

 **KENWOOD / TRIO**

# SERVICE MANUAL

## Model TR-7010



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**2m SSB TRANSCEIVER**

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## SPECIFICATIONS

### GENERAL

|   |  |
|---|--|
| <b>Semiconductor:</b>                       | 34 transistors, 12 FETs, 72 diodes   |
| <b>Frequency Range:</b>                     | 144.0 ~ 145.0MHz   |
| <b>Number of Built-in Channels:</b>         | 40 channels  |
| <b>Frequency Range of Built-in Channel:</b> | A band 144.100 ~ 144.195MHz<br>B band 144.200 ~ 144.295MHz                                 |
| <b>Operating Temperature:</b>               | -20°C ~ +60°C  |
| <b>Standard Power Supply Voltage:</b>       | DC 13.8V   |
| <b>Working Voltage:</b>                     | DC 11.5 ~ 16.0V  |
| <b>Grounding:</b>                           | Negative grounding   |
| <b>Antenna Impedance:</b>                   | 50Ω  |
| <b>Power Consumption:</b>                   | 40VA (DC 13.8V)<br>Approx. 600mA in receive with no input signal<br>Approx. 3A in transmit |
| <b>Dimensions:</b>                          | 180(W) × 60(H) × 240(D) mm   |
| <b>Weight:</b>                              | 2.7kg  |

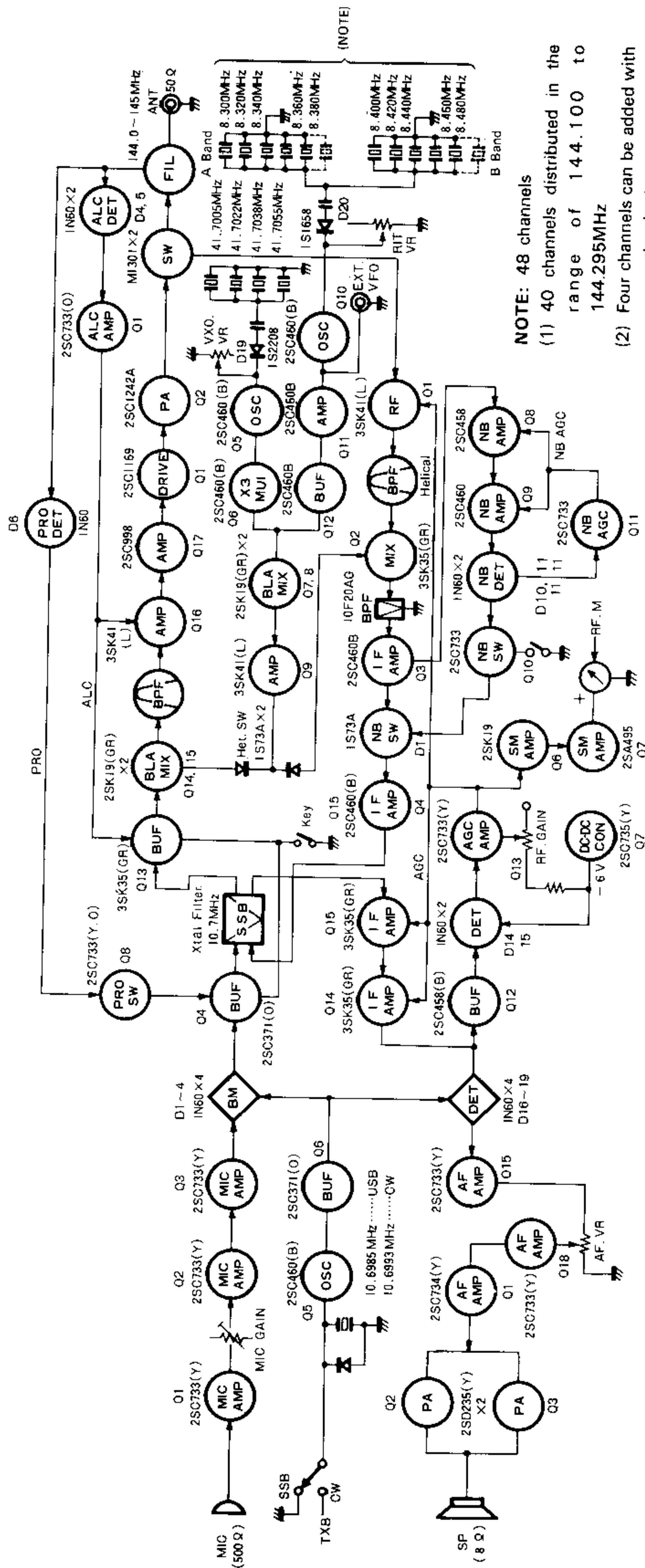
### TRANSMIT SECTION

|   |  |
|---|--|
| <b>Type of Emission:</b>                  | A1, A3J (USB)  |
| <b>Rated Input:</b>                       | 13.5V 20W  |
| <b>Rated Output:</b>                      | 8W   |
| <b>Modulation:</b>                        | Balanced modulation                                    |
| <b>Spurious Radiation:</b>                | Less than -60dB  |
| <b>Carrier Suppression Ratio:</b>         | More than 40dB   |
| <b>Side-band Suppression Ratio:</b>       | More than 40dB   |
| <b>Microphone and Sensitivity:</b>        | 500Ω, dynamic type, with press-talk switch, -72dB ±3dB |
| <b>Transmit Frequency Characteristic:</b> | Characteristic — 500 ~ 2500Hz (-6dB)                   |

### RECEIVE SECTION

|                                |  |
|--------------------------------|--|
| <b>Receiving System:</b>       | Single superheterodyne                   |
| <b>Intermediate Frequency:</b> | 10.7MHz                                  |
| <b>Sensitivity:</b>            | 0.5μV (S/N = better than 10dB)           |
| <b>Image Rejection:</b>        | More than 60dB                           |
| <b>Spurious Interference:</b>  | More than 60dB                           |
| <b>Pass Band Width:</b>        | Less than 2.4kHz (at -6dB)               |
| <b>Selectivity:</b>            | Less than 4.8kHz (at -60dB)              |
| <b>Audio Output:</b>           | More than 1.5W (10% distortion, 8Ω load) |

# BLOCK DIAGRAM / FEATURES



1. All solid-state, handy SSB car transceiver which operates in the band of 144MHz.
2. TR-7010 which operates in SSB (A<sub>3</sub>J) and CW (A<sub>1</sub>) modes is so designed as to serve as a fixed station.
3. By the adoption of a frequency synthesizer 40 channels at intervals of 5kHz are provided.
4. AUX circuit has 18 channels, and it is possible to add another 4 channels with one crystal.
5. An external VFO connection terminal is provided.
6. Kenwood's unique noise blanker circuit whose high performance in the HF range has proven effectively eliminates noise arising from ignition.
7. A pre-mixer and a balanced type HET mixer with FET are used to prevent spurious responses during transmission.
8. A six-element crystal filter is used in the IF stage so that a high level of selectivity is obtained.
9. An RF gain control of threshold type is used to obtain an optimum S/N ratio throughout SSB reception.
10. AGC circuit of amplifier type is used to obtain distortion less sound during reception, and ALC circuit is used to inhibit splatter and minimize wave distortion during transmission.
11. "ON AIR" pilot lamp which lights during transmission is provided.
12. RIT circuit with ON-OFF switch permits the frequency of only the incoming signal to be varied by about  $\pm 1.5$ kHz.
13. Fittings for car mounting, power cord, stand, microphones and all other necessary accessories are provided.
14. VXO circuit permits both the transmit and reception frequencies to be varied by  $\pm 2.5$ kHz or more at the same time, so that TR-7010 can continuously cover all the frequencies of 40 channels divided at intervals of 5kHz.

## CIRCUIT DESCRIPTION

### GENERAL:

TR-7010 is composed of 34 transistors, 12 FETs and 72 diodes. The block diagram is shown on Page 4. The following are the major functional units contained in TR-7010:

### Types of Units and Arrangement:

1. Synthesizer unit (X50-1240-00) ..... Upper side
2. RX unit (X55-1080-00) ..... Lower side
3. Carrier unit (X50-1230-00) ..... Lower side
4. Final unit (X45-1040-00) ..... Upper side
5. Filter unit (X51-1110-00) ..... Lower side

In the synthesizer unit, 4 crystals for 41MHz band and 10 crystals for 8MHz band are combined to provide 40 channels of 133MHz band. The frequency obtained is fed to the transmit and receive MIX circuits by means of the diode switch, as a heterodyne signal.

In the transmitting section, SSB signal of 10.7MHz and heterodyne signal of 133MHz are mixed to obtain a 144MHz frequency which is power amplified to 8W of rated output.

In the receiving section, the receive frequency of 144MHz band and the heterodyne frequency of 133MHz band are mixed to obtain 10.7MHz IF frequency.

The IF frequency is combined with a carrier and is fed to the detector circuit through the crystal filter for SSB detection, thus AF signal being obtained.

Both the transmitting section and the receiving section are provided with various auxiliary circuits and connecting terminals to ensure maximum performance and reliable operation.

### Auxiliary Circuits:

1. S/RF meter
2. Noise blanker circuit
3. Amplification type AGC
4. Amplification type ALC
5. RIT circuit
6. VXO circuit
7. ON AIR indicator circuit
8. Final stage protection
9. CW circuit
10. Transmitting/receiving antenna, diode selector circuit
11. RF gain control
12. Frequency synthesizer
13. Additional channels

### Auxiliary Terminals:

1. ANT
2. EXT SP
3. EXT VFO
4. KEY
5. DC
6. MIC

### 1. Synthesizer Unit (X50-1240-00)

The 41MHz band crystal is oscillated (3rd overtone) by Q5 (2SC460 (B)), and the oscillated frequency is tripled by Q6 (2SC460(B)) to produce 124.9MHz band signal. D19 (1S2208) is connected between Q5 and the crystal to enable the frequencies for both the transmitter and receiver to be varied by the VXO volume control.

The 8MHz band crystal is oscillated by Q10 (2SC460(B)), and the oscillated frequency is amplified through the buffer amplifier, which, together with the above 124.9MHz band signal, is fed to the balanced mixer circuit composed of Q7 and Q8 (2SK19 (GR)). The frequency of the 8MHz band crystal can be selected either to 144.1MHz or 144.2MHz band by means of the BAND selector switch. When the switch is set to 144.2MHz band, the indicator (light emission diode: D102) will be illuminated. The oscillator circuit can be added a variable capacitance diode (D20) for RIT control, thus the receiving frequency can be varied by setting the RIT switch to ON during receive mode.

The balanced mixer circuit is balanced by VR1 (1k $\Omega$ ). When the circuit is under perfectly balanced condition, each signal being fed is mixed and, therefore, they do not appear on the output circuit. Consequently, the 133.4MHz signal produced by the balanced mixer circuit has less spurious component. Since this signal passes through B.P.F. composed of 4 coils, the injected signal of  $\pm 8$ MHz is further suppressed. The signal passing through B.P.F. is amplified by Q9 (3SK41(L, M)) and is then fed to the transmit or receive mixer circuit through the diode switch, as a heterodyne frequency.

In the transmitting mode, the light emission diode (D101) in the ON AIR indicator is illuminated while the 133.4MHz signal is fed to the balanced mixer circuit consisting of Q14 and Q15 (2SK19(GR)), together with the 10.7MHz IF signal which is amplified by Q13 (3SK35 (GR, BL)) after passing through the SSB filter. This signal is then heterodyned to 144MHz, passes through B.P.F. and HF amplified by Q16 (3SK41(L, M)) and Q17 (2SC998) so that it is fed to the driver of the final unit.

The bias of IF amplifier (Q13) and HF amplifier (Q16) are controlled by ALC.

In the receiving mode, the supply voltage of AF power amplifier (Q2, Q3) is turned to ON, thereby the AF signal amplified by Q18 and Q1 is further amplified to drive the speaker.

### 2. Final Unit (X45-1040-00)

The 144MHz input signal is amplified by the driver Q1 (2SC1169) and power amplified by Q2 (2SC1242A) to the rated output of more than 8W. The amplifier used is of AB1 class to improve the

## CIRCUIT DESCRIPTION

linearity; the base circuit is biased by 9V of stabilized voltage while the drive stage employs Q3 (2SD235 (Y, O)) for stability of power supply. The output passes through the  $\pi$  matched circuit and the low pass filter in the filter unit, thus reducing the spurious radiation.

### 3. Filter Unit (X51-1110-00)

The filter unit is composed of the diode type antenna selector circuit, filter circuit, protection circuit, ALC detector and amplifier circuit, and the control unit with RF meter signal detector circuit.

In the ALC circuitry, the transmit output is detected by D4 and D5, passes through the control volume VR3 and is ALC amplified by Q1 (2SC733) to control the amplifier circuit (Q13, Q16) of the synthesizer unit.

The protection circuit detects the reflection wave by the SWR detector circuit when the load becomes abnormal during transmit mode; it is detected by D6 and the DC component is fed to the protection switching circuit (Q8) of the carrier unit.

### 4. Carrier Unit (X50-1230-00)

The 10.6985MHz crystal is oscillated by Q5 and the oscillated signal is used as a carrier for transmission and reception.

In the SSB transmitting mode, the 10.6985MHz carrier signal is fed to the balanced modulator circuit (D1 ~ D4), together with the audio signal amplified by Q1, Q2 and Q3, producing DSB of 10.7MHz band. Since this circuit is a balanced circuit, the 10.6985MHz signal is suppressed and DSB output appears at the output side only when the audio signal is added to it.

The DSB signal thus produced passes through the buffer circuit (Q4) and the 10.7MHz crystal filter, and is then converted into SSB signal of USB so that it is applied to the IF amplifier (Q13) of the synthesizer unit.

In the CW MODE, the 10.6985MHz signal is shifted by D8 (1S2208) to 10.6993MHz while also it is unbalanced by adding a DC voltage through S203 to the balanced circuit, to produce a carrier for keying the emitter of Q4.

Q8 is used as a protection switch, controlling the buffer circuit (Q4) by the DC component after the reflection wave from the final unit is detected.

Q7 is a DC-DC oscillator circuit. The 400Hz signal oscillated from this circuit is rectified by D10 ~ D13, which passes through D14 to produce -6V of voltage. This voltage is supplied to the AGC amplifier (Q13) of the RX unit. The voltage shunted by R30 is applied to the IF amplifier (Q5) through the RB terminal on the RX unit.

### 5. RX Unit (X55-1080-00)

The 144MHz band signal selected by the diode switch is applied to the gate of Q1 (3SK41) from L1 and L2, and is RF amplified. The helical tuning circuit provided between the RF stage and the mixer stage is used to attenuate the signal waves outside the band. The 144MHz band signal picked up from the helical circuit is fed to the mixer circuit (Q2), together with the 133.4MHz signal premixed in the synthesizer unit. In this manner, the 10.7MHz output taken from L6 and L7 is amplified through the IF amplifier.

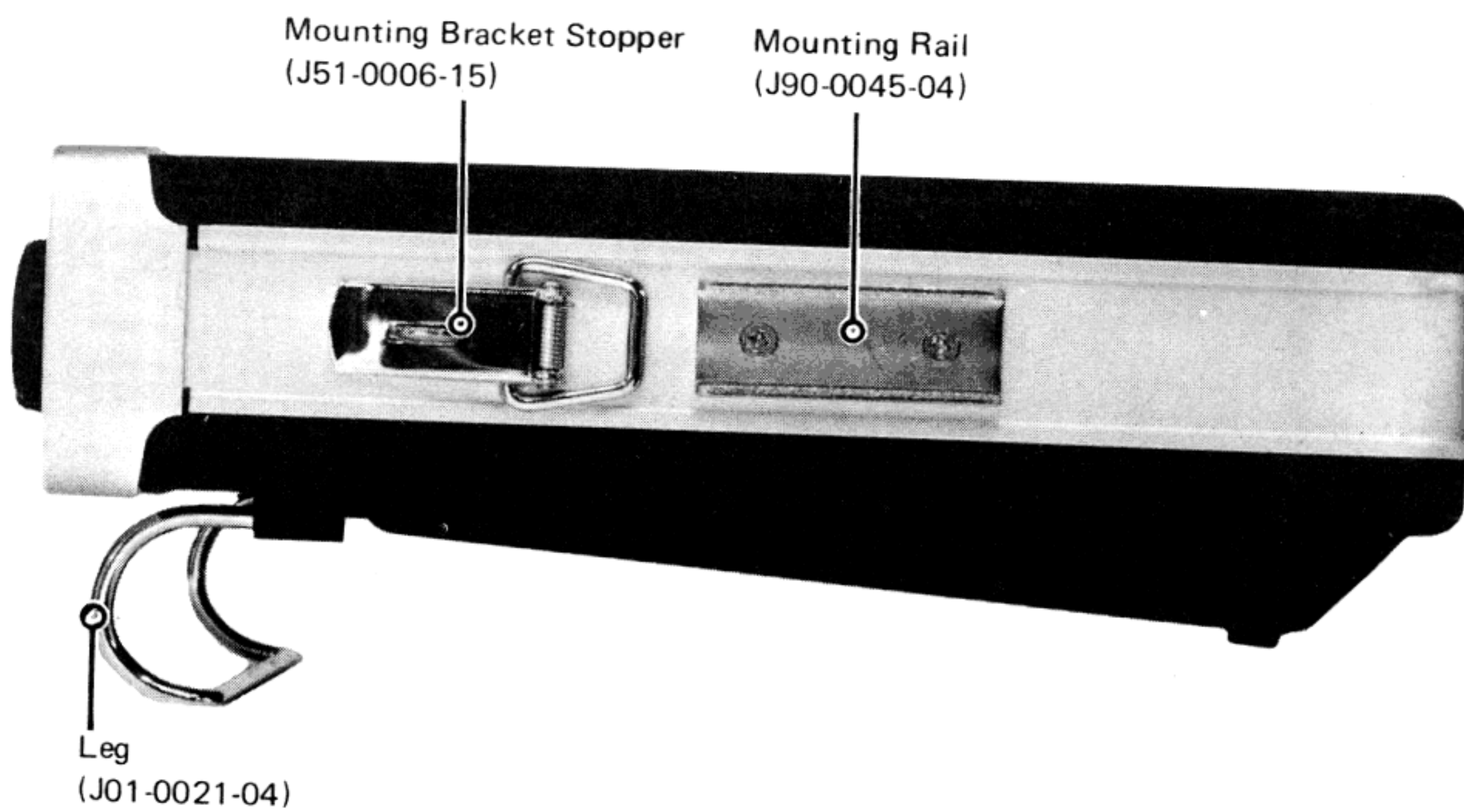
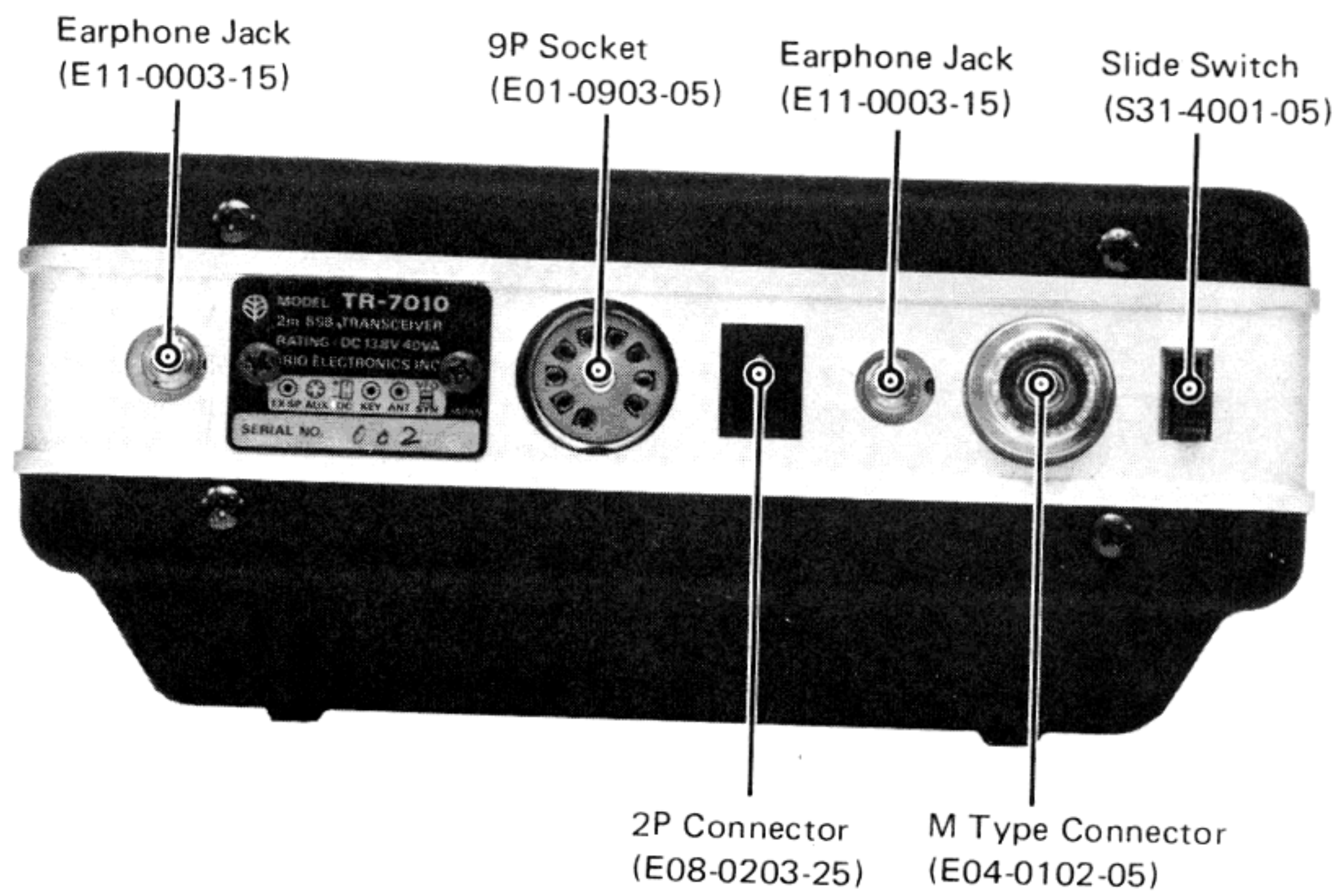
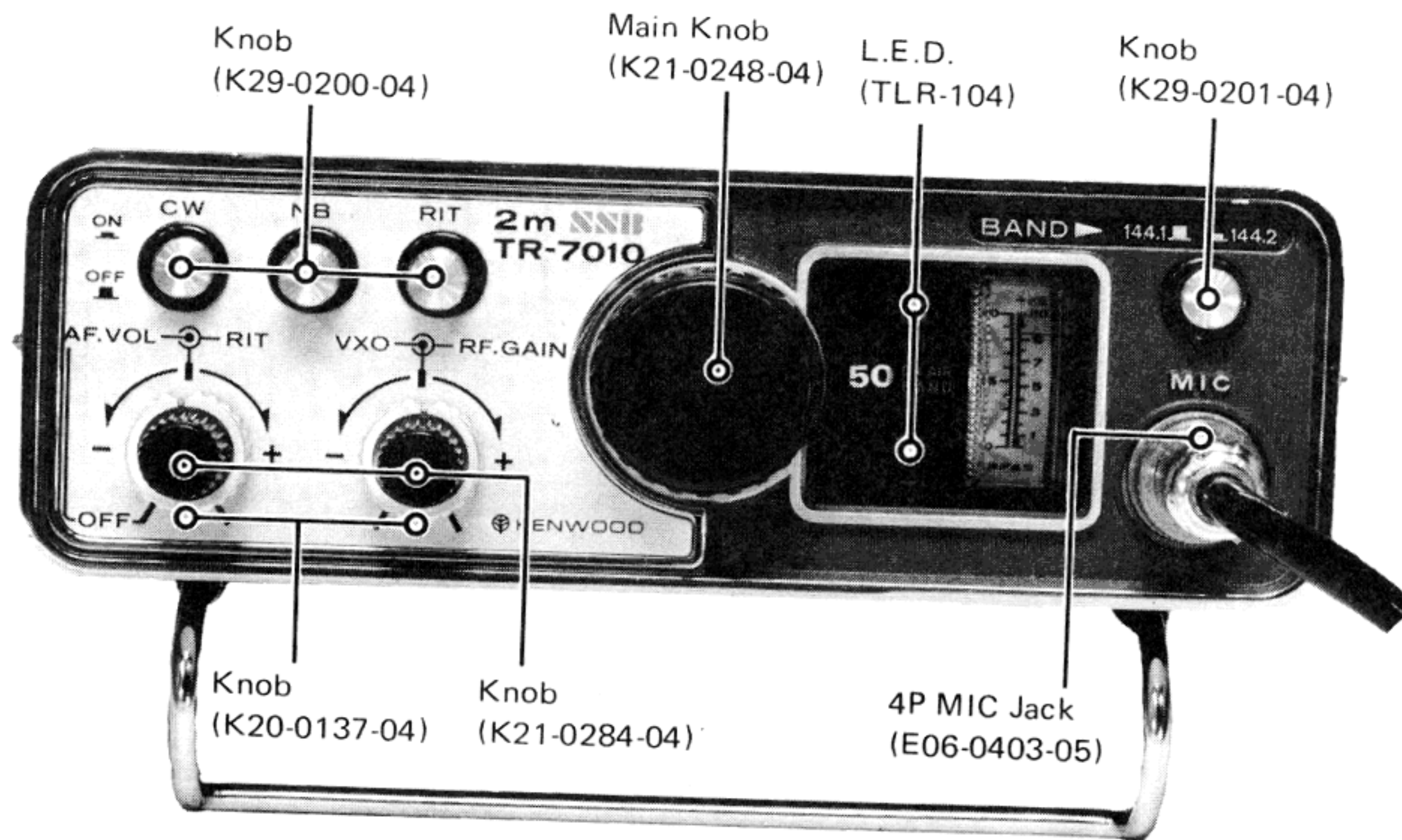
The IF signal passing through the 10.7MHz SSB crystal filter is further amplified by Q5 and Q14 and is applied to the balanced detector circuit composed of D16 ~ D19 including the secondary side of L22. At the same time, the signal from the carrier unit is fed to the circuit through the CAR terminal so that it is picked up as AF signal which is amplified by the AF amplifier (Q15) after passing through the filter.

The NB circuit takes IF signal from Q3 and controls D1 when the NB switch is turned to ON, reducing pulse noise such as ignition noise.

