TRIO

ALL BAND SSB TRANSCEIVER
TS-510

CONTENTS

8. The AGC circuit includes an amplifier to insure such high performance that even the largest input signal can be received without distortion. The AGC circuit also features signal strength meter indication independent of RF gain adjustment.

9. Built-in calibration circuit. This circuit is a 25 kHz multivibrator which permits accurate calibration for every rotation of the dial, such as when making QSY's.

17. Many accessory circuits, such as VOX, PTT, amplifier type AGC, RIT, CAL circuits, bandwidth switching, multimeter which indicates Ip, RF, HV, ALC, and signal strength, AGC switch, terminals for external VFO, ALC, and receiver input and output terminals.

18. The power supply are independently and externally connected to the transceiver. The Model PS-510 (containing speaker) power supply unit is also available.

CIRCUIT DESCRIPTION

The TS-510 transceiver employs a high frequency crystal filter and covers all ham bands from 3.5 ~ 29.7 MHz. Both the receiver and transmitter sections employ the dual conversion configuration. The VFO is solid state and stable.

This transceiver employs printed circuit boards, almost all of which are independently built for individual sections. As shown in the circuit diagram on page 30, each printed circuit board has its own unit number with the resistors, capacitors, and coils having specific 3-digit numbers (see Table 1).

The numbers appearing in the following explanations are all based on this numbering scheme.

Fig. 1 is a block diagram of the TS-510 transceiver.

During transmission, the signals pass through the microphone, mic. amplifier, balanced modulator, buffer amplifier, crystal filter, IF amplifier (common to both receiver and transmitter sections), first mixer, BPF, second mixer, driver, power amplifier, and antenna. ALC is applied to the buffer and common IF amplifier. On the other hand, the received signals are fed through the antenna, RF amplifier, first mixer, BPF amplifier, second mixer, crystal filter, common IF amplifier, IF amplifier, ring detector AF amplifier, and speaker. AGC is applied to the two-stage IF amplifier and RF amplifier.

The TS-510 includes a carrier oscillator, VFO, heterodyne crystal oscillator, 25 kHz marker, and side-tone oscillator. Accessory amplifiers are the AGC, ALC, VOX, and relay amplifiers.

CIRCUITRY COMMON TO BOTH TRANSMITTER AND RECEIVER SECTIONS

1. MICROPHONE AMPLIFIER AND BALANCED MODULATOR (UC1501J)

AF signals fed through the microphone terminals pass through a low-pass filter to eliminate their unwanted high frequency components, supplied to the

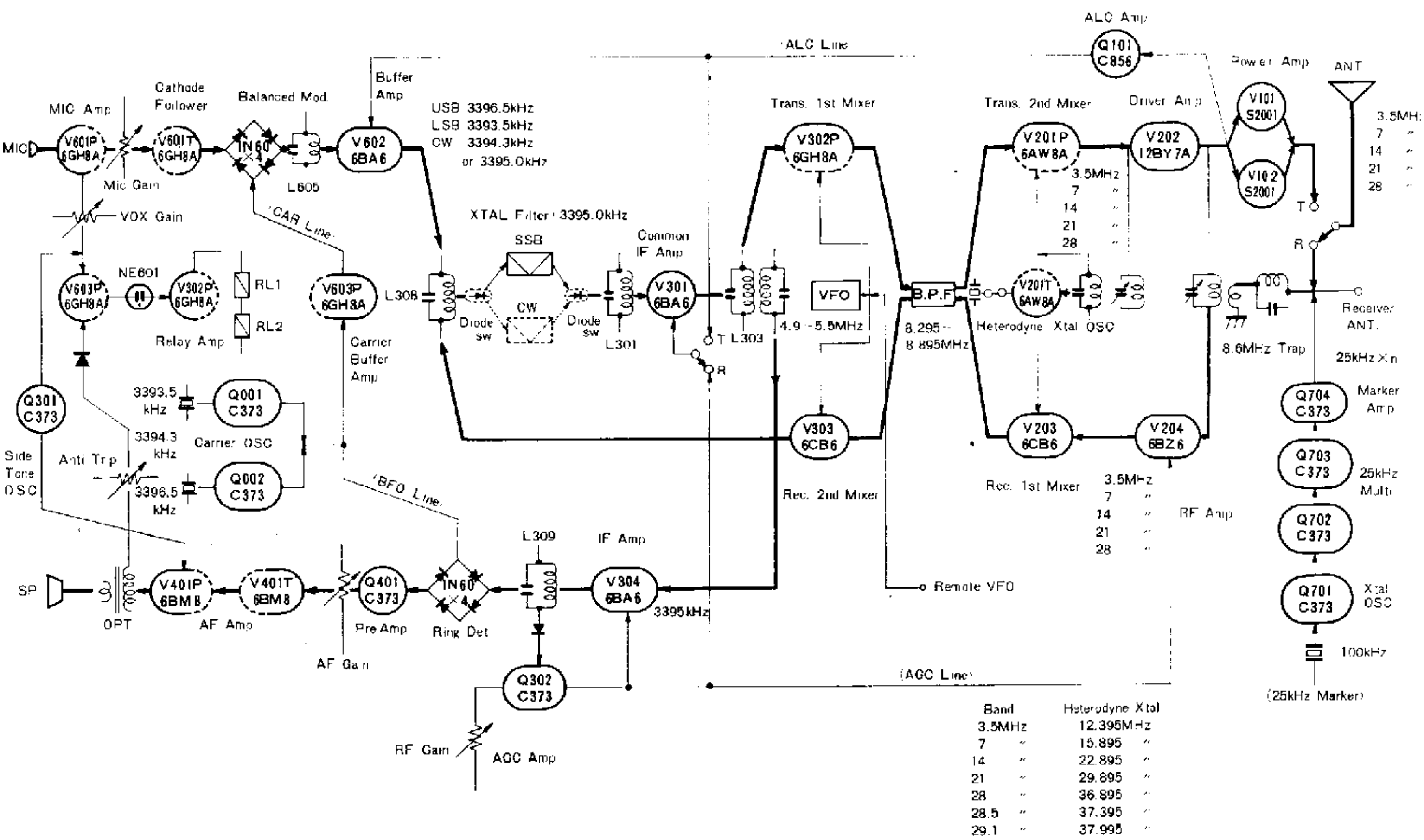


Fig. 1 Block Diagram

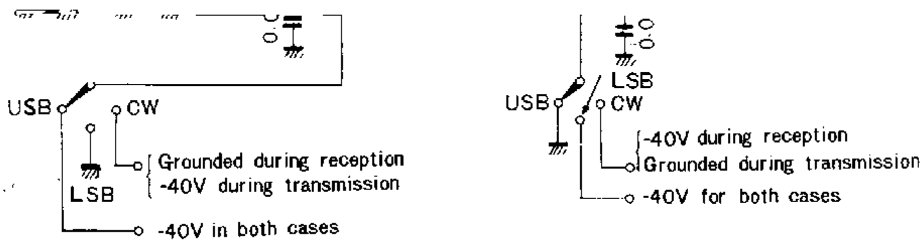


Fig. 2 Carrier oscillator (When the CW filter is equipped and four crystals are installed)

CW filter. A diode switch is provided to switch these two filters. In sets in which only the SSB filter is equipped, the diode switch is unnecessary and is therefore shunted with a jumper wire.

