ICOM

SERVICE MANUAL

VHF AIR BAND TRANSCEIVER

IC-A20

Icom Inc.

INTRODUCTION

This service manual contains information relative to the theoretical, physical, mechanical and electrical characteristics of the IC-A20 VHF AIR BAND TRANSCEIVER.

ASSISTANCE

If you require assistance or further information regarding the operation and capabilities of the IC-A20, 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., IC301, Q318)
3. Printed circuit board name and number (e.g., RF UNIT/ B-1461B)
4. Part number and name (e.g., 2SC2668 Transistor)
5. 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.

TABLE OF CONTENTS

SECTION 1 SPECIFICATIONS ..... 1 — 1

SECTION 2 OUTSIDE AND INSIDE VIEWS ..... 2 — 1 ~ 4

2 - 1 OUTSIDE VIEWS ..... 2 — 1
2 - 2 INSIDE VIEWS ..... 2 — 2

SECTION 3 BLOCK DIAGRAM ..... 3 — 1

SECTION 4 CIRCUIT DESCRIPTION ..... 4 — 1 ~ 7

4 - 1 RECEIVER CIRCUITS ..... 4 — 1
4 - 2 TRANSMITTER CIRCUITS ..... 4 — 3
4 - 3 PLL CIRCUITS ..... 4 — 4
4 - 4 POWER SUPPLY CIRCUITS ..... 4 — 5
4 - 5 LOGIC CIRCUITS (LOGIC UNIT) ..... 4 — 5
4 - 6 VOR CIRCUITS (VOR UNIT) ..... 4 — 6
4 - 7 OTHER CIRCUITS ..... 4 — 7

SECTION 5 MECHANICAL PARTS AND DISASSEMBLY ..... 5 — 1 ~ 5

5 - 1 CASE DISASSEMBLY ..... 5 — 1
5 - 2 TOP PANEL DISASSEMBLY ..... 5 — 3
5 - 3 PA AND EXTERNAL JACK DISASSEMBLY ..... 5 — 4
5 - 4 SPEAKER AND MICROPHONE DISASSEMBLY ..... 5 — 4
5 - 5 PTT SEAL DISASSEMBLY ..... 5 — 5
5 - 6 UNIT BOTTOM DISASSEMBLY ..... 5 — 5

SECTION 6 ADJUSTMENT PROCEDURES ..... 6 — 1 ~ 7

6 - 1 PLL ADJUSTMENT ..... 6 — 1
6 - 2 RECEIVER ADJUSTMENT ..... 6 — 2
6 - 3 TRANSMITTER ADJUSTMENT ..... 6 — 4
6 - 4 VOR ADJUSTMENT ..... 6 — 7

SECTION 7 BOARD LAYOUTS ..... 7 — 1 ~ 9

7 - 1 INTERCONNECTIONS ..... 7 — 1
7 - 2 LOGIC UNIT ..... 7 — 2
7 - 3 VOR UNIT ..... 7 — 4
7 - 4 MAIN UNIT ..... 7 — 6
7 - 5 RF AND VCO UNITS ..... 7 — 8

SECTION 8 VOLTAGE DIAGRAMS ..... 8 — 1 ~ 4

8 - 1 LOGIC UNIT ..... 8 — 1
8 - 2 VOR UNIT ..... 8 — 2
8 - 3 MAIN UNIT ..... 8 — 3
8 - 4 RF AND VCO UNITS ..... 8 — 4

SECTION 9 PARTS LIST ..... 9 — 1 ~ 6

The SCHEMATIC DIAGRAM is attached at the end of this service manual.

SECTION 1 SPECIFICATIONS

■ GENERAL

Antenna impedance	:	50Ω unbalanced		
Memory channels	:	16		
Channel spacing	:	25kHz		
Frequency stability	:	0.002% at −10°C~+50°C		
Usable temperature range	:	−10°C~+50°C		
Dimensions	:	65(74)mm(W)×198(208)mm(H)×35(42)mm(D)		
		Bracketed values include projections.		
Weight	:	675g (including CM-7G BATTERY PACK and flexible antenna)		
Power supply	:	13.2V DC±15%		
Current drain (at 13.2V DC)	:	Receiving	Standby	50mA
			At max. audio output	220mA
		Transmitting	HIGH (5.0W)	900mA
			LOW (1.6W)	600mA

■ TRANSMITTER

Frequency range	:	118.000~135.975MHz
Antenna output power (typical)	:	HIGH 5.0W PEP (1.5W carrier power)
		LOW 1.6W PEP (0.5W carrier power)
		Power shows PEP with 85% modulation by a 1kHz audio tone
Emission mode	:	A3E 6K00 (6A3)
Modulation system	:	Low level modulation

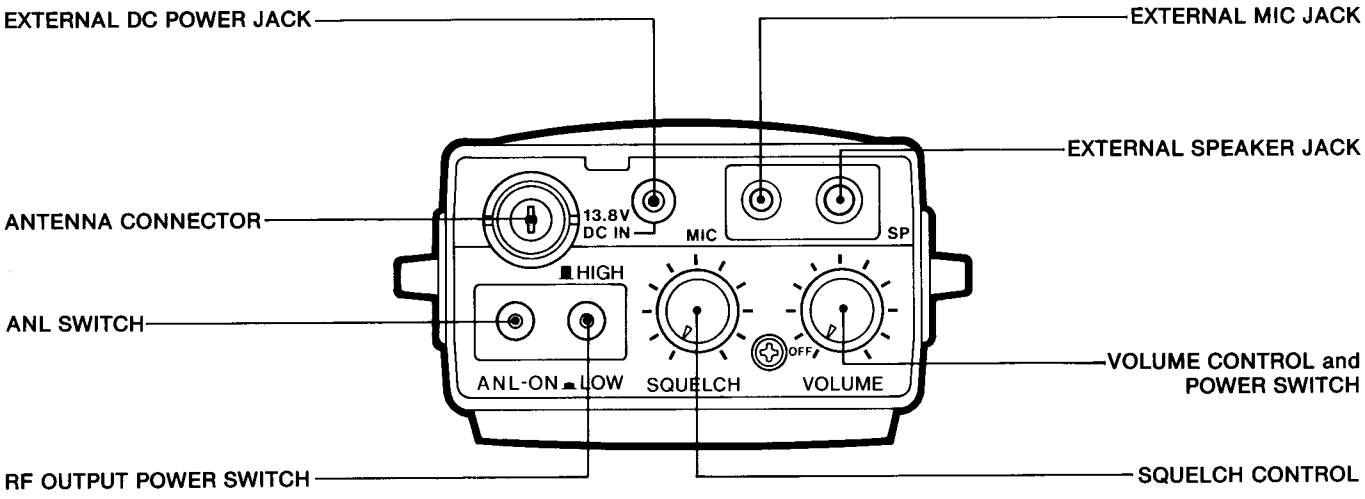
■ RECEIVER

Receiving system	:	Double-conversion superheterodyne
Intermediate frequencies	:	1st 35.8MHz 2nd 455kHz
Frequency range	:	108.000~135.975MHz
		NAV BAND 108.000~117.975MHz
		COM BAND 118.000~135.975MHz
Sensitivity (with 50Ω load)	:	NAV BAND 2μV for 6dB S/N with 1kHz, 30% modulation
		COM BAND 1μV for 6dB S/N with 1kHz, 30% modulation
Audio output power	:	0.5W at 10% distortion
Squelch sensitivity (threshold)	:	NAV BAND 1μV
		COM BAND 0.5μV
Spurious response rejection ratio	:	60dB

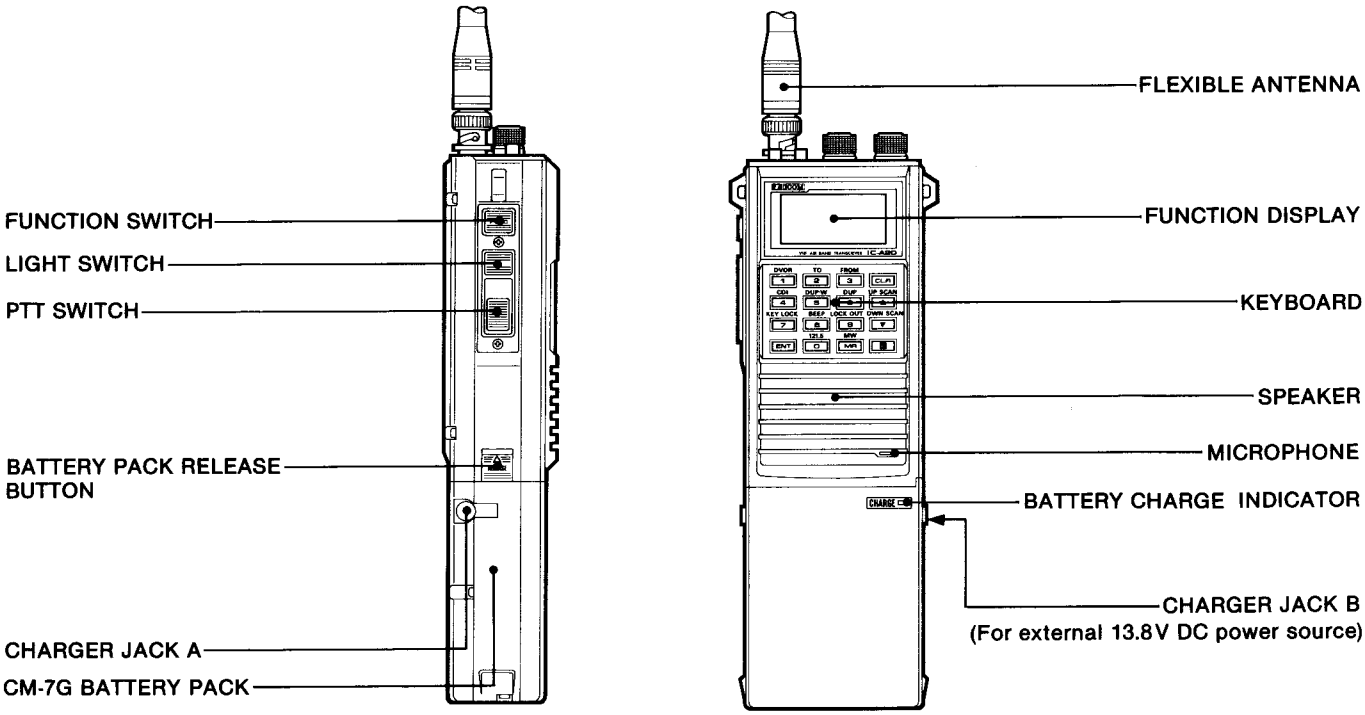
SECTION 2 OUTSIDE AND INSIDE VIEWS

2-1 OUTSIDE VIEWS

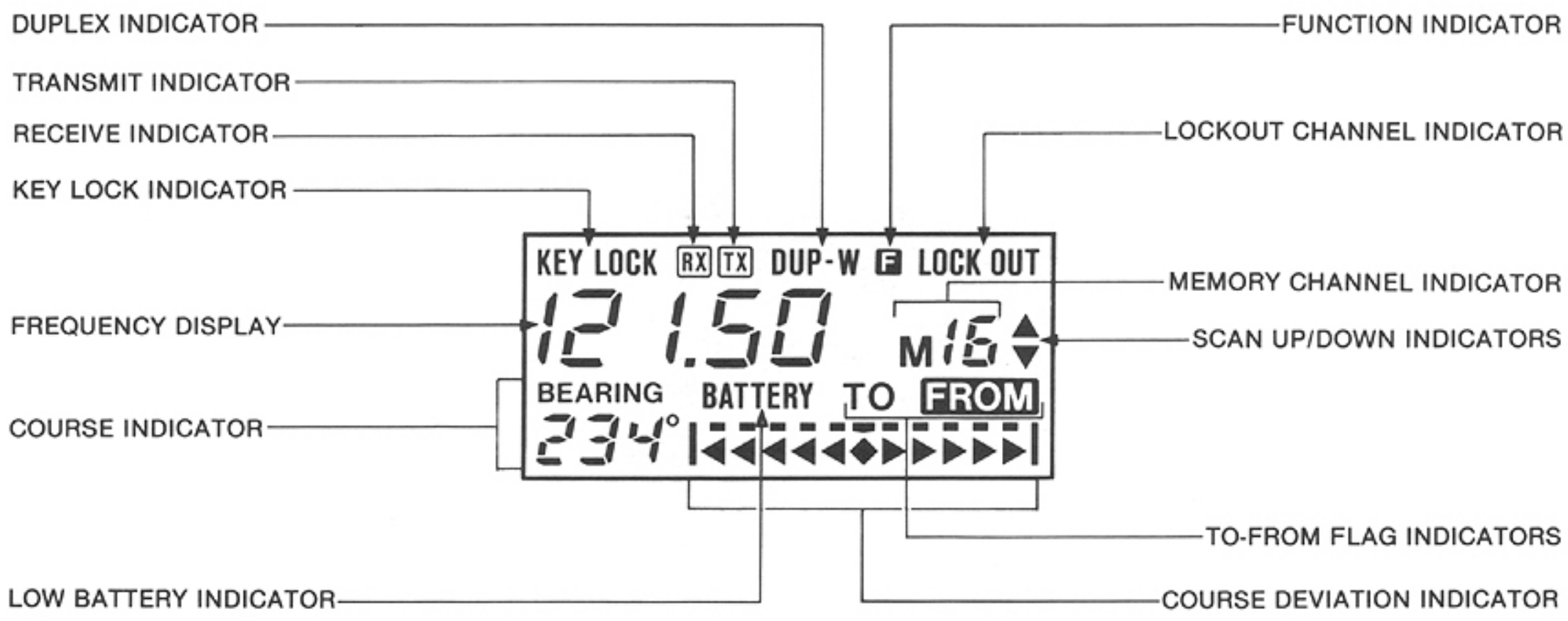
2-1-1 TOP PANEL



2-1-2 FRONT AND SIDE PANELS

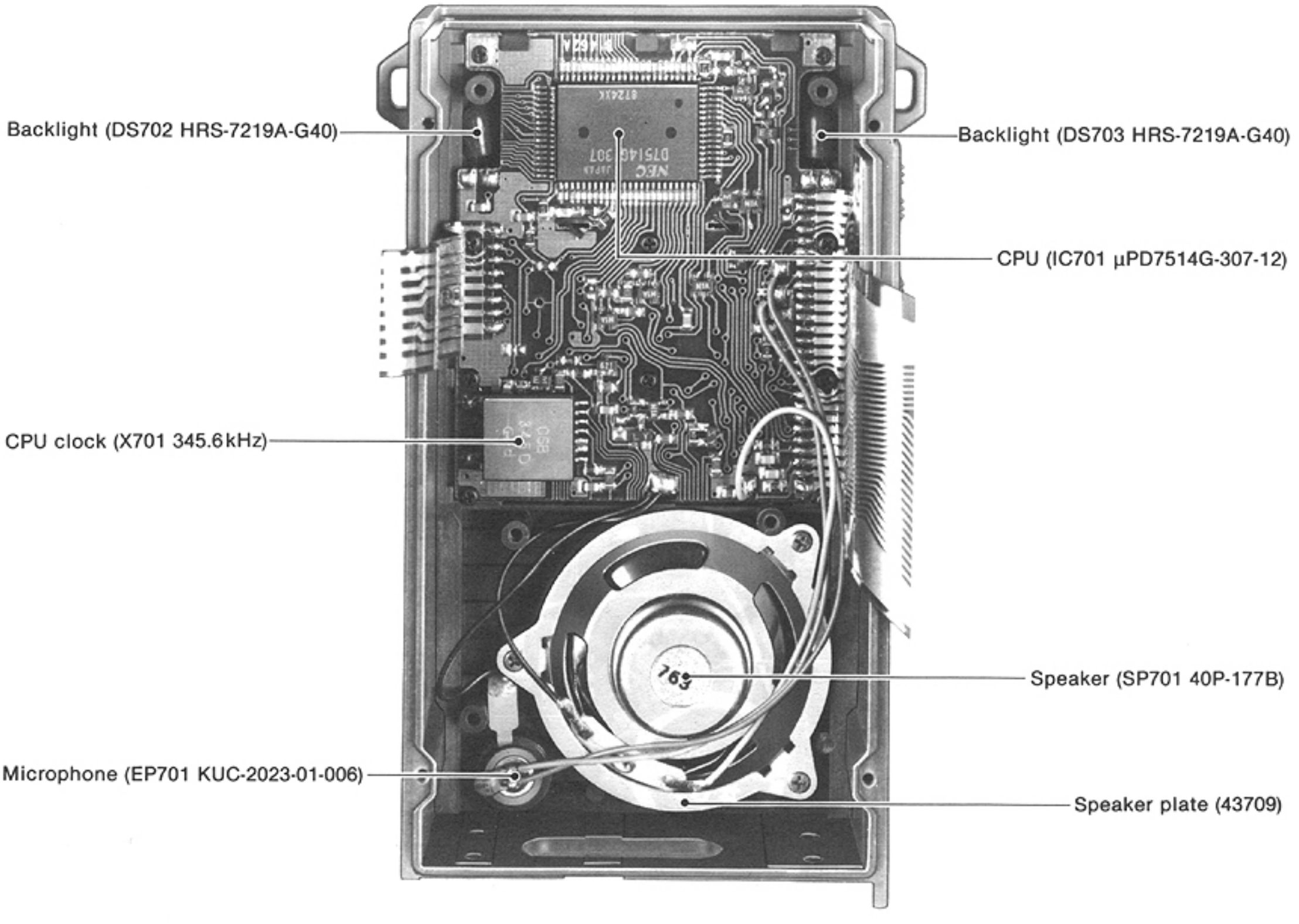


2-1-3 FUNCTION DISPLAY

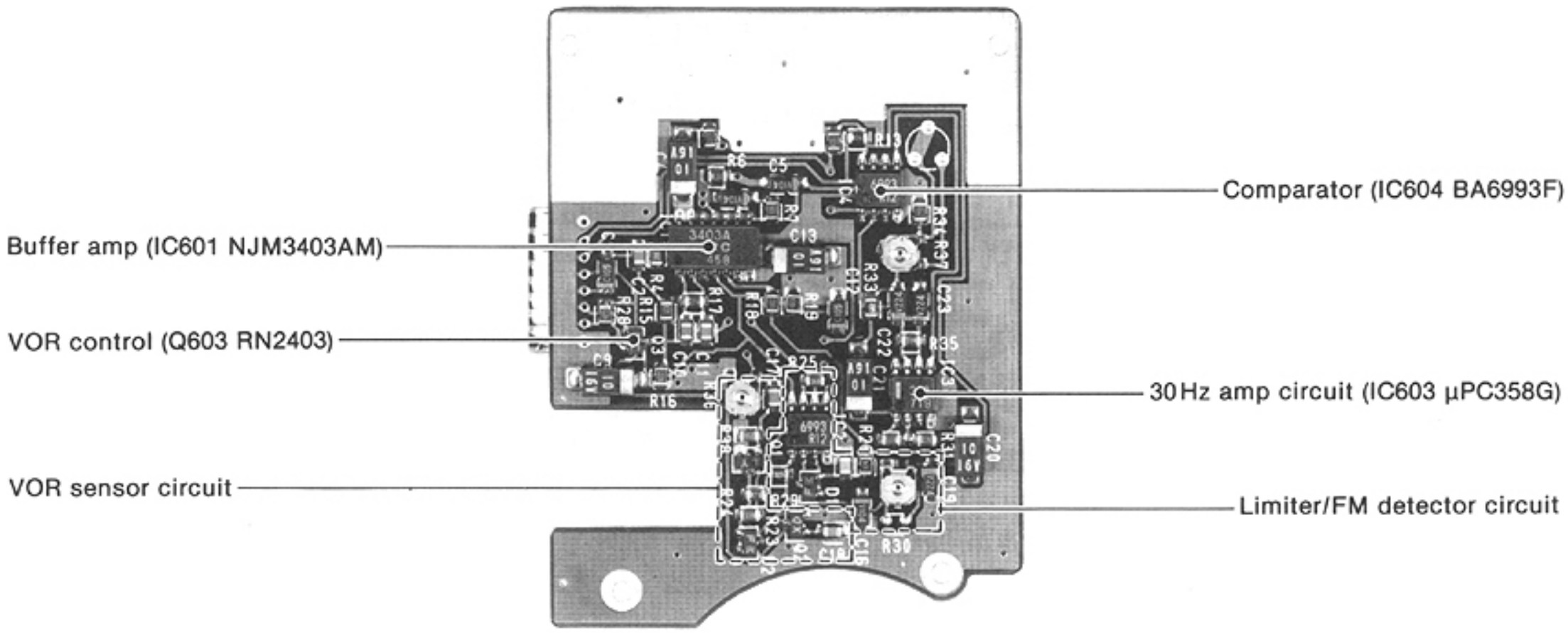


2-2 INSIDE VIEWS

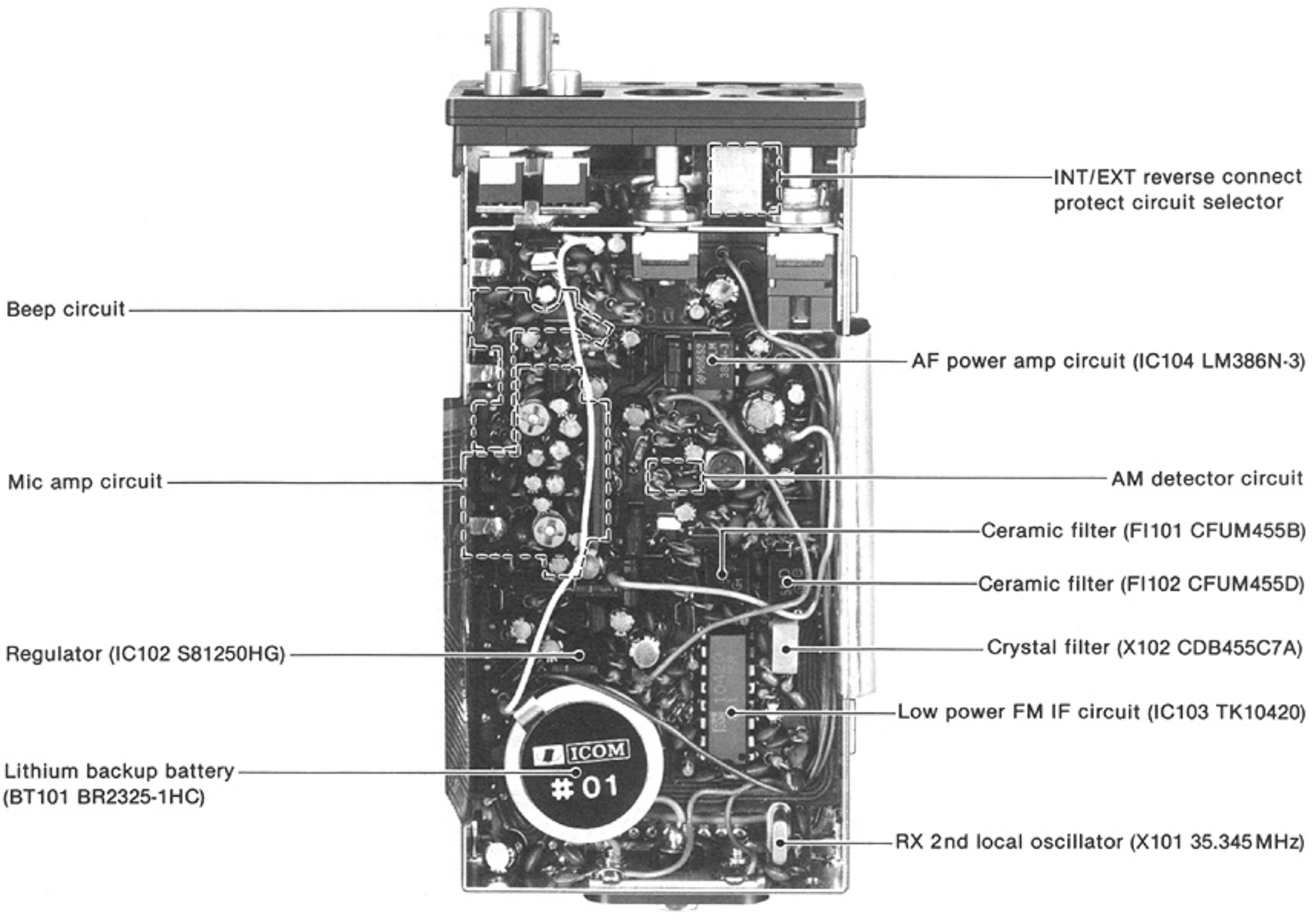
2-2-1 LOGIC UNIT



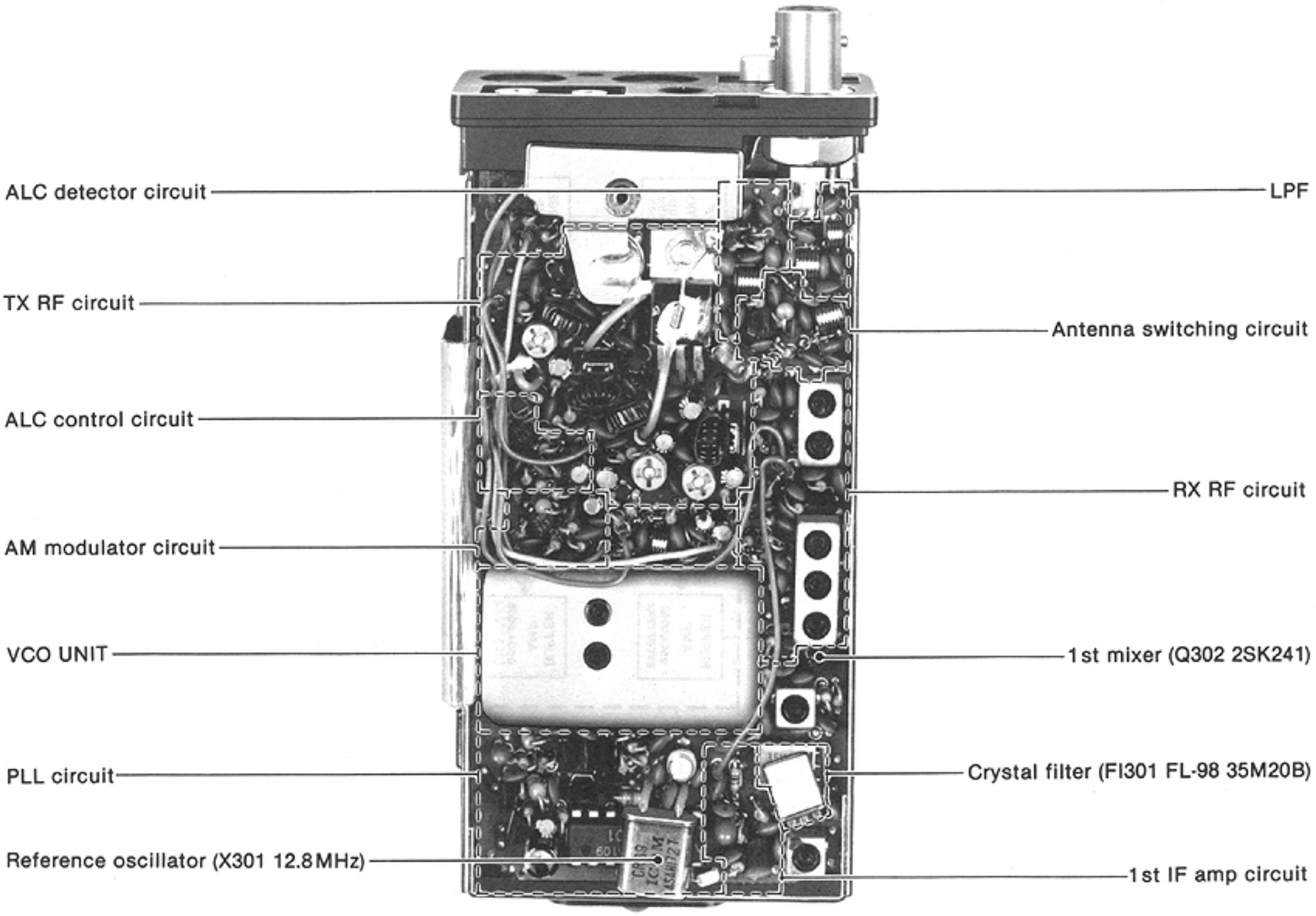
2-2-2 VOR UNIT



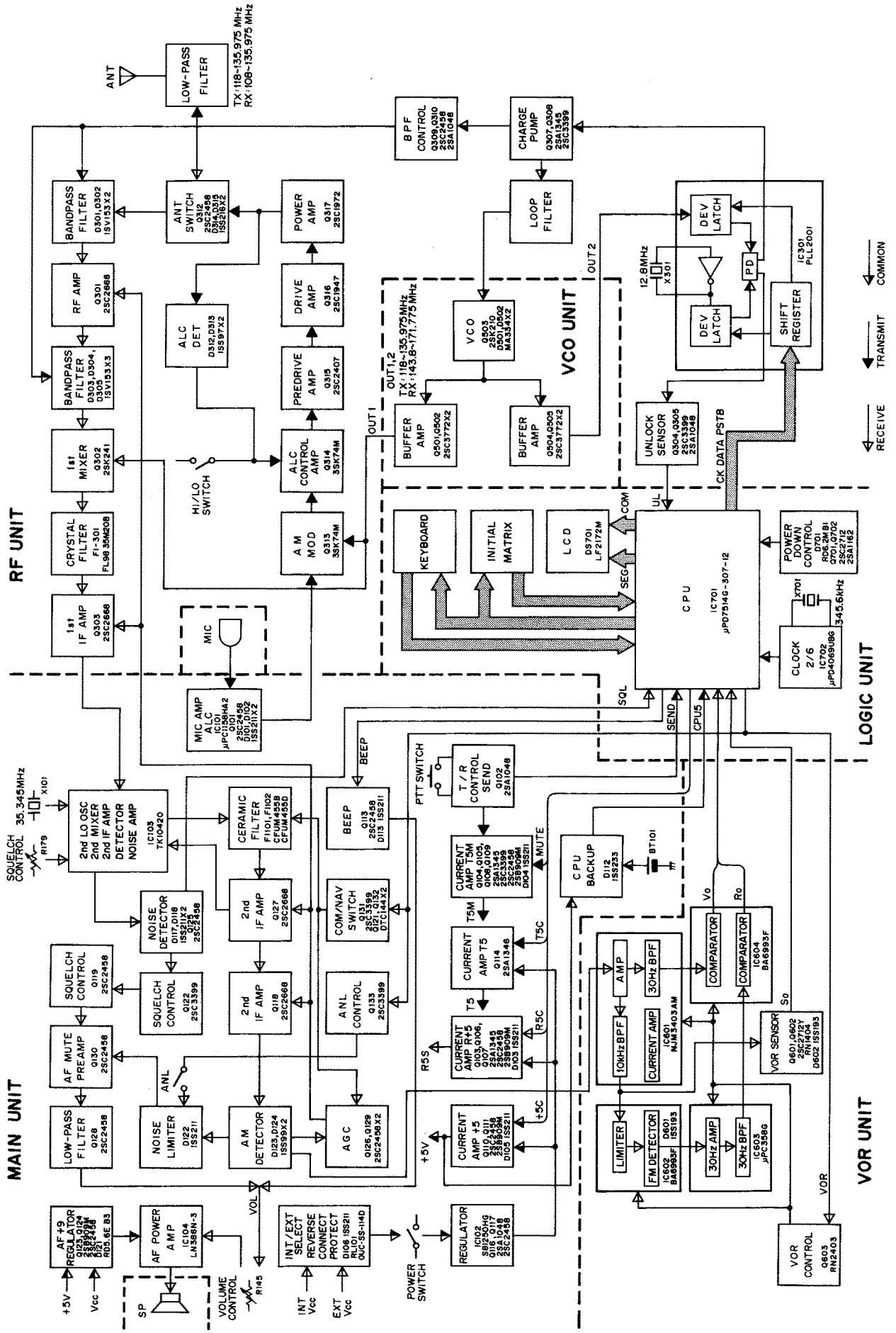
2-2-3 MAIN UNIT



2-2-4 RF AND VCO UNITS



SECTION 3 BLOCK DIAGRAM



SECTION 4 CIRCUIT DESCRIPTION

4-1 RECEIVER CIRCUITS

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

Receiver signals enter the RF UNIT from the ANTENNA CONNECTOR and pass through a Chebyschev low-pass filter consisting of L325, L326 and C396~C400.