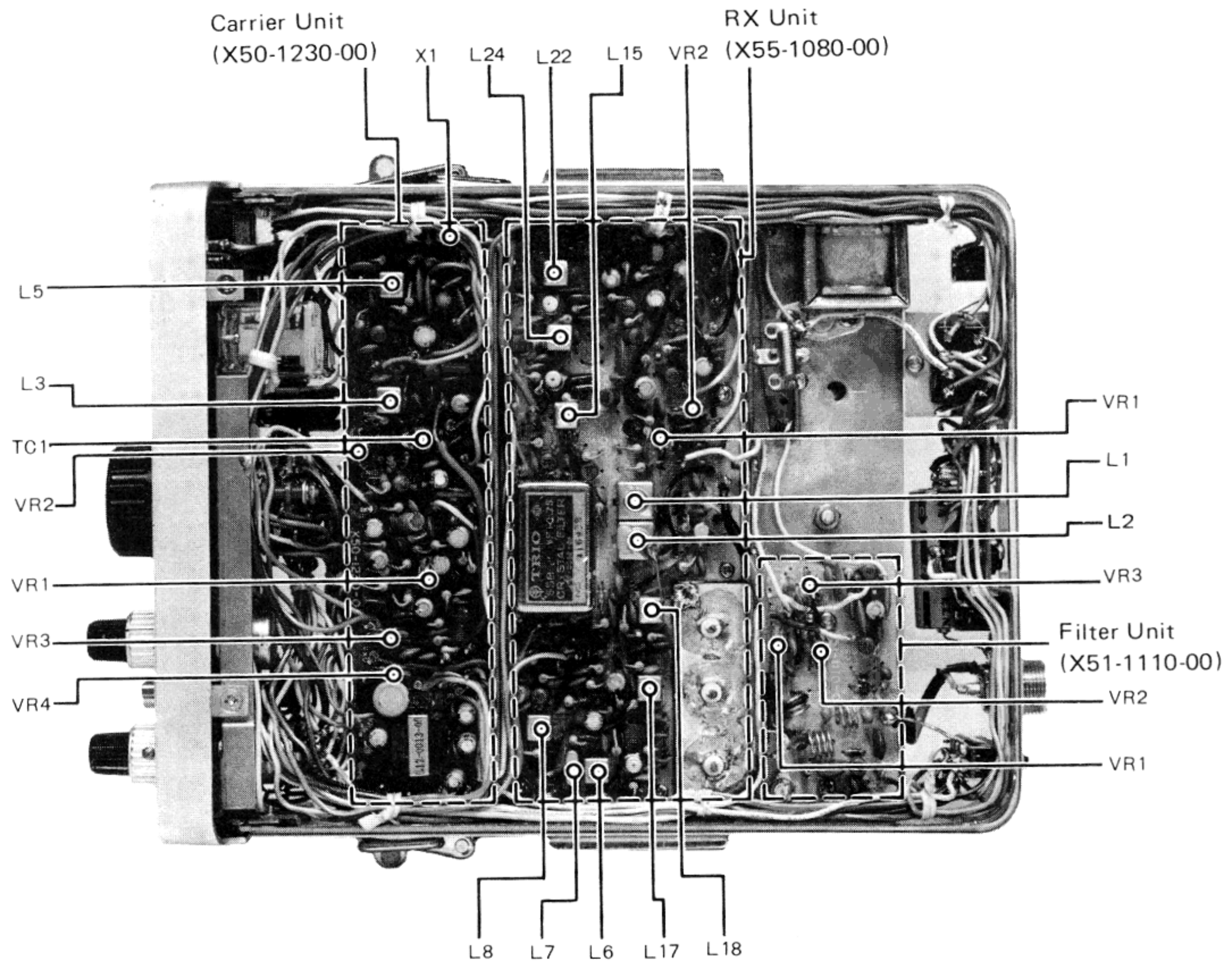
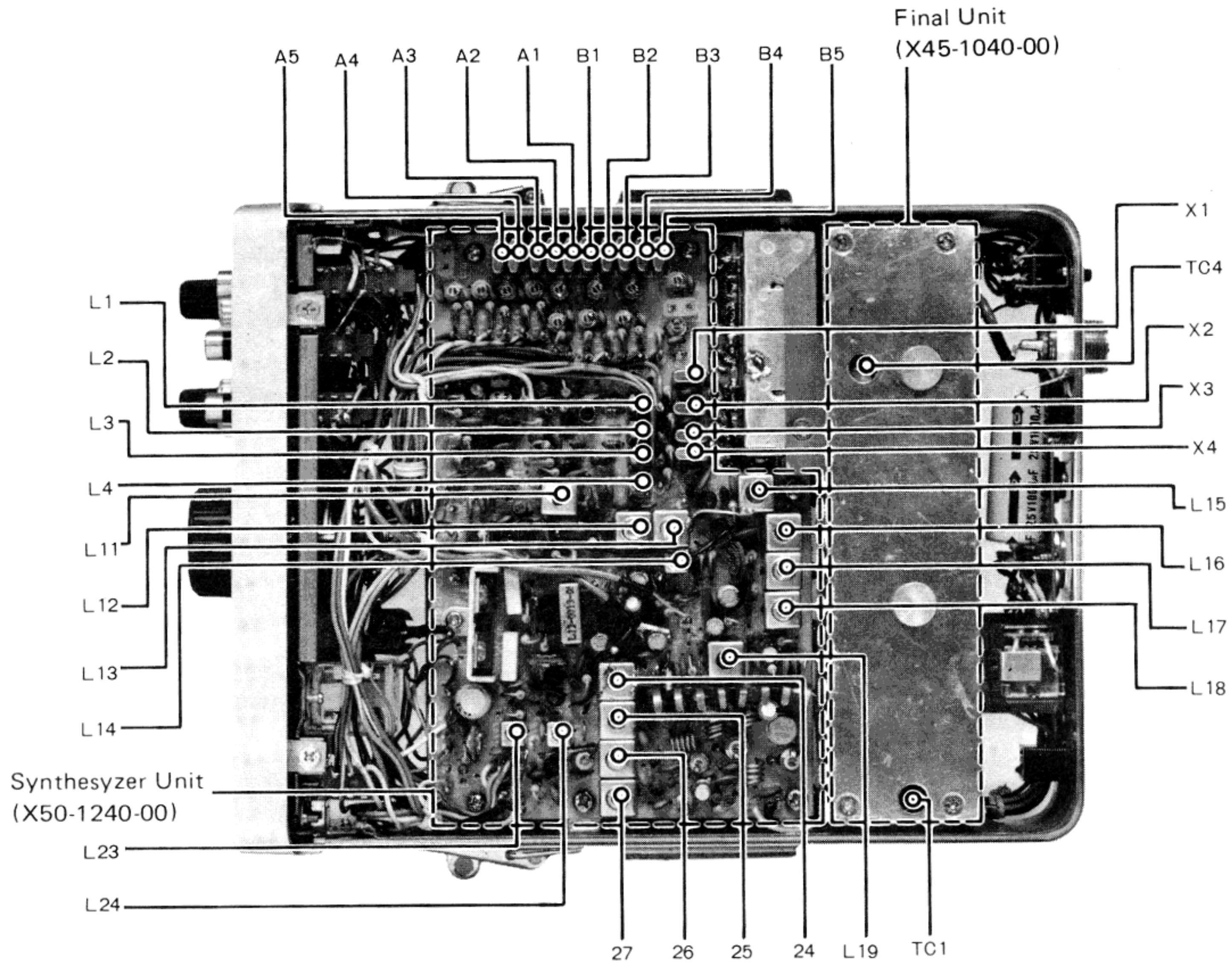
The amplification type AGC circuit takes IF signal from Q14. This signal is amplified by Q12 and Q13 to control the levels of Q1, Q5 and Q14 with the use of the RF gain volume control, thus the cross modulation is suppressed and distortionless sound is obtained.

The S meter circuit is used to amplify the AGC variation factor through Q6 and Q7. The amplified signal passes through switching diode D8 to activate the S meter.

# PARTS ALIGNMENT



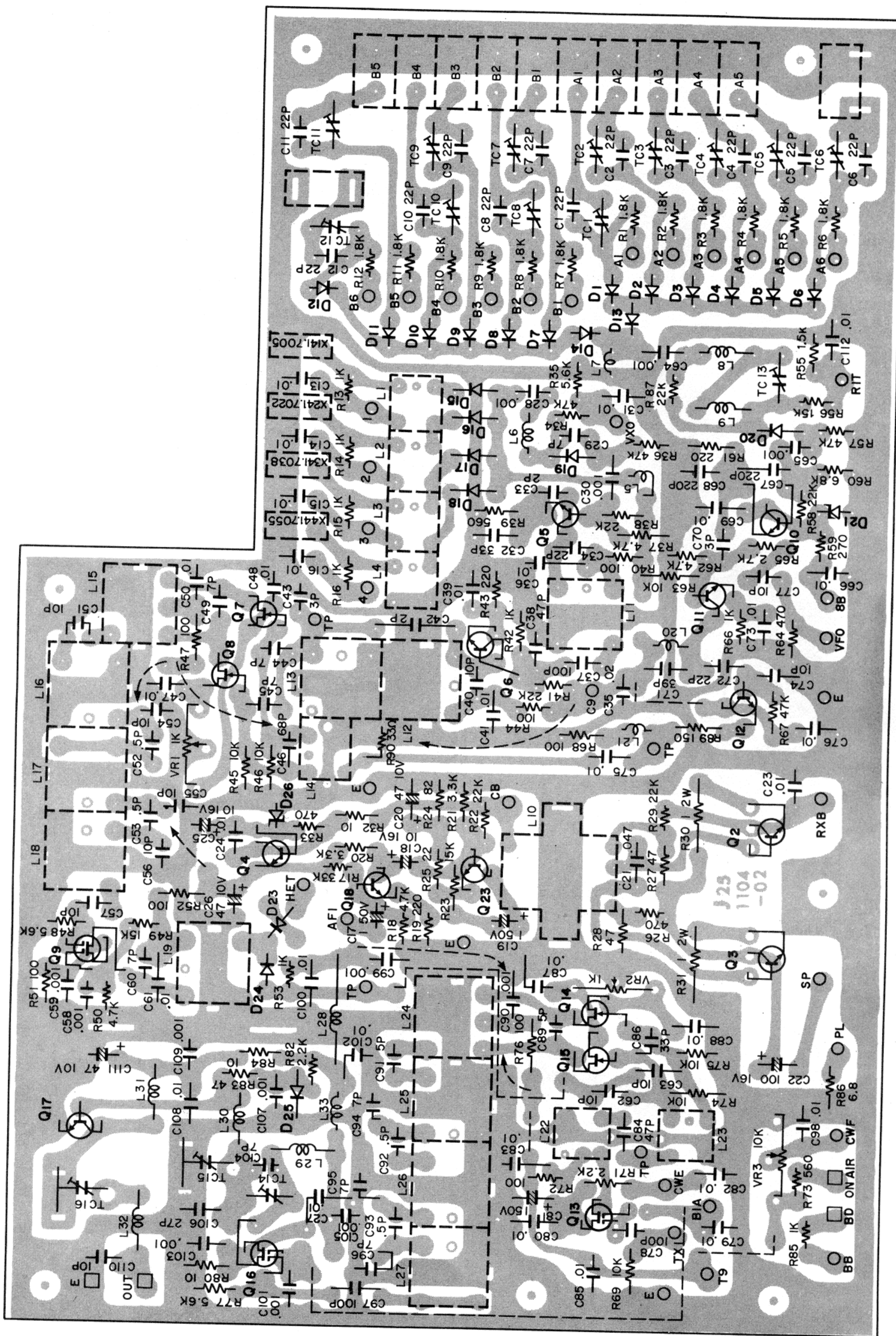
# PARTS ALIGNMENT





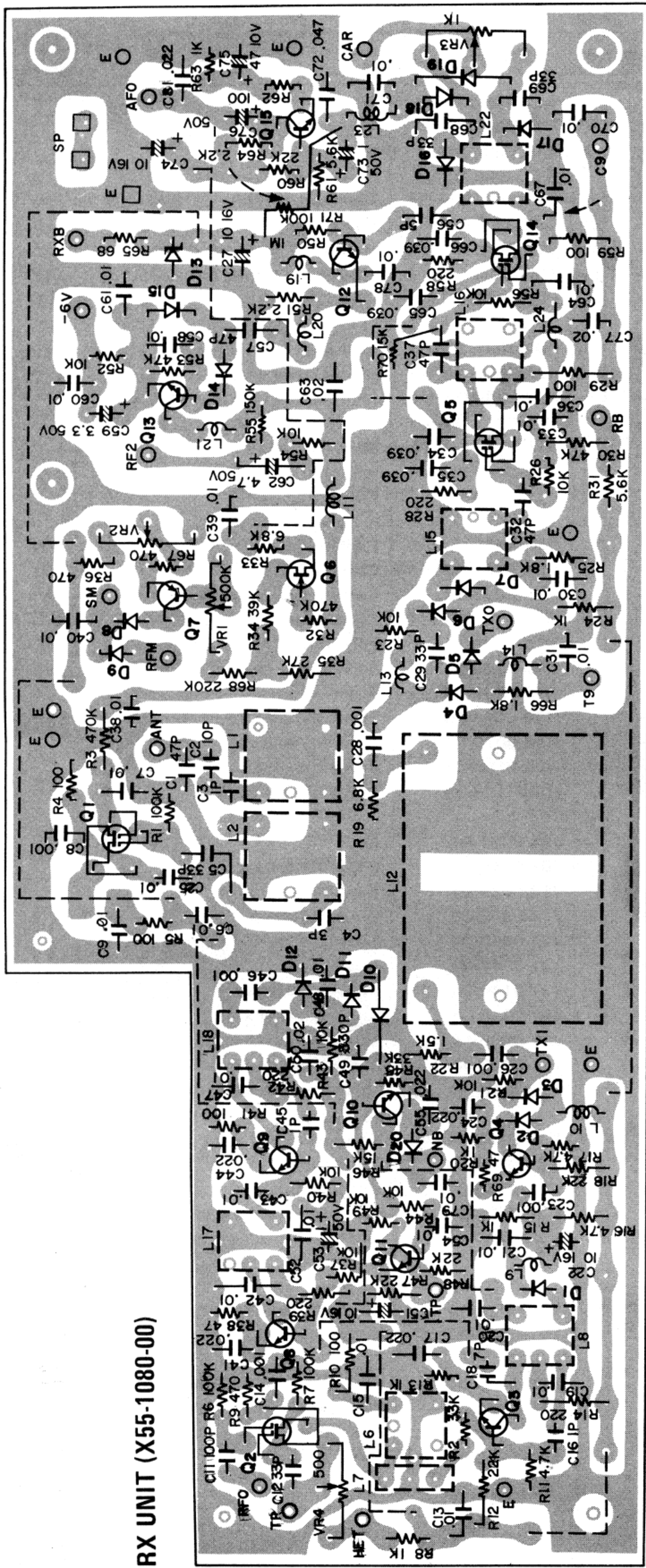
# PC BOARD

## SYNTHESIZER UNIT (X50-1240-00)



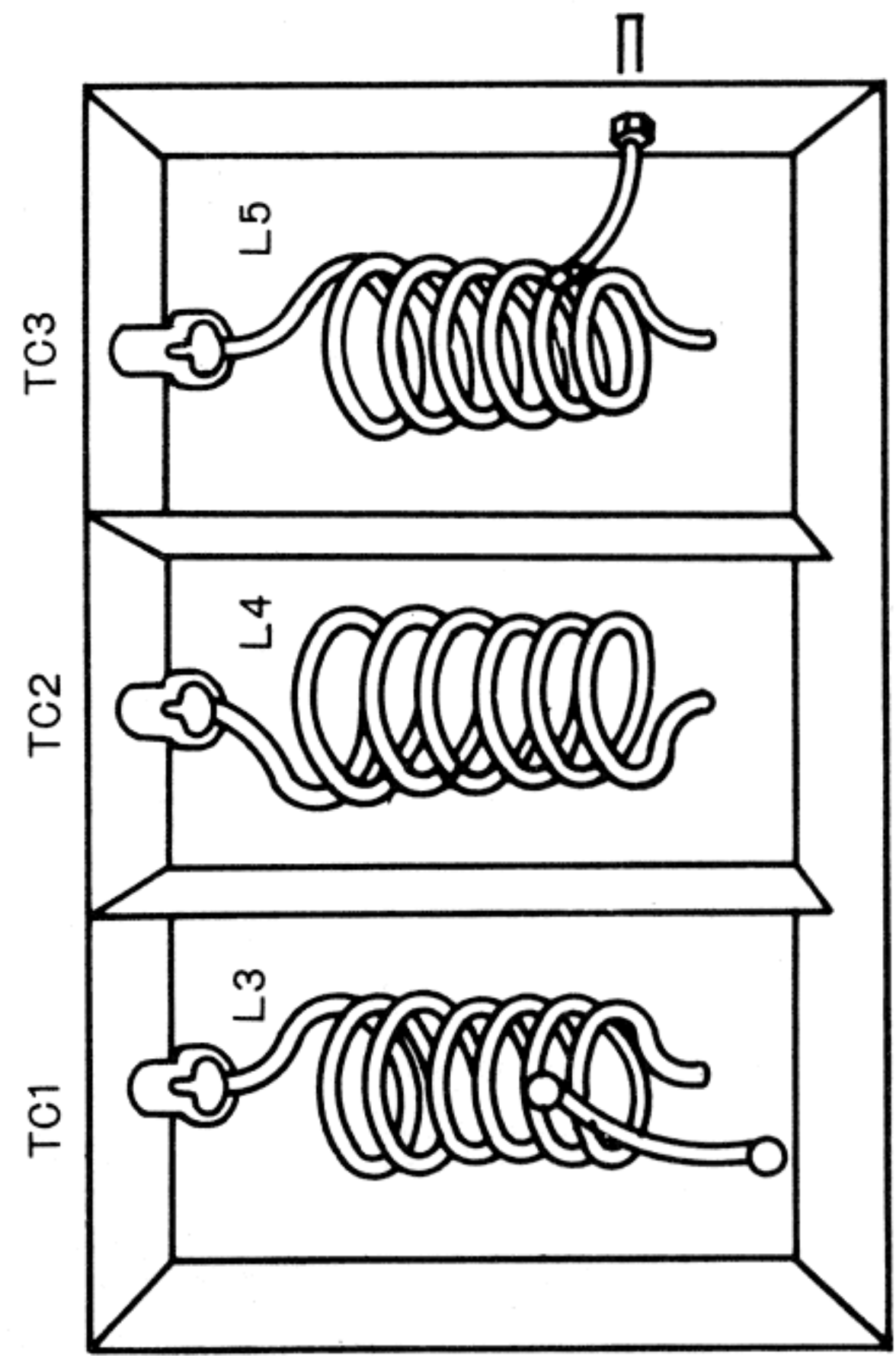
- Q1: 2SC734 (Y)
- Q18: 2SC733 (Y)
- Q2, 3: 2SD235 (Y, O)
- Q4: 2SC496 (Y, O)
- Q5, 6, 10-12: 2SC460 (B)
- Q7, 8, 14, 15: 2SK19 (GR)
- Q17: 2SC998
- Q9, 16: 3SK41 (L, M)
- Q13: 3SK35 (GR, BL)
- D1-18, 25: 1S1555
- D19: 1S2208
- D20: 1S1658-1
- D21, 26: WZ.090
- D23, 24: 1S73A

# PC BOARD



▼ RX UNIT (X55-1080-00)

▼ FILTER UNIT (X51-1110-00)



- D1~7: 1S73A.
- D8~11, 14~20: 1N60
- D12: 1S1555
- D13: WZ 090

- Q7: 2SA495 (Y, O)
- Q10, 11, 13: 2SC733 (Y, O)

- Q3, 4, 9: 2SC460 (B)
- Q12: 2SC458 (B)
- Q6: 2SK19 (GR)

- Q1: 3SK41 (L)
- Q2, 5, 14: 3SK35 (GR)

- Q1: 2SC733 (Y) or (O)

- D1, 2: M1301
- D3 ~ 6: 1N60

# PARTS LIST

061: For Europe except for England

051: Only for England

| Ref. No.             | Parts No.    | Description  | Re-<br>marks | Ref. No. | Parts No.   | Description                  | Re-<br>marks |
|----------------------|--------------|--|--------------|----------|-------------|------------------------------|--------------|
| <b>CAPACITOR</b>     |              |  |              |          |             |                              |              |
| C101                 | CE02W1E102   | Electrolytic 1000 $\mu$ F 25WV                                 |              | -        | E09-0203-25 | 2P connector (plug)          |              |
| C102~<br>105         | CK45F1H103Z  | Ceramic 0.01 $\mu$ F +80%, -20%                                |              | -        | E11-0003-15 | Earphone jack x 2            |              |
| C106                 | CK45D1H102M  | Ceramic 0.001 $\mu$ F $\pm$ 20%                                |              | -        | E12-0001-05 | Phone plug                   |              |
| C107                 | CK45F1H103Z  | Ceramic 0.01 $\mu$ F +80%, -20%                                |              | -        | E15-0038-05 | PL socket                    |              |
| C108                 | CC45SL2H150J | Ceramic 15pF $\pm$ 5%  |              | -        | E18-0801-05 | Relay socket                 |              |
| C109                 | CK45F1H103Z  | Ceramic 0.01 $\mu$ F +80%, -20%                                |              | -        | E22-0216-05 | Lug board                    |              |
| C110                 | CC45SL1H101K | Ceramic 100pF $\pm$ 20%  |              | -        | E29-0046-04 | Repeating hardware x 2       |              |
| C111                 | CK45F1H103Z  | Ceramic 0.01 $\mu$ F +80%, -20%                                |              | -        | E30-0234-15 | Wire (for TX)                |              |
| <b>RESISTOR</b>      |              |  |              |          |             |                              |              |
| R101                 | PD14BY2E472J | Carbon 4.7k $\Omega$ $\pm$ 5%                                  |              | -        | E30-0355-05 | Wire (for speaker)           |              |
| <b>SEMICONDUCTOR</b> |              |  |              |          |             |                              |              |
| D101,102             | V11-0304-05  | L.E. Diode TLR-104   |              | -        | F05-4022-05 | Fuse x 2                     |              |
| D103                 | V11-0076-05  | Diode 1S1555   |              | -        | F07-0312-04 | Shield cover                 |              |
| <b>POTENTIOMETER</b> |              |  |              |          |             |                              |              |
| VR101,<br>102        | R06-9004-05  | 5k $\Omega$ (A) AF(with power switch)<br>10k $\Omega$ (B) RIT. |              | -        | F10-0346-04 | Shield plate (A)             |              |
| VR201,<br>202        | R06-3007-05  | 10k $\Omega$ (B) RF GAIN, 10k $\Omega$ (B) VXO                 |              | -        | F10-0351-04 | Shield plate (B)             |              |
| <b>SWITCH/RELAY</b>  |              |  |              |          |             |                              |              |
| S1                   | S01-2027-05  | Rotary switch  |              | -        | F15-0128-04 | Shading plate x 2            |              |
| S2~4                 | S40-3007-05  | Push switch  |              | -        | G13-0014-04 | Cushion                      |              |
| S5                   | S40-2039-05  | Push switch  |              | -        | H01-1250-03 | Case                         | 051          |
| S6                   | S31-4001-05  | Slide switch   |              | -        | H01-1264-03 | Case                         | 061          |
| RL1                  | S51-2002-05  | Relay  |              | -        | H03-0373-04 | Carton case (external)       | 051          |
| <b>COIL</b>          |              |  |              |          |             |                              |              |
| L101                 | L15-0001-05  | Choke coil (low frequency)                                     |              | -        | H03-0381-04 | Carton case (external)       | 061          |
| L102                 | L33-0074-05  | Choke coil 0.022 $\mu$ H                                       |              | -        | H10-1204-12 | Polystyrene foamed fixture   |              |
| <b>MISCELLANEOUS</b> |              |  |              |          |             |                              |              |
| -                    | A01-0174-02  | Case (B)   |              | -        | H10-1205-04 | Polystyrene foamed plate     |              |
| -                    | A01-0175-02  | Case (C)   |              | -        | H10-1206-14 | Buffer fixture               |              |
| -                    | A10-0401-02  | Chassis  |              | -        | H25-0049-03 | Polyethylene bag             |              |
| -                    | A20-0810-05  | Panel  |              | -        | H25-0079-04 | Polyethylene bag             |              |
| -                    | A21-0181-04  | Dressing panel   | 051          | -        | H25-0103-03 | Polyethylene bag             |              |
| -                    | A21-0201-04  | Dressing panel   | 061          | -        | H25-0106-04 | Polyethylene bag             |              |
| -                    | A22-0160-03  | Subpanel   |              | -        | J01-0021-04 | Leg                          |              |
| -                    | A30-0091-04  | Dial board   |              | -        | J02-0058-04 | Leg (rubber) x 2             |              |
| -                    | B01-0090-03  | Escutcheon   |              | -        | J13-0029-05 | Fuse holder                  |              |
| -                    | B03-0071-14  | Dial mask  |              | -        | J19-0356-05 | Diode holder x 2             |              |
| -                    | B05-0163-14  | Speaker grille cloth   |              | -        | J21-0448-04 | Speaker mounting fitting x 3 |              |
| -                    | B10-0164-04  | Front glass  |              | -        | J21-0941-02 | Angle                        |              |
| PL1                  | B30-0002-05  | Pilot lamp (12V, 3W)   |              | -        | J32-0146-04 | Hexagonal boss x 4           |              |
| -                    | B31-0194-05  | S meter  |              | -        | J41-0020-04 | Knob bushing x 4             |              |
| -                    | B40-1021-04  | Model name plate   |              | -        | J51-0006-15 | Mounting bracket stopper x 2 |              |
| -                    | B42-0540-04  | Dressing name plate<br>(Band indication)                       |              | -        | J61-0019-05 | Cable wrapping band x 12     |              |
| -                    | B50-1290-00  | Operating manual   | 061          | -        | J29-0045-04 | Mounting bracket guide x 2   |              |
| -                    | B50-1369-00  | Operating manual   | 051          | -        | K20-0137-04 | Knob (outside) x 2           |              |
| -                    | D32-0010-04  | Relay stopper  |              | -        | K21-0248-04 | Main knob                    |              |
| -                    | E01-0903-05  | 9P socket (jack)   |              | -        | K21-0284-04 | Knob (inside) x 2            |              |
| -                    | E04-0102-05  | M type connector   |              | -        | K29-0200-04 | Knob (black) x 3             |              |
| -                    | E05-0901-05  | 9P socket (plug)   |              | -        | K29-0201-04 | Knob (red)                   |              |
| -                    | E06-0403-05  | 4P mic jack  |              | -        | T03-0027-15 | Speaker                      |              |
| -                    | E08-0203-25  | 2P connector (jack)  |              | -        | T91-0024-05 | Microphone (TRIO)            | 051          |
|                      |              |  |              | -        | T91-0026-05 | Microphone (Kenwood)         | 061          |
|                      |              |  |              | -        | X45-1040-00 | Final unit                   |              |
|                      |              |  |              | -        | X50-1230-00 | Carrier unit                 |              |
|                      |              |  |              | -        | X50-1240-00 | Synthesizer unit             |              |
|                      |              |  |              | -        | X51-1110-00 | Filter unit                  |              |
|                      |              |  |              | -        | X55-1080-00 | RX unit                      |              |

# PARTS LIST

## ■ FINAL (X45-1040-00)

| Ref. No.             | Parts No.      | Description                  | Re-<br>marks |
|----------------------|----------------|------------------------------|--------------|
| <b>CAPACITOR</b>     |                |                              |              |
| C1                   | CC45SL2H070D   | Ceramic 7pF ±0.5pF           |              |
| C2                   | CC45SL2H150J   | Ceramic 15pF ±5%             |              |
| C4                   | CK18E2H102P    | Ceramic 0.001μF +100%, -0%   |              |
| C6                   | CK45F1H103Z    | Ceramic 0.01μF +80%, -20%    |              |
| C7                   | CK18E2H102P    | Ceramic 0.001μF +100%, -0%   |              |
| C8                   | CC45SL2H220J   | Ceramic 22pF ±5%             |              |
| C9                   | CC45SL2H470J   | Ceramic 47pF ±5%             |              |
| C10                  | C90-0215-05    | Ceramic 100pF ±10%           |              |
| C11                  | CE04W1E100(RL) | Electrolytic 10μF 25WV       |              |
| C12                  | CK45D1H102M    | Ceramic 0.001μF ±20%         |              |
| C13                  | CC45SL2H100J   | Ceramic 10pF ±5%             |              |
| C14                  | CE04W1A470(RL) | Electrolytic 47μF 10WV       |              |
| C15                  | CK45D1H102M    | Ceramic 0.001μF ±20%         |              |
| <b>RESISTOR</b>      |                |                              |              |
| R1                   | PD14BY2E470J   | Carbon 47Ω ±5% 1/4W          |              |
| R2                   | PD14BY2E331J   | Carbon 330Ω ±5% 1/4W         |              |
| R4                   | RC05GF2H221J   | Carbon 220Ω ±5% 1/2W         |              |
| R5                   | RC05GF2H121J   | Carbon 120Ω ±5% 1/2W         |              |
| R6                   | RC05GF2H100J   | Carbon 10Ω ±5% 1/2W          |              |
| R7                   | PD14BY2E101J   | Carbon 100Ω ±5% 1/4W         |              |
| <b>SEMICONDUCTOR</b> |                |                              |              |
| Q1                   | V03-0350-05    | Transistor 2SC1169           |              |
| Q2                   | V03-0349-05    | Transistor 2SC1242A          |              |
| Q3                   | V04-0046-05    | Transistor 2SD235 (Y) or (O) |              |
| D1, 2                | V11-0076-05    | Diode 1S1555                 |              |
| D3                   | V11-0249-05    | Zener diode WZ-120           |              |
| <b>COIL</b>          |                |                              |              |
| L1                   | L34-0426-05    | VHF coil                     |              |
| L2                   | L34-0005-05    | VHF coil                     |              |
| L3                   | L34-0427-05    | VHF coil                     |              |
| L4                   | L34-0411-05    | VHF coil                     |              |
| L5                   | L34-0426-05    | VHF coil                     |              |
| <b>TRIMMER</b>       |                |                              |              |
| TC1, 2               | C05-0013-15    | Ceramic trimmer 20pF x 2     |              |
| TC3                  | C05-0001-05    | Trimmer 20pF                 |              |
| TC4                  | C05-0002-05    | Trimmer 40pF                 |              |
| <b>MISCELLANEOUS</b> |                |                              |              |
| -                    | E23-0015-04    | Earth lug x 2                |              |
| -                    | E23-0048-04    | Terminal                     |              |
| -                    | E23-0072-04    | Terminal (earth)             |              |
| -                    | F01-0158-03    | Heat sink                    |              |
| -                    | F20-0028-05    | Shield plate (for 2SD235)    |              |
| -                    | J25-0916-03    | PC board                     |              |
| -                    | J32-0029-04    | Hexagonal boss               |              |

