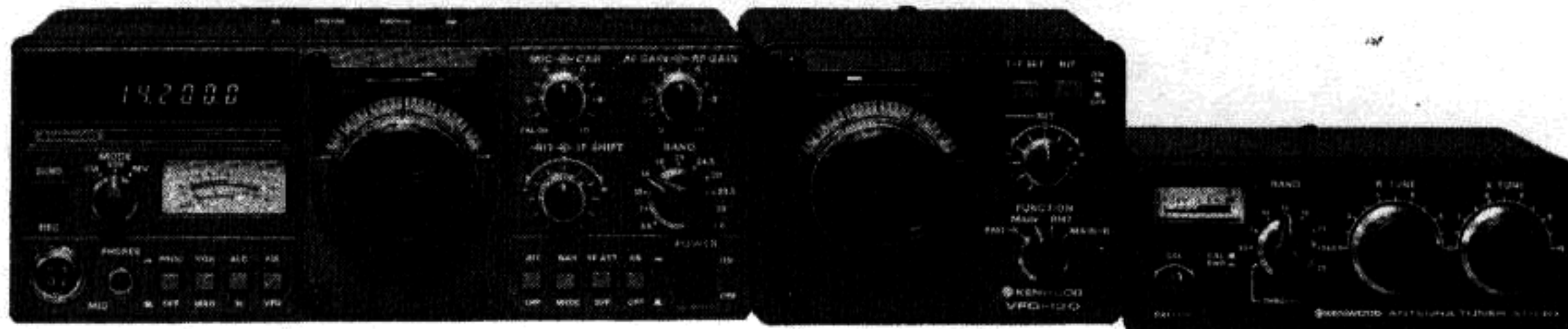




# SERVICE MANUAL

## TS-130S,V/VFO-120/AT-130

### HF SSB TRANSCEIVER



TS-130 S

VFO-120

AT-130

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## SPECIFICATIONS

### [GENERAL]

|                  |                |  |
|------------------|----------------|--|
| Frequency Range: | 80 meter band  | 3.5 ~ 4.0 MHz                              |
|                  | 40 meter band  | 7.0 ~ 7.3 MHz                              |
|                  | *30 meter band | 10.1 ~ 10.15 MHz (10.0 MHz Receiving only) |
|                  | 20 meter band  | 14.0 ~ 14.35 MHz                           |
|                  | *17 meter band | 18.068 ~ 18.168 MHz                        |
|                  | 15 meter band  | 21.0 ~ 21.45 MHz                           |
|                  | *12 meter band | 24.89 ~ 24.99 MHz                          |
|                  | 10 meter band  | 28.0 ~ 29.7 MHz                            |
| Mode:            | SSB/CW         |  |

### Power Requirement:

| TS-130S           | TS-130V           |
|-------------------|-------------------|
| RX: 0.7A 13.8V DC | RX: 0.7A 13.8V DC |
| TX: 18A 13.8V DC  | TX: 4A 13.8V DC   |

### Dimensions:

| TS-130S  | TS-130V   |
|--|---|
| 241 (9.6) W x 94 (3.8) H x<br>293 (11.7) D mm (inch) | 241 (9.6) W x 94 (3.8) H x<br>235 (9.4) D mm (inch) |

### Weight:

| TS-130S           | TS-130V           |
|-------------------|-------------------|
| 5.6 kg (12.4 lbs) | 4.9 kg (10.8 lbs) |

### [TRANSMITTER]

#### Final Power Input:

| TS-130S  | TS-130V  |
|--|--|
| 80 - 15 meter band<br>200 W PEP for SSB operation<br>160 W DC for CW operation | 25W PEP for SSB operation<br>20W DC for CW operation |
| 10 meter band<br>160 W PEP for SSB operation<br>140 W DC for CW operation      | 25W PEP for SSB operation<br>20W DC for CW operation |

|                        |   |
|------------------------|---|
| Audio Input Impedance: | 500Ω ~ 50 kΩ  |
| RF Output Impedance:   | 50Ω   |
| Frequency Stability:   | Within ± 1 kHz during the first hour after 1 minute of warmup<br>Within 100 Hz during any 30-minute period after warmup |
| Carrier Suppression:   | Better than 40 dB   |
| Sideband Suppression:  | Better than 50 dB   |
| Spurious Radiation:    | Better than 40 dB   |
| Harmonic Radiation:    | Better than 40 dB   |

### [RECEIVER]

|                         |  |
|-------------------------|--|
| Receiver Sensitivity:   | 0.25μV at 10 dB S + N/N  |
| Image Ratio:            | Better than 50 dB  |
| IF Rejection:           | Better than 70 dB  |
| Receiver Selectivity:   | 2.4 kHz (-6 dB), 4.2 kHz (-60 dB)                              |
| SSB/CW WIDE             | 1.8 kHz (-6 dB), 3.3 kHz (-60 dB) with optional YK-88SN filter |
| SSB NARROW              | 500 Hz (-6 dB), 1.5 kHz (-60 dB) with optional YK-88C filter   |
| CW NARROW               | 270 Hz (-6 dB), 1.1 kHz (-60 dB) with optional YK-88CN filter  |
| Audio Output Impedance: | 4 ~ 16Ω  |
| Audio Output:           | 1.5 W  |

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

\* Will transmit on the new 30, 17, and 12 meter bands. Diodes installed for preventing accidental transmission before government amateur authorization.

## CIRCUIT DESCRIPTION

Features added from former TS-120S<sub>V</sub> are as follows;

1. The three new HF bands (receive only).

| Band | Receive frequency |
|------|-------------------|
| 10   | 10.0~10.25MHz     |
| 18   | 18.0~18.5MHz      |
| 24.5 | 24.5~25.0MHz      |

(Note) Receives WWV on 10MHz.

2. 20dB RF attenuator

3. 2-position selectivity (receive only).

1) Optional filters available.

| Optional filter           | -6dB bandwidth |
|---------------------------|----------------|
| YK-88SN SSB narrow filter | 1.8kHz         |
| YK-88C CW filter          | 500Hz          |
| YK-88CN CW narrow filter  | 270Hz          |

(Note) YK-88S (-6 dB bandwidth:2.4kHz) is installed at the factory.

2) -6dB bandwidth with various optional filters.

| No. | MODE<br>Filter                        | CW     |                   | SSB    |        |
|-----|---------------------------------------|--------|-------------------|--------|--------|
|     |                                       | WIDE   | NARROW            | WIDE   | NARROW |
| 1)  | YK-88S only<br>(installed at factory) | 2.4kHz | *                 | 2.4kHz | *      |
| 2)  | YK-88C or<br>YK-88CN                  | 2.4kHz | 500Hz or<br>270Hz | 2.4kHz | *      |
| 3)  | YK-88SN                               | 2.4kHz | 1.8kHz            | 2.4kHz | 1.8kHz |
| 4)  | YK-88C or<br>YK-88CN,<br>YK-88SN      | 2.4kHz | 500Hz or<br>270Hz | 2.4kHz | 1.8kHz |

(Note) 1. \*: No receive.

2. Jumper wire on the IF unit should be changed in No. 2 and No.4 Position.

3. YK-88S is always used in transmit.

5. AGC-type speech processor

| Item                       | Rating                                  |
|----------------------------|---|
| Center frequency fo        | 8830kHz                                 |
| Center frequency deviation | 8830kHz ±150Hz at 6dB                   |
| 6dB bandwidth              | ±900Hz or more                          |
| 60dB bandwidth             | ±1800Hz or less                         |
| Guaranteed attenuation     | 80dB or more within fo ±2.5kHz to ±1MHz |
| Ripple                     | 2dB or less                             |
| Loss                       | 3dB ±2dB                                |
| Input and output impedance | 600Ω/15pF                               |

Table 1. SSB crystal filter (L71-0220-05)  
YK-88SN (Option)

| Item                       | Rating                                |
|----------------------------|---------------------------------------|
| Center frequency fo        | 8830.7kHz                             |
| Center frequency deviation | fo ±150Hz at 6dB                      |
| 6dB bandwidth              | ±250Hz or more                        |
| 60dB bandwidth             | ±900Hz or less                        |
| Ripple                     | 2dB or less                           |
| Loss                       | 6dB ±2dB                              |
| Guaranteed attenuation     | 80dB or more within fo ±2kHz to ±1MHz |
| Input and output impedance | 600Ω/15pF                             |

Table 2. CW crystal filter (L71-0211-05)  
YK-88C (Option)

| Item                       | Rating                                |
|----------------------------|---------------------------------------|
| Center frequency fo        | 8830.7kHz                             |
| Center frequency deviation | fo ±50Hz at 6dB                       |
| 6dB bandwidth              | ±125Hz or more                        |
| 60dB bandwidth             | ±600Hz or less                        |
| Ripple                     | 2dB or less                           |
| Loss                       | 8dB ±2dB                              |
| Guaranteed attenuation     | 80dB or more within fo ±2kHz to ±1MHz |
| Input and output impedance | 600Ω/15pF                             |

Table 3. CW crystal filter (L71-0221-05)  
YK-88CN (Option)

## CIRCUIT DESCRIPTION

### SPEECH PROCESSOR CIRCUIT (X54-1550-00)

The AGC-type speech processor is composed of Q2:μPC1158H2, Q3:2SC1815(Y) and D3:1N60.

The audio signal amplified by Q18 on the AF-GEN unit goes through diode switch D1:1S1555 to the MIC control when the processor switch is OFF. When the processor switch is ON the audio signal, which is compressed and gains talk-power by the speech processor circuit, goes through D2:1S1555 to the MIC control. Q1(V type) or Q11 (S type):2SK30A on the filter unit is cut off when the processor switch is ON to shorten the ALC time constant to increase the average RF output power.

### TS-130 FREQUENCY SYSTEM

The TS-130 employs single conversion with a unique PLL circuit, as shown in Fig.1.

The frequency system is basically that of the TS-820 with the exception of the PLL circuit.

### PLL CIRCUIT

Fig. 2 shows PLL circuit construction and Table 4 shows the frequency in each circuit.

Referring to Fig.1, MIX (3) combines CAR and VFO signals and is operated straight through to mixer (1) on 3.5, 7 and 10 MHz. MIX (2) operates at 14 MHz and above with the output of MIX (3) to provide mixer (1) input, as shown in Table 4. MIX (1) output is filtered, amplified, shaped and divided by the programmable divider to obtain 500kHz output.

| Band | RX.TX Frequency | VCO    | MIX(1) Input | MIX(1) Output | Divider | D C B A |
|------|-----------------|--------|--------------|---------------|---------|---------|
| 3.5  | 3.5             | 12.33  | 14.33        | 2.0           | 1/4     | 1 1 0 0 |
|      | ~4.0            | ~12.83 | ~14.83       |               |         |         |
| 7    | 7.0             | 15.83  | 14.33        | 1.5           | 1/3     | 1 1 0 1 |
|      | ~7.5            | ~16.33 | ~14.83       |               |         |         |
| 10   | 10.0            | 18.83  | 14.33        | 4.5           | 1/9     | 0 1 1 1 |
|      | ~10.5           | ~19.33 | ~14.83       |               |         |         |
| 14   | 14.0            | 22.83  | 24.33        | 1.5           | 1/3     | 1 1 0 1 |
|      | ~14.5           | ~23.33 | ~24.83       |               |         |         |
| 18   | 18.0            | 26.83  | 24.33        | 2.5           | 1/5     | 1 0 1 1 |
|      | ~18.5           | ~27.33 | ~24.83       |               |         |         |
| 21   | 21.0            | 29.83  | 34.33        | 4.5           | 1/9     | 0 1 1 1 |
|      | ~21.5           | ~30.33 | ~34.83       |               |         |         |
| 24.5 | 24.5            | 33.33  | 34.33        | 1             | 1/2     | 1 1 1 0 |
|      | ~25.0           | ~33.83 | ~34.83       |               |         |         |
| 28   | 28.0            | 36.83  | 34.33        | 2.5           | 1/5     | 1 0 1 1 |
|      | ~28.5           | ~37.33 | ~34.83       |               |         |         |
| 28.5 | 28.5            | 37.33  | 34.33        | 3.0           | 1/6     | 1 0 1 0 |
|      | ~29.0           | ~37.83 | ~34.83       |               |         |         |
| 29   | 29.0            | 37.83  | 34.33        | 3.5           | 1/7     | 1 0 0 1 |
|      | ~29.5           | ~38.33 | ~34.83       |               |         |         |
| 29.5 | 29.5            | 38.33  | 34.33        | 4.0           | 1/8     | 1 0 0 0 |
|      | ~30.0           | ~38.83 | ~34.83       |               |         |         |

Table 4. The frequency chart

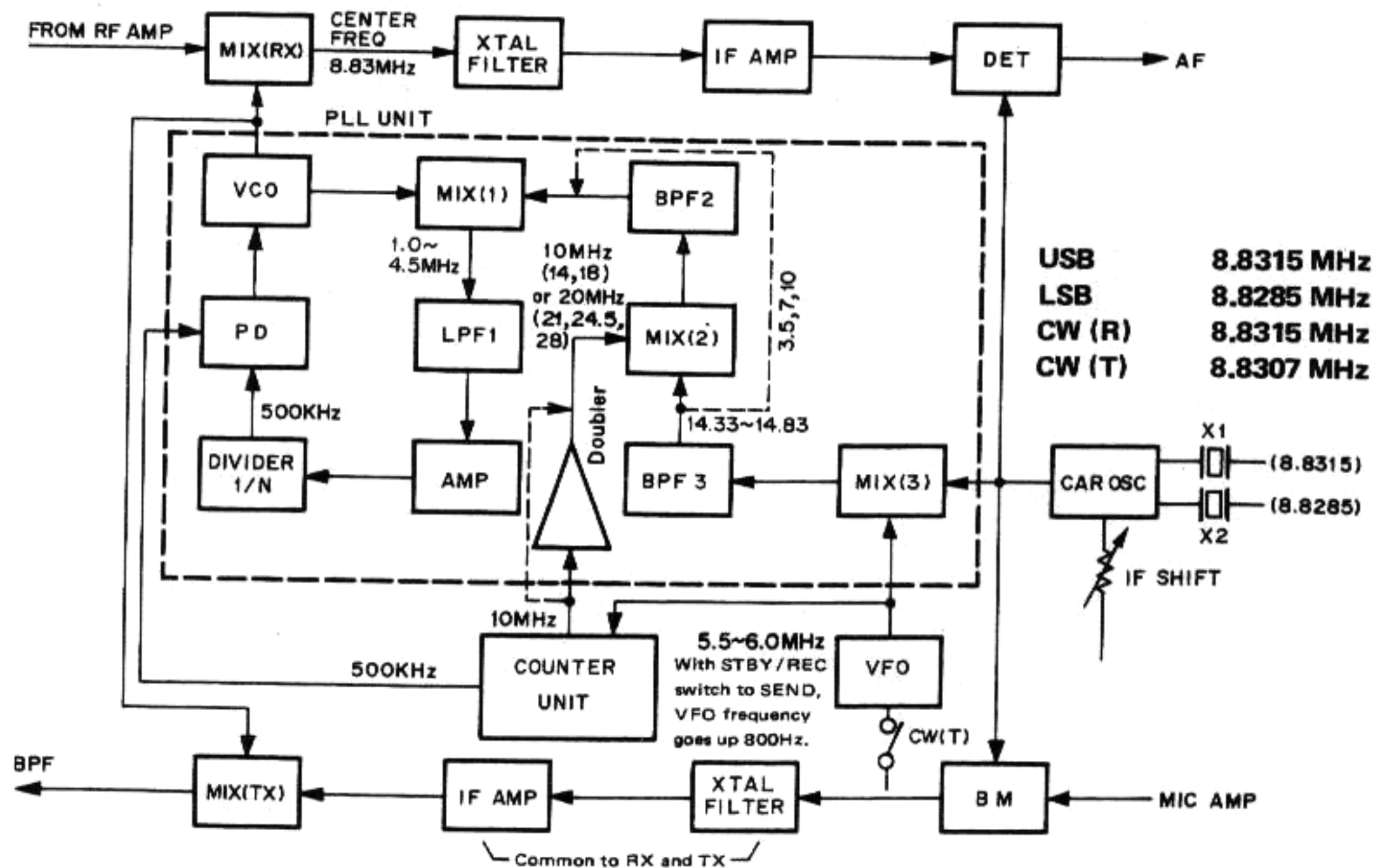


Fig. 1 TS-130 Frequency configuration

# CIRCUIT DESCRIPTION

The programmable divider converts the information from the band switch into a BCD signal in the counter. By presetting, the signal is divided at the ratio shown in Table 4. The phase comparator is a Motorola MC4044P. The loop filter amplifier, component transistors, minimizes unwanted spurious signal. If output of the phase comparator unlocks for any reason, VCO output is switched off to prevent out of band emission and, simultaneously the digital display blanks

## CAR OSCILLATOR

The CAR oscillator contains one oscillator and two crystals for LSB, USB and CW operation. The oscillator frequency in each mode is listed in Fig. 1. Oscillator frequency can be varied by the IF SHIFT control during reception.

## VFO OSCILLATOR

The TS-130 VFO has same circuit and gear ass'y as the VFO-830. An LED indicator for VFO and FIX operation has been added.

## DIGITAL COUNTER

The TS-130 digital counter employs a VFO frequency counting system as shown in Fig.3.

The VFO frequency is mixed with a 5MHz signal obtained from the reference oscillator chain by a 3SK73 (Q7) and is converted to a 0.5MHz to 1MHz signal. This signal passes through the LPF, is amplified, buffered and shaped into a square wave, passes through the 0.1 second gate circuit and is applied to the 7-digit counter. The signal is counted from 10Hz to 10MHz.

The 100kHz, 1MHz and 10MHz order digits are preset by diode matrix operating on bandswitch information.

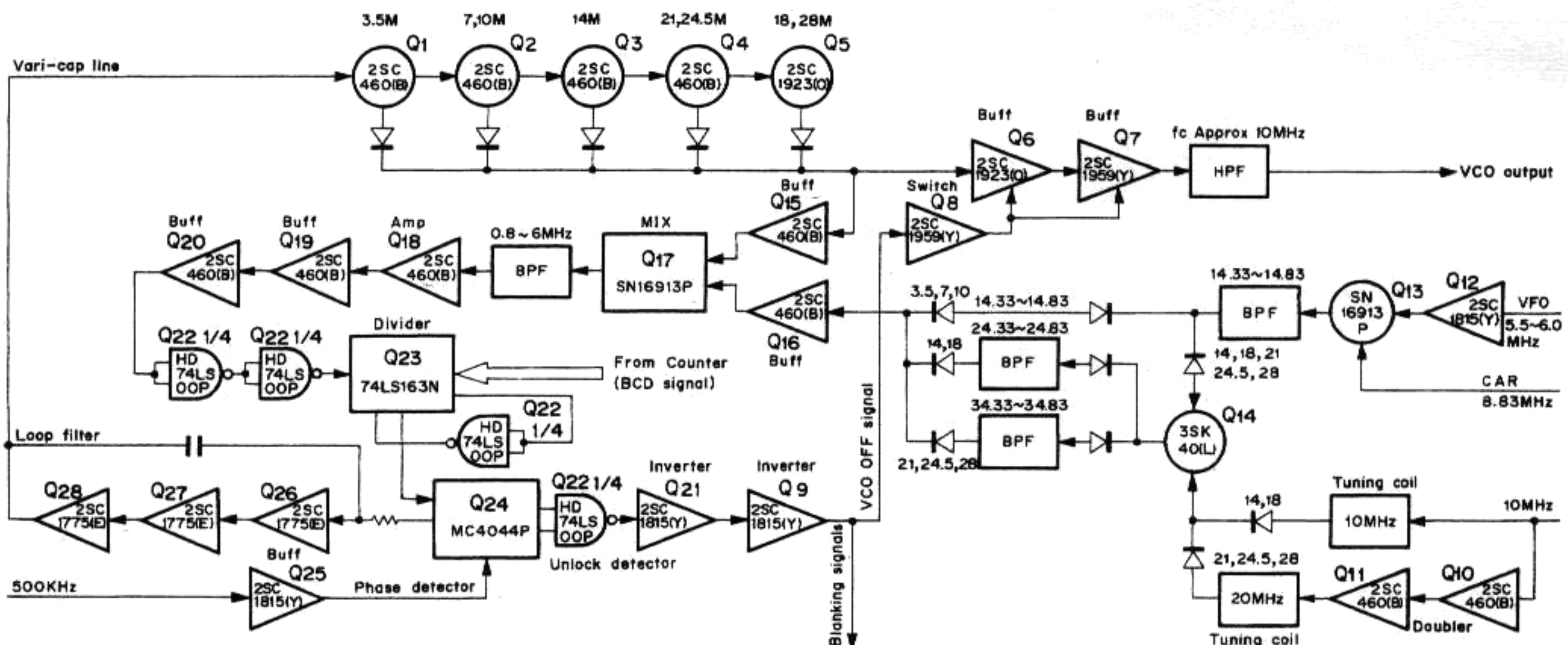


Fig. 2 TS-130 PLL circuit configuration

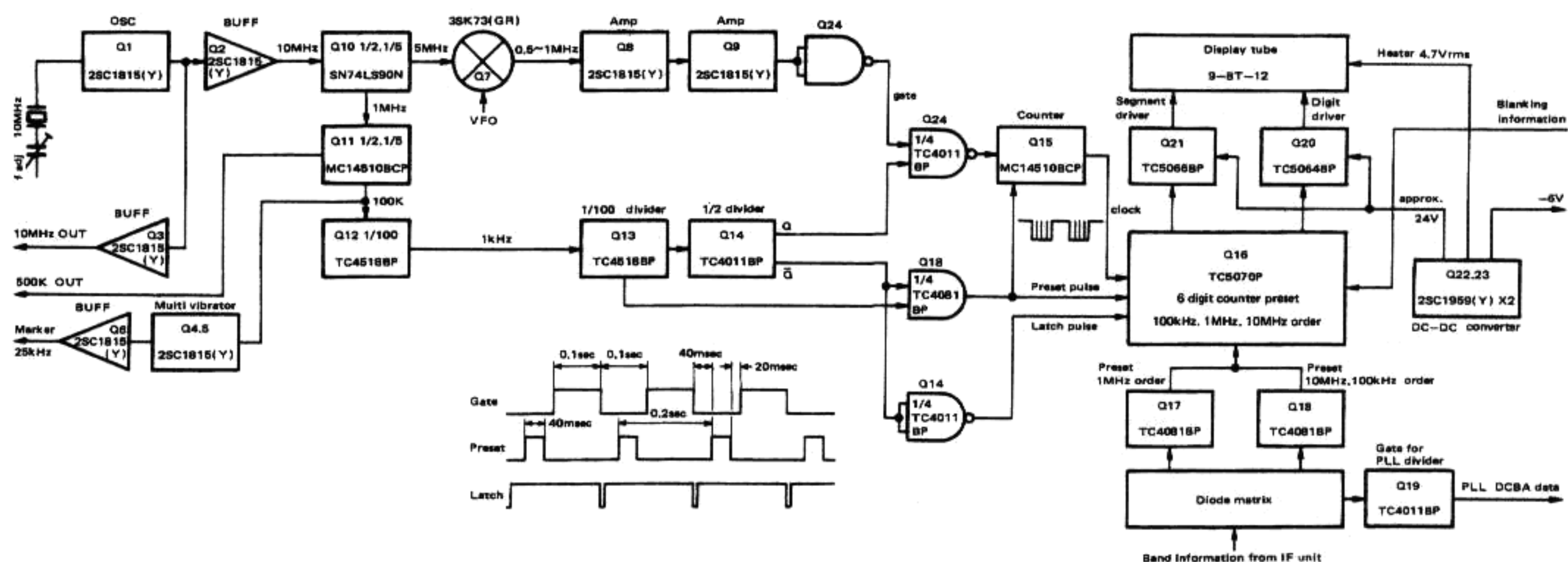


Fig. 3 TS-130 Counter unit block diagram

## CIRCUIT DESCRIPTION/SPECIAL COMPONENTS DATA

The 10MHz signal from the time-base reference oscillator is divided to produce gate, latch, and reset pulses which are fed to the counter. The 10 MHz and 500kHz signals are fed to the PLL circuit.

The marker circuit produces a 100kHz signal which synchronizes the 25kHz multivibrator to obtain a marker signal as accurate as the reference frequency. The analog dial can be accurately calibrated to the marker signal.

The 1/10 division at the first-stage count-down chain uses low-power Schottky TTL, while the remaining divisions are made by a CMOS IC for low power consumption and minimum spurious emission.

Because of the IF SHIFT circuit, the CAR frequency is independent of the transmit/receive frequency. Once the VFO frequency is counted, the operating frequency is indicated as accurately as the 10 MHz reference oscillator frequency is calibrated to WWV. Operating frequency is indicated accurate to the 100Hz order, regardless of the band or mode.

### PROTECTION CIRCUIT

When the transmit output load varies, the toroid in the final circuit samples reflected power. It is then rectified and amplified, producing a protection voltage to control the 2SK19 (Q12) on the AF-GEN unit, so transmitter output is continuously reduced.

### FILTER UNIT

#### 1. ALC: Protection circuit (VSWR)

The protection voltage picked up by L18 (S type), L11 (V type) in the filter unit is amplified by Q1 (S type), Q2 (V type) (2SC1815), then applied to the ALC line to control the output voltage.

#### 2. Fan drive circuit (S type)

The output of the thermistor TH3 detecting the temperature of the final unit is applied to Q6 (2SA562) via Q7 and Q8, so that Q6 is switched to operate the fan. The fan starts to rotate at about 45°C although the operating range shown in specification is 30~60°C. It stops when the temperature drops to a level 5~15°C lower than the start temperature. This circuit operates regardless of transmission or reception because it detects the temperature of the heat sink.

#### 3. AVR circuit

The 11V AVR consists of Q4, Q5 and Q6 (V type), Q4, Q5 and Q10 (S type). The regulated voltage is supplied to every unit except for the fan drive circuit during transmission. The fan drive circuit is always supplied with the regulated voltage regardless of transmission or reception.

#### 4. Filter circuit

The filter is a 2-stage constant K filter (3-stage for 3.5 MHz band). When the processor switch is ON Q1 (V type) or Q11 (S type) is cut off to shorten the ALC time constant.

### FINAL UNIT

#### 1. Temperature protection (S type)

##### 1. Core temperature protection

operates when the output transformer temperature exceeds 120°C. It recovers at approx. 80 to 110°C.

##### 2. Operates when the heat sink temperature exceeds 90°C. It recovers at approx. 50 to 80°C.

When either of the above protection systems operate, the RL circuit in the AF-GEN unit is turned OFF and the unit is forcibly placed in the reception mode and transmission is inhibited. The protection circuit automatically recovers when the temperature drops to the normal level (i.e., the temperature drops by about 40°C).

#### 2. Temperature detection by the fan drive circuit (S type)

The heat sink temperature is detected by the thermistor TH3 to control fan operation.

### SPECIAL COMPONENTS DATA

#### • Applications

2SC2290(V03-2290-06) HF power amplifier for S type.

NPN Epitaxial planar Si transistor

#### • Absolute maximum ratings

| Item  | Pc        | Vcbo  | Vces  | Vebo   | Ic    | Ie     | Tstg        |
|-------|-----------|-------|-------|--------|-------|--------|-------------|
| Value | 175(W)    | 45(V) | 45(V) | 4.0(V) | 20(A) | -20(A) | -65~175(°C) |
|       | (Tc=25°C) |       |       |        |       |        |             |

#### • Application

2SC2509 (V03-2509-06) HF power amplifier for S,V type.

NPN Epitaxial planar Si transistor

#### • Absolute maximum ratings

| Item  | Pc        | Vcbo  | Vces  | Vceo  | Vebo | Ic   | Ie    | Tstg        |
|-------|-----------|-------|-------|-------|------|------|-------|-------------|
| Value | 20(W)     | 40(V) | 40(V) | 18(V) | 4(V) | 5(A) | -5(A) | -55~150(°C) |
|       | (Tc=25°C) |       |       |       |      |      |       |             |

#### • Application

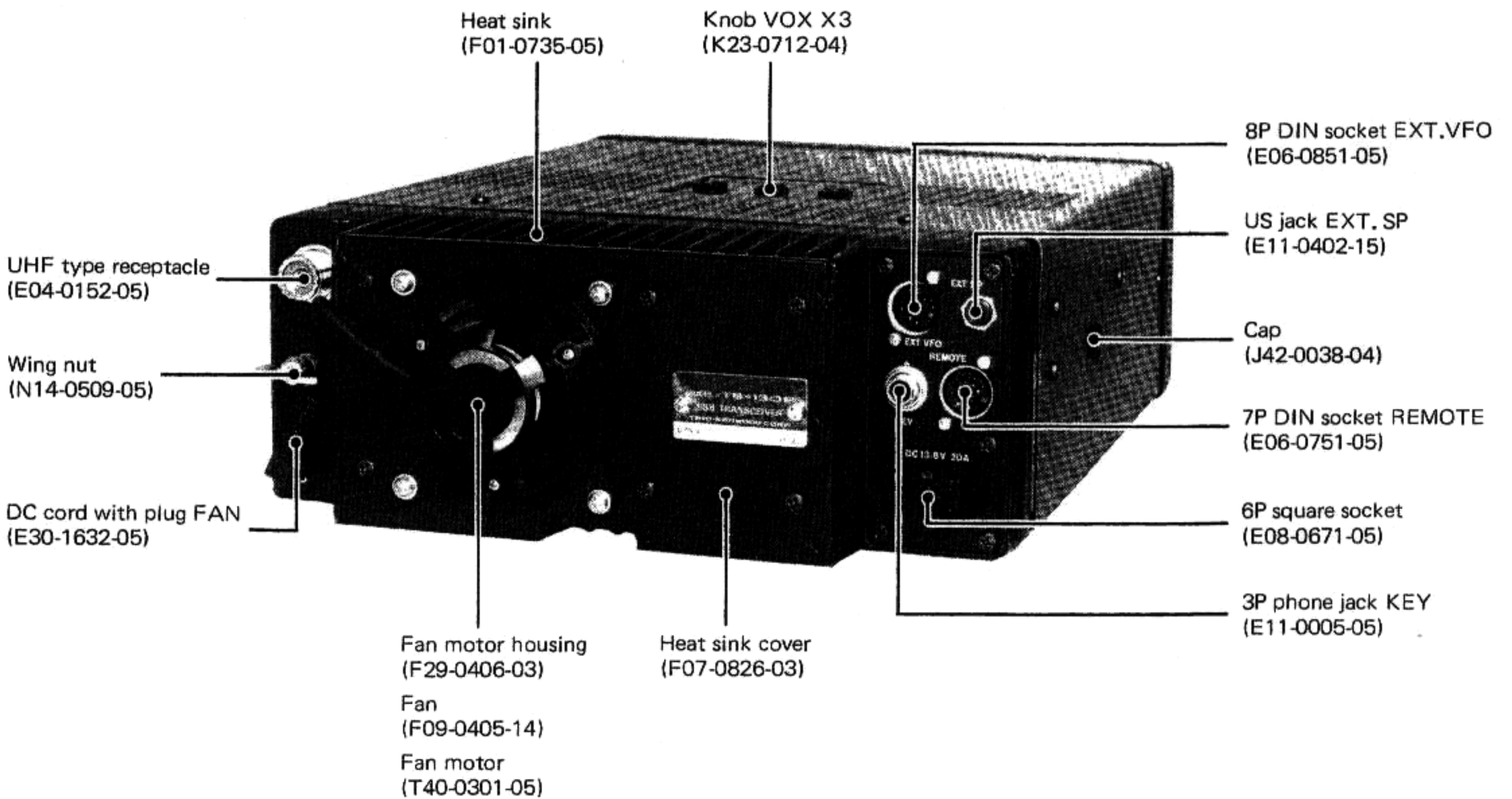
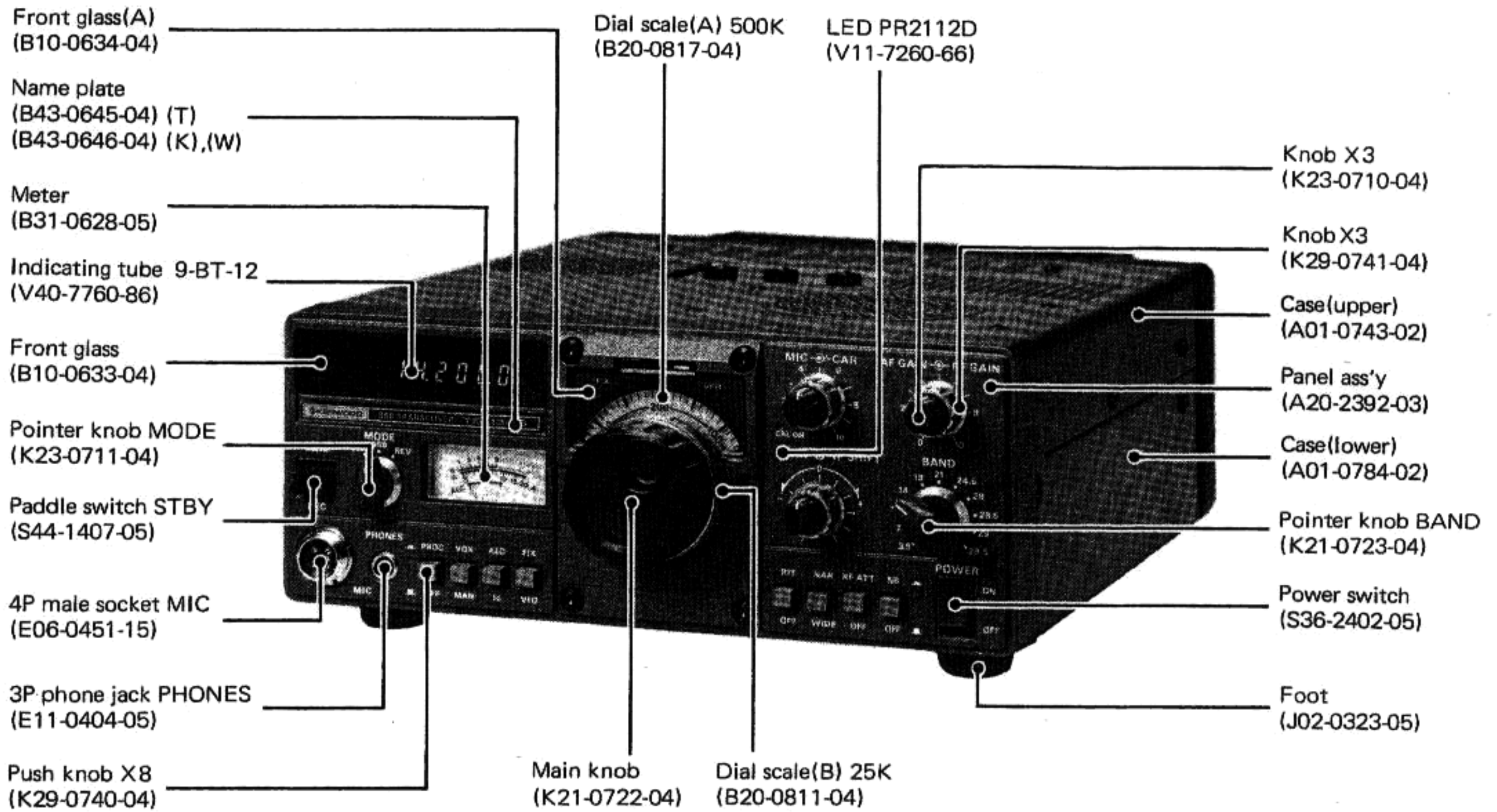
2SC2075(V03-2075-06) HF power amplifier for V type.

NPN Epitaxial planar Si transistor

#### • Absolute maximum ratings

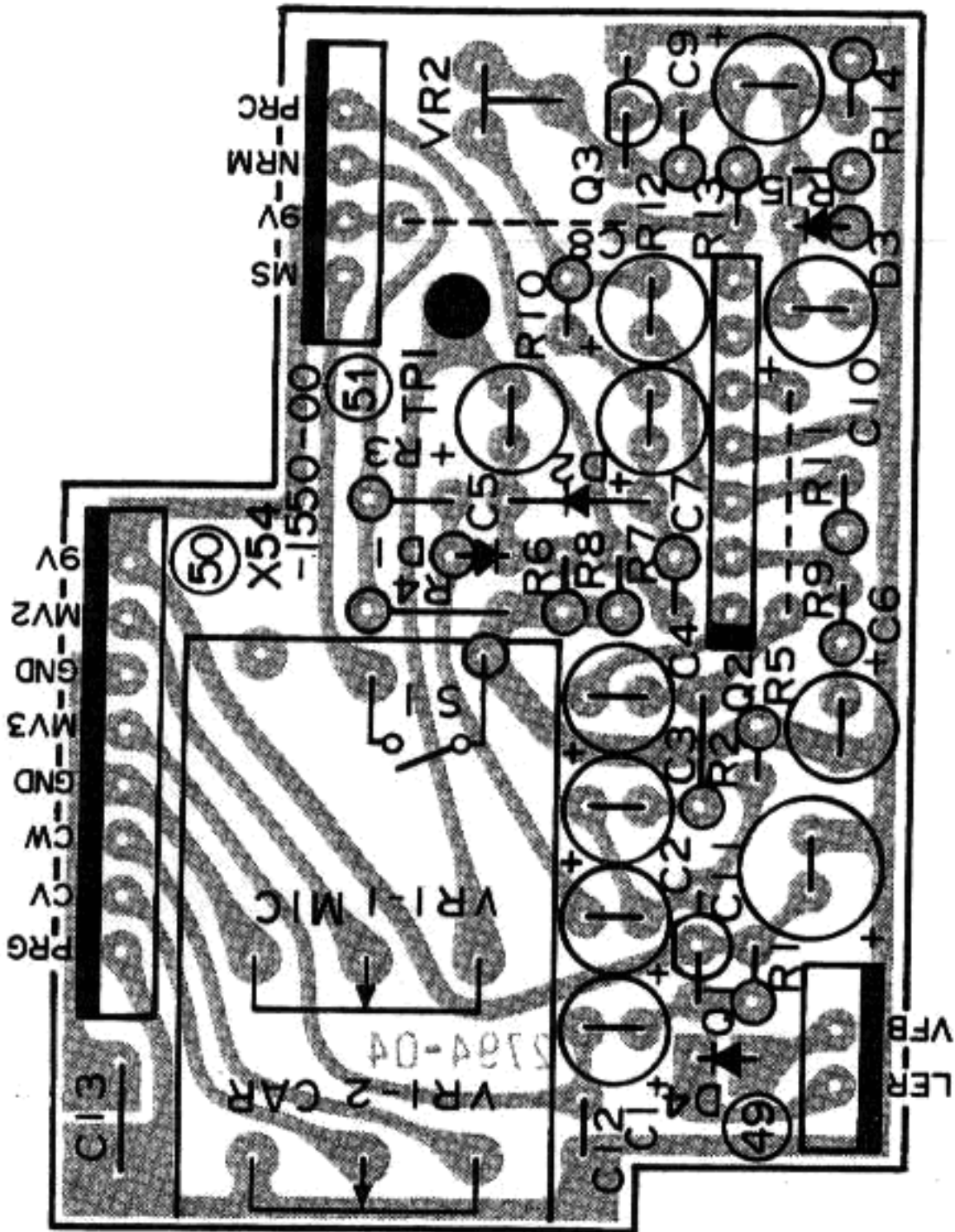
| Item  | Pc        | Vcbo  | Vcer  | Vebo   | Ic   | Ie    | Tstg        |
|-------|-----------|-------|-------|--------|------|-------|-------------|
| Value | 10(W)     | 80(V) | 80(V) | 4.0(V) | 4(A) | -4(A) | -55~150(°C) |
|       | (Tc=25°C) |       |       |        |      |       |             |

OUTSIDE VIEWS (S TYPE)



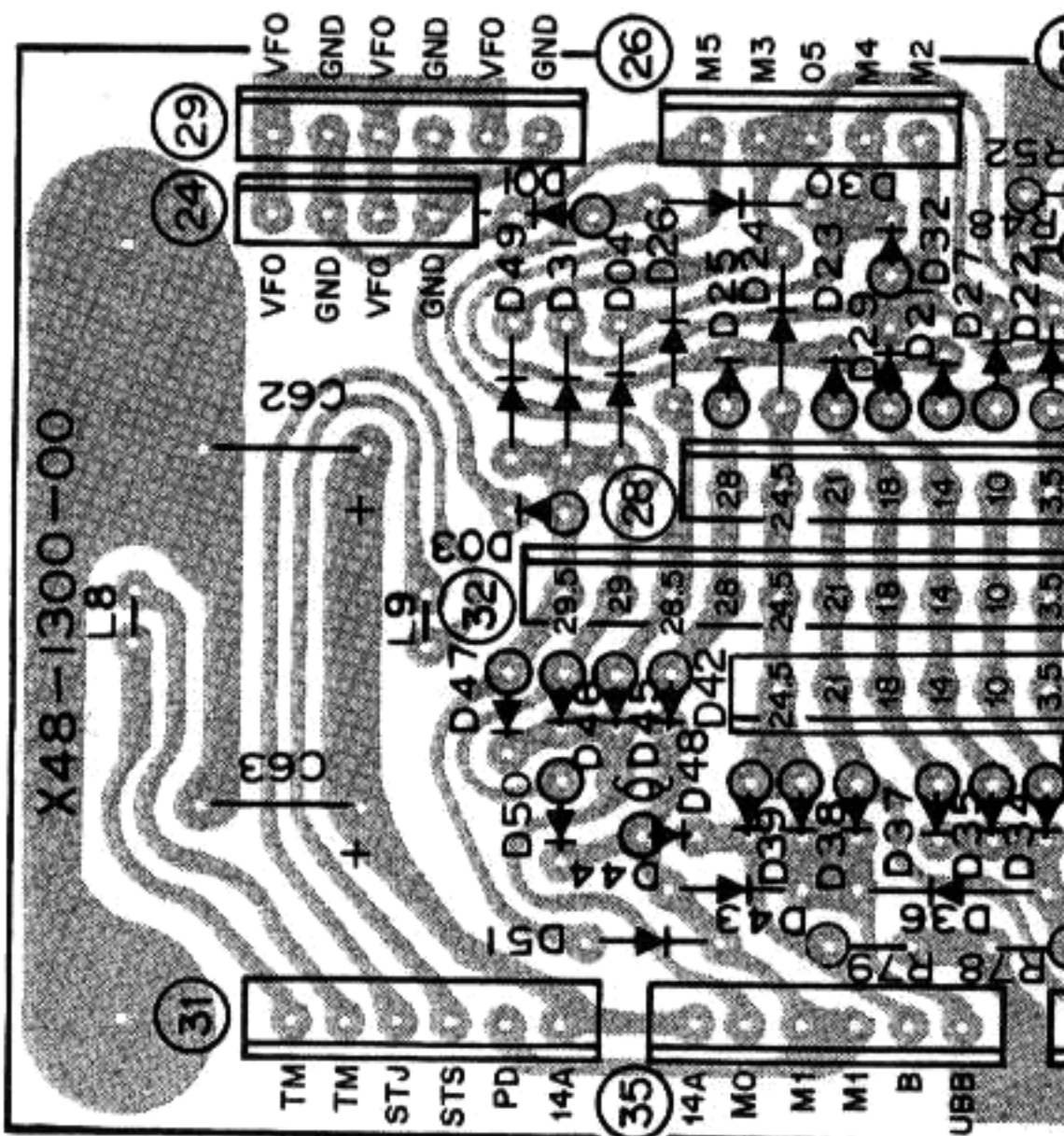
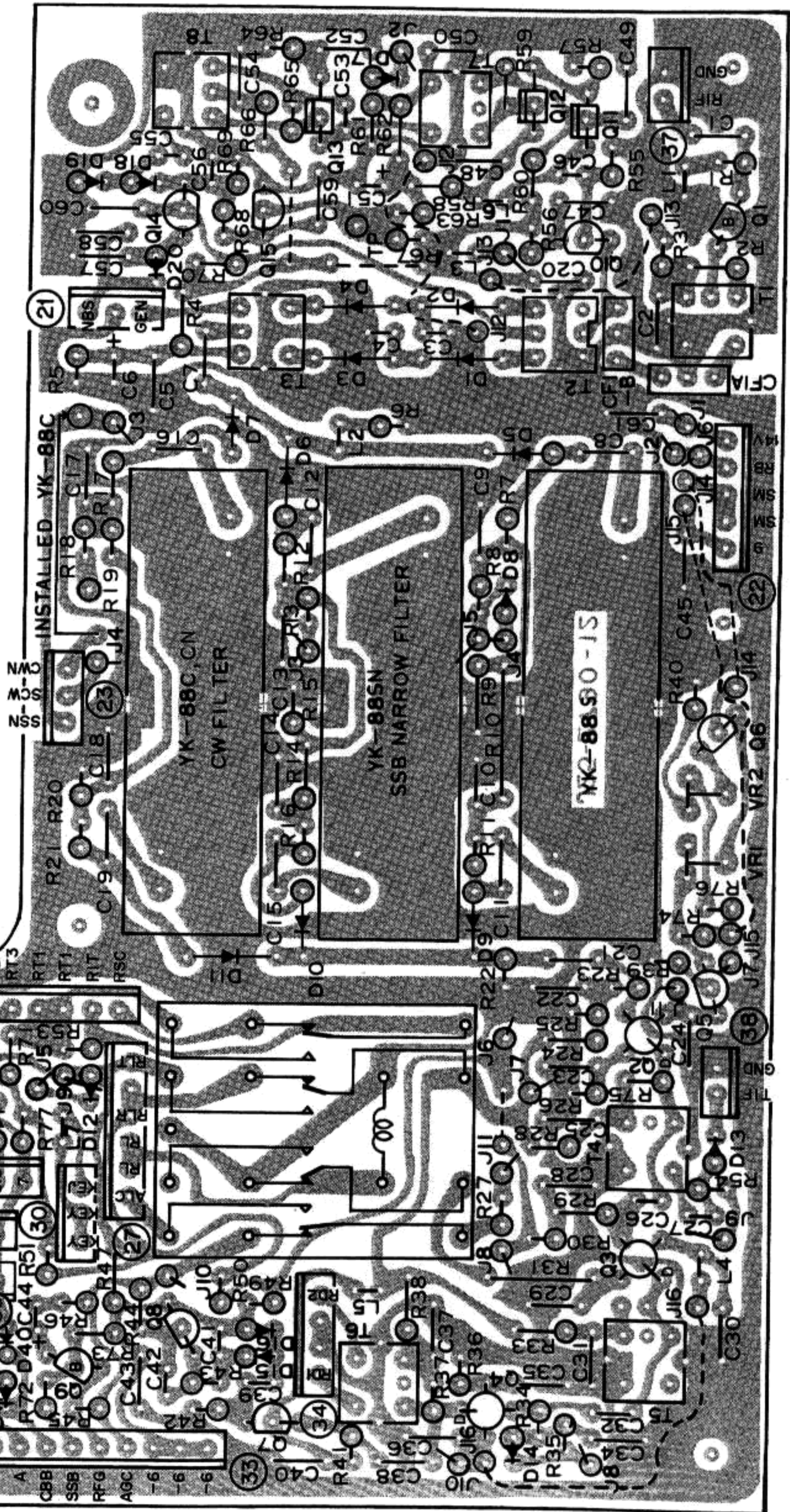
# TS-130S,V PC BOARD VIEWS

