



# SERVICE MANUAL

DUAL BAND FM TRANSCEIVER

**IC-32A**

**IC-32AT**

**IC-32E**

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## INTRODUCTION

This service manual describes the latest service information for the **IC-32A/AT/E DUAL BAND FM TRANSCEIVER** at the time of going to press.

Six versions of the **IC-32A/AT/E** have been designed. This service manual covers each version.

VERSION NO.	VERSION	FREQUENCY RANGE [MHz]		TUNING STEP [kHz]		INITIAL OFFSET [MHz]		ENCODERS
		VHF	UHF	VHF	UHF	VHF	UHF	
#03	Europe (IC-32E)	144~146	430~440	25	25	0.6	7.6	Tone call
#04	Italy (IC-32E)	144~148	430~440	25	25	0.6	7.6	Tone call
#05	U.S.A. (IC-32AT)	144~148	440~450	15	25	0.6	5.0	CTCSS/DTMF
#06	U.S.A. (IC-32A)	144~148	440~450	15	25	0.6	5.0	—
#07	Australia (IC-32A)	144~148	430~440	25	25	0.6	5.0	—
#09	Asia (IC-32AT)	144~148	430~440	15	25	0.6	5.0	CTCSS/DTMF

## DANGER

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

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

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

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

## REPAIR NOTE

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



The picture shows the IC-32AT.

## ORDERING PARTS

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

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

### < SAMPLE ORDER >

IC	μPD4094BG	IC-32A	MAIN UNIT	—	2 pieces
Screw	PH BO 2×31.5 ZK	IC-32E	Front panel	8810004000	4 pieces

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

## TABLE OF CONTENTS

<b>SECTION 1</b>	<b>SPECIFICATIONS</b> .....	<b>1 — 1</b>
<b>SECTION 2</b>	<b>OUTSIDE AND INSIDE VIEWS</b> .....	<b>2 — 1 ~ 4</b>
2-1	OUTSIDE VIEWS .....	2 — 1
2-2	INSIDE VIEWS .....	2 — 2
<b>SECTION 3</b>	<b>BLOCK DIAGRAM</b> .....	<b>3 — 1</b>
<b>SECTION 4</b>	<b>CIRCUIT DESCRIPTION</b> .....	<b>4 — 1 ~ 6</b>
4-1	RECEIVER CIRCUITS .....	4 — 1
4-2	TRANSMITTER CIRCUITS .....	4 — 2
4-3	VHF PLL CIRCUITS .....	4 — 3
4-4	UHF PLL CIRCUITS .....	4 — 3
4-5	POWER SUPPLY CIRCUITS .....	4 — 4
4-6	OTHER CIRCUITS .....	4 — 4
4-7	CPU PORT ALLOCATIONS (LOGIC UNIT) .....	4 — 5
<b>SECTION 5</b>	<b>MECHANICAL PARTS AND DISASSEMBLY</b> .....	<b>5 — 1 ~ 4</b>
5-1	MECHANICAL PARTS .....	5 — 1
5-2	BATTERY PACK .....	5 — 3
<b>SECTION 6</b>	<b>MAINTENANCE AND ADJUSTMENT</b> .....	<b>6 — 1 ~ 6</b>
6-1	PLL ADJUSTMENT .....	6 — 1
6-2	RECEIVER ADJUSTMENT .....	6 — 3
6-3	TRANSMITTER ADJUSTMENT .....	6 — 5
<b>SECTION 7</b>	<b>BOARD LAYOUTS</b> .....	<b>7 — 1 ~ 12</b>
7-1	EF UNIT .....	7 — 1
7-2	LOGIC UNIT .....	7 — 2
7-3	MAIN UNIT .....	7 — 4
7-4	RF UNIT (1) .....	7 — 6
7-5	RF UNIT (2) .....	7 — 8
7-6	U-VCO UNIT .....	7 — 10
7-7	V-VCO UNIT .....	7 — 11
7-8	TONE UNIT (IC-32AT) .....	7 — 12
<b>SECTION 8</b>	<b>PARTS LIST</b> .....	<b>8 — 1 ~ 8</b>
<b>SECTION 9</b>	<b>OPTIONAL UNITS</b> .....	<b>9 — 1 ~ 4</b>
9-1	UT-40 TONE SQUELCH UNIT CIRCUIT DESCRIPTION .....	9 — 1
9-2	UT-40 VOLTAGE/CIRCUIT DIAGRAM .....	9 — 2
9-3	UT-40 BOARD LAYOUTS .....	9 — 3
9-4	UT-40 BLOCK DIAGRAM .....	9 — 4
9-5	UT-40 PARTS LIST .....	9 — 4
<b>SECTION 10</b>	<b>VOLTAGE DIAGRAMS</b> .....	<b>10 — 1 ~ 2</b>

# SECTION 1 SPECIFICATIONS

## GENERAL

- Frequency coverage

VERSION	GUARANTEED RANGE	OPERATIONAL RANGE	
	TRANSCEIVER	RECEIVER	TRANSMITTER
IC-32A/AT (U.S.A. version)	144.00 ~ 148.00	138.00 ~ 174.00	140.00 ~ 150.00
	440.00 ~ 450.00	440.00 ~ 450.00	440.00 ~ 450.00
IC-32A (Australia version)	144.00 ~ 148.00	144.00 ~ 148.00	144.00 ~ 148.00
	430.00 ~ 440.00	430.00 ~ 440.00	430.00 ~ 440.00
IC-32AT (Asia version)	144.00 ~ 148.00	138.00 ~ 174.00	140.00 ~ 150.00
	430.00 ~ 440.00	430.00 ~ 440.00	430.00 ~ 440.00
IC-32E (Europe version)	144.00 ~ 146.00	144.00 ~ 146.00	144.00 ~ 146.00
	430.00 ~ 440.00	430.00 ~ 440.00	430.00 ~ 440.00
IC-32E (Italy version)	144.00 ~ 148.00	138.00 ~ 174.00	140.00 ~ 150.00
	430.00 ~ 440.00	430.00 ~ 440.00	430.00 ~ 440.00

(Unit: MHz)

- Mode
- Tuning step increment

F3 (FM)

IC-32A/AT	5, 10, 15, 20, or 25 kHz
IC-32E	12.5 or 25 kHz

- Antenna impedance
- Power supply requirement
- Current drain (at 13.2 V DC)

50  $\Omega$  unbalanced

5.5 ~ 16.0 V DC (from the bottom terminal)  
12.0 ~ 16.0 V DC (from [DC IN 13.8 V] jack)

TX/RX	DESCRIPTION	VHF	UHF
Receive	Power saved typical	10 mA	12 mA
	Max. audio output	250 mA	250 mA
Transmit	HIGH power	2.0 A	2.2 A
	LOW power	900 mA	1.0 A

- Usable temperature range
- Frequency stability
- Dimensions and weight

-10°C ~ +60°C (+14°F ~ +140°F)

$\pm 10$  ppm (-10°C ~ +60°C, +14°F ~ +140°F)

ATTACHED BATTERY PACK	DIMENSIONS Unit: mm (in)			WEIGHT Unit: g (lb)
	W	H	D	
With BP-70 (U.S.A. version)	65 (2.6)	180.5 (7.1)	35 (1.4)	590 (1.3)
With BP-4 (Asia version)	65 (2.6)	169.0 (6.7)	35 (1.4)	545 (1.2)
With BP-3 (Other versions)	65 (2.6)	159.0 (6.3)	35 (1.4)	510 (1.1)

## TRANSMITTER

- Output power

	VHF	UHF
HIGH	5.5 W	5.0 W
LOW	1.0 W	1.0 W

- Modulation system
- Max. frequency deviation
- Spurious emissions
- Microphone impedance

Variable reactance frequency modulation

$\pm 5$  kHz

Less than -60 dB

2 k $\Omega$

## RECEIVER

- Receive system
- Intermediate frequencies
- Sensitivity
- Squelch sensitivity (threshold)
- Selectivity
- Spurious response rejection
- Intermodulation rejection
- Audio output power
- Audio output impedance

Double-conversion superheterodyne

1st 30.875 MHz 2nd 455 kHz

Less than 0.25  $\mu$ V for 12 dB SINAD

Less than 0.158  $\mu$ V

Less than  $\pm 7.5$  kHz/-6 dB

More than  $\pm 15$  kHz/-60 dB

Less than -60 dB

Less than -50 dB

More than 400 mW at 10 % distortion with an 8  $\Omega$  load

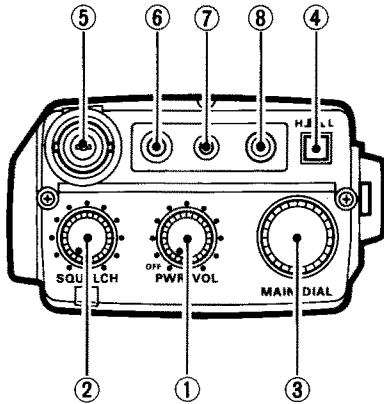
8  $\Omega$

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

## SECTION 2 OUTSIDE AND INSIDE VIEWS

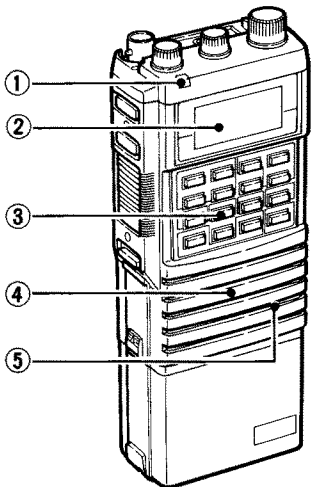
### 2-1 OUTSIDE VIEWS

#### • TOP PANEL

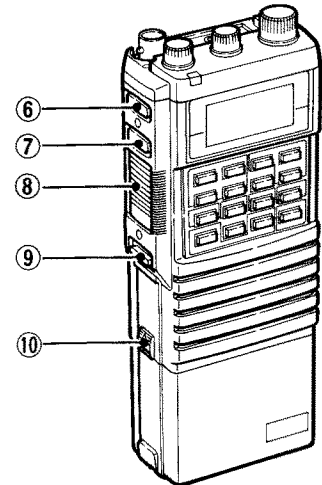


- ① POWER/VOLUME CONTROL [PWR/VOL]
- ② SQUELCH CONTROL [SQUELCH]
- ③ MAIN DIAL [MAIN DIAL]
- ④ RF OUTPUT POWER SWITCH [H/L]
- ⑤ ANTENNA CONNECTOR
- ⑥ EXTERNAL SPEAKER JACK [EXT SP]
- ⑦ EXTERNAL MICROPHONE JACK [MIC]
- ⑧ EXTERNAL DC POWER JACK [DC IN 13.8 V]

#### • FRONT AND SIDE PANELS

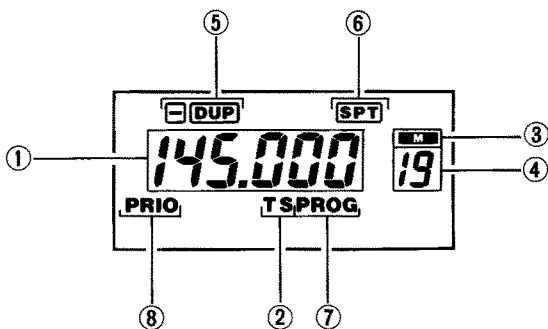


- ① TRANSMIT INDICATOR [TX]
- ② FUNCTION DISPLAY
- ③ KEYBOARD
- ④ SPEAKER
- ⑤ MICROPHONE

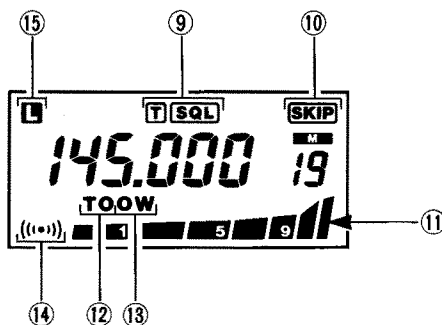


- ⑥ MONITOR SWITCH [MONITOR]
- ⑦ FUNCTION SWITCH [FUNCTION]
- ⑧ PTT SWITCH
- ⑨ LIGHT SWITCH [LIGHT]
- ⑩ BATTERY PACK RELEASE BUTTON [RELEASE]

#### • FUNCTION DISPLAY



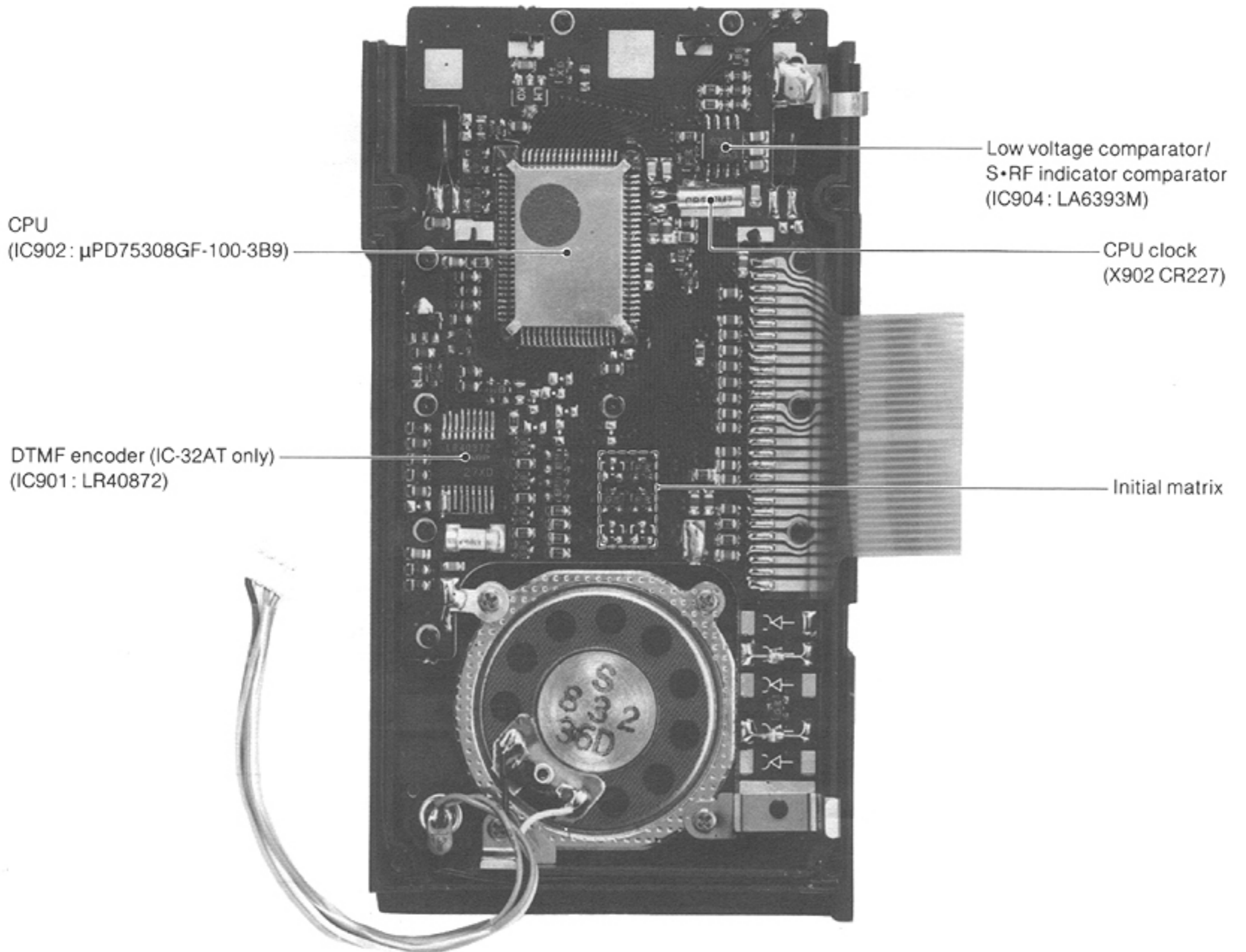
- ① FREQUENCY DISPLAY
- ② TS INDICATOR "TS"
- ③ MEMORY MODE INDICATOR "M"
- ④ MEMORY CHANNEL INDICATOR
- ⑤ DUPLEX INDICATORS "—" "DUP"
- ⑥ FULL DUPLEX INDICATOR "SPT"
- ⑦ PROGRAMMED SCAN INDICATOR "PROG"
- ⑧ PRIORITY WATCH INDICATOR "PRIO"



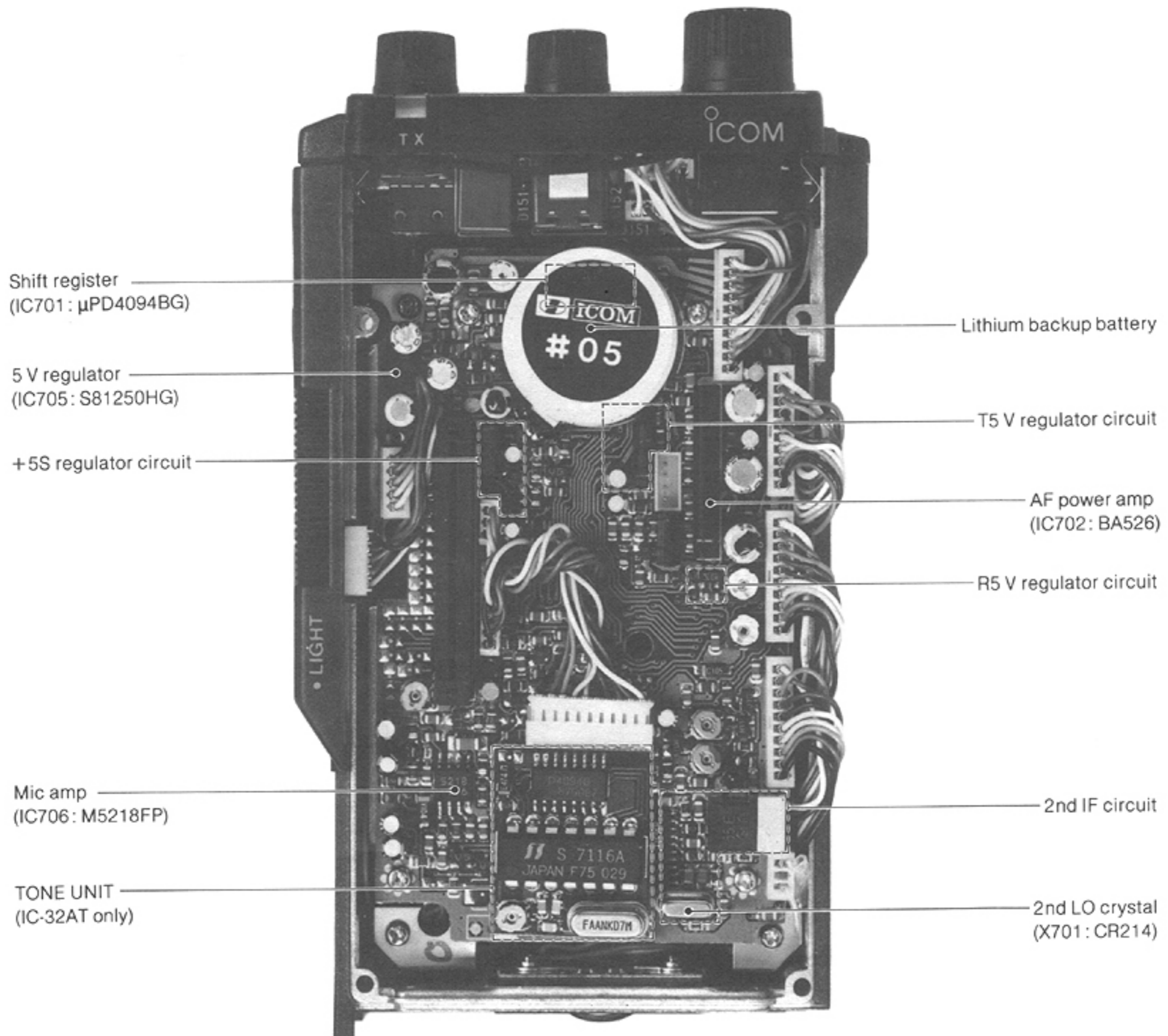
- ⑨ TONE AND SQUELCH INDICATORS "T" "SQL"
- ⑩ MEMORY SKIP INDICATOR "SKIP"
- ⑪ S/R F INDICATOR
- ⑫ TONE SETTING INDICATOR "TO"
- ⑬ OFFSET FREQUENCY WRITE INDICATOR "OW"
- ⑭ POCKET BEEP INDICATOR "(((•)))"
- ⑮ LOCK INDICATOR "L"

## 2-2 INSIDE VIEWS

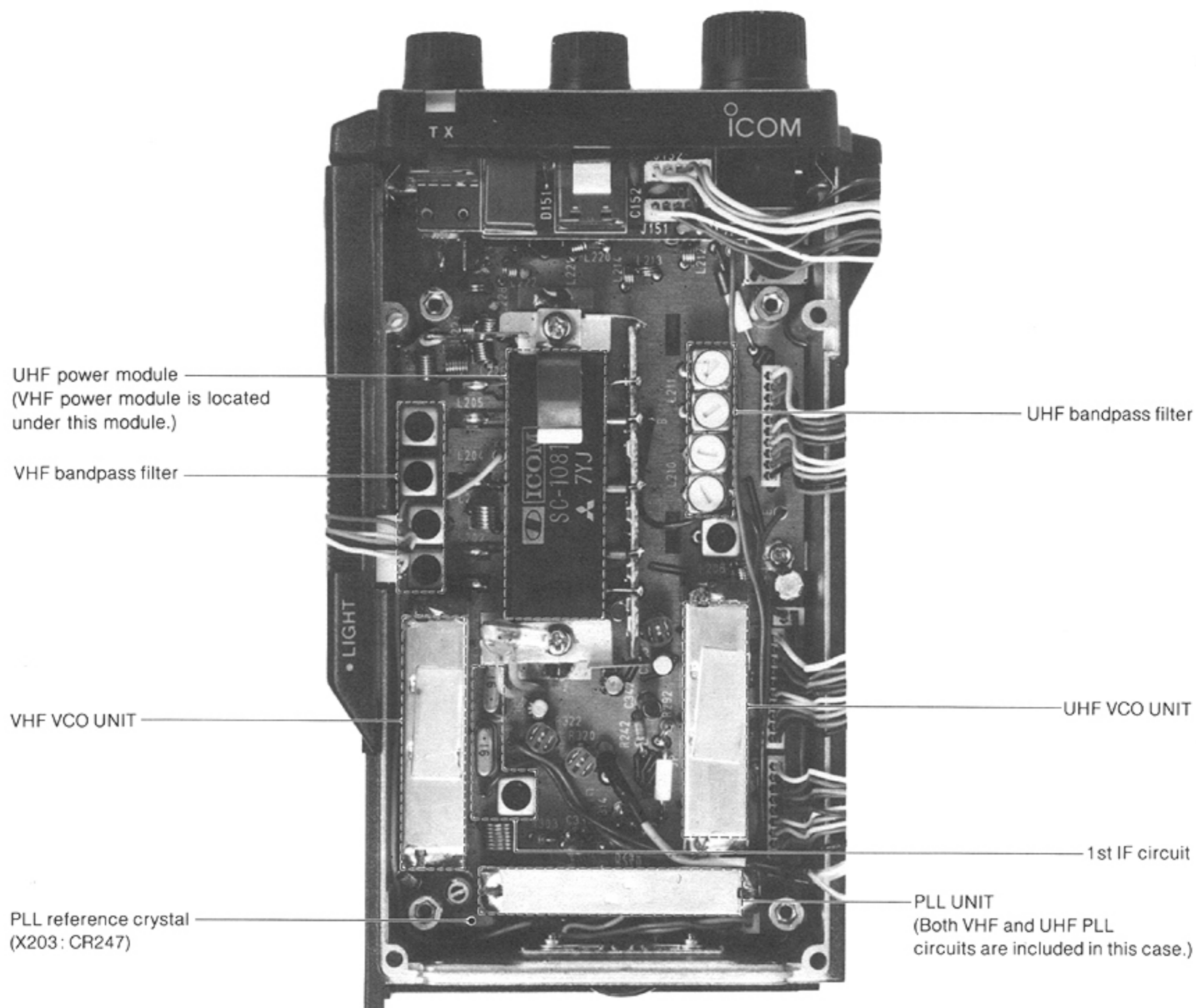
### • LOGIC UNIT



• MAIN UNIT



• RF UNIT







## SECTION 4 CIRCUIT DESCRIPTION

### 4-1 RECEIVER CIRCUITS

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

Received signals enter the ANTENNA CONNECTOR (J210) and pass through a low-pass filter (L222, L223 and C354 ~C358). The low-pass filter is designed to filter signals higher than 450 MHz.

To separate VHF and UHF signals, a low-pass filter (L226~L228, C376~C240) for VHF and a high-pass filter (L220, L221, C346~C350) for UHF are included.

The VHF antenna switching circuit employs a  $\lambda/4$ -type diode switching system consisting of D205, D219, L206, L207 and C244~C246. While receiving, D205 and D219 turn OFF and receive signals are applied to the VHF RF amplifier circuit.

The UHF antenna switching circuit consists of D201, D216, L214 and C283~C285. While receiving, D212 and D216 turn OFF and receive signals are applied to the UHF RF amplifier circuit.

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

VHF receive signals from the antenna switching circuit pass through a bandpass filter consisting of D204, L205, C241 and C242. The signals are then amplified at the VHF RF amplifier (Q203). Amplified signals pass through a bandpass filter consisting of D202, D203, C231, C233, C236, L203 and L204.

#### 4-1-3 VHF 1ST MIXER CIRCUIT (RF AND V-VCO UNITS)

Filtered signals are mixed with the 1st LO signal from the V-VCO UNIT at the VHF 1st mixer (Q202) for conversion to 30.875 MHz 1st IF signals.

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

UHF receive signals from the antenna switching circuit pass through a high-pass filter (C281, C282 and L212) and are then amplified at the UHF RF amplifiers (Q210 and Q211). Bandpass filters (L210 and L211) suppress out-of-band signals.

#### 4-1-5 UHF 1ST MIXER CIRCUIT (RF AND U-VCO UNITS)

The filtered signals are mixed with UHF 1st LO signals from the U-VCO UNIT at the UHF 1st mixer (Q209) for conversion to 30.875 MHz 1st IF signals.

#### 4-1-6 1ST IF CIRCUIT (RF AND MAIN UNITS)

1st IF signals in both the VHF and UHF bands utilize the same frequency (30.875 MHz), and the same 1st IF circuit is used.

1st IF signals from Q209 (UHF) or Q202 (VHF) are applied to a pair of mechanical crystal filters (F1202) which determine receiver selectivity. 1st IF signals amplified at Q201 are applied to an FM IC chip (IC707) on the MAIN UNIT.

IC707 contains the oscillator, mixer, limiter amplifier, and quadrature detector circuits. 1st IF signals from the RF UNIT are applied to pin 20 of IC707. Signals are mixed with the 2nd LO signal at the mixer section for conversion to 455 kHz 2nd IF signals.

2nd IF signals are output from pin 4 and pass through F1701 for removal of unwanted heterodyned signals. The filtered signals re-enter at pin 6 and are amplified in the limiter amplifier section. Amplified signals are detected at the quadrature detector section using ceramic resonator X702 for conversion to audio signals.

#### IF CIRCUIT

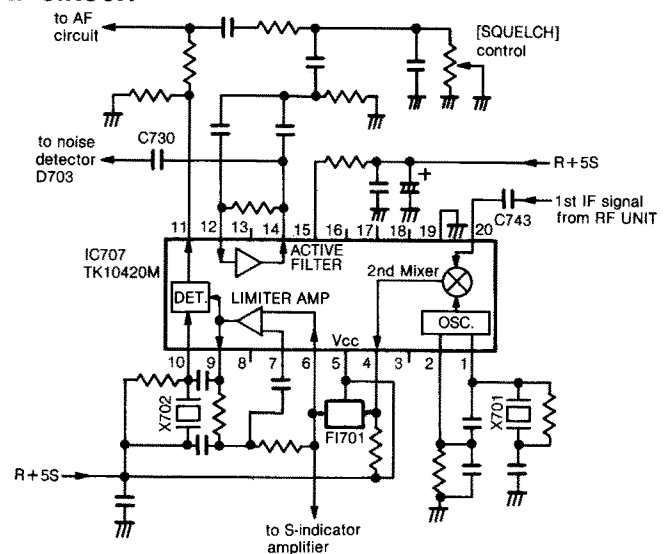


Fig. 1

#### 4-1-7 AF CIRCUIT (MAIN, EF AND LOGIC UNITS)

AF signals from pin 11 of IC707 are applied to a de-emphasis circuit (R724 and C732) and are amplified at Q706 and Q709. The de-emphasis circuit is an integrator circuit with frequency characteristics of  $-6$  dB/oct.

Amplified signals pass through the AF mute switch (Q703) and VOLUME CONTROL (R151), and are then applied to the AF power amplifier (IC702).

The AF power amplifier (IC702) amplifies signals to drive the speaker (SP901).

### 4-1-8 SQUELCH CIRCUIT (MAIN AND EF UNITS)

A portion of signals from pin 11 of IC707 is applied to active filter pin 12 of IC707. The SQUELCH CONTROL (R152) is connected to the active filter input to control the input level. The active filter amplifies noise components of 20 kHz or more.

The noise components output from pin 14 are then rectified by D703 for conversion to DC voltage. When this voltage is at a "HIGH" level, Q708 turns ON, and Q705 turns OFF. Thus Q701 and Q702, the power source circuit of AF power amplifier IC702, is deactivated.

While transmitting, R+5S is not applied to Q705, thus the power source circuit (Q701 and Q702) is deactivated.

## 4-2 TRANSMITTER CIRCUITS

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

AF signals from microphone MC901 or from the EXTERNAL MICROPHONE JACK (J203) are amplified at a limiter amplifier (pin 3 of IC706). This limiter amplifier is formed by a negative feedback circuit with frequency characteristics set at +6 dB/oct. This causes the limiter amplifier to function as a pre-emphasis circuit.

AF signals from the limiter amplifier (pin 1 of IC706) are applied to a splatter filter (pin 6 of IC706) for removing harmonic distortion components higher than 3 kHz. The output signal from the splatter filter (pin 7 of IC706) is applied to D552 through R781 (VHF) or applied to D501 through R779 (UHF) for performing frequency modulation.

### 4-2-2 VHF BUFFER AMPLIFIER CIRCUIT (V-VCO AND RF UNITS)

VHF signals from the V-VCO UNIT are amplified at buffer amplifiers Q553 and Q223, pass through transmit and receive switching diode D218, and are amplified at driver Q229, thus obtaining drive power.

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

Amplified signals at Q229 are power amplified at IC207 and obtain more than 5.5 W (when HIGH is selected) or 1 W (when LOW is selected). Output power from IC207 passes through an antenna switching circuit (D219) and a low-pass filter, and then is applied to the ANTENNA CONNECTOR (J210).

### 4-2-4 UHF BUFFER AMPLIFIER CIRCUIT (U-VCO AND RF UNITS)

UHF signals from the U-VCO UNIT are amplified at buffer amplifiers Q501 and Q221, pass through transmit and receive switching diode D215 and are amplified at driver amp Q224, thus obtaining drive power.

### 4-2-5 UHF POWER AMPLIFIER CIRCUIT (RF UNIT)

Amplified signals at Q224 are power amplified at IC206 and obtain more than 5 W (when HIGH is selected) or 1 W (when LOW is selected). Output power from IC206 passes through an antenna switching circuit (D216), a high-pass filter and a low-pass filter, and then is applied to the ANTENNA CONNECTOR (J210).

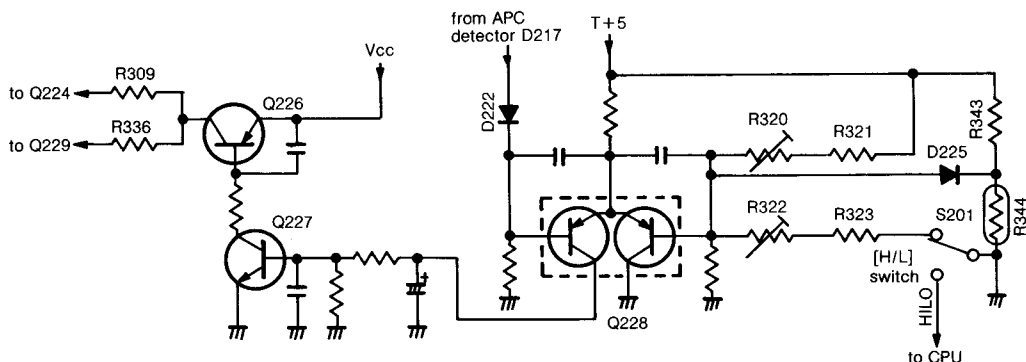
### 4-2-6 APC CIRCUIT (RF UNIT)

The APC circuit protects the power modules (IC206 and IC207) from a mismatched output load and selects HIGH and LOW output power.

The output power level from the power module (IC206 or IC207) is detected at the APC detector (D217). When antenna impedance is matched at 50 Ω, the detected level is at a minimum. However, when antenna impedance is mismatched, the detected voltage is higher than when matched.

When the antenna impedance is mismatched, the base voltage of Q228 is higher than the other base voltage of Q228 (reference voltage). Q228 decreases the collector current of Q226 using Q227. Q226 collector current is used at the driver amplifier (Q224 or Q229). Hence, when the antenna impedance is mismatched, output power is decreased.

**APC CIRCUIT**



**Fig. 2**

The output power selecting circuit uses the APC circuit. The [H/L] switch on the top panel selects the reference voltage, changing output power to HIGH or LOW.

## 4-3 VHF PLL CIRCUITS

### 4-3-1 GENERAL (RF AND V-VCO UNITS)

The VHF PLL circuit uses a one chip PLL IC (IC205) which contains a programmable divider, phase detector, data shift register and data latch circuits. IC205 controls the VHF VCO oscillating frequency using varicap diodes D553 and D554. The VHF VCO oscillating frequency is used as a VHF transmitting frequency while transmitting or as a VHF 1st LO signal while receiving.

The oscillated signal at the VHF VCO circuit is buffer amplified at Q551 and Q222, and is applied to pin 8 of IC205. IC205 divides the signal using N-data from the CPU (IC902) and phase detects the divided signal using the reference oscillator signal. The phase detected signal is converted to a DC voltage (lock voltage) by the charge pump and loop filter. The lock voltage is applied to varicap diodes D553 and D554 in the VHF VCO circuit to control the VCO oscillating frequency. A stable, desired frequency is thus obtained by this loop.

#### VHF PLL CIRCUIT BLOCK DIAGRAM

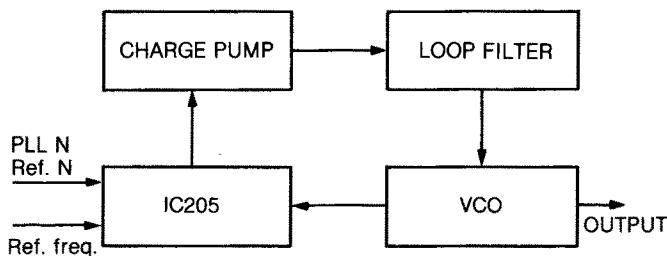


Fig. 3

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

Q212 and X203 oscillate a 10.0 MHz signal. The signal is divided in the divider inside IC205 to obtain the reference frequency. The reference frequency, 6.25 kHz or 5 kHz, is determined by the IC205 dividing ratio using N-data from the CPU (IC902) to obtain selectable tuning steps of 5, 10, 12.5, 15, 20 or 25 kHz.

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

The phase detected signals output from pins 5 and 12 of IC205 are pulse signals. These signals are converted to DC voltage by the charge pump (Q217 and Q219) and the loop filter (R283, R284, R303, C314, C331 and C333).

Q230 and Q236 form the charge pump control circuit which cuts off charge pump output. Signals are not applied to the VCO circuit while the power saver is activated. Q218 is a DC amplifier which amplifies the lock voltage to tune the center frequency of the VHF bandpass filter.

