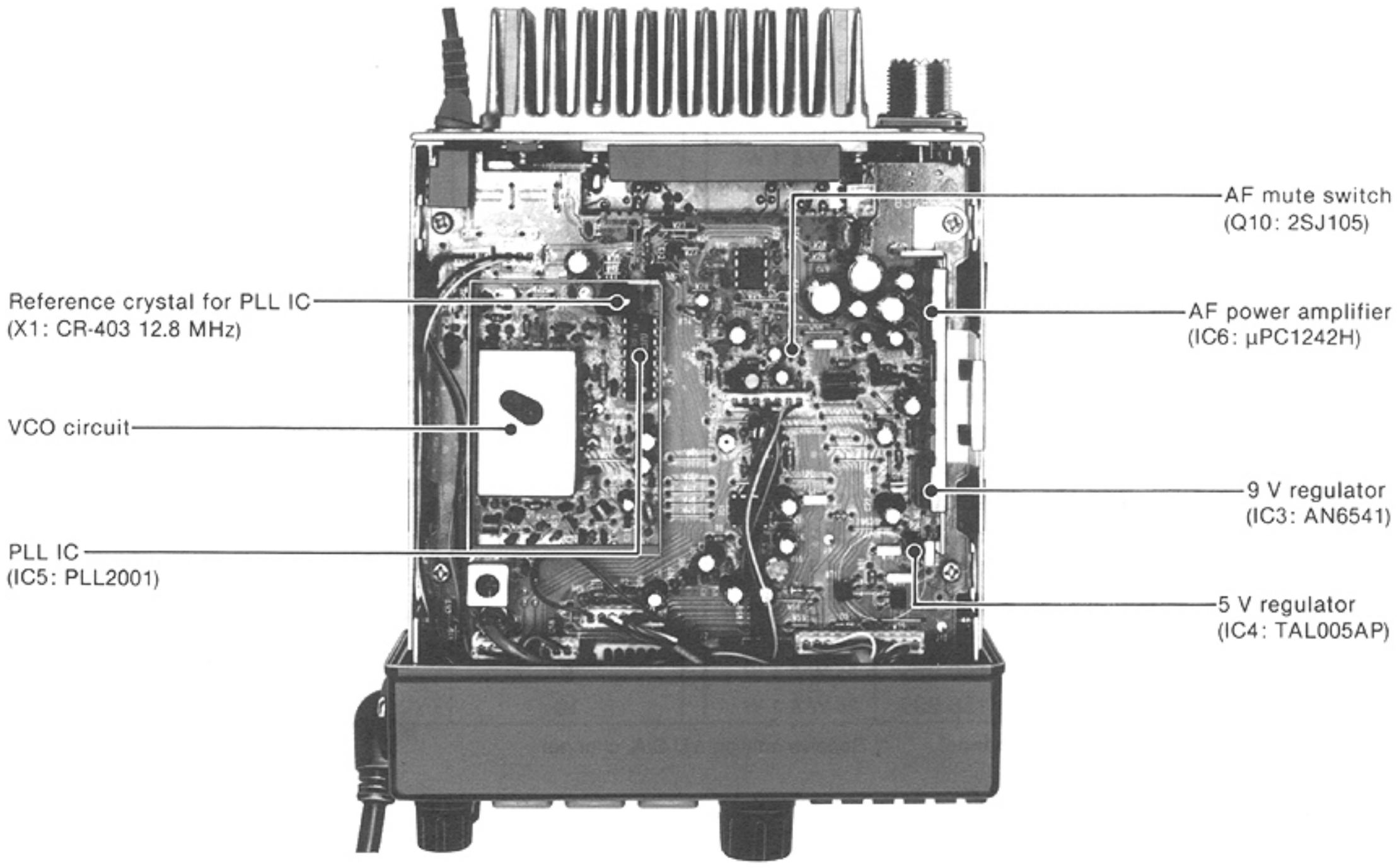
*1 Momentary high power on a U.S.A. channel *2 Receive only on a U.S.A. channel

SECTION 2 INSIDE VIEWS

• MAIN UNIT



• PLL UNIT



SECTION 3 CIRCUIT DESCRIPTION

3-1 RECEIVER CIRCUITS

3-1-1 ANTENNA SWITCHING ATTENUATOR CIRCUITS (MAIN UNIT)

The antenna switching circuit functions as a low-pass filter while receiving and as a resonator circuit while transmitting. It switches the flow of the transmitting and receiving signal.

Received signals enter the MAIN unit from the antenna connector and pass through the low-pass filter (L14~L16, C68~C74, C87). The signals are then applied to the antenna switching circuit (D12, D13).

The current flow of D13 is controlled by the squelch level circuit (Q12, Q13, IC4b). When the [SQUELCH] control is set at deep rotation, the current of D13 is increased. In this case, D13 acts as an attenuator.

3-1-2 RF CIRCUIT (MAIN UNIT)

The signals from the antenna switching circuit pass through a tuned bandpass filter (L1, C3, D17) where the object signals are led to the RF amplifier (Q1).

The signals amplified at Q1 are applied to the 3-stage tuned bandpass filter (L3~L5, C103, C104, C106, D18~D20) to eliminate the out-of-band signals and improve the selectivity. The signals are then applied to the 1st mixer circuit (Q2, Q10).

The PLL lock voltage ("TONE" signal) is used as a control voltage of varactor diodes (D17~D20). The "TONE" signal from the PLL unit (J18, pin 3) is current-amplified by IC4a and is then applied to these diodes.

3-1-3 1ST MIXER CIRCUIT (MAIN UNIT)

The IC-M57 employs a balanced mixer circuit (Q2, Q10, L18) as a 1st mixer circuit to obtain a high intermodulation rejection ratio. The mixer circuit mixes the received signals and 1st LO signal from the PLL unit (J3) to produce a 21.8 MHz 1st IF signal.

3-1-4 1ST IF CIRCUIT (MAIN UNIT)

The 1st IF signal from L6 is applied to FI1. FI1 is a pair of monolithic crystal filters which only picks up an object signal with sufficient selectivity. This signal is amplified by the IF amplifier (Q3) and is then applied to the 2nd mixer circuit.

3-1-5 2ND IF AND FM DETECTOR CIRCUITS (MAIN UNIT)

IC1 contains the 2nd LO circuit, 2nd mixer circuit, limiter amplifier circuit, quadrature detector circuit and squelch trigger circuit.

The 1st IF signal from Q3 is applied to the 2nd mixer section of IC1 (pin 16), and is mixed with a 21.345 MHz 2nd LO signal generated by X1 to produce a 455 kHz 2nd IF signal.

The 2nd IF signal output from IC1 (pin 3) is passed through the ceramic filter (FI2), where unwanted signals are suppressed, and is then applied to the 2nd IF and limiter amplifiers in IC1 (pin 5). The signal is applied to the FM detector section in IC1 to demodulate into an AF signal.

The FM detector circuit employs a quadrature detection method (linear phase detection), which uses a ceramic discriminator (X2) for phase delay to obtain a non-adjusting circuit. The detected signal from IC1 (pin 9) is applied to the AF circuit in the PLL unit.

FM DETECTOR AND SQUELCH CIRCUITS

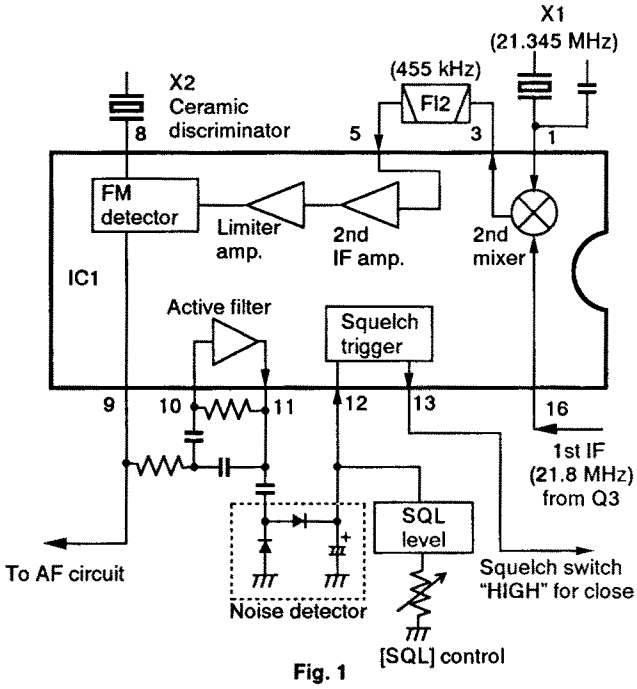


Fig. 1

3-1-6 SQUELCH CIRCUIT (MAIN UNIT)

In an FM receiver, audio noise is produced in its IF and AF circuits when receiving no RF signals. However, the noise is suppressed when receiving a signal. The noise squelch circuit acts in accordance with this phenomenon.

Noise components in the detected signal (20 kHz and higher) from IC1 (pin 9) are amplified at the active filter in IC1 (pin 10) and are then detected by D4 and D5 to convert to DC voltage. The squelch trigger circuit in IC1 (pin 12) converts the voltage to a "HIGH" or "LOW" squelch switch signal.

The squelch switch signal is applied to the CPU (IC1, pin 35) on the LOGIC unit through the SQL signal line. The CPU pin 61 outputs "HIGH" while pin 35 is "HIGH" to cut the audio signals using the AF mute switch (Q10) in the PLL unit.

The [SQL] control (R2) on the VR unit is connected in parallel to the squelch trigger circuit (IC1, pin 12) via the squelch level circuit (Q12, Q13, IC4). Pin 12 input voltage is therefore controlled by the [SQL] control.

The squelch level circuit (Q12, Q13, IC4) controls the antenna switching circuit current using IC4 and the squelch trigger input level (IC 1 pin 12) using Q13.

3-1-7 AF AMP CIRCUIT (MAIN AND PLL UNITS)

AF signal output from IC1 (pin 9) is applied to the de-emphasis circuit (R19, C33). This de-emphasis circuit is an integrated circuit with frequency characteristics of − 6 dB/octave. The resulting signal is applied to the AF amp circuit in the PLL unit.

The AF signal is applied to Q9 and IC2a in the PLL unit. Q9 is an active filter that functions as a high-pass filter to suppress unwanted lower noise signals. IC2a is also an active filter but functions as a low-pass filter to suppress higher noise signals.

The filtered signal passes through the [VOL] control (R1) in the VR unit and then to the AF mute switch (Q10) and is power-amplified at the AF power amplifier (IC6) to drive a speaker.

3-2 TRANSMITTER CIRCUITS

3-2-1 MICROPHONE AMPLIFIER CIRCUIT (PLL UNIT)

The microphone amplifier circuit amplifies audio signals with +6 dB/octave pre-emphasis from the microphone to a level needed at the modulation circuit.

The signals from the microphone pass through the pre-emphasis circuit (C2, R2~R4) to obtain the frequency characteristics of +6 dB/octave.

The signals are amplified by the microphone amplifier (Q1) and then are the limiter amplifier (IC1a) to be limited in frequency deviation. The signals are applied to the splatter filter (IC1b) where signals of 3 kHz and above are eliminated. The signals are then applied to the modulation circuit in the VCO unit to produce an FM signal.

3-2-2 MODULATION CIRCUIT (VCO UNIT)

The modulation circuit modulates the VCO oscillating signal (RF signal) using the microphone audio signals.

Audio signals from IC1b in the PLL unit are applied to the modulation circuit (D3) to change the reactance of D3 and modulate the oscillated signal. The oscillated signal is buffer-amplified at Q1 and is then applied to the PLL unit.

3-2-3 DRIVE AMPLIFIER CIRCUIT (PLL AND MAIN UNITS)

The drive amplifier circuit amplifies the VCO oscillating signal to a level needed at the power amplifier.

The VCO output is buffer-amplified by Q7 in the PLL unit and is applied to the MAIN unit via the low-pass filter (L2, L3, C37~C39). The signal passes through the transmit/receive switching circuit (D6, D7) and is then amplified at the predrive (Q4) and drive (Q5) amplifiers to obtain an approximate +23 dBm (200 mW) signal level. The signal is applied to the RF power amplifier (IC2).

3-2-3 POWER AMPLIFIER CIRCUIT (MAIN UNIT)

The power amplifier circuit amplifies the driver signal to an output power level. Though IC1 is a power module which has amplify capabilities of up to about 35 W, the APC circuit sets the power to 25 W or 1 W.

The output from IC2 (pin 4) passes through D12 and the Chebyschev low-pass filter (L14~L16, C68~C74, C87) to reduce the higher harmonic wave of the transmission frequency.

The transmit/receive switching circuit (D12, D13) is turned ON by the T8 voltage line to prevent transmit output power from going into the receiver circuit. While receiving, D12 and D13 turn OFF for the antenna switching circuit to act as a low-pass filter.

3-2-4 APC CIRCUIT (MAIN UNIT)

The APC circuit stabilizes RF output power with high/low power selection even when the supplied voltage changes.

A portion of the RF output power from the power module (IC2) is detected by the power detection circuit (D11). The detected signal is applied to the inverter amplifier (IC3, pin 2) which functions as a differential amplifier using the high/low power set voltage.

When the output power is lower than the set level, IC3 controls Q7 and Q6 to increase the bias voltage of the power module (IC2) and the collector current of the drive amplifier (Q5). Thereby increasing the power to the set level.

By changing the high/low setting voltage which is applied to IC3 (pin 3), output power can be varied. Q9 and Q11 select low output power.

R63 is a thermistor for temperature detection of the heatsink and decreases the output power when the heatsink becomes extremely hot.

APC CIRCUIT

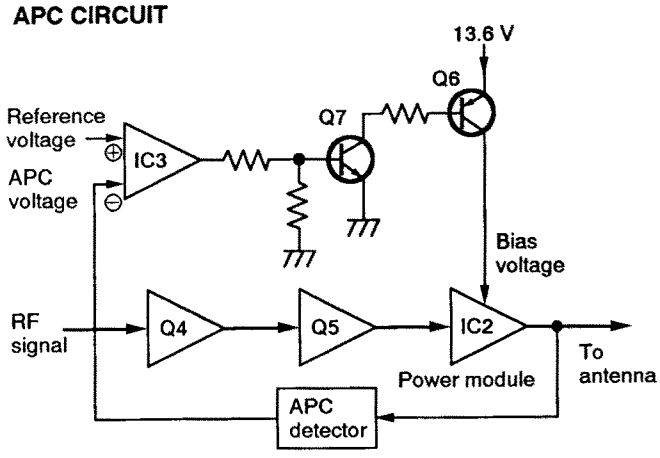


Fig. 2

3-3 PLL CIRCUITS

3-3-1 GENERAL DESCRIPTION (PLL UNIT)

A PLL circuit provides stable oscillation of the transmit frequency and the receive LO frequency. The PLL circuit compares the phase of the divided VCO frequency to the reference frequency. The PLL output frequency is controlled by a reference oscillator and the divided ratio (N data) of a programmable divider.

$$\text{N-data} = \frac{\text{Desired frequency}}{\text{Reference frequency}}$$

The one chip PLL IC (IC5) contains two programmable dividers, a phase detector and a shift register.

The VCO oscillation output from the "OUT" terminal is amplified at Q8 and is then applied to IC5 (pin 8). IC5 divides this input with the serial data from the CPU and phase-detects it with the divided reference frequency (12.5 kHz) and then outputs the phase difference as a pulse.

The output signals from IC5 (pin 5, 12) are amplified by the charge pump (Q4~Q6) to expand the lock voltage. The amplfied signal is then converted to a DC voltage by the lag-lead loop filter (R32, R33, C25) and, as well, controls the varactor diodes (D4, D5 in the VCO unit).

The DC voltage is also applied to the MAIN unit as the "TUNE" signal to provide Rx bandpass filter tuning via Q11.

PLL CIRCUIT BLOCK DIAGRAM

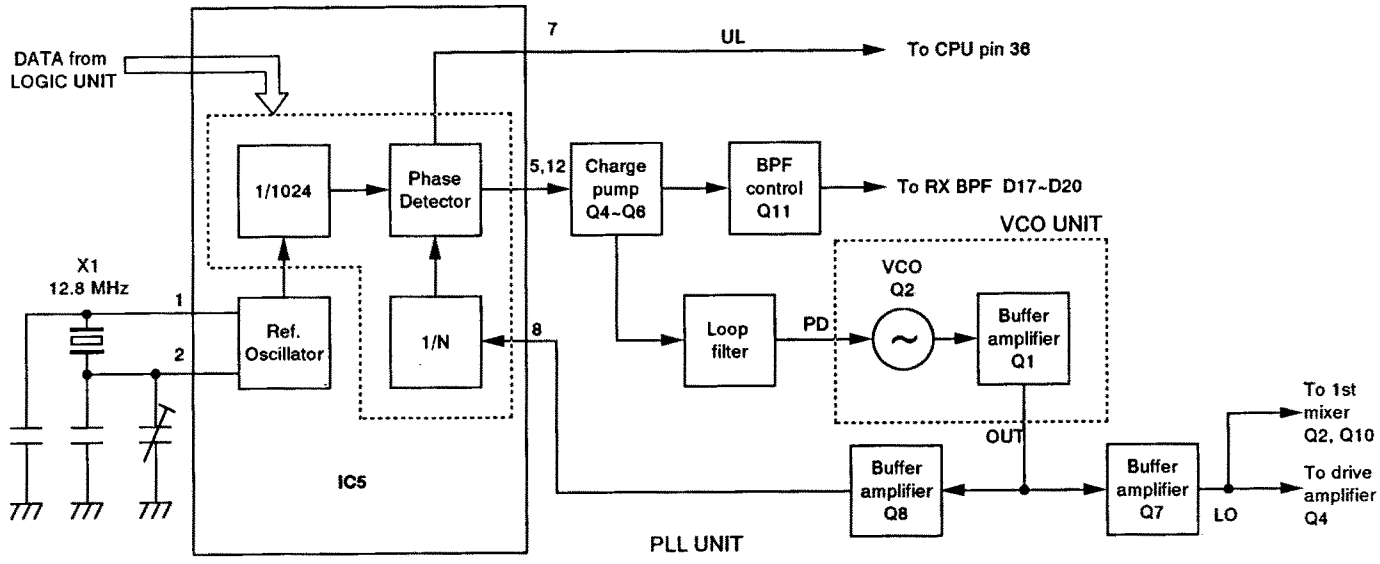


Fig. 3

3-3-2 VCO CIRCUIT (VCO UNIT)

The VCO circuit generates receive 1st LO and transmit frequencies, and produces FM modulation.

The VCO circuit (Q2) forms a Clapp oscillator circuit. Q2 causes oscillation; D3 causes FM modulation; C11, with a small capacitance, provides coupling; and Q1 provides a buffer effect that is unaffected by VCO oscillation.

The VCO output is applied to Q7 and Q8 in the PLL unit. The signal amplified at Q7 is sent to the 1st mixer and predrive amplifier circuit in the MAIN unit. The signal amplified at Q8 is applied to the PLL IC (IC5).

3-3-3 REFERENCE OSCILLATOR CIRCUIT (PLL UNIT)

The reference oscillator circuit oscillates the PLL reference frequency.

The reference frequency (12.8 MHz) is produced by the local oscillator section of IC5 and X1.

3-4 OTHER CIRCUITS

3-4-1 POWER SUPPLY CIRCUITS

LINE	DESCRIPTION
HV	The external DC power from the power connector.
HVO	13.6 V DC passed through the power switch.
5 V	Common 5 V converted from the HVO line at IC4 in the PLL unit.
9 V	Common 9 V converted from the HVO line at IC3 in the PLL unit.
R8	Receive 8 V converted from the 9 V line at Q15 in the PLL unit.
T8	Transmit 8 V converted from the 9 V line at Q12 in the PLL unit.

3-4-2 CPU RESET CIRCUIT (LOGIC UNIT)

The resetting IC (IC2) sets the CPU to the operating mode when turning power ON and sets it to the backup mode when turning power OFF.

When turning power ON, voltages in the 5 V line increase. When the voltage exceeds the IC2 threshold voltage, IC2 outputs "HIGH." The signal switches Q5, for a period determined by the differential circuit (C2, R4, R5), to set the CPU to the operating mode.

When turning power OFF, IC2 applies "LOW" to the "INT4" port of the CPU before the 5 V from the CPU power source disappears, thus setting the CPU to the backup mode.

CPU RESET CIRCUIT

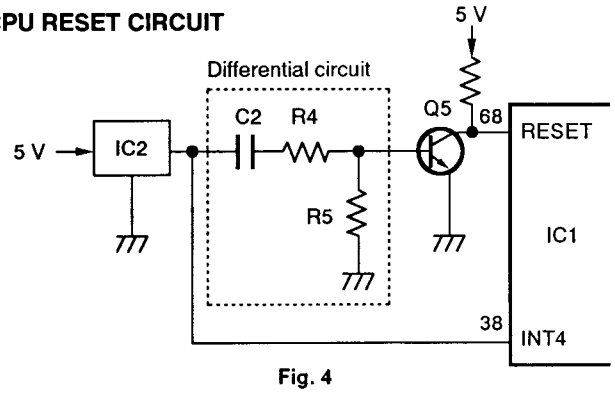


Fig. 4

3-5 CPU PORT ALLOCATIONS (LOGIC UNIT)

• INITIAL MATRIX

NAME	DESCRIPTION
TOT OFF	Inhibits the time-out timer function.
RAM BKUP	Activates the memory channels. The memory contents are backed up.
USA OFF	Inhibits the U.S.A. channels.
WX OFF	Inhibits the weather channels. The [WX] switch becomes the call switch.
SCAN	Activates the scan function.
INTL	Selects international-1 channels.
HOLLAND	Activates the holland channels.
CH70 INH	Inhibits channel 70.

