

INSTALLATION AND OPERATING MANUAL

TRIO

Communications Receiver

model **9R-59**



Designed for today's crowded amateur bands and the discerning Short Wave Listener, the new 9R-59 offers features and performance previously unheard of at this price.

FEATURES

1. The use of a large horizontal dial and the adoption of a flywheel make selection very smooth.
2. An entire frequency range from 540 KC to 30 MC is continuously covered. The ham band is provided with a scale for direct reading and can be spread.
3. A Q-multiplier affords superb selectivity which moreover is variable. The Q-multiplier also serves as a BFO.
4. A vertical S-meter is used to allow easy signal reading.
5. Single-stage HF and double-stage IF amplification ensures high sensitivity and selectivity.
6. Being quite stable, the unit permits SSB reception with extreme clarity.
7. The separate main tuning and band spread variable capacitors are specially designed for communication equipment.
8. With an output transformer built in, the receiver can easily be connected with a speaker available.
9. As auxiliary circuits, an ANL (Automatic Noise Limiter), AVC (Automatic Volume Control) and MVC (Manual Volume Control) circuits are built in.
10. A standby switch socket enables the receiver to be combined with a transmitter to form a ham station.
11. An earphone jack is provided so that the receiver may be operated late at night without disturbing the neighborhood.

THERMIONIC DEVICE EQUIVALENTS:

5Y3 - No Equivalent.
6AQ5 = EL90.
6AV6 = EBC90, EB690.
6BA6 = EF93.
6BE6 = EK90.

DESCRIPTION OF CIRCUITS

1. HF AMPLIFIER CIRCUIT

HF amplification is done by a 6BA6 for a better image ratio and S/N ratio. The AVC for the HF amplifier tube is of the parallel feed type, which is better suited to an all-wave receiver than the conventional method in which the feeding is made from the ground side.

2. OSCILLATOR CIRCUIT

Adopted here is a Hartley oscillator system incorporating a 6BE6. When the frequency is higher than 20 Mc, conversion gain cannot be obtained only with a tap, so plate reaction is used along with this to achieve proper oscillation intensity. The 33 ohm resistor between the coil and G1 is inserted for the purpose of preventing overoscillation at the maximum receivable frequency.

3. MIXER CIRCUIT

Feeding to the first grid of the 6BE6 ensures very high conversion gain and stability. The 250 pF capacitor and 1 M ohm resistor connected to the third grid are for protecting the tube against overloading. AVC is not applied to this stage as the receiver is designed primarily for sensitivity and stability.

4. IF AMPLIFIER CIRCUIT

With double stage amplifier circuit using two 6BA6s and high C and tapdown Trio T-11As, the receiver affords superb selectivity and stability. To lower the degree of amplification at times of great input, the cathode is provided with an IF gain control knob.

5. S-METER CIRCUIT

Adopted here is a stable system in which a bridge circuit is formed on the cathode side of the two IF amplifier tubes, with AVC applied to the first stage IF amplifier tube while the second-stage IF amplifier tube is AVC-free, so that the S-meter will operate according to the two cathode voltage change after feeding the input.

6. DETECTOR AND AF AMPLIFIER CIRCUITS

Detection is achieved by the diode section of a 6AV6, and AF single-stage amplification by its triode section.

7. OUTPUT AND RECTIFIER CIRCUITS

The output tube is a single 6AQ5, and the rectifier tube a 5Y3 (5CG4).

8. ANL

Automatic Noise Limiting (ANL) is done by the diode section of the 6AV6.

9. AVC AND MVC

Placing the switch from AVC to MVC, you can receive DX, telegraphic carrier modulation, SSB, etc.