### 4-3-4 VCO CIRCUIT (V-VCO UNIT)

The VCO (Variable Control Oscillator) circuit oscillates the 1st LO frequency in receive mode and transmit frequency in transmit mode. The VCO free-run frequency is shifted by D551 using C556. The generated frequency is controlled by D553 and D554 using the lock voltage output from the loop filter.

## 4-4 UHF PLL CIRCUITS

### 4-4-1 GENERAL (RF AND U-VCO UNITS)

The UHF VCO circuits use a PLL IC (IC203) and a swallow counter (IC204).

IC203 controls the UHF VCO oscillating frequency using varicap diode D501. The UHF VCO oscillating frequency is used as a UHF transmitting frequency while transmitting or as a UHF 1st LO signal while receiving.

The oscillated signal at the UHF VCO circuit is buffer amplified at Q503, and is applied to pin 1 of IC204. IC204 divides the signal either 1/64 or 1/65. The divided signal is then applied to pin 9 of IC203. IC204 divides the signal using the N-data from the CPU (IC902) and phase detects the divided signal using the reference oscillator signal. The phase detected signal is converted to a DC voltage (lock voltage) by the charge pump and loop filter. The lock voltage is applied to varicap diode D501 in the UHF VCO circuit to control the VCO oscillating frequency. A stable desired frequency is thus obtained by this loop.

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

Q212 and X203 oscillate a 10.0 MHz signal. The signal is divided in the divider inside IC203 to obtain the reference frequency. The reference frequency, 6.25 kHz or 5 kHz, is determined by the IC203 dividing ratio using N-data from the CPU (IC902) to obtain selectable tuning steps of 5, 10, 12.5, 15, 20 or 25 kHz.

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

The phase detected signals output from pins 19 and 21 of IC203 are pulse signals. These signals are converted to a DC voltage by the charge pump (Q237, Q238 and Q239) and the loop filter (C309, C310, R276, R277, R292 and C508).

Q215 and Q216 form the charge pump control circuit which cuts off charge pump output. Signals are not applied to the VCO circuit while the power saver is activated.

### 4-4-4 VCO CIRCUIT (U-VCO UNIT)

The VCO (Variable Control Oscillator) circuit oscillates the 1st LO frequency in receive mode and transmit frequency in transmit mode. The VCO free run frequency is shifted by D502. The generated frequency is controlled by D501 using the lock voltage output from the loop filter.

## 4-5 POWER SUPPLY CIRCUITS

### 4-5-1 VOLTAGE LINES (MAIN UNIT)

LINE	DESCRIPTION
Vcc	Battery pack voltage or external DC power that passes through the POWER CONTROL (R151). Vcc is applied to the power modules (IC206 or IC207), the AF power amp. regulator, and the following 5 V lines.
+5	Common 5 V current amplified at Q720 and Q721 using IC705 output as a reference voltage.
+5S	5 V controlled by the power saver function. Current amplified at Q712 and Q713.
R+5S	5 V controlled by the power saver function. Current amplified at Q716 and Q717. Used by the receive circuits.
T+5	5 V current amplified at Q714 and Q715. Used by the transmitter circuits.

### 4-5-2 VOLTAGE REGULATOR CIRCUIT (MAIN UNIT)

When the battery voltage is 5.5~16 V, the regulator (IC705) outputs a reference voltage of 5 V. The noise components are removed by the noise filter (C785, R756). This output is applied to the current amplifier (Q720, Q721).

### 4-5-3 CPU POWER SOURCE CIRCUIT (MAIN UNIT)

When the transceiver is turned OFF, a voltage is applied to IC902 (CPU) from lithium backup battery BT701.

### 4-5-4 T+5/R+5S SWITCHING CIRCUIT (MAIN AND LOGIC UNITS)

When the PTT switch (S703) is pushed, Q724 is turned ON. The collector of Q725 outputs a "LOW" signal to pin 64 of IC902 (CPU).

Pin 40 of IC902 sends transmit data to IC701. Pin 12 of IC701 outputs a "HIGH" signal. Pin 11 of IC701 outputs a "LOW" signal to pin 13 of IC703c, controlling the base of Q717. Thus, R5+S is turned OFF. Pin 12 of IC701 outputs a "HIGH" signal to pin 1 of IC703e, controlling the base of Q715. Thus T+5 is turned ON.

## 4-6 OTHER CIRCUITS

### 4-6-1 SUBAUDIBLE TONE ENCODER UNIT (TONE UNIT) (IC-32AT only)

IC601 generates subaudible tones. A generated tone is made via the dividing oscillator, and a dividing ratio is controlled by 6-bit data from a shift resistor (IC602). R601 adjusts deviation.

### 4-6-2 DTMF ENCODER CIRCUIT (MAIN AND LOGIC UNITS) (IC-32AT only)

The DTMF encoder (IC901), generates Dual Tone Multi Frequencies. If any key on the KEYBOARD is pushed while transmitting, the proper frequency dividing ratio for the frequency of X901 (3.58 MHz) is selected. One set of audio frequencies corresponding to row input and column input is then output from pin 17.

Also, a "HIGH" level signal is output from pin 11 of IC901 when the KEYBOARD is activated. This level is applied to an integrator circuit (R750, R754 and C773) in the MAIN UNIT to obtain a time constant of approx. 1 sec. for turning Q719 ON. Thus transmission continues during keying.

### 4-6-3 TONE CALL CIRCUIT (MAIN UNIT) (IC-32E only)

This circuit generates a 1750 Hz tone to open a repeater. When the TONE CALL switch (R152) is pushed, Q718 is turned ON and T+5 voltage is applied to IC704. IC704 divides 7.1680 MHz by 4096 and outputs 1750 Hz tones from pin 4. R748 adjusts deviation.

### 4-6-4 S/RF-INDICATOR CIRCUIT (MAIN AND LOGIC UNITS)

A portion of signals passed from FI701 is amplified at the S-indicator amplifier (Q711, Q710), and is detected at voltage doubler (D705). The voltage from D705 or APC detector voltage from D222 is applied to indicator comparator pin 2 of IC904b.

The signal passes through an integrator circuit (R933 and C908); the voltage at pin 3 of IC904 increases with time. When the voltage at pin 3 is greater than pin 2, pin 1 outputs "HIGH." The voltage of pin 3 of IC904 depends on time. IC902 measures the time during which pin 49 outputs "HIGH" and pin 50 receives "HIGH." The S/RF-INDICATOR, DS904, is for indicating the relative signal strength or output power.

#### S/RF INDICATOR CIRCUIT

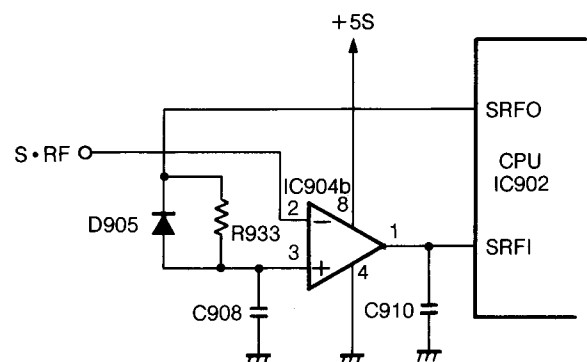


Fig. 4

#### 4-6-5 LAMP CIRCUIT (LOGIC UNIT)

When the LIGHT SWITCH (S701) is pushed, pin 46 of IC902 (CPU) remains "HIGH" for 5 sec. The current of this signal is amplified at Q905 and Q906 to illuminate backlights DS902 and DS903.

If the LIGHT switch is pushed again when pin 46 is in a "HIGH" condition, pin 46 returns to "LOW" when switches are not being used.

#### 4-6-6 POWER SAVER CIRCUIT (MAIN UNIT)

The power saver function starts after approx. 30 sec. when no switch is pushed and the squelch is closed, or when the transceiver is in receive mode.

When the power saver function starts, pin 47 of IC902 (CPU) outputs a power saver signal (IOST) as in the following timing diagram. A +5M signal from pin 13 of IC701 controls +5S signals; RX5 signals from pin 11 control R+5S signals.

#### 4-6-7 LOW VOLTAGE DETECTED CIRCUIT (LOGIC UNIT)

This circuit consists of IC904a, R928 and R926. 1.16 V is applied to pin 5 of IC904a. The Vcc voltage is divided by R926 and R928, and the divided voltage is applied to pin 6 of IC904a. When the Vcc voltage exceeds 5.7 V, the voltage at pin 6 becomes greater than that at pin 5 and pin 7 becomes "LOW." When the Vcc voltage is less than 5.7 V, the voltage at pin 5 exceeds that at pin 6 and pin 7 outputs in a "HIGH" condition. TRANSMIT INDICATOR DS901 does not light even when transmitting.

### 4-7 CPU PORT ALLOCATIONS (LOGIC UNIT)

PORT NO.	PIN NO.	DESCRIPTION	PORT NO.	PIN NO.	DESCRIPTION
RESET	68	When a "LOW" signal is applied, CPU IC902 is initialized.	P33 [ENC]	53	Input port for acknowledge signal whether the tone encoder IC601 is connected or not.
PO0 [INT4]	38	Detects a signal for the standby mode of the CPU. The CPU enters the standby mode when the port reads the trailing edge of a signal.	P40~P43 [KR0~KR3]	29~32	These are input ports for the keyboard matrices.
PO1 [CK]	39	Outputs a serial data output clock for PLL N-data, subaudible tones, and I/O expander data.	P50~P53 [KS0~KS3]	34~37	These are output ports for strobe signals for the initial and keyboard matrices.
PO2 [DATA]	40	Outputs serial data synchronized with CK signals.	P60 [UNLKL V]	60	Input port for a PLL unlock signal. Normally this port is "LOW." When the PLL is unlocked the port receives "HIGH" signals.
PO3 [BUSY]	41	Inputs a squelch signal. When the squelch opens, a "HIGH" signal is applied.	P61 [DET]	61	Input port for an acknowledge signal in the optional UT-40 TONE SQUELCH UNIT. The port becomes "HIGH" when the tone squelch opens.
PO10~PO13 [KIRO~KIR3]	42~45	Input ports for the initial matrix.	P62 [DIAL DN]	62	Input port for the down signal of the MAIN DIAL (S151).
P2 [LAMPO]	46	Outputs control signals for the FUNCTION DISPLAY intensity.	P63 [DIAL UP]	63	Input port for the up signal of the MAIN DIAL (S151).
P21 [IOSTB]	47	Outputs a strobe signal for serial data to the output expander.	P70 [PTT]	64	Input signal on the PTT line. This port receives "HIGH" signals when the PTT switch is pushed.
P22 [CTSTB]	48	Outputs a strobe signal for serial data to the subaudible tone encoder or optional UT-40 TONE SQUELCH UNIT.	P71 [FUNC]	65	Input port for the FUNCTION switch (S702).
P23 [SRFO]	49	Outputs a reference voltage for the S/RF INDICATOR.	P72 [MONI]	66	Input port for the MONITOR switch (S151).
P30 [SRFI]	50	Inputs a compared signal for the S/RF INDICATOR.	P73 [LAMP]	67	Input port for the LIGHT switch (S701).
P31 [HI/LO]	51	Output port for the RF INDICATOR. This port becomes "HIGH" when HIGH output power is selected.	BP6 [PLSL]	19	Outputs a strobe signal for the VHF PLL IC (IC205).
P32 [ENC/DEC]	52	Input port for acknowledge signal which acknowledges whether the optional UT-40 TONE SQUELCH UNIT is connected or not.	BP7 [PLSH]	20	Outputs a strobe signal for the UHF PLL IC (IC203).

**I/O EXPANDER IC701 (MAIN UNIT)**

PORT NO.	PIN NO.	DESCRIPTION
Q1 [SQL OFF]	4	Outputs a "HIGH" signal when the MONITOR switch (S701) is pushed.
Q2 [RMUTE]	5	Outputs an AF mute signal when the optional UT-40's pocket beep function is activated.
Q4 [BEEPO]	7	Outputs 500 Hz or 1 kHz beep tones.
Qs [+5M]	9	Outputs a square wave during the power saver condition. When this port is "HIGH," a +5S signal is cut OFF.
Q7 [TX5]	12	Outputs "HIGH" signals during transmissions. Controls the T+5 line.
Q8 [RX5]	11	Outputs square waves during the power saver condition. When this port is "HIGH," the R+5S line is cut OFF.

**I/O EXPANDER IC202 (RF UNIT)**

PORT NO.	PIN NO.	DESCRIPTION
Q1 [BANDL]	4	Outputs "LOW" signals when the VHF band is selected.
Q2 [TXL]	5	Outputs "LOW" signals during VHF band transmission.
Q3 [RXL]	6	Outputs "LOW" signals during VHF band reception.
Q4 [CPCL]	7	Outputs square waves during the power saver condition. Outputs "LOW" signals when the VHF band is selected and during the power saver condition.
Q5 [BANDH]	14	Outputs "LOW" signals when the VHF band is selected.
Qs [TXH]	9	Outputs "HIGH" signals during UHF band transmission.
Q7 [RXH]	12	Outputs "HIGH" signals during UHF band reception.
Q8 [CPCH]	11	Outputs square waves during the power saver condition. When this port is "HIGH," the VLV line is cut OFF.

# SECTION 5 MECHANICAL PARTS AND DISASSEMBLY

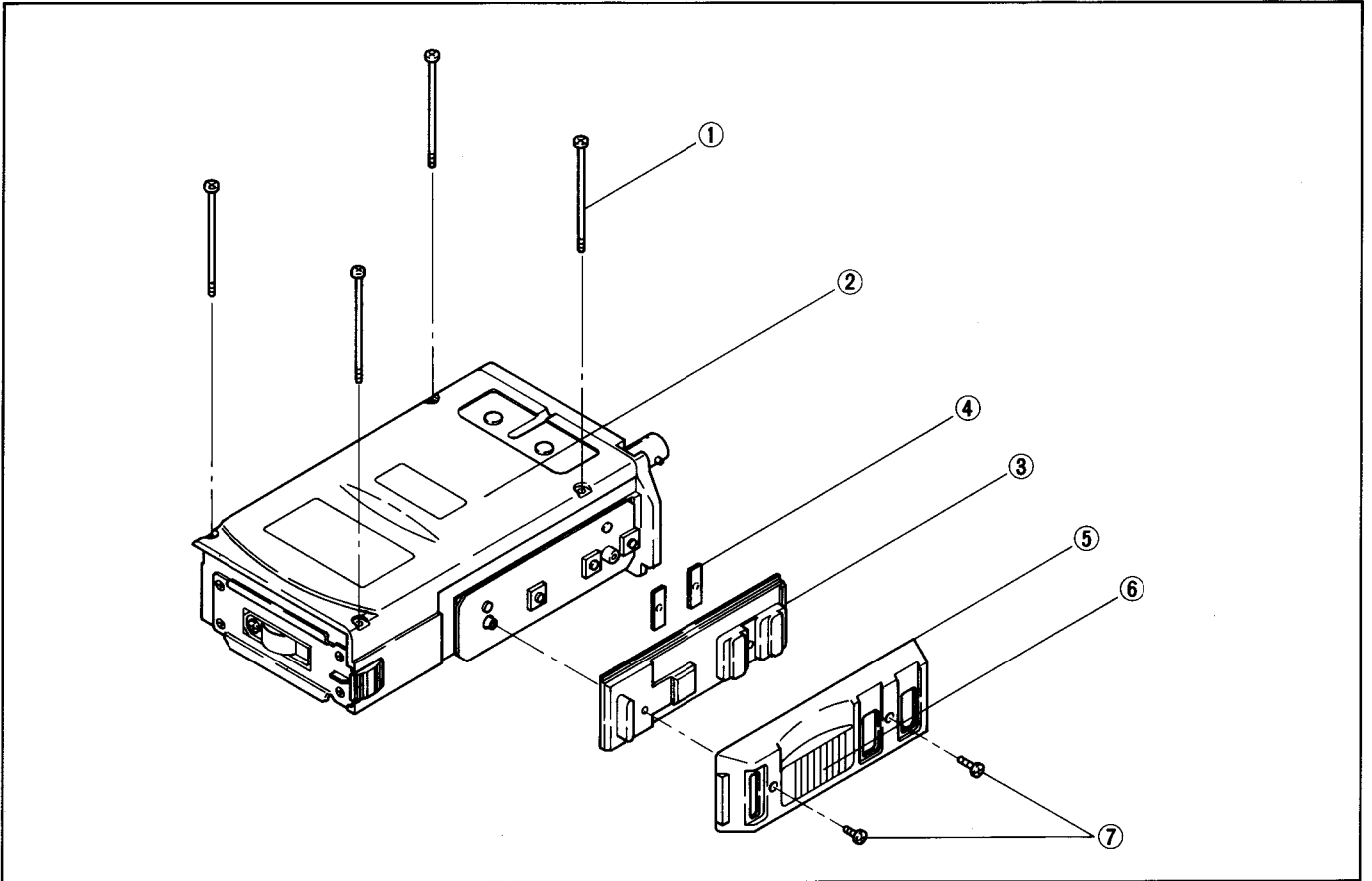
## 5-1 MECHANICAL PARTS

LABELLED NUMBER	DESCRIPTION	ORDERING NUMBER	QTY.
①	PH B0 2×31.5 ZK	8810004000	4
②	575 Rear panel	8010007140	1
③	575 PTT rubber	8930012400	1
④	PTT plates	8930011600	2
⑤	PTT holder	8930013110	1
⑥	PTT button	8930011910	1
⑦	PH No. 0-3 M2×6 ZK	8810004890	2
⑧	PH B0 No. 0-3 M1.4×3.5 ZK	8810001710	11
⑨	Plate (SP)	8930012760	1
⑩	PH B0 No. 0-1 M2×4	8810004800	4
⑪	575 Front ground plate	8930013300	1
⑫	SP plate	8930012100	1
⑬	562 Keyboard (A)	8010007150	1
⑭	573 MIC holder	8930011930	1
⑮	SP seal	8930011580	1
⑯	573 Casing seal (center)	8930012410	1
⑰	575 Front panel (A) (IC-32E)	8210003300	1
	575 Front panel (B) (IC-32AT)	8210003310	1
	575 Front panel (C) (IC-32A)	8210003320	1
⑱	Knob (MAIN) N128	8610004290	1
⑲	Knobs (SQUELCH, PWR/VOL) N126	8610004230	2
⑳	VR nuts (E)	8830000550	3
㉑	PH M2×6 ZK	8810004860	2
㉒	Connector seal	8930012420	1
㉓	575 Top panel-1 (IC-32A/AT)	8210003200	1
	575 Top panel (A)-1 (IC-32E)	8210003210	1
㉔	Top seal	8930012390	1
㉕	Seal plate	8930012300	1
㉖	PH No. 0-3 M1.4×3.5 ZK	8810001710	1
㉗	PH No. 0-1 M2×2.5	8810004870	2
㉘	LCD holder	8930012190	1
㉙	LCD reflector	6910002060	1
㉚	PH M2×4 Ni FE	8810005320	4
㉛	PH M2×3 Ni FE	8810004950	5
㉜	573 standoff	8930012081	4
㉝	PH M2×3 Ni FE	8810004950	1
㉞	PH M2.6×10 Ni	8810004730	2
㉟	Plate	8930012280	1
㊱	Screw lug M2	8860000010	2
㊲	Contact holder	8930011880	1
㊳	BuH M2×6 Ni BS	8810002580	1
㊴	Latch plate (B)	8930013430	1
㊵	Sliding guide	8010006990	1
㊶	FH M2×4 Ni BS	8810002310	4
㊷	Release button (A)	8930008610	1
㊸	PH M2×5 Ni	8810005310	1
㊹	Connection spring	8930005980	1

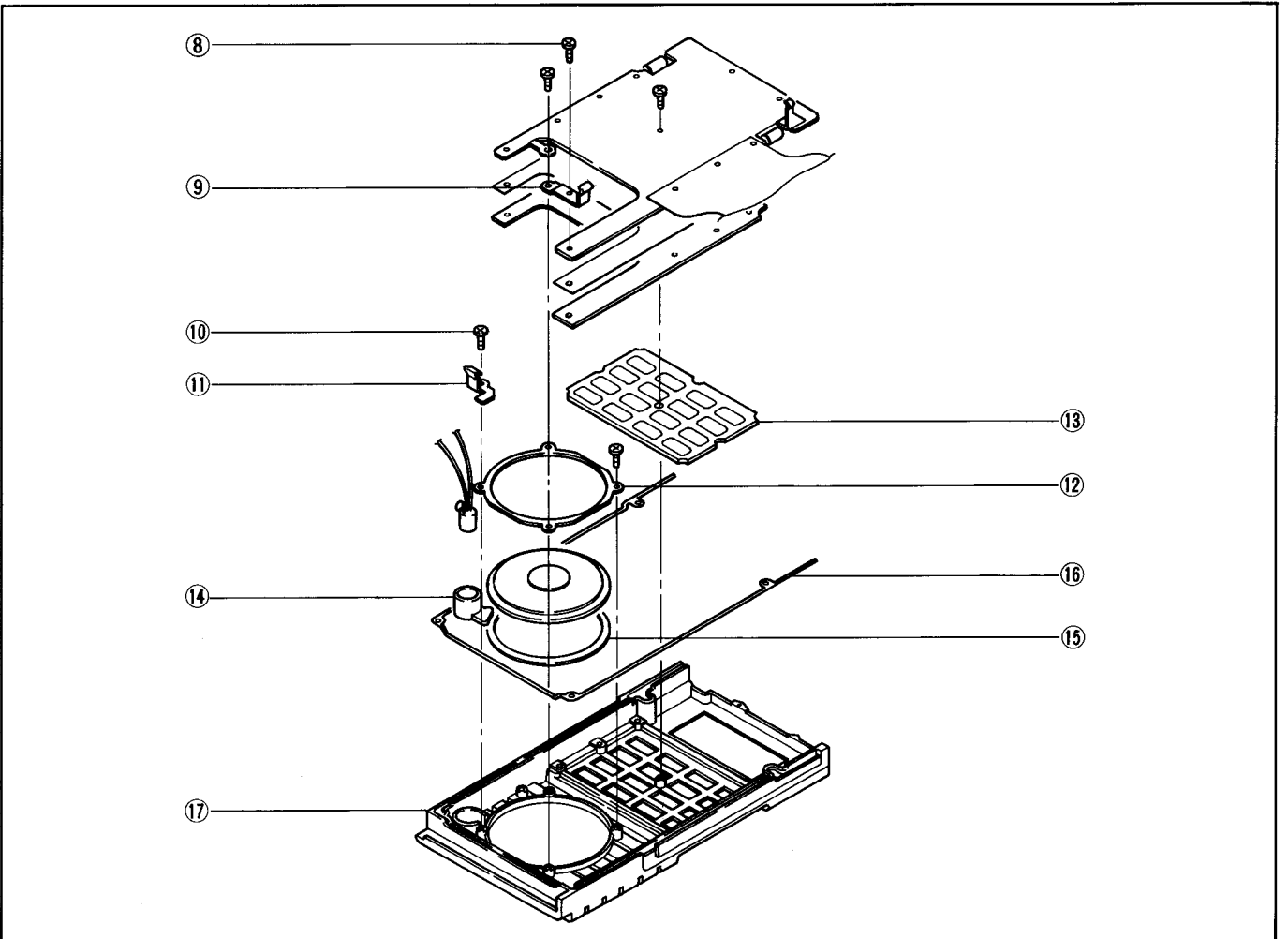
**Screw type** Screw: M2×3, etc. Self-tapping screw: B0 2×15, etc. Precision type screw: No. 0-1, etc.  
**Screw head style** PH: Pan head FH: Flat head BuH: Button head



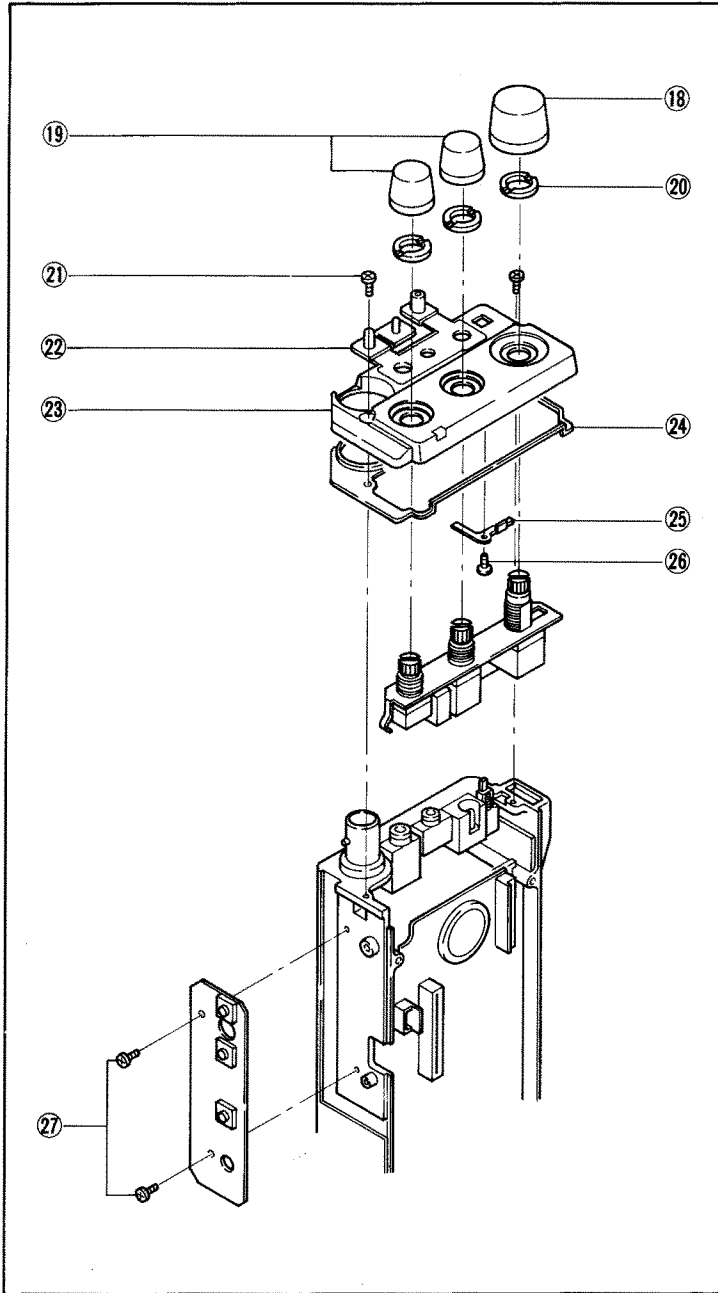
• CASE AND CHASSIS



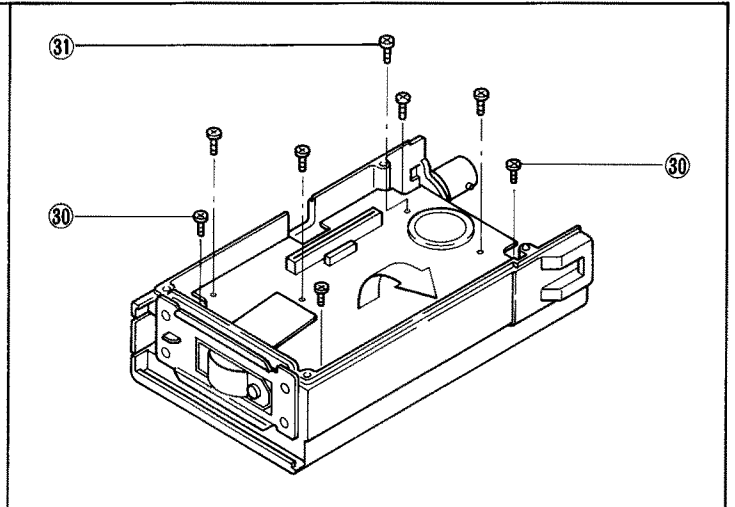
• LOGIC UNIT



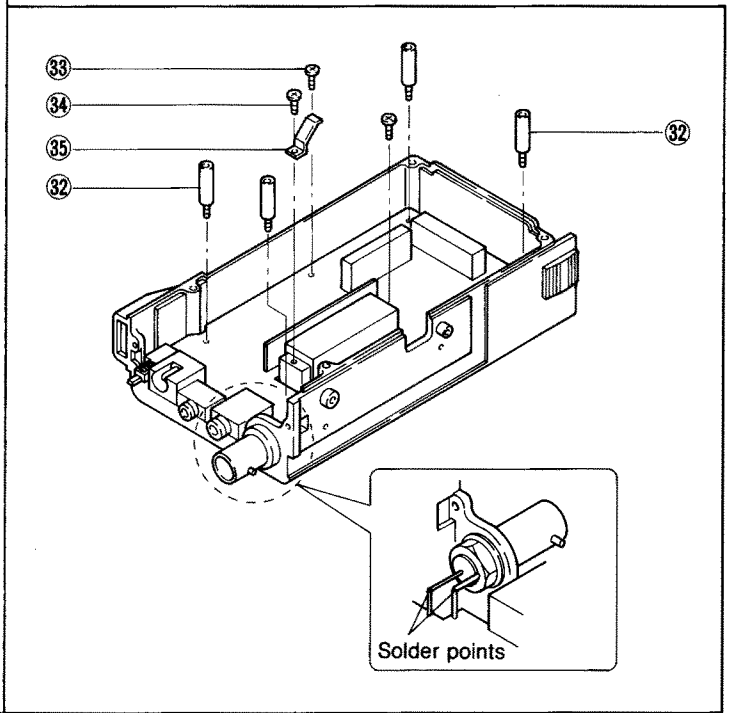
• TOP PANEL



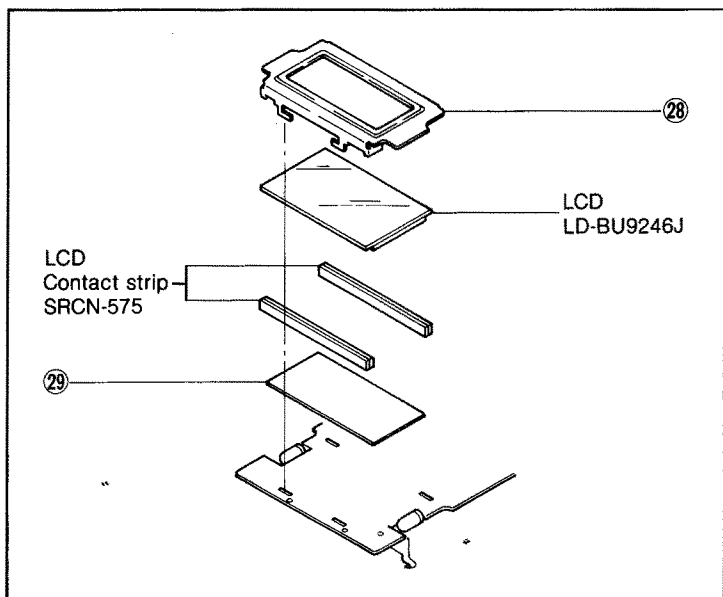
• MAIN UNIT



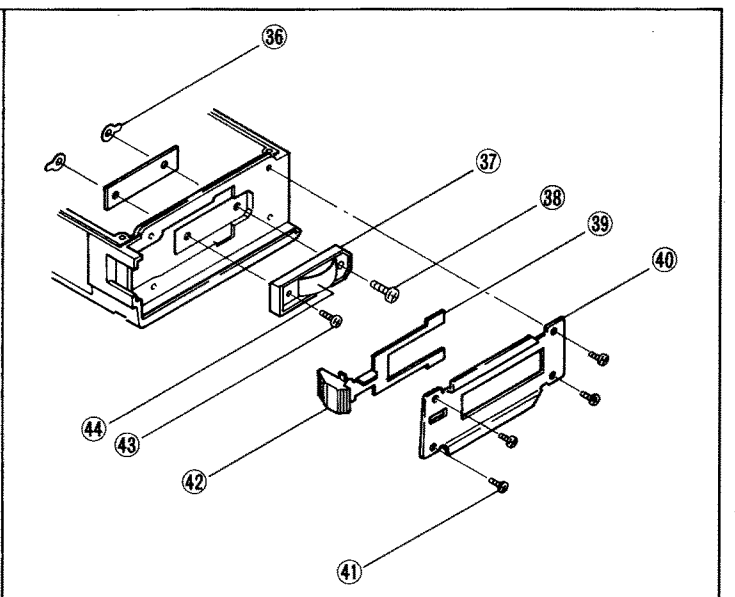
• RF UNIT



• LCD



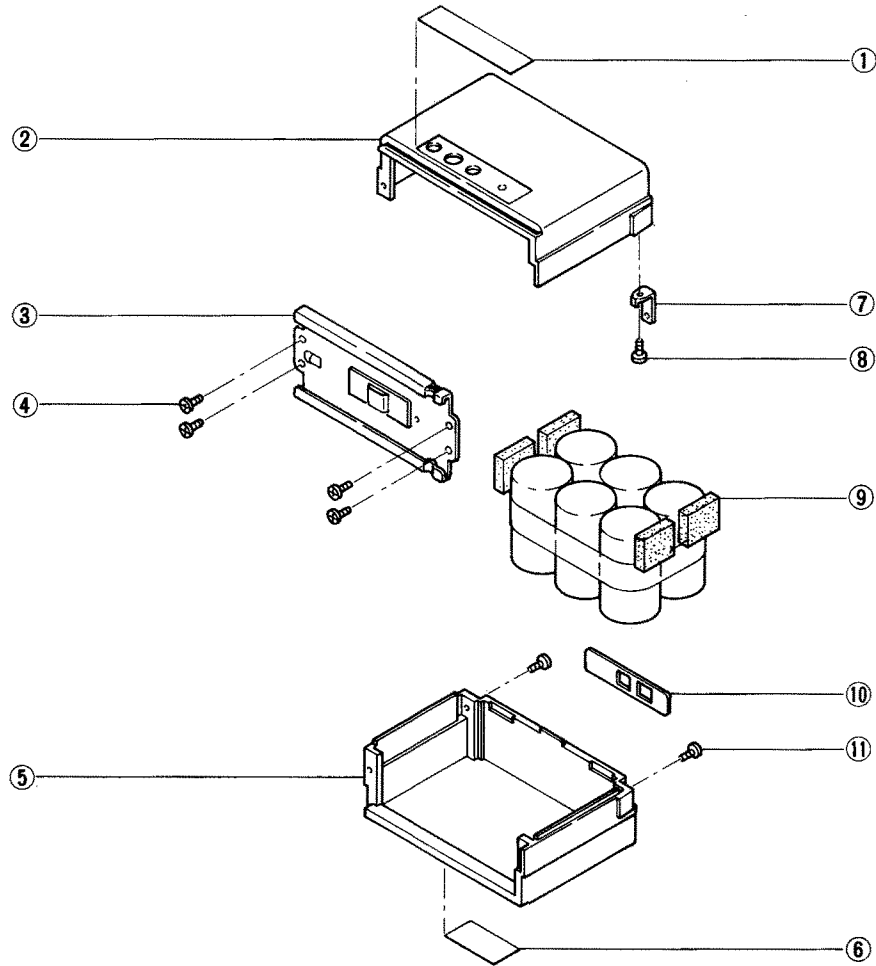
• CONTACT HOLDER



# 5-2 BATTERY PACK

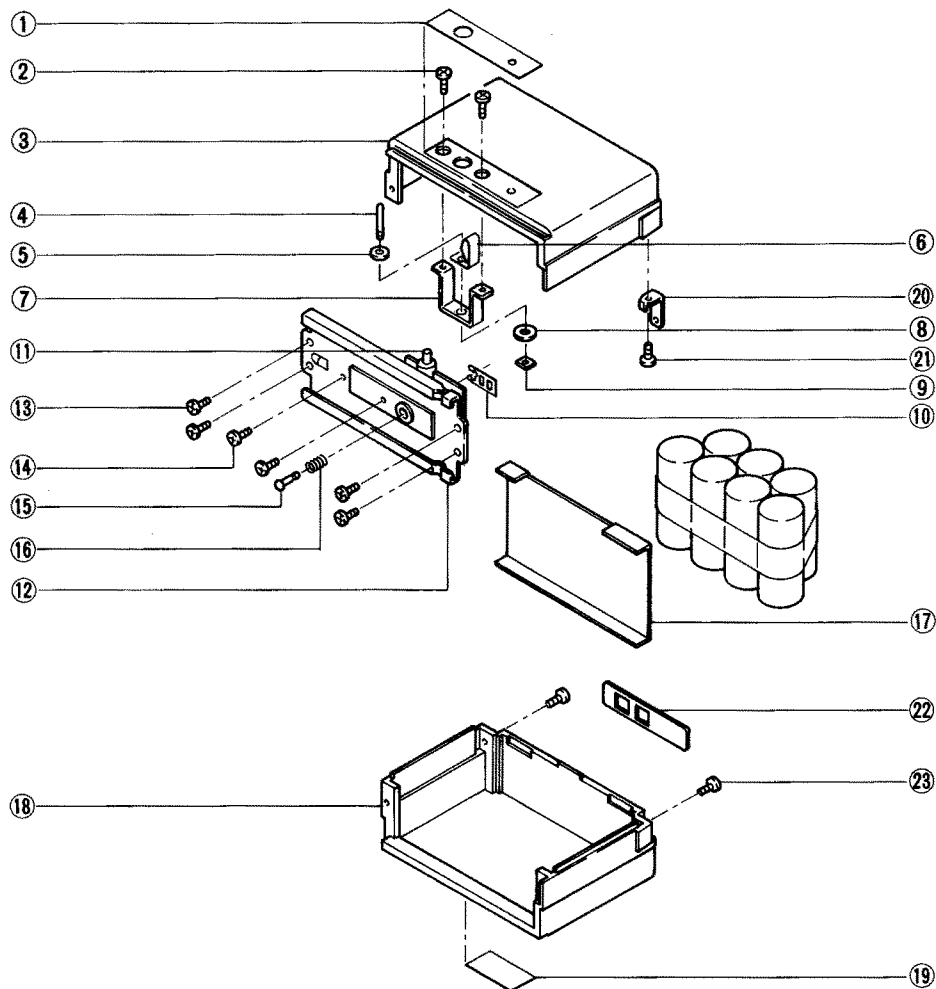
## • BP-2 AND BP-5

LABELLED NUMBER	DESCRIPTION	ORDERING NUMBER	QTY.
①	Rear plate (B)	8310004310	1
②	Rear case (3) B (BP-2)	8010002780	1
	Rear case (5) B (BP-5)	8010002830	1
③	Sliding metal (E)	8010004230	1
④	PH B0 2 × 4	8810000980	4
⑤	Front case (3) A (BP-2)	8010002760	1
	Front case (5) A (BP-5)	8010002820	1
⑥	Name plate BP-2	8310002540	1
	Name plate BP-5	8310002570	1
⑦	Charging metal	8010001920	2
⑧	PH B0 2 × 4	8810000980	2
⑨	Sponge (O)	8930001440	
⑩	Charging selector plate (B)	8930002150	1
⑪	FFH M2 × 4 Ni	8810004671	2



