

STAR
COMMUNICATION RECEIVER
SR-165
INSTRUCTION MANUAL

STAR
STAR CO.,LTD.

OPERATING INSTRUCTIONS
FOR COMMUNICATION RECEIVER

MODEL SR-165

GENERAL DESCRIPTION

Model SR-165 is an all-band communications receiver designed and manufactured with excellent circuitry characteristics suitable for the beginner class ham station, and short-wave listener, and as an auxiliary receiver for advanced ham stations. The receiving frequency range covers from 535 Kc to 30 Mc.

The receiver has been designed to produce excellent results without requiring a special high frequency amplifier, and its intermediate frequency is 1650 Kc in order to obtain a high image ratio. Selectivity is variable from 0.5 Kc to 10 Kc with a band width of 6 dB in attenuation by utilizing a crystal filter of continuously variable selection type.

Because RF is accomplished in the intermediate frequency amplifier stage, the receiver is strongly resistant to cross modulation. A product detector is provided for CW and single side band reception. Stability and uniformity of operation are possible by utilizing printed circuits throughout, in the power supply.

CHARACTERISTICS

1. Receiving Frequency Range

	535 Kc	-	30 Mc
Band 1	535 Kc	-	1605 Kc
Band 2	1.8 Mc	-	4.0 Mc
Band 3	3.5 Mc	-	7.5 Mc
Band 4	7.0 Mc	-	15.0 Mc
Band 5	14.0 Mc	-	30 Mc

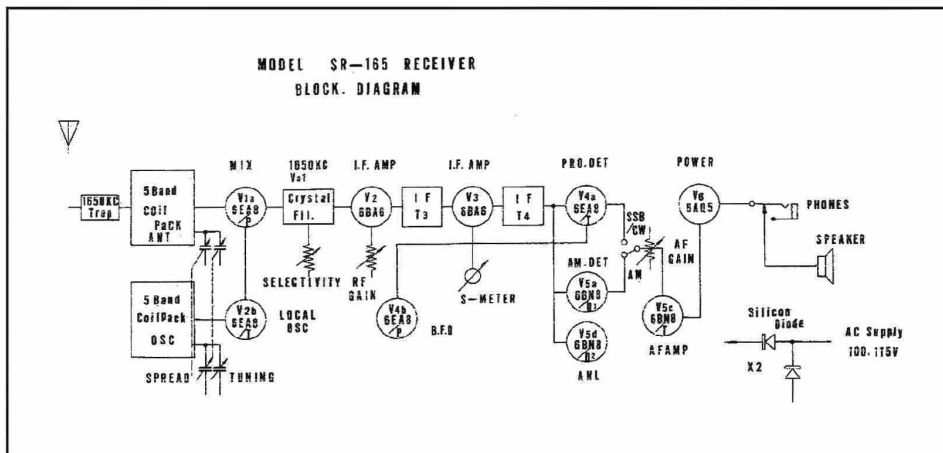
2. Intermediate Frequency : 1650 Kc

3. Sensitivity : Less than 10 μ V
(Antenna input voltage required to obtain an output signal of 20 dB in S+N/N at 7 Mc)

4. Image Interference Ratio: More than 30 dB
(at 7 Mc)

5. Selectivity :
0.5 Kc - 10 Kc with band width of 6 dB in attenuation by means of a crystal filter of continuously variable type.

6. Audio frequency output : More than 1 W
7. Output Impedance : 4 or 8 Ω
(Speaker Terminal)
8. Power Supply :
AC 100 V or 115 V, 50 - 60 cps.,
40 VA
9. Dimensions : 345 mm wide, 165 mm high,
and 220 mm deep
10. Weight : 7 Kg.



