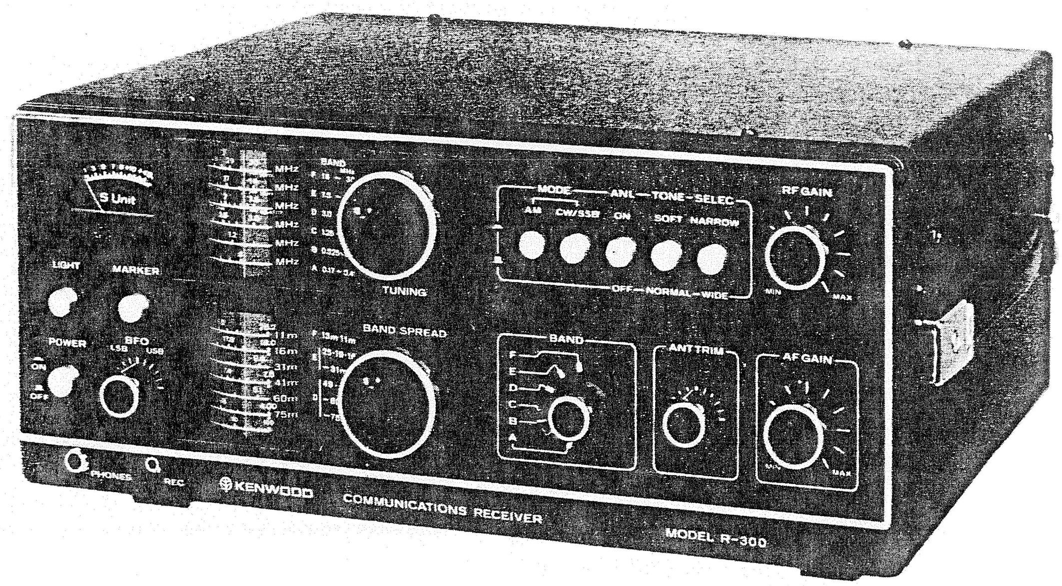
KENWOOD

SERVICE MANUAL

R-300



COMMUNICATIONS RECEIVER

CONTENTS

In this service manual, mark W shows the products for BCL, W2 does for HAM.

SPECIFICATIONS

FREQUENCY RANGE

BAND A	170 ~ 410 kHz
BAND B	525 ~ 1250 kHz
BAND C	1.25 ~ 3.0 MHz
BAND D	3.0 ~ 7.5 MHz
BAND E	7.5 ~ 18.0 MHz
BAND F	18.0 ~ 30 MHz

BAND SPREAD

(different depending on the destination area)

Short Wave Bands:

75 m	3.82 ~ 4.0 MHz
60 m	4.75 ~ 5.1 MHz
49 m	5.9 ~ 6.2 MHz
41 m	7.0 ~ 7.5 MHz
31 m	9.4 ~ 9.8 MHz
25 m	11.7 ~ 12.0 MHz
19 m	15.0 ~ 15.5 MHz
16 m	17.6 ~ 18.0 MHz
13 m	21.4 ~ 21.8 MHz
11 m	25.6 ~ 26.2 MHz

Ham Bands:

80 m and 75 m	3.5 ~ 4.0 MHz
40 m	7 ~ 7.5 MHz
20 m	14 ~ 14.6 MHz
15 m	21 ~ 21.5 MHz
10 m	28 ~ 30 MHz

MODE

AM, SSB, CW

SENSITIVITY

(S+N)/N, 10 dB at 50mW/8Ω

		AM	SSB
BAND A	280 kHz	Less than 1μV	Less than 0.3μV
BAND B	900 kHz	Less than 1μV	Less than 0.3μV
BAND C	2.0 MHz	Less than 1μV	Less than 0.3μV
BAND D	5.0 MHz	Less than 1.5μV	Less than 0.5μV
BAND E	12.0 MHz	Less than 1.5μV	Less than 0.5μV
BAND F	24.0 MHz	Less than 1μV	Less than 0.3μV

IMAGE RATIO

BAND A	280 kHz	More than 65 dB
BAND B	900 kHz	More than 50 dB
BAND C	2.0 MHz	More than 45 dB
BAND D	5.0 MHz	More than 40 dB
BAND E	12.0 MHz	More than 25 dB
BAND F	24.0 MHz	More than 40 dB

IF REJECTION

BAND A	280 kHz	More than 50 dB
BAND B	900 kHz	More than 60 dB
BAND C	2.0 MHz	More than 70 dB
BAND D	5.0 MHz	More than 70 dB
BAND E	12.0 MHz	More than 70 dB
BAND F	24.0 MHz	More than 70 dB

SELECTIVITY

Narrow	More than 2.5 kHz at −6 dB
	Less than 12 kHz at −60 dB
Wide	More than 5 kHz at −6 dB
	Less than 17 kHz at −60 dB

AUDIO OUTPUT

1.5W at 8Ω load (10% distortion)

ANTENNA IMPEDANCE

50 ~ 75Ω

AUDIO OUTPUT IMPEDANCE

4 to 8 ohms

POWER REQUIREMENTS

AC 117/220V
DC 12 ~ 16V (13.8V as reference)

POWER CONSUMPTION

8W (AC 117/220V)
4.1W (DC 13.8V)
6.9W (DC 13.8V, LIGHT switch ON condition)

SEMICONDUCTOR COMPLEMENT

4 FET's
21 Transistors
24 Diodes

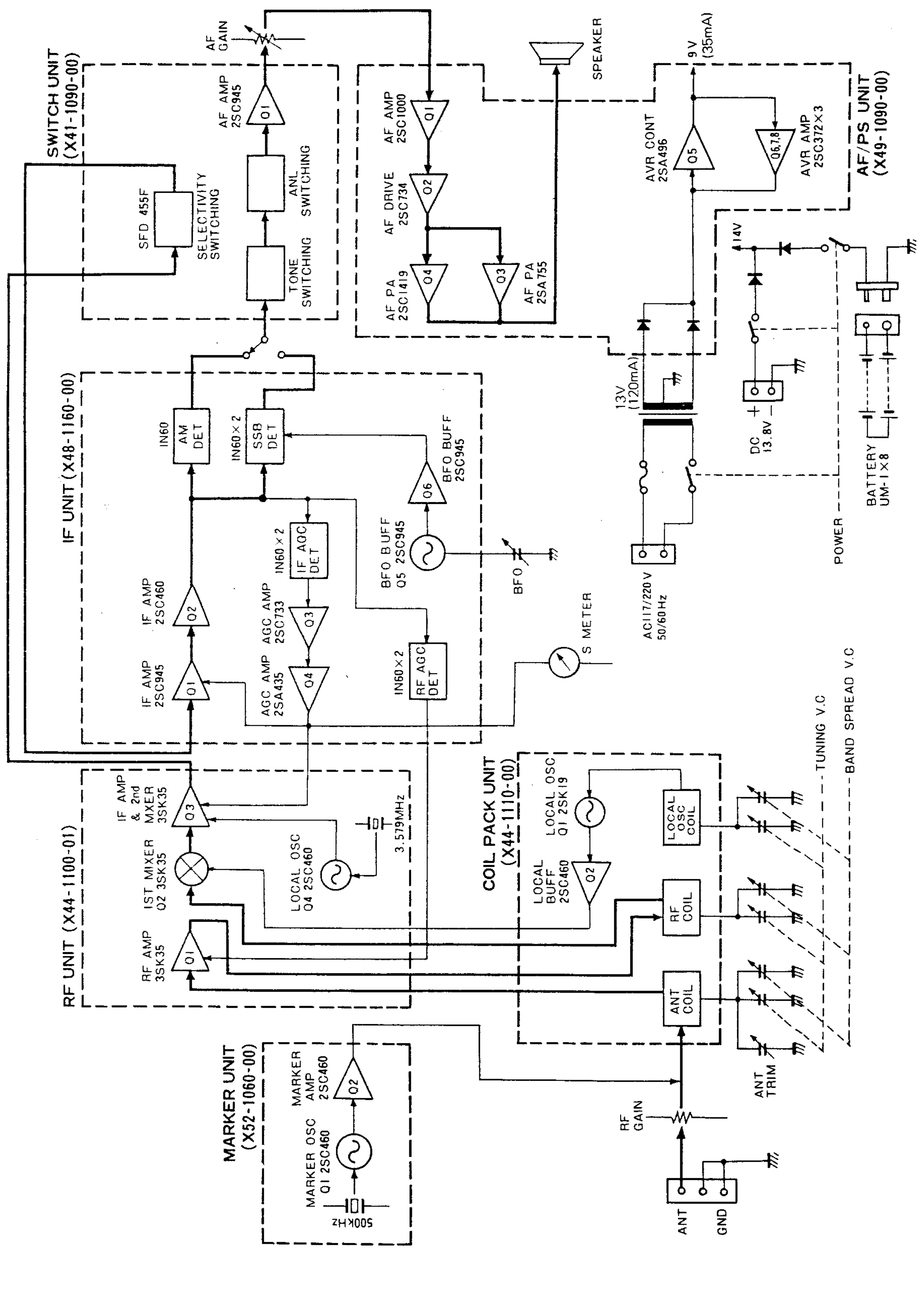
DIMENSIONS

W (362 mm) 14-1/4"
H (163 mm) 6-7/16"
D (322 mm) 12-11/16"

WEIGHT

7.6 kg (16.7 lbs.)

BLOCK DIAGRAM



FEATURES/CIRCUIT DESCRIPTION

FEATURES

1. This is a communications receiver exclusively designed for BCL and HAM radio.
2. In order to facilitate both fixed and mobile operation, it is designed to operate on the AC commerical source, internal battery, and external DC source.
3. A frequency range from 525 kHz to 30 MHz is continuously covered. Single conversion is effected for 525 kHz ~ 18 MHz, and double conversion for 18 MHz ~ 30 MHz.
4. AM, CW, and SSB reception is possible. A variable BFO incorporated is available for CW and SSB.
5. Selectivity is chosen by WIDE/NARROW selector switch. A ceramic filter is adopted.
6. With a built-in 500 kHz marker unit, scale correction is possible for every 500 kHz.
7. Recording in combination with a tape recorder is possible through RECORDING terminal.
8. The tuning dial employs a flywheel to improve operational feeling.
9. A 10cm speaker is incorporated. A terminal for an external speaker is also provided.
10. Meter and dial lamps are always lit when operating on the AC source. In DC operation, they are lit only if LIGHT switch is depressed.

CIRCUIT DESCRIPTIONS

1. Configuration of R-300

R-300 is a all solid-state communications receiver for the reception of AM, CW, and SSB waves. The frequency range of 170 kHz ~ 30 MHz is divided into 6 bands. MOS type dual gate FET's 3SK35 are used for the RF amplifier and mixer. Employing double conversion arrangement for the F band, reception is very stable against cross modulation and image frequency interference.

The whole circuit is composed of a coil pack unit with a local oscillator, RF unit, IF unit, AF and stabilized source unit, and marker unit arranged into 5 printed circuit boards. The following descriptions are given according to the flow of signals in the block diagram.

2. RF Amplifier (RF unit and coil pack unit)

The antenna input passes through the RF and GAIN volume control and enters the antenna coil tap. In the antenna tuning circuit, the coil is split into sections for 6 bands and tuning is effected with main-tuning variable capacitor, band spread variable capacitor, and antenna trimmer. Input impedance ranges from 50 to 75 ohms.

The signal is received at the first gate of MOS type dual gate firld effect transistor (FET 3SK35), where high-frequency amplification is performed. FET 3SK35 has a small feed-back capacity of 0.02pF. Due to the effect of R_2, R_6, and R_8, the signal is amplified stably and fed to the RF coil. AGC voltage taken out of the IF detector stage is applied to the second gate of 3SK35 for gain control.

3. Diode Switch for Output Tuning Circuit Selection and Mixer (RF unit)

The signal from the RF amplifier is applied to the first gate of 3SK35 and mixed with the local oscillation signal of the second gate. The differential mixer output is converted into an IF signal of 455 kHz for the A ~ E bands, or into that of 4.034 MHz for the F band. The MOS type dual gate FET is stable against cross modulation due to excessive input or deviation by local oscillation. In particular it offers an excellent characteristic when used for a mixer.

Switching over between 455 kHz IFT and 4.034 MHz IFT is effected by the aid of a diode switch comprizing D1 ~ 4 and this switch is actuated in conjunction with the band selector switch. In 455 kHz setting for bands A ~ E, current from the 9V source flows through the 2 routes, R15→T1→D1→3SK35 and R15→T1→D3→L1→R17. Thus D1 and D3 are turned on and the 455 kHz output is obtained through 3SK35→D1→T1→D3→C11. In setting for band F, D2 and D4 are turned on and the 4.034 MHz output is obtained through 3SK35→D2→T2→D4→C11.

