



# SERVICE MANUAL

144 MHz FM TRANSCEIVER

**IC-P2AT**  
**IC-P2ET**

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## INTRODUCTION

This service manual describes the latest service information for the **IC-P2AT/ET** 144 MHz FM TRANSCEIVER at the time of publication.

6 versions of the **IC-P2AT/ET** have been designed. This service manual covers each version.

MODEL	VERSION NO.	VERSION	SYMBOL
IC-P2ET	#22	Europe	EUR
	#23	United Kingdom	UK
	#24	Italy	ITA
IC-P2AT	#25	U.S.A.	USA
	#27	Australia	AUS
	#29	Asia	SEA

To upgrade quality, all electrical or mechanical parts and internal circuits are subject to change without notice or obligation.

## DANGER

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

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

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

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

## 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>

1150000730 IC SC1096 IC-P2AT/ET MAIN UNIT 5 pieces

8810001560 Screw PH PT M2×15 ZK IC-P2AT/ET Rear panel 10 pieces

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

## REPAIR NOTES

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 40 dB~50 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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## SECTION 1 SPECIFICATIONS

### GENERAL

- Frequency coverage

MODEL	VERSION	FREQUENCY COVERAGE
IC-P2AT	U.S.A.	140~150 MHz* (TX) 138~174 MHz*
	Australia	144~148 MHz
	Asia	140~150 MHz* (TX) 138~174 MHz* (RX)
IC-P2ET	Europe, United Kingdom	144~146 MHz
	Italy	140~150 MHz*

\*Specifications guaranteed for 144~148 MHz.

- Mode : FM
- Tuning steps : 5, 10, 12.5, 15, 20, 25, 30 or 50 kHz
- Dial select steps : 100 kHz or 1 MHz
- Number of channels : Memory channels 100    Call channels 1  
Scan edge channels 2
- Antenna impedance : 50  $\Omega$  (nominal)
- Usable battery pack or case : BP-110~BP-114
- External DC power supply : 6~16 V DC (negative ground)
- Current drain (at 13.8 V DC) :

Transmit	High	1.5 A
	Low 1	650 mA
Receive	Power saved	16 mA (typical)
	Rated audio output	250 mA

- Usable temperature range :  $-10^{\circ}\text{C} \sim +60^{\circ}\text{C}$  ( $+14^{\circ}\text{F} \sim +140^{\circ}\text{F}$ )
- Frequency stability :  $\pm 15$  ppm ( $-10^{\circ}\text{C} \sim +60^{\circ}\text{C}$ ;  $+14^{\circ}\text{F} \sim +140^{\circ}\text{F}$ )
- Dimensions (with BP-111) : 49 (W)  $\times$  105 (H)  $\times$  38.5 (D) mm  
1.9 (W)  $\times$  41 (H)  $\times$  1.5 (D) in  
(Projections not included)
- Weight (with BP-111) : 280 g (9.9 oz)

### TRANSMITTER

- Output power (at 13.8 V DC) : 5.0, 3.5, 1.5 W or 500 mW (selectable)
- Modulation system : Variable reactance frequency modulation
- Max. frequency deviation :  $\pm 5$  kHz
- Spurious emissions : Less than  $-60$  dB
- Microphone impedance : 2 k $\Omega$
- Heatsink duty cycle : Transmit: Receive=1 min.: 3 min.

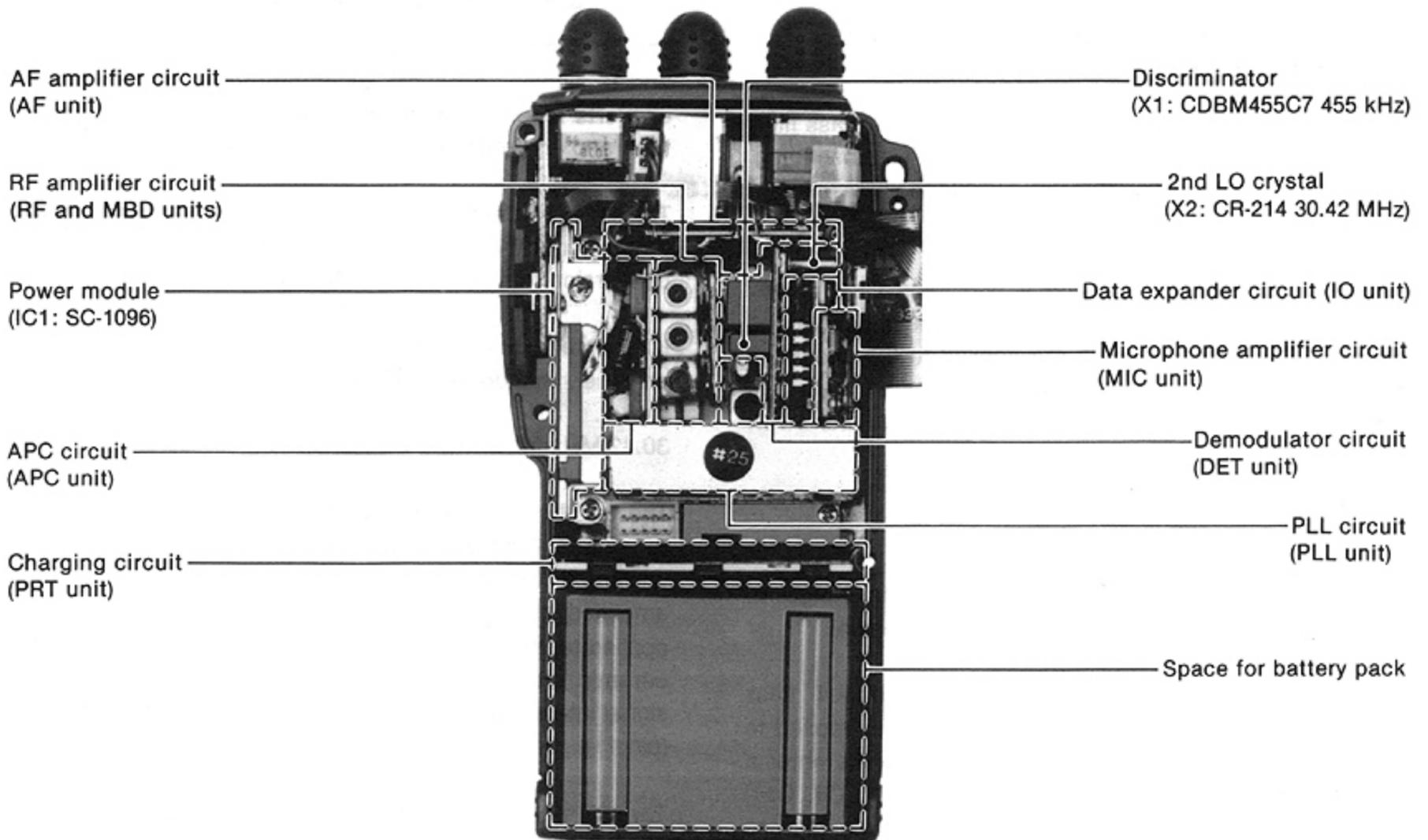
### RECEIVER

- Receive system : Double-conversion superheterodyne
- Intermediate frequencies : 1st 30.875 MHz  
2nd 455 kHz
- Sensitivity : Less than 0.16  $\mu\text{V}$  for 12 dB SINAD
- Squelch sensitivity (threshold) : Less than 0.1  $\mu\text{V}$
- Selectivity : More than 15 kHz/ $-6$  dB  
Less than 30 kHz/ $-60$  dB
- Spurious response rejection : Less than  $-60$  dB
- Audio output power : 200 mW at 10 % distortion with an 8  $\Omega$  load
- Audio output impedance : 8  $\Omega$

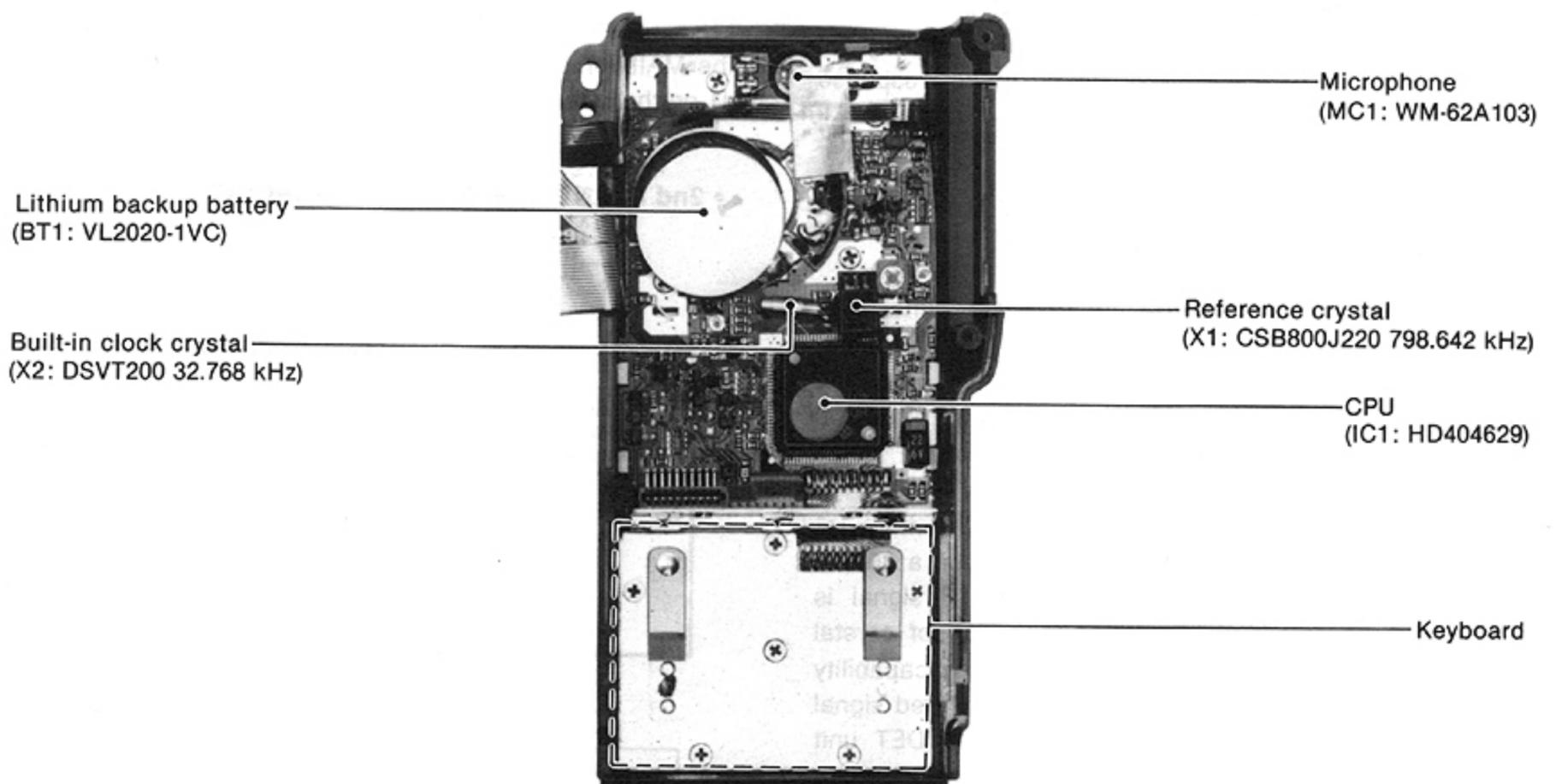
All stated specifications are subject to change without notice or obligation.

## SECTION 2 INSIDE VIEWS

### • MAIN UNIT



### • LOGIC UNIT



Above pictures show the IC-P2AT U.S.A. version

## SECTION 3 CIRCUIT DESCRIPTION

### 3-1 RECEIVER CIRCUITS

#### 3-1-1 ANTENNA SWITCHING CIRCUIT (MAIN UNIT)

The antenna switching circuit functions as a low-pass filter while receiving and a resonator circuit while transmitting. The circuit does not allow transmit signals to enter receiver circuits.

Received signals pass through a two-stage Chebyshev low-pass filter (L2~L4, C21~C25) to suppress out-of-band signals. The filtered signals are applied to the two-stage  $\lambda/4$  type antenna switching circuit (D7, D9, L5, L6, C26~C28) and then to the RF unit through the RFIN signal line.

#### 3-1-2 RF CIRCUIT (RF UNIT)

The RF circuit amplifies signals within the range of frequency coverage and filters out-of-band signals.

The signals from the antenna switching circuit pass through a bandpass filter (L1, D2) and are then applied to the RF amplifier (Q1, Q2). The amplified signals enter a two-stage bandpass filter (L2, L3, D4, D5, C7, C8, C11) to suppress unwanted signals. The filtered signals are applied to the 1st mixer circuit on the MAIN unit.

D2, D4 and D5 employ varactor diodes that track the bandpass filters and are controlled by the PLL lock voltage. The voltage is current-amplified at Q9 on the PLL unit and is then applied to the varactor diodes. These diodes tune the center frequency of an RF passband for wide bandwidth receiving and good image response rejection.

#### 3-1-3 1st MIXER AND IF CIRCUITS (MAIN AND DET UNITS)

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

The signals from the RF circuit are mixed at Q1 with a 1st LO signal coming from the PLL unit to produce a 30.875 MHz 1st IF signal. The 30.875 MHz 1st IF signal is obtained at L1 and is then applied to a pair of crystal filters (F11) in order to obtain wide selection capability and to pass only the desired signals. The filtered signal is applied to a 1st IF amplifier (Q2) on the DET unit through the IFIN signal line and then to a 2nd mixer circuit.

#### 3-1-4 2ND IF AND DEMODULATOR CIRCUITS (DET UNIT)

The 2nd mixer circuit converts the 1st IF signal to a 2nd IF signal. A double superheterodyne system (which converts receive signals twice) improves the image rejection ratio and obtains stable receiver gain.

The 1st IF signal from Q2 is applied to a 2nd mixer section of IC1 (pin 20) and is then mixed with a 2nd LO signal for conversion to a 455 kHz 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 X2 generate 30.42 MHz for the 2nd LO signal.

The 2nd IF signal from the 2nd mixer (IC1, pin 4) passes through a high-quality ceramic filter (F11) to suppress unwanted heterodyned frequency signals. It is then amplified at the limiter amplifier section (IC1, pin 6) and applied to the quadrature detector section (IC1, pin 10 and ceramic discriminator, X1) to demodulate the 2nd IF signal into an AF signal. The AF signal is output from IC1 (pin 11).

The AF signal output from IC1 (pin 11) is applied to the squelch circuit and de-emphasis circuit (R7, C24, C25). This de-emphasis circuit is an integrated circuit with frequency characteristics of  $-6$  dB/octave. The resulting signal passes through the DETO signal line and is then applied to the AF amplifier circuit on the AF unit and the optional units (UT-50 TONE SQUELCH UNIT or UT-51 PROGRAMMABLE TONE ENCODER UNIT through J5 on the MAIN unit and UT-49 DTMF DECODER UNIT through J1 on the LOGIC unit).

#### • 2nd IF AND DEMODULATOR CIRCUITS

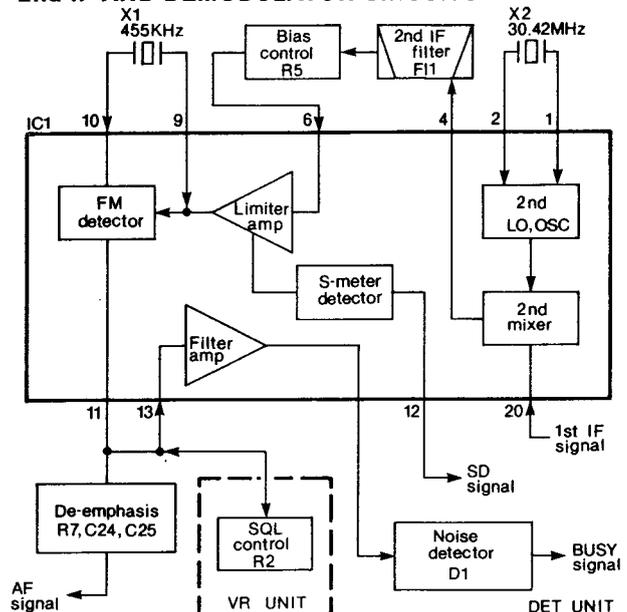


Fig. 1

### 3-1-5 AF AMPLIFIER CIRCUIT (AF AND VR UNITS)

The AF amplifier circuit amplifies the demodulated signal to drive a speaker and includes an AF mute circuit.

The AF signal is applied to Q1 and Q2 on the AF unit. Q1 is an active filter that functions as a high-pass filter to suppress tone signals for the tone squelch operation. Q2 is also an active filter but functions as a low-pass filter to suppress higher noise signals.

The filtered signal is applied to the [VOL] control (R1) on the VR unit via the AF mute circuit (Q3). When the squelch is closed, Q3 cuts the AF signal as the AF mute switch. The AF signal is power-amplified at the AF power amplifier (IC1) to drive the speaker.

The AF amplifier regulator (Q4~Q6) supplies sufficient voltage to drive the AF power amplifier. The AFS signal from the MAIN unit controls Q6 and mutes AF output while receiving no signal or no specified tone/DTMF signal.

### 3-1-6 NOISE SQUELCH CIRCUIT (DET AND VR UNITS)

A noise 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 IC1 (pin 11) are applied to an active filter section (IC1, pin 13). The [SQL] control (R2) on the VR unit is connected in parallel to IC1 (pin 13) to adjust pin 13 input level.

The active filter section in IC1 amplifies the noise components of frequencies 20 kHz and above. The noise signals are output from IC1 (pin 14) and are then rectified by D1 for conversion to DC voltage.

The rectified voltage triggers the squelch switch (Q1). The collector of Q1 outputs the squelch signal. The signal is applied to the CPU (IC1, pin 33) on the LOGIC unit through the BUSY signal line. The CPU outputs the BUSY LED signal.

The "RMUTE" signal, decoded at the output expander (IC1, pin 6) on the IO unit, activates the AF mute circuit (Q3) on the AF unit to cut the AF signal. The BUSY LED signal is applied to Q8 on the LOGIC unit, turning OFF the receive indicator.

### 3-1-7 S-METER SQUELCH AND S/RF INDICATOR CIRCUITS (DET, MAIN AND LOGIC UNITS)

The S-meter squelch and the S/RF indicator circuits indicate the selected output power on the LCD.

The S-meter signal is output from the limiter amplifier section in IC1 and is then detected at the S-meter detector section in IC1. The detected signal is output from IC1 (pin 12) through the SD signal line. The SD signal is then rectified at an S/RF meter detector D1 to obtain an S/RF indicator signal on the MAIN unit. The detected voltage is output as the "S" signal. The signal is applied to an S/RF comparator (IC2, pin 3) on the LOGIC unit.

IC2 (pin 1) receives an S/RF indicator reference signal from the CPU (IC1, pins 20~23) using the D/A converter (R26~R29). These pins increase the reference signal level.

When the reference signal becomes greater than the S signal, IC2 (pin 4) outputs "LOW." The CPU detects the signal strength level using the outputs from IC1 (pins 20~23) and indicates the signal strength level on the LCD when receiving the "LOW" signal.

#### • AF SIGNAL CURRENT

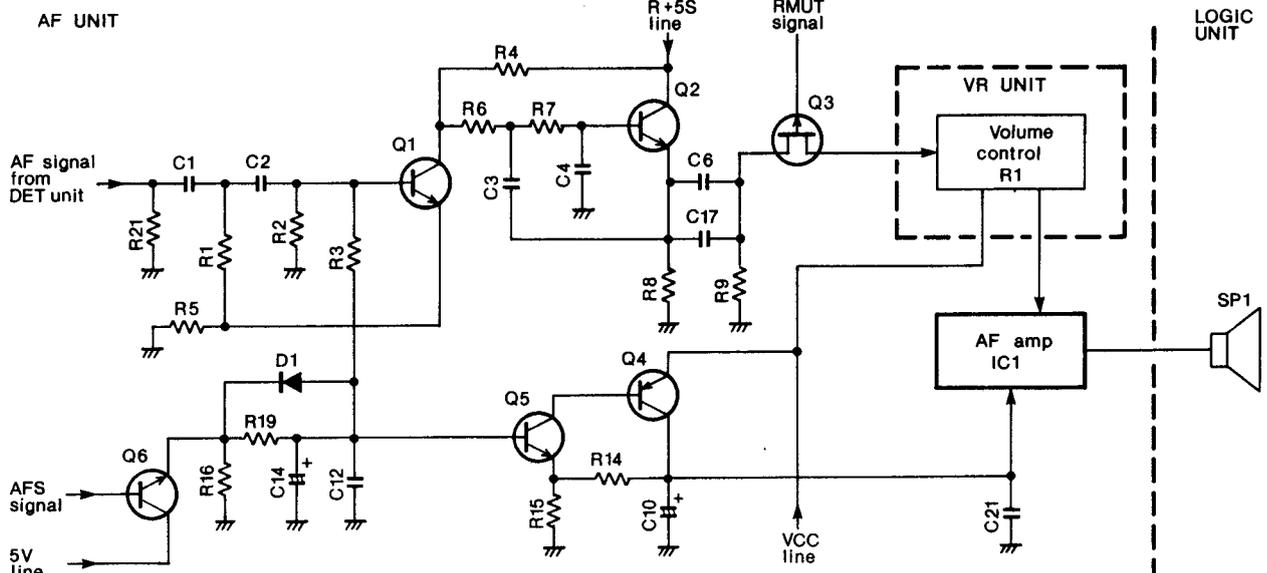


Fig. 2

### 3-2 TRANSMITTER CIRCUITS

#### 3-2-1 MICROPHONE AMPLIFIER CIRCUIT (LOGIC AND MIC UNITS)

The microphone amplifier circuit amplifies audio signals with +6 dB/octave pre-emphasis from the microphone to a level needed for the modulation circuit.

The AF signals from the built-in condenser microphone or from the [MIC] jack are applied to IC1a (pin 3). IC1a functions as the microphone amplifier and the limiter with +6 dB/octave pre-emphasis characteristics.

The output signals from IC1a (pin 1) pass through a splatter filter circuit (IC1b) which eliminates signal components greater than 3 kHz. Pin 7 of IC1b outputs a "MOD" signal. The "MOD" signal is applied to the modulation circuit on the PLL unit.

#### 3-2-2 MODULATION CIRCUIT (PLL UNIT)

The modulation circuit modulates the VCO oscillating signal (RF signal) using the microphone audio signals.

The "MOD" signal changes the reactance of a diode (D1) to modulate the oscillated signal at the VCO circuit (Q5, Q6, L2, D2). The oscillated signal is buffer-amplified at Q7 and Q11. The buffer-amplified signal passes through the transmit/receive switching circuit (D14) on the MAIN unit and is then applied to the drive amplifier circuit.

#### 3-2-3 DRIVE AMPLIFIER CIRCUIT (MAIN UNIT)

The drive amplifier circuit amplifies the VCO oscillating signal to the needed level at the power amplifier.

The signal from the transmit/receive switching circuit (D14) is amplified at the pre-drive amplifier (Q7) and is then re-amplified at a drive amplifier (Q6) to obtain 20 mW.

The control voltage from the APC circuit is applied to the collector of Q6 and Q7 for stable RF output power from a power amplifier (IC1).

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

IC1 is a power module which provides a stable 5 W (at DC 13.8 V) of output power.

The RF signal from the drive amplifier (Q6) is applied to the power amplifier (IC1, pin 1). The amplified signal is output from IC1 (pin 4). The output signal is applied to the antenna connector through the APC detector circuit, the antenna switching circuit and the low-pass filter circuit.

#### 3-2-5 APC CIRCUIT (MAIN, APC AND IO UNITS)

The APC circuit protects the power module (IC1) from a mismatched output load and selects HIGH and LOW output power.

The output power from the power module (IC1, pin 4) is applied to the APC detector circuit (L10, D10, D11) to obtain mismatched voltage. When the antenna impedance is matched at 50 Ω, the detected level is at its minimum. However, when antenna impedance is mismatched, the detected voltage is higher than when it is matched.

The detected voltage is applied to a differential amplifier circuit (Q3b) on the APC unit. The APC reference voltage is determined by the power output control circuit (R2~R6) on the IO unit and is then applied to the base of Q3a on the APC unit through the PCON signal line.

When the antenna impedance is mismatched, the base voltage of Q3b exceeds the reference voltage. The collector voltage of Q3b decreases.

#### • MICROPHONE AMPLIFIER CIRCUIT

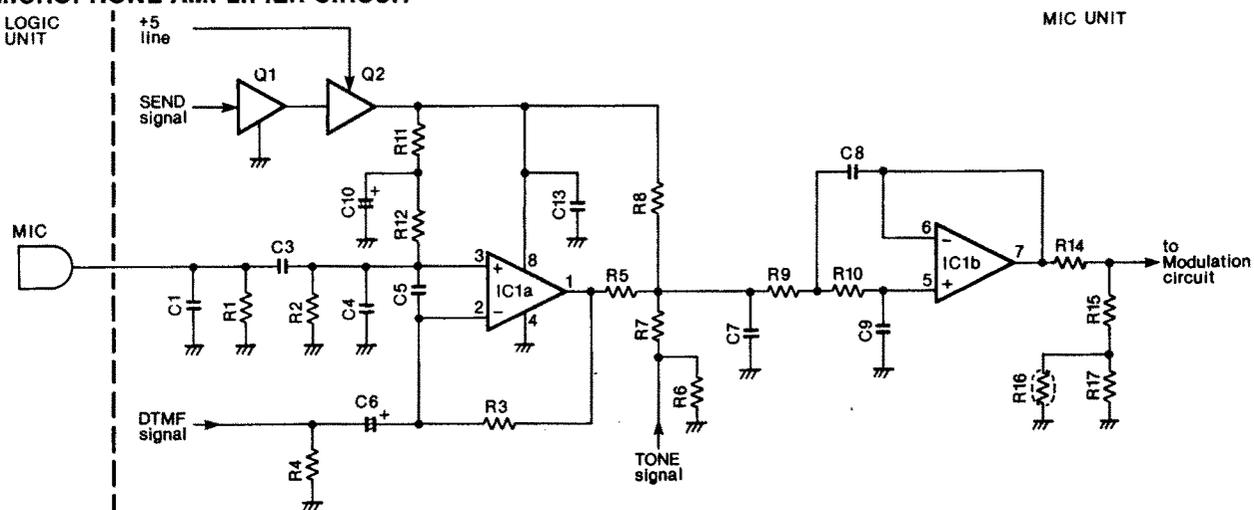


Fig. 3

The current from the differential amplifier circuit (Q3a, Q3b) is amplified at Q2 to control Q1. The control voltage changes the supply voltage to IC1, Q6 and Q7 on the MAIN unit. This decreases the output power from the drive amplifier (Q6) and power module (IC1) until the base voltage of Q3b reaches the same level as the voltage of Q3a.

### 3-2-6 POWER OUTPUT CONTROL CIRCUIT (IO UNIT)

The power output control circuit (R2~R6) selects the output levels (HIGH, LOW 1~LOW 3) and controls the RF output power with the APC reference voltage.

The output signals from IC2 (pins 13 and 14) are converted from digital to analog at the power output control circuit (R2~R6) to select the four output levels (HIGH, LOW 1~LOW 3).

### 3-2-7 TX MUTE CIRCUIT (IO, APC AND MAIN UNITS)

The TX mute circuit interrupts the transmission by controlling the TMUTE signal.

The "TMUTE" signal is output from IC3 and controlled by the outputs from IC1 (pin 7) and Q2 on the IO unit. When Q4 and Q5 on the APC unit are turned OFF to interrupt the transmission by the "TMUTE" signal, the bias voltages are prevented from entering Q6, Q7 and IC1 on the MAIN unit.

### 3-2-8 ANTENNA SWITCHING CIRCUIT (MAIN UNIT)

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

When transmitting, D7 and D9 are turned ON. The RF output signal is not permitted to enter the receiver circuit. The signal passes through D9, C60 and the low-pass filter (L2~L4, C21~C25). The filtered signal is applied to the antenna connector. The low-pass filter suppresses high harmonic components.

## 3-3 PLL CIRCUITS

### 3-3-1 GENERAL

PLL circuits provide steady oscillation of the transmit frequency and the receive 1st LO frequency. The PLL output frequency is controlled by the divided ratio (N-data) of the programmable divider.