## ■ CARRIER (X50-1230-00)

| Ref. No.         | Parts No.      | Description               | Re-<br>marks |
|------------------|----------------|---------------------------|--------------|
| <b>CAPACITOR</b> |                |                           |              |
| C1, 2            | CK45F1H103Z    | Ceramic 0.01μF +80%, -20% |              |
| C3               | CQ93M1H104K    | Mylar 0.1μF ±10%          |              |
| C4               | CK45D1H102M    | Ceramic 0.001μF ±20%      |              |
| C5               | CE04W1C100(RL) | Electrolytic 10μF 16WV    |              |
| C6               | CE04W1A470(RL) | Electrolytic 47μF 10WV    |              |
| C7               | CE04W1H010(RL) | Electrolytic 1μF 50WV     |              |
| C8, 9            | CQ92M1H223K    | Mylar 0.022μF ±10%        |              |
| C10              | CE04W1H010(RL) | Electrolytic 1μF 50WV     |              |
| C11              | CE04W1C100(RL) | Electrolytic 10μF 16WV    |              |
| C12              | CE04W1H010(RL) | Electrolytic 1μF 50WV     |              |
| C13              | CK45F1H103Z    | Ceramic 0.01μF +80%, -20% |              |
| C14, 15          | CK45D1H102M    | Ceramic 0.001μF ±20%      |              |
| C16              | CC45CH1H470J   | Ceramic 47pF ±5%          |              |
| C17              | CC45SL1H100J   | Ceramic 10pF ±5%          |              |
| C18              | CE04W1A470(RL) | Electrolytic 47μF 10WV    |              |
| C19, 20          | CK45F1H103Z    | Ceramic 0.01μF +80%, -20% |              |
| C21              | CK45D1H102M    | Ceramic 0.001μF ±20%      |              |
| C22, 23          | CC45SL1H221K   | Ceramic 220pF ±10%        |              |
| C24, 25          | CK45F1H103Z    | Ceramic 0.01μF +80%, -20% |              |
| C26              | CE04W1C101(RL) | Electrolytic 100μF 16WV   |              |
| C27              | CC45CH1H050D   | Ceramic 5pF ±0.5pF        |              |
| C28              | CC45CH1H330J   | Ceramic 33pF ±5%          |              |
| C29              | CK45F1H103Z    | Ceramic 0.01μF +80%, -20% |              |
| C30              | CC45SL1H470J   | Ceramic 47pF ±5%          |              |
| C31              | CC45SL1H101K   | Ceramic 100pF ±10%        |              |
| C32, 33          | CK45F1H103Z    | Ceramic 0.01μF +80%, -20% |              |
| C34              | CE04W1HR47(RL) | Electrolytic 0.47μF 50WV  |              |
| C35              | CK45F1H103Z    | Ceramic 0.01μF +80%, -20% |              |
| C36 ~<br>39      | CE04W1C100(RL) | Electrolytic 10μF 16WV    |              |
| C41              | CE04W1A470(RL) | Electrolytic 47μF 10WV    |              |
| C42              | CK45F1H103Z    | Ceramic 0.01μF +80%, -30% |              |
| C43              | CE04W1C100(RL) | Electrolytic 10μF 16WV    |              |
| C44              | CK45F1H103Z    | Ceramic 0.01μF +80%, -20% |              |
| C46              | CC45CH1H050D   | Ceramic 5pF ±0.5pF        |              |
| <b>RESISTOR</b>  |                |                           |              |
| R1               | RD14CY2E472J   | Carbon 4.7kΩ ±5% 1/4W     |              |
| R2               | PD14CY2E223J   | Carbon 22kΩ ±5% 1/4W      |              |
| R3               | PD14CY2E102J   | Carbon 1kΩ ±5% 1/4W       |              |
| R4               | PD14CY2E101J   | Carbon 100Ω ±5% 1/4W      |              |
| R5               | PD14CY2E222J   | Carbon 2.2kΩ ±5% 1/4W     |              |
| R6               | PD14CY2E102J   | Carbon 1kΩ ±5% 1/4W       |              |
| R7               | PD14CY2E154J   | Carbon 150kΩ ±5% 1/4W     |              |
| R8               | PD14CY2E221J   | Carbon 220Ω ±5% 1/4W      |              |
| R9, 10           | PD14CY2E223J   | Carbon 22kΩ ±5% 1/4W      |              |
| R11              | PD14CY2E331J   | Carbon 330Ω ±5% 1/4W      |              |
| R12              | PD14CY2E102J   | Carbon 1kΩ ±5% 1/4W       |              |
| R13              | PD14CY2E103J   | Carbon 10kΩ ±5% 1/4W      |              |
| R14, 15          | PD14CY2E101J   | Carbon 100Ω ±5% 1/4W      |              |
| R16              | PD14CY2E103J   | Carbon 10kΩ ±5% 1/4W      |              |
| R17              | PD14CY2E221J   | Carbon 220Ω ±5% 1/4W      |              |
| R18, 19          | PD14CY2E473J   | Carbon 47kΩ ±5% 1/4W      |              |
| R20              | PD14CY2E393J   | Carbon 39kΩ ±5% 1/4W      |              |
| R21              | PD14CY2E103J   | Carbon 10kΩ ±5% 1/4W      |              |
| R22              | PD14CY2E182J   | Carbon 1.8kΩ ±5% 1/4W     |              |
| R23              | PD14CY2E101J   | Carbon 100Ω ±5% 1/4W      |              |
| R24              | PD14CY2E823J   | Carbon 82kΩ ±5% 1/4W      |              |
| R25              | PD14CY2E101J   | Carbon 100Ω ±5% 1/4W      |              |
| R26              | PD14CY2E152J   | Carbon 1.5kΩ ±5% 1/4W     |              |

# PARTS LIST

| Ref. No.             | Parts No.    | Description                    | Re-<br>marks |
|----------------------|--------------|--------------------------------|--------------|
| R27                  | PD14CY2E223J | Carbon 22kΩ ±5% 1/4W           |              |
| R28                  | PD14CY2E472J | Carbon 4.7kΩ ±5% 1/4W          |              |
| R29                  | PD14CY2E471J | Carbon 470Ω ±5% 1/4W           |              |
| R30                  | PD14CY2E472J | Carbon 4.7kΩ ±5% 1/4W          |              |
| R31, 32              | PD14CY2E103J | Carbon 10kΩ ±5% 1/4W           |              |
| R33                  | PD14CY2E471J | Carbon 470Ω ±5% 1/4W           |              |
| R34                  | PC05GF2H100J | Carbon 10Ω ±5% 1/4W            |              |
| R35                  | PD14CY2E331J | Carbon 330Ω ±5% 1/4W           |              |
| R36                  | PD14CY2E152J | Carbon 1.5kΩ ±5% 1/4W          |              |
| R37                  | PD14CY2E223J | Carbon 22kΩ ±5% 1/4W           |              |
| R38                  | PD14CY2E473J | Carbon 47kΩ ±5% 1/4W           |              |
| R39                  | PD14CY2E223J | Carbon 22kΩ ±5% 1/4W           |              |
| <b>SEMICONDUCTOR</b> |              |                                |              |
| Q1~3                 | V03-0129-05  | Transistor 2SC733 (Y)          |              |
| Q4                   | V03-0134-05  | Transistor 2SC371 (O)          |              |
| Q5                   | V03-0079-05  | Transistor 2SC460 (B)          |              |
| Q6                   | V03-0134-05  | Transistor 2SC371 (O)          |              |
| Q7                   | V03-0241-05  | Transistor 2SC735 (Y, O)       |              |
| Q8                   | V03-0123-05  | Transistor 2SC733 (Y, O)       |              |
| Q9                   | V03-0336-05  | Transistor 2SC496 (Y, O)       |              |
| D1~4                 | V11-0051-05  | Diode 1N60                     |              |
| D5                   | V11-0076-05  | Diode 1S1555                   |              |
| D6, 7                |              | Diode 1S1587                   |              |
| D8                   | V11-0317-05  | Diode 1S2208 or 1S2206         |              |
| D9                   | V11-0270-05  | Diode U05B                     |              |
| D10~13               | V11-0076-05  | Diode 1S1555                   |              |
| D14                  | V11-0243-05  | Zener diode WZ-061             |              |
| D15                  | V11-0240-05  | Zener diode WZ-090             |              |
| <b>POTENTIOMETER</b> |              |                                |              |
| VR1                  | R12-2015-05  | Volume 5kΩ                     |              |
| VR2                  | R12-0048-05  | Volume 100Ω                    |              |
| VR3, 4               | R12-3025-05  | Volume 10kΩ                    |              |
| VR5                  | R12-2015-05  | Volume 5kΩ                     |              |
| <b>COIL/TRIMMER</b>  |              |                                |              |
| L1, 2                | L40-1021-03  | Ferri-inductor 1mH             |              |
| L3                   | L30-0005-05  | IFT                            |              |
| L4                   | L40-1021-03  | Ferri-inductor 1mH             |              |
| L5                   | L30-0281-05  | IFT                            |              |
| L6, 7                | L40-1021-03  | Ferri-inductor 1mH             |              |
| L8                   | L12-0013-05  | Input transformer              |              |
| TC1, 2               | C05-0013-15  | Trimmer 20pF                   |              |
| <b>X'tal</b>         |              |                                |              |
| X1                   | L77-0355-05  | Crystal oscillator 10.6985 MHz |              |
| <b>MISCELLANEOUS</b> |              |                                |              |
| -                    | E23-0047-04  | Terminal                       |              |
| -                    | F10-0348-14  | Shield plate                   |              |
| -                    | J25-1102-13  | PC board                       |              |

## ■ SYNTHESIZER (X50-1240-00)

| Ref. No.         | Parts No.      | Description               | Re-<br>marks |
|------------------|----------------|---------------------------|--------------|
| <b>CAPACITOR</b> |                |                           |              |
| C1~12            | CC45SL1H220J   | Ceramic 22pF ±5%          |              |
| C13~16           | CK45F1H103Z    | Ceramic 0.01μF +80%, -20% |              |
| C17              | CE04W1H010(RL) | Electrolytic 1μF 50WV     |              |
| C18              | CE04W1C100(RL) | Electrolytic 10μF 16WV    |              |
| C19              | CE04W1H010(RL) | Electrolytic 1μF 50WV     |              |
| C20              | CE04W1A470(RL) | Electrolytic 47μF 10WV    |              |
| C21              | CQ92M1H473K    | Mylar 0.047μF ±10%        |              |
| C22              | CE04W1C101(RL) | Electrolytic 100μF 16WV   |              |
| C23, 24          | CK45F1H103Z    | Ceramic 0.01μF +80%, -20% |              |
| C25              | CE04W1C100(RL) | Electrolytic 10μF 16WV    |              |
| C26              | CE04W1A470(RL) | Electrolytic 47μF 10WV    |              |
| C27              | CK45F1H103Z    | Ceramic 0.01μF +80%, -20% |              |
| C28              | CK45D1H102M    | Ceramic 0.001μF ±20%      |              |
| C29              | CC45CH1H070D   | Ceramic 7pF ±0.5pF        |              |
| C30              | CK45D1H102M    | Ceramic 0.001μF ±20%      |              |
| C31              | CK45F1H103Z    | Ceramic 0.01μF +80%, -20% |              |
| C32              | CC45CH1H330J   | Ceramic 33pF ±5%          |              |
| C33              | CC45CH1H020C   | Ceramic 2pF ±0.25pF       |              |
| C34              | CC45TH1H220J   | Ceramic 22pF ±5%          |              |
| C35              | CK45F1H203Z    | Ceramic 0.02μF +80%, -20% |              |
| C36              | CK45F1H103Z    | Ceramic 0.01μF +80%, -20% |              |
| C37              | CC45SL1H101J   | Ceramic 100pF ±5%         |              |
| C38              | CC45SL1H470J   | Ceramic 47pF ±5%          |              |
| C39              | CK45F1H103Z    | Ceramic 0.01μF +80%, -20% |              |
| C40              | CC45CH1H100J   | Ceramic 10pF ±5%          |              |
| C41              | CK45F1H103J    | Ceramic 0.01μF +80%, -20% |              |
| C42              | CC45SL1H020C   | Ceramic 2pF ±0.25pF       |              |
| C43              | CC45CH1H030C   | Ceramic 3pF ±0.25pF       |              |
| C44, 45          | CC45CH1H070D   | Ceramic 7pF ±0.5pF        |              |
| C46              | CC45CH1H680J   | Ceramic 68pF ±5%          |              |
| C47, 48          | CK45F1H103Z    | Ceramic 0.01μF +80%, -20% |              |
| C49              | CC45CH1H070D   | Ceramic 7pF ±0.5pF        |              |
| C50              | CK45F1H103Z    | Ceramic 0.01μF +80%, -20% |              |
| C51              | CC45CH1H100J   | Ceramic 10pF ±5%          |              |
| C52, 53          | C90-0231-05    | Ceramic 0.5pF             |              |
| C54~57           | CC45CH1H100J   | Ceramic 10pF ±5%          |              |
| C58, 59          | CK45D1H102M    | Ceramic 0.001μF ±20%      |              |
| C60              | CC45CH1H070D   | Ceramic 7pF ±0.5pF        |              |
| C61              | CK45F1H103Z    | Ceramic 0.01μF +80%, -20% |              |
| C62, 63          | CC45CH1H100J   | Ceramic 10pF ±5%          |              |
| C64, 65          | CK45D1H102M    | Ceramic 0.001μF ±20%      |              |
| C66              | CK45F1H103Z    | Ceramic 0.01μF +80%, -20% |              |
| C67              | CC45SL1H221J   | Ceramic 22pF ±5%          |              |
| C68              | CC45SL1H221J   | Ceramic 220pF ±5%         |              |
| C69              | CK45F1H103Z    | Ceramic 0.01μF +80%, -20% |              |
| C70              | CC45CH1H030C   | Ceramic 3pF ±0.25pF       |              |
| C71              | CC45CH1H390J   | Ceramic 39pF ±5%          |              |
| C72              | CC45SL1H220J   | Ceramic 22pF ±5%          |              |
| C73              | CK45F1H103Z    | Ceramic 0.01μF +80%, -20% |              |
| C74              | CC45SL1H100J   | Ceramic 10pF ±5%          |              |
| C75, 76          | CK45F1H103Z    | Ceramic 0.01μF +80%, -20% |              |
| C77              | CC45SL1H100J   | Ceramic 10pF ±5%          |              |
| C78              | CC45SL1H101J   | Ceramic 100pF ±5%         |              |
| C79, 80          | CK45F1H103Z    | Ceramic 0.01μF +80%, -20% |              |
| C81              | CE04W1H010(RL) | Electrolytic 1μF 50WV     |              |
| C82, 83          | CK45F1H103Z    | Ceramic 0.01μF 50WV       |              |
| C84              | CC45SL1H470J   | Ceramic 47pF ±5%          |              |
| C85              | CK45F1H103J    | Ceramic 0.01μF +80%, -20% |              |

# PARTS LIST

| Ref. No.        | Parts No.      | Description               | Re-<br>marks |
|-----------------|----------------|---------------------------|--------------|
| C86             | CC45CH1H330J   | Ceramic 33pF ±5%          |              |
| C87, 83         | CK45F1H103Z    | Ceramic 0.01μF +80%, -20% |              |
| C89             | CC45CH1H050D   | Ceramic 5pF ±0.5pF        |              |
| C90             | CK45D1H102M    | Ceramic 0.001μF ±20%      |              |
| C91             | CC45CH1H050D   | Ceramic 5pF ±0.5pF        |              |
| C92, 93         | C90-0231-05    | Ceramic 0.5pF             |              |
| C94 ~<br>96     | CC45CH1H070D   | Ceramic 7pF ±0.5pF        |              |
| C97             | CC45SL1H101J   | Ceramic 100pF ±5%         |              |
| C98             | CK45F1H103Z    | Ceramic 0.01μF +80%, -20% |              |
| C99             | CK45D1H102M    | Ceramic 0.001μF ±20%      |              |
| C100            | CK45F1H103Z    | Ceramic 0.01μF +80%, -20% |              |
| C101            | CK45D1H102M    | Ceramic 0.001μF ±20%      |              |
| C102            | CK45F1H103Z    | Ceramic 0.01μF +80%, -20% |              |
| C103            | CK45D1H102M    | Ceramic 0.001μF ±20%      |              |
| C104            | CC45SL1H070D   | Ceramic 7pF ±0.5pF        |              |
| C105            | CK45D1H102M    | Ceramic 0.001μF ±20%      |              |
| C106            | CC45SL1H270J   | Ceramic 27pF ±5%          |              |
| C107            | CK45D1H102M    | Ceramic 0.001μF ±20%      |              |
| C108            | CK45F1H103Z    | Ceramic 0.01μF +80%, -20% |              |
| C109            | CK45D1H102M    | Ceramic 0.001μF ±20%      |              |
| C110            | CC45SL1H100J   | Ceramic 10pF ±5%          |              |
| C111            | CE04W1A470(RL) | Electrolytic 47μF 10WV    |              |
| C112            | CK45F1H103Z    | Ceramic 0.01μF +80%, -20% |              |
| <b>RESISTOR</b> |                |                           |              |
| R1~12           | PD14CY2E182J   | Carbon 1.8kΩ ±5% 1/4W     |              |
| R13 ~<br>16     | PD14CY2E102J   | Carbon 1kΩ ±5% 1/4W       |              |
| R17             | PD14CY2E333J   | Carbon 33kΩ ±5% 1/4W      |              |
| R18             | PD14CY2E472J   | Carbon 4.7kΩ ±5% 1/4W     |              |
| R19             | PD14CY2E221J   | Carbon 220Ω ±5% 1/4W      |              |
| R20, 21         | PD14CY2E332J   | Carbon 3.3kΩ ±5% 1/4W     |              |
| R22             | PD14CY2E223J   | Carbon 22kΩ ±5% 1/4W      |              |
| R23             | PD14CY2E153J   | Carbon 15kΩ ±5% 1/4W      |              |
| R24             | PD14CY2E820J   | Carbon 82Ω ±5% 1/4W       |              |
| R25             | PD14CY2E220J   | Carbon 22Ω ±5% 1/4W       |              |
| R26             | PD14CY2E471J   | Carbon 470Ω ±5% 1/4W      |              |
| R27, 28         | PD14CY2E470J   | Carbon 47Ω ±5% 1/4W       |              |
| R29             | PD14CY2E471J   | Carbon 470Ω ±5% 1/4W      |              |
| R30, 31         | RN92A3D010K    | Metal plate 1Ω ±10% 2W    |              |
| R32             | RC05GF2H100J   | Carbon 10Ω ±5% 1/2W       |              |
| R33             | PD14CY2E471J   | Carbon 470Ω ±5% 1/4W      |              |
| R34             | PD14CY2E473J   | Carbon 47kΩ ±5% 1/4W      |              |
| R35             | PD14CY2E562J   | Carbon 5.6kΩ ±5% 1/4W     |              |
| R36             | PD14CY2E473J   | Carbon 47kΩ ±5% 1/4W      |              |
| R37             | PD14CY2E472J   | Carbon 4.7kΩ ±5% 1/4W     |              |
| R38             | PD14CY2E223J   | Carbon 22kΩ ±5% 1/4W      |              |
| R39             | PD14CY2E561J   | Carbon 560Ω ±5% 1/4W      |              |
| R40             | PD14CY2E101J   | Carbon 100Ω ±5% 1/4W      |              |
| R41             | PD14CY2E223J   | Carbon 22kΩ ±5% 1/4W      |              |
| R42             | PD14CY2E102J   | Carbon 1kΩ ±5% 1/4W       |              |
| R43             | PD14CY2E221J   | Carbon 220Ω ±5% 1/4W      |              |
| R44             | PD14CY2E101J   | Carbon 100Ω ±5% 1/4W      |              |
| R45, 46         | PD14CY2E103J   | Carbon 10kΩ ±5% 1/4W      |              |
| R47             | PD14CY2E101J   | Carbon 100Ω ±5% 1/4W      |              |
| R48             | PD14CY2E562J   | Carbon 5.6kΩ ±5% 1/4W     |              |
| R49             | PD14CY2E153J   | Carbon 15kΩ ±5% 1/4W      |              |
| R50             | PD14CY2E472J   | Carbon 4.7kΩ ±5% 1/4W     |              |
| R51, 52         | PD14CY2E101J   | Carbon 100Ω ±5% 1/4W      |              |
| R53             | PD14CY2E102J   | Carbon 1kΩ ±5% 1/4W       |              |
| R55             | PD14CY2E152J   | Carbon 1.5Ω ±5% 1/4W      |              |
| R56             | PD14CY2E153J   | Carbon 15kΩ ±5% 1/4W      |              |
| R57             | PD14CY2E473J   | Carbon 47kΩ ±5% 1/4W      |              |

| Ref. No.             | Parts No.    | Description              | Re-<br>marks |
|----------------------|--------------|--------------------------|--------------|
| R58                  | PD14CY2E223J | Carbon 22kΩ ±5% 1/4W     |              |
| R59                  | PD14CY2E271J | Carbon 270Ω ±5% 1/4W     |              |
| R60                  | PD14CY2E682J | Carbon 6.8kΩ ±5% 1/4W    |              |
| R61                  | PD14CY2E221J | Carbon 220Ω ±5% 1/4W     |              |
| R62                  | PD14CY2E472J | Carbon 4.7kΩ ±5% 1/4W    |              |
| R63                  | PD14CY2E103J | Carbon 10kΩ ±5% 1/4W     |              |
| R64                  | PD14CY2E471J | Carbon 470Ω ±5% 1/4W     |              |
| R65                  | PD14CY2E272J | Carbon 2.7kΩ ±5% 1/4W    |              |
| R66                  | PD14CY2E102J | Carbon 1kΩ ±5% 1/4W      |              |
| R67                  | PD14CY2E473J | Carbon 47kΩ ±5% 1/4W     |              |
| R68                  | PD14CY2E101J | Carbon 100Ω ±5% 1/4W     |              |
| R69                  | PD14CY2E103J | Carbon 10kΩ ±5% 1/4W     |              |
| R71                  | PD14CY2E222J | Carbon 2.2kΩ ±5% 1/4W    |              |
| R72                  | PD14CY2E101J | Carbon 100Ω ±5% 1/4W     |              |
| R73                  | PD14CY2E561J | Carbon 560Ω ±5% 1/4W     |              |
| R74, 75              | PD14CY2E103J | Carbon 10kΩ ±5% 1/4W     |              |
| R76                  | PD14CY2E101J | Carbon 100Ω ±5% 1/4W     |              |
| R77                  | PD14CY2E562J | Carbon 5.6kΩ ±5% 1/4W    |              |
| R80                  | PD14CY2E100J | Carbon 10Ω ±5% 1/4W      |              |
| R82                  | PD14CY2E222J | Carbon 2.2kΩ ±5% 1/4W    |              |
| R83                  | PD14CY2E470J | Carbon 47Ω ±5% 1/4W      |              |
| R84                  | PD14CY2E100J | Carbon 10Ω ±5% 1/4W      |              |
| R85                  | PD14CY2E102J | Carbon 1kΩ ±5% 1/4W      |              |
| R86                  | RC05GF2H6R8J | Carbon 6.8Ω ±5% 1/2W     |              |
| R87                  | PD14CY2E223J | Carbon 22kΩ ±5% 1/4W     |              |
| R88                  | PD14CY2E103J | Carbon 10kΩ ±5% 1/4W     |              |
| R89                  | PD14CY2E151J | Carbon 150Ω ±5% 1/4W     |              |
| R90                  | PD14CY2E330J | Carbon 33Ω ±5% 1/4W      |              |
| <b>SEMICONDUCTOR</b> |              |                          |              |
| Q1                   | V03-0125-05  | Transistor 2SC734 (Y)    |              |
| Q2, 3                | V04-0046-05  | Transistor 2SD235 (Y, O) |              |
| Q4                   | V03-0336-05  | Transistor 2SC496 (Y, O) |              |
| Q5, 6                | V03-0079-05  | Transistor 2SC460 (B)    |              |
| Q7, 8                | V09-0012-05  | FET 2SK19 (GR)           |              |
| Q9                   | V09-0069-05  | FET 3SK41 (L, M)         |              |
| Q10 ~<br>12          | V03-0079-05  | Transistor 2SC460 (B)    |              |
| Q13                  | V09-0036-05  | FET 3SK35 (GR, BL)       |              |
| Q14, 15              | V09-0012-05  | FET 2SK19 (GR)           |              |
| Q16                  | V09-0069-05  | FET 3SK41 (L, M)         |              |
| Q17                  | V03-0168-05  | Transistor 2SC998        |              |
| Q18                  | V03-0129-05  | Transistor 2SC733 (Y)    |              |
| D1~18                | V11-0076-05  | Diode 1S1555             |              |
| D19                  | V11-0317-05  | Diode 1S2208             |              |
| D20                  | V11-0192-05  | Diode 1S1658-1           |              |
| D21                  | V11-0240-05  | Zener diode WZ-090       |              |
| D23, 24              |              | Diode 1S1587             |              |
| D25                  | V11-0076-05  | Diode 1S1555             |              |
| D26                  | V11-0240-05  | Zener diode WZ-090       |              |
| <b>POTENTIOMETER</b> |              |                          |              |
| VR1, 2               | R12-1020-05  | Volume 1kΩ               |              |
| VR3                  | R12-3025-05  | Volume 10kΩ              |              |
| <b>COIL/TRIMMER</b>  |              |                          |              |
| L1 ~ 4               | L31-0346-05  | Tuning coil              |              |
| L5                   | L40-2201-03  | Ferri-inductor 22μH      |              |
| L6                   | L34-0438-05  | Coil 0.9μH               |              |
| L7                   | L40-1021-03  | Ferri-inductor 1mH       |              |
| L8, 9                | L40-1005-44  | Ferri-inductor 10μH      |              |
| L10                  | L12-0013-05  | Input transformer        |              |
| L11                  | L32-0002-05  | Tuning coil              |              |
| L12, 13              | L31-0266-05  | Tuning coil              |              |

# PARTS LIST

| Ref. No. | Parts No.   | Description          | Re-<br>marks |
|----------|-------------|----------------------|--------------|
| L14      | L31-0313-05 | Tuning coil          |              |
| L15      | L31-0344-05 | Tuning coil          |              |
| L16      | L31-0180-05 | Tuning coil          |              |
| L17, 18  | L31-0267-05 | Tuning coil          |              |
| L19      | L31-0180-05 | Tuning coil          |              |
| L20      | L40-6891-02 | Ferri-inductor 6.8μH |              |
| L21      | L40-1021-03 | Ferri-inductor 1mH   |              |
| L22      | L30-0005-05 | IFT                  |              |
| L23      | L31-0313-05 | Tuning coil          |              |
| L24      | L31-0344-05 | Tuning coil          |              |
| L25      | L31-0180-05 | Tuning coil          |              |
| L26, 27  | L31-0267-05 | Tuning coil          |              |
| L28      | L33-0025-05 | Choke coil 1μH       |              |
| L29      | L34-0463-05 | VHF coil             |              |
| L30      | L34-0462-05 | VHF coil             |              |
| L31      | L34-0461-05 | VHF coil             |              |
| L32      | L34-0462-05 | VHF coil             |              |
| L33      | L40-1021-03 | Ferri-inductor 1mH   |              |
| TC1~12   | C05-0030-15 | Ceramic trimmer 20pF |              |
| TC13     | C05-0031-15 | Ceramic trimmer 10pF |              |
| TC14     | C05-0030-15 | Ceramic trimmer 20pF |              |
| TC15,16  | C05-0013-15 | Ceramic trimmer 20pF |              |

### X'tal

|    |             |                               |  |
|----|-------------|-------------------------------|--|
| X1 | L77-0386-05 | Crystal oscillator 41.7005MHz |  |
| X2 | L77-0387-05 | Crystal oscillator 41.7022MHz |  |
| X3 | L77-0388-05 | Crystal oscillator 41.7038MHz |  |
| X4 | L77-0389-05 | Crystal oscillator 41.7055MHz |  |
| A1 | L77-0390-05 | Crystal oscillator 8.3000MHz  |  |
| A2 | L77-0391-05 | Crystal oscillator 8.3200MHz  |  |
| A3 | L77-0392-05 | Crystal oscillator 8.3400MHz  |  |
| A4 | L77-0393-05 | Crystal oscillator 8.3600MHz  |  |
| A5 | L77-0394-05 | Crystal oscillator 8.3800MHz  |  |
| B1 | L77-0395-05 | Crystal oscillator 8.4000MHz  |  |
| B2 | L77-0396-05 | Crystal oscillator 8.4200MHz  |  |
| B3 | L77-0397-05 | Crystal oscillator 8.4400MHz  |  |
| B4 | L77-0398-05 | Crystal oscillator 8.4600MHz  |  |
| B5 | L77-0399-05 | Crystal oscillator 8.4800MHz  |  |

### MISCELLANEOUS

|   |             |                  |  |
|---|-------------|------------------|--|
| - | E18-0201-05 | Crystal socket   |  |
| - | E23-0046-04 | Terminal x 4     |  |
| - | E23-0047-04 | Terminal x 42    |  |
| - | F01-0150-14 | Heat sink        |  |
| - | F10-0347-04 | Shield plate (B) |  |
| - | F10-0350-04 | Shield plate (D) |  |
| - | F20-0078-05 | Insulator x 2    |  |
| - | J25-1104-12 | PC board         |  |

