KENWOOD

SERVICE MANUAL

Model TS-120V

HF SSB TRANSCEIVER

TS-120V

CONTENTS

SPECIFICATIONS/DATA

Frequency Range:

80 m band	3.5 ~ 3.575 MHz
	3.793 ~ 3.802 MHz
40 m band	7.0 ~ 7.1 MHz
20 m band	14.0 ~ 14.35 MHz
15 m band	21.0 ~ 21.45 MHz
10 m band A	28.0 ~ 28.5 MHz
10 m band B	28.5 ~ 29.0 MHz
10 m band C	29.0 ~ 29.5 MHz
10 m band D	29.5 ~ 29.7 MHz
WWV	15.0 MHz (receive only)

Mode: SSB (A3J), CW (A1)

Power Requirements: 10W

Antenna Impedance: 50Ω

Carrier Suppression: Carrier better than 40 dB down from the output signal.

Sideband Suppression: Unwanted sideband is better than 50 dB down from the output signal.

Mic. Impedance: 500Ω ~ 50kΩ

Audio Frequency Response: 400 ~ 2600 Hz (−6 dB)

Harmonic Radiation: Better than 40 dB from output signal.

Receiver Sensitivity: 0.25μV S/N 10 dB or more

Image Ratio: Image frequency better than 50 dB down from the output signal.

IF Rejection: IF frequency is 70 dB or more down from out signal.

Frequency Stability: Within 100 Hz during any 30 minute period after warm up within ±1 kHz during the first hour after 1 minute of warm up.

Selectivity: SSB, CW 2.4 kHz (−6 dB)
4.2 kHz (−60 dB)

AF Output: More than 1.5W (8Ω load, 10% distortion)

AF Load Impedance: 4 ~ 16Ω for both speaker and headphone.

Power Supply: 12 ~ 16V DC (13.8V)

Power Consumption: Less than 4A in transmit (less than 1.5 SWR ratio)

(at DC 13.8V): Less than 0.7A in receive.

Semiconductors and Tube:

IC's	26
FET's	15
Transistors	82
Diodes	135
Tube	1

Dimensions: W 241(241) × H 94(108) × D 235(281) mm
Protection include.

Weight: Approx. 4.9 kg

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

DATA

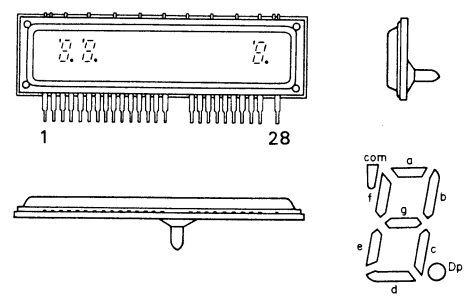
- Application
  2SC2075 (RF band power amplifier) (V03-2075-06)
  NPN Epitaxial planar type
- Absolute maximum ratings

Item	P_C	V_{CBO}	V_{CER}	V_{EBO}	IC	IE	Tstg
Value	10(W) (Tc=25℃)	80(V)	80(V)	4.0(V)	4(A)	−4(A)	−55~150(℃)

- Application
  2SC2509 (HF band power amplifier) (V03-2509-06)
  NPN Epitaxial planer type
- Absolute maximum ratings

Item	P_C	V_{CBO}	V_{CES}	V_{CEO}	V_{EBO}	IC	IE	Tstg
Value	20(W) (Tc=25℃)	40(V)	40(V)	18(V)	4(V)	5(A)	−5(A)	−55~150(℃)

- Indicating tube 9-BT-12 (V40-7760-86)



PIN NO	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CONNECTION	F	Nc	Gq	Nc	Nc	G8	g	f	G7	e	d	G6	Nc	Nc
	15	16	17	18	19	20	21	22	23	24	25	26	27	28
	G5	Np	Np	G4	Dp	G3	c	b	G2	a	com	G1	Np	F

FEATURES/GENERAL

FEATURES

1. SINGLE CONVERSION SYSTEM WITH PLL CIRCUIT

The adoption of a single conversion system with unique PLL (Phase Locked Loop) circuit, FET balanced type mixer and MOS FET assures excellent spurious characteristics and 2-signal characteristic.

2. BUILT-IN DIGITAL DISPLAY

The digital display permits easy reading of operating frequency to an accuracy of 100 Hz on any band and any operating mode.

3. BUILT-IN IF SHIFT CIRCUIT (Passband Tuning)

An IF SHIFT system is built in to the transceiver to allow shifting of IF passband, thereby eliminating adjacent channel interference.

4. 3.5 ~ 29.7 MHz AND WWV BANDS

The transceiver is designed to operate on LSB/USB/CW in the bands 3.5 ~ 29.7 MHz. WWV band (14.5 ~ 15 MHz) is also built in to the transceiver to permit accurate frequency calibration.

5. COMPACT, LIGHT-WEIGHT DESIGN

The TS-120V has many advanced features, yet it is compact and light-weight; suitable for mobile and field operations as well as fixed station operation.

6. EASY OPERATION

All controls and switches are carefully arranged for ease of operation, ensuring optimum transmission and reception.

7. ALL SOLID-STATE DESIGN

The all solid-state, compact unit features a wide band final stage, eliminating the need for frequency tuning during use.

8. FOUR FIX CHANNELS

Four FIX channels can be installed, one channel for each of 7, 14, 21 and 28 MHz bands. FIX channels in 3.5 MHz and 28 MHz can be selected simply by using a connector on the chassis. This facility is particularly useful in mobile and net operation.

9. FULL RANGE OF AUXILIARY FUNCTIONS

The TS-120V is equipped with a VOX circuit, a balanced gate system noise blanker circuit to minimize pulse noise, and a 25 kHz marker.

10. INSTALLATION OF CW FILTER YK-88C

The TS-120V permits the use of the option CW filter YK-88C. CW semi-break-in operation is provided asing the built-in VOX circuit and CW side tone oscillator.

11. WIDE VARIETY OF OPTIONAL ACCESSORIES

The following accessories are available as optional extra: Power Supply Regulator (PS-20), Mobile Mount (MB-100), CW Filter (YK-88C), External VFO (VFO-120), External Speaker (SP-120).

GENERAL

Fig. 1-1 shows a block diagram of the TS-120V HF Amateur transceiver. As in the TS-820 series, the TS-120V employs a single-conversion system with PLL circuitry. The IF is 8.83 MHz.

The TS-120V features a number of unique circuits and overall high performance. It is designed so the PLL lock frequency of each band, the CAL marker signal, and the counter clock circuit use a single reference frequency crystal instead of individual crystals as found in the TS-820 series transceiver.

The TS-120V circuits include IF SHIFT, VOX (with semi-break-in CW), side tone, noise blanker (NB), and crystal calibrator (CAL) for convenient and versatile transceive operation.

CIRCUIT DESCRIPTION

RECEIVING CIRCUIT

The signal from the antenna is fed to the 8.83 MHz IF trap circuit. This signal is stepped up about 10 dB and impedance-converted by a wide-band transformer before it is applied to the bandpass filter (BPF). The BPF is common to transmission and reception, eliminates the need for a preselector, and makes the RF section compact in design.
The signal from the BPF is fed to the dual-gate MOS FET wideband RF amplifiers consisting of a 3SK74 (Q1) and a 2SC1815 (Q2), where the 2 MHz to 35 MHz signal is amplified about 20 dB.
The RF amplifier output is fed through a wide-band transformer to the balanced transformer to the balanced mixer (two 3SK74s, Q3 and Q4), where it is mixed with the VCO output from the PLL circuit and converted to the 8.83 MHz IF. This signal is applied to the IF unit, through the ceramic filters, NB gate circuit and the crystal filter. The NB circuit is controlled by the NB switch on the front panel.
The signal, passing through the crystal filter, is amplified about 90 dB by the three-stage 3SK74 MOS FET IF amplifier (Q1, Q2, and Q3) and is demodulated into audio by the four-diode ring detector.
From the final IF stage, the signal also passes through a buffer amplifier and is fed to the AGC circuit where it is detected and amplified. Receiver gain is controlled by this AGC voltage applied to the second gates of the RF and IF amplifiers, with the time constant determined by R38 (2.2MΩ) and C40 (1μF). Input levels of 2 dB and 34 dB are indicated as S1 and S9 on the S-meter. The AF signal is amplified by Q1, a 2SC2240 (GR), gain controlled, and further amplified by an HA1366W (Q7), the power-amplifier IC, to to drive the speaker. This signal, which is transistor-coupled with Q14, a 2SC1815(Y), and Q15, a 2SA1015(Y), is sampled for ANTI-VOX control, so the VOX circuit is not tripped by the speaker output. This new system is a departure from the conventional transformer-coupled sampling systems.

TRANSMITTING CIRCUIT

The microphone signal is amplified by transistors Q18, a 2SC2240(GR), Q10, and Q11, each a 2SC1815(Y), and is fed to the four-diode balanced modulator (BM) circuit. Microphone impedance is 500Ω to 50kΩ.
The 8.83 MHz DSB signal from the BM is amplified about 10 dB by Q12, a 2SK19 FET, and is fed to the IF unit where the unwanted sideband is removed by the crystal filter to produce an SSB signal. The gate of Q12 is also controlled by the protection voltage which is developed when the transmitter output looks into an incorrect load, continuously reducing output power. The SSB signal from the crystal filter is amplified about 30 dB by the 3SK74 IF amplifier (Q1), and is fed to the transmit 3SK74 MOS FET balanced mixer (Q5 and Q6), where it is mixed with the VCO output and converted to the final transmit frequency.
Unwanted spurious components are eliminated by the transmit/receive BPF circuit, and the signal is wideband-amplified by Q7, Q8 (2SC1815), and Q9 (2SC2086).
In the final unit, the signal is amplified by the 2SC2075 driver (Q1), and by the 2SC2509 push-pull power amplifiers (Q2 and Q3). The signal then passes through an RF filter and is fed to the antenna.
Antenna output is toroid-sampled to detect the forward and reflected power. The forward wave is used for ALC and the reflected wave for protection. The forward wave is fed to the second gate of the 3SK74 transmit/receive IF amplifier(Q1), with a time constant determined by R7 (1MΩ) and C40 (0.47μF). For CW operation, block bias keying controls the base circuit of a 2SA1015 switching transistor (Q10) in the RF circuit. Q10 controls the first and second gate voltages of the transmit mixer (Q5 and Q6) and the base voltage of the predriver (Q9).

FUNCTIONAL DESCRIPTION

TS-120V FREQUENCY SYSTEM

The TS-120V employs single conversion with a unique PLL circuit, as shown in Fig. 1.
The frequency system is basically that of the TS-820 with the exception of the PLL circuit.
In the TS-120V, the WWV receive frequency is 15.0 MHz instead of 14.5 MHz, and the VCO frequency is therefore changed from 23.33 MHz to 23.83 MHz. Also, the 1.9 MHz band is eliminated.

PLL CIRCUIT

VCO output is obtained by synthesizing the 10 MHz and 500 kHz reference from the VFO, CAR and counter.
The TS-120V uses the counter reference oscillator frequency, instead of a HET crystal circuit for each band as found in the TS-820. The PLL contains a programmable divider circuit to attain the intended frequency. This simplifies circuit design and eliminates changes in transmit/receive frequencies due to HET crystal frequency error. Fig. 2 shows PLL circuit construction and Table 1 shows the frequencies in each circuit.
Referring to Fig. 1, MIX (3) is a double mixer circuit to mix CAR frequency with VFO frequency, while MIX (2) operates at other than 3.5 MHz and 7 MHz; it mixes 14 MHz, or 10 MHz in the WWV band, or 20 MHz in the 21 MHz and 28 MHz bands with the output of MIX (3) to provide the frequency necessary to each band as shown in Table 1. This output is mixed with the VCO frequency by MIX (1) to obtain the frequencies shown in Table 1, which are amplified through the LPF (1) and are shaped into digital form and divided by the programmable divider to obtain a 500 kHz output.
The programmable divider converts the information from the band switch into a BCD signal in the counter. By presetting the signal, it is divided at the ratio shown in Table 1. The phase comparator uses a Motorola MC4044P. The loop filter amplifier, component transistors, minimizes unwanted spurious emissions. The VCO oscillator covers all the bands. If, for any reason, output of the phase comparator unlocks, VCO output is switched off to prevent emission at unwanted frequencies and, at the same time, the digital display blanks.

CAR OSCILLATOR

The TS-120V CAR oscillator is composed of one oscillator and two crystals for LSB, USB, and CW operation. The oscillator frequency in each mode is shown in Fig. 1.
The oscillator frequency can be varied by the IF SHIFT control during reception.

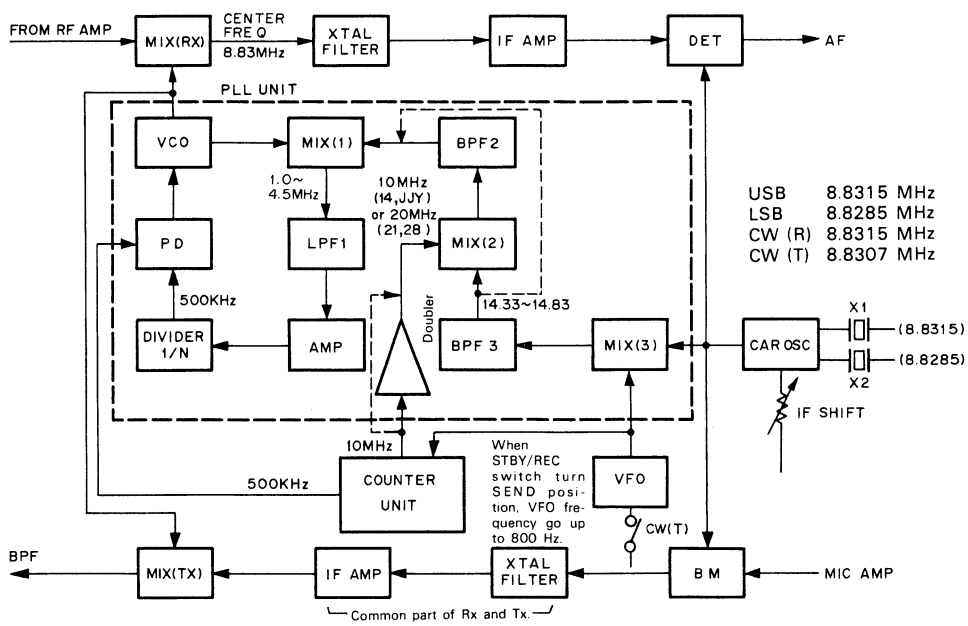


Fig. 1 Frequency configuration of TS-120V

FUNCTIONAL DESCRIPTION

Band	RX, TX Frequency	VCO	MIX(1) Input	MIX(1) Output	Divider	D C B A
WWV	14.5 ~15.0	23.33 ~23.83	24.33 ~24.83	1.0	1/2	1 1 1 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
14	14.0 ~14.5	22.83 ~23.33	24.33 ~24.83	1.5	1/3	1 1 0 1
21	21.0 ~21.5	29.83 ~30.33	34.33 ~35.83	4.5	1/9	0 1 1 1
28	28.0 ~28.5	36.83 ~37.33	34.33 ~35.83	2.5	1/5	1 0 1 1
28.5	28.5 ~29.0	37.33 ~37.83	34.33 ~35.83	3.0	1/6	1 0 1 0
29	29.0 ~29.5	37.83 ~38.33	34.33 ~35.83	3.5	1/7	1 0 0 1
29.5	29.5 ~30.0	38.33 ~38.83	34.33 ~35.83	4.0	1/8	1 0 0 0

Table 1 The frequencies on each circuit

VFO OSCILLATOR

The TS-120V VFO oscillator has been developed on the basis of the TS-820 and TS-520 VFO. It is compact in design and its operating frequency has been changed to cover from 5.5 MHz to 6.0 MHz.

During CW operation, the transmit frequency is shifted 800 Hz above the receive frequency. In the TS-820, the CAR oscillator is used to obtain the frequency difference between transmission and reception during CW operation.

In the TS-120V, CW operating frequency is also digitally displayed.

The main tuning dial covers 25 kHz per rotation and is calibrated at 1 kHz intervals. A 10 kHz subscale is also provided. The operating frequency can be read easily with either the analog or digital display.

DIGITAL COUNTER

The TS-120V digital counter eomploys a VFO frequency counting system as shown in Fig. 3.

The VFO frequency is mixed with a 5 MHz signal obtained from the reference oscillator chain by a 3SK73 (Q7) and is converted into a 1 MHz signal. This signal passes through the LPF, is amplified, buffered and shaped into a digital (square) wave, passes through the 0.1 second gate circuit and is applied to the four-digit counter. The signal is counted from 10 Hz to 100 kHz and fed to the preset counter to derive the carrier output.

The 100 kHz order digit presents "5" or "0" to display the operating frequency by selecting 3.5 MHz, 28.5 MHz, 29.5 MHz, WWV, and the other bands, 7.0 MHz, 14 MHz, 21 MHz, 28.0 MHz and 29.0 MHz.

The digits for 1 MHz and 10 MHz orders are composed by a diode matrix circuit which operates on bandswitch information.

The counter outputs are switched by the multiplexer and are converted from BCD to seven-segment information by the decoder to light the fluorescent display tube.

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

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

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

Because of the IF SHIFT circuit, the CAR frequency is independent of the transmit/receive frequency. Once the VFO

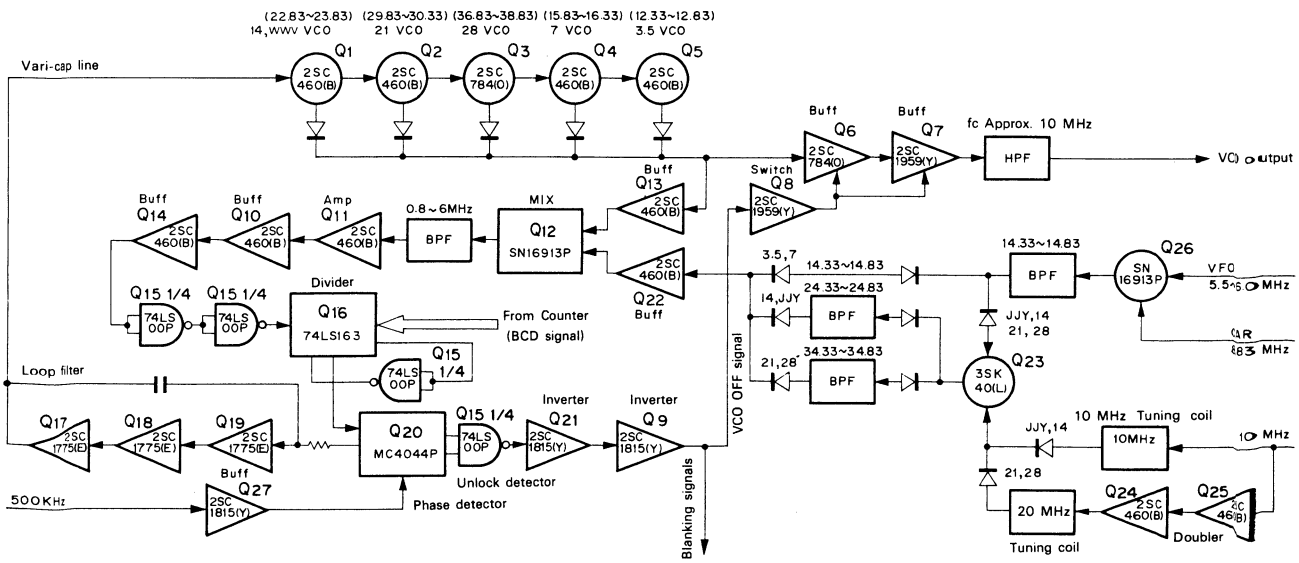


Fig. 2 PLL circuit configuration of TS-120V

FUNCTIONAL DESCRIPTION

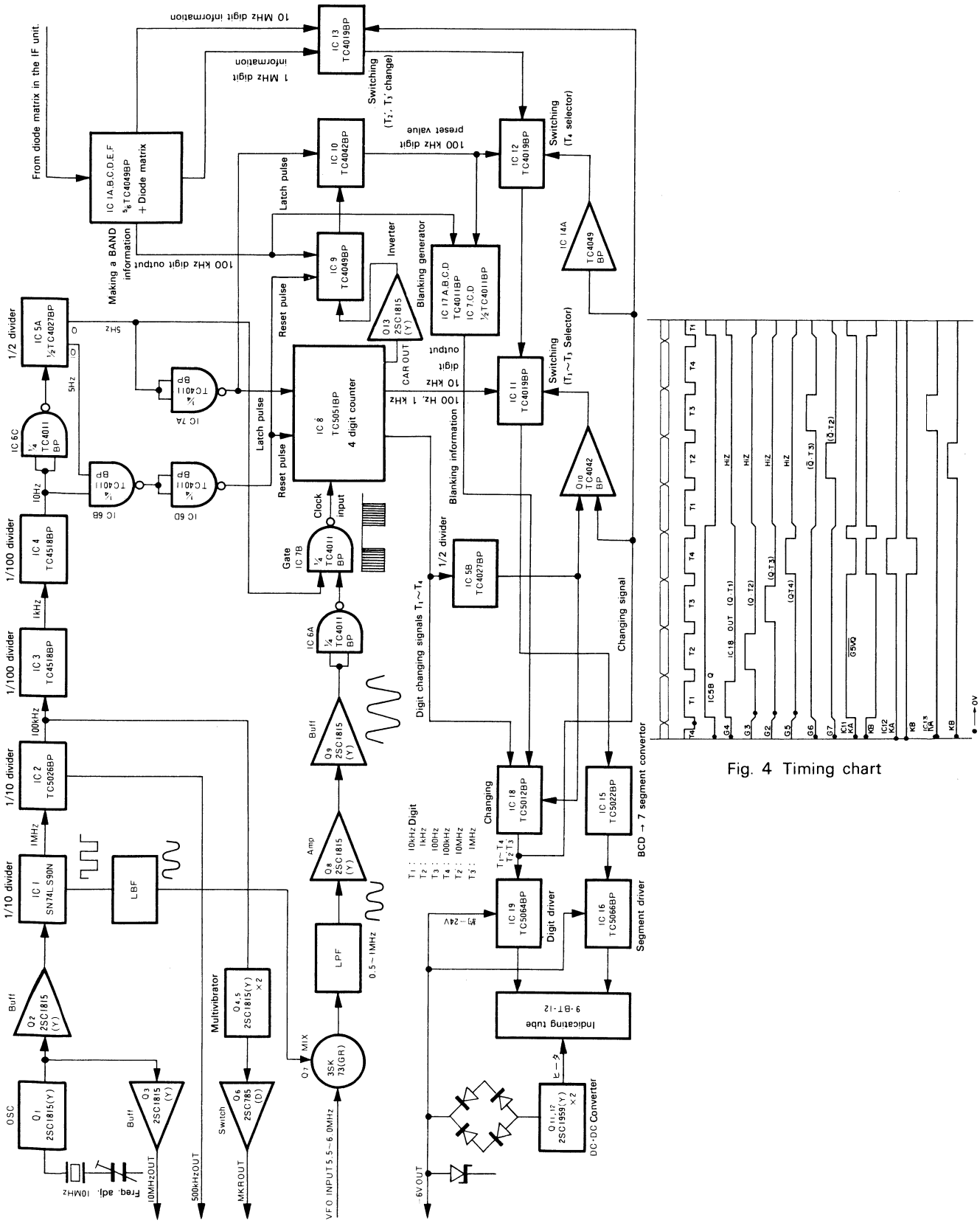


Fig. 4 Timing chart

Fig. 3 Counter circuit configuration of TS-120V

FUNCTIONAL DESCRIPTION

frequency is counted, the operating frequency is indicated as accurately as the reference oscillator frequency, provided that the 10 MHz reference is calibrated to WWV. The CW operating frequency is indicated accurate to the 100 Hz order, regardless of the band or mode.

If the VFO output varies to the extent that the indications of 1 MHz and 10 MHz orders are switched (beyond the band edge), these indications disappear and a blanking signal is developed.

Operating band	Blanking frequencies
3.5 MHz	more than 4.000.0 MHz
7.0 MHz	less than 7.000.0 MHz
14.0 MHz	less than 14.000.0 MHz
21.0 MHz	less than 21.000.0 MHz
28.0 MHz	less than 28.000.0 MHz
28.5 MHz	more than 29.000.0 MHz
29.0 MHz	less than 29.000.0 MHz
29.5 MHz	more than 30.000.0 MHz

PROTECTION CIRCUIT

Fig. 5 shows the TS-120V protection circuit. When the transmit output load varies, the toroid in the final circuit samples the reflected wave. It is then rectified and amplified, producing a protection voltage to control the 2SK19 AF-GEN unit (Q12), so transmitter output is continuously reduced.