INITIAL MATRIX

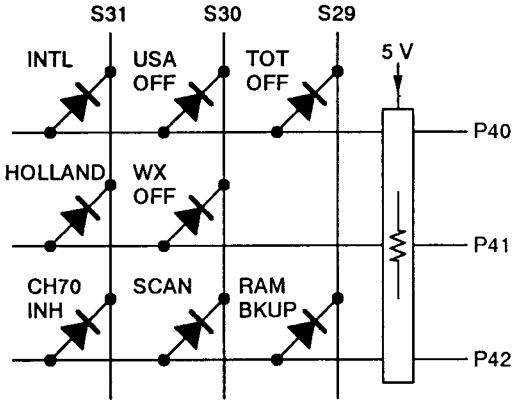


Fig. 5

• INPUT PORT

PIN NO.	NAME	DESCRIPTION
29~31	P40~P42	Input ports for the initial matrix.
34	LDEC	Input port for the low battery detector. (IC2b in the PLL unit) The signal becomes "LOW" when the supplied voltage becomes 10 V DC or lower.
35	SQL	Detects a squelch signal. The signal is "LOW" when the squelch opens.
36	UNLK	Detects a PLL unlock signal. When the signal is "LOW," the PLL is unlocked.
38	INT4	Detects a signal for the standby mode of the CPU. The CPU enters the standby mode when the port becomes "LOW."
41	HANG	Input port for the microphone hanger. Selects Channel 16 when this port changes from "HIGH" to "LOW."
42	PTT	Inputs a signal on the PTT line. This port becomes "LOW" when the PTT switch is pushed.
43, 44	P11, P12	Input ports for the up/down signal of the channel selector.
45	P13,	Input port for the [CH16] switch.
46	P20	Input port for the [D/MODE] switch.
47	P21	Input port for the [DUAL] switch.
48	P22	Input port for the [WX] switch.
49	P23	Input port for the [DIM] switch
50	P30	Input port for the [HI/LO] switch.
53	POC	Sets a channel to LOW output power.

• OUTPUT PORT

PIN NO.	NAME	DESCRIPTION
18~20	S29~S31	Output low strobe signals for the initial matrix.
39	CK	Outputs a synchronized clock signal for the PLL data.
40	DATA	Outputs a data signal for the PLL IC.
61	RMUT	Outputs a receive mute signal. "HIGH" : receive mute
62	LOWO	Outputs transmit power selecting signal. "HIGH" : low output power "LOW" : high output power
63	TMUT	Outputs a transmit mute signal. "HIGH": transmit mute
64	SEND	Outputs transmit/receive switching signals. "HIGH" : transmit "LOW" : receive
65	BEEP	Outputs 500 Hz or 1 kHz beep tones.
66	ST	Output port for a PLL data strobe signal.
67	P73	Outputs the display backlight signal. "HIGH": backlight OFF

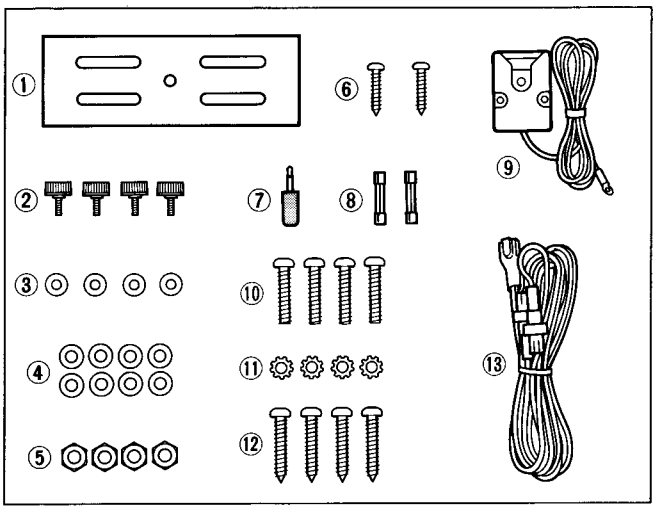
SECTION 4 MECHANICAL PARTS AND DISASSEMBLY

4-1 FRONT PANEL

LABEL NUMBER	ORDER NO.	DESCRIPTION	QTY.
①	8610004890	Knob N140 (#01) [MAIN DIAL]	1
	8610008040	Knob N140 (B) (#02) [MAIN DIAL]	1
②	8610008050	Knob N141 (C) (#01) [VOL]/[SQL]	2
	8610008060	Knob N141 (D) (#02) [VOL]/[SQL]	2
③	8830000550	VR nut (E)	3
④	8210007490	Front panel (D)-2 (#01)	1
	8210007500	Front panel (E)-2 (#02)	1
⑤	7700000890	Microphone M204D40I0816 (EM51) (#01)	1
	7700001030	Microphone M204D40I0821 (EM60) (#02)	1
⑥	8810000590	Screw PH M3×8 SUS (#02)	2
	8810005560	Screw PH M3×8 SUS ZK (#01)	2
⑦	8930014230	Cable holder	1
⑧	8930014350	Speaker ring	1
⑨	8010012580	Front seal (D)	1
⑩	8310025780	Window plate (B) (#01)	1
	8310025770	Window plate (C) (#02)	1
⑪	2510000480	Speaker T045S01A0000	1
⑫	8010008040	Sub chassis	1
⑬	8930014220	Speaker plate	1
⑭	8810001110	Screw PH B0 M3×6	3
⑮	8810001120	Screw PH B0 M3×8	1
⑯	2260000880	Rotary switch SRBM1L038A [MAIN DIAL]	1
⑰	7210001500	Variable resistor RK097111102AA (10KA) [PWR/VOL]	1
⑱	7210001010	Variable resistor RK097111000AA (10KB) [SQUELCH]	1
⑲	8930014660	LCD cover	1
⑳	5030000810	LCD LD-BU5436JZ (E-5626) [FUNCTON DISPLAY]	1
㉑	8310025930	706 LCD filter (A)	1
㉒	8010012560	LCD reflector (B)	1
㉓	8810000150	Screw PH M2.6×6	3
㉔	8810002180	Screw FH M3×8	2
㉕	8930014340	Screw bushing	4
㉖	8010008031	Side plate-1	2
㉗	8810001340	Screw PH B1 M3×5	4
㉘	8810003360	Setscrew C M3×6	1
㉙	8860000580	Screw lug M3	1
㉚	8830000100	Nut M3	1
㉛	8810002510	Screw FH M3×6 SUS	4
㉜	8410001790	706 heatsink (B)-1	1
㉝	8930019020	Antenna seal	1
㉞	6510004880	Connector MR-DS-E 01 [ANT]	1
㉟	8810003690	Icom screw A10	2
㊱	8930010690	Bushing holder	1
㊲	8930014311	Jack cap-1	1
㊳	8900003500	Cable OPC-356 [DC 13.8V]	1
㊴	8810001350	Screw PH B1 M3×6	4
㊵	8510004040	DDS shield case	1
㊶	8930014360	Case w/feed through AS-307	1
㊷	8510000200	194 VCO case cover (B)	1
㊸	8510006670	706 shield case cover	1
㊹	6450000140	Connector HSJ0807-01-010 [EXT SP]	1
㊺	8930014300	Jack bushing	1
㊻	8810003370	Setscrew C M3×8	1
㊼	6910000690	Clip 59TC4772	2
㊽	8810003170	Setscrew A M3×8	2
㊾	8930014260	PLL heatsink	1
㊿	8930014240	IC clip	1
(51)	8930014250	Heatsink holder	1
(52)	8930014320	F-packing	1
(53)	8110003190	Cover (#01)	1
	8110004000	Cover (A) (#02)	1
(54)	8930014330	Heatsink packing	1
(55)	8810005660	Screw BiH M3×10 SUS	4

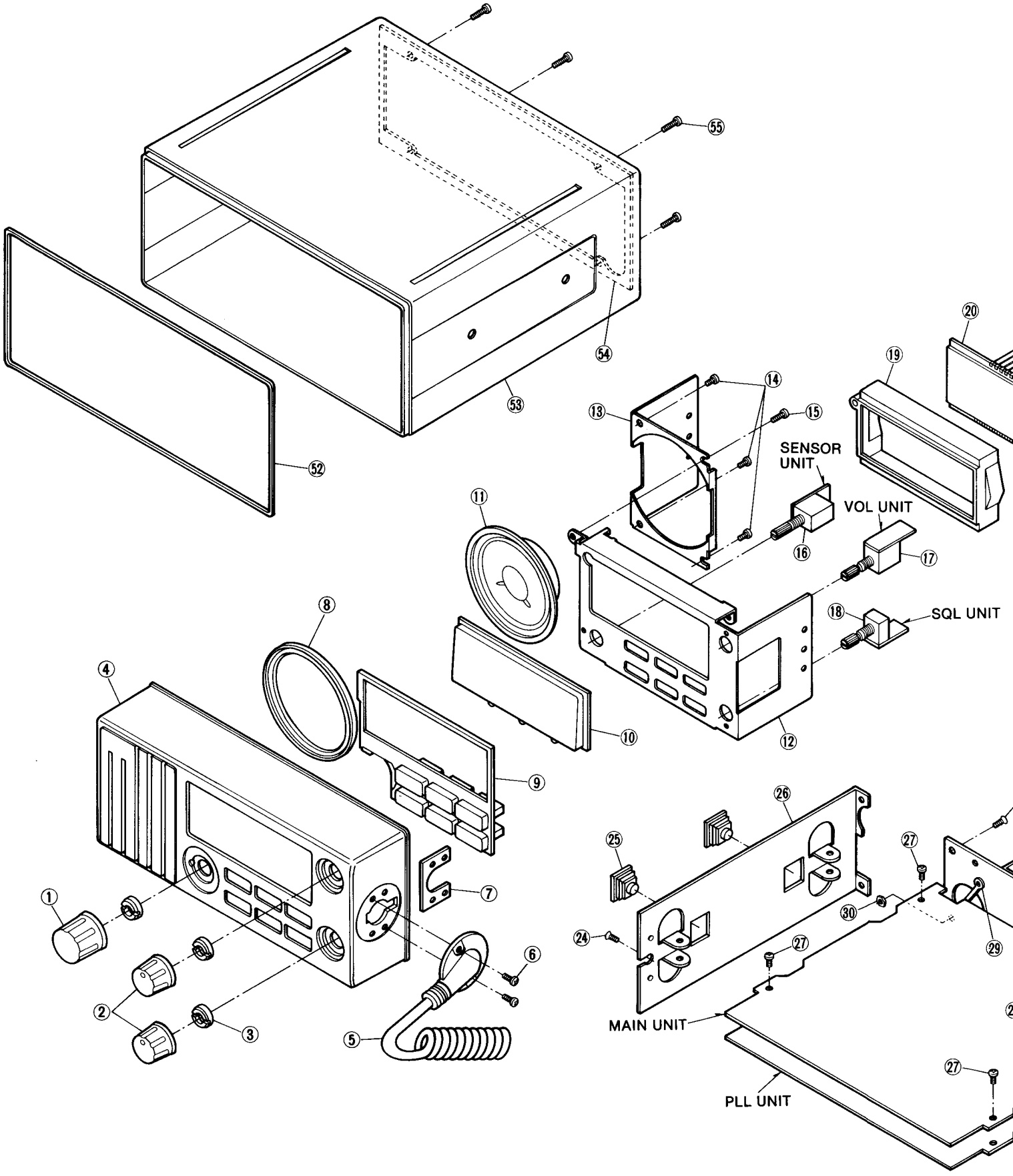
Screw abbreviations B0: Self-tapping screw PH: Pan head FH: Flat head BiH: Binding head SUS: Stainless ZK: Black

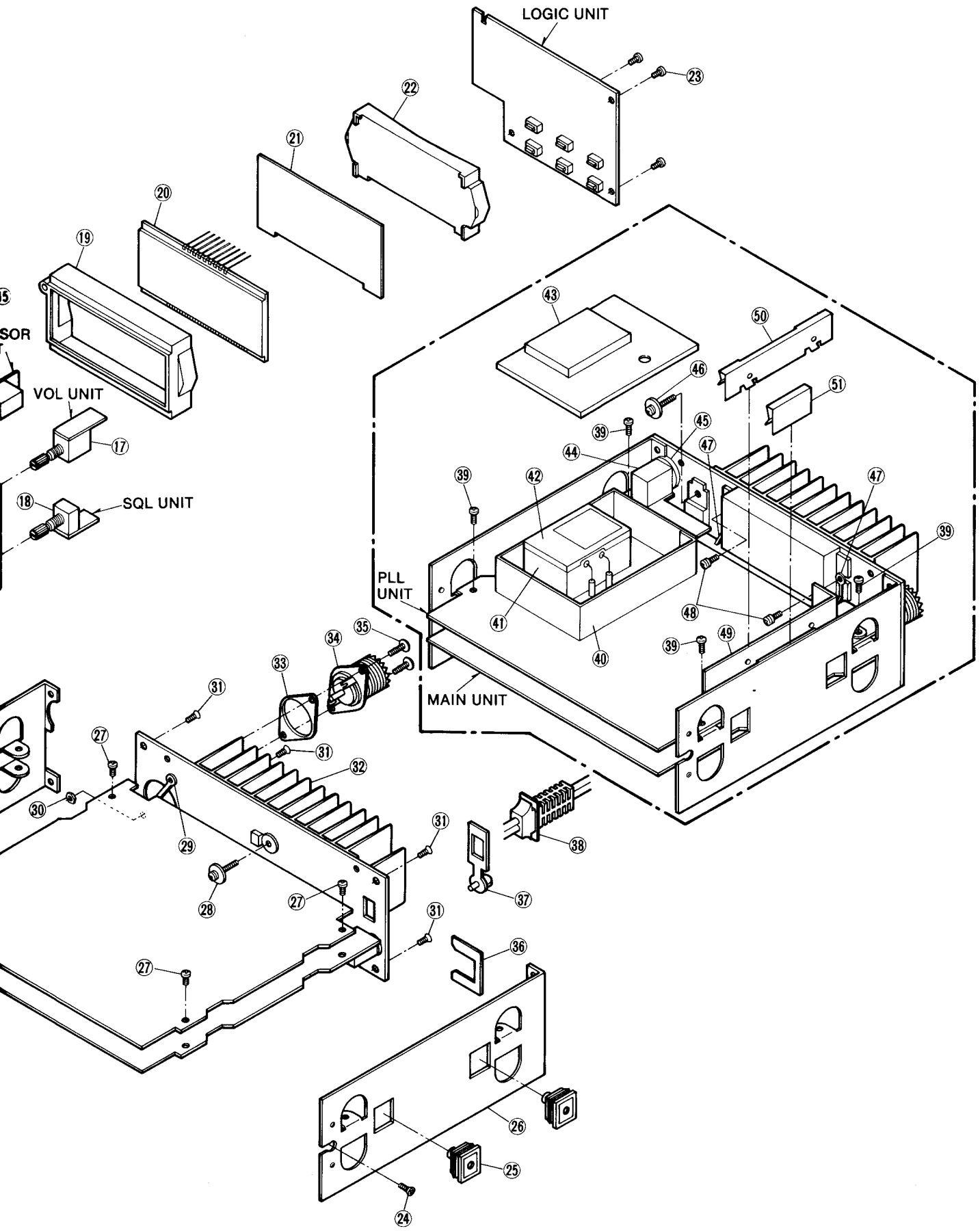
4-2 ACCESSORIES



LABEL NUMBER	ORDER NO.	DESCRIPTION	QTY.
①	8010006000	Mounting bracket (C) (#01)	1
	8010009950	Mounting bracket (D) (#02)	1
②	8820000501	Knob bolt (C)-1 M4×10	4
③	8850000170	Flat washer M4 SUS	4
④	8850000180	Flat washer M5 SUS	8
⑤	8830000250	Nut M5 SUS	4
⑥	8810001470	Screw PH A M3.5×30 SUS	2
⑦	5610000020	External speaker plug AP313 3.5Φ CS	1
⑧	5210000070	Fuse FGB 10A	2
⑨	8900001700	Microphone hanger OPC-117 B (#01)	1
	8900001130	Microphone hanger OPC-117 A (#02)	1
⑩	8810000700	Screw PH M5×20 SUS	4
⑪	8850000600	Star washer M5 SUS	4
⑫	8810001490	Screw PH A M5×20 SUS	4
⑬	8900003490	DC power cable OPC-355	1

Screw abbreviations PH: Pan head SUS: Stainless


SENSOR UNIT
VOL UNIT
SQL UNIT
MAIN UNIT
PLL UNIT


LOGIC UNIT
VOL UNIT
SQL UNIT
PLL UNIT
MAIN UNIT

SECTION 5 PARTS LIST

[FRONT]

REF. NO.	ORDER NO.	DESCRIPTION	
MC1	7700000890	MICROPHONE	M204D40I0816 (EM51) (#01)
	7700001030	MICROPHONE	M204D40I0821 (EM60) (#02)
SP1	2510000480	SPEAKER	T045S01A0000

[VOL UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
R1	7210001500	VARIABLE	RK097111102AA (10KA) [PWR/VOL]
EP1	0910036190	PCB	B 1876 (VOL)

[SQL UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
R2	7210001010	VARIABLE	RK097111000AA (10KB) [SQUELCH]
EP2	0910036200	PCB	B 1877 (SQL)

[VCO UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
Q1	1530002210	TRANSISTOR	2SC3776-D
Q2	1560000110	FET	2SK241-GR
D1	1710000050	DIODE	1SS53
D2	1710000160	DIODE	1SS133
D3	1710000580	DIODE	1SS265
D4	1720000060	VARICAP	1SV50 (1) E
D5	1720000060	VARICAP	1SV50 (1) E
L1	6180000680	COIL	LAL 02NA 4R7K
L2	6180002380	COIL	LAL 02NA 2R2K
L3	6180000850	COIL	LAL 03NA 4R7K
L4	6130002490	COIL	LB-275
L5	6180000850	COIL	LAL 03NA 4R7K
L6	6180000850	COIL	LAL 03NA 4R7K
L7	6180000670	COIL	LAL 02NA R22K
R1	7010003750	RESISTOR	ELR20J 560 kΩ
R2	7010003620	RESISTOR	ELR20J 47 kΩ
R3	7010003700	RESISTOR	ELR20J 220 kΩ
R4	7010003340	RESISTOR	ELR20J 330 Ω
R5	7010004270	RESISTOR	R20J 4.7 kΩ
R6	7010003370	RESISTOR	ELR20J 560 Ω
R7	7010003240	RESISTOR	ELR20J 47 Ω
C3	4010000460	CERAMIC	DD104 B 471K 50V
C4	4010000180	CERAMIC	DD104 SL 220J 50V
C5	4010003520	CERAMIC	DD105 UJ 560J 50V
C6	4010000160	CERAMIC	DD104 SL 180J 50V
C8	4010003270	CERAMIC	DD104 UJ 030C 50V
C9	4010003270	CERAMIC	DD104 UJ 030C 50V
C10	4010000500	CERAMIC	DD104 B 102K 50V
C11	4010000010	CERAMIC	DD104 SL 0R5C 50V
C12	4010000500	CERAMIC	DD104 B 102K 50V
C15	4010000180	CERAMIC	DD104 SL 220J 50V
W1	6910001020	JUMPER	IPS-1041-2
EP1	0910031311	PCB	B 3163A (VCO)

[PLL UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1110000540	IC	NJM4558D
IC2	1110000070	IC	μPC358C
IC3	1110000490	IC	AN6541
IC4	1180000010	IC	TA78L005AP
IC5	1130003050	IC	PLL2001

S.=Surface mount

[PLL UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
IC6	1110001360	IC	μPC1242H
Q1	1530000110	TRANSISTOR	2SC2458-GR
Q2	1510000220	TRANSISTOR	2SA1345
Q3	1530000960	TRANSISTOR	2SC3399
Q4	1530000110	TRANSISTOR	2SC2458-GR
Q5	1510000080	TRANSISTOR	2SA1048-GR
Q6	1530000110	TRANSISTOR	2SC2458-GR
Q7	1530000150	TRANSISTOR	2SC2668-O
Q8	1530000150	TRANSISTOR	2SC2668-O
Q9	1530000110	TRANSISTOR	2SC2458-GR
Q10	1590000280	FET	2SJ105-Y
Q11	1560000010	FET	2SK184-Y
Q12	1520000230	TRANSISTOR	2SB909M Q
Q13	1530000960	TRANSISTOR	2SC3399
Q14	1530000960	TRANSISTOR	2SC3399
Q15	1520000230	TRANSISTOR	2SB909M Q
D1	1710000160	DIODE	1SS133
D2	1710000160	DIODE	1SS133
D3	1710000160	DIODE	1SS133
D4	1710000050	DIODE	1SS53
D7	1710000160	DIODE	1SS133
X1	6050008080	XTAL	CR-403
L1	6110001570	COIL	LA-237
L2	6110001600	COIL	LA-243
L3	6110001530	COIL	LA-233
L4	6110001560	COIL	LA-236
R2	7010003480	RESISTOR	ELR20J 4.7 kΩ
R3	7010003720	RESISTOR	ELR20J 330 kΩ
R4	7010003650	RESISTOR	ELR20J 82 kΩ
R5	7010003470	RESISTOR	ELR20J 3.9 kΩ
R6	7010003280	RESISTOR	ELR20J 100 Ω
R7	7010003370	RESISTOR	ELR20J 560 Ω
R8	7010004210	RESISTOR	R20J 1.5 kΩ
R9	7010003240	RESISTOR	ELR20J 47 Ω
R10	7310000810	TRIMMER	RH0651CS5J10A (474)
R11	7010003660	RESISTOR	ELR20J 100 kΩ
R12	7010003760	RESISTOR	ELR20J 680 kΩ
R13	7010003510	RESISTOR	ELR20J 6.8 kΩ
R14	7010003540	RESISTOR	ELR20J 12 kΩ
R15	7010003590	RESISTOR	ELR20J 27 kΩ
R16	7010003630	RESISTOR	ELR20J 56 kΩ
R17	7010003540	RESISTOR	ELR20J 12 kΩ
R18	7010003240	RESISTOR	ELR20J 47 Ω
R19	7010003490	RESISTOR	ELR20J 5.6 kΩ
R20	7310001710	TRIMMER	RH0421C14J0KA (103)
R21	7010003530	RESISTOR	ELR20J 10 kΩ
R22	7010004320	RESISTOR	R20J 10 kΩ
R23	7010004190	RESISTOR	R20J 1 kΩ
R24	7010003530	RESISTOR	ELR20J 10 kΩ
R25	7010004190	RESISTOR	R20J 1 kΩ
R26	7010003630	RESISTOR	ELR20J 56 kΩ
R27	7010003650	RESISTOR	ELR20J 82 kΩ
R28	7010004420	RESISTOR	R20J 56 kΩ
R29	7010003580	RESISTOR	ELR20J 22 kΩ
R30	7010003950	RESISTOR	R20J 10 Ω
R31	7010003520	RESISTOR	ELR20J 8.2 kΩ
R32	7010004140	RESISTOR	R20J 390 Ω
R33	7010003400	RESISTOR	ELR20J 1 kΩ
R34	7010001370	RESISTOR	R25XJ 56 kΩ
R35	7010003580	RESISTOR	ELR20J 22 kΩ
R36	7010004410	RESISTOR	R20J 47 kΩ
R37	7010004410	RESISTOR	R20J 47 kΩ
R38	7520000010	POSISTOR	PTH60T222M
R39	7010003580	RESISTOR	ELR20J 22 kΩ
R40	7010003730	RESISTOR	ELR20J 390 kΩ