### 3-3-2 PLL CIRCUIT (PLL UNIT)

The PLL circuit, using a one-chip modulus prescaler (IC1), directly generates the transmit frequency and the receive 1st LO frequency with the VCO (Q5, Q6, L2, D2). The modulus prescaler (IC1) sets the dividing ratio based on serial data from the CPU (IC1) on the LOGIC unit and compares the phase of the VCO signal with the reference oscillator frequency. The PLL IC (IC1) detects the out-of-step phase and outputs it from IC1 (pin 13). A reference frequency is oscillated at X1.

#### • PLL CIRCUIT

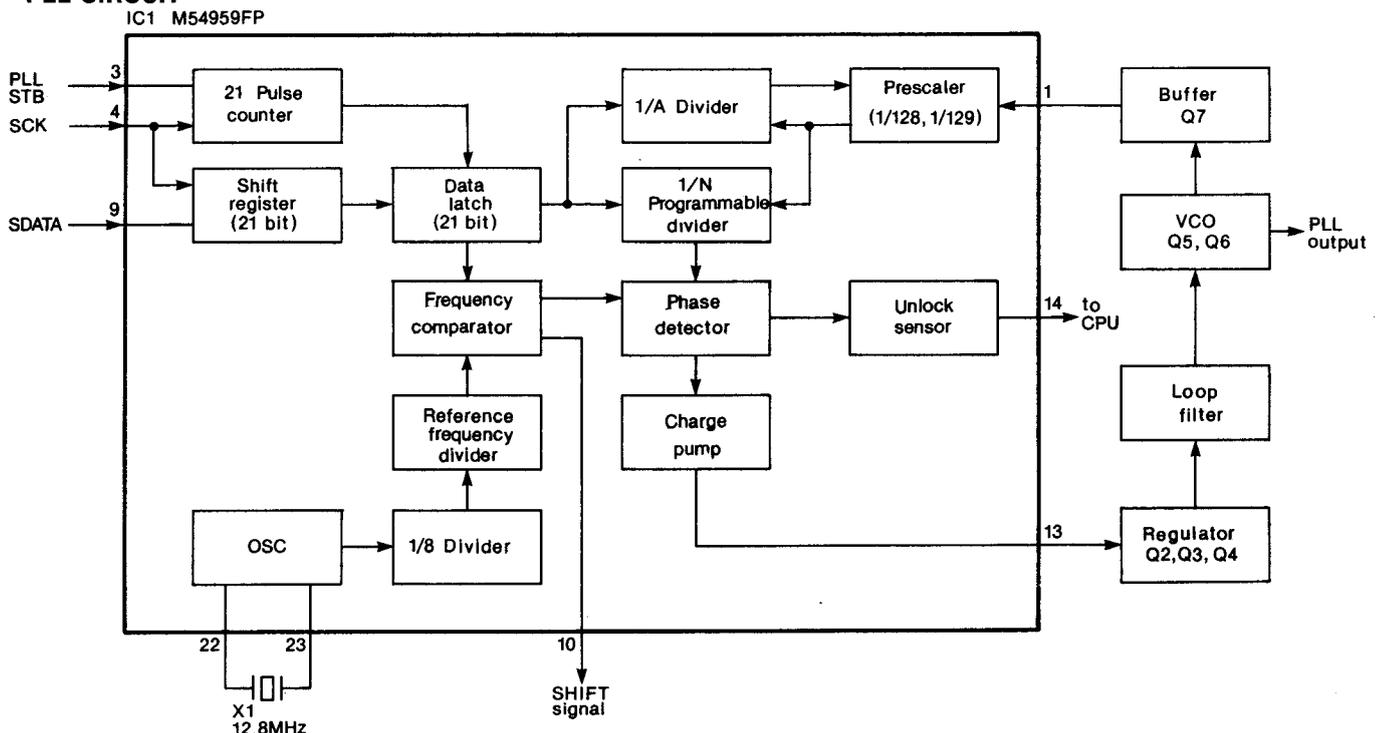


Fig. 4

### 3-3-3 REFERENCE OSCILLATOR CIRCUIT (PLL UNIT)

A 12.8 MHz reference frequency is produced by X1. The frequency is adjusted with C22. The reference frequency is divided by 2560 to obtain 5 kHz.

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

The VCO circuit (Q5, Q6, L2, D2) generates the transmit frequency and the receive 1st LO frequency. The varactor diode (D2) provides frequency control. While transmitting, IC1 (pin 10) becomes "HIGH" to turn D1 OFF. Hence, C5 is added for oscillation. At this time, the microphone signal is applied to D1 cathode for modulation. While receiving, IC1 (pin 10) becomes "LOW" to turn D1 ON. Hence, C5 is ignored for oscillation. The output signal from the VCO circuit is applied to buffer amplifiers (Q7, Q11) which amplify VCO oscillation and do not permit the latter circuit to affect the VCO oscillation. The amplified signal at Q7 is applied to PLL IC (IC1, pin 1). On the other hand, the amplified signal at Q11 is applied to the transmit/receive switching circuit (D14) on the MAIN unit as the PLL output signal.

### 3-3-5 PROGRAMMABLE DIVIDER AND PHASE DETECTOR CIRCUITS (PLL UNIT)

The programmable divider shifts the dividing ratio, depending on the operating frequency, with a prescaler and determines the VCO oscillating frequency.

The phase detector circuit detects the off-phase components of the VCO frequency using a stable reference frequency.

IC1 is a one-chip PLL IC that contains a two-modulus prescaler, a pulse counter, a programmable divider and a phase detector. IC1 accepts up to 500 MHz inputs.

The input signal from the PLL IC (IC1, pin 1) passes through the two-modulus prescaler and the programmable counter sections of IC1. A 12.8 MHz reference frequency from X1 is applied to IC1 (pin 23) and passes through a programmable reference counter section of IC1. Both of the divided signals are compared at a phase detector section of IC1. The phase-detected signal (pulse signal) is output from IC1 (pin 13).

### 3-3-6 LOOP FILTER CIRCUIT (PLL UNIT)

The phase-detected signal (pulse signal) from IC1 (pin 13) passes through the current mirror regulator circuit (Q2~Q4) and is then applied to a lag-lead loop filter (R4, R5, C1~C3). The pulse signal is converted to DC voltage (PLL voltage) to control the oscillation from the VCO circuit. The regulator (Q2~Q4) is used to expand the range of the PLL lock voltage. The PLL lock voltage changes the reactance of a varactor diode (D2).

### 3-3-7 UNLOCK SENSOR CIRCUIT (PLL UNIT)

When the PLL circuit is unlocked, IC1 (pin 14) becomes "HIGH." The "HIGH" signal is applied to the CPU (IC1, pin 31) as an unlock signal.

## 3-4 POWER SUPPLY CIRCUITS

### 3-4-1 VOLTAGE LINES

LINE	DESCRIPTION
HV	The external DC power from the DC power connector.
VCC	This voltage passes through [VOL] control (R1) on the VR unit and is then applied to the 5 V regulator circuit (IC1) on the REG unit. This voltage line changes depending on the battery pack type: 7.2 V (BP-111~BP-113), 12.0 V (BP-114)
+5	Common 5 V converted from the VCC line at the 5 V regulator circuit (Q1, Q2, D3) using IC1 output as the reference voltage on the REG unit. This regulator 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.
+5S	5 V controlled by the power saver function. When the power saver is turned ON, a "PSC" signal from the output expander (IC1, pin 13) on the IO unit interrupts the "+5S" line intermittently to save power. This voltage is converted from the VCC line at Q3, Q4 and D1 using IC2 output as the reference voltage on the REG unit. This regulator circuit forms a complementary circuit.
R+5S	Receive 5 V controlled by the power saver function and a "SEND" signal from the output expander (IC1, pin 14) on the IO unit. This voltage is converted from the VCC line at Q5, Q6 and D2 using IC3 output as the reference voltage on the REG unit. This regulator circuit forms a complementary circuit.
T+5	Transmit 5 V controlled by a "TMUT" signal from the output expander (IC2, pins 13 and 14) on the IO unit. This voltage is converted from the VCC line at Q4, Q5 and D2 on the APC unit. The power output control circuit (R2~R6) on the IO unit provides the reference voltage. This regulator circuit forms a complementary circuit.

### 3-4-2 CPU POWER SUPPLY CIRCUIT (LOGIC UNIT)

When the power switch is turned OFF and the external battery pack is discharged, DC voltage is applied to the CPU (IC1, pin 97) via R2 from the lithium backup battery (BT1) installed in the transceiver to provide backup for the memory contents.

When the attached battery pack voltage or external DC power is applied to the transceiver, BT1 is charged by the current regulator (Q1).

### 3-4-3 +5S AND R+5S SWITCHING CIRCUITS (REG UNIT)

The IC-P2AT/ET has a power saver function to reduce current consumption to approx. 1/4.

The PSC (Power Saver Control) signal is applied to IC2. IC2 controls the +5S regulator (Q3, Q4, D1) to turn ON and OFF the +5S voltage.

PSC and SEND signals are applied to IC3. IC3 controls the R+5S regulator (Q5, Q6, D2). R+5S turns OFF during the power save period or transmitting.

### 3-4-4 CHARGING CIRCUIT (PRT UNIT)

The DC voltage from the [DC 13.8V] jack is applied to the current control circuit (Q1~Q3, D1, D2) to charge an attached battery pack.

When the external battery pack is attached, the current from D1 charges the attached battery pack.

The mechanical switch (MP2) selects the battery packs. This circuit charges one of the battery packs in approx. 15 hours.

## 3-5 OTHER CIRCUITS

### 3-5-1 AF 7 V REGULATOR CIRCUIT (AF UNIT)

The AF 7 V regulator circuit (Q4~Q6) produces a regulated 7 V to the AF amplifier (IC1) when the squelch is open or the [MONI/DSEL] switch is pushed. This circuit is controlled by the AFS signal line. R14 and R15 provide the reference voltage.

### 3-5-2 DIMMER CIRCUIT (LOGIC UNIT)

The dimmer circuit consists of a regulator circuit (Q3, Q4, D4) and the backlight LEDs (DS3~DS6 on the LOGIC unit, DS1~DS4 on the TENKEY unit). This circuit drives the backlight LEDs and ensures that brightness does not change even with a change of power supply.

When the [LIGHT] switch is pushed, the CPU (IC1, pin 30) outputs a "HIGH" signal. The signal is applied to the regulator circuit (Q3, Q4, D4) to light up the backlight LEDs (DS3~DS6 on the LOGIC unit, DS1~DS4 on the TENKEY unit).

### 3-5-3 1750 Hz TONE CALL CIRCUIT (LOGIC UNIT)

A 1750 Hz tone call is provided for IC-P2ET (Europe version only).

When the [PTT] switch is quickly pushed and then briefly held down a second time or when the [PTT] switch is

pushed with the [LIGHT] switch, the CPU (IC1, pin 15) outputs a 1750 Hz tone signal. R45 adjusts the 1750 Hz tone deviation. The signal passes through R46 and is then applied to the AF unit and VR unit through the AF1 signal line.

### 3-5-4 CPU RESET CIRCUIT (LOGIC UNIT)

This circuit resets the CPU (IC1) with a three-terminal voltage regulator IC (IC4). The three-terminal voltage regulator IC (IC4) detects the increase and decrease of the +5 voltage line to control the RST port of the CPU (IC1, pin 26) when the [PWR/VOL] control is turned ON and OFF.

When the [PWR/VOL] control is turned ON, the RST port of the CPU (IC1, pin 26) becomes "HIGH." The CPU (IC1) starts operation.

When the [PWR/VOL] control is turned OFF, the RST port of the CPU (IC1, pin 26) becomes "LOW." The CPU (IC1) stops operation.

CPU initialization requires a pulse input via pin 10 and the [CLR] key operation. While turning the power ON and holding the [FUNC] switch, the AND gate IC (IC3) outputs the pulse signal.

### 3-5-5 TRANSMIT/RECEIVE INDICATOR CIRCUIT (LOGIC UNIT)

The transmit/receive indicator (DS2) uses a 2-input LED and lights up in red or green.

The transmit indicator lights up in red when transmitting with the T+5 voltage.

The receive indicator lights up in green when the squelch opens with the "BUSY LED" signal from the CPU (IC1, pin 14) through the inverter (Q8).

### 3-5-6 CLOCK OSCILLATOR CIRCUIT (LOGIC UNIT)

IC1 oscillates the 798.642 kHz system clock signal with X1. IC1 oscillates the 32.768 kHz clock signal for the built-in clock with X2.

#### • RESET CIRCUIT

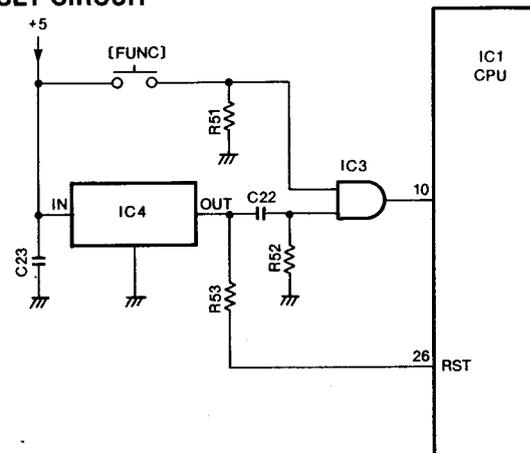


Fig. 5

### 3-6 PORT ALLOCATIONS

#### • IC1 CPU (LOGIC UNIT)

PORT NAME	PIN NUMBER	DESCRIPTION
OSC1	8	Input port for the CPU system clock signal.
OSC2	9	Output port for the CPU system clock signal.
RESET	10	When a "HIGH" signal is applied to this port, either the CPU is initialized or changes to stand-by mode.
X1	11	Input port for the CPU clock signal.
X2	12	Output port for the CPU clock signal.
BUSY LED	14	Output port for the transmit/receive indicator. This port becomes "LOW" when the squelch opens. The transmit/receive indicator lights up in green.
TONE OUT	15	Outputs a 1750 Hz tone signal. (IC-P2ET Europe version only)
PTT	16	The CPU detects that the [PTT] switch has been pushed when this port becomes "LOW."
DIAL UP	17	Input port for the up signal of the main dial.
DIAL DN	18	Input port for the down signal of the main dial.
TOE	19	Outputs an enable signal for the UT-49 DTMF DECODER UNIT.
KEYS0~KEYS3	20~23	Output strobe signals for the key board, initial and key matrix and D/A converter counting signal alternately in an interval.
SIN	24	Inputs a resulting signal from the S/Rf meter comparator (IC2) to indicate the CPU counting level on the function display.
RST	26	Detects a signal for the standby mode of the CPU. The CPU enters the standby mode when the port becomes "LOW."
STD	27	Becomes "LOW" when the CPU decodes the received DTMF code.
FUNC	28	Input port for the [FUNC] switch.
LAMP	29	Input port for the [LIGHT] switch.
LAMPO	30	Becomes "HIGH" when the backlight LEDs (DS3~DS6 on the LOGIC unit; DS1~DS4 on the TENKEY unit) light up.
UL	31	Detects a PLL unlock signal. This port becomes "HIGH" when the PLL is unlocked.
TSQL	32	Input port for an optional unit. This port becomes "HIGH" when the tone squelch opens. (UT-50 TONE SQUELCH UNIT) This port becomes "LOW" when the UT-51 PROGRAMMABLE TONE ENCODER UNIT is installed.
BUSY	33	Detects a squelch signal. This port becomes "HIGH" when the squelch opens.
IOSTB	34	Outputs strobe signals for serial data to the I/O expander ICs (IC1, IC2) on the IO unit.

PORT NAME	PIN NUMBER	DESCRIPTION
SCK	35	Outputs clock signals for serial data.
PLL STB	36	Outputs strobe signals for serial data to the PLL IC (IC1) on the PLL unit.
SDATA	37	Outputs serial data synchronized with the SCK signal.
R30~R33	38~41	Input ports for the initial and key matrix.
R42~R45	42~45	Input ports for the keyboard and DTMF code from UT-49 DTMF DECODER UNIT.
H/L	48	Input port for the [H/L/DTMF] switch.
TONEC, TONER	98, 99	Outputs a DTMF code signal.

#### • IC1 OUTPUT EXPANDER (IO UNIT)

PORT NAME	PIN NUMBER	DESCRIPTION
AF ON	4	Output port for the AF muting signal which mutes the AF power amplifier (IC1) on the AF unit.
MIC	5	Output port for the microphone muting signal. When transmitting a tone signal, this signal line goes to ground.
RMUTE	6	Output port for the receive muting signal which mutes audio power. When emitting a beep tone, this port outputs the muting signal and the AF ON port does not output it.
TMUTE	7	Output port for the transmit muting signal which mutes RF power.
MODE	11	Output port for a mode signal.
CPC	12	Outputs a control signal to cut off the loop filter while the power saver function is activated.
PSC	13	This port becomes "HIGH" while the power saver function is activated.
SEND	14	Output for the transmit/receive signals. This port becomes "HIGH" while transmitting.

#### • IC2 OUTPUT EXPANDER (IO UNIT)

PORT NAME	PIN NUMBER	DESCRIPTION
BA2, BA3	5, 6	Outputs the control signals for the RF bandpass filter.
+5, PCON	13, 14	Outputs the control signals for the output power selecting circuit. These signals are converted into the APC reference voltage with the D/A converter (R2~R6).

### 3-7 OPTIONAL UNITS

#### 3-7-1 UT-49 DTMF ENCODER UNIT

The UT-49 DTMF ENCODER UNIT provides pager and code squelch functions.

The "DETO" signal from the DET unit passes through J1 on the LOGIC unit and is then applied to the DTMF decoder IC (IC1, pin 2). The input signal passes through the filter circuit in IC1 and is then applied to the signal detector circuit in IC1. When the double tone signal is detected, pin 15 of IC1 becomes "HIGH." Therefore, the CPU (IC1, pin 27) on the LOGIC unit becomes "LOW" and then decodes the received DTMF code. The CPU (IC1, pin 19) outputs an enable signal to read out the 4-bit binary outputs (Q1~Q4) from the UT-49 DTMF ENCODER UNIT.

The CPU (IC1, pins 98 and 99) on the LOGIC unit outputs a DTMF code signal. The output signal is applied to R35 for the DTMF deviation adjustment. The signal is applied to the MIC unit through the "DTMF" signal line.

#### 3-7-2 UT-50 TONE SQUELCH UNIT

The UT-50 TONE SQUELCH UNIT provides pocket beep, tone squelch and programmable tone encoder functions.

IC1 encodes and decodes the subaudible tone frequency signals of 67.0 Hz~250.3 Hz. The serial data from the CPU (IC1) on the LOGIC unit passes through J5 on the MAIN unit and is then applied to a serial/parallel converter (IC2) to set the tone signals.

When IC1 (pin 12) becomes "LOW," IC1 (pin 26) outputs the tone signal programmed in IC2. The output signal from IC1 (pin 26) is applied to R10 for the tone deviation adjustment. The signal passes through the tone signal output buffer amplifier (Q4) and is then applied to the MIC unit through the "TONE" signal line.

The "DETO" signal from the DET unit passes through J5 on the MAIN unit and is then applied to IC1 (pin 29). The input signal is compared with the tone signal programmed in IC2. Pin 23 of IC1 becomes "HIGH" during the successful decode.

#### 3-7-3 UT-51 PROGRAMMABLE TONE ENCODER UNIT

The UT-51 PROGRAMMABLE TONE ENCODER UNIT accesses a repeater requiring a subaudible tone.

IC1 encodes the subaudible tone frequency signals of 67.0 Hz~250.3 Hz. The serial data from the CPU (IC1) on the LOGIC unit passes through J5 on the MAIN unit and is then applied to a serial/parallel converter (IC2) to set the tone signals. IC2 supplies the 6-bit parallel data to pins 8~13 of IC1.

The 6-bit parallel data from IC2 passes through the programmable counter section of IC1. A 3.579545 MHz reference frequency from X1 is applied to a programmable counter section of IC1. The divided signal is output from IC1 (pin 1) and is then applied to R5 for the tone deviation adjustment. The signal passes through the tone signal output buffer amplifier (Q1) and is then applied to the MIC unit through the "TONE" signal line.

#### • UT-51 PROGRAMMABLE TONE ENCODER UNIT

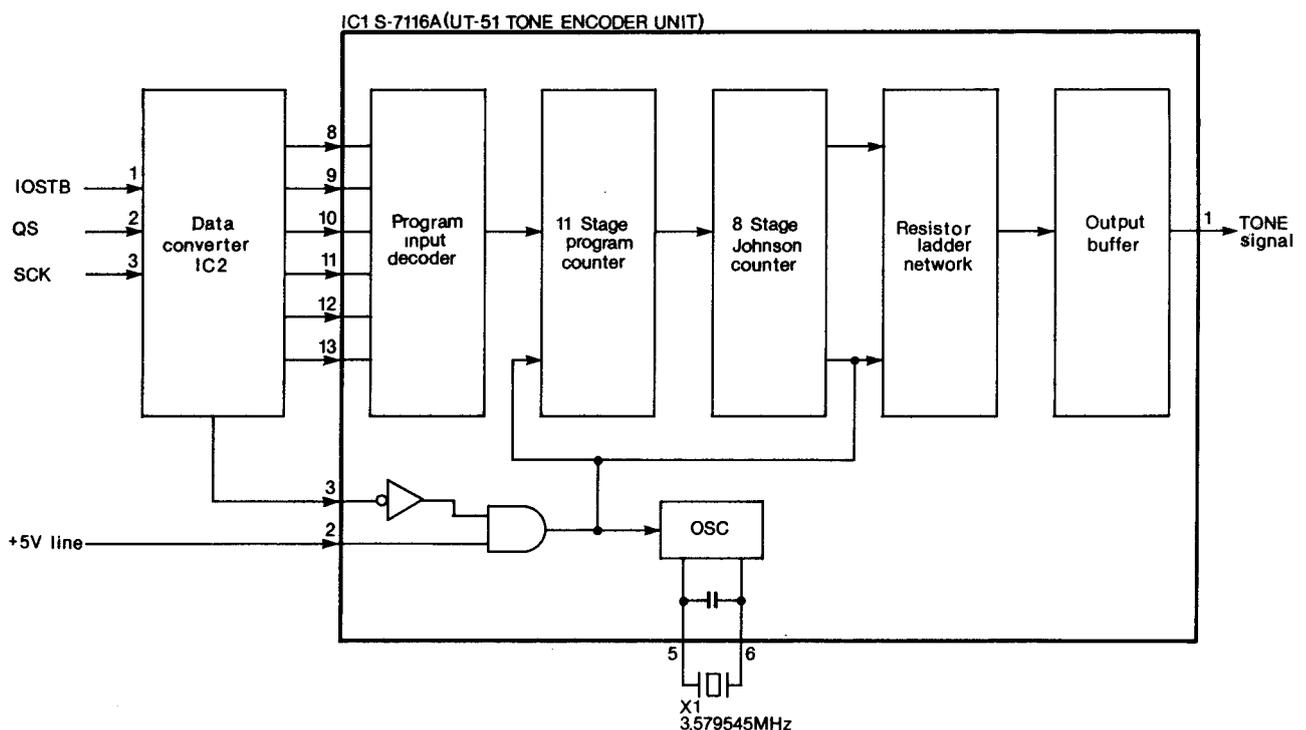


Fig. 6

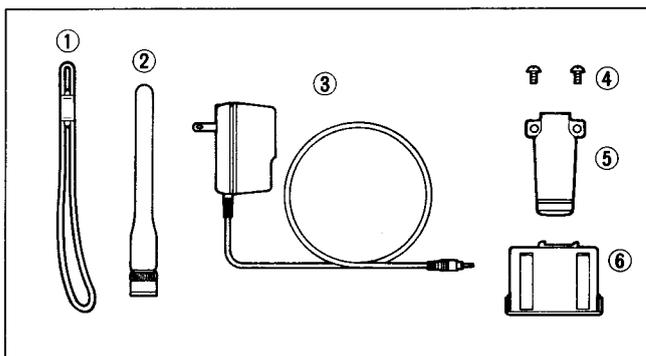
# SECTION 4 MECHANICAL PARTS AND DISASSEMBLY

## 4-1 FRONT PANEL

LABEL NUMBER	ORDER NO.	DESCRIPTION	QTY.	LABEL NUMBER	ORDER NO.	DESCRIPTION	QTY.
①	8610007640	Knob N177 [SQL], [PWR/VOL]	2	⑳	8930022110	LCD holder	1
②	8610007650	Knob N178 [MAIN DIAL]	1	㉑	8930022150	LCD rubber	1
③	8830000710	VR nut (G)	3	㉒	8810005740	Screw FH B0 No. 0 M2 x 3	6
④	8210006610	1144 Top panel	1	㉓	8110004510	1144 PCB cover	1
⑤	8930022230	1144 Top seal	1	㉔	8930022640	1144 U-rubber	1
⑥	8930022121	1144 VR plate-1	1	㉕	8930022650	1144 L-rubber	1
⑦	8810005860	Screw No. 0 M2 x 3 NI	1	㉖	8930010330	Insulate plate AO	1
⑧	8810005700	Screw No. 0 M2 x 4 ZK	2	㉗	8210006620	1144 10 keyboard	1
⑨	2260001400	Encoder SW-122 (RK0971103H) [MAIN DIAL]	1	㉘	8210006721	1144 Front panel (D)-1 (incl. window panel) P2AT	1
⑩	8930009790	Insulate plate AM	1		8210006731	1144 Front panel (E)-1 (incl. window panel) P2ET	1
⑪	7210001450	Variable resistor RK0971110051A (10 KB) [SQL]	1	㉙	8810004450	Screw PH M2 x 8 ZK	1
⑫	7210001440	Variable resistor RK097111101NA (10 KA) [PWR/VOL]	1	㉚	8850001230	Lug washer	1
⑬	6450000870	Connector HEC2711-01-020 [DC 13.8 V]	1	㉛	6510013810	Connector BNC-RM-F1 [ANTENNA CONNECTOR]	1
⑭	6450001060	Connector HSJ1493-01-010 [SP]	1	㉜	8930022630	1144 PTT rubber	1
⑮	6450000130	Connector HSJ1102-01-540 [MIC]	1	㉝	8930014961	752 Rainproof cap-1	1
⑯	8810000120	Screw PH M2.6 x 3	1	㉞	8810006460	Screw FH M2 x 3	1
⑰	8930016240	Fiber insulate plate (D)	1	㉟	8810001560	Screw PH PT M2 x 15 ZK	3
⑱	8810006620	Screw No. 0 M2 x 3.5 NI	4	㊱	8010007602	Hole bush (A)-2	2
㉑	8930011860	Insulate plate AU	1	㊲	8810006950	Screw PH B0 No. 0 M2 x 4 ZK	2
㉒	8510005860	751 MAIN shield plate	1	㊳	8930022720	1144 Release button	1
㉓	8810004800	Screw PH B0 No. 0 M2 x 4	4	㊴	8930023082	1144 Slider-2	1
㉔	8930022980	1144 LOGIC spring	1	㊵	8930022140	1144 Release spring	1
㉕	7700000861	Microphone WM-62A103	1	㊶	8930022131	1144 Lock angle-1	1
㉖	8930014940	752 Microphone holder	1	㊷	8810006980	Screw FH No. 0 M2 x 3.5 NI	2
㉗	8930018080	Speaker ring	1	㊸	8850000110	Flat washer M2 NI BS	2
㉘	2510000530	Speaker T028S14I0810	1	㊹	8930014912	Lamp button-2	1
㉙	8930023010	Insulate plate CE	1	㊺	8010011820	1144 Rear panel	1
㉚	8510007440	1144 Front shield	1	㊻	8930022950	1144 Contact shield	1
㉛	6910006640	LCD reflector ALF39.5 x 24.5 x 0.58	1	㊼	8210006600	1144 Contact panel	1
㉜	8930023130	LCD contact strip SRCN-1144W	2	㊽	8810006940	Screw PH M2 x 2	2
㉝	5030000720	LCD LD-BU5385J (E-5561)	1	㊾	8930022100	1144 Contact terminal	3

