TRIO

ALL BAND SSB RECEIVER

JR-310

OPERATING MANUAL

TRIO

ALL BAND SSB COMMUNICATIONS RECEIVER JR-310

CONTENTS

SPECIAL FEATURES

1. The JR-310 is a high-performance standard SSB receiver typical of the SSB age.

2. It is a newly developed addition to our popular 300 Series which will further enhance your ham shack.

3. Its design perfectly matches the TX-310 transmitter which is also available from our company. Combined, these two components will permit dependable transceiver operation on all amateur bands from 3.5 MHz to 28 MHz.

4. The JR-310 employs an exceptionally stable VFO composed of two FET's and two transistors like the deluxe transceiver TS-510.

5. Precision double-gear dial mechanism and perfectly linear variable capacitor permit accurate frequency readings below 1 kHz. The 25 kHz per rotation dial assures easier and faster SSB demodulation.

7. This receiver covers all amateur bands between 3.5 MHz and 29.7 MHz. It will also receive the standard WWV signal.

8. The JR-310 is a double superheterodyne with a crystal-controlled first local oscillator and a VFO which serves as the second local oscillator.

9. Independent tuning of the 1st IF is provided for minimum cross modulation. A Mechanical filter in the 2nd IF accounts for its excellent selectivity. The receiver's design allows for mounting an additional 10AZ type mechanical filter for even narrower bandwidth selectivity. Sure-action diode switching scheme is adopted for selection of the desired mechanical filter.

10. Diode ring demodulator circuit with crystal controlled BFO assures smooth, intelligible SSB reception. Provisions are available for rapid changeover of LSB/USB reception.

11. Built-in circuits include S meter, ANL for AM and a calibration circuit switch. Space is provided for addition of a marker oscillator calibrator and or voltage regulator circuits. Use of an additional crystal permits addition of an extra receiving band.

12. RIT circuit enables shifting only the receiving frequency during transceiver operation without altering the frequency of your transmitter. It can be used as a spreader when the receiver is used independently.

13. Combined with the TX-310 transmitter and SP-10 speaker, the JR-310 all-band communications receiver should up-grade the efficiency and appearance of any ham shack.

CIRCUIT DESCRIPTION

The block diagram of this receiver is shown in Fig. 1.

The receiver is a double-superheterodyne in which the amateur bands from 3.5 MHz to 29.7 MHz are converted to 5.955 MHz - 5.355 MHz by the first mixer, then reconverted to 455 kHz by the second mixer.

1. RF AMPLIFICATION

This stage selects and amplifies weak, incoming signals to the necessary operating level. It also improves signal to noise and image rejection ratios. A high gm, remote cut-off 6BZ6 is employed which provides stable and ample gain. An all-band coil pack is used in the tuning circuit which provides excellent selectivity and S/N ratio on every band.

AGC voltage is fed to the control grid of the RF tube for automatic gain control which contributes to the smooth reception of SSB in particular. When the set is used in combination with the transmitter, C bias can also be inserted into the AGC circuit through the remote control terminals for standby operation of the receiver. (A potentiometer for RF gain control is placed in the cathode circuit.)

2. FIRST MIXER & FIRST LOCAL OSCILLATOR

This circuit converts the 3.5 MHz — 29.7 MHz ham bands and the 15 MHz WWV signal to the first IF frequency of 5.955 MHz — 5.355 MHz. A low-noise, high-gain, grid-feed type pentode is used here for the mixer. The local oscillator is crystal-controlled for all amateur bands to eliminate frequency drift and assure complete stability. Heterodyning is achieved on the upper side with the local oscillator frequency higher than the receiving frequency. (See Fig. 1.) This permits dial readings to be made in the same direction on the same scale.

The IF TUNE control on the front panel (See Fig. 2) enables independent tuning of this mixer's tank circuit which results in excellent cross modulation and S/N characteristics.

3. SECOND MIXER AND VFO

The 2nd Mixer converts the 5.955 MHz — 5.355 MHz 1st IF frequency to the 455 kHz 2nd IF. Heterodyning is achieved on the lower side. The VFO employs a FET 3SK22 Clapp oscillator cir-

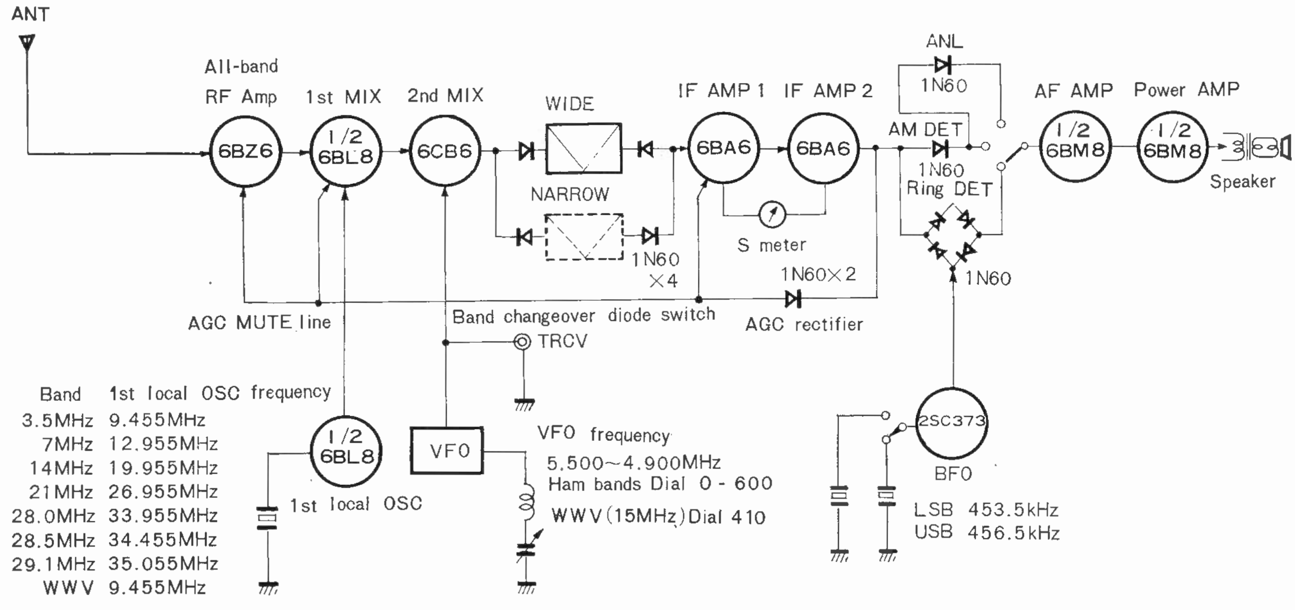


Fig. 1 Block diagram of JR-310

cuit and is followed by a voltage amplifier and two buffer stages. This helps to maintain good stability against load fluctuations.

A precision double-gear dial mechanism and frequency-linear variable capacitor are used in this VFO. They assure easy tuning and accurate frequency readings in graduations of 1 kHz, and through a 25 kHz range per complete rotation. The VFO assembly has been preadjusted and hermetically sealed at our factory and its interior should not be tampered with.

4. RIT CIRCUIT

RIT is an abbreviation for Receiver Incremental Tuning which makes it possible to shift the oscillation frequency of the VFO without moving the main dial. The circuit elements are housed in the VFO assembly and are placed in operation through the application of an appropriate external voltage to the variable capacitor.

Since the VFO frequency is identical to that of the local oscillator supplying the 1st mixer in the TX-310 transmitter, transceiver operation together with it (See Fig. 3) is possible by using the receiver VFO in common. During such transceiver operation, the RIT feature will permit you to follow with your receiver any frequency drift of the other party's transmitter without shifting the frequency of your own transmission. During your transmission the TX-310 relay switches out the RIT circuit, thus maintaining the original transmission frequency. (See Fig. 4)

When the receiver is used independently, the RIT circuit can be used as a spreader.

