



# SERVICE MANUAL

VHF TRANSCEIVER

**IC-H19s1**

**IC-H19s2**

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## INTRODUCTION

This service manual describes the latest service information for the **IC-H19s1/IC-H19s2** VHF TRANSCEIVER at the time of publication.

|                    | MODEL  |                                     |
|--------------------|--|-------------------------------------|
|                    | IC-H19s1   | IC-H19s2                            |
| Intrinsically safe | Class I, II and III, Division 1, Groups C, D, E, F and G | Class I, Division 1, Groups C and D |
| Nonincentive       | Class I, Division 2, Groups A, B, C and D                |                                     |

## DANGER

**NEVER** connect the transceiver to an AC outlet or to a DC power supply that uses more than 14 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.

## INTRINSICALLY SAFE QUALIFICATION

When servicing **IC-H19s1** and **IC-H19s2**, the following conditions must be met. Failing to satisfy any of these conditions will invalidate the INTRINSICALLY SAFE certification.

1. Servicing the transceiver should only be undertaken by suitably qualified personnel in a non-hazardous area. Never attempt to remove the case in a hazardous area.
2. **ONLY** the approved battery, ICOM's CM-71, may be used, and this battery may only be removed or charged in a safe area.
3. **USE ONLY** safety critical components as specified in the parts list (SECTION 6), should replacement of any item be necessary.

## ORDERING PARTS

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

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

<SAMPLE ORDER>

1130000830 IC    μPD4094BG-T1 IC-H19s1/s2 MAIN UNIT    5 pieces  
8810004860 Screw PH M2×6 ZK IC-H19s1/s2 Top cover    10 pieces

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

## 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 its power source.
3. **DO NOT** force any of the variable components. Turn them slowly and smoothly.
4. **DO NOT** short any circuits or electronic parts. An insulated tuning tool **MUST** be used for all adjustments.
5. **DO NOT** keep power ON for a long time when the transceiver is defective.
6. **DO NOT** transmit power into a signal generator or a sweep generator.
7. **ALWAYS** connect a 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.



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To program the operating frequency, tone frequency, etc., see the separately available EX-704 PROGRAMMING MANUAL.

## SECTION 1 SPECIFICATIONS

### ■ GENERAL

- Frequency range : 136~174 MHz
- Type of emission : 16K0F3E
- Number of channels : Up to 16 channels
- Frequency stability :  $\pm 0.0005\%$
- Antenna impedance : 50  $\Omega$  unbalanced
- Power supply voltage :

| BATTERY PACK | OUTPUT VOLTAGE |
|--------------|----------------|
| CM-71 *1     | 7.2 V          |
| CM-72 *2     | 8.4 V          |
| CM-73 *2     | 13.2 V         |

(Negative ground)

\*1 Intrinsically safe type. Same type as supplied with the IC-H19s1/s2.

\*2 Non intrinsically safe type.

- Usable temperature range :  $-30\text{ }^{\circ}\text{C} \sim +60\text{ }^{\circ}\text{C}$  ( $-22\text{ }^{\circ}\text{F} \sim +140\text{ }^{\circ}\text{F}$ )
- Dimensions : 65 (W)  $\times$  109 (H)  $\times$  35 (D) mm  
2.6 (W)  $\times$  4.3 (H)  $\times$  1.4 (D) in, (without battery pack)
- Weight (with CM-71) : 590 g (1.3 lbs)

### ■ TRANSMITTER

- RF output power (At 13.2 V DC) : High: 5 W  
Low : 800 mW
- Modulation system : Variable reactance frequency modulation
- Current drain (At 13.2 V DC) : High: 1.8 A  
Low : 1.2 A
- Microphone impedance : 2.2 k $\Omega$
- Maximum deviation :  $\pm 5$  kHz
- Spurious emissions :  $-65$  dB
- FM hum and noise :  $-50$  dB
- Audio response :  $+1$  dB,  $-3$  dB of  $+6$  dB/octave from 300 Hz to 3000 Hz

### ■ RECEIVER

- Sensitivity : 0.25  $\mu\text{V}$  at 12 dB SINAD
- Squelch sensitivity : 0.25  $\mu\text{V}$
- Modulation acceptance :  $\pm 7$  kHz
- Current drain (At 13.2 V DC) : Audio max. 0.3 A  
Standby 75 mA

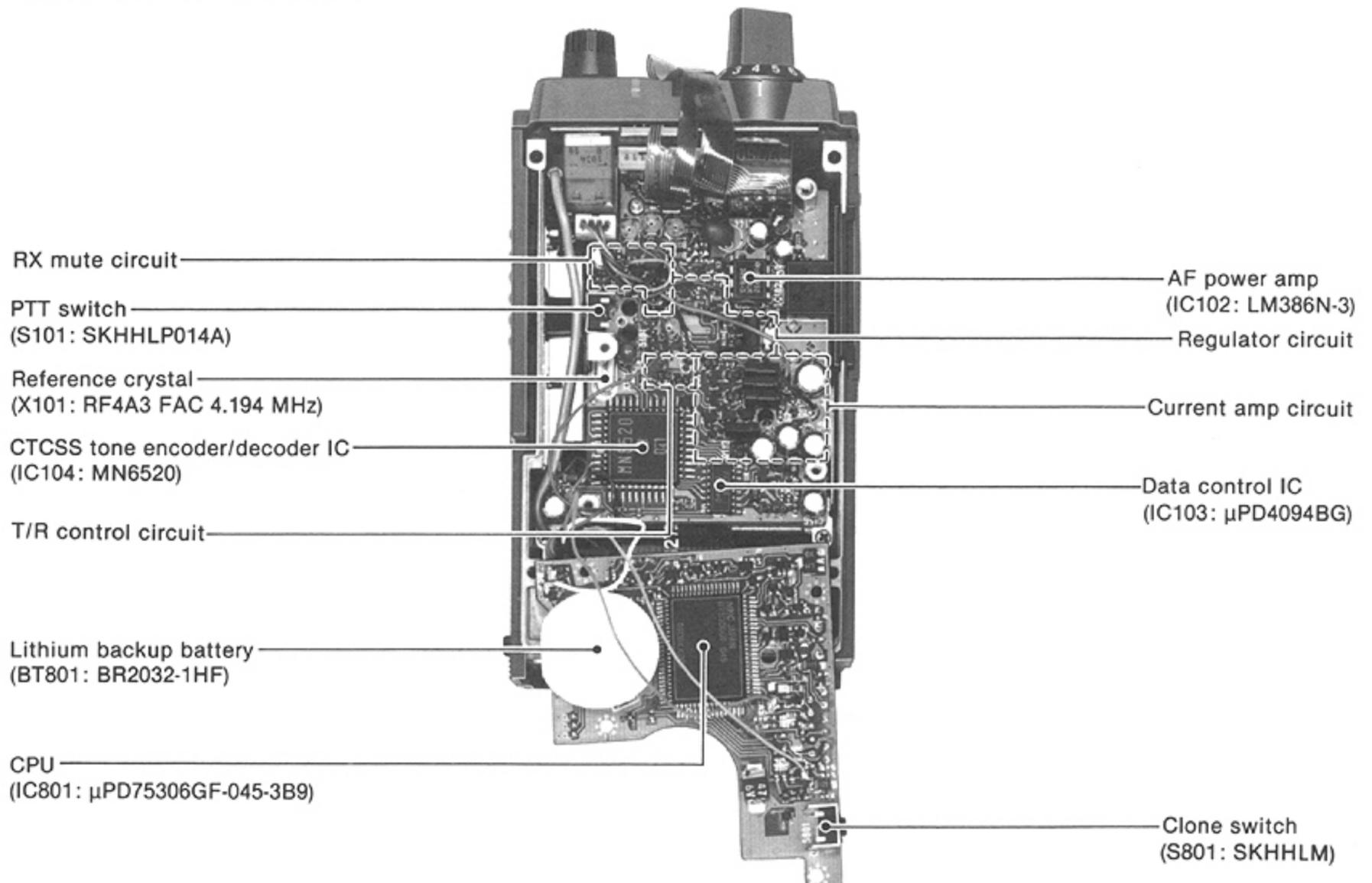
- Audio output power :

| BATTERY PACK | OUTPUT POWER<br>(at 10 % distortion with an 8 $\Omega$ load) |
|--------------|--|
| CM-71        | 200 mW   |
| CM-72        | 350 mW   |
| CM-73        | 500 mW   |

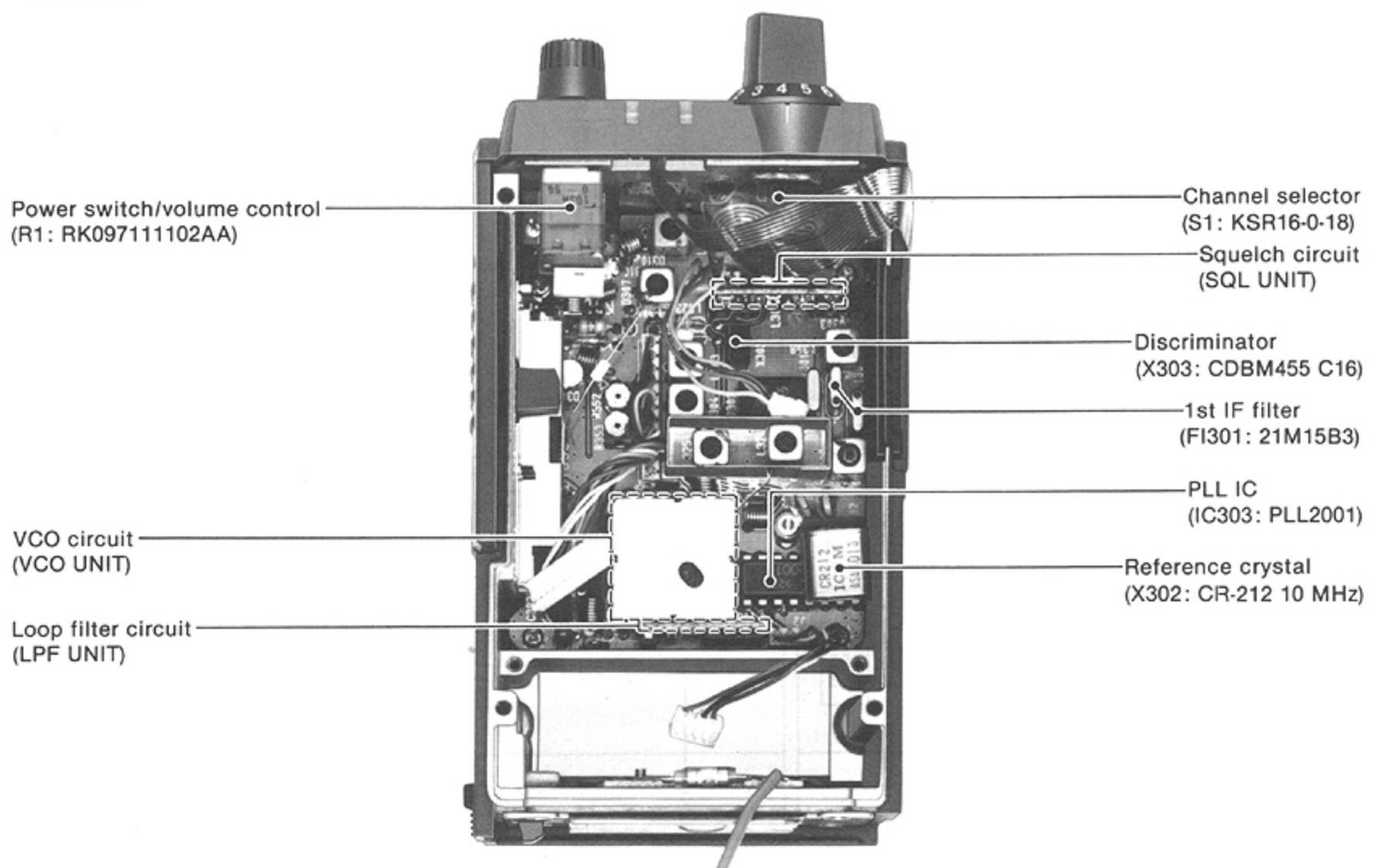
- Adjacent channel selectivity :  $-70$  dB
- Spurious rejection :  $-70$  dB
- Image rejection :  $-75$  dB
- Intermodulation rejection :  $-70$  dB
- Hum and noise :  $-40$  dB
- Audio response :  $+1$  dB,  $-3$  dB of  $-6$  dB/octave from 300 Hz to 3000 Hz

## SECTION 2 INSIDE VIEWS

### • MAIN AND LOGIC UNITS



### • RF UNIT





## SECTION 4 CIRCUIT DESCRIPTION

### 4-1 RECEIVER CIRCUITS

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

The antenna switching circuit functions as a low-pass filter while receiving and as a resonator circuit while transmitting.

Received signals enter the antenna connector and pass through a two-stage Chebyshev low-pass filter (L311, L312, C340~C344) to suppress out-of-band signals. The filtered signals are applied to the  $\lambda/4$ -type diode switching circuit (D307, D310, L310, C337, C338) and then to a two-stage bandpass filter (L301, L302, D301, D302, C304, C305, C385, C419).

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

The signals are amplified at an RF amplifier (Q301). The amplified signals enter a four-stage bandpass filter (L303, L304, L324, L325, D303, D304, D317, D318, C309, C310, C312, C313, C420~C426) to suppress unwanted signals.

D301~D304 employ varactor diodes which are controlled by the PLL lock voltage. These diodes tune the center frequency of the RF circuit for wide bandwidth reception and good image response rejection.

#### 4-1-3 1st MIXER AND IF CIRCUITS (RF UNIT)

The 1st mixer circuit converts the received signals to a fixed frequency of the 1st IF signal with a PLL output frequency. By changing the PLL frequency, only the desired frequency can pass through a pair of crystal filters at the next stage of the 1st mixer.

The filtered signals pass through C427 and then enter a first mixer circuit (Q321). The signals are mixed with a 1st LO signal from the VCO UNIT to produce a 21.8 MHz 1st IF signal. The 21.8 MHz 1st IF signal is applied to L307 and then to a pair of crystal filters (F1301) which suppress out-of-band signals. The filtered signal passes through L308 and then enters a 1st IF amplifier (Q303). The amplified signal is applied to a matching transformer (L309).

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

The 2nd mixer circuit converts the 1st IF signal to a 2nd IF signal.

The 1st IF signal from L309 is applied to a 2nd mixer section of IC301 (pin 16) and then is mixed with a 2nd LO signal for conversion to a 455 MHz 2nd IF signal.

IC1 contains the 2nd mixer, local oscillator circuit, limiter amplifier, quadrature detector circuit and active filter circuit. The local oscillator section and X301 generate 21.345 MHz for the 2nd LO signal.

The 2nd IF signal from the 2nd mixer (IC301, pin 3) passes through a ceramic filter (F1302) where unwanted signals are suppressed. It is then amplified at the limiter amplifier section (IC301, pin 5) and applied to the quadrature detector section (IC301, pin 8 and ceramic discriminator X303) to demodulate the 2nd IF signal into an AF signal. The AF signal is output from IC301 (pin 9).

#### 4-1-5 AF CIRCUIT (MAIN UNIT)

IC104 contains a CTCSS tone encoder/decoder, an AF amplifier circuit and a two-stage AF filter.

The AF signal is applied to the AF amplifier circuit (IC104, pin 29) and then to the two-stage AF filter. The filtered signal is output from IC104 (pin 18) and then applied to a de-emphasis circuit (R155, C153, C167). This circuit is an integrated circuit with frequency characteristics of  $-6$  dB/octave. The resulting signal is applied to a muting circuit (Q109) and then to an AF preamplifier (Q108).

The AF preamplifier (Q108) amplifies the AF signal to a sufficient level in order to drive an AF power amplifier (IC102). When the squelch is closed, Q109 cuts the AF signal like an AF mute switch. Q108 functions as both an AF amplifier and a high-pass filter. The amplified signal from Q108 is applied to the [VOL] CONTROL (R1) on the VR UNIT and then to an AF power amplifier (IC102, pin 2). The AF power amplifier (IC102, pin 5) outputs more than 500 mW with an  $8 \Omega$  load to drive a speaker.

The DC voltage from the battery pack is applied to a voltage regulator circuit (Q106, Q107, D104). This circuit adjusts the voltage to protect IC102 from overloading.

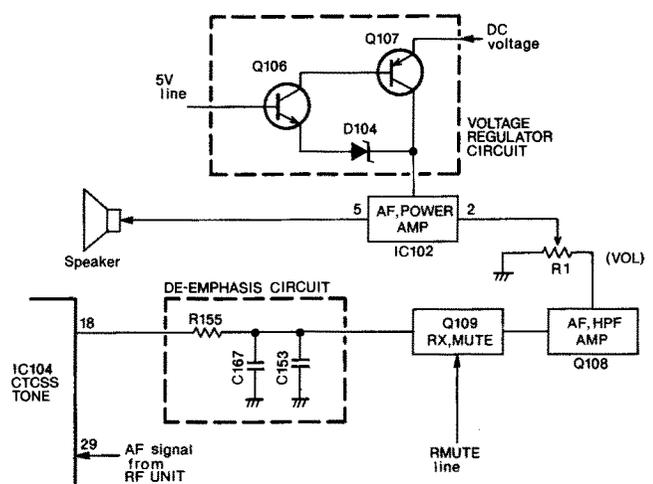


Fig. 1

## 4-1-6 SQUELCH CIRCUIT (RF AND LOGIC UNITS)

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

Some noise components in the AF signal from IC301 (pin 9) are applied to an active filter section of IC301 (pin 10). It amplifies the noise components of frequencies of 20 kHz and above. The resulting signals are output from IC301 (pin 11) and are then amplified at Q602. The amplified signals are rectified by D602 and D604 and are then converted to DC voltage.

### • SQUELCH CIRCUIT

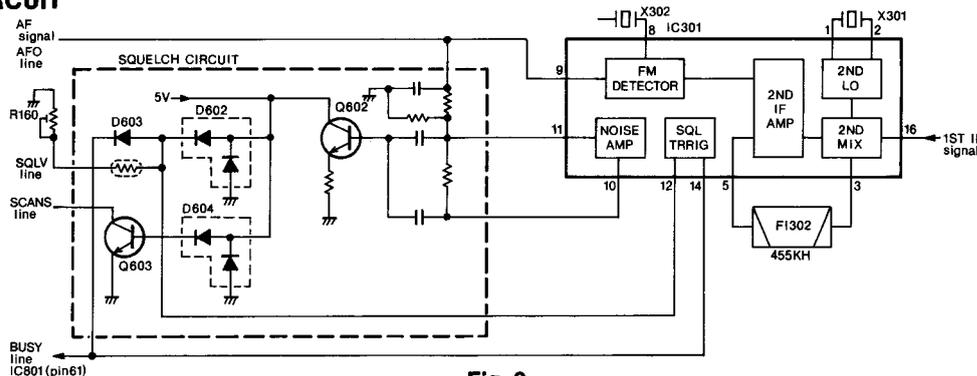


Fig. 2

The rectified voltage from D602 is applied to the SQUELCH CONTROL (R160) on the MAIN UNIT and then to a squelch trigger circuit section of IC301 (pin 12) on the RF UNIT. The squelch signal is output from IC301 (pin 14) and then applied to the CPU (IC801, pin 61) on the LOGIC UNIT through the "BUSY" signal line.

The rectified voltage from D604 outputs a "SCANS" signal. The signal is applied to a scan stop circuit (IC105, Q122, Q123) on the MAIN UNIT.

The squelch circuit is activated when the CPU (IC801, pin 52) outputs an "RMUT" signal to a muting circuit (Q109).

## 4-2 TRANSMITTER CIRCUITS

### 4-2-1 MICROPHONE AMPLIFIER (MAIN AND VCO UNITS)

When the PTT SWITCH (S101) is pushed and held to transmit AF signals, a terminal (MIC2) is connected to a ground to activate a built-in condenser microphone (MIC1) on the FRONT UNIT. The AF signals from the microphone are applied to IC101 (pin 3) and obtain +6 dB/octave pre-emphasis at C104 and R102 which are connected to pin 2. IC101 functions as a microphone amplifier and a limiter. The signals are output from IC101 (pin 1).

The output signals from IC101 (pin 1) are applied to the splatter filter circuit (IC101, R107, R110, R111, C108, C109, C111) to attenuate the components of noise frequencies of 3 kHz and above. The signals are output from IC101 (pin 7). The output signals are adjusted at R116 and are applied to D501 on the VCO UNIT as an "MOD" signal.

The "MOD" signal is modulated into an FM signal at D501 on the VCO UNIT.

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

The VCO output is buffer-amplified at Q305 and applied to the transmit/receive switching circuit (D311).

After passing through the transmit/receive switching circuit (D311), the VCO output is amplified at a pre-amplifier (Q307) and re-amplified at a drive amplifier (Q306) to obtain 20 mW.

The voltage controlled by the APC circuit is applied to the collector of Q306 and a power amplifier (IC302) to stabilize RF output power.

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

IC302 is a mic module which provides a stable 5 W (DC 13.2 V) of output power.

RF signals from the drive amplifier (Q306) are applied to the power amplifier (IC302, pin 1). The amplified signals are output from IC302 (pin 5). The output signals are applied to the [ANT] CONNECTOR through the APC circuit, the antenna switching circuit and the low-pass filter circuit.

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

The APC circuit protects the power module (IC302) from a mismatched output load and selects HIGH and LOW output power.

The output power from the power module (IC302, pin 5) is applied to the mismatch detector circuit (L315, R324, R325, C352, C353) to divide high-frequency components for conversion to DC voltage at D308 and D309. When the antenna impedance is matched at 50  $\Omega$ , the detected voltage is at a minimum. However, when antenna impedance is mismatched, the detected voltage is higher than when it is matched.

The detected voltage at D308 and D309 is applied to the differential amplifier circuit (Q308, Q309). This circuit outputs an APC reference voltage. When "HIGH" power is selected, it is divided at R349, R351, and R353. When "LOW" power is selected, it is divided at R349~R353. The APC reference voltage is applied to the base of Q309.

When the antenna impedance is mismatched, the base voltage of Q308 is higher than the reference voltage. The collector voltage of Q308 decreases.

• APC CIRCUIT

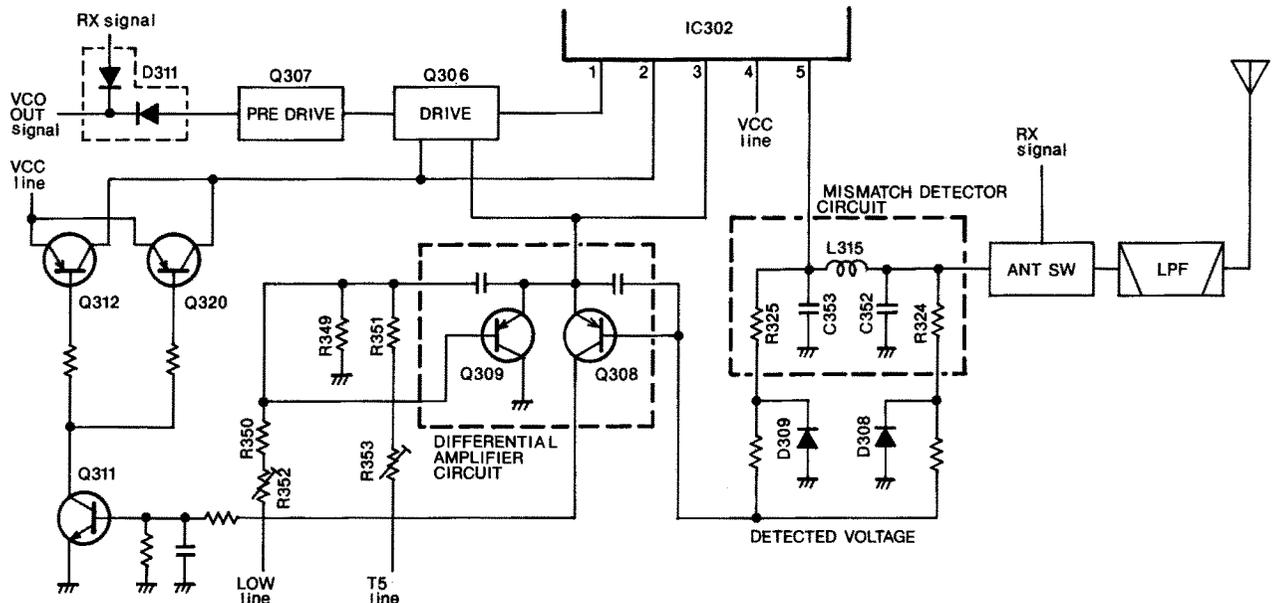


Fig. 3

The current from the differential amplifier circuit (Q308, Q309) is amplified at Q311 to control Q312 and Q320. The control voltage changes the supply voltage to IC302 and Q306.

This decreases the output power of the drive amplifier (Q306) and power amplifier (IC302) until the base voltage of Q308 reaches the same level as the voltage of Q309.

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

The output power control circuit consists of R349~R353. This circuit controls the RF output power with the APC reference voltage.

When "HIGH" output power is selected, RF output power can be adjusted with R353.

When "LOW" output power is selected, the signal for low power selection from the CPU (IC801) is applied to R352 through the "LOW" signal line. RF output power is adjusted with R352.

4-2-6 TX MUTE CIRCUIT (RF UNIT)

When a "TMUT" signal from the CPU (IC801) turns Q313 OFF, transmission is interrupted. The bias voltages are prevented from entering Q306, Q307, and IC302.

4-2-7 ANTENNA SWITCHING CIRCUIT (RF UNIT)

The antenna switching circuit applies the received signal to the receiver circuit and the transmitter signal to the antenna connector.

Q310, D307, and D310 are turned ON to form a parallel resonant circuit (L310, C337, C338) while transmitting. The parallel resonant circuit does not allow the RF output signal from IC302 to enter the receiver circuit. The RF output signal from IC302 passes through L315, D307, C339, and C408. The signal is applied to a low-pass filter (L311, L312, C340~C344) and then to an [ANT] CONNECTOR. The impedance of the parallel resonant circuit increases. The signal leakage from the resonant circuit is bypassed through D310 and Q310.

4-3 PLL CIRCUITS

4-3-1 GENERAL (RF UNIT)

A PLL circuit steadily oscillates the transmit frequency and the receive local frequency. The PLL output frequency is controlled by the divided ratio (N-data) of the programmable divider.