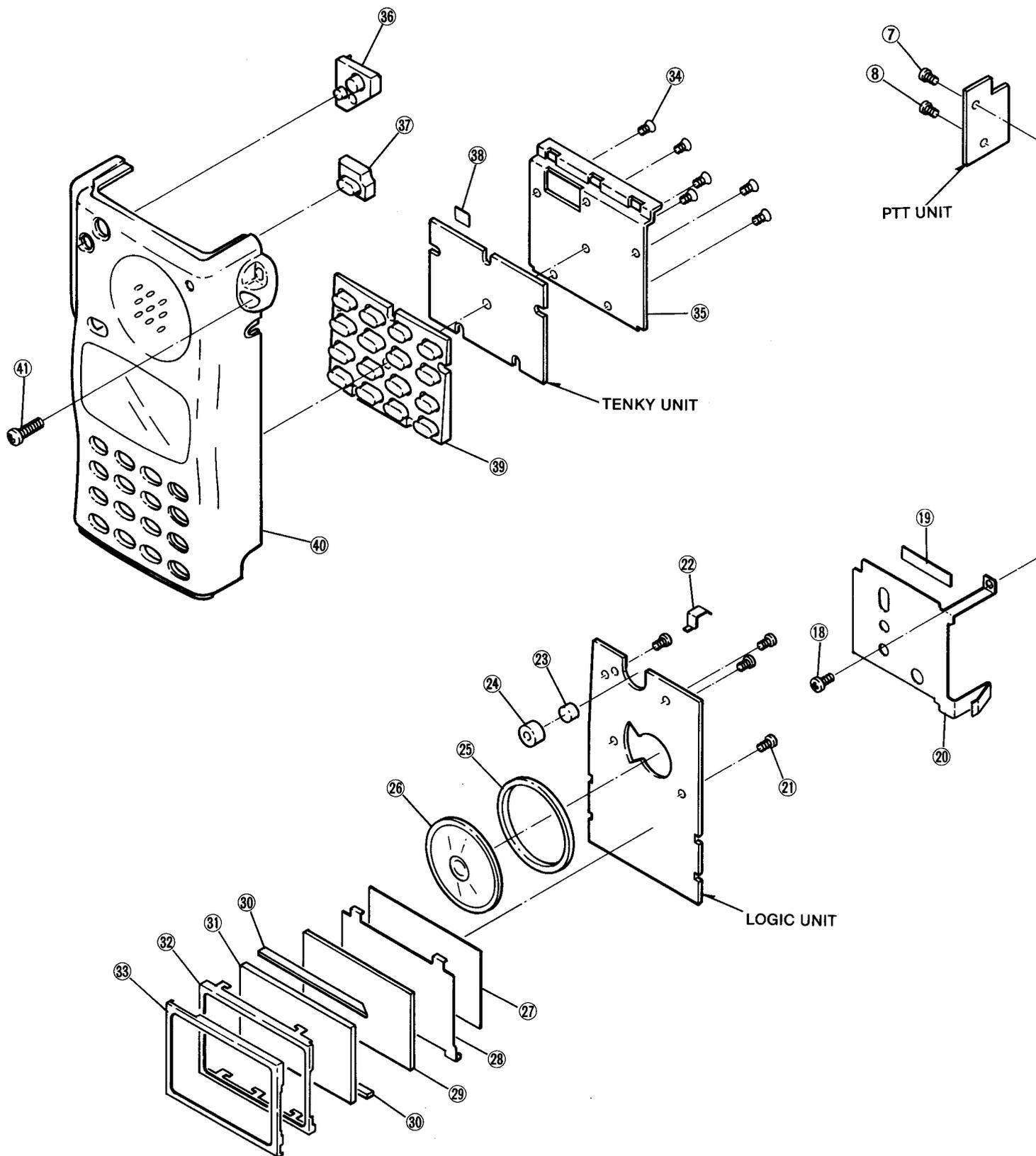
**Screw abbreviations** B0: Self-tapping screw PH: pan head FH: Flat head BS: Brass NI: Nickel ZK: Black

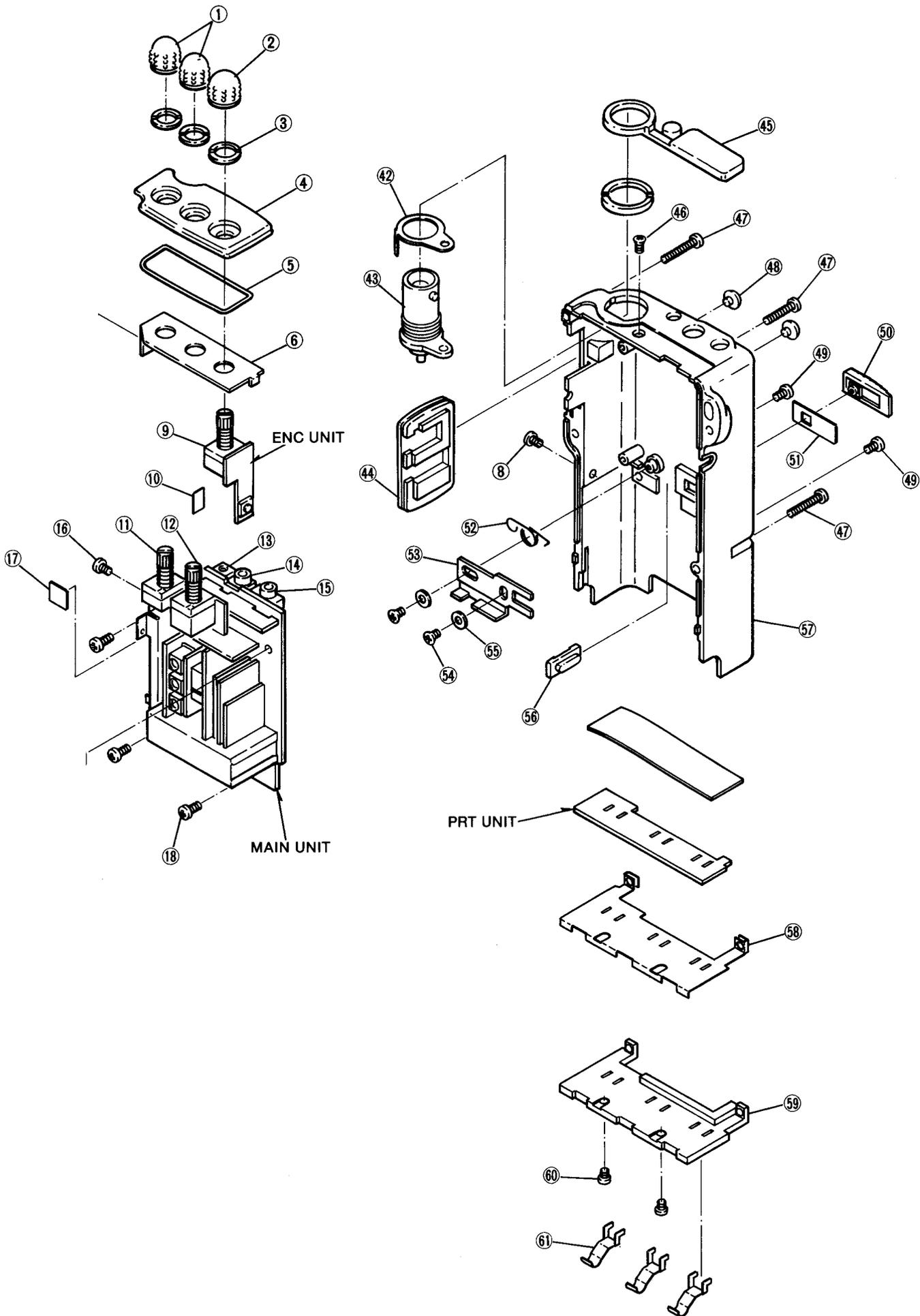
## 4-2 ACCESSORIES



LABEL NUMBER	ORDER NO.	DESCRIPTION	QTY.
①	8010011960	Handstrap HK-005	1
②	Optional product	FA-140BF Flexible antenna	1
③	Optional product	Wall charger BC-73D (#22, #24)	1
		Wall charger BC-73E (#23, #29)	1
		Wall charger BC-74A (#25)	1
		Wall charger BC-74V (#27)	1
④	8810005730	Screw BuH M3 x 3 ZK BS	2
⑤	8010008620	752 Belt clip	1
⑥	0800000670	Battery pack BP-111	1

**Screw abbreviations** BuH: Button head BS: Brass ZK: Black





## SECTION 5 PARTS LIST

## [MAIN UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1150000730	IC	SC1096
Q1	1560000550	FET	2SK882-Y (TE85R)
Q3	1510000510	Transistor	2SA1576 T107 R
Q4	1590000430	Transistor	DTC144EU T107
Q6	1530002340	Transistor	2SC2954-T2B
Q7	1530002560	Transistor	2SC4403-3-TR
Q8	1510000510	Transistor	2SA1576 T107 R
D1	1790000590	Diode	MA110 (TW)
D2	1750000130	Diode	DA204U T107
D7	1790000450	Diode	MA862 (TX)
D8	1160000060	Diode	DAN202U T107
D9	1750000080	Diode	1SS153-T2
D10	1790000490	Diode	HSM88AS-TR
D11	1790000490	Diode	HSM88AS-TR
D12	1790000590	Diode	MA110 (TW)
D13	1750000130	Diode	DA204U T107
D14	1790000450	Diode	MA862 (TX)
D15	1790000680	Diode	SB20-03P-TD
FI1	2010000230	Monolithic	30M15B (FL-76)
L1	6150003210	Coil	LS-319
L2	6110002000	Coil	LA-226
L3	6110002120	Coil	LA-228
L4	6110002120	Coil	LA-228
L5	6110002070	Coil	LA-227
L6	6110002000	Coil	LA-226
L7	6110002070	Coil	LA-227
L8	6110002010	Coil	LA-224
L9	6200000750	Coil	LQH 3N 4R7M
L10	6110002330	Coil	LA-415
L11	6200000760	Coil	LQN 2A 56NM
L12	6200000260	Coil	LQN 2A R10K
R1	7030003290	Resistor	ERJ3GEYJ 560 V (56 Ω)
R2	7030003480	Resistor	ERJ3GEYJ 222 V (2.2 kΩ)
R3	7030003520	Resistor	ERJ3GEYJ 472 V (4.7 kΩ)
R4	7030003400	Resistor	ERJ3GEYJ 471 V (470 Ω)
R6	7030003410	Resistor	ERJ3GEYJ 561 V (560 Ω)
R7	7030003760	Resistor	ERJ3GEYJ 474 V (470 kΩ)
R8	7030003400	Resistor	ERJ3GEYJ 471 V (470 Ω)
R9	7030003400	Resistor	ERJ3GEYJ 471 V (470 Ω)
R10	7030003560	Resistor	ERJ3GEYJ 103 V (10 kΩ)
R11	7030003450	Resistor	ERJ3GEYJ 122 V (1.2 kΩ)
R12	7030003440	Resistor	ERJ3GEYJ 102 V (1 kΩ)
R13	7030003440	Resistor	ERJ3GEYJ 102 V (1 kΩ)
R15	7030003600	Resistor	ERJ3GEYJ 223 V (22 kΩ)
R16	7510000070	Thermistor	ERT-D2FHL 503S
R17	7030003340	Resistor	ERJ3GEYJ 151 V (150 Ω)
R18	7030003380	Resistor	ERJ3GEYJ 331 V (330 Ω)
R19	7030003480	Resistor	ERJ3GEYJ 222 V (2.2 kΩ)
R20	7030003550	Resistor	ERJ3GEYJ 822 V (8.2 kΩ)
R21	7030003490	Resistor	ERJ3GEYJ 272 V (2.7 kΩ)
R22	7030003380	Resistor	ERJ3GEYJ 331 V (330 Ω)
R23	7030003200	Resistor	ERJ3GEYJ 100 V (10 Ω)
R24	7030003280	Resistor	ERJ3GEYJ 470 V (47 Ω)
R25	7030003200	Resistor	ERJ3GEYJ 100 V (10 Ω)
R26	7030003310	Resistor	ERJ3GEYJ 820 V (82 Ω)
R27	7030003320	Resistor	ERJ3GEYJ 101 V (100 Ω)
R28	7030003410	Resistor	ERJ3GEYJ 561 V (560 Ω)
R29	7030003520	Resistor	ERJ3GEYJ 472 V (4.7 kΩ)
R30	7030003520	Resistor	ERJ3GEYJ 472 V (4.7 kΩ)
R31	7030003800	Resistor	ERJ3GEYJ 105 V (1 M Ω)

## [MAIN UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
R32	7030003560	Resistor	ERJ3GEYJ 103 V (10 kΩ)
R33	7030003720	Resistor	ERJ3GEYJ 224 V (220 kΩ)
R34	7030003680	Resistor	ERJ3GEYJ 104 V (100 kΩ)
R35	7030003280	Resistor	ERJ3GEYJ 470 V (47 Ω)
C1	4550002890	Tantalum	TESVA 1A 225M1-8L
C2	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C3	4030006710	Ceramic	C1608 SL 1H 470J-T-A
C4	4030006660	Ceramic	C1608 SL 1H 220J-T-A
C5	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C6	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C8	4030006620	Ceramic	C1608 SL 1H 120J-T-A
C10	4550000460	Tantalum	TESVA 1C 105M1-8L
C11	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C12	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C13	4030006860	Ceramic	C1608 SL 1H 102K-T-A
C14	4550003040	Tantalum	TEMSVB2 0J 106M-8L
C15	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C16	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C17	4030006900	Ceramic	C1608 JB 1E 103K-T-A
C21	4030006660	Ceramic	C1608 SL 1H 220J-T-A
C22	4030006570	Ceramic	C1608 SL 1H 060D-T-A
C23	4030006680	Ceramic	C1608 SL 1H 300J-T-A
C24	4030006540	Ceramic	C1608 SL 1H 030C-T-A
C25	4030006640	Ceramic	C1608 SL 1H 180J-T-A
C26	4030006660	Ceramic	C1608 SL 1H 220J-T-A
C27	4030006690	Ceramic	C1608 SL 1H 330J-T-A
C28	4030006640	Ceramic	C1608 SL 1H 180J-T-A
C29	4030006580	Ceramic	C1608 SL 1H 070D-T-A
C30	4030006580	Ceramic	C1608 SL 1H 070D-T-A
C31	4030006550	Ceramic	C1608 SL 1H 040C-T-A
C32	4030006710	Ceramic	C1608 SL 1H 470J-T-A
C33	4030006580	Ceramic	C1608 SL 1H 070D-T-A
C34	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C35	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C36	4550002890	Tantalum	TESVA 1A 225M1-8L
C37	4550002890	Tantalum	TESVA 1A 225M1-8L
C38	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C39	4510001450	Electrolytic	50 MS5 R33 μF
C40	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C41	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C42	4030006660	Ceramic	C1608 SL 1H 220J-T-A
C43	4030006660	Ceramic	C1608 SL 1H 220J-T-A
C44	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C45	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C46	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C47	4510003160	Electrolytic	16 RC2 22 μF (D=4.0)
C48	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C49	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C50	4510001350	Electrolytic	16 MS5 10 μF
C51	4030006660	Ceramic	C1608 SL 1H 220J-T-A
C52	4030006890	Ceramic	C1608 JF 1H 103Z-T-A
C53	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C54	4030006620	Ceramic	C1608 SL 1H 120J-T-A
C55	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C56	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C57	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C58	4030006890	Ceramic	C1608 JF 1H 103Z-T-A
C59	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C60	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C61	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C62	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C63	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C64	4510001350	Electrolytic	16 MS5 10 μF
C65	4550004010	Tantalum	TEMSVA2 1A 105M-8L
C66	4030006760	Ceramic	C1608 SL 1H 121J-T-A
C67	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C68	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C69	4030006860	Ceramic	C1608 JB 1H 102K-T-A

**[MAIN UNIT]**

REF. NO.	ORDER NO.	DESCRIPTION	
C70	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C71	4030006750	Ceramic	C1608 SL 1H 101J-T-A
C72	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C73	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C74	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C75	4030006750	Ceramic	C1608 SL 1H 101J-T-A
C76	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C77	4030006750	Ceramic	C1608 SL 1H 101J-T-A
C78	4030006750	Ceramic	C1608 SL 1H 101J-T-A
C79	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C80	4030006750	Ceramic	C1608 SL 1H 101J-T-A
EP1	0910033630	P.C. Board	B 3331 (MAIN)

**[AF UNIT]**

REF. NO.	ORDER NO.	DESCRIPTION	
C13	4510003180	Electrolytic	6.3 RC2 100 $\mu$ F (D=5.0)
C14	4550003290	Tantalum	TESVA 0G 475M1-8L
C15	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C16	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C17	4030005110	Ceramic	C2012 JB 1E 473K-T-A
C19	4030006710	Ceramic	C1608 SL 1H 470J-T-A
C20	4550002950	Tantalum	TESVA 0J 335M1-8L
C21	4030004760	Ceramic	C2012 JF 1E 104Z-T-A
EP1	0910034376	P.C. Board	B 2014F (AF)
EP2	6910003110	Lead Frame	HFB2.0-0.7-8 (N)

**[AF UNIT]**

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1110001810	IC	TA7368F (TP1)
Q1	1530002060	Transistor	2SC4081 T107 R
Q2	1530002060	Transistor	2SC4081 T107 R
Q3	1590000520	FET	2SJ106-GR (TE85R)
Q4	1520000270	Transistor	2SB1182 TL Q
Q5	1530002060	Transistor	2SC4081 T107 R
Q6	1530002060	Transistor	2SC4081 T107 R
D1	1160000050	Diode	DAP202U T107
R1	7030003580	Resistor	ERJ3GEYJ 153 V (15 k $\Omega$ )
R2	7030003700	Resistor	ERJ3GEYJ 154 V (150 k $\Omega$ )
R3	7030003760	Resistor	ERJ3GEYJ 474 V (470 k $\Omega$ )
R4	7030003560	Resistor	ERJ3GEYJ 103 V (10 k $\Omega$ )
R5	7030003480	Resistor	ERJ3GEYJ 222 V (2.2 k $\Omega$ )
R6	7030003630	Resistor	ERJ3GEYJ 393 V (39 k $\Omega$ )
R7	7030003630	Resistor	ERJ3GEYJ 393 V (39 k $\Omega$ )
R8	7030003480	Resistor	ERJ3GEYJ 222 V (2.2 k $\Omega$ )
R9	7030003800	Resistor	ERJ3GEYJ 105 V (1 M $\Omega$ )
R10	7030003320	Resistor	ERJ3GEYJ 101 V (100 $\Omega$ )
R13	7030003200	Resistor	ERJ3GEYJ 100 V (10 $\Omega$ )
R14	7030003420	Resistor	ERJ3GEYJ 681 V (680 $\Omega$ )
R15	7030003420	Resistor	ERJ3GEYJ 681 V (680 $\Omega$ )
R16	7030003600	Resistor	ERJ3GEYJ 223 V (22 k $\Omega$ )
R18	7030003760	Resistor	ERJ3GEYJ 474 V (470 k $\Omega$ )
R19	7030003560	Resistor	ERJ3GEYJ 103 V (10 k $\Omega$ )
R20	7030003340	Resistor	ERJ3GEYJ 151 V (150 $\Omega$ )
R21	7030003520	Resistor	ERJ3GEYJ 472 V (4.7 k $\Omega$ )
C1	4030006900	Ceramic	C1608 JB 1E 103K-T-A
C2	4030006900	Ceramic	C1608 JB 1E 103K-T-A
C3	4030006870	Ceramic	C1608 JB 1H 222K-T-A
C4	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C5	4030004760	Ceramic	C2012 JF 1E 104Z-T-A
C6	4030005110	Ceramic	C2012 JB 1E 473K-T-A
C7	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C10	4510001340	Electrolytic	10 MS5 33 $\mu$ F
C11	4030005110	Ceramic	C2012 JB 1E 473K-T-A
C12	4030006850	Ceramic	C1608 JB 1H 471K-T-A

**[MIC UNIT]**

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1110002490	IC	M5218FP-73A
Q1	1590000430	Transistor	DTC144EU T107
Q2	1590000720	Transistor	DTA144EU T107
R1	7030003640	Resistor	ERJ3GEYJ 473 V (47 k $\Omega$ )
R2	7030003880	Resistor	ERJ3GEYJ 244 V (240 k $\Omega$ )
R3	7030003710	Resistor	ERJ3GEYJ 184 V (180 k $\Omega$ )
R4	7030003330	Resistor	ERJ3GEYJ 121 V (120 $\Omega$ )
R4	7030003370	Resistor	ERJ3GEYJ 271 V (270 $\Omega$ )
R5	7030003670	Resistor	ERJ3GEYJ 823 V (82 k $\Omega$ )
R6	7030003720	Resistor	ERJ3GEYJ 224 V (220 k $\Omega$ )
R7	7030003680	Resistor	ERJ3GEYJ 104 V (100 k $\Omega$ )
R8	7030003740	Resistor	ERJ3GEYJ 334 V (330 k $\Omega$ )
R9	7030003630	Resistor	ERJ3GEYJ 393 V (39 k $\Omega$ )
R10	7030003630	Resistor	ERJ3GEYJ 393 V (39 k $\Omega$ )
R11	7030003440	Resistor	ERJ3GEYJ 102 V (1 k $\Omega$ )
R12	7030003710	Resistor	ERJ3GEYJ 184 V (180 k $\Omega$ )
R13	7310002600	Trimmer	RV-110 (RH03A3AS4X0AA) 473
R14	7030003560	Resistor	ERJ3GEYJ 103 V (10 k $\Omega$ )
R15	7030003540	Resistor	ERJ3GEYJ 682 V (6.8 k $\Omega$ )
R16	7510000180	Thermistor	DTN-T203S223LS (T)
R17	7030003570	Resistor	ERJ3GEYJ 123 V (12 k $\Omega$ )
C1	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C3	4030006880	Ceramic	C1608 JB 1H 472K-T-A
C4	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C5	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C6	4550000550	Tantalum	TESVA 1V 224M1-8L (#22, #23, #24, #27, #29)
C6	4550000530	Tantalum	TESVA 1V 104M1-8L (#25)
C7	4030008470	Ceramic	C1608 JB 1H 272K-T-A
C8	4030006900	Ceramic	C1608 JB 1E 103K-T-A
C9	4030006760	Ceramic	C1608 SL 1H 121J-T-A
C10	4510001850	Electrolytic	16 MS5 4R7 $\mu$ F
C11	4030006900	Ceramic	C1608 JB 1E 103K-T-A
C12	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C13	4030006850	Ceramic	C1608 JB 1H 471K-T-A

[MIC UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
EP1	0910034384	P.C. Board	B 1922D (MIC)
EP2	6910003110	Lead Frame	HFB2.0-0.7-8 (N)

[APC UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
Q1	1520000270	Transistor	2SB1182 TL Q
Q2	1530002280	Transistor	2SC4081 T107 S
Q3	1590000620	Transistor	FMS1 T148
Q4	1520000270	Transistor	2SB1182 TL Q
Q5	1530002280	Transistor	2SC4081 T107 S
D1	1750000130	Diode	DA204U T107
D2	1160000050	Diode	DAP202U T107
R1	7030003440	Resistor	ERJ3GEYJ 102 V (1 kΩ)
R2	7030003650	Resistor	ERJ3GEYJ 563 V (56 kΩ)
R3	7030003600	Resistor	ERJ3GEYJ 223 V (22 kΩ)
R6	7030003600	Resistor	ERJ3GEYJ 223 V (22 kΩ)
R7	7030003670	Resistor	ERJ3GEYJ 823 V (82 kΩ)
R8	7030003440	Resistor	ERJ3GEYJ 102 V (1 kΩ)
R9	7030003440	Resistor	ERJ3GEYJ 102 V (1 kΩ)
R11	7030003600	Resistor	ERJ3GEYJ 223 V (22 kΩ)
R12	7030003480	Resistor	ERJ3GEYJ 222 V (2.2 kΩ)
R13	7030000440	Resistor	MCR10EZHJ 3.3 kΩ (332)
C1	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C2	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C3	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C5	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C6	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C7	4030004760	Ceramic	C2012 JF 1E 104Z-T-A
C9	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C10	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C11	4030006850	Ceramic	C1608 JB 1H 471K-T-A
EP1	0910034395	P.C. Board	B 1921E (APC)
EP2	6910003110	Lead Frame	HFB2.0-0.7-8 (N)

[REG UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1180000530	IC	S-81250HG-RD-T1
IC2	1130004170	IC	TC4S01F (TE85R)
IC3	1130004170	IC	TC4S01F (TE85R)

[REG UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
Q1	1530002280	Transistor	2SC4081 T107 S
Q2	1520000200	Transistor	2SB798-T2 DK
Q3	1530002280	Transistor	2SC4081 T107 S
Q4	1520000200	Transistor	2SB798-T2 DK
Q5	1530002280	Transistor	2SC4081 T107 S
Q6	1510000510	Transistor	2SA1576 T107 R
D1	1750000160	Diode	DA114 T107
D2	1750000160	Diode	DA114 T107
D3	1750000160	Diode	DA114 T107
R1	7030003400	Resistor	ERJ3GEYJ 471 V (470 Ω)
R2	7030003520	Resistor	ERJ3GEYJ 472 V (4.7 kΩ)
R3	7030003560	Resistor	ERJ3GEYJ 103 V (10 kΩ)
R7	7030003560	Resistor	ERJ3GEYJ 103 V (10 kΩ)
R8	7030003560	Resistor	ERJ3GEYJ 103 V (10 kΩ)
C1	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C2	4510003160	Electrolytic	16 RC2 22 μF (D=4.0)
C3	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C4	4510001320	Electrolytic	6R3 MS5 47 μF
C5	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C6	4510003190	Electrolytic	6.3 RC2 47 μF (D=4.0)
C7	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C8	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C9	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C10	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C11	4510003190	Electrolytic	6.3 RC2 47 μF (D=4.0)
EP1	0910034400	P.C. Board	B 2778 (REG)
EP2	6910003110	Lead Frame	HFB2.0-0.7-8 (N)

[IO UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1130000830	IC	μPD4094BG-T1
IC2	1130000830	IC	μPD4094BG-T1
IC3	1130004170	IC	TC4S01F (TE85R)
Q1	1590000430	Transistor	DTC144EU T107
Q2	1590000430	Transistor	DTC144EU T107
R2	7030003700	Resistor	ERJ3GEYJ 154 V (150 kΩ)
R3	7030003680	Resistor	ERJ3GEYJ 104 V (100 kΩ)
R4	7030003720	Resistor	ERJ3GEYJ 224 V (220 kΩ)
R5	7310002580	Trimmer	RV-108 (RH03A3A15X05A) 104
R6	7030003620	Resistor	ERJ3GEYJ 333 V (33 kΩ)
R7	7030003720	Resistor	ERJ3GEYJ 224 V (220 kΩ)
C1	4030006860	Ceramic	C1608 JB 1H 102K-T-A
EP1	0910034414	P.C. Board	B 2070D (IO)
EP2	0910034421	P.C. Board	B 2163A (IO)

[IO UNIT]

REF. NO.	ORDER NO.	DESCRIPTION
EP3	6910003110	Lead Frame HFB2.0-0.7-8 (N)
EP4	6510008580	Lead Frame PT2.0-0.7-16.5 (K)

[PRT UNIT]

REF. NO.	ORDER NO.	DESCRIPTION
Q1	1520000200	Transistor 2SB798-T2 DK
Q2	1530002280	Transistor 2SC4081 T107 S
Q3	1590000840	Transistor IMX1 T110
D1	1750000130	Diode DA204U T107
D2	1790000680	Diode SB20-03P-TD
R1	7030000110	Resistor MCR10EZHZ 5.6 Ω (5R6)
R2	7030000500	Resistor MCR10EZHZ 10 kΩ (103)
C1	4030006850	Ceramic C1608 JB 1H 471K-T-A
C2	4030008630	Ceramic C1608 JF 1C 104Z-T-A
C3	4030006850	Ceramic C1608 JB 1H 471K-T-A
C4	4030006850	Ceramic C1608 JB 1H 471K-T-A
C5	4030006850	Ceramic C1608 JB 1H 471K-T-A
EP1	0910033442	P.C. Board B 3327B (PRT)

[DET UNIT]

REF. NO.	ORDER NO.	DESCRIPTION
IC1	1120001650	IC TK10487MTR
Q1	1530002280	Transistor 2SC4081 T107 S
Q2	1530002020	Transistor 2SC3770-3-TA
Q3	1530002280	Transistor 2SC4081 T107 S
Q5	1590000830	Transistor FMG2 T149
Q6	1530002280	Transistor 2SC4081 T107 S
D1	1750000070	Diode 1SS226 (TE85R)
X1	6070000060	Discriminator CDBM455C7
X2	6050005010	Crystal Oscillator CR-214
FI1	2020000550	Ceramic Filter CFUM455E