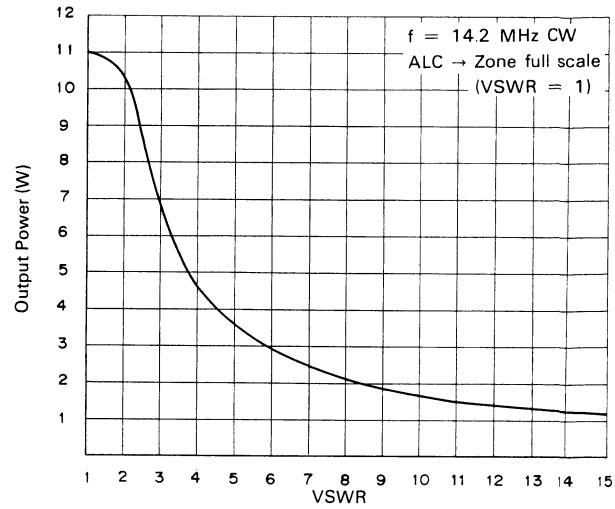


Fig. 6 VSWR vs Power output characteristics

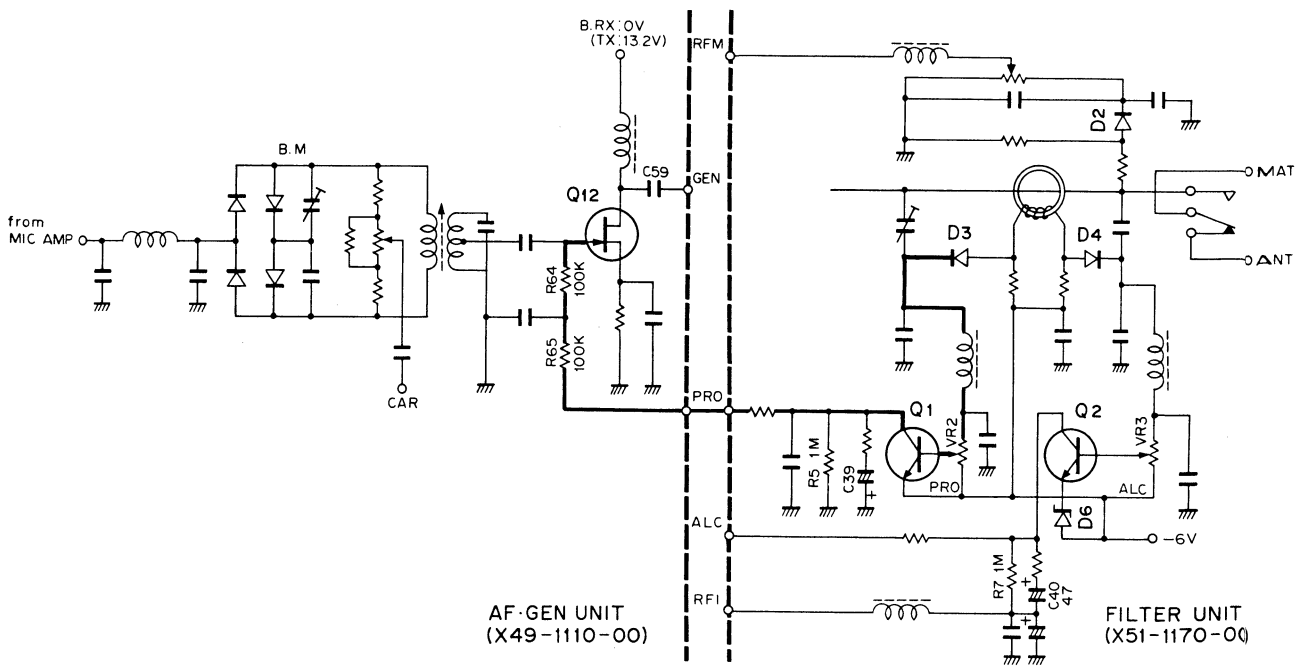
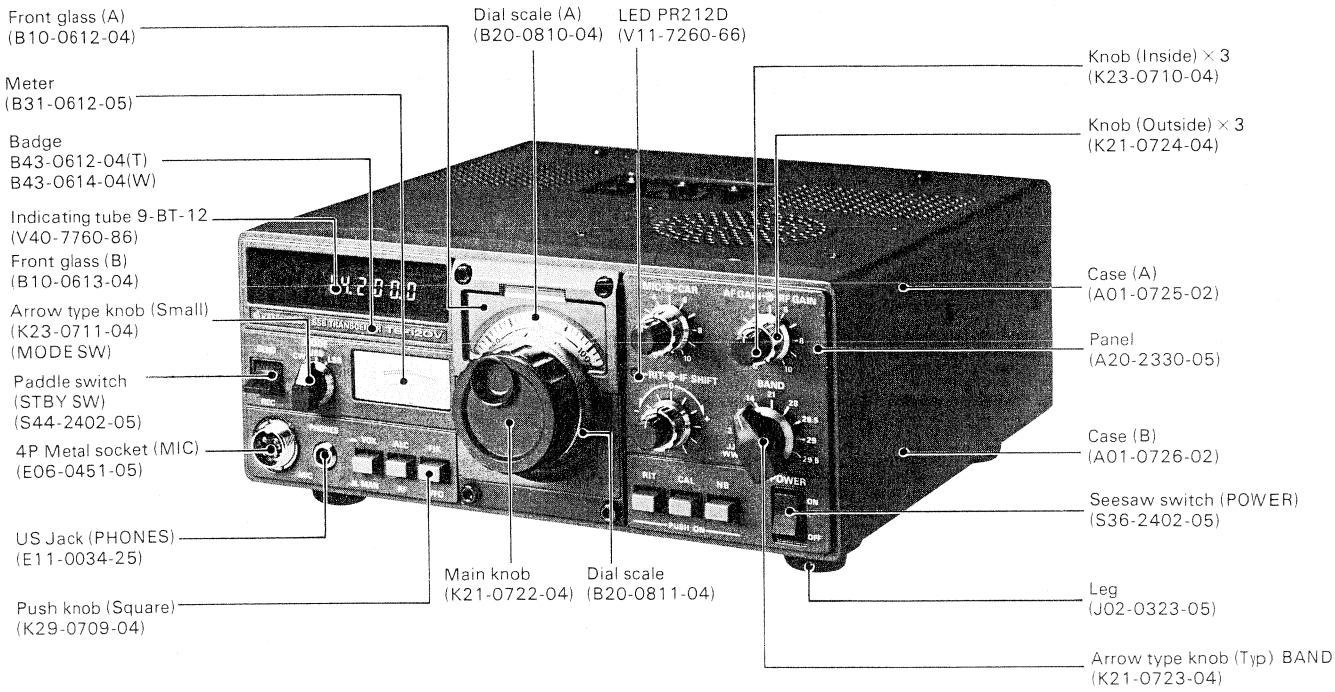
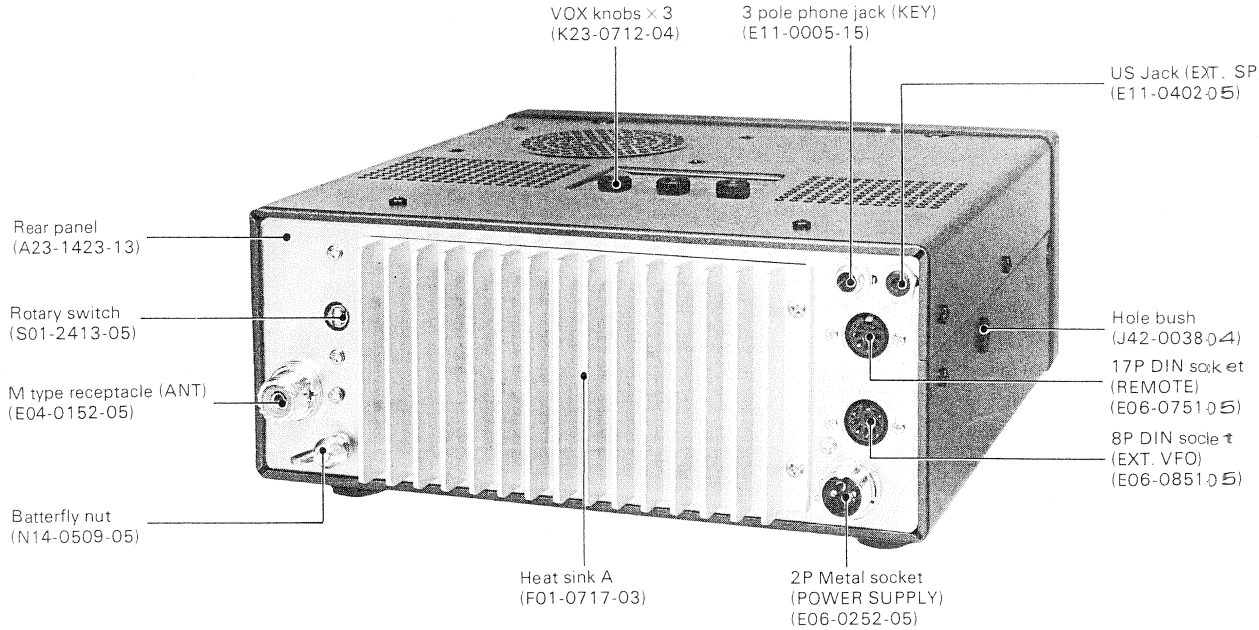


Fig. 5 Protection circuit of TS-120V

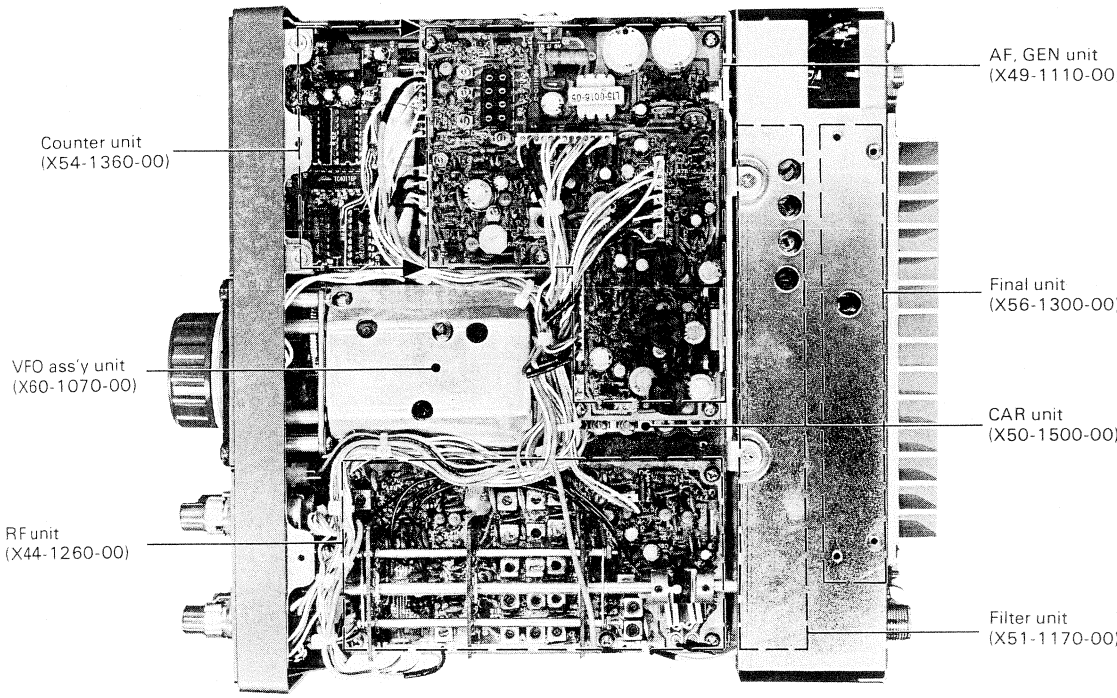
PANEL CONTROLS



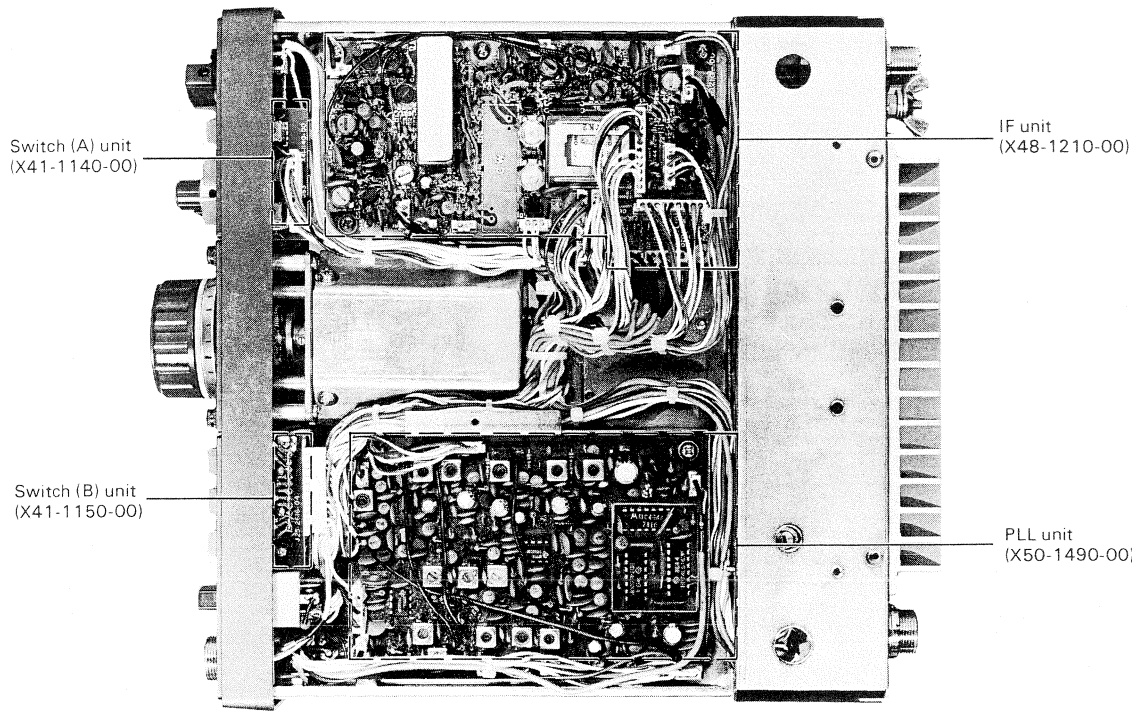


PARTS ALIGNMENT

VIEWED FROM TOP

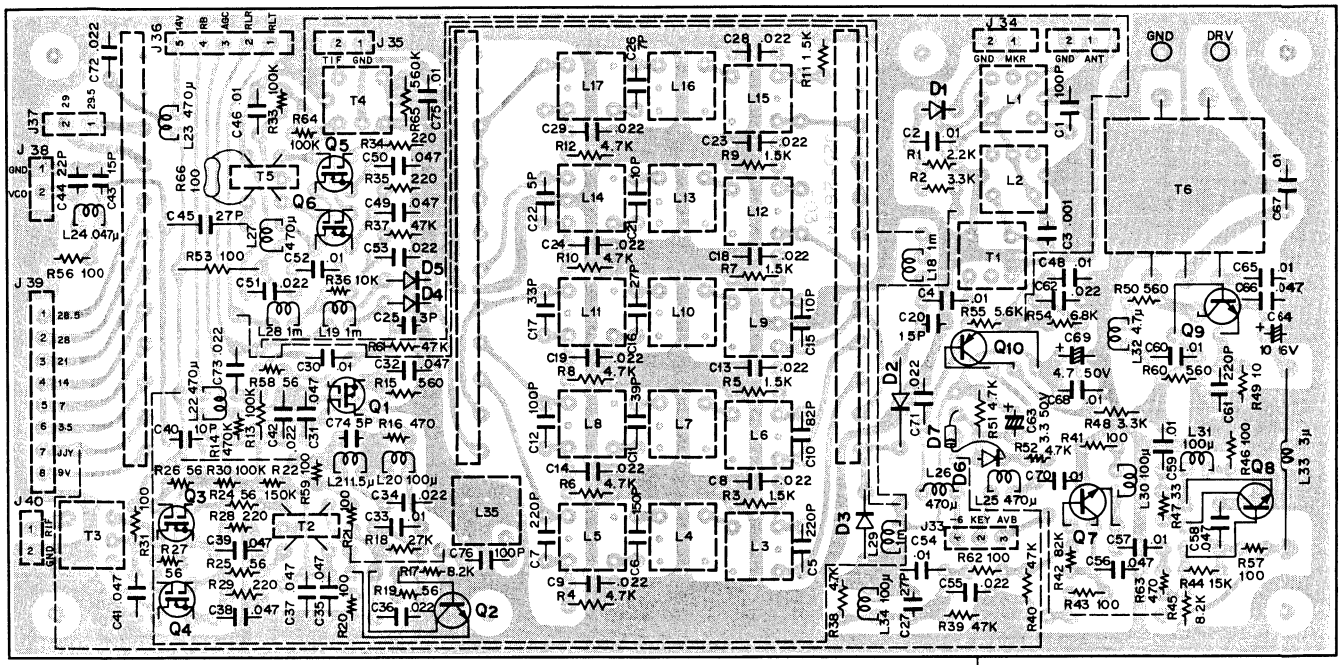


VIEWED FROM BOTTOM

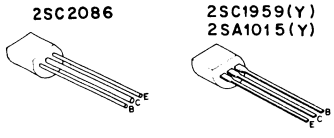


PC BOARD/CIRCUIT DIAGRAM

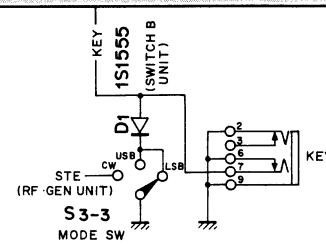
▼ RF UNIT (X44-1260-00)



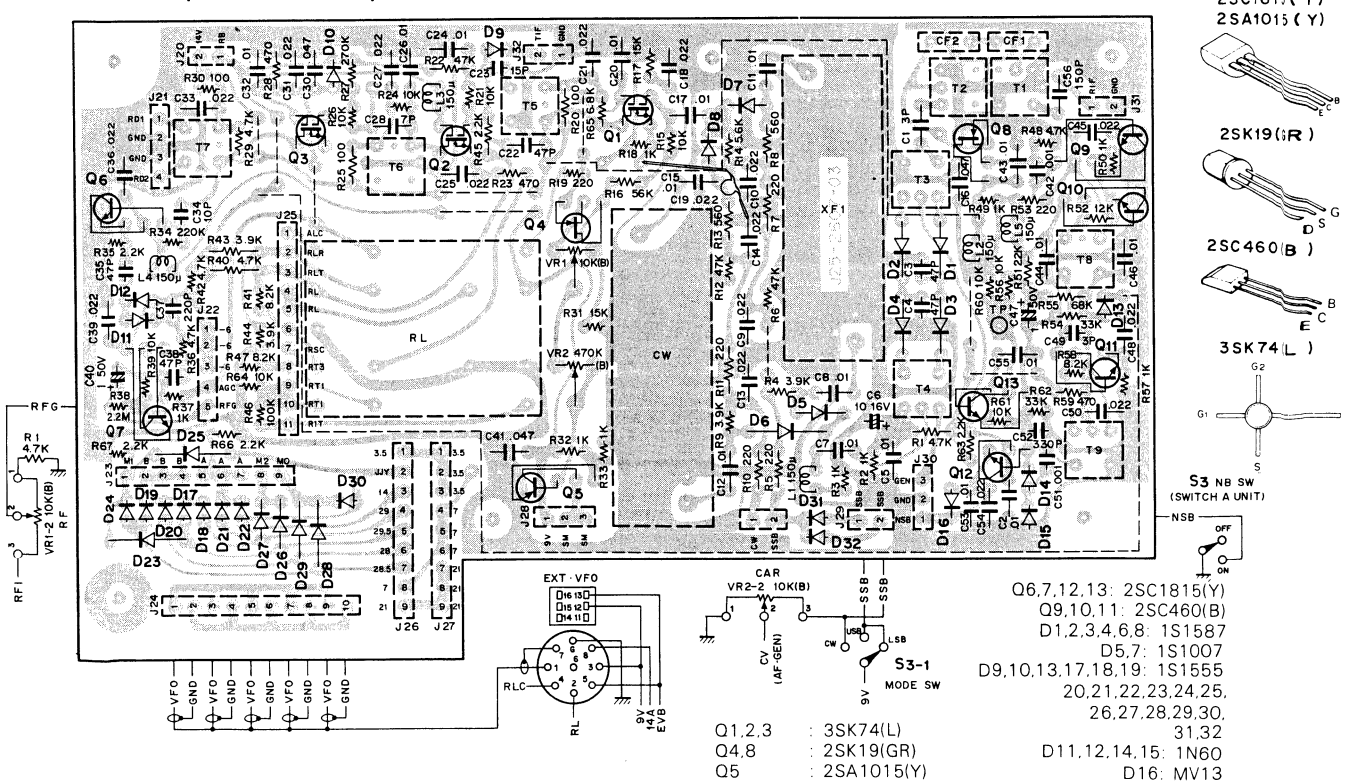
Q1,3,4,5,6: 3SK74(L), Q2,7,8: 2SC1815(Y), Q9: 2SC2086, Q10: 2SA1015(Y)



D1,3,5	:	1S1587
D2,4	:	1S2588
D6	:	1S1555
D7	:	1N60



▼ IF UNIT (X48-1210-00)

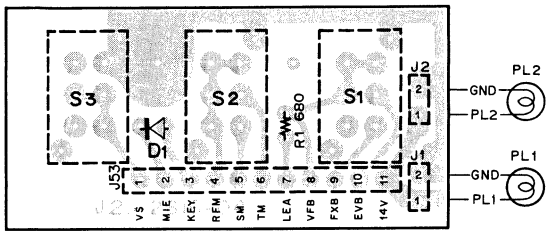


Q1,2,3	:	3SK74(L)
Q4,8	:	2SK19(GR)
Q5	:	2SA1015(Y)

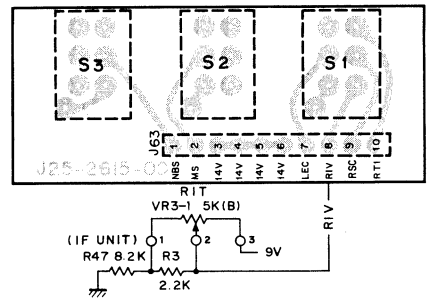
Q6,7,12,13: 2SC1815(Y)
Q9,10,11: 2SC460(B)
D1,2,3,4,6,8: 1S1587
D5,7: 1S1007
D9,10,13,17,18,19: 1S1555
20,21,22,23,24,25,
26,27,28,29,30,
31,32
D11,12,14,15: 1N60
D16: MV13

PC BOARD/CIRCUIT DIAGRAM

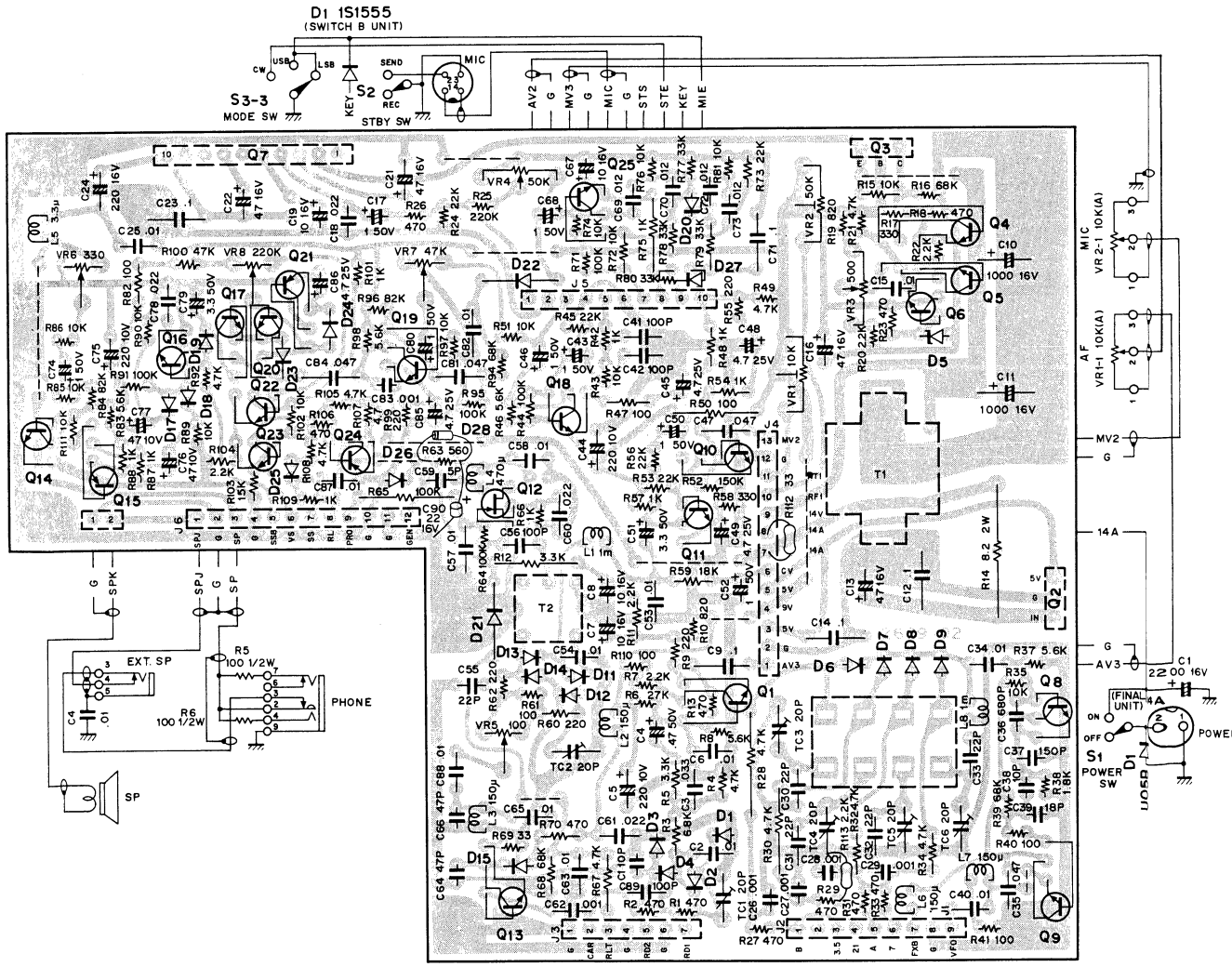
▼ SWITCH (B) UNIT (X41-1150-00)



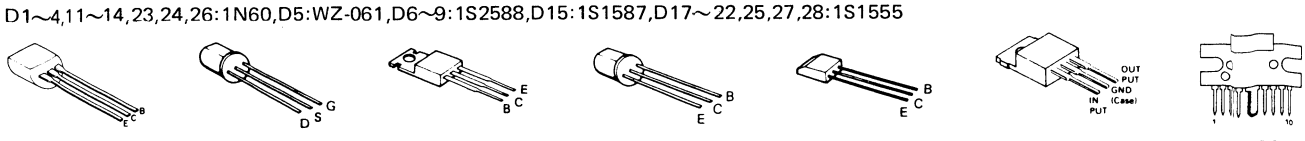
▼ SWITCH (A) UNIT (X41-1140-00)



▼ AF, GEN UNIT (X49-1110-00)

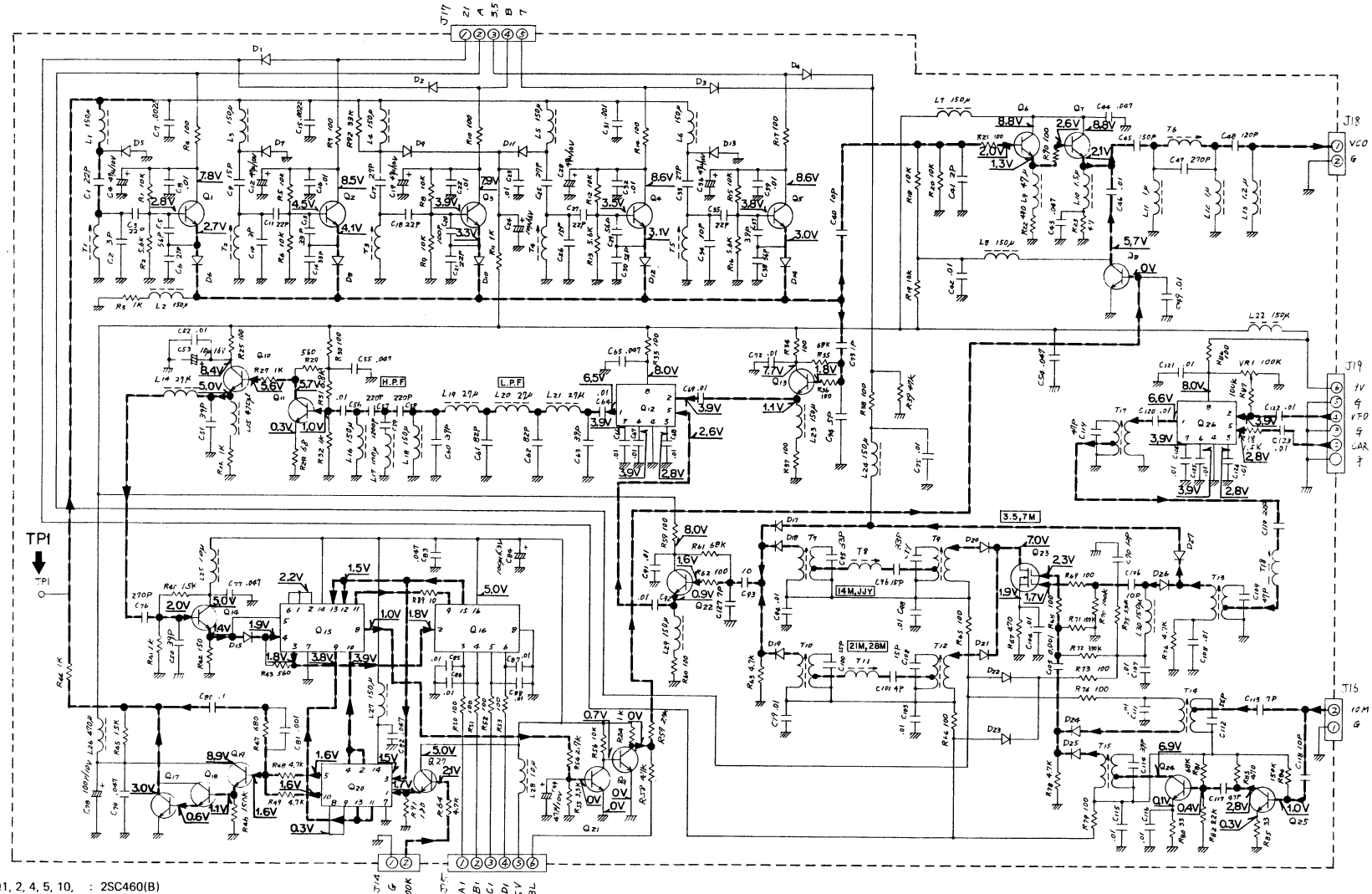


Q1,18:2SC2240(GR),Q2:μPC14305H, Q3:2SA473(Y),Q4~6,10,11,14,16,17,19,20,22,23,25:2SC1815(Y)
Q7:HA1366W,Q8,13:2SC460(B),Q9:2SC1959(Y),Q12:2SK19(GR),Q15,21:2SA1015(Y),Q24:2SA562(Y)
D1~4,11~14,23,24,26:1N60,D5:WZ-061,D6~9:1S2588,D15:1S1587,D17~22,25,27,28:1S1555



PC BOARD/CIRCUIT DIAGRAM

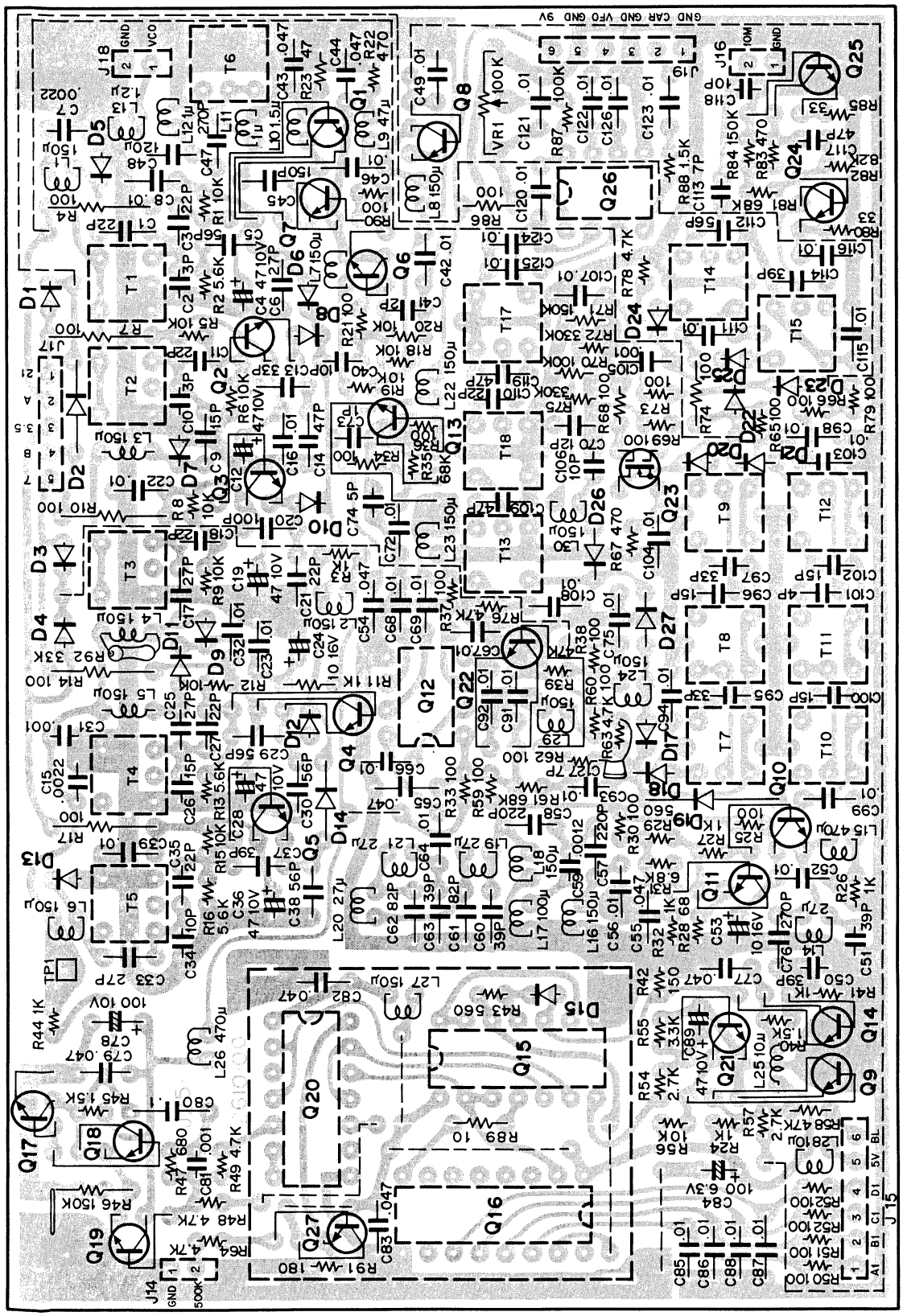
▼ PLL UNIT (X50-1490-00)

