

**iCOM**

**SERVICE  
MANUAL**

VHF MARINE TRANSCEIVER  
**IC-M125**

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## INTRODUCTION

This service manual describes the latest information for the following transceivers at the time of publication.

MODEL	VERSION NO.	COLOR	FREQUENCY COVERAGE
IC-M125	#01	Black	156 MHz ~ 163 MHz
	#02	White	

To upgrade quality, all electrical or 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 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>

1110001020 IC MC3357DR IC-M125 MAIN UNIT 1 pieces  
8810002950 Screw BiH M3 x 6 SUS IC-M125 Top cover 6 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 analyser when using such test equipment.
8. **READ** the instructions of test equipment thoroughly before connecting equipment to the transceiver.

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# SECTION 1 SPECIFICATIONS

## ■ GENERAL

- Frequency coverage : Transmit 156.000 ~ 157.500 MHz  
Receive 156.000 ~ 163.000 MHz
- Mode : FM (16K0G3E)
- Channel spacing : 25 kHz
- Memory channels : Up to 24
- Antenna impedance : 50  $\Omega$  (nominal)
- Power supply requirement : 13.8 V DC  $\pm$  15 % (negative ground)
- Current drain : Receive 400 mA (squelched)  
1.5 A (max. audio output)  
: Transmit 6.3 A (high)  
1.7 A (low)
- Usable temperature range :  $-20^{\circ}\text{C} \sim +60^{\circ}\text{C}$  ( $-4^{\circ}\text{F} \sim +140^{\circ}\text{F}$ )
- Frequency stability :  $\pm 0.0005\%$  ( $-20^{\circ}\text{C} \sim +60^{\circ}\text{C}$ ;  $-4^{\circ}\text{F} \sim +140^{\circ}\text{F}$ )
- Dimensions : 228 (W) x 78 (H) x 208 (D) mm; 9.0 (W) x 3.1 (H) x 8.2 (D) in  
(Projections not included)
- Weight : 2.2 kg (4.9 lbs)

## ■ TRANSMITTER

- Output power : 25 W (high), 1 W (low)
- Modulation system : Variable reactance phase modulation
- Max. frequency deviation :  $\pm 5.0$  kHz
- Spurious emissions :  $-70$  dB
- Harmonic emissions :  $-70$  dB
- Noise and hum ratio :  $-40$  dB
- Audio frequency response :  $+1$  dB  $\sim -3$  dB of  $+6$  dB/octave with 300 Hz to 3000 Hz input
- Microphone impedance : 600  $\Omega$

## ■ RECEIVER

- Receive system : Double-conversion superheterodyne
- Intermediate frequencies : 1st 21.8 MHz  
2nd 455 kHz
- Sensitivity : 0.3  $\mu\text{V}$  for 12 dB SINAD
- Squelch sensitivity : 0.3  $\mu\text{V}$  (threshold level)
- Adjacent channel selectivity :  $-70$  dB
- Spurious response rejection :  $-70$  dB
- Intermodulation rejection :  $-70$  dB
- Audio frequency response :  $+1$  dB  $\sim -3$  dB of  $-6$  dB/octave with 300 Hz to 3000 Hz deviation
- Audio output power : 5 W with a 4  $\Omega$  load
- Audio output impedance : 4  $\Omega$

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	Inter-national channel	U.S.A. channel	Frequency (MHz)		Transmit output power
		Transmit	Receive				Transmit	Receive	
01	—	156.050	160.650	25 W & 1 W	65	—	156.275	160.875	25 W & 1 W
01A	01A	165.050	156.050	25 W & 1 W	65A	65A	156.275	156.275	25 W & 1 W
02	—	156.100	160.700	25 W & 1 W	66	—	156.325	160.925	25 W & 1 W
02A	02A	156.100	156.100	25 W & 1 W	66A	66A	156.325	156.325	25 W & 1 W
03	—	156.150	160.750	25 W & 1 W	67	67	156.375	156.375	25 W & 1 W <sup>*1</sup>
03A	03A	156.150	156.150	25 W & 1 W	68	68	156.425	156.425	25 W & 1 W
04	—	156.200	160.800	25 W & 1 W	69	69	156.475	156.475	25 W & 1 W
04A	04A	156.200	156.200	25 W & 1 W	70	70	156.525	156.525	1 W only
05	—	156.250	160.850	25 W & 1 W	71	71	156.575	156.575	25 W & 1 W
05A	05A	156.250	156.250	25 W & 1 W	72	72	156.625	156.625	25 W & 1 W
06	06	156.300	156.300	25 W & 1 W	73	73	156.675	156.675	25 W & 1 W
07	—	156.350	160.950	25 W & 1 W	74	74	156.725	156.725	25 W & 1 W
07A	07A	156.350	156.350	25 W & 1 W	75	—	—	—	Guard
08	08	156.400	156.400	25 W & 1 W	76	—	—	—	Guard
09	09	156.450	156.450	25 W & 1 W	77	77	156.875	156.875	25 W & 1 W
10	10	156.500	156.500	25 W & 1 W	78	—	156.925	161.525	25 W & 1 W
11	11	156.550	156.550	25 W & 1 W	78A	78A	156.925	156.925	25 W & 1 W
12	12	156.600	156.600	25 W & 1 W	79	—	156.975	161.575	25 W & 1 W
13	13	156.650	156.650	25 W & 1 W <sup>*1</sup>	79A	79A	156.975	156.975	25 W & 1 W
14	14	156.700	156.700	25 W & 1 W	80	—	157.025	161.625	25 W & 1 W
15	15	156.750	156.750	1 W only <sup>*2</sup>	80A	80A	157.025	157.025	25 W & 1 W
16	16	156.800	156.800	25 W & 1 W	81	81	157.075	161.675	25 W & 1 W
17	17	156.850	156.850	1 W only	81A	81A	157.075	157.075	25 W & 1 W
18	—	156.900	161.500	25 W & 1 W	82	—	157.125	161.725	25 W & 1 W
18A	18A	156.900	156.900	25 W & 1 W	82A	82A	157.025	157.125	25 W & 1 W
19	—	156.950	161.550	25 W & 1 W	83	—	157.175	161.775	25 W & 1 W
19A	19A	156.950	156.950	25 W & 1 W	83A	83A	157.175	157.175	25 W & 1 W
20	20	157.000	161.600	25 W & 1 W	84	84	157.225	161.825	25 W & 1 W
20A	20A	157.000	157.000	25 W & 1 W	84A	—	157.225	157.225	25 W & 1 W
21	—	157.050	161.650	25 W & 1 W	85	85	157.275	161.875	25 W & 1 W
21A	21A	157.050	157.050	25 W & 1 W	85A	—	157.275	157.275	25 W & 1 W
22	—	157.100	161.700	25 W & 1 W	86	86	157.325	161.925	25 W & 1 W
22A	22A	157.100	157.100	25 W & 1 W	86A	86A	157.325	157.325	25 W & 1 W
23	—	157.150	161.750	25 W & 1 W	87	87	157.375	161.975	25 W & 1 W
23A	23A	157.150	157.150	25 W & 1 W	87A	—	157.375	157.375	25 W & 1 W
24	24	157.200	161.800	25 W & 1 W	88	88	157.425	162.025	25 W & 1 W
25	25	157.250	161.850	25 W & 1 W	88A	88A	157.425	157.425	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					

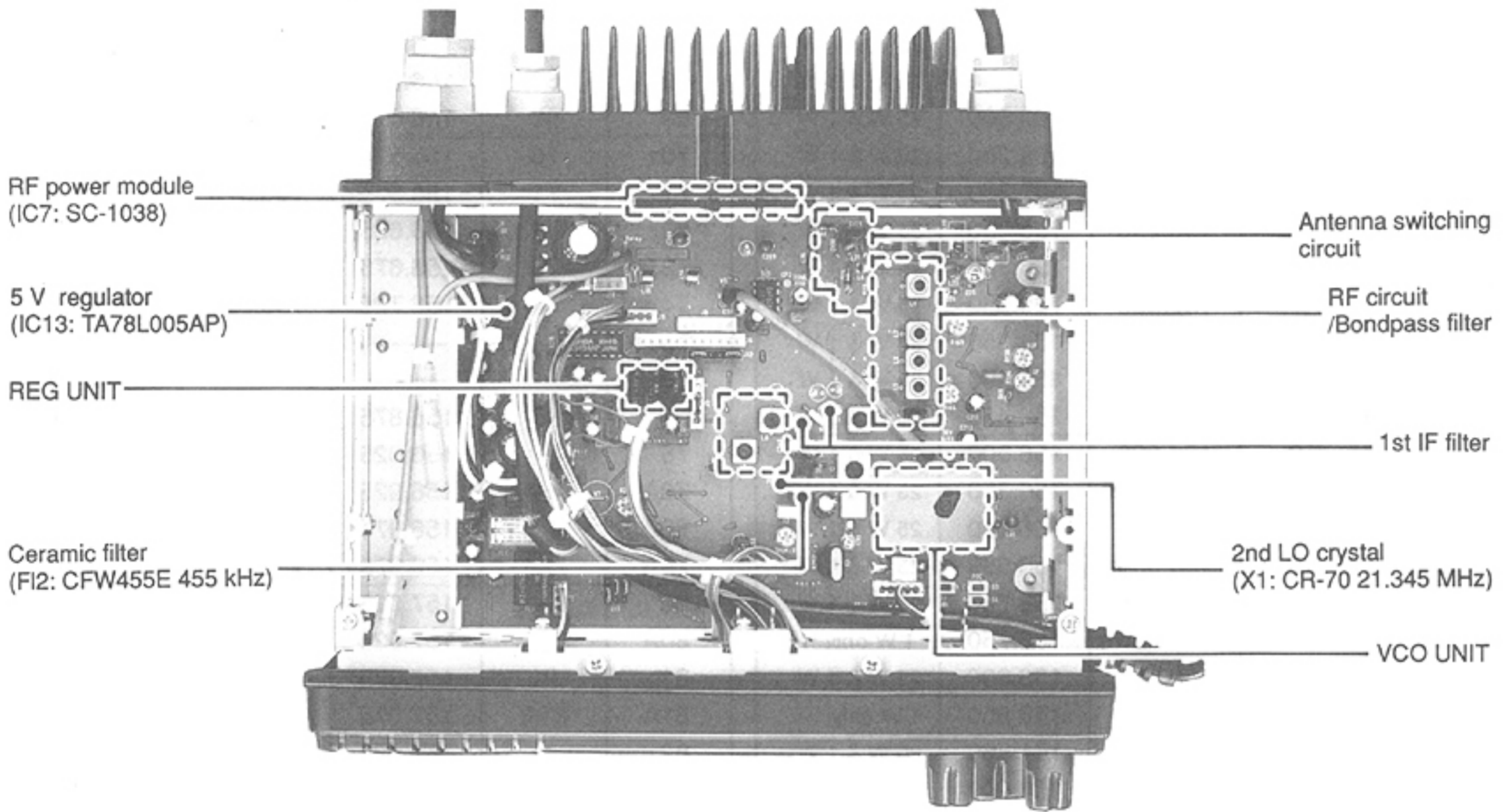
Weather channel	Receive frequency (MHz)	Comment
1	162.550	RX only
2	162.400	RX only
3	162.475	RX only
4	162.425	RX only
5	162.450	RX only
6	162.500	RX only
7	162.525	RX only
8	161.650	RX only
9	161.775	RX only
10	163.275	RX only

<sup>\*1</sup> Momentary high power on a U.S.A. channel

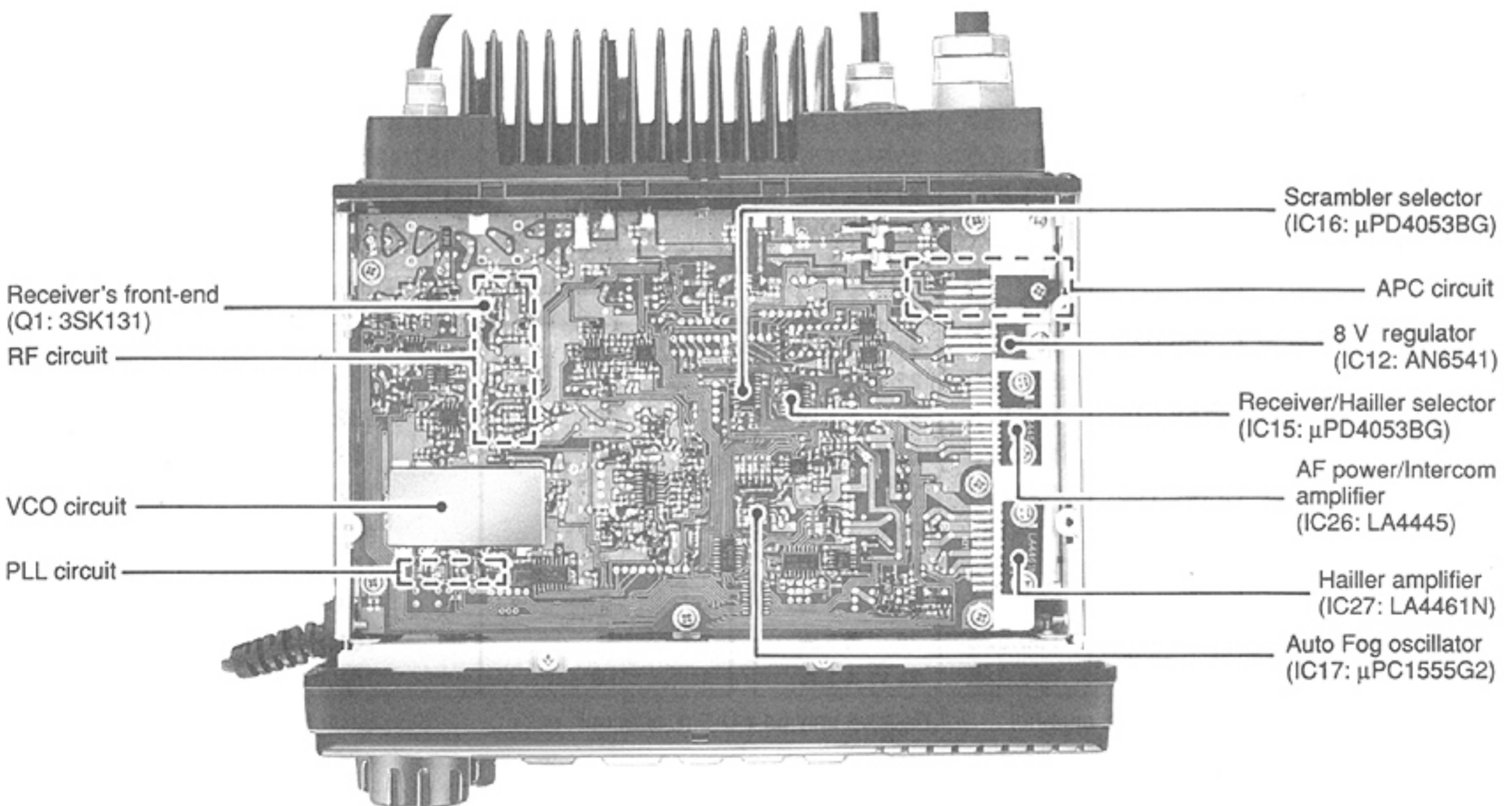
<sup>\*2</sup> Receive only on a U.S.A. channel

## SECTION 2 INSIDE VIEWS

### • TOP VIEW



### • BOTTOM VIEW



## SECTION 3 CIRCUIT DESCRIPTION

### 3-1 RECEIVER CIRCUITS

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

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

Received signals enter the MAIN unit from the antenna connector and pass through low-pass filters (L20, C135, C136) and (L17, L18, C131~C133). The signals are then applied to the RF circuit through the antenna switching circuit (D21~D23). The antenna switching circuit (D21~D23) is switched by the T8 line to apply received signals to the RF circuit.

The antenna connector employs a floating ground system. Until C129, the antenna connector is not direct-currently grounded.

#### 3-1-2 RF ATTENUATOR CIRCUIT (MAIN UNIT)

The antenna switching circuit (D21, D23) also functions as an RF attenuator that reduces excessively strong signals. According to the [SQUELCH] control setting, output voltage from the squelch level control (Q5) increases. The output voltage is current-amplified at IC4A (pin 3) and is applied to D21, D23.

#### 3-1-3 RF CIRCUIT (MAIN UNIT)

The RF signals from the antenna switching circuit pass through a tuned bandpass filter (L1, C4, D1) where the object signals are applied to the RF amplifier (Q1). The RF signals from Q1 are applied to a 3-stage tuned bandpass filter (L2~L5, C12, C14, C18, D2~D4) to eliminate out-of-band signals and improve selectivity.

The PLL lock voltage is used as a control voltage for varactor diodes (D1~D4). The control voltage from the PLL circuit is current-amplified at IC2 and is then applied to D1~D4.

#### 3-1-4 1ST MIXER CIRCUIT (MAIN UNIT)

The 1st mixer (Q2, Q3, L6) mixes the signal from the RF circuit and the 1st LO signal from the VCO board to produce a 21.8 MHz 1st IF signal.

#### 3-1-5 1ST IF CIRCUIT (MAIN UNIT)

The 1st IF signal from the 1st mixer passes through the crystal filter (F1) and is then amplified at the 1st IF amplifier (Q4). F1 is a pair of monolithic crystal filters which suppress out-of-band signals and unwanted heterodyned frequency signals. The 1st IF signal from the 1st IF circuit is then applied to the 2nd mixer (Q44).

#### 3-1-6 2ND IF AND FM DETECTOR CIRCUITS (MAIN UNIT)

At the 2nd mixer (Q44), the 1st IF signal from the 1st IF circuit is mixed with a 21.345 MHz 2nd LO signal to be converted to a 455 kHz 2nd IF signal. The 2nd IF signal from Q44 passes through a ceramic filter (F12), where unwanted signals are suppressed. The 2nd IF signal from F12 is then applied to the 2nd IF amplifier section in IC1 (pin 5).

IC1 contains the 2nd LO oscillator, limiter amplifier, quadrature detector and squelch trigger. The local oscillator section and X1 generate a 21.345 MHz 2nd LO signal.

The applied 2nd IF signal to IC1 (pin 5) passes through the 2nd IF amplifier section, the limiter amplifier section and is then applied to the FM detector section. At the FM detector section, the 2nd IF signal is demodulated into an AF signal using the ceramic filter (X2). The AF signal from IC1 (pin 9) is applied to the AF circuit and squelch circuit.

#### FM DETECTOR AND SQUELCH CIRCUITS

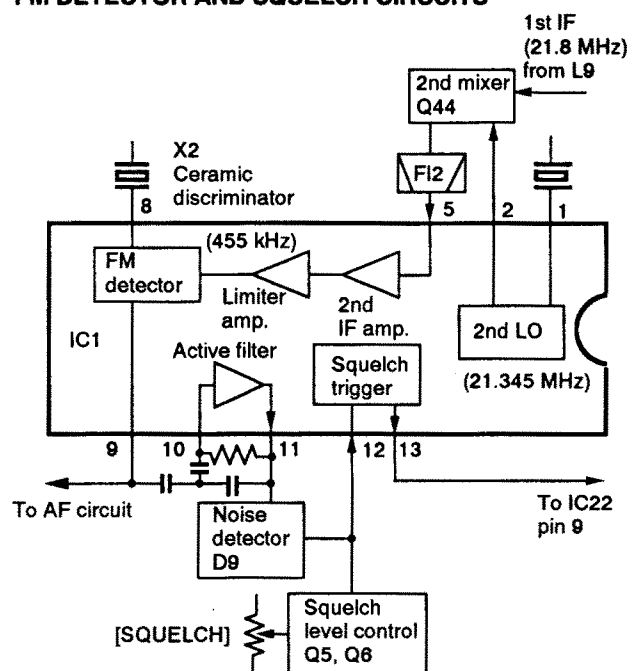


Fig. 1

### 3-1-7 AF CIRCUIT (MAIN UNIT)

AF signals from IC1 (pin 9) are applied to the de-emphasis circuit (R72, C41). This de-emphasis circuit is an integrated circuit with frequency characteristics of  $-6$  dB/octave. The AF signals are then buffer-amplified at IC4B (pin 6). The AF signals are applied to the high-pass filter (IC3B, pins 5, 6), then the low-pass filter (IC3A, pins 2, 3) to suppress unwanted higher or lower noise components.

The AF signals pass through the audio selectors (IC15, pins 2, 15), (IC16, pins 5, 4), the [VOLUME] control (R1) in the VR unit, and is then amplified at the AF amplifier (IC26, pin 5). Output signals from IC26 (pin 8) drive the internal speaker (SP1) via the relay (RL1). See Fig. 4 in p. 3-5 for details.

### 3-1-8 SQUELCH CIRCUIT (MAIN UNIT)

A squelch circuit cuts out AF signals when no RF signal is received. By detecting noise components in the AF signal, this circuit mutes AF signals.

When no RF signal is received, noise components of 20 kHz and higher increase. The noise components from IC1 (pin 9) are amplified at the active filter in IC1 (pin 10). Output signal from IC1 (pin 11) is then detected at the noise detector (D9) and converted to DC voltage. The DC voltage is applied to the squelch trigger section in IC1 (pin 12) and IC1 (pin 13) outputs "HIGH."

The output signal from IC1 (pin 13) is then applied to IC22 (pin 9) to convert serial data (LE/D) for the CPU. When IC22 (pin 9) receives "HIGH," the CPU outputs the RMUT signal from the expander IC24 (pin 13) and controls the audio selector (IC15, pin 2). Thus, the audio signal from the receive circuit is muted.

The [SQUELCH] control (R2) in the VR unit adjusts gate voltage of Q5. Thus, resistance of the squelch level control circuit (Q5, Q6) and the squelch threshold level is varied.

### 3-1-9 WEATHER ALERT DECODER CIRCUIT (MAIN, CPU UNITS) (U.S.A. version only)

When the weather alert function is activated and a 1050 Hz warning tone from an NOAA weather radio broadcast is received, the IC-M125 emits beep tones.

AF signals from IC3A (pin 1) are applied to the 1050 Hz decoder (IC5, pin 3). When a 1050 Hz signal is detected, the TONE signal (IC5, pin 8) becomes "LOW." The output signal from IC5 (pin 8) is then applied to IC22 (pin 7) to convert serial data (LE/D) for the CPU. When IC22 (pin 7) receives the TONE signal, the CPU (IC1, pin 65 on the LOGIC unit) outputs the BEEP1 signal and the signal is then applied to the [VOLUME] control (R1).

## 3-2 TRANSMITTER CIRCUITS

### 3-2-1 MICROPHONE AMPLIFIER CIRCUIT (MAIN UNIT)

The audio signals from the microphone pass through the audio switch (Q45) and pre-emphasis circuit (C163, R191, R260). The pre-emphasis circuit provides frequency characteristics of  $+6$  dB/octave. The signals are then amplified at the microphone amplifier (Q23).

The amplified signals pass through the low-pass filter (IC14A) and audio selector circuit (IC16, pins 2, 15), and are then applied to a limiter amplifier (IC8A) to be limited in frequency deviation. These signals are applied to the splatter filter (IC8B) where signal components of 3 kHz and higher are eliminated.

### 3-2-2 MODULATION CIRCUIT (VCO UNIT)

The modulation circuit modulates the VCO oscillation frequency using the microphone audio signals. Audio signals from IC8B (pin 1) on the MAIN unit are applied to the modulation circuit (D3) to modulate the oscillated signal. The oscillated signal is buffer-amplified at Q1.

### 3-2-3 DRIVE AMPLIFIER CIRCUIT (MAIN UNIT)

The drive amplifier circuit amplifies the VCO oscillating signal to a level needed at the power amplifier. The VCO output signal is buffer-amplified at Q10, and is applied to the low-pass filter (L11, L12, C78-C80). The signal passes through the transmit/receive switching circuit (D15) and is then amplified at the predrive (Q16) and drive (Q17) amplifiers to obtain an approximate  $+23$  dBm (200 mW) signal level.

### 3-2-4 POWER AMPLIFIER CIRCUIT (MAIN UNIT)

The power amplifier circuit amplifies the signal from the drive amplifier (Q17) to an output power level. The output from the power module (IC7, pin 4) passes through D22 and a Butterworth low-pass filter (L17-L20, C131-C136, C252) to reduce the higher harmonic components of the transmission frequency.

The transmit/receive switching circuit (D22, D23) is turned ON by the T8 voltage to prevent transmit output power from going into the receiver circuit. While receiving, D22 and D23 turn OFF for the antenna switching circuit to act as a low-pass filter.

### 3-2-5 APC CIRCUIT (MAIN UNIT)

A portion of the RF output power from IC7 is detected by the output power detection circuit (D24, D25, L19). The forward signal component and reflection signal component of the RF output power are detected by D24 and D25, respectively. Using output DC voltage from D24, the APC circuit sets the power to 25 W or 1 W. Using output DC voltage from D25, the APC circuit protects the power module (IC7).

- **OUTPUT POWER ADJUSTMENT LINES**

Output DC voltage from D24 is amplified at IC11A (pin 3) and then applied to IC9 (pin 6). IC9 functions as a differential amplifier. When the output power is lower than the set level, IC9 (pin 7) controls Q20 and Q18 to increase the output power to the set level. By changing the reference voltage applied to IC9 (pin 5), output power can be varied. Q26 selects the reference voltage.

- **POWER MODULE PROTECTION LINES**

Output DC voltage from D25 is amplified at IC10B (pin 5) and IC11A (pin 3) and then applied to IC9 (pin 6). When the antenna impedance is matched, only the output DC voltage from D24 is applied to IC11A (pin 3), and output power is constant. When the antenna impedance is mismatched, the reflection signal component of the RF output power increases, and output DC voltage from D25 increases. Using the DC voltage, the APC circuit reduces the power module (IC7) output power.

#### APC CIRCUIT

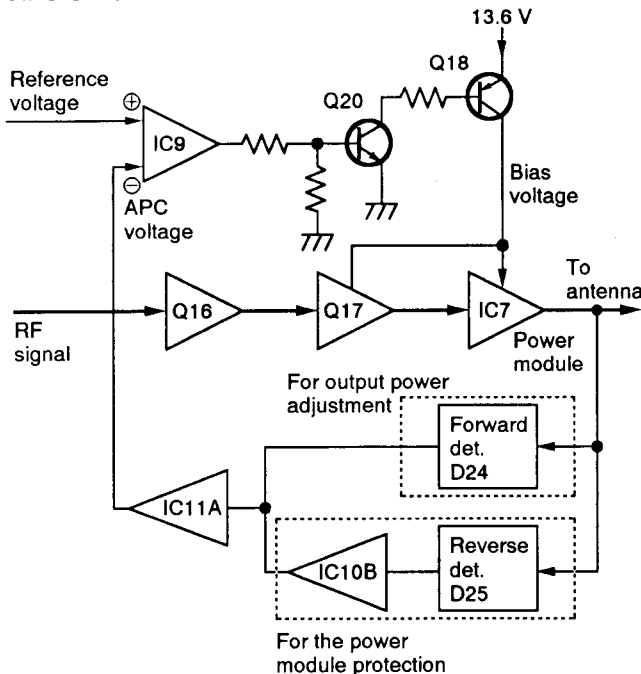


Fig. 2

### 3-2-6 ANTENNA MISMATCHING INDICATOR CIRCUIT (MAIN UNIT)

The DC voltage from D25 is applied to IC10B (pin 5). A portion of the signal from IC10B (pin 7) is applied to IC11B (pin 5). IC11B (pin 7) outputs a "HIGH" signal when SWR is high. The signal is applied to IC22 (pin 11) to convert serial data (LE/D) for the CPU. The TX indicator blinks on the function display to indicate that the antenna has a mismatched condition.

## 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. The PLL IC (IC6) contains two programmable dividers, a phase detector and a shift register.

The VCO output is amplified at Q11 and is then applied to IC6 (pin 8). IC6 divides this input with the serial data from the CPU and phase-detects it with the 12.5 kHz divided reference frequency. The phase difference is then output as a pulse. The output signal from IC6 (pins 5, 12) is amplified by the charge pump (Q12~Q14) to expand the lock voltage.

The amplified signal is then converted to DC voltage by the lag-lead loop filter (R106, R109, C85) and, as well, control the varactor diodes (D4, D5) in the VCO unit. The DC voltage is also applied to a bandpass filter in the receiver circuit to provide tuning voltage via Q15 and IC2.