As shown in Fig. 5, the diode switch operates under the principle in which a forward voltage is applied to the two series diodes to turn them on and the voltage drop developed across the resistors at this time applied to the other diodes in the reverse direction to turn them off.

5. IF AMPLIFIER COMMON TO TRANSMITTER AND RECEIVER SECTIONS (UC1204J)

The SSB signal passing through L301 is amplified by the 6BA6 (V301). The output of V301 is then fed to the transmitter 1st mixer from the primary winding of L303 during transmission, or to the receiver IF amplifier from the secondary winding of L303 during reception.

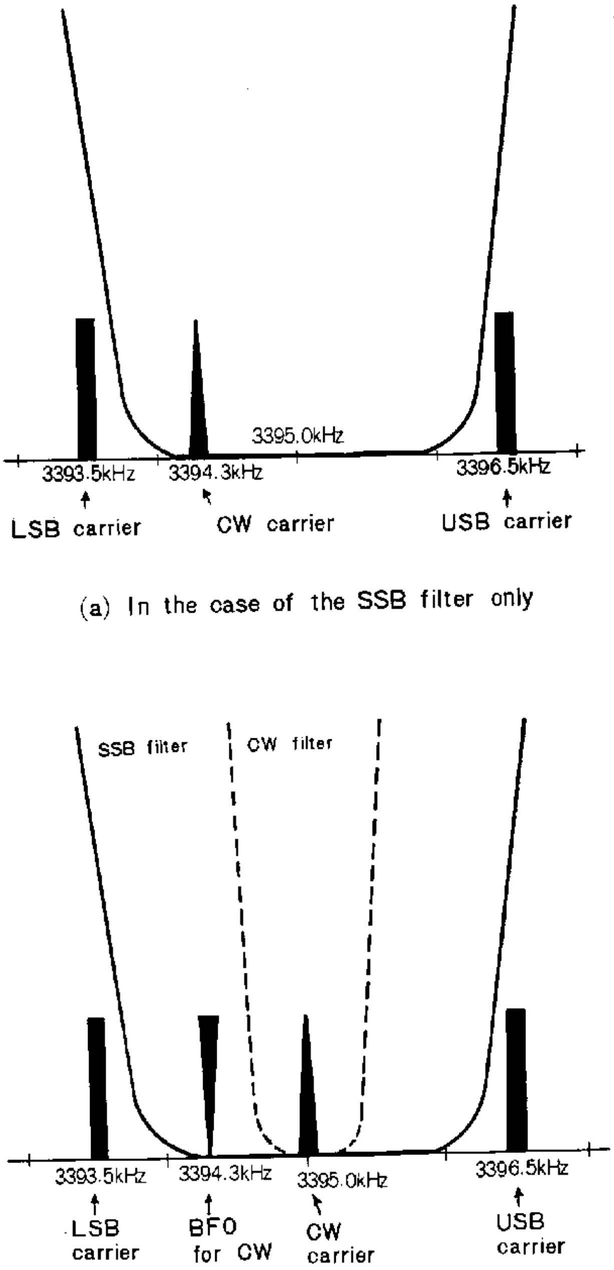
over the entire range of frequency variation.

The VFO has an oscillation frequency range of 600 kHz between 5500 kHz (at 0 deg on the dial) and 4900 kHz (at 600). Solid state components are employed with the oscillator stage using an FET transistor to insure utmost frequency stability. The oscillator circuit used is a Clapp, followed by a one-stage voltage amplifier and two-stage buffer, which guarantees high stability under load flunctuations.

The VFO is completely sealed and all necessary adjustments are already made. Therefore, it is advisable not to open the cover or make any modifications of the exterior since they might result in reduced performance.

The RIT circuit is housed in the VFO box. An RIT voltage is applied from the outside to change the oscillation frequency of the VFO with the dial setting remaining the same.

The circuit to produce this RIT voltage is contained in UC1304J. The voltage can be controlled by RIT VR located on the front panel. (See Fig. 6).



