

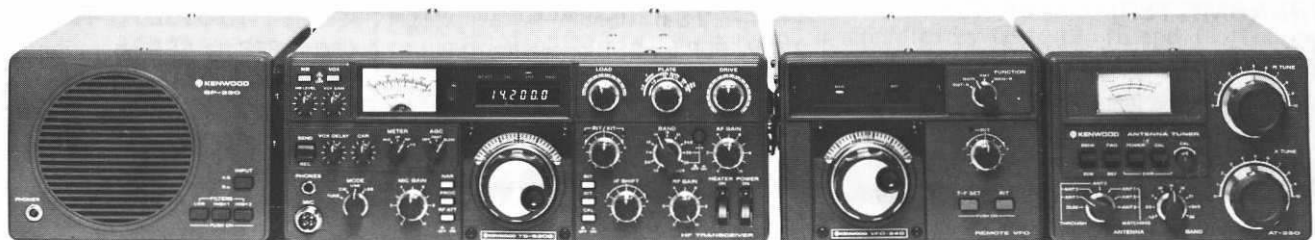
KENWOOD[®]

SERVICE MANUAL

TS-530S/SP/D* (*: KOREA MARKET ONLY)

SP-230, VFO-240, AT-230, PK-3*

HF TRANSCEIVER



SP-230

TS-530S

VFO-240

AT-230

CONTENTS

| | | | |
|-------------------------------------|-------|-------------------------------------|------------|
| SPECIFICATION | 2 | COUNTER UNIT (X54-1540-00) | 19 |
| CIRCUIT DESCRIPTION | 3 | PARTS LIST | 20 |
| AC VOLTAGE CONVERSION | 9 | PACKING | 27 |
| INSIDE VIEWS | 10 | DISASSEMBLY | 28 |
| PC BOARD VIEWS/CIRCUIT DIAGRAMS | | ADJUSTMENTS | 33 |
| RECTIFIER UNIT (X43-1370-02) | 11 | LEVEL DIAGRAM | 45 |
| ANT RELAY BOARD (J25-3015-04) | 11 | VFO-240 | 46 |
| SWITCH BOARD (J25-3016-03) | 11 | AT-230 | 48 |
| FINAL UNIT (X56-1380-00) | 11 | SCHEMATIC ABBREVIATION | 51 |
| VFO UNIT (X40-1170-00) | 12,13 | SCHEMATIC DIAGRAM (S TYPE) | 53 |
| AF UNIT (X49-1150-00) | 12,13 | SCHEMATIC DIAGRAM (SP/D TYPE) | 53,54 |
| IF UNIT (X48-1310-00) | 14,15 | BLOCK DIAGRAM | 54 |
| PLL UNIT (X50-1680-01) | 16,17 | SP-230 | BACK COVER |
| RF UNIT (X44-1360-01) | 18 | PK-3 | BACK COVER |

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SPECIFICATIONS

[GENERAL]

| | |
|--------------------------|---|
| Frequency Range..... | 160 m Band 1.8 ~ 2.0 MHz 80 m Band 3.5 ~ 4.0 MHz 40 m Band 7.0 ~ 7.3 MHz 30 m Band 10.1 ~ 10.15 MHz (10.0 MHz WWV) 20 m Band 14.0 ~ 14.35 MHz * 17 m Band 18.068 ~ 18.168 MHz 15 m Band 21.0 ~ 21.45 MHz * 12 m Band 24.89 ~ 24.99 MHz 10 m Band 28.0 ~ 29.7 MHz |
| Modes..... | SSB/CW |
| Frequency Stability..... | Within 1 kHz during the first hour after 1 minute of warmup. Within 100 Hz during any 30 minute period thereafter. |
| Power Requirement..... | 110VAC/120VAC/240VAC, 50/60 Hz |
| Power Consumption..... | Transmit: 295 watts Receive: 27 watts (with heaters off) |
| Dimensions..... | 333 (13.3) x 133 (5.3) x 333 (13.3) mm (inch) |
| Weight..... | 12.8 kg (28.2 lbs) |

[TRANSMITTER]

| | TS-530S/SP | TS-530D |
|--------------------------------------|--|--|
| * Final Power Input..... | 220W PEP for SSB operation 180W DC for CW operation | 160W PEP for SSB operation 130W DC for CW operation |
| Audio Input Impedance..... | 500 Ω ~ 50 k Ω | |
| RF Output Impedance..... | 50 Ω ~ 75 Ω | |
| Carrier Suppression..... | Better than 40 dB | |
| Sideband Suppression..... | Better than 50 dB | |
| Spurious Radiation..... | Better than 60 dB | |
| Harmonic Radiation..... | Better than 40 dB | |
| Audio Freq. Response..... | 400 to 2,600 Hz, within -6 dB | |
| ALC Input..... | -10V DC Max | |
| Linear Amp Relay Contact Rating..... | 100V DC 1A | |

[RECEIVER]

| | |
|-------------------------------|--|
| Receiver Sensitivity..... | 0.25 μ V at 10 dB S + N/N |
| Image Ratio..... | Better than 60 dB |
| IF Rejection..... | Better than 70 dB |
| Receiver Selectivity | |
| SSB/CW..... | 2.4 kHz (-6 dB), 4.2 kHz (-60 dB) CW Optional Filter YK-88C 500 Hz (-6 dB), 1.5 kHz (-60 dB) YK-88CN 270 Hz (-6 dB), 1.1 kHz (-60 dB) SSB Optional Filter YK-88SN 1.8 kHz (-6 dB), 3.3 kHz (-60 dB) |
| Notch-filter Attenuation..... | Better than 20 dB (1.5 kHz) |
| Audio Output Impedance..... | 8 ~ 16 Ω |
| Audio Output..... | 1.5W (8 Ω) |

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

NOTE: For the TS-530SP shipped to the USA, and for the TS-530D.

* Will transmit on the 17 and 12 meter bands.

Diodes installed for preventing accidental transmission before government Amateur authorization.

CIRCUIT DESCRIPTION

INTRODUCTION

The TS-530 is a single conversion transceiver with an intermediate frequency of 8.83 MHz.

In transmission, an SSB signal generated at 8.83 MHz is mixed with the PLL local oscillator output to produce the final transmission frequency. The circuitry is hybrid with vacuum tubes used only in the driver (12BY7A) and final-stage power amplifier (6146B's).

The PLL circuit generates a heterodyne frequency for each band and a counter reference signal from a single crystal oscillator.

The TS-530 incorporates an IF SHIFT circuit, VOX (also used for CW semi-break-in), side tone circuit, speech processor, noise blanker, XTAL calibrator, and etc.

RECEIVER CIRCUIT

The signal coming from the antenna is routed through a step-up antenna coil via an RF ATT switch and IF trap. MOS FET Q1,3SK73 amplifies this signal. Approximately 9 dB of negative feedback is applied to the RF amplifier to reduce noise and expanded dynamic range. The signal passes through buffer amplifier Q2, 2SK125 and is mixed with the PLL VCO output by a balanced mixer (Q3,Q4 : 2SK125). The DOUBLE SIDE-BAND signal is now converted to the intermediate frequency, 8.83 MHz.

Entering the IF unit, this signal is amplified by Q1(2SK125), passes through ceramic filter CF1 and the NB gating circuit, and is applied to the crystal filter whose center frequency is 8.83 MHz.

The SINGLE SIDE-BAND signal leaving the crystal filter is amplified by Q2~Q4(3SK73) and is then demodulated to an audio signal by the product detector consisting of D16~D19 (1N60 x4).

In the AF unit, the audio signal is amplified by Q2(2SC2240) passes through the AF GAIN control, and after being amplified by the power amplifier Q6 (MB3712), drives the speaker.

| Item | Rating |
|------------------------------------|--|
| Nominal center frequency (f_o) | 8.830 MHz |
| 3 dB Bandwidth | $f_o \pm 5$ kHz or more, total 25 kHz or more |
| 20 dB Bandwidth | 90 kHz or less |
| Ripple (Within 3 dB bandwidth) | 1 dB or less |
| Spurious response | 14 dB or more within $f_o \pm 1.5$ MHz |
| Input and output impedance | 330 Ω |

**Table 1 Ceramic filter (L72-0324-05)
SFE8.83MF (IF unit, CF1)**

| Item | Rating |
|----------------------------|--|
| Center frequency | 8830 kHz |
| Center frequency deviation | Within ± 150 Hz at 6 dB |
| Pass bandwidth | ± 1.2 kHz or more at 6 dB |
| Attenuation bandwidth | ± 1.5 kHz or less at 20 dB ± 2.2 kHz or less at 60 dB ± 3.0 kHz or less at 80 dB |
| Ripple | 2 dB or less |
| Loss | 6 dB or less |
| Guaranteed attenuation | 80 dB or more within ± 3 kHz to ± 1 MHz |
| Input and output impedance | monolithic 600 Ω //15pF |

**Table 2 Crystal (monolithic) filter (L71-0208-05)
YK-88S (IF unit, XF1)**

TRANSMITTER CIRCUIT

Audio input picked up by the microphone comes to the IF unit and is amplified by Q11, 12, 15 and 16. The input circuit adapts to any microphone impedance of from 500 ohms to 50 kohms. This amplified signal is converted into a DSB signal by the balanced modulator D27~D30 (1N60 x4), passes through buffer amplifier Q18 (2SK19) and an 8.83 MHz crystal filter, and the output appears as a SSB signal. The SSB signal is amplified by Q2 (3SK73) and is applied to the transmitter mixer in the RF unit. The transmitter mixer is a double balanced mixer consisting of Q6 and Q7 (3SK73), which mixes the SSB signal with the PLL VCO output to generate the final transmission frequency. The signal is then amplified by the driver (V1 : 12BY7A) and then by the final power amplifier (two 6146B's) and is applied to the antenna via a π -matching network.

PLL CIRCUIT

The PLL signal is synthesized from the VFO, CAR and VCO outputs. The TS-530S employs a programmable divider in the PLL to synthesize the heterodyne frequency from the standard reference oscillator frequency. This simplifies the PLL circuit by eliminating the need for a separate HET XTAL for each band.

Frequency organization of the PLL circuit is shown in **Fig. 1**, the circuit diagram in **Fig. 2**, and frequency organization in other circuits is summarized in **Table 4**. Please refer to **Fig. 1** when reading the following description of PLL circuit operation. MIX (3), a double balanced mixer, mixes the CAR output with the VFO output. MIX (2), which operates for the 18 MHz band and above, mixes either 10 MHz, in the 14 and 18 MHz bands, or 20 MHz, in the 21, 24.5 and 28 MHz bands, with the output of MIX (3) to generate the appropriate frequency needed for each band, as shown in **Table 4**.

CIRCUIT DESCRIPTION

This is mixed with the VCO output for each band by MIX (1) to a frequency given in **Table 4**, which is then routed through LPF (1), amplified, and wave-shaped to a digital signal. A programmable divider divides this signal into a 500kHz output. This programmable divider is preset, as shown in **Table 4**, by the BCD signal which is counter-generated from information coming from the band switch. The phase comparator used is a Motorola MC4044P. The loop filter is made of completely discrete components to minimize VCO spurious content.

Six VCOs cover all bands. If the PLL unlocks for any reason, it will be detected from the phase comparator output. This will turn off the VCO output to prevent spurious radiation and, at the same time, the display will be blanked to inform the operator of unlock status.

| BAND | RX, Tx frequency (MHz) | VCO (MHz) | MIX (1) input (MHz) | MIX (1) output (MHz) | Division ratio | DCBA |
|------|------------------------|-----------------|---------------------|----------------------|----------------|---------|
| 1.5 | 1.5 ~2.0 | 10.33 ~10.83 | 14.33 ~14.83 | 4.0 | 1/8 | 1 0 0 0 |
| 3.5 | 3.5 ~4.0 | 12.33 ~12.83 | 14.33 ~14.83 | 2.0 | 1/4 | 1 1 0 0 |
| 7 | 7.0 ~7.5 | 15.83 ~16.33 | 14.33 ~14.83 | 1.5 | 1/3 | 1 1 0 1 |
| 10 | 10.0 ~10.5 | 18.83 ~19.33 | 14.33 ~14.83 | 4.5 | 1/9 | 0 1 1 1 |
| 14 | 14.0 ~14.5 | 22.83 ~23.33 | 24.33 ~24.83 | 1.5 | 1/3 | 1 1 0 1 |
| 18 | 18.0 ~18.5 | 26.83 ~27.33 | 24.33 ~24.83 | 2.5 | 1/5 | 1 0 1 1 |
| 21 | 21.0 ~21.5 | 29.83 ~30.33 | 34.33 ~34.83 | 4.5 | 1/9 | 0 1 1 1 |
| 24.5 | 24.5 ~25.0 | 33.33 ~33.83 | 34.33 ~34.83 | 1.0 | 1/2 | 1 1 1 0 |
| 28 | 28.0 ~28.5 | 36.83 ~37.33 | " | 2.5 | 1/5 | 1 0 1 1 |
| 28.5 | 28.5 ~29.0 | 37.33 ~37.83 | " | 3.0 | 1/6 | 1 0 1 0 |
| 29 | 29.0 ~29.5 | 37.83 ~38.33 | " | 3.5 | 1/7 | 1 0 0 1 |
| 29.5 | 29.5 ~30.0 | 38.33 ~38.83 | " | 4.0 | 1/8 | 1 0 0 0 |

Table 3 Frequency chart

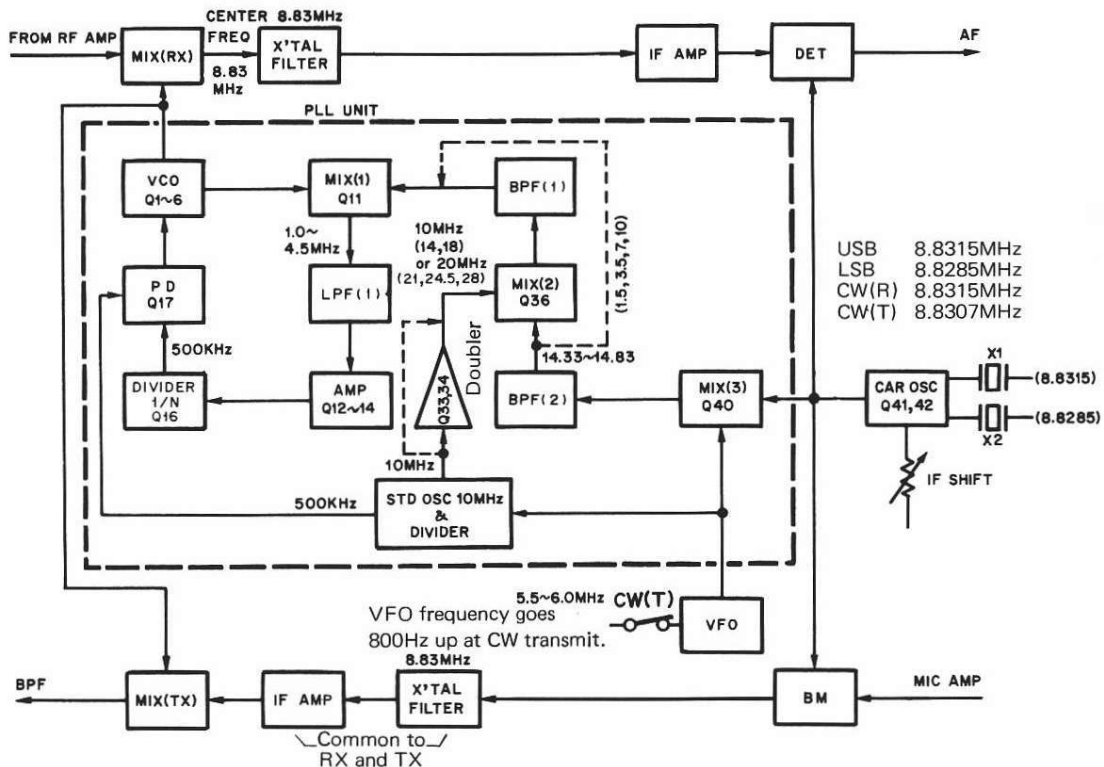


Fig. 1 TS-530 Frequency configuration

CIRCUIT DESCRIPTION

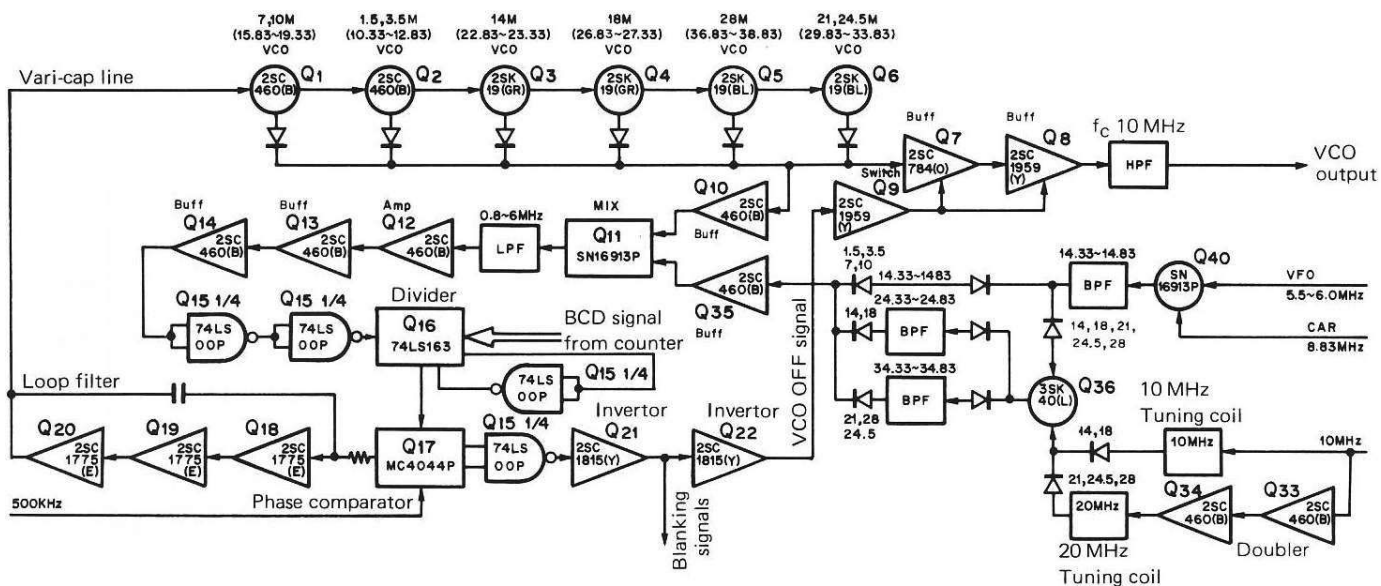


Fig. 2 TS-530 PLL circuit configuration

COUNTER

This counts the 500 kHz to 1 MHz signal which the PLL unit generates by mixing the VFO output with 5 MHz (halved from the 10 MHz reference frequency). Gate, latch, and preset pulses are generated from a 10 Hz pulse generated by dividing 1 kHz, supplied from the PLL, by 100.

| BAND | 100K | 1 M | 10M | DCBA | 0.5 | BAND | 100K | 1 M | 10M | DCBA | 0.5 |
|------|------|-----|-----|---------|-----|------|------|-----|-----|---------|-----|
| 1.5 | 0 | 1 | 0 | 1 0 0 0 | H | 21 | 5 | 0 | 2 | 0 1 1 1 | L |
| 3.5 | 0 | 3 | 0 | 1 1 0 0 | H | 24.5 | 0 | 4 | 2 | 1 1 1 0 | H |
| 7 | 5 | 6 | 0 | 1 1 0 1 | L | 28 | 5 | 7 | 2 | 1 0 1 1 | L |
| 10 | 5 | 9 | 0 | 0 1 1 1 | L | 28.5 | 0 | 8 | 2 | 1 0 1 0 | H |
| 14 | 5 | 3 | 1 | 1 1 0 1 | L | 29 | 5 | 8 | 2 | 1 0 0 1 | L |
| 18 | 5 | 7 | 1 | 1 0 1 1 | L | 29.5 | 0 | 9 | 2 | 1 0 0 0 | H |

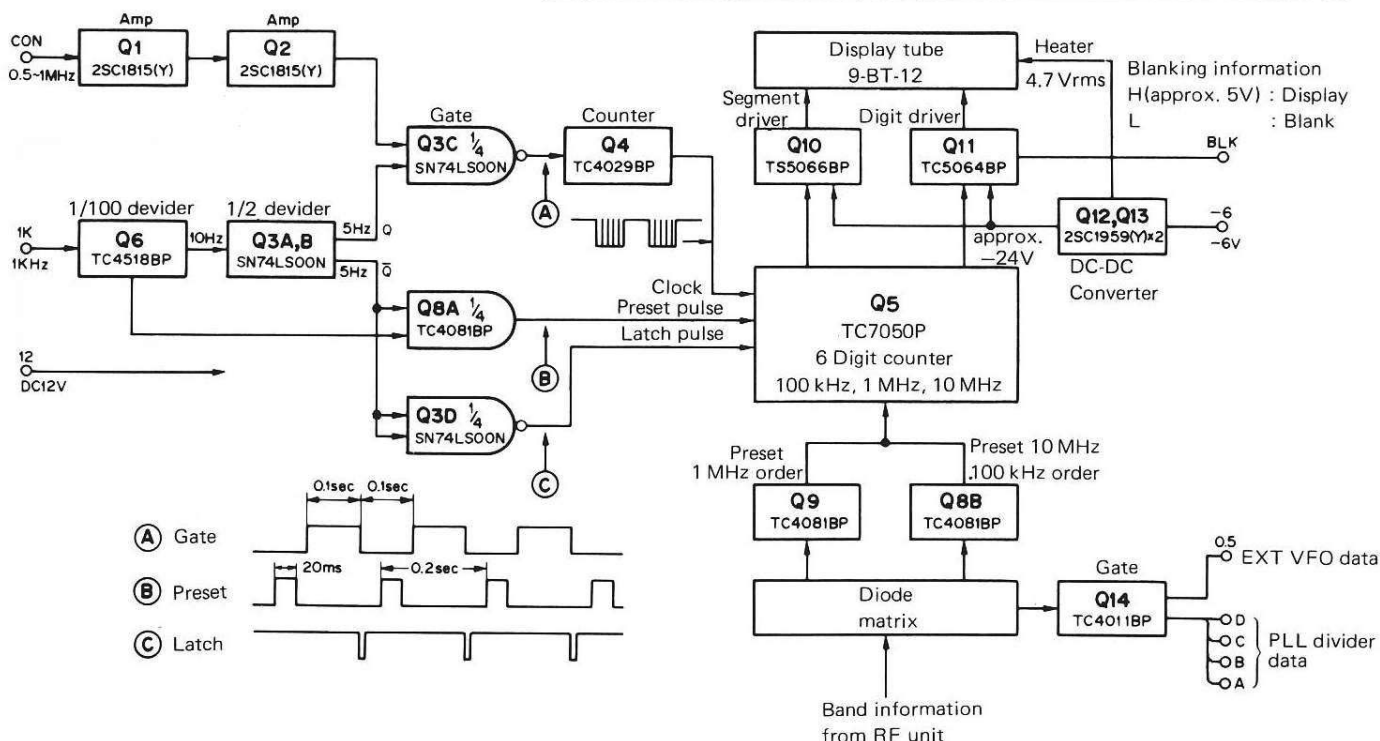


Fig. 3 Counter unit block diagram

CIRCUIT DESCRIPTION

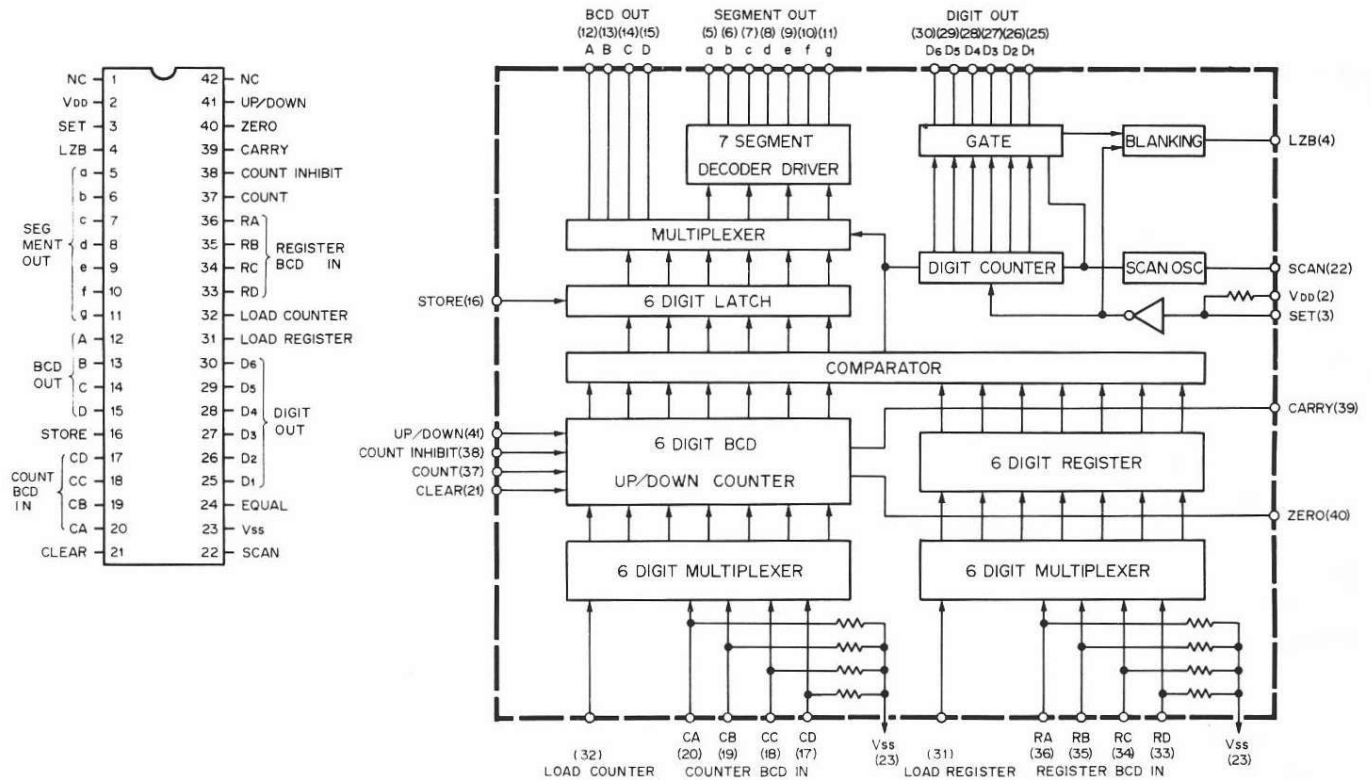


Fig. 4 TS5070P (Counter unit, Q5)

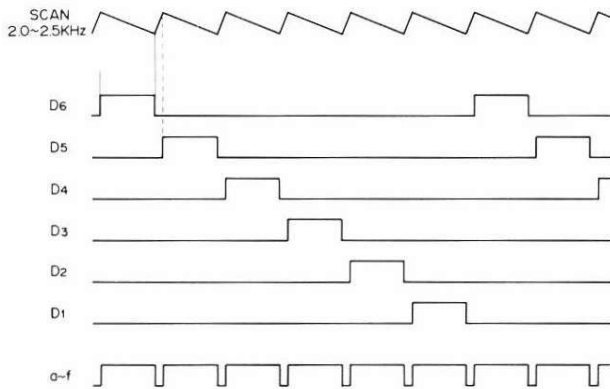
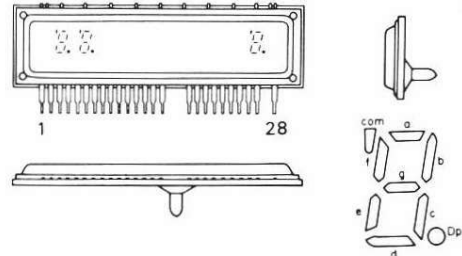


Fig. 5 TC5070P Timing chart



| PIN NO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|------------|----------------|----------------|----------------|----------------|----------------|----------------|----|----|----------------|----|-----|----------------|----------------|----------------|
| CONNECTION | F | N _C | G ₉ | N _C | N _C | G ₈ | g | f | G ₇ | e | d | G ₆ | N _C | N _C |
| | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| CONNECTION | G ₅ | N _P | N _P | G ₄ | D _P | G ₃ | c | b | G ₂ | a | COM | G ₁ | N _P | F |

Fig. 6 Indicating tube 9-BT-12

Q5 (TC5070P) is a presettable, 6-digit BCD counter which incorporates a 6-digit latch, 6-digit dynamic drive digital counter, and 7-segment decoder/driver. Band information supplied from the RF unit is applied to a diode matrix to preset the 100 kHz, 1 MHz and 10 MHz digits. Preset values are given in Fig. 3. For instance, to preset 14.000 MHz, with a 500 kHz counter input signal, the 10 MHz value is preset to 1, 1 MHz to 3, and 100 kHz to 5, and the 500 kHz

counter input signal is subtracted from 14.000 MHz. (If no counter input signal were present, 13.500 MHz would be displayed). Q5 supplies the display tube drivers with 7-segment information and dynamic drive control signals to light the fluorescent display tube.

In the counter unit, a diode matrix generates frequency division information and supplies the PLL unit with this information. If the PLL unlocks, a BLK (Blanking Low) signal will be applied to the digit driver IC (Q11) to blank the fluorescent display tube.

CIRCUIT DESCRIPTION

CAR OSCILLATOR

The CAR oscillator consists of a crystal controlled oscillator which uses two crystals : one for LSB and the other for USB and CW . Frequencies generated are shown in **Fig. 1**. The oscillating frequency can be varied by the IF SHIFT control during reception.

VFO

The VFO range is 5.5~6.0 MHz. Its oscillating frequency is automatically shifted 800 Hz up during CW transmission so that the actual operating frequency is always displayed.

CIRCUIT FEATURES

1. Optional filters available

The TS-530 is equipped with an 8.83 MHz IF filter with a bandwidth of 2.4 kHz. Narrow filters are separately available.

Installation of optional filters

One or two of the YK88SN, YK88C and YK88CN optional filters can be installed in the TS-530. Jumpers A and B (for filter switching) on the IF unit must be repositioned as shown in the following table.

Install each optional filter in the specified position on the IF unit PC board. To install both a YK88C and YK88CN, install the YK88C in the SSB NARROW FILTER position and the YK88CN in the CW FILTER position.

| Option filter YK-88○○ | MODE | | SSB | | CW | |
|--------------------------|--------------------|-----|---------|----------------------|---------|---------|
| | Jumper destination | | NAR SW | | NAR SW | |
| | B | A | OFF | ON | OFF | ON |
| SN | SSB | SSN | 2.4 kHz | 1.8 kHz | 2.4 kHz | 1.8 kHz |
| C | SSB | CW | 2.4 kHz | Reception impossible | 2.4 kHz | 500 Hz |
| CN | SSB | CW | 2.4 kHz | Reception impossible | 2.4 kHz | 270 Hz |
| SN + C | SSB | CW | 2.4 kHz | 1.8 kHz | 2.4 kHz | 500 Hz |
| | SSN | CW | 2.4 kHz | 1.8 kHz | 1.8 kHz | 500 Hz |
| SN + CN | SSB | CW | 2.4 kHz | 1.8 kHz | 2.4 kHz | 270 Hz |
| | SSN | CW | 2.4 kHz | 1.8 kHz | 1.8 kHz | 270 Hz |
| C + CN | SSN | CW | 2.4 kHz | 500 Hz | 500 Hz | 270 Hz |

Table 4 Installation of optional filters

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

Table 5 SSB crystal filter (L71-0220-05)
YK-88SN (option)

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

Table 6 CW crystal filter (L71-0211-05)
YK-88C (Option)

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

Table 7 CW crystal filter (L71-0221-05)
YK-88CN (Option)

CIRCUIT DESCRIPTION

2. IF SHIFT operation

The IF SHIFT circuit shifts the passband of the IF circuit without changing the receiving frequency. The relative position of the passband of the IF filter to the received signal is shifted when the IF SHIFT control is turned as shown in Fig. 7. The IF SHIFT circuit block diagram is shown in Fig. 8.

