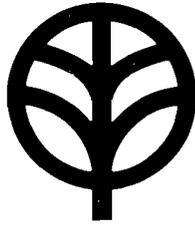


REVISED EDITION



KENWOOD

SERVICE MANUAL

TR-7625



2m FM TRANSCEIVER

INTRODUCTION/CONTENTS

INTRODUCTION

Your KENWOOD Model TR-7625 is an advanced 2-meter transceiver for amateur mobile, and optional fixed station operation.

The TR-7625 features:

- ☆ Memory channel (simplex and repeater mode).
- ☆ Memory TX and ± 600 kHz repeater TX for repeater operation.
- ☆ 800 channel PLL circuit.
- ☆ Digital frequency display.
- ☆ Dual concentric frequency selector switches.
- ☆ PLL UNLOCK and ON AIR indicators.
- ☆ Subaudible ON/OFF switch (Encoder user installed).
- ☆ Powered tone pad connector with 9V DC on one pin.
- ☆ Pin Mic connector with 9V DC on one pin.
- ☆ TX HI-LOW (Power) switch.
- ☆ Having 25W RF output power.

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GENERAL/CIRCUIT DESCRIPTION

GENERAL

The TR-7625 is a 25W, multi-channel (800 channels) FM transceiver covering 144 ~ 147.995 MHz. It features a built-in repeater shift circuit and memory circuit, and provision for connection of an optional (micro-processor) remote control.

PLL CIRCUIT

The TR-7625 employs a PLL circuit using SM5111A IC for programmable counter, reference oscillator, frequency divider and phase detector. Frequency division ratio, memory and remote indication functions are all controlled by BCD codes.

PLL CIRCUIT BLOCK DIAGRAM

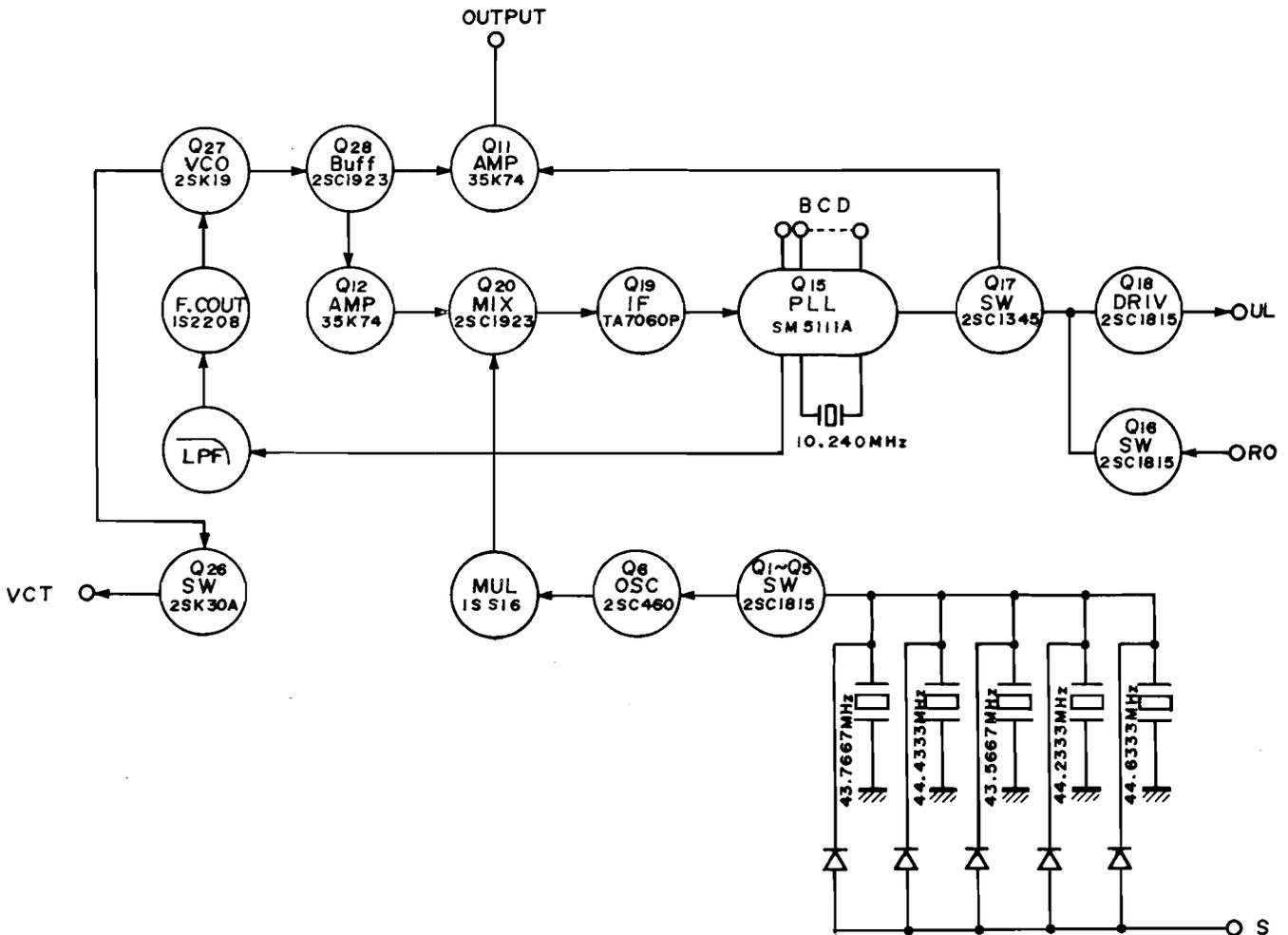


Fig. 1 PLL Circuit

CIRCUIT DESCRIPTION

1. Phase Locked Loop

The 130 MHz signal from Q27 passes through the buffer circuit Q28 and is then divided into a synthesizer output by Q11 and a loop output by Q12 respectively.

The output from Q12 is mixed with the local oscillator output, tripled by Q6, D21 and Q20 to obtain IF frequency. The IF output is amplified by Q19 and is fed to Q15 where the output is frequency divided as specified by the BCD code and compared with the 10 kHz reference frequency (1/1024 of 10,240 MHz).

The DC output thus obtained passes through the low-pass filter to control the VCO vari-cap diode 1S2208 D26. The output from Q26 controls the transmit frequency bandwidth. When the signal is unlocked, output is shut off by Q17 and indicated by Q18. Q16 shuts off output when the rotary switch is between channel setting positions.

| Rx Tx Freq. | Simplex Output | Division | Osc Xtal Freq. | IF Freq. |
|-------------|----------------|----------|----------------|----------|
| 144.00 MHz | 133.3 MHz | 200 | 43.7667 MHz | 2 MHz |
| 145.00 MHz | 134.3 MHz | 300 | 43.7667 MHz | 3 MHz |
| 145.99 MHz | 135.29 MHz | 399 | 43.7667 MHz | 3.99 MHz |
| 146.00 MHz | 135.3 MHz | 200 | 44.4333 MHz | 2 MHz |
| 147.00 MHz | 136.3 MHz | 300 | 44.4333 MHz | 3 MHz |
| 147.99 MHz | 137.29 MHz | 399 | 44.4333 MHz | 3.99 MHz |

Table 1 Division and Frequency

2. +5 kHz Circuit

In the PLL circuit, the reference frequency is controlled in 10 kHz steps. The +5 kHz signal is controlled by varying the local oscillator crystal frequency vari-cap diode, so the frequency division remains unchanged even when the +5 kHz circuit is operated.

The memory circuit also includes the same bit and functions even when the +5 kHz circuit is operating.

3. Shift Circuit

Transmit frequencies can be shifted by changing the local oscillator crystal frequency, as shown below.

144 and 145 MHz bands:

[−] shift 43.5667 MHz
 [S] 43.7667 MHz

The [+] shift is not available for 144 and 145 MHz bands, [S] occurs at the [+] position.

146 and 147 MHz Bands:

[−] shift 44.2333 MHz
 [+] shift 44.6333 MHz
 [S] 44.4333 MHz

4. Memory Shift Circuit

The memory shift (M) is a circuit to shift to the memory frequency during transmission.

CONTROL UNIT

Frequency settings are accomplished by the MHz, 100 kHz and 10 kHz rotary switches. The relationship between the frequency and frequency division is shown below.

| Frequency | Frequency division |
|-------------|--------------------|
| 144.000 MHz | 200 |
| 145.000 MHz | 300 |
| 145.990 MHz | 399 |
| 146.000 MHz | 200 |
| 147.000 MHz | 300 |
| 147.990 MHz | 399 |

The local oscillator kHz order frequency can be (switch) shifted. Frequency division, set by the rotary switch, is stored in the latch IC's 1, 2 and 3 by pressing the memory input switch. The output from the latch circuit is fed through IC's 4, 5 and 6 in the selector circuit to the PLL circuit by pressing the memory call switch. When this switch is not pressed, the output is fed directly to the PLL circuit. Memory function is effected by latching each switch. The information from each switch is stored by pressing the memory switch.

The stored information remains the same unless the memory switch is pressed once again. Selection of memory output and rotary output is accomplished by the selector circuit. A latched output is obtained by pressing the memory output switch.

The signal to the PLL circuit passes through the LED driver circuit and is digitally indicated by LED.

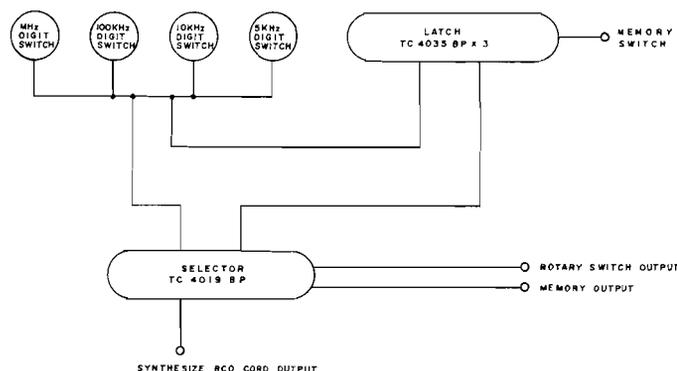


Fig. 2 Block Diagram of Frequency Memory Circuit

CIRCUIT DESCRIPTION

TRANSMITTER UNIT

The microphone signal passes through the limiter amplifier and FM modulates the 10.7 MHz oscillator. This is mixed with the local oscillator signal to obtain 114 ~ 146 MHz signal. The (variable) B.P.F. provides excellent power and spu-

rious characteristics by the use of VCO voltage. The RF power stage uses an M57712H power module manufactured by the Mitsubishi Electric Co., providing high reliability.

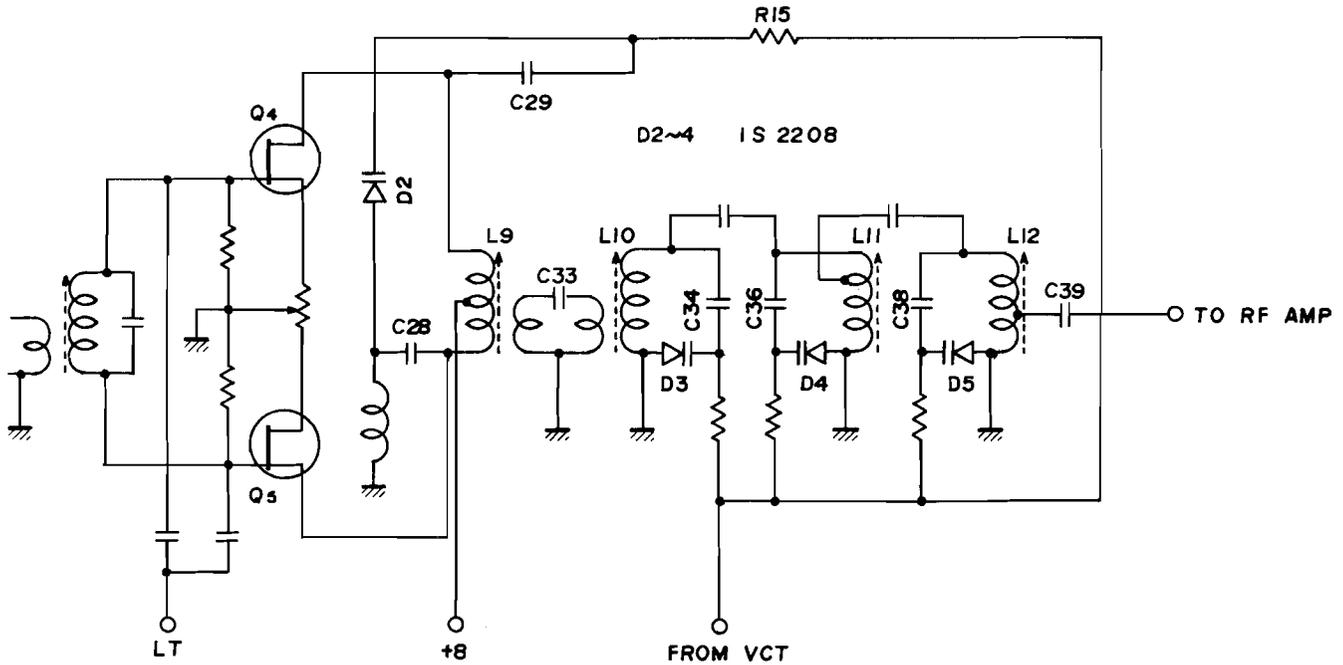


Fig. 3 Variable Transmitter Band Pass Filter Circuit

RECEIVER UNIT

The signal from the transmit/receive matching circuit passes through the diode switch and is fed to the 2-stage antenna tuning circuit, 3-stage herical tuning circuit and (MOS FET) RF amplifier. This signal is further fed to the mixer MOS FET where it is converted to a 10.7 MHz signal. The signal thus converted passes through the 2-stage filter and is fed to the 2nd mixer where it is converted to a 455 kHz signal. The 2nd IF signal from the 455 kHz ceramic filter passes through the limiter circuit where it is converted to an AF signal by the ceramic discriminator. This signal is amplified by the audio power amplifier to drive the speaker. The receiver unit includes a noise amplification type squelch circuit. This circuit picks up the noise component in the squelch signal from the discriminator which is amplified and rectified to control the 1st stage AF amplifier.

The characteristic of the discriminator is opposite that of conventional ones to permit connection of a remote control.

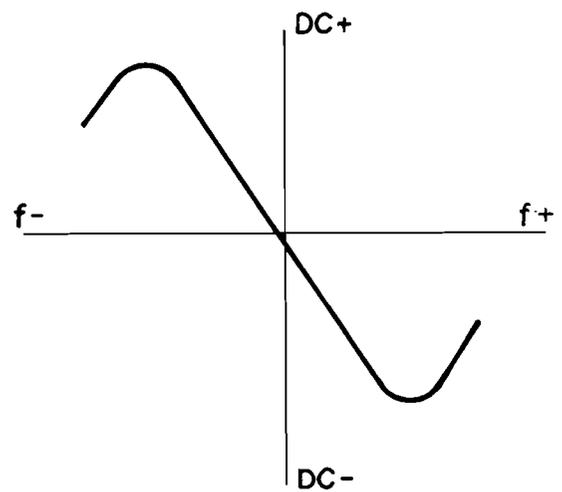


Fig. 4 Discriminator Characteristics

SPECIAL SEMICONDUCTOR DATA

CAUTION

SM5111A

Electrostatic Breakdown Protection

This item contains built-in input protection circuit to prevent a gate breakdown due to normal ambient static presence to protect the input circuit from damage due to high static or, voltage (in excess of permissible circuit limit), the following points must be observed:

1. When the product is not in use, keep all terminals in contact with insulating material (this is done at the factory prior to shipment).
2. Soldering iron, testing instruments and other tools should be grounded while in use.
3. Do not insert or remove IC from the socket without turning off the power.
4. Do not apply signal voltage to the input terminal when power is OFF.
5. Do not apply a voltage exceeding the power voltage to the input terminal.

OPERATING SYSTEM

This product has been developed with C MOS LSI used for PLL circuit. As shown in the block diagram in Fig. 1, it consists of OSC: reference oscillator circuit, DIVIDER: reference frequency dividing circuit, PC: programmable counter, PD: phase comparator, and INV: inverter. A high accuracy feedback type crystal oscillator circuit can be formed by adding a crystal oscillating element, resistor and capacitor between the Qin and Qout terminals of the reference oscillator circuit. This also permits an external signal to be fed to the Qin terminal.

The oscillator output is applied to the reference frequency dividing circuit where it is divided into the desired frequencies of f_{r1} (1/2048) and f_{r2} (1/1024) which are the reference signals for the digital phase comparator in the next stage.

The comparison signal (frequency f_1) fed to the input terminal FIN of the AMP is amplified and wave shaped, then fed to the input of the programmable counter. The frequency "f1" is frequency converted (f_{pc}) through the program terminals P01 ... P33 (for example, when P01 ... P33 = 1, the programmable counter output is 1/999), and is fed to the phase comparator where it is compared with the reference signal in phase so that a pulse signal, shown below, proportional to the phase difference between the two signal is fed to the output terminal DO.

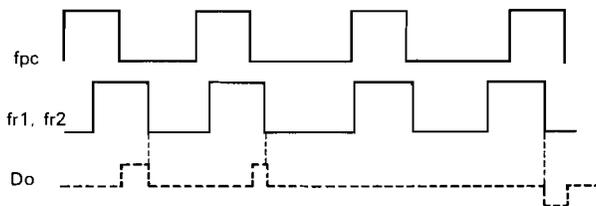


Fig. 5

The table below shows the maximum operation limit and environmental conditions. If any of these values exceeds the given limits, it can be cause of damage to the product or deterioration of quality.

| Item | Symbol | Rating | Unit |
|-----------------------|----------------------------------|---|------|
| Power Supply Voltage | V _{DD} -V _{SS} | -0.3 ~ +7.5 | V |
| Input Voltage | V _{IN} | V _{SS} ≤ V _{IN} ≤ V _{DD} | V |
| Operating Temperature | T _A | -30 ~ +70 | °C |
| Storage Temperature | T _{stg} | -40 ~ +125 | °C |
| Power Consumption | P _D | 250 | mW |
| Soldering Temperature | | 260 | °C |
| Soldering Time | | 5 | sec |

Table 2 SM5111A Absolute Maximum Ratings

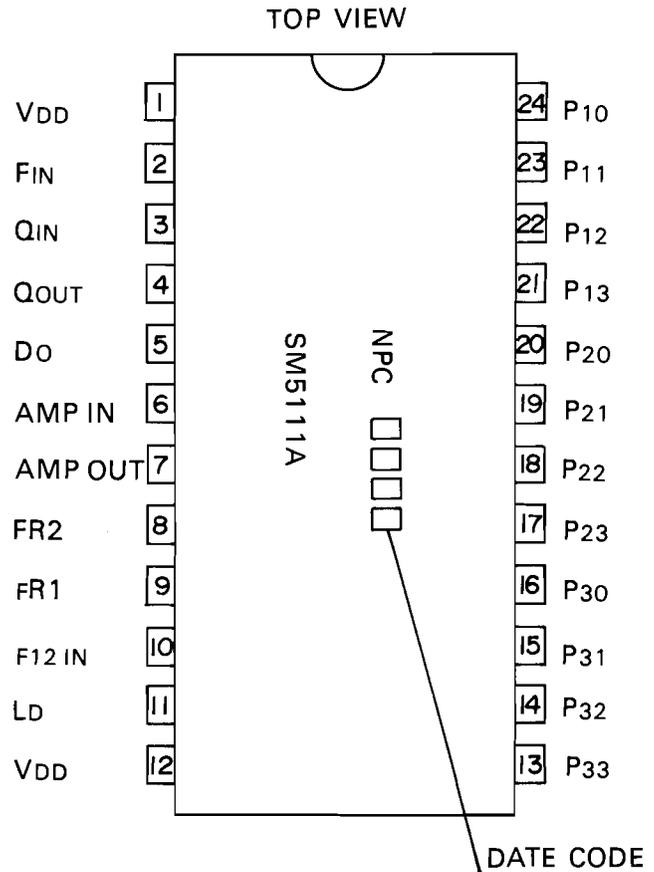


Fig. 6 SM5111A Pin Outline

SPECIAL SEMICONDUCTOR DATA

3SK74

SPECIFICATIONS

| | | |
|-------------------------|---------------------------------|----------------|
| Application | VHF RF Amplifier (Mixer) | |
| Construction | N-Channel • MOS FET (Dual Gate) | |
| Drain • Source Voltage | V_{DSX} | 20V |
| Gate 1 • Source Voltage | V_{G1S} | $\pm 10V$ |
| Gate 2 • Source Voltage | V_{G2S} | $\pm 10V$ |
| Drain Current | I_D | 25 mA |
| Allowable Loss | P_T | 200 mW |
| Channel Temperature | T_{CH} | 125 °C |
| Storage Temperature | T_{STG} | -5.5 ~ +125 °C |

Maximum Specifications

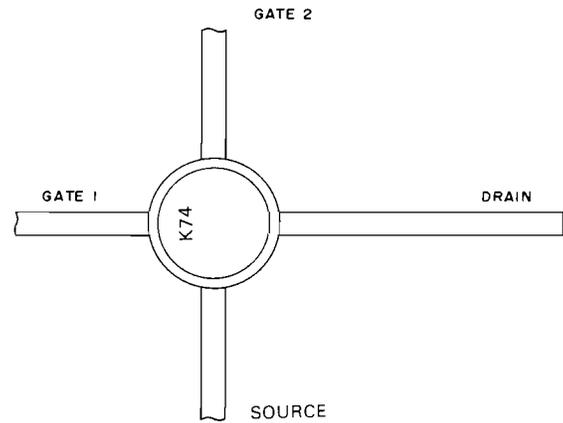


Fig. 7 3SK74 Outline

TEST CONDITION

| Item | Code | Condition |
|----------------------------------|------------|--|
| Drain • Source Voltage | V_{DSX} | $V_{G1S} = -3V, V_{G2S} = 3V, I_D = 500nA$ |
| Drain Current | I_{DSS} | $V_{DS} = 6V, V_{G1S} = 0, V_{G2S} = 3V$ |
| Cut-Off Voltage (Gate 1) | V_{G1S} | $V_{DS} = 6V, V_{G2S} = 0, I_D = 500nA$ |
| Cut-Off Voltage (Gate 2) | V_{G2S} | $V_{DS} = 6V, V_{G1S} = 0, I_D = 500nA$ |
| Gate Leak Current (Gate 1) | I_{G1SS} | $V_{DS} = 0, V_{G1S} = \pm 10V, V_{G2S} = 0$ |
| Gate Leak Current (Gate 2) | I_{G2SS} | $V_{DS} = 0, V_{G1S} = 0, V_{G2S} = \pm 10V$ |
| Small Signal Transfer Admittance | $1/y_{fs}$ | $V_{DS} = 6V, V_{G2S} = 3V, I_D = 10mA, f = 1.0 kHz$ |
| Small Signal Input Capacity | C_{ISS} | $V_{DS} = 6V, V_{G2S} = 3V, I_D = 10mA, f = 1.0 MHz$ |
| Small Signal Output Capacity | C_{OSS} | $V_{DS} = 6V, V_{G2S} = 3V, I_D = 10mA, f = 1.0 MHz$ |
| Small Signal Feedback Capacity | C_{RSS} | $V_{DS} = 6V, V_{G2S} = 3V, I_D = 10mA, f = 1.0 MHz$ |
| Output Power Gain | G_P | $V_{DS} = 10V, I_D = 10mA, f = 200 MHz$ |
| Noise Figure | NF | $V_{DS} = 10V, I_D = 10mA, f = 200 MHz$ |