[DET UNIT]

REF. NO.	ORDER NO.	DESCRIPTION
R1	7030003480	Resistor ERJ3GEYJ 222 V (2.2 kΩ)
R2	7030003440.	Resistor ERJ3GEYJ 102 V (1 kΩ)
R3	7030003520	Resistor ERJ3GEYJ 472 V (4.7 kΩ)
R4	7030003460	Resistor ERJ3GEYJ 152 V (1.5 kΩ)
R5	7310002590	Trimmer RV-109 (RH03A3AJ3X0BA) 222
R6	7030003550	Resistor ERJ3GEYJ 822 V (8.2 kΩ)
R7	7030003560	Resistor ERJ3GEYJ 103 V (10 kΩ)
R8	7030003480	Resistor ERJ3GEYJ 222 V (2.2 kΩ)
R9	7030003400	Resistor ERJ3GEYJ 471 V (470 Ω)
R10	7030003520	Resistor ERJ3GEYJ 472 V (4.7 kΩ)
R11	7030003730	Resistor ERJ3GEYJ 274 V (270 kΩ)
R13	7030003680	Resistor ERJ3GEYJ 104 V (100 kΩ)
R14	7030003800	Resistor ERJ3GEYJ 105 V (1 M Ω)
R16	7030003630	Resistor ERJ3GEYJ 393 V (39 kΩ)
R19	7030003400	Resistor ERJ3GEYJ 471 V (470 Ω)
R20	7030003400	Resistor ERJ3GEYJ 471 V (470 Ω)
R23	7030003440	Resistor ERJ3GEYJ 102 V (1 kΩ)
R25	7030003840	Resistor ERJ3GEYJ 225 V (2.2 M Ω)
R26	7030003490	Resistor ERJ3GEYJ 272 V (2.7 kΩ)
R27	7030003520	Resistor ERJ3GEYJ 472 V (4.7 kΩ)
R28	7030003680	Resistor ERJ3GEYJ 104 V (100 kΩ)
R29	7030003760	Resistor ERJ3GEYJ 474 V (470 kΩ)
R30	7030003630	Resistor ERJ3GEYJ 393 V (39 kΩ)
R31	7030003640	Resistor ERJ3GEYJ 473 V (47 kΩ)
R32	7030003430	Resistor ERJ3GEYJ 821 V (820 Ω)
R33	7030003730	Resistor ERJ3GEYJ 274 V (270 kΩ)
C1	4030004760	Ceramic C2012 JF 1E 104Z-T-A
C2	4030006740	Ceramic C1608 SL 1H 820J-T-A
C3	4030004760	Ceramic C2012 JF 1E 104Z-T-A
C4	4030004760	Ceramic C2012 JF 1E 104Z-T-A
C5	4030004760	Ceramic C2012 JF 1E 104Z-T-A
C6	4030006640	Ceramic C1608 SL 1H 180J-T-A
C7	4030006720	Ceramic C1608 SL 1H 560J-T-A
C8	4030006860	Ceramic C1608 JB 1H 102K-T-A
C10	4030006860	Ceramic C1608 JB 1H 102K-T-A
C11	4030006850	Ceramic C1608 JB 1H 471K-T-A
C12	4030006860	Ceramic C1608 JB 1H 102K-T-A
C13	4030006860	Ceramic C1608 JB 1H 102K-T-A
C14	4030006860	Ceramic C1608 JB 1H 102K-T-A
C15	4030006690	Ceramic C1608 SL 1H 330J-T-A
C16	4030006860	Ceramic C1608 JB 1H 102K-T-A
C17	4030004760	Ceramic C2012 JF 1E 104Z-T-A
C19	4030006890	Ceramic C1608 JF 1H 103Z-T-A
C20	4030006900	Ceramic C1608 JB 1E 103K-T-A
C21	4030006860	Ceramic C1608 JB 1H 102K-T-A
C22	4030005110	Ceramic C2012 JB 1E 473K-T-A
C24	4030005110	Ceramic C2012 JB 1E 473K-T-A
C25	4030005110	Ceramic C2012 JB 1E 473K-T-A
C26	4030006860	Ceramic C1608 JB 1H 102K-T-A
C27	4030006890	Ceramic C1608 JF 1H 103Z-T-A
C28	4030006850	Ceramic C1608 JB 1H 471K-T-A
C29	4030006890	Ceramic C1608 JF 1H 103Z-T-A
C30	4030006890	Ceramic C1608 JF 1H 103Z-T-A
EP1	09100334436	P.C. Board B 1962F (DET)
EP2	6910003110	Lead Frame HFB2.0-0.7-8 (N)

**[RF UNIT]**

REF. NO.	ORDER NO.	DESCRIPTION	
Q1	1530002570	Transistor	2SC4405-3-TR
Q2	1530002560	Transistor	2SC4403-3-TR
D1	1790000620	Diode	MA77 (TW)
D2	1790000640	Varicap	MA363B (TX)
D3	1790000620	Diode	MA77 (TW)
D4	1790000640	Varicap	MA363B (TX)
D5	1790000640	Varicap	MA363B (TX)
D6	1790000620	Diode	MA77 (TW)
L1	6150003120	Coil	LS-321
L2	6150003120	Coil	LS-321
L3	6150003430	Coil	LS-378
R1	7030003560	Resistor	ERJ3GEYJ 103 V (10 kΩ)
R2	7030003680	Resistor	ERJ3GEYJ 104 V (100 kΩ)
R3	7030003240	Resistor	ERJ3GEYJ 220 V (22 Ω)
R4	7030003560	Resistor	ERJ3GEYJ 103 V (10 kΩ)
R5	7030003280	Resistor	ERJ3GEYJ 470 V (47 Ω)
R6	7030003560	Resistor	ERJ3GEYJ 103 V (10 kΩ)
R7	7030003680	Resistor	ERJ3GEYJ 104 V (100 kΩ)
R8	7030003680	Resistor	ERJ3GEYJ 104 V (100 kΩ)
R9	7030003560	Resistor	ERJ3GEYJ 103 V (10 kΩ)
R10	7030003580	Resistor	ERJ3GEYJ 153 V (15 kΩ)
R11	7030003520	Resistor	ERJ3GEYJ 472 V (4.7 kΩ)
R14	7030003330	Resistor	ERJ3GEYJ 121 V (120 Ω)
C1	4030006640	Ceramic	C1608 SL 1H 180J-T-A
C2	4030006690	Ceramic	C1608 SL 1H 330J-T-A
C3	4030006580	Ceramic	C1608 SL 1H 070D-T-A
C4	4030006620	Ceramic	C1608 SL 1H 120J-T-A
C5	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C6	4030006580	Ceramic	C1608 SL 1H 070D-T-A
C7	4030006720	Ceramic	C1608 SL 1H 560J-T-A
C8	4030006520	Ceramic	C1608 SL 1H 010C-T-A
C9	4030006580	Ceramic	C1608 SL 1H 070D-T-A
C10	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C11	4030006720	Ceramic	C1608 SL 1H 560J-T-A
C12	4030006580	Ceramic	C1608 SL 1H 070D-T-A
C13	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C18	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C20	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C21	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C22	4030006860	Ceramic	C1608 JB 1H 102K-T-A
EP1	0910034444	P.C. Board	B 1945D (RF)
EP2	0910020185	P.C. Board	B 1946E (RF)
EP3	6910003110	Lead Frame	HFB2.0-0.7-8 (N)

**[PLL UNIT]**

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1120001550	IC	M54959FP
Q1	1590000660	Transistor	DTC144TU T107
Q2	1590000620	Transistor	FMS1 T148

**[PLL UNIT]**

REF. NO.	ORDER NO.	DESCRIPTION	
Q3	1590000910	Transistor	IMZ2 T108
Q4	1590000670	Transistor	FMW1 T148
Q5	1530000371	Transistor	2SC3356 R25-T2B
Q6	1530000371	Transistor	2SC3356 R25-T2B
Q7	1590000780	Transistor	IMX5 T109
Q8	1590000690	Transistor	IMD6 T108
Q9	1590001110	Transistor	IMT1 T110
Q10	1560000540	FET	2SK880-Y (TE85R)
Q11	1590000780	Transistor	IMX5 T109
D1	1790000620	Diode	MA77 (TW)
D2	1790000530	Varicap	MA333 (TW)
X1	6050005790	Crystal Oscillator	CR-257
L1	6200001220	Coil	MLF2012D R82M-T
L2	6130002360	Coil	LB-257
L3	6200001120	Coil	MLF2012D R12M-T
R1	7030003560	Resistor	ERJ3GEYJ 103 V (10 kΩ)
R2	7030003560	Resistor	ERJ3GEYJ 103 V (10 kΩ)
R3	7030003500	Resistor	ERJ3GEYJ 332 V (3.3 kΩ)
R4	7030003490	Resistor	ERJ3GEYJ 272 V (2.7 kΩ)
R5	7030003400	Resistor	ERJ3GEYJ 471 V (470 Ω)
R6	7030003460	Resistor	ERJ3GEYJ 152 V (1.5 kΩ)
R7	7030003320	Resistor	ERJ3GEYJ 101 V (100 Ω)
R8	7030003550	Resistor	ERJ3GEYJ 822 V (8.2 kΩ)
R9	7030003550	Resistor	ERJ3GEYJ 822 V (8.2 kΩ)
R10	7030003360	Resistor	ERJ3GEYJ 221 V (220 Ω)
R11	7030003360	Resistor	ERJ3GEYJ 221 V (220 Ω)
R12	7030003320	Resistor	ERJ3GEYJ 101 V (100 Ω)
R13	7030003320	Resistor	ERJ3GEYJ 101 V (100 Ω)
R14	7030003380	Resistor	ERJ3GEYJ 331 V (330 Ω)
R15	7030003570	Resistor	ERJ3GEYJ 123 V (12 kΩ)
R16	7030003380	Resistor	ERJ3GEYJ 331 V (330 Ω)
R17	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R18	7030003380	Resistor	ERJ3GEYJ 331 V (330 Ω)
R19	7030003700	Resistor	ERJ3GEYJ 154 V (150 kΩ)
R20	7030003620	Resistor	ERJ3GEYJ 333 V (33 kΩ)
R21	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R22	7030003560	Resistor	ERJ3GEYJ 103 V (10 kΩ)
R23	7030003570	Resistor	ERJ3GEYJ 123 V (12 kΩ)
R24	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R25	7030003380	Resistor	ERJ3GEYJ 331 V (330 Ω)
R26	7030003380	Resistor	ERJ3GEYJ 331 V (330 Ω)
R27	7030003720	Resistor	ERJ3GEYJ 224 V (220 kΩ)
R28	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
C1	4550002890	Tantalum	TESVA 1A 225M1-8L
C2	4550000530	Tantalum	TESVA 1V 104M1-8L
C3	4550000460	Tantalum	TESVA 1C 105M1-8L
C4	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C5	4030006670	Ceramic	C1608 SL 1H 270J-T-A
C6	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C7	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C8	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C9	4030006520	Ceramic	C1608 SL 1H 010C-T-A
C10	4030006520	Ceramic	C1608 SL 1H 010C-T-A
C11	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C12	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C13	4030006510	Ceramic	C1608 SL 1H 0R5C-T-A
C14	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C15	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C16	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C17	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C18	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C19	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C20	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C21	4030008630	Ceramic	C1608 JF 1C 104Z-T-A
C22	4610001260	Trimmer	ECR-JA020 E12W

**[PLL UNIT]**

REF. NO.	ORDER NO.	DESCRIPTION	
C23	4030007030	Ceramic	C1608 CH 1H 150J-T-A
C24	4030007080	Ceramic	C1608 CH 1H 390J-T-A
C25	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C26	4030006710	Ceramic	C1608 SL 1H 470J-T-A
C27	4030006710	Ceramic	C1608 SL 1H 470J-T-A
C28	4030006710	Ceramic	C1608 SL 1H 470J-T-A
C29	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C30	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C32	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C33	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C34	4030006620	Ceramic	C1608 SL 1H 120J-T-A
C35	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C36	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C37	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C38	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C39	4030006630	Ceramic	C1608 JF 1C 104Z-T-A
EP1	0910026653	P.C. Board	B 2675C (PLL)

**[MBD UNIT]**

REF. NO.	ORDER NO.	DESCRIPTION	
EP1	0910034454	P.C. Board	B 2028D (MBD)
EP2	6910003110	Lead Frame	HFB2.0-0.7-8 (N)

**[LOGIC UNIT]**

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1140002350	IC	HD404629A02H
IC2	1110002410	IC	NJM2406F (TE1)
IC3	1130003760	IC	TC4S81F (TE85R)
IC4	1130006210	IC	MN1382P (TX)
Q1	1560000540	FET	2SK880-Y (TE85R)
Q3	1530002060	Transistor	2SC4081 T107 R
Q4	1510000510	Transistor	2SA1576 T107 R
Q5	1590000660	Transistor	DTC144TU T107
Q6	1590000660	Transistor	DTC144TU T107
Q7	1590000650	Transistor	DTA144TU T107
Q8	1590000720	Transistor	DTA144EU T107
D1	1790000990	Zener	MA8051-H (TX)
D2	1160000060	Diode	DAN202U T107
D3	1750000130	Diode	DA204U T107
D4	1750000130	Diode	DA204U T107
D5	1790000590	Diode	MA110 (TW)
D6	1790000870	Diode	MA1S121 (TX)
D9	1790000870	Diode	MA1S121 (TX)
D13	1160000060	Diode	DAN202U T107
D15	1750000130	Diode	DA204U T107
D17	1750000170	Diode	DA115 T107 (P2AT)
D19	1750000160	Diode	DA114 T107 (#22, #23)
D19	1160000060	Diode	DAN202U T107 (#24)
D20	1790000660	Diode	MA728 (TW)
X1	6060000260	Ceramic Oscillator	CSB800J220
X2	6050005801	Crystal Oscillator	DS-VT200 (32.768KHZ ±20)
R1	7030003460	Resistor	ERJ3GEYJ 152 V (1.5 kΩ)
R2	7030003380	Resistor	ERJ3GEYJ 331 V (330 Ω)
R3	7030003560	Resistor	ERJ3GEYJ 103 V (10 kΩ)
R5	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R6	7030003650	Resistor	ERJ3GEYJ 563 V (56 kΩ)
R7	7030003690	Resistor	ERJ3GEYJ 124 V (120 kΩ)
R8	7030003590	Resistor	ERJ3GEYJ 183 V (18 kΩ)
R9	7410000710	Resistor Array	EXB-V8V 224JV
R13	7410000720	Resistor Array	EXB-V8V 473JV
R17	7410000700	Resistor Array	EXB-V8V 105JV
R21	7030003480	Resistor	ERJ3GEYJ 222 V (2.2 kΩ)
R22	7030003340	Resistor	ERJ3GEYJ 151 V (150 Ω)
R23	7030003340	Resistor	ERJ3GEYJ 151 V (150 Ω)
R24	7030003450	Resistor	ERJ3GEYJ 122 V (1.2 kΩ)
R25	7030003450	Resistor	ERJ3GEYJ 122 V (1.2 kΩ)
R26	7030003790	Resistor	ERJ3GEYJ 824 V (820 kΩ)
R27	7030003750	Resistor	ERJ3GEYJ 394 V (390 kΩ)
R28	7030003720	Resistor	ERJ3GEYJ 224 V (220 kΩ)
R29	7030003680	Resistor	ERJ3GEYJ 104 V (100 kΩ)
R30	7030003660	Resistor	ERJ3GEYJ 683 V (68 kΩ)
R31	7030003760	Resistor	ERJ3GEYJ 474 V (470 kΩ)
R32	7030003580	Resistor	ERJ3GEYJ 153 V (15 kΩ)

**[MBD UNIT]**

REF. NO.	ORDER NO.	DESCRIPTION	
Q1	1530002560	Transistor	2SC4403-3-TR
Q2	1530002560	Transistor	2SC4403-3-TR
Q3	1530002560	Transistor	2SC4403-3-TR
Q4	1590000650	Transistor	DTA144TU T107
Q5	1530002560	Transistor	2SC4403-3-TR
L3	6200000100	Coil	LQN 2A 22NM
L4	6200000100	Coil	LQN 2A 22NM
L5	6200000100	Coil	LQN 2A 22NM
R1	7030003630	Resistor	ERJ3GEYJ 393 V (39 kΩ)
R2	7030003290	Resistor	ERJ3GEYJ 560 V (56 Ω)
R3	7030003630	Resistor	ERJ3GEYJ 393 V (39 kΩ)
R4	7030003290	Resistor	ERJ3GEYJ 560 V (56 Ω)
R5	7030003340	Resistor	ERJ3GEYJ 151 V (150 Ω)
R6	7030003610	Resistor	ERJ3GEYJ 273 V (27 kΩ)
R7	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ)
R9	7030003440	Resistor	ERJ3GEYJ 102 V (1 kΩ)
R10	7030003280	Resistor	ERJ3GEYJ 470 V (47 Ω)
R11	7030003390	Resistor	ERJ3GEYJ 391 V (390 Ω)
R12	7030003650	Resistor	ERJ3GEYJ 563 V (56 kΩ)
C6	4030006630	Ceramic	C1608 SL 1H 150J-T-A
C7	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C8	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C9	4030006630	Ceramic	C1608 SL 1H 150J-T-A
C10	4030006510	Ceramic	C1608 SL 1H 0R5C-T-A
C11	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C12	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C14	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C15	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C16	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C17	4030006540	Ceramic	C1608 SL 1H 030C-T-A
C18	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C19	4030006610	Ceramic	C1608 SL 1H 100D-T-A

## [LOGIC UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
R33	7030003580	Resistor	ERJ3GEYJ 153 V (15 kΩ)
R34	7030003760	Resistor	ERJ3GEYJ 474 V (470 kΩ)
R35	7310003600	Trimmer	EVM-1XSX50 B54 (503)
R36	7030003800	Resistor	ERJ3GEYJ 105 V (1 M Ω)
R37	7030003580	Resistor	ERJ3GEYJ 153 V (15 kΩ)
R38	7030003610	Resistor	ERJ3GEYJ 273 V (27 kΩ)
R43	7030003600	Resistor	ERJ3GEYJ 223 V (22 kΩ)
R44	7030003640	Resistor	ERJ3GEYJ 473 V (47 kΩ) (P2ET)
R45	7310003610	Trimmer	EVM-1XSX50 B14 (103)
R46	7030003800	Resistor	ERJ3GEYJ 105 V (1 M Ω) (P2ET)
R47	7410000710	Resistor Array	EXB-V8V 224JV
R49	7030003360	Resistor	ERJ3GEYJ 221 V (220 Ω)
R50	7030003720	Resistor	ERJ3GEYJ 224 V (220 kΩ)
R51	7030003760	Resistor	ERJ3GEYJ 474 V (470 kΩ)
R52	7030003800	Resistor	ERJ3GEYJ 105 V (1 M Ω)
R53	7030003200	Resistor	ERJ3GEYJ 100 V (10 Ω)
R54	7030003800	Resistor	ERJ3GEYJ 105 V (1 M Ω)
R55	7410000590	Resistor Array	EXB-V4V 473JV
R57	7030003720	Resistor	ERJ3GEYJ 224 V (220 kΩ)
R58	7410000580	Resistor Array	EXB-V4V 224JV
R59	7030003800	Resistor	ERJ3GEYJ 105 V (1 M Ω)
R63	7030003620	Resistor	ERJ3GEYJ 333 V (33 kΩ)
R64	7030003720	Resistor	ERJ3GEYJ 224 V (220 kΩ)
R65	7030003800	Resistor	ERJ3GEYJ 105 V (1 M Ω)
R66	7030003560	Resistor	ERJ3GEYJ 103 V (10 kΩ)
C1	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C2	4030008630	Ceramic	C1608 JF 1C 104Z-T-A
C3	4550000770	Tantalum	TESVC 0J 226M-12L
C4	4030008630	Ceramic	C1608 JF 1C 104Z-T-A
C11	4610001290	Trimmer	ECR-JA050 M12W
C12	4030006710	Ceramic	C1608 SL 1H 470J-T-A
C13	4030006800	Ceramic	C1608 SL 1H 221J-T-A
C14	4030007030	Ceramic	C1608 CH 1H 150J-T-A
C15	4030007030	Ceramic	C1608 CH 1H 150J-T-A
C16	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C17	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C18	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C19	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C20	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C21	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C22	4030008630	Ceramic	C1608 JF 1C 104Z-T-A
C23	4030008630	Ceramic	C1608 JF 1C 104Z-T-A
C24	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C25	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C26	4030006710	Ceramic	C1608 SL 1H 470J-T-A
DS1	5030000720	LCD	LD-BU5385J (E-5561) [FUNCTION DISPLAY]
DS2	5040001110	LED	SLM-23VMWS T97B
DS3	5040001260	LED	LN01301C (Q)
DS4	5040001260	LED	LN01301C (Q)
DS5	5040001260	LED	LN01301C (Q)
DS6	5040001260	LED	LN01301C (Q)
S1	2260001610	Switch	SW-134 (SKQDAB) [H/L/DTMF]
S2	2260001610	Switch	SW-134 (SKQDAB) [MONI/DSEL]
S4	2260001610	Switch	SW-134 (SKQDAB) [AI]
BT1	3020000160	Lithium Battery	VL2020-1VC
MC1	7700000861	Microphone	WM-62A103
SP1	2510000530	Speaker	T028S14I0810

## [LOGIC UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
EP1	0910033164	P.C. Board	B 3328D (LOGIC)
EP2	0910033280	F.P.C. Board	B 3329
EP4	8930023130	LCD contact strip	SRCN-1144W

## [PTT UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
S1	2260001610	Switch	SW-134 (SKQDAB) [PTT]
S2	2260001610	Switch	SW-134 (SKQDAB) [FUNC]
EP1	0910033211	P.C. Board	B 3325A (PTT)
EP2	0910033331	F.P.C. Board	B 3385A

## [ENC UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
C30	4030006850	Ceramic	C1608 JB 1H 471K-T-A
C31	4030006850	Ceramic	C1608 JB 1H 471K-T-A
S1	2260001400	Encoder	SW-122 (RK097103H) [MAIN DIAL]
S2	2260001310	Switch	SW-120 (SKHUPD) [LIGHT]
EP1	0910034471	P.C. Board	B 3326A (ENC)
EP2	0910033322	F.P.C. Board	B 3383B

**[TENKEY UNIT]**

REF. NO.	ORDER NO.	DESCRIPTION	
DS1	5010000070	LED	LT1E73A (GL1EG73)
DS2	5010000070	LED	LT1E73A (GL1EG73)
DS3	5010000070	LED	LT1E73A (GL1EG73)
DS4	5010000070	LED	LT1E73A (GL1EG73)
EP1	0910033311	P.C. Board	B 3358A (KEY)
EP2	0910033291	F.P.C. Board	B 3330A

**[VR UNIT]**

REF. NO.	ORDER NO.	DESCRIPTION	
R1	7210001440	Variable Resistor	RK097111101NA (10KA) [PWR/VOL]
R2	7210001450	Variable Resistor	RK0971110051A (10KB) [SQL]
C1	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C2	4030006860	Ceramic	C1608 JB 1H 102K-T-A
C3	4510002650	Electrolytic	16 MS7 100 $\mu$ F
EP1	0910034464	P.C. Board	B 1926D (VR)

# SECTION 6 ADJUSTMENT PROCEDURES

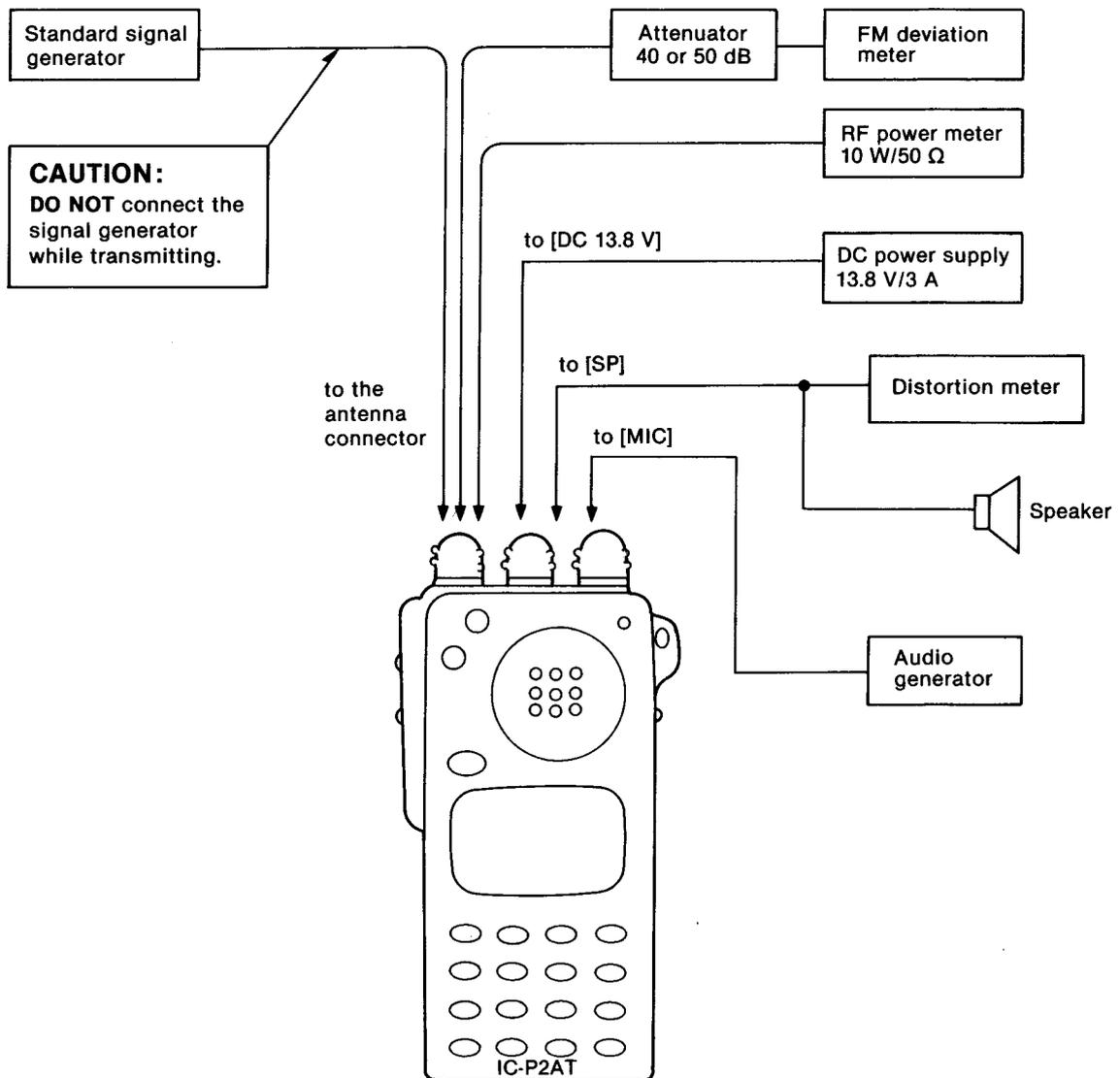
## 6-1 PREPARATION BEFORE SERVICING

### REQUIRED TEST EQUIPMENT

EQUIPMENT	GRADE AND RANGE	EQUIPMENT	GRADE AND RANGE
DC power supply	Output voltage : 13.8 V DC Current capacity : 3 A or more	Audio generator	Frequency range : 300~3000 Hz Output level : 1~500 mV
RF power meter (terminated type)	Measuring range : 1~10 W Frequency range : 120~160 MHz Impedance : 50 Ω SWR : Less than 1.2:1	Attenuator	Power attenuation : 40 or 50 dB Capacity : 10 W or more
Frequency counter	Frequency range : 0.1~160 MHz Frequency accuracy : ±1 ppm or better Sensitivity : 100 mV or better	DC voltmeter	Input impedance : 50 kΩ/DC or better
Distortion meter	Frequency range : 1 kHz±10 Hz Measuring range : 1~100 %	AC milli-voltmeter	Measuring range : 10 mV~10 V
Standard signal generator (SSG)	Frequency range : 0.1~160 MHz Output level : -127~-17 dBm (0.1 μV~32 mV)	External speaker	Impedance : 8 Ω
		FM deviation meter	Frequency minimum : 160 MHz Measuring range : 0~±5 kHz
		Digital multimeter or oscilloscope	Input impedance : 1 MΩ/DC or better