(a) In the case of the SSB filter only

(b) When a CW filter is used

Fig. 3 Carrier and BFO Frequencies for Individual Modes

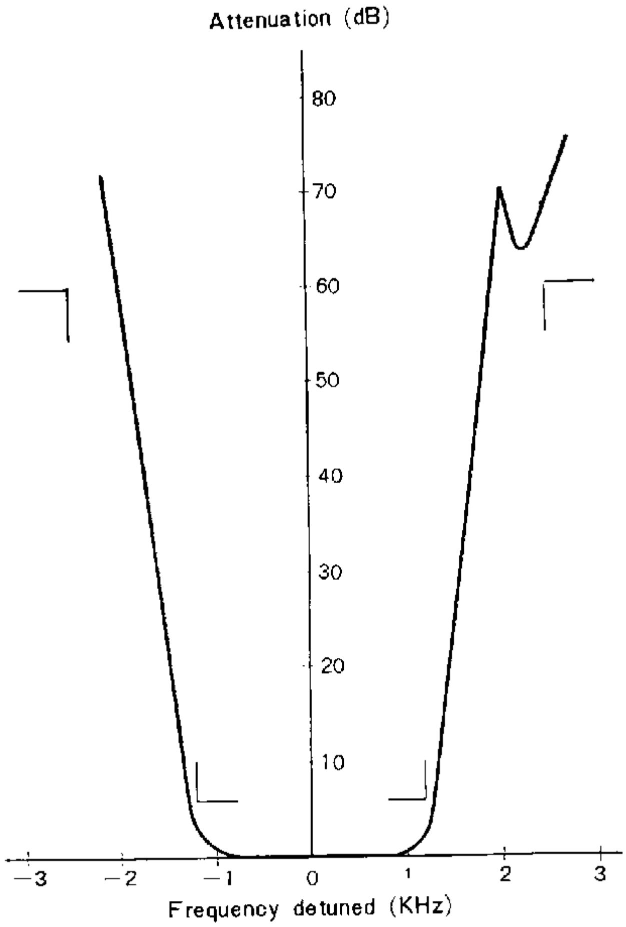


Fig. 4 SSB crystal filter characteristic curve

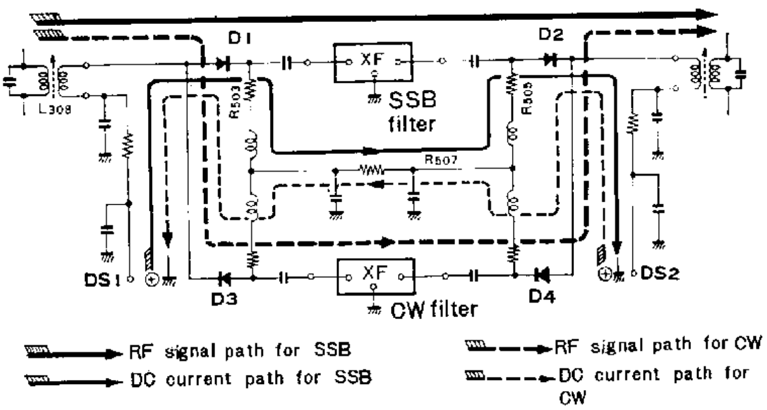


Fig. 5 Operation of diode switch

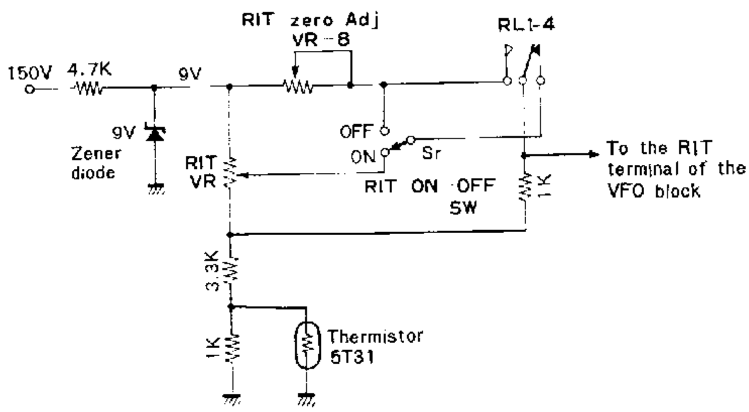


Fig. 6 RIT circuit

[illegible]

frequency by the transmit 2nd mixer is fed to the 12BY7A (V202) and class A amplified to drive the final tubes (S2001 × 2).

[illegible] an SSB signal). Bias voltage for this amount of current is approximately −45 V.

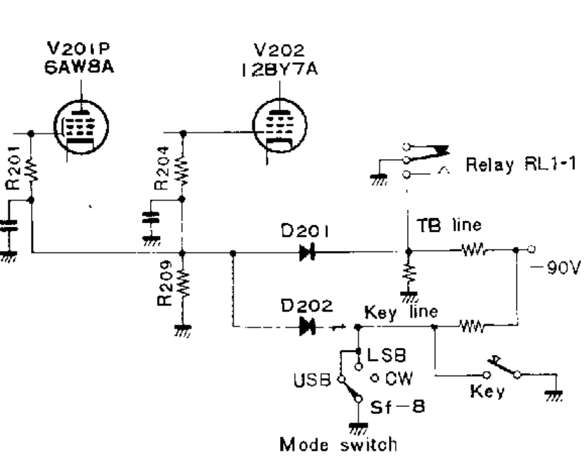


Fig. 7 Block bias keying circuit

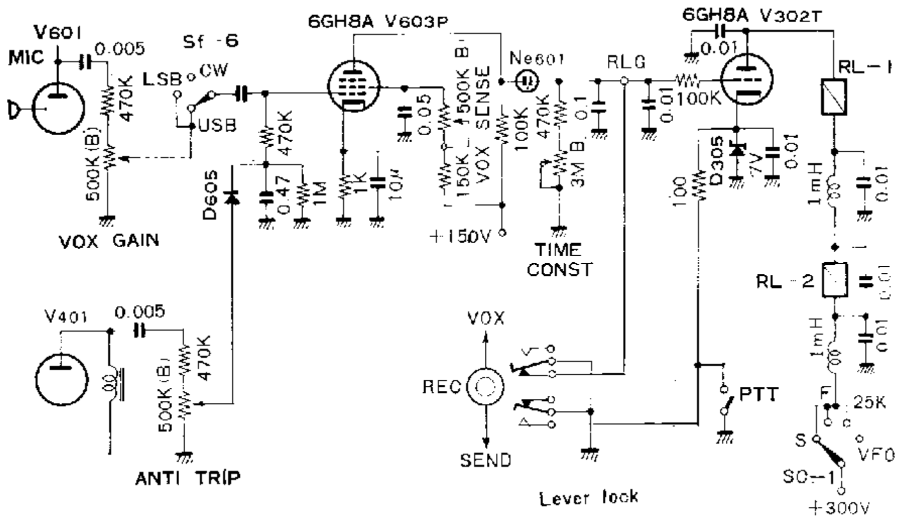


Fig. 8 VOX, anti-trip and relay amplifier

the final amplifier linearity. The ALC time constant has a fast rise and slow decay. The time constant is also designed to be faster for CW than for SSB to facilitate tuning.

This ALC voltage is connected to the external exit terminal and, at the same time, supplied to the buffer amplifier and common IF amplifier to control their gains.

12. VOX AMPLIFIER AND ANTI-TRIP CIRCUIT (UC1501J)

The AF signal supplied through the microphone terminals is amplified by a one-stage microphone amplifier, passed through the VOX gain control, and fed to the 6GH8A (V603P), which amplifies the

Table 2 Relay Contact Allotment

RL 1-1	B	RB (Receiver block bias)
	M	TB (Transmit block bias)
	COM	GND
RL 1-2	B	RC (Receiver Cathode)
	CM	TC (Transmit Cathode)
	COM	GND
RL 1-3	B	AGC
	M	ALC
	COM	V301 grid circuit
RL 1-4	B	RIT VR
	M	Fixed bias
	COM	RIT terminal of VFO
RL 2-1	B	Refer to Fig 9
	M	
	COM	+ terminal of the S-meter
RL 2-2	B	Refer to Fig 9
	M	
	COM	− terminal of the S-meter
RL 2-3	B	REMOTE terminal
	M	
	COM	GND
RL 2-4	B	Receiver input
	M	Transmit output
	COM	ANT terminal

B …… Break contact, M …… Make contact

The anti-trip circuit receives the AF output from the AF final stage (UC1304J), diode rectifies it, and supplies a positive DC voltage to the grid of the VOX amplifier. This voltage causes the plate current of the VOX amplifier to increase and hence the plate voltage drop, which makes the neon tube less dischargable.

