



# SERVICE MANUAL

VHF MARINE TRANSCEIVER

## IC-M11

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## INTRODUCTION

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This service manual contains information relative to the theoretical, physical, mechanical and electrical characteristics of the IC-M11 VHF MARINE TRANSCEIVER.

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## ASSISTANCE

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If you require assistance or further information regarding the operation and capabilities of the IC-M11, please contact your nearest authorized Icom Dealer or Icom Service Center.

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## ORDERING PARTS

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For the fastest service, supply all of the following information when ordering parts from your dealer or Icom Service Center:

1. Equipment model and serial number
2. Schematic part identifier (e.g., IC203, Q201)
3. Printed circuit board name and number (e.g., RF UNIT/B-1551C)
4. Part number and name (e.g., 2SC3772 Transistor)
5. Order number for mechanical parts
6. Quantity required (e.g., 3pcs.)

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## REPAIR NOTE

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1. **DO NOT** open transceiver covers until the transceiver is disconnected from a power source.
2. **DO NOT** connect the transceiver to an external power source of more than 16V.
3. **DO NOT** force any of the variable components. Turn them slowly and smoothly.
4. **DO NOT** short any circuits or electronic parts.
5. An insulated tuning tool **MUST BE** used for all adjustments.
6. **DO NOT** keep power ON for a long time when the transceiver is defective.
7. **DO NOT** transmit power into a signal generator or sweep generator. Always connect a 30dB or 40dB attenuator between the transceiver and a deviation meter or spectrum analyzer when using such test equipment.
8. Read the instructions of test equipment thoroughly before connecting the equipment to the transceiver.



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# SECTION 1 SPECIFICATIONS

## ■ GENERAL

- Frequency range : 156~157.5MHz (Transmit)  
156~163.0MHz (Receive)
- Type of emission : 16K0G3E (16K0F3E)
- Number of channels : All U.S.A. and International channels  
16 Memory channels  
10 Weather channels
- Frequency stability :  $\pm 0.0005\%$
- Antenna impedance :  $50\Omega$
- Power supply voltage : 7.2~13.2V DC (Negative ground)
- Usable temperature range :  $-20^{\circ}\text{C} \sim +60^{\circ}\text{C}$  ( $-4^{\circ}\text{F} \sim 140^{\circ}\text{F}$ )
- Dimensions : 65mm(W)  $\times$  90mm(H)  $\times$  35mm(D)  
2.6"(W)  $\times$  3.5"(H)  $\times$  1.4"(D)
- Weight : 675g (1.49 lbs), (including the battery pack and flexible antenna)

## ■ TRANSMITTER

- RF output power (At 13.2V DC) : High 6W  
Low 1W
- Modulation system : Variable reactance frequency modulation
- Current drain (At 13.2V DC) : High power 2A  
Low power 1A
- Microphone impedance :  $600\Omega$
- Maximum deviation :  $\pm 5\text{kHz}$
- Spurious emissions :  $-60\text{dB}$

## ■ RECEIVER

- Receiver system : Double superheterodyne
- Sensitivity :  $0.35\mu\text{V}$  at 12dB SINAD
- Squelch sensitivity (Threshold) : Less than  $0.3\mu\text{V}$
- Intermediate frequencies : 1st 23.15MHz  
2nd 455kHz
- Current drain (At 13.2V DC) : Audio max. 0.25A  
Standby 50mA
- Audio output power : 0.5W at 10% distortion with an  $8\Omega$  load
- Audio output impedance :  $8\Omega$



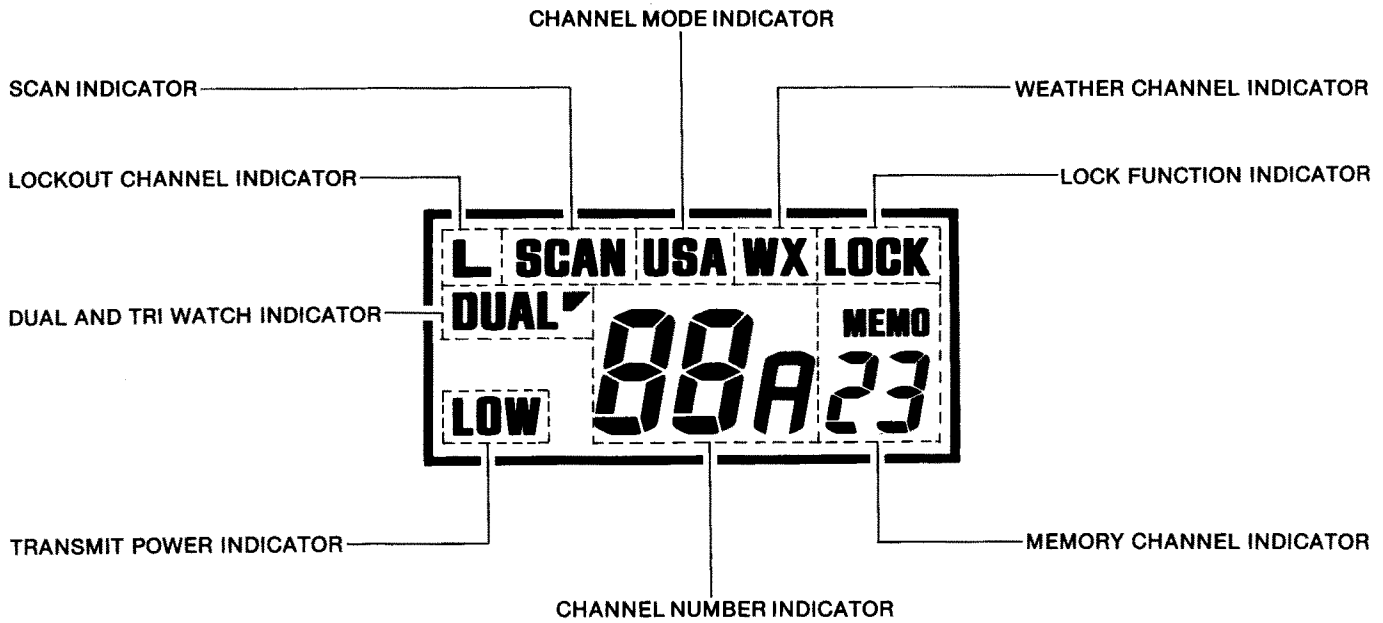
## ■ MARINE VHF TRANSCEIVER CHANNEL CHART

Channel No.	Frequency (MHz)		Transmitter output power	Channel No.	Frequency (MHz)		Transmitter output power
	Transmitter	Receiver			Transmitter	Receiver	
01	156.050	160.650	6W & 1W	65	156.275	160.875	6W & 1W
01A	156.050	156.050	6W & 1W	65A	156.275	156.275	6W & 1W
02	156.100	160.700	6W & 1W	66	156.325	160.925	6W & 1W
02A	156.100	156.100	6W & 1W	66A	156.325	156.325	6W & 1W
03	156.150	160.750	6W & 1W	67	156.375	156.375	6W & 1W
03A	156.150	156.150	6W & 1W	68	156.425	156.425	6W & 1W
04	156.200	160.800	6W & 1W	69	156.475	156.475	6W & 1W
04A	156.200	156.200	6W & 1W	70	156.525	156.525	1W only
05	156.250	160.850	6W & 1W	71	156.575	156.575	6W & 1W
05A	156.250	156.250	6W & 1W	72	156.625	156.625	6W & 1W
06	156.300	156.300	6W & 1W	73	156.675	156.675	6W & 1W
07	156.350	160.950	6W & 1W	74	156.725	156.725	6W & 1W
07A	156.350	156.350	6W & 1W	75	—	—	Guard
08	156.400	156.400	6W & 1W	76	—	—	Guard
09	156.450	156.450	6W & 1W	77	156.875	156.875	6W & 1W
10	156.500	156.500	6W & 1W	78	156.925	161.525	6W & 1W
11	156.550	156.550	6W & 1W	78A	156.925	156.925	6W & 1W
12	156.600	156.600	6W & 1W	79	156.975	161.575	6W & 1W
13	156.650	156.650	6W & 1W	79A	156.975	156.975	6W & 1W
14	156.700	156.700	6W & 1W	80	157.025	161.625	6W & 1W
* 15	156.750	156.750	1W only	80A	157.025	157.025	6W & 1W
16	156.800	156.800	6W & 1W	81	157.075	161.675	6W & 1W
17	156.850	156.850	1W only	81A	157.075	157.075	6W & 1W
18	156.900	161.500	6W & 1W	82	157.125	161.725	6W & 1W
18A	156.900	156.900	6W & 1W	82A	157.125	157.125	6W & 1W
19	156.950	161.550	6W & 1W	83	157.175	161.775	6W & 1W
19A	156.950	156.950	6W & 1W	83A	157.175	157.175	6W & 1W
20	157.000	161.600	6W & 1W	84	157.225	161.825	6W & 1W
20A	157.000	157.000	6W & 1W	84A	157.225	157.225	6W & 1W
21	157.050	161.650	6W & 1W	85	157.275	161.875	6W & 1W
21A	157.050	157.050	6W & 1W	85A	157.275	157.275	6W & 1W
22	157.100	161.700	6W & 1W	86	157.325	161.925	6W & 1W
22A	157.100	157.100	6W & 1W	86A	157.325	157.325	6W & 1W
23	157.150	161.750	6W & 1W	87	157.375	161.975	6W & 1W
23A	157.150	157.150	6W & 1W	87A	157.375	157.375	6W & 1W
24	157.200	161.800	6W & 1W	88	157.425	162.025	6W & 1W
25	157.250	161.850	6W & 1W	88A	157.425	157.425	6W & 1W
26	157.300	161.900	6W & 1W				
27	157.350	161.950	6W & 1W	WX01	—	162.550	RX only
28	157.400	162.000	6W & 1W	WX02	—	162.400	RX only
60	156.025	160.625	6W & 1W	WX03	—	162.475	RX only
60A	156.025	156.025	6W & 1W	WX04	—	162.425	RX only
61	156.075	160.675	6W & 1W	WX05	—	162.450	RX only
61A	156.075	156.075	6W & 1W	WX06	—	162.500	RX only
62	156.125	160.725	6W & 1W	WX07	—	162.525	RX only
62A	156.125	156.125	6W & 1W	WX08	—	161.650	RX only
63	156.175	160.775	6W & 1W	WX09	—	161.775	RX only
63A	156.175	156.125	6W & 1W	WX10	—	163.275	RX only
64	156.225	160.825	6W & 1W				
64A	156.225	156.225	6W & 1W				

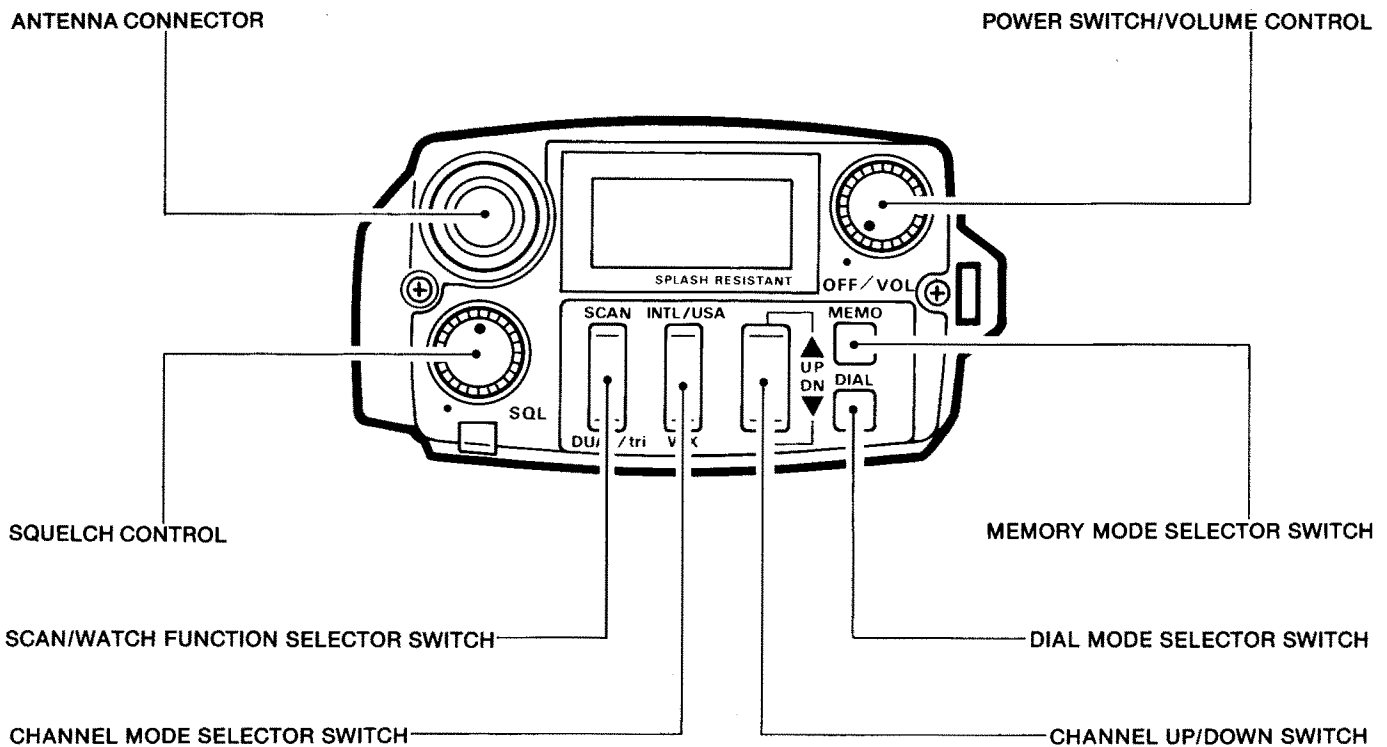
\*: Only receives using a U.S.A. channel.

## SECTION 2 OUTSIDE AND INSIDE VIEWS

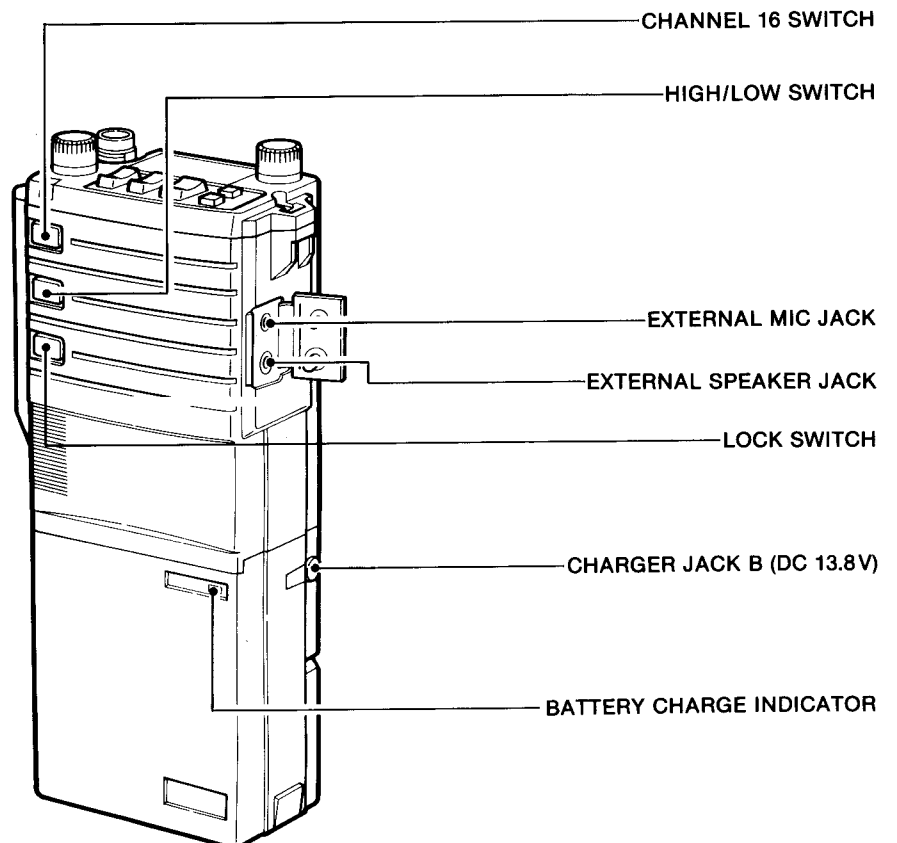
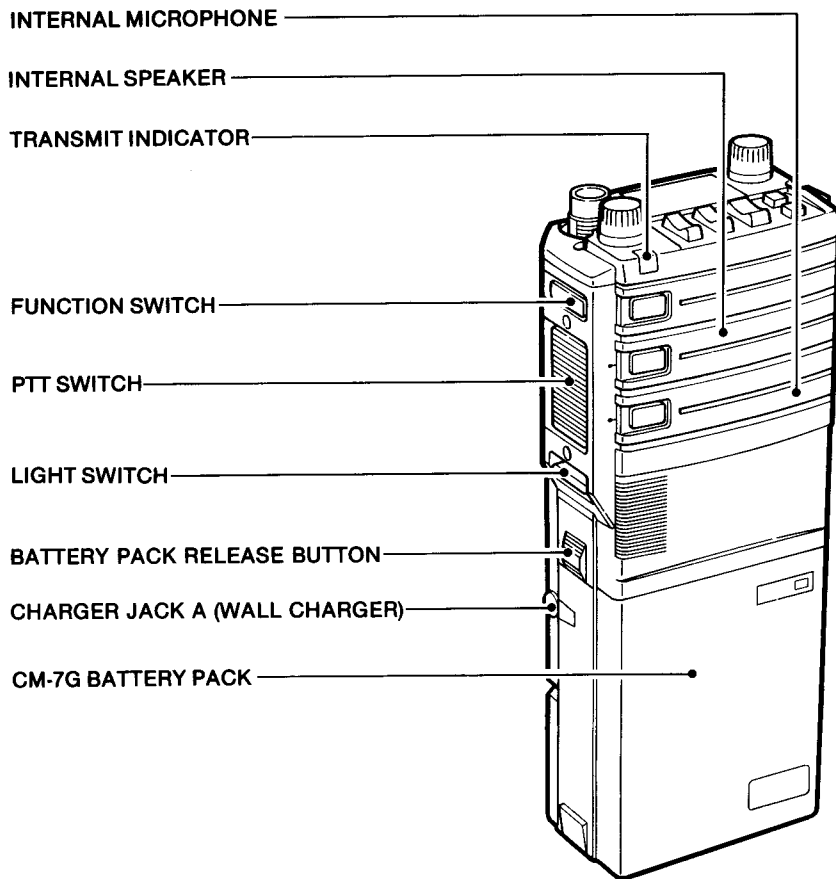
### 2-1 FUNCTION DISPLAY