10. Q-MULTIPLIER AND BFO

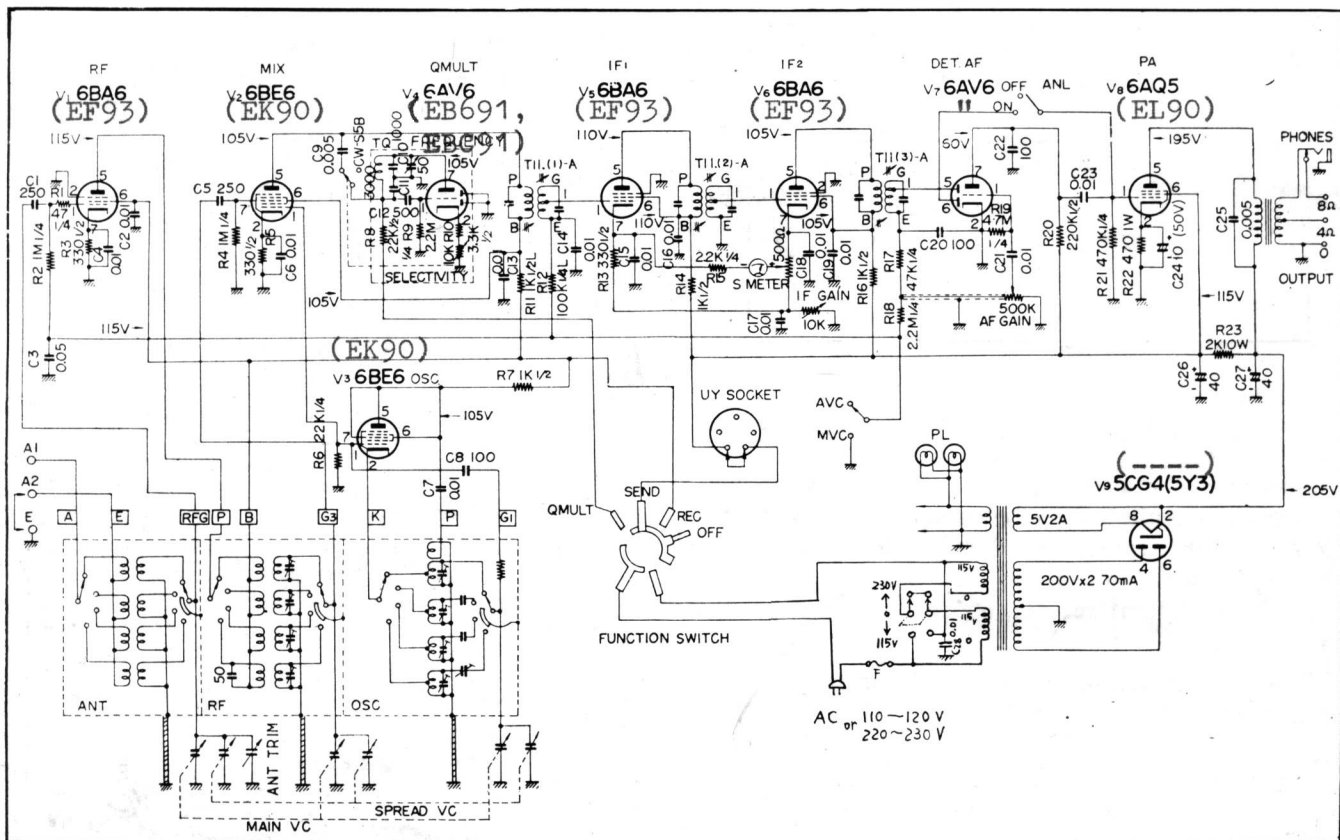
Selectivity, which depends on the IFT used, can be improved by increasing Q . IFT's Q is ordinarily about 100—150 even if it is fairly large. Q is given by $Q = \omega L/R$ (where ω is $2\pi f$, R = effective resistance of coil). In this equation, Q can be increa-

sed by reducing R . If, instead, a negative resistance $-R'$ is added from outside, the equation becomes $Q = \omega L/(R-R')$, and this gives a higher Q .

Preparing this $-R'$ is the purpose of the Q -multiplier, by the use of which Q can be raised to 3000 or so. The Q -multiplier frequency can be finely adjusted within the range of $455\text{Kc} \pm$ several Kc. A Colpitts oscillator circuit is formed here. When the multiplier is to be used as a BFO, keep the circuit in oscillating condition and connect its output to the IF stage.

Schematic diagram

fig. 1



TERMINAL CONNECTIONS

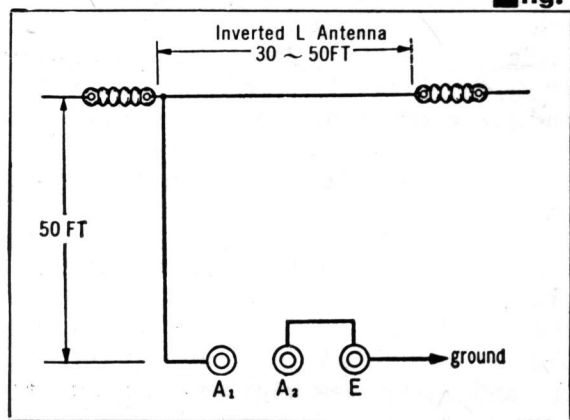
fig. 2

1. ANTENNA

It is often said that a good antenna is more effective than RF single-stage amplification. In a communications receiver, especially, the choice of the antenna determines whether the receiver can fully show its performance or not. Begin, therefore, with erecting a perfect antenna.

a) Inverted L antenna

The inverted L type of antenna will provide satisfactory performance over the entire tuning



range. Simply short A₂ and E with the jumper wire, and connect one end of the antenna wire to A₁.

Each end of the antenna wire should be insulated by a ball insulator, and sufficient care should be taken to keep the lead-in wire apart from the roof or a tree. (see Fig. 2)