CCW: counterclockwise

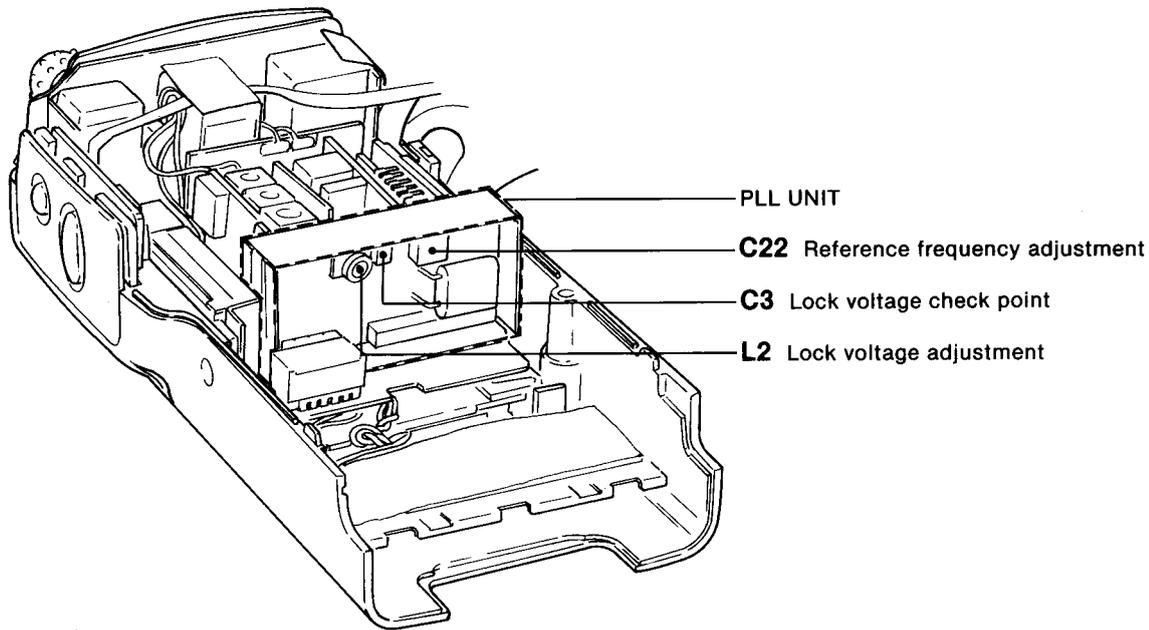
### CONNECTION



## 6-2 PLL ADJUSTMENT

ADJUSTMENT	ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT		
		UNIT	LOCATION		UNIT	ADJUST	
LOCK VOLTAGE	1 <ul style="list-style-type: none"> <li>• Displayed frequency: 145.00 MHz</li> <li>• Simplex</li> <li>• Receiving</li> </ul>	PLL	Connect the digital multimeter or oscilloscope to C3.	1.6 V	PLL	L2	
	2 <ul style="list-style-type: none"> <li>• Transmitting</li> </ul>					1.6 V ± 0.2 V	Verify
	3 <ul style="list-style-type: none"> <li>Repeat steps 1 and 2 several times when the lock voltage is changed.</li> </ul>						
REFERENCE FREQUENCY	1 <ul style="list-style-type: none"> <li>• Displayed frequency: 146.00 MHz</li> <li>• Connect the RF power meter or a 50 Ω dummy load to the antenna connector.</li> <li>• Transmitting</li> </ul>	Top panel	Loosely couple the frequency counter to the antenna connector.	146.0000 MHz	PLL	C22	

### • PLL UNIT



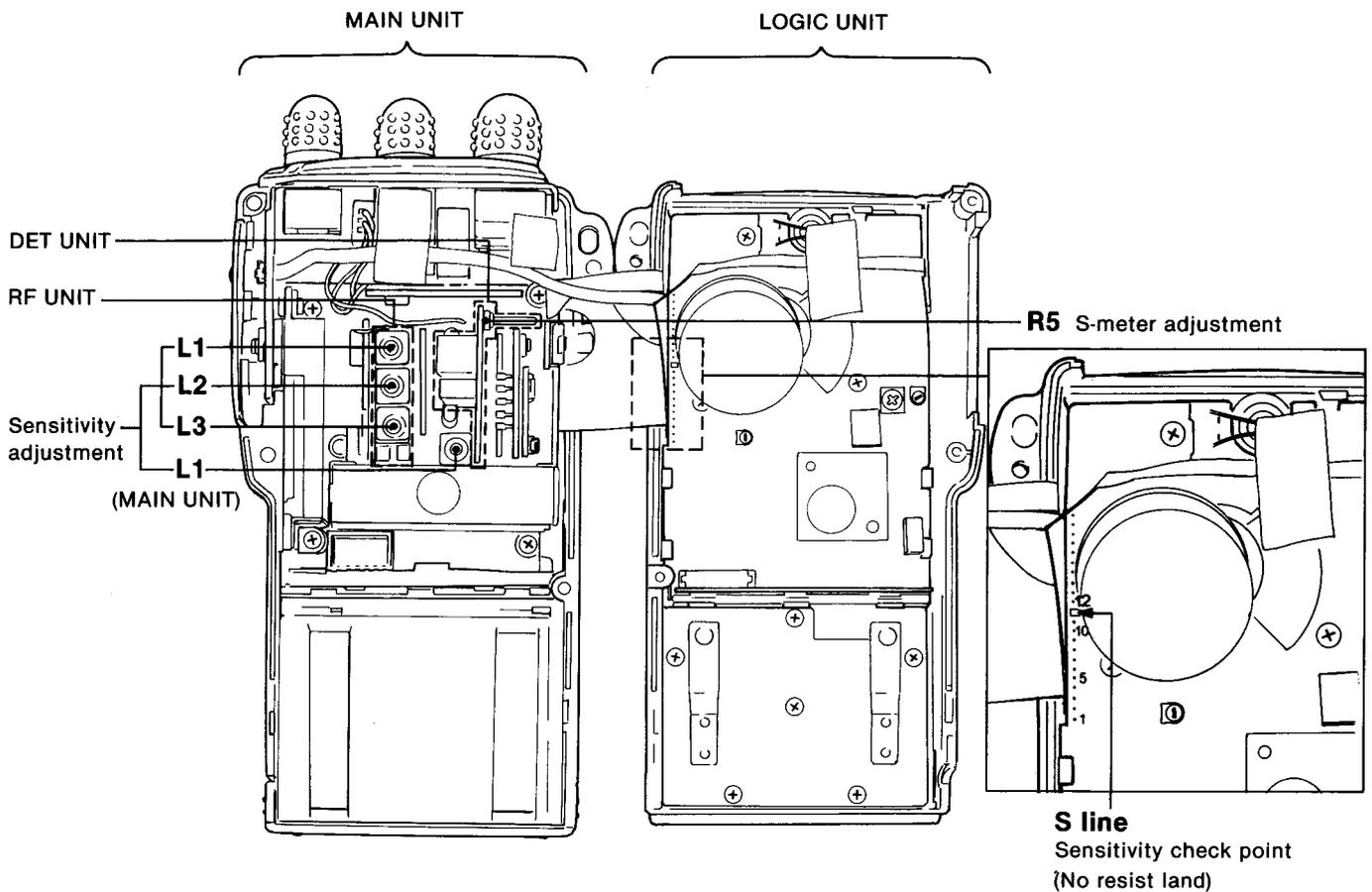
Although the above diagram has no shield cover on the VCO unit, adjustment may be performed without removing the shield cover.

### 6-3 RECEIVER ADJUSTMENT

ADJUSTMENT	ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
		UNIT	LOCATION		UNIT	ADJUST
SENSITIVITY	1 <ul style="list-style-type: none"> <li>• Displayed frequency: 145.00 MHz</li> <li>• [SQL] control : Max. CCW</li> <li>• Connect the SSG to the antenna connector and set as:                             <ul style="list-style-type: none"> <li>Level : 0.32 <math>\mu</math>V* (-117 dBm)</li> <li>Modulation : 1 kHz</li> <li>Deviation : <math>\pm</math>3.5 kHz</li> </ul> </li> <li>• Receiving</li> </ul>	LOGIC	Connect the distortion meter to the [SP] jack with an 8 $\Omega$ load.  S line with DC voltmeter can also be adjusted.	Minimum distortion level	Adjust in sequence	
					RF	L1, L2, L3
					MAIN	L1
S-METER	1 <ul style="list-style-type: none"> <li>• Displayed frequency: 145.00 MHz</li> <li>• Connect the SSG to the antenna connector and set as:                             <ul style="list-style-type: none"> <li>Level : 0.32 <math>\mu</math>V* (-117 dBm)</li> <li>Modulation : 1 kHz</li> <li>Deviation : <math>\pm</math>3.5 kHz</li> </ul> </li> <li>• Receiving</li> </ul>	Function display	S/RF indicator	3 dots (S3) 	DET	R5

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

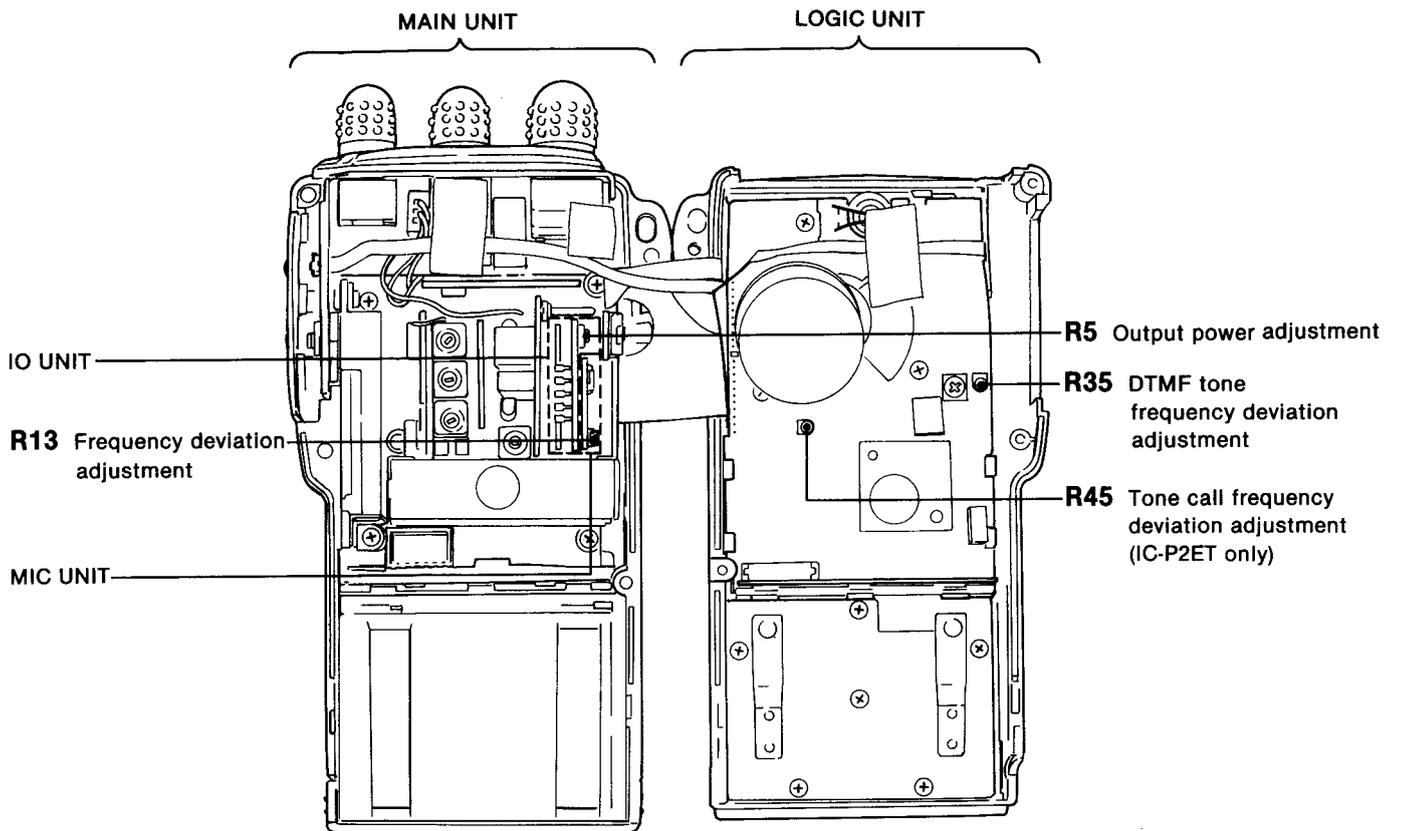
• MAIN, RF AND DET UNITS



## 6-4 TRANSMITTER ADJUSTMENT

ADJUSTMENT	ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT			
		UNIT	LOCATION		UNIT	ADJUST		
OUTPUT POWER	1	<ul style="list-style-type: none"> <li>• Displayed frequency: 145.00 MHz</li> <li>• Output power : HIGH</li> <li>• Simplex</li> <li>• Transmitting</li> </ul>	Top panel	Connect the RF power meter to the antenna connector.	5.0 W	IO	R5	
	2	<ul style="list-style-type: none"> <li>• Output power : LOW 1</li> </ul>					0.25~1.0 W	Verify
	3	<ul style="list-style-type: none"> <li>• Output power : LOW 2</li> </ul>					Approx. 1.5 W	Verify
	4	<ul style="list-style-type: none"> <li>• Output power : LOW 3</li> </ul>					Approx. 3.5 W	Verify
FREQUENCY DEVIATION	1	<ul style="list-style-type: none"> <li>• Displayed frequency: 145.00 MHz</li> <li>• Output power : HIGH</li> <li>• Connect the audio generator to the [MIC] jack and set as: 210 mV/1.0 kHz (USA version) 95 mV/1.0 kHz (All other versions)</li> <li>• Set the FM deviation meter as: HPF : 50 kHz LPF : 20 kHz De-emphasis: OFF Detector : (P-P)/2</li> <li>• Transmitting</li> </ul>	Top panel	Connect the FM deviation meter to the antenna connector via the attenuator.	$\pm 4.8$ kHz	MIC	R13	
DTMF TONE FREQUENCY DEVIATION	1	<ul style="list-style-type: none"> <li>• Displayed frequency: 145.00 MHz</li> <li>• Push and hold the [PTT] switch and then push the [D] key.</li> </ul>	Top panel	Connect the FM deviation meter to the antenna connector via the attenuator.	$\pm 3.5$ kHz	LOGIC	R35	
TONE CALL FREQUENCY DEVIATION (IC-P2ET only)	1	<ul style="list-style-type: none"> <li>• Displayed frequency: 145.00 MHz</li> <li>• Push and hold the [LIGHT] switch and then push the [PTT] switch.</li> </ul>	Top panel	Connect the FM deviation meter to the antenna connector via the attenuator.	$\pm 3.5$ kHz	LOGIC	R45	

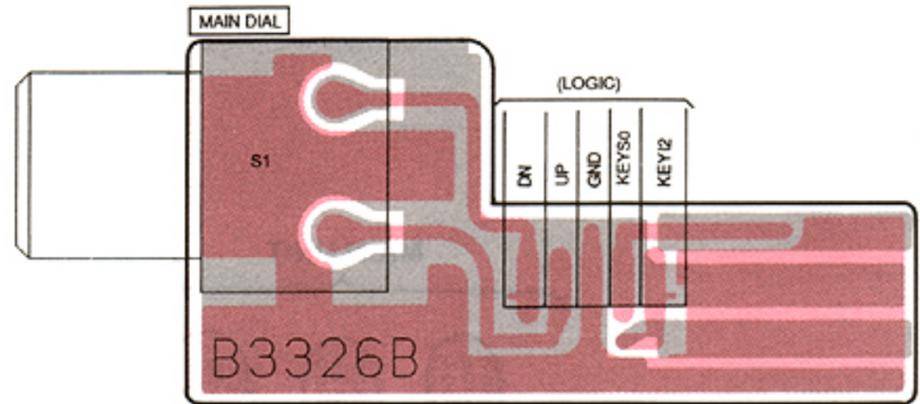
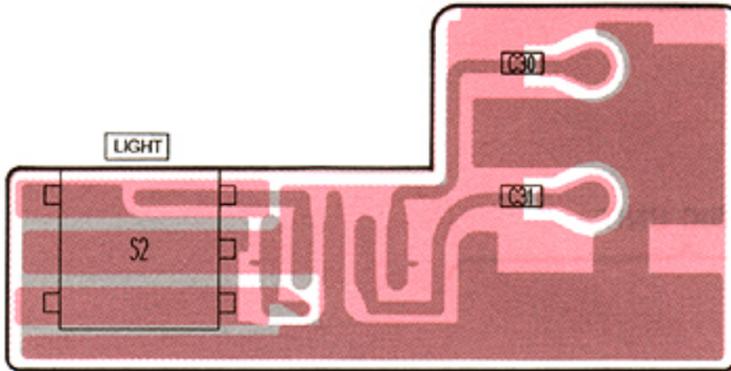
• IO, MIC AND LOGIC UNITs



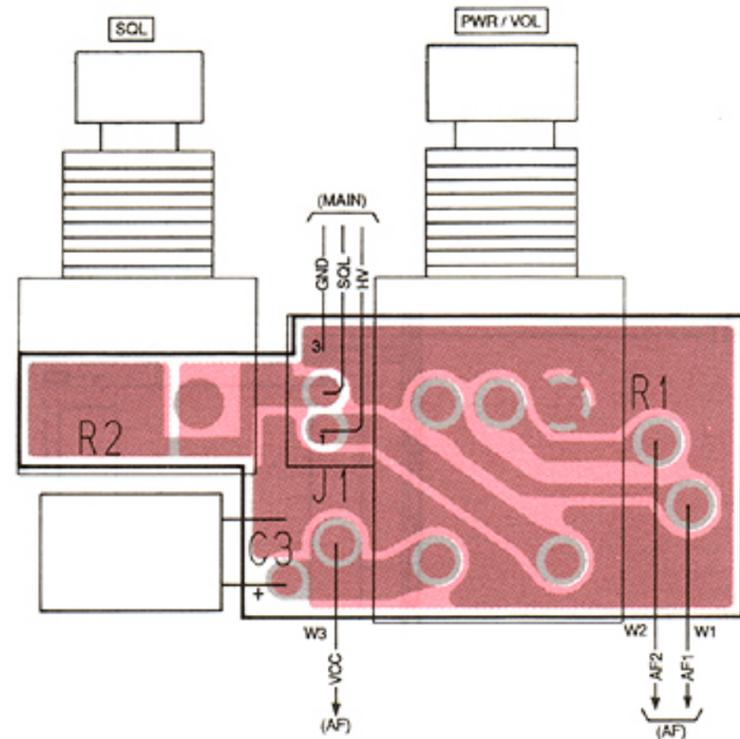
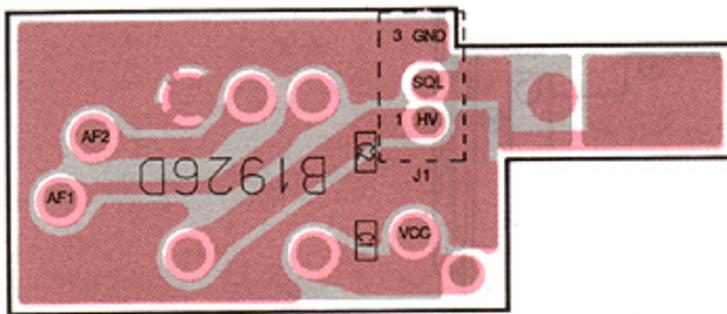
# SECTION 7 BOARD LAYOUTS

## 7-1 LOGIC UNIT

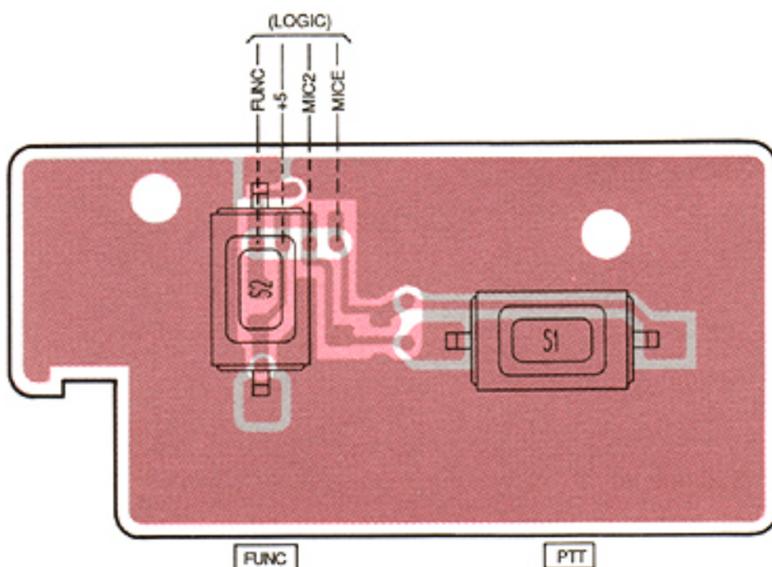
### • ENC UNIT



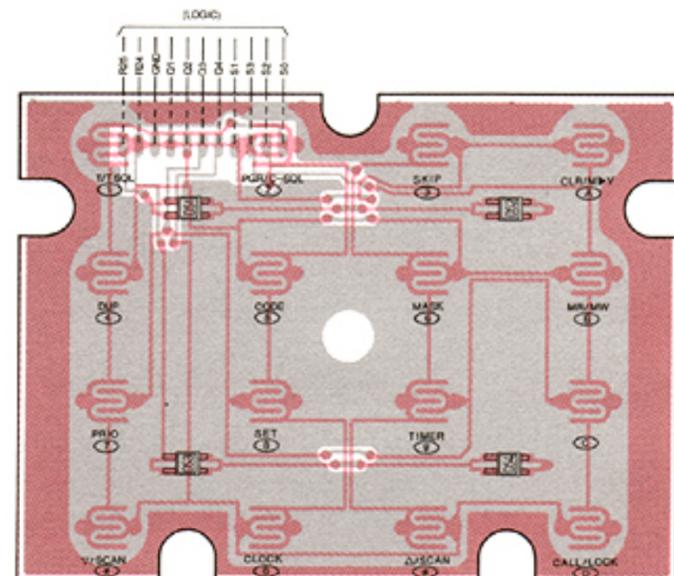
### • VR UNIT



### • PTT UNIT

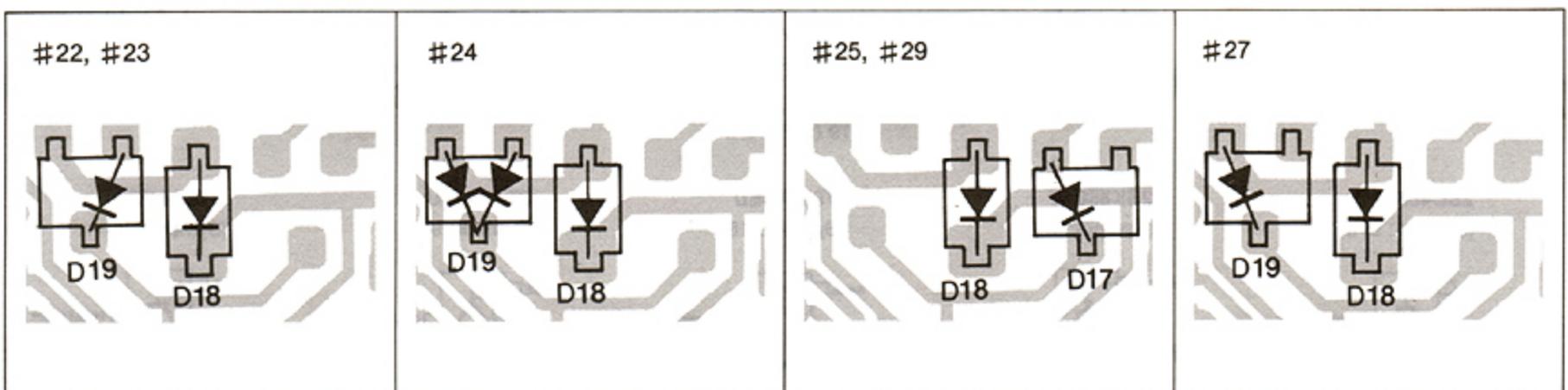
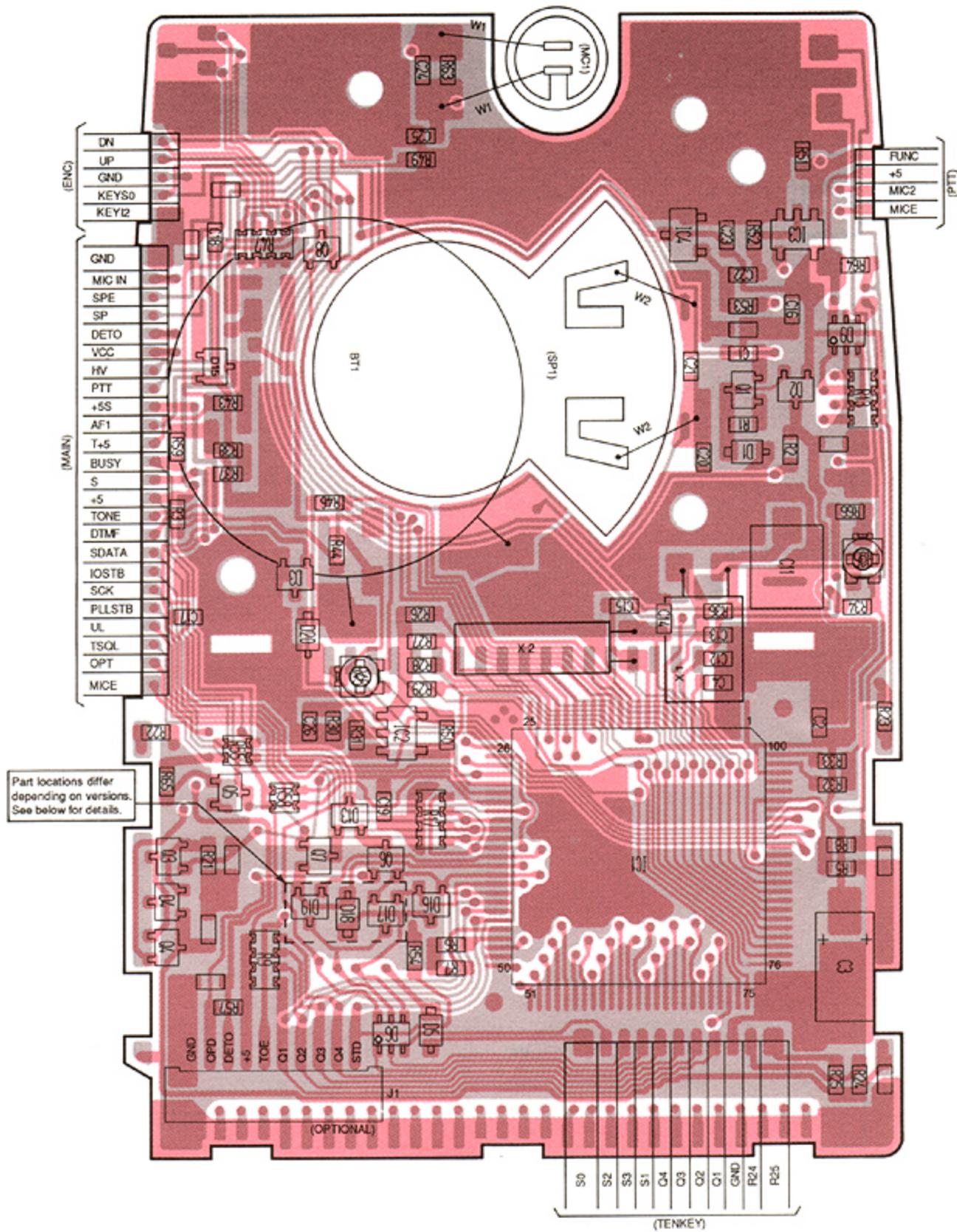


### • TENKEY UNIT

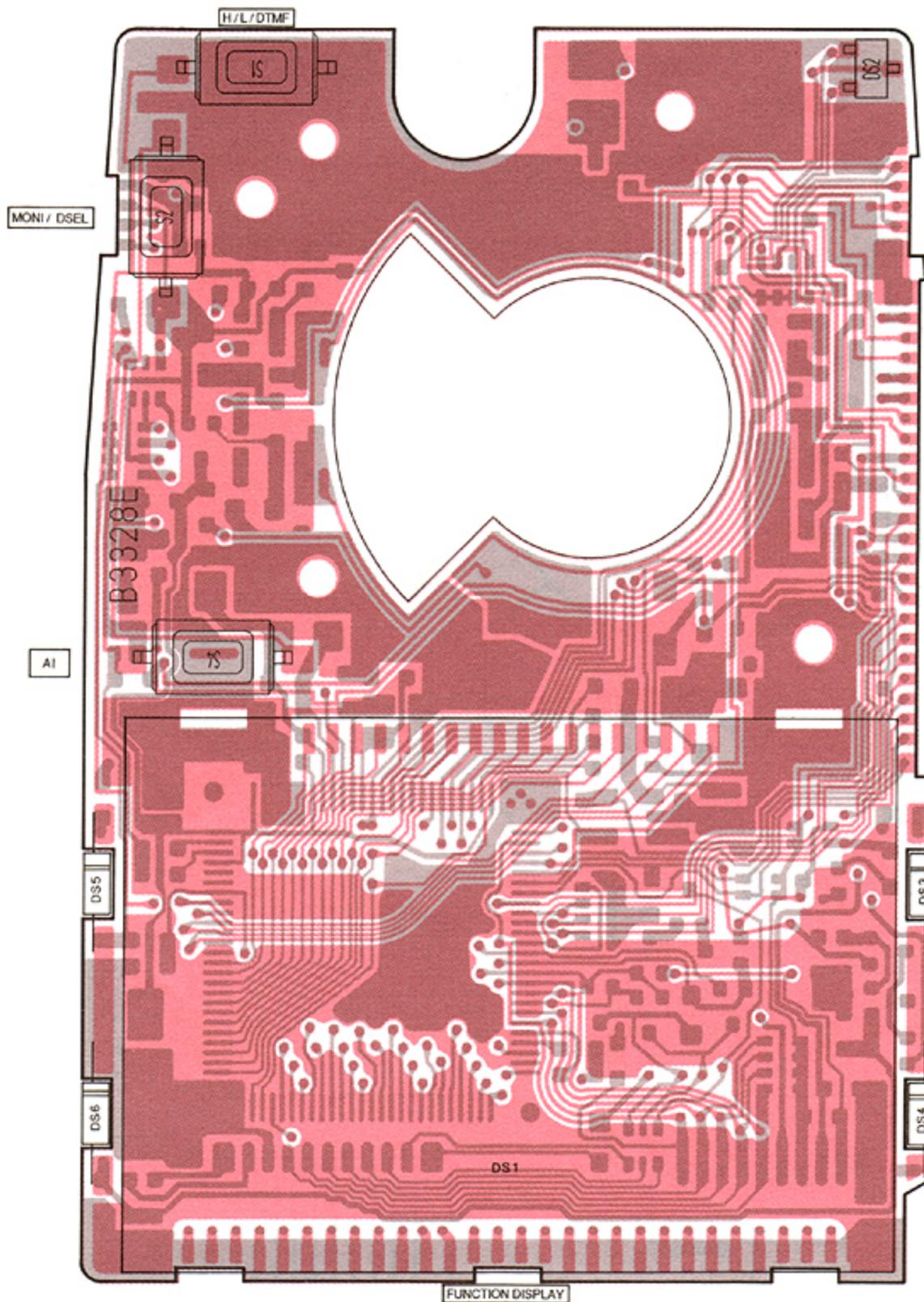


• LOGIC UNIT

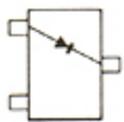
The combination of this page and the next page show the unit layout in the same configuration as the actual P.C. Board.