## ▼ PROCESSOR UNIT (X54-1550-00) Components side view

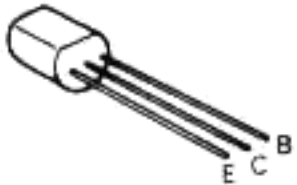


Q1,3: 2SC1815(Y) Q2:  $\mu$ PC1158H2  
D1,2: 2S1555 D3: 1N60 D4: PR2112D

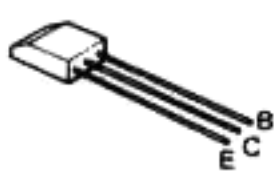
## ▼ IF UNIT (X48-1300-00,-01) 00:S,01:V Components side view



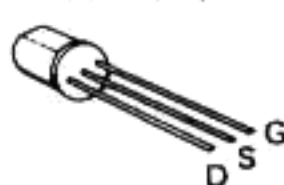
2SC1675L  
2SC1815(Y)



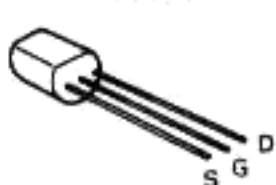
2SC460(B)



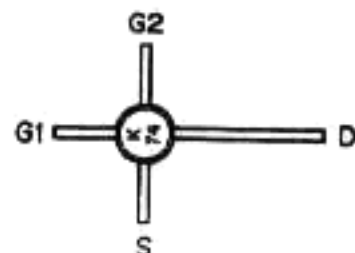
2SK19(GR)  
2SK19(Y)



2SK30A(O)  
2SK125



3SK74(L)



$\mu$ PC1158H2



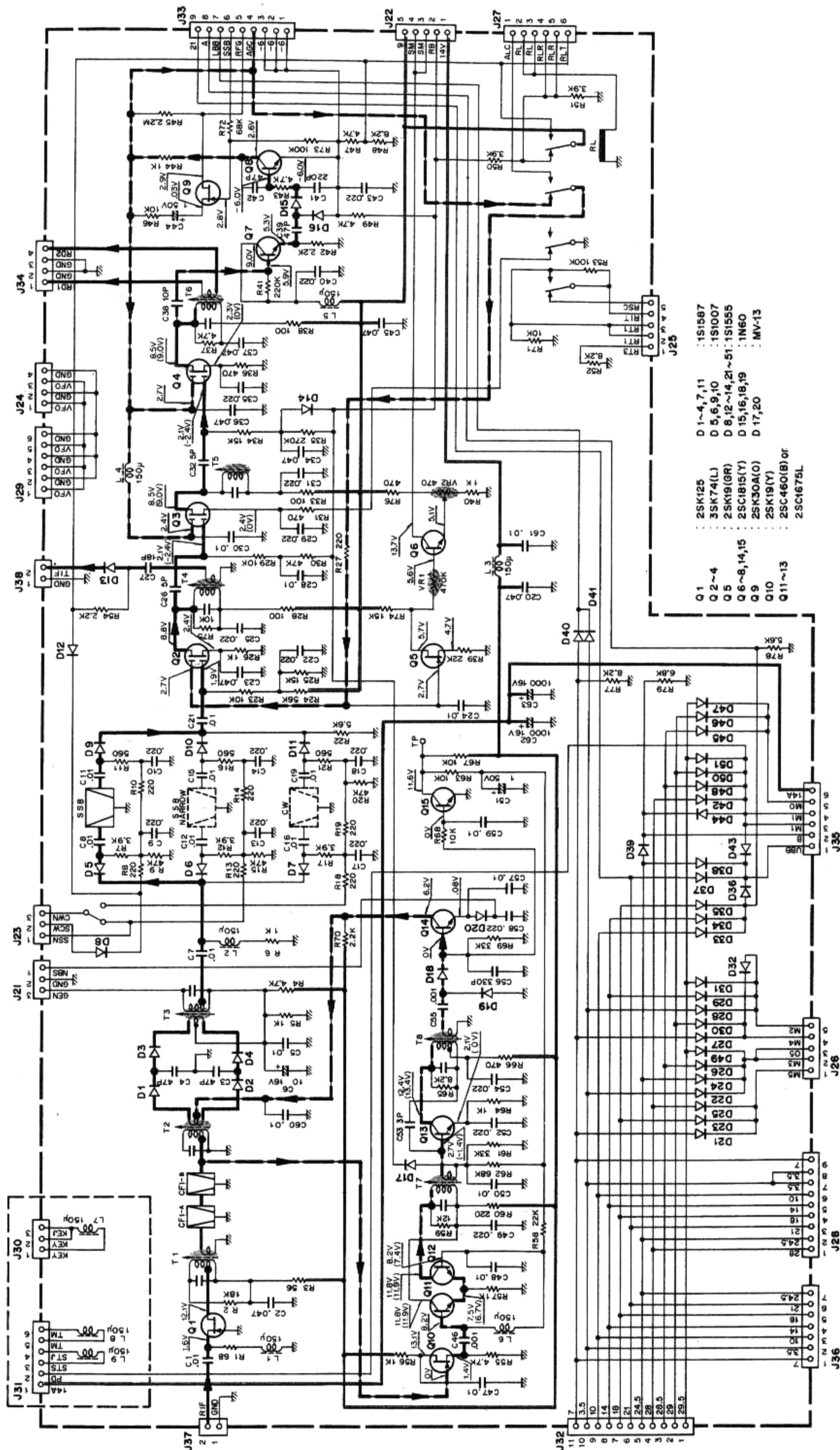
MV-13





▼ IF UNIT (X48-1300-00,-01) 00:S,01:V

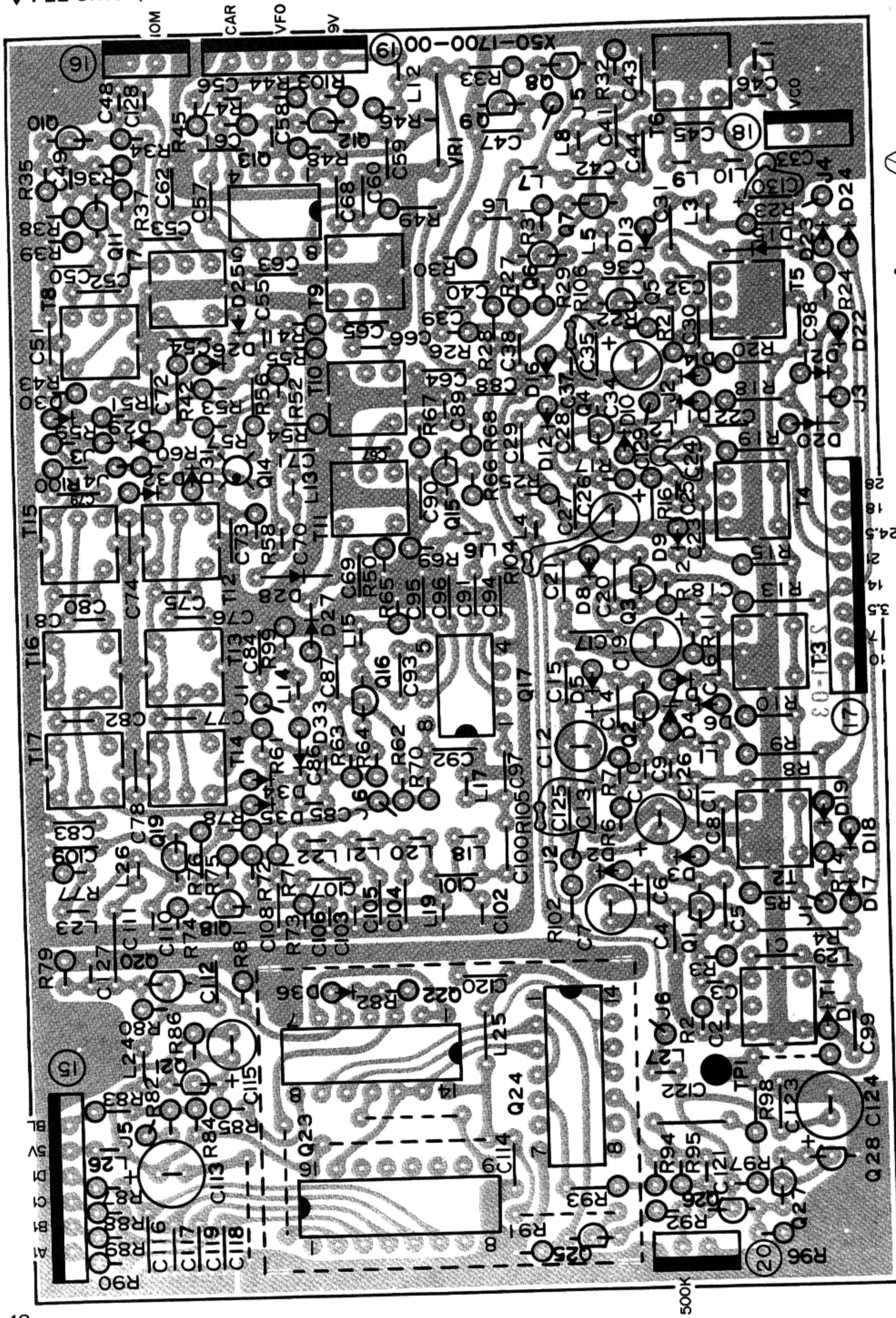
TS-130V does not use J30 and J31.



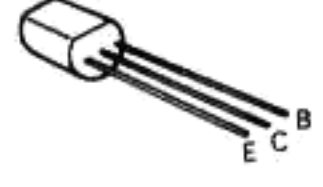
- Q 1 : 2SK125
- Q 2~4 : 3SK74(L)
- Q 5 : 2SK19(GR)
- Q 6~8,14,15 : 2SC1815(Y)
- Q 9 : 2SK30A(O)
- Q 10 : 2SK19(Y)
- Q 11~13 : 2SC460(B) or 2SC1675L
- D 1~4,7,11 : 1S1587
- D 5,6,9,10 : 1S1007
- D 8,12~14,21~51 : 1S1555
- D 15,16,18,19 : 1N60
- D 17,20 : MV-13

# TS-130S,V PC BOARD VIEW

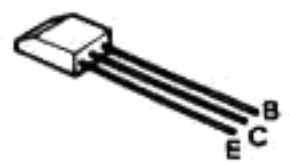
▼ PLL UNIT (X50-1700-00) Components side view



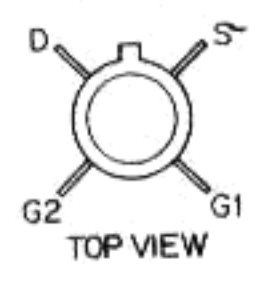
- 2SC1675L
- 2SC1775(E)
- 2SC1923(O)
- 2SC1959(Y)



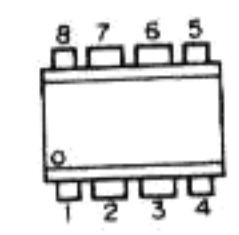
2SC460(B)



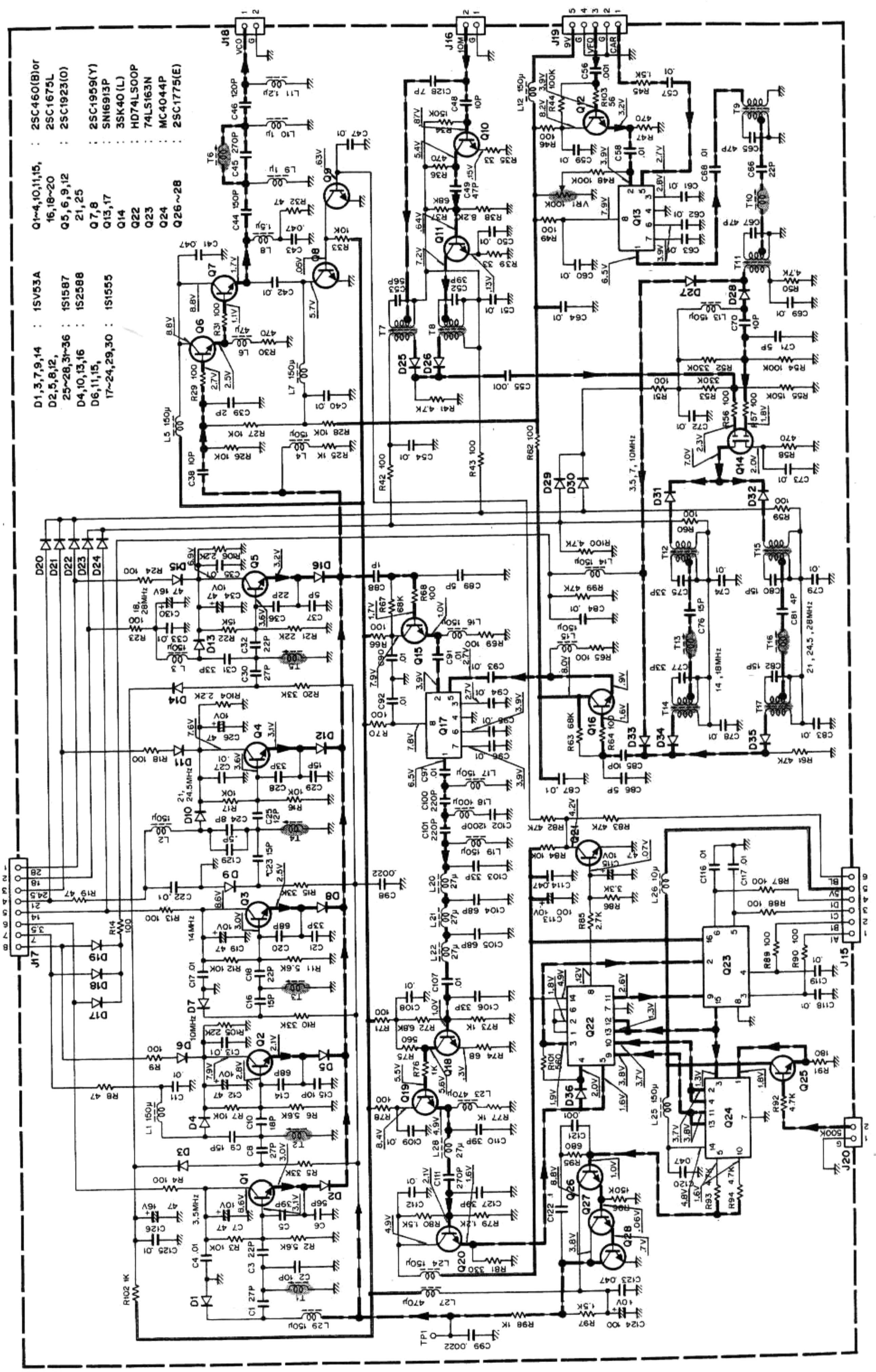
3SK40(L)



SN16913P

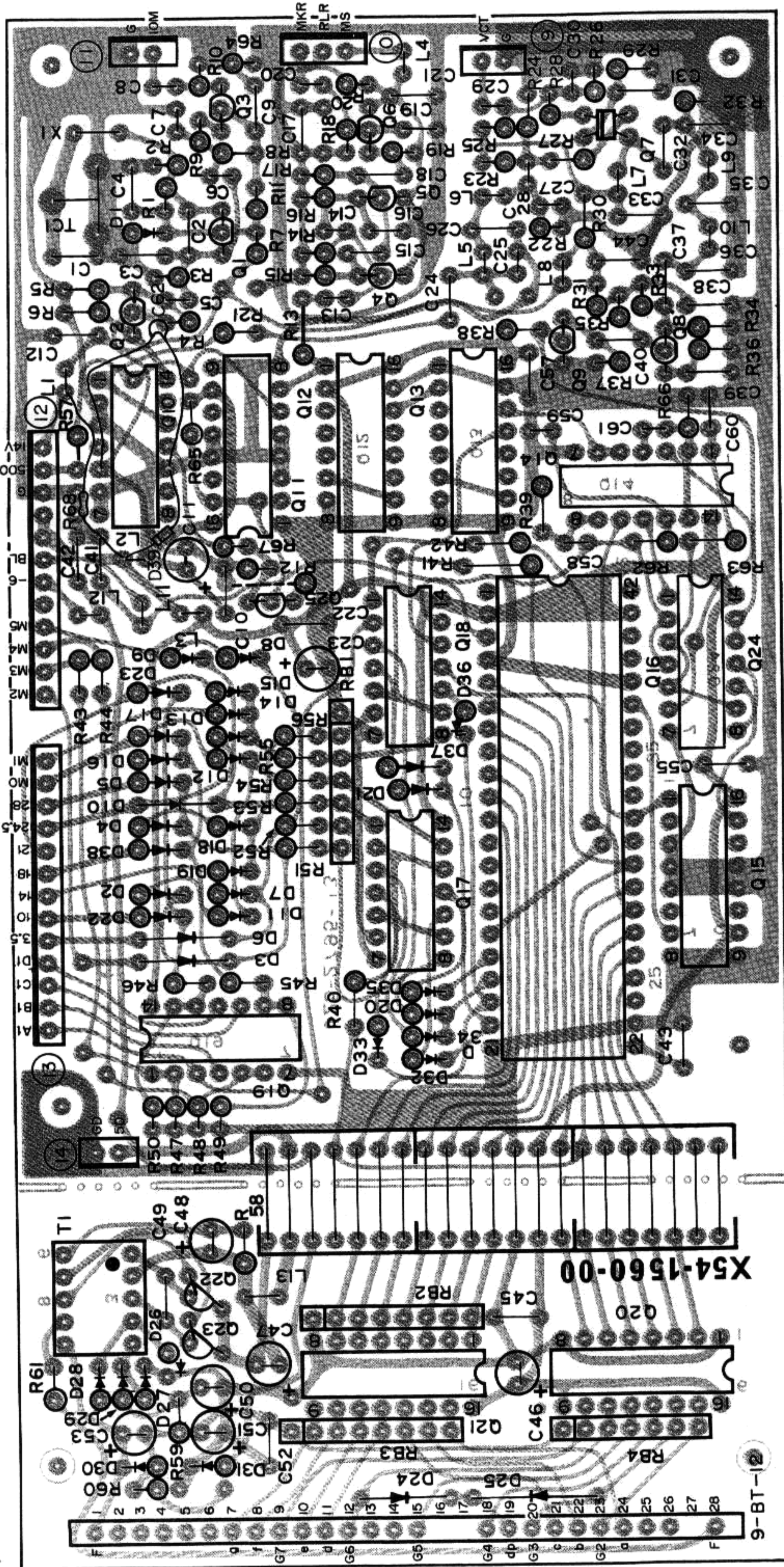


## PLL UNIT (X50-1700-00)

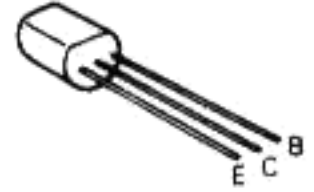


# TS-130S,V PC BOARD VIEW

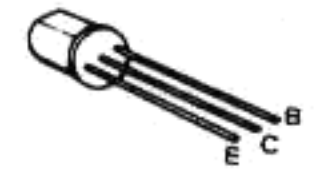
▼ COUNTER UNIT (X54-1560-00) Components side view



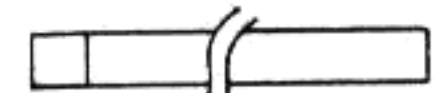
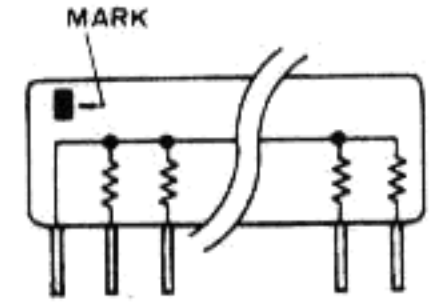
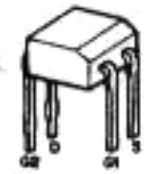
2SC1815(BL)  
2SC1815(Y)  
2SC1959(Y)



2SC785(O)

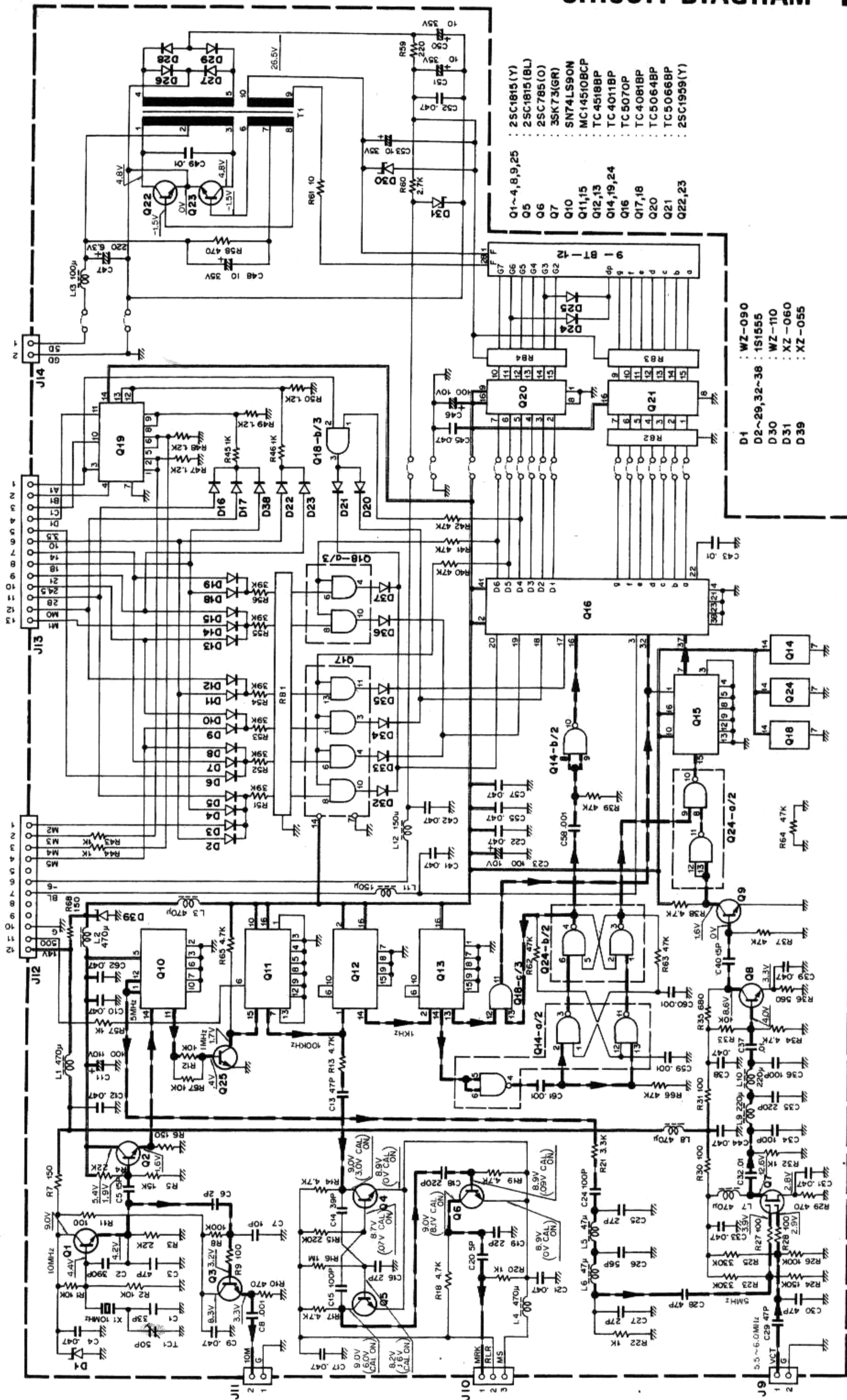


3SK73(GR)



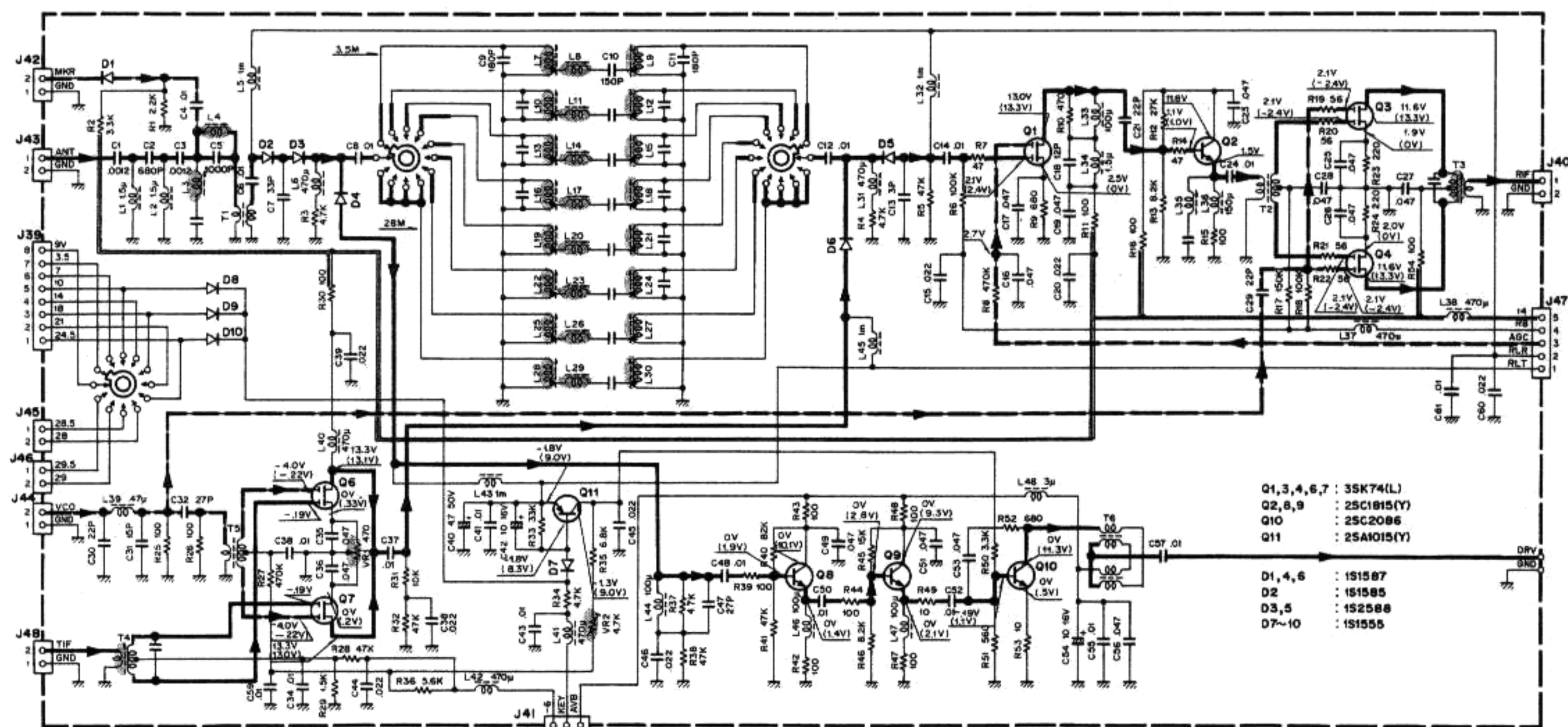
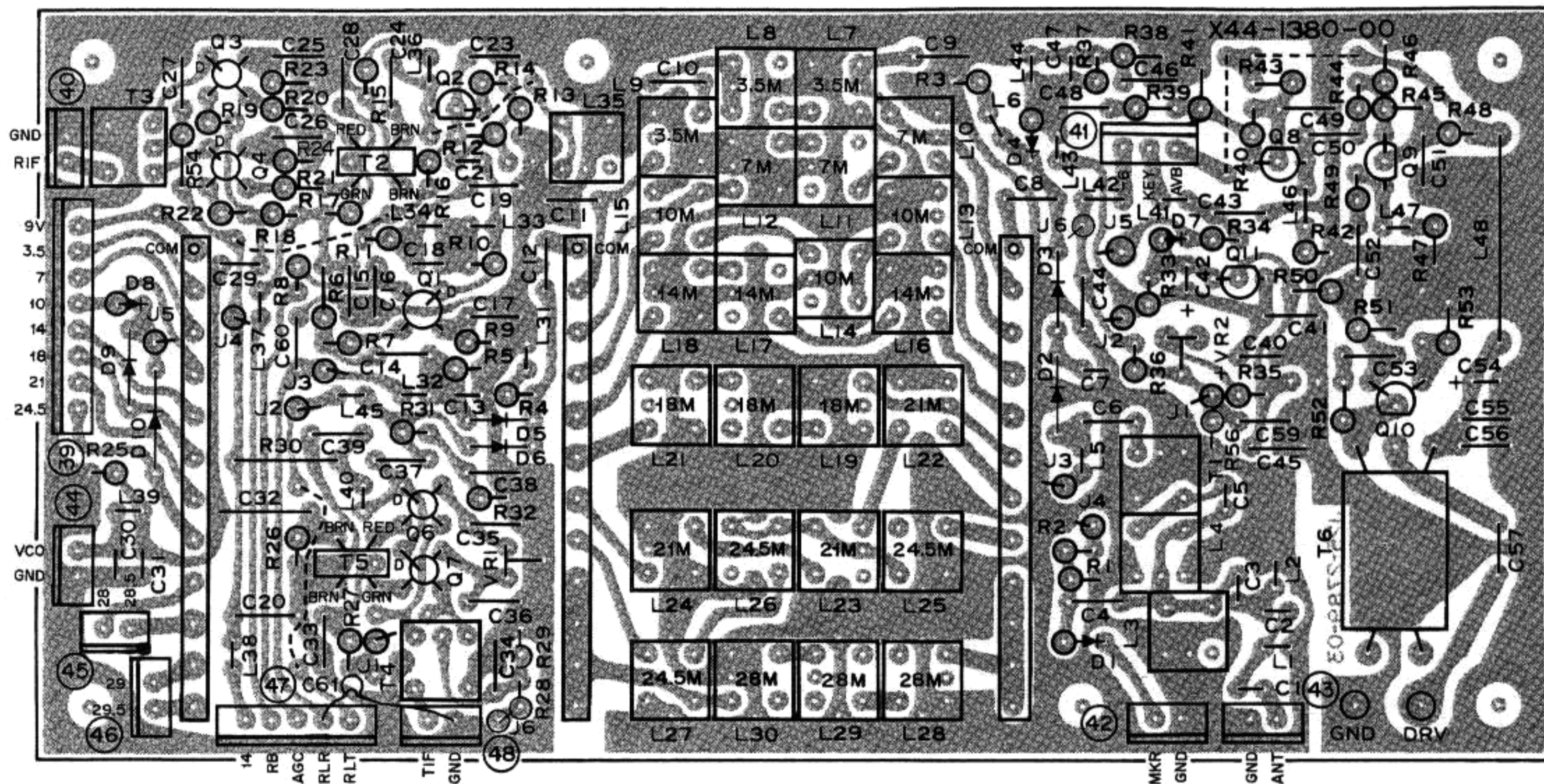
RB1~4

## COUNTER UNIT (X54-1560-00)



# TS-130SV PC BOARD VIEW/CIRCUIT DIAGRAM

## ▼ RF UNIT (X44-1380-00) Components side view



- Q1,3,4,6,7 : 3SK74(L)
- Q2,8,9 : 2SC1815(Y)
- Q10 : 2SC2086
- Q11 : 2SA1015(Y)
- D1,4,6 : 1S1587
- D2,8 : 1S1585
- D3,5 : 1S2588
- D7-10 : 1S1555

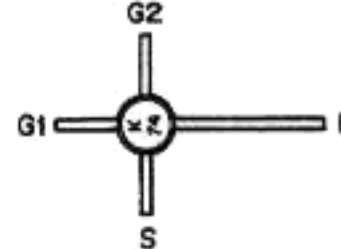
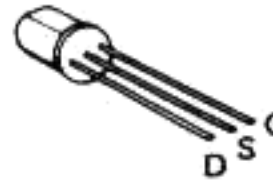
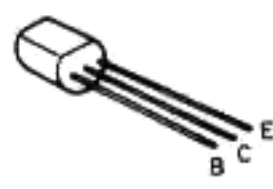
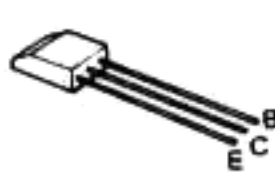
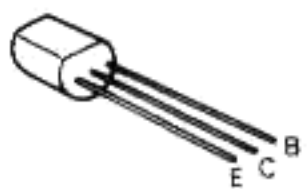
2SC1015(Y)  
2SC1675L  
2SC1815(Y)  
2SC1959(Y)

2SC460(B)

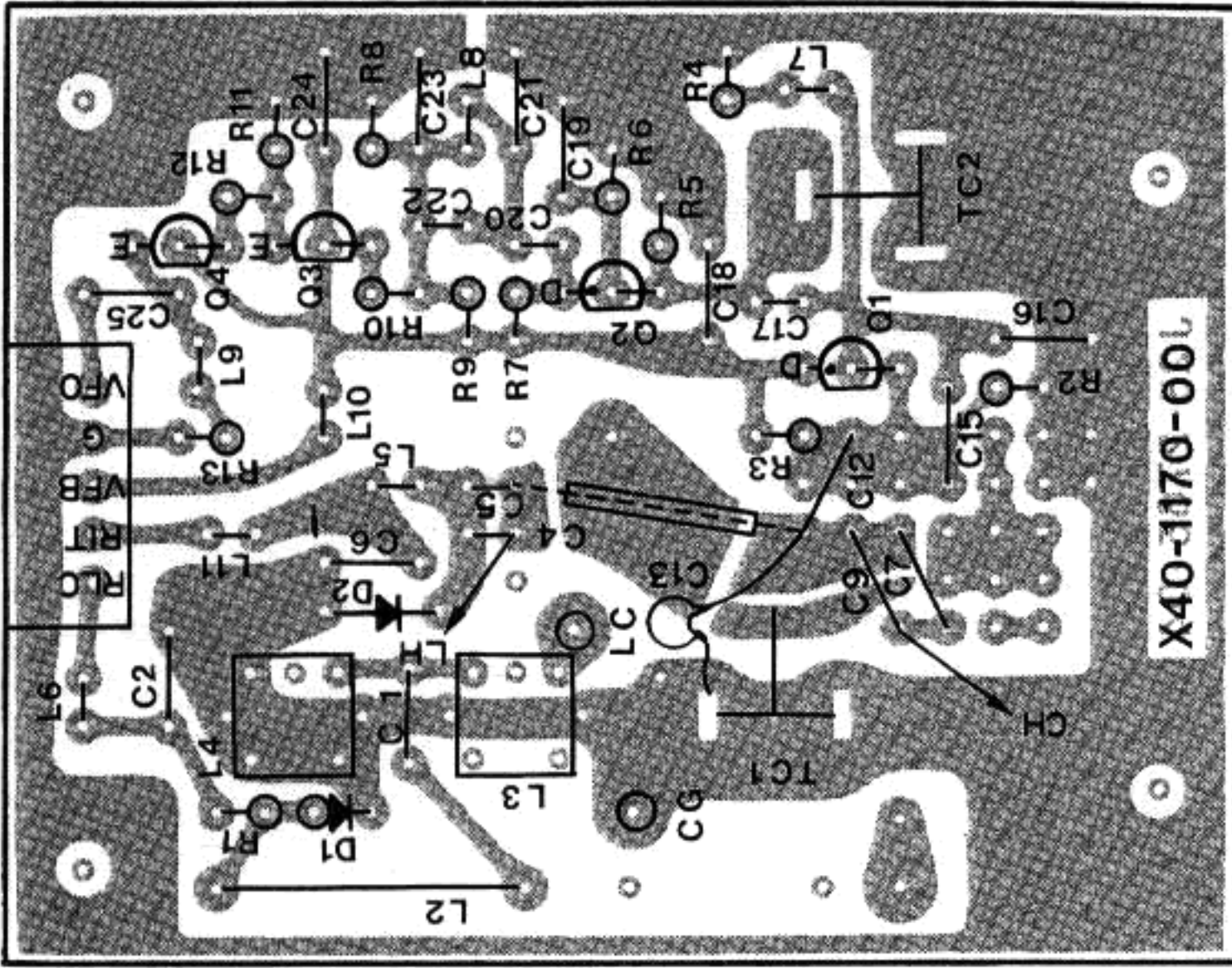
2SC2086

2SK19(Y)

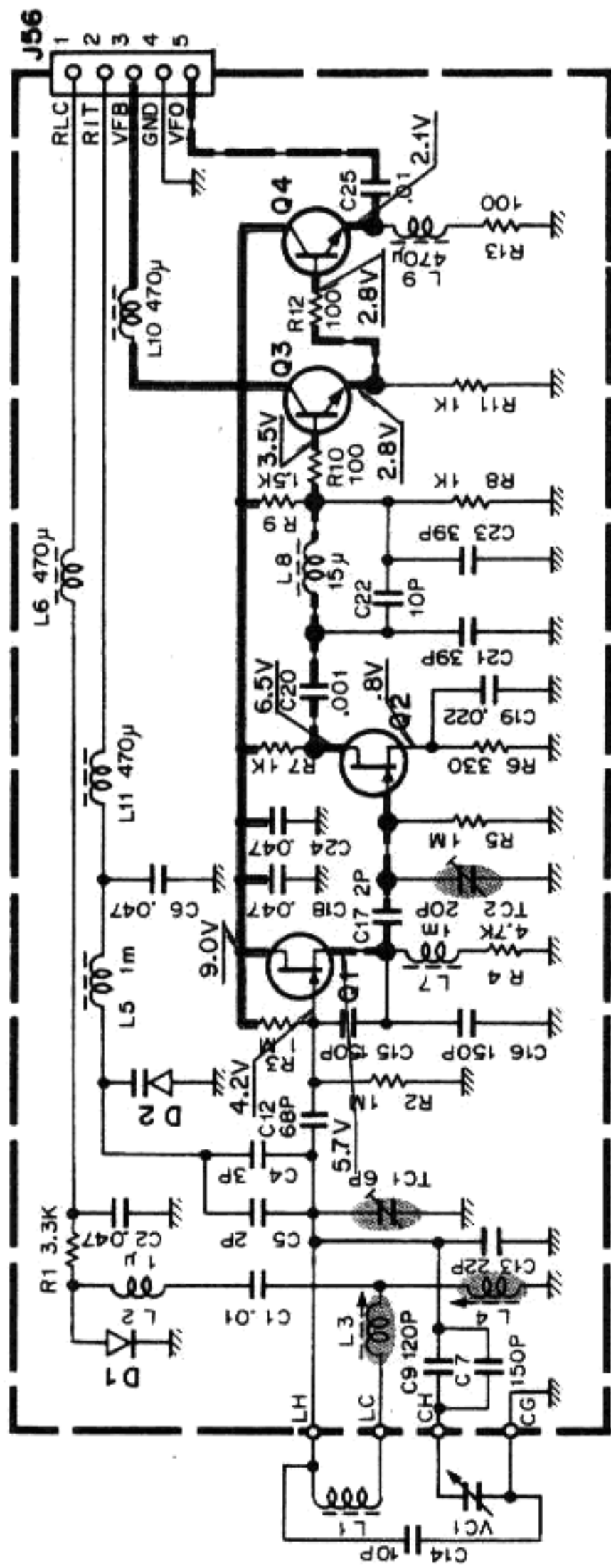
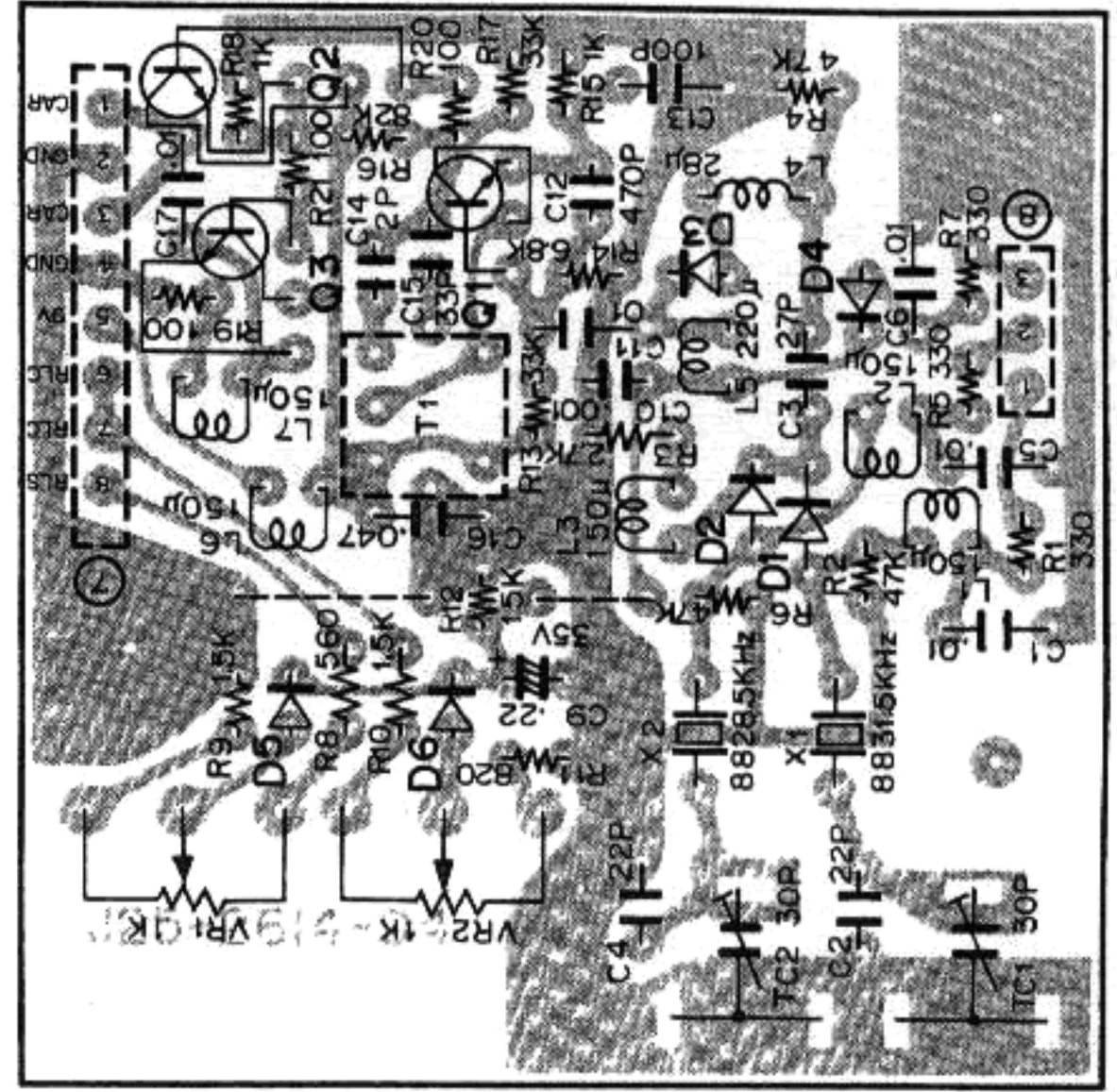
3SK74(L)