[PLL UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
R41	7010003620	RESISTOR	ELR20J 47 kΩ
R42	7010003540	RESISTOR	ELR20J 12 kΩ
R43	7010004070	RESISTOR	R20J 100 Ω
R44	7010003460	RESISTOR	ELR20J 3.3 kΩ
R45	7010003440	RESISTOR	ELR20J 2.2 kΩ
R46	7010003320	RESISTOR	ELR20J 220 Ω
R47	7010003280	RESISTOR	ELR20J 100 Ω
R48	7010003460	RESISTOR	ELR20J 3.3 kΩ
R49	7010003440	RESISTOR	ELR20J 2.2 kΩ
R50	7010003320	RESISTOR	ELR20J 220 Ω
R51	7010003810	RESISTOR	ELR20J 2.2 MΩ
R52	7010003740	RESISTOR	ELR20J 470 kΩ
R53	7010003510	RESISTOR	ELR20J 6.8 kΩ
R54	7010003600	RESISTOR	ELR20J 33 kΩ
R55	7010004200	RESISTOR	R20J 1.2 kΩ
R56	7010003780	RESISTOR	ELR20J 1 MΩ
R57	7010003660	RESISTOR	ELR20J 100 kΩ
R58	7010003440	RESISTOR	ELR20J 2.2 kΩ
R59	7010003280	RESISTOR	ELR20J 100 Ω
R60	7010004450	RESISTOR	R20J 100 kΩ
R61	7010003660	RESISTOR	ELR20J 100 kΩ
R62	7010003040	RESISTOR	ELR20J 1 Ω
R63	7010004070	RESISTOR	R20J 100 Ω
R64	7010003280	RESISTOR	ELR20J 100 Ω
R65	7010001190	RESISTOR	R25XJ 2.2 kΩ
R66	7010003400	RESISTOR	ELR20J 1 kΩ
R67	7010003530	RESISTOR	ELR20J 10 kΩ
R68	7510000090	THERMISTOR	ERT-D2FGL 202S
R69	7010004190	RESISTOR	R20J 1 kΩ
R70	7010003620	RESISTOR	ELR20J 47 kΩ
R71	7010003530	RESISTOR	ELR20J 10 kΩ
R74	7010004470	RESISTOR	R20J 150 kΩ
R75	7010003680	RESISTOR	ELR20J 150 kΩ
R76	7010004420	RESISTOR	R20J 56 kΩ
R77	7010003730	RESISTOR	ELR20J 390 kΩ
R78	7010003650	RESISTOR	ELR20J 82 kΩ
R79	7010003650	RESISTOR	ELR20J 82 kΩ
R81	7010004270	RESISTOR	R20J 4.7 kΩ
R83	7010003540	RESISTOR	ELR20J 12 kΩ
C2	4310000840	MYLAR	50 F2D 152J
C3	4510005270	ELECTROLYTIC	50 MV R22 SWNP
C4	4510003900	ELECTROLYTIC	16 MV 22 HW
C5	4510003940	ELECTROLYTIC	25 MV 4R7 HW
C6	4510003950	ELECTROLYTIC	50 MV R47 HW
C7	4510003900	ELECTROLYTIC	16 MV 22 HW
C8	4310000360	MYLAR	50 F2D 103J
C9	4310000400	MYLAR	50 F2D 223J
C11	4310000330	MYLAR	50 F2D 102J
C12	4510003940	ELECTROLYTIC	25 MV 4R7 HW
C13	4010000500	CERAMIC	DD104 B 102K 50V
C14	4040000150	BARRIER	UAT 05X 472K
C15	4040000260	BARRIER	UZE 08X 104M
C16	4010000500	CERAMIC	DD104 B 102K 50V
C18	4510004020	ELECTROLYTIC	50 MV 3R3 HW
C19	4510003890	ELECTROLYTIC	16 MV 10 HW
C20	4510004340	ELECTROLYTIC	16 MV 100 SW
C21	4040000150	BARRIER	UAT 05X 472K
C22	4510003890	ELECTROLYTIC	16 MV 10 HW
C23	4550000320	TANTALUM	DN 1V 0R1M
C24	4550000360	TANTALUM	DN 1V R47M
C25	4550002120	TANTALUM	DN 1C 220M
C26	4010000210	CERAMIC	DD104 SL 300J 50V
C27	4010000170	CERAMIC	DD104 SL 200J 50V
C28	4610001470	TRIMMER	CV38D 2001E
C29	4510003910	ELECTROLYTIC	16 MV 47 HW
C30	4010000500	CERAMIC	DD104 B 102K 50V
C31	4510004020	ELECTROLYTIC	50 MV 3R3 HW
C32	4010000160	CERAMIC	DD104 SL 180J 50V
C33	4010000160	CERAMIC	DD104 SL 180J 50V
C34	4010000500	CERAMIC	DD104 B 102K 50V
C35	4010000500	CERAMIC	DD104 B 102K 50V
C36	4010000120	CERAMIC	DD104 SL 100D 50V
C37	4010000220	CERAMIC	DD104 SL 330J 50V

S.=Surface mount

[PLL UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
C38	4010000180	CERAMIC	DD104 SL 220J 50V
C39	4010000180	CERAMIC	DD104 SL 220J 50V
C40	4010000500	CERAMIC	DD104 B 102K 50V
C41	4010000120	CERAMIC	DD104 SL 100D 50V
C42	4010000500	CERAMIC	DD104 B 102K 50V
C43	4310000360	MYLAR	50 F2D 103J
C44	4310000340	MYLAR	50 F2D 682J
C45	4510004450	ELECTROLYTIC	50 MV R47 NPDW
C46	4510001150	ELECTROLYTIC	50 MS7 R47 µF
C47	4510001970	ELECTROLYTIC	50 MS7 0R1 µF
C48	4510003940	ELECTROLYTIC	25 MV 4R7 HW
C49	4510003930	ELECTROLYTIC	16 MV 470 HW
C50	4010000500	CERAMIC	DD104 B 102K 50V
C51	4010000500	CERAMIC	DD104 B 102K 50V
C52	4510005080	ELECTROLYTIC	16 MV 220 HW
C53	4510003910	ELECTROLYTIC	16 MV 47 HW
C54	4510003910	ELECTROLYTIC	16 MV 47 HW
C55	4510003930	ELECTROLYTIC	16 MV 470 HW
C56	4310000480	MYLAR	50 F2D 104J
C57	4510001970	ELECTROLYTIC	50 MS7 0R1 µF
C58	4010000260	CERAMIC	DD104 SL 470J 50V
C59	4010000260	CERAMIC	DD104 SL 470J 50V
C60	4010000260	CERAMIC	DD104 SL 470J 50V
C61	4510001970	ELECTROLYTIC	50 MS7 0R1 µF
C62	4510001100	ELECTROLYTIC	16 MS7 10 µF
C63	4010000460	CERAMIC	DD104 B 471K 50V
C64	4010000500	CERAMIC	DD104 B 102K 50V
C67	4010000500	CERAMIC	DD104 B 102K 50V
C68	4510004160	ELECTROLYTIC	10 MV 220 HW
C69	4010000260	CERAMIC	DD104 SL 470J 50V
C70	4010000500	CERAMIC	DD104 B 102K 50V
C71	4010000500	CERAMIC	DD104 B 102K 50V
C72	4010000500	CERAMIC	DD104 B 102K 50V
C73	4010000500	CERAMIC	DD104 B 102K 50V
C74	4010000500	CERAMIC	DD104 B 102K 50V
C75	4010000500	CERAMIC	DD104 B 102K 50V
C76	4040000260	BARRIER	UZE 08X 104M
C77	4310000330	MYLAR	50 F2D 102J
C78	4310000570	MYLAR	50 F2D 222J
C79	4010000340	CERAMIC	DD105 SL 121J 50V
C80	4510004450	ELECTROLYTIC	50 MV R47 NPDW
C84	4510003890	ELECTROLYTIC	16 MV 10 HW
J1	6510003430	CONNECTOR	B07B-EH-S
J2	6510004600	CONNECTOR	WH10D-1
J3	6510003390	CONNECTOR	B03B-EH-S
J4	6450000140	CONNECTOR	HSJ0807-01-010 [EXP SP]
J5	6510003430	CONNECTOR	B07B-EH-S
J6	6510003470	CONNECTOR	B11B-EH-S
J7	6510003450	CONNECTOR	B09B-EH-S
J9	6510003080	CONNECTOR	RT01T-1.0B
J10	6510003080	CONNECTOR	RT01T-1.0B
W1	8900003450	CABLE	OPC-362
W4	6910001030	JUMPER	IPS-1041-4
W5	6910001020	JUMPER	IPS-1041-2
W6	6910001020	JUMPER	IPS-1041-2
W7	6910001020	JUMPER	IPS-1041-2
W9	6910001020	JUMPER	IPS-1041-2
W10	6910001020	JUMPER	IPS-1041-2
W13	6910001020	JUMPER	IPS-1041-2
W16	6910001020	JUMPER	IPS-1041-2
W17	6910001020	JUMPER	IPS-1041-2
W18	6910001020	JUMPER	IPS-1041-2
W19	6910001030	JUMPER	IPS-1041-4
W21	6910001030	JUMPER	IPS-1041-4
W22	6910001030	JUMPER	IPS-1041-4
W23	6910001030	JUMPER	IPS-1041-4
W24	6910001020	JUMPER	IPS-1041-2
W25	6910001020	JUMPER	IPS-1041-2
W26	6910001020	JUMPER	IPS-1041-2
W27	6910001020	JUMPER	IPS-1041-2
W28	6910001020	JUMPER	IPS-1041-2

[PLL UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
W29	6910001030	JUMPER	IPS-1041-4
W30	6910001030	JUMPER	IPS-1041-4
W32	6910001020	JUMPER	IPS-1041-2
W33	6910001020	JUMPER	IPS-1041-2
W34	6910001020	JUMPER	IPS-1041-2
W35	6910001030	JUMPER	IPS-1041-4
W36	6910001030	JUMPER	IPS-1041-4
W37	6910001030	JUMPER	IPS-1041-4
W38	6910001030	JUMPER	IPS-1041-4
W39	6910001020	JUMPER	IPS-1041-2
W40	6910001030	JUMPER	IPS-1041-4
W41	6910001020	JUMPER	IPS-1041-2
W42	6910001030	JUMPER	IPS-1041-4
W43	6910001020	JUMPER	IPS-1041-2
W44	6910001030	JUMPER	IPS-1041-4
W45	6910001030	JUMPER	IPS-1041-4
W46	6910001030	JUMPER	IPS-1041-4
W47	6910001030	JUMPER	IPS-1041-4
W48	6910001030	JUMPER	IPS-1041-4
W49	6910001030	JUMPER	IPS-1041-4
W50	6910001030	JUMPER	IPS-1041-4
W51	6910001030	JUMPER	IPS-1041-4
W52	6910001030	JUMPER	IPS-1041-4
W53	6910001020	JUMPER	IPS-1041-2
W54	6910001020	JUMPER	IPS-1041-2
W55	6910001020	JUMPER	IPS-1041-2
W56	6910001030	JUMPER	IPS-1041-4
W58	6910001030	JUMPER	IPS-1041-4
W59	6910001020	JUMPER	IPS-1041-2
W60	7120000010	JUMPER	JPW 02A
W61	7120000010	JUMPER	JPW 02A
W62	8900003540	CABLE	OPC-363
W63	6910001030	JUMPER	IPS-1041-4
W64	6910001030	JUMPER	IPS-1041-4
W65	6910001030	JUMPER	IPS-1041-4
W66	7120000010	JUMPER	JPW 02A
W67	7120000010	JUMPER	JPW 02A
W68	6910001020	JUMPER	IPS-1041-2
W69	6910001020	JUMPER	IPS-1041-2
W70	6910001030	JUMPER	IPS-1041-4
W73	6910001030	JUMPER	IPS-1041-4
W74	6910001020	JUMPER	IPS-1041-2
W75	6910001020	JUMPER	IPS-1041-2
W76	6910001020	JUMPER	IPS-1041-2
W77	6910001030	JUMPER	IPS-1041-4
W78	7120000010	JUMPER	JPW 02A
W79	6910001030	JUMPER	IPS-1041-4
W80	7120000010	JUMPER	JPW 02A
W81	6910001030	JUMPER	IPS-1041-4
W83	6910001030	JUMPER	IPS-1041-4
W84	7120000010	JUMPER	JPW 02A
W85	6910001020	JUMPER	IPS-1041-2
EP1	0910035373	PCB	B 3496C (PLL)

S.=Surface mount

[MAIN UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1110000630	IC	MC3357 P
IC2	1150000460	IC	SC1038
IC3	1110000070	IC	µPC358C
IC4	1110002900	IC	µPC358HA (MS)
Q1	1580000240	FET	3SK122 M
Q2	1530002210	TRANSISTOR	2SC3776-D
Q3	1560000110	FET	2SK241-GR
Q4	1530002210	TRANSISTOR	2SC3776-D
Q5	1530000640	TRANSISTOR	2SC2407 (A)
Q6	1520000290	TRANSISTOR	2SB1015-Y
Q7	1530000100	TRANSISTOR	2SC2458-Y
Q8	1520000070	TRANSISTOR	2SB561C
Q9	1530000960	TRANSISTOR	2SC3399
Q10	1530002210	TRANSISTOR	2SC3776-D
Q11	1530000960	TRANSISTOR	2SC3399
Q12	1560000280	FET	2SK184-GR
Q13	1590000550	FET	2SJ107-BL
D1	1710000160	DIODE	1SS133
D2	1730000120	ZENER	RD6.2E B2
D3	1710000160	DIODE	1SS133
D4	1710000040	DIODE	1S953
D5	1710000040	DIODE	1S953
D6	1710000580	DIODE	1SS265
D7	1710000580	DIODE	1SS265
D8	1710000040	DIODE	1S953
D9	1730000390	ZENER	RD4.7E B3
D10	1710000160	DIODE	1SS133
D11	1790000250	DIODE	1SS97
D12	1710000290	DIODE	MI308
D13	1710000290	DIODE	MI308
D14	1790000700	DIODE	DSA3A1
D16	1710000050	DIODE	1SS53
D17	1720000040	VARICAP	1SV153
D18	1720000040	VARICAP	1SV153
D19	1720000040	VARICAP	1SV153
D20	1720000040	VARICAP	1SV153
D21	1710000160	DIODE	1SS133
X1	6050002000	XTAL	CR-70
X2	6070000010	DISCRIMINATOR	CDB455C7A
FI1	2010001050	FILTER	21M15B3 (FL-141)
FI2	2020000120	CERAMIC	CFW455E
L1	6150003820	COIL	LS-440
L3	6150003820	COIL	LS-440
L4	6150003820	COIL	LS-440
L5	6150003820	COIL	LS-440
L6	6150002950	COIL	LS-304
L7	6150002730	COIL	LS-298
L8	6150002720	COIL	LS-297
L9	6110001560	COIL	LA-236
L10	6110001560	COIL	LA-236
L11	6170000180	COIL	LW-19
L12	6110001610	COIL	LA-244
L13	6110001580	COIL	LA-238
L14	6110001130	COIL	LA-149
L15	6110001600	COIL	LA-243
L16	6110001670	COIL	LA-253
L18	6140001840	COIL	LR-220
R1	7010003220	RESISTOR	ELR20J 33 Ω
R2	7010003950	RESISTOR	R20J 10 Ω
R3	7010004370	RESISTOR	R20J 22 kΩ
R4	7010003340	RESISTOR	ELR20J 330 Ω
R5	7010003340	RESISTOR	ELR20J 330 Ω
R6	7010001030	RESISTOR	R25XJ 100 Ω

[MAIN UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
R7	7010003440	RESISTOR	ELR20J 2.2 kΩ
R8	7010001120	RESISTOR	R25XJ 560 Ω
R10	7010004070	RESISTOR	R20J 100 Ω
R11	7010004320	RESISTOR	R20J 10 kΩ
R12	7010004070	RESISTOR	R20J 100 Ω
R13	7010003420	RESISTOR	ELR20J 1.5 kΩ
R14	7010001360	RESISTOR	R25XJ 47 kΩ
R15	7010004210	RESISTOR	R20J 1.5 kΩ
R16	7010003420	RESISTOR	ELR20J 1.5 kΩ
R17	7010003620	RESISTOR	ELR20J 47 kΩ
R18	7010004320	RESISTOR	R20J 10 kΩ
R19	7010004250	RESISTOR	R20J 3.3 kΩ
R22	7010003440	RESISTOR	ELR20J 2.2 kΩ
R23	7010004280	RESISTOR	R20J 5.6 kΩ
R24	7010003720	RESISTOR	ELR20J 330 kΩ
R25	7010004190	RESISTOR	R20J 1 kΩ
R26	7010003440	RESISTOR	ELR20J 2.2 kΩ
R27	7010003580	RESISTOR	ELR20J 22 kΩ
R28	7010004190	RESISTOR	R20J 1 kΩ
R29	7010004230	RESISTOR	R20J 2.2 kΩ
R30	7010003480	RESISTOR	ELR20J 4.7 kΩ
R31	7010004320	RESISTOR	R20J 10 kΩ
R32	7010004070	RESISTOR	R20J 100 Ω
R33	7010003320	RESISTOR	ELR20J 220 Ω
R34	7010004190	RESISTOR	R20J 1 kΩ
R35	7010004070	RESISTOR	R20J 100 Ω
R36	7010004190	RESISTOR	R20J 1 kΩ
R37	7010003160	RESISTOR	ELR20J 10 Ω
R38	7010000910	RESISTOR	R25XJ 10 Ω
R39	7010004720	RESISTOR	R50XJ 100 Ω
R40	7010004120	RESISTOR	R20J 270 Ω
R41	7010004260	RESISTOR	R20J 3.9 kΩ
R42	7010001160	RESISTOR	R25XJ 1.2 kΩ
R43	7010004330	RESISTOR	R20J 12 kΩ
R44	7010003490	RESISTOR	ELR20J 5.6 kΩ
R45	7010003620	RESISTOR	ELR20J 47 kΩ
R46	7010003530	RESISTOR	ELR20J 10 kΩ
R47	7010004450	RESISTOR	R20J 100 kΩ
R48	7010004320	RESISTOR	R20J 10 kΩ
R49	7310000760	TRIMMER	RH0651CJ4J01A (223)
R50	7010004320	RESISTOR	R20J 10 kΩ
R51	7310000710	TRIMMER	RH0651C13J1YA (102)
R52	7010004180	RESISTOR	R20J 820 Ω
R53	7010004320	RESISTOR	R20J 10 kΩ
R54	7010003340	RESISTOR	ELR20J 330 Ω
R55	7010003340	RESISTOR	ELR20J 330 Ω
R56	7010003990	RESISTOR	R20J 22 Ω
R57	7010004190	RESISTOR	R20J 1 kΩ
R58	7010004040	RESISTOR	R20J 56 Ω
R59	7010003250	RESISTOR	ELR20J 56 Ω
R60	7010001280	RESISTOR	R25XJ 10 kΩ
R61	7010004300	RESISTOR	R20J 6.8 kΩ
R62	7010001070	RESISTOR	R25XJ 220 Ω
R63	7520000070	POSISTOR	PTH9M04BF222TS-2F333
R64	7010003220	RESISTOR	ELR20J 33 Ω
R65	7010003480	RESISTOR	ELR20J 4.7 kΩ
R66	7010000790	RESISTOR	R25XJ 1 Ω
R67	7010000790	RESISTOR	R25XJ 1 Ω
R68	7010000790	RESISTOR	R25XJ 1 Ω
R69	7010003390	RESISTOR	ELR20J 820 Ω
R70	7010003480	RESISTOR	ELR20J 4.7 kΩ
R71	7010003280	RESISTOR	ELR20J 100 Ω
R72	7010004320	RESISTOR	R20J 10 kΩ
R73	7010004450	RESISTOR	R20J 100 kΩ
R74	7010003660	RESISTOR	ELR20J 100 kΩ
R75	7010003480	RESISTOR	ELR20J 4.7 kΩ
R76	7010003440	RESISTOR	ELR20J 2.2 kΩ
R77	7010003620	RESISTOR	ELR20J 47 kΩ
R78	7010003740	RESISTOR	ELR20J 470 kΩ
R79	7010004250	RESISTOR	R20J 3.3 kΩ
R80	7010003530	RESISTOR	ELR20J 10 kΩ
R81	7010003530	RESISTOR	ELR20J 10 kΩ
R82	7010003660	RESISTOR	ELR20J 100 kΩ
R83	7010003640	RESISTOR	ELR20J 68 kΩ
R84	7010004320	RESISTOR	R20J 10 kΩ