### 2-2 TOP PANEL

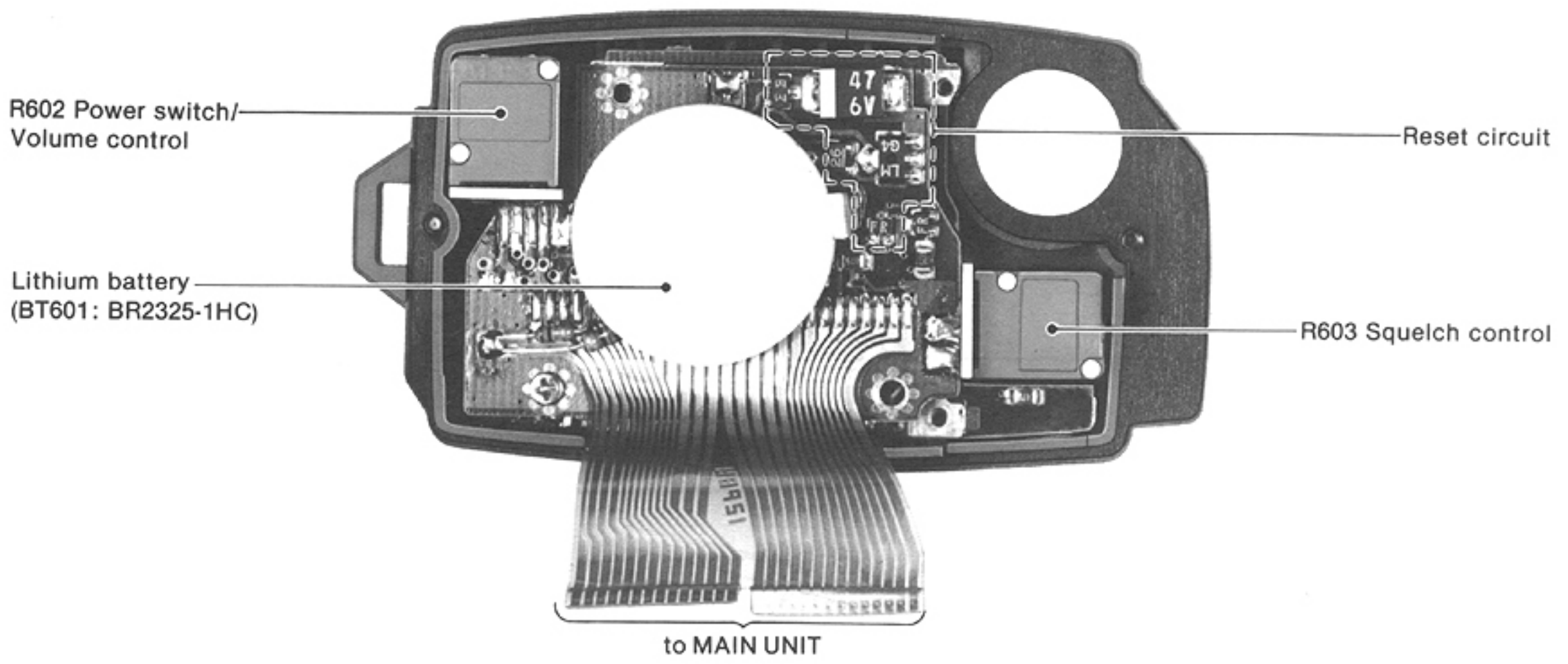


## 2-3 FRONT AND SIDE PANELS

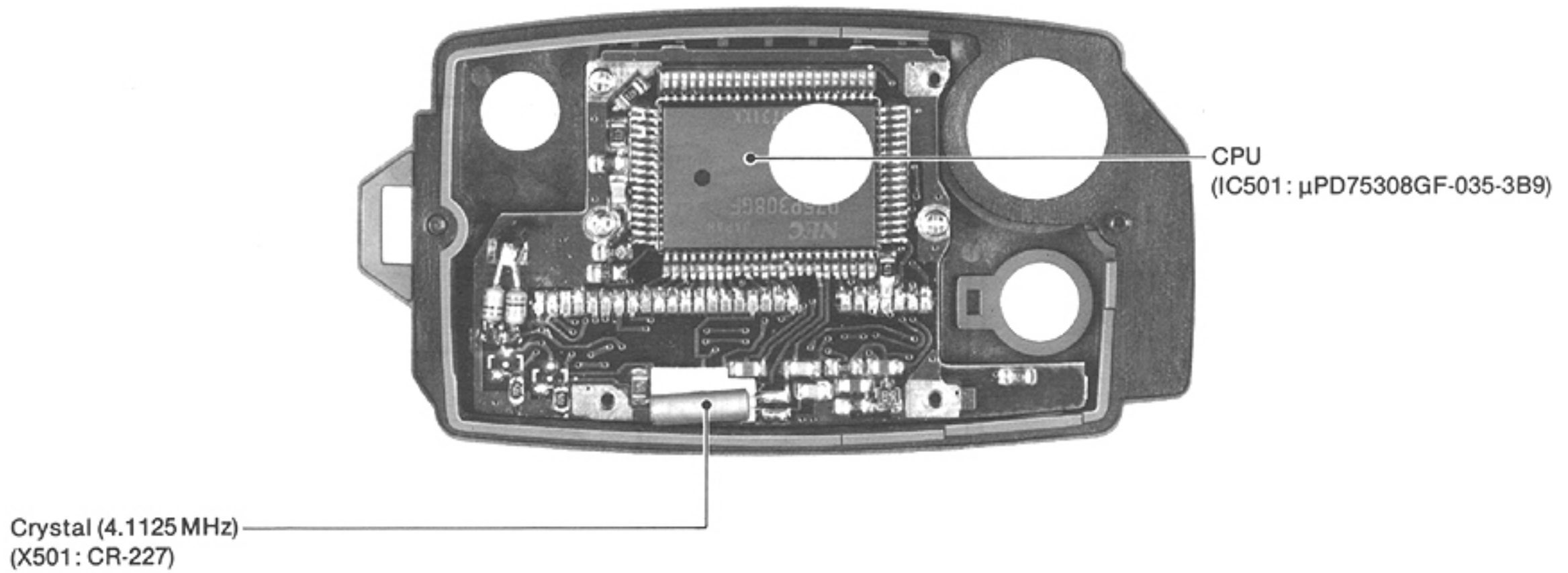


## 2-4 TOP PANEL INSIDE VIEWS

### • LOGIC B UNIT

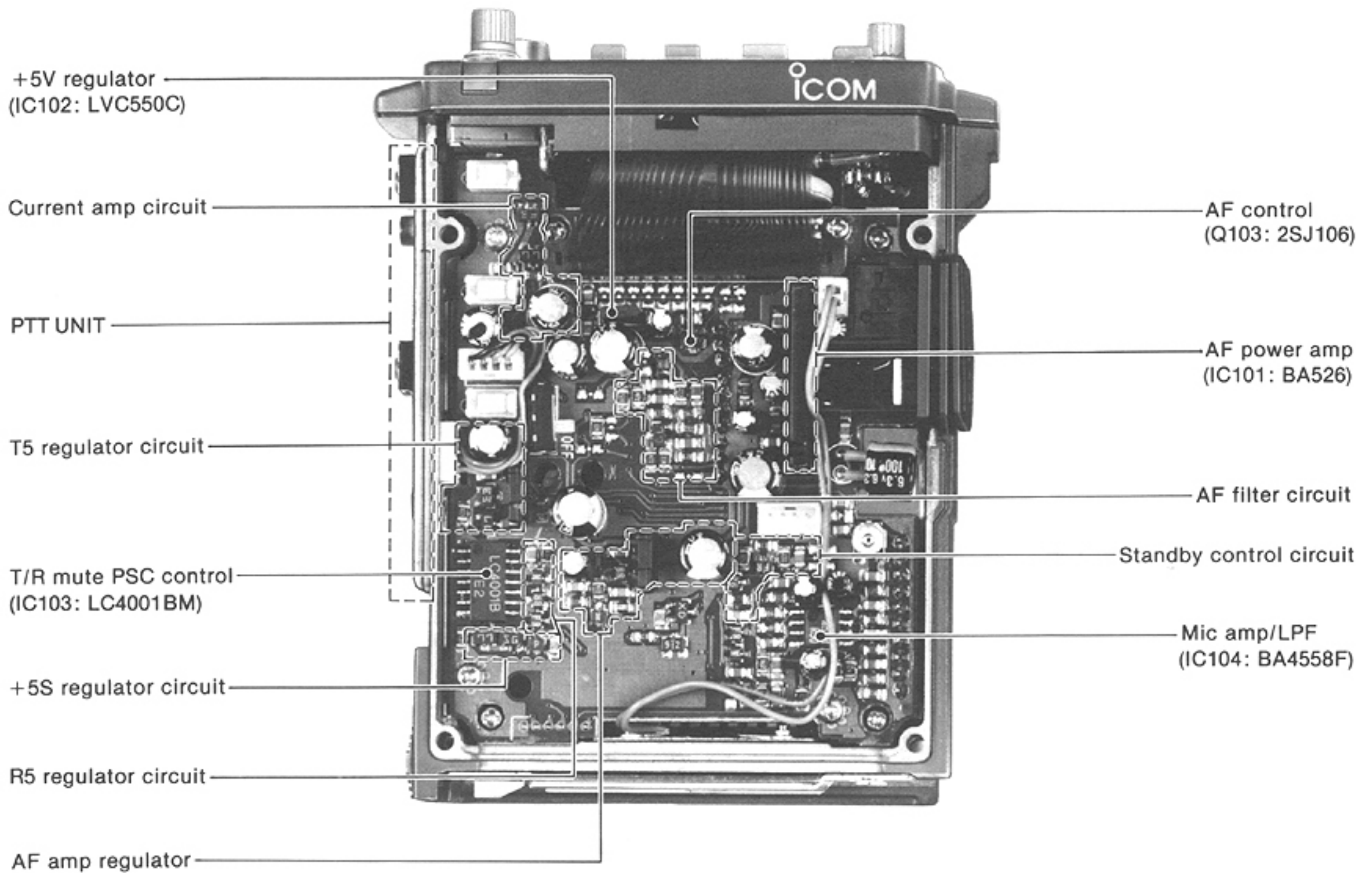


### • LOGIC A UNIT

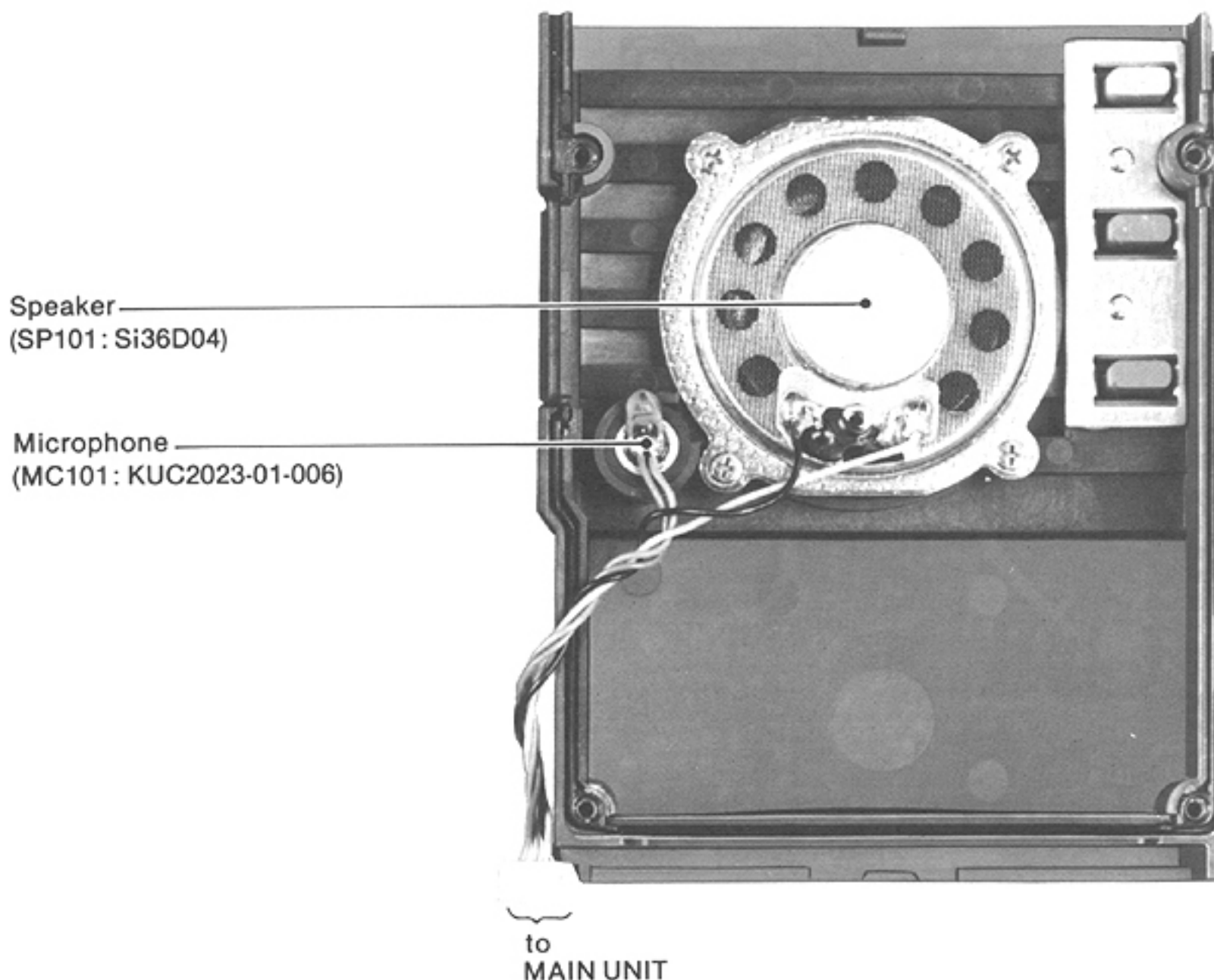


## 2-5 FRONT INSIDE VIEWS

### • MAIN UNIT



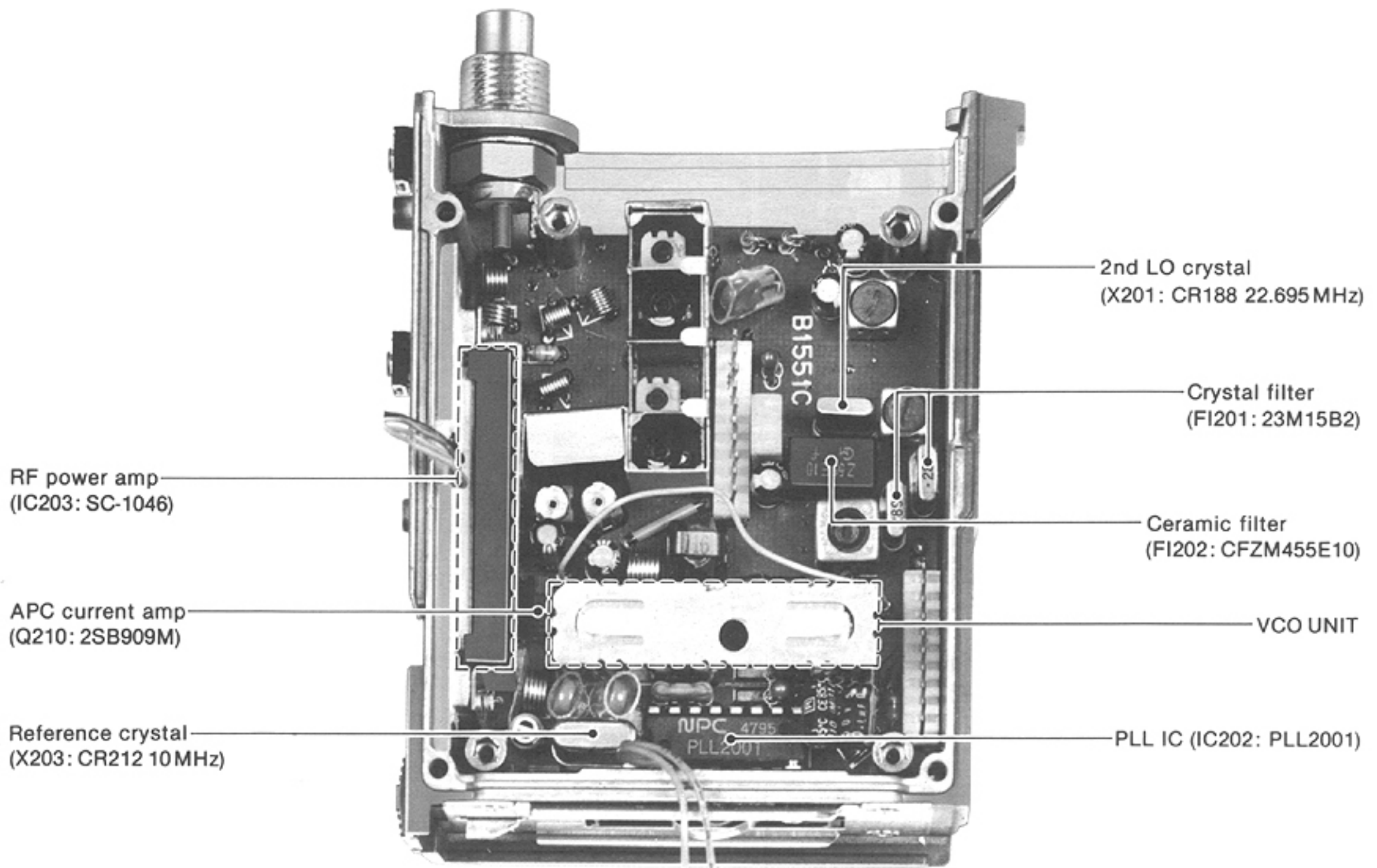
### • SPEAKER UNIT



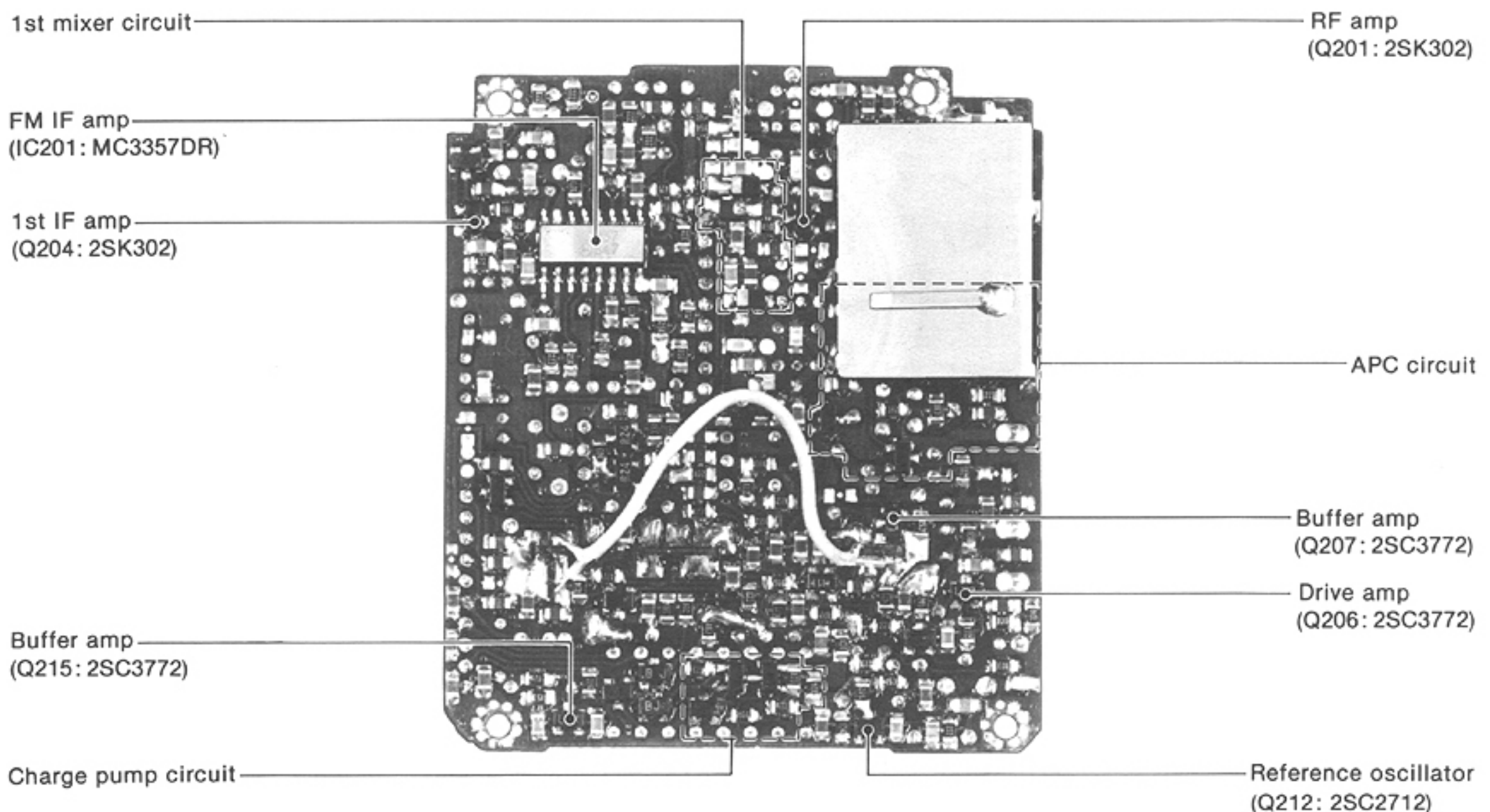


• RF UNIT

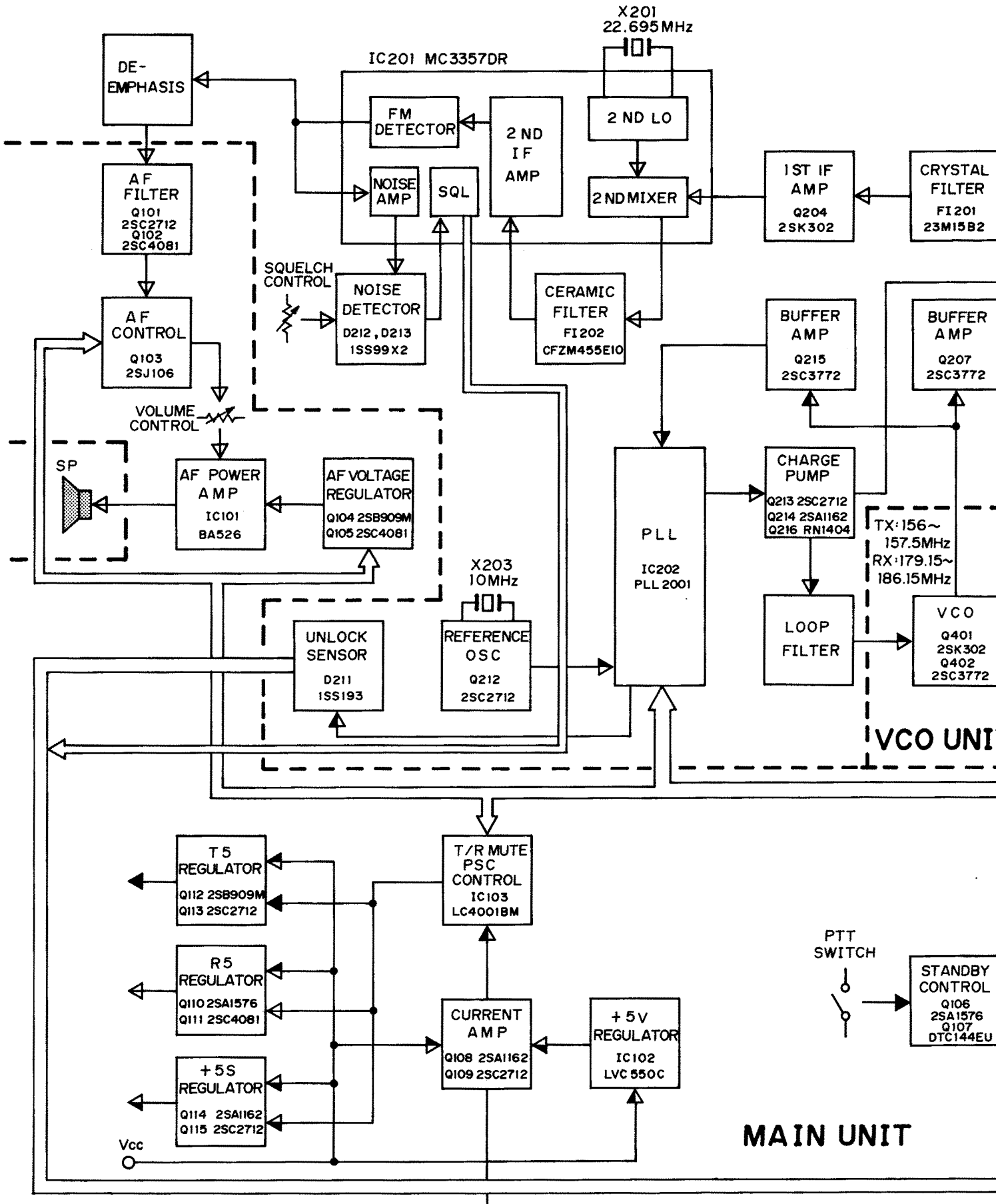
COMPONENTS SIDE



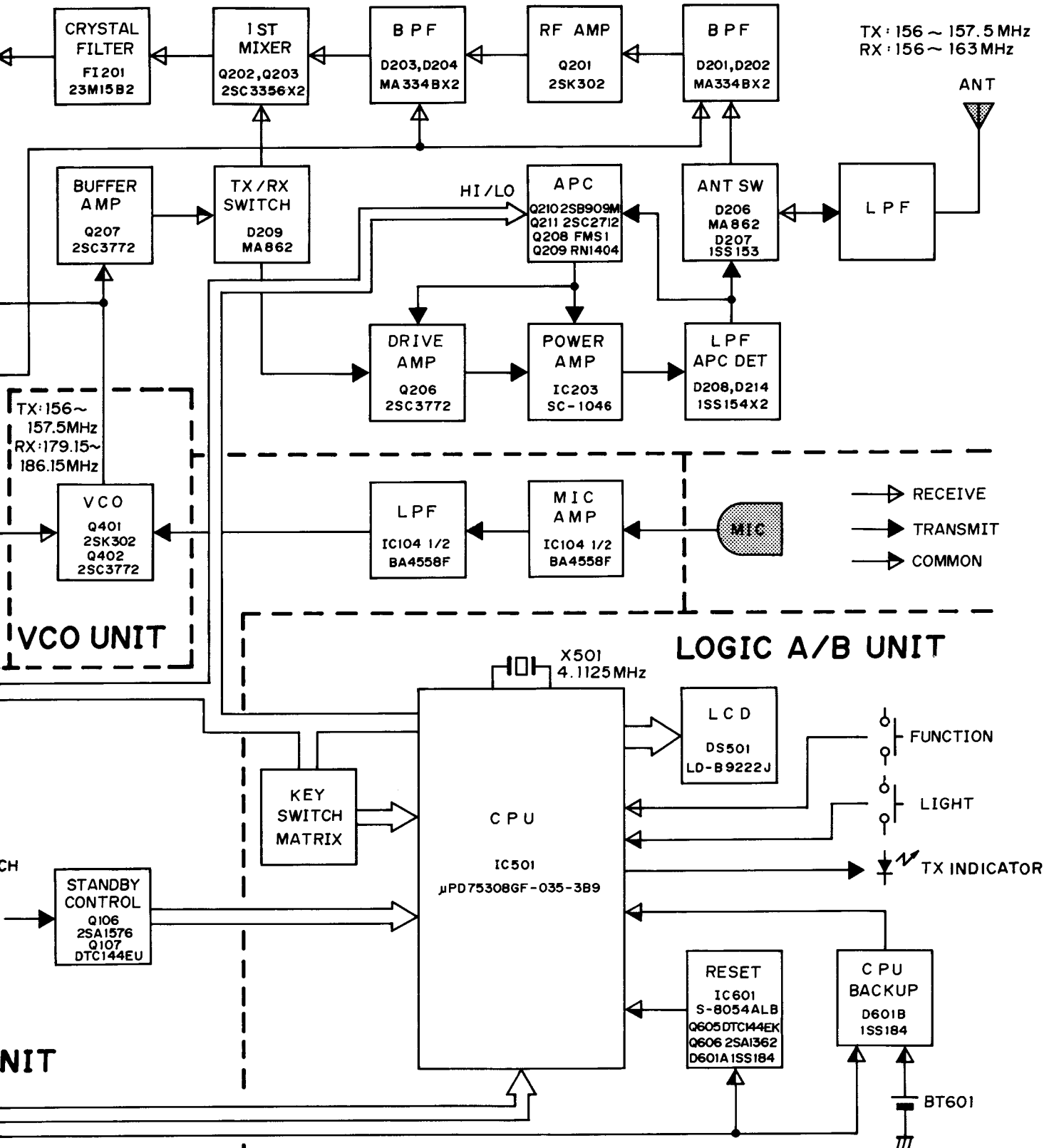
FOIL SIDE



# SECTION 3 BLOCK DIAGRAM



# RF UNIT





## SECTION 4 CIRCUIT DESCRIPTION

### 4-1 RECEIVER CIRCUITS

#### 4-1-1 ANTENNA SWITCHING CIRCUIT (RF UNIT)

Received signals enter the antenna connector and pass through a low-pass filter (L210, L211, C252~C256). The signals are applied to the antenna switching circuit (D206, L208, L209, C248~C250), and then to the RF circuit. This antenna switching circuit employs a two-stage  $\lambda/4$ -type diode switching system.

#### 4-1-2 RF CIRCUIT (RF UNIT)

The signals from the antenna switching circuit pass through a bandpass filter (L201, L202, D201, D202), and are applied to the RF amplifier (Q201). Amplified signals are reapplied to the bandpass filter (L203, L204, D203, D204), and are then applied to the 1st mixer. The bandpass filters suppress out-of-band signals. D201~D204 are varactor diodes that track the bandpass filters and are controlled by the charge pump output voltage. These diodes tune the center frequency of the bandpass filters for wide bandwidth reception and good image response rejection.

#### 4-1-3 1st MIXER CIRCUIT (RF UNIT)

This circuit is a balanced mixer consisting of Q202 and Q203. The signals from the bandpass filter are mixed with the 1st LO signal from the PLL circuit to produce a 23.15MHz 1st IF signal.

#### 4-1-4 1st IF CIRCUIT (RF UNIT)

After passing through the matching transformer (L206), the 1st IF signal is applied to the crystal filter (FI201) to suppress out-of-band signals. The 1st IF signal is then applied to the 2nd IF circuit via L207.

#### 4-1-5 2nd IF AND DEMODULATOR CIRCUITS (RF UNIT)

The 1st IF signal amplified at amplifier Q204 passes through the matching transformer (L219).

The 1st IF signal from L219 is applied to the 2nd mixer section of IC201, and is mixed with the 2nd LO signal to be converted to a 455kHz 2nd IF signal. IC201 contains the 2nd mixer, local oscillator, limiter amplifier and quadrature detector circuits. The local oscillator section and X201 generate 22.695MHz for the 2nd LO signal.

The 2nd IF signal from the 2nd mixer (IC201, pin 3) passes through the ceramic filter, FI202, where unwanted signals are suppressed. It is then amplified at the limiter amplifier section (IC201, pin 5) and

applied to the quadrature detector section (IC201, pin 8 and ceramic discriminator X202) to demodulate the 2nd IF signal into an AF signal.

AF signal output from pin 9 of IC201 is applied to the AF circuit through the AFO signal line.

#### 4-1-6 AF CIRCUIT (MAIN UNIT)

The AF signal from IC201 is applied to the deemphasis circuit (R232, C241), and then to the AF amplifier (Q101, Q102). This deemphasis circuit is an integrated circuit with frequency characteristics of  $-6\text{dB/octave}$ . Q101 and Q102 also function as the bandpass filter.

The amplified signals pass through the AF control circuit (Q103) and the [VOL] CONTROL (R602). When the squelch is closed, Q103 is activated as the AF mute switch. The power-amplified signals from IC101 are applied to the speaker.

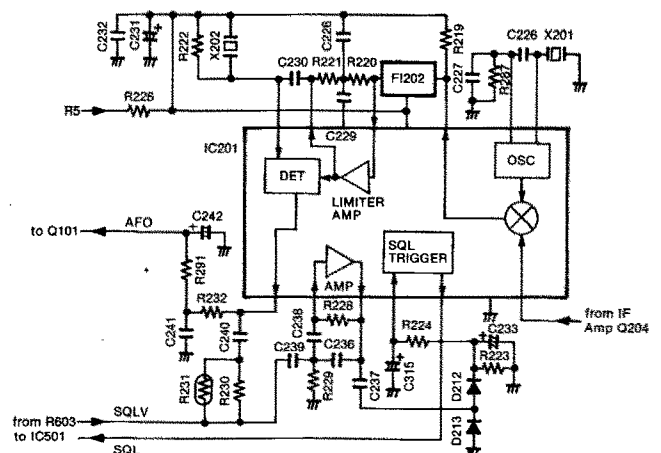
#### 4-1-7 SQUELCH CIRCUIT (RF UNIT)

R230 and R231, connected to pin 9 of IC201, improve the temperature characteristics of the AF output power.

The limiter amplifier section in IC201 amplifies noise components of frequencies of 20kHz and above, and outputs the resulting signals from pin 12. Output signals are rectified by D212 and D213.

The rectified voltage triggers the squelch circuit in IC201. Pin 13 of IC201 outputs the squelch signal. The signal is applied to the CPU (IC501, pin 41) through the SQL signal line.

The squelch circuit controls the AF voltage regulator (Q104, Q105) and mutes AF output while receiving no signal.



## 4-2 TRANSMITTER CIRCUITS

### 4-2-1 MICROPHONE AMPLIFIER (MAIN UNIT)

AF signals from the built-in condenser microphone or from the EXT. MIC JACK are applied to IC104A pin 3, and are pre-emphasized to 6dB/octave through C125 and R122 connected to pin 2. IC101A functions as the microphone amplifier and the limiter.

The signals pass through the splatter filter circuit (IC104B, R124, R128, R129, C127~C129) where signals of 3kHz and above are attenuated. IC104 pin 7 then outputs the signals. The signals are applied to D405 in the VCO circuit to change the capacitance of D405, producing an FM signal.

### 4-2-2 DRIVE AMPLIFIER (RF UNIT)

The VCO output is buffer-amplified at Q207, and applied to the transmit/receive switching circuit (D209).

After passing through the transmit/receive switching circuit (D209), the VCO output is amplified at the drive amplifier (Q206).

The voltage controlled by the APC circuit is applied to the collector of Q206 to protect the RF power module from damage by an antenna mismatch.

### 4-2-3 RF POWER AMPLIFIER (RF UNIT)

IC203 is a power module which provides a stable 6W output power.

RF signals from the drive amplifier (Q206) are applied to pin 1 of IC203. The amplified signals are output from pin 5, and applied to the ANTENNA CONNECTOR through the APC detector, diode switching and low-pass filter circuits.

### 4-2-4 APC CIRCUIT (RF UNIT)

The APC detector circuit consists of L213, C260, C261, R294, R295, D208 and D214.

When the antenna impedance is matched at 50Ω, the voltage detected at D208 and D214 is at a minimum.

The voltage detected at D208 and D214 is applied to the differential amplifier (Q208). The APC reference voltage is applied to the base of Q208B.

When the antenna impedance is mismatched, the base voltage of Q208A is higher than the reference voltage. The collector voltage of Q208A decreases. Q211 amplifies the current from the differential amplifier which controls Q210—changing the supply voltage to Q206.

The change in supply voltage decreases the output power of the drive amplifier (Q206) and power amplifier (IC203) until the base voltage of Q208A equals the base voltage of Q208B.

### 4-2-5 POWER OUTPUT CONTROL CIRCUIT (RF UNIT)

The power output control circuit consists of R240~R244 and Q209. This circuit controls the RF output power with APC reference voltage.

When HIGH output power is selected, Q209 is turned OFF. RF output power is adjusted with R244.

When LOW output power is selected, Q209 is turned ON. Series resistors R240 and R242 are connected in parallel with series resistors R243 and R244. RF output power is adjusted with R242.

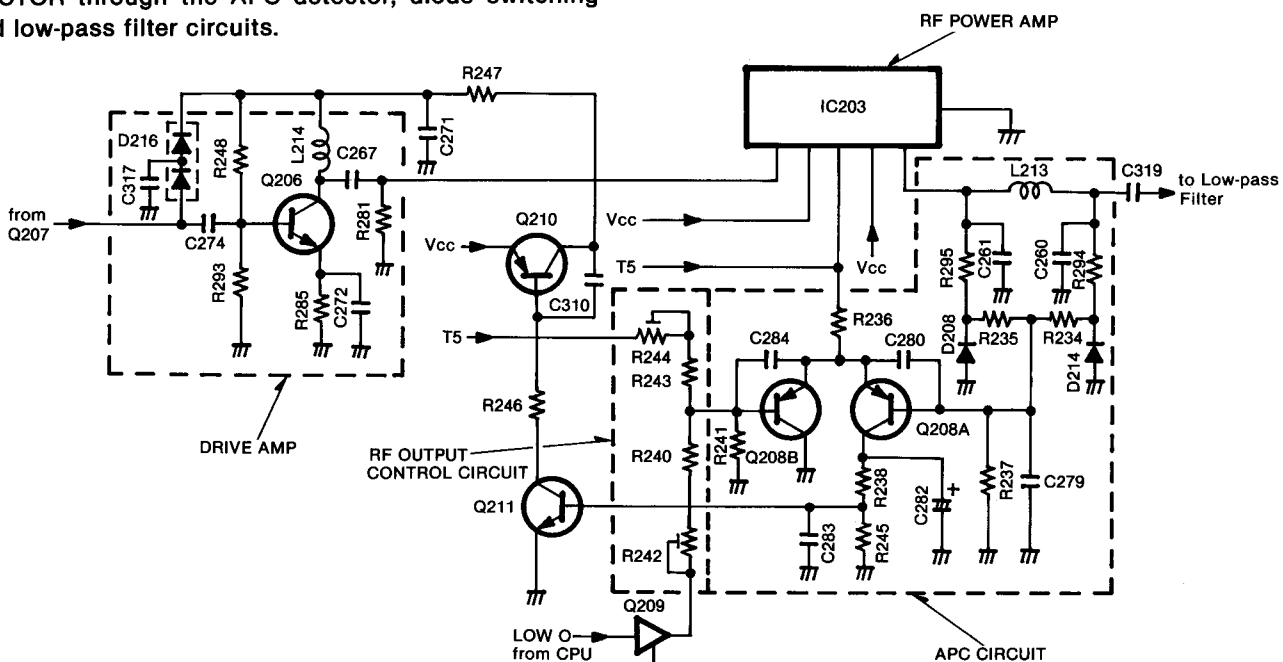


Fig. 2

## 4-2-6 ANTENNA SWITCHING CIRCUIT (RF UNIT)

When transmitting, D206 and D207 are turned ON. L209 and C250 form a parallel resonant circuit. The RF output signal from IC203 is not applied to the receiver circuit, and passes through L213, D207 and C251, the low-pass filter (L210, L211, C252~C256) and then on to the antenna. The impedance of the parallel resonant circuit increases. Signals which leak through the resonant circuit are bypassed through D206.