### ■ FILTER (X51-1110-00)

| Ref. No.         | Parts No.    | Description          | Re-<br>marks |
|------------------|--------------|----------------------|--------------|
| <b>CAPACITOR</b> |              |                      |              |
| C1               | CC45SL1H470J | Ceramic 47pF ±5%     |              |
| C2               | CK45D1H102M  | Ceramic 0.001μF ±20% |              |
| C3               | CC45SL2H470J | Ceramic 47pF ±5%     |              |

| Ref. No.    | Parts No.      | Description               | Re-<br>marks |
|-------------|----------------|---------------------------|--------------|
| C5, 6       | CC45SL2H220J   | Ceramic 22pF ±5%          |              |
| C7          | CC45SL1H010C   | Ceramic 1pF ±0.25pF       |              |
| C8          | CK45D1H102M    | Ceramic 0.001μF ±20%      |              |
| C10         | CC45SL1H070D   | Ceramic 7pF ±0.5pF        |              |
| C11         | CK45D1H102M    | Ceramic 0.001μF ±20%      |              |
| C12         | CC45SL2H100J   | Ceramic 10pF ±5%          |              |
| C13         | CK45F1H103Z    | Ceramic 0.01μF +80%, -20% |              |
| C14         | CK45D1H102M    | Ceramic 0.001μF ±20%      |              |
| C16 ~<br>18 | CK45F1H103Z    | Ceramic 0.01μF +80%, -20% |              |
| C19         | CE04W1C100(RL) | Electrolytic 10μF 16WV    |              |
| C20         | C90-0231-05    | Ceramic 0.5pF             |              |

### RESISTOR

|       |              |                      |  |
|-------|--------------|----------------------|--|
| R1    | PD14CY2E221J | Carbon 220Ω ±5% 1/4W |  |
| R2, 3 | PD14CY2E473J | Carbon 47kΩ ±5% 1/4W |  |

### SEMICONDUCTOR

|        |             |                            |  |
|--------|-------------|----------------------------|--|
| Q1     | V03-0123-05 | Transistor 2SC733 (Y or O) |  |
| D1, 2  | V11-0255-05 | Diode M1301                |  |
| D3 ~ 6 | V11-0051-05 | Diode 1N60                 |  |

### POTENTIOMETER

|     |             |             |  |
|-----|-------------|-------------|--|
| VR1 | R12-4016-05 | Volume 50kΩ |  |
| VR2 | R12-0042-05 | Volume 500Ω |  |
| VR3 | R12-3025-05 | Volume 10kΩ |  |

### COIL

|       |             |                     |  |
|-------|-------------|---------------------|--|
| L1    | L40-1001-03 | Ferri-inductor 10μH |  |
| L2    | L34-0387-05 | VHF coil            |  |
| L3, 4 | L34-0430-05 | VHF coil            |  |
| L5    | L40-1001-03 | Ferri-inductor 10μH |  |
| L6    | L40-1021-03 | Ferri-inductor 1mH  |  |
| L7    | L39-0052-05 | Detecting coil      |  |

### MISCELLANEOUS

|   |             |              |  |
|---|-------------|--------------|--|
| - | E23-0046-04 | Terminal x 2 |  |
| - | E23-0047-04 | Terminal x 8 |  |
| - | J25-1101-14 | PC board     |  |

### ■ RX (X55-1080-00)

| Ref. No.         | Parts No.    | Description               | Re-<br>marks |
|------------------|--------------|---------------------------|--------------|
| <b>CAPACITOR</b> |              |                           |              |
| C1               | CC45CH1H470J | Ceramic 47pF ±5%          |              |
| C2               | CC45RH1H100J | Ceramic 10pF ±5%          |              |
| C3               | CC45CH1H010C | Ceramic 1pF ±0.25pF       |              |
| C4               | CC45CH1H030C | Ceramic 3pF ±0.25pF       |              |
| C5               | CC45CH1H330J | Ceramic 33pF ±5%          |              |
| C6, 7            | CK45F1H103Z  | Ceramic 0.01μF +80%, -20% |              |
| C8               | CK45D1H102M  | Ceramic 0.001μF ±20%      |              |
| C9               | CK45F1H103Z  | Ceramic 0.01μF +80%, -20% |              |
| C10              | C90-0018-05  | Ceramic 0.001μF           |              |
| C11              | CC45SL1H101K | Ceramic 100pF ±10%        |              |
| C12              | CC45CH1H330J | Ceramic 33pF ±5%          |              |
| C13              | CK45F1H103Z  | Ceramic 0.01μF +80%, -20% |              |
| C14              | CK45D1H102M  | Ceramic 0.001μF ±20%      |              |

# PARTS LIST

| Ref. No.        | Parts No.      | Description                | Re-<br>marks |
|-----------------|----------------|----------------------------|--------------|
| C15             | CK45F1H103Z    | Ceramic 0.01μF +80%, -20%  |              |
| C16             | CC45CH1H010C   | Ceramic 1pF ±0.25pF        |              |
| C17             | CQ92M1H223K    | Mylar 0.022μF ±10%         |              |
| C18             | CC45CH1H070D   | Ceramic 7pF ±0.5pF         |              |
| C19 ~<br>21     | CK45F1H103Z    | Ceramic 0.01μF +80%, -20%  |              |
| C22             | CE04W1C100(RL) | Electrolytic 10μF 16WV     |              |
| C23             | CK45D1H102M    | Ceramic 0.001μF ±20%       |              |
| C24             | CQ92M1H223K    | Mylar 0.022μF ±10%         |              |
| C25             | CK45F1H103Z    | Ceramic 0.01μF +80%, -20%  |              |
| C26             | CK45D1H102M    | Ceramic 0.001μF ±20%       |              |
| C27             | CE04W1C100(RL) | Electrolytic 10μF 16WV     |              |
| C28             | CK45D1H102M    | Ceramic 0.01μF ±20%        |              |
| C29             | CC45CH1H330J   | Ceramic 33pF ±5%           |              |
| C30, 31         | CK45F1H103Z    | Ceramic 0.01μF +80%, -20%  |              |
| C32             | CC45SL1H470J   | Ceramic 47pF ±5%           |              |
| C33             | CK45F1H103Z    | Ceramic 0.01μF +80%, -20%  |              |
| C34, 35         | CQ92M1H393K    | Mylar 0.039μF ±10%         |              |
| C36             | CK45F1H103Z    | Ceramic 0.01μF +80%, -20%  |              |
| C37             | CC45SL1H470J   | Ceramic 47pF ±5%           |              |
| C38 ~<br>40     | CK45F1H103Z    | Ceramic 0.01μF +80%, -20%  |              |
| C41             | CQ92M1H223K    | Mylar 0.022μF ±10%         |              |
| C42, 43         | CK45F1H103Z    | Ceramic 0.01μF +80%, -20%  |              |
| C44             | CQ92M1H223K    | Mylar 0.022μF ±10%         |              |
| C45             | CC45CH1H010C   | Ceramic 1pF ±0.25pF        |              |
| C46             | CK45D1H102M    | Ceramic 0.001μF ±20%       |              |
| C47, 48         | CK45F1H103Z    | Ceramic 0.01μF +80%, -20%  |              |
| C49             | CK45B1H331K    | Ceramic 330pF ±10%         |              |
| C50             | CK45F1H203Z    | Ceramic 0.02μF +80%, -20%  |              |
| C51             | CE04W1C100(RL) | Electrolytic 10μF 16WV     |              |
| C52             | CK45F1H103Z    | Ceramic 0.01μF +80%, -20%  |              |
| C53             | CE04W1H010(RL) | Electrolytic 1μF 50WV      |              |
| C54             | CK45F1H103Z    | Ceramic 0.01μF +80%, -20%  |              |
| C55             | CQ92M1H223K    | Mylar 0.022μF ±10%         |              |
| C56             | CC45CH1H050D   | Ceramic 5pF ±0.5pF         |              |
| C57             | CC45SL1H470J   | Ceramic 47pF ±5%           |              |
| C58             | CK45F1H103Z    | Ceramic 0.01μF +80%, -20%  |              |
| C59             | CE04W1H3R3(RL) | Electrolytic 3.3μF 50WV    |              |
| C60, 61         | CK45F1H103Z    | Ceramic 0.01μF +80%, -20%  |              |
| C62             | CE04W1H4R7(RL) | Electrolytic 4.7μF 50WV    |              |
| C63             | CK45F1H203Z    | Ceramic 0.02μF +80%, -20%  |              |
| C64             | CK45F1H103Z    | Ceramic 0.01μF +80%, -20%  |              |
| C65, 66         | CQ92M1H393K    | Mylar 0.039μF ±10%         |              |
| C67             | CK45F1H103Z    | Ceramic 0.01μF +80%, -20%  |              |
| C68, 69         | CC45CH1H330J   | Ceramic 33pF ±5%           |              |
| C70             | CK45F1H103Z    | Ceramic 0.01μF +80%, -20%  |              |
| C71             | CQ92M1H103K    | Mylar 0.01μF ±10%          |              |
| C72             | CQ92M1H473K    | Mylar 0.047μF ±10%         |              |
| C73             | CE04W1H010(RL) | Electrolytic 1μF 50WV      |              |
| C74             | CE04W1C100(RL) | Electrolytic 10μF 16WV     |              |
| C75             | CE04W1A470(RL) | Electrolytic 47μF 10WV     |              |
| C76             | CE04W1H010(RL) | Electrolytic 1μ 50WV       |              |
| C77             | CK45F1H203Z    | Ceramic 0.002μF +80%, -20% |              |
| C78, 79         | CK45F1H103Z    | Ceramic 0.01μF +80%, -20%  |              |
| C80             | CE04W1H010(RL) | Electrolytic 1μF 50WV      |              |
| C81             | CQ92M1H223K    | Mylar 0.022μF ±10%         |              |
| <b>RESISTOR</b> |                |                            |              |
| R1              | PD14CY2E104J   | Carbon 100kΩ ±5% 1/4W      |              |
| R2              | PD14CY2E332J   | Carbon 3.3kΩ ±5% 1/4W      |              |
| R3              | PD14CY2E474J   | Carbon 470kΩ ±5% 1/4W      |              |
| R4, 5           | PD14CY2E101J   | Carbon 100Ω ±5% 1/4W       |              |

| Ref. No.             | Parts No.    | Description           | Re-<br>marks |
|----------------------|--------------|-----------------------|--------------|
| R6, 7                | PD14CY2E104J | Carbon 100kΩ ±5% 1/4W |              |
| R8                   | PD14CY2E102J | Carbon 1kΩ ±5% 1/4W   |              |
| R9                   | PD14CY2E471J | Carbon 470Ω ±5% 1/4W  |              |
| R10                  | PD14CY2E101J | Carbon 100Ω ±5% 1/4W  |              |
| R11                  | PD14CY2E472J | Carbon 4.7kΩ ±5% 1/4W |              |
| R12                  | PD14CY2E223J | Carbon 22kΩ ±5% 1/4W  |              |
| R13                  | PD14CY2E102J | Carbon 1kΩ ±5% 1/4W   |              |
| R14                  | PD14CY2E221J | Carbon 220Ω ±5% 1/4W  |              |
| R15                  | PD14CY2E102J | Carbon 1kΩ ±5% 1/4W   |              |
| R16, 17              | PD14CY2E472J | Carbon 4.7kΩ ±5% 1/4W |              |
| R18                  | PD14CY2E223J | Carbon 22kΩ ±5% 1/4W  |              |
| R19                  | PD14CY2E682J | Carbon 6.8kΩ ±5% 1/4W |              |
| R20                  | PD14CY2E102J | Carbon 1kΩ ±5% 1/4W   |              |
| R21                  | PD14CY2E103J | Carbon 10kΩ ±5% 1/4W  |              |
| R22                  | PD14CY2E152J | Carbon 1.5kΩ ±5% 1/4W |              |
| R23                  | PD14CY2E103J | Carbon 10kΩ ±5% 1/4W  |              |
| R24                  | PD14CY2E102J | Carbon 1kΩ ±5% 1/4W   |              |
| R25                  | PD14CY2E182J | Carbon 1.8kΩ ±5% 1/4W |              |
| R26                  | PD14CY2E103J | Carbon 10kΩ ±5% 1/4W  |              |
| R28                  | PD14CY2E221J | Carbon 220Ω ±5% 1/4W  |              |
| R29                  | PD14CY2E101J | Carbon 100Ω ±5% 1/4W  |              |
| R30                  | PD14CY2E472J | Carbon 47kΩ ±5% 1/4W  |              |
| R31                  | PD14CY2E562J | Carbon 5.6kΩ ±5% 1/4W |              |
| R32                  | PD14CY2E474J | Carbon 470kΩ ±5% 1/4W |              |
| R33                  | PD14CY2E682J | Carbon 6.8kΩ ±5% 1/4W |              |
| R34                  | PD14CY2E393J | Carbon 39kΩ ±5% 1/4W  |              |
| R35                  | PD14CY2E273J | Carbon 27kΩ ±5% 1/4W  |              |
| R36                  | PD14CY2E471J | Carbon 470Ω ±5% 1/4W  |              |
| R37                  | PD14CY2E103J | Carbon 10kΩ ±5% 1/4W  |              |
| R38                  | PD14CY2E470J | Carbon 47Ω ±5% 1/4W   |              |
| R39                  | PD14CY2E221J | Carbon 220Ω ±5% 1/4W  |              |
| R40                  | PD14CY2E103J | Carbon 10kΩ ±5% 1/4W  |              |
| R41                  | PD14CY2E101J | Carbon 100Ω ±5% 1/4W  |              |
| R42                  | PD14CY2E221J | Carbon 220Ω ±5% 1/4W  |              |
| R43, 44              | PD14CY2E103J | Carbon 10kΩ ±5% 1/4W  |              |
| R45                  | PD14CY2E333J | Carbon 33kΩ ±5% 1/4W  |              |
| R46                  | PD14CY2E153J | Carbon 15kΩ ±5% 1/4W  |              |
| R47, 48              | PD14CY2E223J | Carbon 22kΩ ±5% 1/4W  |              |
| R49                  | PD14CY2E103J | Carbon 10kΩ ±5% 1/4W  |              |
| R50                  | PD14CY2E105J | Carbon 1MΩ ±5% 1/4W   |              |
| R51                  | PD14CY2E222J | Carbon 2.2kΩ ±5% 1/4W |              |
| R52                  | PD14CY2E103J | Carbon 10kΩ ±5% 1/4W  |              |
| R53                  | PD14CY2E473J | Carbon 47kΩ ±5% 1/4W  |              |
| R54                  | PD14CY2E103J | Carbon 10kΩ ±5% 1/4W  |              |
| R55                  | PD14CY2E154J | Carbon 150kΩ ±5% 1/4W |              |
| R56                  | PD14CY2E103J | Carbon 10kΩ ±5% 1/4W  |              |
| R58                  | PD14CY2E221J | Carbon 220Ω ±5% 1/4W  |              |
| R59                  | PD14CY2E101J | Carbon 100Ω ±5% 1/4W  |              |
| R60                  | PD14CY2E223J | Carbon 22kΩ ±5% 1/4W  |              |
| R61                  | PD14CY2E562J | Carbon 5.6kΩ ±5% 1/4W |              |
| R62                  | PD14CY2E101J | Carbon 100Ω ±5% 1/4W  |              |
| R63                  | PD14CY2E102J | Carbon 1kΩ ±5% 1/4W   |              |
| R64                  | PD14CY2E222J | Carbon 2.2kΩ ±5% 1/4W |              |
| R65                  | RC05GF2H680J | Carbon 68Ω ±5% 1/2W   |              |
| R66                  | PD14CY2E182J | Carbon 1.8kΩ ±5% 1/4W |              |
| R67                  | PD14CY2E471J | Carbon 470Ω ±5% 1/4W  |              |
| R68                  | PD14CY2E224J | Carbon 220kΩ ±5% 1/4W |              |
| R69                  | PD14CY2E470J | Carbon 47Ω ±5% 1/4W   |              |
| R70                  | PD14CY2E153J | Carbon 15kΩ ±5% 1/4W  |              |
| R71                  | PD14BY2E104J | Carbon 100kΩ ±5% 1/4W |              |
| <b>SEMICONDUCTOR</b> |              |                       |              |
| Q1                   | V09-0057-05  | FET 3SK41 (L)         |              |



# PARTS LIST

| Ref. No.             | Parts No.   | Description              | Re-<br>marks | Ref. No. | Parts No. | Description | Re-<br>marks |
|----------------------|-------------|--------------------------|--------------|----------|-----------|-------------|--------------|
| Q2                   | V09-0036-05 | FET 3SK35 (GR)           |              |          |           |             |              |
| Q3, 4                | V03-0079-05 | Transistor 2SC460 (B)    |              |          |           |             |              |
| Q5                   | V09-0036-05 | FET 3SK35 (GR)           |              |          |           |             |              |
| Q6                   | V09-0012-05 | FET 2SK19 (GR)           |              |          |           |             |              |
| Q7                   | V03-0214-05 | Transistor 2SA495 (Y, O) |              |          |           |             |              |
| Q8                   | V03-0094-05 | Transistor 2SC458 (B)    |              |          |           |             |              |
| Q9                   | V03-0079-05 | Transistor 2SC460 (B)    |              |          |           |             |              |
| Q10, 11              | V03-0123-05 | Transistor 2SC733 (Y, O) |              |          |           |             |              |
| Q12                  | V03-0094-05 | Transistor 2SC458 (B)    |              |          |           |             |              |
| Q13                  | V03-0123-05 | Transistor 2SC733 (Y, O) |              |          |           |             |              |
| Q14                  | V09-0036-05 | FET 3SK35 (GR)           |              |          |           |             |              |
| Q15                  | V03-0129-05 | Transistor 2SC733 (Y)    |              |          |           |             |              |
| D1 ~ 7               | V11-0056-05 | Diode 1S1587             |              |          |           |             |              |
| D8 ~ 11              | V11-0051-05 | Diode 1N60               |              |          |           |             |              |
| D12                  | V11-0076-05 | Diode 1S1555             |              |          |           |             |              |
| D13                  | V11-0240-05 | Zener diode WZ-090       |              |          |           |             |              |
| D14 ~<br>20          | V11-0051-05 | Diode 1N60               |              |          |           |             |              |
| <b>POTENTIOMETER</b> |             |                          |              |          |           |             |              |
| VR1                  | R12-7013-05 | Volume 50k $\Omega$      |              |          |           |             |              |
| VR2, 3               | R12-1020-05 | Volume 1k $\Omega$       |              |          |           |             |              |
| VR4                  | R12-0042-05 | Volume 500 $\Omega$      |              |          |           |             |              |
| <b>COIL/TRIMMER</b>  |             |                          |              |          |           |             |              |
| L1                   | L31-0266-05 | Tuning coil              |              |          |           |             |              |
| L2                   | L31-0267-05 | ANT coil                 |              |          |           |             |              |
| L3                   | L34-0390-05 | VHF coil (B)             |              |          |           |             |              |
| L4                   | L34-0389-05 | VHF coil (A)             |              |          |           |             |              |
| L5                   | L34-0390-05 | VHF coil (B)             |              |          |           |             |              |
| L6                   | L30-0005-05 | IFT                      |              |          |           |             |              |
| L7                   | L71-0021-05 | Crystal filter           |              |          |           |             |              |
| L8                   | L30-0005-05 | IFT                      |              |          |           |             |              |
| L9 ~ 11              | L40-1021-03 | Ferri-inductor 1mH       |              |          |           |             |              |
| L12                  | L71-0022-05 | Crystal filter           |              |          |           |             |              |
| L13, 14              | L40-1021-03 | Ferri-inductor 1mH       |              |          |           |             |              |
| L15 ~<br>18          | L30-0005-05 | IFT                      |              |          |           |             |              |
| L19                  | L40-1021-03 | Ferri-inductor 1mH       |              |          |           |             |              |
| L20                  | L40-1092-03 | Ferri-inductor 1mH       |              |          |           |             |              |
| L21                  | L40-1021-03 | Ferri-inductor 1mH       |              |          |           |             |              |
| L22                  | L33-0005-05 | IFT                      |              |          |           |             |              |
| L23 ~<br>25          | L40-1021-03 | Ferri-inductor 1mH       |              |          |           |             |              |
| TC1 ~ 3              | C05-0039-05 | Ceramic trimmer 6pF      |              |          |           |             |              |
| <b>MISCELLANEOUS</b> |             |                          |              |          |           |             |              |
| -                    | E23-0046-04 | Terminal x 3             |              |          |           |             |              |
| -                    | E23-0047-04 | Terminal x 24            |              |          |           |             |              |
| -                    | E23-0055-05 | Hermetic seal            |              |          |           |             |              |
| -                    | F11-0156-04 | Shield case              |              |          |           |             |              |
| -                    | J25-1103-03 | PC board                 |              |          |           |             |              |

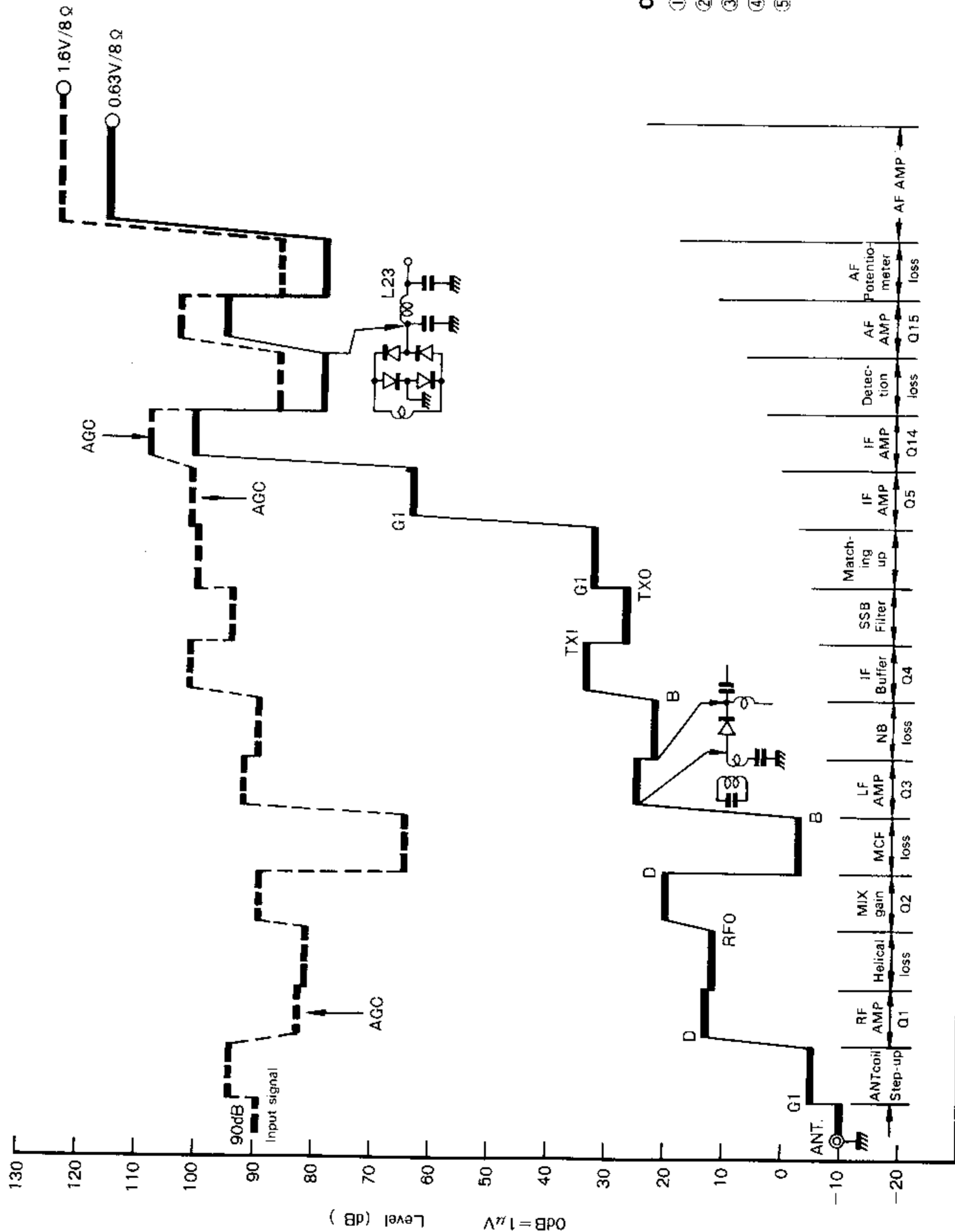
## TROUBLESHOOTING

| TROUBLE   | PROBABLE CAUSE  |  | REMEDY  |
|---|---|--|---|
| <b>1. Power is not supplied</b>   | 1) Fuse<br><br>2) Power cord<br><br>3) Power switch             | <input type="radio"/> Fuse blown<br><br><input type="radio"/> Capacity insufficient<br><input type="radio"/> Plug connection faulty<br><br><input type="radio"/> Power switch defective                      | Check fuse and replace it, if faulty<br>Replace with fuse of 4A<br>Repair plug connection, if faulty<br>Repair power switch, if defective                       |
| <b>2. Fuse is blown</b><br>(during reception)   | 1) Power supply<br>2) B circuit<br><br>3) AF final stage        | <input type="radio"/> Polarity reversed<br><input type="radio"/> D9 (U05B) faulty<br><input type="radio"/> Q7 (2SC735) faulty<br><input type="radio"/> Q2 or Q3 (2SD235) faulty                              | Change polarity<br>Replace D9, if defective<br>Replace Q7, if defective<br>Replace Q2 or Q3, if defective   |
| (during transmission)   | 1) Final unit   | <input type="radio"/> Q2 (2SC1242A) faulty   | Replace Q2, if defective  |
| <b>3. No signal is received at all</b><br>(Even noise is not heard)                   | 1) AF final stage<br>2) Speaker cord<br><br>3) AF VR            | <input type="radio"/> Q2 or Q3 (2SD235) faulty<br><input type="radio"/> Broken wire<br><br><input type="radio"/> Poor contact<br><input type="radio"/> No oscillation  | Check voltage against rating<br>Repair speaker cord, if defective<br>Repair contact, if poor<br>Check oscillator voltage against rating<br>Adjust coil properly |
| (Noise is heard)  | 1) Synthesizer unit   | <input type="radio"/> No oscillation   | Check oscillator voltage against rating   |
| (S meter operates)  | 2) IF circuit<br><br>3) Carrier unit                            | <input type="radio"/> Coil not properly adjusted<br><input type="radio"/> No oscillation   | Adjust coil properly  |
| <b>4. Sensitivity is too low</b>  | 1) RF circuit   | <input type="radio"/> Q1 (3SD41) faulty<br><br><input type="radio"/> Helical part not properly adjusted<br><input type="radio"/> RF coil not properly adjusted<br><input type="radio"/> Output level too low | Check voltage against rating<br>Adjust helical part properly<br>Adjust RF coil properly   |
| (S meter operates)  | 2) Synthesizer unit<br><br>3) IF circuit<br><br>4) Carrier unit | <input type="radio"/> Coil not properly adjusted<br><input type="radio"/> Filter (L7, L12) faulty<br><br><input type="radio"/> Carrier output too low  | Check voltage and adjust it properly<br>Adjust coil properly<br><br>Replace filter, if defective<br>Adjust carrier output properly                              |
| <b>5. S meter does not operate</b>  | 1) Sensitivity<br>2) RX unit<br><br>3) RX unit                  | <input type="radio"/> Refer to Step 4 above<br><input type="radio"/> VR1, VR2 or VR4 not properly adjusted<br><input type="radio"/> AGC circuit faulty   | Adjust VR1, VR2 or VR4 properly<br>Repair AGC circuit, if faulty  |
| <b>6. Sound is distorted</b>  | 1) AF final stage<br>2) RX unit<br>3) Carrier unit              | <input type="radio"/> Q2 or Q3 (2SD235) faulty<br><input type="radio"/> Coil not properly<br><input type="radio"/> Frequency misaligned or output too low  | Replace Q2 or Q3, if defective<br>Adjust coil properly<br>Adjust frequency or output properly   |
| <b>7. NB does not operate</b>   | 1) NB unit  | <input type="radio"/> L17 or L18 not properly adjusted   | Adjust L17 or L18 properly  |
| <b>8. RIT does not function properly</b><br>(ON-OFF switch does not operate properly) | 1) Carrier unit VR3   | <input type="radio"/> VR3 not properly adjusted  | Adjust VR3 properly   |