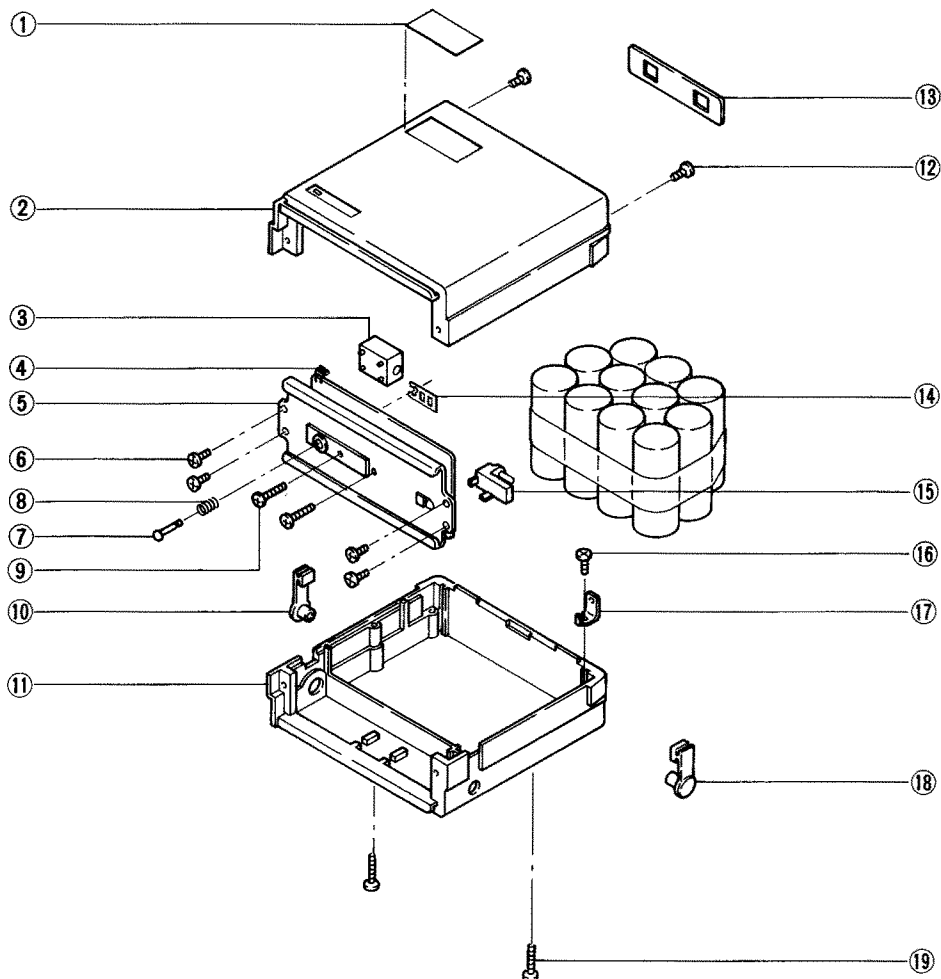
• BP-3

LABELLED NUMBER	DESCRIPTION	ORDERING NUMBER	QTY.
①	Rear plate (A)	8310004260	1
②	FH M2 × 5	8810002060	2
③	Rear case (3) F (supplied BP-3)	8010002300	1
	Rear case (3) B (optional BP-3)	8010002780	1
④	Charging jack metal (A)	8930005740	1
⑤	Isolating washer (J)	8850000850	1
⑥	Charger jack metal (B)	8930005750	1
⑦	Charger jack metal (C)	8930006130	1
⑧	Isolating washer	8850000310	1
⑨	Square nut	8930007370	1
⑩	Plate spring	8930004670	1
⑪	LED (SCLC26UR)	5040000160	1
⑫	Sliding metal (D)	8930007220	1
⑬	PH B0 2 × 4	8810000980	4
⑭	FFH M2 × 8	8810004660	2
⑮	Charger terminal (D)	8930006240	1
⑯	Spring (A)	8930007220	1
⑰	Isolating seat	8930005400	1
⑱	Front case (3) E (supplied BP-3)	8010002290	1
	Front case (3) A (optional BP-3)	8010002760	1
⑲	Name plate	8310002550	1
⑳	Charging metal	8010001920	2
㉑	PH B0 2 × 4	8810000980	2
㉒	Charging selector plate (B)	8930002150	1
㉓	FFH M2 × 4 Ni	8810004671	2



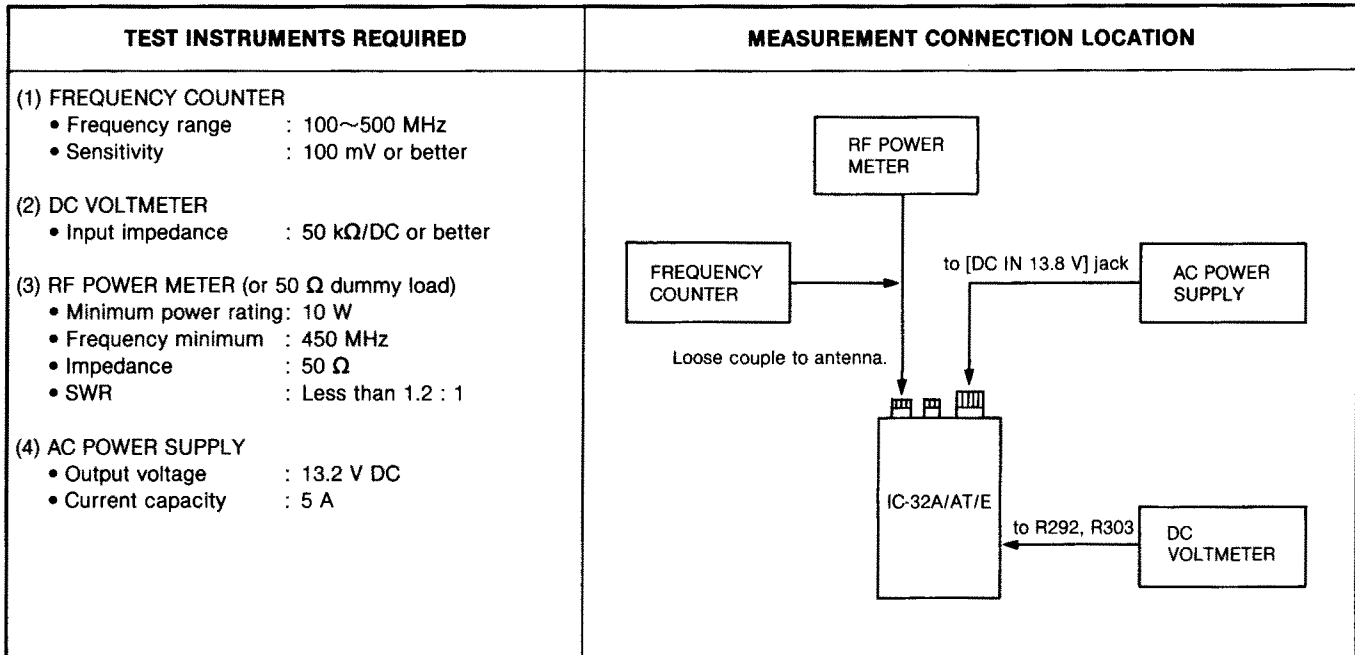
• BP-5A, BP-7, BP-8, BP-70

LABELLED NUMBER	DESCRIPTION	ORDERING NUMBER	QTY.
①	Name plate BP-5A	8310006970	1
	Name plate BP-7	8310002580	1
	Name plate BP-8	8310002590	1
	Name plate BP-70	8310012080	1
②	Front case (7) A (BP-5A, BP-7, BP-8)	8010002860	1
	Front case (9) A (BP-70)	8010007030	1
③	Charge jack (A) HEC0779-01-030	6450000240	1
④	LED (SLB23VR5F)	5040000390	1
⑤	Sliding metal (D)	8930007220	1
⑥	PH B0 2 × 4	8810000980	4
⑦	Charging terminal (D)	8930006240	1
⑧	Spring (A)	8930007220	1
⑨	FFH M2 × 8	8810004660	2
⑩	Rubber cap (for jack A)	8930001740	1
⑪	Rear case (7) B (BP-5A, BP-7, BP-8)	8010002870	1
	Rear case (9) B (BP-70)	8010007040	1
⑫	FFH M2 × 4 Ni	8810004671	2
⑬	Charging selector plate (B) (BP-5A, BP-7, BP-8)	8930002150	1
	Charging selector plate (C) (BP-70)	8930012830	1
⑭	Plate spring	8930004670	1
⑮	Charger jack (B) HEC1737-01-020	6450000230	1
⑯	PH B0 2 × 4	8810000980	2
⑰	Charging metal	8010001920	2
⑱	Rubber cap (for jack B)	8930001750	1
⑲	PH B0 2 × 15 ZK	8810004910	2



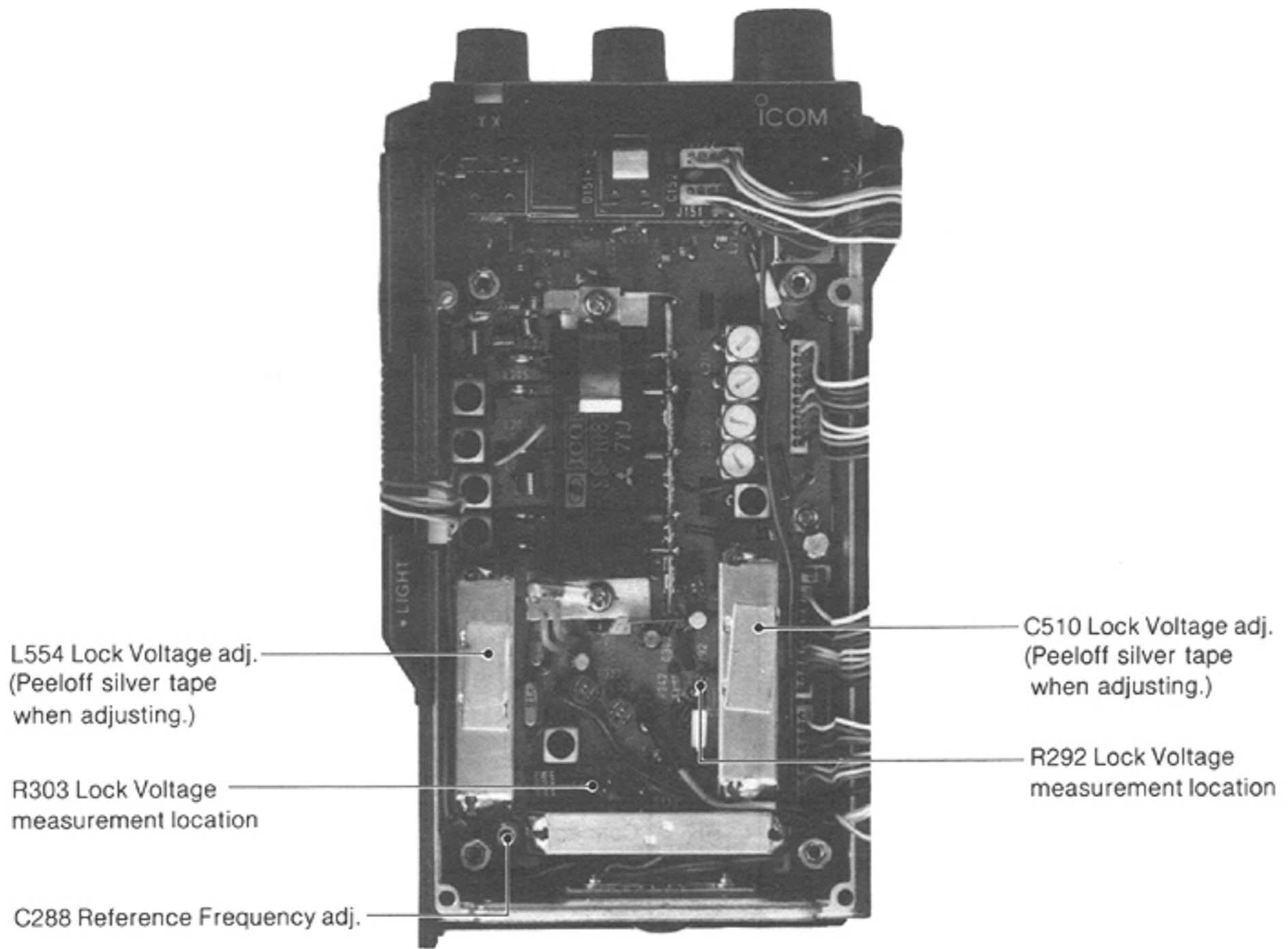
# SECTION 6 MAINTENANCE AND ADJUSTMENT

## 6-1 PLL ADJUSTMENT



ADJUSTMENT	ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
		UNIT	LOCATION		UNIT	ADJUST
LOCK VOLTAGE	1 <ul style="list-style-type: none"> <li>• Frequency display: 430.00 MHz (except U.S.A.)</li> <li>440.00 MHz (U.S.A.)</li> <li>• Receiving</li> </ul>	RF	Connect the DC voltmeter to R292.	1.2 V	U-VCO	C510
	2 <ul style="list-style-type: none"> <li>• Frequency display: 144.00 MHz</li> <li>• Receiving</li> </ul>	RF	Connect the DC voltmeter to R303.	1.5 V	V-VCO	L554
REFERENCE FREQUENCY	1 <ul style="list-style-type: none"> <li>• Frequency display: 440.00 MHz (except U.S.A.)</li> <li>450.00 MHz (U.S.A.)</li> <li>• Transmitting</li> </ul>	Top panel	Loose couple the frequency counter to the antenna connector.	Same as the displayed frequency.	RF	C288

RF UNIT



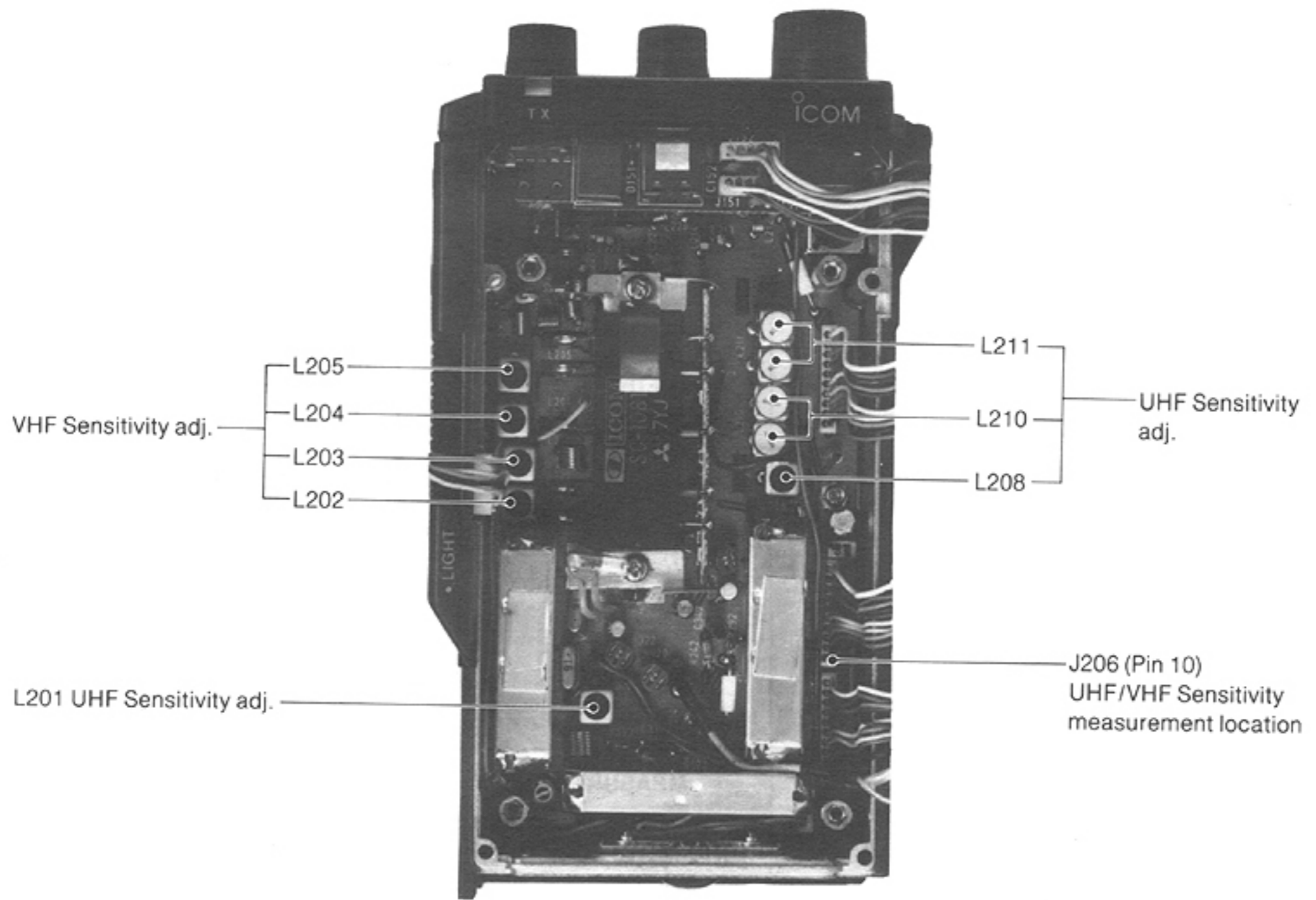
## 6-2 RECEIVER ADJUSTMENT

TEST INSTRUMENTS REQUIRED		MEASUREMENT CONNECTION LOCATION					
(1) STANDARD SIGNAL GENERATOR • Frequency range : 100~500 MHz • Output level : -127~-17 dBm (0.1 μV~32 mV)  (2) DC VOLTMETER • Input impedance : 50 kΩ/V DC or better  (3) AC POWER SUPPLY • Output voltage : 13.2 V DC • Current capacity : 5 A							
ADJUSTMENT	ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT		
		UNIT	LOCATION		UNIT	ADJUST	
UHF SENSITIVITY	1	RF	Connect the DC voltmeter to J206 pin 10.	Maximum	RF	Adjust in sequence L211 L210 L208 L201	
VHF SENSITIVITY	1	RF	Connect the DC voltmeter to J206 pin 10.	Maximum	RF	Adjust in sequence L205 L204 L203 L202	
S-METER	1	FUNCTION DISPLAY	S/R/F INDICATOR	2 dots	MAIN	R738	
	2					R739	

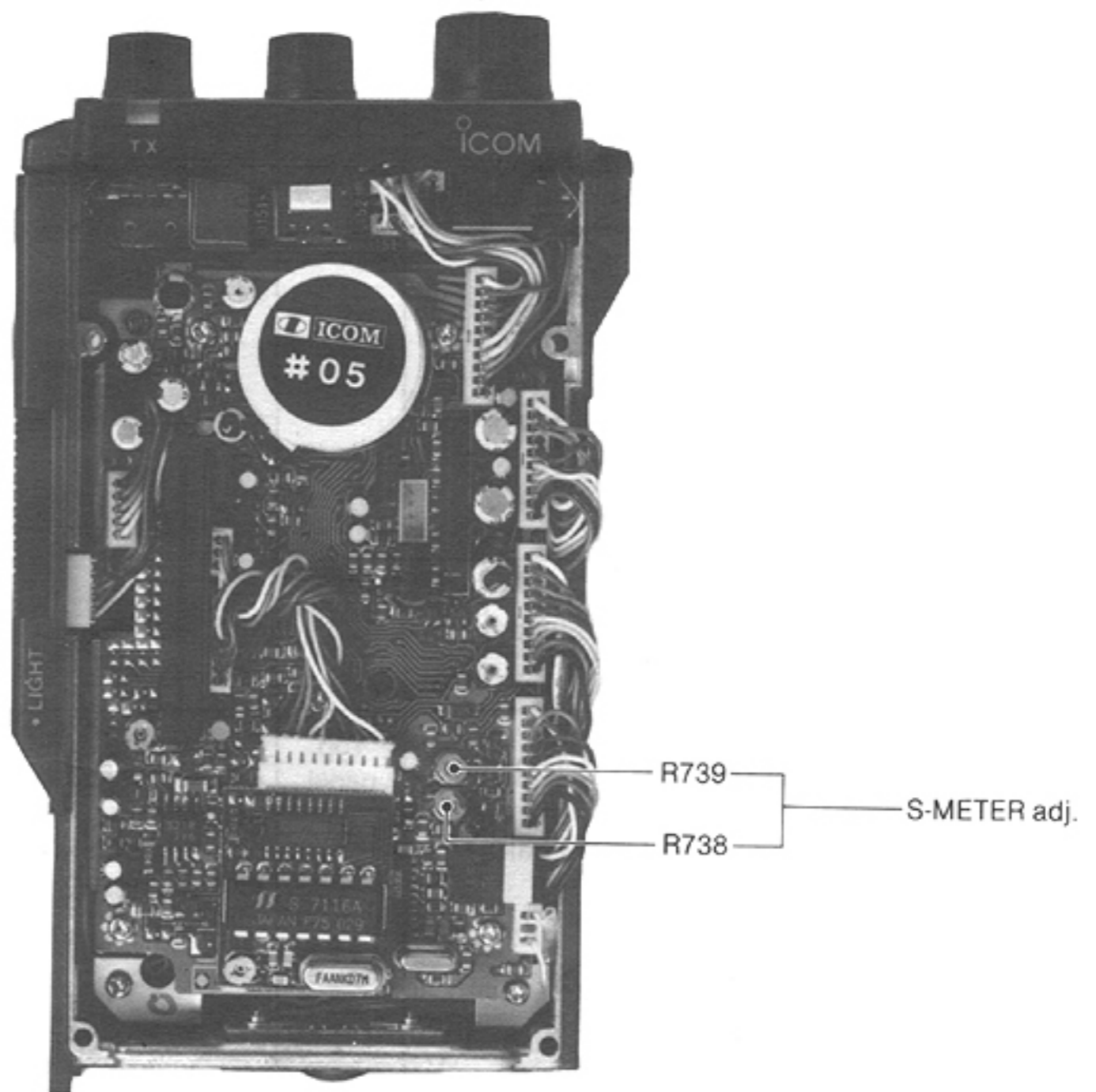
\* CCW : Counterclockwise



# RF UNIT



# MAIN UNIT



## 6-3 TRANSMITTER ADJUSTMENT

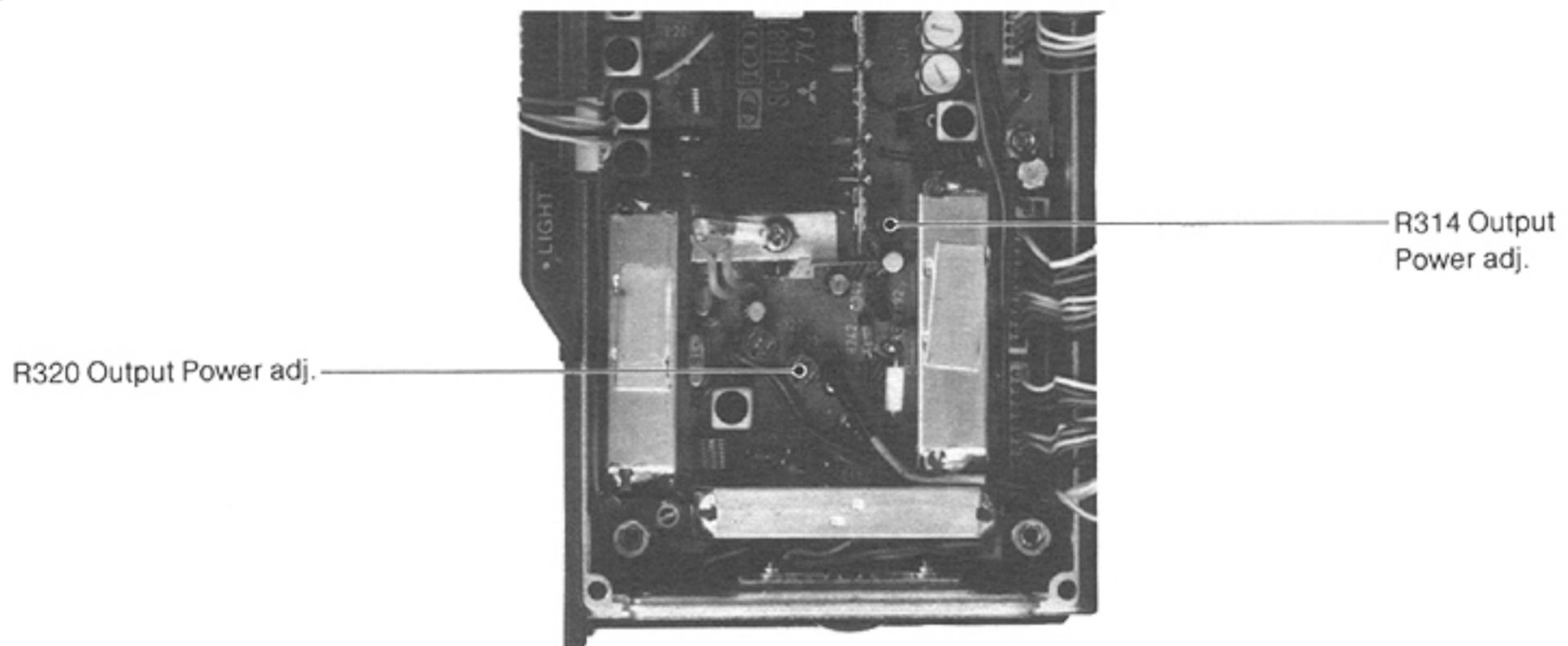
TEST INSTRUMENTS REQUIRED	MEASUREMENT CONNECTION LOCATION
<p>(1) RF POWER METER</p> <ul style="list-style-type: none"> <li>Terminated type</li> <li>Measuring range : 0.1~10 W</li> <li>Frequency range : 100~500 MHz</li> <li>Impedance : 50 Ω</li> <li>SWR : Less than 1.2 : 1</li> </ul> <p>(2) FM DEVIATION METER</p> <ul style="list-style-type: none"> <li>Frequency range : 100~500 MHz</li> <li>Measuring range : 0~±10 kHz</li> </ul> <p>(3) AUDIO GENERATOR</p> <ul style="list-style-type: none"> <li>Frequency range : 200~2000 Hz</li> <li>Output range : 2~200 mV</li> </ul> <p>(4) ATTENUATOR</p> <ul style="list-style-type: none"> <li>Attenuation ratio : 40 or 50 dB</li> <li>Input power rating : At least 10 W</li> </ul> <p>(5) AC POWER SUPPLY</p> <ul style="list-style-type: none"> <li>Output voltage : 13.2 V DC</li> <li>Current capacity : 5 A</li> </ul>	

ADJUSTMENT	ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
		UNIT	LOCATION		UNIT	ADJUST
OUTPUT POWER	1 <ul style="list-style-type: none"> <li>Frequency display: 435.00 MHz (except U.S.A.) 445.00 MHz (U.S.A.)</li> <li>[H/L] switch: High</li> <li>Transmitting</li> </ul>	Top panel	Connect the RF power meter to the antenna connector.	5.0 W	RF	R314
	2 <ul style="list-style-type: none"> <li>Frequency display: 146.00 MHz (except Europe) 145.00 MHz (Europe)</li> </ul>					5.5 W
DEVIATION	1 <ul style="list-style-type: none"> <li>Frequency display: 435.00 MHz (except U.S.A.) 445.00 MHz (U.S.A.)</li> <li>Apply an AF signal to the [MIC] jack. 50 mV/1 kHz (except U.S.A.) 110 mV/1 kHz (U.S.A.)</li> <li>Set the deviation meter. HPF : 50 Hz LPF : 20 kHz De-emphasis: OFF Detector : (P-P)/2</li> </ul>	Top panel	Connect the deviation meter to the antenna connector via the attenuator.	±4.8 kHz	MAIN	R779
	2 <ul style="list-style-type: none"> <li>Frequency display: 146.00 MHz (except Europe) 145.00 MHz (Europe)</li> </ul>					±4.8 kHz
SUBAUDIBLE TONE DEVIATION (IC-32AT only)	1 <ul style="list-style-type: none"> <li>Frequency display: 445.00 MHz (U.S.A.) 435.00 MHz (Asia)</li> <li>Apply no AF signal to the [MIC] jack.</li> <li>Set the deviation meter. HPF : OFF LPF : 20 kHz De-emphasis: OFF Detector : (P-P)/2</li> <li>Set the tone frequency to 88.5 Hz.</li> </ul>	Top panel	Connect the deviation meter to the antenna connector via the attenuator.	±0.75 kHz	TONE	R601

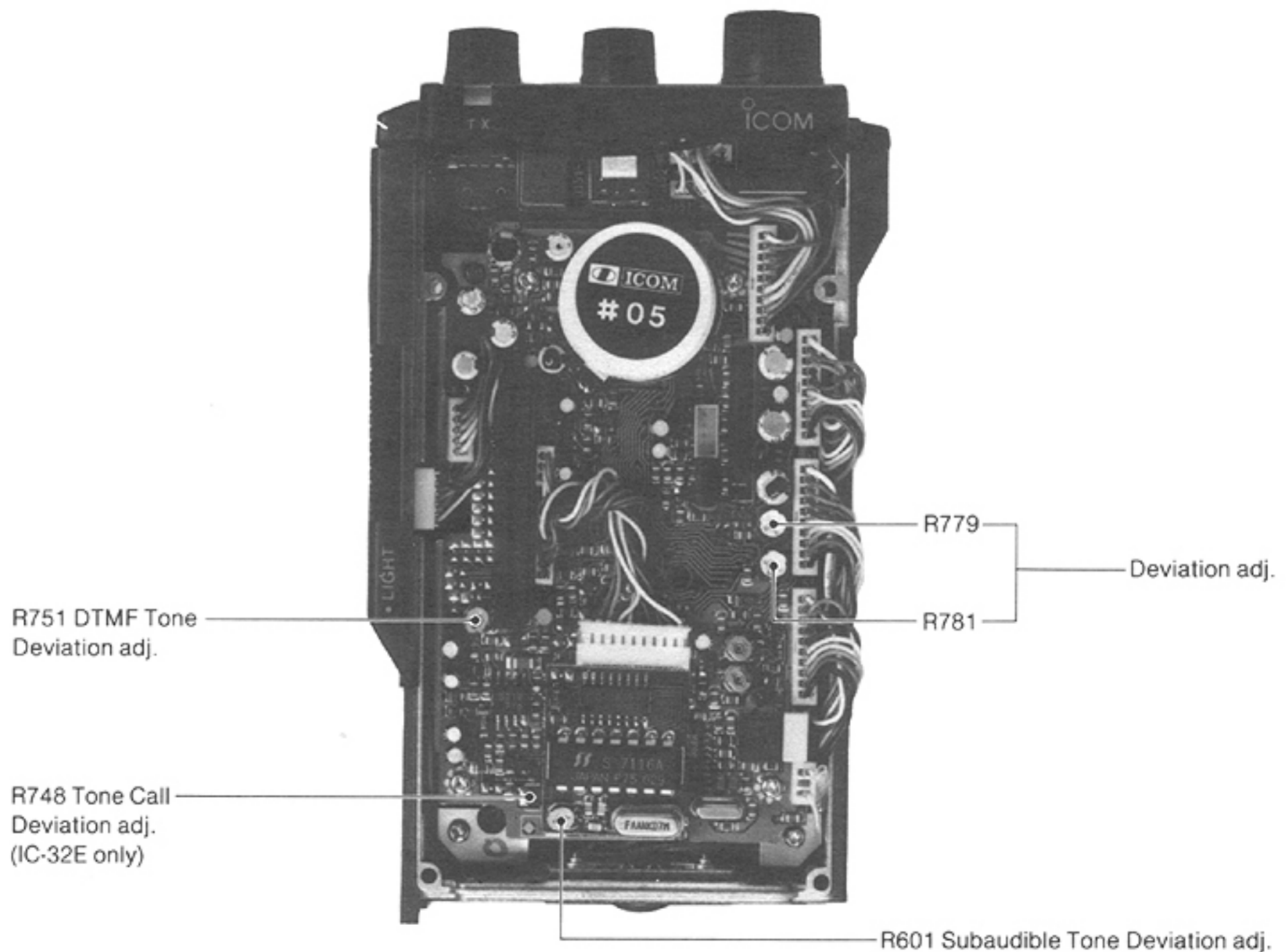
## TRANSMITTER ADJUSTMENT (CONTINUED)

ADJUSTMENT	ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
		UNIT	LOCATION		UNIT	ADJUST
DTMF TONE DEVIATION (IC-32AT only)	1 <ul style="list-style-type: none"> <li>• Frequency display: 445.00 MHz (U.S.A.) 435.00 MHz (Asia)</li> <li>• Push and hold the [D] key while transmitting.</li> </ul>	Top panel	Connect the deviation meter to the antenna connector via the attenuator.	$\pm 3.5$ kHz	MAIN	R751
TONE CALL DEVIATION (IC-32E only)	1 <ul style="list-style-type: none"> <li>• Frequency display: 435.00 MHz</li> <li>• Push and hold the [T. CALL] switch.</li> </ul>	Top panel	Connect the deviation meter to the antenna connector via the attenuator.	$\pm 3.5$ kHz	MAIN	R748

### RF UNIT



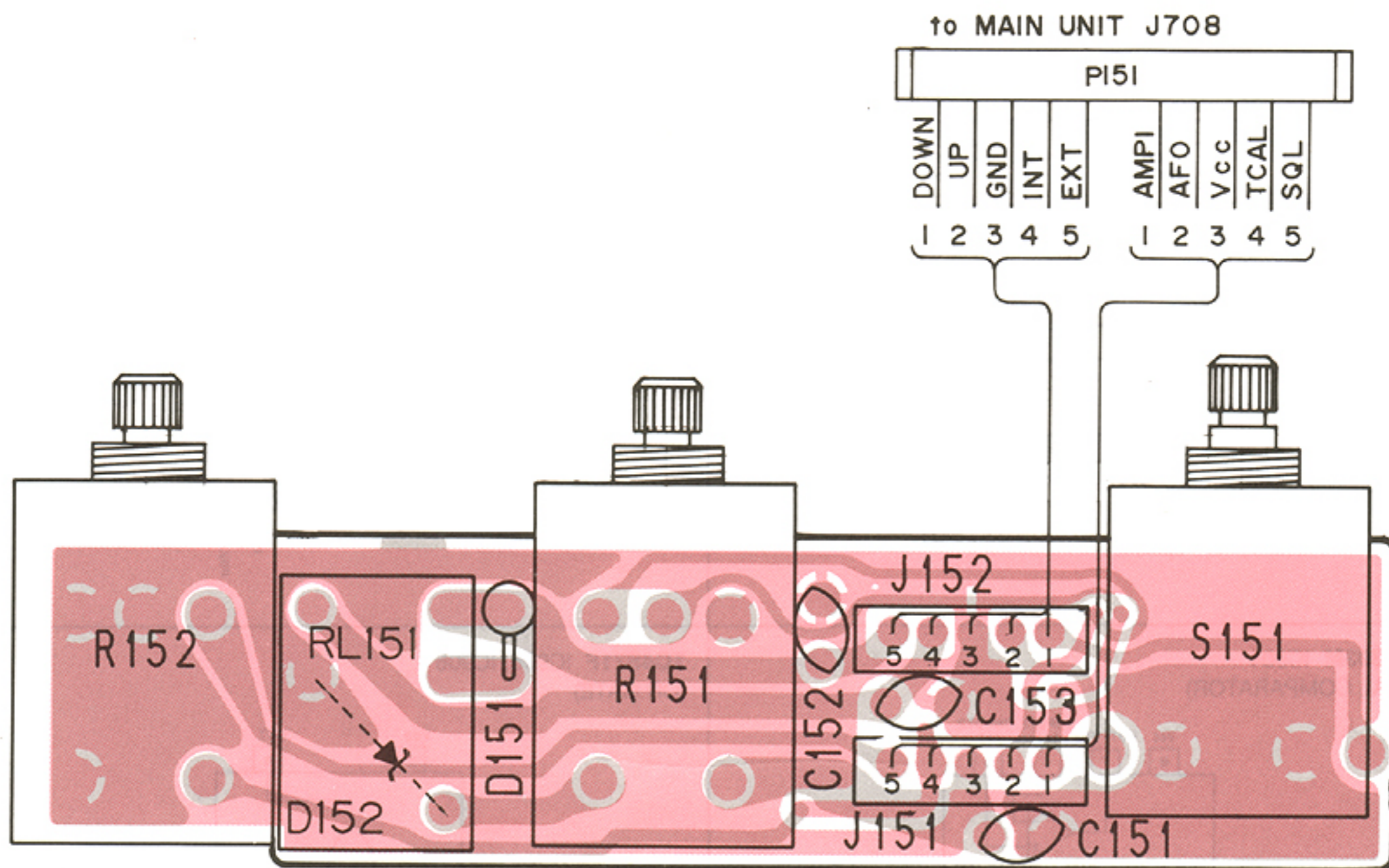
### MAIN UNIT



The above pictures show the IC-32AT.