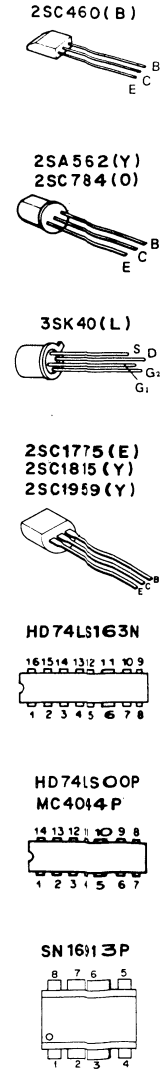


Q1, 2, 4, 5, 10, 11, 13, 14, 22, 24, 25	: 2SC460(B)						
Q7, 8	: 2SC1959(Y)	Q12, 26	: SN16913P	D1, 2, 3, 4, 15, 22, 23	: 1S1555	D6, 8, 12, 14, 17, 18, 19, 20, 21, 24, 25, 26, 27	: 1S1587
Q9, 21, 27	: 2SC1815(Y)	Q15	: HD74LS00P				
Q17, 18, 19	: 2SC1775(E)	Q16	: 74LS163N P	D5, 7, 9, 11, 13	: 1SV53A		
Q23	: 3SK40(L)	Q20	: MC4044P	D10	: 1S2588		
Q3, 6	: 2SC784(O)						

PC BOARD/CIRCUIT DIAGRAM

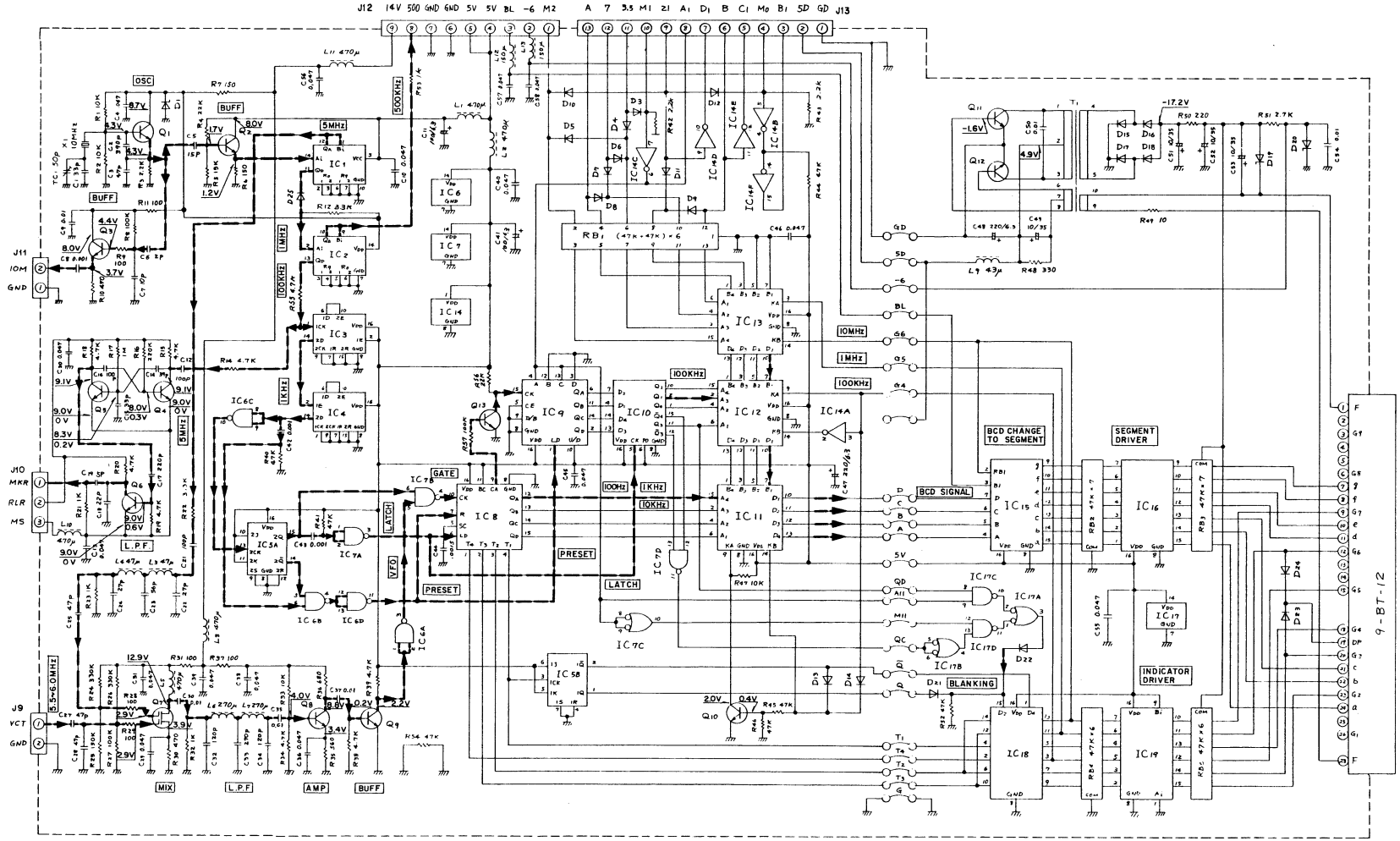
▼ PLL UNIT (X50-1490-00)





PC BOARD/CIRCUIT DIAGRAM

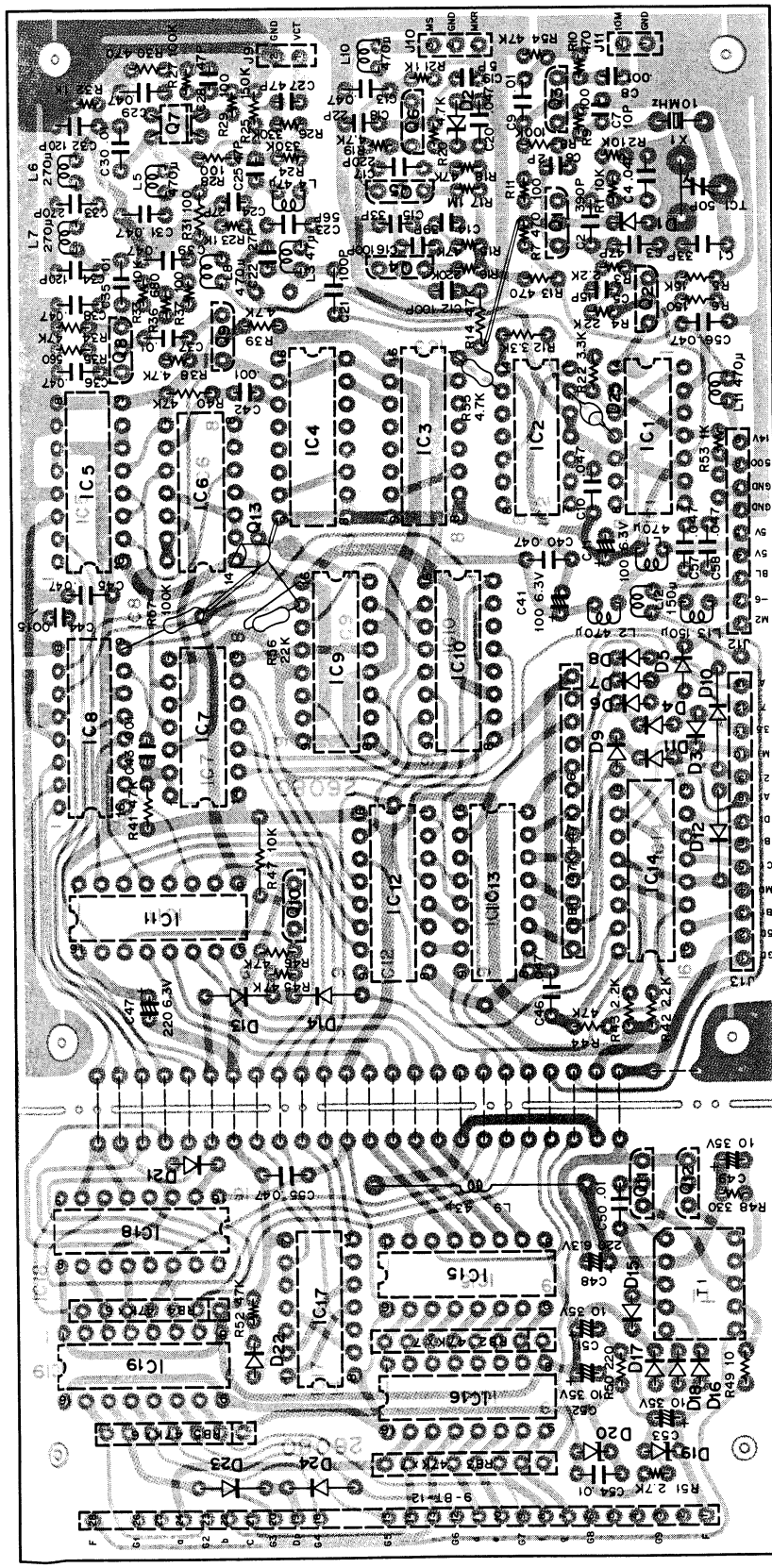
▼ COUNTER UNIT (X54-1360-00)



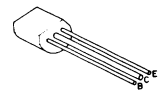
Q1,2,3,4,5,8,9,10,13	: 2SC1815(Y)	D3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 21, 22, 23, 24	: 1S1555	IC1	: SN74LS90N	IC10	: TC4042BP
Q7	: 3SK73(GR)			IC2	: TC5026BP	IC11, 12, 13	: TC4019BP
Q11, 12	: 2SC1959(Y)			IC3, 4	: TC4518BP	IC14	: TC4049BP
Q6	: 2SC785(O)			IC5	: TC4027BP	IC15	: TC5022BP
		D19	: WZ-071	IC6, 7, 17	: TC4011BP	IC16	: TC5066BP
D1	: WZ-090	D20	: XZ-060	IC8	: TC5051BP	IC18	: TC5012BP
		D25	: MV-13	IC9	: TC4029BP	IC19	: TC5064BP

PC BOARD/CIRCUIT DIAGRAM

▼ COUNTER UNIT (X54-1360-00)

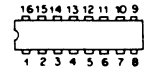


2SC2086

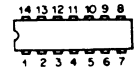


3SK73(GR)

TC4518BP TC4027BP
TC5051BP TC4029BP
TC4042BP TC4019BP
TC4049BP TC5022BP
TC5066BP TC5012BP
TC5064BP HD74LS163N



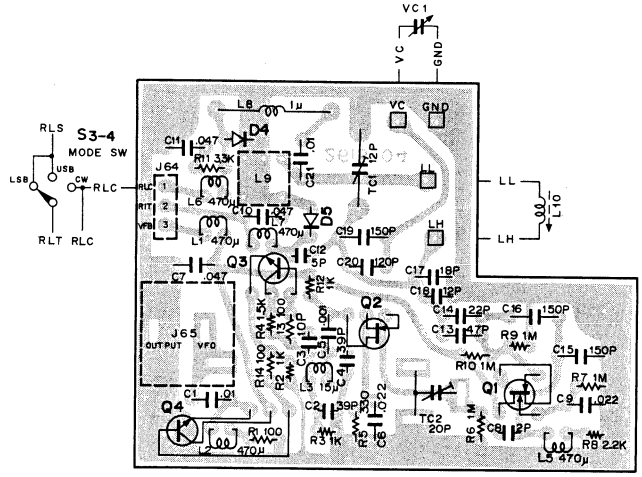
SN74LS90N TC5026BP
TC4011BP



PC BOARD/CIRCUIT DIAGRAM

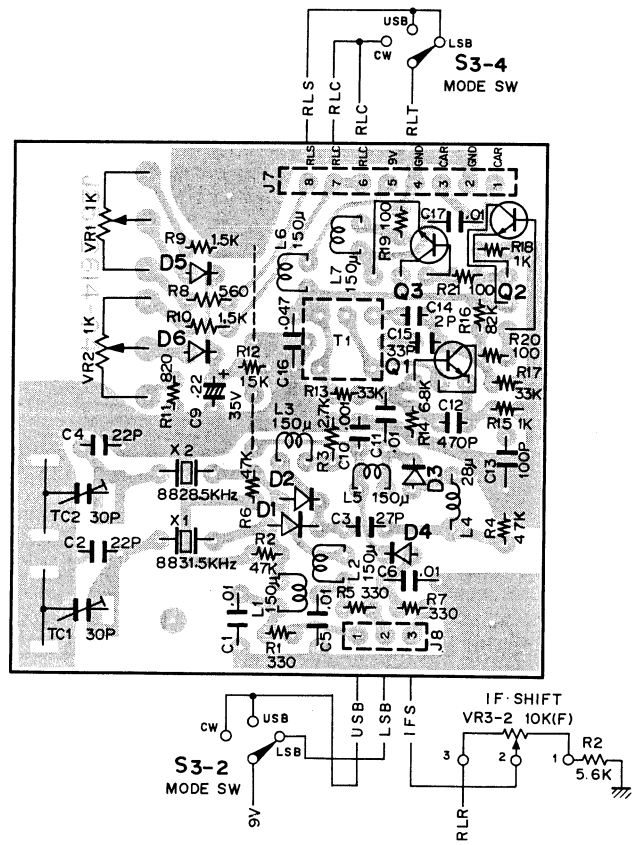
▼ VFO UNIT (X40-1130-00)

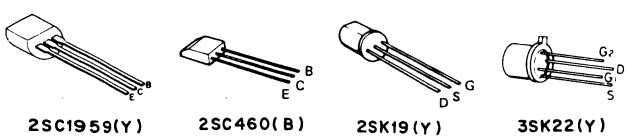
Q1 : 3SK22(Y)
Q2 : 2SK19(Y)
Q3 : 2SC460(B)
Q4 : 2SC1959(Y)
D4 : 1S2588
D5 : 1SV53A



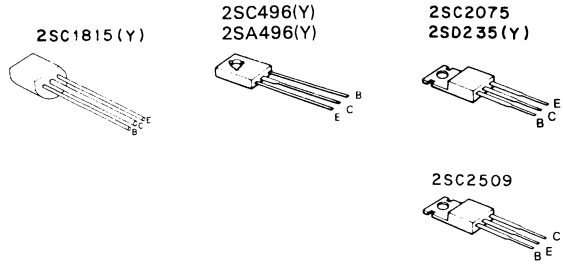
▼ CARRIER UNIT (X50-1500-00)

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

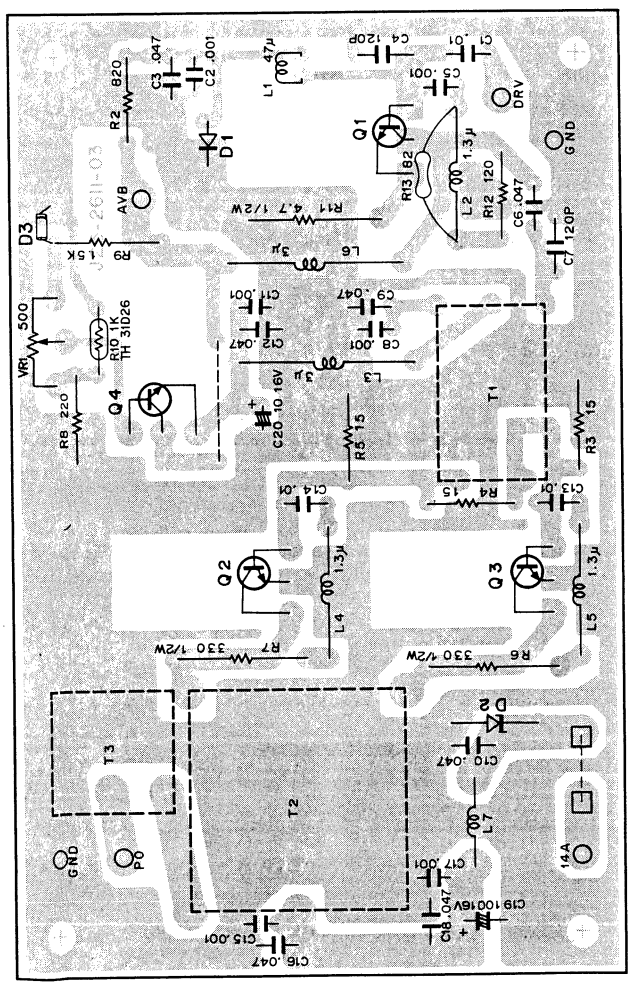




PC BOARD/CIRCUIT DIAGRAM

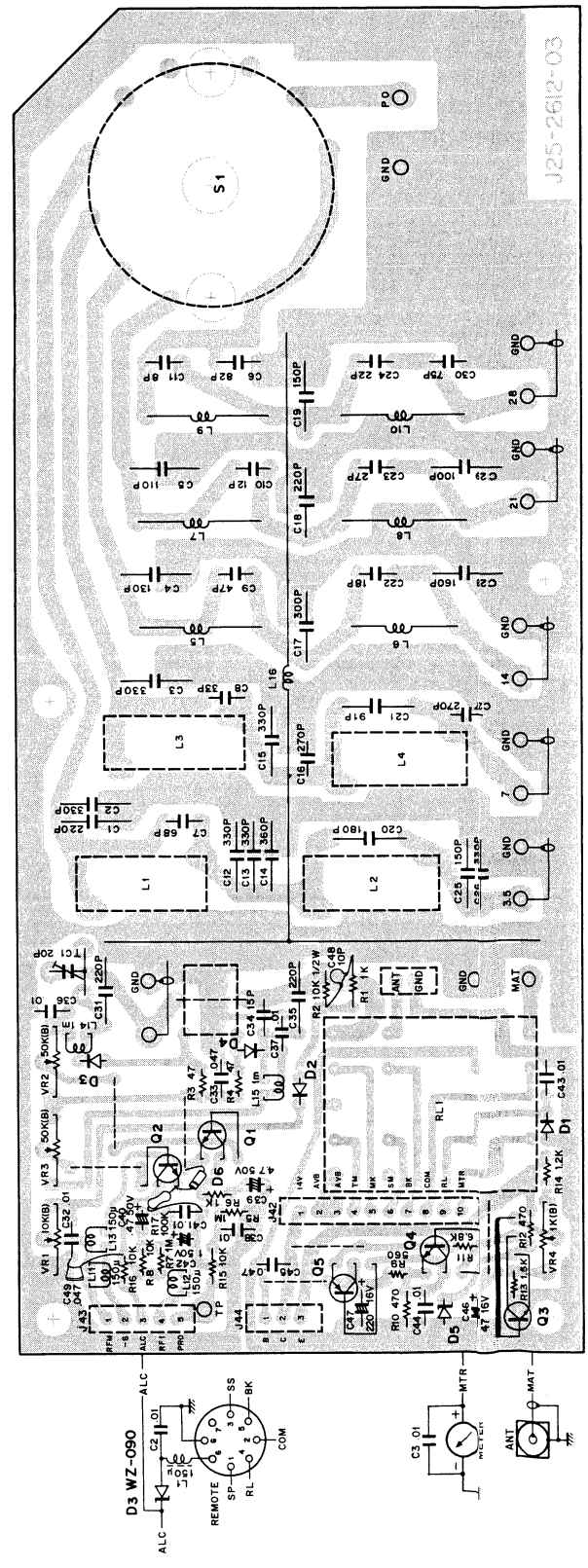


▼ FINAL UNIT (X56-1300-00)



Q1:2SC2075,Q2,3:2SC2509,Q4:2SC496(Y)
Q5:2SD235(Y), D1:SV4A,D2:BZ-240
D3:SV-03

▼ FILTER UNIT (X51-1170-00)



Q1~4:2SC1815(Y),Q5:2SA496(Y), D1:1S1555,D2~4:1N60,D5:WZ-061,D6:WZ-044

PARTS LIST

Note 1:

Except special types (example: cement, metal film, etc.) resistors and capacitors (example: electrolytic, tantalum, mylar, temp. coeff. capacitors) are not detailed in the PARTS LIST. In regard to value, refer to the schematic diagram or the PC board illustration. Resistors not otherwise detailed are carbon type (1/4 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.

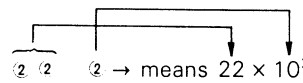
1. Type of the carbon resistor

RD14BY

RD14CY

2. Wattage
   1/4W → 2E
   1/8W → 2B

3. Resistance value



Significant figure Multiplier

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

4. Tolerance
   J = ±5% (Gold)
   K = ±10% (Silver)

Note 2:

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

CAPACITOR'S

CK	45	F	1H	103	Z
1	2	3	4	5	6

CC	45	TH	1H	220	J
1′	2	3′	4	5	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 10μF −10∼+50 Less than 4.7μF −10∼+75

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

CK45F

Ceramic capacitor (type II) 3

Cord	B	D	E	F
Operating temperature °C	−30 +85	−30 +85	−30 +85	−10 +70

Capacitor value

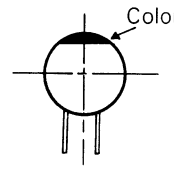
Example: 010 → 1pF
100 → 10pF
101 → 100pF
102 → 1000pF = 0.001μF
103 → 0.01μF

CC4500....

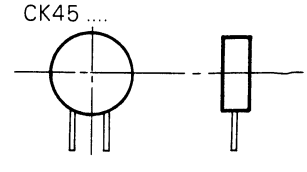
Ceramic capacitor (type I) temperature coeff. capacitor 1′ 3′

1st word (Color)	CH (Black)	LH (Red)	PH (Orange)	RH (Yellow)	SL (Green)	TH (Blue)	UH (Violet)
ppm/°C	0	−80	−150	−220	−330	−470	−750

CC45 ....



CK45 ....



Cord 45

PARTS LIST

☆ New parts

Ref. No.	Parts No.	Description	Re-marks
GENERAL			
		CAPACITOR	
C1	C90-0806-05	Electrolytic 2200μF 16WV	☆
C2～4	CK45F1H103Z	Ceramic 0.01μF +80,−20%	
		RESISTOR	
R1～3	RD14BB2EOOOJ	Carbon resistor OOOΩ ±5% 1/4W	
R5,6	RC05GF2H101J	Solid resistor 100Ω ±5% 1/2W	
		SEMICONDUCTOR	
D1	V11-0270-05	Diode U05B	
D2	V11-7260-66	LED PR212D	☆
D3	V11-0240-05	Zener diode WZ-090	
		POTENTIOMETER	
VR1	R06-9402-05	10kΩ (A) AF 10kΩ (B) RF	
VR2	R06-9402-05	10kΩ (A) MIC 10kΩ (B) CAR	
VR3	R06-9403-05	5kΩ (B) RIT 10kΩ (F) IF SHIFT	
		MISCELLANEOUS	
S1	S36-2402-05	See saw switch POWER	☆
S2	S44-2402-05	Paddle switch STBY	☆
S3	S01-1410-05	Rotary switch MODE	☆
L1	L40-1511-03	Ferri-inductor 150μH	
—	A01-0725-02	Case (A) upper	☆
—	A01-0726-02	Case (B) Lower	☆
—	A20-2331-03	Panel ass'y	☆
—	A23-1423-13	Rear panel	☆
—	B05-0701-04	Speaker grill cloth	
—	B10-0613-04	Front glass (B)	☆
—	B20-0811-04	Dial scale (B)	☆
PL1,2	B30-0808-05	Pilot lamp × 2	☆
—	B31-0612-05	Meter	☆
—	B39-0407-04	Spacer × 2 for leg	☆
—	B42-1644-00	Indicating plate (VOX)	
—	B42-1659-14	Indicating plate (ADJUSTMENT)	
—	B43-0612-04	Badge (T)	☆
—	B43-0614-04	Badge (W)	☆
—	B50-2602-00	Operating manual (W)	☆
—	B50-2603-00	Operating manual (T)	☆
—	D21-0807-05	Band shaft	☆
—	D22-0404-05	Universal joint	☆
—	D40-0603-04	Gear Ass'y	☆
—	E04-0152-05	M type receptacle ANT	☆
—	E06-0252-05	2P metal socket (Power supply)	☆
—	E06-0451-05	4P metal socket MIC	☆
—	E06-0751-05	7P DIN socket REMOTE	☆
—	E06-0851-05	8P DIN socket EXT.VFO SW	☆
—	E07-0751-05	7P DIN plug REMOTE	☆
—	E11-0005-15	3 pole phone jack KEY	
—	E11-0034-25	US jack PHONES	
—	E11-0402-05	US jack EXT.SP	☆
—	E12-0001-05	Phone plug EXT.SP	
—	E22-0207-05	Lug plate 101B	
—	E22-0405-05	Lug plate × 3 202B	
—	F05-6021-05	Fuse 6A	
—	G02-0505-05	Knob fitting spring × 3	☆
—	H01-2580-00	Carton case (inside) (W)	
—	H01-2582-00	Carton case (inside) (T)	
—	H03-1675-00	Carton case (outside) (W)	
—	H03-1676-00	Carton case (outside) (T)	
—	H01-2574-04	Cover case	☆
—	H10-2509-02	Styren foam cushion (F)	☆
—	H10-2510-02	Styren foam cushion (R)	☆
—	H12-0441-04	Cushion	☆
—	H20-1405-03	Protection cover	☆
—	H21-0701-04	Protection sheet for VOX	☆
—	J02-0323-05	Leg × 4	☆
—	J02-0407-04	Assistance leg	☆
—	J21-2504-04	Mounting stopper (SP)	☆
—	J31-0141-04	Spacer ring for mic	
—	J42-0038-04	Hole bush	
—	J42-0407-04	Knob bush × 2	☆
—	J61-0019-05	Vinyle tie × 10	
—	J61-0401-05	Nylon band × 30	
—	K21-0722-04	Main knob VFO	☆
—	K21-0723-04	Arrow type knob (Typ)	☆
—	K21-0724-04	Knob (outside) × 3	☆
—	K23-0710-04	Knob (inside) × 3	☆
—	K23-0711-04	Arrow type knob (small) KNOB	☆
—	K23-0712-04	VOX knob × 3	☆
—	K29-0709-04	Push knob (square) × 6	☆
—	N14-0508-04	Nut with (cross hole) Panel	☆
—	N14-0509-05	Btterfly nut	☆
—	N19-0607-04	Nylon washer Panel	☆
—	N99-0303-05	Hex. socket screw (VFO)	☆
—	T03-0027-15	Speaker	

SWITCH (A) UNIT (X41-1140-00)

Ref. No.	Parts No.	Description	Re-marks
S1～3	S40-2404-05	Push switch SPJ222H	☆

SWITCH (B) UNIT (X41-1150-00)

Ref. No.	Parts No.	Description	Re-marks
R1	RD14CB2E681J	Carbon resistor 680Ω ±5% 1/4W	
D1	V11-0076-05	Diode 1S1555	
S1～3	S40-2405-05	Push switch SPJ222E	☆

DC CORD ASS'Y (X-42-1170-00)

Ref. No.	Parts No.	Description	Re-marks
—	E07-0252-05	2P Metal plug	☆
—	F05-6021-05	Fuse 6A	
—	J13-0029-05	Fuse holder	

PARTS LIST

RF UNIT (X-44-1260-00)