The antenna switching circuit employs a λ/4-type diode switching system consisting of D314, D315, Q312, L324 and others. While receiving, D314 and D315 turn OFF and the receive signals are applied to the RF circuit via C301.

4-1-2 RF CIRCUIT (RF UNIT)

The receive signals from the antenna switching circuit pass through a bandpass filter consisting of L301, L302, C302~C305, D301 and D302. They are then amplified at RF amplifier Q301. After being amplified at Q301, the receive signals are fed to 1st mixer Q302 via a bandpass filter consisting of L303~L305, C311~C314 and D303~D305. Bandpass filters suppress out-of-band signals. Diodes D301~D305 are varactor diodes that track the bandpass filters and are controlled by a output voltage from the charge pump. These diodes tune the center frequency of the bandpass filters for wide bandwidth reception and good image response rejection. Reception with good image response rejection is ensured as L301-L302, L303-L304 and L304-L305 are magnetically coupled.

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

Receive signals from the bandpass filter are mixed with LO signals (143.8~171.775MHz) from the VCO UNIT at Q302, and are converted to 35.8MHz 1st IF signals. 1st IF signals are then output from L306.

4-1-4 IF CIRCUIT (RF UNIT)

1st IF signals from the 1st mixer circuit pass through a pair of crystal filters (FI301) to suppress out-of-band signals. After passing through the filter, the 1st IF signals are amplified at IF amplifier Q303 and are fed to IC103.

RECEIVER RF AND 1st IF CIRCUITS

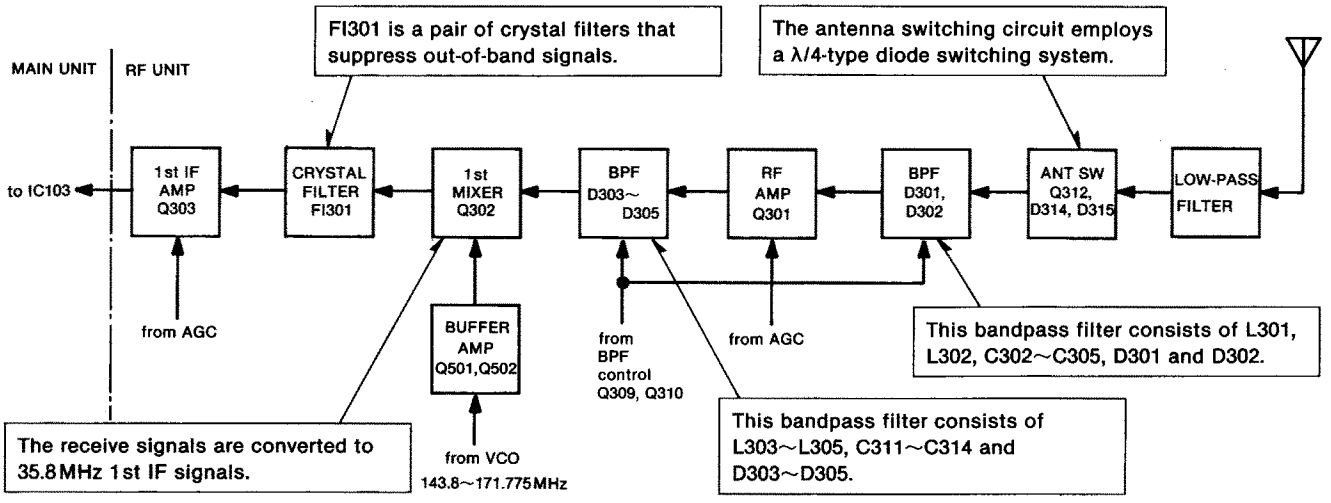


Fig. 1

4-1-5 2nd LO AND 2nd MIXER CIRCUITS (MAIN UNIT)

IC103 contains the 2nd LO circuit, 2nd mixer circuit, limiter amplifier circuit and quadrature detector circuit. The 2nd LO circuit and X101 generate 35.345MHz 2nd LO signals which are used at the 2nd mixer section of IC103.

1st IF signals from the IF circuit are fed to pin 16 of IC103, and are mixed with 2nd LO signals for converting the 1st IF signals to 455kHz 2nd IF signals.

The 2nd IF signals are output from pin 3 and pass through ceramic filter (FI101 or FI102) to suppress unwanted heterodyned frequency signals. They are then amplified at 2nd IF amplifiers Q127 and Q118. In NAV band mode, CPU IC701 turns Q131 OFF and Q132 ON. D130 and D131 turn OFF. D128 and D129 turn ON. Thus the 2nd IF signals pass through FI101. In COM band mode, the 2nd IF signals pass through FI102. Amplified signals from Q118 are detected by D123 and D124 to convert to AF signals.

4-1-6 AGC CIRCUIT (MAIN UNIT)

When receiving strong signals, the AM detector voltage increases, turning Q126 and Q129 ON. The bias voltages of Q118, Q127 and IC103 decrease as they are divided by R159, R162 and R167. The gain of Q303 and Q301 in the RF stage also decreases.

Thus total gain is decreased and protected from distortion.

When receiving VOR signals, a 30Hz sine wave signal is detected by the AM detector. To prevent the AGC function from operating with low frequencies, Q121 turns ON and C199 is connected in parallel with C158.

4-1-7 ANL CIRCUIT (MAIN UNIT)

ANL CIRCUIT

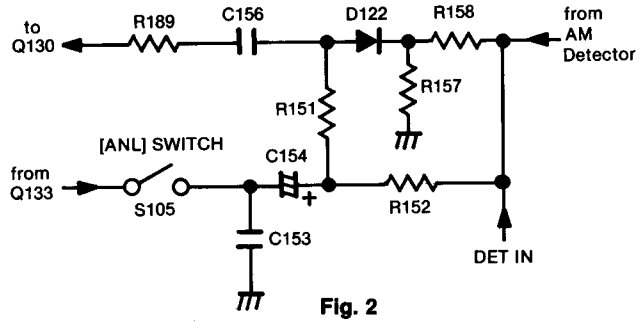


Fig. 2

The ANL circuit consists of R151, R152, R157, R158, D122 and C154. The detector output from D123 and D124 is applied to the anode of D122 through R151 and R152. The detector output is also applied to the cathode of D122, passing through R158 where it is divided by R158 and R157.

When the [ANL] SWITCH is OFF, the anode voltage of D122 is higher than the cathode voltage. D122 is ON.

When the [ANL] SWITCH is ON, C154 is grounded. Therefore the detector output, including pulses, is only applied to the cathode of D122. The cathode voltage becomes higher than the anode voltage and D122 shuts OFF just at the moment when the pulses are received. The AF signal (excluding pulses) is then passed through D122 and applied to Q130.

4-1-8 AF CIRCUIT (MAIN UNIT)

After being amplified at Q130, the detector output is fed to AF amp IC104 through the VOLUME CONTROL (R145) and a low-pass filter consisting of Q128.

IC104 drives the speaker with AF output of more than 500mW with an 8Ω load.

The voltage regulator circuit for AF amp IC104 consists of Q123, Q124 and D121. This circuit applies 9V to IC104 pin 6.

4-1-9 SQUELCH CIRCUIT (MAIN UNIT)

The 2nd IF signals amplified at Q127 are fed to IC103 pin 5. They are then amplified at the limiter amplifier section and applied to a quadrature detector circuit in IC103 with X102.

The detected signals are output from pin 9 and fed to the active filter section (pin 10) via SQUELCH CONTROL R179. The active filter section outputs noise components from pin 11. The noise components are then rectified by D117 and D118 and converted to DC voltage. The DC voltage controls a squelch control circuit consisting of Q119 and Q122 via Q125.

The squelch control circuit controls AF mute pre-amplifier Q130 as shown in Fig. 3.

SQUELCH CIRCUIT

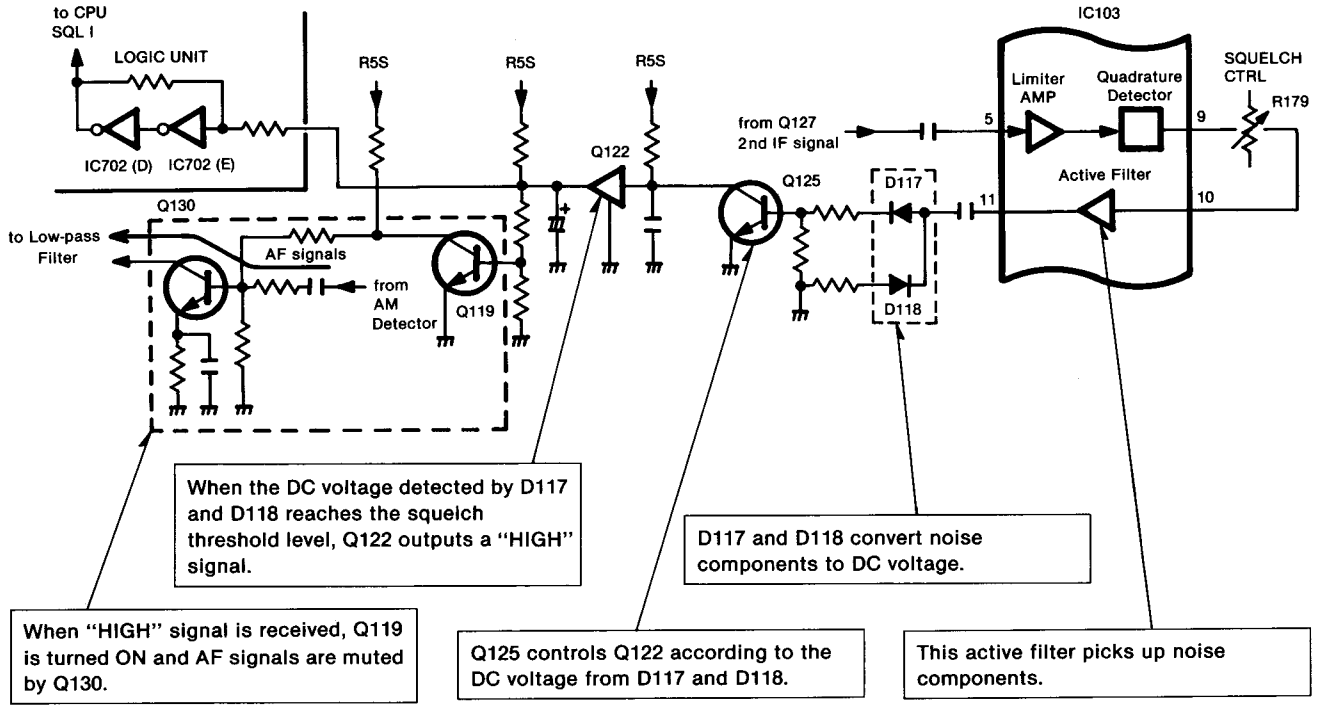


Fig. 3

4-2 TRANSMITTER CIRCUITS

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

AF signals from the INTERNAL MICROPHONE or from the EXTERNAL MIC JACK are fed to IC101 through R178. R178 adjusts the microphone input level. Output signals from IC101 pin 3 are fed to the modulation circuit (Q313 on the RF UNIT) through R106 and buffer amplifier Q101. R106 adjusts the modulation signal level.

To prevent signal distortion output when the strong signals are input, a portion of the output signals from IC101 pin 3 is detected by D101 and D102. The detected voltage is fed to the ALC amplifier of IC101 and the output gain of IC101 is reduced.

MICROPHONE AMPLIFIER AND MODULATOR CIRCUITS

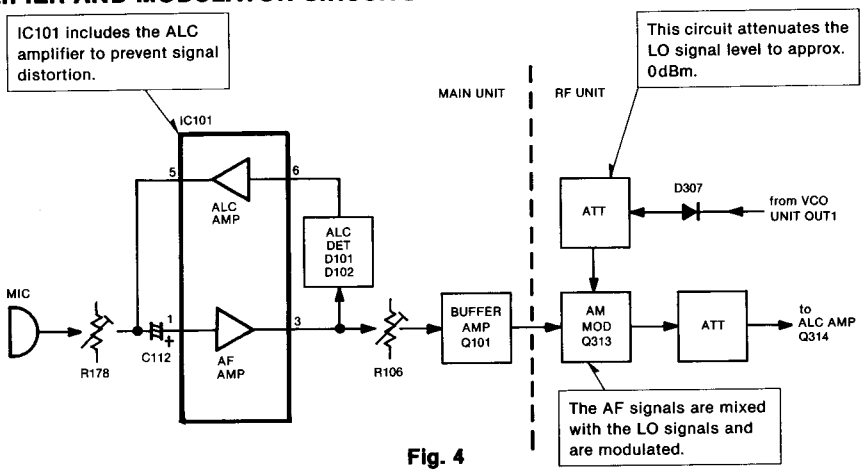


Fig. 4

4-2-2 MODULATOR AND ALC AMPLIFIER (RF UNIT)

In transmit mode, LO signal from VCO UNIT OUT1 are output through D307 and an attenuator consisting of R331~R333, and are then applied to gate 1 of Q313 (at approx. 0dBm). Q313 amplifies LO signals with a gain controlled by AF signals to make low level modulation.

Output signals from Q313 are fed to the ALC amplifier via an attenuator consisting of R343~R345.

Output signals from the modulation circuit are amplified at ALC amplifier Q314. The gain is controlled by the ALC circuit.

4-2-3 DRIVE AMPLIFIER CIRCUIT (RF UNIT)

After being output from Q314, the signals are further amplified by a drive amplifier consisting of Q315 and Q316.

The drive amplifier has a maximum output level of approx. 30dBm (1W PEP).

By using troidal coils as matching transformers between these stages, signals over a wide frequency band can be amplified without adjustment.

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

Amplified signals at the drive amplifier are power amplified at RF power amplifier Q317.

The RF power amplifier gives stable output power of more than 37.8dBm (6W PEP) between 118 and 136MHz.

While transmitting, an antenna switching circuit consisting of Q312, D314 and D315 is turned ON and L324 and C394 become parallel resonance circuits to prevent signals being applied to the receiver circuits.

Thus the signals are applied to ANTENNA CONNECTOR J301 through D314, C395 and the low-pass filter.

TRANSMITTER RF CIRCUIT

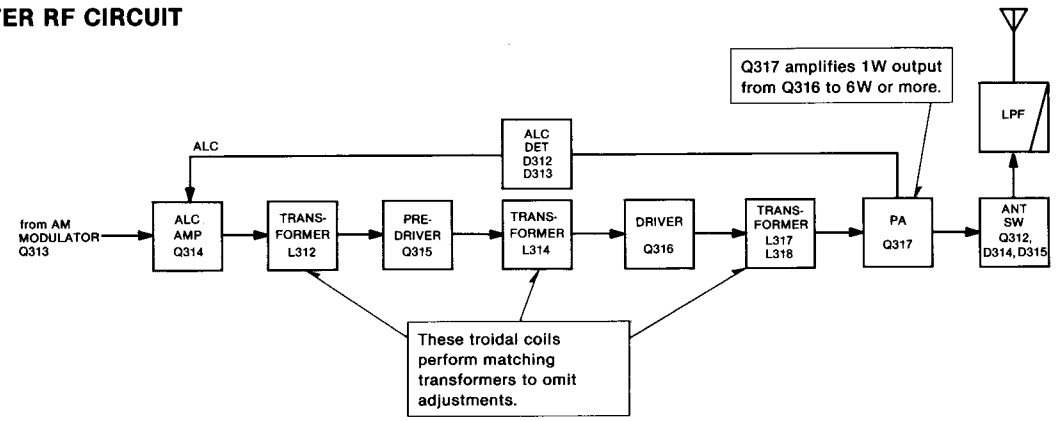


Fig. 5

4-3 PLL CIRCUITS

4-3-1 GENERAL (RF UNIT)

The PLL circuits are designed in a way that allows the desired frequency to be generated directly by the VCO without a prescaler by using high-speed PLL IC IC301. The operating frequency capability of IC301 is up to 180MHz.

The dividing ratio of the programmable counter and the reference divider is determined by N-data from the CPU.

N-data is the number of times the desired frequency is divided by the reference frequency. The desired frequency is transmit frequency in transmit mode and the 1st LO frequency in receive mode.

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

Signals generated by the oscillator section of IC301 and X301 are divided by 512 at the divider section of IC301 to obtain 25kHz as a reference frequency.

Output from VCO OUT2 is fed to IC301 pin 8 and divided N times at the programmable counter section of IC301.

Output signals from the programmable counter are applied to the phase detector section of IC301 and are phase-compared. The output signals of the phase detector are output from IC301 pin 5.

The signals pass through a charge pump consisting of Q306~Q308 and a lag lead-type loop filter consisting of R326, R327 and C340. They are then applied to the VCO UNIT as a lock voltage (LV).

The output from the charge pump is also used on the receiver bandpass filters via a buffer amplifier consisting of Q309 and Q310.

4-3-2 UNLOCK CIRCUIT (RF UNIT)

When the PLL circuit is unlocked, pin 7 of IC301 is "LOW", turning Q304 and Q305 ON via the time constant circuit (R320 and C334).
Q304 sends pin 67 of the CPU (IC701) a "LOW" unlocked signal.

4-3-3 VCO CIRCUIT (VCO UNIT)

The VCO circuit (Q503) employs a Hartley oscillator circuit. The VCO free-run frequency is shifted by inductive reactance with Q506 and D504.

In transmit mode, Q506 turns OFF then D504 is reversely biased. Thus L503 is serial connected with L504. As a result, the free-run frequency is determined by L504, L503, D501 and D502.

In receive mode, Q506 turns ON then D504 turns ON. Thus L503 is shorted. As a result, the free-run frequency is shifted higher than the receive frequency.

VCO generated signals are output as OUT1 and OUT2.
OUT1 is buffer amplified by Q501 and Q502.
OUT2 is buffer amplified by Q504 and Q505.

PLL CIRCUITS BLOCK DIAGRAM

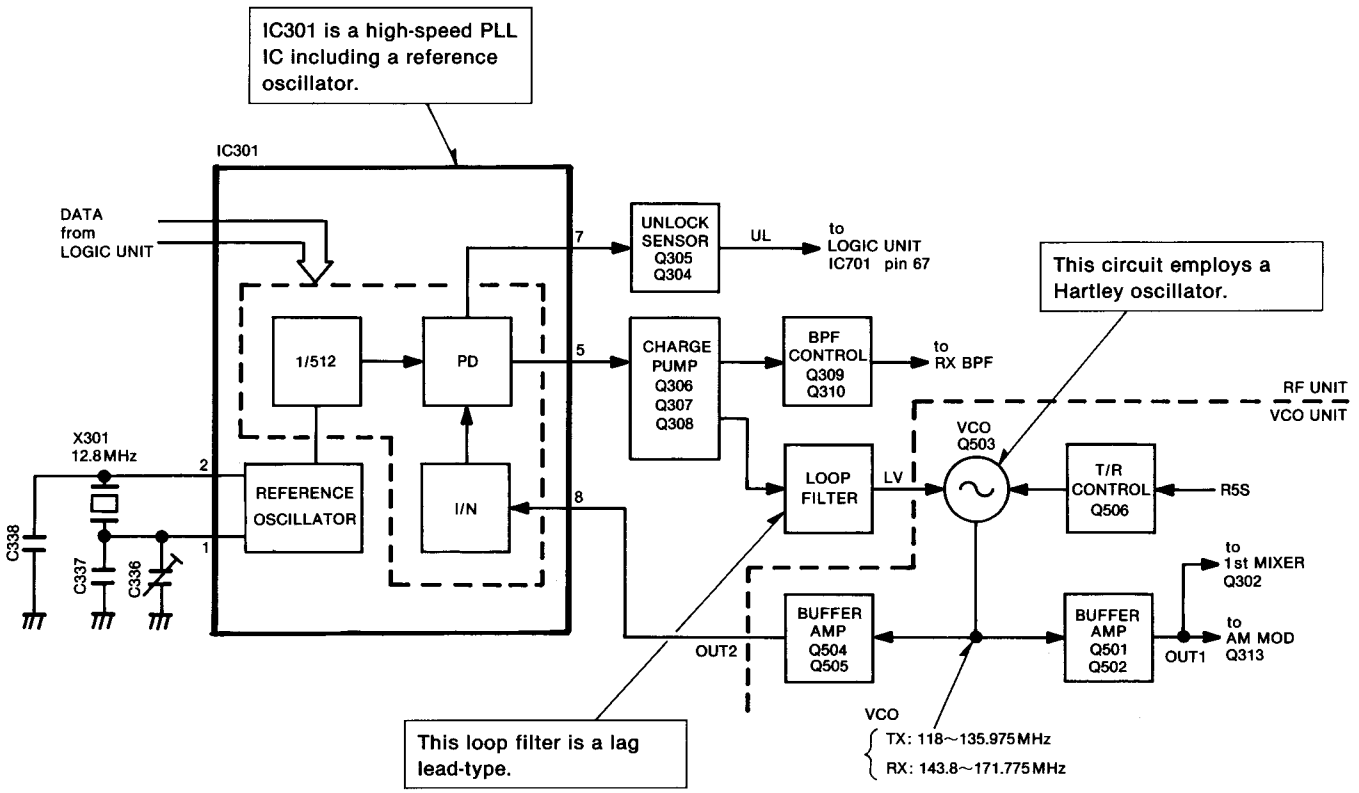


Fig. 6

4-4 POWER SUPPLY CIRCUITS

4-4-1 INTERNAL/EXTERNAL POWER SWITCHING CIRCUIT (MAIN UNIT)

When using a battery pack, relay RL101 is OFF and POWER SWITCH R145 is connected to the battery pack (INT).

When a power source with voltage 13.2V±10% is connected to EXTERNAL DC POWER JACK J304, RL101 is ON and R145 is connected to the external power source.

In case a wrong connection to J304 is made with reverse polarity, D106 is reversely biased, preventing RL101 from being ON and protecting the transceiver.

4-4-2 VOLTAGE LINES

VOLTAGE LINE	DESCRIPTION
Vcc	Passes POWER SWITCH voltage from a battery or EXT DC power source switched by RL101.
+5V	Common 5V current amplified by Q110 and Q111. Reference voltage made by IC102 and current amplifier Q116 and Q117.
+5C	Control line of +5S from the CPU. Normally this line is at "LOW".
+5S	Common 5V used in the VCO UNIT. Current amplified from +5C by Q112.
R5C	Control line of R5S from the CPU. In receive mode, this line is at "LOW".
R5S	Receive 5V current amplified by Q106 and Q107 and controlled by R5C. Reference voltage made by IC102, current amplifier Q116 and Q117 and inverter Q103.
T5C	Control line of mic amplifier IC101 power source. In transmit mode, this line is at "LOW".
T5M	Transmit 5V current amplified by Q108 and Q109 and controlled by MUTE line. Reference voltage made by IC102, current amplifier Q116 and Q117 and inverter Q104.
SEND	Transmit/receive switching line, 5V in receive mode and 0V in transmit mode made by Q102 using MIC2 or MCON line.
CPU5	Power source for the CPU. 4.4V passes through D112 from +5V while POWER SWITCH is ON, or approx. 3V passes through D112 of lithium backup battery BT101.

CPU5 LINE

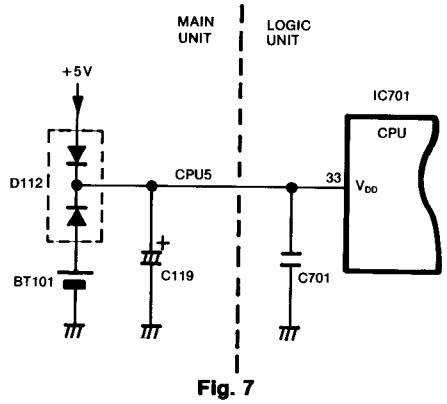


Fig. 7

4-4-3 VOX POWER SOURCE CIRCUIT (RF UNIT)

The current limiter circuit consists of Q318, D316, R366, R367 and R368. This circuit has a current limit of maximum 5mA and supplies a voltage to the optional HS-10SA VOX UNIT.

When the current is overloaded, Q318 reduces the current until the base voltage of Q318 plus V_{BE} and the emitter voltage of Q318 are the same.

4-5 LOGIC CIRCUITS (LOGIC UNIT)

The main part of the logic circuits is CPU IC701. This includes a 4K-byte ROM, 128-byte RAM and a circuit to drive FREQUENCY DISPLAY DS701.

Following are CPU explanations and their I/O ports.

CPU PORT ALLOCATIONS

INPUT PORTS

PORT NUMBER	PIN NUMBER	DESCRIPTION
INT 1 [Ro]	47	Port for VOR reference signals.
P00 [INT 0]	70	When the interrupt signal is received the CPU stops operating.
P03 [UL]	67	When the PLL circuit is unlocked, this port becomes "LOW".
P10~P13	61~58	These are input ports for the initial and key matrices.
P62 [So]	72	Port for VOR (9960 Hz) detector signals. When this port is "LOW" the CPU receives VOR signals.
P63 [Vo]	71	Port for VOR phase comparison data. The CPU reads the leading edge of this data.
P70 [BAT]	54	When this port is "HIGH", the LOW BATTERY INDICATOR appears.
P71 [SQLI]	53	When the squelch opens, this port becomes "LOW".
P72 [SEND]	52	When the [PTT] SWITCH is pushed, this port becomes "HIGH".
P73 [LAMPI]	51	When the [LIGHT] SWITCH is pushed, this port changes from "HIGH" to "LOW".

OUTPUT PORT

PORT NUMBER	PIN NUMBER	DESCRIPTION
P01 [CK]	69	Port for PLL serial data clock.
P02 [DATA]	68	Port for PLL serial data.
P20 [LAMP O]	57	Each time the P73 [LAMP I] changes to "LOW" from "HIGH", this port alternately outputs at "LOW" and "HIGH". While this port outputs "HIGH", the backlight for the FUNCTION DISPLAY is illuminated.
P21 [MUTE]	56	Port for TX MUTE signals. When the transceiver is changed from receive to transmit mode, this port remains "HIGH" for approximately 110msec.
P22 [T5C]	55	Port for T5V control. When this port outputs "LOW", T5V is supplied.
P30 [PSTB]	66	Port for strobe signals of PLL serial data.
P31 [BEEP]	65	Port for beep tone control. When this port outputs "HIGH", the beep tone generator circuit is activated.
P32 [+5C]	63	Port for +5V control. When this port outputs "LOW", +5V is supplied.
P33 [R5C]	62	Port for R5S control. When this port outputs "LOW", R5S is supplied.
P40	2	Port for LCD control. When the [POWER] SWITCH is turned OFF, this port outputs "HIGH".
P41~P43	1, 80, 79	Ports for the initial matrix.
P50~P53	78, 77, 76, 75	Ports for the key matrix.
P60	74	Not used.
P61 [VOR]	73	When the NAV band is selected, this port outputs"HIGH".

4-5-1 RESET CIRCUIT (LOGIC UNIT)

The reset circuit detects the BVC voltage to reset the CPU.

RESET CIRCUIT

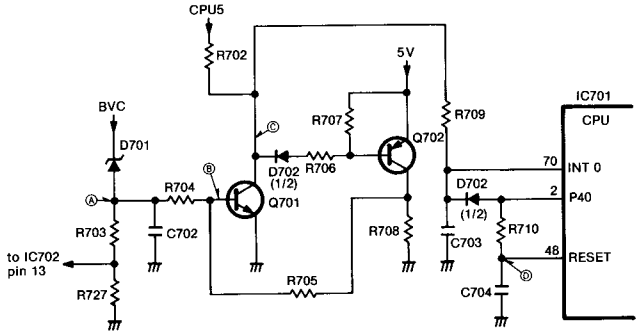


Fig. 8

RESET TIMING CHART

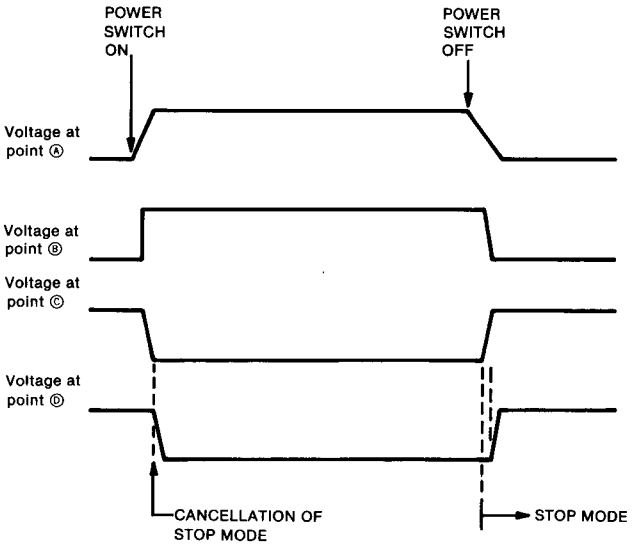


Fig. 9

4-6 VOR CIRCUIT (VOR UNIT)

When the transceiver is set in the NAV band (108~117.975MHz), pin 73 of the CPU (IC701) becomes "LOW", turning Q603 ON, then the VOR circuit is activated.