CONSTRUCTION

1. Circuitry and Vacuum Tubes Used

The block diagram of the receiver circuitry is shown in Fig. 1. The vacuum tubes used and the names of various sections are as follows :

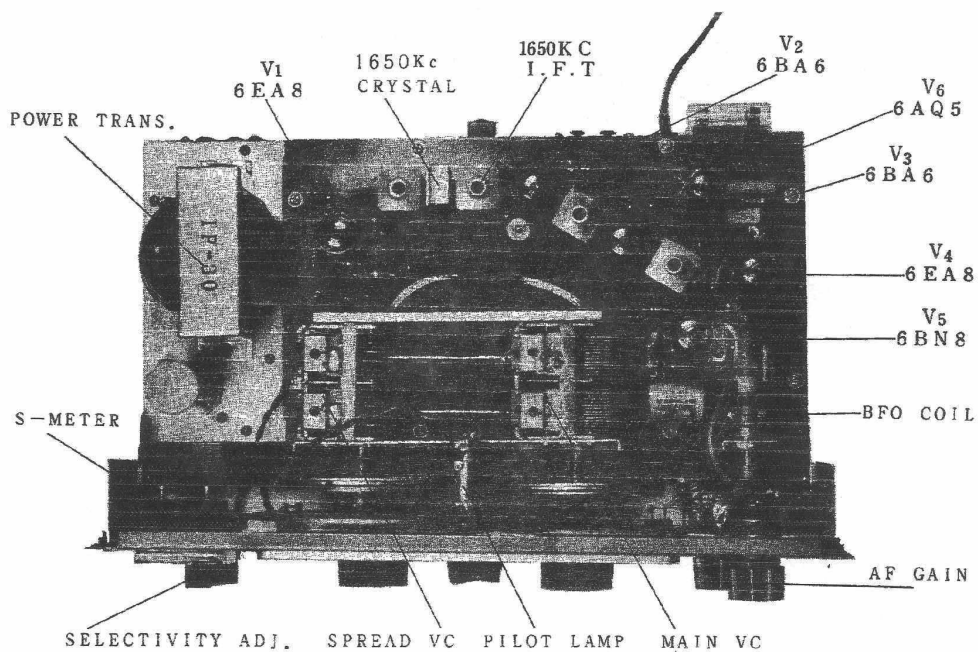
- | | | |
|---------|---|---|
| 6EA8 | : | Frequency mixing and local oscillation. |
| 6BA x 2 | : | Intermediate frequency amplification |
| 6BN8 | : | Diode detection (AM), low frequency amplification and noise limiter (ANL) |
| 6EA8 | : | Product detection (CW/SSB) and BFO |
| 6AQ5 | : | Low frequency power amplification |

Two silicon diodes provide double voltage full wave rectification in the power supply.

2. Controls

- | | | |
|----------------|---|----------------|
| TUNING | : | main tuning |
| SPREAD | : | band spread |
| BAND SELECTOR: | | band selection |

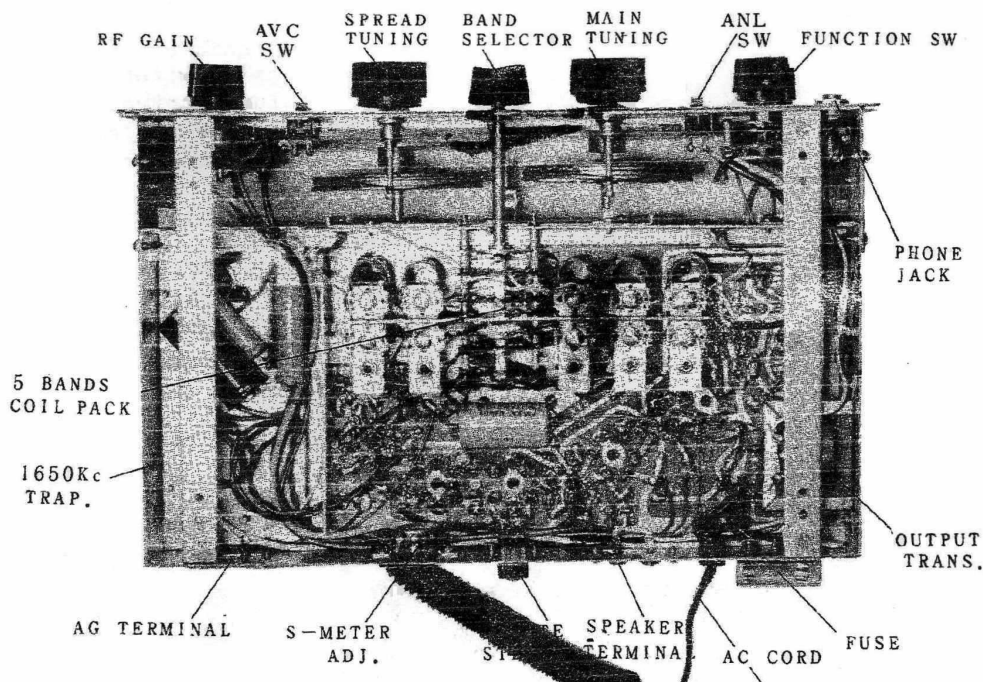
RF GAIN : intermediate frequency gain control
 AF GAIN : low frequency gain control and power supply switch
 AVC : automatic volume control, (gain) control, on-off switch
 ANL : automatic noise limiter switch
 SELECTIVITY : selectivity control (continuously variable)
 FUNCTION : stand-by . AM . CW/SSB switch
 BFO : beat frequency variable
 S METER ADJ. : S-meter zero adjustment