4. Local Oscillator (coil pack)

In order to achieve stabilized oscillation in a wide frequency range from 625 kHz to 34.034 MHz, the local oscillator circuit of R-300 employs a Hartley circuit of drain-grounded FET 2SK19. To secure a stabilized oscillation ofr the F band, an oscillator circuit is incorporated in the coil pack. To reduce unwanted influence from the mixer circuit, an emitter-follower type buffer circuit of 2SC-460 is provided. The oscillating frequencies are 455 kHz higher than the received frequencies of the A ~ E bands, and 4.034 MHz higher than the received frequency of the F band, as specified below:

A	0.625 ~ 0.865 MHz	D	3.455 ~ 7.955 MHz
B	0.98 ~ 1.705 MHz	E	7.955 ~ 18.455 MHz
C	1.705 ~ 3.455 MHz	F	22.034 ~ 34.034 MHz

5. Second Mixer/IF AMP and F-band Conversion Crystal Oscillator (RF unit)

Signals converted into 455 kHz and 4.034 MHz enter the first gate of Q3 3SK35. This stage functions as an IF amplifier of 455 kHz for the A ~ E bands, while for the F band it functions as a 455 kHz mixer and the signal is mixed with a conversion signal of 3.579 MHz injected in the second gate. A mechanical filter is used for the output tuning circuit to obtain high selectivity.

Since the operating point of the 455 kHz IF amplifier is different from the bias point of the second mixer, a diode switch of D5 and D6 is used for interlocked operation with the band switch. When used as an IF amplifier, no voltage is applied to D5 which is therefore turned off. This AGC voltage is applied through D6 for gain control. During operation as a second mixer, a voltage higher than AGC voltage is applied through D5 to FET as a fixed bias. At that time D6 is turned off and AGC voltage is not applied to the mixer.

Q4 2SC460 is a second local oscillator for the double conversion in the F band only. A 3.579 MHz crystal oscillator is employed in this circuit. Output fromt the output coil is divided by C18 and C19, and is supplied to the second gate of the second mixer.

6. IF Amplifier (IF unit)

The 455 kHz IF amplifier contains 2 amplifier stages of 2SC945. The first stage receives an AGC voltage for gain control. Selectivity for a signal is almost settled in the IF circuit. To obtain a required selectivity, R-300 employs an ON-OFF switch to add or remove the ceramic filter. Selectivity (6 dB band) is 5 kHz in WIDE and 2.5 kHz in NARROW setting.

7. AGC Amplifier (IF unit) and S Meter Orcuit

An IF signal from the collector of IF amplifier Q2 is applied to the voltage-double detector circuit of D6 and D7 through C15. This output is amplified at Q3 2SC733 and Q4 2SA495, and fed to the IF amplifier as AGC (automatic gain control) voltage. A signal from the collector of IF amplifier Q2 passes through C11 and is voltage-doubled and detected at D4 and D5. This output is applied to the Rf amplifier as AGC voltage so that the amplifier gain can be controlled in compliance with signal intensity. In the IF-AGC operation, the signal is detected at D6 and D7 and ⊕voltage is applied to the base of Q3. Since collector current flows in Q3 in compliance with the intensity of this voltage, collector voltage of Q3 (and also, base voltage of Q4) is lowered due to the effect of R14, thus resulting in a current flow in Q4. Therefore emitter voltage of Q4 (this is AGC voltage and is also used as bias voltage for the IF amplifier) is lowered to reduce the gain in IF amplifier.

In the RF-AGC operation, the signal is detected at D4 and D6 and the obtained ⊖voltage is applied to both ends of R3 which is connected in series with the second gate bias circuit of the RF amplifier. In this way, voltage of the second gate is lowered for gain control.

The S meter is used to measure IF-AGC voltage.

8. AM Detector Circuit and ANL (IF unit)

The AM signal is detected by the diode linear detector circuit. The signal taken from the collector circuit of Q2 in the final IF stage passes through C9 and the ⊕side of carrier frequency is deleted by diode D3. After passing through the filter consisting of C10 and R28, the obtained envelope is used as a low-frequency signal.

ANL (automatic noise limiter) employs a service diode to be inserted between detector output circuit and low-frequency amplifier. Noise is removed by this diode which is turned on and off by the effect of noise output.

9. CW/SSB Detector and BFO Circuit (IF unit)

The CW and SSB detection employs a balanced detector circuit. The CW/SSB signal supplied to T2 in the final IF stage is mixed with a BFO signal at the balanced detector circuit consisting of T2, D1, D2, R9, and R10, to make up an audio-frequency signal. The balanced detector circuit has a simple but efficient construction which never gives rise to saturation regardless of whether the signal intensity is strong or weak.

The BFO circuit si a base-grounded Colpitts oscillator with a special feature of high capacitance and low inductance. There is a sufficient stability in thermal and drift characteristics, particularly essential in SSB reception. An emitter-follower buffer is connected to the detector circuit for prevention of frequency draw-in and impedance matching. The BFO frequency is adjustable within the range of 455 kHz ±3 kHz by BFO pitch control.

10. AF Amplifier (AF/PS unit)

The detected audio-frequency signal passes through the AF-GAIN volume control, is amplified at the AF preamplifier of Q1 2SC1000, and enters the AF driver amplifier of Q2 2SC734. Since a push-pull type power amplifier is driven, the collector circuit of Q2 is somewhat complicated. D4 and D5 are used to give a proper bias to Q3 and Q4. Thus an equivalent load resistance is raised to increase the amplification degree of Q2 by the aid of the effect of R10, R11, and C9.

The power amplifier is a so-called complementary OTL which performs series operation of NPN and PNP transistors in terms of DC, and parallel operation in terms of AC. The bases of Q3 and Q4 receive audio-frequency signals in the same phase. Thus, Q4 operates on the ⊕side of the signal and Q3 operates on the ⊖side in a push-pull mode.

11. 9V Stabilized Source (AF/PS unit)

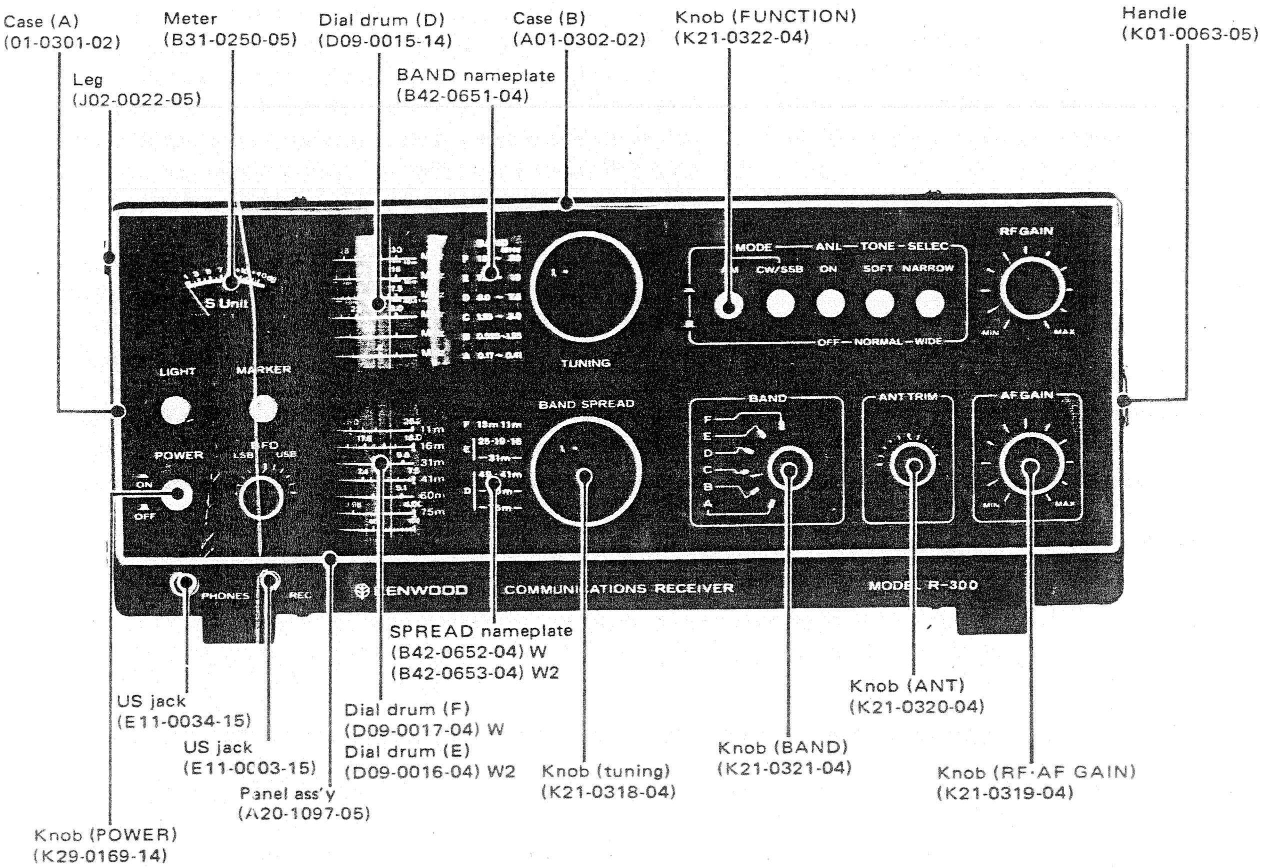
In order to increase operational stability in R-300, all circuits except for the AF power amplifier operate on the 9V stabilized power supply. Voltage of 10 ~ 16V is applied to the emitter of Q5 and a 9V output voltage is obtainable from the collector. If this output voltage deviates from 9V for a certain reason, a voltage deviation component is detected by the error voltage detector circuit consisting of 6V zener diode and a differential amplifier of Q7 and Q8. This component is amplified at Q6 and then applied to the base of Q5 in the direction of canceling an output voltage deviation from 9V, thus always maintaining voltage at 9V. VR1 is a volume control for setting the output voltage to 9V. This circuit also functions as a protective circuit to suppress an overcurrent possibly caused by a short-circuit failure in the 9V output circuit.

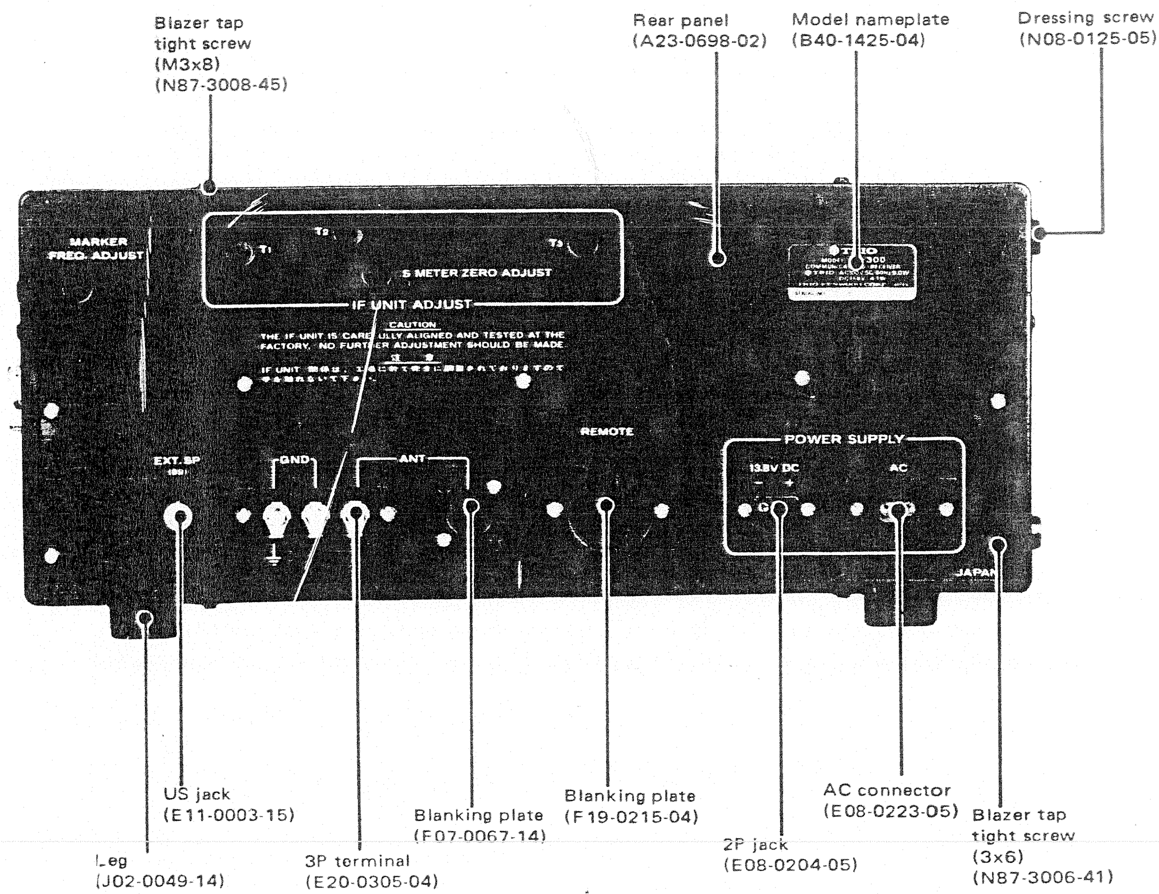
12. Power Circuit and Pilot Lamp Circuit

