



SERVICE MANUAL

220 MHz FM TRANSCEIVER

IC-P3AT

INTRODUCTION

This service manual describes the latest service information for the **IC-P3AT** 220 MHz FM TRANSCEIVER at the time of publication.

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>

1150000720	IC	SC1107	IC-P3AT	MAIN UNIT	5 pieces
8810001560	Screw	PH PT M2×15 ZK	IC-P3AT	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 : 222~225 MHz
- Mode : FM
- Tuning steps : 5 or 25 kHz
- Dial select steps : 100 kHz or 1 MHz
- Number of channels : Memory channels 100 Call channel 1
Scan edge channels 2
- Antenna impedance : 50 Ω (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	1.6 A
	Low 1	650 mA
Receive	Power saved	19 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 : ± 10 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 4.1 (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 : ± 5 kHz
- Spurious emissions : Less than -60 dB
- Microphone impedance : 2 k Ω
- Heatsink duty cycle : Transmit: Receive= 1 min.: 3 min.

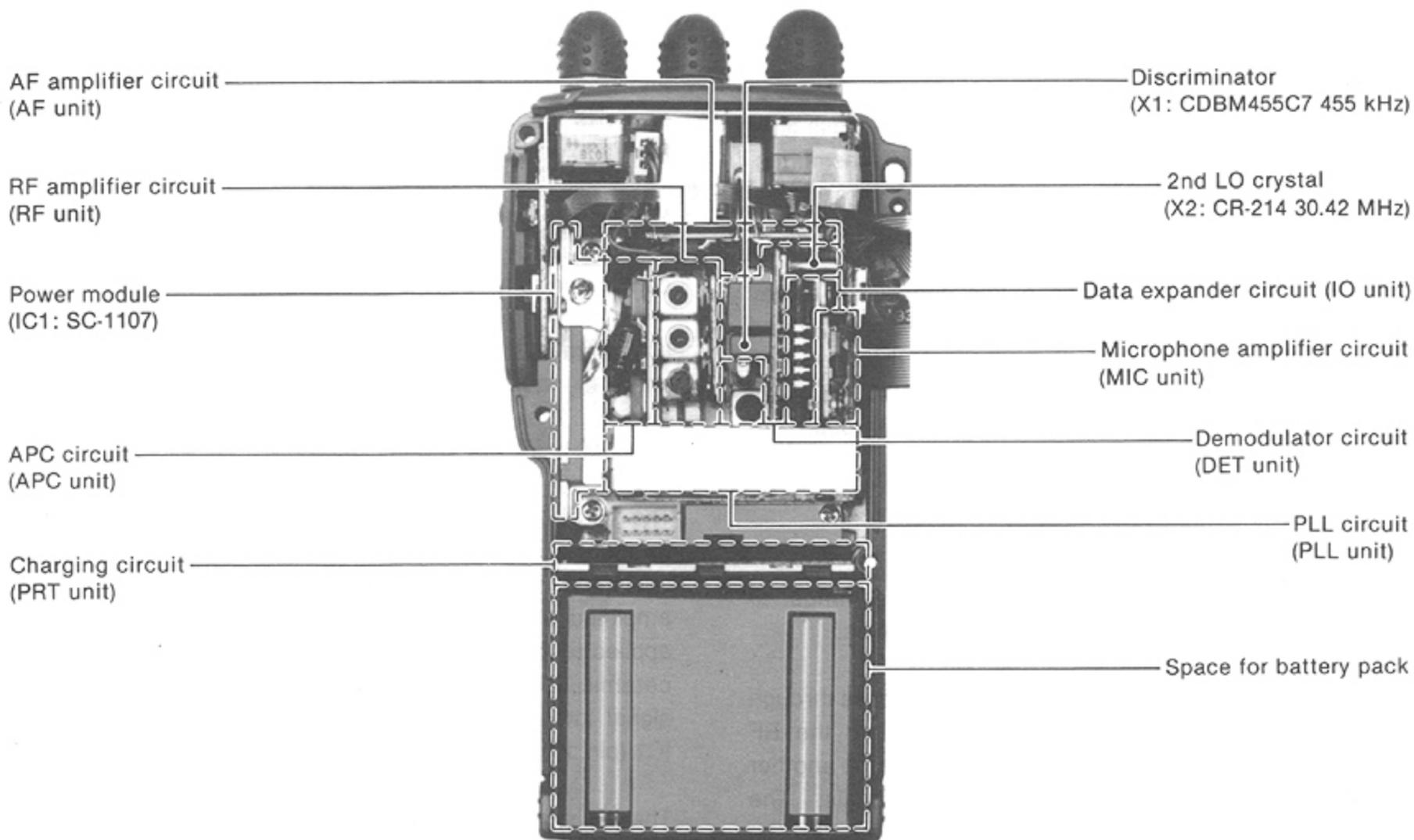
■ RECEIVER

- Receive system : Double-conversion superheterodyne
- Intermediate frequencies : 1st 30.875 MHz
2nd 455 kHz
- Sensitivity : Less than 0.16 μV for 12 dB SINAD
- Squelch sensitivity (threshold) : Less than 0.1 μV
- 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 Ω load
- Audio output impedance : 8 Ω

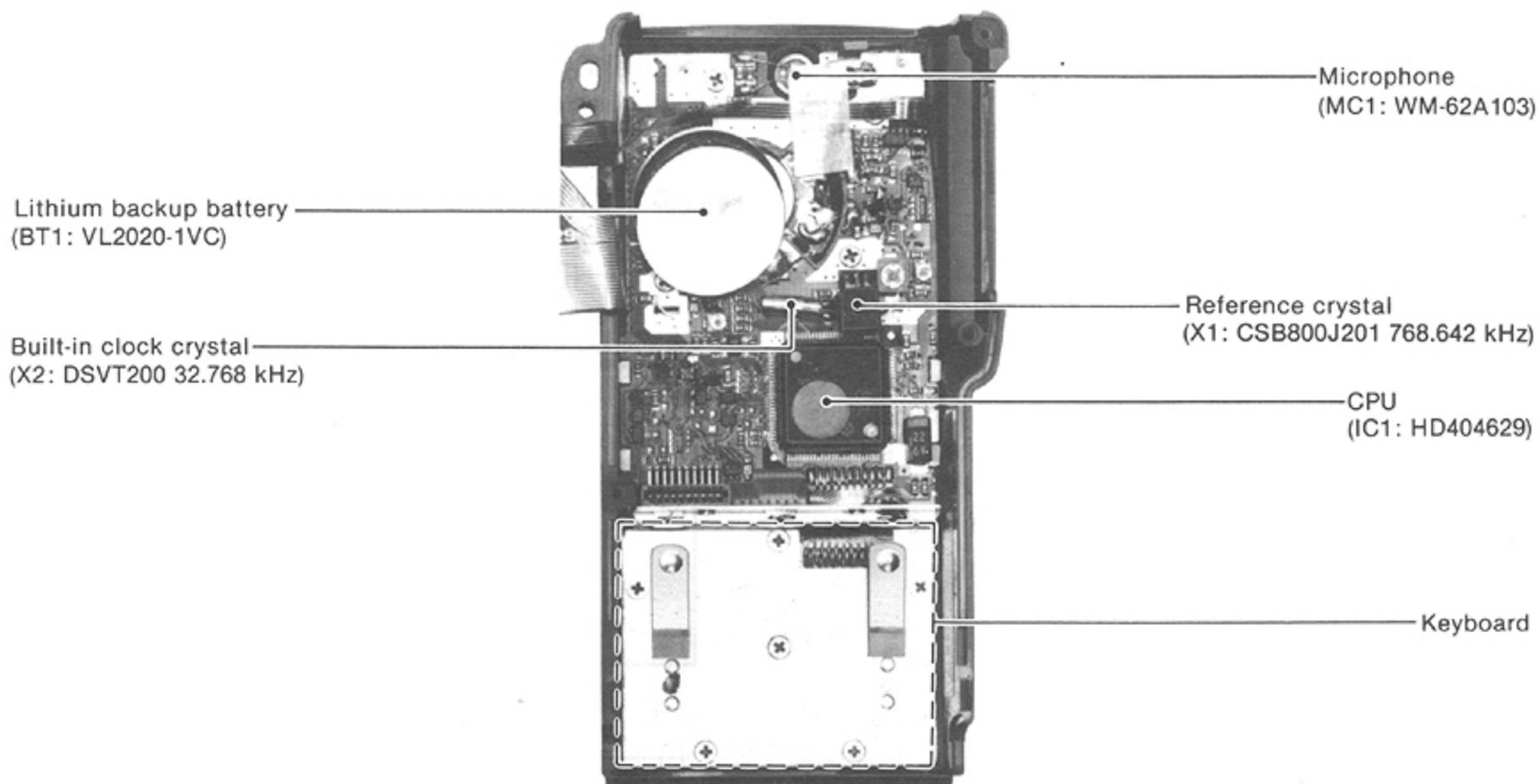
All stated specifications are subject to change without notice or obligation.

SECTION 2 INSIDE VIEWS

• MAIN UNIT



• LOGIC UNIT



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 (L3, L4, C21~C25) to suppress out-of-band signals. The filtered signals pass through the two-stage $\lambda/4$ type antenna switching circuit (D7, D9, L5, L6, C26, C27) and are then applied to the RF unit through the RF IN 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) and are then applied to the RF amplifier (Q1, Q2). The amplified signals enter the another bandpass filter (L2, L3) to suppress unwanted signals. The filtered signals are applied to the 1st mixer circuit on the MAIN unit.

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 through J5 on the MAIN unit and UT-49 DTMF DECODER UNIT through J1 on the LOGIC unit).

• 2ND IF AND DEMODULATOR CIRCUITS

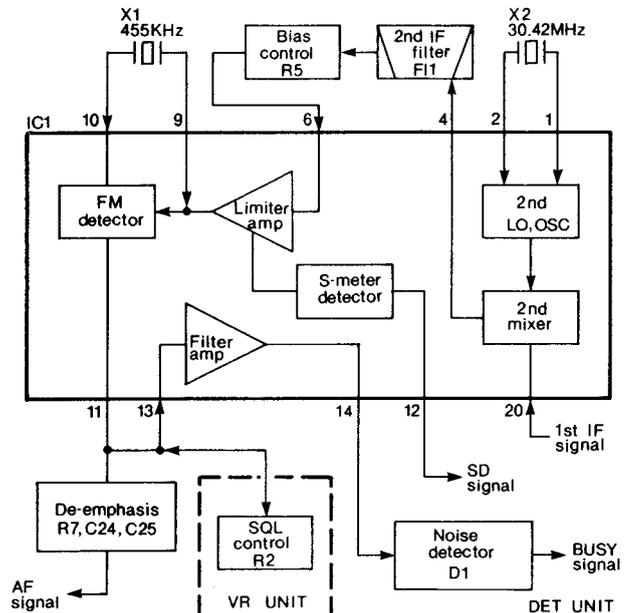


Fig. 1

3-2 TRANSMITTER CIRCUITS

3-2-1 MICROPHONE AMPLIFIER CIRCUIT (MIC UNIT)

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 VCO 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 varactor diode (D4) to modulate the oscillated signal at the VCO circuit (Q1, D1, D2). The oscillated signal is buffer-amplified at Q2 and Q3. 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

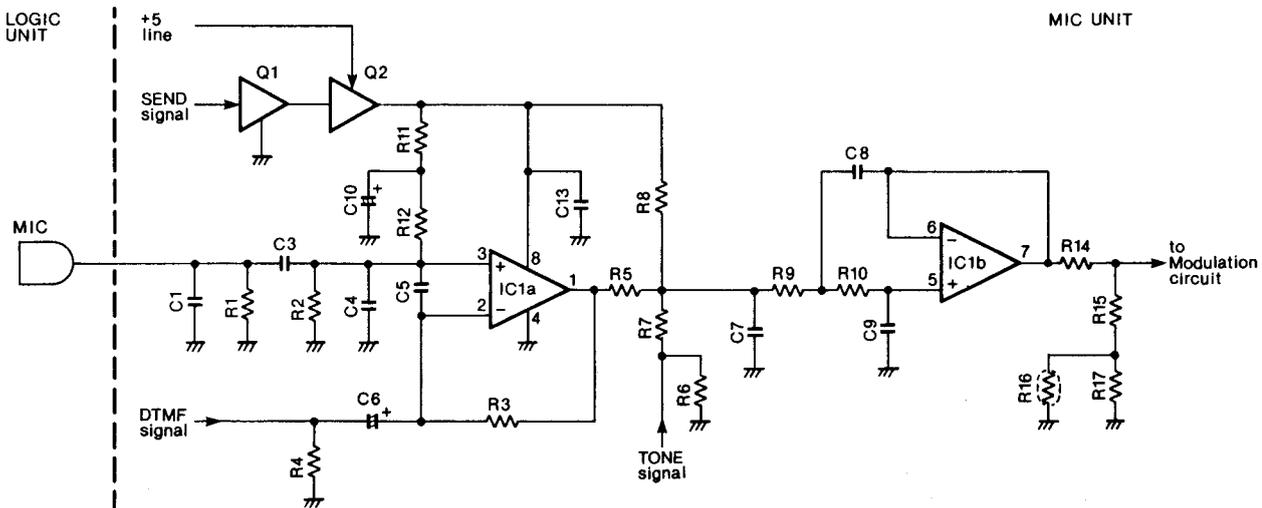


Fig. 3

The current from the differential amplifier circuit (Q3a, Q3b) is amplified at Q2 to control Q1. The control voltage changes the supply voltage to Q6 and Q7 on the MAIN unit. This decreases the output power from the drive amplifier (Q6) 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 (L3, 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 (Q1, D1, 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

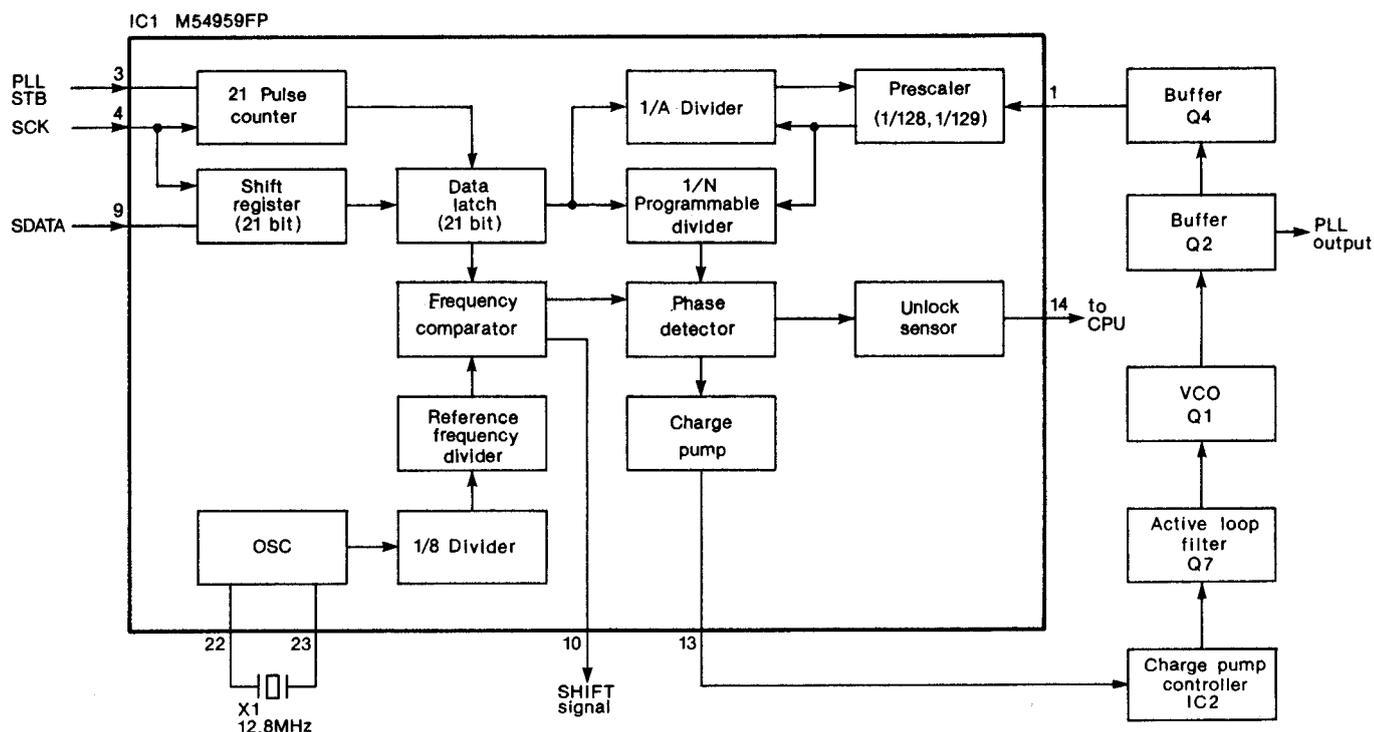


Fig. 4

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

A 12.8 MHz reference frequency is produced by X1. The frequency is adjusted with C21. The reference frequency is divided by 2560 to obtain 5 kHz.

3-3-4 VCO CIRCUIT (PLL UNIT)

The VCO circuit (Q1, D1, D2) generates the transmit frequency and the receive 1st LO frequency. The varactor diodes (D1, D2) provides frequency control. While transmitting, IC1 (pin 10) becomes "HIGH" to turn D3 OFF. Hence, C6 is added for oscillation. At this time, the microphone signal is applied to D4 for modulation. While receiving, IC1 (pin 10) becomes "LOW" to turn D3 ON. Hence, C10 is ignored for oscillation. The output signal from the VCO circuit is buffer-amplified at Q2 and Q4 and is then applied to PLL IC (IC1, pin 1). On the other hand, the amplified signal at Q2 is re-amplified at Q3. These buffer amplifiers amplify VCO oscillation and do not permit the latter circuit to affect the VCO oscillation. The amplified signal is applied to the transmit/receive switching circuit (D14) on the MAIN unit.

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 switching IC (IC2) and is then applied to the active loop filter (Q7, C12, C13, R10, R20). The active loop filter converts the pulse signal to DC voltage while increasing the DC voltage range. The PLL lock voltage changes the reactance of the varactor diodes (D1, 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-P3AT 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 charging current is determined the resistor inside battery pack. The CHG terminal is connected to the battery pack internal resistor.

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 CPU RESET CIRCUIT (LOGIC UNIT)

This circuit resets the CPU (IC1) with a reset IC (IC4). The reset 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.

3-5-4 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).

3-5-5 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

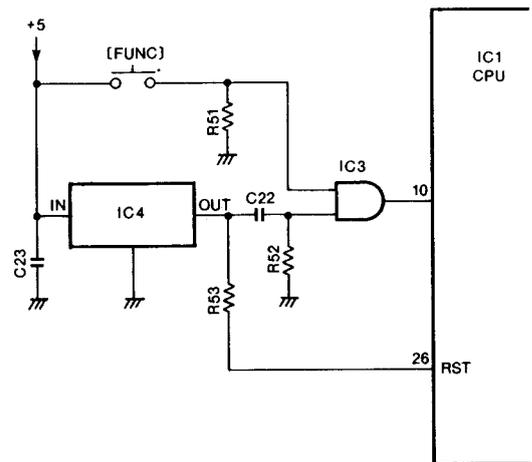


Fig. 5

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 standby 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.
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.
SCK	35	Outputs clock signals for serial data.