# SECTION 7 BOARD LAYOUTS

## 7-1 EF UNIT



SQUELCH

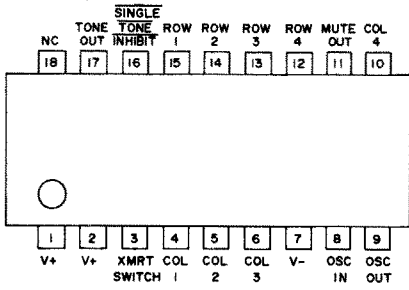
PWR / VOL

MAIN DIAL

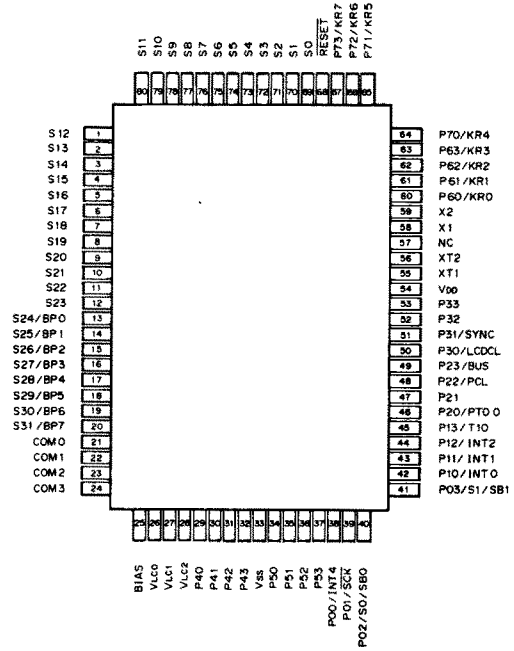
FOIL SIDE  
COMPONENT SIDE

# 7-2 LOGIC UNIT

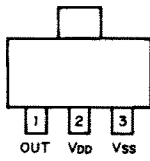
**LR40872 (IC-32AT) IC901**  
(DTMF ENCODER)



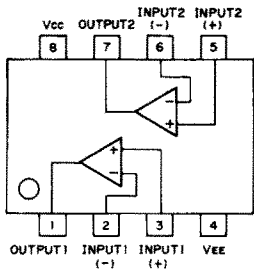
**μPD75308GF-100-389 IC902**  
(CPU)



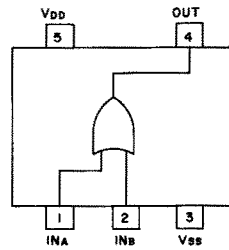
**S-8054ALB-LM IC903**  
(RESET)



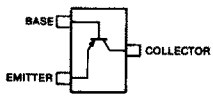
**LA6393M IC904**  
(DUAL COMPARATOR)



**TC4S71F IC905, IC906**  
(OR GATE)

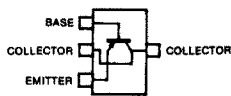


**2SA1362 GR**  
Q908



Symbol: AEG

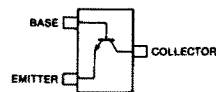
**2SB798 DK**  
Q906



Symbol: DK

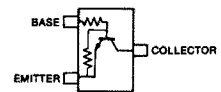
**2SC4081 S**  
Q905, Q907,  
Q910

**2SC4081 S**  
(IC-32AT)  
Q901, Q902,  
Q903, Q904



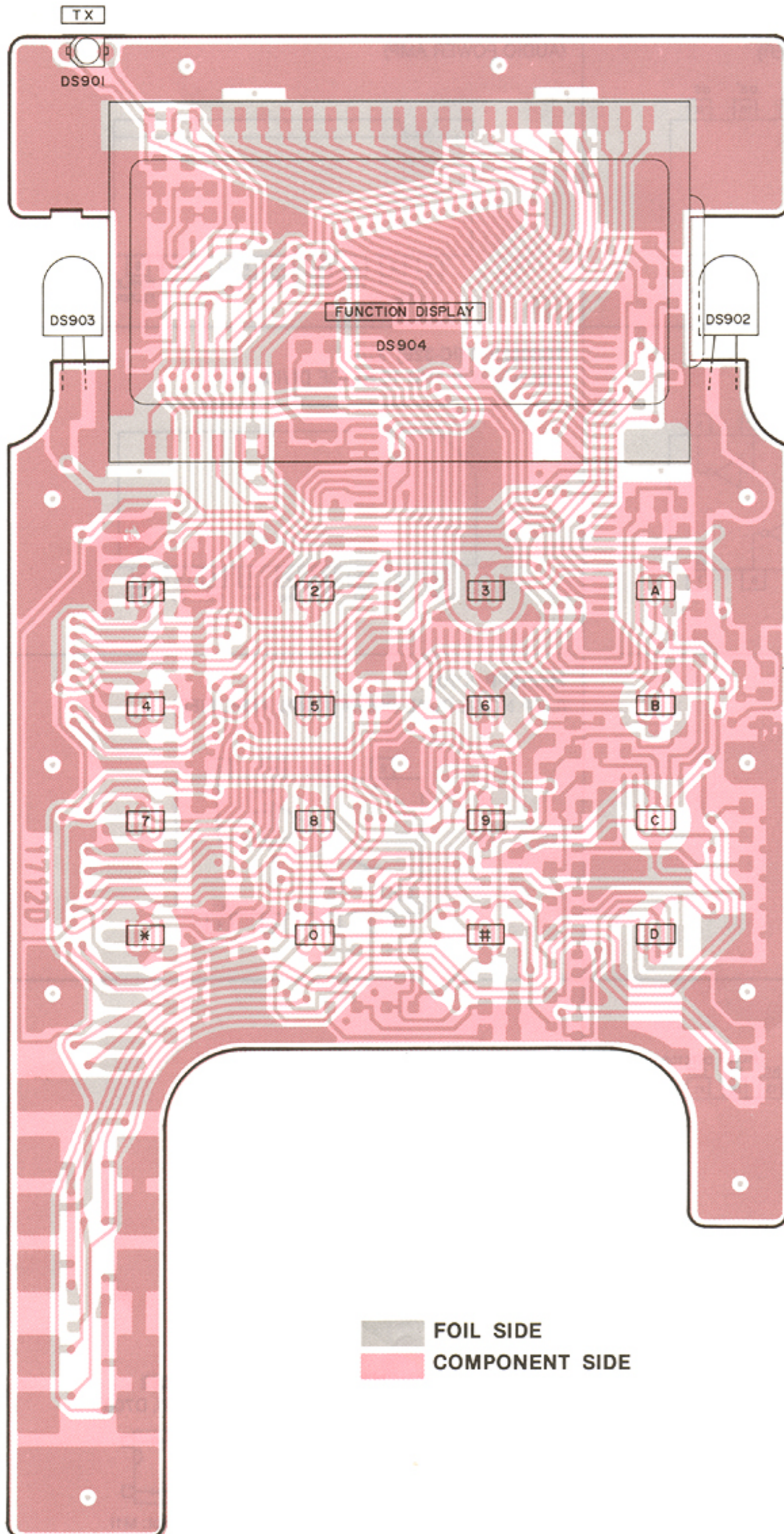
Symbol: BS

**RN1404**  
Q909

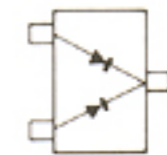


Symbol: XD

# COMPONENT SIDE

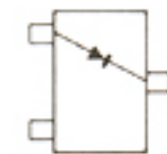


**1SS184**  
 D915 (IC-32E: Italy)  
 D916 (IC-32E)



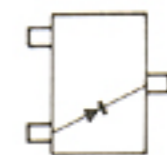
Symbol: B3

**1SS193**  
 D905  
 D909 (IC-32A/AT: U.S.A., Asia)  
 D910 (IC-32A/AT: U.S.A.)  
 D915 (IC-32E: Europe)



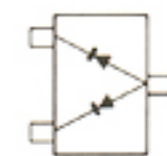
Symbol: F3

**1SS196**  
 D915 (IC-32A: Australia),  
 D916 (IC-32A/AT),  
 D918



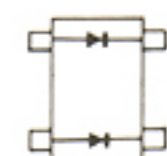
Symbol: G3

**DAP202U**  
 D906



Symbol: P

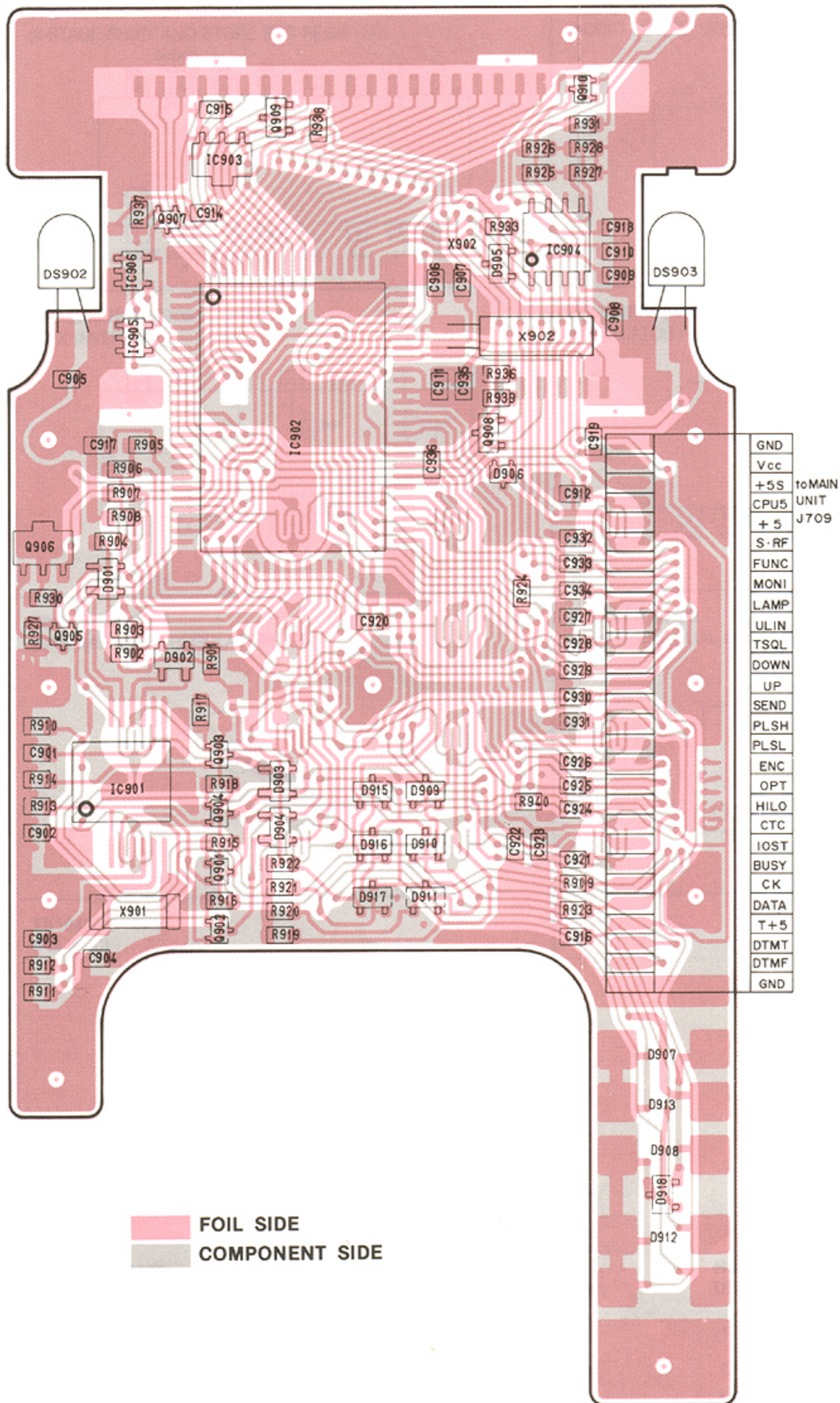
**DWA010**  
 D901 (IC-32AT)  
 D902 (IC-32AT)  
 D903, D904



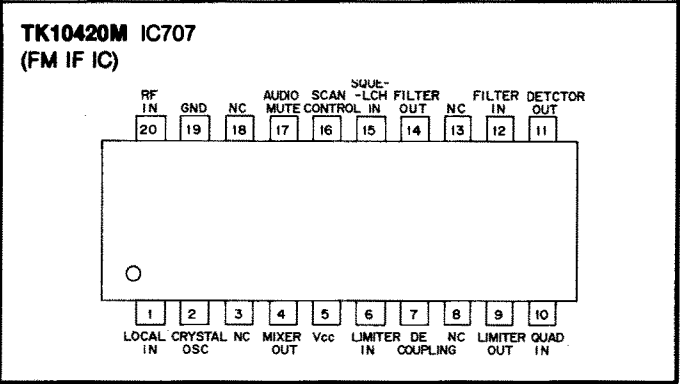
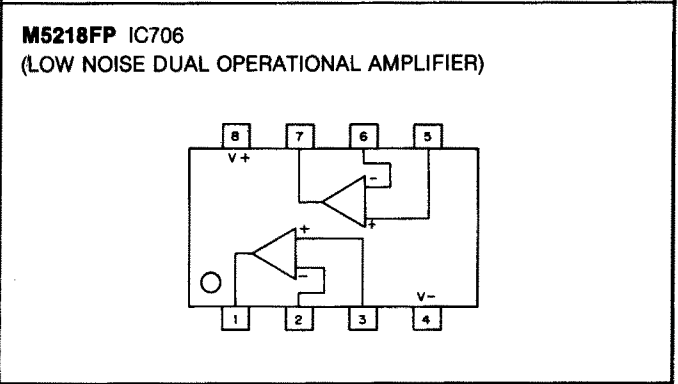
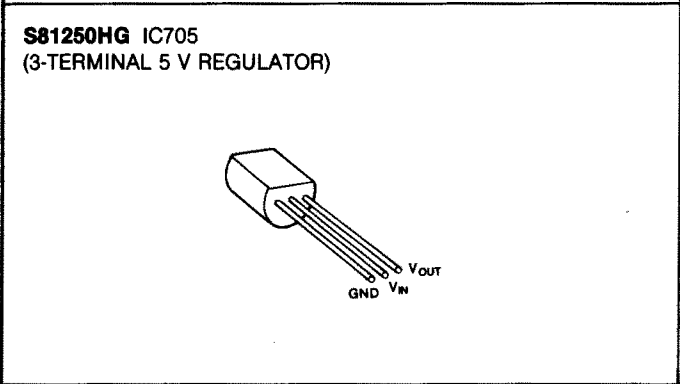
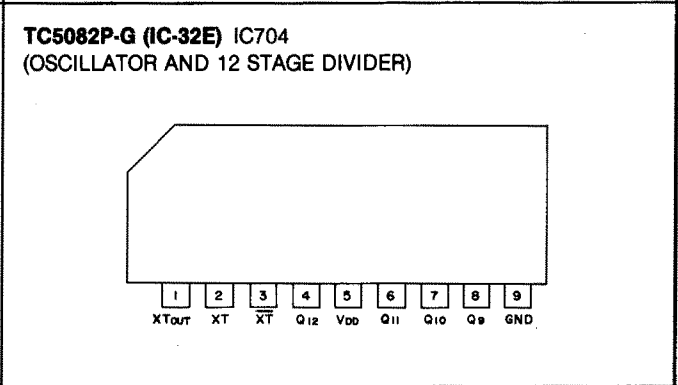
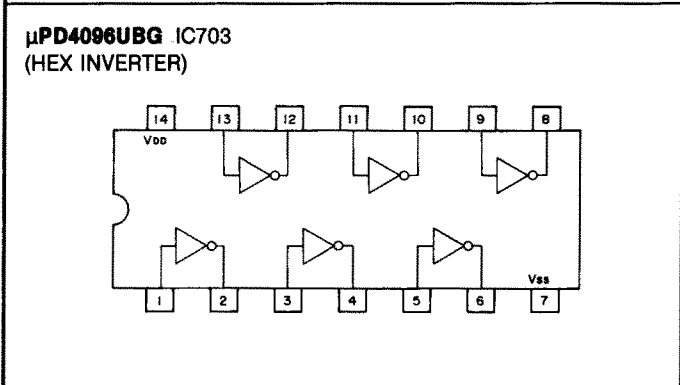
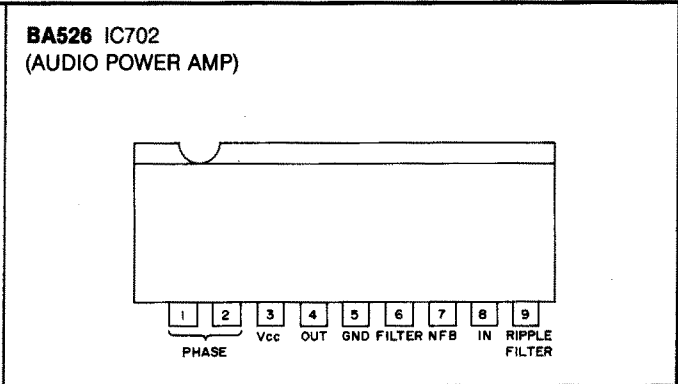
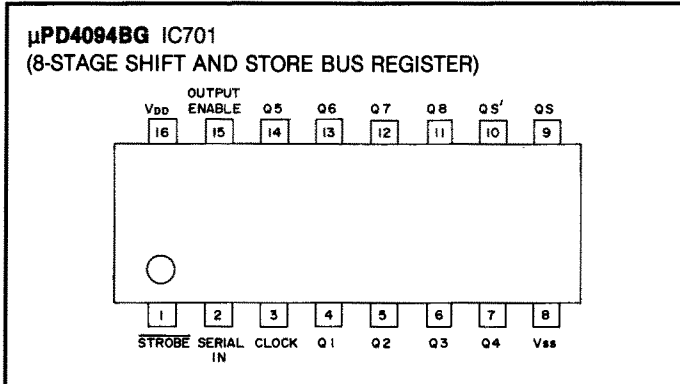
Symbol: BM

FOIL SIDE  
 COMPONENT SIDE

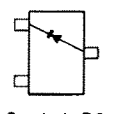
FOIL SIDE



# 7-3 MAIN UNIT

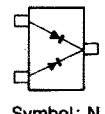


**1SS187**  
D704



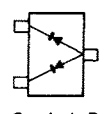
Symbol: D3

**DAN202U**  
D701, D702,  
D707, D709,  
D710, D711,  
D712 (IC-32E),  
D714, D716



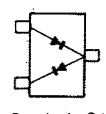
Symbol: N

**DAP202U**  
D713 (IC-32AT)



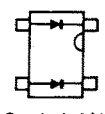
Symbol: P

**HSM88AS**  
D703, D705



Symbol: C1

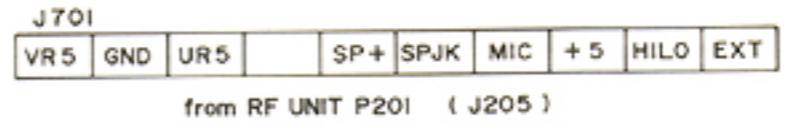
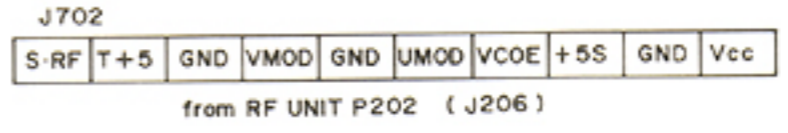
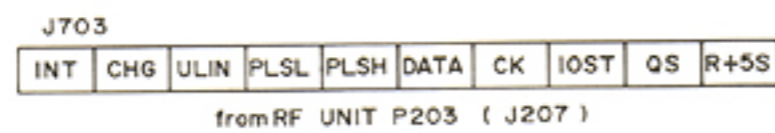
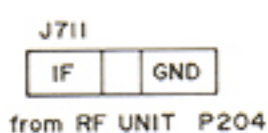
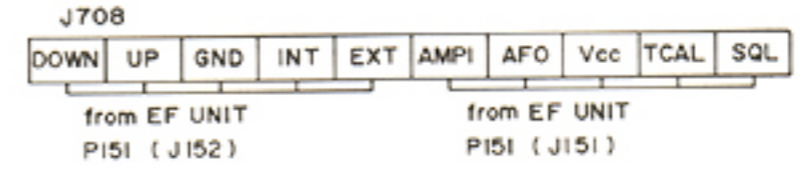
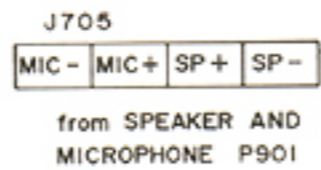
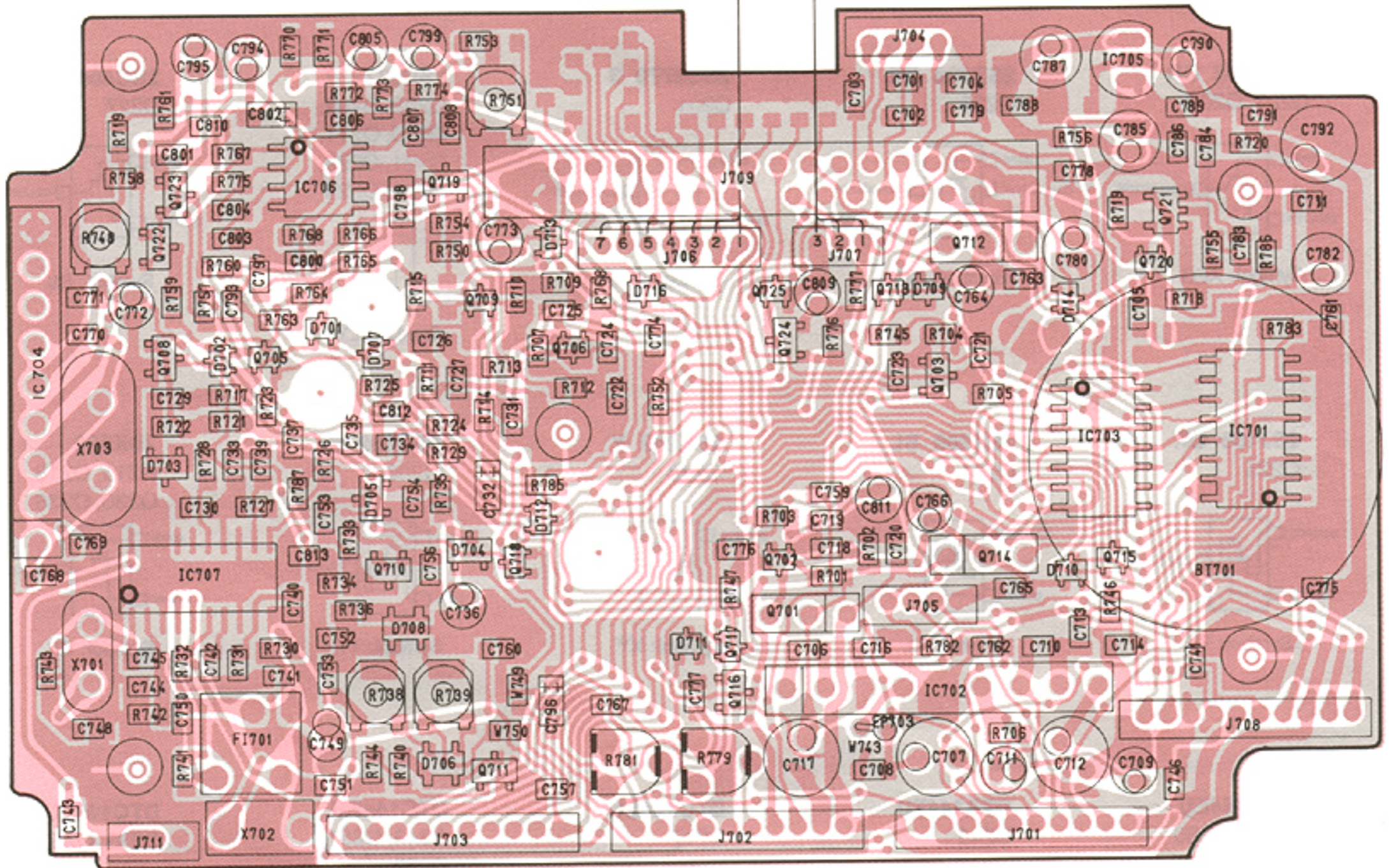
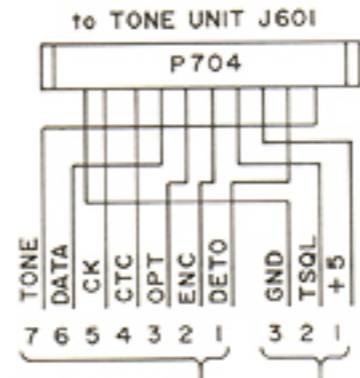
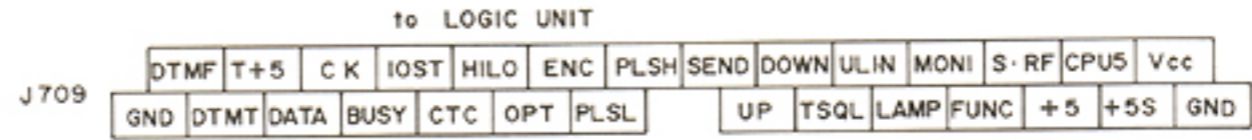
**MA862**  
D706, D708