3. External connections

A/G : antenna/ground terminals
 SPKR : speaker terminals
 STBY : stand-by switch connection

Plug
 Jack
 Power supply cord



CIRCUIT CONSTRUCTION (CIRCUIT FUNCTION)

1. Antenna Input and Coil Pack

The antenna input impedance is designed to be low. Between the antenna terminal and the coil pack is inserted a trap (1650 Kc) of T-notch type which has small insertion loss and large attenuation in order to eliminate beat interference in the neighborhood of the intermediate frequency, and in the area of the 1/2 frequency (825 Kc) within the broadcast band.

The coil pack covers five frequency ranges, and a 2 : 1 frequency spread ratio facilitates tuning in short wave reception. In the ham bands, in particular, the receiving frequency can be altered just by turning the band switch and the band spread. (For example, the receiving frequency can be switched from 3.5 Mc to 7.0 Mc by turning the switch without turning the main tuning knob).

2. Mixing and Local Oscillation

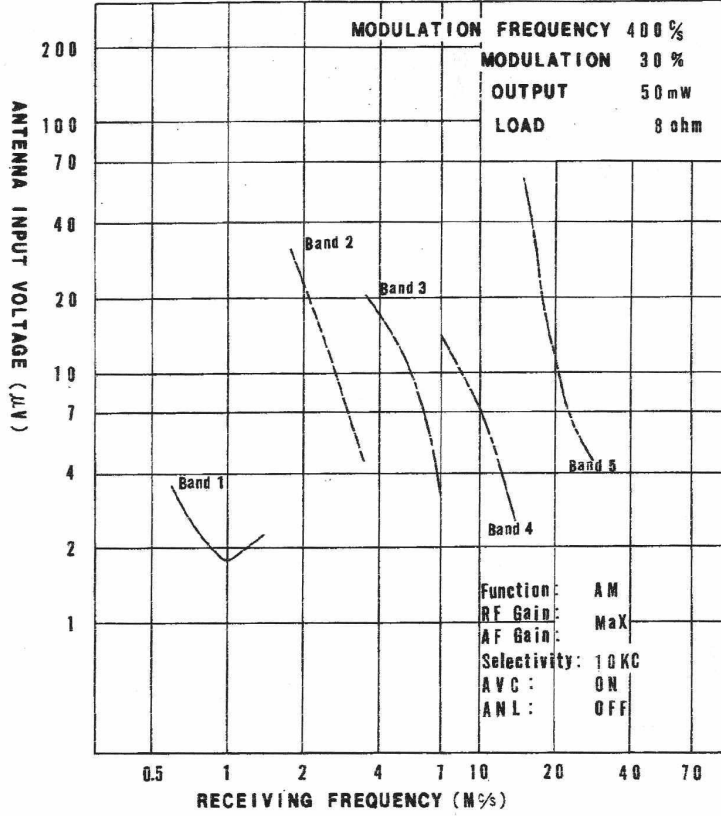
For frequency conversion, a separately-excited circuit is used in order to obtain a high sound noise ratio. For this purpose, the pentode part of the mixer 6EA8 is used.

Grid injection is used to obtain good conversion.

The triode part of the 6EA8 is used for local oscillation in an Hartley circuit of cathode tap type, and the oscillator frequency is in upper heterodyne and higher than the intermediate frequency for each band by 1650 Kc.