Detected signals from the AM detector (D123 and D124 on the MAIN UNIT) are buffer amplified at IC601 (D). Output signals include 30Hz variable phase components and 9960Hz reference phase components.

30Hz variable phase components are picked up at bandpass filter IC601 (C), converted to square wave signals at comparator IC604 (B), and are then applied to pin 71 of the CPU as variable signals (Vo).

9960Hz reference phase components are picked up at bandpass filter IC601 (A). These components are FM modulated with 480Hz deviation and 30Hz modulation. Signals are then amplified to approx. 0~1.8V at limiter amplifier IC602 (B) and converted to PWM (Pulse Width Modulation) signals at IC602 (A).

The PWM (Pulse Width Modulation) signals are detected at a low-pass filter consisting of R629, C616, R630 and C619 to obtain a 30Hz reference phase signal. The 30Hz signals are amplified at IC603 (A), passed through bandpass filter IC603 (B), converted to square wave signals at comparator IC604 (A), and are then applied to pin 47 of the CPU as reference signals (Ro).

A portion of output from IC601 (A) is amplified at Q601 and detected at D602. When the VOR signal is received Q602 is turned ON and the CPU receives a "LOW" to display the VOR INDICATORS.

IC601 (B) applies the bias voltage fixed by R618, R619 and C612 to each IC.

VOR CIRCUIT

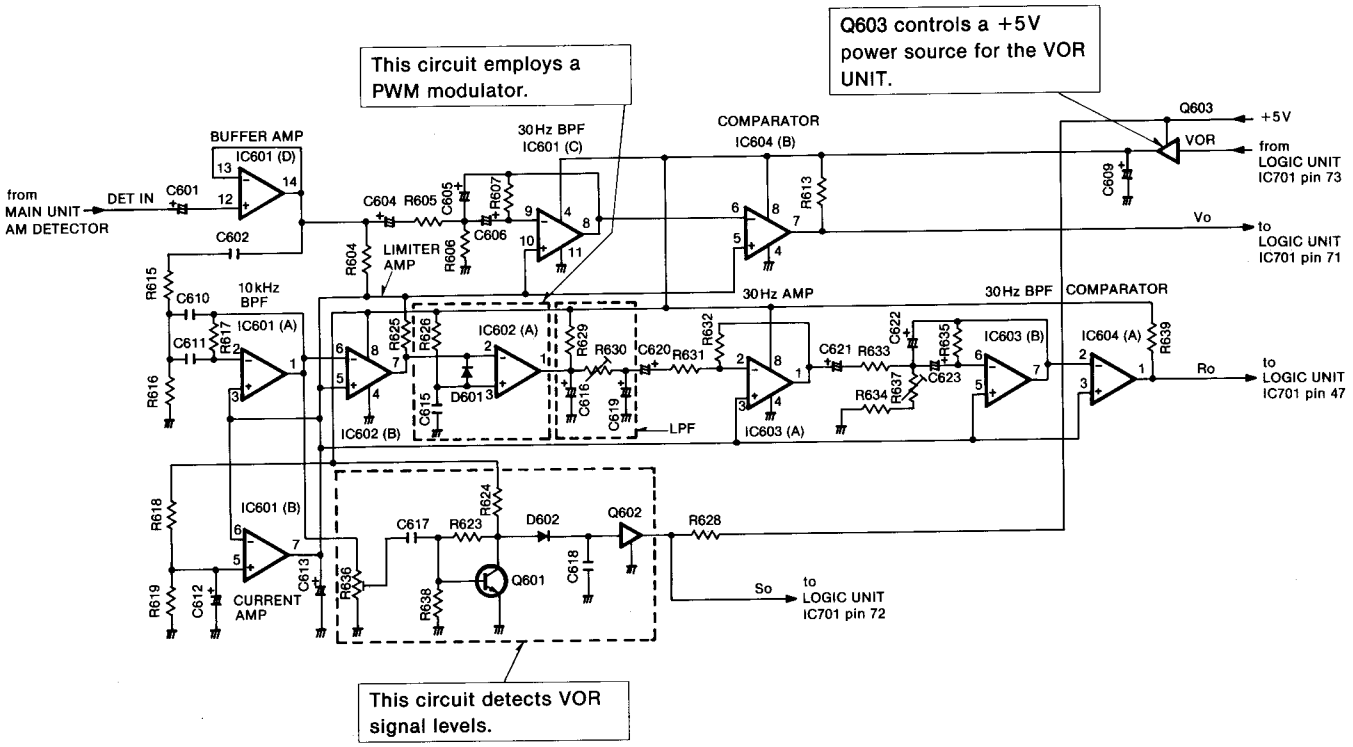


Fig. 10

4-7 OTHER CIRCUITS

4-7-1 LAMP CIRCUIT (MAIN AND LOGIC UNITS)

The lamp circuit consists of Q115, D115 and other components and drives backlights DS702 and DS703, ensuring that brightness does not change even with a change of power voltage.

S102 controls Q120 through the CPU. When Q120 is turned ON current flows into R128, resulting in the base voltage of Q115 being approximately Vcc −1.2V as determined by D115.

The emitter voltage of Q115 is then Vcc −0.6V and the voltage at both ends of R127 is kept constant. The result is a constant current even with a change of power supply voltage.

4-7-2 BEEP CIRCUIT (MAIN UNIT)

This is a phase shift oscillator consisting of R122~R125, C120~C122 and Q113. The circuit oscillates when the cathode of D113 becomes "HIGH". The oscillating frequency is set at approximately 2500Hz.

4-7-3 TRANSMIT/RECEIVE SWITCHING CIRCUIT (MAIN UNIT)

When the PTT SWITCH is pushed, Q102 turns ON and pin 52 (SEND line) of the CPU and the base of Q105 become "HIGH". Q108 then turns ON and is activated. After 110msec., pin 56 (MUTE line) of the CPU becomes "LOW", and then 5V is applied to the base of Q108 via Q104.

When the PTT SWITCH is released, Q102 turns OFF. After 12msec., pin 62 (R5C line) of the CPU becomes "LOW", and then 5V is applied to the base of Q106 via Q103.

4-7-4 REDUCED VOLTAGE DETECTING CIRCUIT

The reduced voltage detecting circuit consists of IC702 (F), D701, R703 and R727.

BVC passes through Vcc R131, is divided at R703 and R727, and is then applied to pin 13 of IC702 (F).

If the voltage of IC702 (F) pin 13 decreases to less than 2.2V, the output voltage at pin 12 is "HIGH". This information is fed to the CPU, causing the LOW BATTERY INDICATOR to appear on the FUNCTION DISPLAY.
Thus, if the output voltage of the BATTERY PACK decreases to less than 10.8V, this function is activated.

REDUCED VOLTAGE DETECTING CIRCUIT

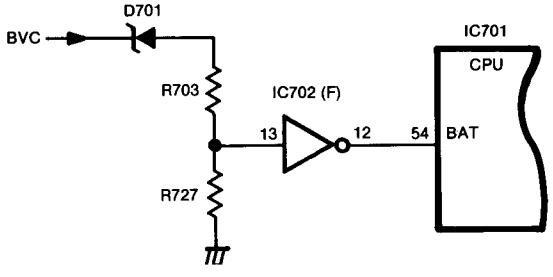


Fig. 11

SECTION 5 MECHANICAL PARTS AND DISASSEMBLY

5-1 CASE DISASSEMBLY

1. Turn the POWER SWITCH OFF and remove the battery pack.

2. Remove the screw Ⓐ and the 4 screws Ⓑ on the rear panel and the 4 screws Ⓒ on the bottom as shown in Fig. 5-1-1.

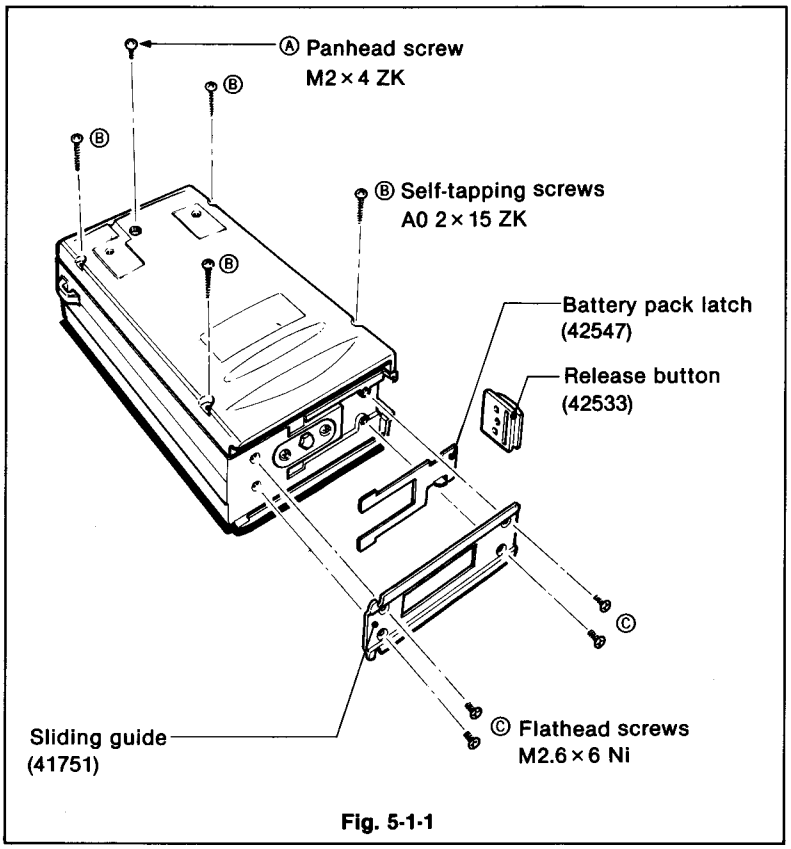


Fig. 5-1-1

3. Remove the rear panel as shown in Fig. 5-1-2.

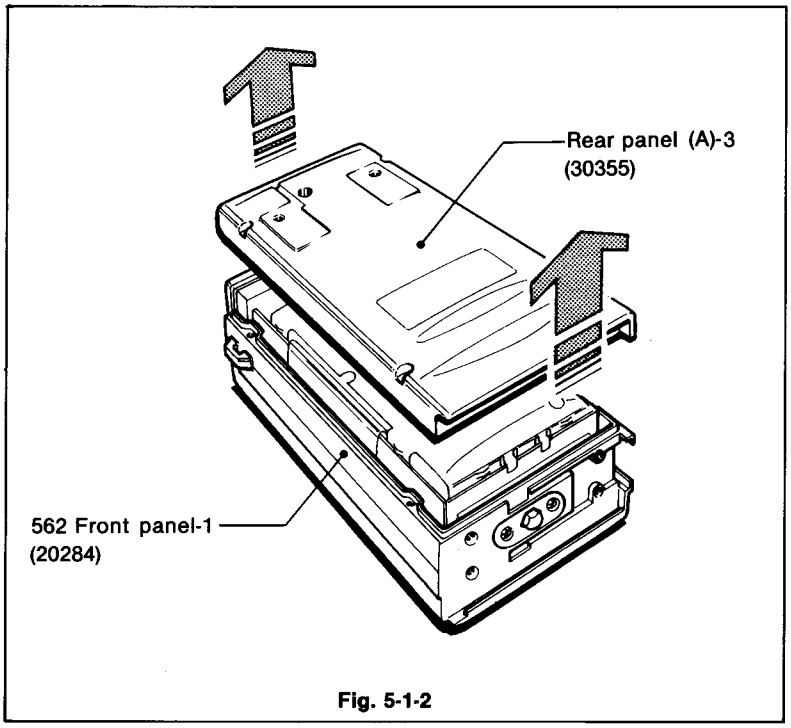


Fig. 5-1-2

4. Slide the inner frame upward slightly as shown in Fig. 5-1-3.

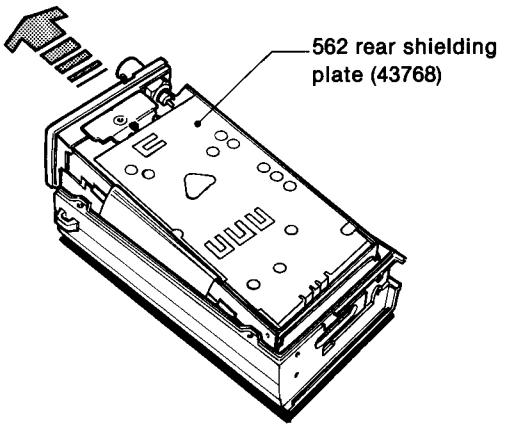


Fig. 5-1-3

5. Lift the frame away from the front panel. Be careful not to damage the flexible board.

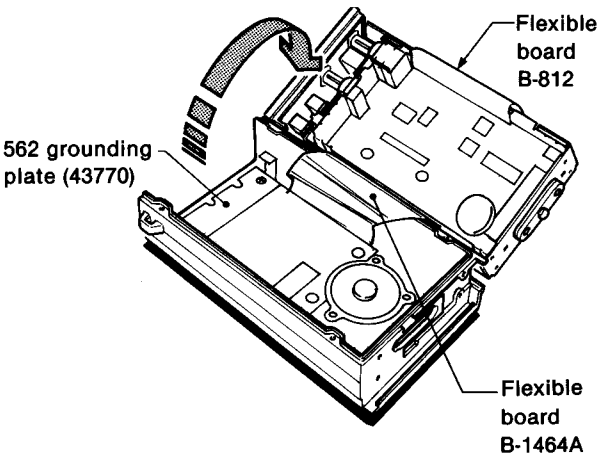


Fig. 5-1-4

6. Remove the 2 knobs on the top panel (VOLUME and SQUELCH) and push IN the ANL and HIGH/LOW SWITCHES.

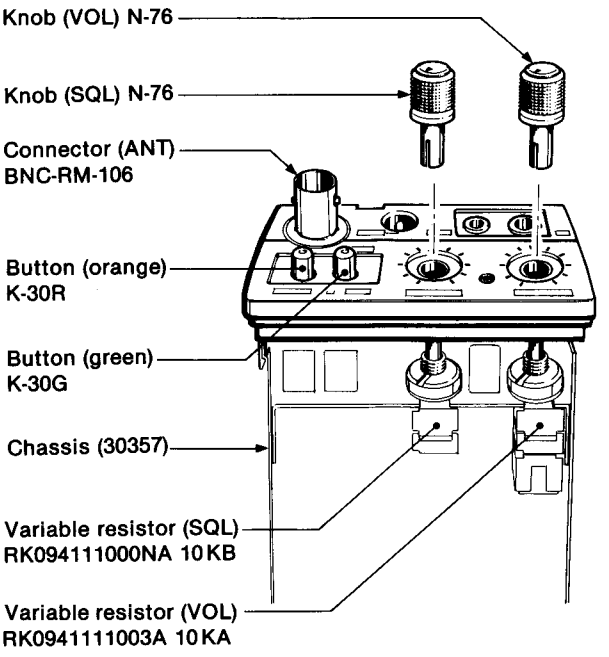


Fig. 5-1-5

7. Remove the 4 screws on the sides of the chassis, and open the chassis as shown in Fig. 5-1-6 and Fig. 5-1-7.

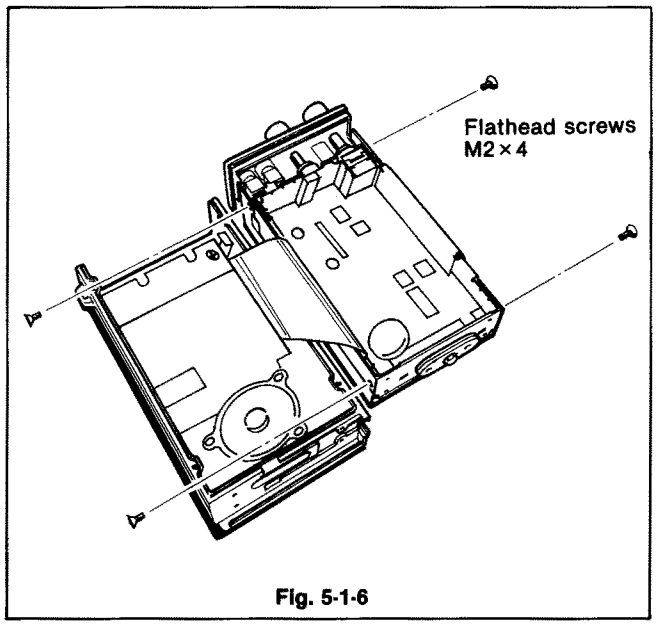


Fig. 5-1-6

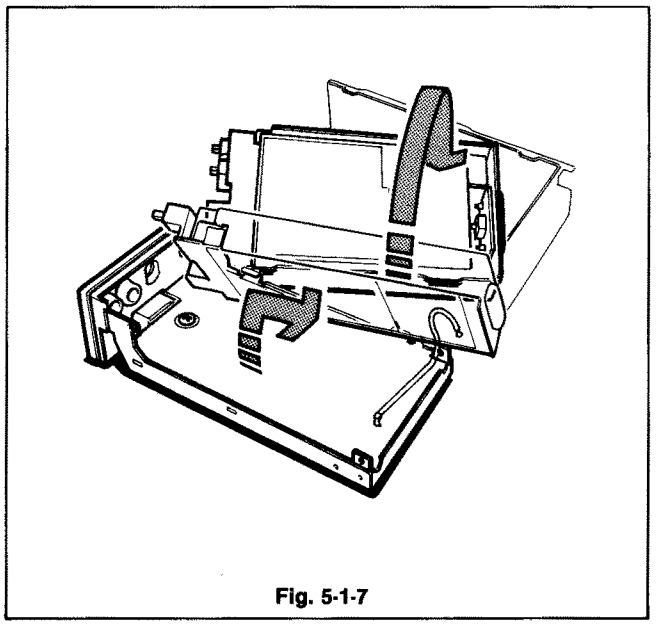


Fig. 5-1-7

5-2 TOP PANEL DISASSEMBLY

1. Remove the screw Ⓐ.
2. Remove the BNC nut and the BNC washer.
3. Remove the ANTENNA CONNECTOR by unsoldering point Ⓑ on the components side and point Ⓒ on the foil side of the RF UNIT. (Fig. 5-2-1)
4. Remove the top panel by slightly prying outward both side tabs (points Ⓓ) of the top panel. See Fig. 5-2-2 below. Be careful not to break the tabs.

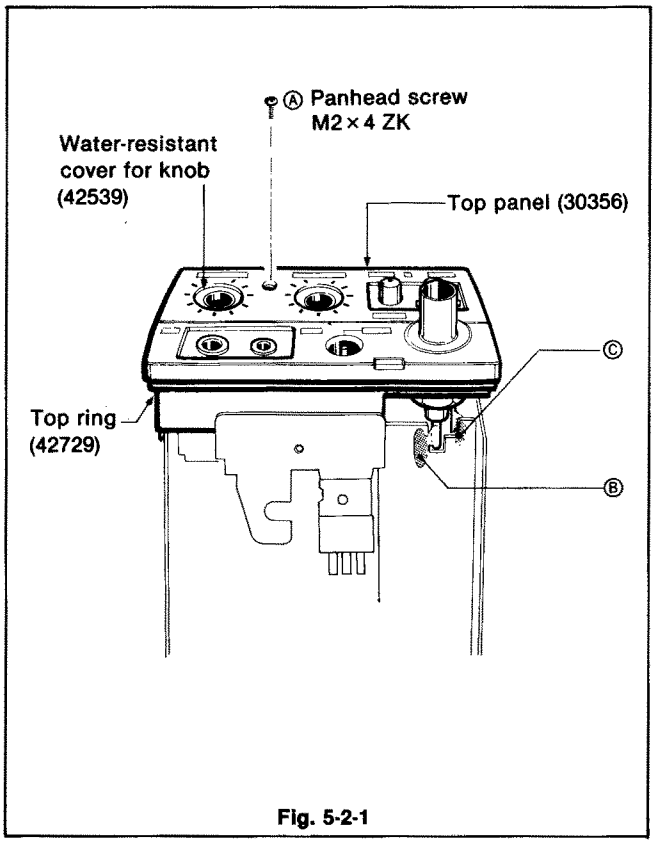


Fig. 5-2-1

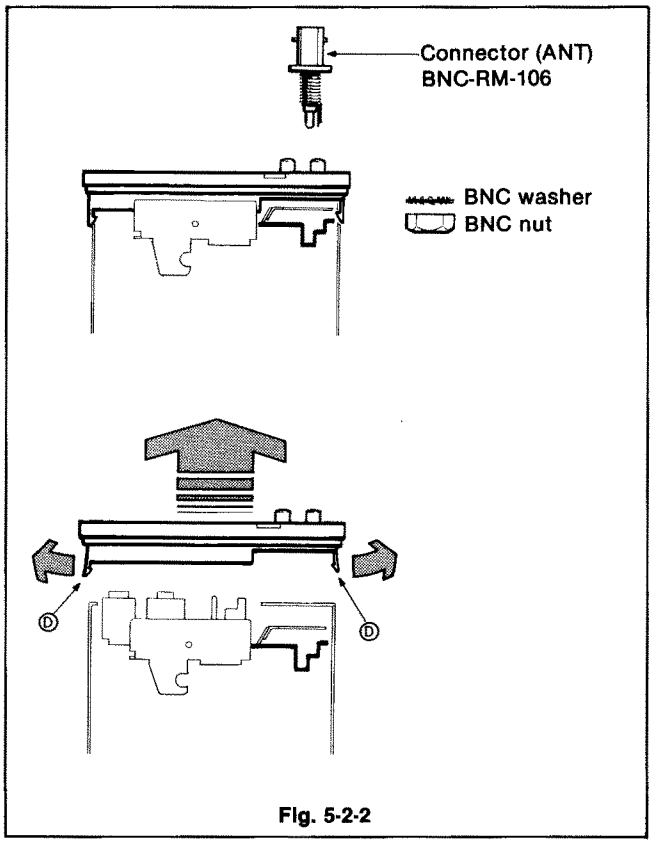


Fig. 5-2-2

5-3 PA AND EXTERNAL JACK DISASSEMBLY

1. Unsolder points Ⓐ to remove the VCO shielding plate. (Fig. 5-3-2)
2. To remove the heatsink unscrew and remove the screw Ⓑ then unsolder solder point Ⓒ on the components side and solder point Ⓓ on the foil side of the RF UNIT.

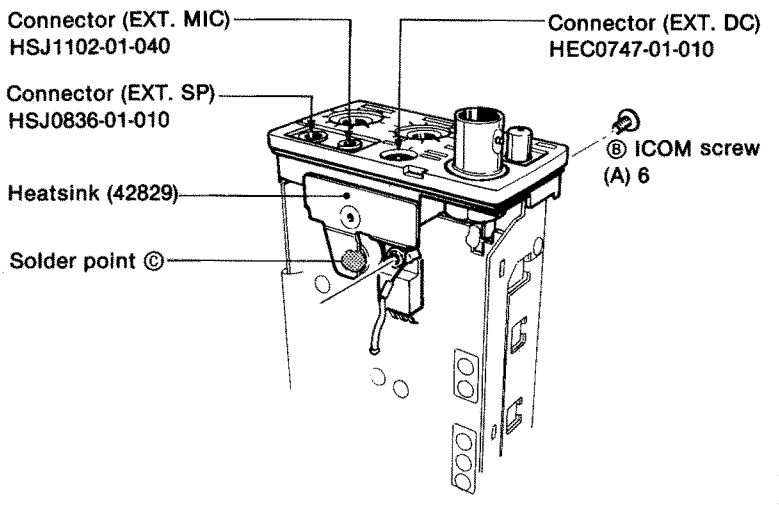


Fig. 5-3-1

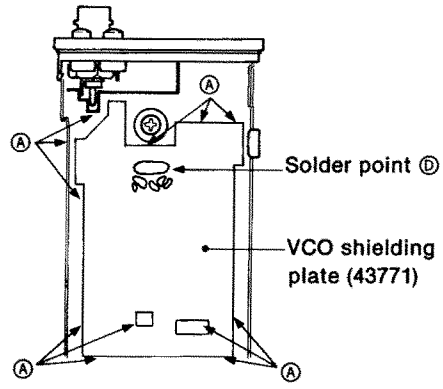


Fig. 5-3-2

5-4 SPEAKER AND MICROPHONE DISASSEMBLY

1. Remove the 3 screws Ⓐ and the speaker plate as shown in Fig. 5-4-1.

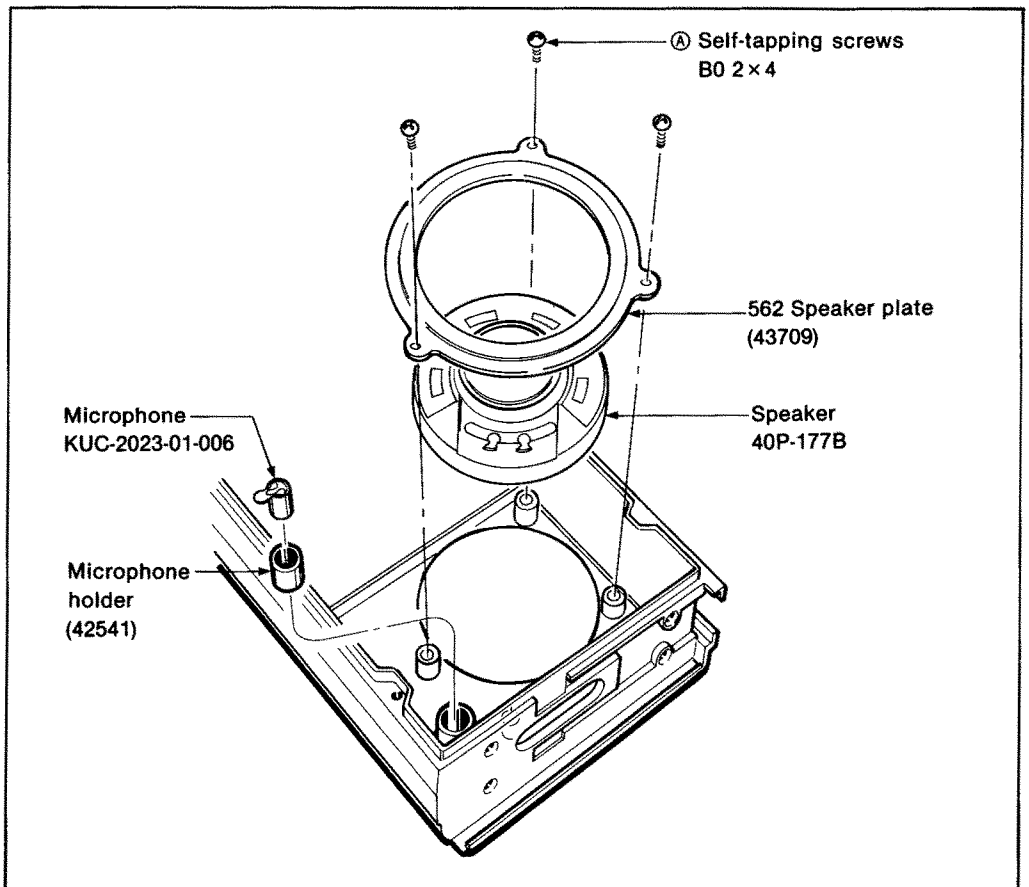


Fig. 5-4-1

5-5 PTT SEAL DISASSEMBLY

1. Remove the 2 screws Ⓐ and the PTT plate as shown in Fig. 5-5-1.

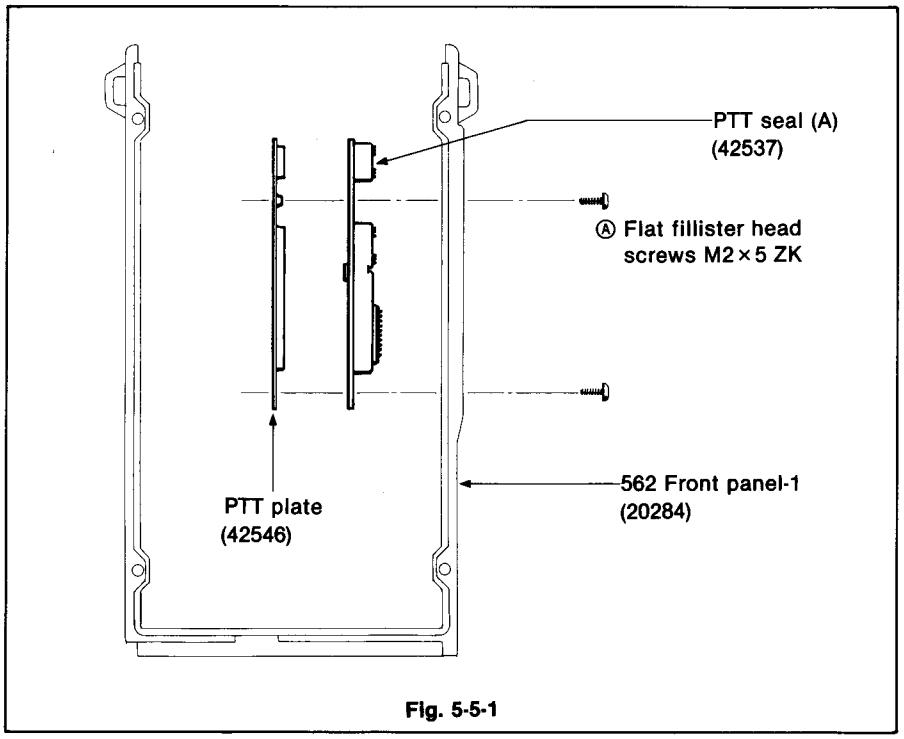


Fig. 5-5-1

5-6 UNIT BOTTOM DISASSEMBLY

1. Unsolder solder points Ⓐ to remove the screw lugs. Unsolder solder point Ⓑ to remove the contact for a short time to avoid damaging the contact holder.
2. Remove the 2 screws Ⓒ and the contact holder as shown in Fig. 5-6-2.

