



SERVICE MANUAL

144MHz FM TRANSCEIVER

IC-2iA

IC-2iE

INTRODUCTION

This service manual describes the latest service information for the **IC-2iA/E** 144 MHz FM TRANSCEIVER at the time of publication.

7 versions of the **IC-2iA/E** have been designed. This service manual covers each version.

MODEL	VERSION NO.	VERSION	SYMBOL
IC-2iE	#02	Europe	EUR
	#03	United Kingdom	UK
	#04	Italy	ITA
	#06	Taiwan	TPE
IC-2iA	#05	U.S.A.	USA
	#07	Australia	AUS
	#09	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>

1150000950 IC SC1144 IC-2iA/E MAIN-A UNIT 5 pieces
8810001560 Screw PH PT M2 × 15 ZK IC-2iA/E 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-2iA	U.S.A.	144~148 MHz (TX) 138~174 MHz (RX)
	Australia	144~148 MHz
	Asia	144~148 MHz (TX) 138~174 MHz (RX)
IC-2iE	Europe, United Kingdom	144~146 MHz
	Italy	144~148 MHz (TX) 138~174 MHz (RX)
	Taiwan	145~146 MHz

- Model : F3 (16K0F3E)
- Default tuning step : 5 kHz (U.S.A. and Asia versions), 25 kHz (All other versions)
- Number of memory channels : 10 plus 2 scan edge channels
- Antenna impedance : 50 Ω (unbalanced)
- Usable battery packs : BP-121~BP-124 BATTERY PACKS,
BP-120 BATTERY CASE with six R6 (AA) size dry cell or Nicd batteries
- External DC power supply : 6~16 V DC (negative ground)

- Current drain (typical; at 13.8 V) :

Transmit	High	1.4 A
	Low 1	100 mA
Receive	Power saved	16 mA (average)
	Rated audio output	150 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 (at $0^{\circ}\text{C} \sim +50^{\circ}\text{C}$; $+32^{\circ}\text{F} \sim +122^{\circ}\text{F}$)
- Dimensions (Projections not included) :

with BP-121	58 (W) \times 91 (H) \times 30 (D) mm	2.3 (W) \times 3.6 (H) \times 1.2 (D) in
with BP-120	58 (W) \times 114 (H) \times 30 (D) mm	2.3 (W) \times 3.6 (H) \times 1.2 (D) in

- Weight :

with BP-121	260 g; 9.1 oz
with BP-120 and 6 dry cell batteries	320 g; 11.3 oz (varies depending on the battery type)

TRANSMITTER

- Output power (approx.; at 13.8 V) : 5 W (High), 2.5 W (Low-3), 500 mW (Low-2), 20 mW (Low-1)
- Modulation system : Variable reactance frequency modulation
- Max. frequency deviation* : ± 5.0 kHz
- Spurious emissions* : Less than -60 dB (HIGH), Less than -40 dB (Low-1)
- Microphone impedance : 2 k Ω

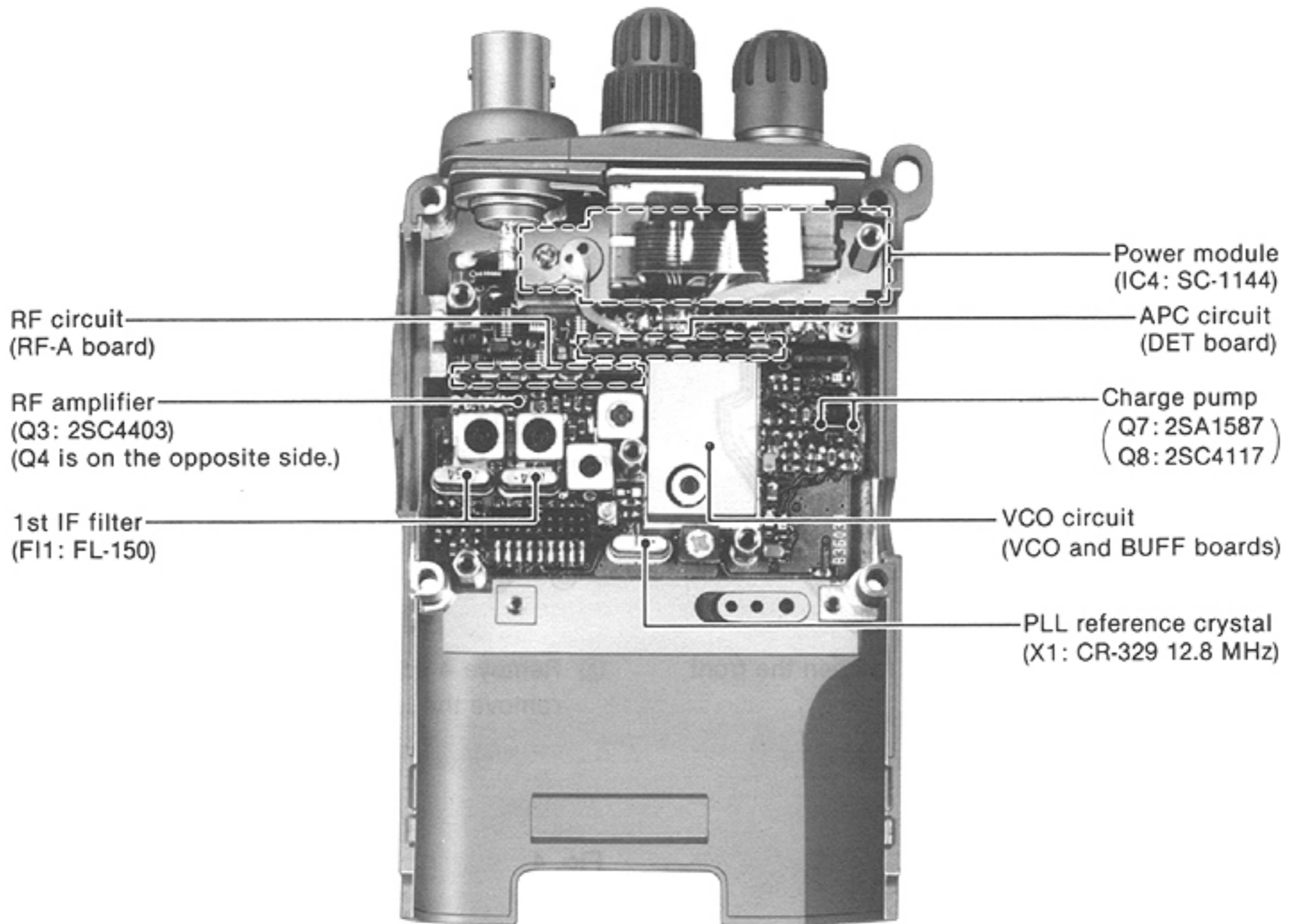
RECEIVER

- Receive system : Double-conversion superheterodyne
- Intermediate frequencies : 1st 30.85 MHz
2nd 455 kHz
- Sensitivity* : Less than 0.18 μV for 12 dB SINAD
- Squelch sensitivity (threshold) : Less than 0.16 μV
- Selectivity : More than 15 kHz/ -6 dB
Less than 30 kHz/ -60 dB
- Spurious response rejection ratio* : More than 60 dB
- Audio output power* (at 13.8 V) : 200 mW at 10 % distortion with an 8 Ω load
- Audio output impedance : 8 Ω

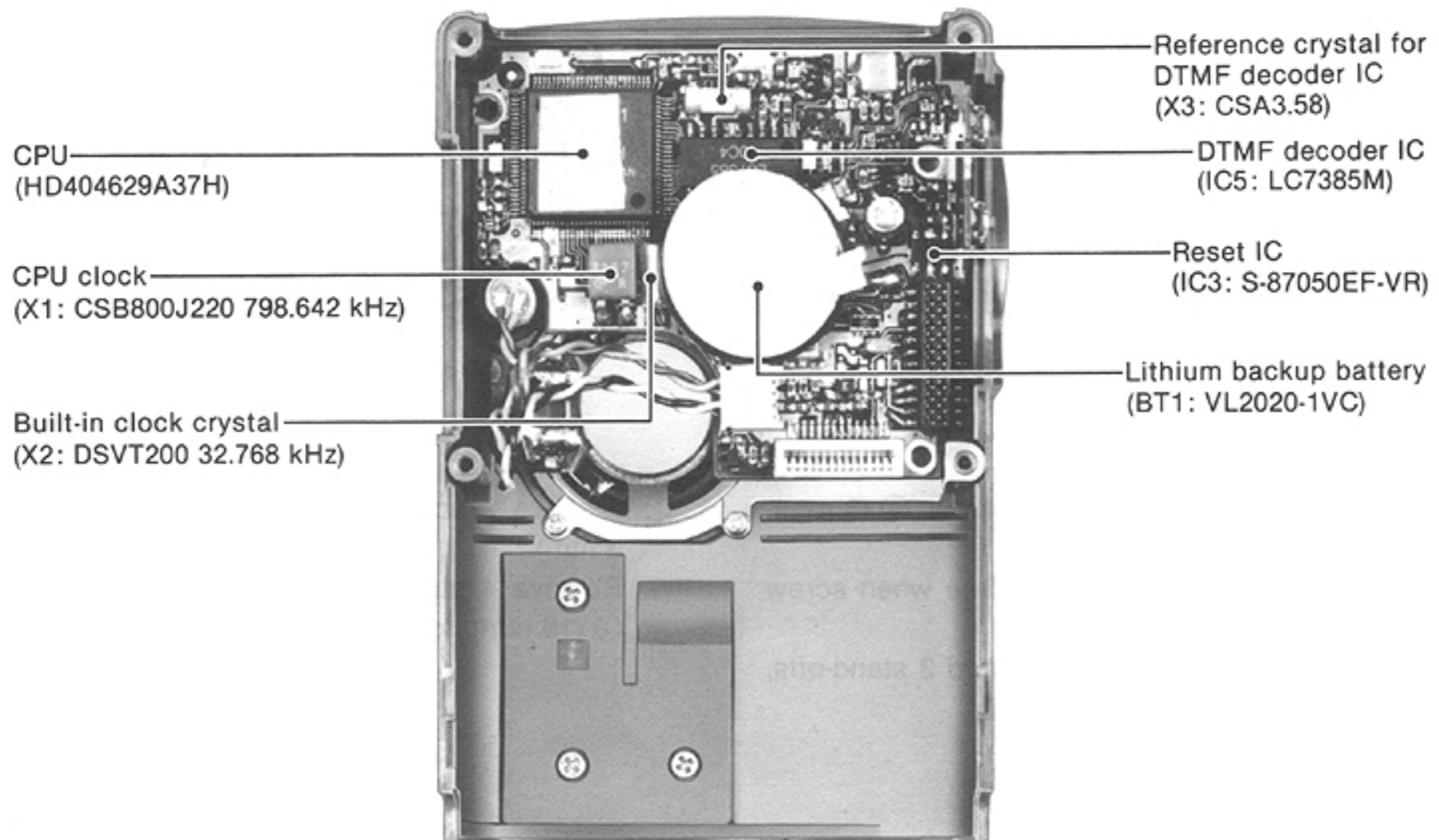
* Specifications guaranteed at a transceiver temperature of 25°C ($+77^{\circ}\text{F}$).
All stated specifications are subject to change without notice or obligation.

SECTION 2 INSIDE VIEWS

• MAIN-A UNIT



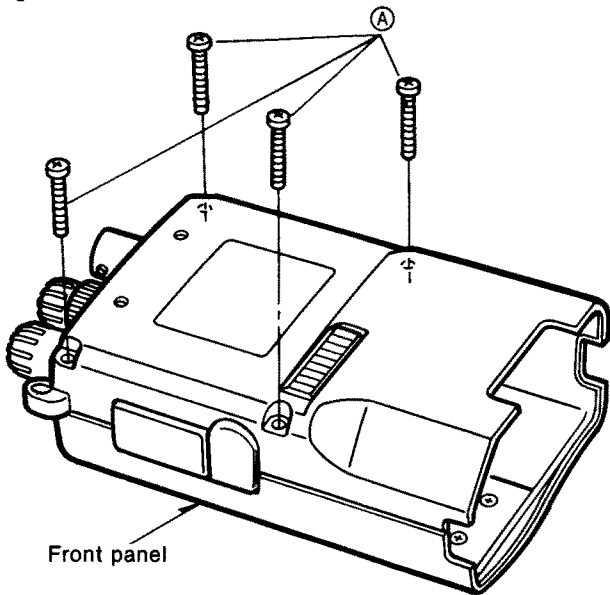
• LOGIC UNIT



*This picture shows the IC-21A U.S.A. version.

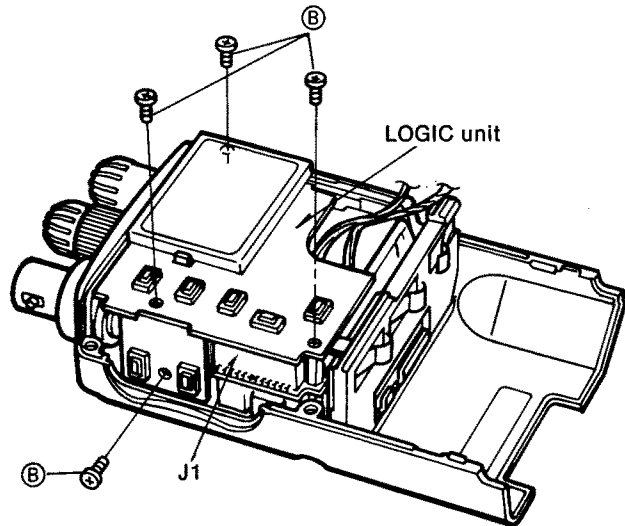
SECTION 3 DISASSEMBLY INSTRUCTIONS

Fig. 1



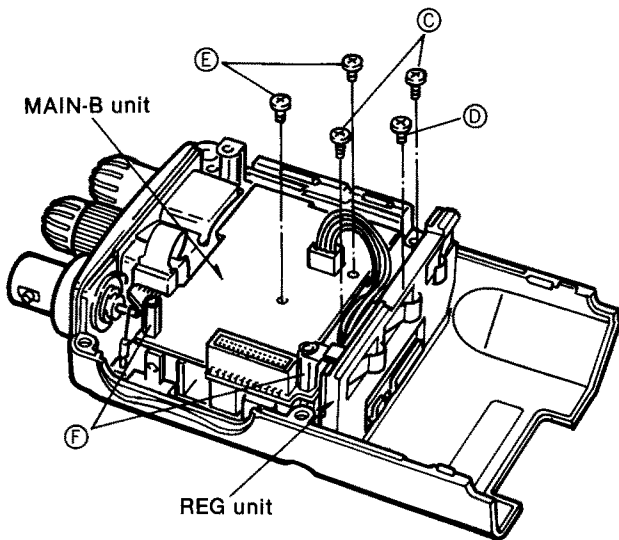
- ① Remove 4 screws, A (black, 15 mm), to open the front panel.

Fig. 2



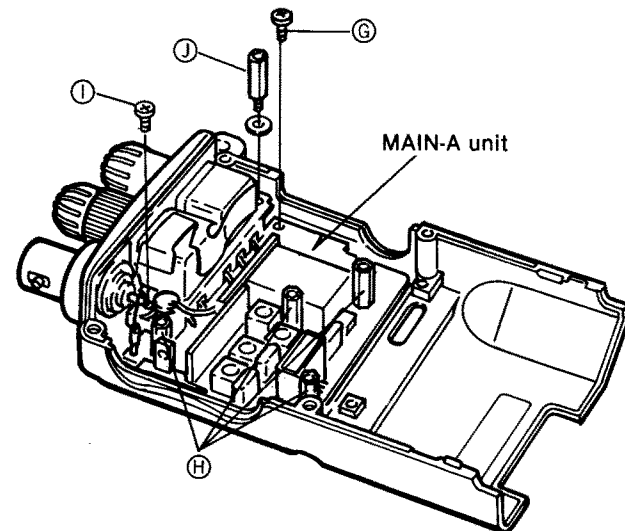
- ② Remove 4 screws, B (silver, 3 mm), then unplug J1 to remove the LOGIC unit.

Fig. 3



- ③ Remove 2 screws, C (4 mm), and 1 screw, D (3 mm), to remove the REG unit.
 • The battery release button comes free when screw D is removed.
- ④ Remove 2 screws, E (silver, 3 mm), and 2 stand-offs, F (11 mm), to remove the MAIN-B unit.

Fig. 4



- ⑤ Remove 2 screws, I (silver, 5 mm), and G (silver, 3 mm). Remove 4 stand-offs, H (13.5 mm), and 1 stand-off, J (19 mm), to remove the MAIN-A unit.

SECTION 4 CIRCUIT DESCRIPTION

4-1 RECEIVER CIRCUITS

4-1-1 ANTENNA SWITCHING CIRCUIT (MAIN-A UNIT)

The antenna switching circuit functions as a low-pass filter while receiving. However, its impedance becomes very high while transmitting (except for 20 mW at low-power) because of the power module's bias voltage. Thus, transmit signals are blocked from entering the receiver circuits.

Received signals pass through a low-pass filter (L7~L9, C36~C39) to suppress out-of-band signals. The filtered signals are applied to the antenna switching circuit (D7, D9~D12) and then to the RF circuit. The antenna switching circuit employs a $\lambda/4$ -type diode switching system.

4-1-2 RF CIRCUIT (MAIN-A 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 (L4, D5), and are applied to the RF amplifier (Q3, Q4). The amplified signals are passed through the other bandpass filter (L2, L3, D2, D3) to suppress unwanted signals. The filtered signals are applied to the 1st mixer circuit (Q2).

D2, D3 and D5 employ varactor diodes that track the bandpass filters and are controlled by the PLL lock voltage. These diodes tune the center frequency of an RF passband for wide bandwidth receiving and good image response rejection.

4-1-3 1ST MIXER AND IF CIRCUITS (MAIN-A AND MAIN-B 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 with the 1st LO signal from the VCO board to produce a 30.85 MHz 1st IF signal.

After passing through the matching circuit (L1), the 1st IF signal is applied to a pair of crystal filters (F1) to suppress out-of-band signals. The 1st IF signal is applied to the 2nd mixer circuit (IC2) on the MAIN-B unit via J1.

4-1-4 2ND IF AND DEMODULATOR CIRCUITS (MAIN-B 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 the MAIN-A unit is applied to the 2nd mixer section of IC2 (pin 20), and is mixed with the 2nd LO signal to be converted to a 455 kHz 2nd IF signal.

IC2 contains the 2nd mixer, local oscillator, limiter amplifier and quadrature detector circuits. The local oscillator section and X2 generate 30.395 MHz for the 2nd LO signal.

The 2nd IF signal from the 2nd mixer (IC2, pin 4) passes through the ceramic filter (F1) where unwanted signals are suppressed. It is then amplified at the limiter amplifier section (IC2, pin 6) and applied to the quadrature detector section (IC2, pin 10 and ceramic discriminator X1) to demodulate the 2nd IF signal into AF signals.

AF signals output from IC2 (pin 11) are applied to the de-emphasis circuit (R37, C40). This de-emphasis circuit is an integrated circuit with frequency characteristics of -6 dB/octave. The resulting signals are applied to the AF amplifier, DTMF decoder and optional tone squelch circuits.

• 2ND IF AND DEMODULATOR CIRCUITS

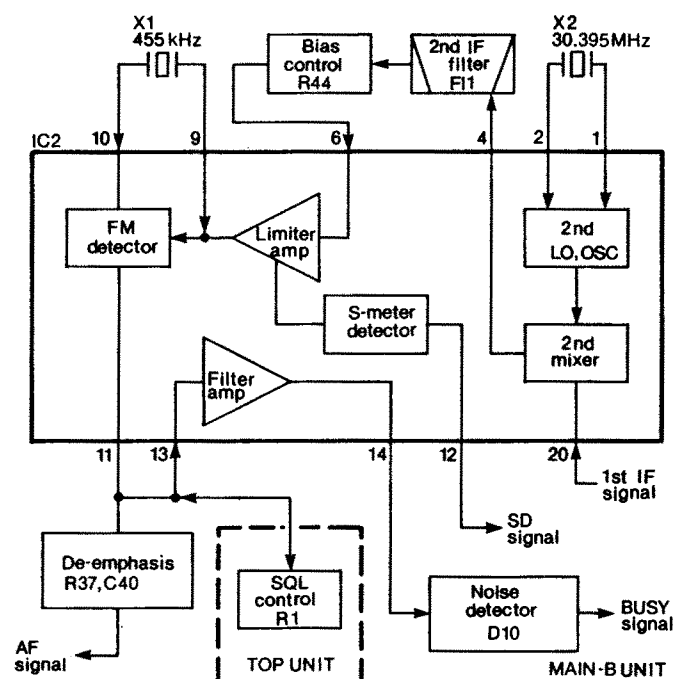


Fig. 1

4-1-5 AF AMP CIRCUIT (MAIN-B AND TOP UNITS)

The AF amplifier circuit, including an AF mute switch, amplifies the demodulated signal to drive a speaker.

AF signals are applied to Q3 and Q4 via Q11. Q3 is an active filter that functions as a high-pass filter to suppress subaudible tone signals for tone squelch operation. Q4 is also an active filter that functions as a low-pass filter to suppress higher noise signals.

The filtered signal is applied to the [VOL] control (R1) on the TOP unit via the AF mute switch (Q5). When the squelch is closed, Q5 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 voltage regulator (Q6~Q8) supplies power to the AF power amplifier. The AFON signal from the data expander (IC4), or the OPMU signal from the TSQL unit, control Q8 to reduce the current drain while the squelch is closed.

4-1-6 NOISE SQUELCH CIRCUIT (MAIN-B UNIT)

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

Some of the noise components in the AF signal from IC2 (pin 11) are applied to IC2 (pin 13) via C41. The [SQL] control (R1) on the TOP unit adjusts the pin 13 input level.

The active filter section in IC2 amplifies noise components of frequencies of 20 kHz and above, and outputs the resulting signals from pin 14. Output signals are rectified by D10 and are converted to DC voltage.

The rectified voltage triggers the squelch switch (Q14). The collector of Q14 outputs the squelch signal. The signal is then applied to the CPU (IC1, pin 33) on the LOGIC unit through the BUSY signal line and the CPU outputs the RMUTE and BUSY LED signals.

The RMUTE signal, decoded at the output expander (IC4), activates the AF mute circuit (Q5) to cut the AF signal. The BUSY LED signal is applied to Q3 on the LOGIC unit, turning OFF the receive indicator.

4-2 TRANSMITTER CIRCUITS

4-2-1 MICROPHONE AMPLIFIER (MAIN-B 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 IC9a (pin 3), and are pre-emphasized to +6 dB/octave. IC9a functions as the microphone amplifier and the limiter.

The output signals from IC9a (pin 1) pass through the splatter filter circuit (IC9b, pins 5 and 6) where signal components greater than 3 kHz are attenuated. IC9b (pin 4) then outputs an "MOD" signal. This signal is applied to the modulation circuit on the VCO board.

• MICROPHONE AMPLIFIER CIRCUIT

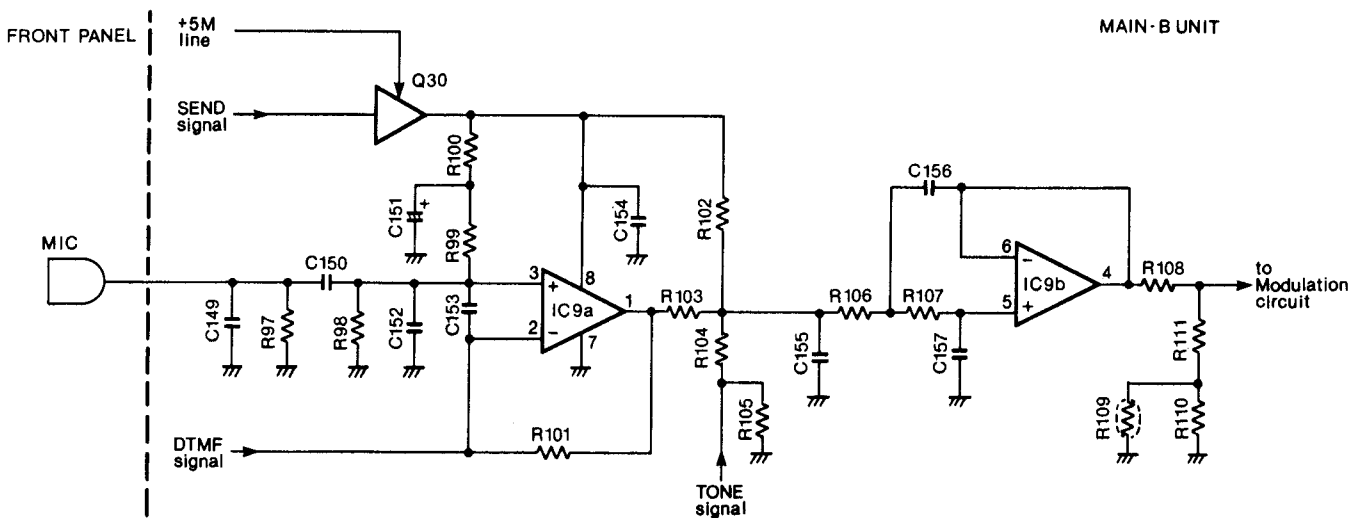


Fig. 2

4-2-2 MODULATION CIRCUIT (VCO BOARD)

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

The "MOD" signal changes the reactance of a diode (D2) to modulate the oscillated signal at the VCO circuit (Q1, Q2, D1). The VCO output is buffer-amplified at Q1 and Q3 on the BUFF board and is then applied to the transmit/receive switching circuit (D16, D17) on the MAIN-A unit.

4-2-3 DRIVE AMPLIFIER (MAIN-A 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 (D17) is amplified at the drive amplifier (Q15) to obtain approx. 20 mW.

An RF signal from the drive amplifier (Q15) passes through the output mixer switching circuit (D19) and is then applied to the RF power amplifier (IC4).

The voltage controlled by the APC circuit is applied to the collector of Q15 to protect the RF power module from damage by an antenna mismatch.

When low power 1 (output mixer) is selected, the output of the drive amplifier (Q15) bypasses the RF power amplifier through D19 and D8. The signal is passed through the low-pass filter and is then applied to the antenna connector. At this time, half of the antenna switching circuit (D7) activates to prevent the output power from entering the receiver circuit.

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

IC4 is a power module which provides more than 5 W of output power with a 13.5 V DC power source.

An RF signal from the drive amplifier (Q15) is applied to IC4 (pin 1). The amplified signal is output from pin 5, and applied to the antenna connector through the diode switching circuit (D11, D12) and low-pass filter.

4-2-5 APC CIRCUIT (MAIN-A UNIT AND DET BOARD)

The APC circuit protects the power module (IC4) from a mismatched output load and selects HIGH, LOW 2, or LOW 3 output power.

The output power level from the power module (IC4) is detected at the APC detector (D1, D2) on the DET board. When antenna impedance is matched at 50 Ω , the detected level is at a minimum. However, when antenna impedance is mismatched, the detected voltage is higher than when matched.

When the antenna impedance is mismatched, the base voltage of Q1 (R8 side on the DET board) is higher than the other base voltage of Q1 (R12 side: reference voltage). Q1 (R12 side) decreases the collector current of Q21 using Q20. Collector current of Q21 is used at the drive amplifier (Q15). Hence, when the antenna impedance is mismatched, the output power is decreased.

The output power setting, except for low power 1, uses the APC circuit. The PCON voltage from the data expander (IC2, pins 13~15) shifts the reference voltage, selecting the three output power levels (HIGH, LOW 2, or LOW 3).