13. RELAY AMPLIFIER (UC1204J)

The relay amplifier actuates two relays connected in series. The controlling operations of the relays are given in Table 2. One of their-major functions is to switch the TS-510 between transmit and receive.

Other functions of the relay amplifier are to produce a voltage drop at the cathode of the 6GH8A (V302T) by means of the PTT and Lever Lock switch, and to apply the positive voltage of the VOX circuit to the grid to permit the plate current which actuates the relays to flow. When these controls are removed, the relays are automatically released by reducion of the plate current caused by the Zener diode inserted in the cathode circuit.

14. SIDE TONE OSCILLATOR (UC1204J)

This is an AF oscillator in which the 2SC373 (Q301) produces an oscillation output frequency of approximately 800 Hz. This output is supplied to the AF power amplifier tube (V401P) via VR to drive the speaker.

Since this circuit is used to monitor CW signals, the emitter, feedback circuit, and base voltage are controlled, and the circuit oscillates when the mode switch is set to CW (the emitter circuit is grounded), a key is inserted into the key jack (the feedback circuit operates), and when the key is depressed (base block bias is off).

■ RECIVER SECTION

1. RF AMPLIFIER AND RECEIVE 1ST MIXER (UC1112J)

The signal fed through the antenna terminal passes through the antenna tuning circuit (UC1108J) and enters the 6BZ6 (V204) RF amplifier. The signals amplified by this RF amplifier pass through the RF tuning circuit (UC1109J), and are fed to the 6CB6 (V203) receive 1st mixer built to be mixed with the output of the heterodyne crystal and converted into the 1st IF frequency (8895 ~ 8295 kHz).

L309 and Ring detector, and enters the AGC circuit. The gain of the receive IF amplifier is controlled by the AGC voltage to maintain the a constant IF constant under fluctuations of antenna input level. The IF amplifier circuit does not operate during transmission since the cathode is opened.

4. AGC AMPLIFIER (UC1204J)

The AGC voltage is obtained by rectifying the signal developed across L309 by D304 and amplifying it with the 2SC373 (Q302) DC amplifier. This AGC amplifier produces an AGC voltage having an ideal time constant to permit quick starts and slow release since the impedance of the AGC source is made low by DC amplification and the impedance of the time

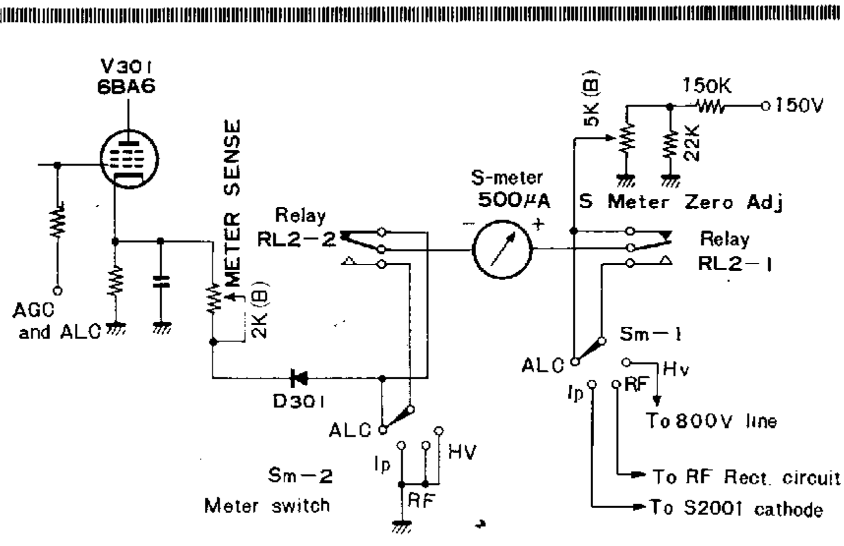


Fig. 9 Meter circuit

[illegible] 8 Ω (low impedance) and AF output is taken from the power supply type connector.

7. 25 kHz MARKER (UC1502J)

All the transistors used in this unit are 2SC373. Q701 oscillates the 100 kHz crystal, whose frequency can be adjusted with the trimmer capacitor (TC701) inserted in the collector circuit. This output serves to synchronize the multivibrator consisting of Q702 and Q703, which generates 25 kHz square waves.

Table 3 Rotary Switch wiring

(a) MODE Switch

Sf-1	Switching of crystal (Q002)
Sf-2	Switching of Q002 Control biases
Sf-3	Switching of Q001 Control biases
Sf-4	Switching of crystal Q001
Sf-5	Switching of ALC time Constant
Sf-6	Switching of VOX
Sf-7	Switching of BM input
Sf-8	Shunting of the Key and side-tone
Sf-9	Diode Switch
Sf-10	

(b) AGC/CAL Switch

Sc-1	Relay of OFF with VFO and CAL
Sc-2	AGC Speed Switching between SLOW and FAST
Sc-3	Beat detector circuit ON
Sc-4	Internal VFO and Marker Power Switch
Sc-5	Remote VFO power Switch

Although the oscillation frequency of the multivibrator can be changed by means of VR701, 25 kHz is obtained with the potentiometer position at approximately the center.

8. SPURIOUS BEAT DURING RECEPTION

The received signals are subjected to spurious beats at certain frequencies due to the relationship between the frequencies of the local oscillator.

The frequencies at which beat interference appears are,

3.5 MHz	3.7367 MHz	(Within the band)
21.0 MHz	21.20 MHz	(Within the band)

Interference at these frequencies is less than 3 dB. Although there is other spurious beat interference, they are less than 0 dB and do not cause any practical inconvenience.

■ OTHER CIRCUITS

1. HEATER CIRCUIT

The heater voltage is 12.6V. The 6.3V tubes used are divided into two groups connected in series. This configuration reduces the current capacity of the heater wires and eliminates the need for voltage balancing resistors which would otherwise be required.

2. METER CIRCUIT

Fig. 9 shows the meter circuit. The AGC and ALC are measured by reading the voltage at the cathode of a 6BA6 tube by means of a bridge circuit, Ip is measured in terms of voltage at the cathode of the 2S001 tubes. These are then displayed on the meter. The RF/HV voltmeter is used as an ordinary voltmeter.

The meter is designed to indicate signal strength during reception and ALC, Ip, RF, and HV during transmission. Switching between these indications is made by means of a relay circuit.