Ref. No.	Parts No.	Description	Remarks
CAPACITOR			
C1	CC45RH1H101J	Ceramic 100pF ±5%	
C3	CQ09S1H102J	Styrene 1000pF ±5%	
C5	CC45RH1H221J	Ceramic 220pF ±5%	
C6	CC45RH1H151J	Ceramic 150pF ±5%	
C7	CC45RH1H221J	Ceramic 220pF ±5%	
C10	CC45RH1H820J	Ceramic 82pF ±5%	
C11	CC45RH1H390J	Ceramic 39pF ±5%	
C12	CC45RH1H101J	Ceramic 100pF ±5%	
C15	CC45RH1H100D	Ceramic 10pF ±0.5pF	
C16	CC45RH1H270J	Ceramic 27pF ±5%	
C17	CC45RH1H330J	Ceramic 33pF ±5%	
C20	CC45RH1H150J	Ceramic 15pF ±5%	
C21	CC45RH1H100D	Ceramic 10pF ±0.5pF	
C22	CC45RH1H050C	Ceramic 5pF ±0.25pF	
C25	CC45RH1H030C	Ceramic 3pF ±0.25pF	
C26	CC45RH1H070C	Ceramic 7pF ±0.25pF	
C27	CC45RH1H270J	Ceramic 27pF ±5%	
C31,32	C90-0262-05	Ceramic 0.047μF 25WV	
C35	C90-0262-05	Ceramic 0.047μF 25WV	
C37～39	C90-0262-05	Ceramic 0.047μF 25WV	
C40	CC45SL1H100D	Ceramic 10pF ±0.5pF	
C41	C90-0262-05	Ceramic 0.047μF 25WV	
C43	CC45SL1H150J	Ceramic 15pF ±5%	
C44	CC45SL1H220J	Ceramic 22pF ±5%	
C45	CC45SL1H270J	Ceramic 27pF ±5%	
C49,50	C90-0262-05	Ceramic 0.047μF 25WV	
C56	C90-0262-05	Ceramic 0.047μF 25WV	
C58	C90-0262-05	Ceramic 0.047μF 25WV	
C61	CC45SL1H221J	Ceramic 220pF ±5%	
C63	CE04W1H3R3	Electrolytic 3.3μF 50WV	
C64	CE04W1C100	Ceramic 10μF 16WV	
C66	C90-0262-05	Ceramic 0.047μF 25WV	
C69	CE04W1H4R7	Electrolytic 4.7μF 50WV	
C74	CC45RH1H050C	Ceramic 5pF ±0.25pF	
C76	CC45RH1H101J	Ceramic 100pF ±5%	
RESISTOR			
R1～66	RD14CB2E○○○J	Carbon Resistor ○○○Ω ±5% 1/4W	
R22,32	VACANT		
SEMICONDUCTOR			
Q1	V09-1002-56	FET 3SK74(L)	☆
Q2	V03-1815-06	Transistor 2SC1815(Y)	
Q3～6	V09-1002-56	FET 3SK74(L)	☆
Q7,8	V03-1815-06	Transistor 2SC1815(Y)	
Q9	V03-2086-06	Transistor 2SC2086	☆
Q10	V01-1015-06	Transistor 2SA1015(Y)	
D1	V11-0370-05	Diode 1S1587	
D2	V11-0414-05	Diode 1S2588	
D3	V11-0370-05	Diode 1S1587	
D4	V11-0414-05	Diode 1S2588	
D5	V11-0370-05	Diode 1S1587	
D6	V11-0076-05	Diode 1S1555	
D7	V11-0051-05	Diode 1N60	
COIL/INDUCTOR/TRANSFORMER			
L1	L34-0559-05	Trap coil 8.83 MHz	
L2	L34-0558-05	Trap coil 8.83 MHz	
L3	L34-0698-05	BPF coil 3.5 MHz	☆
L4	L34-0699-05	BPF coil 3.5 MHz	☆
L5	L34-0698-05	BPF coil 3.5 MHz	☆
L6	L34-0700-05	BPF coil 7 MHz	☆
L7	L34-0701-05	BPF coil 7 MHz	☆
L8	L34-0700-05	BPF coil 7 MHz	☆
L9	L34-0702-05	BPF coil 14 MHz, WWV	☆
L10	L34-0703-05	BPF coil 14 MHz, WWV	☆
L11	L34-0702-05	BPF coil 14 MHz, WWV	☆
L12	L34-0704-05	BPF coil 21 MHz	☆
L13	L34-0705-15	BPF coil 21 MHz	☆
L14	L34-0706-05	BPF coil 21 MHz	☆
L15	L34-0707-05	BPF coil 28 MHz	☆
L16	L34-0737-05	BPF coil 28 MHz	☆
L17	L34-0738-05	BPF coil 28 MHz	☆
L18,19	L40-1021-03	Ferri inductor 1 mH	
L20	L40-1011-03	Ferri inductor 100μH	
L21	L40-1592-02	Ferri inductor 1.5μH	
L22,23	L40-4711-03	Ferri inductor 470 μH	
L24	L40-4782-02	Ferri inductor 0.47μH	
L25～27	L40-4711-03	Ferri inductor 470μH	
L28,29	L40-1021-03	Ferri inductor 1 mH	
L30,31	L40-1011-03	Ferri inductor 100 μH	
L32	L40-4791-02	Ferri inductor 4.7μH	
L33	---)32-05	Choke coil 3 μH	
L34	L40-1011-03	Ferri inductor 100 μH	
L35	L34-0559-05	Trap coil 8.83 MHz	
T1	L34-0696-15	Input coil ANT	
T2	L19-0303-05	Wide range transformer	☆
T3,4	L34-0697-05	Output coil	☆
T5	L19-0303-05	Wide range transformer	☆
T6	L19-0302-05	Wide range transformer P.DRV	☆
MISCELLANEOUS			
—	S29-3404-15	Rotary wafer ass'y	☆

IF UNIT (X48-1210-00)

Ref. No.	Parts No.	Description	Remarks
Capacitor			
C1	CC45SL1H030C	Ceramic 3pF ±0.25pF	
C3,4	CC45SL1H470J	Ceramic 47pF ±5%	
C6	CE04W1C100	Electrolytic 10μF 16WV	
C22	CC45SL1H470J	Ceramic 47pF ±5%	
C23	CC45SL1H150J	Ceramic 15pF ±5%	
C28	CC45SL1H070D	Ceramic 7pF ±0.5pF	
C34	CC45SH1H100D	Ceramic 10pF ±0.5pF	
C35	CC45SH1H470J	Ceramic 47pF ±5%	
C38	CC45SL1H470J	Ceramic 47pF ±5%	
C40	CE04W1H010	Electrolytic 1μF 50WV	
C47	CE04W1H010	Electrolytic 1μF 50WV	
C49	CC45SL1H030C	Ceramic 3pF ±0.25pF	
C56	CC45SL1H151J	Ceramic 150pF ±5%	
RESISTORS			
R1～67	RD14CB2E○○○J	Carbon resistor ○○○Ω ±5% 1/4W	
SEMICONDUCTOR			
Q1～3	V09-1002-56	FET 3SK74(L)	
Q4	V09-0012-05	FET 2SK19(GR)	
Q5	V01-1015-06	Transistor 2SA1015(Y)	
Q6,7	V03-1815-06	Transistor 2SC1815(Y)	
Q8	V09-0012-05	FET 2SK19(GR)	
Q9～11	V03-0079-05	Transistor 2SC460(B)	

PARTS LIST

Ref. No.	Parts No.	Description	Remarks
Q12,13	V03-1815-06	Transistor 2SC1815(Y)	
D1～4	V11-0370-05	Diode 1S1587	
D5	V11-4160-66	Diode 1S1007	
D6	V11-0370-05	Diode 1S1587	
D7	V11-4160-66	Diode 1S1007	
D8	V11-0370-05	Diode 1S1587	
D9,10	V11-0076-05	Diode 1S1555	
D11,12	V11-0051-05	Diode 1N60	
D13	V11-0076-05	Diode 1S1555	
D14,15	V11-0051-06	Diode 1N60	
D16	V21-0004-05	Varistor MV13	
D17～32	V11-0076-05	Diode 1S1555	
POTENTIOMETER			
VR1	R12-3045-05	10kΩ (B)	
VR2	R12-6401-05	470kΩ (B)	
INDUCTOR/COIL			
L1～5	L40-1511-03	Ferri-inductor 150μF	
T1,2	L34-0708-05	Tuning coil	☆
T3	L34-0537-05	Tuning coil	
T4	L34-0538-05	Tuning coil	
T5,6	L34-0535-05	Tuning coil	
T7	L34-0536-05	Tuning coil	
T8	L34-0535-05	Tuning coil	
T9	L34-0536-05	Tuning coil	
MISCELLANEOUS			
XF1	L71-0208-05	Cristal filter 4 element, monolitic	☆
CF1,2	L72-0310-05	Ceramic filter for NB	☆
—	E23-0046-04	Terminal (Square)	
—	S51-4401-05	Relay LZN-4	

AF. GEN UNIT (X49-1110-00)

Ref. No.	Parts No.	Description	Remarks
CAPACITOR			
C1	CC45CH1H100D	Ceramic 10pF ±0.5pF	
C3	CQ92M1H333K	Mylar 0.033μF ±10%	
C4	CE04W1HR47	Electrolytic 0.47μF 50WV	
C5	CE04W1A221	Electrolytic 220μF 10WV	
C7,8	CE04W1C100	Electrolytic 10μF 16WV	
C9	CQ92M1H104K	Mylar 0.1μF ±10%	
C10,11	CE04W1C102Q	Electrolytic 1000μF 16WV	
C12	CQ92M1H104K	Mylar 0.1μF ±10%	
C13	CE04W1C470	Electrolytic 47μF 16WV	
C14	CQ92M1H104K	Mylar 0.1μF ±10%	
C16	CE04W1C470	Electrolytic 47μF 16WV	
C17	CE04W1H010	Electrolytic 1μF 50WV	
C18	CQ92M1H223K	Mylar 0.022μF ±10%	
C19	CE04W1C100	Electrolytic 10μF 16WV	
C20	VACANT		
C21,22	CE04W1C470	Electrolytic 47μF 16WV	
C23	CQ92M1H104K	Mylar 0.1μF ±10%	
C24	CE04W1C221	Electrolytic 220μF 16WV	
C30～33	CC45CH1H220J	Ceramic 22pF ±5%	
C37	CC45SL1H151J	Ceramic 150pF ±5%	
C38	CC45CH1H100D	Ceramic 10pF ±0.5pF	
C39	CC45SL1H180J	Ceramic 18pF ±5%	
C41,42	CC45SL1H101J	Ceramic 100pF ±5%	

Ref. No.	Parts No.	Description	Remarks
C43	CE04W1H010	Electrolytic 1μF 50WV	
C44	CE04W1A221	Electrolytic 220μF 10WV	
C45	CE04W1E4R7	Electrolytic 4.7μF 25WV	
C46	CE04W1H010	Electrolytic 1μF 50WV	
C47	CQ92M1H473K	Mylar 0.047μF ±10%	
C48,49	CE04W1E4R7	Electrolytic 4.7μF 25WV	
C50	CE04W1H010	Electrolytic 1μF 50WV	
C51	CE04W1H3R3	Electrolytic 3.3μF 50WV	
C52	CE04W1H010	Electrolytic 1μF 50WV	
C55	CC45UJ1H220J	Ceramic 22pF ±5%	
C56	CC45SL1H101J	Ceramic 100pF ±5%	
C59	CC45CH1H050C	Ceramic 5pF ±0.25pF	
C64	CC45SL1H470J	Ceramic 47pF ±5%	
C66	CC45SL1H470J	Ceramic 47pF ±5%	
C67	CE04W1C100	Electrolytic 10μF 16WV	
C68	CE04W1H010	Electrolytic 1μF 50WV	
C69,70	CQ92M1H123K	Mylar 0.012μF ±10%	
C71	CQ921H104K	Mylar 0.1μF ±10%	
C72,73	CQ92M1H123K	Mylar 0.012μF ±10%	
C74	CE04W1H010	Electrolytic 1μF 50WV	
C75	CE04W1A221	Electrolytic 220μF 10WV	
C76,77	CE04W1A470	Electrolytic 47μF 10WV	
C78	CQ92M1H223K	Mylar 0.022μF ±10%	
C79	CE04W1H3R3	Electrolytic 3.3μF 50WV	
C80	CE04W1H010	Electrolytic 1μF 50WV	
C81	CQ92M1H473K	Mylar 0.047μF ±10%	
C83	CQ92M1H102K	Mylar 1000pF ±10%	
C84	CQ92M1H473K	Mylar 0.047μF ±10%	
C85,86	CE04W1E4R7	Electrolytic 4.7μF 25WV	
C89	CC45SL1H101J	Ceramic 100pF ±5%	
C90	CE04W1C220	Electrolytic 22μF 16WV	
RESISTOR			
R1～113	RD14CB2E000J RD14BB2E000J	Carbon 000Ω ±5% 1/4W	
R14	RS14GB3D8R2J	Metal film 8.2Ω ±5% 2W	
R36,80,93	VACANT		
SEMICONDUCTOR			
Q1	V03-2240-06	Transistor 2SC2240 (GR)	☆
Q2	V30-1029-36	IC μPC14305H	
Q3	V01-0473-06	Transistor 2SA473 (Y)	☆
Q4～6	V03-1815-06	Transistor 2SC1815 (Y)	
Q7	V30-1045-06	IC HA1366W	☆
Q8	V03-0079-05	Transistor 2SC460 (B)	
Q9	V03-1959-06	Transistor 2SC1959 (Y)	
Q10,11	V03-1815-06	Transistor 2SC1815 (Y)	
Q12	V09-0012-05	FET 2SK19 (GR)	
Q13	V03-0079-05	Transistor 2SC460 (B)	
Q14	V03-1815-06	Transistor 2SC1815 (Y)	
Q15	V01-1015-06	Transistor 2SA1015 (Y)	
Q16,17	V03-1815-06	Transistor 2SC1815 (Y)	
Q18	V03-2240-06	Transistor 2SC2240 (GR)	☆
Q19,20	V03-1815-06	Transistor 2SC1815 (Y)	
Q21	V01-1015-06	Transistor 2SA1015 (Y)	
Q22,23	V03-1815-06	Transistor 2SC1815 (Y)	
Q24	V01-0032-05	Transistor 2SA562 (Y)	
Q25	V03-1815-06	Transistor 2SC1815 (Y)	
D～4	V11-0051-05	Diode 1N60	
D5	V11-0243-05	Zener diode WZ-061	
D6～9	V11-0414-05	Diode 1S2588	
D10	Vacant		
D11～14	V11-0051-06	Diode 1N60	
D15	V11-0370-05	Diode 1S1587	

PARTS LIST

Ref. No.	Parts No.	Description	Re-marks
D16	VACANT		
D17～22	V11-0076-05	Diode 1S1555	
D23,24	V11-0051-06	Diode 1N60	
D25	V11-0076-05	Diode 1S1555	
D26	V11-0051-06	Diode 1N60	
D27,28	V11-0076-05	Diode 1S1555	
	POTENTIOMETER		
VR1	R12-3025-05	10kΩ (B) RIT	
VR2	R12-4016-05	50kΩ RF	
VR3	R12-0042-05	50Ω (B) 9V	
VR4	R12-4016-05	50kΩ SIDE TONE	
VR5	R12-0401-05	100Ω BM	
VR6	R12-0405-05	330Ω (B) ANTI VOX	☆
VR7	R12-3408-05	47kΩ VOX GAIN	☆
VR8	R12-5402-05	220kΩ DELAY	☆
	TRIMMER/COIL/INDUCTOR		
TC1～6	C05-0030-15	Ceramic trimmer 20pF	
L1	L40-1021-03	Ferri-inductor 1 mH	
L2,3	L40-1511-03	Ferri-inductor 150 μH	
L4	L40-4771-03	Ferri-inductor 470 μH	
L5	L40-3392-03	Ferri-inductor 3.3 μH	
L6,7	L40-1511-03	Ferri-inductor 150 μH	
L8	L40-1021-03	Ferri-inductor 1 mH	
T1	L15-0016-05	Chock transformer	
T2	L34-0567-05	Tuning coil	
	MISCELLANEOUS		
—	E18-0401-05	Crystal socket 4P	
—	F20-0078-05	Insulating plate	
—	F29-0014-05	Insulating washer	

PLL UNIT (X50-1490-00)

Ref. No.	Parts No.	Description	Re-marks
	CAPACITOR		
C1	CC45TH1H220J	Ceramic 22pF ±5%	
C2	CC45TH1H030C	Ceramic 3pF ±0.25pF	
C3	CC45TH1H220J	Ceramic 22pF ±5%	
C4	CE0W1A470	Electrolytic 47μF 10WV	
C5	CC45UJ1H560J	Ceramic 56pF ±5%	
C6	CC45UJ1H270J	Ceramic 27pF ±5%	
C9	CC45TH1H150J	Ceramic 15pF ±5%	
C10	CC45TH1H030C	Ceramic 3pF ±0.25pF	
C11	CC45TH1H220J	Ceramic 22pF ±5%	
C12	CE04W1A470	Electrolytic 47μF 10WV	
C13	CC45TH1H330J	Ceramic 33pF ±5%	
C14	CC45TH1H470J	Ceramic 47pF ±5%	
C17	CC45TH1H270J	Ceramic 27pF ±5%	
C18	CC45UJ1H220J	Ceramic 22pF ±5%	
C19	CE04W1A470	Electrolytic 47μF 10WV	
C20	CC45UJ1H101J	Ceramic 100pF ±5%	
C21	CC45UJ1H220J	Ceramic 22pF ±5%	
C24	CE04W1C100	Electrolytic 10μF 16WV	
C25	CC45TH1H270J	Ceramic 27pF ±5%	
C26	CC45TH1H150J	Ceramic 15pF ±5%	
C27	CC45TH1H220J	Ceramic 22pF ±5%	
C28	CE04W1A470	Electrolytic 47μF 10WV	
C29,30	CC45UJ1H560J	Ceramic 56pF ±5%	
C33	CC45TH1H270J	Ceramic 27pF ±5%	
C34	CC45TH1H100D	Ceramic 10pF ±0.5pF	
C35	CC45TH1H220J	Ceramic 22pF ±5%	
C36	CE04W1A470	Electrolytic 47μF 10WV	
C37	CC45RH1H390J	Ceramic 39pF ±5%	
C38	CC45SH1H560J	Ceramic 56pF ±5%	
C40	CC45CH1H100D	Ceramic 10pF ±0.5pF	
C41	CC45CH1H020C	Ceramic 2pF ±0.25pF	
C43,44	C90-0262-05	Ceramic 0.047μF 25WV	
C45	CC45SL1H151J	Ceramic 150μF ±5%	
C47	CC45SL1H271J	Ceramic 270pF ±5%	
C48	CC45SL1H121J	Ceramic 120pF ±5%	
C50,51	CC45SL1H390J	Ceramic 39pF ±5%	
C53	CE04W1C100	Electrolytic 10μF 16WV	
C54,55	C90-0262-05	Ceramic 0.047μF 25WV	
C57,58	CC45SL1H221J	Ceramic 220pF ±5%	
C59	CQ92M1H122K	Mylar 1200pF ±10%	
C60	CC45SL1H390J	Ceramic 39pF ±5%	
C61,62	CC45SL1H820J	Ceramic 82pF ±5%	
C63	CC45SL1H390J	Ceramic 39pF ±5%	
C65	C90-0262-05	Ceramic 0.047μF 25WV	
C70	CC45SL1H120J	Ceramic 12pF ±5%	
C71	VACANT		
C73	CC45CH1H010C	Ceramic 1pF ±0.25pF	
C74	CC45CH1H050C	Ceramic 5pF ±0.25pF	
C76	CC45SL1H271J	Ceramic 270pF ±5%	
C77	C90-0262-05	Ceramic 0.047μF 25WV	
C78	CE04W1A101	Electrolytic 100μF 10WV	
C79	C90-0262-05	Ceramic 0.047μF 25WV	
C80	CQ92M1H104K	Mylar 0.1μF ±10%	
C81	CQ92M1H102K	Mylar 1000pF ±10%	
C82,83	C90-0262-05	Ceramic 0.047μF 25WV	
C84	CE04W0J101	Electrolytic 100μF 6.3WV	
C89	CE04W1A470	Electrolytic 47μF 10WV	
C90	VACANT		
C95	CC45RH1H330J	Ceramic 33pF ±5%	
C96	CC45RH1H150D	Ceramic 15pF ±0.5pF	
C97	CC45RH1H330J	Ceramic 33pF ±5%	
C100	CC45RH1H150D	Ceramic 15pF ±0.5%	
C101	CC45RH1H040C	Ceramic 4pF ±0.25pF	
C102	CC45RH1H150D	Ceramic 15pF ±0.5pF	
C106	CC45CH1H100D	Ceramic 10pF ±0.5pF	
C109	CC45RH1H470J	Ceramic 47pF ±5%	
C110	CC45RH1H220J	Ceramic 22pF ±5%	
C112	CC45RH1H560J	Ceramic 56pF ±5%	
C113	CC45SL1H070D	Ceramic 7pF ±0.5pF	
C114	CC45RH1H390J	Ceramic 39pF ±5%	
C117	CC45SL1H470J	Ceramic 47pF ±5%	
C118	CC45CH1H100D	Ceramic 10pF ±0.5pF	
C119	CC45RH1H470J	Ceramic 47pF ±5%	
C127	CC45RH1H070D	Ceramic 7pF ±0.5%	
R1～92	RD14CB2E○○○J RD14BB2E○○○J		
R77	VACANT		
	SEMICONDUCTOR		
Q1,2	V03-0079-05	Transistor 2SC460 (B)	
Q3	V03-0368-05	Transistor 2SC784 (O)	
Q4,5	V03-0079-05	Transistor 2SC460 (B)	
Q6	V03-0368-05	Transistor 2SC784 (O)	
Q7,8	V03-1959-06	Transistor 2SC1959 (Y)	
Q9	V03-1815-06	Transistor 2SC1815 (Y)	
Q10,11	V03-0079-05	Transistor 2SC460 (B)	

PARTS LIST

Ref. No.	Parts No.	Description	Re-marks
Q12	V30-1048-06	IC SN16913P	☆
Q13,14	V03-0079-05	Transistor 2SC460 (B)	
Q15	V30-1046-06	IC HD74LS00P	☆
Q16	V30-1037-06	IC HD74LS163N	☆
Q17～19	V03-1775-06	Transistor 2SC1775 (E)	☆
Q20	V30-0173-05	IC MC4044P	
Q21	V03-1815-06	Transistor 2SC1815 (Y)	
Q22	V03-0079-05	Transistor 2SC460 (B)	
Q23	V09-0079-05	FET 3SK40 (L)	
Q24,25	V03-0079-05	Transistor 2SC460 (B)	
Q26	V30-1048-06	IC SN16913P	☆
Q27	V03-1815-06	Transistor 2SC1815 (Y)	
D1～4	V11-0076-05	Diode 1S1555	
D5	V11-4161-36	Diode 1SV53A	☆
D6	V11-0370-05	Diode 1S1587	
D7	V11-4161-36	Diode 1SV53A	☆
D8	V11-0370-05	Diode 1S1587	
D9	V11-4161-36	Diode 1SV53A	☆
D10	V11-0414-05	Diode 1S2588	
D11	V11-4161-36	Diode 1SV53A	☆
D12	V11-0370-05	Diode 1S1587	
D13	V11-4161-36	Diode 1SV53A	☆
D14	V11-0370-05	Diode 1S1587	
D15	V11-0076-05	Diode 1S1555	
D16	VACANT		
D17～21	V11-0370-05	Diode 1S1587	
D22,23	V11-0076-05	Diode 1S1555	
D24～27	V11-0370-05	Diode 1S1587	
POTENTIOMETER			
VR1	R12-5014-05	100kΩ Spurious	
INDUCTOR/COIL			
L1～8	L40-1511-03	Ferri-inductor 150μH	
L9	L40-4701-03	Ferri-inductor 47μH	
L10	L40-1592-02	Ferri-inductor 1.5μH	
L11,12	L40-1092-02	Ferri-inductor 1μH	
L13	L40-1292-02	Ferri-inductor 1.2μH	
L14	L40-2701-03	Ferri-inductor 27μH	
L15	L40-4711-03	Ferri-inductor 470μH	
L16	L40-1511-03	Ferri-inductor 150μH	
L17	L40-1011-03	Ferri-inductor 100μH	
L18	L40-1511-03	Ferri-inductor 150μH	
L19～21	L40-2701-03	Ferri-inductor 27μH	
L22～24	L40-1511-03	Ferri-inductor 150μH	
L25	L40-1001-03	Ferri-inductor 10μH	
L26	L40-4711-03	Ferri-inductor 470μH	
L27	L40-1511-03	Ferri-inductor 150μH	
L28	L40-1001-03	Ferri-inductor 10μH	
L29,30	L40-1511-03	Ferri-inductor 150μH	
T1	L32-0199-05	OSC coil 14 MHz	
T2	L32-0197-05	OSC coil 21 MHz	
T3	L32-0198-05	OSC coil 28 MHz	
T4	L32-0195-05	OSC coil 7 MHz	
T5	L32-0193-05	OSC coil 3.5 MHz	
T6	L34-0529-05	Trap coil 8.83 MHz	
T7	L34-0714-05	Tuning coil	☆
T8	L34-0715-05	Tuning coil	☆
T9	L34-0716-05	Tuning coil	☆
T10	L34-0717-05	Tuning coil	☆
T11	L34-0718-05	Tuning coil	☆
T12	L34-0757-05	Tuning coil	☆
T13	L34-0711-05	Tuning coil	☆
T14	L34-0709-05	Tuning coil 10 MHz	☆
T15	L34-0710-05	Tuning coil 20 MHz	☆
T17	L34-0712-05	Tuning coil	☆
T18	L34-0713-05	Tuning coil	☆
MISCELLANEOUS			
—	E23-0046-04	Terminal (square)	

CAR UNIT (X50-1500-00)

Ref. No.	Parts No.	Description	Re-marks
CAPACITOR			
C2	CC45UJ1H220J	Ceramic 22pF ±5%	
C3	CC45UJ1H270J	Ceramic 27pF ±5%	
C4	CC45UJ1H220J	Ceramic 22pF ±5%	
C7,8	VACANT		
C9	CS15E1VR22M	Tantalum 0.22μF 35WV	
C13	CC45SL1H101J	Ceramic 100pF ±5%	
C14	CC45CH1H020C	Ceramic 2pF ±0.25pF	
C15	CC45CH1H330J	Ceramic 33pF ±5%	
C16	C90-0262-05	Ceramic 0.047μF 25WV	
RESISTOR			
R1～21	RD14CB2E○○○J	Carbon resistor ○○○Ω ±5% 1/4W	
SEMICONDUCTOR			
Q1,2	V03-0079-05	Transistor 2SC460 (B)	
Q3	V03-1959-06	Transistor 2SC1959 (Y)	
D1,2	V11-0076-05	Diode 1S1555	
D3	V11-4161-36	Diode 1SV53A	
D4～6	V11-0076-05	Diode 1S1555	
POTENTIOMETER			
VR1,2	R12-1012-05	1kΩ (B)	
MISCELLANEOUS			
TC1,2	C05-0056-05	Ceramic trimmer 30pF	
X1	L77-0485-05	Crystal quartz 8831.5 kHz	
X2	L77-0486-05	Crystal quartz 8828.5 kHz	
L1～3	L40-1511-03	Ferri-inductor 150μH	
L4	L33-0266-05	Choke coil 28μH	
L5～7	L40-1511-03	Ferri-inductor 150μH	
T1	L32-0201-05	OSC coil	

FILTER UNIT (X51-1170-00)

Ref. No.	Parts No.	Description	Re-marks
CAPACITOR			
C1	CC45SL2H221J	Ceramic 220pF ±5%	
C2,3	CC45SL2H331J	Ceramic 330pF ±5%	
C4	CC45CH2H131J	Ceramic 130pF ±5%	
C5	CC45CH2H111J	Ceramic 110pF ±5%	
C6	CC45CH2H820J	Ceramic 82pF ±5%	
C7	CC45CH2H680J	Ceramic 68pF ±5%	
C8	CC45CH2H330J	Ceramic 33pF ±5%	
C9	CC45CH2H470J	Ceramic 47pF ±5%	
C10	CC45CH2H120J	Ceramic 12pF ±5%	
C11	CC45CH2H080D	Ceramic 8pF ±0.5pF	