5. IF AMPLIFICATION

Two stages of IF amplification are used em-

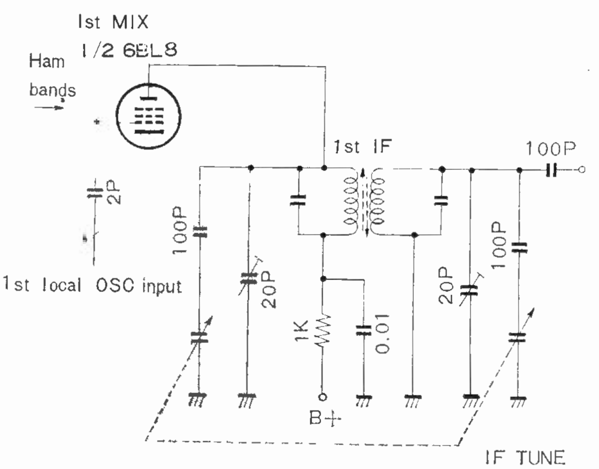


Fig. 2 IF TUNE Circuit

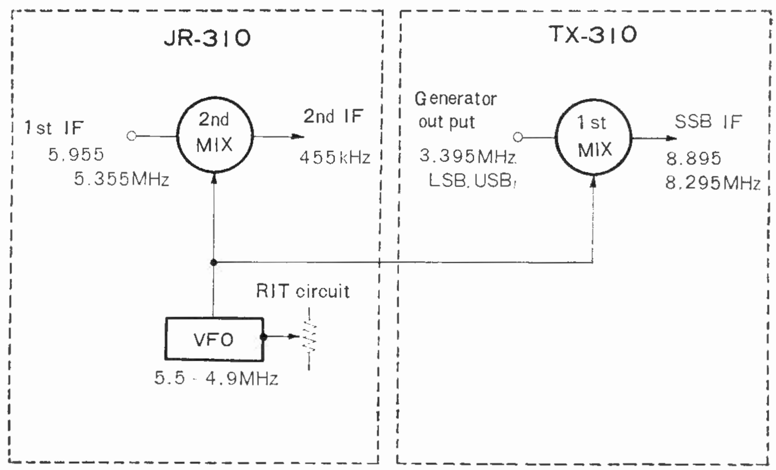


Fig. 3 Transceive operation

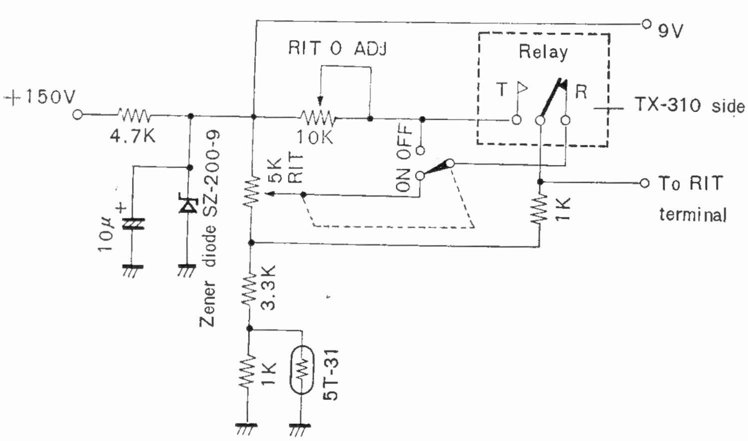
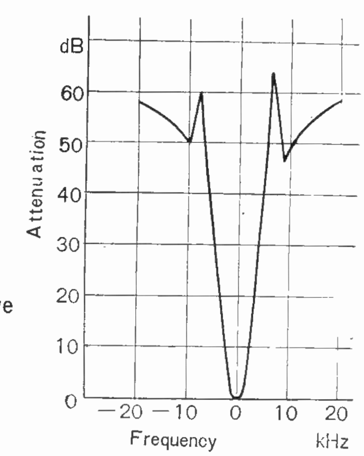


Fig. 4 RIT circuit

Fig. 5
Mechanical filter characteristic curve



ploying two 6BA6 tubes and a mechanical filter to provide good gain and excellent selectivity so that interference from closely adjacent signals can be cut off effectively.

AGC voltage is induced into the 1st IF amplifier to provide for automatic gain control.

Space has been provided in the 2nd IF amplifier stage to accommodate an additional narrower-band mechanical filter. Mechanical filter selection is achieved by a diode switch which consists of two pairs of 1N60 diodes. Switchover is accomplished by the application of a proper bias voltage to the diodes, which turns on or off one pair of diodes at a time and places the desired filter in closed position. The operation of the switch is illustrated in Figure 6.

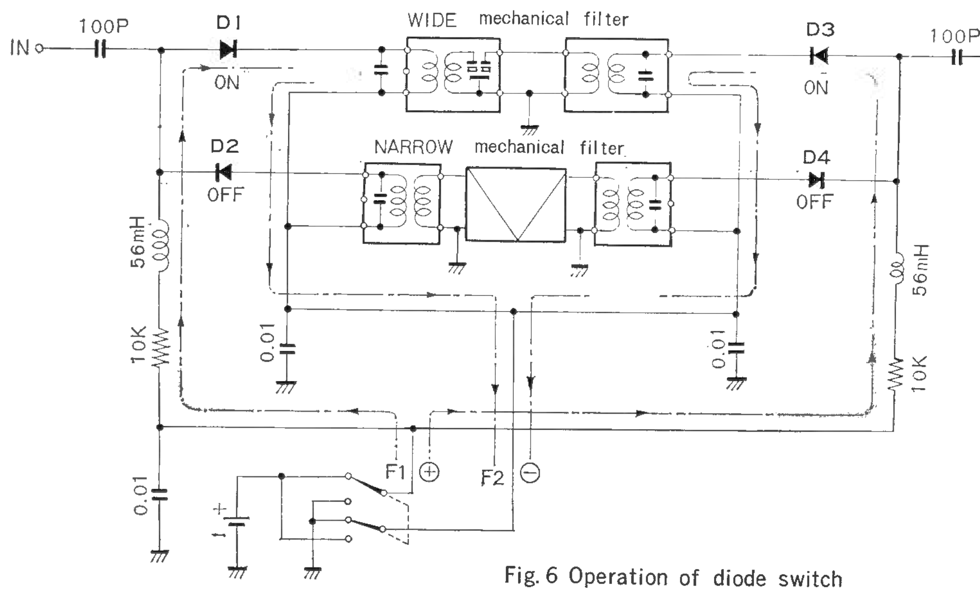
6. S METER CIRCUIT

The "S" meter is connected between the cathodes of the two IF amplifier tubes and it is adjusted with the zero adjust potentiometer to "O" under no signal conditions. At this point the two cathodes are in balance and no current flows through the meter.

Since AGC voltage is fed only to the first IF stage and not to the second, an incoming signal results in a drop in the plate, as well as the cathode current of the first stage only. This destroys the balance between the two IF cathodes, causing current to flow through the meter to indicate signal intensity.

7. AGC AND MUTE CIRCUIT

The negative voltage obtained after rectifica-



(1) Current flows as indicated by arrows through DI and D3 when F1 is+ and F2 is—. This switches WIDE Mechanical Filter in ON position.
NARROW filter will be OFF since no current flows through D2 and D4 because of reverse bias.

(2) Conversely, current will flow in reverse when F1 is — and F2 is+placing the NARROW filter at ON and WIDE filter at OFF.