3. MAJOR ROTARY SWITCH CIRCUITS

Rotary switches include the band switch, mode switch, meter switch, and AGC/CAL switch. The operations of the mode switch, and AGC/CAL switch are listed in Table 3.

FRONT PANEL (PHOTO 1)

(1) METER

This is a meter switch. With this switch set to ALC, the meter serves to monitor the driving conditions of the final power tube during transmission. With the switch set to Ip during transmission the meter indicates the plate current of the final power tube (to be more specific the cathode current). At position RF, the meter reads the RF voltage measured at the output terminal of the transmitter section. At position HV, the meter indicates the voltage at the plate of the final power tube during transmission.
This meter serves as an S-meter during reception regardless of the position of the meter switch.

(2) AGC/CAL

This switches between AGC and CAL. AGC (automatic gain control) can be made SLOW or FAST by selecting the time constant during reception. Set the AGC switch to the speed at which the received signals are most stable.
CAL is the calibration circuit, and switches between "25 kHz" and "VFO".
"25 kHz" is a 25 kHz marker whose frequency is produced by frequency dividing the 100 kHz of a crystal and using it to control a 25 kHz multivibrator. This marker is used to calibrate the main dial reading.

VFO is the calibrating circuit used to calibrate the internal VFO and remote VFO (VFO-5D) with each other.

(3) MIC

This is the microphone connector. Hook up a microphone with the accessory plug. Use a high impedance (50 KΩ) dynamic or crystal microphone.

(4) PHONES

This is a headphone jack. Its impedance is 8Ω. A dynamic earphone with a low impedance is suitable, although a crystal type can be used.
When a plug is inserted in this jack, the speaker is cut off and the earphone connected in its place.

25 kHz per rotation. The flange of this dial is disengaged and idles when turned while being depressed toward the transparent scale plate. Calibrate the dial with the 25 kHz marker to make direct reading as fine as 500 Hz possible.

When the scale is disengaged by turning the knob, the dial cannot be rotated but stops at a certain point. Never attempt to turn it beyond this point. The gear teeth or other parts of the mechanism might otherwise be damaged.

(7) AF GAIN

This is the power switch and volume control. AC power is cut off at the extreme counterclockwise position and is switched on at all other positions. AF gain is increased by turning the knob to the right.

(8) PLATE LOAD

This is a dual knob. The inner knob is for adjusting the final power tube plate variable capacitor and the outer knob for turning the loading variable capacitor. This knob is used only for transmission and is not used during reception.

The upper scale corresponds to the plate knob and the lower scale to the loading knob on the panel. The impedance of the load decreases as the knob moves to the right.

(9) DRIVE

This knob serves for driver tuning during transmission and for ANT and RF tuning during reception. Adjust this knob so that a maximum driving power is obtained during transmission and maximum sensitivity is obtained during reception.

(10) RIT

RIT stands for "receiver incremental tuning" and is used to change the frequency during reception. It allows a frequency variation of approximately ±3 kHz without using the main dial.

Photo 2 Rear Panel

properly matched with a coupler. (Refer to Fig. 11)

BAND	L1	L2
3.5MHz	16×2	6
7MHz	14×2	4
14MHz	5×2	3
21MHz	3×2	2
28MHz	2×2	2

Coil diameter 40φ

Fig. 11 Antenna coupler

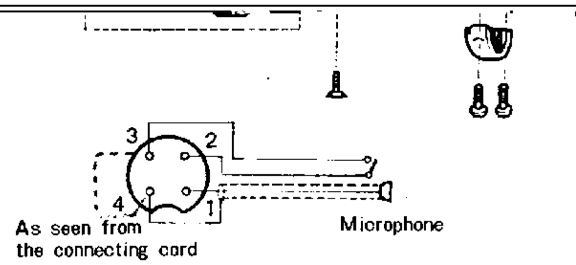


Fig. 13 Microphone cord connections

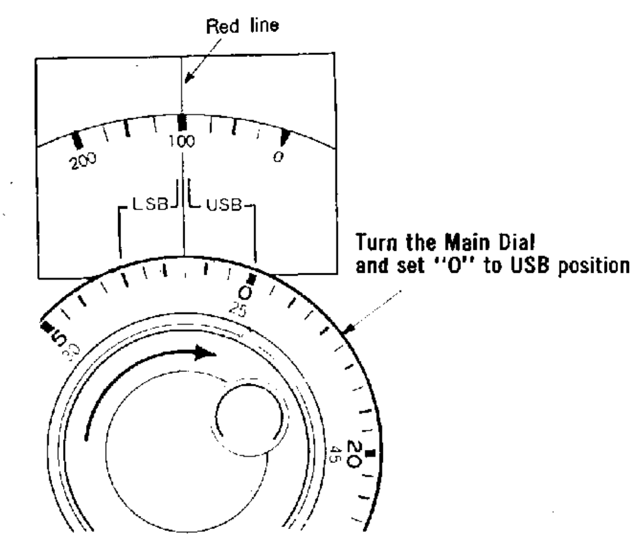


Fig. 14 To Calibrate when MODE switch is turned to the USB position

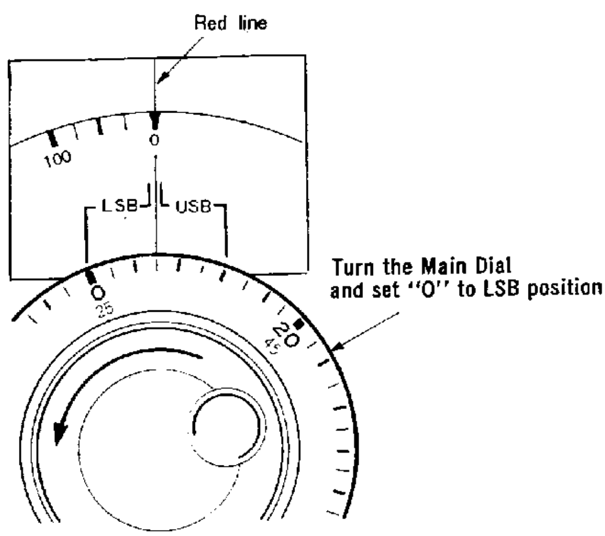


Fig. 15 To Calibrate when MODE switch is turned to the LSB position

(3) VOX

Voice-controlled automatic switching of the transmit and receive modes is possible with this transceiver when SEND-REC is switched from REC to VOX. VOX GAIN control at the top of the chassis should be retarded when the surrounding noise level is high. Changes in supply voltage may sometimes cause sluggish relay action. In such a case, modify the supply voltage to 230V or 250V.