PORT NAME	PIN NUMBER	DESCRIPTION
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.
TOSEC, 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.
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
+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

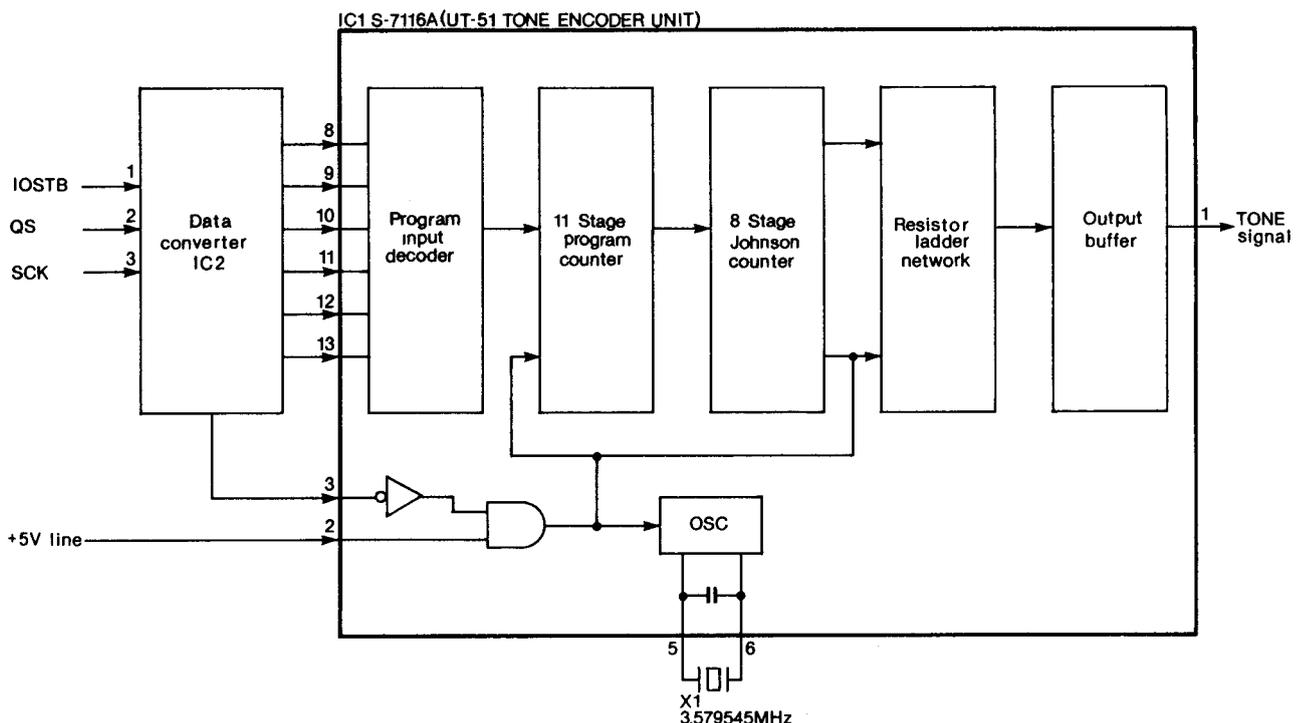


Fig. 6

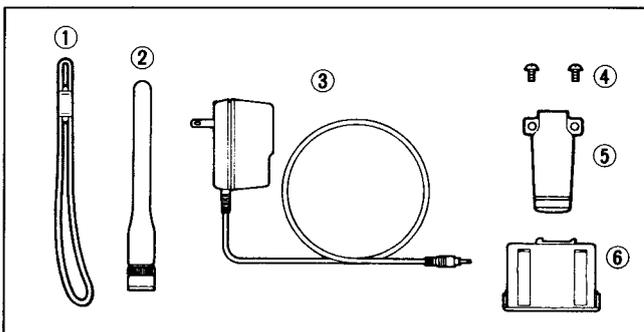
SECTION 4 MECHANICAL PARTS AND DISASSEMBLY

4-1 FRONT PANEL

LABEL NUMBER	ORDER NO.	DESCRIPTION	QTY.	LABEL NUMBER	ORDER NO.	DESCRIPTION	QTY.
①	8610007640	Knob N177 [SQL], [PWR/VOL]	2	③③	6910006640	LCD reflector ALF39.5 × 24.5 × 0.58	1
②	8610007650	Knob N178 [MAIN DIAL]	1	③④	8930023130	LCD contact SRCN-1144W	2
③	8830000710	VR nut (G)	3	③⑤	5030000720	LCD LD-BU5385J (E-5561)	1
④	8210006610	1144 top panel	1	③⑥	8930022111	LCD holder-1	1
⑤	8930022230	1144 top seal	1	③⑦	8930022150	LCD rubber	1
⑥	8930022121	1144 VR plate-1	1	③⑧	8810005740	Screw FH B0 No. 0 M2 × 3	6
⑦	8810005860	Screw PH No. 0 M2 × 3 NI	1	③⑨	8110004510	1144 PCB cover	1
⑧	8810005700	Screw PH No. 0 M2 × 4 ZK	2	④①	8930022640	1144 U-rubber	1
⑨	2260001400	Encoder SW-122 (RK0971103H) [MAIN DIAL]	1	④②	8930010330	1144 L-rubber	1
⑩	8930009790	Insulate plate AM	1	④③	8210006620	1144 10-keyboard	1
⑪	7210001450	Variable resistor RK0971110051A (10 KB) [SQL]	1	④④	8210007291	1144 front panel (F)-1 (incl. window panel)	1
⑫	7210001440	Variable resistor RK097111101NA (10 KA) [PWR/VOL]	1	④⑤	8810004450	Screw PH M2 × 8 ZK	1
⑬	6450000870	Connector HEC2711-01-020 [DC 13.8 V]	1	④⑥	8850001230	Lug washer	1
⑭	6450001060	Connector HSJ1493-01-010 [SP]	1	④⑦	6510013810	Connector BNC-RM-F1 (incl. nut) [ANTENNA CONNECTOR]	1
⑮	6450000130	Connector HSJ1102-01-540 [MIC]	1	④⑧	8930023770	1151 PTT rubber	1
⑯	8810000120	Screw PH M2.6 × 3	1	④⑨	8930014961	752 rainproof cap-1	1
⑰	8930016240	Fiber insulate plate (D)	1	⑤①	8810006460	Screw FH M2 × 3	1
⑱	8510005830	CO-PL shield case cover	1	⑤②	8810001560	Screw PH PT M2 × 15 ZK	3
⑲	8510005850	752 PLL shield case	1	⑤③	8010007602	Hole bush (A)-2	2
⑳	8510006171	755 PLL shield case cover-1	1	⑤④	8810006950	Screw PH B0 No. 0 M2 × 4 ZK	2
㉑	8810006620	Screw PH No. 0 M2 × 3.5 NI	4	⑤⑤	8930022720	1144 release button	1
㉒	8930005510	Insulate plate M	1	⑤⑥	8930023082	1144 slider-2	1
㉓	8930011860	Insulate plate AU	1	⑤⑦	8930022141	1144 release spring-1	1
㉔	8510006180	755 MAIN shield plate	1	⑤⑧	8930022131	1144 lock angle-1	1
㉕	8810004800	Screw PH B0 No. 0 M2 × 4	4	⑤⑨	8810005860	Screw PH No. 0 M2 × 3 NI	2
㉖	8930022980	1144 LOGIC spring	1	⑤⑩	8850000110	Flat washer M2 NI BS	2
㉗	7700000861	Microphone WM-62A103	1	⑥①	8930014912	Lamp button-2	1
㉘	8930014940	752 microphone holder	1	⑥②	8010011821	1144 rear panel-1	1
㉙	8930018080	Speaker ring	1	⑥③	8930018810	Sheet AA	1
㉚	2510000530	Speaker T028S14I0810	1	⑥④	8930022950	1144 contact shield	1
㉛	8930023010	Insulate plate CE	1	⑥⑤	8210006600	1144 contact panel	1
㉜	8510007440	1144 front shield	1	⑥⑥	8810006940	Screw PH M2 × 2	2
					8930022100	1144 contact terminal	3

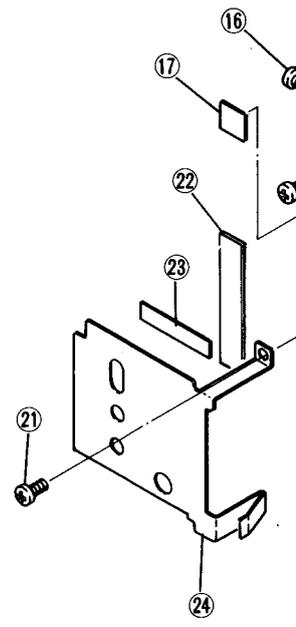
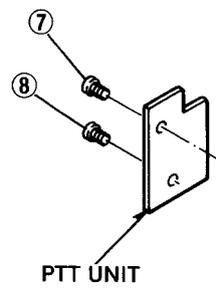
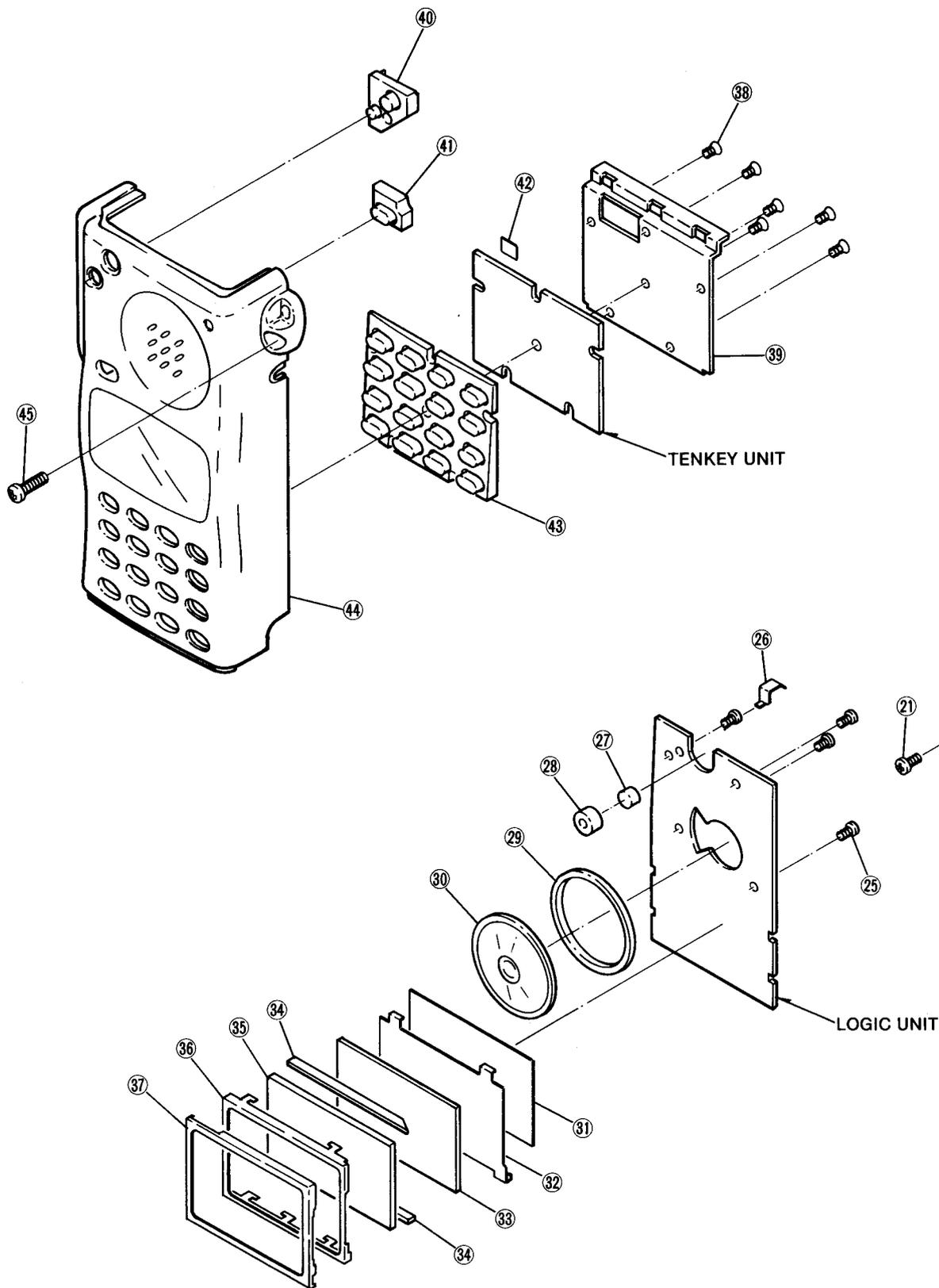
Screw abbreviations B0: Self-tapping screw PH: Pan head FH: Flat head BS: Brass NI: Nickel ZK: Black

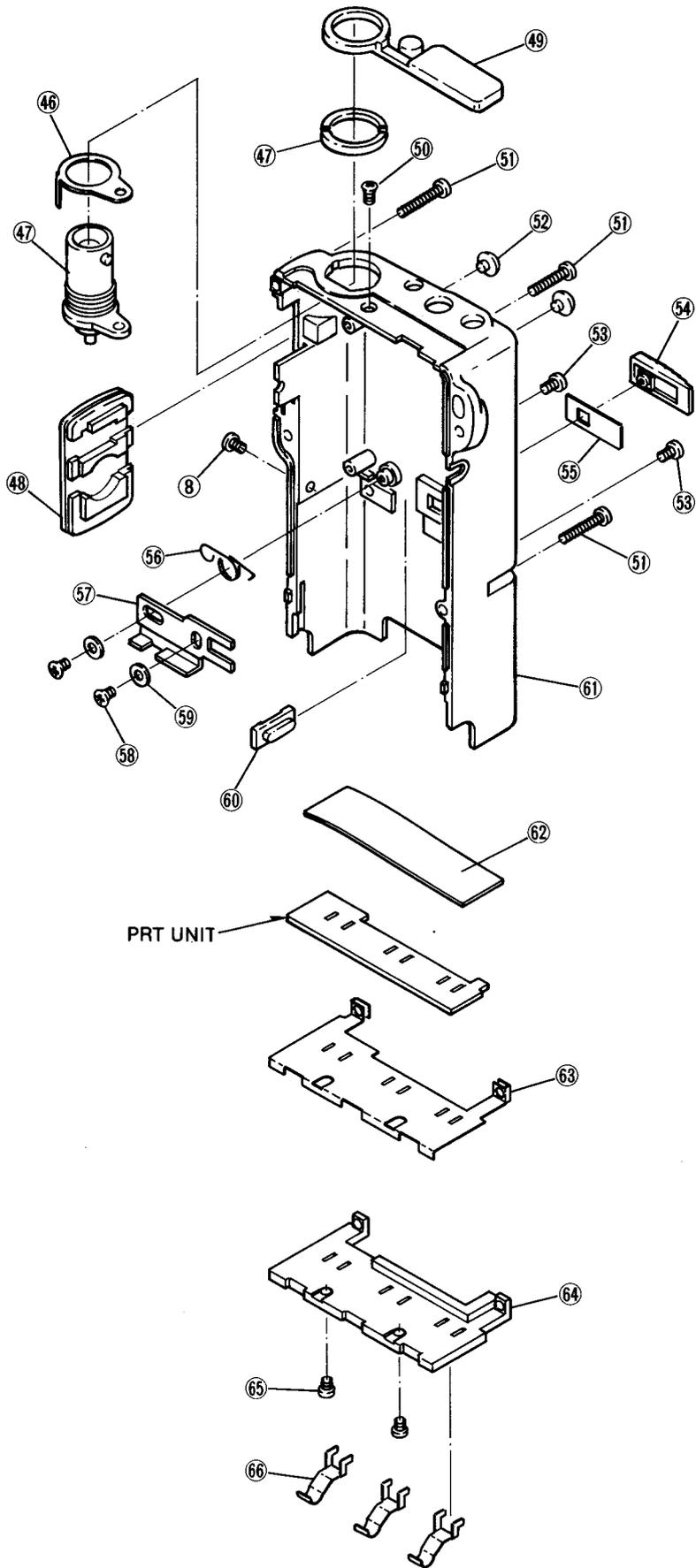
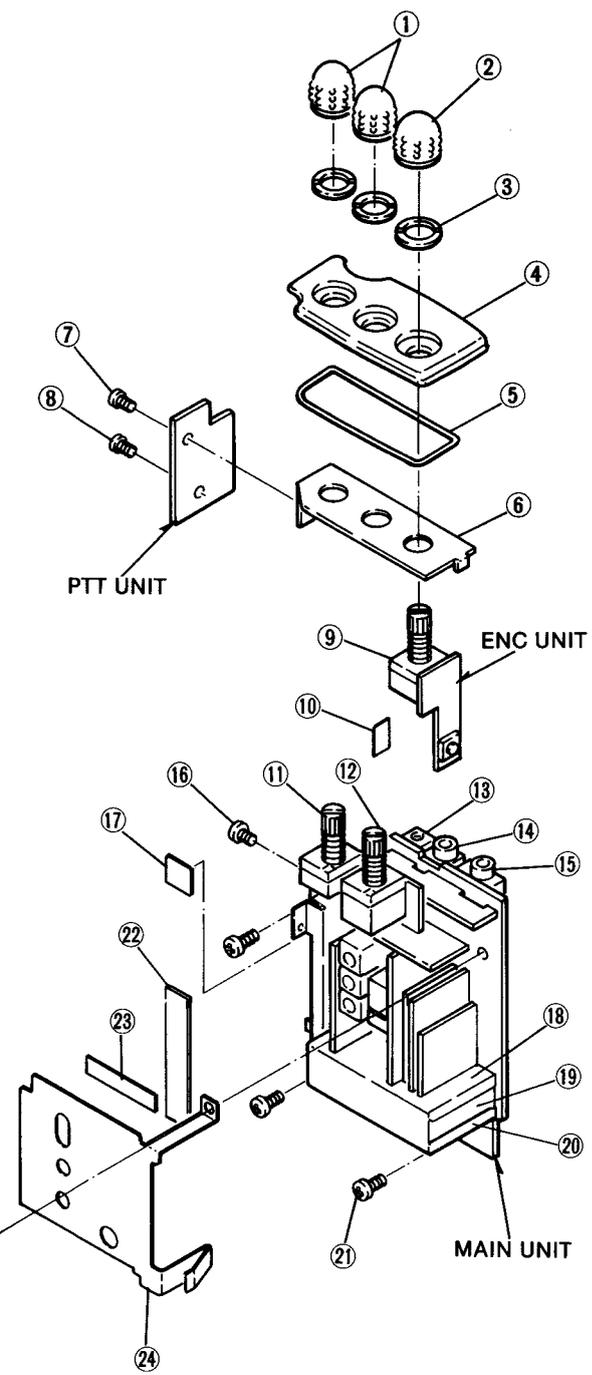
4-2 ACCESSORIES



LABEL NUMBER	ORDER NO.	DESCRIPTION	QTY.
①	8010011960	Handstrap HK-005	1
②	Optional product	FA-215BB flexible antenna	1
③	Optional product	Wall charger BC-74A	1
④	8810005730	Screw BuH M3 × 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

[CHASSIS PART]

REF. NO.	ORDER NO.	DESCRIPTION
J1	6510013810	CONNECTOR BNC-RM-F1

[MAIN UNIT]

REF. NO.	ORDER NO.	DESCRIPTION
IC1	1150000800	IC SC1107
Q1	1560000550	S. FET 2SK882-Y (TE85R)
Q3	1510000510	S. TRANSISTOR 2SA1576 T107 R
Q4	1590000430	S. TRANSISTOR DTC144EU T107
Q6	1530000900	TRANSISTOR 2SC3019
Q7	1530002030	S. TRANSISTOR 2SC3772-3-TA
Q8	1510000510	S. TRANSISTOR 2SA1576 T107 R
D1	1790000590	S. DIODE MA110 (TW)
D2	1750000130	S. DIODE DA204U T107
D7	1790000450	S. DIODE MA862 (TX)
D8	1160000060	S. DIODE DAN202U T107
D9	1750000080	S. DIODE 1SS153-T2
D10	1790000490	S. DIODE HSM88AS-TR
D11	1790000490	S. DIODE HSM88AS-TR
D12	1790000590	S. DIODE MA110 (TW)
D13	1750000130	S. DIODE DA204U T107
D14	1790000450	S. DIODE MA862 (TX)
D15	1790000680	S. DIODE SB20-03P-TD
FI1	2010000230	MONOLITHIC 30M15B (FL-76)
L1	6150003210	COIL LS-319
L3	6110002000	COIL LA-226
L4	6110002000	COIL LA-226
L5	6110002000	COIL LA-226
L6	6110002000	COIL LA-226
L9	6200000260	S. COIL LQN 2A R10K
L10	6110002040	COIL LA-225
L11	6200000110	S. COIL LQN 2A 33NM
L12	6200000760	S. COIL LQN 2A 56NM
L13	6200001060	S. COIL MLF2012D 47NM-T
R1	7030003290	S. RESISTOR ERJ3GEYJ 560 V (56 Ω)
R2	7030003480	S. RESISTOR ERJ3GEYJ 222 V (2.2 kΩ)
R3	7030003520	S. RESISTOR ERJ3GEYJ 472 V (4.7 kΩ)
R4	7030003400	S. RESISTOR ERJ3GEYJ 471 V (470 Ω)
R6	7030003410	S. RESISTOR ERJ3GEYJ 561 V (560 Ω)
R7	7030003760	S. RESISTOR ERJ3GEYJ 474 V (470 kΩ)
R8	7030003400	S. RESISTOR ERJ3GEYJ 471 V (470 Ω)
R9	7030003400	S. RESISTOR ERJ3GEYJ 471 V (470 Ω)
R10	7030003560	S. RESISTOR ERJ3GEYJ 103 V (10 kΩ)
R11	7030003450	S. RESISTOR ERJ3GEYJ 122 V (1.2 kΩ)
R12	7030003440	S. RESISTOR ERJ3GEYJ 102 V (1 kΩ)
R13	7030003440	S. RESISTOR ERJ3GEYJ 102 V (1 kΩ)
R15	7030003600	S. RESISTOR ERJ3GEYJ 223 V (22 kΩ)
R16	7510000070	THERMISTOR ERT-D2FHL 503S
R17	7030003340	S. RESISTOR ERJ3GEYJ 151 V (150 Ω)
R18	7030003380	S. RESISTOR ERJ3GEYJ 331 V (330 Ω)
R19	7030003470	S. RESISTOR ERJ3GEYJ 182 V (1.8 kΩ)
R20	7030003550	S. RESISTOR ERJ3GEYJ 822 V (8.2 kΩ)

[MAIN UNIT]

REF. NO.	ORDER NO.	DESCRIPTION
R21	7030003490	S. RESISTOR ERJ3GEYJ 272 V (2.7 kΩ)
R22	7030003390	S. RESISTOR ERJ3GEYJ 391 V (390 Ω)
R23	7030000100	S. RESISTOR MCR10EZHZJ 4.7 Ω (4R7)
R24	7030003320	S. RESISTOR ERJ3GEYJ 101 V (100 Ω)
R25	7030003200	S. RESISTOR ERJ3GEYJ 100 V (10 Ω)
R26	7030003260	S. RESISTOR ERJ3GEYJ 330 V (33 Ω)
R27	7030003410	S. RESISTOR ERJ3GEYJ 561 V (560 Ω)
R28	7030003410	S. RESISTOR ERJ3GEYJ 561 V (560 Ω)
R29	7030003520	S. RESISTOR ERJ3GEYJ 472 V (4.7 kΩ)
R30	7030003520	S. RESISTOR ERJ3GEYJ 472 V (4.7 kΩ)
R31	7030003800	S. RESISTOR ERJ3GEYJ 105 V (1 MΩ)
R32	7030003560	S. RESISTOR ERJ3GEYJ 103 V (10 kΩ)
R34	7030003680	S. RESISTOR ERJ3GEYJ 104 V (100 kΩ)
C2	4030006860	S. CERAMIC C1608 JB 1H 102K-T-A
C3	4030006710	S. CERAMIC C1608 SL 1H 470J-T-A
C4	4030006670	S. CERAMIC C1608 SL 1H 270J-T-A
C5	4030006860	S. CERAMIC C1608 JB 1H 102K-T-A
C6	4030006860	S. CERAMIC C1608 JB 1H 102K-T-A
C8	4030006620	S. CERAMIC C1608 SL 1H 120J-T-A
C10	4550000460	S. TANTALUM TESVA 1C 105M1-8L
C11	4030006860	S. CERAMIC C1608 JB 1H 102K-T-A
C12	4030006860	S. CERAMIC C1608 JB 1H 102K-T-A
C13	4030006860	S. CERAMIC C1608 JB 1H 102K-T-A
C14	4550003040	S. TANTALUM TEMSVB2 0J 106M-8L
C15	4030006860	S. CERAMIC C1608 JB 1H 102K-T-A
C16	4030006860	S. CERAMIC C1608 JB 1H 102K-T-A
C17	4030006900	S. CERAMIC C1608 JB 1E 103K-T-A
C21	4030006630	S. CERAMIC C1608 SL 1H 150J-T-A
C22	4030006520	S. CERAMIC C1608 SL 1H 010C-T-A
C23	4030006660	S. CERAMIC C1608 SL 1H 220J-T-A
C24	4030008440	S. CERAMIC C1608 SL 1H 1R5C-T-A
C25	4030006630	S. CERAMIC C1608 SL 1H 150J-T-A
C26	4030006630	S. CERAMIC C1608 SL 1H 150J-T-A
C27	4030006660	S. CERAMIC C1608 SL 1H 220J-T-A
C28	4030006610	S. CERAMIC C1608 SL 1H 100D-T-A
C34	4030006860	S. CERAMIC C1608 JB 1H 102K-T-A
C35	4030006860	S. CERAMIC C1608 JB 1H 102K-T-A
C36	4550002890	S. TANTALUM TESVA 1A 225M1-8L
C37	4550002890	S. TANTALUM TESVA 1A 225M1-8L
C38	4030006860	S. CERAMIC C1608 JB 1H 102K-T-A
C39	4510001380	ELECTROLYTIC 25 MS5 4R7 μF
C40	4030006860	S. CERAMIC C1608 JB 1H 102K-T-A
C41	4030006860	S. CERAMIC C1608 JB 1H 102K-T-A
C42	4030006630	S. CERAMIC C1608 SL 1H 150J-T-A
C43	4030006630	S. CERAMIC C1608 SL 1H 150J-T-A
C44	4030006690	S. CERAMIC C1608 SL 1H 330J-T-A
C45	4030006860	S. CERAMIC C1608 JB 1H 102K-T-A
C46	4030006860	S. CERAMIC C1608 JB 1H 102K-T-A
C47	4510003160	ELECTROLYTIC 16 RC2 22 μF (D=4.0)
C48	4030006860	S. CERAMIC C1608 JB 1H 102K-T-A
C49	4030006860	S. CERAMIC C1608 JB 1H 102K-T-A
C50	4510001350	ELECTROLYTIC 16 MS5 10 μF
C51	4030006590	S. CERAMIC C1608 SL 1H 080D-T-A
C52	4030006890	S. CERAMIC C1608 JF 1H 103Z-T-A
C53	4030006860	S. CERAMIC C1608 JB 1H 102K-T-A
C54	4030006610	S. CERAMIC C1608 SL 1H 100D-T-A
C55	4030006860	S. CERAMIC C1608 JB 1H 102K-T-A
C56	4030006860	S. CERAMIC C1608 JB 1H 102K-T-A
C57	4030006860	S. CERAMIC C1608 JB 1H 102K-T-A
C58	4030006890	S. CERAMIC C1608 JF 1H 103Z-T-A
C59	4030006670	S. CERAMIC C1608 SL 1H 270J-T-A
C60	4030006860	S. CERAMIC C1608 JB 1H 102K-T-A
C61	4030006860	S. CERAMIC C1608 JB 1H 102K-T-A
C62	4030006860	S. CERAMIC C1608 JB 1H 102K-T-A
C63	4030006860	S. CERAMIC C1608 JB 1H 102K-T-A
C65	45500004010	S. TANTALUM TEMSVA2 1A 105M-8L
C66	4030006760	S. CERAMIC C1608 SL 1H 121J-T-A
C67	4030006860	S. CERAMIC C1608 JB 1H 102K-T-A