### 3-3-2 VCO CIRCUIT (VCO UNIT)

The VCO generates receive local and transmit frequencies and produces FM modulation. Q2 causes oscillation. D3 causes FM modulation. Q1 is a buffer amplifier that prevents affection for VCO oscillation frequency. A portion of the VCO output signal is buffer-amplified at Q11, and is then reapplied to IC6 (pin 8).

The VCO output signal is amplified at Q10, and is then sent to the transmit/receiver switching circuit (D15).

### 3-3-3 REFERENCE OSCILLATOR CIRCUIT (MAIN UNIT)

The reference oscillator circuit oscillates the PLL reference frequency. The 12.8 MHz reference frequency is produced by the oscillator section of IC6 and X3. C93 provides frequency control.

## PLL CIRCUIT BLOCK DIAGRAM

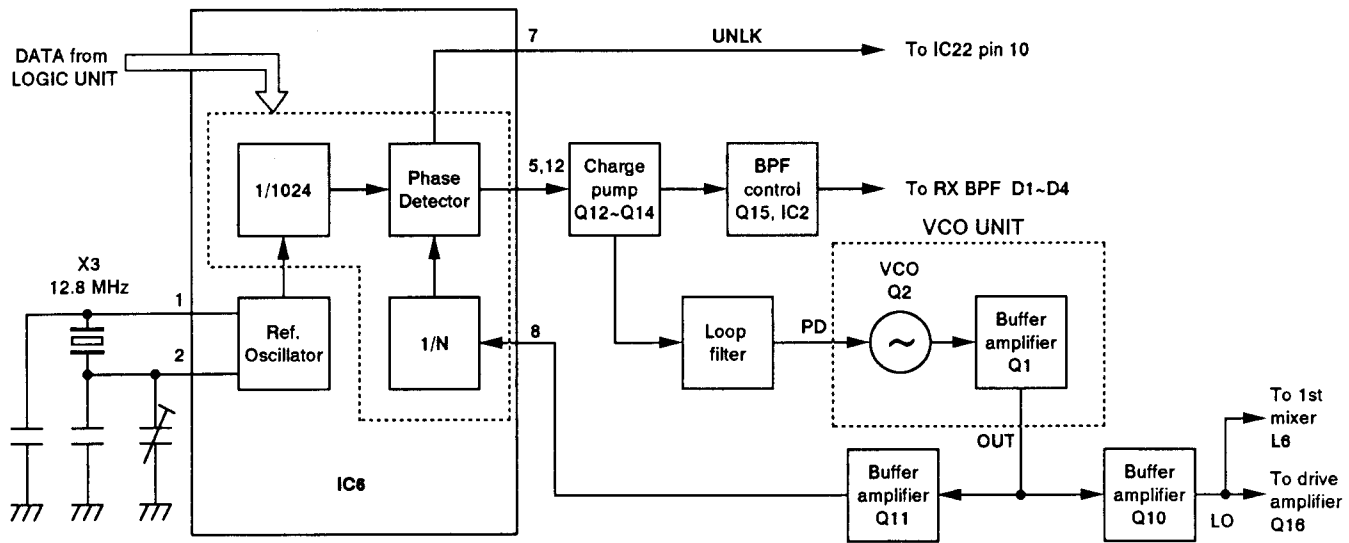


Fig. 3

## 3-4 POWER SUPPLY CIRCUITS

LINE	DESCRIPTION
HV	The external DC power from the power connector.
HVS	13.6 V DC passed through the power switch.
5V	Common 5 V converted from the HVS line at IC13 in the MAIN unit.
8V	Common 8 V converted from the HVS line at IC12 in the MAIN unit.
R8	Receive 8 V converted from the 8V line at Q21 in the MAIN unit.
T8	Transmit 8 V converted from the 8V line at Q22 in the MAIN unit.
- 3V	Common - 3 V converted from the 8V line at IC1 in the REG board.

## 3-5 INTERCOM AND HAILER CIRCUITS (MAIN UNIT)

### 3-5-1 INTERCOM SIGNAL LINES (MAIN UNIT)

When the intercom function is activated, microphone signals from the audio selector (IC15, pins 4, 5) are attenuated at the electronic volume control (IC18, pins 14, 11) and amplified at the AF buffer amplifier (IC20A, pins 3, 1). The signals are then amplified at the AF power amplifier (IC26, pin 2) to drive the external intercom speaker via the relay (RL2).

When the external intercom-1 switch is turned ON, the external intercom speaker functions as a microphone. The audio signals from the external intercom speaker pass through the relay (RL2) and an audio switch (IC15, pins 13, 14) and are then amplified at the audio amplifier (IC14B, pins 2, 1). The amplified signals pass through the audio selector (IC16, pins 3, 4), the [VOLUME] control, and are then amplified at the AF power amplifier (IC26, pin 5) to drive the internal speaker via the relay (RL1).

### 3-5-2 HAILER SIGNAL LINES (MAIN UNIT)

When the hailer function is activated, microphone signals from the audio selector (IC15, pins 4, 3) are attenuated at the electronic volume control (IC18, pins 3, 6), and amplified at the AF buffer amplifier (IC20B, pins 5, 7). The signals are then amplified at the AF power amplifier (IC27, pins 9, 2) to drive a hailer speaker via the relay (RL4).

When the external intercom-2 switch is turned ON, an external hailer speaker functions as a microphone. AF signals from the hailer speaker pass through the relay (RL4), audio selector (IC15, pins 12, 14), AF amplifier (IC14, pins 2, 1), audio selector (IC16, pins 3, 4) and are then amplified at the AF power amplifier (IC26, pins 5, 8) to drive the internal speaker via the relay (RL1).

## HAILER/INTERCOM BLOCK DIAGRAM

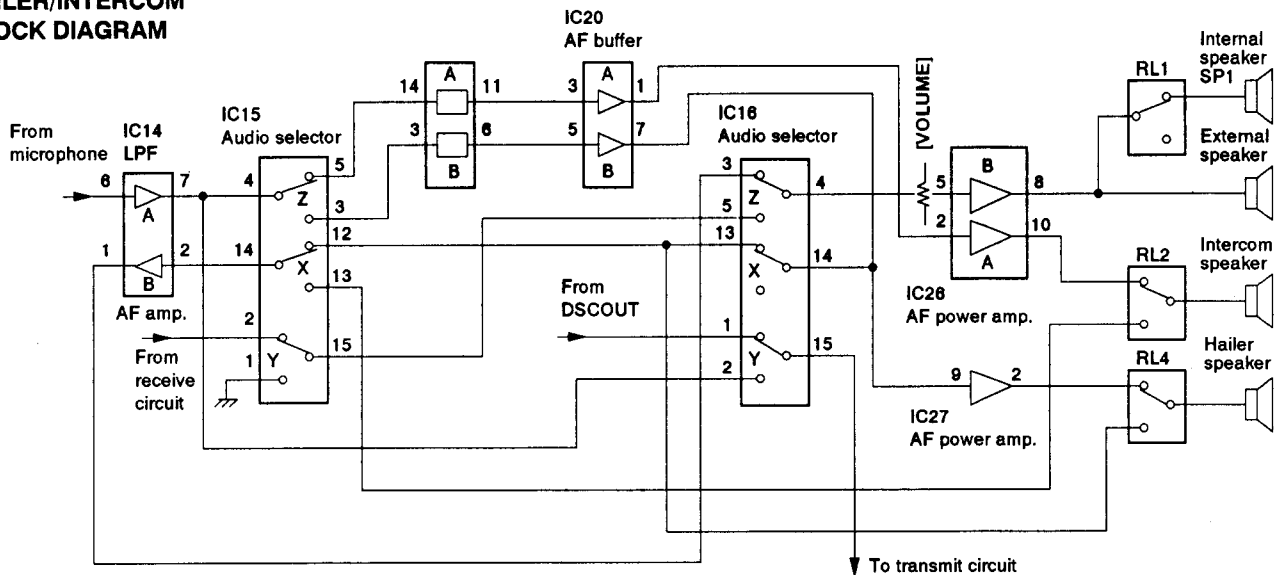


Fig. 4

### 3-5-3 AUTOMATIC FOG HORN CIRCUIT (MAIN UNIT)

When the automatic fog horn function is activated, a 400 Hz square wave signal from the auto fog horn oscillator (IC17, pin 3) is applied to the attenuator (IC18, pin 3) and then buffer amplified at IC20B (pins 5, 7).

The signals are then amplified at the AF power amplifier (IC27, pin 9) to drive the hailer speaker via the relay (RL4).

## 3-6 LOGIC CIRCUITS

### 3-6-1 S/R/F INDICATOR CIRCUIT (MAIN, LOGIC UNITS)

IC11B (pin 7) on the MAIN unit outputs a "HIGH" signal as a reference voltage for the detected S/R/F signal level. IC2B functions as a comparator.

- RECEIVE SIGNAL STRENGTH INDICATOR CIRCUIT**  
 When receiving, the 455 kHz 2nd IF signal from the 2nd IF filter (FI2 on the MAIN unit) is amplified at Q7 and Q8 and is then rectified at the detector circuit (D11, D12, C55, R70, R71) to be converted to DC voltage as the RFDI signal.
- RF OUTPUT POWER INDICATOR CIRCUIT**  
 When transmitting, D24 on the MAIN unit detects the forward component of the RF output power. The detected signal is amplified at IC10A (pin 3). IC10A (pin 1) outputs DC voltage as the RFDI signal.

- COMMON CIRCUIT**

The RFDI signal is applied to IC2B pin 6 on the LOGIC unit. The time interval between "HIGH" output from IC2B (pin 5) and "HIGH" output from IC2B (pin 7) is related to the RFDI signal. Increasing the RFDI signal increases this interval. IC1 measures the interval and the S/R/F indicator displays the relative receive signal strength or transmit power.

### 3-6-2 CPU RESET CIRCUIT (LOGIC UNIT)

The resetting IC (IC3) 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 IC3 threshold voltage, IC3 outputs "HIGH." The signal switches Q8, for a period determined by the differential circuit (C6, R18, R19), to set the CPU to the operating mode. When turning power OFF, IC3 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

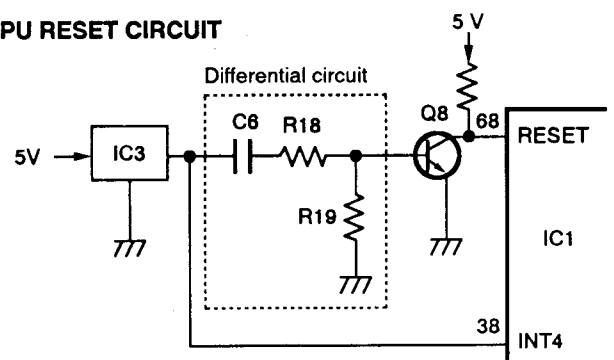


Fig. 5

### 3-6-3 INITIAL MATRIX (LOGIC UNIT)

NAME	DESCRIPTION
HOLLAND	Activates the holland channels.
CH70 INH	Inhibits channel 70.
WX OFF	Inhibits the weather channels. The [WX] switch becomes the [CALL] switch.
P-SCAN	ON : Permits the p-scan function. OFF : Permits the full scan function.
INT1	Selects the international-1 channels.
SCAN OFF	Inhibits the scan function.
USA OFF	Inhibits the U.S.A. channels.
TOT OFF	Inhibits the time-out timer function.

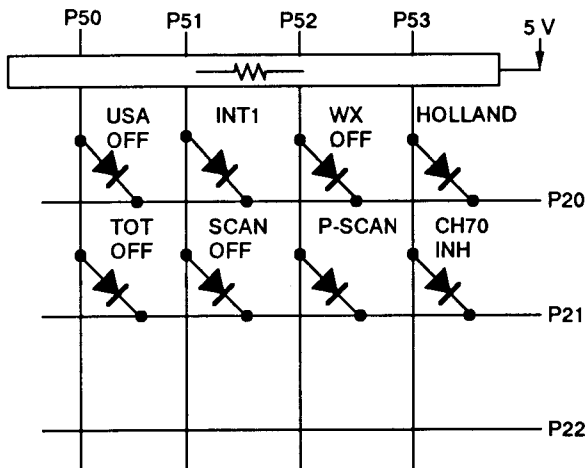


Fig. 6

### 3-6-4 CPU POWER SUPPLY CIRCUIT (LOGIC UNIT)

When the power switch is turned OFF, a voltage is applied to IC1 (pin 7) via D8 from the lithium backup battery (BT1) to backup the memory contents.

### 3-6-5 DIMMER CIRCUIT (LOGIC UNIT)

By changing output levels at IC1 pins 66 and 67, the collector current of Q2 and Q4 change. Therefore, the intensity of the backlighting (DS2-DS4) changes through 4 levels.

### 3-6-6 CPU PORT ALLOCATIONS

#### • INPUT PORTS

PIN	NAME	DESCRIPTION
38	P00 INT4	Detects a signal for the standby mode of the CPU. The CPU enters the standby mode when the port becomes "LOW."
41	P03 SI	Inputs a signal from the [F] switch.
42	P10 INT0	Inputs a signal on the PTT line. This port becomes "LOW" when the PTT switch is pushed.
43	P11 INT1	Inputs a signal from the [HAILER] switch.
44, 45	P12, P13 INT2, TI0	Input ports for the up/down signal of the channel selector.
46-48	P20-22	Input ports for the keyboard matrix and initial matrix.
60	P60 KR0	This port receives a compared voltage for the S/Rf indicator circuit.
63	LE/D	Inputs serial data from IC22 pin 1 on the MAIN unit.

#### • OUTPUT PORTS

PIN	NAME	DESCRIPTION
29-32	P40-P43	Output strobe signals for the keyboard matrix.
34-37	P50-P53	Output strobe signals for the initial matrix.
39	P01 SCK	Outputs a synchronized clock signal for the PLL data.
40	P02 SO	Outputs a data signal synchronized with the CK signal.
49	P23 BUZ	Output port for a PLL data strobe signal.
51	P31 SYNC	Outputs a strobe signal for an optional voice synthesizer.
52	P32 VLSTB	Outputs the electronic volume control strobe signal.
53	P33 HISTB	Outputs a strobe signal for IC23 (pin 1), IC24 (pin 1) on the MAIN unit.
61	P61 KR1	Outputs a reference signal for the comparator for the S/Rf indicator.
63	LE/D	Outputs a data signal for IC23 (pins 15, 16) and IC24 (pins 15, 16).
64	P70 BEEP1	Outputs 500 Hz and 1 kHz beep tones for the internal speaker.
65	P71 BEEP2	Outputs 500 Hz and 1 kHz beep tones for the hailer speaker.
66, 67	P72, P73 KR6, KR5	Outputs signals to control the intensity of the function display backlighting.



### 3-6-7 EXPANDER IC PORT ALLOCATIONS

#### • IC22 INPUT PORTS

PIN	NAME	DESCRIPTION
3	UA-1	When an optional UA-1 AUDIO AMPLIFIER is connected, this port receives "LOW."
4	CALL1	Input port for an external intercom-1 switch. When this port receives "LOW," an audio signal from the hailer speaker is sent to the internal speaker.
5	CALL2	Input port for an external intercom-2 switch. When this port receives "LOW," an audio signal from the intercom speaker is sent to the internal speaker.
6	HANG	Detects the microphone hanger condition. When this port changes from "HIGH" to "LOW," the transceiver selects channel 16.
7	TONE	When a 1050 Hz NOAA weather alert tone is received, this port receives "LOW."
9	SQL	Input port for a squelch trigger signal. When the squelch closes, this port receives "HIGH."
10	UNLK	When the PLL circuit is unlocked, this port receives "LOW."
11	ANT	When an antenna has a mismatched condition, this port receives "LOW."
12	SC/ON	When an optional voice scrambler unit is permitted to use, this port receives "HIGH."
14	SC/CON	When scramble code selection is permitted, this port receives "HIGH."
15	LBAT	Receives low battery voltage condition. When battery voltage is lower than 11 V, this port receives "LOW."

#### • IC23 OUTPUT PORTS

PIN	NAME	DESCRIPTION
4	Q1 FOG	When the automatic fog horn function is activated, this port becomes "HIGH" to oscillate IC17.
5	Q2 IC16(X)	When the hailer function is activated and the PTT switch is released, this port becomes "HIGH." An audio signal from an external hailer speaker is sent to the internal speaker.
6	Q3 TMUT	Outputs the transmit mute signal. While receiving, this port becomes "HIGH."
7	Q4 LOWO	Outputs the transmit power selecting signal. When low output power is selected, this port becomes "HIGH."
11	Q8 SEND	Outputs the transmit/receive switching signal. While transmitting, this port becomes "HIGH."
12	Q7 RL1	When the internal speaker is selected, this port becomes "HIGH."
13	Q6 RL2	When the intercom function is activated and the PTT switch is pushed, this port becomes "HIGH." An audio signal from the microphone is sent to the intercom speaker.
14	Q5 RL4	When the hailer function is activated and the PTT switch is pushed, this port becomes "HIGH." An audio signal from IC27 is sent to the hailer speaker.

#### • IC24 OUTPUT PORTS

PIN	NAME	DESCRIPTION
4	Q1 IC16(Z)	When the hailer or incom function is activated, this port becomes "HIGH."
5	Q2 IC16(Y)	When transmitting, this port becomes "HIGH." An audio signal from the microphone is sent to the transmit circuit.
6	Q3 SCRM	When the scrambler function is activated, this port becomes "HIGH." Activates an optional voice scrambler unit.
11	Q8 IC15(I)	While beep tones are emitted, this port becomes "HIGH." Prevents the beep tones from being emitted from the intercom or hailer speaker.
12	Q7 IC15(X)	When the hailer function is activated and the PTT switch is released, this port becomes "HIGH." An audio signal from the hailer speaker is sent to the internal speaker.
13	Q16 IC15(Y)	Outputs a receive mute signal. While transmitting, this port becomes "HIGH."
14	Q5 IC15(Z)	When the hailer function is activated and the PTT switch is pushed, this port becomes "HIGH." An audio signal from the microphone is sent to the hailer speaker.

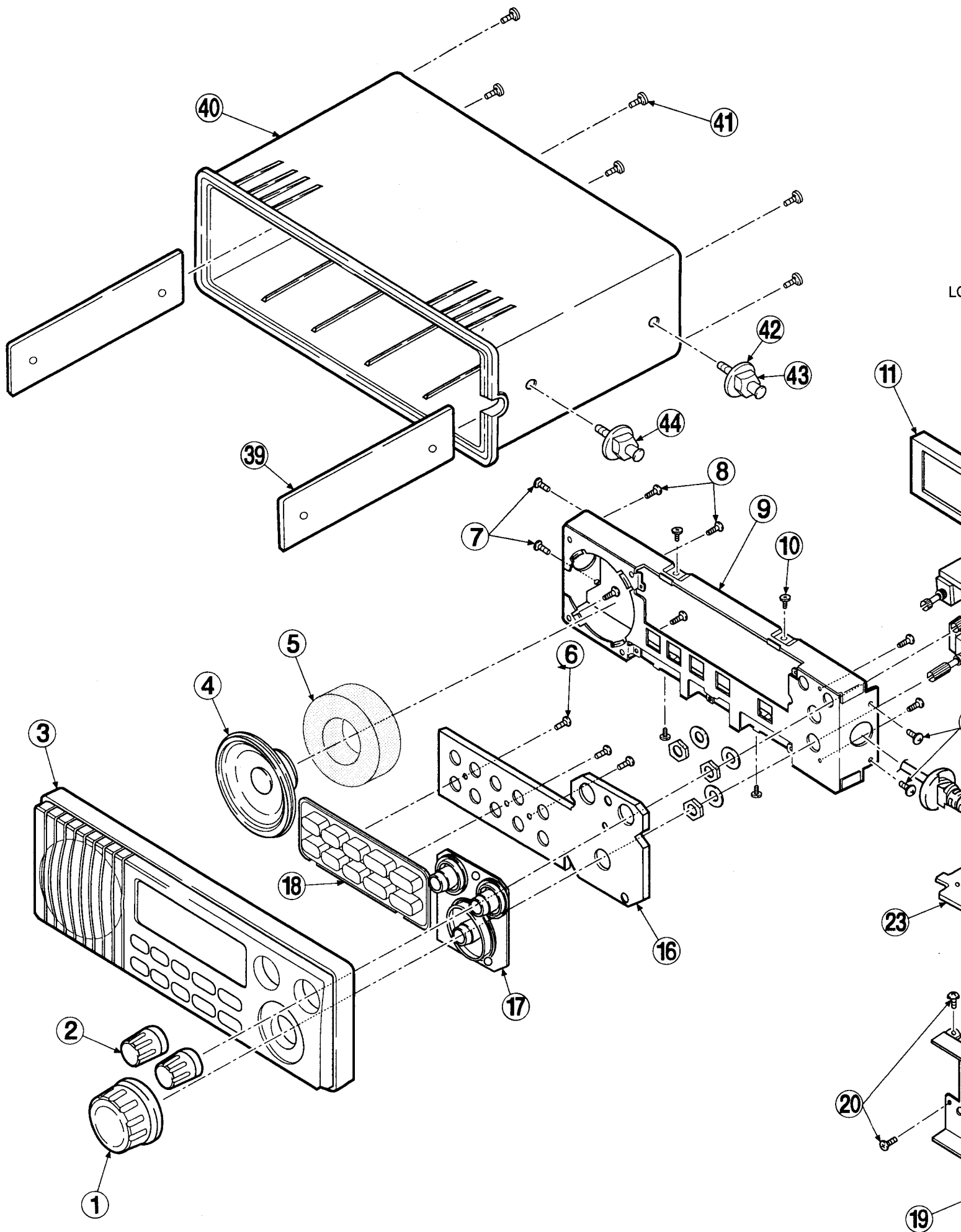
# SECTION 4 MECHANICAL PARTS AND DISSASSEMBLY

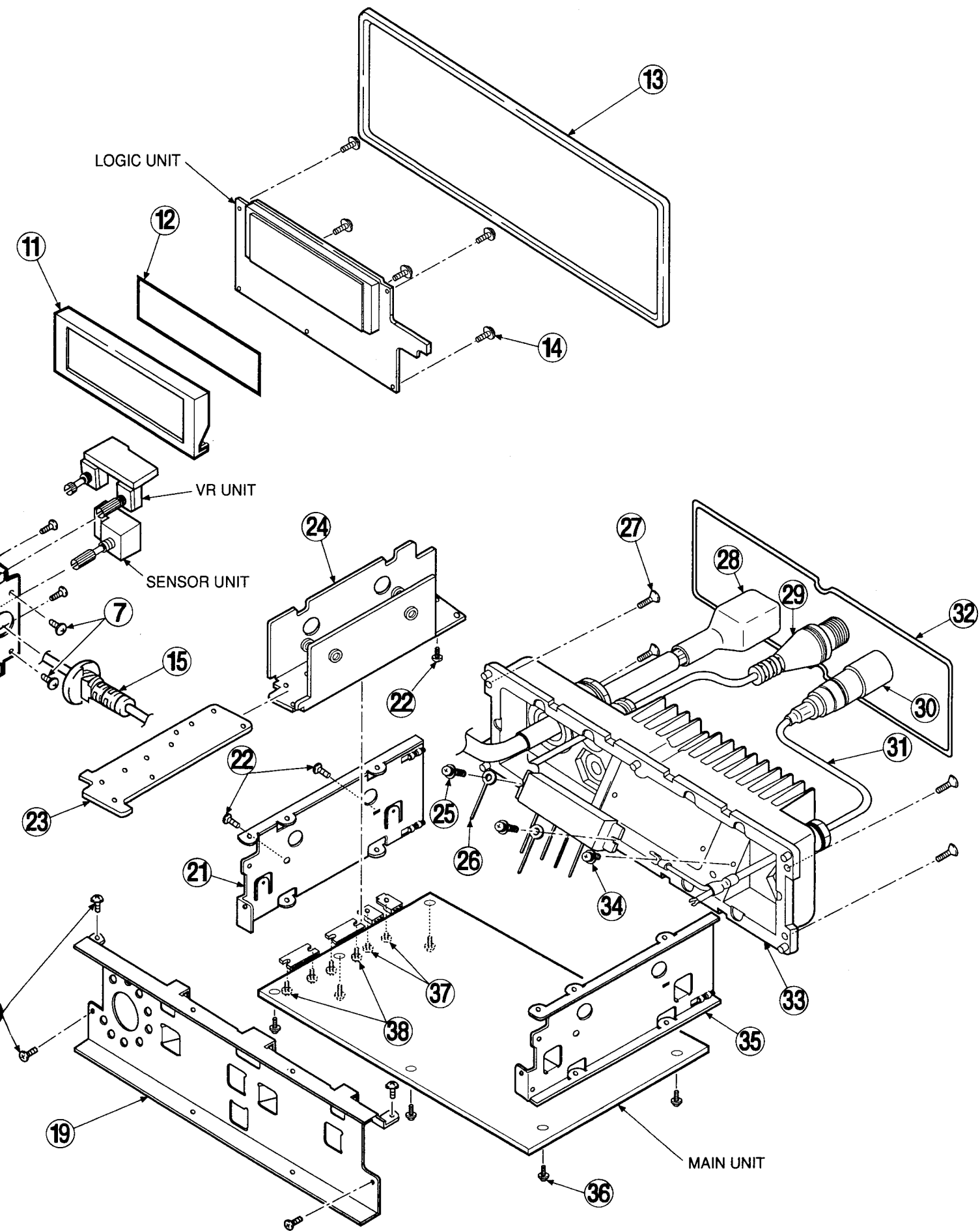
## 4-1 FRONT PANEL AND CHASSIS PARTS

LABEL NO.	ORDER NO.	DESCRIPTION	QTY.
①	8610007970	Knob N-190 (black)	1
	8610007990	Knob N-190(A) (white)	1
②	8610007960	Knob N-189 (black)	2
	8610007980	Knob N-189(A) (white)	2
③	8210007600	1209 Front panel (black) incl. window plate	1
	8210007590	1209 Front panel (A) (white) incl. window plate	1
④	2510000190	Speaker 66F09N-4 8Ω	1
⑤	8930025110	1209 SP sponge	1
⑥	8810001680	Tapping screw PH B0 M3 x 6	3
⑦	8810000230	Screw PH M3 x 6	4
⑧	8810001680	Tapping screw PH B0 M3 x 6	6
⑨	8010012440	1209 Sub chassis	1
⑩	8810002170	Screw FH M3 x 6	4
⑪	8930024350	1209 LCD cover	1
⑫	8310026880	1209 Mask film	1
⑬	8930015610	Front seal	1
⑭	8810003360	Setscrew (C) M3 x 8	5
⑮	7700001430	Microphone (black) EM83	1
	7700001420	Microphone (white) EM82	1
⑯	8010012390	1209 Sub reflector	1
⑰	8930024360	1209 Rubber seal	1
⑱	8930024400	1209 Front rubber	1
⑲	8010012410	1209 Front chassis	1
⑳	8810000230	Screw PH M3 x 6	4
㉑	8010012420	1209 Side chassis (L)	1

LABEL NO.	ORDER NO.	DESCRIPTION	QTY.
㉒	8810000230	Screw PH M3 x 6	3
㉓	8930024590	1209 AF plate	1
㉔	8410001780	1209 AF heatsink	1
㉕	8810003170	Setscrew (A) M3 x 8	2
㉖	6910000690	Cable tie 59TC4772	2
㉗	8810004050	Screw FH M3 x 14	4
㉘	8900003650	Power cable OPC-367	1
㉙	8900003660	ACC connector cable OPC-368	1
㉚	6950000040	M-type cap	1
㉛	8900003560	Antenna cable OPC-370	1
㉜	8930003000	Rear seal	1
㉝	8410001770	1209 Heatsink	1
㉞	8010003360	Setscrew (C) M3 x 6	1
㉟	8010012430	1209 Side chassis (R)	1
㊱	8810003370	Setscrew (C) M3 x 8	6
㊲	8810003170	Setscrew (A) M3 x 8	2
㊳	8810003380	Setscrew (C) M3 x 10	4
㊴	8010000520	Side plate	2
㊵	8010013011	Case (A)-1 (black)	1
	8010002501	Case-1 (white)	1
㊶	8810002950	Screw BiH M3 x 6 SUS	6
㊷	8850000050	Washer	4
㊸	8820000040	Nut (A)	2
㊹	8820000050	Nut (B)	2