• APC CIRCUIT

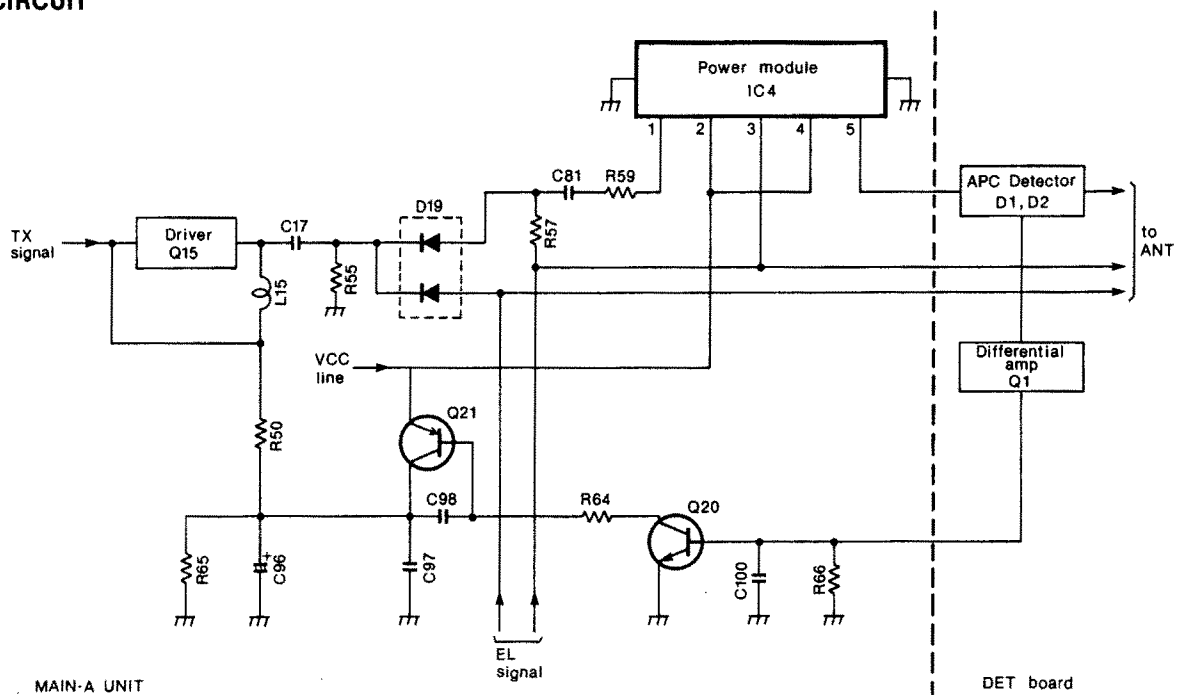


Fig. 3

4-2-6 TRANSMIT MUTE CIRCUIT (MAIN-A UNIT AND DET BOARD)

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

The TMUTE signal is output from the data expander (IC4 in the MAIN-B unit) and controls T5V and the APC circuit. When the TMUTE signal is "LOW," the APC control voltage is grounded by Q2 on the DET board to interrupt the transmission.

4-2-7 ANTENNA SWITCHING CIRCUIT (MAIN-A UNIT)

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

When transmitting, D11 and D12 are turned ON. The RF output signal is applied to the antenna connector via D11, D12 and the low-pass filter (L7~L9, C36~C39). At this time, D9 and D10 are also turned ON to activate the low-pass filter (L5, L6, C32) as a resonator circuit.

4-3 PLL CIRCUITS

4-3-1 GENERAL (MAIN-A UNIT)

A PLL circuit provides steady variable oscillation of the transmit frequency and the receive 1st LO frequency.

The oscillated signal at the VCO (Q1, Q2 on the VCO board) is applied to the one chip dual modulus prescaler (IC1). The prescaler (IC1) divides the VCO output and reference frequency, and detects their phase.

The phase detected signal is rectified to DC voltages by the loop filter (R35~R37, C57~C58) which are then applied to the VCO circuit to control and stabilize the oscillation frequency.

4-3-2 REFERENCE OSCILLATOR CIRCUIT (MAIN-A UNIT)

A 12.8 MHz reference frequency is produced by the oscillator (Q5) and X1 with C46 providing frequency control. The reference frequency is divided by 2560 to obtain 5 kHz.

• PLL CIRCUIT

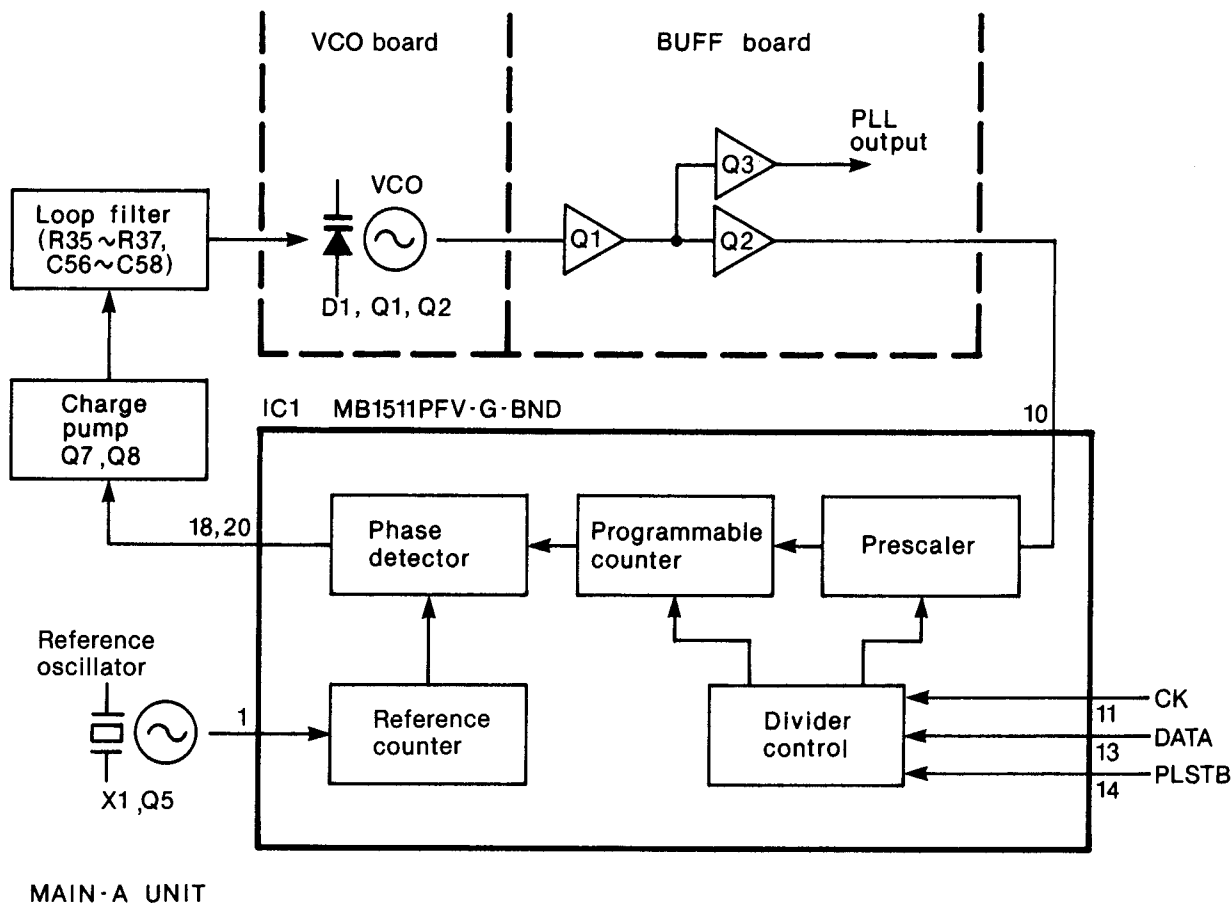


Fig. 4

4-3-3 VCO CIRCUIT (VCO BOARD)

The VCO circuit (Q1, Q2) generates the transmit frequency and the receive 1st LO frequency.

The varactor diode (D1) provides frequency control. While transmitting, IC2 (pin 11, MAIN-A unit) becomes "LOW" to turn D2 OFF using Q11 on the MAIN-A unit. Hence, C3 is added for oscillation. At this time, the microphone signal is applied to the D2 cathode for modulation. While receiving, IC2 (pin 11, MAIN-A unit) becomes "HIGH" to turn D1 ON using Q11 on the MAIN-A unit. Hence, C6 is ignored for oscillation.

The output signal from the VCO circuit is applied to buffer amplifiers (Q1, Q2) on the BUFF board. The amplified signal at Q2 is applied to the PLL IC (IC1) on the MAIN-A unit. At the same time, the output signal from the VCO circuit is applied to buffer amplifiers (Q1, Q3) on the BUFF board, and then to the transmit/receive switching circuit (D16, D17). The buffer amplifiers do not permit the PLL output signal from affecting the VCO oscillation.

4-3-4 PROGRAMMABLE DIVIDER AND PHASE DETECTOR CIRCUITS (MAIN-A 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 1100 MHz inputs.

The input signal from the PLL IC (IC1, pin 10) passes through the two-modulus prescaler and the programmable counter sections of IC1. A 12.8 MHz reference frequency from Q5 and X1 is applied to IC1 (pin 1) 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 (pins 18, 20)

4-3-5 LOOP FILTER CIRCUIT (MAIN-A UNIT)

The phase-detected signal (pulse signal) from IC1 (pins 18, 20) is amplified at the charge pump (Q7, Q8) and converted to DC voltage by the lag-lead loop filter (R35 ~R37, C56~C58).

The converted DC voltage (PLL lock voltage) is applied to the VCO circuit through the LV signal line to control the oscillation. Q9 provides Rx bandpass filter tuning.

4-3-6 UNLOCK SENSOR CIRCUIT (MAIN-A UNIT)

When the PLL circuit is unlocked, IC1 (pin 8) becomes "LOW" and the "LOW" signal turns Q6 ON. "HIGH" signal output from Q6 is applied to the CPU (pin 31) as an unlock signal.

4-4 POWER SUPPLY CIRCUITS

4-4-1 VOLTAGE LINES

LINE	DESCRIPTION
Vcc	The attached battery pack voltage or external DC power voltage.
+5V	Continuous 5 V converted from the Vcc line at IC8 on the MAIN-B unit. This voltage is supplied even when the power is turned OFF.
+5M	Microphone/miscellaneous 5 V controlled by the power saver function and SEND signal line. This voltage is supplied while the power saver is OFF or during transmitting. This voltage is converted from the Vcc line at Q24 and Q25 on the MAIN-B unit using IC8 output as the reference voltage.
+5C	Common 5 V controlled by the PCON signal line ([POWER] switch). This voltage is converted from the Vcc line at Q7 and Q8 on the LOGIC unit.
R5V	Receive 5 V controlled by the power saver function and SEND signal line. This voltage is converted from the Vcc line at Q26 and Q27 on the MAIN-B unit using the AND gate (IC7) output as the reference voltage.
T5V	Transmit 5 V controlled by the TMUTE signal line. This voltage is converted from the Vcc line at Q18 and Q19 on the MAIN-A unit.
PLL 5V	PLL 5 V controlled by the power saver function. This voltage is converted from the Vcc line at Q16 and Q17 on the MAIN-A unit using the AND gate (IC3) output as the reference voltage.

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

When no external power source is applied and the battery pack is discharged, voltage is applied to the CPU (IC1, pin 97) from the lithium backup battery (BT1) installed in the transceiver to keep the CPU on standby.

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

• CPU POWER SUPPLY CIRCUIT

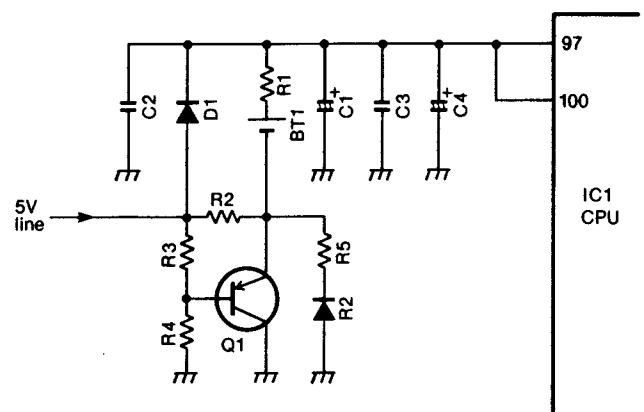


Fig. 5

4-4-3 R5V AND PLL 5 V SWITCHING CIRCUITS (MAIN-A AND MAIN-B UNITS)

The IC-2iA/E has a power saver to reduce current consumption by approx. 1/4. (When the variable power saver is in use.)

The PSC (Power Saver Control) signal from the data expander (IC4, pin 13) on the MAIN-B unit is applied to IC7 and Q31. IC7 controls the R5V regulator (Q26, Q27, D13) to turn the R5V voltage ON and OFF. R5V turns OFF during power saving or transmitting. Q31 controls the +5M regulator (Q24, Q25, D12) to turn the +5M voltage ON and OFF. +5M turns OFF during power saving.

The PSC (Power Saver Control) signal from the data expander (IC2, pin 7) on the MAIN-A unit is applied to IC3. IC3 controls the PLL 5 V regulator (Q16, Q17, D20) to turn the PLL 5 V voltage ON and OFF. PLL 5 V turns OFF during power saving.

4-4-4 CHARGING CIRCUIT (REG UNIT)

Voltage from the [DC12.5V] jack is applied to the constant current circuit (Q1, Q2) to charge an attached battery pack (except the BP-124).

When a battery pack is attached, the current from D2 charges the attached battery pack. The charging current is determined by the battery pack internal resistance.

4-5 OTHER CIRCUITS

4-5-1 DISPLAY BACKLIGHT CIRCUIT (LOGIC UNIT)

When the [LIGHT] switch is pushed, pin 30 of the CPU outputs "HIGH." This signal is applied to Q5 to turn ON the backlight LEDs (DS3, DS4).

4-5-2 DTMF ENCODER/DECODER CIRCUIT (LOGIC UNIT)

The IC-2iA/E has a DTMF encoder/decoder circuit that provides pager and code squelch functions.

Pins 98 and 99 of the CPU (TONEC/TONER) output a DTMF code signal. R10 adjusts the DTMF code signal deviation. The signal is applied to the microphone amplifier (IC9) on the MAIN-B unit via the DTMF signal line.

IC5 is a DTMF decoder IC. The detected AF signal from the MAIN-B unit is applied to pin 2. IC5 decodes the AF signal and outputs the binary data as DTMF code from pins 11~14. This data is applied to the CPU; then, the CPU compares this with the pre-programmed DTMF code.

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

IC3 detects Vcc voltage. When the Vcc voltage line becomes more than approx. 3.7 V, IC3 (pin 4) turns the BACK UP port (IC1 pin 26) "HIGH" and the CPU (IC1) restarts operation.

The CPU is reset when IC1 (pin 10) becomes "HIGH." The AND gate IC (IC2) outputs a reset signal when both input terminals are "HIGH."

The [FUNC] switch and the [POWER] switch lines are connected to the AND gate IC.

4-5-4 TRANSMIT/RECEIVE INDICATOR CIRCUIT (LOGIC UNIT)

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

The indicator lights up in red, as the transmit indicator while transmitting, using the T5V voltage; and lights up in green, as the busy indicator while the squelch opens, using CPU pin 48 output via the inverter (Q3).

4-5-5 CLOCK OSCILLATOR CIRCUIT (LOGIC UNIT)

IC1 oscillates the 800 kHz CPU system clock signal using X1. IC1 oscillates the 32.768 kHz clock signal for the built-in clock using X2.

4-5-6 TONE SQUELCH UNIT (U.S.A version: TSQL UNIT)

The UT-72 TONE SQUELCH UNIT provides pocket beep, tone squelch and programmable tone encoder functions.

IC1 encodes and decodes subaudible tone frequency signals of 67.0 Hz~250.3 Hz. The serial data from the CPU (IC1) passes through the data expanders (IC2, MAIN-A unit; IC4, MAIN-B unit) and is then applied to the serial/parallel converter section of IC1 to set the tone frequency.

The tone signal is output from pin 16 and is applied to the microphone amplifier (IC9b) on the MAIN-B unit through the TONE signal line. R12 adjusts the deviation level.

The received signal from the DETO signal line is applied to the active low-pass filter (Q1) and then to pin 24 of IC1. The filtered signal is compared with the programmed tone signal. Pin 13 of IC1 becomes "LOW" when the received signal includes the programmed tone frequency.

• RESET CIRCUIT

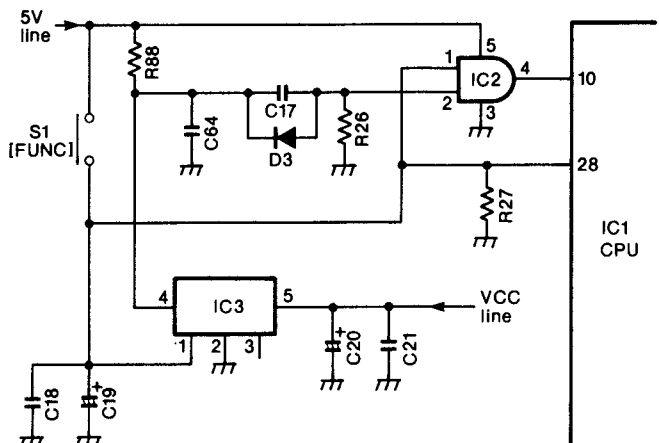


Fig. 6

4-6 PORT ALLOCATIONS

4-6-1 CPU (LOGIC UNIT IC1)

PIN NUMBER	PORT NAME	DESCRIPTION
1	AVcc	Power source input for A/D converter.
2	AN0	Input port for the S-indicator.
8, 9	OSC1, OSC2	I/O port for the CPU oscillator.
10	RESET	CPU is initialized when this port receives "LOW."
11, 12	X1, X2	I/O ports for clock reference oscillator.
14	D0	Input port for the [POWER] switch. The transceiver starts operation when this port receives "HIGH" for 1 sec.
15	TONEO	Outputs a tone signal 1750 Hz or 88.5 Hz.
16	PTT	Input port for the [PTT] switch. "LOW": transmit "HIGH": receive
17, 18	UP, DOWN	Input ports for the dial up/down signal. pin 17 "LOW": dial up pin 18 "LOW": dial down
19	TOE	Outputs the control signal to the DTMF decoder IC (IC5 in the LOGIC unit).
20~23	KS0~KS3	Output key strobe signals.
26	INT1	CPU enters backup mode when this port receives "LOW."
27	INT2	Input port for the DTMF decoder acknowledge signal. When the transceiver receives a correct DTMF signal, this port receives "LOW."
28	FUNC	Input port for the [FUNC] switch.
29	LIGHT	Input port for the [LIGHT] switch.
30	LIGHTO	Outputs the LCD backlight signal. "HIGH": lights
31	UNLK	Input port for the PLL lock condition. "LOW": PLL is unlocked.
32	TSQL	Input port for the optional tone squelch acknowledge signal. When the transceiver receives a correct tone signal, this port receives "HIGH."
33	BUSY	Input port for the noise squelch condition. "HIGH": squelch open. "LOW": squelch close.
34	IOSTB	Outputs a strobe signal to the data expander IC (IC4 in the MAIN-B unit and IC2 in the MAIN-A unit).
35	SCK	Outputs serial clock signal.
36	PLSTB	Outputs a strobe signal to the PLL IC (IC1 in the MAIN-A unit).
37	SDATA	Outputs serial data.
38~41	KI0~KI3	Input ports for the key matrix.
42~45	KR0~KR3	Input ports for the key matrix. Also used for DTMF data input.
46, 47	CONT1, CONT2	Output for the LCD contrast signal.
48	BUSY LED	Outputs the receive LED signal.
49	PCON	Outputs the power save control signal.

PIN NUMBER	PORT NAME	DESCRIPTION
50~96		Used as LCD driver output.
97	Vcc	Input port for the CPU power source.
98, 99	DTMF	Output DTMF row and column signals.
100	VTref	Input port for the DTMF encoder power source.

4-6-2 DATA EXPANDER (MAIN-B UNIT, IC4)

PIN NUMBER	PORT NAME	DESCRIPTION
4	AF ON	Outputs the AF power amplifier control signal. "HIGH": AF amp activates. "LOW": AF amp deactivates.
5	MIC MUTE	Outputs microphone mute signal. "HIGH": mic mute
6	R MUTE	Outputs a receive mute signal. "HIGH": receive mute
7	T MUTE	Outputs transmit mute signal. "HIGH": transmit mute
13	PSC	Outputs the power save control signal.
14	SEND	Outputs Tx/Rx switching signal. "HIGH": transmit "LOW": receive

4-6-3 DATA EXPANDER (MAIN-A UNIT IC2)

PIN NUMBER	PORT NAME	DESCRIPTION
7	PSC	Outputs the power save control signal.
11	SHIFT	Outputs VCO shift signal for the receive frequency oscillation.
12	EL	Outputs the output miser signal for 20 mW transmit power.
13, 14	POW2, POW1	Output transmit power selection signals.

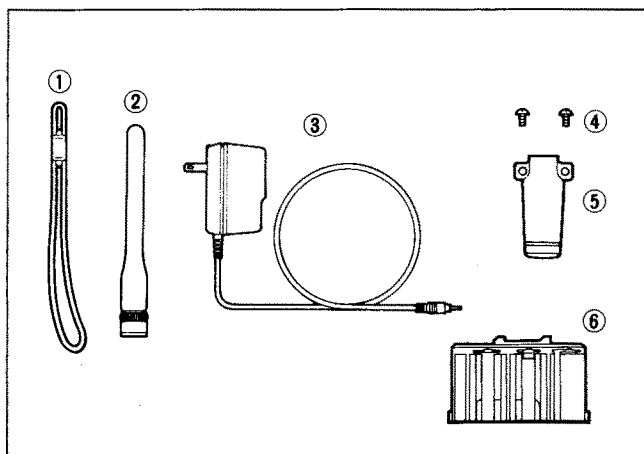
SECTION 5 MECHANICAL PARTS

• CHASSIS PARTS

LABEL NUMBER	ORDER NO.	DESCRIPTION	QTY.	LABEL NUMBER	ORDER NO.	DESCRIPTION	QTY.
①	8610008280	Knob N196 [VOL]	1	⑳	8810007510	Screw PH B0 No. 0 M2 × 2.5	3
②	8610008270	Knob N195 [SQL]	1	㉑	8930024880	1132 battery pad	1
③	8610008260	Knob N194 [DIAL]	1	㉒	8930025420	1132 front rubber	1
④	8830000710	VR nut (G)	2	㉓	8930026521	1132 front shield-1	1
⑤	8010013261	1132 top panel-1	1	㉔	8810003850	Screw PH B0 No. 0-3 M1.4 × 2.5 NI	4
⑥	8930025440	1132 top seal	1	㉕	8930024900	1132 speaker holder	1
⑦	8930024890	1132 VR plate	1	㉖	2510000580	Speaker EAS-2P104D	1
⑧	7210001910	RV-199 (RK0972210) 10 KB/10 KA [SQL/VOL]	1	㉗	7700000861	Microphone WM-62A103	1
				㉘	8930014940	752 microphone holder	1
⑨	2260001400	SW-122 (RK097103H) [DIAL]	1	㉙	8210007980	1132 front panel (A) (incl. window plate) (IC-2iA)	1
⑩	8510007720	1132 module shield	1		8210007990	1132 front panel (B) (incl. window plate) (IC-2iE)	1
⑪	8810006920	Screw PH No. 0 M2 × 5 NI	1	㉚	6950000250	1132 ANT cap	1
⑫	8930025411	Stand-off (BI)-1	1	㉛	6510013810	ANT connector BNC-RM-F1 (incl. nut)	1
⑬	8850001320	1132 washer	1	㉜	8810005490	Screw FH No. 0-3 M2 × 3	1
⑭	8810005860	Screw PH No. 0 M2 × 3 NI	7	㉝	8930025430	1132 PTT rubber	1
⑮	8930026510	Aluminum sheet S	1	㉞	8810001560	Screw PH PT M2 × 15 ZK	4
⑯	8510007740	1132 VCO case	1	㉟	8930025591	1132 release button-1	1
⑰	8930025400	Stand-off (BH)	4	㊱	8010013250	1132 rear panel	1
⑱	6450000130	HSJ1102-01-540 [MIC]	1	㊲	8810005830	Screw PH B0 No. 0 M2 × 3	5
㉑	6450001060	HSJ1493-01-010 [SP]	1	㊳	8930024930	1132 battery lock holder	1
㉒	6450001080	HEC3800-01-010 [DC 12.5 V]	1	㊴	8820000720	1132 battery lock	1
㉓	8930025471	1132 jack holder-1	1	㊵	8510007690	1132 PR shield	1
㉔	8930025450	1132 connector seal	1	㊶	8810004850	Screw PH No. 0 M2 × 4	2
㉕	8930025390	Stand-off (BG)	2	㊷	8930012640	Push spring (K)	1
㉖	6910007110	Reflector ALH31 × 20.1 × 0.9	1	㊸	8310027281	1132 contact base-1	1
㉗	8930025640	LCD contact SRCN-1132	2	㊹	8930022100	1144 contact terminal	3
㉘	5030000840	LCD LD-BU5496J (E-5607)	1				
㉙	8930024940	1132 LCD holder	1				
㉚	8930026180	1181 seal (USA)	1				

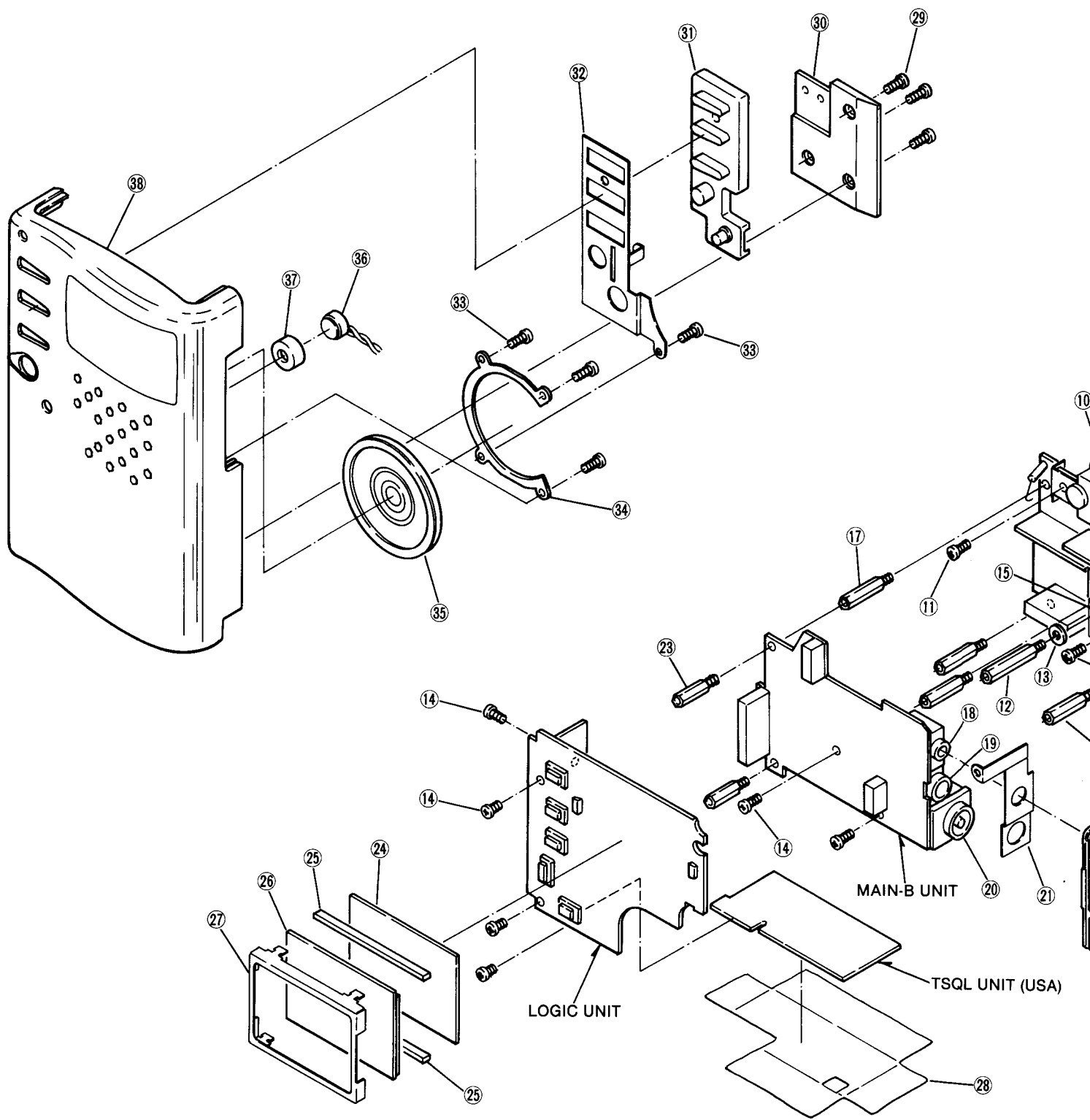
Screw abbreviations B0: Self-tapping screw PH: Pan head FH: Flat head NI: Nickel ZK: Black