S.=Surface mount

[MAIN UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
R85	7010001360	RESISTOR	R25XJ 47 kΩ
R86	7010003520	RESISTOR	ELR20J 8.2 kΩ
R87	7010003710	RESISTOR	ELR20J 270 kΩ
R88	7010003400	RESISTOR	ELR20J 1 kΩ
R89	7010003660	RESISTOR	ELR20J 100 kΩ
R90	7010004450	RESISTOR	R20J 100 kΩ
R91	7010003660	RESISTOR	ELR20J 100 kΩ
R92	7010003660	RESISTOR	ELR20J 100 kΩ
R93	7010003660	RESISTOR	ELR20J 100 kΩ
R94	7010003660	RESISTOR	ELR20J 100 kΩ
R95	7010003660	RESISTOR	ELR20J 100 kΩ
R96	7010004450	RESISTOR	R20J 100 kΩ
R97	7010004230	RESISTOR	R20J 2.2 kΩ
R98	7010004500	RESISTOR	R20J 270 kΩ
R99	7010003660	RESISTOR	ELR20J 100 kΩ
R100	7010003610	RESISTOR	ELR20J 39 kΩ
R101	7010003620	RESISTOR	ELR20J 47 kΩ
C1	4010000100	CERAMIC	DD104 SL 080D 50V
C2	4010000120	CERAMIC	DD104 SL 100D 50V
C3	4010000120	CERAMIC	DD104 SL 100D 50V
C5	4040000260	BARRIER	UZE 08X 104M
C6	4010000500	CERAMIC	DD104 B 102K 50V
C7	4010000040	CERAMIC	DD104 SL 020C 50V
C8	4010000040	CERAMIC	DD104 SL 020C 50V
C9	4010000040	CERAMIC	DD104 SL 020C 50V
C10	4010000050	CERAMIC	DD104 SL 030C 50V
C11	4010003770	CERAMIC	DD06 SL 0R5C 500V
C12	4020000060	CYLINDER	UP125 SL 5R6K
C13	4010000500	CERAMIC	DD104 B 102K 50V
C14	4010000520	CERAMIC	DD108 B 472K 50V
C15	4010000500	CERAMIC	DD104 B 102K 50V
C16	4010000260	CERAMIC	DD104 SL 470J 50V
C17	4040000190	BARRIER	UAT 05X 103K
C18	4010000090	CERAMIC	DD104 SL 070D 50V
C19	4010000260	CERAMIC	DD104 SL 470J 50V
C20	4040000190	BARRIER	UAT 05X 103K
C21	4040000250	BARRIER	UAT 08X 473M
C22	4010000500	CERAMIC	DD104 B 102K 50V
C23	4020000210	CYLINDER	UP125 B 102K
C24	4010000500	CERAMIC	DD104 B 102K 50V
C25	4510003970	ELECTROLYTIC	50 MV 2R2 HW
C26	4510003890	ELECTROLYTIC	16 MV 10 HW
C27	4010000520	CERAMIC	DD108 B 472K 50V
C28	4010000320	CERAMIC	DD104 SL 820J 50V
C29	4040000260	BARRIER	UZE 08X 104M
C30	4550000320	TANTALUM	DN 1V 0R1M
C31	4010000300	CERAMIC	DD104 SL 680J 50V
C32	4010000340	CERAMIC	DD105 SL 121J 50V
C33	4510003950	ELECTROLYTIC	50 MV R47 HW
C35	4310000330	MYLAR	50 F2D 102J
C36	4310000330	MYLAR	50 F2D 102J
C37	4310000330	MYLAR	50 F2D 102J
C38	4010000220	CERAMIC	DD104 SL 330J 50V
C39	4310000360	MYLAR	50 F2D 103J
C40	4510003950	ELECTROLYTIC	50 MV R47 HW
C41	4010000500	CERAMIC	DD104 B 102K 50V
C42	4010000520	CERAMIC	DD108 B 472K 50V
C43	4010000260	CERAMIC	DD104 SL 470J 50V
C44	4010000500	CERAMIC	DD104 B 102K 50V
C46	4010000500	CERAMIC	DD104 B 102K 50V
C47	4010000520	CERAMIC	DD108 B 472K 50V
C48	4010000500	CERAMIC	DD104 B 102K 50V
C49	4010000500	CERAMIC	DD104 B 102K 50V
C50	4010000460	CERAMIC	DD104 B 471K 50V
C51	4010000500	CERAMIC	DD104 B 102K 50V
C52	4020000100	CYLINDER	UP125 SL 220J
C53	4010000160	CERAMIC	DD104 SL 180J 50V
C54	4010000500	CERAMIC	DD104 B 102K 50V
C55	4040000260	BARRIER	UZE 08X 104M
C56	4550002120	TANTALUM	DN 1C 220M
C57	4510003930	ELECTROLYTIC	16 MV 470 HW
C58	4010000500	CERAMIC	DD104 B 102K 50V
C59	4010003770	CERAMIC	DD06 SL 0R5C 500V

[MAIN UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
C60	4010000500	CERAMIC	DD104 B 102K 50V
C61	4010003910	CERAMIC	DD06 SL 220K 500V
C62	4010000460	CERAMIC	DD104 B 471K 50V
C63	4010000500	CERAMIC	DD104 B 102K 50V
C64	4010003900	CERAMIC	DD06 SL 200K 500V
C65	4010004010	CERAMIC	DD09 SL 101K 500V
C66	4020000210	CYLINDER	UP125 B 102K
C67	4010004120	CERAMIC	DD07 B 102K 500V
C68	4010003820	CERAMIC	DD06 SL 050C 500V
C69	4010003860	CERAMIC	DD06 SL 100D 500V
C70	4010003900	CERAMIC	DD06 SL 200K 500V
C71	4010003840	CERAMIC	DD06 SL 070D 500V
C72	4010003920	CERAMIC	DD06 SL 240K 500V
C73	4010003770	CERAMIC	DD06 SL 0R5C 500V
C74	4010003820	CERAMIC	DD06 SL 050C 500V
C75	4010000500	CERAMIC	DD104 B 102K 50V
C76	4010000500	CERAMIC	DD104 B 102K 50V
C77	4560000020	CERAMIC	D33Y5V 1E 104Z21
C78	4010000520	CERAMIC	DD108 B 472K 50V
C79	4010000500	CERAMIC	DD104 B 102K 50V
C80	4510003930	ELECTROLYTIC	16 MV 470 HW
C81	4010000460	CERAMIC	DD104 B 471K 50V
C82	4040000260	BARRIER	UZE 08X 104M
C83	4010000500	CERAMIC	DD104 B 102K 50V
C84	4510003930	ELECTROLYTIC	16 MV 470 HW
C85	4020000090	CYLINDER	UP125 SL 150J
C87	4010003830	CERAMIC	DD06 SL 060D 500V
C88	4010000500	CERAMIC	DD104 B 102K 50V
C89	4510004840	ELECTROLYTIC	50 MV 2R2 NPDW
C90	4310000330	MYLAR	50 F2D 102J
C91	4010000460	CERAMIC	DD104 B 471K 50V
C95	4010000500	CERAMIC	DD104 B 102K 50V
C96	4010000500	CERAMIC	DD104 B 102K 50V
C97	4010000500	CERAMIC	DD104 B 102K 50V
C98	4010000500	CERAMIC	DD104 B 102K 50V
C99	4010000460	CERAMIC	DD104 B 471K 50V
C100	4010000500	CERAMIC	DD104 B 102K 50V
C102	4560000020	CERAMIC	D33Y5V 1E 104Z21
C103	4010000120	CERAMIC	DD104 SL 100D 50V
C104	4010000120	CERAMIC	DD104 SL 100D 50V
C105	4010000040	CERAMIC	DD104 SL 020C 50V
C106	4010000120	CERAMIC	DD104 SL 100D 50V
C107	4010000500	CERAMIC	DD104 B 102K 50V
C108	4010000500	CERAMIC	DD104 B 102K 50V
C109	4010000500	CERAMIC	DD104 B 102K 50V
C110	4010000500	CERAMIC	DD104 B 102K 50V
C111	4040000190	BARRIER	UAT 05X 103K
C112	4010000070	CERAMIC	DD104 SL 050C 50V
J1	6510006120	CONNECTOR	HBRB10S-1J
J3	6510003250	CONNECTOR	TMP-J01X-A2
J4	6510003100	CONNECTOR	RT01T-1.3B
J5	6510003100	CONNECTOR	RT01T-1.3B
J6	6510003100	CONNECTOR	RT01T-1.3B
J7	6510003100	CONNECTOR	RT01T-1.3B
J8	6510003100	CONNECTOR	RT01T-1.3B
J9	6510003100	CONNECTOR	RT01T-1.3B
J10	6510003100	CONNECTOR	RT01T-1.3B
J11	6510003100	CONNECTOR	RT01T-1.3B
J12	6510003100	CONNECTOR	RT01T-1.3B
J13	6510003100	CONNECTOR	RT01T-1.3B
J14	6510003100	CONNECTOR	RT01T-1.3B
J15	6510003100	CONNECTOR	RT01T-1.3B
J16	6510003100	CONNECTOR	RT01T-1.3B
J17	6510003100	CONNECTOR	RT01T-1.3B
J18	6510003390	CONNECTOR	B03B-EH-S
W1	6910001030	JUMPER	IPS-1041-4
W2	6910001030	JUMPER	IPS-1041-4
W3	6910001030	JUMPER	IPS-1041-4
W5	6910001030	JUMPER	IPS-1041-4
W7	6910001020	JUMPER	IPS-1041-2
W8	6910001020	JUMPER	IPS-1041-2

S.=Surface mount

[MAIN UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
W9	6910001020	JUMPER	IPS-1041-2
W10	6910001030	JUMPER	IPS-1041-4
W11	6910001030	JUMPER	IPS-1041-4
W12	6910001030	JUMPER	IPS-1041-4
W13	6910001030	JUMPER	IPS-1041-4
W14	6910001030	JUMPER	IPS-1041-4
W15	6910001030	JUMPER	IPS-1041-4
W16	6910001030	JUMPER	IPS-1041-4
W17	6910001030	JUMPER	IPS-1041-4
W18	6910001030	JUMPER	IPS-1041-4
W19	6910001030	JUMPER	IPS-1041-4
W20	6910001030	JUMPER	IPS-1041-4
W21	6910001030	JUMPER	IPS-1041-4
W22	6910001030	JUMPER	IPS-1041-4
W23	6910001020	JUMPER	IPS-1041-2
W24	6910001030	JUMPER	IPS-1041-4
W25	6910001030	JUMPER	IPS-1041-4
W26	6910001020	JUMPER	IPS-1041-2
W28	6910001030	JUMPER	IPS-1041-4
W29	6910001030	JUMPER	IPS-1041-4
W30	6910001020	JUMPER	IPS-1041-2
W31	6910001020	JUMPER	IPS-1041-2
W32	6910001020	JUMPER	IPS-1041-2
W33	6910001030	JUMPER	IPS-1041-4
W34	6910001030	JUMPER	IPS-1041-4
W35	6910001020	JUMPER	IPS-1041-2
W36	6910001030	JUMPER	IPS-1041-4
W38	6910001020	JUMPER	IPS-1041-2
W39	6910001030	JUMPER	IPS-1041-4
W40	6910001020	JUMPER	IPS-1041-2
W41	6910001030	JUMPER	IPS-1041-4
W42	6910001030	JUMPER	IPS-1041-4
W43	6910001030	JUMPER	IPS-1041-4
W44	6910001020	JUMPER	IPS-1041-2
W45	6910001030	JUMPER	IPS-1041-4
W46	7120000380	JUMPER	JPW 01 R-01
EP1	0910035252	PCB	B 3495B (MAIN)
EP3	6910000970	BEAD	DL 2OP 2.6-3-1.2H
EP4	6910000970	BEAD	DL 2OP 2.6-3-1.2H

[LOGIC UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1140002650	S. IC	μPD75308GF-C73-3B9
IC2	1110001550	S. IC	S-8054ALB-LM-T1
Q1	1530002980	S. TRANSISTOR	2SC3650-TD
Q2	1590000420	S. TRANSISTOR	RN1404 (TE85R)
Q3	1510000580	S. TRANSISTOR	2SA1362-GR (TE85R)
Q4	1590000420	S. TRANSISTOR	RN1404 (TE85R)
Q5	1530000160	S. TRANSISTOR	2SC2712-Y (TE85RTEM)
Q6	1590000420	S. TRANSISTOR	RN1404 (TE85R)
Q7	1590000410	S. TRANSISTOR	RN2404 (TE85R)
D1	1750000040	S. DIODE	1SS190 (TE85R)

[LOGIC UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
D2	1750000040	S. DIODE	1SS190 (TE85R)
D3	1730000730	S. ZENER	RD6.2M-T2B2
D4	1730000730	S. ZENER	RD6.2M-T2B2
D5	1750000040	S. DIODE	1SS190 (TE85R)
D12	1730000870	S. ZENER	RD11M-T2B1
X1	6050004950	XTAL	CR-227
R1	7030000500	S. RESISTOR	MCR10EZHJ 10 kΩ (103)
R2	7030000740	S. RESISTOR	MCR10EZHJ 1 MΩ (105)
R3	7030000580	S. RESISTOR	MCR10EZHJ 47 kΩ (473)
R4	7030000380	S. RESISTOR	MCR10EZHJ 1 kΩ (102)
R5	7030000620	S. RESISTOR	MCR10EZHJ 100 kΩ (104)
R6	7030000580	S. RESISTOR	MCR10EZHJ 47 kΩ (473)
R7	7030000580	S. RESISTOR	MCR10EZHJ 47 kΩ (473)
R8	7030000580	S. RESISTOR	MCR10EZHJ 47 kΩ (473)
R9	7030000580	S. RESISTOR	MCR10EZHJ 47 kΩ (473)
R10	7030000580	S. RESISTOR	MCR10EZHJ 47 kΩ (473)
R11	7030000580	S. RESISTOR	MCR10EZHJ 47 kΩ (473)
R12	7030000500	S. RESISTOR	MCR10EZHJ 10 kΩ (103)
R13	7030000580	S. RESISTOR	MCR10EZHJ 47 kΩ (473)
R14	7030000580	S. RESISTOR	MCR10EZHJ 47 kΩ (473)
R15	7030000740	S. RESISTOR	MCR10EZHJ 1 MΩ (105)
R16	7030000740	S. RESISTOR	MCR10EZHJ 1 MΩ (105)
R17	7030000580	S. RESISTOR	MCR10EZHJ 47 kΩ (473)
R18	7030000580	S. RESISTOR	MCR10EZHJ 47 kΩ (473)
R19	7030000580	S. RESISTOR	MCR10EZHJ 47 kΩ (473)
R20	7030000580	S. RESISTOR	MCR10EZHJ 47 kΩ (473)
R21	7030000620	S. RESISTOR	MCR10EZHJ 100 kΩ (104)
R22	7030000580	S. RESISTOR	MCR10EZHJ 47 kΩ (473)
R23	7010004650	RESISTOR	R50XJ 10 Ω
R24	7030000580	S. RESISTOR	MCR10EZHJ 47 kΩ (473)
R25	7030000500	S. RESISTOR	MCR10EZHJ 10 kΩ (103)
C1	4510004650	S. ELECTROL	ECEV1EA4R7R
C2	4030006450	S. CERAMIC	C2012 JF 1H 103Z-T-A
C3	4030004610	S. CERAMIC	C2012 SL 1H 101J-T-A
C4	4030001150	S. CERAMIC	GRM40 F 104Z 25PT
C5	4030004570	S. CERAMIC	C2012 SL 1H 470J-T-A
C6	4030004570	S. CERAMIC	C2012 SL 1H 470J-T-A
C7	4030001150	S. CERAMIC	GRM40 F 104Z 25PT
C8	4550000790	S. TANTALUM	TESVD 0J 476M-12L
C9	4030001150	S. CERAMIC	GRM40 F 104Z 25PT
C10	4030001150	S. CERAMIC	GRM40 F 104Z 25PT
DS1	5030000810	LCD	LD-BU5436JZ (E-5626) [FUNCTION DISPLAY]
DS2	5080000170	LAMP	HRS-7219A-Y2-30
DS3	5080000170	LAMP	HRS-7219A-Y2-30
S1	2260000580	SWITCH	SKHLAD035A [DIM]
S2	2260000580	SWITCH	SKHLAD035A [HI/LOW]
S3	2260000580	SWITCH	SKHLAD035A [DUAL]
S4	2260000580	SWITCH	SKHLAD035A [WX]
S5	2260000580	SWITCH	SKHLAD035A [CH16]
S6	2260000580	SWITCH	SKHLAD035A [D/MODE]
EP1	0910035232	PCB	B 3497B (LOGIC)

S.=Surface mount

[SENSOR UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
S1	2260000880	SWITCH	SRBM1L038A [CHANNEL SELECTOR]
J1	6510003390	CONNECTOR	B03B-EH-S
EP1	0910017691	PCB	B 1696A (SENSOR)

[REAR]

REF. NO.	ORDER NO.	DESCRIPTION	
J1	6510004880	CONNECTOR	MR-DS-E 01 [ANT]
W1	8900003500	CABLE	OPC-356 [DC 13.8V]
W2	7120000010	JUMPER	JPW 02A

S.=Surface mount

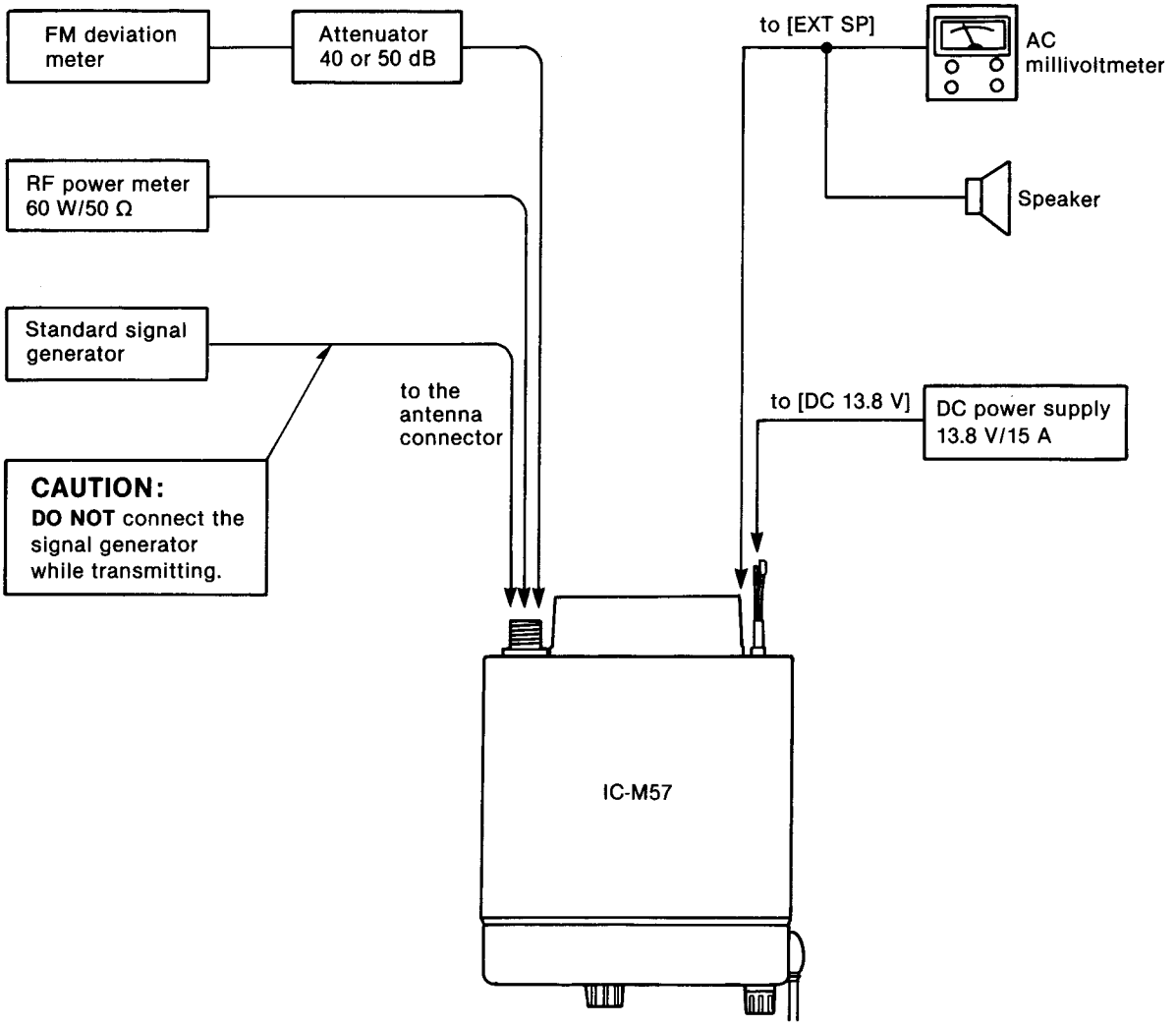
SECTION 6 ADJUSTMENT PROCEDURES

6-1 REQUIRED TEST EQUIPMENT

EQUIPMENT	GRADE AND RANGE	EQUIPMENT	GRADE AND RANGE
DC power supply	Output voltage : 13.8 V DC Current capacity : 10 A or more	Audio generator	Frequency range : 200~2000 Hz Output level : 1~200 mV
RF power meter (terminated type)	Measuring range : 10~50 W Frequency range : 120~180 MHz Impedance 50 Ω SWR : Less than 1.2 : 1	Attenuator	Power attenuation : 40 or 50 dB Capacity : 50 W or more
		AC millivoltmeter	Measuring range : 2~200 mV
		External speaker	Impedance : 4 Ω
Frequency counter	Frequency range : 0.1~180 MHz Frequency accuracy : ±1 ppm or better Sensitivity : 100 mV or better	FM deviation meter	Frequency minimum : 180 MHz Measuring range : 0~±5 kHz
Distortion meter	Frequency range : 1 kHz±10 Hz Measuring range : 1~100 %		
Standard signal generator (SSG)	Frequency range : 0.1~180 MHz Output level : −127~−17 dBm (0.1 μV~32 mV)		
Digital multimeter or oscilloscope	Input impedance : 1 MΩ/DC or better		