PARTS LIST

Ref. No.	Parts No.	Description	Remarks
C12,13	CC45SL2H331J	Ceramic 330pF ±5%	
C14	CC45SL2H361J	Ceramic 360pF ±5%	
C15	CC45SL2H301J	Ceramic 300pF ±5%	
C18	CC45SL2H221J	Ceramic 220pF ±5%	
C19	CC45CH2H151J	Ceramic 150pF ±5%	
C20	CC45SL2H181J	Ceramic 180pF ±5%	
C21	CC45CH2H910J	Ceramic 91pF ±5%	
C22	CC45CH2H180J	Ceramic 18pF ±5%	
C23	CC45CH2H270J	Ceramic 27pF ±5%	
C24	CC45CH2H220J	Ceramic 22pF ±5%	
C25	CC45CH2H151J	Ceramic 150pF ±5%	
C26	CC45SL2H331J	Ceramic 330pF ±5%	
C27	CC45SL2H271J	Ceramic 270pF ±5%	
C28	CC45SL2H161J	Ceramic 160pF ±5%	
C29	CC45CH2H101J	Ceramic 100pF ±5%	
C30	CC45CH2H750J	Ceramic 75pF ±5%	
C31	CC45SL2H221J	Ceramic 220pF ±5%	
C33	C90-0262-05	Ceramic 0.047μF 25WV	
C34	CC45CH2H150J	Ceramic 15pF ±5%	
C35	CC45SL2H221J	Ceramic 220pF ±5%	
C39	CE04W1H4R7	Electrolytic 4.7μF 50WV	
C40	CE04W1HR47	Electrolytic 0.47μF 50WV	
C42	CE04W1H010	Electrolytic 1μF 50WV	
C45	C90-0262-05	Ceramic 0.047μF 25WV	
C46	CE04W1C470	Electrolytic 47μF 16WV	
C47	CE04W1C221	Electrolytic 220μF 16WV	
C48	CC45CH1H100D	Ceramic 10pF ±0.5pF	
C49	C90-0262-05	Ceramic 0.047μF 25WV	
	RESISTOR		
R1～17	RD14CB2E○○○J	Carbon resistor ○○○Ω ±5% 1/4W	
R2	RC05GF2H103K	Solid resistor 10kΩ ±10% 1/2W	
	SEMICONDUCTOR		
Q1～4	V03-1815-06	Transistor 2SC1815 (Y)	
Q5	V01-0113-05	Transistor 2SA496 (Y)	
D1	V11-0076-05	Diode 1S15555	
D2～4	V11-0051-05	Diode 1N60	
D5	V11-0243-05	Zener diode WZ-061	
D6	V11-4161-06	Zener diode WZ-044	
	POTENTIOMETER		
VR1	R12-3025-05	10kΩ (B)	
VR2,3	R12-4016-05	50kΩ (B)	
VR4	R12-1020-05	1kΩ (B)	
	MISCELLANEOUS		
TC1	C05-0043-05	Ceramic trimmer 20pF	
S1	S01-2413-05	Rotary switch	☆
RL1	S51-4402-05	Relay LZN-403	☆
	COIL/INDUCTOR		
L1	L34-0720-05	Filter coil (wide range) 2.85μH	☆
L2	L34-0719-05	Filter coil (wide range) 2.37μH	☆
L3	L34-0722-05	Filter coil (wide range) 1.60μH	☆
L4	L34-0721-05	Filter coil (wide range) 1.36μH	☆
L5	L34-0724-05	Filter coil 0.68μH	☆
L6	L34-0723-05	Filter coil 0.80μH	☆
L7	L34-0726-05	Filter coil 0.59μH	☆
L8	L34-0725-05	Filter coil 0.45μH	☆
L9	L34-0728-05	Filter coil 0.42μH	☆
L10	L34-0727-05	Filter coil 0.36μH	☆
L11～13	L40-1511-03	Ferri-inductor 150μH	
L14,15	L40-1021-03	Ferri-inductor 1 mH	
L16	L39-0404-05	Detector coil	
	MISCELLANEOUS		
—	E23-0046-04	Terminal (square)	
—	E23-0401-05	Terminal (circle) × 4	

COUNTER UNIT (X54-1360-00)

Ref. No.	Parts No.	Description	Remarks
	CAPACITOR		
C1	CC45CH1H330J	Ceramic 33pF ±5%	
C2	CC45SL1H391J	Ceramic 390pF ±5%	
C3	CC45CH1H470J	Ceramic 47pF ±5%	
C4	C90-0262-05	Ceramic 0.047μF 25WV	
C5	CC45SL1H150J	Ceramic 15pF ±5%	
C6	CC45SL1H020C	Ceramic 2pF ±0.25pF	
C7	CC45SL1H100D	Ceramic 10pF ±0.5pF	
C10	C90-0262-05	Ceramic 0.047μF 25WV	
C11	CE04W0J101Q	Electrolytic 100μF 6.3WV	
C12	CC45SL1H101J	Ceramic 100pF ±5%	
C13	C90-0262-05	Ceramic 0.047μF 25WV	
C14	CC45SL1H390J	Ceramic 39pF ±5%	
C15	CC45SL1H330J	Ceramic 33pF ±5%	
C16	CC45SL1H101J	Ceramic 100pF ±5%	
C17	CC45SL1H221J	Ceramic 220pF ±5%	
C18	CC45SL1H220J	Ceramic 22pF ±5%	
C19	CC45SL1H050C	Ceramic 5pF ±0.25pF	
C20	C90-0262-05	Ceramic 0.047μF 25WV	
C21	CC45SL1H101J	Ceramic 100pF ±5%	
C22	CC45SL1H270J	Ceramic 27pF ±5%	
C23	CC45SL1H560J	Ceramic 56pF ±5%	
C24	CC45SL1H270J	Ceramic 27pF ±5%	
C25	CC45SL1H470J	Ceramic 47pF ±5%	
C26	VACANT		
C27,28	CC45SL1H470J	Ceramic 47pF ±5%	
C29	C90-0262-05	Ceramic 0.047μF 25WV	
C31	C90-0262-05	Ceramic 0.047μF 25WV	
C32	CC45SL1H121J	Ceramic 120pF ±5%	
C33	CC45SL1H271J	Ceramic 270pF ±5%	
C34	CC45SL1H121J	Ceramic 120pF ±5%	
C36	C90-0262-05	Ceramic 0.047μF 25WV	
C38～40	C90-0262-05	Ceramic 0.047μF 25WV	
C41	CE04W0J101Q	Electrotique 100μF 6.3WV	
C44	CQ92M1H152K	Mylar 1500pF ±10%	
C45,56	C90-0262-05	Ceramic 0.047μF 25WV	
C47,48	CE04W0J221Q	Electrolytic 220μF 6.3WV	
C49	CE04W1V100Q	Electrolytic 10μF 35WV	
C51～53	CE04W1V100Q	Electrolytic 10μF 35WV	
C55～58	C90-0262-05	Ceramic 0.047μF 25WV	
	RESISTOR		
R1～57	RD14CB2E○○○J	Carbon resistor ○○○Ω ±5% 1/4W	
R13	VACANT		
RB1	R90-0506-05	(47kΩ+47kΩ) × 6	☆
RB2,3	R90-0112-05	47kΩ × 7	
RB4,5	R90-0512-05	47kΩ × 6	☆
	SEMICONDUCTOR		
Q1～5	V03-1815-06	Transistor 2SC1815 (Y)	☆
Q6	V03-0473-05	Transistor 2SC785 (O)	

PARTS LIST

Ref. No.	Parts No.	Description	Re-marks
Q7	V09-1002-46	FET 3SK73 (GR)	☆
Q8～10	V03-1815-06	Transistor 2SC1815 (Y)	☆
Q11,12	V03-1959-06	Transistor 2SC1959 (Y)	☆
Q13	V03-1815-06	Transistor 2SC1815 (Y)	
IC1	V30-1005-26	IC SN74LS90N	
IC2	V30-1040-06	IC TC5026BP	☆
IC3,4	V30-1039-06	IC TC4518BP	
IC5	V30-1050-06	IC TC4027BP	☆
IC6,7	V30-1030-06	IC TC4011BP	☆
IC8	V30-1055-06	IC TC5051BP	☆
IC9	V30-1051-06	IC TC4029BP	☆
IC10	V30-1052-06	IC TC4042BP	☆
IC11～13	V30-1049-06	IC TC4019BP	☆
IC14	V30-1009-26	IC TC4049BP	☆
IC15	V30-1054-06	IC TC5022BP	☆
IC16	V30-1057-06	IC TC5066BP	☆
IC18	V30-1053-06	IC TC5012BP	☆
IC19	V30-1056-06	IC TC5064BP	☆
D1	V11-0240-05	Zener diode WZ-090	
D2	VACANT		
D3～18	V11-0076-05	Diode 1S1555	
D19	V11-4160-86	Zener diode WZ-071	
D20	V11-4162-66	Zener diode XZ-060	
D21～24	V11-0076-05	Diode 1S1555	
D25	V21-0004-05	Varistor MV-13	
MISCELLANEOUS			
—	V40-7760-05	Indicating tube 9-BT-12	☆
TC1	C05-0035-05	Ceramic trimmer 50pF	
L1,2	L40-4711-03	Ferri-inductor 470μH	
L3,4	L40-4701-03	Ferri-inductor 47μH	
L5	L40-4711-03	Ferri-inductor 470μH	
L6,7	L40-2711-03	Ferri-inductor 270μH	
L8	L40-4711-03	Ferri-inductor 470μH	
L9	L33-0616-05	Choke coil 43μH	☆
L10,11	L40-4711-03	Ferri-inductor 470μH	
L12,13	L40-1511-03	Ferri-inductor 150μH	
T1	L19-0305-05	Oscillator transformer	☆
X2	L77-0482-05	Crystal quartz 10 MHz	
—	E31-0430-15	Tape cable (8)	

FINAL UNIT (X56-1300-00)

Ref. No.	Parts No.	Description	Re-marks
CAPACITOR			
C3	C90-0262-05	Ceramic 0.047μF 25WV	
C4	CC45CH1H121J	Ceramic 120pF ±5%	
C6	C90-0262-05	Ceramic 0.047μF 25WV	
C7	CC45CH1H121J	Ceramic 120pF ±5%	
C9,10	C90-0262-05	Ceramic 0.047μF 25WV	
C12	C90-0262-05	Ceramic 0.047μF 25WV	
C16	C90-0262-05	Ceramic 0.047μF 25WV	
C18	C90-0262-05	Ceramic 0.047 25WV	
C19	CE04W1C101	Electrolytic 100μF 16WV	
C20	CE04W1C100	Electrolytic 10μF 16WV	
RESISTOR			
R1～13	RD14BB2E○○○J	Carbon resistor ○○○Ω ±5% 1/4W	
R1	VACANT		
R10	V11-7762-16	Thermistor 31D26 1kΩ	
R6,7	RC05GF2H331J	Solid resistor 330Ω ±5% 1/2W	
R11	RC05GF□4R7J	Solid resistor 4.7Ω ±5% 1/2W	
SEMICONDUCTOR			
Q1	V03-2075-06	Transistor 2SC2075	☆
Q2,3	V03-2509-06	Transistor 2SC2509	☆
Q4	V03-0336-05	Transistor 2SC496 (Y)	
Q5	V04-0046-05	Transistor 2SD235 (Y)	
D1	V11-4363-36	Vristor SV4A	☆
D2	V11-4160-96	Zener diode BZ-240	
D3	V22-0031-05	Varistor SV-03	
POTENTIOMETER/INDUCTOR/COIL			
VR1	R12-0042-05	Potentiometer 500Ω (B)	
L1	L40-4701-03	Ferri-inductor 47μH	
L2	L33-0025-05	RFC 1.3μH	
L3	L33-0032-05	RFC 3μH	
L4,5	L33-0025-05	RFC 1.3μH	
L6	L33-0032-05	RFC 3μH	
L7	L33-0067-05	RFC (wide range)	☆
T1	L19-0302-05	Wide range transformer	
T2	L19-0306-05	Output transformer	☆
T3	L19-0307-05	Output transformer	☆
MISCELLANEOUS			
—	E23-0046-04	Terminal (square) × 2	
—	E23-0401-05	Terminal (circle) × 6	
—	F20-0078-05	Insulating plate × 3	
—	F29-0014-05	Insulating washer × 2	

VFO ASS'Y UNIT (X60-1070-00)

Ref. No.	Parts No.	Description	Re-marks
GENERAL			
—	B01-0615-05	Dial escutcheon	☆
—	B10-0612-04	Front glass (A)	☆
—	B20-0810-04	Dial scale (A)	☆
—	G01-0804-04	Coil spring	☆
—	K21-0722-04	Main knob	☆
—	N19-0608-04	Washer × 2	☆
—	X40-1130-00	VFO unit	☆

VFO UNIT (X40-1130-00)

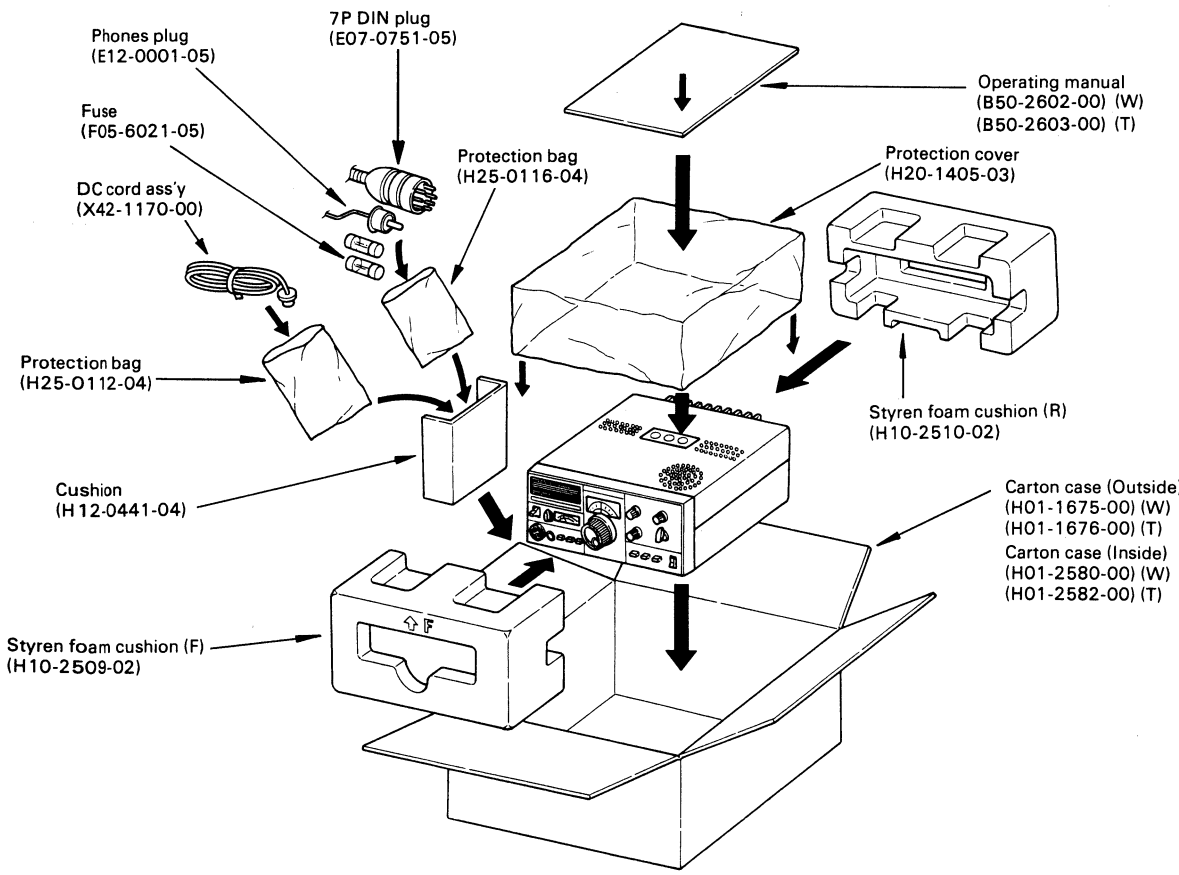
Ref. No.	Parts No.	Description	Re-marks
CAPACITOR			
C2	CC45SL1H390J	Ceramic 39pF ±5%	
C3	CC45CH1H100D	Ceramic 10pF ±0.5pF	
C4	CC45SL1H390J	Ceramic 39pF ±5%	
C7	C90-0262-05	Ceramic 0.047μF 25WV	
C8	CC45CH1H020C	Ceramic 2pF ±0.25pF	
C10,11	C90-0262-05	Ceramic 0.047μF 25WV	
C12	CC45SG1H050C	Ceramic 5pF ±0.25pF	
C13	CC45LG1H470J	Ceramic 47pF ±5%	
C14	CC45LG1H220J	Ceramic 22pF ±5%	
C15,16	CC45LG1H151J	Ceramic 150pF ±5%	
C17	CC45SG1H180J	Ceramic 18pF ±5%	

PARTS LIST/PACKING

Ref. No.	Parts No.	Description	Re-marks
C18	CC45RG1H120J	Ceramic 12pF ±5%	
C19	CC45LG1H151J	Ceramic 150pF ±5%	
C20	CC45CG1H121J	Ceramic 120pF ±5%	
	RESISTOR		
R~14	RD14CB2E○○○J	Carbon resistor ○○○Ω ±5% 1/4W	
	SEMICONDUCTOR		
Q1	V09-0020-05	FET 3SK22 (Y)	
Q2	V09-0011-05	FET 2SK19 (Y)	
Q3	V03-0079-05	Transistor 2SC460 (B)	
Q4	V03-1959-06	Transistor 2SC1959 (Y)	
D4	V11-0414-05	Diode 1S2588	
D5	V1104161-36	Diode 1SV53A	
	TRIMMER/VC		
TC1	C05-0305-05	Ceramic trimmer 12pF	☆

Ref. No.	Parts No.	Description	Re-marks
TC2	C05-0013-15	Ceramic trimmer 20pF	
—	C02-0010-05	Variable capacitor	☆
	INDUCTOR/COIL		
L1,2	L40-4711-03	Ferri-inductor 470μH	
L3	L40-1501-03	Ferri-inductor 15μH	
L5~7	L40-4711-03	Ferri-inductor 470μH	
L8	L33-0025-05	Choke coil 1μH	
L9	L32-0609-05	Oscillator coil B	☆
L10	L32-0608-05	Oscillator coil A	☆
	MISCELLANEOUS		
—	B42-1645-04	Indication tape	☆
—	D22-0405-04	Coupling	☆
—	D40-0604-05	Dial mechanism	☆
—	E13-0163-05	1P Pin jack	
—	E23-0046-04	Terminal (square) × 4	

PACKING



EXPLODED VIEW/DISASSEMBLY

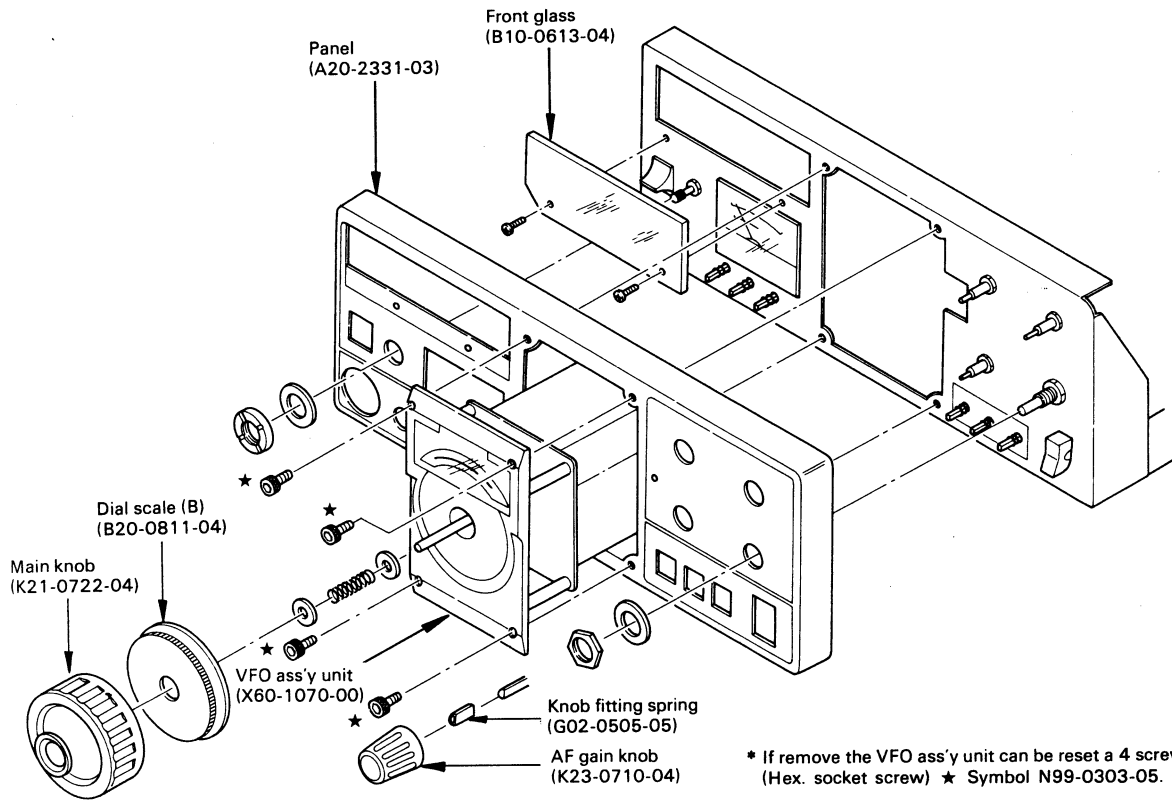


Fig. 7 Front panel exploded view/removing the VFO ass'y

No.	Description	Parts No.	Remarks
1	Subpanel	A22-0714-03	
2	Earth screw	N09-0256-05	
3	Rotary switch	S01-1410-05	MODE
4	US Jack	E11-0402-05	
5	4P Metal socket	E06-0451-05	MIC
6	Paddle switch	S44-2402-05	STBY
7	Switch unit (B)	X41-1150-00	
8	Meter	B31-0612-05	
9	Meter housing	F29-0404-05	
10	Potentiometer	R06-9402-05	MIC CAR
11	Potentiometer	R06-9402-05	RF, AF
12	Potentiometer	R06-9403-05	RIT IF SHIFT
13	Gear ass'y	D40-0603-05	
14	Seesaw switch	S36-2402-05	POWER
15	Switch unit (A)	X41-1140-00	
16	Screw	N30-2604-46	
17	Screw	N34-3004-46	

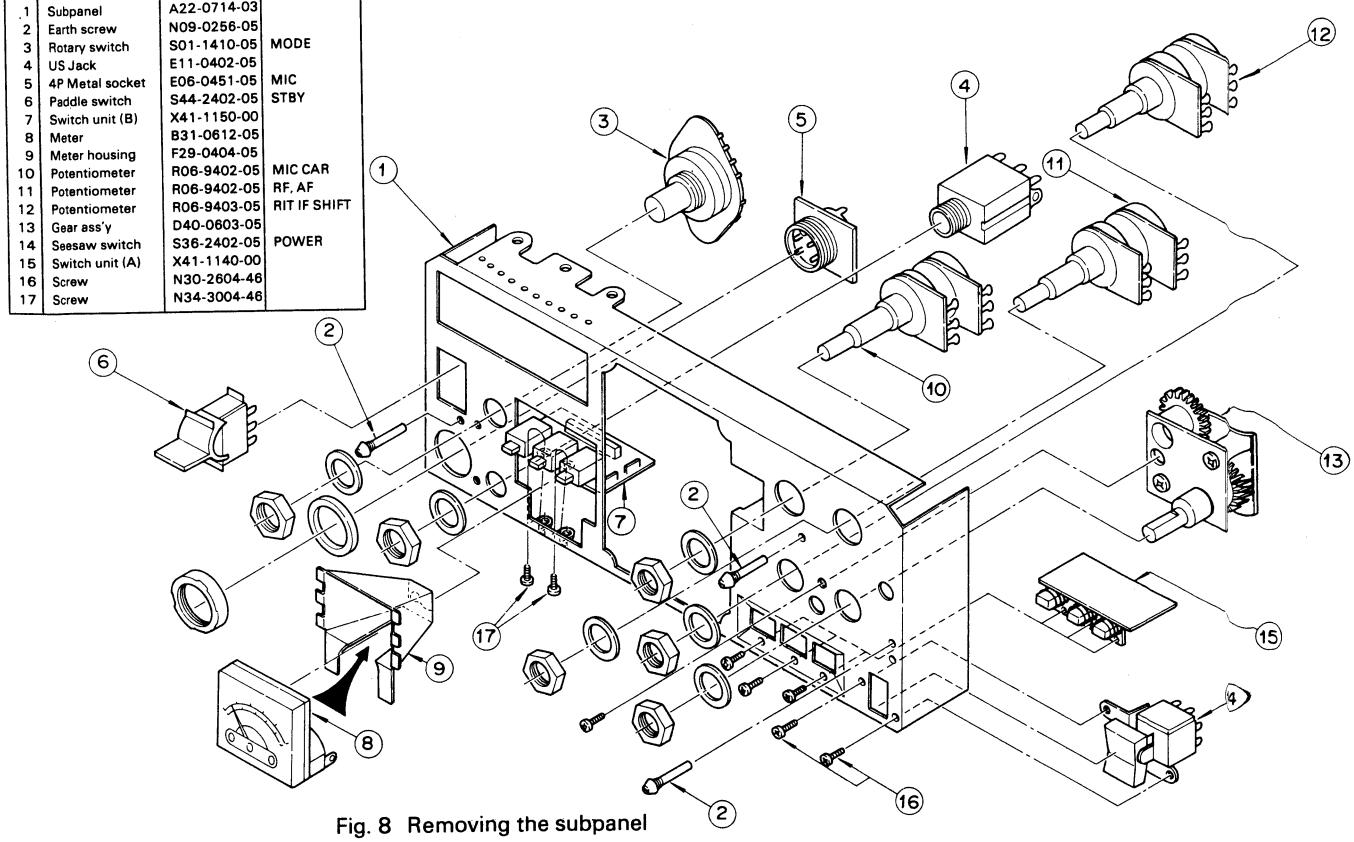


Fig. 8 Removing the subpanel

DISASSEMBLY

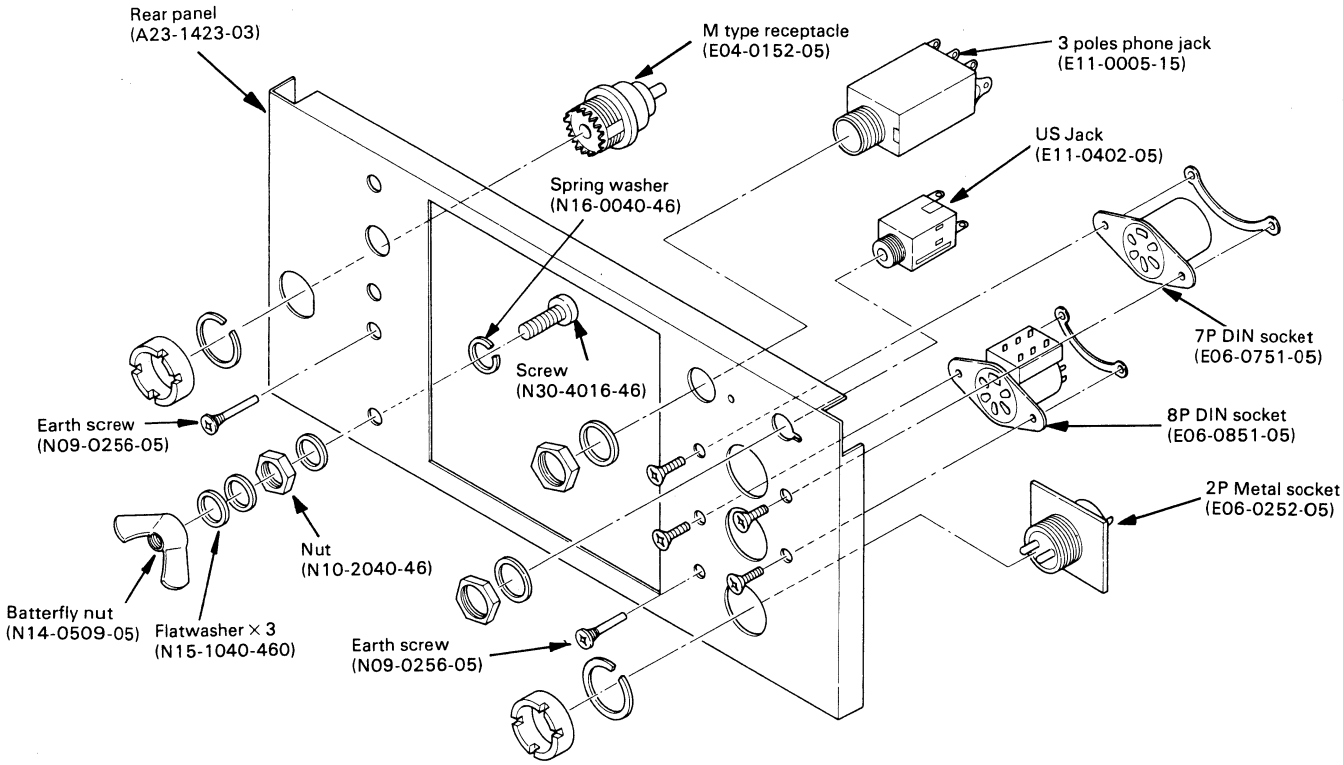
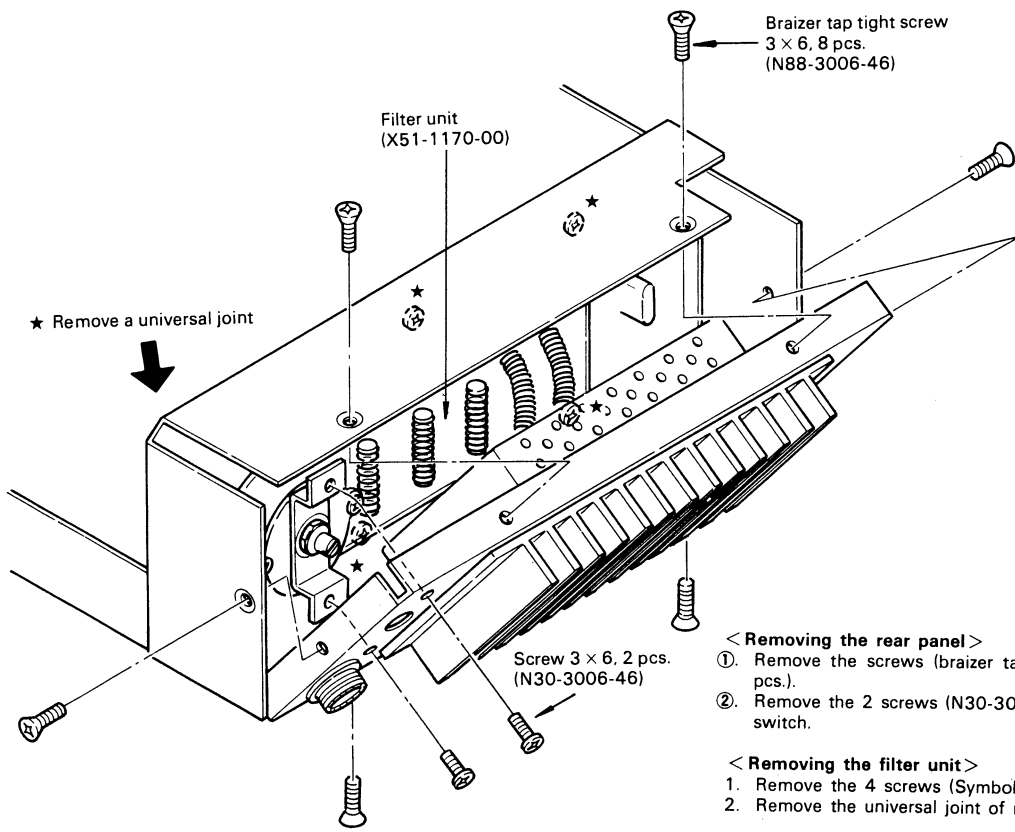


Fig. 9 Rear panel disassembly



<Removing the rear panel>

①. Remove the screws (braizer tap tight screw 6 pcs.).