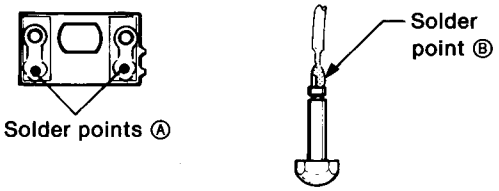


Fig. 5-6-1

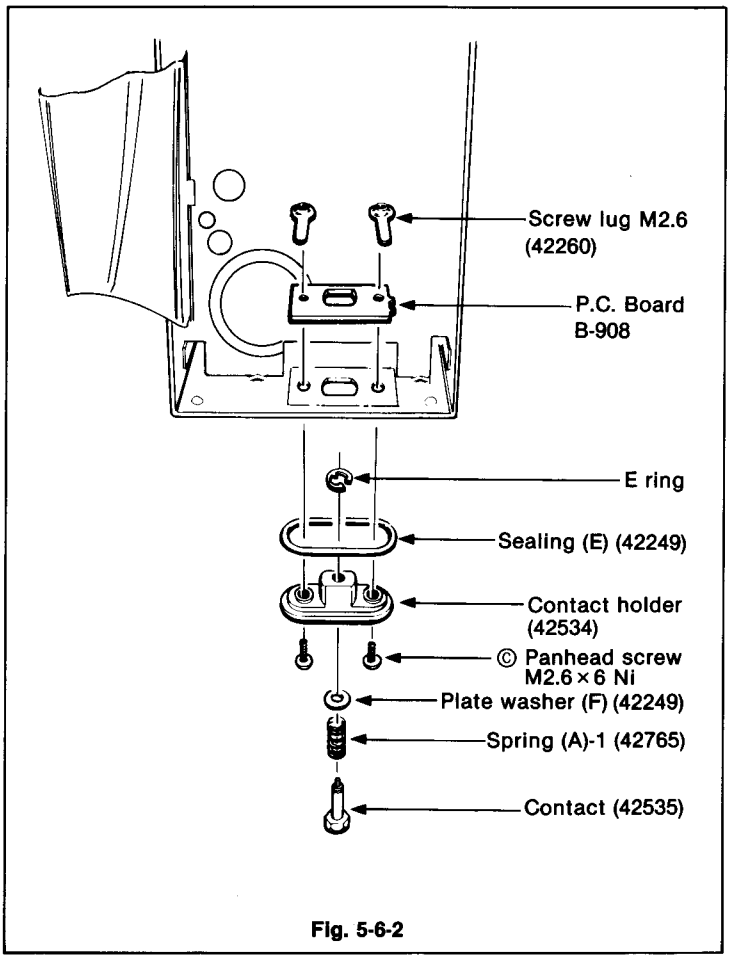
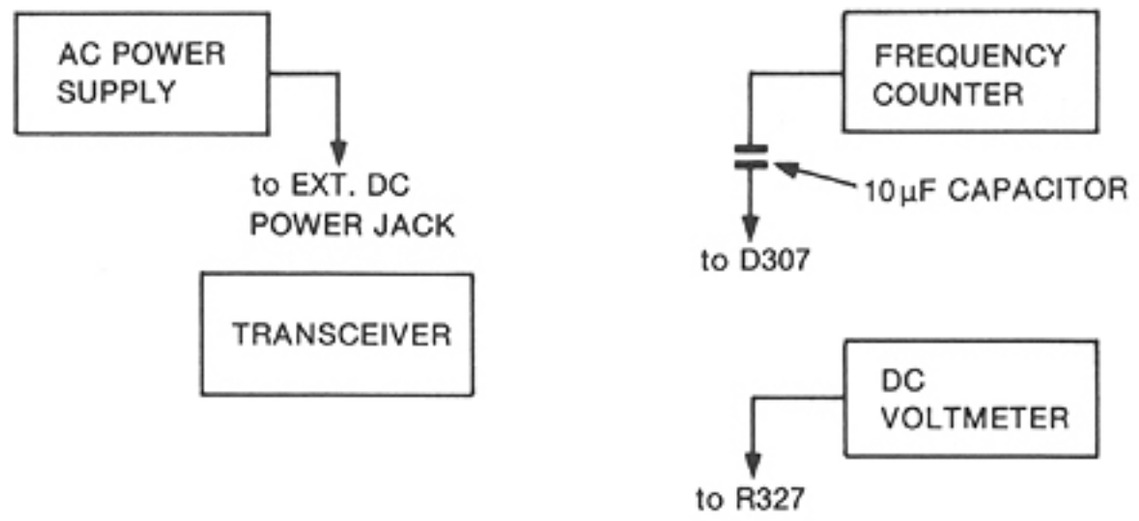


Fig. 5-6-2

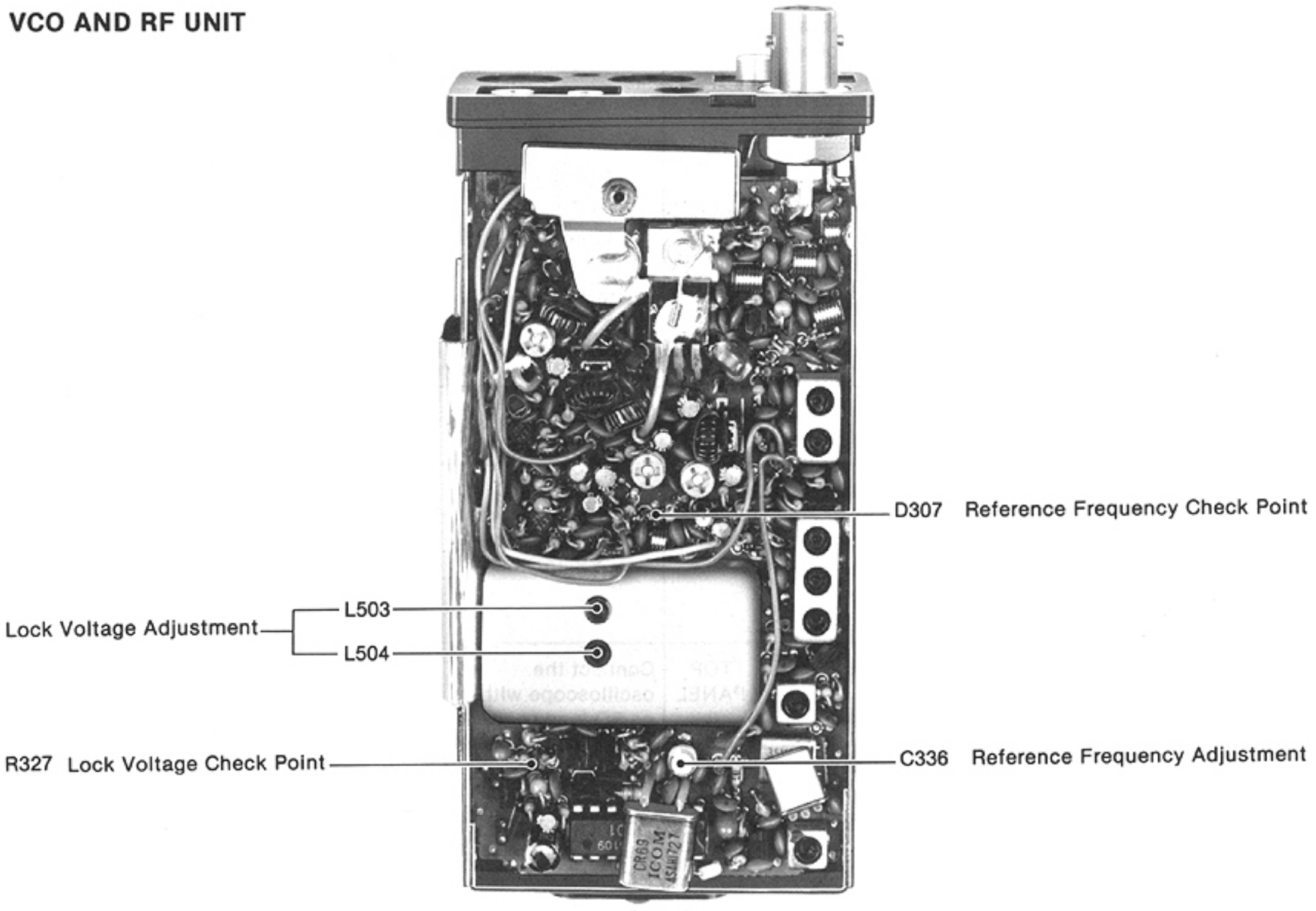
SECTION 6 ADJUSTMENT PROCEDURES

6-1 PLL ADJUSTMENT

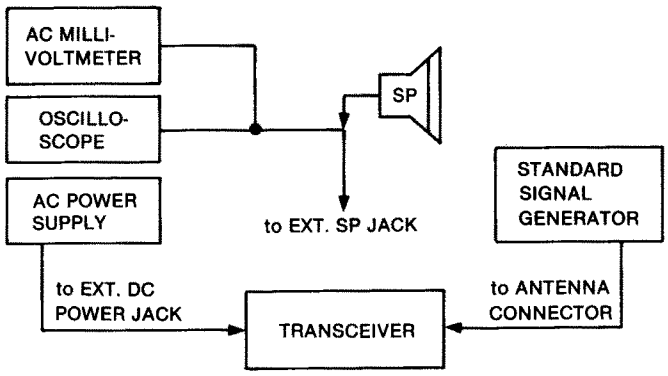
TEST INSTRUMENTS REQUIRED	MEASUREMENT CONNECTION LOCATION
(1) AC POWER SUPPLY • Output voltage : 13.2V DC • Current capacity : 2A or more (2) FREQUENCY COUNTER • Frequency range : 0.1~180MHz • Frequency accuracy : ±1ppm or better • Sensitivity : 100mV or better (3) DC VOLTMETER • Input impedance : 50kΩ/DC or better	

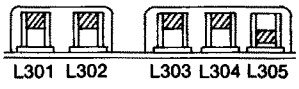
ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
			UNIT	LOCATION		UNIT	ADJUST
LOCK VOLTAGE	1	• Frequency display: 135.975MHz • Connect a 50Ω dummy load to the ANTENNA CONNECTOR. • Receive mode	RF	Connect the DC voltmeter to R327.	6.5V	VCO	L504
	2	• Transmit mode			6.5V		L503
REFERENCE FREQUENCY	1	• Frequency display: 108.00MHz • Receive mode	RF	Connect the frequency counter to the cathode of D307.	143.800MHz	RF	C336

VCO AND RF UNIT



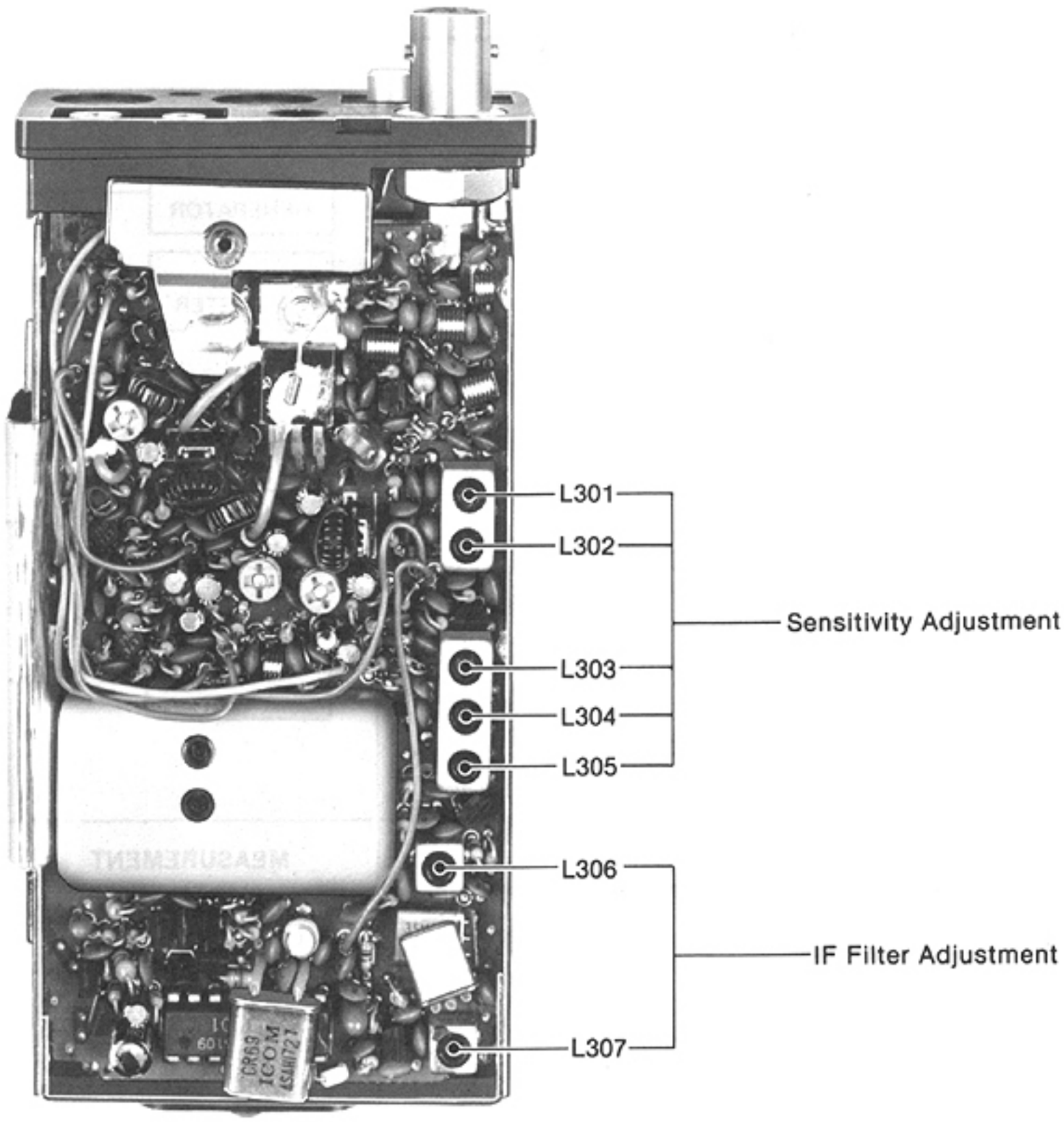
6-2 RECEIVER ADJUSTMENT

TEST INSTRUMENTS REQUIRED	MEASUREMENT CONNECTION LOCATION
(1) AC POWER SUPPLY • Output voltage : 13.2V DC • Current capacity : 2A or more (2) STANDARD SIGNAL GENERATOR (SSG) • Frequency range : 0.1~180MHz • Output level : −127~−17dBm (0.1μV~32mV) (3) AC MILLI-VOLTMETER • Measuring range : 10mV~10V (4) EXTERNAL SPEAKER • Impedance : 8Ω (5) OSCILLOSCOPE • Frequency range : DC~20MHz • Measuring range : 0.01~10V	

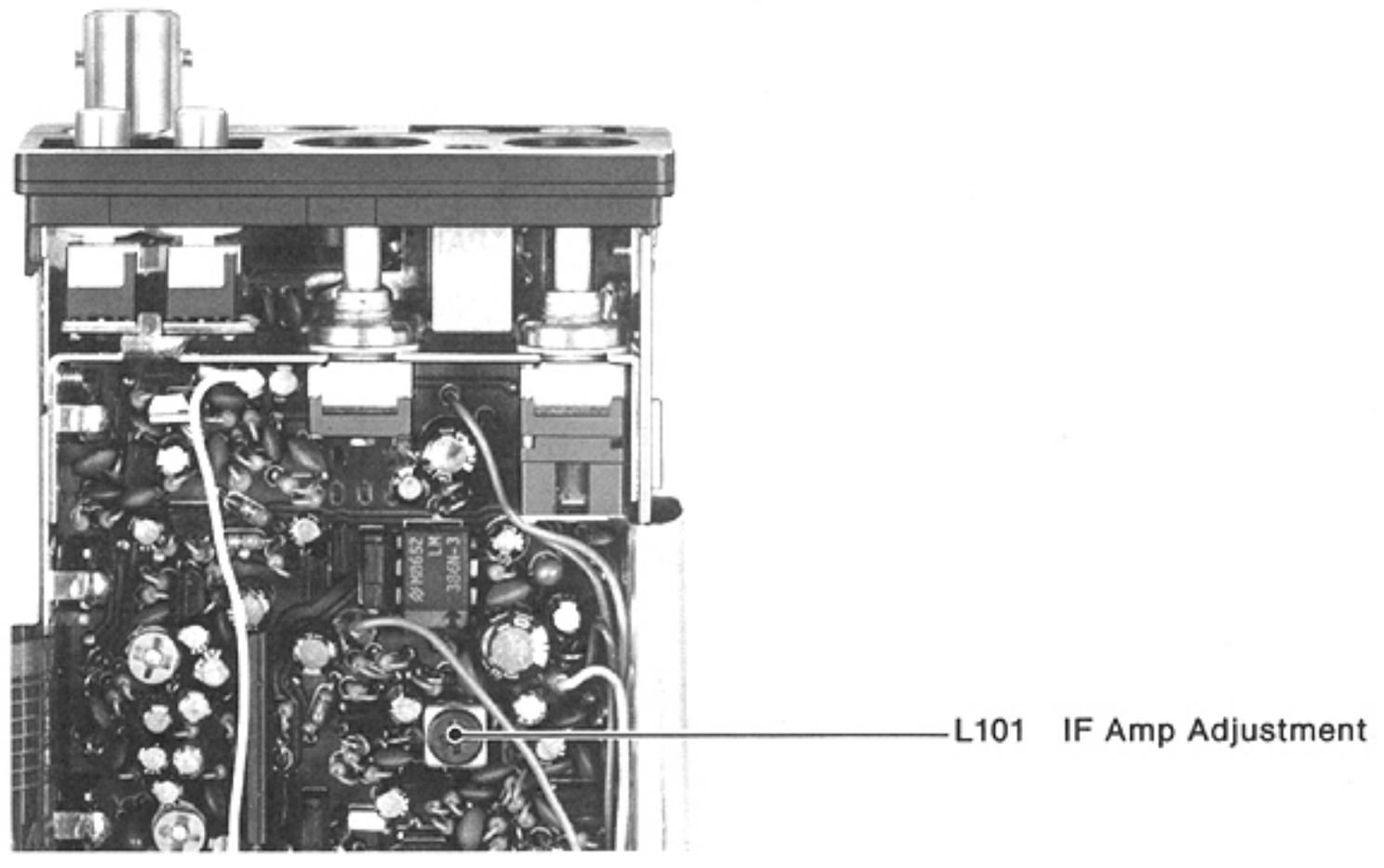
ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
			UNIT	LOCATION		UNIT	ADJUST
SENSI-TIVITY	1	• Frequency display: 127.025MHz • Receive mode • ANL SWITCH: OFF • SQUELCH CONTROL: Max. CW • Apply an RF signal to the ANTENNA CONNECTOR. Level: −107dBm (1μV) Mod. : 1kHz/30%/AM • Each coil has two peak points that must be adjusted as follows:  L301~L304: upper side peak point L305: lower side peak point	TOP PANEL	Connect the AC milli-voltmeter with an 8Ω load to the EXT. SP JACK.	Max. audio output	RF	L301 L302 L303 L304 L305
		NOTE: Repeat above adjustment several times.					
IF FILTER	1	• Apply an RF signal to the ANTENNA CONNECTOR. Level: −97dBm (3.2μV) Mod. : 1kHz/30%/AM	TOP PANEL	Connect the AC milli-voltmeter with an 8Ω load to the EXT. SP JACK.	Max. audio output	RF	L306 L307
IF AMP	1	• Apply an RF signal to the ANTENNA CONNECTOR. Level: −47dBm (1mV) Mod. : 1kHz/30%/AM	TOP PANEL	Connect the oscilloscope with an 8Ω load to the EXT. SP JACK.	Max. audio output	MAIN	L101

CW: Clockwise

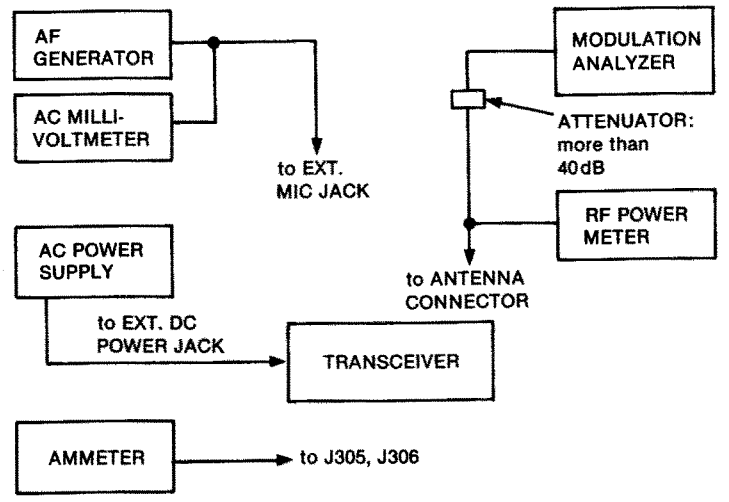
RF UNIT



MAIN UNIT



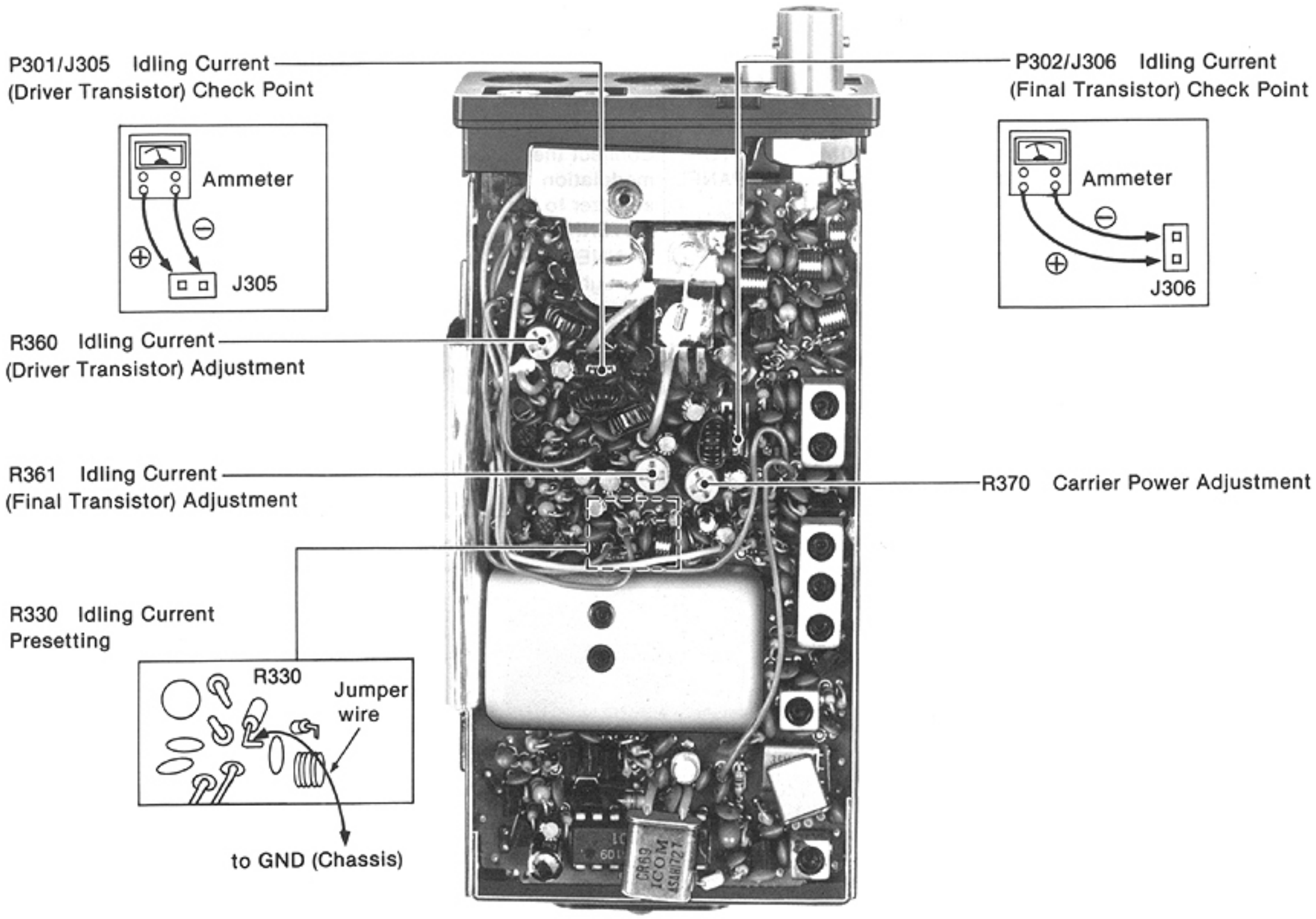
6-3 TRANSMITTER ADJUSTMENT

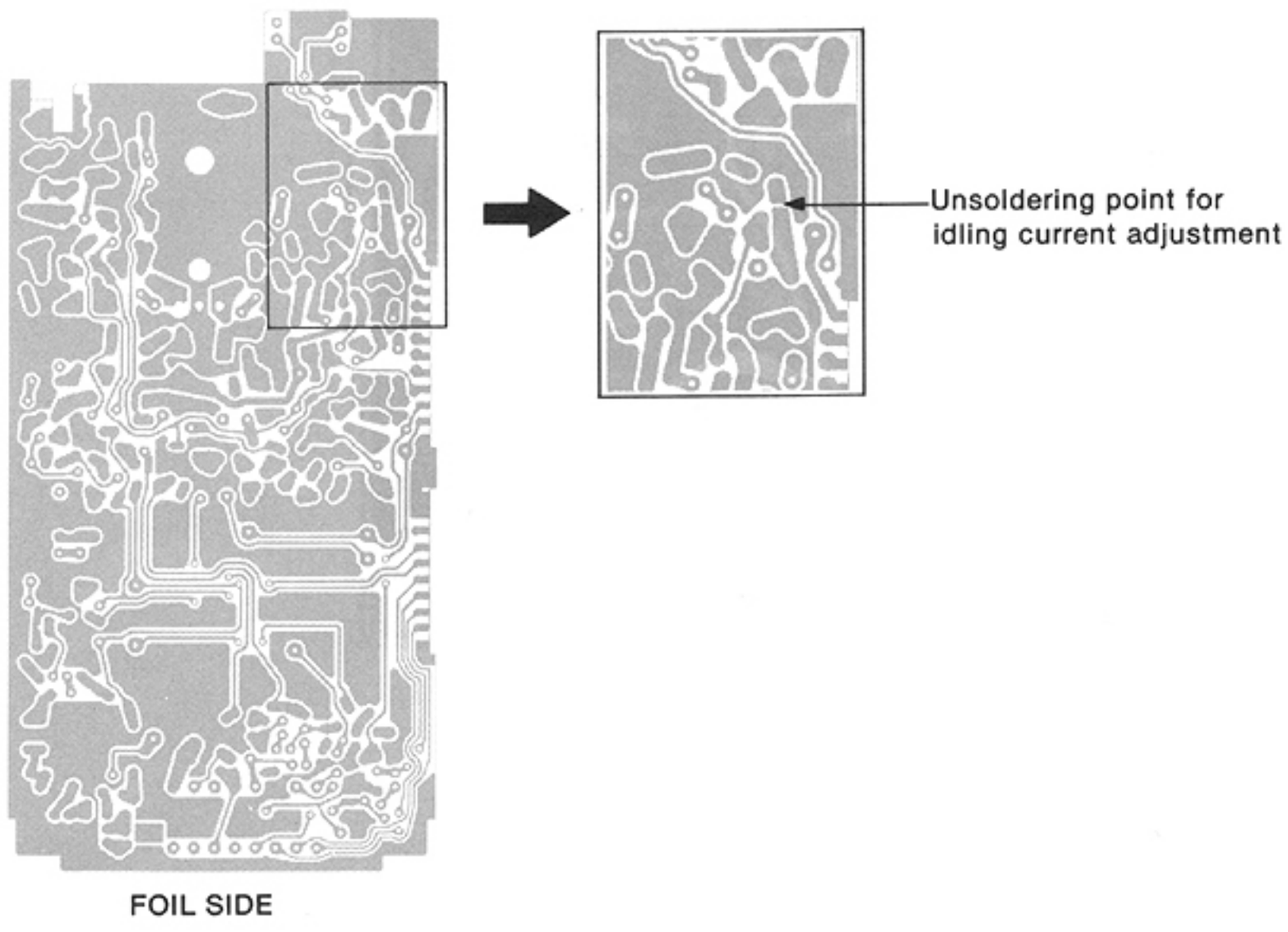
TEST INSTRUMENTS REQUIRED	MEASUREMENT CONNECTION LOCATION
(1) AC POWER SUPPLY • Output voltage : 13.2V DC • Current capacity : 2A or more (2) RF POWER METER (TERMINATED TYPE) • Measuring range : 1~10W • Frequency range : 100~140MHz • Impedance : 50Ω • SWR : Less than 1:1.2 (3) AMMETER • Measurement capability : 200mA (4) AF GENERATOR (AG) • Frequency range : 200~2000Hz • Output level : 0~200mV (5) AC MILLI-VOLTMETER • Measuring range : 2~200mV (6) MODULATION ANALYZER • Frequency minimum : 180MHz • Measuring range : 0~100%	

ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
			UNIT	LOCATION		UNIT	ADJUST
IDLING CURRENT Ⓐ For driver transistor	1	• Frequency display: 127.00MHz • Unsolder land between C369 and L313. (See p. 6-5) • Unplug P301 and P302. • R360, R361: Max. CW • R370: Max. CCW • Connect a jumper wire between R330 and GND. • RF OUTPUT POWER SWITCH: HIGH • Transmit mode	RF	Connect the ammeter to J305.	50mA	RF	R360
Ⓑ For final transistor	2			Connect the ammeter to J306.	100mA		R361
		NOTE: After above adjustments, turn POWER SWITCH OFF. Re-plug P301 and P302 into J305 and J306 respectively, and re-solder land between C369 and L313. Remove the jumper wire from R330.					
CARRIER POWER	1	• Frequency display: 127.00MHz • RF OUTPUT POWER SWITCH: HIGH • R370: Max. CCW • Apply no AF signal to the EXT. MIC JACK. • Transmit mode	TOP PANEL	Connect the RF power meter to the ANTENNA CONNECTOR.	1.6W	RF	R370
	2	• Frequency display: 118.00MHz • Frequency display: 135.975MHz			1.1~1.6W		Verify
		NOTE: If the output power drops under 1.1W in above verification 2, adjust R370 again up to 1.1W.					

