



SERVICE MANUAL

VHF MARINE TRANSCEIVER

IC-M11

INTRODUCTION

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

ASSISTANCE

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.

ORDERING PARTS

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.)

REPAIR NOTE

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 : 50Ω
- 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 : 600Ω
- Maximum deviation : $\pm 5\text{kHz}$
- Spurious emissions : -60dB

■ 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 8Ω load
- Audio output impedance : 8Ω

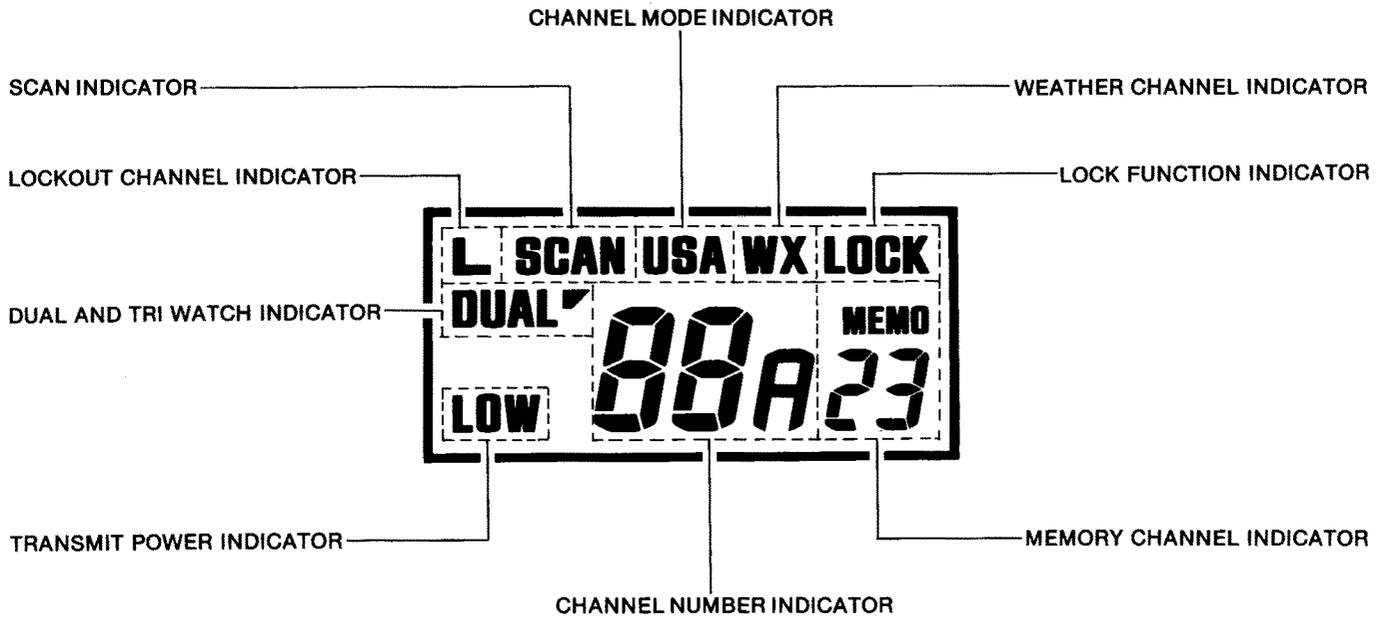
■ MARINE VHF TRANSCEIVER CHANNEL CHART

| 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 | | | | |

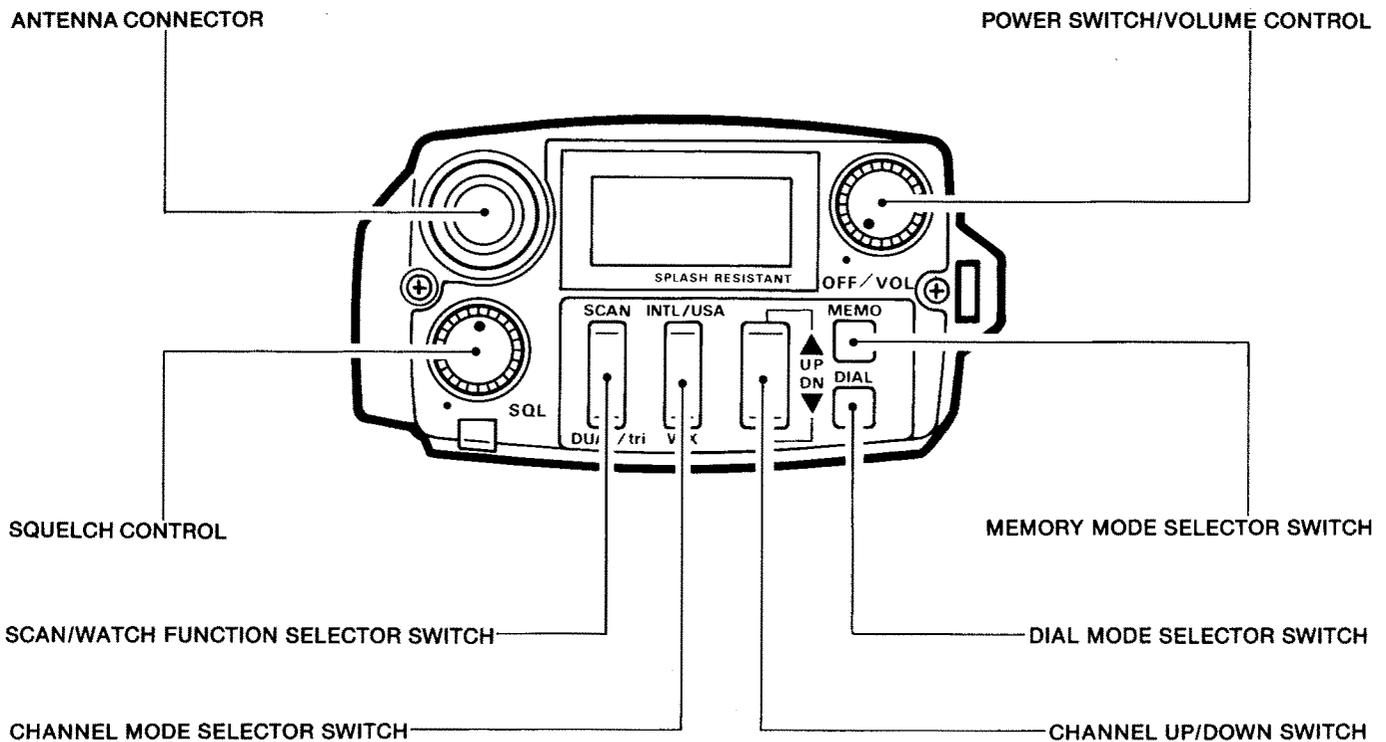
*: Only receives using a U.S.A. channel.

SECTION 2 OUTSIDE AND INSIDE VIEWS

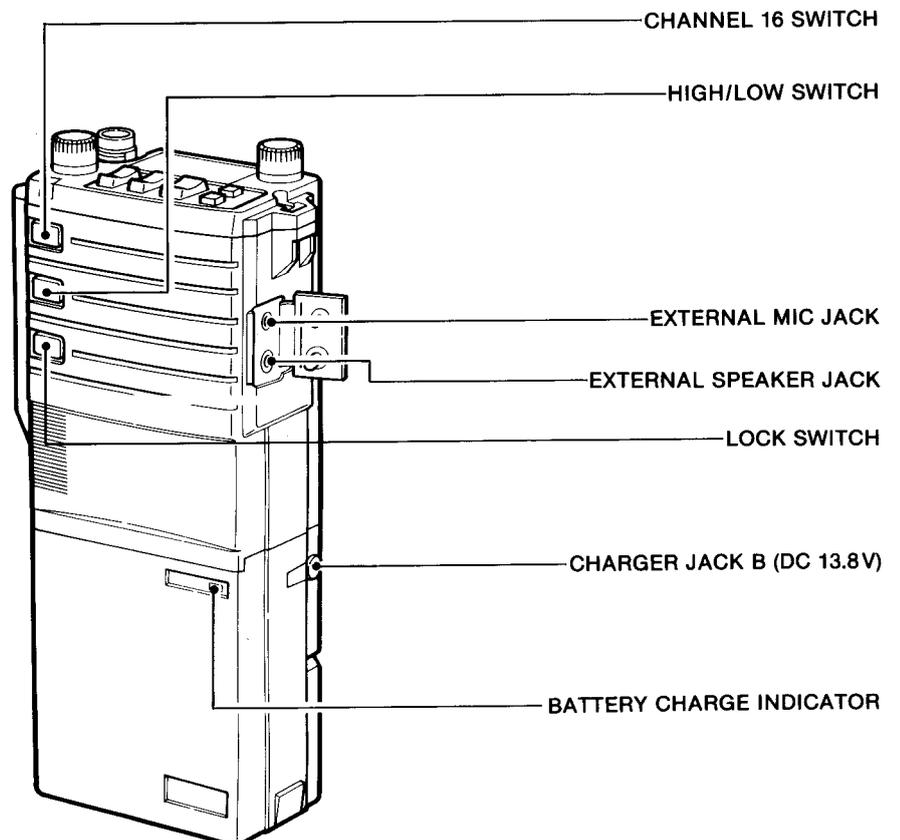
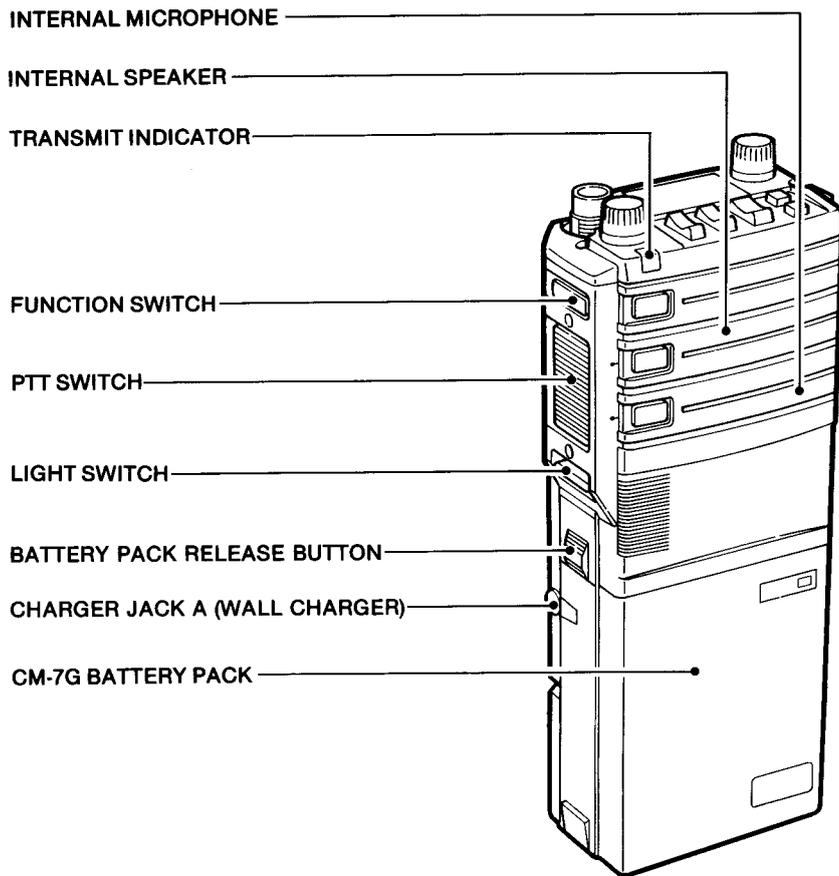
2-1 FUNCTION DISPLAY