The PLL circuit, using a one chip PLL IC (IC303), directly generates the transmit and 1st LO frequency with a Clapp VCO (Q501). The PLL IC sets the divided ratio based on serial data from the CPU (IC801) and compares the phases of a VCO signal and the reference oscillator frequency. The PLL IC detects the out-of-step phase and output from pin 5 and 12. The reference frequency is oscillated at X302.

• PLL CIRCUIT

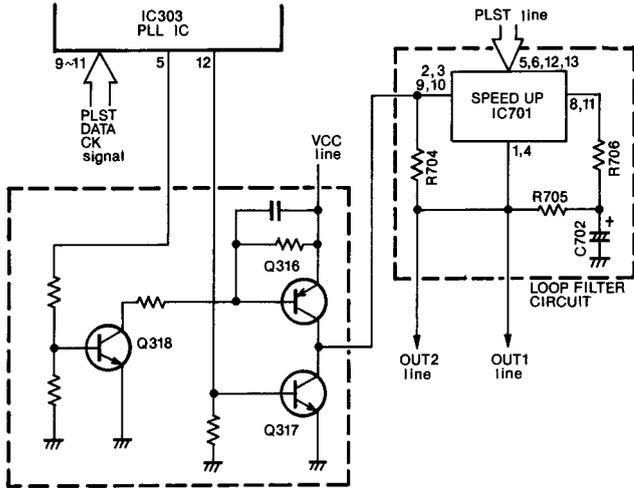


Fig. 4

4-4 OTHER CIRCUITS

4-4-1 VOLTAGE LINES

| LINE | DESCRIPTION   |
|------|---|
| VCC  | This voltage is applied to Q316, Q317, the 5 V regulator circuit and IC102 through the fuse (F1) and [VOL] CONTROL (R1).<br><br>This voltage line changes depending on the battery pack type.<br>7.2 V (CM-71), 8.4 V (CM-72), 13.2 V (CM-73)                                       |
| 5 V  | This regulator circuit (Q118, Q119, D111, D112) supplies 5 V with low noise.<br><br>This circuit is composed of a complementary connection to ensure high current amplification and supplies stable output voltage continuously with good temperature characteristics in all modes. |
| S5   | This regulator circuit (Q112, Q113, D109) forms a complementary circuit. When the power save is turned ON, a "PSC" signal from the CPU (IC801, pin 50) interrupts the "S5" line intermittently to save power.   |
| T5   | Transmit 5 V. Q115 supplies T5V when the CPU (IC801, pin 51) becomes "LOW".   |
| R5   | Receive 5 V. Q111 supplies R5V when the CPU (IC801, pin 51) becomes "HIGH".   |

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

A 10 MHz reference frequency is produced by Q315 and X302. D313, R361, and R364 stabilize the reference frequency from Q315 and X302 over a wide temperature range.

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

Phase-detected signals from IC303 (pin 5 and 12) are converted to DC voltage by a charge pump (Q316~Q318) and a lag-loop filter (R704, R705, C702).

The frequency at which the VCO oscillates is controlled by varactor diodes (D502, D503). The converted voltage (PLL lock voltage) is provided through the filter.

IC701 is used as an accelerator to ensure rapid PLL lock-up time.

On the other hand, the output voltage from the loop filter is applied to Q314 to control the bandpass filter (D301~D304, D317, D318) in the receiver RF circuit.

R358 and R359 adjust the voltage to stabilize the modulation over a wide frequency range.

4-3-4 UNLOCK CIRCUIT (MAIN UNIT)

When the PLL circuit is unlocked, IC303 (pin 7) is "LOW". A "LOW" signal is applied to the unlock circuit (Q120, Q121). The unlock circuit outputs the resulting signal to the CPU (IC801, pin 62).

4-3-5 VCO CIRCUIT (RF UNIT)

D501 changes the inductive reactance of the Clapp oscillator (Q501) to shift the receive and transmit frequencies. Varactor diodes (D502, D503) provide frequency control. The buffer amplifiers (Q305, Q319) protect the PLL output signal from VCO oscillation.

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

When transmitting, the CPU (IC801, pin 51) becomes "LOW". Q117 is turned ON, and Q116 is turned OFF. Bias voltage is applied to a complementary circuit (Q114, Q115, D110) to supply 5 V on the "T5" voltage line.

When receiving, the CPU (IC801, pin 51) becomes "HIGH". Q117 is turned OFF, and Q116 is turned ON. Bias voltage is applied to a complementary circuit (Q110, Q111, D108) to supply 5V on the "R5" voltage line. Q116 obtains the voltage through the "S5" voltage line. When the power saver function is activated, the CPU (IC801, pin 50) outputs a "PSC" signal to cut off the "S5" voltage line intermittently to reduce current consumption. When the "S5" voltage line is interrupted, the "R5" line voltage becomes zero.

4-4-3 CTCSS TONE CIRCUIT (MAIN UNIT)

IC104 is a programmable CTCSS tone encoder/decoder which generates 37 tone frequencies. The CPU (IC801) outputs the serial data through IC103 to set the CTCSS tone frequency at IC104. IC104 (pin 3~8, S0~S5) receives data for the tone frequency.

When transmitting, IC104 (pin 12) becomes "LOW". When receiving, IC104 (pin 12) becomes "HIGH".

**CTCSS TONE FREQUENCIES:**

| OUTPUT<br>FREQUENCY [Hz] | IC104 INPUT PIN NUMBER |   |   |   |   |   |
|--------------------------|------------------------|---|---|---|---|---|
|                          | 3                      | 4 | 5 | 6 | 7 | 8 |
| 67.0                     | H                      | L | H | H | H | L |
| 71.9                     | L                      | L | H | H | H | L |
| 74.4                     | H                      | H | L | H | H | L |
| 77.0                     | L                      | H | L | H | H | L |
| 79.7                     | H                      | L | L | H | H | L |
| 82.5                     | L                      | L | L | H | H | L |
| 85.4                     | H                      | H | H | L | H | L |
| 88.5                     | L                      | H | H | L | H | L |
| 91.5                     | H                      | L | H | L | H | L |
| 94.8                     | H                      | L | L | H | H | H |
| 100.0                    | L                      | L | L | H | H | H |
| 103.5                    | H                      | H | H | L | H | H |
| 107.2                    | L                      | H | H | L | H | H |
| 110.9                    | H                      | L | H | L | H | H |
| 114.8                    | L                      | L | H | L | H | H |
| 118.8                    | H                      | H | L | L | H | H |
| 123.0                    | L                      | H | L | L | H | H |
| 127.3                    | H                      | L | L | L | H | H |
| 131.8                    | L                      | L | L | L | H | H |
| 136.5                    | H                      | H | H | H | L | H |
| 141.3                    | L                      | H | H | H | L | H |
| 146.2                    | H                      | L | H | H | L | H |
| 151.4                    | L                      | L | H | H | L | H |
| 156.7                    | H                      | H | L | H | L | H |
| 162.2                    | L                      | H | L | H | L | H |
| 167.9                    | H                      | L | L | H | L | H |
| 173.8                    | L                      | L | L | H | L | H |
| 179.9                    | H                      | H | H | L | L | H |
| 186.2                    | L                      | H | H | L | L | H |
| 192.8                    | H                      | L | H | L | L | H |
| 203.5                    | L                      | L | H | L | L | H |
| 210.7                    | H                      | H | L | L | L | H |
| 218.1                    | L                      | H | L | L | L | H |
| 225.7                    | H                      | L | L | L | L | H |
| 233.6                    | L                      | L | L | L | L | H |
| 241.8                    | H                      | H | H | H | H | L |
| 250.3                    | L                      | H | H | H | H | L |
| —                        | —                      | — | — | — | — | — |

**4-4-4 CPU (IC801) PORT ALLOCATIONS****• INPUT PORT**

| PORT No. | PIN No. | TERMINAL NAME | DESCRIPTION   |
|----------|---------|---------------|---|
| P00      | 38      | INT4          | Inputs an interrupt signal for the standby mode of the CPU. The CPU enters the standby mode when the port becomes "LOW". When the port becomes "HIGH", the CPU enters the operation mode. |
| P03      | 41      | HIGH/LOW      | Input port for the power control signal output. LOW terminal becomes "HIGH" when the port becomes "LOW".  |
| P10      | 42      | PTT           | Inputs a signal on the PTT line. The CPU detects that the PTT switch has been pushed when the port becomes "LOW".   |

| PORT No. | PIN No. | TERMINAL NAME | DESCRIPTION  |
|----------|---------|---------------|--|
| P11      | 43      | CLONE         | The CPU enters the cloning mode while the port is "LOW", and [VOL] is being turned ON.                                 |
| P12      | 44      | MONI          | The CPU detects that the [MONITOR] switch has been turned ON when the port becomes "LOW" and turns the CTCSS tone OFF. |
| P13      | 45      | SCAN CONTROL  | Scan starts when the port becomes "LOW".   |
| P40~P43  | 29~32   | KR0~KR3       | Input ports for the matrix.  |
| P60      | 60      | DET           | The CPU detects that the same tone frequency is received when the port becomes "HIGH".                                 |
| P61      | 61      | BUSY          | The CPU detects that the squelch opens when the port is "HIGH".  |
| P62      | 62      | UNLOCK        | The CPU detects that the PLL is unlocked when the port becomes "LOW".  |

**• OUTPUT PORT**

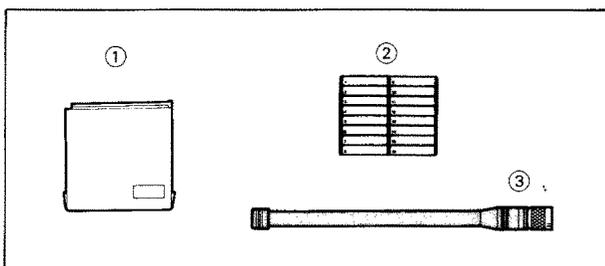
| PORT No. | PIN No. | TERMINAL NAME | DESCRIPTION  |
|----------|---------|---------------|--|
| P50      | 34      | KS4           | Outputs a matrix signal for CH selection   |
| P51      | 35      | KS5           | Outputs a matrix signal.   |
| P52      | 36      | LOW           | Output port for a power control signal. Outputs "LOW" when the transceiver is programmed for low power output. |
| P53      | 37      | TMUT          | Outputs a transmit mute signal.  |
| P01      | 39      | CK            | Outputs clock signals for the serial data.   |
| P02      | 40      | DATA          | Outputs serial data.   |
| P20      | 46      | BEEP          | Outputs a 1 kHz pulse when a beep is emitted over the speaker.   |
| P21      | 47      | PLSTB         | Outputs a strobe signal for the PLL.   |
| P22      | 48      | CTSTB         | Outputs a strobe signal for the CTCSS tone encoder/decoder.  |
| P23      | 49      | TONEC         | Outputs two tone control signals. The port becomes "HIGH" when DTCS or SINGLE tone is selected.                |
| P30      | 50      | PSC           | Outputs a power save control signal. The port becomes "LOW" when the power save function is activated.         |
| P31      | 51      | T/R           | Outputs a Transmit/Receive switching signal. The port becomes "LOW" when transmitting.                         |
| P32      | 52      | RMUT          | Outputs a receiver mute signal. The port becomes "HIGH" when receiver audio output is muted.                   |
| P33      | 53      | CALL          | Outputs a busy signal synchronized with the "BUSY" input. Directly drives the [TX/BUSY] INDICATOR.             |
| P63      | 63      | CPO           | Outputs clone data.  |

## SECTION 5 MECHANICAL PARTS AND DISASSEMBLY

| LABEL NUMBER | ORDER NO.  | DESCRIPTION                  | QTY. | LABEL NUMBER | ORDER NO.  | DESCRIPTION                                     | QTY. |
|--------------|------------|------------------------------|------|--------------|------------|---|------|
| ①            | 8810004000 | Screw PH B0 M2×31.5 ZK       | 4    | ⑳            | 8930012581 | Side plate-1                                    | 1    |
| ②            | 8010007231 | Rear panel-1                 | 1    | ㉑            | 8930012620 | Side seal                                       | 1    |
| ③            | 8810004800 | Screw PH B0 No. 0-1 M2×4     | 4    | ㉒            | 8930012510 | Standoff (AR)                                   | 3    |
| ④            | 8010007240 | Front seal                   | 1    | ㉓            | 8810004870 | Screw PH No. 0-1 M2×2.5                         | 3    |
| ⑤            | 8930012480 | SP plate                     | 1    | ㉔            | 8810000010 | Screw PH M2×4                                   | 4    |
| ⑥            | 8930012630 | SP seal                      | 1    | ㉕            | 8810006520 | Screw PH No. 0-1 M2×6                           | 1    |
| ⑦            | 8210006010 | Front panel (F)-2            | 1    | ㉖            | 8930012490 | Module plate                                    | 1    |
| ⑧            | 8610004300 | Knob N132 [CHANNEL SELECTOR] | 1    | ㉗            | 8860000010 | Screw lug M 2                                   | 2    |
| ⑨            | 8810005100 | Screw PH No. 0-1 M2×7 ZK     | 1    | ㉘            | 8930012640 | Spring (K)                                      | 1    |
| ⑩            | 8610004310 | Knob N133 [VOL]              | 1    | ㉙            | 8930012610 | Release button                                  | 1    |
| ⑪            | 8210003181 | TOP panel-1                  | 1    | ㉚            | 8810002580 | BuH M2×6 NI BS                                  | 2    |
| ⑫            | 8930016760 | TOP seal (A)                 | 1    | ㉛            | 8010007180 | Sliding guide plate (A)                         | 1    |
| ⑬            | 8810004860 | Screw PH M2×6 ZK             | 2    | ㉜            | 8810002310 | Screw FH M2×4 NI BS                             | 4    |
| ⑭            | 8930012600 | Lens                         | 1    | ㉝            | 8930005980 | Connection spring                               | 1    |
| ⑮            | 8810004870 | Screw PH No. 0-1 M2×2.5      | 2    | ㉞            | 8930011880 | Connection holder                               | 1    |
| ⑯            | 8310012090 | TOP plate                    | 1    | ㉟            | 2510000270 | Speaker 40P-177B                                | 1    |
| ⑰            | 6510007250 | Antenna connector TNC-R107   | 1    | ㊱            | 2250000030 | Switch KSR16-0-18 [CHANNEL SELECTOR]            | 1    |
| ⑱            | 8810006520 | Screw PH No. 0-1 M2×2.5      | 1    | ㊲            | 2260000490 | Switch AS-243-A04 [MONITOR]                     | 1    |
| ㉑            | 8830000550 | VR nut (E)                   | 1    | ㊳            | 2260000490 | Switch AS-243-A04 [SCAN]                        | 1    |
| ㉒            | 8310012281 | Switch seal-1                | 1    | ㊴            | 2260000980 | Switch SKHHLP014A [PTT]                         | 1    |
| ㉓            | 8810000530 | Screw PH No. 0-1 M2×5 ZK     | 2    | ㊵            | 8930013461 | LOGIC shield seat-1                             | 1    |
| ㉔            | 8930012500 | Switch plate                 | 1    | ㊶            | 7210001500 | Variable resistor<br>RK097111102AA (10KA) [VOL] | 1    |
| ㉕            | 8930012570 | PTT button                   | 1    | ㊷            | 6450000130 | Jack HSJ1102-01-540                             | 1    |
| ㉖            | 8810000530 | Screw PH No. 0-1 M2×5 ZK     | 2    | ㊸            | 6450000110 | Jack HSJ0836-01-010 (IC-H19 <sub>sz</sub> only) | 1    |
| ㉗            | 8930012590 | PTT holder                   | 1    | ㊹            | 2260000451 | Switch SKHHLM                                   | 1    |
| ㉘            | 8810000010 | Screw PH M2×4                | 4    |              |            |   |      |
| ㉙            | 8810005090 | Screw PH M2×3 ZK             | 2    |              |            |   |      |

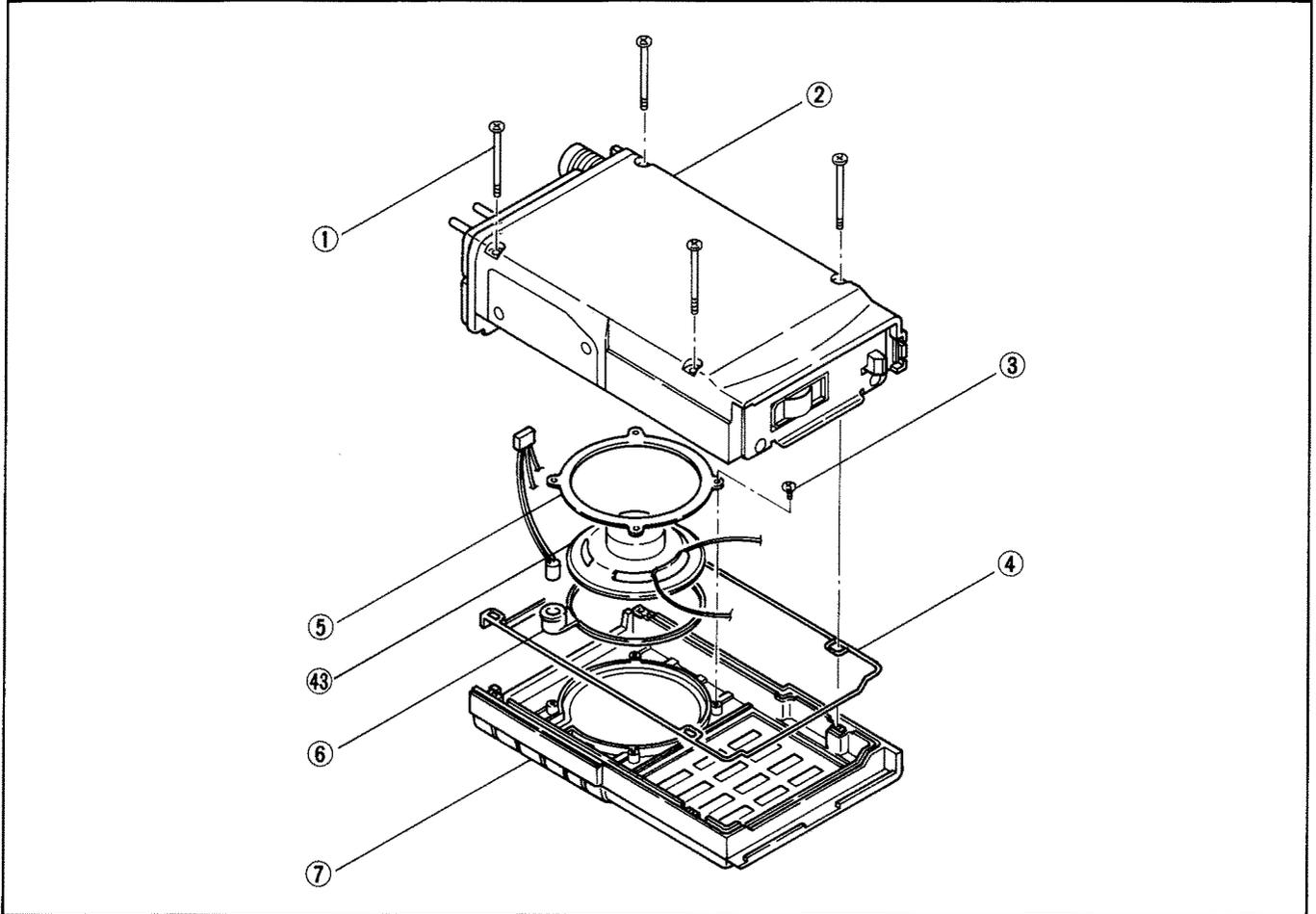
**Screw abbreviations** FH: Flat head PH: Pan head BuH: Button head NI: Nickel ZK: Black

### • ACCESSORIES

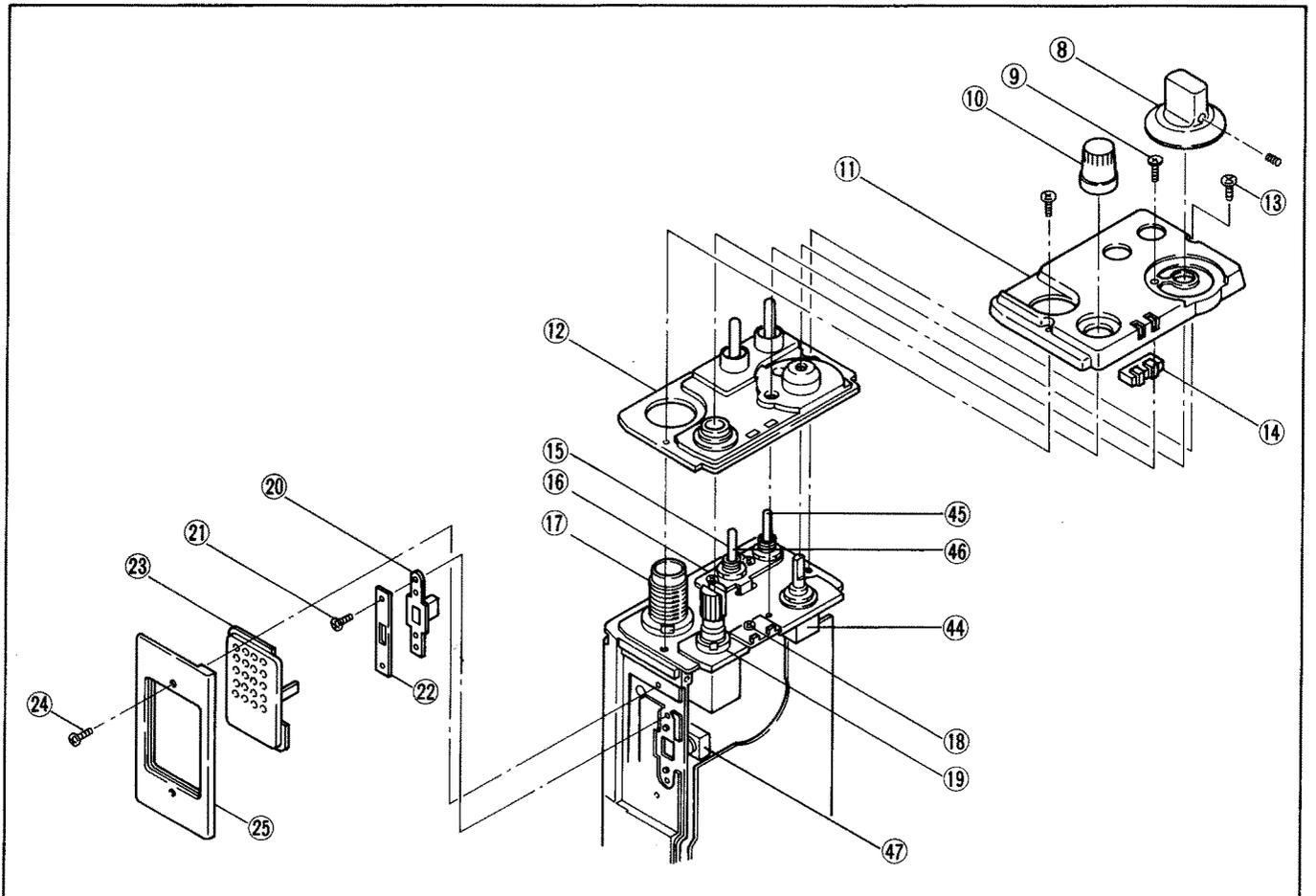


| LABEL NUMBER | ORDER NO.        | DESCRIPTION              | QTY. |
|--------------|------------------|--------------------------|------|
| ①            | Optional product | Battery pack (CM-71)     | 1    |
| ②            | 8310013140       | Front plate seal         | 1    |
| ③            | Optional product | FA-155T Flexible antenna | 1    |