CCW: counterclockwise

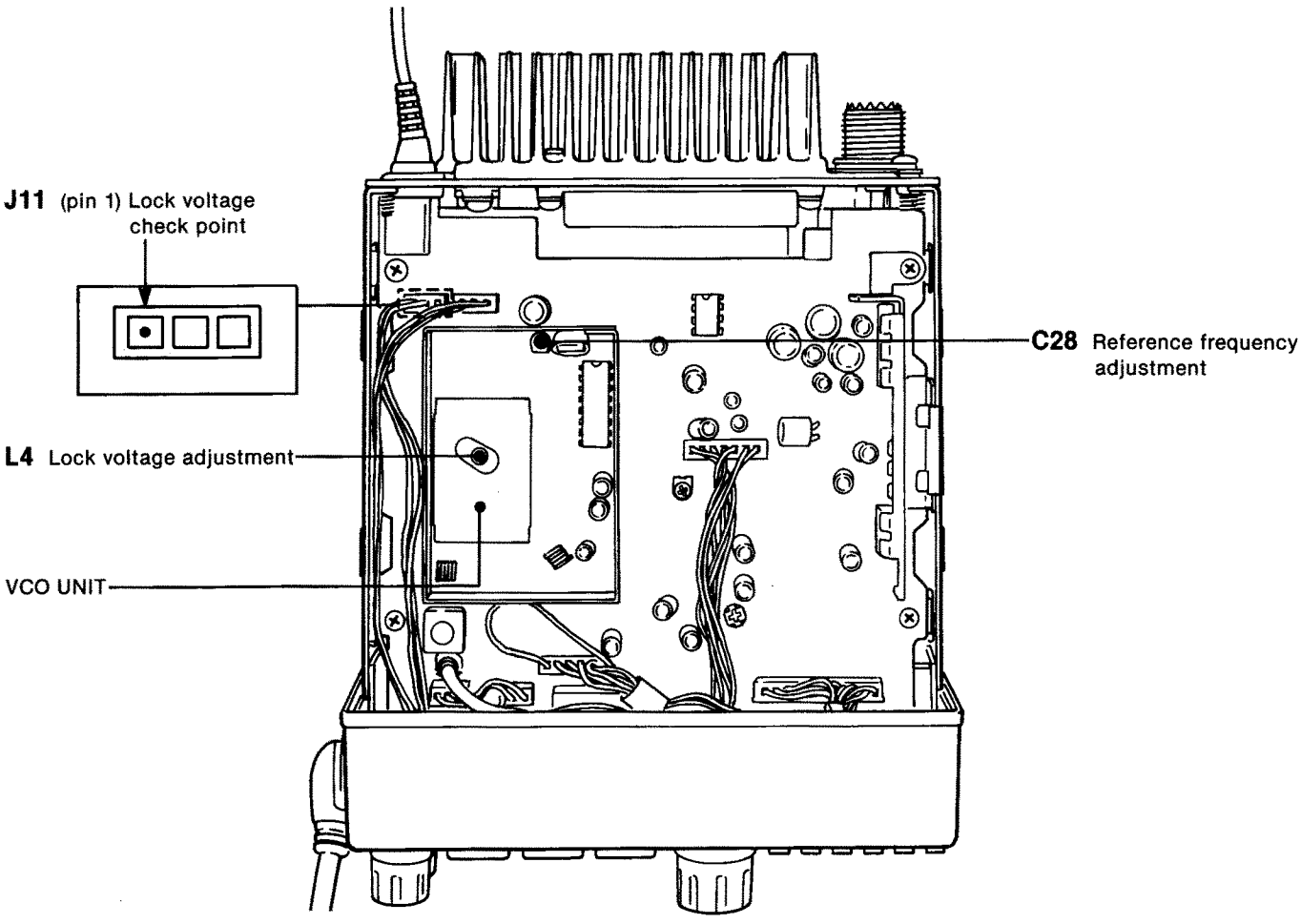
■ CONNECTION



6-2 PLL ADJUSTMENT

ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
			UNIT	LOCATION		UNIT	ADJUST
LOCK VOLTAGE	1	• Operating channel : 16 • Connect the RF power meter or a 50 Ω dummy load to the antenna connector. • Receiving	PLL	Connect the digital multimeter or oscilloscope between J11 (pin 1) and ground.	3.8 V	VCO	L4
	2	• Transmitting			3.0~5.0 V		Verify
REFERENCE FREQUENCY	1	• Operating channel : 16 • Connect the RF power meter or a 50 Ω dummy load to the antenna connector. • Transmitting	Rear panel	Loosely couple the frequency counter to the antenna connector.	156.800 MHz	PLL	C28

• PLL AND VCO UNITS

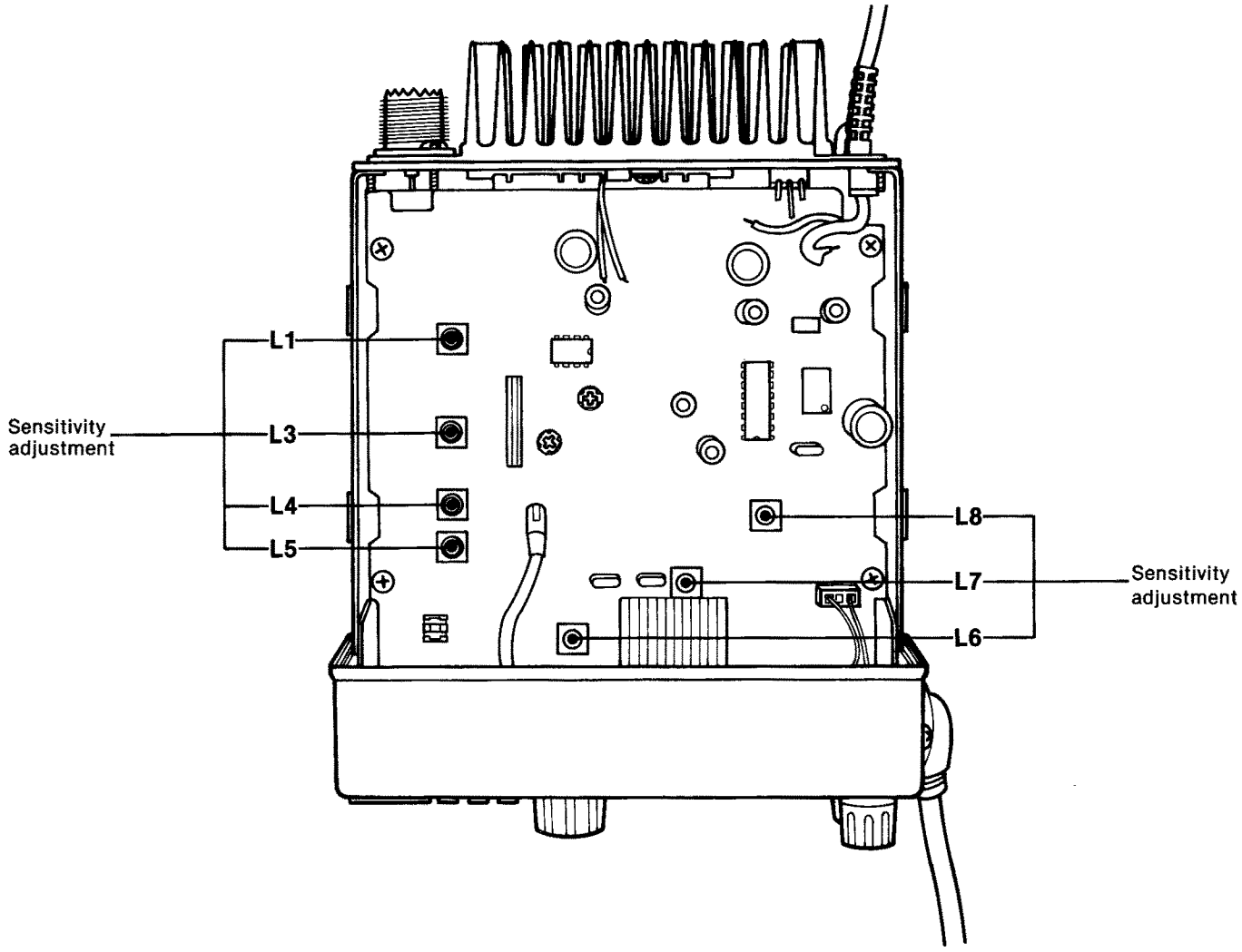


6-3 RECEIVER ADJUSTMENT

ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
			UNIT	LOCATION		UNIT	ADJUST
SENSITIVITY	1	• Operating Channel : 16 • [SQUELCH] control: Max. CCW • Connect the SSG to the antenna connector and set as: Frequency : 156.800 MHz Level : 32 μV* (−77 dBm) Modulation : 1 kHz Deviation : ±3.5 kHz • Receiving	Rear panel	Connect the distortion meter to the [EXT SP] jack with a 4 Ω load.	Minimum distortion level	MAIN	Adjust in sequence L1, L3, L4, L5, L6, L7, L8
	2	• Adjust SSG's output level so that SINAD level becomes 12 dB.			Less than 0.32 μV* (−177 dBm)		Verify

*This output level of the standard signal generator (SSG) is indicated as the SSG's open circuit.

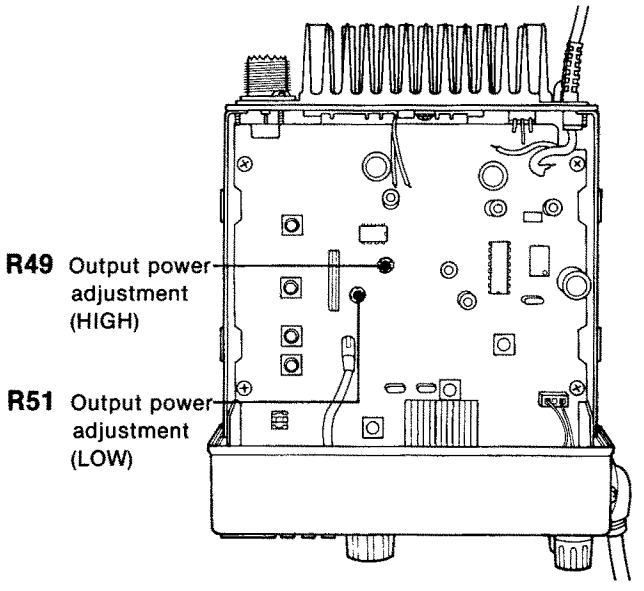
• MAIN UNIT



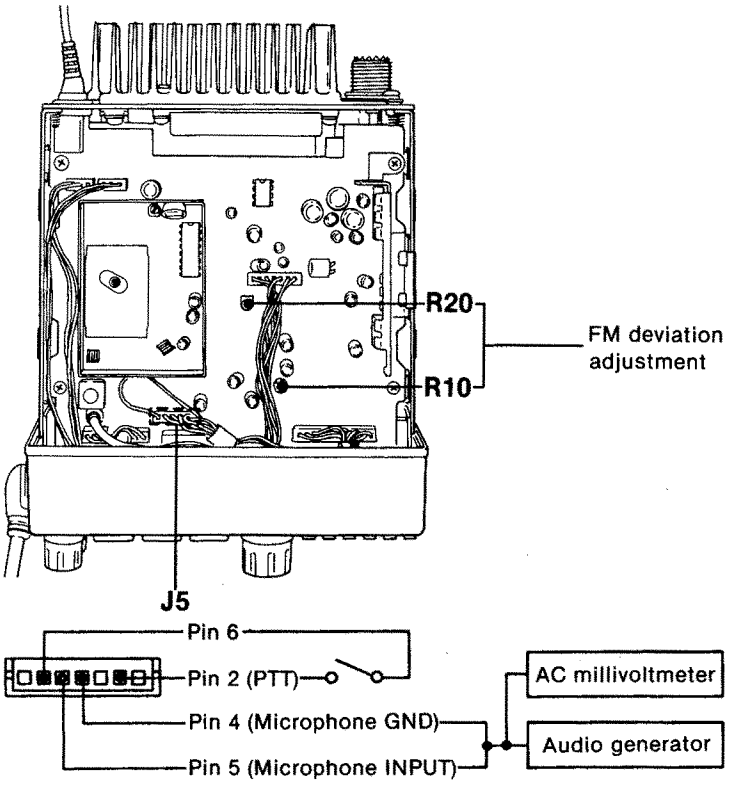
6-4 TRANSMITTER ADJUSTMENT

ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
			UNIT	LOCATION		UNIT	ADJUST
OUTPUT POWER	1	• Operating channel : 16 • Output power : HIGH • Transmitting	Rear panel	Connect the RF power meter to the antenna connector.	25 W	MAIN	R49
	2	• Output power : LOW			1.0 W		R51
FREQUENCY DEVIATION	1	• Operating channel : 16 • Unplug a connector from J5 on the PLL unit. • Output power : HIGH • Connect the audio generator to J5 (pin 5) on the PLL unit with an AC millivoltmeter and set as: 40 mV/1.0 kHz • Set the FM deviation meter as: HPF : OFF LPF : 20 kHz De-emphasis: OFF Detector : (P-P)/2 • Transmitting	Rear panel	Connect the FM deviation meter to the antenna connector via the attenuator.	±4.3 kHz	PLL	R20
	2	• Set the FM deviation meter as: Detector : P and −P			Symmetrical deviation level		R10
		NOTE: After above adjustment, plug the connector to J5.					