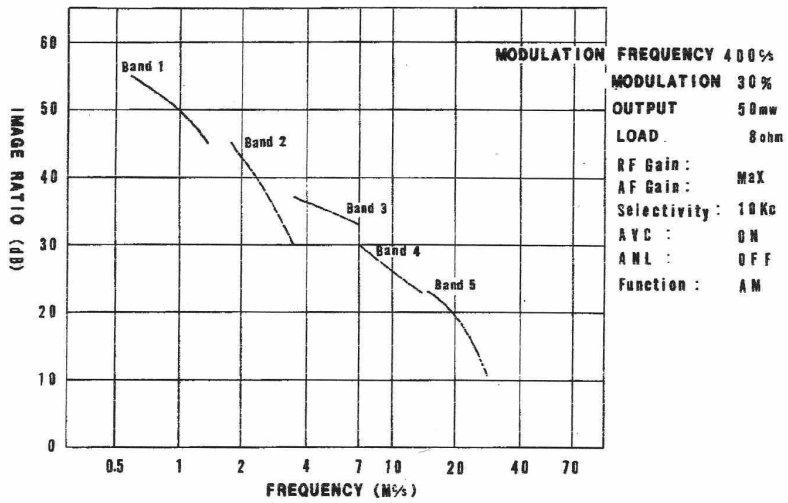
MODEL SR-165 RECEIVER

SENSITIVITY CHARACTERISTICS



MODEL SR-165 RECEIVER

IMAGE RATIO



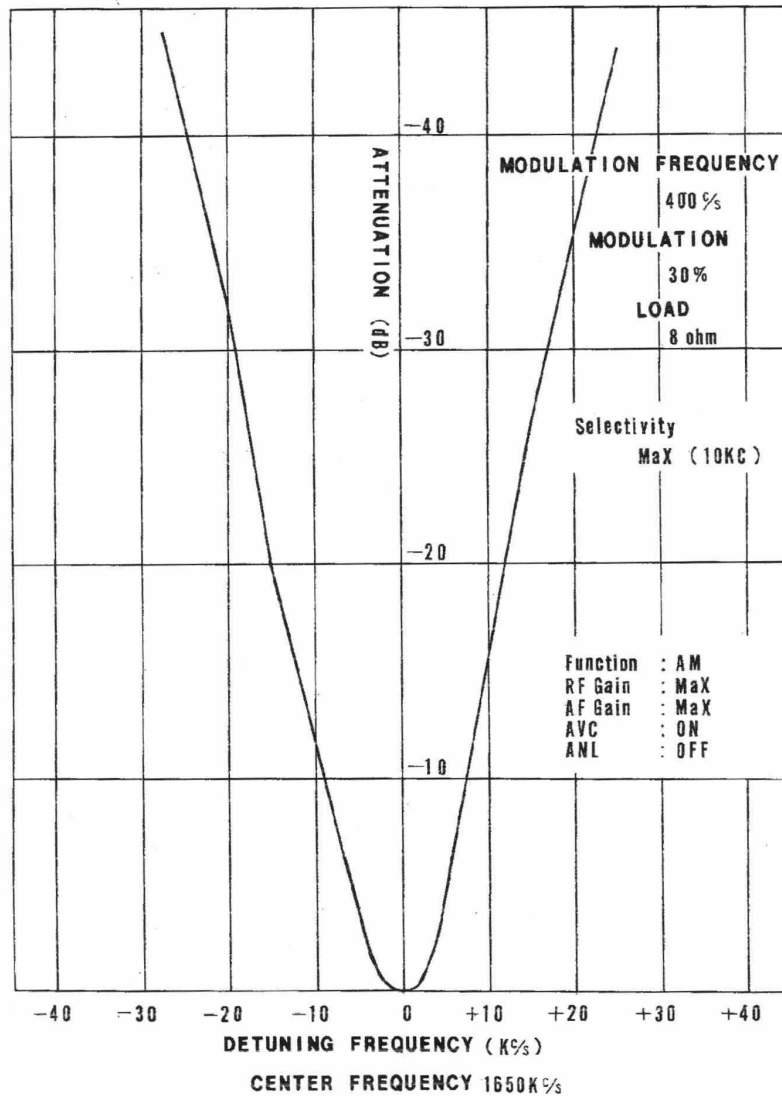
3. Intermediate Frequency Amplification

To obtain a high image ratio, the selected intermediate frequency is 1650 Kc. The selectivity is continuously variable from 0.5 Kc to 10 Kc by means of a crystal filter. Selectivity can be selected quite easily by the front panel control. This system is highly resistant to interference.