**Screw head style** PH: Pan head FH: Flat head BiH: Binding head B0: Self-tapping

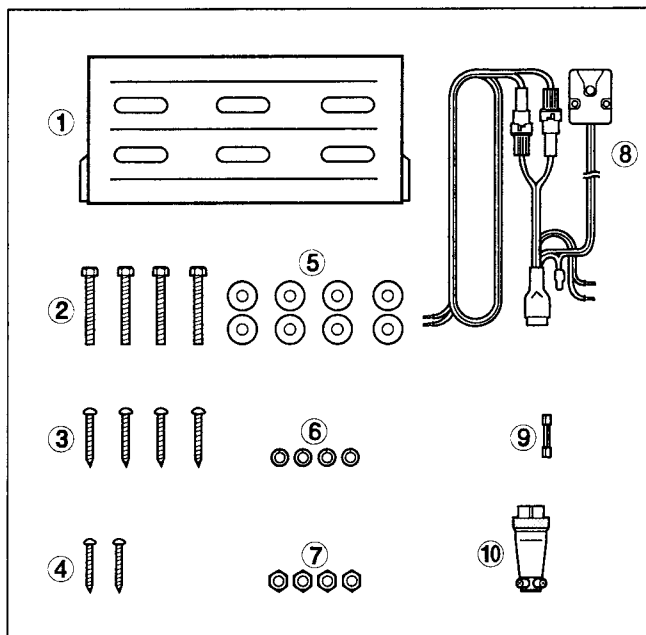




## 4-2 ACCESORIES

LABEL NO.	ORDER NO.	DESCRIPTION	QTY.
①	8010003671	Mounting Bracket (black)	1
	8010003641	Mounting Bracket (white)	1
②	8810003500	HH Bolt M6 x 50 SUS	4
③	810001500	Tapping Screw PH (A) B0 M6 x 30 SUS	4
④	8810001470	Tapping Screw (A) B0 M3.5 x 30 SUS	2
⑤	8850000200	Washer M6(6 x 20 x 1.5) SUS	8
⑥	8850000510	Spring Washer M6 SUS	4
⑦	8830000260	Nut M6 SUS	4
⑧	8900002950	OPC-291 (black)	1
	8900002960	OPC-291A (white)	1
⑨	5210000070	Fuse (10A)	1
⑩	6510009200	ACC Connector Plug	1

**Screw head style** PH: Pan head HH: Hex Head B0: Self-tapping



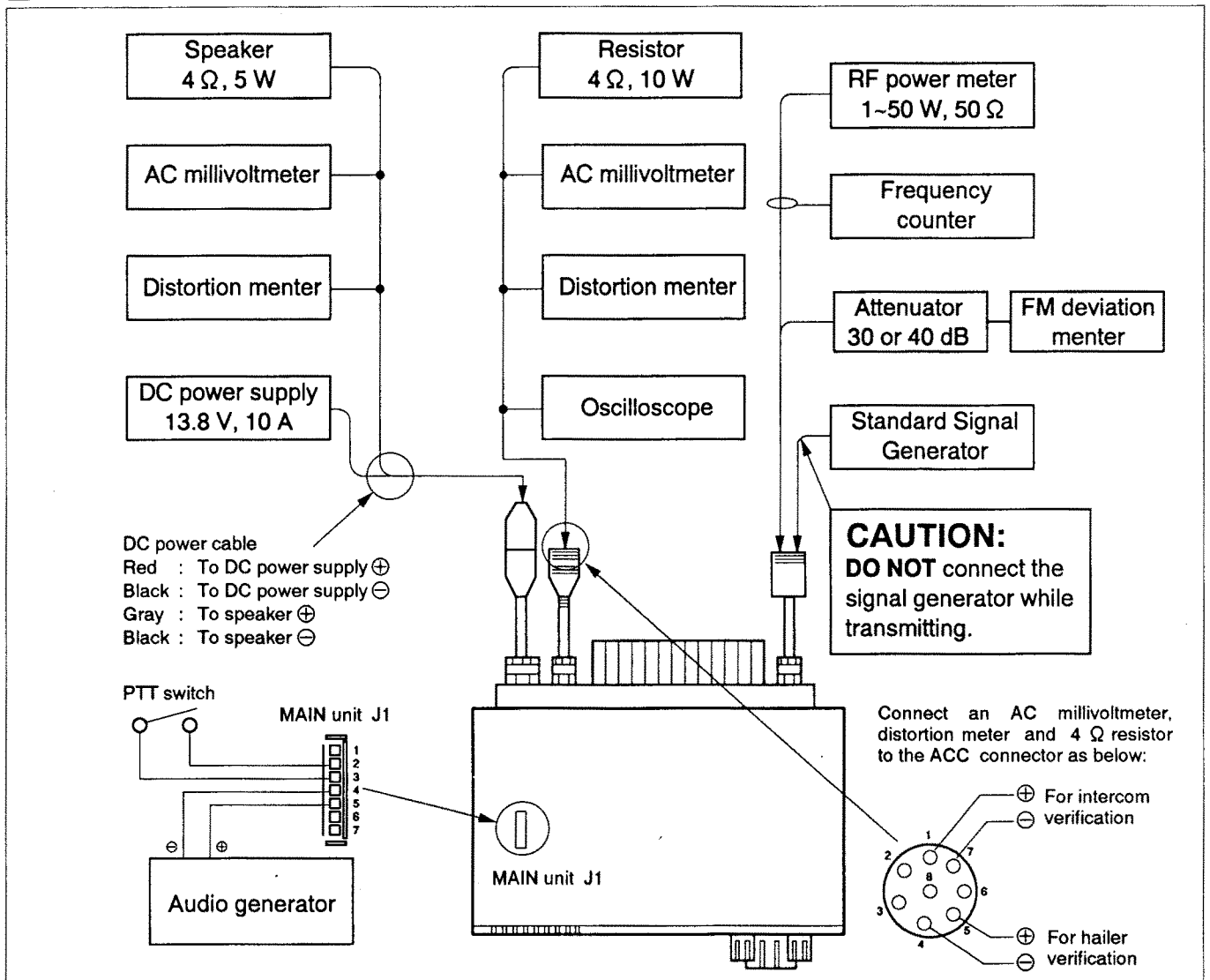
# SECTION 5 ADJUSTMENT PROCEDURES

## 5-1 PREPARATION BEFORE SERVICING

### ■ 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	Resistor	Resistance : 4 Ω Input power : 10 W
RF power meter (terminated type)	Measuring range : 1~50 W Frequency range : 0.1~500 MHz Impedance : 50 Ω SWR : Less than 1.2 : 1	Oscilloscope	Frequency range : DC~20 MHz Measuring range : 0.01~10 V
Frequency counter	Frequency range : 0.1~200 MHz Frequency accuracy: ± 1 ppm or better Sensitivity : 100 mV or better	AC millivoltmeter	Measuring range : 10 mV~10 V
Attenuator	Power attenuation : 30 or 40 dB Capacity : 40 W or more	Distortion meter	Frequency range : 1 kHz ± 10% Measuring range : 1~100%
FM deviation meter	Frequency minimum: 200 MHz Measuring range : 0~ ± 10 kHz	Digital multi-meter	Input impedance : 1 MΩ/DC or better
Standard signal generator (SSG)	Frequency range : 0.1~200 MHz Output level : 0.1 μV~32 mV (-127~-17 dBm)	Audio generator (AG)	Frequency range : 300~3000Hz Output level : 1~500 mV
		External speaker	Impedance : 4 Ω Max. input power : 5 W


### ■ CONNECTION



## 5-2 PLL ADJUSTMENT

ADJUSTMENT	ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
		UNIT	LOCATION		UNIT	ADJUST
LOCK VOLTAGE	1 <ul style="list-style-type: none"> <li>• Operating channel: 16</li> <li>• Receiving</li> </ul>	CPU	Connect the digital multi-meter or oscilloscope to CP1.	3.5 V	VCO	L4
	2 <ul style="list-style-type: none"> <li>• Transmitting</li> </ul>			3~5 V		Verify
REFERENCE FREQUENCY	1 <ul style="list-style-type: none"> <li>• Operating channel : 16</li> <li>• Transmitting</li> </ul>	MAIN	Loosely couple the frequency counter to the power meter.	156.800 MHz	MAIN	C93

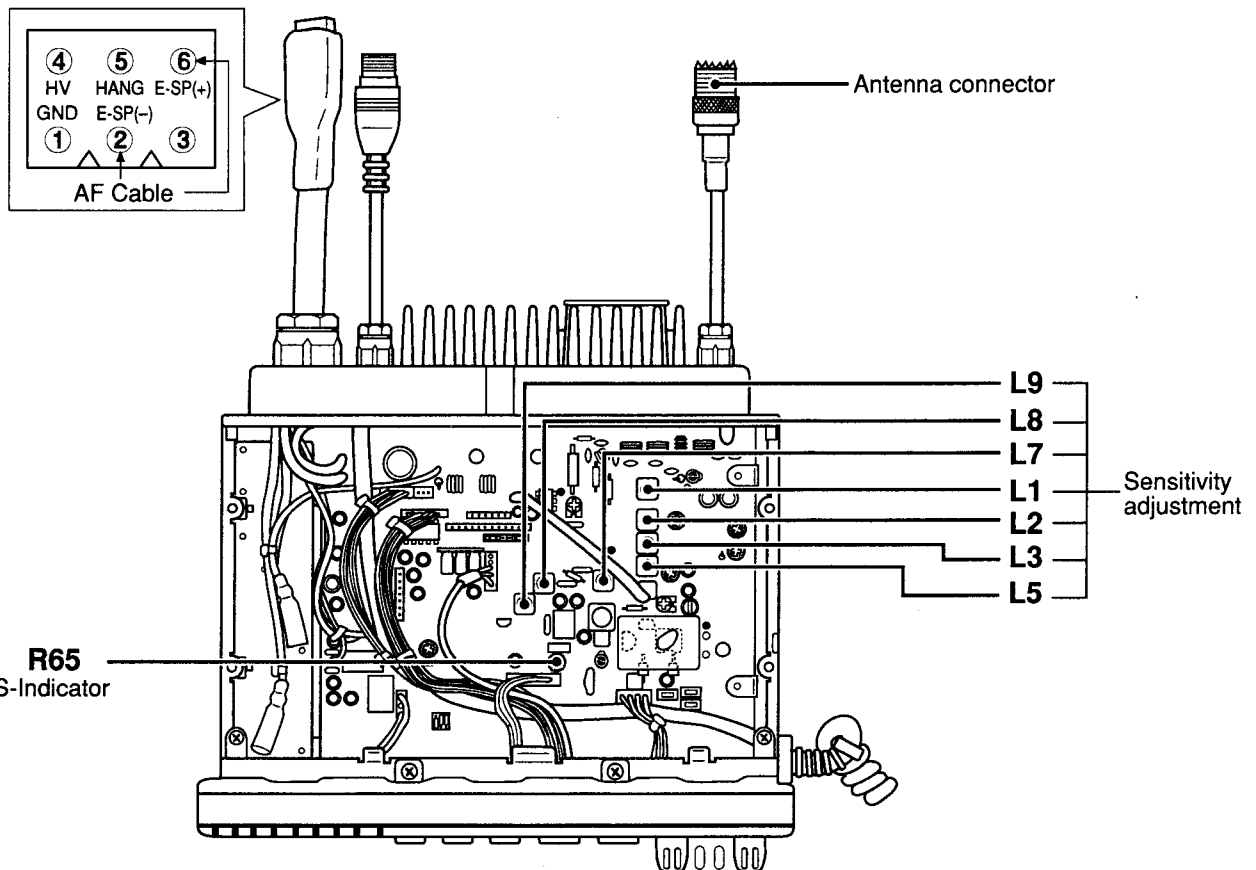
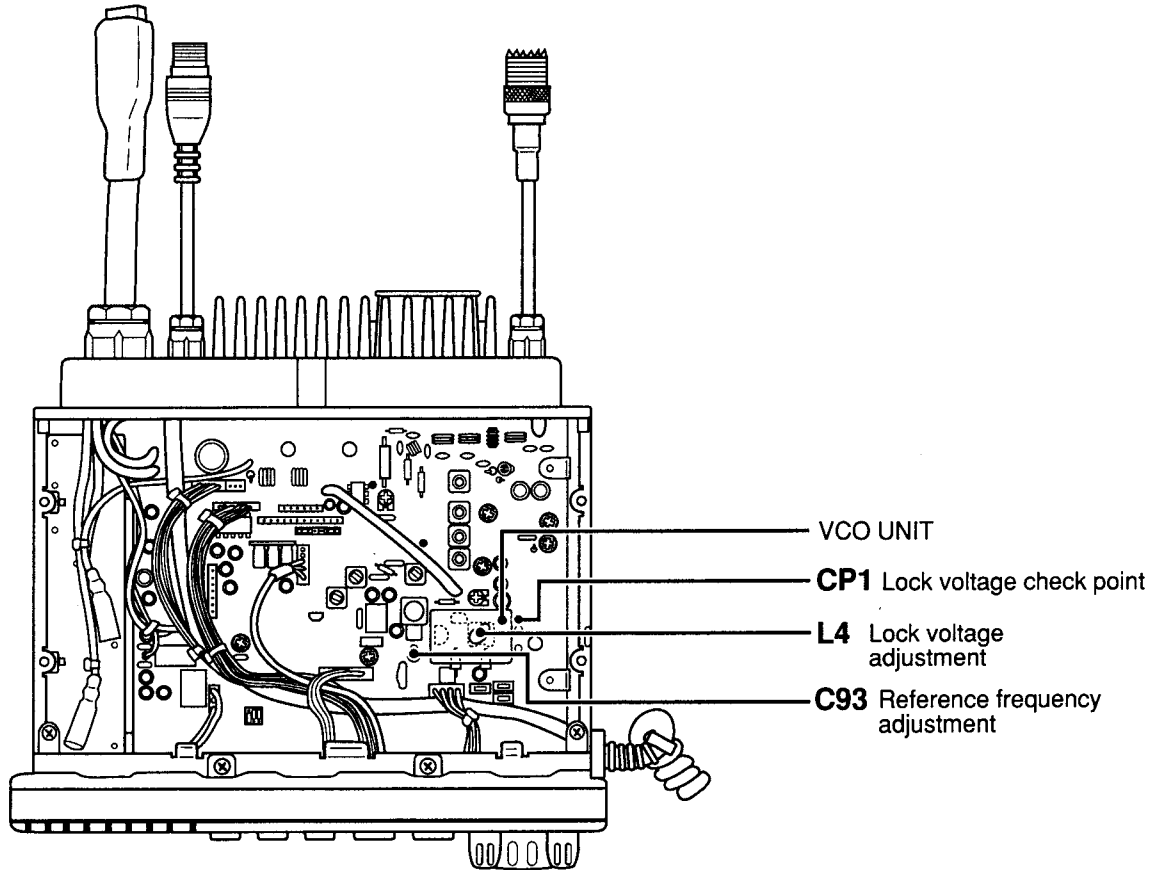
## 5-3 RECEIVER ADJUSTMENT

ADJUSTMENT	ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
		UNIT	LOCATION		UNIT	ADJUST
SENSITIVITY	1 <ul style="list-style-type: none"> <li>• Operating channel: 16</li> <li>• Connect the SSG to the antenna connector and set as:                Frequency : 156.80 MHz                Level : 31.6 <math>\mu</math> V*                ( - 77 dBm)                Deviation : <math>\pm</math> 3.5 kHz                Modulation: 1 kHz</li> <li>• Receiving</li> </ul>	Rear panel	Connect the distortion meter with a 4 $\Omega$ , 5 W speaker to the AF output cable.	Minimum distortion level.	MAIN	L1 L2 L3 L5 L7 L8 L9
S-INDICATOR	1 <ul style="list-style-type: none"> <li>• Operating channel: 16</li> <li>• Connect the SSG to the antenna connector and set as:                Frequency : 156.800 MHz                Level : 1 <math>\mu</math> V*                ( - 107 dBm)                Deviation : <math>\pm</math> 3.5 kHz                Modulation: 1 kHz</li> <li>• Receiving</li> </ul>	Function display	S/RF indicator	3 dots 	MAIN	R65

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


CCW: Counterclockwise.

• MAIN UNIT



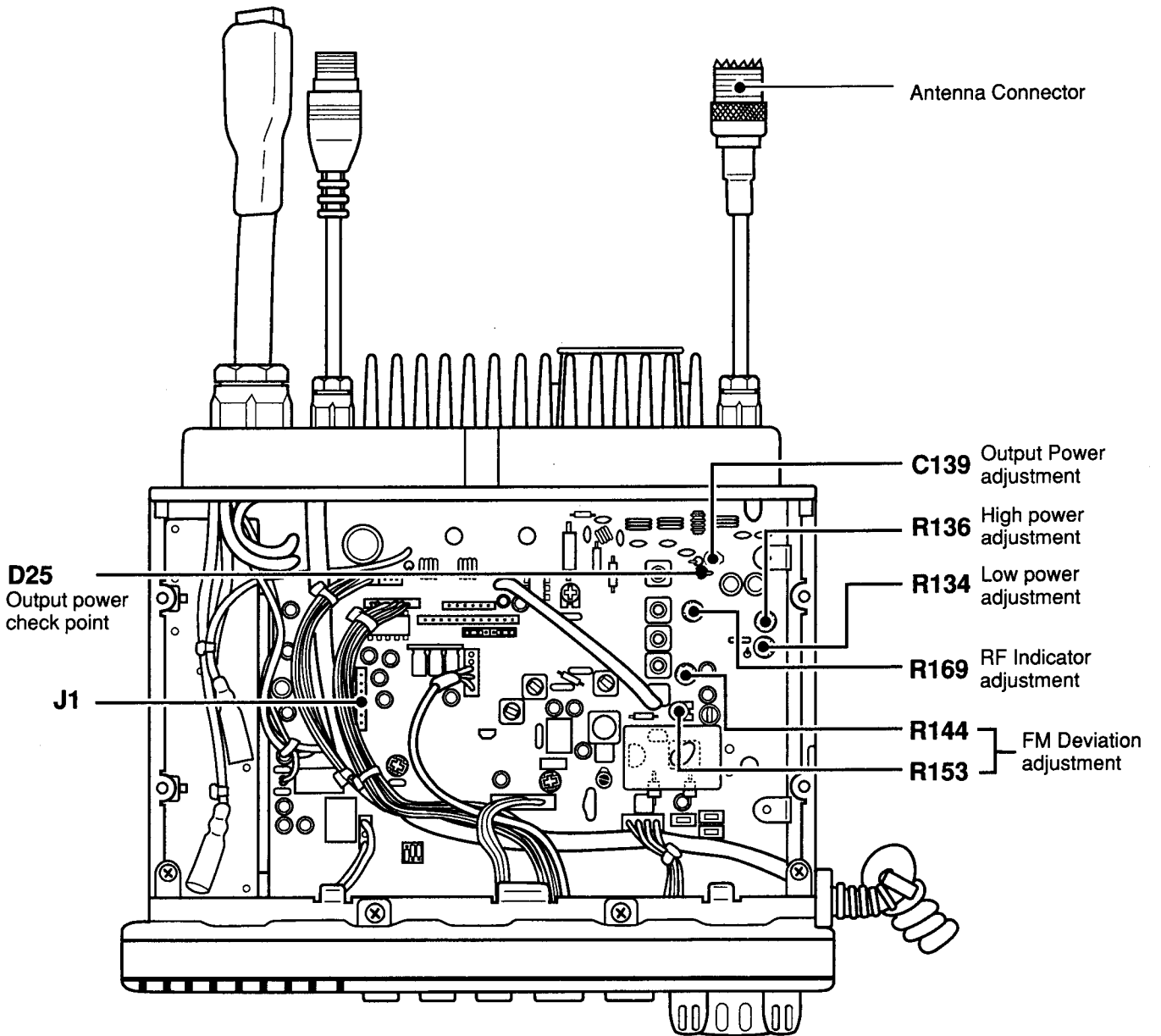


## 5-4 TRANSMITTER ADJUSTMENT

ADJUSTMENT	ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
		UNIT	LOCATION		UNIT	ADJUST
OUTPUT POWER	1 <ul style="list-style-type: none"> <li>• Operating channel : 16</li> <li>• R134, R136 : Max. CW</li> <li>• [HI/LO] switch : High</li> <li>• Transmitting</li> </ul>	MAIN	Connect the oscilloscope to D25 cathode.	Minimum voltage	MAIN	C139
	2 <ul style="list-style-type: none"> <li>• [HI/LO] switch: High</li> </ul>	Rear panel	Connect the RF power meter to the antenna connector.	25 W	MAIN	R136
	3 <ul style="list-style-type: none"> <li>• [HI/LO] switch: Low</li> </ul>			1 W		R134
RF INDICATOR	1 <ul style="list-style-type: none"> <li>• Operating channel : 16</li> <li>• [HI/LO] switch : Low</li> <li>• Transmitting</li> </ul>			3 dots 	MAIN	R169
FM DEVIATION	1 <ul style="list-style-type: none"> <li>• Operating channel : 16</li> <li>• Unplug a connector from J1 on the MAIN unit.</li> <li>• Connect the audio generator to J1 and set as:               <ul style="list-style-type: none"> <li>Frequency : 1 kHz</li> <li>Level : 40 mV</li> </ul> </li> <li>• Connect the FM deviation meter to the antenna connector and set as:               <ul style="list-style-type: none"> <li>HPF : OFF</li> <li>LPF : 20 kHz</li> <li>De-emphasis : OFF</li> <li>Detector : (P - P)/2</li> </ul> </li> <li>• R144 : Center</li> <li>• Transmitting</li> </ul>	Rear panel	Connect the FM deviation meter to the antenna connector through the attenuator.	± 4.3 kHz	MAIN	R153
	2 <ul style="list-style-type: none"> <li>• Set the FM deviation meter. Detector : - P and + P</li> </ul>			Same level at - P and + P.		R144
NOTE: After above adjustment, plug the connector to J1.						

CW: Clockwise.

• MAIN UNIT



## 5-5 HAILER/INTERCOM VERIFICATION

ADJUSTMENT	ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
		UNIT	LOCATION		UNIT	ADJUST
HAILER / INTERCOM OUTPUT LEVEL	1 <ul style="list-style-type: none"> <li>• Unplug a connector from J1 on the MAIN unit.</li> <li>• Connect the audio generator to J1 and set as:                Frequency : 1 kHz                Level : 40 mV</li> <li>• Hailer function : ON</li> <li>• Make connection between J1 pin 2 and pin 3.</li> </ul>	Rear panel	Connect the AC millivoltmeter with a 4 Ω, 10 W resistor to the hailer terminals.	More than 6.5 V at 10% distortion	MAIN	Verify
	2 <ul style="list-style-type: none"> <li>• Intercom function : ON</li> <li>• Make connection between J1 pin 2 and pin 3.</li> </ul>	Rear panel	Connect the AC millivoltmeter with a 4 Ω, 10 W resistor to the intercom terminals.			
NOTE: After above adjustment, cancel the intercom function. Plug the connector to J1.						

## 5-6 AUTOMATIC FOG HORN ADJUSTMENT

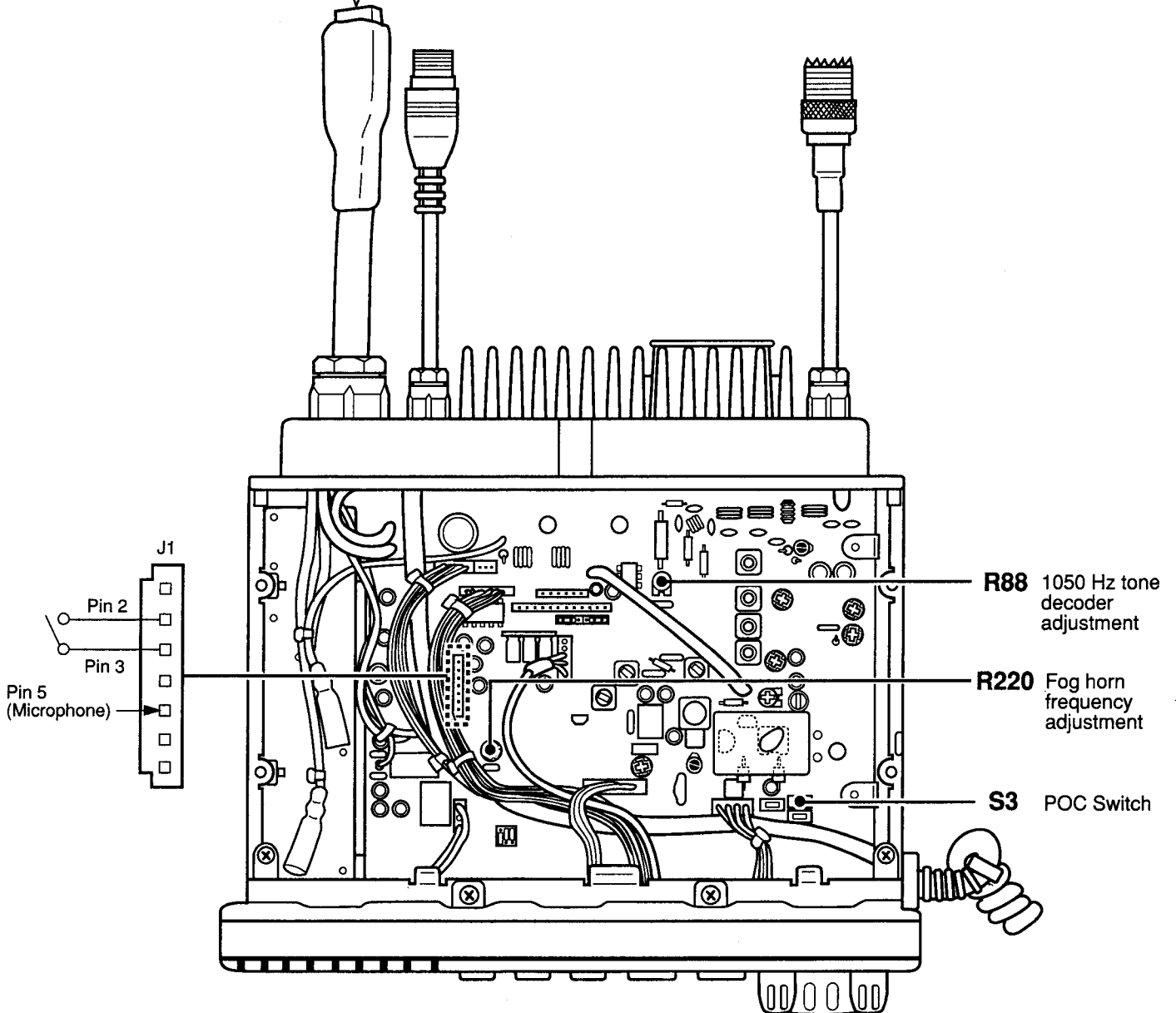
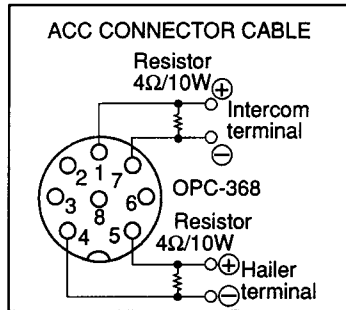
ADJUSTMENT	ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
		UNIT	LOCATION		UNIT	ADJUST
AUTOMATIC FOG HORN FREQUENCY	NOTE: Before this adjustment, if the weather alert function is activated, cancel the function.					
	1 <ul style="list-style-type: none"> <li>• Automatic fog horn function : ON</li> <li>• Push the POC switch (S3) on the MAIN unit.</li> </ul>	Rear panel	Connect the oscilloscope with a 4 Ω, 10 W resistor to the hailer terminals.	400 Hz sine wave	MAIN	R220
AUTOMATIC FOG HORN OUTPUT LEVEL	1 <ul style="list-style-type: none"> <li>• Push the POC switch (S3) on the MAIN unit.</li> </ul>		Connect the AC millivoltmeter with a 4 Ω, 10 W resistor to the hailer terminals.	More than 7 V		Verify

## 5-7 1050 Hz TONE DECODER ADJUSTMENT (U.S.A. version only)

ADJUSTMENT	ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
		UNIT	LOCATION		UNIT	ADJUST
1050 Hz TONE DECODER	1 <ul style="list-style-type: none"> <li>• Operating channel : WX10</li> <li>• Receiving</li> <li>• Connect the SSG to the antenna connector and set as:                Frequency : 163.275 MHz (WX 10)                Level : 31.6 μV* (-77 dBm)                Deviation : ± 3.5 kHz                Modulation: 1050 Hz</li> <li>• Weather alert function : ON</li> <li>• Push the POC switch (S3) on the MAIN unit.</li> </ul>	Front panel	Internal speaker	The center position of the range where the beep emits.	MAIN	R88
	2 <ul style="list-style-type: none"> <li>• [SQUELCH] : Center position.</li> <li>• Weather alert function: ON</li> <li>• Start weather full scan.</li> </ul>	Front panel	Function display	The weather scan function stops on WX 10.		Verify