Fig. 6 Operation of diode switch

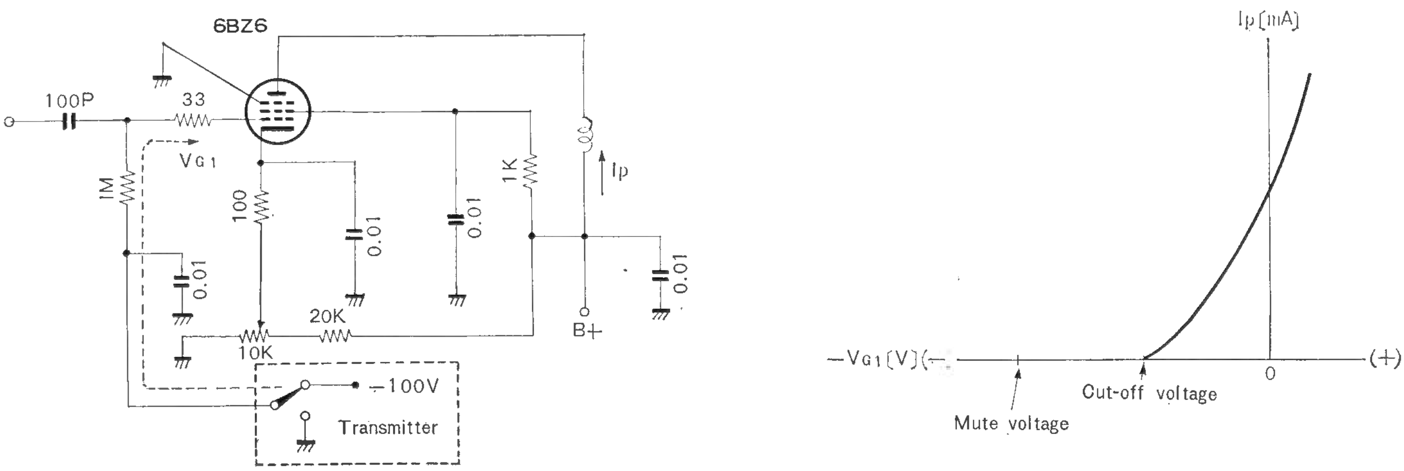


Fig. 7 Stand-by operation by MUTE circuit

tion by the two 1N60 diodes is used as the AGC supply voltage. It is supplied to the grids of the RF and 1st IF amplifier tubes. An increase in signal strength results in an increase in negative bias, thus decreasing the gain of these two stages. Conversely, weak signals cause greater amplification, resulting in maintenance of a constant receiver output level, without cross modulation, regardless of incoming signal fluctuations.

C bias can also be inserted into the AGC circuit through the REMOTE connector for standby operation of the receiver.

This special muting circuit is provided in addition to the conventional standby switching system of shuting off B supply. When this receiver is used in conjunction with the TX-310 transmitter, the –100V "C" bias supply that is required to operate his standby circuit is supplied from the transmitter through the REMOTE terminal.

8. DETECTION

AM detection is accomplished by the use of a 1N60 linear diode detector. AM ANL is used in combination with this detector.

ANL is achieved through the use of a 1N60 diode series type automatic noise limiter circuit. When a pulse type interference accompanies an incoming signal, this diode operates in cut-off position for very brief time intervals and acts as a gate to shut out undesirable noise peaks. Thus, it is very effective in limiting pulse type interference.

A ring demodulator circuit is used for smooth SSB and CW detection. It has been specially designed to be distortion-free regardless of signal intensity.

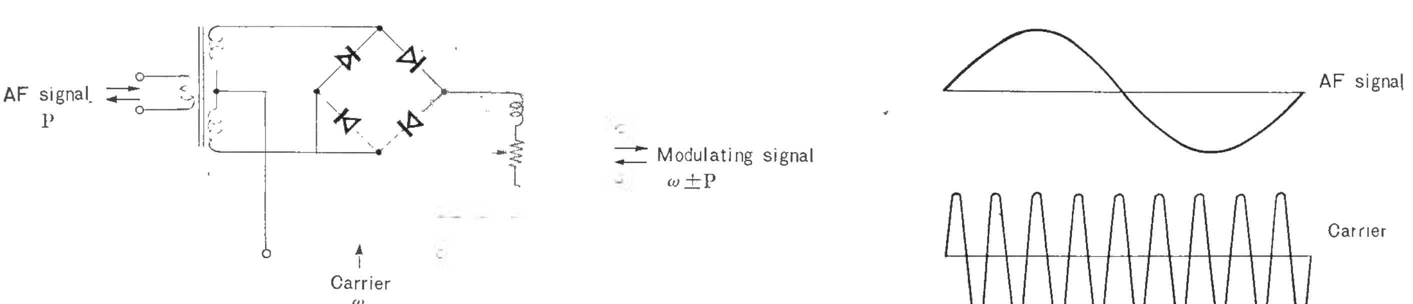
Since the ring circuit permits reverse action, it is also used as a ring modulator in the TX-310 transmitter. (See Fig. 8)

SSB detection is achieved by feeding into this ring demodulator circuit the IF output as the sideband intelligence and receiver supplied BFO output as the carrier since there is no carrier in an SSB signal.

A crystal-controlled oscillator with its high frequency stability has been chosen for the BFO to ensure smooth intelligible SSB demodulation. It supplies a frequency of 456.5 kHz for USB and 453.5 kHz for LSB with respect to the center frequency of the 2nd IF which is 455 kHz. This is because of the transfer of sidebands as a result of upper heterodyning in the first mixer. The compositions of AM, LSB and USB and the transfer of sidebands are shown in Figs. 9 and 10 respectively.

9. AUDIO AMPLIFICATION

A dual-purpose, triode-pentode 6BM8 tube is used for audio amplification. The triode section is used as a voltage amplifier and the pentode section for power amplification to obtain a maximum power output of 1 watt. 8-ohm impedance terminals for speaker connection and 500 ohm impedance terminals for connecting recording equipment, anti-trip circuits, etc., are provided, as well as a headphone jack.



While supplying carrier constantly, feed modulating wave to right side, and AF signal appears from left side. So the circuit can be used as detector.
If AF signal is fed from left side, modulating wave appears from right side. So the circuit can be used as modulator.

Fig. 8 Operation of Diode Ring Demodulator

Use a 4-16 ohm, permanent dynamic speaker without an output transformer and a low impedance dynamic type headphone.

Available from TRIO are the SP-10 speaker designed specifically for use with this receiver and the HS-4 headphone designed for use with communications equipment.

10. POWER SUPPLY

The JR-310 has a built-in power supply which furnishes 210V at 150mA. Utilizing a full-wave, center-tap silicon diode rectifier circuit with capacitor input filters, it supplies a high quality DC voltage to every receiver stage. A stabilizer diode is used to regulate the highly stabilized 9 volt supply required by the VFO, as shown in Figure 4. When this receiver is used for transceiver operation in combination with the TX-310 transmitter, a more stabilized voltage is supplied from the TX-310 to the VFO and 1st local oscillator.