CW: Clockwise CCW: Counterclockwise

RF UNIT

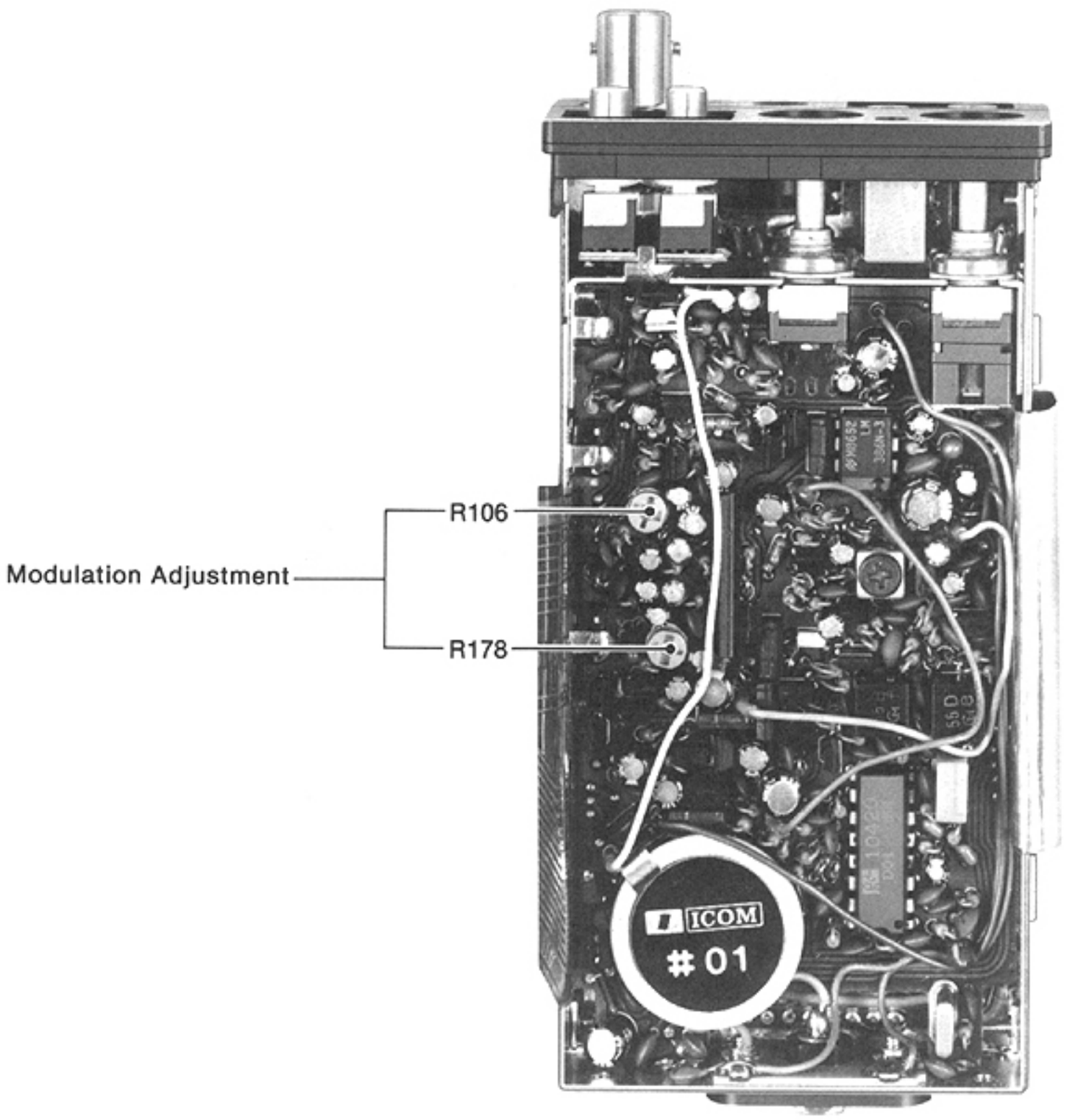

P301/J305 Idling Current
(Driver Transistor) Check Point
Ammeter
J305
P302/J306 Idling Current
(Final Transistor) Check Point
Ammeter
J306
R360 Idling Current
(Driver Transistor) Adjustment
R361 Idling Current
(Final Transistor) Adjustment
R370 Carrier Power Adjustment
R330 Idling Current
Presetting
R330
Jumper wire
to GND (Chassis)


Unsoldering point for
idling current adjustment
FOIL SIDE

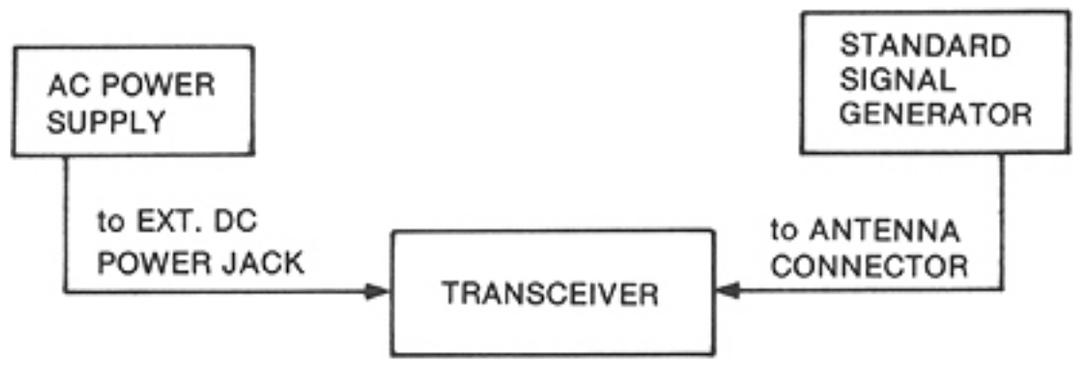
TRANSMITTER ADJUSTMENT (CONTINUED)

ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
			UNIT	LOCATION		UNIT	ADJUST
MODULATION	1	• Frequency display: 127.00 MHz • R178, R106: Center • Apply an AF signal to the EXT. MIC JACK: 1 kHz, 150 mV. • Transmit mode	TOP PANEL	Connect the modulation analyzer to the ANTENNA CONNECTOR through an attenuator.	90%	MAIN	R106
	2	• Apply an AF signal to the EXT. MIC JACK: 1 kHz, 15 mV. (20 dB down)			33%		R178
	3	• Apply an AF signal to the EXT. MIC JACK: 1 kHz, 150 mV.			85~95%		Verify
		NOTE: If modulation level is not within 85~95%, adjust step 1 again.					

MAIN UNIT



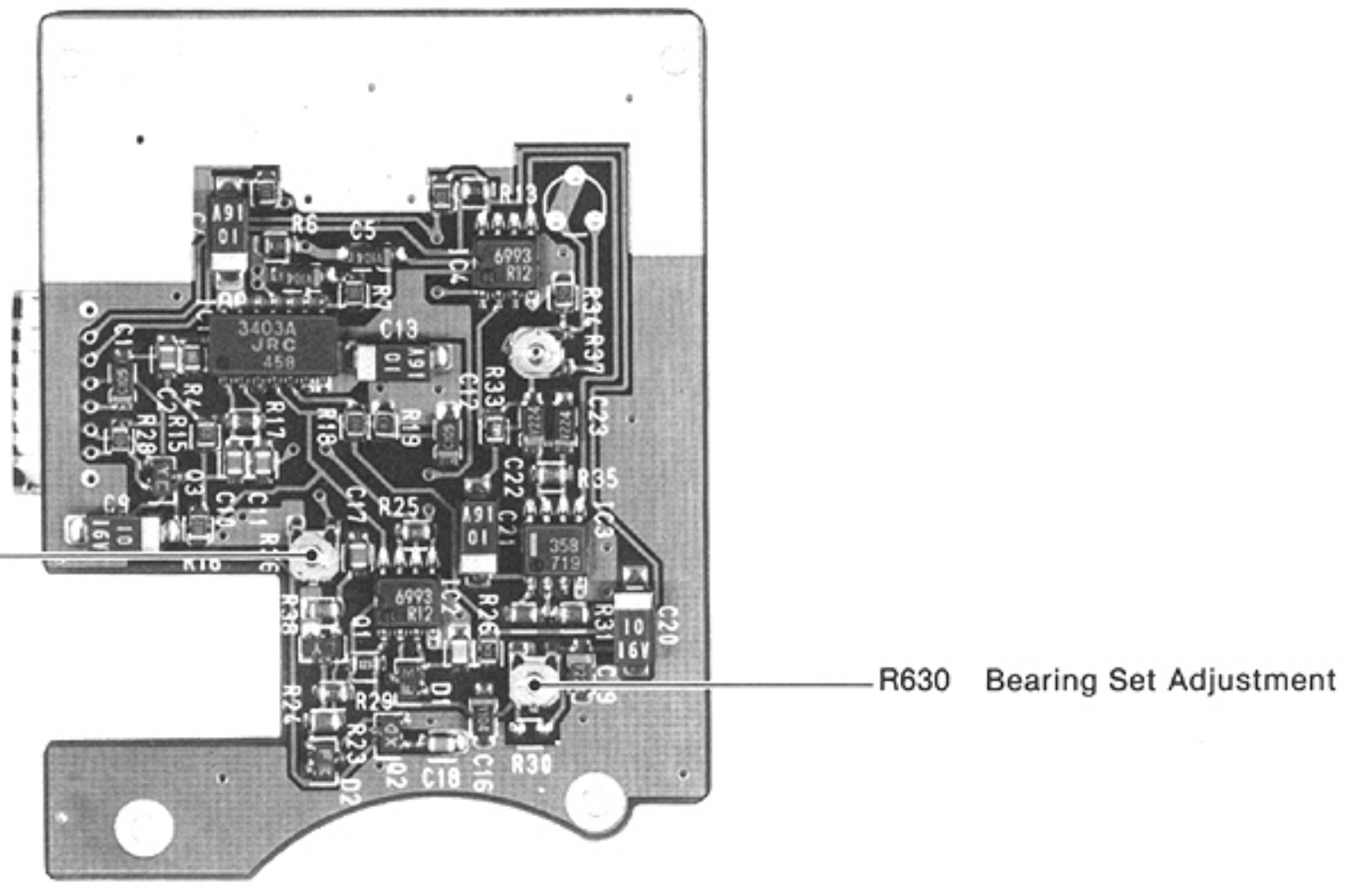
6-4 VOR ADJUSTMENT

TEST INSTRUMENTS REQUIRED	MEASUREMENT CONNECTION LOCATION
(1) AC POWER SUPPLY • Output voltage : 13.2V DC • Current capacity : 2A or more (2) STANDARD SIGNAL GENERATOR (SSG) • VOR bearing function included. • Frequency range : 0.1~180MHz • Output level : −127dBm~−17dBm (0.1μV~32mV)	

ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
			UNIT	LOCATION		UNIT	ADJUST
BEARING SET	1	• Frequency display: 113.00MHz • Receive mode • ANL SWITCH: OFF • SQUELCH CONTROL: Max. CW • Apply an RF signal to the ANTENNA CONNECTOR. Level : −60dBm (0.22mV) Ref. Mod.: 30% Ver. Mod.: 30% Bearing : From 90°	FRONT PANEL	FUNCTION DISPLAY	"FROM" "090°"	VOR	R630
OFF FLAG	1	• Apply an RF signal to the ANTENNA CONNECTOR. Level : −90dBm (7.1μV) Ref. Mod.: 15% Ver. Mod.: 30%	FRONT PANEL	FUNCTION DISPLAY	Adjust to a point just after VOR indicators appear.	VOR	R636

CW: Clockwise

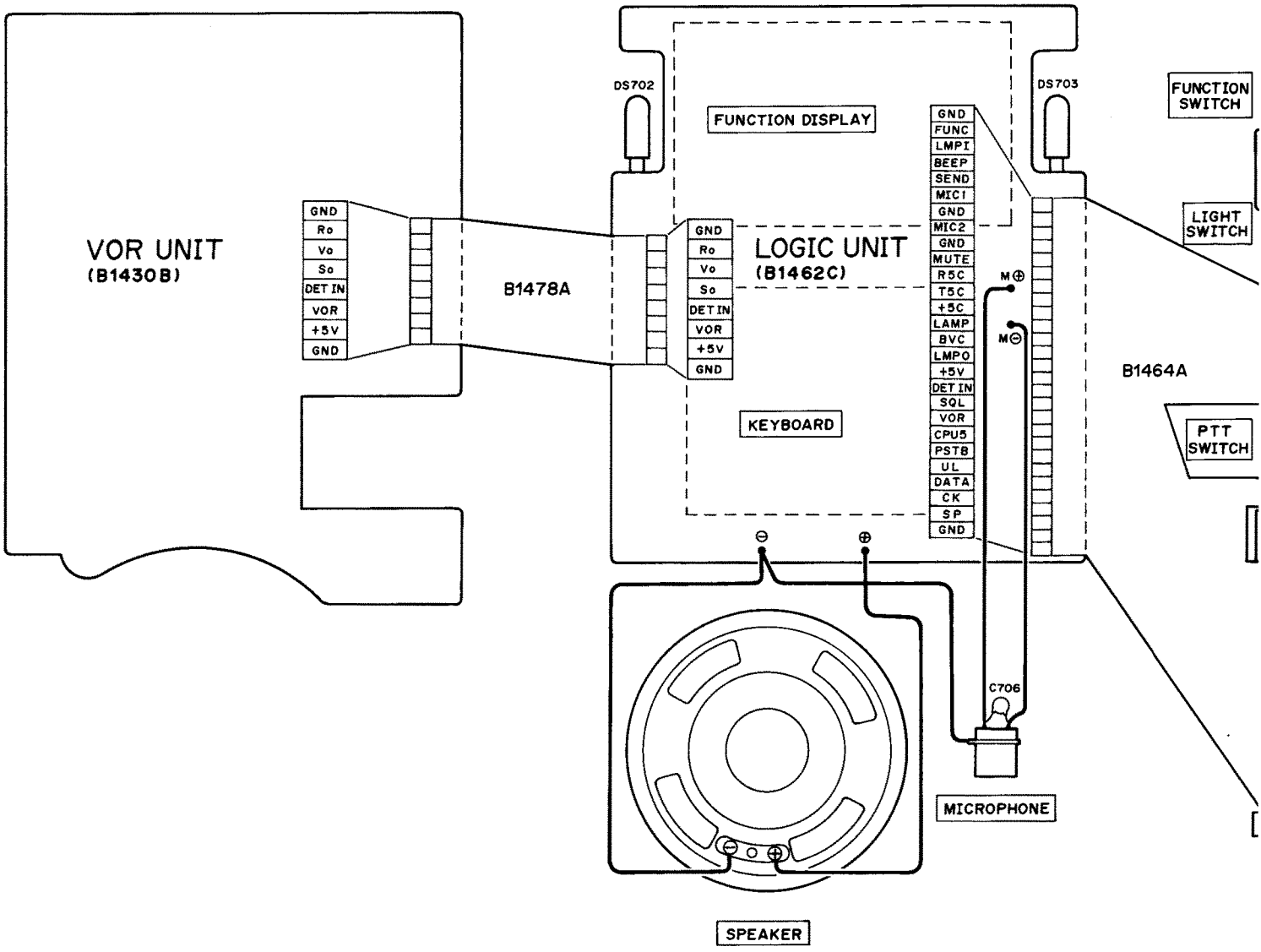
VOR UNIT

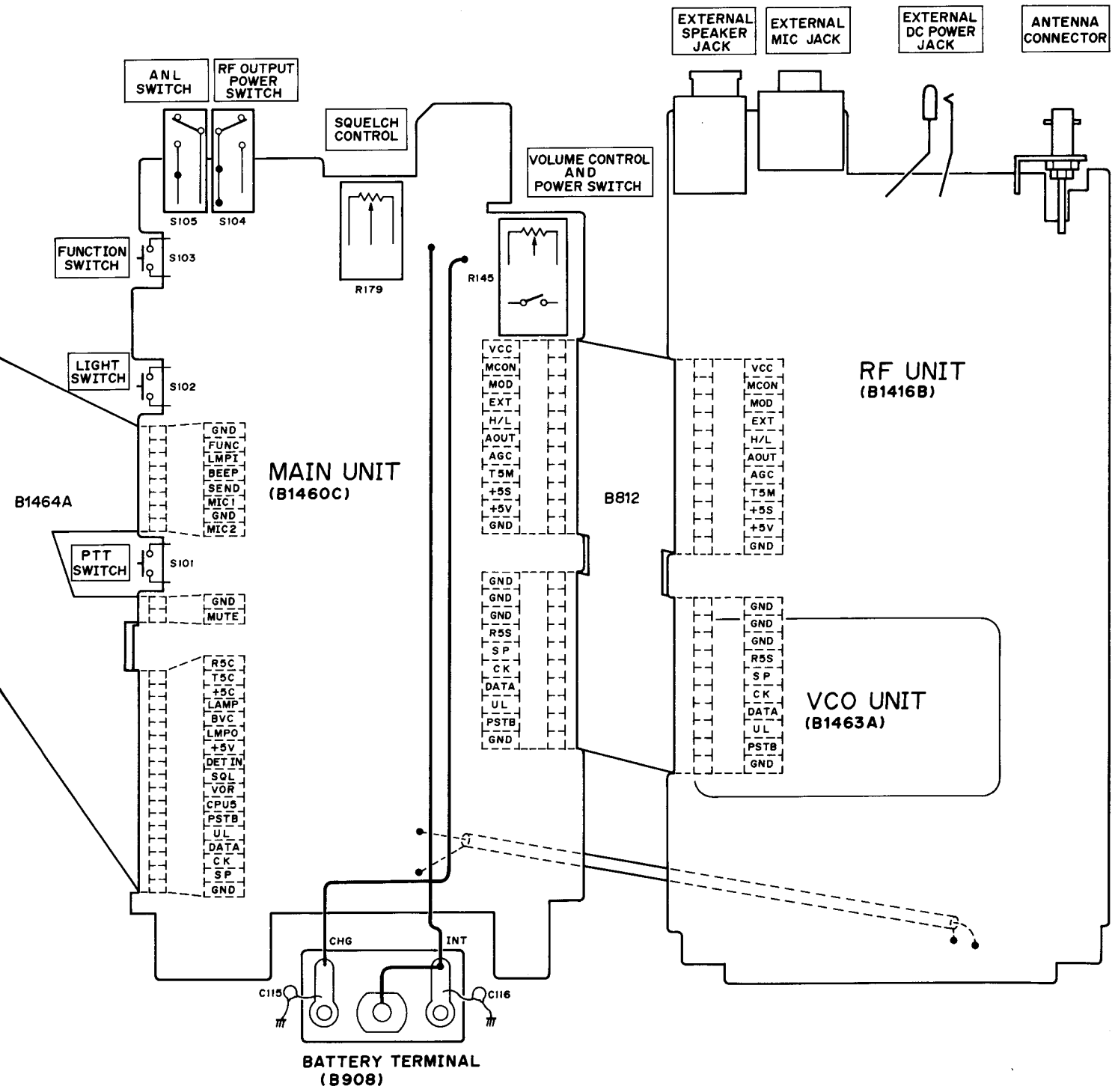


NOTE: For complete part numbers, "600" must be added to each binary numeral on the VOR UNIT.

SECTION 7 BOARD LAYOUTS

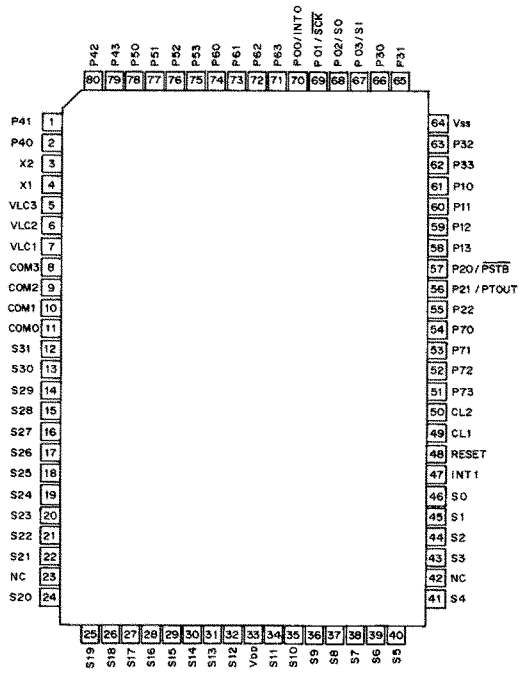
7-1 INTERCONNECTIONS



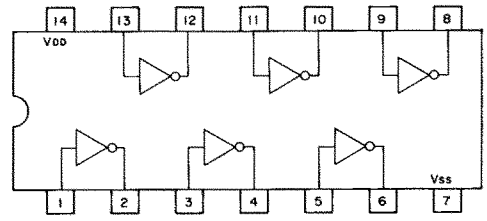

EXTERNAL SPEAKER JACK
EXTERNAL MIC JACK
EXTERNAL DC POWER JACK
ANTENNA CONNECTOR
ANL SWITCH
RF OUTPUT POWER SWITCH
SQUELCH CONTROL
VOLUME CONTROL AND POWER SWITCH
S105
S104
R179
R145
FUNCTION SWITCH
S103
LIGHT SWITCH
S102
PTT SWITCH
S101
B1464A
MAIN UNIT
(B1460C)
B812
RF UNIT
(B1416B)
VCO UNIT
(B1463A)
GND
FUNC
LMPI
BEEP
SEND
MIC1
GND
MIC2
GND
MUTE
R5C
T5C
+5C
LAMP
BVC
LMPO
+5V
DET IN
SQL
VOR
CPU5
PSTB
UL
DATA
CK
SP
GND
VCC
MCON
MOD
EXT
H/L
AOUT
AGC
T5M
+5S
+5V
GND
GND
GND
GND
R5S
SP
CK
DATA
UL
PSTB
GND
CHG
INT
C115
C116
BATTERY TERMINAL
(B908)

7-2 LOGIC UNIT

µPD7514G-307-12 IC701
(CPU)

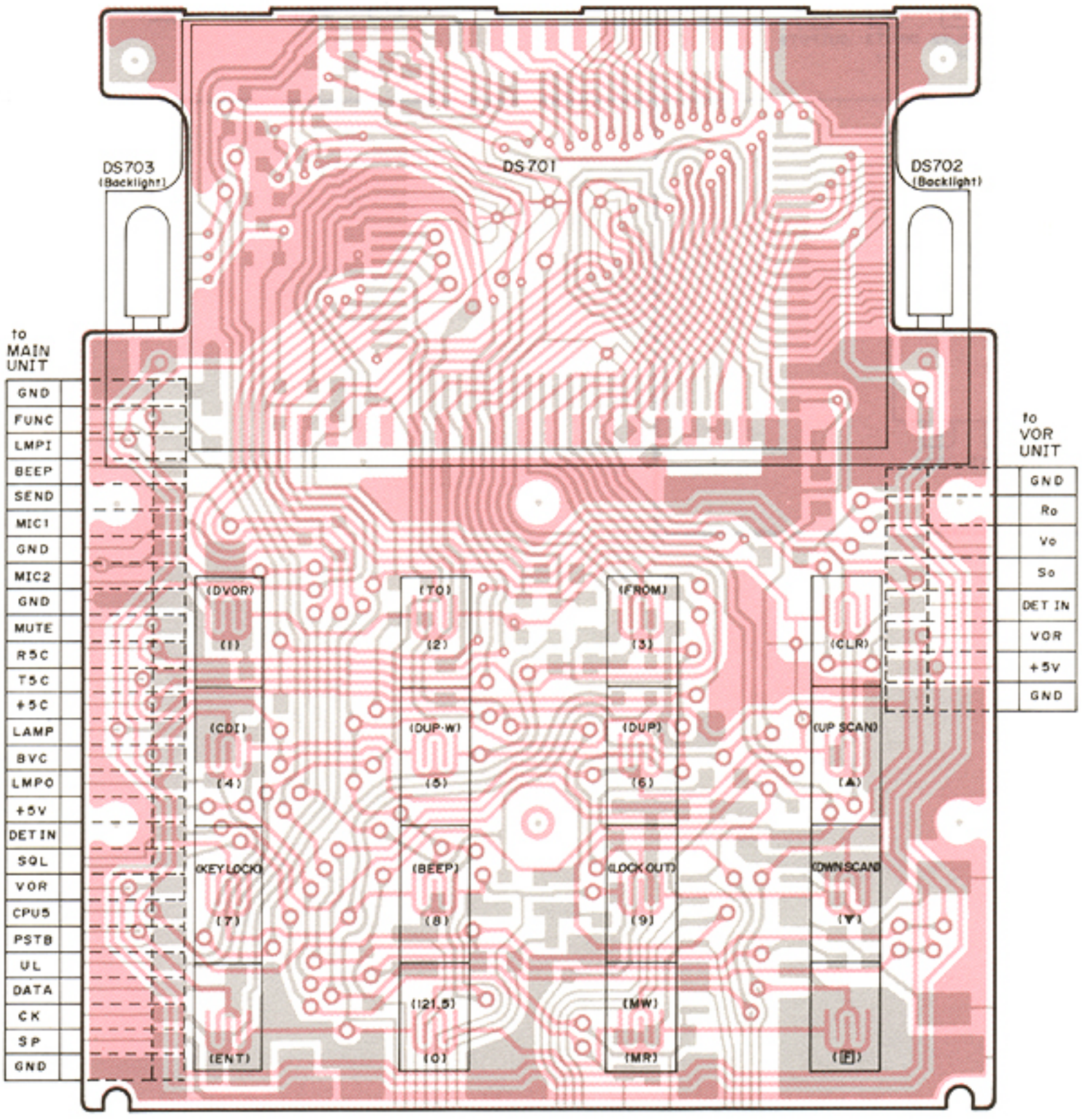


µPD4069UB IC702
(HEX INVERTER)

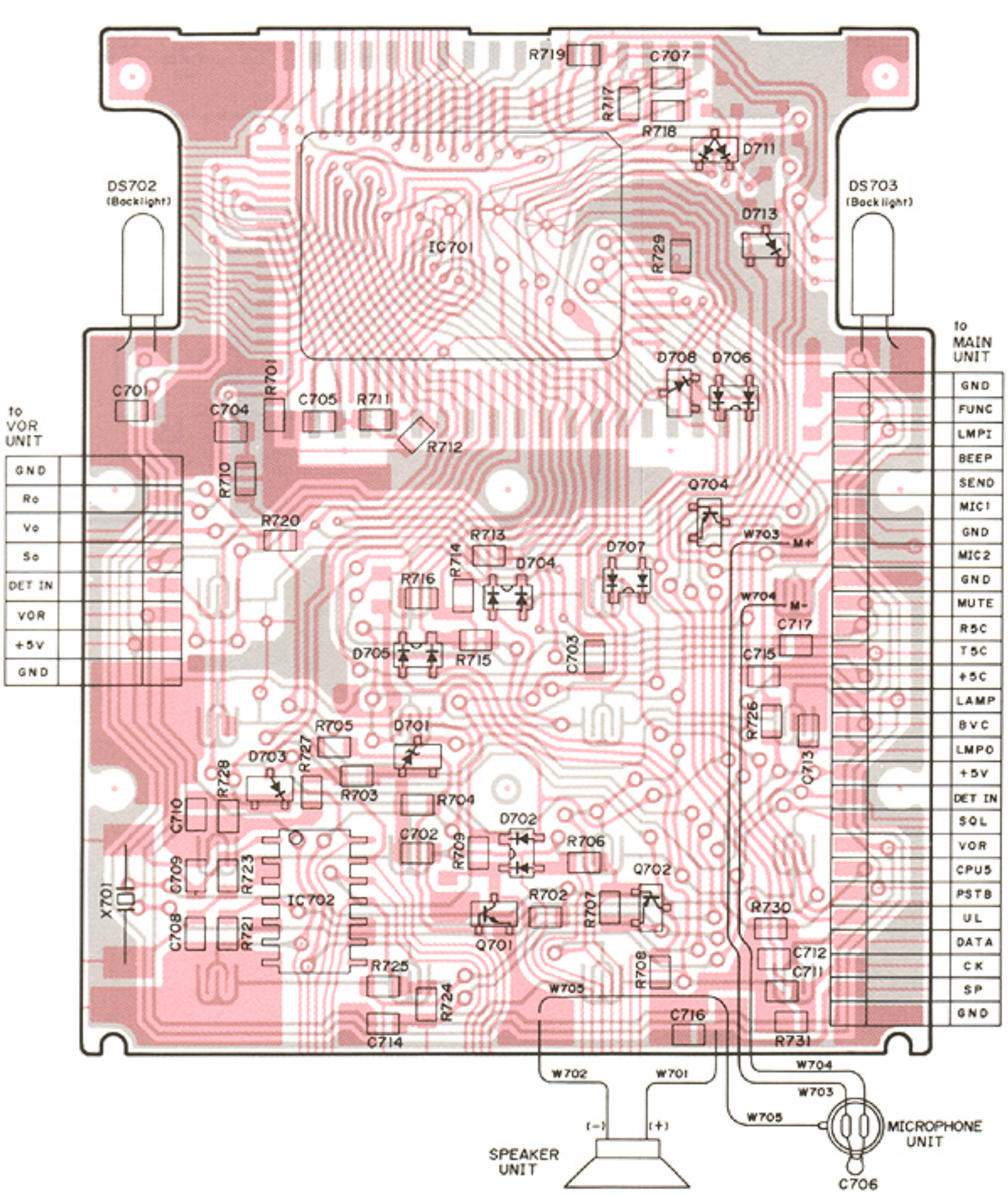


• LOGIC UNIT

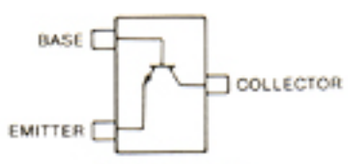
COMPONENTS SIDE



FOIL SIDE

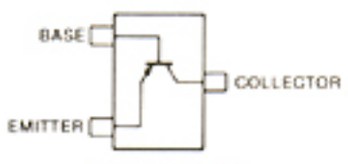


2SC2712
Q701



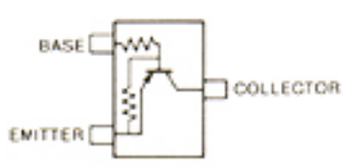
Symbol: LY

2SA1162
Q702



Symbol: SY

2SA1341
Q704

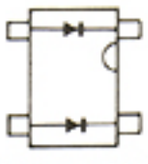


Symbol: BL

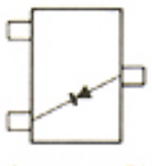
RD6.2M B1
D701


Symbol: 621

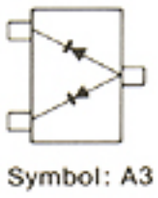
MA159
D702, D704, D705
D706, D707


Symbol: M1A

1SS190
D703, D708, D713

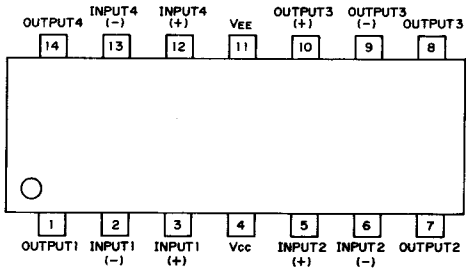

Symbol: E3

1SS181
D711

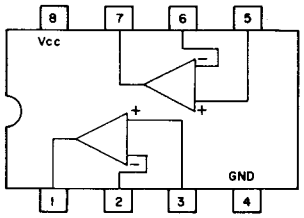

Symbol: A3

7-3 VOR UNIT

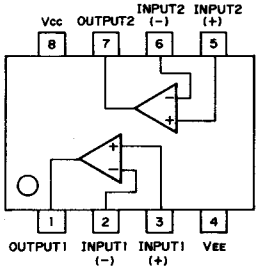
NJM3403AM IC601
(QUAD OPERATIONAL AMPLIFIER)