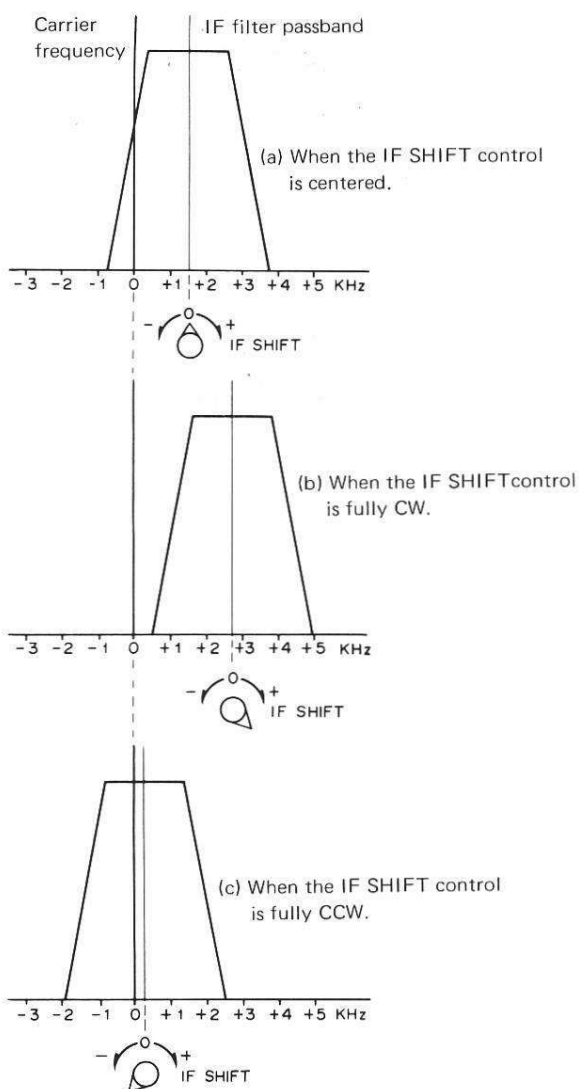


Fig. 7 IF SHIFT operation (for USB mode)

Frequencies within the PLL loop satisfy the following relationship.

$$N \cdot 500 \text{ kHz} = f_{\text{BPF1}} - f_{\text{VCO}} \quad (1)$$

where N : divisor of programmable divider

500 kHz : phase reference frequency

f_{BPF1} : input frequency to MIX (1)

f_{VCO} : VCO frequency

For example, in the case of 14 MHz reception, f_{BPF1} is given by eq. (1) as

$$f_{\text{BPF1}} = 10 \text{ MHz} + f_{\text{BPF2}} \quad (2)$$

where 10 MHz : band setting frequency

$$f_{\text{BPF2}} = f_{\text{VFO}} + f_{\text{CAR}} \quad (3)$$

where f_{VFO} : VFO frequency

f_{CAR} : carrier frequency

By substituting eq. (3) into eq.(2) and eq.(2) into eq.(1)

$$f_{\text{VCO}} = 10 \text{ MHz} + f_{\text{VFO}} + f_{\text{CAR}} - N \cdot 500 \text{ kHz}$$

$$\therefore f_{\text{CAR}} = f_{\text{VCO}} + (N \cdot 500 \text{ kHz} - 10 \text{ MHz} - f_{\text{VFO}})$$

Assuming that f_{VFO} is constant, when f_{CAR} is varied by $\pm \Delta f$,

$$\begin{aligned} f_{\text{CAR}} \pm \Delta f &= [f_{\text{VCO}} + (N \cdot 500 \text{ kHz} - 10 \text{ MHz} - \\ & f_{\text{VFO}})] \pm \Delta f \\ &= (f_{\text{VCO}} \pm \Delta f) + (N \cdot 500 \text{ kHz} - 10 \text{ MHz} - \\ & f_{\text{VFO}}) \end{aligned}$$

Thus, f_{VCO} varies by $\pm \Delta f$ as f_{CAR} is varied by $\pm \Delta f$.

The receiving frequency, f_{R} is given by

$$f_{\text{R}} = f_{\text{VCO}} - f_{\text{CAR}} \quad (4)$$

Therefore, when f_{CAR} is shifted by $+\Delta f$, receiving frequency f'_{R} is given by

$$\begin{aligned} f'_{\text{R}} &= (f_{\text{VCO}} + \Delta f) - (f_{\text{CAR}} + \Delta f) \\ &= f_{\text{VCO}} - f_{\text{CAR}} \end{aligned} \quad (5)$$

From equations (4) and (5),

$$f_{\text{R}} = f'_{\text{R}}$$

Thus the receiving frequency does not vary even if f_{CAR} is varied. However,

$$f_{\text{R}} = f_{\text{VCO}} - \text{IF frequency}$$

so the IF frequency varies as f_{VCO} varies.

This means that the relative position of the IF filter passband to the carrier position (of the received signal) is shifted by the same amount as the f_{VCO} variation.

CIRCUIT DESCRIPTION/AC VOLTAGE CONVERSION

3. Speech processor [Part of IF unit (X48-1310-00)]

This is an audio compression speech processor. When the processor switch is OFF, the audio signal amplified by Q11 (on the IF unit) passes through buffer amplifier Q12 (2SC1815Y) and is then applied to the MIC pot via diode switch D24 (1S1555).

When the processor switch is ON, the audio signal amplified by Q12 is applied to the AGC-type speech processor consisting of Q13 (μ PC1158H2), Q14 (2SC1815Y) and D26 (1N60). The speech processor effectively increases the "talk power" of the audio signal and feeds it to MIC pot via diode switch D25 (1S1555).

When the processor is ON, the ALC time constant is shortened by turning Q30 (2SK30A) in the AF unit OFF to heighten processor effect.

4. RIT/XIT operation

Conventional RIT function is provided by the RIT/XIT control. By also turning the XIT switch ON, the transmission frequency is shifted to the same frequency as received under RIT control.

TS-530(K) AC VOLTAGE CONVERSION

To operate the TS-530S (K) on 240V AC, the power transformer split primaries must be rewired from parallel to series connection.

1. Unplug the AC power cable.
2. Remove the bottom cover.
3. Remove the jumper wires between the two ϕ terminals and two 120 terminals on the bottom of the power transformer.
4. Connect the adjacent 120 and ϕ terminals at the middle of the transformer. This will provide 240V AC operation. For 220V AC operation, change the wires from 120 to 100 winding.
5. Change the AC fuse from 6A to 4A. Tag the power cord at the back of the radio to indicate that the transformer is strapped for 240V AC, and the power fuse should be 4A, and not 6A.
6. Replace the bottom cover and reconnect power to verify your work.

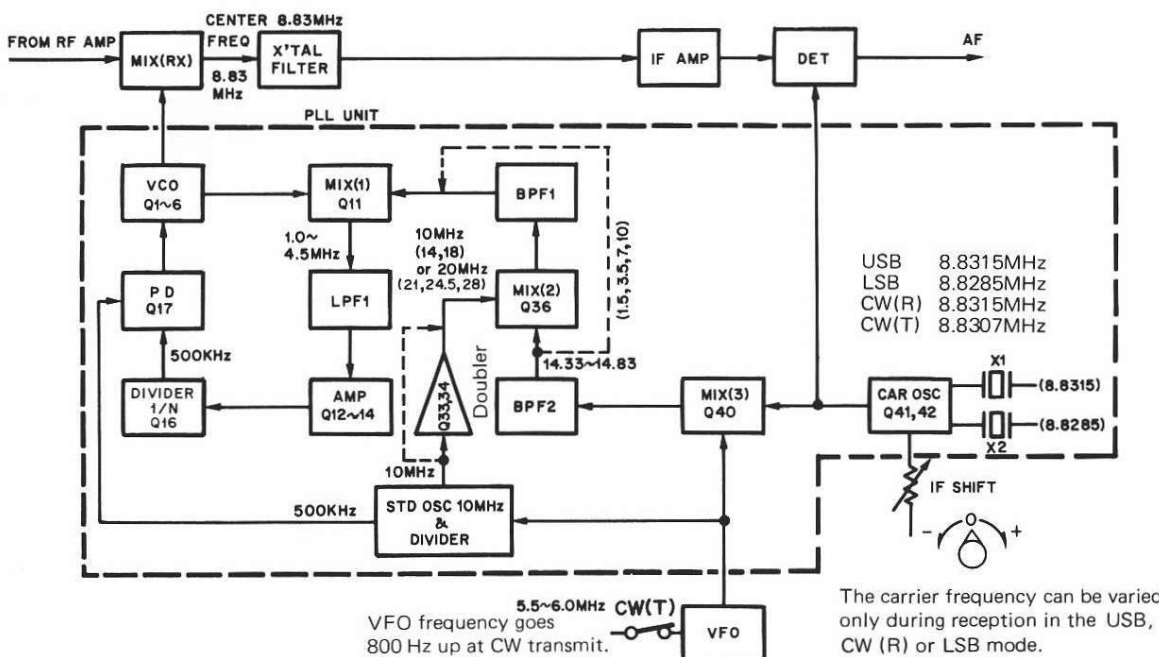
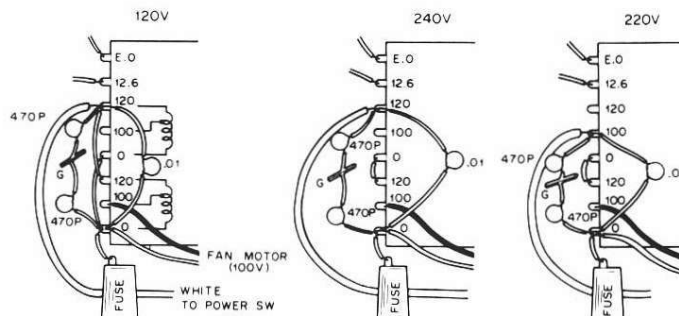
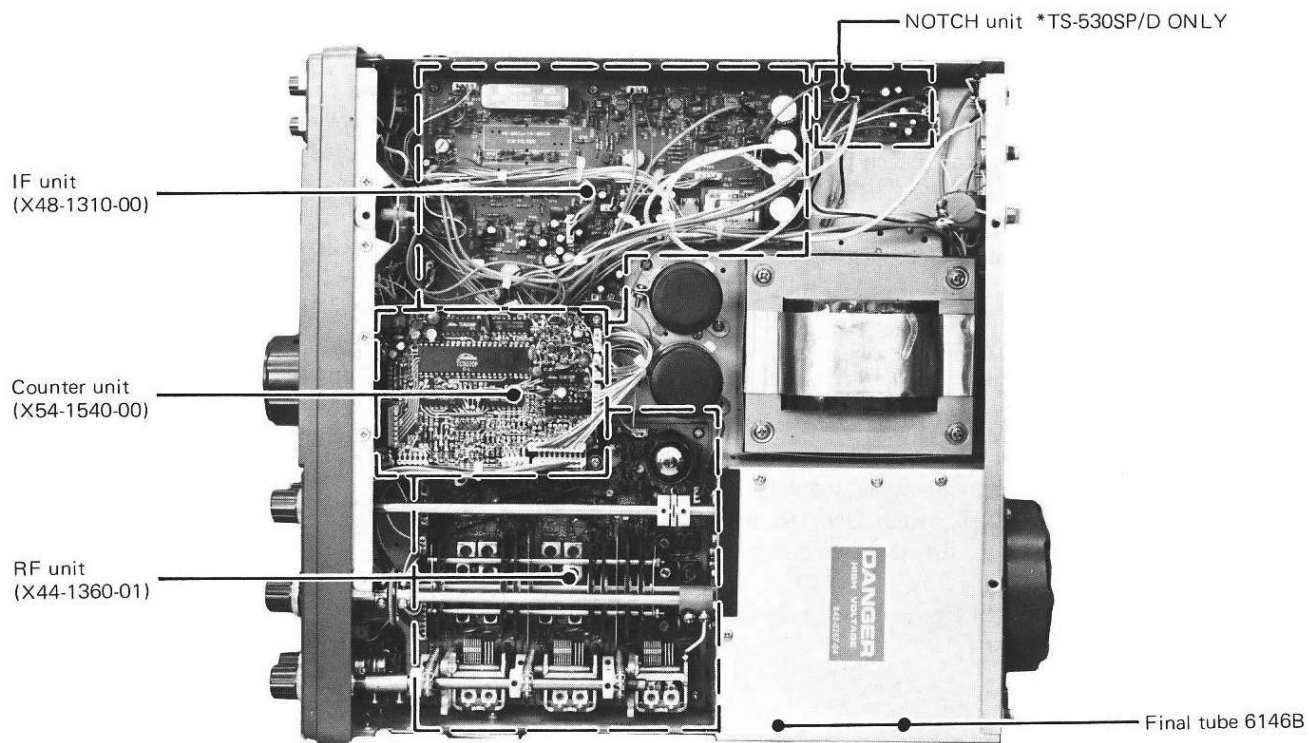


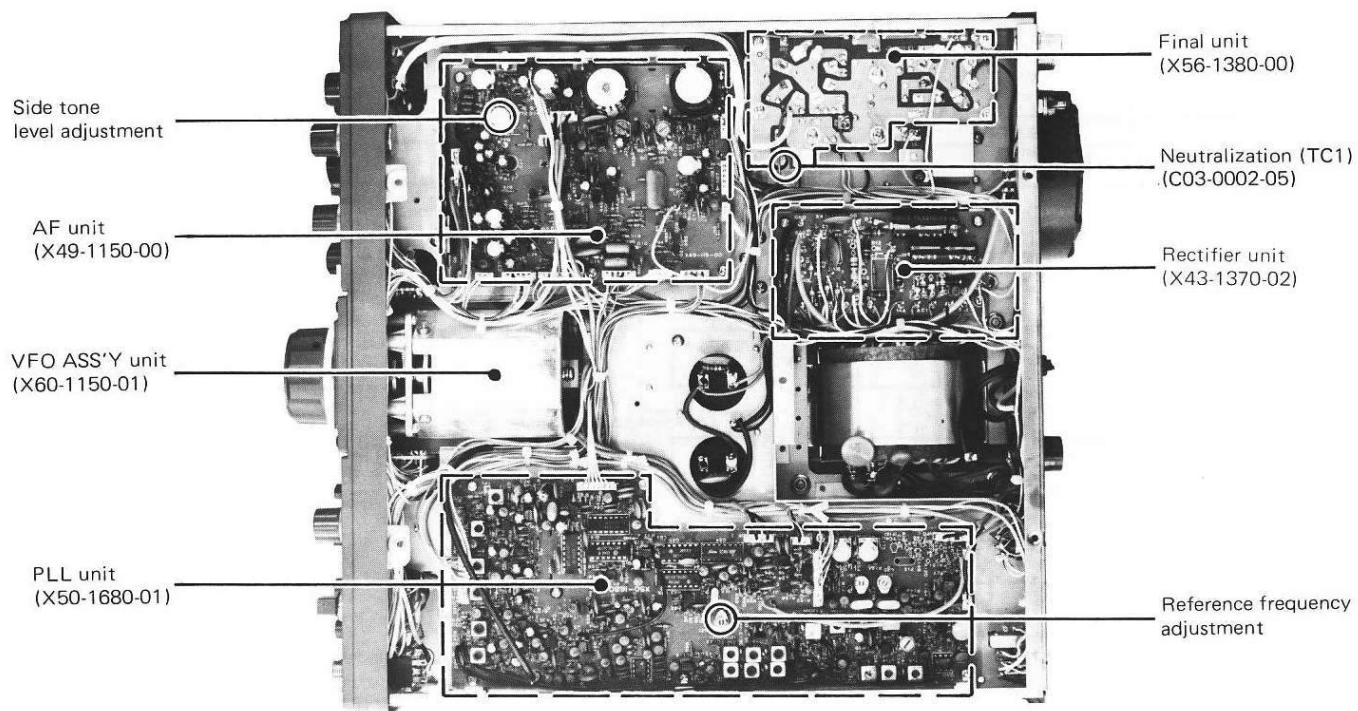
Fig. 8 IF SHIFT Block diagram

INSIDE VIEWS

TOP VIEW

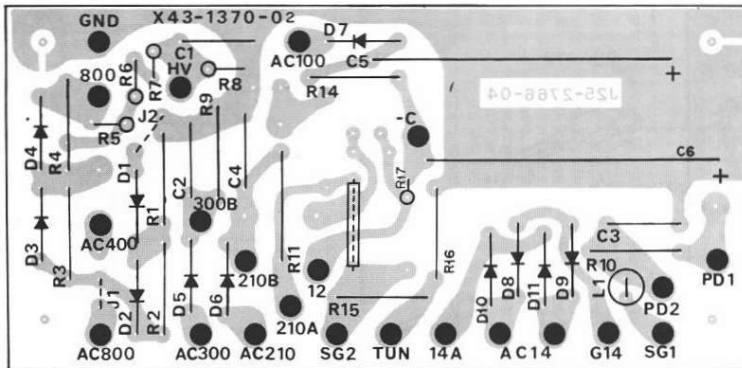


BOTTOM VIEW



▼ RECTIFIER UNIT (X43-1370-02)

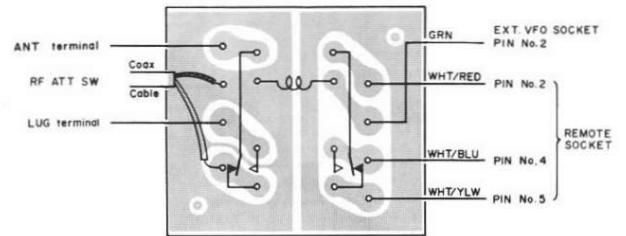
View from component side



D1~6 : V08J D7 : V06E D8~11 : V03C

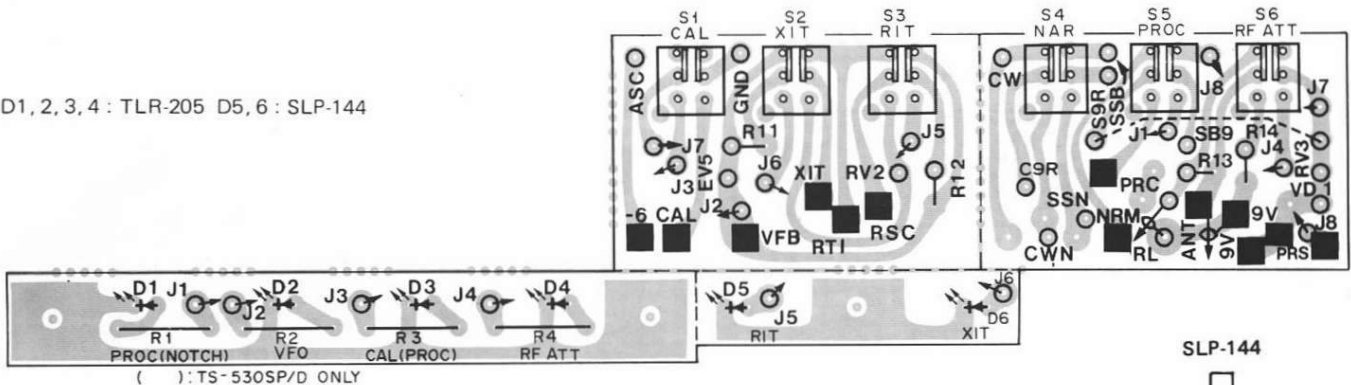
▼ ANT RELAY BOARD (J25-3015-04)

View from foil side

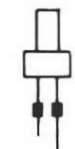


▼ SWITCH BOARD (J25-3016-03) View from component side

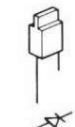
D1, 2, 3, 4 : TLR-205 D5, 6 : SLP-144



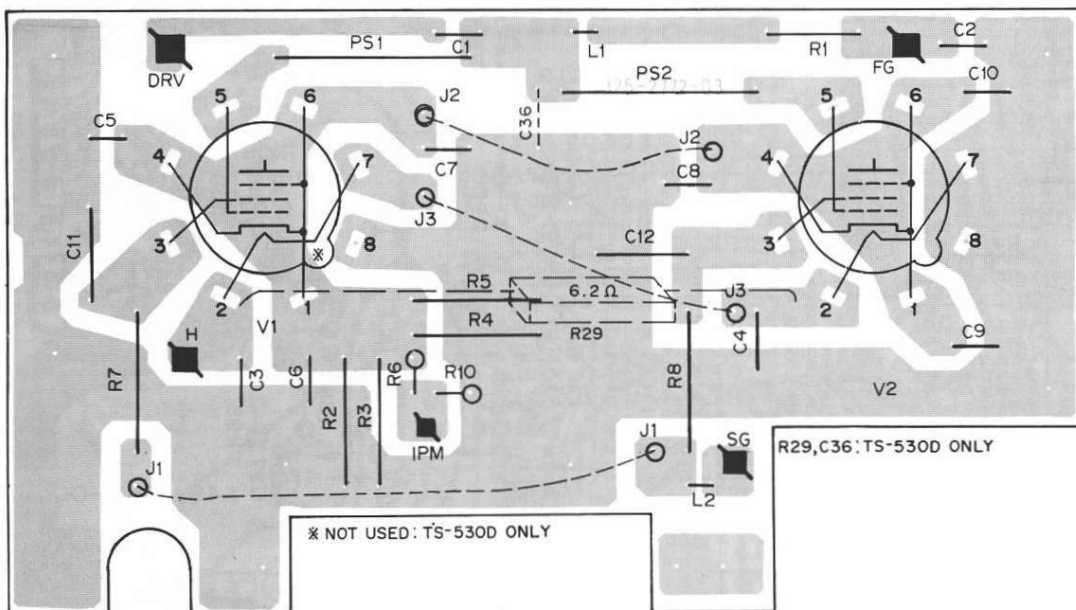
SLP-144



TLR-205

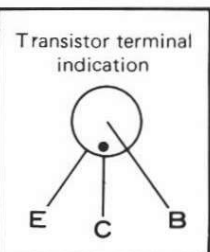


▼ FINAL UNIT (X56-1380-00) View from foil side



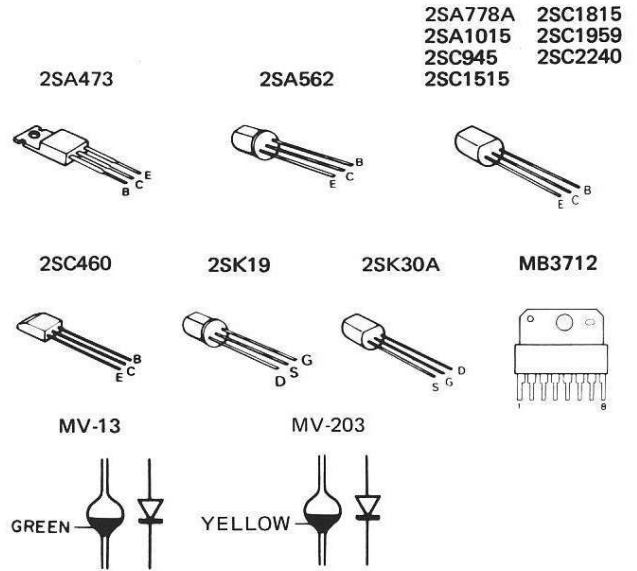
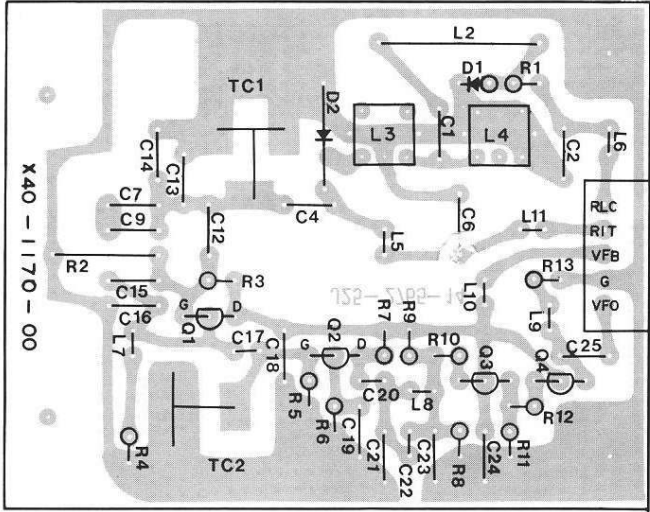
R29, C36: TS-530D ONLY

* NOT USED: TS-530D ONLY

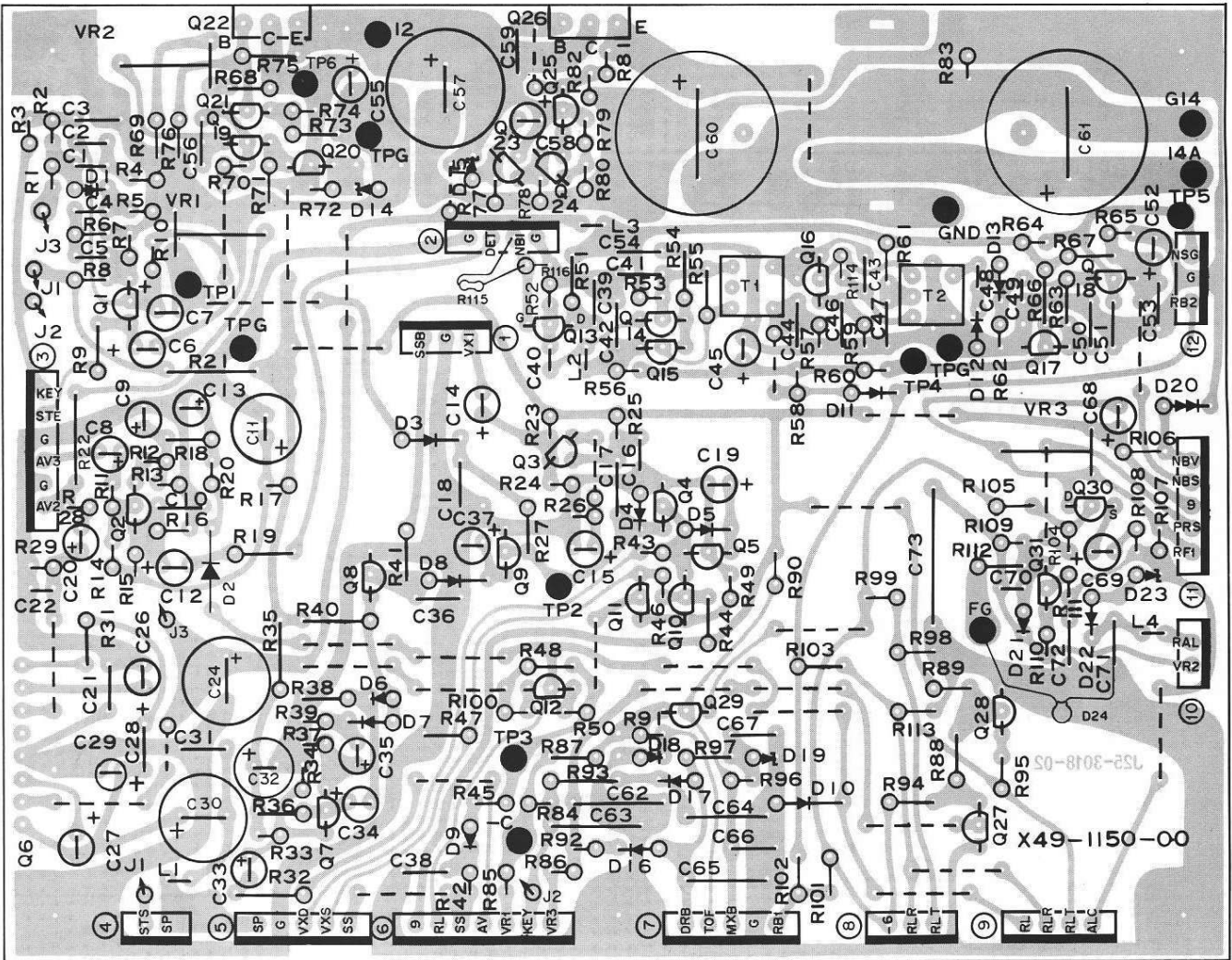


TS-530S PC BOARD VIEWS

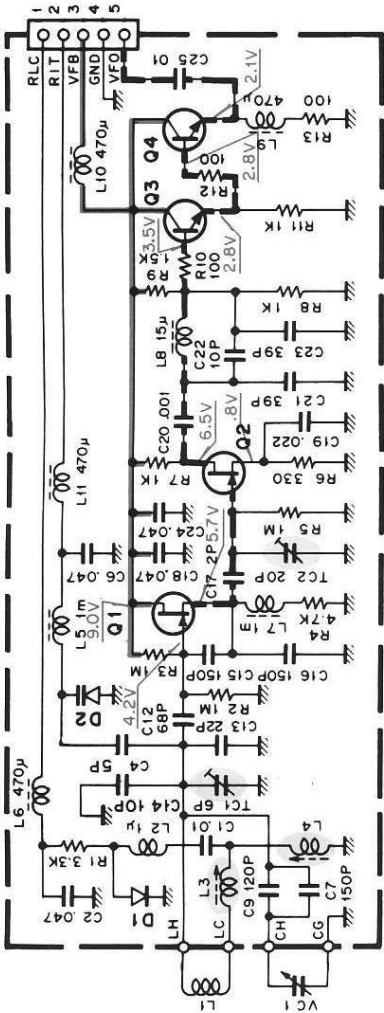
▼ VFO UNIT (X40-1170-00) View from component side