## 4-3 PLL CIRCUITS

### 4-3-1 GENERAL

The PLL circuit, using a dual modular prescaler (IC202), directly generates the desired frequency with the VCO circuit. The dual modular prescaler (IC202) sets the dividing ratio based on serial data from the CPU (IC501), and compares the phases of the VCO signal and the reference oscillator frequency. It detects the out-of-step phase and outputs it.

### 4-3-2 REFERENCE OSCILLATOR CIRCUIT (RF UNIT)

A reference frequency is produced by Q212 and X203. D210, R258 and R260 provide frequency control. Thus, the output frequency of this circuit is stable over a wide temperature range.

### PLL CIRCUIT

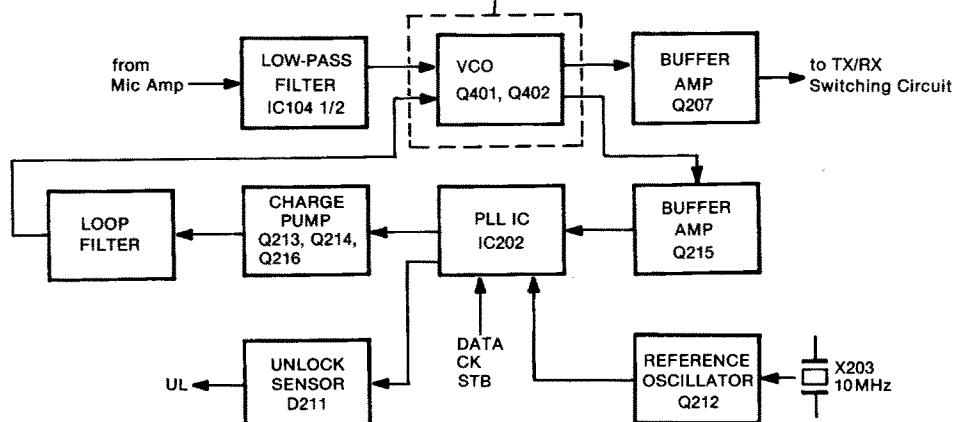
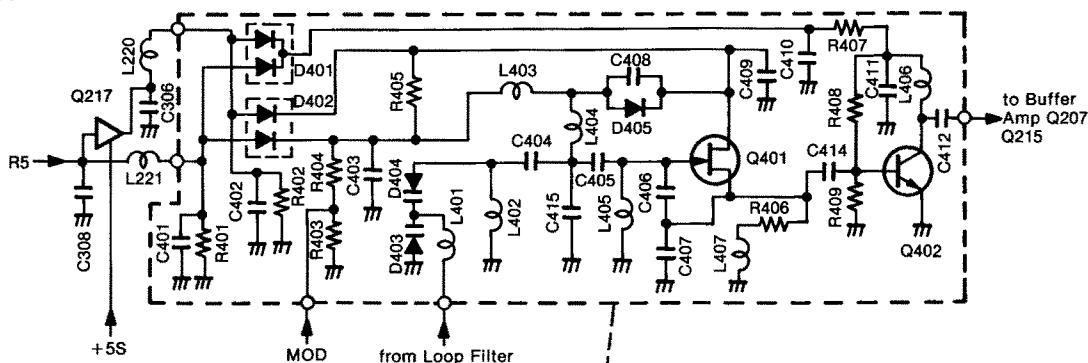


Fig. 3

## 4-3-3 CHARGE PUMP AND LOOP FILTER CIRCUITS (RF UNIT)

Phase-detected signals from pins 5 and 12 are converted to DC voltage by the charge pump Q213, Q214 and Q216; and the lag-lead loop filter consisting of R267, R268, R278, C293, C300 and C314.

The frequency at which the VCO oscillates is controlled by varactor diodes (D403, D404). DC voltage (PLL lock voltage) is provided through the loop filter.

The output of the loop filter passes through Q205, and is used as voltage to control the bandpass filter (D201~D204) of the receiver RF circuit.

### 4-3-4 VCO CIRCUIT

D405 changes the inductive reactance of the Clapp oscillator (Q401), shifting the receive and transmit frequencies. Varactor diodes (D403, D404) provide frequency control. The buffer amplifier (Q402) is unaffected by VCO oscillation.

### 4-3-5 UNLOCK SENSOR CIRCUIT

When the PLL circuit is unlocked, pin 7 of IC202 is "LOW" and a "LOW" signal is applied to the unlock sensor (D211). The unlock sensor outputs an unlock detect signal to CPU (IC501) pin 43.

## 4-4 POWER SUPPLY CIRCUITS

### 4-4-1 VOLTAGE REGULATOR CIRCUIT (MAIN UNIT)

A 3-terminal regulator (IC102) outputs a reference voltage for the +5V line with the 5.5~15V input. The noise components of the output of IC102 are removed by the noise filter (R133, C136). The output is then applied to the current amplifier (Q108, Q109).

### 4-4-2 VOLTAGE LINES

LINE	DESCRIPTION
Vcc	Battery pack output that passes through the power switch. It is applied to the power module (IC203) and the following 5V lines.
+5V	Common 5V current amplified at current amplifier (Q108, Q109 and D104) using IC102 output as a reference voltage. The heat factor of the combined voltages at Q108 ( $V_{BE}$ ) equals D104. The output voltage is stable even with regard to temperature changes.
+5S	Common 5V controlled by the power save function. Current amplified at Q114, Q115 and D107.
T5	Transmit 5V current amplified at Q112.
R5	Receive 5V controlled by the power save function. Current amplified at Q110, Q111 and D105.

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

When the POWER SWITCH is turned OFF, a voltage is applied to the CPU (IC501) pin 54 via D601B from the lithium backup battery installed in the transceiver to provide backup for the memory contents.

### T5/R5 SWITCHING AND POWER SAVER CIRCUITS

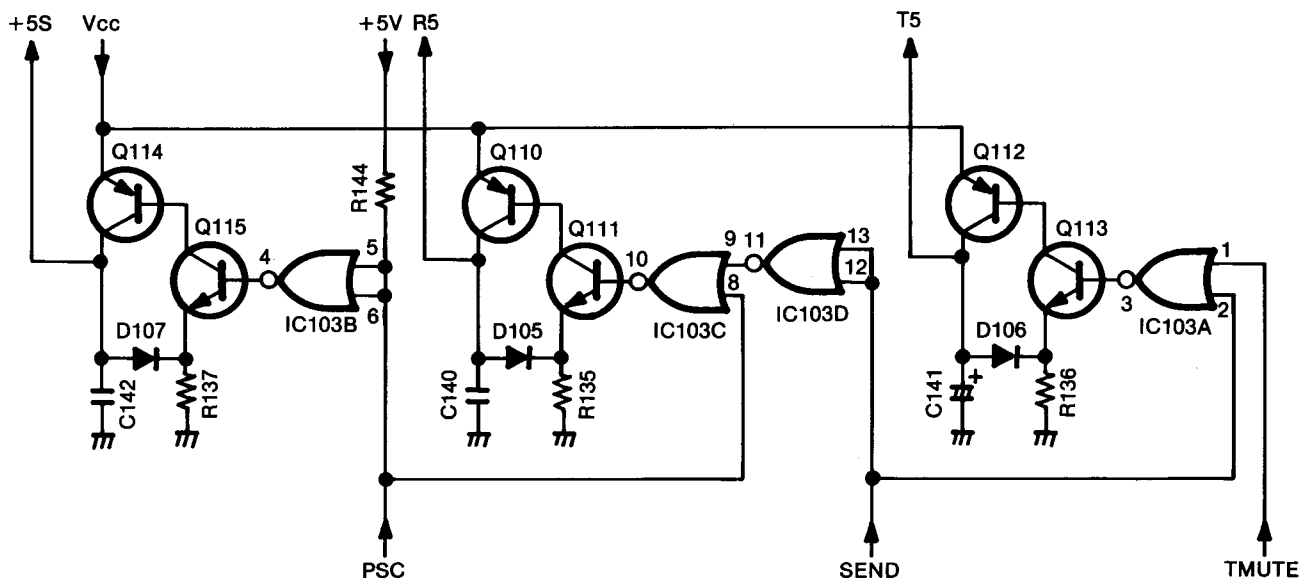


Fig. 4

## 4-5 OTHER CIRCUITS

### 4-5-1 LAMP CIRCUIT (LOGIC A UNIT)

When the LIGHT SWITCH is turned ON, the CPU (IC501) pins 34 and 35 become "LOW" to light up the two chip-type LEDs (DS503, DS504).

### 4-5-2 T5/R5 SWITCHING CIRCUIT (MAIN UNIT)

When the PTT SWITCH is ON, Q106 and Q107 are turned ON, and a "LOW" signal is applied to the CPU (IC501) pin 44. The CPU pin 31 (SEND) becomes "LOW," and the signal is applied to IC103A to control the T5 line. At the same time, the SEND signal is applied also to IC103D to control the R5 line.

### 4-5-3 POWER SAVER CIRCUIT

To reduce current consumption during receive standby, power saver signals are output from the CPU (IC501) pin 32 and applied to IC103.

The timing cycle of the power saver is 500msec. for "VOLTAGE OFF" and 125msec. for standby.

When a PSC port is "HIGH," the output from IC103402B (pin 4) and IC103C (pin 10) is "LOW." R5 and +5S are not supplied to their respective circuits.

The PSC port turns "HIGH" 30sec. after a switch is pushed, and the power saver is activated.

500msec. after the power saver is activated, the PSC port is "LOW" for the next 125msec. standby state. If RF signals are received and the squelch opens during this time, the power saver is turned OFF or the power saver continues.

## 4-6 CPU (IC501) PORT ALLOCATIONS

### INPUT PORT

PIN	PORT	NAME	DESCRIPTION
41	P03	SQL	When the squelch opens, this port becomes "HIGH."
42	P10	LAMPI	When the LIGHT SWITCH is pushed, this port changes from "HIGH" to "LOW."
43	P11	UL	When the PLL circuit is unlocked, this port becomes "LOW," and the CPU turns RMUTE and TMUTE ports "HIGH." The FUNCTION DISPLAY blinks to indicate that the PLL is unlocked.
44	P12	PTT	When the PTT SWITCH is pushed, this port becomes "LOW."
45	P13	FUNC	When the FUNCTION SWITCH is pushed, this port becomes "LOW." The secondary function is activated.
53, 60~63	P33, P60~P63		Matrix input.

### OUTPUT PORT

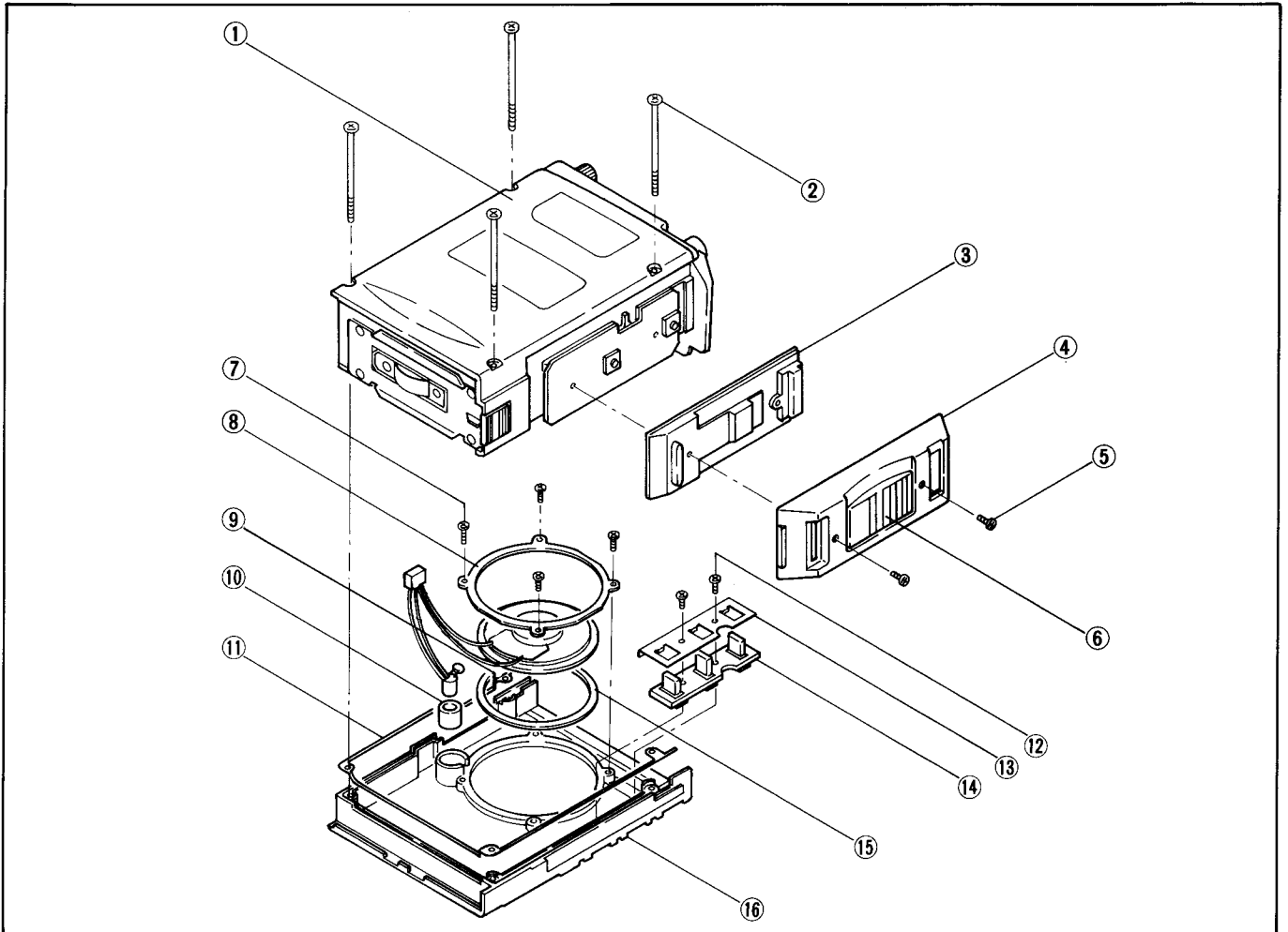
PIN	PORT	NAME	DESCRIPTION
1~11	S12~S22		Ports for the LCD.
29	P40	RMUTE	Port for AF control. When SQL port is "LOW," the AF signal is muted.
30	P41	TMUTE	Port for T5 control. This port becomes "LOW" 80msec. after the PTT port turns "LOW."
31	P42	SEND	Port for R5 and T5 control. This port becomes "LOW" while transmitting.
32	P43	PSC	Port for +5S and R5 control. This port becomes "HIGH" during the power saver "VOLTAGE OFF."
34, 35	P50, P51	LAMP1 LAMP2	Ports for backlight control. When these ports are "LOW," the backlight for the FUNCTION DISPLAY is illuminated.
36	P52	CPC	While the power saver activates, this port becomes "HIGH" according to the PLL data.
39	CK	CK	Port for PLL serial data clock.
40	SO	DATA	Port for PLL serial data.
46	P20	BEEP	Port for the beep tone signal.
47	P21	LOWO	Port for RF output power control. When LOW output power is selected, this port becomes "HIGH."
48	P22	STB	Port for strobe signal of PLL serial data.
50	P30	AFC	Port for AF power amp control. When the squelch opens or the beep tone signal is supplied, this port becomes "HIGH."
64~67	P70~P73		Matrix output.
69~80	S0~S11		Ports for the LCD.

## SECTION 5 MECHANICAL PARTS AND DISASSEMBLY

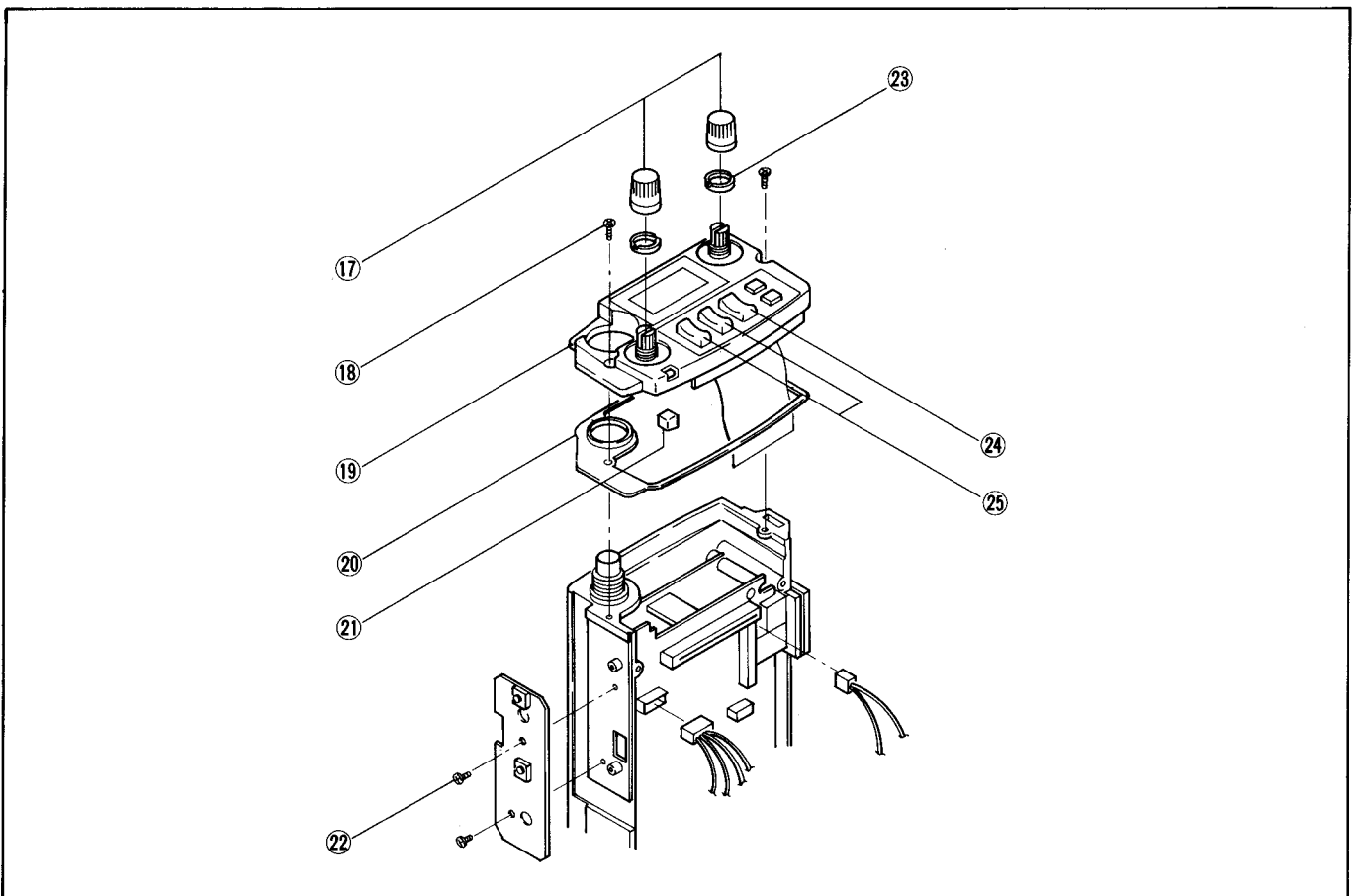
LABELLED NUMBER	DESCRIPTION	ORDERING NUMBER	QTY.
①	Rear panel (A)	8010006970	1
②	PH B0 2×31.5 ZK	8810004000	1
③	PTT switch cover	8930011950	1
④	PTT holder (A)	8930012000	1
⑤	No. 0-1 PH M2×5 ZK	8810000530	2
⑥	PTT Button	8930011910	1
⑦	No. 0-1 PH B0 2×4	8810004800	4
⑧	Speaker plate	8930012100	1
⑨	Casing seal (side)	8930011990	1
⑩	Mic holder	8930011930	1
⑪	Casing seal (center)	8930011870	1
⑫	No. 0-3 PH B0 1.4×2.5 Ni	8810003850	2
⑬	Front switch plate	8930012130	1
⑭	Switch seal (A)	8310011830	1
⑮	Speaker seal	8930011580	1
⑯	Front panel (I)	8210003030	1
⑰	Knobs (Power/Volume/Squelch) N-126	8610004230	2
⑱	No. 0-1 PH M2×6 ZK	8810004860	2
⑲	Top panel (A)	8210002860	1
⑳	Top panel seal	8930011970	1
㉑	Lens	8930011940	1
㉒	No. 0-1 PH M2×2.5	8810004870	2
㉓	VR nut (E)	8830000550	2
㉔	Button K-106	8610004210	1
㉕	Buttons K-107	8610004220	2
㉖	No. 0-1 PH M2×2.5	8810004870	3
㉗	No. 0-3 PH B0 1.4×4.5 Ni	8810004980	6
㉘	VR angle plate	8930012120	1
㉙	Space plate	8930012140	1
㉚	Top panel switch seal (A)	8930012450	1
㉛	Top panel (A)	8210002860	1
㉜	LCD contact strip SRCN573	8930012090	2
㉝	LCD reflector	8010006980	1
㉞	LCD LD-B9222J	5030000320	1
㉟	LCD window plate	8310011530	1
㊱	PH M2×5	8810000020	4
㊲	Jack cover flap	8930011980	1
㊳	573 standoff	8930012080	4
㊴	No. 0-1 PH M2×8 ZK	8810004840	2
㊵	Antenna connector TNC-R106 (includes nut)	6510007120	1
㊶	Screw lug M2	8860000010	2
㊷	Contact holder	8930011880	1
㊸	BuH M2×6 Ni	8810002580	1
㊹	Latch plate (A)	8930008600	1
㊺	Sliding guide	8010006990	1
㊻	Connection spring	8930005980	1
㊼	PH M2×5 Ni	8810001770	1
㊽	Release button (A)	8930008610	1
㊾	FH M2×4 Ni	8810002310	4

**Screw type** Screw: M2×6, M2×3, etc. Self-tapping screw: B0 2×4, B0 2×31.5, etc. Precision type screw: No. 0-1  
**Head style of screws** PH: Pan head BH: Button head FH: Flat head