• MAIN UNIT



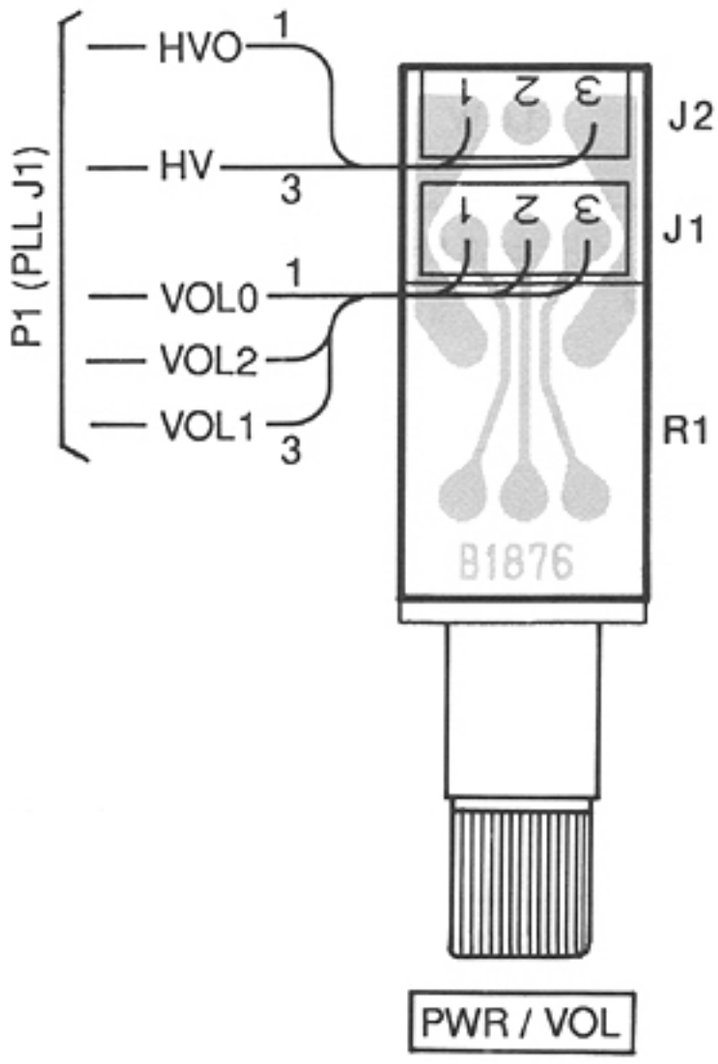
• PLL UNIT



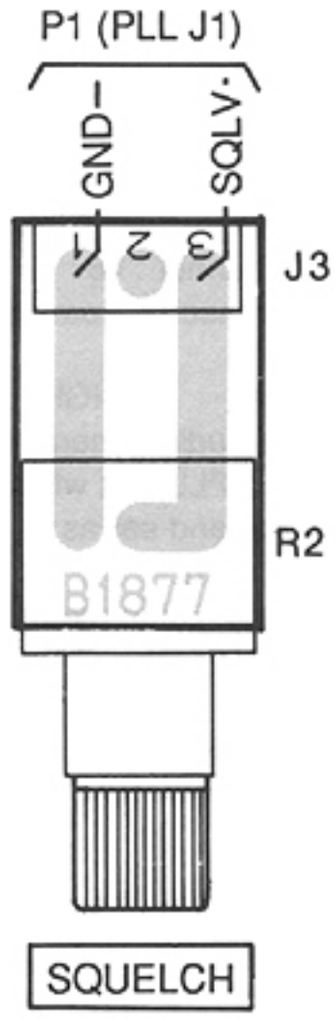
SECTION 7 BOARD LAYOUTS

7-1 VOL, SQL, VCO AND PLL UNITS

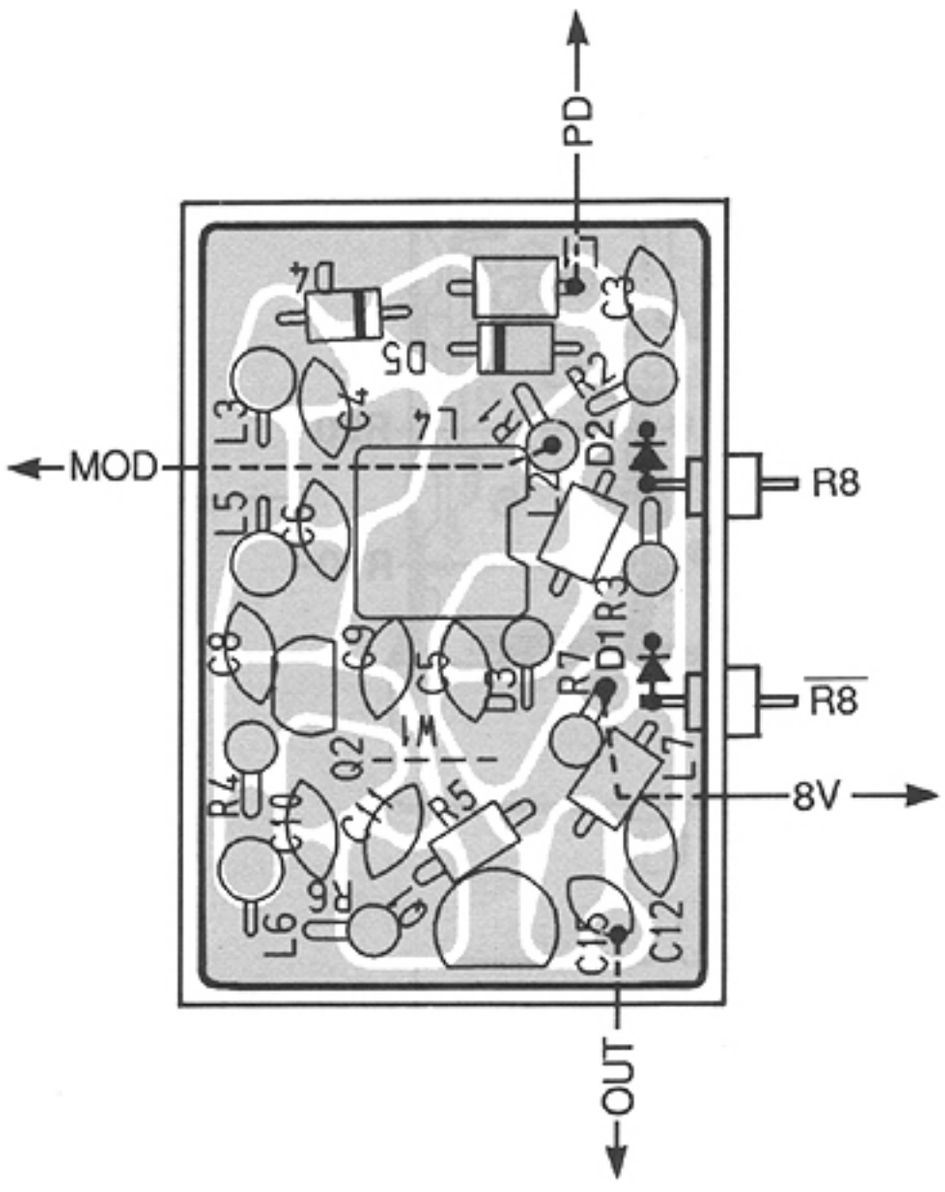
• **VOL UNIT**



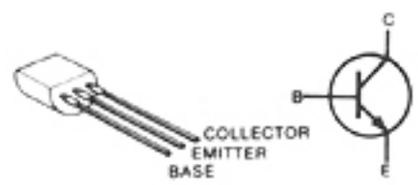
• **SQL UNIT**



• **VCO UNIT**

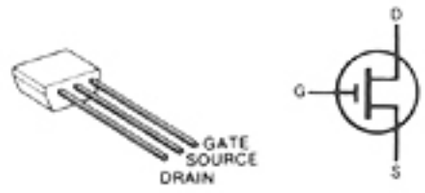


2SC3776 D



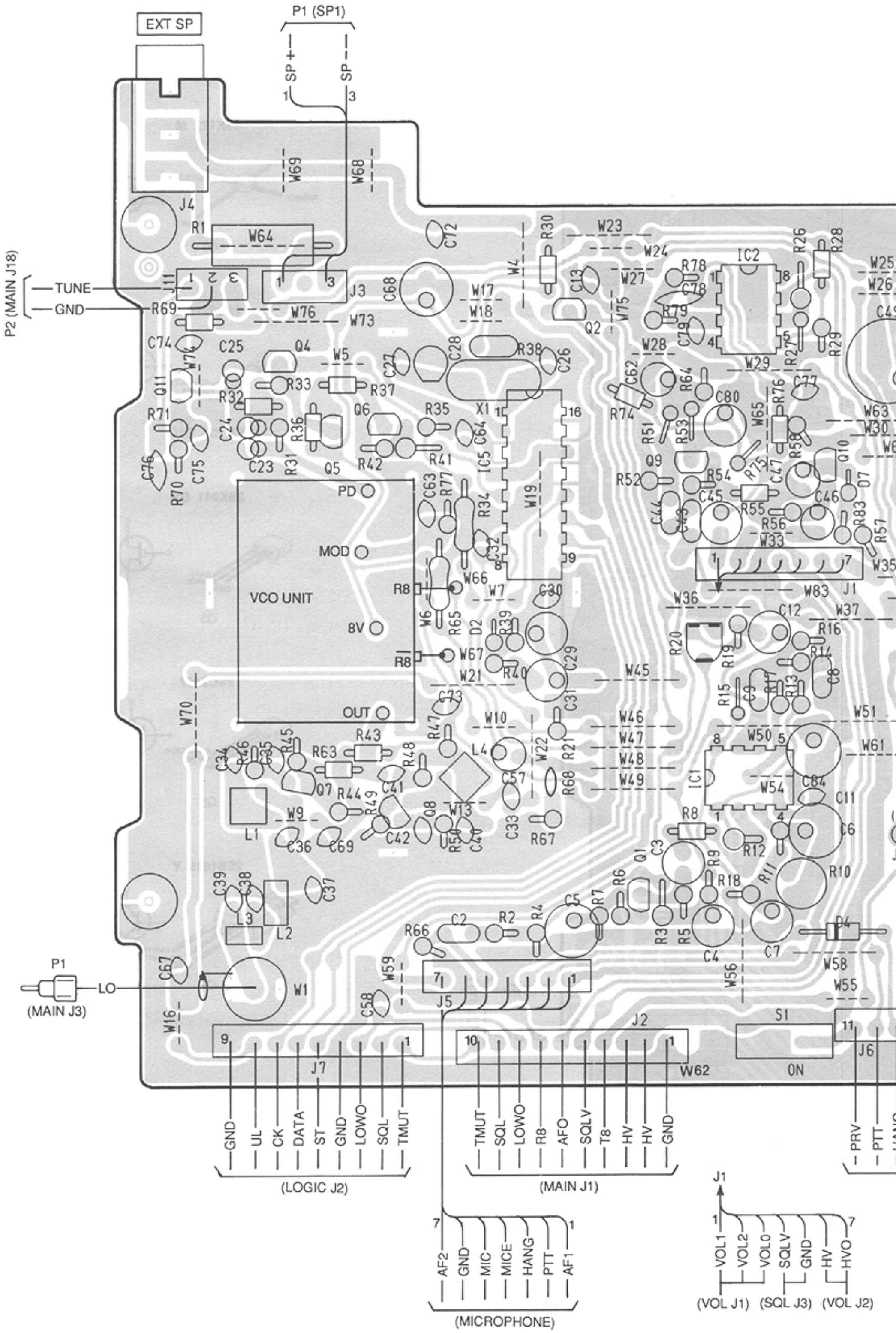
Q1

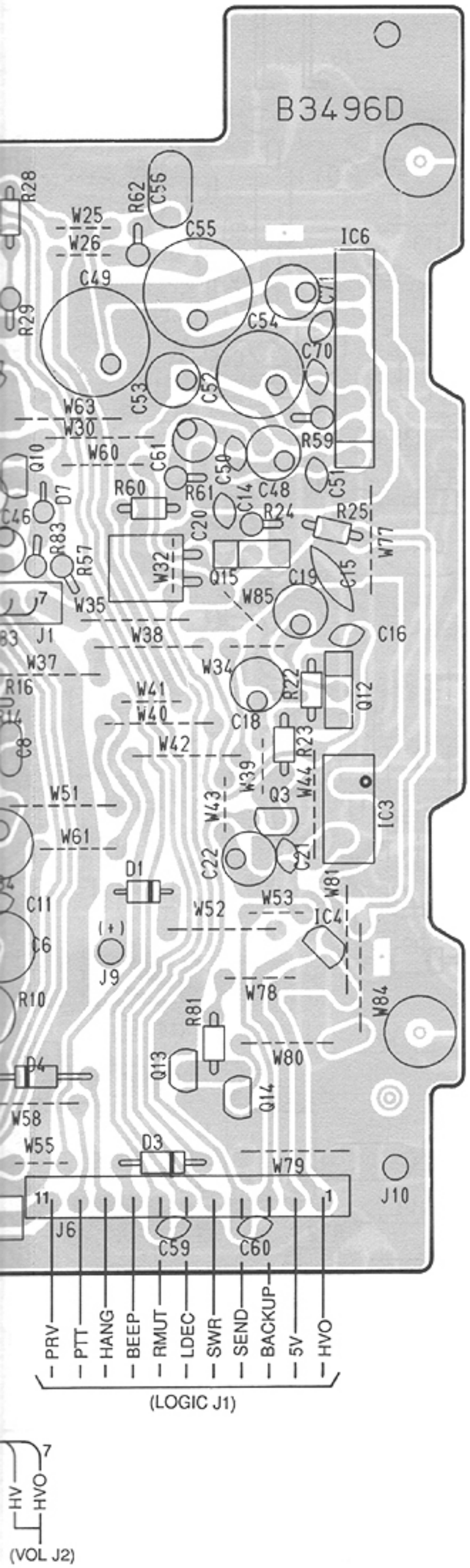
2SK241 GR



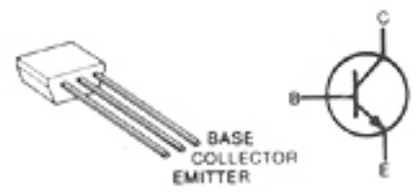
Q2

• PLL UNIT


EXT SP
P1 (SP1)
SP +
SP –
1
3
P2 (MAIN J18)
TUNE
GND
J4
R1
W64
J1
J3
R69
W76
W73
W69
W68
C72
C68
W17
W18
W4
R30
W23
W24
W27
W75
C13
Q2
R78
C78
R79
C79
IC2
R26
R28
W25
W26
W28
W29
R27
R29
C62
R64
R74
C80
R76
C77
W65
R51
R53
R58
Q10
D7
Q9
R52
R54
R75
C47
C45
R55
C46
R56
W33
R83
R57
W35
W36
C12
W37
R16
R14
R20
R19
C8
R15
C9
R17
R13
W45
W46
W47
W48
W49
W50
W51
W61
W63
W30
IC1
W54
C84
C11
C6
R8
R12
R10
C74
C25
Q4
W5
R33
R37
C27
C28
R38
C26
Q11
W74
R32
R71
C24
R36
Q6
R35
X1
C64
IC5
W19
C76
C75
R70
C23
R31
Q5
R42
R41
PD
MOD
VCO UNIT
8V
R8
OUT
C63
R77
R34
C32
W66
W7
C30
W6
R65
D2
R39
W67
W21
R40
C29
C31
C73
W10
W22
R21
R68
R47
L4
C57
R43
R63
R48
R45
C34
R46
C35
Q7
R44
R49
C41
Q8
W13
C42
C33
R67
W9
L1
C36
C69
C40
W70
C39
C38
C37
L3
L2
R66
C2
R2
R4
C5
R7
R6
Q1
C3
R9
R18
R11
R3
R5
C4
C7
P4
W58
W55
P1
LO
(MAIN J3)
C67
W1
W16
C58
W59
J5
J2
S1
J6
W62
ON
J7
GND
UL
CK
DATA
ST
GND
LOWO
SQL
TMUT
(LOGIC J2)
TMUT
SQL
LOWO
R8
AFO
SQLV
T8
HV
HV
GND
(MAIN J1)
PRV
PTT
AF2
GND
MIC
MICE
HANG
PTT
AF1
(MICROPHONE)
VOL1
VOL2
VOL0
SQLV
GND
HV
HVO
(VOL J1)
(SQL J3)
(VOL J2)

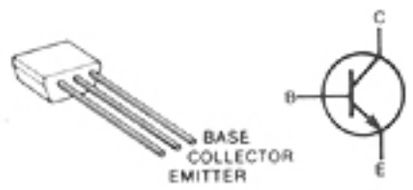


2SC2458 GR



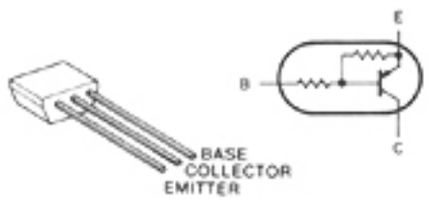
Q1, Q4, Q6, Q9

2SC2668 O



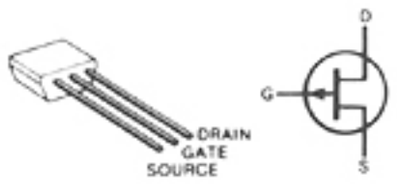
Q7, Q8

2SA1345



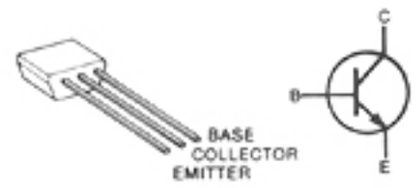
Q2

2SJ105 Y



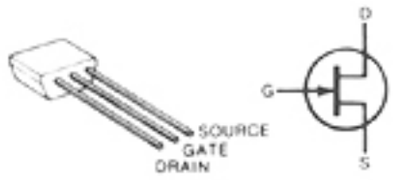
Q10

2SC3399



Q3, Q13, Q14

2SK184 Y

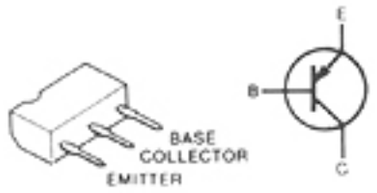


Q11

2SA1048 GR

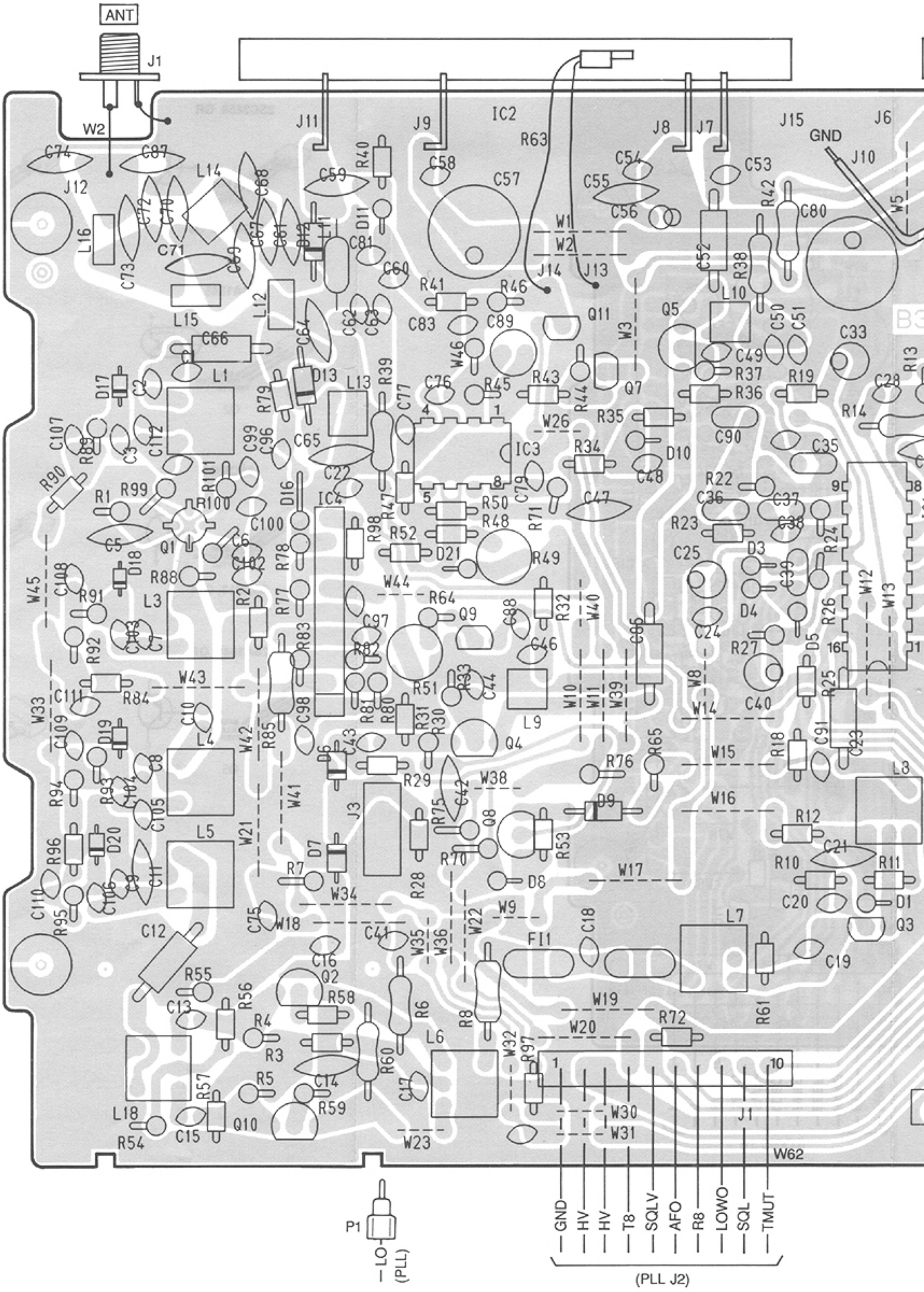
Q5

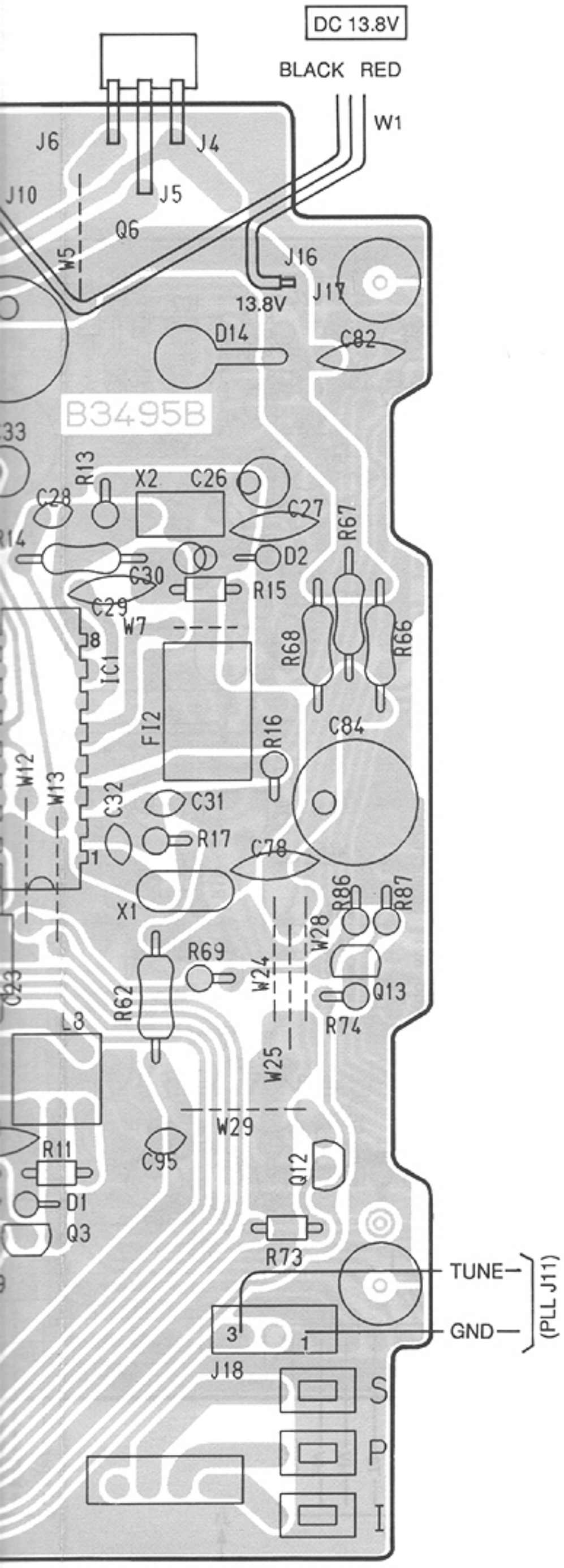
2SB909M Q



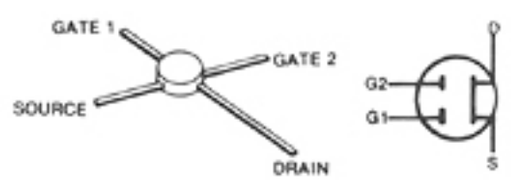
Q12, Q15

7-2 MAIN UNIT


ANT
J1
W2
J11
J9
IC2
R63
J8
J7
J15
GND
J6
J10
W5
C74
C87
J12
L14
C68
C59
R40
C58
C57
C54
C53
C55
C56
R42
C80
L16
C72
C70
C71
C67
C69
C81
D11
W1
W2
J14
J13
C52
R38
C73
L15
L12
C64
C62
C63
R41
R46
C83
C89
Q11
W3
Q5
L10
C50
C51
C33
C66
L1
D13
L13
R39
C77
C76
R45
R43
R44
Q7
W46
C49
R37
R36
R19
C28
R13
D17
C2
R79
C65
C22
4
1
W26
R35
R14
C107
C112
C3
C99
C96
IC3
R34
C90
C35
R90
R89
R101
R100
R99
R1
C100
D16
IC4
R47
R98
R50
R48
C79
C47
D10
C48
R22
C36
C37
C38
R23
R24
C5
Q1
C6
C102
R78
R52
D21
R49
R71
C25
D3
C39
W45
C108
R91
D18
R88
L3
R2
R77
W44
R64
Q9
C97
R32
W40
C24
D4
R26
W12
W13
R92
C103
C7
R83
R82
C46
C95
R27
D5
16
1
W43
C111
R84
C98
R85
R81
R80
R31
R30
R51
R33
C44
L9
W10
W11
W39
W8
W14
C40
R25
W33
C109
C10
L4
W42
D6
C43
Q4
R65
W15
R18
C91
C23
D19
C8
R94
R93
C104
C105
R29
W38
R76
D9
W16
L8
W41
J3
R75
C42
Q8
R53
R12
C21
D7
R7
R70
D8
W17
R10
R11
C110
C106
C9
C11
R96
D20
W21
W34
R28
C20
D1
R95
C75
W18
C41
W35
W36
W22
W9
C18
L7
Q3
C12
C16
Q2
FI1
C19
R55
R58
C13
R56
R4
R3
R6
R8
W19
R72
R61
W20
L6
W32
R97
1
10
L18
R54
C15
Q10
R57
R5
C14
R59
R60
C17
W23
W30
W31
J1
W62
P1
LO
(PLL)
GND
HV
HV
T8
SQLV
AFO
R8
LOWO
SQL
TMUT
(PLL J2)