▼ AF UNIT (X49-1150-00) View from component side

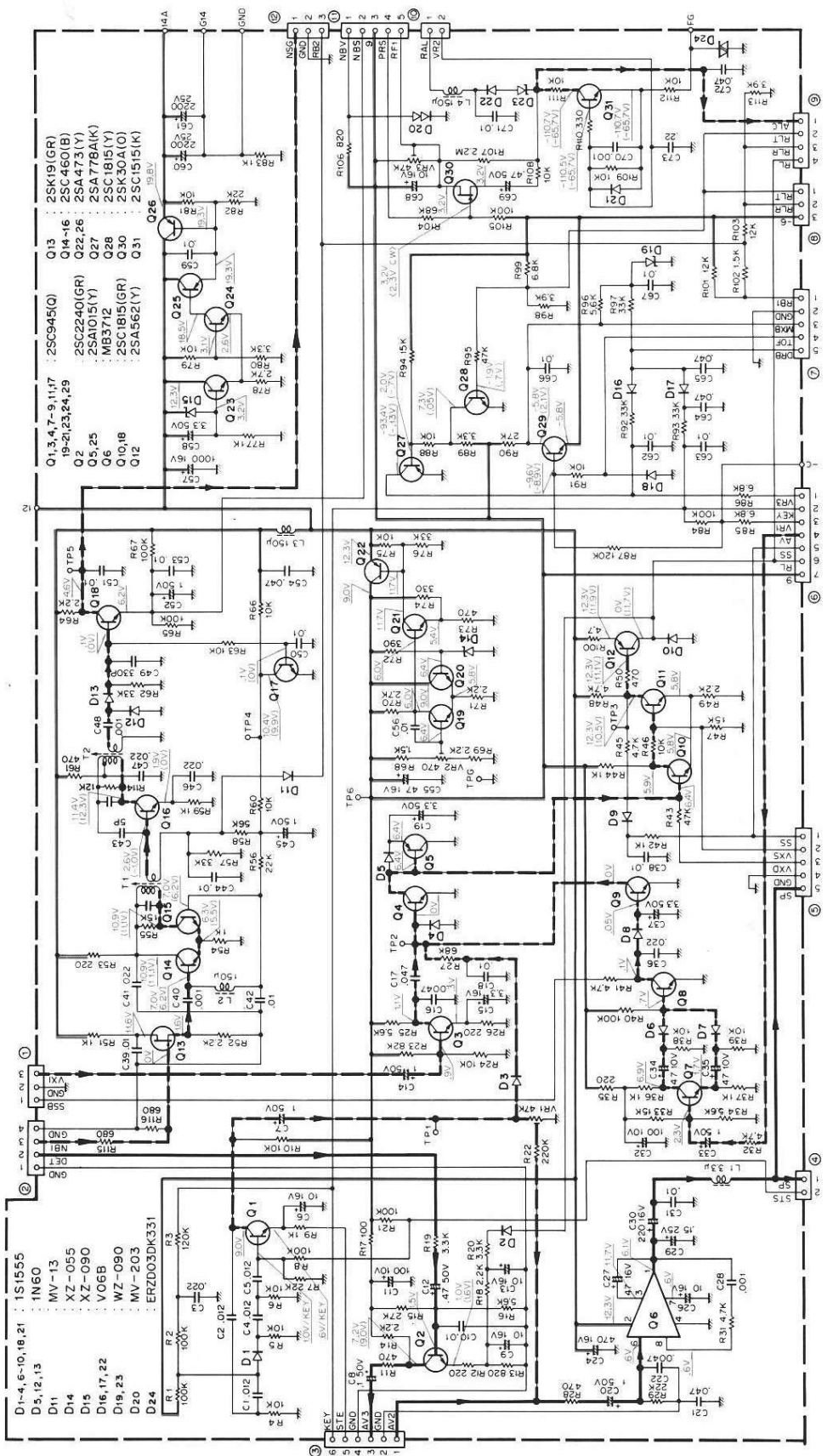


VFO UNIT (X40-1170-00) ▲



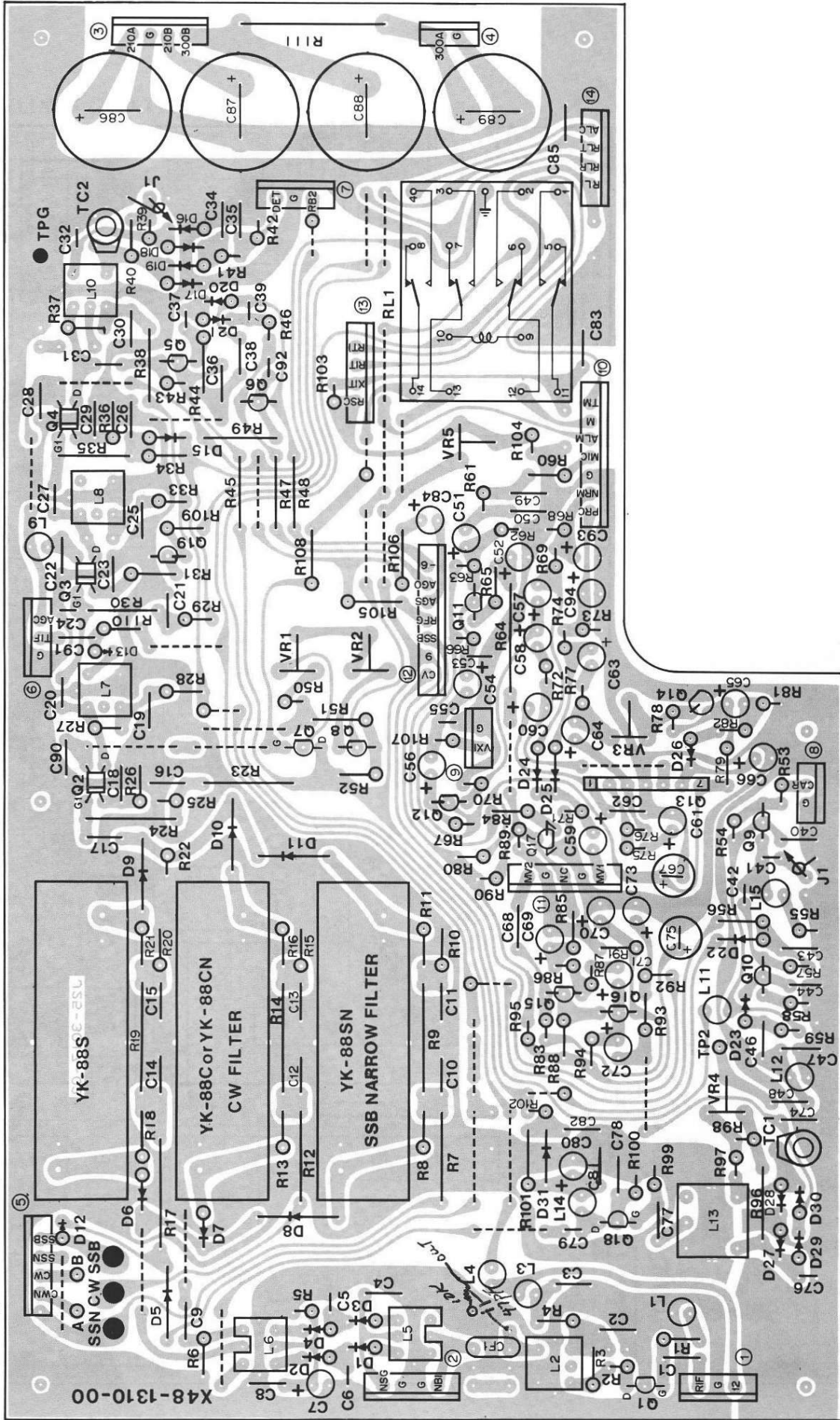
- Q1, 2 : 2SK19 (Y)**
Q3 : 2SC460 (B)
Q4 : 2SC1959 (Y)
D1 : 1S2588
D2 : 1SV53A

▼ AF UNIT (X49-1150-00)



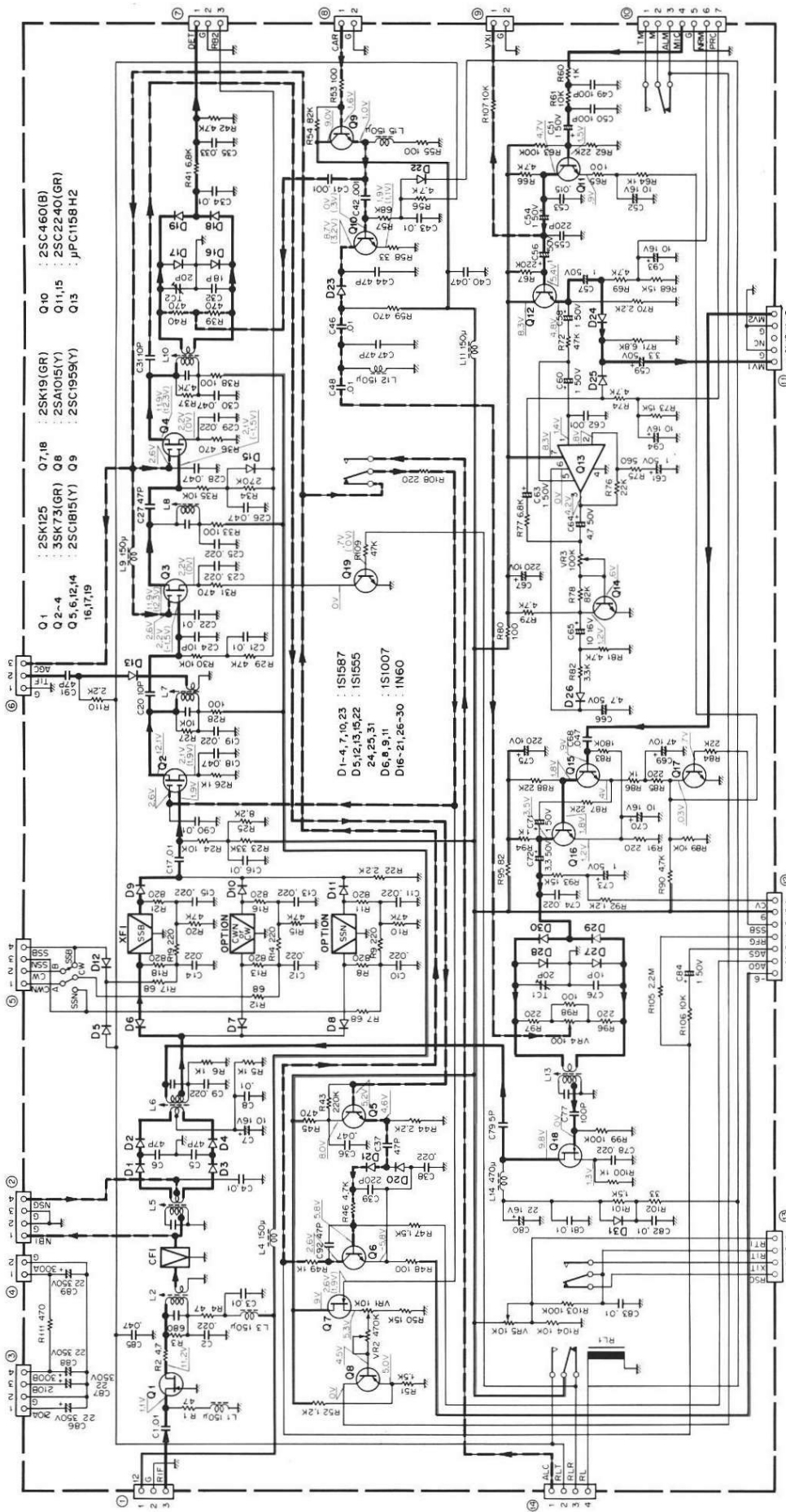
TS-530S PC BOARD VIEW

▼ IF UNIT (X48-1310-00) View from component side

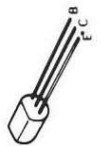


CIRCUIT DIAGRAM TS-530S

▼ IF UNIT (X48-1310-00)



2SA1015
2SC1815
2SC1959
2SC2240



2SC460



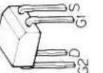
2SK19



2SK125



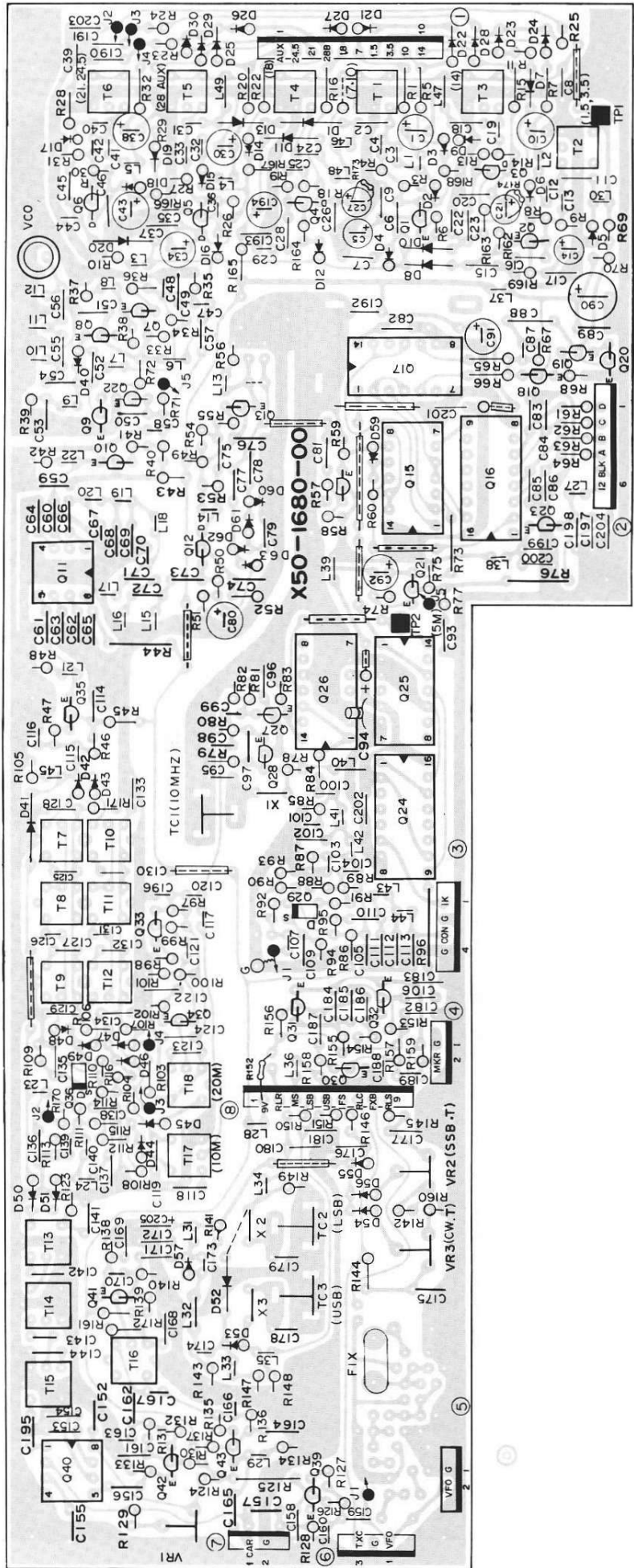
3SK73



μPC1158H2



TS-530S PC BOARD VIEW



▼ PLL UNIT (X50-1680-01) View from component side

- 25C1675
- 25C1775
- 25C1885
- 25C1923
- 25C1959



25C460



25K19



35K73



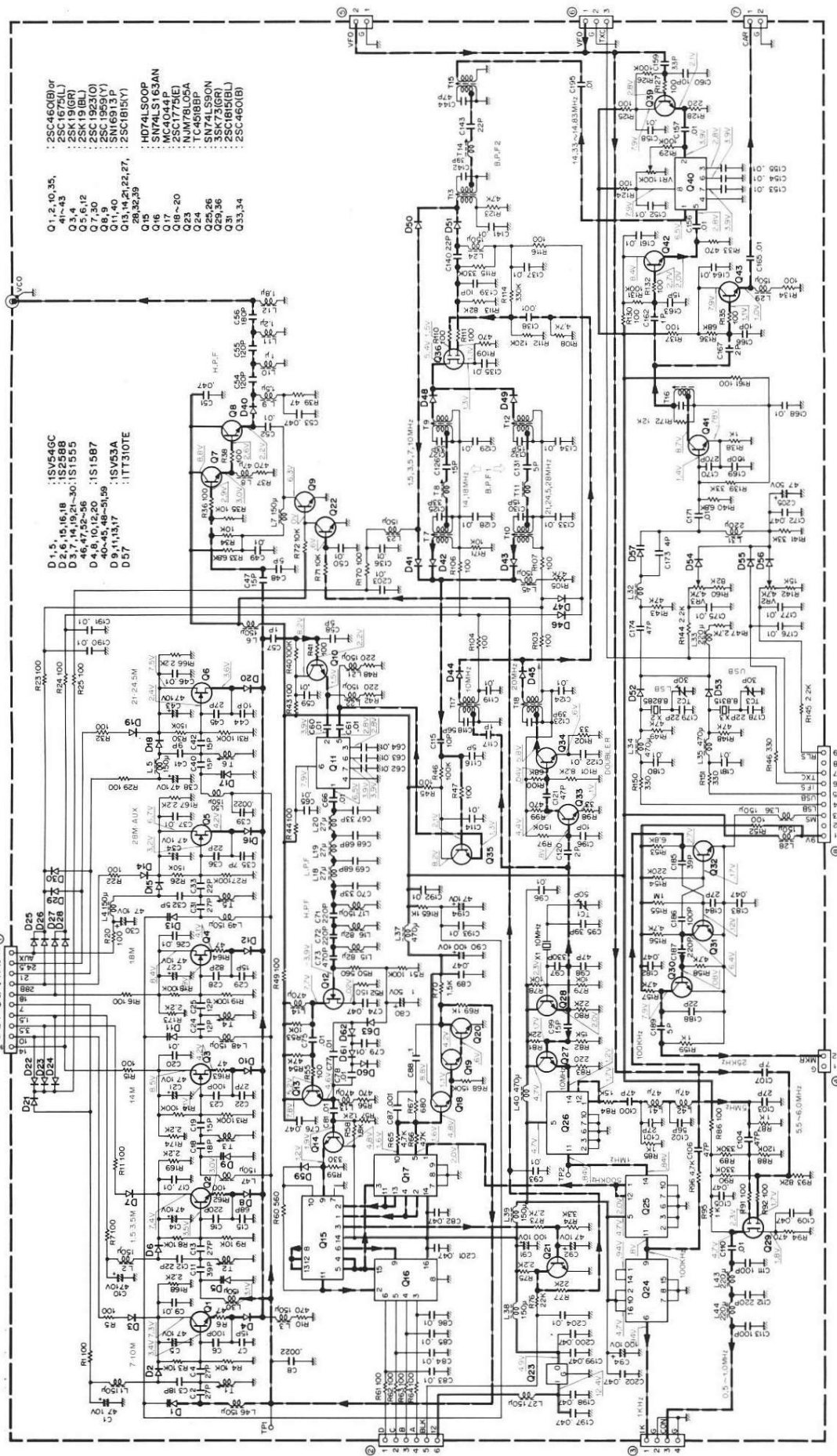
NJM78L05A



For free by
RadioManual.eu

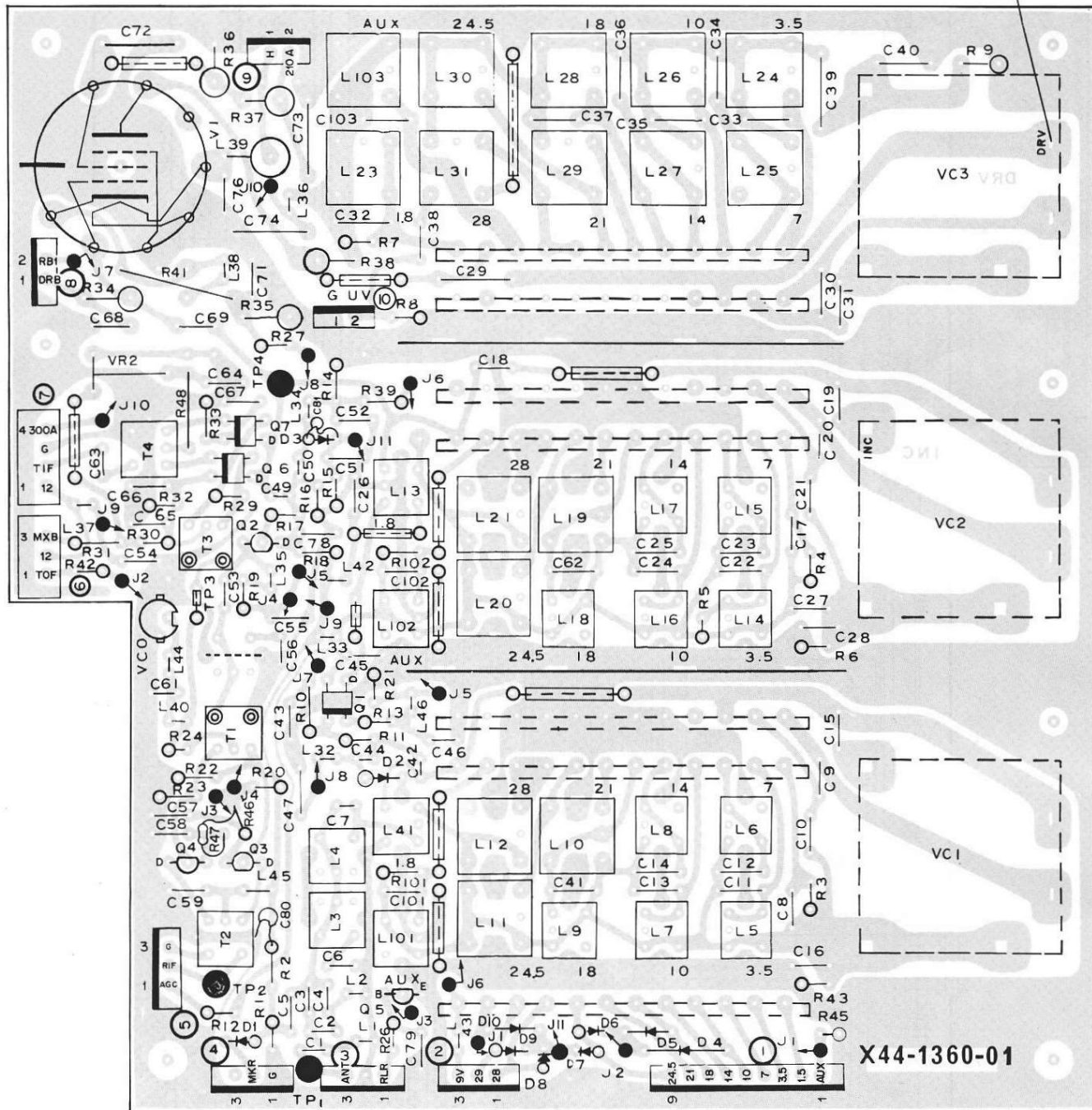
CIRCUIT DIAGRAM TS-530S

▼ PLL UNIT (X50-1680-01)



TS-530S PC BOARD VIEW

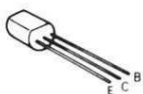
▼ RF UNIT (X44-1360-01) View from component side



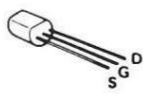
X44-1360-01

D1, 6, 7 : 3SK73(GR) Q2~4 : 2SK125 Q5 : 2SC1815(Y) D1 : 1S1587 D2, 3 1S2588 D4~10 : 1S1555 V1 : 12BY7A

2SC1815



2SK125

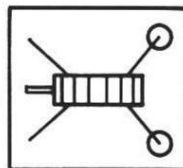


3SK73



Attachment method of T1,T2

Twisted wires

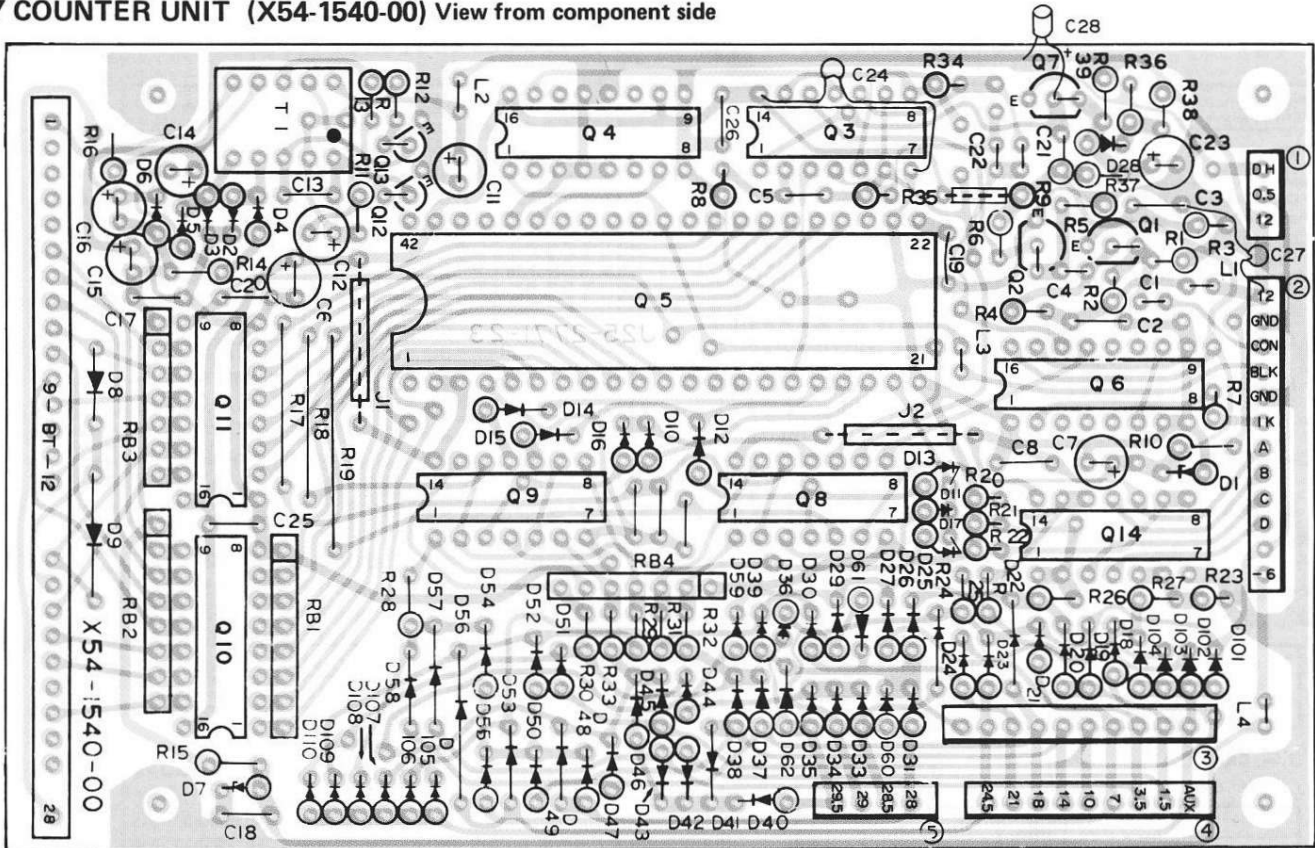


Yellow

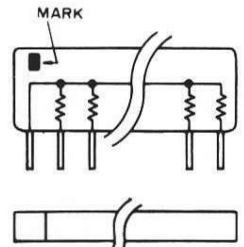
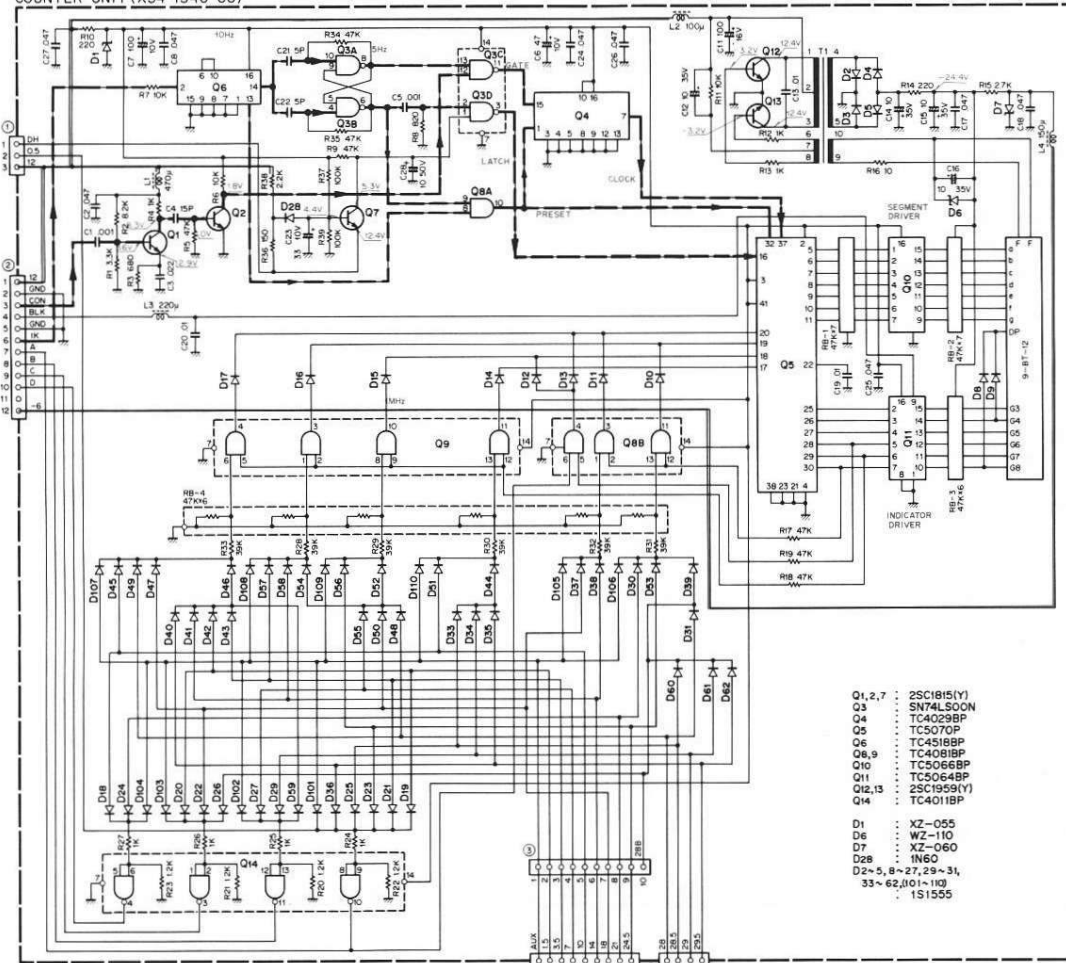
Yellow

PC BOARD VIEW/CIRCUIT DIAGRAM TS-530S

▼ COUNTER UNIT (X54-1540-00) View from component side

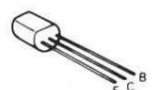


COUNTER UNIT (X54-1540-00)



RB1 ~ 4

2SC1815
2SC1959



- Q1, 2, 7 2SC1815(Y)
- Q2 2SC1959
- Q3 2SC1815(Y)
- Q4 2SC1815(Y)
- Q5 2SC1815(Y)
- Q6 2SC1815(Y)
- Q7 2SC1815(Y)
- Q8 2SC1815(Y)
- Q9 2SC1815(Y)
- Q10 2SC1815(Y)
- Q11 2SC1815(Y)
- Q12 2SC1815(Y)
- Q13 2SC1815(Y)
- Q14 2SC1815(Y)
- D1 XZ-055
- D2 WZ-110
- D7 XZ-060
- D28 1N60
- D29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 1S1555

PARTS LIST

Note 1:

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

Note 2:

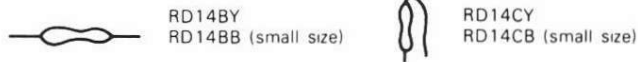
Only special type of resistors (example: cement, metal film, etc.) and capacitors (example: electrolytic, tantalum, mylar, temp. coeff. capacitors) are detailed in the PARTS LIST. For the value of all common type components, refer to the schematic diagram of the P.C. board illustration. Resistors not 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 +85 | -30 +85 | -30 +85 | -10 +70 |

6 = Tolerance

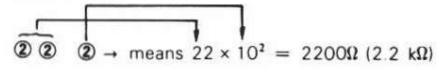
| Cord | C | D | G | J | K | M | X | Z | P | No cord |
|------|-------|------|----|----|-----|-----|------------|------------|------------|---|
| (%) | ±0.25 | ±0.5 | ±2 | ±5 | ±10 | ±20 | +40 -20 | +80 -20 | +100 -0 | More than 10 μF -10 ~ +50 Less than 4.7 μF -10 ~ +75 |

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



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

4. Tolerance

J = ±5% (Gold) K = ±10% (Silver)

CAPACITORS

Type I

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

Type II

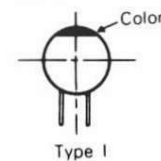
Ex. CK45TH = -470 ±60 ppm/°C

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

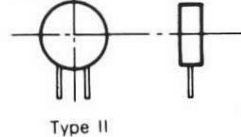
5 = Capacitor value

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

CC45



CK45



TS-530 SEMICONDUCTOR

☆: New parts

| Item | Name | Parts No. | Re- marks | Item | Name | Parts No. | Re- marks |
|-----------------|-----------------------|-----------------------|--------------|-----------------------|-------------|-------------|--------------|
| Diode | 1N60 | V11-0051-05 | | Vari-cap diode | 1SV53A | V11-4161-36 | |
| | 1S1007 | V11-4160-66 | | | 1SV54GC | V11-4173-46 | ☆ |
| | 1S1555 | V11-0076-05 | | LED | SLP-144 | V11-6172-76 | |
| | 1S1587 | V11-0370-05 | | | TLR-205 | V11-3162-96 | |
| | 1S2588 | V11-0414-05 | | Zener diode | WZ-061 | V11-0243-05 | |
| | V03C | V11-0290-05 200V 1.3A | | | WZ-090 | V11-0240-05 | |
| V06B | V11-0219-05 100V 1.1A | | WZ-110 | | V11-4161-46 | | |
| Varistor | V06E | V11-0285-05 400V 1.1A | | XZ-055 | V11-4105-50 | | |
| | V08J | V11-0282-05 800V 1.1A | | XZ-060 | V11-4101-20 | | |
| | MV-13 | V21-0004-05 | | XZ-090 | V11-4167-06 | | |
| | MV-203 | | | Surge absorber | ERZD03DK331 | | |