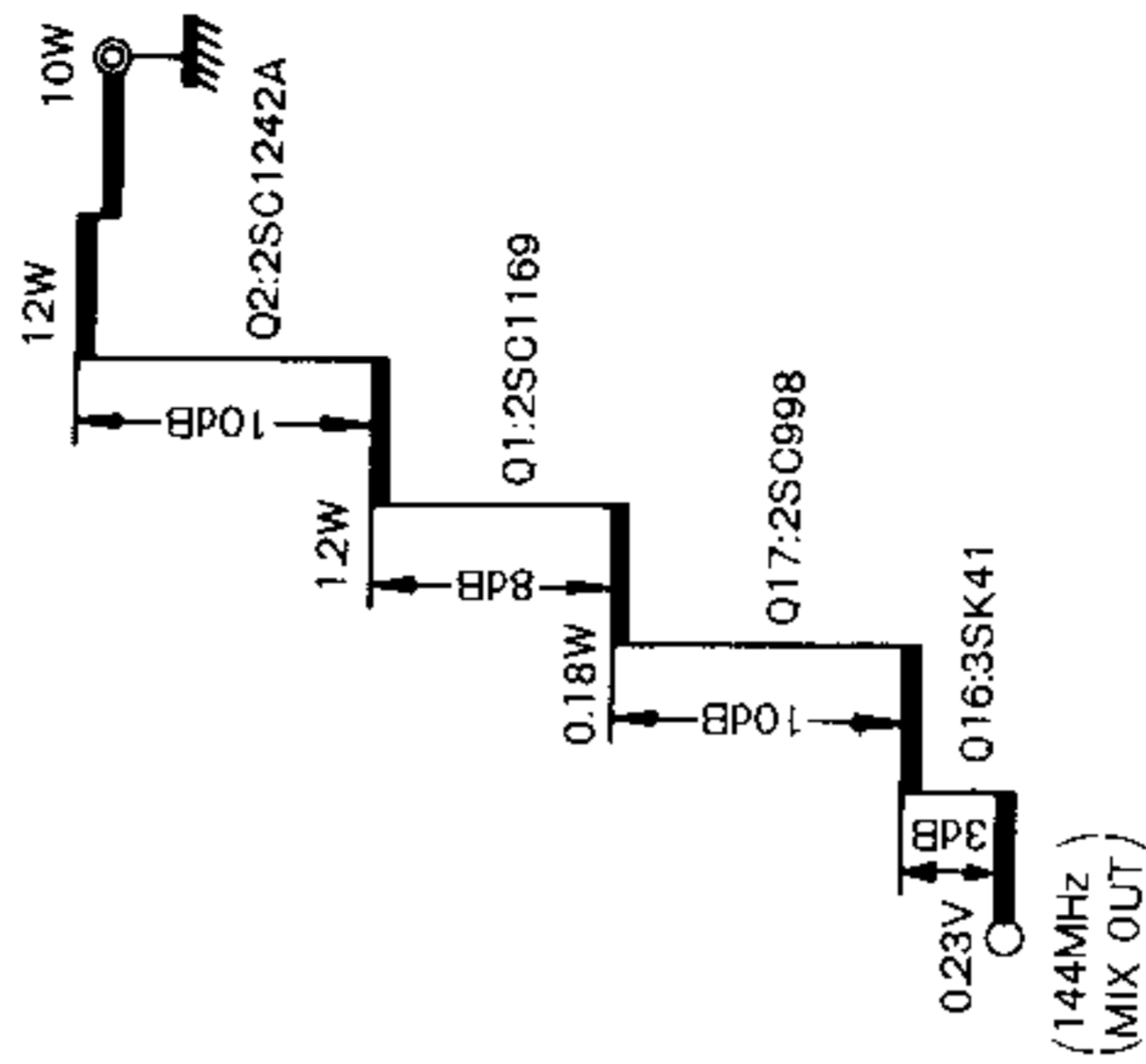
## TROUBLESHOOTING

| TROUBLE  | PROBABLE CAUSE                    |   | REMEDY  |
|--|-----------------------------------|---|---|
| <b>9. CW output is zero</b><br><b>(in all channels)</b><br><br><b>(Individual channel)</b> | 1) Synthesizer unit               | ○ No oscillation at 41MHz                               | Adjust oscillator properly<br>Adjust oscillator properly<br>Replace Q1 or Q2, if defective<br>Replace crystal, if defective   |
|  | 2) Carrier unit                   | ○ No oscillation  |   |
|  | 3) Final unit                     | ○ Q1 or Q2 faulty                                       |   |
|  | 1) Synthesizer unit               | ○ Crystal faulty  |   |
| <b>10. CW output is too low</b>  | 1) Antenna                        | ○ Improper matching                                     | Measure SWR<br>Adjust protection circuit properly<br>Replace Q1 or Q2, if defective<br>Adjust properly<br><br>Adjust properly<br><br>Adjust properly<br><br>Adjust properly |
|  | 2) Protection circuit             | ○ Improper adjustment                                   |   |
|  | 3) Final unit                     | ○ Q1 or Q2 faulty                                       |   |
|  |                                   | ○ TC1 ~ TC4 not properly adjusted                       |   |
|  | 4) Synthesizer unit               | ○ Heterodyne action not properly adjusted               |   |
|  | 5) Filter unit                    | ○ RF amplifier not properly adjusted                    |   |
|  | ○ ALC (VR3) not properly adjusted |   |   |
| <b>11. SSB output is zero</b>  | 1) Microphone                     | ○ Plug connection faulty                                | Check plug connection for broken wire, and repair, if faulty<br>Replace microphone element, if defective<br>Repair<br><br>Replace Q5 or Q6, if defective                    |
|  |                                   | ○ Microphone element faulty                             |   |
|  | 2) Carrier unit                   | ○ Microphone amplifier faulty                           |   |
|  |                                   | ○ Q5 or Q6 faulty                                       |   |
| <b>12. Carrier leaks</b>   | 1) Carrier unit                   | ○ Balanced modulating circuit TC1 not properly adjusted | Adjust properly   |
|  |                                   | ○ VR2 not properly adjusted                             | Adjust properly   |
|  |                                   |   |   |
| <b>13. RF meter reading is too small or too large</b>                                      | 1) Filter unit                    | ○ VR1 not properly adjusted                             | Adjust properly   |
|  | 2) RX unit                        | ○ D9 faulty   | Replace D9, if defective  |

### TR-7010 RECEIVING SECTION



### TRANSMITTING POWER SECTION

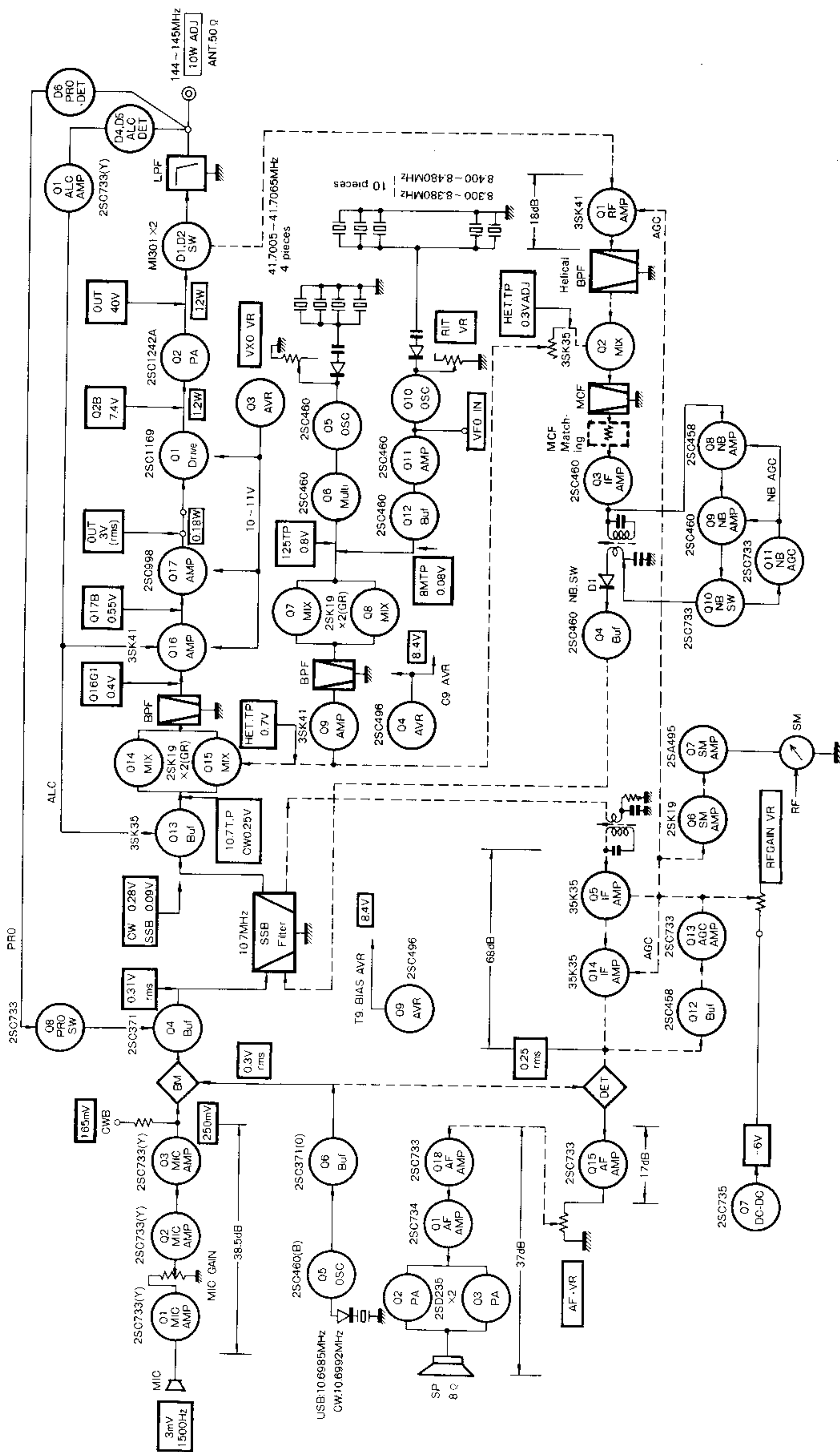


## LEVEL DIAGRAM

#### OSC VOLTAGE

- ① 8 MHz X'tal TP Terminal 0.1V (rsm)
- ② 125 MHz X'tal TP Terminal 0.8V (rms)
- ③ 133 MHz X'tal HET. Terminal 1.1V (rms)
- ④ MIC AMP GAIN 39dB
- ⑤ CARRIER HET. Terminal 0.3V (rms)

# LEVEL DIAGRAM



# ADJUSTMENTS

## TEST EQUIPMENT

### 1. Frequency Counter

Minimum input voltage: 50mV or less  
Frequency range: 200MHz or more

### 2. RF VTVM

Input impedance: More than 1M $\Omega$ , less than 20pF  
Voltage range: 10mV ~ 300V Full scale  
Frequency range: More than 200MHz

### 3. Power Meter

50 $\Omega$ , 20 ~ 30W, frequency range up to 144MHz or more

### 4. Standard Signal Generator

Frequencies generated: 144MHz band

### 5. Oscilloscope

High sensitivity oscilloscope capable of external synchronization

### 6. Sweep Generator

144MHz band

### 7. Marker

Oscillating frequency: 144, 145 and 146MHz

### 8. AF Generator

Frequency range: 300Hz ~ 5kHz  
Output: 1V max.

### 9. AF VTVM

Frequency range: 50Hz ~ 10kHz  
Input resistance: More than 1M $\Omega$   
Voltage range: 10mV ~ 30V Full scale

### 10. DC Power Supply

Voltage: 9V ~ 16V  
Current: More than 3.5A

### 11. Ampere Meter

DC 0 ~ 4A

### 12. Voltmeter

DC 0 ~ 3V (high internal resistance). Tester may be used.

### 13. Noise Generator

### 14. Others

AF dummy load, 8 $\Omega$ /3W  
CW key  
Detector

## 1. Adjustment of 8MHz X'tal Frequency

### A. Setting positions of knobs on panel

- (1) RIT volume: Center
- (2) Receiving

### B. Adjustment

- (1) Connect frequency counter to TP terminal on the synthesizer unit (see Fig. 1 and Fig. 2).
- (2) Set VFO-SYNTHESIZER selector switch on the rear of the case to SYNTHESIZER position and RIT switch to ON.  
Set channel indicator to "80" and BAND switch to "144.2".
- (3) Set TC11 to the center position and adjust TC13 for 8.4800MHz. If this adjustment is difficult, set TC13 as close to 8.4800MHz as possible and then adjust TC11 for 8.4800MHz.

Adjust frequencies in the order given in Table 1.

**NOTE:** Each frequency should be adjusted within  $\pm 100$ Hz.

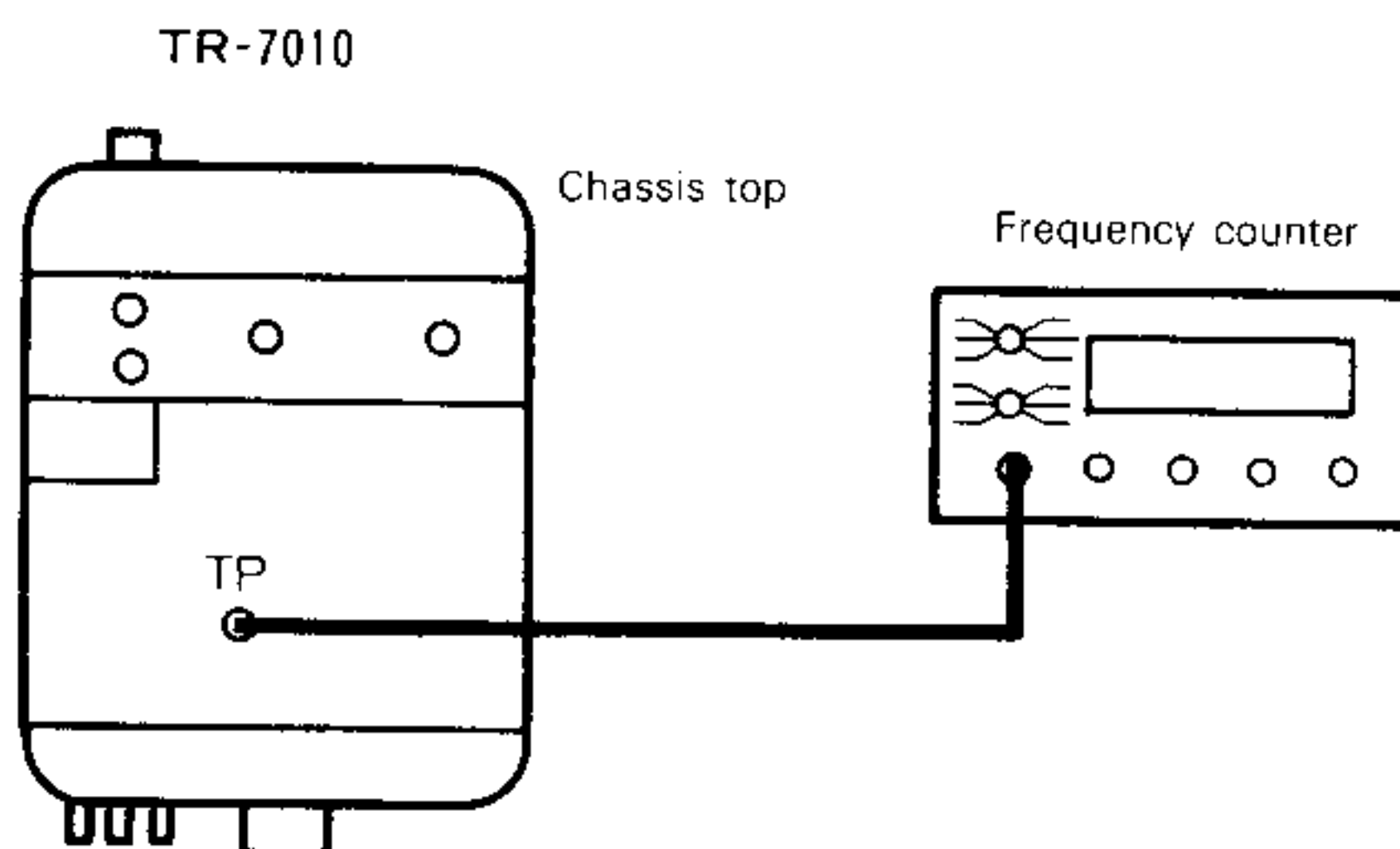


FIG. 1 ADJUSTMENT OF 8MHz FREQUENCIES

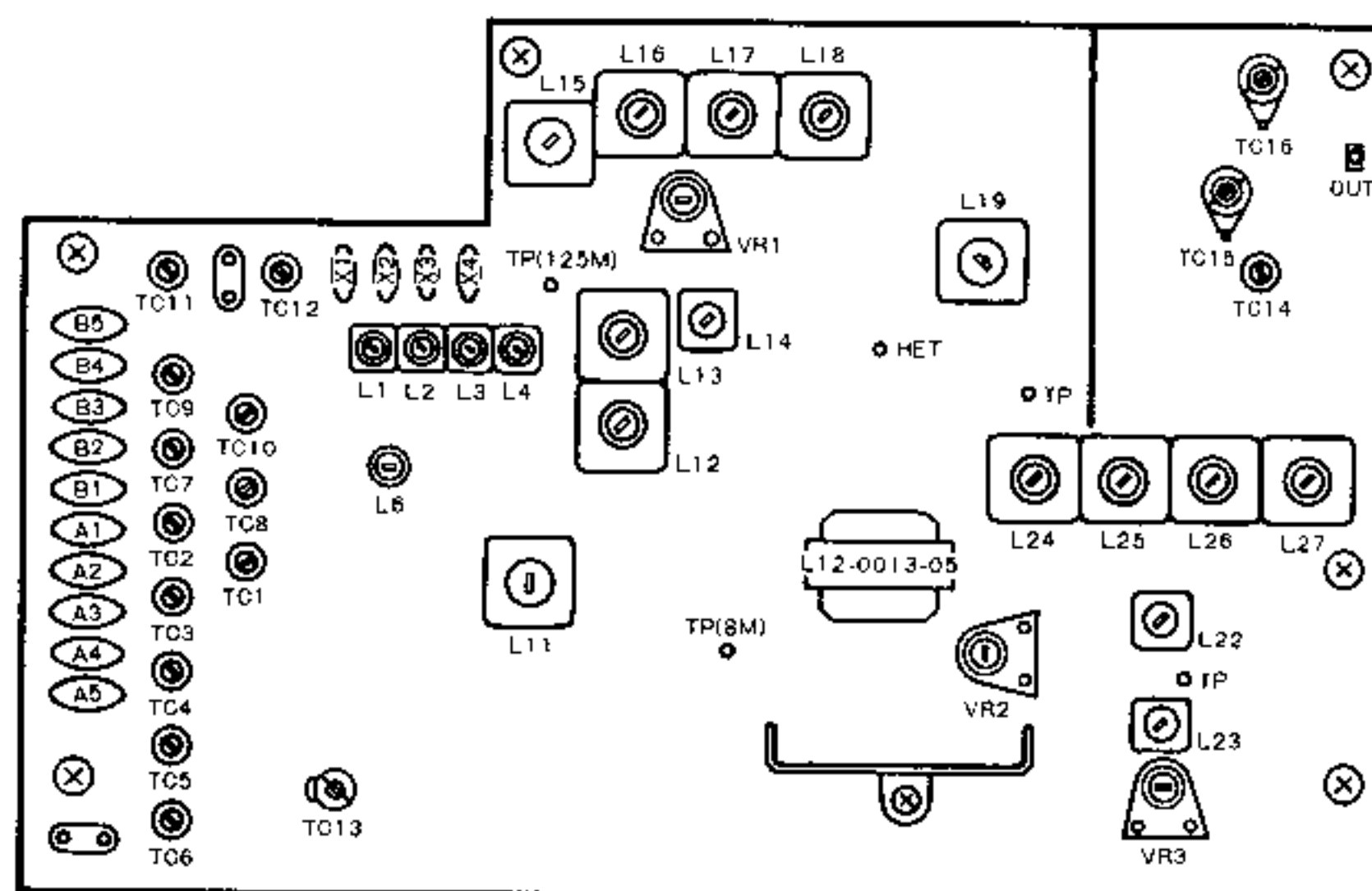


FIG. 2 SYNTHESIZER UNIT

# ADJUSTMENTS

| Channel Indication                 | Frequency for Adjustment | Adjusting Trimmer | Operating Frequency |
|------------------------------------|--------------------------|-------------------|---------------------|
| <b>Band Switch Position: 144.2</b> |                          |                   |                     |
| 60                                 | 8.4600MHz                | TC10              | 144.260MHz          |
| 40                                 | 8.4400MHz                | TC9               | 144.240MHz          |
| 20                                 | 8.4200MHz                | TC8               | 144.220MHz          |
| 00                                 | 8.4000MHz                | TC7               | 144.200MHz          |
| <b>Band Switch Position: 144.1</b> |                          |                   |                     |
| 00                                 | 8.3000MHz                | TC1               | 144.100MHz          |
| 20                                 | 8.3200MHz                | TC2               | 144.120MHz          |
| 40                                 | 8.3400MHz                | TC3               | 144.140MHz          |
| 60                                 | 8.3600MHz                | TC4               | 144.160MHz          |
| 80                                 | 8.3800MHz                | TC5               | 144.180MHz          |

TABLE 1 ADJUSTING POINTS FOR 8MHz FREQUENCIES

- (4) With the frequency set to 144.100, turning the RIT volume fully clockwise and counterclockwise from its center position, confirm that the frequency is varied more than  $\pm 1.5$ kHz.

Less than 8.2985MHz  $\leftrightarrow$  More than 8.3015MHz

- (5) Frequency adjustment at RIT OFF

With the RIT switch set to OFF and the frequency to 144.100MHz, adjust VR3 in the carrier unit (Fig. 3) for 8.3000MHz.

**Check points:**

- 1) The frequency should not be varied when the RIT switch is turned to ON and OFF.
- 2) The frequency should be varied every 4 positions of the rotary switch.

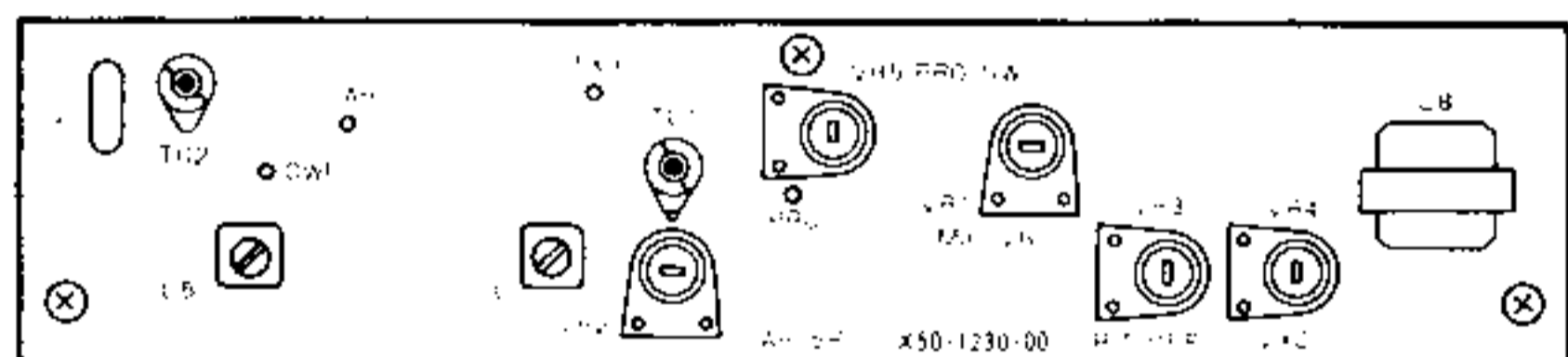


FIG. 3 CARRIER UNIT

## 2. 41MHz Oscillation Adjustment

### A. Setting positions of knobs on panel

- (1) Receiving
- (2) RIT volume: Center
- (3) VXO volume: Center

### B. Adjustment

- (1) Set the VFO-SYNTHESIZER selector switch to SYNTHESIZER position. Set the channel indicator to "00" and the BAND switch to "144.1".
- (2) Connect the frequency counter to the TP terminal on the synthesizer unit (see Fig. 2 and Fig. 4).
- (3) Turn the core of L11 in the synthesizer unit counterclockwise to confirm the starting point of oscillation.

Adjust the core so that the frequency counter counts the frequencies properly in the vicinity of 125.1015MHz.

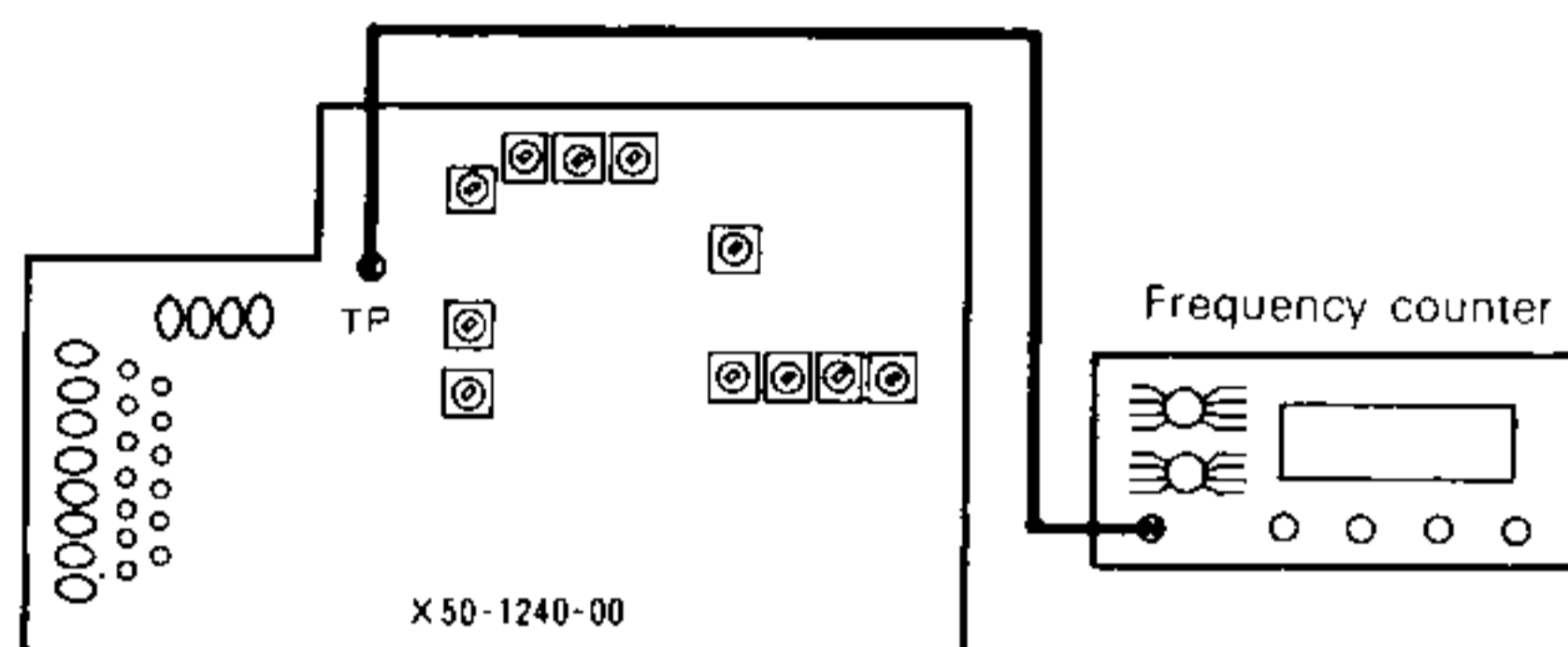


FIG. 4 41MHz OSCILLATION ADJUSTMENT

## 3. VXO Frequency Adjustment

### A. Setting positions of knobs on panel

- (1) Receiving
- (2) VXO volume: Center

### B. Adjustment

- (1) Connect the frequency counter to the TP terminal on the synthesizer unit (see Fig. 2 and Fig. 4).
- (2) Set the VFO-SYNTHESIZER selector switch to SYNTHESIZER position and the channel indicator to "00".
- (3) Adjust L1 ~ L4 so that the frequency counter indicates as shown in Table 2.

| Channel Indicator | Frequency for Adjustment | Adjusting Coil |
|-------------------|--------------------------|----------------|
| 00                | 125.1015MHz              | L1             |
| 05                | 125.1065MHz              | L2             |
| 10                | 125.1115MHz              | L3             |
| 15                | 125.1165MHz              | L4             |

TABLE 2 VXO FREQUENCY ADJUSTING POINTS

**NOTE:** If the cores of L1 ~ L4 are too much out of the center position during adjustment, set them to the center position and then adjust the frequency using L11 (readjustment should be made from 41MHz Oscillation Adjustment under the item 2).

- (4) VXO operation check  
With the channel indicator set back to "00", turning the VXO volume fully clockwise and counterclockwise from its center position, confirm that the frequency is varied more than  $\pm 2.5$ kHz. Less than 125.0990 MHz  $\leftrightarrow$  More than 125.1040 MHz.
- (5) Set the VFO-SYNTHESIZER selector switch on the rear of the case to "VFO" with the channel indicator remaining in "00". Adjust VR4 on the carrier unit (Fig. 3) for 125.1015MHz.

# ADJUSTMENTS

## Check Points:

- 1) The frequency should be varied every 4 positions of the rotary switch.
- 2) The adjusting frequency should be within  $\pm 300\text{Hz}$ .

## 4. Carrier Oscillation Frequency Adjustment

### A. Setting positions of knobs on panel

Any position

### B. Adjustment

- (1) Connect RF VTVM to CAR terminal on the carrier unit (see Fig. 3 and Fig. 5).