• LOGIC UNIT

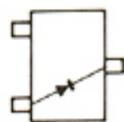


**DA114**  
(Symbol: AV)



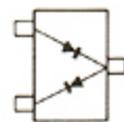
D19 (#22, #23)

**DA115**  
(Symbol: AU)



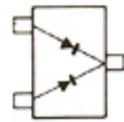
D17 (#25, #27, #29)

**DA204U**  
(Symbol: K)



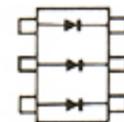
D3, D4, D15

**DAN202U**  
(Symbol: N)



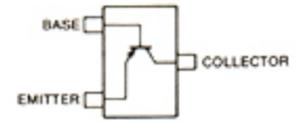
D2, D13,  
D19 (#21, #24)

**MA1S121**  
(Symbol: M2D)



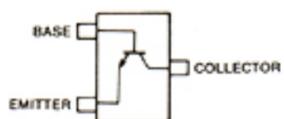
D6, D9

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



Q4

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



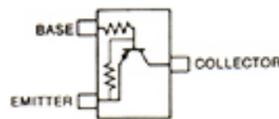
Q3

**2SK880 Y**  
(Symbol: XY)



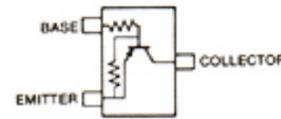
Q1

**DTA144EU**  
(Symbol: 16)



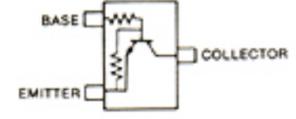
Q8

**DTA144TU**  
(Symbol: 96)



Q7

**DTC144TU**  
(Symbol: 06)

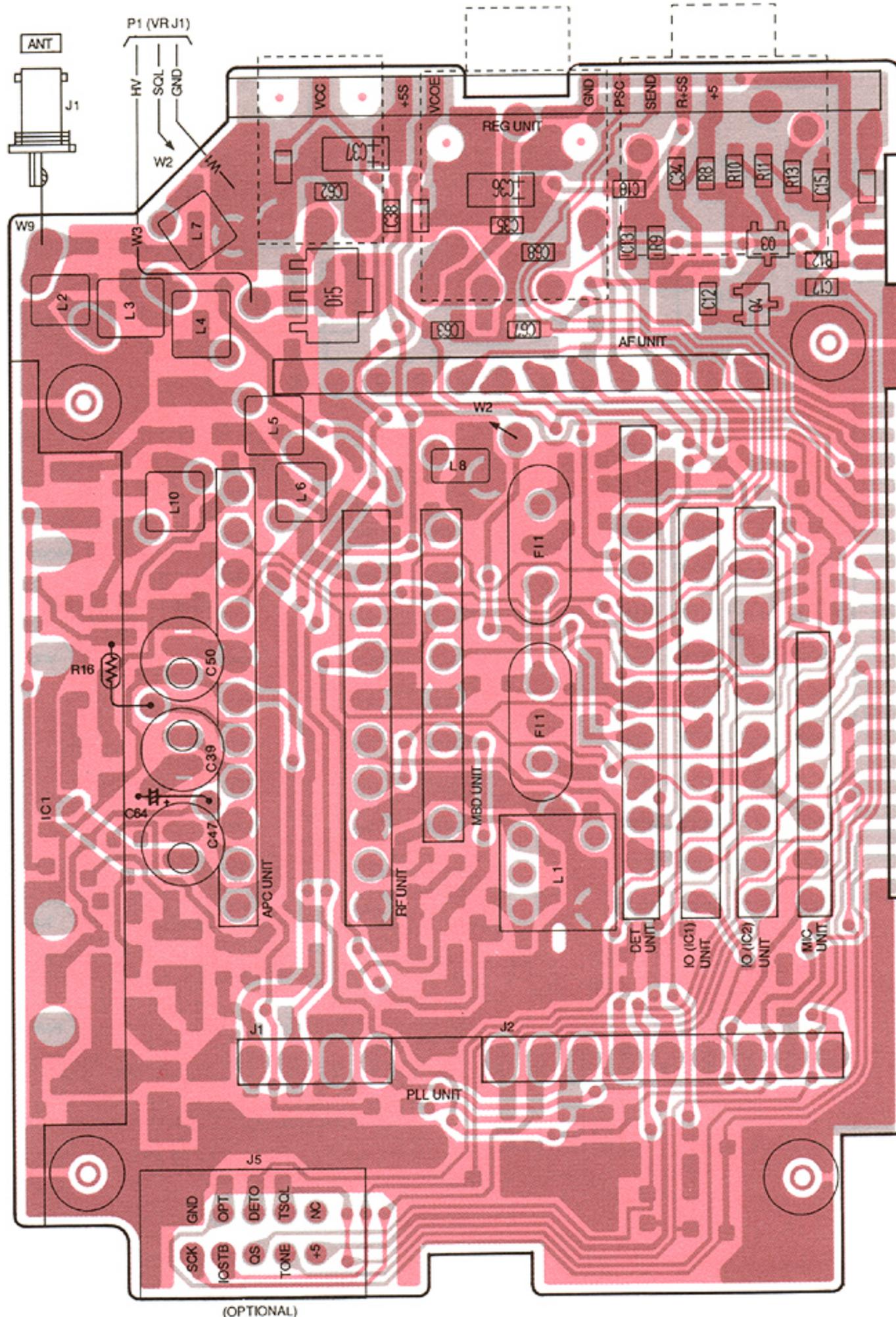


Q5, Q6

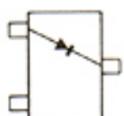
## 7-2 MAIN UNIT

### • MAIN UNIT

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

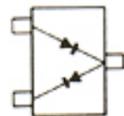


**1SS153**  
(Symbol: A9)



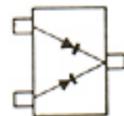
D9

**DA204U**  
(Symbol: K)  
**HSM88AS**  
(Symbol: C1)



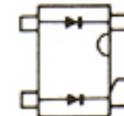
DA204U: D2, D13  
HSM88AS: D10, D11

**DAN202U**  
(Symbol: N)



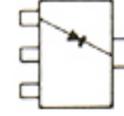
D8

**MA862**  
(Symbol: M11)



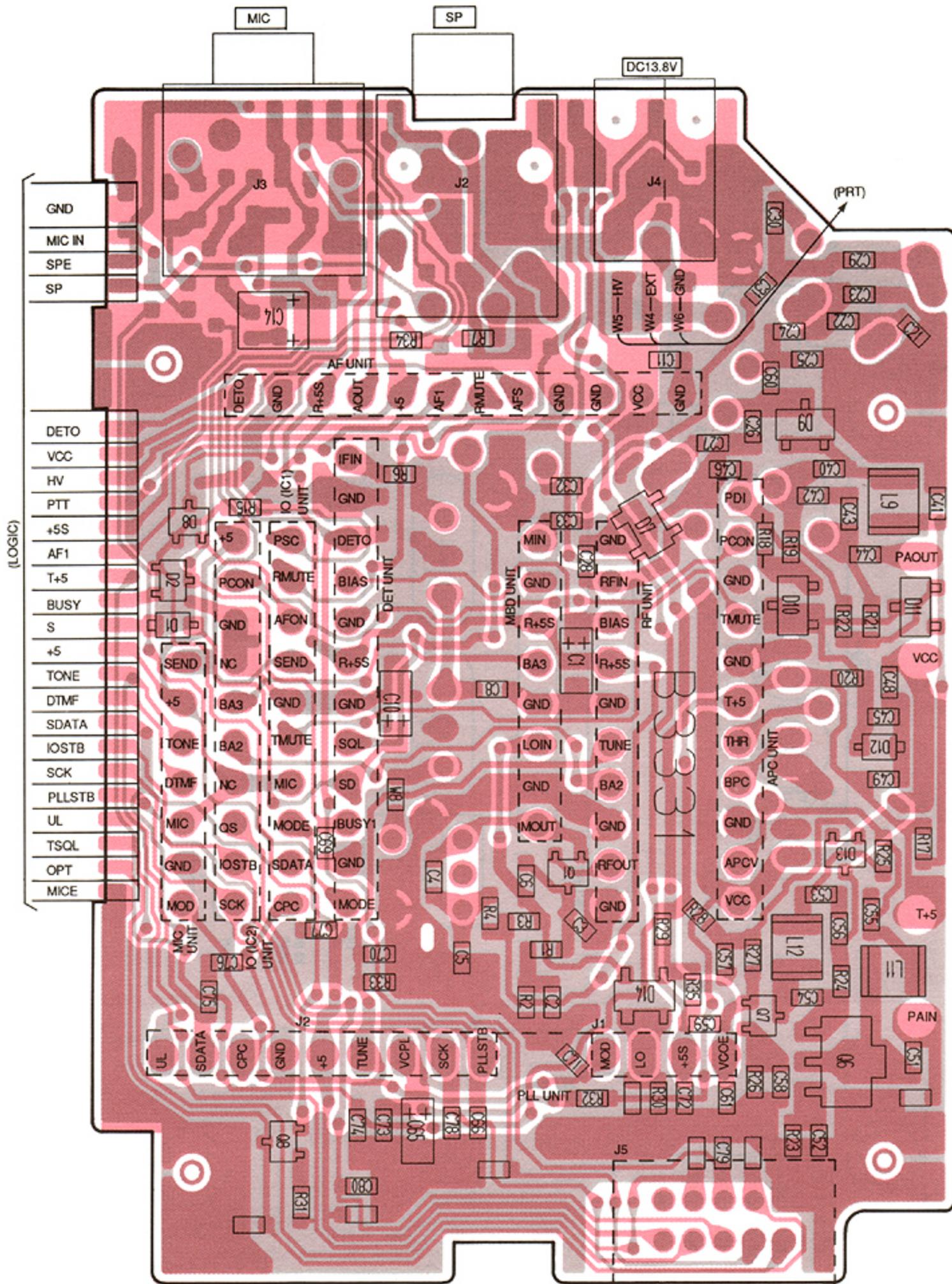
D7, D14

**SB20-03P**  
(Symbol: SC)

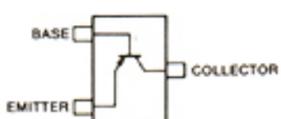


D15

• MAIN UNIT

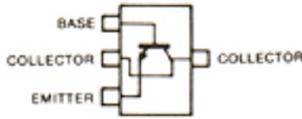


**2SA1576 R**  
(Symbol: FR)



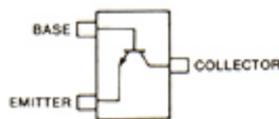
Q3, Q8

**2SC2954**  
(Symbol: QK)



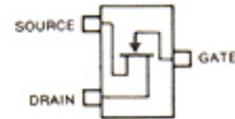
Q6

**2SC4403 3**  
(Symbol: LY3)



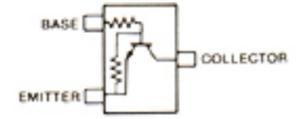
Q7

**2SK882 Y**  
(Symbol: TY)



Q1

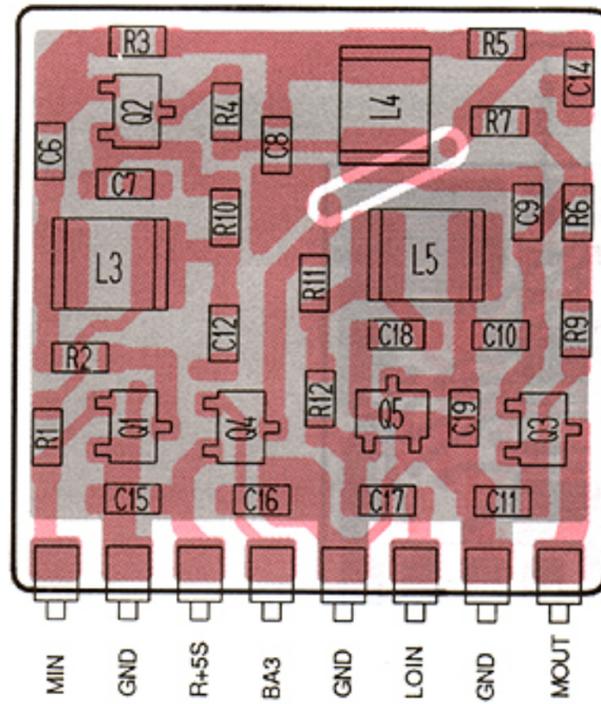
**DTC144EU**  
(Symbol: 26)



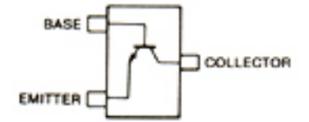
Q4

### 7-3 MBD AND AF UNITS

#### • MBD UNIT

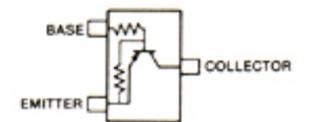


**2SC4403 3**  
(Symbol: LY3)



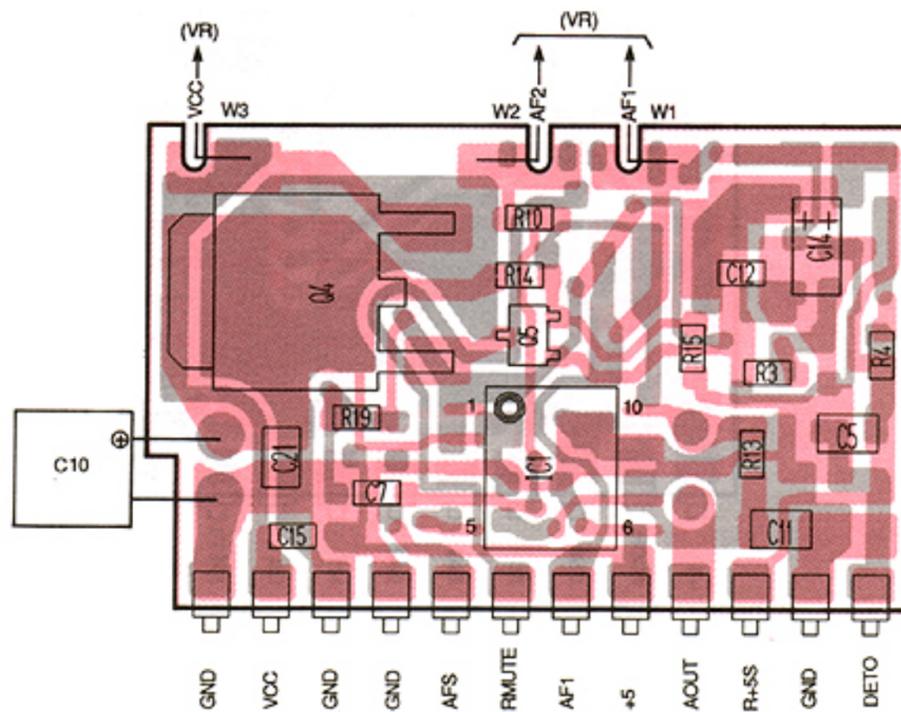
Q1, Q2, Q3, Q5

**DTA144TU**  
(Symbol: 96)

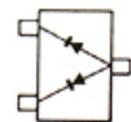


Q4

#### • AF UNIT

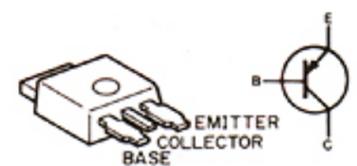


**DAP202U**  
(Symbol: P)



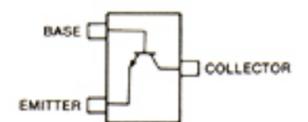
D1

**2SB1182 Q**  
(Symbol: B1182)



Q4

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

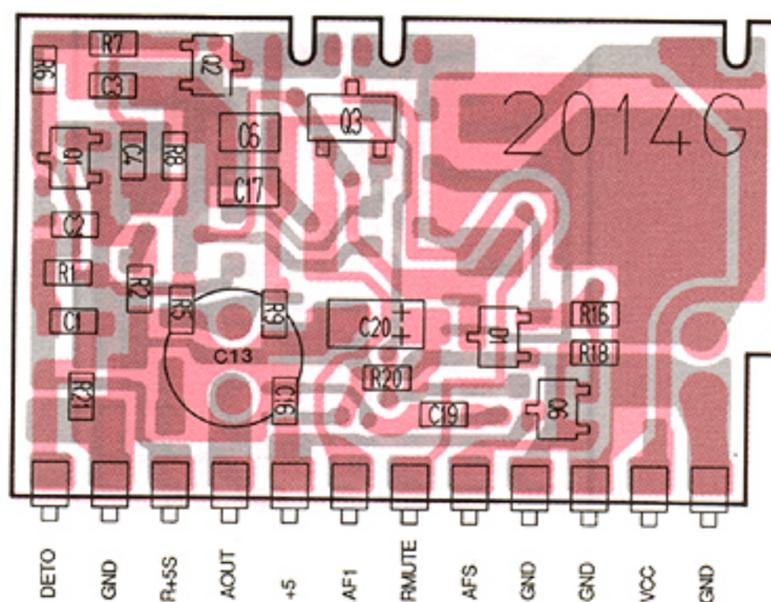


Q1, Q2, Q5, Q6

**2SJ106 GR**  
(Symbol: VG)

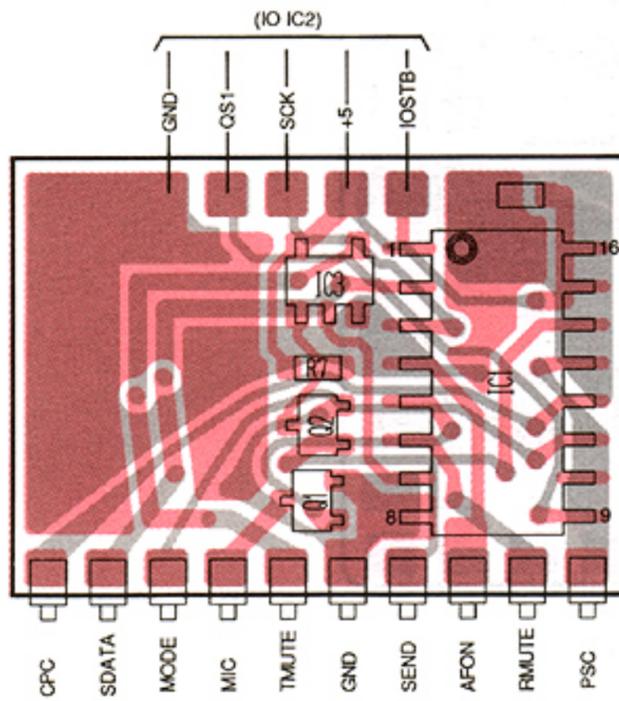


Q3

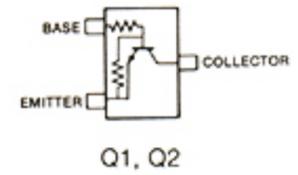


## 7-4 IO AND MIC UNITS

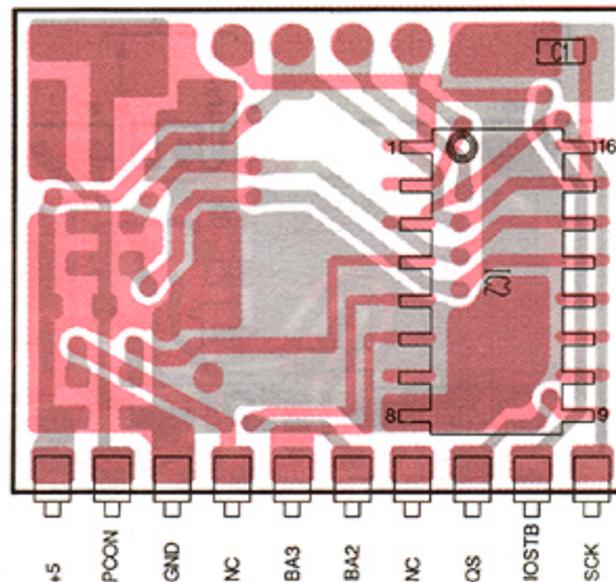
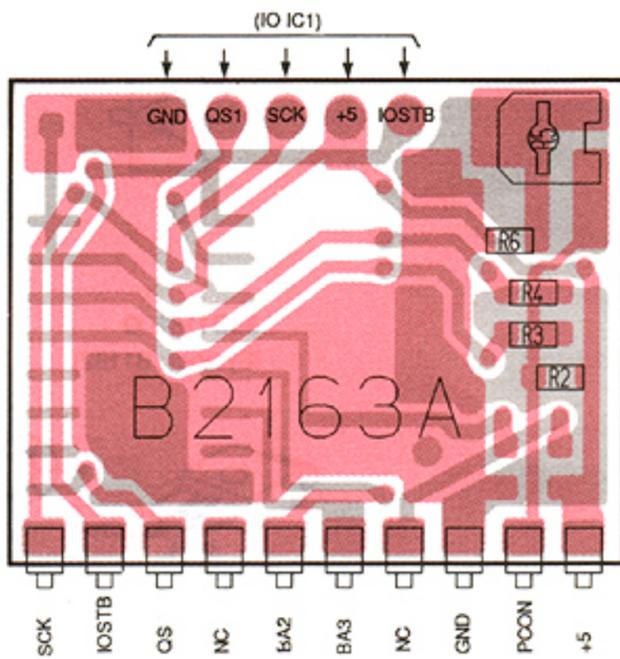
### • IO UNIT (IC1)



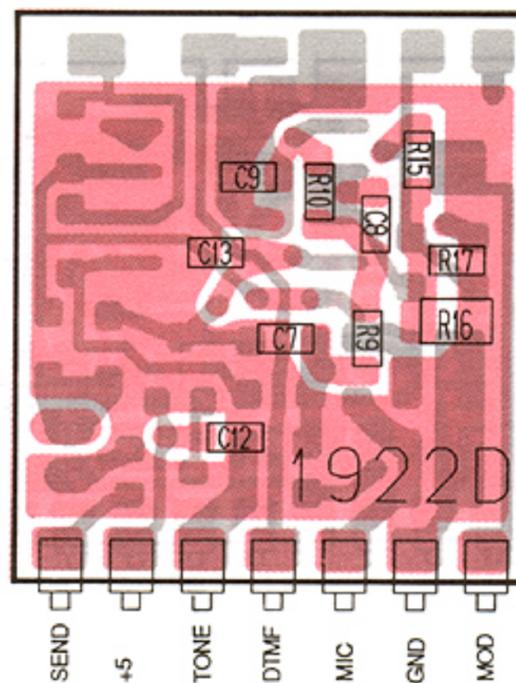
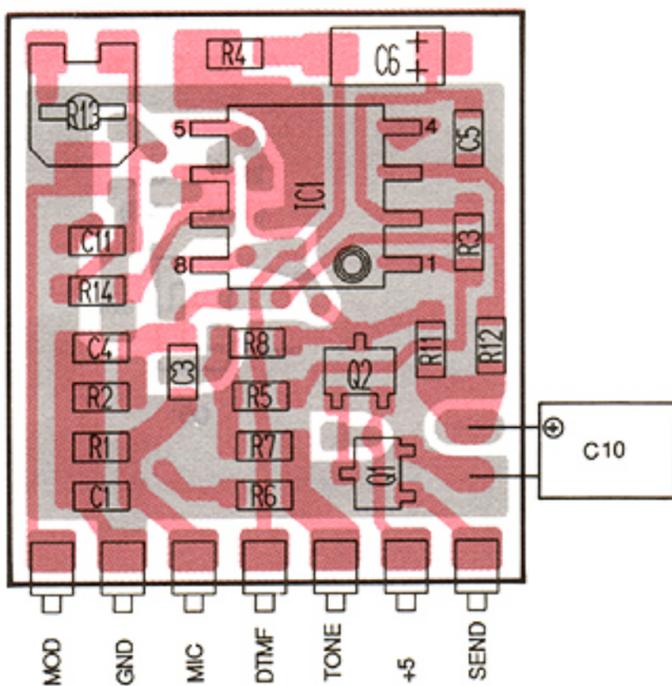
**DTC144EU**  
(Symbol: 26)



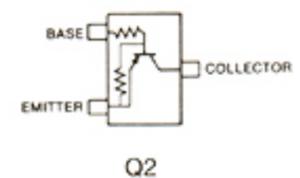
### • IO UNIT (IC2)