S.=Surface mount

[MAIN UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
C68	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C69	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C70	4030006750	S. CERAMIC	C1608 SL 1H 101J-T-A
C71	4030006750	S. CERAMIC	C1608 SL 1H 101J-T-A
C72	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C73	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C74	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C75	4030006750	S. CERAMIC	C1608 SL 1H 101J-T-A
C76	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C77	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C79	4030006750	S. CERAMIC	C1608 SL 1H 101J-T-A
J2	6450001060	CONNECTOR	HSJ1493-01-010
J3	6450000130	CONNECTOR	HSJ1102-01-540
J4	6450000870	CONNECTOR	HEC2711-01-020
J5	6510008940	CONNECTOR	53073-1010
W8	7030003860	S. JUMPER	ERJ3GE JPW V
W9	7120000380	JUMPER	JPW 01 R-01
EP1	0910035670	PCB	B 3521 (MAIN)

[AF UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
C6	4030005110	S. CERAMIC	C2012 JB 1E 473K-T-A
C7	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C10	4510001340	ELECTROLYTIC	10 MS5 33 μF
C11	4030005110	S. CERAMIC	C2012 JB 1E 473K-T-A
C12	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C13	4510003180	ELECTROLYTIC	6.3 RC2 100 μF (D=5.0)
C14	4550003290	S. TANTALUM	TESVA 0G 475M1-8L
C15	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C16	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C17	4030005110	S. CERAMIC	C2012 JB 1E 473K-T-A
C19	4030006710	S. CERAMIC	C1608 SL 1H 470J-T-A
C20	4550002950	S. TANTALUM	TESVA 0J 335M1-8L
C21	4030004760	S. CERAMIC	C2012 JF 1E 104Z-T-A
EP1	0910035607	PCB	B 2014G (AF)
EP2	6910003110	LEADFRAME	HFB2.0-0.7-8 (N)

[AF UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1110001810	S. IC	TA7368F (TP1)
Q1	1530002060	S. TRANSISTOR	2SC4081 T107 R
Q2	1530002060	S. TRANSISTOR	2SC4081 T107 R
Q3	1590000520	S. FET	2SJ106-GR (TE85R)
Q4	1520000270	S. TRANSISTOR	2SB1182 TL Q
Q5	1530002060	S. TRANSISTOR	2SC4081 T107 R
Q6	1530002060	S. TRANSISTOR	2SC4081 T107 R
D1	1160000050	S. DIODE	DAP202U T107
R1	7030003580	S. RESISTOR	ERJ3GEYJ 153 V (15 kΩ)
R2	7030003700	S. RESISTOR	ERJ3GEYJ 154 V (150 kΩ)
R3	7030003760	S. RESISTOR	ERJ3GEYJ 474 V (470 kΩ)
R4	7030003560	S. RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R5	7030003480	S. RESISTOR	ERJ3GEYJ 222 V (2.2 kΩ)
R6	7030003630	S. RESISTOR	ERJ3GEYJ 393 V (39 kΩ)
R7	7030003630	S. RESISTOR	ERJ3GEYJ 393 V (39 kΩ)
R8	7030003480	S. RESISTOR	ERJ3GEYJ 222 V (2.2 kΩ)
R9	7030003800	S. RESISTOR	ERJ3GEYJ 105 V (1 MΩ)
R10	7030003320	S. RESISTOR	ERJ3GEYJ 101 V (100 Ω)
R13	7030003200	S. RESISTOR	ERJ3GEYJ 100 V (10 Ω)
R14	7030003420	S. RESISTOR	ERJ3GEYJ 681 V (680 Ω)
R15	7030003420	S. RESISTOR	ERJ3GEYJ 681 V (680 Ω)
R16	7030003600	S. RESISTOR	ERJ3GEYJ 223 V (22 kΩ)
R18	7030003760	S. RESISTOR	ERJ3GEYJ 474 V (470 kΩ)
R19	7030003560	S. RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R20	7030003340	S. RESISTOR	ERJ3GEYJ 151 V (150 Ω)
R21	7030003520	S. RESISTOR	ERJ3GEYJ 472 V (4.7 kΩ)
C1	4030006900	S. CERAMIC	C1608 JB 1E 103K-T-A
C2	4030006900	S. CERAMIC	C1608 JB 1E 103K-T-A
C3	4030006870	S. CERAMIC	C1608 JB 1H 222K-T-A
C4	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C5	4030004760	S. CERAMIC	C2012 JF 1E 104Z-T-A

[MIC UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1110002490	S. IC	M5218FP-73A
Q1	1590000430	S. TRANSISTOR	DTC144EU T107
Q2	1590000720	S. TRANSISTOR	DTA144EU T107
R1	7030003640	S. RESISTOR	ERJ3GEYJ 473 V (47 kΩ)
R2	7030003880	S. RESISTOR	ERJ3GEYJ 244 V (240 kΩ)
R3	7030003710	S. RESISTOR	ERJ3GEYJ 184 V (180 kΩ)
R4	7030003370	S. RESISTOR	ERJ3GEYJ 271 V (270 Ω)
R5	7030003670	S. RESISTOR	ERJ3GEYJ 823 V (82 kΩ)
R6	7030003720	S. RESISTOR	ERJ3GEYJ 224 V (220 kΩ)
R7	7030003680	S. RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R8	7030003740	S. RESISTOR	ERJ3GEYJ 334 V (330 kΩ)
R9	7030003630	S. RESISTOR	ERJ3GEYJ 393 V (39 kΩ)
R10	7030003630	S. RESISTOR	ERJ3GEYJ 393 V (39 kΩ)
R11	7030003440	S. RESISTOR	ERJ3GEYJ 102 V (1 kΩ)
R12	7030003710	S. RESISTOR	ERJ3GEYJ 184 V (180 kΩ)
R13	7310002600	S. TRIMMER	RV-110 (RH03A3AS4X0AA) 473
R14	7030003560	S. RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R15	7030003540	S. RESISTOR	ERJ3GEYJ 682 V (6.8 kΩ)
R16	7510000180	S. THERMISTOR	DTN-T203S223LS (T)
R17	7030003570	S. RESISTOR	ERJ3GEYJ 123 V (12 kΩ)
C1	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C3	4030006880	S. CERAMIC	C1608 JB 1H 472K-T-A
C4	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C5	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C6	4550000530	S. TANTALUM	TESVA 1V 104M1-8L
C7	4030008470	S. CERAMIC	C1608 JB 1H 272K-T-A
C8	4030006900	S. CERAMIC	C1608 JB 1E 103K-T-A
C9	4030006760	S. CERAMIC	C1608 SL 1H 121J-T-A
C10	4510001850	ELECTROLYTIC	16 MS5 4R7 μF
C11	4030006900	S. CERAMIC	C1608 JB 1E 103K-T-A
C12	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C13	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
EP1	0910035574	PCB	B 1922D (MIC)
EP2	6910003110	LEADFRAME	HFB2.0-0.7-8 (N)

[APC UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
Q1	1520000270	S. TRANSISTOR	2SB1182 TL Q
Q2	1530002280	S. TRANSISTOR	2SC4081 T107 S
Q3	1590000620	S. TRANSISTOR	FMS1 T148
Q4	1520000270	S. TRANSISTOR	2SB1182 TL Q
Q5	1530002280	S. TRANSISTOR	2SC4081 T107 S
Q6	1510000510	S. TRANSISTOR	2SA1576 T107 R
D1	1750000130	S. DIODE	DA204U T107
D2	1160000050	S. DIODE	DAP202U T107
R1	7030003520	S. RESISTOR	ERJ3GEYJ 472 V (4.7 kΩ)
R2	7030003770	S. RESISTOR	ERJ3GEYJ 564 V (560 kΩ)
R3	7030003720	S. RESISTOR	ERJ3GEYJ 224 V (220 kΩ)
R6	7030003600	S. RESISTOR	ERJ3GEYJ 223 V (22 kΩ)
R7	7030003670	S. RESISTOR	ERJ3GEYJ 823 V (82 kΩ)
R8	7030003440	S. RESISTOR	ERJ3GEYJ 102 V (1 kΩ)
R9	7030003440	S. RESISTOR	ERJ3GEYJ 102 V (1 kΩ)
R11	7030003600	S. RESISTOR	ERJ3GEYJ 223 V (22 kΩ)
R12	7030003480	S. RESISTOR	ERJ3GEYJ 222 V (2.2 kΩ)
R13	7030000440	S. RESISTOR	MCR10EZHZ 3.3 kΩ (332)
C1	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C2	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C3	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C5	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C6	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C7	4030004760	S. CERAMIC	C2012 JF 1E 104Z-T-A
C9	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C10	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C11	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
EP1	0910035641	PCB	B 2361A (APC)
EP2	6910003110	LEADFRAME	HFB2.0-0.7-8 (N)

[REG UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1180000530	S. IC	S-81250HG-RD-T1
IC2	1130004170	S. IC	TC4S01F (TE85R)
IC3	1130004170	S. IC	TC4S01F (TE85R)
Q1	1530002280	S. TRANSISTOR	2SC4081 T107 S
Q2	1520000200	S. TRANSISTOR	2SB798-T2 DK
Q3	1530002280	S. TRANSISTOR	2SC4081 T107 S
Q4	1520000200	S. TRANSISTOR	2SB798-T2 DK
Q5	1530002280	S. TRANSISTOR	2SC4081 T107 S
Q6	1510000510	S. TRANSISTOR	2SA1576 T107 R
D1	1750000160	S. DIODE	DA114 T107
D2	1750000160	S. DIODE	DA114 T107
D3	1750000160	S. DIODE	DA114 T107
R1	7030003400	S. RESISTOR	ERJ3GEYJ 471 V (470 Ω)
R2	7030003520	S. RESISTOR	ERJ3GEYJ 472 V (4.7 kΩ)
R3	7030003560	S. RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R7	7030003560	S. RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R8	7030003560	S. RESISTOR	ERJ3GEYJ 103 V (10 kΩ)

[REG UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
C1	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C2	4510003160	ELECTROLYTIC	16 RC2 22 μF (D=4.0)
C3	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C4	4510001320	ELECTROLYTIC	6R3 MS5 47 μF
C5	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C6	4510003190	ELECTROLYTIC	6.3 RC2 47 μF (D=4.0)
C7	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C8	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C9	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C10	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C11	4510003190	ELECTROLYTIC	6.3 RC2 47 μF (D=4.0)
EP1	0910035650	PCB	B 2779 (REG)
EP2	6910003110	LEADFRAME	HFB2.0-0.7-8 (N)

[IO UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1130000830	S. IC	μPD4094BG-T1
IC2	1130000830	S. IC	μPD4094BG-T1
IC3	1130004170	S. IC	TC4S01F (TE85R)
Q1	1590000430	S. TRANSISTOR	DTC144EU T107
Q2	1590000430	S. TRANSISTOR	DTC144EU T107
R2	7030003700	S. RESISTOR	ERJ3GEYJ 154 V (150 kΩ)
R3	7030003680	S. RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R4	7030003720	S. RESISTOR	ERJ3GEYJ 224 V (220 kΩ)
R5	7310002580	S. TRIMMER	RV-108 (RH03A3A15X05A) 104
R6	7030003620	S. RESISTOR	ERJ3GEYJ 333 V (33 kΩ)
R7	7030003720	S. RESISTOR	ERJ3GEYJ 224 V (220 kΩ)
C1	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
EP1	0910035614	PCB	B 2070D (IO)
EP2	0910035621	PCB	B 2163A (IO)
EP3	6910003110	LEADFRAME	HFB2.0-0.7-8 (N)
EP4	6510008580	LEADFRAME	PT2.0-0.7-16.5 (K)

[PRT UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
Q1	1520000200	S. TRANSISTOR	2SB798-T2 DK
Q2	1530002280	S. TRANSISTOR	2SC4081 T107 S
Q3	1590000840	S. TRANSISTOR	IMX1 T110
D1	1750000130	S. DIODE	DA204U T107
D2	1790000680	S. DIODE	SB20-03P-TD

S.=Surface mount

[PRT UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
R1	7030000110	S. RESISTOR	MCR10EZHZ 5.6 Ω (5R6)
R2	7030000500	S. RESISTOR	MCR10EZHZ 10 kΩ (103)
C1	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C2	4030008630	S. CERAMIC	C1608 JF 1C 104Z-T-A
C3	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C4	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C5	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
EP1	0910033442	PCB	B 3327B (PRT)

[DET UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
C10	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C11	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C12	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C13	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C14	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C15	4030006690	S. CERAMIC	C1608 SL 1H 330J-T-A
C16	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C17	4030004760	S. CERAMIC	C2012 JF 1E 104Z-T-A
C19	4030006890	S. CERAMIC	C1608 JF 1H 103Z-T-A
C24	4030005110	S. CERAMIC	C2012 JB 1E 473K-T-A
C25	4030005110	S. CERAMIC	C2012 JB 1E 473K-T-A
C26	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C27	4030006890	S. CERAMIC	C1608 JF 1H 103Z-T-A
C28	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C29	4030006890	S. CERAMIC	C1608 JF 1H 103Z-T-A
EP1	0910035596	PCB	B 1962F (DET)
EP2	6910003110	LEADFRAME	HFB2.0-0.7-8 (N)

[DET UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1120001650	S. IC	TK10487MTR
Q1	1530002280	S. TRANSISTOR	2SC4081 T107 S
Q2	1530002020	S. TRANSISTOR	2SC3770-3-TA
D1	1750000070	S. DIODE	1SS226 (TE85R)
X1	6070000060	DISCRIMINATOR	CDBM455C7
X2	6050005010	XTAL	CR-214
FI1	2020000550	CERAMIC	CFUM455E
R1	7030003480	S. RESISTOR	ERJ3GEYJ 222 V (2.2 kΩ)
R2	7030003440	S. RESISTOR	ERJ3GEYJ 102 V (1 kΩ)
R3	7030003520	S. RESISTOR	ERJ3GEYJ 472 V (4.7 kΩ)
R4	7030003460	S. RESISTOR	ERJ3GEYJ 152 V (1.5 kΩ)
R5	7310002590	S. TRIMMER	RV-109 (RH03A3AJ3X0BA) 222
R6	7030003550	S. RESISTOR	ERJ3GEYJ 822 V (8.2 kΩ)
R7	7030003560	S. RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R8	7030003480	S. RESISTOR	ERJ3GEYJ 222 V (2.2 kΩ)
R9	7030003400	S. RESISTOR	ERJ3GEYJ 471 V (470 Ω)
R10	7030003520	S. RESISTOR	ERJ3GEYJ 472 V (4.7 kΩ)
R11	7030003730	S. RESISTOR	ERJ3GEYJ 274 V (270 kΩ)
R13	7030003680	S. RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R14	7030003800	S. RESISTOR	ERJ3GEYJ 105 V (1 MΩ)
R16	7030003630	S. RESISTOR	ERJ3GEYJ 393 V (39 kΩ)
R19	7030003400	S. RESISTOR	ERJ3GEYJ 471 V (470 Ω)
R20	7030003400	S. RESISTOR	ERJ3GEYJ 471 V (470 Ω)
R23	7030003320	S. RESISTOR	ERJ3GEYJ 101 V (100 Ω)
R28	7030003710	S. RESISTOR	ERJ3GEYJ 184 V (180 kΩ)
R30	7030003670	S. RESISTOR	ERJ3GEYJ 823 V (82 kΩ)
R31	7030003640	S. RESISTOR	ERJ3GEYJ 473 V (47 kΩ)
R32	7030003500	S. RESISTOR	ERJ3GEYJ 332 V (3.3 kΩ)
R33	7030003730	S. RESISTOR	ERJ3GEYJ 274 V (270 kΩ)
C1	4030004760	S. CERAMIC	C2012 JF 1E 104Z-T-A
C2	4030006740	S. CERAMIC	C1608 SL 1H 820J-T-A
C3	4030004760	S. CERAMIC	C2012 JF 1E 104Z-T-A
C4	4030004760	S. CERAMIC	C2012 JF 1E 104Z-T-A
C5	4030004760	S. CERAMIC	C2012 JF 1E 104Z-T-A
C6	4030006640	S. CERAMIC	C1608 SL 1H 180J-T-A
C7	4030006720	S. CERAMIC	C1608 SL 1H 560J-T-A
C8	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A

[RF UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
Q1	1530002570	S. TRANSISTOR	2SC4405-3-TR
Q2	1530002560	S. TRANSISTOR	2SC4403-3-TR
D1	1160000060	S. DIODE	DAN202U T107
L1	6150002970	COIL	LS-308
L2	6150002970	COIL	LS-308
L3	6150002970	COIL	LS-308
R2	7030003570	S. RESISTOR	ERJ3GEYJ 123 V (12 kΩ)
R3	7030003240	S. RESISTOR	ERJ3GEYJ 220 V (22 Ω)
R4	7030003570	S. RESISTOR	ERJ3GEYJ 123 V (12 kΩ)
R5	7030003370	S. RESISTOR	ERJ3GEYJ 271 V (270 Ω)
C1	4030006580	S. CERAMIC	C1608 SL 1H 070D-T-A
C2	4030006590	S. CERAMIC	C1608 SL 1H 080D-T-A
C3	4030006640	S. CERAMIC	C1608 SL 1H 180J-T-A
C4	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C5	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C6	4030006610	S. CERAMIC	C1608 SL 1H 100D-T-A
C7	4030009500	S. CERAMIC	C1608 CH 1H 0R5B-T-A
C8	4030006610	S. CERAMIC	C1608 SL 1H 100D-T-A
C9	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C10	4030006520	S. CERAMIC	C1608 SL 1H 010C-T-A
C11	4030009500	S. CERAMIC	C1608 CH 1H 0R5B-T-A
EP1	0910035632	PCB	B 2174B (RF)
EP2	0910020185	PCB	B 1946E (RF)
EP3	6910003110	LEADFRAME	HFB2.0-0.7-8 (N)