A anti-trip circuit is built-in to prevent speaker response from tripping the relay, and switching the transceiver from the receiving to the transmitting mode. The ANTI-TRIP control located at the top of the chassis should be adjusted so that tripping will not occur. It is undesirable, however, to reduce VOX gain too much since this will result in unreliable tripping. Therefore, the microphone and speaker should be located away from each other and the speaker volume level be kept as low as possible.

TIME CONSTANT controls the discharge time constant of the VOX circuit and regulates the tripping frequency of the relay, which takes place during pauses between speech and vary from individual to individual. Therefore, adjust the time constant to a value which suits the operator. VOX sensitivity can be adjusted with semifixed potentiometer VR601 500 KΩ (VOX SENSE) located on printed circuit board UC1501J.

Use of a uni-directional microphone will make VOX operation even more reliable.

(4) Main Dial Calibration

Calibration of the main dial may be easily performed by setting the zero position of the main dial to the zero of the auxiliary dial plate. For more accuracy, however, the marker signal and calibrator can be used. In this case, set the AGC/CAL knob to 25 kHz and produce a beat with the marker signal. A beat will appear at different frequencies depending upon whether the transceiver is set to LSB or USB.

(a) When the MODE switch is set to USB

Turn the main dial knob clockwise while listening to the beat. The beat frequency will be high at first and then gradually decrease as the main dial is rotated until it become nil. Stop the dial at this zero beat point and set the zero position of the main dial scale to the USB pointer. (Refer Fig. 14)

(b) When the MODE switch is set to LSB

Turn the main dial counterclockwise or the reverse of USB. The beat is similarly high at the beginning, decreases as the dial is turned, and eventually becomes zero.

Calibration procedure is identical to that of USB except that the dial should be set to the LSB pointer (Refer to Fig. 15).

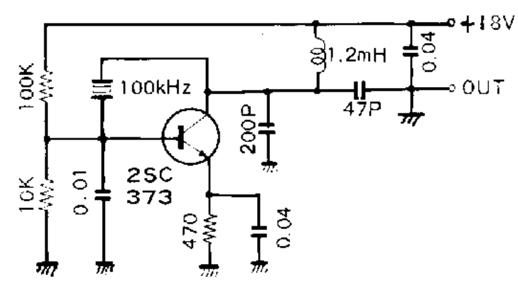


Fig. 16 Marker Crystall Oscillator

Thus, the carrier frequency of both lower and upper sidebands can be read on the dial.

The center frequency of SSB signals is always read at the red pointer. The receive frequency of CW signals can also be read in the same method as for LSB signals. The transmit frequency is always 800 Hz higher than the LSB carrier.

When the CW filter is used, this frequency relationship will change and transmit frequencies can be read at the red point. Receive frequencies can be read by the red pointer when the beat is 700 Hz and will be within ±250 Hz at other best frequencies.

(5) Marker Crystal and Adjustments

The marker crystal is not provided and must be purchased separately. Its specifications are as follows.

Type: HC-13/U
Frequency: 100 kHz
Frequency tolerance: ±0.003%
Specified oscillation circuit: See Fig. 16.

The marker oscillator circuit with this transceiver is already adjusted. The crystal wil oscillate by merely setting the AGC/CAL knob to 25 kHz and inserting the crystal into the socket. However, it may oscillate at a frequency other than 25 kHz when the power source voltage fluctuates.

If this happens, adjust MULTI ADJ (VR701) located on printed circuit board UC1502J inside the chassis so that the oscillation is 25 kHz.

The 25 kHz multivibrator is synchronized with the 100 kHz crystal oscillator. Therefore, it is necessary to match the crystal oscillation to 100 kHz. This adjustment can be accomplished with the ceramic trimmer (TC701).

(6) Remote VFO

The Model VFO-5D is supplied by the manufacturer for use with the TS-510. This is externally connected to the transceiver.

Its major circuitry is identical to the internal VFO in the TS-510. The remote VFO enhances the versatility of the TS-510 when used in conjunction with the built-in VFO.

at the rear of the chassis) so that it does not swing off the scale even with the greatest swing among the bands.

(9) Adjustment of Bias Voltage

The necessity of adjusting the bias voltage arises

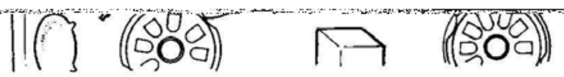


Fig. 17 Installing the CW Crystall Filter

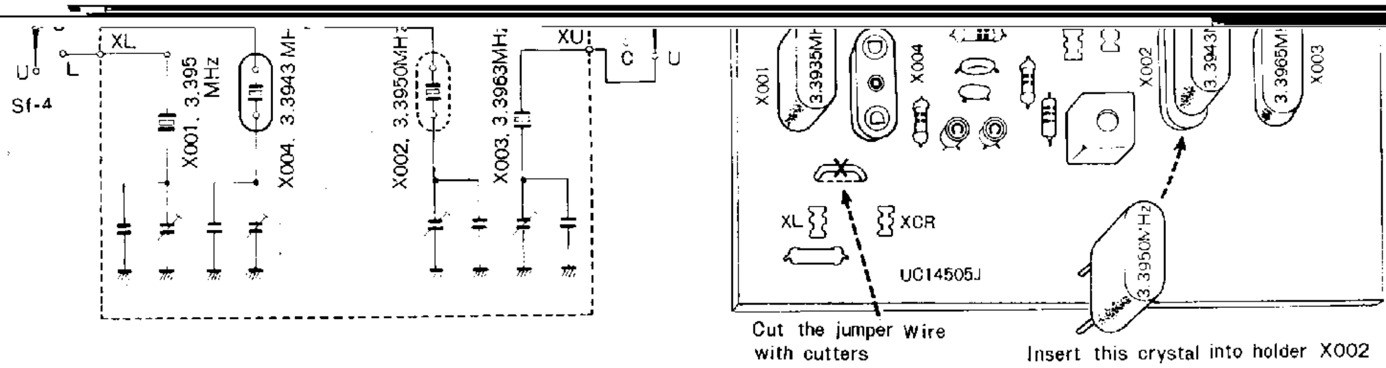


Fig. 18 Installing the crystal

Do not remove the jumper wires with excessive force since this might damage the printed circuits or the board.

This completes the installation of the CW filter. Enjoy CW operation.

2. HOW TO USE THE EXT SWITCH

Remove the blank plate below designation EXT SW at the rear of the chassis.

Install double-pole double-throw slide switch in this hole, the same as the ANT SW.

This switch may used in various ways. One example is to take the output of this transceiver for a 50 MHz converter from the REC ANT terminals. In this case, the final power tube circuit is switched open by this slide switch. The circuit is shown in Fig. 20.