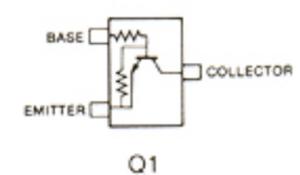
### • MIC UNIT



**DTA144EU**  
(Symbol: 16)

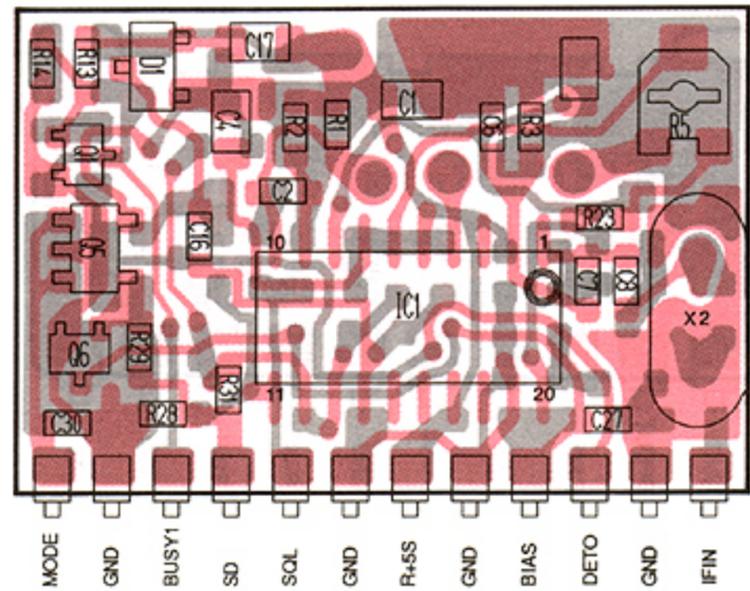
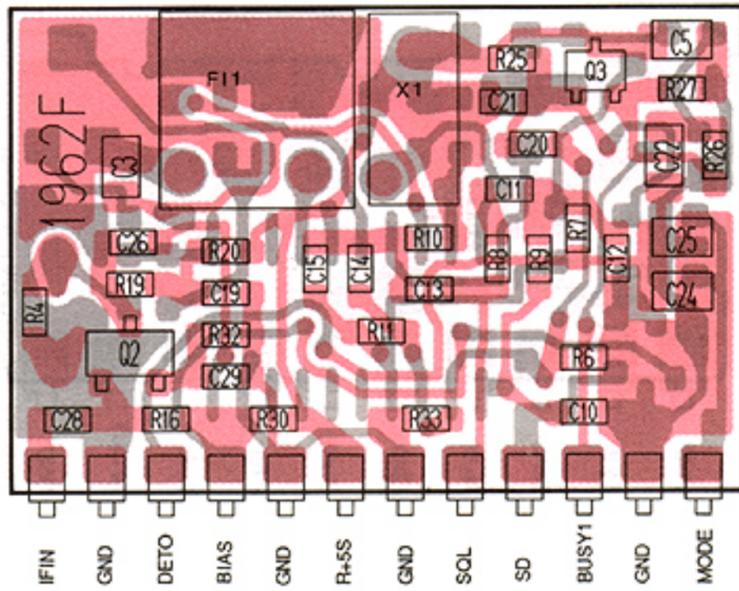


**DTC144EU**  
(Symbol: 26)

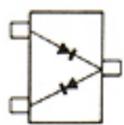


## 7-5 DET AND REG UNITS

### • DET UNIT

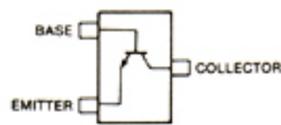


**1SS226**  
(Symbol: C3)



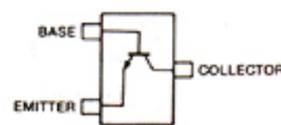
D1

**2SC3770 3**  
(Symbol: JY3)



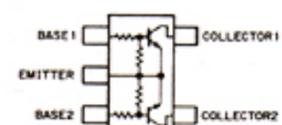
Q2

**2SC4081 S**  
(Symbol: BS)



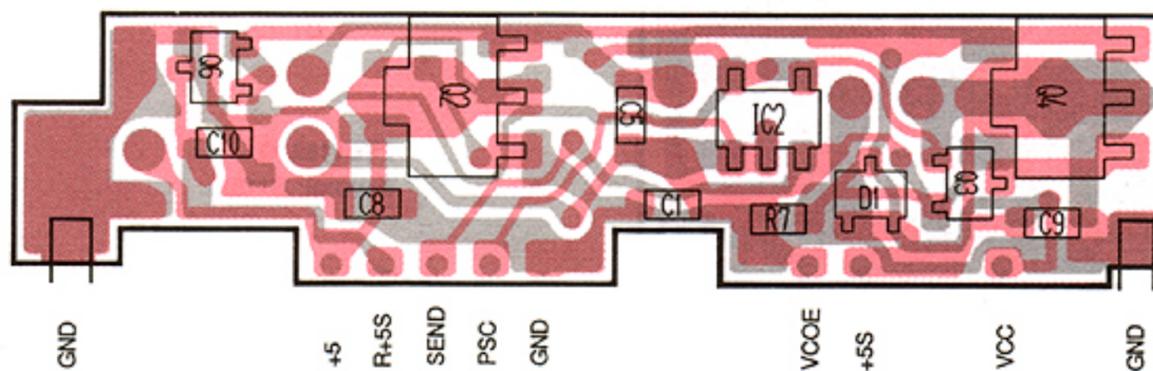
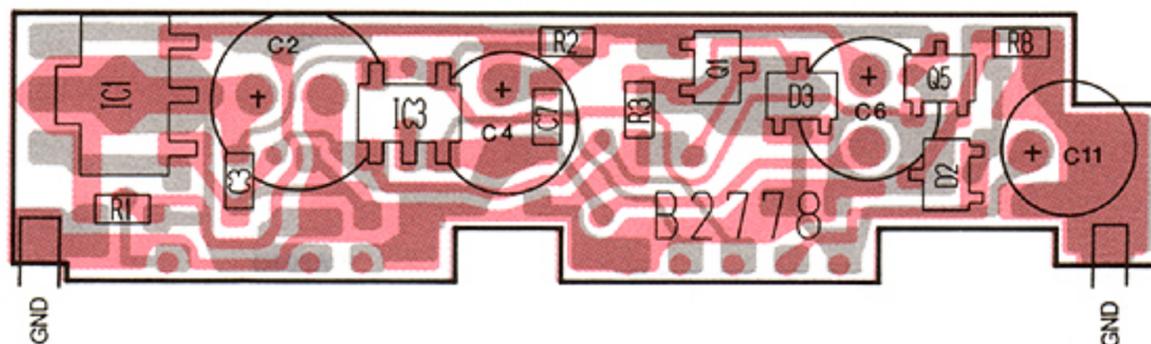
Q1, Q3, Q6

**FMG2**  
(Symbol: G2)

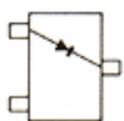


Q5

### • REG UNIT

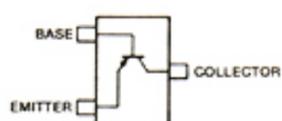


**DA114**  
(Symbol: AV)



D1, D2, D3

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



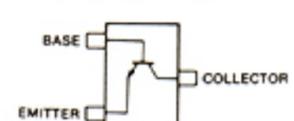
Q6

**2SB798 DK**  
(Symbol: DK)



Q2, Q4

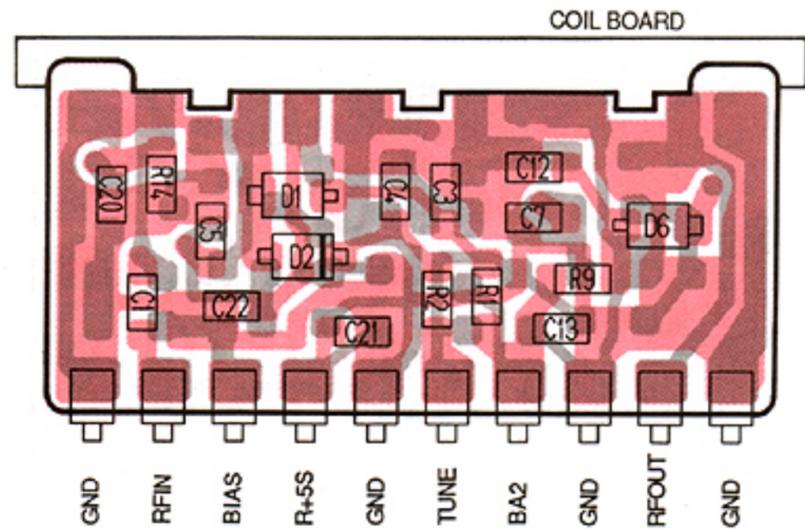
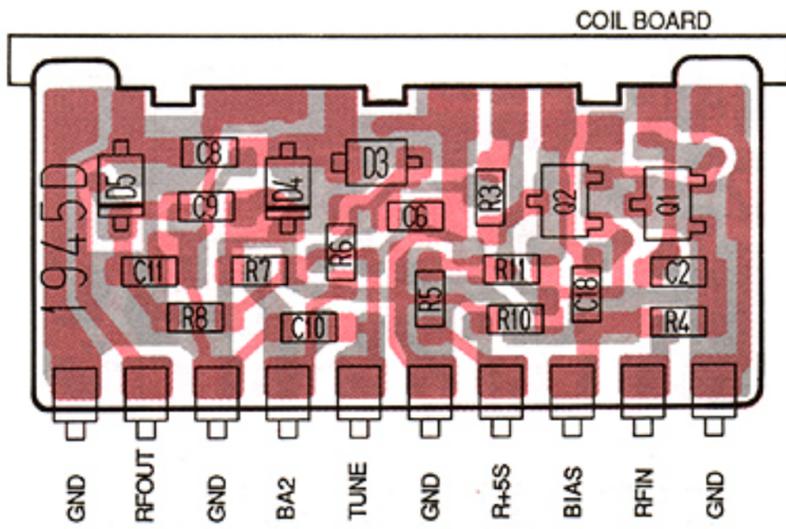
**2SC4081 S**  
(Symbol: BS)



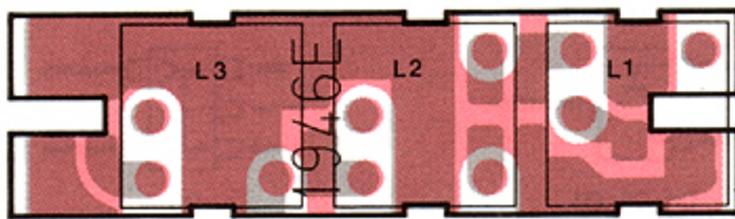
Q1, Q3, Q5

## 7-6 RF AND APC UNITS

### • RF UNIT



### COIL BOARD

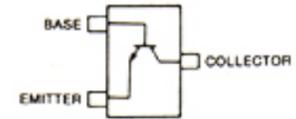


**MA363B**  
(Symbol: 6D)



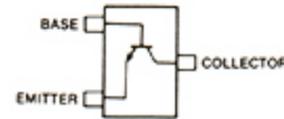
D2, D4, D5

**2SC4403 3**  
(Symbol: LY3)



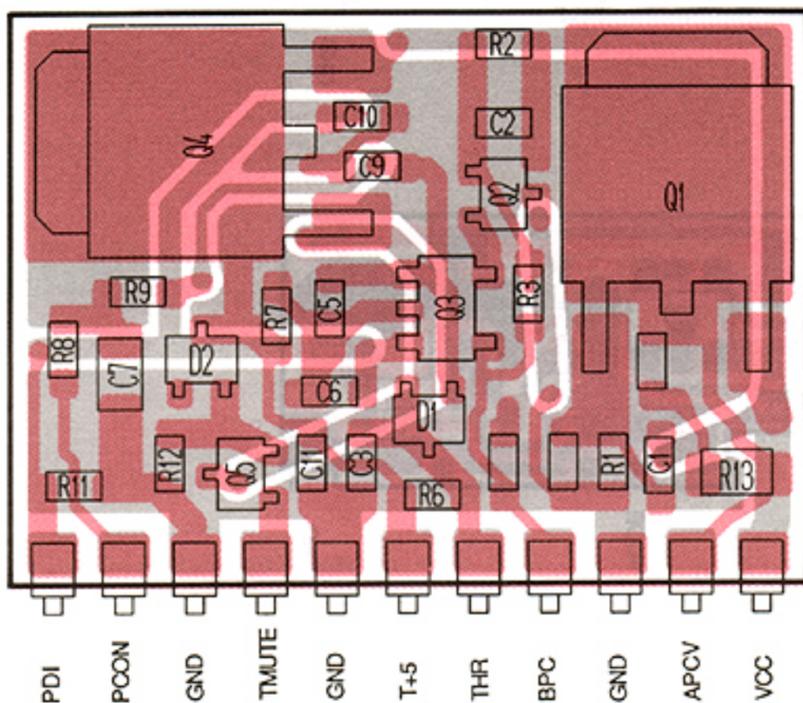
Q2

**2SC4405 3**  
(Symbol: 0Y3)

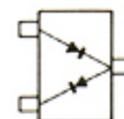


Q1

### • APC UNIT

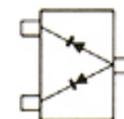


**DA204U**  
(Symbol: K)



D1

**DAP202U**  
(Symbol: P)



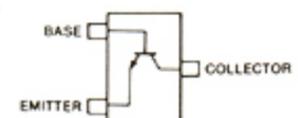
D2

**2SB1182 Q**  
(Symbol: B1182)



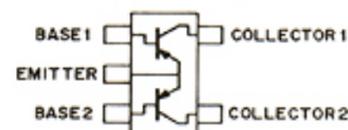
Q1, Q4

**2SC4081 S**  
(Symbol: BS)



Q2, Q5

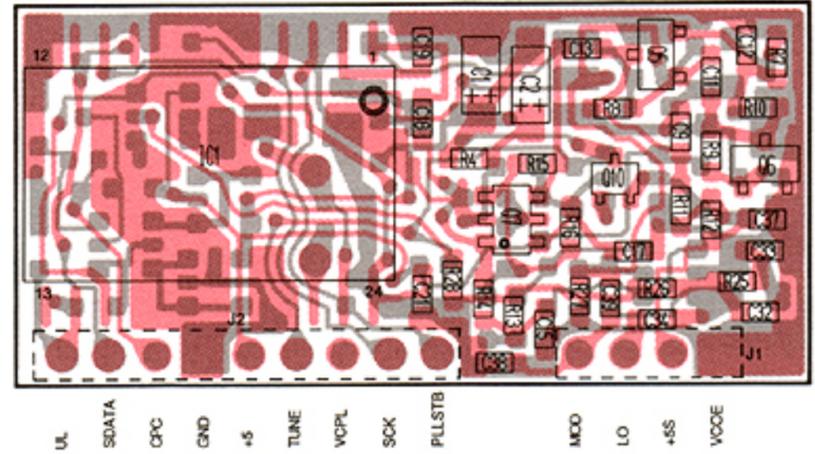
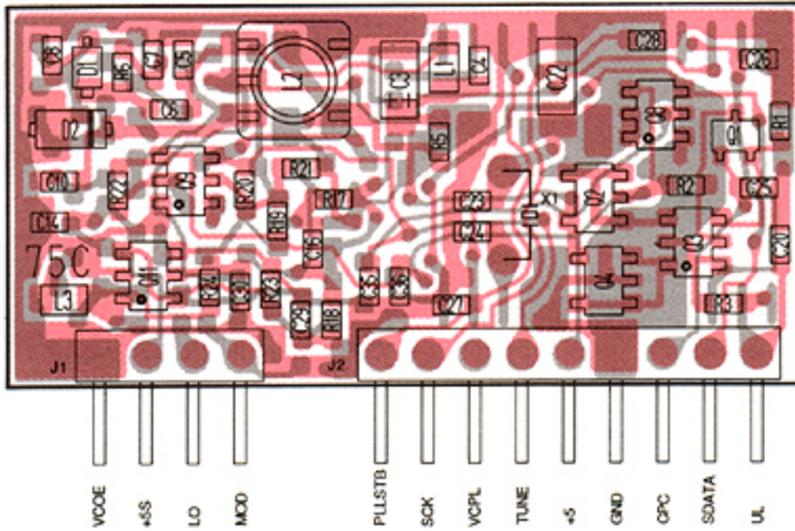
**FMS1**  
(Symbol: SI)



Q3

## 7-7 PLL AND PRT UNITS

### • PLL UNIT

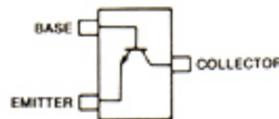


**MA333**  
(Symbol: 6C83)



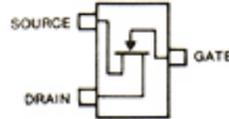
D2

**2SC3356 R25**  
(Symbol: R25)



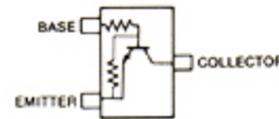
Q5, Q6

**2SK880 Y**  
(Symbol: XY)



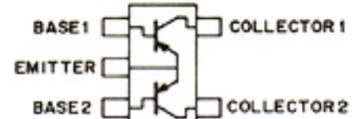
Q10

**DTC144TU**  
(Symbol: 06)



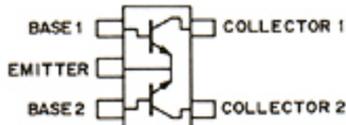
Q1

**FMS1**  
(Symbol: SI)



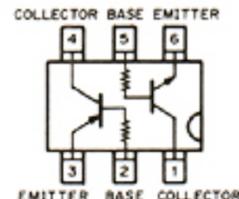
Q2

**FMW1**  
(Symbol: W1)



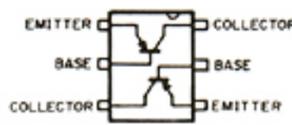
Q4

**IMD6**  
(Symbol: D6)



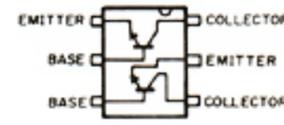
Q8

**IMT1**  
(Symbol: T1)



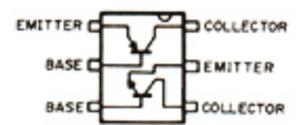
Q9

**IMX5**  
(Symbol: X5)



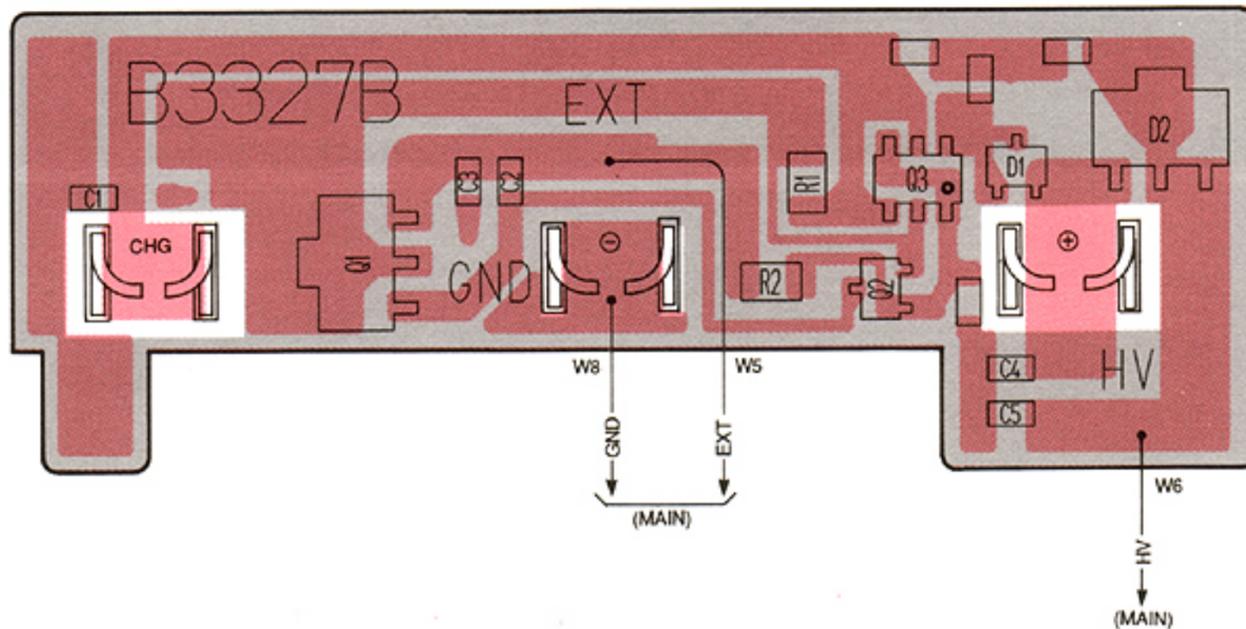
Q7, Q11

**IMZ2**  
(Symbol: Z2)

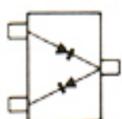


Q3

### • PRT UNIT

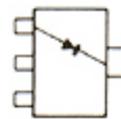


**DA204U**  
(Symbol: K)



D1

**SB20-03P**  
(Symbol: SC)



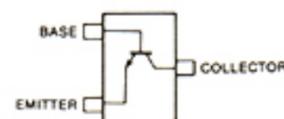
D2

**2SB798 DK**  
(Symbol: DK)



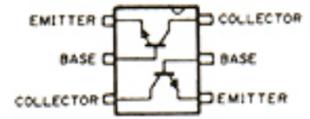
Q1

**2SC4081 S**  
(Symbol: BS)



Q2

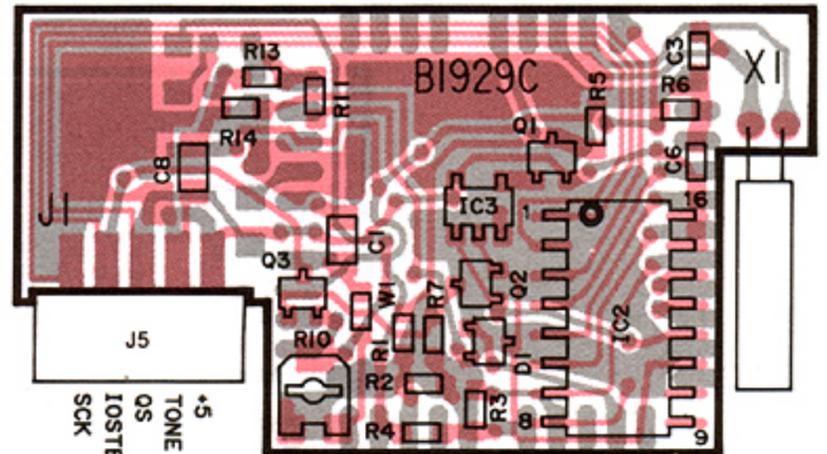
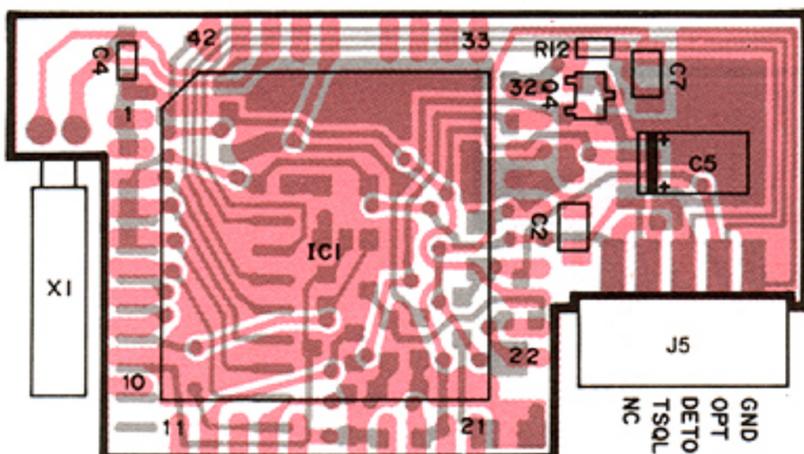
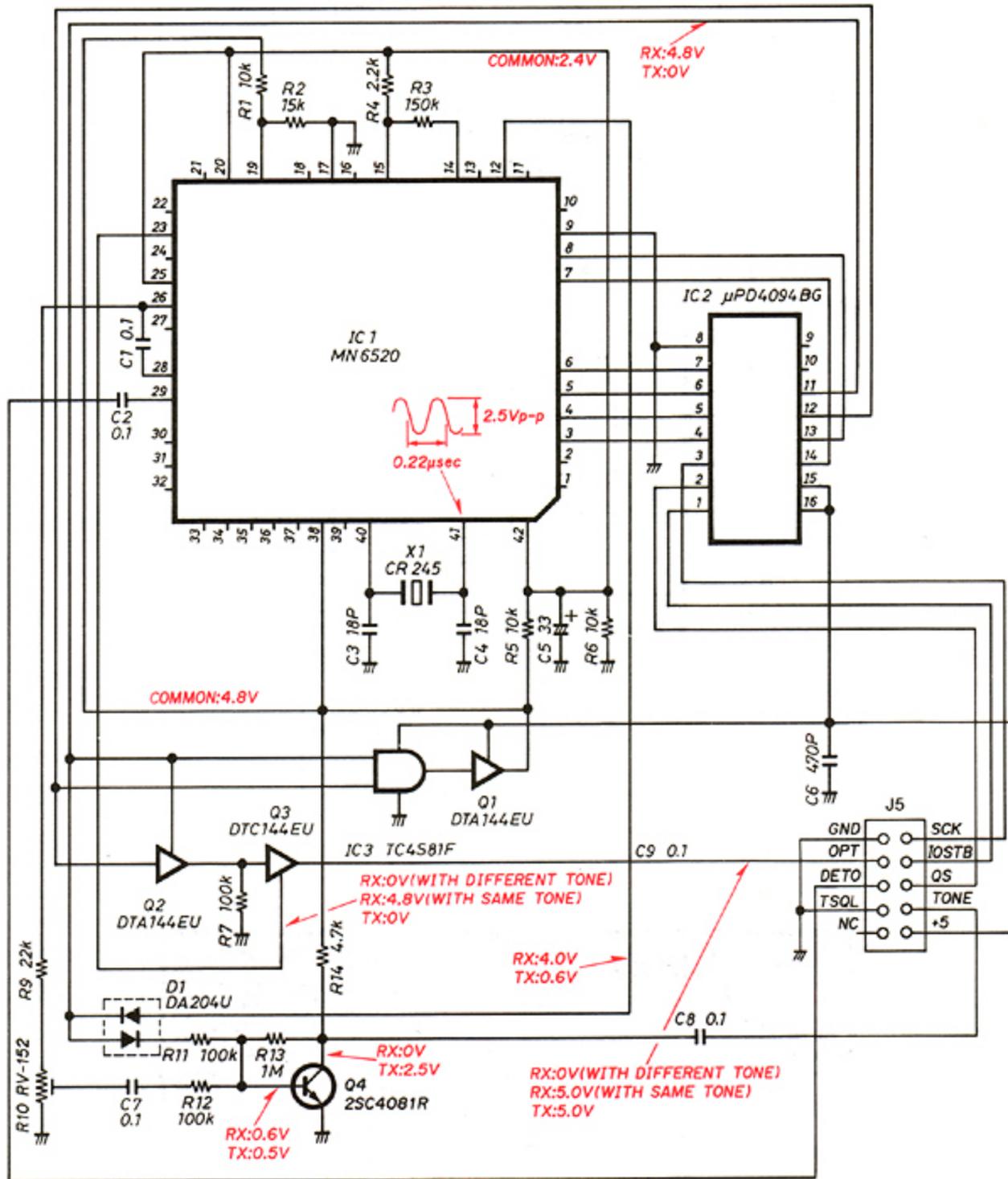
**IMX1**  
(Symbol: X1)