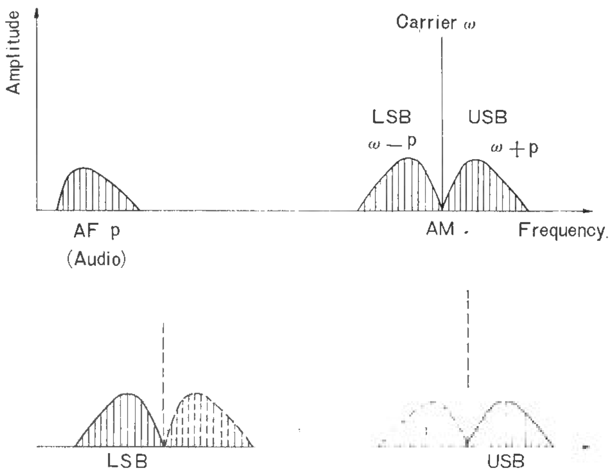


Fig. 9 Compositions of AM, LSB and USB

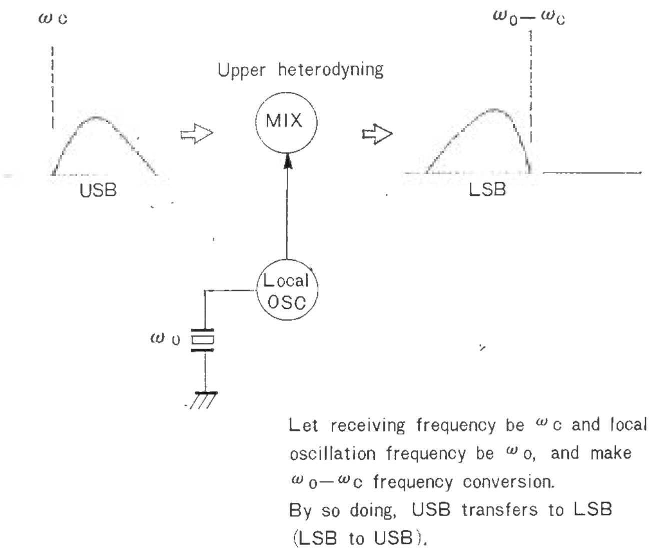


Fig. 10 Transfer of SSB

CONTROLS AND THEIR FUNCTIONS

* FRONT PANEL (See Photo 1)

(1) POWER

Push this switch in to turn receiver ON. Push it in again to turn it OFF.

(2) FUNCTION

This switch is set to the desired receiving mode as follows:

(a) LSB

This position is for SSB reception of LSB. LSB is used for 3.5 MHz and 7 MHz bands in accordance with international practice.

(b) USB

This position is for SSB reception of USB. USB is used for bands higher than 14 MHz. Be sure to use the correct LSB or USB mode. Otherwise SSB demodulation will not be possible.

CW telegraph reception is possible at either LSB or USB position.

(c) STAND BY

This position suspends receiver operation for temporary standby, by opening the B supply and without turning the power supply completely off.

(d) AM

This position is for general AM reception. SSB voice at this position will hardly be intelligible. So switch to LSB for frequencies lower than 7 MHz and to USB for frequencies higher than 14 MHz.

(e) AM ANL

Set switch to this position when static, automobile ignition noise, or pulse type interference hampers AM reception.

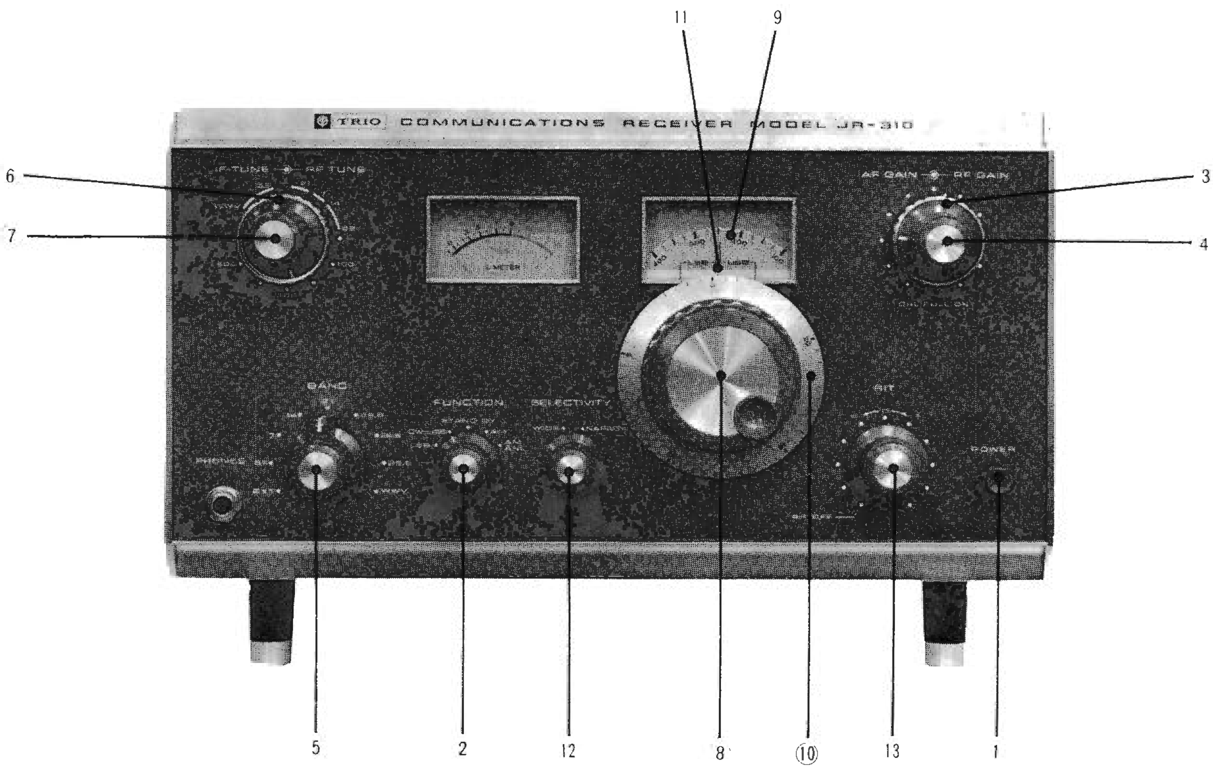


Photo 1 JR-310 Front Panel

(3) RF GAIN

The outer knob controls a variable resistor for sensitivity adjustment. Turn it fully clockwise at maximum sensitivity position for ordinary reception. In certain cases where very strong radio waves from a local station may saturate the receiver, however, it should be rotated counter clockwise to an appropriate position.

(4) AF GAIN, CAL

The inner knob controls the receiver's volume level, clockwise rotation increasing sound volume, and vice versa. This control also has a switch which is turned ON when the knob is pulled forward. It can be used later when a calibration marker oscillator is built into this receiver.

(5) BAND

All the ham bands ranging from 3.5 MHz to 29.7 MHz, including 15 MHz WWV and EXT bands are divided into 9 channels. Selection of any desired channel is controlled by this Knob.

(6) RF TUNE

The outer Knob tunes the RF amplifier. Adjust it so that maximum sensitivity is obtained near the division of a desired receiving band. It should be retuned for each band.

(7) IF TUNE

The inner knob tunes the IFT of the first mixer. First select a desired station using the VFO, then adjust this knob so that maximum sensitivity is obtained. Since it has 600 divisions, adjust it in such a way as to follow the divisions 0 through 600 of the dial plate of the VFO.

(8) VFO MAIN DIAL

A desired band can be received through a range of 600 kHz. This knob covers a range of 25 kHz a rotation and facilitates the selection of SSB stations. The dial stops at the extremities of the 0 to 600 kHz divisional range. Do not rotate the dial beyond these points. Otherwise there may be a danger of damaging the double gears.

(9) DIAL PLATE

Placed inside the panel window, it is a disc type scale plate having divisions 0 to 600. It rotates with the main tuning knob. The plate is graduated in black and red at intervals of 25 kHz.