②. Remove the 2 screws (N30-3006-46) of rotary switch.

<Removing the filter unit>

1. Remove the 4 screws (Symbol ★).
2. Remove the universal joint of rotary switch.

Fig. 10 Removing the rear panel/Removing the filter unit

DISASSEMBLY

<How to repair in the RF unit>
① Remove the six screws in the IF unit (as shown at right).
② Remove the four screws of shield plate.
③ Take off the shield plate.

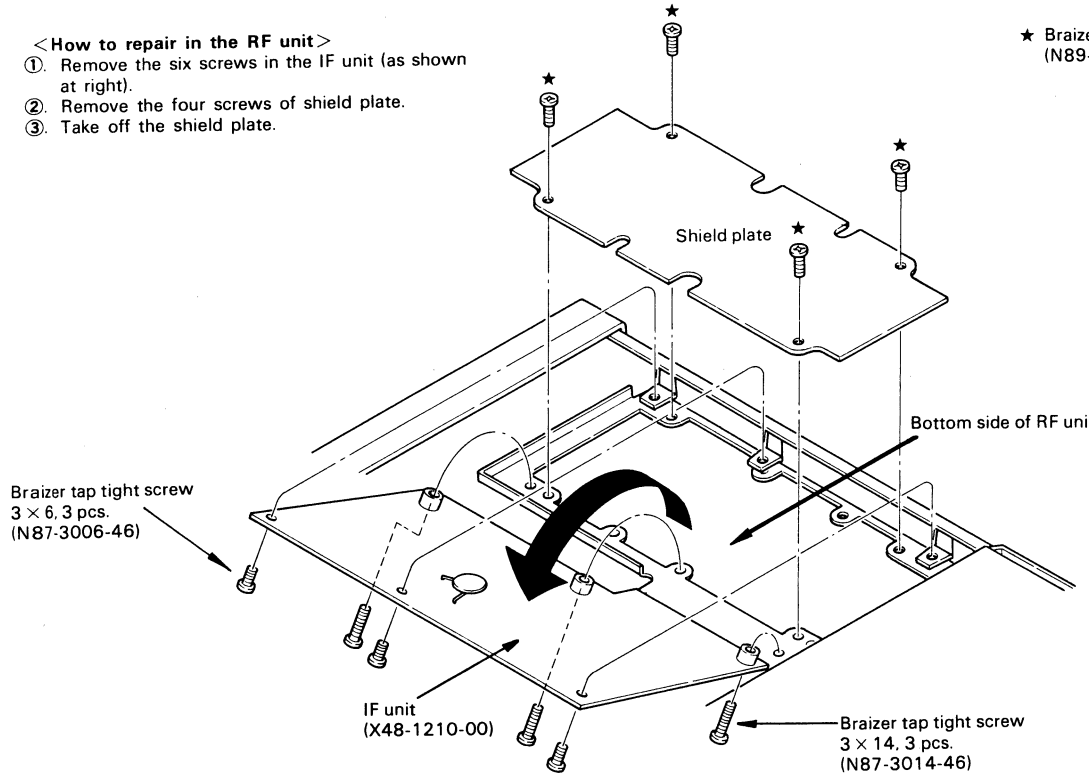


Fig. 11 Repairing the RF unit

<Removing the counter unit>
1. Remove the six screws in the AF•GEN unit (X49-1110-00) (as shown at bottom).
2. Remove the screw (Symbol ★) in the counter unit.

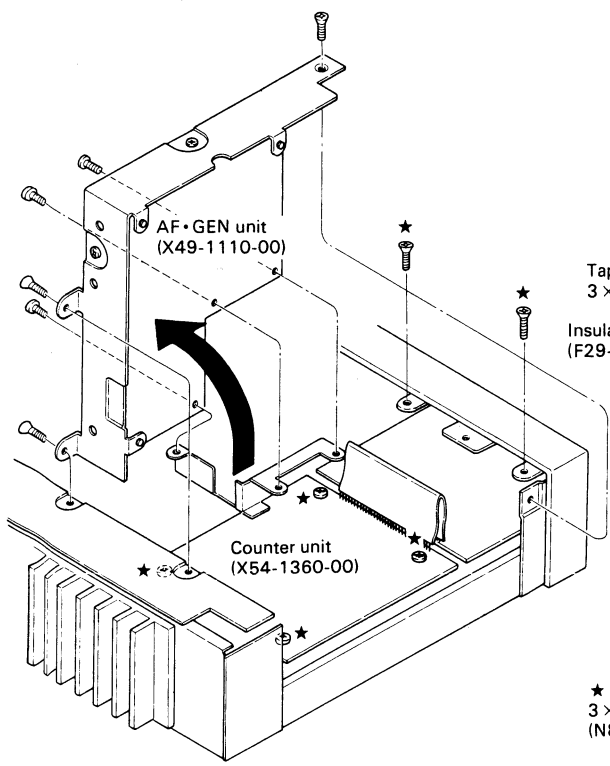


Fig. 12 Removing the counter unit

REMOVING THE FINAL UNIT

Remove the four screws (Symbol ★)

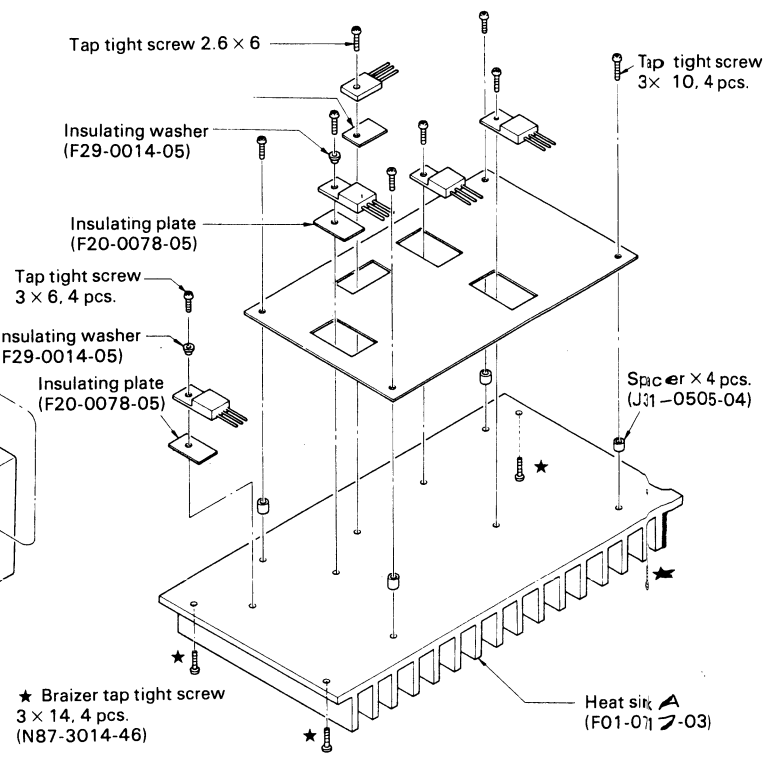
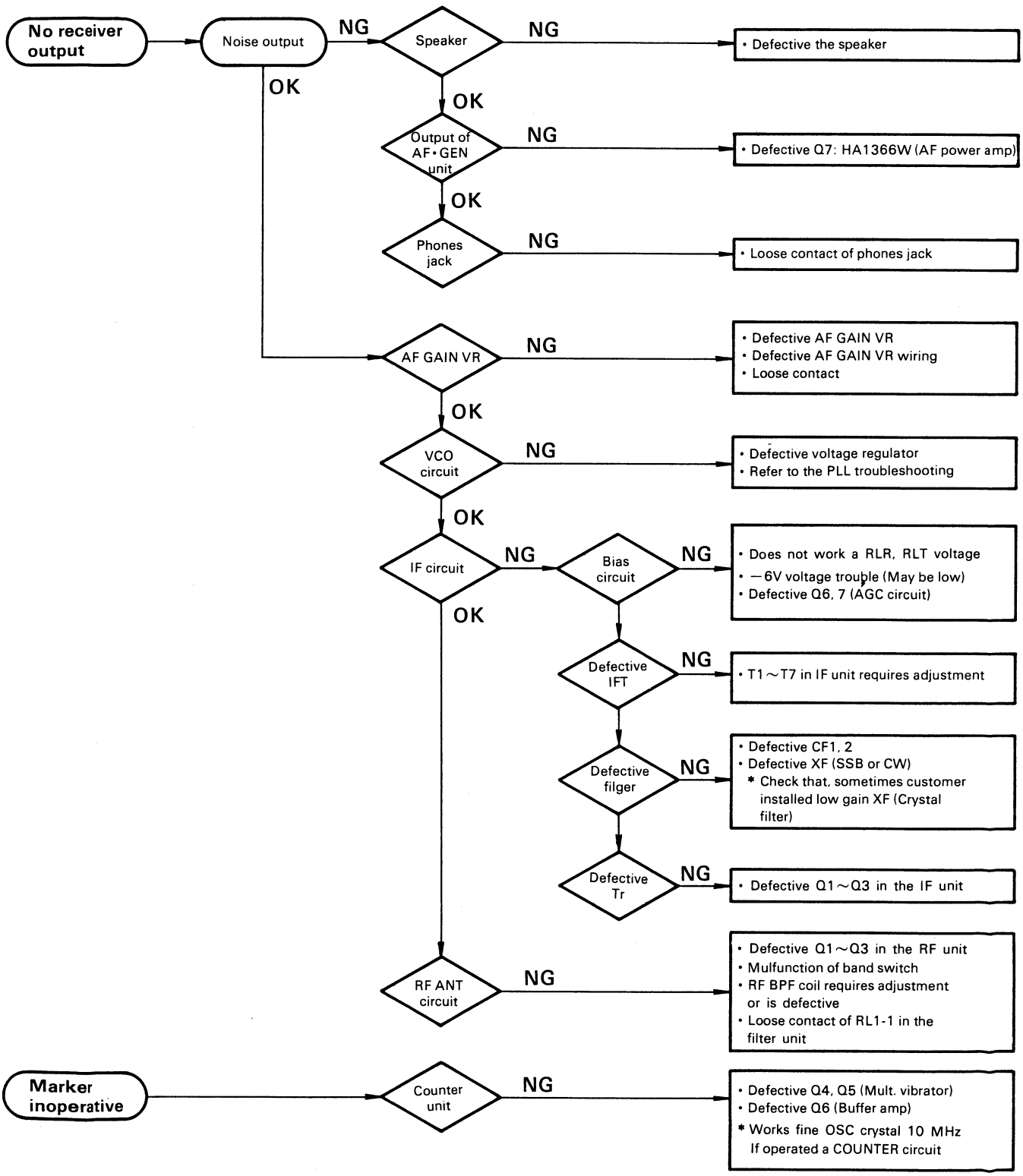


Fig. 13 Final unit disassembly

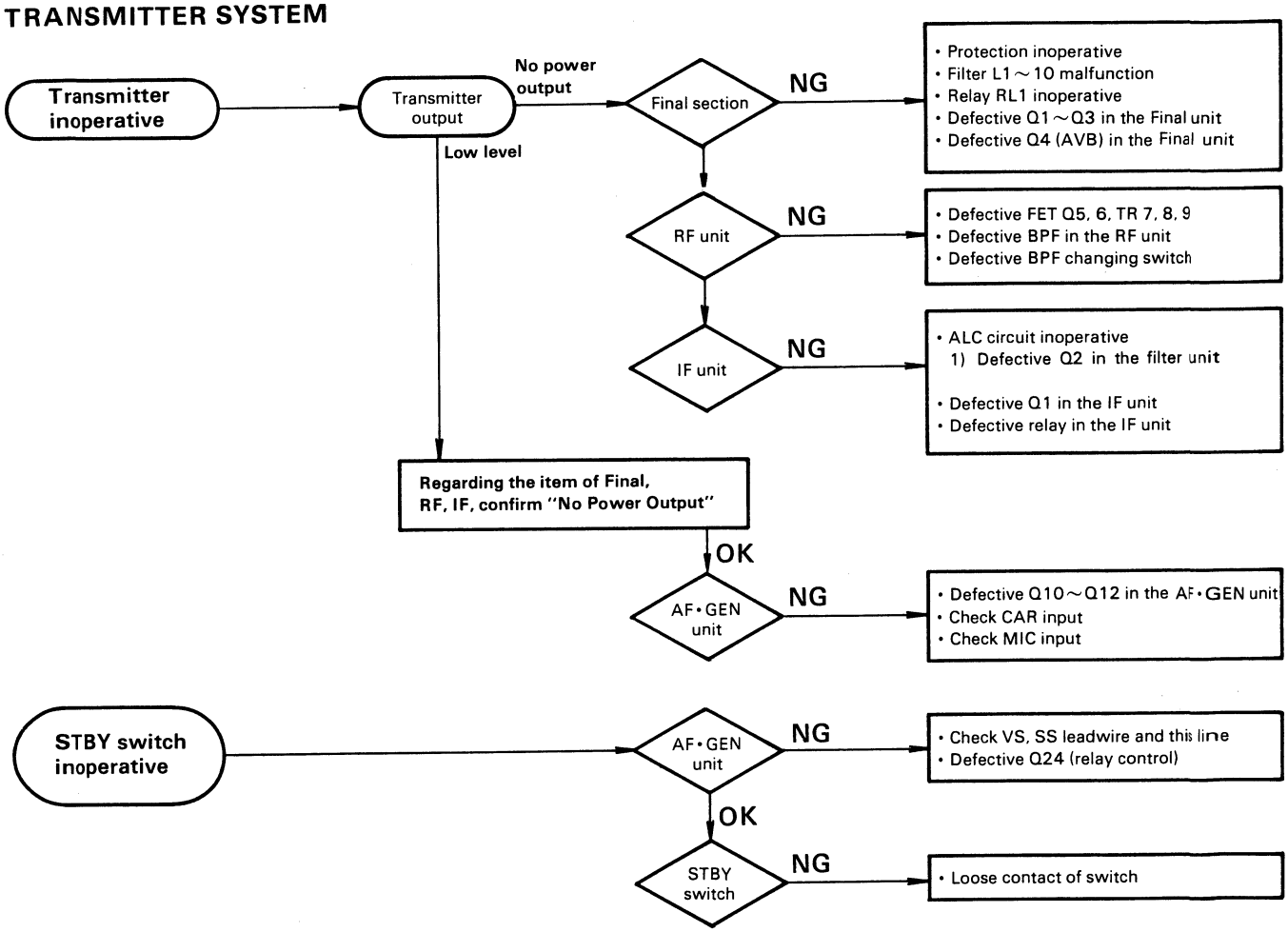
TROUBLE SHOOTING

RECEIVER SYSTEM

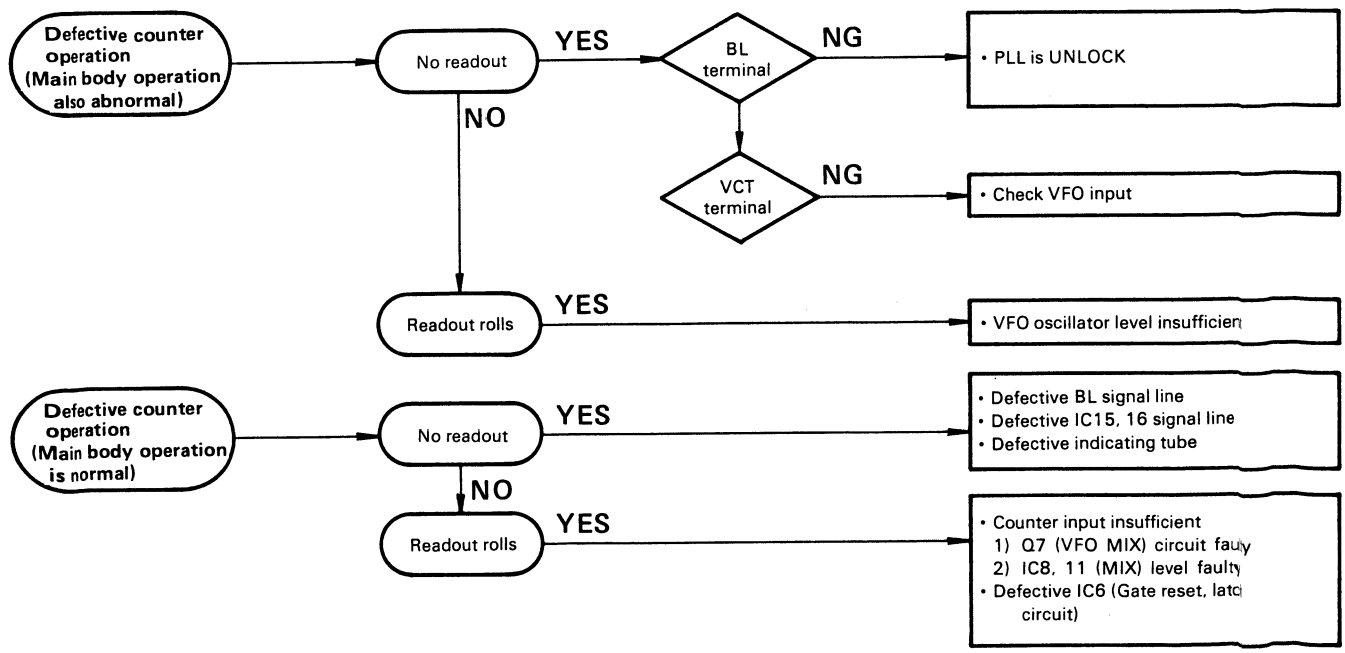


TROUBLE SHOOTING

TRANSMITTER SYSTEM

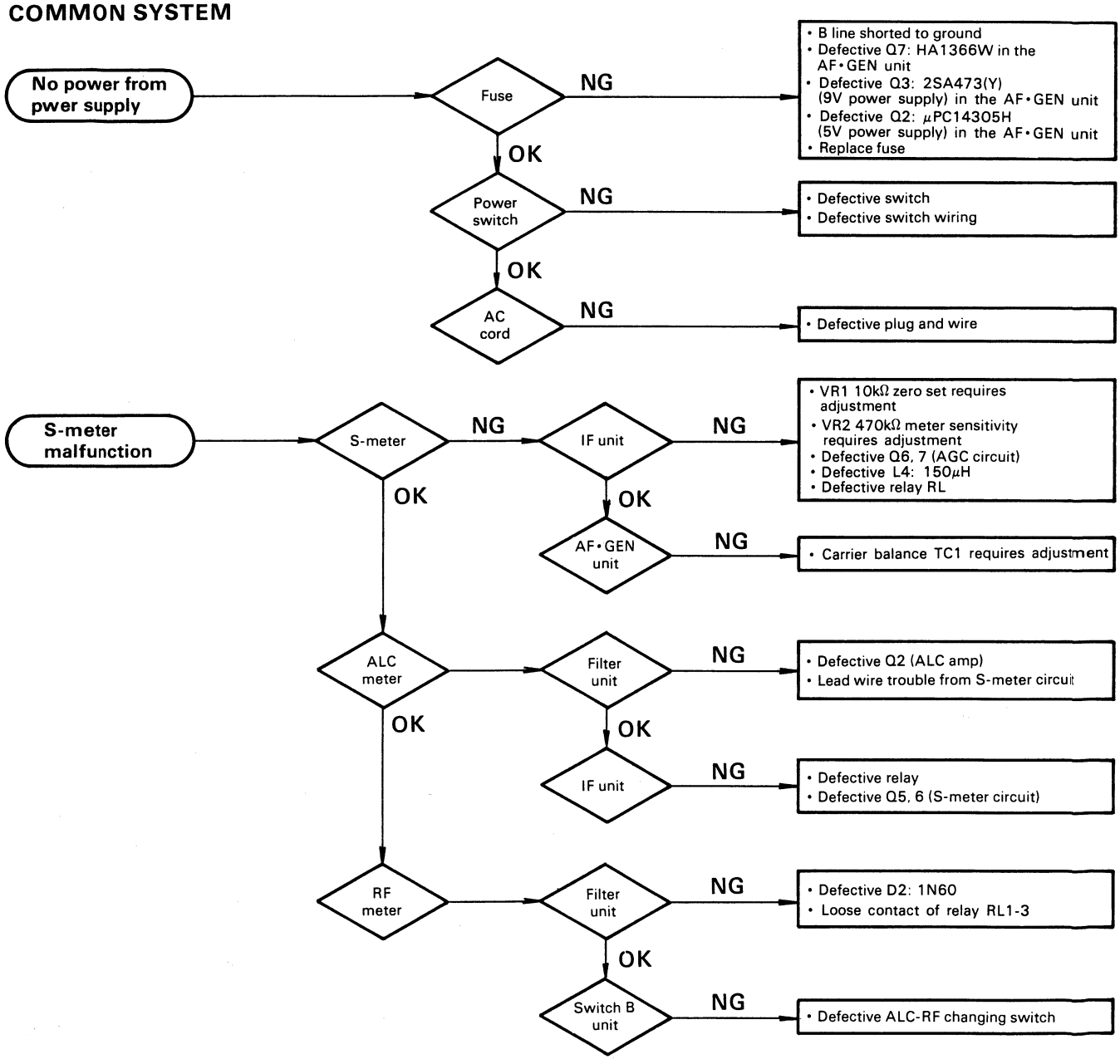


COUNTER SYSTEM

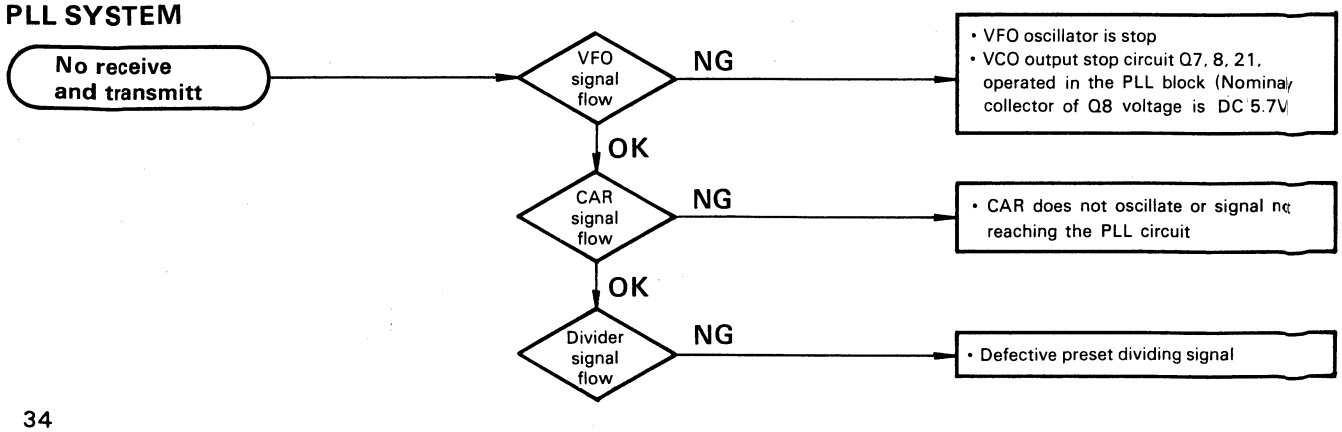


TROUBLE SHOOTING

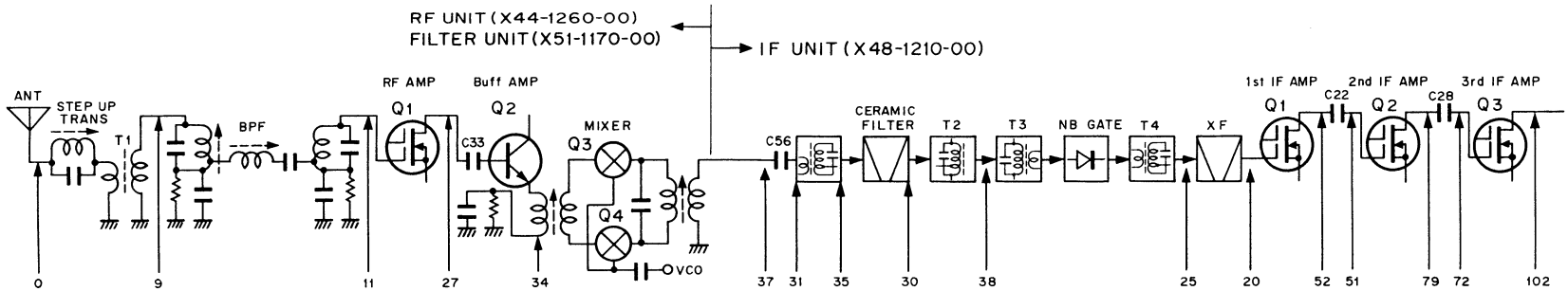
COMMON SYSTEM



PLL SYSTEM



RECEIVER SECTION

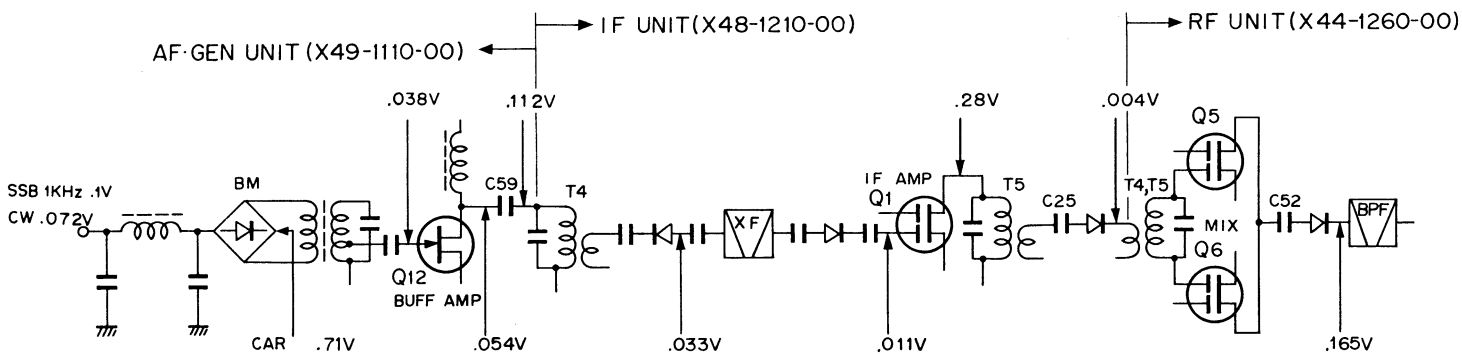


FREQUENCY: 14.250 MHz
INPUT: 0 dB
AF OUTPUT: 0.63V at 8Ω

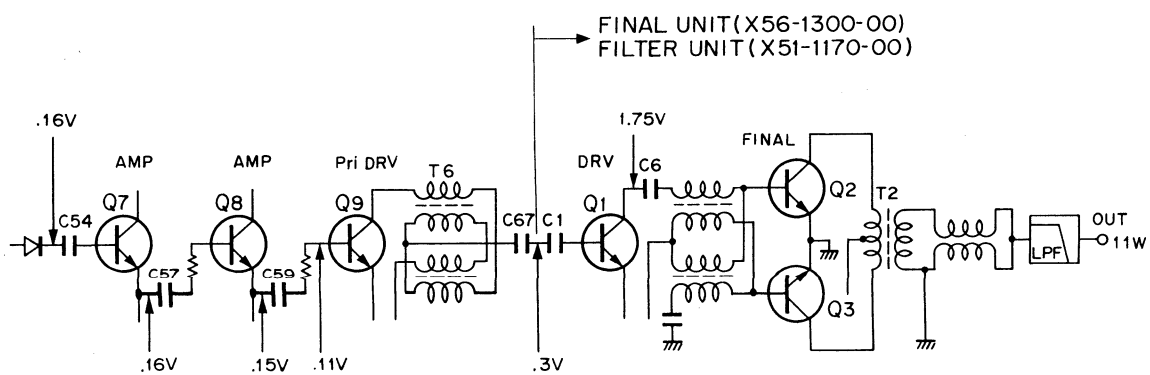
NOTES:

1) The above figure a curve formed by plotting the signal generator output required for a constant audio output with a constant AF gain control setting. Set the AF gain control for a 0.63V/8Ω (50 mW) audio output for a 0 dB signal generator input at 14.250 MHz.
2) Measure the AF output at the ring detector on the IF unit (X48-1210-00).
3) All voltage measurement are read from on RF VTVM.
4) To measure the output of signal generator, contact a 0.01μF 500WV capacitor between the signal generator and the check point.
5) Adjusted a ALC LEVEL VR still over ALC zone to ALC meter indications.
   Then, measurement other signal level.