At this stage, two step amplification is carried out by means of a high Gm tube 6BA6 in order to obtain approximately 70 dB gain.

The S-meter is inserted in the second stage cathode in order to indicate the decrease in the cathode current due to the application of AVC by means of the input signal.

MODEL SR-165 RECEIVER
I. F. CHARACTERISTICS



4. Diode Detection and Noise Limiter

For AM reception, diode detection by means of the diode section of the 6BN8 is used, and the other diode part of the 6BN8 is used as an automatic noise limiter of parallel type.

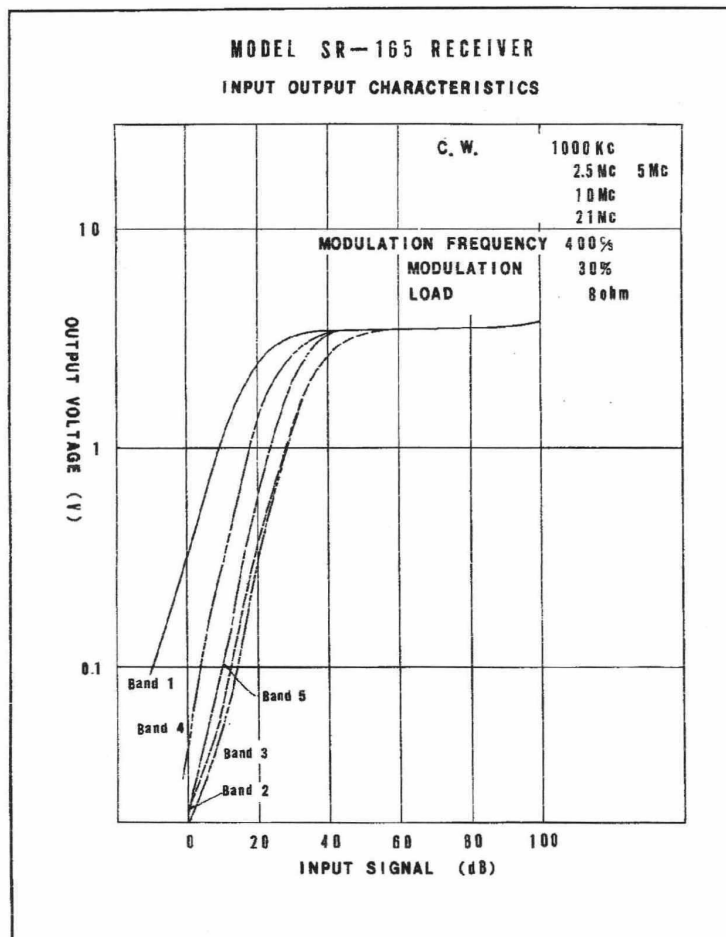
The automatic noise limiter enables the effective elimination of pulse noise such as automobile ignition noise and clicks caused by opening and closing of electrical circuits.

The automatic noise limiter circuit can be short-circuited by switching when not needed.

5. Product Detection

For single side band and CW reception, product detection with a minimum of distortion is attained by use of the triode section of 6EA8. The beat frequency oscillator circuit uses the pentode section of 6EA8 in a highly stable Colpitts circuit of the grounded cathode type. The frequency of the beat frequency oscillator is controlled by tuning the core in the oscillator coil. The variation in frequency per one turn of the knob is approximately 10 Kc, and the variation is ± 5 Kc at the 0 point on the panel which indicates the center of the control function.

Turning the control clockwise will reduce oscillation frequency.



6. Audio Frequency Amplification

The detected signal is selected by the FUNCTION switch, passes AF-GAIN, is amplified in voltage by the triode part of the 6BN8, is amplified in power by the 6AQ5, passes the output transformer, and is carried to the speaker to the speaker terminals.

The frequency characteristics of the audio frequency circuit are attenuated in the low and high audio ranges in order to improve the signal to noise ratio to obtain an easy-to-listen-to tone quality.