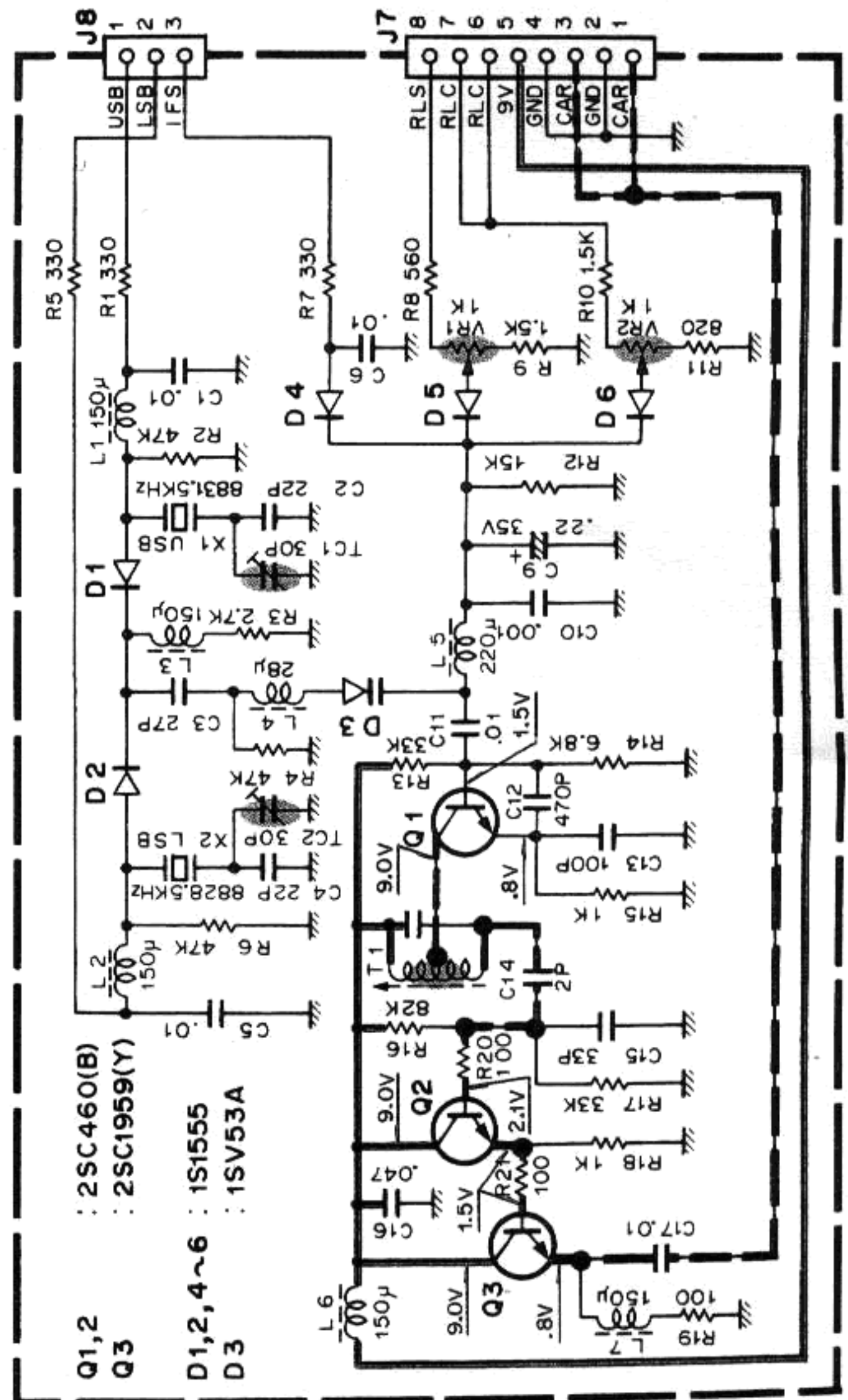
▼ VFO UNIT (X40-1170-00)  
Components side view



▼ CAR UNIT (X50-1500-00)  
Foil side view



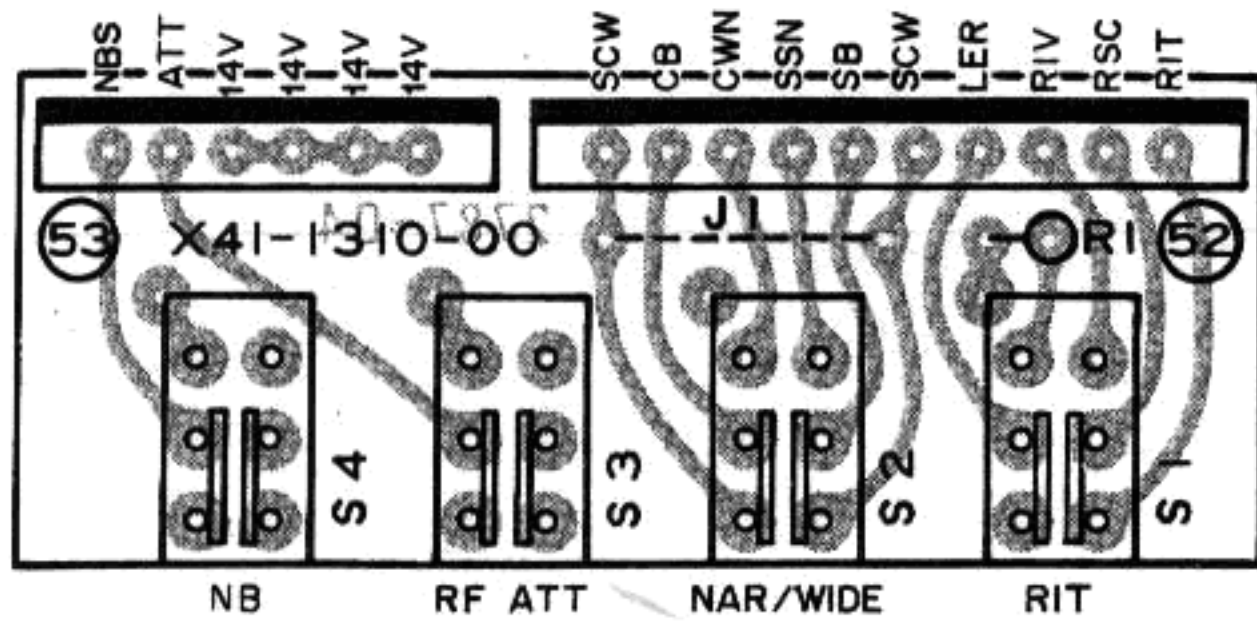
- Q1,2 : 2SK19(Y) D1 : 1S2588
- Q3 : 2SC460(B) or D2 : 1SV53A
- 2SC1675L
- Q4 : 2SC1959(Y)



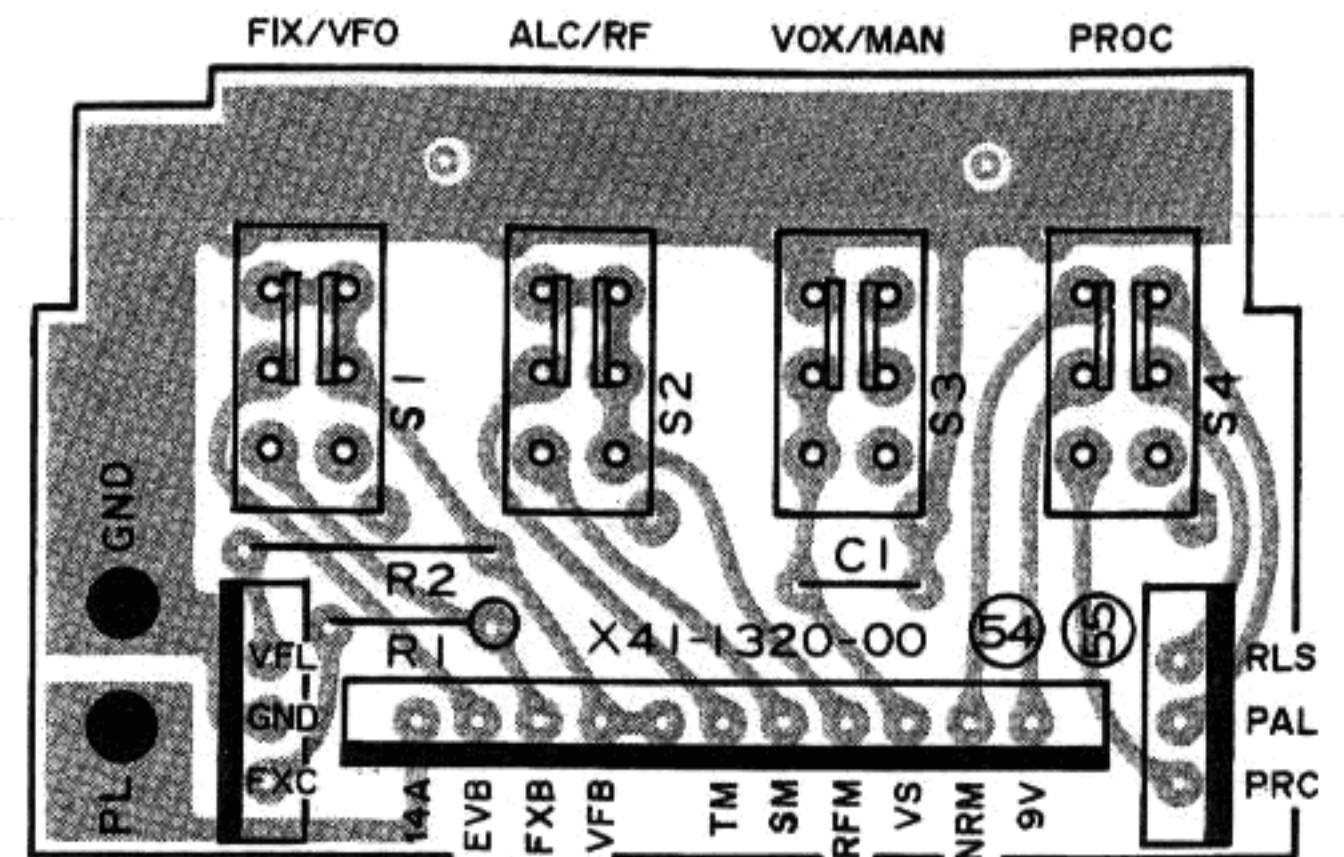
- Q1,2 : 2SC460(B)
- Q3 : 2SC1959(Y)
- D1,2,4~6 : 1S1555
- D3 : 1SV53A

# TS-130S,V PC BOARD VIEWS

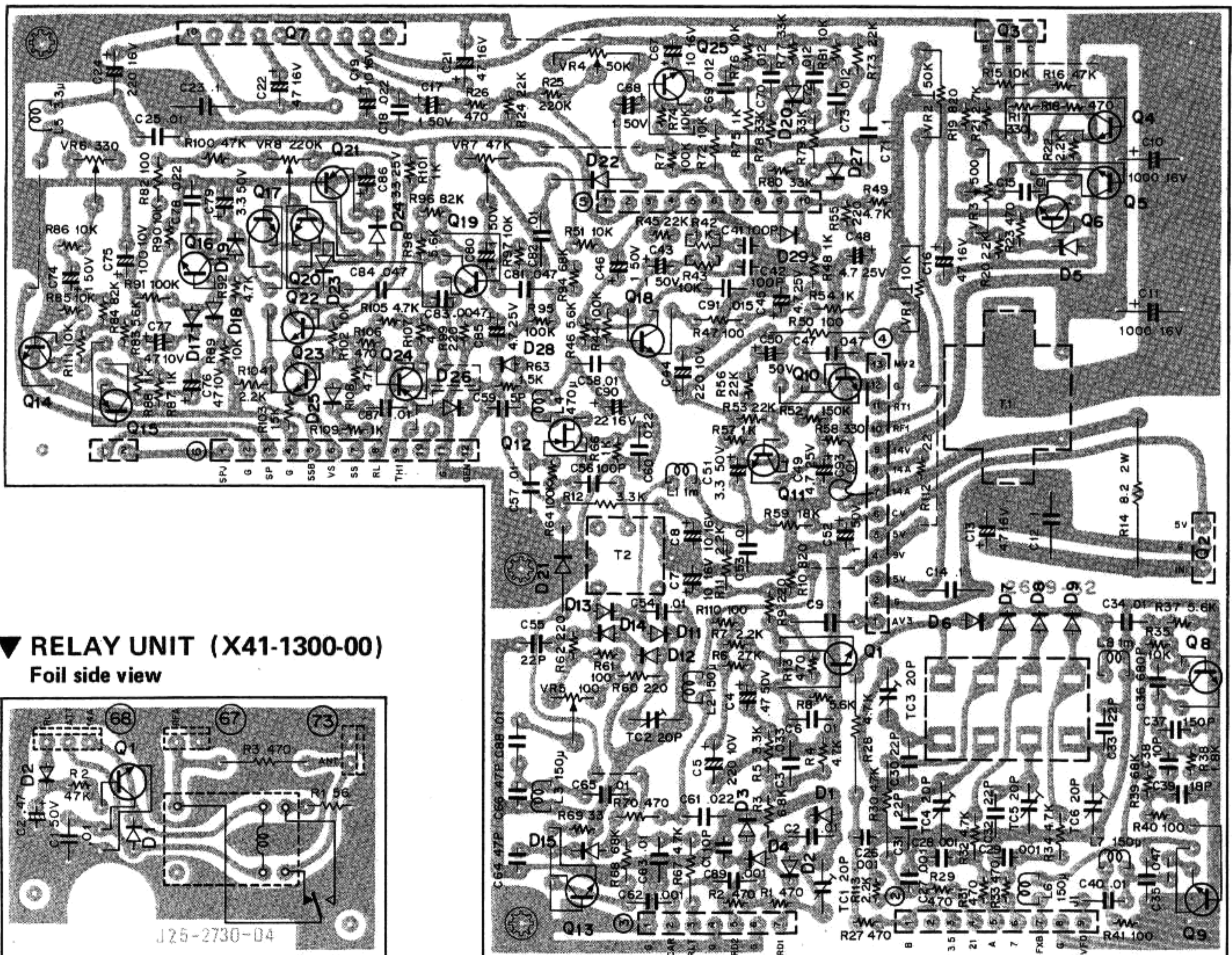
## ▼ SWITCH (A) UNIT (X41-1310-00) Components side view



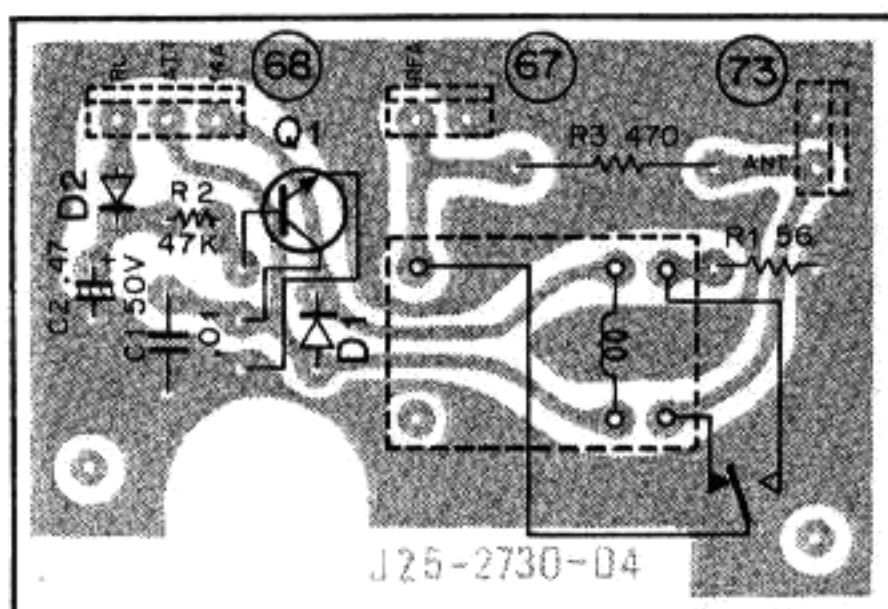
## ▼ SWITCH (B) UNIT (X41-1320-00) Components side view



## ▼ AF-GEN UNIT (X49-1110-01) Foil side view



## ▼ RELAY UNIT (X41-1300-00) Foil side view



Q1: 2SC1959(Y) D1,2: 1S1555

Q1,18: 2SC2240(GR) Q2:  $\mu$ PC14305H Q3: 2SA473(Y)

Q4~6,10,11,14,16,17,19,20,23,25: 2SC1815(Y) Q7: HA1366W or HA1366WR

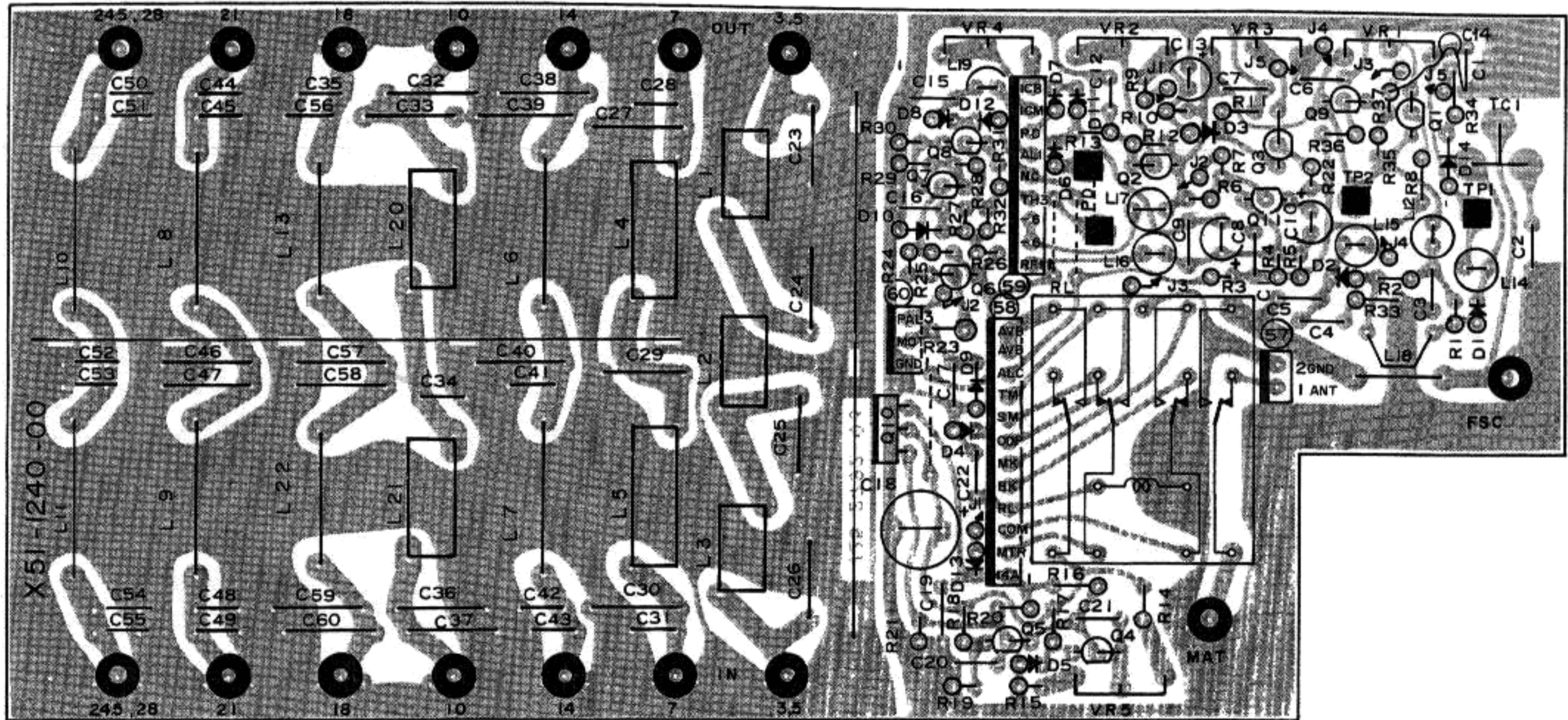
Q8,13: 2SC460(B) or 2SC1675L Q9: 2SC1959(Y) Q12: 2SK19(GR) Q15,21: 2SA1015(Y)

Q22: 2SC1815(GR) Q24: 2SA562(Y) D1~4, 11~14,23,24,26: 1N60 D5: WZ-061

D6~9: 1S2588 D15: 1S1587 D17~22,25,27~29: 1S1555

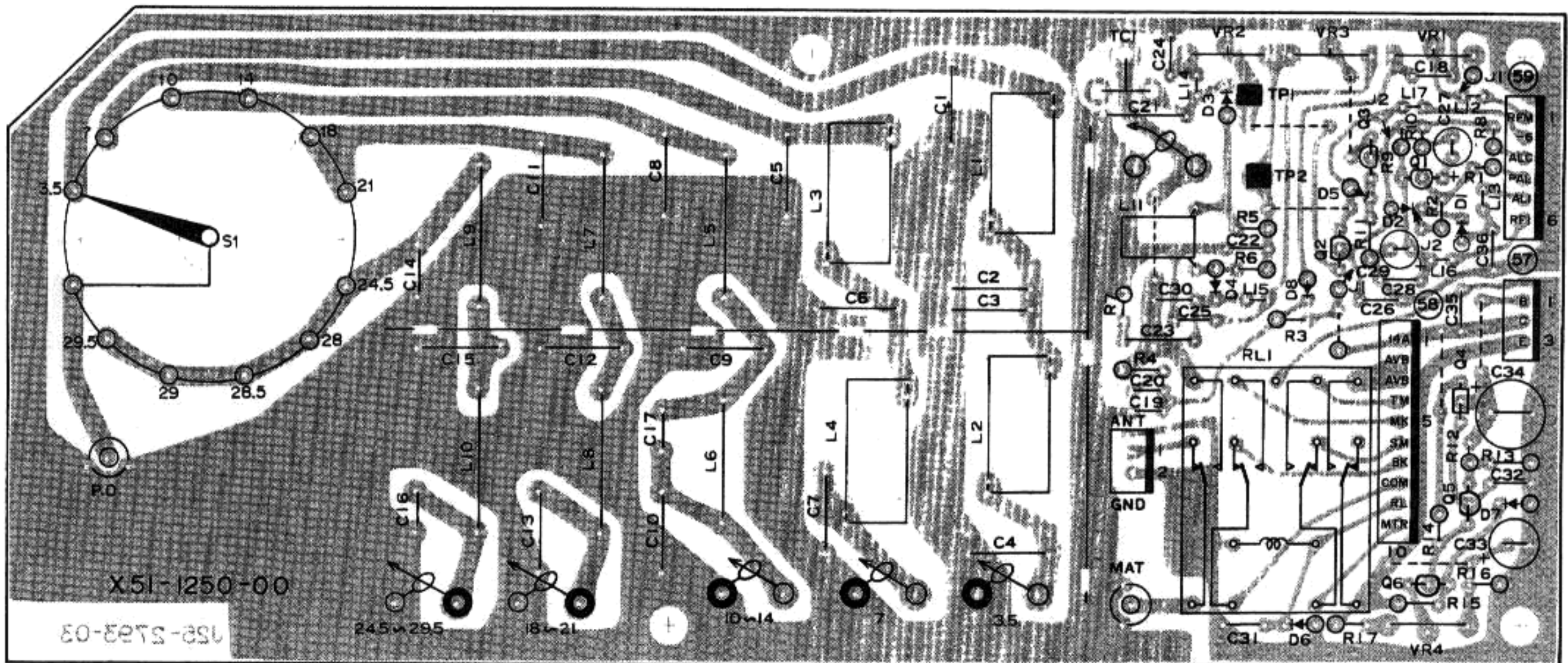


▼ FILTER UNIT (X51-1240-00) S TYPE Components side view



Q1~5,7~9: 2SC1815(Y) Q6: 2SA562(Y) Q10: 2SA473(Y) Q11: 2SK30A(O) D1,2: 1N60 D3: WZ-044  
 D4,6,7,9,12,14: 1S1555 D5,10: WZ-061 D8,11,13: WZ-090

▼ FILTER UNIT (X51-1250-00) V TYPE Components side view



Q1: 2SK30A(O) Q2,3,5,6: 2SC1815(Y) Q4: 2SA496(Y) D1: WZ-090 D2,6: 1S1555 D3,4,8: 1N60 D5: WZ-044 D7: WZ-061

- 2SA1015(Y)
- 2SC1675L
- 2SC1815(GR)
- 2SC1815(Y)
- 2SC1959(Y)
- 2SC2240(GR)

- 2SC460(B)

- 2SA496(Y)

- 2SA473(Y)

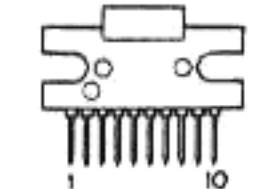
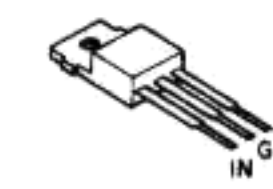
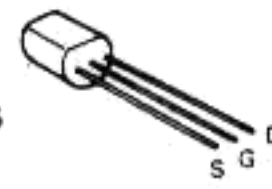
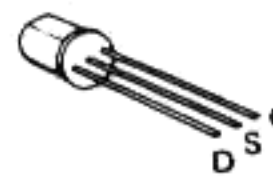
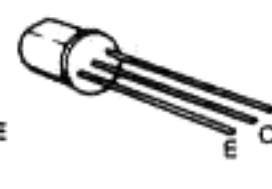
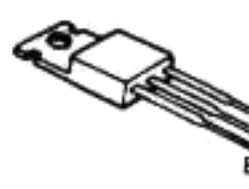
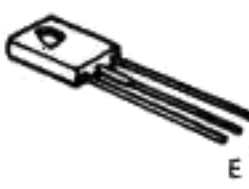
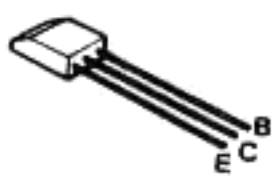
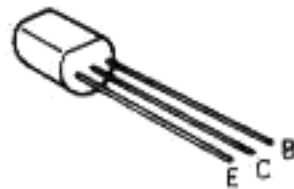
- 2SA562(Y)

- 2SK19(GR)

- 2SK30A(O)

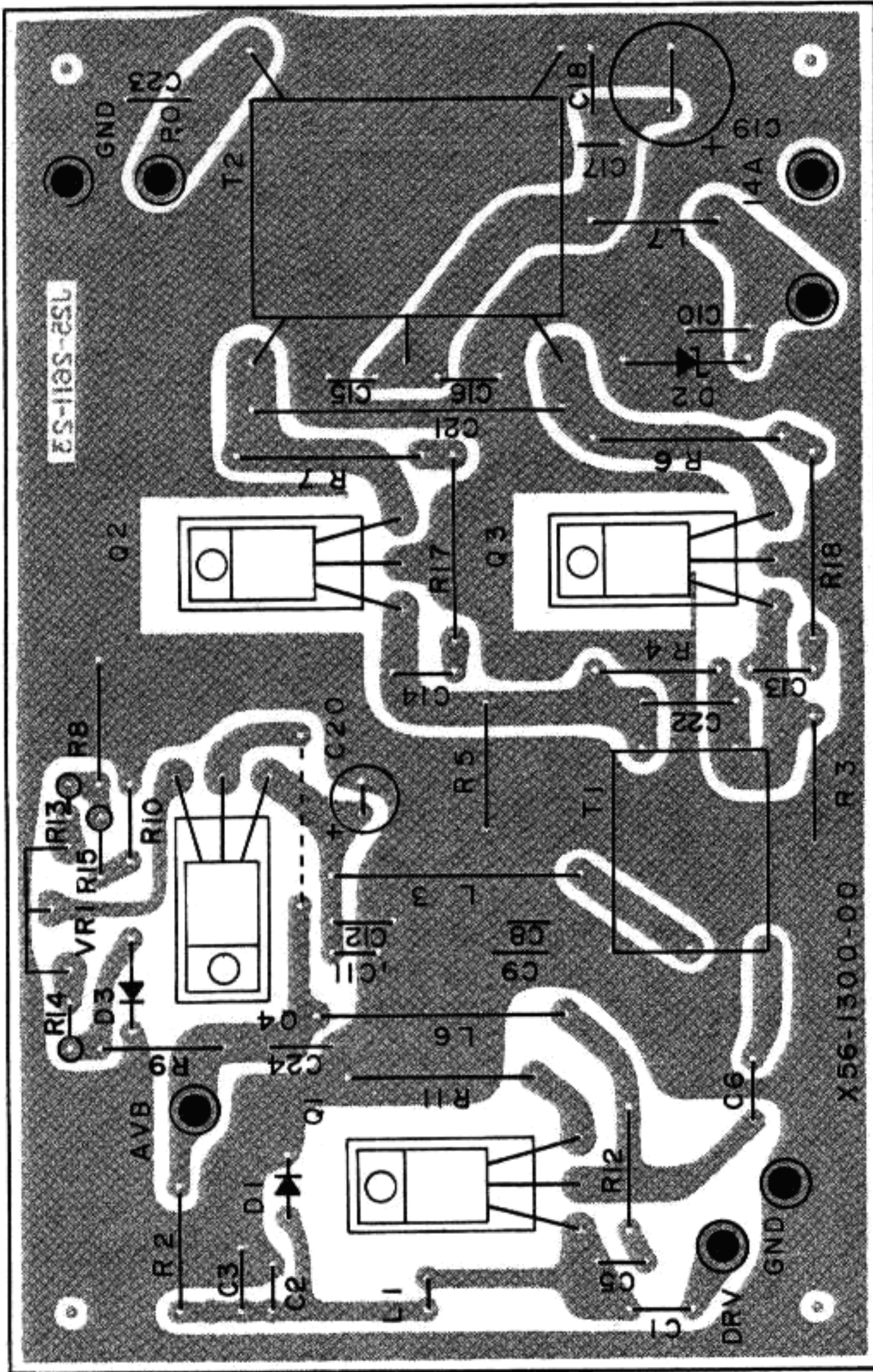
- μPC14305H

- HA1366W
- HA1366WR

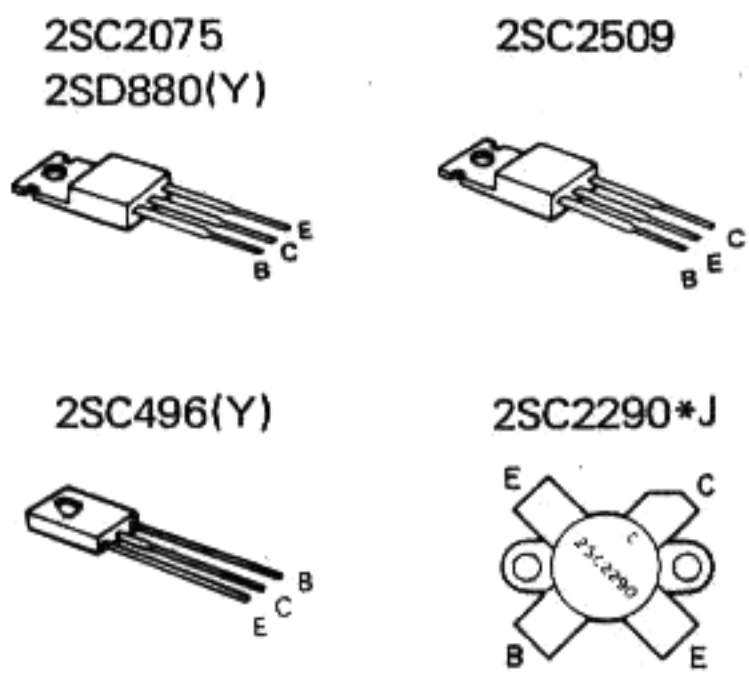


# TS-130S,V PC BOARD VIEWS

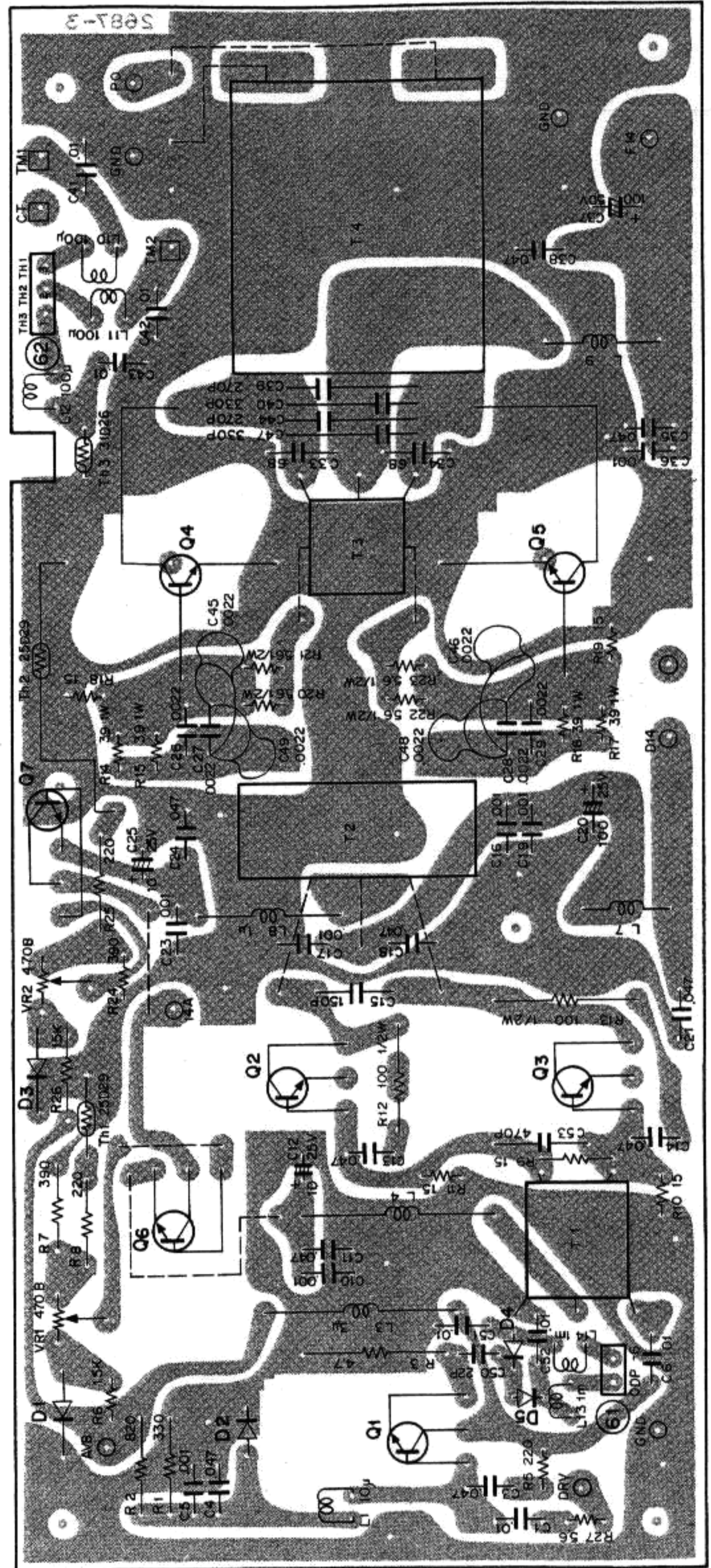
## ▼ FINAL UNIT (X56-1300-00) V TYPE Components side view



Q1: 2SC2075 Q2,3: 2SC2509 Q4: 2SC496(Y) Q5: 2SD880(Y)  
D1: SV-4A D2: BZ-240 D3: SV-03



## ▼ FINAL UNIT (X56-1350-00) S TYPE Components side view



Q1: 2SC2075 Q2,3: 2SC2509 Q4,5: 2SC2290\*J  
Q6,7: 2SD880(Y) D1,3: SV-03 D2: SV-4A D4,5: 1N60

# PARTS LIST

**Note 1:**

K. U.S.A T Britain W Europe X Australia

**Note 2:**

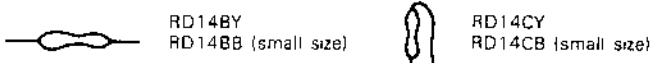
Only special type of resistors (example: cement, metal film, etc.) and capacitors (example: electrolytic, tantalum, mylar, temp. coeff. capacitors) are detailed in the PARTS LIST. For the value of all common type components, refer to the schematic diagram of the PC board illustration. Resistors not otherwise detailed are carbon type (1/4W or 1/8W). Order carbon resistors and capacitors according to the following example:

A carbon resistor's part number is RD14BY 2E222J

A ceramic capacitor's number is CK45F1H103Z, CC45TH1H220J

**RESISTOR**

1. Type of the carbon resistor



2. Wattage

1W → 3A      3W → 3F      5W → 3H  
2W → 3D      4W → 3G

3' = CC45 ○ ○ ...

Ceramic capacitor (type I) temperature coeff. capacitor 1' 3'

| 1st word (Color) | C (Black) | L (Red) | P (Orange) | R (Yellow) | S (Green) | T (Blue) | U (Violet) |
|------------------|-----------|---------|------------|------------|-----------|----------|------------|
| ppm/°C           | 0         | -80     | -150       | -220       | -330      | -470     | -750       |

3 = CK45 ○

Ceramic capacitor (type II) 3

| Cord                     | B          | D          | E          | F          |
|--------------------------|------------|------------|------------|------------|
| Operating temperature °C | -30<br>+85 | -30<br>+85 | -30<br>+85 | -10<br>+70 |

6 = Tolerance

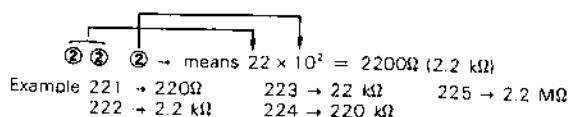
| Cord | C     | D    | G  | J  | K   | M   | X          | Z          | P          | No cord   |
|------|-------|------|----|----|-----|-----|------------|------------|------------|---|
| (%)  | ±0.25 | ±0.5 | ±2 | ±5 | ±10 | ±20 | +40<br>-20 | +80<br>-20 | +100<br>-0 | More than 10 μF -10 ~ +50<br>Less than 4.7 μF -10 ~ +75 |

Less than 10 pF

| Cord | B    | C     | D    | F  | G  |
|------|------|-------|------|----|----|
| (pF) | ±0.1 | ±0.25 | ±0.5 | ±1 | ±2 |

| Abbreviation |              | Abbreviation |          |
|--------------|--------------|--------------|----------|
| Cap.         | Capacitor    | ML           | Mylar    |
| C            | Ceramic      | S            | Styren   |
| E            | Electrolytic | T            | Tantalum |
| MC           | Mica         |              |          |

3. Resistance value



4. Tolerance

J = ±5% (Gold)      K = ±10% (Silver)

**CAPACITORS**

Type I

Type II

| CC | 45               | TH                         | 1H | 220            | J | CK | 45 | F | 1H | 103 | Z |
|----|------------------|----------------------------|----|----------------|---|----|----|---|----|-----|---|
| 1' | 2                | 3'                         | 4  | 5              | 6 | 1  | 2  | 3 | 4  | 5   | 6 |
| 1  | Type             | ceramic, electrolytic, etc | 4  | Voltage rating |   |    |    |   |    |     |   |
| 2  | Shape            | round, square, etc         | 5  | Value          |   |    |    |   |    |     |   |
| 3  | Temp range       |                            | 6  | Tolerance      |   |    |    |   |    |     |   |
| 3' | Temp coefficient |                            |    |                |   |    |    |   |    |     |   |

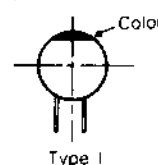
Ex. CC45TH = -470 ±60 ppm/°C

| 2nd Word | G   | H   | J    | K    | L    |
|----------|-----|-----|------|------|------|
| ppm/°C   | ±30 | ±60 | ±120 | ±250 | ±500 |

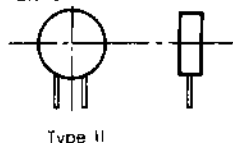
5 = Capacitor value

Example: 010 → 1 pF  
100 → 10 pF  
101 → 100 pF  
102 → 1000 pF = 0.001 μF  
103 → 0.01 μF

CC45



CK45



**TS-130 SEMICONDUCTOR**

☆: New parts

| Item           | Name   | Parts No.   | Re-<br>marks |
|----------------|--------|-------------|--------------|
| Diode          | 1N60   | V11-0051-05 |              |
|                | 1S1007 | V11-4160-66 |              |
|                | 1S1555 | V11-0076-05 |              |
|                | 1S1585 | V11-3172-76 |              |
|                | 1S1587 | V11-0370-05 |              |
|                | 1S2588 | V11-0414-05 |              |
|                | S31C   | V11-2163-86 |              |
|                | U05B   | V11-0270-05 |              |
| Varistor       | MV-13  | V21-0004-05 |              |
|                | SV-03  | V21-0007-05 |              |
|                | SV-4A  | V11-4363-36 | ☆            |
| Vari-cap diode | 1SV53A | V11-4161-36 |              |

| Item            | Name    | Parts No.   | Re-<br>marks |
|-----------------|---------|-------------|--------------|
| Thermistor      | 25D29   | V11-3360-16 | 500Ω at 25°C |
|                 | 31D26   | V11-7762-16 | 1kΩ at 25°C  |
| LED             | PR2112D | V11-7260-66 |              |
|                 | TLY-205 | V11-3163-16 |              |
| Zener diode     | BZ-240  | V11-4160-98 |              |
|                 | XZ-055  | V11-4105-50 |              |
|                 | XZ-060  | V11-4101-20 |              |
|                 | WZ-044  | V11-4161-06 |              |
|                 | WZ-061  | V11-0243-05 |              |
|                 | WZ-090  | V11-0240-05 |              |
|                 | WZ-110  | V11-4161-48 |              |
| Indicating tube | 9-BT-12 | V40-7760-86 |              |

PARTS LIST

| Item | Name        | Parts No.   | Re-<br>marks | Ref.No.     | Parts No.             | Description                    | Re-<br>marks |
|------|-------------|-------------|--------------|-------------|-----------------------|--------------------------------|--------------|
| TR   | 2SA473 (Y)  | V01-0473-06 |              |             | B05-0701-04           | SP grill cloth                 |              |
|      | 2SA496(Y)   | V01-0113-05 |              |             | B10-0633-04           | Front glass                    | ☆            |
|      | 2SA562(Y)   | V01-0032-05 |              |             | B30-0818-05           | Pilot lamp 12V,40mA            | ☆            |
|      | 2SA1015(Y)  | V01-1015-06 |              |             | B31-0628-05           | Meter                          | S ☆          |
|      |             |             |              |             | B31-0629-05           | Meter                          | V ☆          |
|      | 2SC460 (B)  | V03-0079-05 |              |             | B39-0407-04           | Spacer                         |              |
|      | 2SC496(Y)   | V03-0336-05 |              |             | B42-1644-04           | Seal (VOX)                     |              |
|      | 2SC785(O)   | V03-0473-05 |              |             | B42-1693-04           | Seal (Adj.)                    | ☆            |
|      | 2SC1675L    | V03-1675-10 |              |             | B43-0645-04           | Name plate                     | S(T) ☆       |
|      | 2SC1775(E)  | V03-1775-06 |              |             | B43-0646-04           | Name plate                     | S(K),S(W) ☆  |
|      | 2SC1815(BL) | V03-1815-26 |              |             | B43-0647-04           | Name plate                     | V(T) ☆       |
|      | 2SC1815(GR) | V03-1815-16 |              |             | B43-0648-04           | Name plate                     | V(K),V(W) ☆  |
|      | 2SC1815(Y)  | V03-1815-06 |              |             | B46-0058-00           | Warranty card                  | (K) ☆        |
|      | 2SC1923(O)  | V03-1923-06 |              |             | B50-2750-00           | Operating manual               | (K),(W) ☆    |
|      | 2SC1959(Y)  | V03-1959-06 |              |             | B50-2751-00           | Operating manual               | (T) ☆        |
|      | 2SC2075     | V03-2075-06 |              |             |                       |                                |              |
|      | 2SC2086     | V03-2086-06 |              |             | D21-0807-05           | Band shaft                     |              |
|      | 2SC2240(GR) | V03-2240-06 |              |             | D22-0404-05           | Universal joint                |              |
|      | 2SC2290*J   | V03-2290-16 |              |             | D40-0615-04           | Gear ass'y                     | ☆            |
|      | 2SC2509     | V03-2509-06 |              |             |                       |                                |              |
|      | 2SD880(Y)   | V04-0880-16 |              |             |                       |                                |              |
| FET  | 2SK19(GR)   | V09-0012-05 |              |             | E04-0152-05           | UHF type receptacle ANT        | V            |
|      | 2SK19(Y)    | V09-0011-05 |              |             | E06-0252-05           | 2P male socket POWER           | V            |
|      | 2SK30A(O)   | V09-0056-05 |              |             | E06-0451-15           | 4P male socket MIC             |              |
|      | 2SK125      | V09-0136-10 |              |             | E06-0751-05           | 7P DIN socket REMOTE           |              |
|      | 3SK40(L)    | V09-0079-05 |              |             | E06-0851-05           | 8P DIN socket EXT.VFO          |              |
|      | 3SK73(GR)   | V09-1002-46 |              |             | E07-0252-05           | 2P metal plug POWER            | V            |
|      | 3SK74(L)    | V09-1002-56 |              |             | E07-0403-05           | 4P MIC plug (W),(T)            |              |
|      |             |             |              |             | E07-0751-05           | 7P DIN plug REMOTE             |              |
|      |             |             |              |             | E08-0671-05           | 6P square socket POWER         | S            |
|      |             |             |              |             | E09-0671-05           | 6P plug POWER                  | S            |
| IC   | 74LS163N    | V30-1037-06 |              |             | E11-0005-15           | 3P phone jack KEY              | V            |
|      | HA1366W     | V30-1045-06 |              |             | E11-0402-15           | US jack EXT. SP                |              |
|      | HD74LS00P   | V30-0192-16 |              |             | E11-0404-05           | 3P phone jack PHONES           | V            |
|      | MC14510BCP  | V30-1227-16 |              |             | E11-0404-05           | 3P phone jack KEY,PHONES       | S            |
|      | MC4044P     | V30-0173-05 |              |             | E12-0001-05           | phone plug EXT. SP             |              |
|      | SN74LS90N   | V30-1005-26 |              |             | E23-0015-04           | Lug terminal                   | S            |
|      | SN16913P    | V30-1048-06 |              |             | E23-0417-05           | Pin for 6P square socket POWER | S            |
|      | TC4011BP    | V30-0301-70 |              |             | E23-0418-05           | Pin for 6P plug POWER          | S            |
|      | TC4029BP    | V30-1051-06 |              |             | E23-0420-05           | Lug terminal                   | S            |
|      | TC4081BP    | V30-0299-10 |              |             | E29-0407-05           | Bridge connector               |              |
|      | TC4518BP    | V30-1039-06 |              |             | E30-1632-05           | DC cord with plug FAN          | S            |
|      | TC4518BP    | V30-1039-06 |              |             | E30-1638-05           | DC cord ass'y                  | S            |
|      | TC5064BP    | V30-1056-06 |              |             | E30-1675-05           | DC cord ass'y                  | V ☆          |
|      | TC5066BP    | V30-1057-06 |              |             | E31-0431-05           | Speaker cord with 2P plug      |              |
|      | TC5070P     | V30-1172-06 | ☆            |             |                       |                                |              |
|      | μPC1158H2   | V11-1177-26 | ☆            |             | F05-2034-05           | Fuse (20A)                     | S            |
|      | μPC14305H   | V30-1029-36 |              |             | F05-4022-05           | Fuse (4A)                      | V            |
|      |             |             |              |             | F07-0826-03           | Heat sink cover                | S            |
|      |             |             |              |             | F09-0405-14           | Fan                            | S            |
|      |             |             |              |             | F29-0406-03           | Fan motor housing              | S            |
|      |             |             |              | G01-0801-04 | Gnd spring BAND       |                                |              |
|      |             |             |              | G02-0505-05 | Knob spring           |                                |              |
|      |             |             |              | H01-2705-04 | Carton case (inside)  | S(K),S(W) ☆                    |              |
|      |             |             |              | H01-2706-04 | Carton case (inside)  | S(T) ☆                         |              |
|      |             |             |              | H01-2708-04 | Carton case (inside)  | V(K),V(W) ☆                    |              |
|      |             |             |              | H01-2709-04 | Carton case (inside)  | V(T) ☆                         |              |
|      |             |             |              | H03-1769-04 | Carton case (outside) | S ☆                            |              |
|      |             |             |              | H03-1770-04 | Carton case (outside) | V ☆                            |              |

| Ref.No.                   | Parts No.   | Description  | Re-<br>marks |
|---------------------------|-------------|--------------|--------------|
| <b>TS-130 S,V GENERAL</b> |             |              |              |
|                           | A01-0725-02 | Case (upper) | V            |
|                           | A01-0743-02 | Case (upper) | S            |
|                           | A01-0784-02 | Case (lower) | S ☆          |
|                           | A01-0785-02 | Case (lower) | V ☆          |
|                           | A20-2392-03 | Panel ass'y  | S ☆          |
|                           | A20-2393-03 | Panel ass'y  | V ☆          |