A step-down power transformer receives power from an AC 100V power source and lowered voltage is fullwave rectified at D1 and D2 of the AF/PS unit. The power supply of 14 ~ 14.5V is then fed to the AF power amplifier and the stabilized power supply circuit. Diodes D1, D2, and D3 in the internal battery circuit, external DC circuit, and B-power supply line are used to prevent the occurrence of short-circuit failure in the power line and for automatic switching over between AC and DC. If an internal battery is connected and the set is actuated on the AC source, 14V is applied to the Ⓑ side of D1 and 12V to the Ⓐ side. Thus D1 is turned off due to reverse bias and current does not flow from the battery circuit. If the AC cord is pulled out of the AC source circuit or service interruption occurs, voltage at point Ⓑ disappears and D1 is turned on. In this state the set is actuated on the 12V supply from the internal battery circuit.

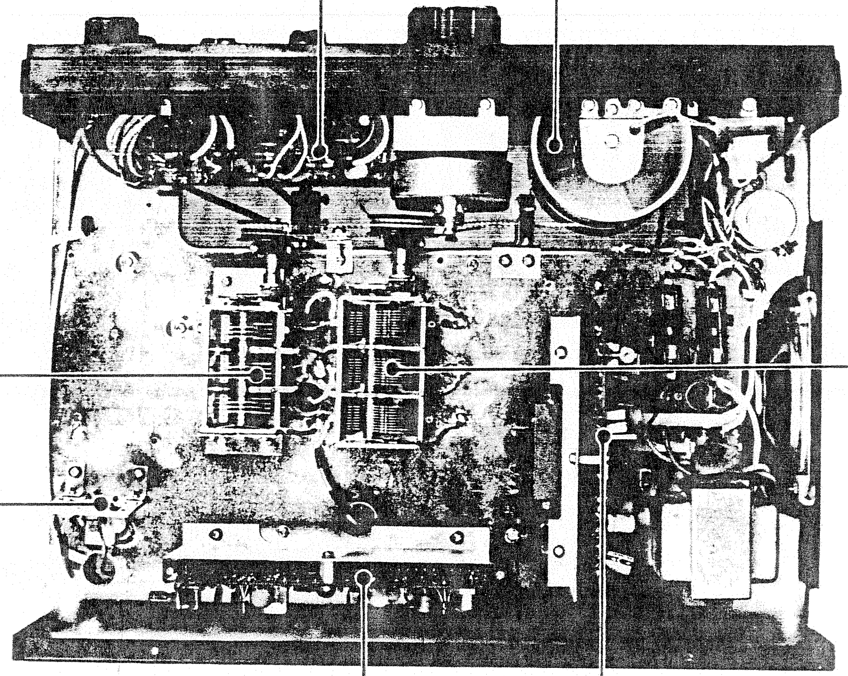
Pilot lamps are used for S meter and dial illumination. Since current for the lamps is larger than that to be consumed in the circuits, the lamps are lit only if the associated switch is turned on during operation on battery source. When operated on the external source, these lamps are lit through D2 at normal voltage. However, in operation on the internal battery source, the lamps are lit through R1 to reduce battery consumption by maintaining current at the lowest permissible level.

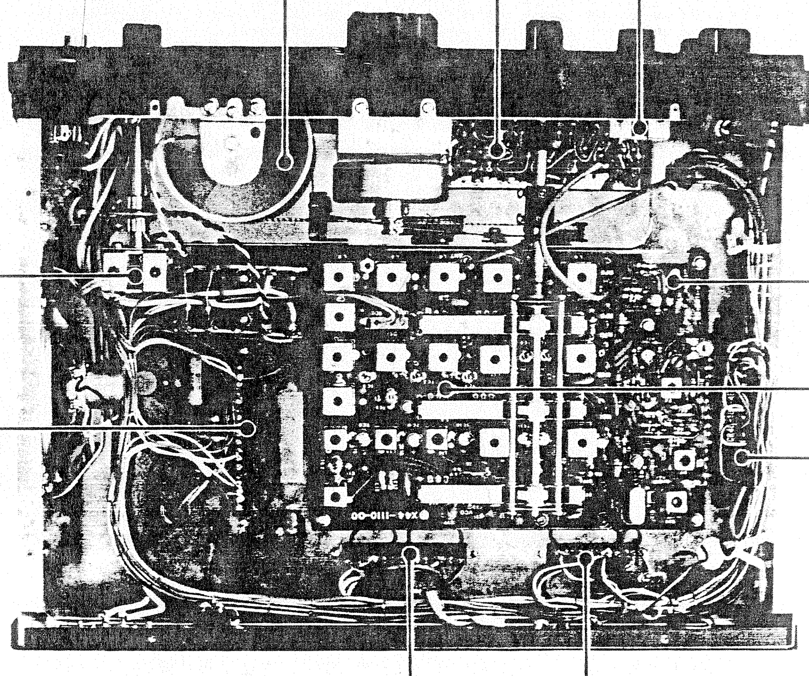
PARTS ALIGNMENT





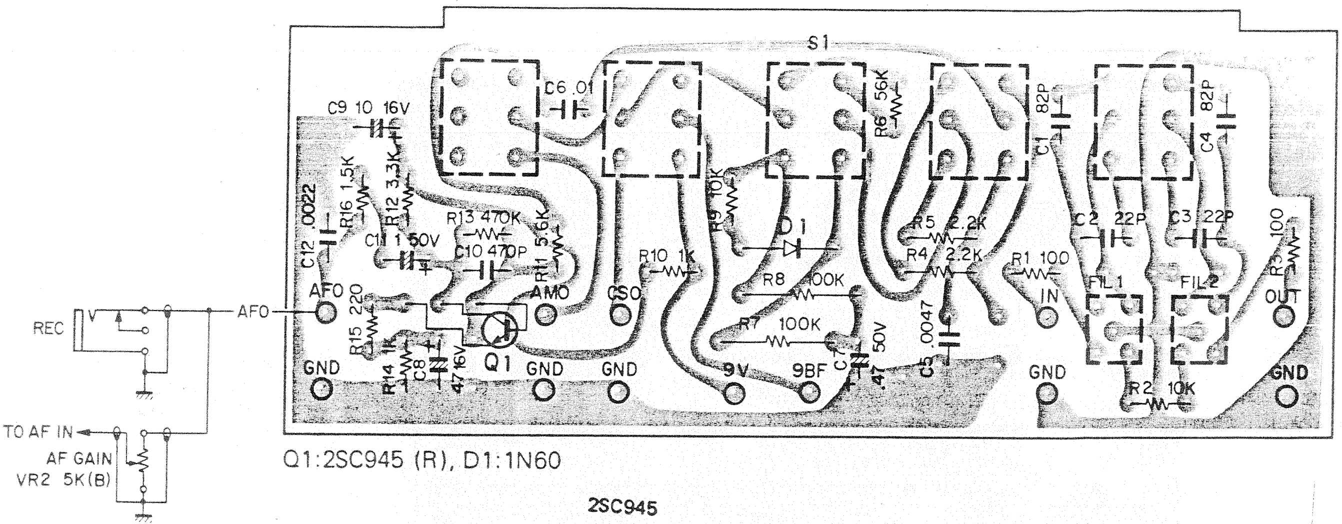
PARTS ALIGNMENT



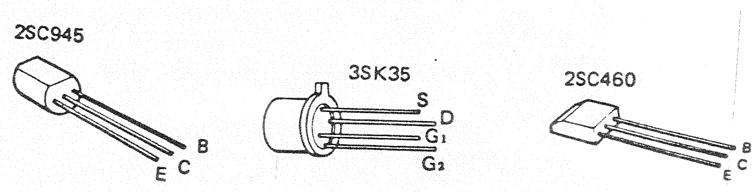


PRINTED BOARD

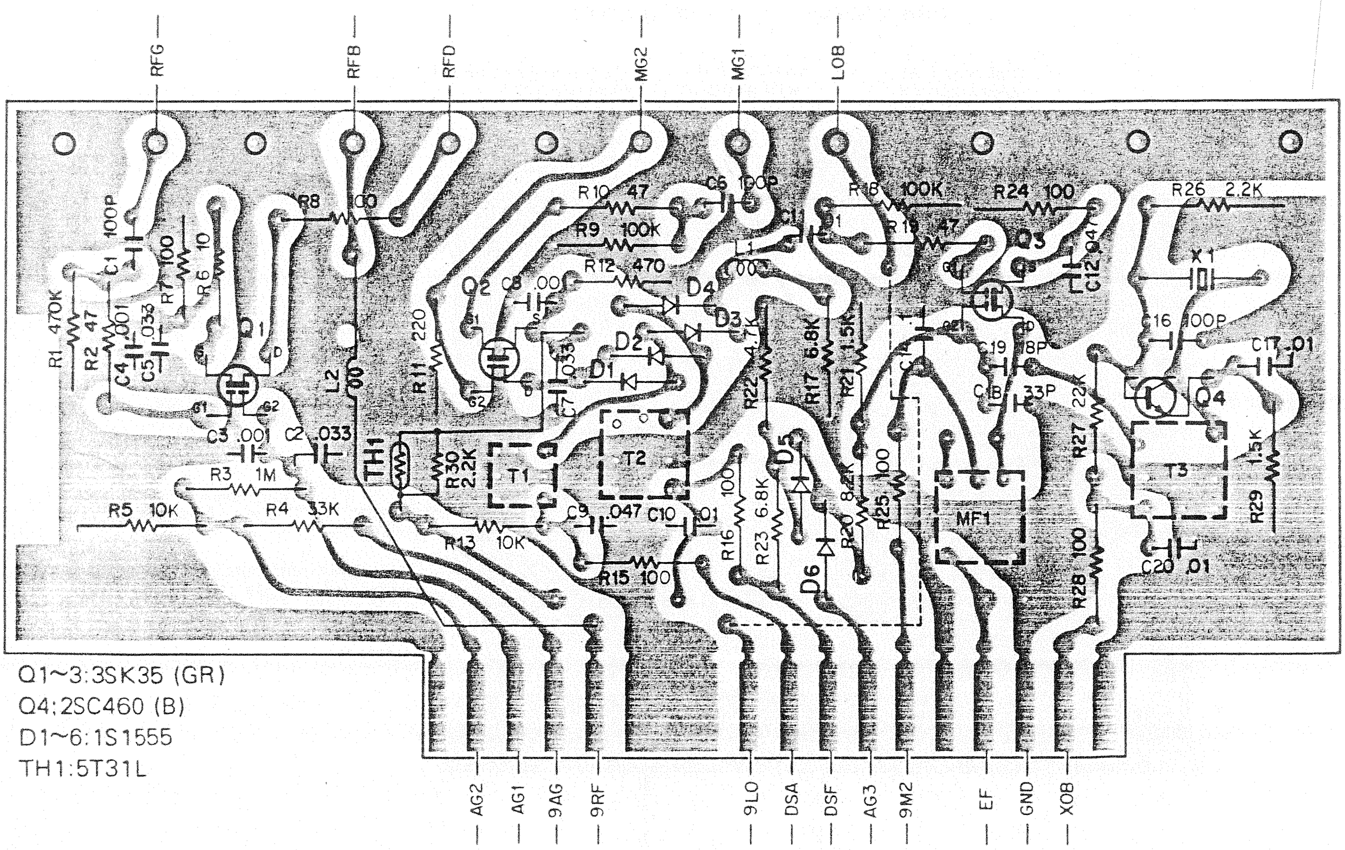
▼ SWITCH (X41-1090-00)