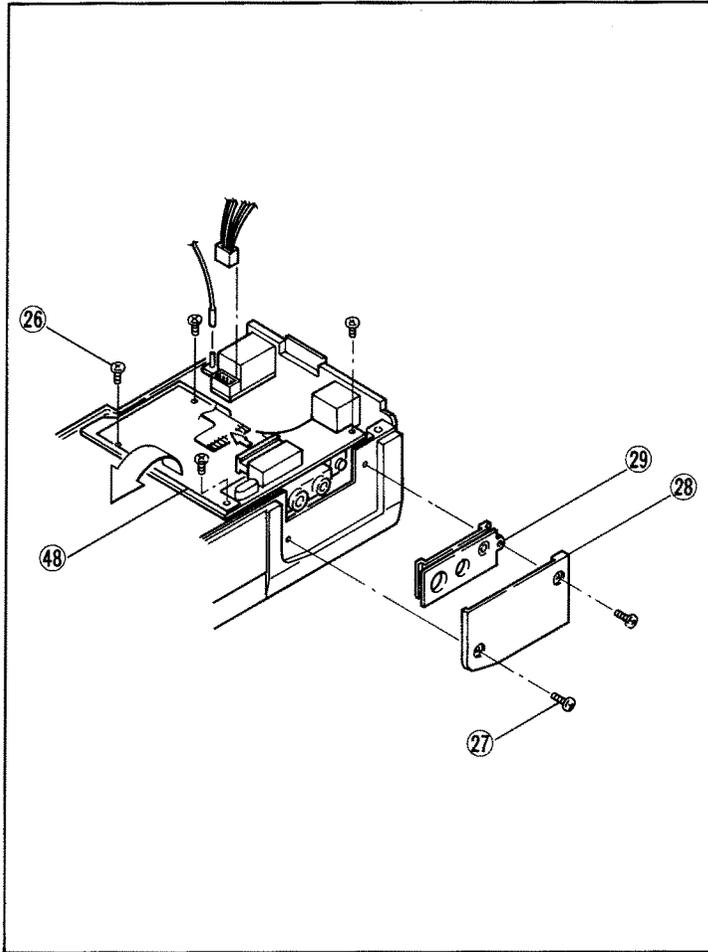
• CASE AND FRONT PANELS



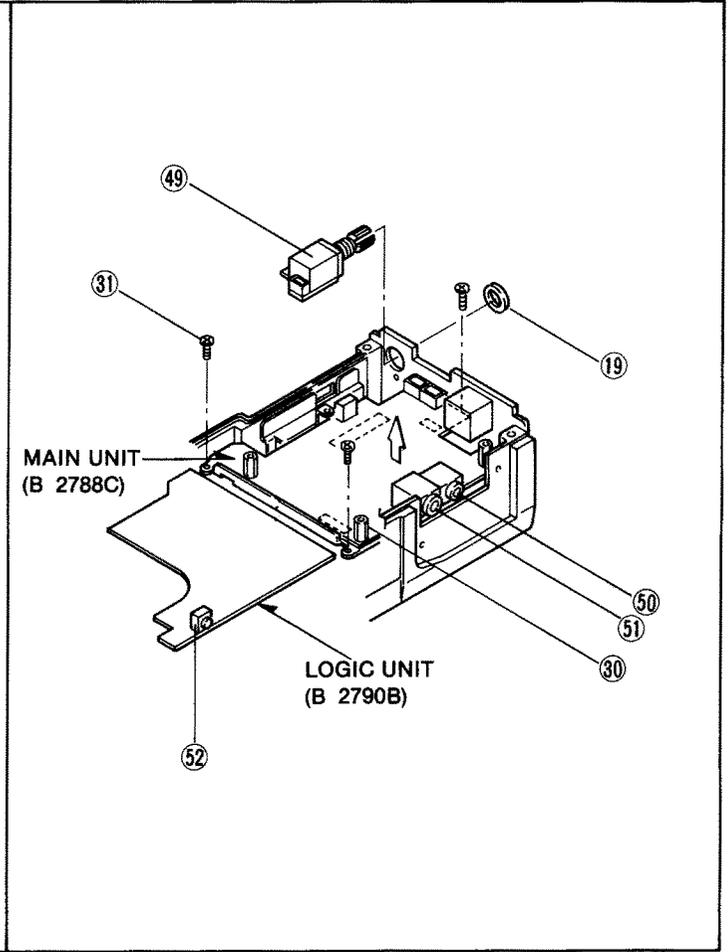
• TOP PANEL



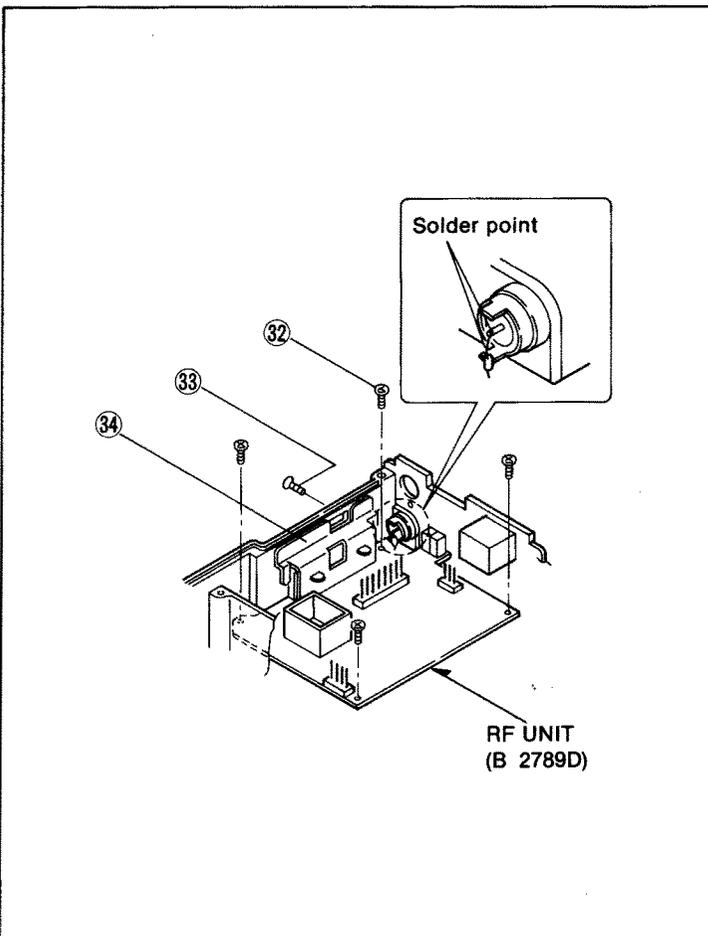
• LOGIC UNIT



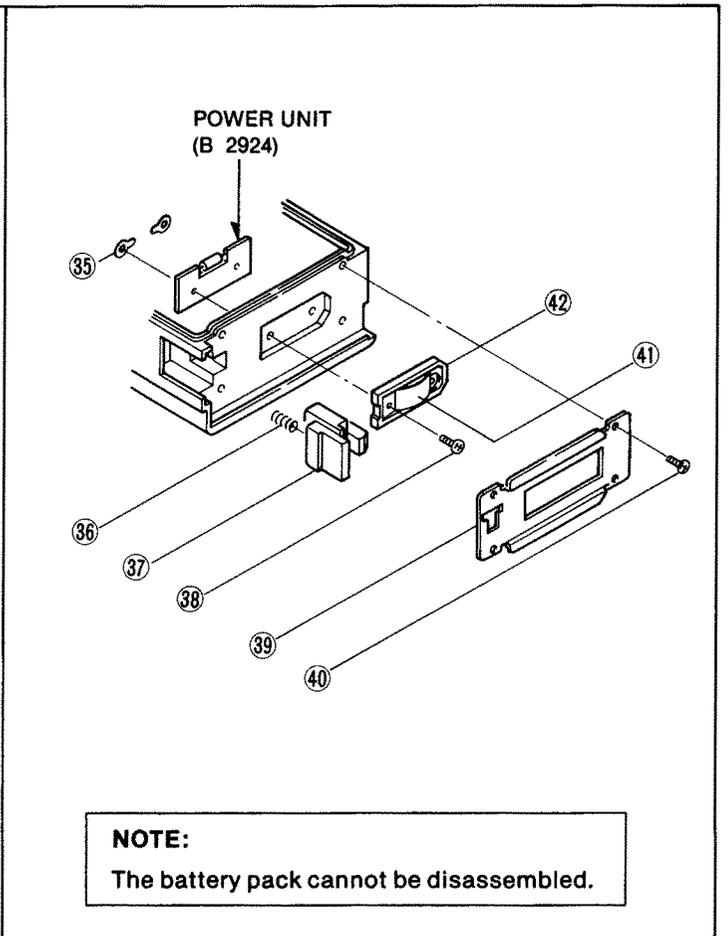
• MAIN UNIT



• RF UNIT



• CONTACT HOLDER



**NOTE:**  
The battery pack cannot be disassembled.

## SECTION 6 PARTS LIST

## [FRONT UNIT]

| REF. NO. | ORDER NO.  | DESCRIPTION |                  |
|----------|------------|-------------|------------------|
| C1       | 4010000460 | Ceramic     | DD104 B 471K 50V |
| SP1 *    | 2510000270 | Speaker     | 40P-177B         |

## [POWER UNIT]

| REF. NO. | ORDER NO.  | DESCRIPTION |                  |
|----------|------------|-------------|------------------|
| C1       | 4010000500 | Ceramic     | DD104 B 102K 50V |
| C2       | 4010000500 | Ceramic     | DD104 B 102K 50V |
| F1       | 5210000230 | Fuse        | MC2 1/2          |
| EP1      | 0910029010 | P.C. Board  | B 2924 (POWER)   |

## [LED UNIT]

| REF. NO. | ORDER NO.  | DESCRIPTION  |                                  |
|----------|------------|--------------|----------------------------------|
| DS1      | 5040001120 | LED          | TLSG222 [TX/BUSY]                |
| DS2      | 5040001120 | LED          | TLSG222 [CALL]                   |
| S1       | 2250000030 | Switch       | KSR16-0-18<br>[CHANNEL SELECTOR] |
| S2       | 2260000490 | Switch       | AS-243-A04 [MONITOR]             |
| S3       | 2260000490 | Switch       | AS-243-A04 [SCAN]                |
| EP1      | 0910030142 | P.C. Board   | B 1704B (LED)                    |
| EP2      | 0910017994 | F.P.C. Board | B 1705D                          |

## [LOGIC UNIT]

| REF. NO. | ORDER NO.  | DESCRIPTION |                               |
|----------|------------|-------------|-------------------------------|
| IC801    | 1140000950 | IC          | μPD75306GF-045-3B 9           |
| IC802    | 1110001550 | IC          | S-8054ALB-LM-T1               |
| IC803    | 1130003760 | IC          | TC4S81F (TE85R)               |
| IC804    | 1130004500 | IC          | TC4S11F (TE85R)               |
| IC805    | 1130004170 | IC          | TC4S01F (TE85R)               |
| IC806    | 1130004200 | IC          | TC4S66F (TE85R)               |
| IC807    | 1130003610 | IC          | TC4SU69F (TE85R)              |
| Q801     | 1590000430 | Transistor  | DTC144EU T107                 |
| Q802     | 1510000510 | Transistor  | 2SA1576 T107R                 |
| Q803     | 1530002060 | Transistor  | 2SC4081 T107R                 |
| Q804     | 1590000430 | Transistor  | DTC144EU T107                 |
| Q805     | 1510000500 | Transistor  | 2SA1162-GR (TE85R)            |
| Q806     | 1590000430 | Transistor  | DTC144EU T107                 |
| Q807     | 1590000430 | Transistor  | DTC144EU T107                 |
| Q808     | 1590000430 | Transistor  | DTC144EU T107                 |
| Q809     | 1590000430 | Transistor  | DTC144EU T107                 |
| Q810     | 1590000720 | Transistor  | DTA144EU T107                 |
| Q811     | 1590000430 | Transistor  | DTC144EU T107                 |
| Q812     | 1590001030 | Transistor  | DTC144WU T107                 |
| D801     | 1160000050 | Diode       | DAP202U T107                  |
| D802     | 1160000050 | Diode       | DAP202U T107                  |
| D803     | 1160000060 | Diode       | DAN202U T107                  |
| D804     | 1750000160 | Diode       | DA114 T107                    |
| D806     | 1750000160 | Diode       | DA114 T107                    |
| D807     | 1750000160 | Diode       | DA114 T107                    |
| D808     | 1160000060 | Diode       | DAN202U T107                  |
| X801     | 6050003110 | Crystal     | RF-4A3 FAC NKD<br>(4.194304M) |
| R801     | 7030002360 | Resistor    | MCR03EZHZJ 47 kΩ (473)        |
| R802     | 7030002360 | Resistor    | MCR03EZHZJ 47 kΩ (473)        |
| R803     | 7030002360 | Resistor    | MCR03EZHZJ 47 kΩ (473)        |
| R804     | 7030002360 | Resistor    | MCR03EZHZJ 47 kΩ (473)        |
| R805     | 7030002360 | Resistor    | MCR03EZHZJ 47 kΩ (473)        |
| R806     | 7030002360 | Resistor    | MCR03EZHZJ 47 kΩ (473)        |

## [VR UNIT]

| REF. NO. | ORDER NO.  | DESCRIPTION       |                               |
|----------|------------|-------------------|-------------------------------|
| R1       | 7210001500 | Variable Resistor | RK097111102AA (10KA)<br>[VOL] |
| EP1      | 0910018231 | P.C. Board        | B 1703A (VR)                  |

\* safety critical component

## [LOGIC UNIT]

| REF. NO. | ORDER NO.  | DESCRIPTION     |                                |
|----------|------------|-----------------|--------------------------------|
| R807     | 7030002550 | Resistor        | MCR03EZHJ 1 M $\Omega$ (105)   |
| R808     | 7030002550 | Resistor        | MCR03EZHJ 1 M $\Omega$ (105)   |
| R809     | 7030002360 | Resistor        | MCR03EZHJ 47 k $\Omega$ (473)  |
| R810     | 7030002360 | Resistor        | MCR03EZHJ 47 k $\Omega$ (473)  |
| R811     | 7030002360 | Resistor        | MCR03EZHJ 47 k $\Omega$ (473)  |
| R812     | 7030002360 | Resistor        | MCR03EZHJ 47 k $\Omega$ (473)  |
| R813     | 7030000340 | Resistor        | MCR10EZHJ 470 $\Omega$ (471)   |
| R814     | 7030000340 | Resistor        | MCR10EZHJ 470 $\Omega$ (471)   |
| R815     | 7030000340 | Resistor        | MCR10EZHJ 470 $\Omega$ (471)   |
| R816     | 7030002320 | Resistor        | MCR03EZHJ 22 k $\Omega$ (223)  |
| R817     | 7030002420 | Resistor        | MCR03EZHJ 100 k $\Omega$ (104) |
| R818     | 7030002360 | Resistor        | MCR03EZHJ 47 k $\Omega$ (473)  |
| R820     | 7030002150 | Resistor        | MCR03EZHJ 1 k $\Omega$ (102)   |
| R821     | 7030002420 | Resistor        | MCR03EZHJ 100 k $\Omega$ (104) |
| R822     | 7030002550 | Resistor        | MCR03EZHJ 1 M $\Omega$ (105)   |
| R823     | 7030002420 | Resistor        | MCR03EZHJ 100 k $\Omega$ (104) |
| R827     | 7030002360 | Resistor        | MCR03EZHJ 47 k $\Omega$ (473)  |
| R828     | 7030002550 | Resistor        | MCR03EZHJ 1 M $\Omega$ (105)   |
| R829     | 7030002470 | Resistor        | MCR03EZHJ 220 k $\Omega$ (224) |
| R831     | 7030002170 | Resistor        | MCR03EZHJ 1.5 k $\Omega$ (152) |
| R832     | 7030002360 | Resistor        | MCR03EZHJ 47 k $\Omega$ (473)  |
| R833     | 7030002420 | Resistor        | MCR03EZHJ 100 k $\Omega$ (104) |
| R834     | 7030002320 | Resistor        | MCR03EZHJ 22 k $\Omega$ (223)  |
| R835     | 7030002550 | Resistor        | MCR03EZHJ 1 M $\Omega$ (105)   |
| R836     | 7030002360 | Resistor        | MCR03EZHJ 47 k $\Omega$ (473)  |
| R837     | 7030002420 | Resistor        | MCR03EZHJ 100 k $\Omega$ (104) |
|          |            |                 |                                |
| C801     | 4030006890 | Ceramic         | C1608 JF 1H 103Z-T-A           |
| C802 *   | 4550002720 | Tantalum        | TESVD2 0J 476M-12 L            |
| C803     | 4030006890 | Ceramic         | C1608 JF 1H 103Z-T-A           |
| C804     | 4030007030 | Ceramic         | C1608 CH 1H 150J-T-A           |
| C805     | 4030007030 | Ceramic         | C1608 CH 1H 150J-T-A           |
| C806     | 4030006860 | Ceramic         | C1608 JB 1H 102K-T-A           |
| C807     | 4030006860 | Ceramic         | C1608 JB 1H 102K-T-A           |
| C808     | 4030006890 | Ceramic         | C1608 JF 1H 103Z-T-A           |
| C809     | 4030006890 | Ceramic         | C1608 JF 1H 103Z-T-A           |
| C810     | 4030006890 | Ceramic         | C1608 JF 1H 103Z-T-A           |
| C811 *   | 4550000460 | Tantalum        | TESVA 1C 105M1-8L              |
| C812 *   | 4550000460 | Tantalum        | TESVA 1C 105M1-8L              |
|          |            |                 |                                |
| S801     | 2260000451 | Switch          | SKHHLM                         |
|          |            |                 |                                |
| BT801*   | 3020000070 | Lithium Battery | BR2032-1HF                     |
|          |            |                 |                                |
| EP1      | 0910027832 | P.C. Board      | B 2790B (LOGIC)                |

## [MAIN UNIT]

| REF. NO. | ORDER NO.  | DESCRIPTION |                                |
|----------|------------|-------------|--------------------------------|
| Q101     | 1530001940 | Transistor  | 2SC2712-BL (TE85F)             |
| Q102     | 1530001940 | Transistor  | 2SC2712-BL (TE85F)             |
| Q103     | 1510000500 | Transistor  | 2SA1162-GR (TE85F)             |
| Q104     | 1510000500 | Transistor  | 2SA1162-GR (TE85F)             |
| Q105     | 1510000500 | Transistor  | 2SA1162-GR (TE85F)             |
| Q106     | 1530001940 | Transistor  | 2SC2712-BL (TE85F)             |
| Q107     | 1520000080 | Transistor  | 2SB909M R                      |
| Q108     | 1530001940 | Transistor  | 2SC2712-BL (TE85F)             |
| Q109     | 1590000380 | FET         | 2SJ106-Y (TE85F)               |
| Q110     | 1530001940 | Transistor  | 2SC2712-BL (TE85F)             |
| Q111     | 1520000080 | Transistor  | 2SB909M R                      |
| Q112     | 1530001940 | Transistor  | 2SC2712-BL (TE85F)             |
| Q113     | 1520000080 | Transistor  | 2SB909M R                      |
| Q114     | 1530001940 | Transistor  | 2SC2712-BL (TE85F)             |
| Q115     | 1520000080 | Transistor  | 2SB909M R                      |
| Q116     | 1510000500 | Transistor  | 2SA1162-GR (TE85F)             |
| Q117     | 1510000500 | Transistor  | 2SA1162-GR (TE85F)             |
| Q118     | 1520000080 | Transistor  | 2SB909M R                      |
| Q119     | 1530001940 | Transistor  | 2SC2712-BL (TE85F)             |
| Q120     | 1530001940 | Transistor  | 2SC2712-BL (TE85F)             |
| Q121     | 1530001940 | Transistor  | 2SC2712-BL (TE85F)             |
| Q122     | 1590000430 | Transistor  | DTC144EU T107                  |
| Q123     | 1590000430 | Transistor  | DTC144EU T107                  |
| Q124     | 1590000700 | Transistor  | DTC144EK T147                  |
|          |            |             |                                |
| D101     | 1790000490 | Diode       | HSM88AS-TR                     |
| D102     | 1160000060 | Diode       | DAN202U T107                   |
| D103     | 1750000160 | Diode       | DA114 T107                     |
| D104     | 1730000010 | Zener       | RD4.7M-T2B3                    |
| D105     | 1750000020 | Diode       | 1SS184 (TE85F)                 |
| D106     | 1750000120 | Diode       | DWA010-TE                      |
| D108     | 1750000020 | Diode       | 1SS184 (TE85F)                 |
| D109     | 1750000160 | Diode       | DA114 T107                     |
| D110     | 1750000040 | Diode       | 1SS190 (TE85F)                 |
| D111     | 1750000010 | Diode       | 1SS181 (TE85F)                 |
| D112     | 1730000360 | Zener       | RD5.1JS B2                     |
| D113     | 1790000620 | Diode       | MA77 (TW)                      |
|          |            |             |                                |
| X101     | 6050003110 | Crystal     | RF-4A3 FAC NKD<br>(4.194304M)  |
|          |            |             |                                |
| R101     | 7030002340 | Resistor    | MCR03EZHJ 33 k $\Omega$ (333)  |
| R102     | 7030002120 | Resistor    | MCR03EZHJ 560 $\Omega$ (561)   |
| R103     | 7030002440 | Resistor    | MCR03EZHJ 150 k $\Omega$ (154) |
| R104     | 7310002510 | Trimmer     | RH04A1AN5X01A (334)            |
| R105     | 7030002450 | Resistor    | MCR03EZHJ 180 k $\Omega$ (184) |
| R106     | 7030002150 | Resistor    | MCR03EZHJ 1 k $\Omega$ (102)   |
| R107     | 7030002450 | Resistor    | MCR03EZHJ 180 k $\Omega$ (184) |
| R108     | 7030002430 | Resistor    | MCR03EZHJ 120 k $\Omega$ (124) |
| R109     | 7030002470 | Resistor    | MCR03EZHJ 220 k $\Omega$ (224) |
| R110     | 7030002410 | Resistor    | MCR03EZHJ 82 k $\Omega$ (823)  |
| R111     | 7030002410 | Resistor    | MCR03EZHJ 82 k $\Omega$ (823)  |
| R112     | 7030002160 | Resistor    | MCR03EZHJ 1.2 k $\Omega$ (122) |
| R113     | 7030002230 | Resistor    | MCR03EZHJ 3.9 k $\Omega$ (392) |
| R114     | 7030002500 | Resistor    | MCR03EZHJ 390 k $\Omega$ (394) |
| R115     | 7030002550 | Resistor    | MCR03EZHJ 1 M $\Omega$ (105)   |
| R116     | 7310002460 | Trimmer     | RH04A1AS4X0NA (473)            |
| R117     | 7030002300 | Resistor    | MCR03EZHJ 15 k $\Omega$ (153)  |
| R118     | 7310002510 | Trimmer     | RH04A1AN5X01A (334)            |
| R119     | 7030002410 | Resistor    | MCR03EZHJ 82 k $\Omega$ (823)  |
| R120     | 7030002330 | Resistor    | MCR03EZHJ 27 k $\Omega$ (273)  |
| R121     | 7030002360 | Resistor    | MCR03EZHJ 47 k $\Omega$ (473)  |
| R122     | 7030002150 | Resistor    | MCR03EZHJ 1 k $\Omega$ (102)   |
| R123     | 7030002360 | Resistor    | MCR03EZHJ 47 k $\Omega$ (473)  |
| R124     | 7030002380 | Resistor    | MCR03EZHJ 56 k $\Omega$ (563)  |
| R125     | 7030002150 | Resistor    | MCR03EZHJ 1 k $\Omega$ (102)   |
| R126     | 7030000190 | Resistor    | MCR10EZHJ 27 $\Omega$ (270)    |
| R127     | 7030002250 | Resistor    | MCR03EZHJ 5.6 k $\Omega$ (562) |

## [MAIN UNIT]

| REF. NO. | ORDER NO.  | DESCRIPTION |                   |
|----------|------------|-------------|-------------------|
| IC101    | 1110001220 | IC          | BA4558FT1         |
| IC102    | 1110000530 | IC          | LM386N-3          |
| IC103    | 1130000830 | IC          | $\mu$ PD4094BG-T1 |
| IC104    | 1130001830 | IC          | MN6520            |
| IC105    | 1130003710 | IC          | TC4S71F (TE85F)   |

\* safety critical component

## [MAIN UNIT]

| REF. NO. | ORDER NO.  | DESCRIPTION |                        |
|----------|------------|-------------|------------------------|
| R128     | 7030002360 | Resistor    | MCR03EZHZ 47 kΩ (473)  |
| R129     | 7030002360 | Resistor    | MCR03EZHZ 47 kΩ (473)  |
| R130     | 7030002150 | Resistor    | MCR03EZHZ 1 kΩ (102)   |
| R131     | 7030002270 | Resistor    | MCR03EZHZ 8.2 kΩ (822) |
| R132     | 7030002440 | Resistor    | MCR03EZHZ 150 kΩ (154) |
| R133     | 7030002140 | Resistor    | MCR03EZHZ 820 Ω (821)  |
| R134     | 7030002260 | Resistor    | MCR03EZHZ 6.8 kΩ (682) |
| R135     | 7030002570 | Resistor    | MCR03EZHZ 1.5 MΩ (155) |
| R136     | 7030002510 | Resistor    | MCR03EZHZ 470 kΩ (474) |
| R137     | 7030002340 | Resistor    | MCR03EZHZ 33 kΩ (333)  |
| R138     | 7030002550 | Resistor    | MCR03EZHZ 1 MΩ (105)   |
| R140     | 7030002550 | Resistor    | MCR03EZHZ 1 MΩ (105)   |
| R141     | 7030002550 | Resistor    | MCR03EZHZ 1 MΩ (105)   |
| R142     | 7030002290 | Resistor    | MCR03EZHZ 12 kΩ (123)  |
| R143     | 7030002090 | Resistor    | MCR03EZHZ 330 Ω (331)  |
| R144     | 7030002290 | Resistor    | MCR03EZHZ 12 kΩ (123)  |
| R145     | 7030002160 | Resistor    | MCR03EZHZ 1.2 kΩ (122) |
| R146     | 7030002280 | Resistor    | MCR03EZHZ 10 kΩ (103)  |
| R147     | 7030002110 | Resistor    | MCR03EZHZ 470 Ω (471)  |
| R148     | 7030002360 | Resistor    | MCR03EZHZ 47 kΩ (473)  |
| R149     | 7030002380 | Resistor    | MCR03EZHZ 56 kΩ (563)  |
| R150     | 7030002360 | Resistor    | MCR03EZHZ 47 kΩ (473)  |
| R151     | 7030000390 | Resistor    | MCR10EZHZ 1.2 kΩ (122) |
| R152     | 7030002360 | Resistor    | MCR03EZHZ 47 kΩ (473)  |
| R153     | 7030002280 | Resistor    | MCR03EZHZ 10 kΩ (103)  |
| R154     | 7030002300 | Resistor    | MCR03EZHZ 15 kΩ (153)  |
| R155     | 7030002420 | Resistor    | MCR03EZHZ 100 kΩ (104) |
| R156     | 7030002440 | Resistor    | MCR03EZHZ 150 kΩ (154) |
| R158     | 7030002280 | Resistor    | MCR03EZHZ 10 kΩ (103)  |
| R159     | 7030002280 | Resistor    | MCR03EZHZ 10 kΩ (103)  |
| R160     | 7310002480 | Trimmer     | RH04A1A15X0KA (104)    |
| R161     | 7030002150 | Resistor    | MCR03EZHZ 1 kΩ (102)   |
| R163     | 7030002360 | Resistor    | MCR03EZHZ 47 kΩ (473)  |
| R164     | 7030002360 | Resistor    | MCR03EZHZ 47 kΩ (473)  |
| R165     | 7030002300 | Resistor    | MCR03EZHZ 15 kΩ (153)  |
| R166     | 7030002280 | Resistor    | MCR03EZHZ 10 kΩ (103)  |
| R167     | 7030002150 | Resistor    | MCR03EZHZ 1 kΩ (102)   |
| R168     | 7030002280 | Resistor    | MCR03EZHZ 10 kΩ (103)  |
| R169     | 7030002260 | Resistor    | MCR03EZHZ 6.8 kΩ (682) |
| R170     | 7030002280 | Resistor    | MCR03EZHZ 10 kΩ (103)  |
| R171     | 7030002450 | Resistor    | MCR03EZHZ 180 kΩ (184) |
| R172     | 7030002340 | Resistor    | MCR03EZHZ 33 kΩ (333)  |
| R173     | 7030002280 | Resistor    | MCR03EZHZ 10 kΩ (103)  |
| R174     | 7030002280 | Resistor    | MCR03EZHZ 10 kΩ (103)  |
| R175     | 7030002260 | Resistor    | MCR03EZHZ 6.8 kΩ (682) |
| R177     | 7030002510 | Resistor    | MCR03EZHZ 470 kΩ (474) |
| R181     | 7030002340 | Resistor    | MCR03EZHZ 33 kΩ (333)  |
| R182     | 7030002430 | Resistor    | MCR03EZHZ 120 kΩ (124) |
| R184     | 7030002520 | Resistor    | MCR03EZHZ 560 kΩ (564) |
| R185     | 7030002380 | Resistor    | MCR03EZHZ 56 kΩ (563)  |
| R186     | 7030002240 | Resistor    | MCR03EZHZ 4.7 kΩ (472) |
| R187     | 7030002420 | Resistor    | MCR03EZHZ 100 kΩ (104) |
| R188     | 7030000140 | Resistor    | MCR10EZHZ 10 Ω (100)   |
| R189     | 7030002360 | Resistor    | MCR03EZHZ 47 kΩ (473)  |
| R190     | 7030002420 | Resistor    | MCR03EZHZ 100 kΩ (104) |
| R191     | 7030002280 | Resistor    | MCR03EZHZ 10 kΩ (103)  |
| R192     | 7030002470 | Resistor    | MCR03EZHZ 220 kΩ (224) |
| R193     | 7030002420 | Resistor    | MCR03EZHZ 100 kΩ (104) |
| R194     | 7030002420 | Resistor    | MCR03EZHZ 100 kΩ (104) |
| R195     | 7310002480 | Trimmer     | RH04A1A15X0KA (104)    |
| R196     | 7030002200 | Resistor    | MCR03EZHZ 2.2 kΩ (222) |
| R197     | 7030002150 | Resistor    | MCR03EZHZ 1 kΩ (102)   |
| R198     | 7030002260 | Resistor    | MCR03EZHZ 6.8 kΩ (682) |
| R199     | 7030002200 | Resistor    | MCR03EZHZ 2.2 kΩ (222) |
| C101     | 4030006850 | Ceramic     | C1608 JB 1H 471K-T-A   |
| C102     | 4030006860 | Ceramic     | C1608 JB 1H 102K-T-A   |
| C103     | 4030006880 | Ceramic     | C1608 JB 1H 472K-T-A   |
| C104     | 4550000530 | Tantalum    | TESVA 1V 104M1-8L      |
| C105     | 4030006860 | Ceramic     | C1608 JB 1H 102K-T-A   |