PARTS LIST

| Ref.No. | Parts No.   | Description                | Re-<br>marks | Ref.No.                              | Parts No.    | Description        | Re-<br>marks |
|---------|-------------|----------------------------|--------------|--------------------------------------|--------------|--------------------|--------------|
|         | H10-2509-02 | Packing fixture (F)        |              |                                      | X56-1300-00  | Final unit         | V            |
|         | H10-2510-02 | Packing fixture (R)        | V            |                                      | X56-1350-00  | Final unit         | S            |
|         | H10-2520-02 | Packing fixture (R)        | S            | <b>RELAY UNIT (X41-1300-00)</b>      |              |                    |              |
|         | H12-0441-04 | Cushion                    | V            |                                      |              |                    |              |
|         | H12-0462-04 | Cushion                    | S            |                                      |              |                    |              |
|         | H20-1405-03 | Protective cover           | V            |                                      |              |                    |              |
|         | H20-1410-03 | Protective cover           | S            |                                      |              |                    |              |
|         | H21-0701-04 | Protective sheet           | VOX          |                                      |              |                    |              |
|         | H25-0112-04 | Protective bag             |              |                                      |              |                    |              |
|         | H25-0116-04 | Protective bag             |              |                                      |              |                    |              |
|         | J02-0323-05 | Foot                       |              |                                      |              |                    |              |
|         | J02-0407-04 | Assistant foot             |              |                                      |              |                    |              |
|         | J13-0404-05 | Fuse holder                | S            | <b>SWITCH (A) UNIT (X41-1310-00)</b> |              |                    |              |
|         | J19-1301-04 | Diode holder               |              |                                      |              |                    |              |
|         | J21-2504-04 | SP mounting hardware       |              |                                      |              |                    |              |
|         | J21-2573-04 | Foot mounting hardware     |              |                                      |              |                    |              |
|         | J21-2631-04 | Motor mounting hardware    | S            |                                      |              |                    |              |
|         | J31-0141-04 | Spacer ring                | MIC          |                                      |              |                    |              |
|         | J42-0038-04 | Cap                        | Case (lower) |                                      |              |                    |              |
|         | J42-0423-04 | Knob bush                  | ☆            |                                      |              |                    |              |
|         | J61-0019-05 | Vinyle tie                 |              |                                      |              |                    |              |
|         | J61-0401-05 | Nylon band                 |              |                                      |              |                    |              |
|         | K21-0723-04 | Pointer knob               | BAND         | <b>SWITCH (B) UNIT (X41-1320-00)</b> |              |                    |              |
|         | K23-0710-04 | Knob                       |              |                                      |              |                    |              |
|         | K23-0711-04 | Pointer knob               | MODE         |                                      |              |                    |              |
|         | K23-0712-04 | Knob                       | VOX          |                                      |              |                    |              |
|         | K29-0740-04 | Push knob                  | ☆            |                                      |              |                    |              |
|         | K29-0741-04 | Knob                       | ☆            |                                      |              |                    |              |
|         | L40-1511-03 | Ferri-inductor             | 150μH        |                                      |              |                    |              |
|         | L40-4711-03 | Ferri-inductor             | 470μH        |                                      |              |                    |              |
|         | N14-0508-04 | Spanner nut M9             | BAND         |                                      |              |                    |              |
|         | N14-0518-04 | Spanner nut M7             | MODE         |                                      |              |                    |              |
|         | N19-0607-04 | Nylon washer               | ☆            | <b>RF UNIT (X44-1380-00)</b>         |              |                    |              |
| VR1     | R19-3409-05 | Pot. 10kΩ(A)/10kΩ(B) RF/AF | ☆            |                                      |              |                    |              |
| VR2     | R19-9405-05 | Pot. 10kΩ(F)/5kΩ(B) RIT/IF | ☆            |                                      |              |                    |              |
| R7      | R92-0620-05 | Cement resistor 15mΩ       |              |                                      |              |                    |              |
|         | S01-2422-05 | Rotary switch              | MODE         |                                      |              |                    |              |
|         | S01-2423-05 | Rotary switch              | BAND         |                                      |              |                    |              |
|         | S36-2402-05 | Power switch               | S            |                                      |              |                    |              |
|         | S44-1407-05 | Paddle switch              | STBY         |                                      |              |                    |              |
|         | T03-0027-15 | Speaker                    |              |                                      |              |                    |              |
|         | T40-0301-05 | Fan motor                  | S            |                                      |              |                    |              |
|         | X40-1170-00 | VFO unit                   |              | C5                                   | CQ09S1H102J  | S                  | 0.001μF      |
|         | X41-1300-00 | Relay unit                 |              | C7                                   | CC45RH1H330J | C                  | 33pF         |
|         | X41-1310-00 | Switch (A) unit            | power side   | C9                                   | CC45RH1H181J | C                  | 180pF        |
|         | X41-1320-00 | Switch (B) unit            | MIC side     | C10                                  | CC45RH1H151J | C                  | 150pF        |
|         | X44-1380-00 | RF unit                    |              | C11                                  | CC45RH1H181J | C                  | 180pF        |
|         | X48-1300-00 | IF unit                    | S            | C13                                  | CC45RH1H030C | C                  | 3pF ±0.25pF  |
|         | X48-1300-01 | IF unit                    | V            | C16,17                               | C91-0456-05  | C                  | 0.047μF 25V  |
|         | X49-1110-01 | AF-GEN unit                |              | C18                                  | CC45RH1H120J | C                  | 12pF         |
|         | X50-1500-00 | CAR unit                   |              | C19                                  | C91-0456-05  | C                  | 0.047μF 25V  |
|         | X50-1700-00 | PLL unit                   |              | C21                                  | CC45SL1H220J | C                  | 22pF         |
|         | X51-1240-00 | Filter unit                | S            | C23                                  | C91-0456-05  | C                  | 0.047μF 25V  |
|         | X51-1250-00 | Filter unit                | V            | C25~28                               | C91-0456-05  | C                  | 0.047μF 25V  |
|         | X54-1450-01 | Indicator unit             | VFO          | C29,30                               | CC45SL1H220J | C                  | 22pF         |
|         | X54-1550-00 | Processor unit             |              | C31                                  | CC45SL1H150J | C                  | 15pF         |
|         | X54-1560-00 | Counter unit               |              | C32                                  | CC45SL1H270J | C                  | 27pF         |
|         |             |                            |              | C33,34                               | C91-0455-05  | C                  | 0.01μF 25V   |
|         |             |                            |              | C35,36                               | C91-0456-05  | C                  | 0.047μF 25V  |
|         |             |                            |              | C40                                  | CE04W1H4R7Q  | E                  | 4.7μF 50V    |
|         |             |                            |              | C42                                  | CE04W1C100Q  | E                  | 10μF 16V     |
|         |             |                            |              | C47                                  | CC45RH1H270J | C                  | 27pF         |
|         |             |                            |              | C49                                  | C91-0456-05  | C                  | 0.047μF 25V  |
|         |             |                            |              | C51,53                               | C91-0456-05  | C                  | 0.047μF 25V  |
|         |             |                            |              | C54                                  | CE04W1C100Q  | E                  | 10μF 16V     |
|         |             |                            |              | C56                                  | C91-0456-05  | C                  | 0.047μF 25V  |
|         |             |                            |              |                                      | E23-0401-05  | Round terminal     |              |
|         |             |                            |              |                                      | E40-0273-05  | Mini connect wafer | 2P           |
|         |             |                            |              |                                      | E40-0373-05  | Mini connect wafer | 3P           |
|         |             |                            |              |                                      | E40-0573-05  | Mini connect wafer | 5P           |
|         |             |                            |              |                                      | E40-0873-05  | Mini connect wafer | 8P           |

PARTS LIST

| Ref.No. | Parts No.                  | Description                      | Re-<br>marks | Ref.No.   | Parts No.    | Description            | Re-<br>marks |
|---------|----------------------------|----------------------------------|--------------|---|--------------|------------------------|--------------|
|         | J31-0502-04<br>J42-0404-05 | PC Board collar<br>PC Board bush |              | <b>IF UNIT (X48-1380-00,-01) 00 : S, 01 : V</b> |              |                        |              |
| L1,2    | L40-1592-02                | Ferri-inducter 1.5μH             | ☆            | C3,4  | CC45SL1H470J | C 47pF                 |              |
| L3      | L34-0966-05                | Trap coil 8.83M                  |              | C6  | CE04W1C100   | E 10μF 16V             |              |
| L4      | L34-0558-05                | Trap coil                        |              | C23   | C91-0456-05  | C 0.047μF 25V          |              |
| L5      | L40-1021-03                | Ferri-inducter 1mH               |              | C26   | CC45SL1H050C | C 5pF ±0.25pF          |              |
| L6      | L40-4711-03                | Ferri-inducter 470μH             |              | C27   | CC45SL1H180J | C 18pF                 |              |
| L7      | L34-0967-05                | BPF coil 3.5A                    | ☆            | C32   | CC45SL1H050C | C 5pF ±0.25pF          |              |
| L8      | L34-0968-05                | BPF coil 3.5B                    | ☆            | C34,36  | C91-0456-05  | C 0.047μF 25V          |              |
| L9      | L34-0967-05                | BPF coil 3.5A                    | ☆            | C38   | CC45SL1H100D | C 10pF ±0.5pF          |              |
| L10     | L34-0969-05                | BPF coil 7A                      | ☆            | C39,42  | CC45SL1H470J | C 47pF                 |              |
| L11     | L34-0970-05                | BPF coil 7B                      | ☆            | C44,51  | CE04W1H010   | E 1μF 50V              |              |
| L12     | L34-0971-05                | BPF coil 7C                      | ☆            | C53   | CC45SL1H030C | C 3pF ±0.25pF          |              |
| L13     | L34-0972-05                | BPF coil 10A                     | ☆            | C62,63  | C90-0817-05  | E 1000μF 16V           |              |
| L14     | L34-0973-05                | BPF coil 10B                     | ☆            |   | E23-0046-04  | Square terminal        |              |
| L15     | L34-0974-05                | BPF coil 10C                     | ☆            |   | E23-0401-05  | Round terminal         |              |
| L16     | L34-0975-05                | BPF coil 14A                     | ☆            |   | E40-0273-05  | Mini connect wafer 2P  |              |
| L17     | L34-0976-05                | BPF coil 14B                     | ☆            |   | E40-0373-05  | Mini connect wafer 3P  |              |
| L18     | L34-0977-05                | BPF coil 14C                     | ☆            |   | E40-0473-05  | Mini connect wafer 4P  |              |
| L19     | L34-0978-05                | BPF coil 18A                     | ☆            |   | E40-0573-05  | Mini connect wafer 5P  |              |
| L20     | L34-0979-05                | BPF coil 18B                     | ☆            |   | E40-0673-05  | Mini connect wafer 6P  |              |
| L21     | L34-0980-05                | BPF coil 18C                     | ☆            |   | E40-0773-05  | Mini connect wafer 7P  |              |
| L22     | L34-0981-05                | BPF coil 21A                     | ☆            |   | E40-0973-05  | Mini connect wafer 9P  |              |
| L23     | L34-0982-05                | BPF coil 21B                     | ☆            |   | E40-1173-05  | Mini connect wafer 11P |              |
| L24     | L34-0983-05                | BPF coil 21C                     | ☆            |   | J31-0502-04  | PC Board collar        |              |
| L25     | L34-0984-05                | BPF coil 24.5A                   | ☆            |   | J42-0404-05  | PC Board bush          |              |
| L26     | L34-0985-05                | BPF coil 24.5B                   | ☆            | L1~9  | L40-1511-03  | Ferri-inducter 150μH   | S            |
| L27     | L34-0986-05                | BPF coil 24.5C                   | ☆            | L1~6  | L40-1511-03  | Ferri-inducter 150μH   | V            |
| L28     | L34-0707-05                | BPF coil 28A                     |              |   |              |                        |              |
| L29     | L34-0987-05                | BPF coil 28B                     | ☆            | T1  | L34-0967-05  | Tuning coil            | ☆            |
| L30     | L34-0738-05                | BPF coil 28C                     |              | T2  | L34-0942-05  | Tuning coil            |              |
| L31     | L40-4711-03                | Ferri-inducter 470μH             |              | T3  | L34-0538-05  | Tuning coil            |              |
| L32     | L40-1021-03                | Ferri-inducter 1mH               |              | T4,5  | L34-0535-05  | Tuning coil            |              |
| L33     | L40-1011-03                | Ferri-inducter 100μH             |              | T6  | L34-0536-05  | Tuning coil            |              |
| L34     | L40-1592-02                | Ferri-inducter 1.5μH             |              | T7  | L34-0535-05  | Tuning coil            |              |
| L35     | L34-0966-05                | Trap coil 8.83M                  | ☆            | T8  | L34-0536-05  | Tuning coil            |              |
| L36     | L40-1511-03                | Ferri-inducter 150μH             |              | CF1   | L72-0310-05  | Ceramic filter 8.83MHz |              |
| L37,38  | L40-4711-03                | Ferri-inducter 470μH             |              | XF1   | L71-0208-05  | MCF 8.83MHz            |              |
| L39     | L40-4782-02                | Ferri-inducter 0.47μH            |              | VR1   | R12-6405-05  | Trim. pot 470kΩ        | ☆            |
| L40~42  | L40-4711-03                | Ferri-inducter 470μH             |              | VR2   | R12-0416-05  | Trim. pot 470Ω         |              |
| L43     | L40-1021-03                | Ferri-inducter 1mH               |              |   | R92-0150-05  | Short jumper           |              |
| L44     | L40-1011-03                | Ferri-inducter 100μH             |              |   | S51-4401-05  | Relay (LZN-4)          |              |
| L45     | L40-1021-03                | Ferri-inducter 1mH               |              | <b>AF-GEN UNIT (X49-1110-01)</b>                |              |                        |              |
| L46,47  | L40-1011-03                | Ferri-inducter 100μH             |              | C1  | CC45CH1H100D | C 10pF ±0.5pF          |              |
| L48     | L33-0032-05                | Choke coil 3μH                   |              | C3  | CQ92M1H333K  | ML 0.033μF             |              |
| T1      | L34-0696-35                | Input coil                       | ☆            | C4  | CE04W1HR47   | E 0.47μF 50V           |              |
| T2      | L19-0303-05                | Wide bandwidth trans             |              | C5  | CE04W1A221   | E 220μF 10V            |              |
| T3      | L30-0506-05                | IFT                              |              | C7,8  | CE04W1C100   | E 10μF 16V             |              |
| T4      | L34-0697-05                | Output coil                      |              | C9  | CQ92M1H104K  | ML 0.1μF               |              |
| T5      | L19-0303-05                | Wide bandwidth trans             |              | C10,11  | C90-0817-05  | E 1000μF 16V           | ☆            |
| T6      | L19-0302-05                | Wide bandwidth trans             |              | C12   | CQ92M1H104K  | ML 0.1μF               |              |
| VR1     | R12-0416-05                | Trim. pot 470Ω                   |              | C13   | CE04W1C470   | E 47μF 16V             |              |
| VR2     | R12-1408-05                | Trim. pot 4.7kΩ                  | ☆            |   |              |                        |              |
|         | R92-0150-05                | Short jumper                     |              |   |              |                        |              |
|         | S29-3406-05                | Rotary wafer ass'y               | ☆            |   |              |                        |              |

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| Ref.No. | Parts No.    | Description            | Re-<br>marks | Ref.No.                       | Parts No.    | Description                | Re-<br>marks |
|---------|--------------|------------------------|--------------|-------------------------------|--------------|----------------------------|--------------|
| C14     | CQ92M1H104K  | ML 0.1μF               |              | T1                            | L15-0016-05  | Choke                      |              |
| C16     | CE04W1C470   | E 47μF 16V             |              | T2                            | L34-0567-05  | Tuning coil                |              |
| C17     | CE04W1H010   | E 1μF 50V              |              | R14                           | RS14GB3D8R2J | Metal film 8.2Ω 2W         |              |
| C18     | CQ92M1H223K  | ML 0.022μF             |              | VR1                           | R12-3025-05  | Trim.pot 10kΩ(B) RIT       |              |
| C19     | CE04W1C100   | E 10μF 16V             |              | VR2                           | R12-4016-05  | Trim.pot 50kΩ(B) RF        |              |
| C21,22  | CE04W1C470   | E 47μF 16V             |              | VR3                           | R12-0042-05  | Trim.pot 50kΩ(B) 9V        |              |
| C23     | CQ92M1H104K  | ML 0.1μF               |              | VR4                           | R12-4016-05  | Trim.pot 50kΩ(B) SIDE TONE |              |
| C24     | CE04W1C221   | E 220μF 16V            |              | VR5                           | R12-0401-05  | Trim.pot 100Ω(B) BM        |              |
| C30~33  | CC45CH1H220J | C 22pF                 |              | VR6                           | R12-0405-05  | Trim.pot 330Ω(B) ANT1.V    | ☆            |
| C37     | CC45SL1H151J | C 150pF                |              | VR7                           | R12-3408-05  | Trim.pot 47kΩ(B) V.GAIN    | ☆            |
| C38     | CC45CH1H100D | C 10pF ±0.5pF          |              | VR8                           | R12-5402-05  | Trim.pot 220kΩ(B) DELAY    | ☆            |
| C39     | CC45SL1H180J | C 18pF                 |              |                               | R92-0150-05  | Short jumper               |              |
| C41,42  | CC45SL1H101J | C 100pF                |              | <b>CAR UNIT (X50-1500-00)</b> |              |                            |              |
| C43     | CE04W1H010   | E 1μF 50V              |              | C2                            | CC45UJ1H220J | C 22pF                     |              |
| C44     | CE04W1A221   | E 220μF 10V            |              | C3                            | CC45UJ1H270J | C 27pF                     |              |
| C45     | CE04W1E4R7   | E 4.7μF 25V            |              | C4                            | CC45UJ1H220J | C 22pF                     |              |
| C46     | CE04W1H010   | E 1μF 50V              |              | C9                            | CS15E1VR22M  | T 0.22μF 35V               |              |
| C47     | CQ92M1H473K  | ML 0.047μF             |              | C13                           | CC45SL1H101J | C 100pF                    |              |
| C48,49  | CE04W1E4R7   | E 4.7μF 25V            |              | C14                           | CC45CH1H020C | C 2pF ±0.25pF              |              |
| C50     | CE04W1H010   | E 1μF 50V              |              | C15                           | CC45CH1H330J | C 33pF                     |              |
| C51     | CE04W1H3R3   | E 3.3μF 50V            |              | C16                           | C91-0456-05  | C 0.047μF 25V              |              |
| C52     | CE04W1H010   | E 1μF 50V              |              | TC1,2                         | C05-0056-05  | Ceramic trimmer 30pF       |              |
| C55     | CC45UJ1H220J | C 22pF                 |              |                               | E40-0373-05  | Mini connect wafer 3P      |              |
| C56     | CC45SL1H101J | C 100pF                |              |                               | E40-0873-05  | Mini connect wafer 8P      |              |
| C59     | CC45CH1H050C | C 5pF ±0.25pF          |              |                               | J31-0502-04  | PC Board collar            |              |
| C64,66  | CC45SL1H470J | C 47pF                 |              |                               | J42-0404-05  | PC Board bush              |              |
| C67     | CE04W1C100   | E 10μF 16V             |              | L1~3                          | L40-1511-03  | Ferri-inductor 150μH       |              |
| C68     | CE04W1H010   | E 1μF 50V              |              | L4                            | L33-0266-05  | Choke coil 28μH            |              |
| C69,70  | CQ92M1H123K  | ML 0.012μF             |              | L5                            | L40-2211-03  | Ferri-inductor 220μH       |              |
| C71     | CQ92M1H104K  | ML 0.1μF               |              | L6,7                          | L40-1511-03  | Ferri-inductor 150μH       |              |
| C72,73  | CQ92M1H123K  | ML 0.012μF             |              | T1                            | L32-0201-05  | OSC coil                   |              |
| C74     | CE04W1H010   | E 1μF 50V              |              | X1                            | L77-0485-05  | Crystal 8831.5kHz          |              |
| C75     | CE04W1A101   | E 100μF 10V            |              | X2                            | L77-0486-05  | Crystal 8828.5kHz          |              |
| C76,77  | CE04W1A470   | E 47μF 10V             |              | VR1,2                         | R12-1012-05  | Trim. pot 1kΩ(B)           |              |
| C78     | CQ92M1H223K  | ML 0.022μF             |              |                               | R92-0150-05  | Short jumper               |              |
| C79     | CE04W1H3R3   | E 3.3μF 50V            |              | <b>PLL UNIT (X50-1700-00)</b> |              |                            |              |
| C80     | CE04W1H010   | E 1μF 50V              |              | C1                            | CC45TH1H270J | C 27pF                     |              |
| C81     | CQ92M1H473K  | ML 0.047μF             |              | C2                            | CC45TH1H100D | C 10pF ±0.5pF              |              |
| C83     | CQ92M1H472K  | ML 0.0047μF            |              | C3                            | CC45TH1H220J | C 22pF                     |              |
| C84     | CQ92M1H473K  | ML 0.047μF             |              | C5                            | CC45RH1H390J | C 39pF                     |              |
| C85     | CE04W1E4R7   | E 4.7μF 25V            |              | C6                            | CC45SH1H560J | C 56pF                     |              |
| C86     | CE04W1E3R3   | E 3.3μF 25V            |              | C7                            | CE04W1A470Q  | E 47μF 10V                 |              |
| C90     | CE04W1C220   | E 22μF 16V             |              | C8                            | CC45TH1H270J | C 27pF                     |              |
| C91     | CQ92M1H153K  | ML 0.015μF             |              |                               |              |                            |              |
| C92     | CC45SL1H050C | C 5pF ±0.25pF          |              |                               |              |                            |              |
| TC1~6   | C05-0030-15  | Ceramic trimmer 20pF   |              |                               |              |                            |              |
|         | E18-0401-05  | Crystal socket 4P      |              |                               |              |                            |              |
|         | E40-0273-05  | Mini connect wafer 2P  |              |                               |              |                            |              |
|         | E40-0773-05  | Mini connect wafer 7P  |              |                               |              |                            |              |
|         | E40-0911-05  | Mini connect wafer 9P  | ☆            |                               |              |                            |              |
|         | E40-1073-05  | Mini connect wafer 10P |              |                               |              |                            |              |
|         | E40-1273-05  | Mini connect wafer 12P |              |                               |              |                            |              |
|         | E40-1373-05  | Mini connect wafer 13P | ☆            |                               |              |                            |              |
|         | F20-0078-05  | Insulating board       |              |                               |              |                            |              |
|         | F29-0014-05  | Shoulder washer        |              |                               |              |                            |              |
| L1      | L40-1021-03  | Ferri-inductor 1mH     |              |                               |              |                            |              |
| L2,3    | L40-1511-03  | Ferri-inductor 150μH   |              |                               |              |                            |              |
| L4      | L40-4711-03  | Ferri-inductor 470μH   |              |                               |              |                            |              |
| L5      | L40-3392-02  | Ferri-inductor 3.3μH   |              |                               |              |                            |              |
| L6,7    | L40-1511-03  | Ferri-inductor 150μH   |              |                               |              |                            |              |
| L8      | L40-1021-03  | Ferri-inductor 1mH     |              |                               |              |                            |              |

PARTS LIST

| Ref.No.  | Parts No.    | Description   | Re-<br>marks | Ref.No. | Parts No.    | Description           | Re-<br>marks |
|----------|--------------|---------------|--------------|---------|--------------|-----------------------|--------------|
| C9       | CC45TH1H150J | C 15pF        |              | C126    | CE04W1A470Q  | E 47μF 10V            |              |
| C10      | CC45TH1H180J | C 18pF        |              | C127    | CC45SL1H390J | C 39pF                |              |
| C12      | CE04W1A470Q  | E 47μF 10V    |              | C128    | CC45SL1H070D | C 7pF ±0.5pF          |              |
| C14      | CC45UJ1H680J | C 68pF        |              | C129    | CC45CH1H0R5C | C 0.5pF ±0.25pF       |              |
| C15      | CC45UJ1H100D | C 10pF ±0.5pF |              | C130    | CE04W1C470M  | E 47μF 16V            |              |
| C16      | CC45TH1H150J | C 15pF        |              |         | E23-0046-04  | Square terminal       |              |
| C18      | CC45TH1H220J | C 22pF        |              |         | E40-0273-05  | Mini connect wafer 2P |              |
| C19      | CE04W1A470Q  | E 47μF 10V    |              |         | E40-0573-05  | Mini connect wafer 5P |              |
| C20      | CC45UJ1H680J | C 68pF        |              |         | E40-0673-05  | Mini connect wafer 6P |              |
| C21      | CC45UJ1H330J | C 33pF        |              |         | E40-0873-05  | Mini connect wafer 8P |              |
| C23      | CC45TH1H150J | C 15pF        |              |         | J31-0502-04  | PC Board collar       |              |
| C24      | CC45TH1H080D | C 8pF ±0.5pF  |              |         | J42-0404-05  | PC Board bush         |              |
| C25      | CC45TH1H120J | C 12pF        |              | L1~5    | L40-1511-03  | Ferri-inductor 150μH  |              |
| C26      | CE04W1A470Q  | E 47μF 10V    |              | L6      | L40-4701-03  | Ferri-inductor 47μH   |              |
| C28      | CC45TH1H330J | C 33pF        |              | L7      | L40-1511-03  | Ferri-inductor 150μH  |              |
| C29      | CC45TH1H150J | C 15pF        |              | L8      | L40-1592-02  | Ferri-inductor 1.5μH  |              |
| C30      | CC45TH1H270J | C 27pF        |              | L9,10   | L40-1092-02  | Ferri-inductor 1.0μH  |              |
| C31      | CC45TH1H330J | C 33pF        |              | L11     | L40-1292-02  | Ferri-inductor 1.2μH  |              |
| C32      | CC45UJ1H220J | C 22pF        |              | L12~17  | L40-1511-03  | Ferri-inductor 150μH  |              |
| C34      | CE04W1A470Q  | E 47μF 10V    |              | L18     | L40-1011-03  | Ferri-inductor 100μH  |              |
| C36      | CC45UJ1H220J | C 22pF        |              | L19     | L40-1511-03  | Ferri-inductor 150μH  |              |
| C37      | CC45UJ1H050C | C 5pF ±0.25pF |              | L20~22  | L40-2701-03  | Ferri-inductor 27μH   |              |
| C38      | CC45CH1H100D | C 10pF ±0.5pF |              | L23     | L40-4711-03  | Ferri-inductor 470μH  |              |
| C39      | CC45CH1H020C | C 2pF ±0.25pF |              | L24,25  | L40-1511-03  | Ferri-inductor 150μH  |              |
| C41,43   | C91-0456-05  | C 0.047μF 25V |              | L26     | L40-1001-03  | Ferri-inductor 10μH   |              |
| C44      | CC45SL1H151J | C 150pF       |              | L27     | L40-4711-03  | Ferri-inductor 470μH  |              |
| C45      | CC45SL1H271J | C 270pF       |              | L28     | L40-2701-03  | Ferri-inductor 27μH   |              |
| C46      | CC45SL1H121J | C 120pF       |              | L29     | L40-1511-03  | Ferri-inductor 150μH  |              |
| C48      | CC45CH1H100D | C 10pF ±0.5pF |              | T1      | L32-0193-05  | OSC coil              |              |
| C49      | CC45SL1H470J | C 47pF        |              | T2      | L32-0195-05  | OSC coil              |              |
| C52      | CC45RH1H390J | C 39pF        |              | T3      | L32-0196-05  | OSC coil              |              |
| C53      | CC45RH1H560J | C 56pF        |              | T4      | L32-0197-05  | OSC coil              |              |
| C65      | CC45RH1H470J | C 47pF        |              | T5      | L32-0198-05  | OSC coil              |              |
| C66      | CC45RH1H220J | C 22pF        |              | T6      | L34-0529-05  | Trap coil 8.83M       |              |
| C67      | CC45RH1H470J | C 47pF        |              | T7      | L34-0709-05  | Tuning coil 10M       |              |
| C70      | CC45RH1H100D | C 10pF ±0.5pF |              | T8      | L34-0710-05  | Tuning coil 20M       |              |
| C71      | CC45SL1H050D | C 5pF ±0.5pF  |              | T9      | L34-0712-05  | Tuning coil           |              |
| C75      | CC45RH1H330J | C 33pF        |              | T10     | L34-0713-05  | Tuning coil           |              |
| C76      | CC45RH1H150J | C 15pF        |              | T11     | L34-0711-05  | Tuning coil           |              |
| C77      | CC45RH1H330J | C 33pF        |              | T12     | L34-0716-05  | Tuning coil           |              |
| C80      | CC45RH1H150J | C 15pF        |              | T13     | L34-0715-05  | Tuning coil           |              |
| C81      | CC45RH1H040C | C 4pF ±0.25pF |              | T14     | L34-0714-05  | Tuning coil           |              |
| C82      | CC45RH1H150J | C 15pF        |              | T15     | L34-0757-05  | Tuning coil           |              |
| C85      | CC45RH1H100D | C 10pF ±0.5pF |              | T16     | L34-0718-05  | Tuning coil           |              |
| C86      | CC45SL1H050D | C 5pF ±0.5pF  |              | T17     | L34-0717-05  | Tuning coil           |              |
| C88      | CC45CH1H010C | C 1pF ±0.25pF |              | VR1     | R12-5014-05  | Trim. pot 100kΩ       |              |
| C89      | CC45CH1H050C | C 5pF ±0.25pF |              |         | R92-0150-05  | Short jumper          |              |
| C100,101 | CC45SL1H221J | C 220pF       |              |         |              |                       |              |
| C102     | CQ92M1H122K  | ML 0.0012μF   |              |         |              |                       |              |
| C103     | CC45SL1H330J | C 33pF        |              |         |              |                       |              |
| C104,105 | CC45SL1H680J | C 68pF        |              |         |              |                       |              |
| C106     | CC45SL1H330J | C 33pF        |              |         |              |                       |              |
| C108,109 | C91-0456-05  | C 0.047μF 25V |              |         |              |                       |              |
| C110     | CC45SL1H390J | C 39pF        |              |         |              |                       |              |
| C111     | CC45SL1H271J | C 270pF       |              |         |              |                       |              |
| C112     | C91-0456-05  | C 0.047μF 25V |              |         |              |                       |              |
| C113     | CE04W1A101Q  | E 100μF 10V   |              |         |              |                       |              |
| C114     | C91-0456-05  | C 0.047μF 25V |              |         |              |                       |              |
| C115     | CE04W1A470Q  | E 47μF 10V    |              |         |              |                       |              |
| C120     | C91-0456-05  | C 0.047μF 25V |              |         |              |                       |              |
| C121     | CQ92M1H102K  | ML 0.001μF    |              |         |              |                       |              |
| C122     | CQ92M1H104K  | ML 0.1μF      |              |         |              |                       |              |
| C123     | C91-0456-05  | C 0.047μF 25V |              |         |              |                       |              |
| C124     | CE04W1A101Q  | E 100μF 10V   |              |         |              |                       |              |



PARTS LIST

| Ref.No.                                 | Parts No.    | Description            | Re-<br>marks | Ref.No.                                 | Parts No.    | Description          | Re-<br>marks |
|---|--------------|------------------------|--------------|---|--------------|----------------------|--------------|
| <b>FILTER UNIT (X51-1240-00) S TYPE</b> |              |                        |              | <b>FILTER UNIT (X51-1250-00) V TYPE</b> |              |                      |              |
| C2                                      | CC45SL2H221J | C 220pF 500V           |              | L8,9                                    | L34-3001-15  | Filter coil (D)      |              |
| C3                                      | C91-0456-05  | C 0.047μF 25V          |              | L10,11                                  | L34-0830-05  | Filter coil (E)      |              |
| C4                                      | CC45CH1H680J | C 68pF                 |              | L12                                     | L40-1021-03  | Ferri-inductor 1mH   |              |
| C5                                      | CC45CH2H030C | C 3pF ±0.25pF 500V     |              | L13                                     | L34-0989-05  | Filter coil (G)      | ☆            |
| C7                                      | C91-0456-05  | C 0.047μF 25V          |              | L14,15                                  | L40-1021-03  | Ferri-inductor 1mH   |              |
| C8                                      | CE04W1H010   | E 1μF 50V              |              | L16,17                                  | L40-1511-03  | Ferri-inductor 150μH |              |
| C10                                     | CE04W1HR47   | E 0.47μF 50V           |              | L18                                     | L39-0406-05  | Detector coil        |              |
| C11                                     | C91-0456-05  | C 0.047μF 25V          |              | L19                                     | L40-1511-03  | Ferri-inductor 150μH |              |
| C13                                     | CE04W1C100   | E 10μF 16V             |              | L20,21                                  | L34-0988-05  | Filter coil (F)      | ☆            |
| C18                                     | CE04W1C221   | E 220μF 16V            |              | L22                                     | L34-0989-05  | Filter coil (G)      | ☆            |
| C19                                     | C91-0456-05  | C 0.047μF 25V          |              | R23                                     | RC05GF2H151J | Solid 150Ω 1/2W      |              |
| C23                                     | CM93D2H561J  | MC 560pF 500V          |              | VR1                                     | R12-4016-05  | Trim. pot 50kΩ(B)    |              |
| C24,25                                  | CM93D2H122J  | MC 0.0012μF 500V       |              | VR2                                     | R12-3025-05  | Trim. pot 10kΩ(B)    |              |
| C26                                     | CM93D2H821J  | MC 820pF 500V          |              | VR3                                     | R12-4016-05  | Trim. pot 50kΩ(B)    |              |
| C27                                     | CC45CH2H151J | C 150pF 500V           |              | VR4                                     | R12-0042-05  | Trim. pot 500Ω(B)    |              |
| C28                                     | CC45SL2H181J | C 180pF 500V           |              | VR5                                     | R12-1020-05  | Trim. pot 1kΩ(B)     |              |
| C29                                     | CM93D2H621J  | MC 620pF 500V          |              |   | R92-0150-05  | Short jumper         |              |
| C30                                     | CC45CH2H151J | C 150pF 500V           |              | RL1                                     | S51-4402-05  | Relay (LZN403)       |              |
| C31                                     | CC45SL2H181J | C 180pF 500V           |              |   |              |                      |              |
| C32,33                                  | CC45CH2H121J | C 120pF 500V           |              |   |              |                      |              |
| C34                                     | CM93D2H471J  | MC 470pF 500V          |              |   |              |                      |              |
| C35                                     | CC45CH2H680J | C 68pF 500V            |              |   |              |                      |              |
| C36                                     | CC45CH2H151J | C 150pF 500V           |              |   |              |                      |              |
| C37                                     | CC45SL2H221J | C 220pF 500V           |              |   |              |                      |              |
| C38                                     | CC45CH2H121J | C 120pF 500V           |              |   |              |                      |              |
| C39                                     | CC45CH2H101J | C 100pF 500V           |              |   |              |                      |              |
| C40                                     | CC45CH2H151J | C 150pF 500V           |              |   |              |                      |              |
| C41                                     | CC45SL2H181J | C 180pF 500V           |              |   |              |                      |              |
| C42                                     | CC45CH2H680J | C 68pF 500V            |              |   |              |                      |              |
| C43                                     | CC45CH2H820J | C 82pF 500V            |              |   |              |                      |              |
| C44                                     | CC45CH2H560J | C 56pF 500V            |              |   |              |                      |              |
| C45                                     | CC45CH2H680J | C 68pF 500V            |              |   |              |                      |              |
| C46                                     | CC45CH2H101J | C 100pF 500V           |              |   |              |                      |              |
| C47                                     | CC45CH2H121J | C 120pF 500V           |              |   |              |                      |              |
| C48                                     | CC45CH2H560J | C 56pF 500V            |              |   |              |                      |              |
| C49                                     | CC45CH2H680J | C 68pF 500V            |              |   |              |                      |              |
| C50                                     | CC45CH2H470J | C 47pF 500V            |              |   |              |                      |              |
| C51                                     | CC45CH2H390J | C 39pF 500V            |              |   |              |                      |              |
| C52,53                                  | CC45CH2H820J | C 82pF 500V            |              |   |              |                      |              |
| C54,55                                  | CC45CH2H680J | C 68pF 500V            |              |   |              |                      |              |
| C56                                     | CC45CH2H820J | C 82pF 500V            |              |   |              |                      |              |
| C57,58                                  | CC45CH2H151J | C 150pF 500V           |              |   |              |                      |              |
| C59,60                                  | CC45CH2H101J | C 100pF 500V           |              |   |              |                      |              |
| TC1                                     | C05-0043-05  | Ceramic trimmer 20pF   |              |   |              |                      |              |
|   | E04-0154-05  | Coax. connector        |              |   |              |                      |              |
|   | E23-0046-04  | Square terminal        |              |   |              |                      |              |
|   | E40-0273-05  | Mini connect wafer 2P  |              |   |              |                      |              |
|   | E40-0373-05  | Mini connect wafer 3P  |              |   |              |                      |              |
|   | E40-0973-05  | Mini connect wafer 9P  |              |   |              |                      |              |
|   | E40-1273-05  | Mini connect wafer 12P |              |   |              |                      |              |
|   | F20-0078-05  | Insulating board       |              |   |              |                      |              |
|   | F29-0014-05  | Shoulder washer        |              |   |              |                      |              |
|   | J31-0502-04  | PC Board collar        |              |   |              |                      |              |
|   | J42-0404-05  | PC Board bush          |              |   |              |                      |              |
| L1~3                                    | L34-0826-05  | Filter coil (A)        |              |   |              |                      |              |
| L4,5                                    | L34-0827-05  | Filter coil (B)        |              |   |              |                      |              |
| L6,7                                    | L34-0828-05  | Filter coil (C)        |              |   |              |                      |              |

PARTS LIST

| Ref.No.                             | Parts No.    | Description                  | Re-<br>marks | Ref.No.   | Parts No.    | Description            | Re-<br>marks |
|-------------------------------------|--------------|------------------------------|--------------|-----------|--------------|------------------------|--------------|
|                                     | E40-0673-05  | Mini connect wafer 6P        |              | C11       | CE04W1A101Q  | E 100μF 10V            |              |
|                                     | E40-1073-05  | Mini connect wafer 10P       |              | C12       | C91-0456-05  | C 0.047μF 25V          |              |
|                                     | J31-0502-04  | PC Board collar              |              | C13       | CC45SL1H470J | C 47pF                 |              |
|                                     | J42-0404-05  | PC Board bush                |              | C14       | CC45CH1H390J | C 39pF                 |              |
|                                     | J61-0019-05  | Vinyle tie                   |              | C15       | CC45CH1H101J | C 100pF                |              |
| L1,2                                | L34-0826-05  | Filter coil                  |              | C16       | CC45CH1H270J | C 27pF                 |              |
| L3,4                                | L34-0827-05  | Filter coil                  |              | C17       | C91-0456-05  | C 0.047μF 25V          |              |
| L5                                  | L34-0828-05  | Filter coil                  |              | C18       | CC45SL1H221J | C 220pF                |              |
| L6                                  | L34-0724-05  | Filter coil                  |              | C19       | CC45SL1H220J | C 22pF                 |              |
| L7,8                                | L34-0829-05  | Filter coil                  |              | C20       | CC45SL1H050C | C 5pF ±0.25pF          |              |
| L9,10                               | L34-0830-05  | Filter coil                  |              | C21,22    | C91-0456-05  | C 0.047μF 25V          |              |
| L11                                 | L39-0404-05  | Detector coil                |              | C23       | CE04W1A101Q  | E 100μF 10V            |              |
| L12,13                              | L40-1511-03  | Ferri-inductor 150μH         |              | C24       | CC45SL1H101J | C 100pF                |              |
| L14,15                              | L40-1021-03  | Ferri-inductor 1mH           |              | C25       | CC45SL1H270J | C 27pF                 |              |
| L16,17                              | L40-1511-03  | Ferri-inductor 150μH         |              | C26       | CC45SL1H560J | C 56pF                 |              |
| R4                                  | RC05GF2H103K | Solid 10kΩ 1/2W              |              | C27       | CC45SL1H270J | C 27pF                 |              |
| VR1                                 | R12-3025-05  | Trim. pot 10kΩ(B)            |              | C28~30    | CC45SL1H470J | C 47pF                 |              |
| VR2,3                               | R12-4016-05  | Trim. pot 50kΩ(B)            |              | C31,33    | C91-0456-05  | C 0.047μF 25V          |              |
| VR4                                 | R12-1020-05  | Trim. pot 1kΩ(B)             |              | C34       | CC45SL1H101J | C 100pF                |              |
|                                     | R92-0150-05  | Short jumper                 |              | C35       | CC45SL1H221J | C 220pF                |              |
|                                     | S01-2424-05  | Rotary switch                | ☆            | C36       | CC45SL1H101J | C 100pF                |              |
|                                     | S51-4402-05  | Relay (LZN403)               |              | C38,39    | C91-0456-05  | C 0.047μF 25V          |              |
| <b>PROCESSOR UNIT (X54-1550-00)</b> |              |                              |              |           |              |                        |              |
| C1~4                                | CE04W1H010Q  | E 1μF 50V                    |              | C40       | CC45SL1H150J | C 15pF                 |              |
| C5                                  | CE04W1H3R3Q  | E 3.3μF 50V                  |              | C41,42    | C91-0456-05  | C 0.047μF 25V          |              |
| C6,7                                | CE04W1H010Q  | E 1μF 50V                    |              | C43       | C092M1H103K  | ML 0.01μF              |              |
| C8                                  | CE04W1H4R7Q  | E 4.7μF 50V                  |              | C44,45    | C91-0456-05  | C 0.047μF 25V          |              |
| C9                                  | CE04W1C100Q  | E 10μF 16V                   |              | C46       | CE04W1A101Q  | E 100μF 10V            |              |
| C10                                 | CE04W1H4R7Q  | E 4.7μF 50V                  |              | C47       | CE04W0J221Q  | E 220μF 6.3V           |              |
| C11                                 | CE04W1C470Q  | E 47μF 16V                   |              | C48       | CE04W1V100Q  | E 10μF 35V             |              |
|                                     | E23-0047-04  | Square terminal              |              | C49       | C092M1H103K  | ML 0.01μF              |              |
|                                     | E40-0273-05  | Mini connect wafer 2P        |              | C50,51    | CE04W1V100Q  | E 10μF 35V             |              |
|                                     | E40-0473-05  | Mini connect wafer 4P        |              | C52       | C91-0456-05  | C 0.047μF 25V          |              |
|                                     | E40-0873-05  | Mini connect wafer 8P        |              | C53       | CE04W1V100Q  | E 10μF 35V             |              |
| VR1,S1                              | R19-3408-05  | Pot. with SW 10kΩ(A),10kΩ(B) | ☆            | C55,57,62 | C91-0456-05  | C 0.047μF 25V          |              |
| VR2                                 | R12-5406-05  | Pot. 100kΩ                   | ☆            |           |              |                        |              |
|                                     | R92-0150-05  | Short jumper                 |              |           |              |                        |              |
| <b>COUNTER UNIT (X54-1560-00)</b>   |              |                              |              |           |              |                        |              |
| C1                                  | CC45CH1H330J | C 33pF                       |              | TC1       | C05-0035-05  | Ceramic trimmer 50pF   |              |
| C2                                  | CC45SL1H391J | C 390pF                      |              |           |              |                        |              |
| C3                                  | CC45CH1H470J | C 47pF                       |              |           |              |                        |              |
| C4                                  | C91-0456-05  | C 0.047μF 25V                |              |           |              |                        |              |
| C5                                  | CC45SL1H150J | C 15pF                       |              |           |              |                        |              |
| C6                                  | CC45SL1H020C | C 2pF ±0.25pF                |              |           |              |                        |              |
| C7                                  | CC45SL1H100D | C 10pF ±0.5pF                |              |           |              |                        |              |
| C9,10                               | C91-0456-05  | C 0.047μF 25V                |              |           |              |                        |              |
|                                     |              |                              |              | L1~4      | L40-4711-03  | Ferri-inductor 470μH   |              |
|                                     |              |                              |              | L5,6      | L40-4701-03  | Ferri-inductor 47μH    |              |
|                                     |              |                              |              | L7,8      | L40-4711-03  | Ferri-inductor 470μH   |              |
|                                     |              |                              |              | L9,10     | L40-2211-03  | Ferri-inductor 220μH   |              |
|                                     |              |                              |              | L11,12    | L40-1511-03  | Ferri-inductor 150μH   |              |
|                                     |              |                              |              | L13       | L40-1011-04  | Ferri-inductor 100μH   |              |
|                                     |              |                              |              | T1        | L19-0305-05  | OSC trans              |              |
|                                     |              |                              |              | X1        | L77-0482-05  | Crystal 10MHz          |              |
|                                     |              |                              |              | R68       | RC05GF2H151K | Solid 150Ω 1/2W        |              |
|                                     |              |                              |              | RB1       | R90-0522-05  | Resistor block 47kΩ X6 |              |
|                                     |              |                              |              | RB2,3     | R90-0521-05  | Resistor block 47kΩ X7 |              |
|                                     |              |                              |              | RB4       | R90-0522-05  | Resistor block 47kΩ X6 |              |
|                                     |              |                              |              |           | R92-0150-05  | Short jumper           |              |