2-2 TOP PANEL

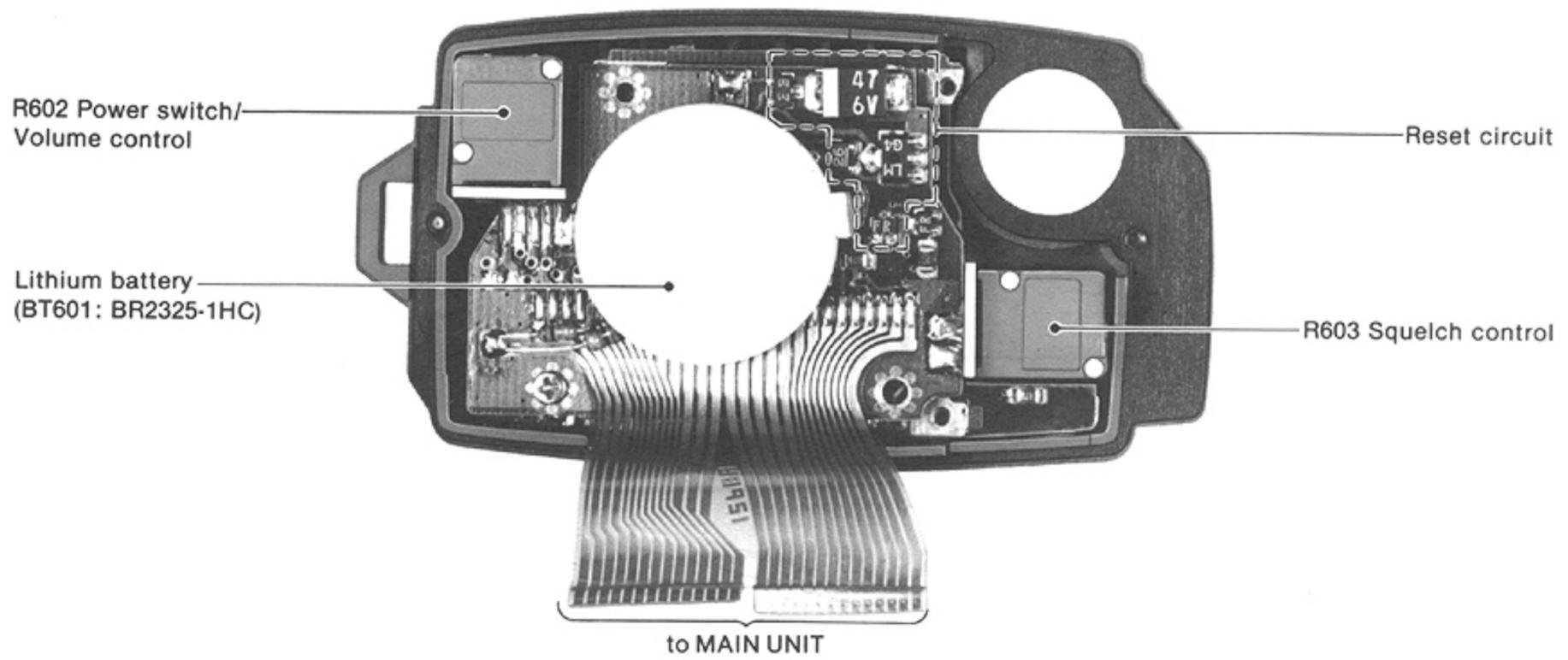


2-3 FRONT AND SIDE PANELS

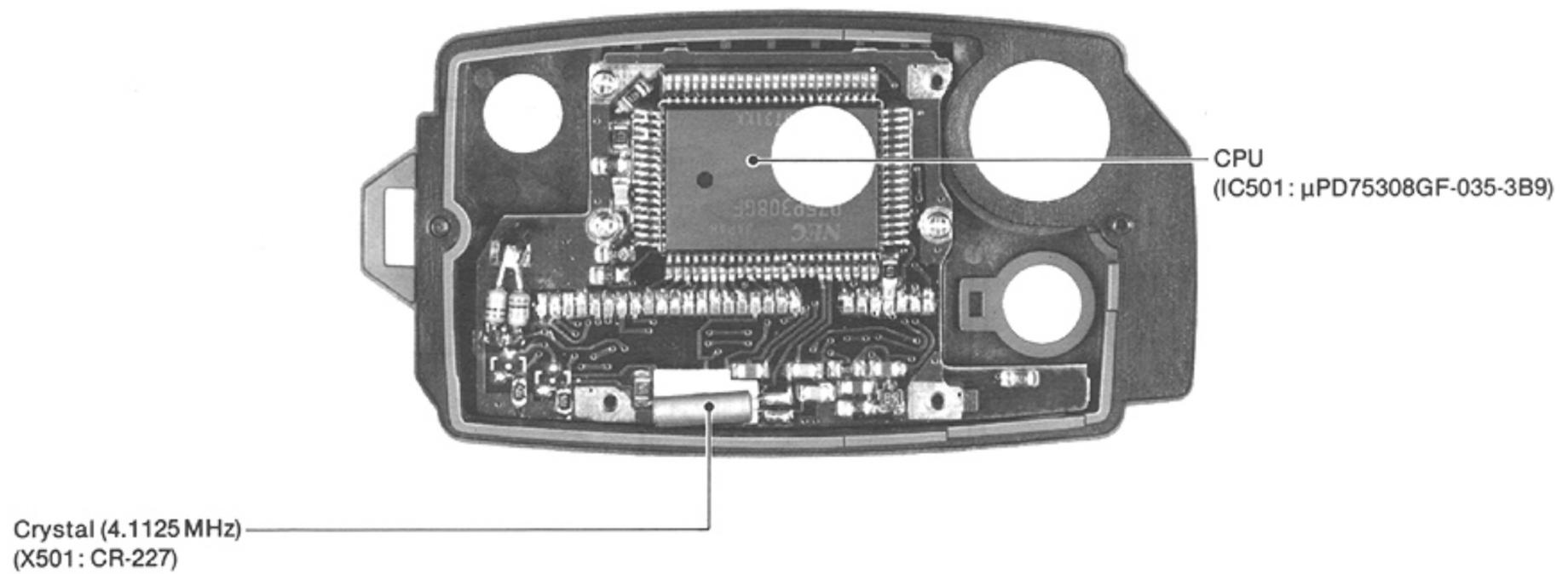


2-4 TOP PANEL INSIDE VIEWS

• LOGIC B UNIT

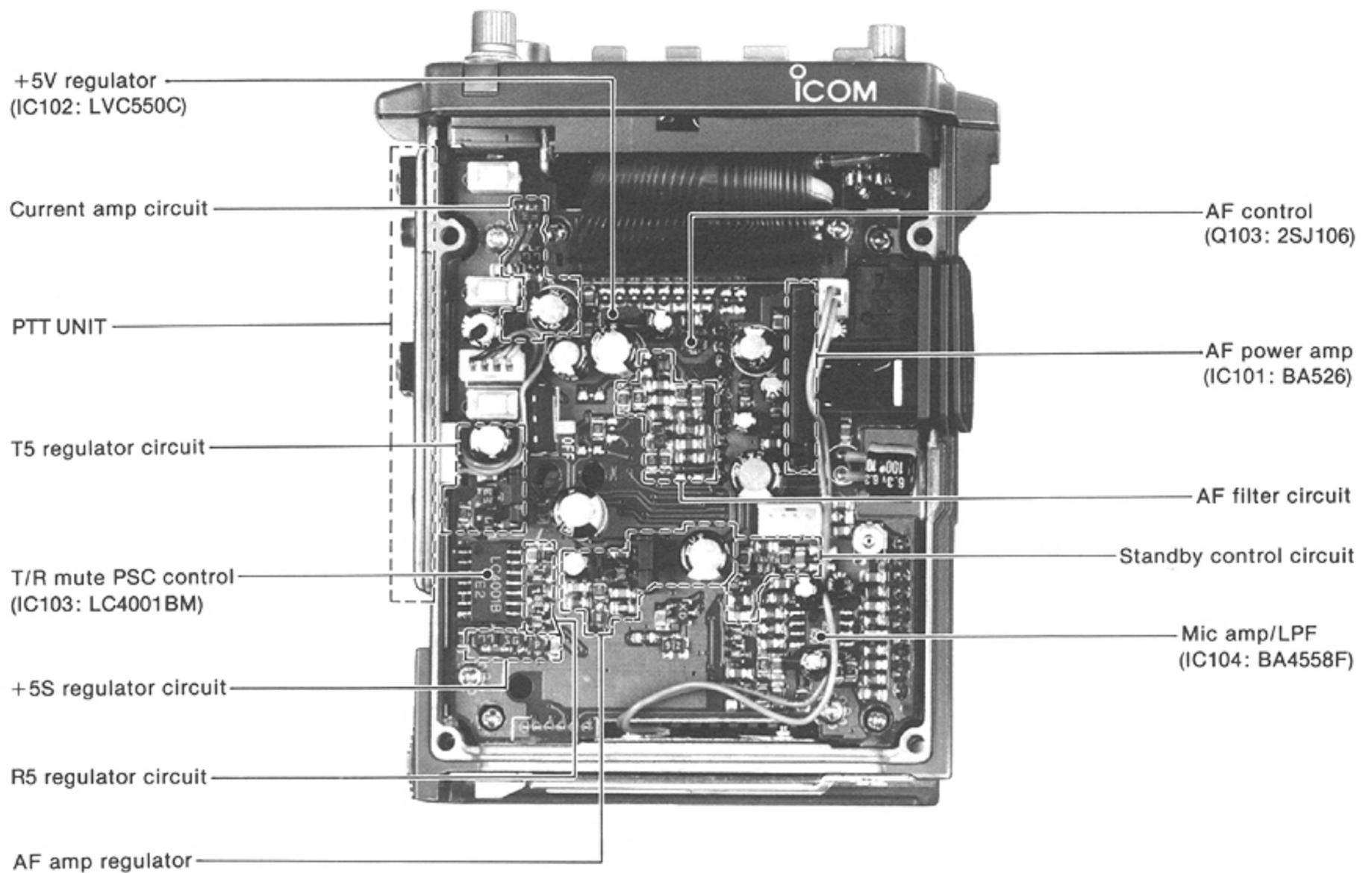


• LOGIC A UNIT

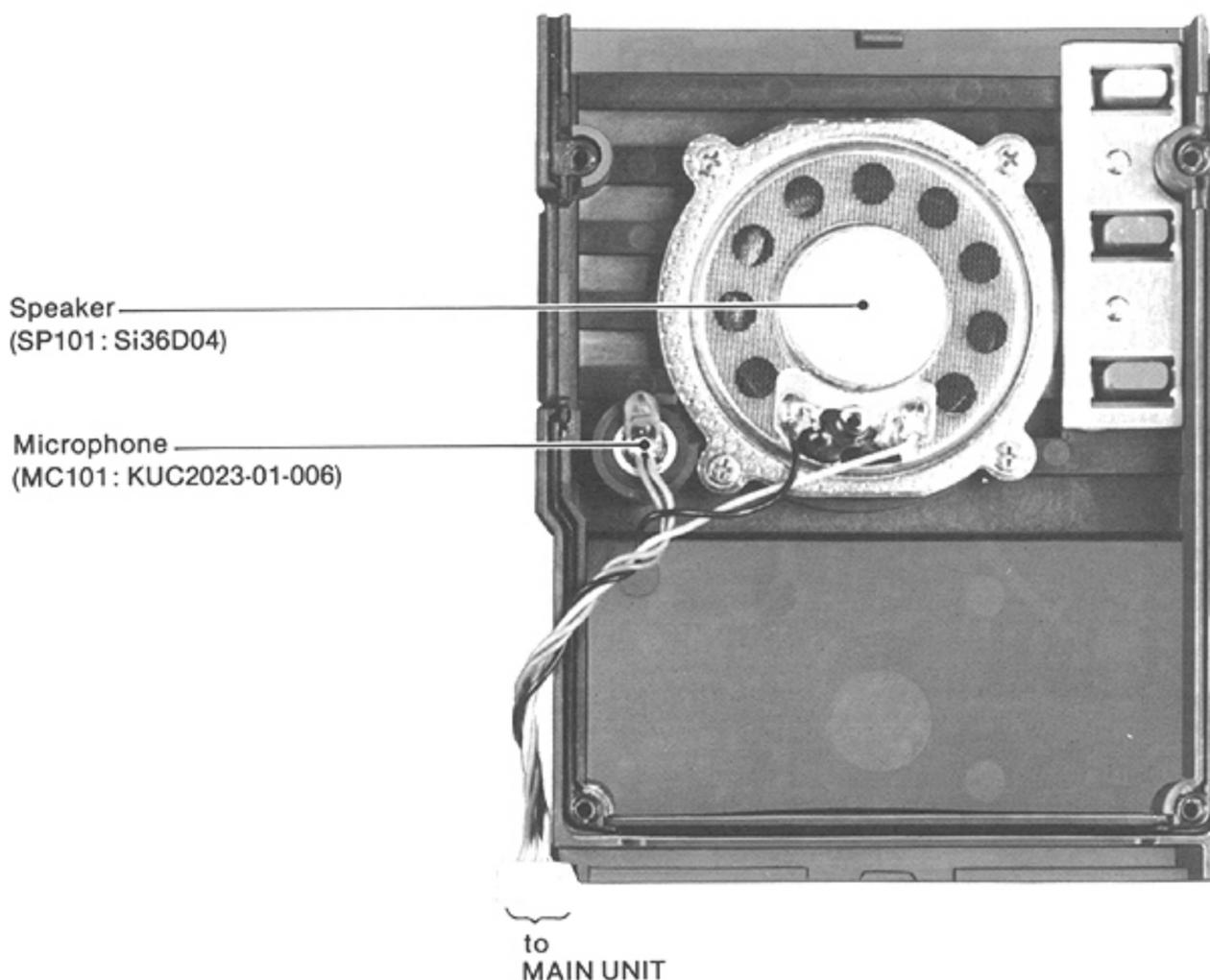


2-5 FRONT INSIDE VIEWS

• MAIN UNIT

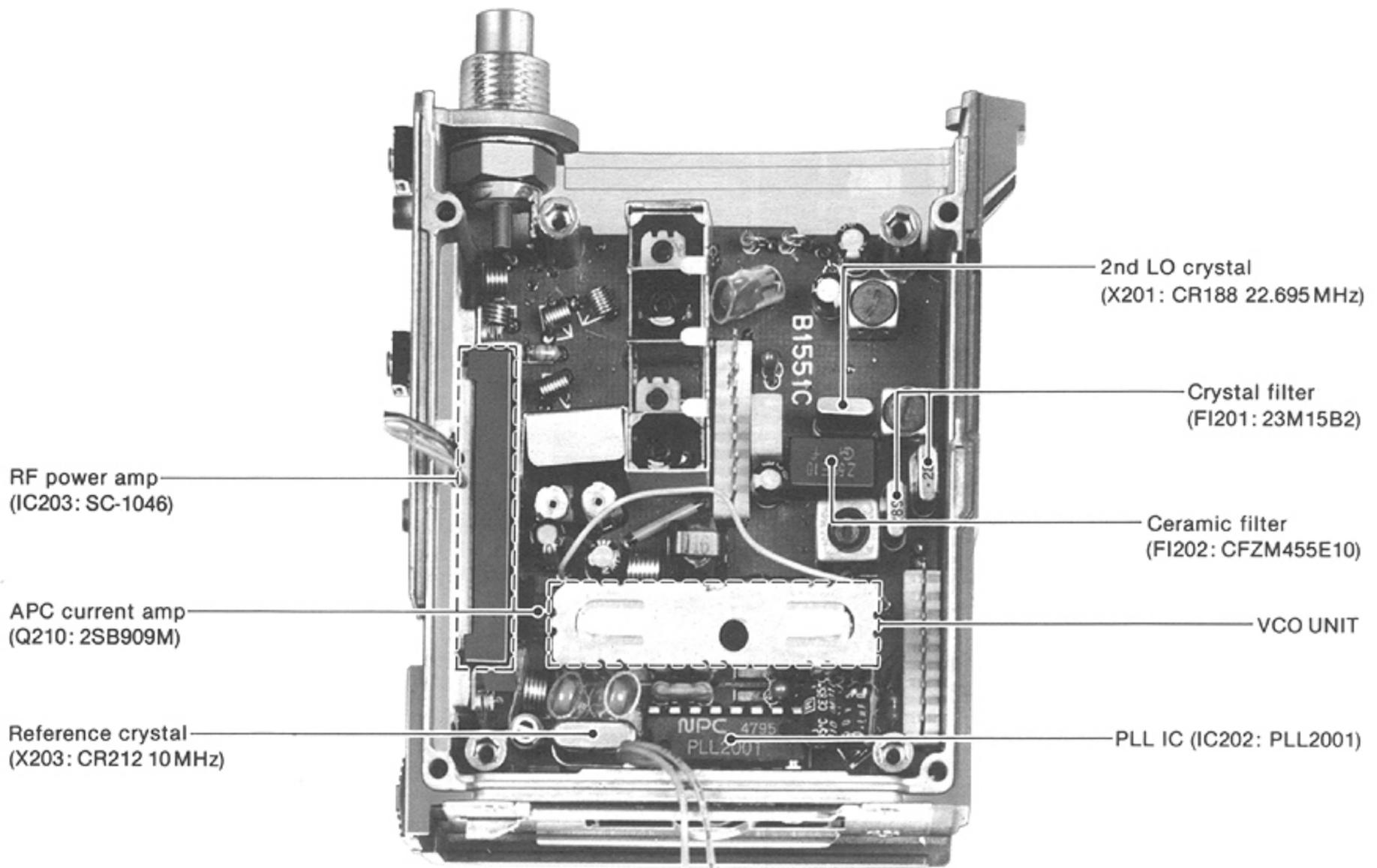


• SPEAKER UNIT

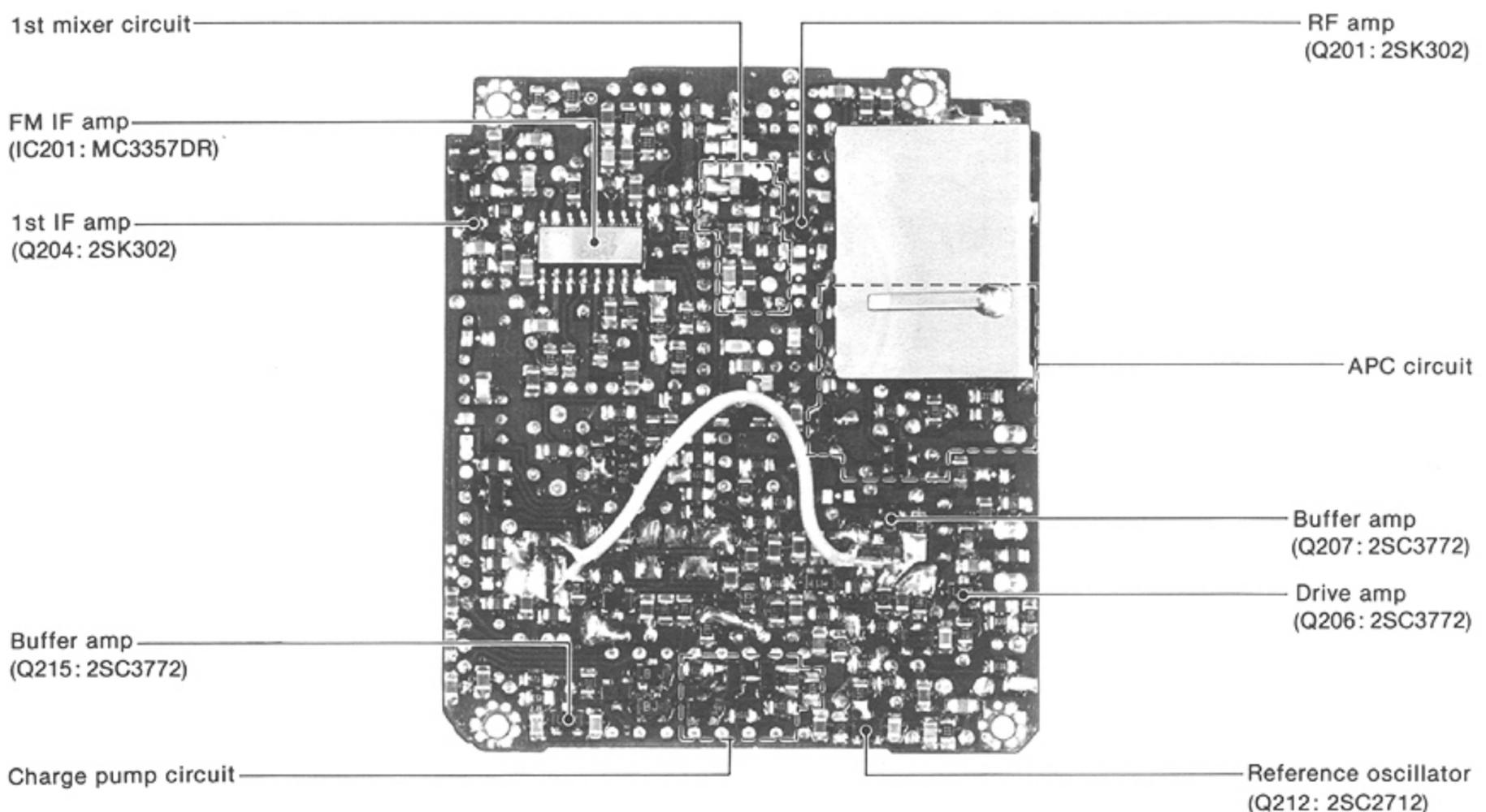


• RF UNIT

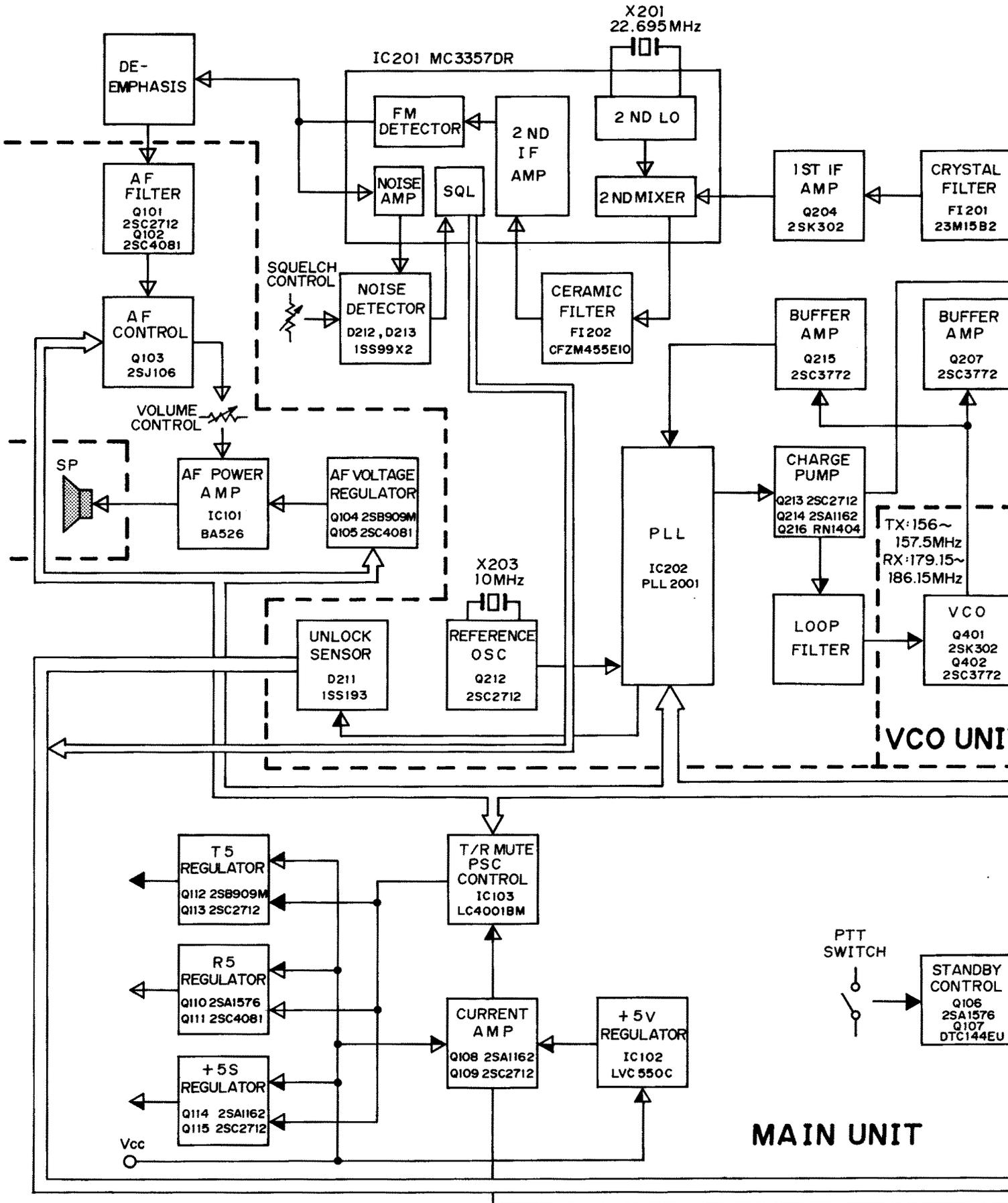
COMPONENTS SIDE



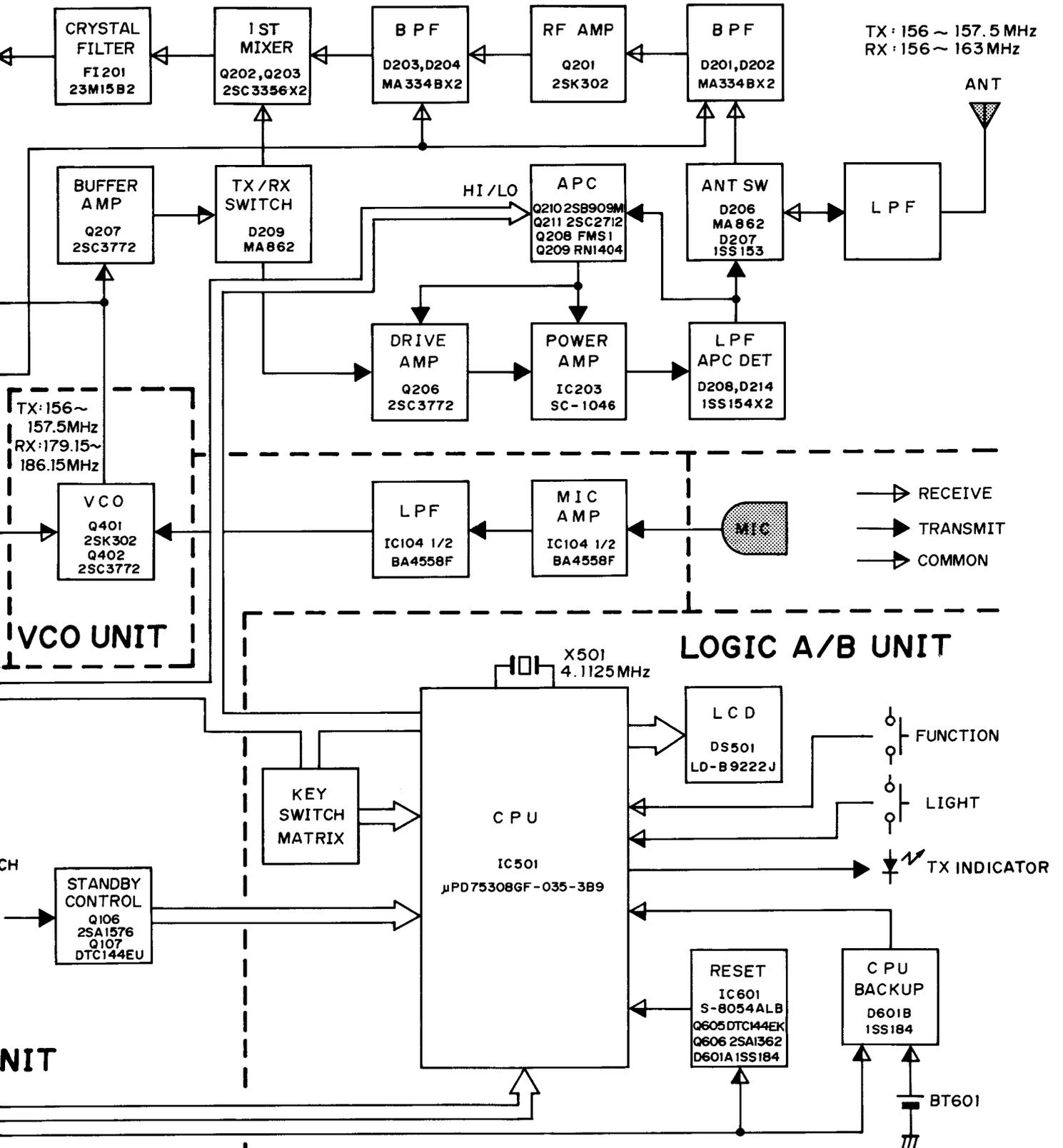
FOIL SIDE



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 -6dB/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.

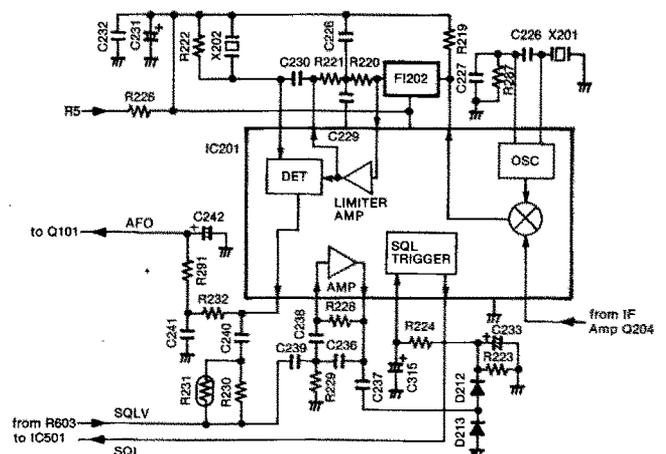
4-1-7 SQUELCH CIRCUIT (RF UNIT)

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.