## [MAIN UNIT]

| REF. NO. | ORDER NO.  | DESCRIPTION  |                      |
|----------|------------|--------------|----------------------|
| C106     | 4030006860 | Ceramic      | C1608 JB 1H 102K-T-A |
| C107     | 4030006860 | Ceramic      | C1608 JB 1H 102K-T-A |
| C108     | 4030006860 | Ceramic      | C1608 JB 1H 102K-T-A |
| C109     | 4030006870 | Ceramic      | C1608 JB 1H 222K-T-A |
| C110     | 4030006850 | Ceramic      | C1608 JB 1H 471K-T-A |
| C111     | 4030007130 | Ceramic      | C1608 CH 1H 101J-T-A |
| C112     | 4030006860 | Ceramic      | C1608 JB 1H 102K-T-A |
| C113 *   | 4550002980 | Tantalum     | TEMSVA 1C 225M-8L    |
| C114     | 4030006830 | Ceramic      | C1608 JF 1C 104Z-T-A |
| C115 *   | 4550002980 | Tantalum     | TEMSVA 1C 225M-8L    |
| C116     | 4030006830 | Ceramic      | C1608 JF 1C 104Z-T-A |
| C117     | 4030006830 | Ceramic      | C1608 JF 1C 104Z-T-A |
| C118     | 4030006830 | Ceramic      | C1608 JF 1C 104Z-T-A |
| C119     | 4030006860 | Ceramic      | C1608 JB 1H 102K-T-A |
| C120     | 4030006830 | Ceramic      | C1608 JF 1C 104Z-T-A |
| C121     | 4030004300 | Ceramic      | GRM39 B 682K 50PT    |
| C122     | 4030004300 | Ceramic      | GRM39 B 682K 50PT    |
| C123     | 4030006710 | Ceramic      | C1608 SL 1H 470J-T-A |
| C124     | 4030006710 | Ceramic      | C1608 SL 1H 470J-T-A |
| C125     | 4030006710 | Ceramic      | C1608 SL 1H 470J-T-A |
| C126 *   | 4550001950 | Tantalum     | DN 0J 101M           |
| C127 *   | 4510001550 | Electrolytic | 16 RC3 10 μF         |
| C128 *   | 4550002980 | Tantalum     | TEMSVA 1C 225M-8L    |
| C129     | 4030006860 | Ceramic      | C1608 JB 1H 102K-T-A |
| C130 *   | 4510001620 | Electrolytic | 50 RC3 1 μF          |
| C131 *   | 4550000460 | Tantalum     | TESVA 1C 105M1-8L    |
| C132     | 4030006860 | Ceramic      | C1608 JB 1H 102K-T-A |
| C133     | 4030006830 | Ceramic      | C1608 JF 1C 104Z-T-A |
| C134     | 4030004300 | Ceramic      | GRM39 B 682K 50PT    |
| C135     | 4030006880 | Ceramic      | C1608 JB 1H 472K-T-A |
| C136     | 4030006890 | Ceramic      | C1608 JF 1H 103Z-T-A |
| C137 *   | 4510001520 | Electrolytic | 6.3 RC3 47 μF        |
| C138     | 4030006830 | Ceramic      | C1608 JF 1C 104Z-T-A |
| C139     | 4030006860 | Ceramic      | C1608 JB 1H 102K-T-A |
| C140     | 4030006830 | Ceramic      | C1608 JF 1C 104Z-T-A |
| C141     | 4030006860 | Ceramic      | C1608 JB 1H 102K-T-A |
| C142     | 4550003250 | Tantalum     | TEMSVA 1V 474M-8L    |
| C143     | 4030006860 | Ceramic      | C1608 JB 1H 102K-T-A |
| C144 *   | 4510001550 | Electrolytic | 16 RC3 10 μF         |
| C145     | 4030006860 | Ceramic      | C1608 JB 1H 102K-T-A |
| C146     | 4030006830 | Ceramic      | C1608 JF 1C 104Z-T-A |
| C147     | 4030006890 | Ceramic      | C1608 JF 1H 103Z-T-A |
| C148 *   | 4510002280 | Electrolytic | 16 RC3 22 μF         |
| C149     | 4030007040 | Ceramic      | C1608 CH 1H 180J-T-A |
| C150     | 4030007040 | Ceramic      | C1608 CH 1H 180J-T-A |
| C151     | 4030006860 | Ceramic      | C1608 JB 1H 102K-T-A |
| C152 *   | 4550003490 | Tantalum     | DSB 0J 686M          |
| C153     | 4030006900 | Ceramic      | C1608 JB 1E 103K-T-A |
| C154     | 4030006860 | Ceramic      | C1608 JB 1H 102K-T-A |
| C155 *   | 4510002280 | Electrolytic | 16 RC3 22 μF         |
| C156 *   | 4510001520 | Electrolytic | 6.3 RC3 47 μF        |
| C158 *   | 4510001520 | Electrolytic | 6.3 RC3 47 μF        |
| C159     | 4030006860 | Ceramic      | C1608 JB 1H 102K-T-A |
| C160     | 4030006850 | Ceramic      | C1608 JB 1H 471K-T-A |
| C161     | 4030006860 | Ceramic      | C1608 JB 1H 102K-T-A |
| C162 *   | 4510002280 | Electrolytic | 16 RC3 22 μF         |
| C163 *   | 4510003390 | Electrolytic | 16 RC3 47 μF         |
| C164     | 4030006860 | Ceramic      | C1608 JB 1H 102K-T-A |
| C165 *   | 4550002950 | Tantalum     | TESVA 0J 335M1-8L    |
| C166     | 4550000360 | Tantalum     | DN 1V R47M           |
| C167     | 4030006900 | Ceramic      | C1608 JB 1E 103K-T-A |
| C168     | 4030006880 | Ceramic      | C1608 JB 1H 472K-T-A |
| C169 *   | 4550000010 | Tantalum     | DN 1C 4R7M           |
| C170     | 4030006850 | Ceramic      | C1608 JB 1H 471K-T-A |
| C171     | 4030006860 | Ceramic      | C1608 JB 1H 102K-T-A |
| C172     | 4030006890 | Ceramic      | C1608 JF 1H 103Z-T-A |
| C174     | 4030006890 | Ceramic      | C1608 JF 1H 103Z-T-A |
| C175     | 4030006860 | Ceramic      | C1608 JB 1H 102K-T-A |
| C176     | 4030006860 | Ceramic      | C1608 JB 1H 102K-T-A |
| C177     | 4030006860 | Ceramic      | C1608 JB 1H 102K-T-A |
| C178 *   | 4550000460 | Tantalum     | TESVA 1C 105M1-8L    |

\* safety critical component

**[MAIN UNIT]**

| REF. NO. | ORDER NO.  | DESCRIPTION  |                      |
|----------|------------|--------------|----------------------|
| C179     | 4030006870 | Ceramic      | C1608 JB 1H 22K-T-A  |
| C180     | 4030006850 | Ceramic      | C1608 JB 1H 471K-T-A |
| C181     | 4550000530 | Tantalum     | TESVA 1V 104M1-8L    |
| S101     | 2260000980 | Switch       | SKHHLPO14A           |
| EP1      | 0910027993 | P.C. Board   | B 2788C (MAIN)       |
| EP3      | 0910027700 | F.P.C. Board | B 2792               |

**[RF UNIT]**

| REF. NO. | ORDER NO.  | DESCRIPTION    |                        |
|----------|------------|----------------|------------------------|
| X301     | 6050002000 | Crystal        | CR-70                  |
| X302     | 6050004930 | Crystal        | CR-212                 |
| X303     | 6070000080 | Discriminator  | CDBM455C16             |
| FI301    | 2010001050 | Filter         | 21M15B3 (FL-141)       |
| FI302    | 2020000490 | Ceramic Filter | CFZM455E10             |
| L301     | 6150003170 | Coil           | LS-334                 |
| L302     | 6150003250 | Coil           | LS-335                 |
| L303     | 6150003180 | Coil           | LS-336                 |
| L304     | 6150003250 | Coil           | LS-335                 |
| L307     | 6150003140 | Coil           | LS-330                 |
| L308     | 6150003160 | Coil           | LS-332                 |
| L309     | 6150003330 | Coil           | LS-372                 |
| L310     | 6110001540 | Coil           | LA-234                 |
| L311     | 6110001540 | Coil           | LA-234                 |
| L312     | 6110002070 | Coil           | LA-227                 |
| L313     | 6180000850 | Coil           | LAL 03NA 4R7K          |
| L315     | 6110001550 | Coil           | LA-235                 |
| L316     | 6110001570 | Coil           | LA-237                 |
| L317     | 6110001570 | Coil           | LA-237                 |
| L318     | 6110001570 | Coil           | LA-237                 |
| L319     | 6110001570 | Coil           | LA-237                 |
| L320     | 6110001570 | Coil           | LA-237                 |
| L321     | 6180000680 | Coil           | LAL 02NA 4R7K          |
| L322     | 6180000680 | Coil           | LAL 02NA 4R7K          |
| L323     | 6180001510 | Coil           | LAL 02NA 101K          |
| L324     | 6150003250 | Coil           | LS-335                 |
| L325     | 6150003180 | Coil           | LS-336                 |
| L326     | 6200000760 | Coil           | LQN 2A 56NM            |
| R301     | 7030002360 | Resistor       | MCR03EZHZ 47 kΩ (473)  |
| R302     | 7030002470 | Resistor       | MCR03EZHZ 220 kΩ (224) |
| R303     | 7030002470 | Resistor       | MCR03EZHZ 220 kΩ (224) |
| R304     | 7030002360 | Resistor       | MCR03EZHZ 47 kΩ (473)  |
| R305     | 7030002410 | Resistor       | MCR03EZHZ 82 kΩ (823)  |
| R306     | 7030002440 | Resistor       | MCR03EZHZ 150 kΩ (154) |
| R307     | 7030002000 | Resistor       | MCR03EZHZ 56 Ω (560)   |
| R308     | 7030001910 | Resistor       | MCR03EZHZ 10 Ω (100)   |
| R309     | 7030002470 | Resistor       | MCR03EZHZ 220 kΩ (224) |
| R310     | 7030002470 | Resistor       | MCR03EZHZ 220 kΩ (224) |
| R312     | 7030002080 | Resistor       | MCR03EZHZ 270 Ω (271)  |
| R313     | 7030002240 | Resistor       | MCR03EZHZ 4.7 kΩ (472) |
| R314     | 7030002420 | Resistor       | MCR03EZHZ 100 kΩ (104) |
| R315     | 7030001990 | Resistor       | MCR03EZHZ 47 Ω (470)   |
| R316     | 7030001950 | Resistor       | MCR03EZHZ 22 Ω (220)   |
| R319     | 7030002360 | Resistor       | MCR03EZHZ 47 kΩ (473)  |
| R319     | 7030002180 | Resistor       | MCR03EZHZ 1.8 kΩ (182) |
| R320     | 7030002360 | Resistor       | MCR03EZHZ 47 kΩ (473)  |
| R321     | 7030002240 | Resistor       | MCR03EZHZ 4.7 kΩ (472) |
| R322     | 7030000290 | Resistor       | MCR10EZHZ 180 Ω (181)  |
| R323     | 7030000410 | Resistor       | MCR10EZHZ 1.8 kΩ (182) |
| R324     | 7030000510 | Resistor       | MCR10EZHZ 12 kΩ (123)  |
| R325     | 7030000510 | Resistor       | MCR10EZHZ 12 kΩ (123)  |
| R326     | 7030000410 | Resistor       | MCR10EZHZ 1.8 kΩ (182) |
| R327     | 7030000220 | Resistor       | MCR10EZHZ 47 Ω (470)   |
| R328     | 7030002160 | Resistor       | MCR03EZHZ 1.2 kΩ (122) |
| R329     | 7030002150 | Resistor       | MCR03EZHZ 1 kΩ (102)   |
| R330     | 7030000340 | Resistor       | MCR10EZHZ 470 Ω (471)  |
| R331     | 7030002250 | Resistor       | MCR03EZHZ 5.6 kΩ (562) |
| R332     | 7030002240 | Resistor       | MCR03EZHZ 4.7 kΩ (472) |
| R333     | 7030002280 | Resistor       | MCR03EZHZ 10 kΩ (103)  |
| R334     | 7030002320 | Resistor       | MCR03EZHZ 22 kΩ (223)  |
| R335     | 7030002060 | Resistor       | MCR03EZHZ 180 Ω (181)  |
| R336     | 7030002310 | Resistor       | MCR03EZHZ 18 kΩ (183)  |
| R337     | 7030002250 | Resistor       | MCR03EZHZ 5.6 kΩ (562) |
| R338     | 7030002280 | Resistor       | MCR03EZHZ 10 kΩ (103)  |
| R340     | 7030002050 | Resistor       | MCR03EZHZ 150 Ω (151)  |

**[RF UNIT]**

| REF. NO. | ORDER NO.  | DESCRIPTION |                  |
|----------|------------|-------------|------------------|
| IC301    | 1110002200 | IC          | MC3372MR         |
| IC302    | 1150000400 | IC          | SC1046           |
| IC303    | 1130003050 | IC          | PLL2001          |
| Q301     | 1580000390 | FET         | 3SK131K-T1       |
| Q303     | 1560000110 | FET         | 2SK241-GR        |
| Q304     | 1530000370 | Transistor  | 2SC3356-T2B      |
| Q305     | 1530000370 | Transistor  | 2SC3356-T2B      |
| Q306     | 1530000520 | Transistor  | 2SC2026          |
| Q307     | 1530000520 | Transistor  | 2SC2026          |
| Q308     | 1510000510 | Transistor  | 2SA1576 T107R    |
| Q309     | 1510000510 | Transistor  | 2SA1576 T107R    |
| Q310     | 1530002060 | Transistor  | 2SC4081 T107R    |
| Q311     | 1530002060 | Transistor  | 2SC4081 T107R    |
| Q312     | 1520000260 | Transistor  | 2SB1237 TV2R     |
| Q313     | 1510000510 | Transistor  | 2SA1576 T107R    |
| Q314     | 1560000360 | FET         | 2SK209-Y (TE85R) |
| Q315     | 1530002060 | Transistor  | 2SC4081 T107R    |
| Q316     | 1510000510 | Transistor  | 2SA1576 T107R    |
| Q317     | 1530002060 | Transistor  | 2SC4081 T107R    |
| Q318     | 1530002060 | Transistor  | 2SC4081 T107R    |
| Q319     | 1530000370 | Transistor  | 2SC3356-T2B      |
| Q320     | 1520000260 | Transistor  | 2SB1237 TV2R     |
| Q321     | 1580000400 | FET         | 3SK151-Y (TE85R) |
| Q322     | 1560000360 | FET         | 2SK209-Y (TE85R) |
| D301     | 1790000460 | Diode       | MA334B (TX)      |
| D302     | 1790000460 | Diode       | MA334B (TX)      |
| D303     | 1790000460 | Diode       | MA334B (TX)      |
| D304     | 1790000460 | Diode       | MA334B (TX)      |
| D306     | 1750000070 | Diode       | 1SS226 (TE85R)   |
| D307     | 1710000580 | Diode       | 1SS265           |
| D308     | 1790000250 | Diode       | 1SS97            |
| D309     | 1790000250 | Diode       | 1SS97            |
| D310     | 1710000580 | Diode       | 1SS265           |
| D311     | 1750000140 | Diode       | 1SS268 (TE85R)   |
| D313     | 1720000220 | Varicap     | 1SV166-T2B       |
| D314     | 1790000240 | Diode       | 1SS99            |
| D315     | 1750000160 | Diode       | DA114 T107       |
| D316     | 1730000490 | Zener       | RD6.8M-T2B2      |
| D317     | 1790000460 | Diode       | MA334B (TX)      |
| D318     | 1790000460 | Diode       | MA334B (TX)      |

\* safety critical component

## [RF UNIT]

| REF. NO. | ORDER NO.  | DESCRIPTION |                        |
|----------|------------|-------------|------------------------|
| R341     | 7030002250 | Resistor    | MCR03EZHJ 5.6 kΩ (562) |
| R342     | 7030002240 | Resistor    | MCR03EZHJ 4.7 kΩ (472) |
| R343     | 7030002320 | Resistor    | MCR03EZHJ 22 kΩ (223)  |
| R344     | 7030002550 | Resistor    | MCR03EZHJ 1 MΩ (105)   |
| R345     | 7030002360 | Resistor    | MCR03EZHJ 47 kΩ (473)  |
| R346     | 7030002410 | Resistor    | MCR03EZHJ 82 kΩ (823)  |
| R347     | 7030002420 | Resistor    | MCR03EZHJ 100 kΩ (104) |
| R348     | 7030002520 | Resistor    | MCR03EZHJ 560 kΩ (564) |
| R349     | 7030002320 | Resistor    | MCR03EZHJ 22 kΩ (223)  |
| R350     | 7030002180 | Resistor    | MCR03EZHJ 1.8 kΩ (182) |
| R351     | 7030002240 | Resistor    | MCR03EZHJ 4.7 kΩ (472) |
| R352     | 7310001760 | Trimmer     | RH0421CJ4J09A (223)    |
| R353     | 7310001810 | Trimmer     | RH0421CN4J02A (333)    |
| R354     | 7030000400 | Resistor    | MCR10EZHJ 1.5 kΩ (152) |
| R355     | 7030000400 | Resistor    | MCR10EZHJ 1.5 kΩ (152) |
| R357     | 7030002260 | Resistor    | MCR03EZHJ 6.8 kΩ (682) |
| R358     | 7030002540 | Resistor    | MCR03EZHJ 820 kΩ (824) |
| R359     | 7030002430 | Resistor    | MCR03EZHJ 120 kΩ (124) |
| R360     | 7030002300 | Resistor    | MCR03EZHJ 15 kΩ (153)  |
| R361     | 7510000090 | Thermistor  | ERT-D2FGL202S          |
| R362     | 7030002280 | Resistor    | MCR03EZHJ 10 kΩ (103)  |
| R363     | 7030002250 | Resistor    | MCR03EZHJ 5.6 kΩ (562) |
| R364     | 7510000090 | Thermistor  | ERT-D2FGL202S          |
| R365     | 7030002260 | Resistor    | MCR03EZHJ 6.8 kΩ (682) |
| R366     | 7030002430 | Resistor    | MCR03EZHJ 120 kΩ (124) |
| R367     | 7030002400 | Resistor    | MCR03EZHJ 68 kΩ (683)  |
| R368     | 7030002200 | Resistor    | MCR03EZHJ 2.2 kΩ (222) |
| R369     | 7030002030 | Resistor    | MCR03EZHJ 100 Ω (101)  |
| R370     | 7030000400 | Resistor    | MCR10EZHJ 1.5 kΩ (152) |
| R371     | 7030002240 | Resistor    | MCR03EZHJ 4.7 kΩ (472) |
| R372     | 7030002280 | Resistor    | MCR03EZHJ 10 kΩ (103)  |
| R373     | 7030002220 | Resistor    | MCR03EZHJ 3.3 kΩ (332) |
| R374     | 7030002380 | Resistor    | MCR03EZHJ 56 kΩ (563)  |
| R375     | 7030002420 | Resistor    | MCR03EZHJ 100 kΩ (104) |
| R376     | 7030002280 | Resistor    | MCR03EZHJ 10 kΩ (103)  |
| R377     | 7030000140 | Resistor    | MCR10EZHJ 10 Ω (100)   |
| R378     | 7030002220 | Resistor    | MCR03EZHJ 3.3 kΩ (332) |
| R379     | 7030000270 | Resistor    | MCR10EZHJ 120 Ω (121)  |
| R380     | 7030002180 | Resistor    | MCR03EZHJ 1.8 kΩ (182) |
| R381     | 7030000300 | Resistor    | MCR10EZHJ 220 Ω (221)  |
| R383     | 7030002360 | Resistor    | MCR03EZHJ 47 kΩ (473)  |
| R384     | 7030001990 | Resistor    | MCR03EZHJ 47 Ω (470)   |
| R388     | 7030002200 | Resistor    | MCR03EZHJ 2.2 kΩ (222) |
| R389     | 7030002510 | Resistor    | MCR03EZHJ 470 kΩ (474) |
| R390     | 7030002110 | Resistor    | MCR03EZHJ 470 Ω (471)  |
| R391     | 7030002440 | Resistor    | MCR03EZHJ 150 kΩ (154) |
| R392     | 7030002420 | Resistor    | MCR03EZHJ 100 kΩ (104) |
| R393     | 7030002430 | Resistor    | MCR03EZHJ 120 kΩ (124) |
| R394     | 7030002420 | Resistor    | MCR03EZHJ 100 kΩ (104) |
| R395     | 7030002420 | Resistor    | MCR03EZHJ 100 kΩ (104) |
| R396     | 7030002470 | Resistor    | MCR03EZHJ 220 kΩ (224) |
| R397     | 7030002470 | Resistor    | MCR03EZHJ 220 kΩ (224) |
| R398     | 7030001970 | Resistor    | MCR03EZHJ 33 Ω (330)   |
| C301     | 4030006750 | Ceramic     | C1608 SL 1H 101J-T-A   |
| C302     | 4030006860 | Ceramic     | C1608 JB 1H 102K-T-A   |
| C303     | 4030006860 | Ceramic     | C1608 JB 1H 102K-T-A   |
| C304     | 4030006520 | Ceramic     | C1608 SL 1H 010C-T-A   |
| C305     | 4030006660 | Ceramic     | C1608 SL 1H 220J-T-A   |
| C306     | 4030006860 | Ceramic     | C1608 JB 1H 102K-T-A   |
| C307     | 4030006860 | Ceramic     | C1608 JB 1H 102K-T-A   |
| C308     | 4030006860 | Ceramic     | C1608 JB 1H 102K-T-A   |
| C309     | 4030006660 | Ceramic     | C1608 SL 1H 220J-T-A   |
| C310     | 4030006510 | Ceramic     | C1608 SL 1H 0R5C-T-A   |
| C312     | 4030006670 | Ceramic     | C1608 SL 1H 270J-T-A   |
| C313     | 4030006580 | Ceramic     | C1608 SL 1H 070D-T-A   |
| C319     | 4030006860 | Ceramic     | C1608 JB 1H 102K-T-A   |
| C320     | 4030006560 | Ceramic     | C1608 SL 1H 050C-T-A   |
| C321     | 4030006780 | Ceramic     | C1608 SL 1H 181J-T-A   |
| C322     | 4030006860 | Ceramic     | C1608 JB 1H 102K-T-A   |