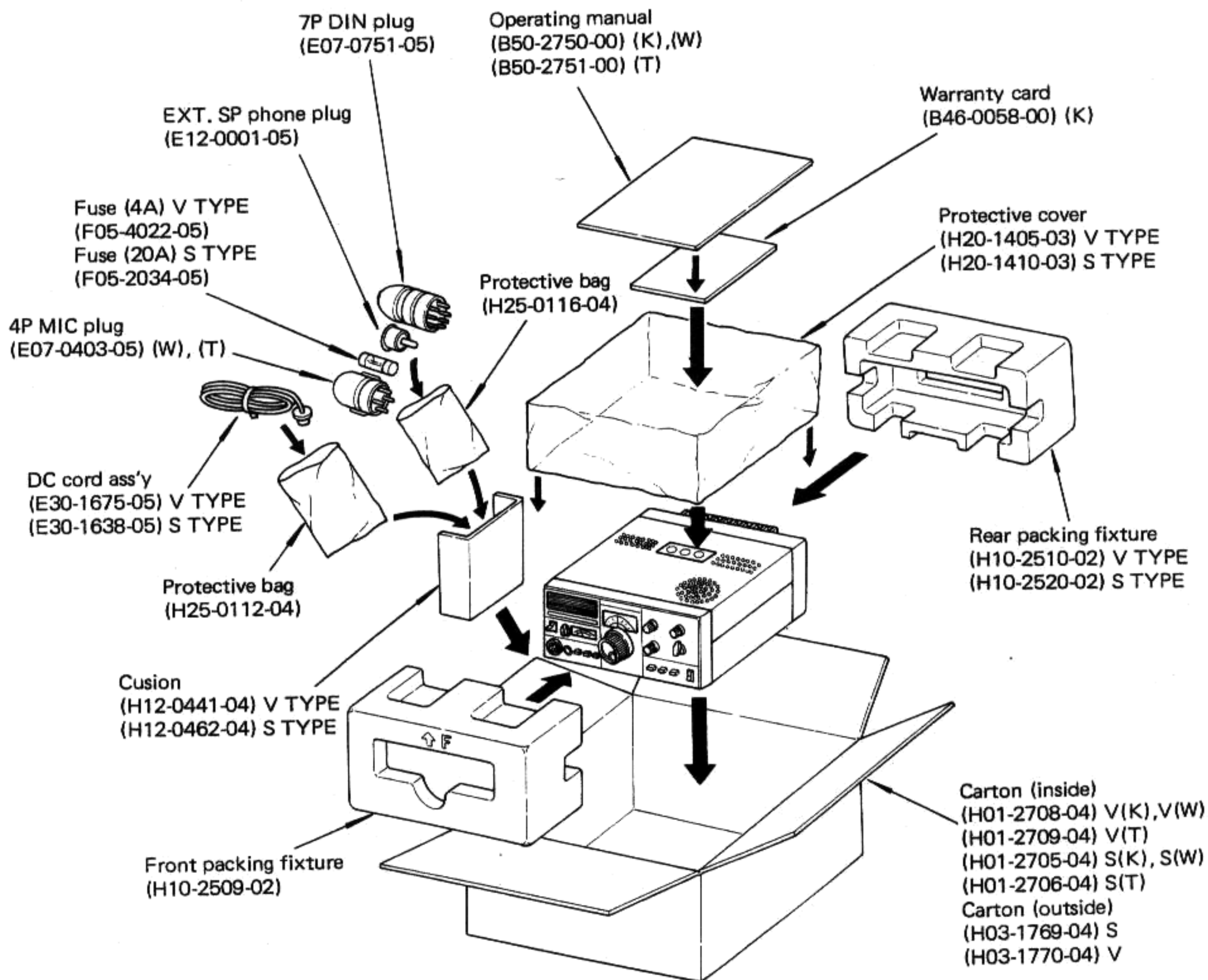
PARTS LIST

| Ref.No.                                 | Parts No.    | Description           | Re-<br>marks | Ref.No.                             | Parts No.             | Description          | Re-<br>marks |
|---|--------------|-----------------------|--------------|-------------------------------------|-----------------------|----------------------|--------------|
| <b>FINAL UNIT (X-56-1300-00) V TYPE</b> |              |                       |              |                                     |                       |                      |              |
| C1,3                                    | C91-0456-05  | C 0.047μF 25V         |              | E23-0043-04                         | Antenna earth lug     |                      |              |
| C5,6,10                                 | C91-0456-05  | C 0.047μF 25V         |              | E23-0046-04                         | Square terminal       |                      |              |
| C12~14                                  | C91-0456-05  | C 0.047μF 25V         |              | E23-0401-05                         | Round terminal        |                      |              |
| C16,18                                  | C91-0456-05  | C 0.047μF 25V         |              | E23-0420-05                         | Earth lug             |                      |              |
| C19                                     | CE04W1C101   | E 100μF 16V           |              | E40-0273-05                         | Mini connect wafer 2P |                      |              |
| C20                                     | CE04W1C100   | E 10μF 16V            |              | E40-0373-05                         | Mini connect wafer 3P |                      |              |
| C21                                     | CC45SL2H151J | C 150pF 500V          |              | F01-0735-05                         | Heat sink             |                      |              |
| C22                                     | CC45SL1H471J | C 470pF               |              | F20-0078-05                         | Insulating board      |                      |              |
| C23                                     | CC45SL2H680J | C 68pF 500V           |              | F29-0014-05                         | Shoulder washer       |                      |              |
| C24                                     | C91-0456-05  | C 0.047μF 25V         |              | J31-0503-05                         | Bees                  |                      |              |
|   | E23-0401-05  | Round terminal        |              | J32-0730-04                         | Hex. boss             |                      | ☆            |
|   | F01-0717-13  | Heat sink A           | ☆            | L1                                  | L40-1001-04           | Ferri-inductor 10μH  |              |
|   | F20-0078-05  | Insulating board      |              | L3,4                                | L33-0032-05           | RFC                  |              |
|   | F29-0014-05  | Shoulder washer       |              | L7                                  | L33-0617-05           | RFC                  |              |
| L1                                      | L40-4701-03  | Ferri-inductor 47μH   |              | L8                                  | L33-0025-05           | RFC                  |              |
| L3,6                                    | L33-0032-05  | RFC 3μH               |              | L9                                  | L33-0625-15           | RFC                  | ☆            |
| L7                                      | L33-0617-05  | RFC                   | ☆            | L10~12                              | L40-1011-04           | Ferri-inductor 100μH |              |
| T1                                      | L19-0315-15  | Wide bandwidth trans  |              | L13,14                              | L40-1021-03           | Ferri-inductor 1mH   |              |
| T2                                      | L19-0306-15  | Output trans          | ☆            | T1                                  | L19-0315-25           | Wide bandwidth trans |              |
| R6,7                                    | RC05GF2H560J | Solid 56Ω 1/2W        |              | T2                                  | L19-0311-05           | Input trans          | ☆            |
| R11                                     | RC05GF2H4R7J | Solid 4.7Ω 1/2W       |              | T3                                  | L19-0313-15           | NF trans             | ☆            |
| R17,18                                  | RC05GF2H560J | Solid 56Ω 1/2W        |              | T4                                  | L19-0312-05           | Output trans         | ☆            |
| VR1                                     | R12-0412-05  | Trim. pot 200Ω(B)     |              |                                     | N19-0611-04           | Washer               | ☆            |
|   | R92-0150-05  | Short jumper          |              | R3                                  | RC05GF2H4R7J          | Solid 4.7Ω 1/2W      |              |
| <b>FINAL UNIT (X56-1350-00) S TYPE</b>  |              |                       |              |                                     |                       |                      |              |
| C1                                      | C91-0455-05  | C 0.01μF 25V          |              | R12,13                              | RC05GF2H101J          | Solid 100Ω 1/2W      |              |
| C3,4                                    | C91-0456-05  | C 0.047μF 25V         |              | R14~17                              | RS14A83A3R9J          | Metal film 3.9Ω 1W   |              |
| C6                                      | C91-0455-05  | C 0.01μF 25V          |              | R18,19                              | RC05GF2H150J          | Solid 15Ω 1/2W       |              |
| C11                                     | C91-0456-05  | C 0.047μF 25V         |              | R20~23                              | RC05GF2H5R6J          | Solid 5.6Ω 1/2W      |              |
| C12                                     | CE04W1E100   | E 10μF 25V            |              | VR1,2                               | R12-0058-05           | Trim. pot 470Ω(B)    |              |
| C13,14                                  | C91-0456-05  | C 0.047μF 25V         |              |                                     | R92-0150-05           | Short jumper         |              |
| C15                                     | CM93AD2H151J | MC 150pF 500V         |              | TM1                                 | S59-1404-05           | Thermostat Heat sink |              |
| C18,19                                  | C91-0456-05  | C 0.047μF 25V         |              | TM2                                 | S59-1403-05           | Thermostat core      |              |
| C20                                     | CE04W1E101   | E 100μF 25V           |              | <b>VFO ASS'Y UNIT (X60-1160-00)</b> |                       |                      |              |
| C21,24                                  | C91-0456-05  | C 0.047μF 25V         |              | B01-0621-04                         | Dial escutcheon       |                      | ☆            |
| C25                                     | CE04W1E100   | E 10μF 25V            |              | B08-4301-04                         | Dial back board       |                      | ☆            |
| C33,34                                  | C91-0448-05  | Laminated cap. 0.68μF | ☆            | B10-0634-04                         | Front glass (A)       |                      |              |
| C35                                     | C91-0456-05  | C 0.047μF 25V         |              | B20-0811-04                         | Dial scale (B) 25K    |                      | ☆            |
| C37                                     | CE04W1H101Q  | E 100μF 50V           |              | B20-0817-04                         | Dial scale (A) 500K   |                      |              |
| C38                                     | C91-0456-05  | C 0.047μF 25V         |              | B42-1645-04                         | Seal Bottom           |                      |              |
| C39                                     | CM93AD2H271J | MC 270pF 500V         |              | B42-1671-04                         | Seal Top              |                      |              |
| C40                                     | CM93AD2H331J | MC 330pF 500V         |              | G01-0804-04                         | Coil spring           |                      |              |
| C41~43                                  | C91-0455-05  | C 0.01μF 25V          |              | J19-1317-04                         | Diode holder          |                      |              |
| C44                                     | CM93AD2H271J | MC 270pF 500V         |              | K21-0722-04                         | Main knob             |                      |              |
| C47                                     | CM93AD2H331J | MC 330pF 500V         |              | N19-0613-04                         | washer B              |                      |              |
| C50                                     | CC45SL1H220J | C 22pF                |              | X40-1170-00                         | VFO unit              |                      |              |
| C51,52                                  | C91-0455-05  | C 0.01μF 25V          |              | X54-1450-01                         | INDICATOR unit        |                      | ☆            |
| C53                                     | CC45SL1H471J | C 470pF               |              |                                     |                       |                      |              |
|   | E04-0152-05  | UHF type receptacle   |              |                                     |                       |                      |              |
|   | E08-0271-05  | DC socket FAN         |              |                                     |                       |                      |              |

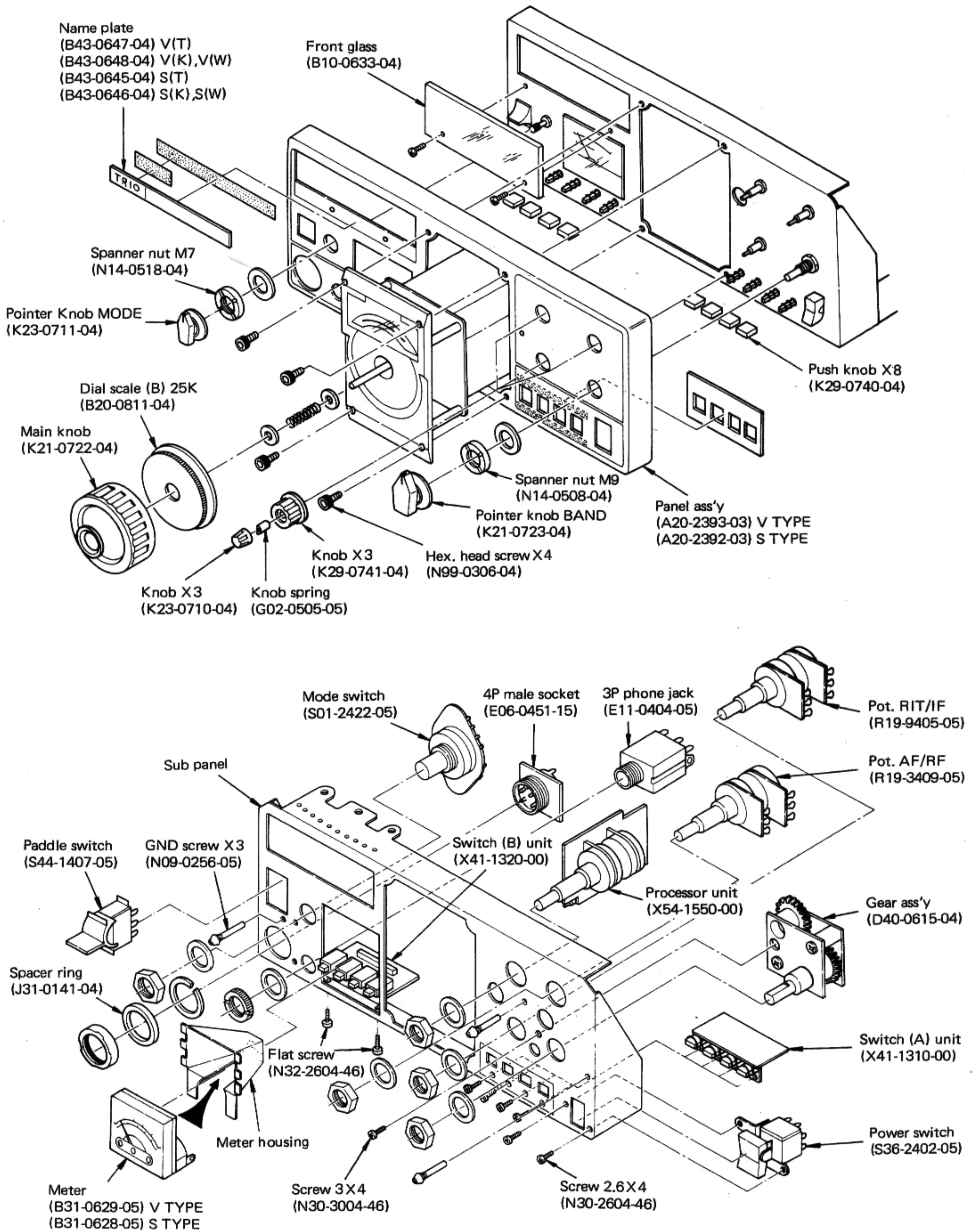
## PARTS LIST/PACKING

| Ref.No.                       | Parts No.    | Description         | Re-<br>marks | Ref. No. | Parts No.   | Description                | Re-<br>marks |
|-------------------------------|--------------|---------------------|--------------|----------|-------------|----------------------------|--------------|
| <b>VFO UNIT (X40-1170-00)</b> |              |                     |              | TC1      | C05-0009-15 | Ceramic trimmer 6pF        |              |
| C2                            | C91-0456-05  | C 0.047 $\mu$ F 25V |              | TC2      | C05-0013-15 | Ceramic trimmer 20pF       |              |
| C4                            | CC45RG1H030C | C 3pF $\pm$ 0.25pF  |              |          | C02-0019-05 | Variable cap.              | ☆            |
| C5                            | CC45PG1H020C | C 2pF $\pm$ 0.25pF  |              |          | D40-0614-05 | Dial mechanism ass'y       | ☆            |
| C6                            | C91-0456-05  | C 0.047 $\mu$ F 25V |              |          | E40-0574-05 | Mini connect wafer 5P      |              |
| C7                            | CC45LG1H151J | C 150pF             |              | L1       | L32-0628-05 | OSC coil                   | ☆            |
| C9                            | CC45LG1H121J | C 120pF             |              | L2       | L33-0025-05 | Choke coil 1 $\mu$ H       |              |
| C12                           | CC45LG1H680J | C 68pF              |              | L3       | L32-0629-05 | OSC coil (C)               | ☆            |
| C13                           | CC45LG1H220J | C 22pF              |              | L4       | L32-0609-05 | OSC coil (B)               |              |
| C14                           | CC45CG1H100D | C 10pF $\pm$ 0.5pF  |              | L5       | L40-1021-03 | Ferri-inductor 1mH         |              |
| C15                           | CC45LG1H151J | C 150pF             |              | L6       | L40-4711-03 | Ferri-inductor 470 $\mu$ H |              |
| C16                           | CC45LG1H151J | C 150pF             |              | L7       | L40-1021-03 | Ferri-inductor 1mH         |              |
| C17                           | CC45CH1H020C | C 2pF $\pm$ 0.25pF  |              | L8       | L40-1501-03 | Ferri-inductor 15 $\mu$ H  |              |
| C18                           | C91-0456-05  | C 0.047 $\mu$ F 25V |              | L9~11    | L40-4711-03 | Ferri-inductor 470 $\mu$ H |              |
| C21                           | CC45SL1H390J | C 39pF              |              |          | R92-0150-05 | Short jumper               |              |
| C22                           | CC45CH1H100D | C 10pF $\pm$ 0.5pF  |              |          |             |                            |              |
| C23                           | CC45SL1H390J | C 39pF              |              |          |             |                            |              |
| C24                           | C91-0456-05  | C 0.047 $\mu$ F 25V |              |          |             |                            |              |

### PACKING

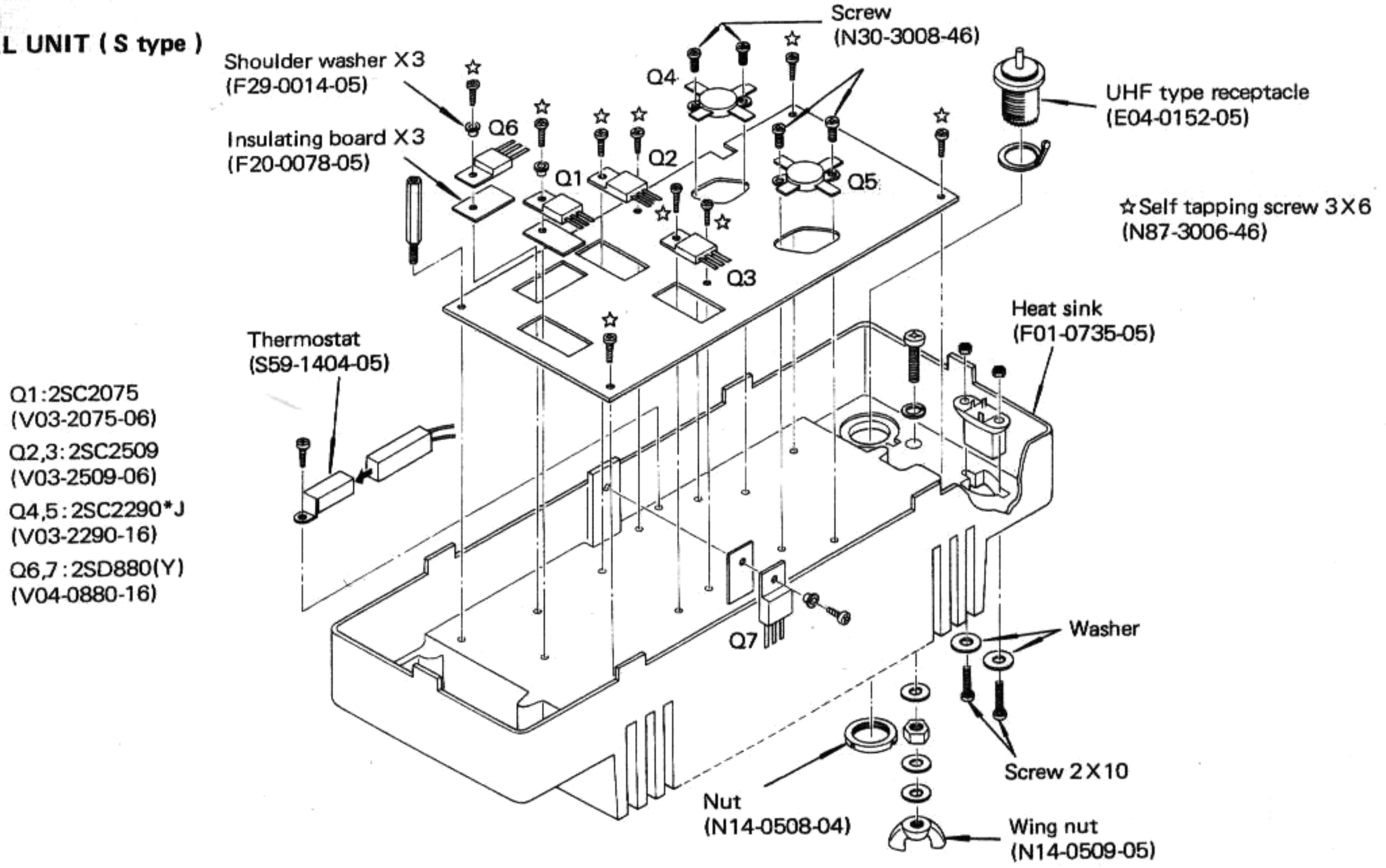


DISASSEMBLY

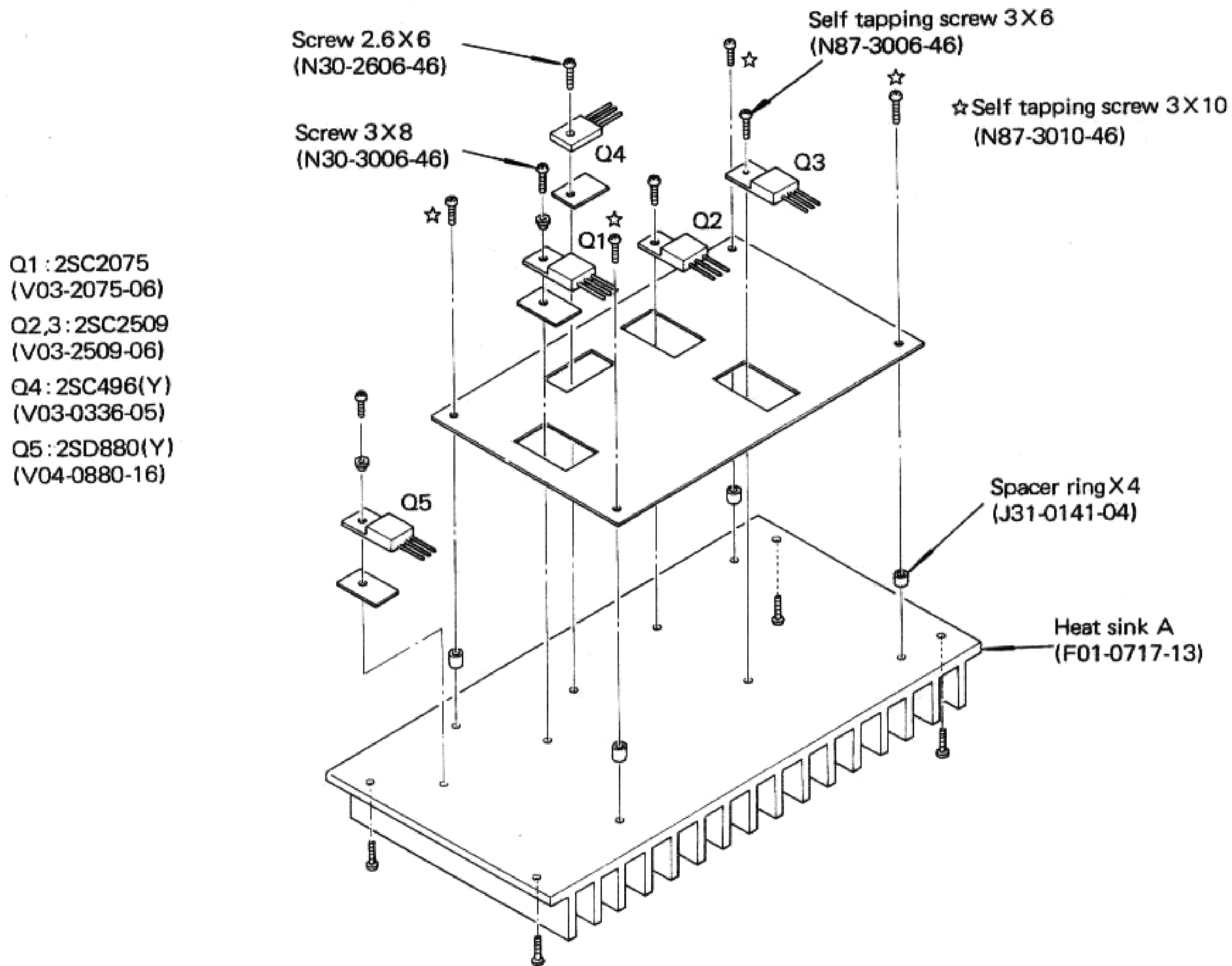


## DISASSEMBLY

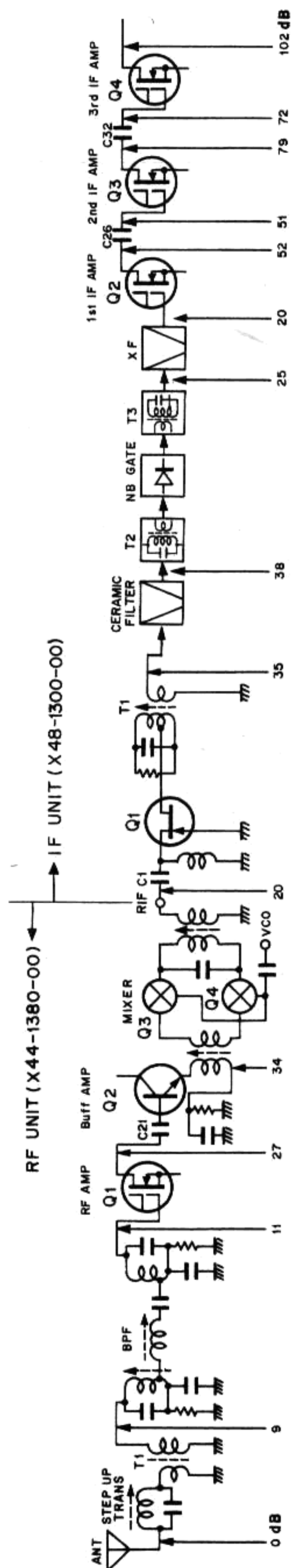
### FINAL UNIT ( S type )



### FINAL UNIT ( V type )



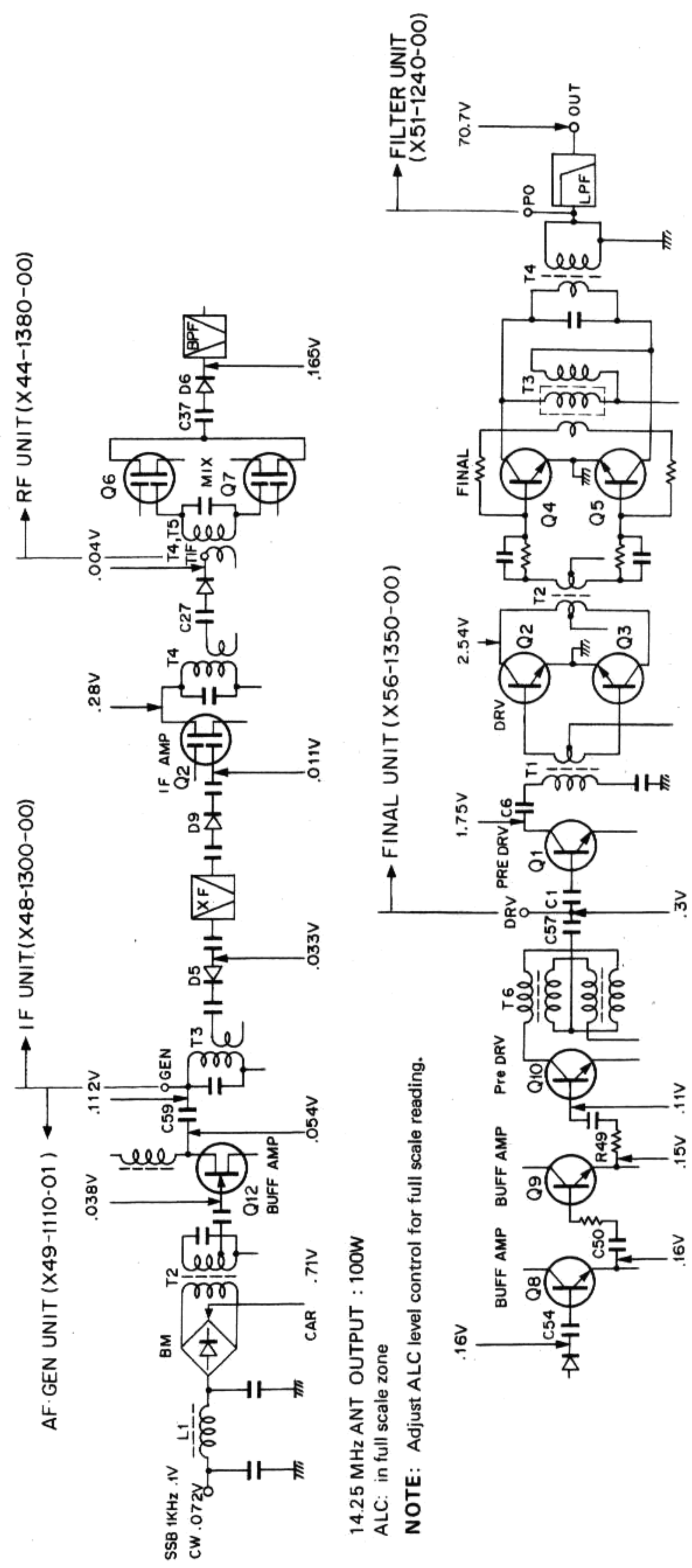
RECEIVER SECTION



NOTES:  
 1) The figures shown are signal generator output required for a constant audio output with a constant AF gain control setting. Set the AF gain control for 0.63V/8Ω (50 mW) audio output at 0 dB signal generator input at 14.250 MHz.  
 2) All voltage measurement are read from an RF VTVM.  
 3) To measure signal generator output connect a 0.01 μF 500 WV capacitor between the signal generator and the check point.

LEVEL DIAGRAM

TRANSMITTER SECTION (S TYPE)



14.25 MHz ANT OUTPUT : 100W  
 ALC: in full scale zone

NOTE: Adjust ALC level control for full scale reading.

## ADJUSTMENTS

### GENERAL

Adjustment procedures for this transceiver are classified into formal adjustments requiring a full service bench and simplified adjustment using a VTVM, AF and RF VTVM, AG, and AF and RF dummy load.

Complete adjustment also requires a frequency counter, SSG, sweep generator, etc.

### TEST EQUIPMENT REQUIRED

#### 1. VTVM or DVM

- 1) Input resistance: More than 1M $\Omega$
- 2) Voltage range: 1.5 to 1000V AC/DC

NOTE : A high-precision voltmeter may be used. However, accurate readings can not be obtained for high-impedance circuits.

#### 2. DC current meter

- 1) Current range: 100mA, 200mA, 2A, 10A, High-precision current meter may be used.

#### 3. RF VTVM

- 1) Input impedance: 1M $\Omega$  and less than 3 pF, min.
- 2) Voltage range: 10mV to 300V
- 3) Frequency range: 50MHz or greater

NOTE: During adjustment special accuracy is not required (such as input level or PLL circuit carrier oscillator output), a VTVM or VOM may substitute for an RF VTVM by measuring through the output of a detector as shown in item 14.

#### 4. AF VTVM

- 1) Frequency range: 50Hz to 10kHz
- 2) Input resistance: 1M $\Omega$  or greater
- 3) Voltage range: 10mV to 30V

#### 5. AF GENERATOR (AG)

- 1) Frequency range: 200Hz to 5kHz
- 2) Output: 2mV~1V, low distortion

#### 6. AF DUMMY LOAD

- 1) Impedance: 8 $\Omega$
- 2) Dissipation: 3W or greater

#### 7. RF DUMMY LOAD

- 1) Impedance: 50 $\Omega$ , 150 $\Omega$
- 2) Dissipation: 100W continuous or greater
- 3) Frequency limits: 1.8 to 30MHz

The above-mentioned instruments may be used for simplified adjustment. For complete, precise adjustment, the following instruments are also necessary.

#### 8. OSCILLOSCOPE

Requires high sensitivity, and external synchronization capability.

#### 9. SWEEP GENERATOR

- 1) Center frequency: 8.83MHz
- 2) Frequency deviation: Maximum  $\pm 5$ kHz
- 3) Output voltage: More than 0.1V
- 4) Sweep rate: At least 0.5 sec/cm

#### 10. Standard Signal Generator (SSG)

- 1) Frequency range: 1.8 to 30MHz
- 2) Output: -20dB/0.1 $\mu$ V~120dB/1V

NOTE: Generator must be frequency stable.

#### 11. FREQUENCY COUNTER

- 1) Minimum input voltage: 50mV
- 2) Frequency range: Greater than 40MHz

#### 12. NOISE GENERATOR

Must generate ignition noise containing harmonics beyond 30MHz.

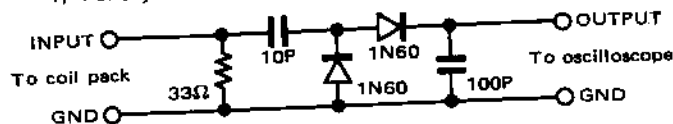
#### 13. Spectrum analyzer

- 1) Frequency range: 100K to 110MHz
- 2) Bandwidth: 1kHz to 3MHz

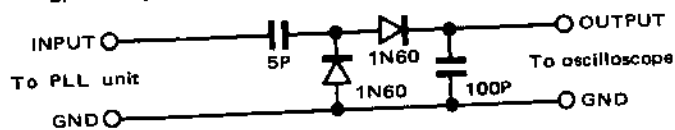
NOTE: R-1000 receiver may be used.

#### 14. Detector

- 1) For adjustment of TX BPF



- 2) For adjustment of PLL unit BPF



#### 15. Directional coupler

#### 16. FIX-CH adjusting crystal element

- 1) 5.750MHz (center: 250kHz)

### REFERENCE

| Japanese "SSG" | American "SG" |
|----------------|---------------|
| -6dB           | .025 $\mu$ V  |
| 0dB            | .05 $\mu$ V   |
| 6dB            | .1 $\mu$ V    |
| 12dB           | .2 $\mu$ V    |
| 24dB           | .8 $\mu$ V    |
| 30dB           | .158 $\mu$ V  |
| 40dB           | .50 $\mu$ V   |
| 50dB           | .158 $\mu$ V  |
| 60dB           | .500 $\mu$ V  |
| 70dB           | .1.58mV       |
| 80dB           | .5mV          |
| 90dB           | .15.8mV       |
| 100dB          | .50mV         |
| 120dB          | .0.5V         |



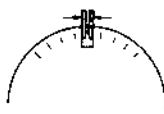
ADJUSTMENTS

PREPARATION

Unless otherwise specified, set the controls as follows.

- |                                   |                        |
|-----------------------------------|------------------------|
| POWER . . . . .ON                 | SEND/REC . . . . .REC  |
| AF GAIN . . . . .COUNTERCLOCKWISE | NB . . . . .OFF        |
| RF GAIN . . . . .FULL CLOCKWISE   | FIX./VFO . . . . .VFO  |
| RIT SW. . . . .OFF                | VOX/MAN. . . . .MAN    |
| IF SHIFT . . . . .CENTERED        | PROC. . . . .OFF       |
| NODE . . . . .SSB                 | WIDE/NAR . . . . .WIDE |

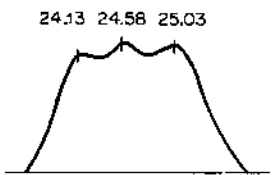
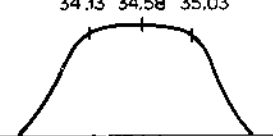
(V): TS-130 V type  
(S): TS-130 S type

| Item   | Condition  | Measuring point                         |        |          | Adjust |                  |   | Specifications/Remarks         |  |
|--|--|---|--------|----------|--------|------------------|---|--------------------------------|--|
|  |  | Test equipment                          | Unit   | Terminal | Unit   | Parts            | Reference   |                                |  |
| 1. Power Supply voltage  |  | DC VTVM                                 | AF-GEN | J4,7P    | AF-GEN | VR3              | 3.8V  |                                |  |
|  |  |   |        | J4,4P    |        |                  | 9V  |                                |  |
|  |  |   |        | J4,5P    |        |                  | 50V   |                                |  |
|  |  |   |        | J4,10P   |        |                  | 2.8V  |                                |  |
|  | STBY:SEND  |   | Filter | AVB      | Filter | VR4(V)<br>VR5(S) | 11.0V   |                                |  |
| 2. CAR<br>1) CAR output<br>2) Freq. RX   | BAND:3.5<br>STBY:REC<br>IF SHIFT:<br>Centered<br>MODE:SSB<br>MODE:REV<br>MODE:CW<br>STBY:SEND  | RF VTVM<br>Frequency counter            | AF-GEN | J3,2P    | CAR    | T1               | 0.3Vrms   | 0.3V±1dB                       |  |
|  |  |   | AF-GEN | J3,2P    | CAR    | TC2<br>TC1       | 8.82850MHz<br>8.83150MHz  |                                |  |
|  |  |   | AF-GEN | J3,2P    | CAR    | VR2              | 8.83070MHz  |                                |  |
| 3. IF SHIFT  | MODE:SSB<br>STBY:Alternate<br>SEND/REC   | Frequency counter                       | AF-GEN | J3,2P    | CAR    | VR1              | 8.82850MHz  | RX and TX frequency no change. |  |
| 4. VFO<br>1) Output<br>2) 800Hz shift<br><br>3) Frequency tracking and check   | VFO scale:250<br>MODE:CW<br>STBY:SEND  | RF VTVM<br>Frequency counter            | AF-GEN | J1,6P    | VFO    | TC2<br>L4        | 0.2Vrms<br>Adjust for 800Hz higher than receive state.          | 0.2V±1dB rms<br>800±50Hz       |  |
|  |  |   |        |          |        | L3               | 5550.00kHz ±200Hz   |                                | Repeat this adjustment several times until the frequency is within specification.    |
|  | VFO:50<br>Set the CAL control to the index.<br>VFO scale: Approx. 450<br>Set the CAL control calibrated under this VFO setting exactly to the index. |   |        |          |        |                  | TC1   | 5950.00kHz ±200Hz              |  |
|  |  | Set the VFO main tuning to 5750.000kHz. |        |          |        |                  |   |                                |  |
| Under the above condition, set the CAL control to the index. Turn the main tuning, and set the calibrated CAL control to the index in the order of 0, 100, 200, 300, 400, and 500 to check frequency deviation at each 100kHz point. |  |   |        |          |        |                  | 0 5.5MHz<br>100 5.6<br>200 5.7<br>300 5.8<br>400 5.9<br>500 6.0 | Within ±2kHz                   |  |
| Set the CAL control back to 250 under the above condition (do not turn excessively.), then further set back the CAL control to 0 with respect to the frequency at 250 to check The difference from the reference frequency.          |  |   |        |          |        |                  | Less than 400Hz   | Backlash                       |  |