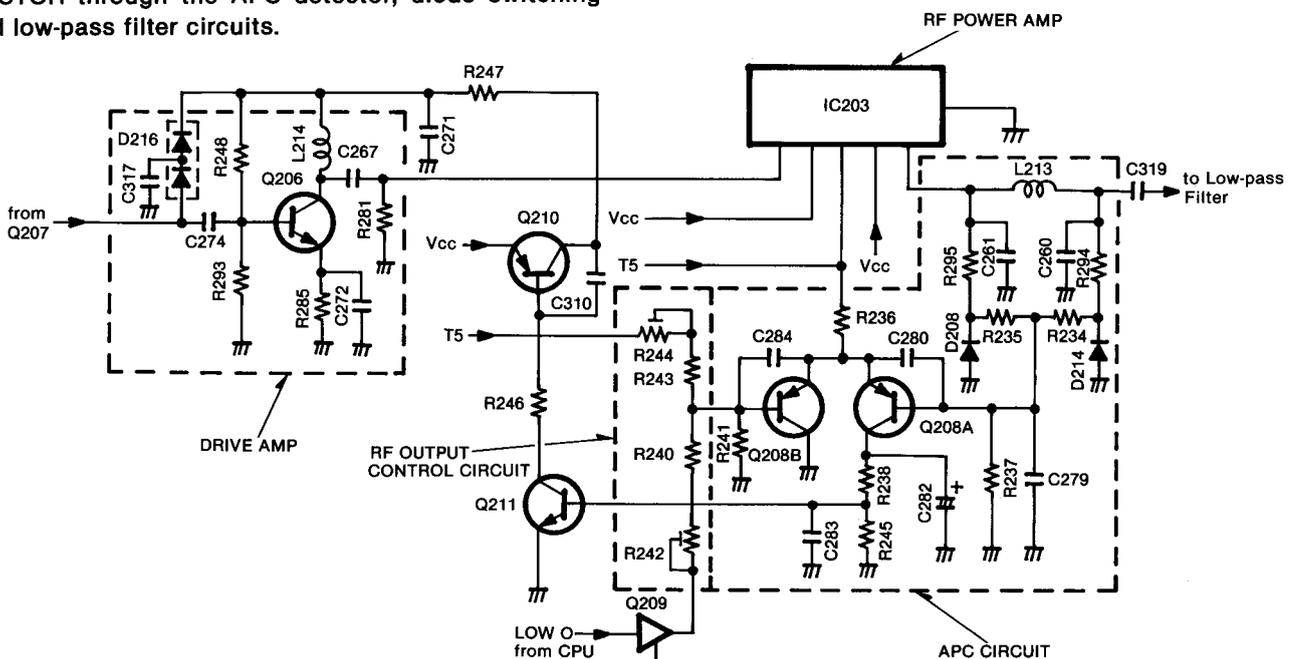


Fig. 2

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

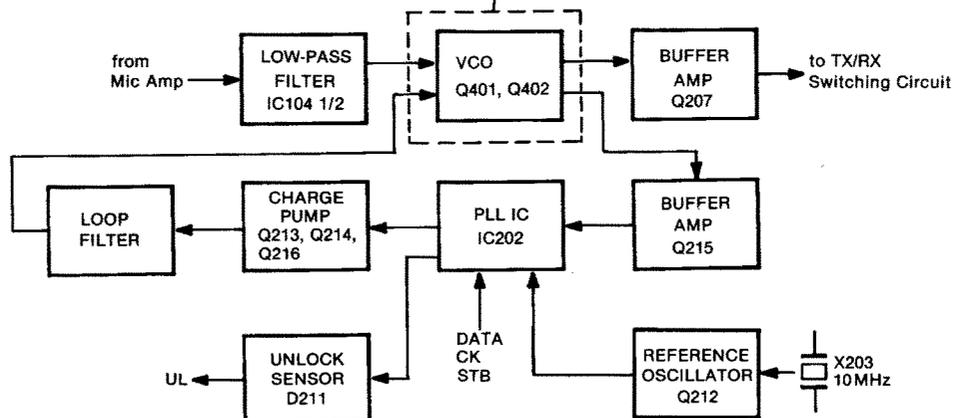
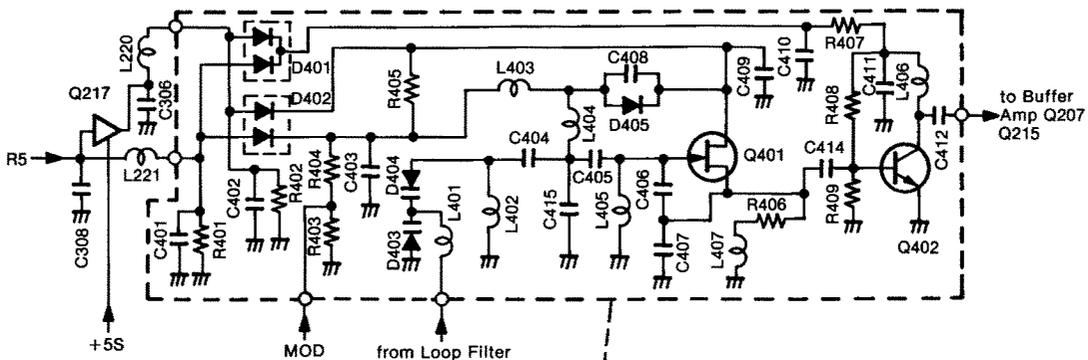


Fig. 3

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

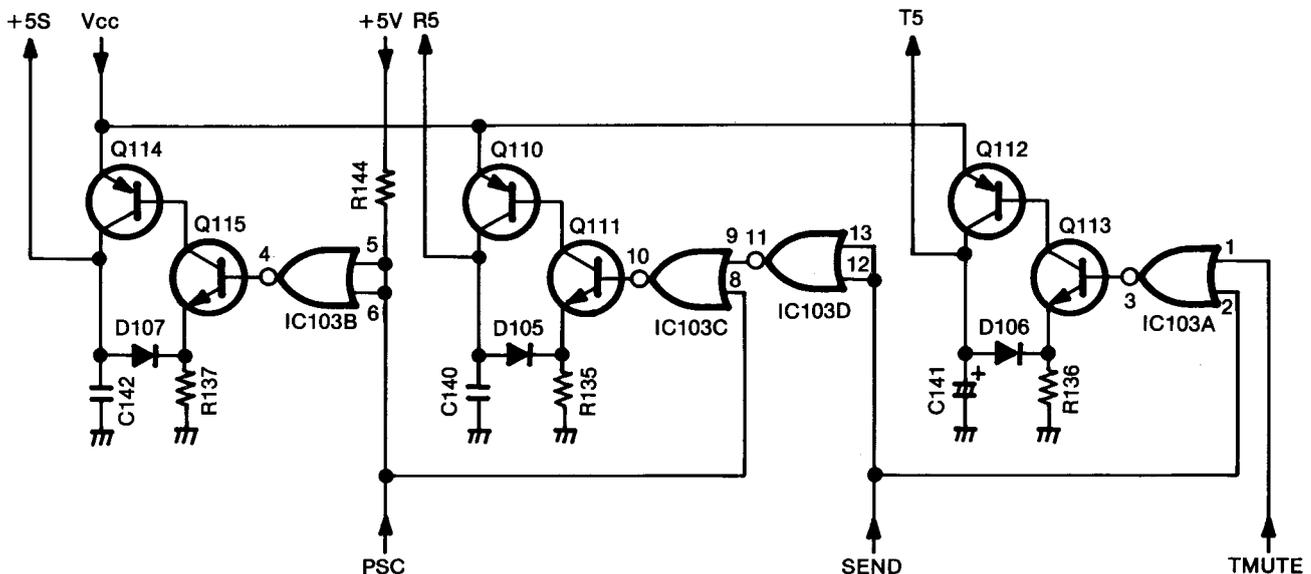


Fig. 4

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

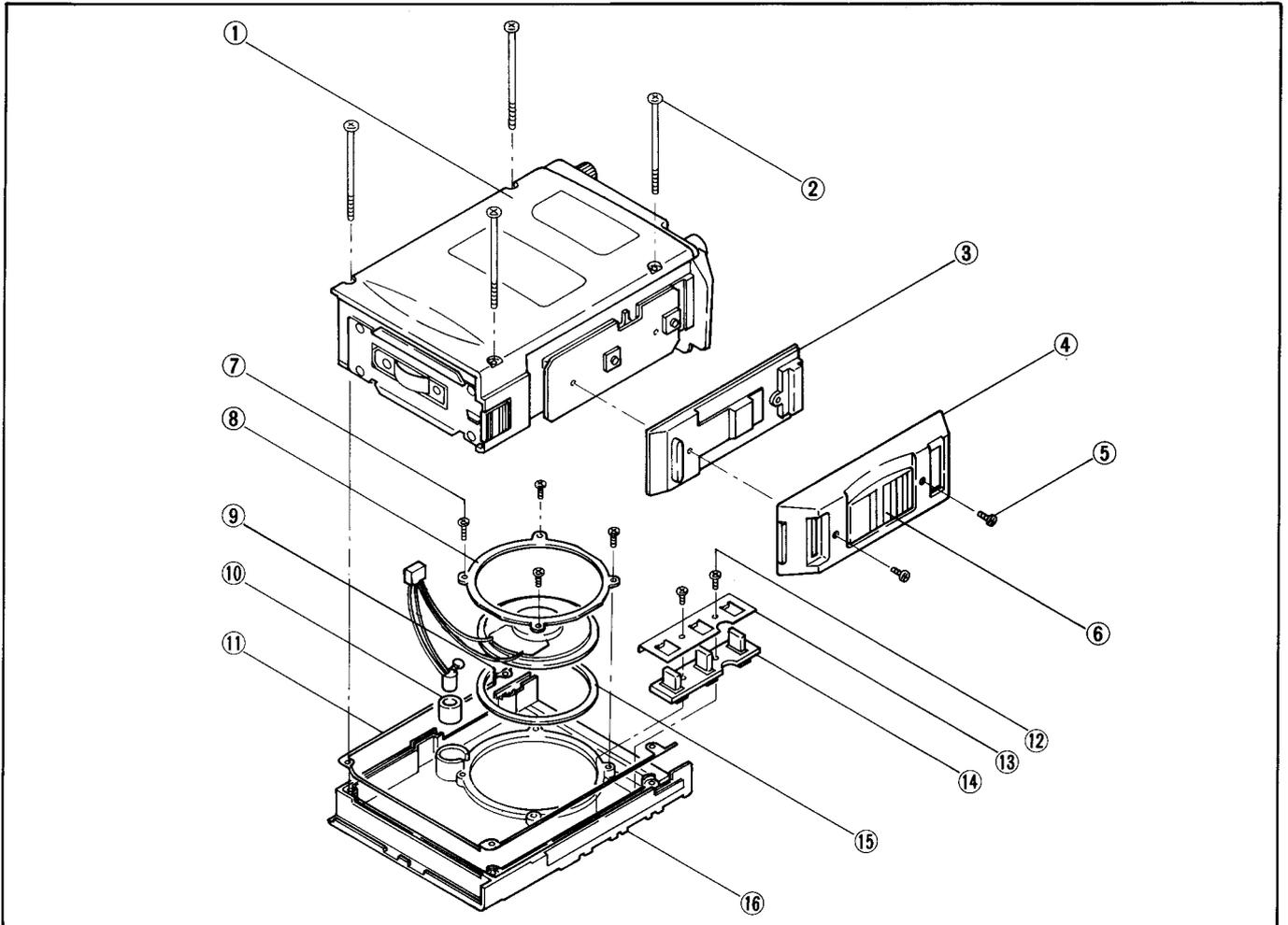
| PIN | PORT | NAME | DESCRIPTION |
|--------|----------|----------------|---|
| 1~11 | S12~S22 | | Ports for the LCD. |
| 29 | P40 | RMUTE | Port for AF control. When SQL port is "LOW," the AF signal is muted. |
| 30 | P41 | TMUTE | Port for T5 control. This port becomes "LOW" 80msec. after the PTT 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

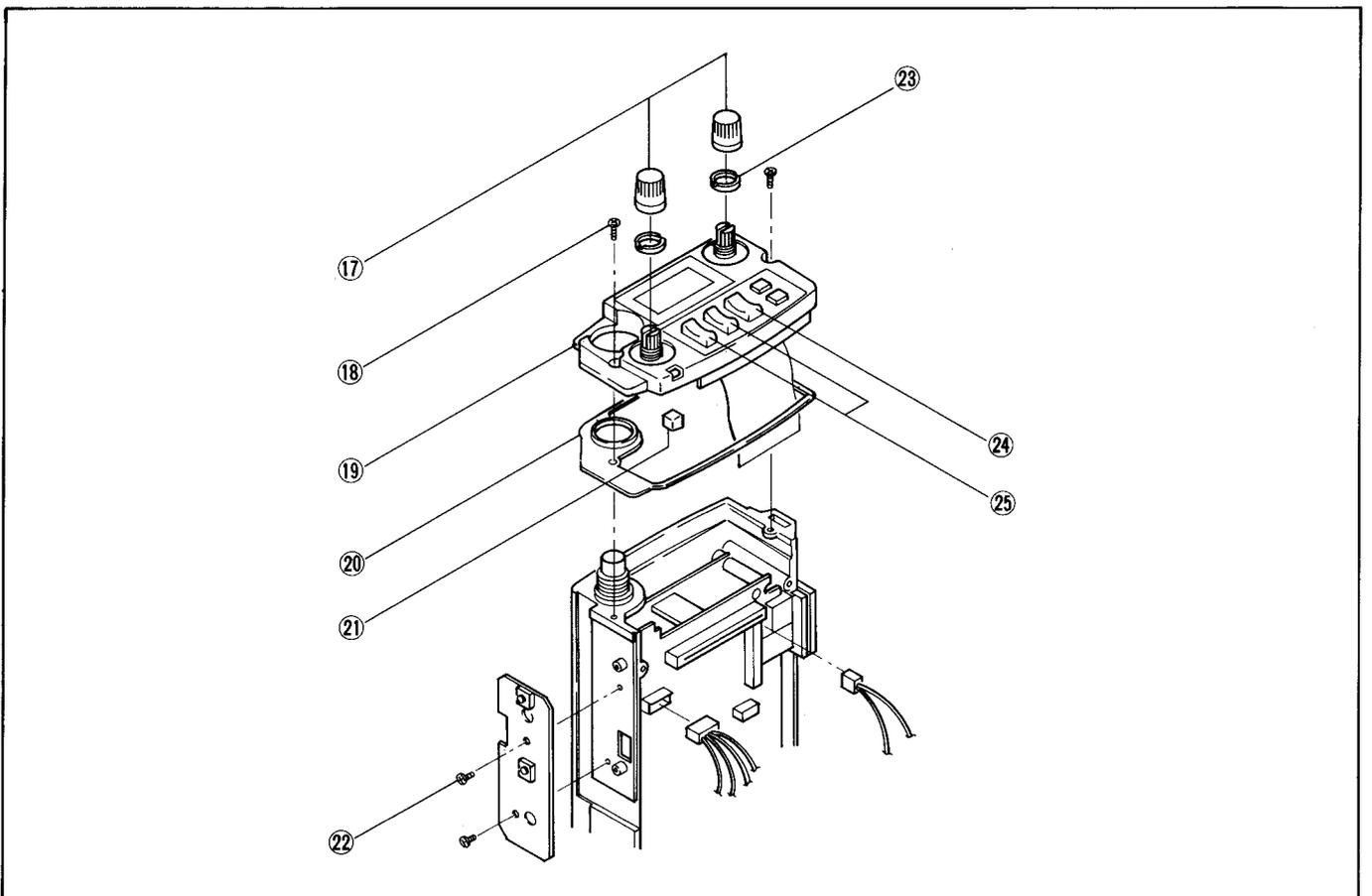
| LABELLED NUMBER | DESCRIPTION | ORDERING NUMBER | QTY. |
|-----------------|---|-----------------|------|
| ① | Rear panel (A) | 8010006970 | 1 |
| ② | PH B0 2×31.5 ZK | 8810004000 | 1 |
| ③ | PTT switch cover | 8930011950 | 1 |
| ④ | PTT holder (A) | 8930012000 | 1 |
| ⑤ | No. 0-1 PH M2×5 ZK | 8810000530 | 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