(10) MAIN DIAL

This is a knob flange pressure-fitted to the main tuning knob. It is graduated at 500 Hz intervals covering 25 kHz in one rotation. Held in place by a spring, this flange can be slip-adjusted for calibration purposes by pressing it toward the acryl pointer plate and turning the knob.

(11) DIAL GAUGE

The acryl plate has three gauges: center red line is for CW, left black line is for LSB, and right black line is for USB. The divisions between LSB and CW and USB are at 1.5 kHz intervals. An accurate frequency reading can be made through integration with the main dial (10).

(12) SELECTIVITY

This is the IF bandwidth selector. It permits selection of WIDE or NARROW bandwidth, whichever provides best reception, depending on receiving mode and interference conditions.

(a) WIDE

The second IF stage has a built-in, high-performance mechanical filter. It passes all modes of reception, AM, SSB and CW, with a proper bandwidth when SELECTIVITY is set at WIDE.

(b) NARROW

If a 10AZ type mechanical filter is added in the 2nd IF for which space is made available, setting SELECTIVITY to NARROW will provide sharper selectivity for SSB and CW work. The NARROW circuit is shorted out if the Mechanical Filter is not installed.

(13) RIT — Receiver Incremental Tuning

This switch is used when the receiver is combined with the Model TX-310 transmitter for transceiver operation.

Set RIT to OFF and determine a desired QSO frequency with the main dial. The transmitting and receiving frequencies will then coincide. If the frequency of the party station should shift during QSO, it can, of course, be followed by rotating the main dial. This, however, will result in an undesirable change of your transmission frequency. Turning RIT from OFF to 0, and tracking the party station with it will keep your transmitting frequency unchanged.

Therefore RIT 0 which is equivalent to RIT OFF should be the position used at the start of every QSO so that you can be ready to follow any frequency drift of the other station by manipulating RIT. This circuit is automatically switched off by the relay circuit of the TX-310 transmitter during your transmissions, so that RIT need not be turned off.

However, set RIT to OFF when this receiver is used independently. RIT may also be used effectively at such times as a spread dial.

* REAR PANEL (See Photo 2.)

(1) A. E.

These are antenna and earth terminals. An antenna with an impedance of 50 to 70 Ω is ideal for use with this receiver but antennas with other impedances may of course be used.

(2) EXT. ANT

This is a spare slot provided to permit connections to coaxial cables. A 3C2V or 502V coaxial connector can be mounted here if necessary.

(3) OUTPUT 0, 8, 500

These are AF output terminals. Connect the speaker to 0 and 8. 8 is the 8 Ω output terminal and 500 is the 500 Ω output terminal.

(4) GND

This is an earth terminal used to connect the receiver electrically to the earth. Be sure to make a complete earth connection in order to use the receiver under the best condition, as well as to avoid any danger from electrical leakage.

(5) REMOTE

This is used to make connections to a transmitter. Connection can be made easily to the TX-310 or TX-88D. The ANT, MUTE, ANTI-TRIP and other circuits are connected through this REMOTE socket.

(6) TRCV

Use this terminal when combining the receiver with the Model TX-310 transmitter for transceiver operation. The VFO output is supplied from the receiver to the transmitter, and the stabilized voltage for the VFO and the RIT auto changeover circuit is supplied from the transmitter to the receiver.

(7) S. ADJUST

This is the zero adjust variable resistor of the S meter. With the receiver in operating condition, adjust this variable resistor without connecting the antenna until the S meter points to 0.

(8) FUSE

The fuse will blow when there is excessive current flow as a result of trouble, so, be sure to trouble-shoot before replacing. Sometimes a fuse may fail by itself. To replace, turn FUSE cover counter-clockwise and remove blown fuse. Always use a 2A glass enclosed fuse when replacing.

(9) AC

Insert the plug into an AC 110 — 120V/220 — 240V 50/60 Hz outlet.

(10) 115 — 230V Power Selector

Set this switch properly according to the line voltage.

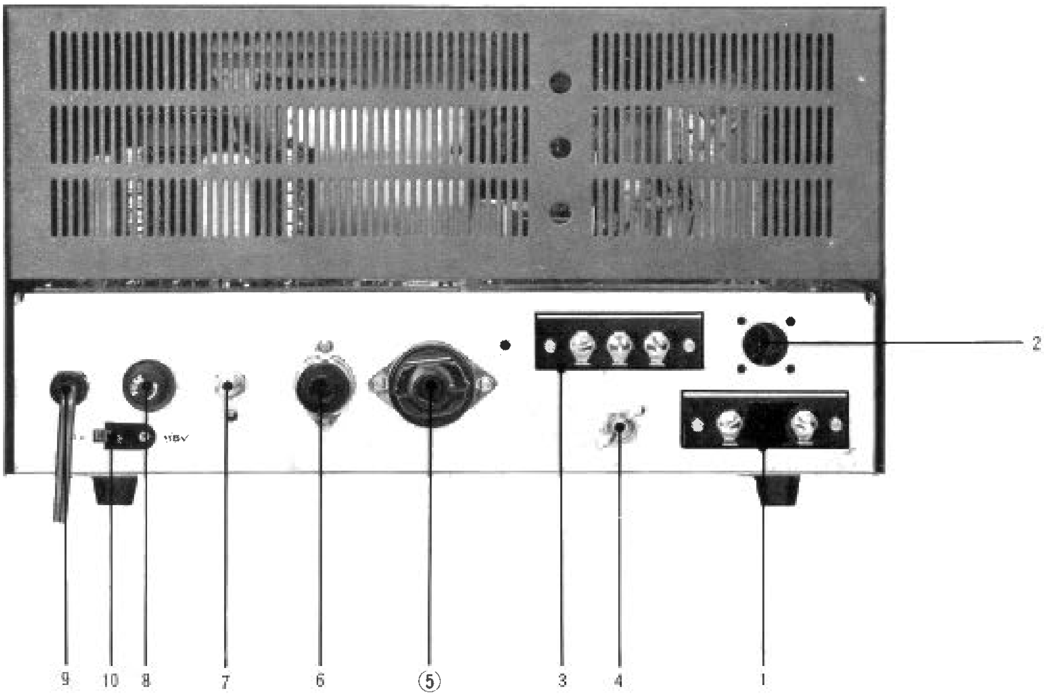


Photo 2 Rear Panel

OPERATING INSTRUCTIONS

1. ANTENNA

It is imperative to use a good antenna to enable the receiver to work at the highest efficiency.

The vertical-or inverted-L-type antennas are the easiest to set up. Most amateur stations use one antenna for both transmission and reception. An antenna designed for transmission can be used unchanged for quality reception. Dipole or Yagi antennas are also popular among amateur stations. Do not forget to make complete earth connections in order to ensure stable reception and prevent the danger of electrical leakage. Fig. 11 shows examples of antennas.

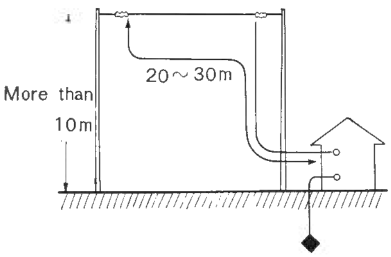
2. RECEIVER CONNECTIONS

Connect the antenna earth and speaker as shown in Fig. 12. When the receiver is used independently, be sure to keep the REMOTE and TRCV plugs attached in their sockets. Otherwise the receiver will not operate.

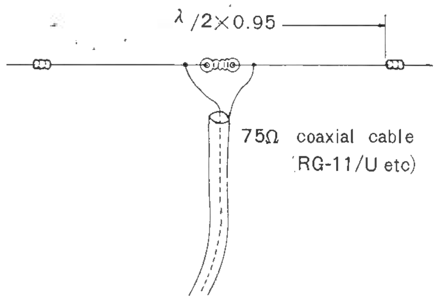
Fig. 13 shows connections for combining the receiver with the Model TX-310 transmitter for transceiver operation.