Maximum Rating of M57712H

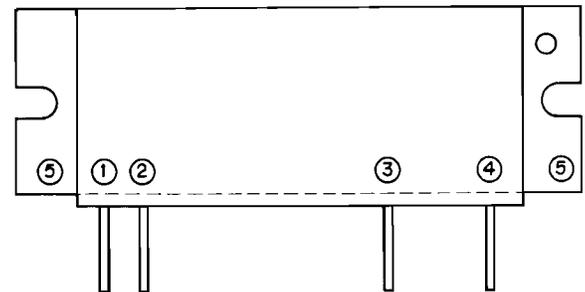
($T_A = 25^\circ C$, unless otherwise noted)

| Item | Symbol | Condition | Value | Unit |
|-----------------------|-------------|-----------|------------|------|
| Operating Voltage | V_{CC} | | 17 | V |
| DC Current | I_{CC} | | 7 | A |
| Operating Temperature | $T_{C(OP)}$ | | -30 ~ +110 | °C |
| Storage | T_{STG} | | -40 ~ +110 | °C |

Electrical Characteristic of M57712H

($T_A = 25^\circ C$ unless otherwise noted)

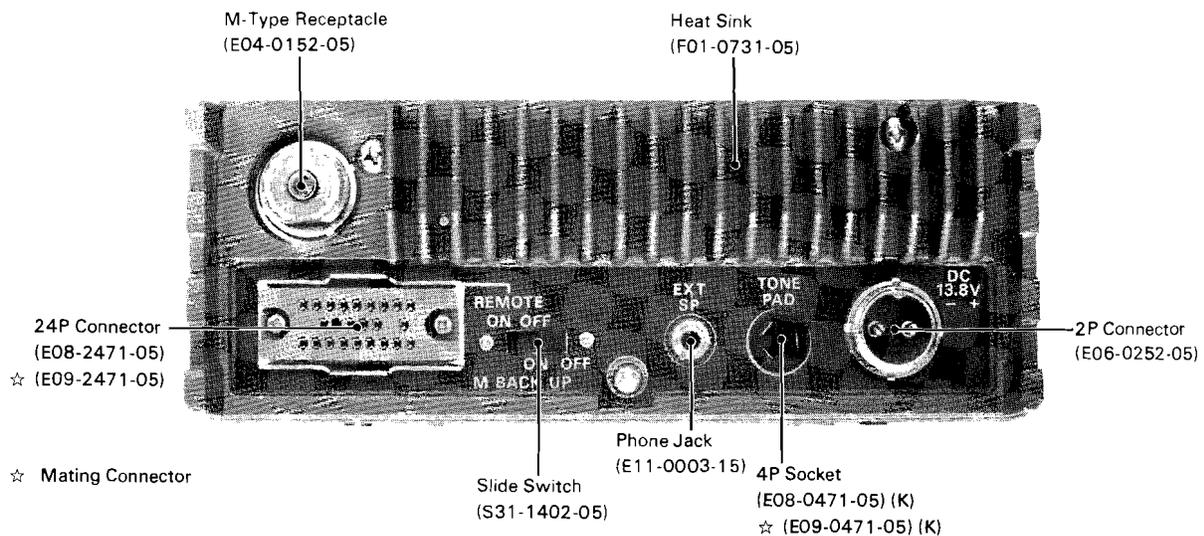
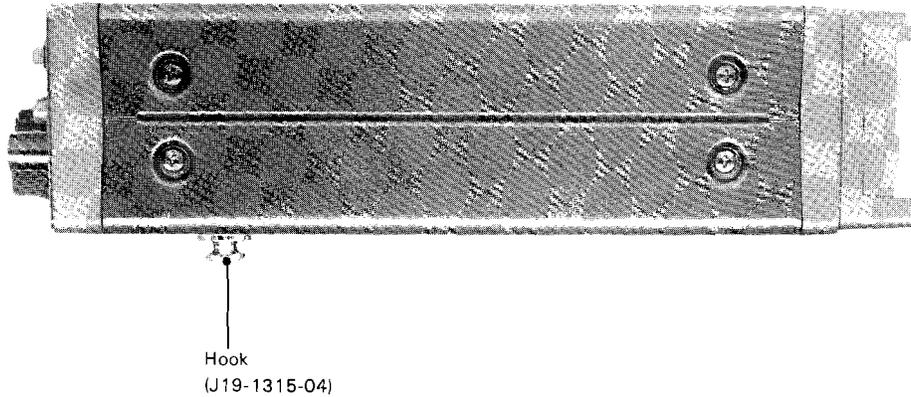
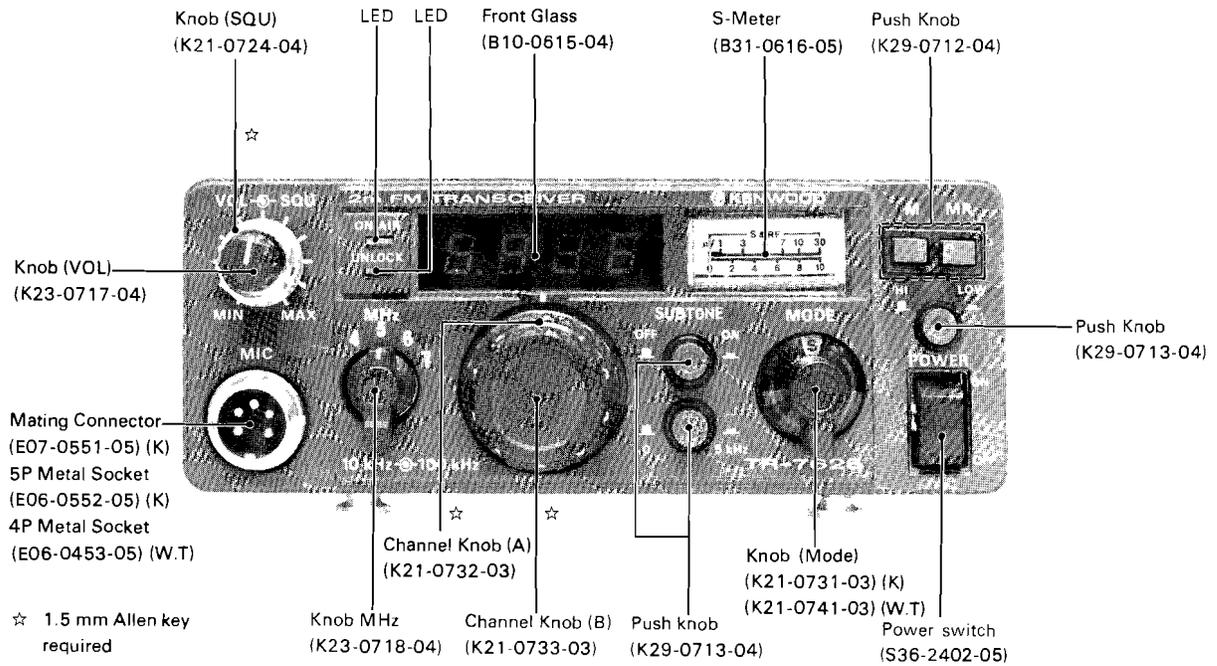
| Item | Symbol | Condition | Value | | | Unit |
|-------------------------------------|-----------|--|--------------|------|------|------|
| | | | Min. | Std. | Max. | |
| Output Power | P_O | $f = 144 \sim 148 MHz, V_{CC} = 12V, P_{in} = 0.15W, Z_G = Z_L = 50\Omega$ | 30 | 34 | | W |
| Total Efficiency | S_T | $f = 144 \sim 148 MHz, V_{CC} = 12V, P_{in} = 0.15W, Z_G = Z_L = 50\Omega$ | 45 | 50 | | % |
| 2nd Harmonic Radiation | | $f = 144 \sim 148 MHz, V_{CC} = 12V, P_{in} = 0.15W, Z_G = Z_L = 50\Omega$ | | | -25 | dB |
| Greater than 3rd Harmonic Radiation | | $f = 144 \sim 148 MHz, V_{CC} = 12V, P_{in} = 0.15W, Z_G = Z_L = 50\Omega$ | | | -30 | dB |
| Input VSWR | P_{IN} | $f = 144 \sim 148 MHz, V_{CC} = 12V, P_{in} = 0.15W, Z_G = Z_L = 50\Omega$ | | 2.0 | 2.8 | |
| Output VSWR | P_{OUT} | $f = 144 \sim 148 MHz, V_{CC} = 12V, P_{in} = 0.15W, Z_G = Z_L = 50\Omega$ | | 1.5 | | |
| Impedance | | Note | $\infty : 1$ | | | |



1. Input Terminal (RFI)
2. Power Supply of Drive Stage (DRB)
3. Power Supply of Output Stage (FIB)
4. Output Terminal (RFO)
5. GND

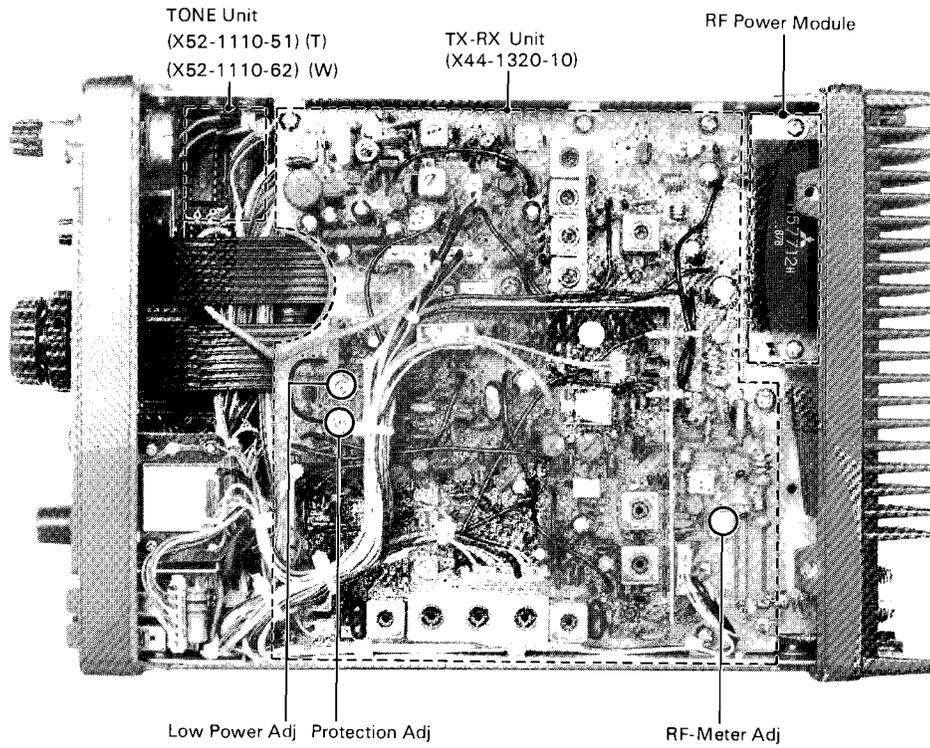
Fig. 8 M57712H Outline

OUTSIDE VIEWS

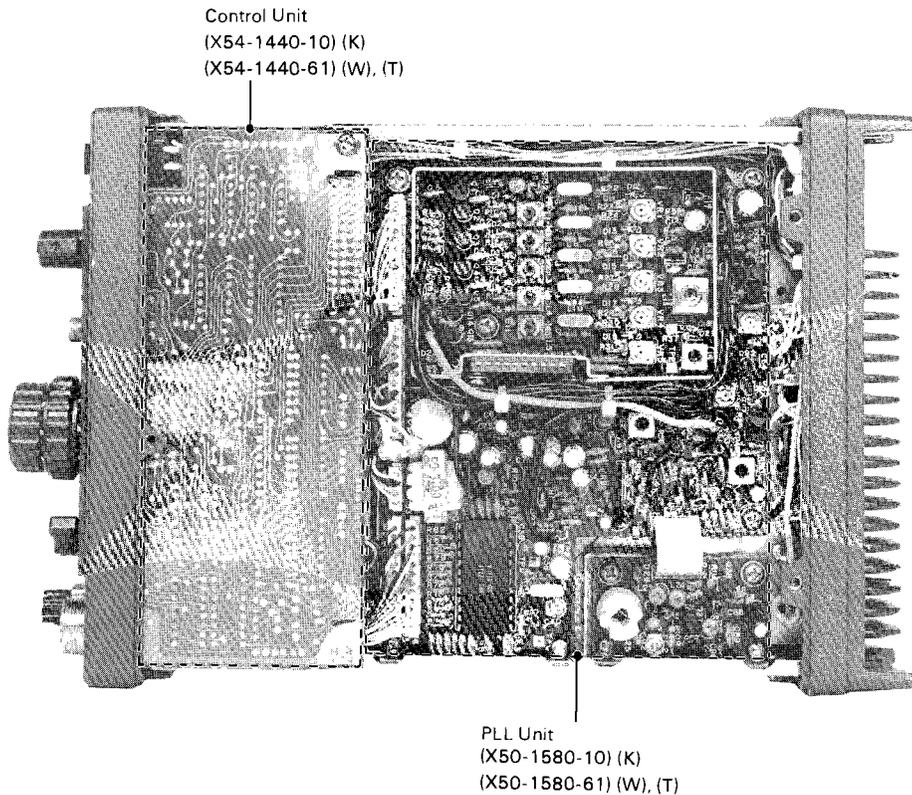


INSIDE VIEWS

TOP VIEW

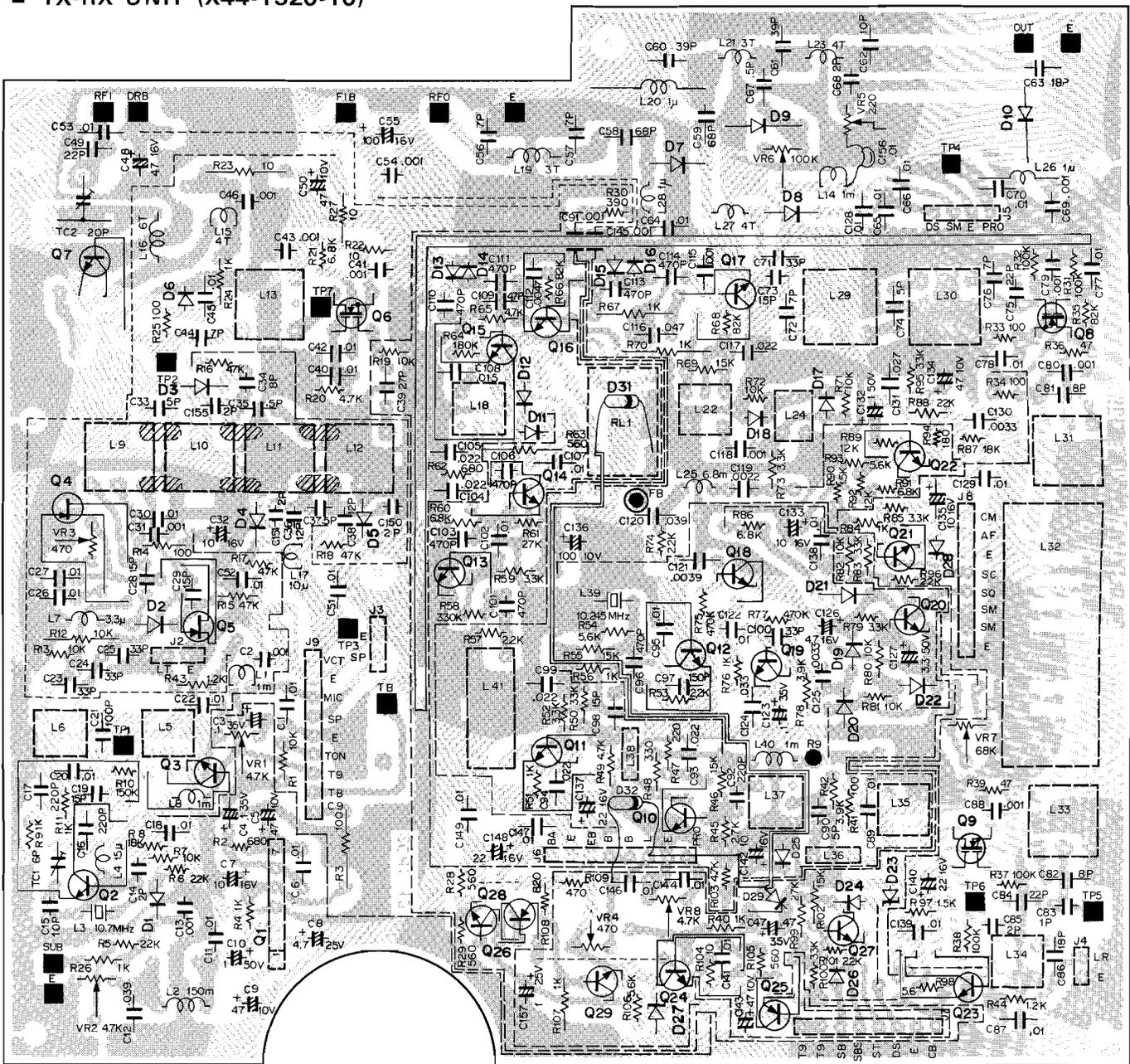


BOTTOM VIEW

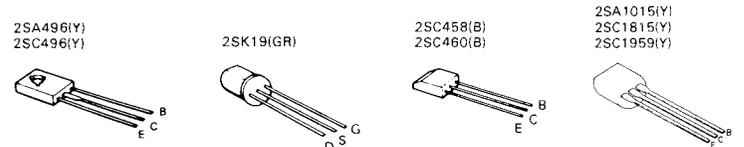


■ TX-RX UNIT (X44-1320-10)

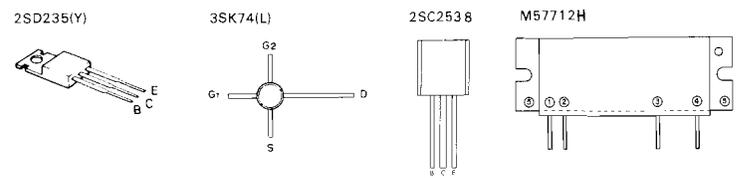
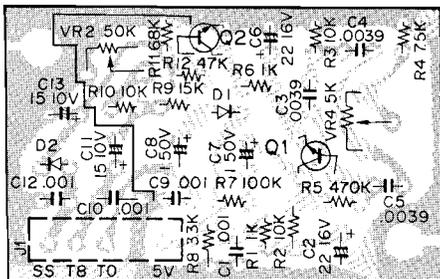
PC BOARD



| | | | |
|------------------|-------------------|------------------------------------|-----------------|
| Q1 :TA7061AP | Q18~22,28,29 | D1~5, :IS2208 | D23 :XZ-088 |
| Q2,3,10~17 | :2SC1815(Y) | D6,13-16,21,24,26,28,31,32 :IS1555 | D25 :WZ-100 |
| :2SC460(B) | Q23,24 :2SC496(Y) | D7 :M1402 | D27 :XZ-064 |
| Q4,5 :2SK19(GR) | Q25 :2SA1015(Y) | D8 :IS2588 | D28 :1S1555 |
| Q6,8,9 :3SK74(L) | Q27 :2SC1959(Y) | D9,11,12,17,18,19,20 :1N60 | D29 :CRO2AM-2.1 |
| Q7 :2SC2538 | Q26 :2SA496(Y) | D22 :IS1212 | D10 :IS516 |

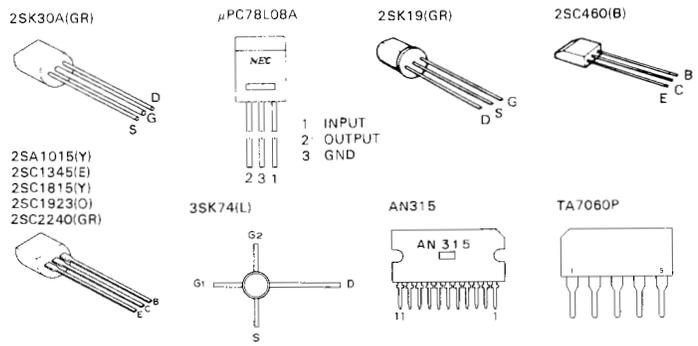
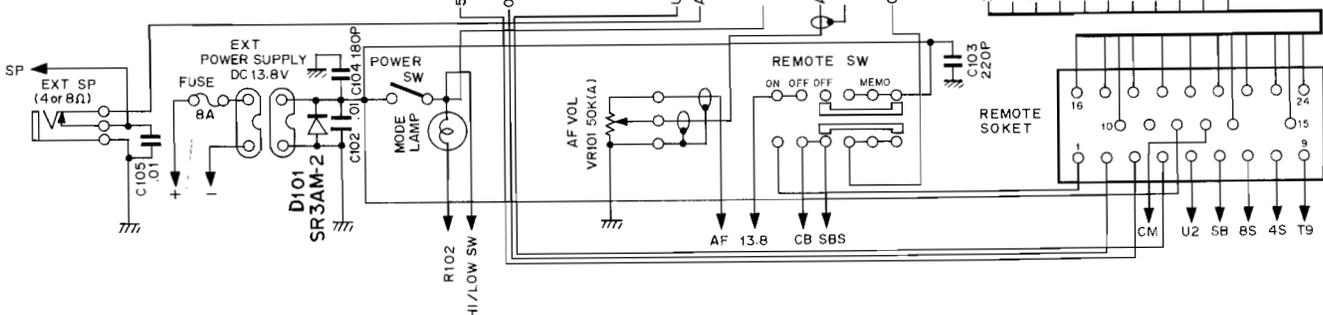
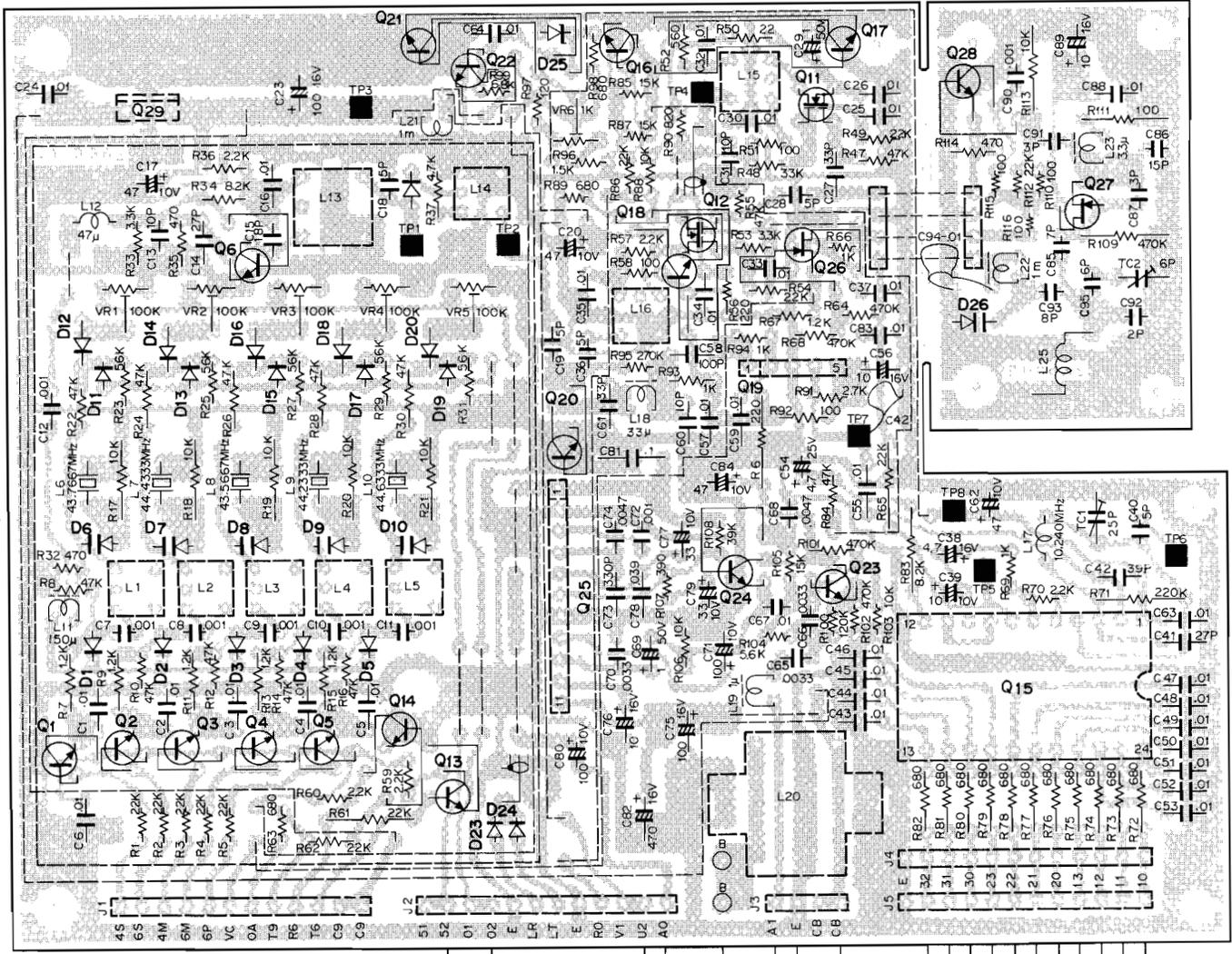