TRANSMITTER SECTION



14.25 MHz ANT OUT: 11W
ALC: in full scale zone



ADJUSTMENTS

GENERAL

The contents of the adjustment procedures of this transceiver are classified into formal adjustment at service benches and simplified adjustment using a voltmeter, AF and RF vacuum-tube voltmeters AG, and dummy load (AF and RF). The following adjustments require high precision measuring instruments such as a frequency counter, SSG, and sweep generator and so on. Thus, if such measuring instruments are unavailable, it is necessary to bring the transceiver to a place where such instruments are available and make adjustment while taking care not to touch the parts to be adjusted.

(TX BPF, RX BPF, IF trap) MEASURING INSTRUMENTS

1. VOLTMETER

1) Input resistance: More than 1MΩ
2) Voltage range: FS = AC/DC 1.5 to 1000V

NOTE:

High-precision circuit testers may be used. However, be careful since accurate reading is not obtained in high-impedance circuit measurement.

2. RF VACUUM-TUBE VOLTMETER (RF VTVM)

1) Input impedance: More than 1MΩ and less than 3pF
2) Voltage range: FS = 10 mV to 300V
3) Measurable frequency range: More than 50 MHz

NOTE:

When special accuracy is not required during adjustment (such as input level or carrier oscillation output in PLL circuit), a voltmeter or circuit tester may be substituted for RF VTVM by connecting it to the output of detector as mentioned later.

3. AF VOLTMETER

1) Measurable frequency: 50 Hz to 10 kHz
2) Input resistance: More than 1MΩ
3) Voltage range: FS = 10 mV to 30V

4. AF GENERATOR (AG)

1) Frequency range: 200 Hz to 5 kHz
2) Output: Maximum 1V minimum 2 mV

NOTE:

The distortion factor of AF generator should be small.

5. AF DUMMY LOAD

1) Impedance: 8Ω
2) Power: More than 3W

6. RF DUMMY LOAD

1) Impedance: 50 to 75Ω
2) Power: Endurable against power of more than 100W
3) Applicable frequency: 1.8 to 30 MHz

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

7. OSCILLOSCOPE

Select equipment that has as high sensitivity as possible and permits external synchronization.

8. SLOW SWEEP GENERATOR

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

9. SSG

1) Oscillation frequency: 1.8 to 30 MHz
2) Output: 0 dB/μV ~ 120 dB/μV

NOTE:

Select an equipment that the oscillation frequency is stable in non-modulation and there are small level of frequency modulation components.

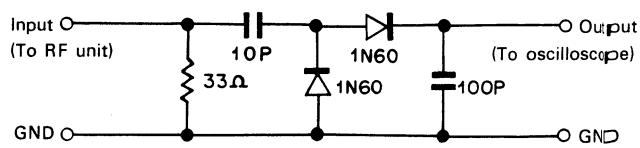
10. FREQUENCY COUNTER

1) Minimum input voltage: 50 mV
2) Measurable frequency range: More than 40 MHz

11. NOISE GENERATOR

Select an equipment that generates ignition-like noise containing high harmonics up to 30 MHz or more.

12. DETECTOR



13. DIRECTIONAL COUPLER

ADJUSTMENTS

PREPATORY WORK

1. Remove the upper and lower cases according to the figure below.

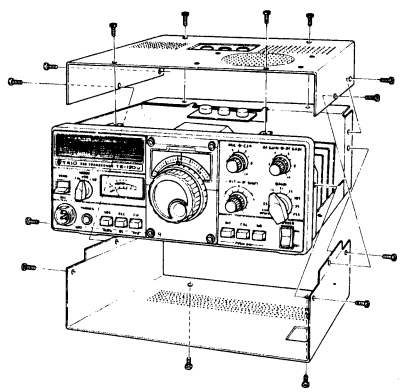


Fig. 14 Case disassembly

2. Unless otherwise specified, set the respective knobs to the following positios.

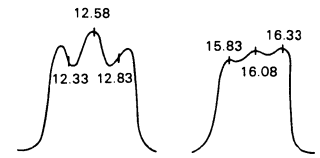
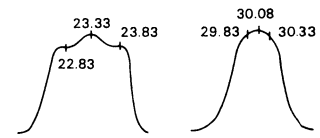
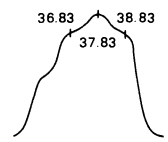
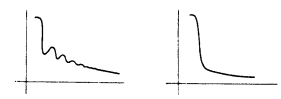
AF GAIN	COUNTERCLOCKWISE
RF GAIN	FULL CLOCKWISE
MIC GAIN	CENTERED
CAR GAIN	CENTERED
RIT	CENTERED
IF SHIFT	CENTERED
MODE	LSB
SEND/REC	REC
NB	OFF
CAL	OFF
RIT	OFF
FIX /VFO	VFO
ALC/RF	RF
VOX/MAN	MAN
POWER	ON

Item	Condition	Measuring point			Adjusting point			Specifications/Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Reference	
1. Power Supply Voltage 1) 9V set		DC voltmeter	AF•GEN	J4, 4P	AF•GEN	VR-3	9V	
2) 2.8V		DC voltmeter	AF•GEN	J4, 10P	AF•GEN	VR-2	2.8V	
3) AVB 11V		DC voltmeter	FILTER	AVB	FILTER	VR-4	11.0V	
2. CAR 1) CAR output		RF voltmeter	AF•GEN	J3, 2P	CAR	T1	0.3Vrms	0.3V ±1 dB
2) Freq. RX	1) IF SHIFT centered 2) MODE LSB 3) MODE USB	Frequency counter	AF•GEN	J3, 2P	CAR CAR	TC2 TC1	8.82850 MHz 8.83150 MHz	
3) Freq. RX	MODE CW	Frequency counter	AF•GEN	J3, 2P	CAR	VR2	8.83070 MHz	
3. IF SHIFT	Must be change REC/SEND	Frequency counter	AF•GEN	J3, 2P	CAR	VR-1	Same as RX frequencies	
4. VFO	Check output turn a dial scale 0～500	RF voltmeter	AF•GEN	J1, 6P	VFO	TC2	0.2Vrms	0.2V±1 dB rms at VFO scale 250 0.2V±2 dB rms in FIX CH output
5. RIT	1) Adjust to VFO frequency at 5.5 MHz 2) RIT VR centered	Frequency counter	AF•GEN	J1, 6P	AF•GEN	VR1	The RIT switch is turned ON and OFF	1) No frequency change when the RIT switch is turned ON and OFF 2) More than ±1.5 kHz variable range of RIT
6. VCO		Frequency counter	PLL	J18, 1P	PLL	T1 T2 T3 T4 T5	WWV, 14 MHz → 3.5V (VFO: 0) 21 MHz → 3.5V (VFO: 250) 28.29 MHz → 5.0V 7 MHz → 5.5V (VFO: 250) 3.5 MHz → 3.5V (VFO: 250)	Oscillator level 1V ±2 dB
		DC voltmeter	PLL	TP1				

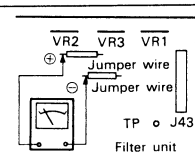
	"0"	"250"	"500"
WWV	(3.5V) 23.33 MHz	23.58 MHz	23.83 MHz
3.5 M	12.33 MHz	(3.5V) 12.58 MHz	12.83 MHz
7.0 M	15.83 MHz	(5.5V) 16.08 MHz	16.33 MHz
14.0 M	22.83 MHz	23.08 MHz	(3.5V) 23.33 MHz
21.0 M	29.83 MHz	(3.5V) 30.08 MHz	30.33 MHz
28.0 M	36.83 MHz	37.08 MHz	37.33 MHz
28.5 M	37.33 MHz	37.58 MHz	(5.5V) 37.83 MHz
29.0 M	(5.0V) 37.83 MHz	38.08 MHz	38.33 MHz
29.5 M	38.33 MHz	38.58 MHz	38.83 MHz

Note ( ) control voltage

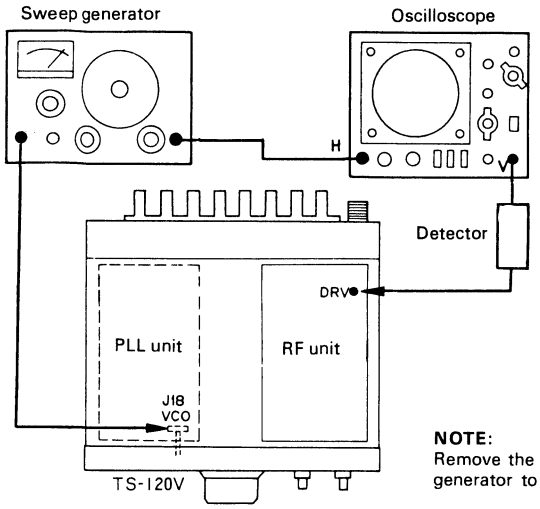
ADJUSTMENTS

Item	Condition	Measuring point			Adjusting point			Specifications/Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Reference	
7. TX BPF	Adjustment order 3.5 MHz, 7.5 MHz, 14 MHz, 21 MHz, 28 MHz should be keep	Sweep generator Oscilloscope Detector	RF PLL	DRV VCO	RF	L3～17	Adjust the coil for a waveform as shown at right *Shown Fig. 15	3.5 MHz L3, 4, 5 / 7 MHz L6, 7, 8  Ripple ratio less than 5 dB Ripple ratio less than 2 dB
8. RX BPF	If this adjustment is need a spectrum analyzer and tracking generator Adjust item 7 as a general rule	Tracking generator Spectrum analyzer	Rear panel RF	ANT Q2, E	RF	L3～17	Check that same as above *Shown Fig. 16	 Ripple ratio less than 2 dB Ripple ratio less than 1 dB
9. IF AMP	1) VFO: 250 BAND: 14 MHz MODE: USB	SSG Oscilloscope AF voltmeter 8Ω dummy or speaker		SP	RF IF	T3 T1～17	1) Adjust for a maximum output 2) Apply SSG output at −6 dB to the antenna terminal signal to noise ratio approx. 15 dB	 Ripple ratio less than 2 dB
10. IF trap		SSG AF voltmeter		SP	RF	L1, 2 L35	S-meter reading and AF output become adjust for a minimum level and repeat the same procedure two or three times, 0.3V ±1 dB	Check that attenuated when apply a signal of 8.83 MHz at 80 dB to the antenna a from SSG Shown Fig. 17
11. NB		Noise generator Oscilloscope	RF	D14(K) (cathode)	RF IF	T3 T1	Adjust the coil for wave form as shown at right, repeat the same procedure two or three times	
12. Counter standard Oscillator	BAND: WWV VFO: 500 (15.000 MHz)	ANT			Freq. count.	TC1	Set the BAND switch to WWV (dial scale: 500) antenna to set. While receiving a WWV Signal of 15 MHz adjust trimmer TC1 at the side of counter unit so that zero beat is obtain between this signal and 15 MHz	Set the zero beat between WWV and CAL
13. Base current	MODE: LSB MIC: Counter-clockwise BAND: 14 MHz Adjust to SEND position	Power meter Current meter	FINAL	ANT Base current	FINAL	VR1	70 mA	Soldering a base current terminal, after adjustment of base current. Note: Please adjust ASAP power switch turn on.
14. Carrier suppression	Adjust 14 MHz untill full power is obtain by SSB position	Power meter Oscilloscope Direction coopler		ANT	AF•GEN	VR5 TC2 (Min.) *	Carrier better than 40 dB down from the output signal	*Repeat the same procedure two or three times

ADJUSTMENTS

Item	Condition	Measuring point			Adjusting point			Specifications/Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Reference	
15. Carrier point	1) Connect AG to MIC terminal and apply an input of 1500 Hz at 7 mV 2) Adjust MIC GAIN until output becomes 5W	Power meter Oscilloscope AG AF voltmeter			CAR	USB→ TC1 LSB→ TC2	Shifting the signal frequency to 300 Hz or 2700 Hz adjust TC1 (in USB) and TC2 (in LSB) so that RF voltmeter reading is the same level.	400 Hz, 2600 Hz (−6 dB down) 1500 Hz: Centered Check that carrier suppression again if adjust a carrier point Adjust TC1 (in USB) and TC2 (in LSB) so that RF voltmeter reading is the same level.
16. Side tone	AF GAIN: 12 o'clock MODE: CW Installed KEY and KEY down	KEY AF voltmeter			AF•GEN	VR4	0.63V/8Ω	
17. ALC	BAND: 14 MHz VFO: 200 MODE: CW VR2 in the filter Unit: counter-clockwise STBY: SEND	Power meter AG AF voltmeter			FILTER	VR3	11W	Check that, RF power output is the same level by SSB position at 7 mV (1500 Hz)
18. Protection	VR2 in the filter Unit: Full clock-wise Same as above	Disconnect to power meter DC voltmeter	FILTER	Jumper wire Shown at right	FILTER	TC1	MIN. (Approx. 40～50 mV)	
19. Total current by transmit operation	Same as item 17	Power meter			FILTER	VR2	2.3A	
20. S-meter 1) Starting level 2) S1 3) S9	Adjust 14, 175 MHz in receive position	SSG			1) IF 2) IF 3) IF	1) VR1 2) T6 3) VR2	1) Antenna ground 2) 8 dB to the antenna from SSG→S1 3) 40 dB to the antenna from SSG→S9	 2) Less than 8 dB ±4 dB 3) Less than 40 dB ±6 dB
21. RF meter	In transmit by CW position	Power meter			FILTER	VR1	Set the RF meter reading "8"	RF meter reading "8" at 11W

ADJUSTMENTS



NOTE:
Remove the J18 and connect the sweep generator to J18 connector (pin 1).

Fig. 15 Test equipment connection/Item 7 TX BPF

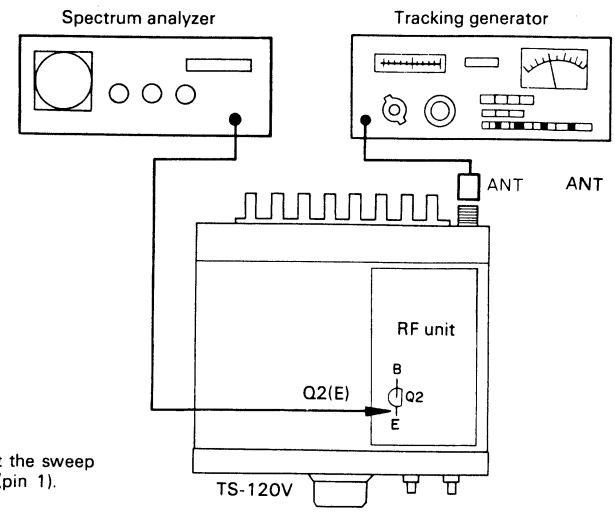
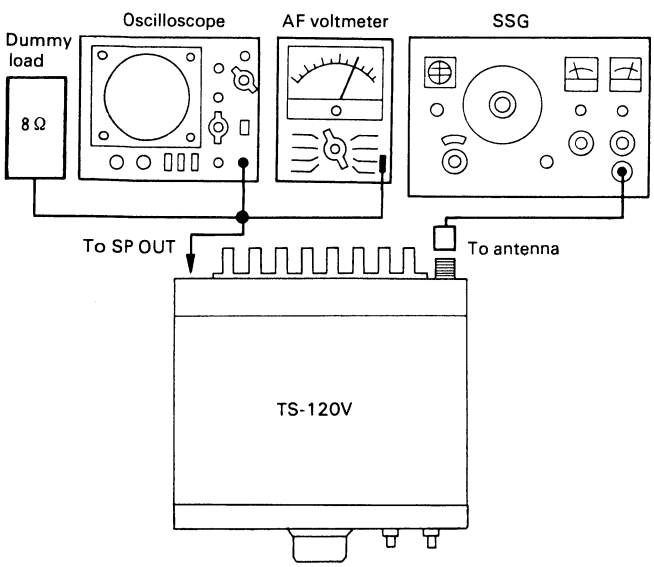


Fig. 16 Test equipment connection/Item 8 RX BPF

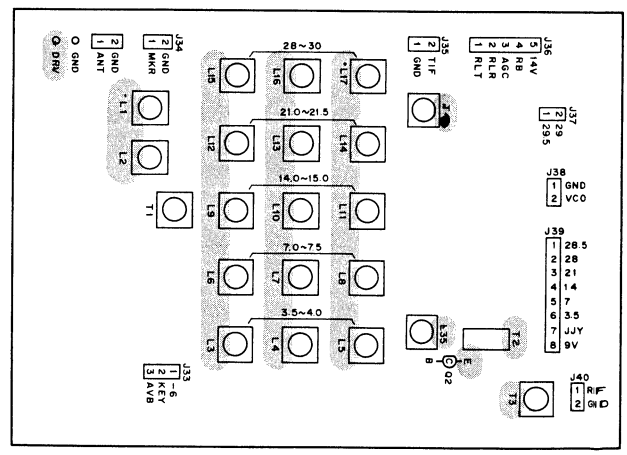


★ **Caution:**
If connect SSG to the antenna terminal NEVER TRANSMIT.

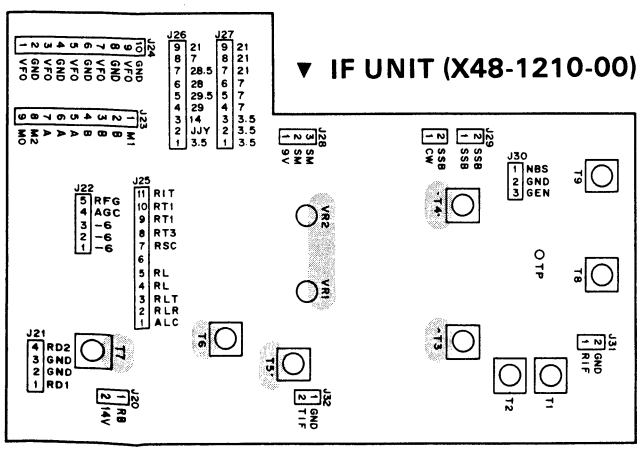
Fig. 17 Test equipment connection/Item 9 IF AMP, Item 10 IF TRAP

PC BOARD ALIGNMENT

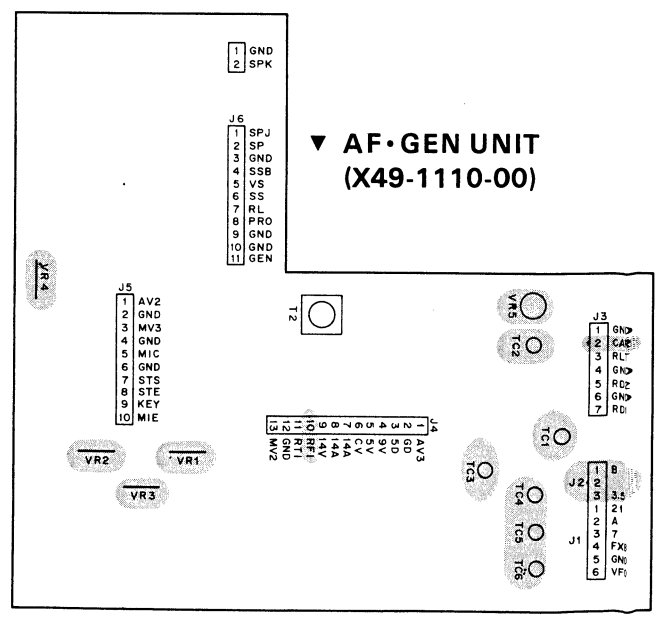
▼ RF UNIT (X44-1260-00)



▼ IF UNIT (X48-1210-00)



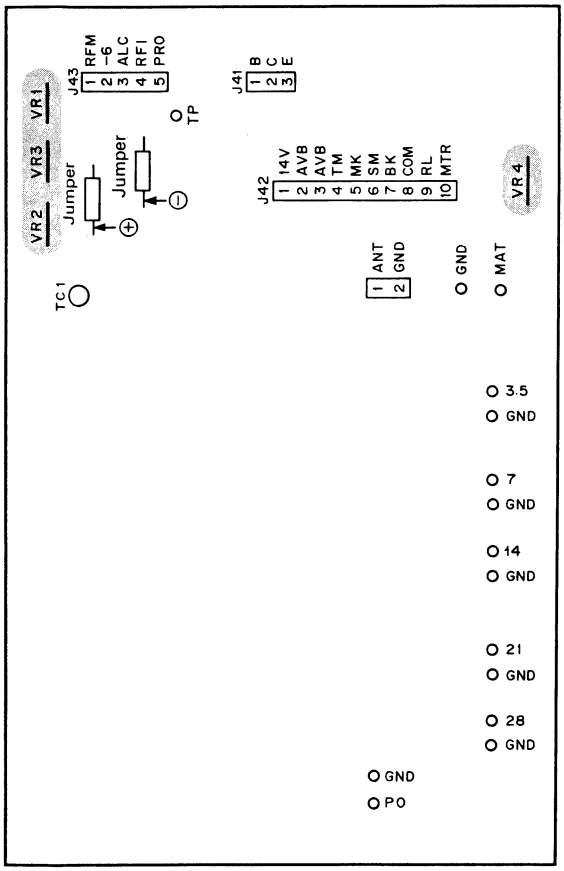
▼ AF•GEN UNIT (X49-1110-00)



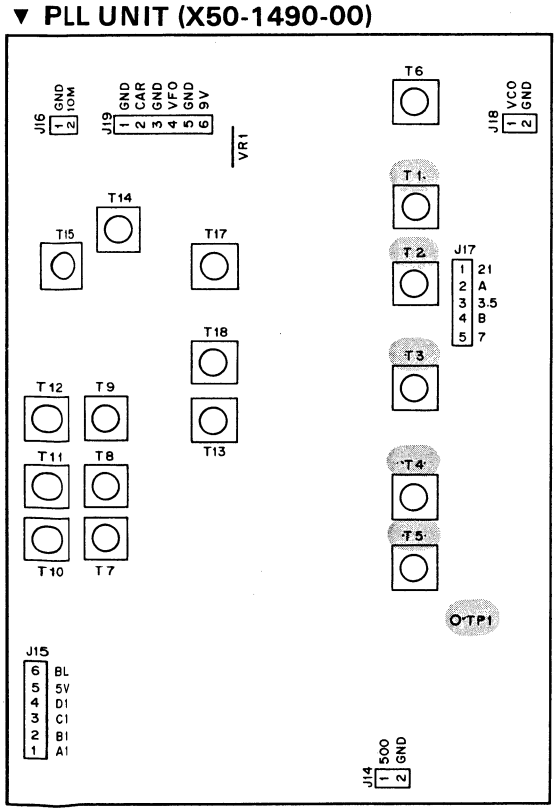
ADJUSTMENTS

PC BOARD ALIGNMENT

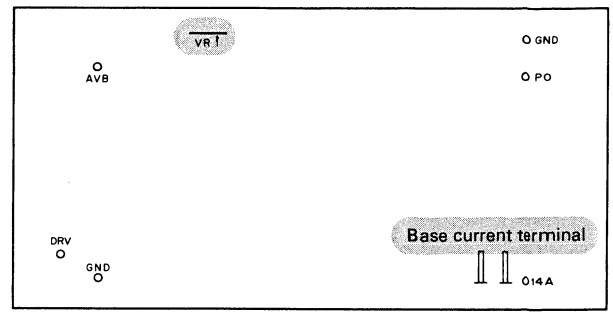
▼ FILTER UNIT (X51-1170-00)



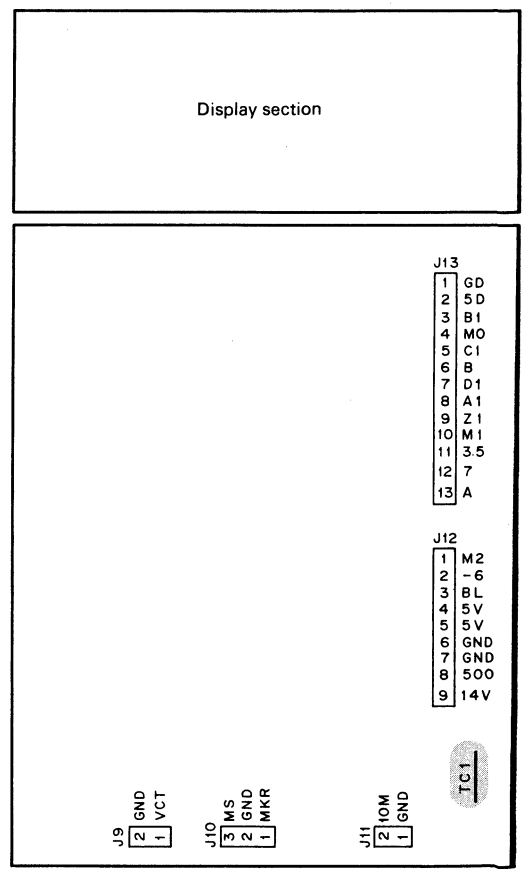
▼ PLL UNIT (X50-1490-00)



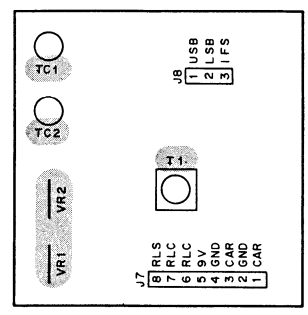
▼ FINAL UNIT (X56-1300-00)



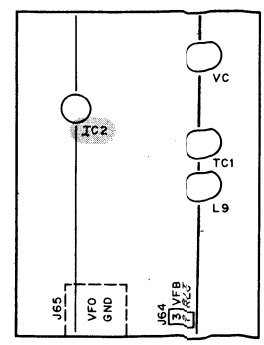
▼ COUNTER UNIT (X54-1360-00)



▼ CAR UNIT (X50-1500-00)



▼ VFO UNIT (X40-1130-00)



PS-20

PS-20 CIRCUIT CONFIGURATION

As shown in the circuit diagram, the voltage regulator is a standard series regulator. This circuit is composed mainly of a voltage regulator and an overcurrent protection circuit.
The voltage-regulating circuit consists of a comparator circuit (Q5), DC amplifier (Q2 and Q3), and pass transistors (Q1 and Q2), to control the output voltage.
In the PS-20, the transformer secondary voltage is lowered to prevent the output circuit from being overheated, and a 15,000μF filter capacitor is used to prevent the AVR input voltage from dropping at maximum load. The overcurrent protection circuit is used to protect the pass transistors by reducing the output current when the supply is overloaded or shorted. During overcurrent, the voltage drop across R14 and R15 (0.1Ω) is increased. This controls Q2 and Q3, which reduces Q1 and Q2 emitter voltage. Q4 is forward-biased by the voltage on D2 (an XZ137), which is almost equal to the supply's rated output voltage, thus reducing the output current of Q1 and Q2 and protecting them from overcurrent damage.