3. HOW TO RECEIVE

Operate the knobs according to Section on CONTROLS AND THEIR FUNCTIONS.

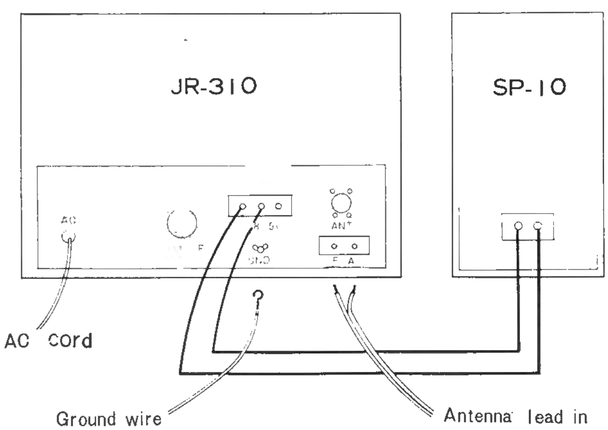


Long wire Antenna



Dipole antenna

Fig. 11 Examples of antennas



Connect speaker to OUTPUT terminals 0 and 8, connect earth to GND, and connect dipole antenna to ANT terminals A and E. (Connect vertical antenna to A.) Insert attached sockets to REMOTE and TRCV terminals.

Fig. 12 Antenna, earth and speaker connections

(a) Push POWER in to turn the power supply on.

(b) Set BAND to a desired band.

(c) Rotate RF GAIN fully clockwise to maximum sensitivity position.

(d) Adjust AF GAIN to proper sound volume.

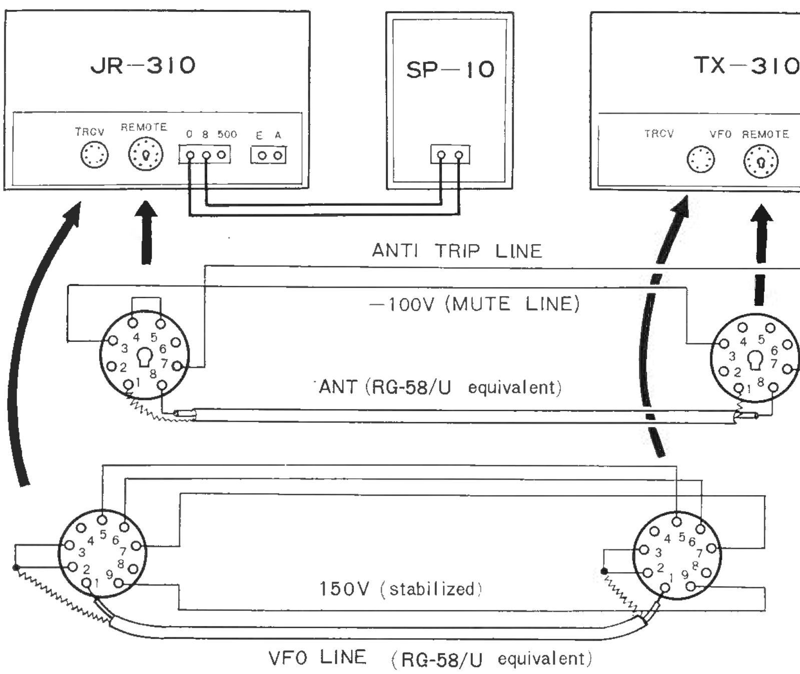
(e) Rotate RF TUNE near division of desired band and carefully adjust further for maximum sensitivity.

(f) After selecting a desired station with the main dial, rotate IF TUNE to a higher sensitivity position.

(g) When the type of reception is SSB, set FUNCTION to LSB for 3.5 to 7 MHz band and USB for frequencies higher than 14 MHz. Use either LSB or USB for telegraph reception. Set FUNCTION to AM ANL if pulse type noise hampers telephone reception.

(h) Keep SELECT at WIDE to use the built-in mechanical filter. Set SELECT to NARROW if you have added a 10AZ Type mechanical filter and there is excessive jamming.

(i) The VFO dial permits the direct reading of 1 kHz in each band. Remember not to misread USB and LSB of dial gauge when receiving SSB. (Note) During transceiver operation, the VFO power supply is delivered from the transmitter. Therefore, the receiver does not operate until the power switch of the transmitter is turned on. Consequently the receiver ceases to operate if the power switch of the transmitter is turned off. Do not forget to turn off the power switch of the receiver.



(Note) 1. Connector (plug) connections are when pins are faced toward you as shown below.

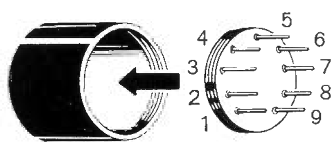


Fig. 13 Interconnecting with the TX-310 Transmitter

ACCESSORIES CIRCUIT

1. MECHANICAL FILTER

The JR-310 has a high-performance built-in compact mechanical filter. For higher selectivity, however, it is possible to add a 10AZ Type Mechanical filter. These two mechanical filters can be switched over by a diode switch and an optimum selectivity can be obtained according to the condition of jamming.

The built-in mechanical filter is connected to WIDE, while the added 10AZ Type Mechanical filter is to be connected to NARROW.

The printed circuit board on which these mechanical filters are located, is specially designed so that the removal of these filters will make it possible to mount 10AZ Type Mechanical filters instead. You can expect a higher grade of operation by connecting an SSB 10AZ Type Mechanical filter to WIDE and CW filter to NARROW. Engineering information is shown in Fig. 14.

2. CALIBRATION CIRCUIT

(1) The calibration circuit consists of a marker oscillator which employs a stable crystal oscillator circuit to calibrate the dial of the receiver accurately. Commonly-used crystals are 100 kHz, 500 kHz and 1 MHz. For the ham bands, a 3.5 MHz crystal can be used effectively.

A marker consisting of a 25 kHz multivibrator added with a 100 kHz crystal oscillator, makes fine calibration possible at the intervals of 25 kHz. The JR-310, as shown in Fig. 15, has space for accommodating this calibration circuit and is already equipped with an ON-OFF switch for this circuit. So mount the circuit if necessary. As to the marker unit with a multivibrator, call