BA6993F IC602, IC604
(DUAL COMPARATOR)



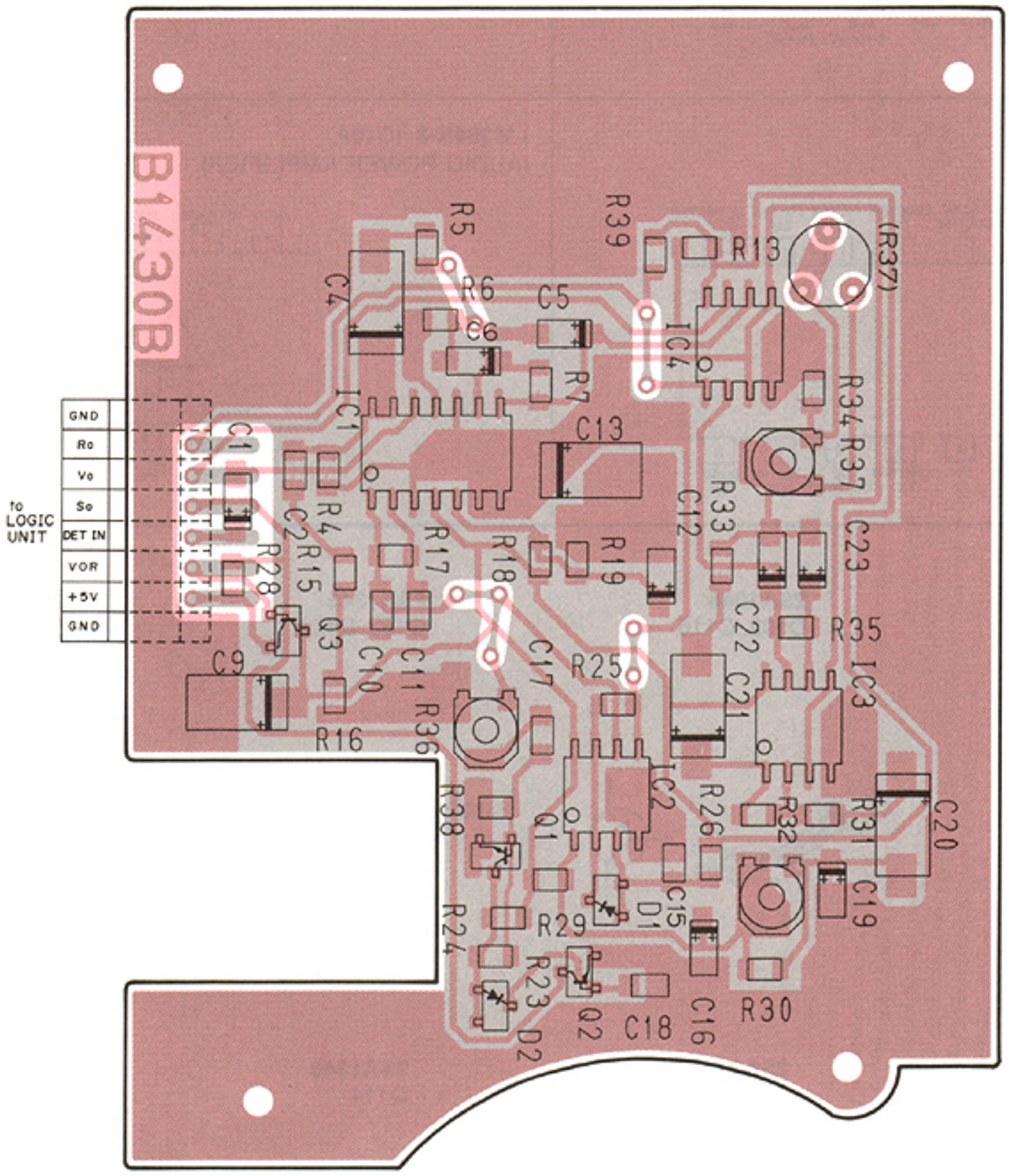
µPC358G IC603
(DUAL DRIVER)

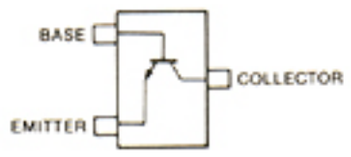
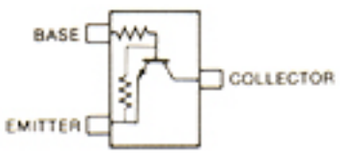
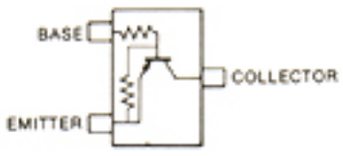
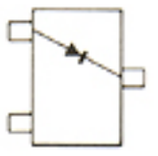


- **VOR UNIT**

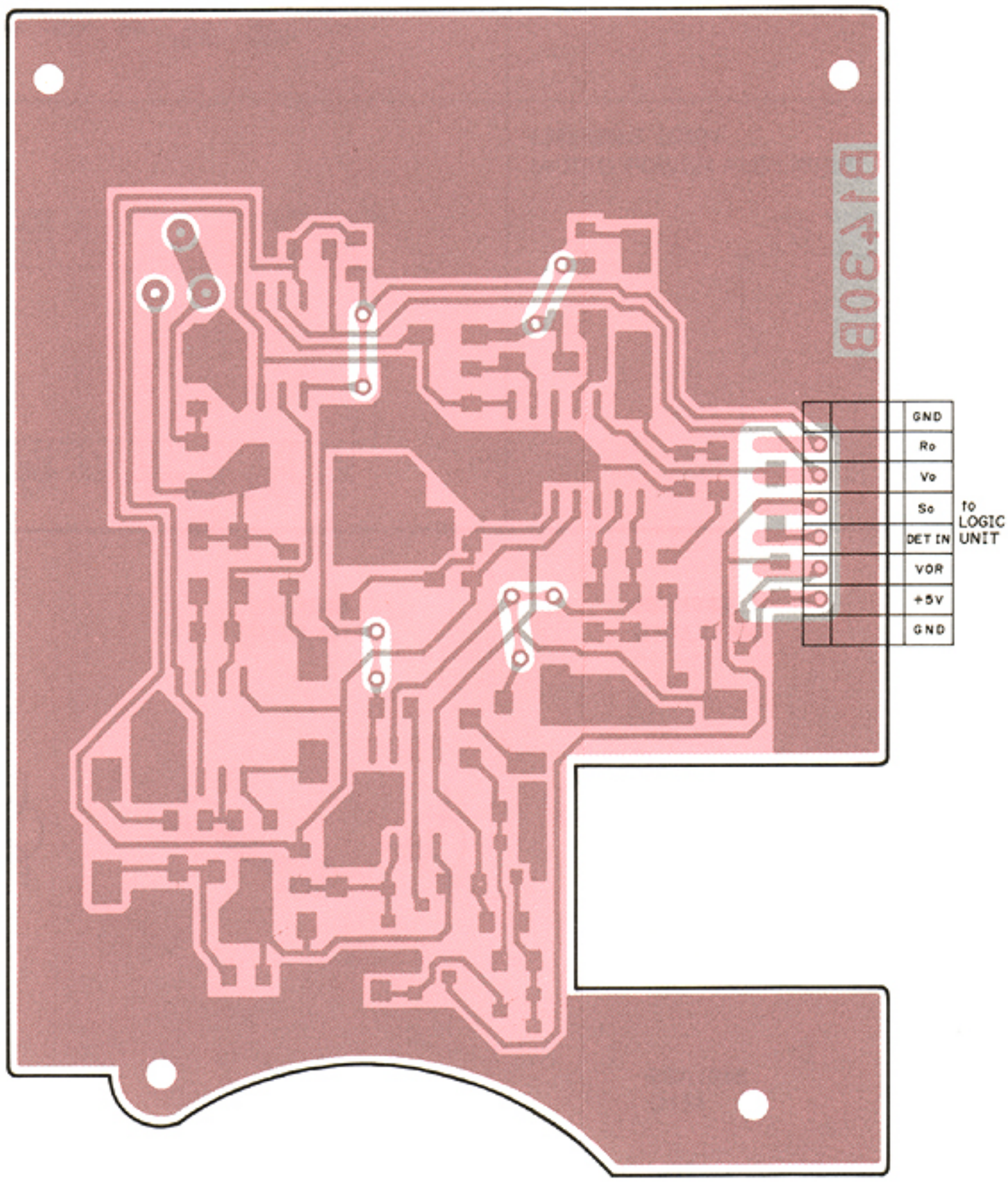
NOTE: For complete part numbers, "600" must be added to each binary numeral on the VOR UNIT.

COMPONENTS SIDE



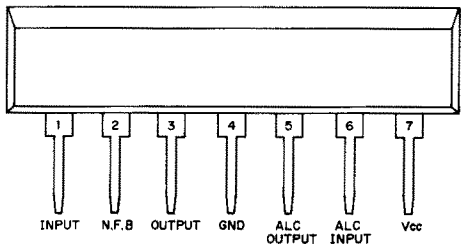
2SC2712	RN1404	RN2403	1SS193
Q601	Q602	Q603	D601, D602
			
Symbol: LY	Symbol: XD	Symbol: YC	Symbol: F3

FOIL SIDE

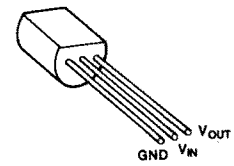


7-4 MAIN UNIT

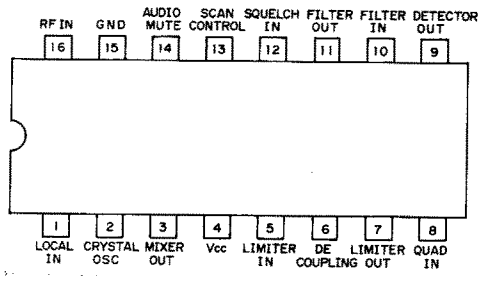
µPC1158HA2 IC101
(MIC AMPLIFIER)



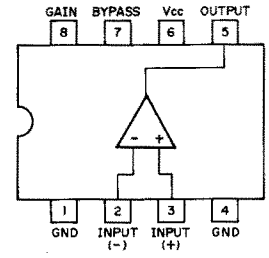
S81250HG IC102
(CMOS VOLTAGE REGULATOR)



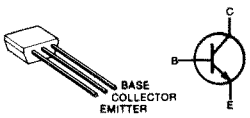
TK10420 IC103
(FM IF IC)



LM386N-3 IC104
(AUDIO POWER AMPLIFIER)



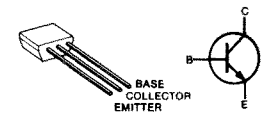
2SC2458
Q101, Q106, Q108
Q110, Q113, Q117
Q119, Q124, Q125
Q126, Q128, Q129
Q130



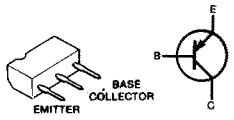
2SA1048
Q102, Q116

2SA1345
Q103, Q104

2SC3399
Q105, Q120, Q122
Q131, Q133

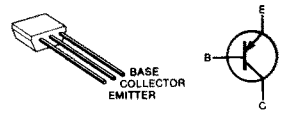


2SB909M
Q107, Q109, Q111
Q115, Q123

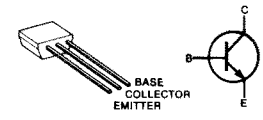


2SA1348
Q112

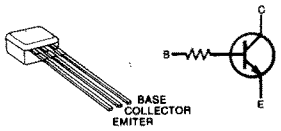
2SA1346
Q114



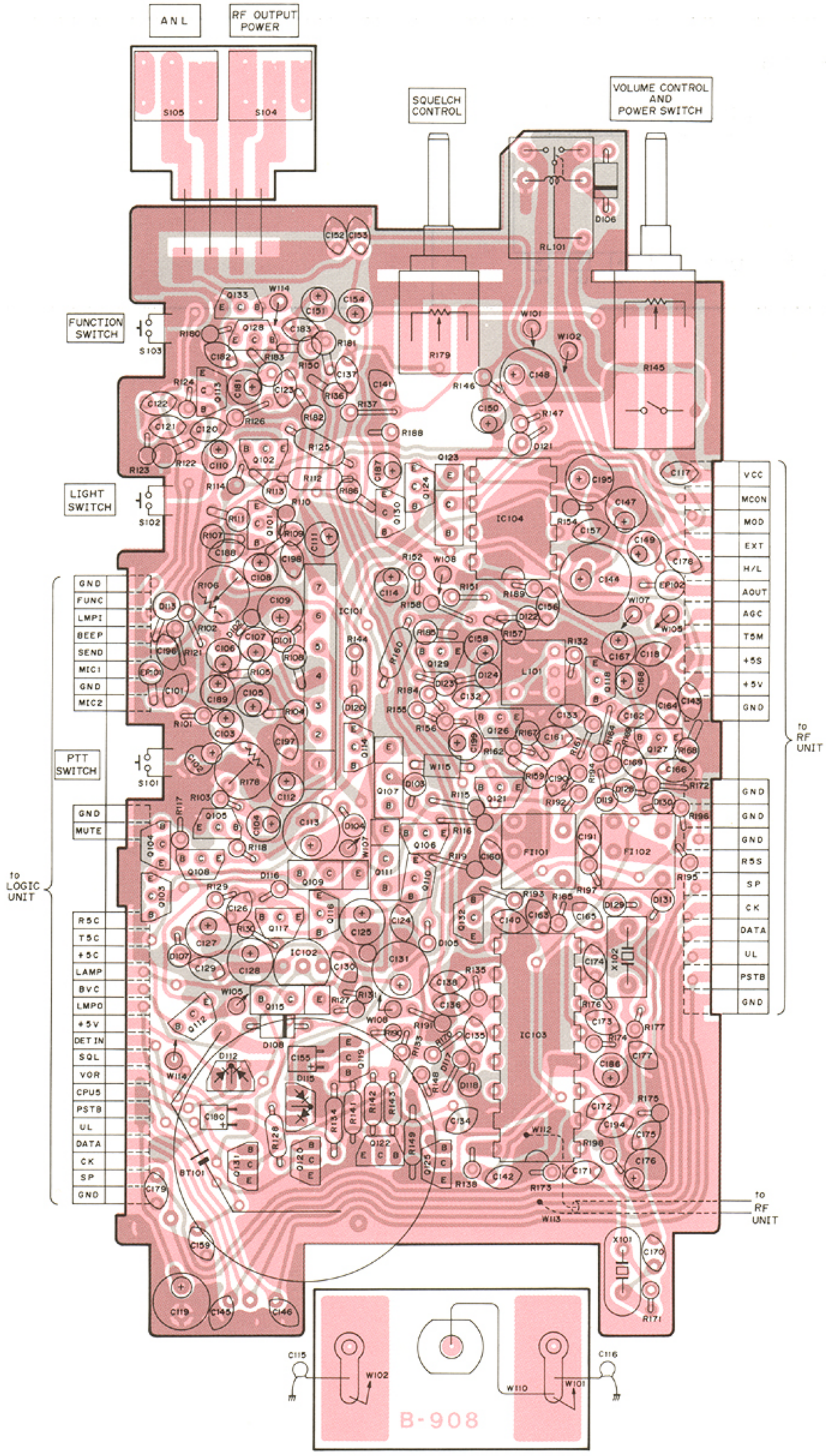
2SC2668
Q118, Q127



DTC144TS
Q121, Q132

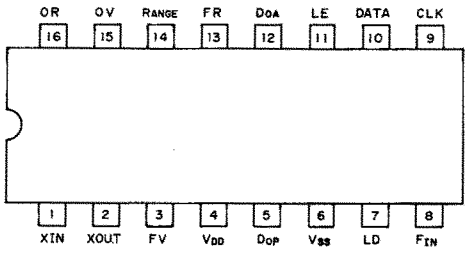


• MAIN UNIT

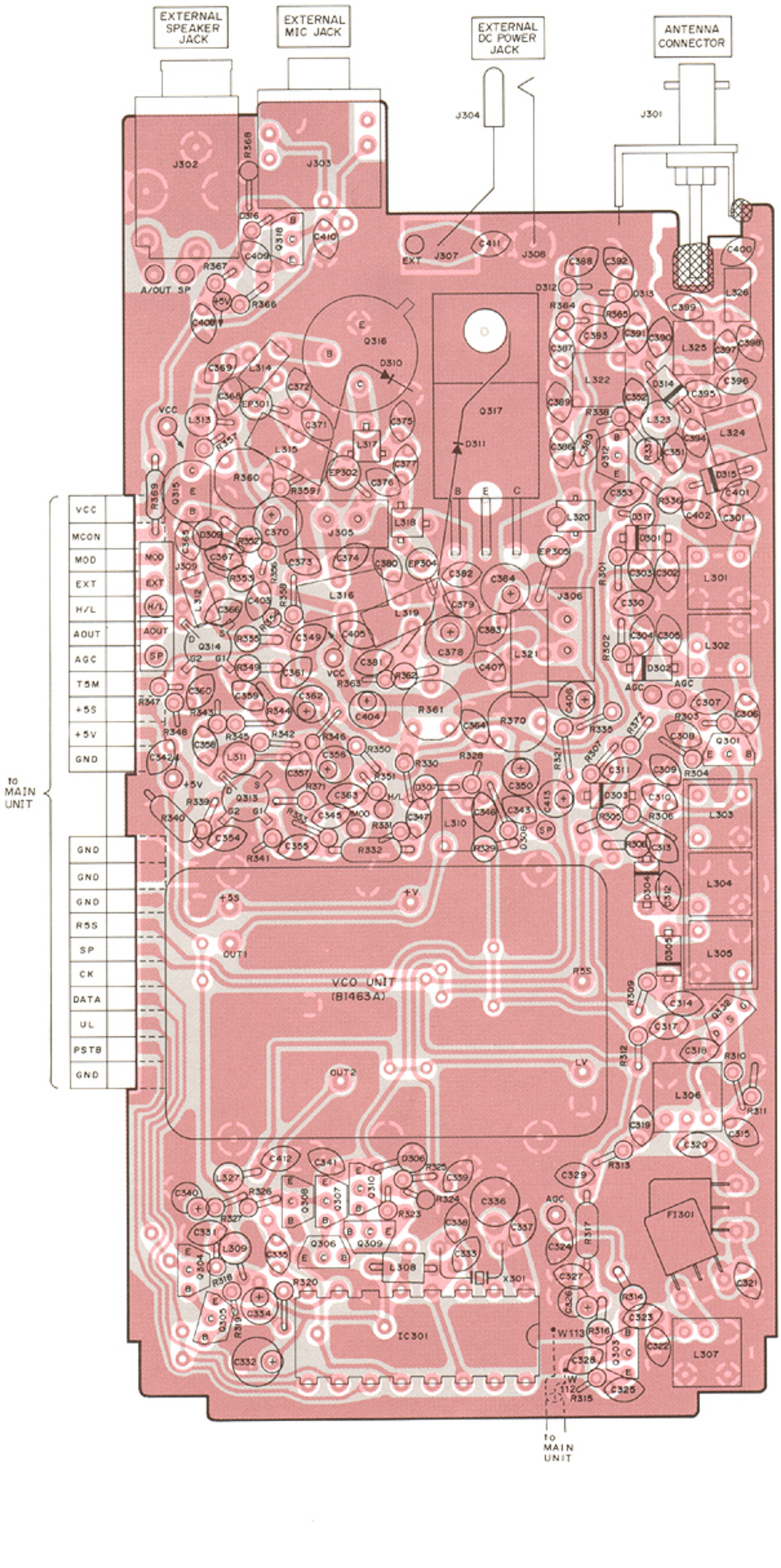

ANL
RF OUTPUT POWER
SQUELCH CONTROL
VOLUME CONTROL AND POWER SWITCH
S105
S104
D106
RL101
FUNCTION SWITCH
S103
LIGHT SWITCH
S102
PTT SWITCH
S101
R179
R145
IC104
IC101
IC102
IC103
L101
FI101
FI102
X102
X101
BT101
B-908
GND
FUNC
LMPI
BEEP
SEND
MIC1
GND
MIC2
GND
MUTE
R5C
T5C
+5C
LAMP
BVC
LMPO
+5V
DET IN
SQL
VOR
CPU5
PSTB
UL
DATA
CK
SP
GND
to LOGIC UNIT
VCC
MCON
MOD
EXT
H/L
AOUT
AGC
T5M
+5S
+5V
GND
GND
GND
GND
R5S
SP
CK
DATA
UL
PSTB
GND
to RF UNIT
to RF UNIT

7-5 RF AND VCO UNITS

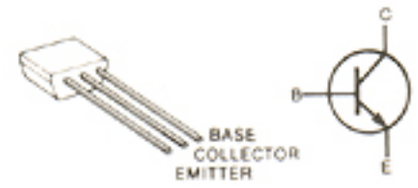
PLL2001 IC301
(PLL SYNTHESIZER IC)