# ADJUSTMENTS

| Item                   | Condition   | Measuring point                         |        |            | Adjust |                                 |  | Specification/Remarks   |          |   |     |     |  |     |        |               |        |  |     |        |               |        |            |      |        |        |        |  |      |        |             |        |  |      |        |                |        |            |      |        |        |        |  |      |        |               |        |            |      |        |        |        |  |      |        |        |        |  |      |        |        |        |  |      |        |        |        |  |
|------------------------|---|---|--------|------------|--------|---------------------------------|--|---|----------|---|-----|-----|--|-----|--------|---------------|--------|--|-----|--------|---------------|--------|------------|------|--------|--------|--------|--|------|--------|-------------|--------|--|------|--------|----------------|--------|------------|------|--------|--------|--------|--|------|--------|---------------|--------|------------|------|--------|--------|--------|--|------|--------|--------|--------|--|------|--------|--------|--------|--|------|--------|--------|--------|--|
|                        |   | Instruments                             | Unit   | Terminal   | Unit   | Parts                           | Reference  |   |          |   |     |     |  |     |        |               |        |  |     |        |               |        |            |      |        |        |        |  |      |        |             |        |  |      |        |                |        |            |      |        |        |        |  |      |        |               |        |            |      |        |        |        |  |      |        |        |        |  |      |        |        |        |  |      |        |        |        |  |
| 5. RIT                 | 1) Adjust VFO frequency to 5.75MHz<br>2) RIT control: Centered  | Frequency counter                       | AF-GEN | J1,6P      | AF-GEN | VR1                             | Alternate RIT ON and OFF                               | 1) No frequency change between RIT ON and OFF<br>2) More than ±1.5kHz variable RIT range  |          |   |     |     |  |     |        |               |        |  |     |        |               |        |            |      |        |        |        |  |      |        |             |        |  |      |        |                |        |            |      |        |        |        |  |      |        |               |        |            |      |        |        |        |  |      |        |        |        |  |      |        |        |        |  |      |        |        |        |  |
| 6. VCO                 | VFO BAND<br>250 3.5<br>250 7<br>250 14<br>250 18<br>250 21<br>500 29.0  | DCVTVM Frequency counter                | PLL    | TP1        | PLL    | T1<br>T2<br>T3<br>T5<br>T4<br>- | 3.5V<br>5.0V<br>4.0V<br>6.1V<br>3.75V<br>4.75V (check) | Oscillator level 1V+3dB, -1dB at J18, 1P on PLL unit<br><table border="1"> <thead> <tr> <th>VFO BAND</th> <th>0</th> <th>250</th> <th>500</th> <th></th> </tr> </thead> <tbody> <tr> <td>3.5</td> <td>12.33M</td> <td>(3.5V) 12.58M</td> <td>12.83M</td> <td></td> </tr> <tr> <td>7.0</td> <td>15.83M</td> <td>(5.0V) 16.08M</td> <td>16.33M</td> <td>VCO Common</td> </tr> <tr> <td>10.0</td> <td>18.33M</td> <td>19.08M</td> <td>19.33M</td> <td></td> </tr> <tr> <td>14.0</td> <td>22.83M</td> <td>(4V) 23.08M</td> <td>23.33M</td> <td></td> </tr> <tr> <td>21.0</td> <td>29.83M</td> <td>(3.75V) 30.08M</td> <td>30.33M</td> <td>VCO Common</td> </tr> <tr> <td>24.5</td> <td>33.33M</td> <td>33.58M</td> <td>33.83M</td> <td></td> </tr> <tr> <td>18.0</td> <td>26.83M</td> <td>(6.1V) 27.08M</td> <td>27.33M</td> <td>VCO Common</td> </tr> <tr> <td>28.0</td> <td>36.83M</td> <td>37.08M</td> <td>37.33M</td> <td></td> </tr> <tr> <td>28.5</td> <td>37.33M</td> <td>37.58M</td> <td>37.83M</td> <td></td> </tr> <tr> <td>29.0</td> <td>37.83M</td> <td>38.08M</td> <td>38.33M</td> <td></td> </tr> <tr> <td>29.5</td> <td>38.33M</td> <td>38.58M</td> <td>38.83M</td> <td></td> </tr> </tbody> </table> Note ( ) : control voltage | VFO BAND | 0 | 250 | 500 |  | 3.5 | 12.33M | (3.5V) 12.58M | 12.83M |  | 7.0 | 15.83M | (5.0V) 16.08M | 16.33M | VCO Common | 10.0 | 18.33M | 19.08M | 19.33M |  | 14.0 | 22.83M | (4V) 23.08M | 23.33M |  | 21.0 | 29.83M | (3.75V) 30.08M | 30.33M | VCO Common | 24.5 | 33.33M | 33.58M | 33.83M |  | 18.0 | 26.83M | (6.1V) 27.08M | 27.33M | VCO Common | 28.0 | 36.83M | 37.08M | 37.33M |  | 28.5 | 37.33M | 37.58M | 37.83M |  | 29.0 | 37.83M | 38.08M | 38.33M |  | 29.5 | 38.33M | 38.58M | 38.83M |  |
| VFO BAND               | 0   | 250                                     | 500    |            |        |                                 |  |   |          |   |     |     |  |     |        |               |        |  |     |        |               |        |            |      |        |        |        |  |      |        |             |        |  |      |        |                |        |            |      |        |        |        |  |      |        |               |        |            |      |        |        |        |  |      |        |        |        |  |      |        |        |        |  |      |        |        |        |  |
| 3.5                    | 12.33M  | (3.5V) 12.58M                           | 12.83M |            |        |                                 |  |   |          |   |     |     |  |     |        |               |        |  |     |        |               |        |            |      |        |        |        |  |      |        |             |        |  |      |        |                |        |            |      |        |        |        |  |      |        |               |        |            |      |        |        |        |  |      |        |        |        |  |      |        |        |        |  |      |        |        |        |  |
| 7.0                    | 15.83M  | (5.0V) 16.08M                           | 16.33M | VCO Common |        |                                 |  |   |          |   |     |     |  |     |        |               |        |  |     |        |               |        |            |      |        |        |        |  |      |        |             |        |  |      |        |                |        |            |      |        |        |        |  |      |        |               |        |            |      |        |        |        |  |      |        |        |        |  |      |        |        |        |  |      |        |        |        |  |
| 10.0                   | 18.33M  | 19.08M                                  | 19.33M |            |        |                                 |  |   |          |   |     |     |  |     |        |               |        |  |     |        |               |        |            |      |        |        |        |  |      |        |             |        |  |      |        |                |        |            |      |        |        |        |  |      |        |               |        |            |      |        |        |        |  |      |        |        |        |  |      |        |        |        |  |      |        |        |        |  |
| 14.0                   | 22.83M  | (4V) 23.08M                             | 23.33M |            |        |                                 |  |   |          |   |     |     |  |     |        |               |        |  |     |        |               |        |            |      |        |        |        |  |      |        |             |        |  |      |        |                |        |            |      |        |        |        |  |      |        |               |        |            |      |        |        |        |  |      |        |        |        |  |      |        |        |        |  |      |        |        |        |  |
| 21.0                   | 29.83M  | (3.75V) 30.08M                          | 30.33M | VCO Common |        |                                 |  |   |          |   |     |     |  |     |        |               |        |  |     |        |               |        |            |      |        |        |        |  |      |        |             |        |  |      |        |                |        |            |      |        |        |        |  |      |        |               |        |            |      |        |        |        |  |      |        |        |        |  |      |        |        |        |  |      |        |        |        |  |
| 24.5                   | 33.33M  | 33.58M                                  | 33.83M |            |        |                                 |  |   |          |   |     |     |  |     |        |               |        |  |     |        |               |        |            |      |        |        |        |  |      |        |             |        |  |      |        |                |        |            |      |        |        |        |  |      |        |               |        |            |      |        |        |        |  |      |        |        |        |  |      |        |        |        |  |      |        |        |        |  |
| 18.0                   | 26.83M  | (6.1V) 27.08M                           | 27.33M | VCO Common |        |                                 |  |   |          |   |     |     |  |     |        |               |        |  |     |        |               |        |            |      |        |        |        |  |      |        |             |        |  |      |        |                |        |            |      |        |        |        |  |      |        |               |        |            |      |        |        |        |  |      |        |        |        |  |      |        |        |        |  |      |        |        |        |  |
| 28.0                   | 36.83M  | 37.08M                                  | 37.33M |            |        |                                 |  |   |          |   |     |     |  |     |        |               |        |  |     |        |               |        |            |      |        |        |        |  |      |        |             |        |  |      |        |                |        |            |      |        |        |        |  |      |        |               |        |            |      |        |        |        |  |      |        |        |        |  |      |        |        |        |  |      |        |        |        |  |
| 28.5                   | 37.33M  | 37.58M                                  | 37.83M |            |        |                                 |  |   |          |   |     |     |  |     |        |               |        |  |     |        |               |        |            |      |        |        |        |  |      |        |             |        |  |      |        |                |        |            |      |        |        |        |  |      |        |               |        |            |      |        |        |        |  |      |        |        |        |  |      |        |        |        |  |      |        |        |        |  |
| 29.0                   | 37.83M  | 38.08M                                  | 38.33M |            |        |                                 |  |   |          |   |     |     |  |     |        |               |        |  |     |        |               |        |            |      |        |        |        |  |      |        |             |        |  |      |        |                |        |            |      |        |        |        |  |      |        |               |        |            |      |        |        |        |  |      |        |        |        |  |      |        |        |        |  |      |        |        |        |  |
| 29.5                   | 38.33M  | 38.58M                                  | 38.83M |            |        |                                 |  |   |          |   |     |     |  |     |        |               |        |  |     |        |               |        |            |      |        |        |        |  |      |        |             |        |  |      |        |                |        |            |      |        |        |        |  |      |        |               |        |            |      |        |        |        |  |      |        |        |        |  |      |        |        |        |  |      |        |        |        |  |
| 7. TX BPF (RX BPF)     | MODE:SSB<br>STBY:SEND<br>Make adjustments in the following sequence: 3.5→7→10→14→18→21→24.5→28MHz.<br>Disconnect connector J18 on the PLL unit and connect the sweep generator RF output to it. Connect the detector input to the DRV terminal on the RF unit.  | Sweep generator, Oscilloscope, Detector | PLL RF | J18 DRV    | RF     | L7~30                           | Adjust coils for waveform as shown.                    | <p>3.5M: 3.5, 3.75, 4.0. Ripple less than 5dB. L7,8,9</p> <p>7M: 7.0, 7.15, 7.3. Ripple less than 2dB. L10,11,12</p> <p>10M: 9.875, 10.125, 10.375. Ripple less than 2dB. L13,14,15</p> <p>14M: 14.0, 14.2, 14.4. Ripple less than 2dB. L16,17,18</p> <p>18M: 17.875, 18.125, 18.375. Ripple less than 2dB. L19,20,21</p> <p>21M: 21, 21.25, 21.5. Ripple less than 1dB. L22, 23, 24</p> <p>24.5M: 24.5, 24.95, 25.35. Ripple less than 1dB. L25, 26, 27</p> <p>28M: 28.0, 29.0, 30.0. Ripple less than 2dB. L28, 29, 30</p>  |          |   |     |     |  |     |        |               |        |  |     |        |               |        |            |      |        |        |        |  |      |        |             |        |  |      |        |                |        |            |      |        |        |        |  |      |        |               |        |            |      |        |        |        |  |      |        |        |        |  |      |        |        |        |  |      |        |        |        |  |
| 8. PLL BPF<br>1) BPF-A | STBY:REC<br>Disconnect connectors J17 and J19 on the PLL unit.<br>Connect the cathode of D17 on the PLL unit to the jumper wire next to the D22 on the AF-GEN unit with a lead.<br>Connect the sweep generator RF output to the J19, 3P (VFO) on the PLL unit. Connect the detector input to Q16 emitter on the PLL unit. | Detector, Oscilloscope, Sweep generator | PLL    | Q16Ⓔ       | PLL    | T9<br>T10<br>T11                | Adjust T9~T11 for waveform as shown at right.          |   |          |   |     |     |  |     |        |               |        |  |     |        |               |        |            |      |        |        |        |  |      |        |             |        |  |      |        |                |        |            |      |        |        |        |  |      |        |               |        |            |      |        |        |        |  |      |        |        |        |  |      |        |        |        |  |      |        |        |        |  |

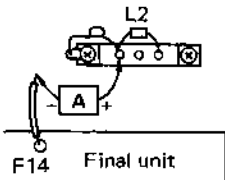
## ADJUSTMENTS

| Item                | Condition   | Measuring point                         |      |                  | Adjust |                             |   | Specifications/Remarks  |
|---------------------|---|---|------|------------------|--------|-----------------------------|---|---|
|                     |   | Instruments                             | Unit | Terminal         | Unit   | Parts                       | Reference   |   |
| 2) BPF-B            | Disconnect connectors J17 and J19 on the PLL unit.<br>Connect the cathode of D24 and D27 on the PLL unit to the jumper wire next to the D22 on the AF-GEN unit with a lead.<br>Connect the sweep generator RF output to the anode of D28 on the PLL unit via a 15pF capacitor.<br>Detector input: Same as above | Detector, Oscilloscope, Sweep generator | PLL  | Q16 (E)          | PLL    | T12<br>T13<br>T14<br><br>T7 | Adjust T12~T14 for waveform as shown at right.<br>Adjust T7 for maximum output. |  <p>24.13 24.58 25.03</p>  |
| 3) BPF-C            | Disconnect connectors J17 and J19 on the PLL unit.<br>Connect the cathode of D20 and D27 on the PLL unit to the jumper wire next to the D22 on the AF-GEN unit.<br>Sweep generator RF output: Same as above<br>Detector input: Same as above  |   |      |                  |        | T15<br>T16<br>T17<br><br>T8 | Adjust T15~T17 for waveform as shown at right.<br>Adjust T8 for maximum output  |  <p>34.13 34.58 35.03</p> |
| 9. VFO MIX spurious | Disconnect connector J17 on the PLL unit.<br>Connect the cathode of D17 on the PLL unit to the jumper wire next to the D22 on the AF-GEN unit.<br>VFO scale: 250 MODE: CW   | Spectrum analyzer or monitor receiver   | PLL  | Q16 (E)          | PLL    | VR1                         | Adjust for minimum output at 14.99MHz.  | Less than -55dB   |
| 10. PLL-IF trap     | Disconnect connector J17 on the PLL unit.<br>Connect the SSG output 8.83MHz, 60dB to Q7 emitter on the PLL unit via a 0.01μF capacitor.   | SSG, RF VTVM                            | PLL  | Q7 (E)<br>J18,1P | PLL    | T6                          | Adjust for minimum output.  |   |

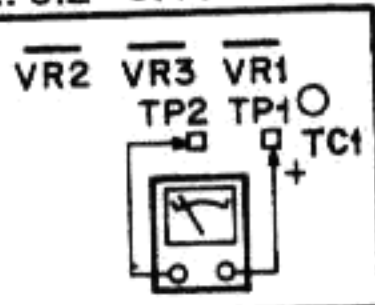
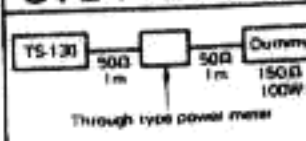
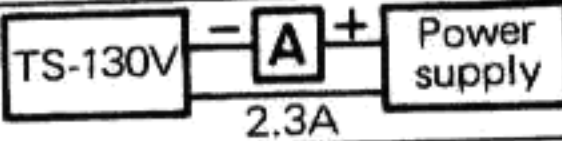
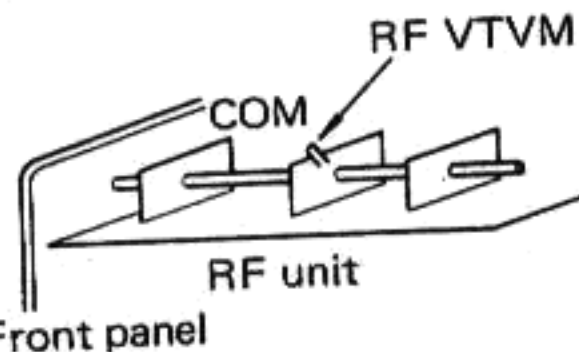
ADJUSTMENTS

| Item  | Condition   | Measuring point  |      |               | Adjust  |  |   | Specifications/Remarks  |
|---|---|--|------|---------------|---------|--|---|---|
|   |   | Instruments  | Unit | Terminal      | Unit    | Parts  | Reference   |   |
| 11. IF AMP  | VFO:250<br>IF SHIFT:<br>Centered<br>VFO/FIX:<br>VFO<br>MODE:SSB<br>BAND:14<br>AF GAIN:10<br>o'clock<br>RF GAIN:<br>Fully clock-<br>wise<br>Connect the<br>SSG output<br>14.25MHz,<br>-6dB to the<br>ANT terminal. | SSG,<br>Oscillo-<br>scope,<br>AF VTVM,<br>AF Dum-<br>my load |      | SP            | RF      | T3<br><br>IF<br>T1<br>T2<br>T3<br>T4<br>T5<br>T6 | The slug of<br>T3 should be<br>turned counter-<br>clockwise from<br>the peak point<br>to reduce audio<br>output by 2dB.<br>Adjust T1~T6<br>for maximum<br>audio output. |   |
| 12. IF trap   | 1) BAND:<br>10MHz<br>VFO:any fre-<br>quency<br>SSG:8.83MHz,<br>80dB   | SSG,<br>AF VTVM  |      | SP            | RF      | L3<br>L4<br>L35                                  | Adjust for<br>minimum<br>S-meter reading<br>and AF output<br>level. Repeat the<br>procedure two or<br>three times.  | L3 and L4 should be adjusted<br>while they are turned<br>counterclockwise.                            |
| 13. NB  | BAND:10<br>VFO:250<br>NB SW:ON<br>Connect the<br>SSG output<br>10.25 MHz,<br>60dB to the<br>ANT terminal.   | DC VTVM,<br>SSG  | IF   | TP<br>(Q15 ©) | IF      | T7<br>T8   | Adjust for mini-<br>mum DC voltage.   |   |
|   | Disconnect the<br>SSG output.<br>Connect the<br>noise genera-<br>tor output to<br>the ANT ter-<br>minal.<br>Set the noise ge-<br>nerator output<br>level to S5~7.   | Noise<br>generator   |      |               | IF      | T2   | Turned counter-<br>clockwise 90 de-<br>gree from the<br>peak point.<br>If adequate effect<br>is not obtained,<br>repeat the adjust-<br>ment several<br>times.           | T2 has been adjusted for the<br>peak point in item 11.<br><br>The NB must provide adequate<br>effect. |
| 14. Carrier<br>balance<br>(IF SHIFT)                  | IF SHIFT:<br>Centered<br>RF GAIN:<br>Counterclock-<br>wise  | RF VTVM  | IF   | Q7 (E)        | AF-GEN  | TC1  | Adjust for mini-<br>mum.  |   |
| 15. S meter<br>1) Starting<br>level<br>2) S1<br>3) S9 | RF GAIN:<br>Fully counter-<br>clockwise   |  |      |               | IF      | VR2  | Set to starting<br>level.   |   |
|   | BAND:14<br>VFO:175<br>MODE:CW<br>SSG:14.175M,<br>8dB  |  |      |               |         | T5   | Set to S1.  | T5 should be adjusted while<br>it is turned counterclockwise.   |
|   | SSG:14.175M,<br>40dB  |  |      |               |         | VR2  | Set to S9.  |   |
| 16. Counter<br>standard<br>Oscillator                 | BAND:10<br>VFO:0<br>Receive WWV<br>signal.  |  |      |               | Counter | TC1  | Set to zero beat.   |   |

ADJUSTMENTS

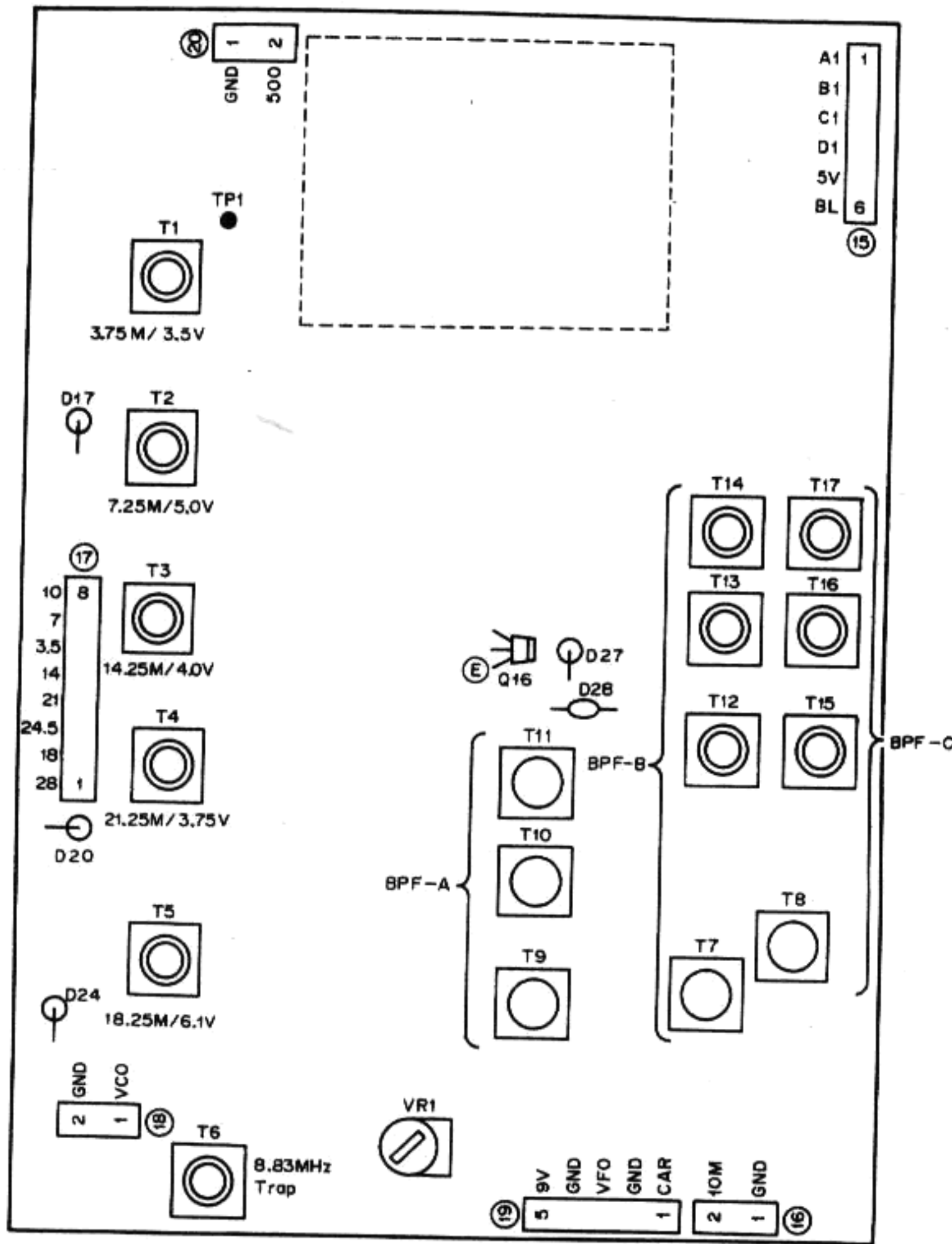
| Item                            | Condition   | Measuring point  |                  |                 | Adjust       |          |                               | Specifications/Remarks  |
|---------------------------------|---|--|------------------|-----------------|--------------|----------|-------------------------------|---|
|                                 |   | Instruments  | Unit             | Terminal        | Unit         | Parts    | Reference                     |   |
| 17. Base current<br>1) S type   | MODE:SSB<br>MIC GAIN:<br>Full counter-clockwise<br>DC current meter: Connect ⊕ to D14 lead, ⊖ to D14 terminal.<br>STBY:SEND<br>STBY:REC | DC current meter   | Final            | D14             | Final        | VR1      | 150mA                         |  |
|                                 |   |  |                  | F14 3P terminal |              | VR2      | 100mA                         |   |
|                                 | 2) V type   | DC current meter: Connect ⊕ to 14A, ⊖ to D2 side.<br>STBY:SEND<br>STBY:REC | DC current meter | Final           | 14A          | Final    | VR1                           |   |
| 18. Carrier level               | BAND:14<br>MODE:CW<br>STBY:SEND<br>Reduce RF power(S type) to 30W, RF meter(V type) to 3 by CAR level control.<br>STBY:REC              | Power meter  |                  |                 | AF-GEN<br>RF | T2<br>T4 | Adjust for maximum RF output. |   |
| 19. ALC (RF power)<br>1) S type | BAND:14<br>CAR LEVEL: Centered<br>VFO:200<br>MODE:CW<br>STBY:SEND<br>Filter unit, VR2:Counter-clockwise<br>BAND:28.5                    | Power meter  |                  |                 | Filter       | VR3      | Set to 95W.                   |   |
|                                 |   |  |                  |                 |              | VR2      | Set to 75W.                   |   |
| 2) V type                       | Same as above.  |  |                  |                 | Filter       | VR3      | Set to 11W.                   |   |
| 20. RF meter (V type only)      | BAND:14<br>MODE:CW<br>Meter: RF(IC)<br>STBY:SEND<br>STBY:REC  | Power meter  |                  |                 | Filter       | VR1      | Set to 8W.                    |   |
|                                 |   |  |                  |                 |              |          |                               |   |
| 21. IC meter (S type only)      | MODE:CW<br>DC current meter: Connect ⊖ to red wire from F14 terminal ⊕ to 3P terminal.<br>STBY:SEND<br>STBY:REC                         | Power meter, DC current meter  |                  |                 | Filter       | VR4      | Set to 11A on IC meter.       |   |
|                                 |   |  |                  |                 |              |          |                               |   |

ADJUSTMENTS

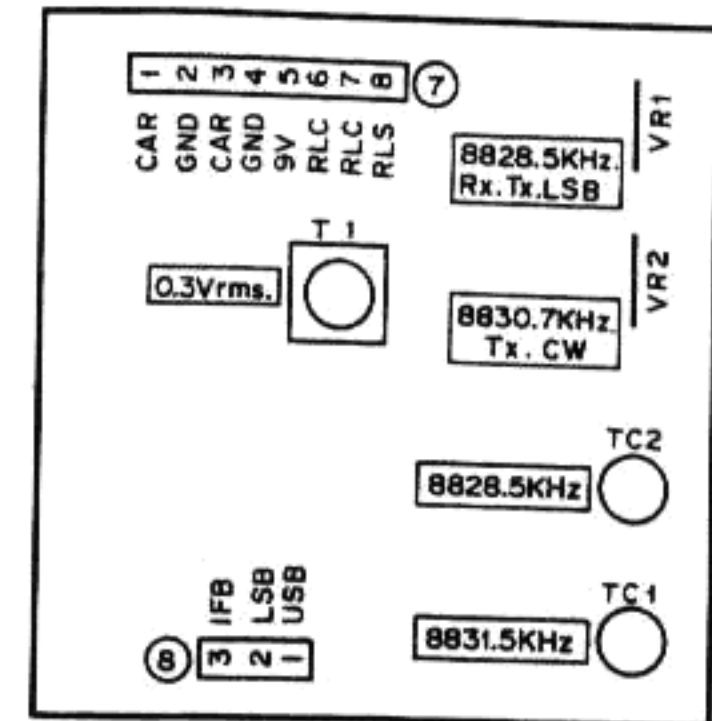
| Item                        | Condition  | Measuring point   |           |                                  | Adjust     |                        |   | Specifications/Remarks  |
|-----------------------------|--|---|-----------|----------------------------------|------------|------------------------|---|---|
|                             |  | Instruments   | Unit      | Terminal                         | Unit       | Parts                  | Reference   |   |
| 22. Protection<br>1) S type | Filter unit, VR1:<br>Fully clockwise<br>BAND: 14<br>MODE: CW<br>ANT: Power meter (50Ω)<br>STBY: SEND   | DVM, power meter (50Ω)  | Filter    | TP1<br>TP2                       | Filter     | TC1                    | Adjust for minimum.   |    |
|                             | <br>150Ω, 100W<br>Dummy load  |   |           |                                  |            | VR1                    | Adjust VR1 to obtain 39W RF power.  |   |
|                             | 2) V type  | Filter unit, VR1:<br>Fully clockwise<br>BAND: 14<br>MODE: CW<br>ANT: 50Ω<br>Dummy<br>STBY: SEND |           | Filter                           | TP1<br>TP2 | Filter                 | TC1   | Adjust for minimum.   |
|                             | STBY: REC  |   |           |                                  |            |                        |   |   |
|                             | ANT: Shorted<br>STBY: SEND   | DC current meter  |           |                                  | Filter     | VR2                    | Set to 2.3A.  |  |
|                             | STBY: REC  |   |           |                                  |            |                        |   |   |
| 23. TX spurious             | BAND: 21<br>VFO: 250<br>MODE: SSB<br>MIC, CAR level: Fully counter-clockwise<br>STBY: SEND   | RF VTVM   | RF        | Common terminal of rotary switch | RF         | VR1                    | Adjust for minimum.   |  |
|                             | STBY: REC  |   |           |                                  |            |                        |   |   |
| 24. SSB carrier point       | BAND: 14<br>MIC input: AG 1.5kHz, 7mV<br>MODE: SSB<br>STBY: SEND<br>1) Adjust MIC GAIN control until RF power becomes 50W (S type), 5W (V type).<br>2) Change AG frequency to 300Hz and 2.7kHz alternately.<br>MODE: SSB and REV | Power meter, Synchroscope, AG   |           |                                  | CAR        | TC1 (SSB)<br>TC2 (REV) | Adjust TC1 and TC2 so that RF power is equal at AG frequency 300Hz and 2.7 kHz. | Within -6dB at AG frequency 400Hz and 2.6kHz respect to 1.5kHz signal level.          |
| 25. Carrier suppression     | BAND: 14<br>MODE: CW ↔ SSB, REV<br>STBY: SEND<br>MIC: No input<br>STBY: REC  | Power meter, Oscilloscope   |           | ANT                              | AF-GEN     | VR5<br>TC2             | Adjust VR5 and TC2 alternately for minimum output.                              | Carrier better than 40dB down from output signal.                                     |
| 26. Speech processor        | MODE: SSB<br>MIC input: AG 1kHz, 10mV<br>PROC: ON ↔ OFF  | AF VTVM   | Processor | TP1                              | Processor  | VR2                    | Adjust for equal level.   | Approx. 150mV   |
| 27. Side tone               | MODE: CW<br>AF GAIN: 12:00<br>KEY: Plug a key and operate.   | AF VTVM, KEY  |           | SP                               | AF-GEN     | VR4                    | Set to 0.63V/8Ω.  |   |

## ADJUSTMENTS

### ▼ PLL UNIT (X50-1700-00)



### ▼ CAR UNIT (X50-1500-00)



### TEST AND ALIGNMENT SET-UP

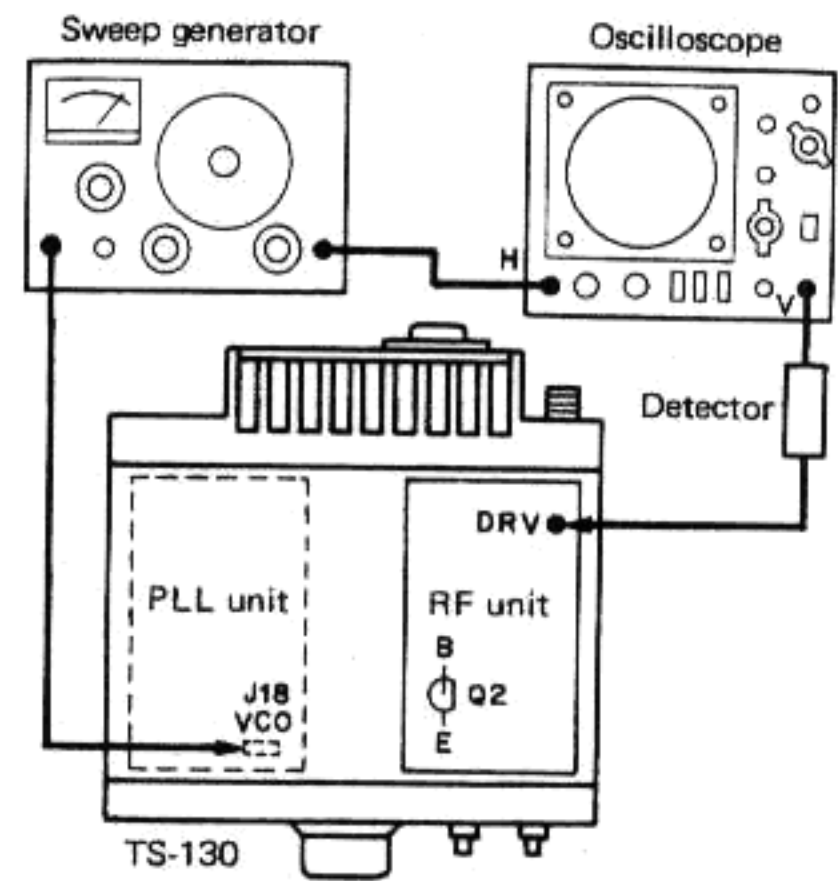


Fig. 4 7. TX BPF (RX BPF)

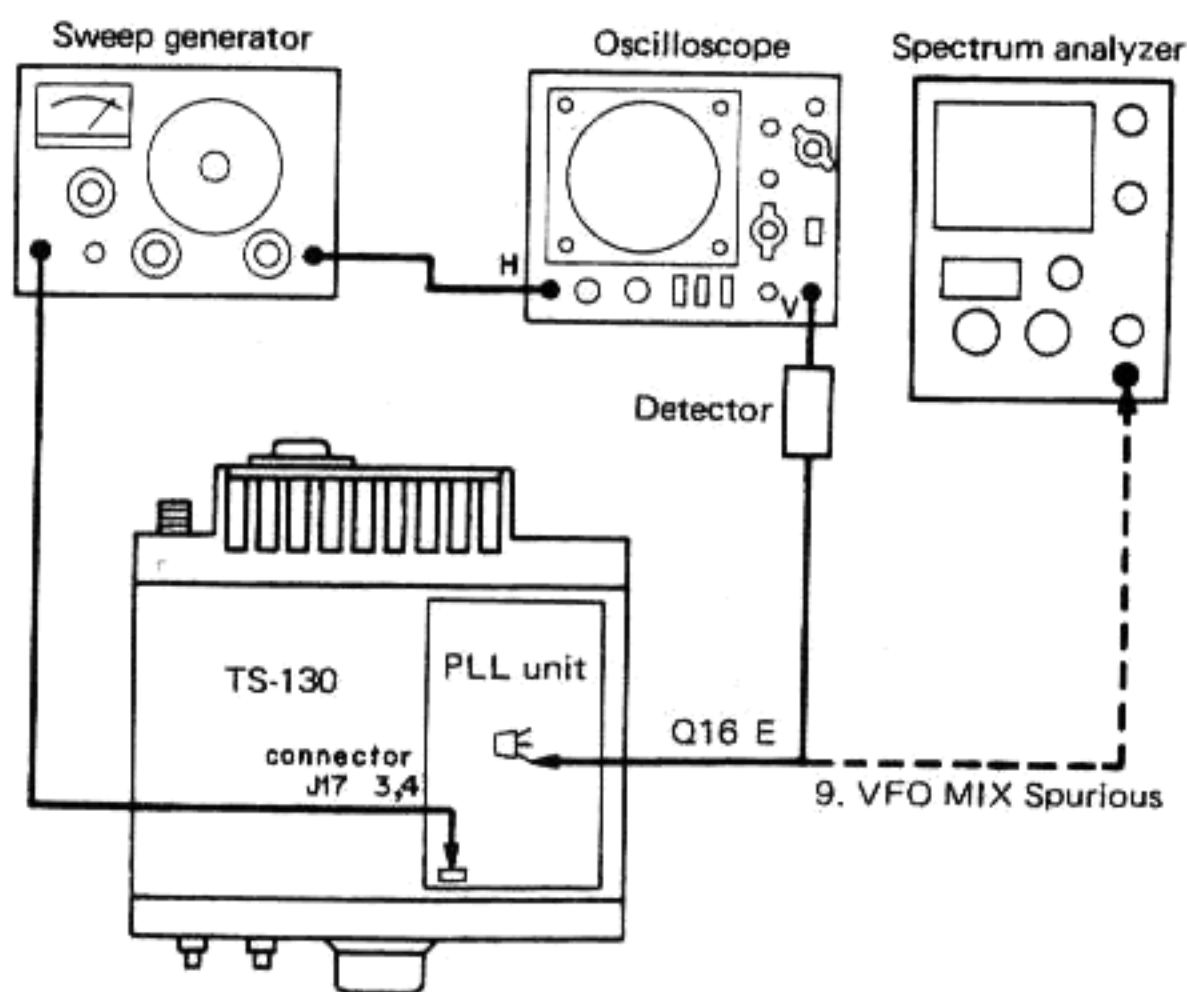


Fig. 5 8. PLL BPF-A,B,C  
9. VFO MIX spurious (Disconnect Sweep generator and Oscilloscope)

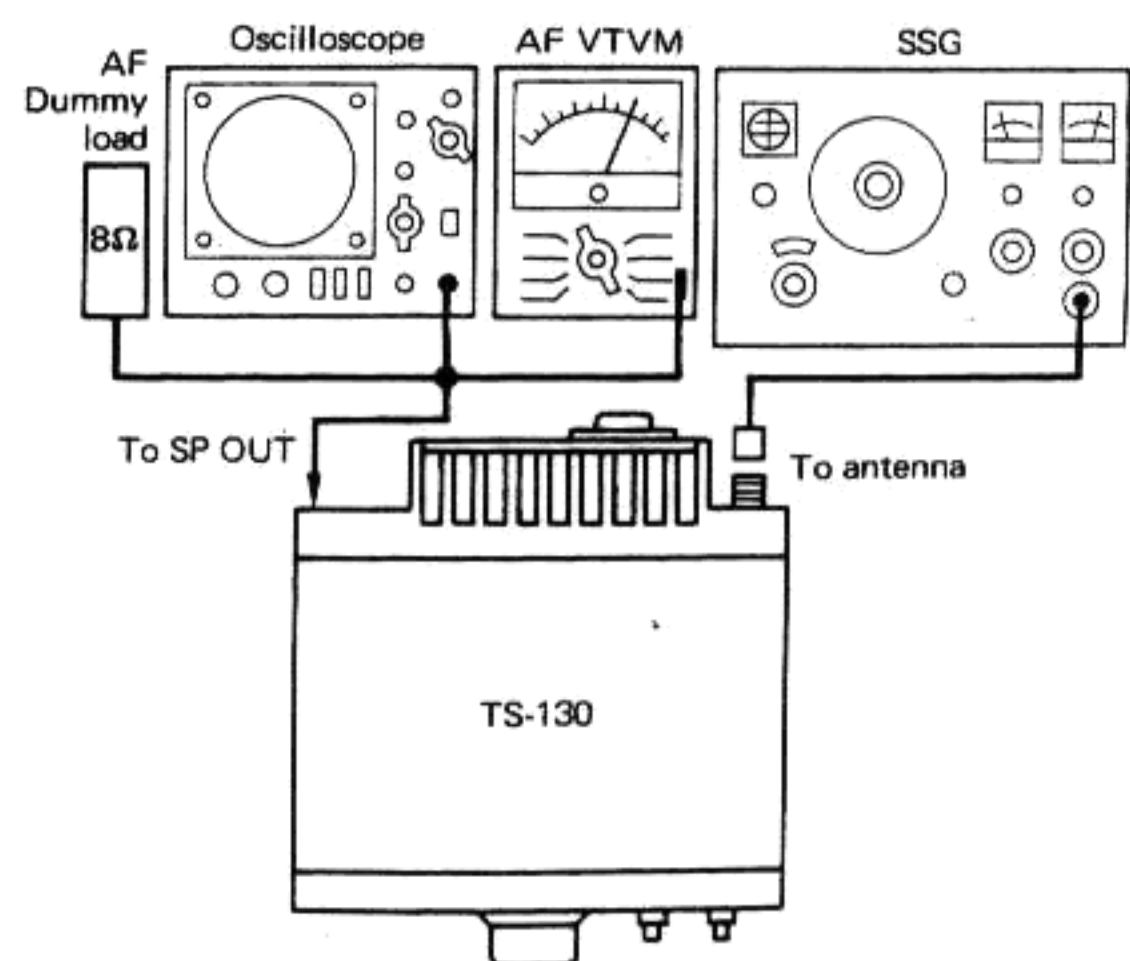
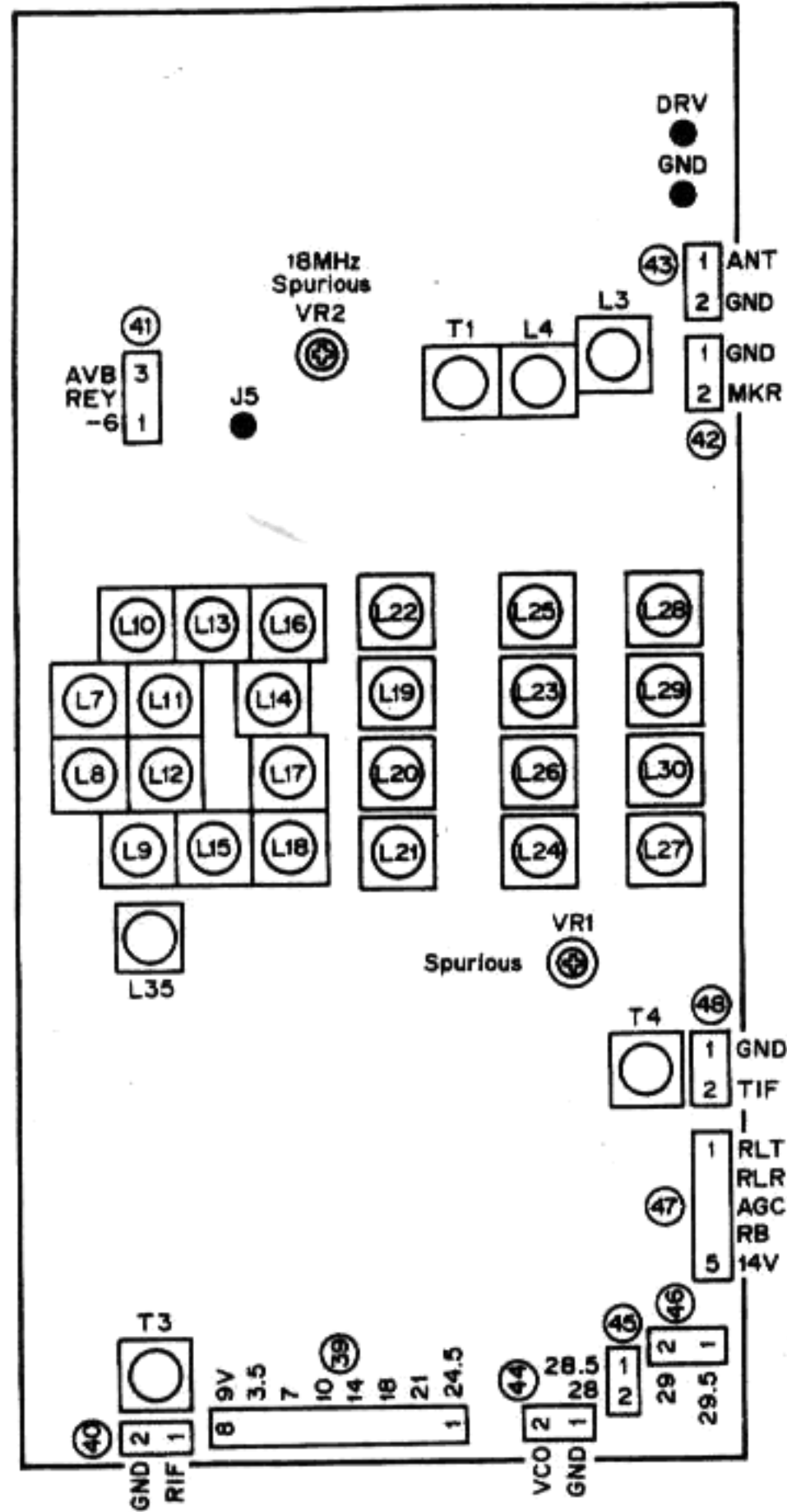