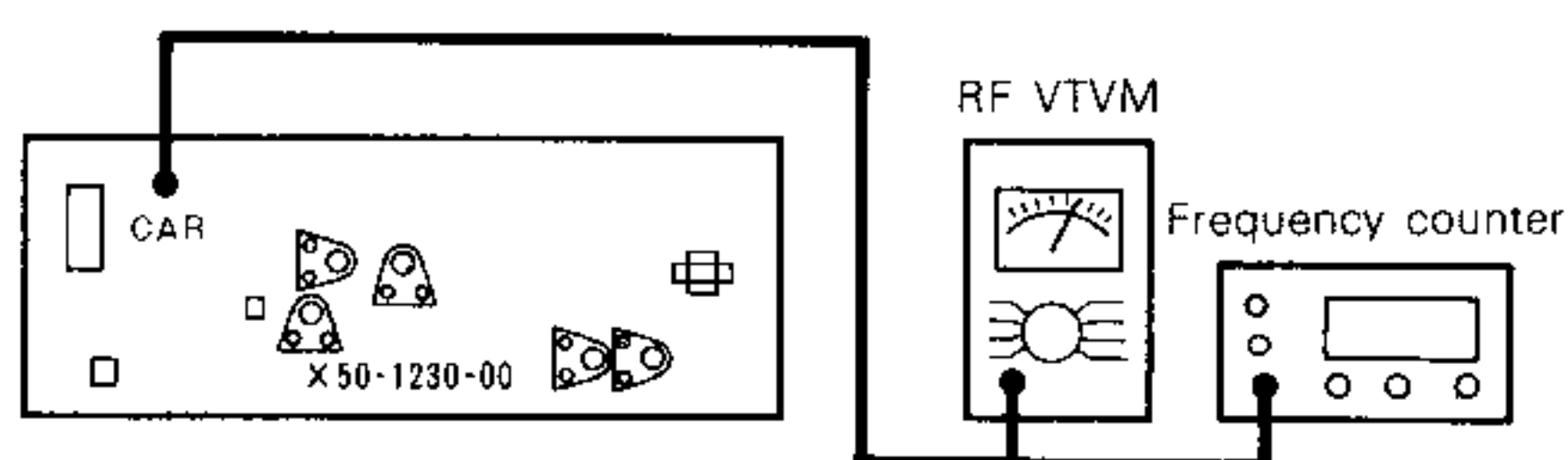


FIG. 5 CARRIER OSCILLATION ADJUSTMENT

- (2) Adjust L5 for maximum reading on RF VTVM.
- (3) Adjustment of SSB carrier oscillation frequency: Remove RF VTVM and connect the frequency counter to CAR terminal on the carrier unit (Fig. 5). Adjust TC2 for 10.6985MHz.
- (4) Adjustment of CW carrier oscillation frequency: Under the transmit mode, set CW/SSB switch to "CW" (press down) and adjust VR3 on the synthesizer unit (Fig. 2) for 10.6992MHz.

## 5. HET Adjustment (Important)

### A. Setting positions of knobs on panel

CW/SSB switch: SSB (OFF) position  
BAND switch: 144.2MHz position  
Channel indicator: "95"  
VFO-SYNTHESIZER selector switch (on the rear of case):  
SYNTHESIZER position

### B. Adjustment

- (1) Insert the adjusting crystal (8.900MHz) into the crystal socket on the synthesizer unit (Fig. 6).

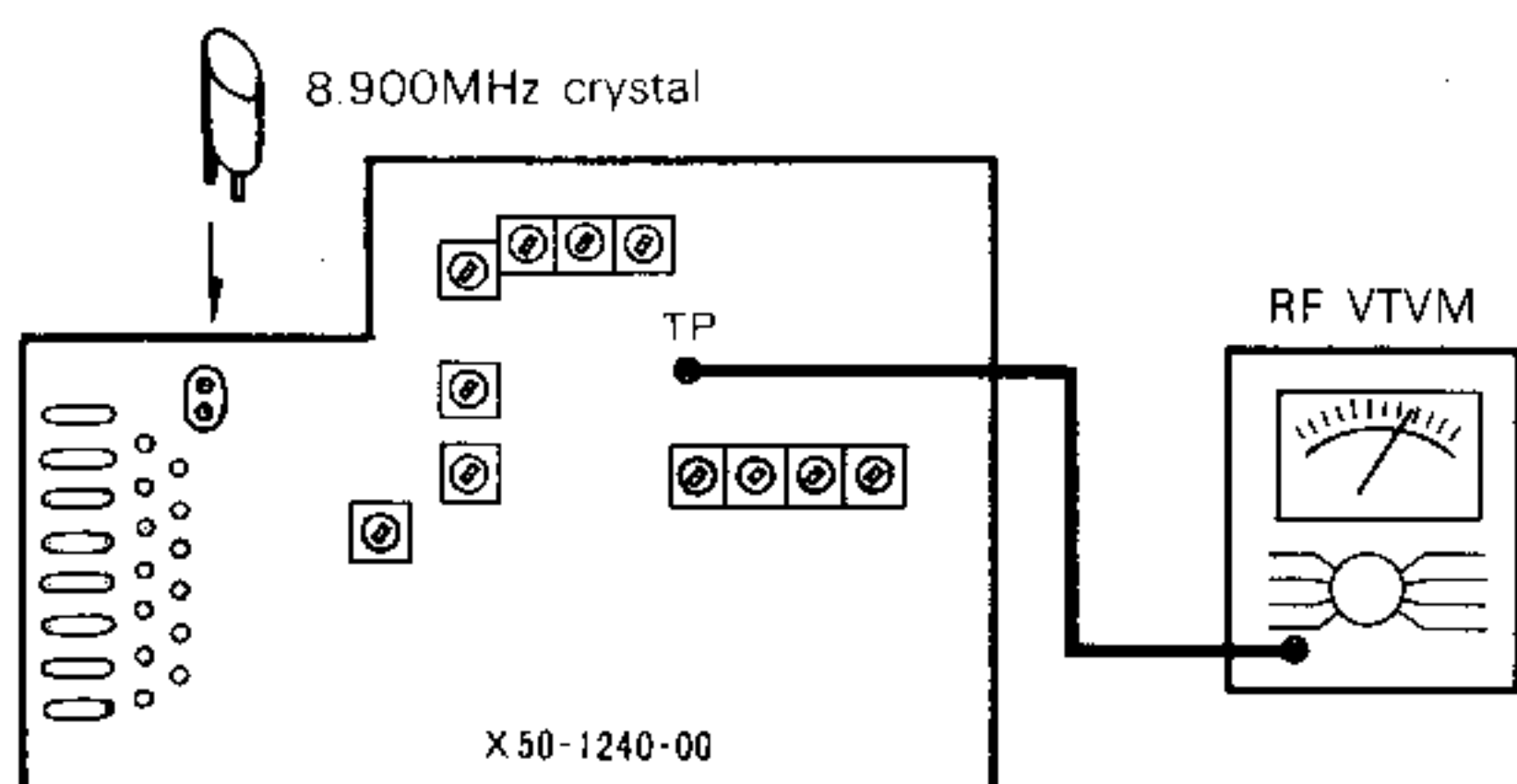
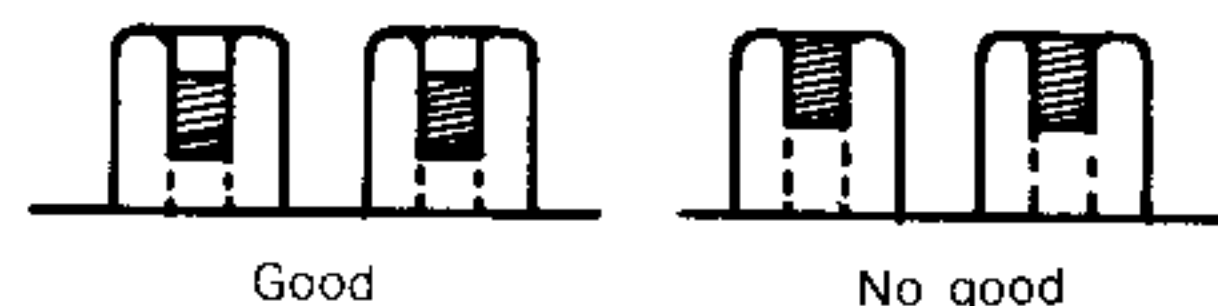


FIG. 6 HET ADJUSTMENT

- (2) Connect RF VTVM (1V range) to the TP terminal (Fig. 6).
- (3) Under the transmit mode, obtain a maximum reading on RF VTVM by adjusting L12 → L13 → L15 → L16 → L17 → L18 → L19 (f: 144.295MHz). This adjustment should be made several times.

**NOTE:** L12 and L13 should be tuned at the inner position as shown in the illustration below.



- (4) Set the channel indicator from "95" (144.295MHz) to "A" (144.70MHz) and adjust L14 for maximum reading on RF VTVM.
- (5) With the channel indicator set back to "95", obtain a maximum reading on RF VTVM by adjusting L12, L13, L15, L16, L17, L18 and L19 (RF VTVM may indicate a variation of 0.4 ~ 0.8V rms).

## 6. Adjustments of 10.7MHz and 144MHz

### A. Setting positions of knobs on panel

CW/SSB switch: CW(ON) position  
Frequency: 144.295MHz  
VFO-SYNTHESIZER selector switch (on rear of case):  
SYNTHESIZER position  
Others: Any position

### B. Adjustment

- (1) Remove the press-fitted lead from the OUT terminal on the synthesizer unit.
- (2) Connect RF VTVM to the TP terminal on the synthesizer unit (Fig. 7).
- (3) Set into transmitting
- (4) Obtain a maximum reading on RF VTVM by adjusting L3 on the carrier unit (Fig. 3) and L22 and L23 on the synthesizer unit (Fig. 2). The reading should be about 0.25V rms at 0.3V range.
- (5) Next, connect RF VTVM (3V range) to the OUT terminal (Fig. 7) on the synthesizer unit and then set TC16 to 1/2 in capacitance.
- (6) Obtain a maximum reading on RF VTVM by adjusting L24, L25, L26 and L27. Also adjust TC14 and TC15 for maximum reading.

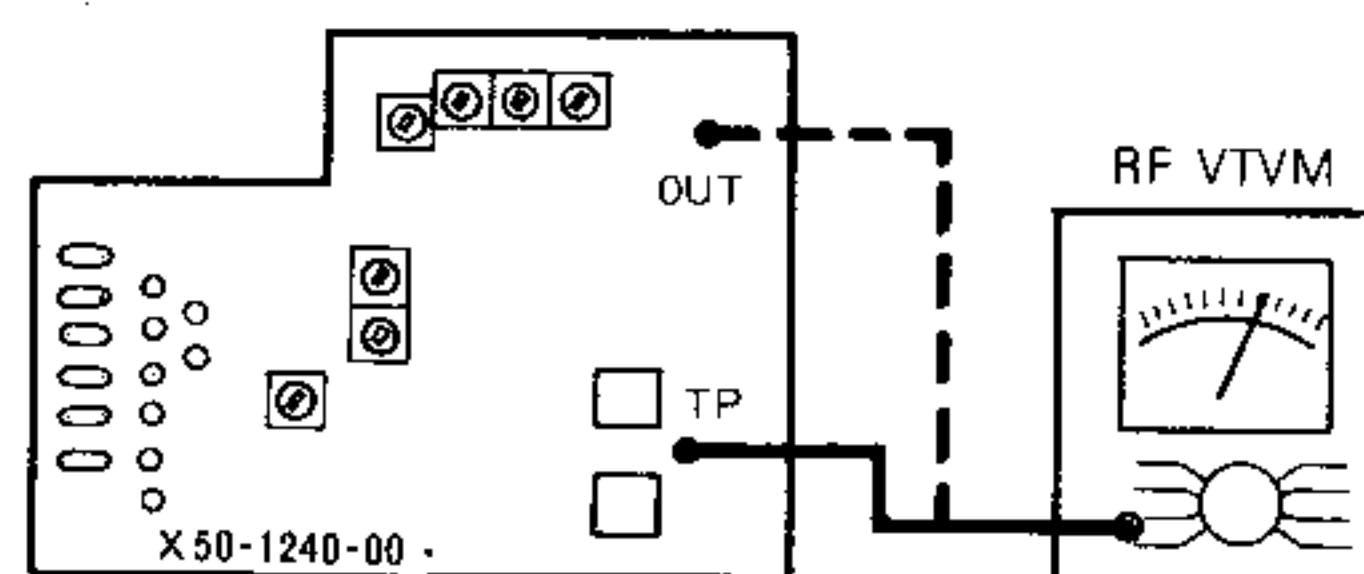


FIG. 7 ADJUSTMENT OF HF AMPLIFIER



## ADJUSTMENTS

### 7. Power Adjustment

#### A. Setting positions of knobs on panel

Same as the item 6 above.

#### B. Adjustment

- (1) Connect the power meter to the ANT terminal and the press-fitted lead (removed under the item 6) to the OUT terminal. Set VR3 on the filter unit (Fig. 8) and VR5 on the carrier unit (Fig. 3) to minimum and then connect the ampere meter (DC 0 ~ 4A) to the power supply (Fig. 9).

**NOTE:** The ampere meter equipped with the DC power supply may be used.

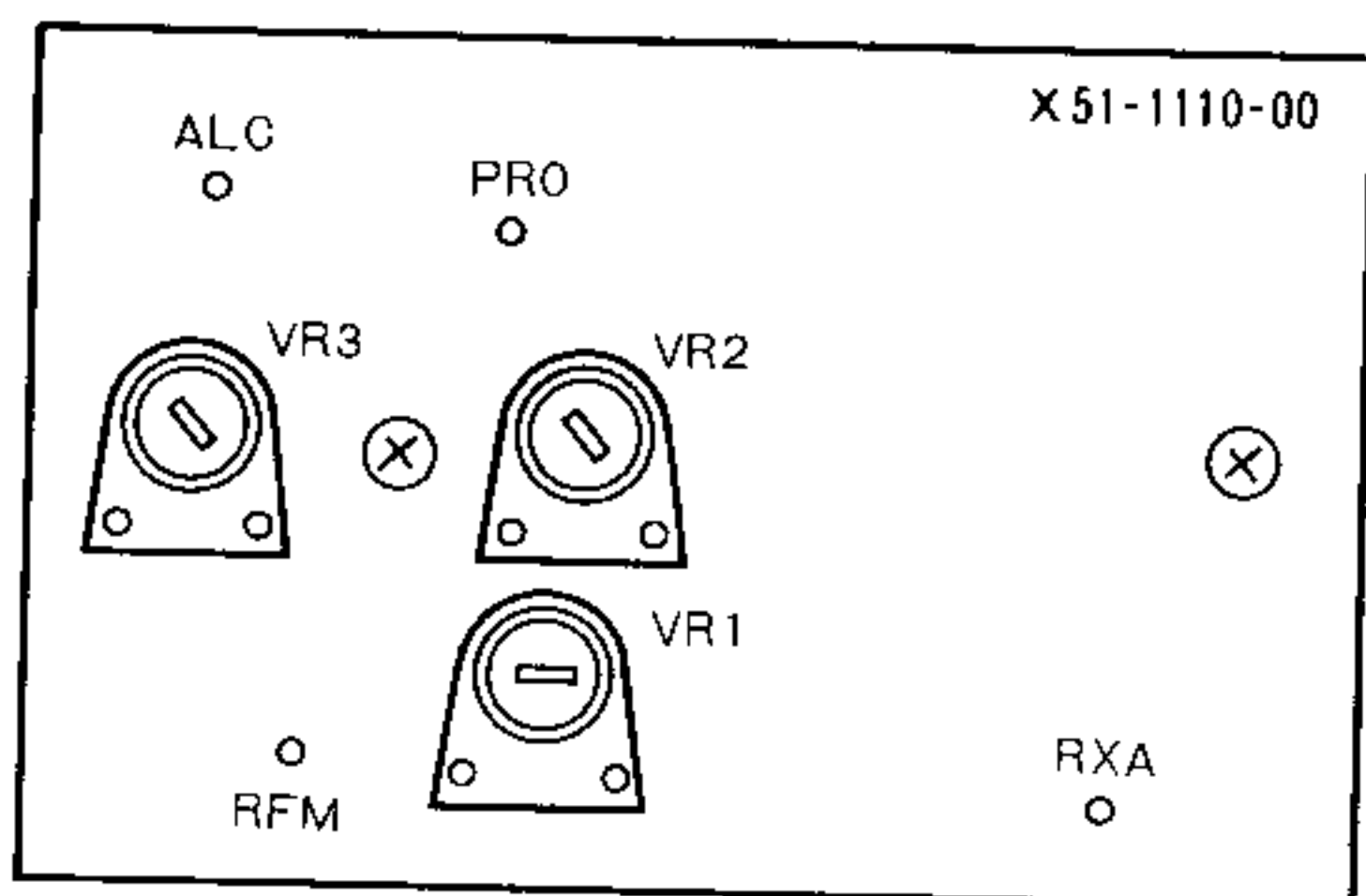


FIG. 8 FILTER UNIT

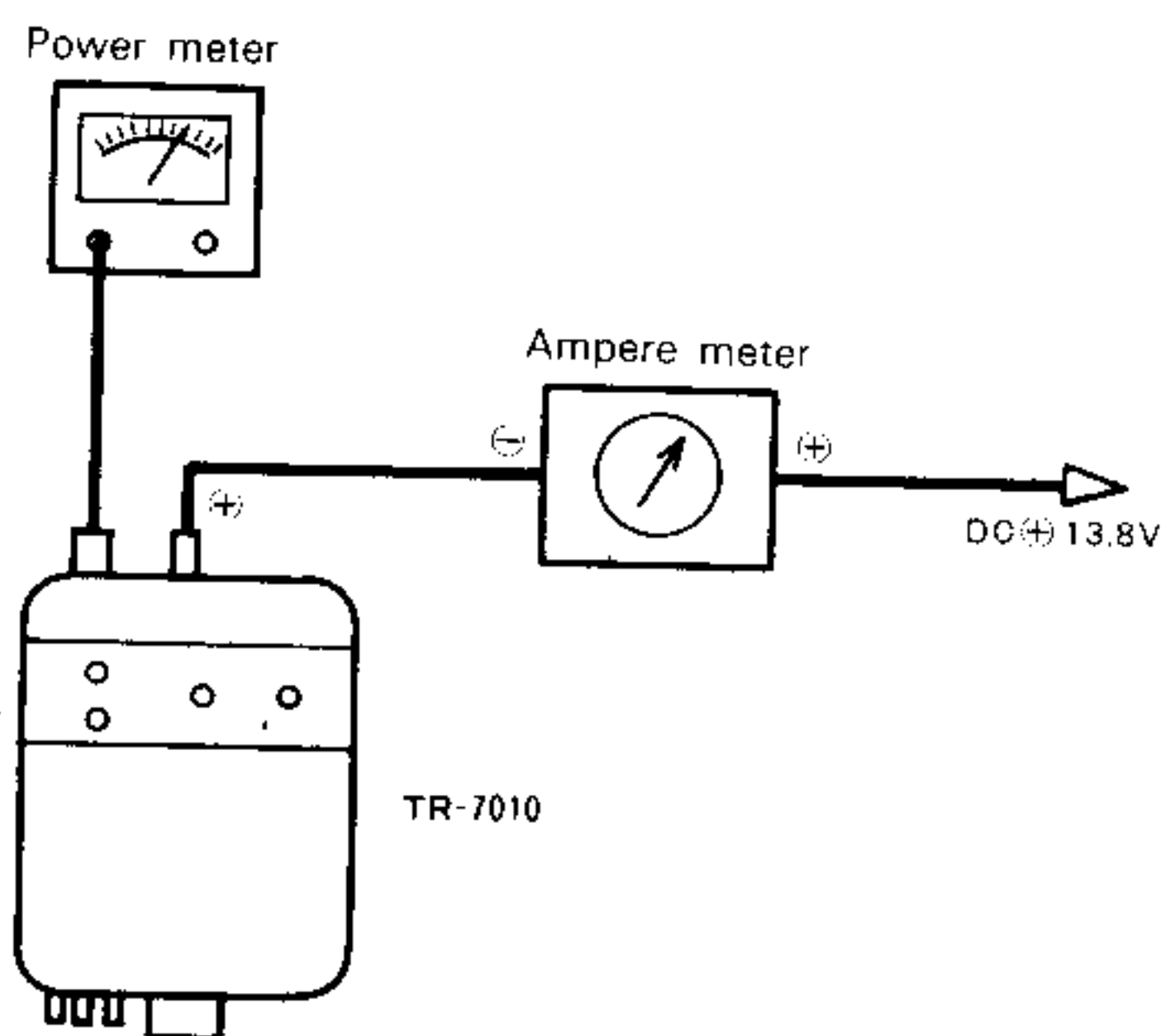


FIG. 9 CONNECTION OF AMPERE METER

- (2) Adjust TC1 on the final unit (Fig. 10) for maximum current. Then, adjust TC16 on the synthesizer unit (Fig. 2) for maximum output.

**NOTE:** Adjustments should be made in the above mentioned order.

- (3) Obtain a maximum output by adjusting TC2, TC3 and TC4 on the final unit (Fig. 10). Be sure that TC4 is turned in the direction where the current is decreased while the output remains unchanged.

This adjustment should be made carefully because it largely relates to spurious radiation.

**NOTE:** The power meter may indicate a variation of  $12W \pm 1W$ .

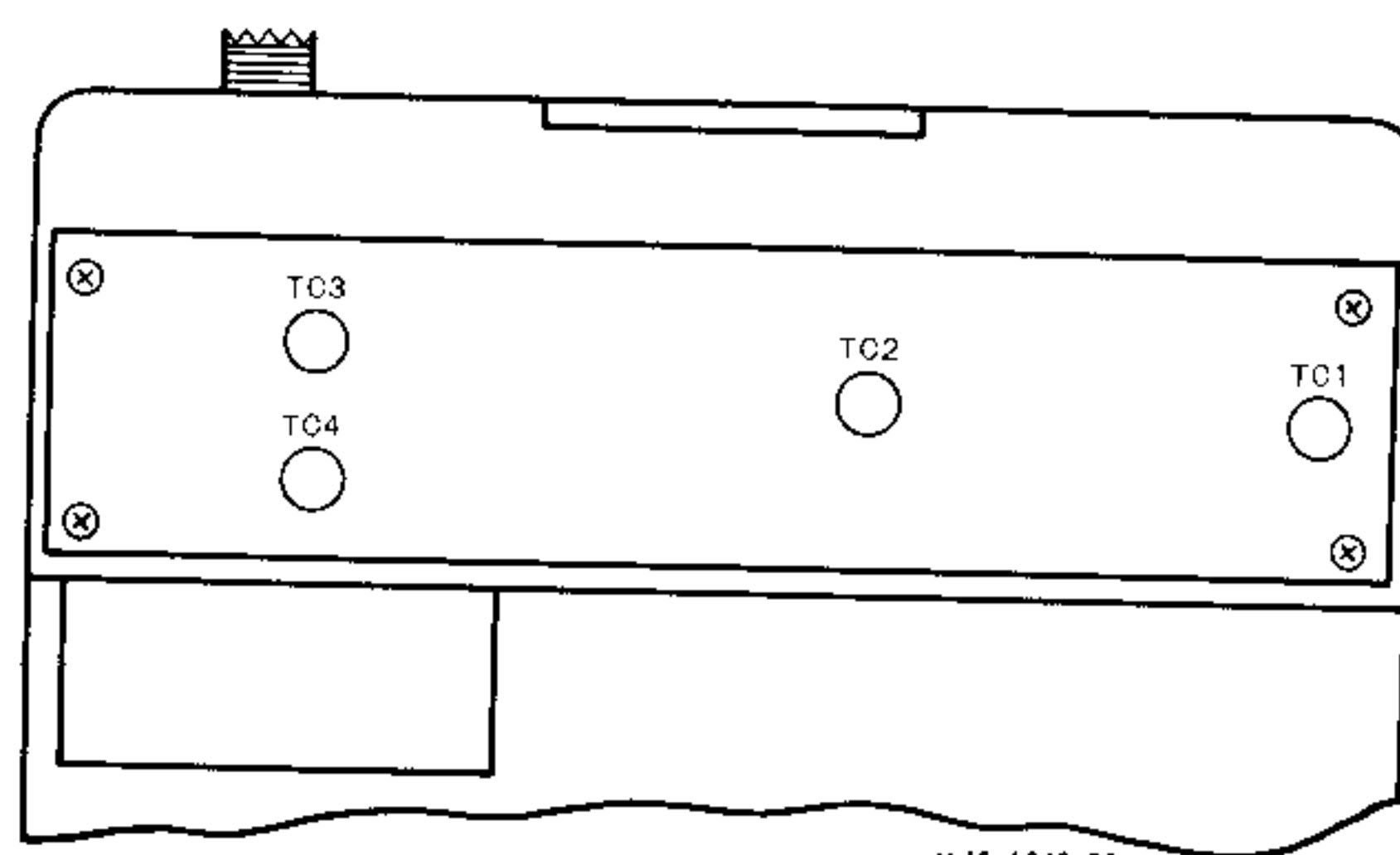


FIG. 10 PA UNIT

### 8. ALC Adjustment

Remaining the condition of item 7, proceed as follows:

- (4) Adjust VR3 on the filter unit (Fig. 8) until the transmit output reaches 10W.

### 9. Adjustment of RF Meter Indication

Remaining the condition of the item 8, proceed as follows:

- (5) Adjust VR1 on the filter unit so that the S meter indicates the "9" position on the scale ("8" position on RF scale).

### 10. Protection Adjustment

Remaining the condition of the item 9, proceed as follows:

- (6) Connect the voltmeter (DC 3V range) to the PRO terminal on the filter unit (Fig. 8).
- (7) Precisely adjust VR2 on the filter unit for minimum reading on the voltmeter.
- (8) Remove the power meter from the ANT terminal and adjust VR5 on the carrier unit (Fig. 3) so that the meter indicates the RF "5" (upper section of the figure "5").

### 11. Adjustment of Carrier Suppression

#### A. Setting positions of knobs on panel

CW/SSB switch: SSB position (OFF condition)

Channel indicator: "95" position

BAND switch: 144.2 position

VFO-SYNTHESIZER selector switch: SYNTHESIZER position

Others: Any position

#### B. Adjustment

- (1) Connect the power meter to the ANT terminal. Connect RF VTVM (0.3V range) to the ANT terminal of the filter unit (Fig. 11).
- (2) Short the MIC terminals "2" and "4" to set into transmitting.
- (3) Adjust alternately VR2 and TC1 on the carrier unit (Fig. 3) for minimum reading on RF VTVM. This adjustment should be repeated two or three times.

# ADJUSTMENTS

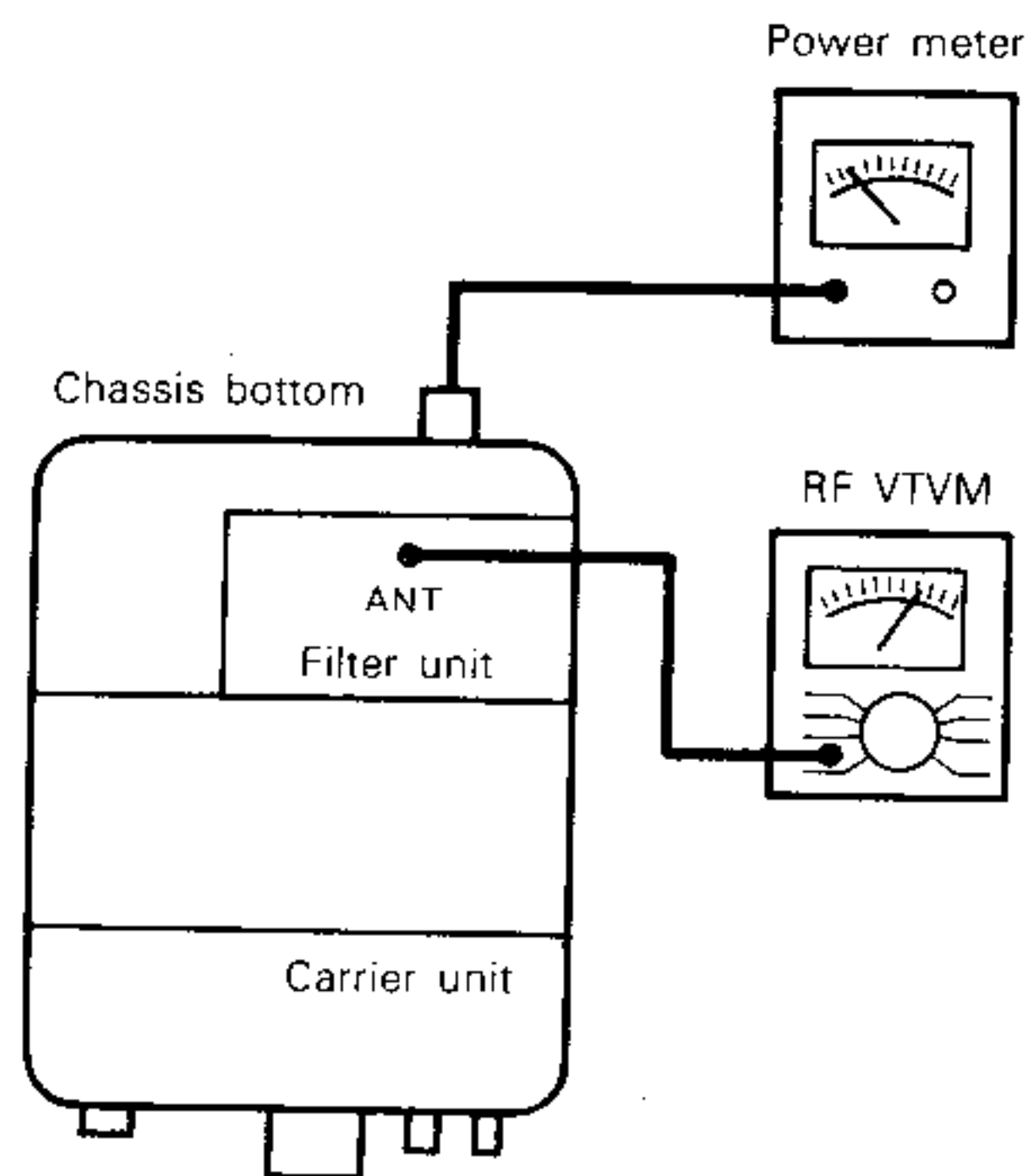


FIG. 11 ADJUSTMENT OF CARRIER SUPPRESSION

## 12. SSB Power Adjustment

After the adjustment under the item 11 above, proceed as follows:

- (4) Remove RF VTVM and connect the audio generator (AG) to the MIC terminal. Set the generator output to 3mV/600Ω, 1,500Hz.
- (5) Under the transmitting, adjust VR1 on the carrier unit (Fig. 3) until the power meter indicates 9W.