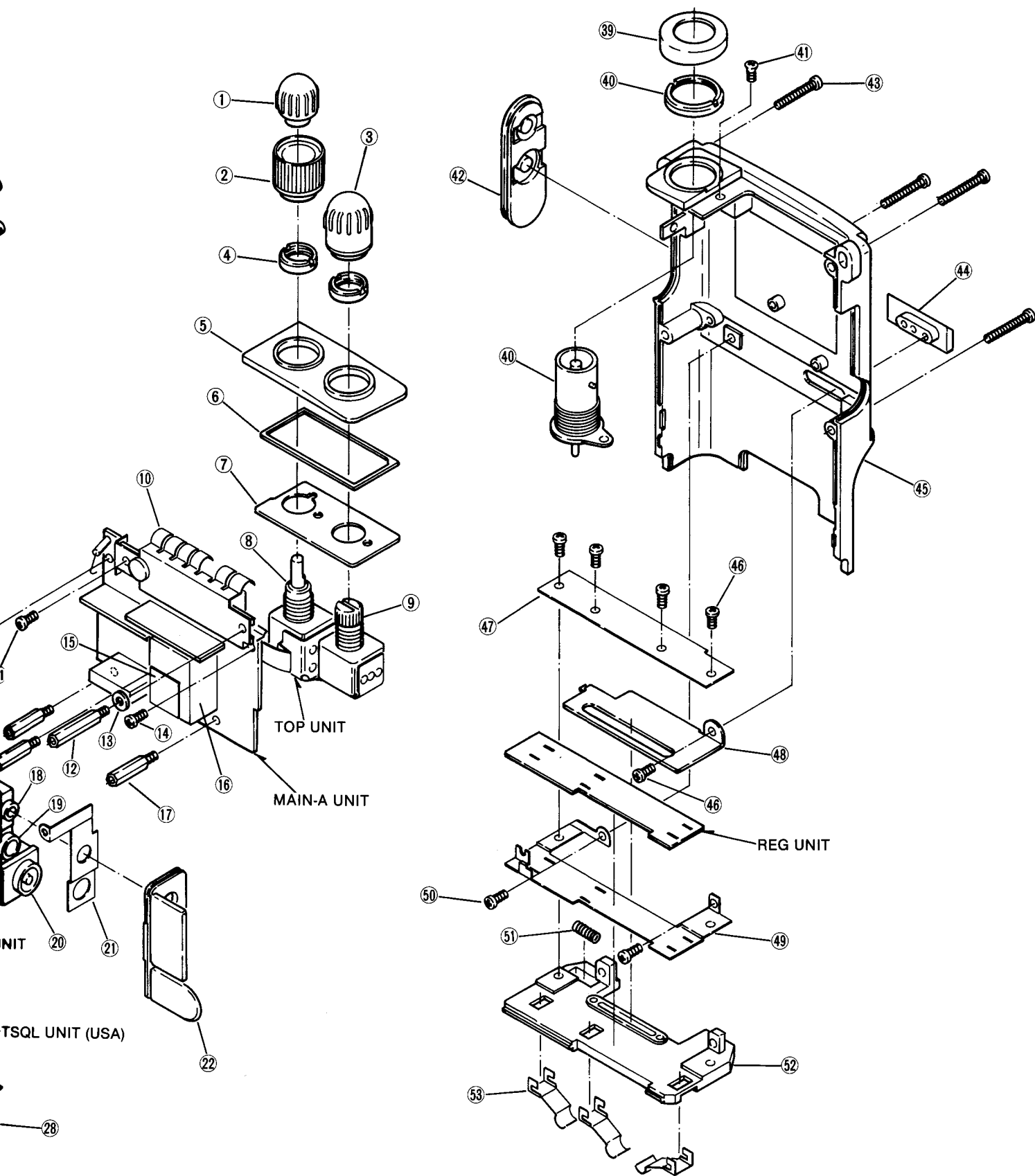
• ACCESSORIES



LABEL NUMBER	ORDER NO.	DESCRIPTION	QTY.
①	8010013920	Strap belt HK-006	1
②	Optional product	FA-140BF FLEXIBLE ANTENNA	1
③	Optional product	BC-77A WALL CHANGER (USA)	1
		BC-77V WALL CHANGER (AUS)	1
		BC-78D WALL CHANGER (EUR, ITA)	1
		BC-78E WALL CHANGER (SEA)	1
④	8810005730	Screw BuH M3 × 3 ZK BS	2
⑤	8930024910	1132 belt clip	1
⑥	Optional product	BP-121 BATTERY PACK (Except TPE)	1
		BP-120 BATTERY PACK (TPE)	1

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





SECTION 6 PARTS LIST

[LOGIC UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1140002500	S. IC	HD404629A37H
IC2	1130006550	S. IC	TC7S08FU (TE85R)
IC3	1180000680	S. IC	S-87050EF-VR-T1
IC5	1130004330	S. IC	LC7385M
Q1	1520000430	S. TRANSISTOR	2SB1462-R (TX)
Q3	1590000650	S. TRANSISTOR	DTA144TU T107
Q4	1590000650	S. TRANSISTOR	DTA144TU T107
Q5	1530002280	S. TRANSISTOR	2SC4081 T107 S
Q6	1510000620	S. TRANSISTOR	2SA1576 T107 S
Q7	1530002280	S. TRANSISTOR	2SC4081 T107 S
Q8	1510000620	S. TRANSISTOR	2SA1576 T107 S
Q9	1590000650	S. TRANSISTOR	DTA144TU T107
Q12	1510000620	S. TRANSISTOR	2SA1576 T107 S
D1	1750000340	S. DIODE	1SS357 (TPHR3)
D2	1790000660	S. DIODE	MA728 (TW)
D3	1790000810	S. DIODE	MA132A (TX)
D9	1790000820	S. DIODE	MA132K (TX) (#02, #03, #05~#07, #09)
D10	1790000820	S. DIODE	MA132K (TX) (#04)
D11	1790000820	S. DIODE	MA132K (TX) (#07)
	1790000830	S. DIODE	MA132HK (TX) (#02, #03, #06)
	1790000850	S. DIODE	MA132WK (TX) (#04)
D12	1790000830	S. DIODE	MA132HK (TX) (#05, #06, #09)
D13	1790000810	S. DIODE	MA132A (TX)
D15	1790000870	S. DIODE	MA1S121 (TX)
D23	1790000590	S. DIODE	MA110 (TW)
D24	1790000590	S. DIODE	MA110 (TW)
D25	1750000130	S. DIODE	DA204U T107
X1	6060000260	CERAMIC	CSB800J220
X2	6050005801	XTAL	DS-VT200 (32.768kHz)
X3	6060000150	S. CERAMIC	CSAC3.58MGC300CD
R1	7030003360	S. RESISTOR	ERJ3GEYJ 221 V (220 Ω)
R2	7030003620	S. RESISTOR	ERJ3GEYJ 333 V (33 kΩ)
R3	7030003680	S. RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R4	7030004020	S. RESISTOR	ERJ3GEYG 243 V (24 kΩ)
R5	7030003360	S. RESISTOR	ERJ3GEYJ 221 V (220 Ω)
R6	7030003640	S. RESISTOR	ERJ3GEYJ 473 V (47 kΩ)
R7	7410000610	S. ARRAY	EXB-V4V 153JV
R9	7030003620	S. RESISTOR	ERJ3GEYJ 333 V (33 kΩ)
R10	7310003630	S. TRIMMER	EVM-1XSX50 BQ4 (473)
R11	7030003600	S. RESISTOR	ERJ3GEYJ 223 V (22 kΩ)
R12	7030003800	S. RESISTOR	ERJ3GEYJ 105 V (1 MΩ)
R17	7310003630	S. TRIMMER	EVM-1XSX50 BQ4 (473)
R18	7030003800	S. RESISTOR	ERJ3GEYJ 105 V (1 MΩ) (#02~#04)
R19	7030003580	S. RESISTOR	ERJ3GEYJ 153 V (15 kΩ)
R20	7030003610	S. RESISTOR	ERJ3GEYJ 273 V (27 kΩ)
R21	7030003640	S. RESISTOR	ERJ3GEYJ 473 V (47 kΩ) (#02~#04)
R22	7030003800	S. RESISTOR	ERJ3GEYJ 105 V (1 MΩ)
R23	7410000580	S. ARRAY	EXB-V4V 224JV
R26	7030003800	S. RESISTOR	ERJ3GEYJ 105 V (1 MΩ)
R27	7030003760	S. RESISTOR	ERJ3GEYJ 474 V (470 kΩ)

[LOGIC UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
R28	7030003360	S. RESISTOR	ERJ3GEYJ 221 V (220 Ω)
R34	7030003200	S. RESISTOR	ERJ3GEYJ 100 V (10 Ω)
R35	7030003720	S. RESISTOR	ERJ3GEYJ 224 V (220 kΩ)
R36	7030003720	S. RESISTOR	ERJ3GEYJ 224 V (220 kΩ)
R38	7410000700	S. ARRAY	EXB-V8V 105JV
R42	7410000800	S. ARRAY	EXB-V8V 103JV
R48	7410000710	S. ARRAY	EXB-V8V 224JV
R51	7030003590	S. RESISTOR	ERJ3GEYJ 183 V (18 kΩ)
R53	7030003760	S. RESISTOR	ERJ3GEYJ 474 V (470 kΩ)
R54	7030003720	S. RESISTOR	ERJ3GEYJ 224 V (220 kΩ)
R55	7030003720	S. RESISTOR	ERJ3GEYJ 224 V (220 kΩ)
R57	7030003620	S. RESISTOR	ERJ3GEYJ 333 V (33 kΩ)
R58	7030003480	S. RESISTOR	ERJ3GEYJ 222 V (2.2 kΩ)
R59	7030003350	S. RESISTOR	ERJ3GEYJ 181 V (180 Ω)
R60	7030003350	S. RESISTOR	ERJ3GEYJ 181 V (180 Ω)
R63	7030003800	S. RESISTOR	ERJ3GEYJ 105 V (1 MΩ)
R64	7030003600	S. RESISTOR	ERJ3GEYJ 223 V (22 kΩ)
R65	7030003740	S. RESISTOR	ERJ3GEYJ 334 V (330 kΩ)
R66	7030003680	S. RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R67	7030003680	S. RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R84	7030003330	S. RESISTOR	ERJ3GEYJ 121 V (120 Ω) (#02~#04, #06, #07, #09)
	7030003370	S. RESISTOR	ERJ3GEYJ 271 V (270 Ω) (#05)
R88	7030003560	S. RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R89	7030003800	S. RESISTOR	ERJ3GEYJ 105 V (1 MΩ)
R90	7030003680	S. RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R91	7030003650	S. RESISTOR	ERJ3GEYJ 563 V (56 kΩ)
R92	7030003690	S. RESISTOR	ERJ3GEYJ 124 V (120 kΩ)
C1	4550004080	S. TANTALUM	F950J336MWCAQ2
C2	4030008630	S. CERAMIC	C1608 JF 1C 104Z-T-A
C3	4030008630	S. CERAMIC	C1608 JF 1C 104Z-T-A
C4	4550004070	S. TANTALUM	F950J226MVCAQ2
C5	4030008630	S. CERAMIC	C1608 JF 1C 104Z-T-A
C6	4030008880	S. CERAMIC	C1608 JB 1C 223K-T-A
C7	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C12	4030006740	S. CERAMIC	C1608 SL 1H 820J-T-A
C13	4030006800	S. CERAMIC	C1608 SL 1H 221J-T-A
C14	4030006630	S. CERAMIC	C1608 SL 1H 150J-T-A
C15	4030006630	S. CERAMIC	C1608 SL 1H 150J-T-A
C17	4030008630	S. CERAMIC	C1608 JF 1C 104Z-T-A
C18	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C19	4550004150	S. TANTALUM	F950J476MYC
C20	4510004430	S. ELECTROLYTIC	ECEV1CV220WR
C21	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C23	4030006710	S. CERAMIC	C1608 SL 1H 470J-T-A
C31	4030006710	S. CERAMIC	C1608 SL 1H 470J-T-A
C32	4030006710	S. CERAMIC	C1608 SL 1H 470J-T-A
C33	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C35	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C36	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C38	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C39	4550004150	S. TANTALUM	F950J476MYC
C40	4030008630	S. CERAMIC	C1608 JF 1C 104Z-T-A
C41	4030008630	S. CERAMIC	C1608 JF 1C 104Z-T-A
C42	4030007070	S. CERAMIC	C1608 CH 1H 330J-T-A
C43	4030007080	S. CERAMIC	C1608 CH 1H 390J-T-A
C44	4030008630	S. CERAMIC	C1608 JF 1C 104Z-T-A
C58	4550004160	S. TANTALUM	F951V104MQAAQ2 (#05)

S.=Surface mount

[LOGIC UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
	4550004170	S. TANTALUM	F951V224MQAAQ2 (#02~#04, #06, #07, #09)
C60	4030006710	S. CERAMIC	C1608 SL 1H 470J-T-A
C64	4030006900	S. CERAMIC	C1608 JB 1E 103K-T-A
C65	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C66	4030008630	S. CERAMIC	C1608 JF 1C 104Z-T-A
C69	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
DS1	5030000840	LCD	LD-BU5496J (E-5607) [FUNCTION DISPLAY]
DS2	5040001110	S. LED	SLM-23VMWS T97B [TX/RX INDICATOR]
DS3	5040001260	LED	LN01301C (Q)
DS4	5040001260	LED	LN01301C (Q)
S2	2260001680	S. SWITCH	SKQDPB [S]
S3	2260001680	S. SWITCH	SKQDPB [MONI]
S6	2260001680	S. SWITCH	SKQDPB [V/M MW]
S7	2260001680	S. SWITCH	SKQDPB [POWER]
S9	2260001680	S. SWITCH	SKQDPB [LIGHT]
BT1	3020000160	LITHIUM	VL2020-1VC
J1	6510014540	S. CONNECTOR	5-176313-4
J2	6510014560	CONNECTOR	53048-0410
J3	6510012880	S. CONNECTOR	CEW9114-0201
EP1	0910034685	PCB	B 3292E (LOGIC)
EP2	8930025640	LCD CONTACT	SRCN-1132

[PTT BOARD]

REF. NO.	ORDER NO.	DESCRIPTION	
S1	2260001680	S. SWITCH	SKQDPB [FUNC]
S2	2260001680	S. SWITCH	SKQDPB [PTT]
EP1	0910034545	PCB	B 3301E (PTT)

[MAIN-A UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1140002130	S. IC	MB1511PFV-G-BND
IC2	1130005810	S. IC	BU4094BF-T1
IC3	1130006550	S. IC	TC7S08FU (TE85R)
IC4	1150000950	IC	SC1144

[MAIN-A UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
Q1	1530002600	S. TRANSISTOR	2SC4215-O (TE85R)
Q2	1560000550	S. FET	2SK882-Y (TE85R)
Q3	1530002560	S. TRANSISTOR	2SC4403-3-TR
Q4	1530002570	S. TRANSISTOR	2SC4405-3-TR
Q5	1530002560	S. TRANSISTOR	2SC4403-3-TR
Q6	1510000620	S. TRANSISTOR	2SA1576 T107 S
Q7	1510000830	S. TRANSISTOR	2SA1587-GR (TE85R)
Q8	1530003010	S. TRANSISTOR	2SC4117-GR (TE85R)
Q9	1560000540	S. FET	2SK880-Y (TE85R)
Q10	1590000650	S. TRANSISTOR	DTA144TU T107
Q11	1590000660	S. TRANSISTOR	DTC144TU T107
Q12	1590001540	S. TRANSISTOR	UMD6 TL
Q13	1590001540	S. TRANSISTOR	UMD6 TL
Q14	1590001550	S. TRANSISTOR	DTB114EK WT146
Q15	1530002030	S. TRANSISTOR	2SC3772-3-TA
Q16	1530002280	S. TRANSISTOR	2SC4081 T107 S
Q17	1510000620	S. TRANSISTOR	2SA1576 T107 S
Q18	1530002280	S. TRANSISTOR	2SC4081 T107 S
Q19	1520000080	TRANSISTOR	2SB909M R
Q20	1530002280	S. TRANSISTOR	2SC4081 T107 S
Q21	1520000200	S. TRANSISTOR	2SB798-T2 DK
D1	1790000620	S. DIODE	MA77 (TW)
D2	1720000370	S. VARICAP	HVU350TRF
D3	1720000370	S. VARICAP	HVU350TRF
D4	1790000620	S. DIODE	MA77 (TW)
D5	1720000370	S. VARICAP	HVU350TRF
D6	1790000620	S. DIODE	MA77 (TW)
D7	1790000620	S. DIODE	MA77 (TW)
D8	1790000620	S. DIODE	MA77 (TW)
D9	1790000620	S. DIODE	MA77 (TW)
D10	1790000620	S. DIODE	MA77 (TW)
D11	1790000620	S. DIODE	MA77 (TW)
D12	1790000620	S. DIODE	MA77 (TW)
D13	1790000590	S. DIODE	MA110 (TW)
D14	1790000590	S. DIODE	MA110 (TW)
D15	1790000590	S. DIODE	MA110 (TW)
D16	1790000620	S. DIODE	MA77 (TW)
D17	1790000620	S. DIODE	MA77 (TW)
D18	1720000240	S. DIODE	1SV172 (TE85R)
D19	1790000450	S. DIODE	MA862 (TX)
D20	1790000590	S. DIODE	MA110 (TW)
D21	1790000590	S. DIODE	MA110 (TW)
X1	6050007230	XTAL	CR-329 UM-1/T 12.80000 MHz
F11	2010001220	FILTER	30M15B9 (FL-150)
L1	6150003210	COIL	LS-319
L2	6150003430	COIL	LS-378
L3	6150003120	COIL	LS-321
L4	6150003120	COIL	LS-321
L5	6110002070	COIL	LA-227
L6	6110002040	COIL	LA-225
L7	6110002000	COIL	LA-226
L8	6110002120	COIL	LA-228
L9	6110002070	COIL	LA-227
L10	6200001790	S. COIL	NL 252018T-022M
L11	6200001790	S. COIL	NL 252018T-022M
L12	6110002000	COIL	LA-226
L13	6200001520	S. COIL	MLF2012D R82K-T
L14	6200002180	S. COIL	NL 252018T-R12J
L15	6200002180	S. COIL	NL 252018T-R12J
R1	7030003400	S. RESISTOR	ERJ3GEYJ 471 V (470 Ω)

S. = Surface mount

[MAIN-A UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
R2	7030003400	S. RESISTOR	ERJ3GEYJ 471 V (470 Ω)
R3	7030003430	S. RESISTOR	ERJ3GEYJ 821 V (820 Ω)
R4	7030003630	S. RESISTOR	ERJ3GEYJ 393 V (39 kΩ)
R5	7030003410	S. RESISTOR	ERJ3GEYJ 561 V (560 Ω)
R6	7030003400	S. RESISTOR	ERJ3GEYJ 471 V (470 Ω)
R7	7030003290	S. RESISTOR	ERJ3GEYJ 560 V (56 Ω)
R8	7030003480	S. RESISTOR	ERJ3GEYJ 222 V (2.2 kΩ)
R9	7030003560	S. RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R10	7030003680	S. RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R11	7030003680	S. RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R12	7030003560	S. RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R13	7030003280	S. RESISTOR	ERJ3GEYJ 470 V (47 Ω)
R14	7030003520	S. RESISTOR	ERJ3GEYJ 472 V (4.7 kΩ)
R15	7030003580	S. RESISTOR	ERJ3GEYJ 153 V (15 kΩ)
R16	7030003240	S. RESISTOR	ERJ3GEYJ 220 V (22 Ω)
R17	7030003330	S. RESISTOR	ERJ3GEYJ 121 V (120 Ω)
R18	7030003680	S. RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R19	7030003560	S. RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R20	7030003520	S. RESISTOR	ERJ3GEYJ 472 V (4.7 kΩ)
R21	7030003520	S. RESISTOR	ERJ3GEYJ 472 V (4.7 kΩ)
R22	7030003560	S. RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R23	7510000430	S. THERMISTOR	DTN-T203K202LS (T)
R24	7030003680	S. RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R25	7030003200	S. RESISTOR	ERJ3GEYJ 100 V (10 Ω)
R26	7030003480	S. RESISTOR	ERJ3GEYJ 222 V (2.2 kΩ)
R27	7030003680	S. RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R28	7030003640	S. RESISTOR	ERJ3GEYJ 473 V (47 kΩ)
R29	7030003600	S. RESISTOR	ERJ3GEYJ 223 V (22 kΩ)
R30	7030003200	S. RESISTOR	ERJ3GEYJ 100 V (10 Ω)
R31	7030003570	S. RESISTOR	ERJ3GEYJ 123 V (12 kΩ)
R32	7030003570	S. RESISTOR	ERJ3GEYJ 123 V (12 kΩ)
R33	7030003570	S. RESISTOR	ERJ3GEYJ 123 V (12 kΩ)
R34	7030003570	S. RESISTOR	ERJ3GEYJ 123 V (12 kΩ)
R35	7030003520	S. RESISTOR	ERJ3GEYJ 472 V (4.7 kΩ)
R36	7030003480	S. RESISTOR	ERJ3GEYJ 222 V (2.2 kΩ)
R37	7030003550	S. RESISTOR	ERJ3GEYJ 822 V (8.2 kΩ)
R38	7030003800	S. RESISTOR	ERJ3GEYJ 105 V (1 MΩ)
R39	7030003680	S. RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R40	7030003560	S. RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R41	7030003560	S. RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R42	7030003720	S. RESISTOR	ERJ3GEYJ 224 V (220 kΩ)
R43	7030003690	S. RESISTOR	ERJ3GEYJ 124 V (120 kΩ)
R44	7030003710	S. RESISTOR	ERJ3GEYJ 184 V (180 kΩ)
R45	7310003580	S. TRIMMER	EVM-1XSX50 B15 (104)
R46	7030003620	S. RESISTOR	ERJ3GEYJ 333 V (33 kΩ)
R47	7030003680	S. RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R48	7030003520	S. RESISTOR	ERJ3GEYJ 472 V (4.7 kΩ)
R49	7030003480	S. RESISTOR	ERJ3GEYJ 222 V (2.2 kΩ)
R50	7030003370	S. RESISTOR	ERJ3GEYJ 271 V (270 Ω)
R51	7030003360	S. RESISTOR	ERJ3GEYJ 221 V (220 Ω)
R52	7030003600	S. RESISTOR	ERJ3GEYJ 223 V (22 kΩ)
R53	7030003540	S. RESISTOR	ERJ3GEYJ 682 V (6.8 kΩ)
R54	7030003200	S. RESISTOR	ERJ3GEYJ 100 V (10 Ω)
R55	7030003520	S. RESISTOR	ERJ3GEYJ 472 V (4.7 kΩ)
R56	7030003450	S. RESISTOR	ERJ3GEYJ 122 V (1.2 kΩ)
R57	7030003520	S. RESISTOR	ERJ3GEYJ 472 V (4.7 kΩ)
R59	7030003250	S. RESISTOR	ERJ3GEYJ 270 V (27 Ω)
R61	7030003320	S. RESISTOR	ERJ3GEYJ 101 V (100 Ω)
R62	7030003560	S. RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R63	7030003520	S. RESISTOR	ERJ3GEYJ 472 V (4.7 kΩ)
R64	7030003520	S. RESISTOR	ERJ3GEYJ 472 V (4.7 kΩ)
R65	7030003500	S. RESISTOR	ERJ3GEYJ 332 V (3.3 kΩ)
R66	7030003650	S. RESISTOR	ERJ3GEYJ 563 V (56 kΩ)
R67	7030003520	S. RESISTOR	ERJ3GEYJ 472 V (4.7 kΩ)
R68	7030003680	S. RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R69	7030003320	S. RESISTOR	ERJ3GEYJ 101 V (100 Ω)
C1	4030006900	S. CERAMIC	C1608 JB 1E 103K-T-A
C2	4030006900	S. CERAMIC	C1608 JB 1E 103K-T-A
C3	4030006900	S. CERAMIC	C1608 JB 1E 103K-T-A

[MAIN-A UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
C4	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C5	4030006610	S. CERAMIC	C1608 SL 1H 100D-T-A
C6	4030006660	S. CERAMIC	C1608 SL 1H 220J-T-A
C7	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C8	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C9	4030006710	S. CERAMIC	C1608 SL 1H 470J-T-A
C10	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C11	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C12	4030006620	S. CERAMIC	C1608 SL 1H 120J-T-A
C13	4030006740	S. CERAMIC	C1608 SL 1H 820J-T-A
C14	4030006910	S. CERAMIC	C1608 CH 1H 0R5C-T-A
C15	4030006560	S. CERAMIC	C1608 SL 1H 050C-T-A
C16	4030006740	S. CERAMIC	C1608 SL 1H 820J-T-A
C17	4030006600	S. CERAMIC	C1608 SL 1H 090D-T-A
C18	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C19	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C20	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C21	4030006690	S. CERAMIC	C1608 SL 1H 330J-T-A
C23	4030006620	S. CERAMIC	C1608 SL 1H 120J-T-A
C24	4030006600	S. CERAMIC	C1608 SL 1H 090D-T-A
C25	4030006640	S. CERAMIC	C1608 SL 1H 180J-T-A
C27	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C28	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C29	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C30	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C32	4030007050	S. CERAMIC	C1608 CH 1H 220J-T-A
C34	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C36	4030006940	S. CERAMIC	C1608 CH 1H 030C-T-A
C37	4030007060	S. CERAMIC	C1608 CH 1H 270J-T-A
C38	4030006980	S. CERAMIC	C1608 CH 1H 070D-T-A
C39	4030007050	S. CERAMIC	C1608 CH 1H 220J-T-A
C40	4030007030	S. CERAMIC	C1608 CH 1H 150J-T-A
C41	4030007060	S. CERAMIC	C1608 CH 1H 270J-T-A
C42	4030006980	S. CERAMIC	C1608 CH 1H 070D-T-A
C43	4030007120	S. CERAMIC	C1608 CH 1H 820J-T-A
C44	4030006960	S. CERAMIC	C1608 CH 1H 050C-T-A
C45	4030007040	S. CERAMIC	C1608 CH 1H 180J-T-A
C46	4610001260	S. TRIMMER	ECR-JA02H E12W
C47	4030007130	S. CERAMIC	C1608 CH 1H 101J-T-A
C48	4030007130	S. CERAMIC	C1608 CH 1H 101J-T-A
C49	4030007170	S. CERAMIC	C1608 CH 1H 221J-T-A
C50	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C51	4030008960	S. CERAMIC	C2012 JB 1C 104K-T-A
C52	4030006900	S. CERAMIC	C1608 JB 1E 103K-T-A
C54	4030006550	S. CERAMIC	C1608 SL 1H 040C-T-A
C56	4030006630	S. CERAMIC	C1608 JF 1C 104Z-T-A
C57	4550004090	S. TANTALUM	F951A475MRAAQ2
C58	4030008960	S. CERAMIC	C2012 JB 1C 104K-T-A
C59	4030006850	S. CERAMIC	C1608 JB 1H 471K-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
C64	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C65	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C66	4030006900	S. CERAMIC	C1608 JB 1E 103K-T-A
C67	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C68	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C69	4030008960	S. CERAMIC	C2012 JB 1C 104K-T-A
C70	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C71	4030006560	S. CERAMIC	C1608 SL 1H 050C-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	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C76	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C77	4030007020	S. CERAMIC	C1608 CH 1H 120J-T-A
C78	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C79	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C80	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C81	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A

S.=Surface mount

[MAIN-A UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
C82	4030006900	S. CERAMIC	C1608 JB 1E 103K-T-A
C83	4550004140	S. TANTALUM	F951C106MWCAQ2
C84	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C85	4030007020	S. CERAMIC	C1608 CH 1H 120J-T-A
C86	4030007080	S. CERAMIC	C1608 CH 1H 390J-T-A
C87	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C88	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C89	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C90	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C91	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C92	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C93	4550004060	S. TANTALUM	F950J106MSAAQ2
C94	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C95	4550004140	S. TANTALUM	F951C106MWCAQ2
C96	4550004140	S. TANTALUM	F951C106MWCAQ2
C97	4030006900	S. CERAMIC	C1608 JB 1E 103K-T-A
C98	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C99	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C100	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C101	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C102	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C103	4030006900	S. CERAMIC	C1608 JB 1E 103K-T-A
C104	4030006510	S. CERAMIC	C1608 SL 1H 0R5C-T-A
C105	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
J1	6510014530	S. CONNECTOR	4-176833-8
W1	7120000380	JUMPER	JPW 01 R-01
EP1	0910035982	PCB	B 3603B (MAIN-A)

[RF-A BOARD]