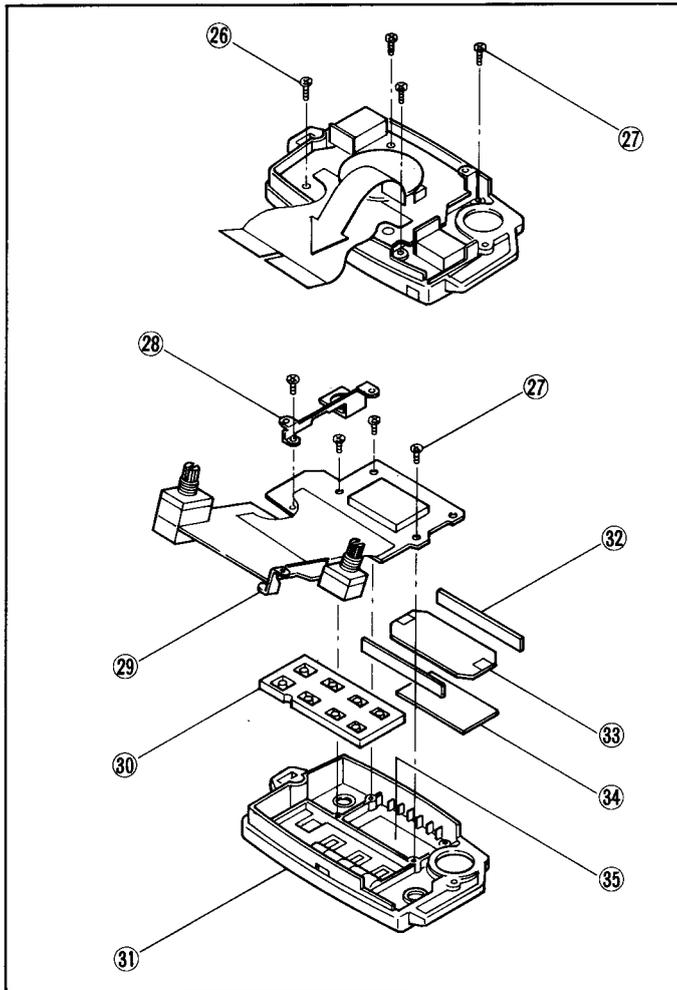
• CASE AND FRONT PANELS



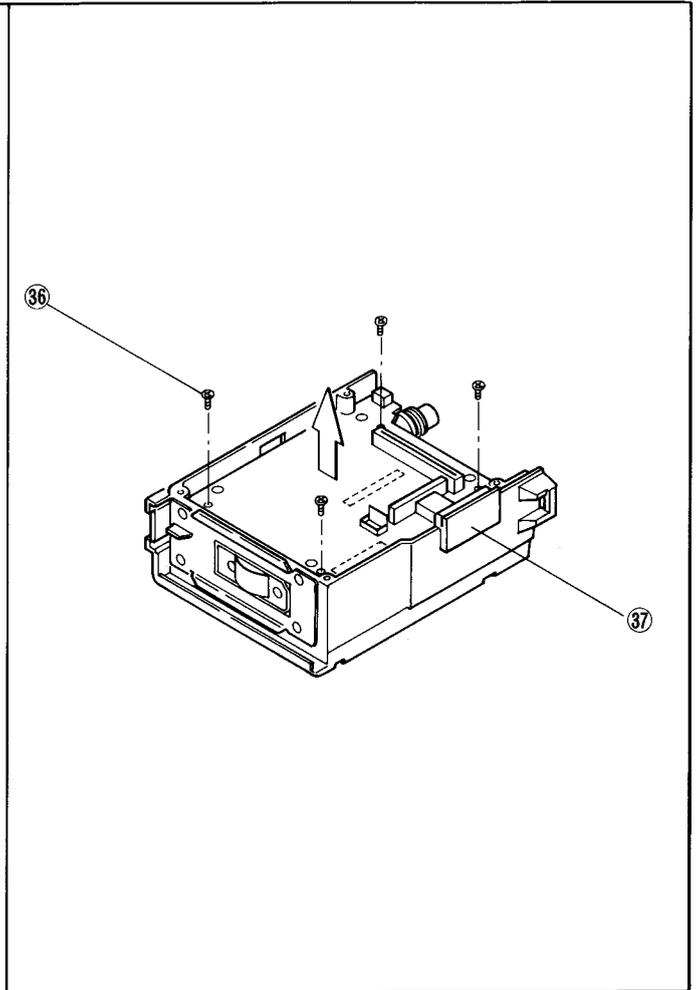
• TOP PANEL



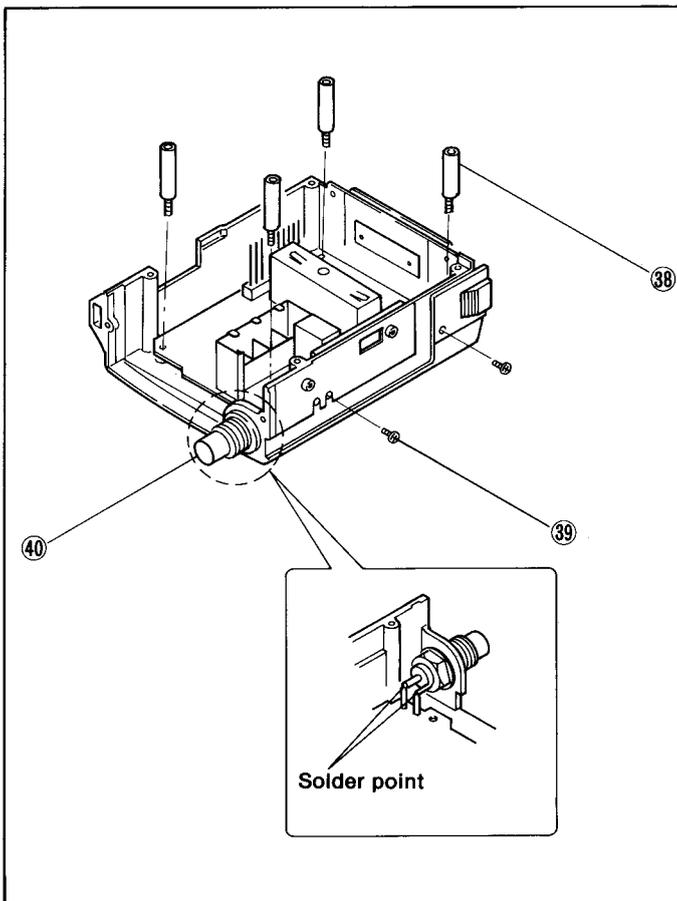
• LOGIC-A AND LOGIC-B UNITS



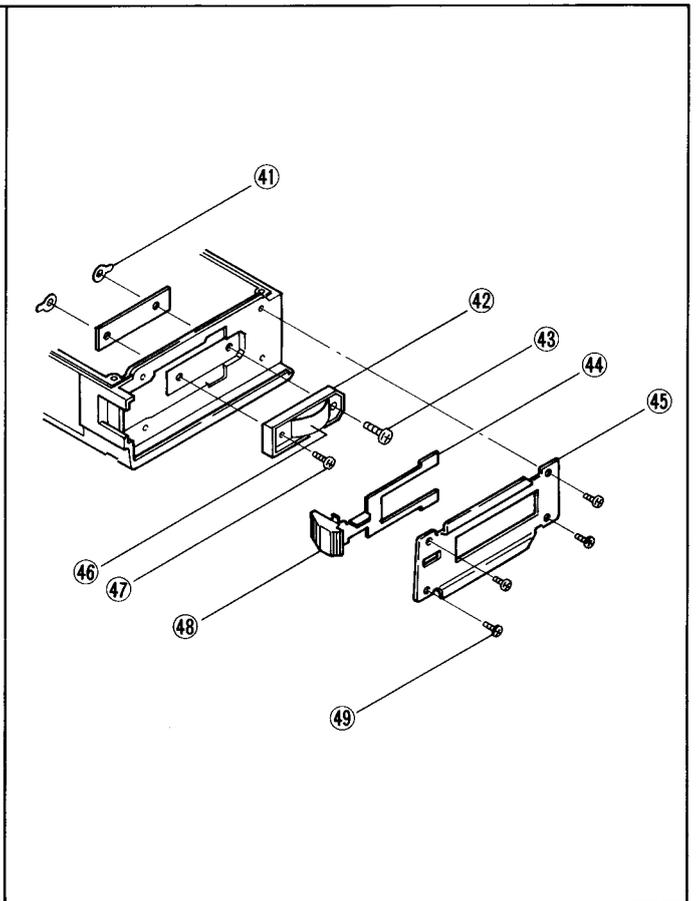
• MAIN UNIT



• RF UNIT



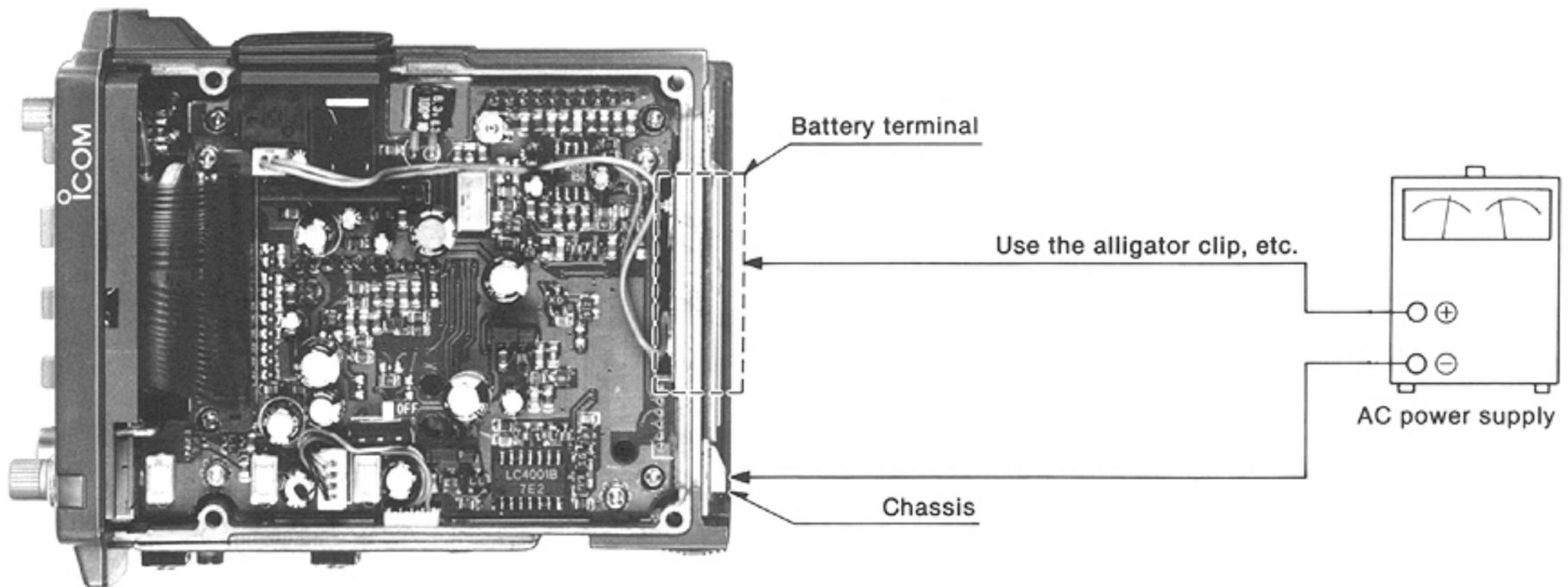
• CONTACT HOLDER



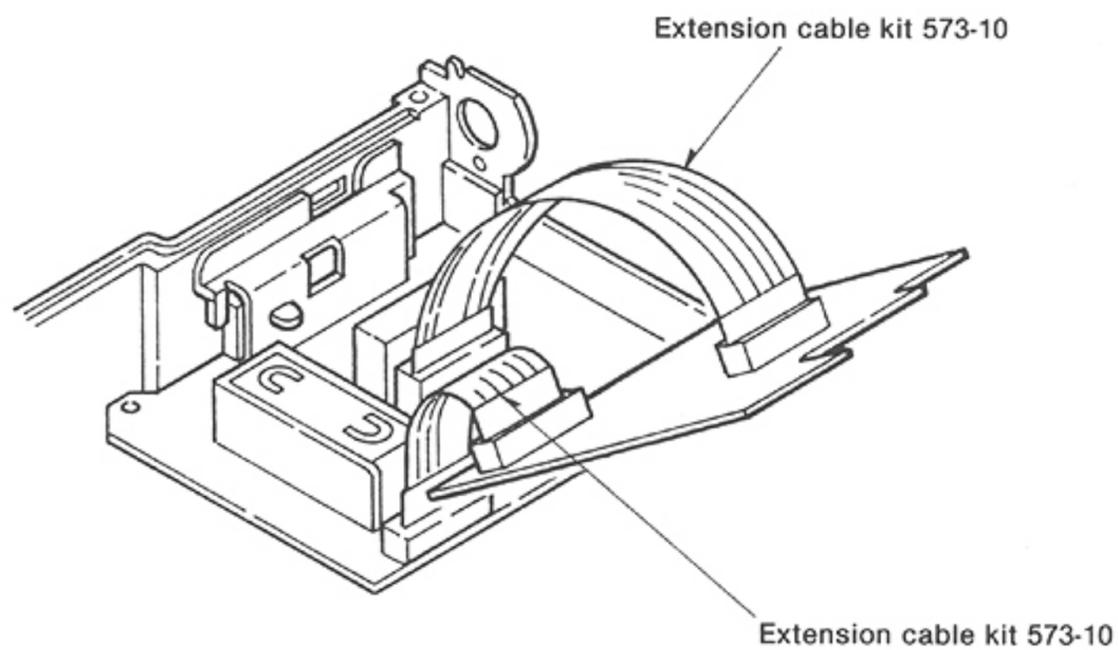
SECTION 6 ADJUSTMENT PROCEDURES

6-1 BEFORE ADJUSTMENT

■ POWER SUPPLY CONNECTION



■ RF AND MAIN UNITS SEPARATION

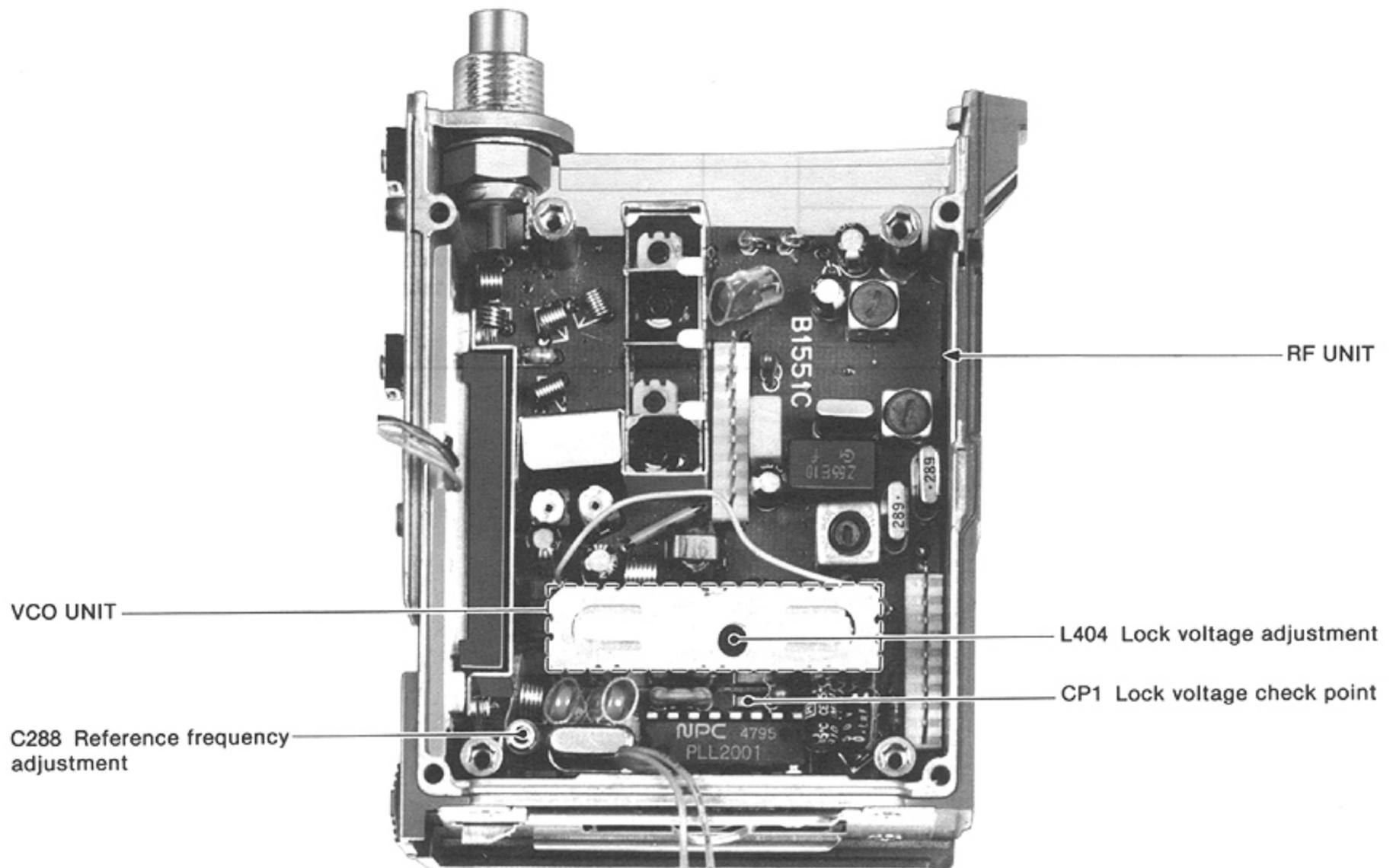


Order the extension cable kit from an authorized Icom Dealer.

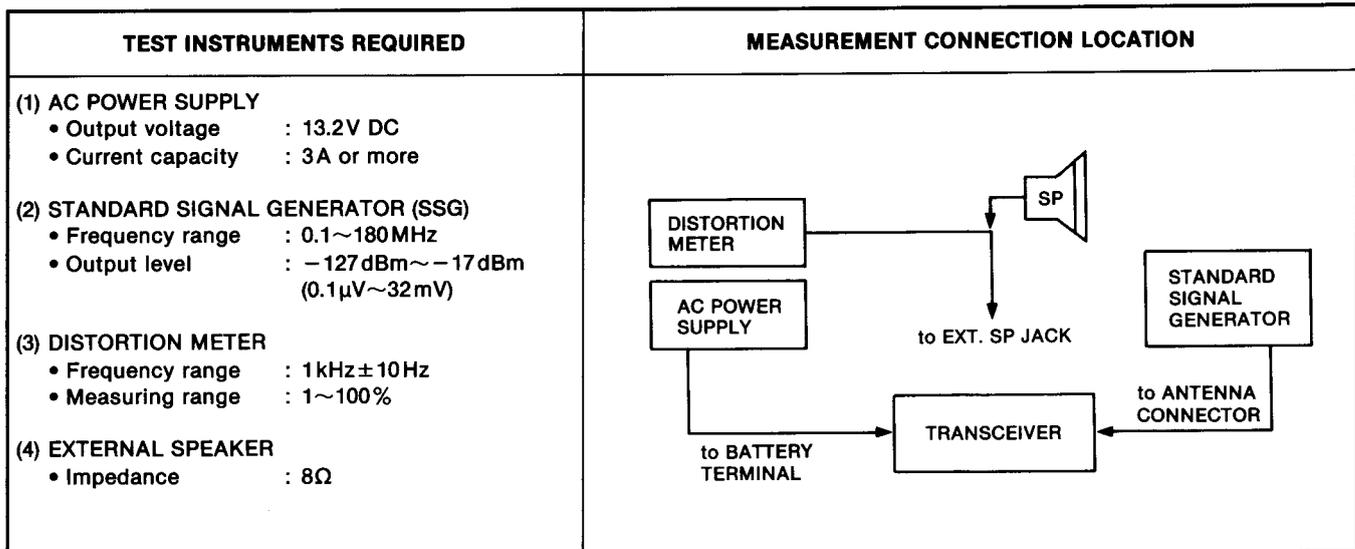
6-2 PLL ADJUSTMENT

| 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 : ± 1 ppm or better • Sensitivity : 100mV or better (3) DC VOLTMETER • Input impedance : 50k Ω /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



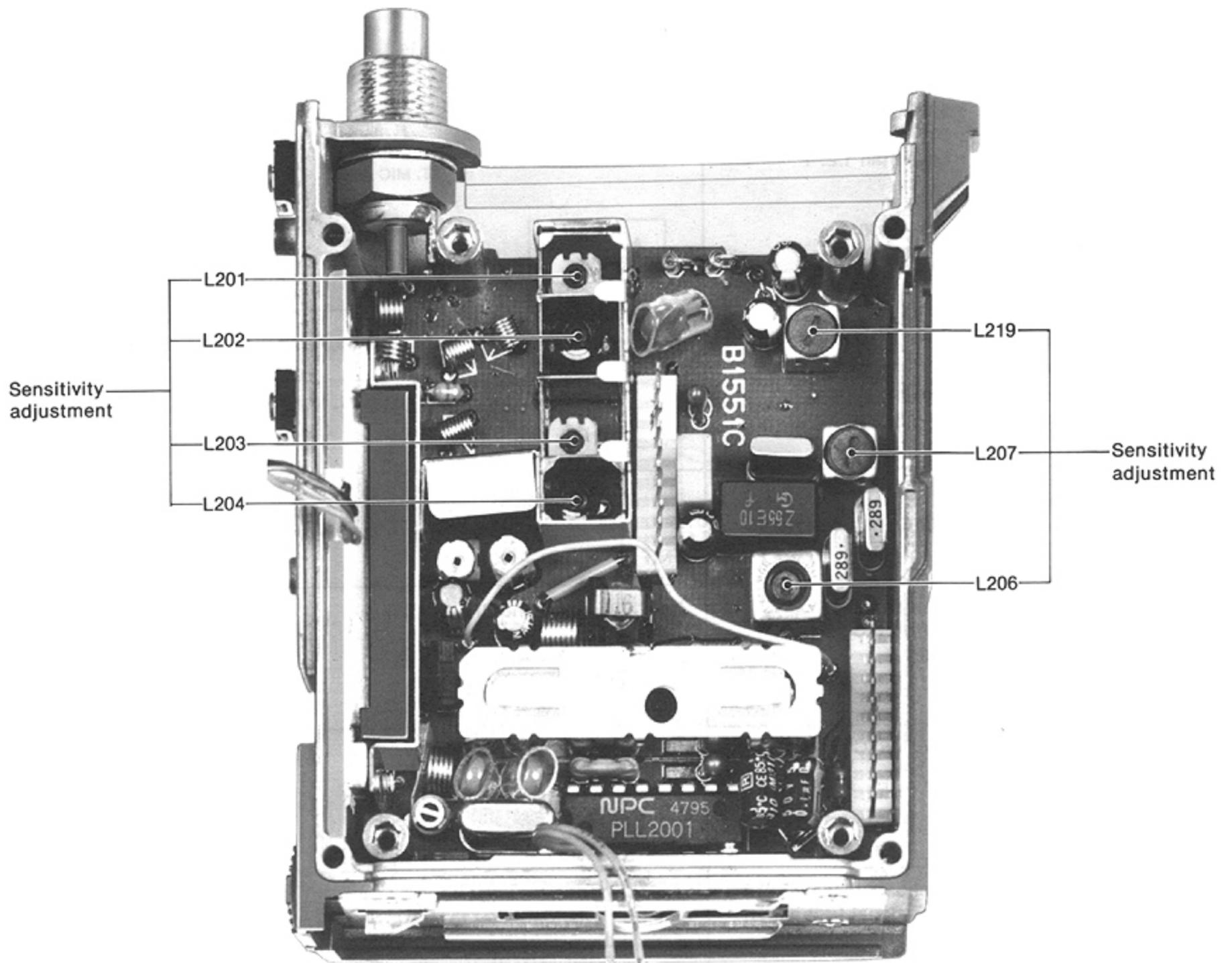
6-3 RECEIVER ADJUSTMENT



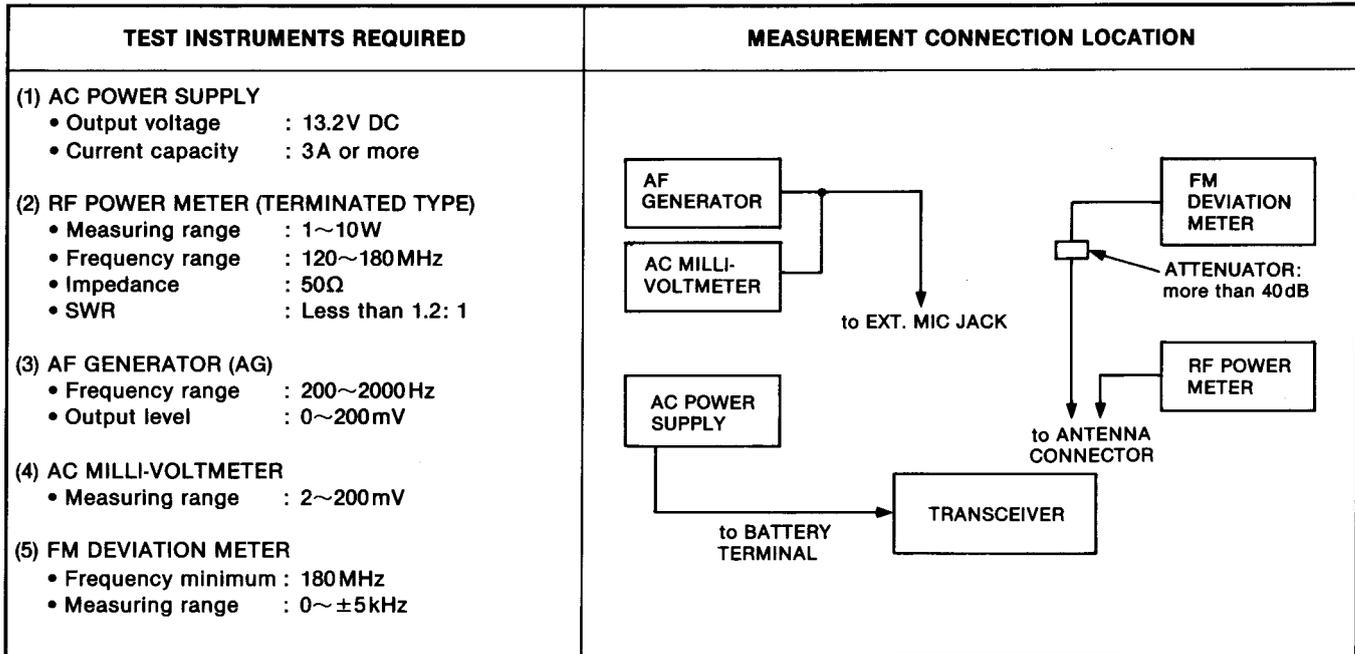
| ADJUSTMENT | ADJUSTMENT CONDITIONS | MEASUREMENT | | VALUE | ADJUSTMENT POINT | | |
|--------------|--|---|------------|---|--|--------|--|
| | | UNIT | LOCATION | | UNIT | ADJUST | |
| SENSI-TIVITY | <p>NOTE: When the sensitivity is less than 0.35μV (12dB SINAD) on every channel, the following sensitivity 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"> • Operating Channel: 16 • Receiving • Apply an RF signal to the ANTENNA CONNECTOR. Frequency: 156.800 MHz Level : -116dBm (0.35μV) Mod. : 1kHz Dev. : ±3.5kHz • SQUELCH CONTROL: Max. CCW. | Side panel | Connect the distortion meter with an 8Ω load to the EXT. SP JACK. | Minimum distortion level | RF | L201 L202 L203 L204 L206 L207 L219 |
| | 2 | <ul style="list-style-type: none"> • Adjust SSG output level so that SINAD level becomes 12dB. | | | Applied RF signal level is less than -116dBm (0.35μV). | | Verify |