■ TONE UNIT (X52-1110-51) T TYPE



PC BOARD

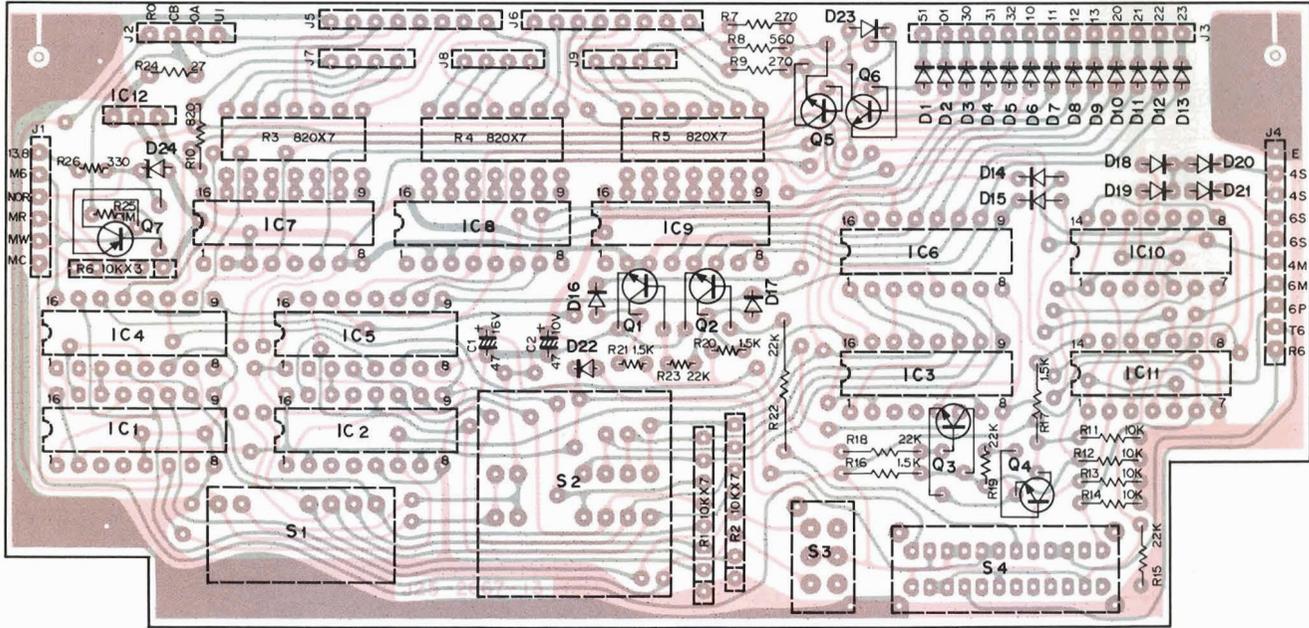
■ PLL UNIT (X50-1580-10)



- | | | | |
|------------------------------------|----------------|--------|--------------|
| Q1~3, 4, 5, 13, 14, 16, 18, 21, 22 | : 2SC1815 (Y) | Q25 | : AN315 |
| Q6 | : 2SC460 (B) | Q26 | : 2SK30A(GR) |
| Q11, 12 | : 3SK74 (L) | Q27 | : 2SK19(GR) |
| Q15 | : SM5111A | Q29 | : μPC78L08A |
| Q17 | : 2SC1345 (E) | D1~5 | : 1S2588 |
| Q19 | : TA7060P | D6-10 | : 1SV53A |
| Q20, 28 | : 2SC1923(O) | D11-20 | : 1S1555 |
| Q23, 24 | : 2SC2240 (GR) | D21 | : 1S516 |
| | | D23~24 | : 1S2588 |
| | | D25 | : WZ-040 |
| | | D26 | : 1S2208 |

PC BOARD

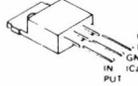
CONTROL UNIT (X54-1440-10)



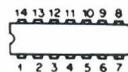
2SA1015(Y)
2SC1815(Y)



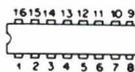
FS-7806M



TC4081P

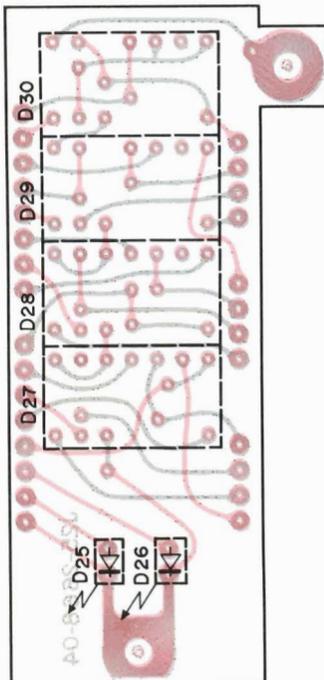


TC5022BP
TC4019BP
TC4035BP

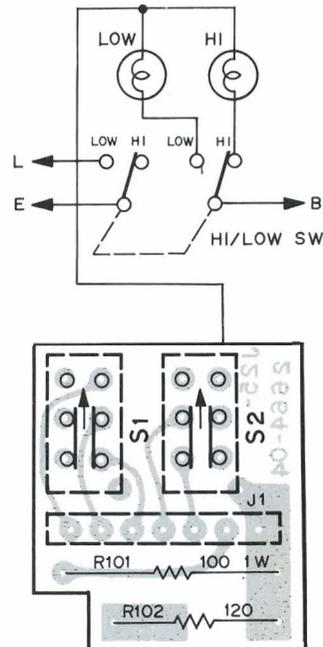


- IC1~3 : TC4035BP
- IC4~6 : TC4019BP
- IC7~9 : TC5022BP
- IC10,11 : TC4081P-3/4
- IC10,11 : TC4081P-1/4
- IC12 : FS-7806M
- Q1~6 : 2SC1815(Y)
- Q7 : 2SA1015(Y)
- D1~22 : 1N60
- D23 : 1S1555
- D24 : WZ-150
- D25 : TLR-205
- D26 : TLR-205
- D27~30 : S130K

J25-2668-04 (Indicator)



J25-2664-04 (Switch)



PARTS LIST

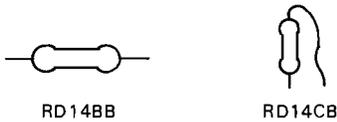
NOTE:

Except special types (example' cement, metal film, etc.) resistors are not detailed in the PARTS LIST. Refer to the schematic diagram of the PC board illustration for value. Resistors not otherwise detailed are carbon type (1/4 or 1/8W).

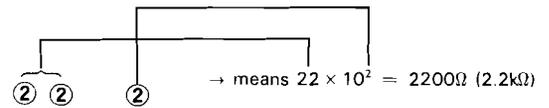
Order carbon resistors according to the following example:

A carbon resistor's part number is RD14BB 2E222J.

1. Type of the carbon resistor



3. Resistance value



Significant figure Multiplier

Example:

- 221 → 220Ω
- 222 → 2.2kΩ
- 223 → 22kΩ
- 224 → 220kΩ
- 225 → 2.2MΩ

2. Wattage

- 1/4W → 2E
- 1/2W → 2H
- 2W → 3D
- 4W → 3G
- 1/8W → 2B
- 1W → 3A
- 3W → 3F
- 5W → 3H

GENERAL

☆ : New parts

| Ref. No. | Parts No. | Description | Re- marks |
|----------------------|--------------|-------------------------------|--------------|
| CAPACITORS | | | |
| C101 | CC45SL2H100D | Ceramic 10pF ±0.5pF | |
| C102,105 | CK45F1H103Z | Ceramic 0.01μF +80%--20% | |
| C103 | CK45B1H221K | Ceramic 220pF ±10% | |
| C104 | CC45SL1H181J | Ceramic 180pF ±5% | |
| SEMICONDUCTOR | | | |
| Q101 | V30-1043-06 | Power module M57712H | ☆ |
| Q102 | V04-0880-16 | Transistor 2SD880 (Y) | |
| D101 | V11-0171-05 | Diode SR3AM-2 | |
| D102 | V11-0076-05 | Diode 1S1555 | |
| COIL | | | |
| L101 | L34-0814-05 | Coil 4φ4T | ☆ |
| POTENTIOMETER | | | |
| VR101 | R19-9403-05 | 10kΩ (A) 50k (B) | |
| MISCELLANEOUS | | | |
| — | A01-0734-13 | Case (A) | ☆ |
| — | A01-0735-03 | Case (B) | ☆ |
| — | A20-2345-03 | Die cast panel (Front) (K) | ☆ |
| — | A20-2347-03 | Die cast panel (Front) (W) | ☆ |
| — | A20-2346-03 | Die cast panel (Front) (T) | ☆ |
| — | B05-0707-04 | Speaker grill cloth | ☆ |
| — | B10-0615-04 | Front glass | ☆ |
| — | B31-0616-05 | Meter | ☆ |
| — | B30-0802-05 | Pilot lamp (white) | ☆ |
| — | B30-0803-05 | Pilot lamp (Blue) | ☆ |
| — | B30-0106-05 | Pilot lamp (Small) | ☆ |
| — | B42-1660-04 | Sticker (K) | ☆ |
| — | B46-0058-00 | Warranty card (K) | ☆ |
| — | B50-2639-00 | Operating manual (K) | ☆ |
| — | B50-2641-00 | Operating manual (W) | ☆ |
| — | B50-2640-00 | Operating manual (T) | ☆ |
| — | E04-0152-05 | M type receptacle | ☆ |
| — | E06-0453-05 | 4P metal socket (MIC) (W) (T) | ☆ |
| — | E06-0552-05 | 5P metal socket (MIC) (K) | ☆ |
| — | E07-0451-05 | 4P metal consent (W) (T) | ☆ |
| — | E07-0551-05 | 5P metal consent (K) | ☆ |

| Ref. No. | Parts No. | Description | Re- marks |
|----------|-------------|------------------------------|--------------|
| — | E06-0252-05 | 2P connector (Jack) | |
| — | E08-0471-05 | 4P socket (TONE PAD) (K) | |
| — | E09-0471-05 | 4P plug (TONE PAD) (K) | |
| — | E11-0003-15 | Earphone jack | |
| — | E12-0001-05 | Phone plug | |
| — | E23-0043-04 | Antenna ground lug | |
| — | E23-0015-04 | Earth lug | |
| — | F01-0731-05 | Heat sink | ☆ |
| — | F05-8021-05 | Fuse (8A) | |
| — | F20-0078-05 | Insulating plate | |
| — | F29-0014-05 | Insulating washer | |
| — | G02-0505-05 | "D" spring knob | |
| — | G11-0054-14 | Insulating cushion × 2 | |
| — | G13-0616-14 | Cushion (A) × 2 | ☆ |
| — | G13-0617-04 | Cushion (B) | ☆ |
| — | G13-0618-04 | Cushion × 2 (angle) | |
| — | H01-2615-03 | Carton (K) (W) | ☆ |
| — | H01-2616-03 | Carton (T) | ☆ |
| — | H10-2519-12 | Packing fixture | ☆ |
| — | H10-2501-03 | Styren foam cushion | |
| — | H20-1408-03 | Protective cover | ☆ |
| — | H25-0049-03 | Accessory bag | |
| — | H25-0079-04 | Polyethylene bag (MIC) | |
| — | H25-0103-04 | Polyethylene bag (Cord) | |
| — | J21-2607-03 | Mount-base | |
| — | J21-2608-03 | C type angle | ☆ |
| — | J51-0006-15 | Snap-lock × 2 | |
| — | J61-0019-05 | Vinyl tie | |
| — | K21-0724-04 | Knob (Outside) SQU | |
| — | K21-0731-03 | Knob (Mode) (K) | ☆ |
| — | K21-0732-03 | Channel Knob (A) | ☆ |
| — | K21-0733-03 | Channel Knob (B) | ☆ |
| — | K21-0741-03 | Knob Mode (W) (T) | ☆ |
| — | K23-0717-04 | Knob VOL | ☆ |
| — | K23-0718-04 | Knob MHz | ☆ |
| — | K29-0712-04 | Push knob (square) × 2 M, MR | ☆ |

PARTS LIST

| Ref. No. | Parts No. | Description | Re- marks |
|----------|-------------|---------------------------|--------------|
| — | K29-0713-04 | Push knob (circle) × 3 | ☆ |
| — | N09-0008-04 | Screw × 4 (angle) | |
| — | N14-0009-04 | Nut × 4 (angle) | |
| — | N15-1040-46 | Flat washer × 4 (angle) | |
| — | N15-1060-46 | Flat washer × 4 (angle) | |
| — | N16-0060-46 | Spring washer × 4 (angle) | |
| — | N99-0304-04 | Allen head bolt × 4 | ☆ |
| — | S31-1402-05 | Slide switch (remote) | |
| — | S36-2402-05 | Power switch | |
| — | S40-2409-05 | Push switch (M) | ☆ |
| — | S40-2404-05 | Push switch (MR) | |
| — | S40-2403-05 | Push switch SUB. HI/LOW | |
| — | S40-2406-05 | Push switch TONE (W) | |
| — | T07-0201-05 | Speaker (8Ω) | |
| — | T91-0310-05 | Microphone | (K) |
| — | T91-0302-05 | Microphone | (W) ☆ |
| — | T91-0301-05 | Microphone | (T) |
| — | W01-0401-04 | Allen key (angle) | |
| — | X44-1320-10 | TX-RX unit | ☆ |
| — | X50-1580-10 | PLL unit | (K) ☆ |
| — | X50-1580-61 | PLL unit | (W) (T) ☆ |
| — | X52-1110-62 | TONE unit | (W) ☆ |
| — | X52-1110-51 | TONE unit | (T) ☆ |
| — | X54-1440-10 | CONTROL unit | (K) ☆ |
| — | X54-1440-61 | CONTROL unit | (W) (T) ☆ |
| — | X42-1170-01 | DC cord Ass'y | ☆ |

TX-RX Unit (X44-1320-10)

| Ref. No. | Parts No. | Description | Re- marks |
|------------------|--------------|--------------------------|--------------|
| CAPACITOR | | | |
| C1 | CK45F1H103Z | Ceramic 0.01μF +80, -20% | |
| C2 | CK45B1H102K | Ceramic 0.001μF ±10% | |
| C3.4 | CS15E1V0R1M | Tantalum 0.1μF 35WV | |
| C5 | CE04W1A470 | Electrolytic 47μF 10WV | |
| C6 | CK45F1H103Z | Ceramic 0.01μF +80, -20% | |
| C7 | CE04W1C100 | Electrolytic 10μF 16WV | |
| C8 | CE04W1E4R7 | Electrolytic 4.7μF 25WV | |
| C9 | CE04W1A470 | Electrolytic 47μF 10WV | |
| C10 | CE04W1H010 | Electrolytic 1μF 50WV | |
| C11 | CQ92M1H103K | Mylar 0.01μF ±10% | |
| C12 | CQ92M1H393K | Mylar 0.039μF ±10% | |
| C13 | CK45B1H102K | Ceramic 0.001μF ±10% | |
| C14 | CC45UJ1H020C | Ceramic 2pF ±0.25pF | |
| C15 | CC45TH1H100D | Ceramic 10pF ±0.5pF | |
| C16.17 | CC45SL1H221J | Ceramic 220pF ±10% | |
| C18 | CK45F1H103Z | Ceramic 0.01μF +80, -20% | |
| C19 | CC45CH1H150J | Ceramic 15pF ±5% | |
| C20 | CK45F1H103Z | Ceramic 0.01μF +80, -20% | |
| C21 | CC45SL1H101J | Ceramic 100pF ±5% | |
| C22 | CK45F1H103Z | Ceramic 0.01μF +80, -20% | |
| C23~25 | CC45CH1H330J | Ceramic 33pF ±5% | |
| C26.27 | CK45F1H103Z | Ceramic 0.01μF +80, -20% | |
| C28.29 | CC45TH1H150J | Ceramic 15pF ±5% | |
| C30 | CK45F1H103Z | Ceramic 0.01μF +80, -20% | |
| C31 | CK45B1H102K | Ceramic 0.001μF ±10% | |
| C32 | CE04W1C100 | Electrolytic 10μF 16WV | |
| C33 | CC45CH1H050C | Ceramic 5pF ±0.25pF | |
| C34 | CC45TH1H080D | Ceramic 8pF ±0.5pF | |
| C35 | CC45CH1H0R5C | Ceramic 0.5pF ±0.25pF | |
| C36 | CC45TH1H120J | Ceramic 12pF ±5% | |
| C37 | CC45CH1H0R5C | Ceramic 0.5pF ±0.25pF | |

| Ref. No. | Parts No. | Description | Re- marks |
|----------|--------------|---------------------------|--------------|
| C38 | CC45TH1H120J | Ceramic 12pF ±5% | |
| C39 | CC45CH1H270J | Ceramic 27pF ±5% | |
| C40 | CK45F1H103Z | Ceramic 0.01μF +80, -20% | |
| C41 | CK45B1H102K | Ceramic 0.001μF ±10% | |
| C42 | CK45F1H103Z | Ceramic 0.01μF +80, -20% | |
| C43 | CK45B1H102K | Ceramic 0.001μF ±10% | |
| C44 | CC45CH1H070D | Ceramic 7pF ±0.5pF | |
| C45 | CK45F1H103Z | Ceramic 0.01μF +80, -20% | |
| C46 | CK45B1H102K | Ceramic 0.001μF ±10% | |
| C47 | CS15E1VR47M | Tantalum 0.47μF 35WV | |
| C48 | CE04W1C470 | Electrolytic 47μF 16WV | |
| C49 | CC45CH1H220J | Ceramic 22pF ±5% | |
| C50 | CE04W1A470 | Electrolytic 47μF 10WV | |
| C51~53 | CK45F1H103Z | Ceramic 0.01μF +80, -20% | |
| C54 | CK45B1H102K | Ceramic 0.001μF ±10% | |
| C55 | CE04W1C101Q | Electrolytic 100μF 16WV | |
| C56.57 | CC45SL2H070D | Ceramic 7pF ±0.5pF | |
| C58.59 | CC45SL2H680J | Ceramic 68pF ±5% | |
| C60.61 | CC45SL2H390J | Ceramic 39pF ±5% | |
| C62 | CC45SL2H100J | Ceramic 10pF ±5% | |
| C63 | CC45SL2H180J | Ceramic 18pF ±5% | |
| C64~66 | CK45F1H103Z | Ceramic 0.01μF +80, -20% | |
| C67 | CC45CH1H0R5C | Ceramic 0.5pF ±0.25pF | |
| C68 | CC45CH1H020C | Ceramic 2pF ±0.25pF | |
| C69 | CK45B1H102K | Ceramic 0.001μF ±10% | |
| C70 | CK45F1H103Z | Ceramic 0.01μF +80, -20% | |
| C71 | CC45CH1H330J | Ceramic 33pF ±5% | |
| C72 | CC45RH1H070D | Ceramic 7pF ±0.5pF | |
| C73 | CC45CH1H150H | Ceramic 15pF ±5% | |
| C74 | CC45CH1H050C | Ceramic 5pF ±0.25pF | |
| C75 | CC45CH1H220J | Ceramic 22pF ±5% | |
| C76 | CC45RH1H070D | Ceramic 7pF ±0.5pF | |
| C77.78 | CK45F1H103Z | Ceramic 0.01μF +80, -20% | |
| C79.80 | CK45B1H102K | Ceramic 0.001μF ±10% | |
| C81.82 | CM93F2A080D | Mica 8pF ±0.5pF | |
| C83 | CC45SL1H010C | Ceramic 1pF ±0.25pF | |
| C84 | CC45CH1H220J | Ceramic 22pF ±5% | |
| C85 | CC45CH1H020C | Ceramic 2pF ±0.25pF | |
| C86 | CC45CH1H180J | Ceramic 18pF ±5% | |
| C87 | CK45F1H103Z | Ceramic 0.01μF +80, -20% | |
| C88 | CK45B1H102K | Ceramic 0.001μF ±10% | |
| C89 | CK45F1H103Z | Ceramic 0.01μF +80, -20% | |
| C90 | CC45CH1H050C | Ceramic 5pF ±0.25pF | |
| C91 | C91-0405-15 | Through type cap. 0.001μF | |
| C92 | CK45B1H221K | Ceramic 220pF ±10% | |
| C93.94 | CQ92M1H223K | Mylar 0.022μF ±10% | |
| C95 | CK45F1H103Z | Ceramic 0.01μF +80, -20% | |
| C96 | CK45B1H471K | Ceramic 470pF ±10% | |
| C97 | CC45SL1H151J | Ceramic 150pF ±5% | |
| C98 | CC45CH1H150J | Ceramic 15pF ±5% | |
| C99 | CQ92M1H223K | Mylar 0.022μF ±10% | |
| C100 | CC45SL1H330J | Ceramic 33pF ±5% | |
| C101 | CK45B1H471K | Ceramic 470pF ±10% | |
| C102 | CQ92M1H103K | Mylar 0.01μF ±10% | |
| C103 | CK45B1H471K | Ceramic 470pF ±10% | |
| C104.105 | CQ92M1H223K | Mylar 0.022μF ±10% | |
| C106 | CK45B1H471K | Ceramic 470pF ±10% | |
| C107 | CK45F1H103Z | Ceramic 0.01μF +80, -20% | |
| C108 | CQ92M1H153K | Mylar 0.015μF ±10% | |
| C109 | CC45CH1H470J | Ceramic 47pF ±5% | |
| C110.111 | CK45B1H471K | Ceramic 470pF ±10% | |
| C112 | CQ92M1H472K | Mylar 0.0047μF ±10% | |
| C113.114 | CK45B1H471K | Ceramic 470pF ±10% | |
| C115 | CQ92M1H102K | Mylar 0.001μF ±10% | |
| C116 | CQ92M1H473K | Mylar 0.047μF ±10% | |