REF. NO.	ORDER NO.	DESCRIPTION	
C3	4030006630	S. CERAMIC	C1608 SL 1H 150J-T-A
C4	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C5	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C6	4030006630	S. CERAMIC	C1608 SL 1H 150J-T-A
C7	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C8	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
EP1	0910034832	PCB	B 3297B (RF-A)

[VCO BOARD]

REF. NO.	ORDER NO.	DESCRIPTION	
Q1	1530002920	S. TRANSISTOR	2SC4226-T2 R25
Q2	1530002920	S. TRANSISTOR	2SC4226-T2 R25
D1	1720000370	S. VARICAP	HVU350TRF
D2	1790000620	S. DIODE	MA77 (TW)
L1	6200001520	S. COIL	MLF2012D R82K-T
L2	6130002480	S. COIL	LB-277
R1	7030003560	S. RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R2	7030003560	S. RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R3	7030003720	S. RESISTOR	ERJ3GEYJ 224 V (220 kΩ)
R4	7030003550	S. RESISTOR	ERJ3GEYJ 822 V (8.2 kΩ)
R5	7030003360	S. RESISTOR	ERJ3GEYJ 221 V (220 Ω)
R6	7030003550	S. RESISTOR	ERJ3GEYJ 822 V (8.2 kΩ)
R7	7030003320	S. RESISTOR	ERJ3GEYJ 101 V (100 Ω)
R8	7030003360	S. RESISTOR	ERJ3GEYJ 221 V (220 Ω)
C1	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C2	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C3	4030007050	S. CERAMIC	C1608 CH 1H 220J-T-A
C4	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C6	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C7	4030006910	S. CERAMIC	C1608 CH 1H 0R5C-T-A
C8	4030006910	S. CERAMIC	C1608 CH 1H 0R5C-T-A
C9	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C10	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C11	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C12	4030006520	S. CERAMIC	C1608 SL 1H 010C-T-A
EP1	0910032644	PCB	B 3299D (VCO)

[RF-A BOARD]

REF. NO.	ORDER NO.	DESCRIPTION	
Q1	1530002560	S. TRANSISTOR	2SC4403-3-TR
Q2	1530002560	S. TRANSISTOR	2SC4403-3-TR
Q3	1530002560	S. TRANSISTOR	2SC4403-3-TR
L1	6200001790	S. COIL	NL 252018T-022M
L2	6200001790	S. COIL	NL 252018T-022M
R1	7030003440	S. RESISTOR	ERJ3GEYJ 102 V (1 kΩ)
R2	7030003610	S. RESISTOR	ERJ3GEYJ 273 V (27 kΩ)
R3	7030003640	S. RESISTOR	ERJ3GEYJ 473 V (47 kΩ)
R4	7030003340	S. RESISTOR	ERJ3GEYJ 151 V (150 Ω)
R5	7030003290	S. RESISTOR	ERJ3GEYJ 560 V (56 Ω)
R6	7030003280	S. RESISTOR	ERJ3GEYJ 470 V (47 Ω)
R7	7030003630	S. RESISTOR	ERJ3GEYJ 393 V (39 kΩ)
R8	7030003290	S. RESISTOR	ERJ3GEYJ 560 V (56 Ω)
R9	7030003630	S. RESISTOR	ERJ3GEYJ 393 V (39 kΩ)
C1	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C2	4030006510	S. CERAMIC	C1608 SL 1H 0R5C-T-A

S. =Surface mount

[BUFF BOARD]

REF. NO.	ORDER NO.	DESCRIPTION	
Q1	1530002560	S. TRANSISTOR	2SC4403-3-TR
Q2	1530002560	S. TRANSISTOR	2SC4403-3-TR
Q3	1590001530	S. TRANSISTOR	UMX5 TL
L1	6200001500	S. COIL	MLF2012D R12K-T
R1	7030003550	S. RESISTOR	ERJ3GEYJ 822 V (8.2 kΩ)
R2	7030003380	S. RESISTOR	ERJ3GEYJ 331 V (330 Ω)
R3	7030003550	S. RESISTOR	ERJ3GEYJ 822 V (8.2 kΩ)
R4	7030003320	S. RESISTOR	ERJ3GEYJ 101 V (100 Ω)
R5	7030003380	S. RESISTOR	ERJ3GEYJ 331 V (330 Ω)
R6	7030003610	S. RESISTOR	ERJ3GEYJ 273 V (27 kΩ)
R7	7030003610	S. RESISTOR	ERJ3GEYJ 273 V (27 kΩ)
R8	7030003290	S. RESISTOR	ERJ3GEYJ 560 V (56 Ω)
R9	7030003320	S. RESISTOR	ERJ3GEYJ 101 V (100 Ω)
C1	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C2	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C3	4030006860	S. CERAMIC	C1608 SL 1H 220J-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	4030006660	S. CERAMIC	C1608 SL 1H 220J-T-A
C8	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C9	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C10	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C11	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C12	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
EP1	0910035482	PCB	B 3577B (BUFF)

[DET BOARD]

REF. NO.	ORDER NO.	DESCRIPTION	
Q1	1590001520	S. TRANSISTOR	UMS1 TL
Q2	1510000620	S. TRANSISTOR	2SA1576 T107 S
D1	1790000980	S. DIODE	MA742 (TX)
D2	1790000980	S. DIODE	MA742 (TX)
D3	1160000060	S. DIODE	DAN202U T107
L1	6200001500	S. COIL	MLF2012D R12K-T
R1	7030003480	S. RESISTOR	ERJ3GEYJ 222 V (2.2 kΩ)
R2	7030003340	S. RESISTOR	ERJ3GEYJ 151 V (150 Ω)
R3	7030003470	S. RESISTOR	ERJ3GEYJ 182 V (1.8 kΩ)
R4	7030003340	S. RESISTOR	ERJ3GEYJ 151 V (150 Ω)
R5	7030003480	S. RESISTOR	ERJ3GEYJ 222 V (2.2 kΩ)
R6	7030003480	S. RESISTOR	ERJ3GEYJ 222 V (2.2 kΩ)
R7	7030003600	S. RESISTOR	ERJ3GEYJ 223 V (22 kΩ)
R8	7030003700	S. RESISTOR	ERJ3GEYJ 154 V (150 kΩ)
R9	7030003610	S. RESISTOR	ERJ3GEYJ 273 V (27 kΩ)
R10	7030003670	S. RESISTOR	ERJ3GEYJ 823 V (82 kΩ)
R11	7510000280	THERMISTOR	ERT-D2FIL 154S

[DET BOARD]

REF. NO.	ORDER NO.	DESCRIPTION	
R12	7030003440	S. RESISTOR	ERJ3GEYJ 102 V (1 kΩ)
R13	7030003600	S. RESISTOR	ERJ3GEYJ 223 V (22 kΩ)
C1	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C2	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C3	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C4	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C5	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C6	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C7	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C8	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C9	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C10	4550004090	S. TANTALUM	F951A475MRAAQ2
C11	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
EP1	0910034922	PCB	B 3489B (DET)

[MAIN-B UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
IC1	1110001810	S. IC	TA7368F (TP1)
IC2	1120001650	S. IC	TK10487MTR
IC4	1130005810	S. IC	BU4094BF-T1
IC5	1130006550	S. IC	TC7S08FU (TE85R)
IC7	1130006550	S. IC	TC7S08FU (TE85R)
IC8	1180000800	S. IC	S-81350HG-KD-T1
IC9	1110002490	S. IC	M5218FP-73A
Q3	1530002280	S. TRANSISTOR	2SC4081 T107 S
Q4	1530002280	S. TRANSISTOR	2SC4081 T107 S
Q5	1590001450	S. FET	2SJ144-GR (TE85R)
Q6	1520000270	S. TRANSISTOR	2SB1182 TL Q
Q7	1530002280	S. TRANSISTOR	2SC4081 T107 S
Q8	1530002280	S. TRANSISTOR	2SC4081 T107 S
Q9	1590001450	S. FET	2SJ144-GR (TE85R)
Q11	1590001450	S. FET	2SJ144-GR (TE85R)
Q12	1590000720	S. TRANSISTOR	DTA144EU T107
Q13	1590000430	S. TRANSISTOR	DTC144EU T107
Q14	1530002280	S. TRANSISTOR	2SC4081 T107 S
Q15	1590000430	S. TRANSISTOR	DTC144EU T107
Q16	1510000620	S. TRANSISTOR	2SA1576 T107 S
Q17	1590000430	S. TRANSISTOR	DTC144EU T107
Q21	1530002280	S. TRANSISTOR	2SC4081 T107 S
Q23	1590000430	S. TRANSISTOR	DTC144EU T107
Q24	1520000200	S. TRANSISTOR	2SB798-T2 DK
Q25	1530002280	S. TRANSISTOR	2SC4081 T107 S
Q26	1510000620	S. TRANSISTOR	2SA1576 T107 S
Q27	1530002280	S. TRANSISTOR	2SC4081 T107 S
Q28	1590000430	S. TRANSISTOR	DTC144EU T107
Q29	1530002280	S. TRANSISTOR	2SC4081 T107 S
Q30	1590000720	S. TRANSISTOR	DTA144EU T107
Q31	1590000430	S. TRANSISTOR	DTC144EU T107
D6	1160000050	S. DIODE	DAP202U T107
D8	1750000130	S. DIODE	DA204U T107
D9	1160000060	S. DIODE	DAN202U T107
D10	1790000980	S. DIODE	MA742 (TX)

S.=Surface mount

[MAIN-B UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
D11	1790000590	S. DIODE	MA110 (TW)
D12	1790000590	S. DIODE	MA110 (TW)
D13	1790000590	S. DIODE	MA110 (TW)
D14	1790000680	S. DIODE	SB20-03P-TD
D15	1160000060	S. DIODE	DAN202U T107
X1	6070000060	DISCRIMINATOR	CDBM455C7
X2	6050007190	XTAL	CR-325 UM-1/T 30.39500MHz
FI1	2020000550	CERAMIC	CFUM455E
R10	7030003580	S. RESISTOR	ERJ3GEYJ 153 V (15 kΩ)
R11	7030003710	S. RESISTOR	ERJ3GEYJ 184 V (180 kΩ)
R12	7030003320	S. RESISTOR	ERJ3GEYJ 101 V (100 Ω)
R13	7030003480	S. RESISTOR	ERJ3GEYJ 222 V (2.2 kΩ)
R14	7030003560	S. RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R15	7030003630	S. RESISTOR	ERJ3GEYJ 393 V (39 kΩ)
R16	7030003630	S. RESISTOR	ERJ3GEYJ 393 V (39 kΩ)
R17	7030003760	S. RESISTOR	ERJ3GEYJ 474 V (470 kΩ)
R18	7030003340	S. RESISTOR	ERJ3GEYJ 151 V (150 Ω)
R19	7030003200	S. RESISTOR	ERJ3GEYJ 100 V (10 Ω)
R20	7030003420	S. RESISTOR	ERJ3GEYJ 681 V (680 Ω)
R21	7030003420	S. RESISTOR	ERJ3GEYJ 681 V (680 Ω)
R22	7030003420	S. RESISTOR	ERJ3GEYJ 681 V (680 Ω)
R23	7030003520	S. RESISTOR	ERJ3GEYJ 472 V (4.7 kΩ)
R24	7030003800	S. RESISTOR	ERJ3GEYJ 105 V (1 MΩ)
R25	7030003560	S. RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R26	7030003600	S. RESISTOR	ERJ3GEYJ 223 V (22 kΩ)
R27	7030003760	S. RESISTOR	ERJ3GEYJ 474 V (470 kΩ)
R28	7030003680	S. RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R30	7030003680	S. RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R31	7030003680	S. RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R32	7030003680	S. RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R33	7030003680	S. RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R36	7030003480	S. RESISTOR	ERJ3GEYJ 222 V (2.2 kΩ)
R37	7030003400	S. RESISTOR	ERJ3GEYJ 471 V (470 Ω)
R38	7030003540	S. RESISTOR	ERJ3GEYJ 682 V (6.8 kΩ)
R39	7030000360	S. RESISTOR	MCR10EZHZ 680 Ω (681)
R40	7030003490	S. RESISTOR	ERJ3GEYJ 272 V (2.7 kΩ)
R41	7030003520	S. RESISTOR	ERJ3GEYJ 472 V (4.7 kΩ)
R42	7030003760	S. RESISTOR	ERJ3GEYJ 474 V (470 kΩ)
R43	7030003340	S. RESISTOR	ERJ3GEYJ 151 V (150 Ω)
R44	7310003740	S. TRIMMER	EVM-1XSX50 BE3 (222)
R46	7030003640	S. RESISTOR	ERJ3GEYJ 473 V (47 kΩ)
R47	7030003760	S. RESISTOR	ERJ3GEYJ 474 V (470 kΩ)
R48	7030003690	S. RESISTOR	ERJ3GEYJ 124 V (120 kΩ)
R49	7030003800	S. RESISTOR	ERJ3GEYJ 105 V (1 MΩ)
R50	7030003540	S. RESISTOR	ERJ3GEYJ 682 V (6.8 kΩ)
R51	7410000770	S. ARRAY	EXB-V4V 102JV
R53	7030003450	S. RESISTOR	ERJ3GEYJ 122 V (1.2 kΩ)
R54	7030003560	S. RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R55	7030003400	S. RESISTOR	ERJ3GEYJ 471 V (470 Ω)
R56	7030003400	S. RESISTOR	ERJ3GEYJ 471 V (470 Ω)
R57	7030003560	S. RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R58	7030003760	S. RESISTOR	ERJ3GEYJ 474 V (470 kΩ)
R76	7030003600	S. RESISTOR	ERJ3GEYJ 223 V (22 kΩ)
R78	7030003800	S. RESISTOR	ERJ3GEYJ 105 V (1 MΩ)
R80	7030003720	S. RESISTOR	ERJ3GEYJ 224 V (220 kΩ)
R81	7030003560	S. RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R82	7030003560	S. RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R83	7030003440	S. RESISTOR	ERJ3GEYJ 102 V (1 kΩ)
R84	7030003730	S. RESISTOR	ERJ3GEYJ 274 V (270 kΩ)
R85	7030003550	S. RESISTOR	ERJ3GEYJ 822 V (8.2 kΩ)
R86	7030003610	S. RESISTOR	ERJ3GEYJ 273 V (27 kΩ)
R87	7030003840	S. RESISTOR	ERJ3GEYJ 225 V (2.2 MΩ)
R88	7030003440	S. RESISTOR	ERJ3GEYJ 102 V (1 kΩ)
R89	7030003520	S. RESISTOR	ERJ3GEYJ 472 V (4.7 kΩ)

[MAIN-B UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
R90	7030003520	S. RESISTOR	ERJ3GEYJ 472 V (4.7 kΩ)
R92	7030003560	S. RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R94	7030003590	S. RESISTOR	ERJ3GEYJ 183 V (18 kΩ)
R95	7030003680	S. RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R96	7030003680	S. RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R97	7030003640	S. RESISTOR	ERJ3GEYJ 473 V (47 kΩ)
R98	7030003880	S. RESISTOR	ERJ3GEYJ 244 V (240 kΩ)
R99	7030003710	S. RESISTOR	ERJ3GEYJ 184 V (180 kΩ)
R100	7030003440	S. RESISTOR	ERJ3GEYJ 102 V (1 kΩ)
R101	7030003710	S. RESISTOR	ERJ3GEYJ 184 V (180 kΩ)
R102	7030003740	S. RESISTOR	ERJ3GEYJ 334 V (330 kΩ)
R103	7030003670	S. RESISTOR	ERJ3GEYJ 823 V (82 kΩ)
R104	7030003680	S. RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R105	7030003720	S. RESISTOR	ERJ3GEYJ 224 V (220 kΩ)
R106	7030003630	S. RESISTOR	ERJ3GEYJ 393 V (39 kΩ)
R107	7030003630	S. RESISTOR	ERJ3GEYJ 393 V (39 kΩ)
R108	7030003560	S. RESISTOR	ERJ3GEYJ 103 V (10 kΩ)
R109	7510000180	S. THERMISTOR	DTN-T203S223LS (T)
R110	7030003570	S. RESISTOR	ERJ3GEYJ 123 V (12 kΩ)
R111	7030003540	S. RESISTOR	ERJ3GEYJ 682 V (6.8 kΩ)
R112	7310003630	S. TRIMMER	EVM-1XSX50 BQ4 (473)
R113	7030003660	S. RESISTOR	ERJ3GEYJ 683 V (68 kΩ)
R114	7030003650	S. RESISTOR	ERJ3GEYJ 563 V (56 kΩ)
R115	7030003680	S. RESISTOR	ERJ3GEYJ 104 V (100 kΩ)
R116	7030003460	S. RESISTOR	ERJ3GEYJ 152 V (1.5 kΩ)
C1	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C9	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C10	4030006710	S. CERAMIC	C1608 SL 1H 470J-T-A
C11	4030006900	S. CERAMIC	C1608 JB 1E 103K-T-A
C12	4030006900	S. CERAMIC	C1608 JB 1E 103K-T-A
C13	4030006880	S. CERAMIC	C1608 JB 1H 472K-T-A
C14	4550005710	S. TANTALUM	F950J107MGC
C15	4030008630	S. CERAMIC	C1608 JF 1C 104Z-T-A
C16	4550004330	S. TANTALUM	F951C336MGC
C17	4550004130	S. TANTALUM	F951C335MSAAQ2
C19	4030006880	S. CERAMIC	C1608 JB 1H 472K-T-A
C20	4030006870	S. CERAMIC	C1608 JB 1H 222K-T-A
C21	4030008630	S. CERAMIC	C1608 JF 1C 104Z-T-A
C22	4030008920	S. CERAMIC	C1608 JB 1C 473K-T-A
C23	4030008920	S. CERAMIC	C1608 JB 1C 473K-T-A
C24	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C25	4550004090	S. TANTALUM	F951A475MRAAQ2
C26	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C27	4550004150	S. TANTALUM	F950J476MYC
C29	4030008630	S. CERAMIC	C1608 JF 1C 104Z-T-A
C30	4030004760	S. CERAMIC	C2012 JF 1E 104Z-T-A
C31	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C32	4030008630	S. CERAMIC	C1608 JF 1C 104Z-T-A
C33	4030008680	S. CERAMIC	C2012 JF 1C 105Z-T-A
C34	4030004760	S. CERAMIC	C2012 JF 1E 104Z-T-A
C40	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C41	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C42	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C43	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C44	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C45	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C46	4030006690	S. CERAMIC	C1608 SL 1H 330J-T-A
C47	4030006900	S. CERAMIC	C1608 JB 1E 103K-T-A
C48	4030004760	S. CERAMIC	C2012 JF 1E 104Z-T-A
C49	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C51	4550004110	S. TANTALUM	F951E105MSAAQ2
C52	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C53	4550004080	S. TANTALUM	F950J336MWCAQ2
C54	4030006710	S. CERAMIC	C1608 SL 1H 470J-T-A
C55	4030008630	S. CERAMIC	C1608 JF 1C 104Z-T-A
C56	4030008630	S. CERAMIC	C1608 JF 1C 104Z-T-A
C57	4030008630	S. CERAMIC	C1608 JF 1C 104Z-T-A
C58	4030007100	S. CERAMIC	C1608 CH 1H 560J-T-A
C59	4030007030	S. CERAMIC	C1608 CH 1H 150J-T-A

S.=Surface mount

[MAIN-B UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
C61	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C62	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C63	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C64	4550004110	S. TANTALUM	F951E105MSAAQ2
C68	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C70	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C85	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C88	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C89	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C94	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C99	4030006710	S. CERAMIC	C1608 SL 1H 470J-T-A
C100	4030006710	S. CERAMIC	C1608 SL 1H 470J-T-A
C104	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C114	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C115	4550004100	S. TANTALUM	F951C225MQAAQ2
C116	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C117	4550004100	S. TANTALUM	F951C225MQAAQ2
C122	4030006900	S. CERAMIC	C1608 JB 1E 103K-T-A
C126	4030008880	S. CERAMIC	C1608 JB 1C 223K-T-A
C127	4030008880	S. CERAMIC	C1608 JB 1C 223K-T-A
C128	4030008880	S. CERAMIC	C1608 JB 1C 223K-T-A
C129	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C130	4030006740	S. CERAMIC	C1608 SL 1H 820J-T-A
C131	4550004100	S. TANTALUM	F951C225MQAAQ2
C132	4030006900	S. CERAMIC	C1608 JB 1E 103K-T-A
C133	4030008920	S. CERAMIC	C1608 JB 1C 473K-T-A
C134	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C135	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C136	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C137	4510004430	S. ELECTROLYTIC	ECEV1CV220WR
C138	4550004060	S. TANTALUM	F950J106MSAAQ2
C139	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C140	4550004090	S. TANTALUM	F951A475MRAAQ2
C141	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C143	4030006710	S. CERAMIC	C1608 SL 1H 470J-T-A
C144	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C145	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C146	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C147	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C148	4030006900	S. CERAMIC	C1608 JB 1E 103K-T-A
C149	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C150	4030006880	S. CERAMIC	C1608 JB 1H 472K-T-A
C151	4550004090	S. TANTALUM	F951A475MRAAQ2
C152	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C153	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C154	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C155	4030008470	S. CERAMIC	C1608 JB 1H 272K-T-A
C156	4030006900	S. CERAMIC	C1608 JB 1E 103K-T-A
C157	4030006760	S. CERAMIC	C1608 SL 1H 121J-T-A
C158	4030006900	S. CERAMIC	C1608 JB 1E 103K-T-A
J1	6450001080	CONNECTOR	HEC3800-01-010
J2	6450001060	CONNECTOR	HSJ1493-01-010
J3	6450000130	CONNECTOR	HSJ1102-01-540
J5	6510014130	S. CONNECTOR	4-175638-8
J6	6510014550	S. CONNECTOR	2-176834-4
J7	6510014500	S. CONNECTOR	07FM-1.0BP
J8	6510015160	CONNECTOR	53047-0410
W1	7030003860	S. JUMPER	ERJ3GE JPW V
EP1	0910034343	PCB	B 3296C (MAIN-B)

[REG UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
Q1	1520000200	S. TRANSISTOR	2SB798-T2 DK
Q2	1530002280	S. TRANSISTOR	2SC4081 T107 S
D1	1790000680	S. DIODE	SB20-03P-TD
D2	1790000670	S. DIODE	SB07-03C-TA
D3	1790000590	S. DIODE	MA110 (TW)
D4	1730002160	S. ZENER	02CZ5.1-Z (TE85R)
D5	1790000680	S. DIODE	SB20-03P-TD
D6	1750000020	S. DIODE	1SS184 (TE85R)
R1	7030000140	S. RESISTOR	MCR10EZHZ 10 Ω (100)
R2	7030000140	S. RESISTOR	MCR10EZHZ 10 Ω (100)
R3	7030003370	S. RESISTOR	ERJ3GEYJ 271 V (270 Ω)
R4	7030003440	S. RESISTOR	ERJ3GEYJ 102 V (1 kΩ)
R5	7030003610	S. RESISTOR	ERJ3GEYJ 273 V (27 kΩ)
R6	7030003320	S. RESISTOR	ERJ3GEYJ 101 V (100 Ω)
R7	7030003440	S. RESISTOR	ERJ3GEYJ 102 V (1 kΩ)
R8	7030003600	S. RESISTOR	ERJ3GEYJ 223 V (22 kΩ)
R9	7030003470	S. RESISTOR	ERJ3GEYJ 182 V (1.8 kΩ)
R12	7030000140	S. RESISTOR	MCR10EZHZ 10 Ω (100)
R13	7030003600	S. RESISTOR	ERJ3GEYJ 223 V (22 kΩ)
C1	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C2	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C3	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C4	4030006710	S. CERAMIC	C1608 SL 1H 470J-T-A
C5	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C6	4030006860	S. CERAMIC	C1608 JB 1H 102K-T-A
C7	4550004130	S. TANTALUM	F951C335MSAAQ2
C8	4030006850	S. CERAMIC	C1608 JB 1H 471K-T-A
C9	4550004140	S. TANTALUM	F951C106MWCAQ2
C10	4550004140	S. TANTALUM	F951C106MWCAQ2
EP1	0910034702	PCB	B 3300B (REG)

[TOP UNIT]

REF. NO.	ORDER NO.	DESCRIPTION	
R1	7210001910	VARIABLE	RV-199 (RK0972210) 10KB/10KA [VOL/SQL]
S1	2260001400	ENCODER	SW-122 (RK097103H) [DIAL]
EP1	0910034973	FPC	B 3302C (TOP)

S.=Surface mount

[CHASSIS PARTS]

REF. NO.	ORDER NO.	DESCRIPTION
MC1	7700000861	MICROPHONE WM-62A103
SP1	2510000580	SPEAKER EAS-2P104D
J1	6510013810	CONNECTOR BNC-RM-F1 [ANT]

[TSQL UNIT] (#05)

REF. NO.	ORDER NO.	DESCRIPTION
IC1	1130005100	S. IC FX365LG
Q1	1530002280	S. TRANSISTOR 2SC4081 T107 S
Q2	1510000580	S. TRANSISTOR 2SA1362-GR (TE85R)
Q3	1590000430	S. TRANSISTOR DTC144EU T107
D1	1790000590	S. DIODE MA110 (TW)
D2	1790000870	S. DIODE MA1S121 (TX)
X1	6060000480	CERAMIC CSB1000J221T
R1	7030003710	S. RESISTOR ERJ3GEYJ 184 V (180 kΩ)
R2	7030003780	S. RESISTOR ERJ3GEYJ 684 V (680 kΩ)
R3	7030003700	S. RESISTOR ERJ3GEYJ 154 V (150 kΩ)
R4	7030003570	S. RESISTOR ERJ3GEYJ 123 V (12 kΩ)
R5	7030003680	S. RESISTOR ERJ3GEYJ 104 V (100 kΩ)
R6	7030003680	S. RESISTOR ERJ3GEYJ 104 V (100 kΩ)
R7	7030003600	S. RESISTOR ERJ3GEYJ 223 V (22 kΩ)
R8	7030003800	S. RESISTOR ERJ3GEYJ 105 V (1 MΩ)
R9	7410000560	S. ARRAY EXB-V4V 474JV
R11	7030003580	S. RESISTOR ERJ3GEYJ 153 V (15 kΩ)
R12	7310003630	S. TRIMMER EVM-1XSX50 BQ4 (473)
R13	7030003560	S. RESISTOR ERJ3GEYJ 103 V (10 kΩ)
R14	7030003760	S. RESISTOR ERJ3GEYJ 474 V (470 kΩ)
R15	7030003810	S. RESISTOR ERJ3GEYJ 125 V (1.2 MΩ)
C1	4030008920	S. CERAMIC C1608 JB 1C 473K-T-A
C2	4030006900	S. CERAMIC C1608 JB 1E 103K-T-A
C3	4030006850	S. CERAMIC C1608 JB 1H 471K-T-A
C4	4030008920	S. CERAMIC C1608 JB 1C 473K-T-A
C5	4550002950	S. TANTALUM TESVA 0J 335M1-8L
C6	4030007170	S. CERAMIC C1608 CH 1H 221J-T-A
C7	4030007170	S. CERAMIC C1608 CH 1H 221J-T-A
C8	4550000420	S. TANTALUM TESVA 1A 105M1-8L
C9	4030008880	S. CERAMIC C1608 JB 1C 223K-T-A
C10	4550000550	S. TANTALUM TESVA 1V 224M1-8L
EP1	0910035142	PCB B 3510B (TSQL)