[PLL UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1120001550	S. IC	M54959FP
IC2	1130004200	S. IC	TC4S66F (TE85R)
Q1	1560000430	S. FET	2SK302-GR (TE85R)
Q2	1530002560	S. TRANSISTOR	2SC4403-3-TR
Q3	1530002560	S. TRANSISTOR	2SC4403-3-TR
Q4	1530002560	S. TRANSISTOR	2SC4403-3-TR
Q6	1590000970	S. TRANSISTOR	FMA2 T148
Q7	1560000540	S. FET	2SK880-Y (TE85R)
Q8	1590000430	S. TRANSISTOR	DTC144EU T107
Q9	1590000440	S. TRANSISTOR	DTA143ZU T107
D1	1790000460	S. DIODE	MA334B (TX)
D2	1720000370	S. VARICAP	HVU350TRF
D3	1790000620	S. DIODE	MA77 (TW)
D4	1790000640	S. VARICAP	MA363B (TX)
X1	6050005790	XTAL	CR-257
L1	6200000240	S. COIL	LQH 3N R68M
L2	6130002000	S. COIL	LB-204
L3	6200000750	S. COIL	LQH 3N 4R7M
L4	6200000750	S. COIL	LQH 3N 4R7M
L5	6200000910	S. COIL	LQN 2A 82NM
L6	6200000910	S. COIL	LQN 2A 82NM
R4	7030003440	S. RESISTOR	ERJ3GEYJ 102 V (1 kΩ)
R5	7030003550	S. RESISTOR	ERJ3GEYJ 822 V (8.2 kΩ)
R6	7030003560	S. RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R7	7030003800	S. RESISTOR	ERJ3GEYJ 105 V (1 MΩ)
R10	7030003550	S. RESISTOR	ERJ3GEYJ 822 V (8.2 kΩ)
R11	7030003240	S. RESISTOR	ERJ3GEYJ 220 V (22 Ω)
R12	7030003660	S. RESISTOR	ERJ3GEYJ 683 V (68 kΩ)
R13	7030003420	S. RESISTOR	ERJ3GEYJ 681 V (680 Ω)
R14	7030003650	S. RESISTOR	ERJ3GEYJ 563 V (56 kΩ)
R15	7030003390	S. RESISTOR	ERJ3GEYJ 391 V (390 Ω)
R18	7030003680	S. RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R19	7030003400	S. RESISTOR	ERJ3GEYJ 471 V (470 Ω)
R20	7030003500	S. RESISTOR	ERJ3GEYJ 332 V (3.3 kΩ)
R21	7030003800	S. RESISTOR	ERJ3GEYJ 105 V (1 MΩ)
R22	7030003680	S. RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R23	7030003680	S. RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R24	7030003680	S. RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
C1	4030004760	S. CERAMIC	C2012 JF 1E 104Z-T-A
C2	4030006900	S. CERAMIC	C1608 JB 1E 103K-T-A
C3	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C4	4030006690	S. CERAMIC	C1608 SL 1H 330J-T-A
C5	4030006690	S. CERAMIC	C1608 SL 1H 330J-T-A
C6	4030006700	S. CERAMIC	C1608 SL 1H 390J-T-A
C6	4030006710	S. CERAMIC	C1608 SL 1H 470J-T-A
C7	4030006540	S. CERAMIC	C1608 SL 1H 030C-T-A
C8	4030006560	S. CERAMIC	C1608 SL 1H 050C-T-A
C9	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C10	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C11	4030008440	S. CERAMIC	C1608 SL 1H 1R5C-T-A
C12	4030004760	S. CERAMIC	C2012 JF 1E 104Z-T-A
C13	4550000460	S. TANTALUM	TESVA 1C 105M1-8L
C14	4030006620	S. CERAMIC	C1608 SL 1H 120J-T-A
C15	4030006560	S. CERAMIC	C1608 SL 1H 050C-T-A
C16	4030006560	S. CERAMIC	C1608 SL 1H 050C-T-A
C17	4030004760	S. CERAMIC	C2012 JF 1E 104Z-T-A
C18	4030006610	S. CERAMIC	C1608 SL 1H 100D-T-A
C19	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C20	4030007080	S. CERAMIC	C1608 CH 1H 390J-T-A
C21	4610001260	S. TRIMMER	ECR-JA020 E12W
C22	4030007030	S. CERAMIC	C1608 CH 1H 150J-T-A
C25	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C27	4030009170	S. CERAMIC	GRM40 F 105Z 16PT

[PLL UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
C28	4030009550	S. CERAMIC	C1608 CH 1H 2R5B-T-A
C29	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C30	4030006510	S. CERAMIC	C1608 SL 1H 0R5C-T-A
C31	4030004760	S. CERAMIC	C2012 JF 1E 104Z-T-A
C32	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C33	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C34	4030006750	S. CERAMIC	C1608 SL 1H 101J-T-A
C35	4030006750	S. CERAMIC	C1608 SL 1H 101J-T-A
C36	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C37	4030006750	S. CERAMIC	C1608 SL 1H 101J-T-A
C38	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C39	4030006750	S. CERAMIC	C1608 SL 1H 101J-T-A
C40	4030006580	S. CERAMIC	C1608 SL 1H 070D-T-A
J1	6510012250	CONNECTOR	TKX-P04P-A2
J2	6510012300	CONNECTOR	TKX-P09P-A2
EP1	0910024412	PCB	B 2346B (PLL)

[LOGIC UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1140002630	S. IC	HD404629A05H
IC2	1110002410	S. IC	NJM2406F (TE1)
IC3	1130003760	S. IC	TC4S81F (TE85R)
IC4	1130006210	S. IC	MN1382P (TX)
Q1	1560000540	S. FET	2SK880-Y (TE85R)
Q3	1530002060	S. TRANSISTOR	2SC4081 T107 R
Q4	1510000510	S. TRANSISTOR	2SA1576 T107 R
Q5	1590000660	S. TRANSISTOR	DTC144TU T107
Q6	1590000660	S. TRANSISTOR	DTC144TU T107
Q7	1590000650	S. TRANSISTOR	DTA144TU T107
Q8	1590000720	S. TRANSISTOR	DTA144EU T107
D1	1790000990	S. ZENER	MA8051-H (TX)
D2	1160000060	S. DIODE	DAN202U T107
D3	1750000130	S. DIODE	DA204U T107
D4	1750000130	S. DIODE	DA204U T107
D5	1790000590	S. DIODE	MA110 (TW)
D6	1790000870	S. DIODE	MA1S121 (TX)
D9	1790000870	S. DIODE	MA1S121 (TX)
D13	1160000060	S. DIODE	DAN202U T107
D15	1750000130	S. DIODE	DA204U T107
D18	1790000590	S. DIODE	MA110 (TW)
D20	1790000660	S. DIODE	MA728 (TW)
X1	6060000390	CERAMIC	CSB800J201
X2	6050005801	XTAL	DS-VT200 (32.768kHz±20)
R1	7030003460	S. RESISTOR	ERJ3GEYJ 152 V (1.5 kΩ)
R2	7030003380	S. RESISTOR	ERJ3GEYJ 331 V (330 Ω)
R3	7030003560	S. RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R5	7030003640	S. RESISTOR	ERJ3GEYJ 473 V (47 kΩ)
R6	7030003650	S. RESISTOR	ERJ3GEYJ 563 V (56 kΩ)
R7	7030003690	S. RESISTOR	ERJ3GEYJ 124 V (120 kΩ)
R8	7030003590	S. RESISTOR	ERJ3GEYJ 183 V (18 kΩ)
R9	7410000710	S. ARRAY	EXB-V8V 224JV
R13	7410000720	S. ARRAY	EXB-V8V 473JV

S. = Surface mount

[LOGIC UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
R17	7410000700	S. ARRAY	EXB-V8V 105JV
R21	7030003480	S. RESISTOR	ERJ3GEYJ 222 V (2.2 kΩ)
R22	7030003340	S. RESISTOR	ERJ3GEYJ 151 V (150 Ω)
R23	7030003340	S. RESISTOR	ERJ3GEYJ 151 V (150 Ω)
R24	7030003450	S. RESISTOR	ERJ3GEYJ 122 V (1.2 kΩ)
R25	7030003450	S. RESISTOR	ERJ3GEYJ 122 V (1.2 kΩ)
R26	7030003790	S. RESISTOR	ERJ3GEYJ 824 V (820 kΩ)
R27	7030003750	S. RESISTOR	ERJ3GEYJ 394 V (390 kΩ)
R28	7030003720	S. RESISTOR	ERJ3GEYJ 224 V (220 kΩ)
R29	7030003680	S. RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R30	7030003580	S. RESISTOR	ERJ3GEYJ 153 V (15 kΩ)
R31	7030003760	S. RESISTOR	ERJ3GEYJ 474 V (470 kΩ)
R32	7030003580	S. RESISTOR	ERJ3GEYJ 153 V (15 kΩ)
R33	7030003580	S. RESISTOR	ERJ3GEYJ 153 V (15 kΩ)
R34	7030003760	S. RESISTOR	ERJ3GEYJ 474 V (470 kΩ)
R35	7310003600	S. TRIMMER	EVM-1XSX50 B54 (503)
R36	7030003800	S. RESISTOR	ERJ3GEYJ 105 V (1 MΩ)
R37	7030003580	S. RESISTOR	ERJ3GEYJ 153 V (15 kΩ)
R38	7030003610	S. RESISTOR	ERJ3GEYJ 273 V (27 kΩ)
R43	7030003600	S. RESISTOR	ERJ3GEYJ 223 V (22 kΩ)
R45	7310003610	S. TRIMMER	EVM-1XSX50 B14 (103)
R47	7410000710	S. ARRAY	EXB-V8V 224JV
R49	7030003360	S. RESISTOR	ERJ3GEYJ 221 V (220 Ω)
R50	7030003720	S. RESISTOR	ERJ3GEYJ 224 V (220 kΩ)
R51	7030003760	S. RESISTOR	ERJ3GEYJ 474 V (470 kΩ)
R52	7030003800	S. RESISTOR	ERJ3GEYJ 105 V (1 MΩ)
R53	7030003200	S. RESISTOR	ERJ3GEYJ 100 V (10 Ω)
R54	7030003800	S. RESISTOR	ERJ3GEYJ 105 V (1 MΩ)
R55	7410000590	S. ARRAY	EXB-V4V 473JV
R57	7030003720	S. RESISTOR	ERJ3GEYJ 224 V (220 kΩ)
R58	7410000580	S. ARRAY	EXB-V4V 224JV
R59	7030003800	S. RESISTOR	ERJ3GEYJ 105 V (1 MΩ)
R63	7030003620	S. RESISTOR	ERJ3GEYJ 333 V (33 kΩ)
R64	7030003720	S. RESISTOR	ERJ3GEYJ 224 V (220 kΩ)
R65	7030003800	S. RESISTOR	ERJ3GEYJ 105 V (1 MΩ)
R66	7030003560	S. RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
C1	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C2	4030006830	S. CERAMIC	C1608 JF 1C 104Z-T-A
C3	4550000770	S. TANTALUM	TESVC 0J 226M-12L
C4	4030006830	S. CERAMIC	C1608 JF 1C 104Z-T-A
C6	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C11	4610001290	S. TRIMMER	ECR-JA050 M12W
C12	4030006710	S. CERAMIC	C1608 SL 1H 470J-T-A
C13	4030006800	S. CERAMIC	C1608 SL 1H 221J-T-A
C14	4030007030	S. CERAMIC	C1608 CH 1H 150J-T-A
C15	4030007030	S. CERAMIC	C1608 CH 1H 150J-T-A
C16	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C17	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C18	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C19	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C20	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C21	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C22	4030006830	S. CERAMIC	C1608 JF 1C 104Z-T-A
C23	4030006830	S. CERAMIC	C1608 JF 1C 104Z-T-A
C24	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C25	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C26	4030006710	S. CERAMIC	C1608 SL 1H 470J-T-A
DS1	5030000720	LCD	LD-BU5385J (E-5561) [FUNCTION DISPLAY]
DS3	5040001260	LED	LN01301C (Q)
DS4	5040001260	LED	LN01301C (Q)
DS5	5040001260	LED	LN01301C (Q)
DS6	5040001260	LED	LN01301C (Q)
S1	2260001610	S. SWITCH	SW-134 (SKQDAB) [H/L/DTMF]
S2	2260001610	S. SWITCH	SW-134 (SKQDAB) [MONI/DSEL]
S4	2260001610	S. SWITCH	SW-134 (SKQDAB) [AI]

[LOGIC UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
BT1	3020000160	LITHIUM	VL2020-1VC
MC1	7700000861	MICROPHONE	WM-62A103
SP1	2510000530	SPEAKER	T028S1410810
J1	6510013610	CONNECTOR	10FM-1.0BP
EP1	0910033165	PCB	B 3328E (LOGIC)
EP2	0910033280	FPC	B 3329
EP4	8930023130	LCD CONTACT	SRCN-1144W

[PTT UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
S1	2260001610	S. SWITCH	SW-134 (SKQDAB) [PTT]
S2	2260001610	S. SWITCH	SW-134 (SKQDAB) [FUNC]
EP1	0910033212	PCB	B 3325B (PTT)
EP2	0910033332	FPC	B 3385B (PTT)

[ENC UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
C30	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C31	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
S1	2260001400	ENCODER	SW-122 (RK097103H) [MAIN DIAL]
S2	2260001310	S. SWITCH	SW-120 (SKHUPD) [LIGHT]
EP1	0910035663	PCB	B 3326C (ENC)
EP2	0910033323	FPC	B 3383C

[TENKEY UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
DS1	5010000070	S. LED	LT1E73A (GL1EG73)
DS2	5010000070	S. LED	LT1E73A (GL1EG73)
DS3	5010000070	S. LED	LT1E73A (GL1EG73)
DS4	5010000070	S. LED	LT1E73A (GL1EG73)
EP1	0910033311	PCB	B 3358A (TENKEY)
EP2	0910033291	FPC	B 3330A

[VR UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
R1	7210001440	VARIABLE	RK097111101NA (10KA) [PWR/VOL]
R2	7210001450	VARIABLE	RK09711110051A (10KB) [SQL]
C1	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C2	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C3	4510002650	ELECTROLYTIC	16 MS7 100 μF
J1	6510007170	CONNECTOR	PI28A-03M
W1	7120000380	JUMPER	JPW 01 R-01
W2	7120000380	JUMPER	JPW 01 R-01
W3	7120000380	JUMPER	JPW 01 R-01
EP1	0910035584	PCB	B 1926D (VR)

[TSQL UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1130001830	S. IC	MN6520
IC2	1130000830	S. IC	μPD4094BG-T1
IC3	1130003760	S. IC	TC4S81F (TE85R)
Q1	1590000720	S. TRANSISTOR	DTA144EU T107
Q2	1590000720	S. TRANSISTOR	DTA144EU T107
Q3	1590000430	S. TRANSISTOR	DTC144EU T107
Q4	1530002060	S. TRANSISTOR	2SC4081 T107 R
D1	1750000130	S. DIODE	DA204U T107
X1	6050005090	XTAL	CR-245
R1	7030003560	S. RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R2	7030003580	S. RESISTOR	ERJ3GEYJ 153 V (15 kΩ)
R3	7030003760	S. RESISTOR	ERJ3GEYJ 474 V (470 kΩ)
R4	7030003480	S. RESISTOR	ERJ3GEYJ 222 V (2.2 kΩ)

[TSQL UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
R5	7030003560	S. RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R6	7030003560	S. RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R7	7030003680	S. RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R10	7310002760	S. TRIMMER	RV-152 (RH03A3AJ4X0HA) 223
R11	7030003680	S. RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R12	7030003680	S. RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R13	7030003800	S. RESISTOR	ERJ3GEYJ 105 V (1 MΩ)
R14	7030003520	S. RESISTOR	ERJ3GEYJ 472 V (4.7 kΩ)
C1	4030004760	S. CERAMIC	C2012 JF 1E 104Z-T-A
C2	4030004760	S. CERAMIC	C2012 JF 1E 104Z-T-A
C3	4030006640	S. CERAMIC	C1608 SL 1H 180J-T-A
C4	4030006640	S. CERAMIC	C1608 SL 1H 180J-T-A
C5	4550000700	S. TANTALUM	TESVC 0G 336M-12L
C6	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C7	4030004760	S. CERAMIC	C2012 JF 1E 104Z-T-A
C8	4030004760	S. CERAMIC	C2012 JF 1E 104Z-T-A
J1	6510008610	CONNECTOR	52022-1010
W1	7030003860	S. JUMPER	ERJ3GE JPW V
EP1	0910020153	PCB	B 1929C (TSQL)

S.=Surface mount

SECTION 6 ADJUSTMENT PROCEDURES

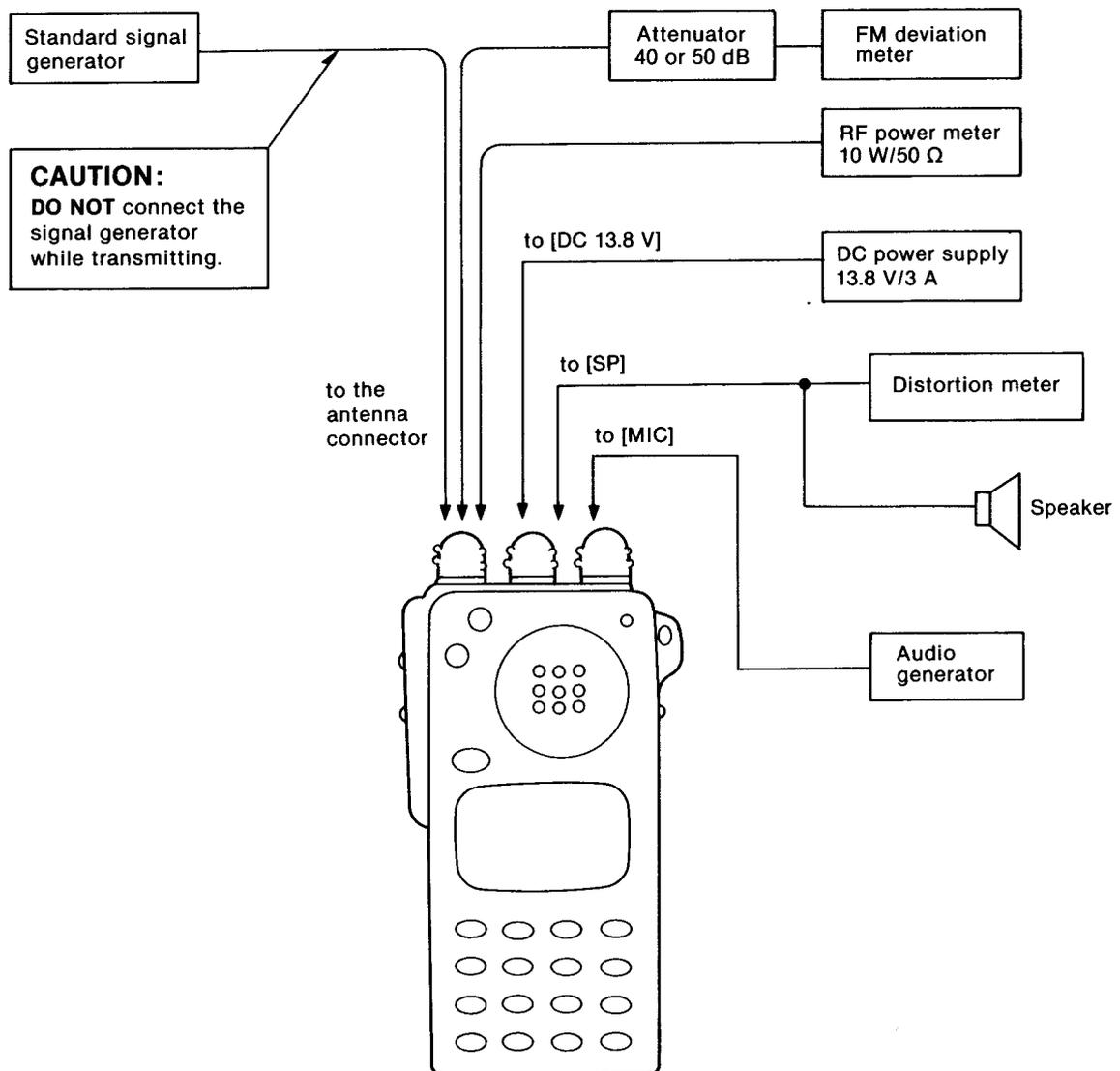
6-1 PREPARATION BEFORE SERVICING

■ 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 : 220~250 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 : 0.1~250 MHz Frequency accuracy : ±1 ppm or better Sensitivity : 100 mV or better	DC voltmeter	Input impedance : 50 kΩ/DC or better
		AC millivoltmeter	Measuring range : 10 mV~10 V
Distortion meter	Frequency range : 1 kHz±10 Hz Measuring range : 1~100 %	External speaker	Impedance : 8 Ω
		FM deviation meter	Frequency minimum : 250 MHz Measuring range : 0~±5 kHz
Standard signal generator (SSG)	Frequency range : 0.1~250 MHz Output level : -127~-17 dBm (0.1 μV~32 mV)	Digital multimeter or oscilloscope	Input impedance : 1 MΩ/DC or better

CCW: counterclockwise

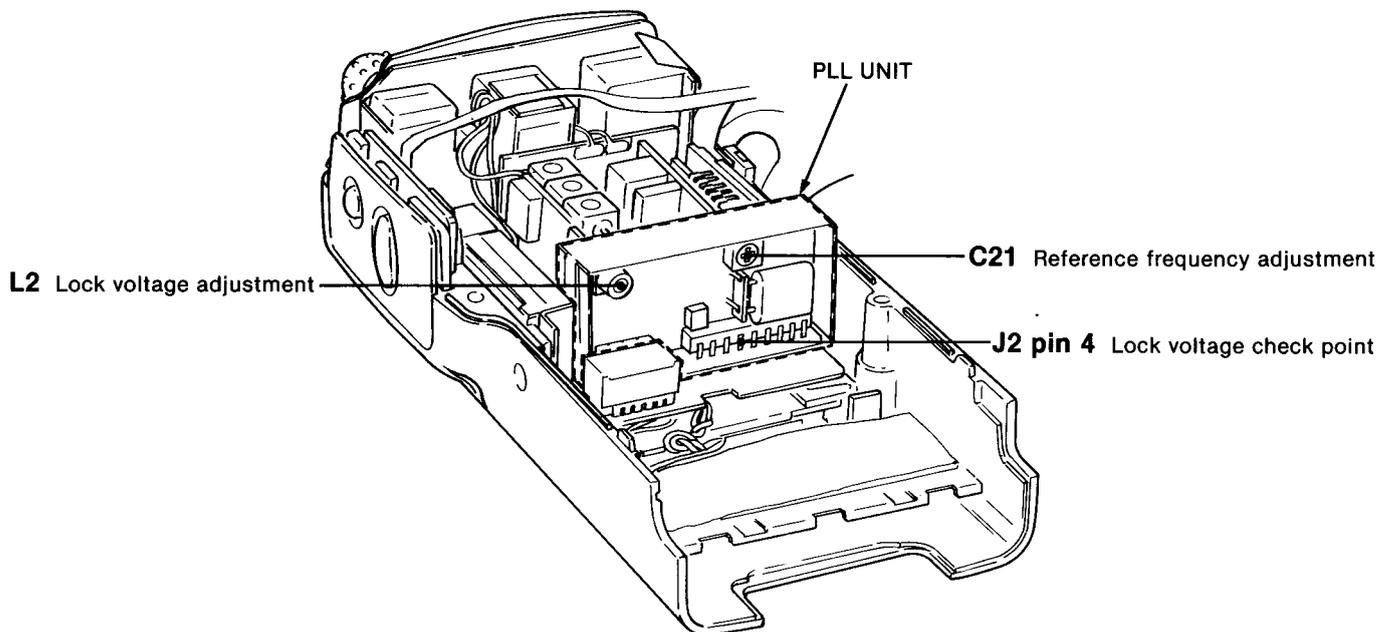
■ CONNECTION



6-2 PLL ADJUSTMENT

ADJUSTMENT	ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
		UNIT	LOCATION		UNIT	ADJUST
LOCK VOLTAGE	1 <ul style="list-style-type: none"> • Displayed frequency: 222.00 MHz • Simplex • Receiving 	PLL	Connect the digital multimeter or oscilloscope to J2 (pin 4).	1.6 V	PLL	L2
	2 <ul style="list-style-type: none"> • Transmitting 					1.6 V ± 0.6 V
REFERENCE FREQUENCY	1 <ul style="list-style-type: none"> • Displayed frequency: 225.00 MHz • Connect the RF power meter or a 50 Ω dummy load to the antenna connector. • Transmitting 	Top panel	Loosely couple the frequency counter to the antenna connector.	225.000 MHz	PLL	C21