Symbol: M11

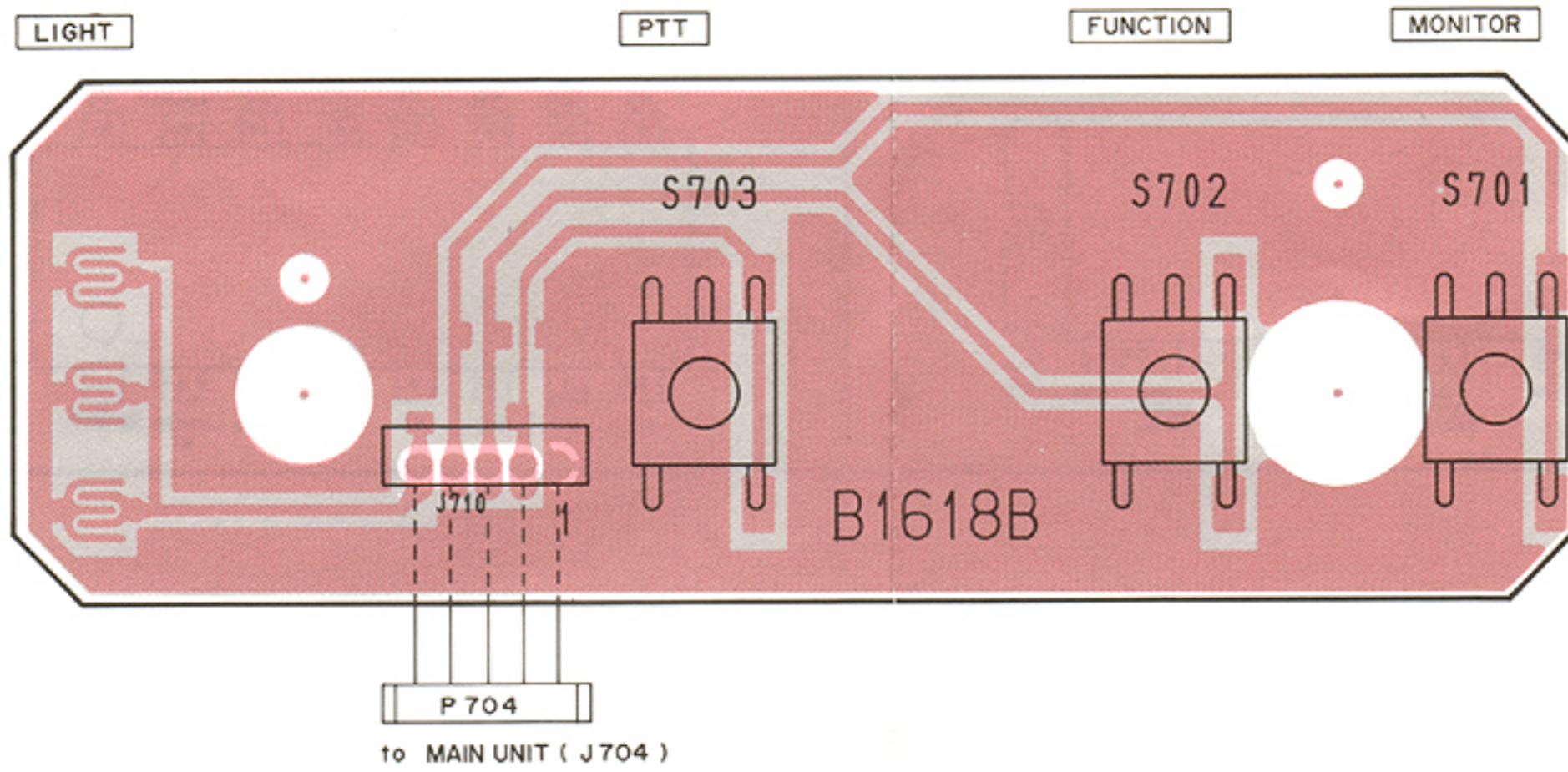


• MAIN UNIT



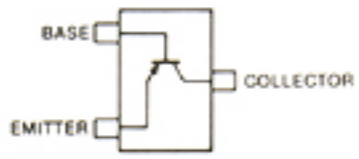
FOIL SIDE  
COMPONENT SIDE

• PTT BOARD



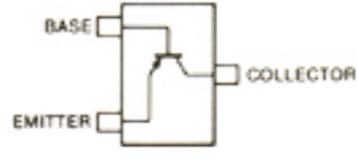
FOIL SIDE  
COMPONENT SIDE

**2SA1162 GR**  
Q716, Q724



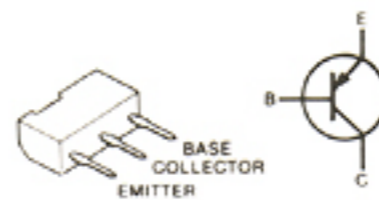
Symbol: SG

**2SA1576 S**  
Q720

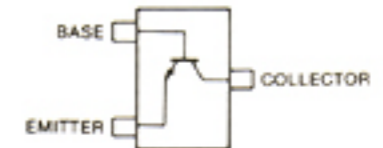


Symbol: FS

**2SB909M R**  
Q701, Q712,  
Q714

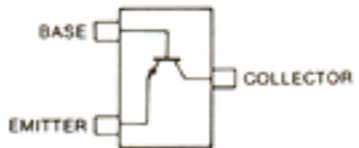


**2SC2712 BL**  
Q708,  
Q719 (IC-32AT)



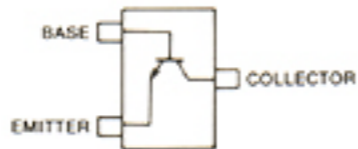
Symbol: LL

**2SC3770 3**  
Q710, Q711



Symbol: JY3

**2SC4081 S**  
Q702, Q705,  
Q706, Q709,  
Q713, Q715,  
Q717



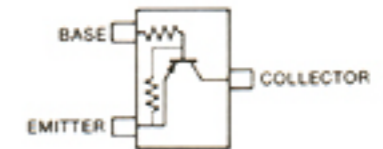
Symbol: BS

**2SJ106 GR**  
Q703, Q722,  
Q723



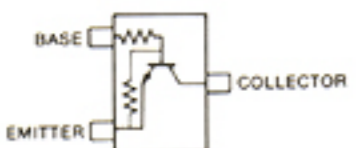
Symbol: VG

**DTA144EU**  
Q718 (IC-32E)



Symbol: 16

**DTC144EU**  
Q725



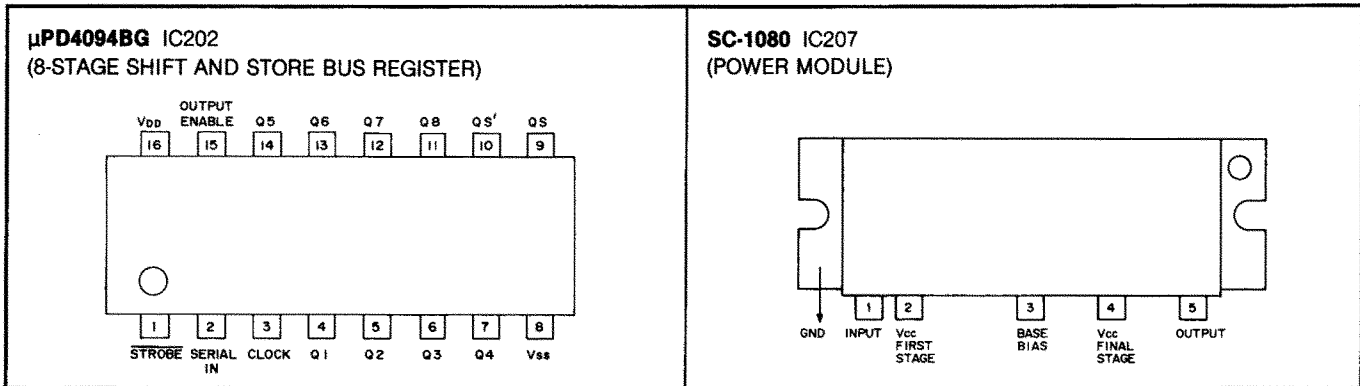
Symbol: 26

**FMW1**  
Q721

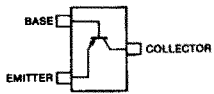


Symbol: W1

# 7-4 RF UNIT (1)

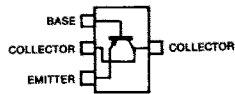


**2SA1362 GR**  
Q207, Q208



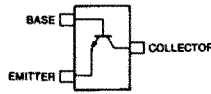
Symbol: AEG

**2SB798 DK**  
Q226



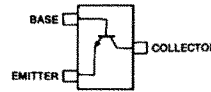
Symbol: DK

**2SC3770 3**  
Q201



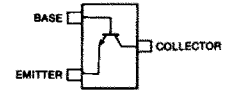
Symbol: JY3

**2SC3772 3**  
Q203, Q209,  
Q210, Q211,  
Q221, Q222,  
Q223, Q229



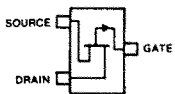
Symbol: LY3

**2SC4081 S**  
Q227



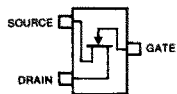
Symbol: BS

**2SJ106 GR**  
Q225



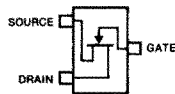
Symbol: VG

**2SK209 BL**  
Q204



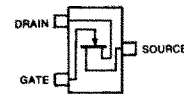
Symbol: XL

**2SK209 Y**  
Q218



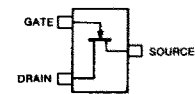
Symbol: XY

**2SK302 Y**  
Q202



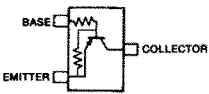
Symbol: TY

**2SK536**  
Q215, Q216,  
Q230, Q236



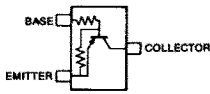
Symbol: CP

**DTA144EU**  
Q244, Q250



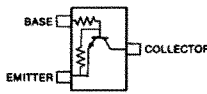
Symbol: 16

**DTA144TU**  
Q245



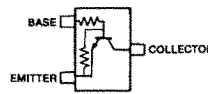
Symbol: 96

**DTC124EU**  
Q247



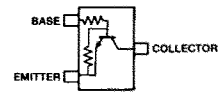
Symbol: 25

**DTC144EU**  
Q243, Q251,  
Q252



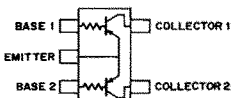
Symbol: 26

**DTC144TU**  
Q233, Q242



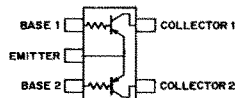
Symbol: 06

**FMA3**  
Q231



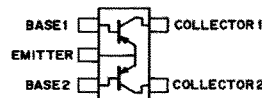
Symbol: A3

**FM4**  
Q232



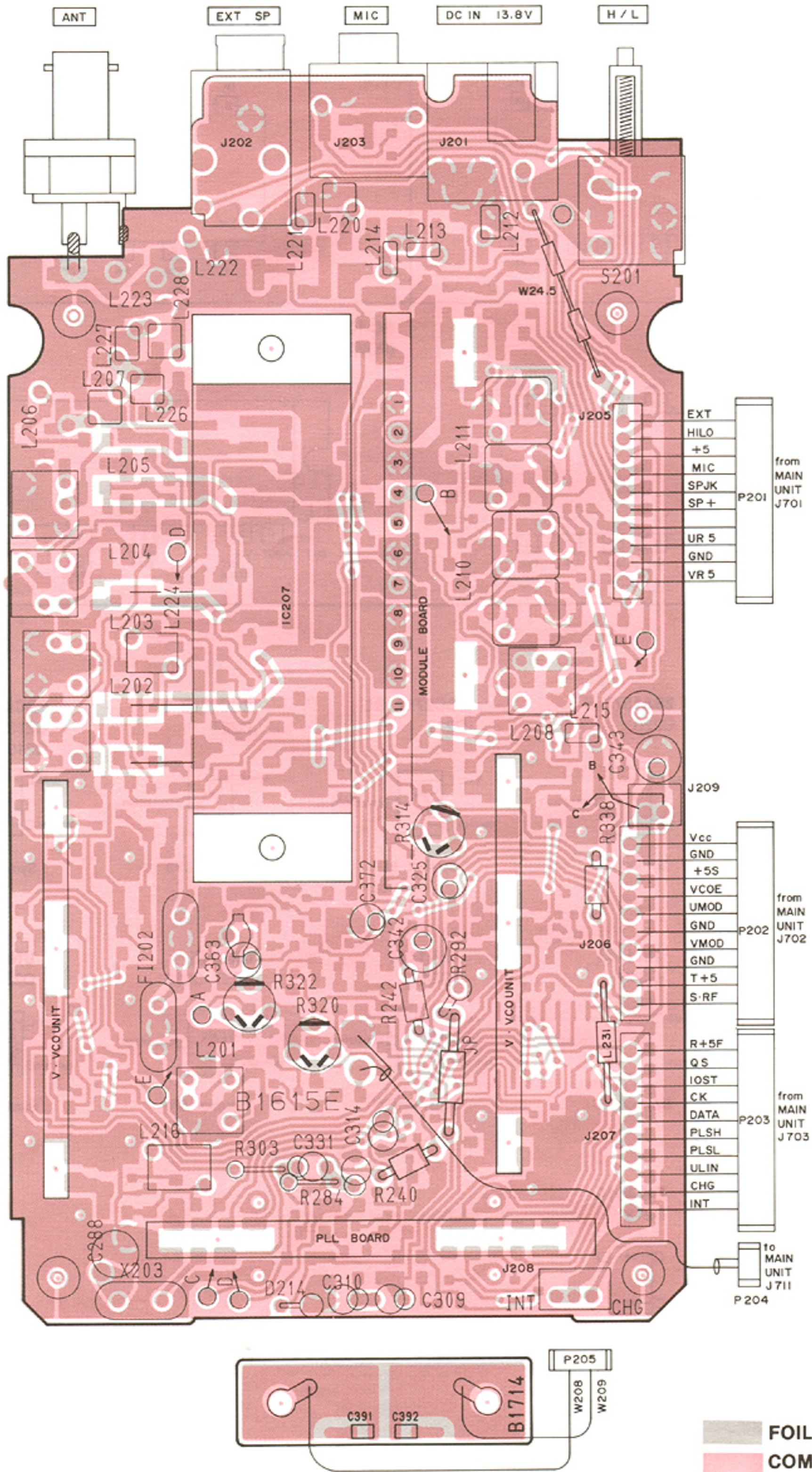
Symbol: A4

**FMS1**  
Q228

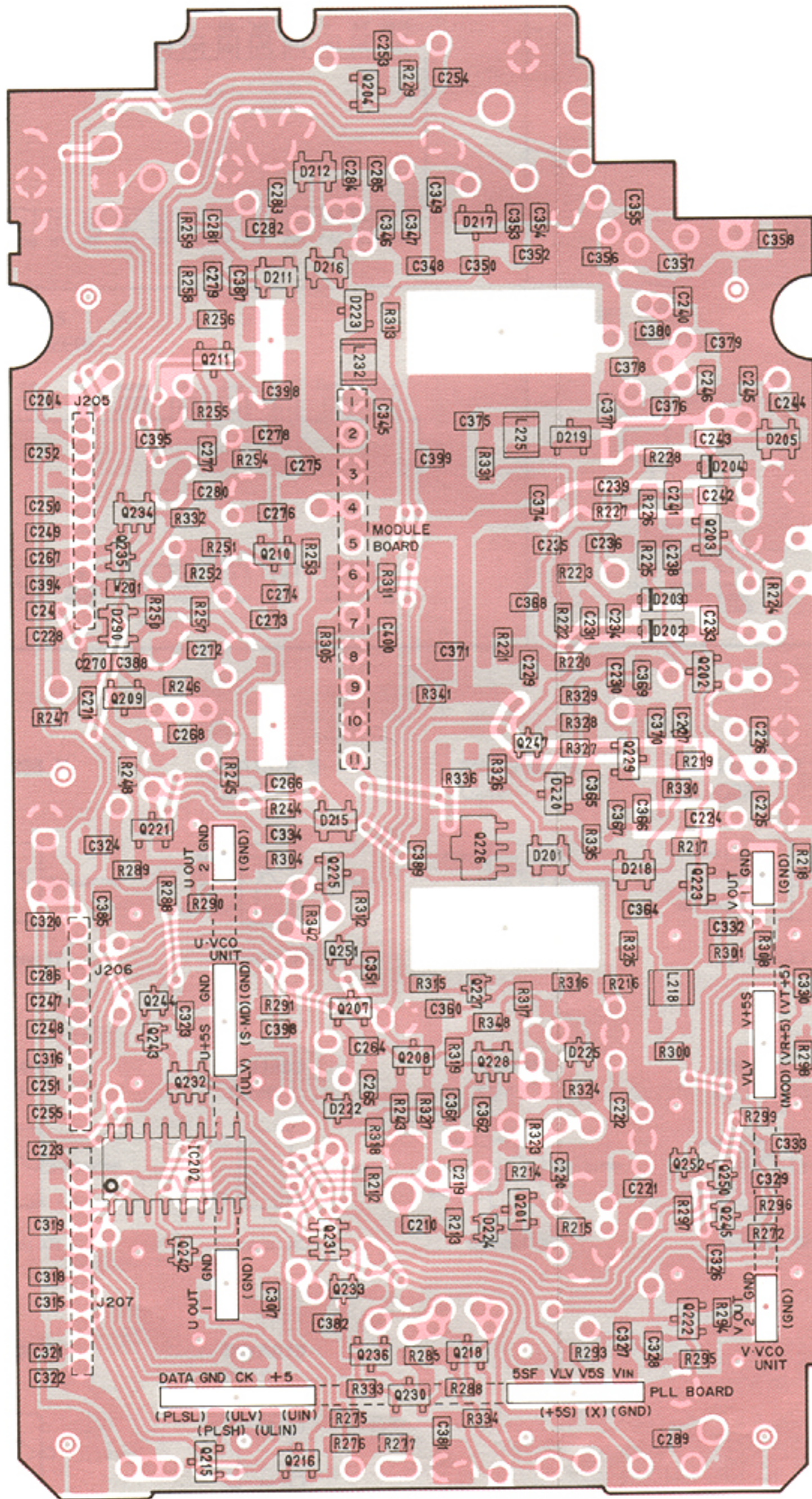


Symbol: S1

# COMPONENT SIDE

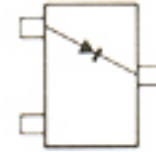


**FOIL SIDE**



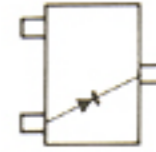
**FOIL SIDE**  
 **COMPONENT SIDE**

**1SS153**  
D219, D223



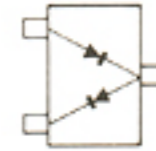
Symbol: A9

**1SS154**  
D217



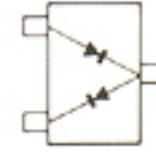
Symbol: BA

**1SV172**  
D220



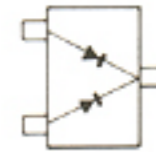
Symbol: BE

**DA204U**  
D224



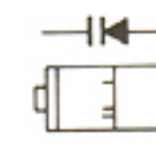
Symbol: K

**DAN202U**  
D222, D225



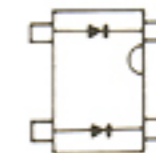
Symbol: N

**MA334 B**  
D202, D203,  
D204



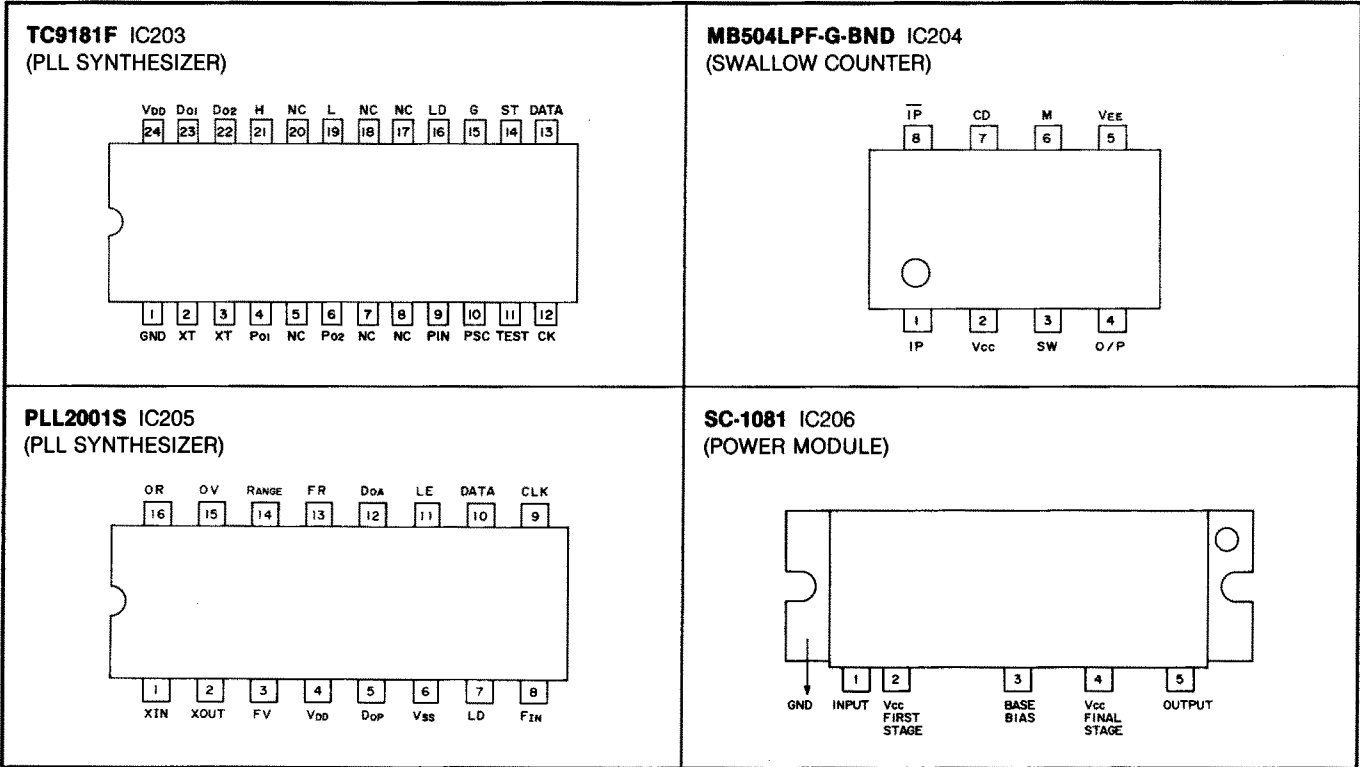
Symbol: 6D82

**MA862**  
D201, D205,  
D212, D215,  
D216, D218

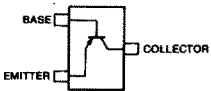


Symbol: M11

## 7-5 RF UNIT (2)

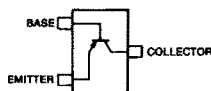


**2SA1298 Y**  
Q248



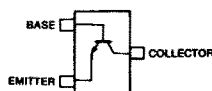
Symbol: IY

**2SA1576 S**  
Q220



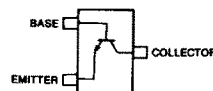
Symbol: FS

**2SC2712 BL**  
Q212



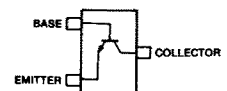
Symbol: LL

**2SC3772 3**  
Q224



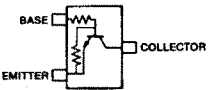
Symbol: LY3

**2SC4081 S**  
Q213, Q217,  
Q219



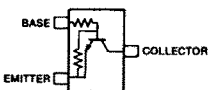
Symbol: BS

**RN1402**  
Q249



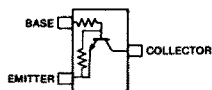
Symbol: XB

**RN1403**  
Q246



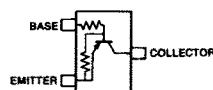
Symbol: XC

**RN1404**  
Q241



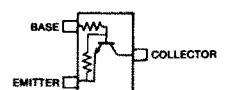
Symbol: XD

**UN511E**  
Q237, Q238



Symbol: 6N

**UN521E**  
Q239



Symbol: 8N

**DAN202U**  
D221



Symbol: N

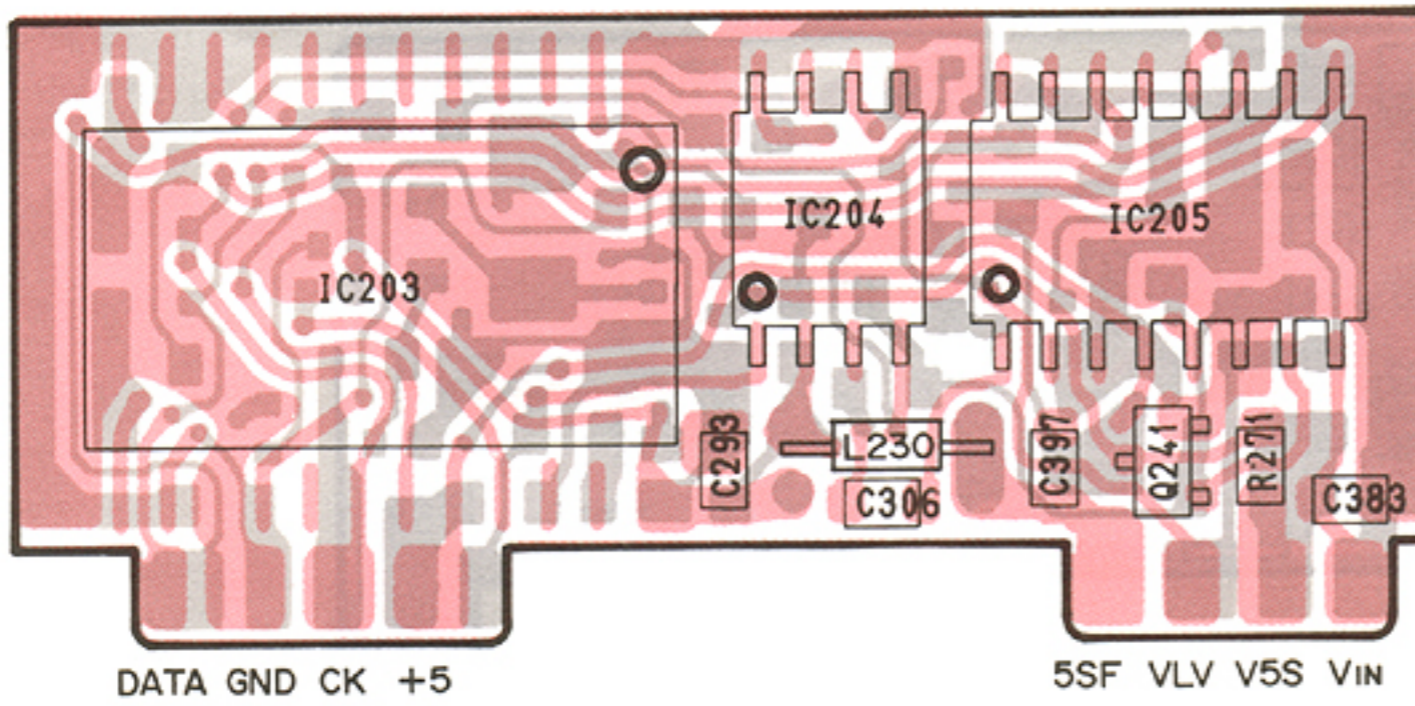
**DWA010**  
D213



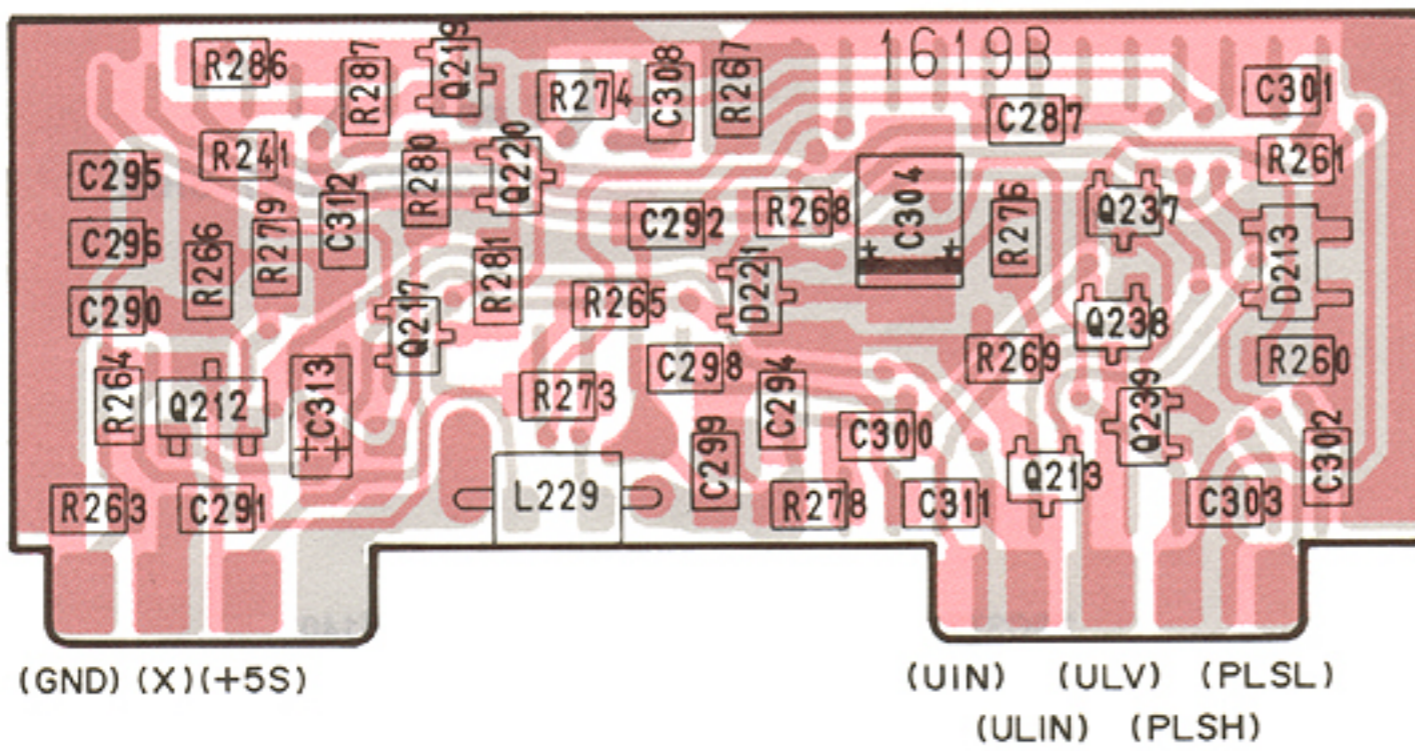
Symbol: BM

# PLL BOARD

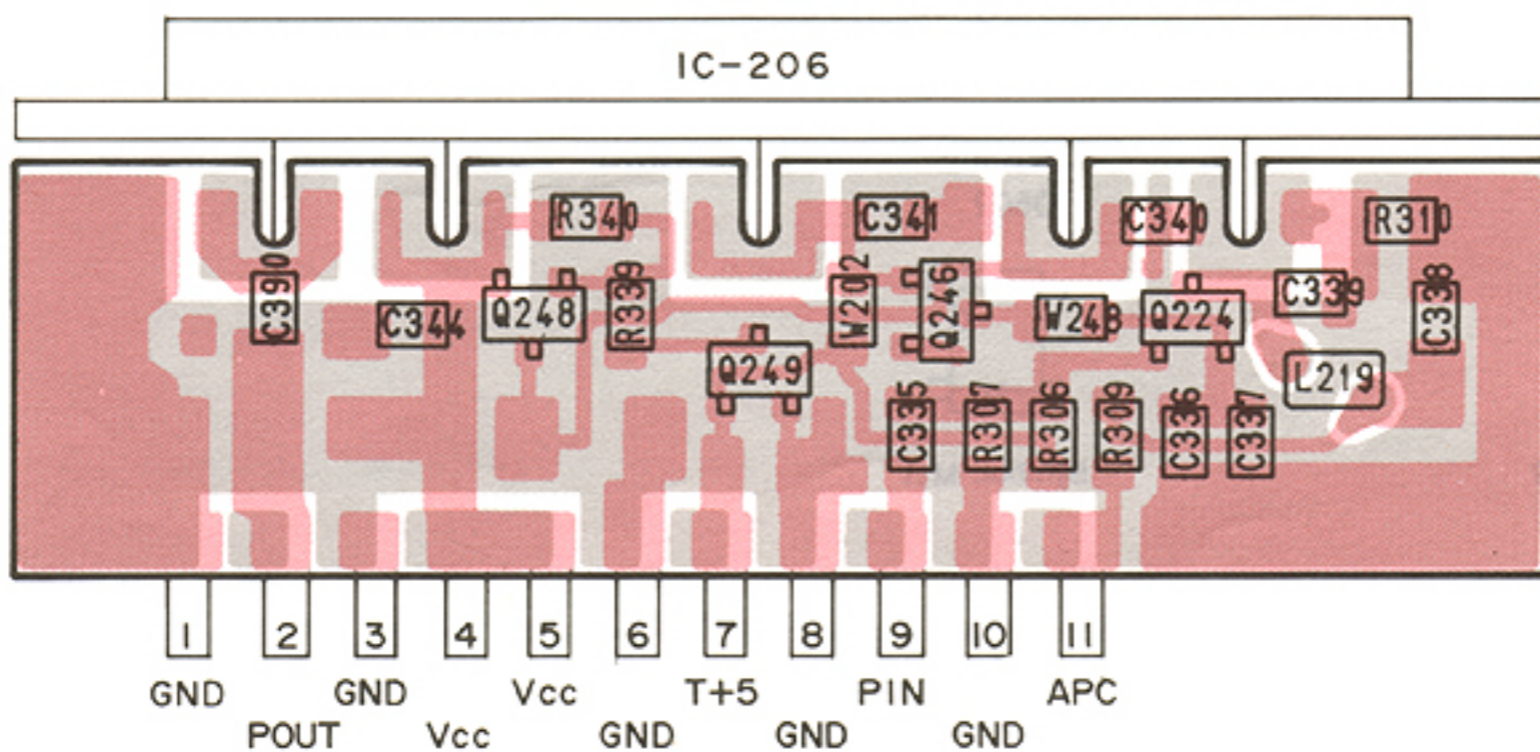
## COMPONENT SIDE



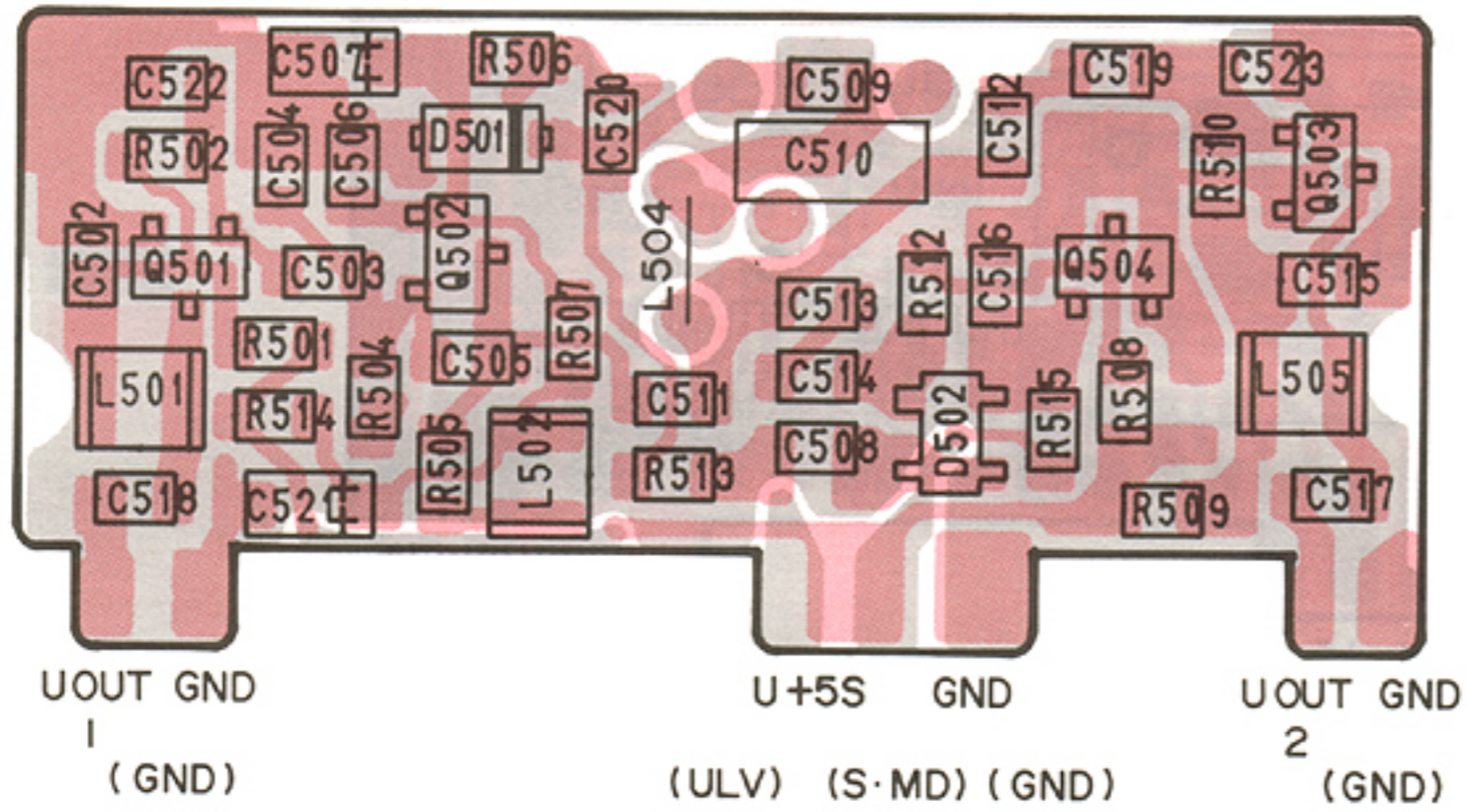
## FOIL SIDE





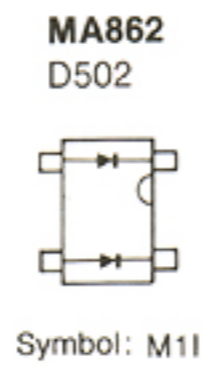
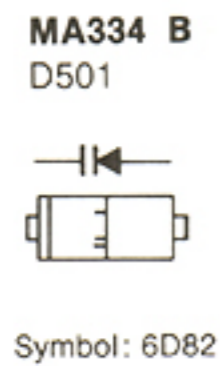
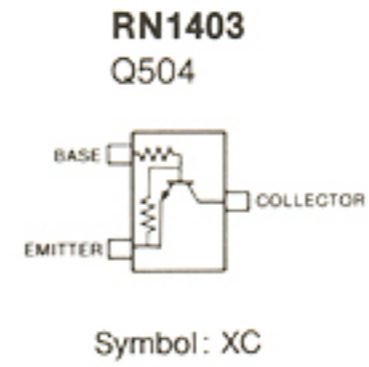
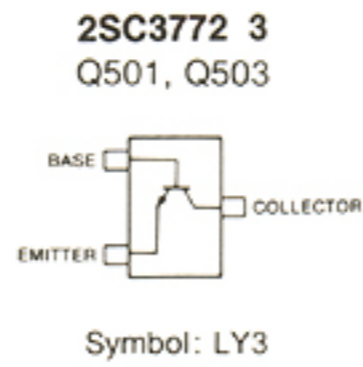
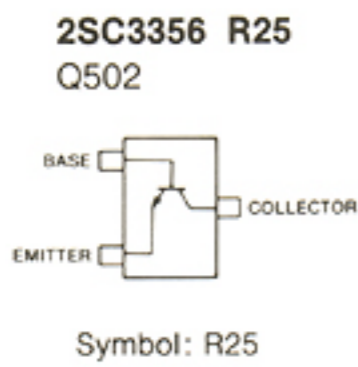
## MODULE BOARD