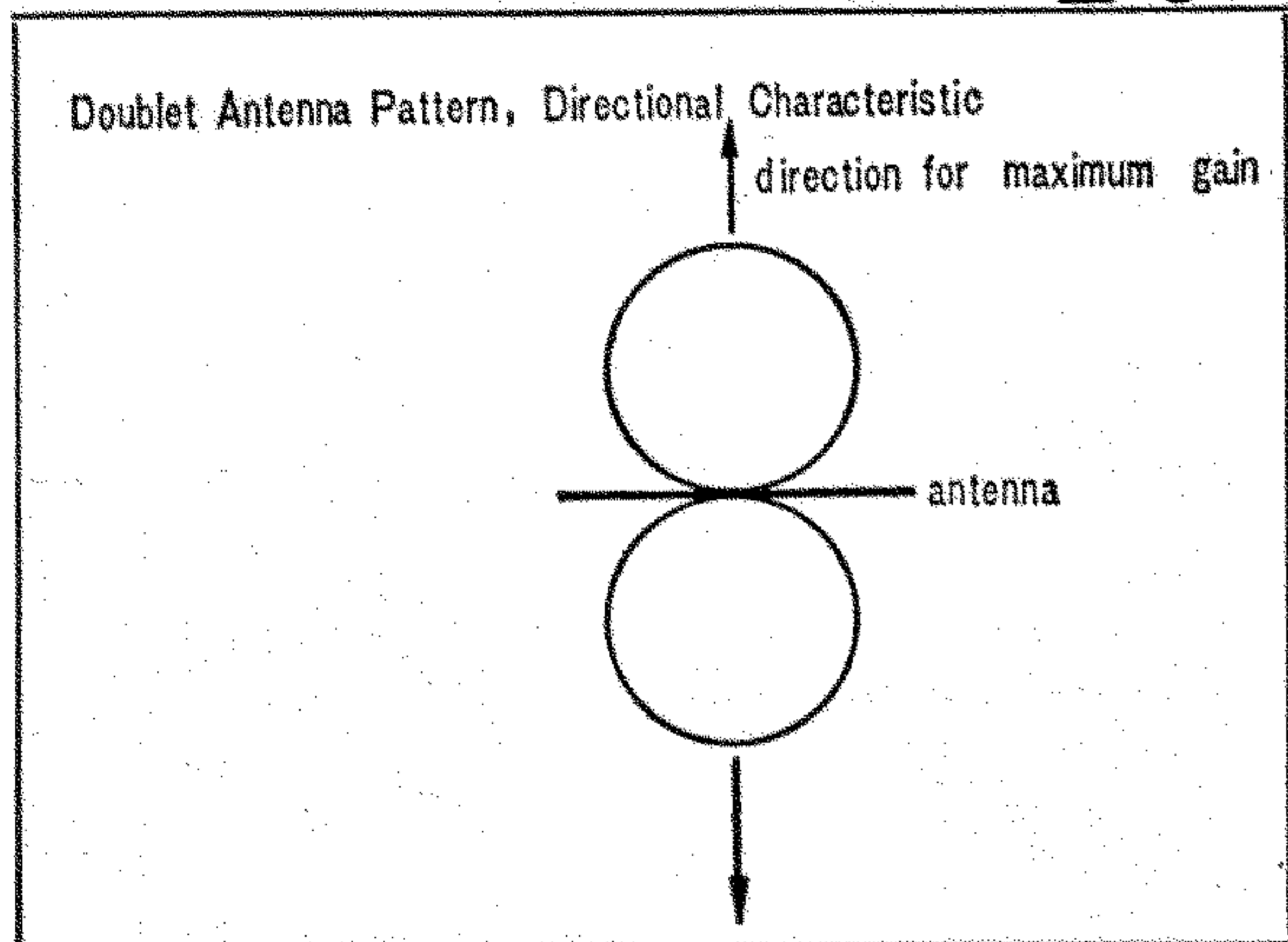
2. SPEAKER

Use a permanent dynamic type speaker without a power transformer. Use the 8 or 4 ohm output terminal, depending on the impedance of the speaker available. A 16 ohm speaker should be connected to the 8 ohm terminal. Head-phones should be connected to the 8 ohm terminal to disable the speaker.

3. HEAD-PHONES

The low-impedance magnetic head-phones are most recommendable, but other types also will sufficiently serve the purpose.

fig. 3



b) Doublet antenna

Most amateur ham stations use a single antenna both for transmission and reception. An antenna efficient for transmission may be considered efficient for reception too. A doublet antenna will give excellent results, especially on amateur bands.

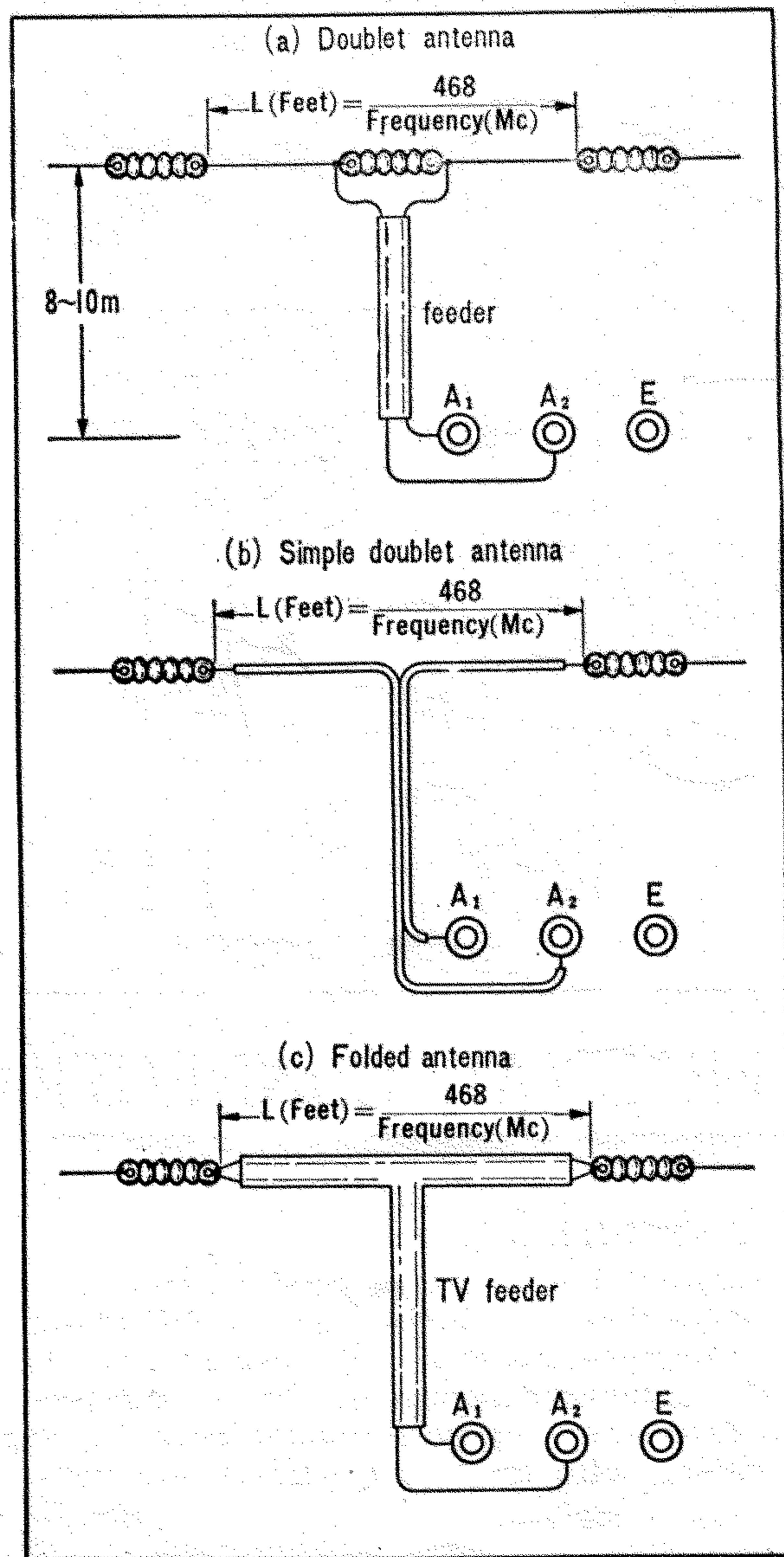
The overall length of a doublet antenna can be determined by using the following formula:

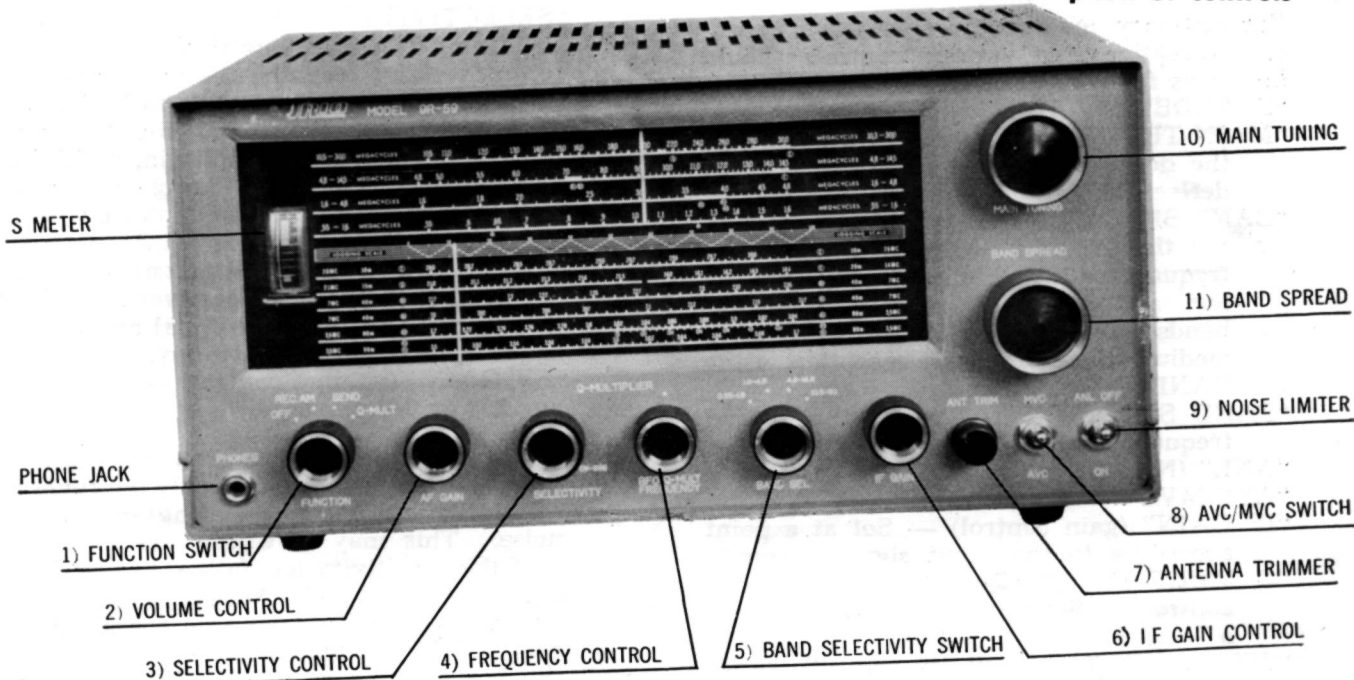
$$L \text{ (Length in feet)} = \frac{468}{\text{Frequency in megacycles}}$$

Fig. 4-(a) shows an example in which a 75 ohm coaxial cable (3CV2, etc.) is used as feeder; (b), the simplest form of doublet antenna which is made of a necessary length of a twin-lead type, vinyl chloride-coated cord for electric lighting; and (c), a type called a "folded dipole", which can be made of a TV feeder — it is light and gives you a wider band than an ordinary doublet antenna.

Since the doublet antenna displays directional properties, it should be oriented in such a manner that maximum signal pickup can be realized. The antenna should be connected to terminals A₁ and A₂ respectively, and the jumper wire between A₂ and E is removed.

fig. 4





DESCRIPTION OF CONTROLS

- 1) **FUNCTION** — function switch
 This switch has many uses. "REC" is the position for ordinary reception. With the switch turned to "SEND", B+ is cut off and the equipment is ready for transmission.
 At the "Q MULT" position, the Q-multiplier and BFO circuit begins to operate.
- 2) **AF-GAIN** — volume control knob
- 3) **SELECTIVITY**
 This is provided for peak control during "Q MULT" operation. In ordinary reception, the knob is set to the "CW-SSB" position. The same position should be taken for BFO operation.
- 4) **FREQUENCY**
 This represents a midget variable capacitor for fine frequency adjustment for "Q MULT" and "CW" operation. At ordinary times, it should be set in the marked point.
- 5) **BAND SEL**
 This should be set for the band covering the desired range of frequencies.