• PLL UNIT



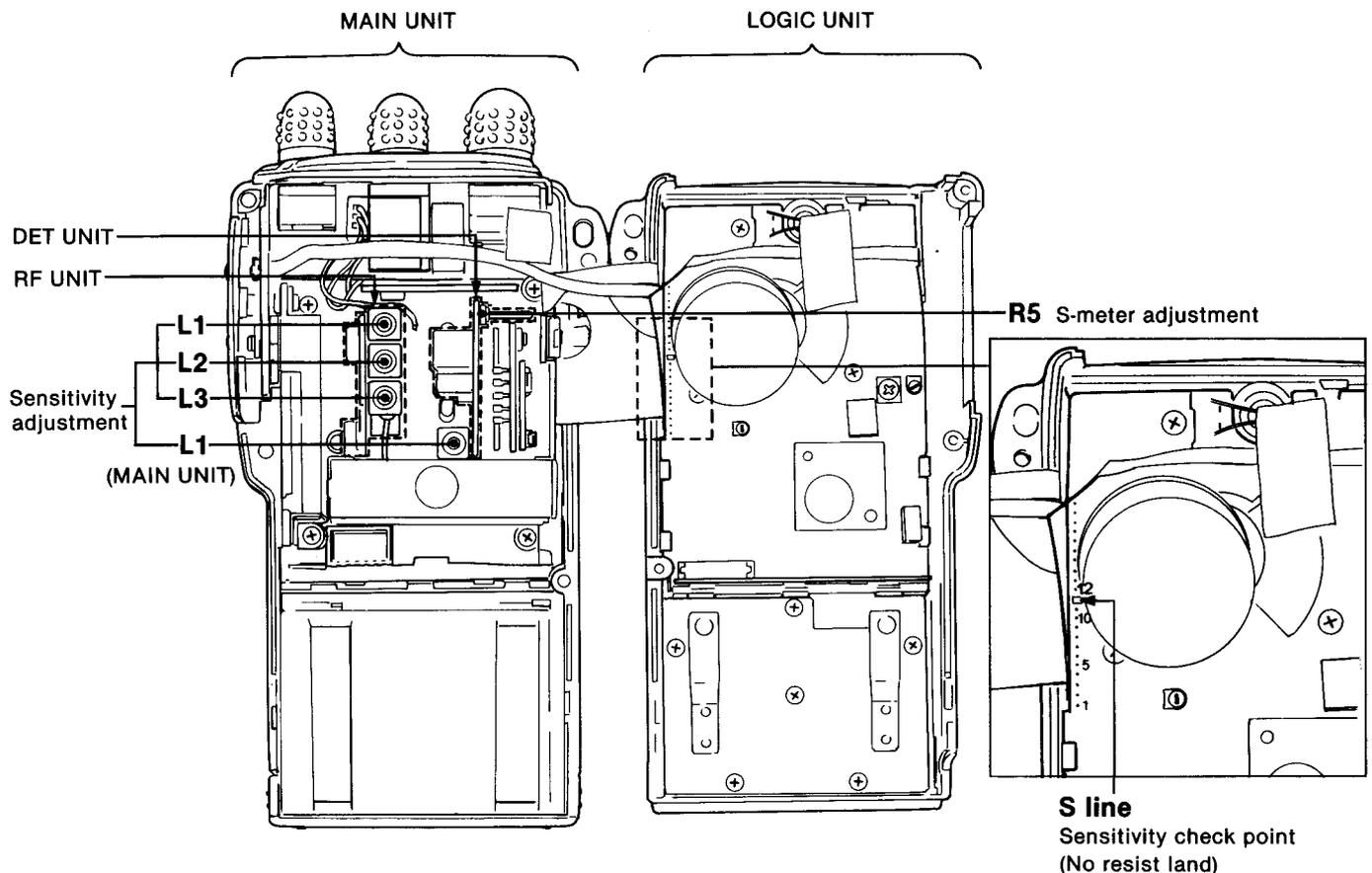
Although the above diagram has no shield cover on the PLL unit, adjustment may be performed without removing the shield cover.

6-3 RECEIVER ADJUSTMENT

ADJUSTMENT	ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
		UNIT	LOCATION		UNIT	ADJUST
SENSITIVITY	<ul style="list-style-type: none"> • Displayed frequency: 223.50 MHz • [SQL] control : Max. CCW • Connect the SSG to the antenna connector and set as: <ul style="list-style-type: none"> Level : $0.32 \mu\text{V}^*$ (-117 dBm) Modulation: 1 kHz Deviation : $\pm 3.5 \text{ kHz}$ • Receiving 	LOGIC	Connect the distortion meter to the [SP] jack with an 8Ω load. S line with DC voltmeter can also be adjusted.	Minimum distortion level	Adjust in sequence	
					RF	L1, L2, L3
					MAIN	L1
S-METER	<ul style="list-style-type: none"> • Displayed frequency: 223.50 MHz • Connect the SSG to the antenna connector and set as: <ul style="list-style-type: none"> Level : $0.32 \mu\text{V}^*$ (-117 dBm) Modulation: 1 kHz Deviation : $\pm 3.5 \text{ kHz}$ • Receiving 	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.

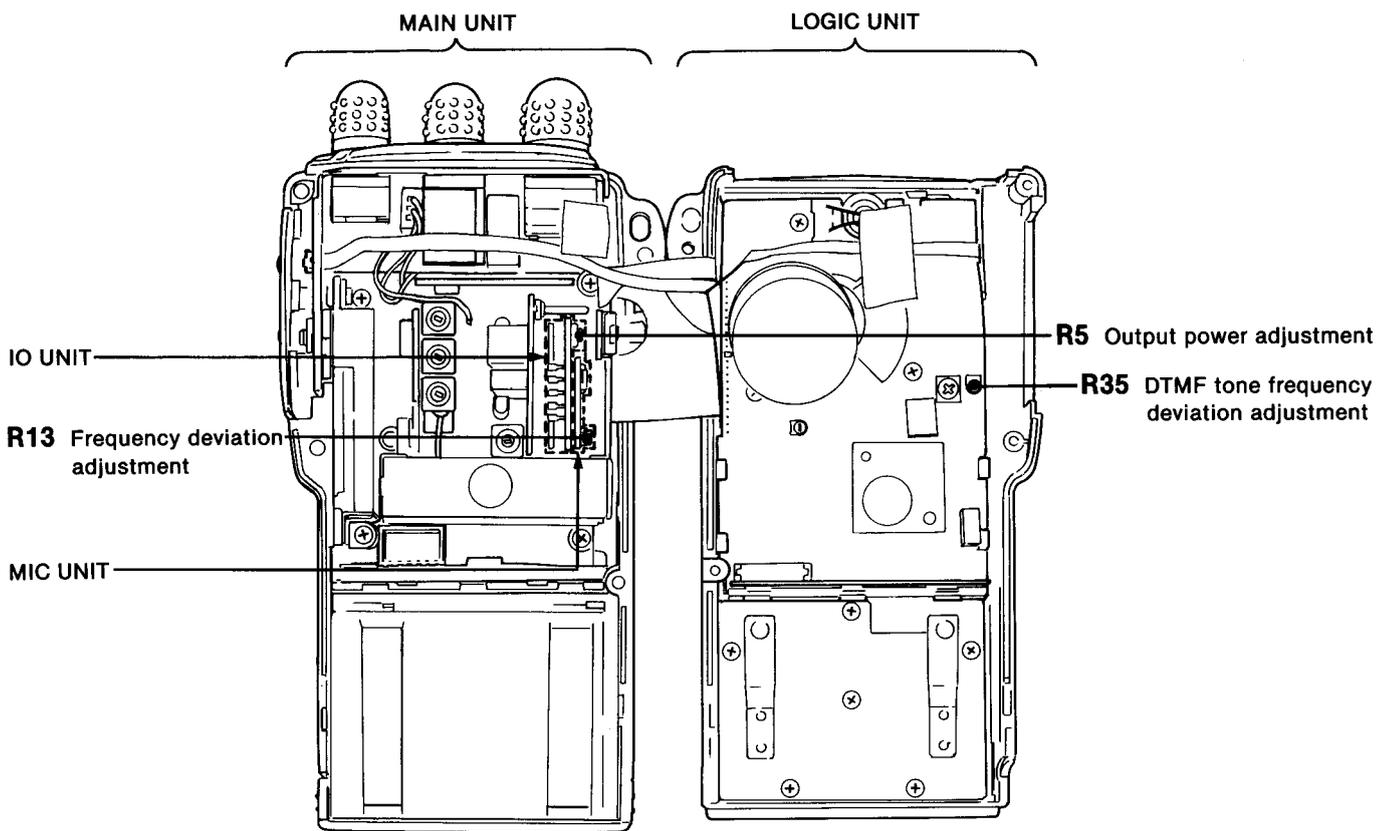
• MAIN, RF AND DET UNITS



6-4 TRANSMITTER ADJUSTMENT

ADJUSTMENT	ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT			
		UNIT	LOCATION		UNIT	ADJUST		
OUTPUT POWER	1	<ul style="list-style-type: none"> • Displayed frequency: 223.50 MHz • Output power : HIGH • Simplex • Transmitting 	Top panel	Connect the RF power meter to the antenna connector.	5.0 W	IO	R5	
	2	<ul style="list-style-type: none"> • Output power : LOW 1 					0.25~1.0 W	Verify
	3	<ul style="list-style-type: none"> • Output power : LOW 2 					Approx. 1.5 W	Verify
	4	<ul style="list-style-type: none"> • Output power : LOW 3 					Approx. 3.5 W	Verify
FREQUENCY DEVIATION	1	<ul style="list-style-type: none"> • Displayed frequency: 223.50 MHz • Output power : HIGH • Connect the audio generator to the [MIC] jack and set as: 210 mV/1.0 kHz • Set the FM deviation meter as: HPF : 50 Hz LPF : 20 kHz De-emphasis: OFF Detector : (P-P)/2 • Transmitting 	Top panel	Connect the FM deviation meter to the antenna connector via the attenuator.	±4.8 kHz	MIC	R13	
DTMF TONE FREQUENCY DEVIATION	1	<ul style="list-style-type: none"> • Displayed frequency: 223.50 MHz • Push and hold the [PTT] switch and then push the [D] key. 	Top panel	Connect the FM deviation meter to the antenna connector via the attenuator.	±3.5 kHz	LOGIC	R35	

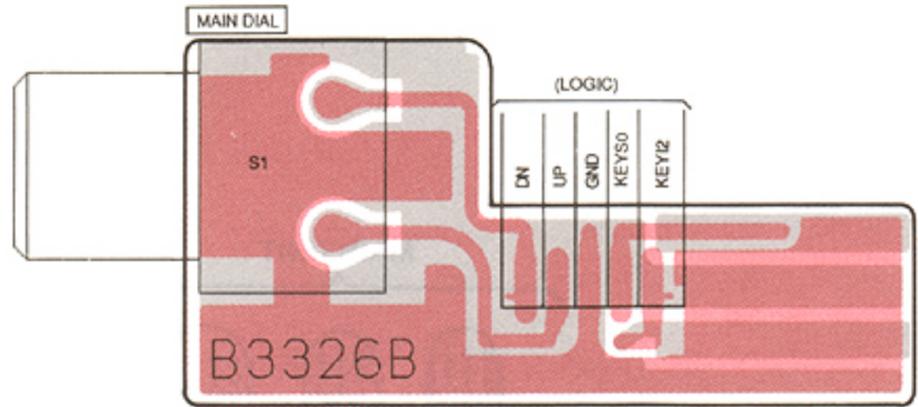
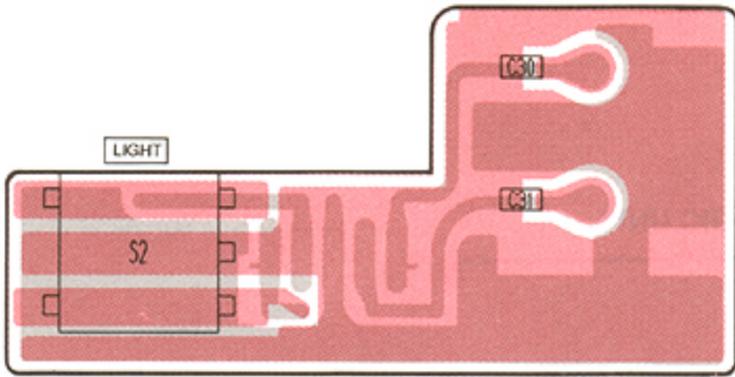
• IO, MIC AND LOGIC UNITS



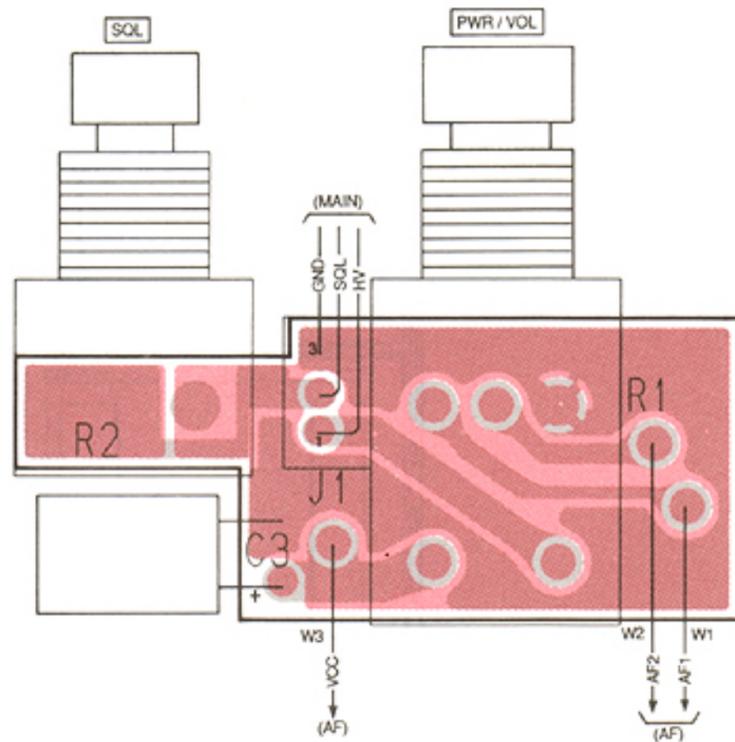
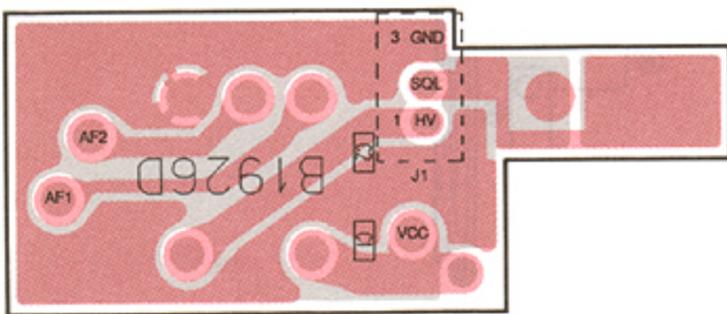
SECTION 7 BOARD LAYOUTS

7-1 LOGIC UNIT

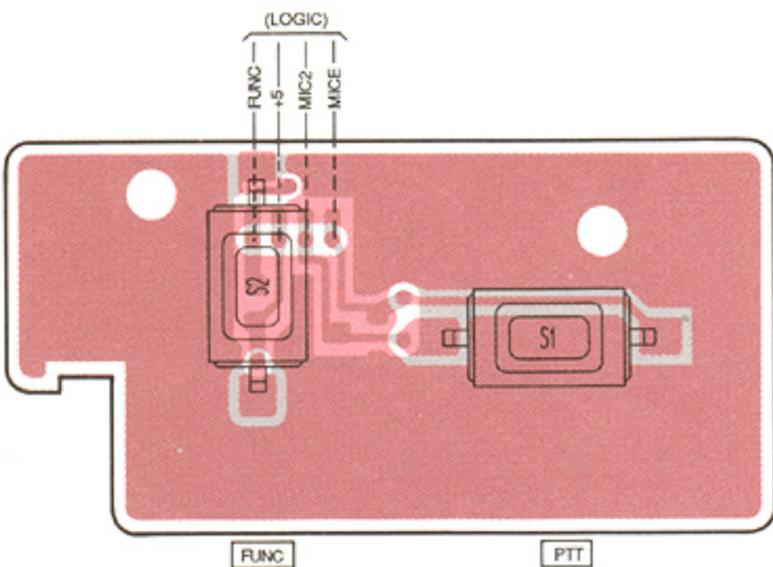
• ENC UNIT



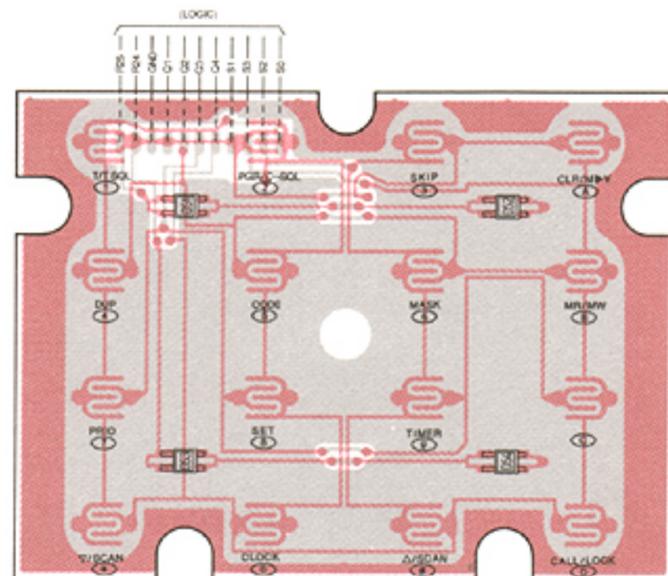
• VR UNIT



• PTT UNIT

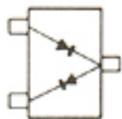
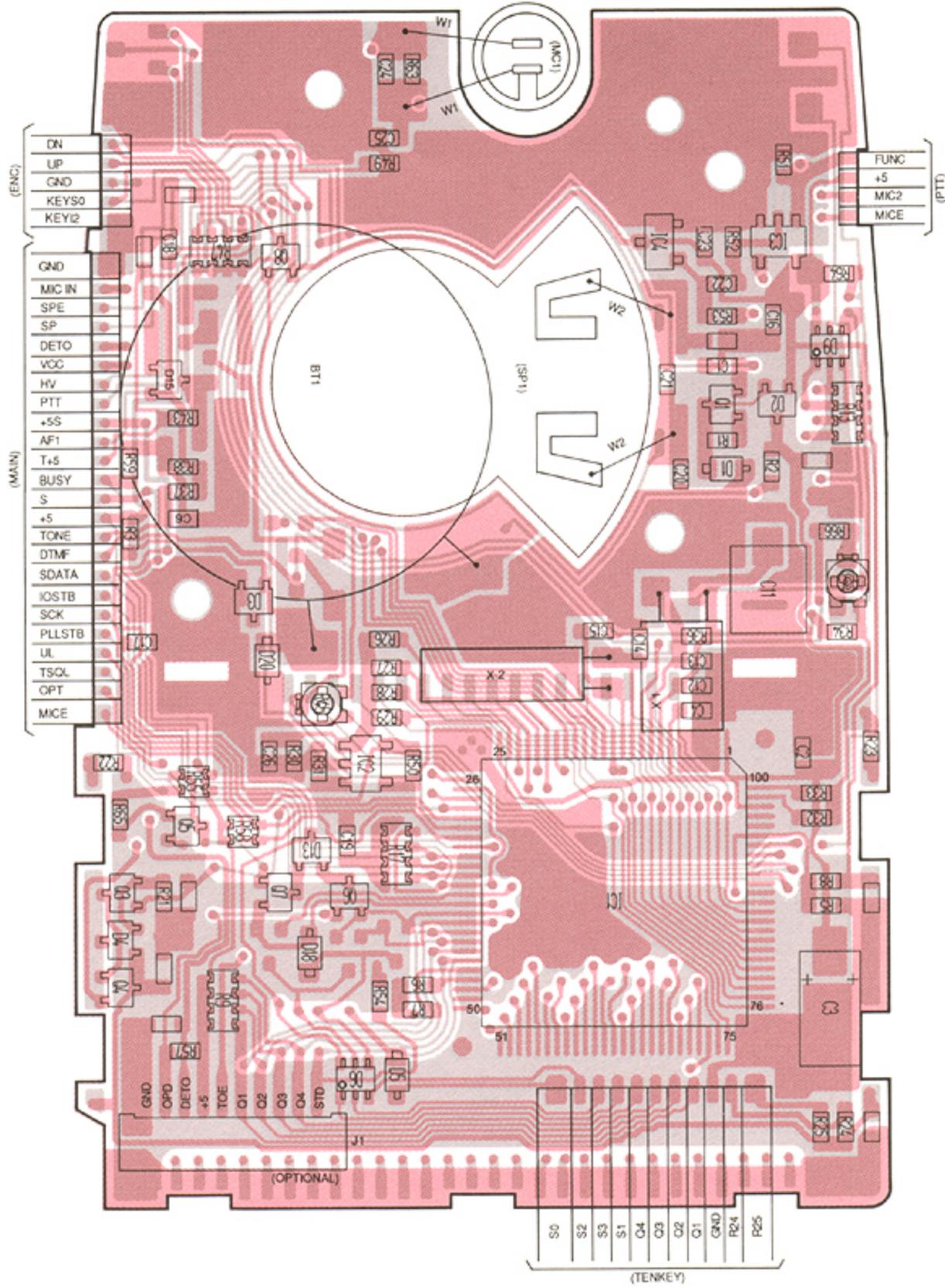


• TENKEY UNIT



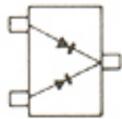
• LOGIC UNIT

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



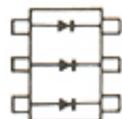
D3, D4, D15

DAN202U
(Symbol: N)



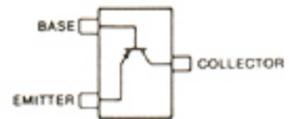
D2, D13

MA1S121
(Symbol: M2D)