## 7-6 U-VCO UNIT

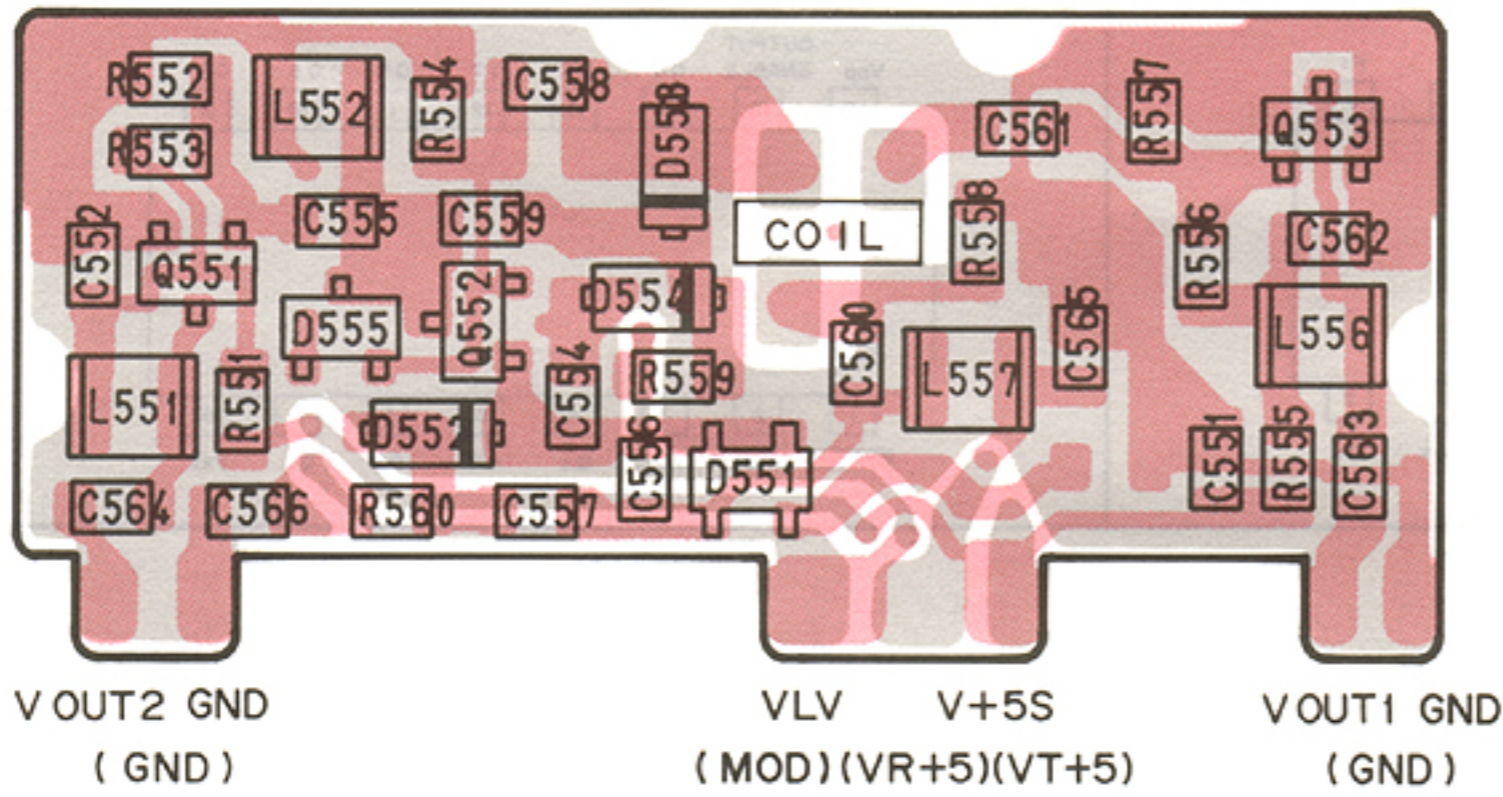


 FOIL SIDE  
 COMPONENT SIDE

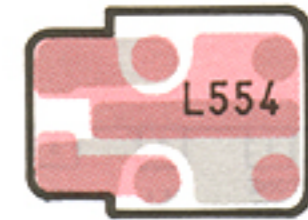




## 7-7 V-VCO UNIT

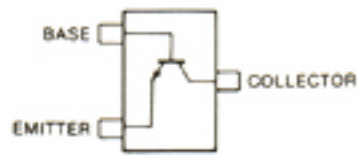


COIL BOARD



FOIL SIDE  
COMPONENT SIDE

**2SC3772 3**  
Q551, Q553



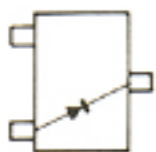
Symbol: LY3

**2SK302 Y**  
Q552



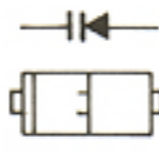
Symbol: TY

**1SS154**  
D555



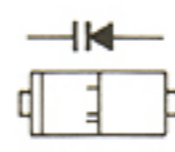
Symbol: BA

**MA333**  
D553



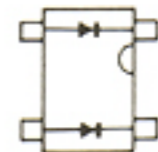
Symbol: 6C83

**MA334 B**  
D552, D554



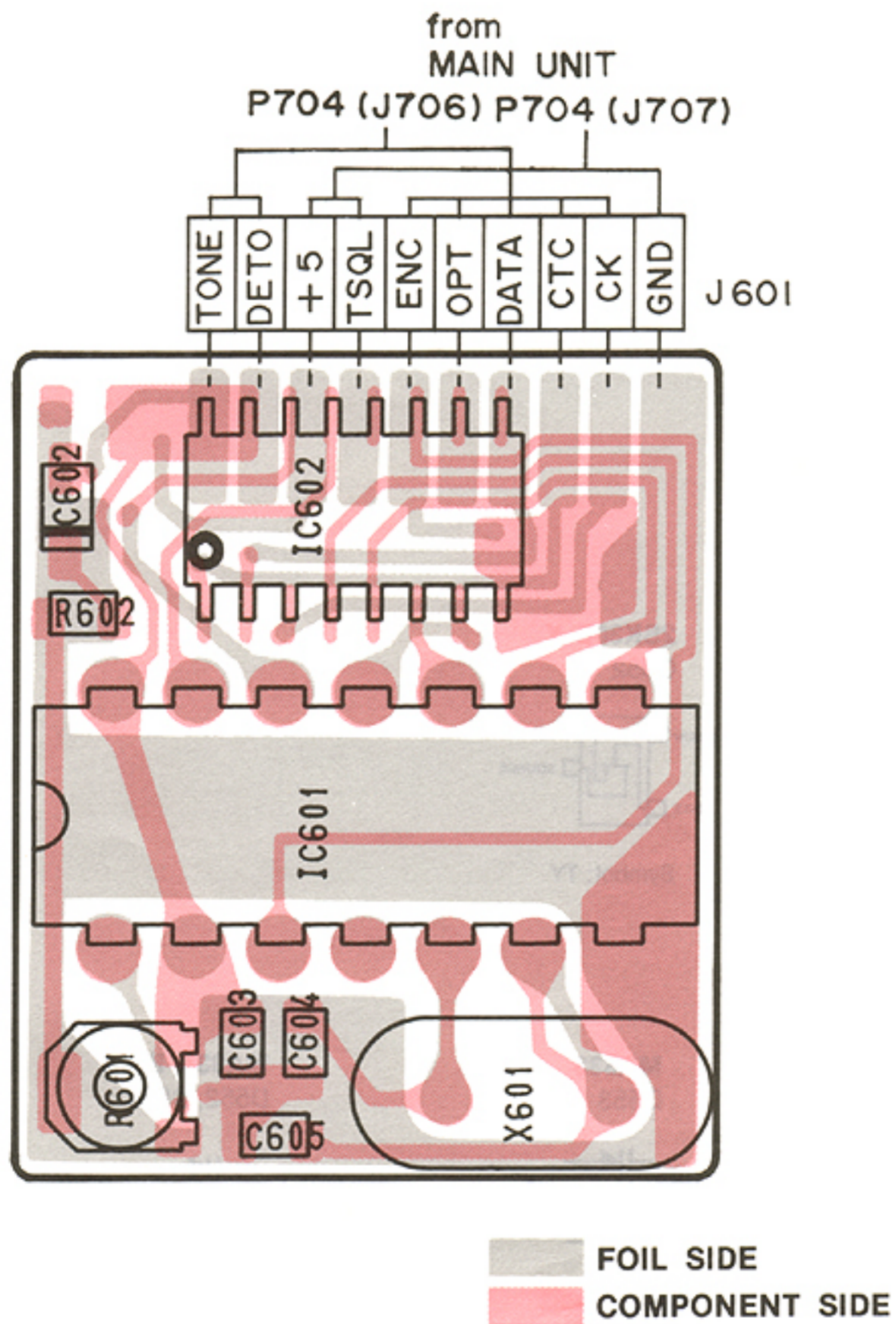
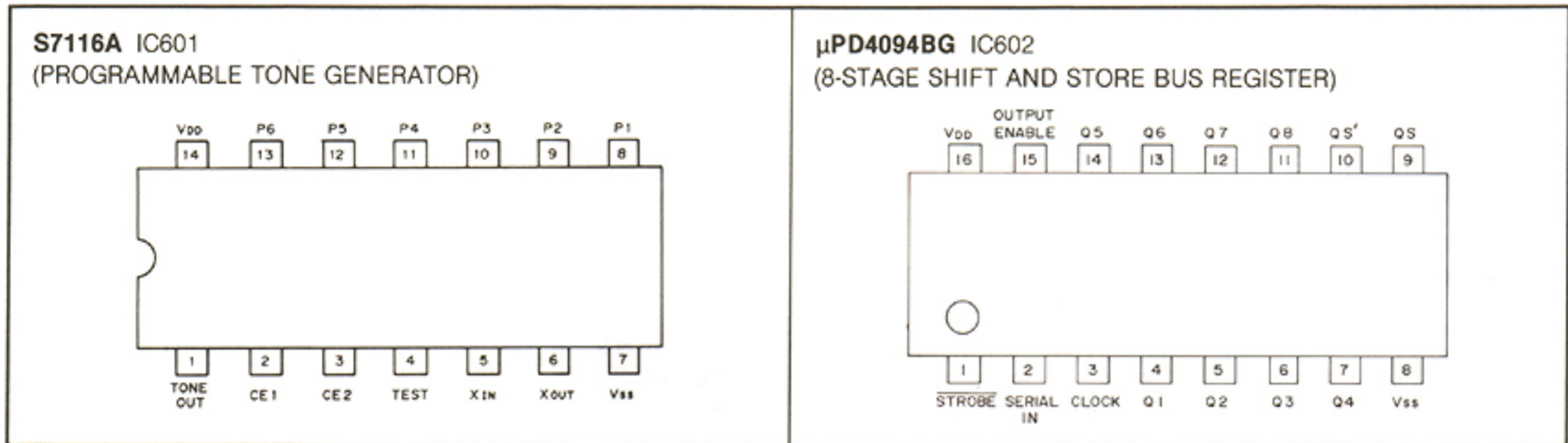
Symbol: 6D82

**MA862**  
D551



Symbol: M11

## 7-8 TONE UNIT (IC-32AT)



# SECTION 8 PARTS LIST

## [EF UNIT]

REF. NO.	DESCRIPTION	PART NO.	
D151	Diode	1SS133	
D152	Zener	RD20E B2	
R151	Variable Resistor	10 kΩ A	RK097111101NA
R152	Variable Resistor	10 kΩ B	RK0971110051A
		(IC-32A/AT)	
R152	Variable Resistor	10 kΩ B	RK0971114003A
		(IC-32E)	
C151	Ceramic	47 pF	50 V
C152	Ceramic	47 pF	50 V
C153	Ceramic	47 pF	50 V
RL151	Relay	OUC-SH-114D	
J151	Connector	TZB-P05H-A1	
J152	Connector	TZB-P05H-A1	
P151	Connector	PI28A10F	
S151	Encoder	SRBM1L040A	
EP151	P.C. Board	B-1617B	

## [LOGIC UNIT]

REF. NO.	DESCRIPTION	PART NO.	
IC901	IC	LR40872 (IC-32AT)	
IC902	IC	μPD75308GF-100-3B9	
IC903	IC	S-8054ALB-LM	
IC904	IC	LA6393M	
IC905	IC	TC4S71F	
IC906	IC	TC4S71F	
Q901	Transistor	2SC4081 S (IC-32AT)	
Q902	Transistor	2SC4081 S (IC-32AT)	
Q903	Transistor	2SC4081 S (IC-32AT)	
Q904	Transistor	2SC4081 S (IC-32AT)	
Q905	Transistor	2SC4081 S	
Q906	Transistor	2SB798 DK	
Q907	Transistor	2SC4081 S	
Q908	Transistor	2SA1362 GR	
Q909	Transistor	RN1404	
Q910	Transistor	2SC4081 S	
D901	Diode	DWA010 (IC-32AT)	
D902	Diode	DWA010 (IC-32AT)	
D903	Diode	DWA010	
D904	Diode	DWA010	
D905	Diode	1SS193	
D906	Diode	DAP202U	
D907	Diode	1SS254	
		(IC-32A/E: Australia, Europe)	

## [LOGIC UNIT]

REF. NO.	DESCRIPTION	PART NO.	
D909	Diode	1SS193 (IC-32A/AT: U.S.A., Asia)	
D910	Diode	1SS193 (IC-32A/AT: U.S.A.)	
D912	Diode	1SS254	
D913	Diode	1SS254	
D915	Diode	1SS193 (IC-32E: Europe)	
D915	Diode	1SS184 (IC-32E: Italy)	
D915	Diode	1SS196 (IC-32A: Australia)	
D916	Diode	1SS184 (IC-32E)	
D916	Diode	1SS196 (IC-32A/AT)	
D918	Diode	1SS196	
X901	Ceramic Resonator	CSAC3.58MGC300CD (IC-32AT)	
X902	Crystal	CR227 (4.1125 MHz)	
R901	Resistor	82 kΩ	MCR10
R902	Resistor	82 kΩ	MCR10
R903	Resistor	82 kΩ	MCR10
R904	Resistor	82 kΩ	MCR10
R905	Resistor	10 kΩ	MCR10
R906	Resistor	47 kΩ	MCR10
R907	Resistor	47 kΩ	MCR10
R908	Resistor	47 kΩ	MCR10
R909	Resistor	1 MΩ	MCR10
R910	Resistor	47 kΩ	MCR10 (IC-32AT)
R911	Resistor	82 kΩ	MCR10 (IC-32AT)
R912	Resistor	82 kΩ	MCR10 (IC-32AT)
R913	Resistor	82 kΩ	MCR10 (IC-32AT)
R914	Resistor	82 kΩ	MCR10 (IC-32AT)
R915	Resistor	1 MΩ	MCR10 (IC-32AT)
R916	Resistor	1 MΩ	MCR10 (IC-32AT)
R917	Resistor	1 MΩ	MCR10 (IC-32AT)
R918	Resistor	1 MΩ	MCR10 (IC-32AT)
R919	Resistor	150 kΩ	MCR10
R920	Resistor	150 kΩ	MCR10
R921	Resistor	150 kΩ	MCR10
R922	Resistor	150 kΩ	MCR10
R923	Resistor	1 MΩ	MCR10
R924	Resistor	1 MΩ	MCR10
R925	Resistor	330 kΩ	MCR10
R926	Resistor	390 kΩ	MCR10
R927	Resistor	100 kΩ	MCR10
R928	Resistor	100 kΩ	MCR10
R929	Resistor	2.2 kΩ	MCR10
R930	Resistor	1.5 kΩ	MCR10
R931	Resistor	220 Ω	MCR10
R933	Resistor	1.2 MΩ	MCR10
R936	Resistor	100 kΩ	MCR10
R937	Resistor	100 kΩ	MCR10
R938	Resistor	47 kΩ	MCR10
R939	Resistor	1.2 MΩ	MCR10
R940	Resistor	1 MΩ	MCR10
C901	Ceramic	0.001 μF	GRM40 (IC-32AT)
C902	Ceramic	0.1 μF	GRM40 F (IC-32AT)
C903	Ceramic	30 pF	GRM40 SL 50PT
		(IC-32AT)	
C904	Ceramic	30 pF	GRM40 SL 50PT
		(IC-32AT)	
C905	Ceramic	0.001 μF	GRM40
C906	Ceramic	15 pF	GRM40
C907	Ceramic	15 pF	GRM40
C908	Ceramic	330 pF	GRM40 CH
C909	Ceramic	0.001 μF	GRM40
C910	Ceramic	47 pF	GRM40
C911	Ceramic	0.001 μF	GRM40
C912	Ceramic	0.1 μF	GRM40 F
C913	Ceramic	470 pF	50 V

**[LOGIC UNIT]**

REF. NO.	DESCRIPTION	PART NO.
C914	Ceramic	0.01 μF GRM40 F
C915	Ceramic	0.001 μF GRM40
C916	Ceramic	470 pF GRM40
C917	Ceramic	470 pF GRM40
C918	Ceramic	470 pF GRM40
C919	Ceramic	470 pF GRM40
C920	Ceramic	470 pF GRM40
C921	Ceramic	470 pF GRM40
C922	Ceramic	470 pF GRM40
C923	Ceramic	470 pF GRM40
C924	Ceramic	470 pF GRM40
C925	Ceramic	470 pF GRM40
C926	Ceramic	470 pF GRM40
C927	Ceramic	470 pF GRM40
C928	Ceramic	470 pF GRM40
C929	Ceramic	470 pF GRM40
C930	Ceramic	470 pF GRM40
C931	Ceramic	470 pF GRM40
C932	Ceramic	470 pF GRM40
C933	Ceramic	470 pF GRM40
C934	Ceramic	470 pF GRM40
C935	Ceramic	470 pF GRM40
C936	Ceramic	470 pF GRM40
P901	Connector	PI28A04F
DS901	LED	SLN-210VC
DS902	Lamp	HRS-3060A-G40
DS903	Lamp	HRS-3060A-G40
DS904	LCD	LD-BU9246J
MC901	Microphone	KUC2023-01-006
SP901	Speaker	Si36D04
EP901	P.C. Board	B-1712D
EP902	F.P.C Board	B-1622B
EP903	LCD Contact Strip	SRCN-575

**[MAIN UNIT]**

REF. NO.	DESCRIPTION	PART NO.
IC701	IC	μPD4094BG
IC702	IC	BA526
IC703	IC	μPD4069UBG
IC704	IC	TC5082P-G (IC-32E)
IC705	IC	S81250HG
IC706	IC	M5218FP
IC707	IC	TK10420M
Q701	Transistor	2SB909M R
Q702	Transistor	2SC4081 S
Q703	FET	2SJ106 GR
Q705	Transistor	2SC4081 S
Q706	Transistor	2SC4081 S
Q708	Transistor	2SC2712 BL
Q709	Transistor	2SC4081 S
Q710	Transistor	2SC3770 3
Q711	Transistor	2SC3770 3
Q712	Transistor	2SB909M R
Q713	Transistor	2SC4081 S

**[MAIN UNIT]**

REF. NO.	DESCRIPTION	PART NO.
Q714	Transistor	2SB909M R
Q715	Transistor	2SC4081 S
Q716	Transistor	2SA1162 GR
Q717	Transistor	2SC4081 S
Q718	Transistor	DTA144EU (IC-32E)
Q719	Transistor	2SC2712 BL (IC-32AT)
Q720	Transistor	2SA1576 S
Q721	Transistor	FMW1
Q722	FET	2SJ106 GR
Q723	FET	2SJ106 GR
Q724	Transistor	2SA1162 GR
Q725	Transistor	DTC144EU
D701	Diode	DAN202U
D702	Diode	DAN202U
D703	Diode	HSM88AS
D704	Diode	1SS187
D705	Diode	HSM88AS
D706	Diode	MA862
D707	Diode	DAN202U
D708	Diode	MA862
D709	Diode	DAN202U
D710	Diode	DAN202U
D711	Diode	DAN202U
D712	Diode	DAN202U (IC-32E)
D713	Diode	DAP202U (IC-32AT)
D714	Diode	DAN202U
D716	Diode	DAN202U
FI701	Ceramic	CFUM455E
X701	Crystal	CR214 (30.42 MHz)
X702	Discriminator	CDB455C7A
X703	Crystal	CR251 (7.168 MHz) (IC-32E)
R701	Resistor	820 Ω MCR10
R702	Resistor	680 Ω MCR10
R703	Resistor	4.7 kΩ MCR10
R704	Resistor	1 MΩ MCR10
R705	Resistor	100 kΩ MCR10
R706	Resistor	1 kΩ MCR10
R707	Resistor	4.7 kΩ MCR10
R708	Resistor	39 kΩ MCR10
R709	Resistor	39 kΩ MCR10
R710	Resistor	4.7 kΩ MCR10
R711	Resistor	150 kΩ MCR10
R712	Resistor	2.2 kΩ MCR10
R713	Resistor	15 kΩ MCR10
R714	Resistor	27 kΩ MCR10
R715	Resistor	330 kΩ MCR10
R717	Resistor	47 kΩ MCR10
R718	Resistor	560 Ω MCR10
R719	Resistor	3.3 kΩ MCR10
R720	Resistor	680 Ω MCR10
R721	Resistor	1 MΩ MCR10
R722	Resistor	100 kΩ MCR10
R723	Resistor	22 kΩ MCR10
R724	Resistor	6.8 kΩ MCR10
R725	Resistor	2.2 kΩ MCR10
R726	Resistor	470 Ω MCR10
R727	Resistor	330 kΩ MCR10
R728	Resistor	100 kΩ MCR10
R729	Resistor	5.6 kΩ MCR10
R730	Resistor	1.5 kΩ MCR10
R731	Resistor	47 kΩ MCR10
R732	Resistor	1.5 kΩ MCR10
R733	Resistor	680 kΩ MCR10
R734	Resistor	10 kΩ MCR10
R735	Resistor	100 kΩ MCR10
R736	Resistor	47 kΩ MCR10
R738	Trimmer	22 kΩ B RH04A3AJ4J01A

[MAIN UNIT]

REF. NO.	DESCRIPTION	PART NO.	
R739	Trimmer	22 kΩ B	RH04A3AJ4J01A
R740	Resistor	560 kΩ	MCR10
R741	Resistor	1.5 kΩ	MCR10
R742	Resistor	4.7 kΩ	MCR10
R743	Resistor	1.5 kΩ	MCR10
R744	Resistor	4.7 kΩ	MCR10
R745	Resistor	10 kΩ	MCR10
R746	Resistor	5.6 kΩ	MCR10
R747	Resistor	22 kΩ	MCR10
R748	Trimmer	10 kΩ B (IC-32E)	RH04A3A14J02A
R749	Resistor	47 kΩ	MCR10 (IC-32E)
R750	Resistor	150 kΩ	MCR10 (IC-32AT)
R751	Trimmer	10 kΩ B (IC-32AT)	RH04A3A14J02A
R752	Resistor	33 kΩ	MCR10 (IC-32AT)
R753	Resistor	22 kΩ	MCR10 (IC-32AT)
R754	Resistor	100 kΩ	MCR10 (IC-32AT)
R755	Resistor	4.7 kΩ	MCR10
R756	Resistor	4.7 kΩ	MCR10
R757	Resistor	68 kΩ	MCR10
R758	Resistor	2.2 MΩ	MCR10
R759	Resistor	100 kΩ	MCR10
R760	Resistor	100 kΩ	MCR10
R761	Resistor	2.2 MΩ	MCR10
R763	Resistor	68 kΩ	MCR10
R764	Resistor	220 kΩ	MCR10
R765	Resistor	82 kΩ	MCR10
R766	Resistor	82 kΩ	MCR10
R767	Resistor	270 kΩ	MCR10
R768	Resistor	220 kΩ	MCR10
R770	Resistor	120 Ω	MCR10 (IC-32A/AT/E: except U.S.A.)
	Resistor	270 Ω	MCR10 (IC-32A/AT: U.S.A.)
R771	Resistor	240 kΩ	MCR10
R772	Resistor	180 kΩ	MCR10
R773	Resistor	47 kΩ	MCR10
R774	Resistor	1 kΩ	MCR10
R775	Resistor	180 kΩ	MCR10
R776	Resistor	10 kΩ	MCR10
R777	Resistor	470 Ω	MCR10
R779	Trimmer	47 kΩ B	RH0421CS4J08A
R781	Trimmer	47 kΩ B	RH0421CS4J08A
R782	Resistor	33 kΩ	MCR10
R783	Resistor	220 kΩ	MCR10
R785	Resistor	2.2 kΩ	MCR10
R786	Resistor	22 kΩ	MCR10
R787	Resistor	8.2 kΩ	MCR10
C701	Ceramic	470 pF	GRM40
C702	Ceramic	470 pF	GRM40
C703	Ceramic	470 pF	GRM40
C704	Ceramic	470 pF	GRM40
C705	Ceramic	0.1 μF	GRM40 F
C706	Ceramic	0.01 μF	GRM40 B 25PT
C707	Electrolytic	100 μF	6.3 V RC2 D=5.0
C708	Ceramic	470 pF	GRM40
C709	Electrolytic	2.2 μF	35 V MS5 D=3.0
C710	Ceramic	0.001 μF	GRM40
C711	Electrolytic	1 μF	50 V MS5
C712	Electrolytic	47 μF	16 V RC2 D=5.0
C713	Ceramic	0.1 μF	GRM40 F
C714	Ceramic	47 pF	GRM40
C716	Ceramic	0.001 μF	GRM40
C717	Electrolytic	47 μF	16 V RC2 D=5.0
C718	Ceramic	470 pF	GRM40
C719	Ceramic	470 pF	GRM40
C720	Ceramic	470 pF	GRM40
C721	Ceramic	0.001 μF	GRM40
C722	Ceramic	0.1 μF	GRM40 F
C723	Ceramic	0.1 μF	GRM40 F
C724	Ceramic	0.001 μF	GRM40
C725	Ceramic	0.0022 μF	GRM40

[MAIN UNIT]

REF. NO.	DESCRIPTION	PART NO.	
C726	Ceramic	0.01 μF	GRM40 B 25PT
C727	Ceramic	0.01 μF	GRM40 B 25PT
C729	Ceramic	0.1 μF	GRM40 F
C730	Ceramic	0.001 μF	GRM40
C731	Ceramic	0.01 μF	GRM40 B 25PT
C732	Tantalum	0.047 μF	35 V SV
C733	Ceramic	33 pF	GRM40
C734	Ceramic	0.001 μF	GRM40
C735	Ceramic	470 pF	GRM40
C736	Electrolytic	0.22 μF	50 V MS5
C737	Ceramic	0.001 μF	GRM40
C739	Ceramic	0.001 μF	GRM40
C740	Ceramic	82 pF	GRM40
C741	Ceramic	0.1 μF	GRM40 F
C742	Ceramic	0.1 μF	GRM40 F
C743	Ceramic	0.001 μF	GRM40
C744	Ceramic	18 pF	GRM40
C745	Ceramic	56 pF	GRM40
C746	Ceramic	470 pF	GRM40
C747	Ceramic	470 pF	GRM40
C748	Ceramic	0.001 μF	GRM40
C749	Tantalum	2.2 μF	16 V DN
C750	Ceramic	0.1 μF	GRM40 F
C751	Ceramic	100 pF	GRM40
C752	Ceramic	0.1 μF	GRM40 F
C753	Ceramic	470 pF	GRM40
C754	Ceramic	100 pF	GRM40
C756	Ceramic	470 pF	GRM40
C757	Ceramic	0.1 μF	GRM40 F
C758	Ceramic	0.1 μF	GRM40 F
C759	Ceramic	470 pF	GRM40
C760	Ceramic	470 pF	GRM40
C761	Ceramic	470 pF	GRM40
C762	Ceramic	470 pF	GRM40
C763	Ceramic	0.1 μF	GRM40 F
C764	Electrolytic	2.2 μF	35 V MS5 D=3.0
C765	Ceramic	0.1 μF	GRM40 F
C766	Electrolytic	4.7 μF	16 V MS5
C767	Ceramic	0.1 μF	GRM40 F
C768	Ceramic	47 pF	GRM40 (IC-32E)
C769	Ceramic	10 pF	GRM40 (IC-32E)
C770	Ceramic	10 pF	GRM40 (IC-32E)
C771	Ceramic	0.001 μF	GRM40 (IC-32E)
C772	Electrolytic	0.1 μF	50 V MS5 (IC-32E)
C773	Electrolytic	4.7 μF	16 V MS5 (IC-32AT)
C774	Ceramic	0.1 μF	GRM40 F (IC-32AT)
C775	Ceramic	470 pF	GRM40
C776	Ceramic	470 pF	GRM40
C777	Ceramic	470 pF	GRM40
C778	Ceramic	470 pF	GRM40
C779	Ceramic	0.001 μF	GRM40
C780	Electrolytic	47 μF	6.3 V RC2 D=4.0
C781	Ceramic	0.001 μF	GRM40
C782	Electrolytic	47 μF	6.3 V RC2 D=4.0
C783	Ceramic	470 pF	GRM40
C784	Ceramic	470 pF	GRM40
C785	Electrolytic	47 μF	6.3 V RC2 D=4.0
C786	Ceramic	0.001 μF	GRM40
C787	Electrolytic	47 μF	6.3 V RC2 D=4.0
C788	Ceramic	470 pF	GRM40
C789	Ceramic	470 pF	GRM40
C790	Electrolytic	22 μF	16 V RC2 D=4.0
C791	Ceramic	0.001 μF	GRM40
C792	Electrolytic	47 μF	16 V RC2 D=5.0
C793	Ceramic	100 pF	GRM40
C794	Electrolytic	0.47 μF	50 V MS5
C795	Electrolytic	0.47 μF	50 V MS5
C796	Tantalum	1 μF	16 V SV
C797	Ceramic	0.001 μF	GRM40 SL 50PT
C798	Ceramic	0.0022 μF	GRM42-6 SL 50PT
C799	Electrolytic	4.7 μF	16 V MS5
C800	Ceramic	120 pF	GRM40
C801	Ceramic	0.1 μF	GRM40 F
C802	Tantalum	0.22 μF	TESVA1V224K1-8L (IC-32A/AT/E: except U.S.A.)

**[MAIN UNIT]**

REF. NO.	DESCRIPTION	PART NO.
C802	Tantalum	0.1 μF TESVA1V104K1-8L (IC-32/AT: U.S.A.)
C803	Ceramic	470 pF GRM40
C804	Ceramic	470 pF GRM40
C805	Electrolytic	10 μF 10 V MS5 D=3.0
C806	Ceramic	0.0047 μF GRM40
C807	Ceramic	0.001 μF GRM40 B 25PT
C808	Ceramic	0.001 μF GRM40
C809	Electrolytic	10 μF 10 V MS5 D=3.0
C810	Ceramic	0.1 μF GRM40 F
C811	Electrolytic	2.2 μF 35 V MS5 D=3.0
C812	Ceramic	47 pF GRM40
C813	Ceramic	0.001 μF GRM40
J701	Connector	PI28A10M
J702	Connector	PI28A10M
J703	Connector	PI28A10M
J704	Connector	PI28A05M
J705	Connector	PI28A04M
J706	Connector	TZB-P07H-A1
J707	Connector	TZB-P03H-A1
J708	Connector	PI28A10M
J709	Connector	CFP4128-0121
J710	Connector	TZB-P05H-A1
J711	Connector	PI28A03M
P704	Connector	PI28A10F
P706	Connector	PI28A05F
S701	Switch	SKHMPD004A
S702	Switch	SKHMPD004A
S703	Switch	SKHMPD004A
BT701	Lithium Battery	BR2325-1HC
W749	Jumper	MCR10-JPW
W750	Jumper	MCR10-JPW
EP701	P.C. Board	B-1614D (MAIN)
EP702	P.C. Board	B-1618B (PTT)
EP703	Ferrite Bead	DL2-OP2.6-3-1.2H

**[RF UNIT]**

REF. NO.	DESCRIPTION	PART NO.
IC202	IC	μPD4094BG
IC203	IC	TC9181F
IC204	IC	MB504LPF-G-BND
IC205	IC	PLL2001S
IC206	IC	SC-1081
IC207	IC	SC-1080
Q201	Transistor	2SC3770 3
Q202	FET	2SK302 Y
Q203	Transistor	2SC3772 3
Q204	FET	2SK209 BL
Q207	Transistor	2SA1362 GR
Q208	Transistor	2SA1362 GR
Q209	Transistor	2SC3772 3
Q210	Transistor	2SC3772 3

**[RF UNIT]**

REF. NO.	DESCRIPTION	PART NO.
Q211	Transistor	2SC3772 3
Q212	Transistor	2SC2712 BL
Q213	Transistor	2SC4081 S
Q215	FET	2SK536
Q216	FET	2SK536
Q217	Transistor	2SC4081 S
Q218	FET	2SK209 Y
Q219	Transistor	2SC4081 S
Q220	Transistor	2SA1576 S
Q221	Transistor	2SC3772 3
Q222	Transistor	2SC3772 3
Q223	Transistor	2SC3772 3
Q224	Transistor	2SC3772 3
Q225	FET	2SJ106 GR
Q226	Transistor	2SB798 DK
Q227	Transistor	2SC4081 S
Q228	Transistor	FMS1
Q229	Transistor	2SC3772 3
Q230	FET	2SK536
Q231	Transistor	FMA3
Q232	Transistor	FMA4
Q233	Transistor	DTC144TU
Q236	FET	2SK536
Q237	Transistor	UN511E
Q238	Transistor	UN511E
Q239	Transistor	UN521E
Q241	Transistor	RN1404
Q242	Transistor	DTC144TU
Q243	Transistor	DTC144EU
Q244	Transistor	DTA144EU
Q245	Transistor	DTA144TU
Q246	Transistor	RN1403
Q247	Transistor	DTC124EU
Q248	Transistor	2SA1298 Y
Q249	Transistor	RN1402
Q250	Transistor	DTA144EU
Q251	Transistor	DTC144EU
Q252	Transistor	DTC144EU
D201	Diode	MA862
D202	Varicap	MA334 B
D203	Varicap	MA334 B
D204	Varicap	MA334 B
D205	Diode	MA862
D212	Diode	MA862
D213	Diode	DWA010
D214	Zener	RD6.8E B2
D215	Diode	MA862
D216	Diode	MA862
D217	Diode	1SS154
D218	Diode	MA862
D219	Diode	1SS153
D220	Diode	1SV172
D221	Diode	DAN202U
D222	Diode	DAN202U
D223	Diode	1SS153
D224	Diode	DA204U
D225	Diode	DAN202U
FI202	Monolithic	30M15B
X203	Crystal	CR247 (10.0 MHz)
L201	Coil	LS-320
L202	Coil	LS-319
L203	Coil	LS-321
L204	Coil	LS-321
L205	Coil	LS-321
L206	Coil	LA-228
L207	Coil	LA-227
L208	Coil	LS-319

## [RF UNIT]

REF. NO.	DESCRIPTION	PART NO.	
L210	Coil	LS-338	
L211	Coil	LS-337	
L212	Coil	LA-224	
L213	Coil	LA-223	
L214	Coil	LA-223	
L215	Coil	LA-224	
L216	Coil	LA-247	
L218	Coil	LQN2A R15K	
L219	Coil	LA-224	
L220	Coil	LA-224	
L221	Coil	LA-225	
L222	Coil	LA-223	
L223	Coil	LA-232	
L224	Coil	LA-236	
L225	Coil	LQH3N 1R5M	
L226	Coil	LA-226	
L227	Coil	LA-225	
L228	Coil	LA-227	
L229	Coil	LAL02TA 100K	
L230	Coil	LAL02TA 100K	
L231	Coil	LAL02TA 1R5M	
L232	Coil	LQN2A 56NM	
R212	Resistor	1.5 k $\Omega$	MCR10
R213	Resistor	1 k $\Omega$	MCR10
R214	Resistor	39 k $\Omega$	MCR10
R215	Resistor	10 k $\Omega$	MCR10
R216	Resistor	22 k $\Omega$	MCR10
R217	Resistor	10 k $\Omega$	MCR10
R218	Resistor	470 $\Omega$	MCR10
R219	Resistor	4.7 k $\Omega$	MCR10
R220	Resistor	56 $\Omega$	MCR10
R221	Resistor	2.2 k $\Omega$	MCR10
R222	Resistor	100 k $\Omega$	MCR10
R223	Resistor	100 k $\Omega$	MCR10
R224	Resistor	22 $\Omega$	MCR10
R225	Resistor	330 $\Omega$	MCR10
R226	Resistor	15 k $\Omega$	MCR10
R227	Resistor	5.6 k $\Omega$	MCR10
R228	Resistor	100 k $\Omega$	MCR10
R229	Resistor	33 $\Omega$	MCR10
R240	Resistor	100 $\Omega$	R20
R241	Resistor	47 k $\Omega$	MCR10
R242	Resistor	6.8 k $\Omega$	R20
R243	Resistor	6.8 k $\Omega$	MCR10
R244	Resistor	10 k $\Omega$	MCR10
R245	Resistor	1 k $\Omega$	MCR10
R246	Resistor	150 k $\Omega$	MCR10
R247	Resistor	68 k $\Omega$	MCR10
R248	Resistor	22 $\Omega$	MCR10
R251	Resistor	22 $\Omega$	MCR10
R252	Resistor	470 $\Omega$	MCR10
R253	Resistor	39 k $\Omega$	MCR10
R254	Resistor	47 $\Omega$	MCR10
R255	Resistor	22 $\Omega$	MCR10
R256	Resistor	39 k $\Omega$	MCR10
R257	Resistor	47 k $\Omega$	MCR10
R260	Resistor	15 k $\Omega$	MCR10
R261	Resistor	15 k $\Omega$	MCR10
R263	Resistor	100 k $\Omega$	MCR10
R264	Resistor	100 k $\Omega$	MCR10
R265	Resistor	1 k $\Omega$	MCR10
R266	Resistor	2.2 k $\Omega$	MCR10
R267	Resistor	10 k $\Omega$	MCR10
R268	Resistor	330 k $\Omega$	MCR10
R269	Resistor	680 k $\Omega$	MCR10
R270	Resistor	680 k $\Omega$	MCR10
R271	Resistor	330 k $\Omega$	MCR10
R272	Resistor	100 k $\Omega$	MCR10
R273	Resistor	1 k $\Omega$	MCR10
R274	Resistor	2.2 k $\Omega$	MCR10
R275	Resistor	1.2 M $\Omega$	MCR10
R276	Resistor	1 k $\Omega$	MCR10
R277	Resistor	1.5 k $\Omega$	MCR10