7. Power Supply

In the B power supply circuit, double voltage, full-wave rectification is provided by use of a silicon rectifier for improved voltage regulation.

HANDLING INSTRUCTIONS

1. Preparations for Reception

Power Supply

The power supply for this receiver is AC 100 V (50 or 60 cps), but the receiver will operate without difficulty at voltage between 90 V and 110 V. When the line voltage ranges from 110 V to 125 V (or when a power supply of 105 to 125 V is used), it is recommended that the connection of the internal power supply transformer terminal be changed to the 115 V terminal.

Connect the power supply cord to a voltage outlet, and turn clockwise the AF-GAIN control on the upper right corner of the panel. The illumination of the dial panel indicates that the power supply is turned on.

Antenna

The antenna input impedance of this receiver is designed to be low. Connect a half wave doublet antenna matching the receiving frequency, or a single wire antenna, to terminal A and terminal G. A simple antenna will also enable adequate reception. Use of an external ground is not necessary, but grounding may be effective in elimination of external noise.

Speaker or Head Phone

The speaker output terminal impedance is 8 ohms, but internal connections are provided for change to 4 ohms. No problems will be experienced within an impedance range of $\pm 30\%$.

Use of head phones of low impedance is recommended, but head phones of high impedance may be used also by appropriate control of the sound level. When the head phone jack is inserted in the phone jack, the speaker is automatically turned off.

2. AM Reception

Control Positions

FUNCTION	:	AM
SELECTIVITY	:	2.5 Kc = 10 Kc
AVC	:	ON
RF-GAIN	:	Turned fully clockwise.
AF-GAIN	:	Turned to a suitable noise level.
BAND SELECTOR:		Desired reception band.
SPREAD	:	At 100 in calibration scale.

How to read the turning dial

Turn the main tuning (TUNING) control to match the desired receiving frequency. The calibrations on the right dial panel are placed in the order of 100 scale (LOG), Band 1, and Band 2 from the outermost.

Fine Tuning (Use of BAND SPREAD)

As you turn the SPREAD control counter-clockwise, the receiving frequency is reduced. Adjust the tuning control so that the incoming signal becomes maximum, i.e., maximize the swing of the S-meter. The level of sound is adjusted by means of AF-GAIN.

Eliminating Noise

Pulse noise can be effectively reduced by turning the ANL switch "On".

Eliminating Interference

In case of interference, turn the SELECTIVITY control counter-clockwise to narrow the passband width from 1 Kc to 0.5 Kc.

Standby operation, or Use in Combination with a Transmitter

Place the FUNCTION switch at STBY, and receiver operation will be stopped with the power supply turned on. When used in combination with a remote control, or a transmitter, the operation of the receiver can be stopped by turning the STBY terminal on the back off, with the switch placed at AM through manipulation of the switch or relay.

This applies also to SSB and CW reception.

S-meter

The S-meter needle swings in accordance with the strength of the incoming carrier, and may be used also as a tuning indicator. S and dB scales are provided in order to indicate approximate signal strength.

3. CW Reception

Control Positions

FUNCTION	:	SSB/CW
SELECTIVITY	:	Approximately 1 Kc
AVC	:	Off
RF GAIN	:	Turned fully clockwise
AF GAIN	:	Turned to audible noise level
BAND SELECTOR	:	Desired receiving band
BFO	:	0

Reception

As in AM reception, turn the main tuning and band spread controls to match the desired receiving frequency. When the signal is too strong with AVC turned off, adjust RF GAIN to an appropriate level.

Adjust BFO either clockwise or counter-clockwise to obtain an easy-to-listen-to tone.

4. SSB Reception

Control Positions

FUNCTION	:	SSB/CW
SELECTIVITY	:	1 Kc - 3 Kc
AVC	:	Off
RF GAIN	:	Turned fully clockwise
AF GAIN	:	Turned to audible noise level
BAND SELECTOR	:	Desired receiving band
BFO	:	+2 - -2 (i.e. USB or LSB)

Reception

As in AM and CW reception, turn the main tuning and band spread controls to match the desired receiving frequency. For an operator who is not accustomed to SSB reception, it is advisable to turn FUNCTION knob to AM, tune to the center of the SSB signal whose amplitude is characterized by irregular noise, and then switch to SSB/CW. Turn BFO either clockwise or counter-clockwise from 0 gradually, and at a certain point the sound will become clear. Thus adjust the BFO for the clearest sound. When the signal is too strong, the sound may be distorted. In this case, adjust RF GAIN. You will soon become accustomed to the SELECTIVITY and BFO relationship for best SSB reception.