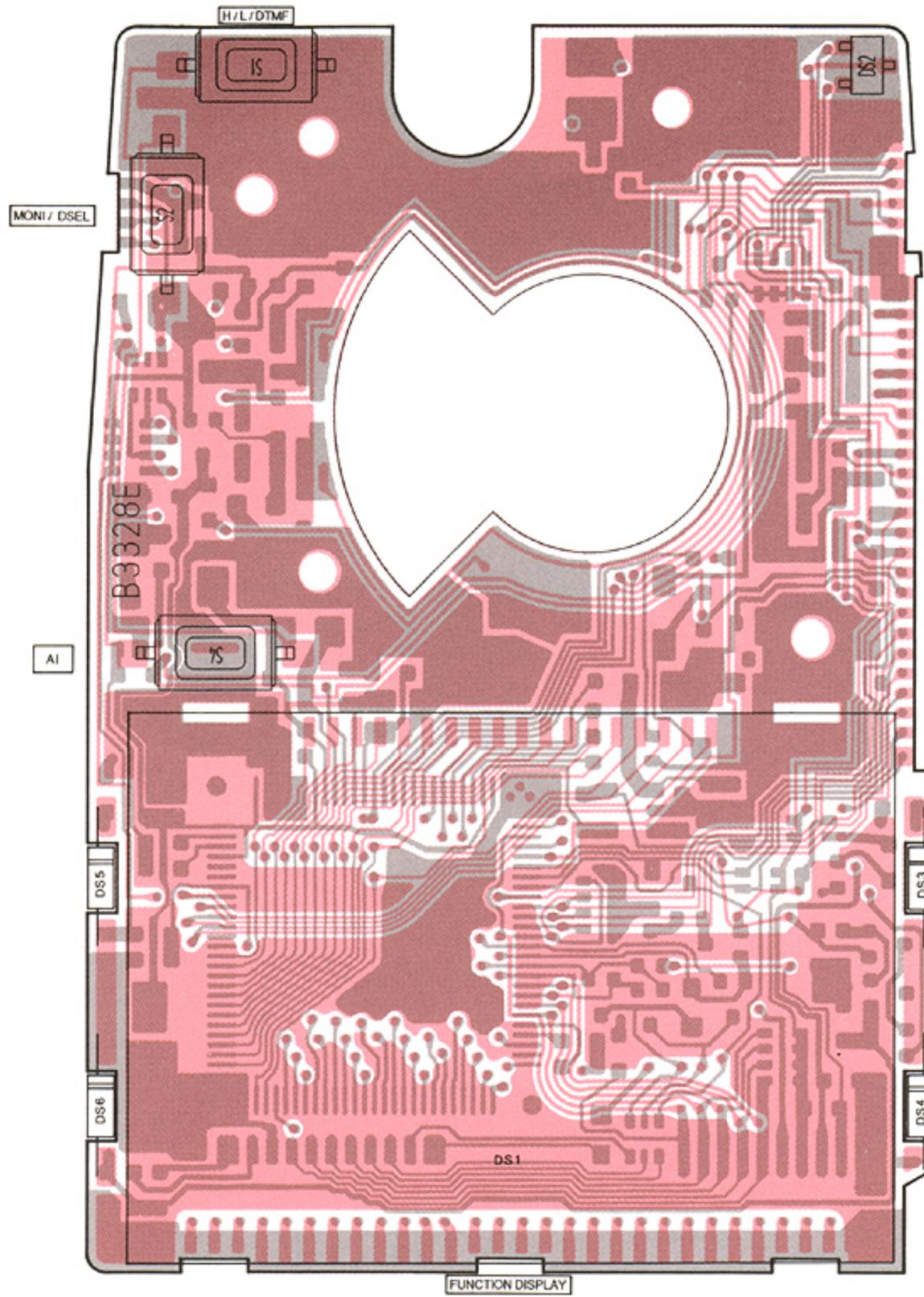
D6, D9

2SA1576 R
(Symbol: FR)

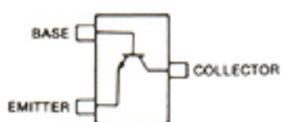


Q4

• LOGIC UNIT



2SC4081 R
(Symbol: BR)



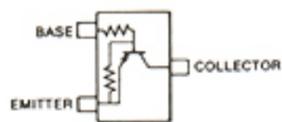
Q3

2SK880 Y
(Symbol: XY)



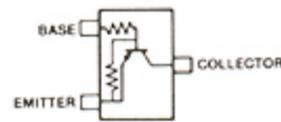
Q1

DTA144EU
(Symbol: 16)



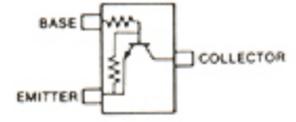
Q8

DTA144TU
(Symbol: 96)



Q7

DTC144TU
(Symbol: 06)

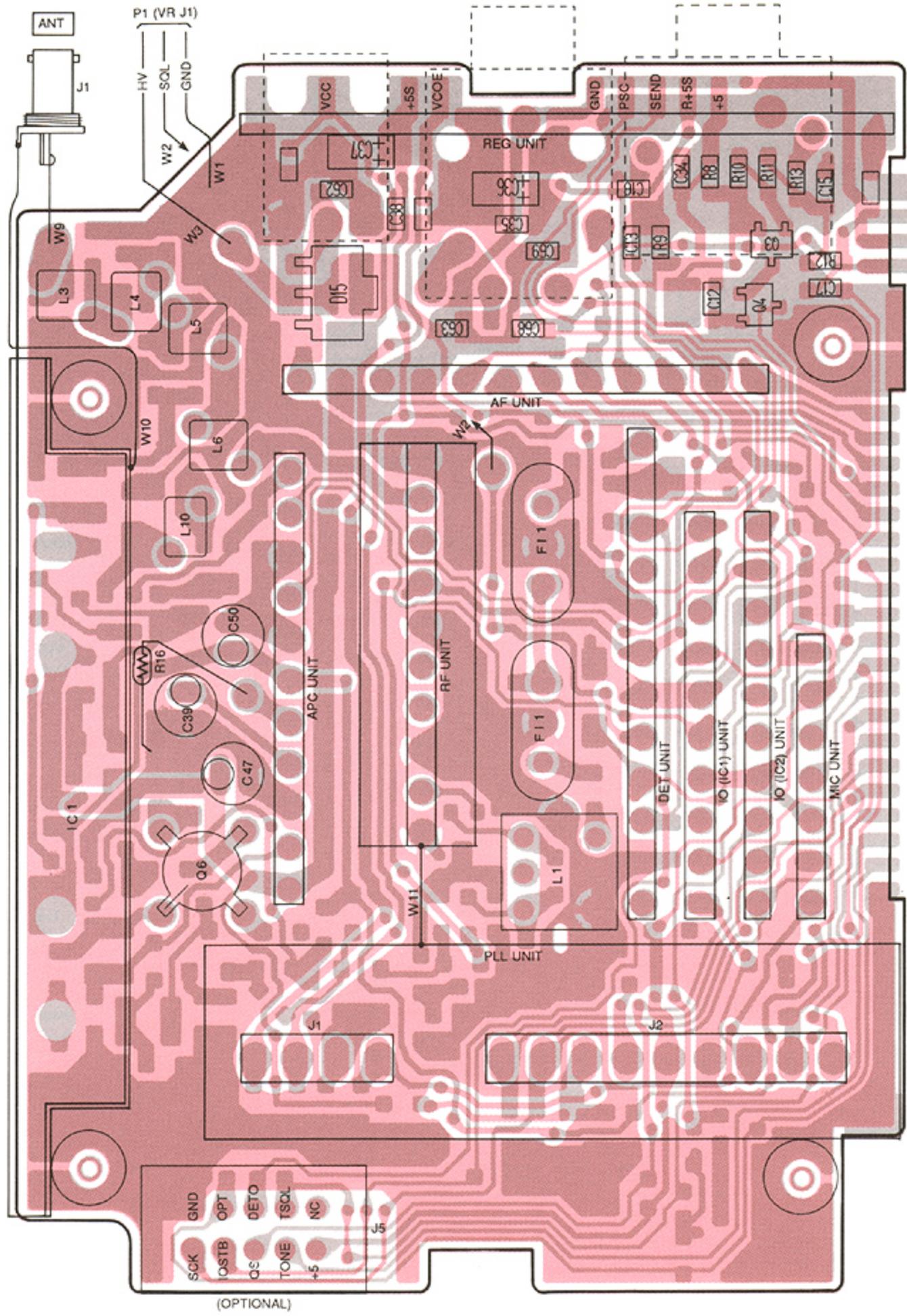


Q5, Q6

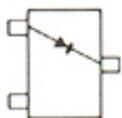
7-2 MAIN UNIT

• 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.

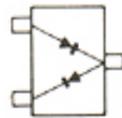


1SS153
(Symbol: A9)



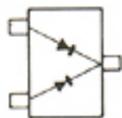
D9

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



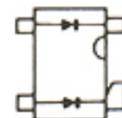
DA204U: D2, D13
HSM88AS: D10, D11

DAN202U
(Symbol: N)



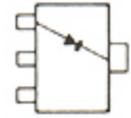
D8

MA862
(Symbol: M11)



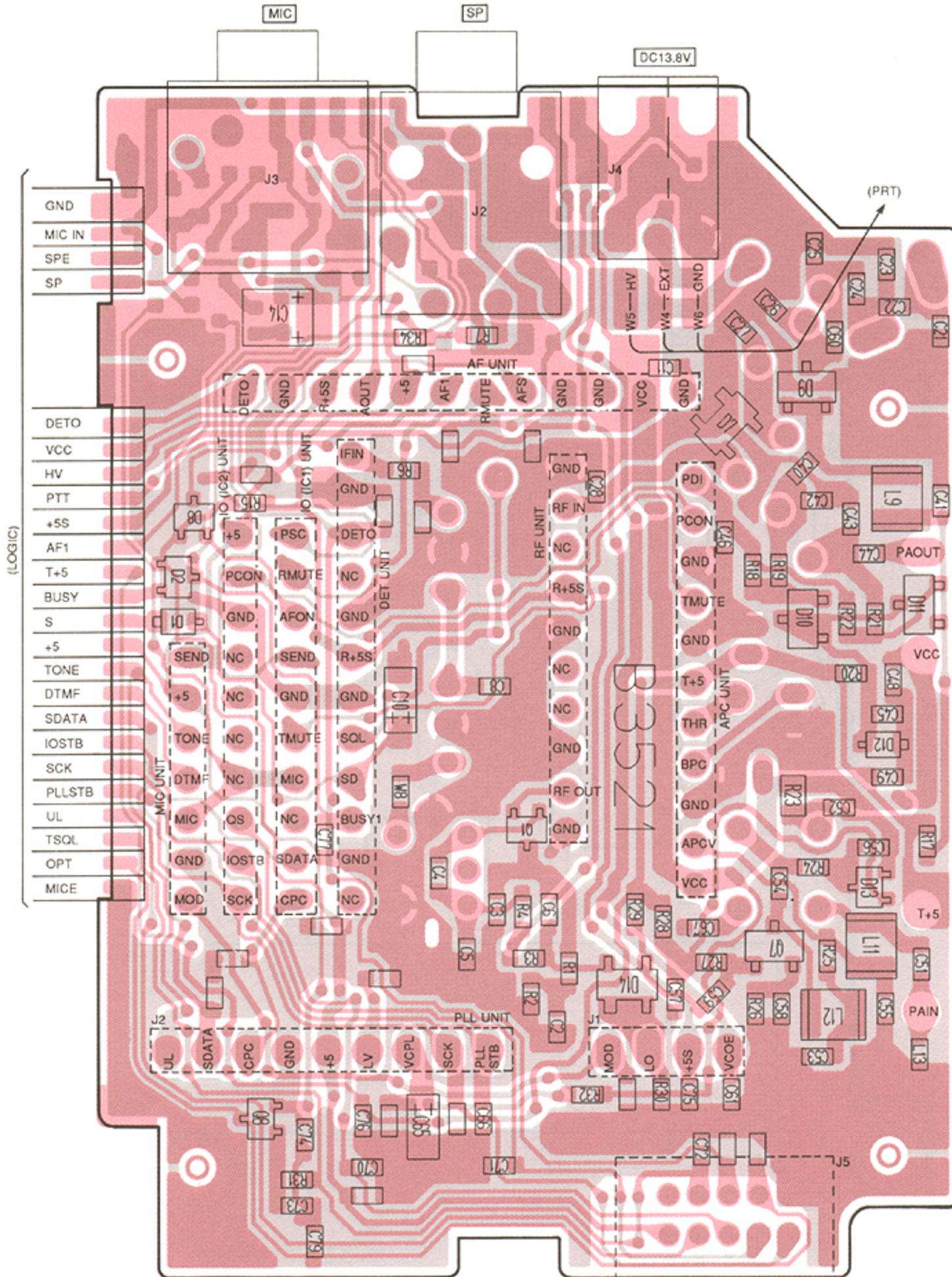
D7, D14

SB20-03P
(Symbol: SC)

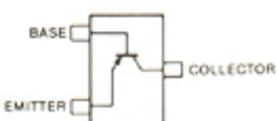


D15

• MAIN UNIT



2SA1576 R
(Symbol: FR)



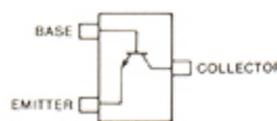
Q3, Q8

2SC3019



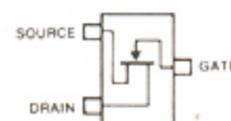
Q6

2SC3772 3
(Symbol: LY3)



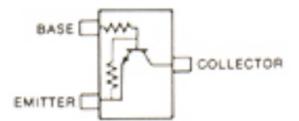
Q7

2SK882 Y
(Symbol: TY)



Q1

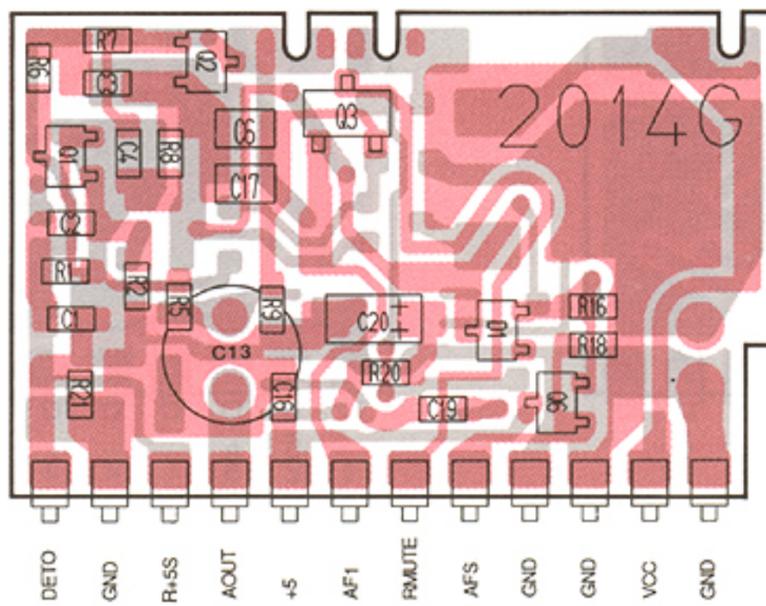
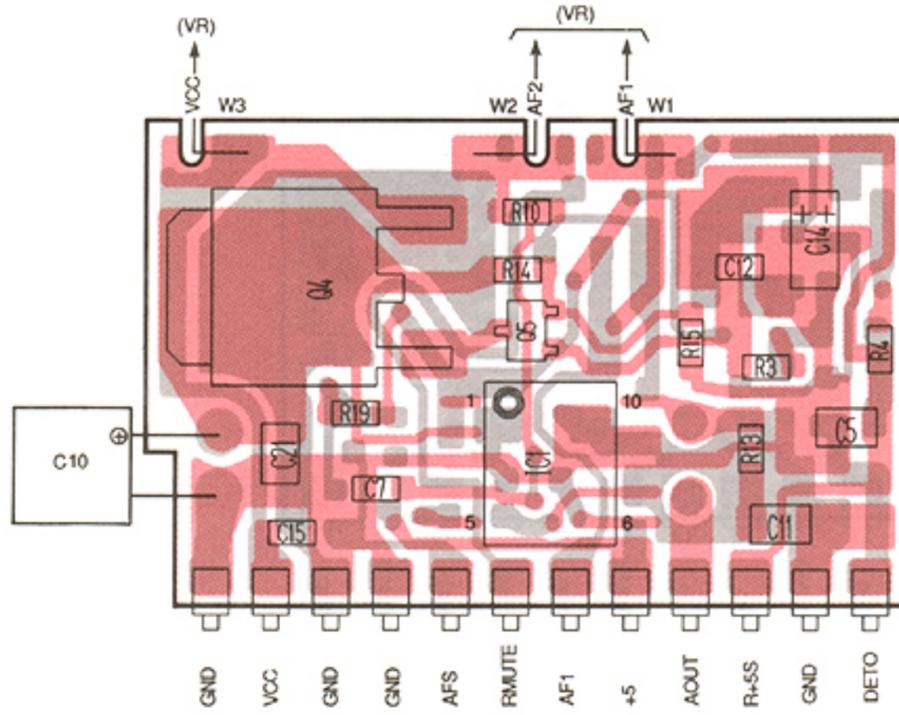
DTC144EU
(Symbol: 26)



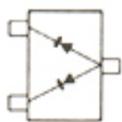
Q4

7-3 AF UNIT

• AF UNIT



DAP202U
(Symbol: P)



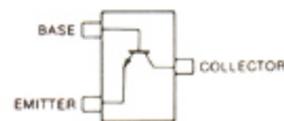
D1

2SB1182 Q
(Symbol: B1182)



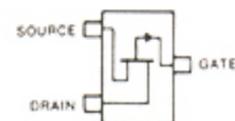
Q4

2SC4081 R
(Symbol: BR)



Q1, Q2, Q5, Q6

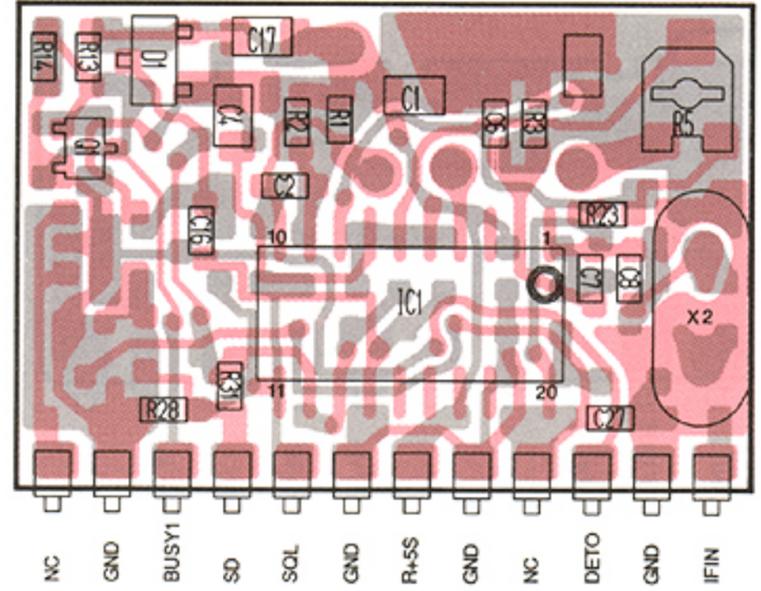
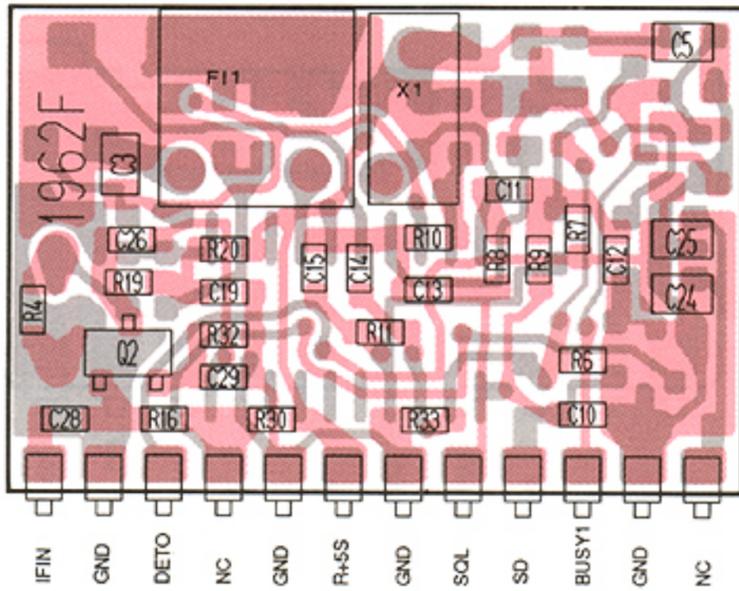
2SJ106 GR
(Symbol: VG)



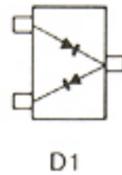
Q3

7-5 DET AND REG UNITS

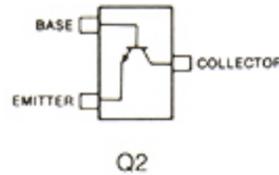
• DET UNIT



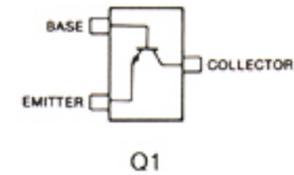
1SS226
(Symbol: C3)



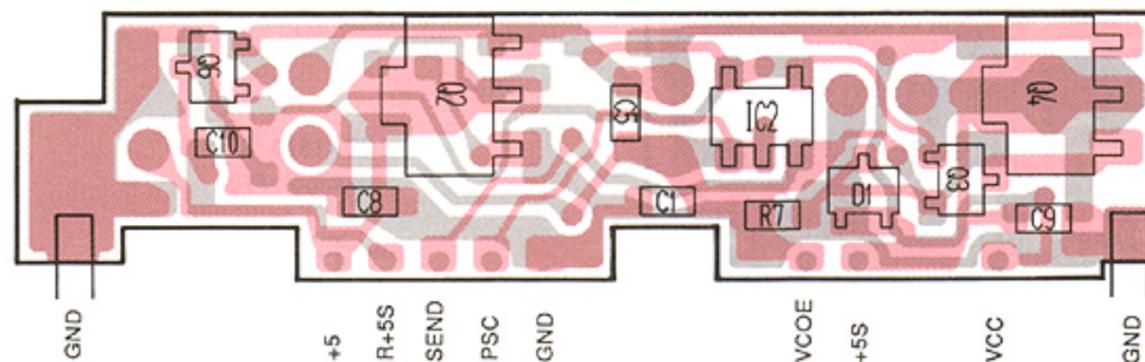
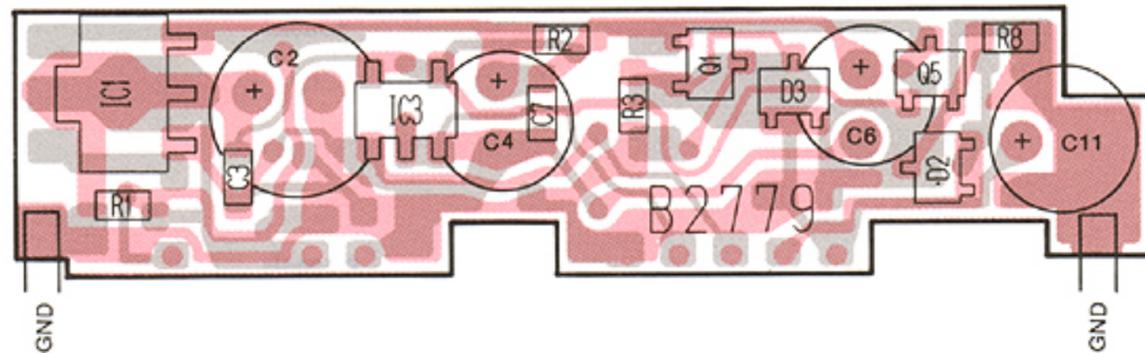
2SC3770 3
(Symbol: JY3)