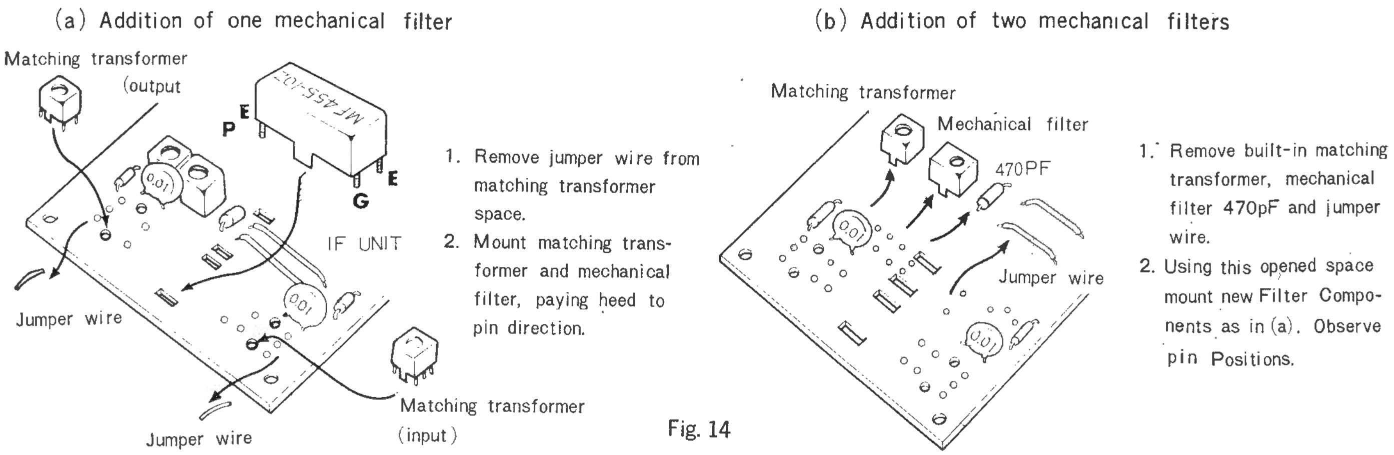


Fig. 14

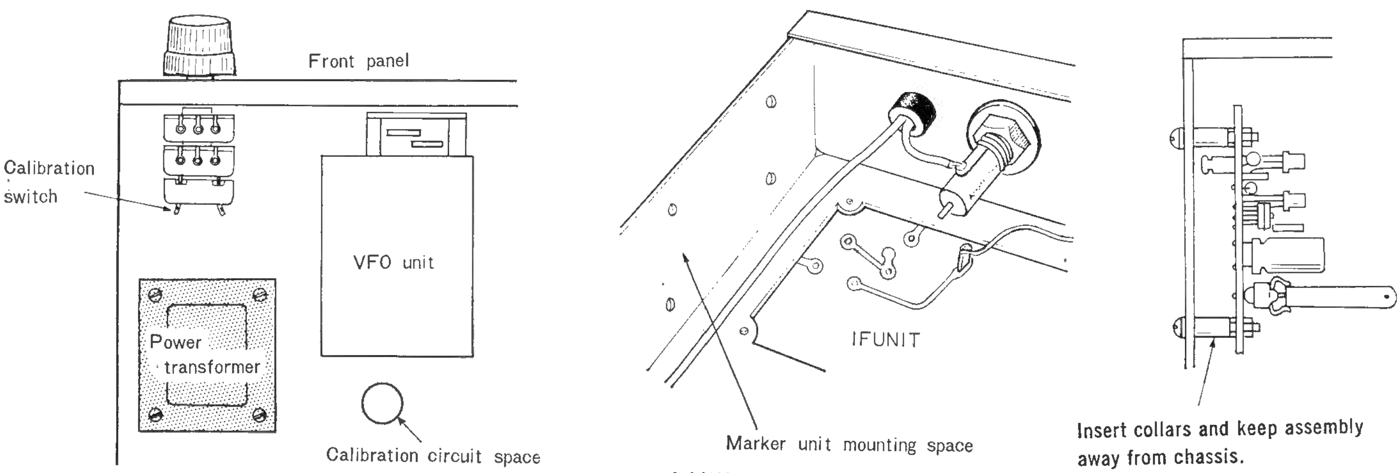


Fig. 15 Addition of Marker circuit

your nearest TRIO dealer. The circuit diagram of the marker unit is shown in Fig. 16. Fig. 17 shows an adjustment-free oscillator circuit anybody can build into the receiver as a simplified calibration circuit.

If you use an HC-6U or FT-243 type 3.5 MHz crystal oscillator unit, you can receive not only 3.5 MHz but also 7.0 MHz, 14.0 MHz, 21.0 MHz and 28.0 MHz higher harmonics. Therefore, it is possible to calibrate the 0 point of the dial for each band. If you use a 500 kHz crystal instead of a 3.5 MHz one, calibration is possible at two points, 0 and 500 of the dial. Derive the marker power supply as shown in Fig. 18.

(2) How to Calibrate

(a) USB

Rotate the main dial knob clockwise while listening to beat note. The beat note which at first is as at a high frequency will gradually be reduced to zero as the knob is rotated. Hold the dial at that point and adjust the 0 of the scale plate of the main dial to the dial gauge USB. This completes USB calibration.

(b) LSB

Rotate the main dial counter-clockwise. The beat note will be reduced from a high frequency to zero. Hold the dial at that point and set the 0 of the scale plate of the main dial to LSB.

For SSB, both LSB and USB read the carrier point. The center frequency of SSB is shown by the red line on the dial gauge. See Fig. 19. CW reception is possible at either LSB or USB. The carrier frequency is the frequency read at the zero beat point.

WWV, unlike other ham bands, does the first mixer heterodyning on the lower side, the converted frequency being produced by subtract-

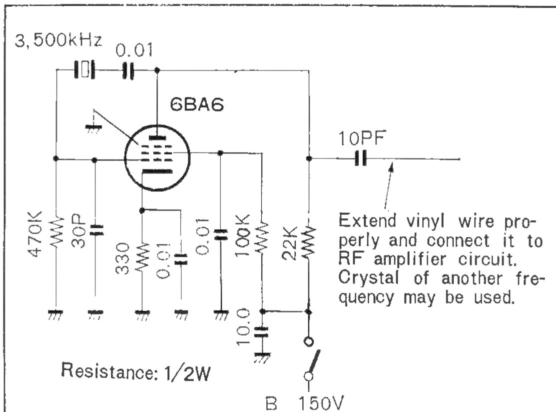


Fig. 17 Calibration circuit

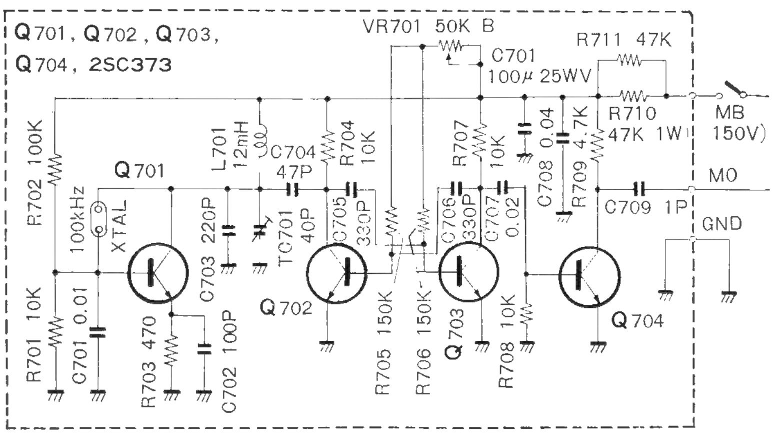


Fig. 16 ↑

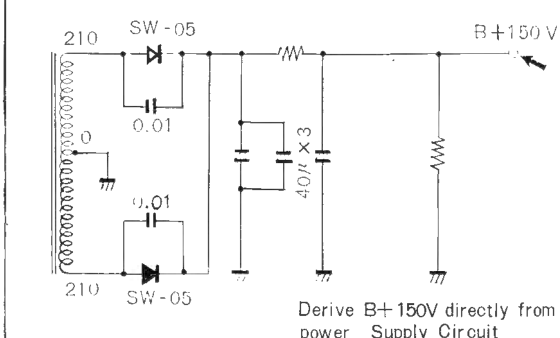


Fig. 18 Marker oscillator power supply outlet

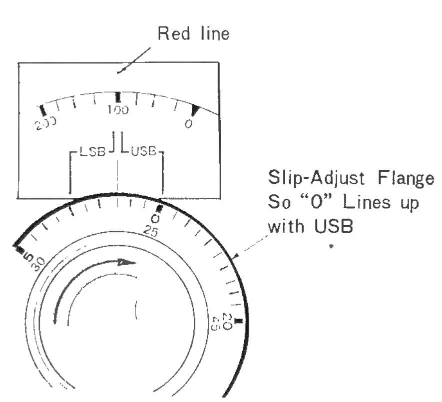


Fig. 19 (A) Calibration Point when FUNCTION is Set to USB

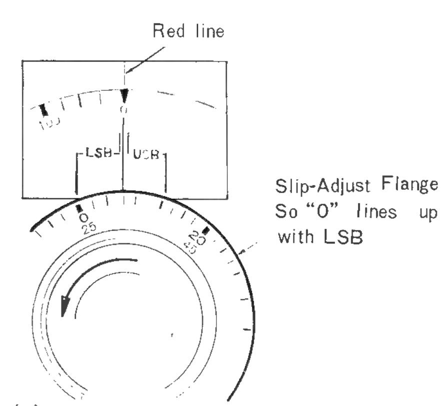


Fig. 19 (B) Calibration Point when FUNCTION is Set to LSB

ing the local oscillation frequency from WWV's 15 MHz. So note the relationship between USB and LSB is reversed only in this band. WWV is received at the 410 kHz point of the dial.