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

• MAIN UNIT



# SECTION 6 PARTS LIST

## [MAIN UNIT]

REF. NO.	PARTS NO.	DESCRIPTION
IC1	1110001020	S.IC MC3357DR
IC2	1110002210	S.IC TA75358CF(TP1)
IC3	1110000960	S.IC NJM4558M(T1)
IC4	1110002210	S.IC TA75358CF(TP1)
IC5	1110000500	IC BA1604
IC6	1130003650	S.IC PLL2001S-ET
IC7	1150000460	IC S-AV6 / SC1038
IC8	1110000960	S.IC NJM4558M(T1)
IC9	1110002210	S.IC TA75358CF(TP1)
IC10	1110002210	S.IC TA75358CF(TP1)
IC11	1110002210	S.IC TA75358CF(TP1)
IC12	1110000490	IC AN6541
IC13	1180000010	IC TA78L005AP
IC14	1110000960	S.IC NJM4558M(T1)
IC15	1130002420	S.IC μPD4053BG
IC16	1130002420	S.IC μPD4053BG
IC17	1110001400	S.IC μPC1555G2-T1
IC18	1130003060	IC TC9154AP
IC19	1110002210	S.IC TA75358CF(TP1)
IC20	1110000960	S.IC NJM4558M(T1)
IC21	1110000960	S.IC NJM4558M(T1)
IC22	1150001110	S.IC M66007FP
IC23	1130005810	S.IC BU4094BF-T1
IC24	1130005810	S.IC BU4094BF-T1
IC26	1110002540	IC LA4445
IC27	1110002940	IC LA4461N
Q1	1580000540	S.FET 3SK131-T2-LA
Q2	1530002030	S.TRANSISTOR 2SC3772-3-TA
Q3	1530002030	S.TRANSISTOR 2SC3772-3-TA
Q4	1560000430	S.FET 2SK302-GR (TE85R)
Q5	1560000360	S.FET 2SK209-Y (TE85R)
Q6	1590000550	FET 2SJ107-BL
Q7	1530001950	S.TRANSISTOR 2SC2712-GR (TE85R)
Q8	1530001950	S.TRANSISTOR 2SC2712-GR (TE85R)
Q10	1530002030	S.TRANSISTOR 2SC3772-3-TA
Q11	1530002030	S.TRANSISTOR 2SC3772-3-TA
Q12	1530001950	S.TRANSISTOR 2SC2712-GR (TE85R)
Q13	1510000500	S.TRANSISTOR 2SA1162-GR (TE85R)
Q14	1530001950	S.TRANSISTOR 2SC2712-GR (TE85R)
Q15	1560000360	S.FET 2SK209-Y (TE85R)
Q16	1530002030	S.TRANSISTOR 2SC3772-3-TA
Q17	1530002340	S.TRANSISTOR 2SC2954-T2B
Q18	1520000290	TRANSISTOR 2SB1015-Y
Q19	1510000500	S.TRANSISTOR 2SA1162-GR (TE85R)
Q20	1530000160	S.TRANSISTOR 2SC2712-Y (TE85RTEM)
Q21	1520000200	S.TRANSISTOR 2SB798-T2 DK
Q22	1520000200	S.TRANSISTOR 2SB798-T2 DK
Q23	1530000160	S.TRANSISTOR 2SC2712-Y (TE85RTEM)
Q24	1530000160	S.TRANSISTOR 2SC2712-Y (TE85RTEM)
Q25	1590001000	S.TRANSISTOR RN2427 (TE85R)
Q26	1590000420	S.TRANSISTOR RN1404 (TE85R)
Q27	1590000420	S.TRANSISTOR RN1404 (TE85R)
Q28	1590000420	S.TRANSISTOR RN1404 (TE85R)
Q29	1590000420	S.TRANSISTOR RN1404 (TE85R)
Q30	1590000420	S.TRANSISTOR RN1404 (TE85R)
Q31	1590001510	S.TRANSISTOR RN1424 (TE85R)
Q32	1590001510	S.TRANSISTOR RN1424 (TE85R)
Q34	1590001510	S.TRANSISTOR RN1424 (TE85R)
Q41	1590000420	S.TRANSISTOR RN1404 (TE85R)
Q42	1590000420	S.TRANSISTOR RN1404 (TE85R)
Q43	1590000420	S.TRANSISTOR RN1404 (TE85R)
Q44	1530002370	S.TRANSISTOR 2SC2714-O (TE85R)

## [MAIN UNIT]

REF. NO.	PARTS NO.	DESCRIPTION
Q45	1590000380	S.FET 2SJ106-Y (TE85R)
D1	1720000180	S.VARICAP 1SV164-T2B
D2	1720000180	S.VARICAP 1SV164-T2B
D3	1720000180	S.VARICAP 1SV164-T2B
D4	1720000180	S.VARICAP 1SV164-T2B
D5	1750000060	S.DIODE 1SS196 (TE85R)
D6	1730000120	ZENER RD6.2E B2
D7	1750000060	S.DIODE 1SS196 (TE85R)
D8	1750000060	S.DIODE 1SS196 (TE85R)
D9	1790000490	S.DIODE HSM88AS-TR
D11	1790000490	S.DIODE HSM88AS-TR
D12	1750000050	S.DIODE 1SS193 (TE85R)
D15	1790000450	S.DIODE MA862(TX)
D17	1750000050	S.DIODE 1SS193 (TE85R)
D18	1750000060	S.DIODE 1SS196 (TE85R)
D19	1730000390	ZENER RD4.7E B3
D20	1750000030	S.DIODE 1SS187 (TE85R)
D21	1710000290	DIODE MI308
D22	1710000290	DIODE MI308
D23	1710000290	DIODE MI308
D24	1790000690	S.DIODE HSM88ASR-TR
D25	1790000250	DIODE 1SS97
D26	1720000360	S.DIODE HSU88TRF
D27	1710000050	DIODE 1SS53
D28	1750000060	S.DIODE 1SS196 (TE85R)
D29	1750000060	S.DIODE 1SS196 (TE85R)
D31	1750000060	S.DIODE 1SS196 (TE85R)
D32	1750000020	S.DIODE 1SS184 (TE85R)
D33	1750000070	S.DIODE 1SS226 (TE85R)
D35	1750000070	S.DIODE 1SS226 (TE85R)
D37	1750000070	S.DIODE 1SS226 (TE85R)
D38	1750000070	S.DIODE 1SS226 (TE85R)
D40	1790000700	DIODE DSA3A1
X1	6050002000	XTAL CR-70
X2	6070000010	Discriminator CDB455C7A
X3	6050008080	XTAL CR-403
FI1	2010001050	FILTER 21M15B3(FL-141)
FI2	2020000120	CERAMIC CFW455E
L1	6150003820	COIL LS-440
L2	6150003820	COIL LS-440
L3	6150003820	COIL LS-440
L4	6110001540	COIL LA-234
L5	6150003820	COIL LS-440
L6	6140001840	COIL LR-220
L7	6150002950	COIL LS-304
L8	6150002730	COIL LS-298
L9	6150002720	COIL LS-297
L10	6110001570	COIL LA-237
L11	6110001600	COIL LA-243
L12	6110001530	COIL LA-233
L13	6110001570	COIL LA-237
L14	6110001560	COIL LA-236
L15	6110001560	COIL LA-236
L16	6170000180	COIL LW-19
L17	6110001740	COIL LA-263
L18	6110001680	COIL LA-254

S. = Surface mount

[MAIN UNIT]

REF. NO.	PARTS NO.	DESCRIPTION	
L19	6140001070	COIL	LR-132
L20	6110001680	COIL	LA-254
L21	6110001550	COIL	LA-235
L22	6180000850	COIL	LAL 03NA 4R7K
L23	6170000140	COIL	LW-15
R1	7030000620	S.RESISTOR	MCR10EZHZ 100 KΩ (104)
R2	7030000620	S.RESISTOR	MCR10EZHZ 100 KΩ (104)
R3	7030000580	S.RESISTOR	MCR10EZHZ 47 KΩ (473)
R4	7030000200	S.RESISTOR	MCR10EZHZ 33 Ω (330)
R5	7030000620	S.RESISTOR	MCR10EZHZ 100 KΩ (104)
R6	7030000570	S.RESISTOR	MCR10EZHZ 39 KΩ (393)
R7	7030000380	S.RESISTOR	MCR10EZHZ 1 KΩ (102)
R8	7030000620	S.RESISTOR	MCR10EZHZ 100 KΩ (104)
R9	7030000620	S.RESISTOR	MCR10EZHZ 100 KΩ (104)
R10	7030000620	S.RESISTOR	MCR10EZHZ 100 KΩ (104)
R11	7030000620	S.RESISTOR	MCR10EZHZ 100 KΩ (104)
R12	7030000260	S.RESISTOR	MCR10EZHZ 100 Ω (101)
R13	7030000620	S.RESISTOR	MCR10EZHZ 100 KΩ (104)
R14	7030000620	S.RESISTOR	MCR10EZHZ 100 KΩ (104)
R15	7030000500	S.RESISTOR	MCR10EZHZ 10 KΩ (103)
R16	7030000320	S.RESISTOR	MCR10EZHZ 330 Ω (331)
R17	7030000180	S.RESISTOR	MCR10EZHZ 22 Ω (220)
R18	7030000320	S.RESISTOR	MCR10EZHZ 330 Ω (331)
R19	7030000600	S.RESISTOR	MCR10EZHZ 68 KΩ (683)
R20	7030000620	S.RESISTOR	MCR10EZHZ 100 KΩ (104)
R21	7030000500	S.RESISTOR	MCR10EZHZ 10 KΩ (103)
R22	7030000500	S.RESISTOR	MCR10EZHZ 10 KΩ (103)
R23	7030000230	S.RESISTOR	MCR10EZHZ 56 Ω (560)
R24	7030000230	S.RESISTOR	MCR10EZHZ 56 Ω (560)
R25	7030000320	S.RESISTOR	MCR10EZHZ 330 Ω (331)
R26	7030000540	S.RESISTOR	MCR10EZHZ 22 KΩ (223)
R27	7030000380	S.RESISTOR	MCR10EZHZ 1 KΩ (102)
R28	7030000320	S.RESISTOR	MCR10EZHZ 330 Ω (331)
R29	7030000500	S.RESISTOR	MCR10EZHZ 10 KΩ (103)
R30	7030000350	S.RESISTOR	MCR10EZHZ 560 Ω (561)
R31	7030000260	S.RESISTOR	MCR10EZHZ 100 Ω (101)
R32	7030000500	S.RESISTOR	MCR10EZHZ 10 KΩ (103)
R33	7030000260	S.RESISTOR	MCR10EZHZ 100 Ω (101)
R34	7030000480	S.RESISTOR	MCR10EZHZ 6.8 KΩ (682)
R35	7030000420	S.RESISTOR	MCR10EZHZ 2.2 KΩ (222)
R36	7030000260	S.RESISTOR	MCR10EZHZ 100 Ω (101)
R37	7030000700	S.RESISTOR	MCR10EZHZ 470 KΩ (474)
R38	7030000420	S.RESISTOR	MCR10EZHZ 2.2 KΩ (222)
R39	7030000460	S.RESISTOR	MCR10EZHZ 4.7 KΩ (472)
R40	7030000580	S.RESISTOR	MCR10EZHZ 47 KΩ (473)
R41	7030000670	S.RESISTOR	MCR10EZHZ 270 KΩ (274)
R42	7030000500	S.RESISTOR	MCR10EZHZ 10 KΩ (103)
R43	7030000620	S.RESISTOR	MCR10EZHZ 100 KΩ (104)
R44	7030000420	S.RESISTOR	MCR10EZHZ 2.2 KΩ (222)
R45	7030000490	S.RESISTOR	MCR10EZHZ 8.2 KΩ (822)
R46	7030000670	S.RESISTOR	MCR10EZHZ 270 KΩ (274)
R47	7030000620	S.RESISTOR	MCR10EZHZ 100 KΩ (104)
R48	7030000500	S.RESISTOR	MCR10EZHZ 10 KΩ (103)
R49	7030000370	S.RESISTOR	MCR10EZHZ 820 Ω (821)
R50	7030000540	S.RESISTOR	MCR10EZHZ 22 KΩ (223)
R51	7030000420	S.RESISTOR	MCR10EZHZ 2.2 KΩ (222)
R52	7030000680	S.RESISTOR	MCR10EZHZ 330 KΩ (334)
R53	7030000380	S.RESISTOR	MCR10EZHZ 1 KΩ (102)
R54	7030000420	S.RESISTOR	MCR10EZHZ 2.2 KΩ (222)
R55	7030000420	S.RESISTOR	MCR10EZHZ 2.2 KΩ (222)
R56	7030000300	S.RESISTOR	MCR10EZHZ 220 Ω (221)
R57	7030000400	S.RESISTOR	MCR10EZHZ 1.5 KΩ (152)
R58	7030000540	S.RESISTOR	MCR10EZHZ 22 KΩ (223)
R59	7030000400	S.RESISTOR	MCR10EZHZ 1.5 KΩ (152)
R60	7030000580	S.RESISTOR	MCR10EZHZ 47 KΩ (473)
R61	7030000400	S.RESISTOR	MCR10EZHZ 1.5 KΩ (152)
R62	7030000650	S.RESISTOR	MCR10EZHZ 180 KΩ (184)
R63	7030000580	S.RESISTOR	MCR10EZHZ 47 KΩ (473)
R64	7030000430	S.RESISTOR	MCR10EZHZ 2.7 KΩ (272)
R65	7310000740	TRIMMER	RH0651CS3J2KA (472)

[MAIN UNIT]

REF. NO.	PARTS NO.	DESCRIPTION	
R66	7030000620	S.RESISTOR	MCR10EZHZ 100 KΩ (104)
R67	7030000400	S.RESISTOR	MCR10EZHZ 1.5 KΩ (152)
R68	7030000580	S.RESISTOR	MCR10EZHZ 47 KΩ (473)
R69	7030000380	S.RESISTOR	MCR10EZHZ 1 KΩ (102)
R70	7030000540	S.RESISTOR	MCR10EZHZ 22 KΩ (223)
R71	7030000550	S.RESISTOR	MCR10EZHZ 27 KΩ (273)
R72	7030000600	S.RESISTOR	MCR10EZHZ 68 KΩ (683)
R73	7030000490	S.RESISTOR	MCR10EZHZ 8.2 KΩ (822)
R74	7030000500	S.RESISTOR	MCR10EZHZ 10 KΩ (103)
R75	7030000500	S.RESISTOR	MCR10EZHZ 10 KΩ (103)
R76	7030000600	S.RESISTOR	MCR10EZHZ 68 KΩ (683)
R77	7030000490	S.RESISTOR	MCR10EZHZ 8.2 KΩ (822)
R79	7030000490	S.RESISTOR	MCR10EZHZ 8.2 KΩ (822)
R80	7030000490	S.RESISTOR	MCR10EZHZ 8.2 KΩ (822)
R82	7030000520	S.RESISTOR	MCR10EZHZ 15 KΩ (153)
R83	7030000740	S.RESISTOR	MCR10EZHZ 1 MΩ (105)
R84	7030000610	S.RESISTOR	MCR10EZHZ 82 KΩ (823)
R85	7030000740	S.RESISTOR	MCR10EZHZ 1 MΩ (105)
R86	7030000260	S.RESISTOR	MCR10EZHZ 100 Ω (101)
R88	7310001760	TRIMMER	RH0421CJ4J09A (223)
R89	7030000560	S.RESISTOR	MCR10EZHZ 33 KΩ (333)
R90	7030000260	S.RESISTOR	MCR10EZHZ 100 Ω (101)
R92	7030000380	S.RESISTOR	MCR10EZHZ 1 KΩ (102)
R93	7030000260	S.RESISTOR	MCR10EZHZ 100 Ω (101)
R94	7030000420	S.RESISTOR	MCR10EZHZ 2.2 KΩ (222)
R95	7030000300	S.RESISTOR	MCR10EZHZ 220 Ω (221)
R96	7030000260	S.RESISTOR	MCR10EZHZ 100 Ω (101)
R97	7030000440	S.RESISTOR	MCR10EZHZ 3.3 KΩ (332)
R98	7030000260	S.RESISTOR	MCR10EZHZ 100 Ω (101)
R99	7030000440	S.RESISTOR	MCR10EZHZ 3.3 KΩ (332)
R100	7030000420	S.RESISTOR	MCR10EZHZ 2.2 KΩ (222)
R101	7030000300	S.RESISTOR	MCR10EZHZ 220 Ω (221)
R102	7030000580	S.RESISTOR	MCR10EZHZ 47 KΩ (473)
R103	7030000510	S.RESISTOR	MCR10EZHZ 12 KΩ (123)
R104	7030000580	S.RESISTOR	MCR10EZHZ 47 KΩ (473)
R105	7030000580	S.RESISTOR	MCR10EZHZ 47 KΩ (473)
R106	7030000380	S.RESISTOR	MCR10EZHZ 1 KΩ (102)
R107	7030000590	S.RESISTOR	MCR10EZHZ 56 KΩ (563)
R108	7030000540	S.RESISTOR	MCR10EZHZ 22 KΩ (223)
R109	7030000330	S.RESISTOR	MCR10EZHZ 390 Ω (391)
R110	7030000490	S.RESISTOR	MCR10EZHZ 8.2 KΩ (822)
R111	7030000500	S.RESISTOR	MCR10EZHZ 10 KΩ (103)
R112	7030000580	S.RESISTOR	MCR10EZHZ 47 KΩ (473)
R113	7030000380	S.RESISTOR	MCR10EZHZ 1 KΩ (102)
R114	7030000140	S.RESISTOR	MCR10EZHZ 10 Ω (100)
R115	7030000540	S.RESISTOR	MCR10EZHZ 22 KΩ (223)
R116	7030000580	S.RESISTOR	MCR10EZHZ 47 KΩ (473)
R117	7030000580	S.RESISTOR	MCR10EZHZ 47 KΩ (473)
R118	7030000580	S.RESISTOR	MCR10EZHZ 47 KΩ (473)
R119	7030000460	S.RESISTOR	MCR10EZHZ 4.7 KΩ (472)
R120	7030000500	S.RESISTOR	MCR10EZHZ 10 KΩ (103)
R121	7030000260	S.RESISTOR	MCR10EZHZ 100 Ω (101)
R122	7030000380	S.RESISTOR	MCR10EZHZ 1 KΩ (102)
R123	7030000260	S.RESISTOR	MCR10EZHZ 100 Ω (101)
R124	7030000380	S.RESISTOR	MCR10EZHZ 1 KΩ (102)
R125	7030000140	S.RESISTOR	MCR10EZHZ 10 Ω (100)
R126	7010004650	RESISTOR	R50XJ 10 Ω
R127	7030000420	S.RESISTOR	MCR10EZHZ 2.2 KΩ (222)
R128	7030000260	S.RESISTOR	MCR10EZHZ 100 Ω (101)
R129	7030000490	S.RESISTOR	MCR10EZHZ 8.2 KΩ (822)
R130	7030000500	S.RESISTOR	MCR10EZHZ 10 KΩ (103)
R131	7030000460	S.RESISTOR	MCR10EZHZ 4.7 KΩ (472)
R132	7030000500	S.RESISTOR	MCR10EZHZ 10 KΩ (103)
R133	7030000340	S.RESISTOR	MCR10EZHZ 470 Ω (471)
R134	7310000710	TRIMMER	RH0651C13J1YA (102)
R135	7030000500	S.RESISTOR	MCR10EZHZ 10 KΩ (103)
R136	7310000780	TRIMMER	RH0651CS4J25A (473)
R137	7030000500	S.RESISTOR	MCR10EZHZ 10 KΩ (103)
R138	7030000260	S.RESISTOR	MCR10EZHZ 100 Ω (101)
R139	7030000700	S.RESISTOR	MCR10EZHZ 470 KΩ (474)
R140	7030000510	S.RESISTOR	MCR10EZHZ 12 KΩ (123)

S. = Surface mount

[MAIN UNIT]

REF. NO.	PARTS NO.	DESCRIPTION
R141	7030000390	S.RESISTOR MCR10EZHZ 1.2 KΩ (122)
R142	7030000470	S.RESISTOR MCR10EZHZ 5.6 KΩ (562)
R143	7030000430	S.RESISTOR MCR10EZHZ 2.7 KΩ (272)
R144	7310000810	TRIMMER RH0651CS5J10A (474)
R145	7030000620	S.RESISTOR MCR10EZHZ 100 KΩ (104)
R146	7030000500	S.RESISTOR MCR10EZHZ 10 KΩ (103)
R147	7030000550	S.RESISTOR MCR10EZHZ 27 KΩ (273)
R148	7030000510	S.RESISTOR MCR10EZHZ 12 KΩ (123)
R149	7030000590	S.RESISTOR MCR10EZHZ 56 KΩ (563)
R150	7030000510	S.RESISTOR MCR10EZHZ 12 KΩ (123)
R151	7030000260	S.RESISTOR MCR10EZHZ 100 Ω (101)
R152	7030000470	S.RESISTOR MCR10EZHZ 5.6 KΩ (562)
R153	7310001710	TRIMMER RH0421C14J0KA (103)
R154	7510000090	THERMISTOR ERT-D2FGL 202S
R155	7030000500	S.RESISTOR MCR10EZHZ 10 KΩ (103)
R156	7030000690	S.RESISTOR MCR10EZHZ 390 KΩ (394)
R157	7030000420	S.RESISTOR MCR10EZHZ 2.2 KΩ (222)
R158	7030000580	S.RESISTOR MCR10EZHZ 47 KΩ (473)
R159	7030000300	S.RESISTOR MCR10EZHZ 220 Ω (221)
R160	7030000580	S.RESISTOR MCR10EZHZ 47 KΩ (473)
R161	7030000700	S.RESISTOR MCR10EZHZ 470 KΩ (474)
R162	7030000700	S.RESISTOR MCR10EZHZ 470 KΩ (474)
R163	7030000700	S.RESISTOR MCR10EZHZ 470 KΩ (474)
R164	7030000700	S.RESISTOR MCR10EZHZ 470 KΩ (474)
R165	7030000700	S.RESISTOR MCR10EZHZ 470 KΩ (474)
R166	7030000620	S.RESISTOR MCR10EZHZ 100 KΩ (104)
R167	7030000700	S.RESISTOR MCR10EZHZ 470 KΩ (474)
R168	7030000260	S.RESISTOR MCR10EZHZ 100 Ω (101)
R169	7310000750	TRIMMER RH0651C14J2WA (103)
R170	7030000470	S.RESISTOR MCR10EZHZ 5.6 KΩ (562)
R171	7030000620	S.RESISTOR MCR10EZHZ 100 KΩ (104)
R172	7030000500	S.RESISTOR MCR10EZHZ 10 KΩ (103)
R173	7030000500	S.RESISTOR MCR10EZHZ 10 KΩ (103)
R174	7030000300	S.RESISTOR MCR10EZHZ 220 Ω (221)
R175	7030000460	S.RESISTOR MCR10EZHZ 4.7 KΩ (472)
R176	7030000460	S.RESISTOR MCR10EZHZ 4.7 KΩ (472)
R177	7030000460	S.RESISTOR MCR10EZHZ 4.7 KΩ (472)
R178	7030000460	S.RESISTOR MCR10EZHZ 4.7 KΩ (472)
R179	7030000460	S.RESISTOR MCR10EZHZ 4.7 KΩ (472)
R180	7030000620	S.RESISTOR MCR10EZHZ 100 KΩ (104)
R181	7030000140	S.RESISTOR MCR10EZHZ 10 Ω (100)
R182	7030000100	S.RESISTOR MCR10EZHZ 4.7 Ω (4R7)
R183	7030000100	S.RESISTOR MCR10EZHZ 4.7 Ω (4R7)
R185	7030000620	S.RESISTOR MCR10EZHZ 100 KΩ (104)
R186	7030000100	S.RESISTOR MCR10EZHZ 4.7 Ω (4R7)
R187	7030000100	S.RESISTOR MCR10EZHZ 4.7 Ω (4R7)
R188	7030000400	S.RESISTOR MCR10EZHZ 1.5 KΩ (152)
R189	7030000620	S.RESISTOR MCR10EZHZ 100 KΩ (104)
R191	7030000540	S.RESISTOR MCR10EZHZ 22 KΩ (223)
R192	7030000590	S.RESISTOR MCR10EZHZ 56 KΩ (563)
R193	7030000470	S.RESISTOR MCR10EZHZ 5.6 KΩ (562)
R194	7030000260	S.RESISTOR MCR10EZHZ 100 Ω (101)
R195	7030000430	S.RESISTOR MCR10EZHZ 2.7 KΩ (272)
R196	7030000260	S.RESISTOR MCR10EZHZ 100 Ω (101)
R197	7030000430	S.RESISTOR MCR10EZHZ 2.7 KΩ (272)
R198	7030000490	S.RESISTOR MCR10EZHZ 8.2 KΩ (822)
R200	7030000490	S.RESISTOR MCR10EZHZ 8.2 KΩ (822)
R202	7030000540	S.RESISTOR MCR10EZHZ 22 KΩ (223)
R203	7030000620	S.RESISTOR MCR10EZHZ 100 KΩ (104)
R204	7030000460	S.RESISTOR MCR10EZHZ 4.7 KΩ (472)
R205	7030000660	S.RESISTOR MCR10EZHZ 220 KΩ (224)
R206	7030000500	S.RESISTOR MCR10EZHZ 10 KΩ (103)
R207	7030000500	S.RESISTOR MCR10EZHZ 10 KΩ (103)
R208	7030000620	S.RESISTOR MCR10EZHZ 100 KΩ (104)
R209	7030000620	S.RESISTOR MCR10EZHZ 100 KΩ (104)
R211	7030000620	S.RESISTOR MCR10EZHZ 100 KΩ (104)
R212	7030000620	S.RESISTOR MCR10EZHZ 100 KΩ (104)
R213	7030000620	S.RESISTOR MCR10EZHZ 100 KΩ (104)
R214	7030000620	S.RESISTOR MCR10EZHZ 100 KΩ (104)
R215	7030000620	S.RESISTOR MCR10EZHZ 100 KΩ (104)
R216	7030000620	S.RESISTOR MCR10EZHZ 100 KΩ (104)

[MAIN UNIT]