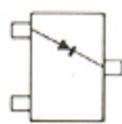
2SC4081 S
(Symbol: BS)



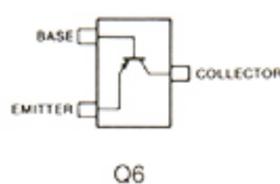
• REG UNIT



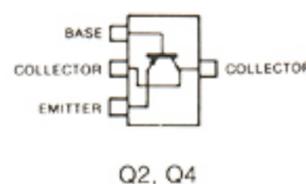
DA114
(Symbol: AV)



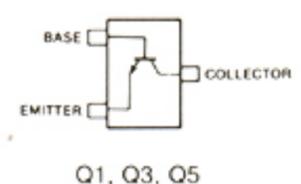
2SA1576 R
(Symbol: FR)



2SB798 DK
(Symbol: DK)

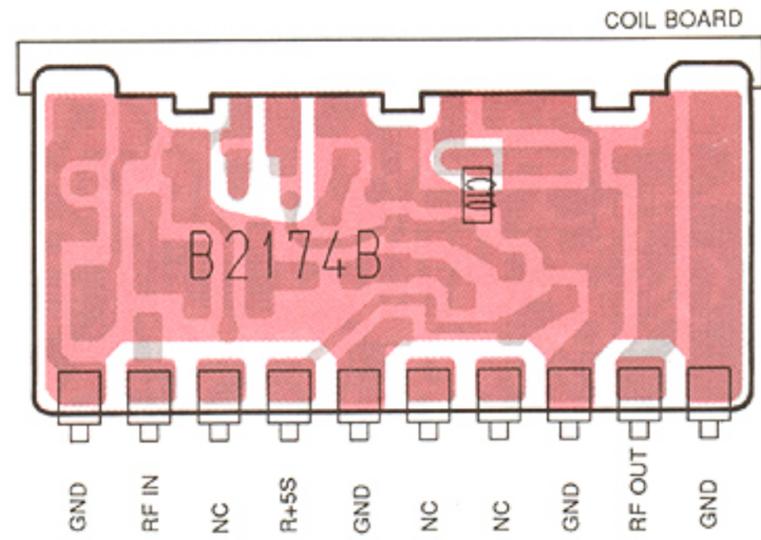
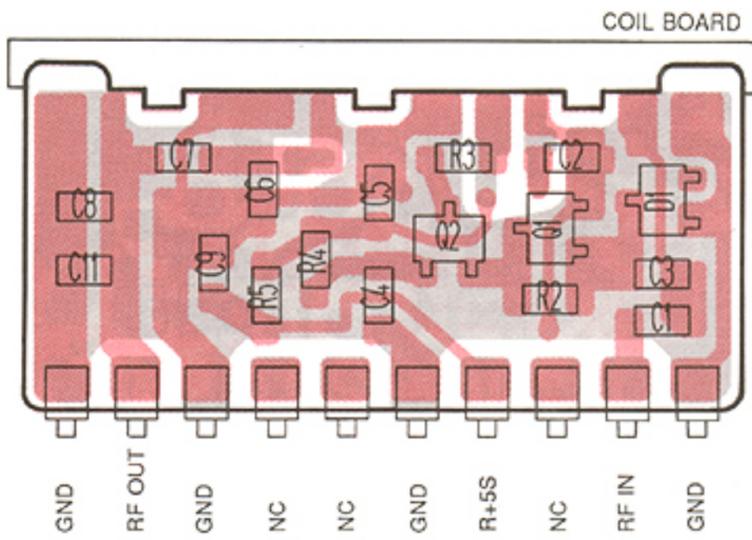


2SC4081 S
(Symbol: BS)

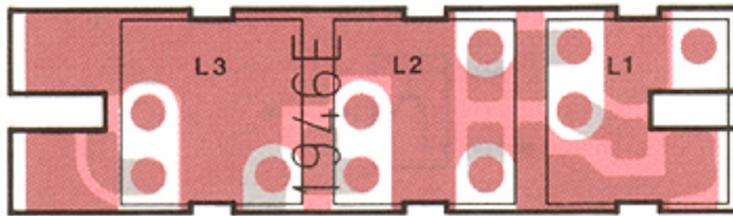


7-6 RF AND APC UNITS

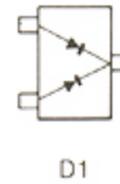
• RF UNIT



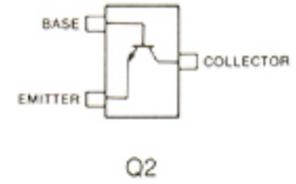
COIL BOARD



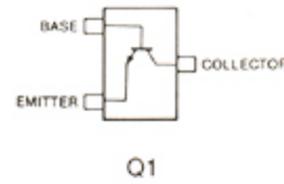
DAN202U
(Symbol: N)



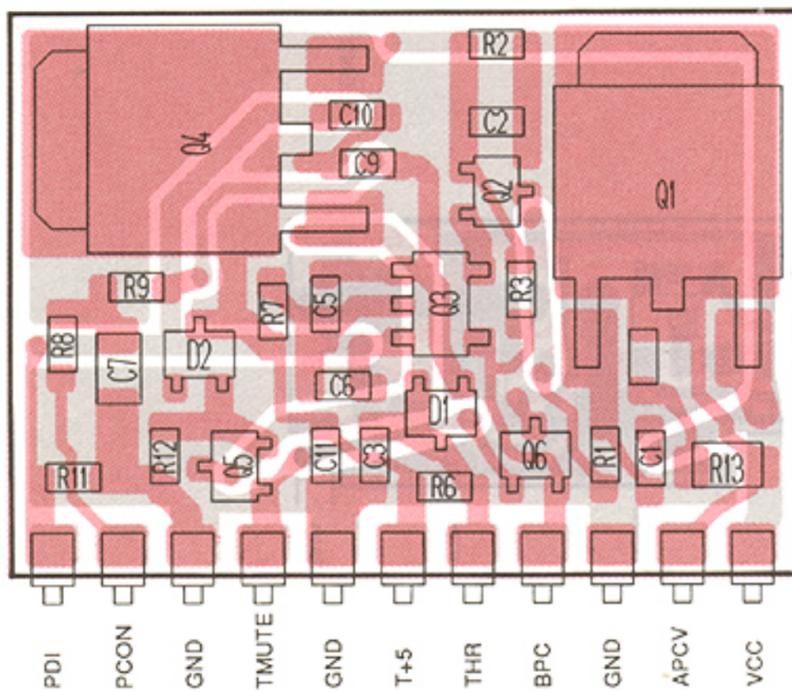
2SC4403 3
(Symbol: LY3)



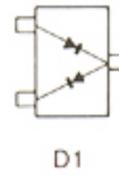
2SC4405 3
(Symbol: OY3)



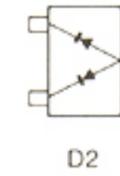
• APC UNIT



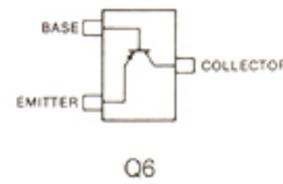
DA204U
(Symbol: K)



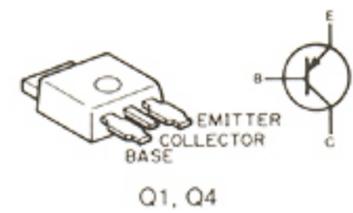
DAP202U
(Symbol: P)



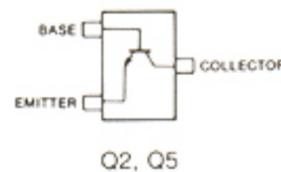
2SA1576 R
(Symbol: FR)



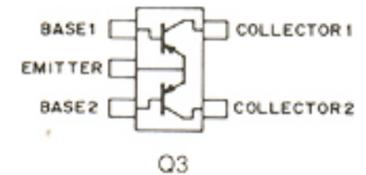
2SB1182 Q
(Symbol: B1182)



2SC4081 S
(Symbol: BS)

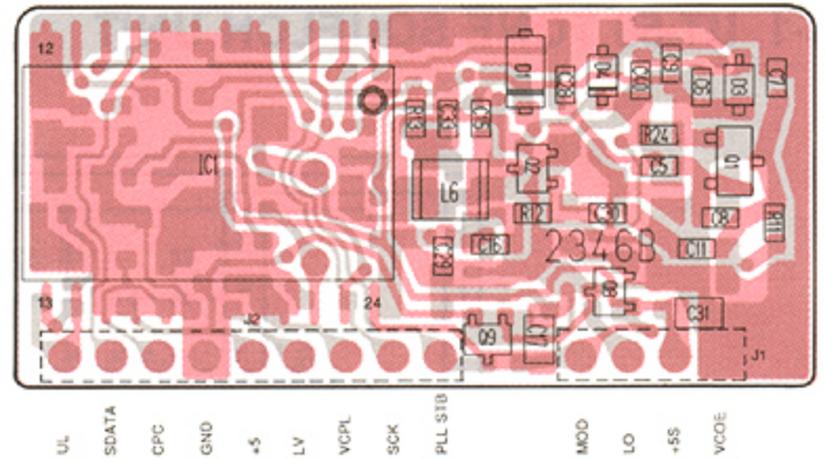
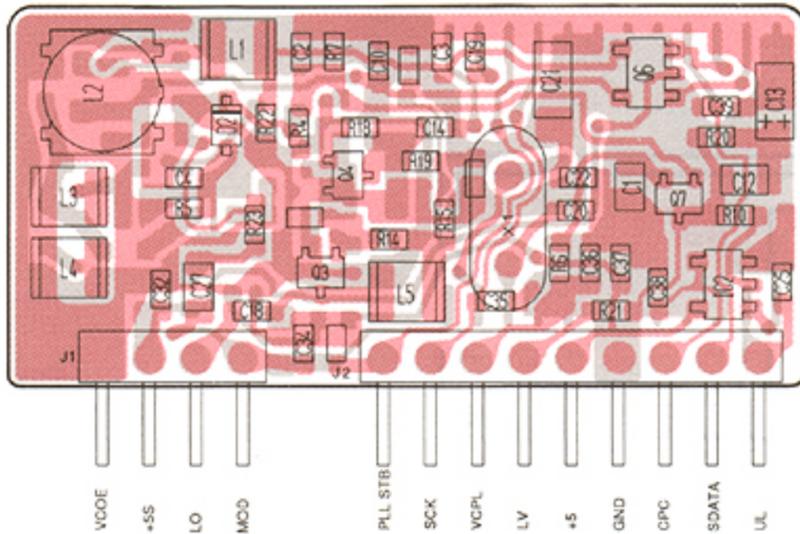


FMS1
(Symbol: SI)



7-7 PLL AND PRT UNITS

• PLL UNIT

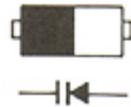


HVU350TRF
(Symbol: 4)



D2

MA334B
(Symbol: 6D on cathode area)



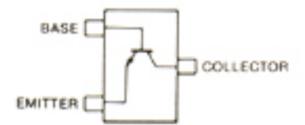
D1

MA363B
(Symbol: 6D on anode area)



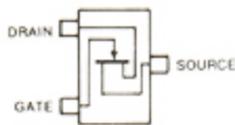
D4

2SC4403 3
(Symbol: LY3)



Q2, Q3, Q4

2SK302 GR
(Symbol: TG)



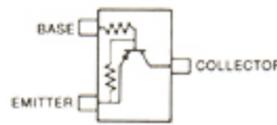
Q1

2SK880 Y
(Symbol: XY)



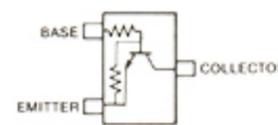
Q7

DTA143ZU
(Symbol: 113)



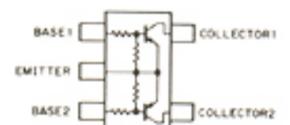
Q9

DTC144EU
(Symbol: 26)



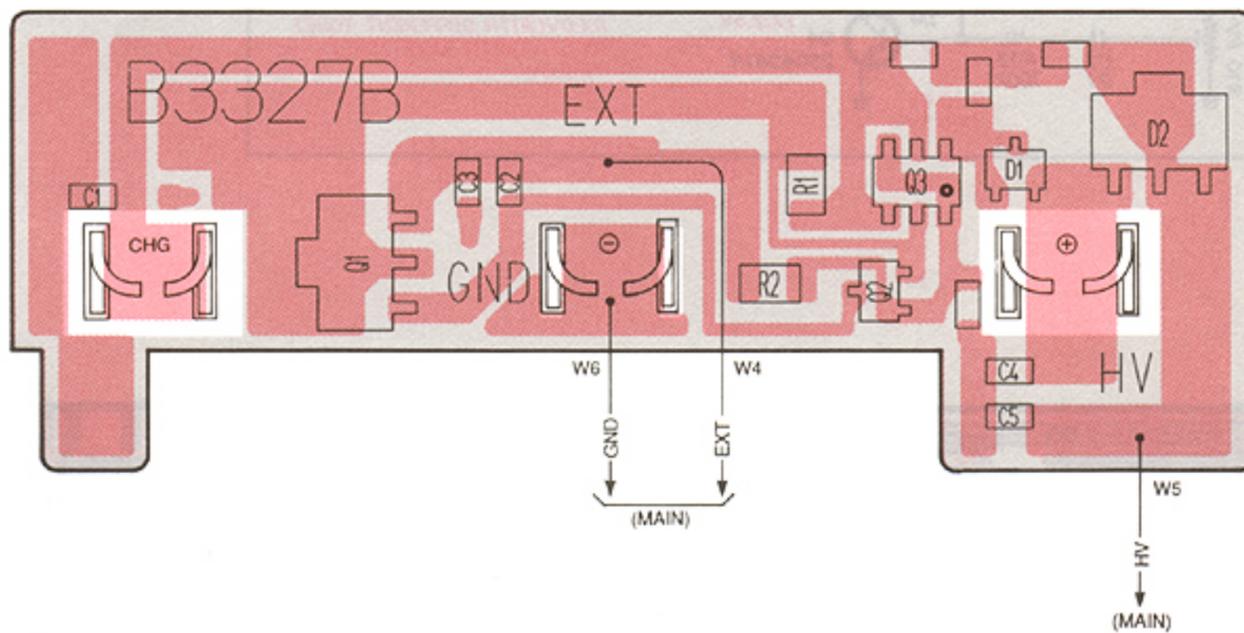
Q8

FMA2
(Symbol: A2)

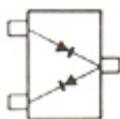


Q6

• PRT UNIT

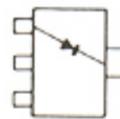


DA204U
(Symbol: K)



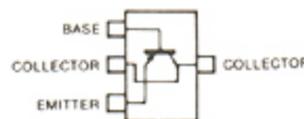
D1

SB20-03P
(Symbol: SC)



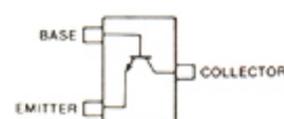
D2

2SB798 DK
(Symbol: DK)



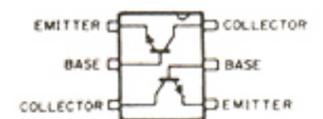
Q1

2SC4081 S
(Symbol: BS)



Q2

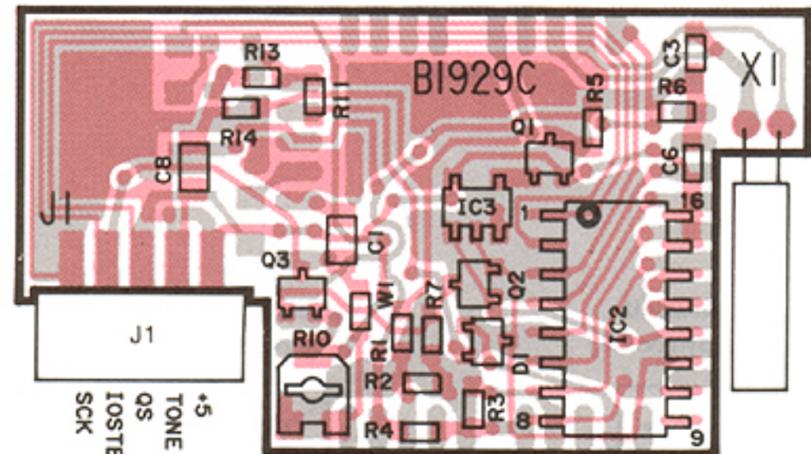
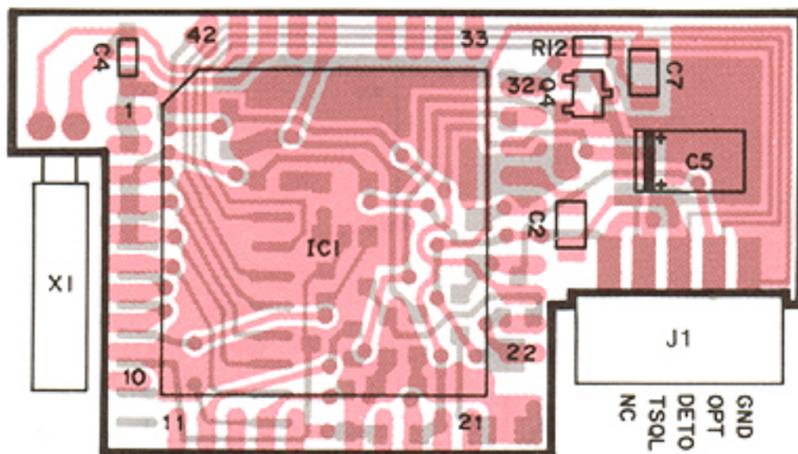
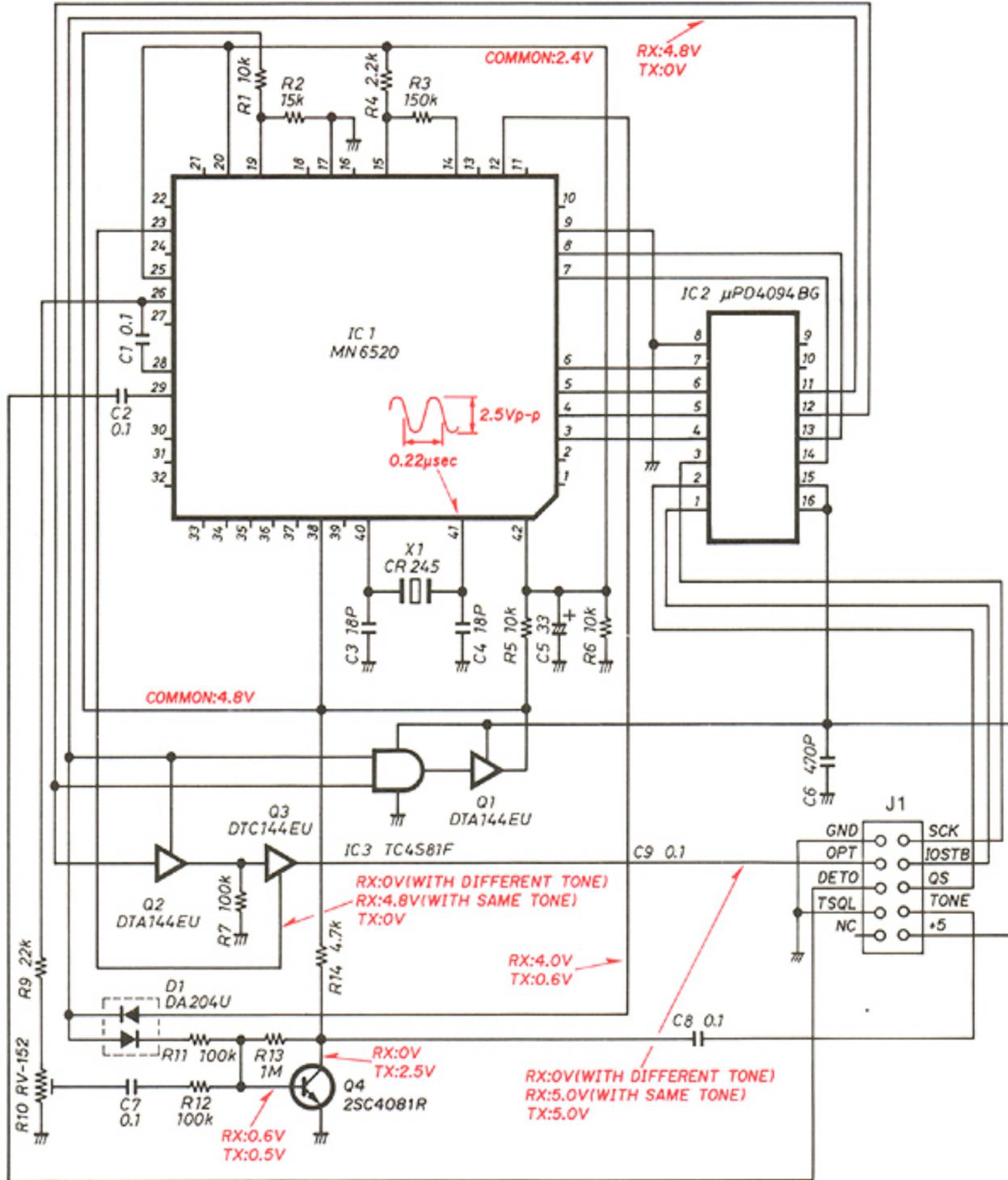
IMX1
(Symbol: X1)