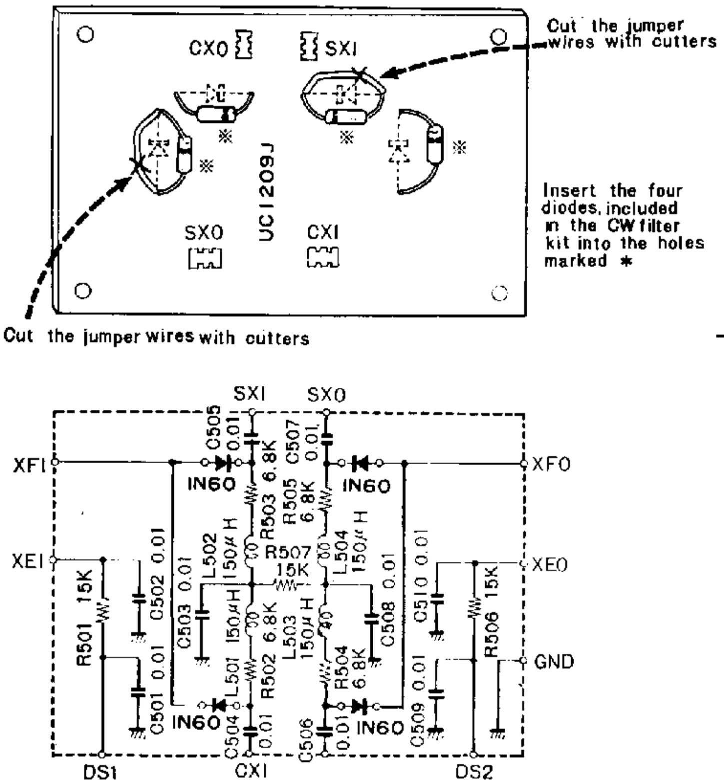


Fig. 19 Installing the diodes

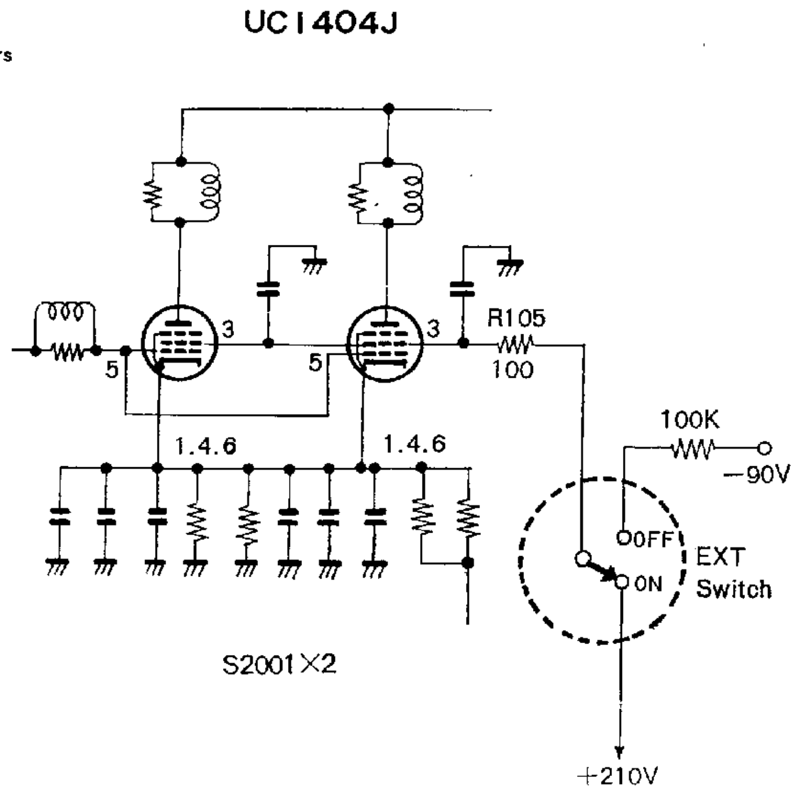


Fig. 20 Example use of the EXT switch

Be Careful of High Voltages.

Some of the TS-510 circuits have extremely high voltages. Adequate precaution is required to avoid accidents.

dividual. Therefore, adjusting methods which can be done with a simple multimeter are presented here. When adjustments prove to be beyond the capability of the available test equipment or difficult troubles occur, your repair shop will handle them for you at costs.

Table 4 Voltage at Individual Electrodes

(Vacuum tubes)

Pin No.		1	2	3	4	5	6	7	8	9	P
V101	T	1.05	(6.3)	200	Same as 1	−50	Same as 1	(12.6)			830
S 2001	R	0.05		210		−65					950
V102	T	1.05	(0)	200	Same as 1	−50	Same as 1	(6.3)			830
S 2001	R	0.05		210		−65					950
V201	T	0	−8	120	(12.6)	(6.3)	4.6	0	150	285	
6AW8A	R	0	−9	120			0	−28	150	300	
V202	T	3	0	0	(12.6)	(12.6)	(6.3)	290	150	0	
12BY7A	R	0	−29	0				300	150	0	
V203	T	−27	0	(6.3)	(12.6)	150	150	0			
6CB6	R	0	1.7			145	65	0			
V204	T	0	150	(0)	(6.3)	290	150	0			
6BZ6	R	0	1.1			300	80	0			
V301	T	−3.1	0	(6.3)	(12.6)	140	140	0.8			
6BA6	R	0	0			130	130	1.8			
V302	T	75	0	90	(12.6)	(6.3)	150	2.5	0.8	0	
6GH8A	R	230	−28	150			150	−19	7	0	
V303	T	−55	−27	(6.3)	(0)	150	150	0			
6CB6	R	0	2			150	85	0			
V304	T	0	0	(0)	(6.3)	150	150	230			
6BA6	R	0	0			130	130	1.3			
V401	T	50	14.0	0	(6.3)	(0)	200	200	0	150	
6BM8	R	0	14.0	0			220	207	1.3	90	
V601	T	150	0	13	(0)	(6.3)	27	0.5	48	30	
6GH8A	R	150	0	13			47	0.5	48	30	
V602	T	−3	0	(12.6)	(6.3)	150	140	6			
6BA6	R	0	0			150	150	39			
V603	T	150	0	45	(6.3)	(0)	60	1.3	3.5	0	
6GH8A	R	150	0	45			60	1.3	0	−29	

(Transistors)