PARTS LIST

| Item | Name | Parts No. | Re- marks | Ref. No. | Parts No. | Description | Re- marks |
|-------------|-------------|---------------|--------------|------------------------|--------------------------------|------------------------------|--------------|
| TR | 2SA473(Y) | V01-0473-06 | ☆ | TS-530S GENERAL | | | |
| | 2SA562(Y) | V01-0032-05 | | A01-0274-05 | Fan case | | |
| | 2SA778A(K) | V01-0778-16 | | A01-0778-11 | Case (upper) | | |
| | 2SA1015(Y) | V01-1015-06 | | A01-0779-01 | Case (lower) | | |
| | 2SC460(B) | V03-0079-05 | | A20-2420-03 | Panel | ☆ | |
| | 2SC945(O) | V03-0945-06 | | B03-0519-04 | Switch mask Panel | | |
| | 2SC1515(K) | V03-0450-05 | | B03-0520-04 | Switch mask Panel | | |
| | 2SC1775(E) | V03-1775-06 | | B05-0708-04 | Speaker grill cloth | | |
| | 2SC1815(BL) | V03-1815-26 | | B09-0003-05 | Coupling Plate | | |
| | 2SC1815(GR) | V03-1815-16 | | B10-0631-04 | Front glass (small) | | |
| | 2SC1815(Y) | V03-1815-06 | | B10-0639-04 | Front glass (large) | ☆ | |
| | 2SC1923(O) | V03-1923-06 | | B21-0501-04 | Pointer Plate | | |
| | 2SC1959(Y) | V03-1959-06 | | B30-0817-15 | Pilot lamp Meter 12V, 80mA | | |
| | 2SC2240(GR) | V03-2240-06 | | B31-0630-05 | Meter | ☆ | |
| FET | 2SK19(BL) | V09-0111-05 | | B42-1702-04 | Adj. seal | ☆ | |
| | 2SK19(GR) | V09-0012-05 | | B43-0651-04 | Name plate | ☆ | |
| | 2SK19(Y) | V09-0011-05 | | B43-0653-04 | Name plate | ☆ | |
| | 2SK30A(O) | V09-0056-05 | | B46-0058-10 | Warranty card | K | |
| | 2SK125 | V09-0136-10 | | B50-2791-00 | Operating manual | K, W, X, M | |
| | 3SK73(GR) | V09-1002-46 | | B50-2792-00 | Operating manual | T | |
| IC | 74LS163N | V30-1037-06 | | B58-0625-00 | Transmit warning paper | ☆ | |
| | | | | B58-0631-00 | Warning paper | W, T, X, M | |
| | HD74LS00P | V30-0192-16 | | C7 | C90-0186-05 | C 0.001μF 3kV | |
| | HD74LS90P | V30-1083-06 | | C8 | C91-0079-05 | C 0.01μF 2kV | |
| | HD74LS163P | V30-1047-06 | | C9 | C91-0401-05 | C 100pF 3kV | |
| | | | | C10 | C91-0017-05 | C 390pF 3kV | |
| | MB3712 | V30-1231-16 | ☆ | C12 | CC45SL2H101J | C 100pF 500V | |
| | MC4044P | V30-0173-05 | | C13 | CC45SL2H271J | C 270pF 500V | S/SP |
| | | | | C14 | CC45SL2H681J | C 680pF 500V | S/SP |
| | NJM78L05A | V30-1149-06 | | C15 | CC45SL2H121J | C 120pF 500V | |
| | | | | C16 | CC45SL2H821J | C 820pF 500V | |
| | SN74LS00N | V30-1005-66 | | C17 | CC45SL2H102J | C 0.001μF 500V | |
| | SN74LS90N | V30-1005-26 | | C18, 19 | C90-0300-05 | C 470pF AC150V | |
| | SN74LS163AN | V30-1154-06 | | C20 | C91-0079-05 | C 0.01μF 2kV | |
| | SN16913P | V30-1048-06 | | C22,24 | C90-0327-05 | E 100μF 500V | |
| | | | | C26 | C91-0467-05 | C 22pF 3kV | |
| | TC4011BP | V30-0301-70 | | C30 | CC45SL1H030C | C 3pF ±0.25pF | |
| | TC4029BP | V30-1051-06 | | C31 | CC45SL2H101J | C 100pF 500V | |
| | TC4081BP | V30-0299-10 | | TC1 | C03-0002-05 | Trimmer | |
| | TC4518BP | V30-1039-06 | | VC1 | C03-0060-05 | Variable cap. (A) FINAL | |
| | TC5064BP | V30-1056-06 | | VC2 | C01-0084-05 | Variable cap. (B) LOAD | |
| | TC5066BP | V30-1057-06 | | | D22-0402-05 | Universal coupling BAND LOAD | |
| TC5070P | V30-1172-06 | | | D22-0405-04 | Coupling PLATE | | |
| μPC1158H2 | V11-1177-26 | | | D22-0407-04 | Shaft coupling φ6 | | |
| Tube | 12BY7A | V40-0114-00 | | | D32-0051-04 | Shaft stopper M3 x 10 | |
| | | | | | D32-0075-04 | Switch stopper | W, T, X, M |
| | 6146B | V40-0138-00 K | | | D40-0613-05 | Vernier mechanism | |
| | S2001A | W, T, X, M | | | E04-0152-05 | UHF type receptacle ANT | |
| | | | | | E06-0451-15 | 4P male socket MIC | |
| | | | | | E06-0751-05 | 7P DIN socket REMOTE | |
| | | | | | E06-0851-05 | 8P DIN socket EXT. VFO | |
| | | | | | E07-0403-05 | 4P MIC plug (accessory) | W, T, X, M |
| | | | | | E07-0751-05 | 7P DIN plug (accessory) | |
| | | | | | E07-0851-05 | 8P DIN plug EXT. VFO | |
| | | | | | E11-0404-05 | 3P phone jack KEY, PHONE | |
| | | | | | E11-0410-05 | Phone jack EXT. SP | |
| | | | | E12-0001-05 | Phone plug (accessory) EXT. SP | | |

PARTS LIST

| Ref. No. | Parts No. | Description | Re- marks | Ref. No. | Parts No. | Description | Re- marks |
|----------|-------------|-----------------------|-----------------|----------|--------------|--------------------|--------------------------------|
| | E22-0207-05 | Lug plate | | | N14-0115-05 | Flange nut | GND |
| | E22-0472-05 | Lug plate | Final | ☆ | N14-0509-05 | Wing nut | GND |
| | E23-0046-04 | Square terminal | Switch, Relay | | N14-0517-05 | Cap nut | BIAS |
| | E30-0181-05 | AC cord | UL/CSA | K, M | N30-4012-46 | Round screw | Foot (large) |
| | E30-0185-05 | AC cord | SAA | X | N30-4016-46 | Round screw | GND |
| | E30-0585-05 | AC cord | CEE | W | N30-4025-46 | Round screw | Foot (accessory) |
| | E30-0602-05 | AC cord | 3P | T | N33-3006-41 | Round flat screw | SP |
| | E31-2086-05 | Coax cable with plug | | | N35-3008-45 | Bind screw | Foot (small) |
| | E90-0004-15 | Plate cap | | | N35-4006-41 | Bind screw | Case |
| | F05-4022-05 | Fuse 4A | W, T, X, M | | N87-4012-46 | Self tapping screw | Foot (large) |
| | F05-6021-05 | Fuse 6A | K, M | | N89-3006-46 | Bind tapping screw | Final cover |
| | F09-0041-05 | Fan | | | N99-0306-04 | Hex. head screw | VFO |
| | G01-0801-04 | Gnd spring | | R22 | RC05GF2H221J | Solid | 220Ω 1/2W |
| | G09-0410-05 | D spring | φ6 | R24 | RC05GF3A103K | Solid | 10kΩ 1W |
| | G13-0633-14 | Cushion | Meter | R25,26 | RC05GF2H474J | Solid | 470kΩ 1/2W |
| | G13-0639-04 | Cushion | Indicating tube | R28 | RC05GF2H330J | Solid | 33Ω 1/2W |
| | G53-0502-04 | Packing | Case side | | VR1 | R01-3414-05 | Pot. 10kΩ(A) AF ☆ |
| | G53-0512-04 | Packing | Panel | | VR2 | R01-3415-05 | Pot. 10kΩ(B) RF ☆ |
| | H01-2741-04 | Carton case (inside) | K, W, X, M | ☆ | VR3 | R01-3417-05 | Pot. 10kΩ(F) IF SHIFT ☆ |
| | H01-2742-04 | Carton case (inside) | T | ☆ | VR4 | R01-2405-05 | Pot. 5kΩ(B) RIT/XIT ☆ |
| | H03-1797-04 | Carton case (outside) | | ☆ | VR5 | R01-3414-05 | Pot. 10kΩ(A) MIC ☆ |
| | H10-2539-02 | Packing fixture (F) | | | VR6 | R01-3416-05 | Pot. 10kΩ(B) CAR ☆ |
| | H10-2540-02 | Packing fixture (R) | | | VR7 | R01-4408-05 | Pot. 50kΩ(B) VOX GAIN ☆ |
| | H20-0439-03 | Protective cover | | | VR8 | R01-0404-05 | Pot. 300Ω(B) NB |
| | H25-0120-04 | Protective bag | | | VR9 | R01-6401-05 | Pot. 250kΩ(B) DELAY |
| | J02-0022-05 | Foot (small) | | | VR10 | R01-0405-05 | Pot. 300Ω(B) ANTI ☆ |
| | J02-0049-14 | Foot (large) | | | VR11,12 | R01-3411-05 | Pot. 10kΩ(B) RF OUT, BIAS |
| | J13-0033-15 | Fuse holder | | S1~6 | S40-2419-05 | Push switch | PC board type |
| | J25-3015-04 | PC board | Relay | ☆ | S7 | S40-2403-05 | Push switch +0.5 SHIFT |
| | J32-0029-04 | Hex. boss | Relay, PLL | | S8,9 | S36-1403-05 | See saw switch HEATER, POWER ☆ |
| | J32-0159-04 | Hex. boss | Final | | S11 | S01-1423-05 | Rotary switch AGC |
| | J41-0006-05 | Cord bushing | K, M | | S13 | S01-1427-05 | Rotary switch METER ☆ |
| | J41-0024-15 | Cord bushing | W, T, X | | S14,16 | S40-2415-05 | Push switch Lead type |
| | J42-0409-04 | Knob bushing | +0.5 SHIFT | | S17 | S33-2403-05 | Paddle switch STBY ☆ |
| | J61-0019-05 | Vinyle tie | | | S18 | S01-2429-05 | Rotary switch MODE ☆ |
| | J61-0401-05 | Nylon band | | | S20 | S31-2007-05 | Slide switch SG |
| | J61-0402-05 | Free up belt | W | | S22 | S01-3406-05 | Rotary switch FINAL |
| | K01-0406-05 | Handle | | | S23 | S31-2027-05 | Slide switch AC volt W,T,X,M |
| | K21-0723-04 | Pointer knob | BAND | ☆ | RL1 | S51-2407-05 | Relay |
| | K23-0738-04 | Knob 1 | METER, AGC | | | T07-0215-05 | Speaker |
| | K23-0745-04 | Knob | VOX, NB, CAR | ☆ | | T40-0022-05 | Motor FAN |
| | K27-0414-04 | Push knob | | | | X43-1370-02 | Rectifier unit |
| | K29-0713-04 | Push knob | +0.5 SHIFT | | | X44-1360-01 | RF unit |
| | K29-0715-04 | Pointer knob | MODE | | | X48-1310-00 | IF unit |
| | K29-0737-04 | Knob 5 | PLATE | | | X49-1150-00 | AF unit |
| | K29-0738-04 | Knob 6 | | | | X50-1680-01 | PLL unit |
| | K29-0744-04 | Paddle knob | STBY | ☆ | | X54-1540-00 | Counter unit |
| L1 | L40-6891-13 | Choke coil | 6.8μH | | | X56-1380-00 | Final unit |
| L2 | L33-0635-05 | Final choke | | | | X60-1150-01 | VFO ass'y unit |
| L3 | L34-1004-05 | Final coil B | 28 MHz | | | | |
| L4 | L34-0560-25 | Final coil A | | | | | |
| L5 | L33-0259-05 | Choke coil | 470μH | | | | |
| T1 | L01-8106-15 | Power trans | | | | | |
| PS1,2 | L39-0046-05 | PS coil | PLATE | | | | |
| | N09-0256-05 | Gnd screw | | | | | |

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PARTS LIST

| Ref. No. | Parts No. | Description | Re- marks | Ref. No. | Parts No. | Description | Re- marks |
|-------------------------------------|----------------|----------------------------|--------------|-------------|------------------------------|-----------------------------|--------------|
| RECTIFIER UNIT (X43-1370-02) | | | | | | | |
| C5,6 | CE02W2C330 | E 33 μ F 160V | | C62 | CC45RH1H150J | C 15pF | |
| | E23-0047-04 | Square terminal | | C63 | CC45SL1H151J | C 150pF | |
| | J31-0502-04 | PC board collar | | C66,67 | C91-0456-05 | C 0.047 μ F | |
| | J42-0404-05 | PC board bushing | | C69 | CC45SL2H151J | C 150pF 500V | |
| L1 | L40-1511-03 | Ferri-inductor 150 μ H | | C78 | C91-0456-05 | C 0.047 μ F | |
| R1~4 | RC05GF2H474J | Solid 470k Ω 1/2W | | VC1~3 | C01-0127-15 | Variable capacitor | |
| R9 | RC05GF2H334J | Solid 330k Ω 1/2W | | D13-0404-04 | Sprocket large | | |
| R10 | RC05GF2H183J | Solid 18k Ω 1/2W | | D13-0405-04 | Sprocket small | | |
| R11 | RS14AB3A471J | Metal film 470 Ω 1W | | D16-0403-04 | Chain ass'y | | |
| R14 | RC05GF2H102J | Solid 1k Ω 1/2W | | E04-0154-05 | Coax connector | | |
| R15 | RC05GF2H563J | Solid 56k Ω 1/2W | | E10-1902-05 | 9P tube socket | | |
| R16 | RC05GF2H563J | Solid 56k Ω 1/2W | | E23-0047-04 | Square terminal | | |
| | R92-0150-05 | Short jumper | | E40-0273-05 | Mini connect wafer 2P | | |
| | | | | E40-0373-05 | Mini connect wafer 3P | | |
| | | | | E40-0374-05 | Mini connect wafer 3P L type | | |
| | | | | E40-0474-05 | Mini connect wafer 4P L type | | |
| | | | | E40-0973-05 | Mini connect wafer 9P | | |
| | | | | F11-0249-05 | Tube shield | | |
| RF UNIT (X44-1360-01) | | | | | | | |
| | | | | J31-0502-04 | PC board collar | | |
| | | | | J42-0404-05 | PC board bushing | | |
| C1 | CQ92M1H182K | ML 0.0018 μ F | | L1 | L40-2792-02 | Ferri-inductor 2.7 μ H | |
| C4 | CQ92M1H152K | ML 0.0015 μ F | | L2 | L40-4791-02 | Ferri-inductor 4.7 μ H | |
| C6 | CC45RH1H101J | C 100pF | | L3 | L34-0559-05 | Trap coil | |
| C7 | CQ09S1H122J | S 0.0012 μ F | | L4 | L34-0558-05 | Trap coil | |
| C8 | CC45RH1H221J | C 220pF | | L5 | L34-0930-05 | Tuning coil 3.5 MHz | |
| C9 | CC45RH1H330J | C 33pF | | L6 | L34-0931-05 | Tuning coil 7 MHz | |
| C10 | CC45RH1H121J | C 120pF | | L7 | L34-0932-05 | Tuning coil 10 MHz | |
| C11 | CC45RH1H560J | C 56pF | | L8 | L34-0933-05 | Tuning coil 14 MHz | |
| C12 | CC45RH1H330J | C 33pF | | L9 | L34-0934-05 | Tuning coil 18 MHz | |
| C13 | CC45RH1H101J | C 100pF | | L10 | L34-0990-05 | Tuning coil 21 MHz | |
| C14,15 | CC45RH1H330J | C 33pF | | L11 | L34-0935-05 | Tuning coil 24.5 MHz | |
| C16 | CC45SL1H561J | C 560pF | | L12 | L34-0995-05 | Tuning coil 28 MHz | |
| C17 | CC45RH1H221J | C 220pF | | L13 | L34-0936-05 | Tuning coil MIX 1.5 MHz | |
| C19 | CC45RH1H150J | C 15pF | | L14 | L34-0930-05 | Tuning coil 3.5 MHz | |
| C20 | CC45RH1H330J | C 33pF | | L15 | L34-0931-05 | Tuning coil 7 MHz | |
| C21 | CC45RH1H121J | C 120pF | | L16 | L34-0932-05 | Tuning coil 10 MHz | |
| C22 | CC45RH1H560J | C 56pF | | L17 | L34-0933-05 | Tuning coil 14 MHz | |
| C23 | CC45RH1H330J | C 33pF | | L18 | L34-0934-05 | Tuning coil 18 MHz | |
| C24 | CC45RH1H101J | C 100pF | | L19 | L34-0990-05 | Tuning coil 21 MHz | |
| C25 | CC45RH1H330J | C 33pF | | L20 | L34-0935-05 | Tuning coil 24.5 MHz | |
| C26 | C91-0456-05 | C 0.047 μ F | | L21 | L34-0995-05 | Tuning coil 28 MHz | |
| C28 | CC45SL1H561J | C 560pF | | L23 | L34-0552-15 | Tuning coil 1.5 MHz | |
| C30 | CC45RH2H330J | C 33pF 500V | | L24 | L34-0553-15 | Tuning coil 3.5 MHz | |
| C31 | CC45RH2H121J | C 120pF 500V | | L25 | L34-0554-05 | Tuning coil 7 MHz | |
| C32 | CC45RH2H181J | C 180pF 500V | | L26 | L34-0937-05 | Tuning coil 10 MHz | |
| C33 | CC45RH2H470J | C 47pF 500V | | L27 | L34-0555-05 | Tuning coil 14 MHz | |
| C34 | CC45RH2H270J | C 27pF 500V | | L28 | L34-0938-05 | Tuning coil 18 MHz | |
| C35 | CC45RH2H101J | C 100pF 500V | | L29 | L34-0556-05 | Tuning coil 21 MHz | |
| C36 | CC45RH2H390J | C 39pF 500V | | L30 | L34-0939-05 | Tuning coil 24.5 MHz | |
| C37 | CC45RH2H180J | C 18pF 500V | | L31 | L34-0557-05 | Tuning coil 28 MHz | |
| C38 | CC45SL2H100D | C 10pF \pm 0.5pF 500V | | L32~34 | L40-4711-03 | Ferri-inductor 470 μ H | |
| C40 | CC45SL2H561JTD | C 560pF 500V | | L35 | L40-1511-03 | Ferri-inductor 150 μ H | |
| C41 | CC45RH1H150J | C 15pF | | L36 | L40-4711-03 | Ferri-inductor 470 μ H | |
| C42 | CC45SL1H101J | C 100pF | | L37 | L40-1511-03 | Ferri-inductor 150 μ H | |
| C45,46 | C91-0456-05 | C 0.047 μ F | | L39 | L33-0074-05 | Heater choke 0.3 μ H | |
| C49 | CC45SL1H050C | C 5pF \pm 0.25pF | | L40 | L40-4782-02 | Ferri-inductor 0.47 μ H | |
| C50 | CC45SL1H220J | C 22pF | | L41 | L34-2004-05 | Tuning coil ANT 1.5 MHz | |
| C55,57,58 | C91-0456-05 | C 0.047 μ F | | L42 | L40-4711-03 | Ferri-inductor 470 μ H | |
| C61 | CC45SL1H470J | C 47pF | | L43 | L40-1511-03 | Ferri-inductor 150 μ H | |

PARTS LIST

| Ref. No. | Parts No. | Description | Re- marks | Ref. No. | Parts No. | Description | Re- marks | |
|------------------------------|--------------|-----------------------|--------------|------------------------------|--------------|----------------------------|-----------------------|--|
| L44 | L40-2282-01 | Ferri-inductor 0.22μH | | C76 | CC45UJ1H100D | C 10pF ±0.5pF | | |
| L45,46 | L40-1511-03 | Ferri-inductor 150μH | | C77 | CC45SL1H101J | C 100pF | | |
| T1 | L19-0303-05 | Wide bandwidth trans | | C78 | C91-0457-05 | C 0.022μF | | |
| T2 | L30-0509-05 | IFT | | C79 | CC45CH1H050C | C 5pF ±0.25pF | | |
| T3 | L19-0303-05 | Wide bandwidth trans | | C80 | CE04W1C220M | E 22μF 16V | | |
| T4 | L30-0509-05 | IFT | | C84 | CE04W1H010M | E 1μF 50V | | |
| R34 | RC05GF2H104J | Solid 100kΩ 1/2W | | C85 | C91-0456-05 | C 0.047μF | | |
| R35 | RC05GF2H151J | Solid 150Ω 1/2W | | C86~89 | CE04W2V220 | E 22μF 350V | | |
| R36 | RC05GF2H104J | Solid 100kΩ 1/2W | | C91,92 | CC45SL1H470J | C 47pF | | |
| R37 | RS14AB3A332J | Metal film 3.3kΩ 1W | | C93,94 | CE04W1C100M | E 10μF 16V | | |
| R38 | RC05GF2H474J | Solid 470kΩ 1/2W | | TC1,2 | C05-0030-15 | Ceramic trimmer 20pF | | |
| VR2 | R12-6404-05 | Trim. pot 470kΩ | | | E23-0401-05 | Round terminal | | |
| | R92-0150-05 | Short jumper | | | E40-0273-05 | Mini connect wafer 2P | | |
| | S29-7401-05 | Rotary wafer ass'y | | | E40-0373-05 | Mini connect wafer 3P | | |
| IF UNIT (X48-1310-00) | | | | | | E40-0473-05 | Mini connect wafer 4P | |
| | | | | | E40-0573-05 | Mini connect wafer 5P | | |
| | | | | | E40-0773-05 | Mini connect wafer 7P | | |
| | | | | | J31-0502-04 | PC board collar | | |
| | | | | | J42-0404-05 | PC board bushing | | |
| C2 | C91-0457-05 | C 0.022μF | | L1 | L40-1511-03 | Ferri-inductor 150μH | | |
| C5,6 | CC45SL1H470J | C 47pF | | L2 | L34-0940-05 | Tuning coil | | |
| C7 | CE04W1C100M | E 10μF 16V | | L3,4 | L40-1511-03 | Ferri-inductor 150μH | | |
| C9~15 | C91-0457-05 | C 0.022μF | | L5 | L34-0942-05 | Tuning coil | | |
| C18 | C91-0456-05 | C 0.047μF | | L6 | L34-0997-05 | Tuning coil | | |
| C19 | C91-0457-05 | C 0.022μF | | L7,8 | L34-0535-05 | Tuning coil | | |
| C20 | CC45SL1H100D | C 10pF ±0.5pF | | L9 | L40-1511-03 | Ferri-inductor 150μH | | |
| C23 | C91-0457-05 | C 0.022μF | | L10 | L34-0536-05 | Tuning coil | | |
| C24 | CC45SL1H100D | C 10pF ±0.5pF | | L11,12 | L40-1511-03 | Ferri-inductor 150μH | | |
| C25 | C91-0457-05 | C 0.022μF | | L13 | L34-0567-05 | Tuning coil BM | | |
| C26 | C91-0456-05 | C 0.047μF | | L14 | L40-4711-03 | Ferri-inductor 470μH | | |
| C27 | CC45SL1H470J | C 47pF | | L15 | L40-1511-03 | Ferri-inductor 150μH | | |
| C28 | C91-0456-05 | C 0.047μF | | CF1 | L72-0324-05 | Ceramic filter 8.83 MHz NB | ☆ | |
| C29 | C91-0457-05 | C 0.022μF | | XF1 | L71-0208-05 | MCF YK-88S | | |
| C30 | C91-0456-05 | C 0.047μF | | R111 | RS14GB3D471J | Metal film 470Ω 2W | | |
| C31 | CC45SL1H100D | C 10pF ±0.5pF | | VR1 | R12-3045-05 | Trim. pot 10kΩ | | |
| C32 | CC45UJ1H070D | C 7pF ±0.5pF | | VR2 | R12-6401-05 | Trim. pot 470kΩ | | |
| C35 | CQ92M1H333K | ML 0.033μF | | VR3 | R12-5030-05 | Trim. pot 100kΩ | | |
| C36 | C91-0456-05 | C 0.047μF | | VR4 | R12-0401-05 | Trim. pot 100Ω | | |
| C37 | CC45SL1H470J | C 47pF | | VR5 | R12-3045-05 | Trim. pot 10kΩ | | |
| C38 | C91-0457-05 | C 0.022μF | | | R92-0150-05 | Short jumper | | |
| C40 | C91-0456-05 | C 0.047μF | | RL1 | S51-4401-05 | Relay LZN-4 | | |
| C44,47 | CC45SL1H470J | C 47pF | | AF UNIT (X49-1150-00) | | | | |
| C49,50 | CC45SL1H101J | C 100pF | | C1,2 | CQ92M1H123K | ML 0.012μF | | |
| C51 | CE04W1H010M | E 1μF 50V | | C3 | CQ92M1H223K | ML 0.022μF | | |
| C52 | CE04W1C100M | E 10μF 16V | | C4,5 | CQ92M1H123K | ML 0.012μF | | |
| C53 | CQ92M1H153K | ML 0.015μF | | C6 | CE04W1C100M | E 10μF 16V | | |
| C54,56~58 | CE04W1H010M | E 1μF 50V | | C7 | CE04W1H010M | E 1μF 50V | | |
| C59 | CE04W1H3R3M | E 3.3μF 50V | | C8 | CE04W1HR10M | E 0.1μF 50V | | |
| C60,61,63 | CE04W1H010M | E 1μF 50V | | C9 | CE04W1C100M | E 10μF 16V | | |
| C64 | CE04W1H4R7M | E 4.7μF 50V | | C10 | CQ92M1H103K | ML 0.01μF | | |
| C65 | CE04W1C100M | E 10μF 16V | | C11 | CE04W1A101M | E 100μF 10V | | |
| C66 | CE04W1H4R7M | E 4.7μF 50V | | C12 | CE04W1HR47M | E 0.47μF 50V | | |
| C67 | CE04W1A221M | E 220μF 10V | | | | | | |
| C68 | CQ92M1H473K | ML 0.047μF | | | | | | |
| C69 | CE04W1A470M | E 47μF 10V | | | | | | |
| C70 | CE04W1C100M | E 10μF 16V | | | | | | |
| C71 | CE04W1H010M | E 1μF 50V | | | | | | |
| C72 | CE04W1H3R3M | E 3.3μF 50V | | | | | | |
| C73 | CE04W1H010M | E 1μF 50V | | | | | | |
| C74 | C91-0457-05 | C 0.022μF | | | | | | |
| C75 | CE04W1A221M | E 220μF 10V | | | | | | |

PARTS LIST

| Ref. No. | Parts No. | Description | Re- marks | Ref. No. | Parts No. | Description | Re- marks |
|-------------------------------|--------------|----------------------------|--------------|----------|--------------|--------------------|--------------|
| C13 | CE04W1C100M | E 10 μ F 16V | | C10 | CE04W1A470M | E 47 μ F 10V | |
| C14 | CE04W1H010M | E 1 μ F 50V | | C11 | CC45TH1H390J | C 39pF | |
| C15 | CE04W1C3R3M | E 3.3 μ F 16V | | C12 | CC45TH1H220J | C 22pF | |
| C16 | CQ92M1H472K | ML 0.0047 μ F | | C13 | CC45TH1H270J | C 27pF | |
| C17 | CQ92M1H473K | ML 0.047 μ F | | C14 | CE04W1A470M | E 47 μ F 10V | |
| C19 | CE04W1H3R3M | E 3.3 μ F 50V | | C15 | CC45SH1H680J | C 68pF | |
| C20 | CE04W1H010M | E 1 μ F 50V | | C16 | CC45RH1H221J | C 220pF | |
| C21 | C91-0456-05 | C 0.047 μ F 25V | | C18 | CC45TH1H180J | C 18pF | |
| C22 | CQ92M1H223K | ML 0.022 μ F | | C19 | CC45TH1H150J | C 15pF | |
| C24 | CE04W1C471M | E 470 μ F 16V | | C21 | CE04W1A470M | E 47 μ F 10V | |
| C26 | CE04W1C100M | E 10 μ F 16V | | C22 | CC45UJ1H270J | C 27pF | |
| C27 | CE04W1C470M | E 47 μ F 16V | | C23 | CC45TH1H101J | C 100pF | |
| C29 | C90-0834-05 | Cap. 0.15 μ F 25V | ☆ | C24,25 | CC45UJ1H120J | C 12pF | |
| C30 | CE04W1C221M | E 220 μ F 16V | | C27 | CE04W1A470M | E 47 μ F 10V | |
| C32 | CE04W1A101M | E 100 μ F 10V | | C28 | CC45UJ1H820J | C 82pF | |
| C33 | CE04W1H010M | E 1 μ F 50V | | C29 | CC45UJ1H150J | C 15pF | |
| C34,35 | CE04W1A470M | E 47 μ F 10V | | C30 | CE04W1A470M | E 47 μ F 10V | |
| C37 | CE04W1H3R3M | E 3.3 μ F 50V | | C31 | CC45TH1H270J | C 27pF | |
| C43 | CC45SL1H100D | C 10pF \pm 0.25pF | | C32 | CC45UJ1H050C | C 5pF \pm 0.25pF | |
| C45,52 | CE04W1H010M | E 1 μ F 50V | | C33 | CC45UJ1H220J | C 22pF | |
| C55 | CE04W1C470M | E 47 μ F 16V | | C34 | CE04W1A470M | E 47 μ F 10V | |
| C57 | CE04W1C102M | E 0.001 μ F 16V | | C35 | CC45UJ1H070D | C 7pF \pm 0.5pF | |
| C58 | CE04W1H3R3M | E 3.3 μ F 50V | | C36 | CC45UJ1H220J | C 22pF | |
| C60,61 | C90-0807-05 | E 2200 μ F 25V | | C38 | CE04W1A470M | E 47 μ F 10V | |
| C64,65 | CQ93M2A473K | ML 0.047 μ F 100V | | C40 | CC45UJ1J150J | C 15pF | |
| C68 | CE04W1C100M | E 10 μ F 16V | | C41 | CC45UJ1H090D | C 9pF \pm 0.5pF | |
| C69 | CE04W1HR47M | E 0.47 μ F 50V | | C42 | CC45TH1H150J | C 15pF | |
| C73 | CQ93M2A224M | ML 0.22 μ F 100V | | C43 | CE04W1A470M | E 47 μ F 10V | |
| | E23-0047-04 | Square terminal | | C44 | CC45UJ1H100D | C 10pF \pm 0.5pF | |
| | E40-0273-05 | Mini connect wafer 2P | | C45 | CC45UJ1H270J | C 27pF | |
| | E40-0373-05 | Mini connect wafer 3P | | C47 | CC45TH1H150J | C 15pF | |
| | E40-0473-05 | Mini connect wafer 4P | | C48 | CC45TH1H050C | C 5pF \pm 0.25pF | |
| | E40-0573-05 | Mini connect wafer 5P | | C51,53 | C91-0456-05 | C 0.047 μ F | |
| | E40-0673-05 | Mini connect wafer 6P | | C54,55 | CC45SL1H121J | C 120pF | |
| | E40-0773-05 | Mini connect wafer 7P | | C56 | CC45SL1H181J | C 180pF | |
| | F20-0516-05 | Insulating sheet | | C57 | CC45CH1H010C | C 1pF \pm 0.25pF | |
| | F29-0014-05 | Shoulder washer | | C58 | CC45SL1H050C | C 5pF \pm 0.25pF | |
| | J31-0502-04 | PC board collar | | C67 | CC45SL1H330J | C 33pF | |
| | J42-0404-05 | PC board bushing | | C68,69 | CC45SL1H680J | C 68pF | |
| L1 | L40-3392-02 | Ferri-inductor 3.3 μ H | | C70 | CC45SL1H330J | C 33pF | |
| L2~4 | L40-1511-03 | Ferri-inductor 150 μ H | | C71,72 | CC45SL1H221J | C 220pF | |
| T1 | L34-0535-05 | Tuning coil red NB | | C74,76 | C91-0456-05 | C 0.047 μ F | |
| T2 | L34-0536-05 | Tuning coil blue NB | | C80 | CE04W1H010M | E 1 μ F 50V | |
| VR1 | R12-3411-05 | Trim. pot 47k Ω | | C82 | C91-0456-05 | C 0.047 μ F | |
| VR2 | R12-0413-05 | Trim. pot 470 Ω | | C87 | CQ92M1H102K | ML 0.001 μ F | |
| VR3 | R12-3411-05 | Trim. pot 47k Ω | | C88 | CQ92M1H104K | ML 0.1 μ F | |
| | R92-0150-05 | Short jumper | | C89 | C91-0456-05 | C 0.047 μ F | |
| PLL UNIT (X50-1680-01) | | | | C90,91 | CE04W1A101M | E 100 μ F 10V | |
| C1 | CE04W1A470M | E 47 μ F 10V | | C92 | CE04W1A470M | E 47 μ F 10V | |
| C2 | CC45TH1H270J | C 27pF | | C94 | CE04W1A101M | E 100 μ F 10V | |
| C3 | CC45TH1H180J | C 18pF | | C95 | CC45SL1H390J | C 39pF | |
| C4 | CC45TH1H270J | C 27pF | | C97 | CC45SL1H331J | C 330pF | |
| C5 | CE04W1A470M | E 47 μ F 10V | | C98 | CC45SL1H470J | C 47pF | |
| C6 | CC45UJ1H101J | C 100pF | | C99 | CC45SL1H150J | C 15pF | |
| C7 | CC45UJ1H150J | C 15pF | | C100 | CC45SL1H470J | C 47pF | |
| | | | | C101 | CC45SL1H270J | C 27pF | |
| | | | | C102 | CC45SL1H560J | C 56pF | |
| | | | | C103 | CC45SL1H270J | C 27pF | |
| | | | | C104 | CC45SL1H470J | C 47pF | |
| | | | | C105 | C91-0456-05 | C 0.047 μ F | |
| | | | | C106 | CC45SL1H470J | C 47pF | |
| | | | | C107 | CC45SL1H070D | C 7pF \pm 0.5pF | |
| | | | | C109 | C91-0456-05 | C 0.047 μ F | |
| | | | | C111 | CC45SL1H101J | C 100pF | |
| | | | | C112 | CC45SL1H221J | C 220pF | |