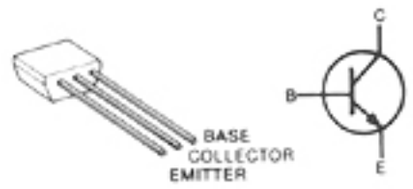


3SK122 M



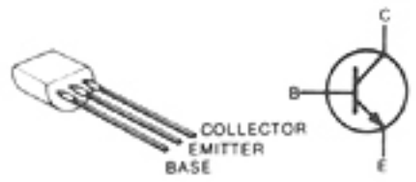
Q1

2SC2458 Y



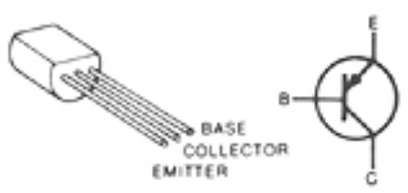
Q7

2SC3776 D



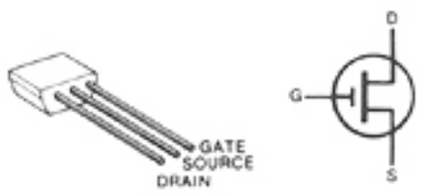
Q2, Q4, Q10

2SB561C



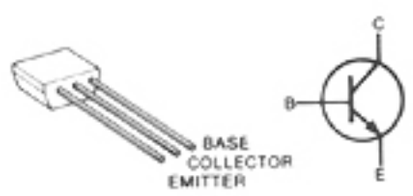
Q8

2SK241 GR



Q3

2SC3399

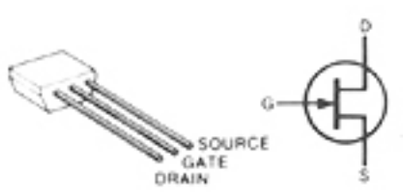


Q9, Q11

2SC2407

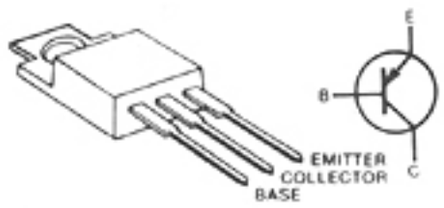
Q5

2SK184 GR



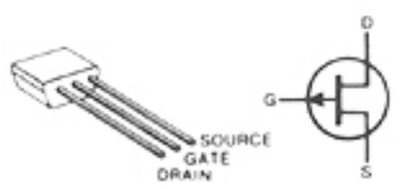
Q12

2SB1015 Y



Q6

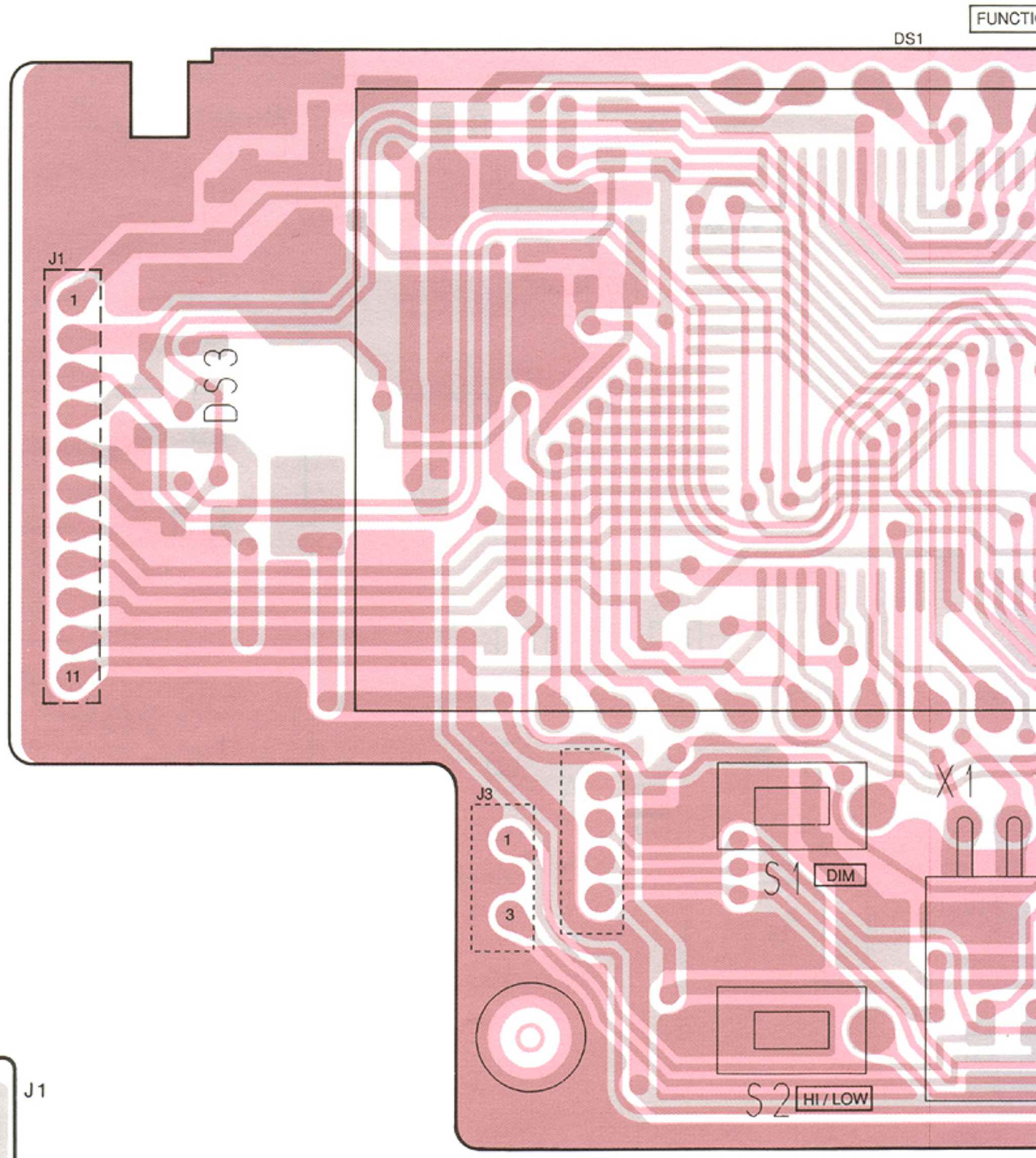
2SJ107 BL



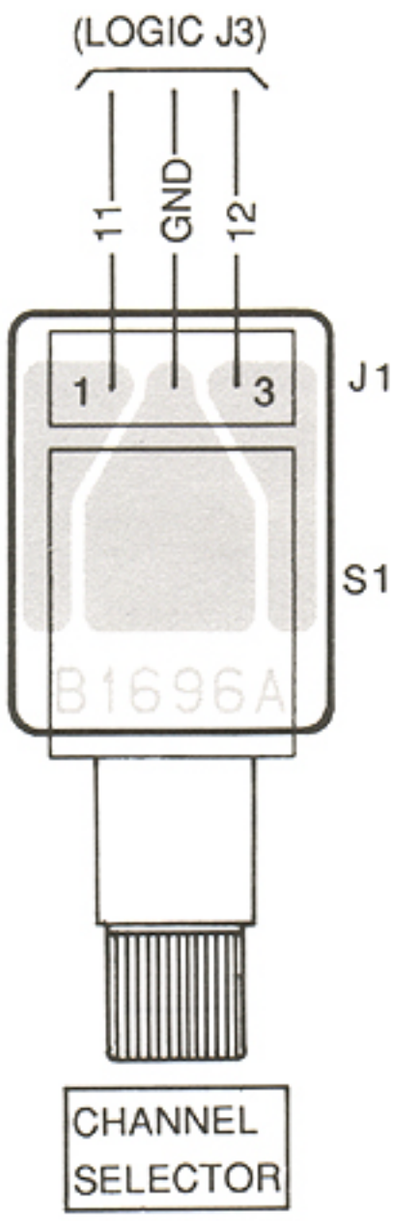
Q13

7-3 LOGIC AND SENSOR UNITS

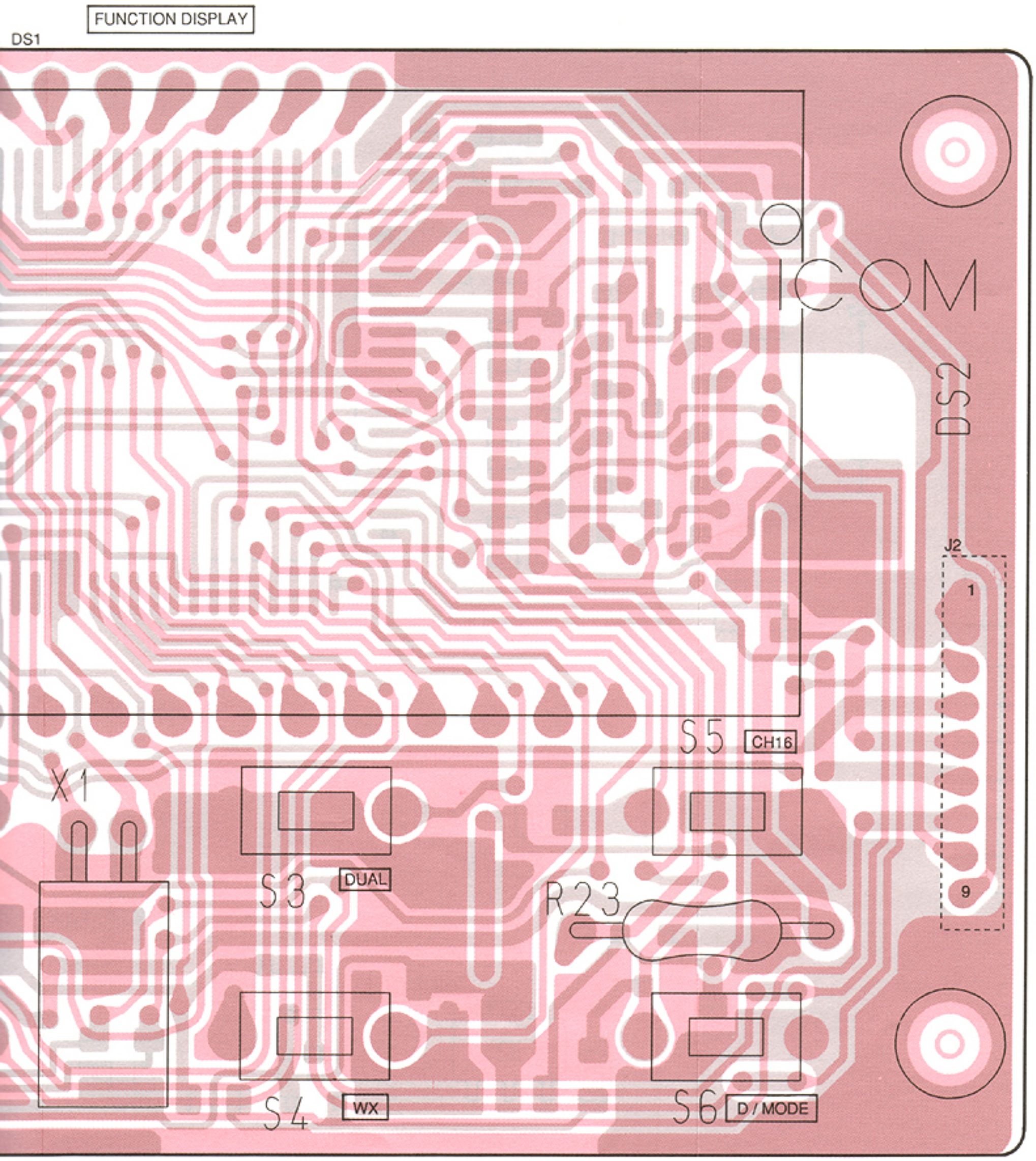
• LOGIC UNIT



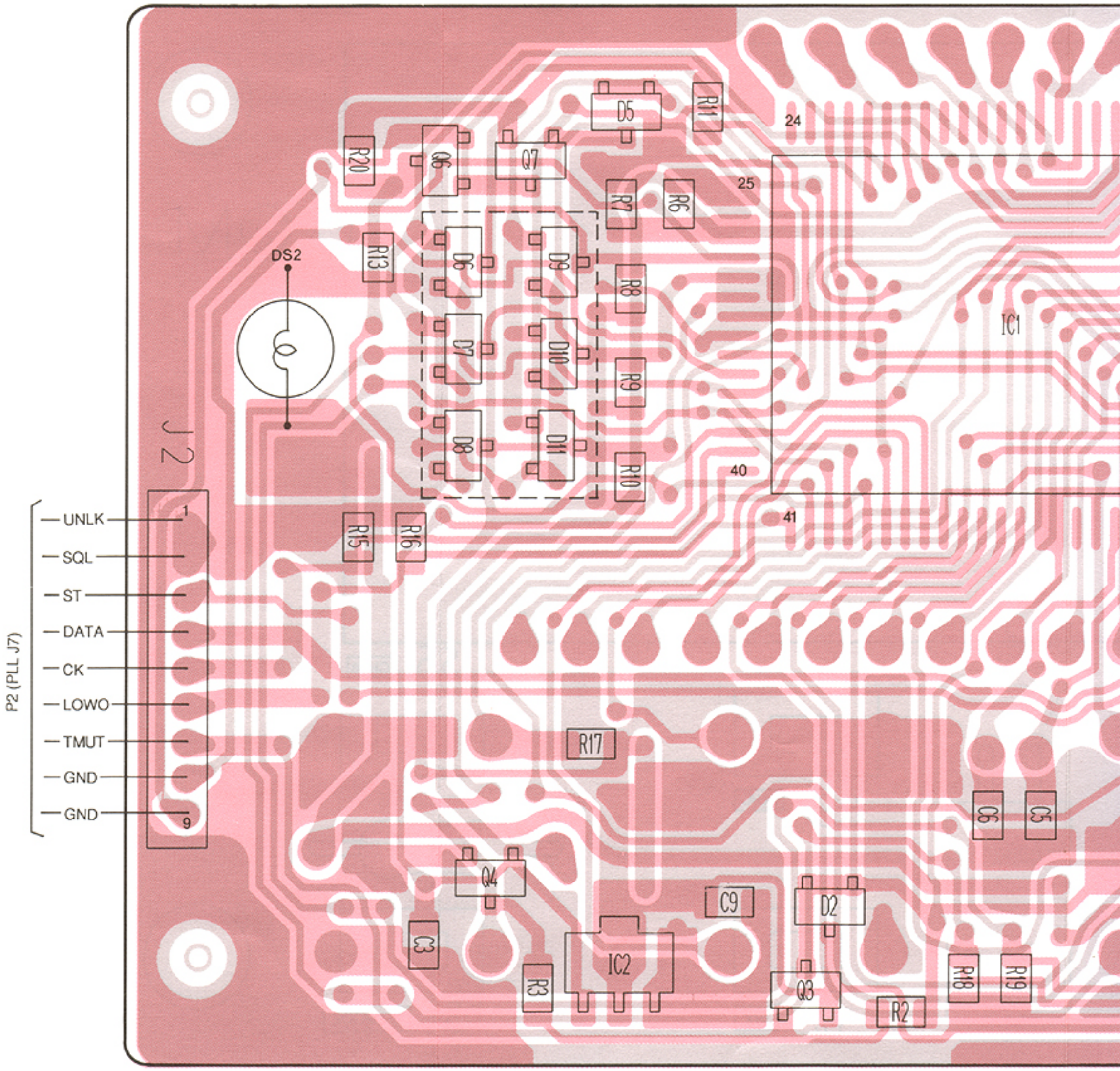
• SENSOR UNIT



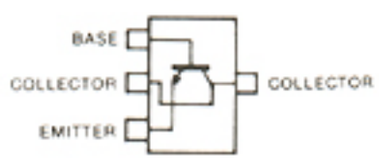
The combination of this page and the next page show the unit layout in the same configuration as the actual P.C. Board.



• **LOGIC UNIT**

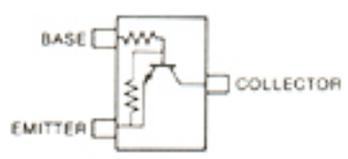


2SC3650 TD
(Symbol: CF)



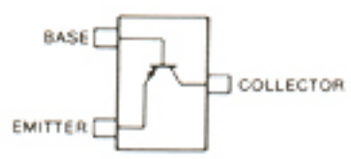
Q1

RN1404
(Symbol: XD)



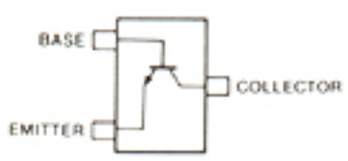
Q2, Q4, Q6

2SA1362 GR
(Symbol: AEG)

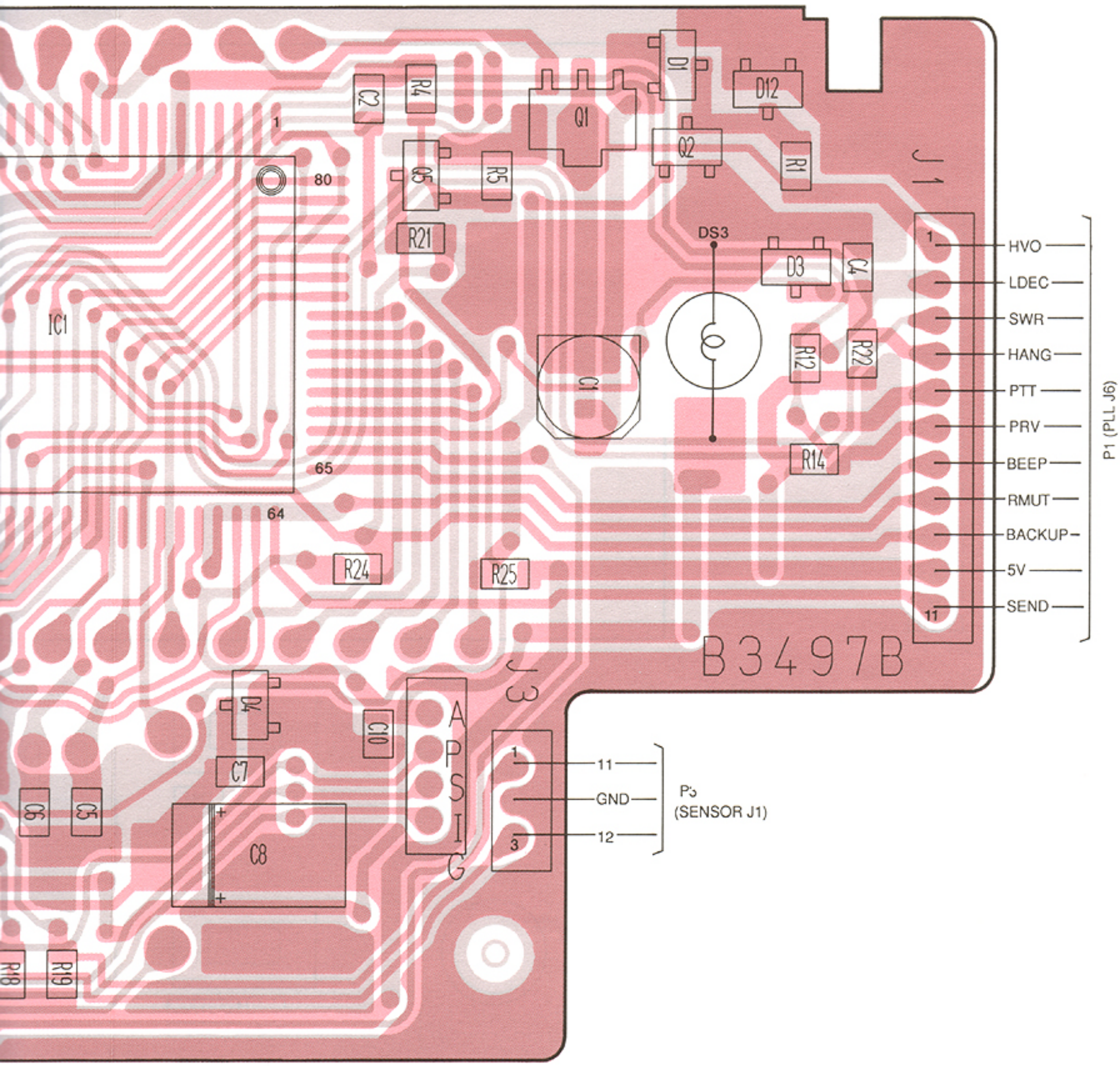


Q3

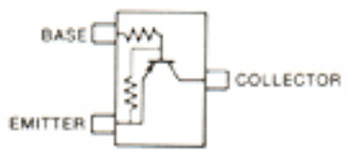
2SC2712 Y
(Symbol: LY)



Q5

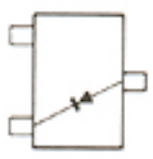


RN2404
(Symbol: YD)



Q7

1SS190
(Symbol: E3)

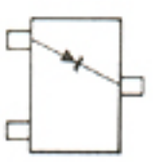


D1, D2, D5

RD6.2M B2
(Symbol: 622)

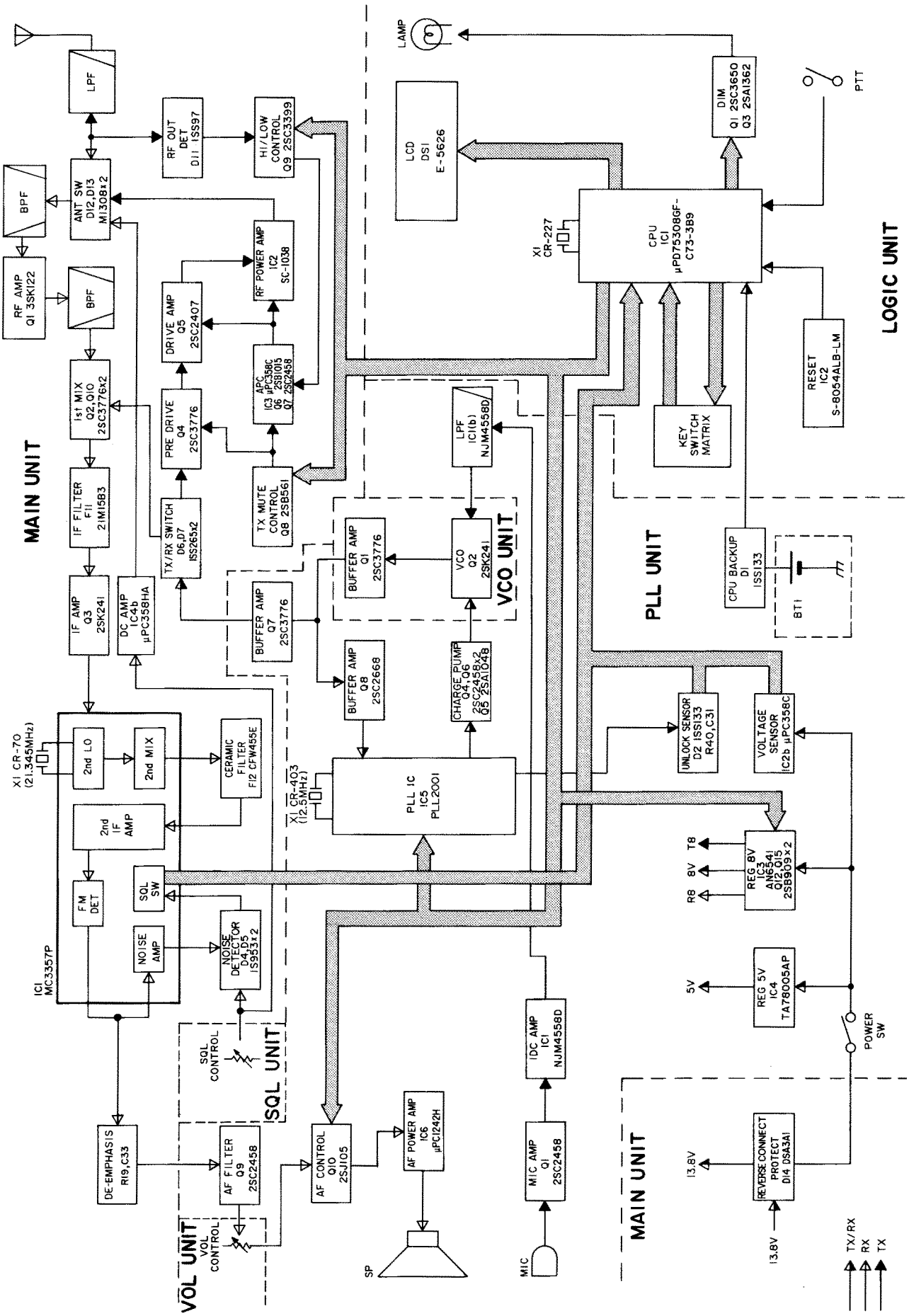
D3, D4

RD11M B1
(Symbol: 111)