- 6) **IF GAIN**
 This allows intermediate frequency gain control or sensitivity control.
- 7) **ANT TRIM** (Antenna Trimmer)
- 8) **AVC — MVC**
 This permits switching from Automatic Volume Control (AVC) to Manual Volume Control (MVC).
- 9) **ANL** (Automatic Noise Limiter Circuit)
 Place the switch in ON position to insert the automatic noise limiter circuit.
- 10) **MAIN TUNING**
 When the tuning pointer is set at 100°, the calibration is correct.
- 11) **BAND SPREAD**
 This is a supplementary control which electrically spreads out the scales of the main tuning dial. Logging of stations is possible within the accuracy of ±5 Kc.

INSTRUCTIONS

1. ZERO ADJUSTMENT OF S-METER
 First, bring the receiver into operating condition. Adjust the S METER ADJUST con-

trol on the back of the chassis for a reading of 0 on the S Meter with the IF GAIN control at maximum and the antenna terminal A₁ and A₂ shorted.

2. ORDINARY RECEPTION

For ordinary medium or shortwave broadcast reception, the various controls should be set as follows:

"STANDBY" — Turn to "REC".

"MAIN TUNING" — Tune in a point where the desired signal causes the maximum deflection on the S-meter.

"BAND SPREAD" — Set at 100° on the dial. Set the MAIN TUNING pointer at the frequency a little higher than the desired one and you can receive shortwave bands as easily as in the case of a medium-wave broadcast reception, using BAND SPREAD knob.

"BAND SELECTOR" — Set to the desired frequency band.

"ANL" (Noise Limiter) — Switch "OFF"

"AVC-MVC" — Turn to "AVC"

"IF GAIN" (gain control) — Set at a point according to the input signal strength.

"Q MULT FREQ" (Q-multiplier frequency control) — Set to the point marked with a small circle.

"SELECTIVITY" (selectivity control) — Set to "CW — SSB".

3. RECEPTION WITH Q-MULTIPLIER

This is effective when there is much QRM (interference).

"FUNCTION" — Set to the "Q MULT" position.

"MAIN TUNING" — Set properly so that the desired signal may cause the maximum deflection on the S-meter.

"BAND SPREAD" — In a ham band, direct reading is possible after main tuning.

"BAND SELECTOR" — Set to the desired frequency band.

"ANL" (Noise Limiter) — Switched either to "OFF" or "ON" depending on the volume of external noise.

"AVC-MVC" — "AVC" for ordinary reception; "MVC" for DX reception.

"IF GAIN" — Adjust for proper output.

"SELECTIVITY" — Turn counter-clockwise from "CW-SSB" until the switch goes off. After reaching the extreme in that direction, turn the switch back clockwise until it comes around the 2/3 point where oscillation may begin, which may be found from the swinging-out of the S-meter pointer. Set the knob right before this oscillation-starting point.

"FREQUENCY" (frequency control) — Set at a point where the receiver is perfectly tuned in to a desired signal and receives it with maximum intensity.

"AF GAIN" (volume control) — Set around 2/3 or 3/4.

Note: The Q-multiplier reduces the gain by several decibels and remarkably improves the selectivity with the resulting decrease in noise. This may give you the impression that the sensitivity has fallen, but by bringing "IF GAIN" and "AF GAIN" a little up you can achieve a favorable receiving condition. Also, as the band is narrowed and the hollow tone is noted, adjust so as not to impair the articulation.

4. CW RECEPTION

For CW reception, turn "FUNCTION" to "Q MULT" and "SELECTIVITY" to "CW-SSB" so that the "FREQUENCY" knob may act as pitch control. Thus you can obtain a beat most audible during reception.

5. SSB RECEPTION

With the receiver under the same condition as for CW reception ("SELECTIVITY" at "CW-SSB") adjust for a point giving you the maximum clarity, manipulating FREQUENCY knob and SPREAD dial knob alternately. Also, the "MVC" position should be taken in this case.