S.=Surface mount

SECTION 7 ADJUSTMENT PROCEDURES

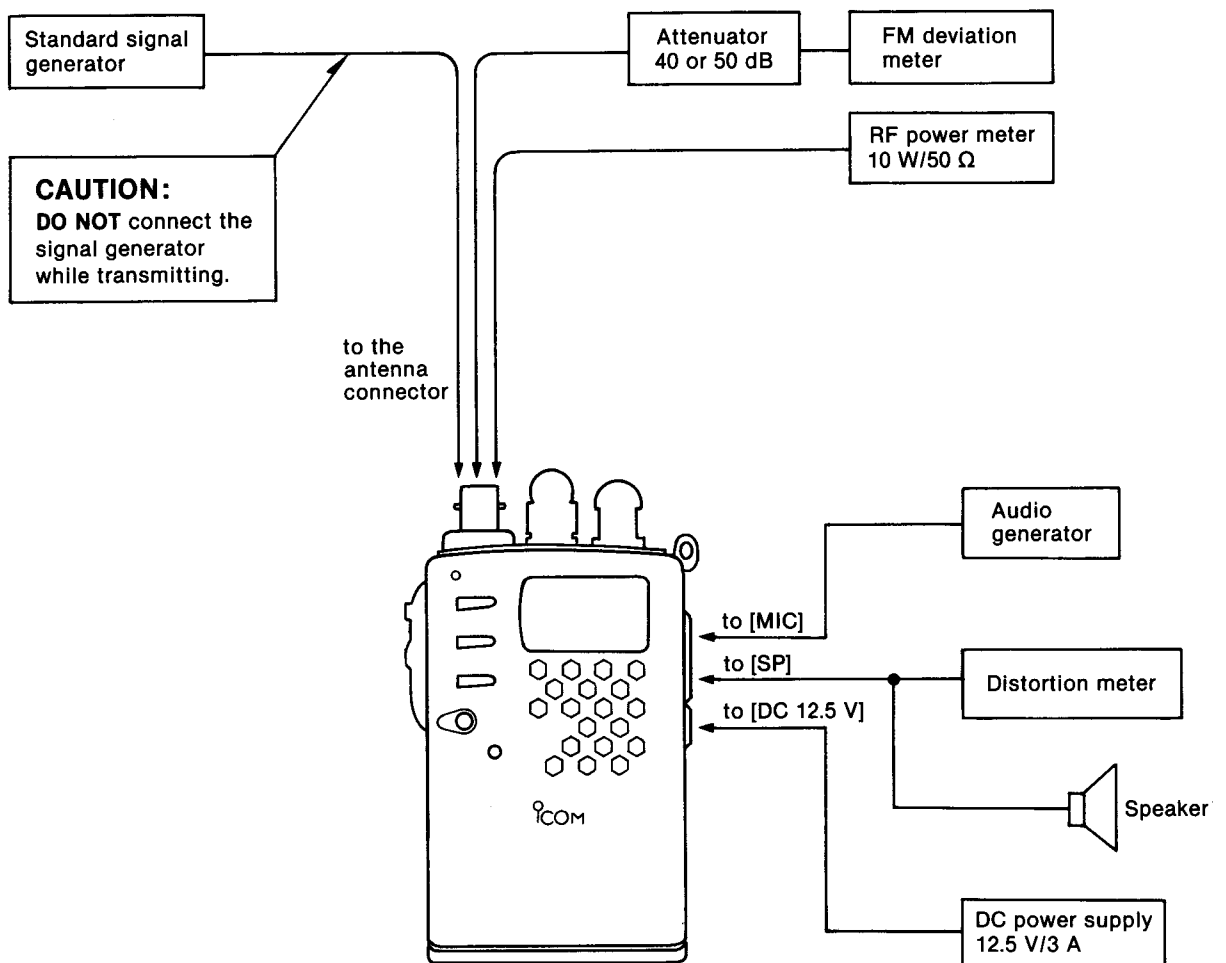
7-1 PREPARATION BEFORE SERVICING

REQUIRED TEST EQUIPMENT

EQUIPMENT	GRADE AND RANGE	EQUIPMENT	GRADE AND RANGE
DC power supply	Output voltage : 12.5 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
		AC milli-voltmeter	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 : 160 MHz Measuring range : 0~±5 kHz
Standard signal generator (SSG)	Frequency range : 0.1~160 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



7-2 PLL ADJUSTMENT

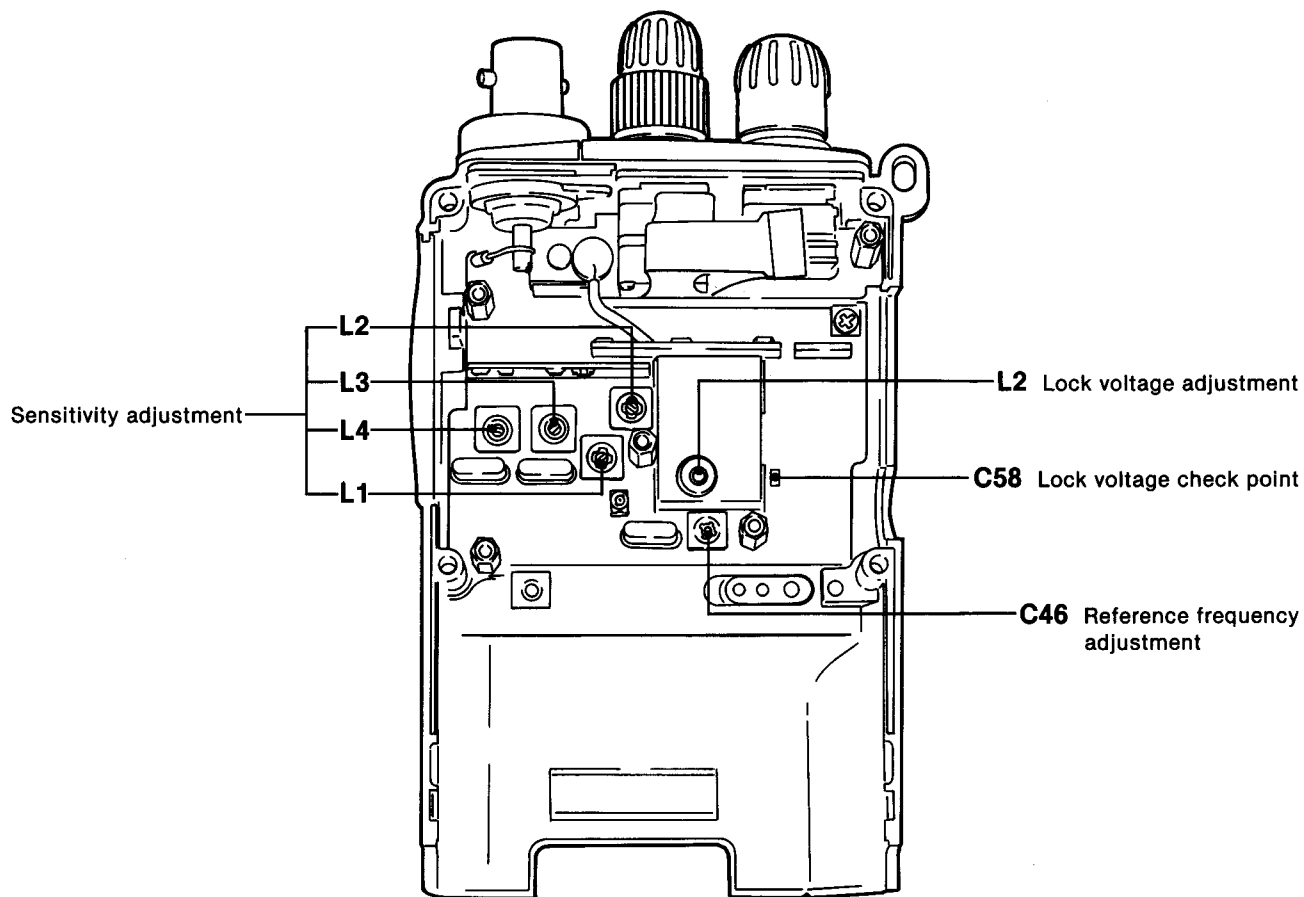
ADJUSTMENT	ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
		UNIT	LOCATION		UNIT	ADJUST
LOCK VOLTAGE	1 <ul style="list-style-type: none"> • Displayed frequency: 145.00 MHz • Simplex • Receiving 	MAIN-A	Connect the digital multimeter or oscilloscope to C58.	1.6 V	VCO BOARD	L2
REFERENCE FREQUENCY	1 <ul style="list-style-type: none"> • Displayed frequency: 145.00 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.	145.0000 MHz	MAIN-A	C46

7-3 RECEIVER ADJUSTMENT

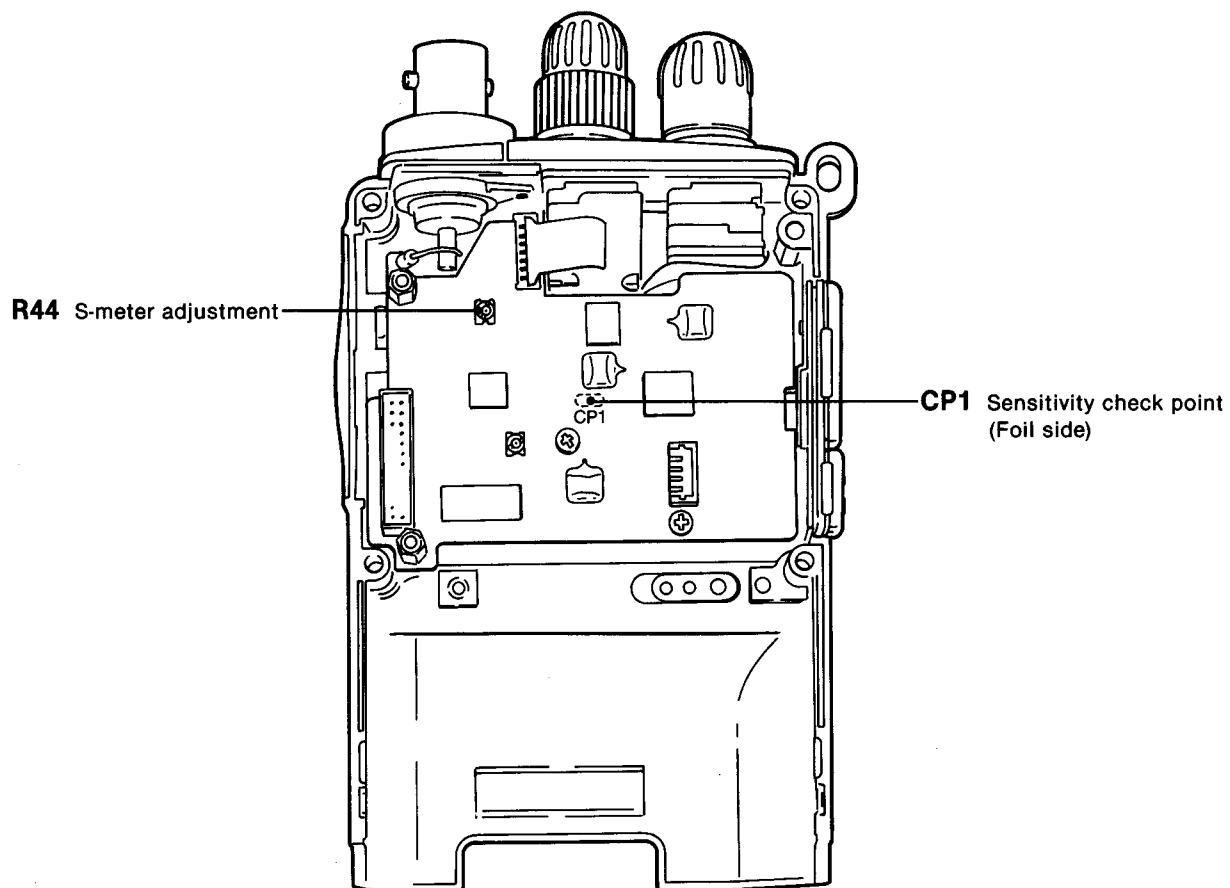
ADJUSTMENT	ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
		UNIT	LOCATION		UNIT	ADJUST
SENSITIVITY	1 <ul style="list-style-type: none"> • Displayed frequency: 145.00 MHz • [SQL] control : Max. CCW • Connect the SSG to the antenna connector and set as: Level : 0.32 μV* (-117 dBm) Modulation: 1 kHz Deviation : \pm3.5 kHz • Receiving 	MAIN-B	Connect the DC voltmeter to CP1.	Maximum	MAIN-A	Adjust in sequence L4, L3, L2, L1
S-METER	1 <ul style="list-style-type: none"> • Displayed frequency: 145.00 MHz • Connect the SSG to the antenna connector and set as: Level : 0.32 μV* (-117 dBm) Modulation: 1 kHz Deviation : \pm3.5 kHz • Receiving 	Function display	S/RF indicator	3 dots (S3) 	MAIN-B	R44

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

• MAIN-A UNIT



• MAIN-B UNIT

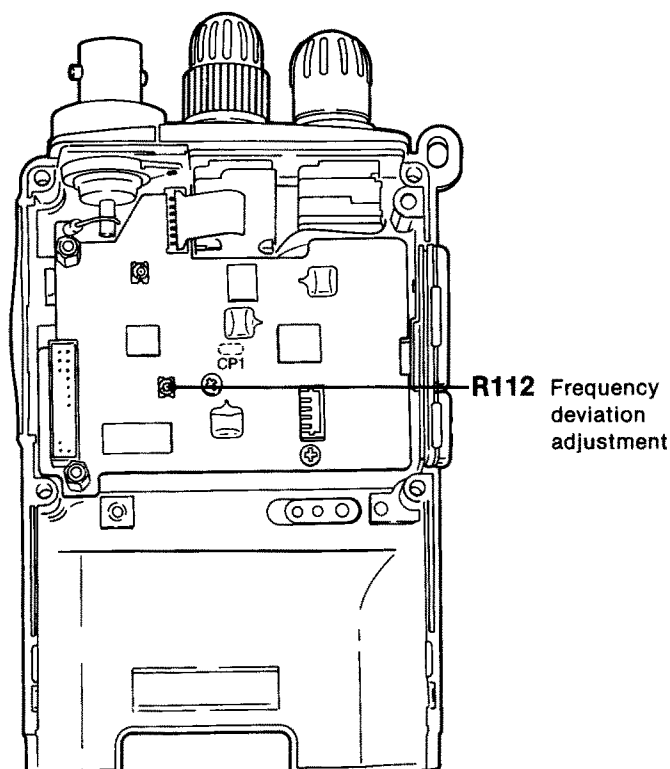
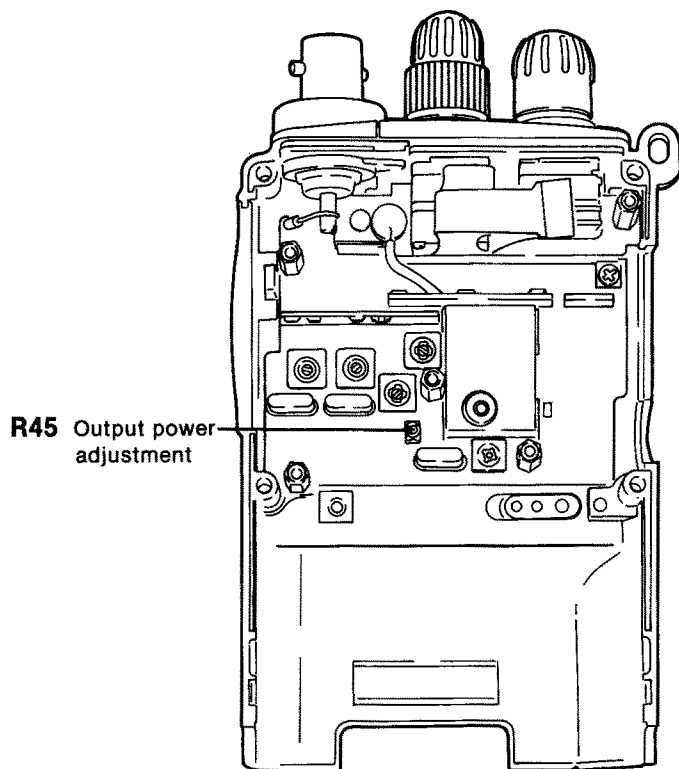


7-4 TRANSMITTER ADJUSTMENT

ADJUSTMENT	ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
		UNIT	LOCATION		UNIT	ADJUST
OUTPUT POWER	1 <ul style="list-style-type: none"> • Displayed frequency: 145.00 MHz • Output power : HIGH • Simplex • Transmitting 	Top panel	Connect the RF power meter to the antenna connector.	5.0 W	MAIN-A	R45
	2 <ul style="list-style-type: none"> • Output power : LOW 1 					More than 10 mW
FREQUENCY DEVIATION	1 <ul style="list-style-type: none"> • Displayed frequency: 145.00 MHz • Output power : HIGH • Connect the audio generator to the [MIC] jack and set as: 170 mV/1.0 kHz (USA version) 85 mV/1.0 kHz (All other versions) • Set the FM deviation meter as: HPF : OFF 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	MAIN-B	R112

• MAIN-A UNIT

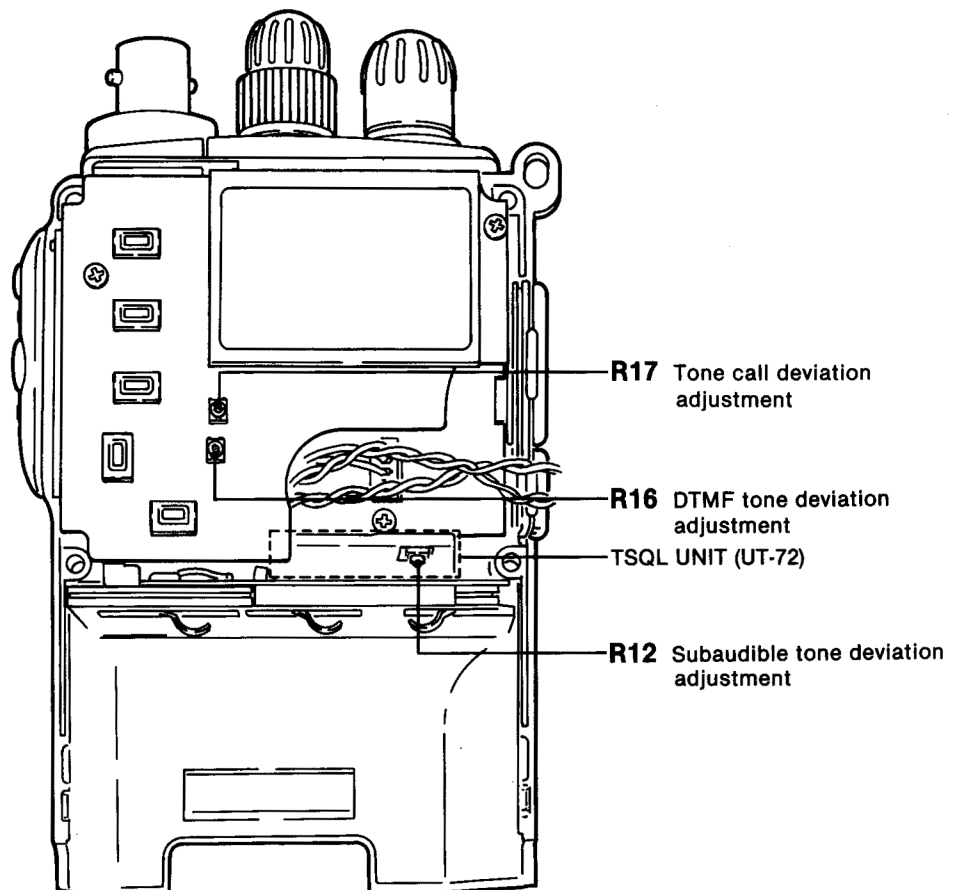
• MAIN-B UNIT



TRANSMITTER ADJUSTMENT (CONTINUED)

ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
			UNIT	LOCATION		UNIT	ADJUST
DTMF TONE DEVIATION	1	<ul style="list-style-type: none"> • Displayed frequency: 145.00 MHz • While pushing [FUNC], [MONI] and [LIGHT] switches, turn power ON. • While pushing the [LIGHT] switch, push the [PTT] switch. 	Top panel	Connect the FM deviation meter to the antenna connector via the attenuator.	± 3.5 kHz	LOGIC	R10
TONE CALL DEVIATION (EUR, UK, ITA only)	1	<ul style="list-style-type: none"> • Displayed frequency: 145.00 MHz • While pushing the [LIGHT] switch, push the [PTT] switch. 	Top panel	Connect the FM deviation meter to the antenna connector via the attenuator.	± 3.5 kHz	LOGIC	R17
SUBAUDIBLE TONE DEVIATION (USA only)	1	<ul style="list-style-type: none"> • Displayed frequency: 145.00 MHz • Apply no signal to the microphone connector. • Set the tone frequency as: 88.5 Hz • Set the FM deviation meter as: <ul style="list-style-type: none"> HPF : OFF 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.	± 0.75 kHz	TSQL (UT-72)	R12

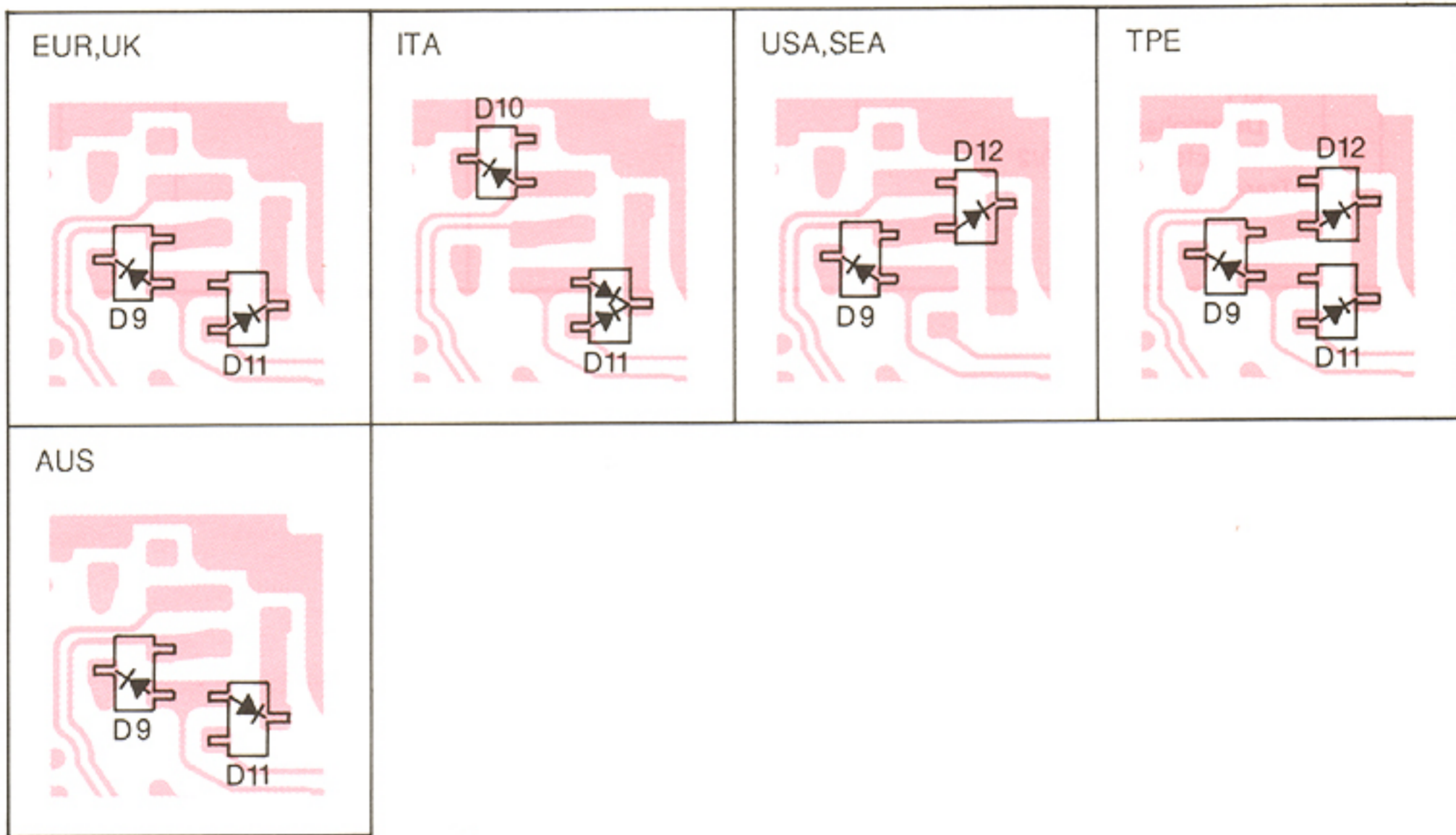
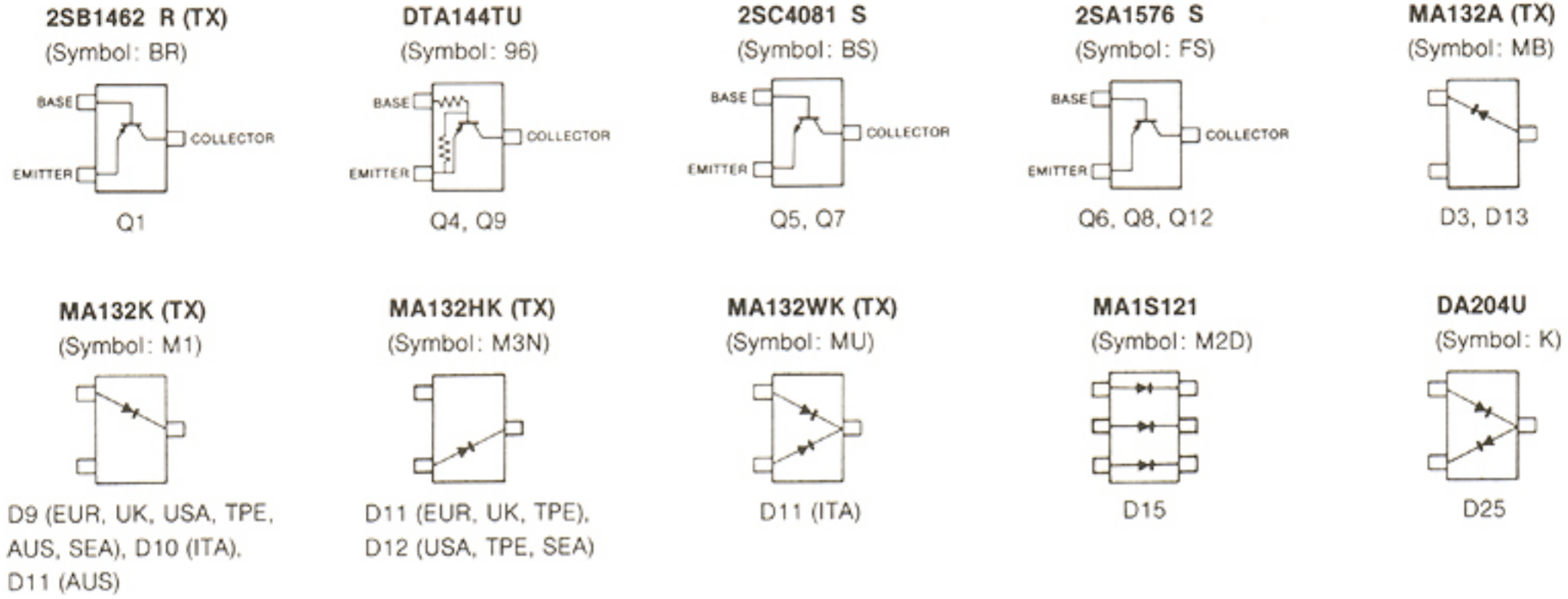
• LOGIC UNIT