PS-20 SPECIFICATIONS

[Power Supply Section]

Input Voltage:	AC 220/240V ±10%, 50/60 Hz
Output Voltage:	DC 13.8V (standard voltage)
Output Current:	4.5A (intermittent load 50% duty cycle)
Continuous Load Current:	4A max.
Output Voltage Fluctuation:	Within ±50 mV at AC 220/240V ±10% (at load current 4A) Within 0.1V at 0～4A of load current (at AC 220/240V)
Ripple Voltage:	Less than 5 mV at 13.8V, 4A (at AC 220/240V)
Power Consumption:	Approx. 100W (at AC 220/240V, DC 13.8V, 4A)

[General]

Dimensions:	123(124) W × 96(106) H × 235(250) D mm Figures in ( ): Projections included.
Weight:	Approx. 3.8 kg

[Accessories]

Operating Manual:	1
DC Power Cord:	1
Fuse (1A):	1
Crimp Style Terminal:	2

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

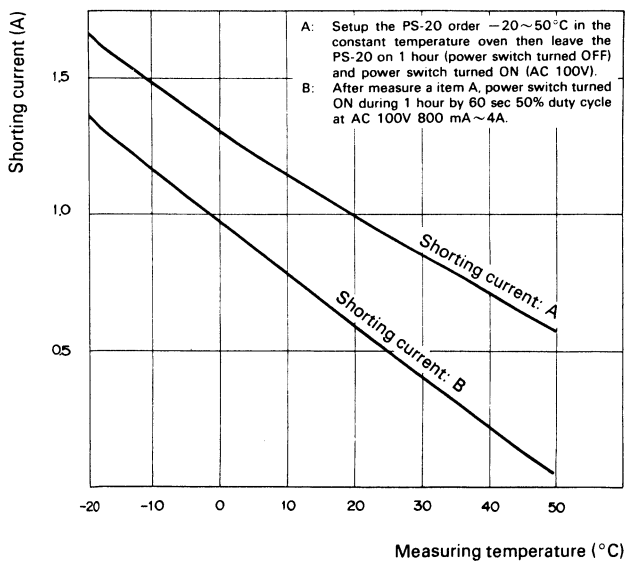


Fig. 18 Load shorting current temperature characteristics

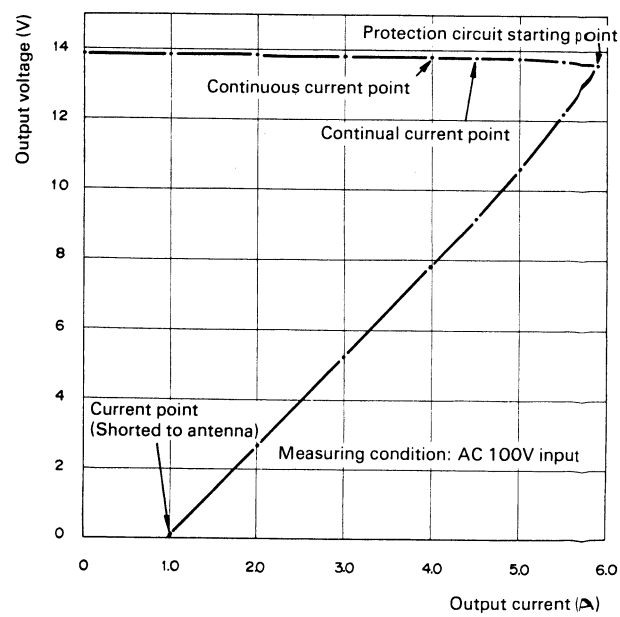
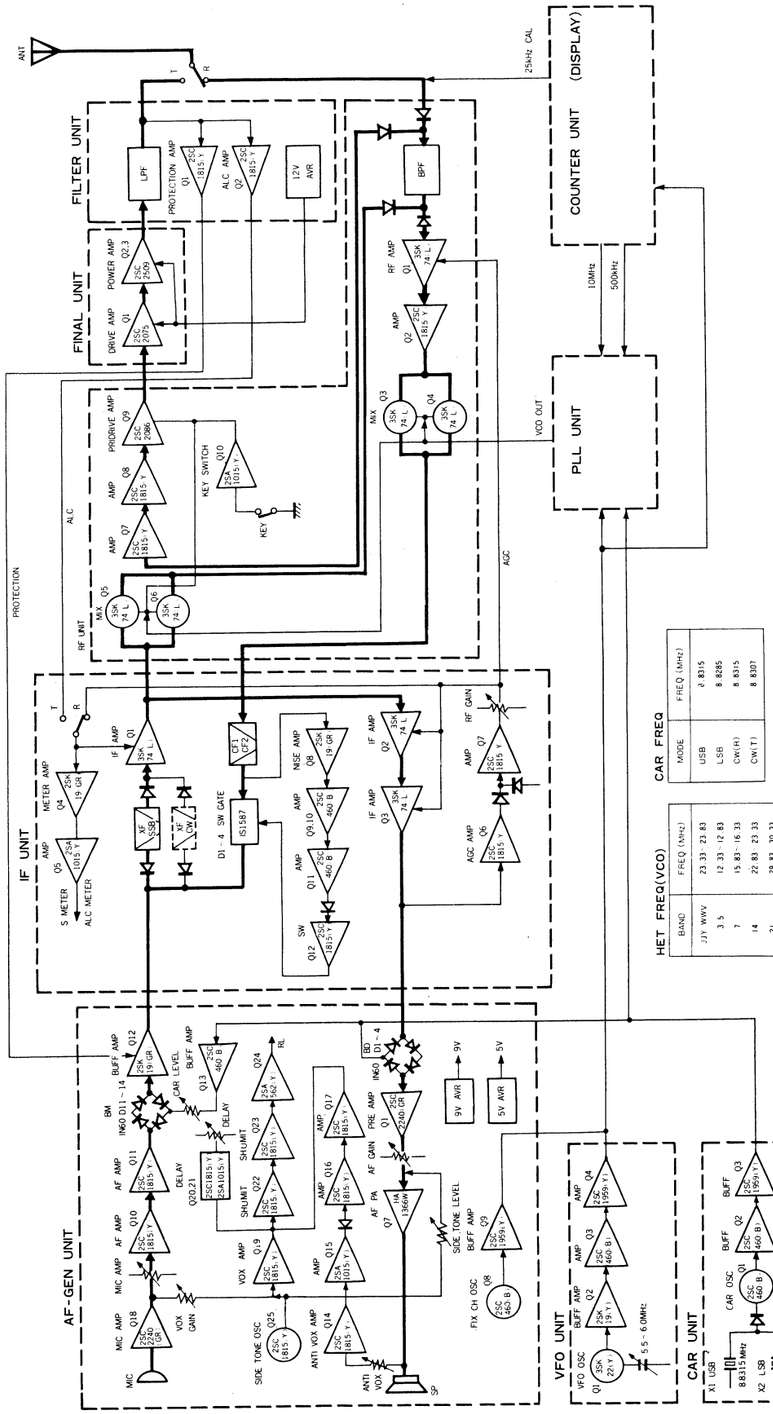


Fig. 19 Output voltage characteristic

BLOCK DIAGRAM



CAR FREQ	
MODE	FREQ (MHz)
USB	8.8315
LSB	8.8285
CW(H)	8.8315
CW(T)	8.8307

HET FREQ(VCO)	
BAND	FREQ (MHz)
JJY WWV	23.33 - 23.83
3.5	12.33 - 12.83
7	15.83 - 16.33
14	22.83 - 23.33
21	29.83 - 30.33
28	36.83 - 37.33
28.5	37.33 - 37.83
29	37.83 - 38.33
29.5	38.33 - 38.83

2SC2086 — 2SC496(Y) 2SA496(Y)

2SK19(GR) — 2SC460(B)

3SK40(L) — 3SK22(Y)

2SC2240(GR)
2SC785(O)
2SC1775(E)
2SC1815(Y)
2SC1959(Y)
2SA1015(Y)
— 2SC2075 2SD235(Y) 2SA473(Y)

2SA562(Y)
2SC784(O)
— μPC14305H

3SK74(L) — 3SK73(GR)

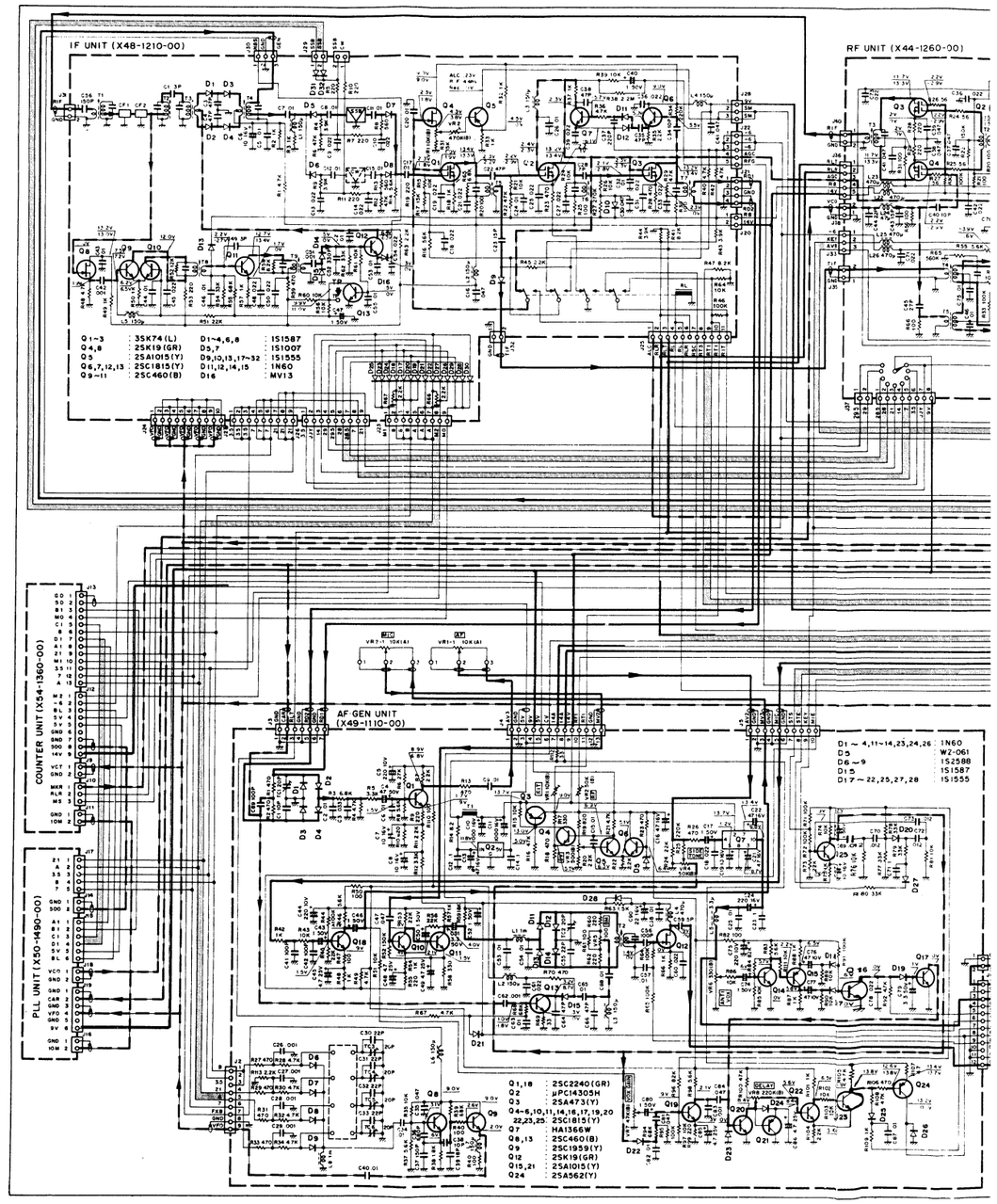
SN16913P — HA1366W

HD74LS00P MC4044P
SN74LS90N TC5026BP
TC4011BP

TC4518BP TC4027BP
TC5051BP TC4029BP
TC4042BP TC4019BP
TC4049BP TC5022BP
TC5066BP TC5012BP
TC5064BP HD74LS163N

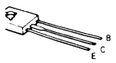
2SC2509

SCHEMATI

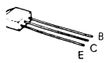


SCHEMATIC DIAGRAM

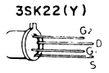
SC496(Y)
SA496(Y)



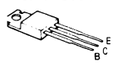
SC460(B)



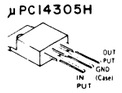
3SK22(Y)



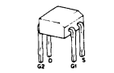
2SC2075
2SD235(Y)
2SA473(Y)



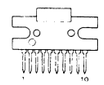
μPC14305H



3SK73(GR)

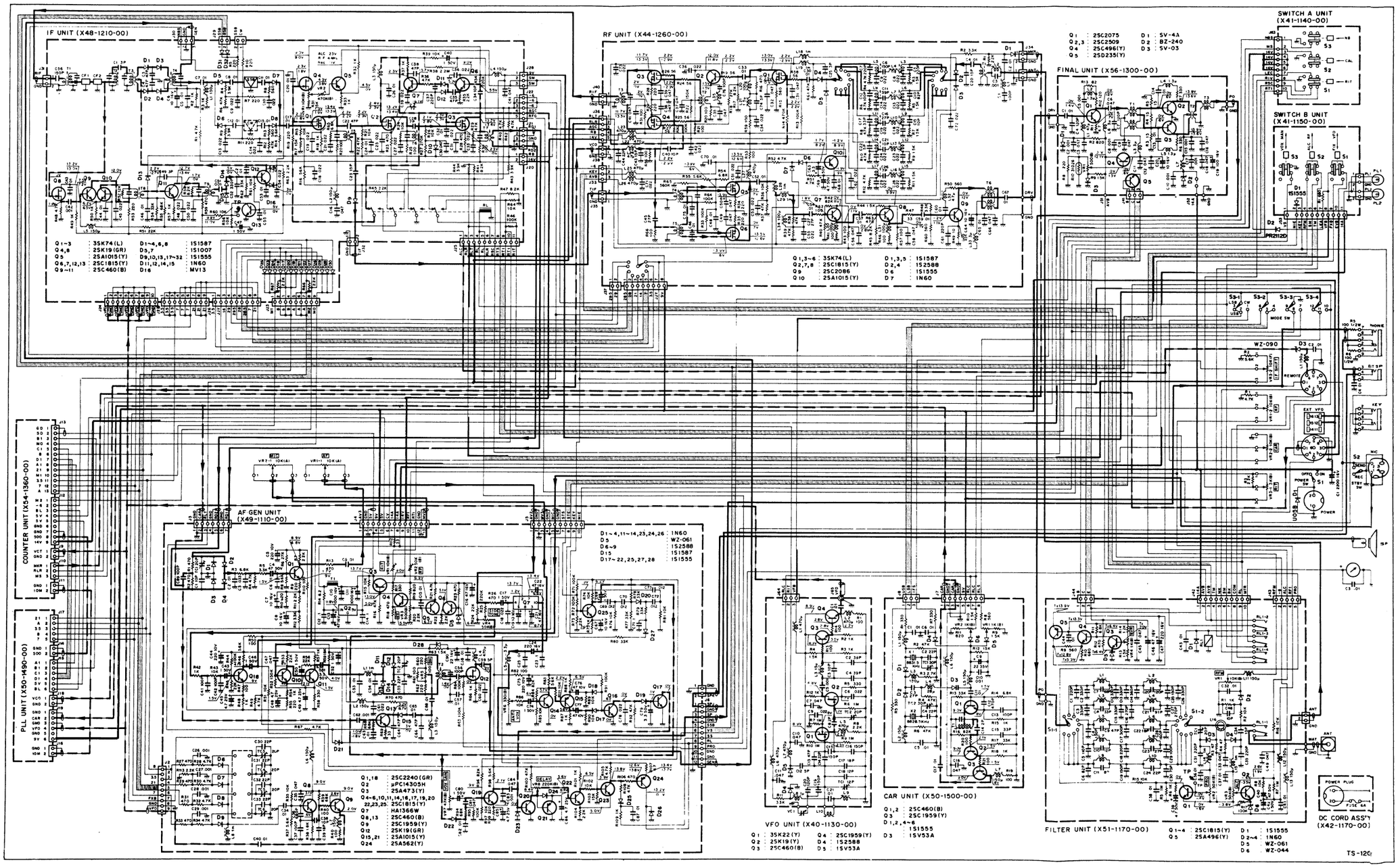


HA1366W



:4044P
:5026BP

:4027BP
:4029BP
:4019BP
:5022BP
:5012BP
74LS163N



PS-20
PARTS LIST

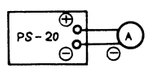
GENERAL

Ref. No.	Parts No.	Description	Remarks
—	C90-0808-05	Electrolytic 15000μF 25WV	☆
Q1,2	V04-0525-06	Transistor 2SD525	☆
D1	V11-2163-76	Rectifier stack M4B51	☆
S1	S36-2402-05	See saw switch (power)	☆
—	L01-8056-05	Power transformer	☆
—	A01-0732-03	Case (A)	☆
—	A01-0733-02	Case (B)	☆
—	A20-2333-03	Panel (T)	☆
—	A20-2336-03	Panel (W)	☆
—	B39-0407-04	Spacer (assistance leg)	
—	B50-2616-00	Operating manual (W)	☆
—	B50-2617-00	Operating manual (T)	
—	E07-0252-05	2P Metal plug	
—	E20-0282-05	2P Terminal plate	☆
—	E23-0412-05	Crimp, style terminal × 2	☆
—	E30-0545-05	AC cord with plug	
—	E30-1620-05	DC power supply cord	☆
—	F05-2023-05	Fuse (2A) × 1	
—	F05-1023-05	Fuse (1A) × 1	
—	F29-0014-05	Insulating washer × 2	
—	H01-2593-04	Carton case (T)	
—	H01-2592-04	Carton case (W)	☆
—	H10-2513-02	Styren foam cushion (F)	☆
—	H10-2514-02	Styren foam cushion (R)	☆
—	H12-0445-04	Cushion	☆
—	H20-1407-03	Protection cover	☆
—	J02-0323-05	Leg × 4	
—	J02-0409-04	Assistance leg	☆
—	J21-2537-04	Leg pushing metal × 2	
—	J32-0133-04	Hex. boss × 4	
—	J41-0024-05	Cord bush	
—	X43-1350-00	AVR unit	☆

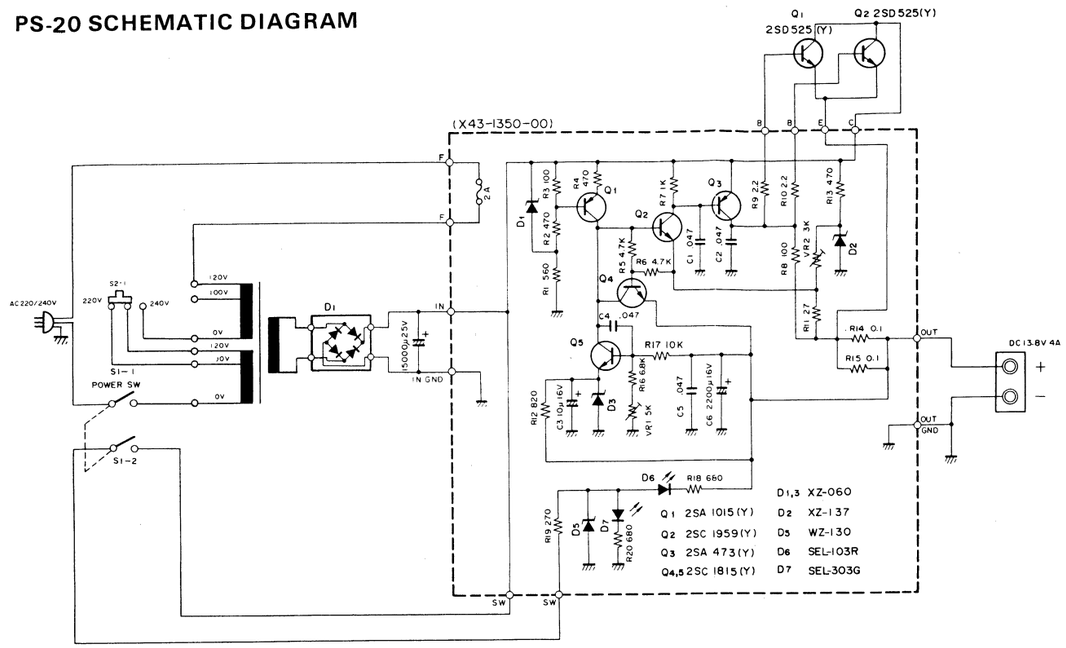
AVR UNIT (X43-1350-00)

Ref. No.	Parts No.	Description	Remarks
CAPACITOR			
C1,2	C90-0262-05	Ceramic 0.047μF 25WV	
C3	CE04W1C100	Electrolytic 10μF 16WV	
C4,5	C90-0262-05	Ceramic 0.047μF 25WV	
C6	C90-0810-25	Electrolytic 2200μF 16WV	
RESISTOR			
R1～20	RD14BB2E○○○J	Carbon resistor ○○○Ω ±5% 1/4W	
R14,15	R92-0618-05	Metal film 0.1Ω	☆
SEMICONDUCTOR			
Q1	V01-1015-06	Transistor 2SA1015 (Y)	
Q2	V03-1959-06	Transistor 2SC1959 (Y)	
Q3	V01-0473-06	Transistor 2SA473 (Y)	
Q4,5	V03-1815-06	Transistor 2SC1815 (Y)	
D1	V11-4162-66	Zener diode XZ-060	
D2	V11-4161-76	Zener diode XZ-137	
D3	V11-4162-76	Zener diode XZ-060	
D5	V11-0297-05	Zener diode WZ-130	
D6	V11-5160-66	LED SEL103R	
D7	V11-5160-76	LED SEL303G	
MISCELLANEOUS			
VR1	R12-2015-05	Potentiometer 5kΩ	
VR2	R12-1016-05	Potentiometer 3kΩ	
—	E23-0047-04	Terminal (square) × 10	
—	J32-0503-05	Beads × 4	

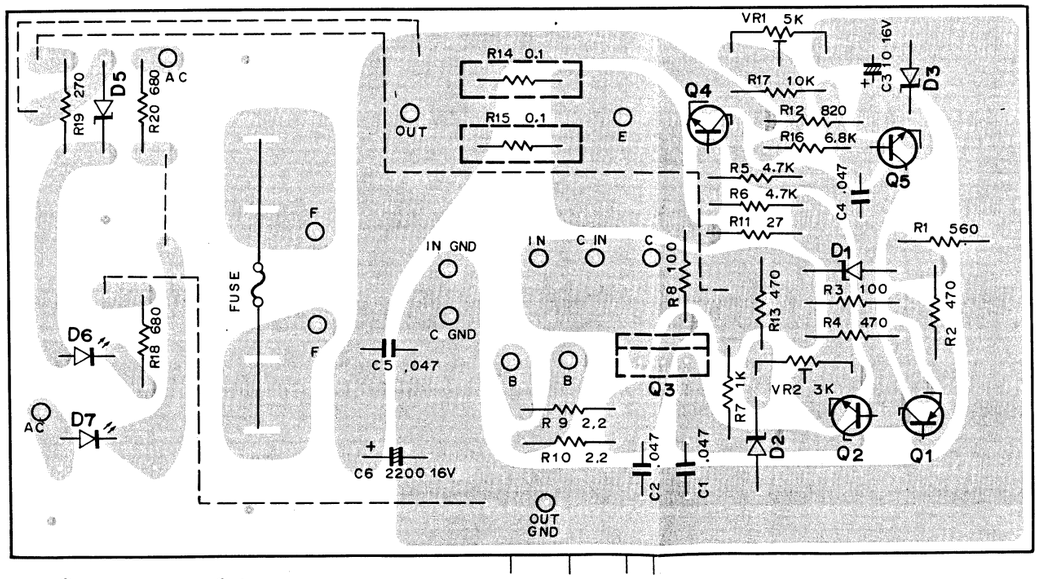
PS-20 ADJUSTMENTS

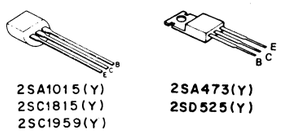
Item	Condition	Measuring point				Adjusting point		Specifications/Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Reference	
1. Output voltage		DC voltmeter		DC OUT	AVR	VR1	Adjust 13.8V	DC 13.8V
2. Protection	Output terminal shorted to ground			R14 or R15 both ends			Adjust to DC 0.05V 	1A (0.05V to the R14 or R15 both ends) 1) If adjustment to VR2 Please quickly adjustment (Less than 2 sec) 2) Please adjust soon power switch turned ON 3) If adjustment of protection Please use a 10A value current meter (Max. 6A)

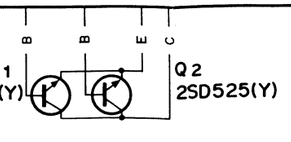
PS-20 SCHEMATIC DIAGRAM



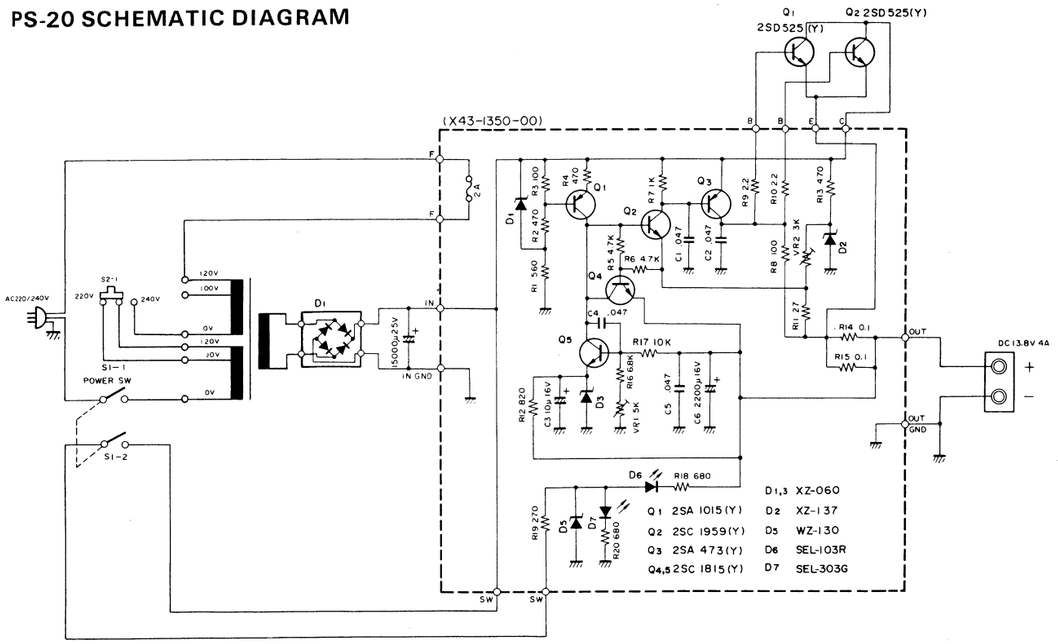
PS-20 PC BOARD ▲ AVR UNIT (X43-1350-00)



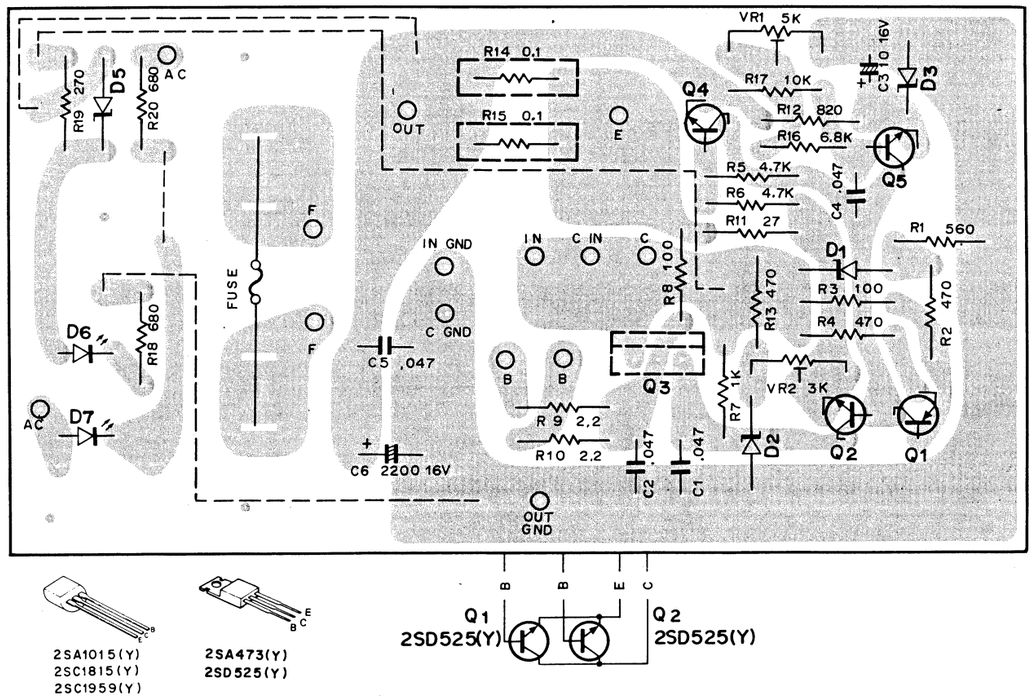




PS-20 SCHEMATIC DIAGRAM



PS-20 PC BOARD ▲ AVR UNIT (X43-1350-00)



YK-88C SPECIFICATIONS

Center frequency:	8830.7 kHz
Center frequency deviation:	Less than ±150 Hz (6 dB)
Passband width:	500 Hz −6 dB
Attenuation band width:	1.5 kHz (−60 dB)
Ripple:	Less than 2 dB
Minimum los:	6 dB ±2 dB
Guarranteed attenuation:	Less than ±2 kHz ~ ±1 MHz More than 80 dB
Terminal impedance:	600Ω ±5%, 15pF ±5%

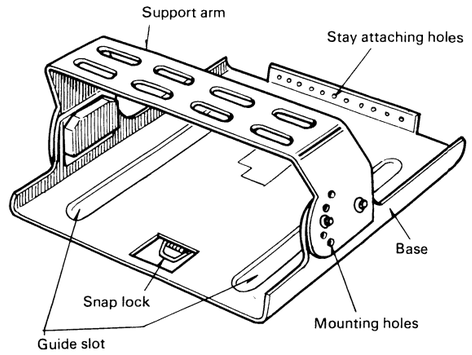


Fig. 21 MB-100 Installation location

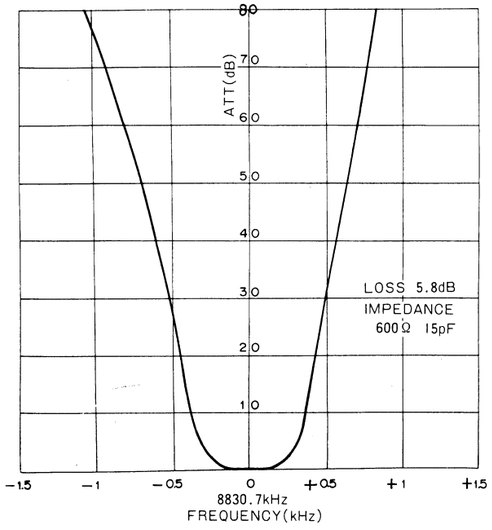


Fig. 20 YK-88C filter attenuation characteristic

Ref. No.	Parts No.	Description/Specification	Remarks
—	J51-0006-15	Snap lock	
—	J54-0401-14	Stay × 2	☆
—	J90-0401-04	Guide stopper	☆
—	N09-0008-04	Hex. screw × 6	
—	N14-0009-04	Screw nut × 6	
—	N15-1060-46	Plain washer	
—	N16-0040-46	Spring washer × 2	
—	N16-0060-46	Spring washer × 6	
—	N19-0609-04	Nylon washer	☆
—	N30-4008-46	Screw	
—	N32-3006-46	Flat screw	
—	N87-3006-46	Braizer tap tight screw × 2	
—	N88-3006-46	Flat tap light tight screw × 2	
—	N99-0304-04	Hex. socket screw × 6	
—	W01-0401-04	Hex. bar wrench	

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