PARTS LIST

| Ref. No. | Parts No. | Description | Re- marks |
|------------------------------------|---|---|--------------|
| C117 | CQ92M1H223K | Mylar 0.022 μ F \pm 10% | |
| C118 | CQ92M1H102K | Mylar 0.001 μ F \pm 10% | |
| C119 | CQ92M1H222K | Mylar 0.0022 μ F \pm 10% | |
| C120 | CQ92M1H393K | Mylar 0.039 μ F \pm 10% | |
| C121 | CQ92M1H392K | Mylar 0.0039 μ F \pm 10% | |
| C122 | CQ92M1H103K | Mylar 0.01 μ F \pm 10% | |
| C123 | CS15E1VOR1M | Tantalum 0.1 μ F 35WV | |
| C124 | CQ92M1H333K | Mylar 0.033 μ F \pm 10% | |
| C125 | CQ92M1H332K | Mylar 0.0033 μ F \pm 10% | |
| C126 | CS15E1C4R7M | Tantalum 4.7 μ F 16WV | |
| C127 | CE04W1H3R3 | Electrolytic 3.3 μ F 50WV | |
| C128 | CK45F1H103Z | Ceramic 0.01 μ F +80, -20% | |
| C129 | CQ92M1H103K | Mylar 0.01 μ F \pm 10% | |
| C130 | CQ92M1H332K | Mylar 0.0033 μ F \pm 10% | |
| C131 | CQ92M1H273K | Mylar 0.027 μ F \pm 10% | |
| C132 | CE04W1H010 | Electrolytic 1 μ F 50WV | |
| C133 | CE04W1C100 | Electrolytic 10 μ F 16WV | |
| C134 | CE04W1A470 | Electrolytic 47 μ F 10WV | |
| C135 | CE04W1C100 | Electrolytic 10 μ F 16WV | |
| C136 | CE04W1A101 | Electrolytic 100 μ F 10WV | |
| C137 | CE04W1C220 | Electrolytic 22 μ F 16WV | |
| C138,139 | CK45F1H103Z | Ceramic 0.01 μ F +80, -20% | |
| C140 | CE04W1C220 | Electrolytic 22 μ F 16WV | |
| C141 | CK45F1H103Z | Ceramic 0.01 μ F +80, -20% | |
| C142 | CE04W1C100 | Electrolytic 10 μ F 16WV | |
| C143 | CE04W1A470 | Electrolytic 47 μ F 10WV | |
| C144 | CK45F1H103Z | Ceramic 0.01 μ F +80% -20% | |
| C145 | C91-0405-15 | Through type cap. 0.001 μ F | |
| C146,147 | CK45F1H103Z | Ceramic 0.01 μ F +80% -20% | |
| C148 | CE04W1C220 | Electrolytic 22 μ F 16WV | |
| C149 | CK45F1H103Z | Ceramic 0.01 μ F +80, -20% | |
| C150,151 | CC45TH1H020C | Ceramic 2pF \pm 0.25pF | |
| C155 | CC45TH1H020C | Ceramic 2pF \pm 0.25pF | |
| C156,157 | CC45F1H103Z | Ceramic 0.01 μ F +80% -20% | |
| SEMICONDUCTOR | | | |
| Q1 | V03-0039-05 | IC TA7061AP | |
| Q2,3 | V03-0079-05 | Transistor 2SC460 (B) | |
| Q4,5 | V09-0012-05 | FET 2SK19 (GR) | |
| Q6 | V09-1002-56 | FET 3SK74 (L) | |
| Q7 | V03-2538-06 | Transistor 2SC2538 | |
| Q8,9 | V09-1002-56 | FET 3SK74 (L) | |
| Q10~17 | V03-0079-05 | Transistor 2SC460 (B) | |
| Q18~22 | V03-1815-06 | Transistor 2SC1815 (Y) | |
| Q23,24 | V03-0336-05 | Transistor 2SC496 (Y) | |
| Q25 | V01-1015-06 | Transistor 2SA1015 (Y) | |
| Q27 | V03-1959-06 | Transistor 2SC1959 (Y) | |
| Q28,29 | V03-1815-06 | Transistor 2SC1815 (Y) | |
| Q26 | V01-0113-05 | Transistor 2SA496 (Y) | |
| D1~5 | V11-0317-05 | Varicap diode 1S2208 | |
| D6 | V11-0076-05 | Diode 1S1555 | |
| D7 | V11-5260-16 | Diode M1402 | |
| D8 | V11-0414-05 | Diode 1S2588 | |
| D9,11,12 | V11-0051-05 | Diode 1N60 | |
| D10 | V11-0374-05 | Diode 1SS16 | |
| D13~16 | V11-0076-05 | Diode 1S1555 | |
| D17~20 | V11-0051-05 | Diode 1N60 | |
| D21 | V11-0076-05 | Diode 1S1555 | |
| D22 | V11-1262-06 | Varistor 1S1212 | |
| D23 | V11-4163-56 | Zener diode XZ-088 | |
| D24 | V11-0076-05 | Diode 1S1555 | |
| D25 | V11-0247-05 | Zener diode WZ-100 | |
| D26 | V11-0076-05 | Diode 1S1555 | |
| D27 | V11-4161-86 | Zener diode XZ-064 | ☆ |
| Ref. No. | Parts No. | Description | Re- marks |
| D28 | V11-0076-05 | Diode 1S1555 | |
| D29 | V13-0004-05 | SCR CR02AM-2-1 | ☆ |
| D31,32 | V11-0076-05 | Diode 1S1555 | |
| POTENTIOMETER | | | |
| VR1,2 | R12-1404-05 | Potentiometer 4.7k Ω | |
| VR3,4 | R12-0406-05 | Potentiometer 470 Ω | |
| VR5 | R12-0409-05 | Potentiometer 220 Ω | |
| VR6 | R12-5403-05 | Potentiometer 100k Ω | |
| VR7 | R12-4404-05 | Potentiometer 68k Ω | |
| VR8 | R12-1404-05 | Potentiometer 4.7k Ω | |
| TRIMMER | | | |
| TC1 | C05-0062-05 | Ceramic trimmer 6pF | |
| TC2 | C05-0013-15 | Ceramic trimmer 20pF | |
| COIL/INDUCTOR/CRYSTALQUARTZ | | | |
| L1 | L40-1021-03 | Ferri inductor 1mH | |
| L2 | L40-1545-06 | Ferri inductor 150mH | |
| L3 | L77-0710-05 | Quartz crystal (10.7 MHz) | |
| L4 | L33-0615-05 | Choke coil 15 μ H | |
| L5 | L30-0005-05 | IFT | |
| L6 | L31-0313-05 | IFT | |
| L7 | L40-3391-03 | Ferri inductor 3.3mH | |
| L8 | L40-1021-03 | Ferri inductor 1 mH | |
| L9 | L31-0344-05 | Tuning coil | |
| L10 | L31-0180-05 | Tuning coil | |
| L11,12 | L31-0267-05 | Tuning coil | |
| L13 | L34-0672-05 | Tuning coil | |
| L14 | L40-1021-03 | Ferri inductor 1 mH | |
| L15 | L34-0499-05 | VHF coil 3 ϕ 4T | |
| L16 | L34-0452-05 | VHF coil 3 ϕ 6T | |
| L17 | L40-1001-03 | Ferri inductor 10 μ H | |
| L18 | L30-0504-05 | IFT | |
| L19 | L34-0823-05 | VHF coil 5 ϕ 3T | |
| L20 | L33-0025-05 | Choke coil 1 μ H | |
| L21 | L34-0823-05 | VHF coil 5 ϕ 3T | |
| L22 | L30-0503-05 | IFT | |
| L23 | L34-0499-05 | VHF coil 3 ϕ 4T | |
| L24 | L79-0442-05 | Ceramic disc 455D | |
| L25 | L40-6825-04 | Ferri inductor 6.8 mH | |
| L26 | L33-0026-05 | Choke coil 1 μ H | |
| L27 | L34-0818-05 | VHF coil 5 ϕ 4T | |
| L28 | L33-0025-05 | Choke coil 1 μ H | |
| L29,30 | L34-0694-05 | Tuning coil | |
| L31 | L34-0812-05 | Tuning coil | |
| L32 | L79-0451-05 | Helical block | |
| L33 | L34-0812-05 | Tuning coil | |
| L34 | L34-0683-05 | Tuning coil | |
| L35 | L30-0289-05 | IFT | |
| L36 | L71-0201-05 | Monolithic filter 10F15A | |
| L37 | L30-0289-05 | IFT | |
| L38 | L72-0014-05 | Ceramic filter SFE-10.7 MA5 | |
| L39 | L77-0327-06 | Quartz crystal (10.245 MHz) | |
| L40 | L40-1021-03 | Ferri inductor 1 mH | |
| L41 | L72-0309-05 | Ceramic filter CFT-455F2 | |
| MISCELLANEOUS | | | |
| RL1 | E23-0046-04 E23-0401-05 S51-1404-05 | Terminal (square) \times 17 Terminal (circle) Relay | |

PARTS LIST

PLL Unit (X50-1580-10)

| Ref. No. | Parts No. | Description | Re- marks |
|------------------|--------------|---------------------------------|--------------|
| CAPACITOR | | | |
| C1~6 | CK45F1H103Z | Ceramic 0.01 μ F +80, -20% | |
| C7~12 | CK45B1H102K | Ceramic 0.001 μ F \pm 10% | |
| C13 | CC45CH1H100D | Ceramic 10pF \pm 0.5pF | |
| C14 | CC45CH1H270J | Ceramic 27pF \pm 0.5% | |
| C15 | CC45UJ1H180J | Ceramic 18pF \pm 5% | |
| C16 | CK45F1H103Z | Ceramic 0.01 μ F +80, -20% | |
| C17 | CE04W1A470 | Electrolytic 47 μ F 10WV | |
| C18,19 | CC45CH1H050C | Ceramic 5pF \pm 0.25pF | |
| C20 | CE04W1A470 | Electrolytic 47 μ F 10WV | |
| C23 | CE04W1C101Q | Electrolytic 100 μ F 16WV | |
| C24~26 | CK45F1H103Z | Ceramic 0.01 μ F +80, -20% | |
| C27 | CC45CH1H330J | Ceramic 33pF \pm 5% | |
| C28 | CC45CH1H050C | Ceramic 5pF \pm 0.25pF | |
| C29 | CE04W1H010 | Electrolytic 1 μ F 50WV | |
| C30 | CK45F1H103Z | Ceramic 0.01 μ F +80, -20% | |
| C31 | CC45CH1H100D | Ceramic 10pF \pm 0.5pF | |
| C32~35 | CK45F1H103Z | Ceramic 0.01 μ F +80, -20% | |
| C36 | CC45CH1H050C | Ceramic 5pF \pm 0.25pF | |
| C37 | CK45F1H103Z | Ceramic 0.01 μ F +80, -20% | |
| C38 | CS15E1C4R7M | Tantalum 4.7 μ F 16WV | |
| C39 | CS15E1A100M | Tantalum 10 μ F 10WV | |
| C40 | CC45CH1H050C | Ceramic 5pF \pm 0.25pF | |
| C41 | CC45CH1H270J | Ceramic 27pF \pm 0.5% | |
| C42 | CC45CH1H390J | Ceramic 39pF \pm 5% | |
| C43~53 | CK45F1H103Z | Ceramic 0.01 μ F +80, -20% | |
| C54 | CE04W1E4R7 | Electrolytic 4.7 μ F 25WV | |
| C55 | C90-0246-05 | Ceramic 0.01 μ F \pm 10% | |
| C56 | CE04W1C100 | Electrolytic 10 μ F 16WV | |
| C57 | CK45F1H103Z | Ceramic 0.01 μ F +80, -20% | |
| C58 | CC45SL1H101J | Ceramic 100pF \pm 5% | |
| C59 | CK45F1H103Z | Ceramic 0.01 μ F +80, -20% | |
| C60 | CC45CH1H100D | Ceramic 10pF \pm 0.5pF | |
| C61 | CC45CH1H330J | Ceramic 33pF \pm 5% | |
| C62 | CE04W1A470 | Electrolytic 47 μ F 10WV | |
| C63,64 | CK45F1H103Z | Ceramic 0.01 μ F +80, -20% | |
| C65,66 | CQ92M1H332K | Mylar 0.0033 μ F \pm 10% | |
| C67 | CQ92M1H103K | Mylar 0.01 μ F \pm 10% | |
| C68 | CQ92M1H472K | Mylar 0.0047 μ F \pm 10% | |
| C69 | CE04W1H010 | Electrolytic 1 μ F 50WV | |
| C70 | CQ92M1H332K | Mylar 0.0033 μ F \pm 10% | |
| C71 | CE04W1A101Q | Electrolytic 100 μ F 10WV | |
| C72 | CQ92M1H102K | Mylar 0.001 μ F \pm 10% | |
| C73 | CK45B1H331K | Ceramic 330pF \pm 10% | |
| C74 | CQ92M1H472K | Mylar 0.0047 μ F \pm 10% | |
| C75 | CE04W1C101Q | Electrolytic 100 μ F 16WV | |
| C76 | CE04W1C100 | Electrolytic 10 μ F 16WV | |
| C77 | CE04W1A330 | Electrolytic 33 μ F 10WV | |
| C78 | CQ92M1H393K | Mylar 0.039 μ F \pm 10% | |
| C79 | CE04W1A330 | Electrolytic 33 μ F 10WV | |
| C80 | CE04W1A101Q | Electrolytic 100 μ F 10WV | |
| C81 | CQ92M1H104K | Mylar 0.1 μ F \pm 10% | |
| C82 | CE04W1C471Q | Electrolytic 470 μ F 16WV | |
| C84 | CE04W1A470 | Electrolytic 47 μ F 10WV | |
| C85 | CC45CH1H070D | Ceramic 7pF \pm 0.5pF | |
| C86 | CC45CH1H150J | Ceramic 15pF \pm 5% | |
| C87 | CC45CH1H030C | Ceramic 3pF \pm 0.25pF | |
| C88 | CK45F1H103Z | Ceramic 0.01 μ F +80, -20% | |
| C89 | CE04W1C100 | Electrolytic 10 μ F 16WV | |
| C90 | CK45B1H102K | Ceramic 0.001 μ F \pm 10% | |
| C91 | CC45CH1H030C | Ceramic 3pF \pm 0.25pF | |
| C92 | CC45UJ1H020C | Ceramic 2pF \pm 0.25pF | |
| C93 | CC45CH1H080D | Ceramic 8pF \pm 0.5pF | |

| Ref. No. | Parts No. | Description | Re- marks |
|----------------------|--------------|------------------------------|--------------|
| C94 | CQ92M1H103K | Mylar 0.01 μ F \pm 10% | |
| C95 | CC45UJ1H060D | Ceramic 6pF \pm 0.5pF | |
| SEMICONDUCTOR | | | |
| Q1~5 | V03-1815-06 | Transistor 2SC1815 (Y) | |
| Q6 | V03-0079-05 | Transistor 2SC460 (B) | |
| Q11,12 | V09-1002-56 | FET 3SK74 (L) | |
| Q13,14 | V03-1815-06 | Transistor 2SC1815 (Y) | |
| Q15 | V30-1030-46 | IC SM5111A | ☆ |
| Q16 | V03-1815-06 | Transistor 2SC1815 (Y) | |
| Q17 | V03-0272-05 | Transistor 2SC1345 (E) | |
| Q18 | V03-1815-06 | Transistor 2SC1815 (Y) | |
| Q19 | V30-0087-05 | IC TA7060P | |
| Q20 | V03-1923-06 | Transistor 2SC1923 (O) | ☆ |
| Q21,22 | V03-1815-06 | Transistor 2SC1815 (Y) | |
| Q23,24 | V03-2240-06 | Transistor 2SC2240 (GR) | |
| Q25 | V30-0208-05 | IC AN315 | |
| Q26 | V09-0060-05 | FET 2SK30A (GR) | |
| Q27 | V09-1001-16 | FET 2SK19 (GR) (T) | |
| Q28 | V03-1923-06 | Transistor 2SC1923 (O) | ☆ |
| Q29 | V30-1030-26 | IC μ PC78L08A | |
| D1~5 | V11-0414-05 | Diode 1S2588 | |
| D6~10 | V11-4161-36 | Varicap diode 1SV53A | |
| D11~20 | V11-0076-05 | Diode 1S1555 | |
| D21 | V11-0374-05 | Diode 1SS16 | |
| D23,24 | V11-0414-05 | Diode 1S2588 | |
| D25 | V11-4161-56 | Zener diode WZ-040 | ☆ |
| D26 | V11-0317-05 | Varicap diode 1S2208 | |
| POTENTIOMETER | | | |
| VR1~5 | R12-5403-05 | Potentiometer 100k Ω | |
| VR6 | R12-1403-05 | Potentiometer 1k Ω | ☆ |
| TRIMMER | | | |
| TC1 | C05-0067-05 | Ceramic trimmer 25pF | |
| TC2 | C05-0062-05 | Ceramic trimmer 6pF | |
| COIL/INDUCTOR | | | |
| L1~5 | L34-0437-05 | Choke coil | ☆ |
| L6 | L77-0832-05 | Quartz crystal 43.7667 MHz | ☆ |
| L7 | L77-0833-05 | Quartz crystal 44.4333 MHz | ☆ |
| L8 | L77-0834-05 | Quartz crystal 43.5667 MHz | ☆ |
| L9 | L77-0835-05 | Quartz crystal 44.2333 MHz | ☆ |
| L10 | L77-0836-05 | Quartz crystal 44.6333 MHz | ☆ |
| L11 | L40-1511-03 | Ferri-inductor 150 μ H | |
| L12 | L33-0605-05 | Choke coil 0.47 μ H | |
| L13 | L32-0002-05 | Oscillator coil | |
| L14 | L34-0683-05 | Tuning coil | |
| L15 | L34-0820-05 | Tuning coil | ☆ |
| L16 | L34-0683-05 | Tuning coil | |
| L17 | L77-0720-05 | Quartz crystal 10,240 MHz | |
| L18 | L40-3301-03 | Ferri-inductor 33 μ H | |
| L19 | L40-1091-03 | Ferri-inductor 1 μ H | |
| L20 | L15-0016-05 | Choke coil (Low frequency) | |
| L21 | L40-1021-03 | Ferri-inductor 1mH | |
| L22 | L40-1021-25 | Ferri-inductor 1mH | |
| L23 | L40-3391-03 | Ferri-inductor 3.3 μ H | |
| L25 | L32-0618-05 | Oscillator coil | ☆ |
| MISCELLANEOUS | | | |
| | E23-0046-04 | Terminal \times 8 (square) | |
| | E23-0401-05 | Terminal \times 2 (circle) | |

PARTS LIST/PACKING

CONTROL UNIT (X54-1440-10)

| Ref. No. | Parts No. | Description | Re- marks |
|------------------|-------------|---------------------------------|--------------|
| CAPACITOR | | | |
| C1 | CE04W1C470Q | Electrolytic 47 μ F 16WV | |
| C2 | CE04W1A470 | Electrolytic 47 μ F 10WV | |
| R1,2 | R90-0514-05 | Resistor block 10k \times 7 | ☆ |
| R3~5 | R90-0516-05 | Resistor network | ☆ |
| R6 | R90-0515-05 | Resistor block 10k \times 4 | ☆ |
| Q1~6 | V03-1815-06 | Transistor 2SC1815 (Y) | |
| Q7 | V01-1015-06 | Transistor 2SA1015 (Y) | |
| IC1~3 | V30-1006-46 | IC TC4035BP | ☆ |
| IC4~6 | V30-1049-06 | IC TC4019BP | |
| IC7~9 | V30-1054-06 | IC TC5022BP | |
| IC10,11 | V30-1006-36 | IC TC4081BP | ☆ |
| IC12 | V30-1025-26 | IC FS7806M | ☆ |
| D1~22 | V11-0051-05 | Diode 1N60 | |
| D23 | V11-0076-05 | Diode 1S1555 | |
| D24 | V11-0307-05 | Zener diode WZ-150 | |
| D25 | V11-3162-86 | LED TLG205 | ☆ |
| D26 | V11-3162-96 | LED TLR205 | ☆ |
| D27~30 | V11-4161-66 | LED 513 OK | ☆ |
| S1 | S29-1406-05 | Rotary switch (1 MHz) | (K) ☆ |
| S1 | S29-1408-05 | Rotary switch (1 MHz) | (W) ☆ |
| S2 | S29-1405-05 | Rotary switch (100 kHz, 10 kHz) | ☆ |
| S3 | S40-2405-05 | Push switch (0k, 5k) | |
| S4 | S29-4402-05 | Slide rotary (for shift) | ☆ |