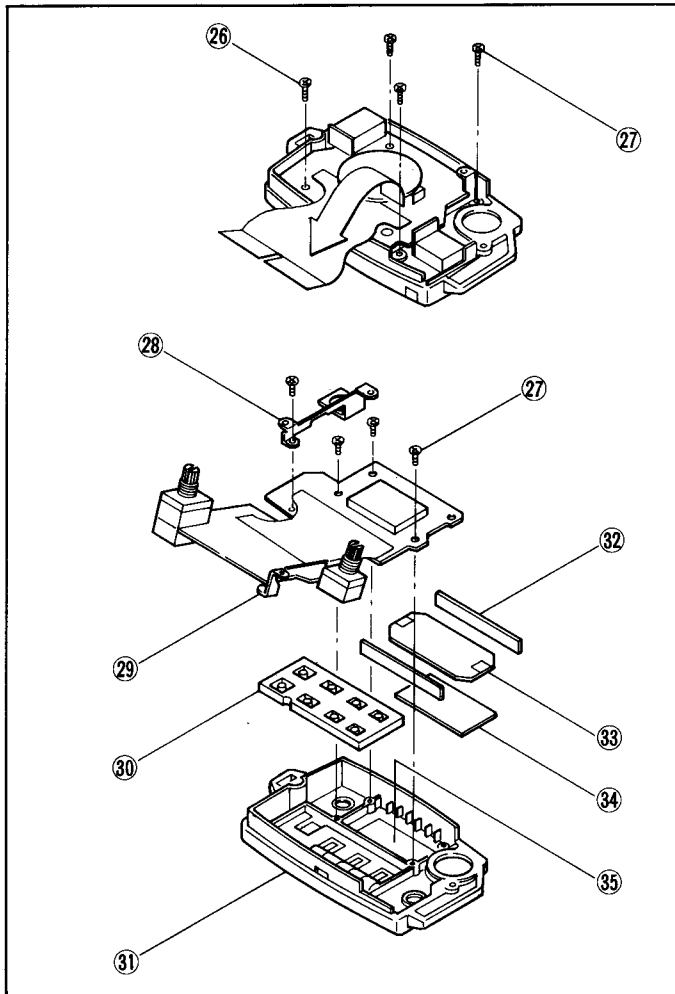
• CASE AND FRONT PANELS



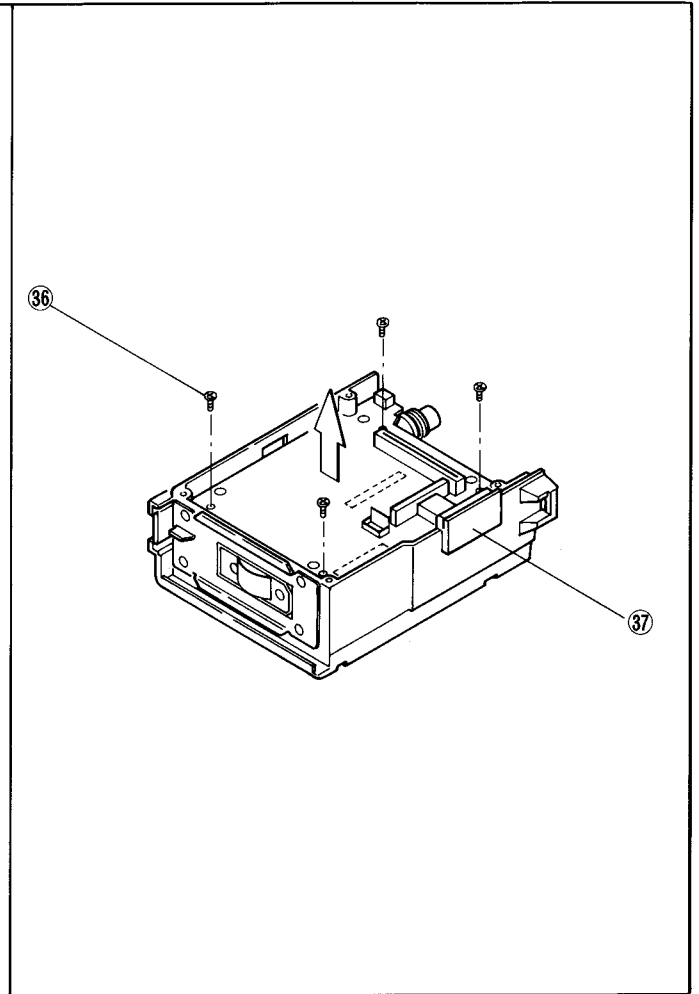
• TOP PANEL



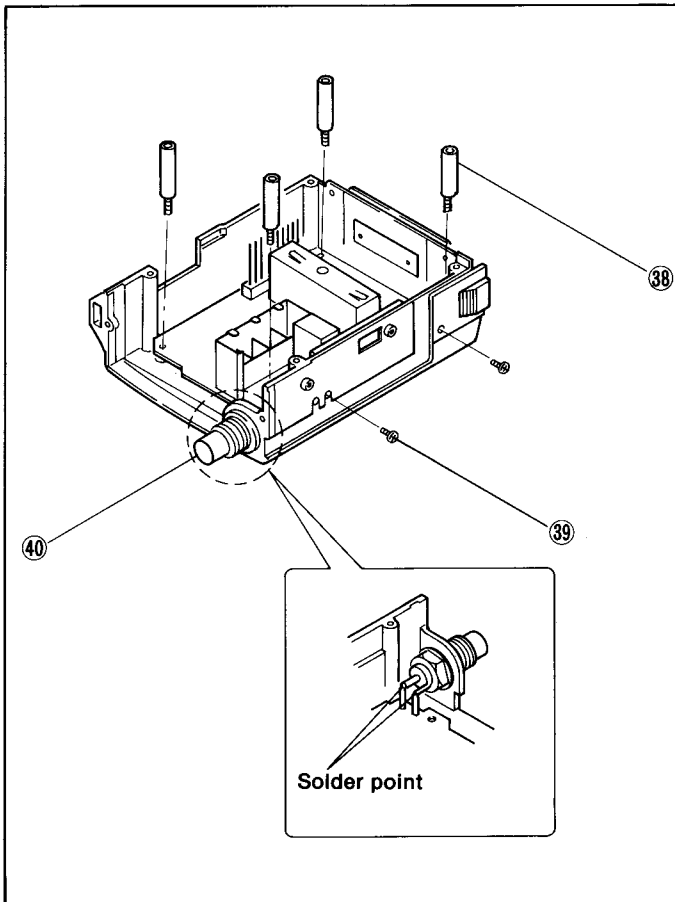
• LOGIC-A AND LOGIC-B UNITS



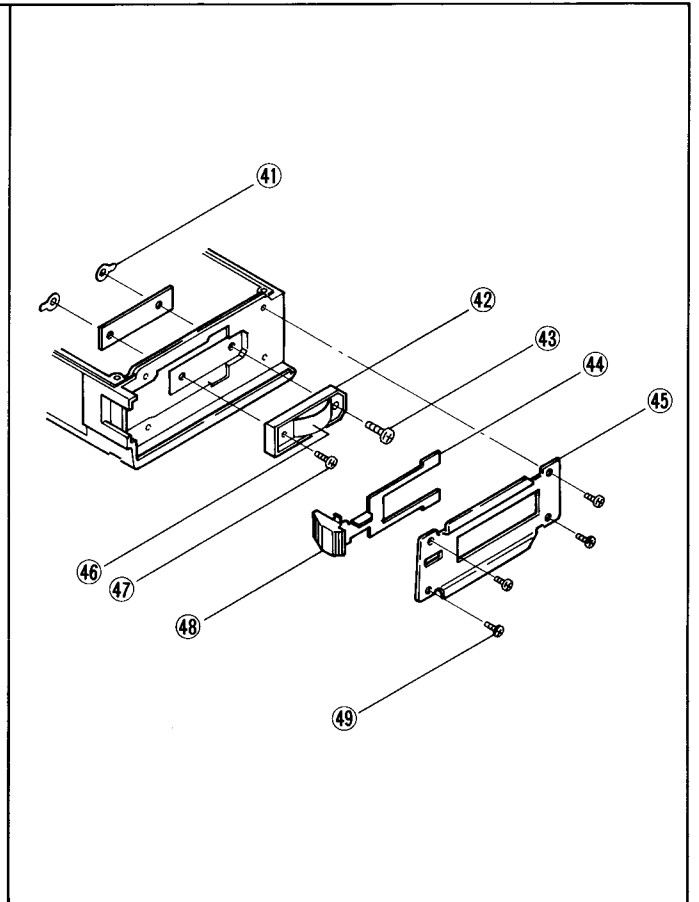
• MAIN UNIT



• RF UNIT



• CONTACT HOLDER

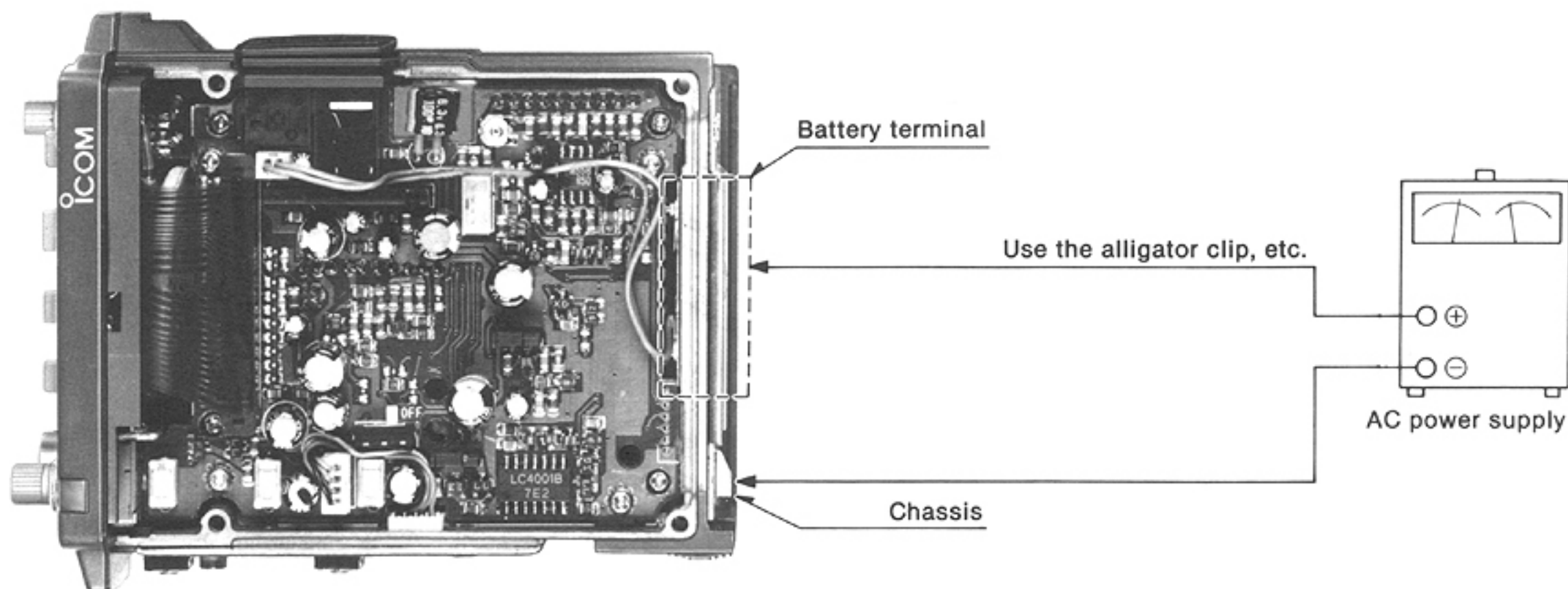




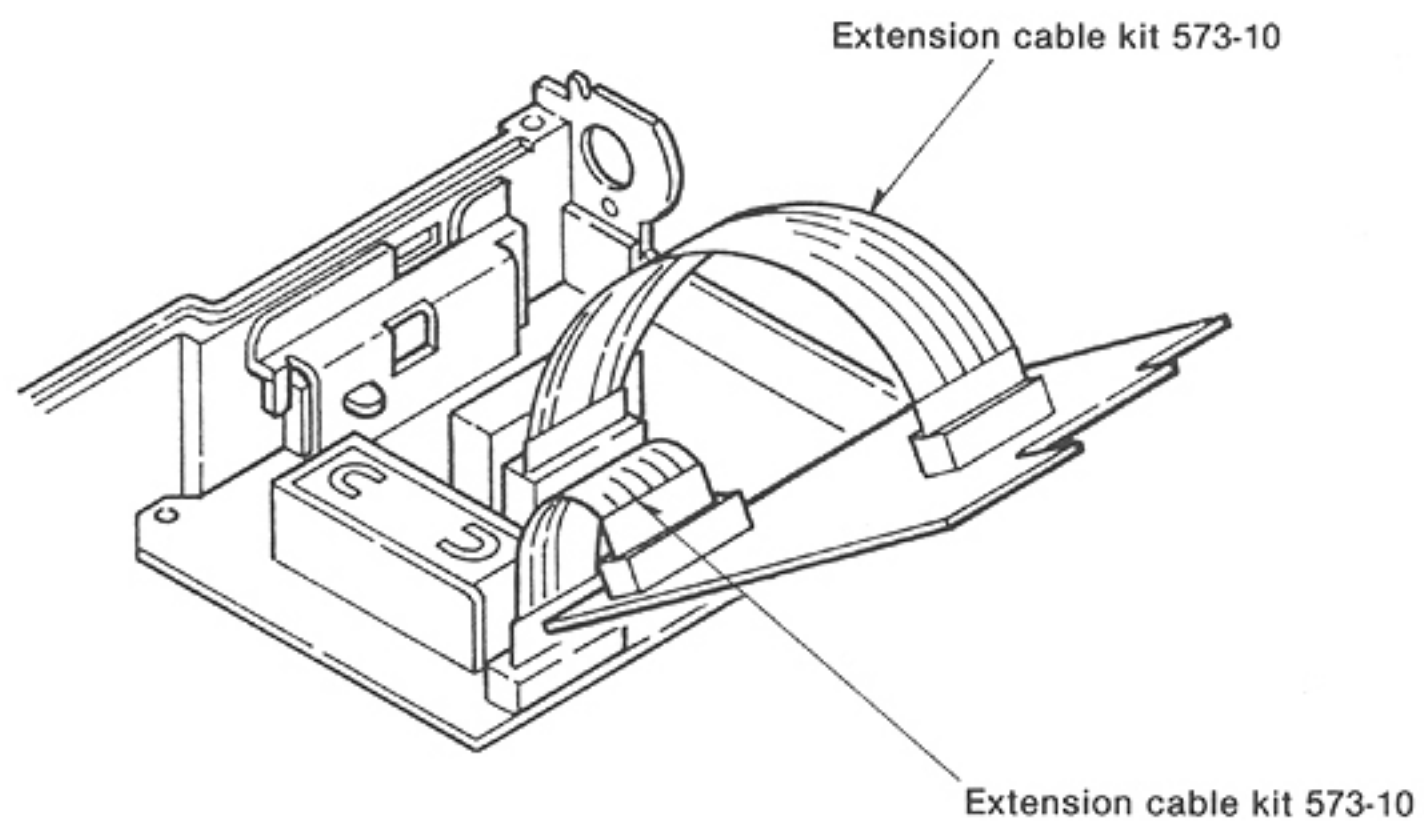
## SECTION 6 ADJUSTMENT PROCEDURES

### 6-1 BEFORE ADJUSTMENT

#### ■ POWER SUPPLY CONNECTION



#### ■ RF AND MAIN UNITS SEPARATION

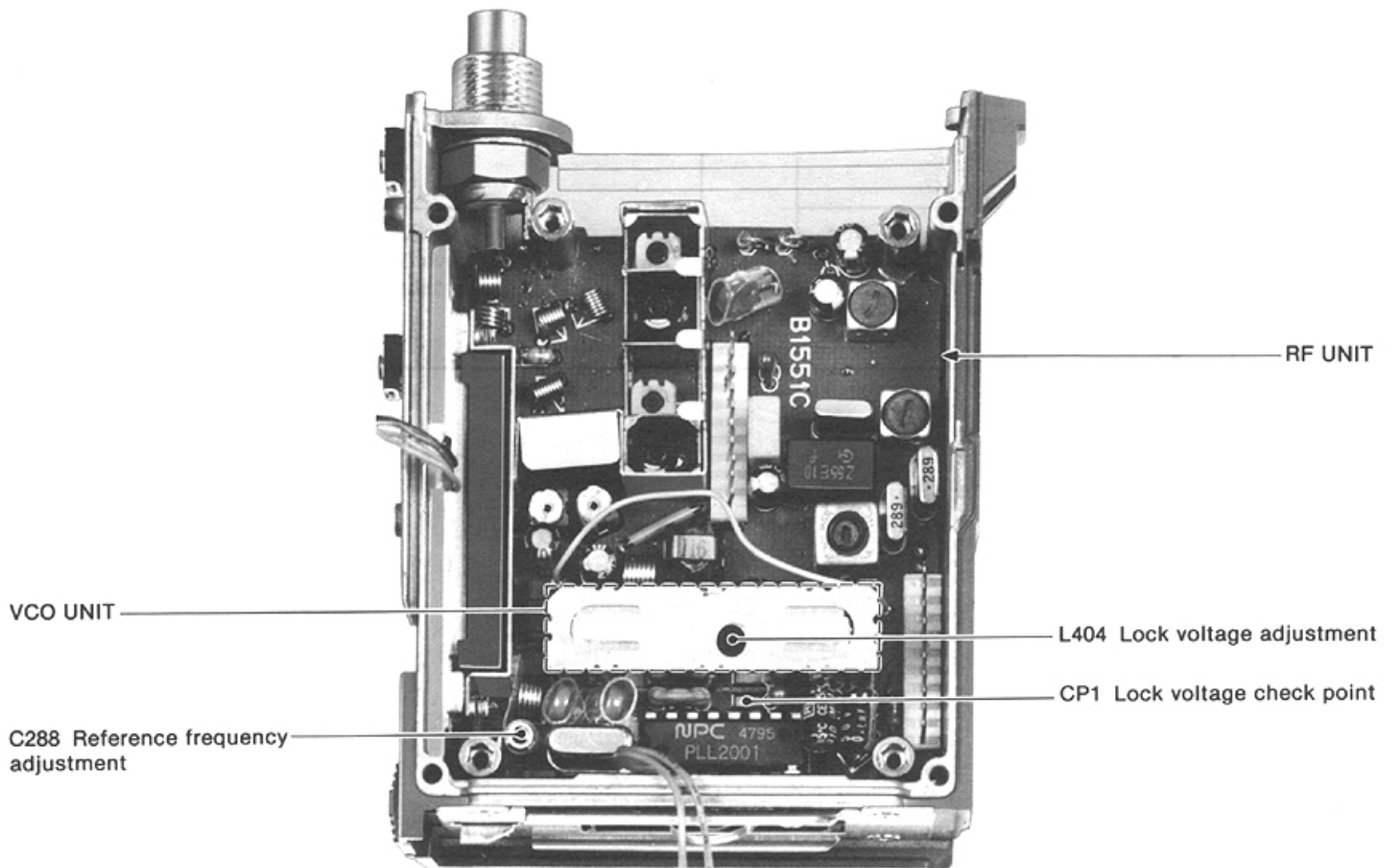


Order the extension cable kit from an authorized Icom Dealer.

## 6-2 PLL ADJUSTMENT

TEST INSTRUMENTS REQUIRED		MEASUREMENT CONNECTION LOCATION					
(1) AC POWER SUPPLY • Output voltage : 13.2V DC • Current capacity : 3A or more  (2) FREQUENCY COUNTER • Frequency range : 0.1~180MHz • Frequency accuracy : $\pm 1$ ppm or better • Sensitivity : 100mV or better  (3) DC VOLTMETER • Input impedance : 50k $\Omega$ /DC or better							
ADJUSTMENT	ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT		
		UNIT	LOCATION		UNIT	ADJUST	
LOCK VOLTAGE	1 • Operating channel: 16 • Receiving	RF	Connect the DC voltmeter to CP1.	2.0V	VCO	L404	
REFERENCE FREQUENCY	1 • Operating channel: 16 • Transmitting • Connect an antenna.	Top panel	Loose couple the frequency counter to the antenna.	156.800 MHz	RF	C288	

### VCO AND RF UNITS

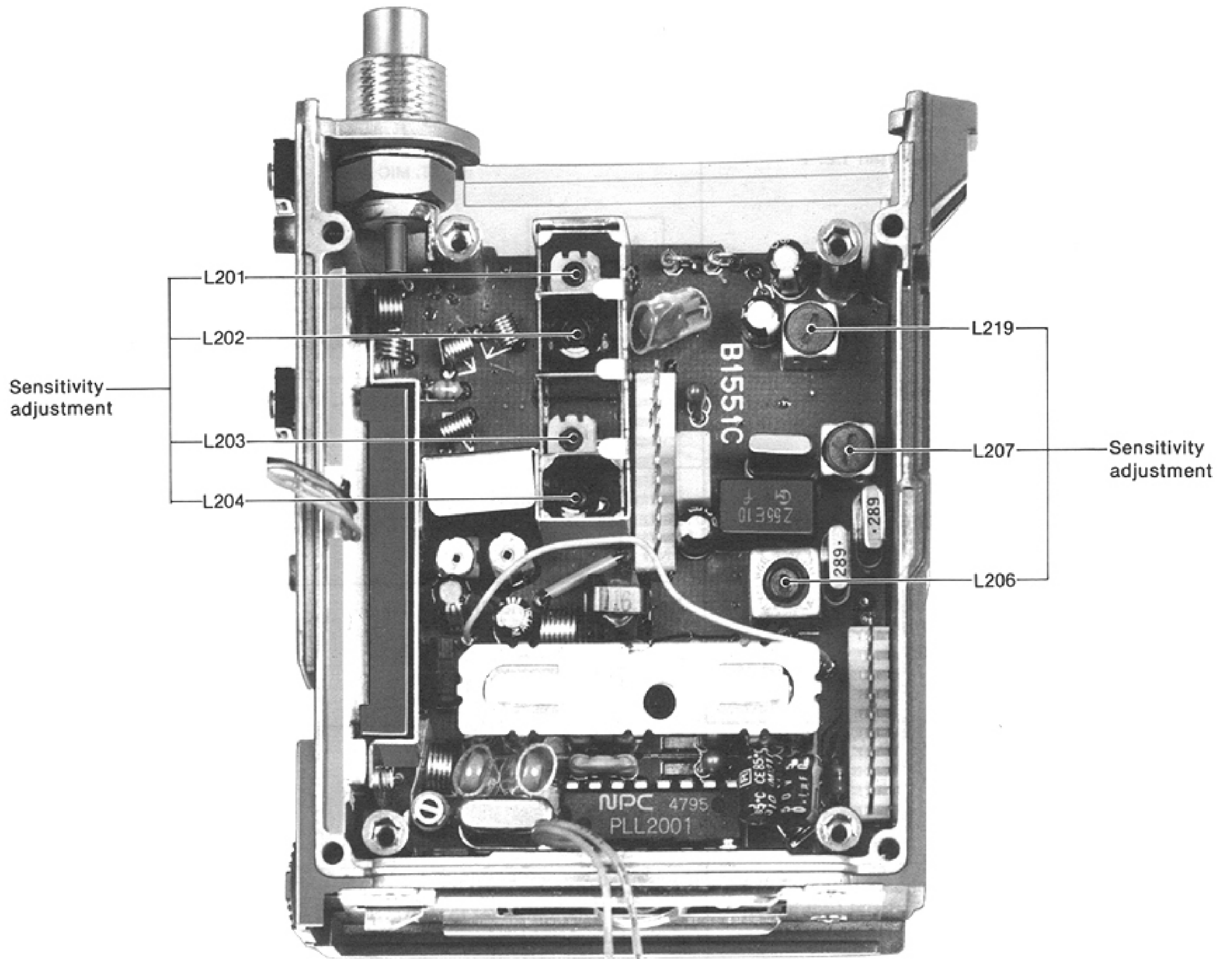


## 6-3 RECEIVER ADJUSTMENT

TEST INSTRUMENTS REQUIRED		MEASUREMENT CONNECTION LOCATION				
<p>(1) AC POWER SUPPLY</p> <ul style="list-style-type: none"> <li>Output voltage : 13.2V DC</li> <li>Current capacity : 3A or more</li> </ul> <p>(2) STANDARD SIGNAL GENERATOR (SSG)</p> <ul style="list-style-type: none"> <li>Frequency range : 0.1~180MHz</li> <li>Output level : -127dBm~-17dBm (0.1μV~32mV)</li> </ul> <p>(3) DISTORTION METER</p> <ul style="list-style-type: none"> <li>Frequency range : 1kHz±10Hz</li> <li>Measuring range : 1~100%</li> </ul> <p>(4) EXTERNAL SPEAKER</p> <ul style="list-style-type: none"> <li>Impedance : 8Ω</li> </ul>						
ADJUSTMENT	ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
		UNIT	LOCATION		UNIT	ADJUST
SENSI-TIVITY	<p>NOTE: When the sensitivity is less than 0.35μV (12dB SINAD) on every channel, the following sensitivity adjustment is not necessary. Skip to 6-4 TRANSMITTER ADJUSTMENT.</p> <p>To adjust the RF bandpass filters, see the diagram on p. 6-1.</p>					
	1	<ul style="list-style-type: none"> <li>Operating Channel: 16</li> <li>Receiving</li> <li>Apply an RF signal to the ANTENNA CONNECTOR.                             <ul style="list-style-type: none"> <li>Frequency: 156.800 MHz</li> <li>Level : -116dBm (0.35μV)</li> <li>Mod. : 1kHz</li> <li>Dev. : ±3.5kHz</li> </ul> </li> <li>SQUELCH CONTROL: Max. CCW.</li> </ul>	Side panel	Connect the distortion meter with an 8Ω load to the EXT. SP JACK.	Minimum distortion level	RF
2	<ul style="list-style-type: none"> <li>Adjust SSG output level so that SINAD level becomes 12dB.</li> </ul>			Applied RF signal level is less than -116dBm (0.35μV).		Verify

CCW: Counterclockwise

RF UNIT



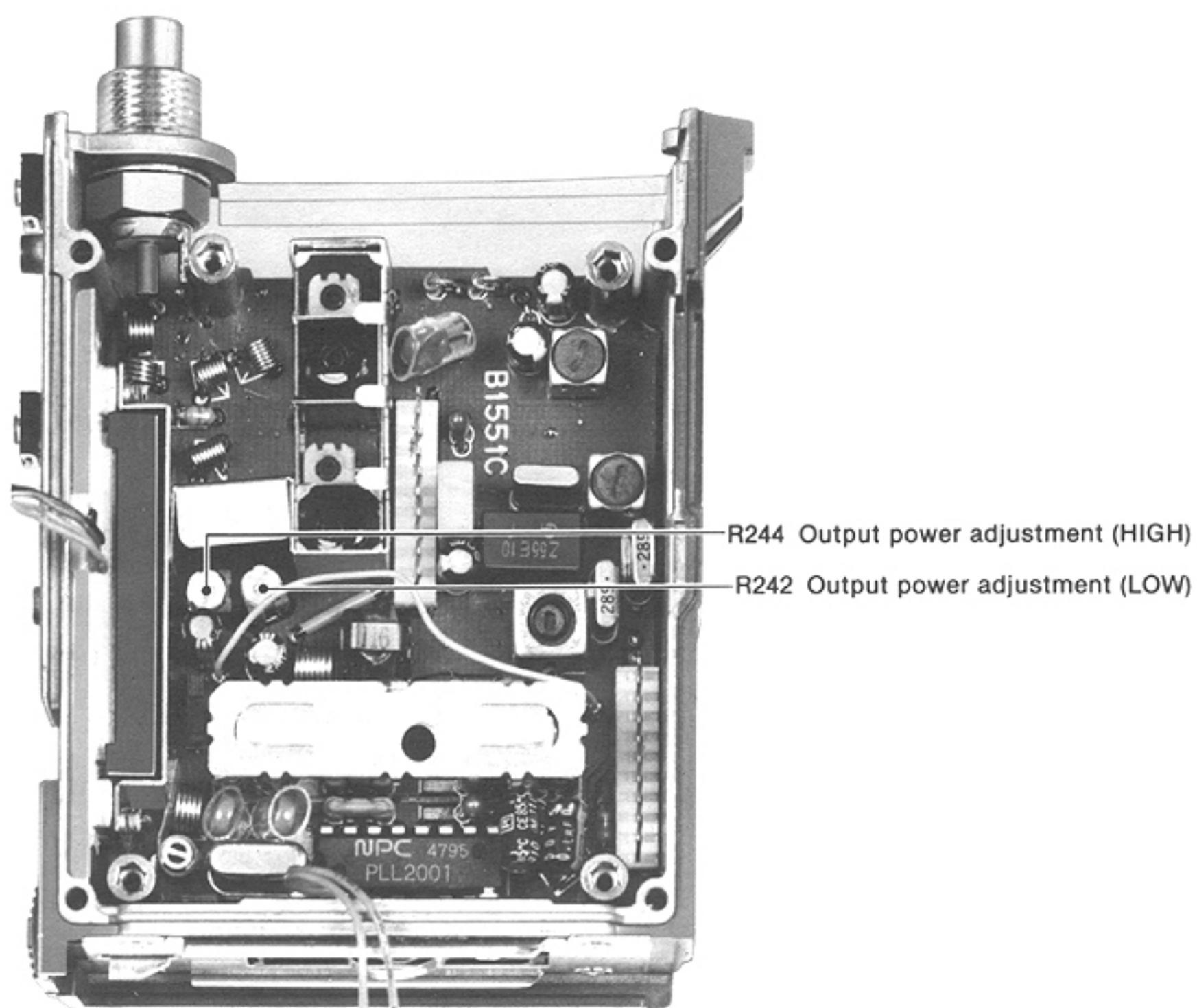
## 6-4 TRANSMITTER ADJUSTMENT

TEST INSTRUMENTS REQUIRED	MEASUREMENT CONNECTION LOCATION
<p>(1) AC POWER SUPPLY</p> <ul style="list-style-type: none"> <li>• Output voltage : 13.2V DC</li> <li>• Current capacity : 3A or more</li> </ul> <p>(2) RF POWER METER (TERMINATED TYPE)</p> <ul style="list-style-type: none"> <li>• Measuring range : 1~10W</li> <li>• Frequency range : 120~180MHz</li> <li>• Impedance : 50Ω</li> <li>• SWR : Less than 1.2: 1</li> </ul> <p>(3) AF GENERATOR (AG)</p> <ul style="list-style-type: none"> <li>• Frequency range : 200~2000Hz</li> <li>• Output level : 0~200mV</li> </ul> <p>(4) AC MILLI-VOLTMETER</p> <ul style="list-style-type: none"> <li>• Measuring range : 2~200mV</li> </ul> <p>(5) FM DEVIATION METER</p> <ul style="list-style-type: none"> <li>• Frequency minimum : 180MHz</li> <li>• Measuring range : 0~±5kHz</li> </ul>	

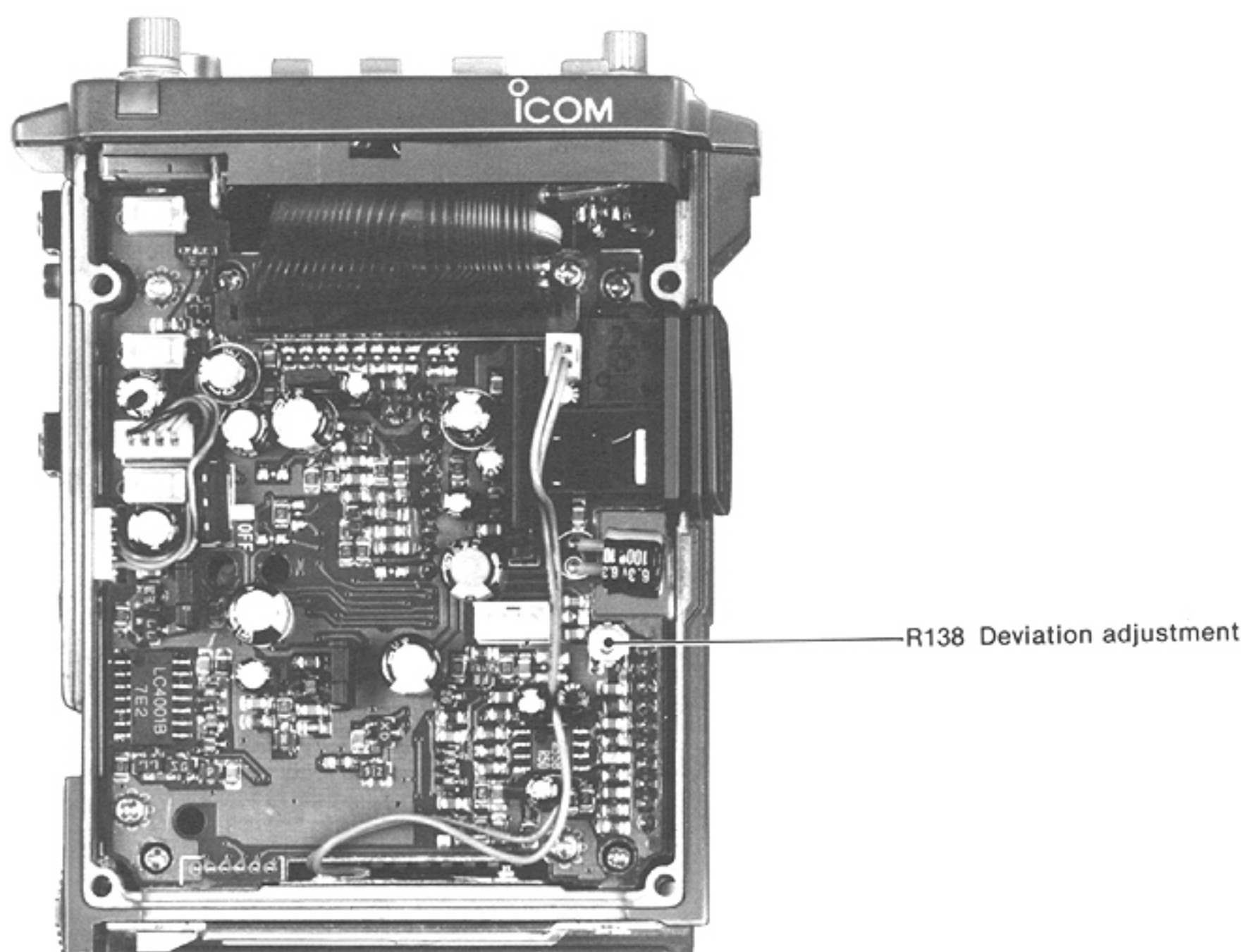
ADJUSTMENT	ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
		UNIT	LOCATION		UNIT	ADJUST
OUTPUT POWER	1	Top panel	Connect the RF power meter to the ANTENNA CONNECTOR.	6W	RF	R244
	2			1.0W		R242
FM DEVIATION	1	Top panel	Connect the FM deviation meter to the ANTENNA CONNECTOR through an attenuator.	±4.5kHz	MAIN	R138
	2			±3kHz~±4kHz		Verify