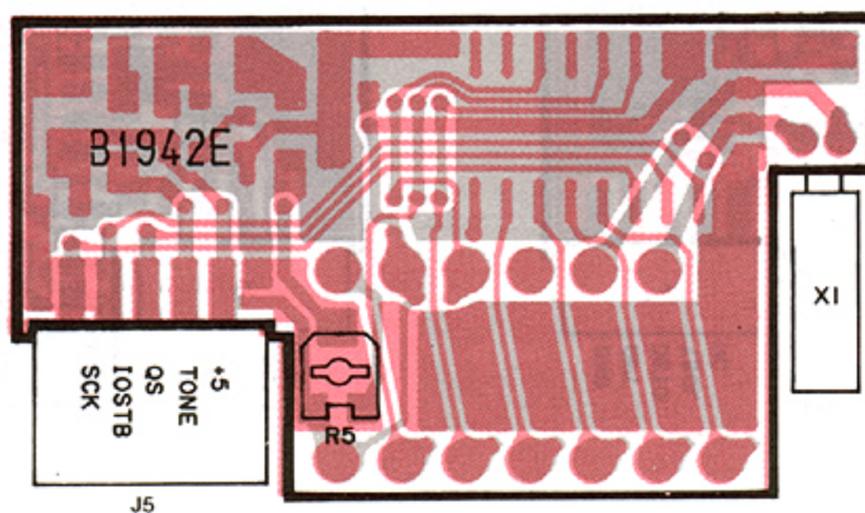
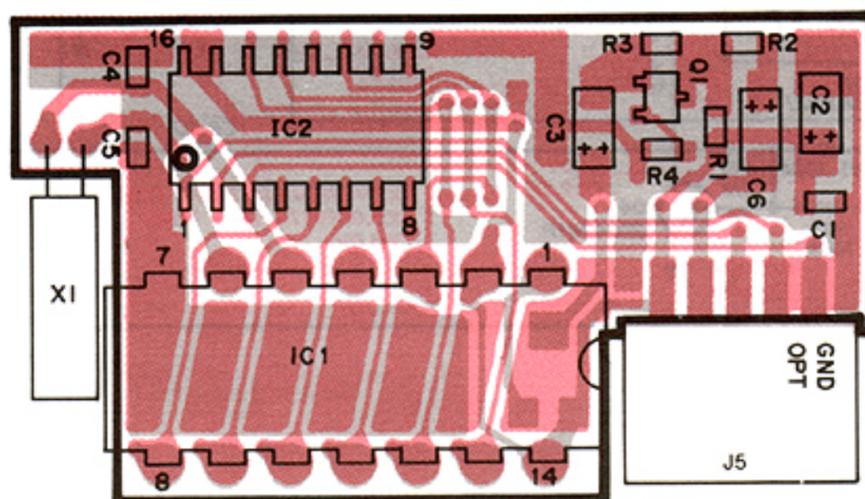
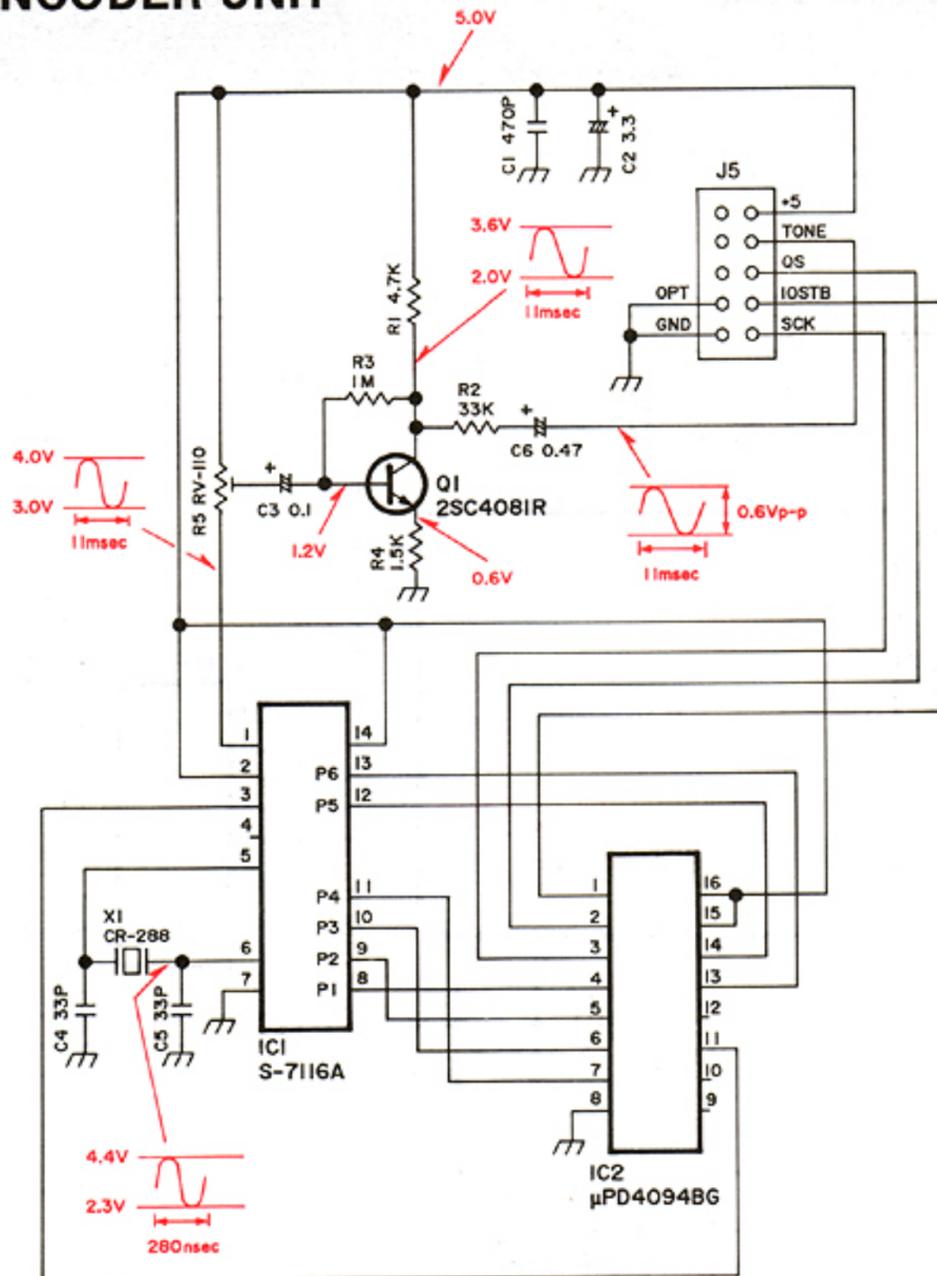
Q3

# SECTION 8 OPTIONAL UNITS

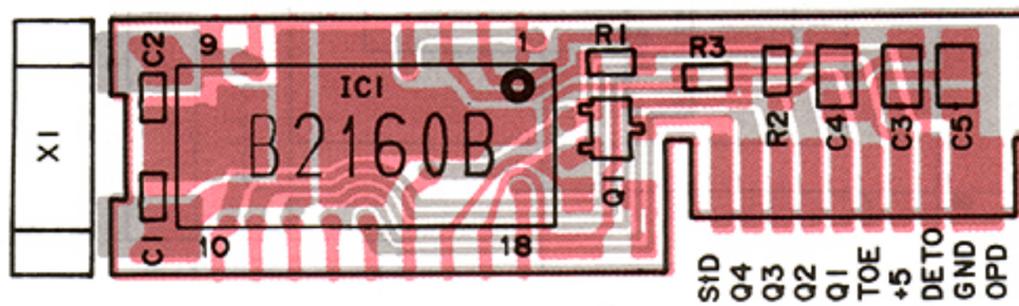
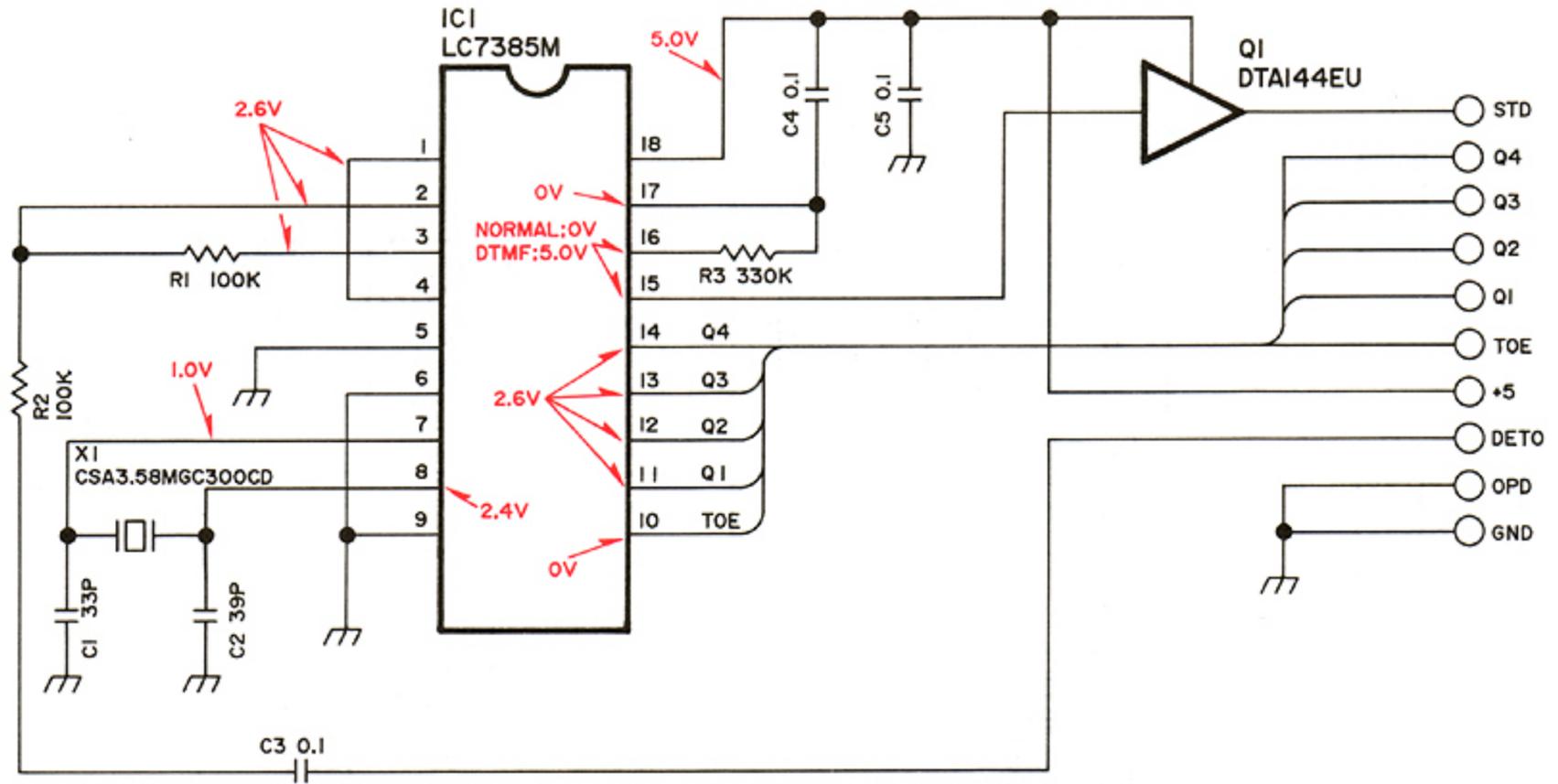
## 8-1 UT-50 TONE SQUELCH UNIT



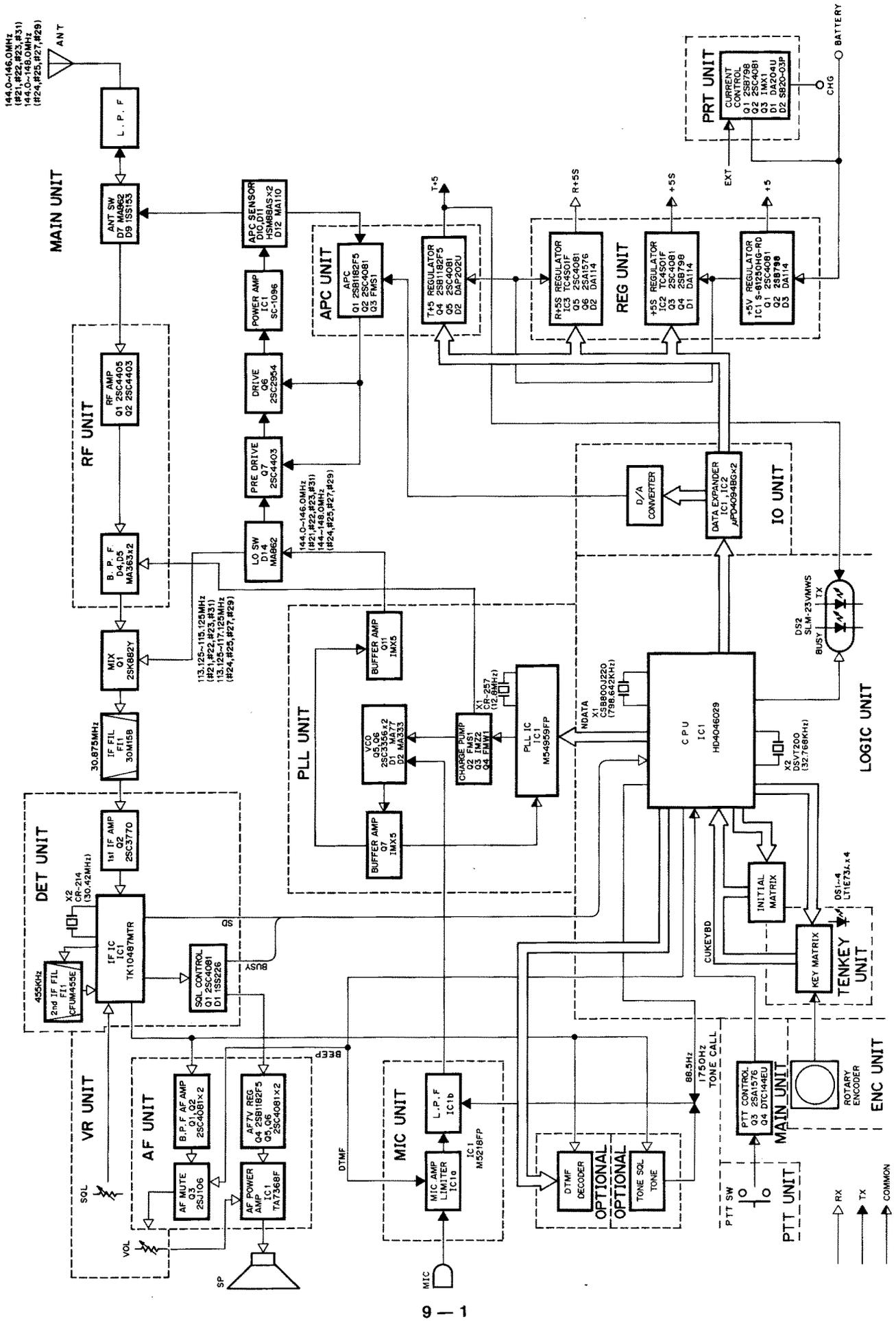
## 8-2 UT-51 TONE ENCODER UNIT



### 8-3 UT-49 DTMF DECODER UNIT

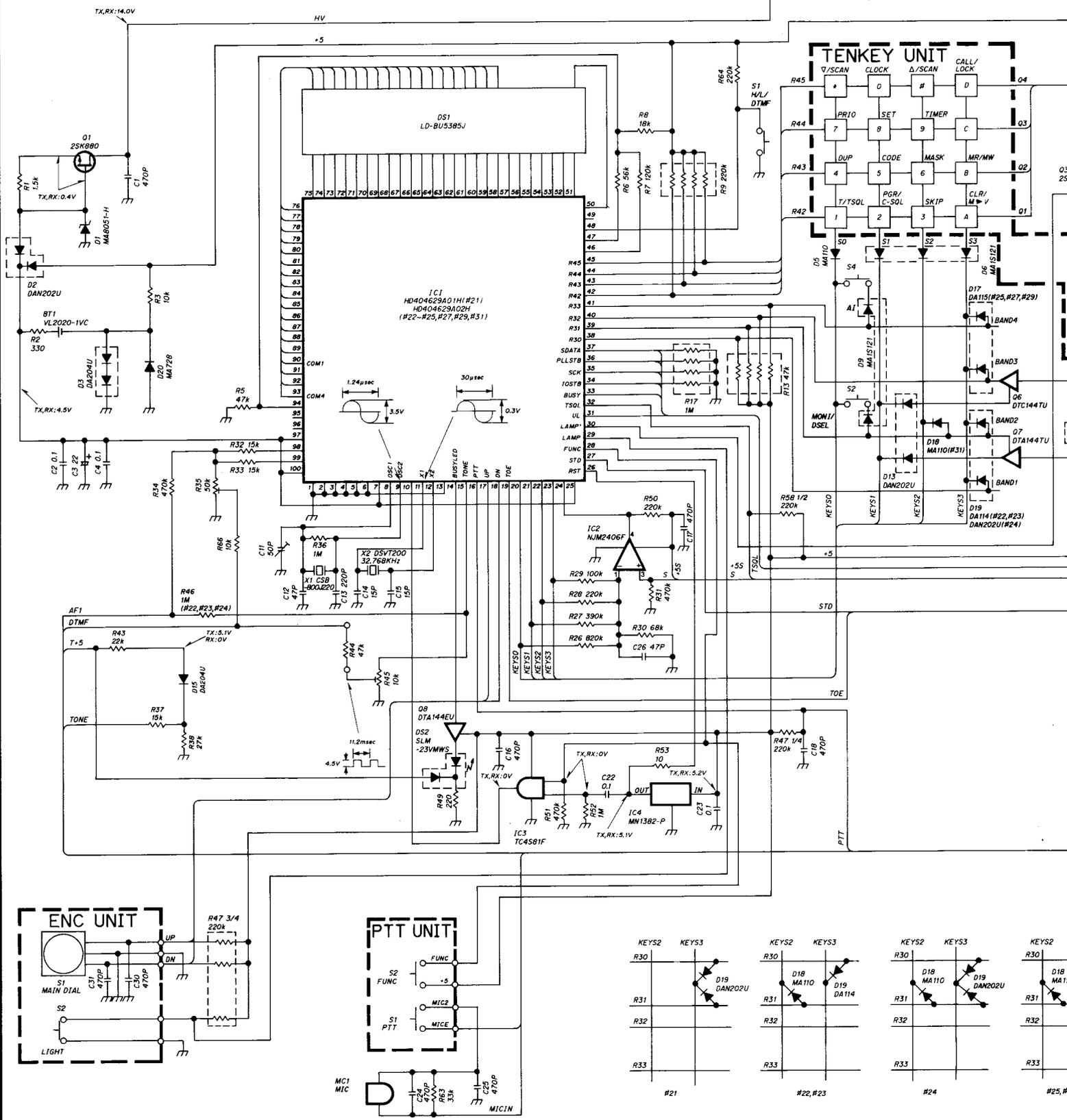


SECTION 9 BLOCK DIAGRAM



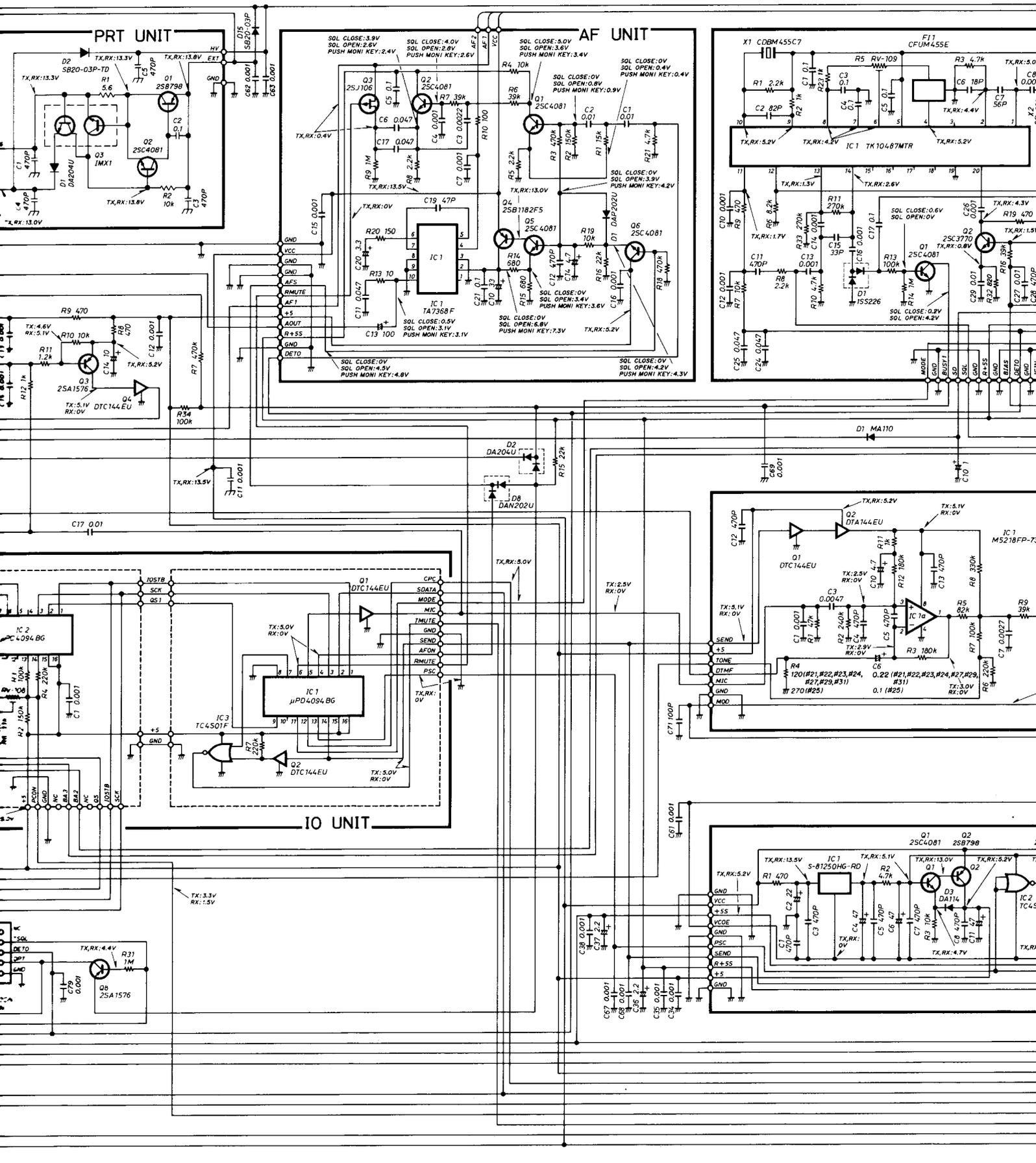
SECTION 10 VOLTAGE DIAGRAM

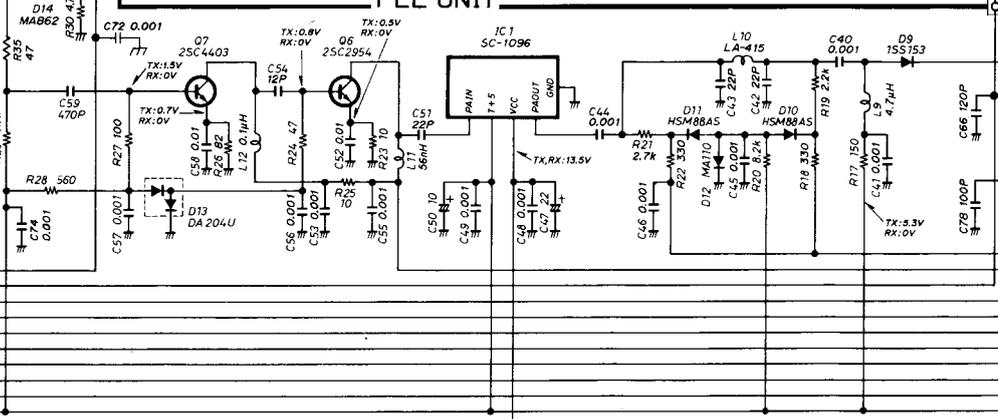
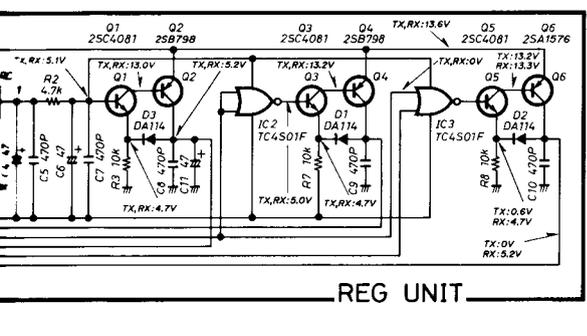
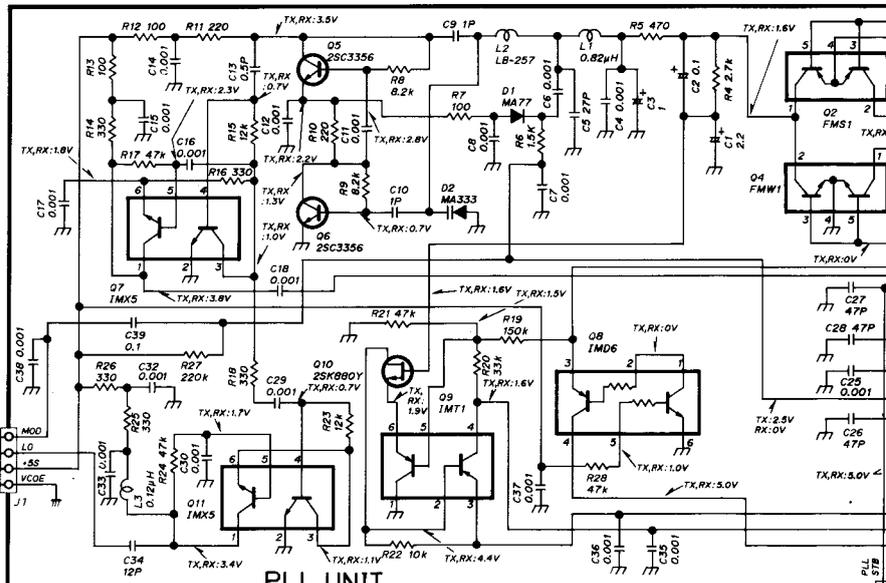
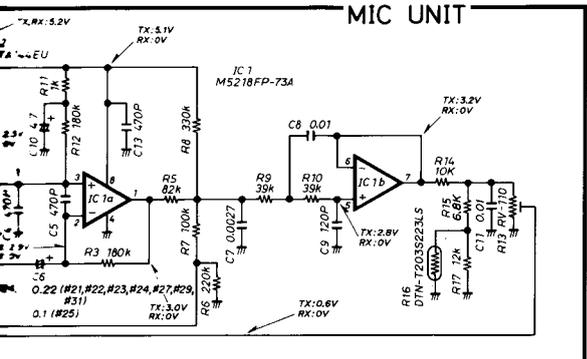
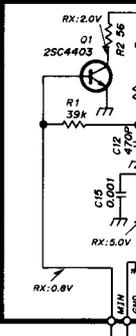
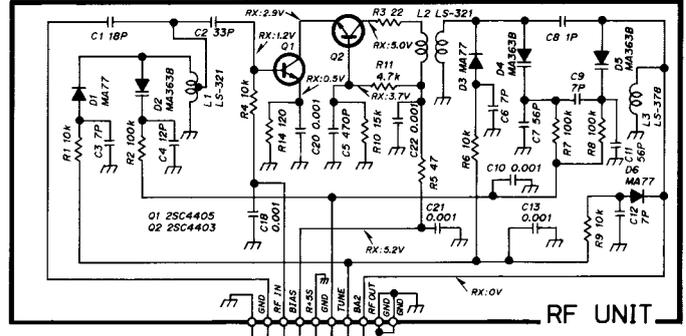
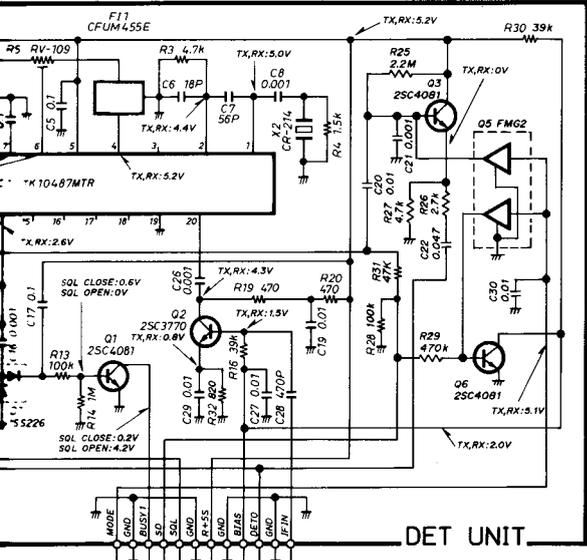
LOGIC UNIT





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