Fig. 6 11. IF AMP, 12. IF trap

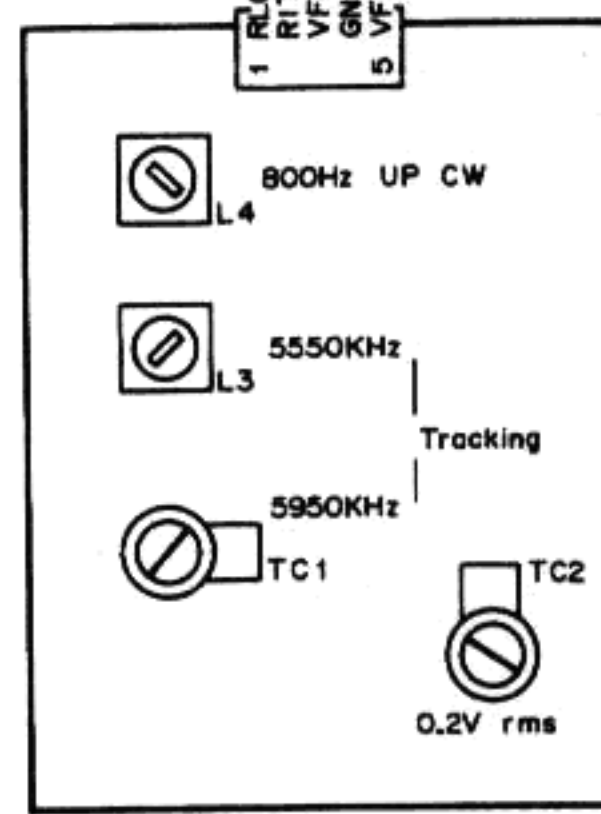
# ADJUSTMENTS

## PC BOARD ALIGNMENT

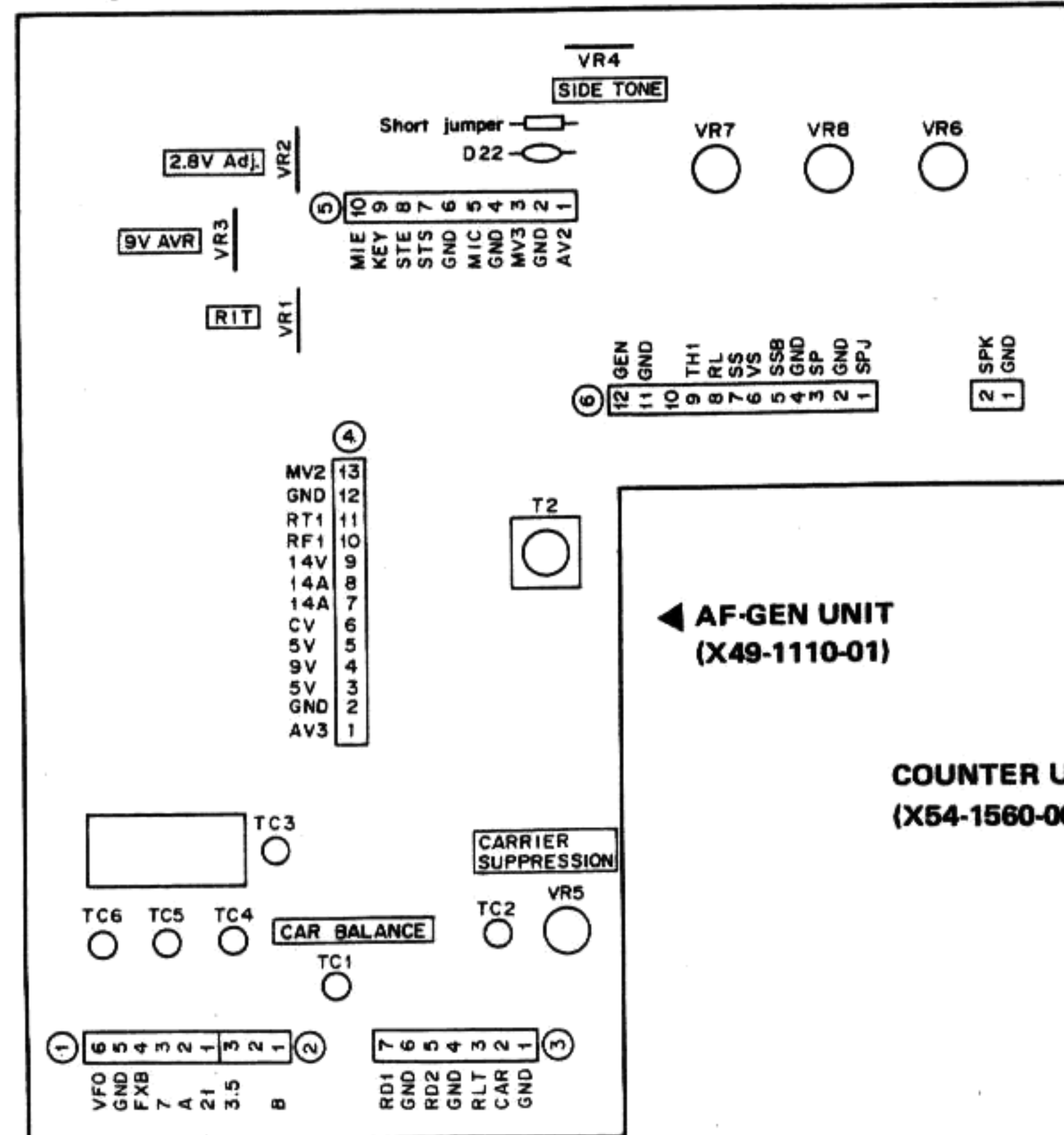
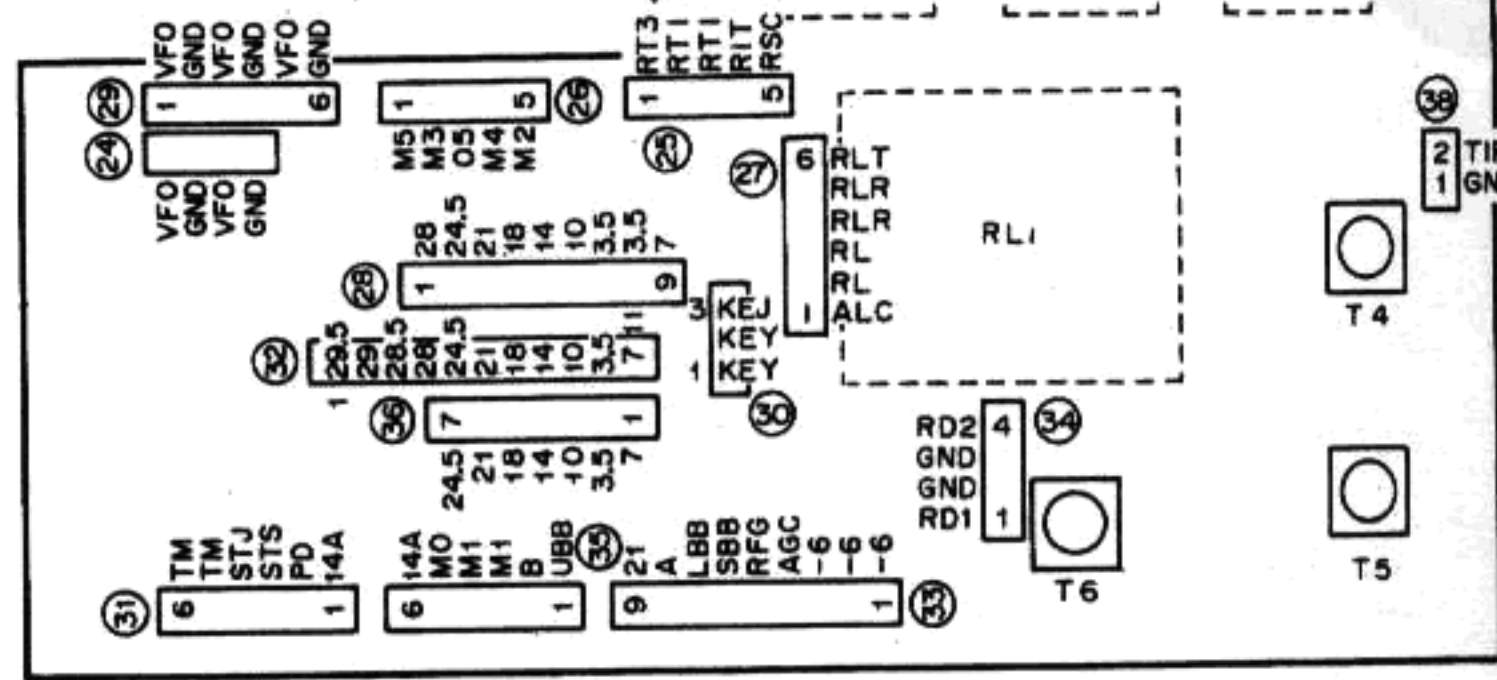
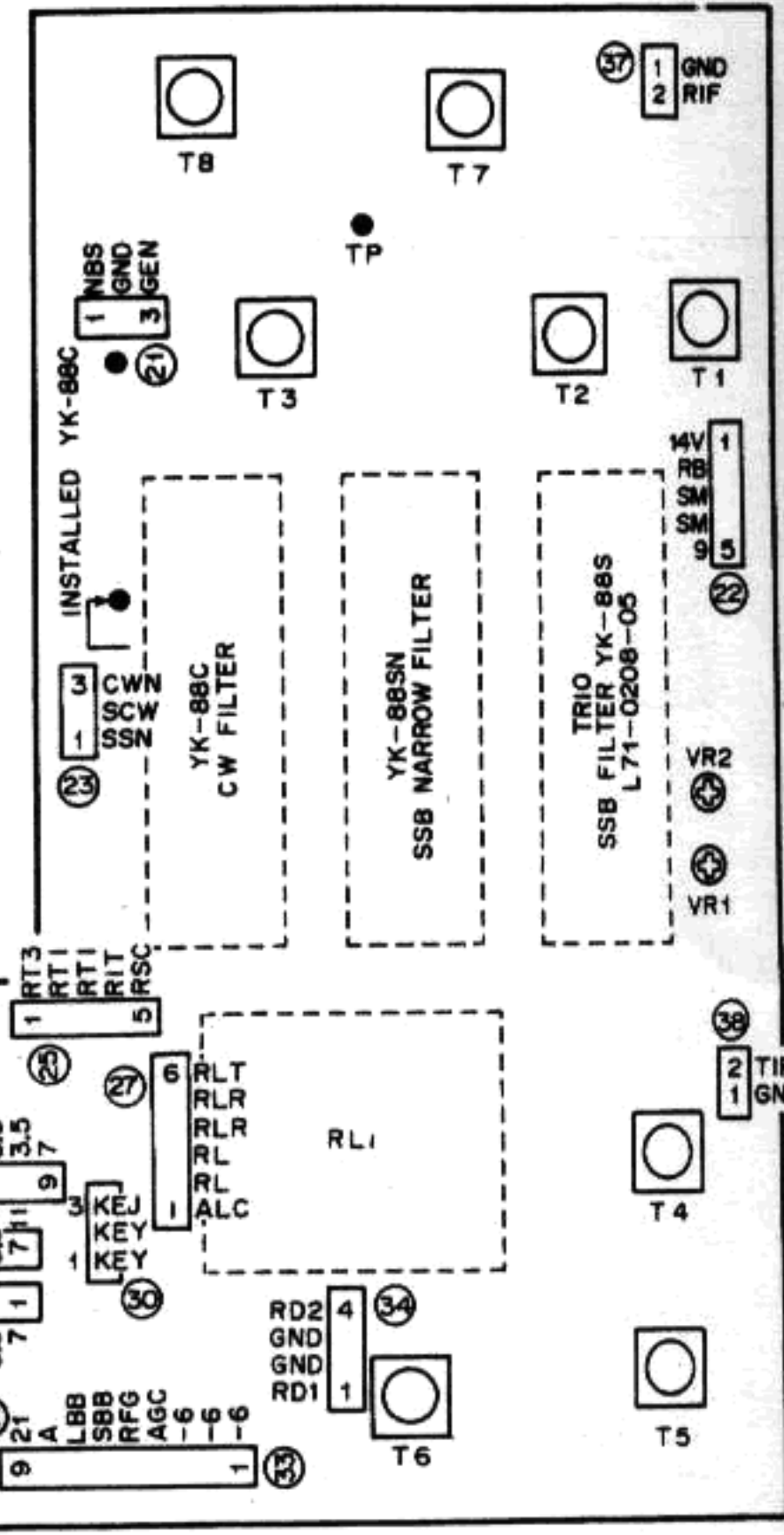
### ▼ RF UNIT (X44-1380-00)



### ▼ VFO UNIT (X40-1170-00)

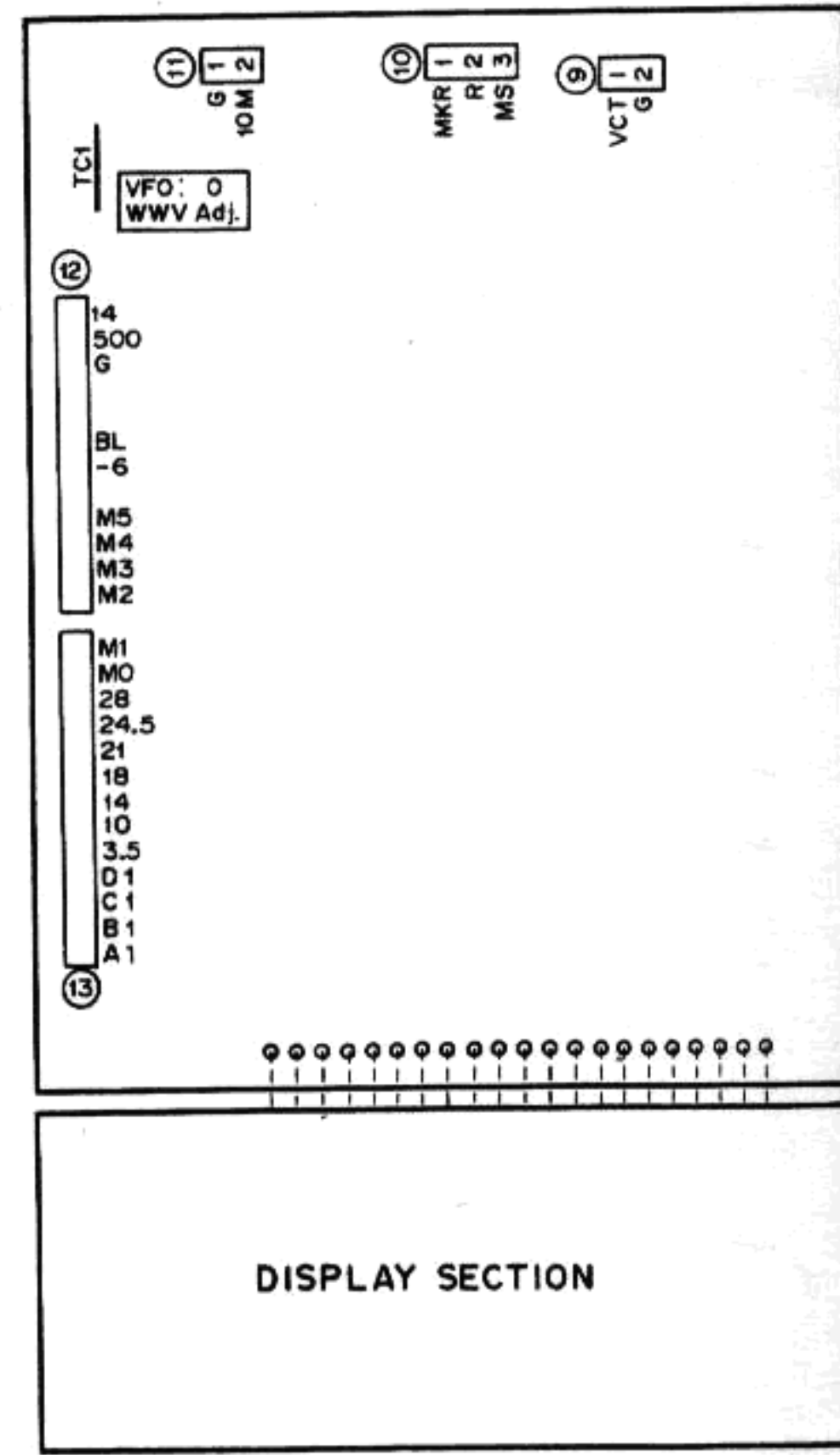


### ▼ IF UNIT (X48-1300-00)



### ◀ AF-GEN UNIT (X49-1110-01)

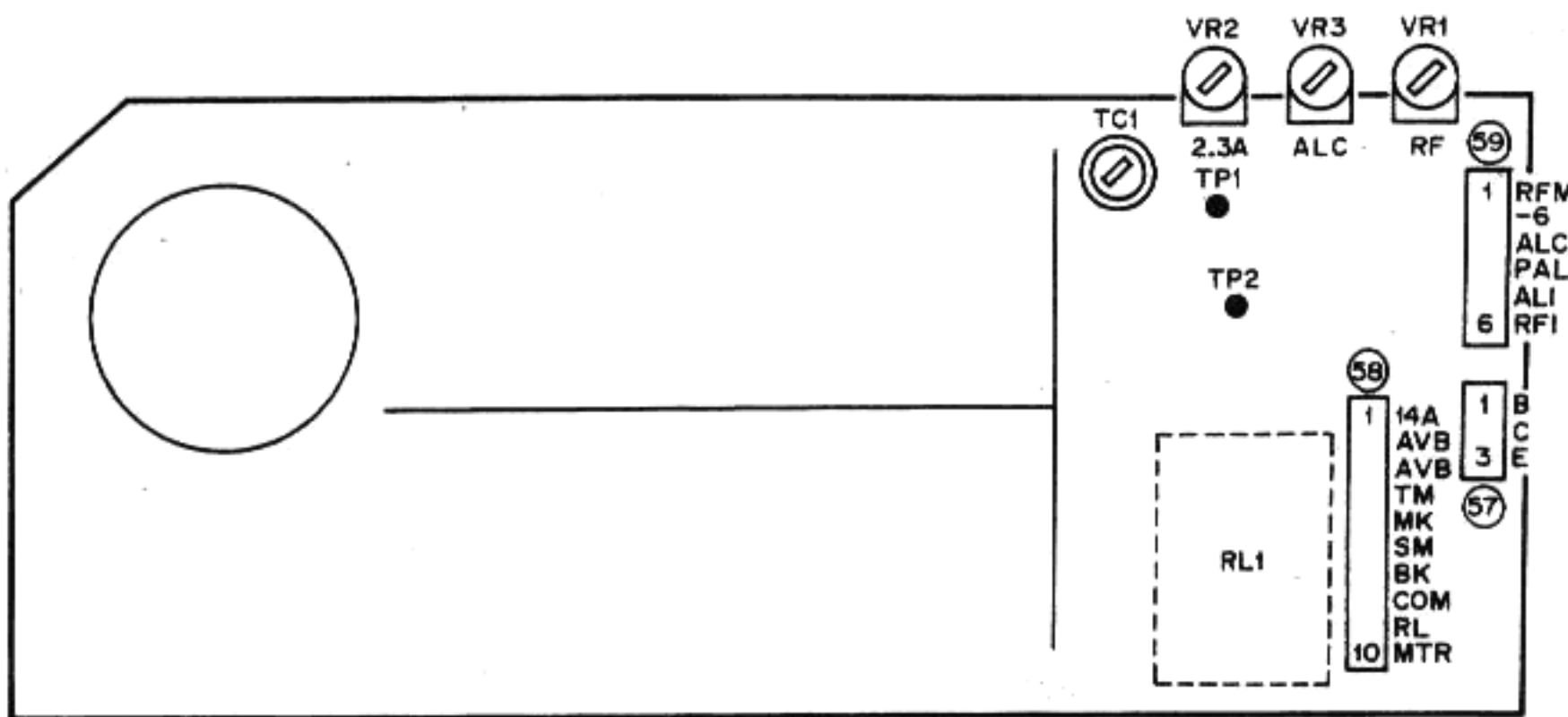
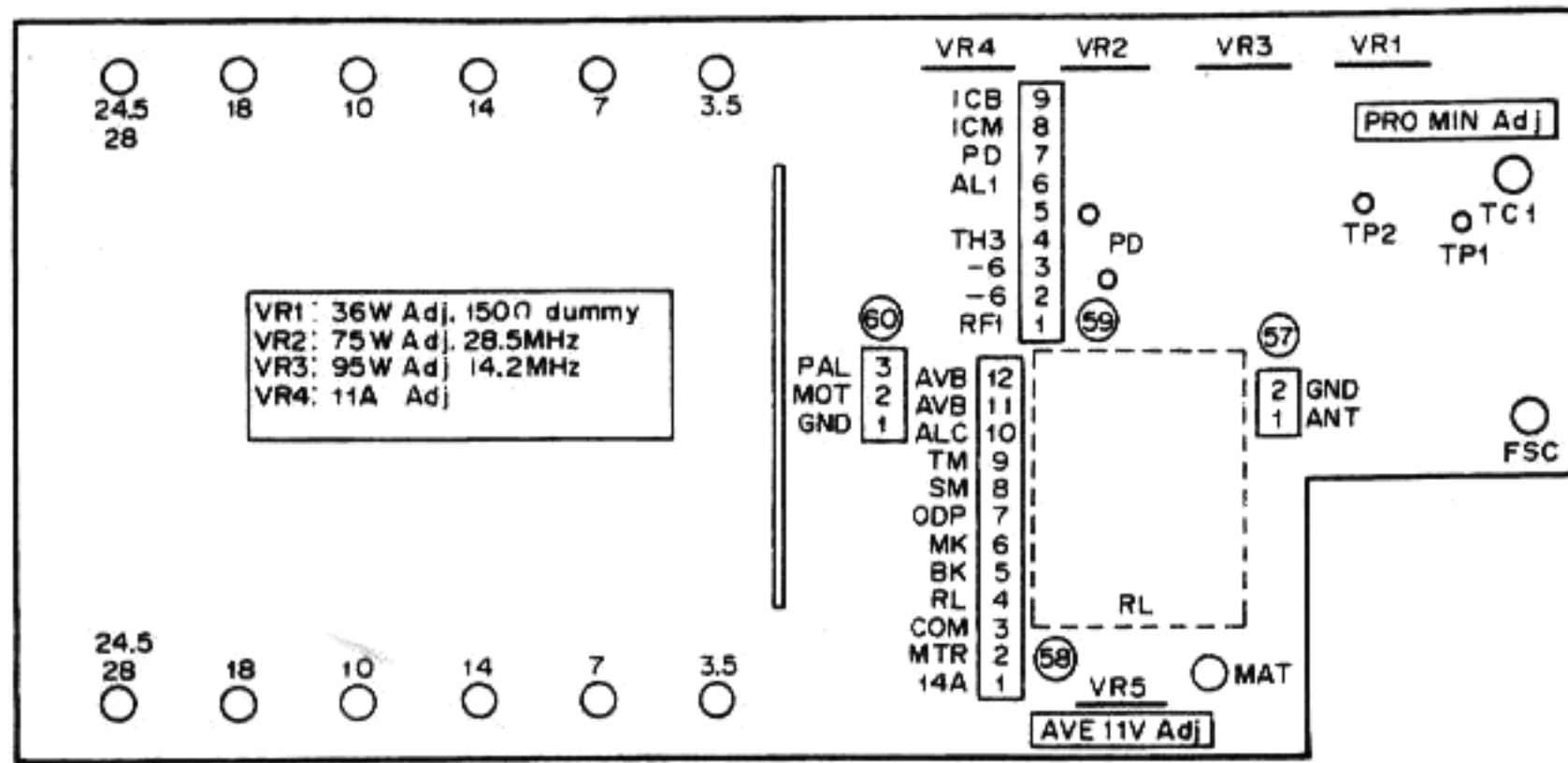
### COUNTER UNIT ▶ (X54-1560-00)





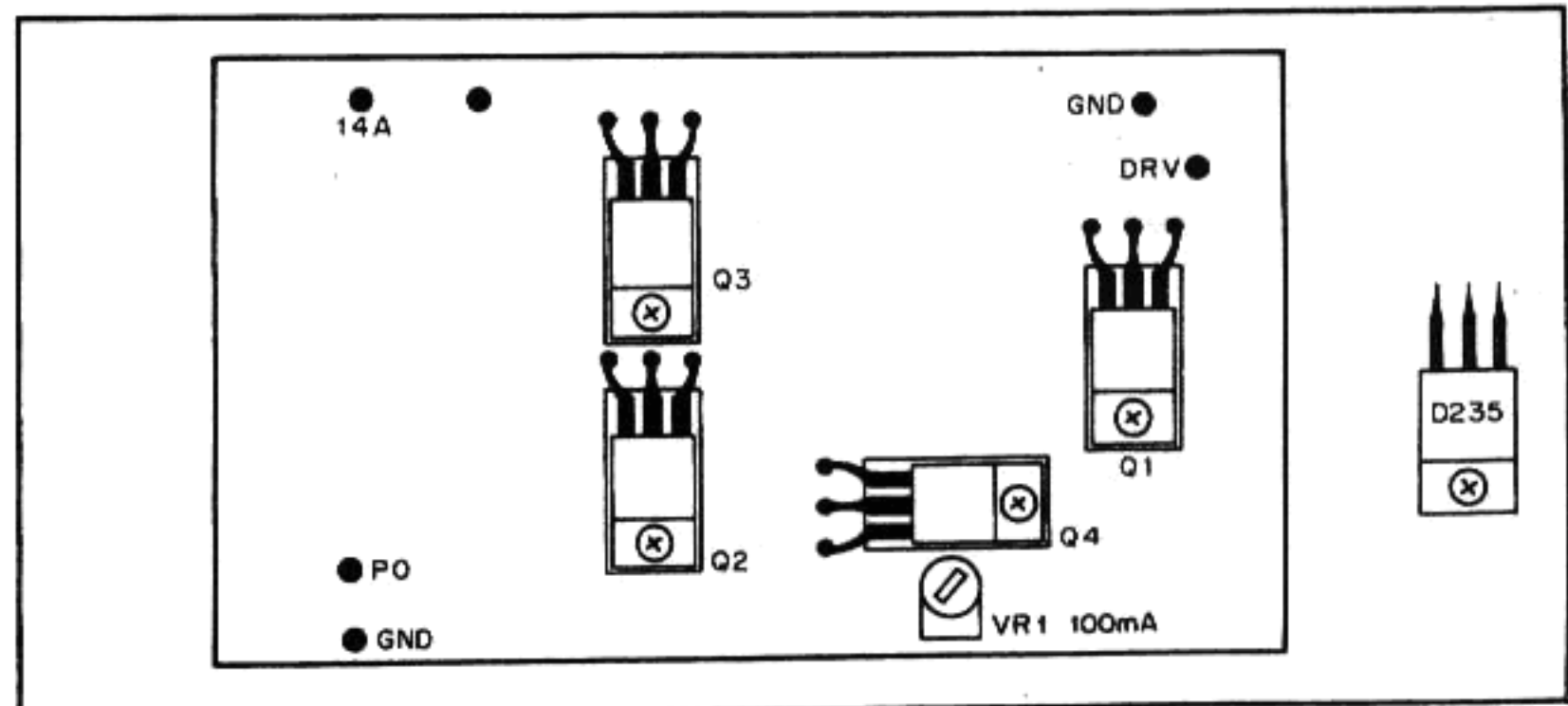
# ADJUSTMENTS

▼ FILTER UNIT (X51-1240-00) S TYPE

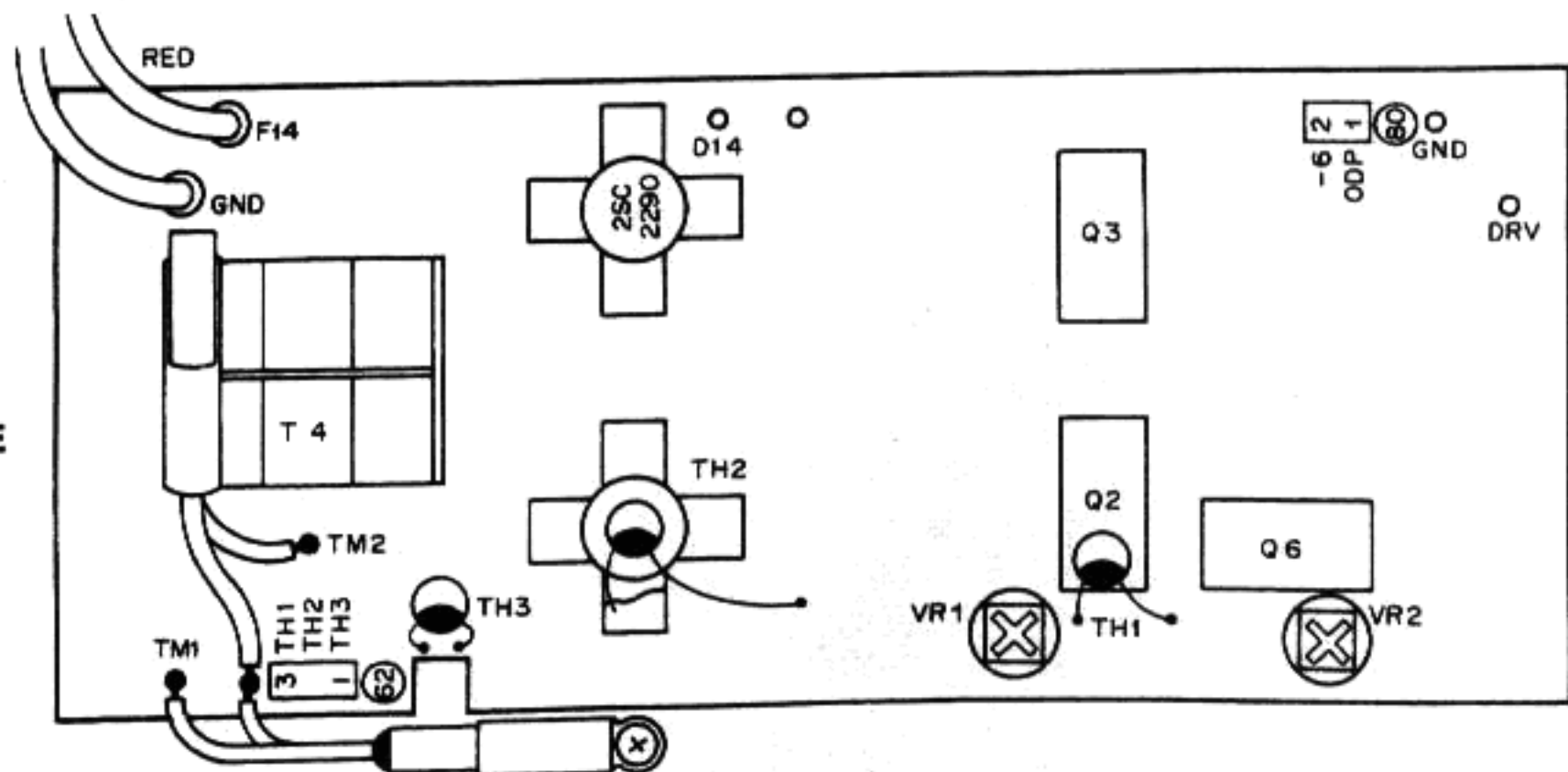


◀ FILTER UNIT (X51-1250-00) V TYPE

FINAL UNIT ► (X56-1300-00) V TYPE

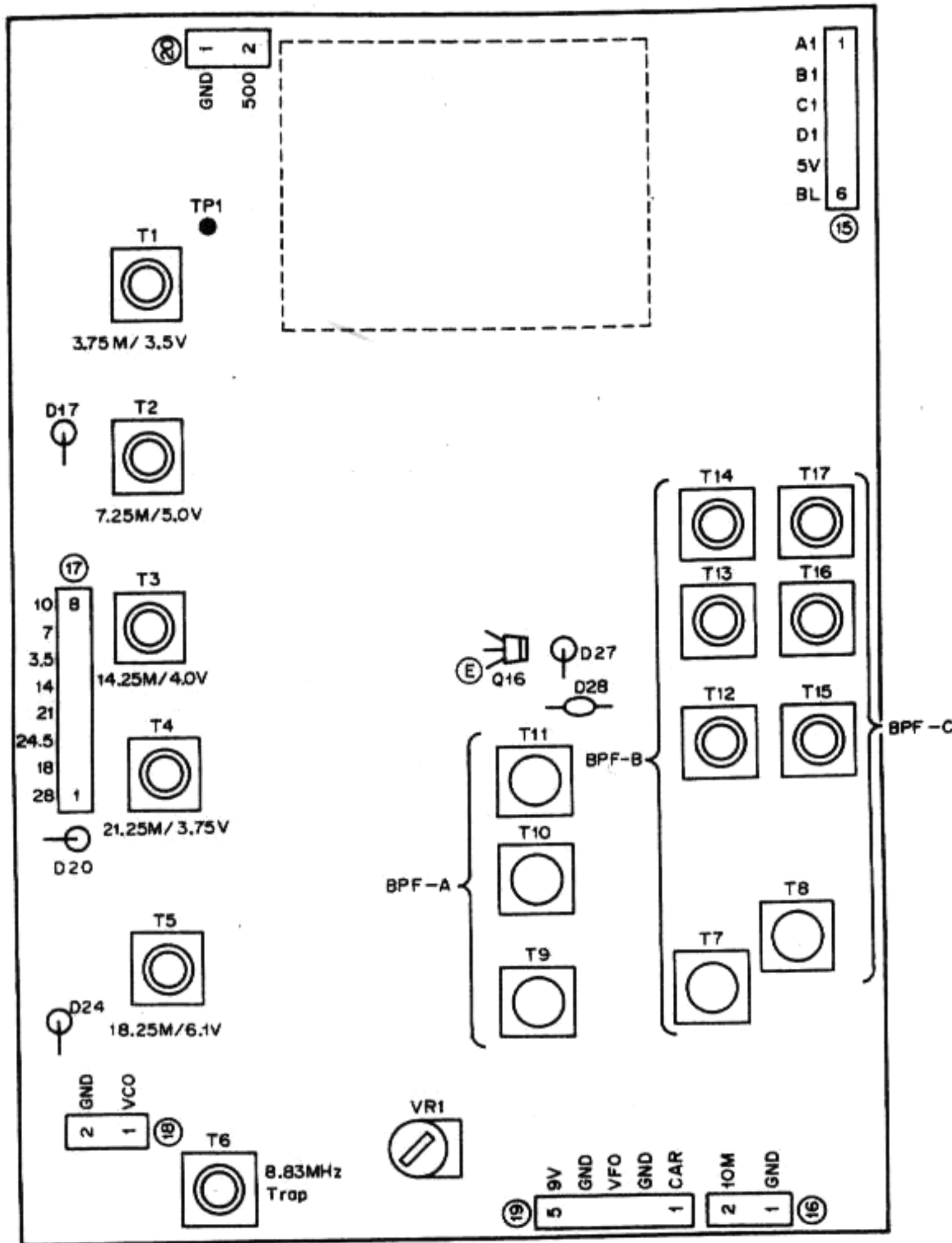


FINAL UNIT ► (X56-1350-00) S TYPE

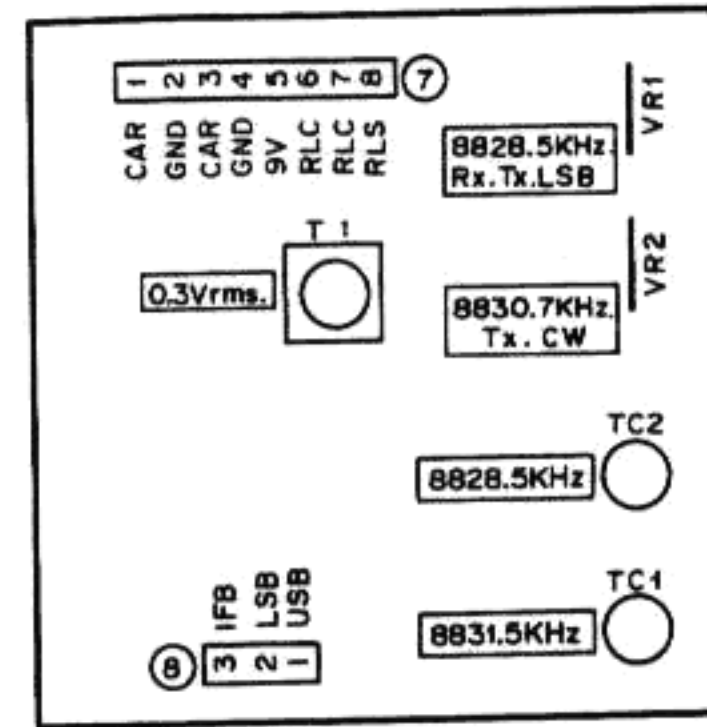


## ADJUSTMENTS

### ▼ PLL UNIT (X50-1700-00)



### ▼ CAR UNIT (X50-1500-00)



### TEST AND ALIGNMENT SET-UP

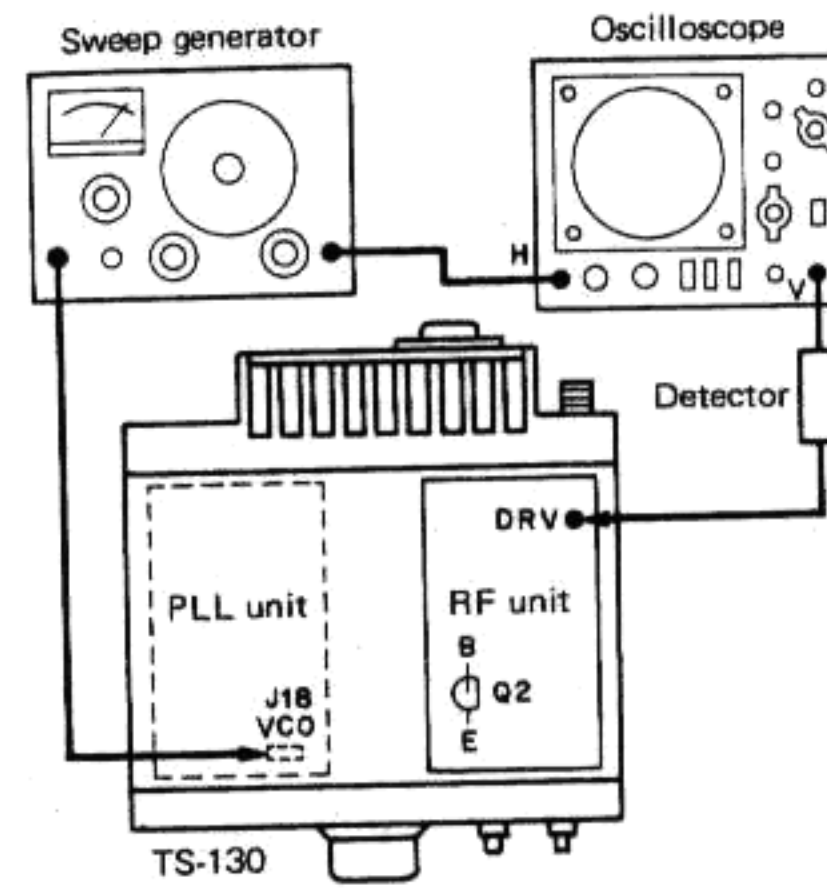


Fig. 4 7. TX BPF (RX BPF)

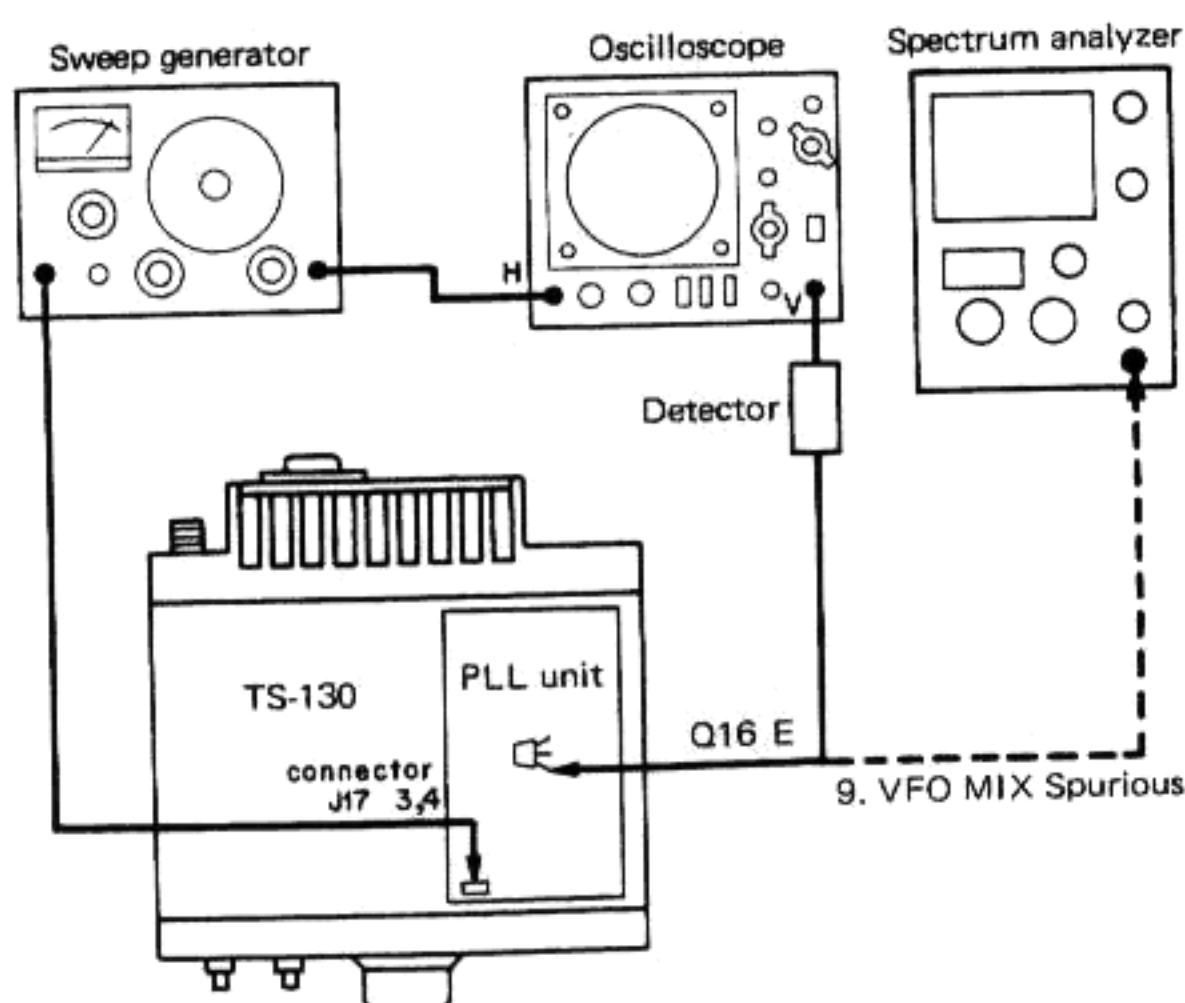


Fig. 5 8. PLL BPF-A,B,C  
9. VFO MIX spurious (Disconnect Sweep generator and Oscilloscope)

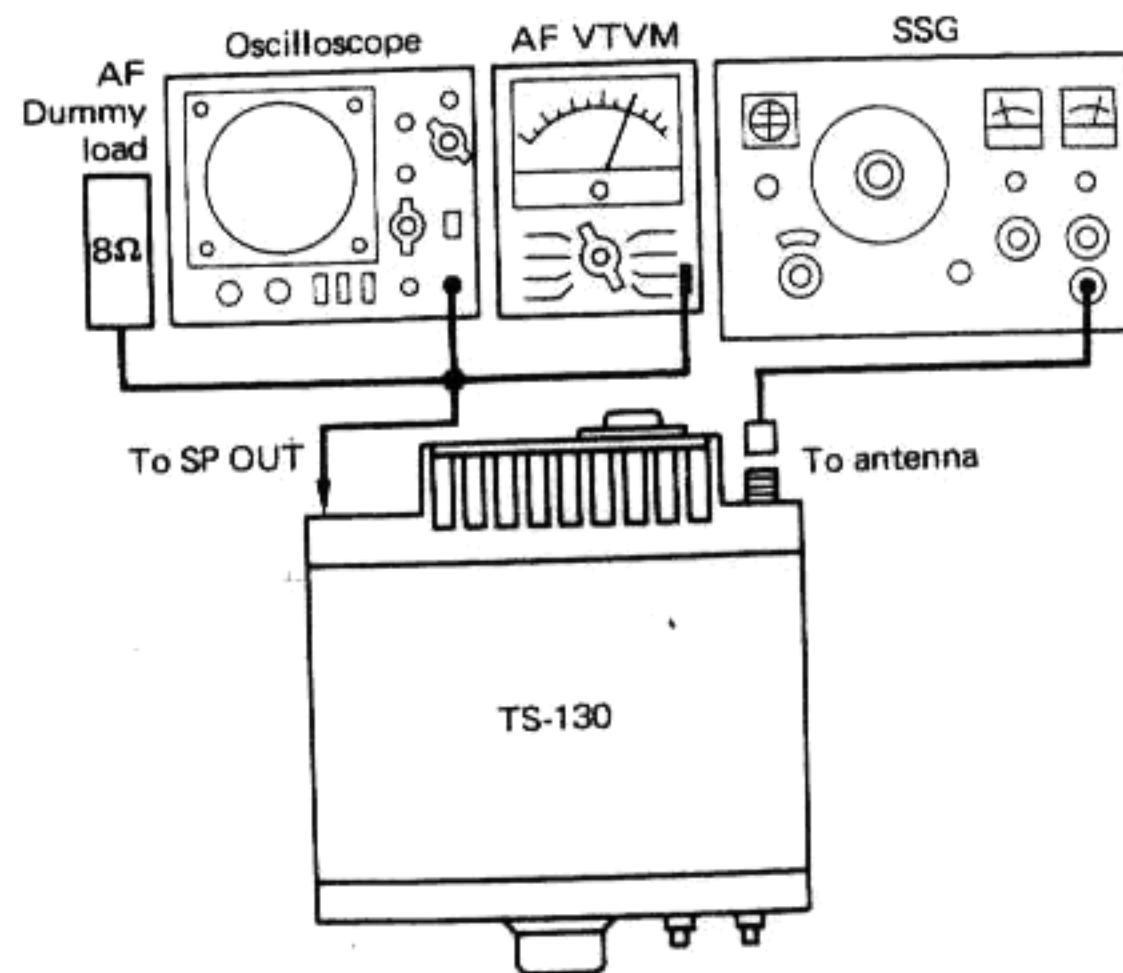
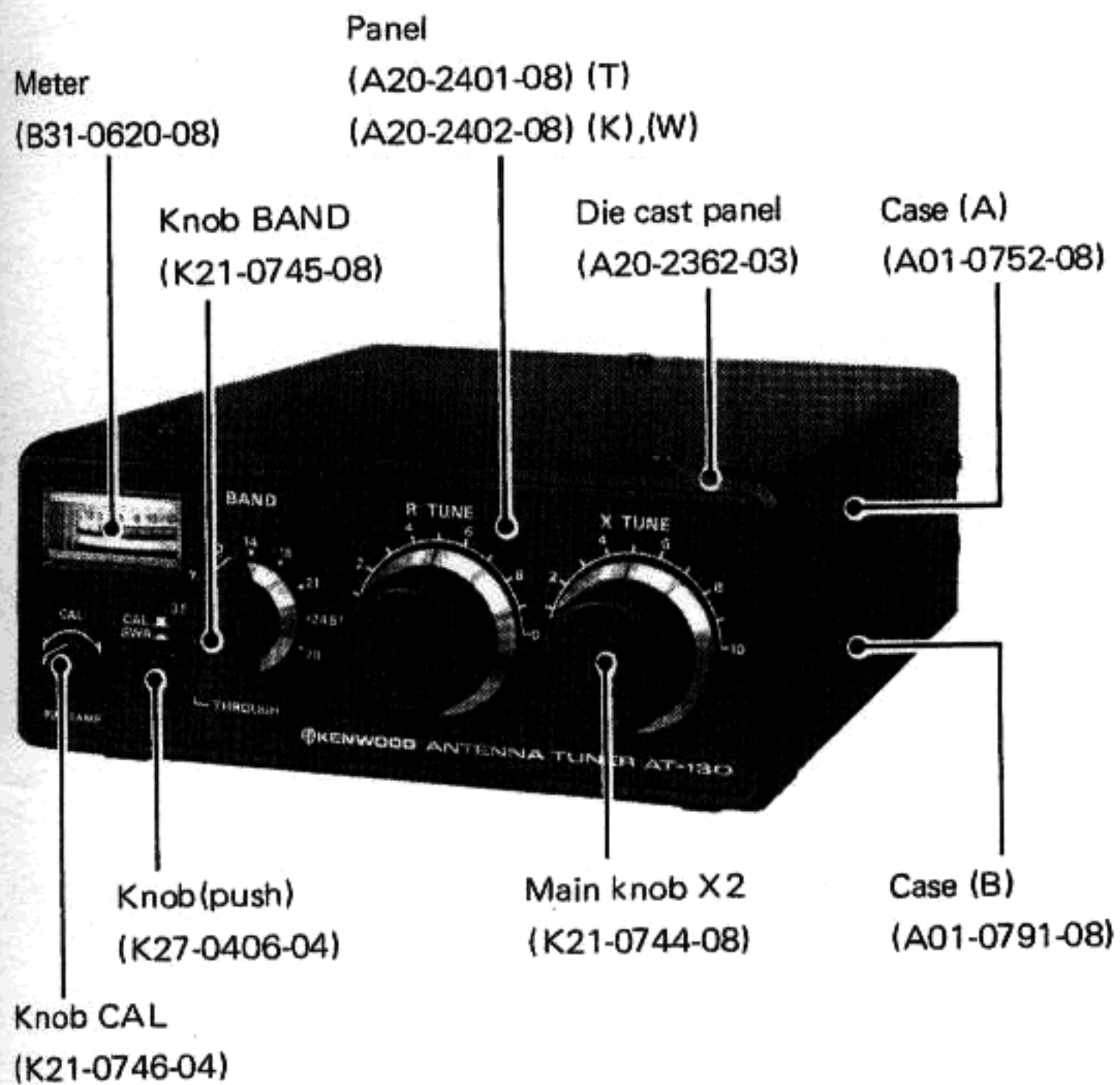