Fig. 5

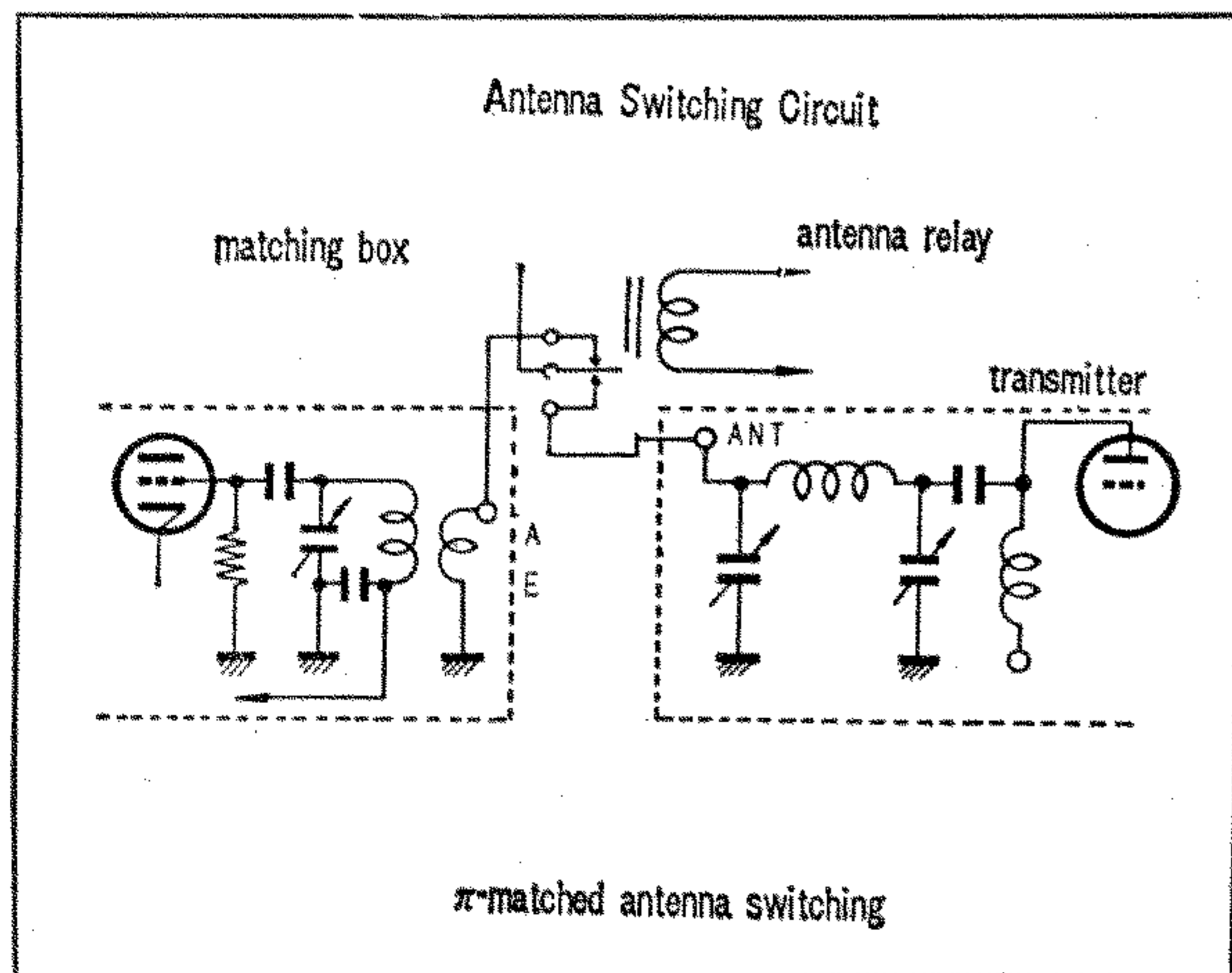
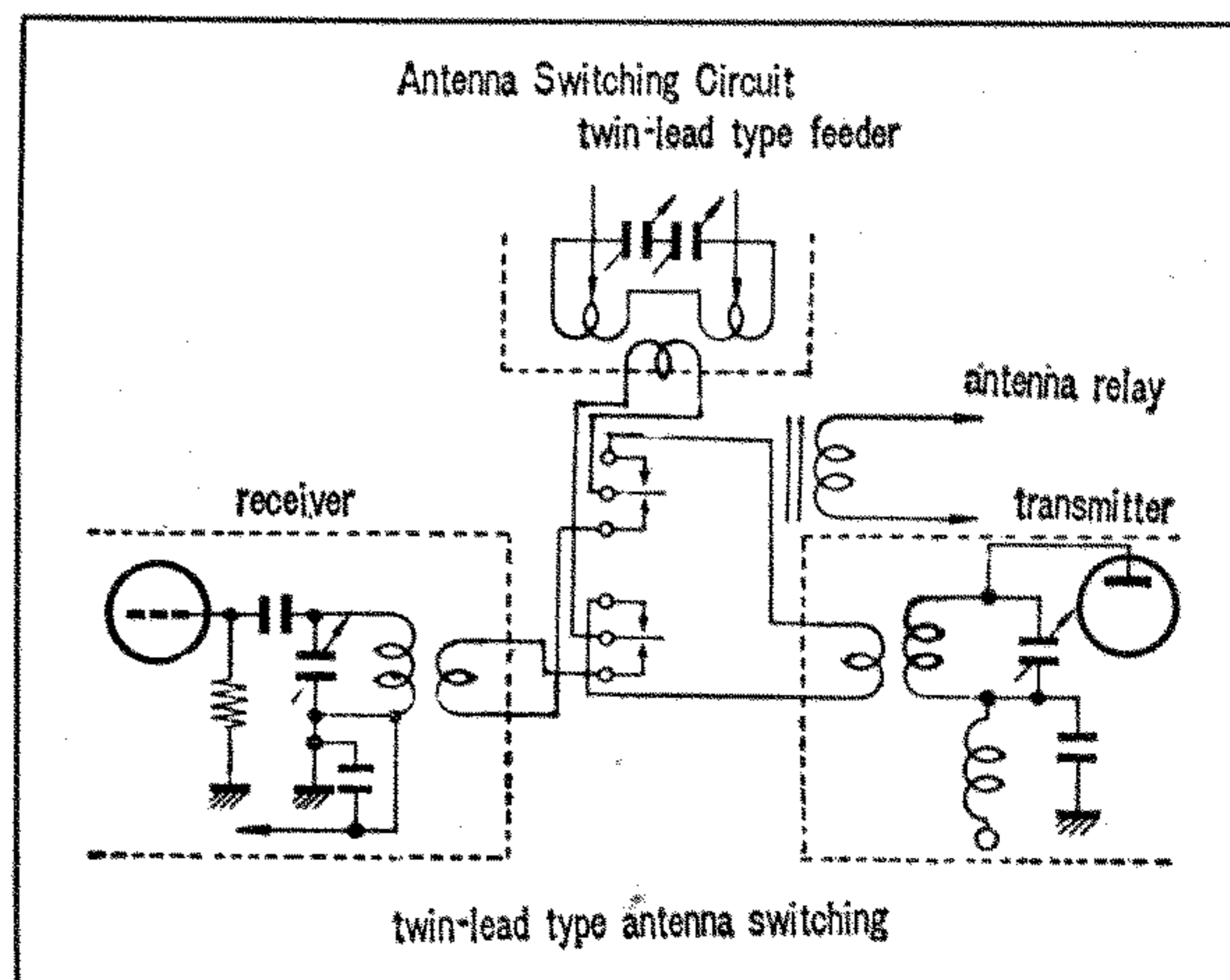