REF. NO.	PARTS NO.	DESCRIPTION
R217	7030000620	S.RESISTOR MCR10EZHZ 100 KΩ (104)
R218	7030000620	S.RESISTOR MCR10EZHZ 100 KΩ (104)
R219	7030000430	S.RESISTOR MCR10EZHZ 2.7 KΩ (272)
R220	7310000800	TRIMMER RH0651CJ5J01A (224)
R221	7030000500	S.RESISTOR MCR10EZHZ 10 KΩ (103)
R222	7030000620	S.RESISTOR MCR10EZHZ 100 KΩ (104)
R223	7030000620	S.RESISTOR MCR10EZHZ 100 KΩ (104)
R224	7030000620	S.RESISTOR MCR10EZHZ 100 KΩ (104)
R226	7030000620	S.RESISTOR MCR10EZHZ 100 KΩ (104)
R227	7030000620	S.RESISTOR MCR10EZHZ 100 KΩ (104)
R230	7030000460	S.RESISTOR MCR10EZHZ 4.7 KΩ (472)
R231	7030000580	S.RESISTOR MCR10EZHZ 47 KΩ (473)
R232	7030000460	S.RESISTOR MCR10EZHZ 4.7 KΩ (472)
R233	7030000460	S.RESISTOR MCR10EZHZ 4.7 KΩ (472)
R234	7030000500	S.RESISTOR MCR10EZHZ 10 KΩ (103)
R235	7030000500	S.RESISTOR MCR10EZHZ 10 KΩ (103)
R237	7030000580	S.RESISTOR MCR10EZHZ 47 KΩ (473)
R238	7030000580	S.RESISTOR MCR10EZHZ 47 KΩ (473)
R239	7030000610	S.RESISTOR MCR10EZHZ 82 KΩ (823)
R240	7030000550	S.RESISTOR MCR10EZHZ 27 KΩ (273)
R241	7030000600	S.RESISTOR MCR10EZHZ 68 KΩ (683)
R242	7030000500	S.RESISTOR MCR10EZHZ 10 KΩ (103)
R243	7030000590	S.RESISTOR MCR10EZHZ 56 KΩ (563)
R244	7030000580	S.RESISTOR MCR10EZHZ 47 KΩ (473)
R245	7030000580	S.RESISTOR MCR10EZHZ 47 KΩ (473)
R246	7030000500	S.RESISTOR MCR10EZHZ 10 KΩ (103)
R247	7030000580	S.RESISTOR MCR10EZHZ 47 KΩ (473)
R248	7030000420	S.RESISTOR MCR10EZHZ 2.2 KΩ (222)
R249	7030000500	S.RESISTOR MCR10EZHZ 10 KΩ (103)
R250	7030000620	S.RESISTOR MCR10EZHZ 100 KΩ (104)
R251	7030000670	S.RESISTOR MCR10EZHZ 270 KΩ (274)
R252	7520000010	POSISTOR PTH60T222M
R253	7030000260	S.RESISTOR MCR10EZHZ 100 Ω (101)
R254	7030000540	S.RESISTOR MCR10EZHZ 22 KΩ (223)
R256	7030000620	S.RESISTOR MCR10EZHZ 100 KΩ (104)
R257	7030000580	S.RESISTOR MCR10EZHZ 47 KΩ (473)
R258	7030000580	S.RESISTOR MCR10EZHZ 47 KΩ (473)
R259	7030000580	S.RESISTOR MCR10EZHZ 47 KΩ (473)
R260	7030000500	S.RESISTOR MCR10EZHZ 10 KΩ (103)
R261	7030000620	S.RESISTOR MCR10EZHZ 100 KΩ (104)
R262	7030000300	S.RESISTOR MCR10EZHZ 220 Ω (221)
R263	7030000140	S.RESISTOR MCR10EZHZ 10 Ω (100)
R264	7030000510	S.RESISTOR MCR10EZHZ 12 KΩ (123)
R265	7030000590	S.RESISTOR MCR10EZHZ 56 KΩ (563)
R266	7030000530	S.RESISTOR MCR10EZHZ 18 KΩ (183)
R267	7030000380	S.RESISTOR MCR10EZHZ 1 KΩ (102)
R268	7030000380	S.RESISTOR MCR10EZHZ 1 KΩ (102)
R269	7030000500	S.RESISTOR MCR10EZHZ 10 KΩ (103)
R270	7030000380	S.RESISTOR MCR10EZHZ 1 KΩ (102)
R271	7030000500	S.RESISTOR MCR10EZHZ 10 KΩ (103)
R272	7030000500	S.RESISTOR MCR10EZHZ 10 KΩ (103)
R273	7030000440	S.RESISTOR MCR10EZHZ 3.3 KΩ (332)
R274	7030000290	S.RESISTOR MCR10EZHZ 180 Ω (181)
R275	7010004450	RESISTOR R20J 100 KΩ
R275	7030000620	S.RESISTOR MCR10EZHZ 100 KΩ (104)
C1	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C2	4030004450	S.CERAMIC C2012 SL 1H 080D-T-A
C3	4030004470	S.CERAMIC C2012 SL 1H 100D-T-A
C4	4030004470	S.CERAMIC C2012 SL 1H 100D-T-A
C5	4030004420	S.CERAMIC C2012 SL 1H 050C-T-A
C6	4030004760	S.CERAMIC C2012 JF 1E 104Z-T-A
C7	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C8	4030004760	S.CERAMIC C2012 JF 1E 104Z-T-A
C9	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C10	4030004760	S.CERAMIC C2012 JF 1E 104Z-T-A
C11	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C12	4030004470	S.CERAMIC C2012 SL 1H 100D-T-A
C13	4030004390	S.CERAMIC C2012 SL 1H 020C-T-A
C14	4030004470	S.CERAMIC C2012 SL 1H 100D-T-A

S. = Surface mount

[MAIN UNIT]

REF. NO.	PARTS NO.	DESCRIPTION
C15	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C16	4030004390	S.CERAMIC C2012 SL 1H 020C-T-A
C17	4030004390	S.CERAMIC C2012 SL 1H 020C-T-A
C18	4030004470	S.CERAMIC C2012 SL 1H 100D-T-A
C19	4030004370	S.CERAMIC C2012 SL 1H 0R5C-T-A
C20	4030004390	S.CERAMIC C2012 SL 1H 020C-T-A
C21	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C22	4030004760	S.CERAMIC C2012 JF 1E 104Z-T-A
C23	4030004430	S.CERAMIC C2012 SL 1H 060D-T-A
C24	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C25	4030004740	S.CERAMIC C2012 JB 1H 472K-T-A
C26	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C27	4030004570	S.CERAMIC C2012 SL 1H 470J-T-A
C28	4030004750	S.CERAMIC C2012 JB 1H 103K-T-A
C29	4030004410	S.CERAMIC C2012 SL 1H 040C-T-A
C30	4030004570	S.CERAMIC C2012 SL 1H 470J-T-A
C31	4030004750	S.CERAMIC C2012 JB 1H 103K-T-A
C32	4030008550	S.CERAMIC C2012 JF 1H 473Z-T-A
C33	4030004400	S.CERAMIC C2012 SL 1H 030C-T-A
C34	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C35	4030008680	S.CERAMIC C2012 JF 1C 105Z-T-A
C36	4030008680	S.CERAMIC C2012 JF 1C 105Z-T-A
C37	4030004550	S.CERAMIC C2012 SL 1H 330J-T-A
C38	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C39	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C40	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C41	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C42	4030004740	S.CERAMIC C2012 JB 1H 472K-T-A
C43	4030004970	S.CERAMIC C2012 CH 1H 680J-T-A
C44	4030005000	S.CERAMIC C2012 CH 1H 121J-T-A
C45	4030008760	S.CERAMIC C2012 X7R 1C 104K-T-A
C46	4030008760	S.CERAMIC C2012 X7R 1C 104K-T-A
C47	4030004980	S.CERAMIC C2012 CH 1H 820J-T-A
C48	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C49	4030008680	S.CERAMIC C2012 JF 1C 105Z-T-A
C50	4030004750	S.CERAMIC C2012 JB 1H 103K-T-A
C51	4030004750	S.CERAMIC C2012 JB 1H 103K-T-A
C52	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C53	4030004750	S.CERAMIC C2012 JB 1H 103K-T-A
C54	4030004750	S.CERAMIC C2012 JB 1H 103K-T-A
C55	4510003890	ELECTROLYTIC 16 MV 10 HW
C57	4030008680	S.CERAMIC C2012 JF 1C 105Z-T-A
C58	4030004750	S.CERAMIC C2012 JB 1H 103K-T-A
C60	4030008690	S.CERAMIC C2012 SL 1H 821J-T-A
C61	4030008660	S.CERAMIC C2012 JB 1H 333K-T-A
C62	4030004750	S.CERAMIC C2012 JB 1H 103K-T-A
C63	4030004750	S.CERAMIC C2012 JB 1H 103K-T-A
C64	4030004750	S.CERAMIC C2012 JB 1H 103K-T-A
C65	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C66	4310000400	MYLAR 50 F2D 223J
C67	4550002890	S.TANTALUM TESVA 1A 225M1-8L
C68	4550000460	S.TANTALUM TESVA 1C 105M1-8L
C69	4030008680	S.CERAMIC C2012 JF 1C 105Z-T-A
C70	4030004750	S.CERAMIC C2012 JB 1H 103K-T-A
C71	4510001970	ELECTROLYTIC 50 MS7 0R1UF
C72	4510003900	ELECTROLYTIC 16 MV 22 HW
C74	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C75	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C76	4030004570	S.CERAMIC C2012 SL 1H 470J-T-A
C77	4030004470	S.CERAMIC C2012 SL 1H 100D-T-A
C78	4030004550	S.CERAMIC C2012 SL 1H 330J-T-A
C79	4030004520	S.CERAMIC C2012 SL 1H 220J-T-A
C80	4030004520	S.CERAMIC C2012 SL 1H 220J-T-A
C81	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C82	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C83	4030004470	S.CERAMIC C2012 SL 1H 100D-T-A
C84	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C85	4550002120	TANTALUM DN 1C 220M
C86	4550000360	TANTALUM DN 1V R47M
C87	4550002880	TANTALUM DN 1V 0R1K
C88	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A

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REF. NO.	PARTS NO.	DESCRIPTION
C89	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C90	4030004500	S.CERAMIC C2012 SL 1H 180J-T-A
C91	4030004500	S.CERAMIC C2012 SL 1H 180J-T-A
C92	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C93	4610001470	TRIMMER CV38D 2001E
C94	4030008610	S.CERAMIC C2012 CH 1H 200J-T-A
C95	4030009640	S.CERAMIC C2012 CH 1H 300J-T-A
C96	4030004570	S.CERAMIC C2012 SL 1H 470J-T-A
C97	4030004740	S.CERAMIC C2012 JB 1H 472K-T-A
C98	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C99	4030004740	S.CERAMIC C2012 JB 1H 472K-T-A
C100	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C101	4030004490	S.CERAMIC C2012 SL 1H 150J-T-A
C102	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C104	4030004710	S.CERAMIC C2012 JB 1H 471K-T-A
C105	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C106	4030004490	S.CERAMIC C2012 SL 1H 150J-T-A
C108	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C109	4030004710	S.CERAMIC C2012 JB 1H 471K-T-A
C110	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C111	4030004710	S.CERAMIC C2012 JB 1H 471K-T-A
C112	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C113	4030004710	S.CERAMIC C2012 JB 1H 471K-T-A
C114	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C115	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C116	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C117	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C118	4560000050	CERAMIC D67X5T 1E 684M51
C119	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C120	4030008680	S.CERAMIC C2012 JF 1C 105Z-T-A
C121	4030004750	S.CERAMIC C2012 JB 1H 103K-T-A
C122	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C123	4030005090	S.CERAMIC C2012 JB 1H 223K-T-A
C124	4030008760	S.CERAMIC C2012 X7R 1C 104K-T-A
C125	4030004710	S.CERAMIC C2012 JB 1H 471K-T-A
C126	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C127	4030004520	S.CERAMIC C2012 SL 1H 220J-T-A
C129	4010004120	CERAMIC DD07 B 102K 500V
C130	4010003910	CERAMIC DD06 SL 220K 500V
C131	4010003880	CERAMIC DD06 SL 150K 500V
C132	4010003940	CERAMIC DD06 SL 300K 500V
C133	4010003880	CERAMIC DD06 SL 150K 500V
C134	4010003770	CERAMIC DD06 SL 0R5C 500V
C135	4010003880	CERAMIC DD06 SL 150K 500V
C136	4010003850	CERAMIC DD06 SL 080D 500V
C137	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C138	4030004710	S.CERAMIC C2012 JB 1H 471K-T-A
C139	4610000140	TRIMMER CV05E5001
C140	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C141	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C142	4030004730	S.CERAMIC C2012 JB 1H 222K-T-A
C143	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C145	4030008680	S.CERAMIC C2012 JF 1C 105Z-T-A
C146	4030004760	S.CERAMIC C2012 JF 1E 104Z-T-A
C147	4030004760	S.CERAMIC C2012 JF 1E 104Z-T-A
C148	4510003890	ELECTROLYTIC 16 MV 10 HW
C149	4030004760	S.CERAMIC C2012 JF 1E 104Z-T-A
C150	4030004760	S.CERAMIC C2012 JF 1E 104Z-T-A
C151	4510003890	ELECTROLYTIC 16 MV 10 HW
C152	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C153	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C154	4510003930	ELECTROLYTIC 16 MV 470 HW
C155	4510005080	ELECTROLYTIC 16 MV 220 HW
C156	4030004760	S.CERAMIC C2012 JF 1E 104Z-T-A
C157	4310000480	MYLAR 50 F2D 104J
C158	4310000420	MYLAR 50 F2D 333J
C159	4310000420	MYLAR 50 F2D 333J
C160	4030004750	S.CERAMIC C2012 JB 1H 103K-T-A
C163	4030008680	S.CERAMIC C2012 JF 1C 105Z-T-A
C164	4030004750	S.CERAMIC C2012 JB 1H 103K-T-A
C165	4030004710	S.CERAMIC C2012 JB 1H 471K-T-A

S. = Surface mount



[MAIN UNIT]

REF. NO.	PARTS NO.	DESCRIPTION
C167	4030008660	S.CERAMIC C2012 JB 1H 333K-T-A
C168	4510004150	ELECTROLYTIC 50 MV 4R7 HW
C169	4030004710	S.CERAMIC C2012 JB 1H 471K-T-A
C170	4030004750	S.CERAMIC C2012 JB 1H 103K-T-A
C171	4510004150	ELECTROLYTIC 50 MV 4R7 HW
C172	4030008680	S.CERAMIC C2012 JF 1C 105Z-T-A
C173	4030004760	S.CERAMIC C2012 JF 1E 104Z-T-A
C174	4030004760	S.CERAMIC C2012 JF 1E 104Z-T-A
C175	4030004750	S.CERAMIC C2012 JB 1H 103K-T-A
C176	4030005090	S.CERAMIC C2012 JB 1H 223K-T-A
C177	4030008550	S.CERAMIC C2012 JF 1H 473Z-T-A
C178	4030004750	S.CERAMIC C2012 JB 1H 103K-T-A
C179	4030004750	S.CERAMIC C2012 JB 1H 103K-T-A
C180	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C181	4310000360	MYLAR 50 F2D 103J
C182	4030004750	S.CERAMIC C2012 JB 1H 103K-T-A
C183	4030004750	S.CERAMIC C2012 JB 1H 103K-T-A
C185	4030004750	S.CERAMIC C2012 JB 1H 103K-T-A
C186	4030004750	S.CERAMIC C2012 JB 1H 103K-T-A
C187	4030004760	S.CERAMIC C2012 JF 1E 104Z-T-A
C188	4030004760	S.CERAMIC C2012 JF 1E 104Z-T-A
C189	4030004760	S.CERAMIC C2012 JF 1E 104Z-T-A
C190	4030004760	S.CERAMIC C2012 JF 1E 104Z-T-A
C192	4030004760	S.CERAMIC C2012 JF 1E 104Z-T-A
C193	4030004760	S.CERAMIC C2012 JF 1E 104Z-T-A
C194	4030004760	S.CERAMIC C2012 JF 1E 104Z-T-A
C195	4030008680	S.CERAMIC C2012 JF 1C 105Z-T-A
C196	4030008680	S.CERAMIC C2012 JF 1C 105Z-T-A
C197	4510001970	ELECTROLYTIC 50 MS7 0R1UF
C197	4510004150	ELECTROLYTIC 50 MV 4R7 HW
C198	4510003910	ELECTROLYTIC 16 MV 47 HW
C199	4030004760	S.CERAMIC C2012 JF 1E 104Z-T-A
C200	4510003890	ELECTROLYTIC 16 MV 10 HW
C202	4510003890	ELECTROLYTIC 16 MV 10 HW
C203	4030008680	S.CERAMIC C2012 JF 1C 105Z-T-A
C204	4030008760	S.CERAMIC C2012 X7R 1C 104K-T-A
C205	4030008680	S.CERAMIC C2012 JF 1C 105Z-T-A
C206	4030008680	S.CERAMIC C2012 JF 1C 105Z-T-A
C207	4510004020	ELECTROLYTIC 50 MV 3R3 HW
C208	4550002120	TANTALUM DN 1C 220M
C209	4550002120	TANTALUM DN 1C 220M
C210	4030004750	S.CERAMIC C2012 JB 1H 103K-T-A
C211	4510003900	ELECTROLYTIC 16 MV 22 HW
C212	4510004150	ELECTROLYTIC 50 MV 4R7 HW
C213	4510003920	ELECTROLYTIC 16 MV 100 HW
C214	4310000480	MYLAR 50 F2D 104J
C215	4050000050	FEED THR TF318-452E102GMV
C216	4050000050	FEED THR TF318-452E102GMV
C217	4510003920	ELECTROLYTIC 16 MV 100 HW
C218	4510003880	ELECTROLYTIC 10 MV 47 HW
C219	4510003880	ELECTROLYTIC 10 MV 47 HW
C220	4510004150	ELECTROLYTIC 50 MV 4R7 HW
C221	4510005230	ELECTROLYTIC 16 MV 2200 HW
C222	4510004150	ELECTROLYTIC 50 MV 4R7 HW
C223	4510004150	ELECTROLYTIC 50 MV 4R7 HW
C226	4030004760	S.CERAMIC C2012 JF 1E 104Z-T-A
C227	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C228	4510003920	ELECTROLYTIC 16 MV 100 HW
C229	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C230	4030004760	S.CERAMIC C2012 JF 1E 104Z-T-A
C231	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C232	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C233	4510004150	ELECTROLYTIC 50 MV 4R7 HW
C234	4510005220	ELECTROLYTIC 16 MV 1000 HW
C235	4510003920	ELECTROLYTIC 16 MV 100 HW
C237	4510005220	ELECTROLYTIC 16 MV 1000 HW
C238	4510003920	ELECTROLYTIC 16 MV 100 HW
C239	4510003910	ELECTROLYTIC 16 MV 47 HW
C240	4510003910	ELECTROLYTIC 16 MV 47 HW
C241	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C242	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A

[MAIN UNIT]

REF. NO.	PARTS NO.	DESCRIPTION
C243	4030008680	S.CERAMIC C2012 JF 1C 105Z-T-A
C244	4030004760	S.CERAMIC C2012 JF 1E 104Z-T-A
C245	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C246	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A
C247	4030004420	S.CERAMIC C2012 SL 1H 050C-T-A
C248	4510004150	ELECTROLYTIC 50 MV 4R7 HW
C249	4510003920	ELECTROLYTIC 16 MV 100 HW
C250	4030004740	S.CERAMIC C2012 JB 1H 472K-T-A
C251	4510003910	ELECTROLYTIC 16 MV 47 HW
C252	4010003840	CERAMIC DD06 SL 070D 500V
C253	4030008760	S.CERAMIC C2012 X7R 1C 104K-T-A
C254	4030004740	S.CERAMIC C2012 JB 1H 472K-T-A
C255	4040000310	BARRIER UAT 04V 222K
RL1	6330000180	RELAY MZ-12HG
RL2	6330000180	RELAY MZ-12HG
RL4	6330000480	RELAY RZ-12
S2	2260000580	SWITCH SKHLAD035A
S3	2260000580	SWITCH SKHLAD035A
S4	2260000580	SWITCH SKHLAD035A
EP1	910035514	PCB B 3563D

[LOGIC UNIT]

REF. NO.	PARTS NO.	DESCRIPTION
IC1	1140002750	S.IC $\mu$ PD75308GF-C75-3B9
IC2	1120000430	S.IC LA6393M-TP-T1
IC3	1110001550	S.IC S-8054ALB-LM-T1
Q1	1590000420	S.TRANSISTOR RN1404 (TE85R)
Q2	1540000250	S.TRANSISTOR 2SD999-T2 CK
Q3	1590000420	S.TRANSISTOR RN1404 (TE85R)
Q4	1540000250	S.TRANSISTOR 2SD999-T2 CK
Q5	1530000160	S.TRANSISTOR 2SC2712-Y (TE85RTEM)
Q6	1590000410	S.TRANSISTOR RN2404 (TE85R)
Q7	1590000420	S.TRANSISTOR RN1404 (TE85R)
Q8	1590000410	S.TRANSISTOR RN2404 (TE85R)
Q9	1590000410	S.TRANSISTOR RN2404 (TE85R)
Q10	1590000410	S.TRANSISTOR RN2404 (TE85R)
Q11	1590000410	S.TRANSISTOR RN2404 (TE85R)
D1	1730000890	S.ZENER RD11M-T2B3
D2	1750000260	S.DIODE 1SS352 (TPH3)
D3	1730000890	S.ZENER RD11M-T2B3
D4	1750000260	S.DIODE 1SS352 (TPH3)
D5	1720000360	S.DIODE HSU88TRF
D6	1750000260	S.DIODE 1SS352 (TPH3)
D7	1720000360	S.DIODE HSU88TRF
D8	1720000360	S.DIODE HSU88TRF
D9	1750000260	S.DIODE 1SS352 (TPH3)
D10	1750000120	S.DIODE DWA010-TE
X1	6050004950	XTAL CR-227
R1	7030000580	S.RESISTOR MCR10EZJH 47 K $\Omega$ (473)
R2	7030000440	S.RESISTOR MCR10EZJH 3.3 K $\Omega$ (332)

S. = Surface mount

[LOGIC UNIT]

REF. NO.	PARTS NO.	DESCRIPTION	
R3	7030000580	S.RESISTOR	MCR10EZHZ 47 KΩ (473)
R4	7030000440	S.RESISTOR	MCR10EZHZ 3.3 KΩ (332)
R5	7070000210	RESISTOR	CRH100X R-02J 47 Ω (470)
R6	7070000340	RESISTOR	CRH100X R-02J 33 Ω (330)
R7	7030001600	S.RESISTOR	MCR10EZHZ 1.2 MΩ (125)
R8	7030000620	S.RESISTOR	MCR10EZHZ 100 KΩ (104)
R10	7030000620	S.RESISTOR	MCR10EZHZ 100 KΩ (104)
R12	7030000620	S.RESISTOR	MCR10EZHZ 100 KΩ (104)
R13	7030000620	S.RESISTOR	MCR10EZHZ 100 KΩ (104)
R14	7030000620	S.RESISTOR	MCR10EZHZ 100 KΩ (104)
R15	7030000620	S.RESISTOR	MCR10EZHZ 100 KΩ (104)
R16	7030000620	S.RESISTOR	MCR10EZHZ 100 KΩ (104)
R17	7030000620	S.RESISTOR	MCR10EZHZ 100 KΩ (104)
R18	7030000380	S.RESISTOR	MCR10EZHZ 1 KΩ (102)
R19	7030000620	S.RESISTOR	MCR10EZHZ 100 KΩ (104)
R20	7030000620	S.RESISTOR	MCR10EZHZ 100 KΩ (104)
R21	7030000620	S.RESISTOR	MCR10EZHZ 100 KΩ (104)
R22	7030000620	S.RESISTOR	MCR10EZHZ 100 KΩ (104)
R23	7030000620	S.RESISTOR	MCR10EZHZ 100 KΩ (104)
R24	7030000620	S.RESISTOR	MCR10EZHZ 100 KΩ (104)
R25	7030000620	S.RESISTOR	MCR10EZHZ 100 KΩ (104)
R26	7030000500	S.RESISTOR	MCR10EZHZ 10 KΩ (103)
R27	7030000500	S.RESISTOR	MCR10EZHZ 10 KΩ (103)
R28	7030000620	S.RESISTOR	MCR10EZHZ 100 KΩ (104)
R29	7030000620	S.RESISTOR	MCR10EZHZ 100 KΩ (104)
R30	7030000620	S.RESISTOR	MCR10EZHZ 100 KΩ (104)
R31	7030000620	S.RESISTOR	MCR10EZHZ 100 KΩ (104)
R32	7030000430	S.RESISTOR	MCR10EZHZ 2.7 KΩ (272)
R33	7030000420	S.RESISTOR	MCR10EZHZ 2.2 KΩ (222)
R34	7030000370	S.RESISTOR	MCR10EZHZ 820 Ω (821)
R35	7030000370	S.RESISTOR	MCR10EZHZ 820 Ω (821)
R36	7030000370	S.RESISTOR	MCR10EZHZ 820 Ω (821)
R37	7030000350	S.RESISTOR	MCR10EZHZ 560 Ω (561)
R38	7030000350	S.RESISTOR	MCR10EZHZ 560 Ω (561)
R39	7030000350	S.RESISTOR	MCR10EZHZ 560 Ω (561)
R40	7030000620	S.RESISTOR	MCR10EZHZ 100 KΩ (104)
R41	7030000500	S.RESISTOR	MCR10EZHZ 10 KΩ (103)
R42	7030000620	S.RESISTOR	MCR10EZHZ 100 KΩ (104)
R43	7030000620	S.RESISTOR	MCR10EZHZ 100 KΩ (104)
R44	7030000620	S.RESISTOR	MCR10EZHZ 100 KΩ (104)
R45	7030000620	S.RESISTOR	MCR10EZHZ 100 KΩ (104)
C3	4030005050	S.CERAMIC	C2012 CH 1H 331J-T-A
C4	4030004520	S.CERAMIC	C2012 SL 1H 220J-T-A
C5	4030004520	S.CERAMIC	C2012 SL 1H 220J-T-A
C6	4030004750	S.CERAMIC	C2012 JB 1H 103K-T-A
C7	4030004760	S.CERAMIC	C2012 JF 1E 104Z-T-A
C8	4030004760	S.CERAMIC	C2012 JF 1E 104Z-T-A
C9	4030004760	S.CERAMIC	C2012 JF 1E 104Z-T-A
C10	4030004760	S.CERAMIC	C2012 JF 1E 104Z-T-A
C11	4030004760	S.CERAMIC	C2012 JF 1E 104Z-T-A
C12	4030004740	S.CERAMIC	C2012 JB 1H 472K-T-A
C13	4030004740	S.CERAMIC	C2012 JB 1H 472K-T-A
C14	4030004740	S.CERAMIC	C2012 JB 1H 472K-T-A
C15	4030004740	S.CERAMIC	C2012 JB 1H 472K-T-A
DS1	5030000820	LCD	FTD-11166AAPH
DS2	5080000110	LAMP	BQ031-22403A
DS3	5080000110	LAMP	BQ031-22403A
DS4	5080000110	LAMP	BQ031-22403A
S1	2260001820	SWITCH	SW-143 (SKHQFH)
S2	2260001820	SWITCH	SW-143 (SKHQFH)
S3	2260001820	SWITCH	SW-143 (SKHQFH)
S4	2260001820	SWITCH	SW-143 (SKHQFH)
S5	2260001820	SWITCH	SW-143 (SKHQFH)
S6	2260001810	SWITCH	SW-142 (SKHQFF)
S7	2260001820	SWITCH	SW-143 (SKHQFH)

[LOGIC UNIT]

REF. NO.	PARTS NO.	DESCRIPTION	
S8	2260001820	SWITCH	SW-143 (SKHQFH)
S9	2260001820	SWITCH	SW-143 (SKHQFH)
S10	2260001820	SWITCH	SW-143 (SKHQFH)
BT1	3020000020	LITHIUM	BR2032-1T2
EP1	910035562	PCB	B 3564B

[VCO UNIT]

REF. NO.	PARTS 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	R20J4.7 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
EP1	910031311	PCB	B 3163

S. = Surface mount

**[VR UNIT]**

REF. NO.	PARTS NO.	DESCRIPTION	
R1	7210001190	VARIABLE	RK0971112001A (10KA)
R2	7210001360	VARIABLE	RK097111004NA (10KB)
EP1	910035472	PCB	B 3576B

**[SENSOR UNIT]**

REF. NO.	PARTS NO.	DESCRIPTION	
S1	2250000020	ENCODER	SRB18100 25KC
EP1	910036503	PCB	B 2072C

**[REG UNIT]**

REF. NO.	PARTS NO.	DESCRIPTION	
IC1	1110001400	S.IC	$\mu$ PC1555G2-T1
D1	1750000070	S.DIODE	1SS226 (TE85R)
R1	7030000340	S.RESISTOR	MCR10EZHZ 470 $\Omega$ (471)
R2	7030000500	S.RESISTOR	MCR10EZHZ 10 K $\Omega$ (103)
R3	7030000580	S.RESISTOR	MCR10EZHZ 47 K $\Omega$ (473)
R4	7030000380	S.RESISTOR	MCR10EZHZ 1 K $\Omega$ (102)
R5	7030000390	S.RESISTOR	MCR10EZHZ 1.2 K $\Omega$ (122)
C1	4510003880	ELECTROLYTIC 10 MV 47 HW	
C2	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A	
C3	4030004720	S.CERAMIC C2012 JB 1H 102K-T-A	
C4	4510003880	ELECTROLYTIC 10 MV 47 HW	
C5	4510003880	ELECTROLYTIC 10 MV 47 HW	
C6	4510004150	ELECTROLYTIC 50 MV 4R7 HW	
EP1	910035502	PCB	B 3579B