Q1:2SC945 (R), D1:1N60



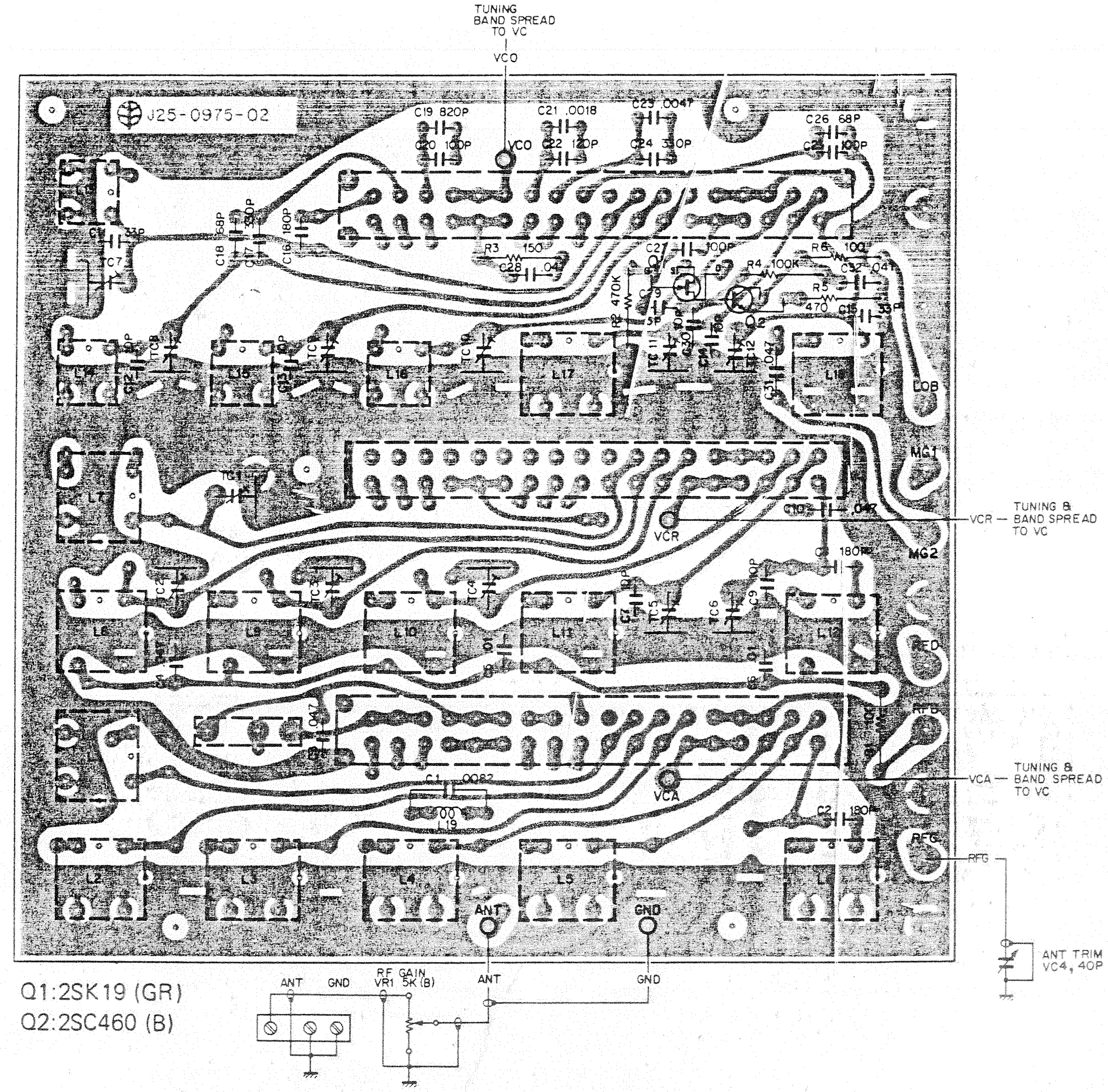
▼ RF UNIT (X44-1100-01)



Q1~3:3SK35 (GR)
Q4:2SC460 (B)
D1~6:1S1555
TH1:5T31L

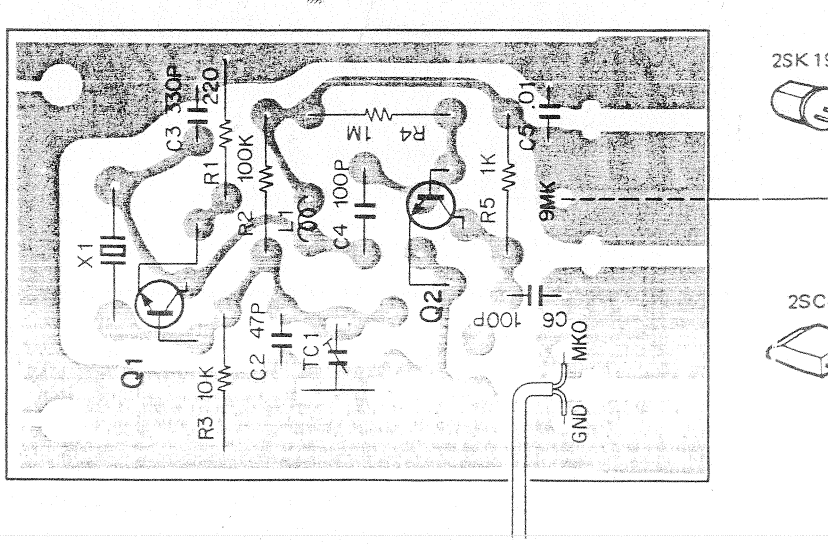
PRINTED BOARD

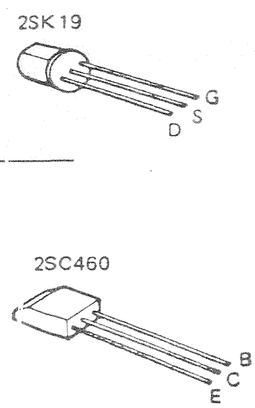
▼ COIL PACK (X44-1110-00)



Q1:2SK19 (GR)
Q2:2SC460 (B)

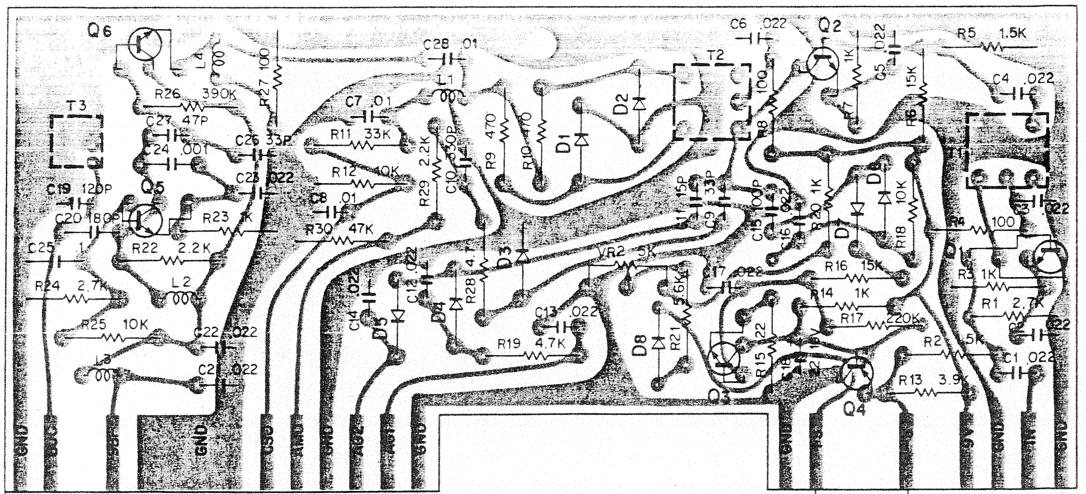
▶ MARKER
(X52-1060-00)

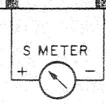




PRINTED BOARD

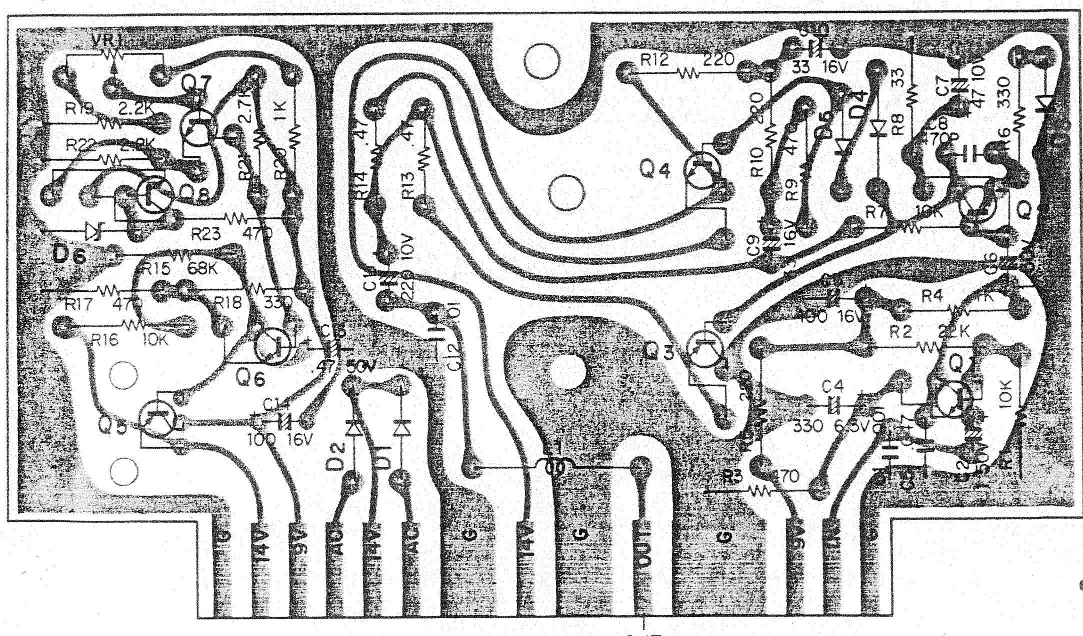
▼ IF UNIT (X48-1160-00)

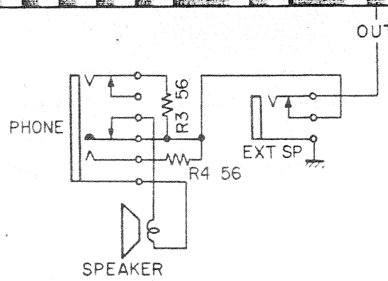


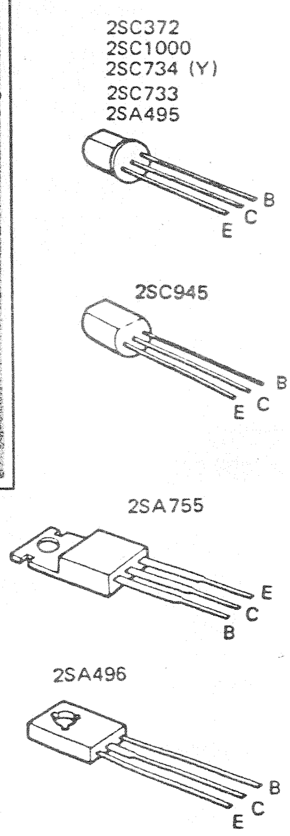


Q1, 2, 5, 6:2SC945 (R), Q3:2SC733 (Y), Q4:2SA495 (Y), D1~8:1N60

▼ AF/PS UNIT (X49-1090-00)







Q1:2SC1000 (BL), Q2:2SC734 (Y), Q3:2SA755 (C), Q4:2SC1419 (C), Q5:2SA496 (Y), Q6~8:2SC372 (Y), D1, 2, 4, 5:V06B, D3:1S1555, D6:WZ-061