## [RF UNIT]

REF. NO.	DESCRIPTION	PART NO.	
R278	Resistor	100 $\Omega$	MCR10
R279	Resistor	47 k $\Omega$	MCR10
R280	Resistor	10 k $\Omega$	MCR10
R281	Resistor	47 k $\Omega$	MCR10
R283	Resistor	4.7 k $\Omega$	MCR10
R284	Resistor	1.8 k $\Omega$	ELR20
R285	Resistor	100 k $\Omega$	MCR10
R286	Resistor	47 k $\Omega$	MCR10
R287	Resistor	10 k $\Omega$	MCR10
R288	Resistor	220 $\Omega$	MCR10
R289	Resistor	22 k $\Omega$	MCR10
R290	Resistor	5.6 k $\Omega$	MCR10
R291	Resistor	150 k $\Omega$	MCR10
R292	Resistor	8.2 k $\Omega$	R20
R293	Resistor	470 $\Omega$	MCR10
R294	Resistor	15 k $\Omega$	MCR10
R295	Resistor	47 k $\Omega$	MCR10
R296	Resistor	100 k $\Omega$	MCR10
R297	Resistor	47 k $\Omega$	MCR10
R298	Resistor	47 k $\Omega$	MCR10
R299	Resistor	100 k $\Omega$	MCR10
R300	Resistor	100 $\Omega$	MCR10
R301	Resistor	22 k $\Omega$	MCR10
R302	Resistor	5.6 k $\Omega$	MCR10
R303	Resistor	8.2 k $\Omega$	R20
R304	Resistor	10 k $\Omega$	MCR10
R305	Resistor	56 $\Omega$	MCR10
R306	Resistor	18 k $\Omega$	MCR10
R307	Resistor	6.8 k $\Omega$	MCR10
R309	Resistor	330 $\Omega$	MCR10
R310	Resistor	220 $\Omega$	MCR10
R311	Resistor	100 $\Omega$	MCR10
R312	Resistor	1 M $\Omega$	MCR10
R313	Resistor	4.7 k $\Omega$	MCR10
R314	Trimmer	100 k $\Omega$ B EVM-LGG A00 B15	
R315	Resistor	5.6 k $\Omega$	MCR10
R316	Resistor	560 k $\Omega$	MCR10
R317	Resistor	220 k $\Omega$	MCR10
R318	Resistor	22 k $\Omega$	MCR10
R319	Resistor	82 k $\Omega$	MCR10
R320	Trimmer	30 k $\Omega$ B EVM-LGG A00 B34	
R321	Resistor	33 k $\Omega$	MCR10
R322	Trimmer	5 k $\Omega$ B EVM-LGG A00 B53	
R323	Resistor	1.8 k $\Omega$	MCR10
R324	Resistor	22 k $\Omega$	MCR10
R325	Resistor	10 k $\Omega$	MCR10
R326	Resistor	4.7 k $\Omega$	MCR10
R327	Resistor	18 k $\Omega$	MCR10
R328	Resistor	6.8 k $\Omega$	MCR10
R329	Resistor	10 $\Omega$	MCR10
R330	Resistor	220 $\Omega$	MCR10
R331	Resistor	150 $\Omega$	MCR10
R332	Resistor	100 $\Omega$	MCR10
R333	Resistor	1.2 M $\Omega$	MCR10
R334	Resistor	47 k $\Omega$	MCR10
R336	Resistor	330 $\Omega$	MCR10
R337	Resistor	220 $\Omega$	MCR10
R338	Resistor	1 M $\Omega$	R20
R339	Resistor	1.8 k $\Omega$	MCR10
R340	Resistor	10 k $\Omega$	MCR10
R341	Resistor	100 k $\Omega$	MCR10
R342	Resistor	100 k $\Omega$	MCR10
R343	Resistor	47 k $\Omega$	MCR10
R344	Thermistor	ERT-D2FHL503S	
C204	Ceramic	0.001 $\mu$ F	GRM40
C210	Ceramic	0.001 $\mu$ F	GRM40
C219	Ceramic	0.1 $\mu$ F	GRM40 F
C220	Ceramic	0.01 $\mu$ F	GRM40 F
C221	Ceramic	47 pF	GRM40
C222	Ceramic	12 pF	GRM40
C223	Ceramic	0.001 $\mu$ F	GRM40
C224	Ceramic	10 pF	GRM40
C225	Ceramic	22 pF	GRM40

## [RF UNIT]

REF. NO.	DESCRIPTION	PART NO.
C226	Ceramic	0.001 $\mu$ F GRM40
C227	Ceramic	0.001 $\mu$ F GRM40
C228	Ceramic	0.001 $\mu$ F GRM40
C229	Ceramic	0.01 $\mu$ F GRM40 F
C230	Ceramic	47 pF GRM40
C231	Ceramic	56 pF GRM40
C233	Ceramic	1 pF GRM40
C234	Ceramic	7 pF GRM40
C235	Ceramic	0.001 $\mu$ F GRM40
C236	Ceramic	56 pF GRM40
C238	Ceramic	0.001 $\mu$ F GRM40
C239	Ceramic	0.001 $\mu$ F GRM40
C240	Ceramic	22 pF GRM40
C241	Ceramic	12 pF GRM40
C242	Ceramic	33 pF GRM40
C243	Ceramic	18 pF GRM40
C244	Ceramic	22 pF GRM40
C245	Ceramic	27 pF GRM40
C246	Ceramic	22 pF GRM40
C247	Ceramic	47 pF GRM40
C248	Ceramic	470 pF GRM40
C249	Ceramic	470 pF GRM40
C250	Ceramic	470 pF GRM40
C251	Ceramic	0.001 $\mu$ F GRM40
C252	Ceramic	0.001 $\mu$ F GRM40
C253	Ceramic	470 pF GRM40
C254	Ceramic	470 pF GRM40
C255	Ceramic	0.001 $\mu$ F GRM40
C264	Ceramic	470 pF GRM40
C265	Ceramic	470 pF GRM40
C266	Ceramic	10 pF GRM40
C267	Ceramic	470 pF GRM40
C268	Ceramic	22 pF GRM40
C269	Ceramic	470 pF GRM40
C271	Ceramic	0.5 pF GRM40
C272	Ceramic	470 pF GRM40
C273	Ceramic	470 pF GRM40
C274	Ceramic	470 pF GRM40
C275	Ceramic	470 pF GRM40
C276	Ceramic	10 pF GRM40
C277	Ceramic	470 pF GRM40
C278	Ceramic	470 pF GRM40
C280	Ceramic	0.001 $\mu$ F GRM40
C281	Ceramic	5 pF GRM40
C282	Ceramic	5 pF GRM40
C283	Ceramic	7 pF GRM40
C284	Ceramic	22 pF GRM40
C285	Ceramic	8 pF GRM40
C286	Ceramic	0.001 $\mu$ F GRM40
C287	Ceramic	0.001 $\mu$ F GRM40
C288	Trimmer	15 pF ECR-GA015E30
C289	Ceramic	18 pF GRM40 CH
C290	Ceramic	56 pF GRM40 CH
C291	Ceramic	120 pF GRM40 CH
C292	Ceramic	0.001 $\mu$ F GRM40
C293	Ceramic	470 pF GRM40
C294	Ceramic	0.1 $\mu$ F GRM40 F
C295	Ceramic	0.1 $\mu$ F GRM40 F
C296	Ceramic	0.001 $\mu$ F GRM40
C298	Ceramic	0.001 $\mu$ F GRM40
C299	Ceramic	0.1 $\mu$ F GRM40 F
C300	Ceramic	470 pF GRM40
C301	Ceramic	47 pF GRM40
C302	Ceramic	47 pF GRM40
C303	Ceramic	47 pF GRM40
C304	Tantalum	6.8 $\mu$ F 6.3 V SV
C306	Ceramic	0.001 $\mu$ F GRM40
C307	Ceramic	47 pF GRM40
C308	Ceramic	0.001 $\mu$ F GRM40
C309	Tantalum	0.1 $\mu$ F 35 V DN
C310	Tantalum	3.3 $\mu$ F 16 V DN
C311	Ceramic	470 pF GRM40
C312	Ceramic	0.001 $\mu$ F GRM40
C313	Tantalum	3.3 $\mu$ F 6.3 V SV
C314	Tantalum	3.3 $\mu$ F 16 V DN

## [RF UNIT]

REF. NO.	DESCRIPTION	PART NO.
C315	Ceramic	470 pF GRM40
C316	Ceramic	0.001 $\mu$ F GRM40
C318	Ceramic	47 pF GRM40
C319	Ceramic	47 pF GRM40
C320	Ceramic	0.001 $\mu$ F GRM40
C321	Ceramic	470 pF GRM40
C322	Ceramic	470 pF GRM40
C323	Ceramic	470 pF GRM40
C324	Ceramic	470 pF GRM40
C325	Electrolytic	0.22 $\mu$ F 50 V MS5
C326	Ceramic	0.001 $\mu$ F GRM40
C327	Ceramic	33 pF GRM40
C328	Ceramic	0.001 $\mu$ F GRM40
C329	Ceramic	470 pF GRM40
C330	Ceramic	470 pF GRM40
C331	Tantalum	0.1 $\mu$ F 35 V DN
C332	Ceramic	0.001 $\mu$ F GRM40
C333	Ceramic	0.001 $\mu$ F GRM40
C334	Ceramic	4 pF GRM40
C335	Ceramic	470 pF GRM40
C336	Ceramic	470 pF GRM40
C337	Ceramic	470 pF GRM40
C338	Ceramic	470 pF GRM40
C339	Ceramic	4 pF GRM40
C340	Ceramic	470 pF GRM40
C341	Ceramic	470 pF GRM40
C342	Electrolytic	10 $\mu$ F 10 V MS5 D=3.0
C343	Electrolytic	22 $\mu$ F 16 V RC2 D=4.0
C344	Ceramic	470 pF GRM40
C345	Ceramic	470 pF GRM40
C346	Ceramic	5 pF GRM40
C347	Ceramic	56 pF GRM40
C348	Ceramic	4 pF GRM40
C349	Ceramic	22 pF GRM40
C350	Ceramic	5 pF GRM40
C351	Ceramic	470 pF GRM40
C352	Ceramic	1 pF GRM40
C353	Ceramic	5 pF GRM40
C354	Ceramic	5 pF GRM40
C355	Ceramic	2 pF GRM40
C356	Ceramic	10 pF GRM40
C357	Ceramic	0.75 pF GRM40 SL 50PT
C358	Ceramic	7 pF GRM40
C360	Ceramic	470 pF GRM40
C361	Ceramic	470 pF GRM40
C362	Ceramic	470 pF GRM40
C363	Electrolytic	10 $\mu$ F 10 V MS5 D=3.0
C364	Ceramic	10 pF GRM40
C365	Ceramic	0.001 $\mu$ F GRM40
C366	Ceramic	0.001 $\mu$ F GRM40
C367	Ceramic	0.001 $\mu$ F GRM40
C368	Ceramic	0.001 $\mu$ F GRM40
C369	Ceramic	0.001 $\mu$ F GRM40
C370	Ceramic	15 pF GRM40
C371	Ceramic	0.001 $\mu$ F GRM40
C372	Electrolytic	10 $\mu$ F 10 V MS5 D=3.0
C374	Ceramic	0.001 $\mu$ F GRM40
C375	Ceramic	470 pF GRM40
C376	Ceramic	8 pF GRM40
C377	Ceramic	0.001 $\mu$ F GRM40
C378	Ceramic	6 pF GRM40
C379	Ceramic	15 pF GRM40
C380	Ceramic	15 pF GRM40
C381	Ceramic	0.1 $\mu$ F GRM40 F
C382	Ceramic	47 pF GRM40
C383	Ceramic	7 pF GRM40
C385	Ceramic	470 pF GRM40
C387	Ceramic	470 pF GRM40
C388	Ceramic	0.001 $\mu$ F GRM40
C389	Ceramic	470 pF GRM40
C390	Ceramic	0.001 $\mu$ F GRM40
C391	Ceramic	470 pF GRM40
C392	Ceramic	470 pF GRM40
C393	Tantalum	10 $\mu$ F 16 V DN



[RF UNIT]

REF. NO.	DESCRIPTION	PART NO.
C394	Ceramic	470 pF GRM40
C395	Ceramic	470 pF GRM40
C396	Ceramic	470 pF GRM40
C397	Ceramic	470 pF GRM40
C398	Ceramic	100 pF GRM40
C399	Ceramic	0.001 μF GRM40
C400	Ceramic	470 pF GRM40
J201	Connector	HEC0779-01-030
J202	Connector	HSJ0836-01-010
J203	Connector	HSJ1102-01-540
J205	Connector	TZB-P10H-A1
J206	Connector	TZB-P10H-A1
J207	Connector	TZB-P10H-A1
J208	Connector	PI28A03M
J209	Connector	TZB-P02H-A1
J210	Connector	BNC-R111-E
P201	Connector	PI28A10F
P202	Connector	PI28A10F
P203	Connector	PI28A10F
P204	Connector	PI28A03F
P205	Connector	PI28A03F
S201	Switch	SPPJ62
W201	Jumper	MCR10-JPW
W202	Jumper	MCR10-JPW
W248	Jumper	MCR10-JPW
W249	Jumper	JPW-02A
W250	Jumper	JPW-02A
EP201	P.C. Board	B-1615E (RF)
EP202	P.C. Board	B-1619B (PLL)
EP203	P.C. Board	B-1668B (MODULE)
EP205	P.C. Board	B-1714 (BATTERY TERMINAL)
EP208	Ferrite Bead	DL2-OP2.6-3-1.2H
EP209	Ferrite Bead	DL2-OP2.6-3-1.2H
EP210	Ferrite Bead	DL2-OP2.6-3-1.2H
EP211	Ferrite Bead	DL2-OP2.6-3-1.2H

[U-VCO UNIT]

REF. NO.	DESCRIPTION	PART NO.
Q501	Transistor	2SC3772 3
Q502	Transistor	2SC3356 R25
Q503	Transistor	2SC3772 3
Q504	Transistor	RN1403
D501	Varicap	MA334 B
D502	Varicap	MA862
L501	Coil	LQN2A 47NM
L502	Coil	LQH3N R39M
L504	Coil	LA-225 (IC-32A/AT/E: except U.S.A.)
L504	Coil	LA-224 (IC-32/AT: U.S.A.)
L505	Coil	LQN2A 47NM

[U-VCO UNIT]

REF. NO.	DESCRIPTION	PART NO.
R501	Resistor	330 Ω MCR10
R502	Resistor	33 kΩ MCR10
R504	Resistor	220 Ω MCR10
R505	Resistor	47 Ω MCR10
R506	Resistor	4.7 kΩ MCR10
R507	Resistor	6.8 kΩ MCR10
R508	Resistor	47 kΩ MCR10
R509	Resistor	330 Ω MCR10
R510	Resistor	33 kΩ MCR10
R512	Resistor	4.7 kΩ MCR10
R513	Resistor	4.7 kΩ MCR10
R514	Resistor	100 Ω MCR10
R515	Resistor	2.2 kΩ MCR10
C502	Ceramic	470 pF GRM40
C503	Ceramic	0.5 pF GRM40
C504	Ceramic	6 pF GRM40 CH
C505	Ceramic	6 pF GRM40 CH
C506	Ceramic	470 pF GRM40
C507	Tantalum	1 μF 16 V SV
C508	Ceramic	0.1 μF GRM40 F
C509	Ceramic	12 pF GRM40
C510	Trimmer	10 pF ECR-LB010A12
C511	Ceramic	12 pF GRM40
C512	Ceramic	0.3 pF GRM40 SL 50PT
C513	Ceramic	8 pF GRM40
C514	Ceramic	6 pF GRM40
C515	Ceramic	470 pF GRM40
C516	Ceramic	470 pF GRM40
C517	Ceramic	4 pF GRM40
C518	Ceramic	4 pF GRM40
C519	Ceramic	0.5 pF GRM40
C521	Tantalum	1 μF 16 V SV
C522	Ceramic	10 pF GRM40
C523	Ceramic	10 pF GRM40
EP501	P.C. Board	B-1718A

[U-VCO UNIT]

REF. NO.	DESCRIPTION	PART NO.
Q551	Transistor	2SC3772 3
Q552	FET	2SK302 Y
Q553	Transistor	2SC3772 3
D551	Diode	MA862
D552	Varicap	MA334 B
D553	Varicap	MA333
D554	Varicap	MA334 B
D555	Diode	1SS154
L551	Coil	LQN2A R15K
L552	Coil	LQH3N 1R5M
L554	Coil	LB-230
L556	Coil	LQN2A R15K
L557	Coil	LQH3N 1R5M
R551	Resistor	1 kΩ MCR10
R552	Resistor	39 kΩ MCR10
R553	Resistor	100 kΩ MCR10
R554	Resistor	10 kΩ MCR10
R555	Resistor	1 kΩ MCR10

**[V-VCO UNIT]**

REF. NO.	DESCRIPTION	PART NO.	
R556	Resistor	100 kΩ	MCR10
R557	Resistor	39 kΩ	MCR10
R558	Resistor	4.7 kΩ	MCR10
R559	Resistor	1 kΩ	MCR10
R560	Resistor	10 kΩ	MCR10
C551	Ceramic	0.001 μF	GRM40
C552	Ceramic	0.001 μF	GRM40
C554	Ceramic	0.001 μF	GRM40
C555	Ceramic	0.5 pF	GRM40
C556	Ceramic	15 pF	GRM40
C557	Ceramic	3 pF	GRM40
C558	Ceramic	100 pF	GRM40
C559	Ceramic	0.001 μF	GRM40
C560	Ceramic	0.001 μF	GRM40
C561	Ceramic	0.75 pF	GRM40 SL 50PT
C562	Ceramic	0.001 μF	GRM40
C563	Ceramic	7 pF	GRM40
C564	Ceramic	7 pF	GRM40
C565	Ceramic	0.001 μF	GRM40
C566	Ceramic	470 pF	GRM40
EP551	P.C. Board	B-1623C (V-VCO)	
EP552	P.C. Board	B-1604 (COIL)	

**[TONE UNIT] (IC-32AT)**

REF. NO.	DESCRIPTION	PART NO.	
IC601	IC	S7116A	
IC602	IC	μPD4094BG	
X601	Crystal	RF4A3 FAA (3.578 MHz)	
R601	Trimmer	47 kΩ	RH04A3AS4J01A
R602	Resistor	47 kΩ	MCR10
C602	Tantalum	0.47 μF	25 V SV
C603	Ceramic	470 pF	GRM40
C604	Ceramic	47 pF	GRM40
C605	Ceramic	39 pF	GRM40
J601	Connector	PI28A10M	
EP601	P.C. Board	B-1566B	

## SECTION 9 OPTIONAL UNITS

### 9-1 UT-40 TONE SQUELCH UNIT CIRCUIT DESCRIPTION

#### 9-1-1 GENERAL DESCRIPTION

IC1 is a tone encoder/decoder IC chip that outputs and detects 37 different kinds of tones. A tone is set by serial data from IC902 on the LOGIC UNIT in the IC-32A/AT/E.

IC2 functions as a serial/parallel converter, applying 6-bit parallel data to IC1. The following table shows the relation between frequency and input data in IC1.

OUTPUT FREQUENCY [Hz]	IC1 INPUT PIN NUMBER						OUTPUT FREQUENCY [Hz]	IC1 INPUT PIN NUMBER						OUTPUT FREQUENCY [Hz]	IC1 INPUT PIN NUMBER					
	3	4	5	6	7	8		3	4	5	6	7	8		3	4	5	6	7	8
67.0	H	L	H	H	H	L	110.9	H	L	H	L	H	H	173.8	L	L	L	H	L	H
71.9	L	L	H	H	H	L	114.8	L	L	H	L	H	H	179.9	H	H	H	L	L	H
74.4	H	H	L	H	H	L	118.8	H	H	L	L	H	H	186.2	L	H	H	L	L	H
77.0	L	H	L	H	H	L	123.0	L	H	L	L	H	H	192.8	H	L	H	L	L	H
79.7	H	L	L	H	H	L	127.3	H	L	L	L	H	H	203.5	L	L	H	L	L	H
82.5	L	L	L	H	H	L	131.8	L	L	L	L	H	H	210.7	H	H	L	L	L	H
85.4	H	H	H	L	H	L	136.5	H	H	H	H	L	H	218.1	L	H	L	L	L	H
88.5	L	H	H	L	H	L	141.3	L	H	H	H	L	H	225.7	H	L	L	L	L	H
91.5	H	L	H	L	H	L	146.2	H	L	H	H	L	H	233.6	L	L	L	L	L	H
94.8	H	L	L	H	H	H	151.4	L	L	H	H	L	H	241.8	H	H	H	H	H	L
100.0	L	L	L	H	H	H	156.7	H	H	L	H	L	H	250.3	L	H	H	H	H	L
103.5	H	H	H	L	H	H	162.2	L	H	L	H	L	H	—	—	—	—	—	—	—
107.2	L	H	H	L	H	H	167.9	H	L	L	H	L	H	—	—	—	—	—	—	—

H: HIGH L: LOW

#### 9-1-2 ENCODER CIRCUIT

Pin 26 in IC1 outputs a programmed tone frequency when pin 12 in IC1 becomes "LOW."

Q4 functions as a buffer amplifier. The collector of Q4 outputs the tone signal and the signal is applied to the VCO circuit to be modulated.

Tone deviation can be adjusted by R10.

#### 9-1-3 DECODER CIRCUIT

Detected signals from pin 11 in IC707 on the MAIN UNIT of the IC-32A/AT/E are applied to pin 29 in IC1 on the UT-40 through the DETO line. When the signals have a tone modulated and the tone is matched with the programmed tone frequency by IC2, pin 23 in IC1 changes from "LOW" to "HIGH."

#### • When the tone squelch function is turned OFF:

Both pins 11 and 12 in IC2 are "HIGH" and +5 V are not applied to IC1. Q2 and Q3 turn OFF and the TSQL line is "HIGH."

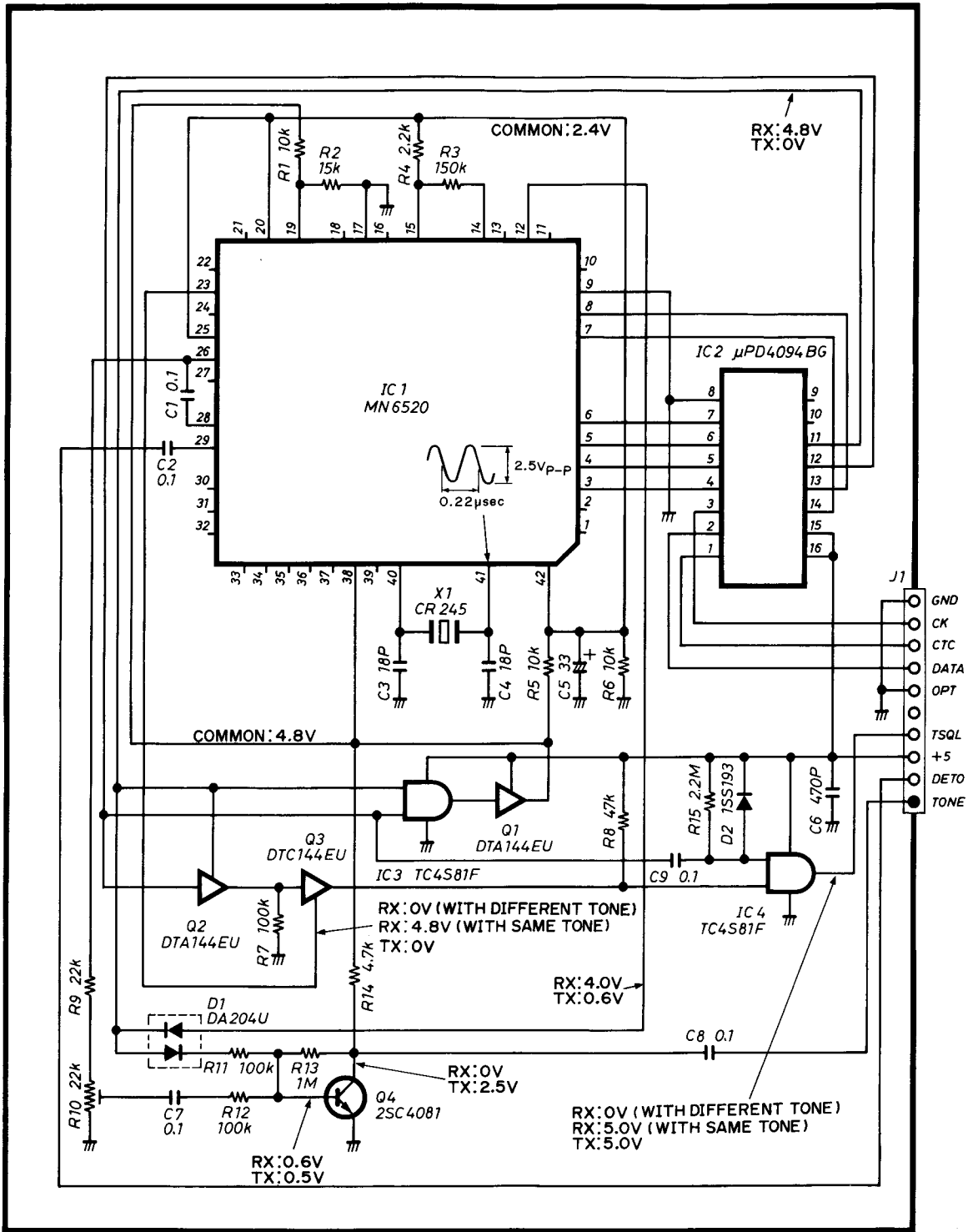
#### • When the tone squelch function is turned ON:

Pin 11 of IC2 is "HIGH" and pin 12 of IC2 is "LOW." Both Q2 and Q3 turn ON.

When the received tone frequency is not matched with the programmed tone frequency, pin 23 of IC1 is "LOW" and the TSQL line is "LOW."

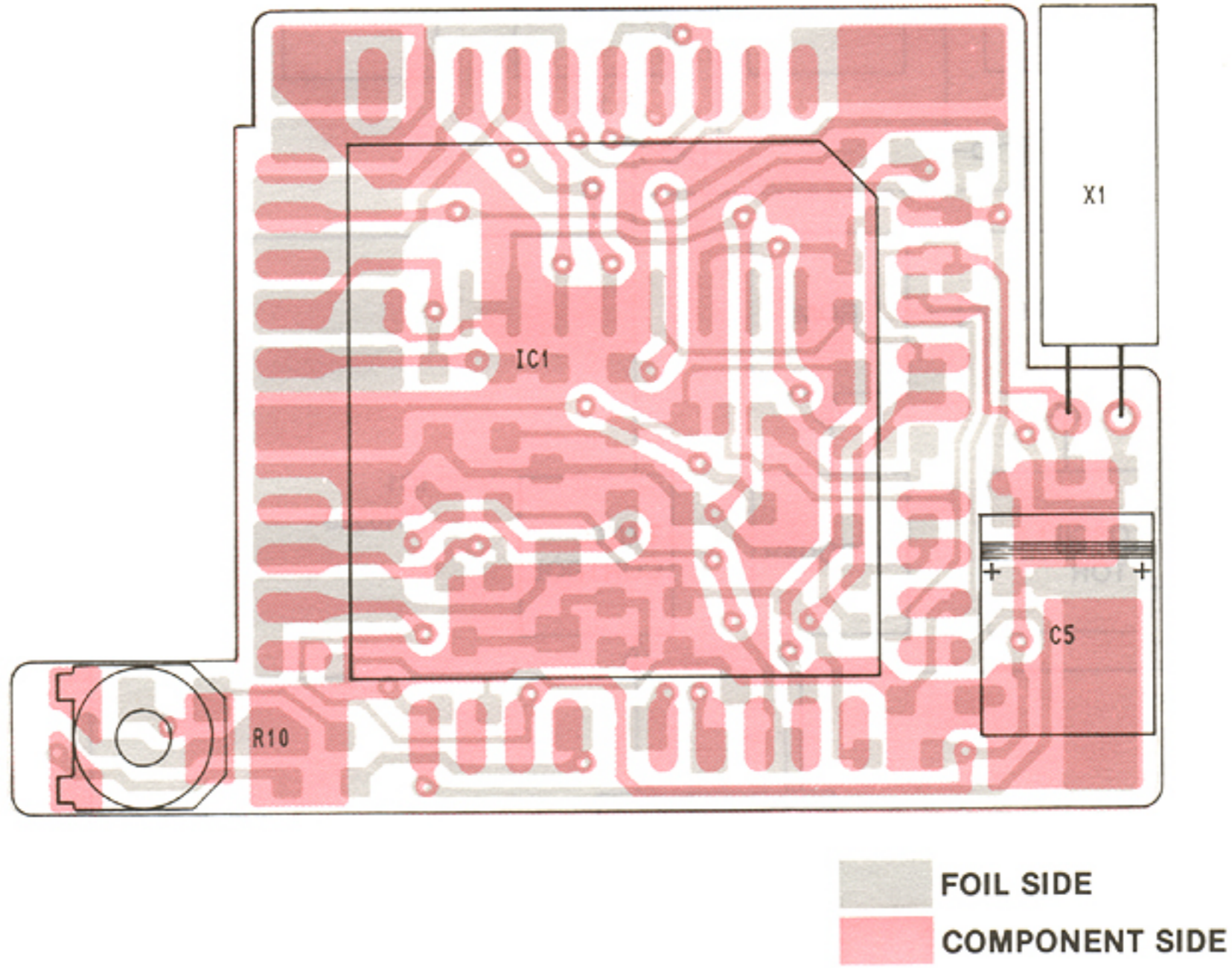
When the received tone frequency is matched with the programmed tone, pin 23 becomes "HIGH" and the TSQL line becomes "HIGH."