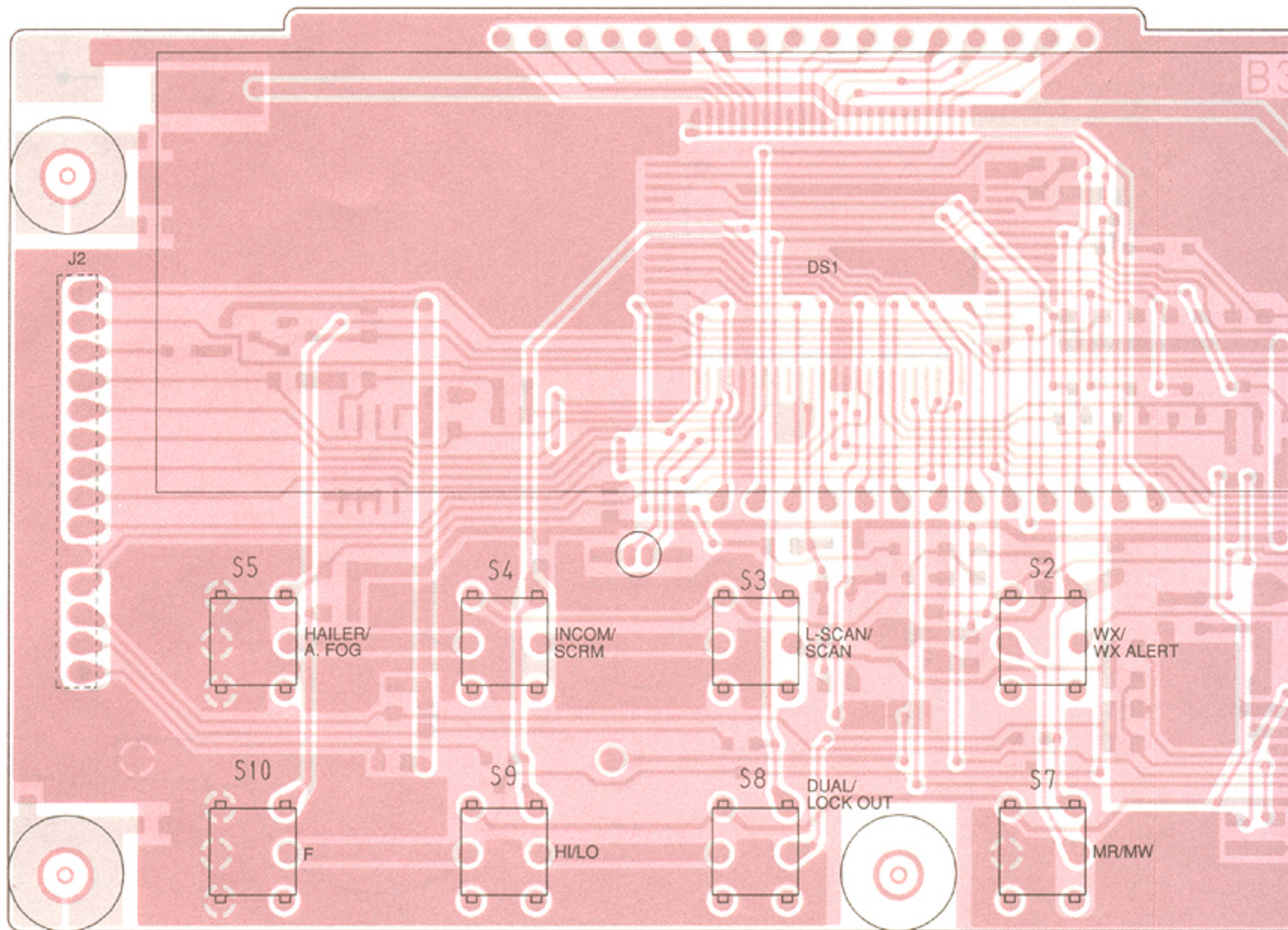
S. = Surface mount



## SECTION 7 BOARD LAYOUTS

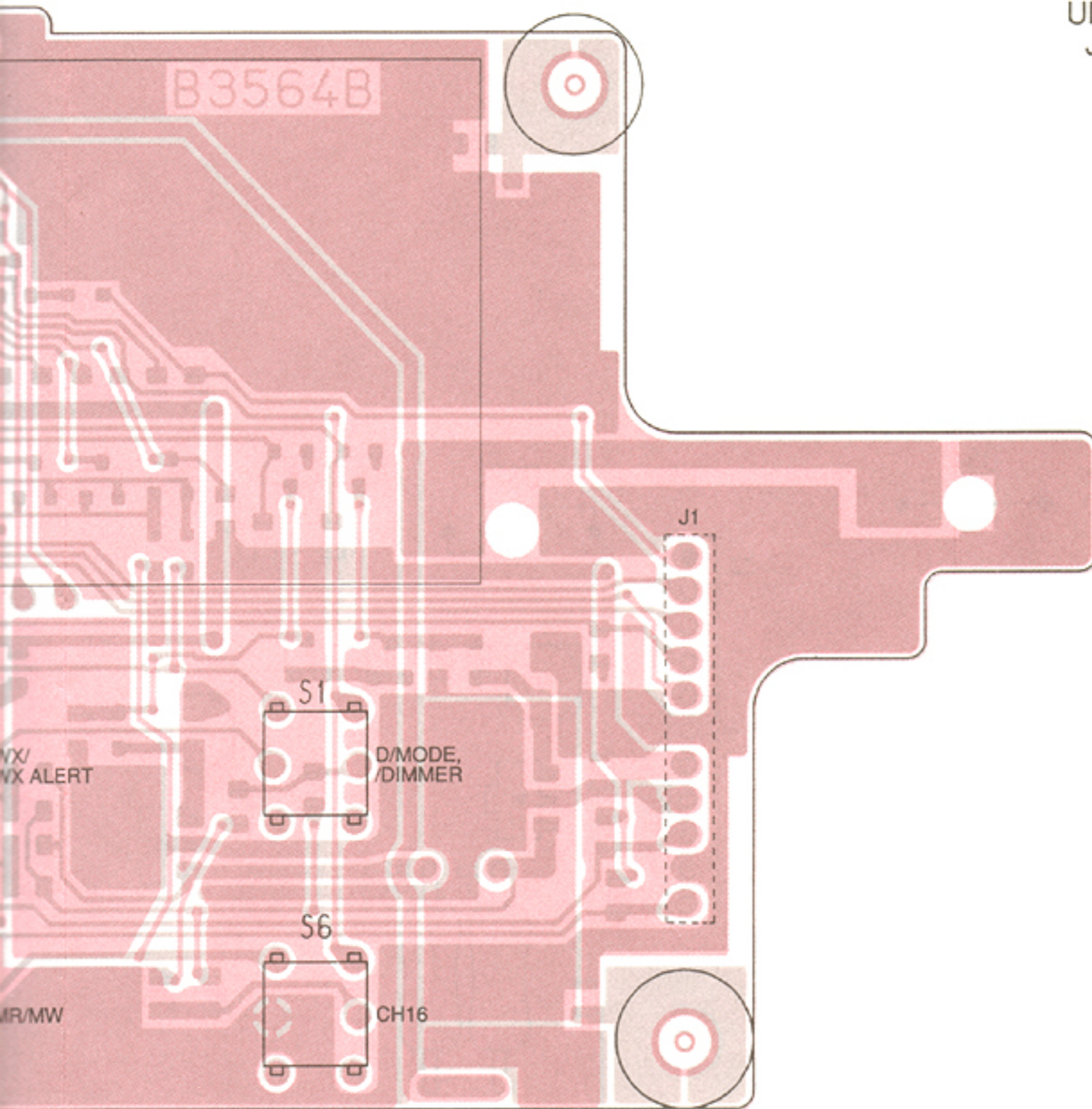
### 7-1 LOGIC UNIT, VR UNIT AND SENSOR UNIT

#### • LOGIC UNIT (TOP VIEW)

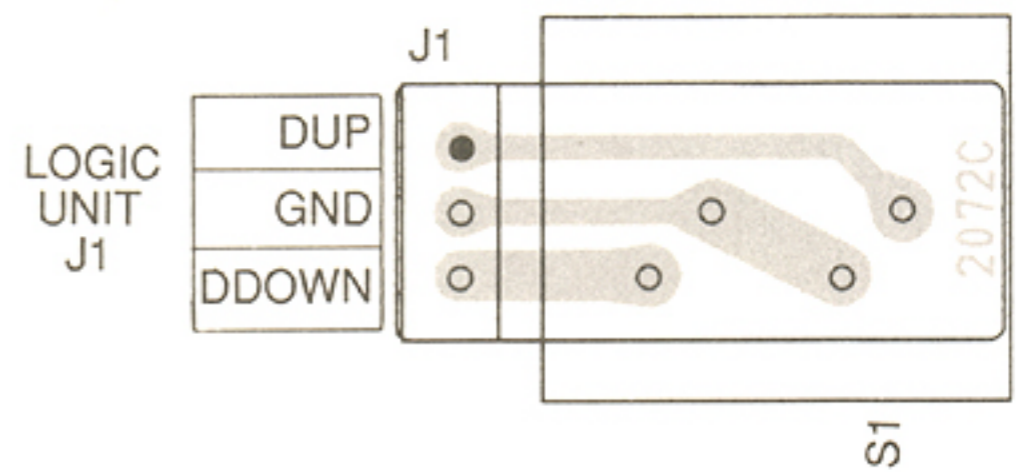




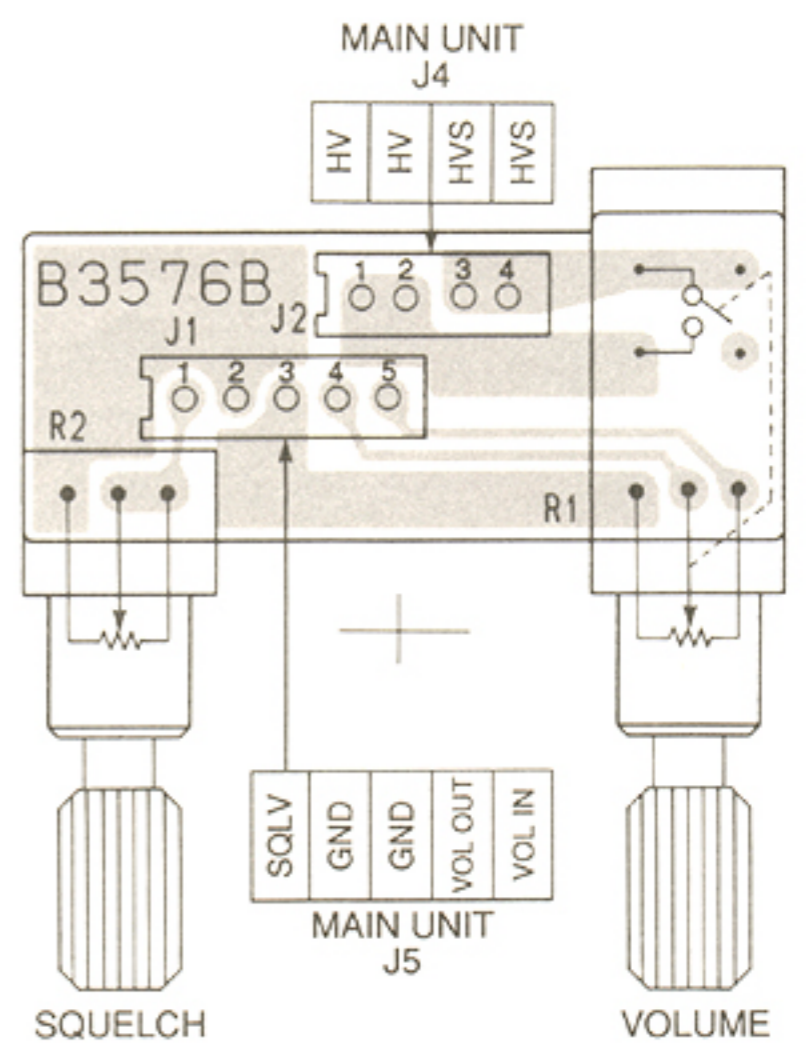
The combination of this page and the next page shows the unit layout in the same configuration as the actual P.C. Board.



• SENSOR UNIT (TOP VIEW)

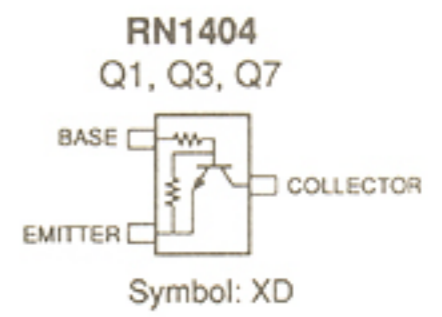
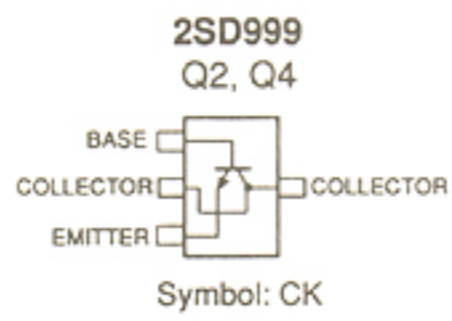
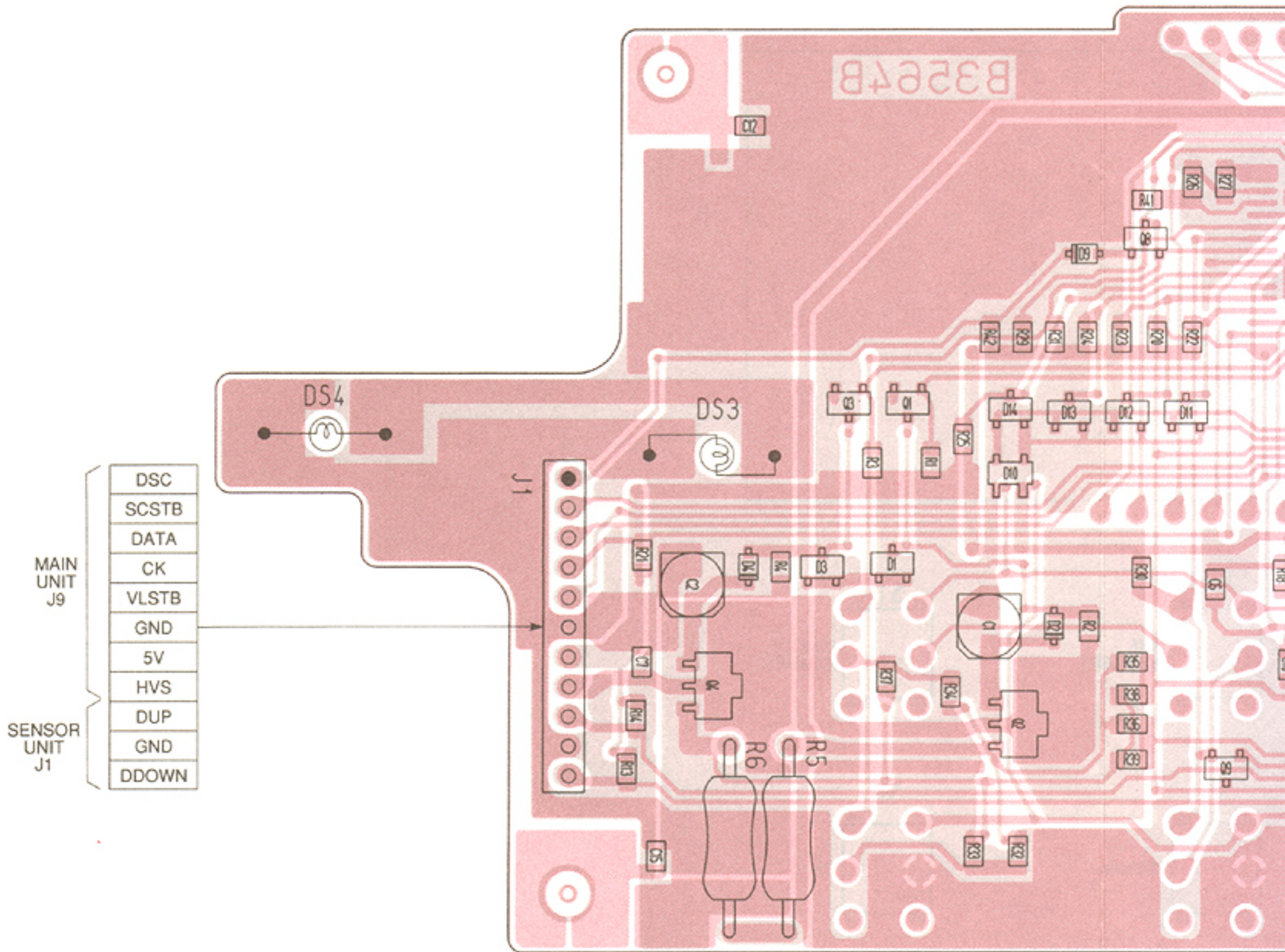


• VR UNIT (TOP VIEW)

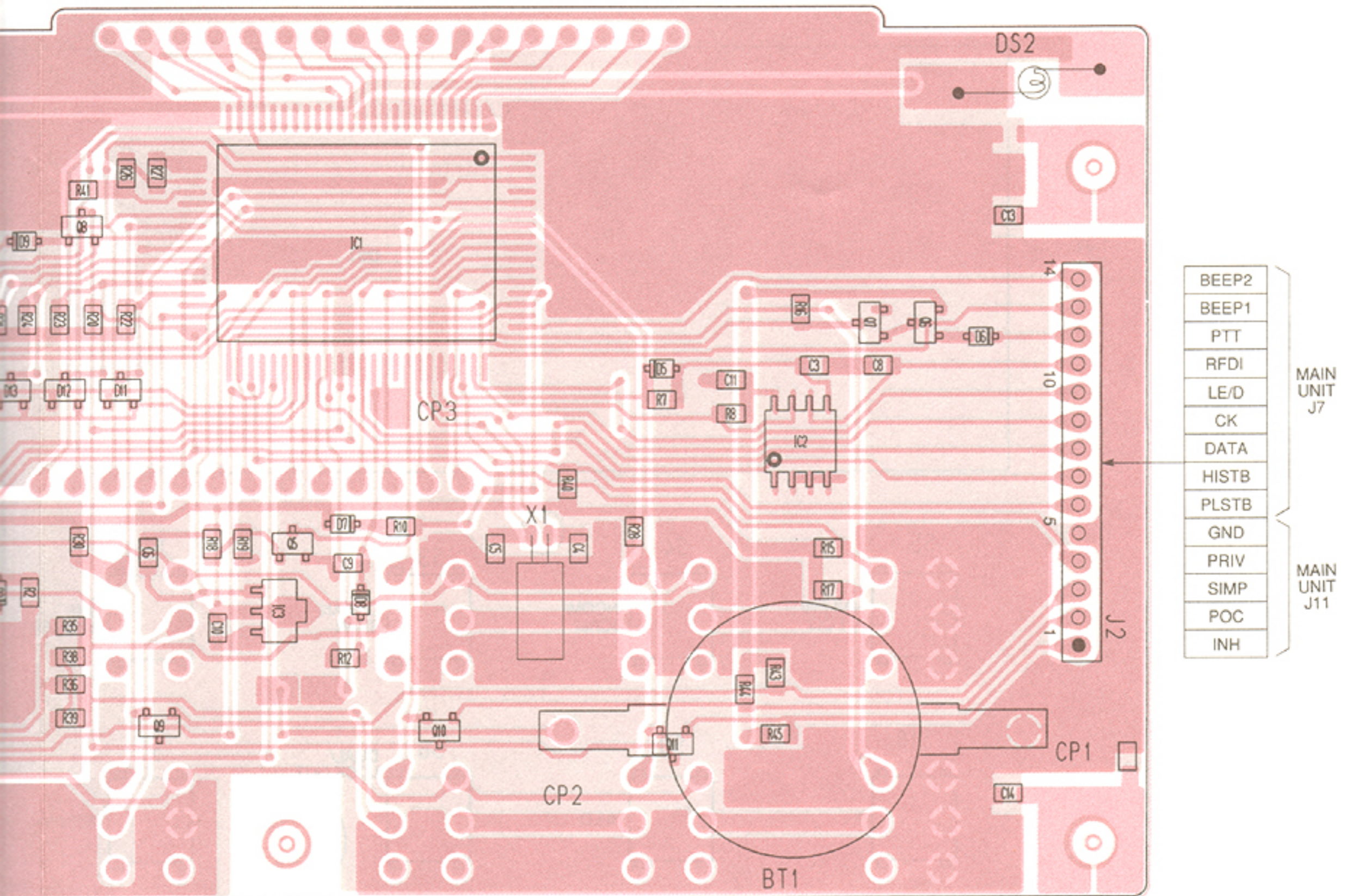




• LOGIC UNIT (BOTTOM VIEW)

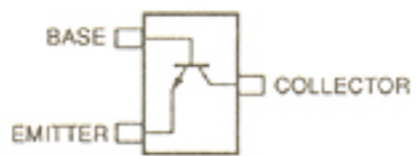






2SC2712-Y

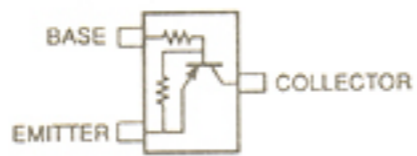
Q5



Symbol: LY

RN2404

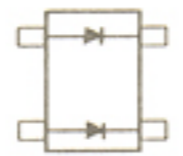
Q6, Q8, Q9, Q10, Q11



Symbol: YD

DWA010

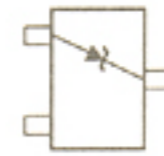
D10



Symbol: W8

RD11M

D1, D3

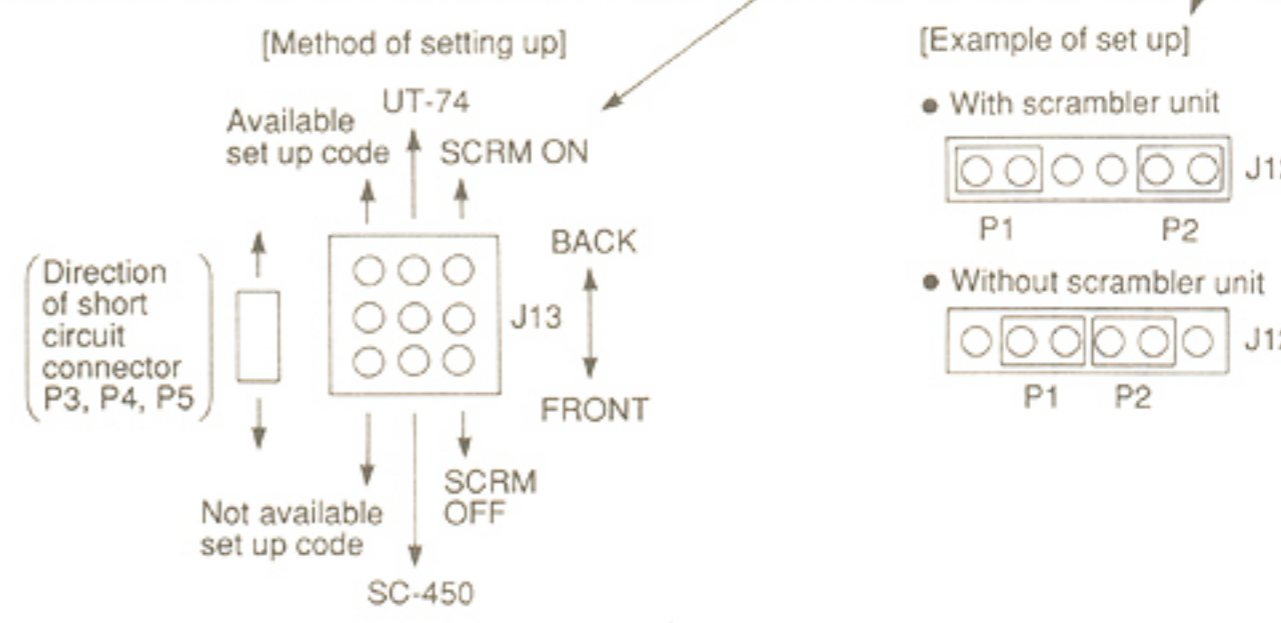
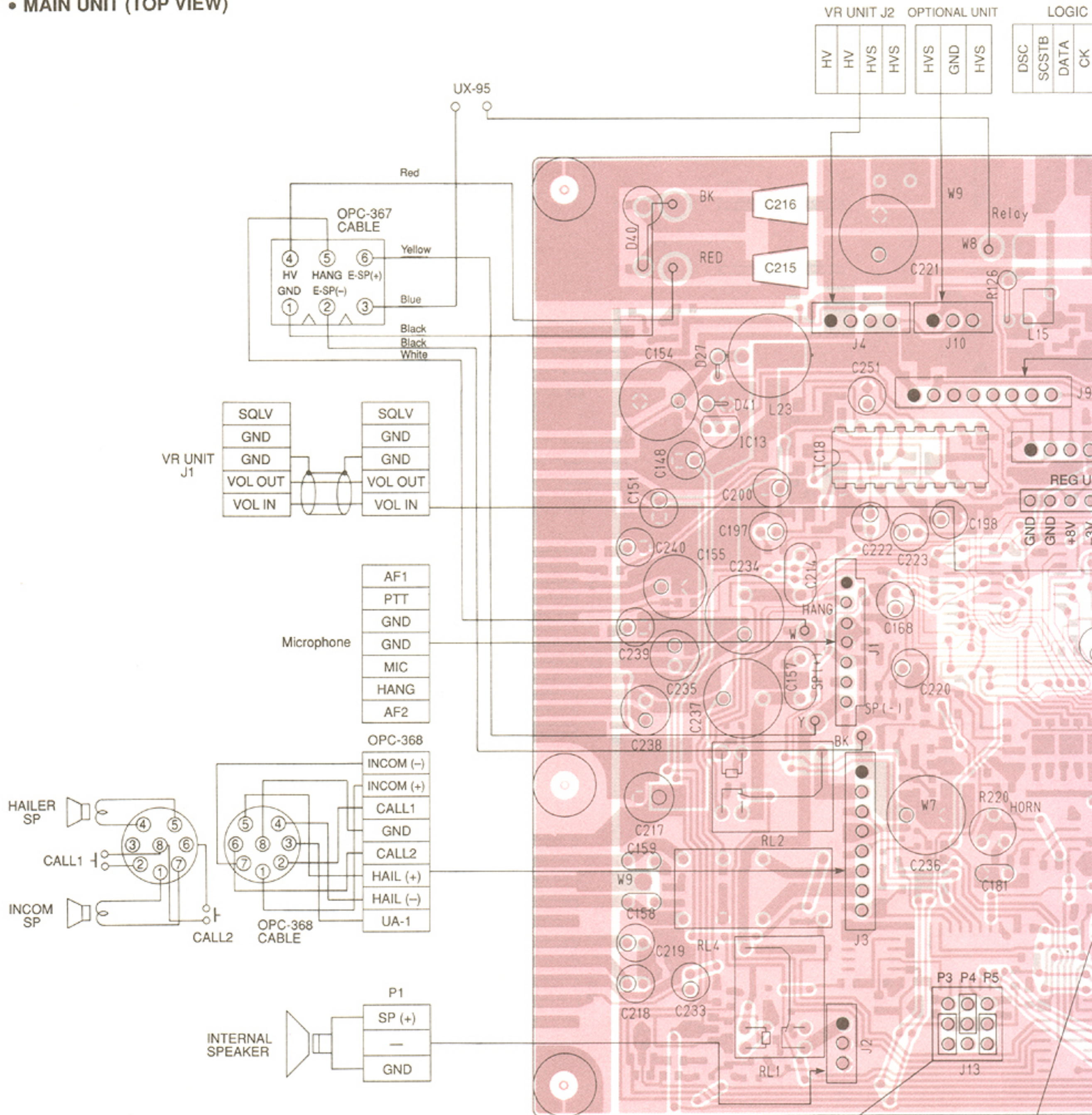