CCW: Counterclockwise

RF UNIT

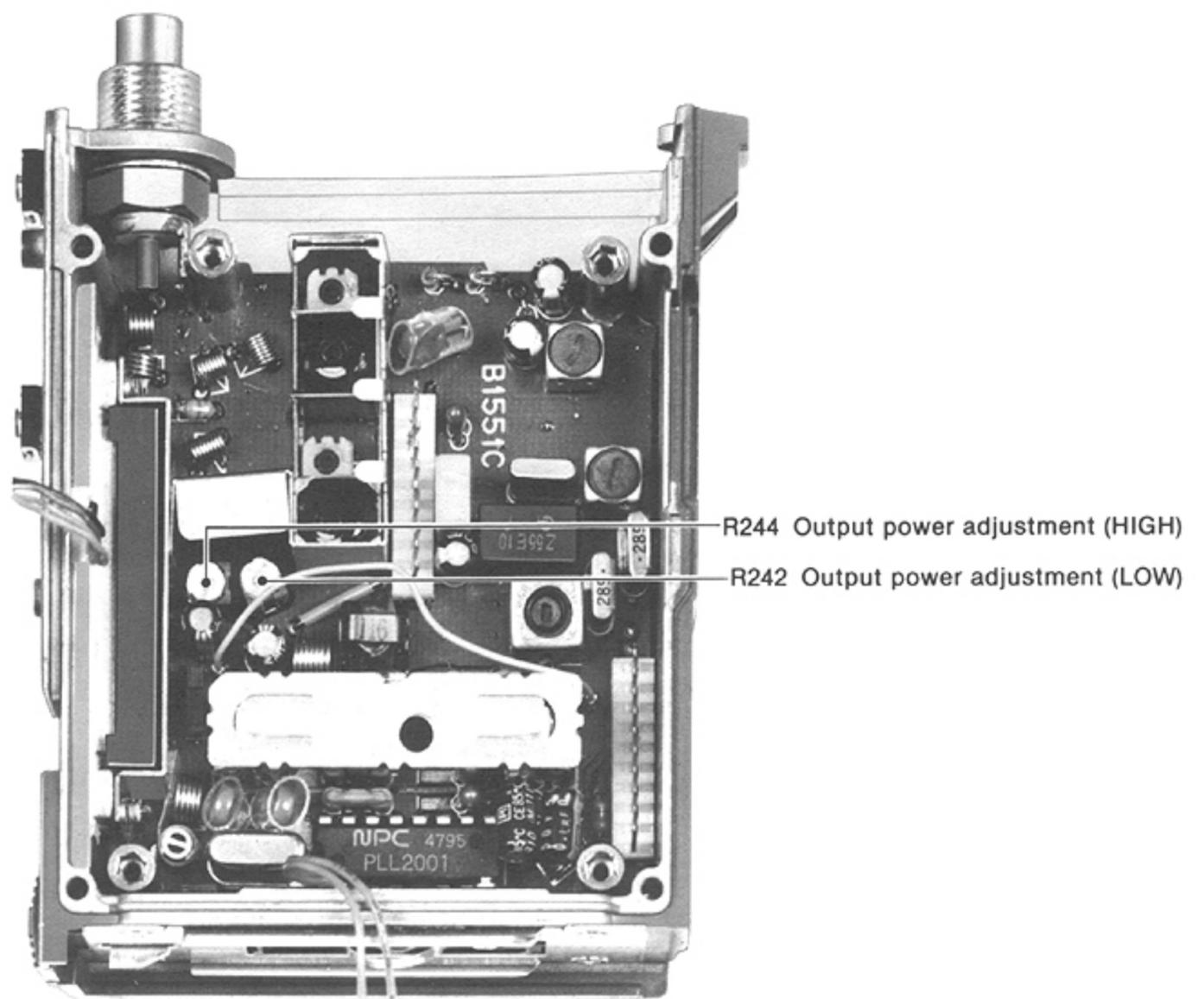


6-4 TRANSMITTER ADJUSTMENT

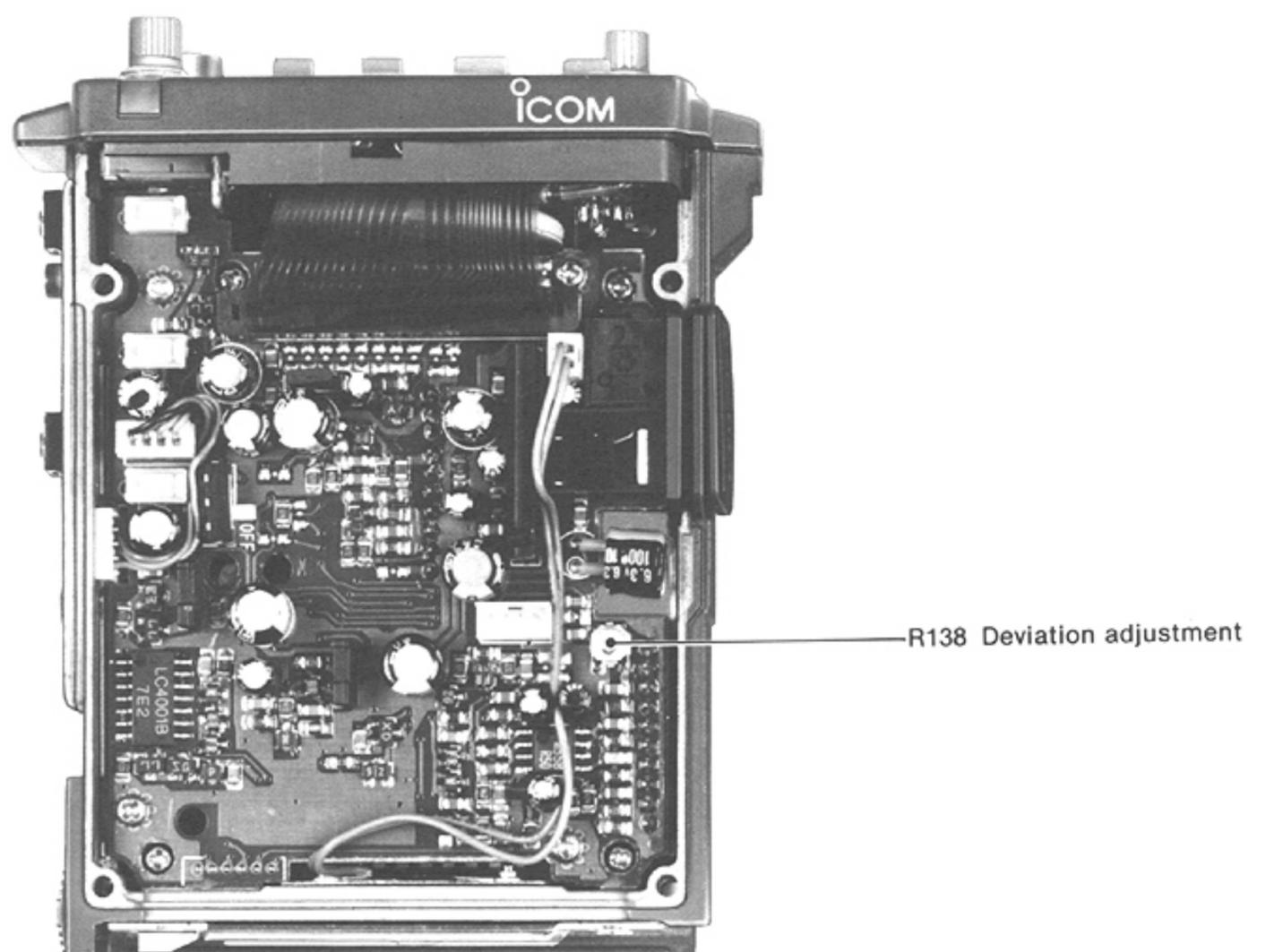


| ADJUSTMENT | ADJUSTMENT CONDITIONS | MEASUREMENT | | VALUE | ADJUSTMENT POINT | |
|--------------|-----------------------|-------------|--|-------------|------------------|--------|
| | | UNIT | LOCATION | | UNIT | ADJUST |
| OUTPUT POWER | 1 | Top panel | Connect the RF power meter to the ANTENNA 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