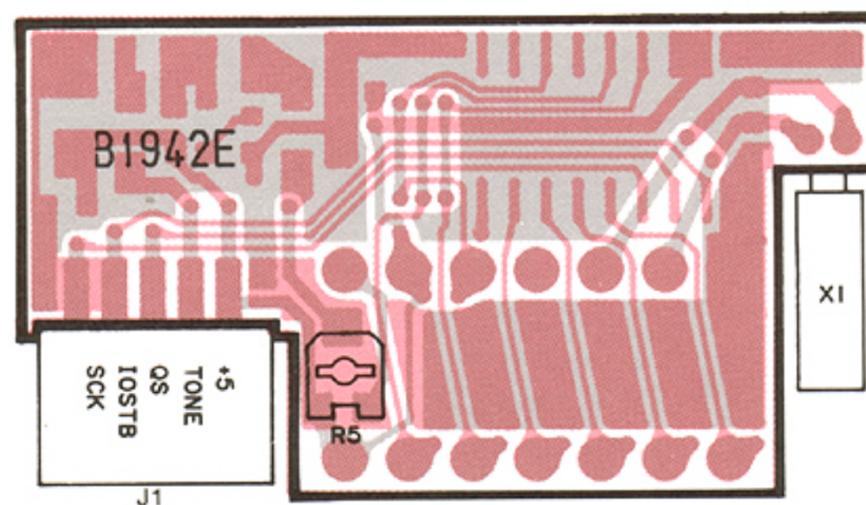
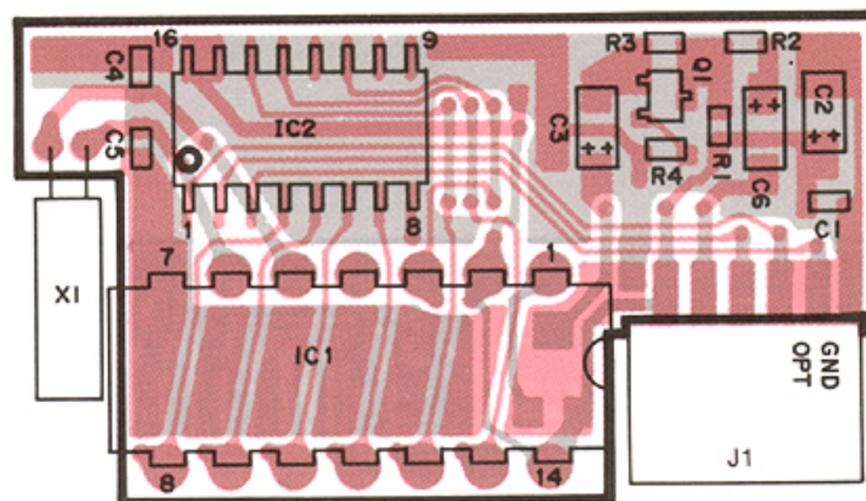
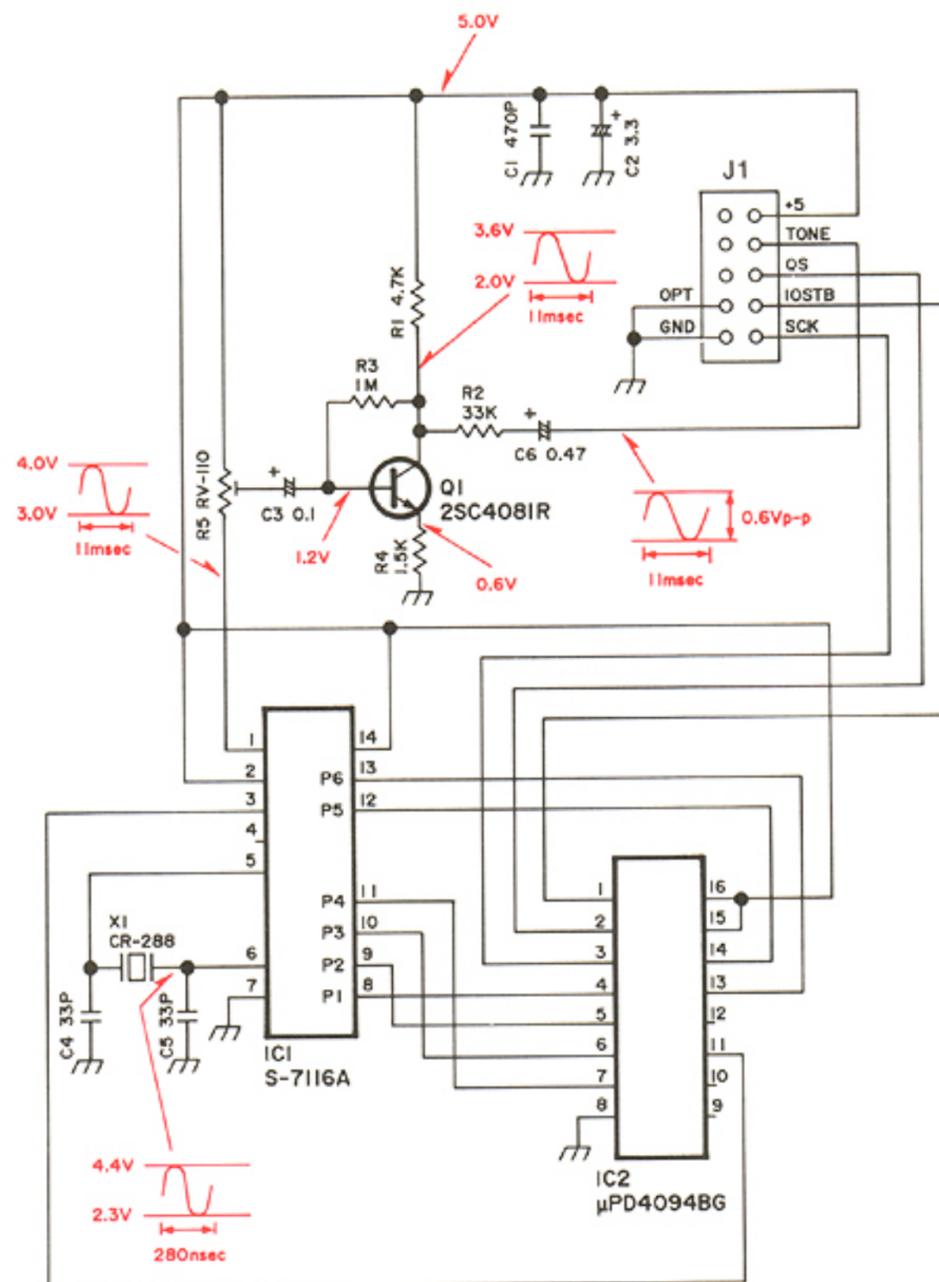
Q3

SECTION 8 OPTIONAL UNITS

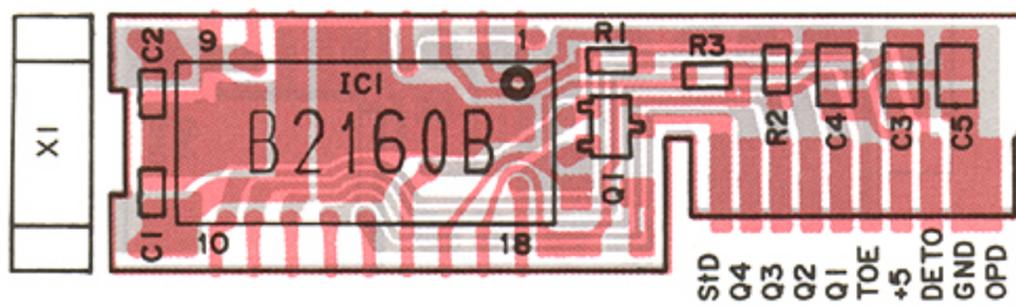
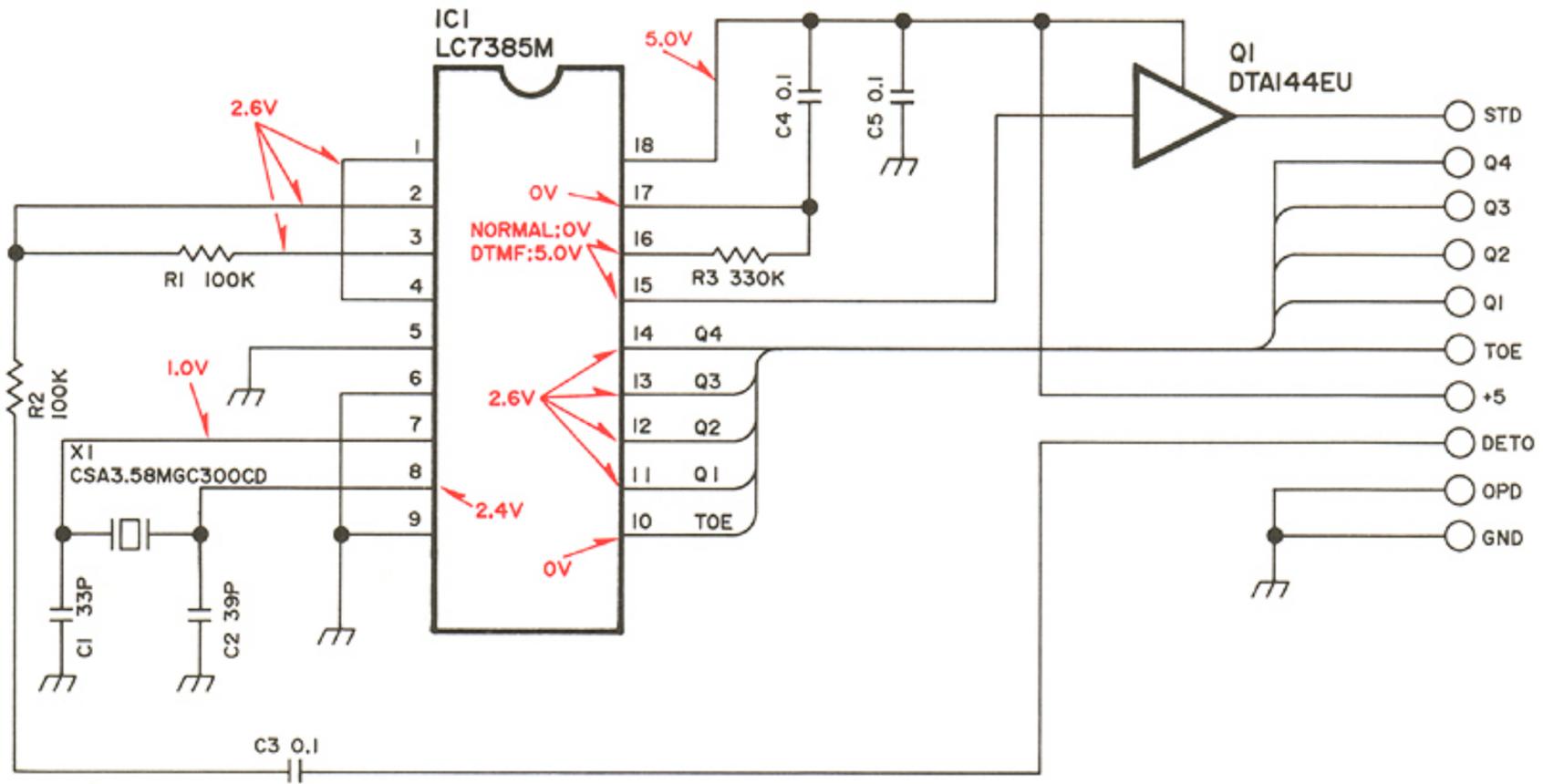
8-1 UT-50 TONE SQUELCH UNIT

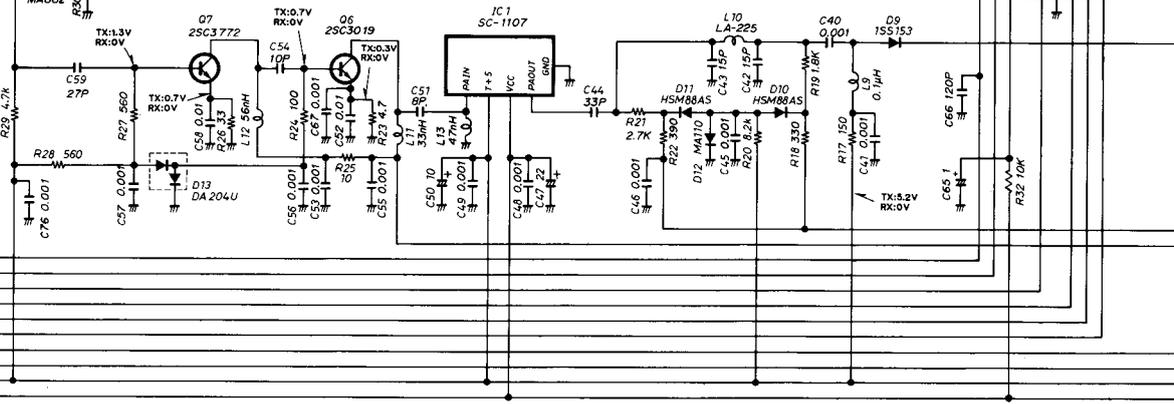
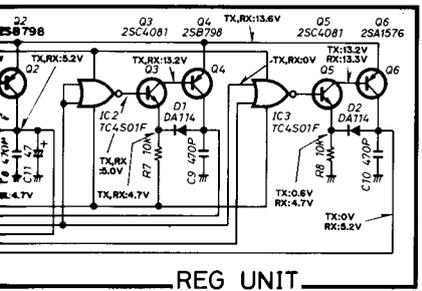
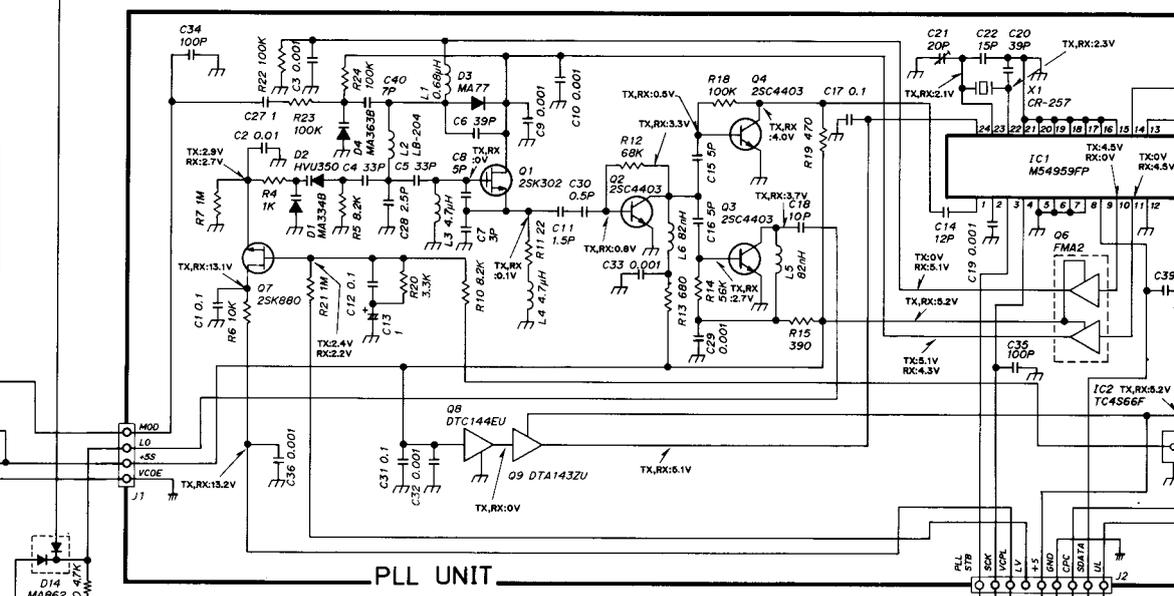
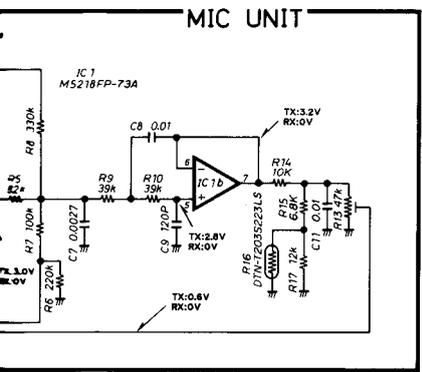
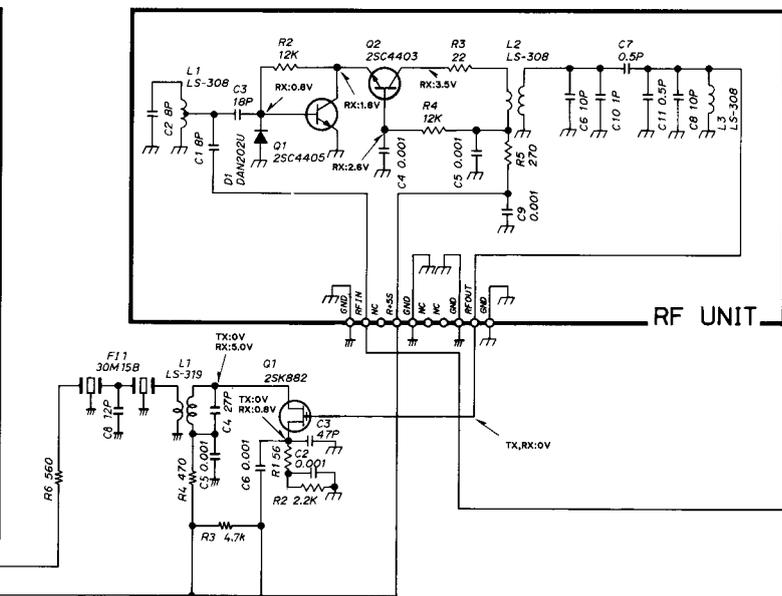
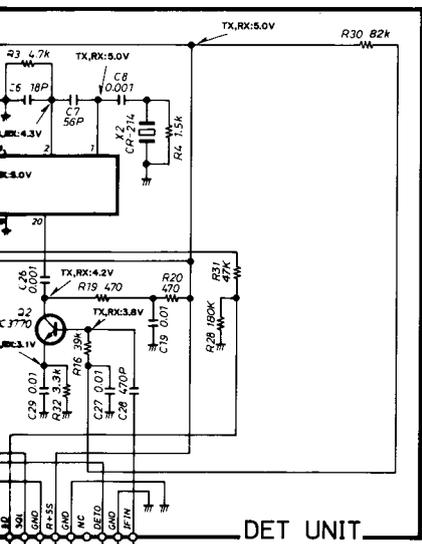


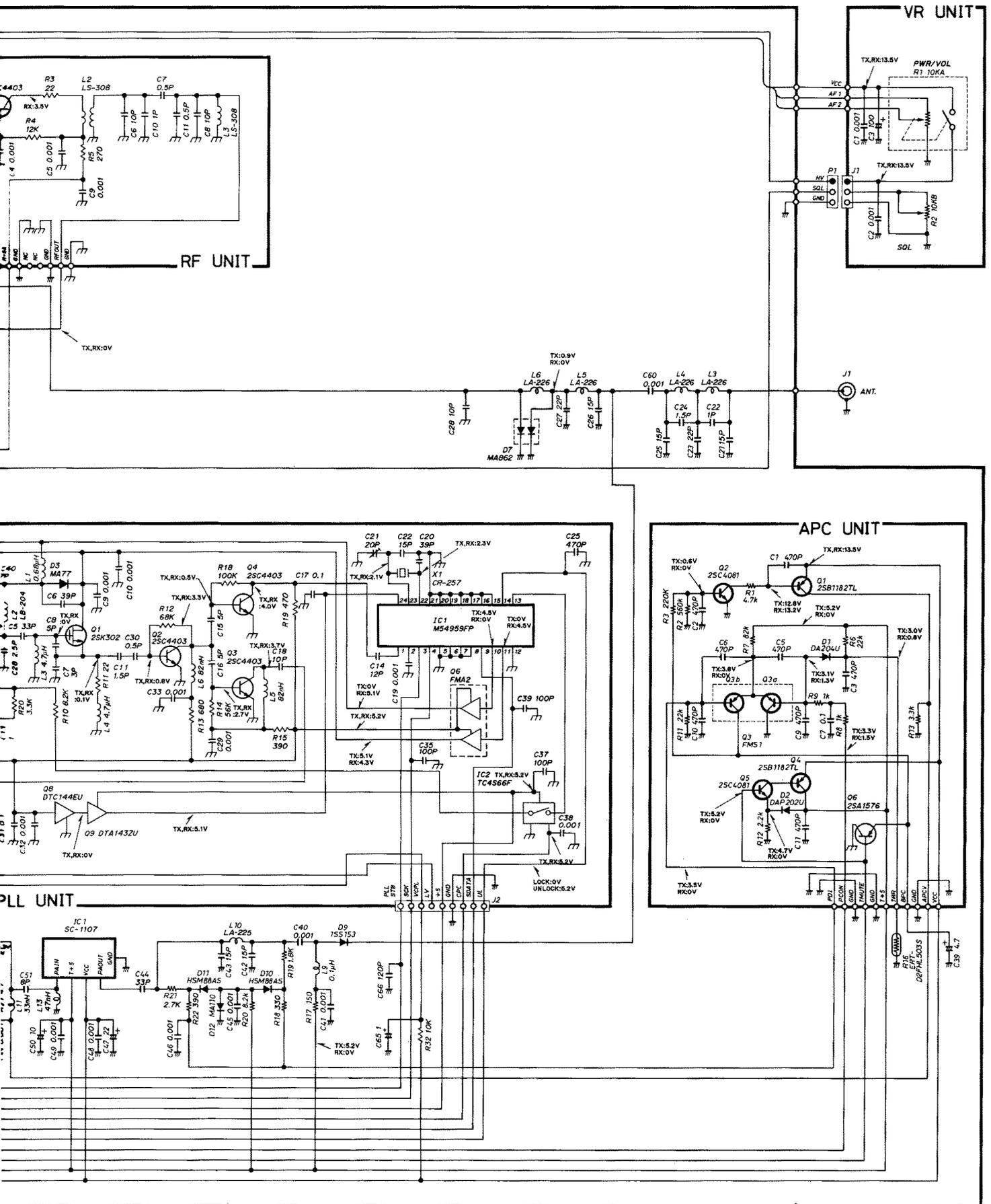
8-2 UT-51 TONE ENCODER UNIT



8-3 UT-49 DTMF DECODER UNIT







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