## RF UNIT

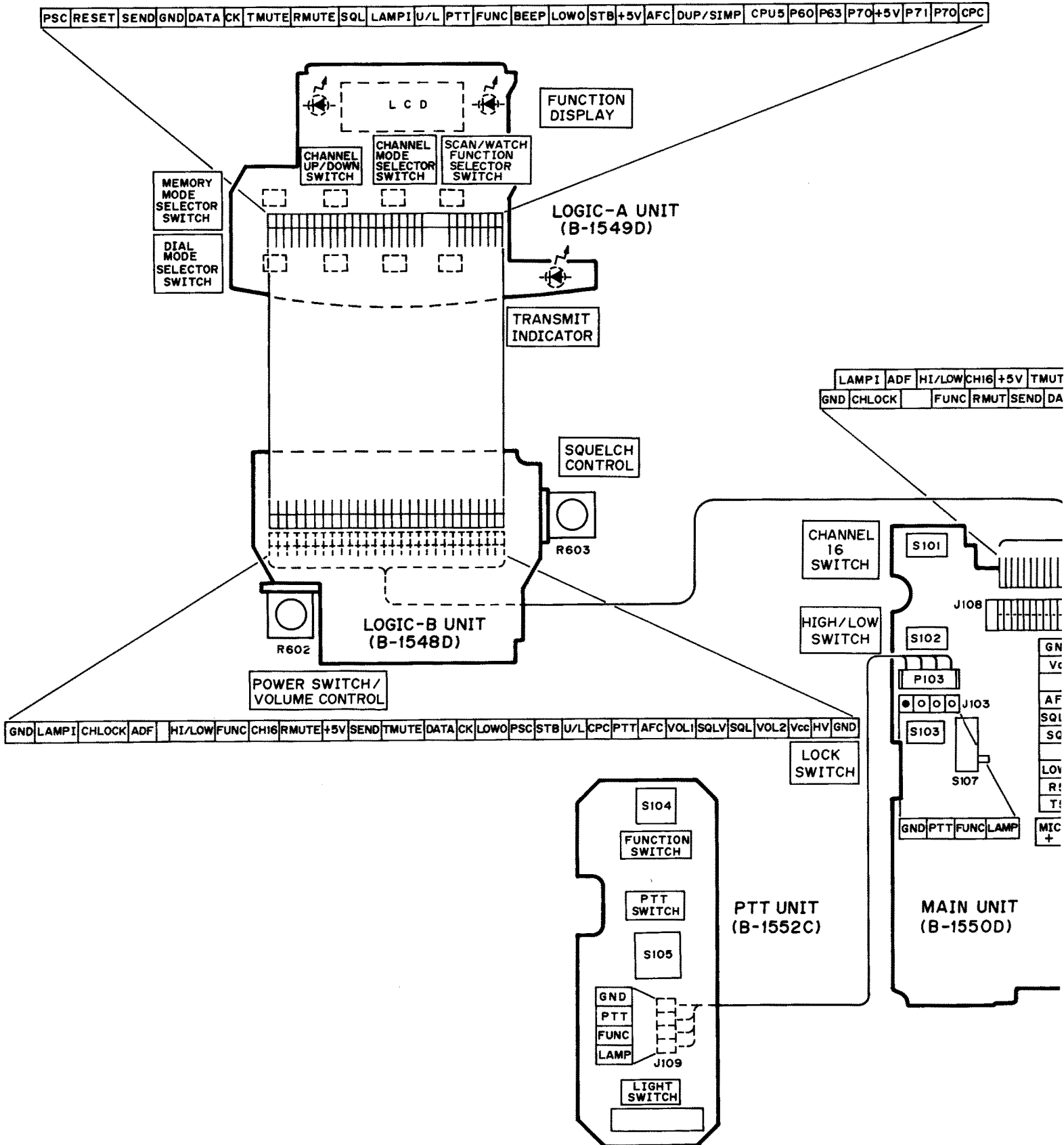


## MAIN UNIT

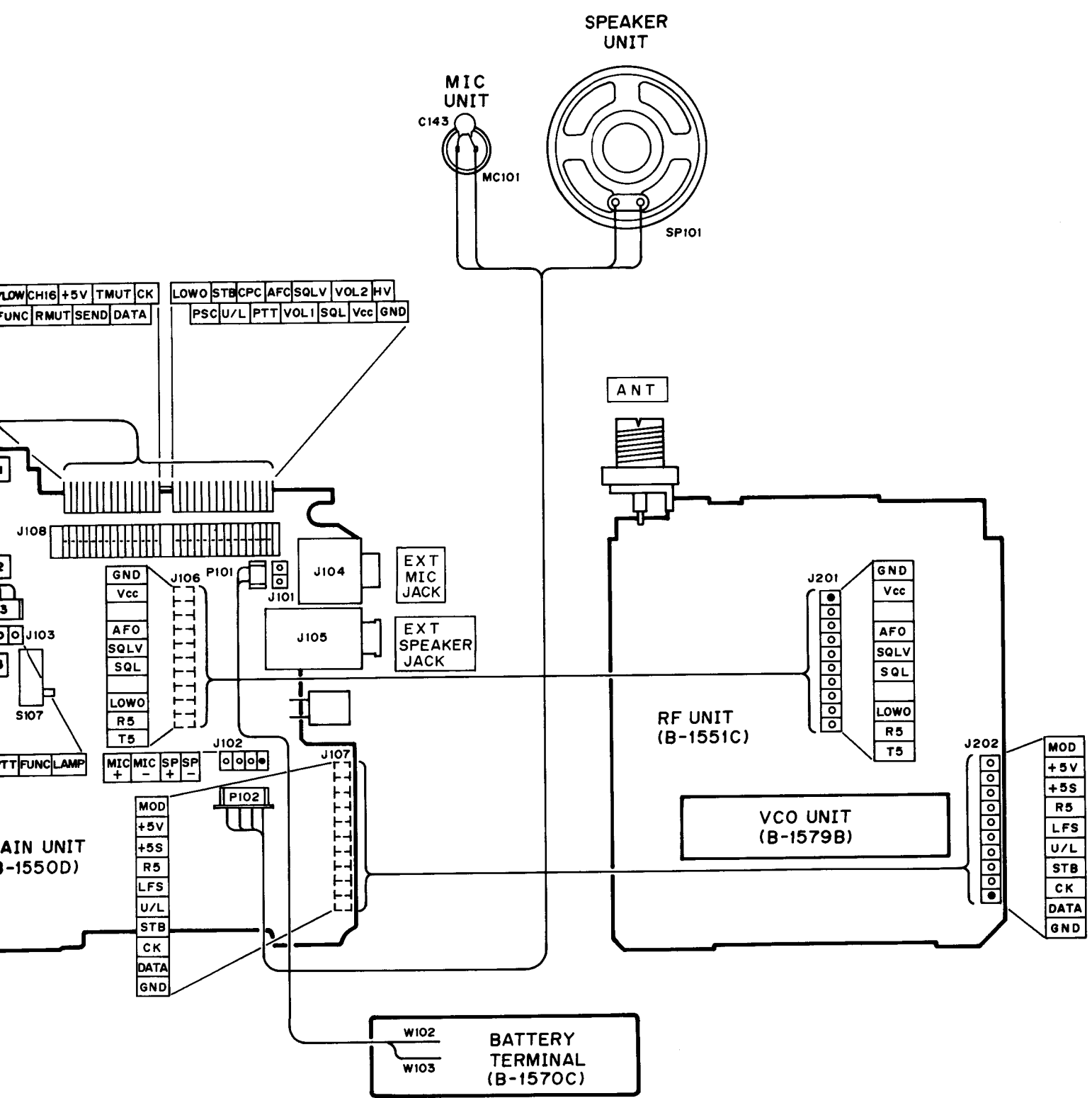


# SECTION 7 BOARD LAYOUTS

## 7-1 INTERCONNECTIONS

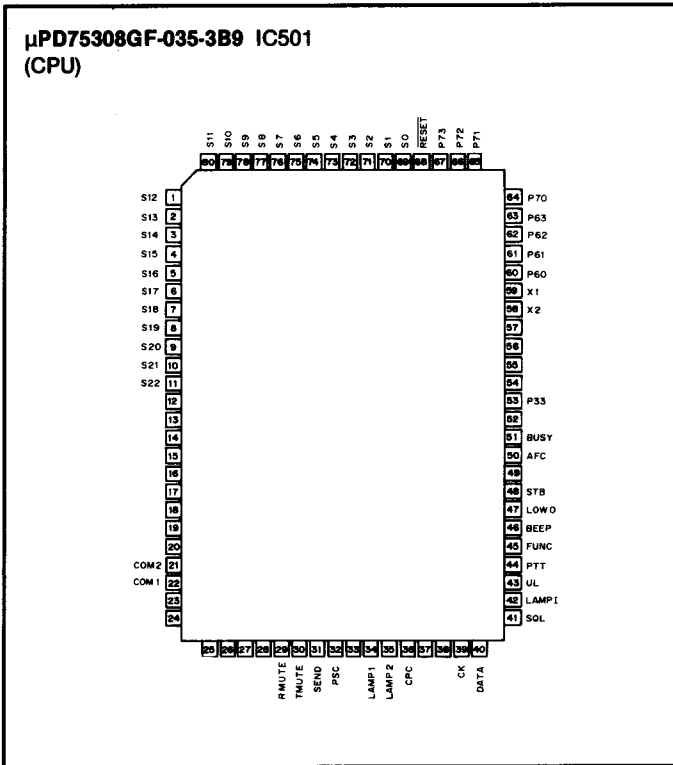


70 CPC



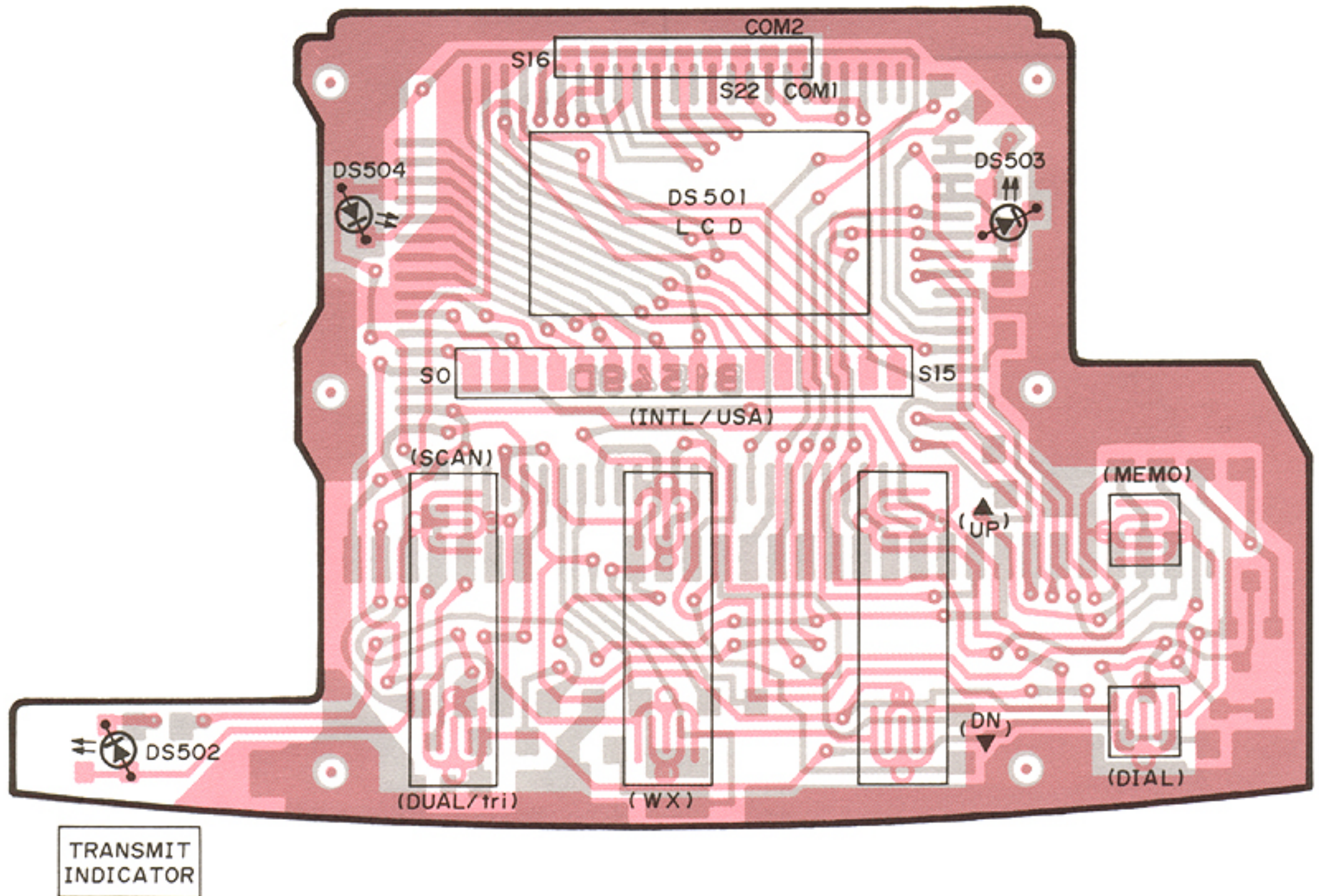


## 7-2 LOGIC A UNIT

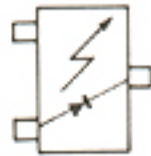


• LOGIC A UNIT

COMPONENTS SIDE

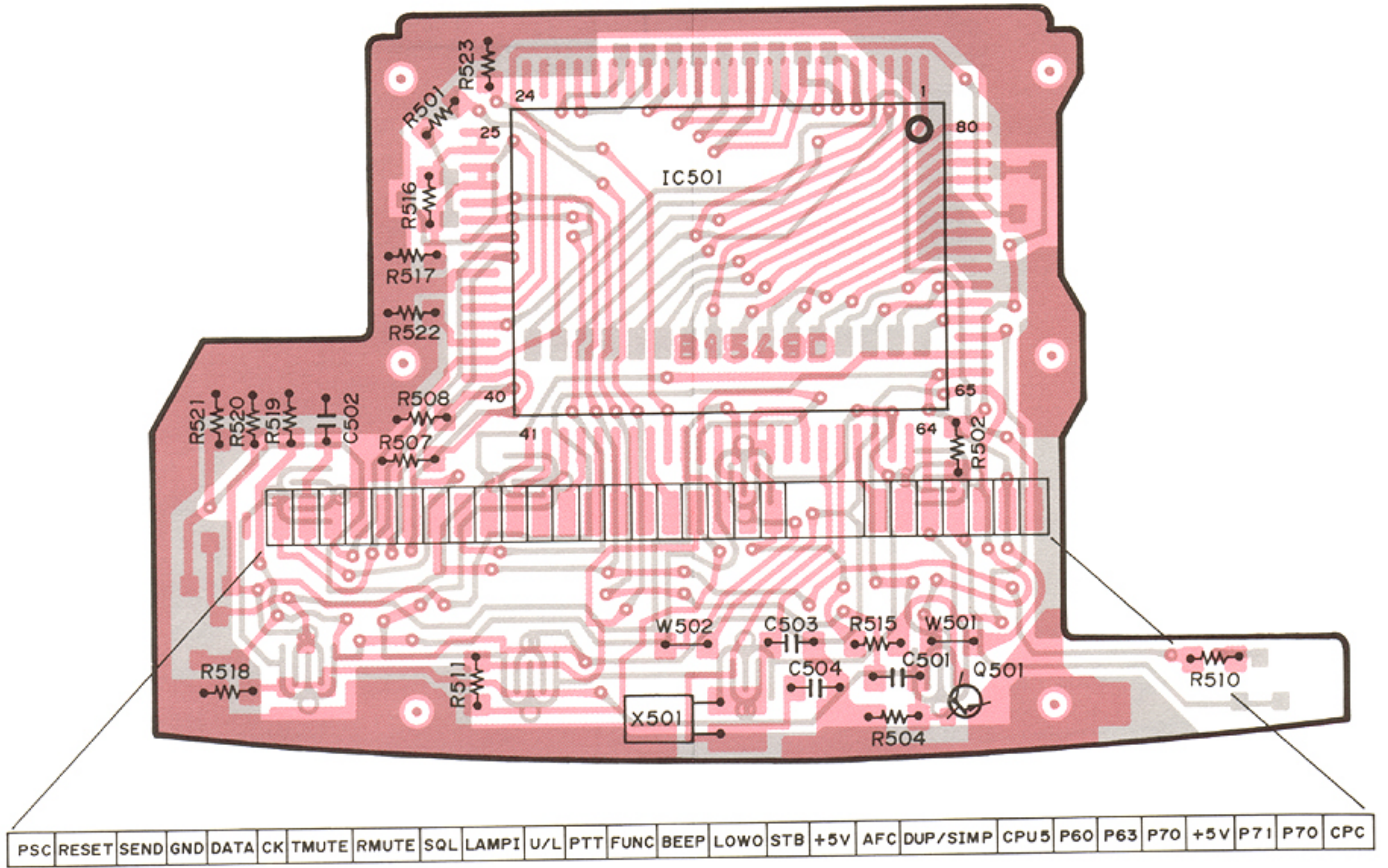


SLM-13MW  
DS502, DS503  
DS504



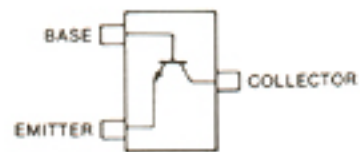


FOIL SIDE



to LOGIC-B UNIT

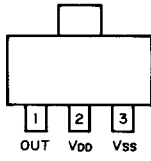
2SC4081 R  
Q501



Symbol: BR

## 7-3 LOGIC B UNIT

S-8054ALB IC601  
(RESET)