Fig. 6 11. IF AMP, 12. IF trap

# AT-130

## OUTSIDE VIEW

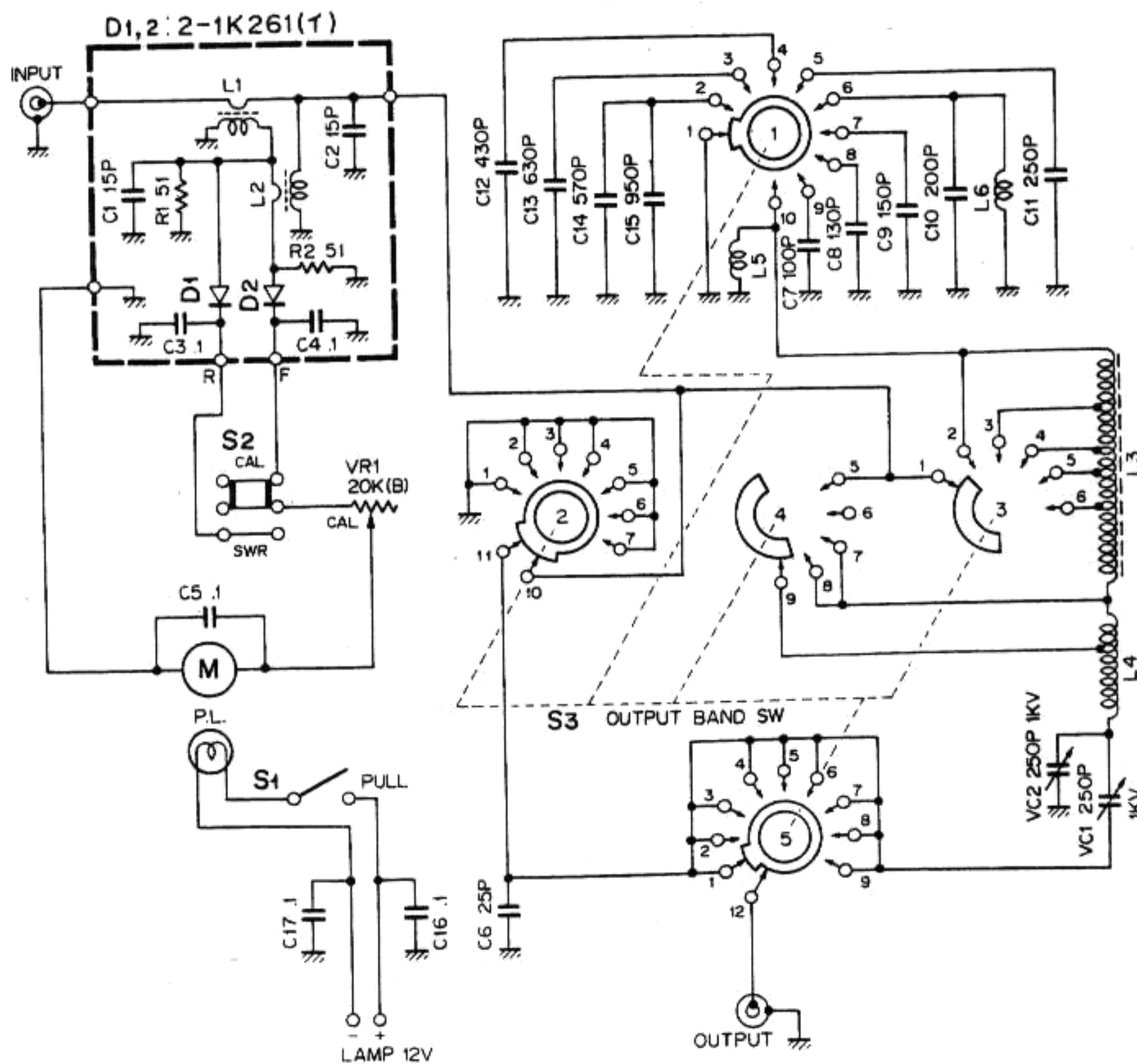


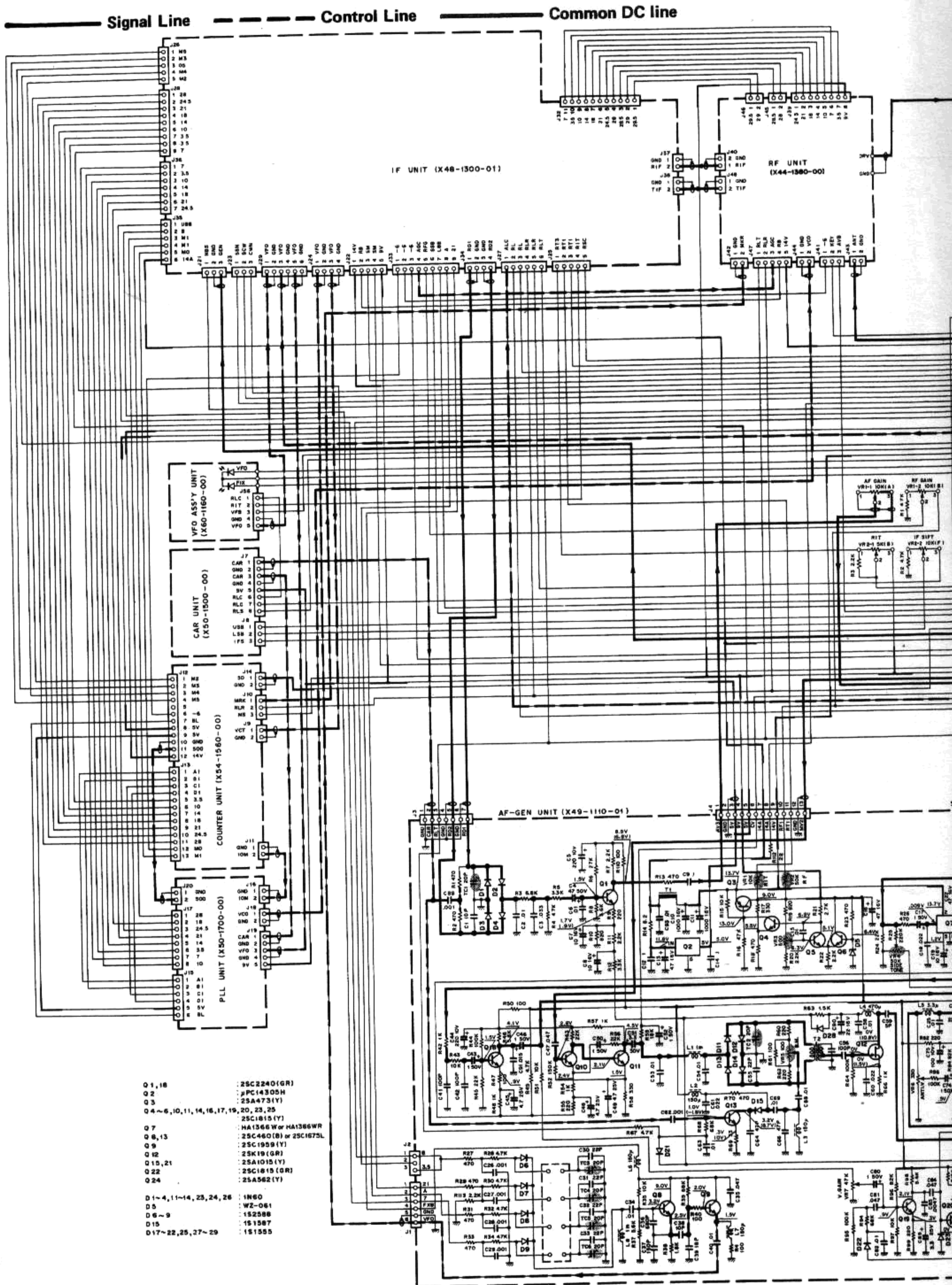
## SPECIFICATIONS

- 1. Antenna Coupler**  
 Frequency range . . . . . 8 amateur bands from 3.5 to 29.7 MHz  
 Input impedance . . . . . 50Ω  
 Output impedance . . . . . 20 to 300Ω, unbalanced.  
 Through power . . . . . 150W max. (3.5 MHz band, 120W)  
 Insertion loss . . . . . Less than 0.5dB at optimum match.
- 2. SWR Meter**  
 Frequency range . . . . . 3.5 to 29.7MHz  
 Max. power . . . . . 150W  
 Measurable range . . . . . 1.0:1 to 10:1  
 Min. power required . . . . . 2W
- 3. General**  
 INPUT Connector . . . . . UHF type (50Ω)  
 ANT Connector . . . . . UHF type (50Ω)  
 GND . . . . . Wing nut and STUD.  
 Dimensions . . . . . H. 60mm (2-3/8")  
 W. 152mm (6")  
 D. 159mm (6-1/4")  
 Weight . . . . . 1.6kg (3.5 lbs) approx.

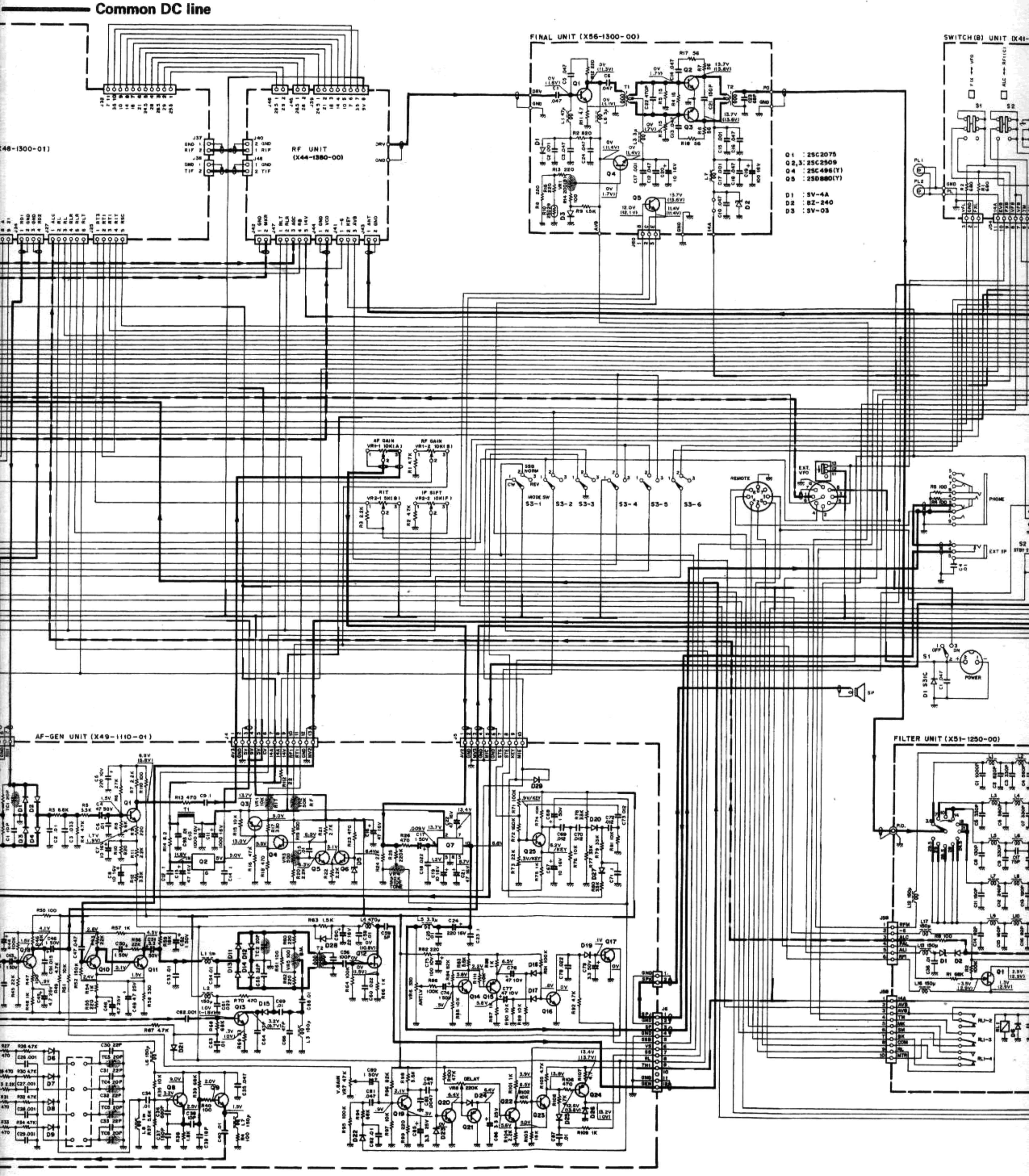
NOTE: The circuit and ratings may change without notice due to developments in technology.

## SCHEMATIC DIAGRAM





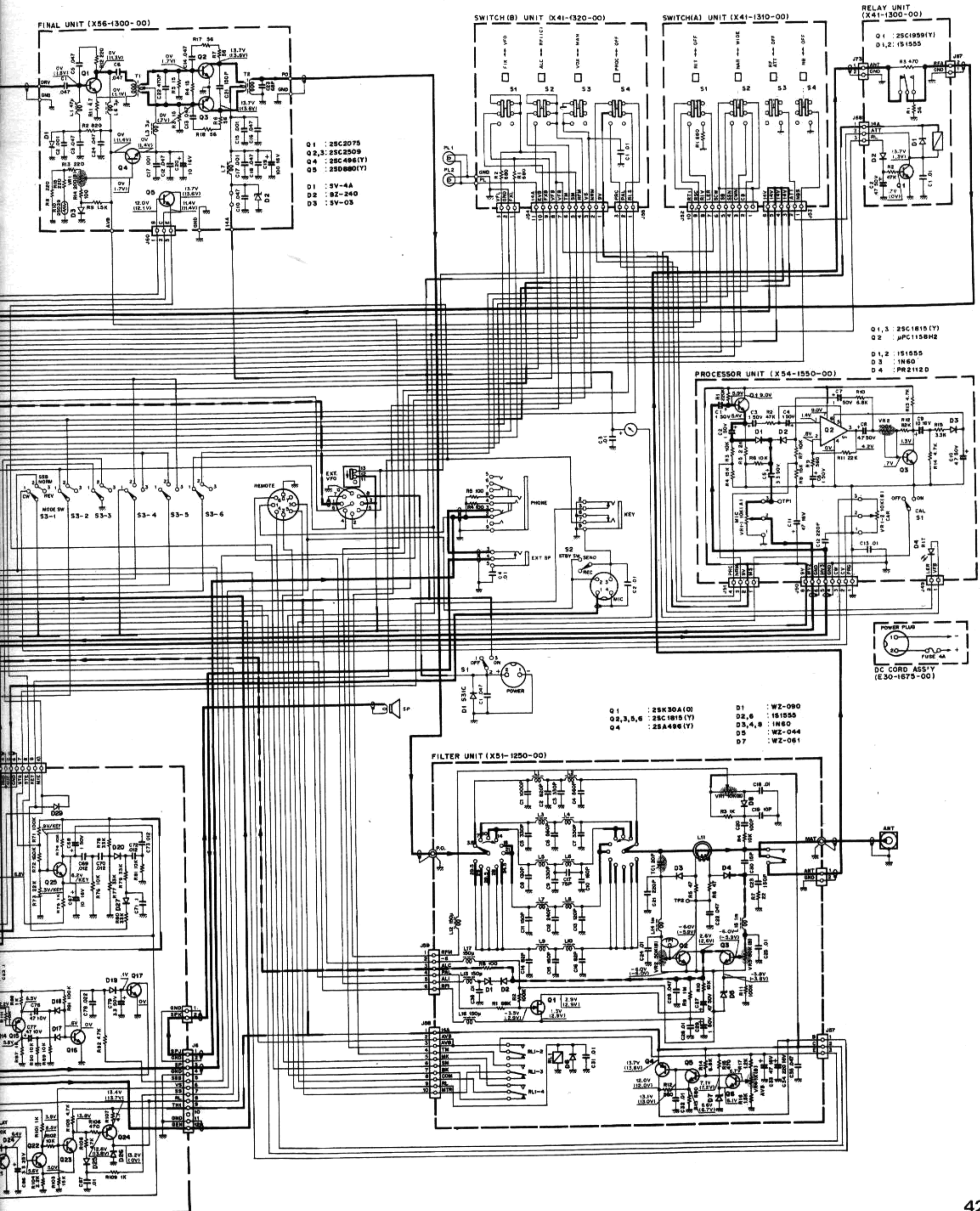
# SCHEMATIC DIAGRAM (V) TYPE



- Q1 : 25C2075
- Q2,3 : 25C2509
- Q4 : 25C496(Y)
- Q5 : 25B80(Y)
- D1 : 5V-4A
- D2 : 8Z-240
- D3 : 5V-03

## CIRCUIT DIAGRAM (V) TYPE

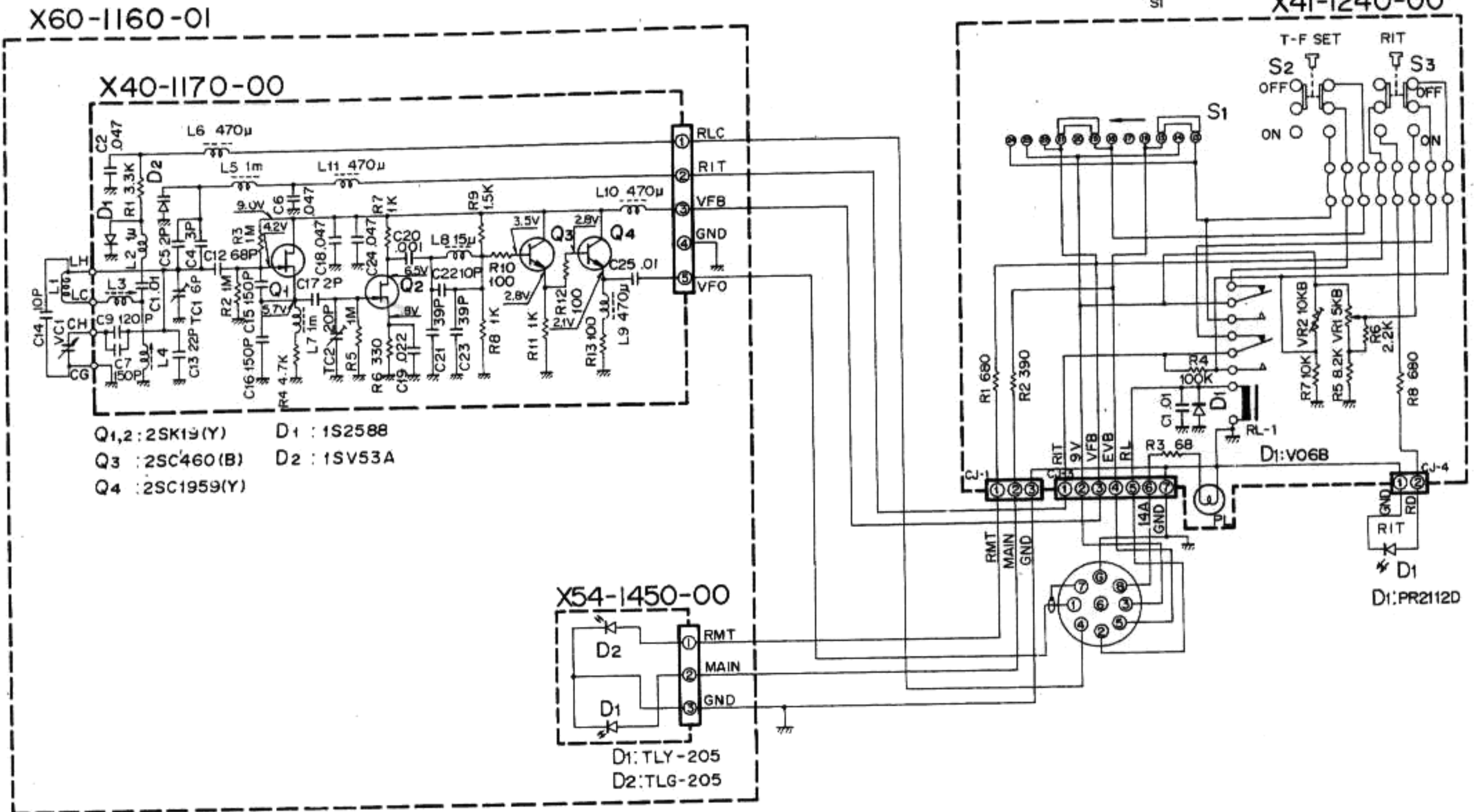
Voltage measurement conditions  
 $f = 14.25\text{MHz}$ , MODE SSB, RX no signal, ( ) in TX



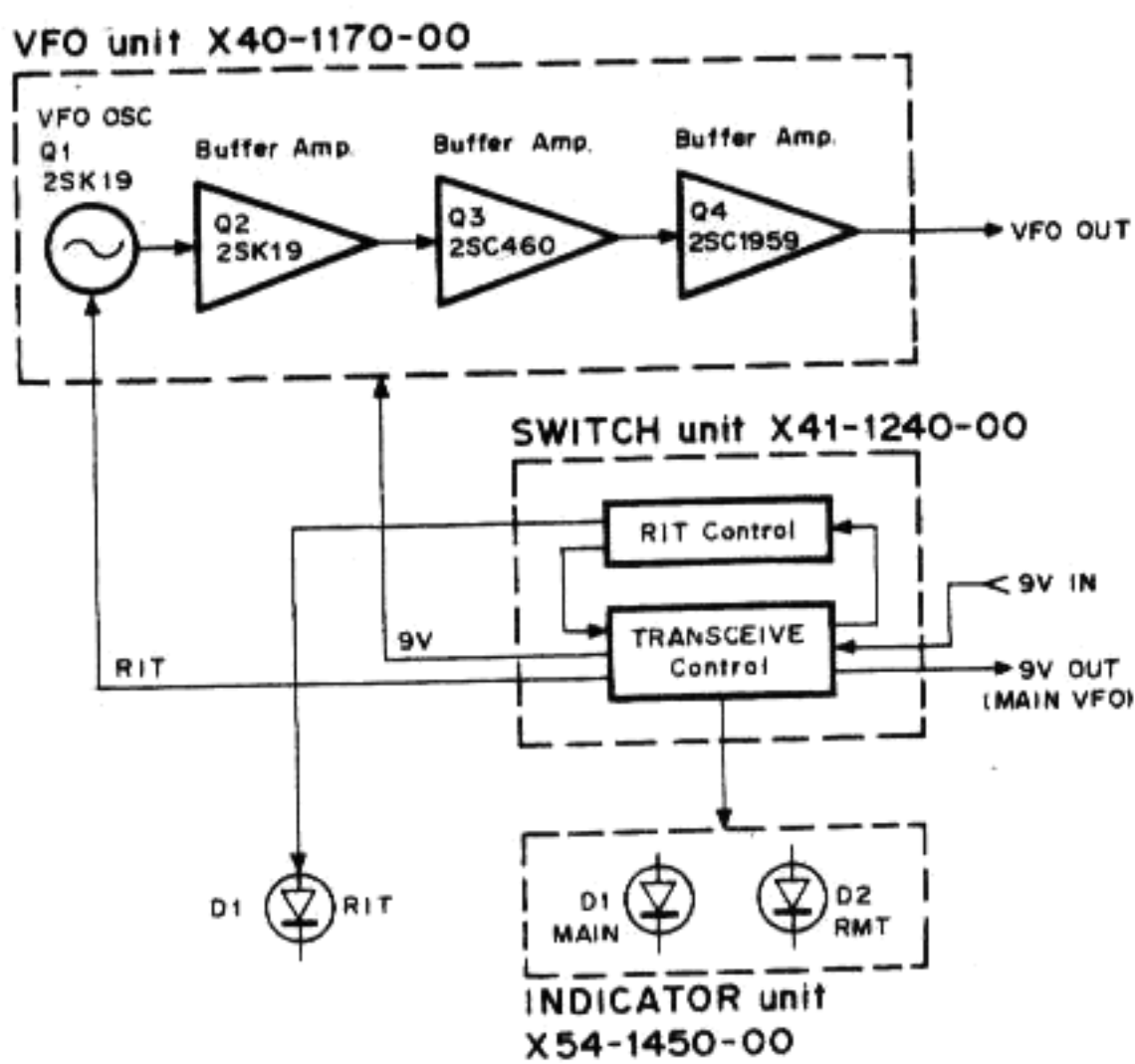


# VFO-120

## SCHEMATIC DIAGRAM



## BLOCK DIAGRAM



## PARTS LIST

☆: New parts

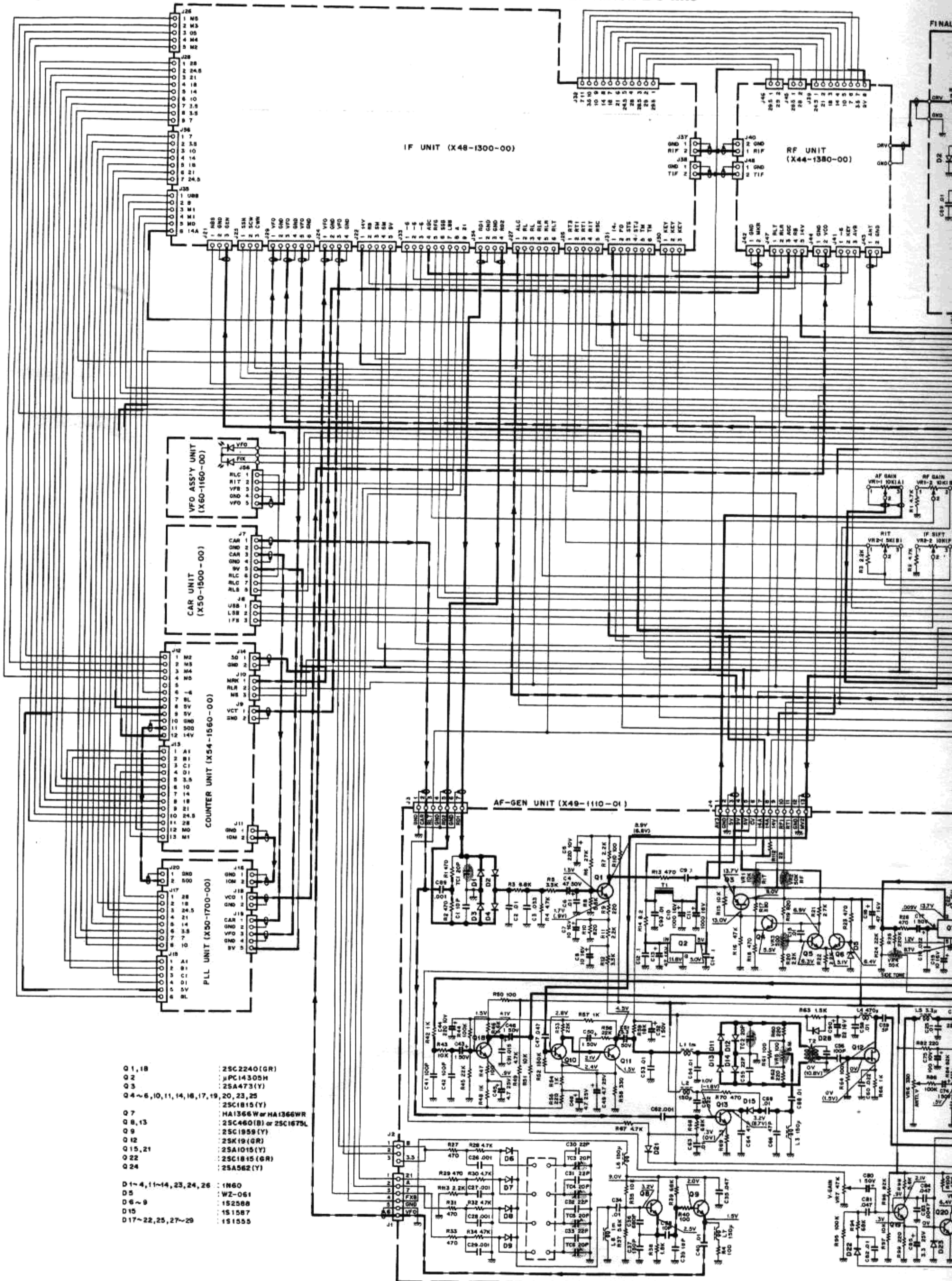
| Ref.No.        | Parts No.   | Description              | Re-<br>marks |
|----------------|-------------|--------------------------|--------------|
| <b>GENERAL</b> |             |                          |              |
|                | A01-0739-03 | Case(A) upper            |              |
|                | A01-0740-03 | Case(B) lower            |              |
|                | A20-2341-04 | Panel                    | (T)          |
|                | A20-2342-04 | Panel                    | (K),(W)      |
|                | B39-0407-04 | Spacer for foot          |              |
|                | B46-0058-00 | Warranty card            | (K)          |
|                | B50-2633-10 | Operating manual         | (K),(W) ☆    |
|                | B50-2634-10 | Operating manual         | (T) ☆        |
|                | E02-0107-05 | Diode socket             |              |
|                | E06-0852-05 | 8P DIN socket            |              |
|                | E30-1623-05 | Earth cable              |              |
|                | E30-1628-15 | VFO cable                | ☆            |
|                | E31-0482-15 | Connector with lead      |              |
|                | G09-0405-05 | Spring                   |              |
|                | H01-2609-04 | Carton case (inside)     | (K),(W)      |
|                | H01-2610-04 | Carton case (inside)     | (T)          |
|                | H10-2513-02 | Packing fixture (F)      |              |
|                | H10-2514-02 | Packing fixture (R)      |              |
|                | H12-0445-04 | Cushion                  |              |
|                | H20-1407-03 | Protective cover         |              |
|                | H25-0117-04 | Accessories bag 80 X 250 |              |



Signal Line

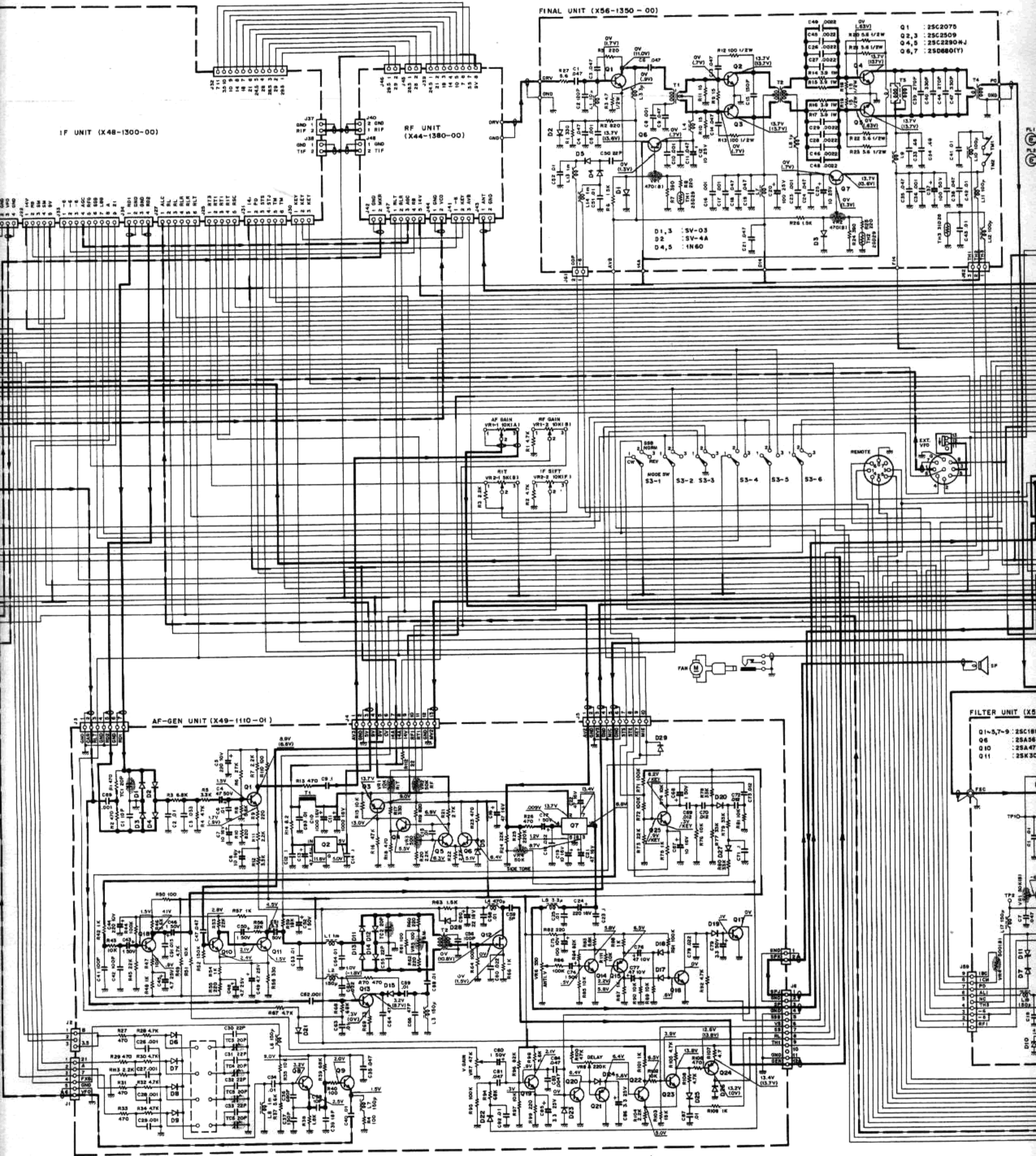
Control Line

Common DC line



# SCHEMATIC DIAGRAM (S) TYPE

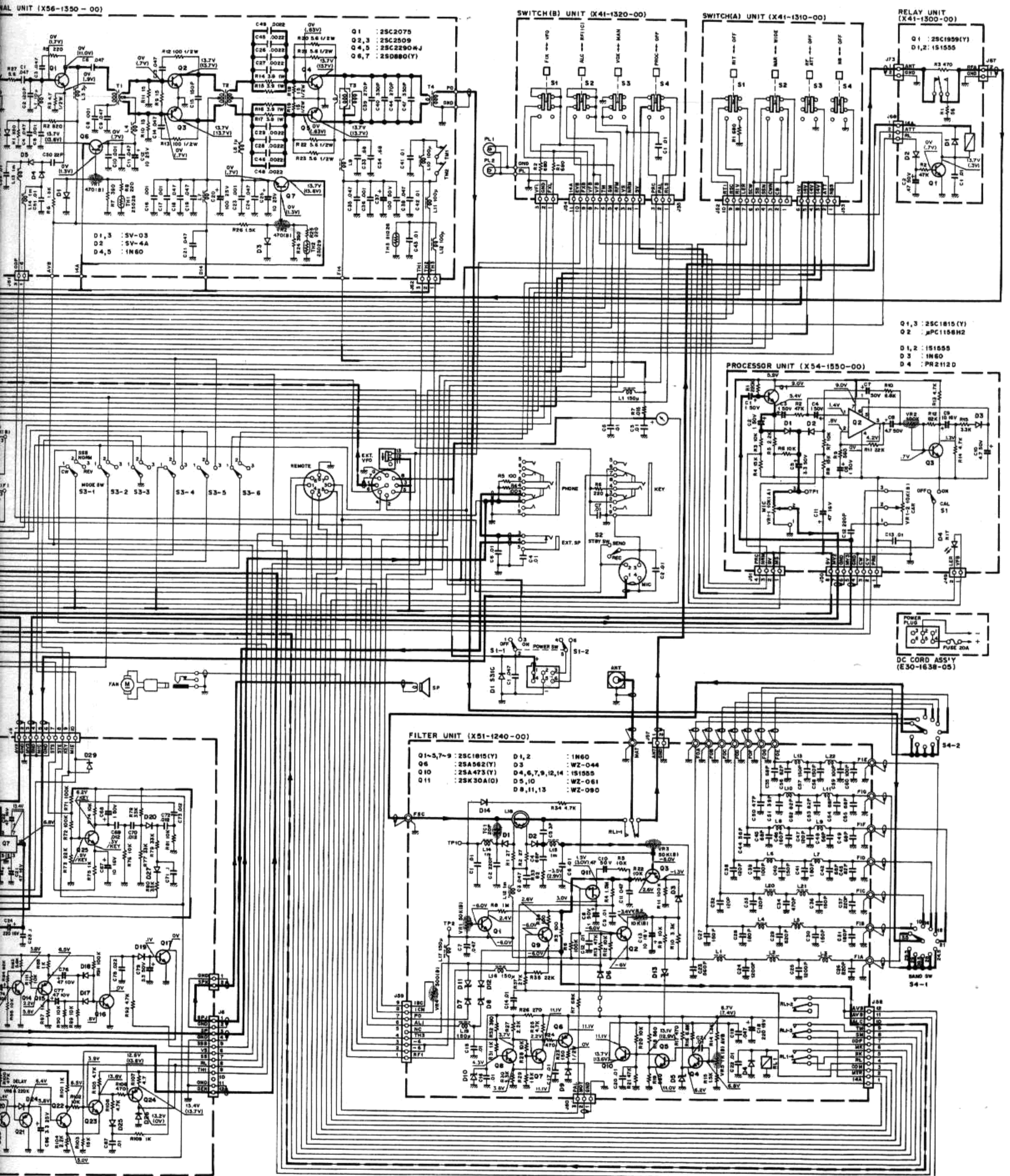
Control Line      Common DC line



FILTER UNIT (X5)  
Q1-5,7-9 : 25C18  
Q6 : 25A56  
Q10 : 25A47  
Q11 : 25K30

## WIRING DIAGRAM (S) TYPE

Voltage measurement conditions  
 f = 14.25MHz, MODE SSB, RX no signal, ( ) : in TX



# TS-130SV

## VFO-120

| Ref.No.   | Parts No.    | Description              | Re-<br>marks | Ref.No.                       | Parts No.    | Description         | Re-<br>marks |
|---|--------------|--------------------------|--------------|-------------------------------|--------------|---------------------|--------------|
| <b>D1</b><br>J02-0323-05 Foot<br>J02-0409-04 Assistance foot<br>J61-0019-05 Vinyl tie<br><br>K23-0721-04 Knob RIT<br>K29-0709-04 Push knob (square)<br>K29-0715-04 Pointer knob FUNCTION<br><br>N14-0509-05 Wing nut<br>N99-0306-04 Hex. head screw (VFO M4X10)<br><br>V11-7260-66 LED PR2112D RIT<br><br>X41-1240-00 Switch unit<br>X60-1160-01 VFO ass'y unit ☆ |              |                          |              | <b>VFO UNIT (X40-1170-00)</b> |              |                     |              |
|   |              |                          |              | C2                            | C91-0456-05  | C 0.047 $\mu$ F 25V |              |
|   |              |                          |              | C4                            | CC45RG1H030C | C 3pF $\pm$ 0.25pF  |              |
|   |              |                          |              | C5                            | CC45PG1H020C | C 2pF $\pm$ 0.25pF  |              |
|   |              |                          |              | C6                            | C91-0456-05  | C 0.047 $\mu$ F 25V |              |
|   |              |                          |              | C7                            | CC45LG1H151J | C 150pF             |              |
|   |              |                          |              | C9                            | CC45LG1H121J | C 120pF             |              |
|   |              |                          |              | C12                           | CC45LG1H680J | C 68pF              |              |
|   |              |                          |              | C13                           | CC45LG1H220J | C 22pF              |              |
|   |              |                          |              | C14                           | CC45CG1H100D | C 10pF $\pm$ 0.5pF  |              |
| C15,16  | CC45LG1H151J | C 150pF                  |              |                               |              |                     |              |
| C17   | CC45CH1H020C | C 2pF $\pm$ 0.25pF       |              |                               |              |                     |              |
| C18   | C91-0456-05  | C 0.047 $\mu$ F 25V      |              |                               |              |                     |              |
| C21   | CC45SL1H390J | C 39pF                   |              |                               |              |                     |              |
| C22   | CC45CH1H100D | C 10pF $\pm$ 0.5pF       |              |                               |              |                     |              |
| C23   | CC45SL1H390J | C 39pF                   |              |                               |              |                     |              |
| C24   | C91-0456-05  | C 0.047 $\mu$ F 25V      |              |                               |              |                     |              |
|   | C02-0019-05  | Variable capacitor       | ☆            |                               |              |                     |              |
| TC1   | C05-0009-15  | Ceramic trimmer          | 6pF          |                               |              |                     |              |
| TC2   | C05-0013-15  | Ceramic trimmer          | 20pF         |                               |              |                     |              |
|   | D40-0814-05  | Dial mechanism ass'y     | ☆            |                               |              |                     |              |
|   | E40-0574-05  | Mini connect wafer       | 5P           |                               |              |                     |              |
| L1  | L32-0628-05  | OSC coil                 | ☆            |                               |              |                     |              |
| L2  | L33-0025-05  | Choke coil               | 1 $\mu$ H    |                               |              |                     |              |
| L3  | L32-0629-05  | OSC coil (C)             | ☆            |                               |              |                     |              |
| L4  | L32-0609-05  | OSC coil (B)             |              |                               |              |                     |              |
| L5  | L40-1021-03  | Ferri-inductor           | 1mH          |                               |              |                     |              |
| L6  | L40-4711-03  | Ferri-inductor           | 470 $\mu$ H  |                               |              |                     |              |
| L7  | L40-1021-03  | Ferri-inductor           | 1mH          |                               |              |                     |              |
| L8  | L40-1501-03  | Ferri-inductor           | 15 $\mu$ H   |                               |              |                     |              |
| L9~11   | L40-4711-03  | Ferri-inductor           | 470 $\mu$ H  |                               |              |                     |              |
|   | R92-0150-05  | Short jumper             |              |                               |              |                     |              |
| Q1,2  | V09-0011-05  | FET 2SK19(Y)             |              |                               |              |                     |              |
| Q3  | V03-0079-05  | TR 2SC460(B)             |              |                               |              |                     |              |
| Q4  | V03-1959-06  | TR 2SC1959(Y)            |              |                               |              |                     |              |
| D1  | V11-0414-05  | Diode 1S2588             |              |                               |              |                     |              |
| D2  | V11-4161-36  | Varicap diode 1SV53A     |              |                               |              |                     |              |
| <b>SWITCH UNIT (X41-1240-00)</b>  |              |                          |              |                               |              |                     |              |
|   | B30-0818-05  | Pilot lamp               |              |                               |              |                     |              |
| CJ-1  | E40-0373-05  | Mini connect wafer       | 3P           |                               |              |                     |              |
| CJ-3  | E40-0774-05  | Mini connect wafer       | 7P           |                               |              |                     |              |
| CJ-4  | E40-0274-05  | Mini connect wafer       | 2P           |                               |              |                     |              |
| VR1   | R01-2404-05  | Pot. 5k $\Omega$ (B) RIT |              |                               |              |                     |              |
| VR2   | R12-3025-05  | Pot. 10k $\Omega$ (B)    |              |                               |              |                     |              |
| S1  | S29-1410-05  | Slide rotary switch      |              |                               |              |                     |              |
| S2  | S40-2409-15  | Push switch T-F SET      |              |                               |              |                     |              |
| S3  | S40-2404-05  | Push switch RIT          |              |                               |              |                     |              |
| RL1   | S51-2408-05  | Relay G2V-2              |              |                               |              |                     |              |
| D1  | V11-0219-05  | Diode V06B               |              |                               |              |                     |              |
| <b>VFO ASS'Y UNIT (X60-1160-01)</b>   |              |                          |              |                               |              |                     |              |
|   | B01-0621-04  | Dial escutcheon          |              |                               |              |                     |              |
|   | B08-4301-04  | Dial back board          | ☆            |                               |              |                     |              |
|   | B10-0620-04  | Front glass (A) MAIN-RMT |              |                               |              |                     |              |
|   | B20-0811-04  | Dial scale (B) 25K       |              |                               |              |                     |              |
|   | B20-0817-04  | Dial scale (A) 500K      | ☆            |                               |              |                     |              |
|   | B42-1645-04  | Seal bottom              |              |                               |              |                     |              |
|   | B42-1671-04  | Seal top                 |              |                               |              |                     |              |
|   | G01-0840-04  | Coil spring              |              |                               |              |                     |              |
|   | K21-0722-04  | Main knob                |              |                               |              |                     |              |
|   | N19-0608-04  | Washer Main knob         |              |                               |              |                     |              |
|   | X40-1170-00  | VFO unit                 |              |                               |              |                     |              |
|   | X54-1450-00  | Indicator unit           |              |                               |              |                     |              |
| <b>INDICATOR UNIT (X54-1450-00)</b>   |              |                          |              |                               |              |                     |              |
| D1  | V11-3163-16  | LED TLY-205 MAIN         |              |                               |              |                     |              |
| D2  | V11-3162-86  | LED TLG-205 RMT          |              |                               |              |                     |              |

# BLOCK DIAGRAM