## [RF UNIT]

| REF. NO. | ORDER NO.  | DESCRIPTION |                      |
|----------|------------|-------------|----------------------|
| C323     | 4030006860 | Ceramic     | C1608 JB 1H 102K-T-A |
| C324     | 4030006700 | Ceramic     | C1608 SL 1H 390J-T-A |
| C325     | 4030008630 | Ceramic     | C1608 JF 1C 104Z-T-A |
| C326     | 4030006800 | Ceramic     | C1608 SL 1H 221J-T-A |
| C328     | 4030006760 | Ceramic     | C1608 SL 1H 121J-T-A |
| C329     | 4030006730 | Ceramic     | C1608 SL 1H 680J-T-A |
| C330     | 4030008430 | Ceramic     | C1608 JF 1H 223Z-T-A |
| C331     | 4030008630 | Ceramic     | C1608 JF 1C 104Z-T-A |
| C332     | 4030006670 | Ceramic     | C1608 SL 1H 270J-T-A |
| C333     | 4030008630 | Ceramic     | C1608 JF 1C 104Z-T-A |
| C334 *   | 4550003030 | Tantalum    | TEMSVA 0J 475M-8L    |
| C336     | 4030006780 | Ceramic     | C1608 SL 1H 181J-T-A |
| C337     | 4030006670 | Ceramic     | C1608 SL 1H 270J-T-A |
| C338     | 4030006670 | Ceramic     | C1608 SL 1H 270J-T-A |
| C339     | 4030006860 | Ceramic     | C1608 JB 1H 102K-T-A |
| C340     | 4030006620 | Ceramic     | C1608 SL 1H 120J-T-A |
| C341     | 4030006590 | Ceramic     | C1608 SL 1H 080D-T-A |
| C342     | 4030006670 | Ceramic     | C1608 SL 1H 270J-T-A |
| C343     | 4030006530 | Ceramic     | C1608 SL 1H 020C-T-A |
| C344     | 4030006630 | Ceramic     | C1608 SL 1H 150J-T-A |
| C345     | 4030006850 | Ceramic     | C1608 JB 1H 471K-T-A |
| C346     | 4030006860 | Ceramic     | C1608 JB 1H 102K-T-A |
| C347     | 4030006850 | Ceramic     | C1608 JB 1H 471K-T-A |
| C348     | 4030006850 | Ceramic     | C1608 JB 1H 471K-T-A |
| C350 *   | 4550003030 | Tantalum    | TEMSVA 0J 475M-8L    |
| C351     | 4030006850 | Ceramic     | C1608 JB 1H 471K-T-A |
| C352     | 4030006640 | Ceramic     | C1608 SL 1H 180J-T-A |
| C353     | 4030006640 | Ceramic     | C1608 SL 1H 180J-T-A |
| C354     | 4030006850 | Ceramic     | C1608 JB 1H 471K-T-A |
| C355     | 4030006860 | Ceramic     | C1608 JB 1H 102K-T-A |
| C356     | 4030006860 | Ceramic     | C1608 JB 1H 102K-T-A |
| C357     | 4030008630 | Ceramic     | C1608 JF 1C 104Z-T-A |
| C358     | 4030006860 | Ceramic     | C1608 JB 1H 102K-T-A |
| C359     | 4030006860 | Ceramic     | C1608 JB 1H 102K-T-A |
| C360     | 4030006630 | Ceramic     | C1608 SL 1H 150J-T-A |
| C361 *   | 4550000400 | Tantalum    | DN 1C 2R2M           |
| C362     | 4030006860 | Ceramic     | C1608 JB 1H 102K-T-A |
| C363     | 4030008630 | Ceramic     | C1608 JF 1C 104Z-T-A |
| C364     | 4030006860 | Ceramic     | C1608 JB 1H 102K-T-A |
| C365     | 4030008630 | Ceramic     | C1608 JF 1C 104Z-T-A |
| C366     | 4030006860 | Ceramic     | C1608 JB 1H 102K-T-A |
| C367     | 4030006860 | Ceramic     | C1608 JB 1H 102K-T-A |
| C368     | 4030006860 | Ceramic     | C1608 JB 1H 102K-T-A |
| C369     | 4030006670 | Ceramic     | C1608 SL 1H 270J-T-A |
| C370     | 4030006860 | Ceramic     | C1608 JB 1H 102K-T-A |
| C371     | 4030006860 | Ceramic     | C1608 JB 1H 102K-T-A |
| C372     | 4030006530 | Ceramic     | C1608 SL 1H 020C-T-A |
| C373     | 4030006860 | Ceramic     | C1608 JB 1H 102K-T-A |
| C374     | 4030006860 | Ceramic     | C1608 JB 1H 102K-T-A |
| C375     | 4030006610 | Ceramic     | C1608 SL 1H 100D-T-A |
| C376     | 4030006860 | Ceramic     | C1608 JB 1H 102K-T-A |
| C377     | 4030006660 | Ceramic     | C1608 SL 1H 220J-T-A |
| C379     | 4030006550 | Ceramic     | C1608 SL 1H 040C-T-A |
| C381 *   | 4550000740 | Tantalum    | TESVB2 0J 685M-8L    |
| C382 *   | 4550000010 | Tantalum    | DN 1C 4R7M           |
| C383     | 4030006860 | Ceramic     | C1608 JB 1H 102K-T-A |
| C385     | 4030006660 | Ceramic     | C1608 SL 1H 220J-T-A |
| C386     | 4030006860 | Ceramic     | C1608 JB 1H 102K-T-A |
| C389     | 4030006860 | Ceramic     | C1608 JB 1H 102K-T-A |
| C390     | 4030006960 | Ceramic     | C1608 CH 1H 050C-T-A |
| C391     | 4030007070 | Ceramic     | C1608 CH 1H 330J-T-A |
| C393     | 4610000380 | Trimmer     | ECRGA020E30          |
| C394     | 4030006800 | Ceramic     | C1608 SL 1H 221J-T-A |
| C395     | 4030006750 | Ceramic     | C1608 SL 1H 101J-T-A |
| C396     | 4030008430 | Ceramic     | C1608 JF 1H 223Z-T-A |
| C397     | 4030008630 | Ceramic     | C1608 JF 1C 104Z-T-A |
| C398 *   | 4550003100 | Tantalum    | TEMSVB 1A 106M-12 L  |
| C399     | 4030008630 | Ceramic     | C1608 JF 1C 104Z-T-A |
| C400     | 4030006860 | Ceramic     | C1608 JB 1H 102K-T-A |
| C401     | 4030006750 | Ceramic     | C1608 SL 1H 101J-T-A |
| C402     | 4030006860 | Ceramic     | C1608 JB 1H 102K-T-A |

\* safety critical component

[RF UNIT]

| REF. NO. | ORDER NO.  | DESCRIPTION    |                      |
|----------|------------|----------------|----------------------|
| C403     | 4030006630 | Ceramic        | C1608 JF 1C 104Z-T-A |
| C404     | 4030006860 | Ceramic        | C1608 JB 1H 102K-T-A |
| C405     | 4030006690 | Ceramic        | C1608 SL 1H 330J-T-A |
| C406     | 4030006860 | Ceramic        | C1608 JB 1H 102K-T-A |
| C407 *   | 4550003030 | Tantalum       | TEMSVA 0J 475M-8L    |
| C408     | 4030006860 | Ceramic        | C1608 JB 1H 102K-T-A |
| C410     | 4030006860 | Ceramic        | C1608 JB 1H 102K-T-A |
| C411     | 4030006860 | Ceramic        | C1608 JB 1H 102K-T-A |
| C412     | 4030006630 | Ceramic        | C1608 SL 1H 150J-T-A |
| C413     | 4030006850 | Ceramic        | C1608 JB 1H 471K-T-A |
| C414     | 4030006620 | Ceramic        | C1608 SL 1H 120J-T-A |
| C415     | 4030006860 | Ceramic        | C1608 JB 1H 102K-T-A |
| C419     | 4030006580 | Ceramic        | C1608 SL 1H 070D-T-A |
| C420     | 4030006550 | Ceramic        | C1608 SL 1H 040C-T-A |
| C421     | 4030006550 | Ceramic        | C1608 SL 1H 040C-T-A |
| C422     | 4030006630 | Ceramic        | C1608 SL 1H 150J-T-A |
| C423     | 4030006510 | Ceramic        | C1608 SL 1H 0R5C-T-A |
| C424     | 4030006550 | Ceramic        | C1608 SL 1H 040C-T-A |
| C425     | 4030006660 | Ceramic        | C1608 SL 1H 220J-T-A |
| C426     | 4030006540 | Ceramic        | C1608 SL 1H 030C-T-A |
| C427     | 4030006540 | Ceramic        | C1608 SL 1H 030C-T-A |
| C428     | 4030006630 | Ceramic        | C1608 SL 1H 150J-T-A |
| C429     | 4030006710 | Ceramic        | C1608 SL 1H 470J-T-A |
| C430     | 4030006630 | Ceramic        | C1608 SL 1H 150J-T-A |
| C431     | 4030006570 | Ceramic        | C1608 SL 1H 060D-T-A |
| C432     | 4030006630 | Ceramic        | C1608 JF 1C 104Z-T-A |
| C433     | 4030006850 | Ceramic        | C1608 JB 1H 471K-T-A |
| C434 *   | 4550002840 | Tantalum       | TESVB 0J 475M-12L    |
| C435     | 4030006890 | Ceramic        | C1608 JF 1H 103Z-T-A |
| C436     | 4030008430 | Ceramic        | C1608 JF 1H 223Z-T-A |
| C437     | 4030006870 | Ceramic        | C1608 JB 1H 222K-T-A |
| C438     | 4030006860 | Ceramic        | C1608 JB 1H 102K-T-A |
| C439     | 4030006860 | Ceramic        | C1608 JB 1H 102K-T-A |
| C440     | 4030006860 | Ceramic        | C1608 JB 1H 102K-T-A |
| C441     | 4030006860 | Ceramic        | C1608 JB 1H 102K-T-A |
| FI301    | 2010001050 | Filter         | 21M15B3 (FL-141)     |
| FI302    | 2020000490 | Ceramic Filter | CFZM455E10           |
| EP1      | 0910027924 | P.C. Board     | B 2789D (RF)         |
| EP5      | 6910000970 | Lead Frame     | DL 2OP 2.6-3-1.2H    |

[VCO UNIT]

| REF. NO. | ORDER NO.  | DESCRIPTION |                        |
|----------|------------|-------------|------------------------|
| L505     | 6180002380 | Coil        | LAL 02NA 2R2K          |
| L506     | 6180002380 | Coil        | LAL 02NA 2R2K          |
| R501     | 7030000620 | Resistor    | MCR10EZHZ 100 kΩ (104) |
| R502     | 7030000140 | Resistor    | MCR10EZHZ 10 Ω (100)   |
| C501     | 4030004710 | Ceramic     | C2012 JB 1H 471K-T-A   |
| C503     | 4030004980 | Ceramic     | C2012 CH 1H 820J-T-A   |
| C504     | 4030004870 | Ceramic     | C2012 CH 1H 100D-T-A   |
| C505     | 4030004720 | Ceramic     | C2012 JB 1H 102K-T-A   |
| C506     | 4030004990 | Ceramic     | C2012 CH 1H 101J-T-A   |
| C507     | 4030004970 | Ceramic     | C2012 CH 1H 680J-T-A   |
| C508     | 4030004820 | Ceramic     | C2012 CH 1H 050C-T-A   |
| C509     | 4030004800 | Ceramic     | C2012 CH 1H 030C-T-A   |
| C510     | 4030004720 | Ceramic     | C2012 JB 1H 102K-T-A   |
| C512     | 4010000010 | Ceramic     | DD104 SL 0R5C 50V      |
| C514     | 4030004820 | Ceramic     | C2012 CH 1H 050C-T-A   |
| C515     | 4030004720 | Ceramic     | C2012 JB 1H 102K-T-A   |
| C516     | 4030006450 | Ceramic     | C2012 JF 1H 103Z-T-A   |
| EP1      | 0910027641 | P.C. Board  | B 2721A (VCO)          |

[SQL UNIT]

| REF. NO. | ORDER NO.  | DESCRIPTION |                        |
|----------|------------|-------------|------------------------|
| Q602     | 1530002060 | Transistor  | 2SC4081 T107R          |
| Q603     | 1530002060 | Transistor  | 2SC4081 T107R          |
| D602     | 1790000490 | Diode       | HSM88AS-TR             |
| D603     | 1750000160 | Diode       | DA114 T107             |
| D604     | 1790000490 | Diode       | HSM88AS-TR             |
| R602     | 7030002410 | Resistor    | MCR03EZHZ 82 kΩ (823)  |
| R603     | 7030002170 | Resistor    | MCR03EZHZ 1.5 kΩ (152) |
| R604     | 7030002220 | Resistor    | MCR03EZHZ 3.3 kΩ (332) |
| R613     | 7030002480 | Resistor    | MCR03EZHZ 270 kΩ (274) |
| R614     | 7030002220 | Resistor    | MCR03EZHZ 3.3 kΩ (332) |
| R615     | 7030002030 | Resistor    | MCR03EZHZ 100 Ω (101)  |
| R616     | 7030002330 | Resistor    | MCR03EZHZ 27 kΩ (273)  |
| R617     | 7030002420 | Resistor    | MCR03EZHZ 100 kΩ (104) |
| R618     | 7030002420 | Resistor    | MCR03EZHZ 100 kΩ (104) |
| R619     | 7030002340 | Resistor    | MCR03EZHZ 33 kΩ (333)  |
| R620     | 7030002360 | Resistor    | MCR03EZHZ 47 kΩ (473)  |
| R621     | 7030002420 | Resistor    | MCR03EZHZ 100 kΩ (104) |
| R623     | 7510000440 | Thermistor  | DTN-T203E681LS (T)     |
| R624     | 7030002130 | Resistor    | MCR03EZHZ 680 Ω (681)  |
| C602     | 4030006860 | Ceramic     | C1608 JB 1H 102K-T-A   |
| C603     | 4030006860 | Ceramic     | C1608 JB 1H 102K-T-A   |
| C604     | 4030006860 | Ceramic     | C1608 JB 1H 102K-T-A   |
| C606     | 4030006860 | Ceramic     | C1608 JB 1H 102K-T-A   |
| C610     | 4030006860 | Ceramic     | C1608 JB 1H 102K-T-A   |
| C611     | 4030006860 | Ceramic     | C1608 JB 1H 102K-T-A   |

[VCO UNIT]

| REF. NO. | ORDER NO.  | DESCRIPTION |                  |
|----------|------------|-------------|------------------|
| Q501     | 1560000270 | FET         | 2SK302-Y (TE85R) |
| D501     | 1710000580 | Diode       | 1SS265           |
| D502     | 1720000220 | Varicap     | 1SV166-T2B       |
| D503     | 1720000220 | Varicap     | 1SV166-T2B       |
| L501     | 6130002390 | Coil        | LB-262           |
| L502     | 6180000680 | Coil        | LAL 02NA 4R7K    |
| L503     | 6180002380 | Coil        | LAL 02NA 2R2K    |
| L504     | 6180000680 | Coil        | LAL 02NA 4R7K    |

\* safety critical component

**[SQL UNIT]**

| REF. NO. | ORDER NO.  | DESCRIPTION |                      |
|----------|------------|-------------|----------------------|
| C612     | 4030008430 | Ceramic     | C1608 JF 1H 223Z-T-A |
| C613 *   | 4550002860 | Tantalum    | TESVA 1V 224K1-8L    |
| C614 *   | 4550000540 | Tantalum    | TESVA 1V 154M1-8L    |
| C615     | 4030006900 | Ceramic     | C1608 JB 1E 103K-T-A |
| EP1      | 0910027681 | P.C. Board  | B 2786A (SQL)        |

**[LPF UNIT]**

| REF. NO. | ORDER NO.  | DESCRIPTION |                                |
|----------|------------|-------------|--------------------------------|
| IC701    | 1130001250 | IC          | $\mu$ PD4066BG-T1              |
| R702     | 7030002210 | Resistor    | MCR03EZHJ 2.7 k $\Omega$ (272) |
| R704     | 7030002150 | Resistor    | MCR03EZHJ 1 k $\Omega$ (102)   |
| R705     | 7030002200 | Resistor    | MCR03EZHJ 2.2 k $\Omega$ (222) |
| R706     | 7030002090 | Resistor    | MCR03EZHJ 330 $\Omega$ (331)   |
| C701     | 4030008630 | Ceramic     | C1608 JF 1C 104Z-T-A           |
| C702 *   | 4550003280 | Tantalum    | TEMSVB 1V 225M-12 L            |
| C703     | 4030008630 | Ceramic     | C1608 JF 1C 104Z-T-A           |
| C704     | 4030008630 | Ceramic     | C1608 JF 1C 104Z-T-A           |
| EP1      | 0910028541 | P.C. Board  | B 2897A (LPF)                  |

\* safety critical component

# SECTION 7 ADJUSTMENT PROCEDURES

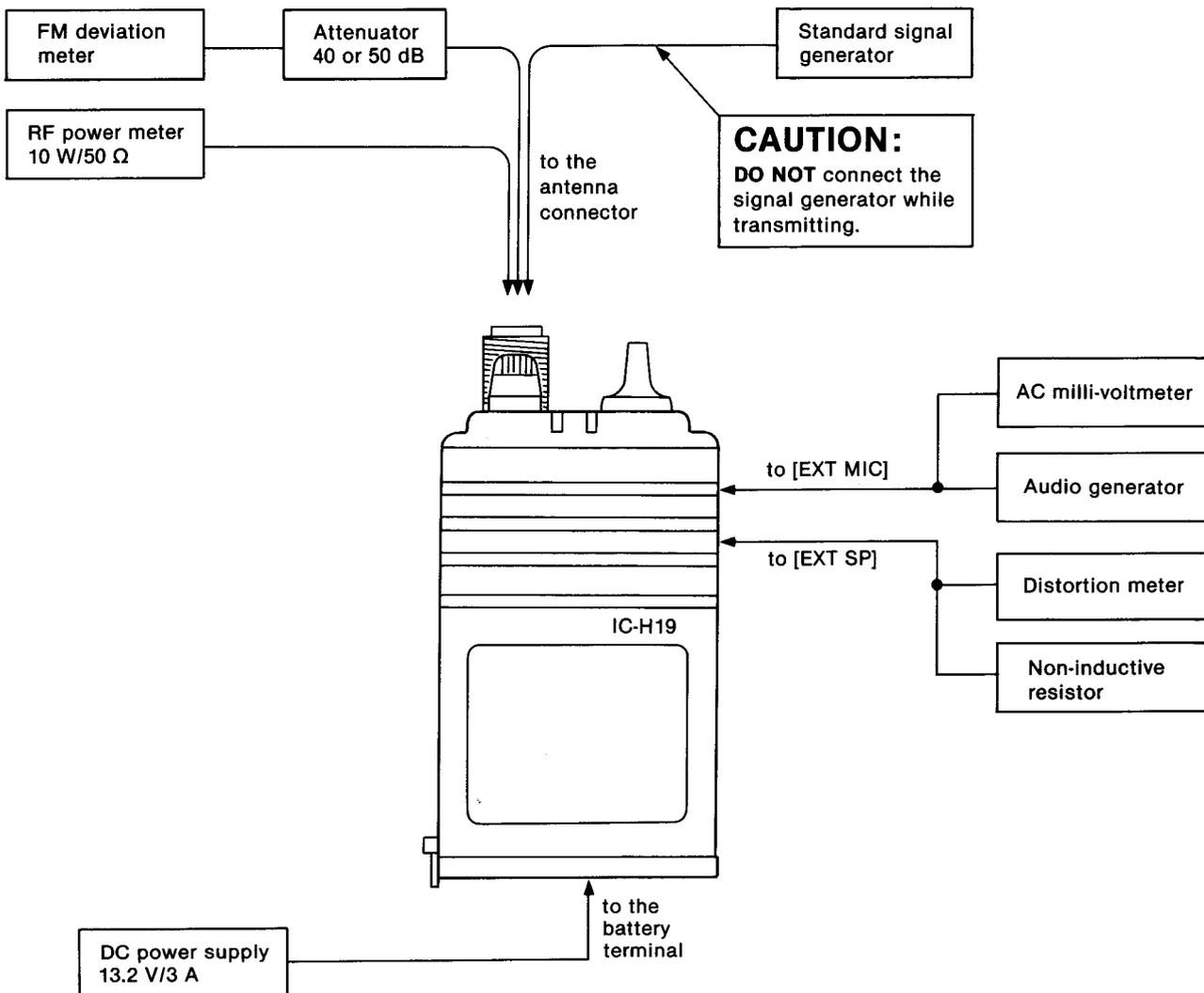
## 7-1 PREPARATION BEFORE SERVICING

### REQUIRED TEST EQUIPMENT

| EQUIPMENT                        | GRADE AND RANGE  | EQUIPMENT              | GRADE AND RANGE  |
|----------------------------------|--|------------------------|--|
| DC power supply                  | Output voltage : 13.2 V DC<br>Current capacity : 3 A or more   | Audio generator        | Frequency range : 300~3000 Hz<br>Output level : 1~200 mV   |
| RF power meter (terminated type) | Measuring range : 1~10 W<br>Frequency range : 120~180 MHz<br>Impedance : 50 Ω<br>SWR : Less than 1.2 : 1 | Attenuator             | Power attenuation : 40 or 50 dB<br>Capacity : 10 W or more |
| Frequency counter                | Frequency range : 0.1~180 MHz<br>Frequency accuracy : ±1 ppm or better<br>Sensitivity : 100 mV or better | AC milli-voltmeter     | Measuring range : 2~200 mV                                 |
| Distortion meter                 | Frequency range : 1 kHz ± 10 Hz<br>Measuring range : 1~100 %   | Non-inductive resistor | Impedance : 8 Ω  |
| Standard signal generator (SSG)  | Frequency range : 0.1~180 MHz<br>Output level : -127~-17 dBm<br>(0.1 μV~32 mV)                           | DC voltmeter           | Input impedance : 50 kΩ/DC or better                       |
|                                  |  | FM deviation meter     | Frequency minimum : 480 MHz<br>Measuring range : 0~±5 kHz  |

CW: Clockwise  
CCW: Counterclockwise

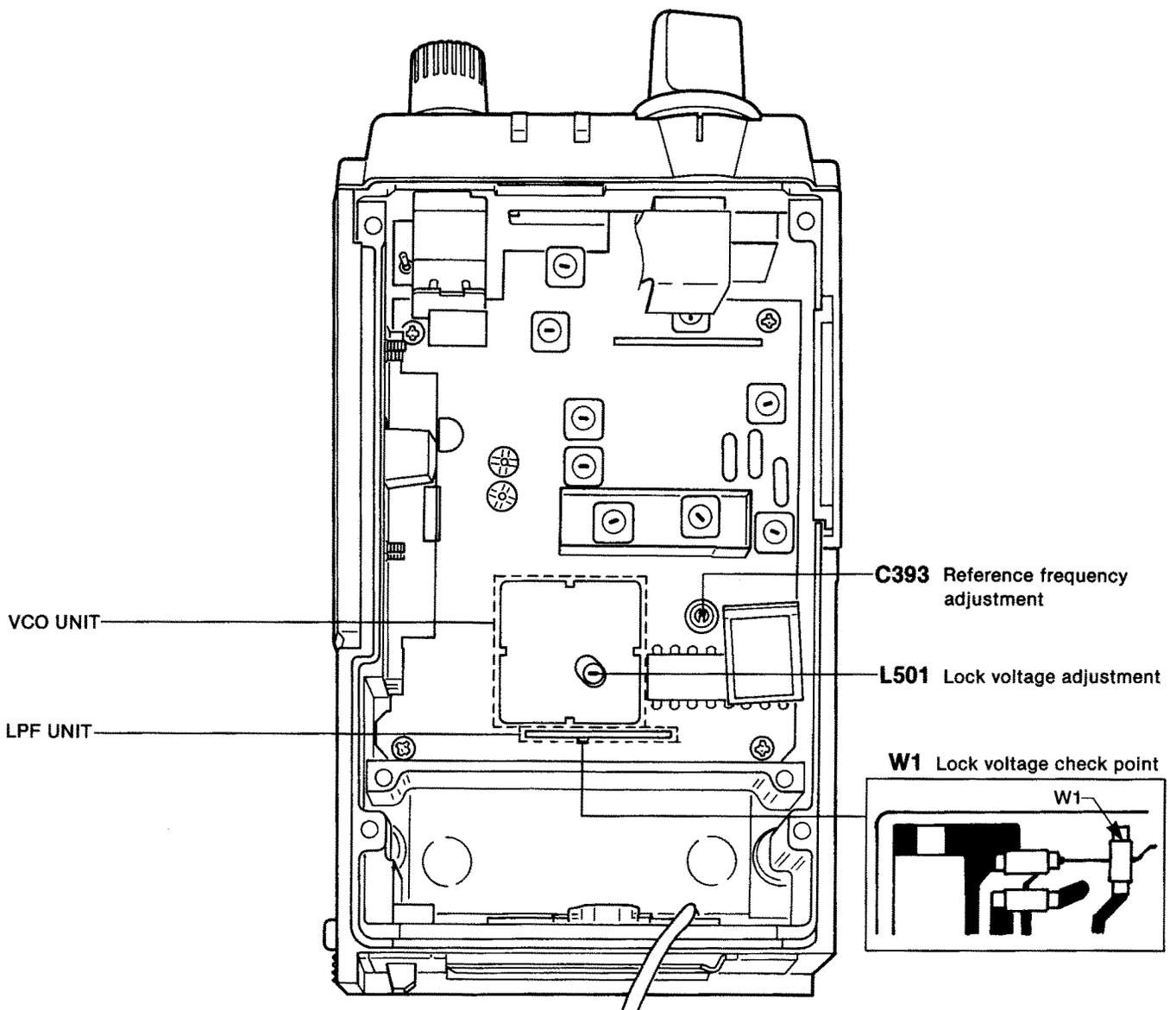
### CONNECTION



## 7-2 PLL ADJUSTMENT

| ADJUSTMENT          | ADJUSTMENT CONDITIONS   | MEASUREMENT |  | VALUE  | ADJUSTMENT POINT |        |  |
|---------------------|---|-------------|--|--|------------------|--------|--|
|                     |   | UNIT        | LOCATION   |  | UNIT             | ADJUST |  |
| REFERENCE FREQUENCY | 1 <ul style="list-style-type: none"> <li>• Select any channel.</li> <li>• Connect the RF power meter or a 50 <math>\Omega</math> dummy load.</li> <li>• Transmitting</li> </ul> | Top panel   | Loosely couple the frequency counter to the antenna connector. | Same frequency as the programmed one. To check the programmed frequency, use the EX-704. | RF               | C393   |  |
| LOCK VOLTAGE        | NOTE: Lock voltage affects the C/N ratio. If you adjust the lock voltage, set the frequency with the EX-704.  |             |  |  |                  |        |  |
|                     | 1 <ul style="list-style-type: none"> <li>• Operating frequency : 150.0000 MHz</li> <li>• Receiving</li> </ul>   | LPF         | Connect the DC voltmeter to W1.                                | 1.0 V  | VCO              | L501   |  |