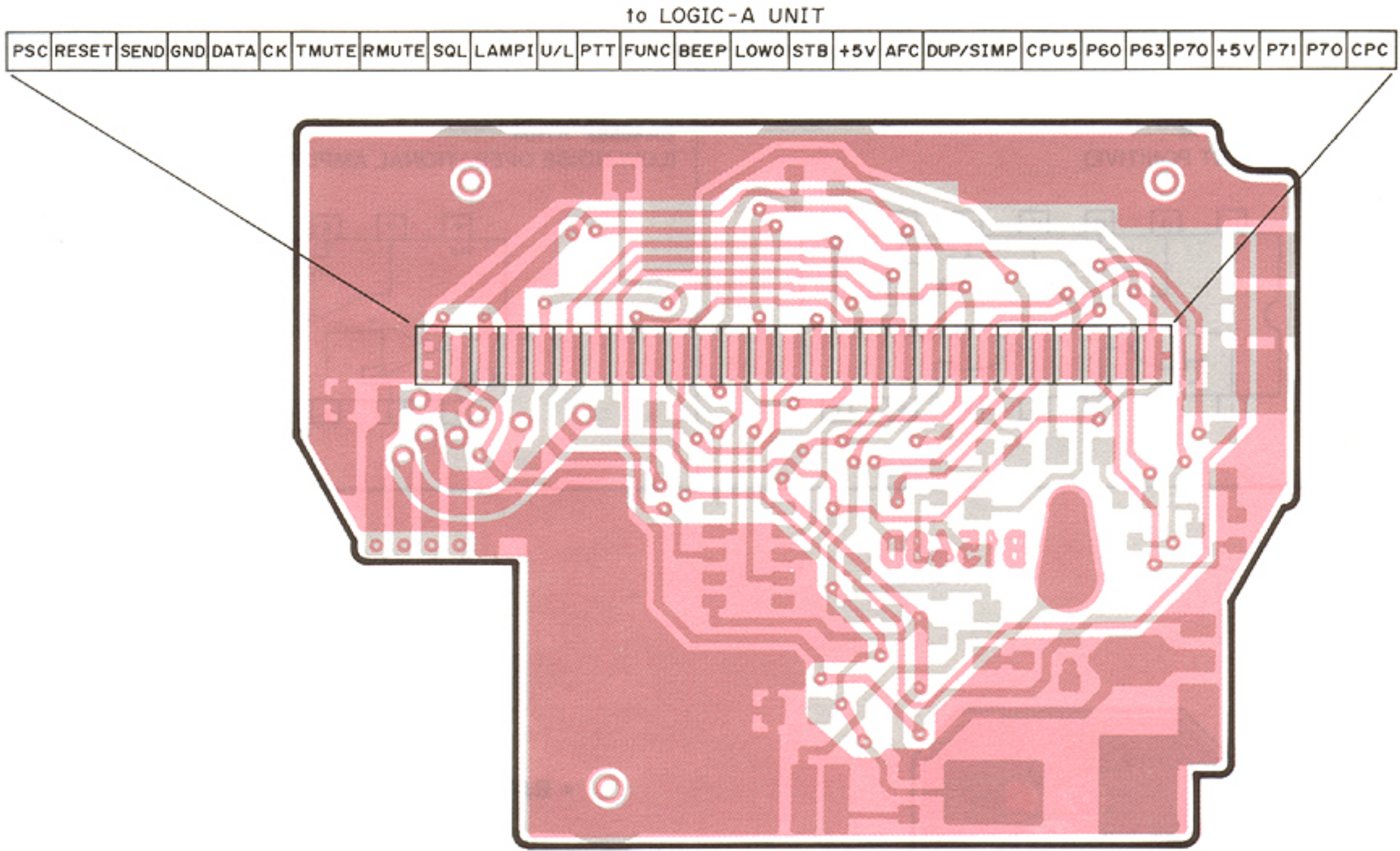




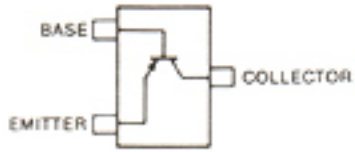
• LOGIC B UNIT

COMPONENTS SIDE

FOIL SIDE

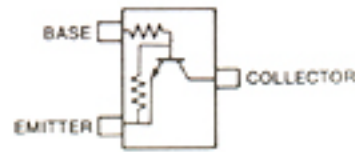


**2SA1576 R**  
Q601, Q602  
Q603, Q604



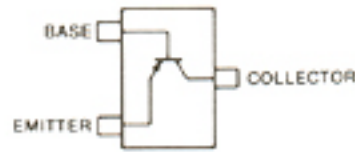
Symbol: FR

**DTC144EK**  
Q605



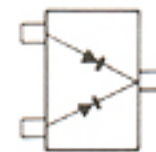
Symbol: 26

**2SA1362 GR**  
Q606



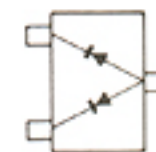
Symbol: AEG

**1SS184**  
D601



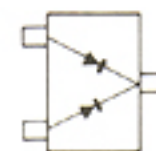
Symbol: B3

**DAP202U**  
D602



Symbol: P

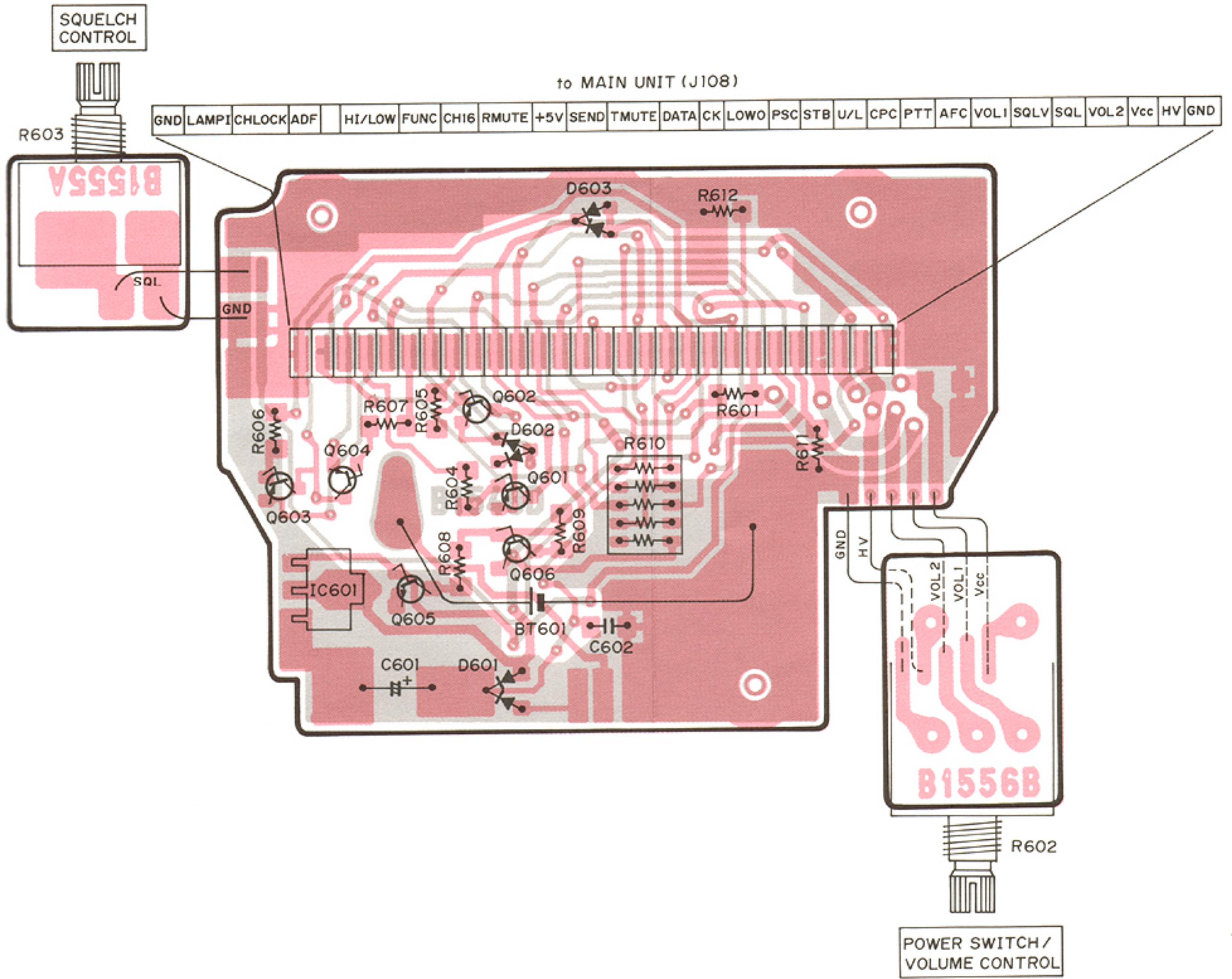
**DAN202U**  
D603



Symbol: N

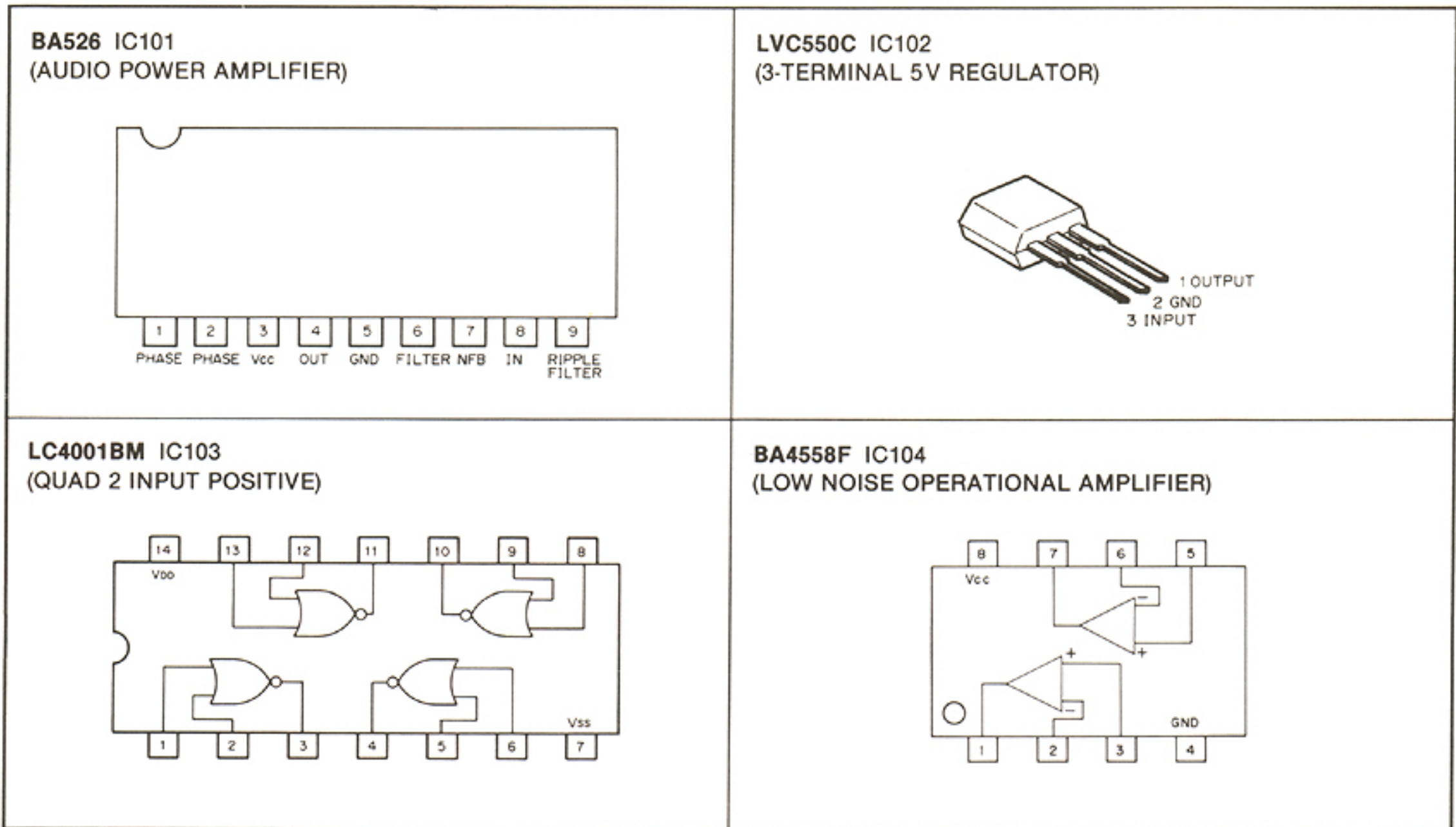


FOIL SIDE

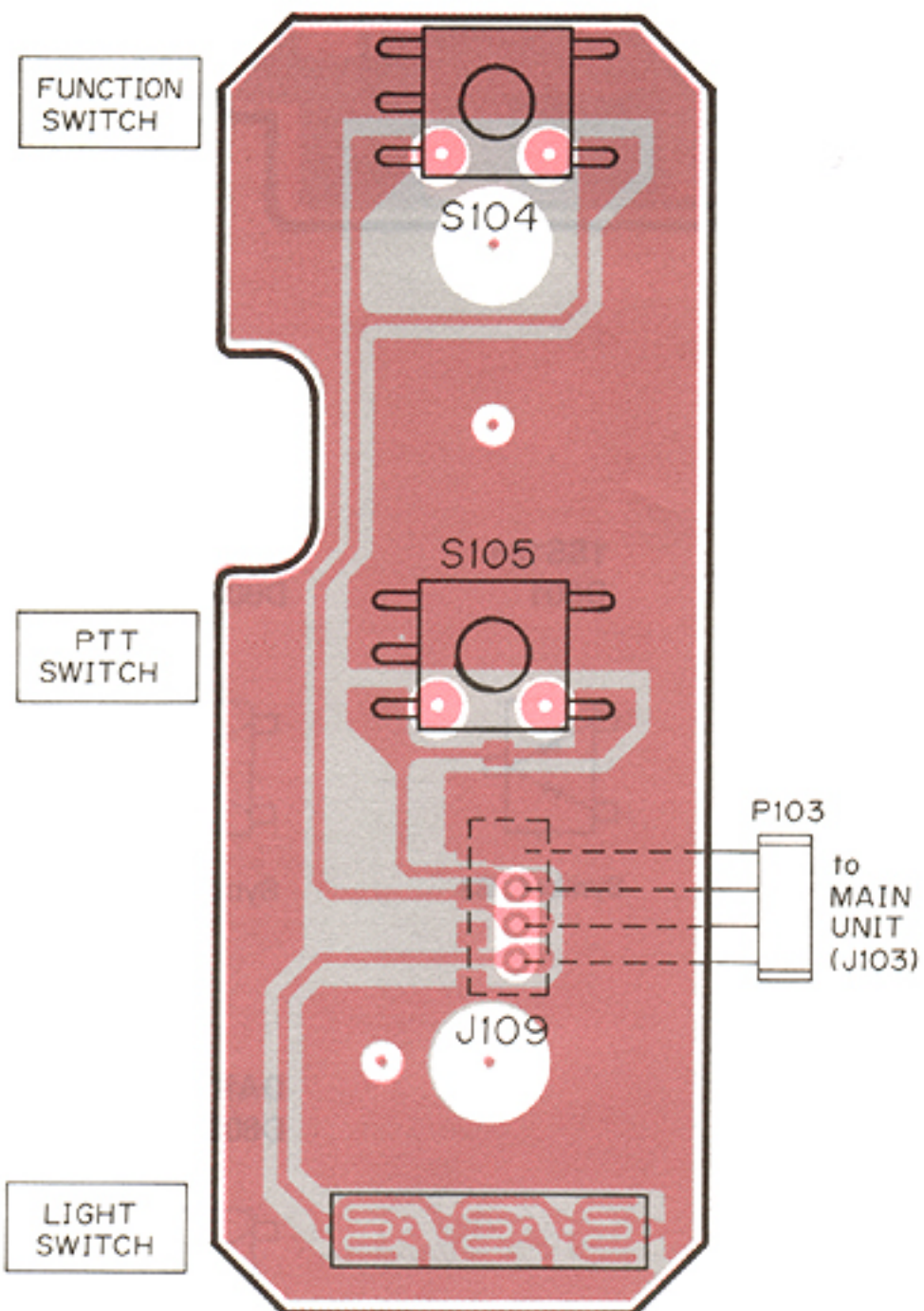




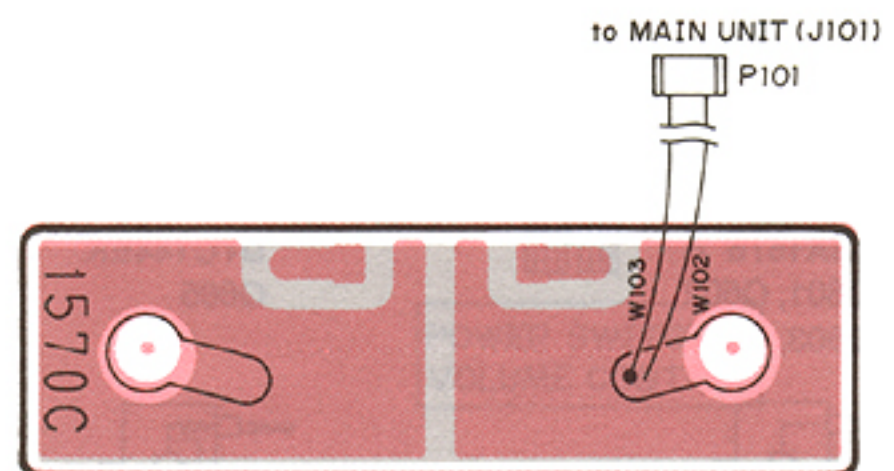
## 7-4 MAIN UNIT



### • PTT UNIT



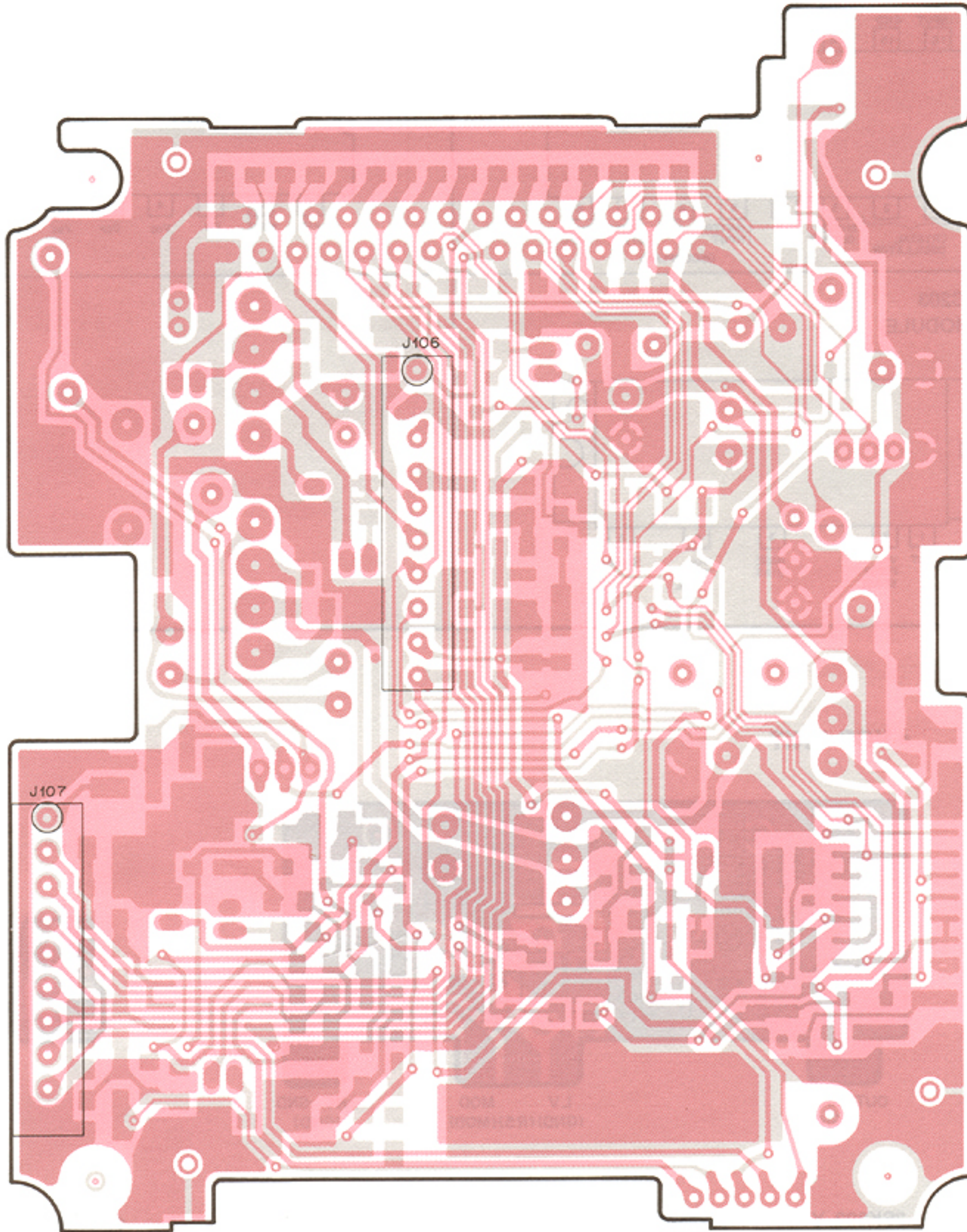
### • BATTERY TERMINAL





• MAIN UNIT

FOIL SIDE



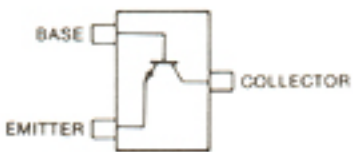
TO RF UNIT (J201)

TO RF UNIT (J202)

- J106
- GND
- Vcc
- AFO
- SQLV
- SQL
- LOWO
- R5
- T5

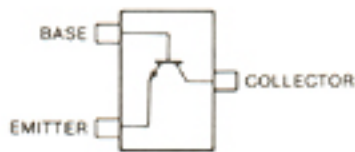
- J107
- MOD
- +5V
- +5S
- R5
- LFS
- U/L
- STB
- CK
- DATA
- GND

**2SC2712 BL**  
Q101, Q109  
Q113, Q115



Symbol: LL

**2SC4081 R**  
Q102, Q105  
Q111



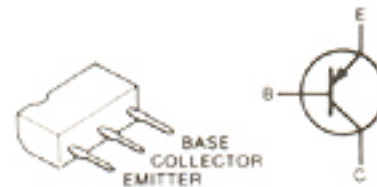
Symbol: BR

**2SJ106 Y**  
Q103

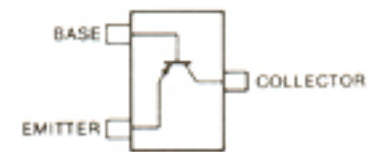


Symbol: VY

**2SB909M Q/R**  
Q104, Q112

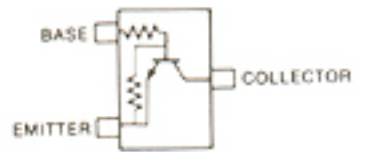


**2SA1576 R**  
Q106, Q110  
Q116



Symbol: FR

**DTC144EU**  
Q107



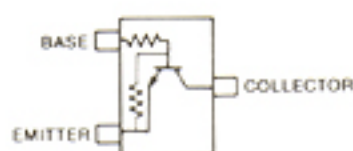
Symbol: 26

**2SA1162 GR**  
Q108, Q114



Symbol: SG

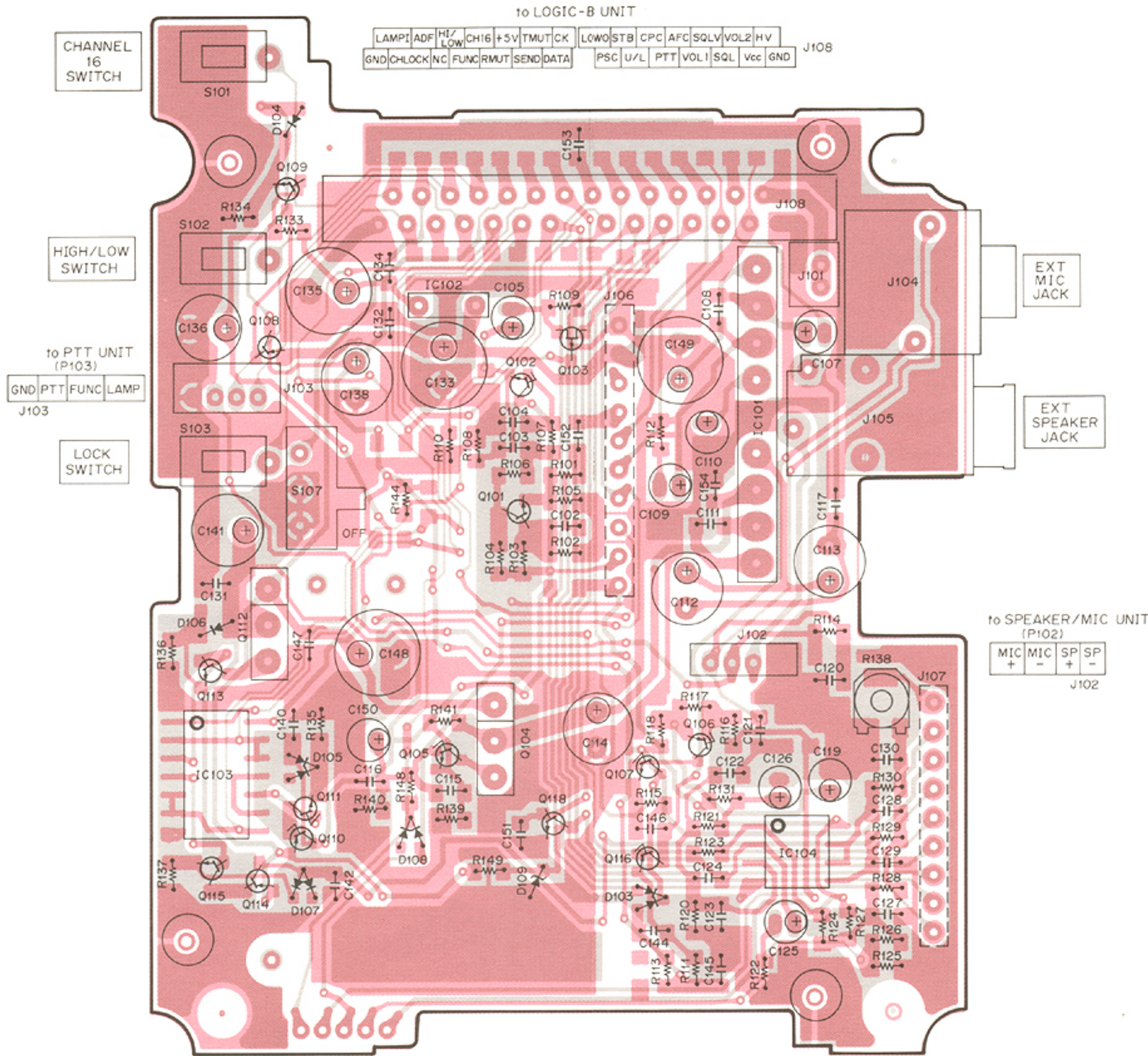
**RN1404**  
Q118



Symbol: XD



**COMPONENTS SIDE**



to LOGIC-B UNIT

LAMP	ADF	HI/LOW	CH16	+5V	TMUT	CK	LOW	STB	CPC	AFC	SQLV	VOL2	HV
GND	CHLOCK	NC	FUNC	RMUT	SEND	DATA	PSC	U/L	PTT	VOL1	SQL	Vcc	GND

to PTT UNIT (P103)

GND	PTT	FUNC	LAMP
-----	-----	------	------

to SPEAKER/MIC UNIT (P102)