Maintenance

1. Removing the Case

Remove the four rubber soled screws on the bottom, and push the chassis from behind, and the panel and the chassis can be pulled to the front.

2. Replacing the Illuminating Bulb

The bulb used is a Swan-base 8 V bulb. When replacing this bulb, pull out the bulb together with the supporting metal base and exchange.

SCHEMATIC DIAGRAM MODEL SR-165

SCHMATIC DIAGRAM MODEL SR-165

Notes :

1. Rated value of resistors and capacitors :

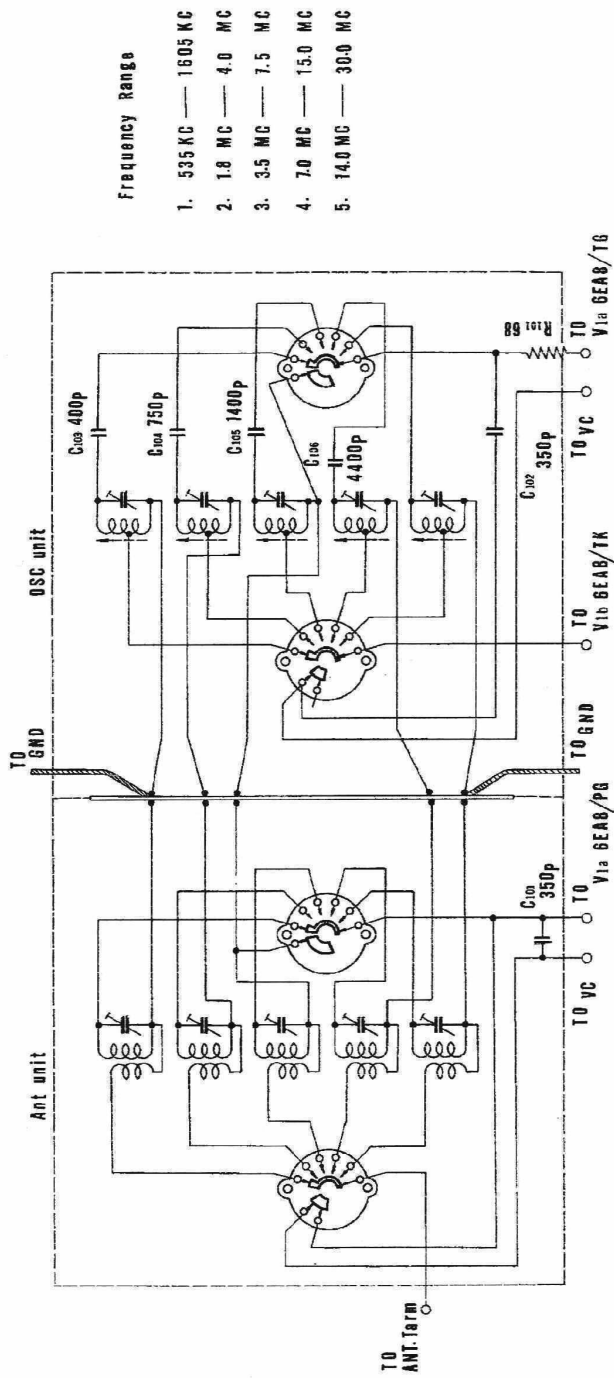
Resistor :			Ohm
	K.	x	10^3
	M.	x	10^6

Capacitor:			F
	μ F	x	10^{-6}
	PF.	x	10^{-12}

2. Position of FUNCTION control is AM

The order is counter-clockwise, i.e., STBY \rightarrow AM

\rightarrow CW/SSB



Frequency Range

1. 535 KC — 1605 KC
2. 1.8 MC — 4.0 MC
3. 3.5 MC — 7.5 MC
4. 7.0 MC — 15.0 MC
5. 14.0 MC — 30.0 MC

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COILPACK