TONE UNIT (X52-1110-50) (T TYPE) (X52-1110-61) (W TYPE)

| Ref. No. | Parts No. | Description | Re- marks |
|----------------------|---------------|--|--------------|
| C1 | CK45B1H102K | Ceramic 1000pF \pm 10% | |
| C2 | CE04W1C220Q | Electrolytic 22 μ F 16WV | |
| C3~5 | C91-0433-05 | Layer-built 0.0039 μ F \pm 5% | ☆ |
| C6 | CE04W1C220Q | Electrolytic 22 μ F 16WV | |
| C7,8 | CE04W1H010 | Electrolytic 1 μ F 50WV | |
| C9,10 | CK45B1H102K | Ceramic 1000pF \pm 10% | |
| C11 | CS15E1A150K | Tantalum 15 μ F \pm 10% | (T) |
| C12 | CK45B1H102K | Ceramic 1000pF \pm 10% | |
| C13 | CS15E1A150K | Tantalum 15 μ F \pm 10% | (T) |
| RESISTOR | | | |
| R1~12 | RD14CB2E000J | Carbon 000 Ω \pm 5% 1/4W | |
| R2,3 | R92-0616-05 | Metal film 10k Ω \pm 1% 1/4W | |
| R4 | R92-0617-05 | Metal film 7.5k Ω \pm 1% 1/4W | ☆ |
| R5 | RN14BK2E4703F | Metal film 470k Ω \pm 1% 1/4W | ☆ |
| R10 | RD14CB2E102J | Carbon 15k Ω \pm 5% 1/4W | (T) |
| SEMICONDUCTOR | | | |
| Q1,2 | V03-0093-05 | Transistor 2SC458 (B) | |
| D1,2 | V11-0076-05 | Diode 1S1555 | (T) |
| D1 | V11-0076-05 | Diode 1S1555 | (W) |
| POTENTIOMETER | | | |
| VR1 | R12-2405-05 | Semi-fixed resistor 5k Ω | ☆ |
| VR2 | R12-4403-05 | Semi-fixed resistor 50k Ω | (T) ☆ |
| MISCELLANEOUS | | | |
| — | E40-0464-05 | Pin plug 4P | |

PACKING

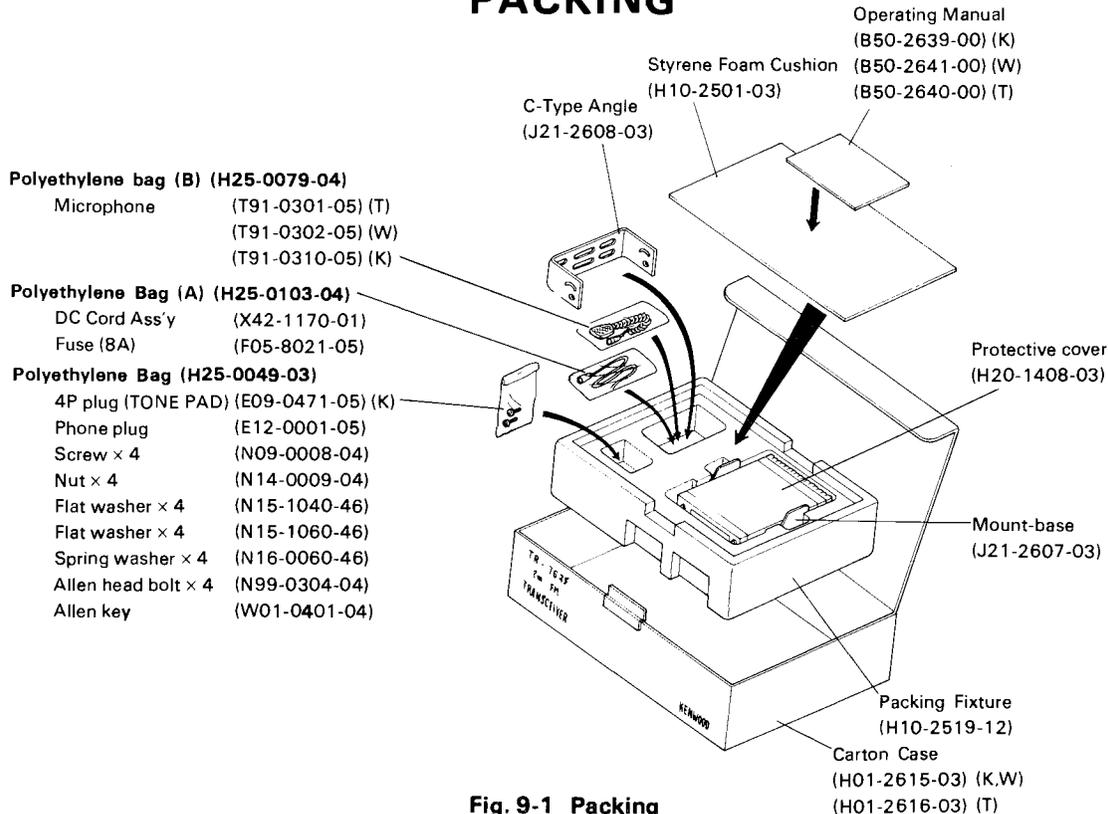


Fig. 9-1 Packing

BRACKET INSTALLATION/EXPLODED VIEWS

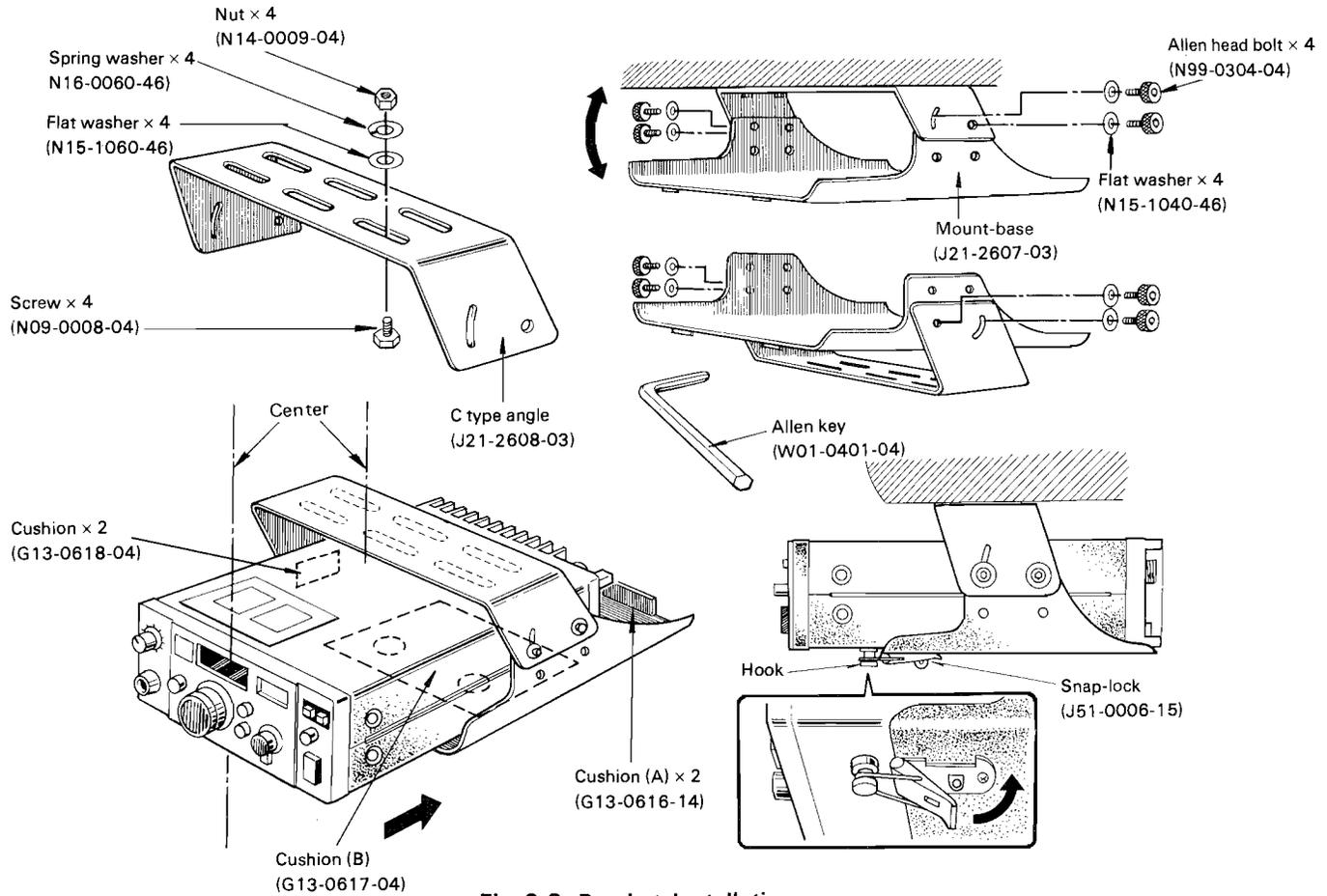


Fig. 9-2 Bracket Installation

EXPLODED VIEW

I. Case removal

- (1) Remove the bind screws ① ~ ⑪
- (2) Remove the upper and lower cases.

II. Panel removal

- (1) Remove the knobs.
- (2) Remove screws A ~ D.

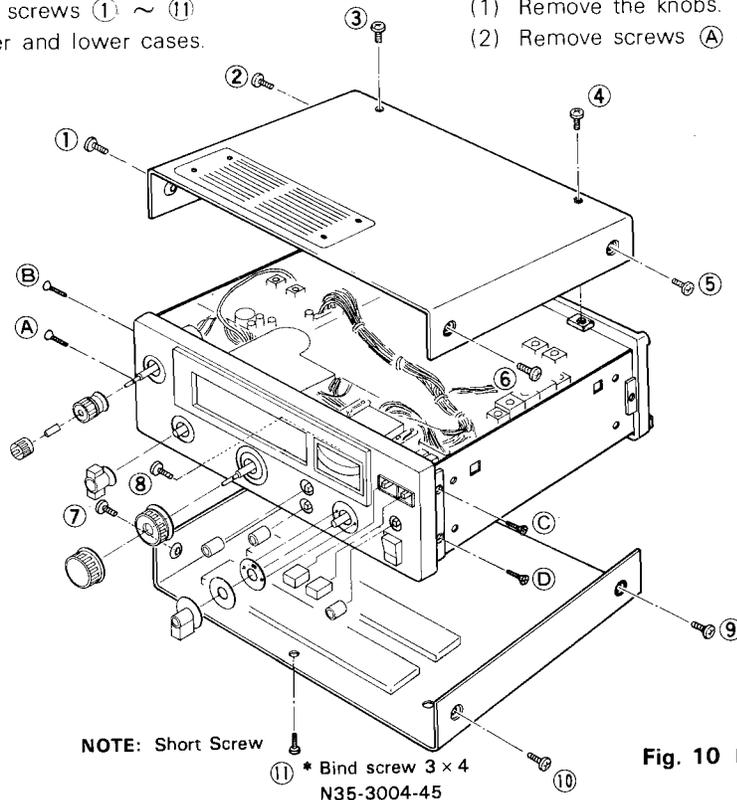


Fig. 10 Panel and Case Removal

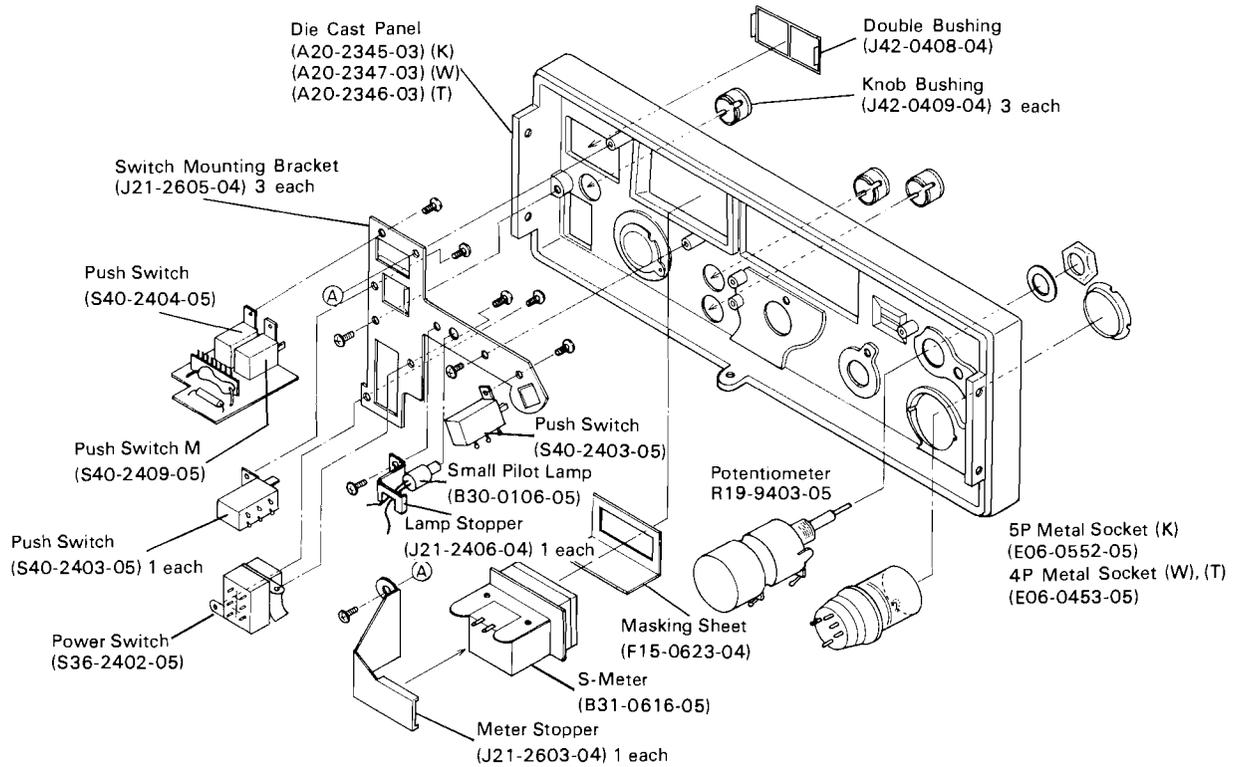
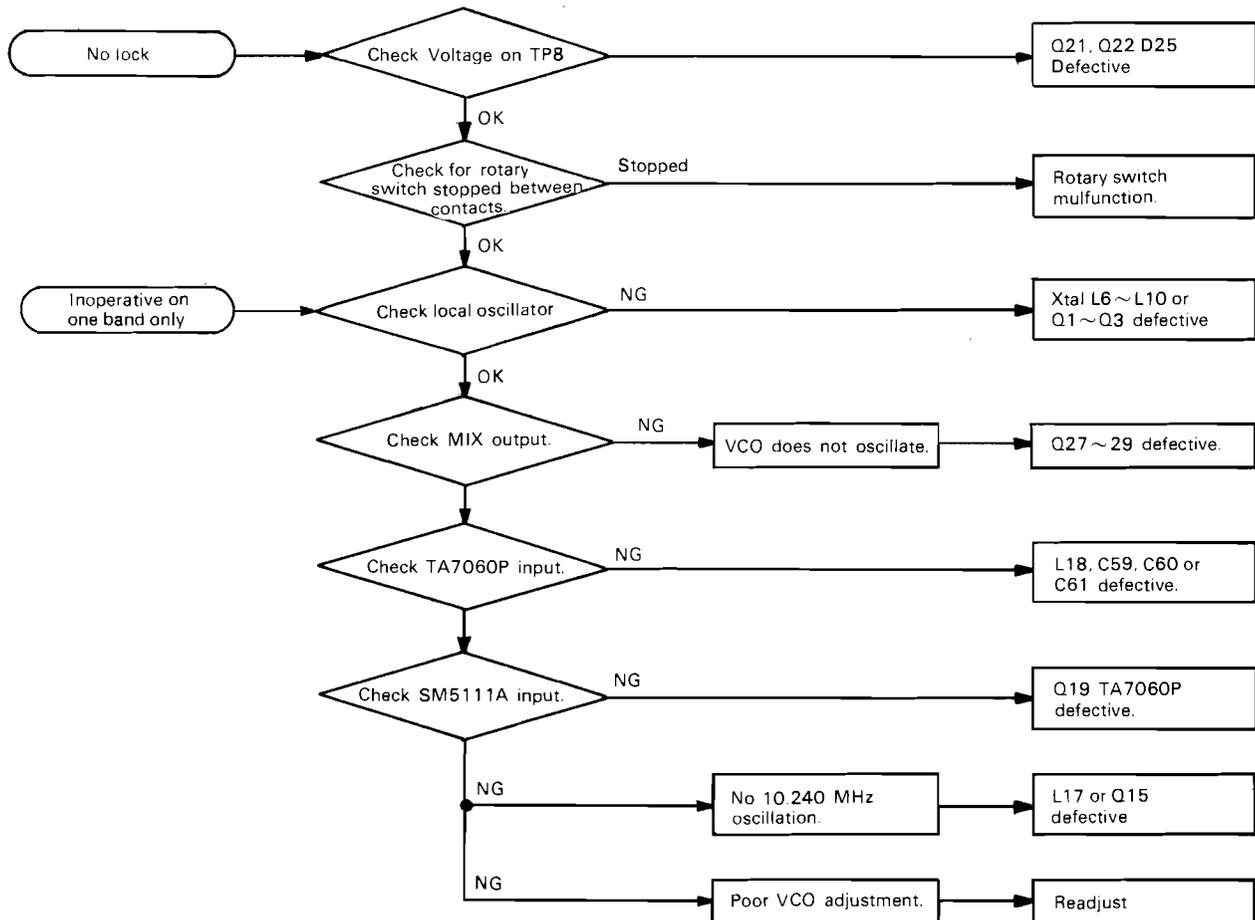


Fig. 11 Disassembly of Front Panel

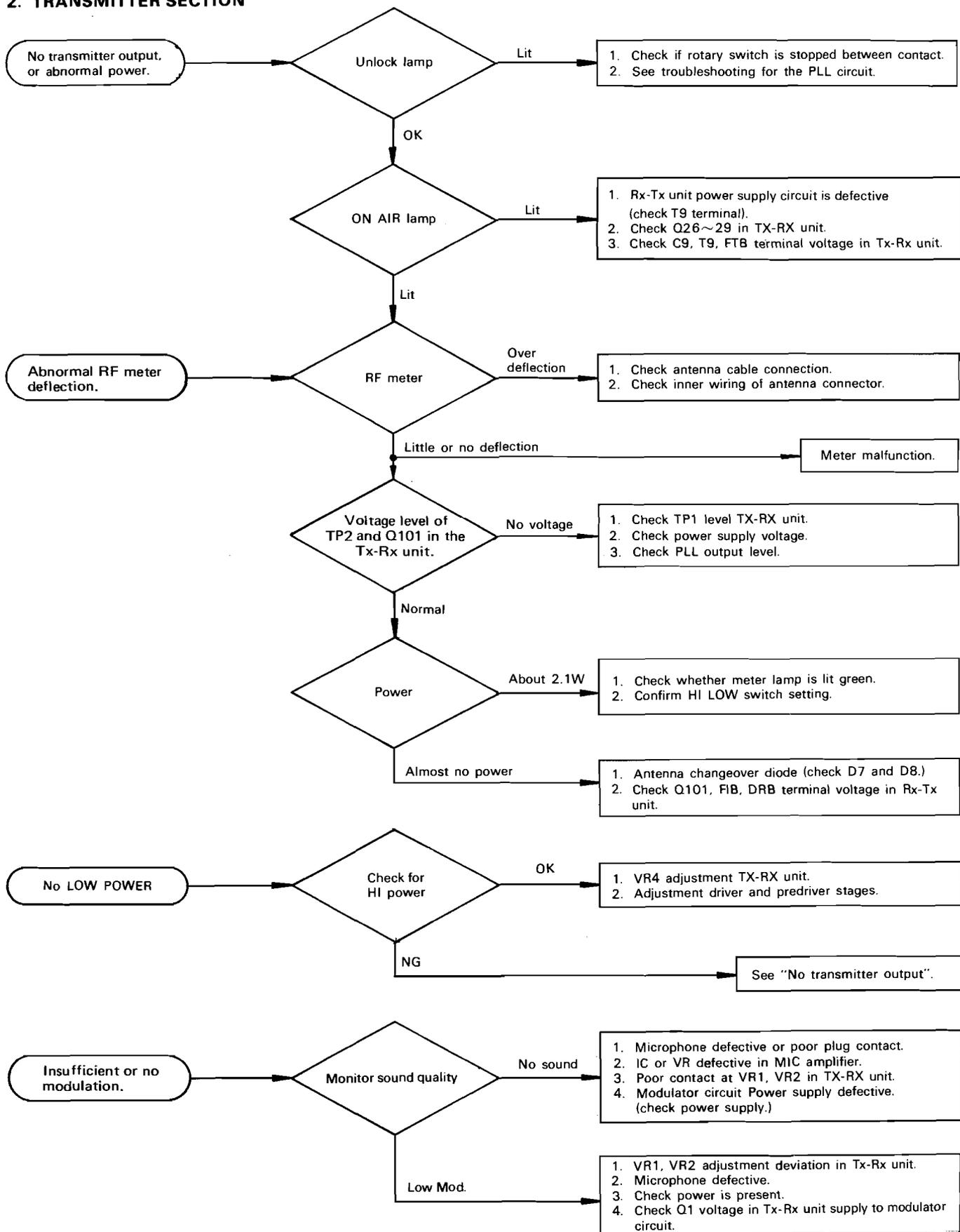
TROUBLESHOOTING

1. PLL CIRCUIT



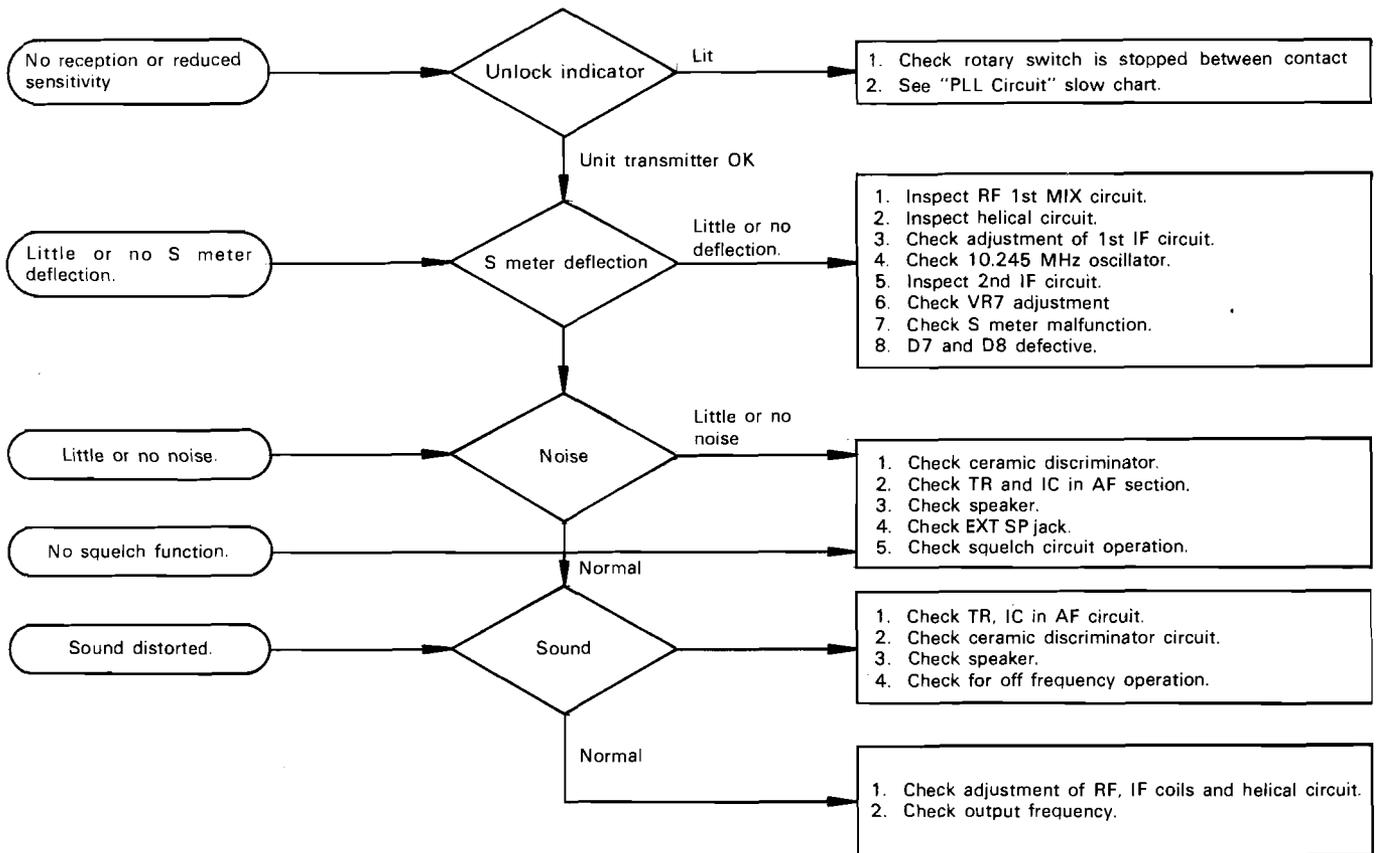
TROUBLESHOOTING

2. TRANSMITTER SECTION



TROUBLESHOOTING/ADJUSTMENTS

3. RECEIVER SECTION



ADJUSTMENTS

TEST EQUIPMENT REQUIRED

1. DC Power Supply

Voltage: Variable from 9 to 16V.
Current: 8A min.