**NOTE:** Before readjusting the final unit, be sure to set ALC to OFF (turn VR3 on the filter unit fully clockwise).

## 13. Readjustment of Heterodyne Coil (L14)

- (1) Remove all the measuring instruments, except for the power cord (receiving). Set the channel to "A" and insert the adjusting crystal (8.9MHz for 144.70MHz) into the crystal socket (Fig. 6).
- (2) Connect RF VTVM to the 8MHz TP terminal (Fig. 2) on the synthesizer unit and then adjust L14 for maximum reading on RF VTVM.

## 14. Helical Adjustment

### A. Setting positions of knobs on panel

- Receiving  
 Channel indicator: "00"  
 BAND switch: 144.2MHz position  
 RF GAIN volume: Fully clockwise (MAX)  
 VFO-SYNTHESIZER selector switch: SYNTHESIZER position  
 Antenna terminal: Unconnected  
 NB switch: ON position  
 Others: Any position

### B. Adjustment

- (1) Adjustment setup is shown in Fig. 12.

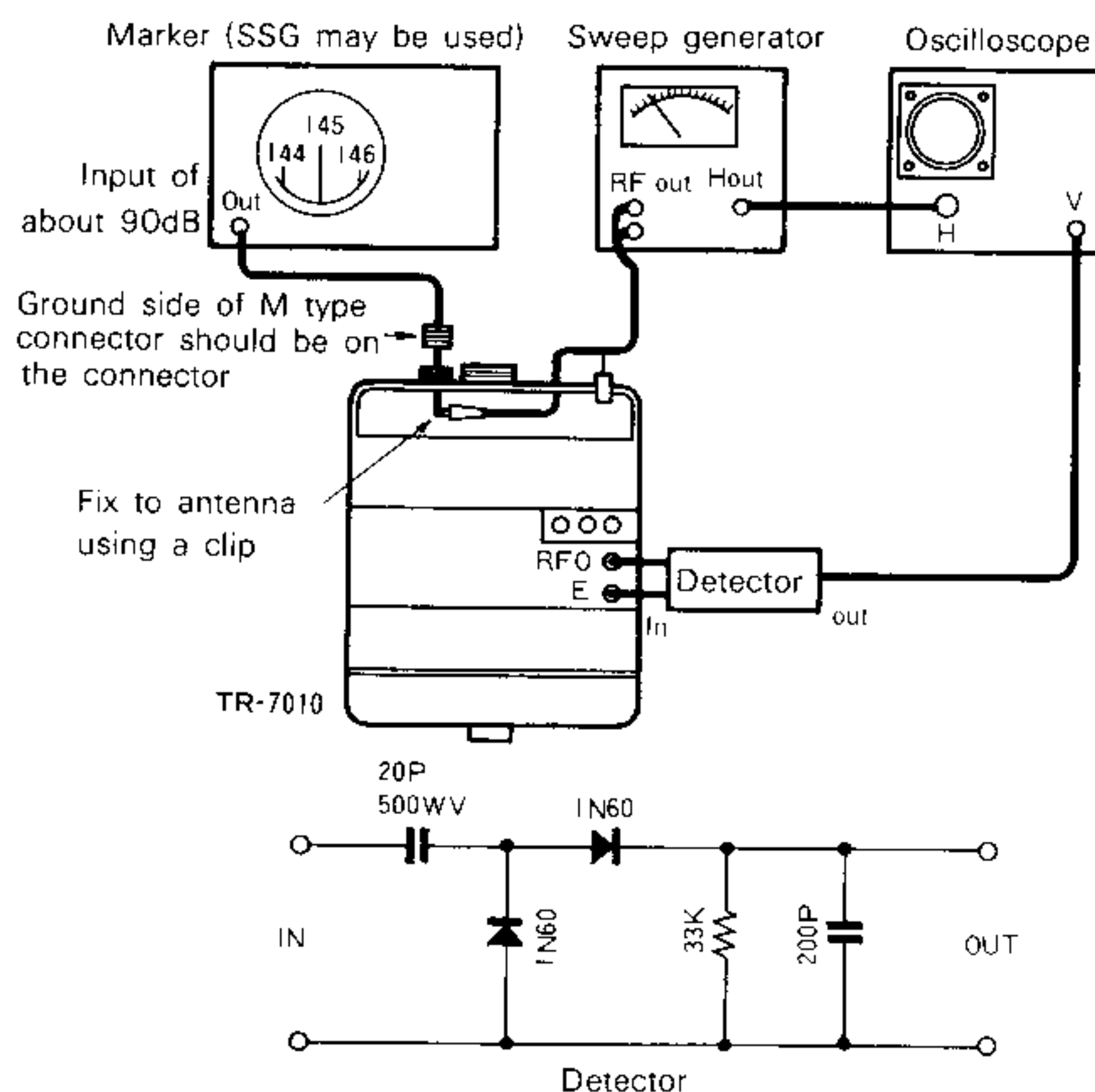


FIG. 12 HELICAL ADJUSTMENT

- (2) Turn the power switch to ON (power voltage: 13.8V).
- (3) Produce 144MHz marker signal (Fig. 13) and adjust TC2 and TC1 for maximum gain.
- (4) After the maximum gain is obtained, turn TC3 just about 1 rotation so that the gain is decreased.

**NOTE:** Since the frequency band of this unit is 144 ~ 145MHz, only the 144MHz marker signal is enough for the adjustment.

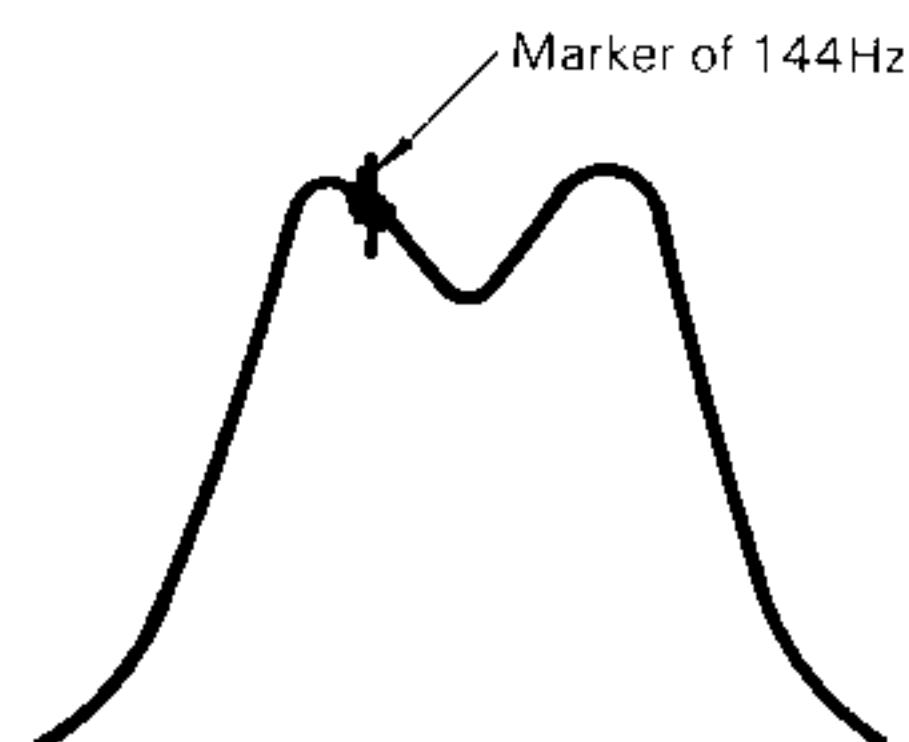


FIG. 13 WAVEFORM AT HELICAL SECTION

## 15. Voltage Setting of RX, HET

- (1) Disconnect all the measuring instruments. Set the channel indicator to "00" and the BAND switch to 144.2MHz.
- (2) Connect RF VTVM to the TP terminal on the RX unit (see Fig. 14 and Fig. 15).
- (3) Adjust VR4 on the RX unit until the voltage reaches 0.3V.

**NOTE:** When the voltage does not reach 0.3V with VR4, turn L19 (less than 1/4 turn) on the synthesizer unit (Fig. 2).

# ADJUSTMENTS

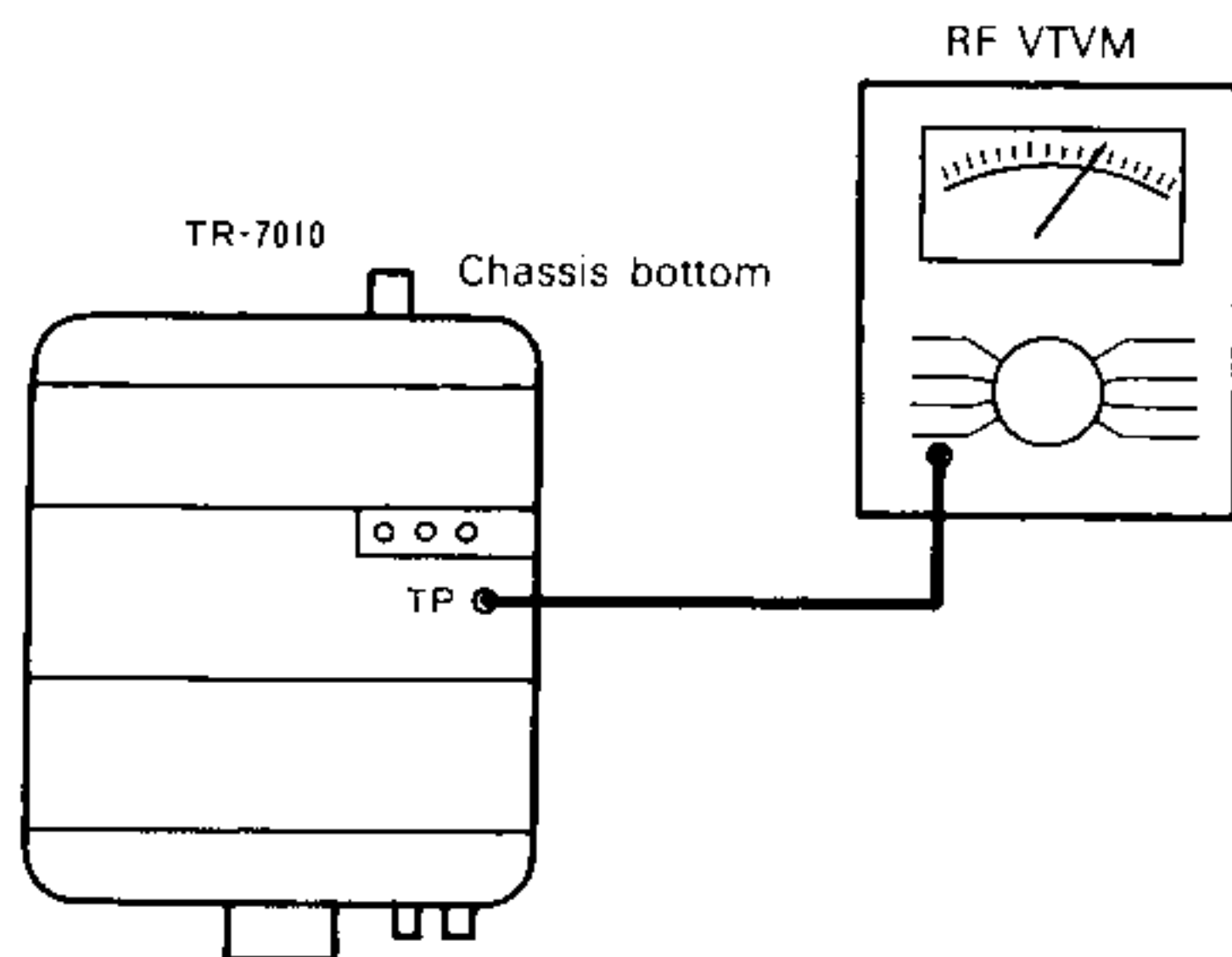


FIG. 14 RX, HET VOLTAGE SETTING

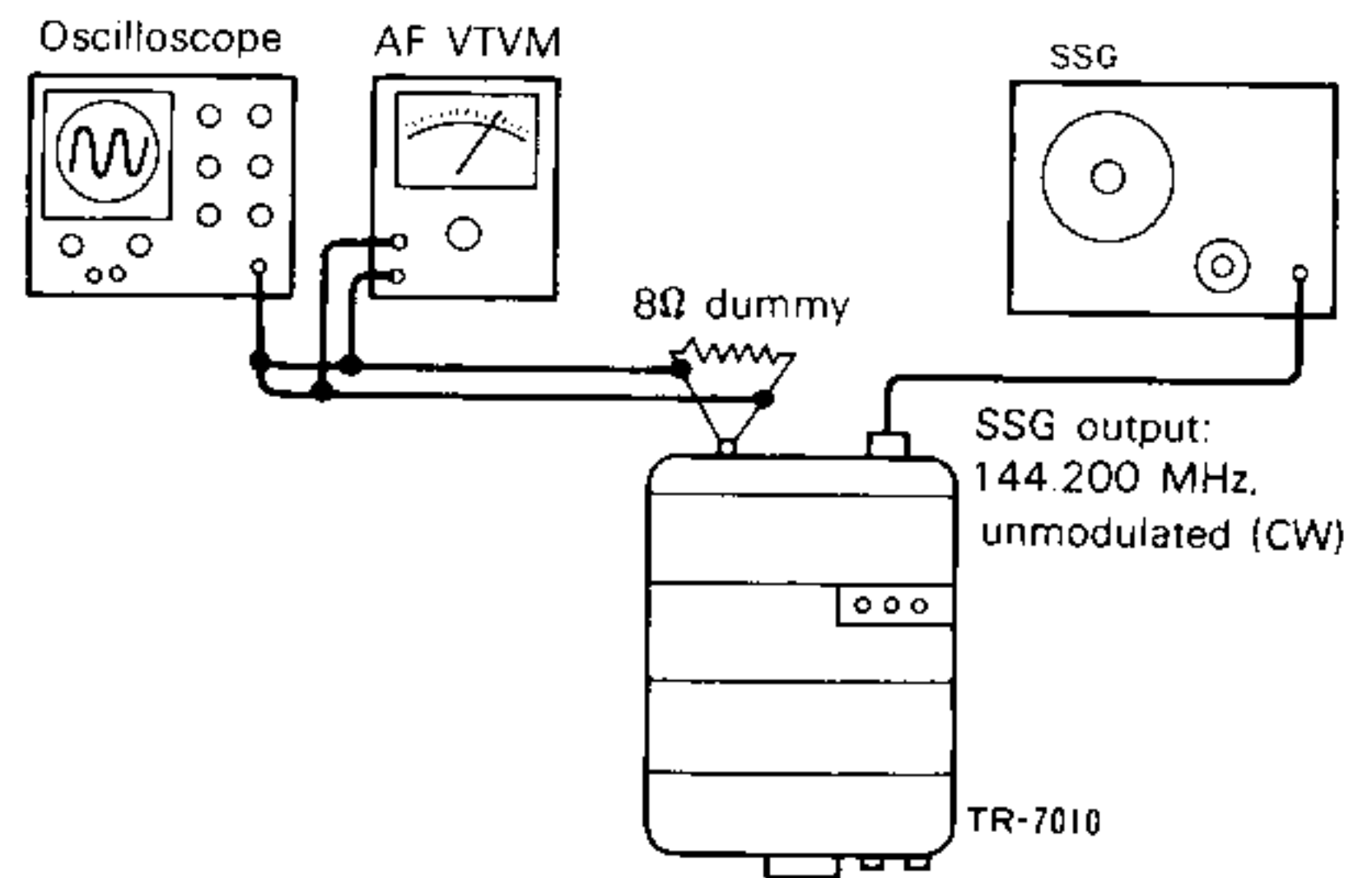


FIG. 16 RECEIVE SENSITIVITY ADJUSTMENT

## 16. "0" Point Setting of S Meter

### A. Setting positions of knobs on panel

- Receiving mode.
- Channel indicator: "00"
- BAND switch: 144.2MHz
- RF GAIN volume: Fully clockwise (MAX)
- VFO-SYNTHESIZER selector switch: SYNTHESIZER position
- Antenna terminal: Unconnected
- Others: Any position

### B. Adjustment

- (1) Adjust VR2 on the RX unit (Fig. 15) until the S meter indicates the exact "0" position.

**NOTE:** Be sure to set VR2 at the point where the S meter deflects to the "0" position. It should be noted that the meter will not deflect in the "minus" direction even when VR2 is turned further after it has reached the "0" position.

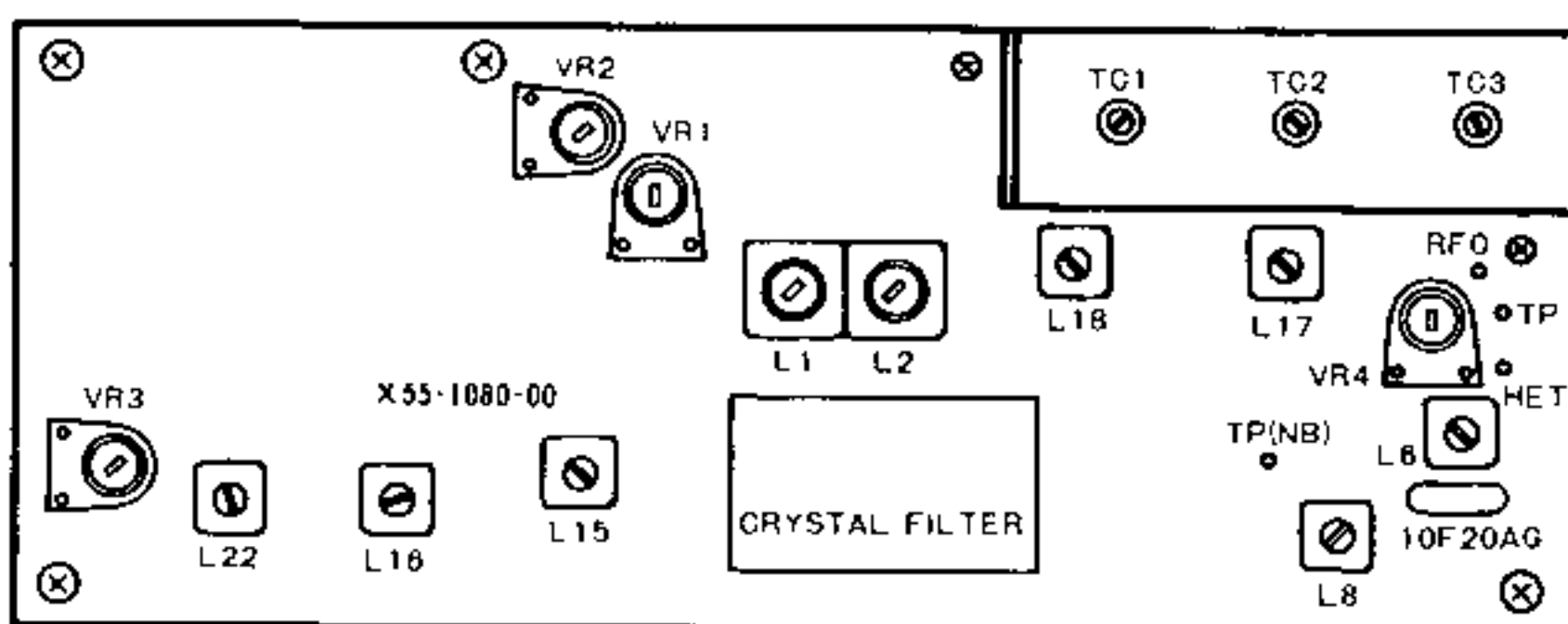


FIG. 15 RX UNIT

## 17. Adjustment of Receiving Sensitivity

### A. Setting positions of knobs on panel

Same as the item 16 above.

### B. Adjustment

- (1) Connect the measuring instruments as shown in Fig. 16.

- (2) Using the input from SSG, tune in to about 144.200MHz and fine adjust VXO volume so that AF signal of about 1,000Hz is obtained on the oscilloscope.
- (3) Slowly decrease the input from SSG and obtain a maximum reading on AF VTVM by adjusting L1 → L2 → TC3 → L6 → L8 → L15 → L16 → L22 on the RX unit (Fig. 15). This adjustment should be repeated several times.
- (4) With the SSG input set to the minimum sensitivity (0dB), precisely adjust TC3 for maximum reading on AF VTVM.

## 18. NB Adjustment

Remaining the condition of the item 17.

### A. Adjustment without synchroscope

- (1) Connect a voltmeter (or tester) to the TP terminal on the RX unit (Fig. 17). Set the SSG input to 20 ~ 30dB and then adjust L17 and L18 for minimum reading on the voltmeter. During the adjustment, the AF waveform should be about 1,000Hz.
- (2) Connect the noise generator to the ANT terminal and fine adjust L17 until the noise waveform on the oscilloscope becomes minimum.

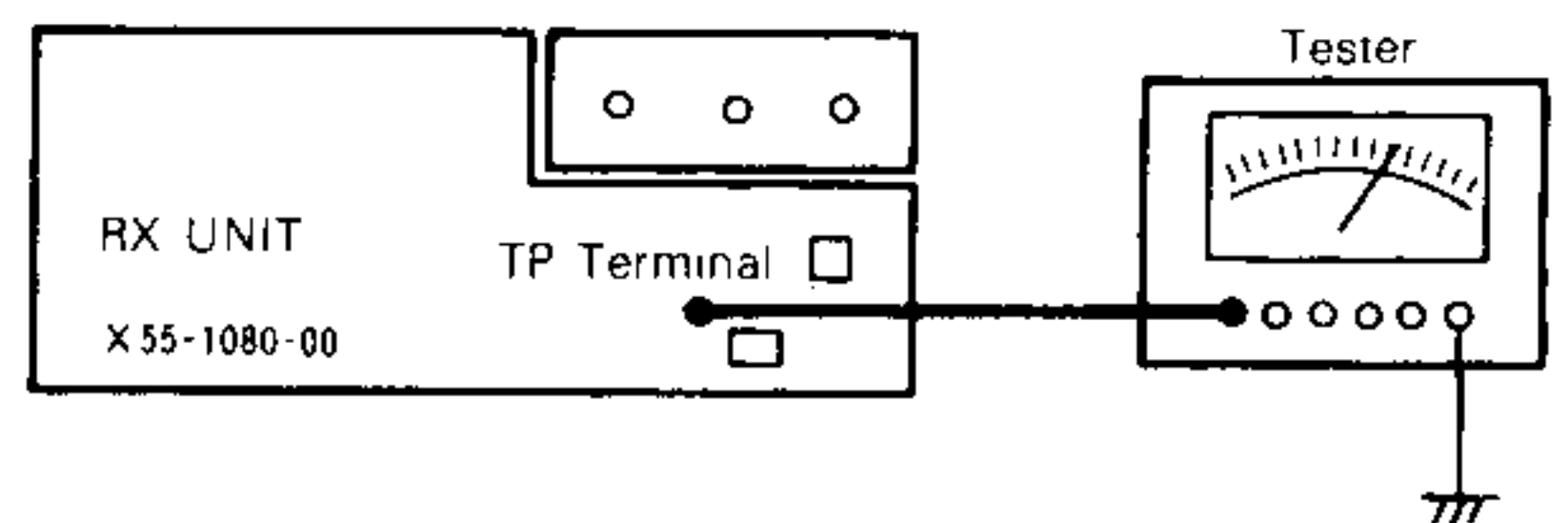


FIG. 17 NB ADJUSTMENT

# CHANNEL INSTALLATION

## INSTALLATION OF OPTIONAL CHANNEL

### 1. Installation

The unit employs the frequency synthesized system, permitting installations of 8 additional channels; it is provided with 2 crystal sockets for installations so that each crystal covers 4 additional channels.

- \* The frequency of any additional channel can be selected in the range of 144.0 ~ 145.0MHz. Use the following equation to obtain a crystal oscillating frequency:

$$Xf = (fd - 135,800.0) \text{ kHz}$$

Where Xf: Crystal oscillating frequency (kHz)  
fd: Additional channel wanted frequency (kHz)

Because of the synthesized system, the relation between the indications on the dial and the frequencies are:

| Channel Indication | Frequency  |
|--------------------|------------|
| A                  | fd kHz     |
| B                  | fd + 5kHz  |
| C                  | fd + 10kHz |
| D                  | fd + 15kHz |

**NOTE:** Each crystal operates at the corresponding position of the BAND selector switch. For example, if a crystal is plugged into the "A" socket, it operates only at the "144.1MHz" position of the switch and does not operate at "144.2MHz" position.

Example: For installation of 144.050MHz channel

Use 8.250MHz crystal (for TR-7010) because the crystal oscillating frequency is  $144.050 - 135.8 = 8.250\text{MHz}$ .

Practically, the following channels can be additionally installed:

- |               |   |
|---------------|---|
| A: 144.050MHz | } Frequency related to wanted frequency |
| B: 144.055MHz |   |
| C: 144.060MHz |   |
| D: 144.065MHz |   |

### 2. Installing the Crystal

Remove the upper lid of the case fixed with 2 screws. Then, insert the crystal of desired channel into the crystal socket on the printed circuit board (Fig. 18).

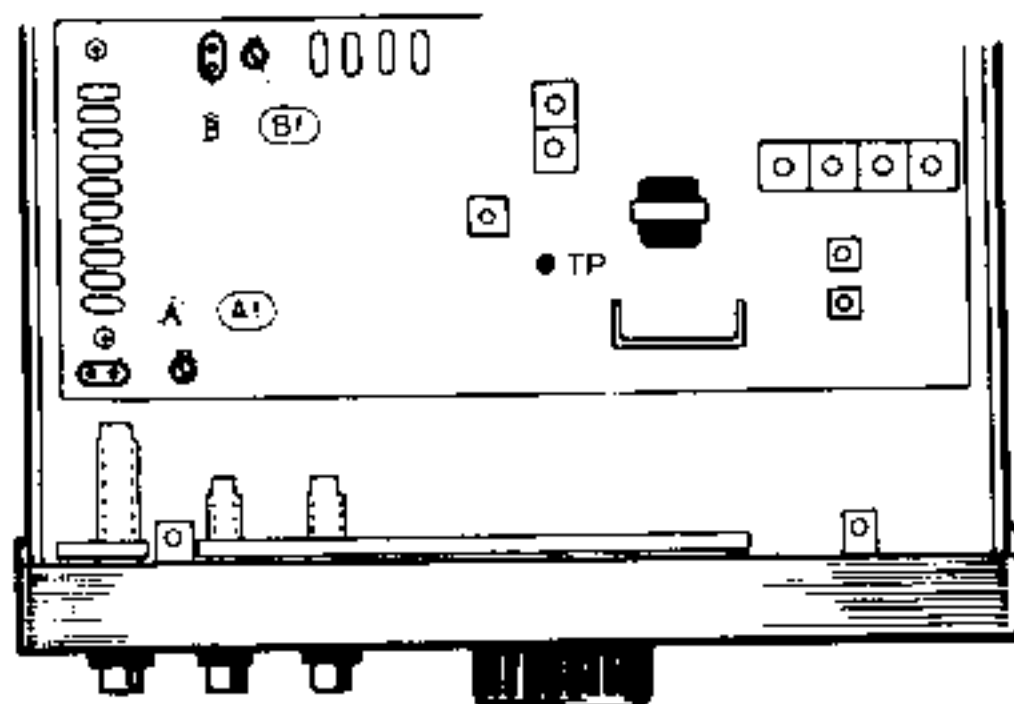


FIG. 18 INSTALLATION OF OPTIONAL CRYSTALS

- (A): Crystal socket for "144.1MHz" position of BAND switch.
  - (A1): Trimmer to adjust oscillation frequency of crystal in "(A)" socket.
  - B: Crystal socket for "144.2MHz" position of BAND switch.
  - (B1): Trimmer to adjust oscillation frequency of crystal in "(B)" socket.
- Note: The trimmers other than "(A1)" and "(B1)" are factory adjusted and require no further attention.

### 3. Frequency Adjustment

#### A. Setting positions of knobs on panel

- Receiving
- RIT volume: 12 hour (center) position
- RIT switch: ON
- VFO-SYNTHESIZER selector switch on the rear side: SYNTHESIZER position
- Channel indicator: "A"
- BAND switch: Set to the position corresponding to the additional channel crystal.