PARTS LIST

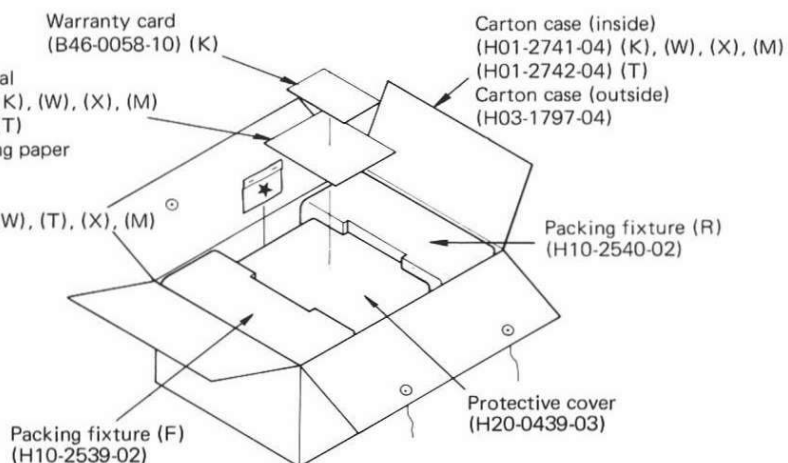
| Ref. No. | Parts No. | Description | Re- marks | Ref. No. | Parts No. | Description | Re- marks |
|--------------|--------------|------------------------|--------------|-----------------------------------|--------------|-----------------------|--------------|
| C113 | CC45SL1H101J | C 100pF | | L31 | L40-2211-03 | Ferri-inductor 220μH | |
| C115 | CC45RH1H100D | C 10pF ±0.5pF | | L32 | L33-0636-05 | Choke coil 20μH | |
| C116 | CC45TH1H050C | C 5pF ±0.25pF | | L33~36 | L40-1511-03 | Ferri-inductor 150μH | |
| C117 | CC45CH1H010C | C 1pF ±0.25pF | | L37 | L40-4711-03 | Ferri-inductor 470μH | |
| C118 | CC45RH1H560J | C 56pF | | L38,39 | L40-1511-03 | Ferri-inductor 150μH | |
| C120 | CC45CH1H020C | C 2pF ±0.25pF | | L40 | L40-4711-03 | Ferri-inductor 470μH | |
| C121 | CC45SL1H470J | C 47pF | | L41,42 | L40-4701-03 | Ferri-inductor 47μH | |
| C123 | CC45RH1H390J | C 39pF | | L43,44 | L40-2211-03 | Ferri-inductor 220μH | |
| C125 | CC45TH1H330J | C 33pF | | L45~50 | L40-1511-03 | Ferri-inductor 150μH | |
| C126 | CC45TH1H150J | C 15pF | | T1 | L32-0195-05 | OSC coil 7, 10 MHz | |
| C127 | CC45TH1H330J | C 33pF | | T2 | L32-0193-05 | OSC coil 1.5, 3.5 MHz | |
| C130 | CC45UJ1H150J | C 15pF | | T3 | L32-0196-05 | OSC coil 14 MHz | |
| C131 | CC45UJ1H050C | C 5pF ±0.25pF | | T4 | L32-0199-05 | OSC coil 18 MHz | |
| C132 | CC45UJ1H150J | C 15pF | | T5 | L32-0198-05 | OSC coil 28 MHz | |
| C139 | CC45SL1H100D | C 10pF ±0.5pF | | T6 | L32-0197-05 | OSC coil 21, 24.5 MHz | |
| C140 | CC45RH1H220J | C 22pF | | T7 | L34-0714-05 | Tuning coil | |
| C142 | CC45RH1H470J | C 47pF | | T8 | L34-0715-05 | Tuning coil | |
| C143 | CC45RH1H220J | C 22pF | | T9 | L34-0716-05 | Tuning coil | |
| C144 | CC45RH1H470J | C 47pF | | T10 | L34-0717-05 | Tuning coil | |
| C159 | CC45SL1H330J | C 33pF | | T11 | L34-0718-05 | Tuning coil | |
| C160 | CC45SL1H100D | C 10pF ±0.5pF | | T12 | L34-0757-05 | Tuning coil | |
| C162 | CC45CH1H010C | C 1pF ±0.25pF | | T13 | L34-0711-05 | Tuning coil | |
| C163 | CC45SL1H150J | C 15pF | | T14 | L34-0713-15 | Tuning coil | |
| C166 | CC45SL1H100D | C 10pF ±0.5pF | | T15 | L34-0712-05 | Tuning coil | |
| C167 | CC45CH1H020C | C 2pF ±0.25pF | | T16 | L32-0201-05 | OSC coil 8.83 MHz | |
| C169 | CC45SL1H101J | C 100pF | | T17 | L34-0709-05 | Tuning coil 10 MHz | |
| C172 | C91-0456-05 | C 0.047μF | | T18 | L34-0710-05 | Tuning coil 20 MHz | |
| C173 | CC45RH1H040C | C 4pF ±0.25pF | | X1 | L77-0482-05 | Crystal 10 MHz | |
| C174 | CC45RH1H470J | C 47pF | | X2 | L77-0486-05 | Crystal 8.8285 MHz | |
| C178,179 | CC45RH1H220J | C 22pF | | X3 | L77-0485-05 | Crystal 8.8315 MHz | |
| C182,183 | C91-0456-05 | C 0.047μF | | VR1 | R12-5030-05 | Trim. pot 100kΩ | |
| C184 | CC45CH1H270J | C 27pF | | VR2,3 | R12-1040-05 | Trim. pot 4.7kΩ | |
| C185 | CC45CH1H390J | C 39pF | | | R92-0150-05 | Short jumper | |
| C186 | CC45CH1H101J | C 100pF | | COUNTER UNIT (X54-1540-00) | | | |
| C187 | CC45SL1H221J | C 220pF | | C2 | C91-0456-05 | C 0.047μF | |
| C188 | CC45SL1H220J | C 22pF | | C3 | C91-0457-05 | C 0.022μF | |
| C189 | CC45SL1H050C | C 5pF ±0.25pF | | C4 | CC45SL1H150J | C 15pF | |
| C194 | CE04W1A470M | E 47μF 10V | | C6 | CE04W1A470Q | E 47μF 10V | |
| C196 | CC45SL1H100D | C 10pF ±0.5pF | | C7 | CE04W1A101Q | E 100μF 10V | |
| C197~202 | C91-0456-05 | C 0.047μF | | C8,9 | C91-0456-05 | C 0.047μF | |
| C205 | CE04W1HR47M | E 0.47μF 50V | | C11 | CE04W1C101M | E 100μF 16V | |
| TC1 | C05-0029-15 | Ceramic trimmer 50pF | | C12 | CE04W1V100Q | E 10μF 35V | |
| TC2,3 | C05-0056-05 | Ceramic trimmer 30pF | | C13 | CQ92M1H103K | ML 0.01μF 50V | |
| | E04-0154-05 | Coax connector | | C14~16 | CE04W1V100Q | E 10μF 35V | |
| | E23-0046-04 | Square terminal | | C17,18 | C91-0456-05 | C 0.047μF | |
| | E40-0273-05 | Mini connect wafer 2P | | C19 | CQ92M1H103K | ML 0.01μF 50V | |
| | E40-0373-05 | Mini connect wafer 3P | | C21,22 | CC45SL1H050C | C 5pF ±0.25pF | |
| | E40-0473-05 | Mini connect wafer 4P | | C23 | CE04W1A330Q | E 33μF 10V | |
| | E40-0673-05 | Mini connect wafer 6P | | C24~26 | C91-0456-05 | C 0.047μF | |
| | E40-0973-05 | Mini connect wafer 9P | | C28 | CE04W1H100M | E 10μF 50V | |
| | E40-1073-05 | Mini connect wafer 10P | | | J31-0502-04 | PC board collar | |
| L1~7 | L40-1511-03 | Ferri-inductor 150μH | | | J42-0404-05 | PC board bushing | |
| L8 | L40-4701-03 | Ferri-inductor 47μH | | L1 | L40-4711-03 | Ferri-inductor 470μH | |
| L9 | L40-1592-02 | Ferri-inductor 1.5μH | | L2 | L40-1011-04 | Ferri-inductor 100μH | |
| L10 | L40-1092-02 | Ferri-inductor 1μH | | L3 | L40-2211-03 | Ferri-inductor 220μH | |
| L11 | L40-1292-02 | Ferri-inductor 1.2μH | | L4 | L40-1511-03 | Ferri-inductor 150μH | |
| L12 | L40-1892-02 | Ferri-inductor 1.8μH | | | | | |
| L13,14 | L40-4711-03 | Ferri-inductor 470μH | | | | | |
| L15,16 | L40-8201-03 | Ferri-inductor 82μH | | | | | |
| L17 | L40-1511-03 | Ferri-inductor 150μH | | | | | |
| L18~20 | L40-2701-03 | Ferri-inductor 27μH | | | | | |
| L21~24,27~30 | L40-1511-03 | Ferri-inductor 150μH | | | | | |

PARTS LIST/PACKING

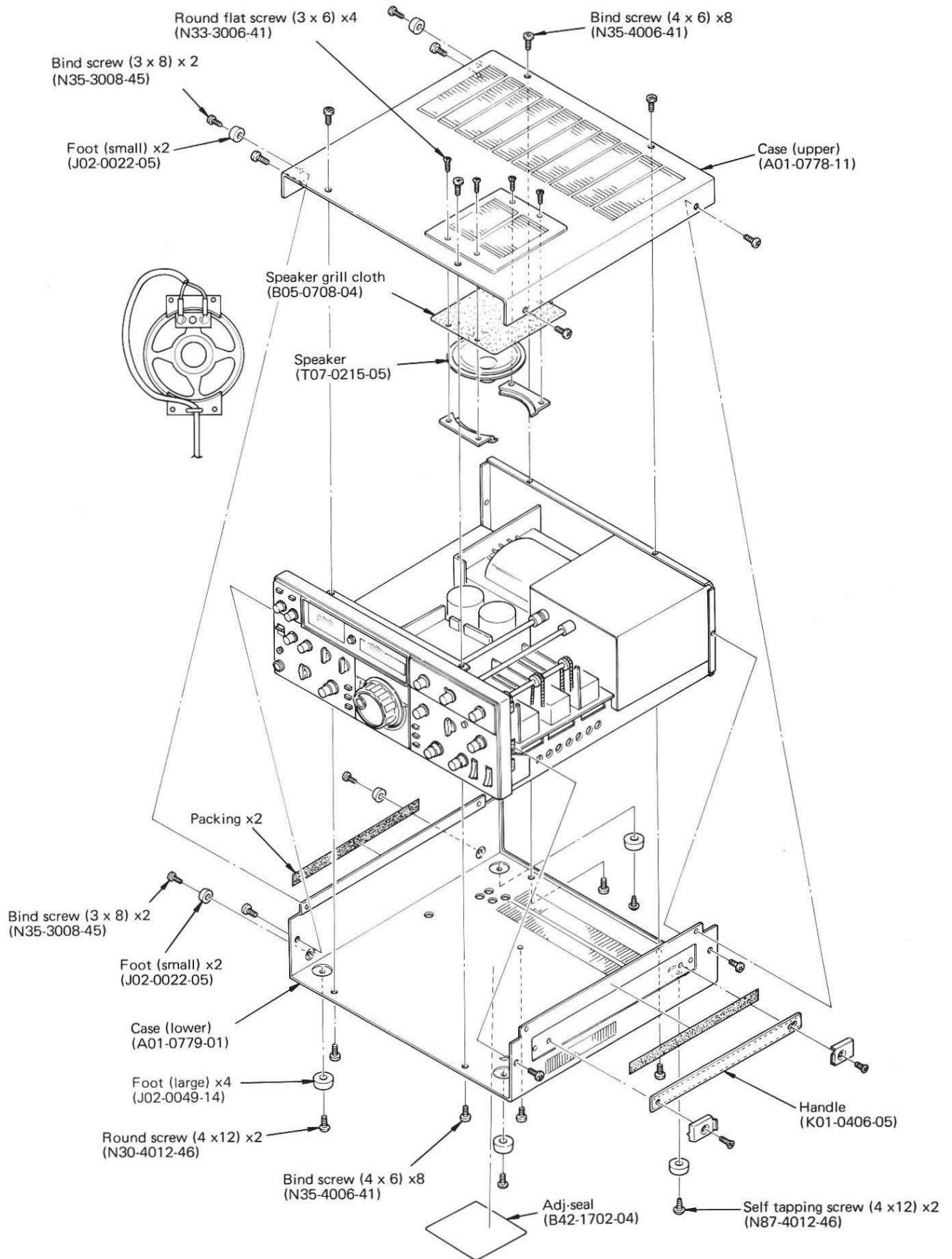
| Ref. No. | Parts No. | Description | Re- marks | Ref. No. | Parts No. | Description | Re- marks |
|-------------------------------------|--------------|--------------------------|--------------|-------------------------------|--------------|-----------------------|--------------|
| T1 | L19-0323-05 | OSC trans | ☆ | VFO UNIT (X40-1170-00) | | | |
| R10 | RC05GF2H221J | Solid 220Ω 1/2W | | C2 | C91-0456-05 | C 0.047μF 25V | |
| RB1,2 | R90-0521-05 | Resistor block 47kΩ X7 | | C4 | CC45CG1H050C | C 5pF ±0.25pF | |
| RB3,4 | R90-0522-05 | Resistor block 47kΩ X6 | | C6 | C91-0456-05 | C 0.047μF 25V | |
| | R92-0150-05 | Short jumper | | C7 | CC45LG1H151J | C 150pF | |
| FINAL UNIT (X56-1380-00) | | | | C9 | CC45LG1H121J | C 120pF | |
| C1 | CC45SL2H101J | C 100pF 500V | | C12 | CC45LG1H680J | C 68pF | |
| C36 | CC45CH2H150J | C 15pF 500V D | | C13 | CC45CG1H220J | C 22pF | |
| | E01-0002-05 | 8P (octal) socket | | C14 | CC45PG1H100D | C 10pF ±0.5pF | |
| | E23-0046-04 | Square terminal | | C15,16 | CC45LG1H151J | C 150pF | |
| L1 | L40-1511-03 | Ferr-inductor 150μH | | C17 | CC45CH1H020C | C 2pF ±0.25pF | |
| L2 | L40-4711-03 | Ferri-inductor 470μH | | C18 | C91-0456-05 | C 0.047μF 25V | |
| PS1,2 | L33-0010-05 | Parastic suppressor GRID | | C21 | CC45SL1H390J | C 39pF | |
| R2~5 | RC05GF2H200J | Solid 20Ω 1/2W | | C22 | CC45CH1H100D | C 10pF ±0.5pF | |
| R7 | RC05GF2H101J | Solid 100Ω 1/2W | | C23 | CC45SL1H390J | C 39pF | |
| R8 | RC05GF2H101J | Solid 100Ω 1/2W | | C24 | C91-0456-05 | C 0.047μF 25V | |
| R29 | R92-0615-05 | Cement 6.2Ω 7W D | | TC1 | C05-0009-15 | Ceramic trimmer 6pF | |
| VFO ASS'Y UNIT (X60-1150-01) | | | | TC2 | C05-0013-15 | Ceramic trimmer 20pF | |
| | B07-0630-05 | Dial escutcheon | | VC1 | C02-0019-05 | Variable cap. | |
| | B10-0632-04 | Escutcheon glass | | | D40-0614-05 | Dial mechanism ass'y | |
| | B20-0816-04 | Dial scale (B) | | | E40-0574-05 | Mini connect wafer 5P | |
| | B20-0818-04 | Dial scale (A) | ☆ | | F29-0014-05 | Insulating washer | |
| | B30-0819-05 | Pilot lamp | | L1 | L32-0628-05 | OSC coil | |
| | B42-1645-04 | Seal Bottom | | L2 | L33-0025-05 | Choke coil 1μH | |
| | B42-1671-04 | Seal Top | | L3 | L32-0629-05 | OSC coil | |
| | G01-0804-04 | Coil spring | | L4 | L32-0609-05 | OSC coil | |
| | K21-0753-04 | Main knob | | L5 | L40-1021-03 | Ferri-inductor 1mH | |
| | X40-1170-00 | VFO unit | | L6 | L40-4711-03 | Ferri-inductor 470μH | |
| | | | | L7 | L40-1021-03 | Ferri-inductor 1mH | |
| | | | | L8 | L40-1501-03 | Ferri-inductor 15μH | |
| | | | | L9~11 | L40-4711-03 | Ferri-inductor 470μH | |
| | | | | | R92-0150-05 | Short jumper | |

PACKING

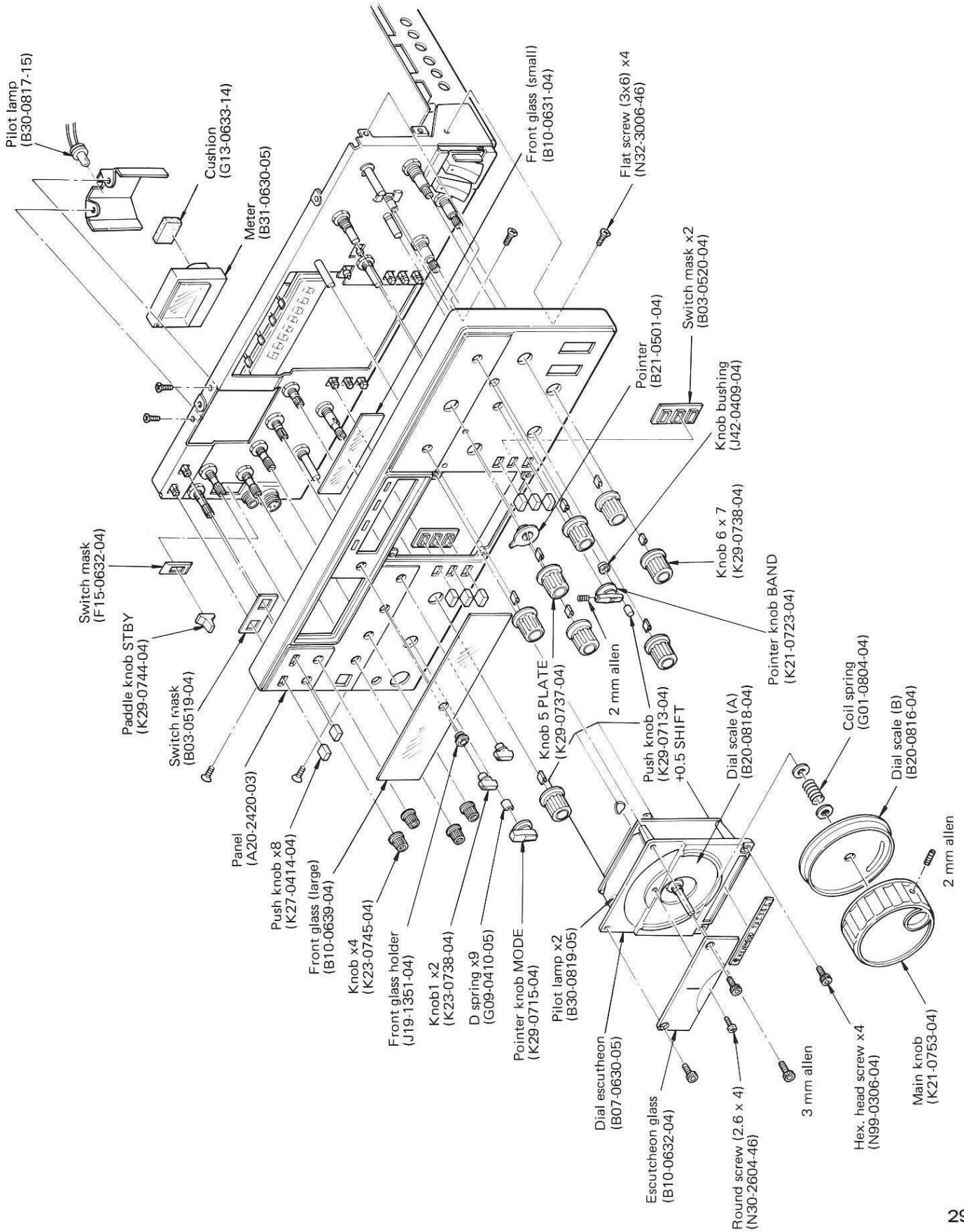
- ★ Protective bag (H25-0120-04)
- 4P MIC plug (E07-0403-05) (W),(T),(X),(M)
- 7P DIN plug (E07-0751-05)
- Phone plug (E12-0001-05)
- Fuse 4A (F05-4022-05) (W),(T),(X),(M)
- Fuse 6A (F05-6021-05) (K),(M)
- Foot (large) x2 (J02-0049-14)
- Round crew (4 x25) x2 (N30-4025-46)



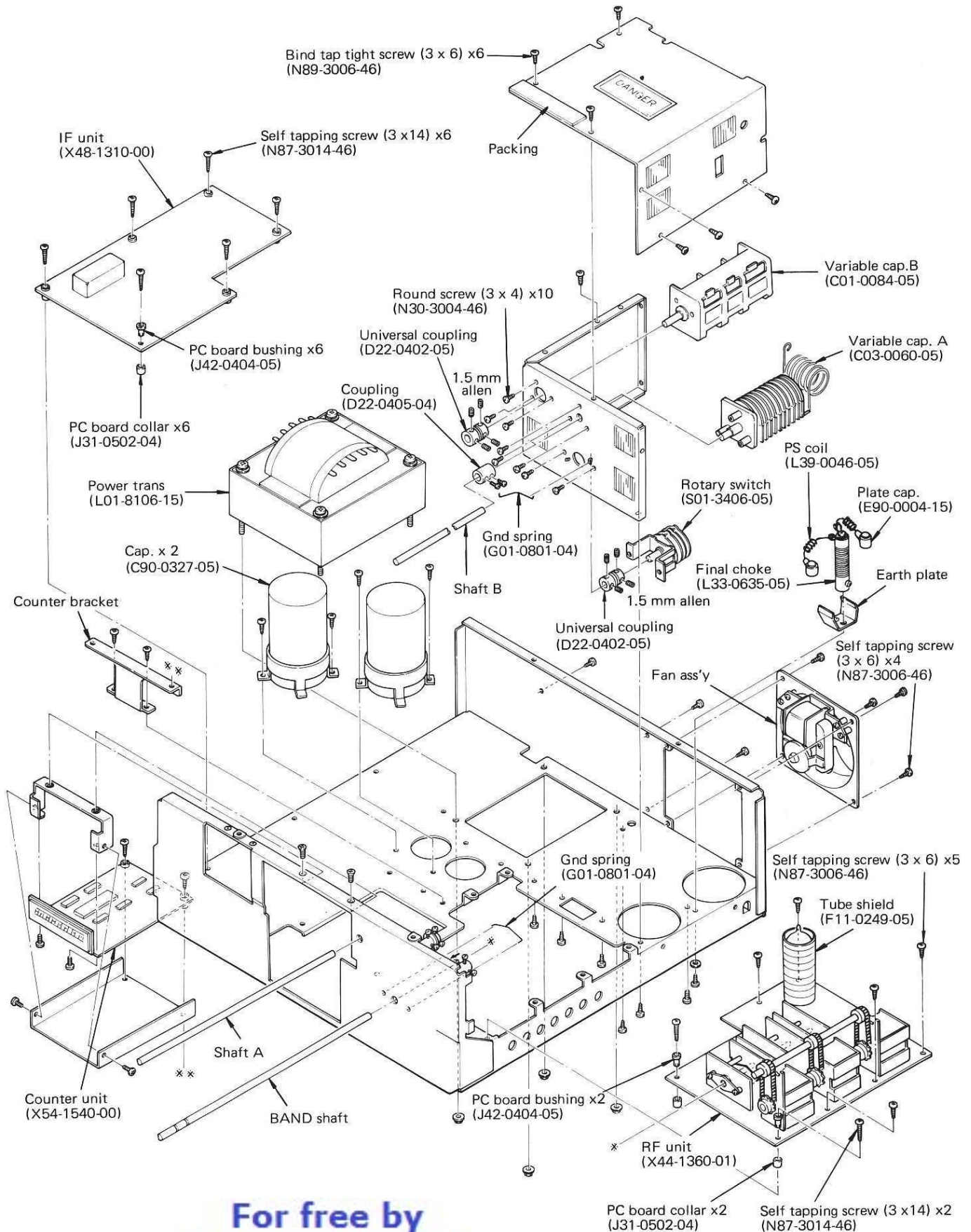
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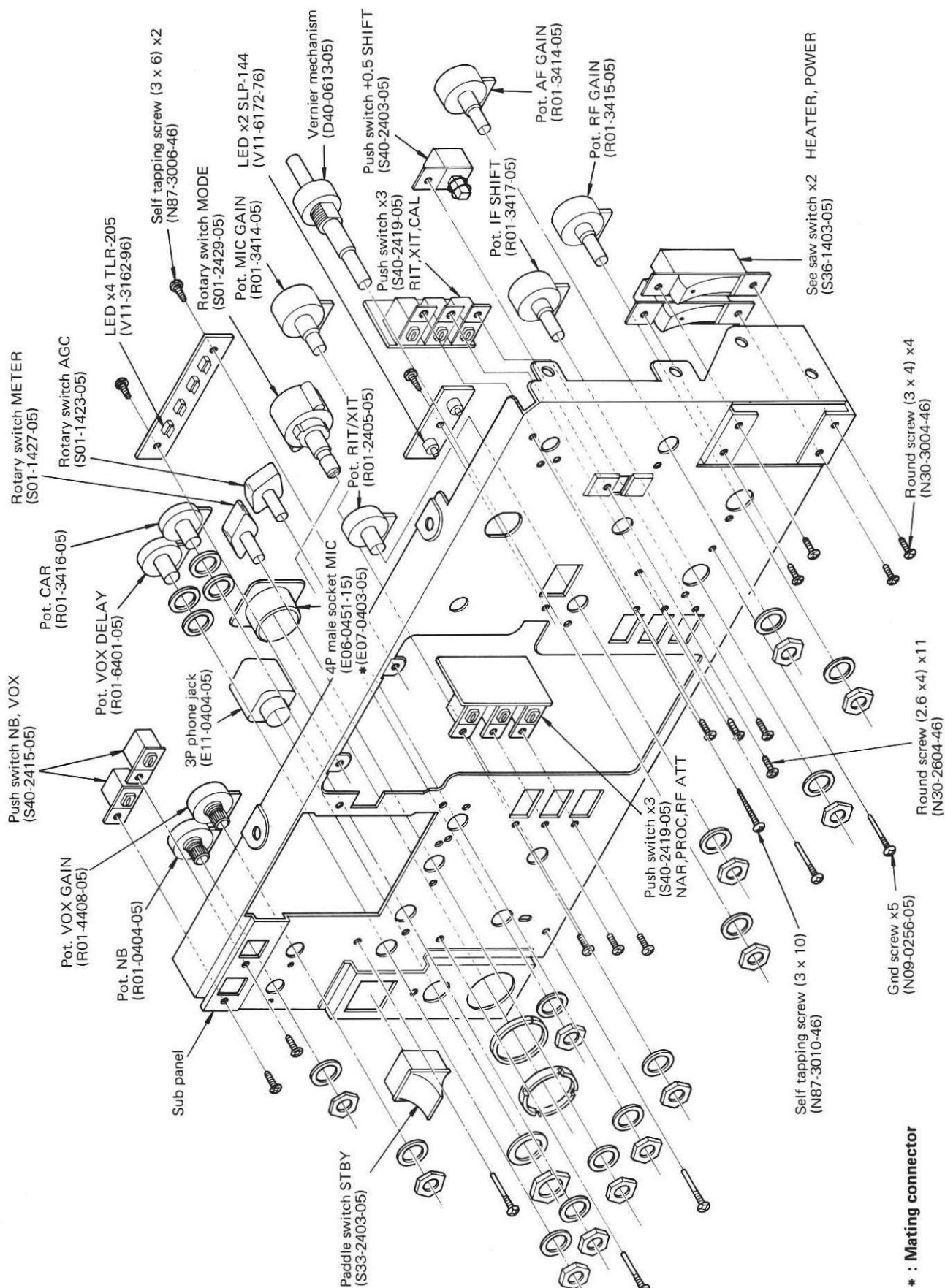
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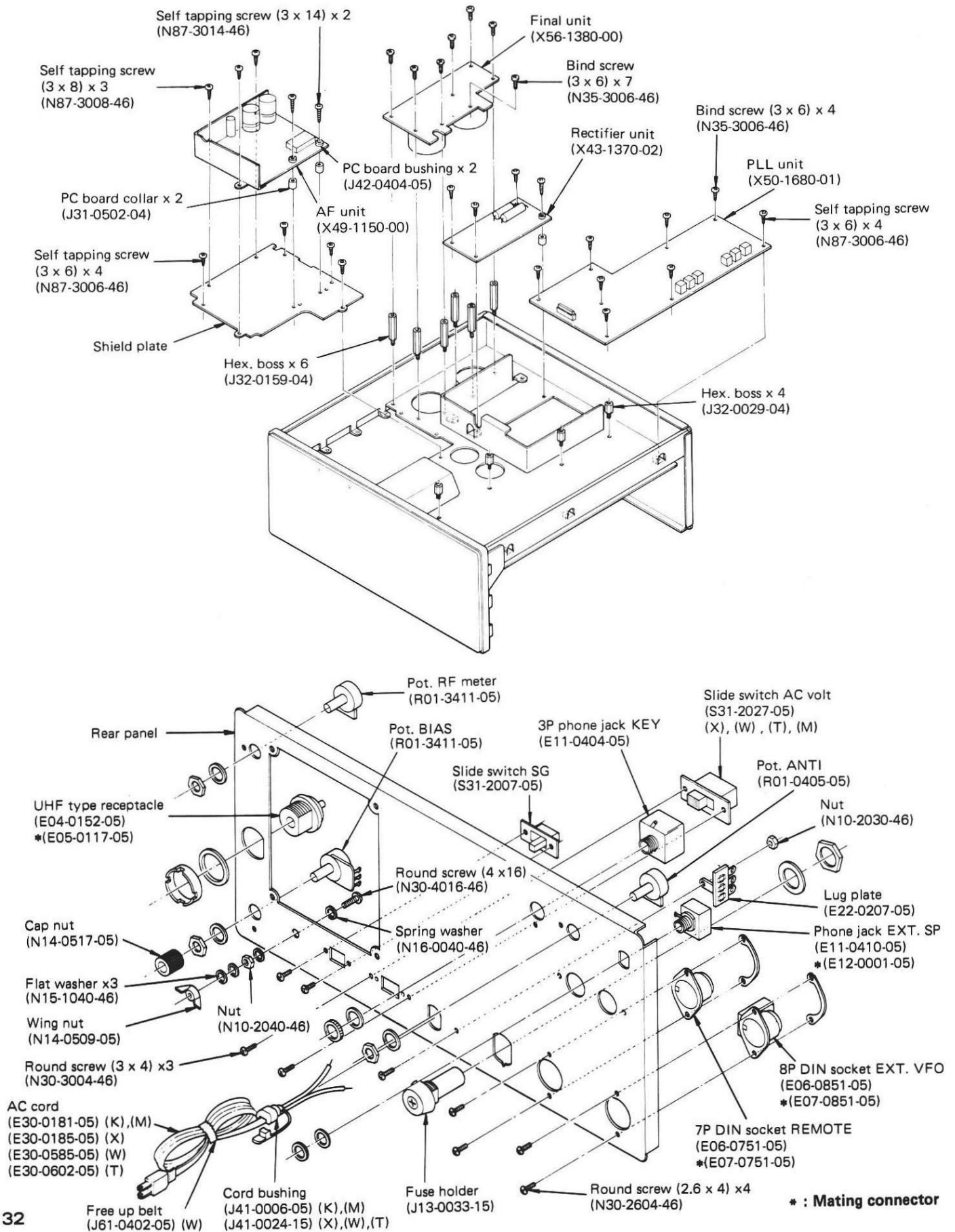
DISASSEMBLY



DISASSEMBLY



DISASSEMBLY



ADJUSTMENTS

TEST EQUIPMENT REQUIRED

1. VTVM or DVM

- 1) Input resistance: More than 1 MΩ
- 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. RF VTVM

- 1) Input impedance: 1 MΩ and less than 3 pF.
- 2) Voltage range: 10 mV to 300V
- 3) Frequency range: 50 MHz or greater

3. AF VTVM

- 1) Frequency range: 50 Hz to 10 kHz
- 2) Input impedance: 1 MΩ or greater
- 3) Voltage range: 10 mV to 30V

4. AF GENERATOR (AG)

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

5. AF DUMMY LOAD

- 1) Impedance: 8Ω
- 2) Dissipation: 3W or greater

6. RF DUMMY LOAD

- 1) Impedance: 50Ω
- 2) Dissipation: 100W continuous or greater
- 3) Frequency limits: 1.8 to 30 MHz

7. OSCILLOSCOPE

Requires high sensitivity and external synchronization capability.