Symbol: 113



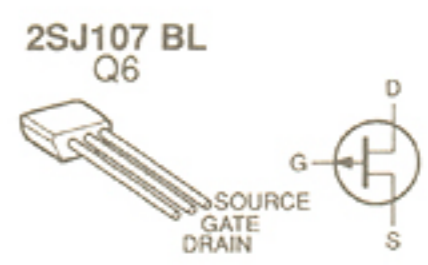
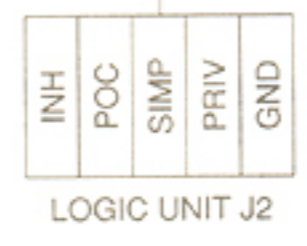
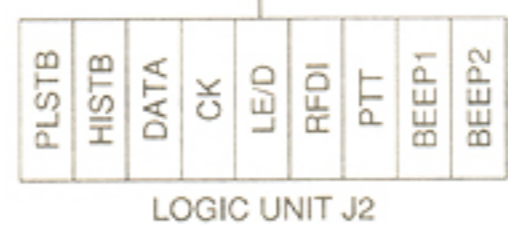
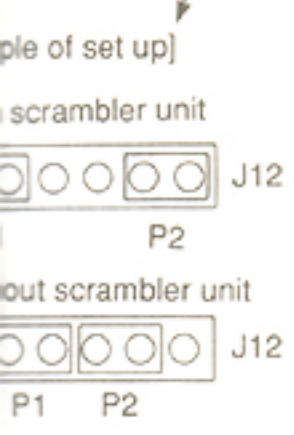
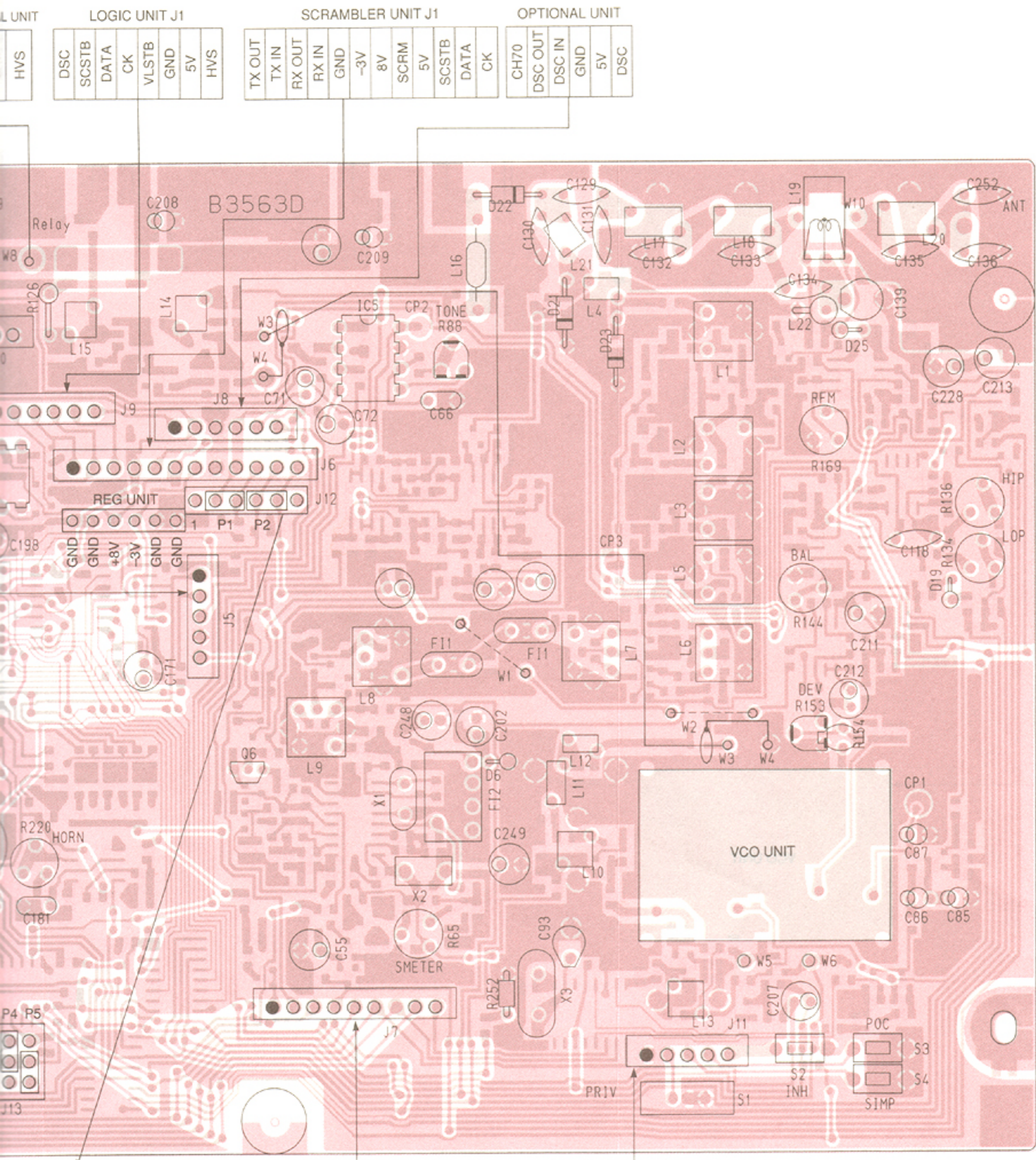
# 7-2 MAIN UNIT

## • MAIN UNIT (TOP VIEW)



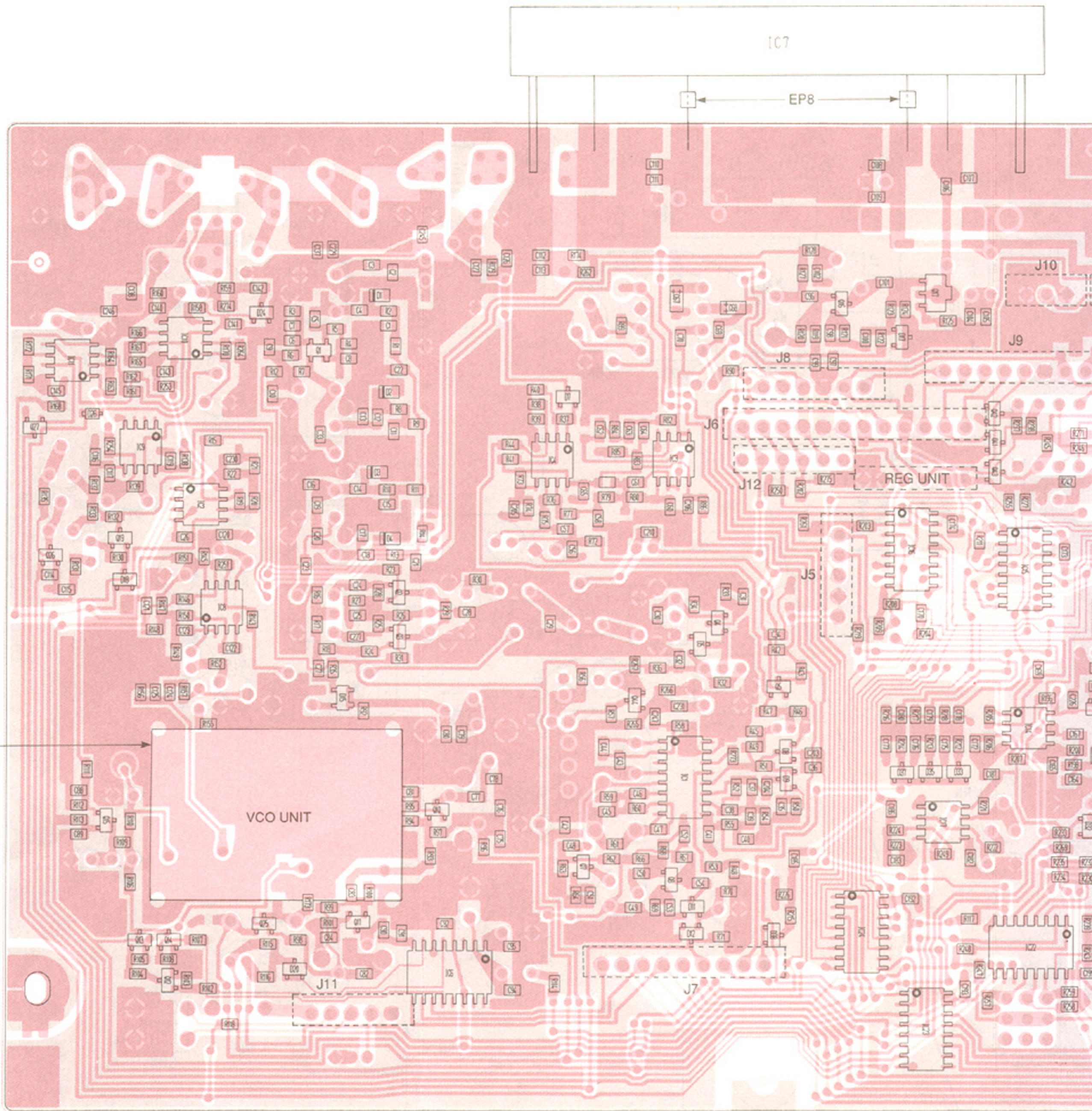


The combination of this page and the next page shows the unit layout in the same configuration as the actual P.C. Board.

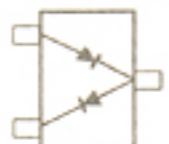




• MAIN UNIT (BOTTOM VIEW)



**HSM88AS**  
D9, D11, D24



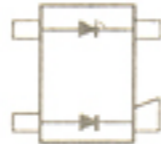
Symbol: C1

**1SS193**  
D12, D17



Symbol: F3

**MA862**  
D15



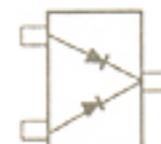
Symbol: M11

**1SS187**  
D20



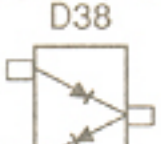
Symbol: D3

**1SS184**  
D32



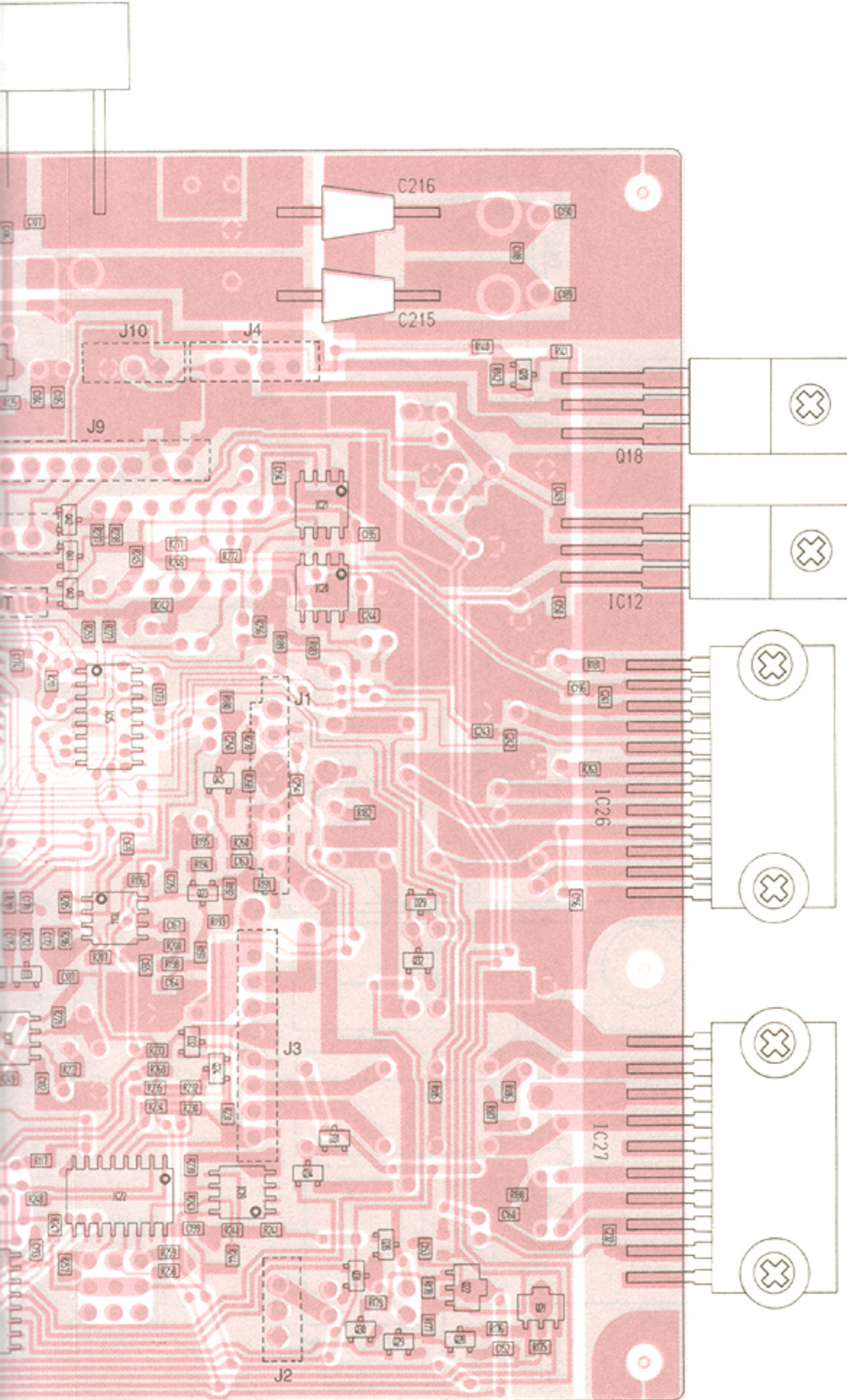
Symbol: B3

**1SS226**  
D33, D35, D37,  
D38

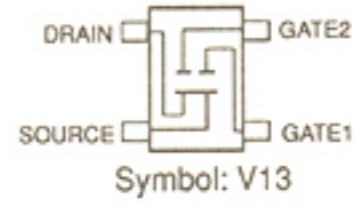


Symbol: C3

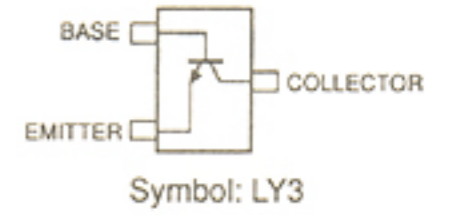




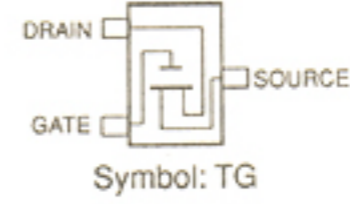
**3SK131**  
Q1



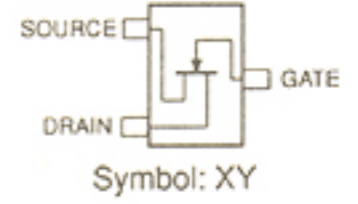
**2SC3772-3**  
Q2, Q3, Q10,  
Q11, Q16



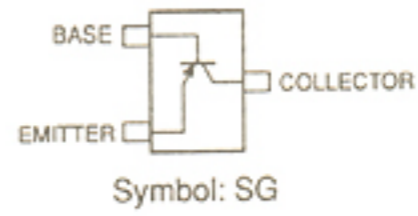
**2SK302-GR**  
Q4



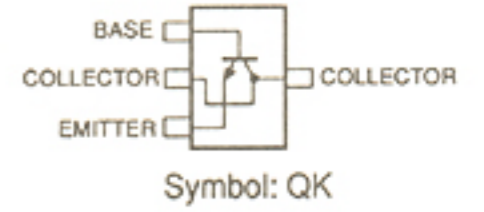
**2SK209-Y**  
Q5, Q15



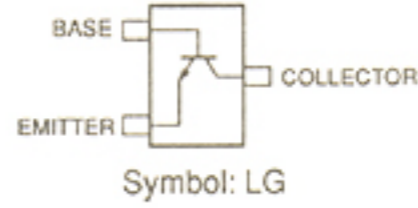
**2SA1162-GR**  
Q13, Q19



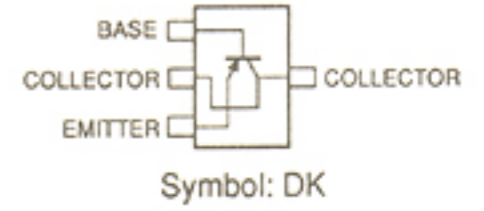
**2SC2954**  
Q17



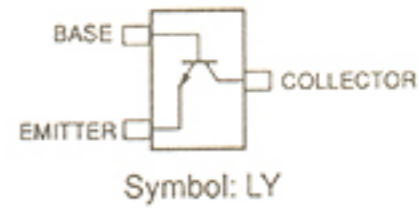
**2SC2712-GR**  
Q7, Q8,  
Q12, Q14



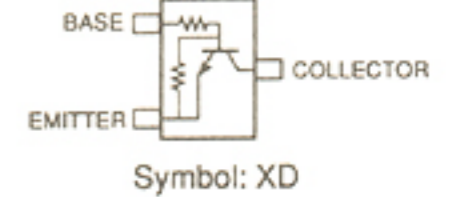
**2SB798**  
Q21, Q22



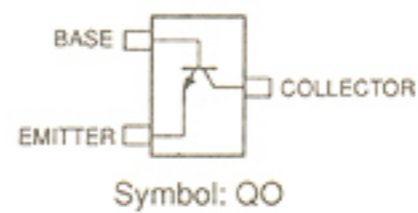
**2SC2712-Y**  
Q20, Q23, Q24



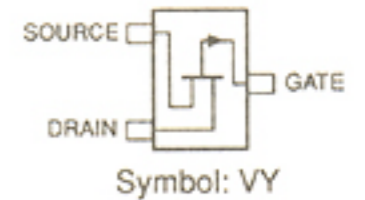
**RN1404**  
Q26, Q27, Q28,  
Q29, Q30, Q41,  
Q42, Q43



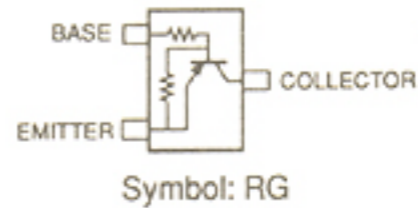
**2SC2714-O**  
Q44



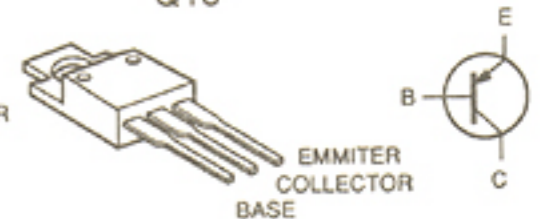
**2SJ106-Y**  
Q45



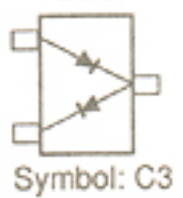
**RN2427**  
Q25



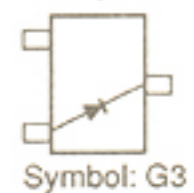
**2SB1015**  
Q18



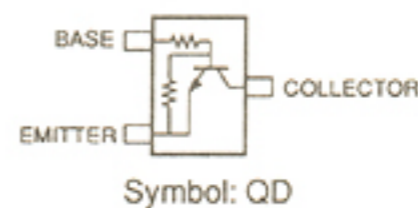
**1SS226**  
D33, D35, D37,  
D38



**1SS196**  
D5, D7, D8,  
D18, D28,  
D29, D31



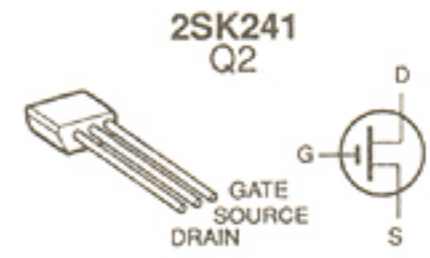
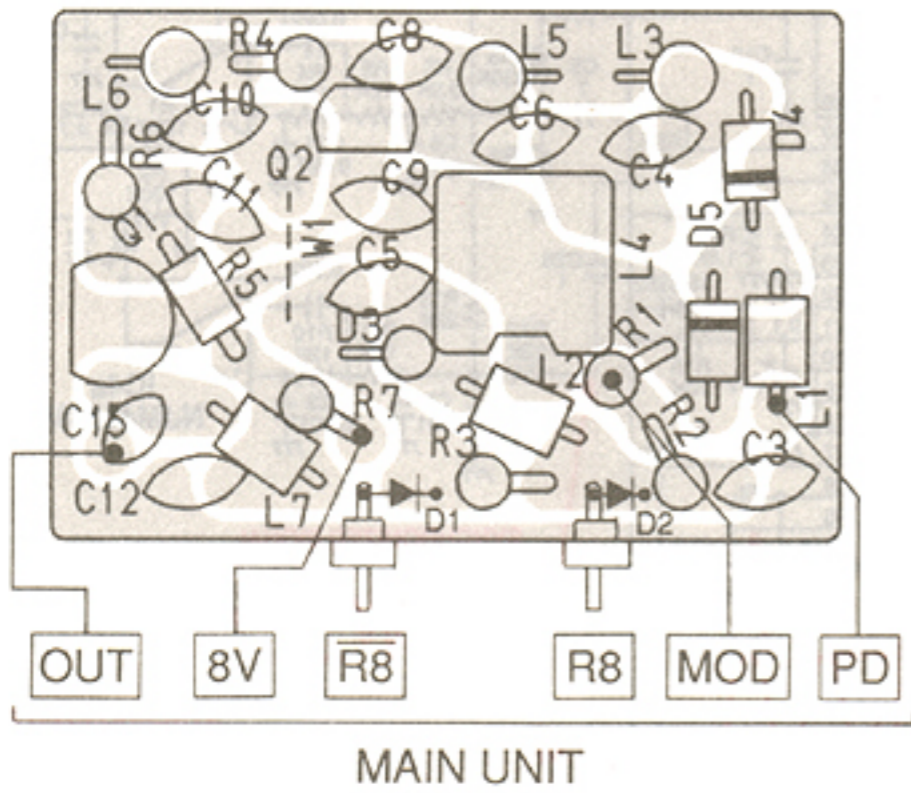
**RN1424**  
Q31, Q32, Q34



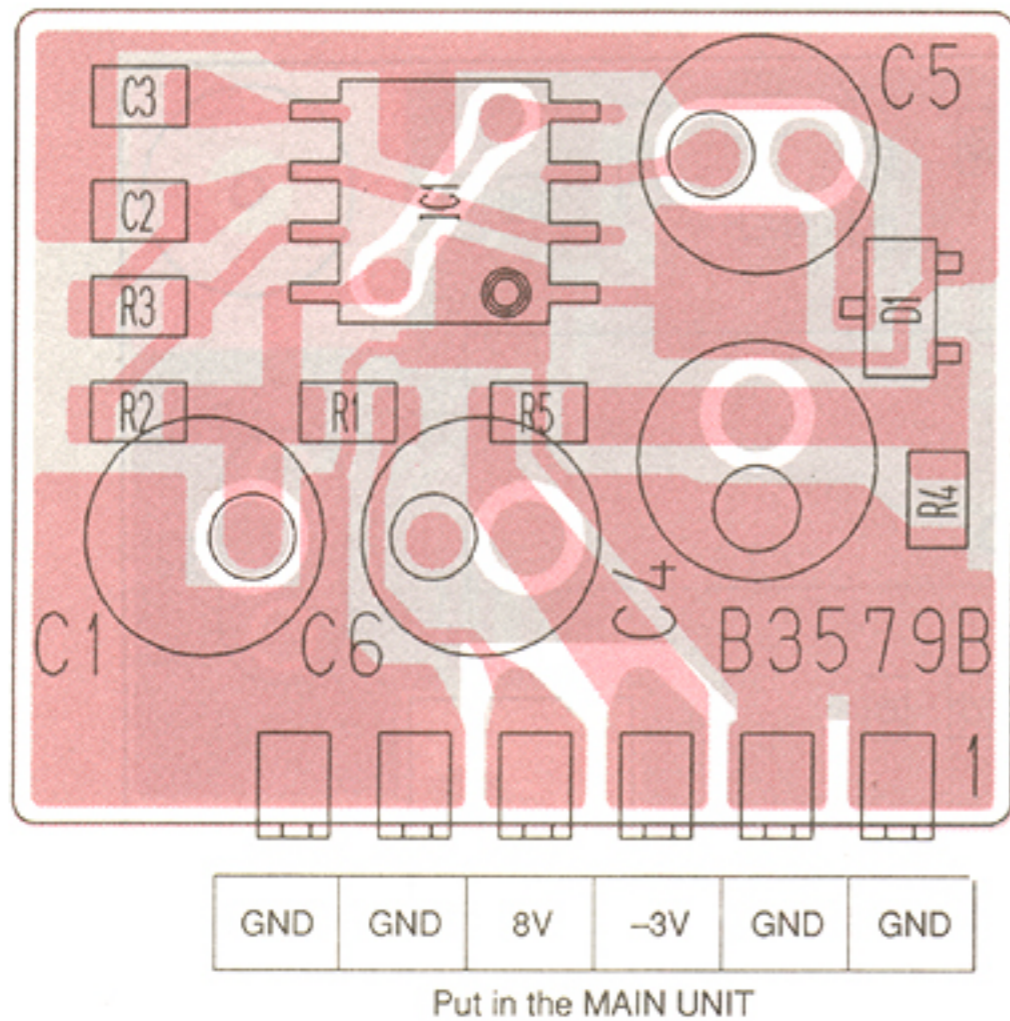


# 7-3 VCO UNIT AND REG UNIT

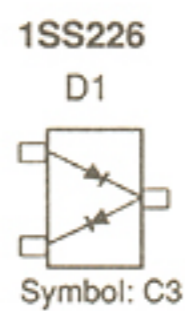
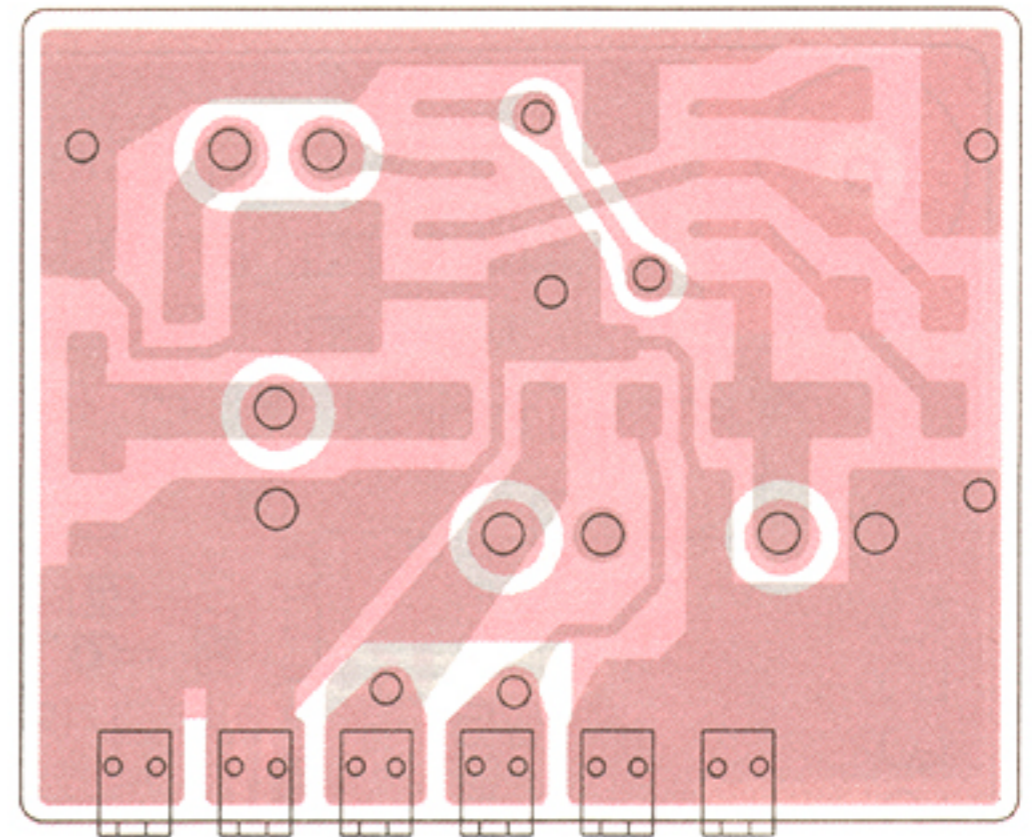
## • VCO UNIT (TOP VIEW)