2. DC VTVM or DVM

Voltage range: 10V~16V (min.)
Input impedance: 1 MΩ or better

3. RF VTVM

Voltage range: F.S. 10 mV~300V
Frequency response: 200 MHz min.
Input impedance: 1 MΩ min., 3pF max.

4. Frequency Counter

Frequency response: 150 MHz min.
Min. input sensitivity: about 50 mV
Input impedance: 1 MΩ min.

5. Oscilloscope

With horizontal input and high sensitivity.
Frequency response: 3 MHz min.

6. Power Meter with Dummy Load

Frequency limit: 150 MHz min.
Impedance: 50Ω
Ranges: 50W, 3W

7. Linear Detector

8. Audio Generator (AG)

Frequency range: 300 Hz~5 kHz
Output: 0.5 mV~1V

9. AF Voltmeter

Frequency range: 50 Hz~10 kHz
Input impedance: 1 MΩ min.
Voltage range: 3 mV~30V

10. Standard Signal Generator (SSG)

Output frequency: Capable of covering 144 MHz
~148 MHz
Modulation: Frequency modulation

11. Sweep Generator

Frequency range: Capable of covering 144 MHz
~148 MHz

12. AF Dummy Load

8Ω 5W (approx.)

13. Directional Coupler

14. Detector Probe

ADJUSTMENTS

1. PLL Adjustments (See Fig. 1 on page 28 for Set-up)

| Item | Condition | Measuring point | | | Adjust | | | Reference | Remarks | | | | | | |
|---|--|-------------------|------|----------|--------|--|---|----------------------|---------|----------------------|--------------|------|--|--|--|
| | | Instrument | Unit | Terminal | Unit | Parts | Method | | | | | | | | |
| 1. Voltage check and adjustment initial control setting | 1) POWER SW: ON HI: LOW SW: HI MR SW: OFF MODE SW: S MHz SW: 6 100 kHz SW: 0 10 kHz SW: 0 SUBTONE SW: 0 5Hz SW: 0 REMOTE SW: OFF SEND/REC. SEND 2) SEND/REC. REC. 3) Same as above. 4) Same as item 2) | DC VTVM | PLL | T9 (J1) | | | | 8.9V ~ 10.2V | Confirm | | | | | | |
| | | | | TX.RX | T9 | | | | | 8.9V ~ 10.2V | | | | | |
| | | | | | CB | | | | | | Approx. 12V | | | | |
| | | | | TX.RX | R9 | | | | | | 7.7V ~ 8.3V | | | | |
| | | | | PLL | TP3 | PLL | | | | | Approx. 8.0V | | | | |
| | | PLL | TP8 | PLL | VR6 | 6.0V | | ±0.2V | | | | | | | |
| 2 PLL | 1) 100 kHz SW: 0 10 kHz SW: 0 | RF VTVM | PLL | TP1 | PLL | L13 | Turn the L13 core counter clockwise 180° from oscillation starting point. | 0.46V | | | | | | | |
| | | | | | | | | | | L14 L16 | MAX | 1.4V | | | |
| | 2) MHz SW: 4 | DC VTVM | PLL | TP5 | PLL | TC2 | 1.5V | ±0.05V | | | | | | | |
| | 3) MHz SW: 7 100 kHz SW: 9 10 kHz SW: 9 | DC VTVM | PLL | TP5 | | | | Less than 5.5V | Confirm | | | | | | |
| | 4) Same as above | F. Counter | PLL | TP6 | PLL | TC1 | 10.24000 Hz | ±100Hz | | | | | | | |
| | 5) MHz SW: 4 100 kHz SW: 0 10 kHz SW: 0 5 kHz SW: 5 kHz | Frequency Counter | PLL | TP4 | PLL | L1 | 133.3050 MHz | ±500 Hz | | | | | | | |
| | | | | | | L2 | 135.3050 MHz | ±500 Hz | | | | | | | |
| | | | | | | L3 | 133.7050 MHz | ±500 Hz | | | | | | | |
| | | | | | | L4 | 135.7050 MHz | ±500 Hz | | | | | | | |
| | | | | | | L5 | 136.9050 MHz | ±500 Hz | | | | | | | |
| | 6) MHz SW: 6 7) MHz SW: 5 MODE SW: ⊖ SEND/REC SW: SEND 8) MHz SW: 7 9) MODE SW: ⊕ | F.COUNTER | PLL | TP4 | PLL | VR1 | 133.3000 MHz | ±500 Hz | | | | | | | |
| | | | | | | VR2 | 135.3000 MHz | ±500 Hz | | | | | | | |
| | | | | | | VR3 | 133.7000 MHz | ±500 Hz | | | | | | | |
| | | | | | | VR4 | 135.7000 MHz | ±500 Hz | | | | | | | |
| | | | | | | VR5 | 136.9000 MHz | ±500 Hz | | | | | | | |
| | | | | | | 10) MHz SW: 4 5 kHz SW: 0 MODE SW: S SEND/REC. REC. | F. Counter | PLL | | TP4 | PLL | | | | |
| | | | | | | 11) MHz SW: 6 | | | | | | | | | |
| | 12) MHz SW: 5 MODE SW: ⊖ SEND/REC. SNED | | | | | | | | | | | | | | |
| | 13) MHz SW: 7 14) MODE SW: ⊕ Recheck the frequencies in Item (5) through (9). If they are deviated, readjust L1 through L5 necessary | | | | | | | | | | | | | | |
| 15) MHz SW: 5 100 kHz SW: 9 10 kHz SW: 9 MODE SW: S SEND/REC. REC. 16) MHz SW: 7 17) MHz SW: 5 MODE SW: ⊖ SEND/REC. SEND 18) MHz SW: 7 19) MHz SW: 4 100 kHz SW: 0 10 kHz SW: 0 | F. Counter | PLL | TP4 | PLL | | | | 135.2900 MHz ±500 Hz | | | | | | | |
| | | | | | | | | | | 137.2900 MHz ±500 Hz | | | | | |
| | | | | | | | | | | 134.6900 MHz ±500 Hz | | | | | |
| | | | | | | | | | | 136.6900 MHz ±500 Hz | | | | | |
| | | | | | | | | | | 132.7000 MHz ±500 Hz | | | | | |

ADJUSTMENTS

| Item | Condition | Measuring point | | | Adjust | | | Reference | Remarks |
|-------------------------------------|---|-------------------|------|----------|--------|-------|--------|--|---------|
| | | Instrument | Unit | Terminal | Unit | Parts | Method | | |
| PLL (Cont.) | 20) MHz SW: 6 | Frequency Counter | PLL | TP4 | | | | 134 7000 MHz ± 500 Hz | |
| | 21) MHz SW: 5 SEND/REC. REC. | | | | | | | 134 3000 MHz ± 500 Hz | |
| | 22) MHz SW: 7 | | | | | | | 136 3000 MHz ± 500 Hz | |
| | 23) MHz SW: 6 SEND/REC SW: SEND MODE SW: ⊕ | | | | | | | 135 9000 MHz ± 500 Hz | |
| | 24) MHz SW: 7 SEND/REC. REC. | | | | | | | 136 3000 MHz ± 500 Hz | |
| | 25) MHz SW: 4 SEND/REC. SW. SEND & REC. | | | | | | | 133 3000 MHz ± 500 Hz | |
| | 26) MHz SW: 5 SEND/REC. SEND & REC. | | | | | | | 134 3000 MHz ± 500 Hz | |
| | 27) MHz SW: 4→5→6→7→4 MODE SW: S SEND/REC. REC. | F. Counter | PLL | TP4 | | | | The frequency should become higher than 133 3000 MHz in 1 MHz steps and should return to the original frequency at the "4" position. | |
| | 28) 100 kHz SW: 0 → 1 → 9 → 0 | | | | | | | The frequency should become higher than 133 3000 MHz in 100 kHz steps and should return to the original frequency at the "0" position. | |
| | 29) 10 kHz SW: 0 → 1 → 9 → 0 | | | | | | | The frequency should become higher than 133 3000 MHz in 10 kHz steps and should return to the original frequency at the "0" position. | |
| 30) MHz SW: 6 SEND/REC. SW. SEND | RF VTVM | PLL | TP4 | PLL | L15 | MAX | | | |
| 3. Wax seal all coil adjustment | 1) L1. L2. L3. L4. L5. L13 | | | | | | | | |

ADJUSTMENTS

2. TX Adjustments (See Fig. 2a-d on page 28, 29 for Set-up)

| Item | Condition | Measuring point | | | Adjust | | | Reference | Remarks |
|---------------------------|--|-------------------|--------------------------|--------------|--------|-------------------|---|---|--|
| | | Instrument | Unit | Terminal | Unit | Parts | Method | | |
| 1 Initial control setting | 1) POWER SW: ON HI/LOW SW: HI MR SW: OFF MODE SW: S MHz SW: 4 100 kHz SW: 0 10 kHz SW: 0 5 kHz SW: 0 SUBTONE SW: OFF REMOTE SW: OFF SEND/REC: SEND TC 1: Centered TC 2: Centered VR8: Counter clockwise (CCW) | | | | | | | | Key only during actual adjustment period. |
| 2 10.7 MHz | | RF VTVM | TX RX | TP1 | TX RX | L5, L6 | MAX | 0.4 V | |
| | | F Counter | TX RX | TP1 | TX RX | TC1 | 10.7000 MHz | ±50 Hz | |
| 3 VCT | 1) MHz SW: 4 → 5 → 6 → 7 | DC VTVM | TX RX | TP3 | | | | Check voltage goes up step by step | Confirm |
| 4 B P F DRIVE | 1) MHz SW: 6 | RF VTVM | TX RX | gate 1 of Q6 | TX RX | L9, L10, L11, VR3 | MAX Repeat procedure two or three times. | 1.2V (R.M.S.) | Adjust for peak. |
| | 2) MHz SW: 7 100 kHz SW: 9 10 kHz SW: 9 | | TX RX | TP2 | TX RX | L12, L13 | MAX Repeat procedure two or three times. | | |
| | 3) MHz SW: 4 100 kHz SW: 0 10 kHz SW: 0 | | TX RX | RFI | TX RX | L13 | MAX | | |
| 5 RF POWER | 1) MHz SW: 4 100 kHz SW: 0 10 kHz SW: 0 POWER SW: ON | DC A M | | | TX RX | L13 | MAX | | |
| | 2) MHz SW: 6 100 kHz SW: 0 10 kHz SW: 0 | POWER M DC A M | | | TX RX | TC2, L21 | Adjust TC2, L21 for Max. | Less than 60A More than 25W | If RF output is less than 25W, adjust L21 spacing and TC2 for best efficiency at rated output. |
| | 3) Same as above | POWER M DC A M | | | TX RX | L101 | Adjust L101 to increase to inductance. | Less than 6A | |
| | 4) MHz SW: 4 | POWER M DC A M | | | | | | More than 25W Less than 6A | Confirm |
| | 5) MHz SW: 7 100 kHz SW: 9 10 kHz SW: 9 | POWER M DC A M | | | | | | More than 25W Less than 6A | Confirm |
| 6 RF METER | 1) MHz SW: 6 100 kHz SW: 0 10 kHz SW: 0 TX RX unit VR6 Centered | RF METER | front panel | | TX RX | VR6 | Meter indicates "8". | | |
| 7. LOW POWER | 1) HI/LOW SW: LOW | POWER M | | | TX RX | VR4 | 5.0W | Check that the meter lamp changes from yellow to green in low power | |
| | 2) MHz SW: 4 | POWER M | | | | | | 3~7W | |
| | 3) MHz SW: 7 100 kHz SW: 9 10 kHz SW: 9 | POWER M | rear panel ANT. Term. | | | | | 3~7W | Confirm |

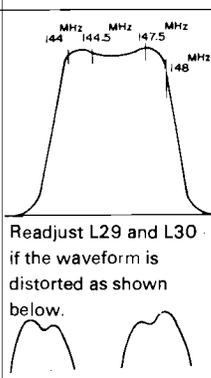
ADJUSTMENTS

| Item | Condition | Measuring point | | | Adjust | | | Reference | Remarks |
|--------------------------------|---|-----------------|------------|-----------------|--------|-------|----------------------------|--|--|
| | | Instrument | Unit | Terminal | Unit | Parts | Method | | |
| 8. RF Output at 11.5V DC input | 1) DC Terminal: 11.5 V | POWER METER | rear panel | ANT. Term. | | | | Check power output | Confirm |
| | 2) MHz SW: 6 10 kHz SW: 0 100 kHz SW: 0 | | | | | | | | |
| | 3) MHz SW: 4 | | | | | | | | |
| | 4) HI/LOW SW: HI | | | | | | | | |
| | 5) MHz SW: 6 | | | | | | | | |
| | 6) MHz SW: 7 100 kHz SW: 9 10 kHz SW: 9 | | | | | | | | |
| 9. Frequency check | 1) DC input: 13.8V | F. Counter | | | | | | | |
| | 2) MHz SW: 6 100 kHz SW: 0 10 kHz SW: 0 | | | | | | | | |
| 10. Protection | 1) Connect the Power Meter to the ANTENNA | DC VTVM | TX.RX | TP4 | TX.RX | VR5 | MIN (Null) (146.00 MHz) | | |
| | 2) Disconnect the Power meter and lead from the ANTENNA TX,RX unit. VR8: VR8: Full counter-clockwise Antenna shorted to ground | DC A.M | | | TX.RX | VR8 | 3.0A (144.00 MHz) | | In antenna shorted to ground, adjust to relay still turning point. |
| | 3) MHz SW: 4 | | | | | | | Approx 3.0A | Confirm |
| | 4) MHz SW: 7 100 kHz SW: 9 10 kHz SW: 9 | | | | | | | Approx 3.0A | Confirm |
| | 5) Connect the power meter to the ANTENNA | POWER.M | rear panel | ANT TERM | | | | | RF output to spec. |
| 11. Deviation | 1) MHz SW: 6 100 kHz SW: 0 10 kHz SW: 0 AG OUTPUT: 30 mV/ 1 kHz | Linear Detector | | | TX.RX | VR2 | 5.0 kHz DEV. | | |
| | 2) AG OUTPUT: 3 mV/ 1 kHz | Linear Detector | | | TX.RX | VR1 | 3.5 kHz DEV. | | |
| 12. SUBTONE | 1) MIC Terminal: OPEN SEND/REC. SEND AG OUTPUT: 300 mV/ 1 kHz SUBTONE SW: ON | Linear Detector | | SUB GND > AG | | | | 1) Check that output waveform from the Linear Detector 2) Confirm that TV Terminal Voltage is approx. 10V | AG output applied to SUB and GND terminal. |
| 13. Abnormal Oscillation | 1) Same as above | Linear Detector | | | | | | Vary the supply voltage from 11.5 to 16 V for each item to check for abnormal oscillation or operation | |
| | 2) HI/LOW SW: LOW | | | | | | | | |
| | 3) MHz SW: 4 | | | | | | | | |
| | 4) HI/LOW SW: HI | | | | | | | | |
| | 5) MHz SW: 7 100 kHz SW: 9 10 kHz SW: 9 | | | | | | | | |
| | 6) HI/LOW SW: LOW | | | | | | | | |
| 14. Shift & Memory Shift | 1) MHz SW: 5 100 kHz SW: 0 10 kHz SW: 0 5 kHz SW: 0 HI/LOW SW: HI 13.8V DC MODE SW: ⊖ SEND/REC. SW: SEND MR SW: OFF | F. Counter | rear panel | ANT. TERM. | | | | 144.400 MHz | Confirm |
| | 2) MODE SW: ⊕ | | | | | | | | |
| | 3) MHz SW: 7 MODE SW: ⊖ | | | | | | | | |
| | 4) MODE SW: ⊕ | | | | | | | | |
| | 5) MODE SW: S M SW (NON-LOCK): ON | | | | | | | | |
| | | | | | | | | | |

ADJUSTMENTS

| Item | Condition | Measuring point | | | Adjust | | | Reference | Remarks |
|----------------------------------|------------------------------------|-----------------|------------|------------|--------|-------|--------|--|---------|
| | | Instrument | Unit | Terminal | Unit | Parts | Method | | |
| Shift and memory shift (cont.) | 6) MHz SW: 4 MODE SW: M (green) | F. Counter | rear panel | ANT. TERM. | | | | 147.000 MHz Check that LED's indicate "7.000" | Confirm |
| | 7) MODE SW: S | | | | | | | 144.000 MHz | Confirm |
| | 8) MR SW: ON | | | | | | | 147.000 MHz Check that LED's indicate "7.000" | Confirm |
| 15. Wax seal all coil adjustment | 1) L10, L11, L12, L13 | | | | | | | | |

3. RX Adjustment (See Fig. 3a-b on page 29 for Set-up)

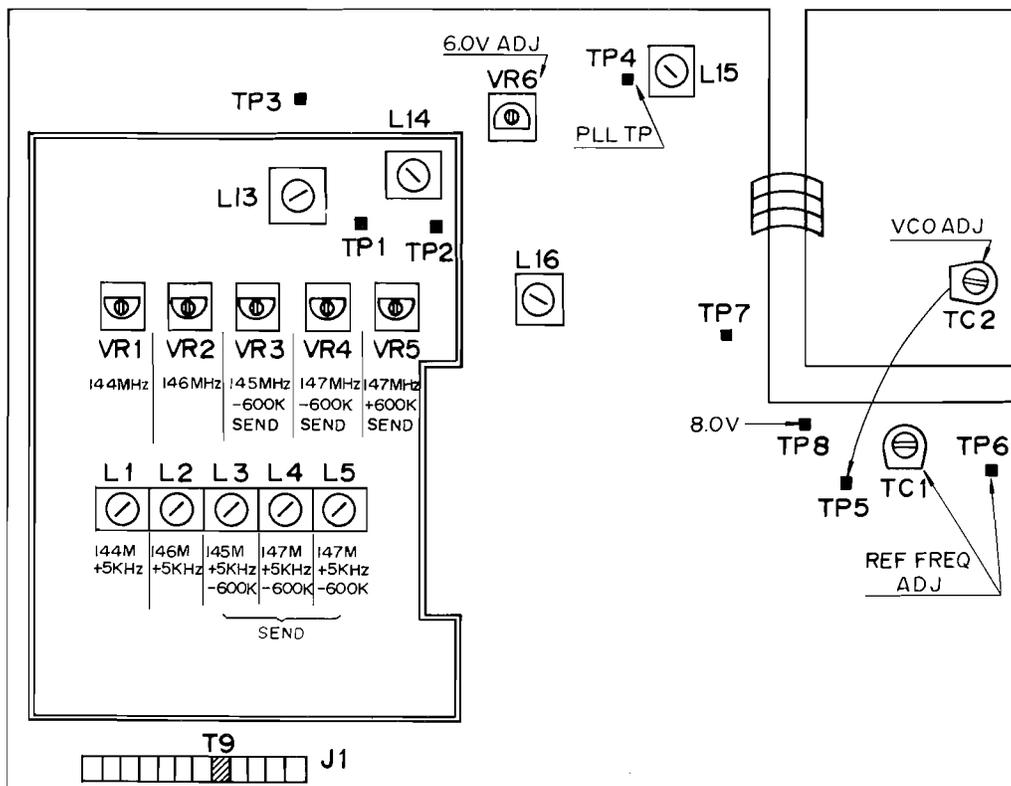
| Item | Condition | Measuring point | | | Adjust | | | Reference | Remarks |
|--|---|-------------------------|-------|----------|--------|-------------------------------------|---|---|---------|
| | | instruments | Unit | Terminal | Unit | Parts | Method | | |
| 1. Initial control SETTING | 1) POWER SW: ON HI/LOW SW: LOW MR SW: OFF MODE SW: S MHz SW: 5 100 kHz SW: 9 10 kHz SW: 5 5 kHz SW: 0 SUBTONE SW: OFF REMOTE SW: ON SEND/REC. REC. SQUELCH VR: MIN EXT. SP terminal: AF VTVM, 8Ω Oscilloscope | | | | | | | | |
| 2. Helical block CAUTION: Do not attempt adjustment without a Sweep Generator | 1) ANT terminal: SWEEP GEN. Oscilloscope VERT GAIN: MAX | Oscilloscope (Detector) | TX RX | TP5 | TX RX | L29,30 L31 L32 (a,b,c) L33 | Adjust for a maximum gain and for a waveform as shown at right. Adjust L29 and L30 for a maximum waveform. Adjust L31, L32 (a,b,c) and L33 for proper bandwidth and optimum waveform |  | Repeat |
| 3. IF GAIN | 1) REMOTE SW: OFF ANT: SSG (DEV.: 5 kHz MOD.: 1 KHz) SSG OUTPUT: Approx. 10 dB (2μV) AF GAIN: 0.63V/8Ω | AF VTVM | | | | | Adjust SSG for correct frequency and optimum waveform. | | |
| | 2) SSG OUTPUT: 5 ~ 10 dB | S METER | | | TX RX | L34,35 L37 | MAX. Repeat procedure two or three times. | | |
| 4. S METER | 1) SSG OUTPUT: 30 dB | S METER | | | TX RX | VR7 | Set scale 30μV | 30 dB ± 4 dB | |
| 5. Discriminator | 1) SSG OUTPUT: 0 dB (0.5μV) | AF VTVM | | | TX RX | L22 | MAX | | |