### • RF UNIT

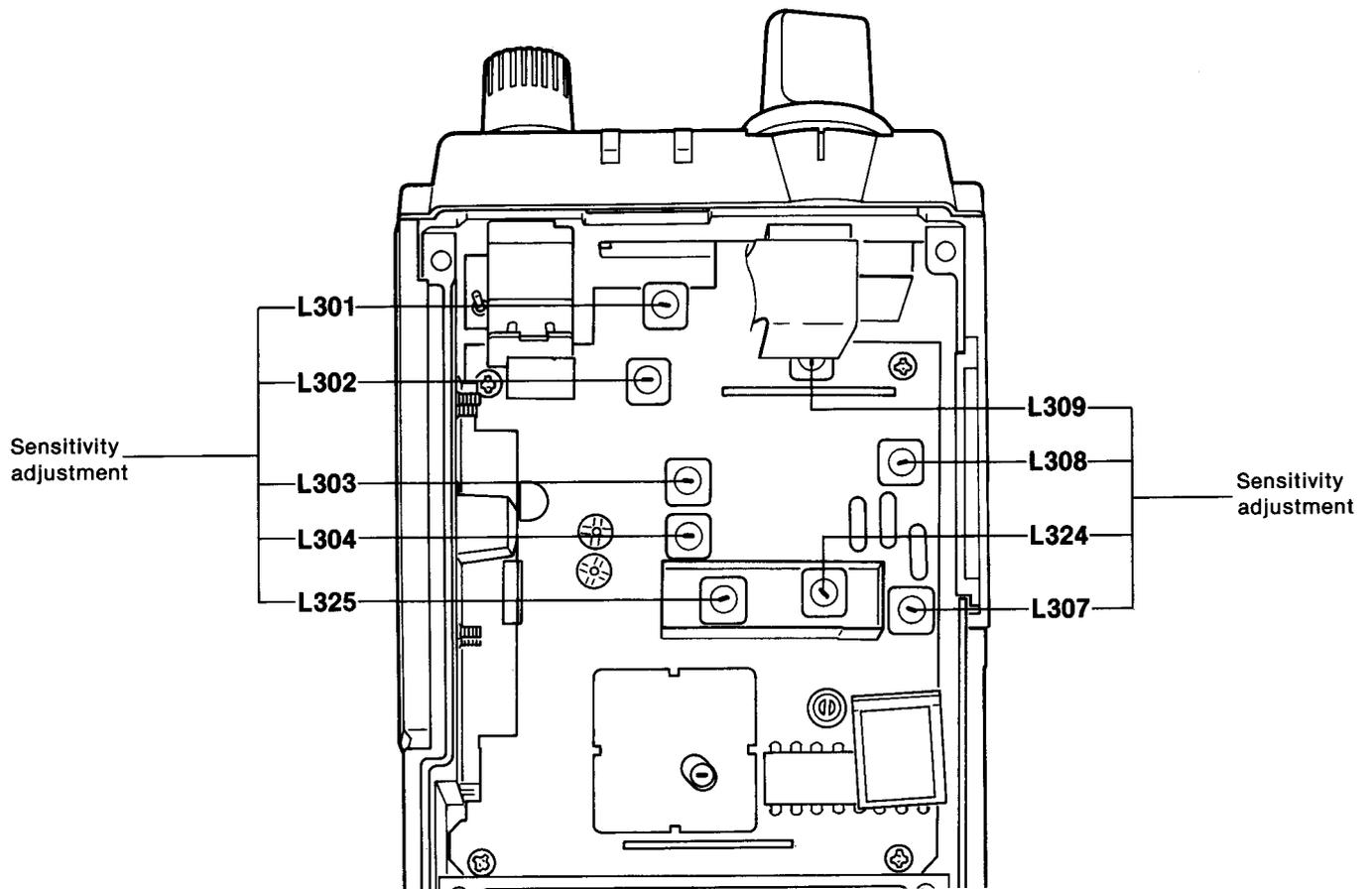


### 7-3 RECEIVER ADJUSTMENT

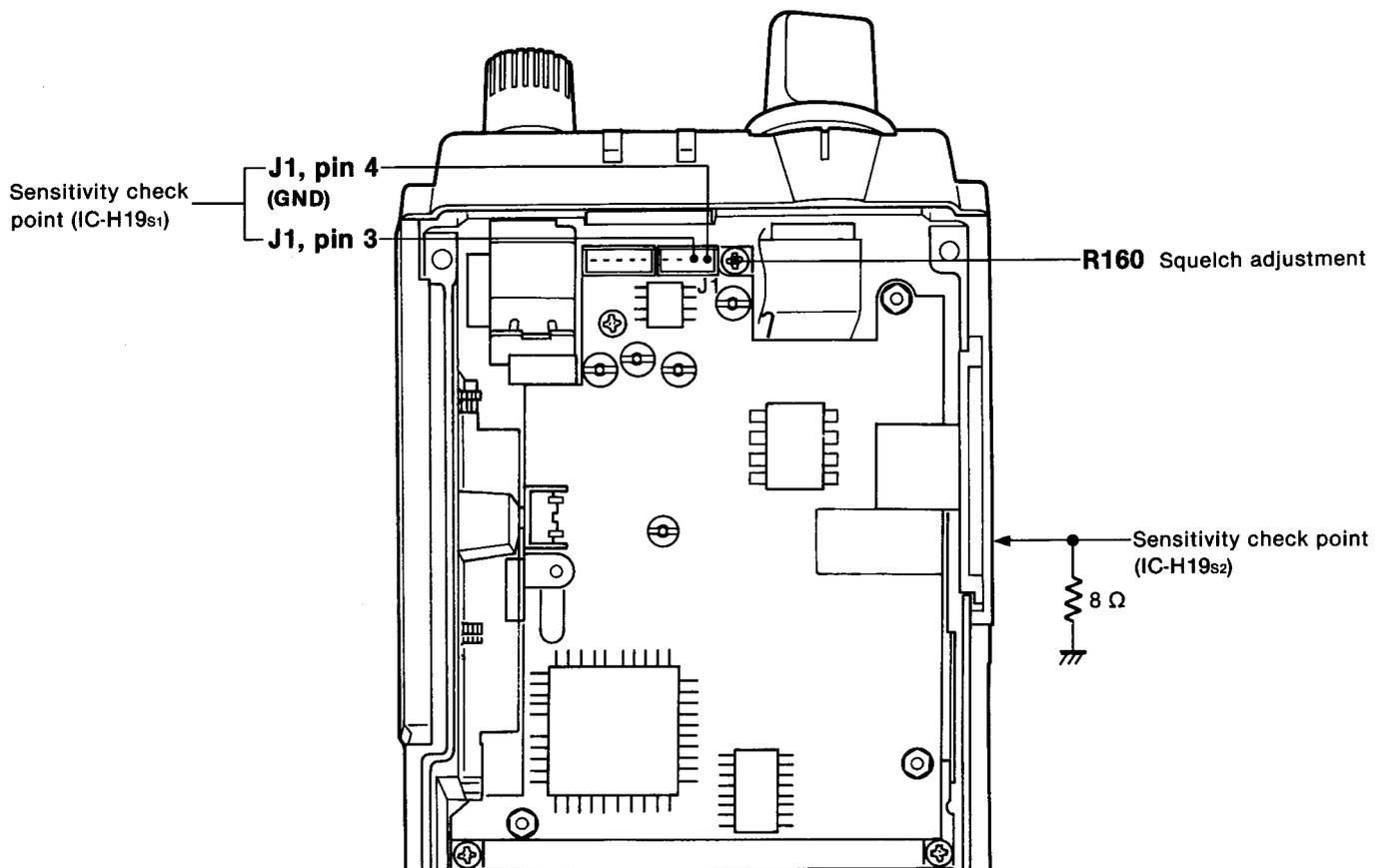
| ADJUSTMENT  | ADJUSTMENT CONDITIONS   | MEASUREMENT  |                    | VALUE   | ADJUSTMENT POINT         |        |  |
|-------------|---|--|--------------------|---|--------------------------|--------|--|
|             |   | UNIT   | LOCATION           |   | UNIT                     | ADJUST |  |
| SENSITIVITY | NOTE: When the sensitivity is less than 0.25 $\mu$ V (12 dB SINAD) on every channel, the following sensitivity adjustment is not necessary. Skip to squelch adjustment below. |  |                    |   |                          |        |  |
|             | 1   | <ul style="list-style-type: none"> <li>Operating frequency: Center of the frequency edge.</li> <li>Connect the SSG to the antenna connector and set as:                             <ul style="list-style-type: none"> <li>Level : 1.0 mV* (-47 dBm)</li> <li>Modulation: 1 kHz</li> <li>Deviation : <math>\pm</math>3.5 kHz</li> </ul> </li> <li>[MONITOR] switch: ON</li> <li>Receiving</li> </ul> | MAIN or Side panel | IC-H19s <sub>1</sub> :<br>Connect the distortion meter to J1, pins 3 and 4.<br><br>IC-H19s <sub>2</sub> :<br>Connect the distortion meter to the [EXT SP] jack with an 8 $\Omega$ load. | Minimum distortion level | RF     | Adjust in sequence<br>L301<br>L302<br>L303<br>L304<br>L325<br>L324<br>L307<br>L308<br>L309 |
|             | 2   | <ul style="list-style-type: none"> <li>Connect the SSG to the antenna connector and set as:                             <ul style="list-style-type: none"> <li>Level : 0.1 V* (-7 dBm)</li> <li>Modulation: 1 kHz</li> <li>Deviation : <math>\pm</math>3.5 kHz</li> </ul> </li> </ul>  |                    |   |                          |        | Adjust in sequence<br>L307<br>L308<br>L309   |
| SQUELCH     | NOTE: Before squelch adjustment, be sure that the sensitivity on every channel is less than 0.25 $\mu$ V (12 dB SINAD).   |  |                    |   |                          |        |  |
|             | 1   | <ul style="list-style-type: none"> <li>Connect the SSG to the antenna connector and set as:                             <ul style="list-style-type: none"> <li>Level : 0.2 <math>\mu</math>V* (-121 dBm)</li> <li>Modulation: 1 kHz</li> <li>Deviation : <math>\pm</math>3.5 kHz</li> </ul> </li> <li>R160 (MAIN): Max. CCW</li> <li>Receiving</li> </ul>  | Front panel        | Speaker   | Squelch threshold point  | MAIN   | R160   |

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

• RF UNIT



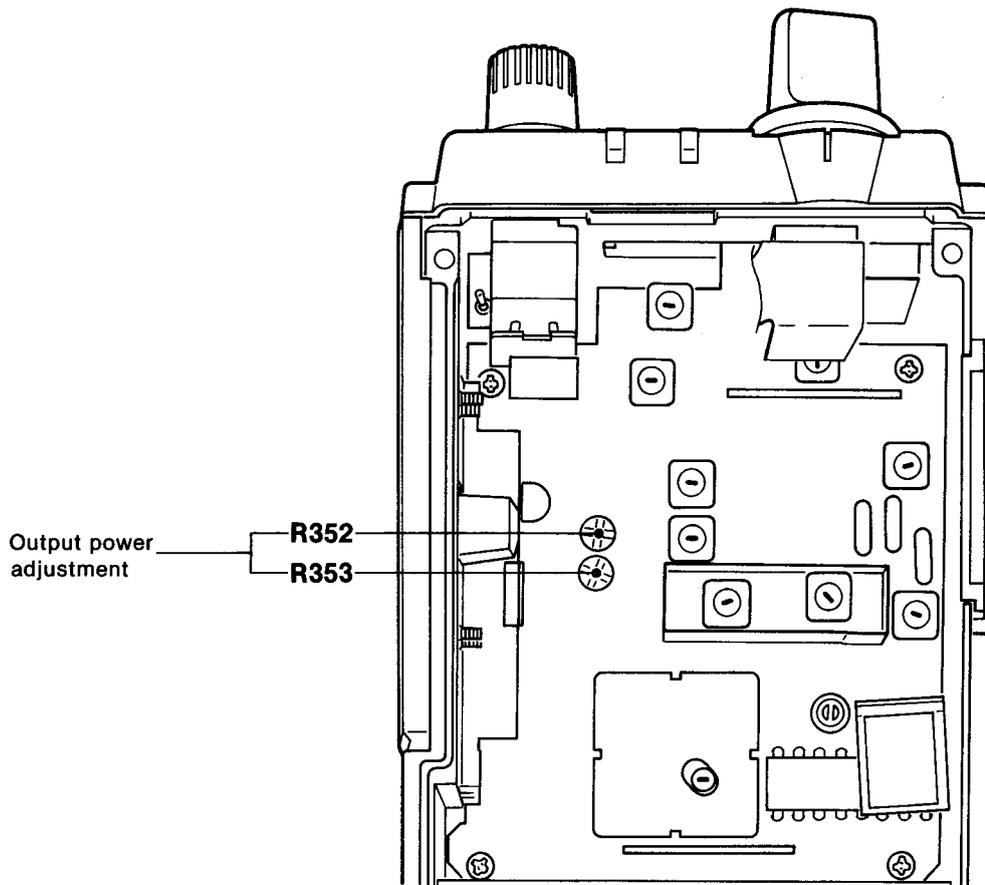
• MAIN UNIT



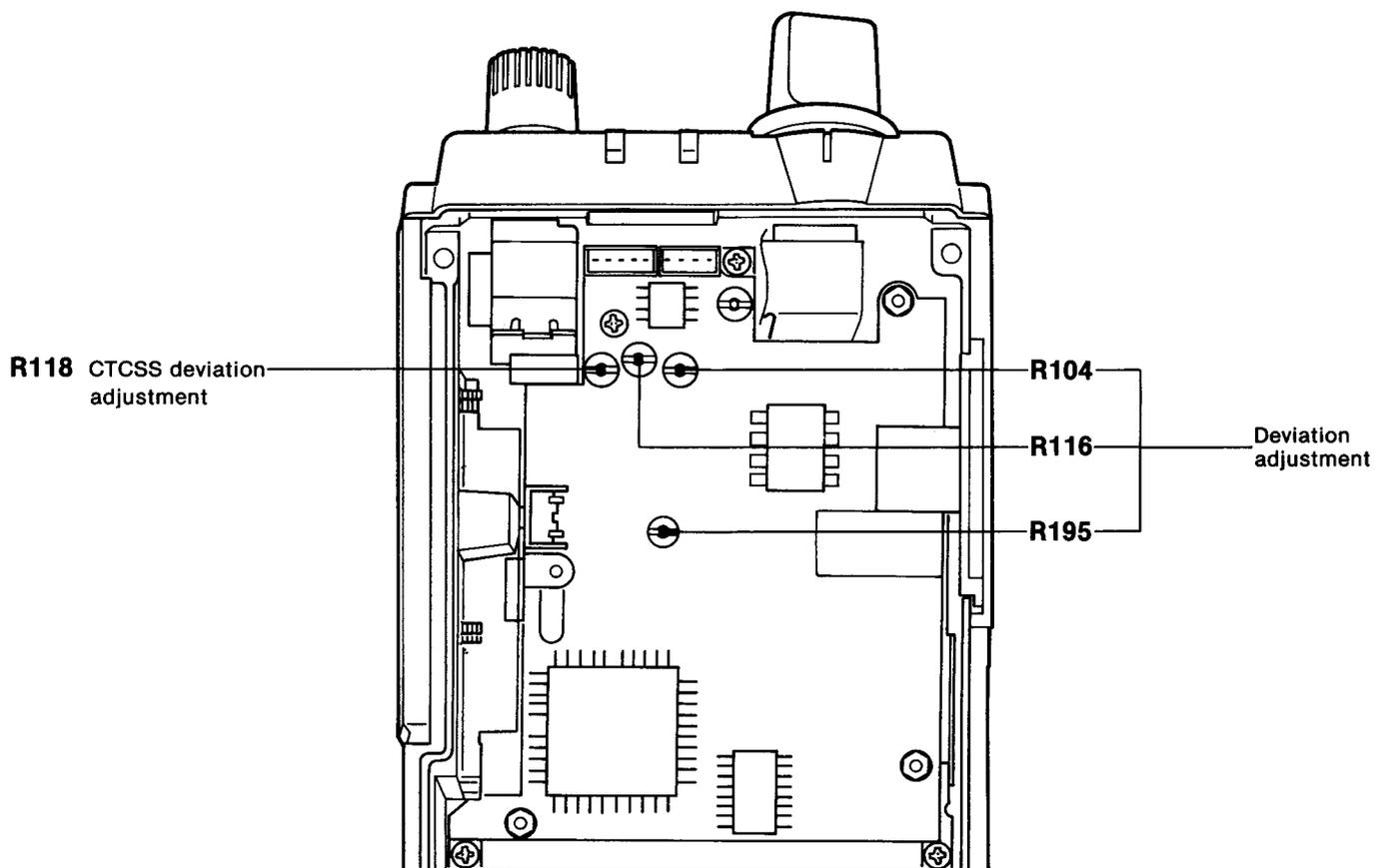
## 7-4 TRANSMITTER ADJUSTMENT

| ADJUSTMENT      |   | ADJUSTMENT CONDITIONS  | MEASUREMENT |   | VALUE  | ADJUSTMENT POINT |                             |      |
|-----------------|---|--|-------------|---|--|------------------|-----------------------------|------|
|                 |   |  | UNIT        | LOCATION  |  | UNIT             | ADJUST                      |      |
| OUTPUT POWER    | 1 | <ul style="list-style-type: none"> <li>Select any channel.</li> <li>Output power: HIGH</li> <li>Transmitting</li> </ul>  | Top panel   | Connect the RF power meter to the antenna connector.                        | 5.0 W (13.2 V DC)<br>3.5 W (8.75 V DC)<br>2.5 W (7.5 V DC) | RF               | R353                        |      |
|                 | 2 | <ul style="list-style-type: none"> <li>Output power: LOW (if programmed.)</li> </ul>   |             |   |  |                  | 800 mW                      | R352 |
| DEVIATION       | 1 | <ul style="list-style-type: none"> <li>Select any channel.</li> <li>Output power: HIGH</li> <li>Connect the audio generator to the [EXT MIC] connector with an AC milli-voltmeter and set as:</li> </ul>   | Top panel   | Connect the FM deviation meter to the antenna connector via the attenuator. | Preset to center.  | MAIN             | R195                        |      |
|                 | 2 | <ul style="list-style-type: none"> <li>Level : 250 mV</li> <li>Modulation : 1.0 kHz</li> <li>Set the FM deviation meter as:</li> <li>HPF : OFF</li> <li>LPF : 20 kHz</li> <li>De-emphasis: OFF</li> <li>Detector : (P-P)/2</li> <li>Transmitting</li> </ul>  |             |   |  |                  | $\pm 4.3$ kHz               | R116 |
|                 | 3 | <ul style="list-style-type: none"> <li>Set the FM deviation meter as:</li> <li>HPF : OFF</li> <li>LPF : 20 kHz</li> <li>De-emphasis: OFF</li> <li>Detector : P and -P</li> </ul>   |             |   |  |                  | Symmetrical deviation level | R104 |
| CTCSS DEVIATION | 1 | <ul style="list-style-type: none"> <li>Select a tone encoder programmed channel, if programmed.</li> <li>Output power: HIGH</li> <li>Set the FM deviation meter as:</li> <li>HPF : OFF</li> <li>LPF : 20 kHz</li> <li>De-emphasis: OFF</li> <li>Detector : (P-P)/2</li> <li>Apply no signal to the [EXT MIC] connector.</li> <li>Transmitting</li> </ul> | Top panel   | Connect the FM deviation meter to the antenna connector via the attenuator. | $\pm 0.75$ kHz   | MAIN             | R118                        |      |

• RF UNIT



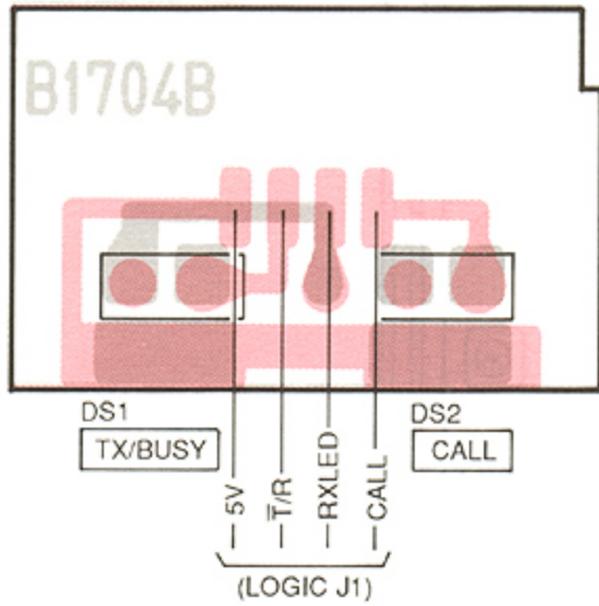
• MAIN UNIT



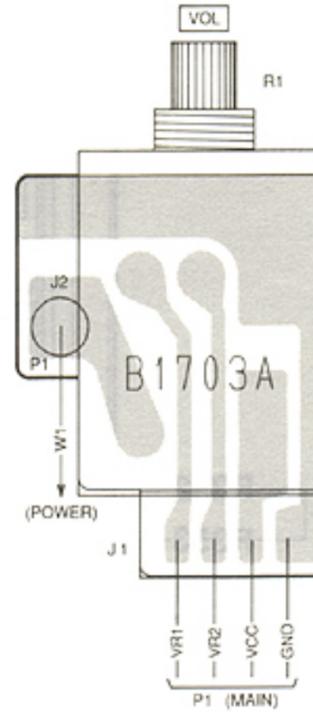
# SECTION 8 BOARD LAYOUTS

## 8-1 LED, VR, POWER AND LOGIC UNITS

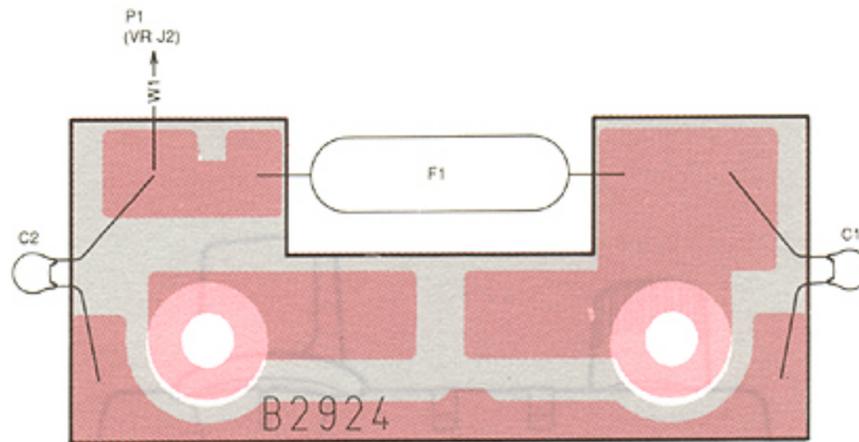
### • LED UNIT



### • VR UNIT

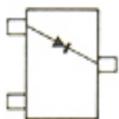


### • POWER UNIT



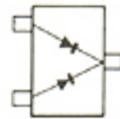
### • LOGIC UNIT

**DA114**  
(Symbol: AV)



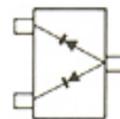
D804, D806, D807

**DAN202U**  
(Symbol: N)



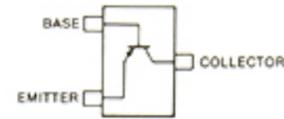
D803, D808

**DAP202U**  
(Symbol: P)



D801, D802

**2SA1162 GR**  
(Symbol: SG)



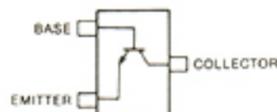
Q805

**2SA1576R**  
(Symbol: FR)



Q802

**2SC4081 R**  
(Symbol: BR)



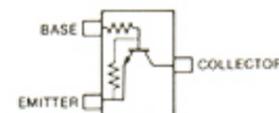
Q803

**DTA144EU**  
(Symbol: 16)



Q810

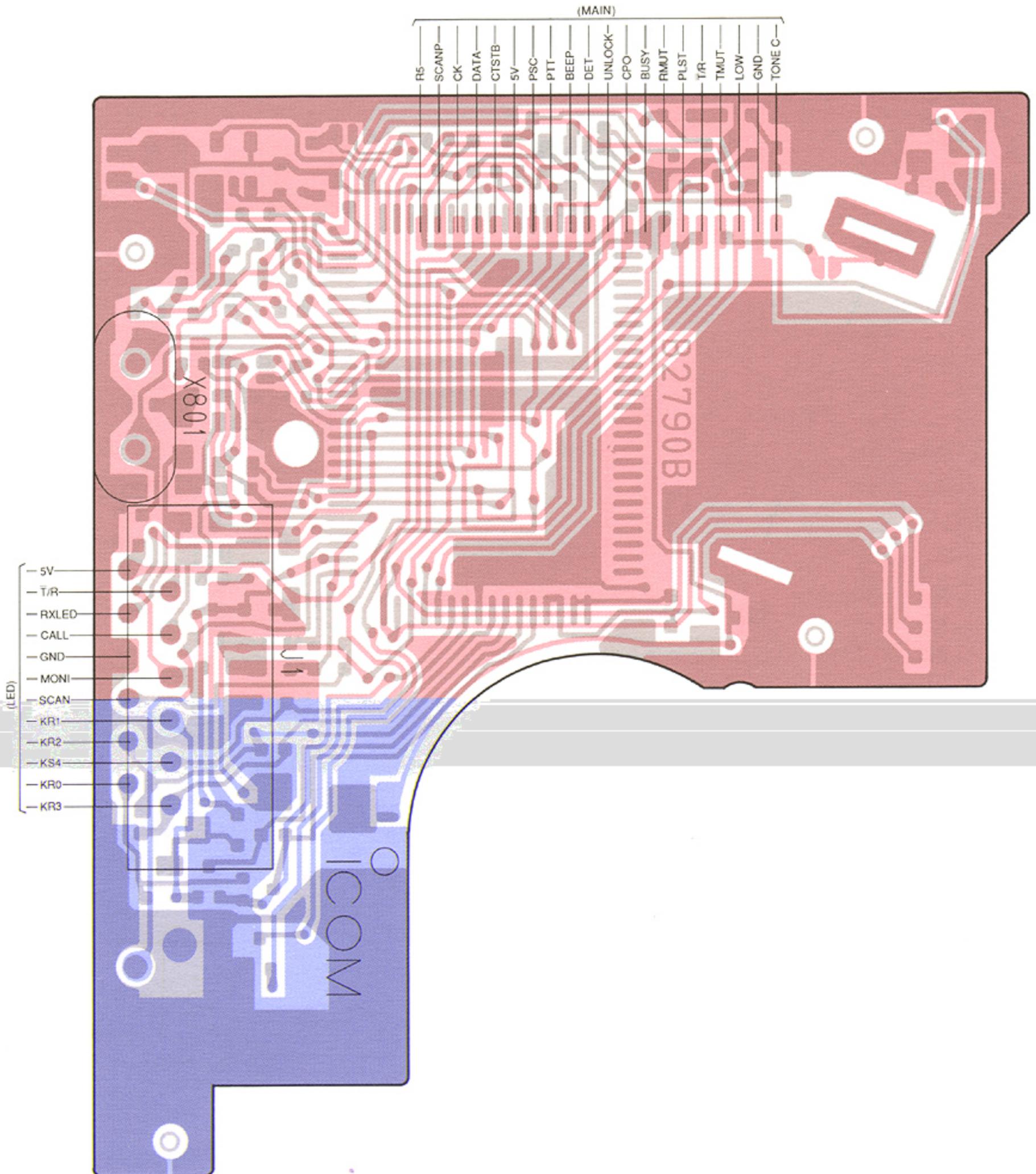
**DTC144EU**  
(Symbol: 26)  
**DTC144WU**  
(Symbol: 86)