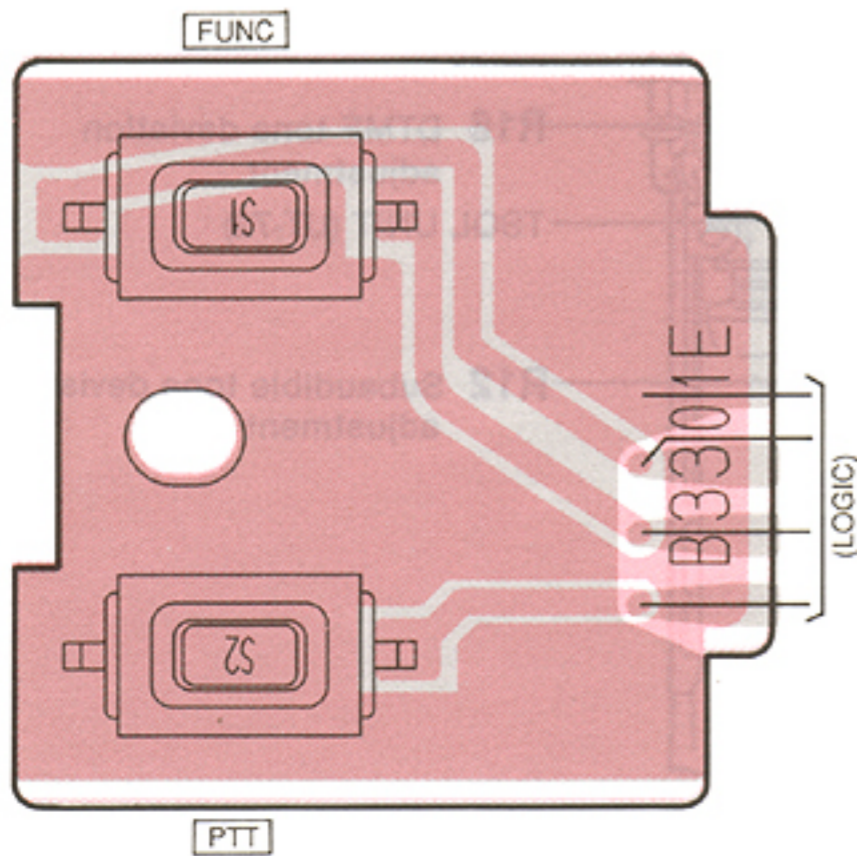
SECTION 8 BOARD LAYOUTS

8-1 LOGIC UNIT AND PTT BOARD

• LOGIC UNIT

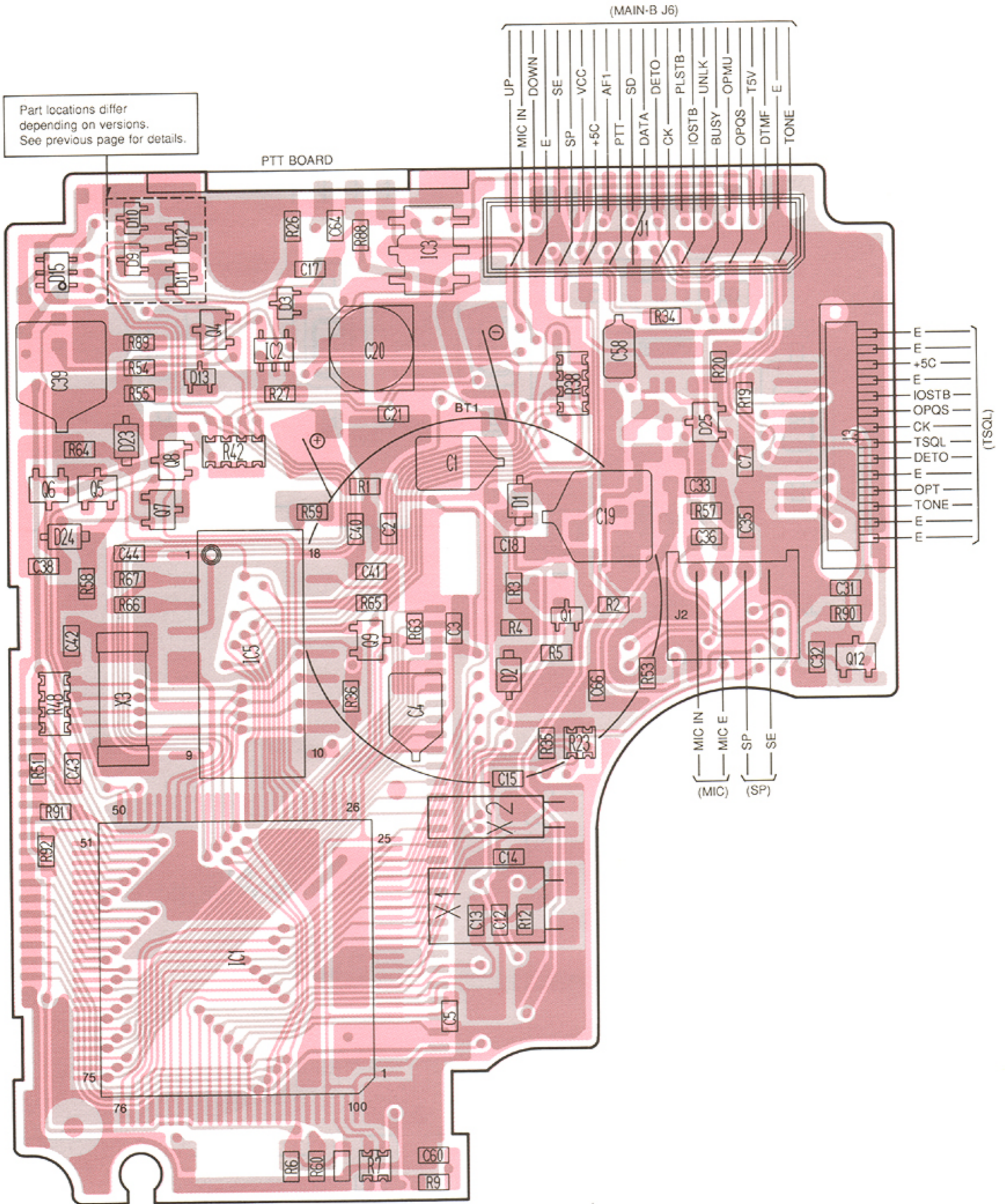


• PTT BOARD

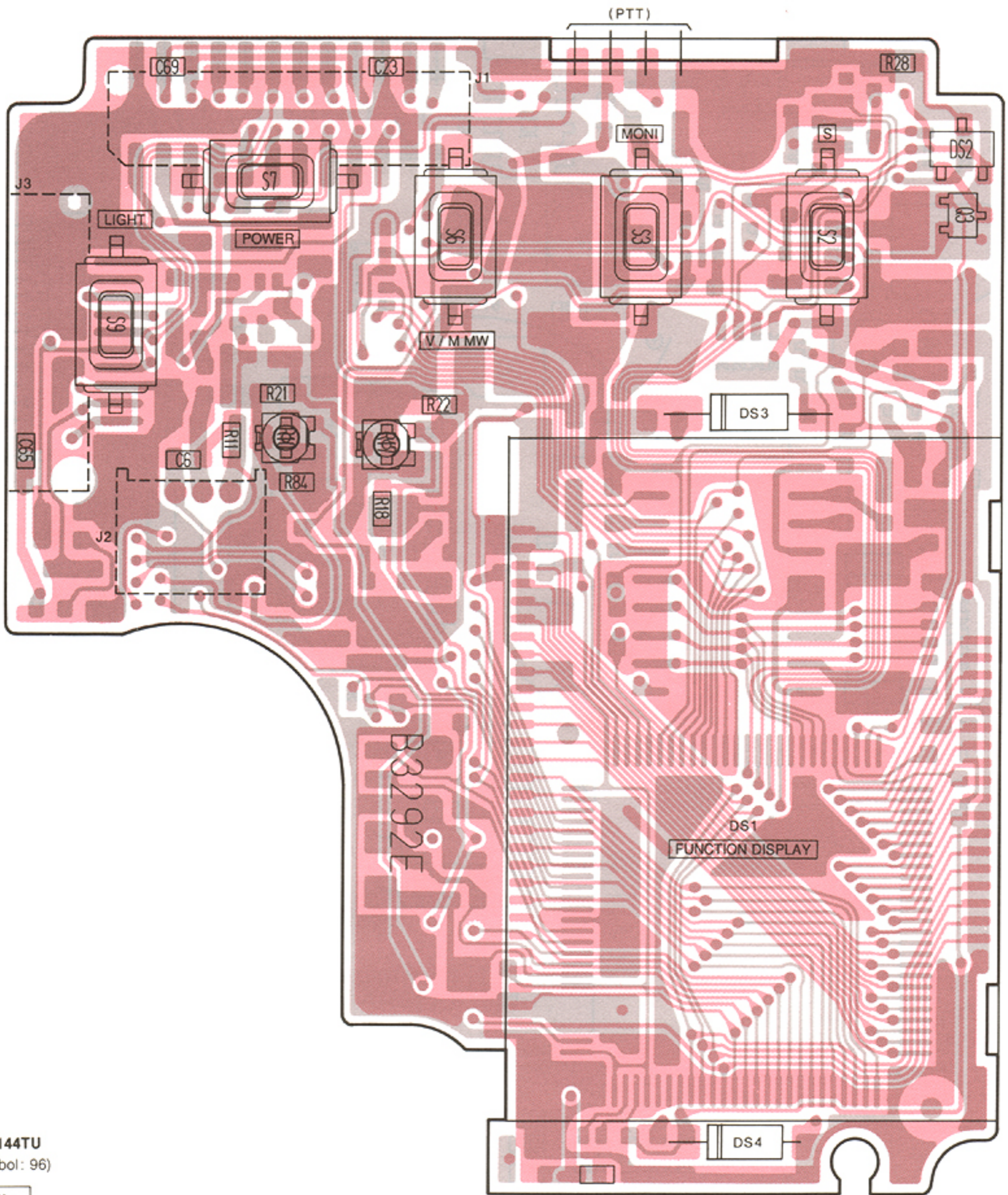


• LOGIC UNIT

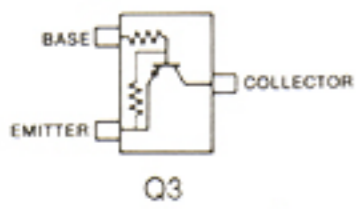
The combination of this page and the next page show the unit layout in the same configuration as the actual P.C. Board.



• LOGIC UNIT



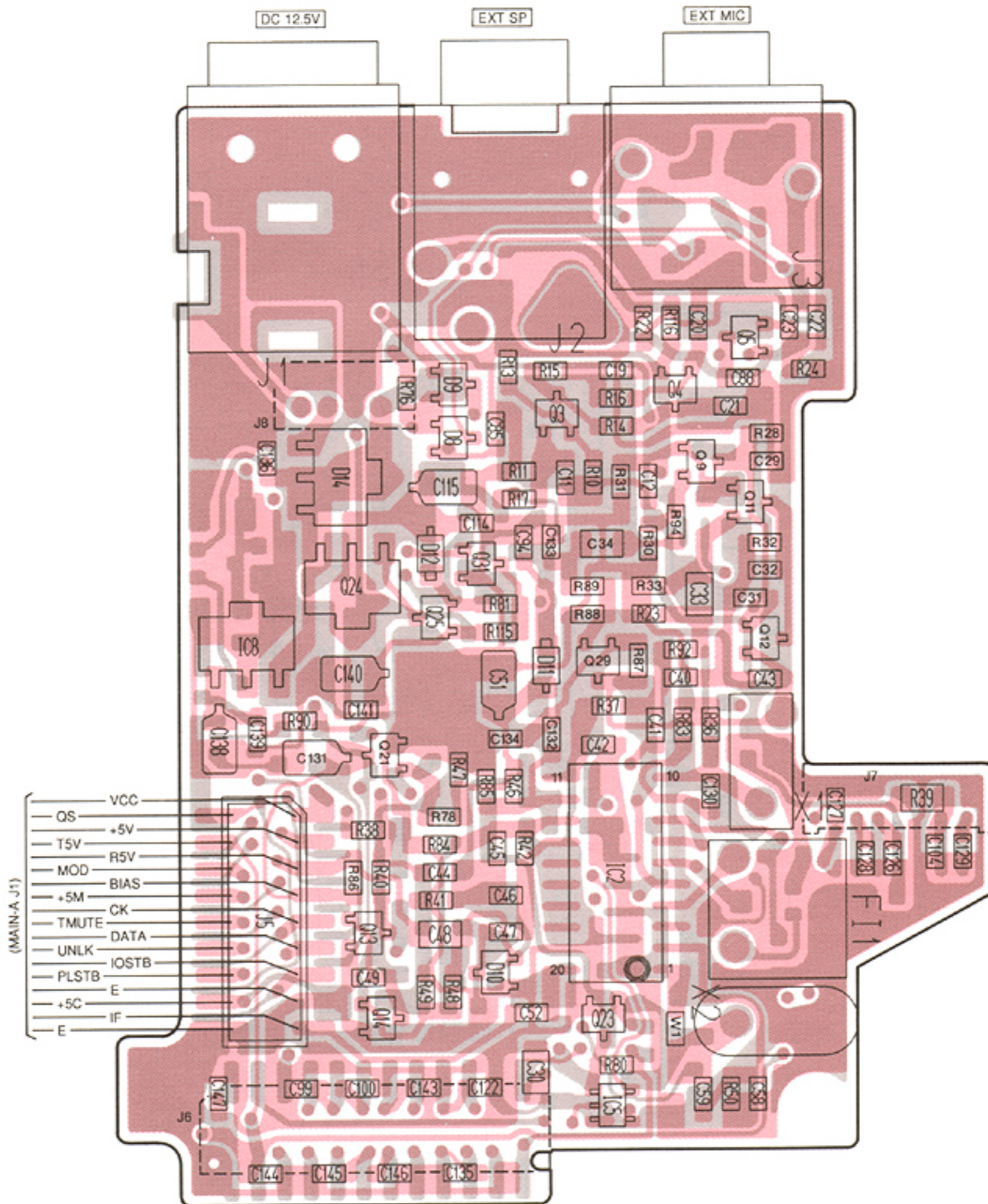
DTA144TU
(Symbol: 96)



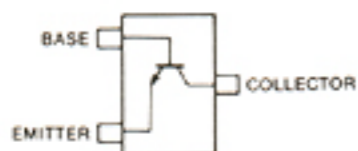
8-2 MAIN-B UNIT

• MAIN-B UNIT

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



2SC4081 S
(Symbol: BS)



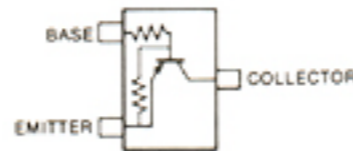
Q3, Q4, Q14, Q21, Q25,
Q29

2SJ144 GR
(Symbol: VG)



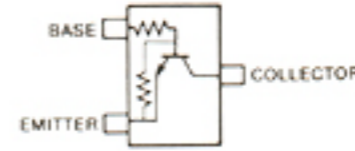
Q5, Q9, Q11

DTA144EU
(Symbol: 16)



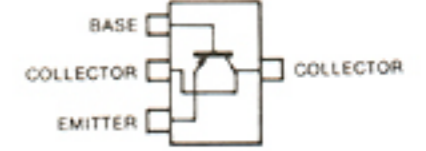
Q12

DTC144EU
(Symbol: 26)



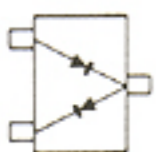
Q13, Q23, Q31

2SB798 DK
(Symbol: DK)



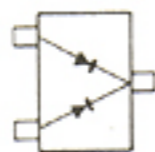
Q24

DA204U
(Symbol: K)



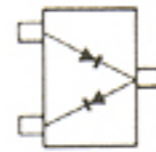
D8

DAN202U
(Symbol: N)



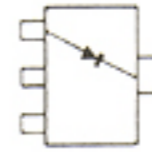
D9

MA742 (TX)
(Symbol: M1U)



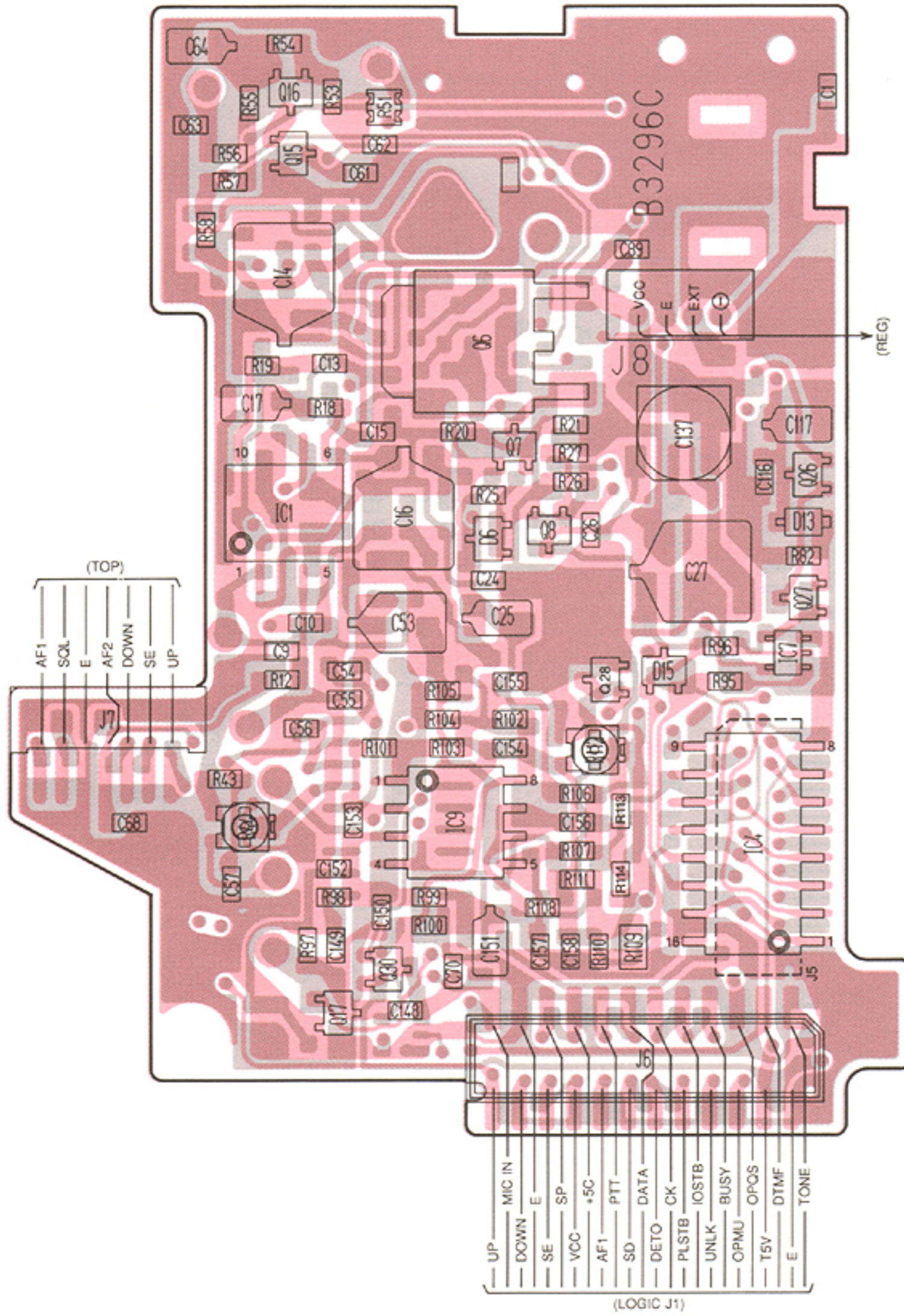
D10

SB20 03P
(Symbol: SC)

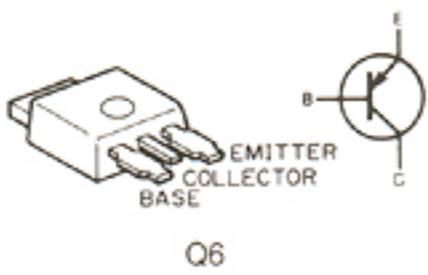


D14

• MAIN-B UNIT



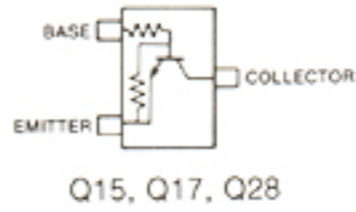
2SB1182 Q
(Symbol: B1182)



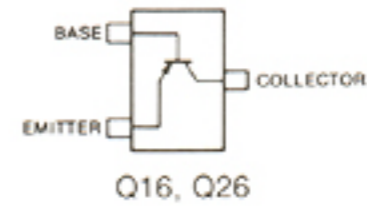
2SC4081 S
(Symbol: BS)



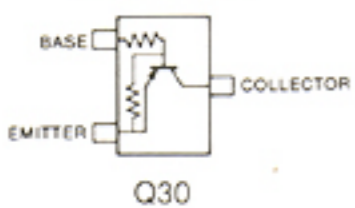
DTC144EU
(Symbol: 26)



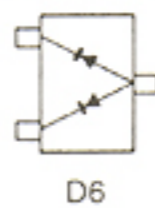
2SA1576 S
(Symbol: FS)



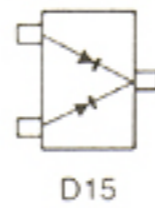
DTA144EU
(Symbol: 16)



DAP202U
(Symbol: P)



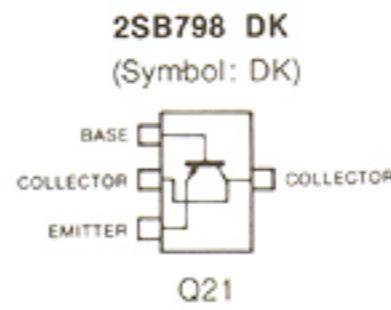
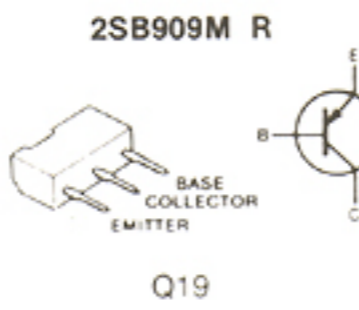
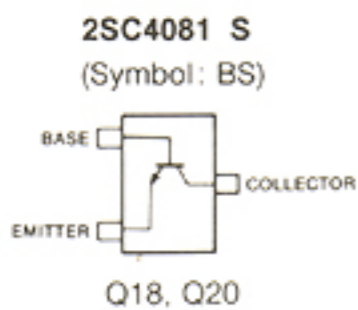
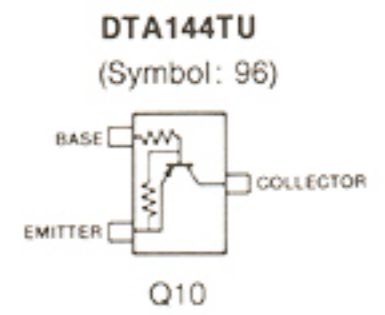
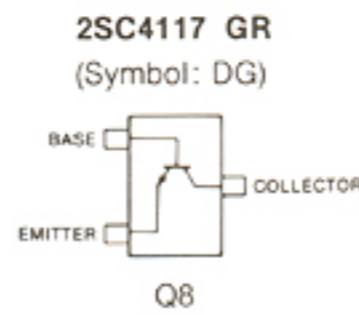
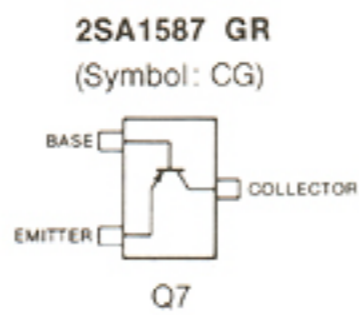
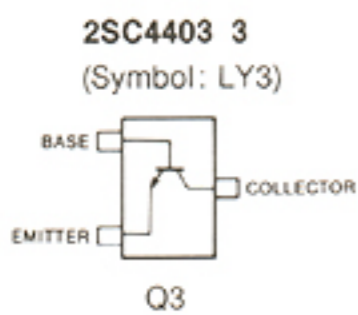
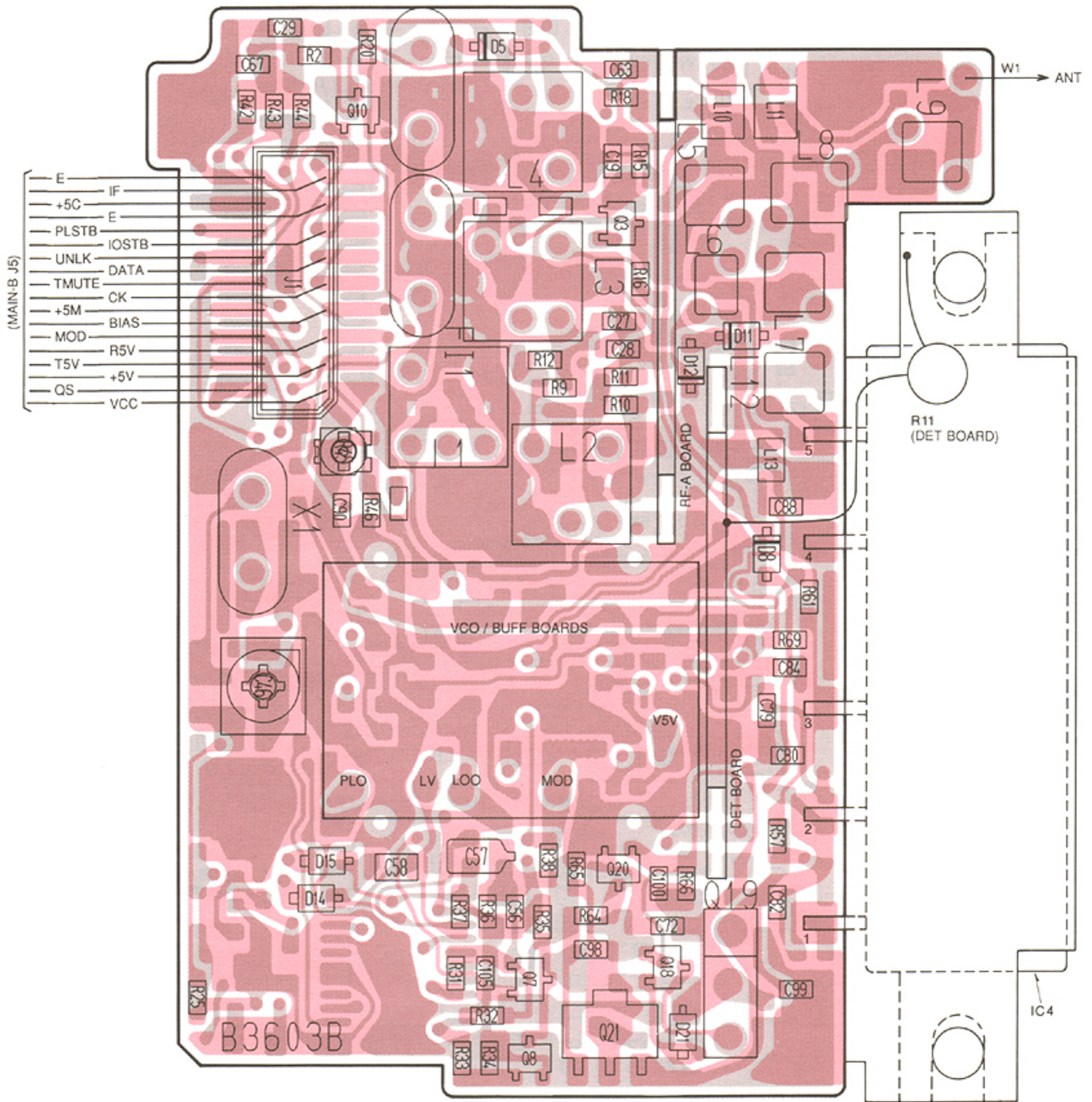
DAN202U
(Symbol: N)