MIC	MIC	SP	SP
+	-	+	-

**DTC144EU**  
Q107

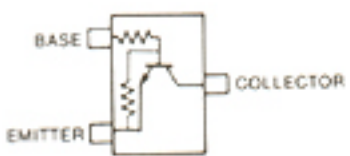
**DAN202U**  
D103, D105  
D108

**1SS193**  
D104

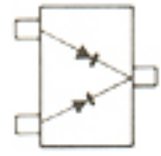
**1SS190**  
D106

**RD9.1M B2**  
D109

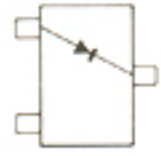
**DAP202U**  
D107



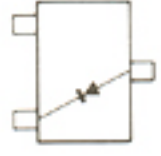
Symbol: 26



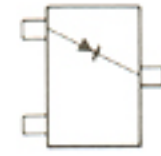
Symbol: N



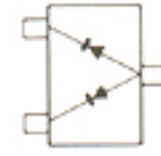
Symbol: F3



Symbol: E3



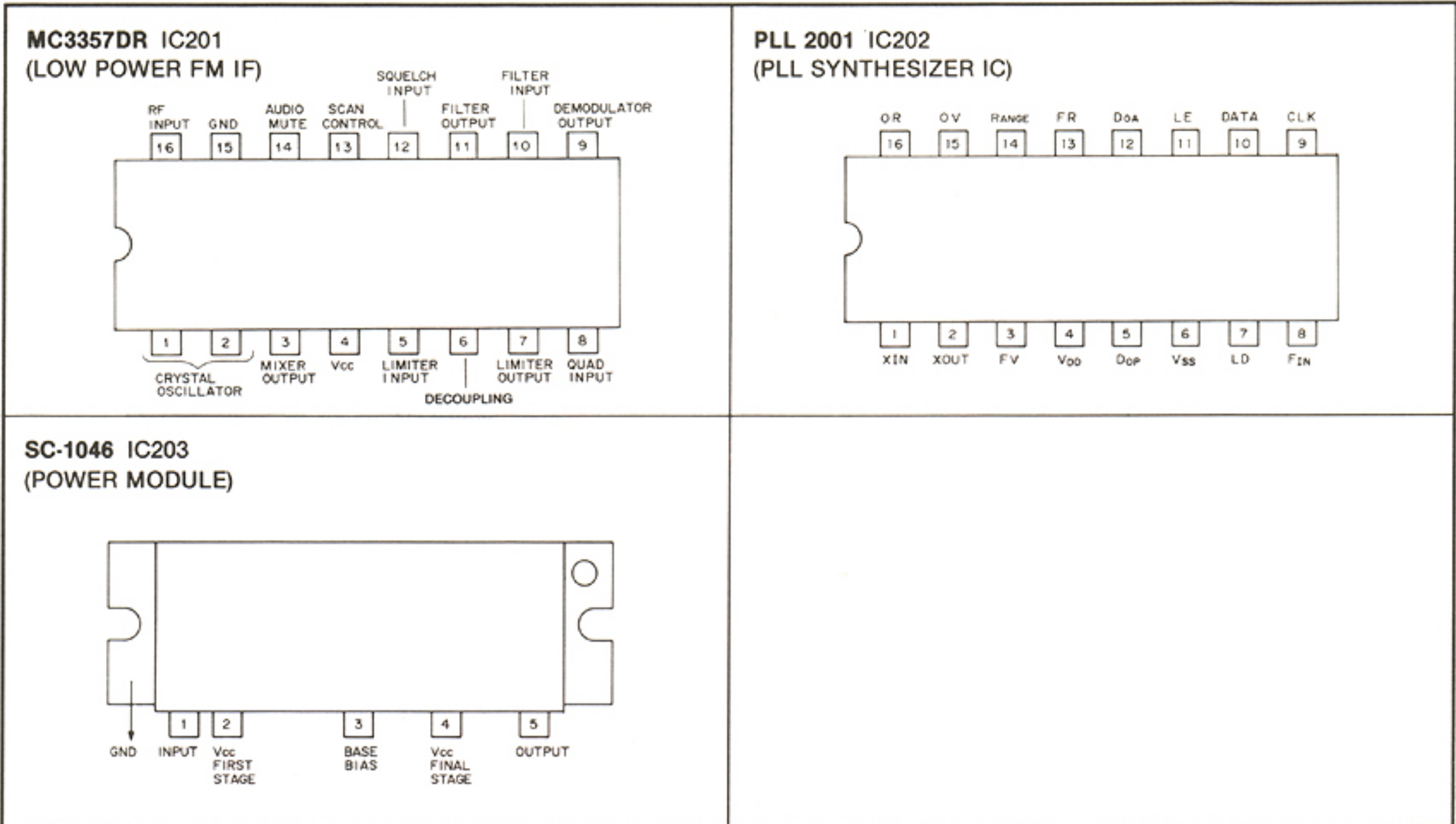
Symbol: 912



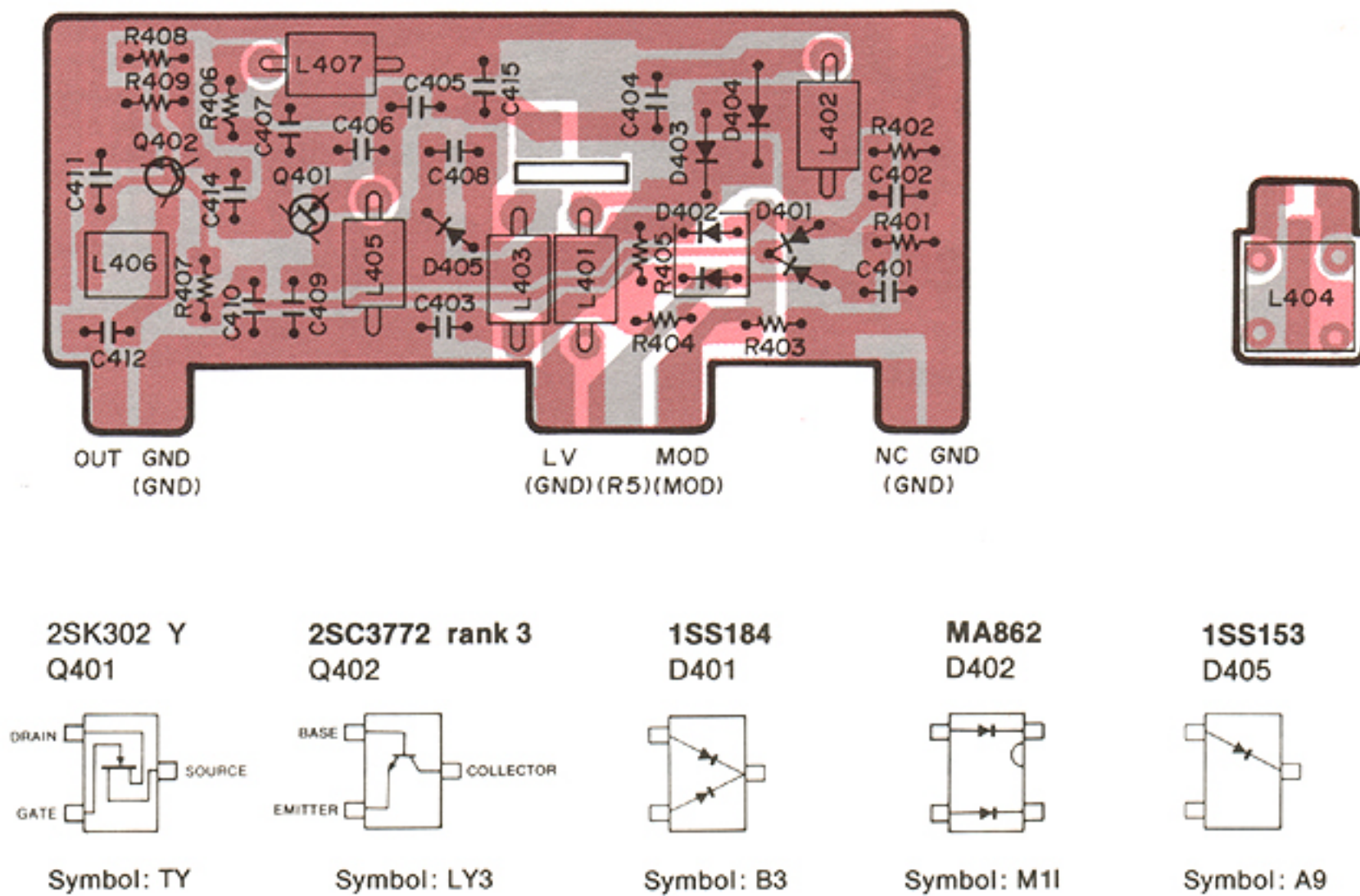
Symbol: P



## 7-5 RF UNIT



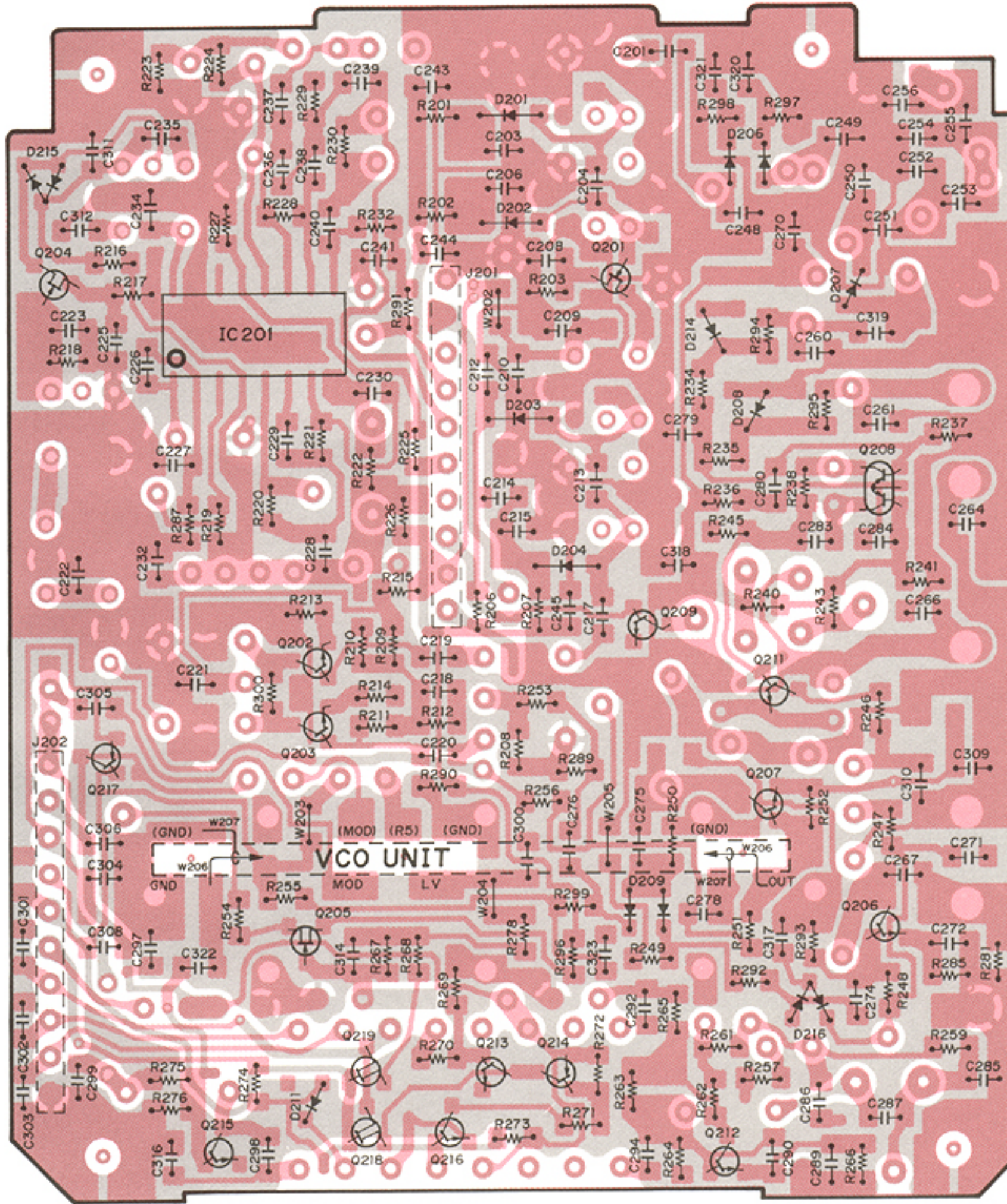
### • VCO UNIT





• RF UNIT

FOIL SIDE

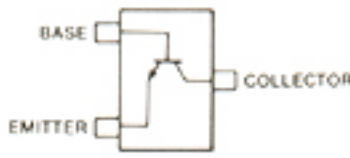


**2SK302 Y**  
Q201, Q204



Symbol: TY

**2SC3356**  
Q202, Q203



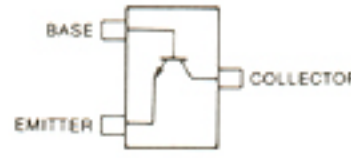
Symbol: R22

**2SK209 Y**  
Q205



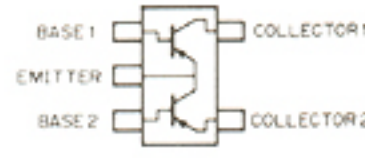
Symbol: XY

**2SC3772 rank 3**  
Q206, Q207  
Q215



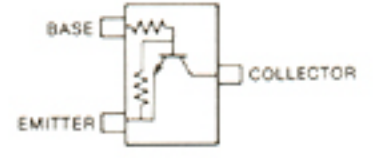
Symbol: LY3

**FMS1**  
Q208



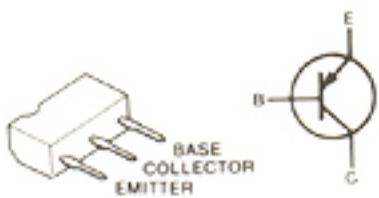
Symbol: SI

**RN1404**  
Q209, Q216

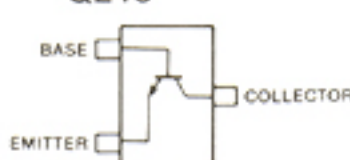


Symbol: XD

**2SB909M Q/R**  
Q210



**2SC2712 BL**  
Q211, Q212  
Q213



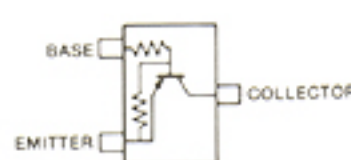
Symbol: LL

**2SA1162 GR**  
Q214



Symbol: SG

**RN2404**  
Q217



Symbol: YD

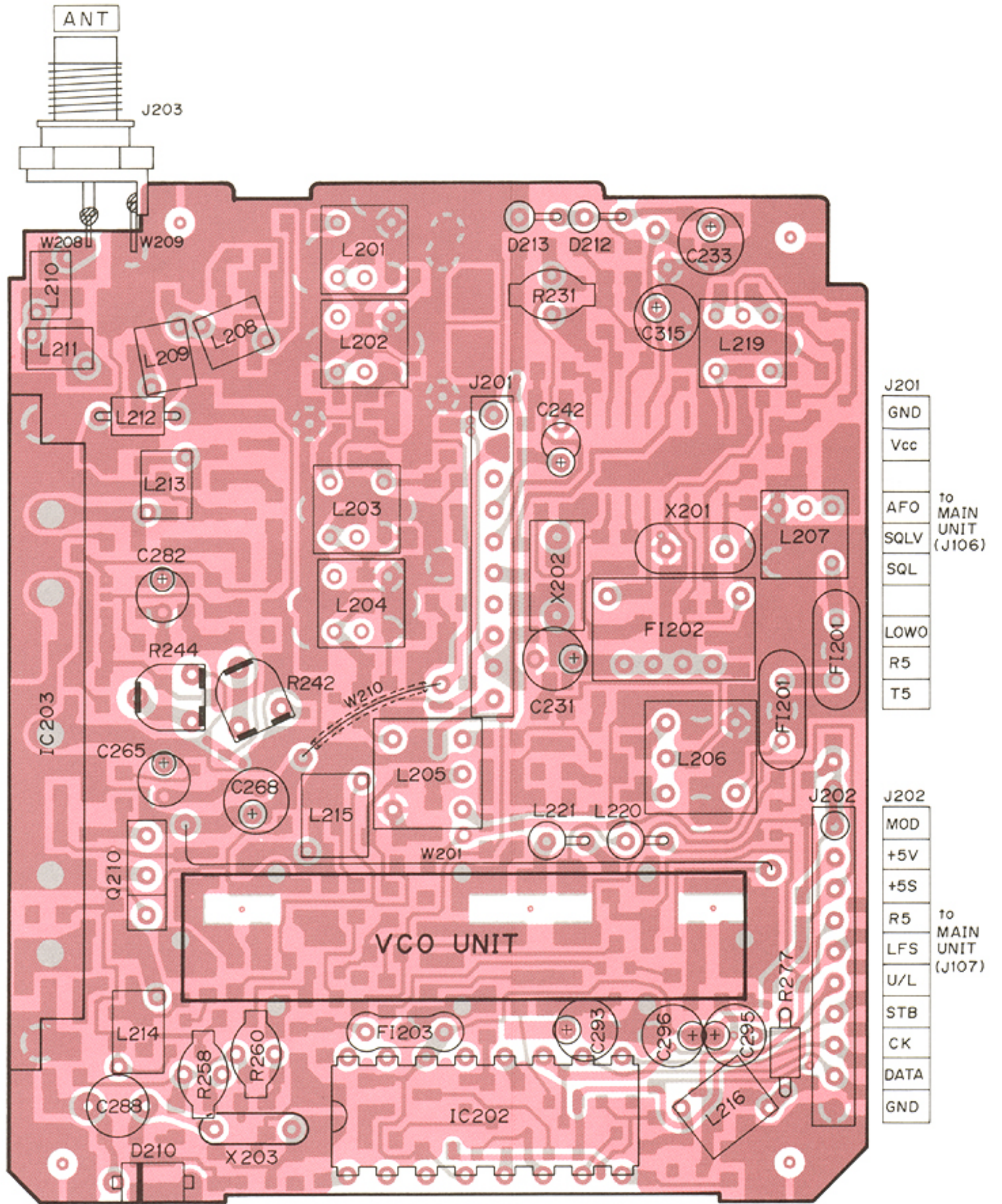
**2SK536**  
Q218, Q219



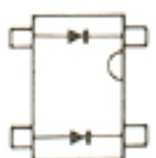
Symbol: CP



**COMPONENTS SIDE**

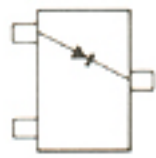


**MA862**  
D206, D209



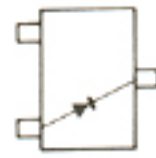
Symbol: M1I

**1SS153**  
D207



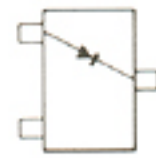
Symbol: A9

**1SS154**  
D208, D214



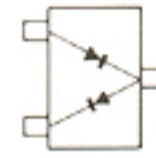
Symbol: BA

**1SS193**  
D211



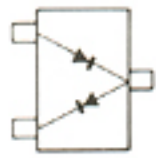
Symbol: F3

**1SS226**  
D215



Symbol: C3

**1SV172**  
D216



Symbol: BE



# SECTION 8 PARTS LIST

## [LOGIC A UNIT]

REF. NO.	DESCRIPTION	PART NO.	
IC501	IC	μPD75308GF-035-3B9	
Q501	Transistor	2SC4081 R	
X501	Crystal	CR-227	
R501	Resistor	470Ω	MCR10
R502	Resistor	470Ω	MCR10
R504	Resistor	100kΩ	MCR10
R507	Resistor	1MΩ	MCR10
R508	Resistor	1MΩ	MCR10
R510	Resistor	470Ω	MCR10
R511	Resistor	220kΩ	MCR10
R515	Resistor	100kΩ	MCR10
R516	Resistor	47kΩ	MCR10
R517	Resistor	47kΩ	MCR10
R518	Resistor	1MΩ	MCR10
R519	Resistor	1MΩ	MCR10
R520	Resistor	1MΩ	MCR10
R521	Resistor	1MΩ	MCR10
R522	Resistor	1MΩ	MCR10
R523	Resistor	1MΩ	MCR10
C501	Ceramic	0.01μF	GRM40 F
C502	Ceramic	100pF	GRM40
C503	Ceramic	15pF	GRM40
C504	Ceramic	15pF	GRM40
DS501	LCD	LD-B9222J	
DS502	LED	SLM-13VW	
DS503	LED	SLM-13MW	
DS504	LED	SLM-13MW	
EP501	LCD Contact Strip	SRCN573	
EP502	P.C. Board	B-1549D (LOGIC A)	
EP503	FPC	B-1569A	
W501	Jumper	MCR10-JPW	
W502	Jumper	MCR10-JPW	

## [LOGIC B UNIT]

REF. NO.	DESCRIPTION	PART NO.	
IC601	IC	S-8054ALB	
Q601	Transistor	2SA1576 R	
Q602	Transistor	2SA1576 R	
Q603	Transistor	2SA1576 R	
Q604	Transistor	2SA1576 R	
Q605	Transistor	DTC144EK	
Q606	Transistor	2SA1362 GR	
D601	Diode	1SS184	
D602	Diode	DAP202U	

## [LOGIC B UNIT]

REF. NO.	DESCRIPTION	PART NO.	
D603	Diode	DAN202U	
R601	Resistor	18kΩ	MCR10
R602	Variable Resistor	10kΩ A	RK0971111 01NA
R603	Variable Resistor	10kΩ B	RK0971110 051A
R604	Resistor	1MΩ	MCR10
R605	Resistor	1MΩ	MCR10
R606	Resistor	1MΩ	MCR10
R607	Resistor	1MΩ	MCR10
R608	Resistor	47kΩ	MCR10
R609	Resistor	1MΩ	MCR10
R610	Array	MA5025 F 09 224 J	
R611	Resistor	1MΩ	MCR10
R612	Resistor	1MΩ	MCR10
C601	Tantalum	47μF	6.3V SV
C602	Ceramic	0.1μF	GRM40 F
BT601	Lithium Battery	BR2325-1HC	
EP601	P.C. Board	B-1548D (LOGIC B)	
EP602	FPC	B-1568A	
EP603	P.C. Board	B-1555A (SQL)	
EP604	P.C. Board	B-1556B (VOL)	

## [MAIN UNIT]

REF. NO.	DESCRIPTION	PART NO.	
IC101	IC	BA526	
IC102	IC	LVC550C	
IC103	IC	LC4001BM	
IC104	IC	BA4558F	
Q101	Transistor	2SC2712 BL	
Q102	Transistor	2SC4081 R	
Q103	FET	2SJ106 Y	
Q104	Transistor	2SB909M Q/R	
Q105	Transistor	2SC4081 R	
Q106	Transistor	2SA1576 R	
Q107	Transistor	DTC144EU	
Q108	Transistor	2SA1162 GR	
Q109	Transistor	2SC2712 BL	
Q110	Transistor	2SA1576 R	
Q111	Transistor	2SC4081 R	
Q112	Transistor	2SB909M Q/R	
Q113	Transistor	2SC2712 BL	
Q114	Transistor	2SA1162 GR	
Q115	Transistor	2SC2712 BL	
Q116	Transistor	2SA1576 R	
Q118	Transistor	RN1404	
D103	Diode	DAN202U	
D104	Diode	1SS193	
D105	Diode	DAN202U	
D106	Diode	1SS190	
D107	Diode	DAP202U	
D108	Diode	DAN202U	

[MAIN UNIT]

REF. NO.	DESCRIPTION	PART NO.	
D109	Zener	RD9.1M B2	
R101	Resistor	5.6kΩ	MCR10
R102	Resistor	82kΩ	MCR10
R103	Resistor	330kΩ	MCR10
R104	Resistor	4.7kΩ	MCR10
R105	Resistor	2.2kΩ	MCR10
R106	Resistor	22kΩ	MCR10
R107	Resistor	22kΩ	MCR10
R108	Resistor	4.7kΩ	MCR10
R109	Resistor	1MΩ	MCR10
R110	Resistor	1MΩ	MCR10
R111	Resistor	27Ω	MCR10
R112	Resistor	470Ω	MCR10
R113	Resistor	5.6kΩ	MCR10
R114	Resistor	33kΩ	MCR10
R115	Resistor	47kΩ	MCR10
R116	Resistor	2.2kΩ	MCR10
R117	Resistor	10kΩ	MCR10
R118	Resistor	470Ω	MCR10
R120	Resistor	270kΩ	MCR10
R121	Resistor	180kΩ	MCR10
R122	Resistor	470Ω	MCR10
R123	Resistor	180kΩ	MCR10
R124	Resistor	180kΩ	MCR10
R125	Resistor	100kΩ	MCR10
R126	Resistor	120kΩ	MCR10
R127	Resistor	120kΩ	MCR10
R128	Resistor	82kΩ	MCR10
R129	Resistor	82kΩ	MCR10
R130	Resistor	12kΩ	MCR10
R131	Resistor	1kΩ	MCR10
R133	Resistor	4.7kΩ	MCR10
R134	Resistor	10kΩ	MCR10
R135	Resistor	10kΩ	MCR10
R136	Resistor	10kΩ	MCR10
R137	Resistor	10kΩ	MCR10
R138	Trimmer	47kΩ	RH04A3AS4J
R139	Resistor	680Ω	MCR10
R140	Resistor	47kΩ	MCR10
R141	Resistor	820Ω	MCR10
R144	Resistor	100kΩ	MCR10
R148	Resistor	4.7kΩ	MCR10
R149	Resistor	10kΩ	MCR10
C102	Ceramic	0.01μF	GRM40 F
C103	Ceramic	0.001μF	GRM40
C104	Ceramic	0.001μF	GRM40
C105	Electrolytic	4.7μF	16V MS5
C107	Electrolytic	0.47μF	50V MS5
C108	Ceramic	0.001μF	GRM40
C109	Electrolytic	4.7μF	16V MS5
C110	Electrolytic	10μF	10V MS5
C111	Ceramic	0.01μF	GRM40 F
C112	Electrolytic	100μF	6.3V MS5
C113	Electrolytic	100μF	6.3V MS5
C114	Electrolytic	47μF	16V MS5
C115	Ceramic	470pF	GRM40
C116	Ceramic	470pF	GRM40
C117	Ceramic	470pF	GRM40
C119	Electrolytic	1μF	50V MS5
C120	Ceramic	0.001μF	GRM40
C121	Ceramic	0.01μF	GRM40 F
C122	Ceramic	0.1μF	GRM40 F
C123	Ceramic	470pF	GRM40
C124	Ceramic	470pF	GRM40
C125	Electrolytic	0.1μF	50V MS5
C126	Electrolytic	4.7μF	16V MS5
C127	Ceramic	0.001μF	GRM40
C128	Ceramic	GRM40 B 222K 50PT	
C129	Ceramic	100pF	GRM40
C130	Ceramic	GRM40 B 222K 50PT	
C131	Ceramic	0.1μF	GRM40 F

[MAIN UNIT]

REF. NO.	DESCRIPTION	PART NO.	
C132	Ceramic	470pF	GRM40
C133	Electrolytic	47μF	16V MS5
C134	Ceramic	470pF	GRM40
C135	Electrolytic	47μF	6.3V MS5
C136	Electrolytic	47μF	6.3V MS5
C138	Electrolytic	47μF	6.3V MS5
C140	Ceramic	470pF	GRM40
C141	Electrolytic	47μF	6.3V MS5
C142	Ceramic	470pF	GRM40
C143	Ceramic	470pF	50V
C144	Ceramic	470pF	GRM40
C145	Ceramic	470pF	GRM40
C146	Ceramic	470pF	GRM40
C147	Ceramic	470pF	GRM40
C148	Electrolytic	47μF	16V MS5
C149	Electrolytic	47μF	6.3V MS5
C150	Electrolytic	2.2μF	50V MS5
C151	Ceramic	470pF	GRM40
C152	Ceramic	0.1μF	GRM40 F
C153	Ceramic	0.001μF	GRM40
C154	Ceramic	470pF	GRM40
J101	Connector	PI28A02M	
J102	Connector	PI28A04M	
J103	Connector	PI28A04M	
J104	Connector	HSJ1102-01-540	
J105	Connector	HSJ0836-01-010	
J106	Connector	BB04A10F	
J107	Connector	BB04A10F	
J108	Connector	CFP4128-0121	
J109	Connector	TZB-P04H-A1	
P101	Connector	PI28A02F	
P102	Connector	PI28A04F	
P103	Connector	PI28A04F	
MC101	Microphone	KUC2023-01-006	
S101	Switch	SKHLAD (CH16)	
S102	Switch	SKHLAD (HI/LOW)	
S103	Switch	SKHLAD (LOCK)	
S104	Switch	SKHMPD (FUNCTION)	
S105	Switch	SKHMPD (PTT)	
S107	Switch	SSSS21148A	
SP101	Speaker	SI36D04	
EP101	P.C. Board	B-1550D (MAIN)	
EP102	P.C. Board	B-1552C (PTT)	
EP103	P.C. Board	B-1570B (BATTERY TERMINAL)	
W102	Wire	23/02/095/D02/W02	
W103	Wire	23/02/095/D02/W02	
W104	Wire	24/02/055/D02/W01	
W105	Wire	24/07/055/D02/W01	
W106	Wire	24/04/070/D02/W01	
W107	Wire	24/00/070/D02/W01	
W108	Wire	24/00/040/C23/D02	
W109	Wire	24/01/040/C23/D02	
W110	Wire	24/02/040/C23/D02	
W111	Wire	24/03/040/C23/D02	

## [RF UNIT]

REF. NO.	DESCRIPTION	PART NO.
IC201	IC	MC3357DR
IC202	IC	PLL2001
IC203	IC	SC-1046
Q201	FET	2SK302 Y
Q202	Transistor	2SC3356
Q203	Transistor	2SC3356
Q204	FET	2SK302 Y
Q205	FET	2SK209 Y
Q206	Transistor	2SC3772 3
Q207	Transistor	2SC3772 3
Q208	Transistor	FMS1
Q209	Transistor	RN1404
Q210	Transistor	2SB909M Q/R
Q211	Transistor	2SC2712 BL
Q212	Transistor	2SC2712 BL
Q213	Transistor	2SC2712 BL
Q214	Transistor	2SA1162 GR
Q215	Transistor	2SC3772 3
Q216	Transistor	RN1404
Q217	Transistor	RN2404
Q218	FET	2SK536
Q219	FET	2SK536
D201	Varicap	MA334B
D202	Varicap	MA334B
D203	Varicap	MA334B
D204	Varicap	MA334B
D206	Diode	MA862
D207	Diode	1SS153
D208	Diode	1SS154
D209	Diode	MA862
D210	Varicap	1SV50E
D211	Diode	1SS193
D212	Diode	1SS99
D213	Diode	1SS99
D214	Diode	1SS154
D215	Diode	1SS226
D216	Diode	1SV172
FI201	Crystal	23M15B2
FI202	Ceramic	CFZM455 E10
FI203	LC	ZJSR5101-333
X201	Crystal	CR188
X202	Discriminator	CDB455C7A
X203	Crystal	CR212
L201	Coil	LB-227
L202	Coil	LB-226
L203	Coil	LB-228
L204	Coil	LB-226
L205	Coil	LR-116
L206	Coil	LS-304
L207	Coil	LS-264
L208	Coil	LA-227
L209	Coil	LA-227
L210	Coil	LA-235
L211	Coil	LA-234
L212	Coil	LAL02KR 4R7K 4.7 $\mu$
L213	Coil	LA-228
L214	Coil	LA-245
L215	Coil	LA-247
L216	Coil	LA-247
L219	Coil	LS-264
L220	Coil	LAL02KR 1R5M 1.5 $\mu$
L221	Coil	LAL02KR 1R5M 1.5 $\mu$
R201	Resistor	150k $\Omega$ MCR10

## [RF UNIT]

REF. NO.	DESCRIPTION	PART NO.
R202	Resistor	150k $\Omega$ MCR10
R203	Resistor	18 $\Omega$ MCR10
R206	Resistor	150k $\Omega$ MCR10
R207	Resistor	150k $\Omega$ MCR10
R208	Resistor	270 $\Omega$ MCR10
R209	Resistor	10k $\Omega$ MCR10
R210	Resistor	330 $\Omega$ MCR10
R211	Resistor	330 $\Omega$ MCR10
R212	Resistor	1k $\Omega$ MCR10
R213	Resistor	22 $\Omega$ MCR10
R214	Resistor	22 $\Omega$ MCR10
R215	Resistor	47 $\Omega$ MCR10
R216	Resistor	100 $\Omega$ MCR10
R217	Resistor	470 $\Omega$ MCR10
R218	Resistor	4.7k $\Omega$ MCR10
R219	Resistor	1.5k $\Omega$ MCR10
R220	Resistor	1.5k $\Omega$ MCR10
R221	Resistor	47k $\Omega$ MCR10
R222	Resistor	1.5k $\Omega$ MCR10
R223	Resistor	22k $\Omega$ MCR10
R224	Resistor	2.2k $\Omega$ MCR10
R225	Resistor	1k $\Omega$ MCR10
R226	Resistor	100 $\Omega$ MCR10
R227	Resistor	10k $\Omega$ MCR10
R228	Resistor	100k $\Omega$ MCR10
R229	Resistor	2.2k $\Omega$ MCR10
R230	Resistor	2.2k $\Omega$ MCR10
R231	Thermistor	33D28
R232	Resistor	470 $\Omega$ MCR10
R234	Resistor	330 $\Omega$ MCR10
R235	Resistor	330 $\Omega$ MCR10
R236	Resistor	82k $\Omega$ MCR10
R237	Resistor	22k $\Omega$ MCR10
R238	Resistor	15k $\Omega$ MCR10
R240	Resistor	3.3k $\Omega$ MCR10
R241	Resistor	22k $\Omega$ MCR10
R242	Trimmer	2.2k $\Omega$ RH0421C
R243	Resistor	18k $\Omega$ MCR10
R244	Trimmer	22k $\Omega$ RH0421C
R245	Resistor	56k $\Omega$ MCR10
R246	Resistor	5.6k $\Omega$ MCR10
R247	Resistor	330 $\Omega$ MCR10
R248	Resistor	22k $\Omega$ MCR10
R249	Resistor	4.7k $\Omega$ MCR10
R250	Resistor	10k $\Omega$ MCR10
R251	Resistor	47k $\Omega$ MCR10
R252	Resistor	15k $\Omega$ MCR10
R253	Resistor	18 $\Omega$ MCR10
R254	Resistor	100k $\Omega$ MCR10
R255	Resistor	4.7k $\Omega$ MCR10
R256	Resistor	220 $\Omega$ MCR10
R257	Resistor	15k $\Omega$ MCR10
R258	Thermistor	33D28
R259	Resistor	10k $\Omega$ MCR10
R260	Thermistor	33D28
R261	Resistor	22k $\Omega$ MCR10
R262	Resistor	6.8k $\Omega$ MCR10
R263	Resistor	100k $\Omega$ MCR10
R264	Resistor	100k $\Omega$ MCR10
R265	Resistor	100 $\Omega$ MCR10
R266	Resistor	2.2k $\Omega$ MCR10
R267	Resistor	390 $\Omega$ MCR10
R268	Resistor	1k $\Omega$ MCR10
R269	Resistor	18k $\Omega$ MCR10
R270	Resistor	47k $\Omega$ MCR10
R271	Resistor	47k $\Omega$ MCR10
R272	Resistor	10k $\Omega$ MCR10
R273	Resistor	390k $\Omega$ MCR10
R274	Resistor	220k $\Omega$ MCR10
R275	Resistor	47k $\Omega$ MCR10
R276	Resistor	15k $\Omega$ MCR10
R277	Resistor	470 $\Omega$ R20
R278	Resistor	8.2k $\Omega$ MCR10
R281	Resistor	100k $\Omega$ MCR10
R285	Resistor	10 $\Omega$ MCR10

## [RF UNIT]

REF. NO.	DESCRIPTION	PART NO.	
R287	Resistor	22kΩ	MCR10
R289	Resistor	270Ω	MCR10
R290	Resistor	47kΩ	MCR10
R291	Resistor	3.3kΩ	MCR10
R292	Resistor	220Ω	MCR10
R293	Resistor	5.6kΩ	MCR10
R294	Resistor	3.3kΩ	MCR10
R295	Resistor	3.3kΩ	MCR10
R296	Resistor	47kΩ	MCR10
R297	Resistor	180Ω	MCR10
R298	Resistor	3.3kΩ	MCR10
R299	Resistor	56Ω	MCR10
R300	Resistor	10kΩ	MCR10
C201	Ceramic	39pF	GRM40
C203	Ceramic	5pF	GRM40
C204	Ceramic	1pF	GRM40
C206	Ceramic	56pF	GRM40
C208	Ceramic	0.001μF	GRM40
C209	Ceramic	0.001μF	GRM40
C210	Ceramic	0.001μF	GRM40
C212	Ceramic	12pF	GRM40
C213	Ceramic	0.5pF	GRM40
C214	Ceramic	0.75pF	GRM40
C215	Ceramic	33pF	GRM40
C217	Ceramic	8pF	GRM40
C218	Ceramic	0.001μF	GRM40
C219	Ceramic	0.001μF	GRM40
C220	Ceramic	0.001μF	GRM40
C221	Ceramic	0.001μF	GRM40
C222	Ceramic	5pF	GRM40
C223	Ceramic	47pF	GRM40
C225	Ceramic	0.001μF	GRM40
C226	Ceramic	27pF	GRM40
C227	Ceramic	27pF	GRM40
C228	Ceramic	0.1μF	GRM40 F
C229	Ceramic	0.1μF	GRM40 F
C230	Ceramic	82pF	GRM40
C231	Electrolytic	10μF	16V MS7
C232	Ceramic	0.1μF	GRM40 F
C233	Electrolytic	0.47μF	50V MS7
C234	Ceramic	15pF	GRM40
C235	Ceramic	33pF	GRM40
C236	Ceramic	33pF	GRM40
C237	Ceramic	0.1μF	GRM40 F
C238	Ceramic	0.001μF	GRM40
C239	Ceramic	0.001μF	GRM40
C240	Ceramic	0.001μF	GRM40
C241	Ceramic	0.0047μF	GRM40
C242	Tantalum	0.22μF	35V DN
C243	Ceramic	0.001μF	GRM40
C244	Ceramic	0.001μF	GRM40
C245	Ceramic	0.001μF	GRM40
C248	Ceramic	22pF	GRM40
C249	Ceramic	39pF	GRM40
C250	Ceramic	22pF	GRM40
C251	Ceramic	0.001μF	GRM40
C252	Ceramic	10pF	GRM40
C253	Ceramic	12pF	GRM40
C254	Ceramic	27pF	GRM40
C255	Ceramic	3pF	GRM40
C256	Ceramic	15pF	GRM40
C260	Ceramic	18pF	GRM40
C261	Ceramic	18pF	GRM40
C264	Ceramic	0.001μF	GRM40
C265	Electrolytic	10μF	16V MS7
C266	Ceramic	0.001μF	GRM40
C267	Ceramic	10pF	GRM40
C268	Electrolytic	10μF	16V MS7
C270	Ceramic	470pF	GRM40
C271	Ceramic	0.001μF	GRM40
C272	Ceramic	0.001μF	GRM40
C274	Ceramic	47pF	GRM40
C275	Ceramic	7pF	GRM40

## [RF UNIT]

REF. NO.	DESCRIPTION	PART NO.	
C276	Ceramic	0.001μF	GRM40
C278	Ceramic	0.001μF	GRM40
C279	Ceramic	0.001μF	GRM40
C280	Ceramic	0.001μF	GRM40
C282	Electrolytic	4.7μF	35V MS7
C283	Ceramic	0.001μF	GRM40
C284	Ceramic	0.001μF	GRM40
C285	Ceramic	4pF	GRM40 CH
C286	Ceramic	0.001μF	GRM40
C287	Ceramic	33pF	GRM40 CH
C288	Trimmer	15pF	ECRGA015E30
C289	Ceramic	100pF	GRM40
C290	Ceramic	220pF	GRM40
C292	Ceramic	0.001μF	GRM40
C293	Tantalum	3.3μF	16V DN
C294	Ceramic	0.001μF	GRM40
C295	Electrolytic	0.1μF	50V MS7
C296	Electrolytic	1μF	50V MS7
C297	Ceramic	0.001μF	GRM40
C298	Ceramic	33pF	GRM40
C299	Ceramic	0.001μF	GRM40
C300	Ceramic	0.0022μF	GRM40
C301	Ceramic	0.001μF	GRM40
C302	Ceramic	0.001μF	GRM40
C303	Ceramic	0.001μF	GRM40
C304	Ceramic	470pF	GRM40
C305	Ceramic	0.1μF	GRM40 F
C306	Ceramic	0.001μF	GRM40
C308	Ceramic	0.001μF	GRM40
C309	Ceramic	0.001μF	GRM40
C310	Ceramic	0.001μF	GRM40
C311	Ceramic	0.001μF	GRM40
C312	Ceramic	0.001μF	GRM40
C314	Ceramic	0.1μF	GRM40 F
C315	Electrolytic	1μF	50V MS7
C316	Ceramic	10pF	GRM40
C317	Ceramic	0.001μF	GRM40
C318	Ceramic	0.001μF	GRM40
C319	Ceramic	0.001μF	GRM40
C320	Ceramic	0.001μF	GRM40
C321	Ceramic	0.001μF	GRM40
C322	Ceramic	0.001μF	GRM40
C323	Ceramic	0.001μF	GRM40
J201	Connector	BB04G10M	
J202	Connector	BB04G10M	
J203	Connector	TNC-R106	
EP201	P.C. Board	B-1551C (RF)	
W201	Wire	24/03/060/C23/C23	
W202	Jumper	MCR10-JPW	
W203	Jumper	MCR10-JPW	
W204	Jumper	MCR10-JPW	
W205	Jumper	MCR10-JPW	
W206	Shield Cable	[66/99/50/W18D/W18D]	
W207		[ /08/ / / ]	
W208	Wire	73/98/020/X98/X98	
W209	Wire	73/98/020/X98/X98	
W210	Wire	72/98/030/X98/X98	