		E	C	B	
Q101	T	−50	−4	−50	
2SC856	R	−65	0	−65	
Q001	T	0	18	−9	※(A)
C373	R	3	18	3.2	※(A)
Q002	T	2.9	18	+3.2	※(A)
C373	R	0	18	−2.8	※(A)
Q301	T	0.85	18	1.4	
C373	R				
Q302	T	−27	−0.12	−28	
C373	R				
Q401	T	0.35	10.5	0.9	
C373	R				
Q701	T	0.25	18	0.85	※(B)
C373	R				※(B)
Q702	T	0	2.3	−1.0	※(B)
C373	R				※(B)
Q703	T	0	8.1	−2.8	※(B)
C373	R				※(B)
Q704	T	0	4.0	−1.5	※(B)
C373	R				※(B)

1. * (A) : MODE switch - CW
 * (B) : AGC/CAL switch - 25kHz
 T : At maximum transmit power
 R : In the absence of receive signals
 ( ) : Indicates AC voltages

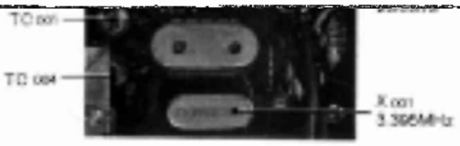


Fig. 21 Carrier Unit

Fig. 22 IF Block

Fig. 23 Coil Pack

Fig. 24 BM Block

mers (TC601) and VR (VR602) on the BM block. Then switch the MODE to USB and readjust so that the same amount of carrier suppression is obtained at both LSB and USB.

(2) Neutralization of final power amplifier stage

Tune the driving and final power stages with the MODE set to CW (28 MHz).

Remove the voltage from the screen grid and anode of the S2001 tubes, and measure the output at the antenna terminal with a high sensitivity voltmeter. Adjust the neutralizing capacitor (TC1, attached to the final power tube shielding box) so that the output is minimized. A receiver which is capable of receiving the 28 MHz band can be used in place of a high sensitivity voltmeter.

Remove the high voltage from the screen grid and anode before disconnecting the wiring.

3. TROUBLES RESULTING FROM MALADJUSTMENT

(1) Carrier oscillator

The transmit output will not be delivered when the oscillation stops. Nor is a beat produced during reception. Therefore, SSB and CW cannot be received.

Carrier frequency changes may result in a double beat, higer reproduced SSB tone, or reduced output if the CW filter is used but not tuned exactly to 3395.0 kHz.

(2) IF stage and coil pack

Receive sensitivity and transmit output drop. Malfunctioning of the crystal heterodyne oscillator makes transmit driving and reception of the amateur bands impossible.

(3) 8.6 MHz trap

Trouble appears as interference in the receive 1st IF frequency (8.895 ~ 8.295 MHz) at the 7 MHz band.

(4) Carrier balance

The RF voltmeter does not return to the zero position even in the absence of an SSB signal. This can be observed when all the stages are finely tuned and the set is in the CW mode. If this signal is received the carrier cannot be received.

AF input, do not open in the absence of an RF input, or operation is delayed.

(7) RIT

Tuning the transmit frequency to that of the associated station becomes impossible.

(8) Balance with the final stage

The plate dissipation of the S2001 tubes increases and the service life of the tubes is shortened or distortion and hence splutter increases.

(9) S-meter

If the zero point is on the negative side of the scale, deflection will become sluggish or in the worst case it does not deflect at all.

(10) Drop power source voltage

Receive sensitivity and transmit output decrease.

Caution is necessary when there are large line voltage fluctuations.

Voltage drop of the 150 V line of the voltage regulated power supply in the PS-510 also appears as the identical trouble. When it goes higher, the service life of the vacuum tubes will be reduced.

4. MAINTENANCE

(1) Removal of the case

Top cover: The top cover can be removed in the upward direction by removing the two black screws on top and the four large and small decorative screws on each (right and Left) side.

Bottom cover: The bottom cover can be removed by removing the nine screws from the bottom of the chassis. The Hyzex legs need not be removed, as they are not connected to the chassis.

A Phillips screwdriver must be used to remove the screws, while a coil may be used for the decorative screws.

Prepare a container in which the (removed) screws may be kept, to avoid misplacement.

(2) Vacuum tubes and transistors

Do not use the S2001 tubes under a voltage of higher than 1000 volts or under detuned conditions since the will increase plate dissipation beyond the rated value and hence reduce their service life.

recommended.

SPECIFICATIONS

RECEIVE AND TRANSMIT FREQUENCIES:	80 meter band 3.5 ~ 4.000 MHz 40 meter band 7.0 ~ 7.300 MHz 20 meter band 14.0 ~ 14.35 MHz 15 meter band 21.0 ~ 21.45 MHz 10 meter band A 28.0 ~ 28.5 MHz B 28.5 ~ 29.1 MHz C 29.1 ~ 29.7 MHz
TYPE OF EMISSION:	SSB (A3J), CW (A1)
RATED INPUT TO FINAL STAGE:	160 W at 3.5 ~ 21 MHz 120 W at 28 MHz
ANTENNA INPUT IMPEDANCE:	50 ~ 75 Ω
CARRIER SUPPRESSION:	Less than −40 dB
SIDEBAND SUPPRESSION:	Less than −40 dB
MICROPHONE IMPEDANCE:	50 KΩ (high impedance)
TRANSMIT FREQUENCY CHARACTERISTIC:	300 ~ 2700 Hz (−6 dB)
RADIATION OF UNWANTED COMPONENTS:	Less than −50 dB
RECEIVE SENSITIVITY:	0.5μV, S/N ratio of 10 dB at 3.5 ~ 21 MHz 1.5μV, S/N ratio of 10 dB at 28 MHz
IMAGE RATIO:	More than 50 dB
IF INTERFERENCE:	More than 50 dB
FREQUENCY STABILITY:	Within +2 kHz 60 minutes after the power switch is turned on. With in 100 Hz after 30 minutes.
SELECTIVITY:	SSB: More than ±1.2 kHz (at −6 dB) Less than ±2.4 kHz (at −60 dB) CW: More than ±250 Hz (−6 dB) Less than ±750 Hz (at −60 dB) Note: Selectivity values in the CW mode applies to a transceiver with the CW filter used.
AF OUTPUT:	More than 1 watts (with 10% distortion)
RECEIVER OUTPUT IMPEDANCE:	8 Ω for both speaker and headphones
POWER CONSUMPTION:	315 watts at maximum output of reception (When the PS-510 is used)
VACUUM TUBES AND TRANSISTORS:	14 vacuum tubes, 2 FET's, 13 transistors, and 29 diodes
DIMENSIONS:	330 (W) × 180 (H) × 345 (D) mm (13″ W, 7″ H, 13⅝″ D)
WEIGHT:	9.5 kg (20.9 lbs)