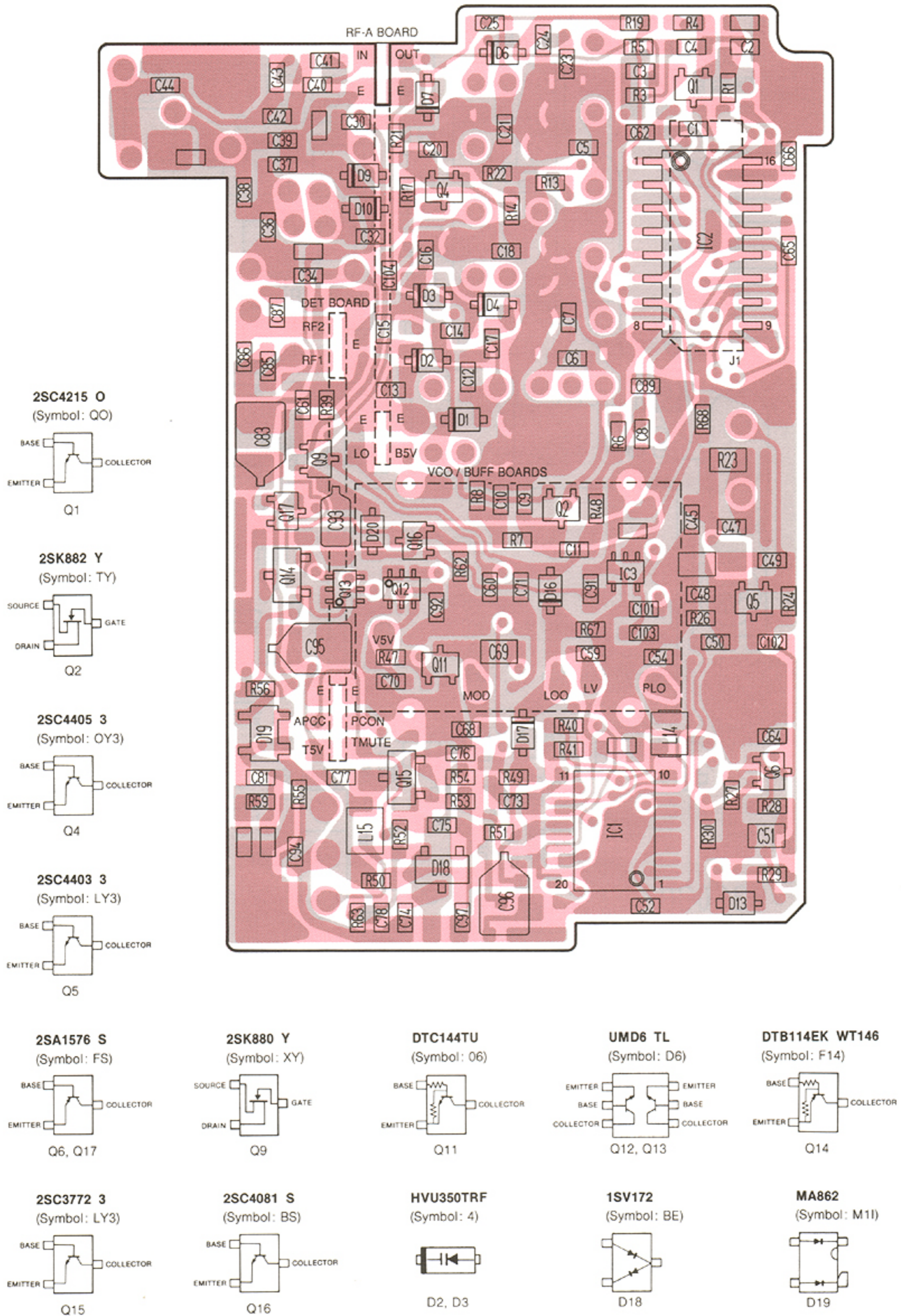
8-3 MAIN-A UNIT

• MAIN-A UNIT

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

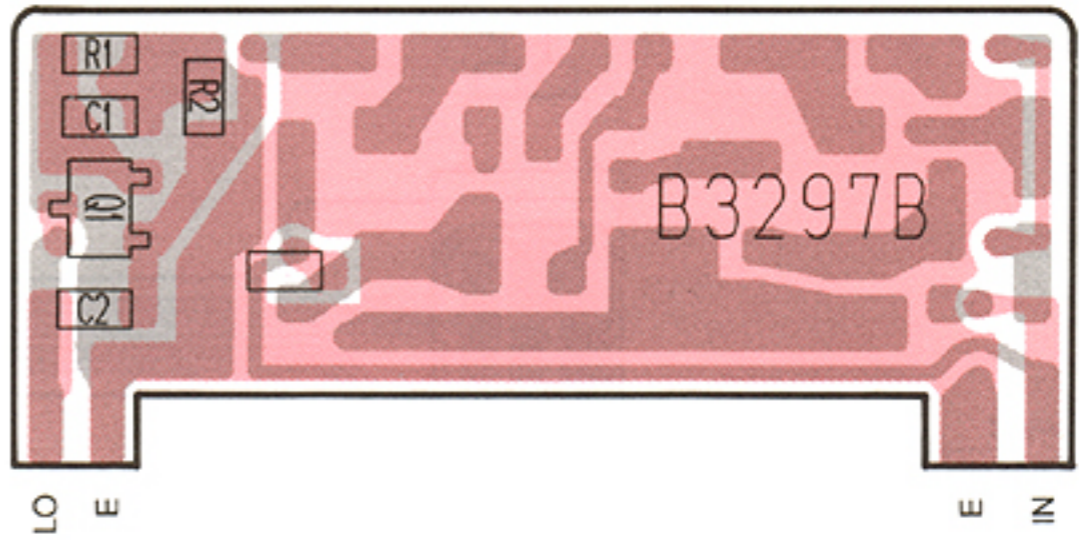
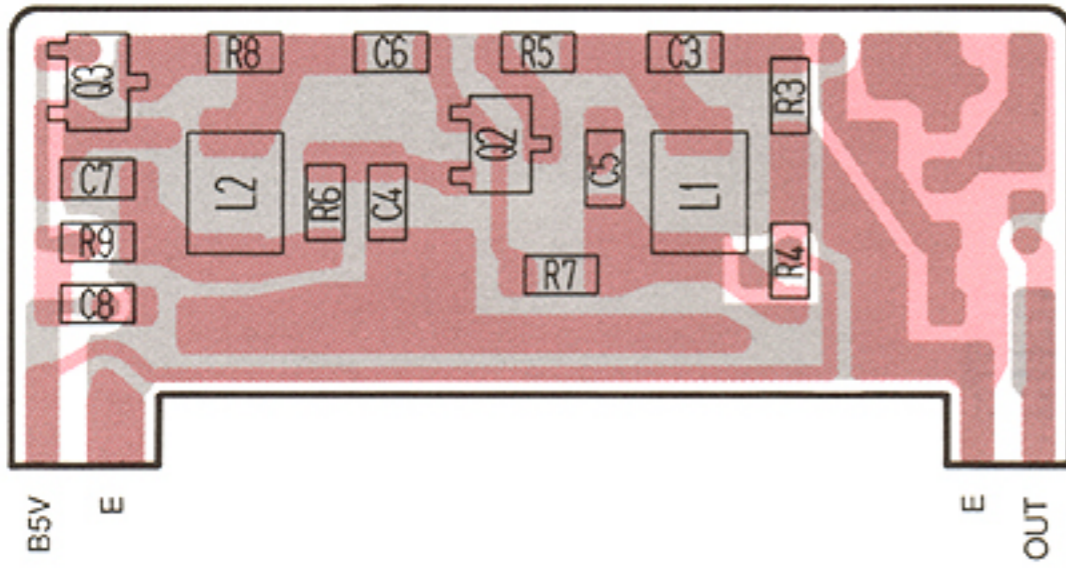


• MAIN-A UNIT

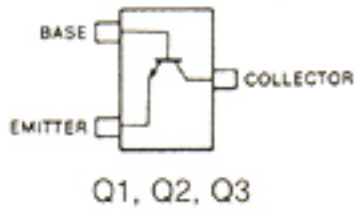


8-4 RF-A, VCO, BUFF AND DET BOARDS

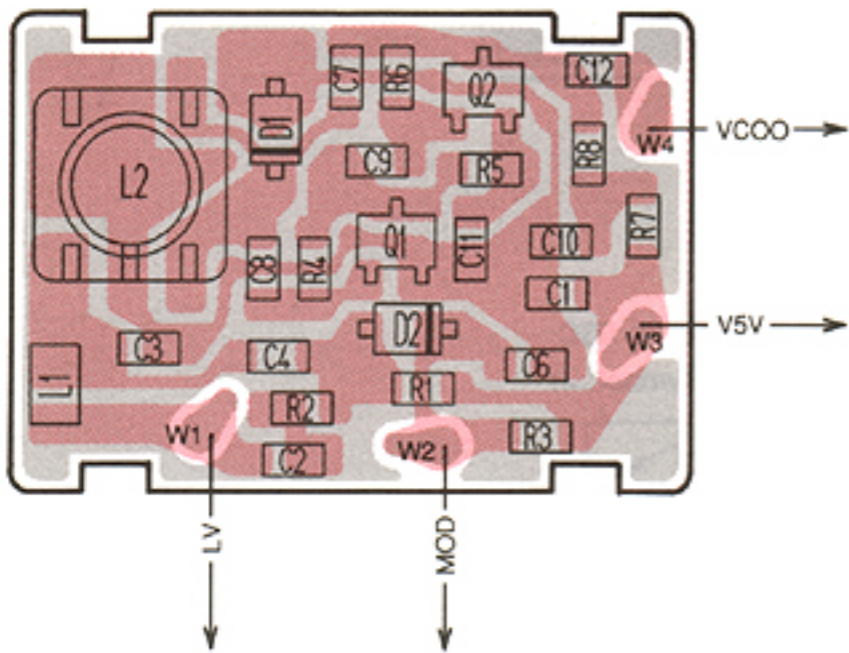
• RF-A BOARD



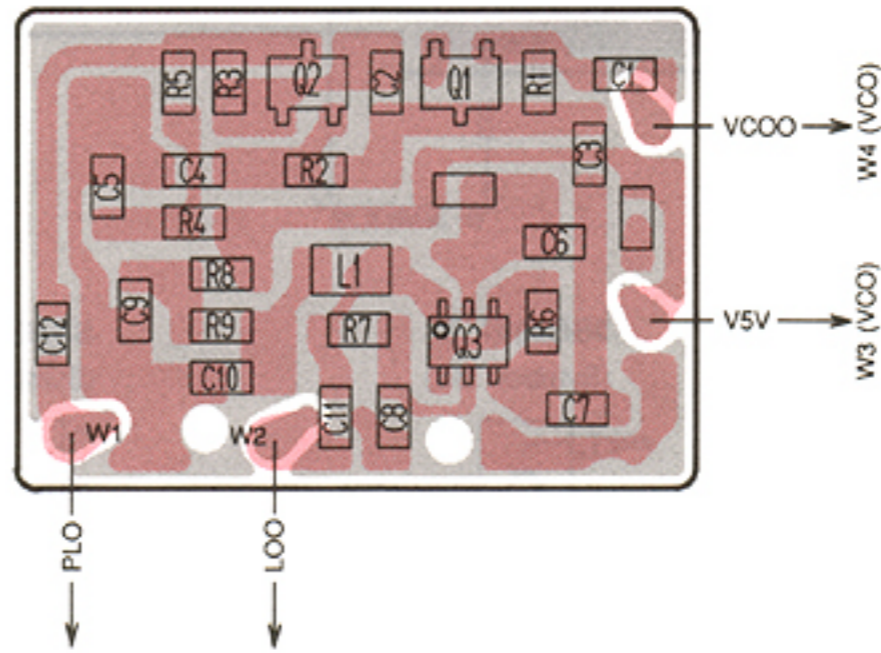
2SC4403 3
(Symbol: LY3)



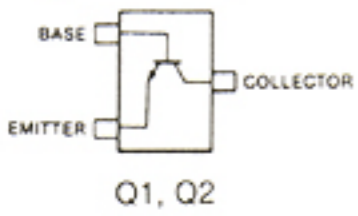
• VCO BOARD



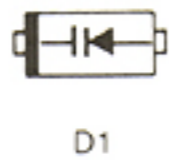
• BUFF BOARD



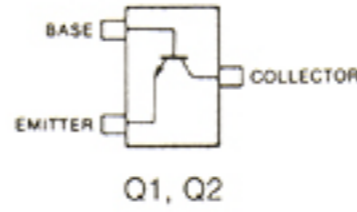
2SC4226 T2 R25
(Symbol: R25)



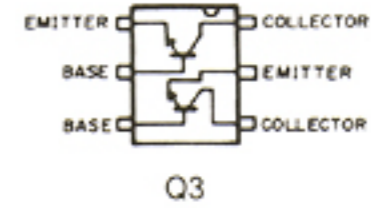
HVU350TRF
(Symbol: 4)



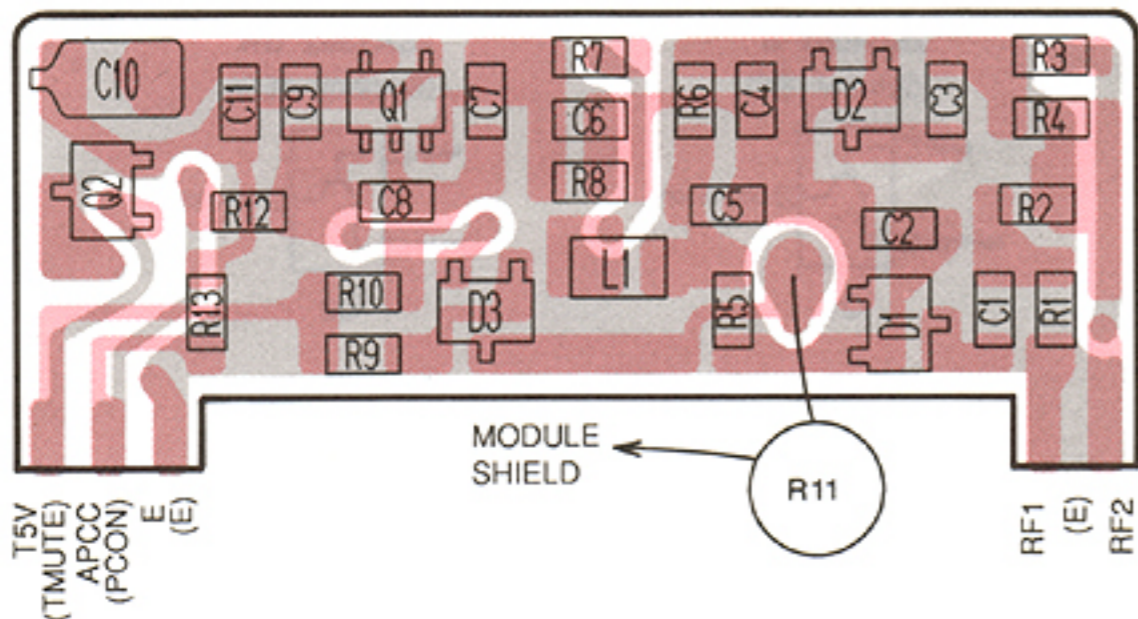
2SC4403 3
(Symbol: LY3)



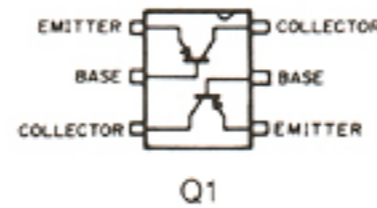
UMX5 TL
(Symbol: X5)



• DET BOARD



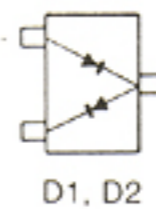
UMS1 TL
(Symbol: S1)



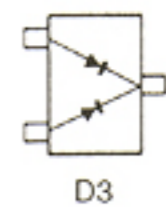
2SA1576 S
(Symbol: FS)



MA742 (TX)
(Symbol: M1U)

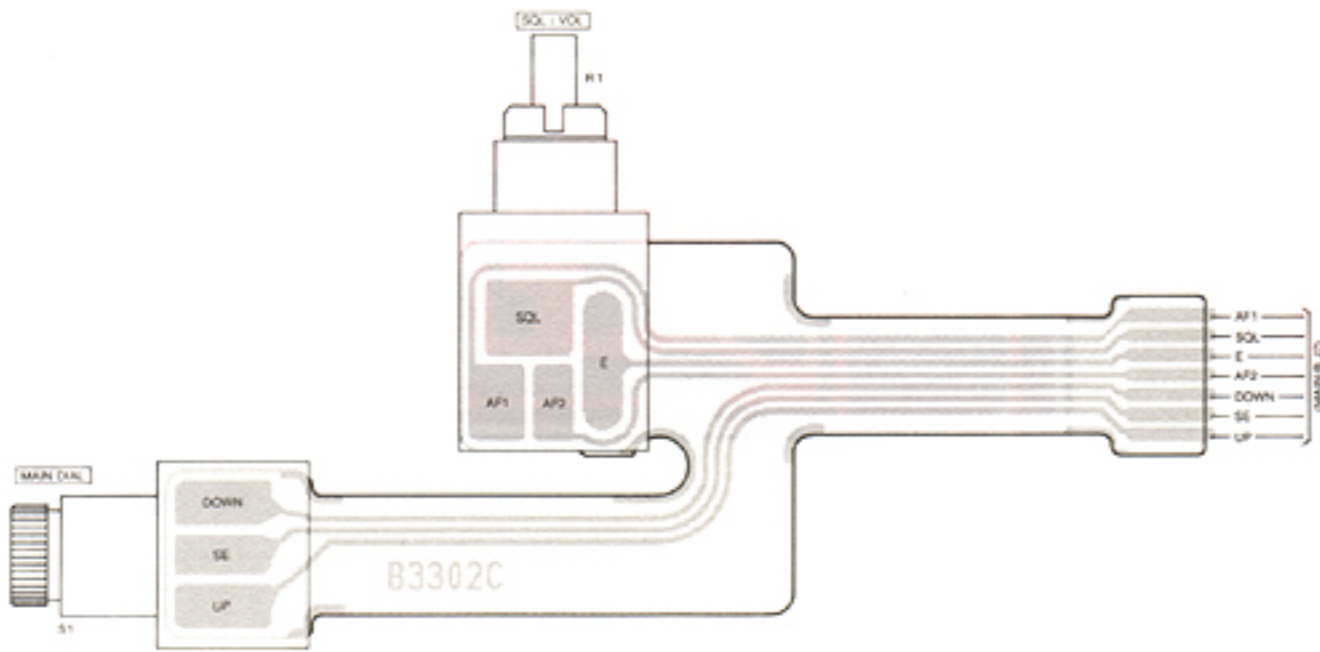


DAN202U
(Symbol: N)

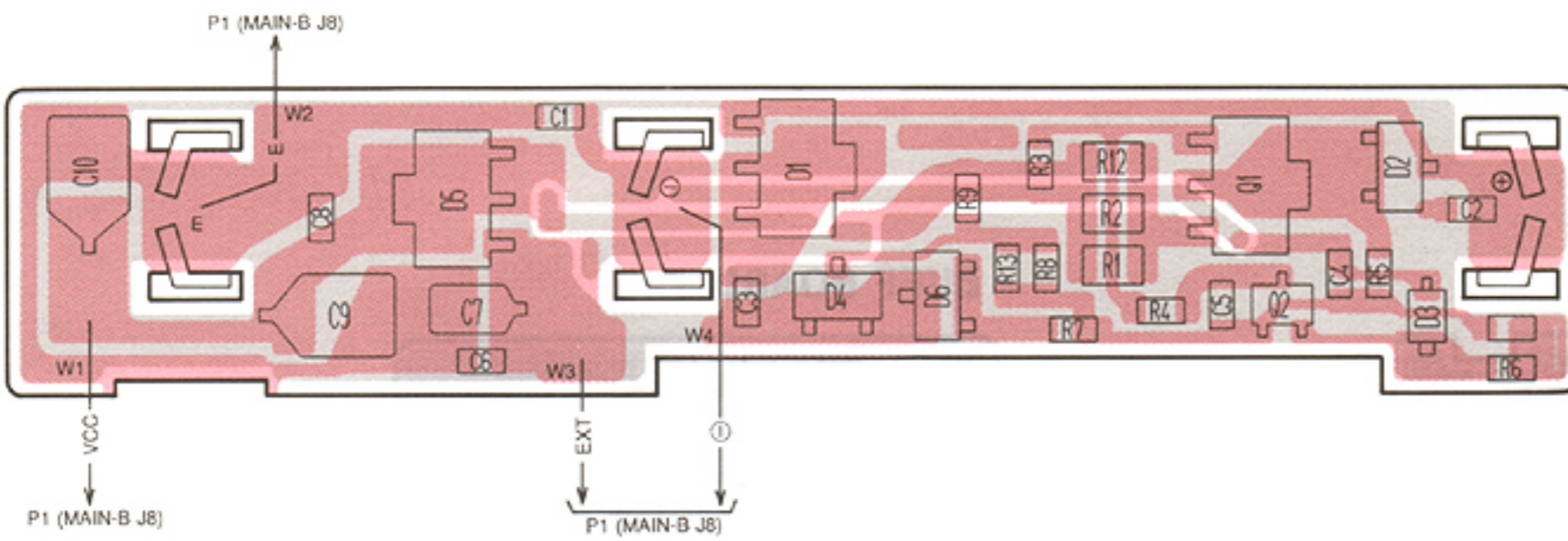


8-5 TOP, REG AND TSQL (USA only) UNITS

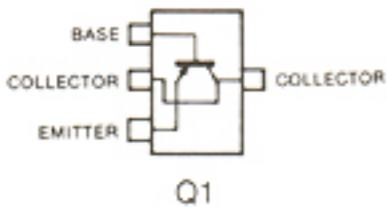
• TOP UNIT



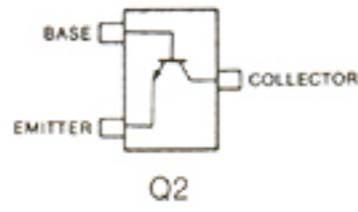
• REG UNIT



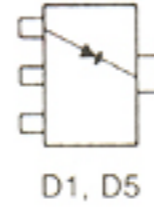
2SB798 DK
(Symbol: DK)



2SC4081 S
(Symbol: BS)



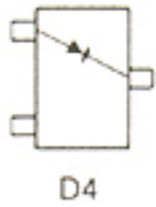
SB20 03P
(Symbol: SC)



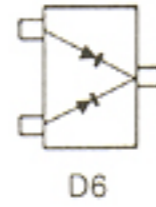
SB07 03C
(Symbol: J)



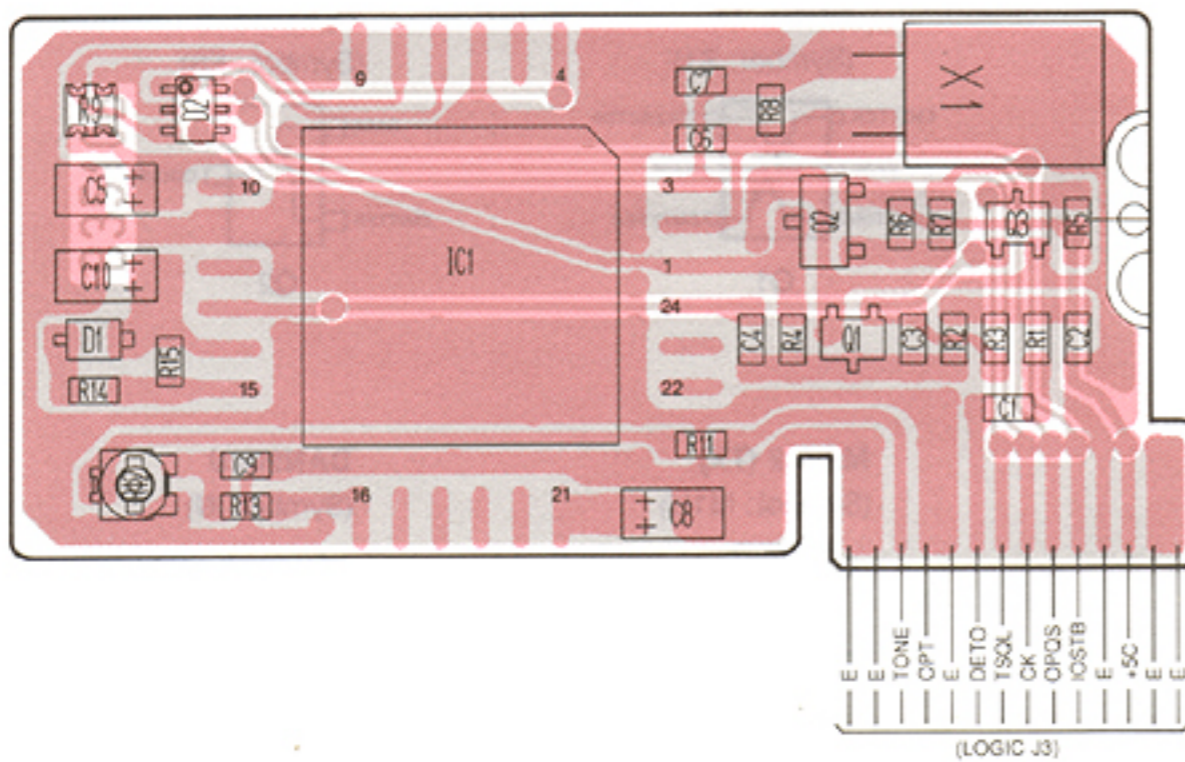
02CZ5.1 Z
(Symbol: 5.1Z)



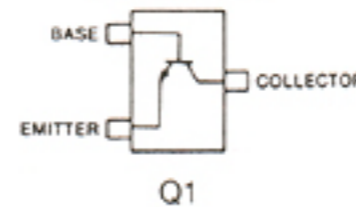
1SS184
(Symbol: B3)



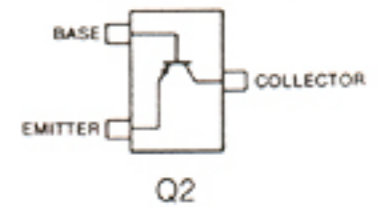
• TSQL UNIT (USA only)



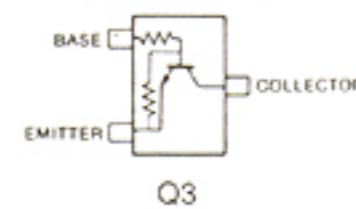
2SC4081 S
(Symbol: BS)



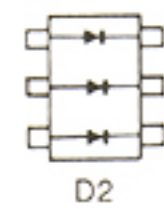
2SA1362 GR
(Symbol: AEG)



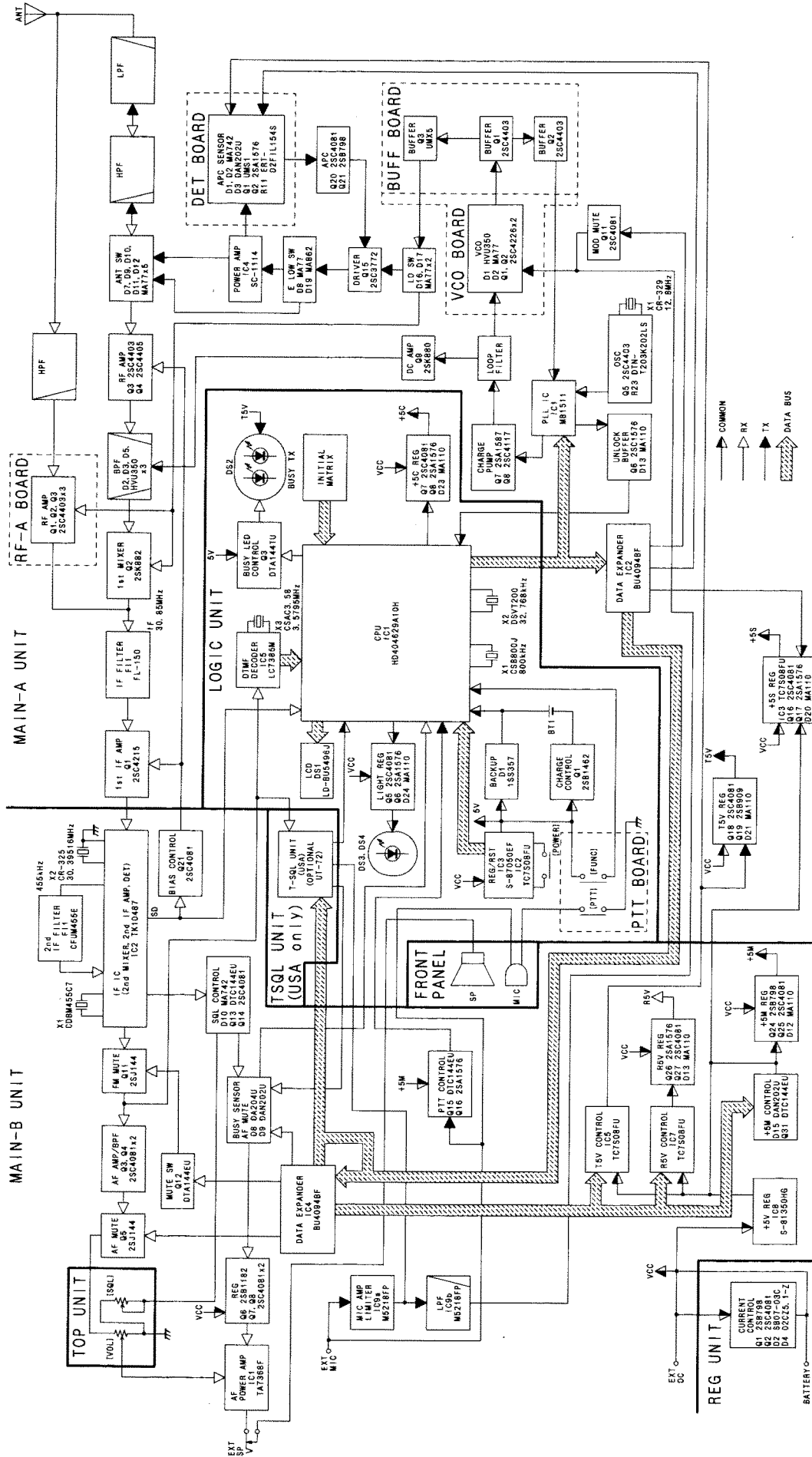
DTC144EU
(Symbol: 26)