ADJUSTMENTS/PC BOARD ALIGNMENT AND TEST POINT LOCATIONS

| Item | Condition | Measuring point | | | Adjust | | | Reference | Remarks |
|---|---|-------------------------|------|----------|--------|-----------|--|--|---------|
| | | Instrument | Unit | Terminal | Unit | Parts | Method | | |
| 6 S/N (Signal to Noise ratio) (-6 dB 0.25μV) | 1) SSG OUTPUT: -6 dB 2) MHz SW: 4 100 kHz SW: 0 10 kHz SW: 0 | AF VTVM | | | | | With a signal received at each channel. Set AF GAIN for 0.63V/8Ω. Next turn the SSG and measure the noise. | S/N 20 dB | Confirm |
| | 3) MHz SW: 7 100 kHz SW: 9 10 kHz SW: 9 | | | | | S/N 20 dB | | Confirm | |
| | 4) MHz SW: 5 10 kHz SW: 9 SSG OUTPUT: 40 dB (50μV) (DEV.: 3.5 kHz) | | | | | S/N 40 dB | | Confirm | |
| | | | | | | | | | |
| 7 SQUELCH | 1) SSG OUTPUT OFF SQUELCH: threshold on | Oscilloscope or speaker | | | | | | Critical point 9.00 ~ 11.00 | Confirm |
| | 2) SSG OUTPUT: -6dB (0.25μV) SQUELCH: threshold on | | | | | | | When signal is applied, squelch should open. | Confirm |

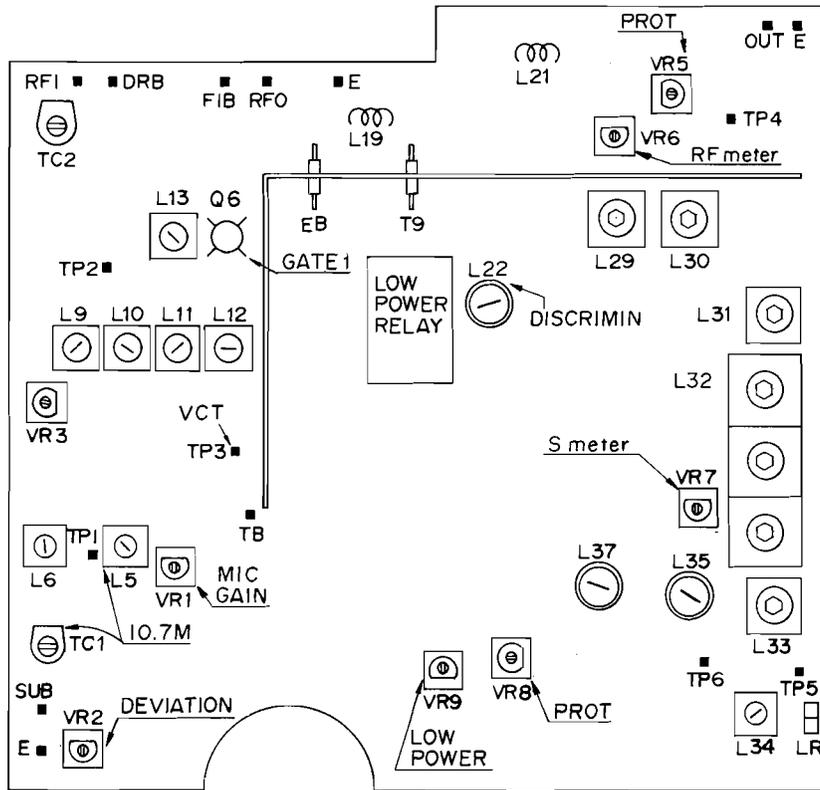
PC BOARD ALIGNMENT AND TEST POINT LOCATIONS

PLL Unit (X50-1580-10)



PC BOARD ALIGNMENT AND TEST POINT LOCATIONS

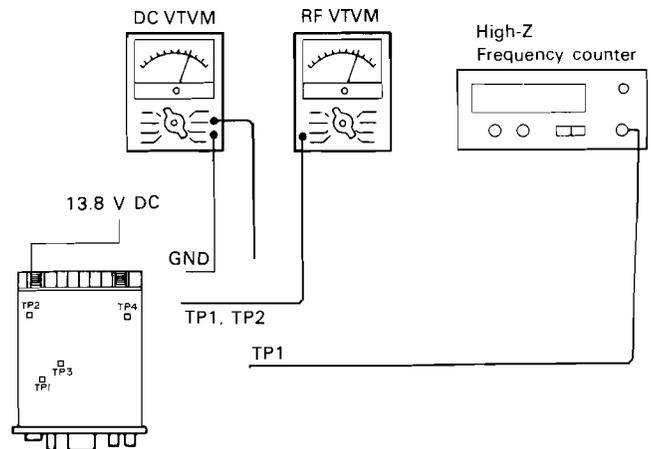
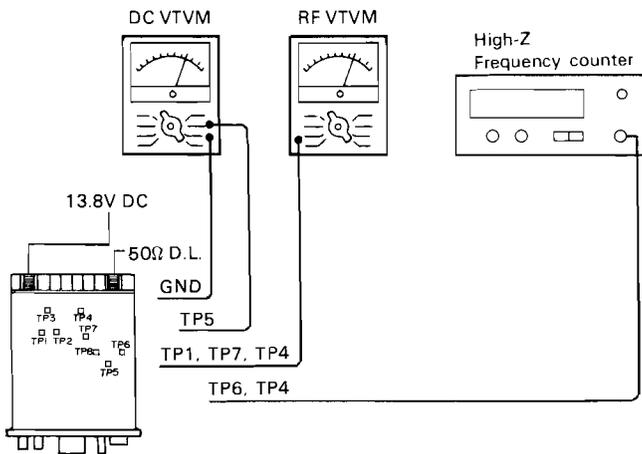
TX, RX Unit (X44-1320-10)



TEST AND ALIGNMENT SET-UPS

1. PLL Adjustments Fig. 1.

Fig. 2a. TX adjustments



TEST AND ALIGNMENT SET-UPS

Fig. 2b. TX adjustments

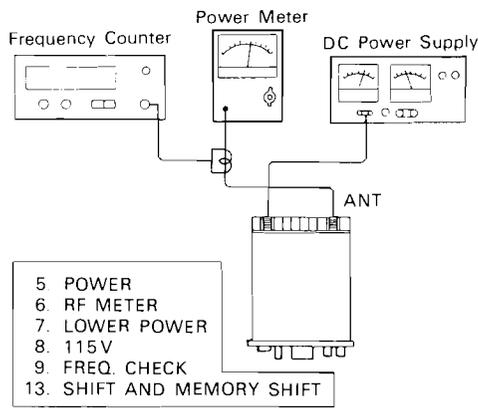


Fig. 2c. TX adjustments

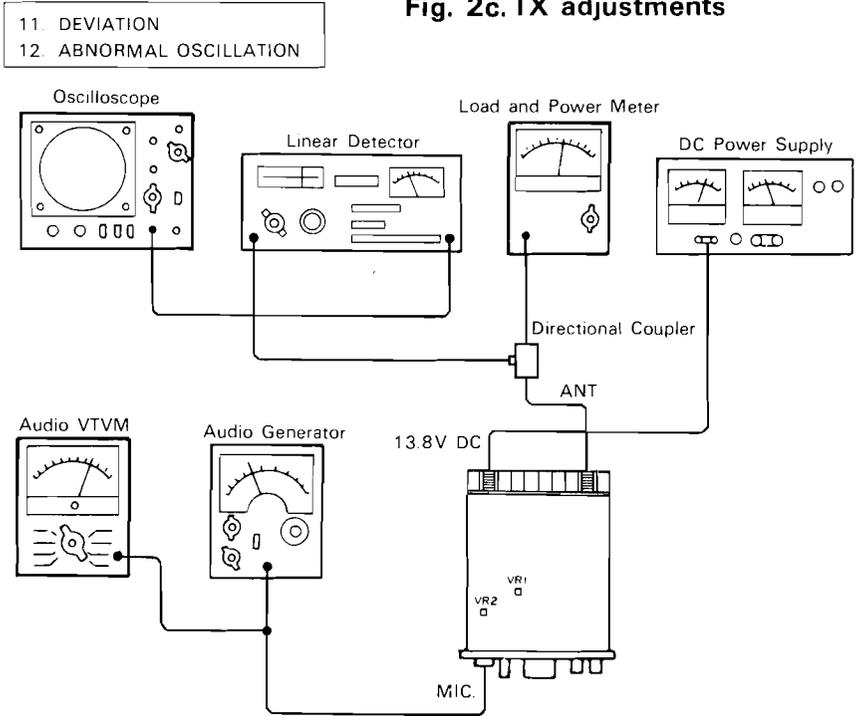


Fig. 2d. TX adjustments

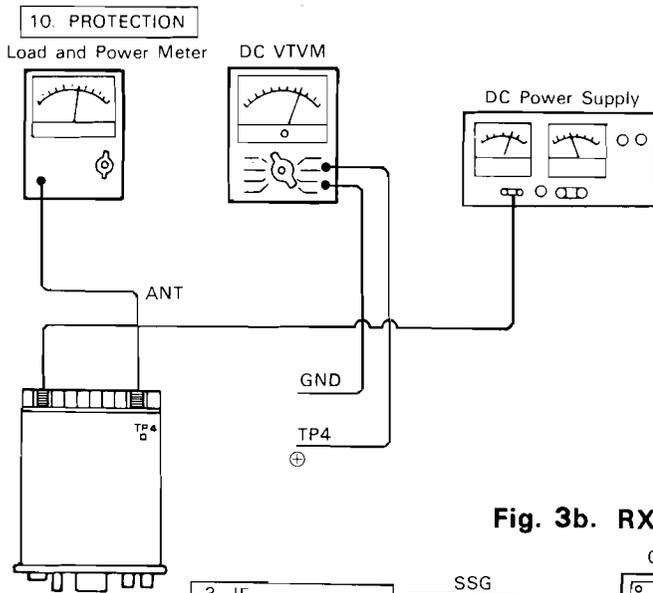


Fig. 3a. RX adjustments

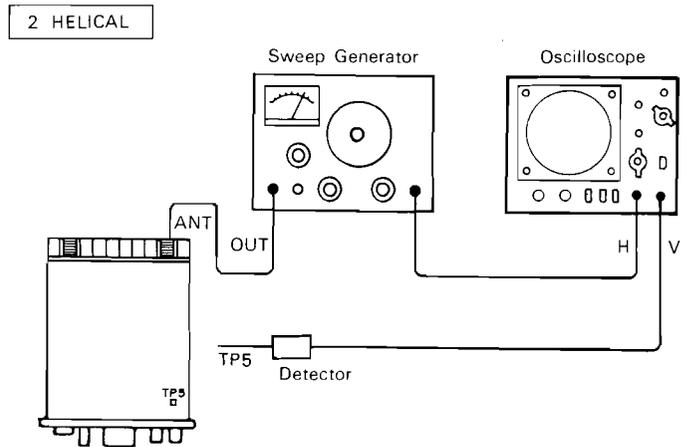
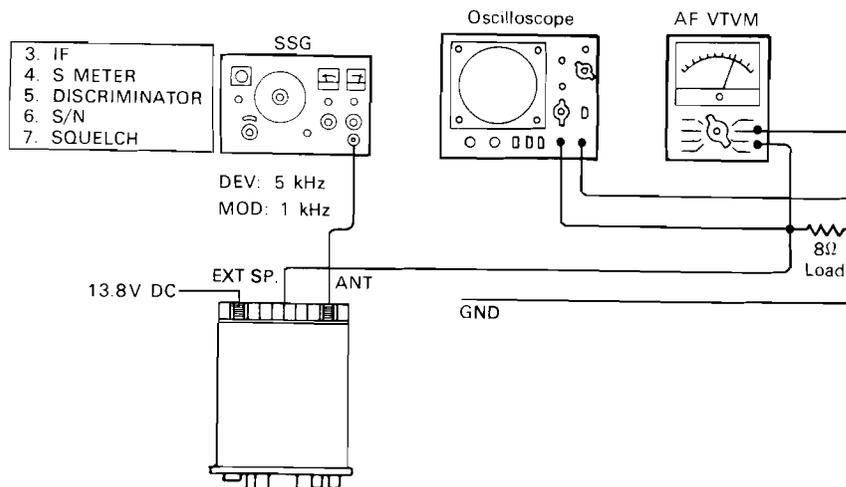
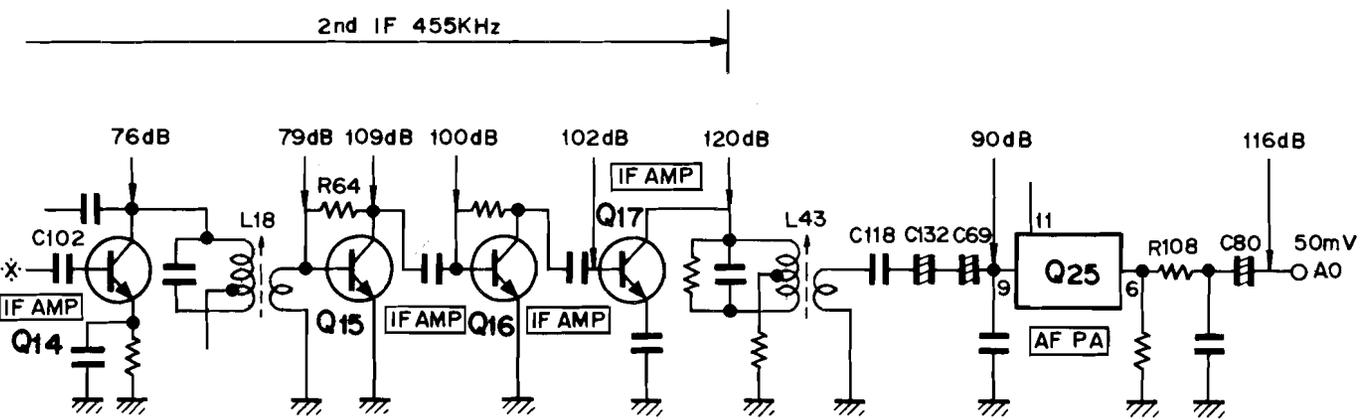
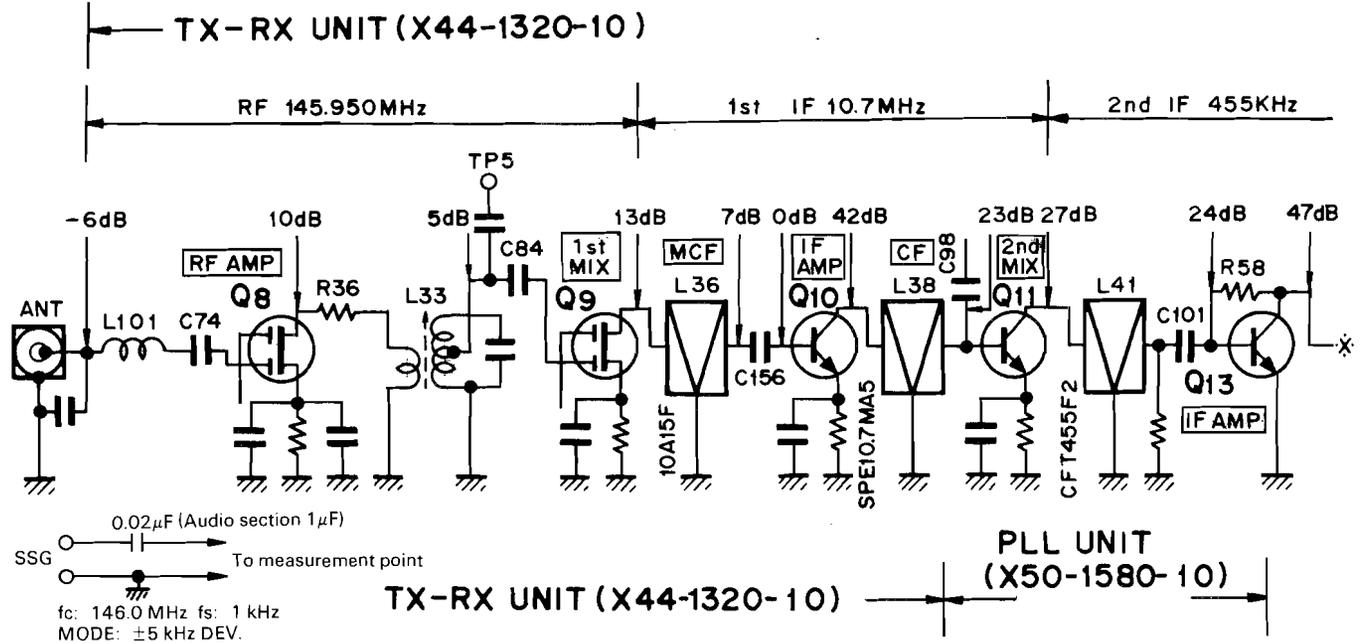