# 9-2 UT-40 VOLTAGE/CIRCUIT DIAGRAM

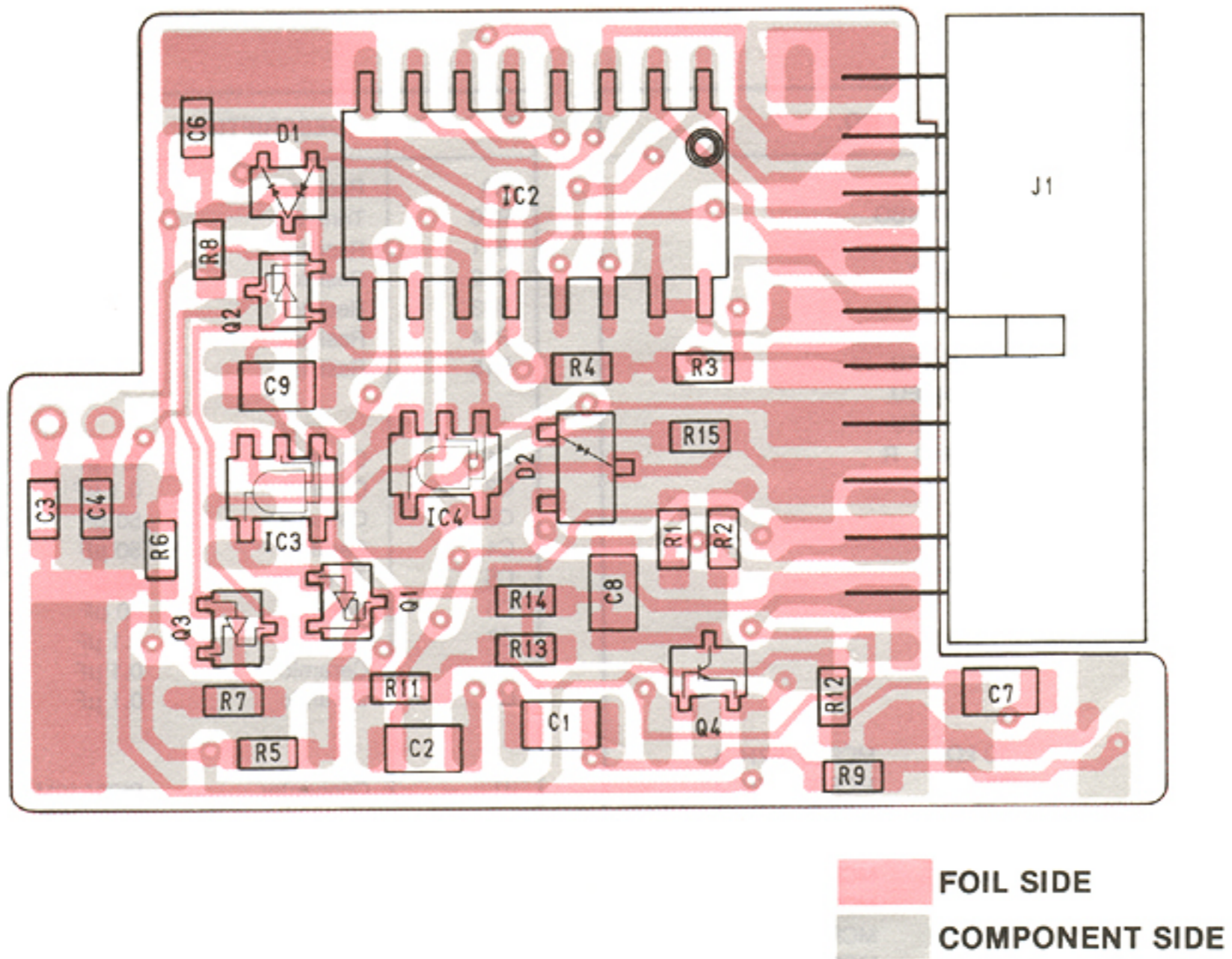


# 9-3 UT-40 BOARD LAYOUTS

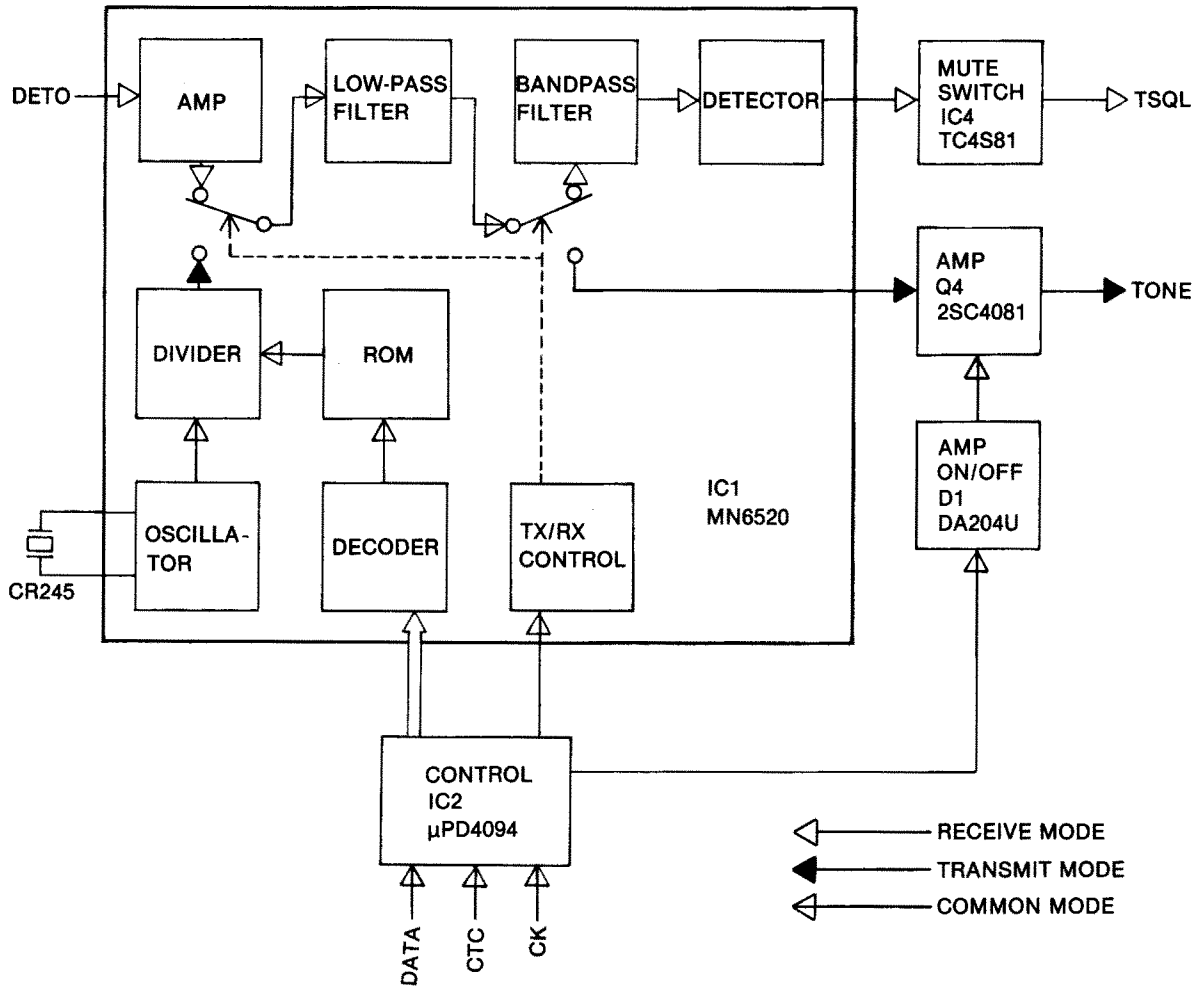
## COMPONENT SIDE



## FOIL SIDE



## 9-4 UT-40 BLOCK DIAGRAM



## 9-5 UT-40 PARTS LIST

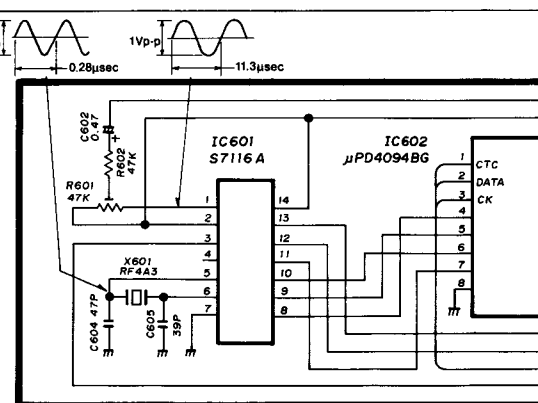
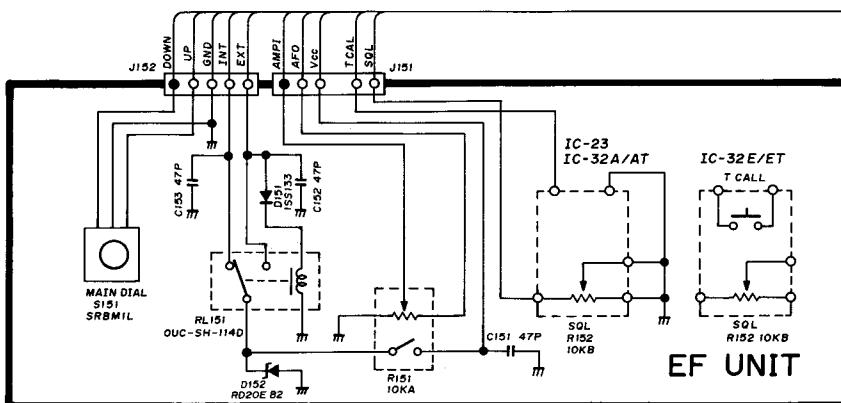
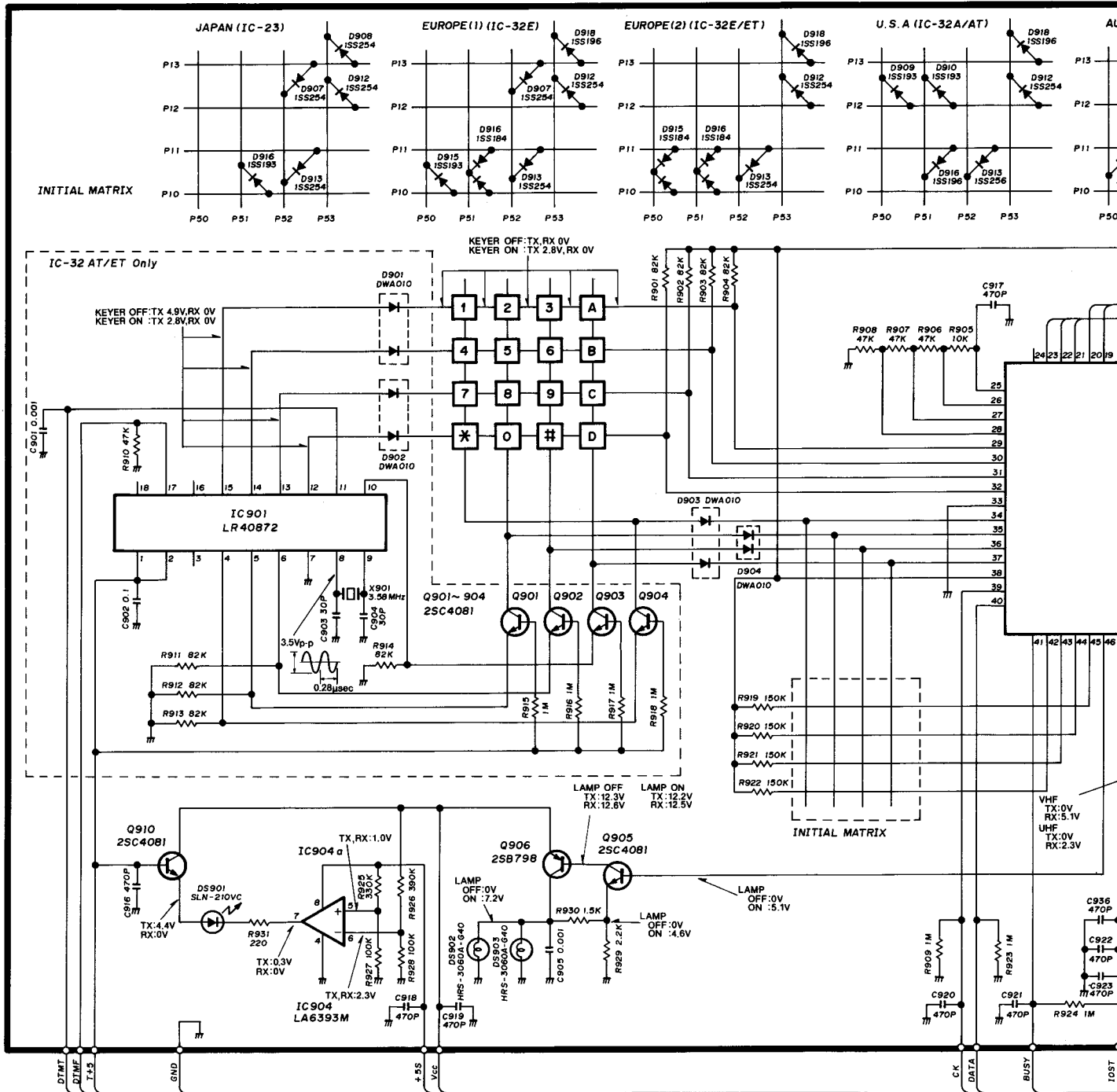
[T. SQL UNIT]

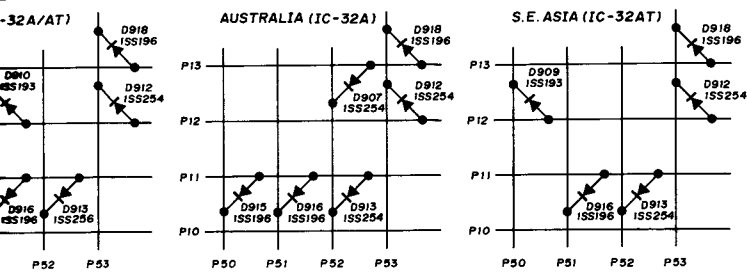
REF. NO.	DESCRIPTION	PART NO.	
IC1	IC	MN6520	
IC2	IC	µPD4094BG	
IC3	IC	TC4S81F	
IC4	IC	TC4S81F	
Q1	Transistor	DTA144EU	
Q2	Transistor	DTA144EU	
Q3	Transistor	DTC144EU	
Q4	Transistor	2SC4081 R	
D1	Diode	DA204U	
D2	Diode	1SS193	
X1	Crystal	CR245	
R1	Resistor	10 kΩ	MCR03 EZH J
R2	Resistor	15 kΩ	MCR03 EZH J
R3	Resistor	150 kΩ	MCR03 EZH J
R4	Resistor	2.2 kΩ	MCR03 EZH J
R5	Resistor	10 kΩ	MCR03 EZH J
R6	Resistor	10 kΩ	MCR03 EZH J
R7	Resistor	100 kΩ	MCR03 EZH J
R8	Resistor	47 kΩ	MCR03 EZH J

REF. NO.	DESCRIPTION	PART NO.	
R9	Resistor	22 kΩ	MCR03 EZH J
R10	Trimmer	22 kΩ	RH04A3AJ4J
R11	Resistor	100 kΩ	MCR03 EZH J
R12	Resistor	100 kΩ	MCR03 EZH J
R13	Resistor	1 MΩ	MCR03 EZH J
R14	Resistor	4.7 kΩ	MCR03 EZH J
R15	Resistor	2.2 MΩ	MCR03 EZH J
C1	Ceramic	0.1 µF	GRM40 F
C2	Ceramic	0.1 µF	GRM40 F
C3	Ceramic	50 µF	GRM39 SL 180J
C4	Ceramic	50 µF	GRM39 SL 180J
C5	Tantalum	33 µF	TESVC0G336M12L
C6	Ceramic	50 µF	GRM39 B 471K
C7	Ceramic	0.1 µF	GRM40 F
C8	Ceramic	0.1 µF	GRM40 F
C9	Ceramic	0.1 µF	GRM40 F
J1	Connector	PI28A10M	
EP1	P.C. Board	B-1577C	

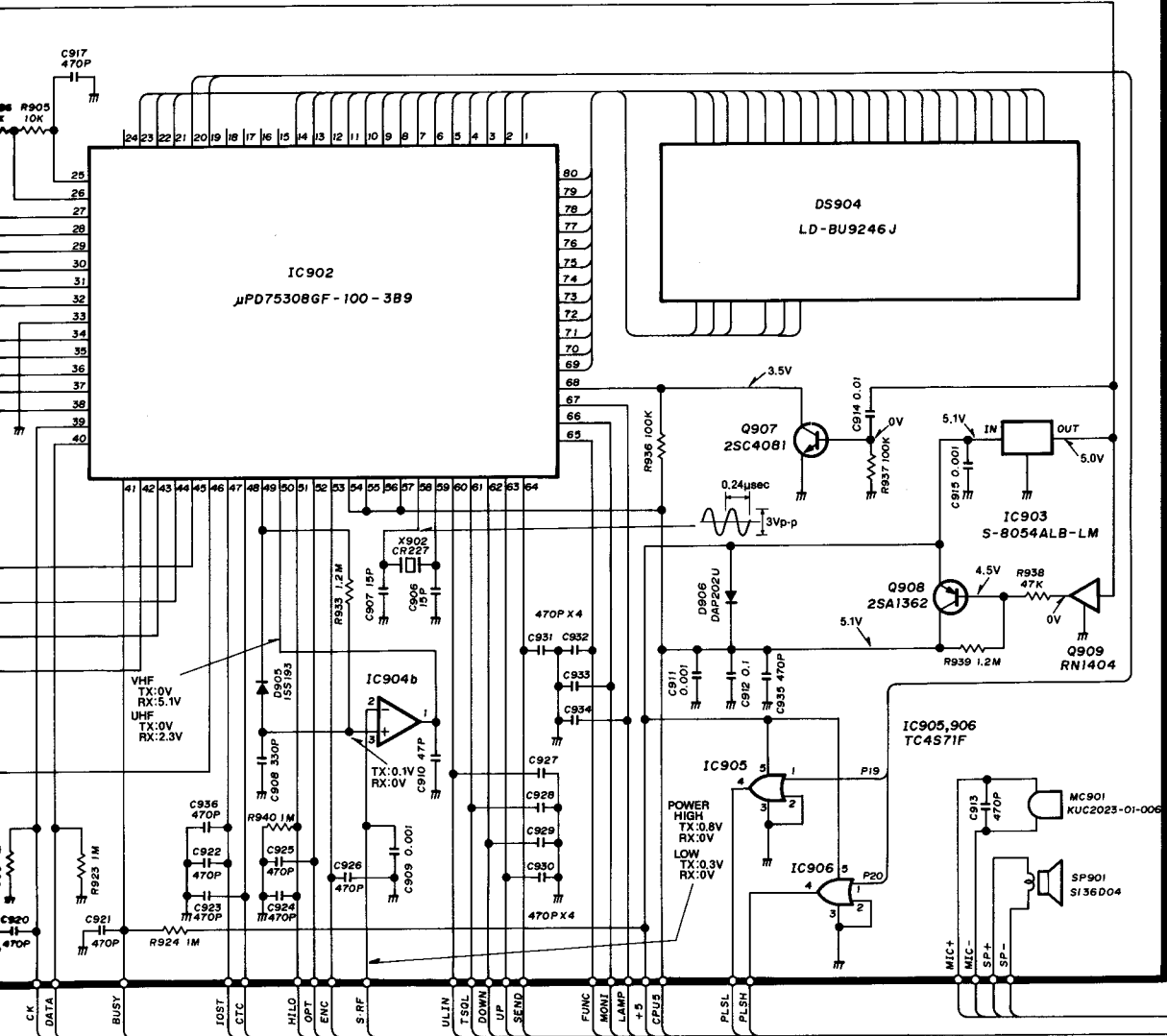
# SECTION 10 VOLTAGE DIAGRAMS

## LOGIC AND MAIN UNITS

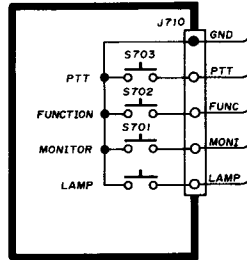
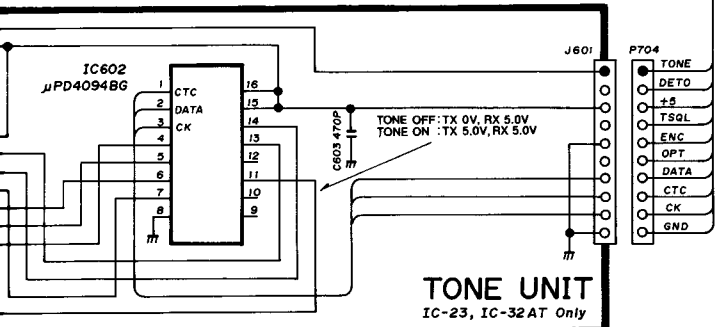
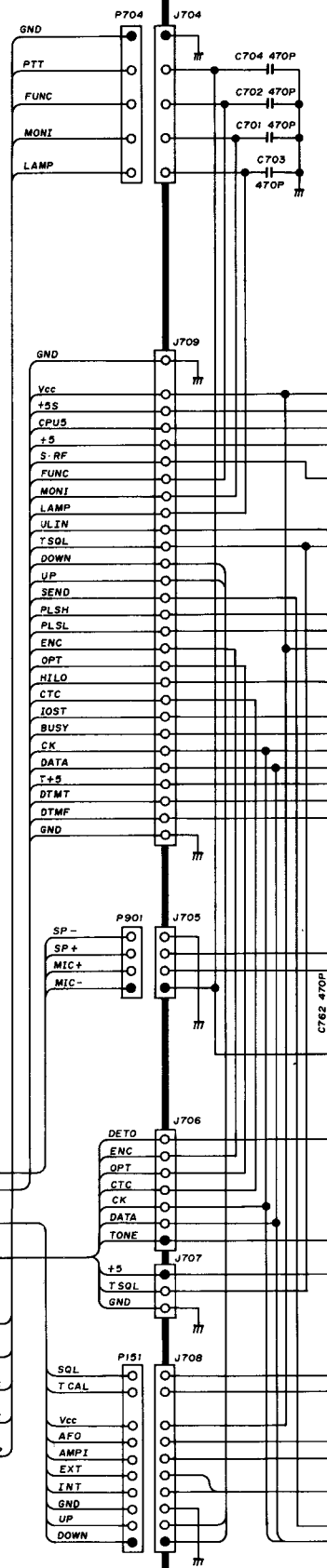




### LOGIC UNIT

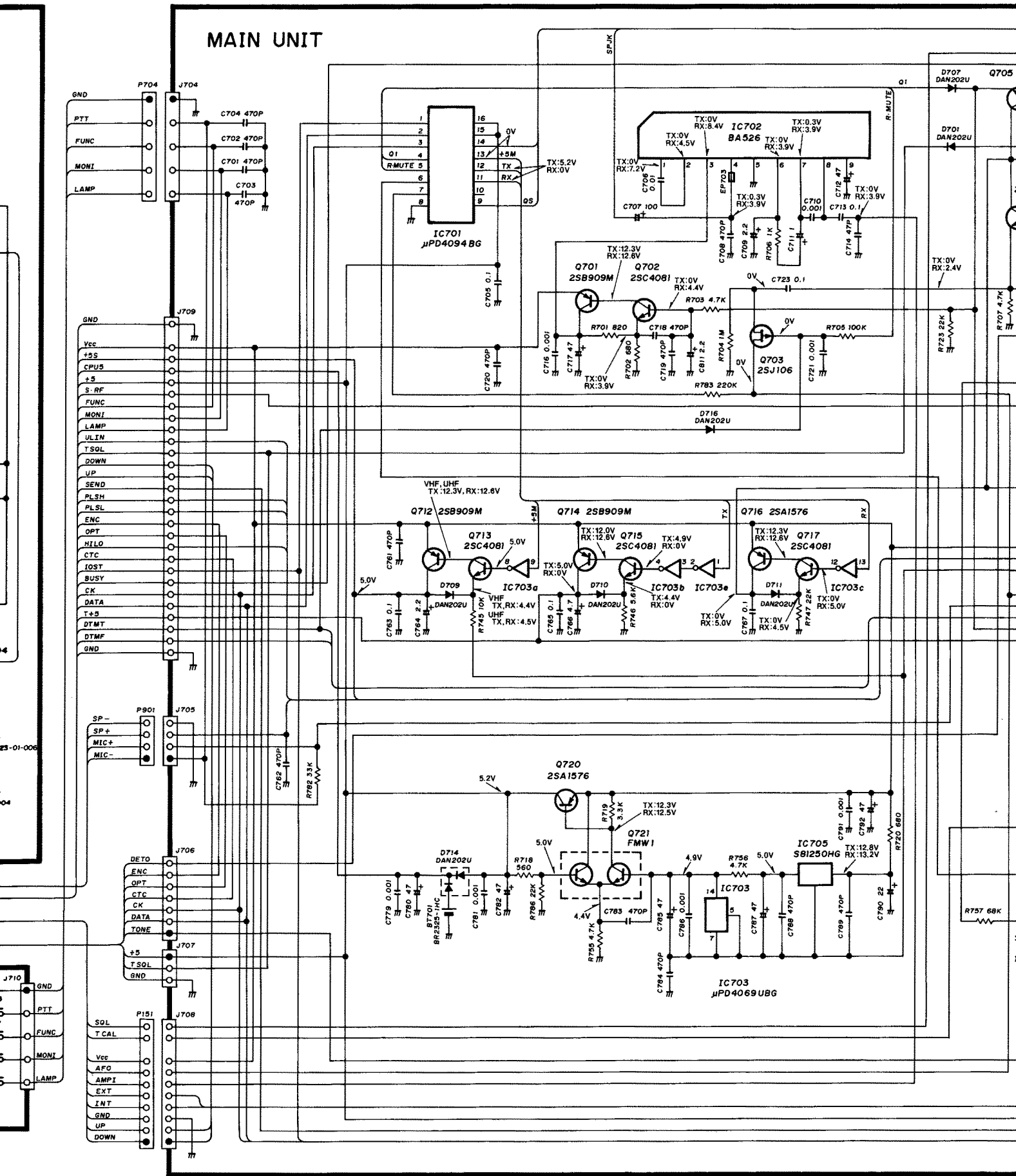


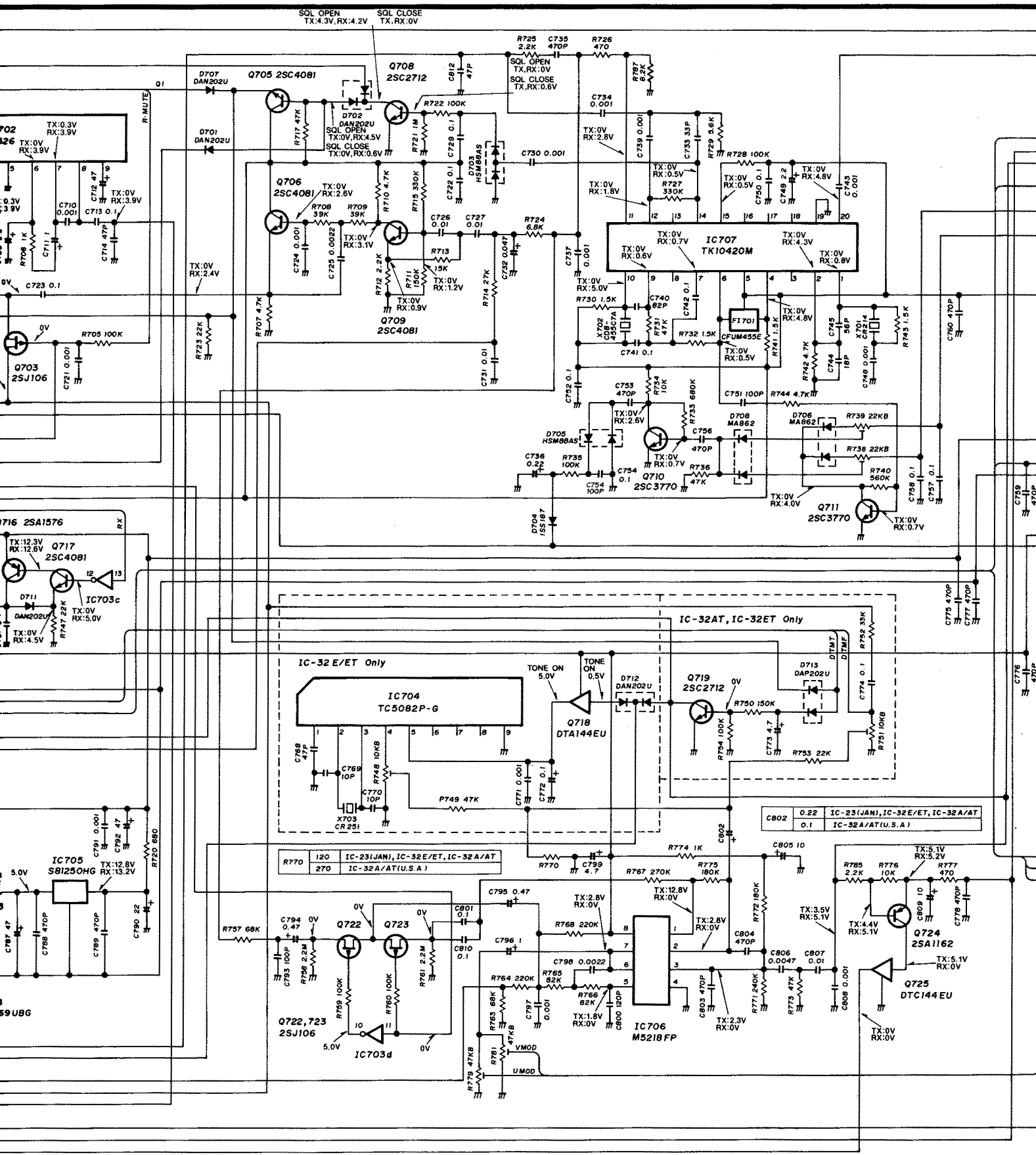
### MAIN UNIT

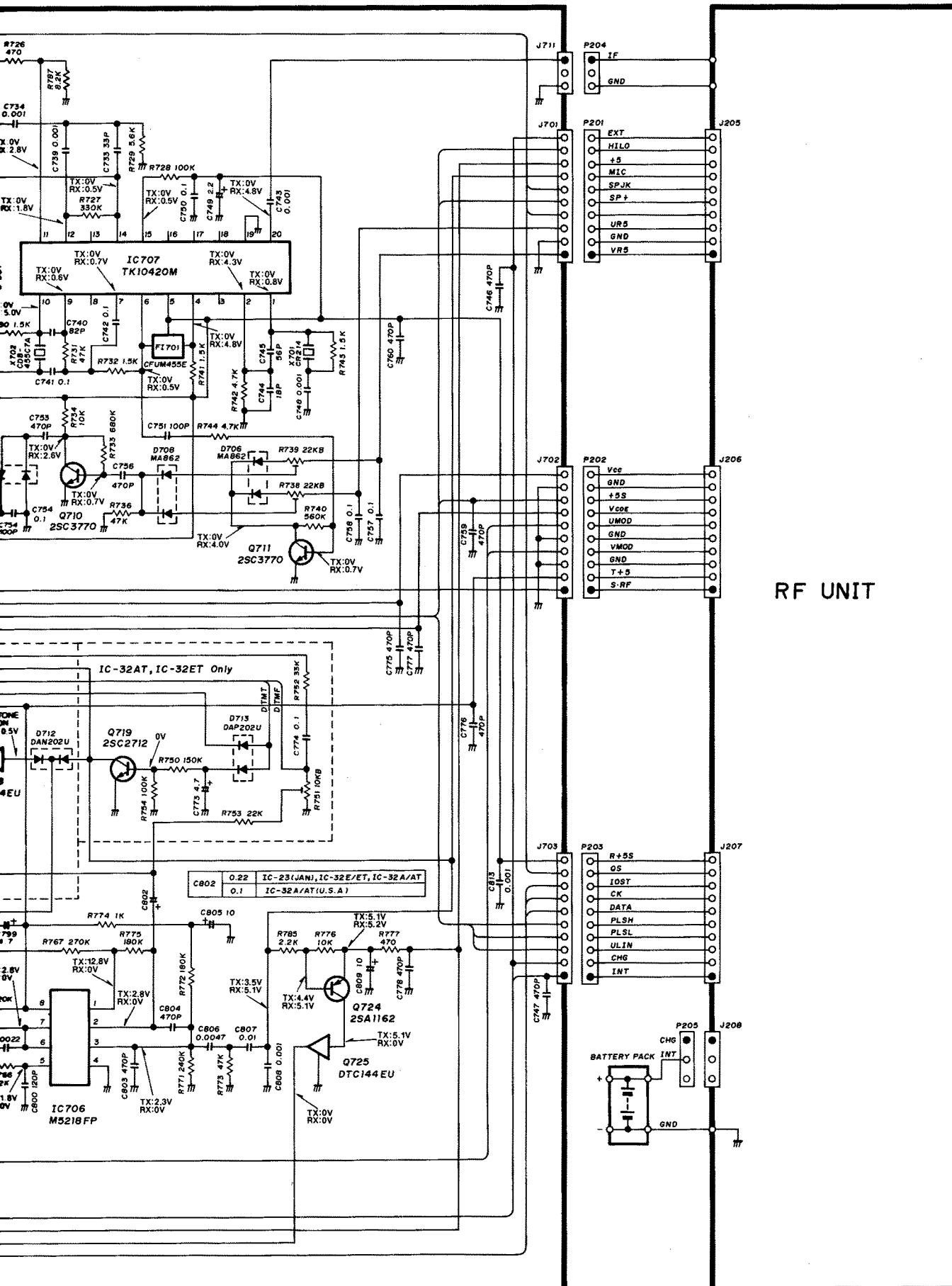




# MAIN UNIT



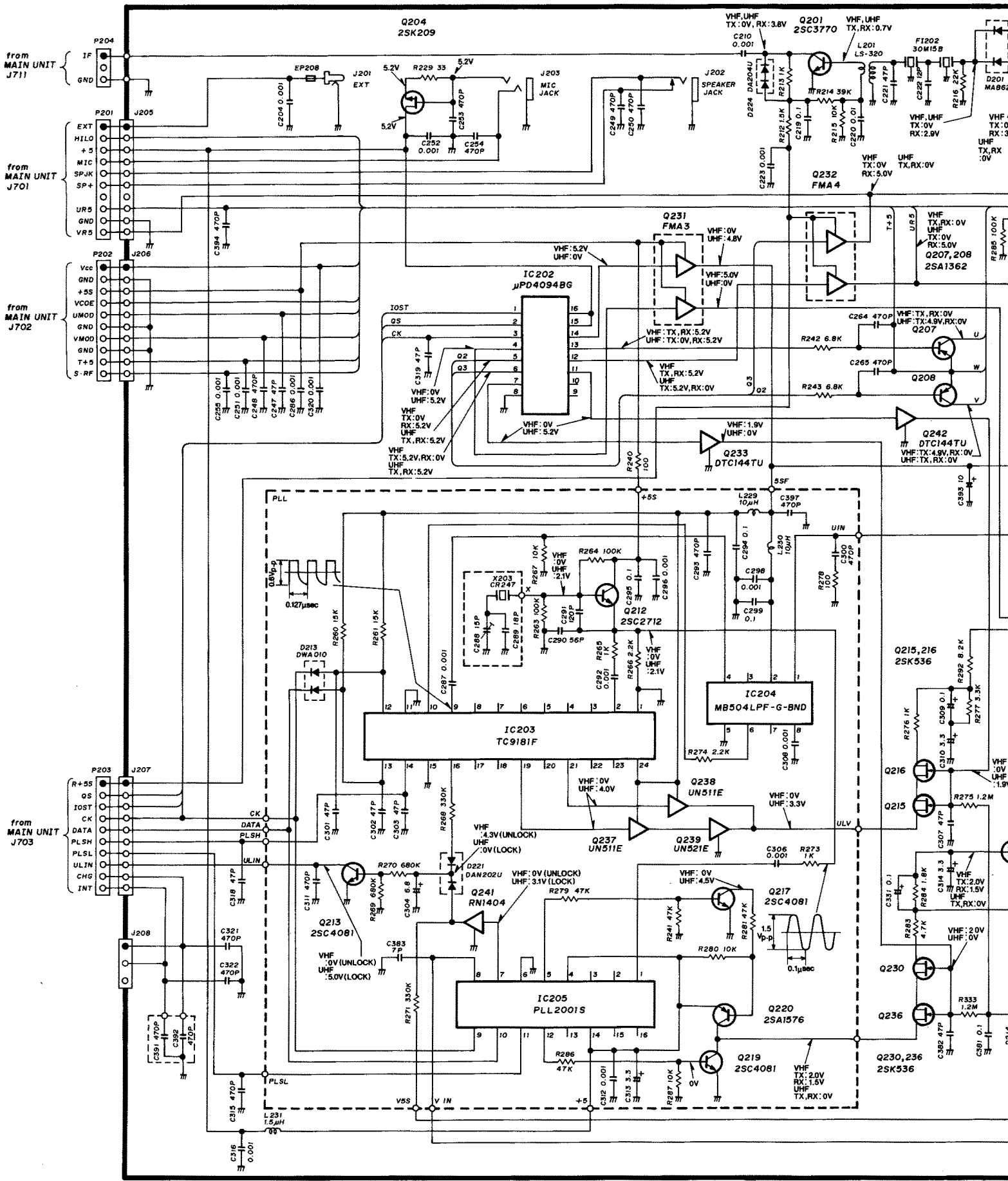




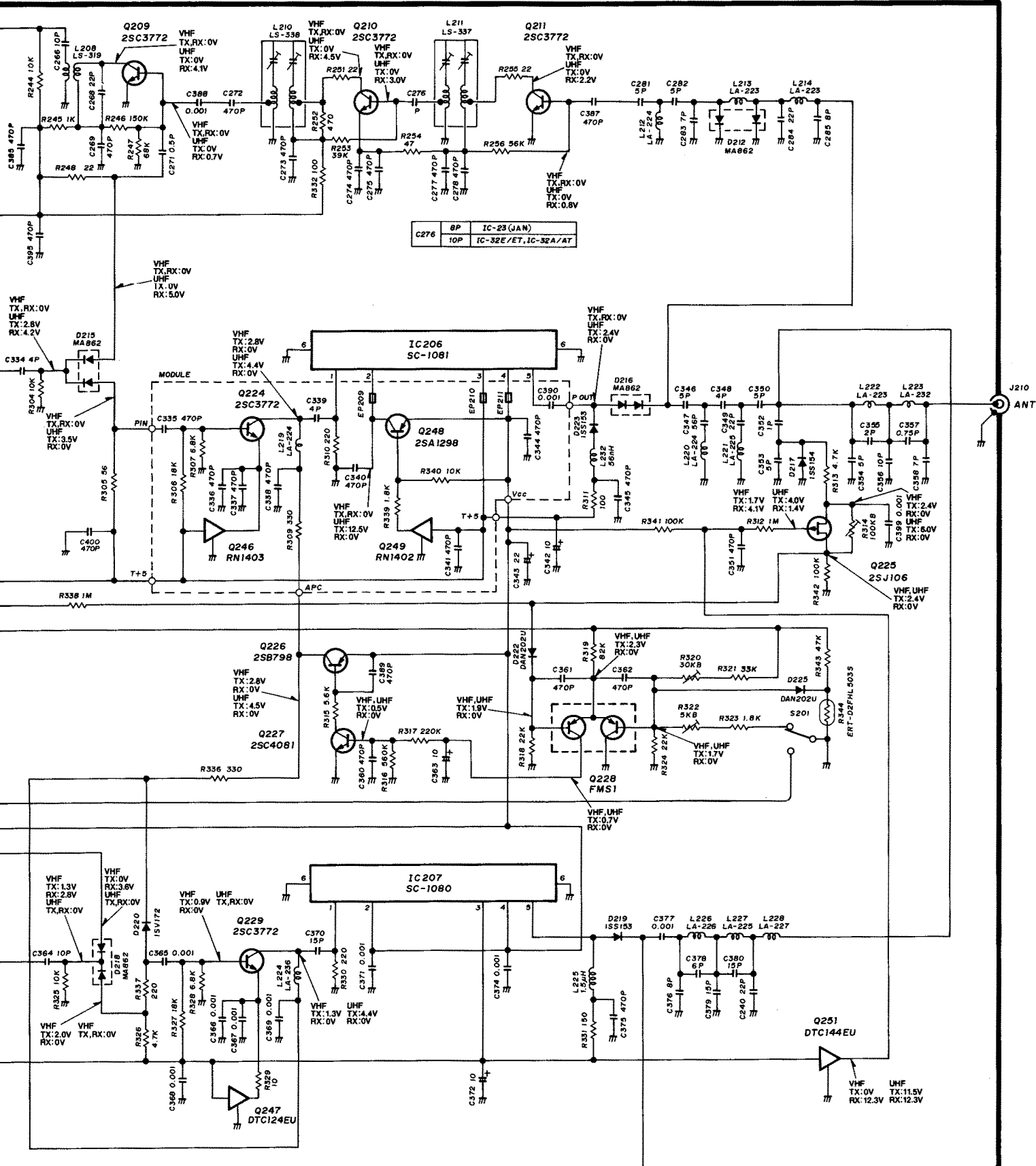
RF UNIT

To upgrade quality, some components may be subject to change without notice.

# RF UNIT







C276	8P	IC-23 (JAN)
	10P	IC-32E/ET, IC-32A/AT

**RF UNIT**

To upgrade quality, some components may be subject to change without notice.

## 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

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Phone: 61. 20. 31. 49  
Fax : 61. 34. 05. 91  
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