Fig. 6



MAINTENANCE

1. EXTRACTION FROM CASE

The top cover can be removed by removing four fancy screws on both sides.

The bottom plate can be detached easily by removing six screws along the two edges. The hyzex feet should be left untouched.

2. DIAL STRINGING

When the string of the dial has been snapped, restring it following the manner shown in Fig. 8. Use a special dial belt for this purpose.

3. FUSE REPLACEMENT

When the fuse has blown, replace it with a 1A fuse in glass tube. By turning the fuse holder counter-clockwise, you can open it

and take out the fuse inside.

Before replacing a blown fuse, find out the cause. If any part of the equipment is in trouble, repair it completely before putting in a new fuse.

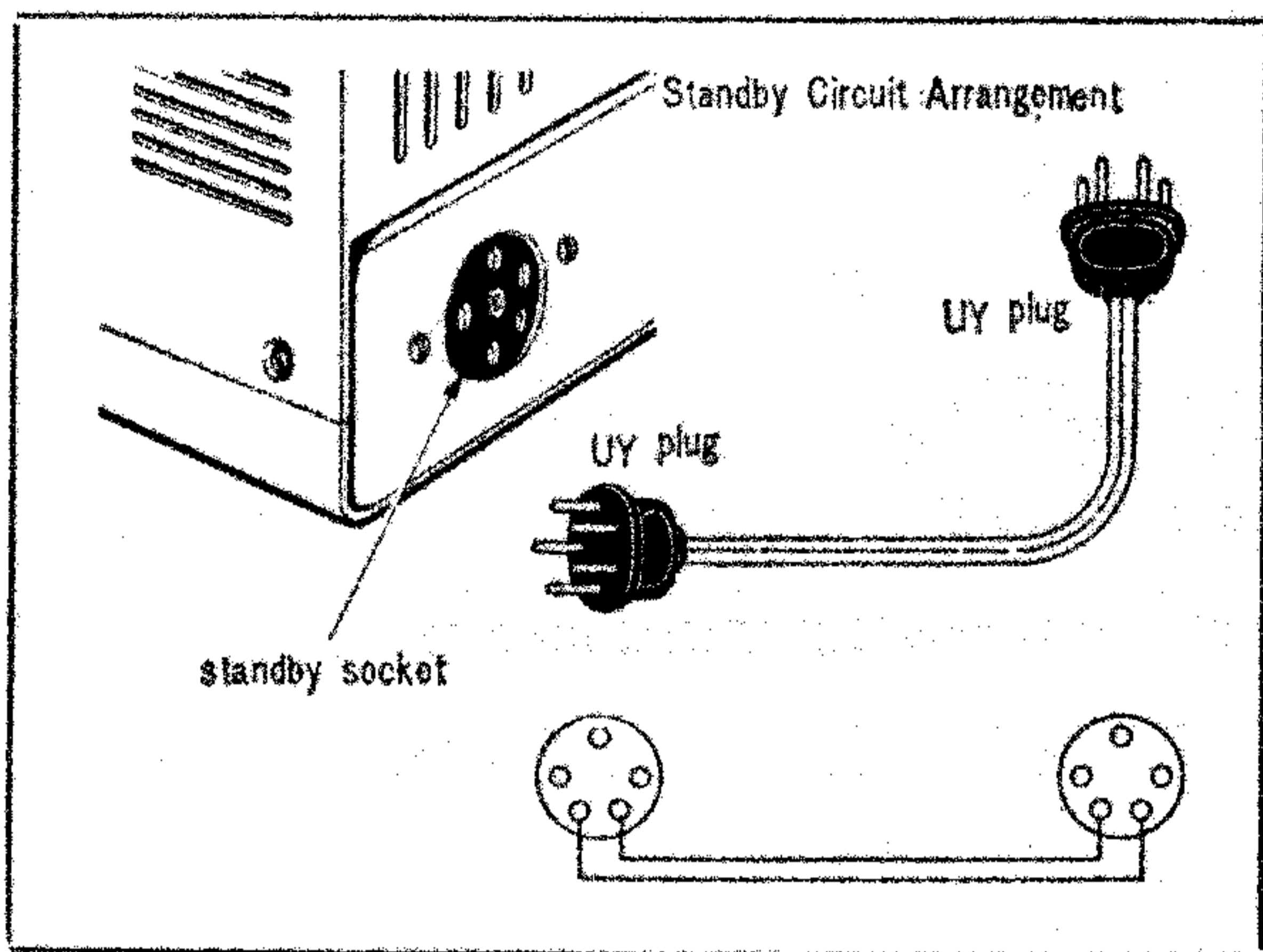
4. PILOT LAMP

The pilot lamp for illuminating the dial should be an 8V swan-base midget bulb.