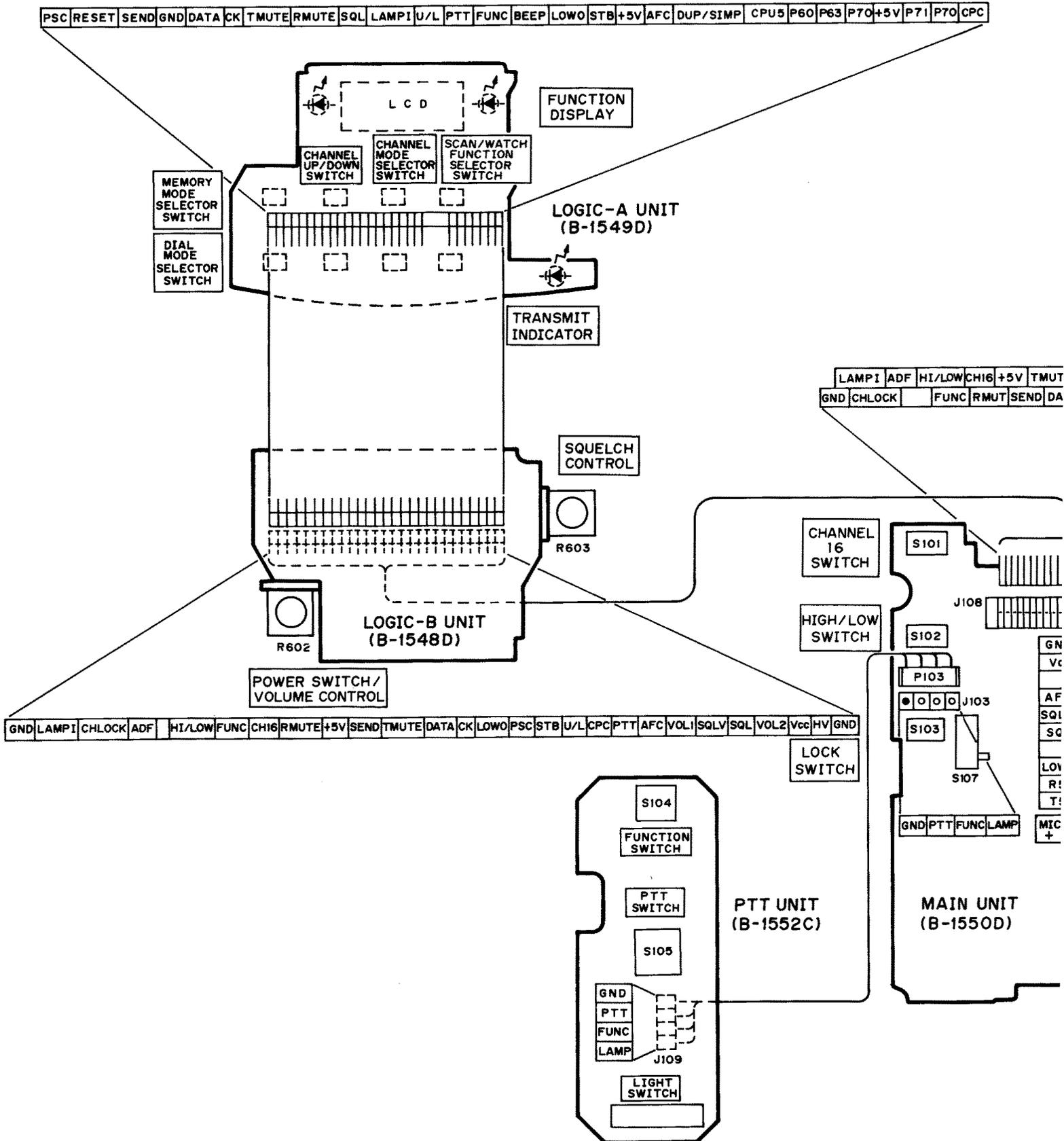


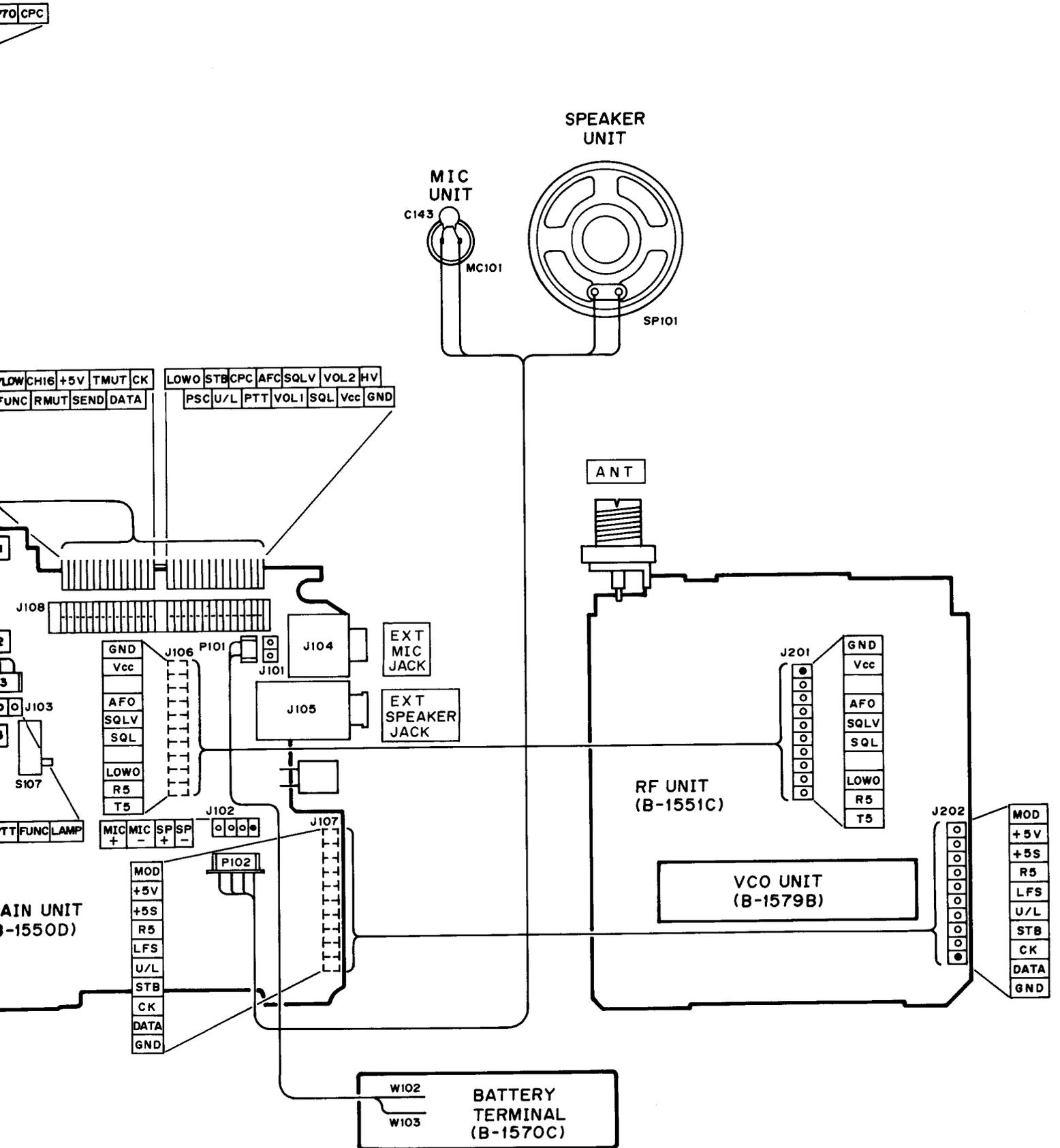
MAIN UNIT



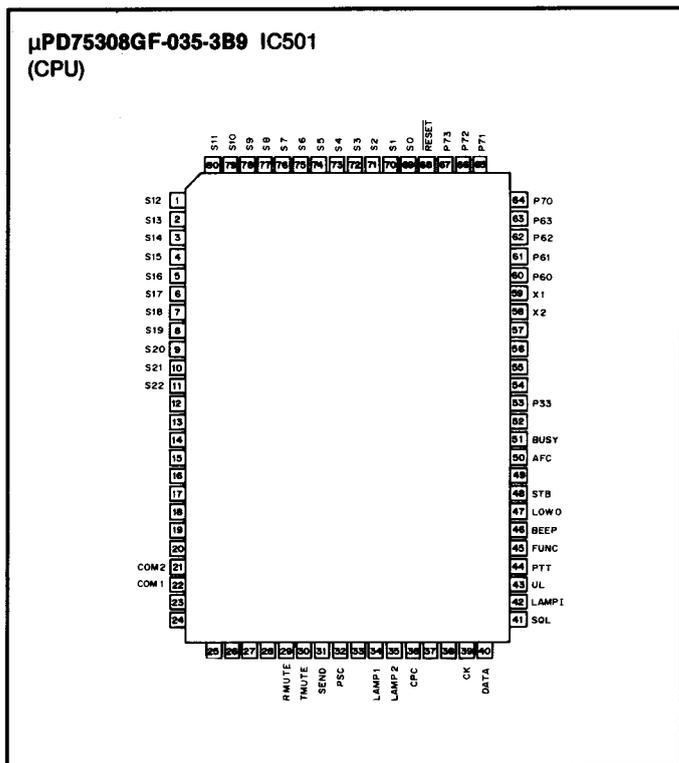
SECTION 7 BOARD LAYOUTS

7-1 INTERCONNECTIONS



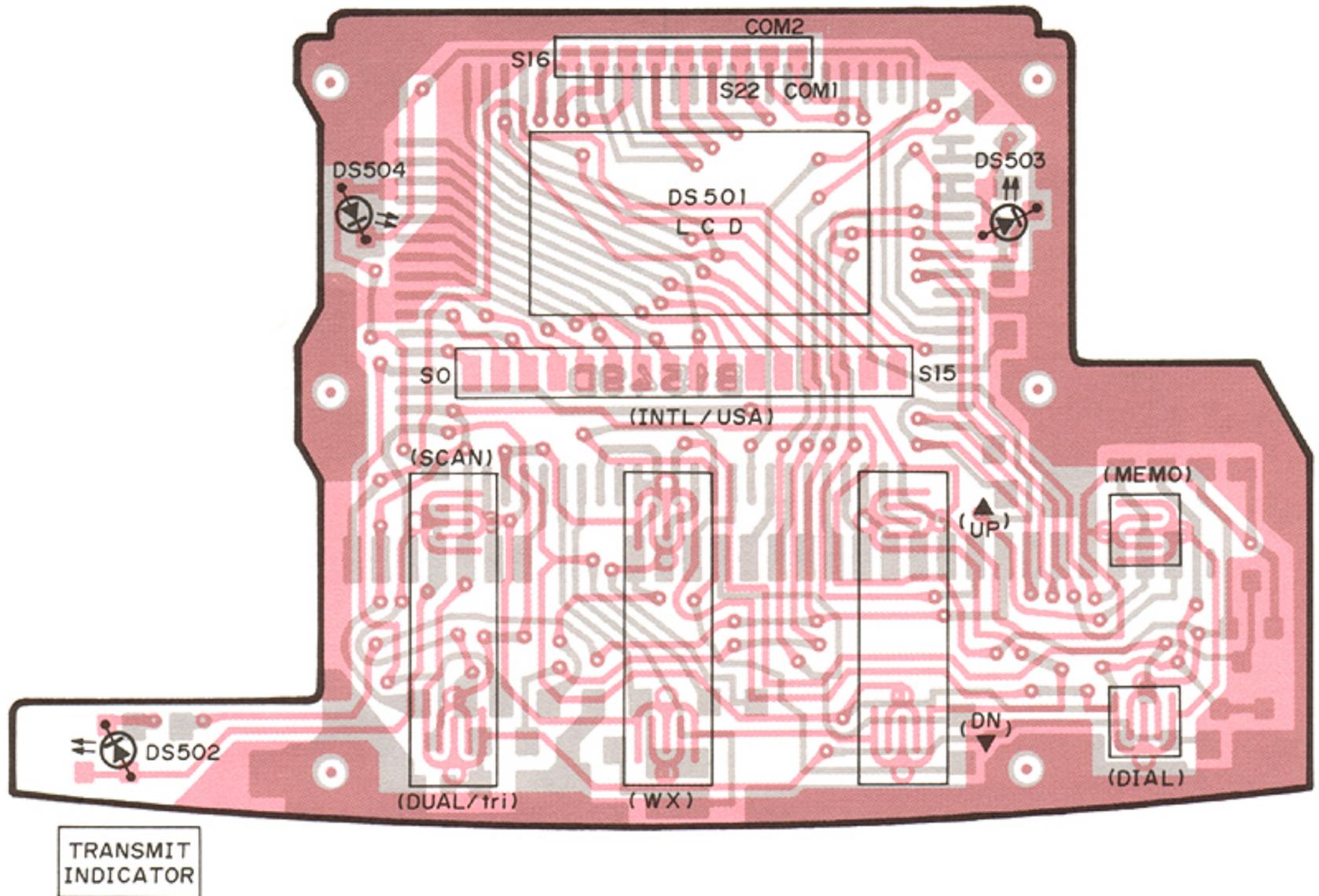


7-2 LOGIC A UNIT

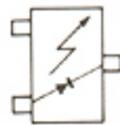


• LOGIC A UNIT

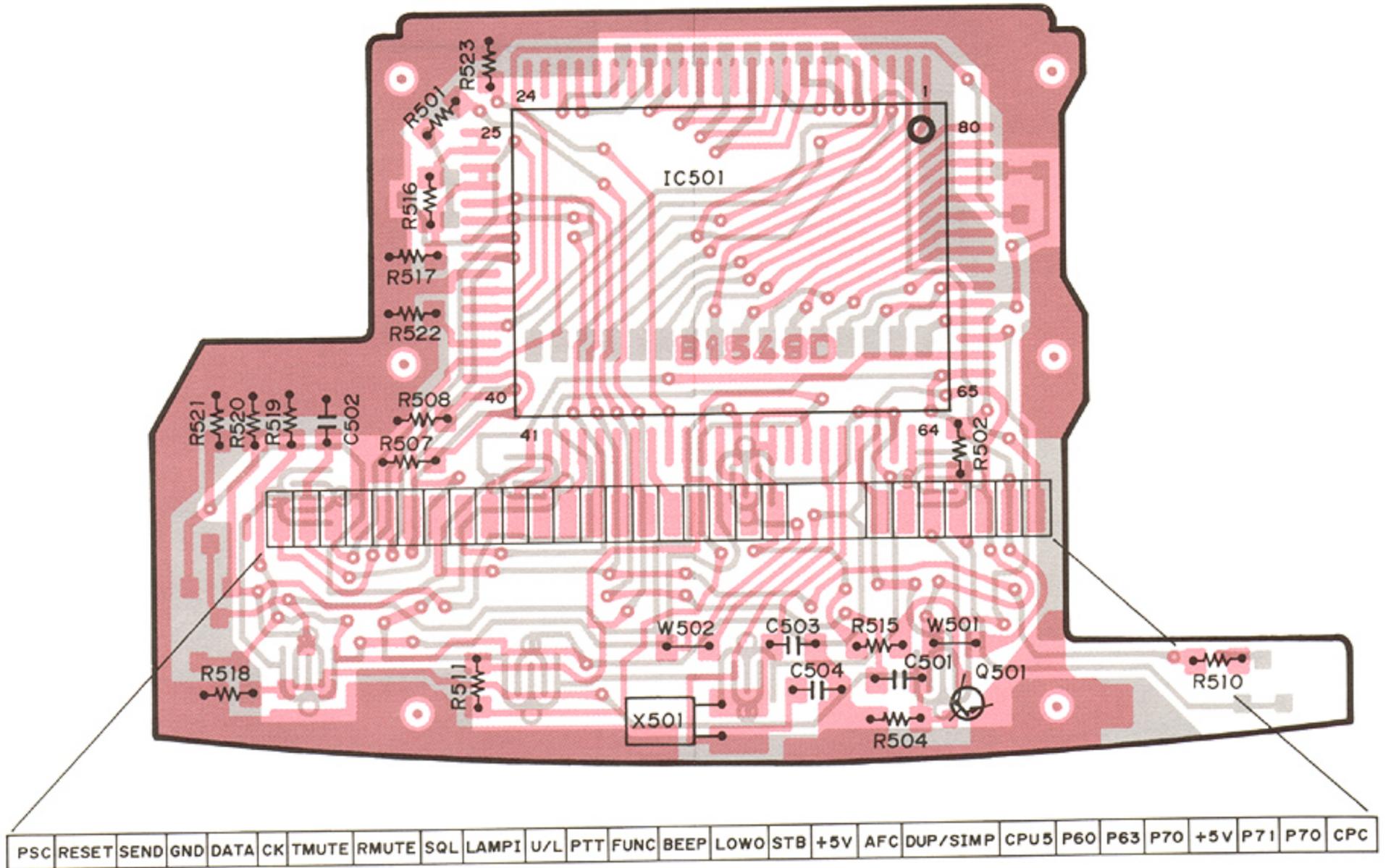
COMPONENTS SIDE



SLM-13MW
 DS502, DS503
 DS504

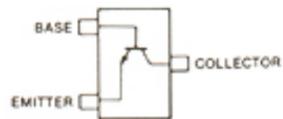


FOIL SIDE



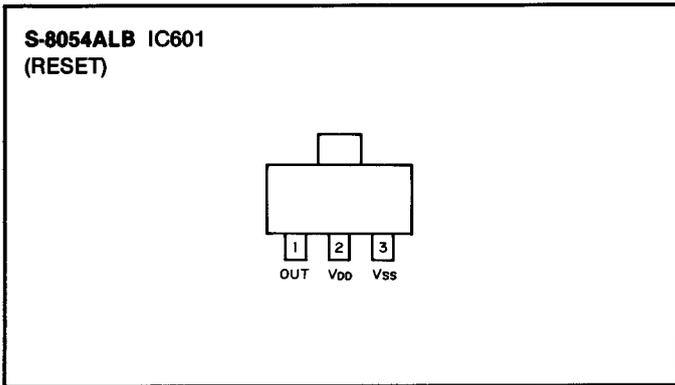
to LOGIC-B UNIT

2SC4081 R
Q501



Symbol: BR

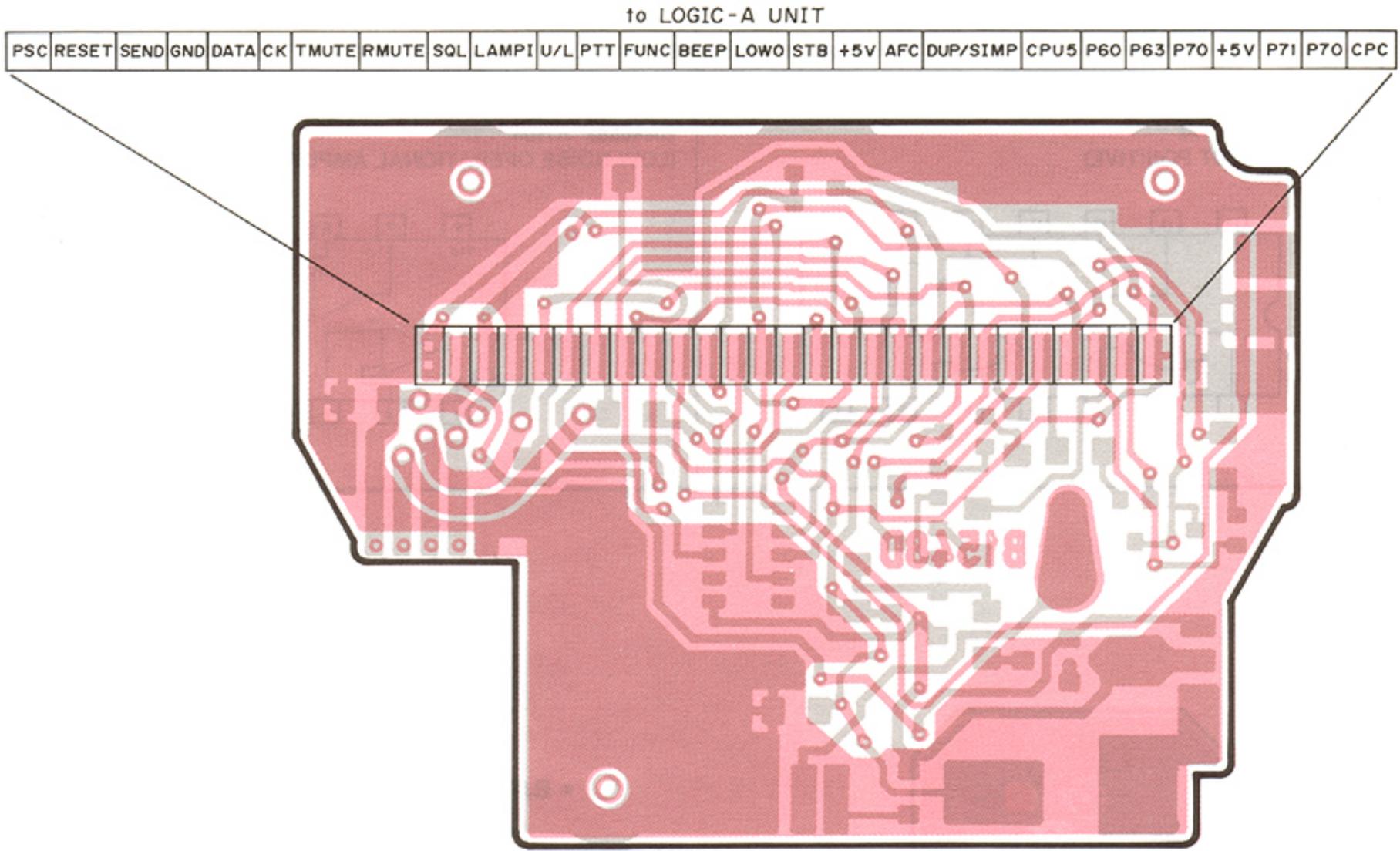
7-3 LOGIC B UNIT



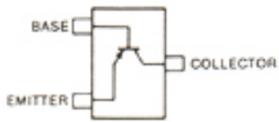
• LOGIC B UNIT

COMPONENTS SIDE

FOIL SIDE

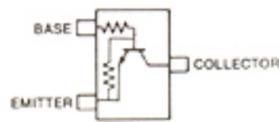


2SA1576 R
Q601, Q602
Q603, Q604



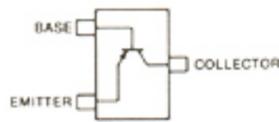
Symbol: FR

DTC144EK
Q605



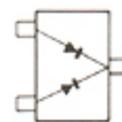
Symbol: 26

2SA1362 GR
Q606



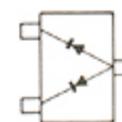
Symbol: AEG

1SS184
D601



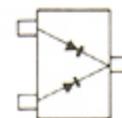
Symbol: B3

DAP202U
D602



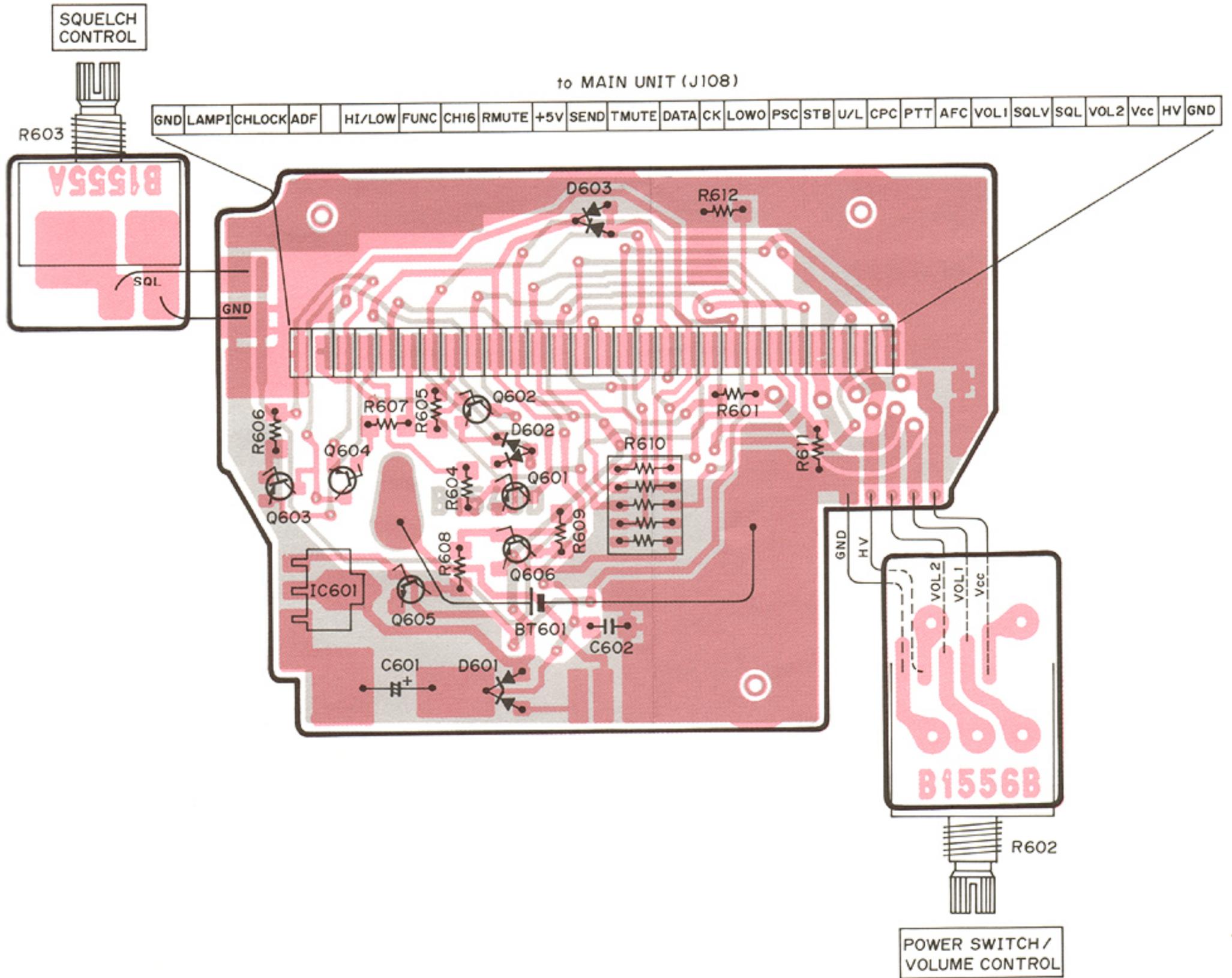
Symbol: P

DAN202U
D603

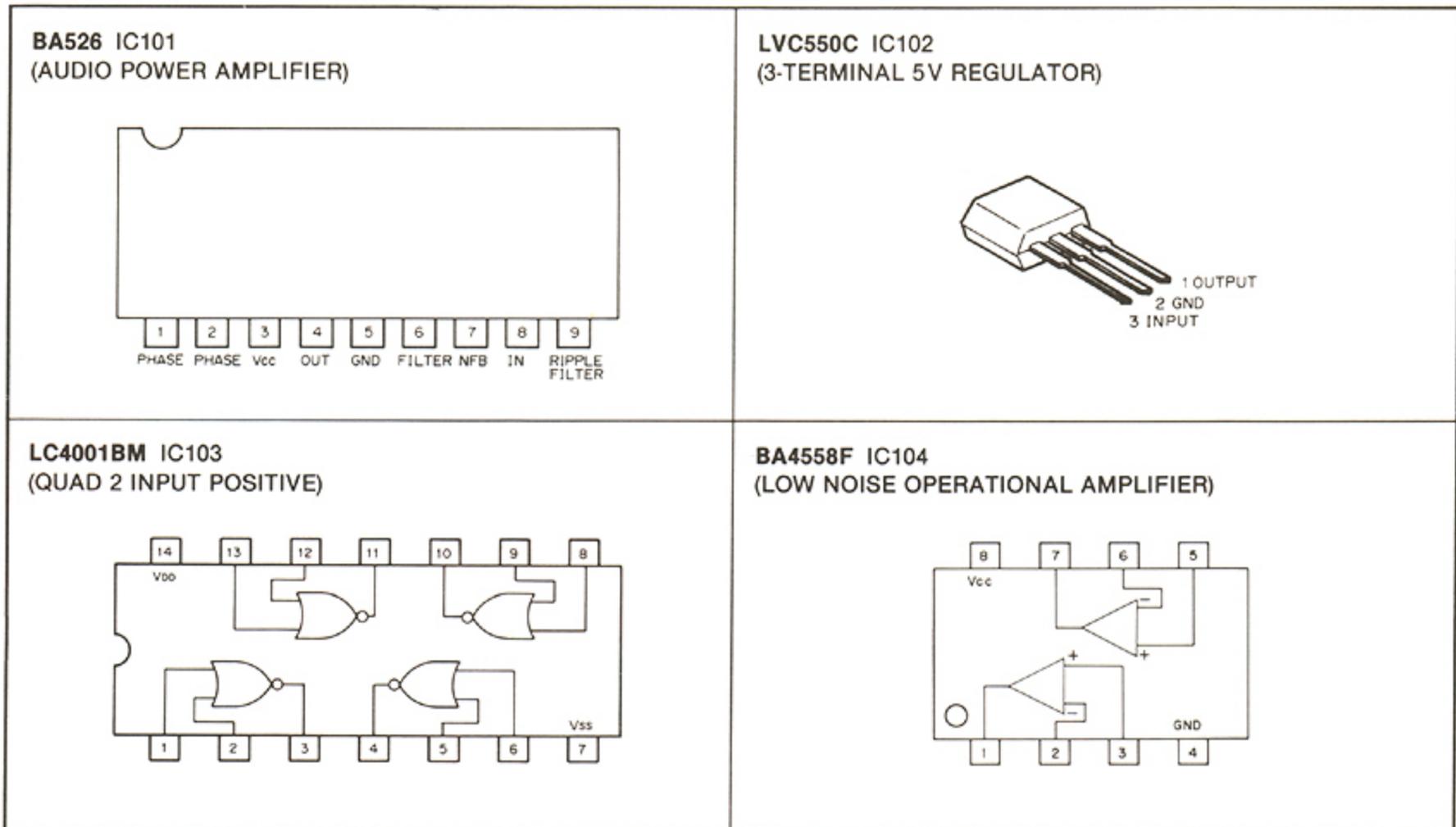


Symbol: N

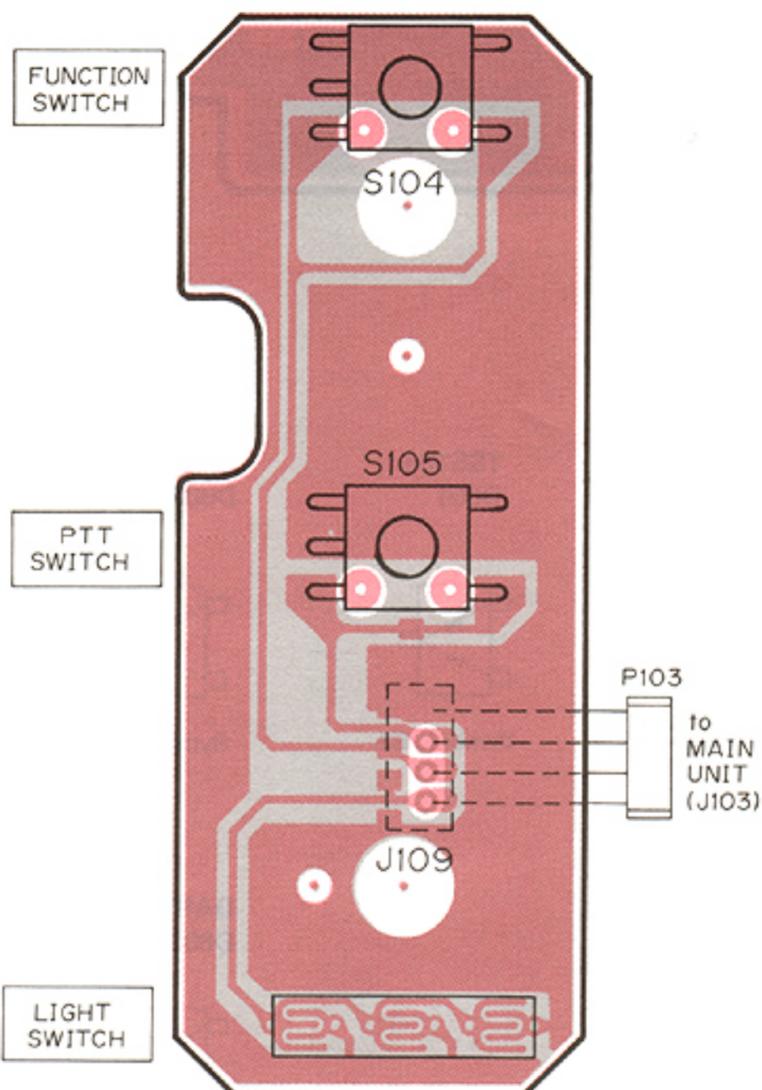
FOIL SIDE



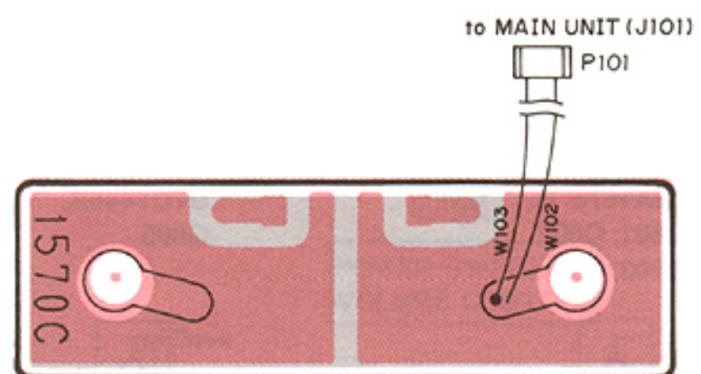
7-4 MAIN UNIT



• PTT UNIT

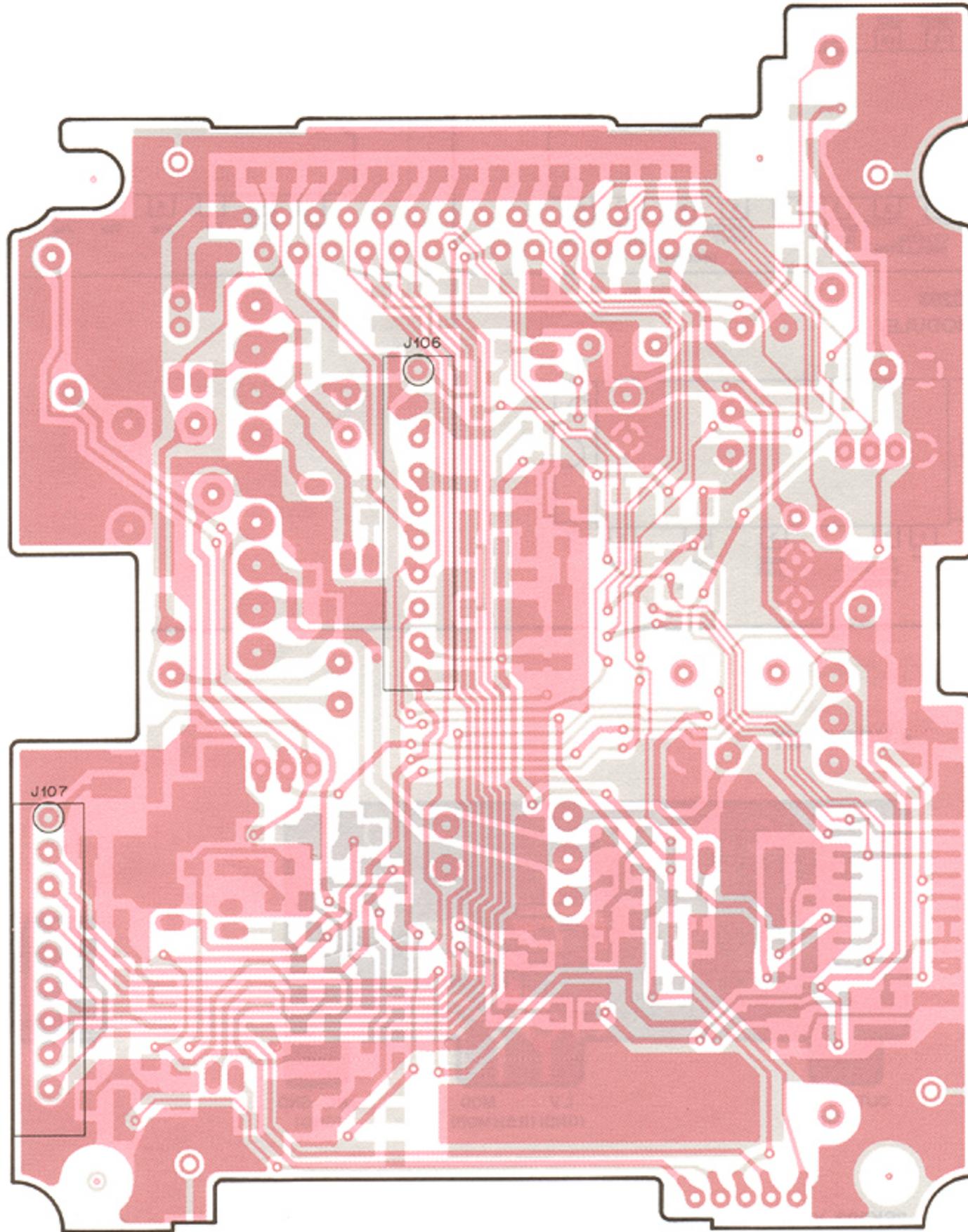


• BATTERY TERMINAL



• MAIN UNIT

FOIL SIDE



TO RF UNIT (J201)