## • REG UNIT (TOP VIEW)

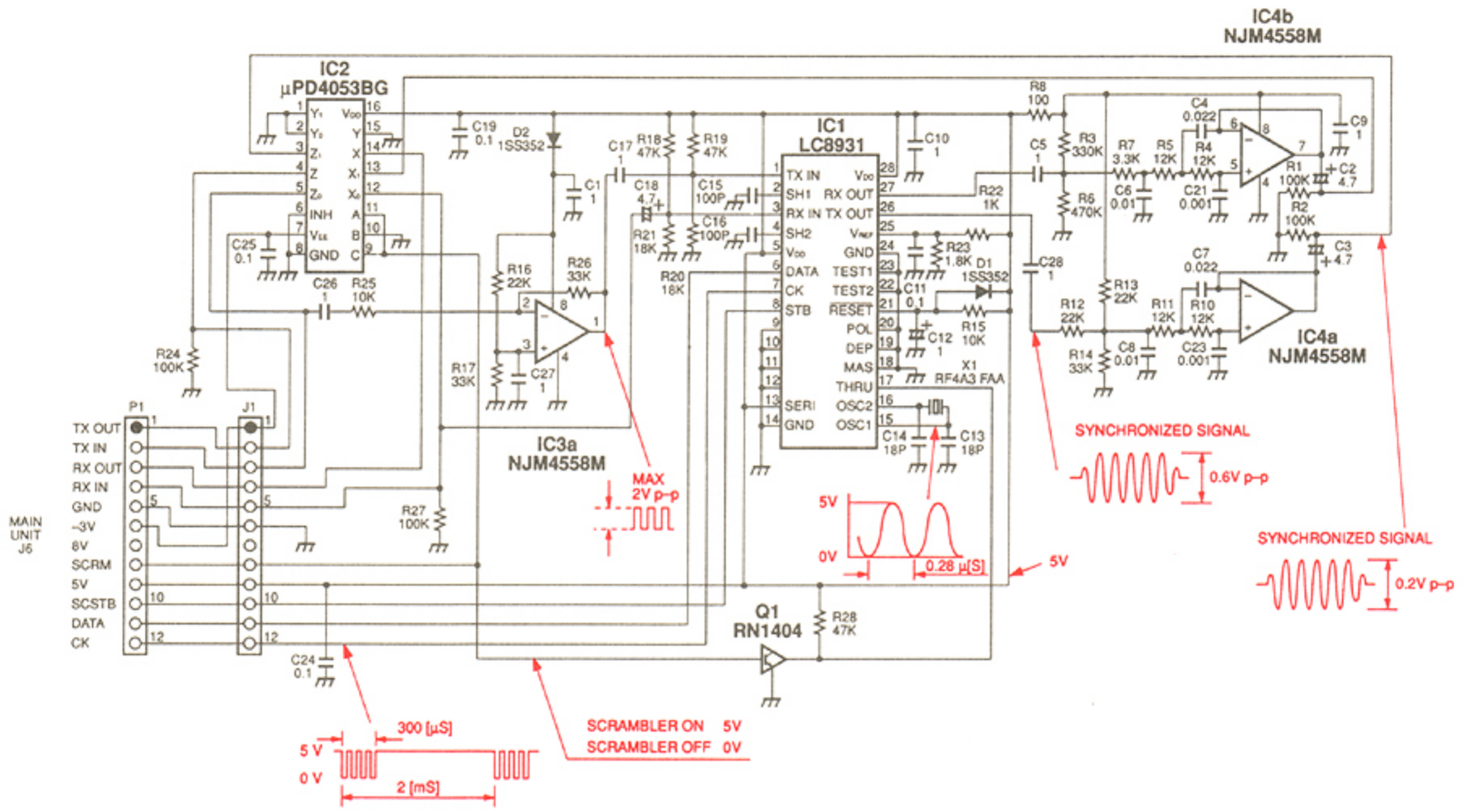


## • REG UNIT (BOTTOM VIEW)

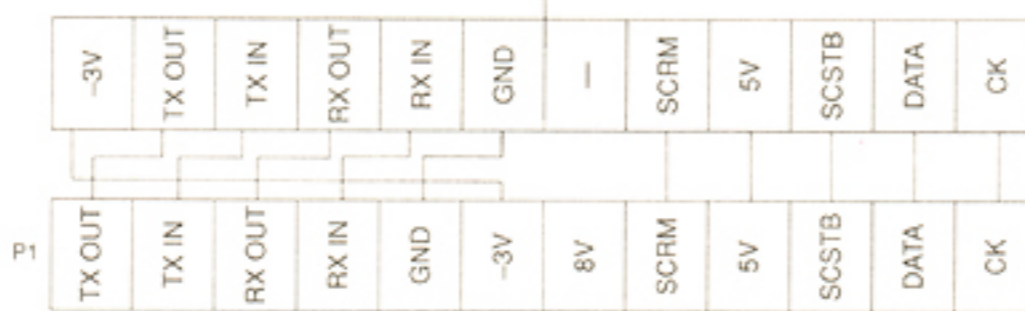
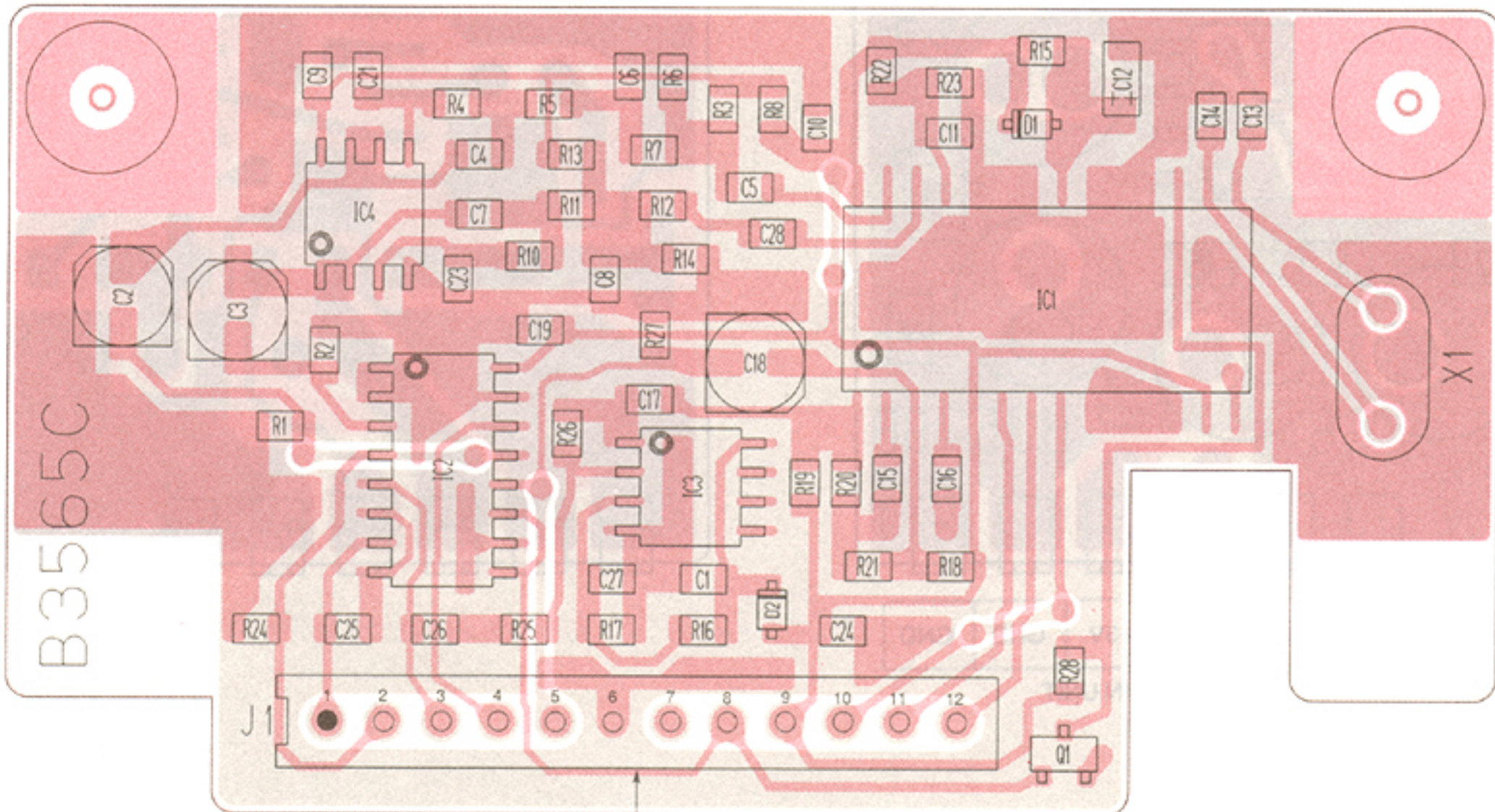




# SECTION 8 UT-74 VOICE SCRAMBLER UNIT



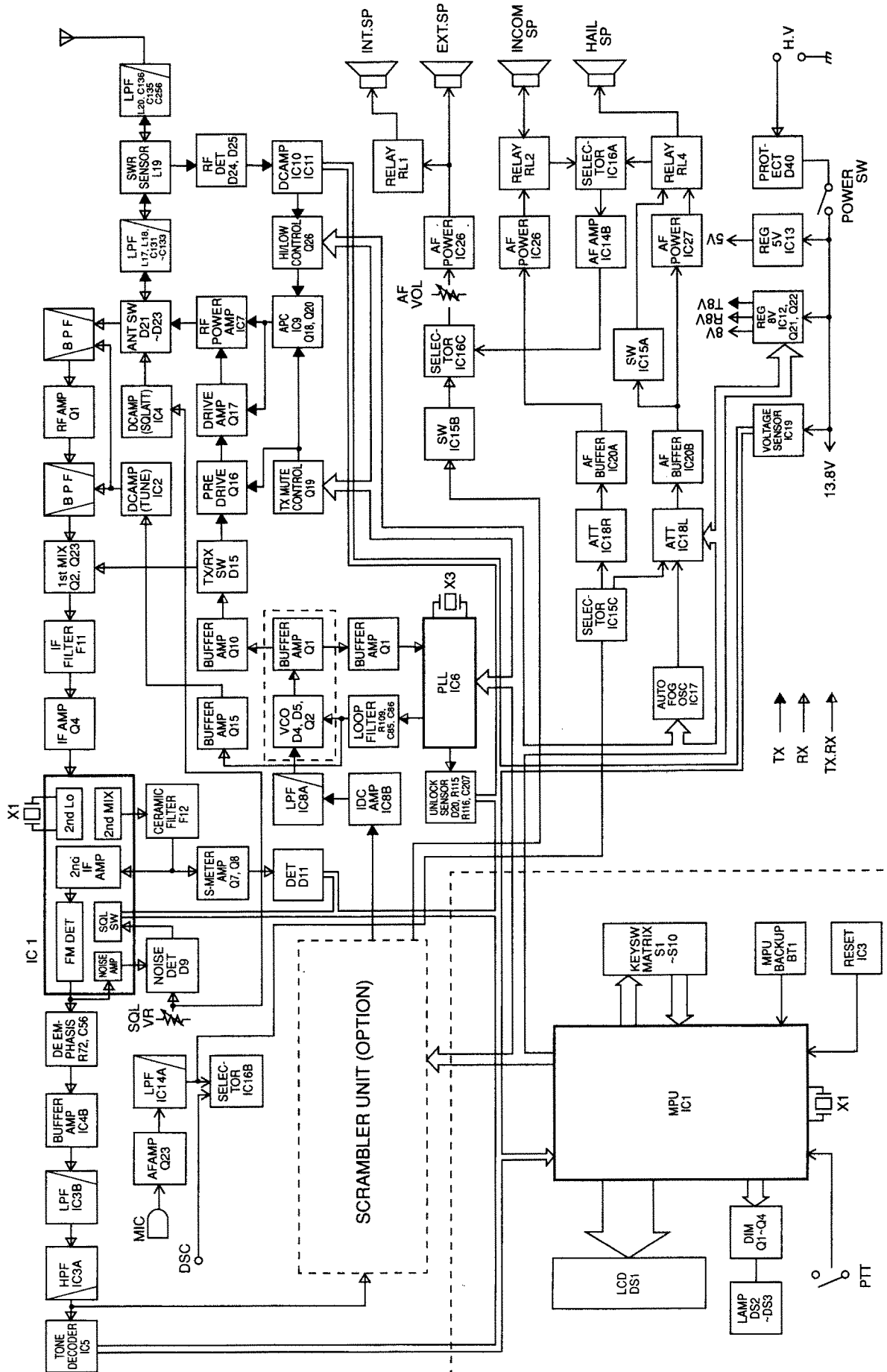
## • BOARD LAYOUT (TOP VIEW)



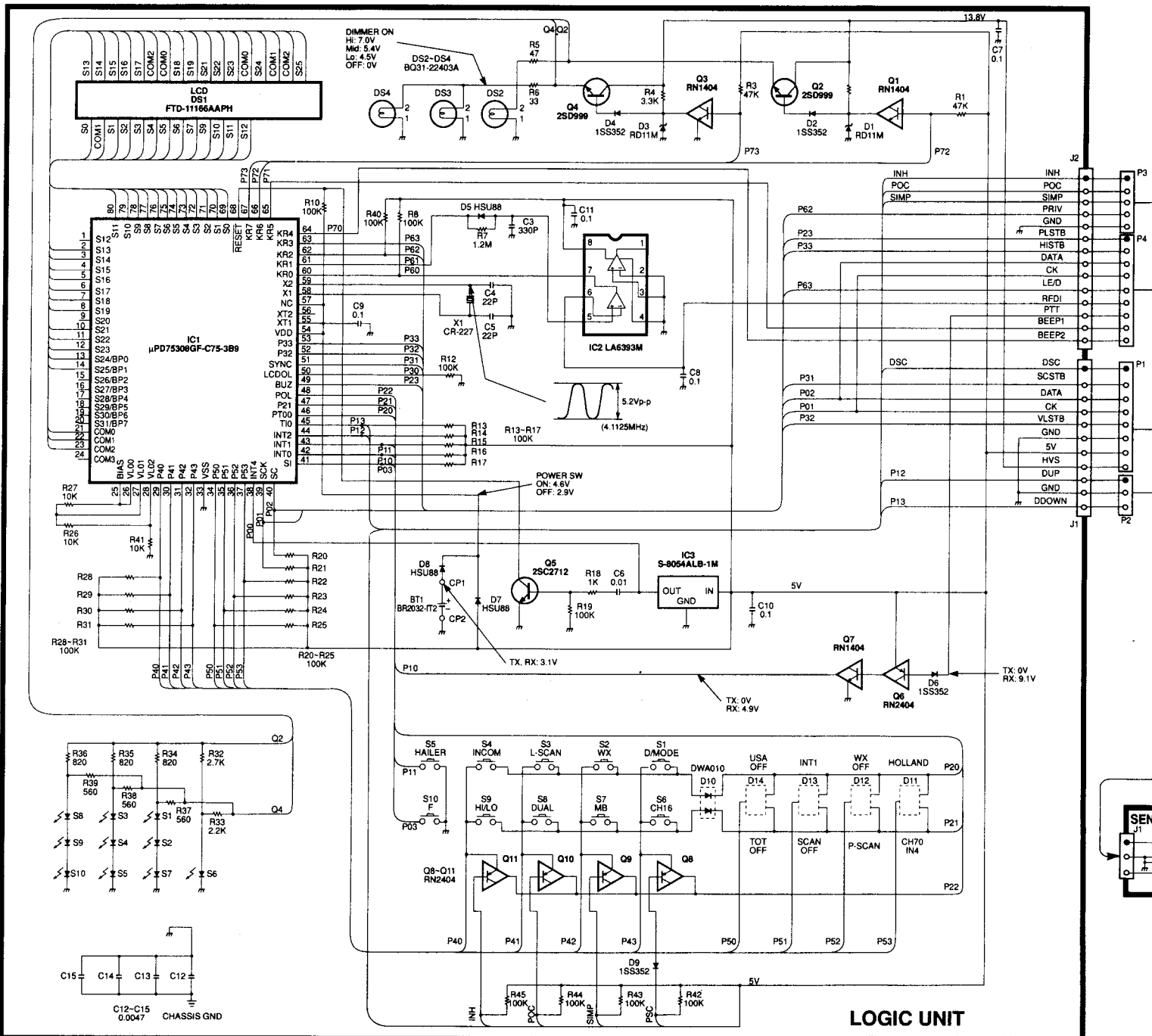
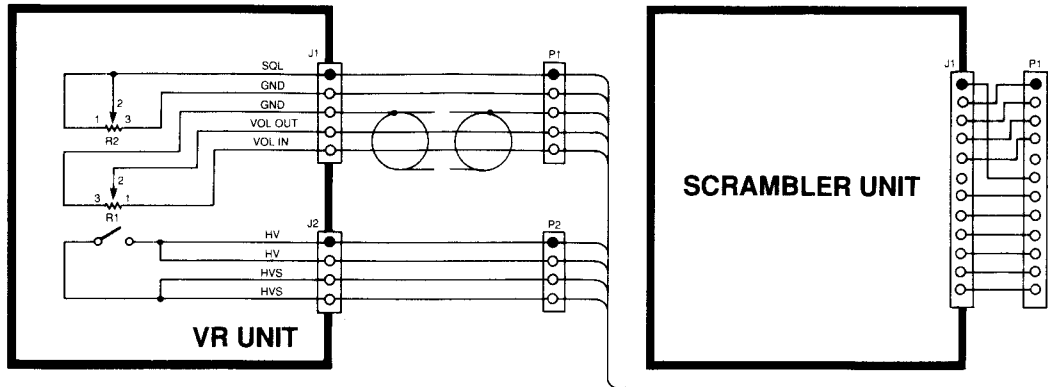
MAIN UNIT J6



# SECTION 9 BLOCK DIAGRAM

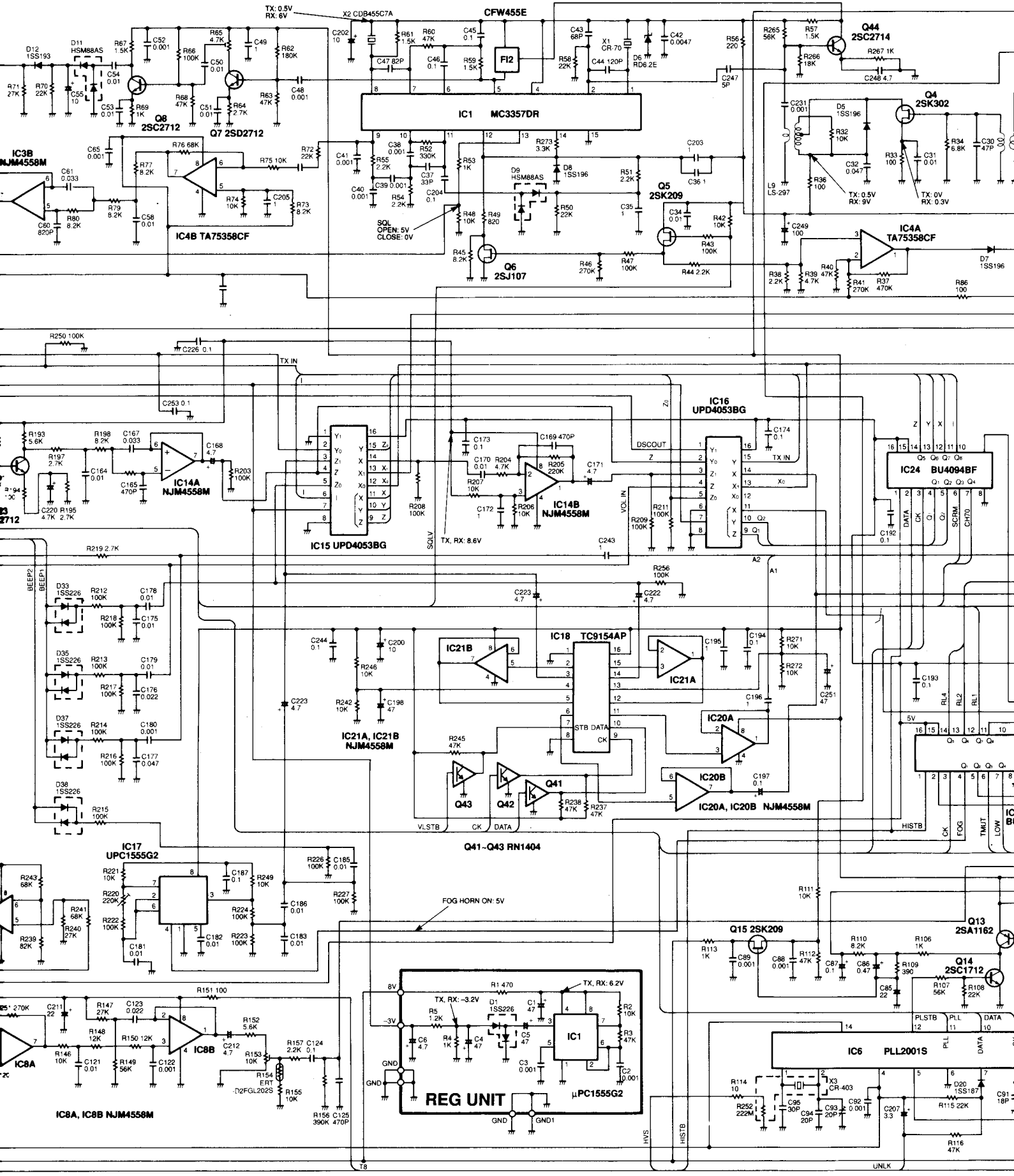


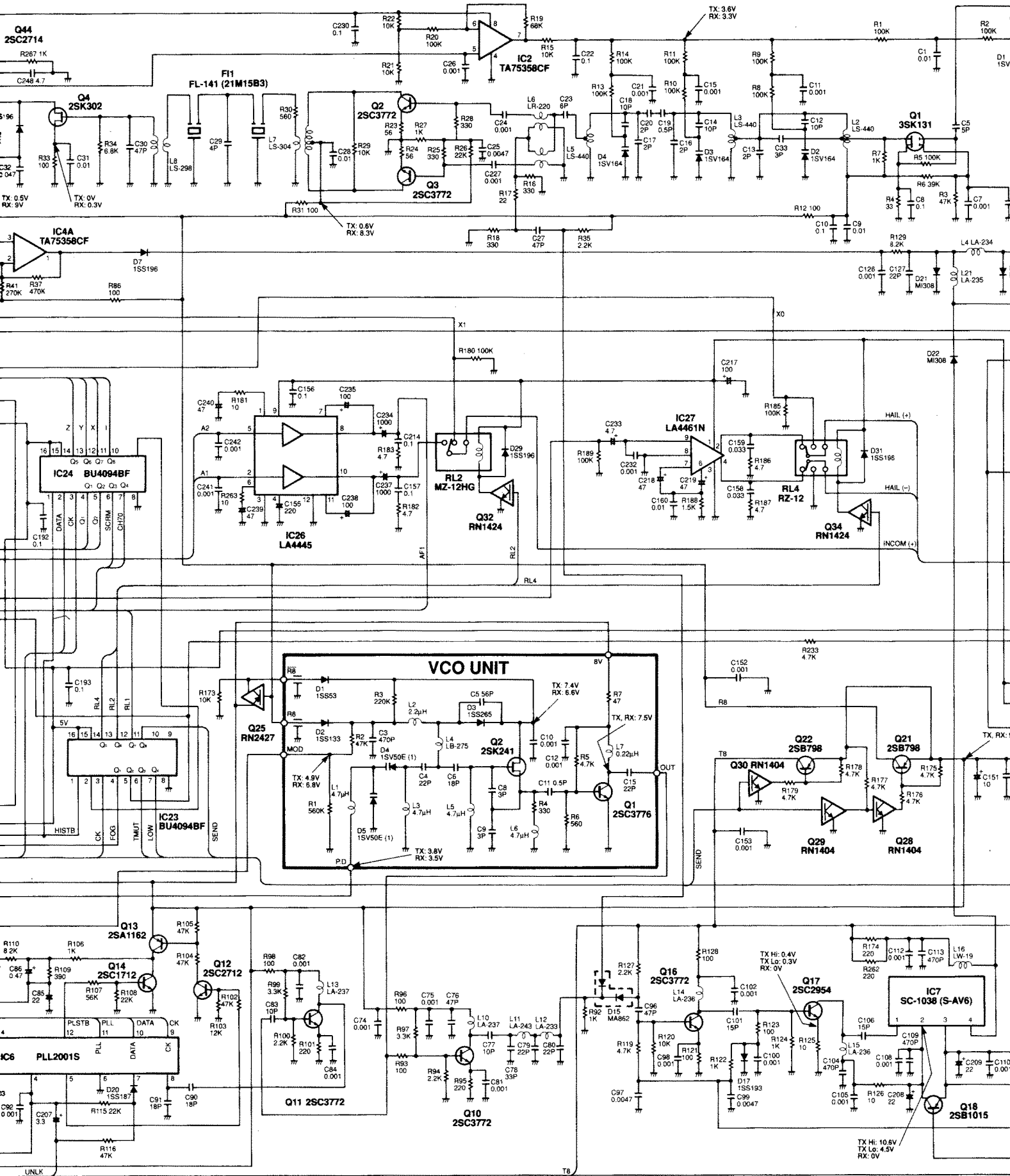
# SECTION 10 VOLTAGE DIAGRAM

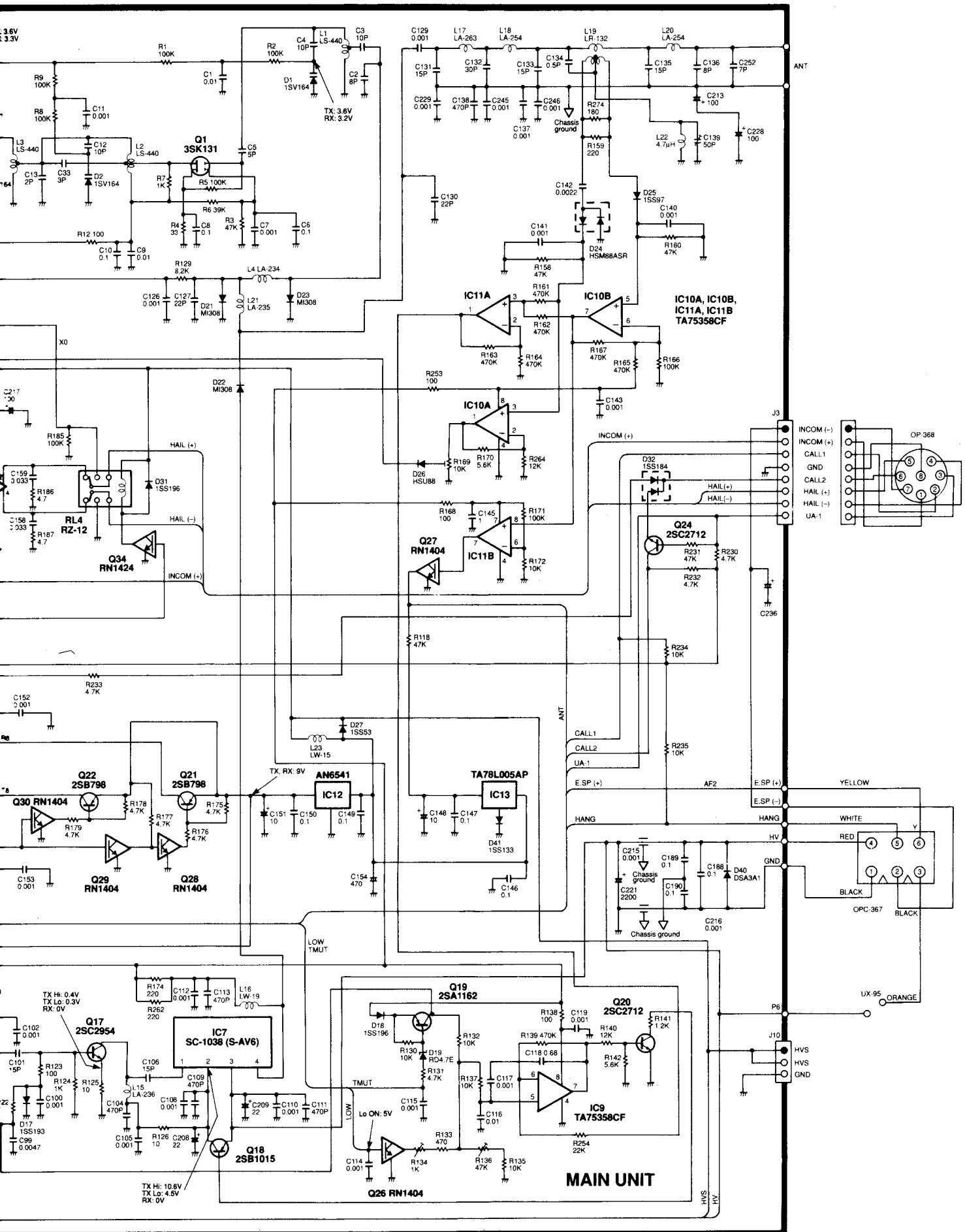












## Icom Inc.

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

Himmelgeist 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

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