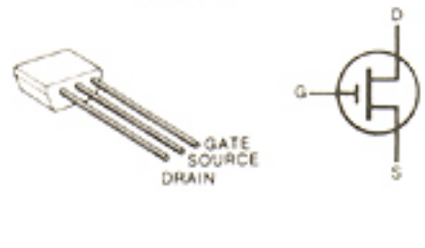
• RF UNIT



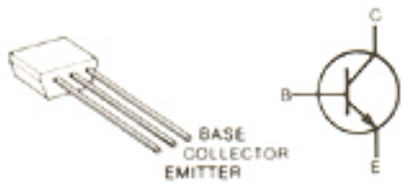
2SC2668
Q301, Q303



2SK241
Q302



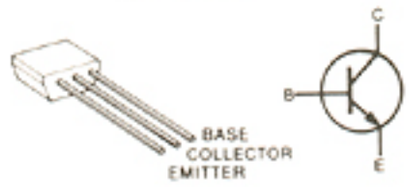
2SC3399
Q304, Q306, Q308



2SA1048
Q305, Q310, Q318

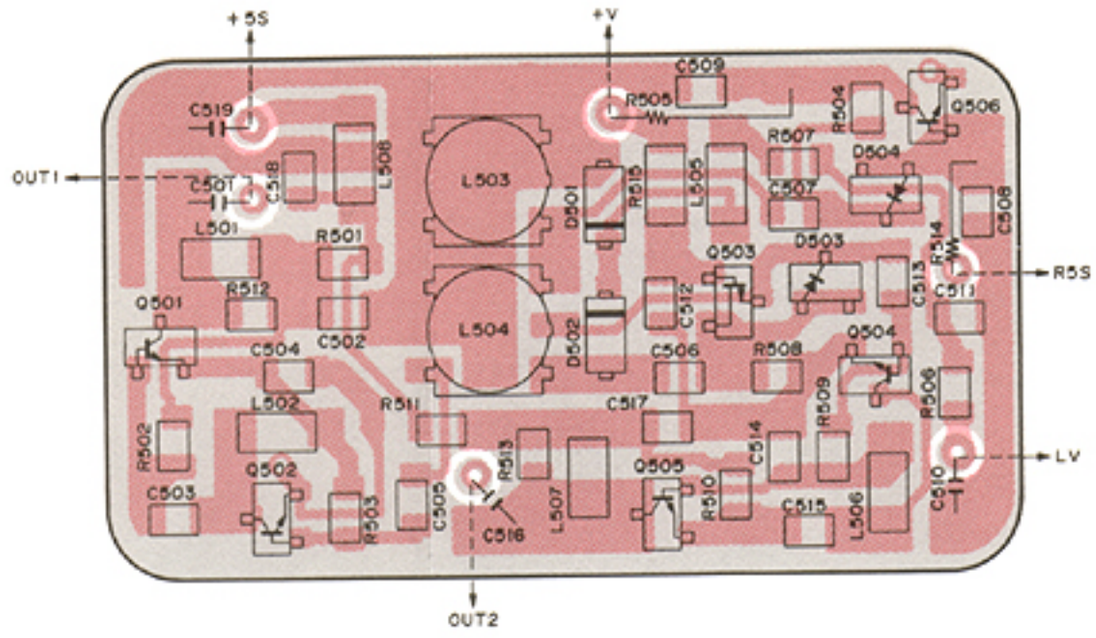
2SA1345
Q307

2SC2458
Q309, Q312

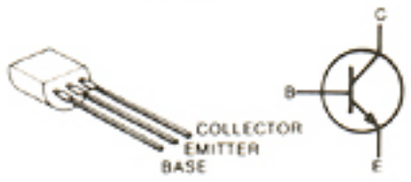


2SK74M
Q313, Q314

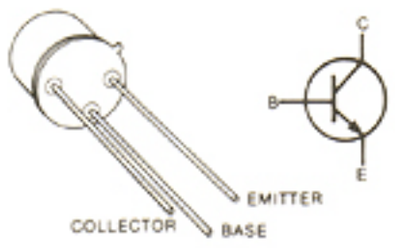
• VCO UNIT



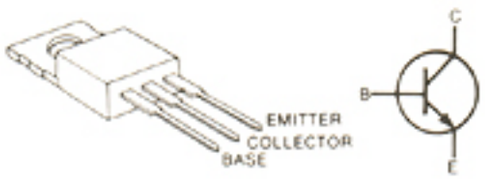
2SC2407A
Q315



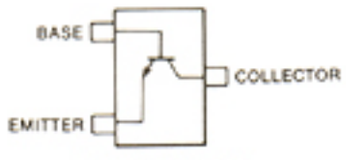
2SC1947
Q316



2SC1972
Q317



2SC3772
Q501, Q502, Q504
Q505

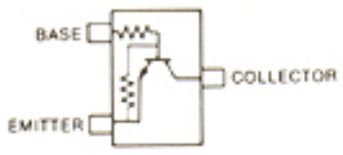


Symbol: LY3

2SK210
Q503

Symbol: YY

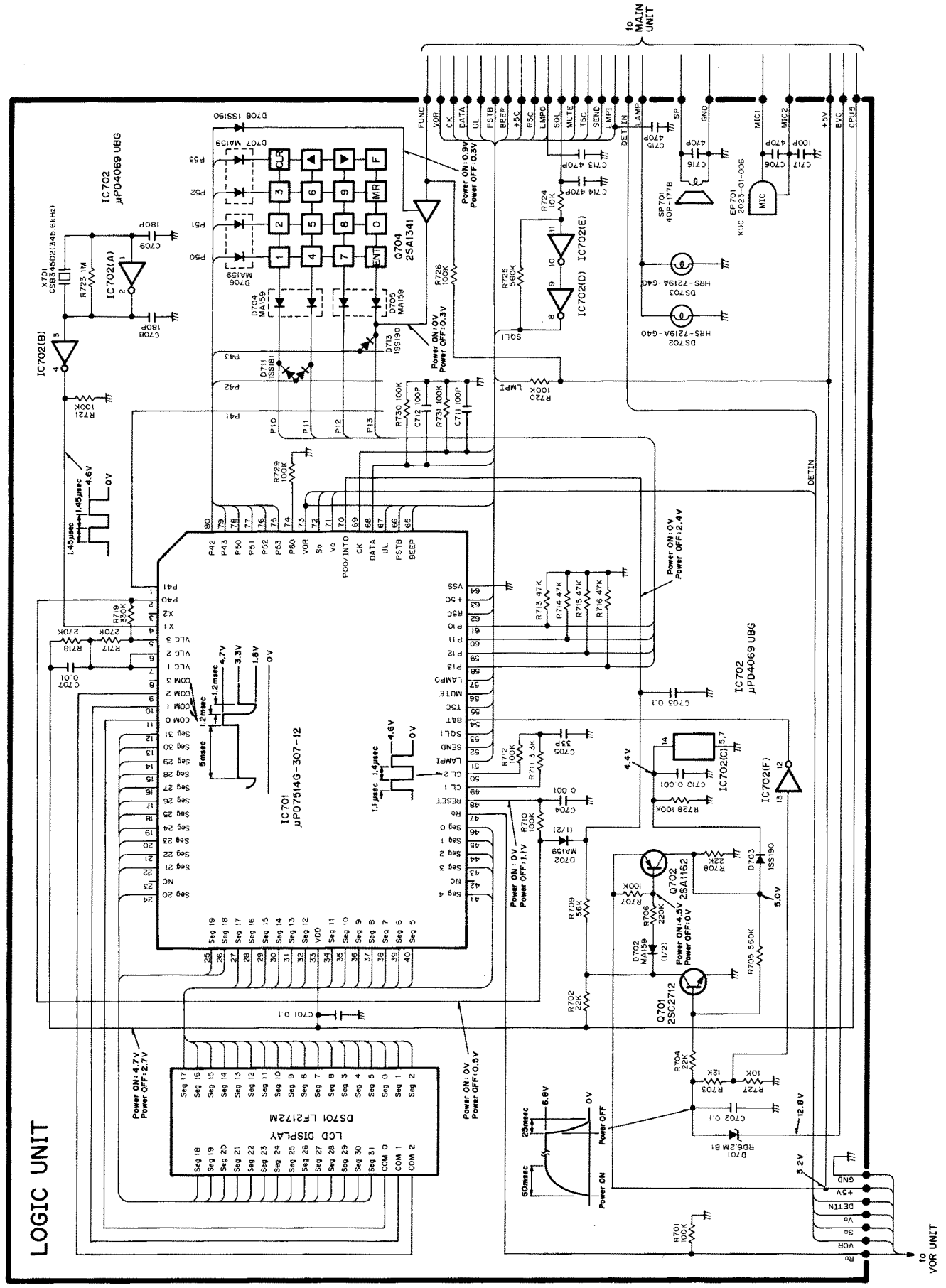
DTC124EK
Q506



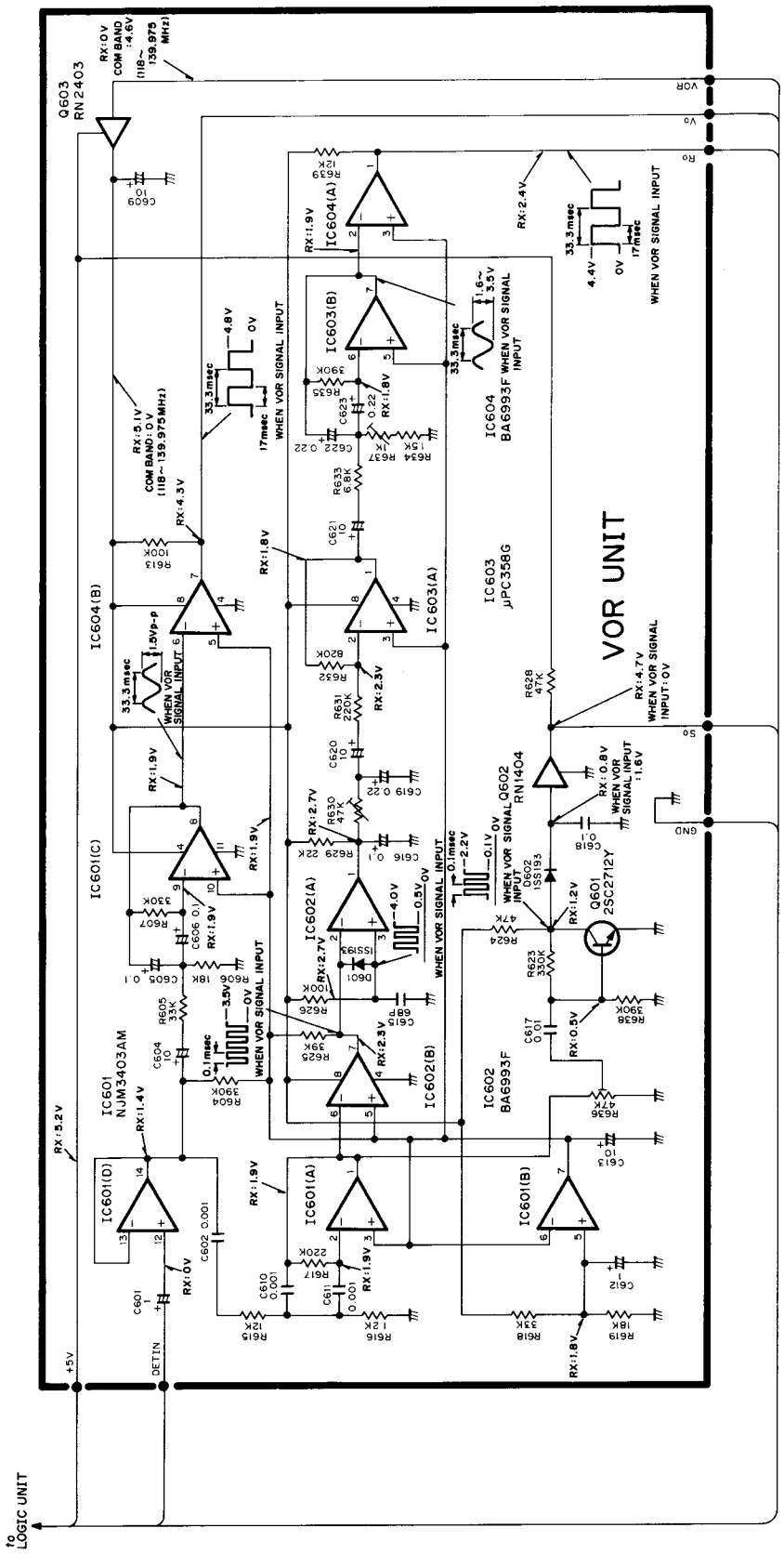
Symbol: 25

SECTION 8 VOLTAGE DIAGRAMS

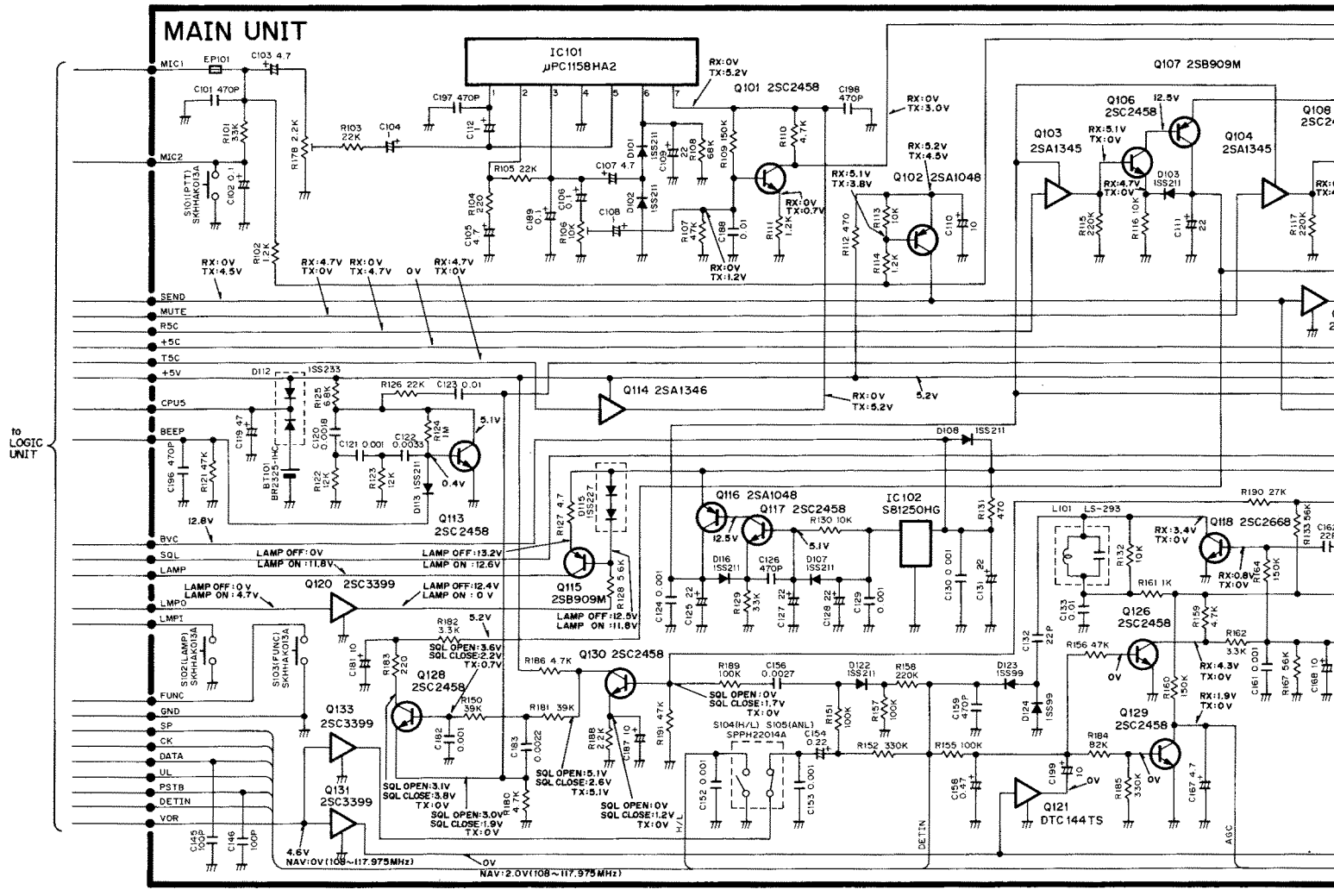
8-1 LOGIC UNIT

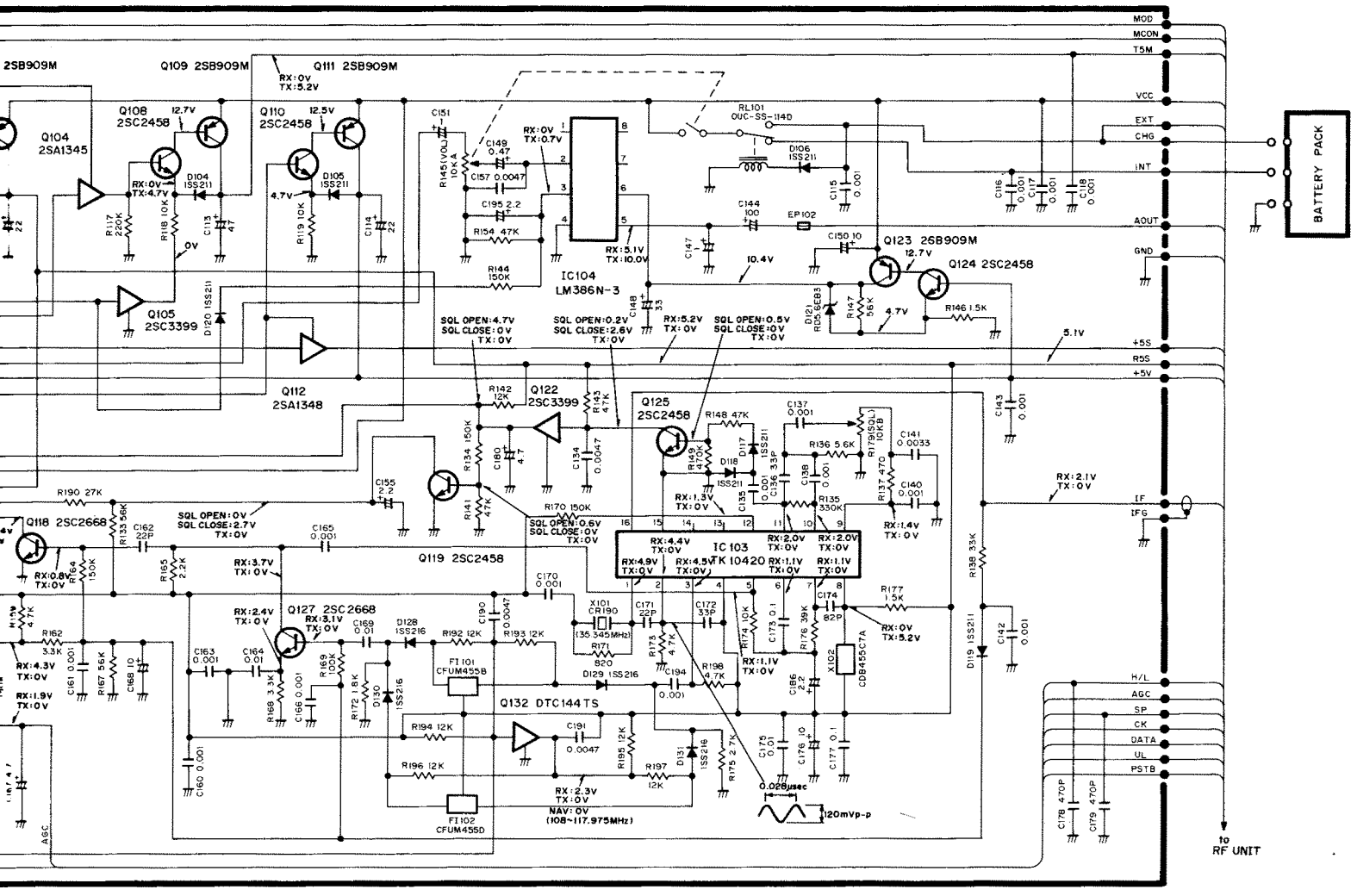


8-2 VOR UNIT

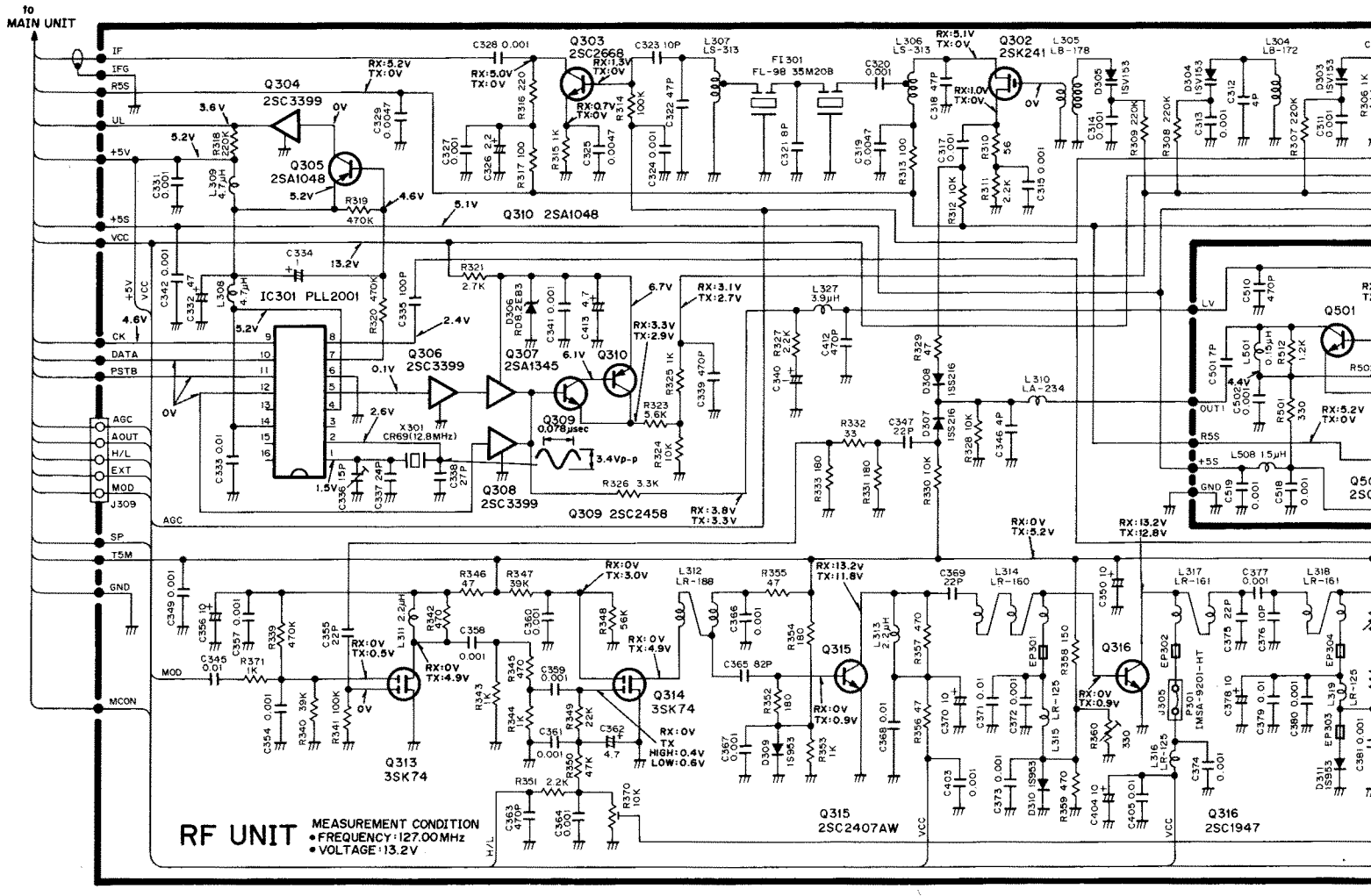

VOR UNIT
IC603 μPC358G
IC604 BA6993F
IC602 BA6993F
IC601 NJM3403AM
Q603 RN2403
Q602 RN1404
Q601 2SC2712Y
IC604(A)
IC604(B)
IC603(A)
IC603(B)
IC602(A)
IC602(B)
IC601(A)
IC601(B)
IC601(C)
IC601(D)
WHEN VOR SIGNAL INPUT
WHEN VOR SIGNAL INPUT: 0V
to LOGIC UNIT
+5V
GND
VOR
Vo
Ro
So
DETIN

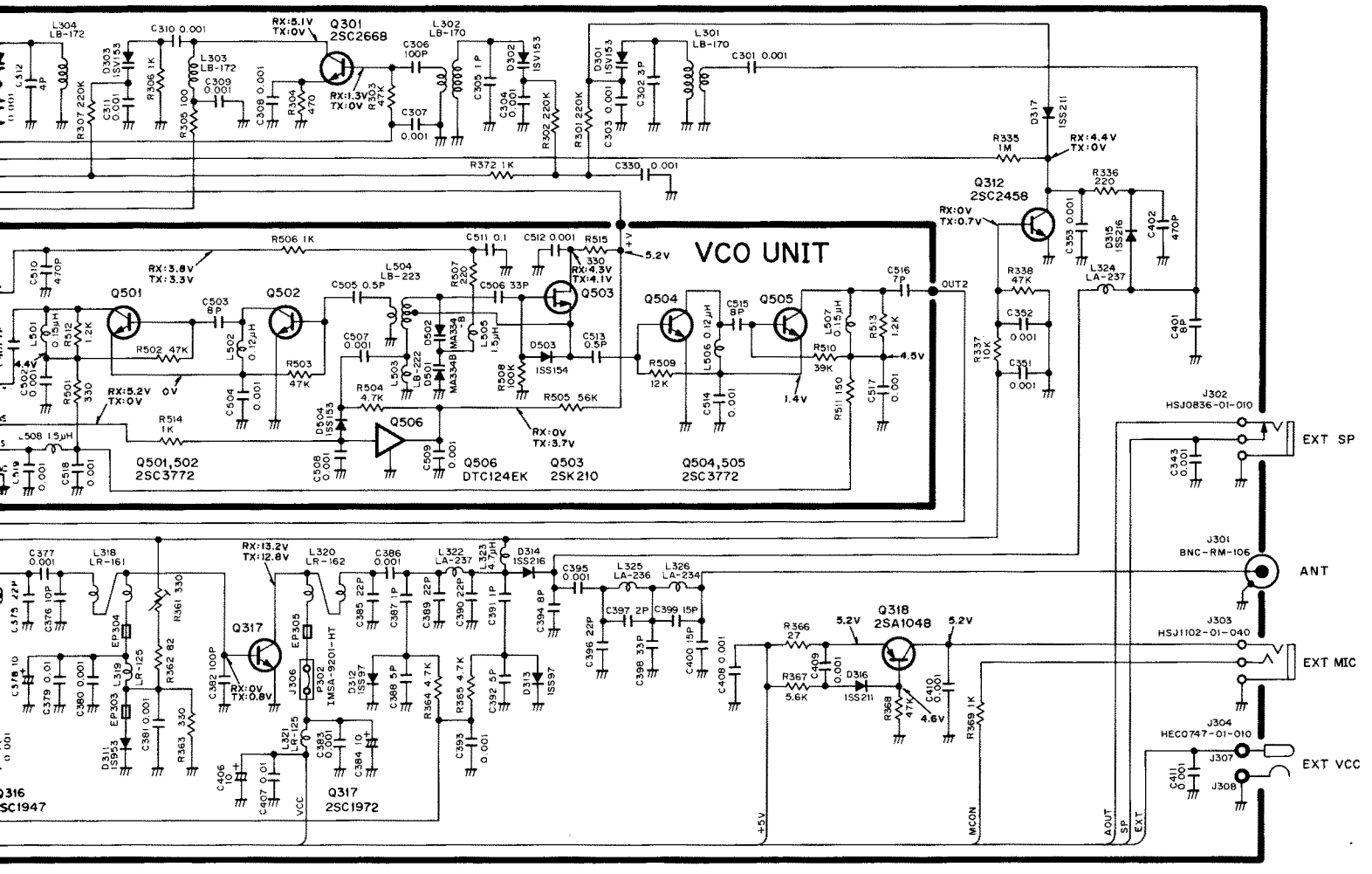
8-3 MAIN UNIT


MAIN UNIT
IC101
μPC1158HA2
Q101 2SC2458
Q102 2SA1048
Q103 2SA1345
Q104 2SA1345
Q106 2SC2458
Q107 2SB909M
Q108 2SC2
Q113 2SC2458
Q114 2SA1346
Q115 2SB909M
Q116 2SA1048
Q117 2SC2458
IC102 S81250HG
Q118 2SC2668
Q120 2SC3399
Q121 DTC144TS
Q126 2SC2458
Q128 2SC2458
Q129 2SC2458
Q130 2SC2458
Q131 2SC3399
Q133 2SC3399
MIC1
MIC2
SEND
MUTE
R5C
+5C
T5C
+5V
CPU5
BEEP
BVC
SQL
LAMP
LMP0
LMP1
FUNC
GND
SP
CK
DATA
UL
PSTB
DETIN
VOR
to LOGIC UNIT
S101(PTT) SKHHAK013A
S102(LAMP) SKHHAK013A
S103(FUNC) SKHHAK013A
S104(H/L) S105(ANL) SPPH22014A
L101 LS-293
BT101 BR2325-1HC
D112 1SS233
D101 1SS211
D102 1SS211
D103 1SS211
D107 1SS211
D108 1SS211
D113 1SS211
D114 1SS227
D116 1SS211
D122 1SS211
D123 1SS99
D124 1SS99
RX:0V TX:5.2V
RX:0V TX:3.0V
RX:5.2V TX:4.5V
RX:5.1V TX:3.8V
RX:0V TX:0.7V
RX:0V TX:1.2V
RX:4.7V TX:0V
RX:0V TX:4.5V
RX:0V TX:4.7V
0V
RX:5.1V TX:0V
RX:4.7V TX:0V
RX:0V TX:5.2V
5.2V
5.1V
0.4V
12.8V
LAMP OFF:0V LAMP ON:11.8V
LAMP OFF:13.2V LAMP ON:12.6V
LAMP OFF:0 V LAMP ON:4.7V
LAMP OFF:12.4V LAMP ON:0 V
LAMP OFF:12.8V LAMP ON:11.8V
SQL OPEN:3.6V SQL CLOSE:2.2V TX:0.7V
SQL OPEN:3.1V SQL CLOSE:3.8V TX:0V
SQL OPEN:3.0V SQL CLOSE:1.9V TX:0V
SQL OPEN:5.1V SQL CLOSE:2.6V TX:5.1V
SQL OPEN:0V SQL CLOSE:1.2V TX:0V
SQL OPEN:0V SQL CLOSE:1.7V TX:0V
RX:3.4V TX:0V
RX:0.8V TX:0V
RX:4.3V TX:0V
RX:1.9V TX:0V
4.6V NAV:0V(108~117.975MHz)
0V NAV:2.0V(108~117.975MHz)
H/L
DETIN
AGC


MOD
MCON
T5M
VCC
EXT
CHG
INT
AOUT
GND
+5S
R5S
+5V
IF
IFG
H/L
AGC
SP
CK
DATA
UL
PSTB
BATTERY PACK
to RF UNIT
Q104 2SA1345
Q105 2SC3399
Q108 2SC2458
Q109 2SB909M
Q110 2SC2458
Q111 2SB909M
Q112 2SA1348
Q118 2SC2668
Q119 2SC2458
Q122 2SC3399
Q123 2SB909M
Q124 2SC2458
Q125 2SC2458
Q127 2SC2668
Q132 DTC144TS
IC104 LM386N-3
IC103 TK10420
RL101 OUC-SS-114D
FI101 CFUM455B
FI102 CFUM455D
X101 CR190 (35.345MHz)
X102 CDB455C7A
D104 1SS211
D105 1SS211
D106 1SS211
D118 1SS211
D119 1SS211
D120 1SS211
D121 RD4.5EB3
D128 1SS216
D129 1SS216
D130 1SS216
D131 1SS216
EP102
SQL OPEN:4.7V SQL CLOSE:0V TX:0V
SQL OPEN:0.2V SQL CLOSE:2.6V TX:0V
RX:5.2V TX:0V
SQL OPEN:0.5V SQL CLOSE:0V TX:0V
SQL OPEN:0V SQL CLOSE:2.7V TX:0V
SQL OPEN:0.6V SQL CLOSE:0V TX:0V
RX:0V TX:4.7V
RX:0V TX:0.7V
RX:5.1V TX:10.0V
RX:0V TX:5.2V
RX:3.7V TX:0V
RX:2.4V TX:0V
RX:3.1V TX:0V
RX:2.3V TX:0V
NAV:0V (108~117.975MHz)
RX:4.4V TX:0V
RX:4.9V TX:0V
RX:4.5V TX:0V
RX:2.0V TX:0V
RX:1.1V TX:0V
RX:1.3V TX:0V
RX:2.1V TX:0V
RX:1.4V TX:0V
RX:0.8V TX:0V
RX:4.3V TX:0V
RX:1.9V TX:0V
0.028μsec
120mVp-p
5.1V
10.4V
12.7V
12.5V
4.7V
0V

8-4 RF AND VCO UNITS




VCO UNIT
Q301 2SC2668
Q312 2SC2458
Q501 Q502 Q503 Q504 Q505
Q501,502 2SC3772
Q506 DTC124EK
Q503 2SK210
Q504,505 2SC3772
Q316 2SC1947
Q317 2SC1972
Q318 2SA1048
J301 BNC-RM-106
ANT
J302 HSJ0836-01-010
EXT SP
J303 HSJ1102-01-040
EXT MIC
J304 HEC0747-01-010
EXT VCC
OUT2
+5V
MCON
AOUT
SP
EXT
VCC

SECTION 9 PARTS LIST

[LOGIC UNIT]

REF. NO.	DESCRIPTION	PART NO.	
IC701	IC	μPD7514G-307-12	
IC702	IC	μPD4069UBG	
Q701	Transistor	2SC2712 Y	
Q702	Transistor	2SA1162 Y	
Q704	Transistor	2SA1341	
D701	Zener	RD6.2M B1	
D702	Diode	MA159	
D703	Diode	1SS190	
D704	Diode	MA159	
D705	Diode	MA159	
D706	Diode	MA159	
D707	Diode	MA159	
D708	Diode	1SS190	
D711	Diode	1SS181	
D713	Diode	1SS190	
X701	Discriminator	CSB345D2	
R701	Chip	100kΩ	MCR10
R702	Chip	22kΩ	MCR10
R703	Chip	12kΩ	MCR10
R704	Chip	22kΩ	MCR10
R705	Chip	560kΩ	MCR10
R706	Chip	220kΩ	MCR10
R707	Chip	100kΩ	MCR10
R708	Chip	22kΩ	MCR10
R709	Chip	56kΩ	MCR10
R710	Chip	100kΩ	MCR10
R711	Chip	3.3kΩ	MCR10
R712	Chip	100kΩ	MCR10
R713	Chip	47kΩ	MCR10
R714	Chip	47kΩ	MCR10
R715	Chip	47kΩ	MCR10
R716	Chip	47kΩ	MCR10
R717	Chip	270kΩ	MCR10
R718	Chip	270kΩ	MCR10
R719	Chip	330kΩ	MCR10
R720	Chip	100kΩ	MCR10
R721	Chip	100kΩ	MCR10
R723	Chip	1MΩ	MCR10
R724	Chip	10kΩ	MCR10
R725	Chip	560kΩ	MCR10
R726	Chip	100kΩ	MCR10
R727	Chip	10kΩ	MCR10
R728	Chip	100kΩ	MCR10
R729	Chip	100kΩ	MCR10
R730	Chip	100kΩ	MCR10
R731	Chip	100kΩ	MCR10
C701	Monolithic	0.1μF	GRM40 F
C702	Monolithic	0.1μF	GRM40 F
C703	Monolithic	0.1μF	GRM40 F
C704	Monolithic	0.001μF	GRM40
C705	Monolithic	33pF	GRM40
C706	Ceramic	470pF	50V
C707	Monolithic	0.01μF	GRM40 F
C708	Monolithic	180pF	GRM40
C709	Monolithic	180pF	GRM40
C710	Monolithic	0.001μF	GRM40
C711	Monolithic	100pF	GRM40
C712	Monolithic	100pF	GRM40
C713	Monolithic	470pF	GRM40
C714	Monolithic	470pF	GRM40

[LOGIC UNIT]

REF. NO.	DESCRIPTION	PART NO.	
C715	Monolithic	470pF	GRM40
C716	Monolithic	470pF	GRM40
C717	Monolithic	100pF	GRM40
DS701	LCD	LF2172M	
DS702	Lamp	HRS-7219A-G40	
DS703	Lamp	HRS-7219A-G40	
SP701	Speaker	40P-177B	
EP701	Microphone	KUC-2023-01-006	
EP702	P.C. Board	B-1462C	
EP703	F.P.C. Board	B-1464A	
W701	Wire	23/04/060/W01/W01	
W702	Wire	23/00/050/W01/W01	
W703	Wire	23/02/105/W01/W01	
W704	Wire	23/07/100/W01/W01	
W705	Wire	23/00/060/W01/W01	

[VOR UNIT]

REF. NO.	DESCRIPTION	PART NO.	
IC601	IC	NJM3403AM	
IC602	IC	BA6993F	
IC603	IC	μPC358G	
IC604	IC	BA6993F	
Q601	Transistor	2SC2712Y	
Q602	Transistor	RN1404	
Q603	Transistor	RN2403	
D601	Diode	1SS193	
D602	Diode	1SS193	
R604	Chip	390kΩ	MCR10
R605	Chip	33kΩ	MCR10
R606	Chip	18kΩ	MCR10
R607	Chip	330kΩ	MCR10
R613	Chip	100kΩ	MCR10
R615	Chip	12kΩ	MCR10
R616	Chip	1.2kΩ	MCR10
R617	Chip	220kΩ	MCR10
R618	Chip	33kΩ	MCR10
R619	Chip	18kΩ	MCR10
R623	Chip	330kΩ	MCR10
R624	Chip	47kΩ	MCR10
R625	Chip	39kΩ	MCR10
R626	Chip	100kΩ	MCR10
R628	Chip	47kΩ	MCR10
R629	Chip	22kΩ	MCR10
R630	Trimmer	47kΩ	RH04A3AS4J
R631	Chip	220kΩ	MCR10
R632	Chip	820kΩ	MCR10
R633	Chip	6.8kΩ	MCR10
R634	Chip	1.5kΩ	MCR10