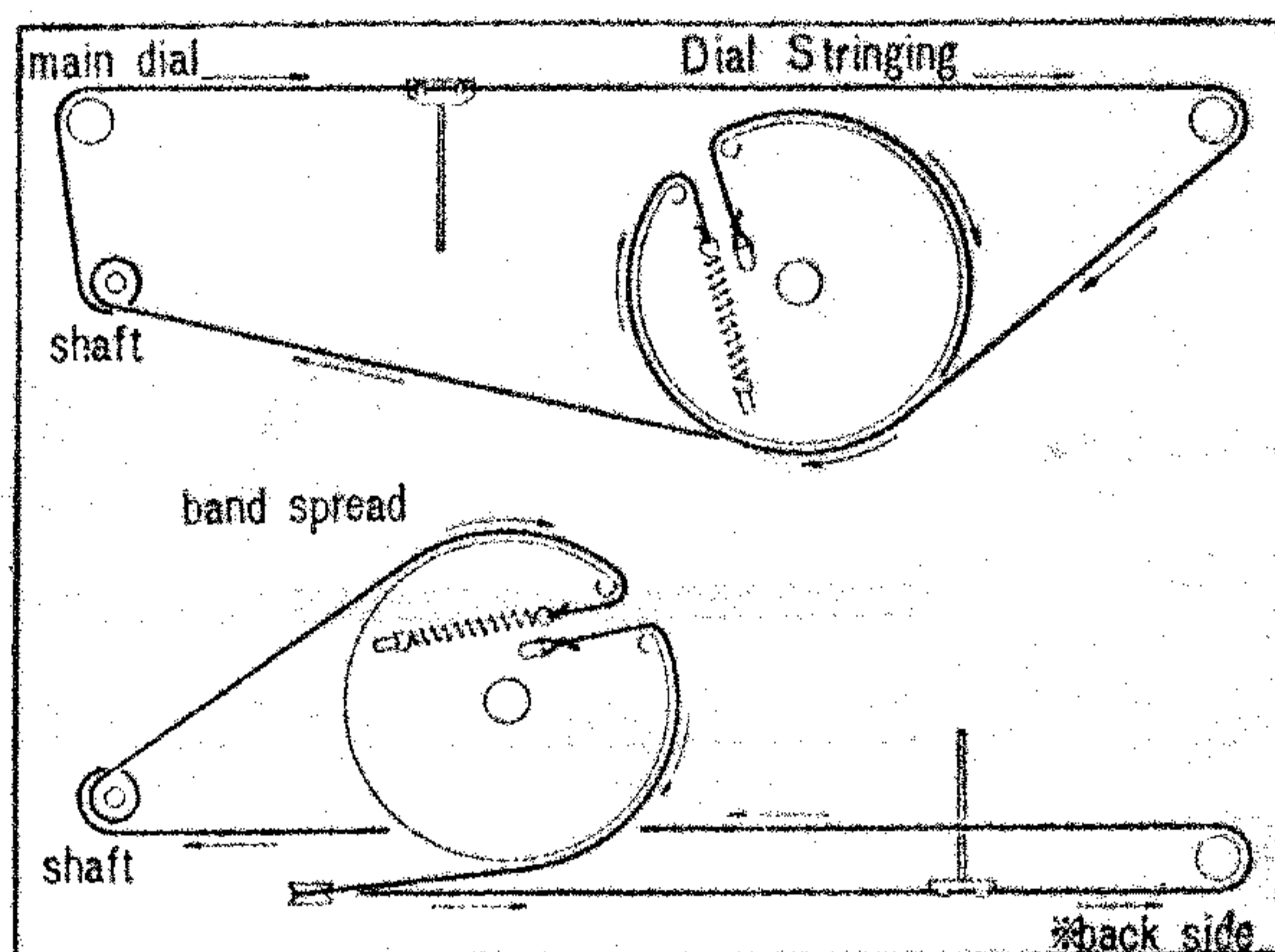
5. RESISTORS

A deteriorated resistor may be replaced with a new resistor rating $\pm 10\%$ of the old one. For instance, a 300 ohm resistor may safely be used in place of 330 ohm resistor for all practical purposes.

■ Fig. 7



■ Fig. 8



SPECIFICATIONS

Frequency Range

540 — 1605Kc
1.6 — 4.8Mc
4.8 — 14.5Mc
10.5 — 30Mc

Band spread (ham band directly read)

3.5Mc 80m
7Mc 40m
14Mc 20m
21Mc 15m
28Mc 10m

3.5Mc and 7Mc bands calibrated on 5Kc.

Sensitivity

10 μ V (input at 10Mc, S/N ratio = 20dB)

Selectivity

Variable from -93dB to -60dB ("Q-MULT" in operation, with ± 10 Kc detuning)

Output

1.5W

Power consumption

50VA

Tubes used

6BA6 for RF amplifier
6BE6 for Mixer
6BE6 for Local oscillator
6BA6 x 2 for IF amplifier
6AV6 for Detector, AF amplifier, & ANL
6AV6 for Q-multiplier, BFO
6AQ5 for Power amplifier
5Y3 for Rectifier

Speaker to be used

Permanent type dynamic speaker (VC 4 or 8 ohms) Without output transformer

Dimensions

Width 15" x height 7" x depth 10"

Weight

9.3 kg (20.5 lbs.)

Auxiliary circuits

* Band spread.
* Q-multiplier (high selectivity control)
* ANL (Automatic Noise Control Circuit)
* AVC — MVC (Automatic/Manual Volume Control)
* Phone jack plug

The speaker is not provided

TRIO

Manufactured by TRIO CORPORATION, TOKYO, JAPAN.