PARTS LIST

TOTAL

Ref. No.	Parts No.	Description	Remarks
CAPACITOR			
C1	C90-0207-05	Electrolytic 3300μF 25WV	
C2	CE04W1H010(RL)	Electrolytic 1μF 50WV	
C3	CK45E3D103P	Ceramic 0.01μF +100%,-0%	
RESISTOR			
R1	RN14AB3G220K	Metal film 22Ω ±10% .4W	
R3, 4	PD14BY2E560J	Carbon 56Ω ±5% 1/4W	
SEMICONDUCTOR			
D1~3	V11-0219-05	Diode V06B	
POTENTIOMETER			
VR1, 2	R03-2033-05	Semi-fixed 5kΩ (B)	
VC1	C01-0179-05	Variable capacitor (Main)	
VC2	C01-0180-05	Variable capacitor (Spread)	
VC3	C02-0003-05	Midget variable capacitor (BFO)	
VC4	C02-0004-05	Midget variable capacitor (Antenna trimmer)	
MISCELLANEOUS			
–	A01-0301-02	Case (A) (Under)	
–	A01-0302-02	Case (B) (Upper)	
–	A10-0372-21	Chassis	
–	A20-1097-05	Panel ass'y	
–	A20-1098-05	Panel	
–	A22-0202-22	Sub panel	
–	A23-0698-02	Back panel	
–	A25-0005-23	Buffle	
–	B05-0204-04	Speaker grille cloth	
–	B09-0003-05	Shaft joint	
–	B10-0213-04	Front glass	
–	B21-0011-24	Pointer	
–	B30-0079-06	Pilot lamp 12V 40mA x 2	
–	B31-0250-05	Pilot lamp (Meter) with B30-0085-15	
–	B40-1425-04	Name plate (Model)	
–	B41-0211-04	Name plate (Fuse)	
–	B42-0458-04	Name plate (Adjusting)	
–	B42-0651-04	Name plate (Band)	
–	B42-0652-04	Name plate (Spread A)	W
–	B42-0053-04	Name plate (Spread B)	W2
–	B50-1557-00	Instruction manual	
–	D09-0015-14	Dial drum (D)	
–	D09-0016-04	Dial drum (E)	W2
–	D09-0017-04	Dial drum (F)	W
–	D13-0032-03	Sprocket	
–	D15-0083-14	Pulley x 2	
–	D15-0160-04	Pulley (Small)	
–	D15-0166-04	Pulley for Band	
–	D15-0167-03	Dial pulley x 2	
–	D21-0331-14	Drive shaft (for Drum)	
–	D21-0333-14	Drive shaft (for BFO)	
–	D21-0425-04	Band shaft	
–	D21-0426-04	Pulley shaft	
–	D22-0004-04	Shaft coupler	
–	D23-0061-04	Bearing (BFO)	
–	D23-0117-04	Bearing (Band)	
–	D40-0213-03	Dial pulley	
–	D40-0214-04	Pulley ass'y (Band)	
–	E08-0203-25	Connector jack (2P)	
–	E08-0204-05	Consent jack (2P)	
–	E08-0223-05	AC connector	
–	E09-0203-05	Connector plug (2P)	
–	E09-0204-25	Consent plug (2P)	
–	E09-0314-05	Mini connector	
–	E10-1005-05	Connector socket (See P. 9)	

Ref. No.	Parts No.	Description	Remarks
–	E10-1406-05	Connector socket (See P. 9)	
–	E10-1807-15	Connector socket (See P. 9)	
–	E10-1809-05	Connector socket (See P. 9)	
–	E11-0003-15	US jack (for EXT SP) x 2	
–	E11-0034-15	US jack	
–	E20-0305-04	Terminal (3P)	
–	E20-0509-05	T type lug	
–	E20-0105-04	Lug	
–	E22-0207-04	Lug	
–	E22-0305-05	Lug	
–	E22-0404-05	Lug x 2	
–	E23-0015-04	Earth lug	
–	E30-0044-05	Lead wire x 2	
–	E30-0045-05	Lead wire	
–	E30-0247-05	Lead wire	
–	E30-0321-05	AC cord	W
–	E33-0088-00	Wire kit	W
–	E33-0089-00	Wire kit	W2
–	E33-0607-00	Wire kit	W2
–	E33-0608-00	Wire kit	
–	F05-8002-05	Fuse 80mAT	
–	F07-0067-14	Blinding plate	
–	F09-0026-05	Battery case	
–	F09-0033-05	Capacitor cover	
–	F10-0325-04	IF shield plate	
–	F10-0325-04	AF shield plate	
–	F15-0212-14	Band mask	
–	F19-0215-14	Blinding plate	
–	F19-0216-04	Back cover	
–	F20-0084-04	Insulating plate (for terminal)	
–	F20-0085-04	Insulating plate (for coil pack)	
–	G01-0044-14	Dial spring x 2	
–	G01-0349-04	Coil spring	
–	G13-0014-04	Vibration protector (rubber) x 8	
–	G13-0082-04	Cushion rubber x 4	
–	H01-1607-04	Case (Inside)	
–	H03-0536-04	Case (Outside)	
–	H10-1123-02	Styrene foam cushion (B)	
–	H10-1459-02	Styrene foam cushion (A)	
–	H20-0381-14	Protection cover	
–	H25-0007-04	Protection bag	
–	H25-0110-04	Protection bag (Large)	
–	J02-0022-05	Leg	
–	J02-0049-14	Leg	
–	J13-0027-05	Fuse holder	
–	J13-0029-05	Fuse holder (DC CODE)	
–	J19-0498-14	Meter holder	
–	J19-0499-04	Lamp holder (Upper)	
–	J19-0500-04	Lamp holder (Under)	
–	J21-0047-04	Meter stopper	
–	J21-1173-04	VC fitting (A) (Spread Back)	
–	J21-1174-04	VC fitting (B) (Spread Front)	
–	J21-1175-14	VC fitting (C) (BFO)	
–	J21-1571-14	Drum fitting	
–	J21-1573-04	Small pulley stopper (A)	
–	J21-1574-04	Small pulley stopper (B) x 3	
–	J21-1575-04	Small pulley stopper (C)	
–	J21-1576-04	Dial pulley fitting	
–	J30-0061-04	Rubber spacer x 4	
–	J32-0117-04	Hexagonal boss x 10	
–	J32-0133-04	Hexagonal boss x 8	
–	J32-0229-04	Hexagonal boss	
–	J39-0029-04	Consent mask	
–	J39-0049-14	Spacer	
–	J59-0001-05	Plunger	
–	J59-0032-05	Grommet	
–	J61-0019-05	Vinyl tigh	
–	J90-0079-04	Pointer shaft	

PARTS LIST

Ref. No.	Parts No.	Description	Re-marks
–	K01-0063-05	Handle	
–	K21-0318-04	Knob (Tuning) x 2	
–	K21-0319-04	Knob (RF, AF GAIN) x 2	
–	K21-0320-04	Knob (ANT BFO) x 2	
–	K21-0321-04	Knob (BAND)	
–	K21-0322-24	Knob (Function marker light) x 7	
–	K29-0169-14	Knob (Power)	
–	L09-0001-25	Power transformer	
–	N08-0125-05	Dressing screw (Black) x 4	
–	S40-2039-05	Push switch (With lock)	
–	S40-2040-05	Push switch (Non lock)	
–	S40-4015-05	Push switch (Power)	
–	T05-0006-25	Speaker	
–	X41-1090-00	Switch unit	
–	X44-1100-01	RF unit	
–	X44-1110-00	Coil pack	
–	X48-1160-00	IF unit	
–	X49-1090-00	AF/PS unit	
–	X52-1060-00	Marker unit	

SWITCH (X41-1090-00)

Ref. No.	Parts No.	Description	Re-marks
		CAPACITOR	
C1	CC45CH1H820J	Ceramic 82pF ±5%	
C2,3	CC45CH1H220J	Ceramic 22pF ±5%	
C4	CC45CH1H820J	Ceramic 82pF ±5%	
C5	CQ92M1H472K	Mylar 0.0047μF ±10%	
C6	CQ92M1H103K	Mylar 0.01μF ±10%	
C7	CE04W1HR47	Electrolytic 0.47μF 50WV	
C8	CE04W1C470	Electrolytic 47μF 16WV	
C9	CE04W1C100	Electrolytic 10μF 16WV	
C10	CK45B1H471K	Ceramic 470pF ±10%	
C11	CE04W1H010	Electrolytic 1μF 50WV	
C12	CQ92M1H222K	Mylar 0.0022μF 50WV	
		RESISTOR	
R1	PD14CY2E101J	Carbon 100Ω ±5% 1/4W	
R2	PD14CY2E103J	Carbon 10kΩ ±5% 1/4W	
R3	PD14CY2E101J	Carbon 100Ω ±5% 1/4W	
R4,5	PD14CY2E222J	Carbon 2.2kΩ ±5% 1/4W	
R6	PD14CY2E563J	Carbon 56kΩ ±5% 1/4W	
R7,8	PD14BY2E104J	Carbon 100kΩ ±5% 1/4W	
R9	PD14CY2E103J	Carbon 10kΩ ±5% 1/4W	
R10	PD14CY2E102J	Carbon 1kΩ ±5% 1/4W	
R11	PD14CY2E562J	Carbon 5.6kΩ ±5% 1/4W	
R12	PD14CY2E332J	Carbon 3.3kΩ ±5% 1/4W	
R13	PD14CY2E474J	Carbon 470kΩ ±5% 1/4W	
R14	PD14CY2E102J	Carbon 1kΩ ±5% 1/4W	
R15	PD14CY2E221J	Carbon 220Ω ±5% 1/4W	
R16	PD14CY2E152J	Carbon 1.5kΩ ±5% 1/4W	
		SEMICONDUCTOR	
Q1	V03-0270-05	Transistor 2SC945 (R)	
D1	V11-0051-05	Diode 1N60	
F1,2	L72-0042-05	Ceramic filter SED455F	
		MISCELLANEOUS	
–	E23-0047-04	Terminal (Square) x 12	

Ref. No.	Parts No.	Description	Re-marks
–	J25-1424-04	Printed board	
–	S42-5008-05	Push switch	

RF (X44-1100-01)

Ref. No.	Parts No.	Description	Re-marks
		CAPACITOR	
C1	CC45CH1H101J	Ceramic 100pF ±5%	
C2	CQ92M1H333K	Mylar 0.033μF ±10%	
C3,4	CK45D1H102M	Ceramic 0.001μF ±20%	
C5	CQ92M1H333K	Mylar 0.033μF ±10%	
C6	CC45CH1H101J	Ceramic 100pF ±5%	
C7	CQ92M1H333K	Mylar 0.033μF ±10%	
C8	CK45D1H102M	Ceramic 0.001μF ±20%	
C9	CQ92M1H473K	Mylar 0.047μF ±10%	
C10,11	CQ92M1H103K	Mylar 0.01μF ±10%	
C12	CQ92M1H473K	Mylar 0.047μF ±10%	
C14	CQ92M1H104K	Mylar 0.1μF ±10%	
C16	CC45CH1H101J	Ceramic 100pF ±5%	
C17	CQ92M1H103K	Mylar 0.01μF ±10%	
C18	CC45CH1H330J	Ceramic 33pF ±5%	
C19	CC45CH1H180J	Ceramic 18pF ±5%	
C20	CQ92M1H103K	Mylar 0.01μF ±10%	
		RESISTOR	
R1	PD14By2E474J	Carbon 470kΩ ±5% 1/4W	
R2	PD14BY2E470J	Carbon 47Ω ±5% 1/4W	
R3	PD14BY2E105J	Carbon 1MΩ ±5% 1/4W	
R4	PD14BY2E333J	Carbon 33kΩ ±5% 1/4W	
R5	PD14BY2E103J	Carbon 10kΩ ±5% 1/4W	
R6	PD14BY2E100J	Carbon 10Ω ±5% 1/4W	
R7,8	PD14BY2E101J	Carbon 100Ω ±5% 1/4W	
R9	PD14BY2E104J	Carbon 100kΩ ±5% 1/4W	
R10	PD14BY2E470J	Carbon 47Ω ±5% 1/4W	
R11	PD14BY2E221J	Carbon 220Ω ±5% 1/4W	
R12	PD14BY2E471J	Carbon 470Ω ±5% 1/4W	
R15,16	PD14BY2E101J	Carbon 100Ω ±5% 1/4W	
R17	PD14BY2E682J	Carbon 6.8kΩ ±5% 1/4W	
R18	PD14BY2E104J	Carbon 100kΩ ±5% 1/4W	
R19	PD14BY2E470J	Carbon 47Ω ±5% 1/4W	
R20	PD14BY2E822J	Carbon 8.2kΩ ±5% 1/4W	
R21	PD14BY2E152J	Carbon 1.5kΩ ±5% 1/4W	
R22	PD14BY2E472J	Carbon 4.7kΩ ±5% 1/4W	
R23	PD14BY2E682J	Carbon 6.8kΩ ±5% 1/4W	
R24,25	PD14BY2E101J	Carbon 100Ω ±5% 1/4W	
R26	PD14BY2E222J	Carbon 2.2kΩ ±5% 1/4W	
R27	PD14BY2E223J	Carbon 22kΩ ±5% 1/4W	
R28	PD14BY2E101J	Carbon 100Ω ±5% 1/4W	
R29	PD14BY2E152J	Carbon 1.5kΩ ±5% 1/4W	
R30	PD14BY2E222J	Carbon 2.2kΩ ±5% 1/4W	
		SEMICONDUCTOR	
Q1,2,3	V09-0036-05	FET 3SK35GR	
Q4	V03-0079-05	Transistor 2SC460 (B)	
D1~6	V11-0076-05	Diode 1S1555	
		POTENTIOMETER	
VR1	R12-3022-05	Trimmer potentiometer 10kΩ (B)	
		COIL/CRYSTAL	
L1	L40-4725-04	Ferri-inductor 4.7 mH	
L2	L40-1021-03	Ferri-inductor 4.7mH	
T1	L30-0288-05	IFT	
T2	L30-0267-05	IFT	
T3	L32-0167-05	OSC coil	
T4	L30-0293-05	IFT	