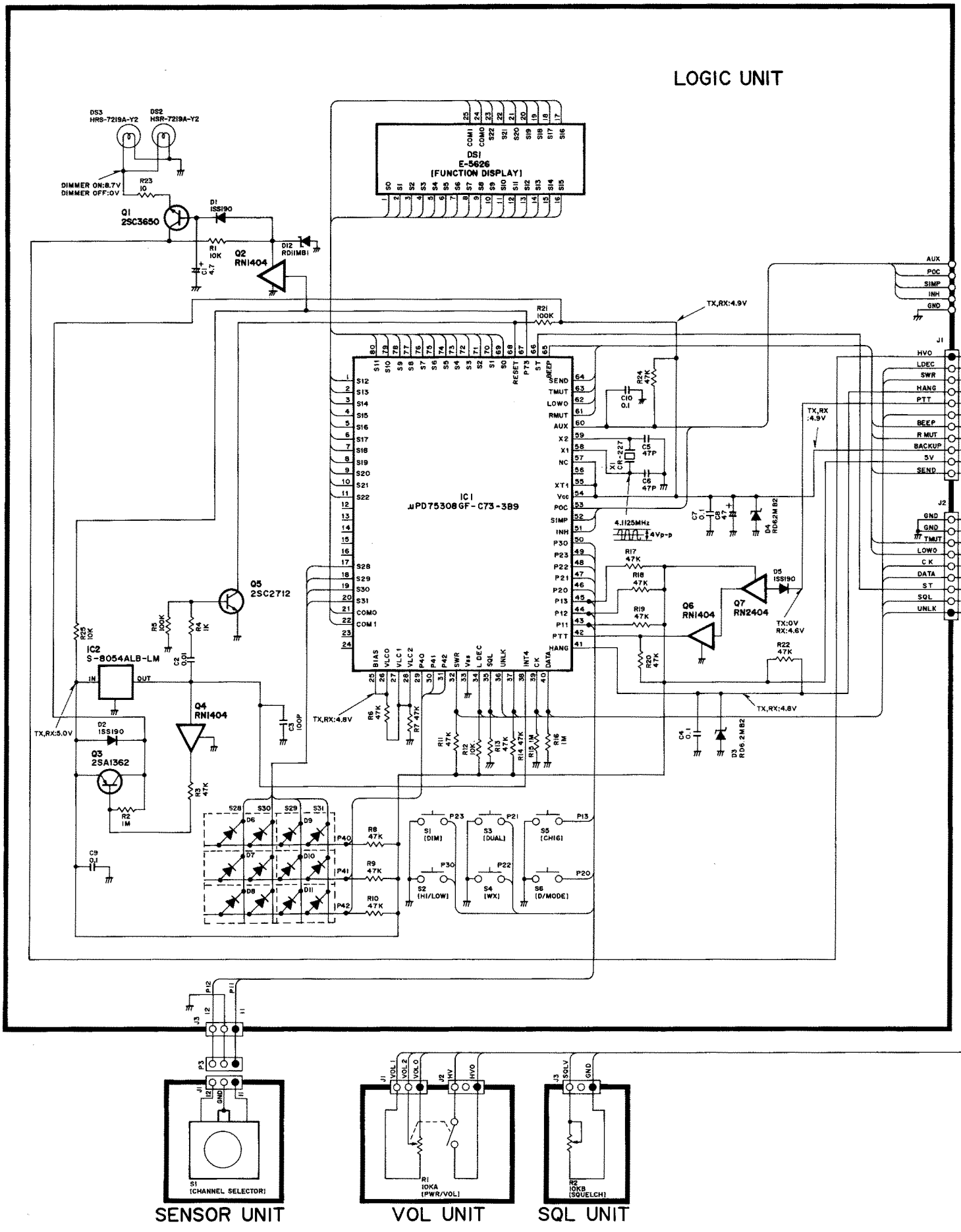


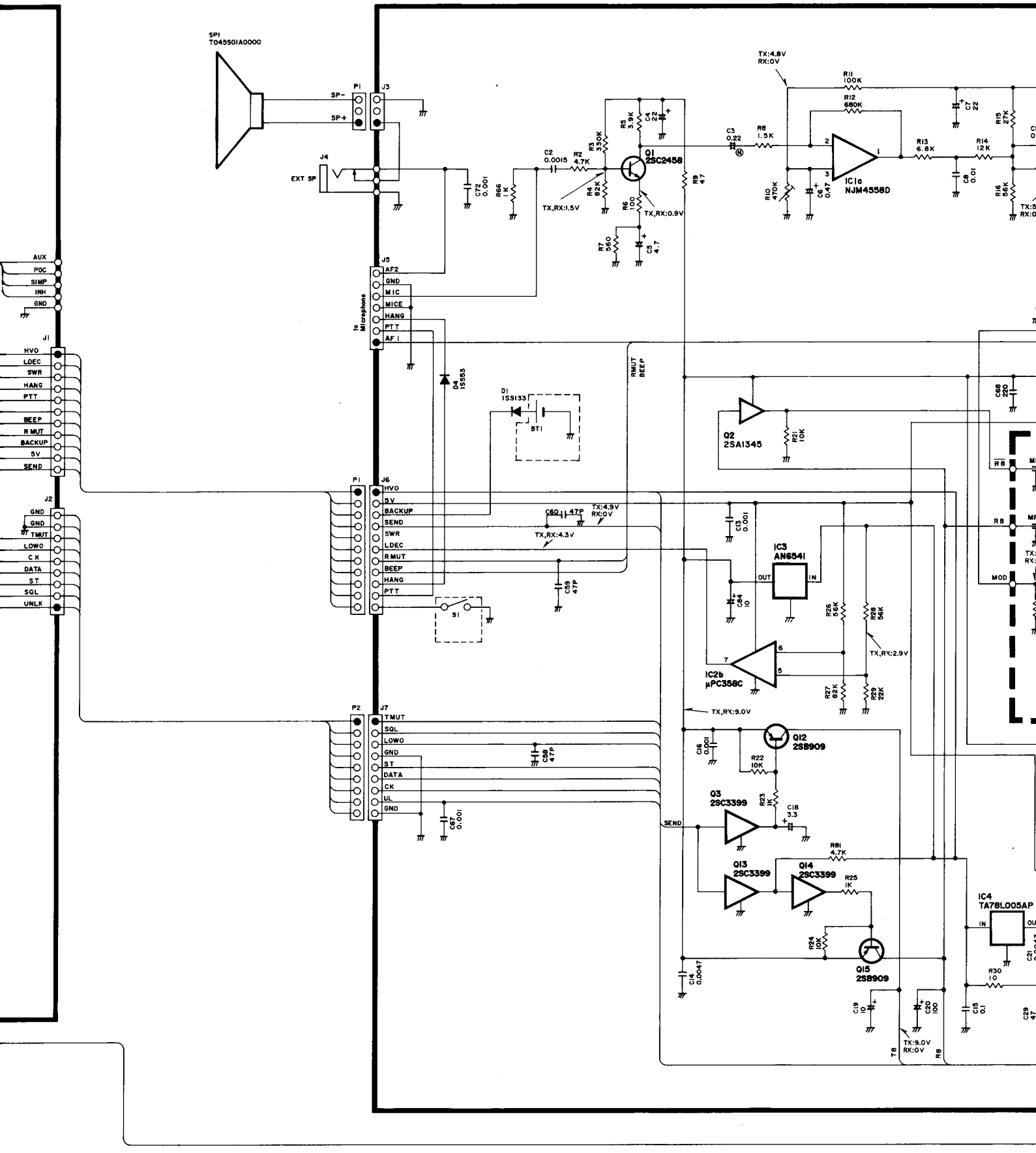
D12

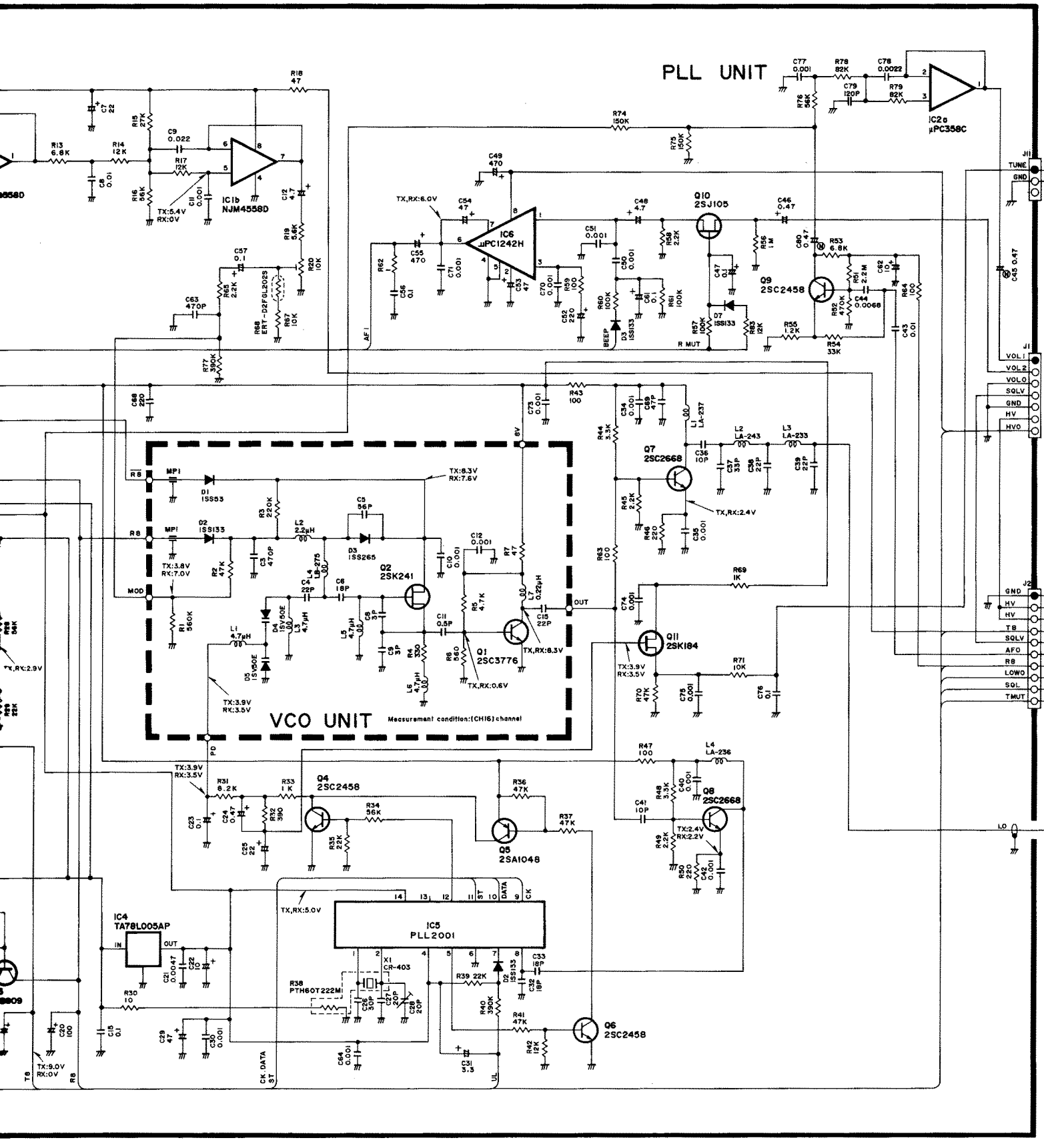
SECTION 8 BLOCK DIAGRAM

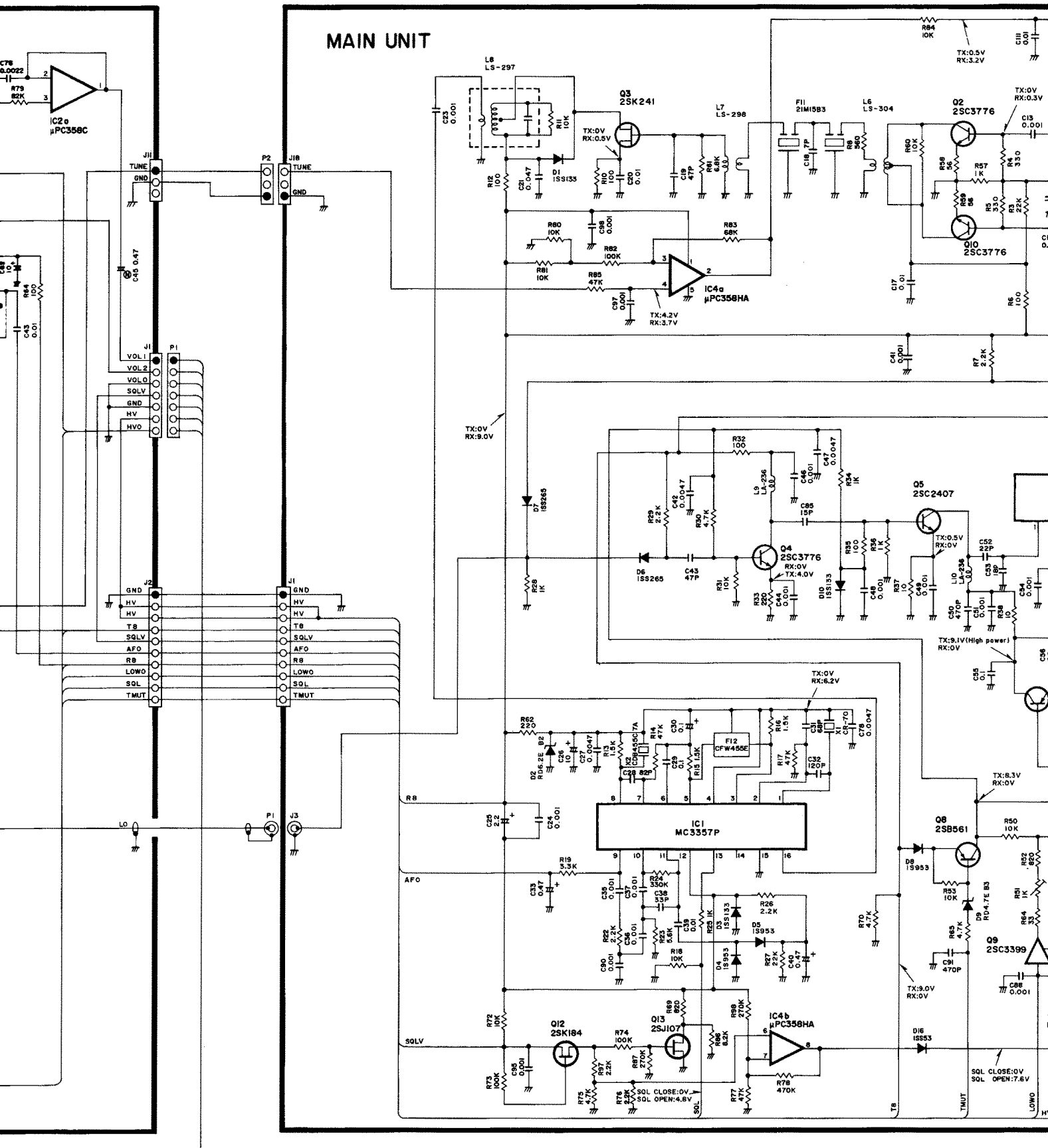


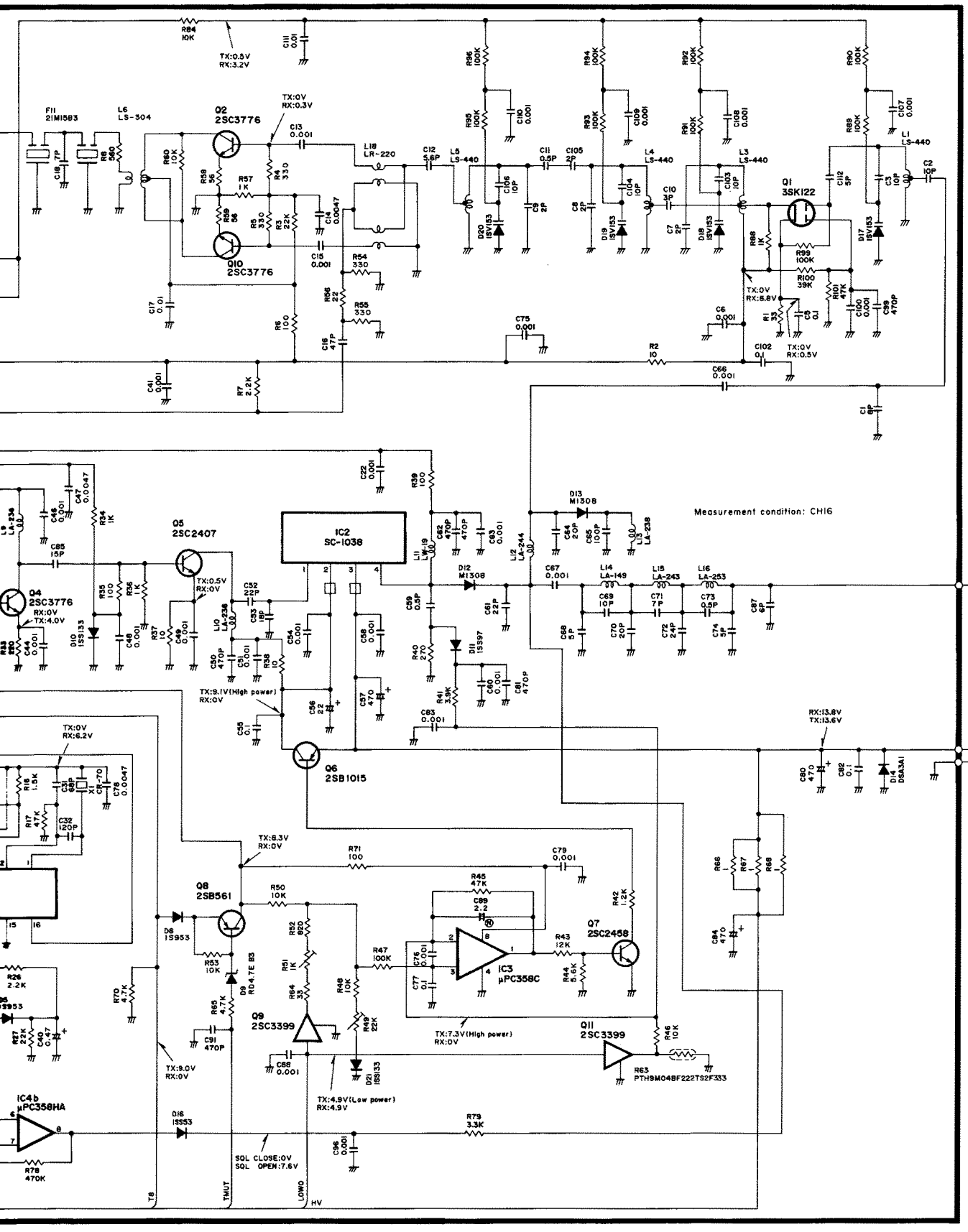
SECTION 9 VOLTAGE DIAGRAM




SP1
T0455O1A0000
P1
J3
SP-
SP+
J4
EXT SP
J5
AF2
GND
MIC
MICE
HANG
PTT
AF1
to Microphone
AUX
POC
SIMP
INH
GND
J1
HVO
LDEC
SWR
HANG
PTT
BEEP
R MUT
BACKUP
5V
SEND
J2
GND
GND
TMUT
LOWO
C K
DATA
ST
SQL
UNLK
P1
J6
HVO
5V
BACKUP
SEND
SWR
LDEC
R MUT
BEEP
HANG
PTT
P2
J7
TMUT
SQL
LOWO
GND
ST
DATA
CK
UL
GND
S1
D1
1SS133
BT1
D4
1S553
Q1
2SC2458
Q2
2SA1345
IC1a
NJM4558D
IC2b
μPC358C
IC3
AN6541
Q3
2SC3399
Q12
2SB909
Q13
2SC3399
Q14
2SC3399
Q15
2SB909
IC4
TA78L005AP
TX:4.8V
RX:0V
TX,RX:1.5V
TX,RX:0.9V
TX:4.9V
RX:0V
TX,RX:4.3V
TX,RX:2.9V
TX,RX:9.0V
TX:9.0V
RX:0V
RMUT
BEEP
SEND
MOD
R1 100K
R2 4.7K
R3 330K
R4 82K
R5 3.9K
R6 100
R7 560
R8 1.5K
R9 47
R10 470K
R11 100K
R12 680K
R13 6.8K
R14 12K
R15 27K
R16 56K
R21 10K
R22 10K
R23 1K
R24 10K
R25 1K
R26 56K
R27 82K
R28 56K
R29 22K
R30 10
R66 1K
R81 4.7K
C1 0.0015
C2 0.0015
C3 0.22
C4 22
C5 4.7
C6 0.01
C7 22
C8 0.01
C9 0.47
C13 0.001
C14 0.0047
C15 0.1
C16 0.001
C18 3.3
C19 10
C20 100
C21
C29 47
C44 10
C58 47P
C59 47P
C60 47P
C66 220
C67 0.001
C72 0.001


PLL UNIT
VCO UNIT
IC1b NJM4558D
IC2a µPC358C
IC6 µPC1242H
IC4 TA78L005AP
IC5 PLL2001
Q1 2SC3776
Q2 2SK241
Q4 2SC2458
Q5 2SA1048
Q6 2SC2458
Q7 2SC2668
Q8 2SC2668
Q9 2SC2458
Q10 2SJ105
Q11 2SK184
D1 1SS53
D2 1SS133
D3 1SS265
D4 1SV50E
D5 1SV50E
D6 1SS133
D7 1SS133
X1 CR-403
TX:8.3V RX:7.6V
TX,RX:2.4V
TX,RX:8.3V
TX,RX:0.6V
TX:3.9V RX:3.5V
TX:3.8V RX:7.0V
TX:5.4V RX:0V
TX,RX:6.0V
TX,RX:5.0V
TX:9.0V RX:0V
TX,RX:2.9V
TX:2.4V RX:2.2V
Measurement condition:[CH16] channel
TUNE
GND
VOL1
VOL2
VOLO
SQLV
HV
HVO
TB
AFO
RB
LOWO
SQL
TMUT
LO
CK
DATA
ST
R MUT
BEEP
AF1
MOD
PD


MAIN UNIT
IC2a μPC358C
J11
P2
J18
TUNE
GND
J1
P1
VOL1
VOL2
VOL0
SQLV
GND
HV
HVO
J2
J1
HV
T8
AFO
R8
LOWO
SQL
TMUT
LO
P1
J3
L8 LS-297
Q3 2SK241
L7 LS-298
FI1 21MI5B3
L6 LS-304
Q2 2SC3776
Q10 2SC3776
IC4a μPC358HA
TX:4.2V RX:3.7V
TX:0V RX:0.5V
TX:0V RX:0.3V
TX:0V RX:9.0V
Q5 2SC2407
Q4 2SC3776
TX:0.5V RX:0V
RX:0V TX:4.0V
TX:9.1V(High power) RX:0V
TX:0V RX:6.2V
IC1 MC3357P
FI2 CFW455E
TX:8.3V RX:0V
Q8 2SB561
Q9 2SC3399
TX:9.0V RX:0V
Q12 2SK184
Q13 2SJ107
IC4b μPC358HA
SQL CLOSE:0V SQL OPEN:4.6V
SQL CLOSE:0V SQL OPEN:7.6V


Measurement condition: CH16
IC2 SC-1038
IC3 μPC358C
IC4b μPC358HA
Q1 3SK122
Q2 2SC3776
Q4 2SC3776
Q5 2SC2407
Q6 2SB1015
Q7 2SC2458
Q8 2SB561
Q9 2SC3399
Q10 2SC3776
Q11 2SC3399
ANT
13.8V
GND
SOL CLOSE:0V
SOL OPEN:7.6V

Icom Inc.

6-9-16, Kamihigashi, Hirano-ku, Osaka 547, Japan
Phone: 06 793 5301
Fax : 06 793 0013
Telex : 05277822 ICOMTR J

Icom America Inc.

<Corporate Headquarters>
2380 116th Avenue N.E., Bellevue, WA 98004, U.S.A.
Phone : (206) 454-8155
Fax : (206) 454-1509
Telex : 152210 ICOM AMER BVUE

<Customer Service>
Phone : (206) 454-7619

<Regional Customer Service Centers>
18102 Sky Park South, Suite 52-B, Irvine, CA 92714, U.S.A.
Phone : (714) 852-8026
Fax : (714) 852-8716

1777 Phoenix Parkway, Suite 201, Atlanta, GA 30349, U.S.A.
Phone : (404) 991-6166
Fax : (404) 991-6327

Icom Canada

A Division of Icom America Inc.
3071 #5 Road, Unit 9, Richmond, B.C., V6X 2T4, Canada
Phone : (604) 273-7400
Fax : (604) 273-1900

Icom (Europe) GmbH

Communication Equipment
Himmelgeister Str. 100, 4000 Düsseldorf 1, F.R.G.
Phone : 0211 346047
Fax : 0211 333639
Telex : 8588082 ICOM D

Icom (Australia) Pty. Ltd.

A.C.N 006 092 575
7 Duke Street, Windsor, Victoria, 3181, Australia
Phone : 03 529 7582
Fax : 03 529 8485
Telex : AA 35521 ICOM AS

Icom (UK) Ltd.

Unit 9, Sea St., Herne Bay, Kent, CT6 8LD, U.K.
Phone : 0227 741741
Fax : 0227 360155
Telex : 965179 ICOM G

Icom France S.a

Zac de la Plaine, Rue Brindejonc des Moulinais
BP 5804, 31505 Toulouse Cedex, France
Phone : 61. 20. 31. 49 Fax : 61. 34. 05. 91
Telex : 521515 ICOM FRA

Count on us!

Icom Inc.
6-9-16, Kamihigashi, Hirano-ku, Osaka 547, Japan

A-5197H-S
Printed in Japan