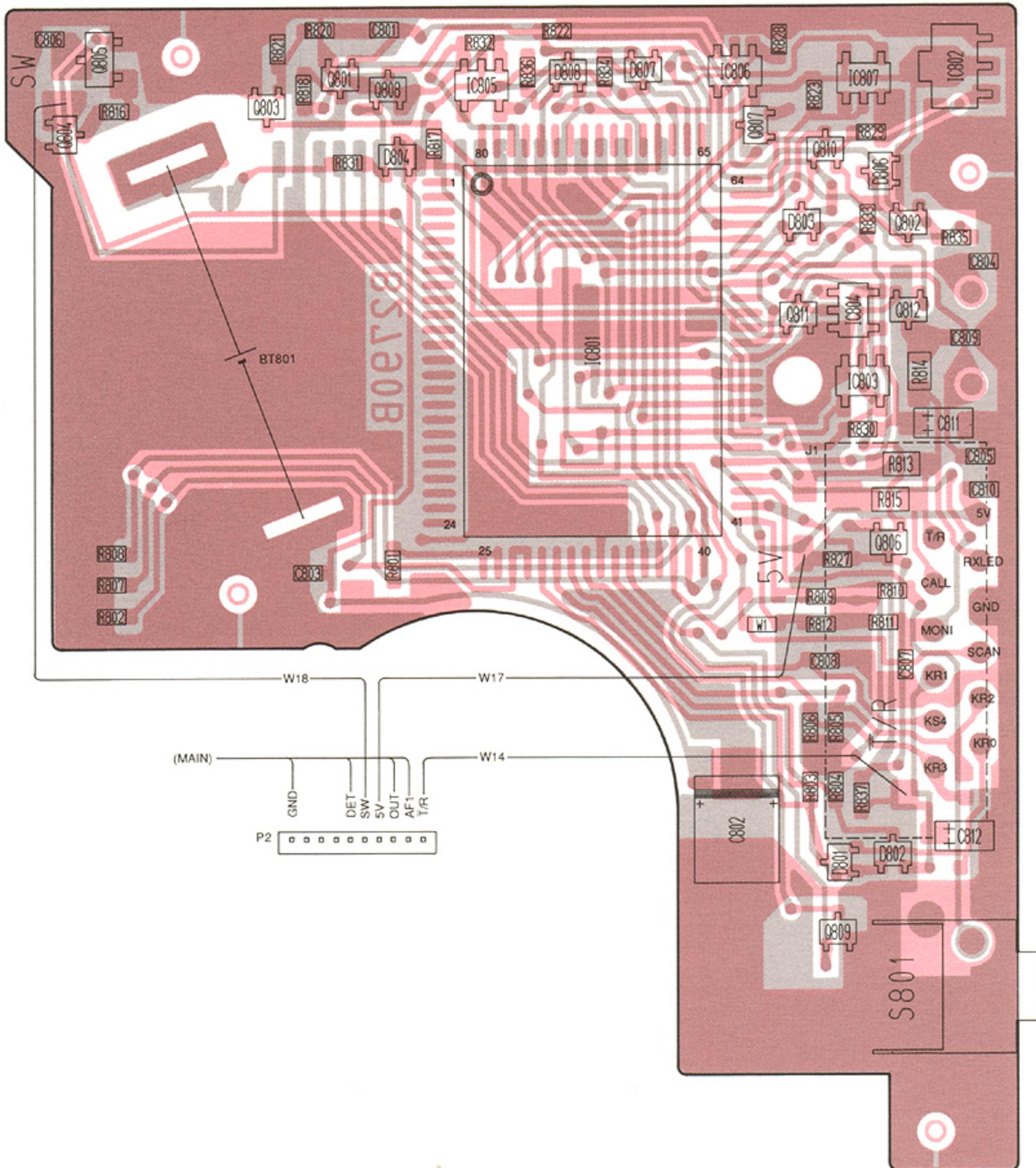
**DTC144WU**  
Q812  
**DTC144EU**  
Q801, Q804, Q806, Q807,  
Q808, Q809, Q811

• LOGIC UNIT

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

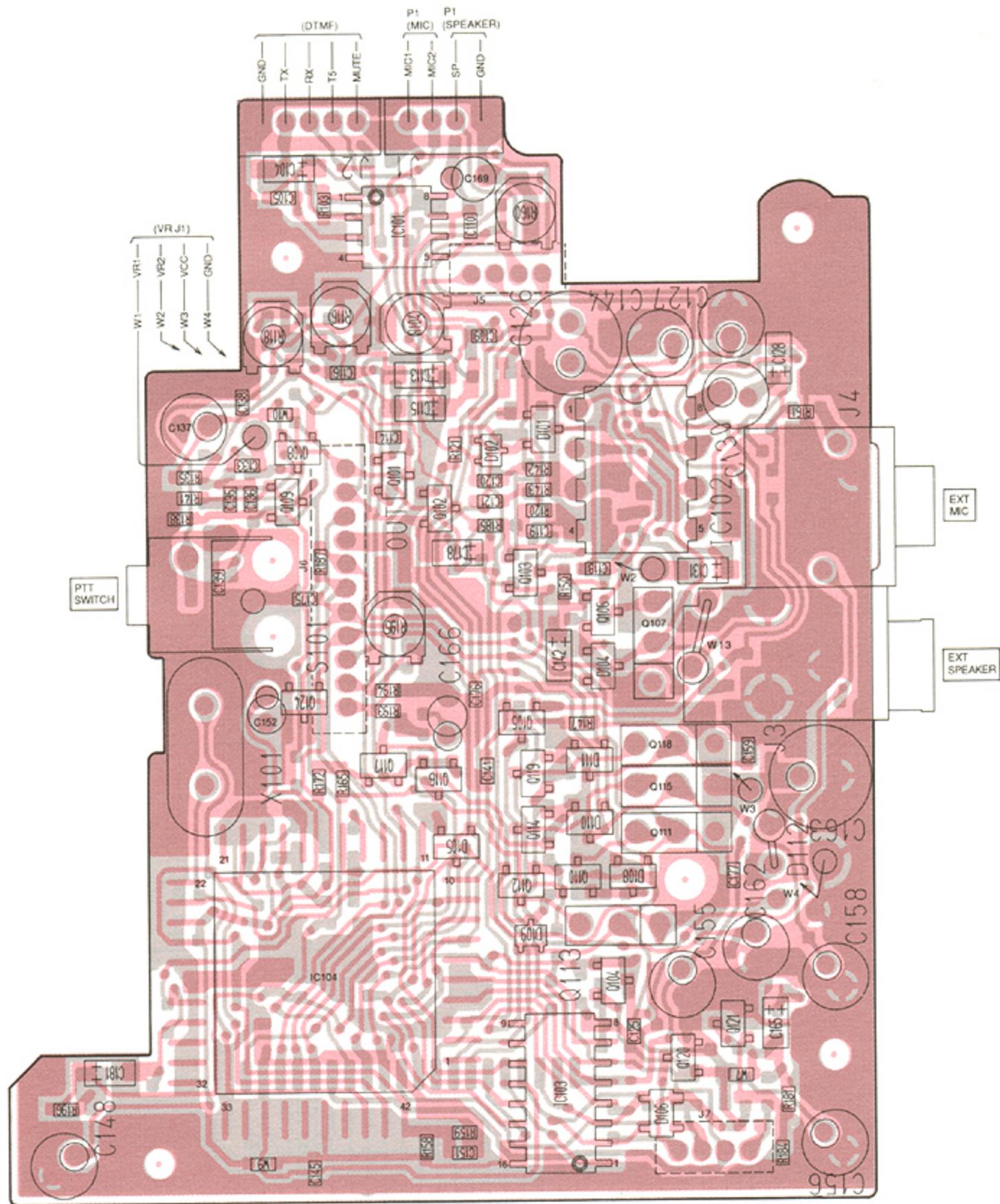


• LOGIC UNIT

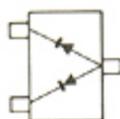


## 8-2 MAIN UNIT

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

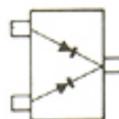


**1SS181**  
(Symbol: A3)



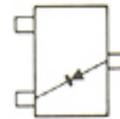
D111

**1SS184**  
(Symbol: B3)



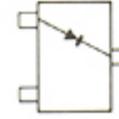
D105, D108

**1SS190**  
(Symbol: E3)



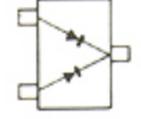
D110

**DA114**  
(Symbol: AV)



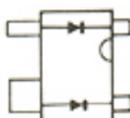
D103, D109

**DAN202U**  
(Symbol: N)



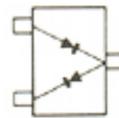
D102

**DWA010**  
(Symbol: W8)



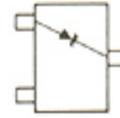
D106

**HSM88AS**  
(Symbol: C1)



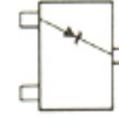
D101

**RD4.7M B3**  
(Symbol: 473)



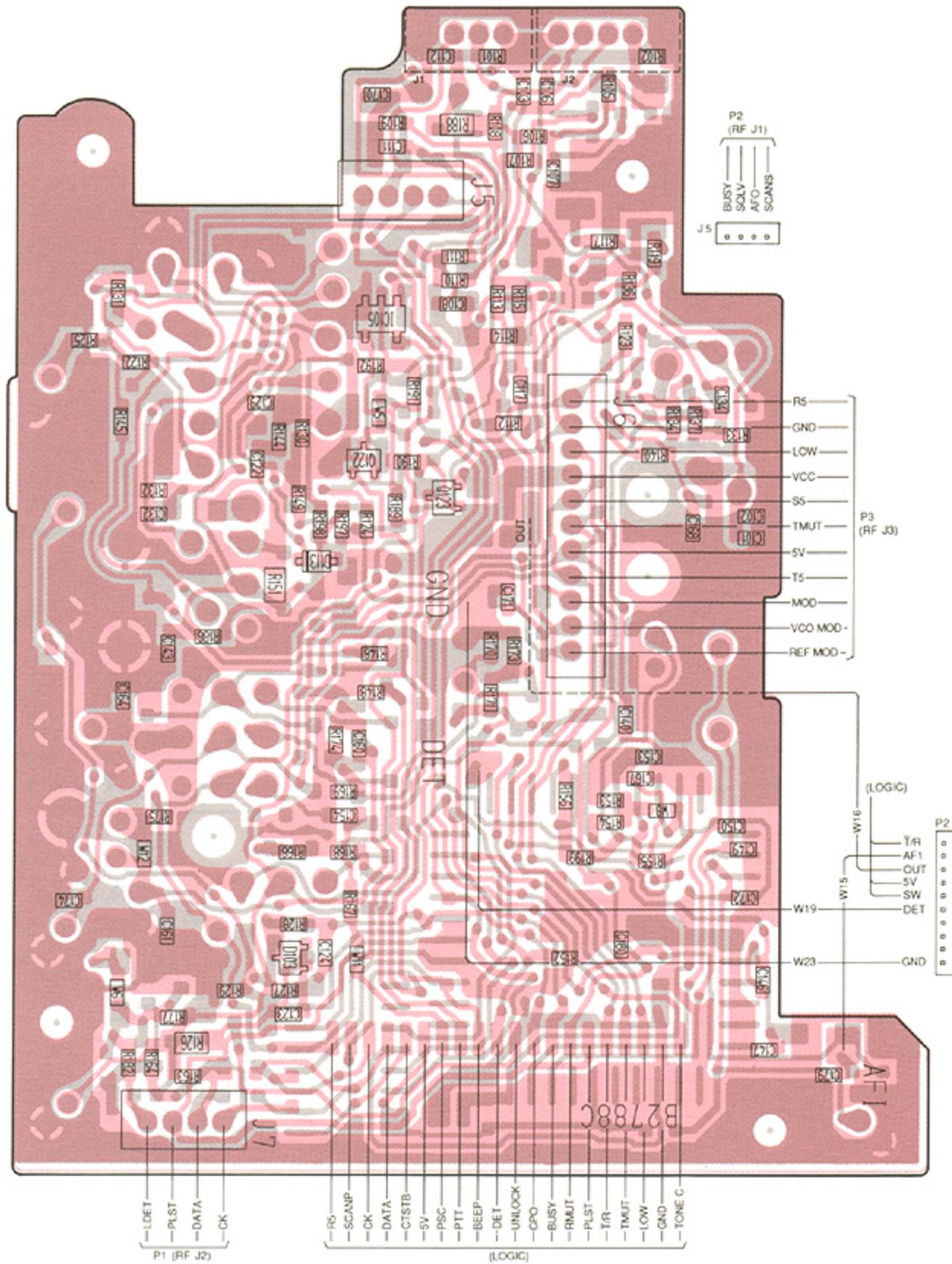
D104

**RD5.1M B2**  
(Symbol: 512)

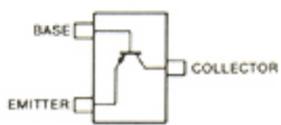


D112

• MAIN UNIT

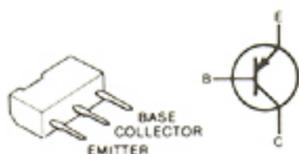


**2SA1162 GR**  
(Symbol: SG)



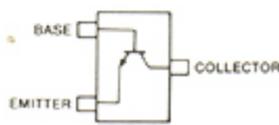
- Q103, Q104, Q105, Q116, Q117

**2SB909M R**



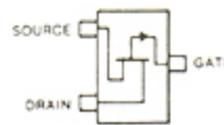
- Q107, Q111, Q113, Q115, Q118

**2SC2712 BL**  
(Symbol: LL)



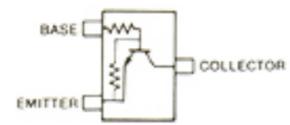
- Q101, Q102, Q106, Q108, Q110, Q112, Q114, Q119, Q120, Q121

**2SJ106 Y**  
(Symbol: VY)



- Q109

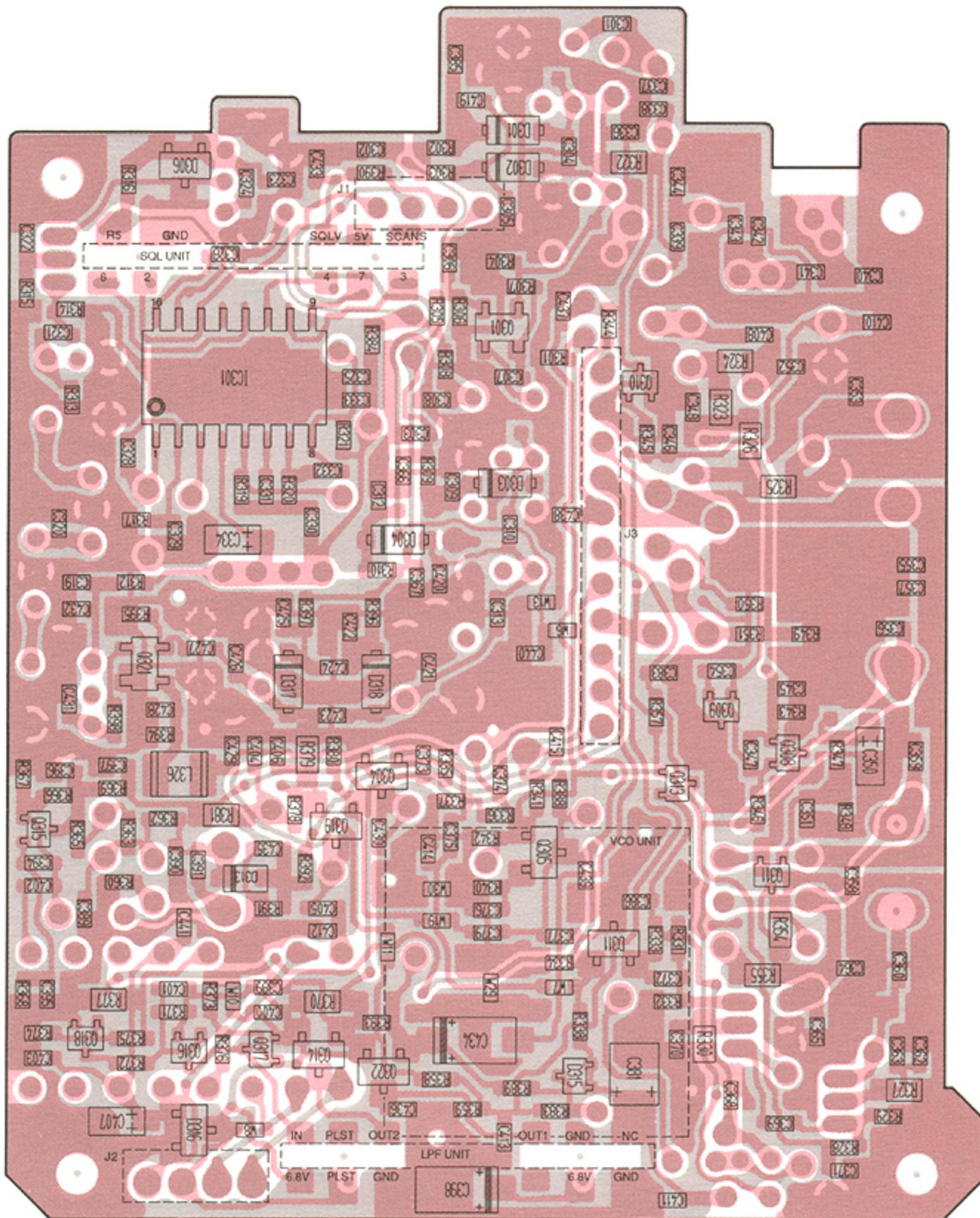
**DTC144 EU/EK**  
(Symbol: 26)



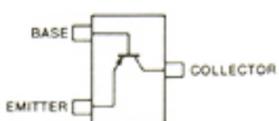
- Q122, Q123, Q124



• RF UNIT



**2SA1576 R**  
(Symbol: FR)



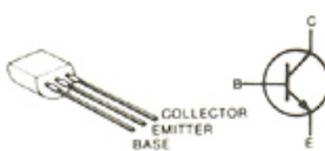
Q308, Q309, Q313,  
Q316

**2SB1237**



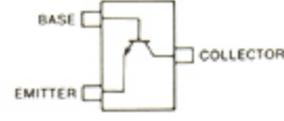
Q312, Q320

**2SC2026**



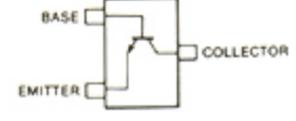
Q306, Q307

**2SC3356**  
(Symbol: R22)



Q304, Q305, Q319

**2SC4081 R**  
(Symbol: BR)



Q310, Q311, Q315,  
Q317, Q318

**2SK209 Y**  
(Symbol: XY)



Q314, Q322

**2SK241 GR**



Q303

**3SK131K T1**  
(Symbol: V13)



Q301

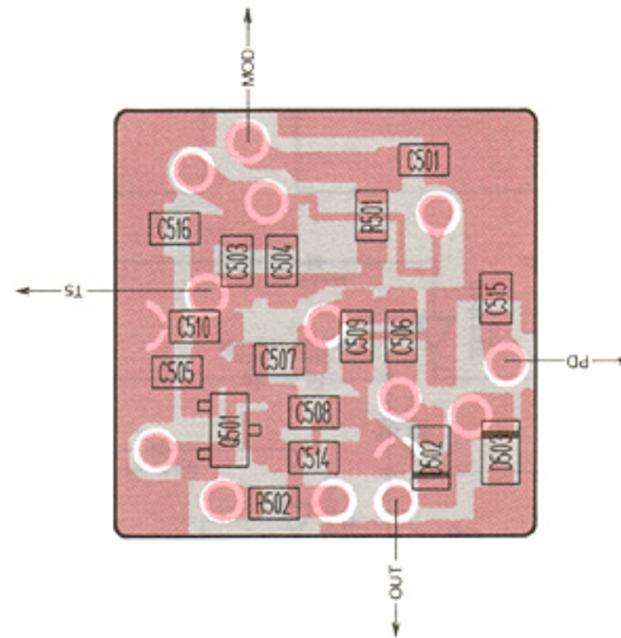
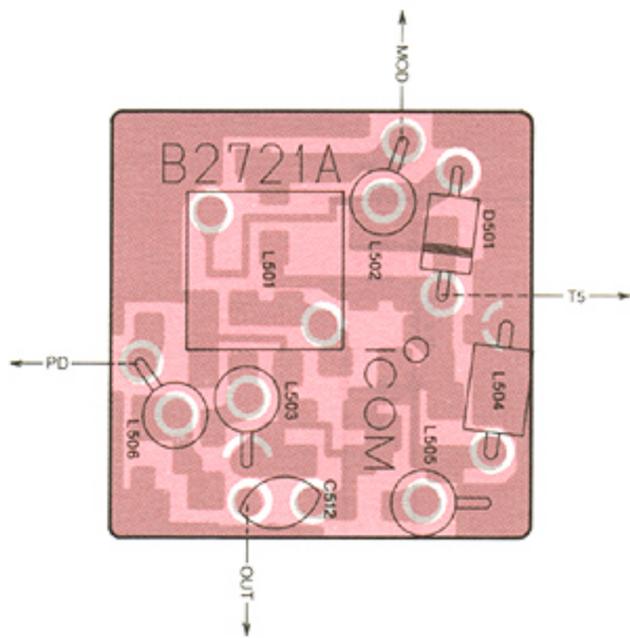
**3SK151 Y**  
(Symbol: UH)



Q321

## 8-4 VCO, SQL AND LPF UNITS

### • VCO UNIT

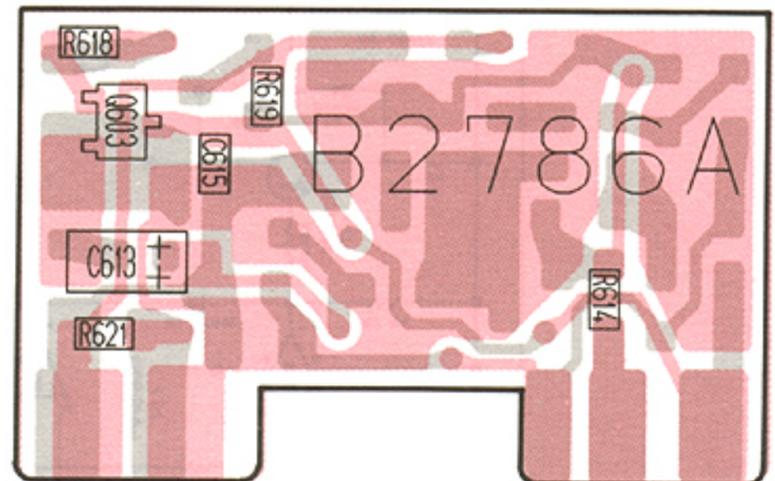
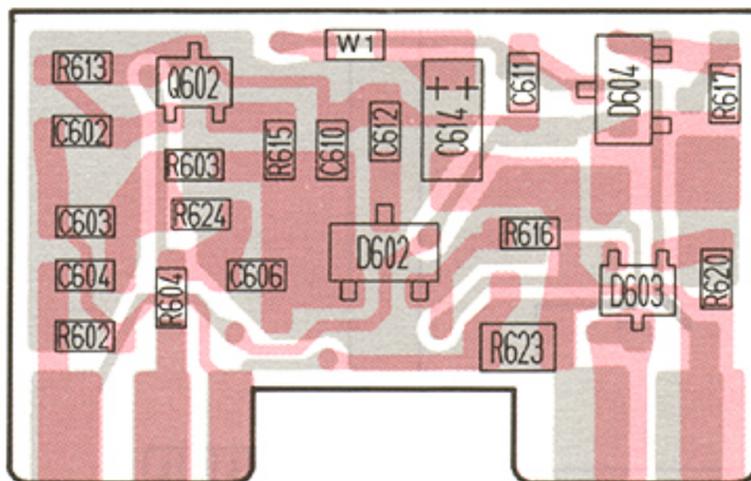