PARTS LIST

Ref. No.	Parts No.	Description	Re-marks
X1	L77-0365-05	Quartz crystal (3.579 MHz)	
–	V22-0022-05	Thermister (5T31L)	
–	E06-0406-05	Transistor socket	
–	E23-0046-04	Terminal x 12	

COIL PACK (X44-1110-00)

Ref. No.	Parts No.	Description	Re-marks
		CAPACITOR	
C1	CQ93M1H822J	Mylar 0.0082μF ±5%	
C2	CC45PH1H181J	Ceramic 180pF ±10%	
C3,4	CQ92M1H473K	Mylar 0.047μF ±10%	
C5,6	CQ92M1H103K	Mylar 0.01μF ±10%	
C7	CC45CH1H100D	Ceramic 10pF ±0.5pF	
C8	CC45PH1H181J	Ceramic 180pF ±5%	
C9	CC45CH1H100D	Ceramic 10pF ±0.5pF	
C10	CQ92M1H473K	Mylar 0.047μF ±10%	
C11	CC45CH1H330J	Ceramic 33pF ±5%	
C12,13,14	CC45CH1H100D	Ceramic 10pF ±0.5pF	
C15	CC45CH1H330J	Ceramic 33pF ±5%	
C16	CC45PH1H181J	Ceramic 180pF ±5%	
C17	CQ09S1H331J	Polystyrene 330pF ±5%	
C18	CC45PH1H680J	Ceramic 68pF ±5%	
C19	CQ09S1H821	Polystyrene 820pF ±5%	
C20	CC45PH1H101J	Ceramic 100pF ±5%	
C21	CQ09S1H182J	Polystyrene 0.0018μF ±5%	
C22	CC45PH1H121J	Ceramic 120pF ±5%	
C23	CQ09S1H472J	Polystyrene 0.0047μF ±5%	
C24	CQ09S1H331J	Polystyrene 330pF ±5%	
C25	CC45PH1H101J	Ceramic 100pF ±5%	
C26	CC45PH1H680J	Ceramic 68pF ±5%	
C27	CC45CH1H101J	Ceramic 100pF ±5%	
C28	CQ92M1H473K	Mylar 0.047μF ±10%	
C29	CC45CH1H050D	Ceramic 5pF ±0.5pF	
C30	CC45CH1H100D	Ceramic 10pF ±0.5pF	
C31,32	CQ92M1H473K	Mylar 0.047μF ±10%	
		RESISTOR	
R1	PD14BY2E101J	Carbon 100Ω ±5% 1/4W	
R2	PD14BY2E474J	Carbon 470kΩ ±5% 1/4W	
R3	PD14BY2E151J	Carbon 150Ω ±5% 1/4W	
R4	PD14BY2E104J	Carbon 100kΩ ±5% 1/4W	
R5	PD14BY2E471J	Ceramic 470Ω ±5% 1/4W	
R6	PD14BY2E101J	Carbon 100Ω ±5% 1/4W	
		SEMICONDUCTOR	
Q1	V09-0012-05	FET 2SK19 (GR)	
Q2	V03-0079-05	Transistor 2SC460 (B)	
		COIL	
L1	L31-0326-05	Tuning coil ANT A	
L2	L31-0327-05	Tuning coil ANT B	
L3	L31-0328-05	Tuning coil ANT C	
L4	L31-0329-05	Tuning coil ANT D	
L5	L31-0330-05	Tuning coil ANT E	
L6	L34-0566-05	Tuning coil ANT F	
L7	L31-0332-05	Tuning coil RF A	
L8	L31-0333-05	Tuning coil RF B	
L9	L31-0334-05	Tuning coil RF C	
L10	L31-0335-05	Tuning coil RF D	
L11	L31-0336-05	Tuning coil RF E	
L12	L31-0337-05	Tuning coil RF F	
L13	L32-0168-05	OSC coil OSC A	
L14	L32-0169-05	OSC coil OSC B	
L15	L32-0170-05	OSC coil OSC C	
L16	L32-0171-05	OSC coil OSC D	
L17	L32-0172-05	OSC coil OSC E	

Ref. No.	Parts No.	Description	Re-marks
L18	L32-0173-05	OSC coil F	
L19	L40-1501-03	Ferri-inductor 15μH	
		TRIMMER	
TC1~7	C05-0013-15	Trimmer capacitor 20pF	
Tc8	C05-0010-15	Trimmer capacitor 10pF	
		MISCELLANEOUS	
–	E23-0046-04	Terminal (Square) x 5	
–	E40-0371-05	Mini-connector	
–	J25-0975-02	Printed board	
–	S29-3005-05	Rotary switch	

IF (X48-1160-00)

Ref. No.	Parts No.	Description	Re-marks
		CAPACITOR	
C1,2	CQ92M1H223K	Mylar 0.022μF ±10%	
C3	CK45F1H223Z	Ceramic 0.022μF +80%, −20%	
C4,5	CQ92M1H223K	Mylar 0.022μF ±10%	
C6	CK45F1H223Z	Ceramic 0.022μF +80%, −20%	
C7,8	CK45F1H103Z	Ceramic 0.001μF +80%, −20%	
C9	CC45CH1H330J	Ceramic 33pF ±5%	
C10	CK45B1H331K	Ceramic 330pF ±10%	
C11	CC45CH1H150J	Ceramic 15pF ±5%	
C12~14	CK45F1H223Z	Ceramic 0.022μF +80%, −20%	
C15	CC45CH1H101J	Ceramic 100pF ±5%	
C16,17	CK45F1H223Z	Ceramic 0.022μF +80%, −20%	
C18	CE04W1C220	Electrolytic 22μF 16WV	
C19	CC45SH1H121J	Ceramic 120pF ±5%	
C20	CC45PH1H181J	Ceramic 180pF ±5%	
C21,22	CK45F1H223Z	Ceramic 0.022μF +80%, −20%	
C23	CQ92M1H223K	Mylar 0.022μF ±10%	
C24	CQ92M1H102K	Mylar 0.001μF ±10%	
C25	CQ92M1H104K	Mylar 0.1μF ±10%	
C26	CC45CH1H330J	Ceramic 33pF ±5%	
C27	CC45CH1H470J	Ceramic 47pF ±5%	
C28	CQ92M1H103K	Mylar 0.01μF ±10%	
		RESISTOR	
R1	PD14BY2E272J	Carbon 2.7kΩ ±5% 1/4W	
R2	PD14BY2E152J	Carbon 1.5kΩ ±5% 1/4W	
R3	PD14BY2E102J	Carbon 1kΩ ±5% 1/4W	
R4	PD14BY2E101J	Carbon 100Ω ±5% 1/4W	
R5	PD14BY2E151J	Carbon 1.5kΩ ±5% 1/4W	
R6	PD14BY2E153J	Carbon 15kΩ ±5% 1/4W	
R7	PD14BY2E102J	Carbon 1kΩ ±5% 1/4W	
R8	PD14BY2E101J	Carbon 100Ω ±5% 1/4W	
R9,10	PD14BY2E471J	Carbon 470Ω ±5% 1/4W	
R11	PD14BY2E333J	Carbon 33kΩ ±5% 1/4W	
R12	PD14BY2E103J	Carbon 10kΩ ±5% 1/4W	
R13	PD14BY2E392J	Carbon 3.9kΩ ±5% 1/4W	
R14	PD14BY2E102J	Carbon 1kΩ ±5% 1/4W	
R15	PD14BY2E220J	Carbon 22Ω ±5% 1/4W	
R16	PD14BY2E153J	Carbon 15kΩ ±5% 1/4W	
R17	PD14BY2E224J	Carbon 220kΩ ±5% 1/4W	
R18	PD14BY2E103J	Carbon 10kΩ ±5% 1/4W	
R19	PD14BY2E472J	Carbon 4.7kΩ ±5% 1/4W	
R20	PD14BY2E102J	Carbon 1kΩ ±5% 1/4W	
R21	PD14BY2E562J	Carbon 5.6kΩ ±5% 1/4W	
R22	PD14BY2E222J	Carbon 2.2kΩ ±5% 1/4W	
R23	PD14BY2E102J	Carbon 1kΩ ±5% 1/4W	
R24	PD14BY2E272J	Carbon 2.7kΩ ±5% 1/4W	
R25	PD14BY2E103J	Carbon 10kΩ ±5% 1/4W	
R26	PD14BY2E394J	Carbon 390kΩ ±5% 1/4W	
R27	PD14BY2E101J	Carbon 100Ω ±5% 1/4W	
R28	PD14BY2E472J	Carbon 4.7kΩ ±5% 1/4W	

PARTS LIST

Ref. No.	Parts No.	Description	Re-marks
R29	PD14BY2E222J	Carbon 2.2kΩ ±5% 1/4W	
R30	PD14BY2E473J	Carbon 47kΩ ±5% 1/4W	
		SEMICONDUCTOR	
Q1,2	V03-0270-05	Transistor 2SC945 (R)	
Q3	V03-0129-05	Transistor 2SC733 (Y)	
Q4	V01-0037-05	Transistor 2SA495 (Y)	
Q5,6	V03-0270-05	Transistor 2SC945 (R)	
D1~8	V11-0051-05	Diode 1N60	
		POTENTIOMETER	
VR1	R12-1024-05	Semi-fixed 1kΩ	
VR2	R12-2017-05	Semi-fixed 5kΩ	
		COIL	
L1	L40-4725-04	Ferri-inductor	
L2	L40-6825-04	Ferri-inductor	
L3,4	L40-2225-04	Ferri-inductor	
		TRIMMER	
T1,2	L30-0293-05	IFT	
T3	L32-0202-05	OSC coil	
		MISCELLANEOUS	
—	J25-1422-04	Print board	

Ref. No.	Parts No.	Description	Re-marks
		SEMICONDUCTOR	
Q1	V03-0279-05	Transistor 2SC1000 (BL)	
Q2	V03-0125-05	Transistor 2SC734 (Y)	
Q3	V01-0116-05	Transistor 2SA755 (C)	
Q4	V03-0343-05	Transistor 2SC1419 (C)	
Q5	V01-0113-05	Transistor 2SA496 (Y)	
Q6~8	V03-0099-05	Transistor 2SC372 (Y)	
D1,2	V11-0219-05	Diode V06B	
D3	V11-0076-05	Diode 1S1555	
D4, 5	V11-0219-05	Diode V06B	
D6	V11-0243-05	Diode WZ-061	
		POTENTIOMETER	
VR1	V12-0042-05	500Ω	
		MISCELLANEOUS	
—	F01-0114-04	Heat sink x 2	
—	F01-0243-04	Heat sink	
—	J25-1423-04	Printed board	

AF/PS (X49-1090-00)