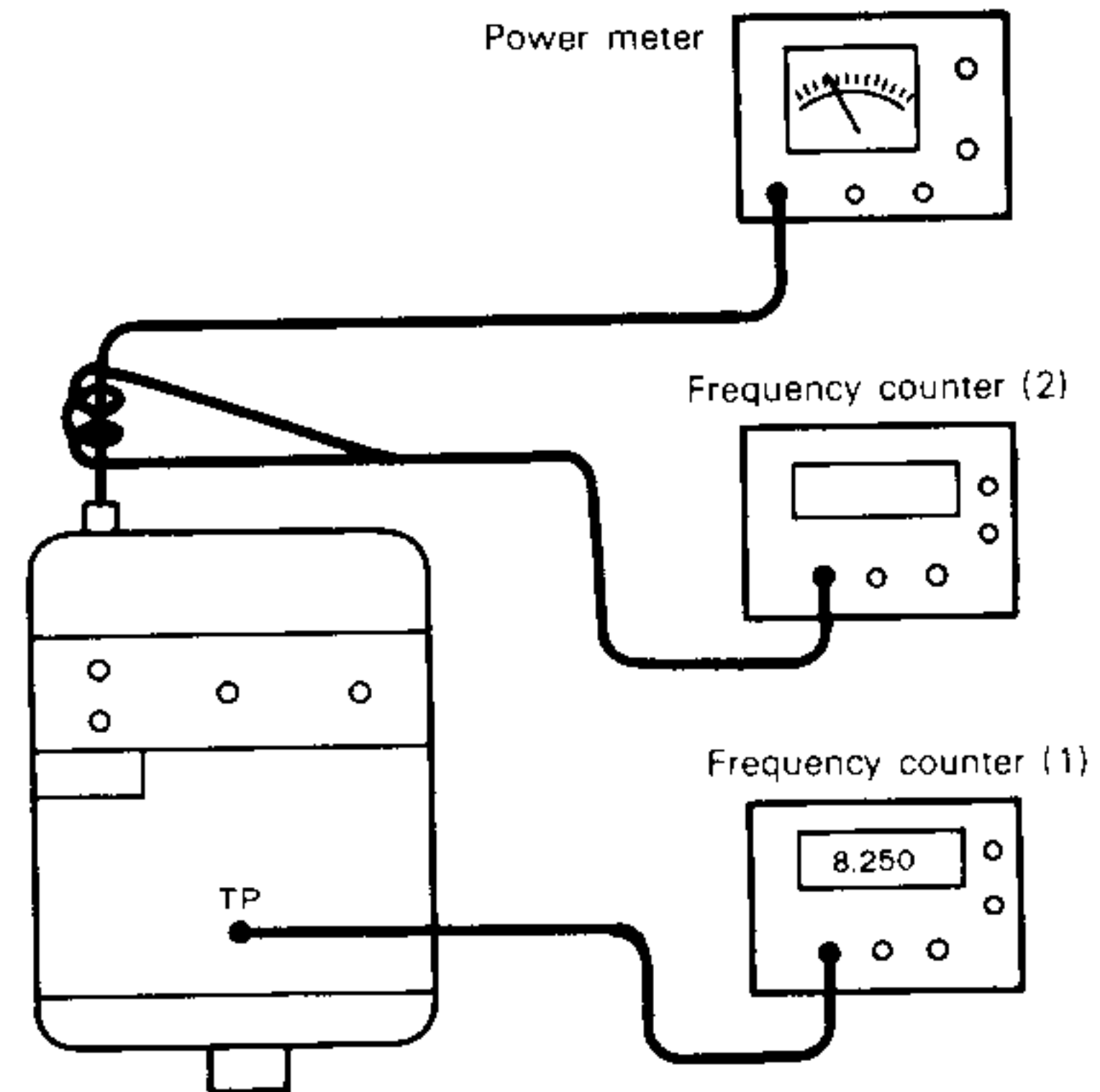


FIG. 19 FREQUENCY ADJUSTMENT

#### B. Adjustment

- (1) Connect the frequency counter (1) to the TP terminal and the power meter to the ANT terminal (see Fig. 18 and Fig. 19).
- (2) Perform adjustment on the bands of additional channels by referring to Table 3 below.
- (3) Connect the frequency counter to the point (2) and set the unit in CW transmit mode. Change the position of the channel indicator from A to B, C and D to check that the frequency increases by 5kHz at each position.

| Band  | Channel Indicator | Adjusting Frequency                          | Adjusting Trimmer (Fig. 18) |
|-------|-------------------|--|-----------------------------|
| 144.1 | A                 | Frequency (Xf) of additional channel crystal | A1                          |
| 144.2 | A                 | Same as above                                | B1                          |

TABLE 3

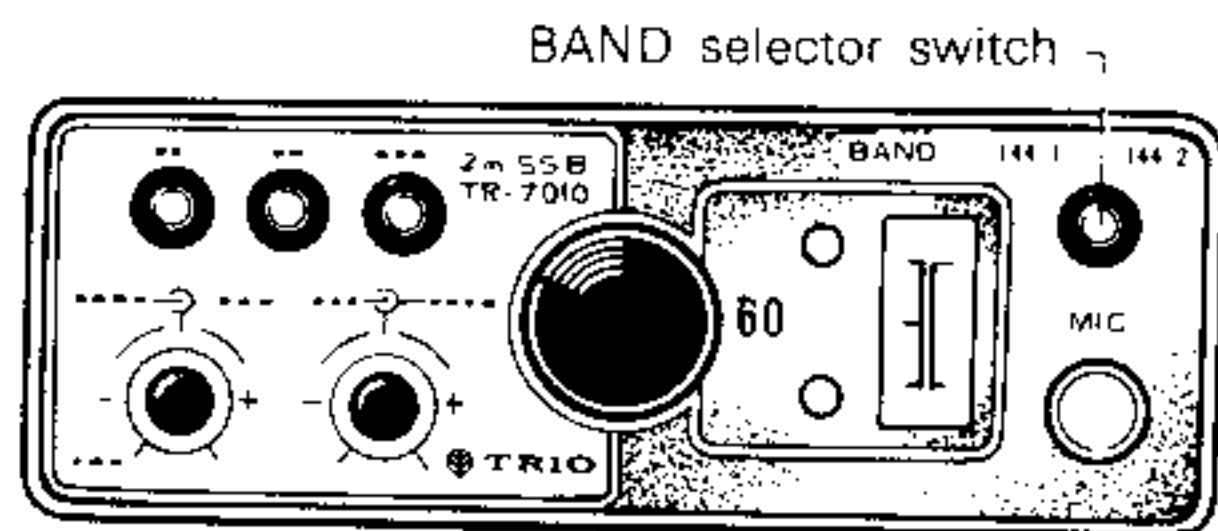
# REFERENCE

## REFERENCE

### 1. Dial Indication and Reading

The figure shown on the dial represents the last 2 numbers of the operating frequency. By using the BAND selector switch, the frequency band can be changed quickly to 144.1MHz or 144.2MHz (quick QSY).

The frequency reading is illustrated in Fig. 20.



Frequency indicated is:

- ① Setting of BAND switch → 144.160MHz
- ② Setting of BAND switch → 144.260MHz

**NOTE:** The frequency differs from 144.60MHz of FM unit.

FIG. 20 FREQUENCY READING

### 2. Power Cord Connection

When connecting the power cord, be sure that the polarity of the cord and plug is correct (Fig. 21).

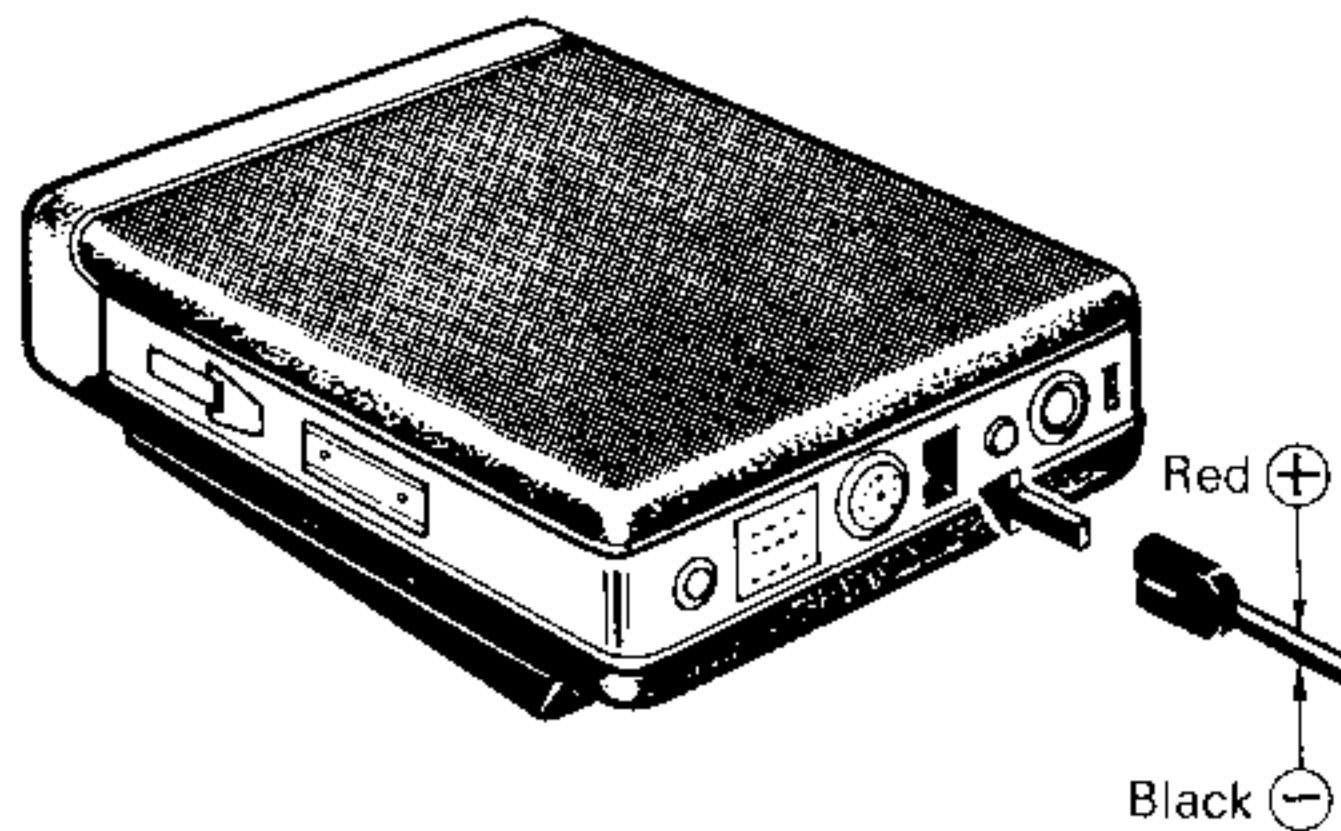


FIG. 21 POWER CORD CONNECTION

### 3. Key Connection

A miniature single-pin plug is supplied with the unit. Connect the plug to the key as shown in Fig. 22.

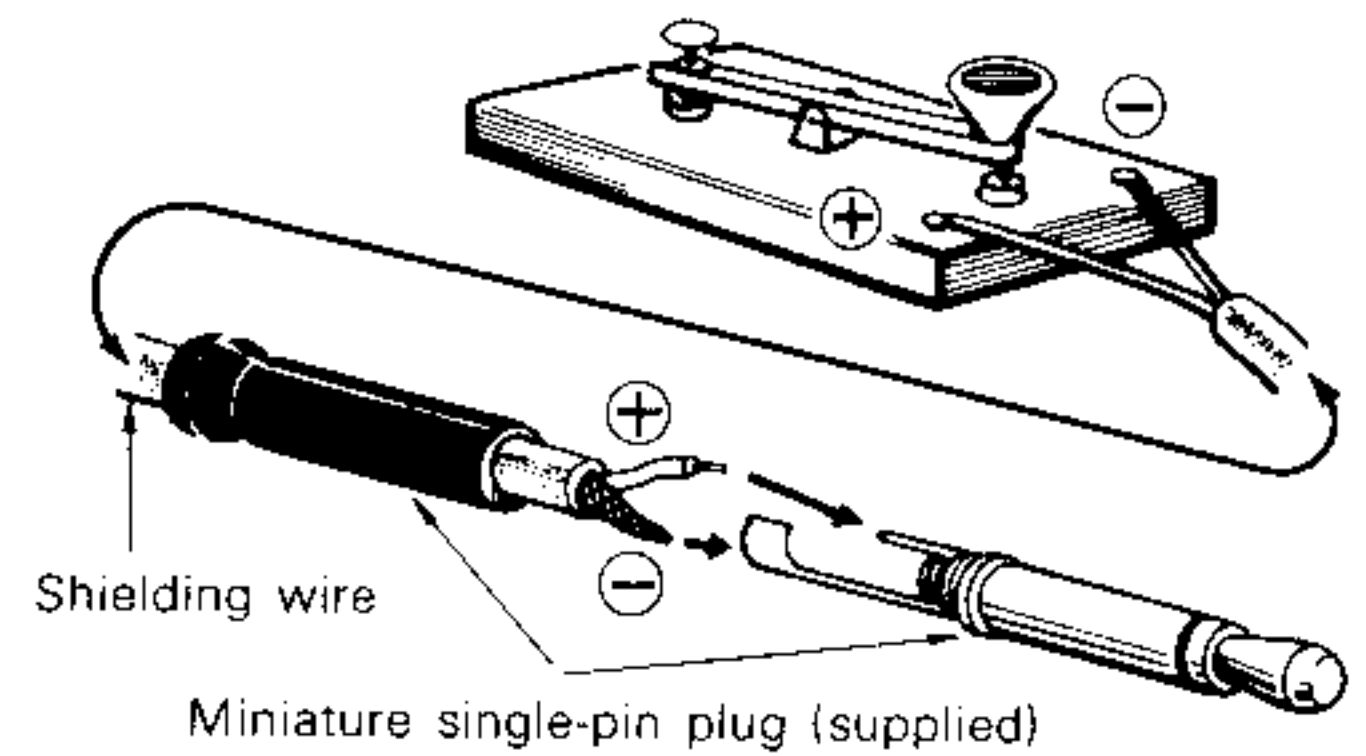


FIG. 22 KEY CONNECTION

### 4. AUX Terminal

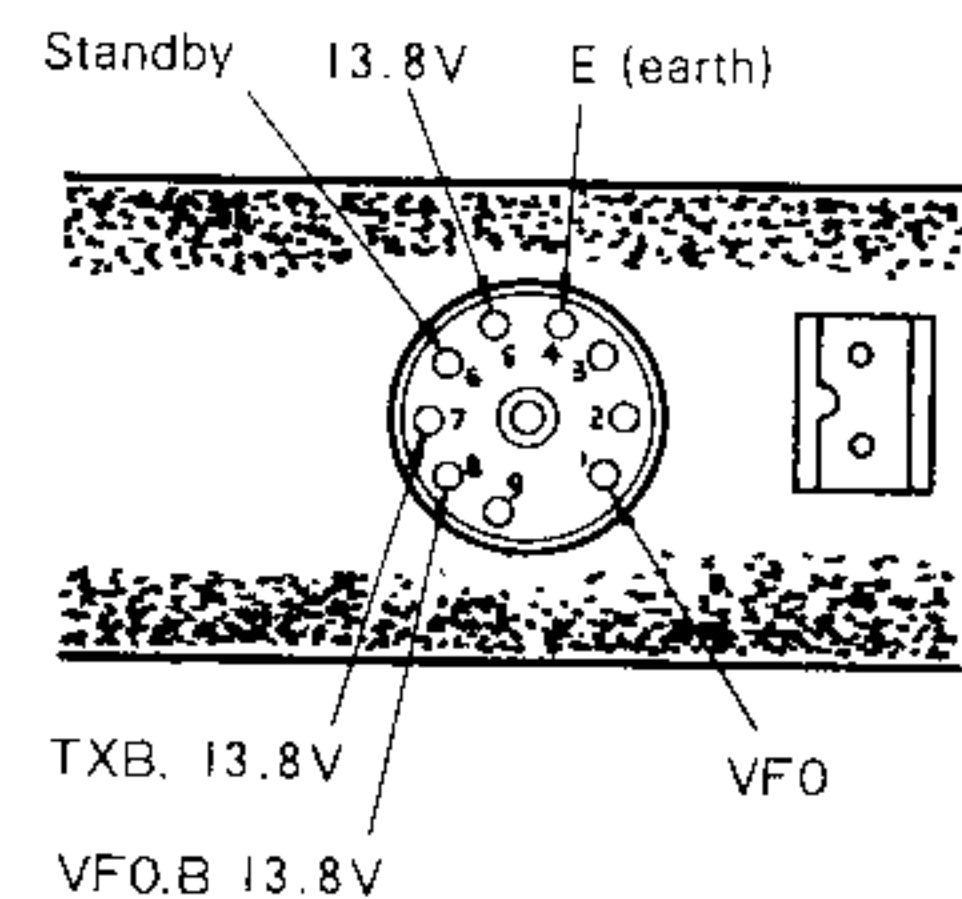


FIG. 23 AUX TERMINAL (VIEWED FROM THE REAR OF SET)

### 5. Connection of Microphone Connector

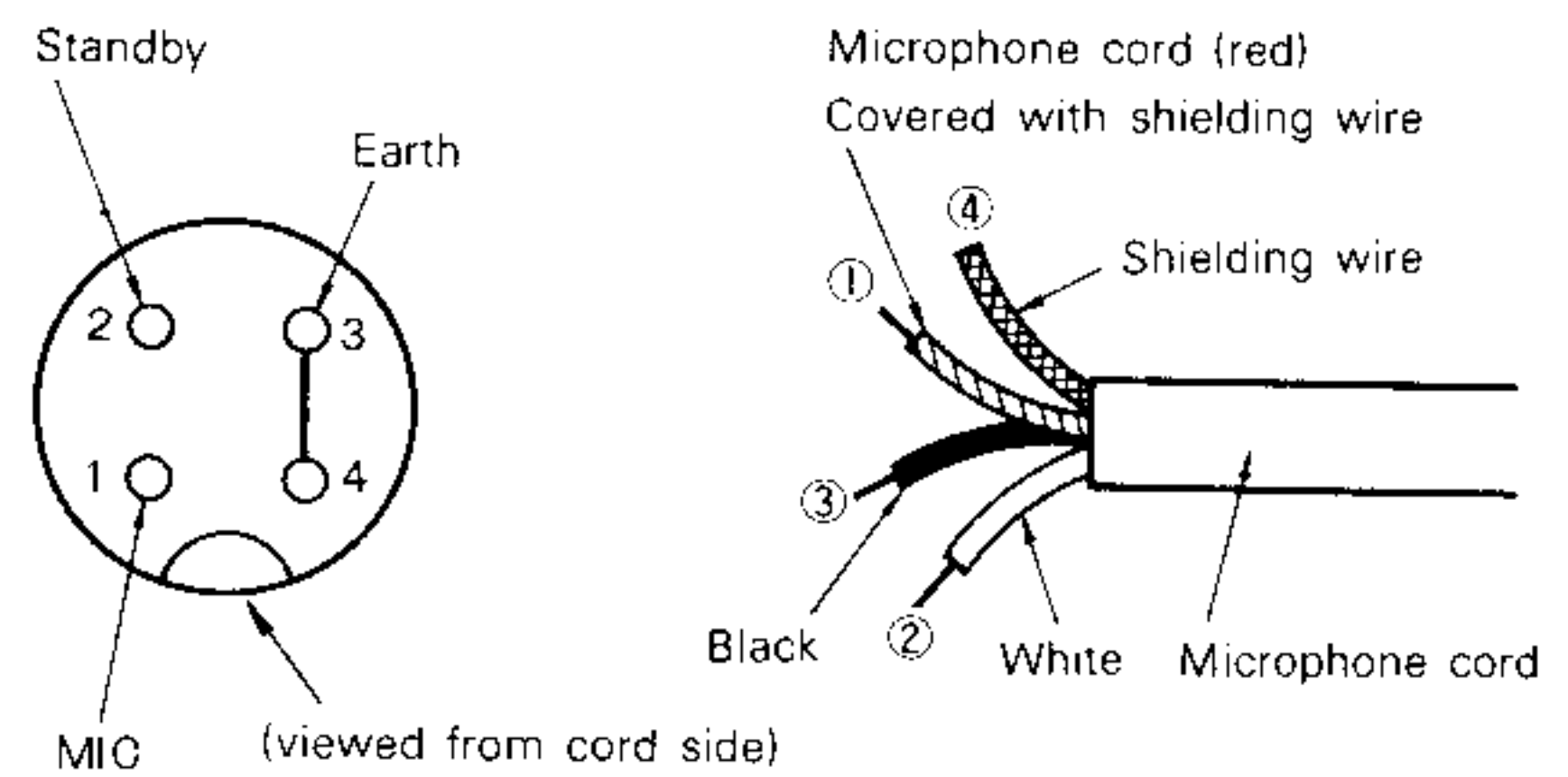
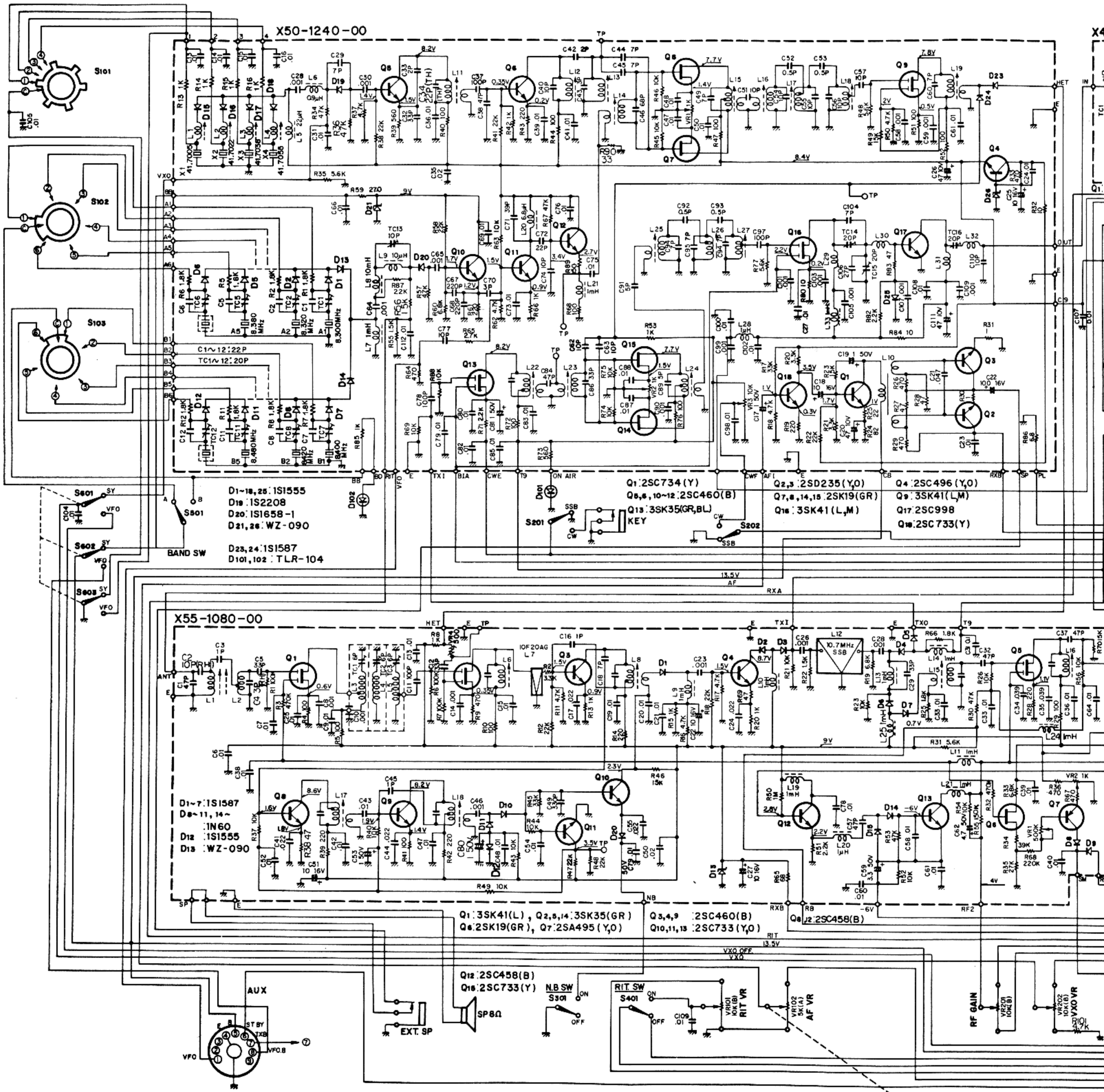
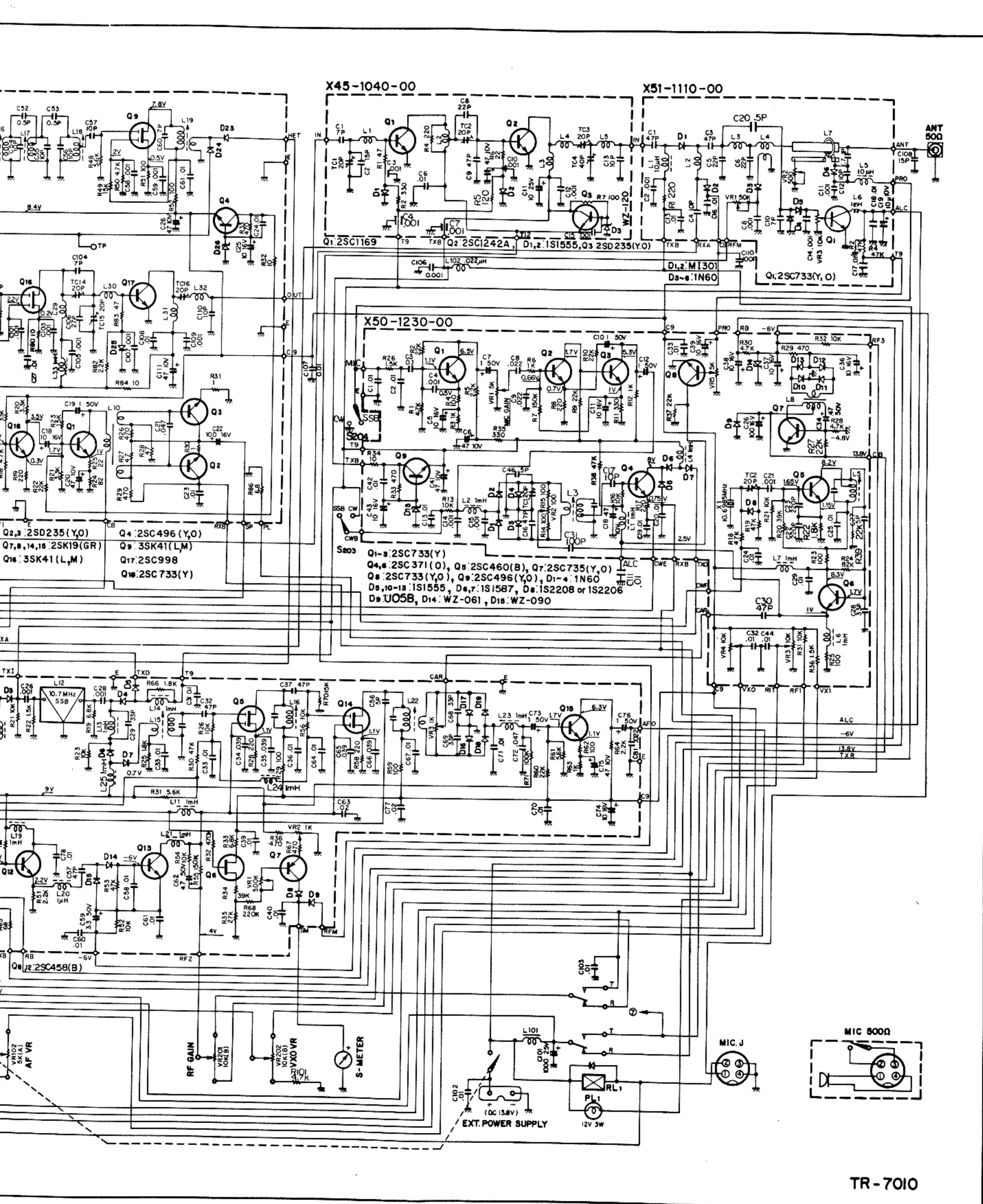


FIG. 24 CONNECTION OF MICROPHONE CONNECTOR

# SCHEMATIC DIAGRAM



# SCHEMATIC DIAGRAM



- 2SC460B
- 2SC458
- 2SC371
- 2SC373
- 2SC388A
- 2SC733
- 2SC734
- 2SC735
- 2SA495
- 2SC998
- 2SA671
- 2SC1061
- 2SD235
- 2SK19
- 2SK30
- 3SK22
- 3SK35
- TA-7045
- MFC4060A
- TA7061AP
- 2N5641
- 2N5642