TO RF UNIT (J202)

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

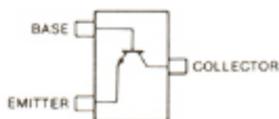
- J107
- MOD
- +5V
- +5S
- R5
- LFS
- U/L
- STB
- CK
- DATA
- GND

2SC2712 BL
Q101, Q109
Q113, Q115



Symbol: LL

2SC4081 R
Q102, Q105
Q111



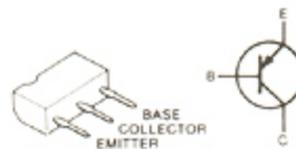
Symbol: BR

2SJ106 Y
Q103



Symbol: VY

2SB909M Q/R
Q104, Q112

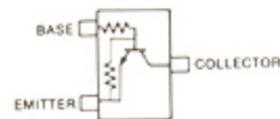


2SA1576 R
Q106, Q110
Q116



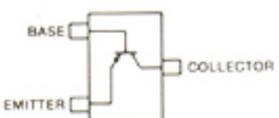
Symbol: FR

DTC144EU
Q107



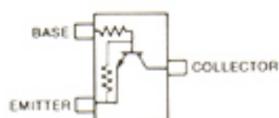
Symbol: 26

2SA1162 GR
Q108, Q114



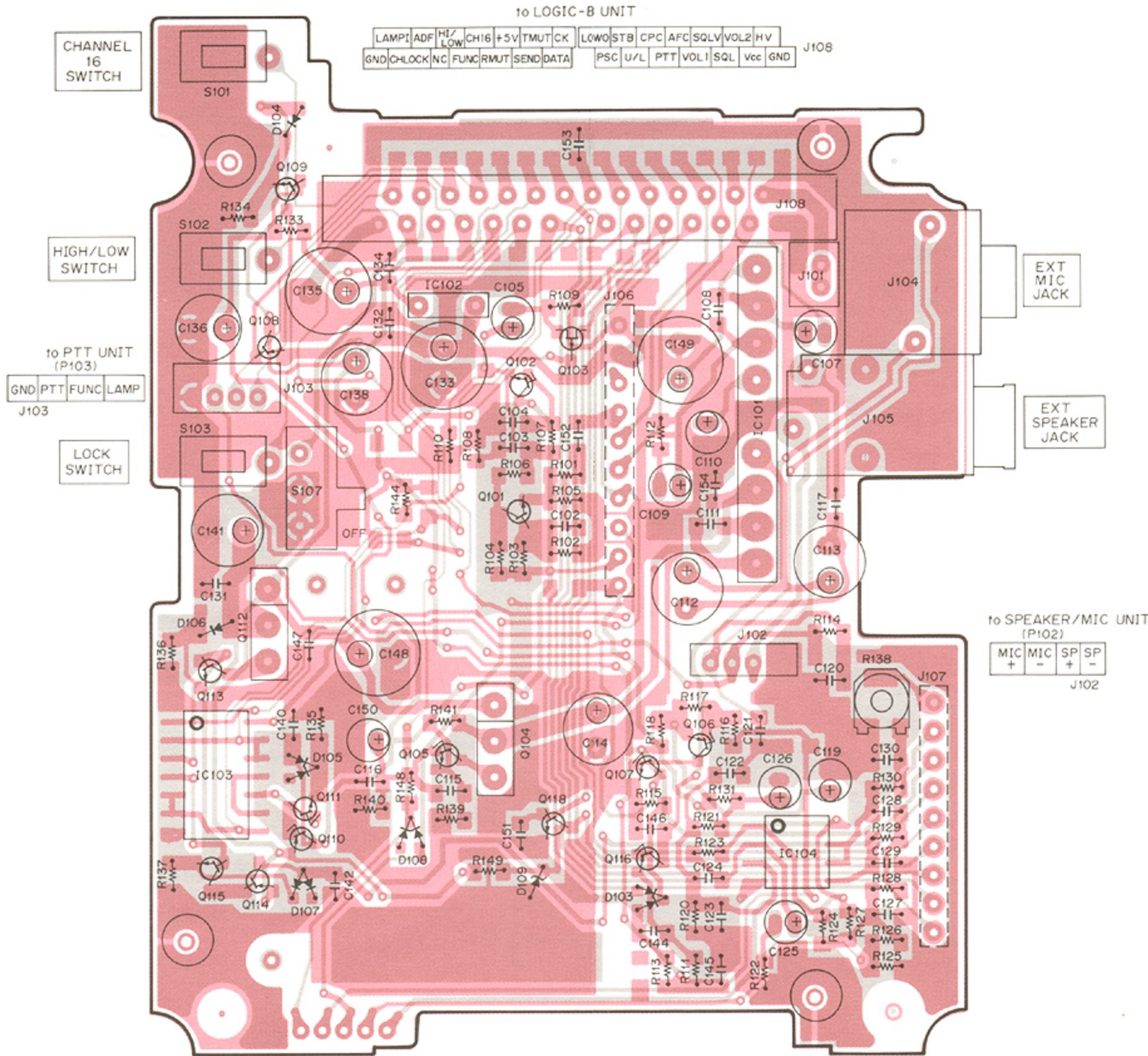
Symbol: SG

RN1404
Q118



Symbol: XD

COMPONENTS SIDE



DTC144EU
Q107

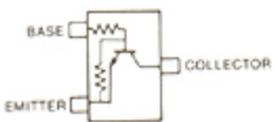
DAN202U
D103, D105
D108

1SS193
D104

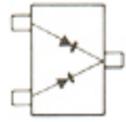
1SS190
D106

RD9.1M B2
D109

DAP202U
D107



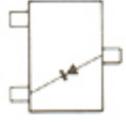
Symbol: 26



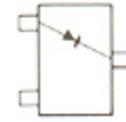
Symbol: N



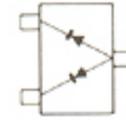
Symbol: F3



Symbol: E3

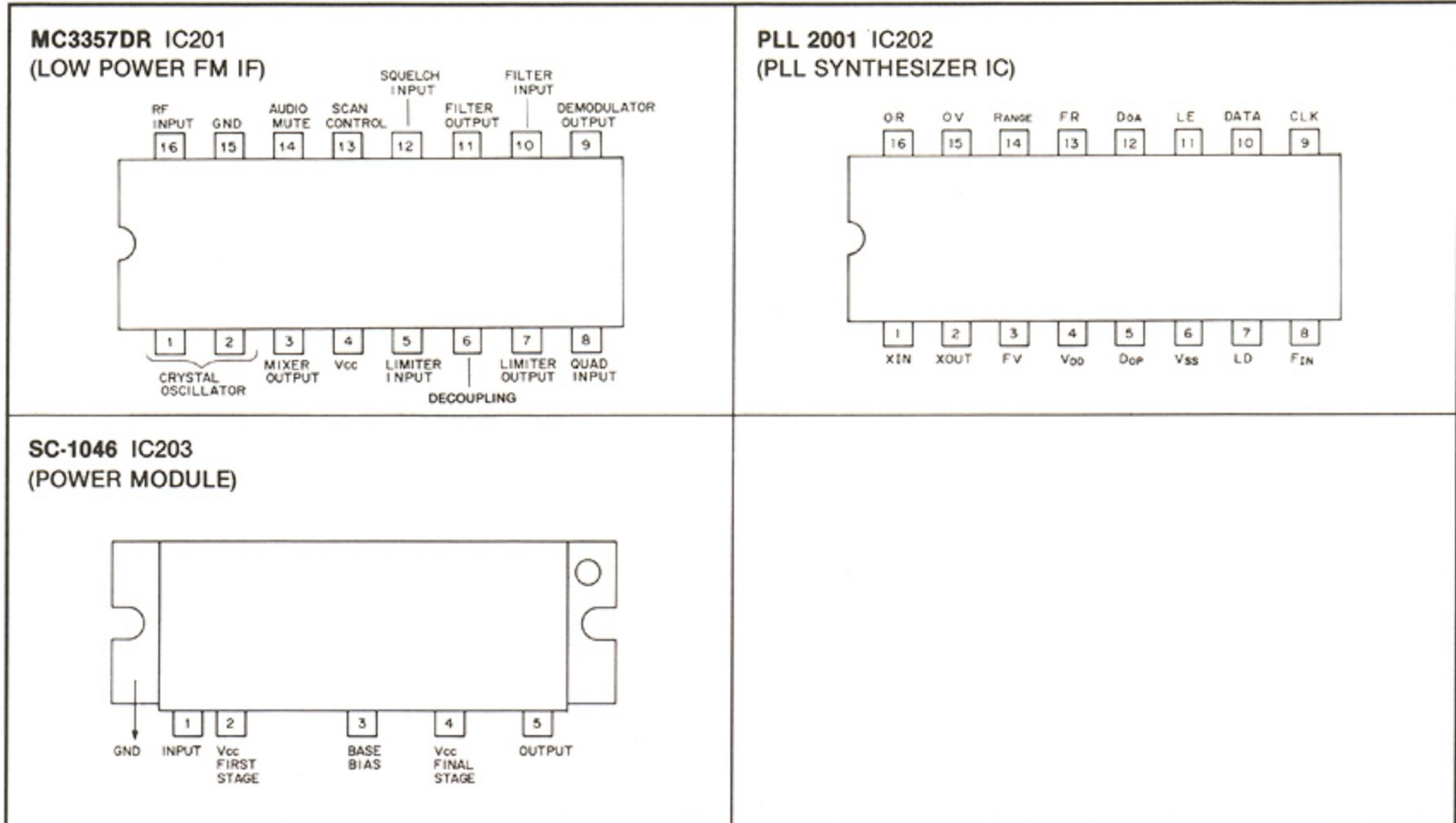


Symbol: 912

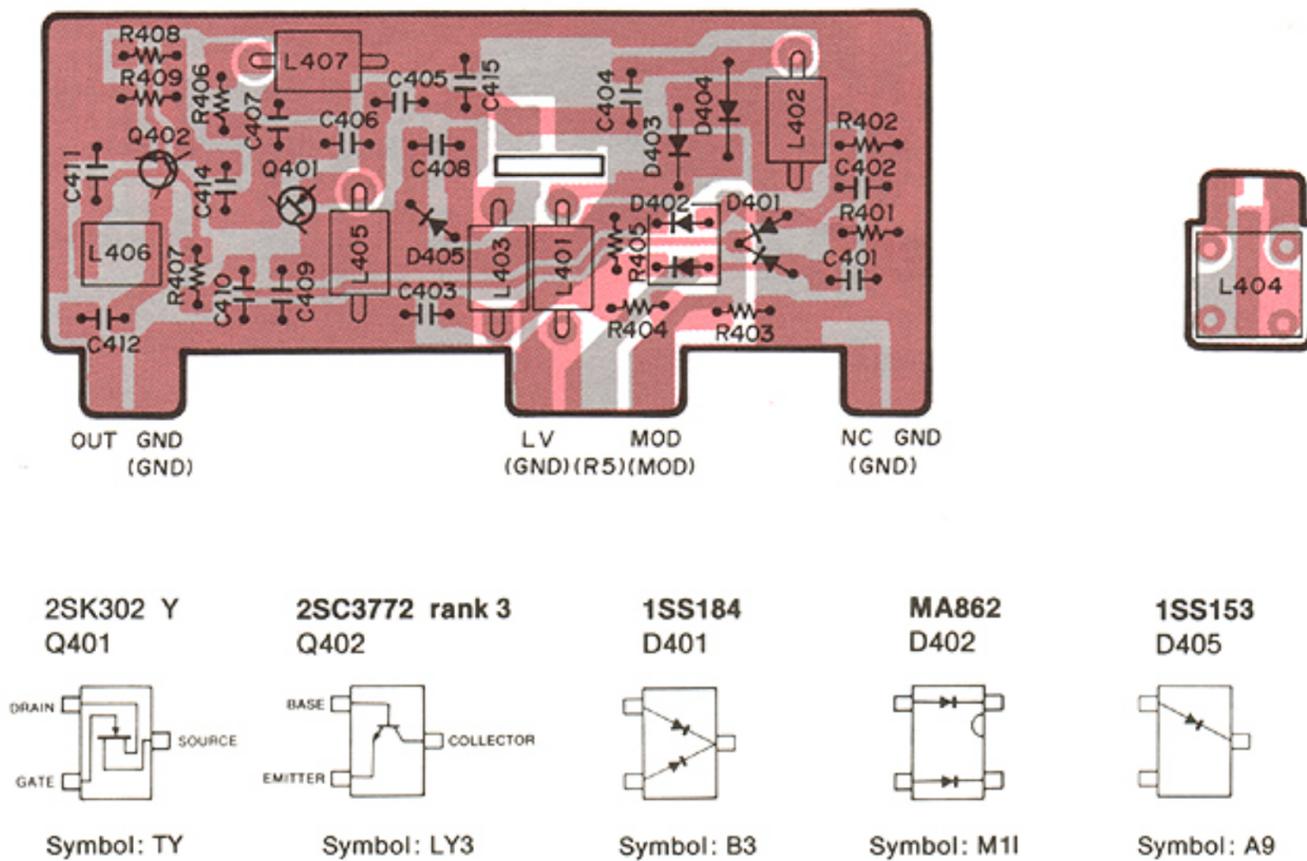


Symbol: P

7-5 RF UNIT

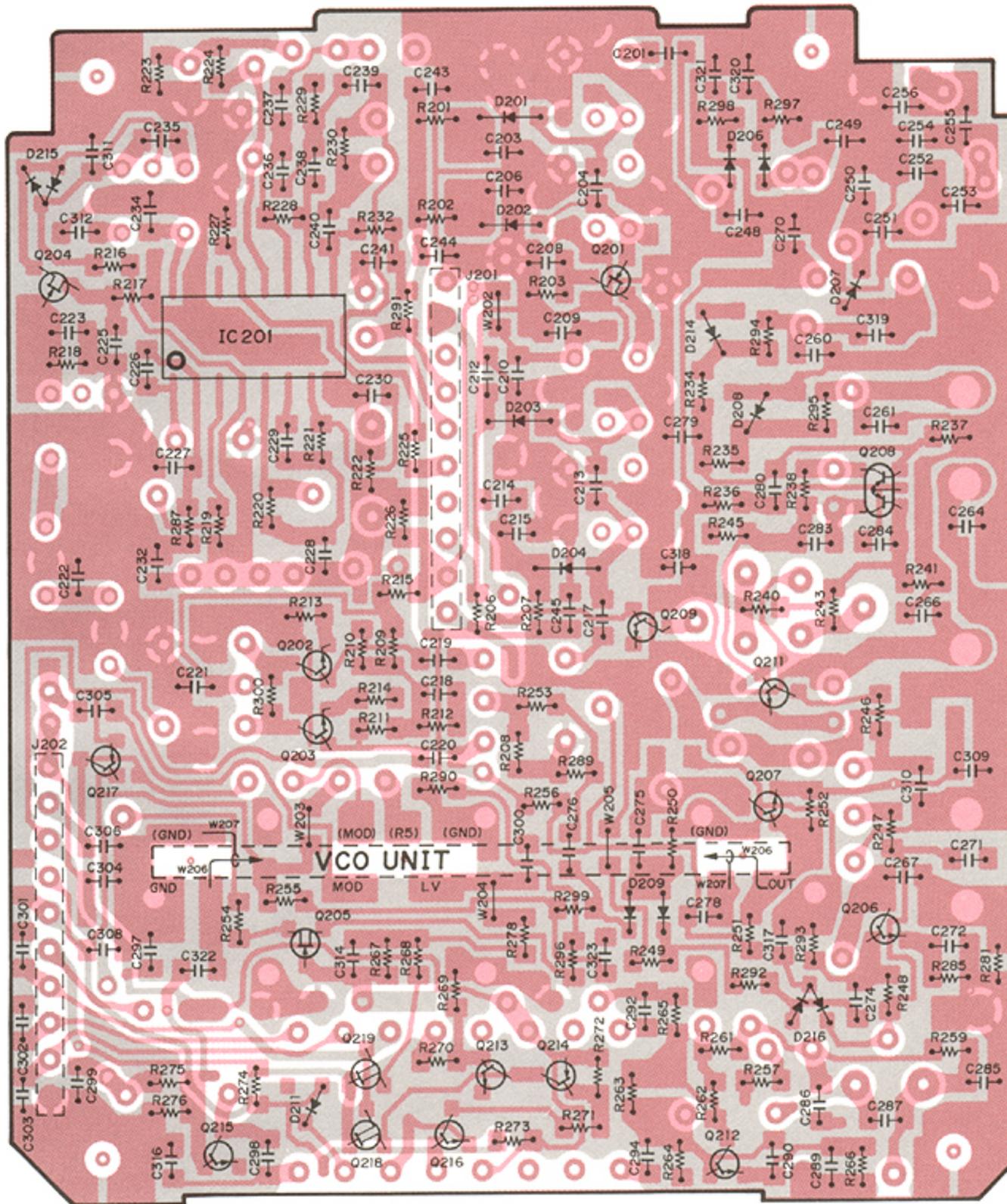


• VCO UNIT



• RF UNIT

FOIL SIDE

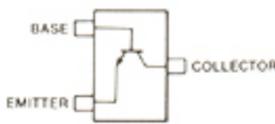


2SK302 Y
Q201, Q204



Symbol: TY

2SC3356
Q202, Q203



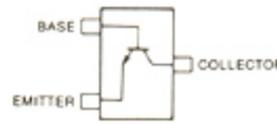
Symbol: R22

2SK209 Y
Q205



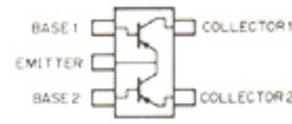
Symbol: XY

2SC3772 rank 3
Q206, Q207
Q215



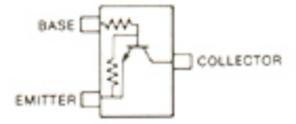
Symbol: LY3

FMS1
Q208



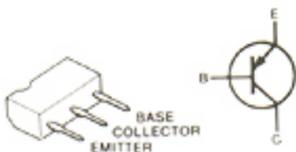
Symbol: SI

RN1404
Q209, Q216

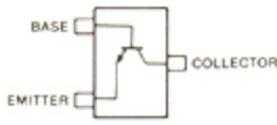


Symbol: XD

2SB909M Q/R
Q210

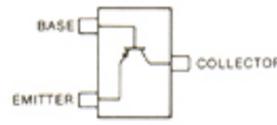


2SC2712 BL
Q211, Q212
Q213



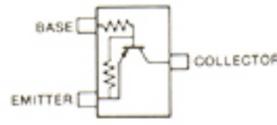
Symbol: LL

2SA1162 GR
Q214



Symbol: SG

RN2404
Q217



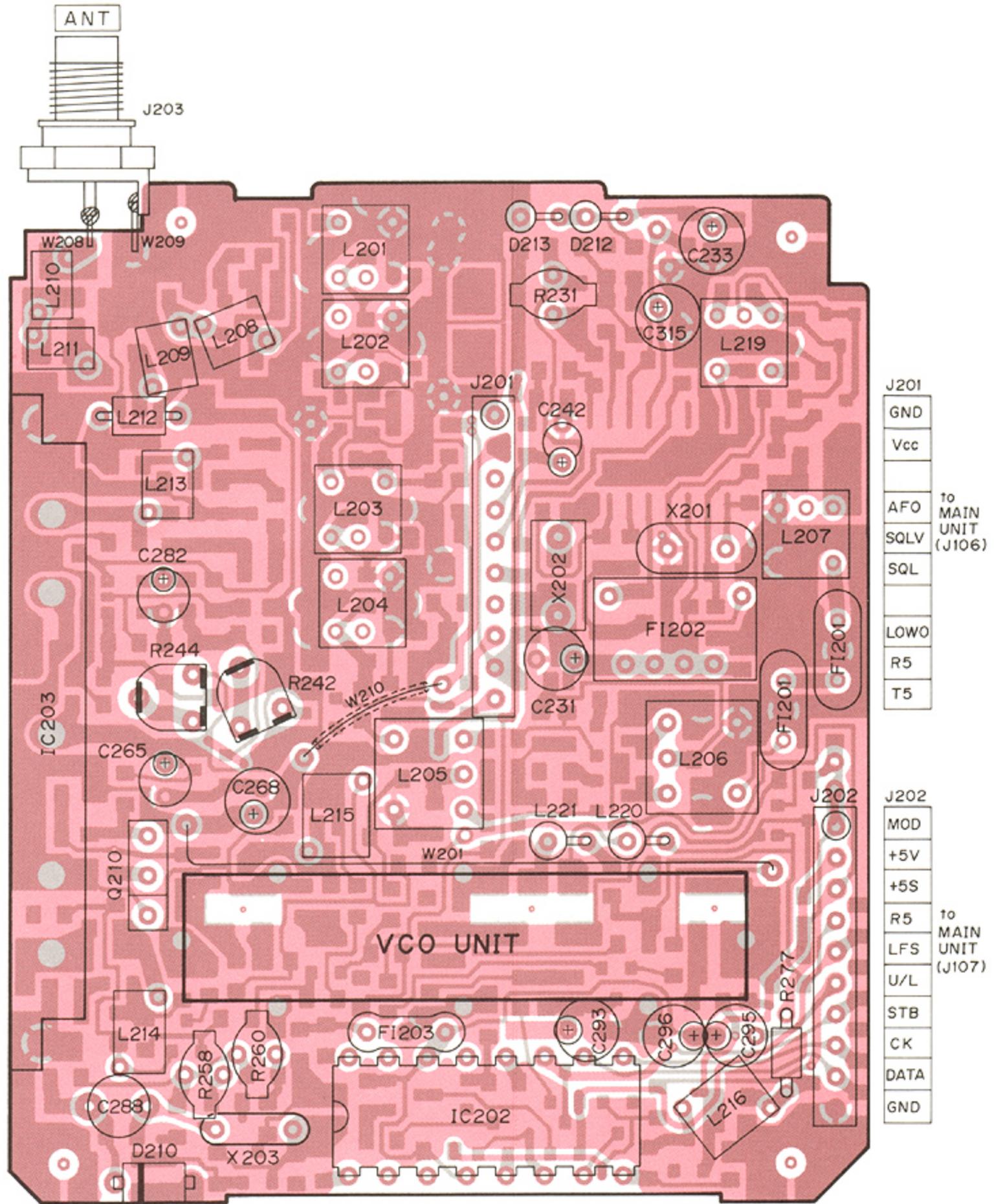
Symbol: YD

2SK536
Q218, Q219



Symbol: CP

COMPONENTS SIDE



- | | | | | | |