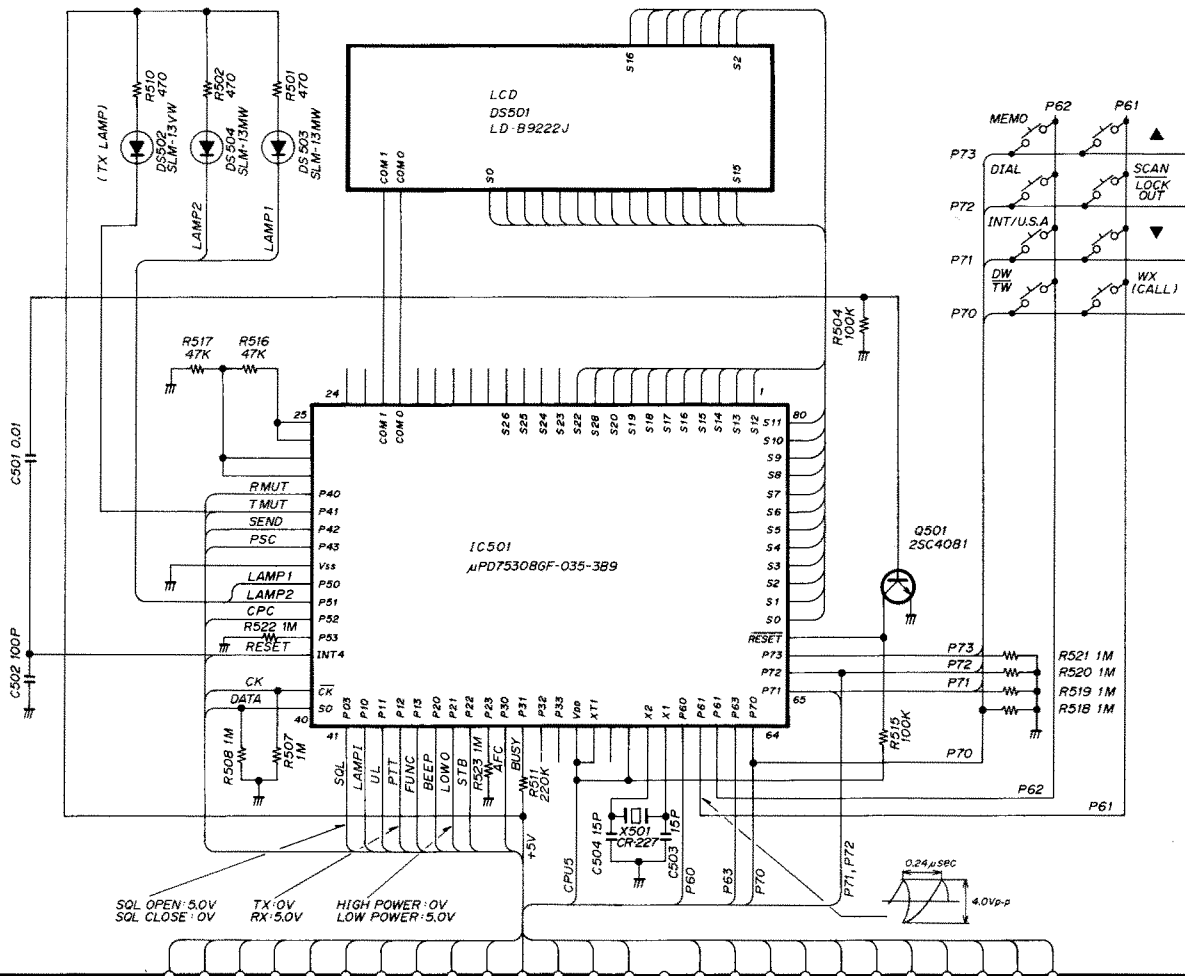


**[VCO UNIT]**

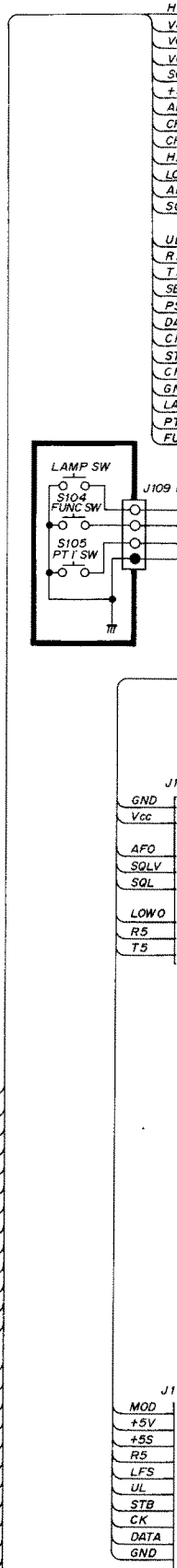
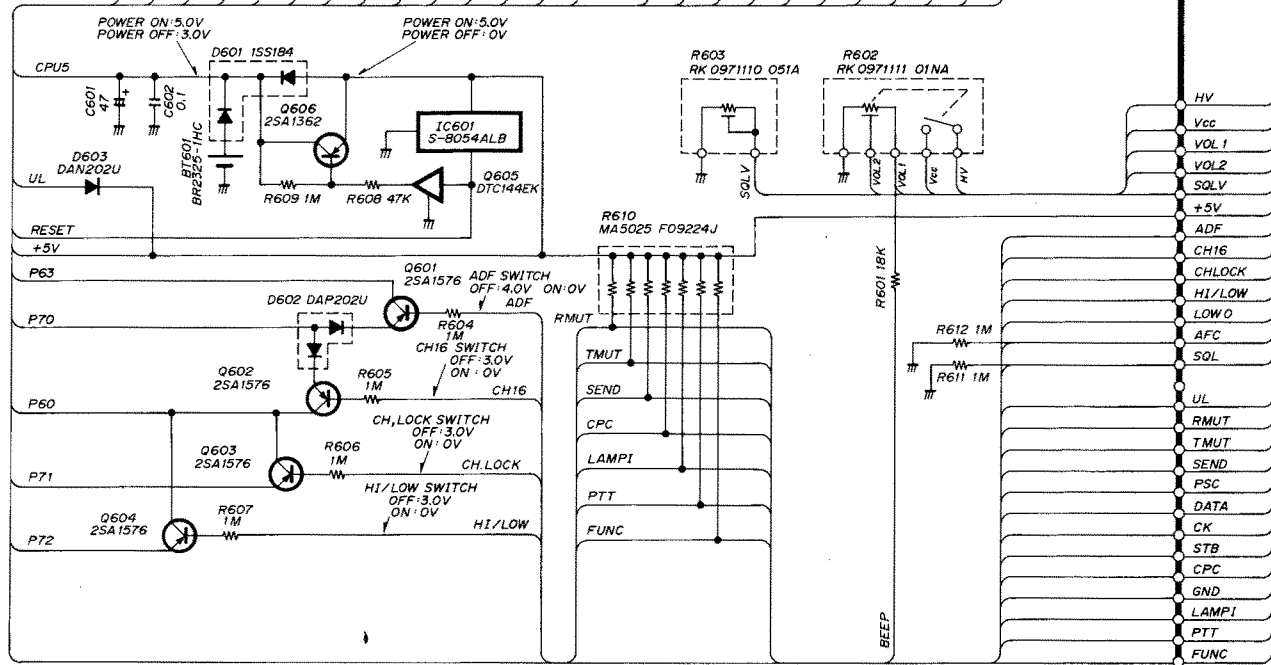
REF. NO.	DESCRIPTION	PART NO.	
Q401	FET	2SK302 Y	
Q402	Transistor	2SC3772 3	
D401	Diode	1SS184	
D402	Diode	MA862	
D403	Varicap	MA334B	
D404	Varicap	MA334B	
D405	Diode	1SS153	
L401	Coil	LAL02KR 4R7K 4.7μ	
L402	Coil	LAL02KR 4R7K 4.7μ	
L403	Coil	LAL02KR 4R7K 4.7μ	
L404	Coil	LB-229	
L405	Coil	LAL02KR 4R7K 4.7μ	
L406	Coil	LQN2A R15K 0.15μ	
L407	Coil	LAL02KR 4R7K 4.7μ	
R401	Resistor	220kΩ	MCR10
R402	Resistor	100kΩ	MCR10
R403	Resistor	100kΩ	MCR10
R404	Resistor	47kΩ	MCR10
R405	Resistor	220kΩ	MCR10
R406	Resistor	56Ω	MCR10
R407	Resistor	1kΩ	MCR10
R408	Resistor	100kΩ	MCR10
R409	Resistor	39kΩ	MCR10
C401	Ceramic	470pF	GRM40
C402	Ceramic	470pF	GRM40
C403	Ceramic	470pF	GRM40
C404	Ceramic	47pF	GRM40
C405	Ceramic	18pF	GRM40
C406	Ceramic	3pF	GRM40
C407	Ceramic	3pF	GRM40
C408	Ceramic	39pF	GRM40
C409	Ceramic	0.001μF	GRM40
C410	Ceramic	0.001μF	GRM40
C411	Ceramic	0.001μF	GRM40
C412	Ceramic	6pF	GRM40
C414	Ceramic	0.5pF	GRM40
C415	Ceramic	2pF	GRM40
EP401	P.C. Board	B-1579B (VCO)	
EP402	P.C. Board	B-1604 (COIL)	

# SECTION 9 VOLTAGE DIAGRAM

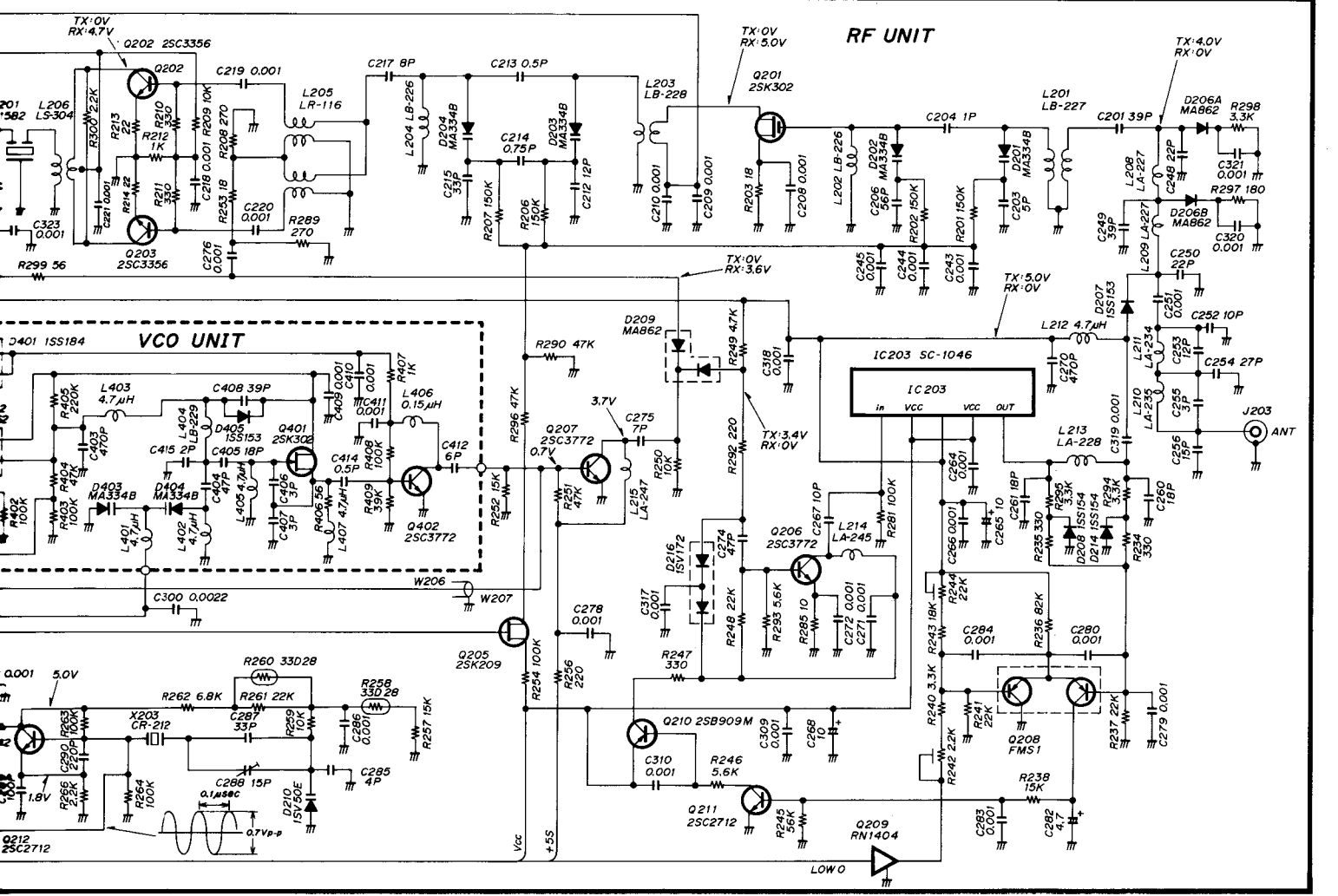
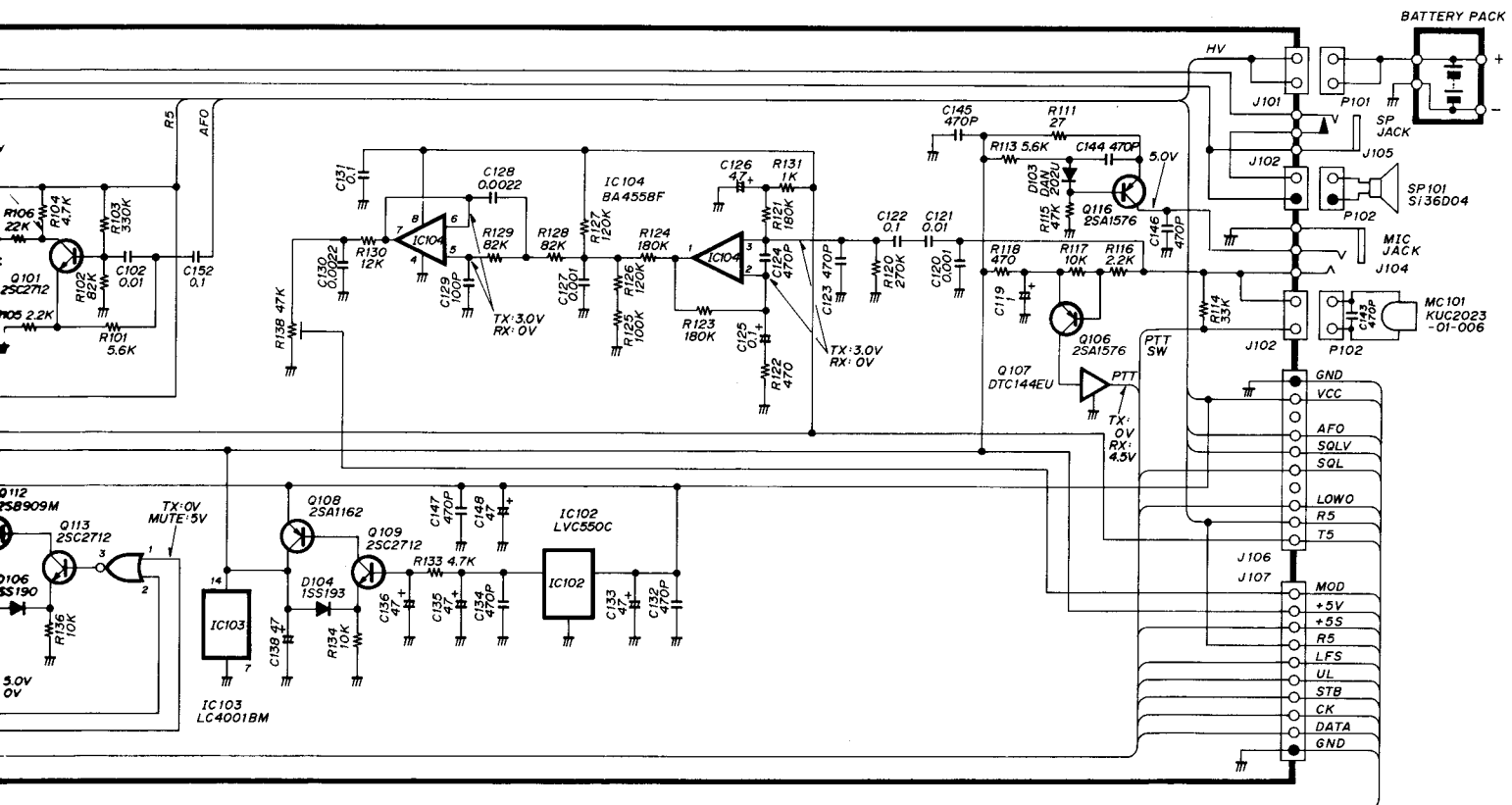
## LOGIC A UNIT



## LOGIC B UNIT







# **SUPPLEMENTAL FUNCTIONS**

## 1. HOW TO PROGRAM PRIVATE CHANNELS INTO A MEMORY CHANNEL

- 1) Push the [MEMO] SWITCH to select the MEMORY mode.
- 2) Push and hold the [FUNCTION] SWITCH and push the [MEMO] SWITCH for about 3 seconds to set the MEMORY WRITE mode.
- 3) Push and hold the [FUNCTION] SWITCH and push the [H/L] SWITCH.
  - "PRV" appears on the FUNCTION DISPLAY.
- 4) Push the [UP/DN] SWITCH either upwards or downwards to select the desired memory channel.
- 5) Push the [DIAL] SWITCH.
  - The dial channel blinks.
- 6) Select the desired private channel number using the [UP/DN] SWITCH.
- 7) Push the [MEMO] SWITCH to program the desired channel.
  - The channel number stops blinking.

## 2. HOW TO INHIBIT OPERATION ON A CHANNEL

### (1) PROGRAMMING THE INHIBIT CHANNEL

- 1) Push the [DIAL] SWITCH to select the DIAL mode.
- 2) Push and hold the [FUNCTION] SWITCH and push the [CH16] SWITCH for about 3 seconds to set the INHIBIT mode.
  - The dial channel blinks.
- 3) Select the desired channel you wish to inhibit using the [UP/DN] SWITCH.
- 4) Push and hold the [FUNCTION] SWITCH and push the [CH16] SWITCH.
  - "—" appears on the FUNCTION DISPLAY.
  - The channel is now inhibited.
- 5) Push the [CH16] SWITCH to exit the INHIBIT mode.

### (2) CANCELLING THE INHIBIT CHANNEL

- 1) Access the INHIBIT mode as described in steps 1 and 2 above.
- 2) Select the inhibited channel using the [UP/DN] SWITCH.
  - "—" appears on the FUNCTION DISPLAY.
- 3) Push and hold the [FUNCTION] SWITCH and push the [CH16] SWITCH.
  - The inhibited channel number appears on the FUNCTION DISPLAY.

- 4) Push the [CH16] SWITCH to exit the INHIBIT mode.

## 3. HOW TO PROGRAM LOW OUTPUT POWER ON A CHANNEL

- 1) Push the [DIAL] SWITCH to select the DIAL mode.
- 2) Select the desired channel for LOW power you wish to program using the [UP/DN] SWITCH.
- 3) Push and hold the [FUNCTION] SWITCH and push the [H/L] SWITCH for about 3 seconds to set the POC (Power Output Control) function.
  - "LOW" appears on the FUNCTION DISPLAY.
  - The transceiver is in the LOW power mode.
  - The [H/L] SWITCH on the front panel does not function in the channel.
- 4) To cancel the POC function, push and hold the [FUNCTION] SWITCH and push the [H/L] SWITCH for about 3 seconds.
  - "LOW" disappears from the FUNCTION DISPLAY.
  - Output power can be selected by the [H/L] SWITCH.

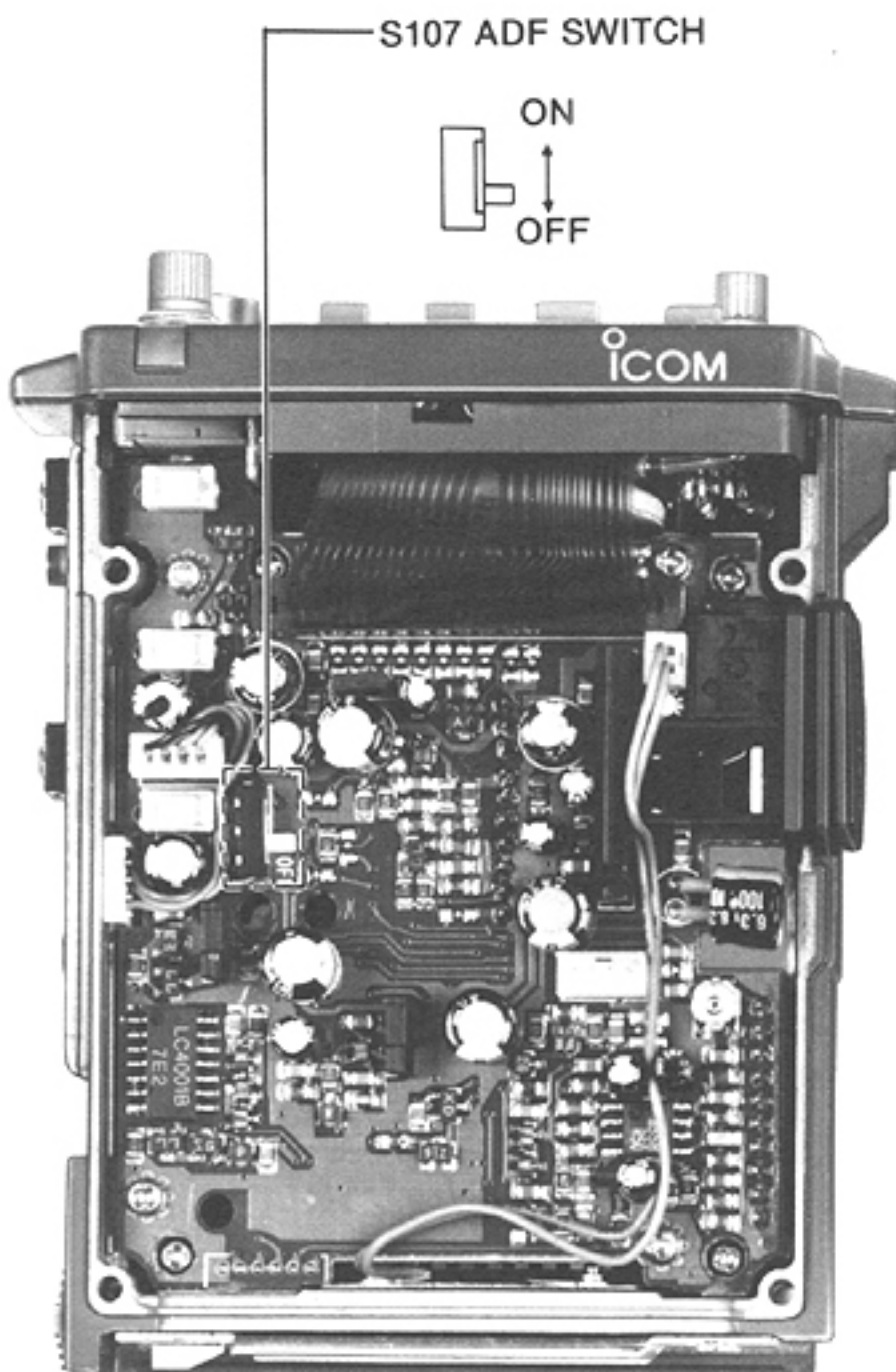
## 4. HOW TO CHANGE THE DUPLEX CHANNEL TO SIMPLEX AND PROGRAM INTO A MEMORY CHANNEL

- 1) Push the [MEMO] SWITCH to select the MEMORY mode.
- 2) Push and hold the [FUNCTION] SWITCH and push the [MEMO] SWITCH for about 3 seconds to set the MEMORY WRITE mode.
- 3) If you wish to change the private duplex channel to simplex, push and hold the [FUNCTION] SWITCH and push the [H/L] SWITCH.
- 4) Push the [UP/DN] SWITCH either upwards or downwards to select the desired memory channel.
- 5) Push the [DIAL] SWITCH.
  - The dial channel blinks.
- 6) Select the desired duplex channel you wish to change to simplex, using the [UP/DN] SWITCH.
- 7) Push and hold the [FUNCTION] SWITCH and push the [DIAL] SWITCH.
  - "A" appears on the FUNCTION DISPLAY.
- 8) Push the [MEMO] SWITCH to program the desired channel.
  - The channel number stops blinking.

## 5. HOW TO INHIBIT DESCRIBED FUNCTIONS

- 1) Turn ON the [ADF] SWITCH on the MAIN UNIT.
  - The following functions are now inhibited:
    - Private channel writing.
    - Inhibit channel setting.
    - POC function.
    - Changing the duplex channel to simplex channel.

### MAIN UNIT



## 6. CALL CHANNEL OPERATION (Except U.S.A. version)

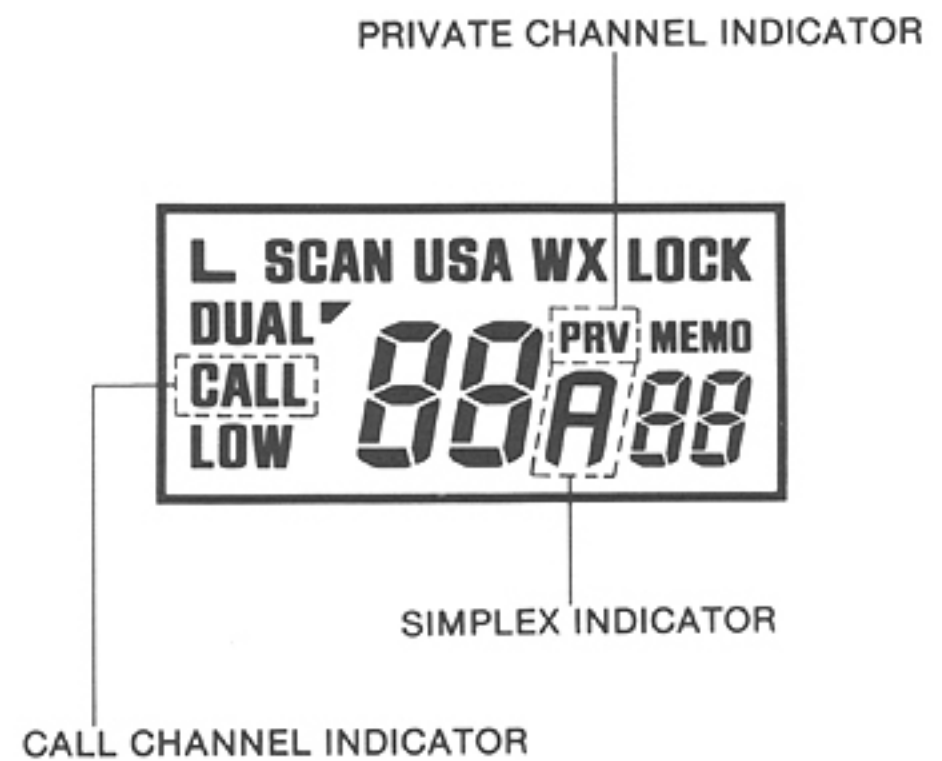
### (1) SELECTING CALL CHANNEL

- 1) Push the [CALL] SWITCH to select a call channel.
- 2) Push the [DIAL] SWITCH to return to the previously displayed frequency.

### (2) PROGRAMMING THE CALL CHANNEL

- 1) Push the [DIAL] SWITCH to select the DIAL mode.
- 2) Select the desired call channel number using the [UP/DN] SWITCH.
- 3) Push and hold the [FUNCTION] SWITCH and push the [CALL] SWITCH for about 3 seconds to set the CALL CHANNEL WRITE mode.
  - "CALL" blinks on the FUNCTION DISPLAY.
- 4) Push the [CALL] SWITCH to program the desired channel.

### FUNCTION DISPLAY



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