8. SWEEP GENERATOR

- 1) Center frequency: 8 to 40 MHz
- 2) Sweep bandwidth: Maximum ±16 MHz
- 3) Output voltage: More than 0.1V

9. STANDARD SIGNAL GENERATOR (SSG)

- 1) Frequency range: 1.8 to 30 MHz
 - 2) Output: -20 dB/0.1 μV~120 dB/1V
 - 3) Output Z= 50Ω
- Generator must be frequency stable.

10. FREQUENCY COUNTER

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

11. NOISE GENERATOR

Must generate ignition-like noise containing harmonics beyond 30 MHz.

12. Spectrum analyzer

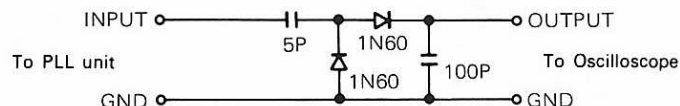
- 1) Frequency range: 100 kHz to 110 MHz
- 2) Bandwidth: 1 kHz to 3 MHz

NOTE:

R-1000 receiver may be used.

13. Detector

For adjustment of PLL unit BPF.



14. Directional coupler

15. 8P DIN connector

Refer to Fig. 9 on page 43.

PREPARATION

Unless otherwise specified, set the controls as follows.

Rear panel

SG SW OFF



Front panel

| | | | |
|----------|----------|-----------|-----|
| MODE | TUNE | MIC GAIN | MIN |
| CAR | MIN | RF GAIN | MAX |
| VOX | OFF | PROC | OFF |
| METER | IP | BAND | 1.5 |
| RIT/XIT | CENTERED | AGC | OFF |
| HEATER | OFF | VOX GAIN | MIN |
| NB | OFF | RIT | OFF |
| RF ATT | OFF | CAL | OFF |
| XIT | OFF | VOX DELAY | MIN |
| IF SHIFT | CENTERED | AF GAIN | MIN |
| | | NB LEVEL | MIN |

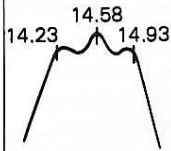
ADJUSTMENTS

| Item | Condition | Measurement | | | Adjustment | | | Specification | Remarks | |
|----------------------------------|--|----------------|------------|-------------------------------|--|------------|---|---|---|-----------------------|
| | | Test equipment | Unit | Terminal | Unit | Parts | Method | | | |
| 1. 9V AVR and 3.2V adjustment | | DVM | AF | TP-6 Pin-5, connector ⑪ | AF | VR2 VR3 | 9V 3.2V | 9V±0.05V 3.2V±0.05V | RF1 (FET bias) | |
| 2. Base current adjustment | SG SW : ON MODE: USB METER : IP HEATER : ON DRIVE :Fully clockwise STBY : SEND BIAS pot. : Adjust just | 1P meter | | | | | | | | |
| | STBY REC, SG SW OFF | | | | | Rear panel | Bias pot. | | Set to 60mA | Set to 30mA (TS-530D) |
| 3. Carrier adjustment① | IF SHIFT : Centered MODE : USB | RF VTVM | IF | Pin1, connector ⑧ | PLL | NOTE : T16 | 0.3V | 0.3V±1 dB | NOTE : The slug of T16 should be turned counter clockwise for this adjustment after the peak point is determined. | |
| | MODE : LSB STBY : REC ↓ SEND | F. counter | | | | VR2 | Obtain the same frequency for both transmission and reception | ±20 Hz | | |
| | STBY : REC | | | | | TC2 | 8828.50 kHz | | | |
| | MODE : USB | | | | | TC3 | 8831.50 kHz | | | |
| | MODE : CW STBY : SEND | | | | | VR3 | 8830.70 kHz | | | |
| | STBY : REC | | | | | | | | | |
| 4. IF SHIFT check | MODE : LSB Rotate the IF SHIFT and check the variation | F. counter | IF | Pin 1, connector ⑧ | | | | Set IF SHIFT to center. More than + 1.1 kHz , Less than -1.1 kHz. | | |
| | MODE : USB Same as above | | | | | | | | | |
| | STBY : SEND Regardless of the IF SHIFT setting | | | | | | | | 8831.50 kHz | USB |
| | STBY : REC | | | | | | | | 8828.50 kHz | LSB |
| 5. VFO, RIT check and adjustment | Scale 0~500 | | | | | | | Should rotate smoothly and have no abnormal noise. | | |
| | Rear panel SG SW OFF | RF VTVM | PLL | Pin 1, connector ⑧ 2P(GND) | Adjust if the voltage is out of specification. | | | 200 mV± 1 dB | | |
| | VFO : 250 | | | | VFO | TC2 | 200mV | | | |
| | MODE : CW STBY : SEND | F. counter | Rear panel | EXT VFO 1P, 7P (GND) | Adjust if the frequency is out of specification. | | 800 Hz UP | 800±50 Hz | CW SHIFT | |

ADJUSTMENTS

| Item | Condition | Measurement | | | Adjustment | | | Specification | Remarks |
|-------------------------------|---|----------------|------------|----------|--------------------------------------|--|--|---|--|
| | | Test equipment | Unit | Terminal | Unit | Parts | Method | | |
| | STBY : REC Set the VFO dial to 50. At this time set the CAL control to the index. | F.counter | Rear panel | EXT VFO | VFO | L3 | | 5550.00 kHz ± 200 Hz | Repeat the adjustment several times until the frequency is within specification. |
| | 1P 7P (GND) | | | TC1 | | 5950.00 kHz ± 200 Hz | | | |
| | Tune to 5550.00 kHz with the main tuning knob. | | | | |  | The 50 kHz point on the dial scale must be aligned to the index. | | |
| Dial calibration, electrical. | Tune to the CAL signal in order : 0, 100, 200, 300, 400, and 500 to check dial calibration at each 100 kHz point. | | | | 0 100 200 300 400 500 | 5.5 MHz 5.6 5.7 5.8 5.9 6.0 | | Within ± 2.5 kHz | Check the dial scale (Electrically) |
| Backlash | Calibrate the dial at 0 kHz. Tune to 250kHz, then reverse direction and tune back to 0kHz without rocking the dial, and stop. | | | | | | | Less than 400Hz Backlash | Backlash |
| Dial calibration mechanical | Repeat electrical dial scale check procedure (for mechanical spec). | | | | | |  | Calibration should come in contact with the dial pointer. | Check the dial scale (mechanically). |
| | RIT : Centered RIT SW : ON Set the VFO main control to 5750.000 kHz | | | | IF | VR5 | | 5750.000 kHz | |
| | Check that the same frequency is obtained when the RIT switch is turned ON and OFF. | | | | | | | Within ± 50 Hz | |
| | RIT SW : ON VFO : 250 RIT control : fully counter-clockwise (⊖ position) RIT control: fully clockwise (⊕ position). | | | | | | | | -1.5kHz or less +1.5kHz or more Reference to the center (ϕ position of the RIT control). |

ADJUSTMENTS

| Item | Condition | Measurement | | | Adjustment | | | Specification | Remarks | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------------------|---|---|---------------|-----------------|------------|-------------------|---|---|---------|-----------------|--|--|--|--|------|------|-----|-----------|------------------|-----------|-----|----|-----|-------|-------|-------|--|--|---|-------|---------------|-------|--|----|----|-------|-------|-------|--|--|----|-------|--------------|-------|--|----|----|-------|--------------|-------|--|----|----|-------|--------------|-------|--|----|------|-------|-------|-------|--|--|----|-------|-------|-------|--|----|------|-------|-------|---------------|--|--|----|-------|-------|-------|--|--|------|-------|-------|-------|--|--|--|--|
| | | Test equipment | Unit | Terminal | Unit | Parts | Method | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | RIT OFF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6. Reference oscillator adjustment | | F. counter | PLL | TP2 | PLL | TC1 | 1000.000 kHz | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7. VCO adjustment and check | Check the frequencies at the following points and adjust coils until those given in brackets are obtained. | F. counter DVM | PLL PLL | D40 TP1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | <table border="1"> <thead> <tr> <th rowspan="2">VFO BAND</th> <th>0</th> <th>250</th> <th>500</th> <th colspan="2">Adjusting point</th> </tr> <tr> <th></th> <th></th> <th></th> <th>Unit</th> <th>Part</th> </tr> </thead> <tbody> <tr> <td>1.5</td> <td>10.33 MHz</td> <td>10.58 MHz (4.0V)</td> <td>10.83 MHz</td> <td>PLL</td> <td>T2</td> </tr> <tr> <td>3.5</td> <td>12.33</td> <td>12.58</td> <td>12.83</td> <td></td> <td></td> </tr> <tr> <td>7</td> <td>15.83</td> <td>16.08 (4.75V)</td> <td>16.33</td> <td></td> <td>T1</td> </tr> <tr> <td>10</td> <td>18.83</td> <td>19.08</td> <td>19.33</td> <td></td> <td></td> </tr> <tr> <td>14</td> <td>22.83</td> <td>23.08 (4.5V)</td> <td>23.33</td> <td></td> <td>T3</td> </tr> <tr> <td>18</td> <td>26.83</td> <td>27.08 (5.0V)</td> <td>27.33</td> <td></td> <td>T4</td> </tr> <tr> <td>21</td> <td>29.83</td> <td>30.08 (3.5V)</td> <td>30.33</td> <td></td> <td>T6</td> </tr> <tr> <td>24.5</td> <td>33.33</td> <td>33.58</td> <td>33.83</td> <td></td> <td></td> </tr> <tr> <td>28</td> <td>36.83</td> <td>37.08</td> <td>37.33</td> <td></td> <td>T5</td> </tr> <tr> <td>28.5</td> <td>37.33</td> <td>37.58</td> <td>37.83 (4.75V)</td> <td></td> <td></td> </tr> <tr> <td>29</td> <td>37.83</td> <td>38.08</td> <td>38.33</td> <td></td> <td></td> </tr> <tr> <td>29.5</td> <td>38.33</td> <td>38.58</td> <td>38.83</td> <td></td> <td></td> </tr> </tbody> </table> | | | | VFO BAND | 0 | 250 | 500 | Adjusting point | | | | | Unit | Part | 1.5 | 10.33 MHz | 10.58 MHz (4.0V) | 10.83 MHz | PLL | T2 | 3.5 | 12.33 | 12.58 | 12.83 | | | 7 | 15.83 | 16.08 (4.75V) | 16.33 | | T1 | 10 | 18.83 | 19.08 | 19.33 | | | 14 | 22.83 | 23.08 (4.5V) | 23.33 | | T3 | 18 | 26.83 | 27.08 (5.0V) | 27.33 | | T4 | 21 | 29.83 | 30.08 (3.5V) | 30.33 | | T6 | 24.5 | 33.33 | 33.58 | 33.83 | | | 28 | 36.83 | 37.08 | 37.33 | | T5 | 28.5 | 37.33 | 37.58 | 37.83 (4.75V) | | | 29 | 37.83 | 38.08 | 38.33 | | | 29.5 | 38.33 | 38.58 | 38.83 | | | | |
| VFO BAND | 0 | 250 | 500 | Adjusting point | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | Unit | Part | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.5 | 10.33 MHz | 10.58 MHz (4.0V) | 10.83 MHz | PLL | T2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.5 | 12.33 | 12.58 | 12.83 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | 15.83 | 16.08 (4.75V) | 16.33 | | T1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | 18.83 | 19.08 | 19.33 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | 22.83 | 23.08 (4.5V) | 23.33 | | T3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 18 | 26.83 | 27.08 (5.0V) | 27.33 | | T4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 21 | 29.83 | 30.08 (3.5V) | 30.33 | | T6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 24.5 | 33.33 | 33.58 | 33.83 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 28 | 36.83 | 37.08 | 37.33 | | T5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 28.5 | 37.33 | 37.58 | 37.83 (4.75V) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 29 | 37.83 | 38.08 | 38.33 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 29.5 | 38.33 | 38.58 | 38.83 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Check the level at each of the above points. | RF VTVM | RF | TP3 | | | | 1V +3 dB -2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PLL lock range | Both edges of the VFO frequency in each band. | | | | | | | Display should indicate. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8. BPF-A | Disconnect connectors ① and ⑤ on the PLL unit. Connect the cathode of D24 (1S1555) to the jumper wire next to R44 with a clip lead. Connect the sweep generator RF output to the EXT-VFO connector. | Sweep generator Oscilloscope | PLL | Q35 Ⓔ | PLL | T13 T14 T15 | Adjust until the response shown to the right is obtained. |  | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

ADJUSTMENTS

| Item | Condition | Measurement | | | Adjustment | | | Specification | Remarks |
|--------------------------------|--|------------------------------|------------|-------------|------------|---|---|---------------|------------------------|
| | | Test equipment | Unit | Terminal | Unit | Parts | Method | | |
| 9. BPF-B adjustment | Disconnect connectors ① and ⑤ on the PLL unit. Connect the cathode of D27 (1S1555) to the jumper wire next to R44 with a clip lead. Connect the cathode of D50 (1S1587) to the jumper wire next to TC1 with a clip lead. Connect the RF output of the sweep generator to R111(100Ω) via a 15pF capacitor. | Sweep generator Oscilloscope | PLL | Q35 ⑥ | PLL | T7 T8 T9 T17 | Adjust T7~T9 until the response shown at the right is obtained. Then adjust T17 for maximum amplitude. | | |
| 10. BPF-C adjustment | Disconnect connectors ① and ⑤ on the PLL unit. Connect the cathode of D26 (1S1555) to the jumper wire next to R44 with a clip lead. Connect the cathode of D50 (1S1587) to the jumper wire next to TC1 with a clip lead. | | | | | T10 T11 T12 T18 | Adjust T10 through T12 until the band response shown at right is obtained. Then adjust T18 for maximum amplitude. | | |
| 11. Carrier balance adjustment | IF SHIFT : Centered RF GAIN : Fully counter-clockwise | RF VTVM | IF | Drain of Q4 | IF | TC2 | Minimum | | Reference approx. 5 mV |
| 12. IF AMP adjustment | BAND : 1.5 VFO : 400 DRIVE : 12 : 00 RF GAIN : fully clockwise IF SHIFT : Centered RF ATT : OFF MODE : USB AGC : OFF NB SW : OFF SG SW : OFF Connect the SSG output (1.9MHz, 40dB) to the antenna terminal. While adjusting, gradually decrease the SSG output level down to -6dB. | AF VTVM Oscilloscope | Rear panel | EXT. SP | RF | ANT coil 1.8 | Max. audio output | | |
| | | | | | | RF coil 1.8 | | | |
| | | | | | IF | T2 L2 L5 L6 L7 L8 L10 | | | |

ADJUSTMENTS

| Item | Condition | Measurement | | | Adjustment | | | Specification | Remarks | | | | |
|---------------------------|--|----------------------|------------|----------|------------|-------------------------|------------------------|---------------|---|--------|-------|------|---------|
| | | Test equipment | Unit | Terminal | Unit | Parts | Method | | | | | | |
| 13. Coil pack adjustment | Connect the SSG (40dB) to the ANT terminal DRIVE : 12:00 While adjusting, gradually decrease the SSG output level down to -6dB. Adjust at the following points: | AF VTVM Oscilloscope | Rear panel | EXT. SP | RF | ANT coil RF coil | Max. audio output | | | | | | |
| | | | | | | | | | | No. | BAND | VFO | f |
| | | | | | | | | | | 1 | 1.5 | 400 | 1.9 MHz |
| | | | | | | | | | | 2 | 3.5 | 250 | 3.75 |
| | | | | | | | | | | 3 | 7 | 150 | 7.15 |
| | | | | | | | | | | 4 | 10 | 125 | 10.125 |
| | | | | | | | | | | 5 | 14 | 175 | 14.175 |
| | | | | | | | | | | 6 | 18 | 125 | 18.125 |
| | | | | | | | | | | 7 | 21 | 225 | 21.225 |
| | | | | | | | | | | 8 | 24.5 | 450 | 24.950 |
| 9 | 28.5 | 300 | 28.800 | | | | | | | | | | |
| 14. Drive coil adjustment | CAL : ON CAR VR : optimum level METER : ALC HEATER : ON MODE : CW SG SW : OFF ANT : 50Ω dummy should be connected. Connect pin 2 to pin 4, connector ⑦ on the AF unit with a clip lead. Receive the marker frequency in the following bands and obtain the peak level by adjusting the DRIVE control. Set the STBY switch to SEND and adjust each drive coil. | 50Ω dummy | | | RF | DRIVE coil | Max. ALC meter reading | | NOTE: The 50Ω dummy should be connected to the ANT terminal. Otherwise drive tuning will be incorrect. () : See note BEFORE adjustment Note : <p style="text-align: center;">TRANSMITTING ON WARC BANDS</p> As supplied, the TS-530S will receive but not transmit on the 3 new WARC bands. If transmit capability is desired, a minor wiring change is required. 1. For all 3 bands : Break the line between the RF unit X44-1360-01, connector #6, Pin #1 (TOF terminal) and AF unit X49-1150-00, connector #7, Pin #4 (TOF terminal). 2. Or, for individual Bands : On the RF unit X44-1360-01 : | | | | |
| | | | | | | | | | | BAND | VFO | | |
| | | | | | | | | | | 1.5 | 400 | 1.8 | |
| | | | | | | | | | | 3.5 | 250 | 3.5 | |
| | | | | | | | | | | 7 | 150 | 7 | |
| | | | | | | | | | | (10) | (125) | 10 | |
| | | | | | | | | | | 14 | 175 | 14 | |
| | | | | | | | | | | (18) | (125) | 18 | |
| | | | | | | | | | | 21 | 225 | 21 | |
| | | | | | | | | | | (24.5) | (450) | 24.5 | |
| 28.5 | 300 | 28 | | | | | | | | | | | |
| | STBY : REC | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

ADJUSTMENTS

| Item | Condition | Measurement | | | Adjustment | | | Specification | Remarks |
|---------------------------------|---|-------------------------|------------|------------|------------|-----------|--|---------------|--|
| | | Test equipment | Unit | Terminal | Unit | Parts | Method | | |
| | BAND : 14 VFO : 175 STBY : SEND Adjust the CAR control until the ALC meter reads maximum. | | | | IF RF | L13 T4 | Max. ALC meter reading | | |
| | STBY : REC Disconnect clip lead from connector ⑦. | | | | | | | | |
| 15. IF TRAP adjustment | BAND : Between 1.5 and AUX. Connect the SSG (8.83 MHz, 80dB) to the ANT terminal. | Oscilloscope AF VTVM | Rear panel | EXT. SP | RF | L3 L4 | Adjust alternately for minimum | | Preset the slugs of L3 and L4 fully clockwise. |
| 16. VFO MIX spurious adjustment | BAND : 3.5 VFO : 388 MODE : LSB Connect the SSG output (3.888 MHz, 60dB) to the ANT terminal. 1) Adjust the SSG frequency to obtain zero beat. 2) Turn the VFO tuning to dial 384 to obtain a spurious beat. | Oscilloscope AF VTVM | Rear panel | EXT. SP | PLL | VR1 | minimum beat output | | The position of VR1 after adjustment should be approximately centered. |
| 17. S meter adjustment | AGC : OFF | | | | IF | VR1 | Set to the deflection starting point. | | |
| | BAND : 14 VFO : 175 AGC : FAST Connect the SSG (14.174 MHz, 8dB) to the ANT terminal. | Oscilloscope AF VTVM | Rear panel | EXT. SP | | | Adjust the DRIVE control for maximum AF output. | | |
| | SSG output : 40dB | | | | IF | L8 | Turn the coil slug counterclockwise until S-1 is obtained. | | |
| | SSG output : 40dB | | | | | VR2 | Set to S-9 | | Repeat S-1,9 adjustment several times. |
| 18. NB adjustment | NB LEVEL : fully counterclockwise BAND : 14 VFO : 175 Connect the SSG output (14.175 MHz 60dB) to the ANT terminal. SSG output : 20dB Adjust as described above. | DVM | AF | TP4 | AF | T1 T2 | Minimum | | |

ADJUSTMENTS

| Item | Condition | Measurement | | | Adjustment | | | Specification | Remarks |
|--|--|------------------------------|------------|----------|------------|----------------------------|----------|--|----------------------------|
| | | Test equipment | Unit | Terminal | Unit | Parts | Method | | |
| NB adjustment | AGC : FAST | Speaker | Rear panel | EXT. SP | | | | | |
| | Disconnect the SSG output from the ANT terminal, and connect the noise generator output in it's place. Set the noise generator output level to S5~7. | | | | | | | | |
| | NB : ON | | | | | | | The NB must provide adequate effect. | |
| | | | | | | | | If adequate effect is not obtained, repeat the adjustment several times. | |
| | Reduce the noise generator output level to below the threshold of sensitivity. Turn the NB LEVEL control fully clockwise. | | | | | | | Noise must be blanked. | |
| | NB : OFF | | | | | | | | |
| 19. Neutralization trimmer adjustment | +0.5 SHIFT : ON | Power meter Sync'ed scope | Rear panel | ANT | | | | | Tune-up for MAX RF output. |
| | VFO :300 SG SW : ON STBY : SEND Tune the DRIVE, PLATE and LOAD | | | | | | | | |
| | SG SW : OFF | | | | | | | RF output must be 0. | |
| | METER : ALC Set the ALC to maximum with the DRIVE control. Increase oscilloscope sensitivity. | | | | | Neutralization trimmer TC1 | Minimum | | |
| | Reduce oscilloscope sensitivity (5V/div.). SG SW : ON | | | | | | | The normal power must be obtained. The signal waveform must be normal. | |
| 20. Side tone, semi-break-in function adjustment | Connect a power meter to the ANT terminal. Plug key into the rear Key jack to transmit in any band. Operate the key. | Oscilloscope AF VTVM | Rear panel | EXT. SP | AF | VR1 | 0.63V/8Ω | | |
| | | | | | | | | | |
| | STBY : REC VOX : ON Operate the key | | | | | | | The key must control RF output. | |
| | | | | | | | | Semi-break- in operation should be available. | |

ADJUSTMENTS

| Item | Condition | Measurement | | | Adjustment | | | Specification | Remarks | | | | |
|---------------------------------------|--|---|------------|----------|------------|---------------|--|-----------------|----------------------------|--|----|---------|--|
| | | Test equipment | Unit | Terminal | Unit | Parts | Method | | | | | | |
| 21. Transmission spurious adjustment | Connect pin2 and 4 of connector ⑦ on the AF unit with a clip lead. Set the BAND switch to 18, and VFO to 125. Connect a power meter to the ANT terminal. Set the STBY switch to SEND and tune up. STBY : REC Disconnect clip lead from connector ⑦ | Spectrum analyzer (receive 17.66MHz with a monitor receiver.) | Rear panel | ANT | RF | VR2 | Minimum (Monitor level) | Less than -40dB | | | | | |
| | | | | | | | | | | | | | |
| 22. RF meter adjustment | BAND : 14 VFO : 175 METER : RF Connect a power meter to the ANT terminal. Tune up. STBY : REC | | | | Rear panel | RF Meter Pot. | Set the meter to read 250 on the IP scale. | | | | | | |
| 23. Carrier suppression adjustment | BAND : 14 VFO : 175 MODE : CW Connect power meter to ANT. STBY : SEND MODE : USB MODE : LSB ↓ USB MODE : CW Sync'ed scope level calibration MODE : USB, LSB STBY : REC | Sync'ro scope | Rear panel | ANT | | | | | Tune-up for max RF output. | | | | |
| | | | | | | | | | | | IF | VR4 TC1 | Adjust alternately until minimum output is obtained. |
| | | | | | | | | | | | | | Adjust until no level difference exists between LSB and USB. |
| | | | | | | | | | | | | | Note scope deflection level. |
| | | | | | | | | | | | | | Less than -50dB |
| 24. SSB frequency response adjustment | BAND : 14 VFO : 175 MODE : USB Connect the AG (1500 Hz, 7mV) to the MIC input connector. STBY : SEND Tune up. Set to 50W output with MIC GAIN control. | Power meter Sync'ed scope | Rear panel | ANT | | | | | | | | | |

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ADJUSTMENTS

| Item | Condition | Measurement | | | Adjustment | | | Specification | Remarks |
|---------------------------------|--|----------------|------|----------|------------|------------|--|-----------------|---------|
| | | Test equipment | Unit | Terminal | Unit | Parts | Method | | |
| | AG : 300Hz ↓ 2700Hz | | | | PLL | TC3 | Adjust until the same level is obtained for both 300Hz and 2700Hz (equal audio rolloff). | | |
| | MODE : LSB same as above | | | | | TC2 | | | |
| | AG : 400Hz AG : 2600Hz | | | | | | More than 1/2 with respect to the 1500Hz signal level observed on the scope. | | |
| | After completing the above adjustment, readjust carrier suppression (see item 23.) | | | | IF | VR4 TC1 | Minimum | Less than -50dB | |
| | STBY : REC | | | | | | | | |
| 25. Speech processor adjustment | SG SW : OFF MODE : USB PROC : OFF METER : ALC Connect the AG (1500 Hz, 10mV) to the MIC input connector. STBY : SEND Adjust the MIC gain control until the meter indicates the maximum on-scale ALC reading. | | | | | | | | |
| | PROC : ON | | | | IF | VR3 | Adjust until the same meter reading is obtained (max on-scale ALC). | | |
| | STBY : REC PROC : OFF | | | | | | | | |

ADJUSTMENTS

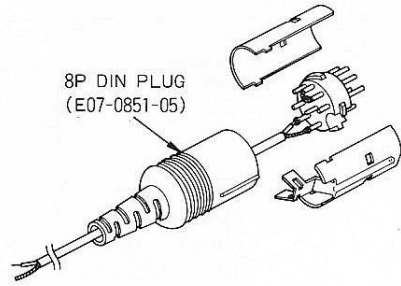


Fig. 9 8P DIN connector

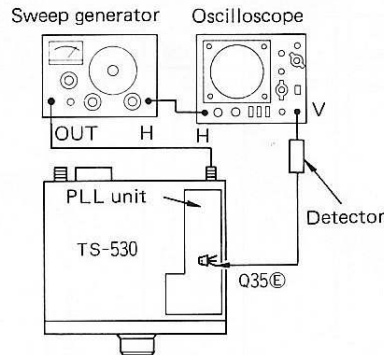


Fig. 10 (8) BPF-A, (9) BPF-B, (10) BPF-C

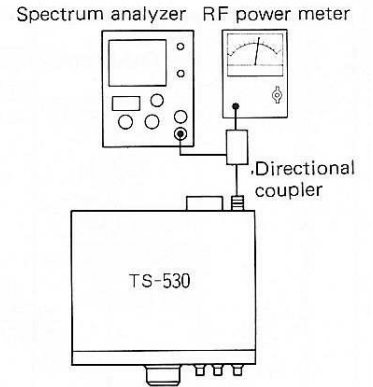
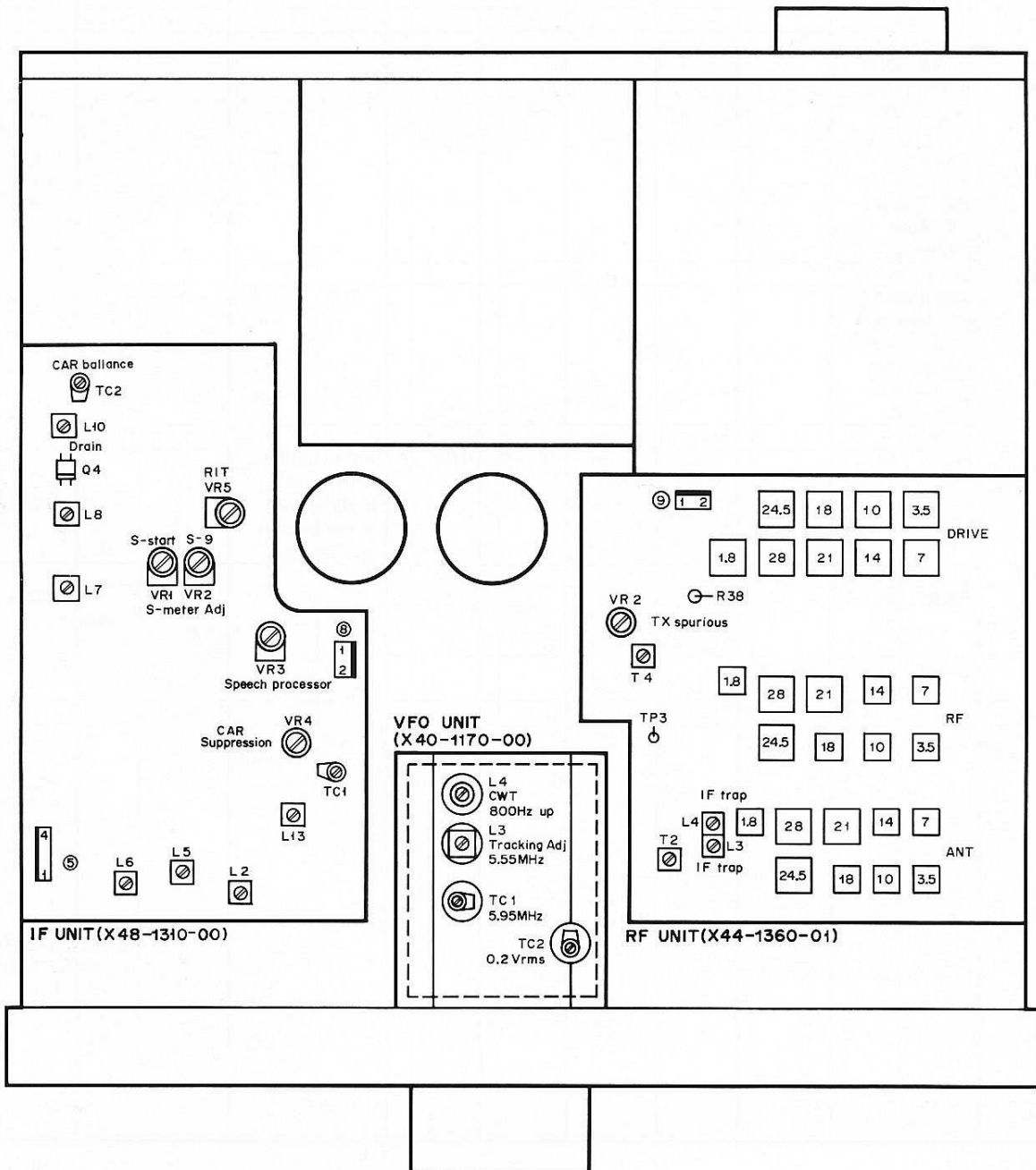