|----------------------------|-----------------------|-----------------------------|-----------------------|-----------------------|-----------------------|
| MA862 D206, D209 | 1SS153 D207 | 1SS154 D208, D214 | 1SS193 D211 | 1SS226 D215 | 1SV172 D216 |
| | | | | | |
| Symbol: M1I | Symbol: A9 | Symbol: BA | Symbol: F3 | Symbol: C3 | 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 μ |
| 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 μ |
| L221 | Coil | LAL02KR 1R5M 1.5 μ |
| R201 | Resistor | 150k Ω MCR10 |

[RF UNIT]

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

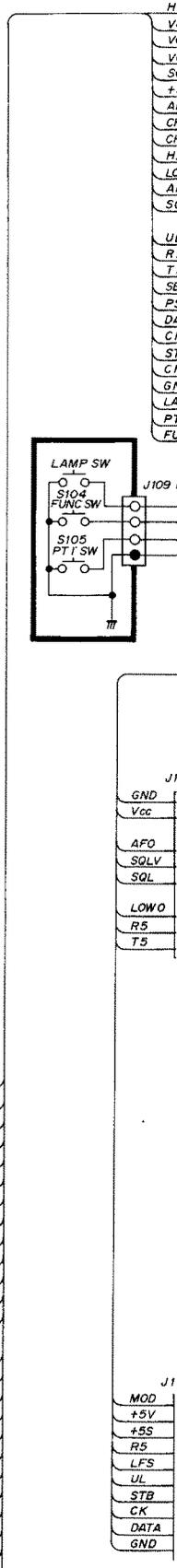
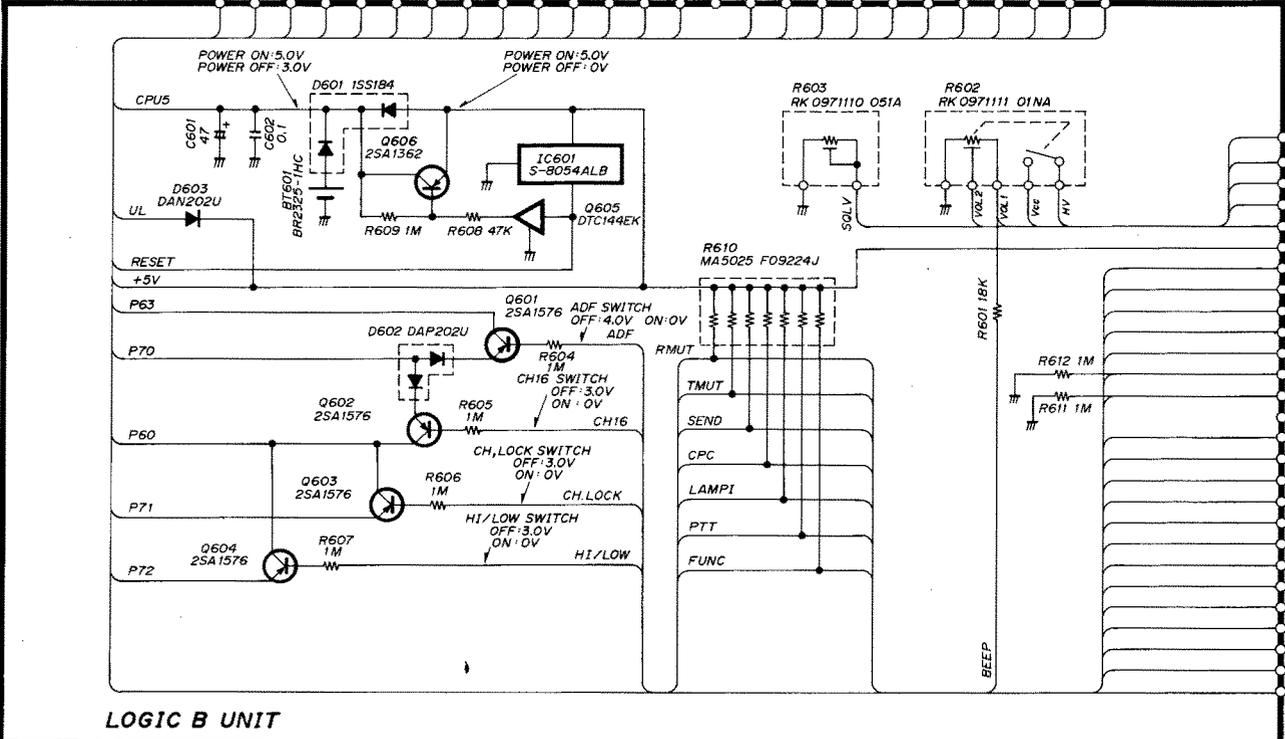
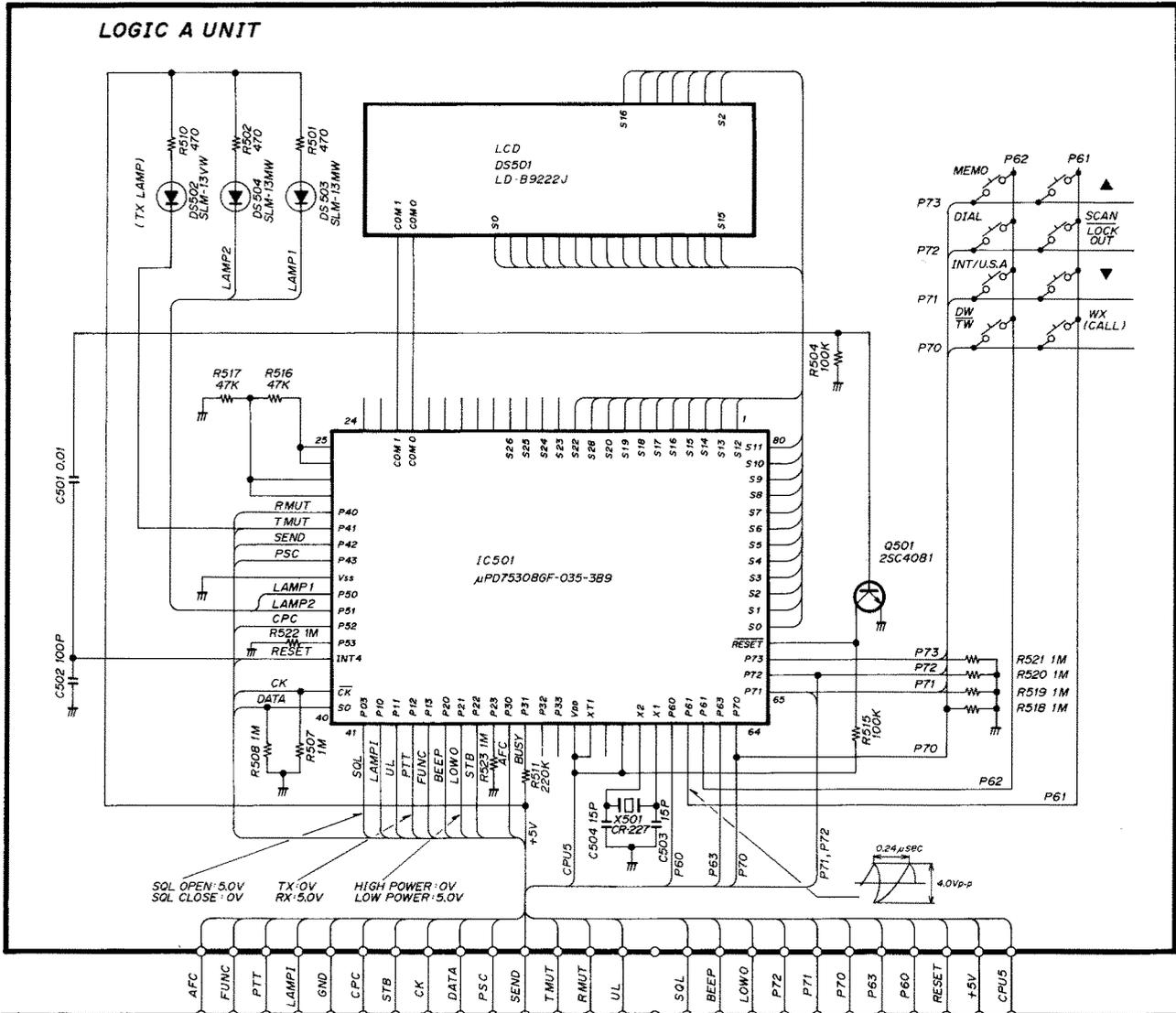
[RF UNIT]

| 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 | |

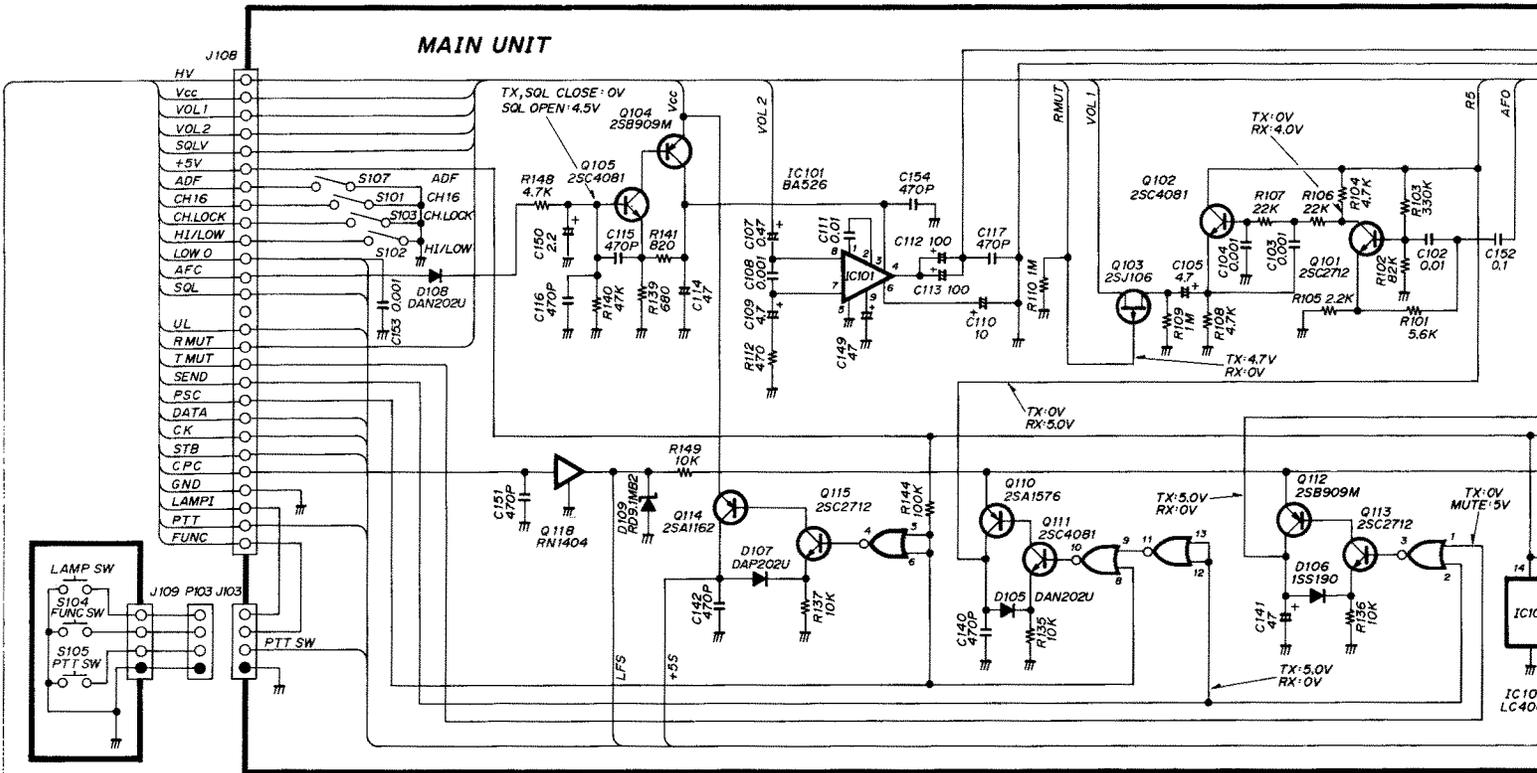
[VCO UNIT]

| 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 4.7 μ | |
| L402 | Coil | LAL02KR 4R7K 4.7 μ | |
| L403 | Coil | LAL02KR 4R7K 4.7 μ | |
| L404 | Coil | LB-229 | |
| L405 | Coil | LAL02KR 4R7K 4.7 μ | |
| L406 | Coil | LQN2A R15K 0.15 μ | |
| L407 | Coil | LAL02KR 4R7K 4.7 μ | |
| R401 | Resistor | 220k Ω | MCR10 |
| R402 | Resistor | 100k Ω | MCR10 |
| R403 | Resistor | 100k Ω | MCR10 |
| R404 | Resistor | 47k Ω | MCR10 |
| R405 | Resistor | 220k Ω | MCR10 |
| R406 | Resistor | 56 Ω | MCR10 |
| R407 | Resistor | 1k Ω | MCR10 |
| R408 | Resistor | 100k Ω | MCR10 |
| R409 | Resistor | 39k Ω | 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 | 0.001 μ F | GRM40 |
| C410 | Ceramic | 0.001 μ F | GRM40 |
| C411 | Ceramic | 0.001 μ F | 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



MAIN 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.

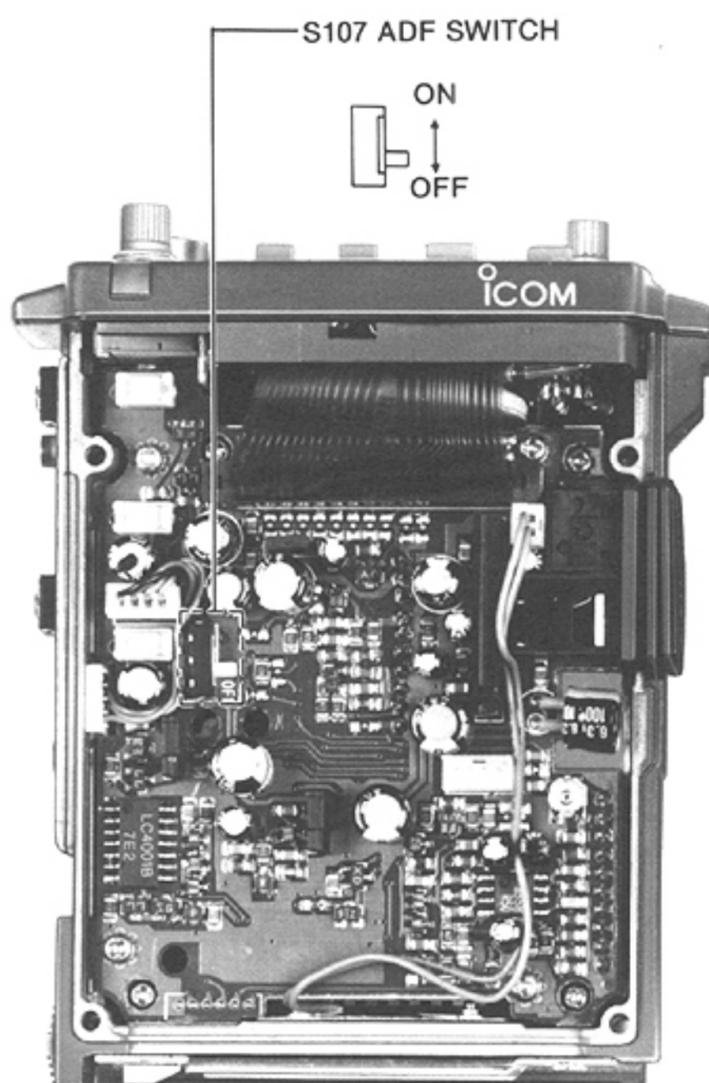
4. HOW TO CHANGE THE DUPLEX CHANNEL TO SIMPLEX AND PROGRAM INTO A MEMORY CHANNEL

- 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)

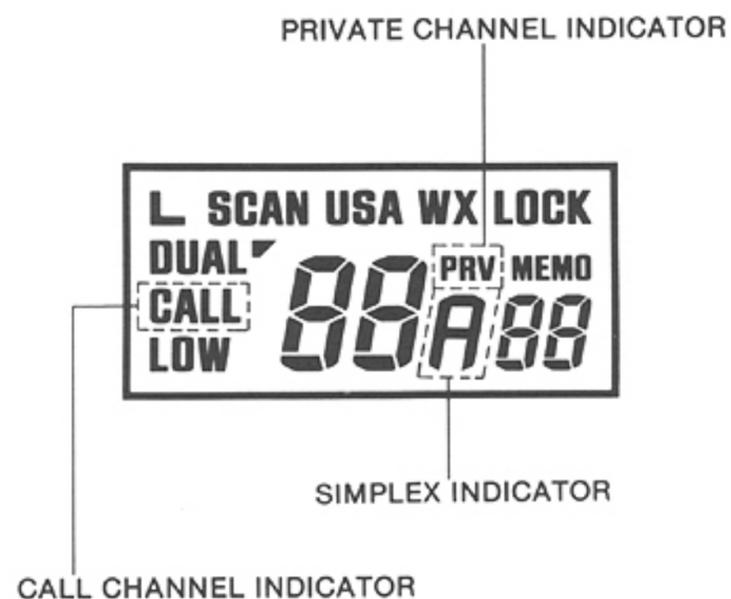
(1) SELECTING CALL CHANNEL

- 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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