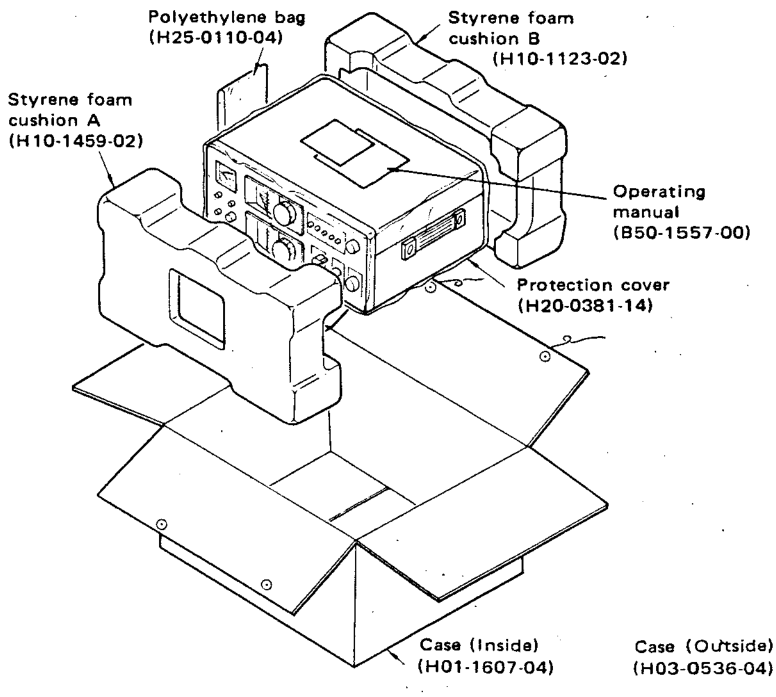
Ref. No.	Parts No.	Description	Re-marks
		CAPACITOR	
C1	CK45B1H102K	Ceramic 0.001μF ±10%	
C2	CE04W1H010(RL)	Electrolytic 1μF 16WV	
C3	CE04W1C101(RL)	Electrolytic 100μF 16WV	
C4	CE04W0J331	Electrolytic 330μF 6.3WV	
C5	CQ93M1H473K-NS	Mylar 0.047μF ±10%	
C6	CE04W1H010(RL)	Electrolytic 1μF 50WV	
C7	CE04W1A470(RL)	Electrolytic 47μF 10WV	
C8	CK45B1H471K	Ceramic 470pF ±10%	
C9,10	CE04W1C330(RL)	Electrolytic 33μF 16WV	
C11	CE04W1A221(RL)	Electrolytic 220μF 10WV	
C12	CK45F1H103Z	Ceramic 0.01μF +80%, −20%	
C13	CE04W1HR47(RL)	Electrolytic 0.47μF 50WV	
C14	CE04W1C101(RL)	Electrolytic 100μF 16WV	
		RESISTOR	
R1	PD14BY2E103J	Carbon 10kΩ ±5% 1/4W	
R2	PD14BY2E223J	Carbon 22kΩ ±5% 1/4W	
R3	PD14BY2E471J	Carbon 470Ω ±5% 1/4W	
R4	PD14BY2E102J	Carbon 1kΩ ±5% 1/4W	
R5	PD14BY2E221J	Carbon 220Ω ±5% 1/4W	
R6	PD14BY2E331J	Carbon 330Ω ±5% 1/4W	
R7	PD14BY2E103J	Carbon 10kΩ ±5% 1/4W	
R8	PD14BY2E330J	Carbon 33Ω ±5% 1/4W	
R9	PD14BY2E471J	Carbon 470Ω ±5% 1/4W	
R10	PD14BY2E221J	Carbon 220Ω ±5% 1/4W	
R12	PD14BY2E221	Carbon 220Ω ±5% 1/4W	
R13,14	R92-0041-25	Metal plate 0.47Ω	
R15	PD14BY2E683J	Carbon 68kΩ ±5% 1/4W	
R16	PD14BY2E103J	Carbon 10kΩ ±5% 1/4W	
R17	PD14BY2E471J	Carbon 470Ω ±5% 1/4W	
R18	PD14BY2E331J	Carbon 330Ω ±5% 1/4W	
R19	PD14BY2E222J	Carbon 2.2kΩ ±5% 1/4W	
R20	PD14BY2E102J	Carbon 1kΩ ±5% 1/4W	
R21	PD14BY2E272J	Carbon 2.7kΩ ±5% 1/4W	
R22	PD14BY2E222J	Carbon 2.2kΩ ±5% 1/4W	
R23	PD14BY2E471J	Carbon 470Ω ±5% 1/4W	

MARKER (X52-1060-00)

Ref. No.	Parts No.	Description	Re-marks
		CAPACITOR	
C2	CC45CH1H470J	Ceramic 47pF ±5%	
C3	CQ08S1H331J	Polystyrene 330pF ±5%	
C4	CC45CH1H101J	Ceramic 100pF ±5%	
C5	CK45F1H103Z	Ceramic 0.01μF +80%, −20%	
C6	CC35SL1H010C	Ceramic 1pF ±0.25pF	
		RESISTOR	
R1	PD14BY2E221J	Carbon 220Ω ±5% 1/4W	
R2	PD14BY2E104J	Carbon 100kΩ ±5% 1/4W	
R3	PD14BY2E103J	Carbon 10kΩ ±5% 1/4W	
R4	PD14BY2E105J	Carbon 1MΩ ±5% 1/4W	
R5	PD14BY2E102J	Carbon 1kΩ ±5% 1/4W	
		SEMICONDUCTOR	
Q1,2	V03-0079-05	Transistor 2SC460B	
		CRYSTAL	
L1	L40-1021-05	Ferri-inductor 1mH	
TC1	C05-0029-15	Ceramic trimmer 50pF	
X1	L77-0364-05	Quartz crystal 500 kHz	
		MISCELLANEOUS	
—	J25-0982-14	Printed board	

TROUBLESHOOTING/PACKING

Symptom	Condition	Service Point	Possible Cause	Remedy
1. The set is not energized.		1) Fuse 2) POWER switch 3) Power cord	· Fuse bloken · Switch malfunction · Poor contact in leads and chassis	· Check · Check and modification
2. Lamps are not lit up.				· In DC operation lamps are lit only if the LIGHT switch is depressed.
	· Meter and dial lamps are not lit.	1) LIGHT switch 2) Transformer wiring	· Switch malfunction · Defective wiring	· Check · Check
3. Poor sensitivity	· Noise cannot be heard either.	1) AF/PS unit 2) PHONE jack 3) Speaker connector	· Q3,, Q4 defective · Poor contact · Poor contact	· Check · Check · Check
	· Noise can be heard.	1) AF/PS unit 2) RF unit 3) Switch unit 4) IF unit 5) Coil pack unit	· Stabilized voltage insufficient · Q1 (3SK35) defective · Filter defective · Poor switch contact · AGC transistor defective · Deviation from coil adjustment	· Check · Voltage check · Check · Check · Voltage check · Readjustment
	· Sensitivity is defective only in band F.	1) RF unit	· Q4 (2SC460) defective	· Oscillation check
4. Meter does not deflect.		1) IF unit	· Deviation in VR2 (S ZERO ADJ.) or associated circuit	· Readjustment and check
	· Deflection is insufficient	1) IF unit	· Deviation in VR1 (S SENSE ADJ.) or associated circuit	· Readjustment and check
5. Abnormal oscillation occurs in the marker unit.	· No oscillation	1) Marker unit	· TC1 deviation or crystal defective	· Check
	· Many beats are generated.	1) Marker unit	· Crystal defective · Excessive output	· Replacement · Reduction of C6 capacity



DIAL STRING ARRANGEMENTS

1. REPLACEMENT OF DIAL DRUM AND DIAL STRING ARRANGEMENT

(1) Dismantle Upper and Lower Cases

a. The upper case has 8 bolts.
b. The lower case has 13 bolts. Remove the DC battery cord plug which is attached to the lower case.

(2) Dismantle the Panel

a. Remove 7 knobs from the front panel
b. Remove each fixing bolt at right and left of the panel.
c. Remove 2 fixing bolts respectively from right and left sides of the sub-panel. This widens the clearance between chassis and sub-panel.

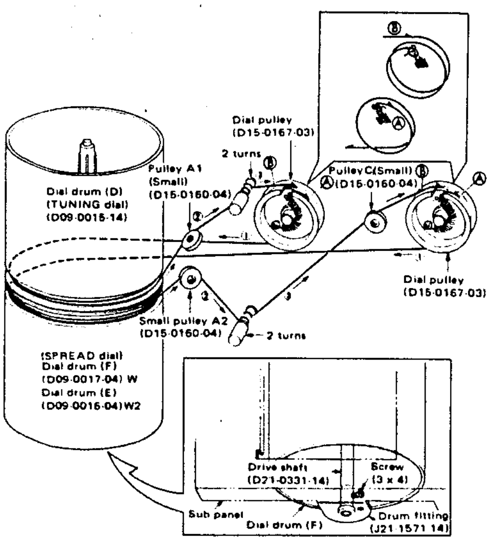
(3) Replace the Dial Drum

a. Remove a string from the dial drum.
b. Remove 3 bolts respectively from top and bottom hardware, used to support the dial drum.
c. Loosen the center shaft stopper of the dial drum.
d. Slowly draw out the dial drum from the center shaft, protecting the drum against damage.
e. The dial drum can be mounted in the reverse order of the above.

2. STRING ARRANGEMENT FOR TUNING AND SPREAD DIALS

(1) Carefully refer to the drawing of the finished string arrangement to grasp the entire setting condition.

① Give one and half turns of a dial string around the pulley groove center toward you. Then, starting from the bottom groove of dial drum D, give 2 turns around the drum and hang it on small pulley A1.



String Arrangement for Tuning and Spread Dials

② Stretch the string of small pulley A1 and give 2 turns around the pulley shaft, starting from bottom of hither side and finishing at thither side. Starting from the thither side, also give 2 turns around the dial pulley and join it with the other end of string.

SPREAD DIAL

① Give one and half turns of a dial string around the center groove of the dial pulley. Then, starting ffrom the upper groove of dial drum F (or E), give 2 turns around the drum and hang it on small pulley A2.

② Stretch the string of small pulley A2 adn give 2 turns around the pulley shaft, starting from bottom of hither side and finishing at thither side. Then hang this string on small pulley C.

③ Stretch the string of small pulley C and give 2 turns around the dial pulley, starting from top of hither side. Then connect it with the other end of string.

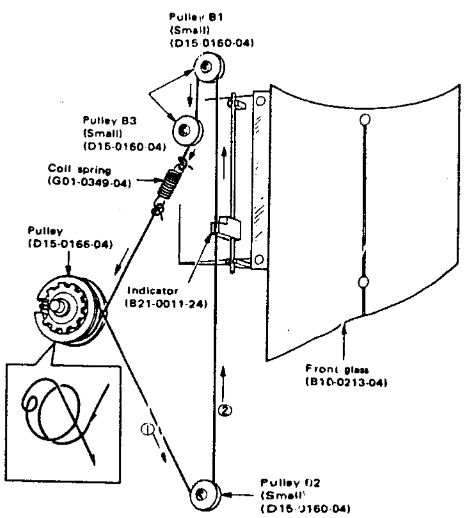
3. STRING ARRANGEMENT FOR BAND SELECTOR PULLEY

① Connect one end of spring with a string.

② As illustrated, give a single turn of string around the hollow part of the pulley, starting from the thither side. After giving another turn around the pulley, hang it on small pulley B2.

③ Stretch the string from small pulley B2 and hang it on small pulley B1. Connect this string with the other end of spring. (The string knot at the end of spring should have moderate tightness not to permit loosening.)

④ Hang the string on small pulley B3 to give proper tension.



String Arrangement for BAND Selector Pulley

ADJUSTMENTS

TEST EQUIPMENT REQUIRED

(1) DC Valve Voltmeter

Input impedance — More than 100 MΩ

(2) Oscilloscope

With sufficient sensitivity

(3) AF Valve Voltmeter

Measuring frequency — 50 Hz ~ 10 kHz
Input impedance — More than 1 MΩ

(4) RF Valve Voltmeter

Measurable frequency — 40 MHz

(5) SSG

Oscillating frequency — 170 kHz ~ 40 MHz
ATT — -20 dB ~ 120 dB

(6) Frequency Counter

Measurable frequency — More than 40 MHz

1. PRELIMINARY WORK

(1) Knob Setting

Unless otherwise specified, knobs should be set to the following positions:

RF GAIN	MAX
MODE	AM
ANL	OFF
TONE	NORMAL
SELEC	WIDE
MARKER	OFF

(2) Connect an 8Ω dummy load to EXT SP terminal.

(3) Power Supply Check

Prepare for the power supply of AC, 13.8V DC, and 12V DC (UM-1 x 8 or equivalent).