Fig. 11 (21) TX SPURIOUS

▼ TOP VIEW



ADJUSTMENTS

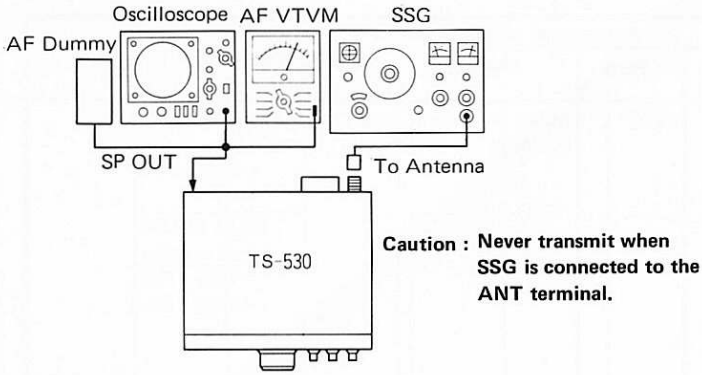
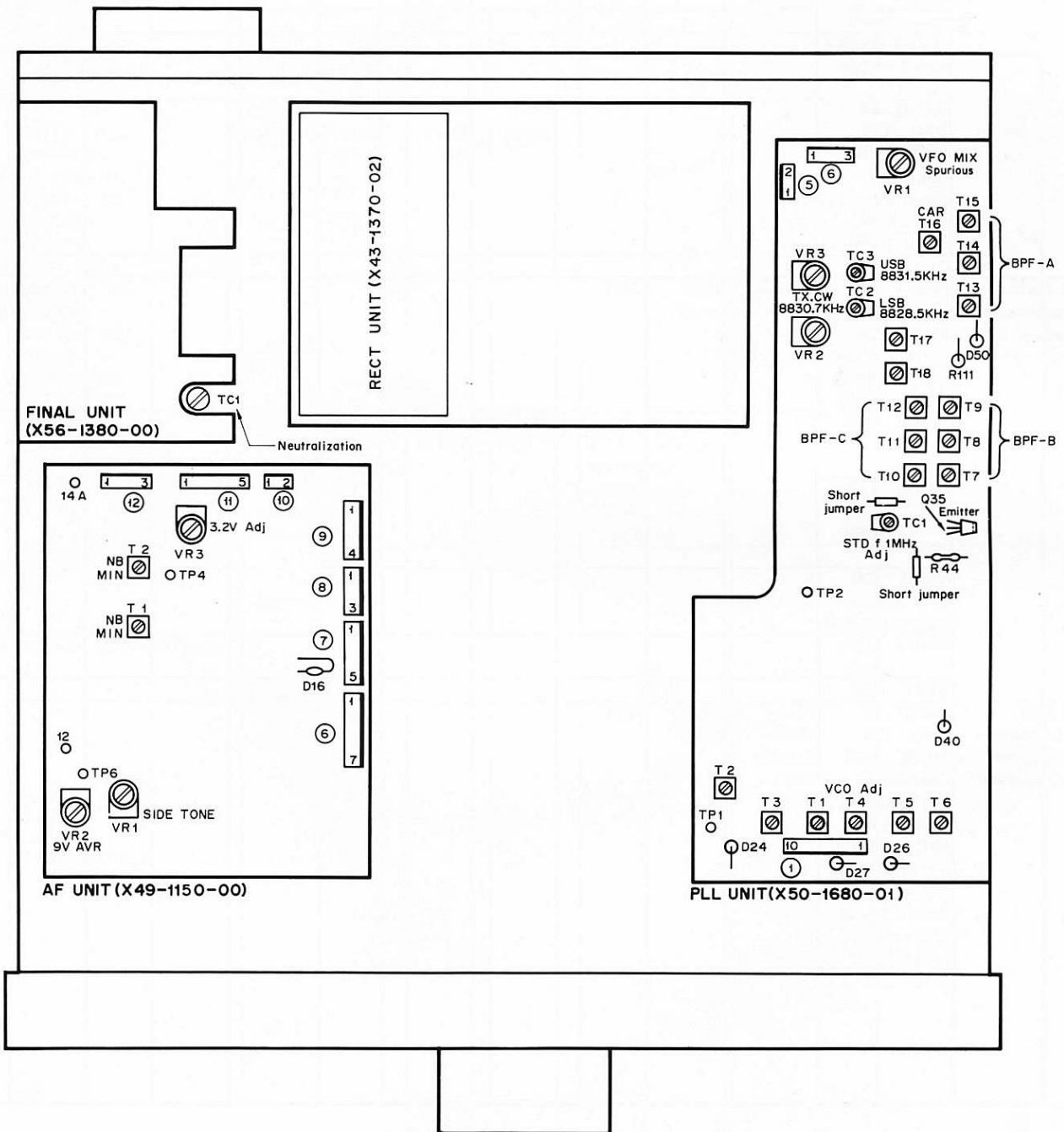


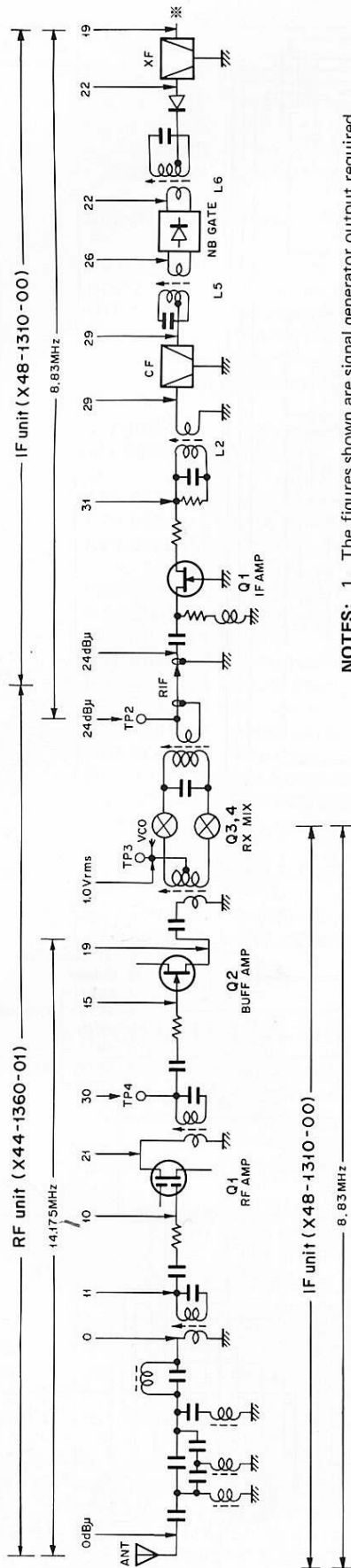
Fig. 12 (12) IF AMP, (13) COIL PACK, (15) IF TRAP

▼ BOTTOM VIEW



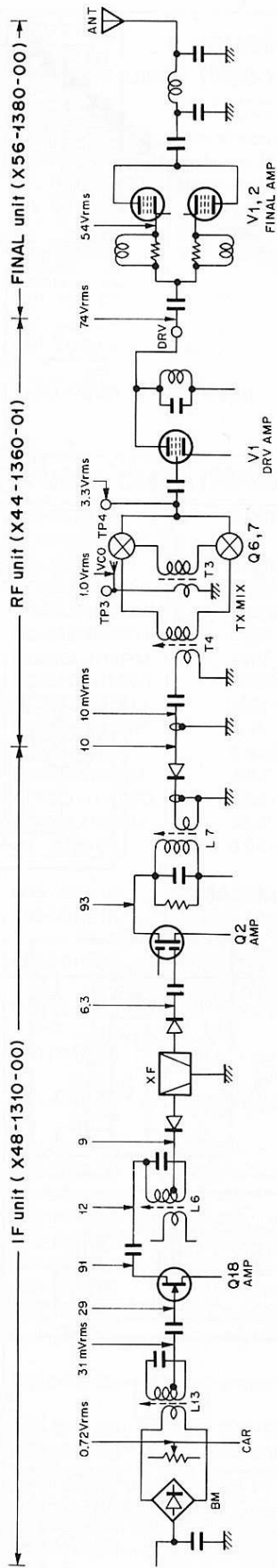
LEVEL DIAGRAM

RECEIVER SECTION



- NOTES:**
- 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 (50mW) audio output 0 dBμ signal generator input at 14.175MHz.
 - To inject signal generator connect a 0.04μF 50V capacitor between the signal generator and the check point.

TRANSMITTER SECTION



- NOTES:**
- Levels are measured at 14.175MHz in the CW MODE and SG SW OFF. Carrier level is adjusted until the meter indicates the maximum on-scale ALC reading.
 - All voltage measurements are read from an RF VTVM.
 - A probe with a capacitance of less than 3PF should be used and the ground should be made near the point of measurement.

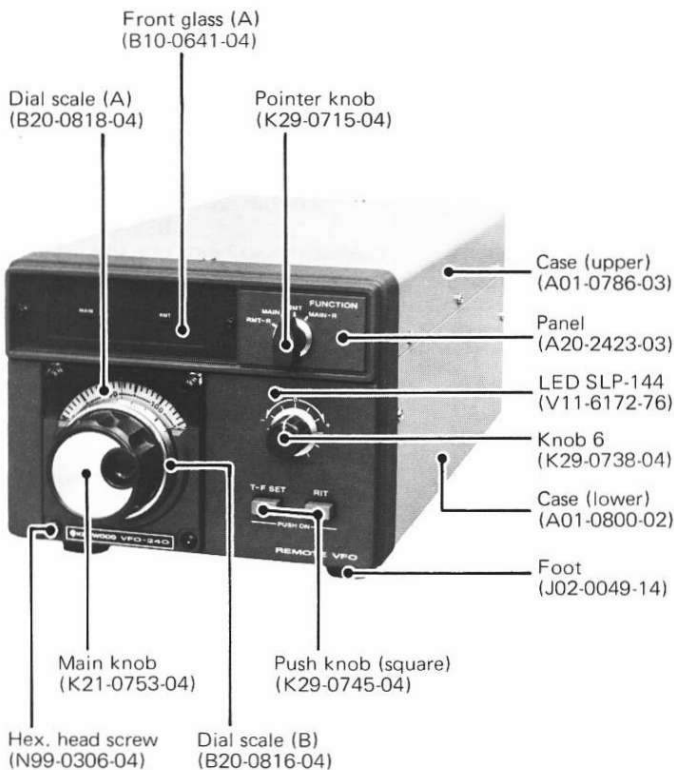
VFO-240

SPECIFICATIONS

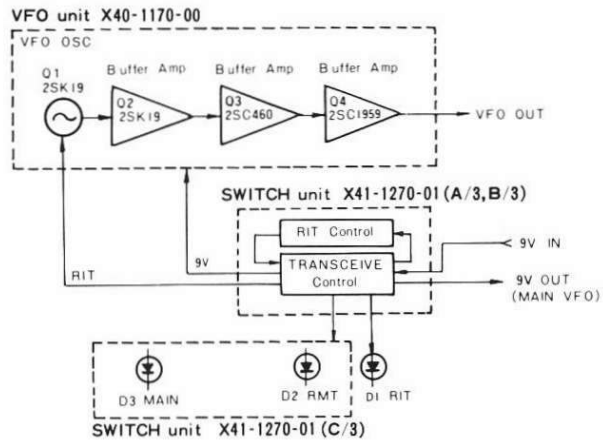
- Oscillator frequency** 5.50~6.00 MHz
Oscillator circuit..... Clapp
Output voltage 0.2V ± 1dB (across 470 ohm load)
Frequency stability Within 100 Hz per 30 minutes
 after 3 minutes warm-up
 (at room temperature)
Solid-state complement FET: 2
 Transistor: 2
 Diode: 6
Power source From TS-530S or TS-830S
Dimensions 180 (7-1/8") W × 133 (5-1/4") H
 × 288 (11-5/16") D mm (inch)
Weight 2.9 kg (6.4 lbs)

* Specifications are subject to change for improvement without notice.

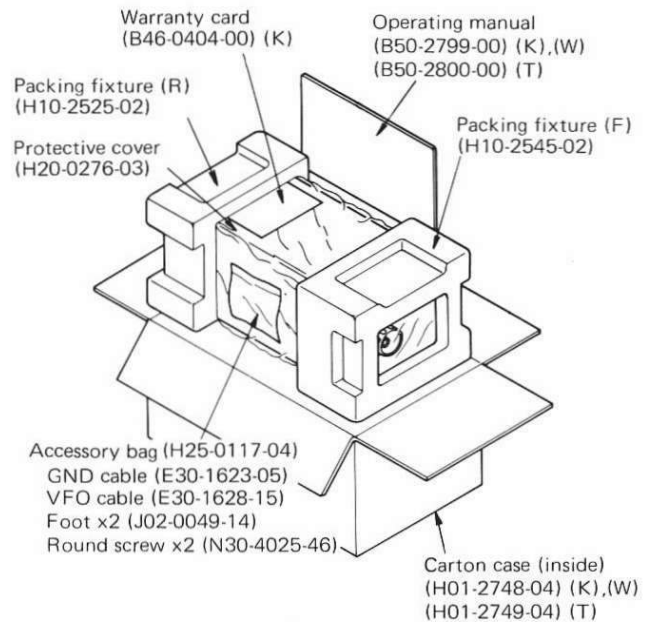
OUTSIDE VIEW



BLOCK DIAGRAM



PACKING



PARTS LIST

☆: New parts

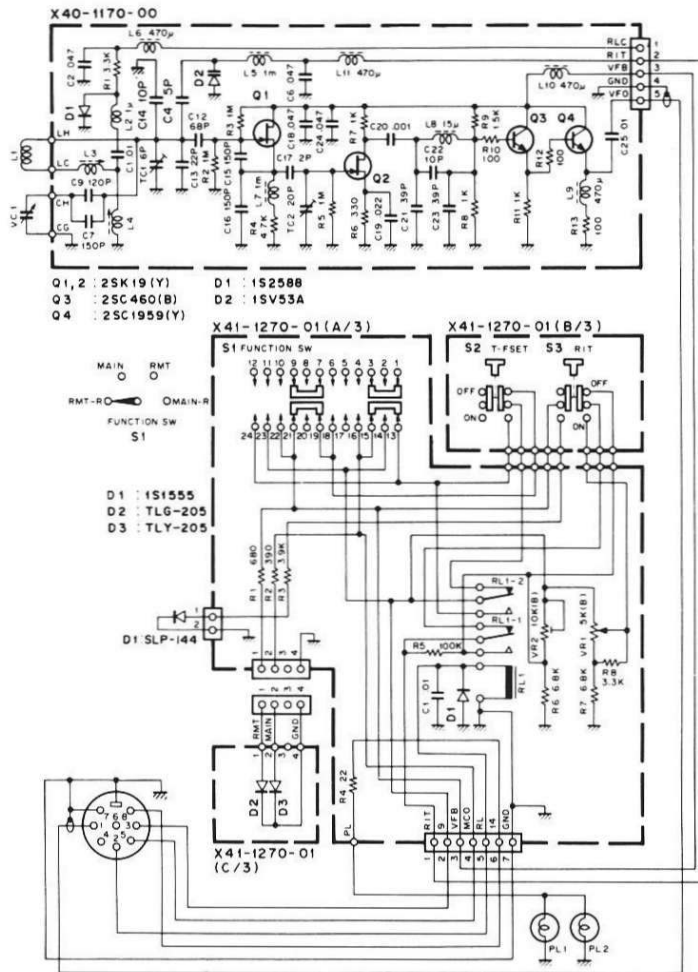
| Ref. No. | Parts No. | Description | Re- marks |
|------------------------|-------------|------------------|--------------|
| VFO-240 GENERAL | | | |
| | A01-0786-03 | Case (upper) | |
| | A01-0800-02 | Case (lower) | ☆ |
| | A20-2423-03 | Panel | ☆ |
| | B10-0641-04 | Front glass (A) | ☆ |
| | B43-0658-04 | Name plate | T ☆ |
| | B43-0659-04 | Name plate | K,W ☆ |
| | B46-0404-00 | Warranty card | K |
| | B50-2799-00 | Operating manual | K,W ☆ |
| | B50-2800-00 | Operating manual | T ☆ |

VFO-240

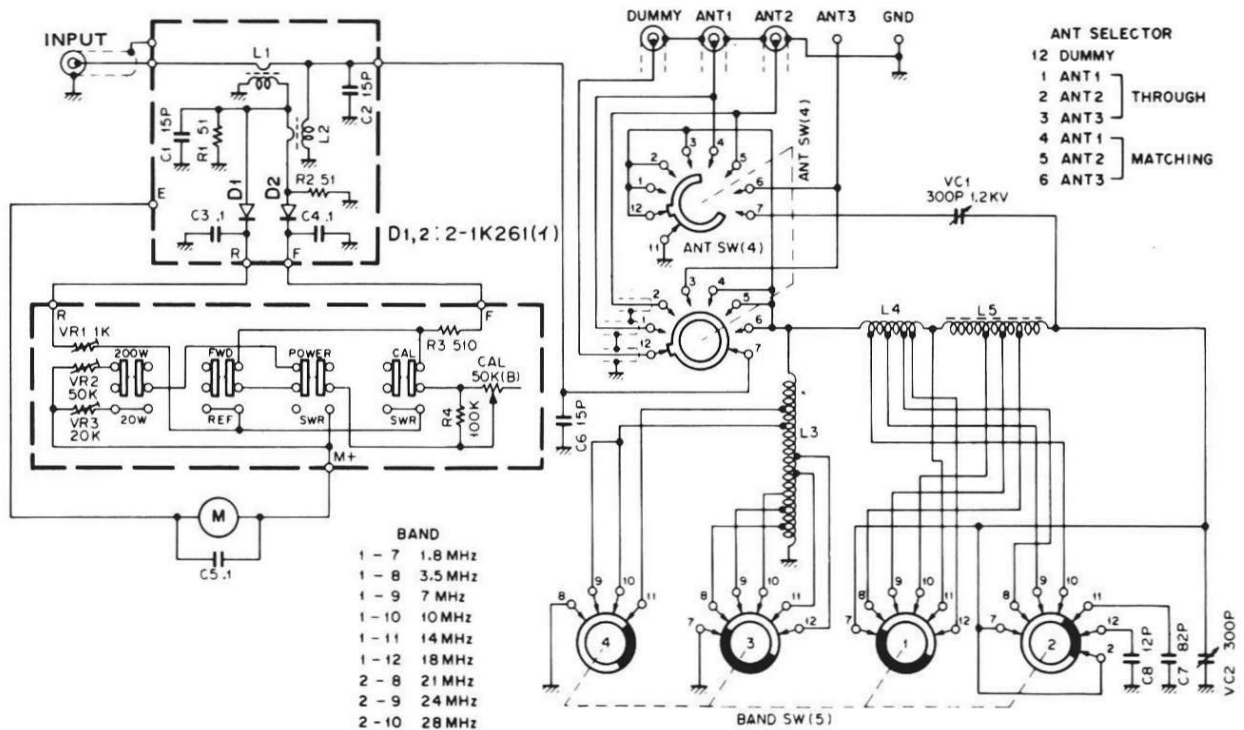
| Ref. No. | Parts No. | Description | Re- marks | Ref. No. | Parts No. | Description | Re- marks |
|----------------------------------|-------------|---------------------------------|--------------|-------------------------------------|-----------------------|----------------------|--------------|
| | E06-0852-05 | 8P DIN socket VFO OUT | | VFO ASS'Y UNIT (X60-1150-01) | | | |
| | E30-1623-05 | GND cable (accessory) | | B07-0630-05 | Dial escutcheon | | |
| | E30-1628-15 | VFO cable (accessory) | | B10-0632-04 | Escutcheon glass | | |
| | E31-2091-05 | Connector with lead (A) | ☆ | B20-0816-04 | Dial scale (B) | | |
| | E31-2092-05 | Connector with lead (B) | ☆ | B20-0818-04 | Dial scale (A) | ☆ | |
| | G09-0410-05 | D spring φ6 RIT,FUNCTION | | B30-0819-05 | Pilot lamp | | |
| | H01-2748-04 | Carton case (inside) K,W | ☆ | B42-1645-04 | Seal Bottom | | |
| | H01-2749-04 | Carton case (inside) T | ☆ | B42-1671-04 | Seal Top | | |
| | H10-2525-02 | Packing fixture (R) | | G01-0804-04 | Coil spring | | |
| | H10-2545-02 | Packing fixture (F) | | K21-0753-04 | Main knob | | |
| | H20-0276-03 | Protective cover | | X40-1170-00 | VFO unit | | |
| | H25-0117-04 | Accessory bag | | VFO UNIT (X40-1170-00) | | | |
| | J02-0049-14 | Foot (large) | | C2 | C91-0456-05 | C 0.047μF 25V | |
| | J61-0019-05 | Vinyle tie | | C4 | CC45CG1H050C | C 5pF ±0.25pF | |
| | K29-0715-04 | Pointer knob FUNCTION | | C6 | C91-0456-05 | C 0.047μF 25V | |
| | K29-0738-04 | Knob 6 RIT | | C7 | CC45LG1H151J | C 150pF | |
| | K29-0745-04 | Push knob (square) RIT, T-F SET | ☆ | C9 | CC45LG1H121J | C 120pF | |
| | N14-0115-05 | Flange nut GND | | C12 | CC45LG1H680J | C 68pF | |
| | N14-0509-05 | Wing nut GND | | C13 | CC45CG1H220J | C 22pF | |
| | N15-1040-46 | Washer GND | | C14 | CC45PG1H100D | C 10pF ±0.5pF | |
| | N16-0040-46 | Spring washer GND | | C15,16 | CC45LG1H151J | C 150pF | |
| | N30-4012-46 | Round screw Foot | | C17 | CC45CH1H020C | C 2pF ±0.25pF | |
| | N30-4016-46 | Round screw GND | | C18 | C91-0456-05 | C 0.047μF 25V | |
| | N30-4025-46 | Round screw Foot (accessory) | | C21 | CC45SL1H390J | C 39pF | |
| | N35-3006-41 | Bind screw Case | | C22 | CC45CH1H100D | C 10pF ±0.5pF | |
| | N87-4012-46 | Self tapping screw Foot | | C23 | CC45SL1H390J | C 39pF | |
| | N99-0306-04 | Hex. head screw VFO | | C24 | C91-0456-05 | C 0.047μF 25V | |
| | N99-0308-04 | Hex. head screw Front glass | ☆ | TC1 | C05-0009-15 | Ceramic trimmer 6pF | |
| D1 | V11-6172-76 | LED SLP-144 | | TC2 | C05-0013-15 | Ceramic trimmer 20pF | |
| | X41-1270-01 | Switch unit | ☆ | VC1 | C02-0019-05 | Variable cap. | |
| | X60-1150-01 | VFO ass'y unit | | D40-0614-05 | Dial mechanism ass'y | | |
| SWITCH UNIT (X41-1270-01) | | | | D40-0574-05 | Mini connect wafer 5P | | |
| | E23-0047-04 | Square terminal | | F29-0014-05 | Insulating washer | | |
| | E23-0401-05 | Round terminal | | L1 | L32-0628-05 | OSC coil | |
| | E40-0216-05 | Mini connect wafer 2P | | L2 | L33-0025-05 | Choke coil 1μH | |
| | E40-0474-05 | Mini connect wafer 4P L type | | L3 | L32-0629-05 | OSC coil | |
| | E40-0774-05 | Mini connect wafer 7P L type | | L4 | L32-0609-05 | OSC coil | |
| VR1 | R01-2407-05 | Pot. 5kΩ (B) RIT | ☆ | L5 | L40-1021-03 | Ferri-inductor 1mH | |
| VR2 | R12-3025-05 | Trim. pot 10kΩ (B) | | L6 | L40-4711-03 | Ferri-inductor 470μH | |
| | R92-0150-05 | Short jumper | | L7 | L40-1021-03 | Ferri-inductor 1mH | |
| S1 | S29-1418-05 | Slide rotary switch | ☆ | L8 | L40-1501-03 | Ferri-inductor 15μH | |
| S2 | S40-2424-05 | Push switch T-F SET | ☆ | L9~11 | L40-4711-03 | Ferri-inductor 470μH | |
| S3 | S40-2425-05 | Push switch RIT | ☆ | R92-0150-05 | Short jumper | | |
| RL1 | S51-2408-05 | Relay G2V-2 | | Q1,2 | V09-0011-05 | FET 2SK19(Y) | |
| D1 | V11-0076-05 | Diode 1S1555 | | Q3 | V03-0079-05 | TR 2SC460(B) | |
| D2 | V11-3162-86 | LED TLG-205 | | Q4 | V03-1959-06 | TR 2SC1959(Y) | |
| D3 | V11-3163-16 | LED TLY-205 | | D1 | V11-0414-05 | Diode 1S2588 | |
| | | | | D2 | V11-4161-36 | Vari-cap. 1SV53A | |

VFO-240/AT-230

**VFO-240
SCHEMATIC DIAGRAM**



**AT-230
SCHEMATIC DIAGRAM**



AT-230

SPECIFICATIONS

ANTENNA COUPLER

| | |
|-------------------------------|--------------------------------------|
| Frequency Range | 9 amateur bands from 1.8 to 29.7 MHz |
| Input Impedance | 50Ω |
| Output Impedance | 10 to 500Ω, unbalanced |
| Through Power | 200W, at max. |
| Insertion Loss | Less than 0.5 dB in matched state |
| Pi-L | 1.8 MHz only |
| Output Impedance | 20 to 500Ω, unbalanced |
| Through Power | 100W at max. |

WATTMETER

| | |
|----------------------------------|---------------------------------------|
| Type | Through-line wattmeter |
| Frequency Range | 1.8 to 30 MHz |
| Measurable RF Power | Up to 20/200W, switched |
| Kinds of RF Power | Forward or reflected power, switched. |
| Net weight | 3.4 kg (7.5 lbs.) approx. |
| Impedance | 50Ω |
| Accuracy | Better than ±10% of full scale |

SWR METER

| | |
|----------------------------------|-------------------------------|
| SWR Detection | Toroid core direction coupler |
| Measurable Range | 1.1 to 10 |
| Min. Power Required | 4W |

GENERAL

| | |
|-------------------------|----------------------|
| Connectors | |
| INPUT | UHF type, 50Ω |
| ANT-1 | UHF type |
| ANT-2 | UHF type |
| ANT-3 | Stud and wing nut |
| Dimensions | W 180 mm (7-3/32") |
| | H 133 mm (5-15/64") |
| | D 288 mm (11-11/32") |

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

PARTS LIST

☆ New parts

| Ref. No. | Parts No. | Description | Re-marks |
|-----------------------|-------------|--------------------------|----------|
| AT-230 GENERAL | | | |
| | A01-0786-03 | Case (upper) | ☆ |
| | A01-0788-02 | Case (lower) | ☆ |
| | A20-2397-02 | Panel | ☆ |
| | B07-0632-08 | Meter escutcheon (T) | ☆ |
| | B07-0633-08 | Meter escutcheon (K)(W) | ☆ |
| | B20-0808-04 | Knob skirt | |
| | B31-0621-08 | Meter | |
| | B46-0058-00 | Warranty card (K) | |
| | B50-2756-08 | Operating manual (K)(W) | ☆ |
| | B50-2757-08 | Operating manual (T) | ☆ |
| VC1, 2 | C02-0016-08 | Variable cap 300pF 1.2kV | |
| C7 | C91-0419-05 | C 82pF 3kV | ☆ |
| C8 | C91-0402-05 | C 12pF 3kV | ☆ |
| | D23-0061-04 | Bearing | |

| Ref No | Parts No. | Description | Re-marks |
|--------|-------------|----------------------------|----------|
| | E04-0102-05 | UHF type receptacle | |
| | E23-0015-04 | Gnd lug φ3 | |
| | E23-0408-05 | Terminal | |
| | F09-0402-05 | Insulating cover | |
| | F29-0402-08 | Insulator | |
| | G13-0621-04 | Cushion | |
| | H01-2714-04 | Carton case (inside)(K)(W) | ☆ |
| | H01-2715-04 | Carton case (inside)(T) | ☆ |
| | H10-2525-02 | Packing fixture (R) | ☆ |
| | H10-2545-02 | Packing fixture (F) | ☆ |
| | J02-0049-14 | Foot (large) | |
| | J32 1030-04 | Round boss | |
| | K21-0715-04 | Main knob R, X Tune | |
| | K21-0745-08 | Knob, BAND, ANT | |
| | K23-0719-04 | Knob, CAL | |
| | K23-0720-04 | Switch paddle | |
| L3 | L34-0992-08 | Coil | ☆ |
| L4 | L34-0993-08 | Coil | ☆ |
| L5 | L34-0994-08 | Coil | ☆ |
| | N14-0506-08 | Wing nut, M5 ANT3, GND | |
| | S01-2418-08 | Rotary switch, ANT | |
| | S01-5404-08 | Rotary switch, BAND | ☆ |
| | W02-0302-08 | Switch module | |
| | W02-0303-08 | Detector module | |

SWITCH UNIT (W02-0302-08)

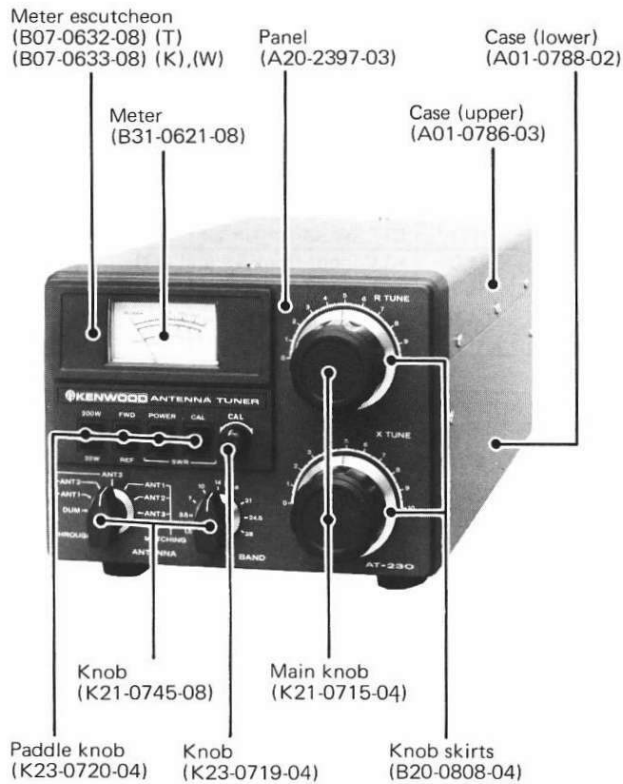
| | | |
|-----|--------------|--------------------------------|
| VR1 | R12-1024-05 | Trim. pot 1kΩ (B) |
| VR2 | R12-4020-05 | Trim. pot 50kΩ (B) |
| VR3 | R12-3420-08 | Trim. pot 20kΩ (B) |
| VR4 | R05-3407-08 | Pot. 50kΩ (B) CAL |
| R3 | RD14BB2E511J | Carbon resistor 510Ω ±5% 1/4W |
| R4 | RD14BB2E104J | Carbon resistor 100kΩ ±5% 1/4W |
| | S36-2026-15 | Paddle switch × 4 |

DETECTOR MODULE (W02-0303-08)

| | | |
|-------|--------------|------------------------------|
| C1, 2 | FM05ZC150J5 | Mica 15pF 500V |
| C6 | FM05ZC150J5 | Mica 15pF 500V |
| R1, 2 | RD14BB2E510J | Carbon resistor 51Ω ±5% 1/4W |
| D1, 2 | V11-7763-26 | Diode 2-1K261 × 2 |
| L1, 2 | L39-0403-08 | Detector coil |

AT-230

OUTSIDE VIEW



ADJUSTMENTS

1. INSTRUMENTS

1) Terminated Power Meter

1. Frequency range: 50 MHz or more
2. Input impedance: 50Ω
3. Power range: 20W and 200W

2) HF Transmitter or Transceiver

- 1) Output: 100W CW
Variable to 10W.
Example: TS-530, TS-830S

2. POWER METER ADJUSTMENT

1) Test Equipment Connection

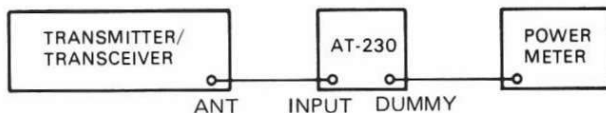


Fig. 1

2) Adjustment

1. Connect as in Fig. 1.
2. Unless otherwise specified, controls should be set as follows:

| | |
|--------------|-------|
| ANT SW | DUMMY |
| BAND SW | 14 |
| 200W/20W SW | 200W |
| FWD/REF SW | FWD |
| POWER/SWR SW | POWER |
| CAL/SWR SW | SWR |

Tune up the transceiver at 14.175 MHz.

3. Adjust the transceiver for 100W output at the power meter (adjusted by the carrier level control).
Adjust VR2 on the switch unit for a meter reading of 100 on the AT-230.

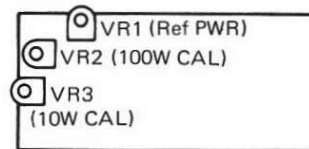


Fig. 2

4. As in step 3, lower transceiver output to 10W and adjust VR3 for a meter indication of 10 on the 20W scale.

3. CALIBRATION OF REF POWER

1) Connection

As in Fig. 1.

2) Adjustment

1. Set controls as described in 2.2.
Confirm 100W CW output reading.
2. Unkey the transceiver and reverse the coaxial cable between the INPUT and DUMMY terminals on the AT-230. Move the FWD/REF switch to the REF position.
3. Transmit and adjust VR1 for previously confirmed 100W reading.