Fig. 3b. RX adjustments

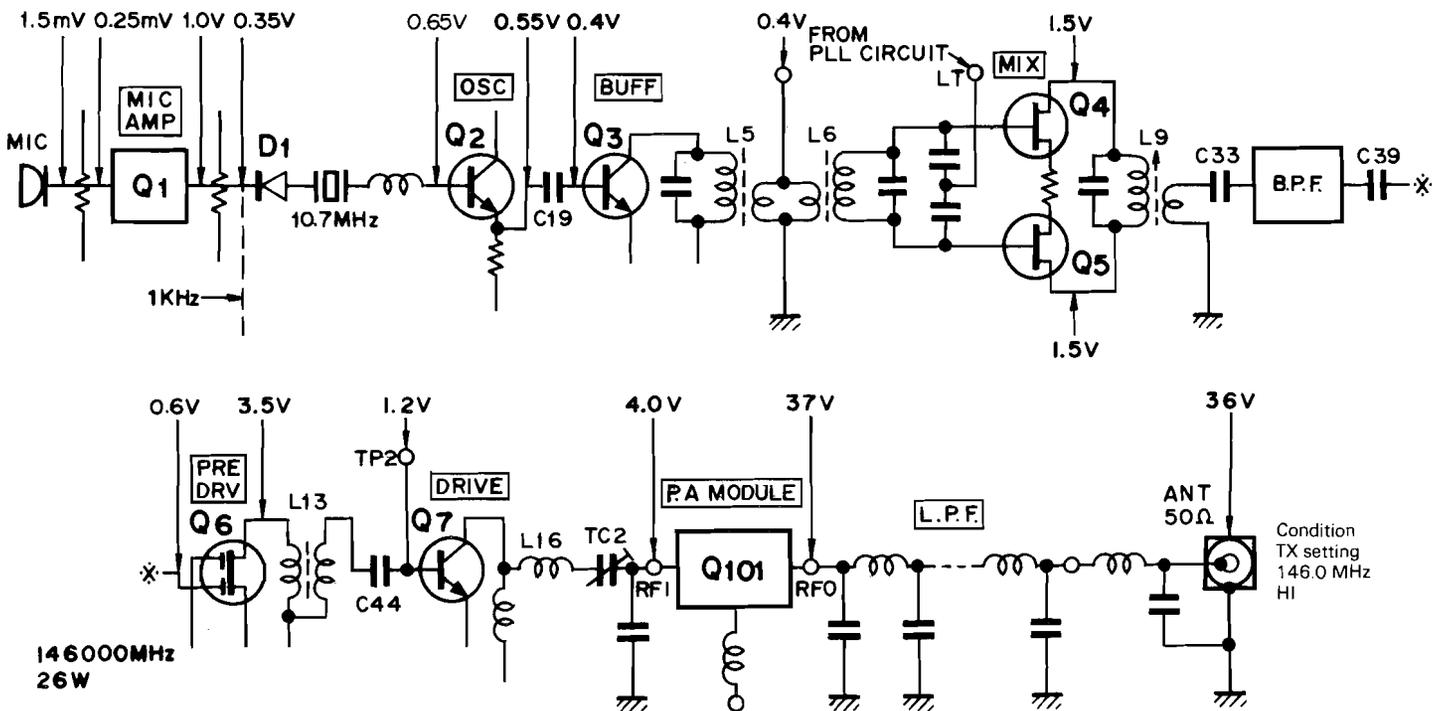


LEVEL DIAGRAM

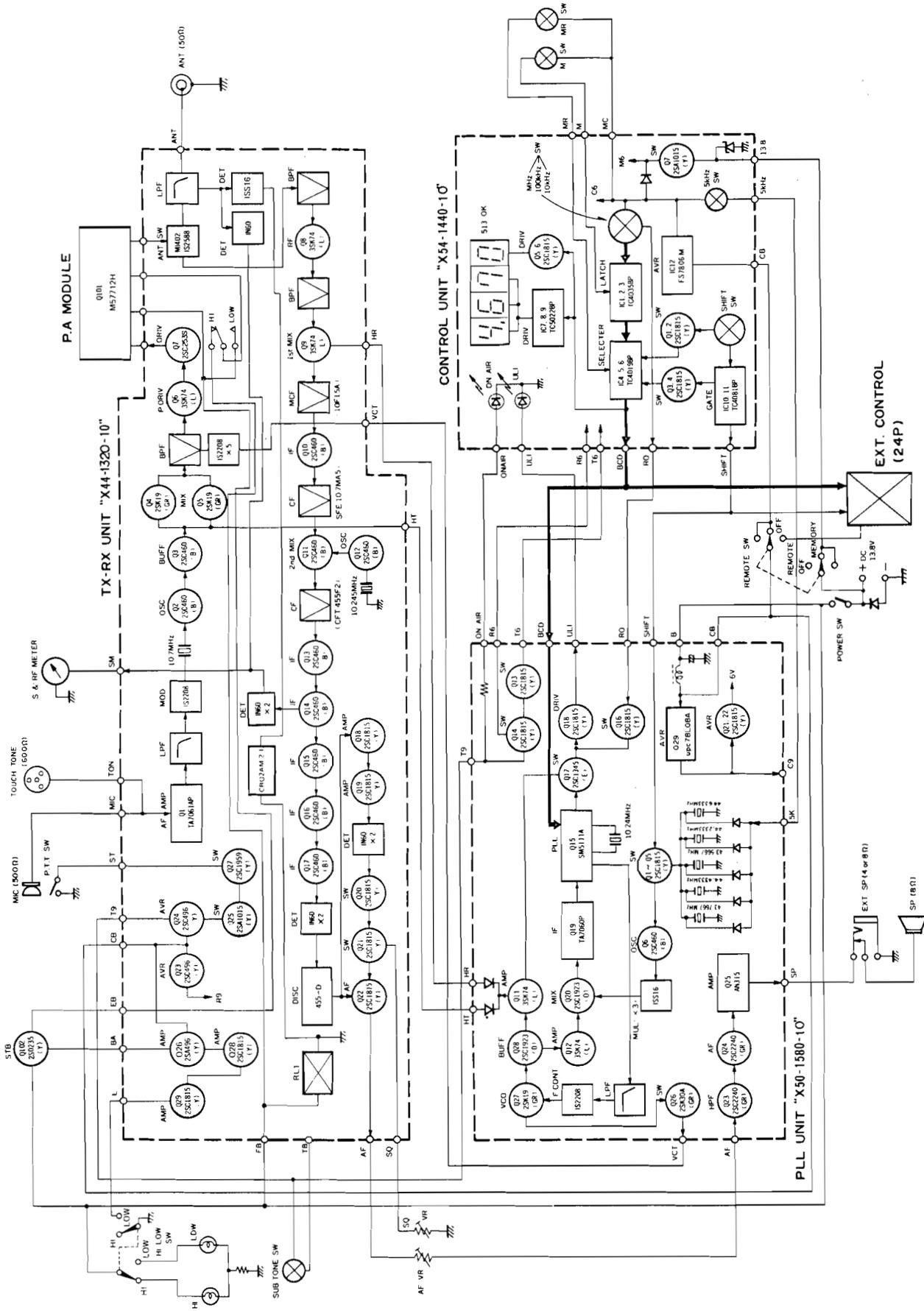
RECEIVER SECTION



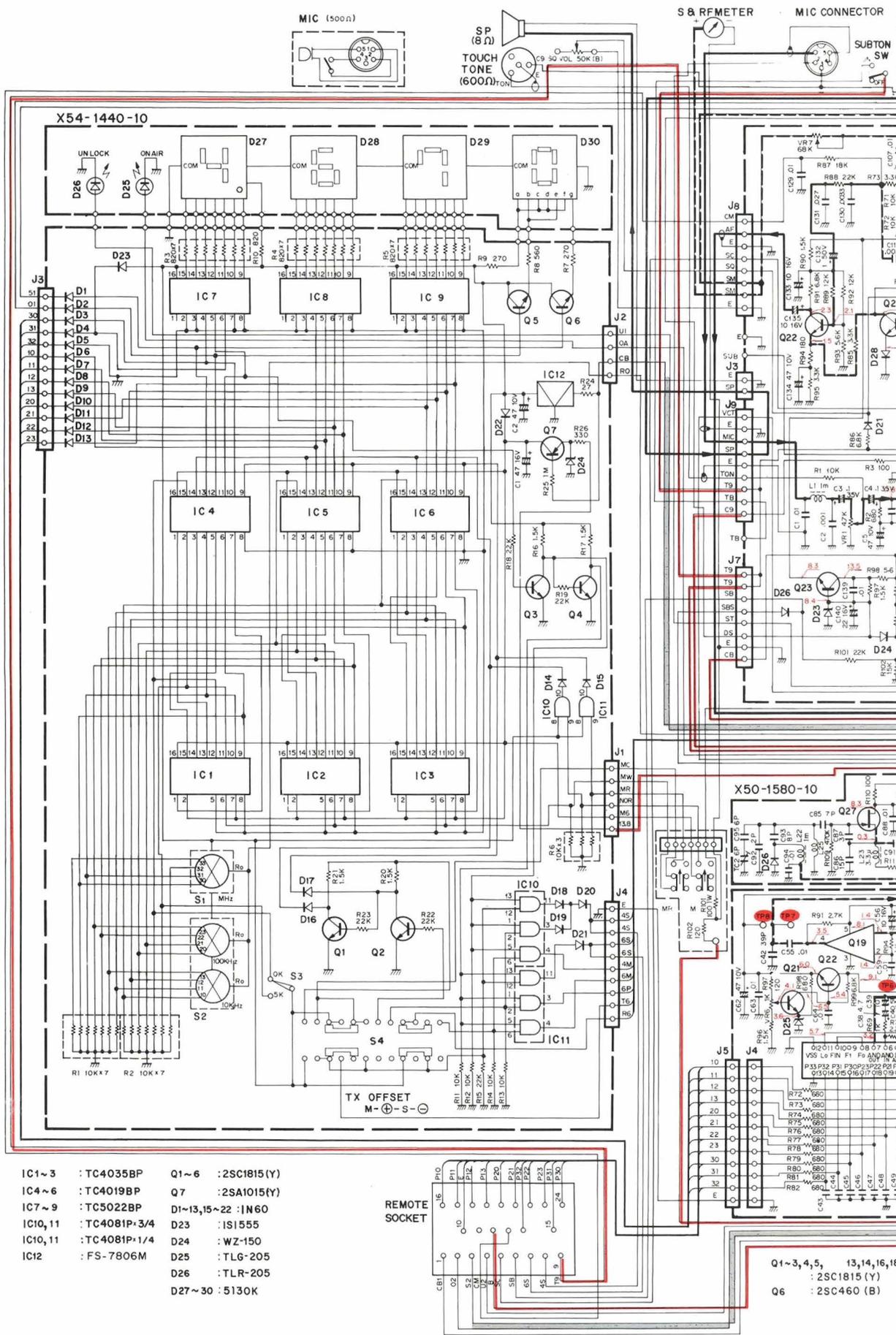
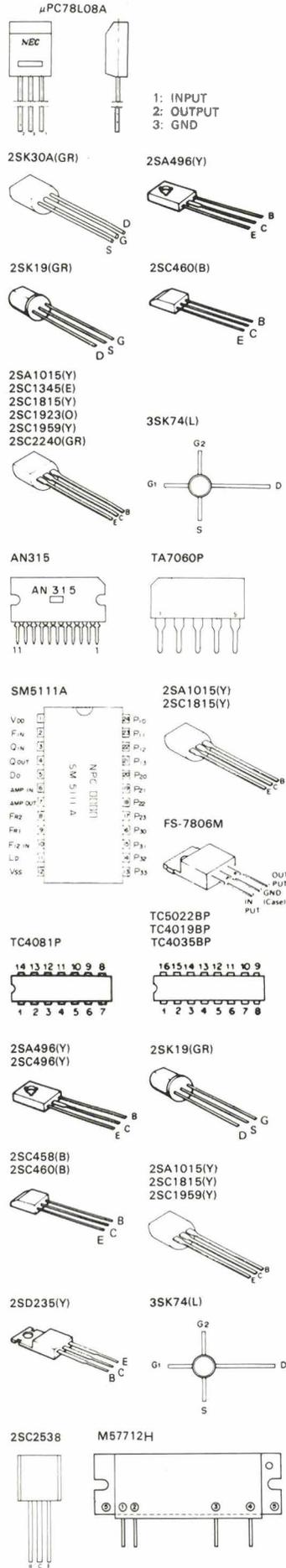
TRANSMITTER SECTION



BLOCK DIAGRAM (K)

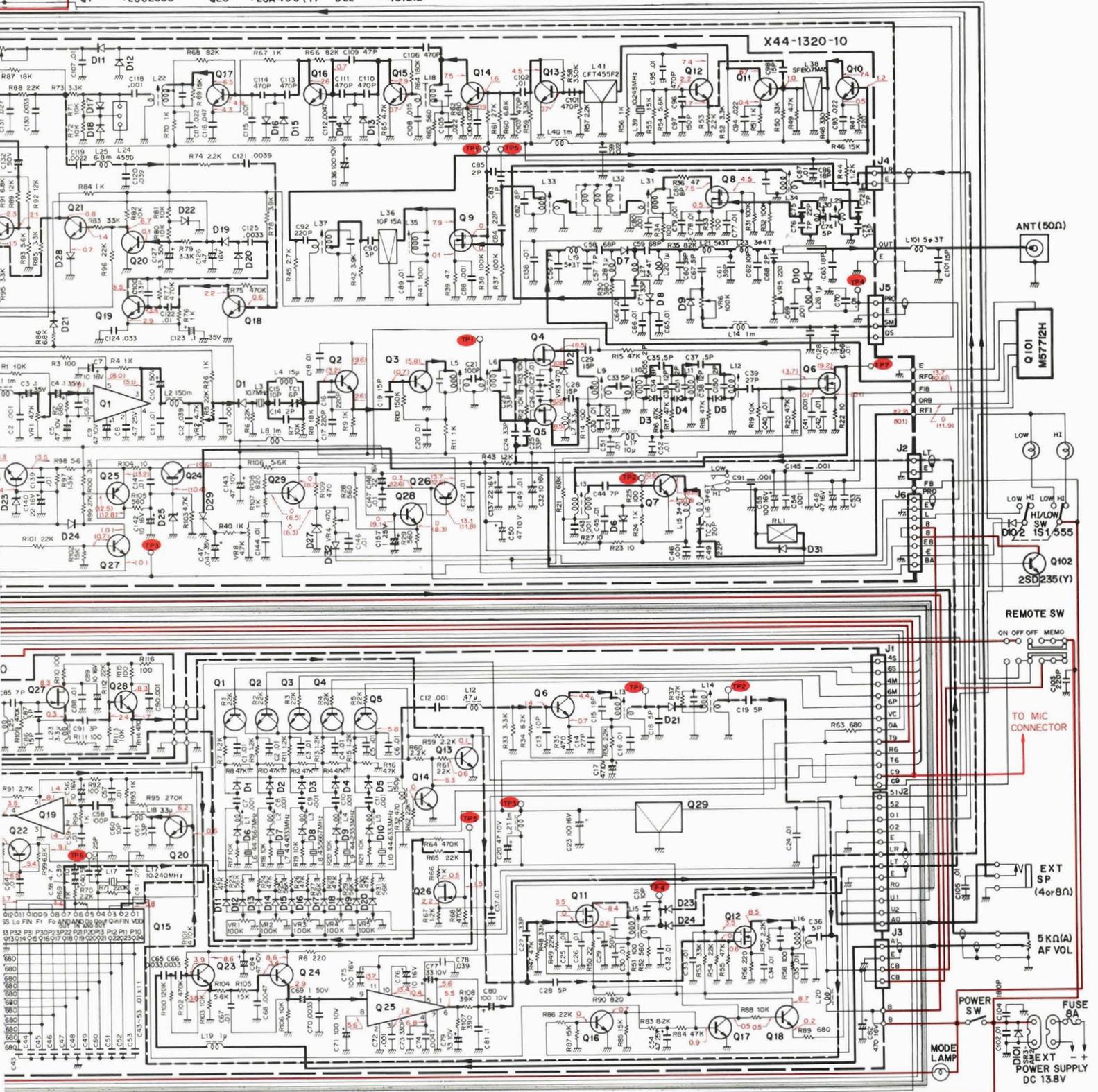


- μPC78L08A
- NEC
- 25K30A(GR)
- 25K19(GR)
- 25A1015(Y)
- 25C1345(E)
- 25C1815(Y)
- 25C1923(B)
- 25C1959(Y)
- 25C2240(GR)
- AN315
- AN 315
- SM5111A
- TC4081P
- 25A496(Y)
- 25C496(Y)
- 25C458(B)
- 25C460(B)
- 25D235(Y)
- 25C2538
- M577



MATIC DIAGRAM (K)

CONNECTOR Q1 :TA7061AP Q18~22,28,29, D1~5, :1S2208 D23 :XZ-086 Voltage measure condition. Power supply voltage. 13.8V Receive section no input signal, squeeze min
 Q2,3,10~17 :2SC460(B) Q23,24 :2SC1815(Y) D6,13~16,21,24,26,28,31,32:1S1555 D25 :WZ-100 MODE S Transmitter section. 50Ω Load HI position
 SUBTON SW Q4,5 :2SK19(GR) Q25 :2SA1015(Y) D7 :M1402 D27 :XZ-064 M-BUCKUP ON () : Transmitter voltage
 Q6,8,9 :3SK74(L) Q27 :2SC1959(Y) D8 :1S2588 D29 :CRO2AM-2-1 Frequency 146.000MHz
 Q7 :2SC2538 Q26 :2SA496(Y) D22 :1S1212 D10 :1S516



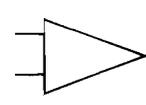
Q1,12 :3SK74(L) Q23,24 :2SC2240(GR) D1~5 :1S2588 D23~24 :1S2588
 :2SC1815(Y) Q15 :SM5111A Q25 :AN315 D6~10 :1S5V53A D25 :WZ-040
 :2SC460(B) Q17 :2SC1345(E) Q26 :3SK30A(GR) D11~20 :1S1555 D26 :1S2208
 Q19 :TA7060P Q27 :2SK19(GR) D21 :1S516
 Q20,28 :2SC19231(O) Q29 :μPC78L08A

< Switch Logic >

Control Unit (X54-1440-10)

| | | 5 kHz SW. | | | | | | | | | | | | BCD CODE | |
|-----------------|---|-----------|----|--------|--------|--------|--------|---|---|---|---|---|----------|----------|--|
| | | OFF | ON | | | | | | | | | | | | |
| J-3 | | | | | | | | | | | | | | | |
| 51 | ○ | | 0 | | | | | | | | | | | | |
| 01 | ○ | 0 | 1 | 144MHz | 145MHz | 146MHz | 147MHz | | | | | | F. order | | |
| 30 | ○ | | | 0 | | 0 | | | | | | | MHz | | |
| 31 | ○ | | | | | | | | | | | | | | |
| 32 | ○ | | | 0 | 0 | 0 | 0 | | | | | | | | |
| CH. Knob (A)(B) | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | | | | |
| 10 | ○ | 0 | | 0 | | 0 | | 0 | | 0 | | 1 | 10 kHz | | |
| 11 | ○ | 0 | 0 | | | 0 | 0 | | | 0 | 0 | 2 | | | |
| 12 | ○ | 0 | 0 | 0 | 0 | | | | | 0 | 0 | 4 | | | |
| 13 | ○ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | 8 | | | |
| 20 | ○ | 0 | | 0 | | 0 | | 0 | | 0 | | 1 | 100 kHz | | |
| 21 | ○ | 0 | 0 | | | 0 | 0 | | | 0 | 0 | 2 | | | |
| 22 | ○ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | 8 | | | |
| 23 | ○ | 0 | 0 | 0 | 0 | | | | | 0 | 0 | 4 | | | |

| | | 144MHz | | | | 145MHz | | | | 146MHz | | | | 147MHz | | | |
|-----|---|--------------|---|---|---|--------|--|--|--|--------|--|--|--|--------|--|--|--|
| J-4 | | | | | | | | | | | | | | | | | |
| 4S | ○ | 4 simplex | | | 0 | 0 | | | | | | | | | | | |
| 4S | ○ | 4 simplex | | | 0 | 0 | | | | | | | | | | | |
| 6S | ○ | 6 simplex | 0 | 0 | | | | | | | | | | | | | |
| 6S | ○ | 6 simplex | 0 | 0 | | | | | | | | | | | | | |
| 4M | ○ | 6 minus "TX" | | | 0 | 0 | | | | | | | | | | | |
| 6M | ○ | 6 minus "TX" | 0 | 0 | | | | | | | | | | | | | |
| 6P | ○ | 6 plus "TX" | 0 | 0 | | | | | | | | | | | | | |
| T6 | ○ | | | | | | | | | | | | | | | | |
| R6 | ○ | | | | | | | | | | | | | | | | |



To J-1
X50-1580-10
info to switch
on Q1-Q5 and
Q6 Local OSC

1. MINIM

2. KEEP
READY

< TERMINALS >

| | | | | | |
|----|---------------|------|------------------------------|-----|-----------------------------|
| 51 | 5 kHz | R6 | + 6 VDC in RX | T9 | Transmit + 9 VDC |
| 01 | Signal | UI | Unlock indicate | TB | + 9 VDC when tone switch on |
| | | OA | On Air | SB | |
| 30 | Megahertz sig | RO | Rotary Switch Active | SBS | |
| 31 | | CB | Common B+ | ST | PTT Line |
| 32 | | MC | Memory cancel | DS | Diode switch for antenna |
| | | NR | Normal | LR | Receive HET OSC |
| 10 | 100 kHz | MR | Memory Read | LT | Transmit HET OSC |
| 11 | | MW | Memory Write | PRO | Protection signal |
| 12 | | M6 | + 6 VDC memory on | RFO | RF out |
| 13 | | 13.8 | Raw B+ | FIB | Final B+ |
| | | | | DRB | Drive B+ |
| 20 | 10 kHz | CM | Center meter | RFI | RF in |
| 21 | | AF | Audio Freq. | L | Low Power |
| 22 | | SC | Squelch Control + 6 VDC when | BA | Base Q102 |
| 23 | | | SQ active | FB | Emitter of Q102 |
| 4S | 144 simplex | SQ | Squelch VR | | |
| 6S | 146 simplex | SM | S meter signal | | |
| 4m | 144 offset ⊖ | E | Earth | | |
| 6m | 146 offset ⊖ | S | Speaker | | |
| | | VCT | Vari cap tune | | |
| 6P | 146 offset ⊕ | MIC | MIC | | |
| T6 | + 6 VDC in TX | TON | Tone signal in | | |

3. DISCH
DEVI

4. HAND
WARNI

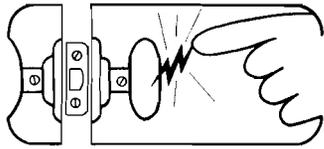
CAUTION

(From: FI

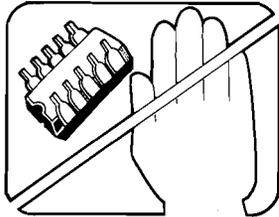
STATIC AWARENESS

Some semiconductors and custom IC's can be damaged by electrostatic discharge during handling. This notice explains how you can minimize the chances of destroying such devices by:

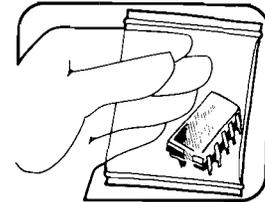
1. Knowing that there is a problem.
2. Learning the guidelines for handling them.
3. Using the procedures, and packaging and bench techniques that are recommended.



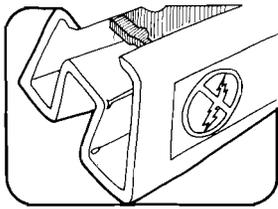
The following practice should be followed to minimize damage to S.S. devices.



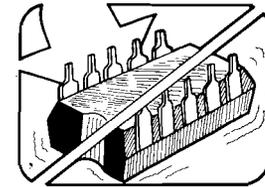
1. MINIMIZE HANDLING



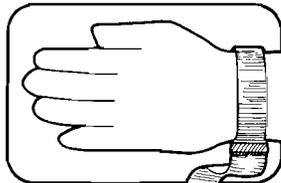
5. USE ANTI-STATIC CONTAINERS FOR HANDLING AND TRANSPORT



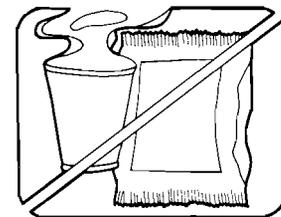
2. KEEP PARTS IN ORIGINAL CONTAINERS UNTIL READY FOR USE.



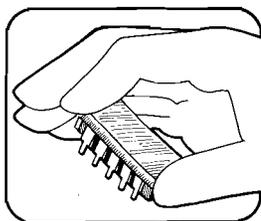
6. DO NOT SLIDE S.S. DEVICES OVER ANY SURFACE.



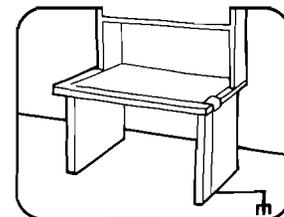
3. DISCHARGE PERSONAL STATIC BEFORE HANDLING DEVICE



7. AVOID PLASTIC, VINYL AND STYROFOAM IN WORK AREA.



4. HANDLE S.S. DEVICES BY THE BODY



8. HANDLE S.S. DEVICES ONLY AT A STATIC-FREE WORK STATION.

WARNING: INDICATES USAGE OF MOS DEVICE(S) WHICH MAY BE DAMAGED BY STATIC DISCHARGE USE SPECIAL HANDLING.

9. ONLY GROUNDED TIP SOLDER-SUCKERS SHOULD BE USED.

CAUTION: SUBJECT TO DAMAGE BY STATIC ELECTRICITY.

10. ONLY GROUNDED TIP SOLDERING IRON SHOULD BE USED.

(From: Fluke model 1219A freq. counter manual.)

SPECIFICATIONS [K, W type]**GENERAL**

| | |
|-------------------------------|--|
| Semiconductors: | Transistors: 48 (K), 47 (W) FETs: 9 ICs: 17 Diodes: 88 (K), 77 (W) |
| Frequency Range: | 144.00 to 147.995 MHz (K), 144.00 to 145.995 MHz (W) |
| Frequency Synthesizer: | Digital control of phase locked VCO |
| Synthesizer Stability: | Better than ± 750 Hz at 25°C |
| Mode: | FM |
| No. of Channels: | 800 (K), 400 (W) |
| Operating Temperature: | -20 to +50°C |
| Power Voltage: | 11.5V DC to 16.0V DC (13.8V DC standard) |
| Grounding: | Negative grounding |
| Antenna Impedance: | 50 Ω |
| DC Current: | Less than 0.5A in receive with no input signal Less than 6A in HI transmit (at 13.8V DC) |
| Dimensions: | 161 mm (6-5/16") wide 61 mm (2-3/8") high 230 mm (9-1/16") deep |
| Weight: | 1.75 kg (3.85 lbs) Approx. |

TRANSMITTER SECTION

| | |
|------------------------------------|--|
| RF Output Power: | High: 25 watts (min.) Low: 5 watts approx. (adjustable to 25 watts) |
| Modulation: | Variable reactance direct shift |
| Max. Frequency Deviation: | ± 5 kHz |
| Spurious Radiation: | Less than -60 dB |
| Touch Tone Input Impedance: | 600 Ω |
| Microphone: | Dynamic microphone with PTT switch, 500 Ω |

RECEIVER SECTION

| | |
|--------------------------------|---|
| Circuitry: | Double superheterodyne |
| Intermediate Frequency: | 1st: IF 10.7 MHz 2nd: IF 455 kHz |
| Sensitivity: | Less than 0.4 μ V for 20 dB quieting (Less than 1 μ V for 30 dB S/N) Less than 0.25 μ V |
| Squelch Sensitivity: | Better than 12 kHz at 6 dB down |
| Pass Band Width: | Better than 76 dB at 30 kHz (K), 70 dB at 25 kHz (W) of adjacent channel |
| Selectivity (2 Signal): | Better than 70 dB |
| Image Rejection: | Better than 60 dB |
| Spurious Interference: | Better than 66 dB (K), 60 dB (W) |
| Intermodulation: | More than 1.5 watts across 8 Ω load (10% distortion) |

NOTE: The circuit and ratings may change without notice due to developments in technology.

A product of
TRIO-KENWOOD CORPORATION
6-17, 3-chome, Aobadai, Meguro-ku, Tokyo 153, Japan

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