[VOR UNIT]

REF. NO.	DESCRIPTION	PART NO.	
R635	Chip	390kΩ	MCR10
R636	Trimmer	47kΩ	RH04A3AS4J
R637	Trimmer	1kΩ	RH04A3A13J
R638	Chip	390kΩ	MCR10
R639	Chip	12kΩ	MCR10
C601	Chip Tantalum	1μF	16V SV
C602	Monolithic	0.001μF	GRM40
C604	Chip Tantalum	10μF	16V SV
C605	Chip Tantalum	0.1μF	TESVA1V104K1-8L
C606	Chip Tantalum	0.1μF	TESVA1V104K1-8L
C609	Chip Tantalum	10μF	16V SV
C610	Monolithic	0.001μF	GRM40
C611	Monolithic	0.001μF	GRM40
C612	Chip Tantalum	1μF	16V SV
C613	Chip Tantalum	10μF	16V SV
C615	Monolithic	68pF	GRM40
C616	Chip Tantalum	0.1μF	TESVA1V104K1-8L
C617	Monolithic	0.01μF	GRM40 F
C618	Monolithic	0.1μF	GRM40 F
C619	Chip Tantalum	0.22μF	TESVA1V224K1-8L
C620	Chip Tantalum	10μF	16V SV
C621	Chip Tantalum	10μF	16V SV
C622	Chip Tantalum	0.22μF	TESVA1V224K1-8L
C623	Chip Tantalum	0.22μF	TESVA1V224K1-8L
EP601	P.C. Board	B-1430B	
EP602	F.P.C. Board	B-1478A	

[MAIN UNIT]

REF. NO.	DESCRIPTION	PART NO.
IC101	IC	μPC1158HA2
IC102	IC	S81250HG
IC103	IC	TK10420
IC104	IC	LM386N-3
Q101	Transistor	2SC2458 GR
Q102	Transistor	2SA1048 GR
Q103	Transistor	2SA1345
Q104	Transistor	2SA1345
Q105	Transistor	2SC3399
Q106	Transistor	2SC2458 GR
Q107	Transistor	2SB909M R
Q108	Transistor	2SC2458 GR
Q109	Transistor	2SB909M R
Q110	Transistor	2SC2458 GR
Q111	Transistor	2SB909M R
Q112	Transistor	2SA1348
Q113	Transistor	2SC2458 GR
Q114	Transistor	2SA1346
Q115	Transistor	2SB909M R
Q116	Transistor	2SA1048 GR
Q117	Transistor	2SC2458 GR
Q118	Transistor	2SC2668 O
Q119	Transistor	2SC2458 GR
Q120	Transistor	2SC3399
Q121	Transistor	DTC144 TS
Q122	Transistor	2SC3399
Q123	Transistor	2SB909M R
Q124	Transistor	2SC2458 GR
Q125	Transistor	2SC2458 GR
Q126	Transistor	2SC2458 GR
Q127	Transistor	2SC2668 O
Q128	Transistor	2SC2458 GR

[MAIN UNIT]

REF. NO.	DESCRIPTION	PART NO.	
Q129	Transistor	2SC2458 GR	
Q130	Transistor	2SC2458 GR	
Q131	Transistor	2SC3399	
Q132	Transistor	DTC144 TS	
Q133	Transistor	2SC3399	
D101	Diode	1SS211	
D102	Diode	1SS211	
D103	Diode	1SS211	
D104	Diode	1SS211	
D105	Diode	1SS211	
D106	Diode	1SS211	
D107	Diode	1SS211	
D108	Diode	1SS211	
D112	Diode	1SS233	
D113	Diode	1SS211	
D115	Diode	1SS227	
D116	Diode	1SS211	
D117	Diode	1SS211	
D118	Diode	1SS211	
D119	Diode	1SS211	
D120	Diode	1SS211	
D121	Zener	RD5.6E B3	
D122	Diode	1SS211	
D123	Diode	1SS99	
D124	Diode	1SS99	
D128	Diode	1SS216	
D129	Diode	1SS216	
D130	Diode	1SS216	
D131	Diode	1SS216	
FI101	Ceramic	CFUM455B	
FI102	Ceramic	CFUM455D	
X101	Crystal	CR190	
X102	Discriminator	CDB455C7A	
L101	Coil	LS-293	
R101	Resistor	33kΩ	ELR10
R102	Resistor	1.2kΩ	ELR10
R103	Resistor	22kΩ	ELR10
R104	Resistor	220Ω	ELR10
R105	Resistor	22kΩ	ELR10
R106	Trimmer	10kΩ	RH0521C14J08A
R107	Resistor	47kΩ	ELR10
R108	Resistor	68kΩ	ELR10
R109	Resistor	150kΩ	ELR10
R110	Resistor	4.7kΩ	ELR10
R111	Resistor	1.2kΩ	ELR10
R112	Resistor	470Ω	R10
R113	Resistor	10kΩ	ELR10
R114	Resistor	1.2kΩ	ELR10
R115	Resistor	220kΩ	ELR10
R116	Resistor	10kΩ	ELR10
R117	Resistor	220kΩ	ELR10
R118	Resistor	10kΩ	ELR10
R119	Resistor	10kΩ	ELR10
R121	Resistor	47kΩ	ELR10
R122	Resistor	12kΩ	ELR10
R123	Resistor	12kΩ	ELR10
R124	Resistor	1MΩ	ELR10
R125	Resistor	6.8kΩ	R10
R126	Resistor	22kΩ	ELR10
R127	Resistor	4.7Ω	ELR20
R128	Resistor	5.6kΩ	R20
R129	Resistor	33kΩ	ELR10
R130	Resistor	10kΩ	ELR10
R131	Resistor	470Ω	ELR10
R132	Resistor	10kΩ	ELR10

[MAIN UNIT]

REF. NO.	DESCRIPTION	PART NO.	
R133	Resistor	56kΩ	ELR10
R134	Resistor	150kΩ	R10
R135	Resistor	330kΩ	ELR10
R136	Resistor	5.6kΩ	ELR10
R137	Resistor	470Ω	ELR10
R138	Resistor	33kΩ	ELR10
R141	Resistor	47kΩ	R20
R142	Resistor	12kΩ	R20
R143	Resistor	47kΩ	R20
R144	Resistor	150kΩ	ELR10
R145	Variable Resistor	10kΩA	RK0941111003A
R146	Resistor	1.5kΩ	ELR10
R147	Resistor	56kΩ	ELR10
R148	Resistor	47kΩ	ELR10
R149	Resistor	470kΩ	R10
R150	Resistor	39kΩ	ELR10
R151	Resistor	100kΩ	ELR10
R152	Resistor	330kΩ	ELR10
R154	Resistor	47kΩ	ELR10
R155	Resistor	100kΩ	ELR10
R156	Resistor	47kΩ	ELR10
R157	Resistor	100kΩ	ELR10
R158	Resistor	220kΩ	ELR10
R159	Resistor	4.7kΩ	ELR10
R160	Resistor	150kΩ	R10
R161	Resistor	1kΩ	ELR10
R162	Resistor	3.3kΩ	ELR10
R164	Resistor	150kΩ	ELR10
R165	Resistor	2.2kΩ	ELR10
R167	Resistor	56kΩ	ELR10
R168	Resistor	3.3kΩ	ELR10
R169	Resistor	100kΩ	ELR10
R170	Resistor	150kΩ	ELR10
R171	Resistor	820Ω	ELR10
R172	Resistor	1.8kΩ	ELR10
R173	Resistor	4.7kΩ	ELR10
R174	Resistor	10kΩ	ELR10
R175	Resistor	2.7kΩ	ELR10
R176	Resistor	39kΩ	ELR10
R177	Resistor	1.5kΩ	ELR10
R178	Trimmer	2.2kΩ	RH0521CJ3J05A
R179	Variable Resistor	10kΩB	RK094111000NA
R180	Resistor	4.7kΩ	ELR20
R181	Resistor	39kΩ	ELR10
R182	Resistor	3.3kΩ	ELR10
R183	Resistor	220Ω	ELR10
R184	Resistor	82kΩ	ELR10
R185	Resistor	330kΩ	ELR10
R186	Resistor	4.7kΩ	ELR10
R188	Resistor	2.2kΩ	ELR10
R189	Resistor	100kΩ	ELR10
R190	Resistor	27kΩ	ELR10
R191	Resistor	47kΩ	ELR10
R192	Resistor	12kΩ	ELR10
R193	Resistor	12kΩ	ELR10
R194	Resistor	12kΩ	ELR10
R195	Resistor	12kΩ	ELR10
R196	Resistor	12kΩ	ELR10
R197	Resistor	12kΩ	ELR10
R198	Resistor	4.7kΩ	ELR10
C101	Ceramic	470pF	50V
C102	Tantalum	0.1μF	35V DN
C103	Electrolytic	4.7μF	16V MS5
C104	Electrolytic	1μF	50V MS5
C105	Electrolytic	4.7μF	16V MS5
C106	Electrolytic	0.1μF	50V MS5
C107	Electrolytic	4.7μF	16V MS5
C108	Electrolytic	1μF	50V MS5
C109	Electrolytic	22μF	6.3V MS5
C110	Electrolytic	10μF	16V MS5
C111	Electrolytic	22μF	6.3V MS5
C112	Electrolytic	1μF	50V MS5
C113	Electrolytic	47μF	6.3V MS5

[MAIN UNIT]

REF. NO.	DESCRIPTION	PART NO.		
C114	Electrolytic	22μF	6.3V	MS5
C115	Ceramic	0.001μF	50V	
C116	Ceramic	0.001μF	50V	
C117	Ceramic	0.001μF	50V	
C118	Ceramic	0.001μF	50V	
C119	Electrolytic	47μF	6.3V	MS5
C120	Barrier Layer	0.0018μF	25V	
C121	Ceramic	0.001μF	50V	
C122	Barrier Layer	0.0033μF	25V	
C123	Barrier Layer	0.01μF	25V	
C124	Ceramic	0.001μF	50V	
C125	Electrolytic	22μF	6.3V	MS5
C126	Ceramic	470pF	50V	
C127	Electrolytic	22μF	6.3V	MS5
C128	Electrolytic	22μF	6.3V	MS5
C129	Ceramic	0.001μF	50V	
C130	Ceramic	0.001μF	50V	
C131	Electrolytic	22μF	16V	MS5
C132	Ceramic	22pF	50V	
C133	Barrier Layer	0.01μF	25V	
C134	Barrier Layer	0.0047μF	25V	
C135	Ceramic	0.001μF	50V	
C136	Ceramic	33pF	50V	
C137	Ceramic	0.001μF	50V	
C138	Ceramic	0.001μF	50V	
C140	Ceramic	0.001μF	50V	
C141	Barrier Layer	0.0033μF	25V	
C142	Ceramic	0.001μF	50V	
C143	Ceramic	0.001μF	50V	
C144	Electrolytic	100μF	16V	MS7
C145	Ceramic	100pF	50V	
C146	Ceramic	100pF	50V	
C147	Tantalum	1μF	35V	DN
C148	Electrolytic	33μF	10V	MS5
C149	Electrolytic	0.47μF	50V	MS5
C150	Electrolytic	10μF	16V	MS5
C151	Electrolytic	1μF	50V	MS5
C152	Ceramic	0.001μF	50V	
C153	Ceramic	0.001μF	50V	
C154	Electrolytic	0.22μF	50V	MS5
C155	Electrolytic	2.2μF	50V	MS5
C156	Barrier Layer	0.0027μF	25V	
C157	Barrier Layer	0.0047μF	25V	
C158	Electrolytic	0.47μF	50V	MS5
C159	Ceramic	470pF	50V	
C160	Ceramic	0.001μF	50V	
C161	Ceramic	0.001μF	50V	
C162	Ceramic	22pF	50V	
C163	Ceramic	0.001μF	50V	
C164	Barrier Layer	0.01μF	25V	
C165	Ceramic	0.001μF	50V	
C166	Ceramic	0.001μF	50V	
C167	Electrolytic	4.7μF	16V	MS5
C168	Electrolytic	10μF	10V	MS5
C169	Barrier Layer	0.01μF	25V	
C170	Ceramic	0.001μF	50V	
C171	Ceramic	22pF	50V	
C172	Ceramic	33pF	50V	
C173	Monolithic	0.1μF	D33Y5V1E 104Z21	
C174	Ceramic	82pF	50V	
C175	Barrier Layer	0.01μF	25V	
C176	Tantalum	ECSF0JE106		
C177	Monolithic	0.1μF	D33Y5V1E 104Z21	
C178	Ceramic	470pF	50V	
C179	Ceramic	470pF	50V	
C180	Electrolytic	4.7μF	16V	MS5
C181	Electrolytic	10μF	10V	MS5
C182	Ceramic	0.001μF	50V	
C183	Barrier Layer	0.0022μF	25V	
C186	Electrolytic	2.2μF	35V	MS5
C187	Electrolytic	10μF	10V	MS5
C188	Barrier Layer	0.01μF	25V	
C189	Electrolytic	0.1μF	50V	MS5
C190	Barrier Layer	0.0047μF	25V	
C191	Barrier Layer	0.0047μF	25V	

[MAIN UNIT]

REF. NO.	DESCRIPTION	PART NO.
C194	Ceramic	0.001µF 50V
C195	Electrolytic	2.2µF 35V MS5
C196	Ceramic	470pF 50V
C197	Ceramic	470pF 50V
C198	Ceramic	470pF 50V
C199	Electrolytic	10µF 10V MS5
RL101	Relay	OUC-SS-114D
S101	Switch	SKHHAK013A (PTT)
S102	Switch	SKHHAK013A (LIGHT)
S103	Switch	SKHHAK013A (FUNC)
S104	Switch	SPPH22014A (RF OUTPUT POWER)
S105	Switch	SPPH22014A (ANL)
BT101	Lithium Battery	BR2325-1HC
EP101	Ferrite Bead	RE DL2-OP2.6-3-1.2H
EP102	Ferrite Bead	RE DL2-OP2.6-3-1.2H
EP103	P.C. Board	B-1460C
EP104	P.C. Board	B-908
EP105	F.P.C. Board	B-812
W101	Wire	23/03/135/D21/W01
W102	Wire	23/02/115/D21/W01
W103	Wire	72/98/050/X98/X98
W104	Wire	72/98/050/X98/X98
W105	Wire	23/01/125/D21/D21
W107	Wire	23/04/085/D21G/D21G
W108	Wire	23/05/090/D21G/D21
W110	Wire	31/03/040/W02/W02
W112	Shield Cable	66/99/100/W11A/W18 08
W113		
W114	Wire	23/09/105/D21G/D21
W115	Jumper	JPW-01 R01
W116	Wire	73/98/012/X98/X98

[RF UNIT]

REF. NO.	DESCRIPTION	PART NO.
IC301	IC	PLL2001
Q301	Transistor	2SC2668 O
Q302	FET	2SK241 Y
Q303	Transistor	2SC2668 O
Q304	Transistor	2SC3399
Q305	Transistor	2SA1048 GR
Q306	Transistor	2SC3399
Q307	Transistor	2SA1345
Q308	Transistor	2SC3399
Q309	Transistor	2SC2458 GR
Q310	Transistor	2SA1048 GR
Q312	Transistor	2SC2458 GR
Q313	FET	3SK74M
Q314	FET	3SK74M
Q315	Transistor	2SC2407AW
Q316	Transistor	2SC1947
Q317	Transistor	2SC1972
Q318	Transistor	2SA1048 GR

[RF UNIT]

REF. NO.	DESCRIPTION	PART NO.
D301	Varicap	1SV153
D302	Varicap	1SV153
D303	Varicap	1SV153
D304	Varicap	1SV153
D305	Varicap	1SV153
D306	Zener	RD8.2E B3
D307	Diode	1SS216
D308	Diode	1SS216
D309	Diode	1S953
D310	Diode	1S953
D311	Diode	1S953
D312	Diode	1SS97
D313	Diode	1SS97
D314	Diode	1SS216
D315	Diode	1SS216
D316	Diode	1SS211
D317	Diode	1SS211
FI301	Crystal	FL-98 35M20B
X301	Crystal	CR69
L301	Coil	LB-170
L302	Coil	LB-170
L303	Coil	LB-172
L304	Coil	LB-172
L305	Coil	LB-178
L306	Coil	LS-313
L307	Coil	LS-313
L308	Coil	LAL02NA 4R7K
L309	Coil	LAL03NA 4R7K
L310	Coil	LA-234
L311	Coil	LAL03NA 2R2M
L312	Coil	LR-188
L313	Coil	LAL03NA 2R2M
L314	Coil	LR-160
L315	Coil	LR-125
L316	Coil	LR-125
L317	Coil	LR-161
L318	Coil	LR-161
L319	Coil	LR-125
L320	Coil	LR-162
L321	Coil	LR-125
L322	Coil	LA-237
L323	Coil	LAL03NA 4R7K
L324	Coil	LA-237
L325	Coil	LA-236
L326	Coil	LA-234
L327	Coil	LAL02NA 3R9K
R301	Resistor	220kΩ ELR10
R302	Resistor	220kΩ ELR10
R303	Resistor	47kΩ ELR10
R304	Resistor	470Ω ELR10
R305	Resistor	100Ω ELR10
R306	Resistor	1kΩ ELR10
R307	Resistor	220kΩ ELR10
R308	Resistor	220kΩ ELR10
R309	Resistor	220kΩ ELR10
R310	Resistor	56Ω ELR10
R311	Resistor	2.2kΩ ELR10
R312	Resistor	10kΩ ELR10
R313	Resistor	100Ω ELR10
R314	Resistor	100kΩ ELR10
R315	Resistor	1kΩ ELR10
R316	Resistor	220Ω ELR10
R317	Resistor	100Ω R10
R318	Resistor	220kΩ ELR10
R319	Resistor	470kΩ ELR10
R320	Resistor	470kΩ ELR10
R321	Resistor	2.7kΩ ELR10

[RF UNIT]

REF. NO.	DESCRIPTION	PART NO.	
R323	Resistor	5.6kΩ	ELR10
R324	Resistor	10kΩ	ELR10
R325	Resistor	1kΩ	ELR10
R326	Resistor	3.3kΩ	ELR10
R327	Resistor	2.2kΩ	R10
R328	Resistor	10kΩ	ELR10
R329	Resistor	47Ω	ELR10
R330	Resistor	10kΩ	R10
R331	Resistor	180Ω	ELR10
R332	Resistor	33Ω	R10
R333	Resistor	180Ω	ELR10
R335	Resistor	1MΩ	ELR10
R336	Resistor	220Ω	ELR10
R337	Resistor	10kΩ	ELR10
R338	Resistor	47kΩ	ELR10
R339	Resistor	470kΩ	ELR10
R340	Resistor	39kΩ	R10
R341	Resistor	100kΩ	ELR10
R342	Resistor	470Ω	ELR10
R343	Resistor	1kΩ	ELR10
R344	Resistor	1kΩ	ELR10
R345	Resistor	470Ω	ELR10
R346	Resistor	47Ω	ELR10
R347	Resistor	39kΩ	ELR10
R348	Resistor	56kΩ	ELR10
R349	Resistor	22kΩ	ELR10
R350	Resistor	47kΩ	ELR10
R351	Resistor	2.2kΩ	ELR10
R352	Resistor	180Ω	ELR10
R353	Resistor	1kΩ	ELR10
R354	Resistor	180Ω	ELR10
R355	Resistor	47Ω	ELR10
R356	Resistor	47Ω	ELR10
R357	Resistor	470Ω	ELR10
R358	Resistor	150Ω	ELR20
R359	Resistor	470Ω	ELR10
R360	Trimmer	330Ω	RH0521CN2J05A
R361	Trimmer	330Ω	RH0521CN2J05A
R362	Resistor	82Ω	ELR20
R363	Resistor	330Ω	ELR10
R364	Resistor	4.7kΩ	ELR10
R365	Resistor	4.7kΩ	ELR10
R366	Resistor	27Ω	ELR10
R367	Resistor	5.6kΩ	ELR10
R368	Resistor	47kΩ	ELR10
R369	Resistor	1kΩ	R10
R370	Trimmer	10kΩ	RH0521C14J08A
R371	Resistor	1kΩ	ELR10
R372	Resistor	1kΩ	ELR10
C301	Ceramic	0.001μF	50V
C302	Ceramic	3pF	50V
C303	Ceramic	0.001μF	50V
C304	Ceramic	0.001μF	50V
C305	Ceramic	1pF	50V
C306	Ceramic	100pF	50V
C307	Ceramic	0.001μF	50V
C308	Ceramic	0.001μF	50V
C309	Ceramic	0.001μF	50V
C310	Ceramic	0.001μF	50V
C311	Ceramic	0.001μF	50V
C312	Ceramic	4pF	50V
C313	Ceramic	0.001μF	50V
C314	Ceramic	0.001μF	50V
C315	Ceramic	0.001μF	50V
C317	Ceramic	0.001μF	50V
C318	Ceramic	47pF	50V
C319	Barrier Layer	0.0047μF	25V
C320	Ceramic	0.001μF	50V
C321	Ceramic	8pF	50V
C322	Ceramic	47pF	50V
C323	Ceramic	10pF	50V
C324	Ceramic	0.001μF	50V
C325	Barrier Layer	0.0047μF	25V

[RF UNIT]

REF. NO.	DESCRIPTION	PART NO.		
C326	Tantalum	2.2μF	35V	DN
C327	Ceramic	0.001μF	50V	
C328	Ceramic	0.001μF	50V	
C329	Barrier Layer	0.0047μF	25V	
C330	Ceramic	0.001μF	50V	
C331	Ceramic	0.001μF	50V	
C332	Electrolytic	47μF	6.3V	MS5
C333	Barrier Layer	0.01μF	25V	
C334	Electrolytic	1μF	50V	MS5
C335	Ceramic	100pF	50V	
C336	Trimmer	15pF	ECRGA015E30	
C337	Ceramic	24pF	50V	
C338	Ceramic	27pF	50V	
C339	Ceramic	470pF	50V	
C340	Tantalum	1μF	35V	DN
C341	Ceramic	0.001μF	50V	
C342	Ceramic	0.001μF	50V	
C343	Ceramic	0.001μF	50V	
C345	Barrier Layer	0.01μF	25V	
C346	Ceramic	4pF	50V	
C347	Ceramic	22pF	50V	
C349	Ceramic	0.001μF	50V	
C350	Electrolytic	10μF	10V	MS5
C351	Ceramic	0.001μF	50V	
C352	Ceramic	0.001μF	50V	
C353	Ceramic	0.001μF	50V	
C354	Ceramic	0.001μF	50V	
C355	Ceramic	22pF	50V	
C356	Electrolytic	10μF	10V	MS5
C357	Ceramic	0.001μF	50V	
C358	Ceramic	0.001μF	50V	
C359	Ceramic	0.001μF	50V	
C360	Ceramic	0.001μF	50V	
C361	Ceramic	0.001μF	50V	
C362	Electrolytic	4.7μF	16V	MS5
C363	Ceramic	470pF	50V	
C364	Ceramic	0.001μF	50V	
C365	Ceramic	82pF	50V	
C366	Ceramic	0.001μF	50V	
C367	Ceramic	0.001μF	50V	
C368	Barrier Layer	0.01μF	25V	
C369	Ceramic	22pF	50V	
C370	Electrolytic	10μF	16V	MS5
C371	Barrier Layer	0.01μF	25V	
C372	Ceramic	0.001μF	50V	
C373	Ceramic	0.001μF	50V	
C374	Ceramic	0.001μF	50V	
C375	Ceramic	22pF	50V	
C376	Ceramic	10pF	50V	
C377	Ceramic	0.001μF	50V	
C378	Electrolytic	10μF	10V	MS5
C379	Barrier Layer	0.01μF	25V	
C380	Ceramic	0.001μF	50V	
C381	Ceramic	0.001μF	50V	
C382	Ceramic	100pF	50V	
C383	Ceramic	0.001μF	50V	
C384	Electrolytic	10μF	16V	MS5
C385	Ceramic	22pF	50V	
C386	Ceramic	0.001μF	50V	
C387	Ceramic	1pF	50V	
C388	Ceramic	5pF	50V	
C389	Ceramic	22pF	50V	
C390	Ceramic	22pF	50V	
C391	Ceramic	1pF	50V	
C392	Ceramic	5pF	50V	
C393	Ceramic	0.001μF	50V	
C394	Ceramic	8pF	50V	
C395	Ceramic	0.001μF	50V	
C396	Ceramic	22pF	50V	
C397	Ceramic	2pF	50V	
C398	Ceramic	33pF	50V	
C399	Ceramic	15pF	50V	
C400	Ceramic	15pF	50V	
C401	Ceramic	8pF	50V	
C402	Ceramic	470pF	50V	

[RF UNIT]

REF. NO.	DESCRIPTION	PART NO.		
C403	Ceramic	0.001µF	50V	
C404	Electrolytic	10µF	16V	MS5
C405	Barrier Layer	0.01µF	25V	
C406	Electrolytic	10µF	16V	MS5
C407	Barrier Layer	0.01µF	25V	
C408	Ceramic	0.001µF	50V	
C409	Ceramic	0.001µF	50V	
C410	Ceramic	0.001µF	50V	
C411	Ceramic	0.001µF	50V	
C412	Ceramic	470pF	50V	
C413	Electrolytic	4.7µF	16V	MS5
J301	Connector	BNC-RM-106		
J302	Connector	HSJ0836-01-010		
J303	Connector	HSJ1102-01-040		
J304	Connector	HEC0747-01-010		
J305	Connector	IMSA-9201B-1-02-T		
J306	Connector	IMSA-9201B-1-02-T		
J307	Connector	171255-1		
J308	Connector	171255-1		
J309	Connector	PD09A05M		
P301	Connector	IMSA-9201-HT		
P302	Connector	IMSA-9201-HT		
EP301	Ferrite Bead	RE DL2-OP2.6-3-1.2H		
EP302	Ferrite Bead	RE DL2-OP2.6-3-1.2H		
EP303	Ferrite Bead	RE DL2-OP2.6-3-1.2H		
EP304	Ferrite Bead	RE DL2-OP2.6-3-1.2H		
EP305	Ferrite Bead	RE DL2-OP2.6-3-1.2H		
EP306	P.C. Board	B-1461B		
W301	Wire	23/08/085/Y/D21		
W302	Wire	23/01/055/Y/D21		
W303	Wire	23/06/055/Y/D21		
W304	Wire	23/03/065/Y/D21		
W305	Wire	23/05/055/Y/D21		
W306	Wire	23/08/070/D21/D21		
W307	Wire	23/04/095/D21/D21		
W308	Wire	23/07/055/D21/D21		
W309	Wire	23/02/055/D21/D21		
W311	Wire	72/98/050/X98/X98		
W312	Wire	72/98/050/X98/X98		
W313	Wire	72/98/050/X98/X98		
W314	Wire	72/98/050/X98/X98		
W315	Wire	72/98/015/X98/X98		
W316	Wire	72/98/050/X98/X98		
W317	Jumper	JPW-01 R01		

[VCO UNIT]

REF. NO.	DESCRIPTION	PART NO.
Q501	Transistor	2SC3772 3
Q502	Transistor	2SC3772 3
Q503	FET	2SK210 Y
Q504	Transistor	2SC3772 3
Q505	Transistor	2SC3772 3
Q506	Transistor	DTC124EK
D501	Varicap	MA334 B
D502	Varicap	MA334 B
D503	Diode	1SS154
D504	Diode	1SS153

[VCO UNIT]

REF. NO.	DESCRIPTION	PART NO.	
L501	Coil	MLF321606DR15M	
L502	Coil	MLF321606DR12M	
L503	Coil	LB-222	
L504	Coil	LB-223	
L505	Coil	MLF321611A1R5M	
L506	Coil	MLF321606DR12M	
L507	Coil	MLF321606DR15M	
L508	Coil	MLF321611A1R5M	
R501	Chip	330Ω	MCR10
R502	Chip	47kΩ	MCR10
R503	Chip	47kΩ	MCR10
R504	Chip	4.7kΩ	MCR10
R505	Resistor	56kΩ	R20
R506	Chip	1kΩ	MCR10
R507	Chip	220Ω	MCR10
R508	Chip	100kΩ	MCR10
R509	Chip	12kΩ	MCR10
R510	Chip	39kΩ	MCR10
R511	Chip	150Ω	MCR10
R512	Chip	1.2kΩ	MCR10
R513	Chip	1.2kΩ	MCR10
R514	Resistor	1kΩ	R20
R515	Chip	330Ω	MCR18
C501	Ceramic	7pF	50V
C502	Monolithic	0.001µF	GRM40
C503	Monolithic	8pF	GRM40
C504	Monolithic	0.001µF	GRM40
C505	Monolithic	0.5pF	GRM40
C506	Monolithic	33pF	GRM40
C507	Monolithic	0.001µF	GRM40
C508	Monolithic	0.001µF	GRM40
C509	Monolithic	0.001µF	GRM40
C510	Ceramic	470pF	50V
C511	Monolithic	0.1µF	GRM40 F
C512	Monolithic	0.001µF	GRM40
C513	Monolithic	0.5pF	GRM40
C514	Monolithic	0.001µF	GRM40
C515	Monolithic	8pF	GRM40
C516	Ceramic	7pF	50V
C517	Monolithic	0.001µF	GRM40
C518	Monolithic	0.001µF	GRM40
C519	Ceramic	0.001µF	50V
EP501	P.C. Board	B-1463A	

Icom Inc.

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

Icom America Inc.

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

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

<Regional Customer Service Centers>
3150 Premier Drive, Suite 126, Irving, TX 75063, U.S.A.
Phone : (214) 550-7525
Fax : (214) 550-7423

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

Icom Canada

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

Icom (Europe) GmbH

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

Icom (Australia) Pty. Ltd.

Incorporated In Victoria
7 Duke Street, Windsor, Victoria, 3181, Australia
Phone : 03 529 7582
Fax : 03 529 8485
Telex : AA 35521 ICOM AS

Icom (UK) Ltd.

Unit 9, Sea St., Herne Bay, Kent, U.K.
Phone : 0227 363859
Fax : 0227 360155
Telex : 965179 ICOM G

Icom France S.a

120 Route de Revel, BP4063, 31029 Toulouse Cedex, France
Phone : 61. 20. 31. 49
Fax : 61. 34. 05. 91
Telex : 521515 ICOM FRA

Count on us!

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

A-1028H-N
Printed in Japan