(i) Confirm that POWER SW is OFF. Connect respective sources to the AC cord, external DC cord, and internal battery terminal. Examine whether respective source voltages are correctly maintained.
(ii) Set POWER SW to ON and confirm that the meter and dial lamps are lit.
(iii) Set LIGHT SW to ON and confirm that the meter and dial lamps are turned dim.
(iv) Pull out the AC cord with POWER SW set to ON and check whether the lamps go out. Also confirm that these lamps are lit at normal brightness when the LIGHT SW is depressed.
(v) Pull out the DC cord further and depress LIGHT SW. Confirm that the meter and dial lamps dimly at that time.
(vi) Again, connect the AC cord only.
(vii) Check the power supply voltage.
 (a) 13.8V ±0.8V at socket terminal 9 of AF/PS unit
 (b) 9.0V ±0.2V at socket terminal 5 of AR/PS unit
 If there is an extreme fluctuation from 9V, adjust VR1 of AF/PS unit until 9V is obtained.

2. IF CIRCUIT ADJUSTMENT

(1) Adjustment of IFT and OSC Coil in RF IF Unit

(i) Adjust IFT of the RF IF unit to obtain the required bandwidth and also adjust the local oscillator of F BAND.
(ii) Adjustment
 (a) Set BAND selector SW to A ~ E BAND, with SELEC SW in WIDE setting.
 (b) Apply SSG output (455 kHz) to MGI terminal of the RF unit so that the S meter deflects by about 5 graduations.
 (c) When input signal is swept in SSG mode, the S meter deflection appears as illustrated in Fig. 1.
 (d) Adjust T1 and T4 of the RF unit and T1 and T2 of the IF unit so that a maximum S meter deflection can be obtained at the adjusting point (lower side of f).
 (e) Set BAND selector switch to F BAND and connect the RF valve voltmeter to G2 of the RF unit.
 (f) Turn the T3 core of the RF unit and fix it in a position 1/2 turn withdrawn from the maximum output point (about 0.7V rms).
 (g) Set the SSG signal frequency to 4.034 MHz and adjust T2 of the RF unit until the S meter deflection becomes maximum at the S meter peak on lower side of f, in the same manner as for (c).

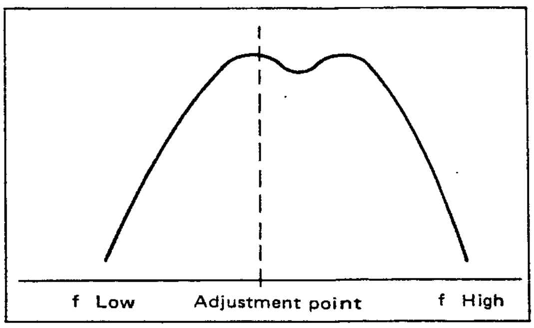


Fig. 1 S Meter Deflection

ADJUSTMENTS

3. COIL PACK ADJUSTMENT (Table 1)

Adjust trimmer and coil of the coil pack in the following order to the graduation of dial frequency.

Secure required sensitivity and selectivity.

(i) Put the receiver so that the cursor line can be seen directly. Connect the AF valve voltmeter and oscilloscope to both ends of 8Ω dummy load, as illustrated in Fig. 2.
Receiver's knob setting positions are as follows:
(a) MODE AM
(b) SELEC NARROW
(c) RF GAIN MAX
(d) SPREAD DIAL 100°

(ii) Adjustment should be started from 3.4 MHz of D BAND (because of rigorous sensitivity control).

(iii) Permissible frequency deviation at the tracking points should be such that the dial graduation end touches the edge of cursor line. (Repeat this adjustment 2 or 3 times.) Therefore, SSG should have been corrected in advance.

(iv) In a high-frequency range of E ~ F BAND, care must be taken not to seize an image frequency. While signals are received by turning the dial of receiver, a higher frequency on the dial is the wanted one and a lower frequency is the image frequency. This relationship is reversed when the receiver dial is fixed and frequency tracing is effected in SSG mode.

(v) All adjustments should be aimed to obtain peak deflections of S meter.

(vi) Conditions for sensitivity measurement are SSG 1 kHz 30% in MODE-AM setting and 0.63V/8Ω for MOD input and AF output. Each knob should be adjusted until maximum sensitivity is obtained.

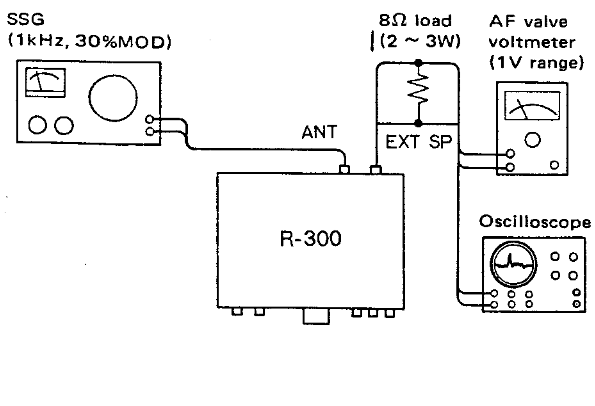


Fig. 2

4. BFO ADJUSTMENT

(i) Set MODE SW to CW/SSB position and receive a signal (its frequency obtainable from previous adjustment). Obtain a maximum S meter deflection (S ~ 9 approximately) in SELEC NARROW setting.

(ii) With the BFO knob set in the center, turn the T3 core of the IF unit through the adjusting hole of the rear panel and adjust it to a condition of zero beat.

(iii) Turn the BFO knob to the right and left ends and confirm that the variation range is more than 2.5 kHz at both ends. If the variable range has deviated, check whether the knob is mounted correctly.

5. S METER ADJUSTMENT

(i) Set RF GAIN to the minimum position and adjust S METER 0 ADJUST on the rear panel so that the S meter can be ready to start deflection at the left end of the scale.

(ii) Set the receiver to D BAND (5 MHz) and the SELEC knob to NARROW position. Then apply unmodulated signal of about 30 dB from SSG and adjust respective knobs to the maximum sensitivity.

(iii) Adjust semi-solid resistor VR1 of the IF unit so that a deflection of the S meter can be S-9 at that time.

(iv) Confirm that SSB outputs for maintaining S-9 are respectively adjacent to the following values in the center frequency of each band. However, these values are merely for reference.

BAND	Frequency	SSG ATT
A	280 kHz	15 dB
B	900 kHz	12 dB
C	2.0 MHz	22 dB
D	5.0 MHz	30 dB
E	12.0 MHz	31 dB
F	24.0 MHz	45 dB

6. MARKER ADJUSTMENT AND OPERATION CHECK

(i) Connect a counter to the MKO terminal of marker unit. If a coaxial cable for ANT input is left connected to this MKO terminal at that time, counter's input level is lowered and counting is impossible. Therefore the coaxial cable should be disconnected in this case.

(ii) Adjust TC1 of the marker unit so that marker's oscillating frequency attains 500 kHz.

(iii) Connect the coaxial cable for ANT input.

(iv) Set the BAND selector SW to F BAND and receive marker signal at 19 MHz. Confirm that the S meter deflection is more than S-9 when each knob is adjusted to the maximum sensitivity.

ADJUSTMENTS

1 Adjustment is conducted in accordance with the chart for tracking adjustment.

BAND	SSG & DIAL	SSG ATT (dB)	ANT TRIM position or output standard	No.	Adjustment point	Remarks
D	3.4 MHz	*1	2 graduations from center to left	1	L16 ¦ OSC-D coil	*1 Adjust SSG ATT until S meter deflection amounts to 5 ~ 6 graduations.
				2	L 4 ¦ ANT-D coil	
				3	L10 ¦ RF-D coil	
	7.0 MHz			4	Tc10 ¦ OSC-D trimmer	*2 If ANT TRIM peak cannot be obtained for No. 6, move L4 slightly to the left.
				5	Tc 4 ¦ RF-D trimmer	
			*2	6	Adjust ANT TRIM to peak.	
	3.4 MHz 5.0 MHz 7.0 MHz	9 6 6	S/N ratio more than 10 dB	7	Repeat No. 1 ~ 6 adjustments 2 or 3 times until correct dial frequency is obtained and sensitivity standard (at left) is satisfied. If sensitivity is still insufficient, turn VR1 of the RF unit until the standard requirement is met at 3.4 MHz. (Fix VR1 to a point slightly before saturation of AF output at 3.4 MHz, 9 dB input.)	
E	8.0 MHz	*1	To the center	8	L17 ¦ OSC-E coil	*1 Adjust SSG ATT until S meter deflection amounts to 5 ~ 6 graduations.
				9	L 5 ¦ ANT-E coil	
				10	L11 ¦ RF-E coil	
	17 MHz			11	Tc11 ¦ PSC-E trimmer	*2 If ANT TRIM peak cannot be obtained for No. 13, move L5 slightly to the left.
				12	Tc 5 ¦ RF-E trimmer	
			*2	13	Adjust ANT TRIM to peak.	
	8.0 MHz 12 MHz 17 MHz	14 9 9	S/N ratio more than 10 dB	14	Repeat adjustments of No. 8 ~ 13 2 or 3 times in accordance with adjustments for BAND D. VR1 of RF unit need not be adjusted.	
F	19 MHz	*1	To the center	15	L 18 ¦ OSC-F coil	*1 Adjust SSG ATT until S meter deflection amounts to 5 ~ 6 graduations.
				16	L 6 ¦ ANT-F coil	
				17	L 12 ¦ RF-F coil	
	29 MHz			18	Tc12 ¦ OSC-F trimmer	*2 If ANT TRIM peak cannot be obtained for No. 20, move L6 slightly to the left.
				19	Tc 6 ¦ RF-F trimmer	
			*2	20	Adjust ANT TRIM to peak.	
	19 MHz 24 MHz 29 MHz	14 9 6	S/N ratio more than 10 dB	21	Repeat adjustments of No. 15 ~ 20 2 or 3 times in accordance with adjustments for BAND D. VR1 of RF unit need not be adjusted.	
A	190 kHz	*1	Move the variable condenser fully to the right.	22	L 13 ¦ OSC-A coil	*1 Adjust SSG ATT until S meter deflection amounts to 5 ~ 6 graduations.
				23	L 1 ¦ ANT-A coil	
				24	L 7 ¦ RF-A coil	
	380 kHz			25	Tc 7 ¦ OSC-A trimmer	*2 ANT TRIM is not used.
				26	Tc 1 ¦ RF-A trimmer	
			*2			
	190 kHz 280 kHz 380 kHz	9 6 6	S/N ratio more than 10 dB	27	Repeat adjustments of No. 22 ~ 26 2 or 3 times in accordance with adjustments ofor BAND D. VR1 of RF unit need not be adjusted.	
B	600 kHz	*1	Move tha variable condenser fully to the right.	28	L 14 ¦ OSC-B coil	*1 Adjust SSG ATT until S meter deflection amounts to 5 ~ 6 graduations.
				29	L 2 ¦ ANT-B coil	
				30	L 8 ¦ RF-B coil	
	1200 kHz			31	Tc 8 ¦ OSC-B trimmer	*2 ANT TRIM is not used.
				32	Tc 2 ¦ RF-B trimmer	
	600 kHz 900 kHz 1200 kHz	9 4 4	S/N ratio more than 10 dB	33	Repeat adjustments of No. 29 ~ 32 2 or 3 times in accordance with adjustments for BAND D. VR1 of RF unit need not be adjusted.	
C	1.3 MHz	*1	To the center	34	L 15 ¦ OSC-C coil	*1 Adjust SSG ATT until S meter deflection amounts to 5 ~ 6 graduations.
				35	L 3 ¦ ANT-C coil	
				36	L 9 ¦ RF-C coil	
	2.8 MHz			37	Tc 9 ¦ OSC-C trimmer	*2 If ANT TRIM peak cannot be obtained for No. 39, move L3 slightly to the left.
				38	Tc 3 ¦ RF-C trimmer	
			*2	39	Adjust ANT TRIM to peak.	
	1.3 MHz 2.0 MHz 2.8 MHz	9 4 4	S/N ratio more than 10 dB		Repeat adjustments of No. 34 ~ 39 2 or 3 times in accordance with adjustments for BAND D. The RF unit need not be adjusted.	

Table 1

7. ANL OPERATION CHECK

(i) Connect SSG and noise generator to the ANT terminal of receiver. Set MODE SW to AM and receive a proper AM signal from SSG.

(ii) Switch on the noise generator and impose a noise signal on the AM signal.

(iii) Set ANL to ON watching at the oscilloscope. Confirm that the noise peak level is limited at that time.

(iv) Switch off the noise generator and set ANL from OFF to ON. Confirm that the output level is lowered by 6 dB or less at that time.

8. TONE CHECK

(i) Apply an AM signal of 1 kHz 30% modulation to the receiver (TONE to be set to NORMAL).

(ii) Confirm that the output level is lowered by 6 dB or less when TONE SW is set to SOFT.

SCHEMATIC DIAGRAM