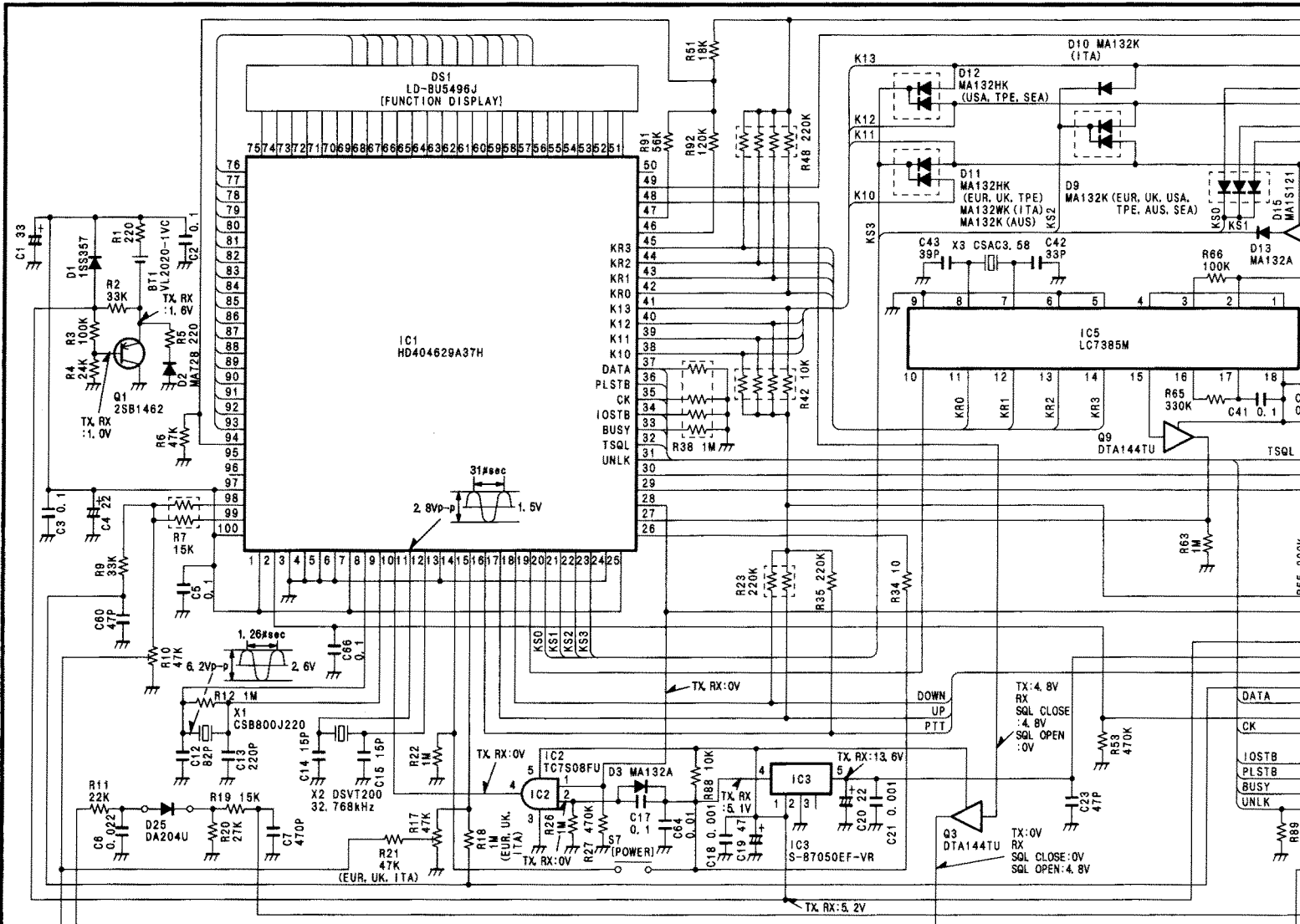
MA1S121
(Symbol: M2D)



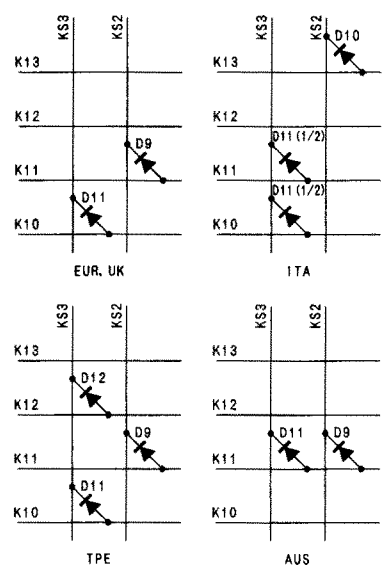
SECTION 9 BLOCK DIAGRAM



SECTION 10 VOLTAGE DIAGRAM

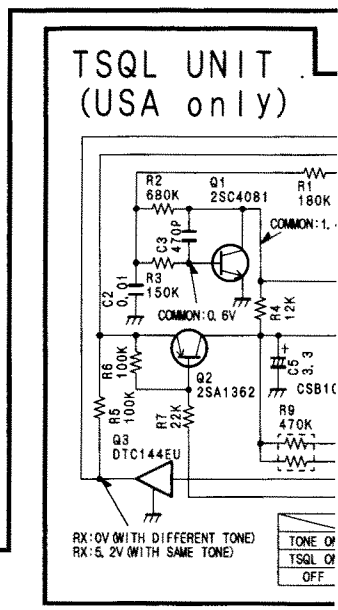


R84
120 (EUR, UK, ITA, TPE,
AUS, SEA)
270 (USA)
C58
0.22 (EUR, UK, ITA,
TPE, AUS, SEA)
0.1 (USA)



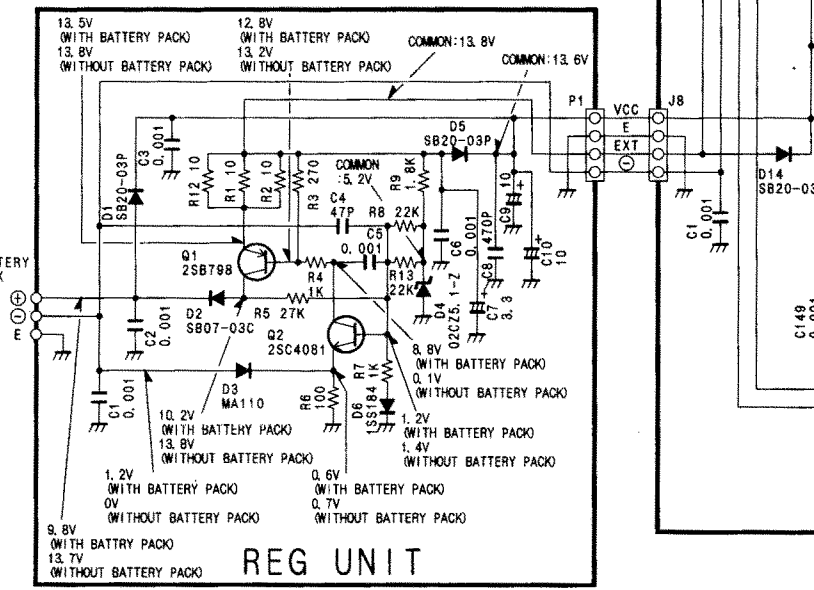
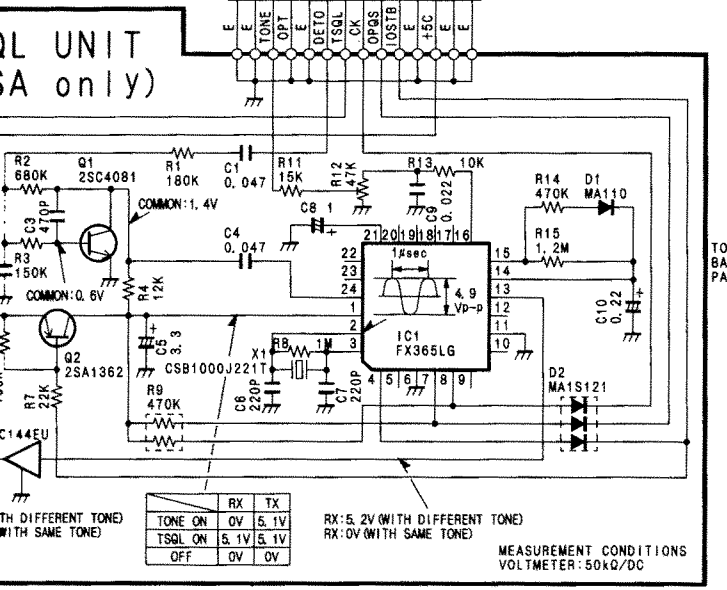
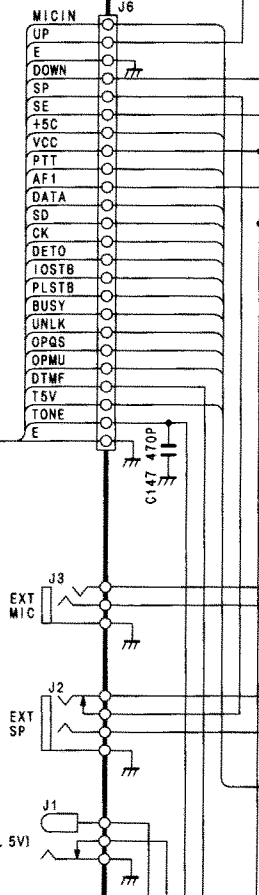
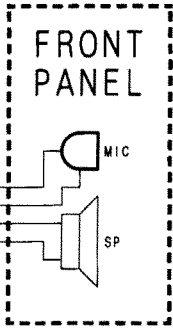
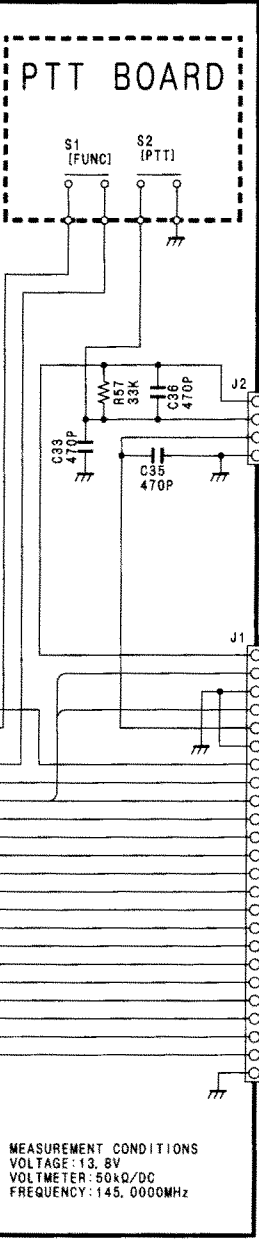
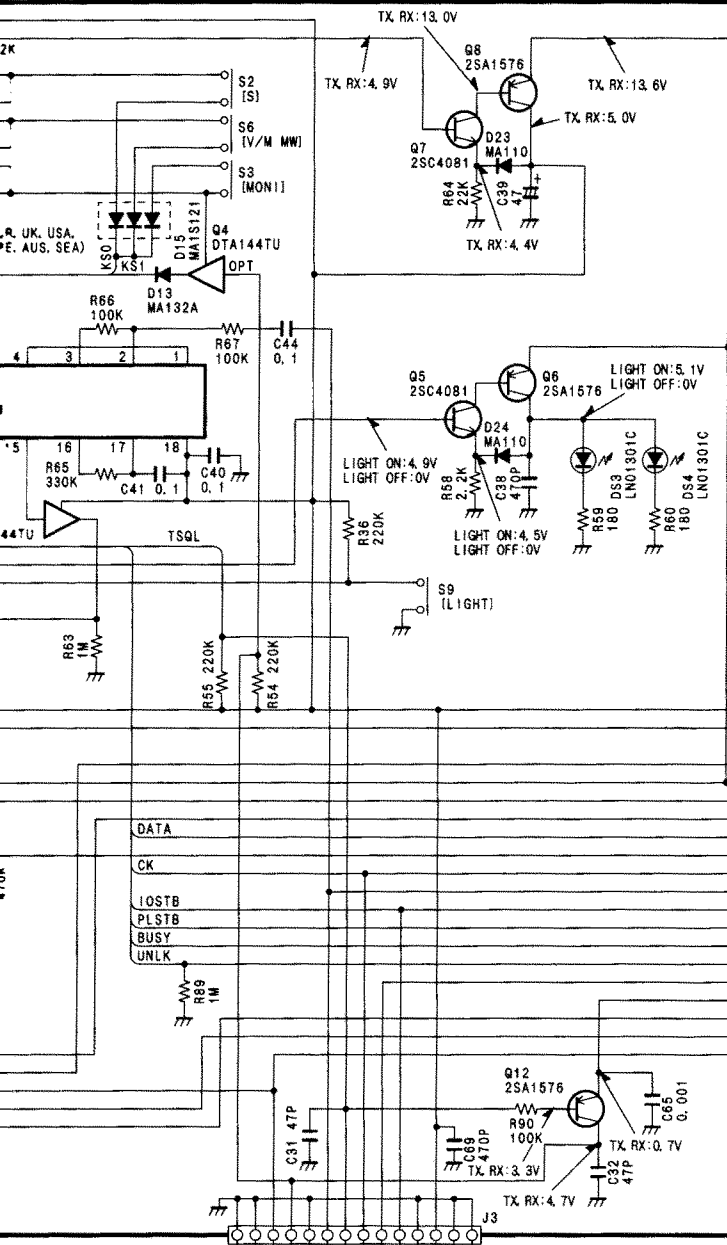
LOGIC UNIT

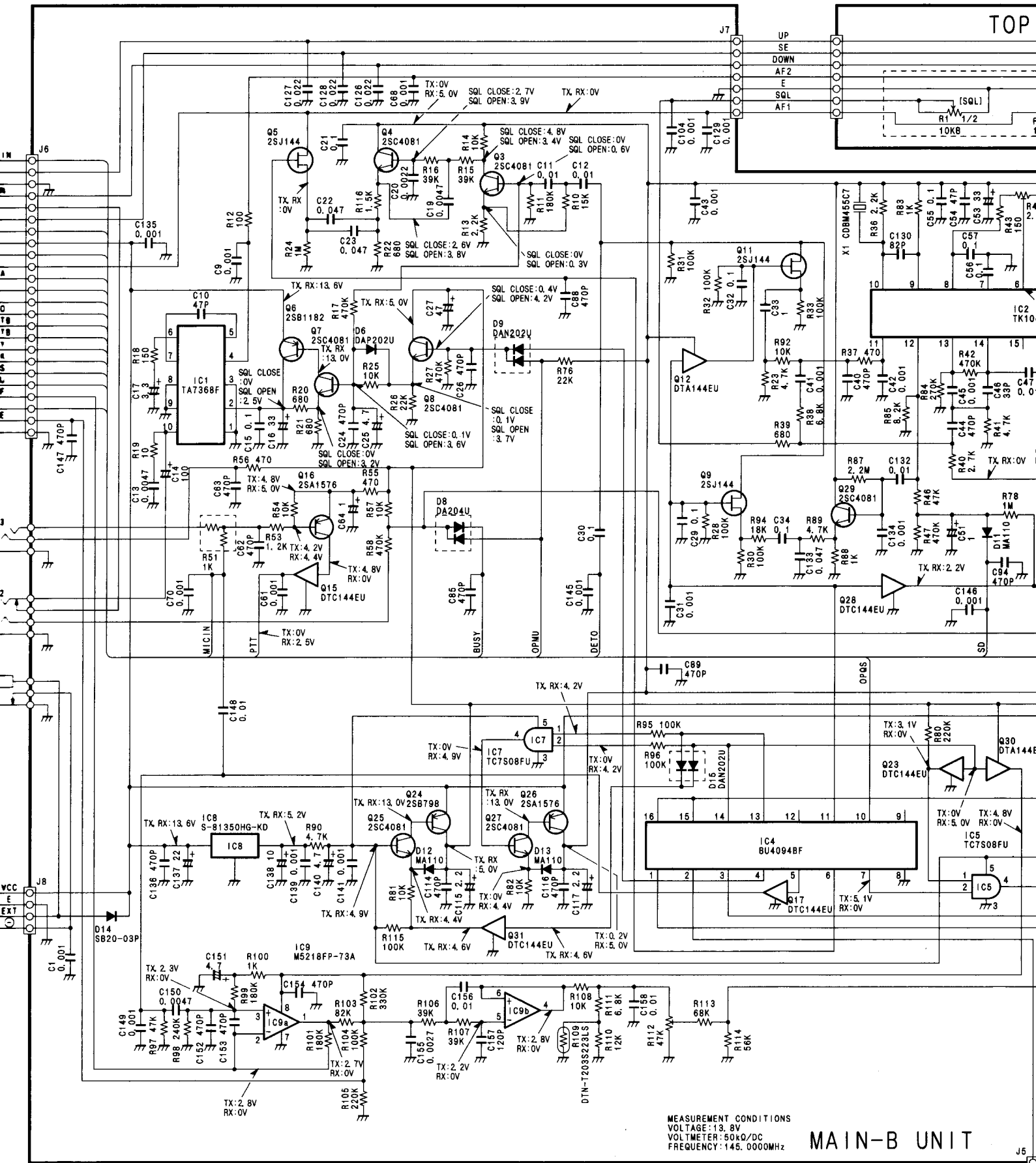
TX: 4.9V
RX: 0V
DS2
SLM-23VMWS
(TX/RX INDICATOR)



TSQL UNIT
(USA only)

RX: 0V (WITH DIFFERENT TONE)
RX: 5.2V (WITH SAME TONE)
TONE OF
TSQL UNIT
OFF

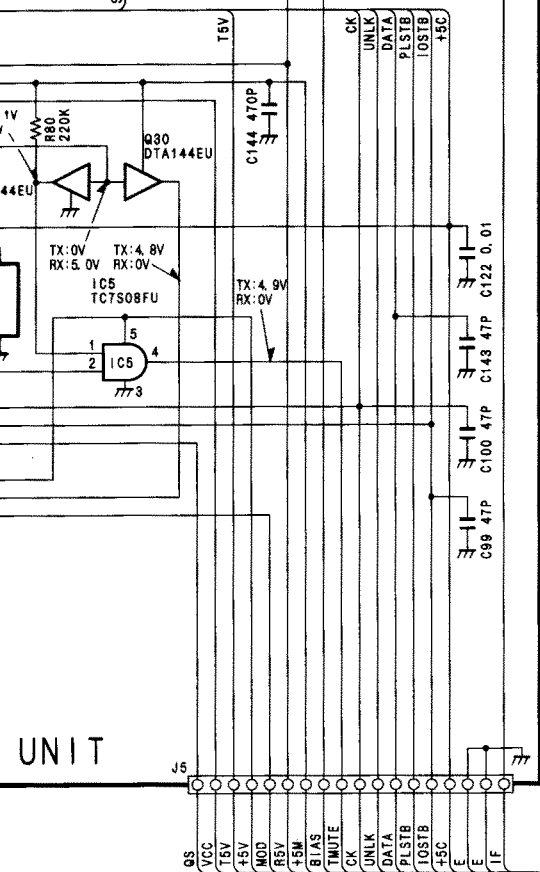
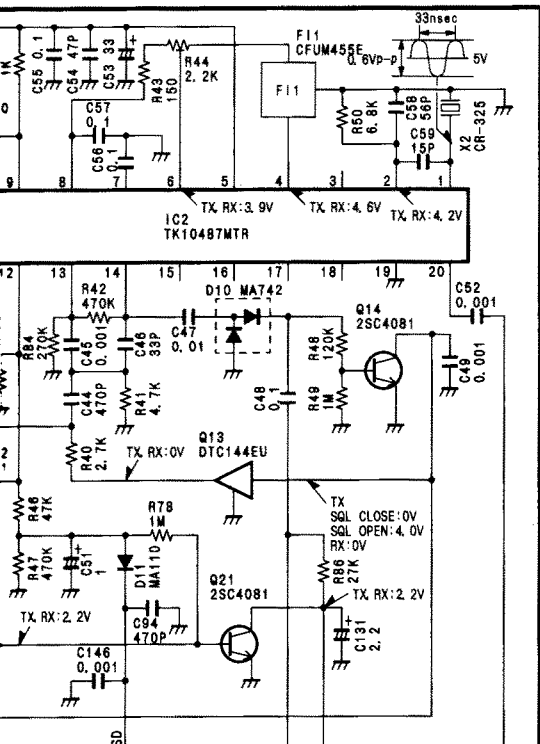
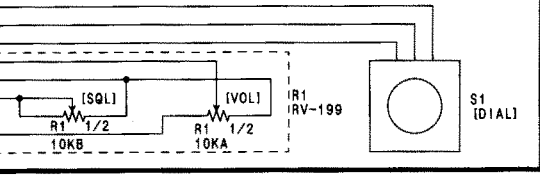




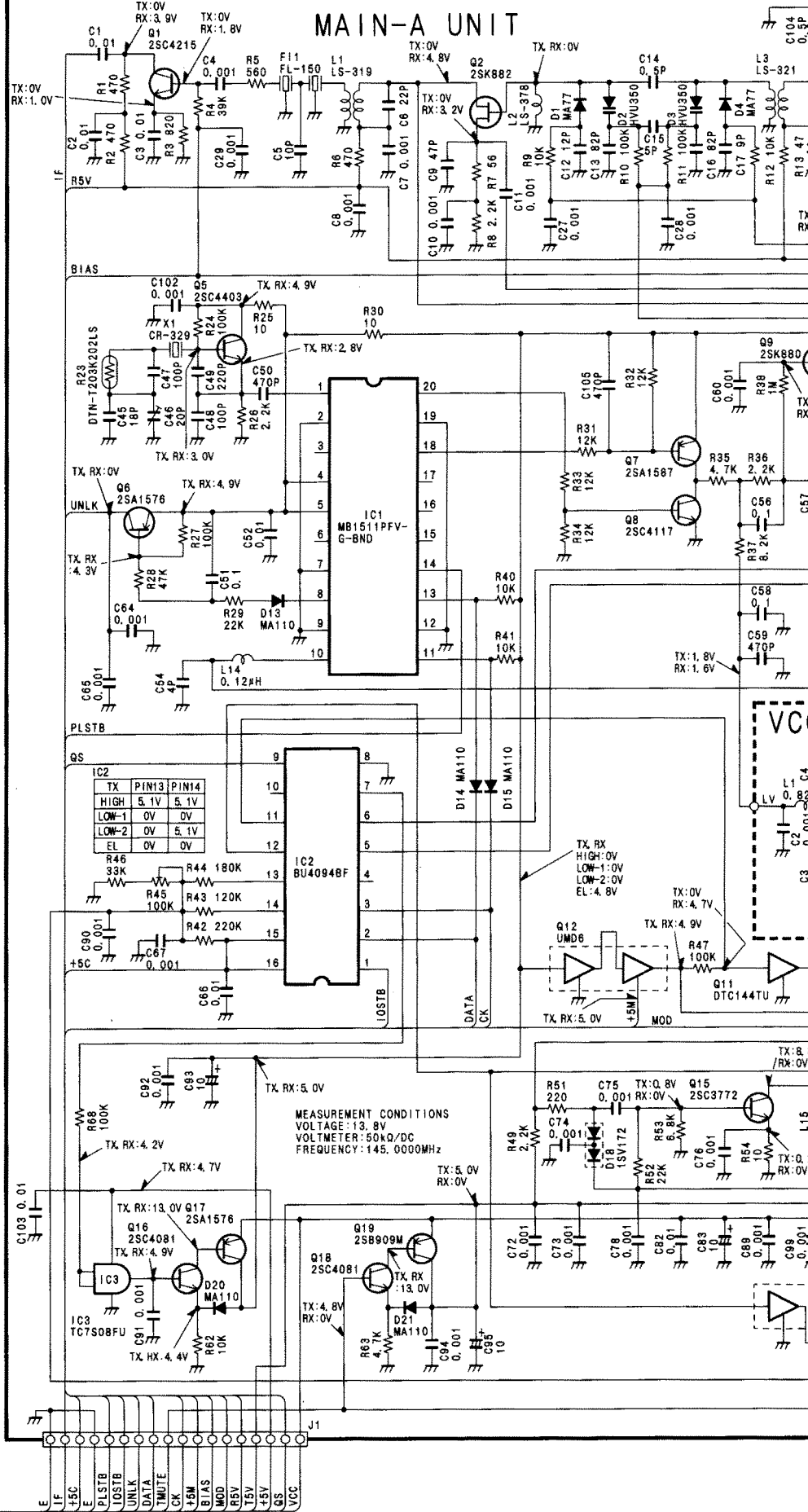
MEASUREMENT CONDITIONS
 VOLTAGE: 13.8V
 VOLT METER: 50kΩ/DC
 FREQUENCY: 145.0000MHz

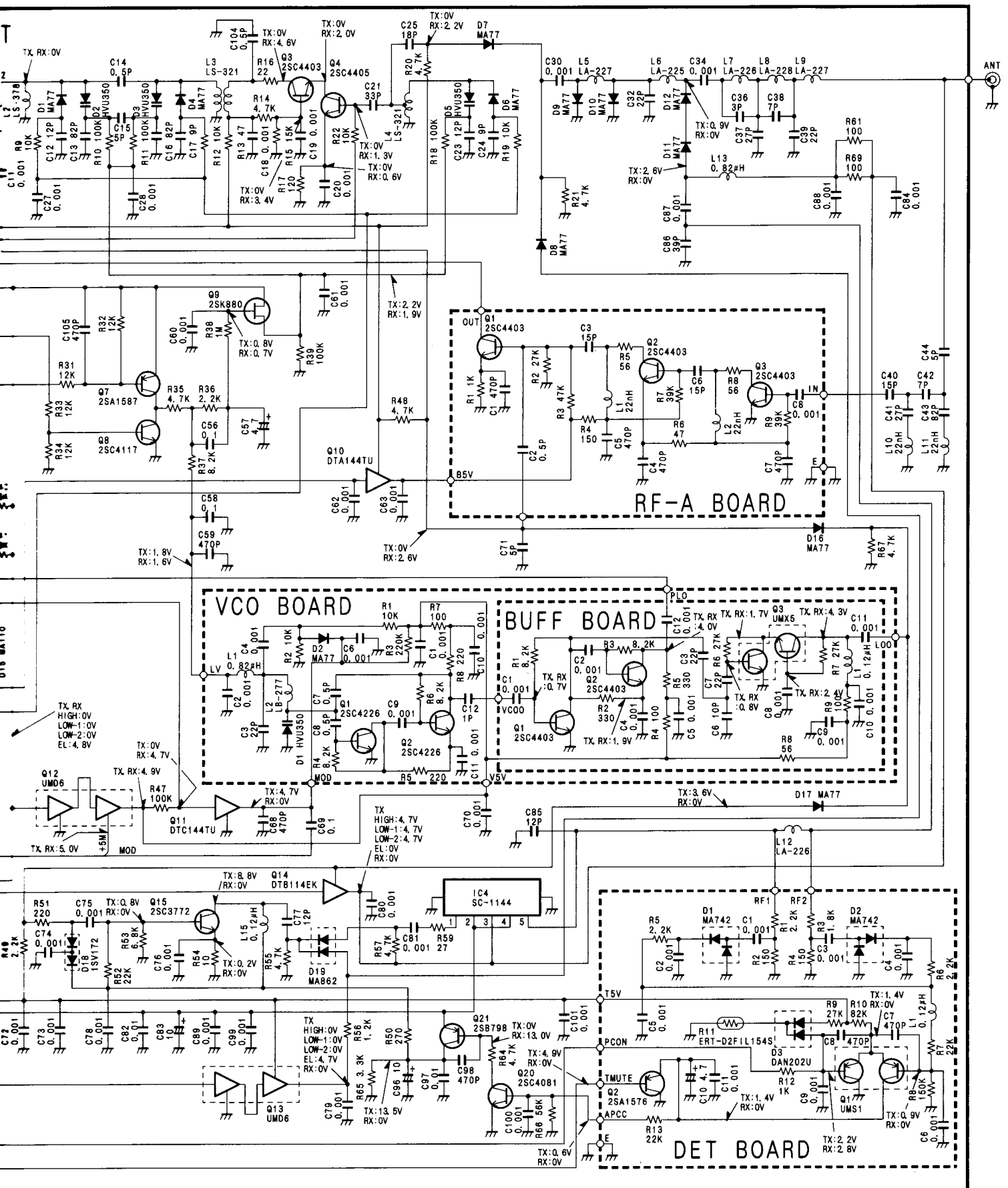
MAIN-B UNIT

TOP UNIT



MAIN-A UNIT





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