**2SK302 Y**  
(Symbol: TY)



Q501

### • SQL UNIT



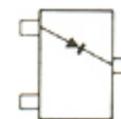
3 7 4

2 6

R5 GND

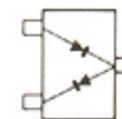
SQLV 5V SCANS

**DA114**  
(Symbol: AV)



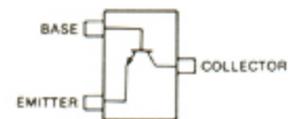
D603

**HSM88AS**  
(Symbol: C1)



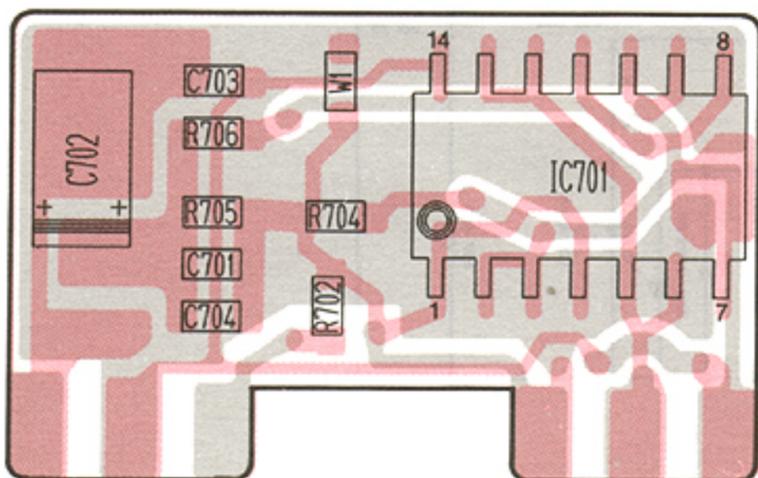
D602, D604

**2SC4081 R**  
(Symbol: BR)



Q602, Q603

### • LPF UNIT

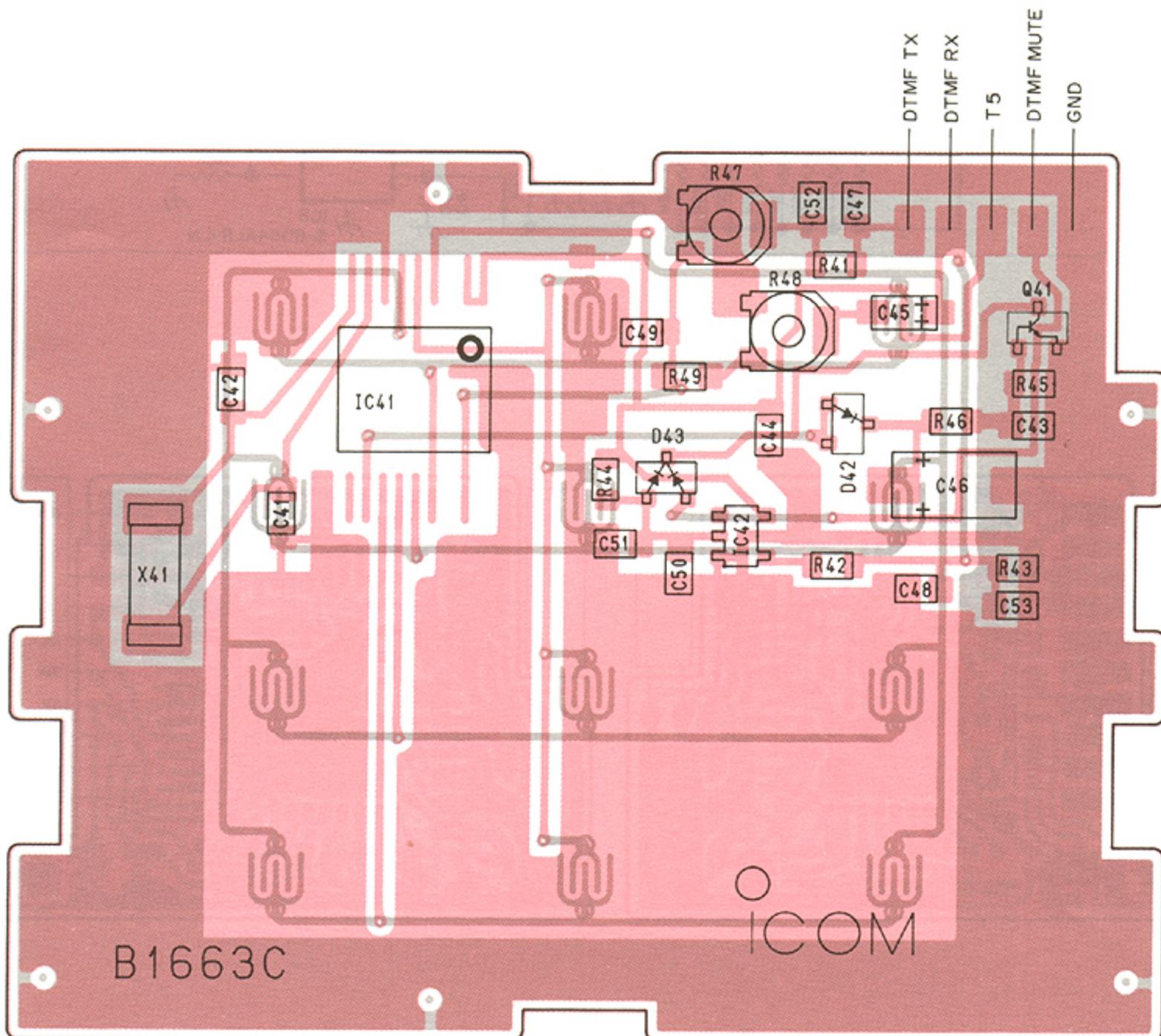
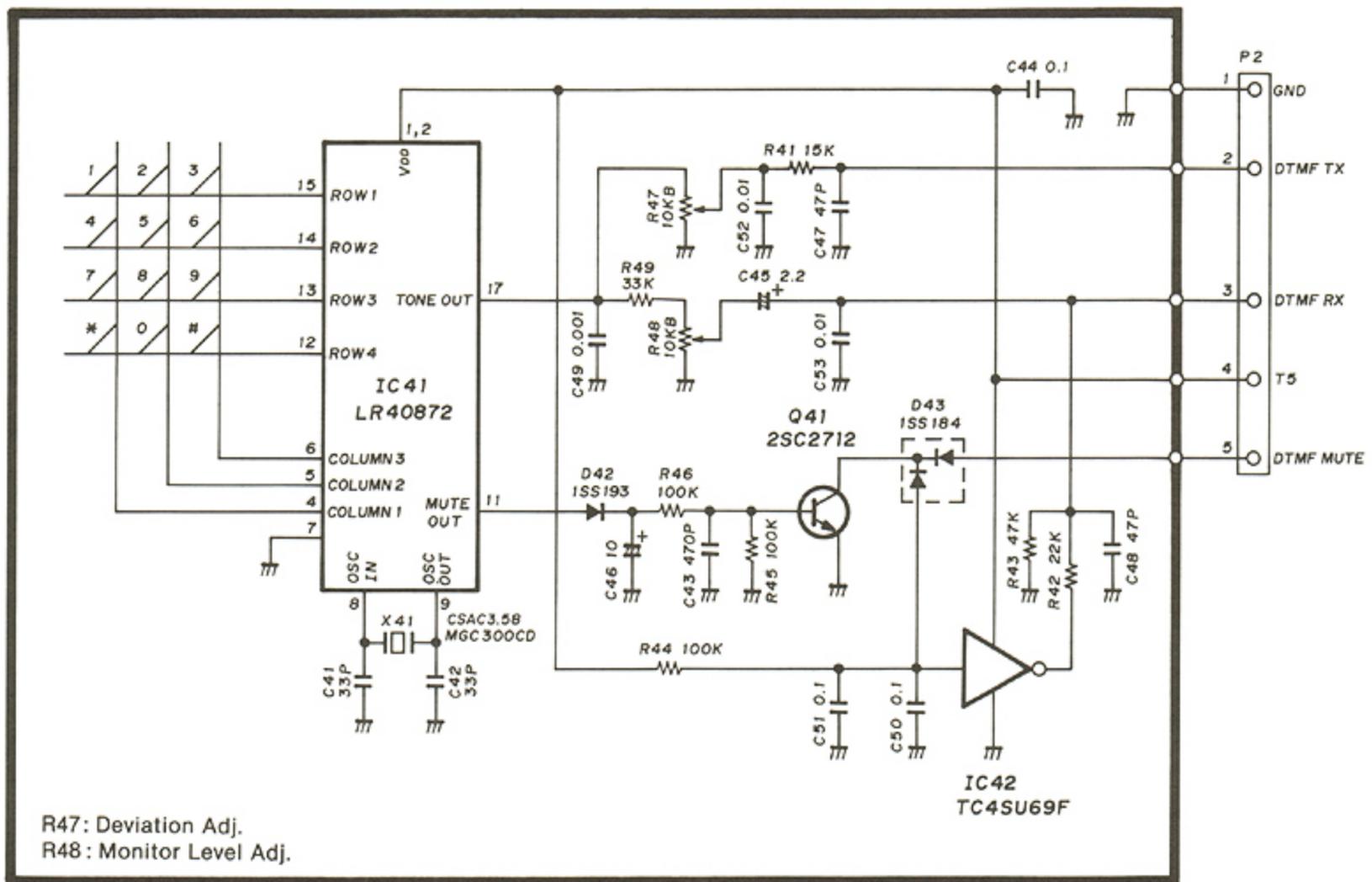


GND 6.8V  
(NC) (GND) (OUT1)

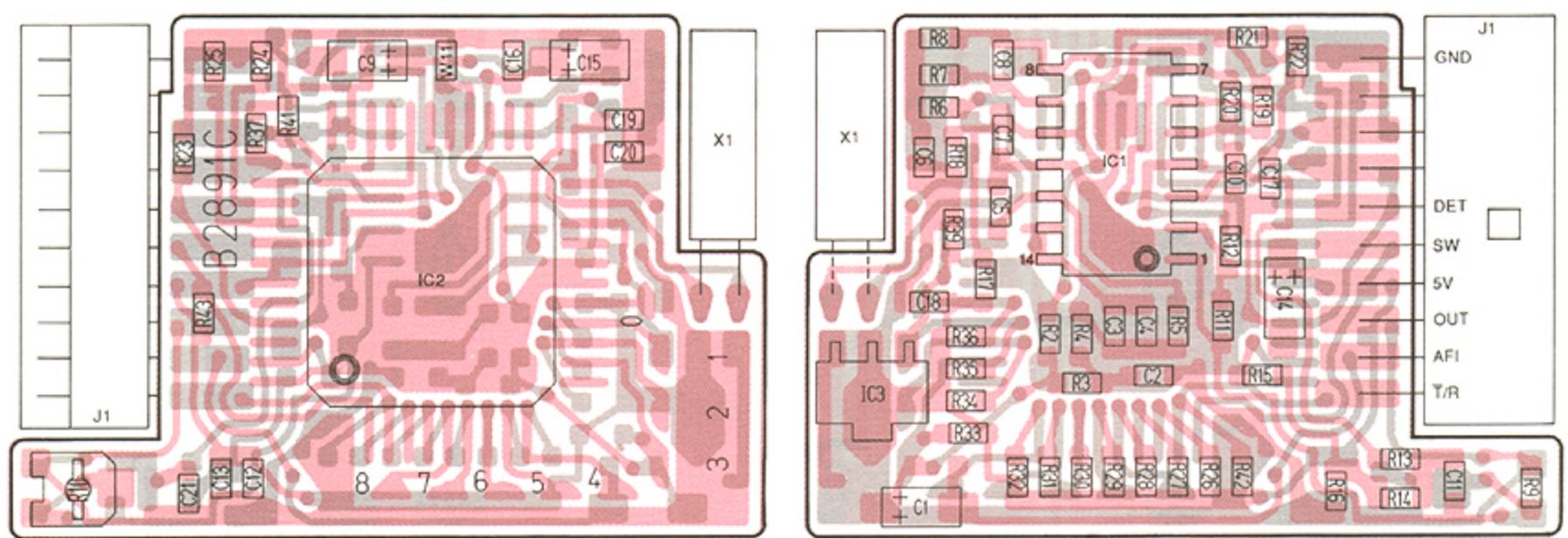
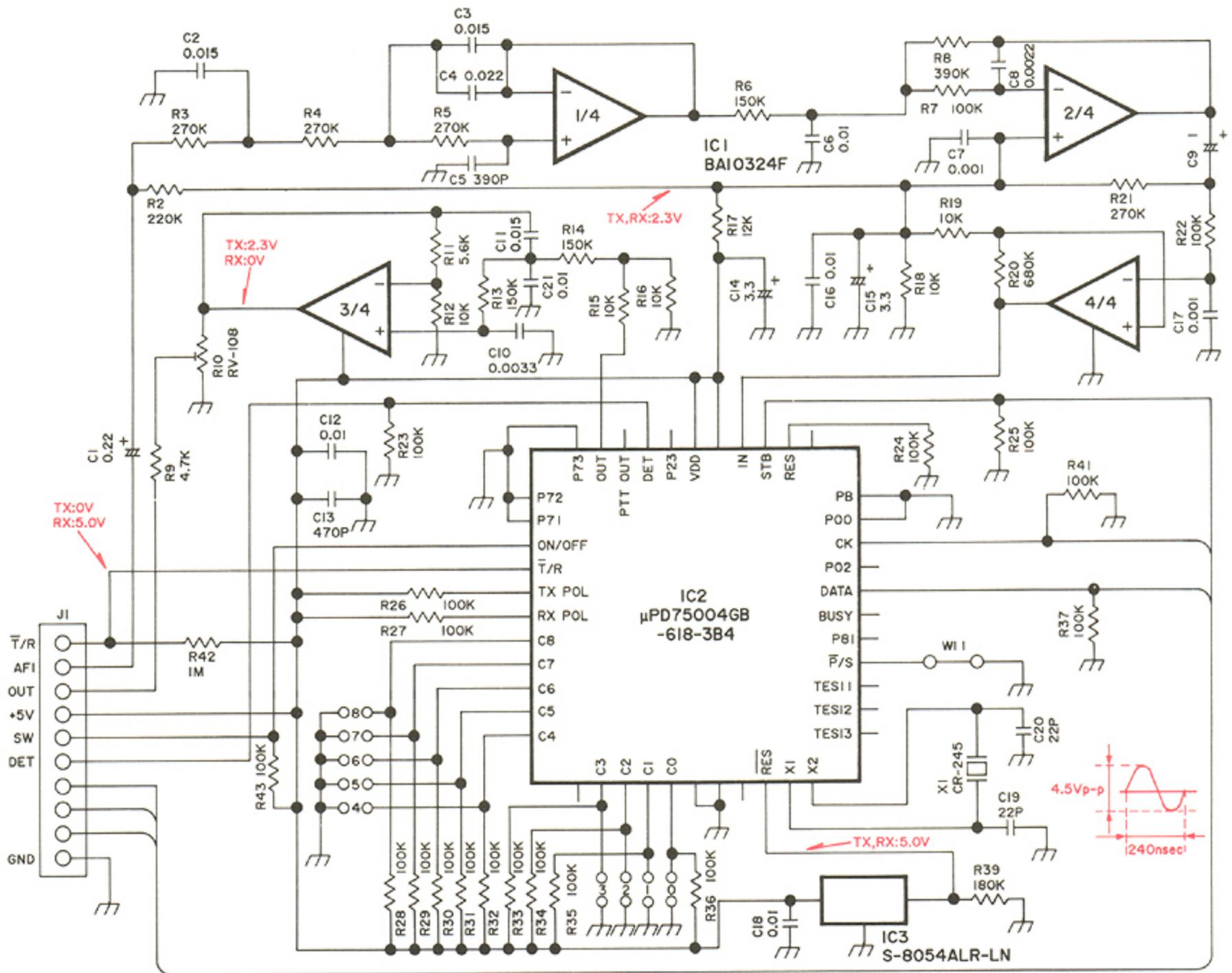
GND PLST 6.8V  
(OUT2) (PLST) (IN)



### 9-2 UT-42 DTMF ENCODER UNIT

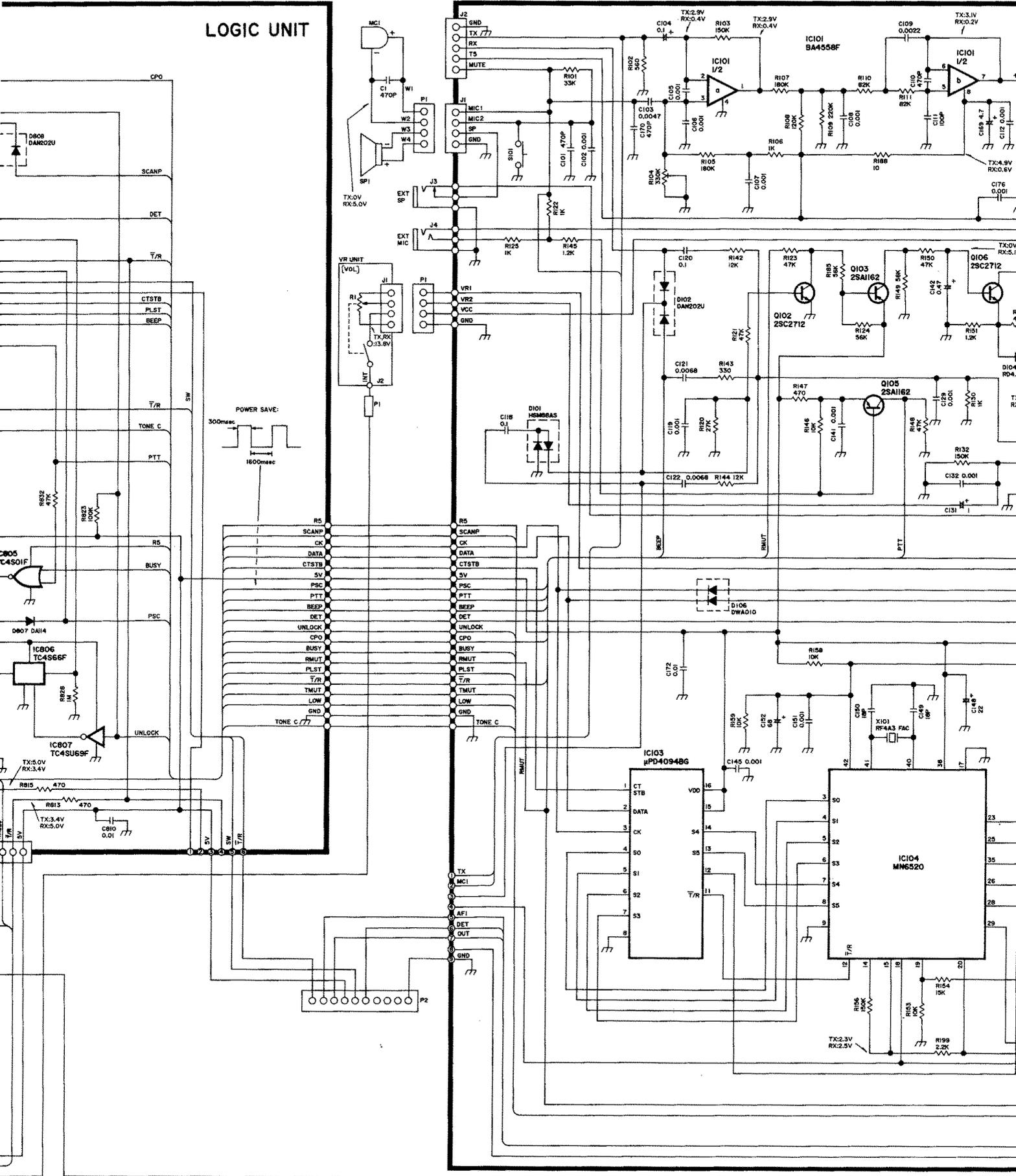


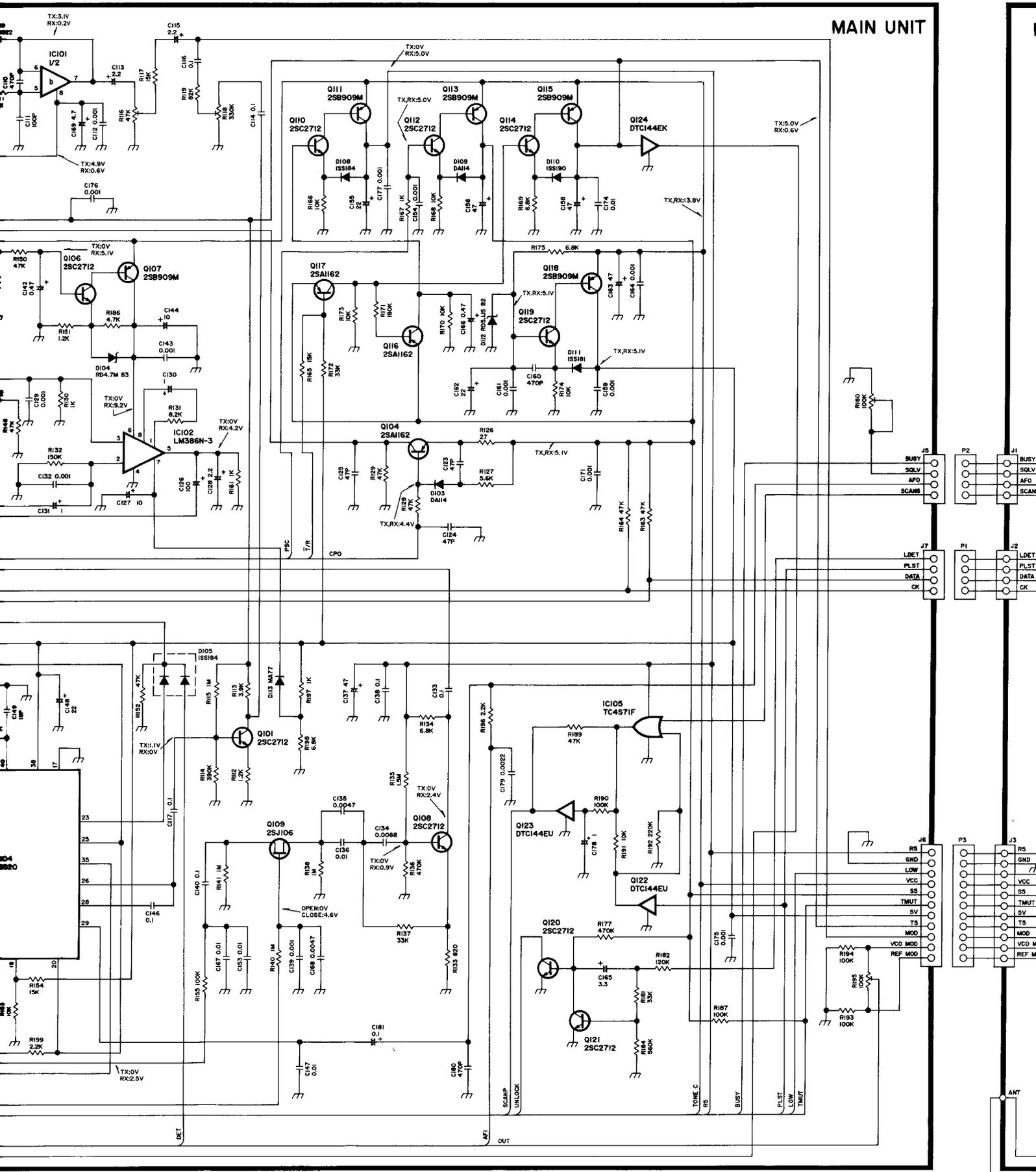
### 9-3 UT-59 DTCS ENCODER/DECODER UNIT



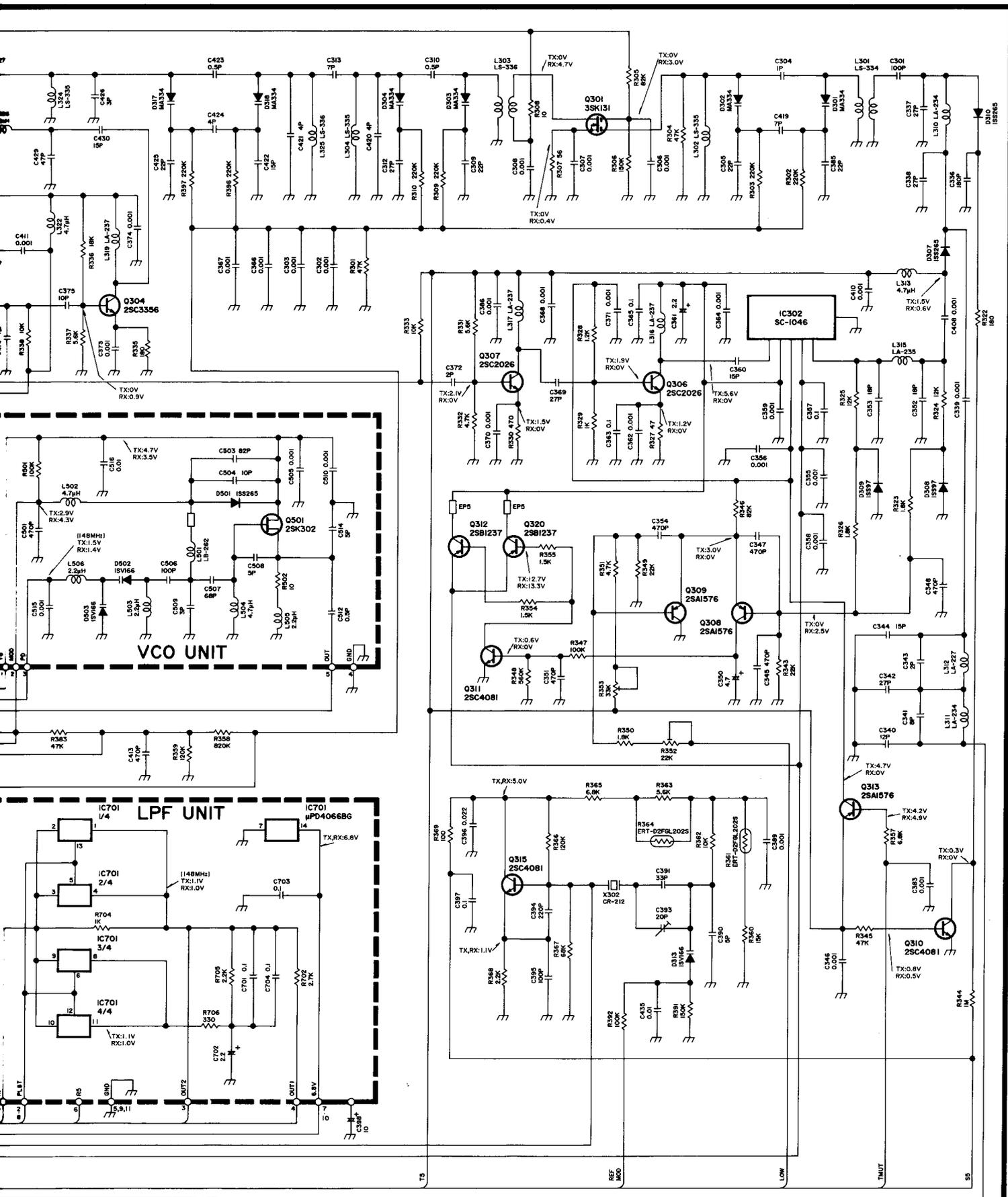


### LOGIC UNIT









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Fax : 06 793 0013

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