SCHEMATIC ABBREVIATION

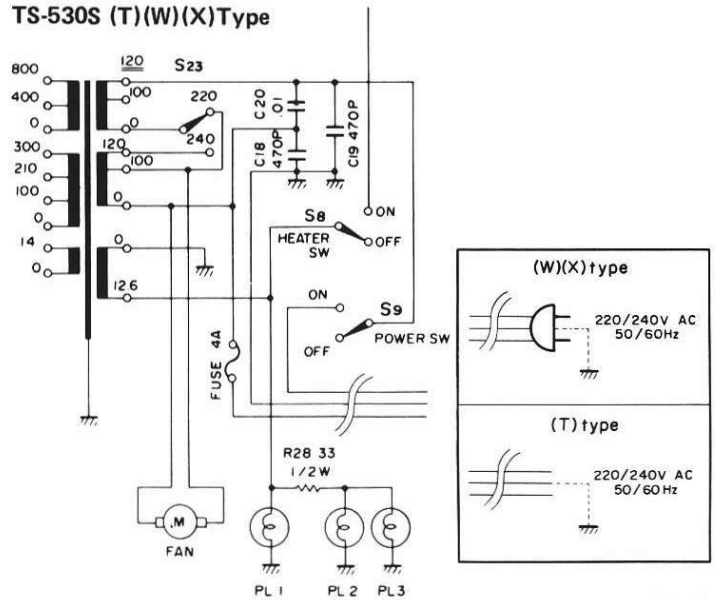
| Connector No. | Terminal name | Description |
|-------------------------------------|--|--|
| VFO ass'y unit (X60-1150-01) | | |
| | RLC | From MODE SW S-18-3, 5 |
| | RIT | RIT voltage input |
| | VFB | VFO B + 9V |
| | G | |
| | VFO | VFO output |
| PLL unit (X50-1680-01) | | |
| ① | | BAND SW input information |
| ② | A,B,C,D BLK 12 | BCD code from counter unit Blanking signal B + 12V |
| ③ | 1K CON | Reference signal from PLL Q24 To counter unit from PLL Q29 |
| ④ | MKR | Marker output |
| | VCO | VCO output |
| ⑤、⑥ | VFO | VFO input |
| ⑦ | CAR | Carrier output |
| ⑧ | RLS TXC IFS USB LSB MS 9 | MODE SW S18-3 MODE SW S18-3 IF shift arm of VR-3 From S18-1 + 9V on USB From S18-1 + 9V on LSB Calibrator SW S1-1 B + 9V |
| Counter unit (X54-1540-00) | | |
| ① | 0.5 12 | 0.5 MHz shift signal B + 12V |
| ② | 12 CON BLK 1K A~D -6 | B + 12V Counter signal input Blanking signal Reference signal 1 kHz BCD input from PLL B - 6V |
| ③ | AUX~28B | Band information to PLL |
| ④、⑤ | AUX~29.5 | Band SW information to +9V on any band |
| IF unit (X48-1310-00) | | |
| ① | 12 RIF | B + 12V Receiver IF input |
| ② | NBI NSG | To noise blanker amp Noise blanker gate signal |
| ③ | 210A 210B 300B | B + 210V B + 210V B + 300V |
| ④ | 300A | B + 300V |
| ⑤ | CWN~SSB | To NAR SW S4-1,2 |
| ⑥ | TIF AGC | Transceiver IF output Output for AGC |
| ⑦ | DET RB2 | Detector output Receiver amp bias |
| ⑧ | CAR | Carrier input |
| ⑨ | VXI | To VOX circuit |
| ⑩ | TM M ALM MIC NRM PRC | Meter select SW S-13 arm S meter voltage To ALC meter DC signal MIC input Processor SW OFF Processor SW ON |
| ⑪ | MV1 MV2 | Top of MIC gain control Arm of MIC gain control |

| Connector No. | Terminal name | Description |
|------------------------------|---|--|
| ⑫ | -6 AGO AGS RFG SSB 9 CV | B - 6V input AGC off AGC slow Arm of RF gain control From mode SW S18-4 B + 9V Arm of carrier level control |
| ⑬ | RSC XIT RIT RTI | Receiver RIT Transmitter RIT RIT voltage to VFO RIT SW S3-1 |
| ⑭ | ALC RLT RLR RL | ALC input from AF unit Q31 + 9V when transmit + 9V when receive Relay voltage |
| RF unit (X44-1360-01) | | |
| ① | AUX~24.5 | To counter unit + 9V on any band |
| ② | 28,29 9V | To counter unit + 9V on any band B + 9V |
| ③ | ANT RLR | Receiver antenna + 9V at receive |
| ④ | MKR | Marker signal input |
| ⑤ | AGC RIF | AGC input Receiver IF output |
| ⑥ | TOF 12 MXB | Transmit stop signal input for WARC B + 12V MIXer B + turn on signal |
| ⑦ | 12 TIF 300A | B + 12V Transmit IF signal input From IF unit + 300V |
| ⑧ | DRB RB1 | Control grid bias for 12BY7A Receiver bias voltage |
| ⑨ | H 210A | Heater voltage B + 210V |
| | VCO | VCO input |
| | DRV | Drive voltage to 6146B |
| | NC | Neutralization |
| AF unit (X49-1150-00) | | |
| ① | SSB VXI | + 9V on SSB mode VOX amp input |
| ② | DET NBI | Detector signal from IF unit Noise blanker amp input |
| ③ | AV2 AV3 STE KEY | Arm of AF gain control Top of AF gain control To ground in CW and CW NAR To ground in tune and USB/LSB |
| ④ | SP STS | Speaker internal Side tone SW |
| ⑤ | SS VXS VXD SP | Stand by SW VOX SW to ground when VOX ON VOX delay control Speaker internal |
| ⑥ | VR3 KEY VR1 AV SS RL 9 | Final grid bias control To ground in tune and USB/LSB Final grid bias control Anti VOX signal input Stand by SW Relay voltage B + 9V |
| ⑦ | RB1 MXB TOF DRB | Bias for Q1 RF amp on RF unit B + to MIXer from Q29 on AF unit TX stop signal for WARC Bias for control grid of 12BY7A |

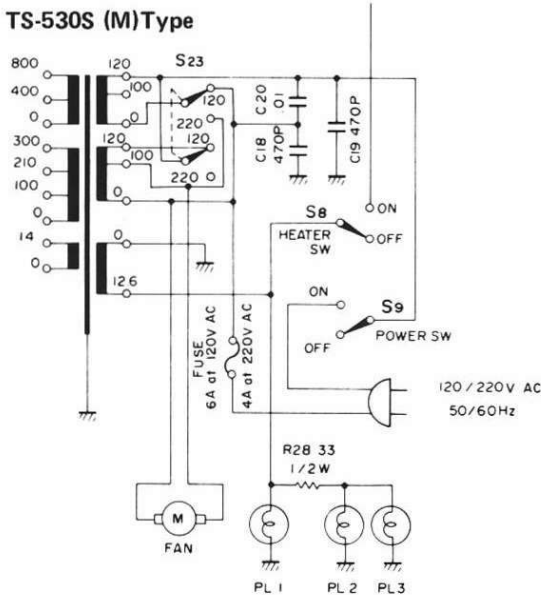
SCHEMATIC ABBREVIATION

| Connector No. | Terminal name | |
|-------------------------------------|---------------|----------------------------------|
| ⑧ | RLT | + 9V on transmit |
| | RLR | + 9V on receive |
| | -6 | B -6V |
| ⑨ | ALC | ALC output from Q31 |
| | RLT | + 9V when transmit |
| | RLR | + 9V when receive |
| ⑩ | RL | Relay voltage |
| | RAL | External ALC input remote socket |
| ⑪ | VR2 | Arm of TX bias control |
| | NBV | Top of noise blanker VR |
| | NBS | Noise blanker SW |
| | 9 | B + 9V |
| | PRS | Processor SW |
| ⑫ | RF1 | Top of RF gain control |
| | NSG | Noise blanker gate signal |
| | RB2 | Receiver bias for IF unit |
| | 14A | 14V input |
| | G14 | 14V input (ground) |
| | FG | Bias for control grid of 6146B |
| Final unit (X56-1380-00) | | |
| | DRV | Drive input |
| | FG | Control grid bias |
| | H | Heater voltage AC12.3V |
| | IPM | IP meter voltage |
| | SG | Screen grid voltage |
| Rectifier unit (X43-1370-02) | | |
| | 800 | B + 800V |
| | HV | High voltage signal to METER |
| | 300B | B + 300V |
| | 210B | B + 210V |
| | 210A | B + 210V |
| | -C | Common B- approx. -100V |
| | 12 | Screen grid cut off voltage |
| | SG2 | Screen grid voltage |
| | TUN | Screen grid voltage for TUN |

TS-530S (T)(W)(X)Type



TS-530S (M)Type



2SA778A 2SC1775
 2SA1015 2SC1815
 2SC945 2SC1923
 2SC1515 2SC1959
 2SC1675 2SC2240

2SA473

2SA562

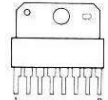
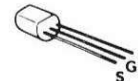
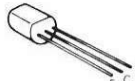
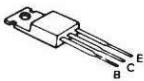
2SC460

2SK19

2SK125
 2SK30A

3SK73

MB3712



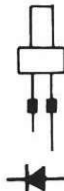
NJM78L05A

μPC1158H2

SLP-144

TLR-205

MV-13



Signal Line

Control Line

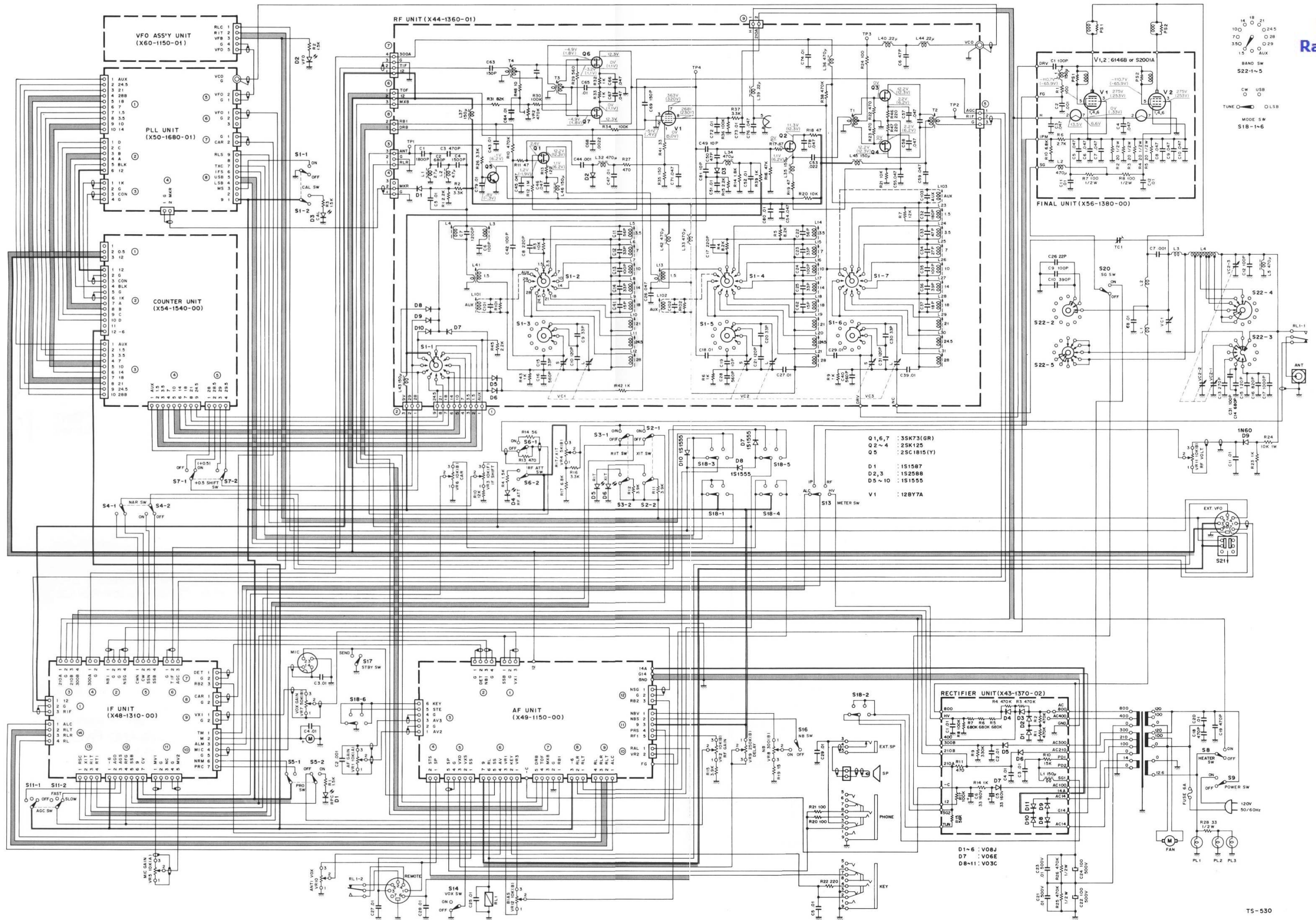
Common DC Line

SCHEMATIC DIAGRAM (K)

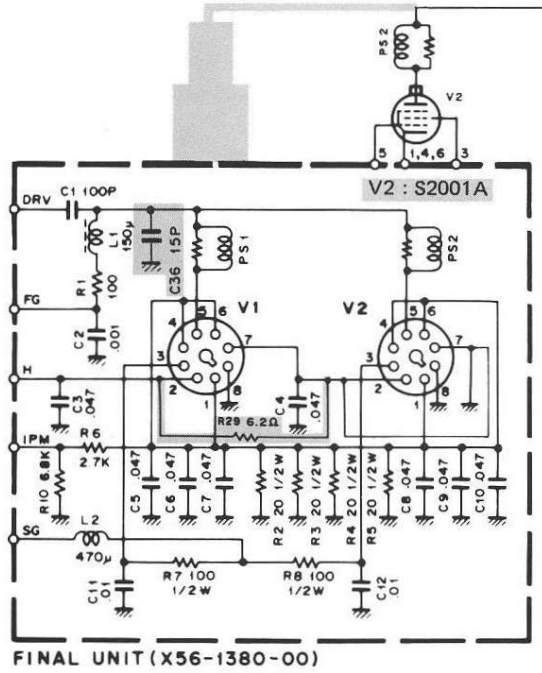
Voltage measurement conditions f=14.175MHz, RX no signal, () in TX

TS-530S

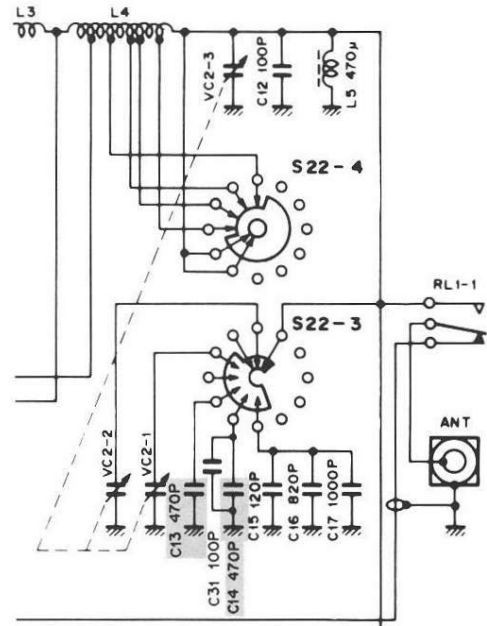
For free by
RadioManual.eu



TS-530SP/D SCHEMATIC DIAGRAM



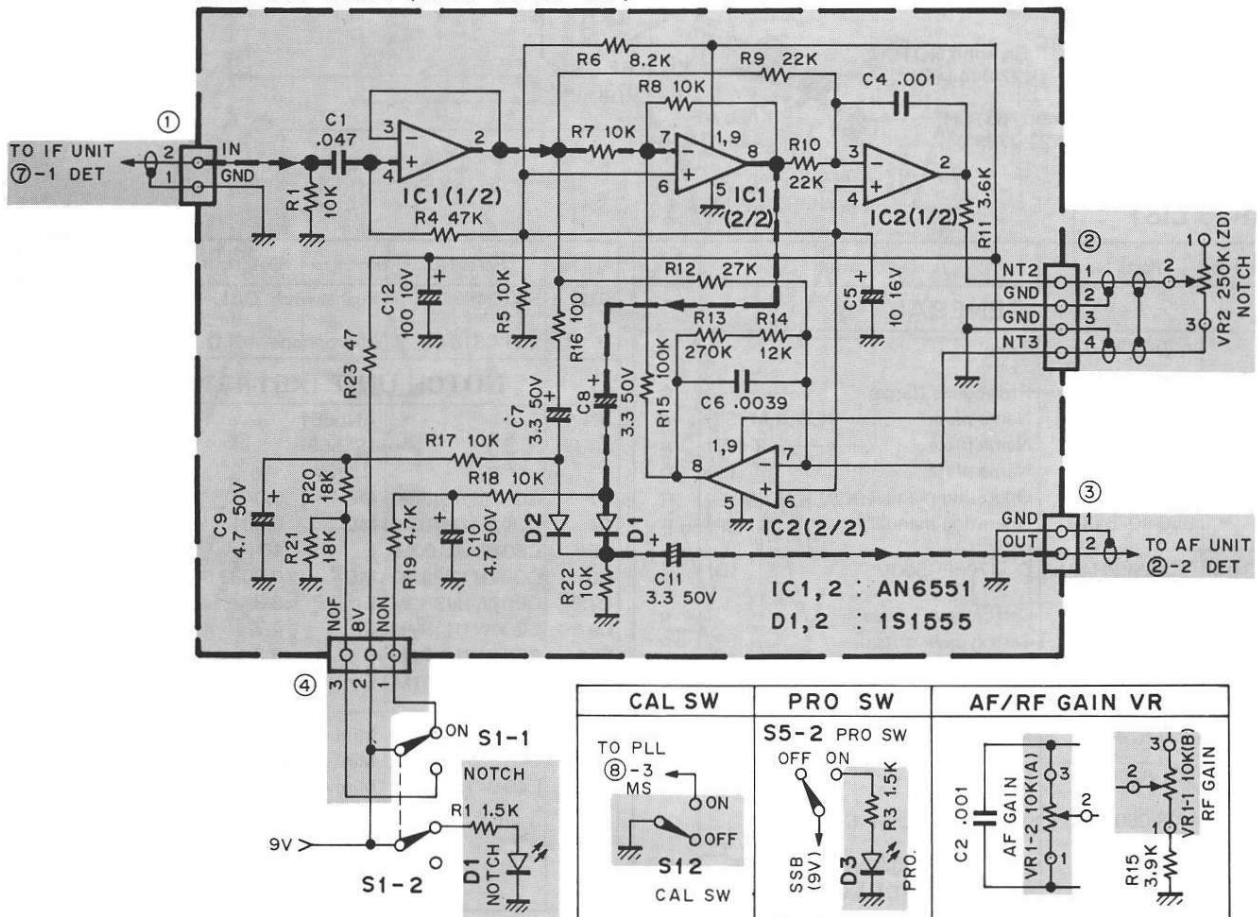
TS-530D ONLY



▼NOTCH UNIT

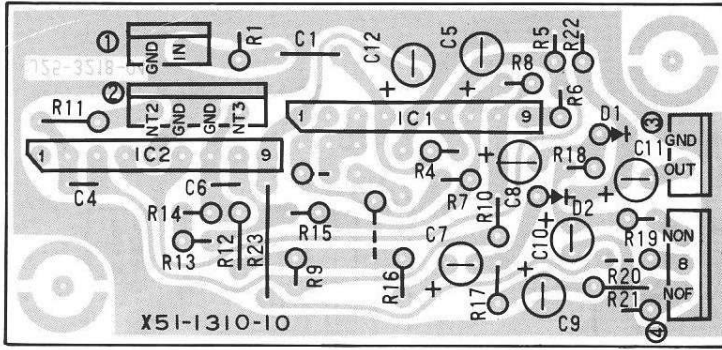
The shaded parts indicate the changed circuit from TS-530S to TS-530SP/D.

NOTCH UNIT (X51-1310-10)



TS-530SP/D

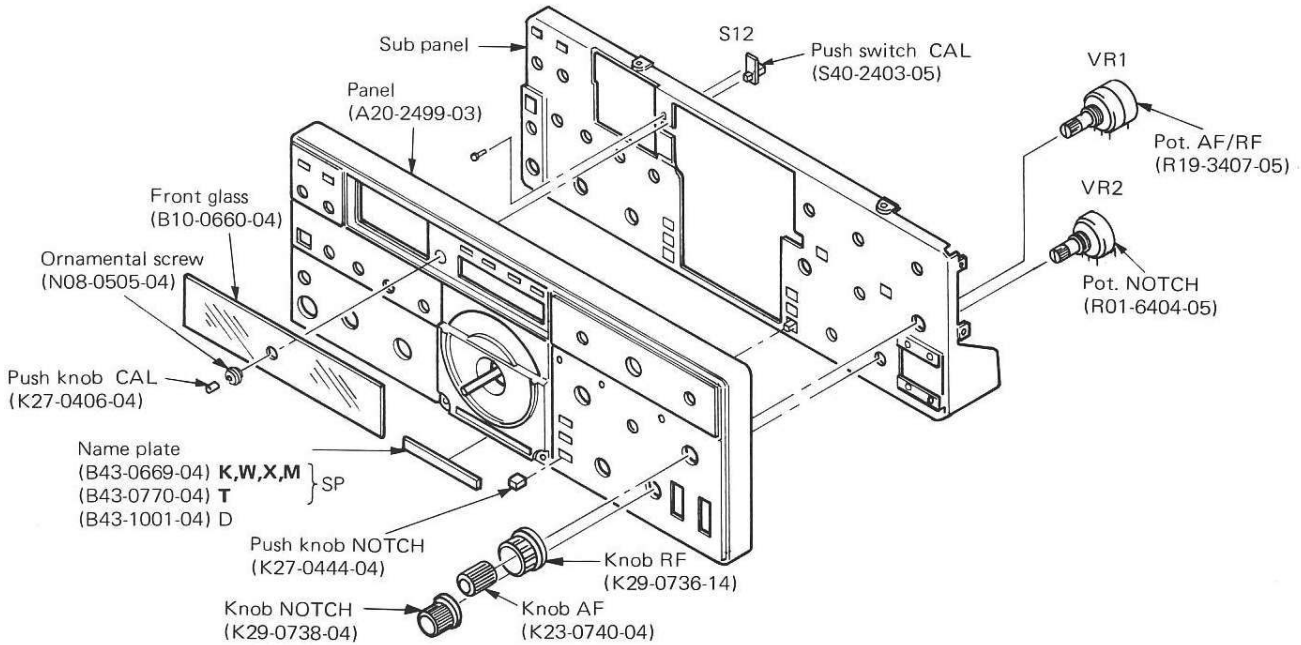
PC BOARD VIEW



◀ NOTCH UNIT (X51-1310-10)

View from component side

DISASSEMBLY

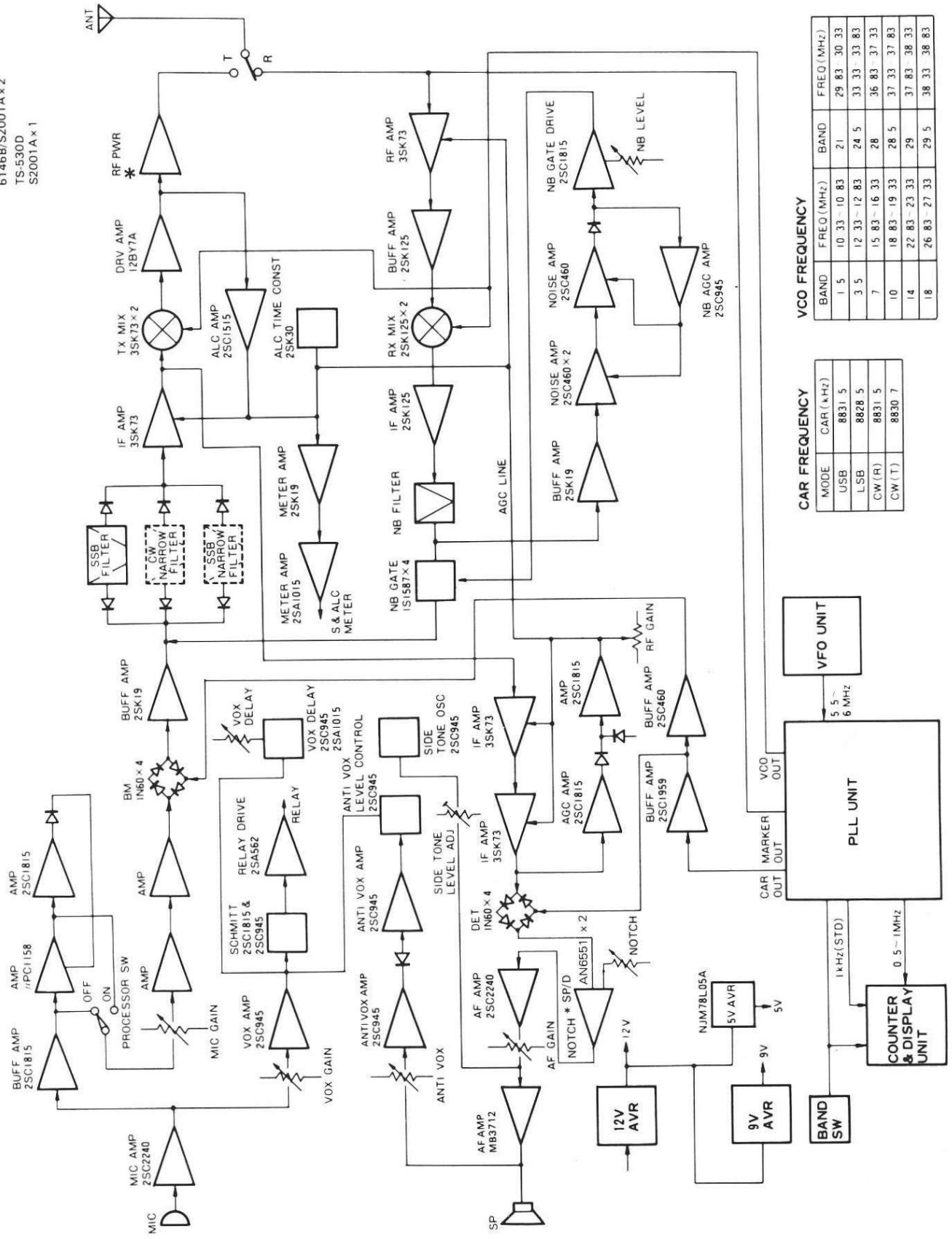


PARTS LIST

| Ref. No. | Parts No. | Description | Re- marks |
|---------------------------------|--------------|--|--------------|
| GENERAL | | | |
| | A20-2499-03 | Panel | ☆ |
| | B10-0660-04 | Front glass (large) | ☆ |
| | B43-0669-04 | Name plate K,W,X,M (SP) | ☆ |
| | B43-0700-04 | Name plate T (SP) | ☆ |
| | B43-1001-04 | Name plate (D) | ☆ |
| | B50-4075-00 | Operating manual K,W,X,M (SP,D) | ☆ |
| | B50-4076-00 | Operating manual T (SP) | ☆ |
| C13,14 | CC45SL2H471J | C 470pF 500V (D) | |
| | H01-4520-04 | Carton case inside | ☆ |
| | H03-2151-04 | Carton case outside (SP) | ☆ |
| | H03-2152-04 | Carton case outside (D) | ☆ |
| | K23-0740-04 | Knob AF | |
| | K29-0736-14 | Knob RF | |
| | L01-8206-05 | Power trans (D) | ☆ |
| | N08-0505-04 | Ornamental screw CAL | |
| VR1 | R19-3407-05 | Pot. 100kΩ(A)/10kΩ(B) AF/RF | |
| VR2 | R01-6404-05 | Pot. 250kΩ(ZD) NOTCH | |
| Ref. No. | Parts No. | Description | Re- marks |
| S12 | S40-2403-05 | Push switch CAL | |
| | T91-0318-05 | Microphone 10kΩ X,M | ☆ |
| NOTCH UNIT (X51-1310-10) | | | |
| IC1,2 | | AN6551 | |
| D1,2 | | 1S1555 | |
| C1 | CQ92M1H473K | ML 0.047 | |
| C4 | CQ92M1H102K | ML 0.001 | |
| C5 | CE04W1C100M | E 10 16V | |
| C6 | CQ92M1H392K | ML 0.0039 | |
| C7,8 | CE04W1H3R3M | E 3.3 50V | |
| C9,10 | CE04W1H4R7M | E 4.7 50V | |
| C11 | CE04W1H3R3M | E 3.3 50V | |
| C12 | CE04W1A101M | E 100 10V | |
| | E40-0273-05 | Mini connector 2P | |
| | E40-0373-05 | Mini connector 3P | |
| | E40-0473-05 | Mini connector 4P | |

BLOCK DIAGRAM

* TS-530S/SP
6146B/S2001A x 2
TS-530D
S2001A x 1



CAR FREQUENCY

| MODE | CAR (kHz) |
|--------|-----------|
| USB | 8831.5 |
| LSB | 8828.5 |
| CW (R) | 8831.5 |
| CW (T) | 8830.7 |

VCO FREQUENCY

| BAND | FREQ (MHz) | BAND | FREQ (MHz) |
|------|---------------|------|---------------|
| 1-5 | 10.33 - 10.83 | 21 | 29.83 - 30.33 |
| 3-5 | 12.33 - 12.83 | 24-5 | 33.33 - 33.83 |
| 7 | 15.83 - 16.33 | 28 | 36.83 - 37.33 |
| 10 | 18.83 - 19.33 | 28-5 | 37.33 - 37.83 |
| 14 | 22.83 - 23.33 | 29 | 37.83 - 38.33 |
| 18 | 26.83 - 27.33 | 29-5 | 38.33 - 38.83 |

SP-230/PK-3

SPECIFICATIONS

Speaker used: 12 cm dia.
Rated Input: 2 Watts
Impedance: 8Ω
Frequency response: 100Hz to 5kHz.
Filter cut-off frequency,
LOW: 400Hz, -3dB.
HIGH 1: 3kHz, -3dB.
HIGH 2: 1.5kHz, -3dB.
HIGH 1 + HIGH 2: 1 kHz, -3dB.
Filter attenuation: -6dB/oct.
Dimensions: W 180 mm (7-1/16")
H 133 mm (5-1/4")
D 287 mm (11-5/16")
Net weight: 1.8 kg. (4.0 lbs.)
Accessories furnished: Speaker cord, 1 pc.
(E 14-0101-05)
Extension foot, 2 pcs.
(J02-0049-14)
Screw, M4 x 12, 2 pcs.
(N30-4012-41)
1 pin plug, 2 pcs.
(E20-1610-05)

PK-3

POWER UP KIT for the TS-530D

| Ref. No. | Parts No. | Description | Re- marks |
|----------|-------------|--------------------|--------------|
| | S2001A | | |
| | B50-4103-00 | Instruction manual | ☆ |
| | E90-0004-15 | Plate cap | |
| | H01-4540-03 | Carton case | ☆ |
| | H21-0802-04 | Protective sheet | ☆ |
| | H25-0096-04 | Protective bag | ☆ |
| | L39-0046-05 | PS coil PLATE | |

| Ref. No. | Parts No. | Description | Re- marks |
|----------|--------------|----------------------------|--------------|
| | A01-0786-03 | Case (upper) | |
| | A01-0789-02 | Case (lower) | ☆ |
| | A20-2399-05 | Panel (T) | ☆ |
| | A20-2400-05 | Panel (K)(W) | ☆ |
| | B46-0058-00 | Warranty card (K) | |
| | B50-2759-00 | Operating manual (K)(W) | ☆ |
| | B50-2760-00 | Operating manual (T) | ☆ |
| | E11-0404-05 | Phone jack | |
| | E12-0001-05 | Phone plug | |
| | E13-0361-05 | 3P Pin jack | |
| | E14-0101-05 | 1P Pin plug | |
| | E30-1610-05 | Connector with lead | |
| | G53-0502-04 | Packing | |
| | H01-2723-04 | Carton (inside)(K)(W) | ☆ |
| | H01-2724-04 | Carton case (inside)(T) | ☆ |
| | H10-2523-02 | Packing fixture (F) | |
| | H10-2525-02 | Packing fixture (R) | |
| | H20-0276-03 | Protective cover | |
| | H25-0049-03 | Protective bag | |
| | J02-0049-14 | Foot | |
| | K29-0716-04 | Push knob | |
| | L79-0443-25 | Filter | |
| | RS14AB3D8R2J | Solid 8.2Ω 2W | |
| | S40-2414-05 | Push switch INPUT | |
| | S42-3401-05 | Push switch LOW, HIGH 1, 2 | |
| | T06-0011-05 | Speaker | |

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