(3) COAXIAL CONNECTOR

The rear chassis has a space for a coaxial connector used as the antenna terminal. Fasten a coaxial connector here with screws and wire the lead to the antenna input.

(4) EXT CHANNEL

The coil pack has room for the addition of an extra channel for any desired frequency between 3.5 and 30 MHz with a width of 60 kHz. That is the EXT channel. To add this EXT channel, an OSC coil and a crystal oscillator unit for the first local oscillator are required. The frequency of the first local oscillator is determined by the receiving frequency desired. Since the first IF of this receiver is 5.955 MHz at point 0 of the dial, the sum of the first IF frequency and the desired receiving frequency is the frequency of the first local oscillator. The method for determining the local oscillation frequency will be explained taking the 27 MHz citizen's band as an example.

First local oscillation frequency = 27.0 + 5.95 = 32.955 MHz.

So the crystal oscillator must be resonant at 32.955 MHz. Reception between 27.0 to 27.6 MHz is possible by the use of this unit.

Calculate your desired frequency as described above. The specifications for the crystal oscillator unit are shown in Fig. 20.

The coil pack has two sets of tuning coils; low-band coils which are tuned to frequencies from 3.5 to 14 MHz by a BC two-gang variable capacitor and high-band coils which are set to be in resonance with frequencies from 14 to 30 MHz. So the EXT wiring varies with the desired receiving frequency. The wiring information is given in Fig. 21.

The coil pack has a total of six wafers. Of these, "a" wafers through "d" are for ANT and RF switchover, while "e" and "f" are for OSC switchover. If the wafer pins are numbered No. 1 through No. 6 as viewed from the top, the non-wired No. 2 pins are for EXT. So wire the pins as shown in the drawing. When you wind the OSC coil yourself, note that the coil pack has a built-in 15 PF capacitor, which must be taken into consideration when winding a coil to resonate.

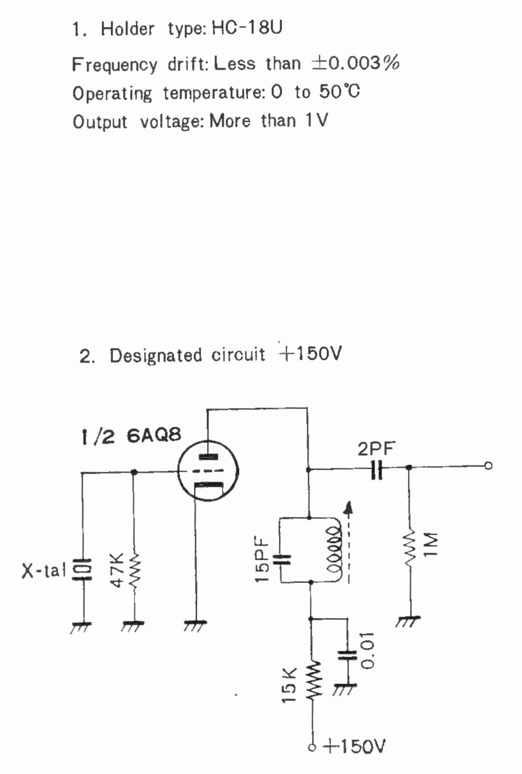


Fig. 20 Specifications for EXT channel crystal oscillator units

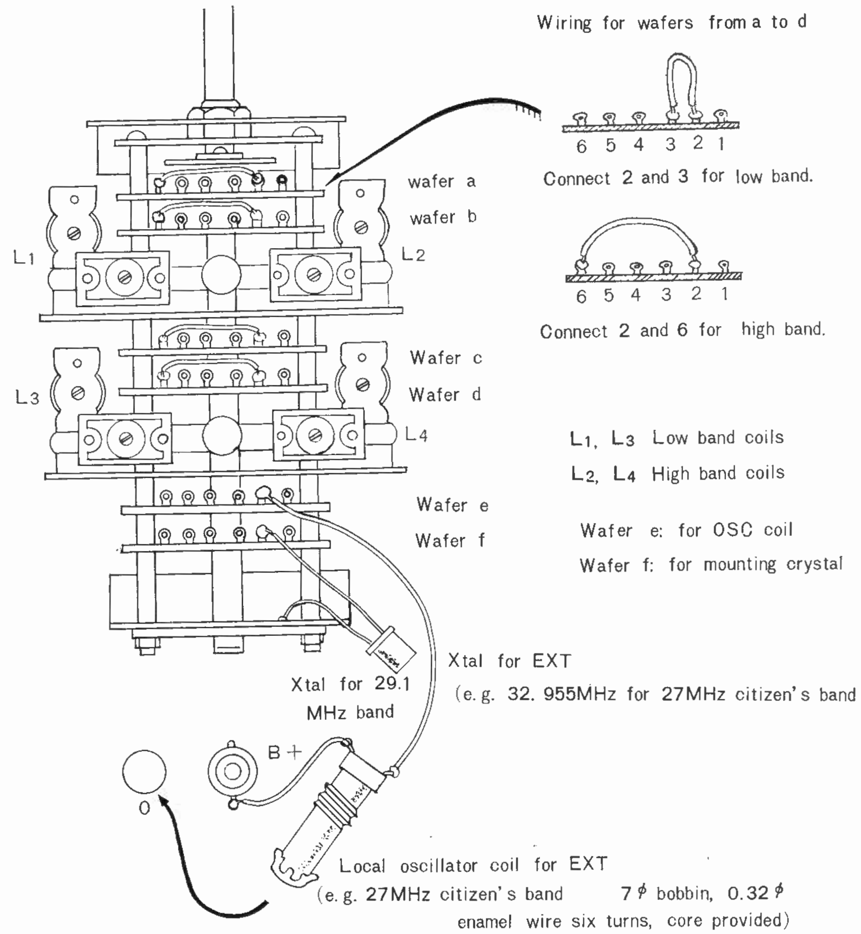


Fig. 21 EXT channel addition engineering

ALIGNMENT AND MAINTENANCE

1. ALIGNMENT

The JR-310 has been precisely aligned at the factory before shipment. So it requires no special realignment. Over years of use, however, the controls are likely to undergo some changes. To use the receiver in the best condition, therefore, it is advisable to readjust the controls once in a few years. Since full-scale alignment requires a considerable number of test equipment, only the adjusting procedures for practical purposes will be given here. For full-scale realignment and repairs, contact your nearest TRIO dealer. He will offer service at reasonable cost. Note that TRIO is not responsible for any careless adjustment on your part of precision units such as the VFO.

Use a test oscillator for adjustment.

Although you can get a rough idea of whether or not maximum sensitivity is reached simply by using your ears, it is advisable, however, to utilize the attached S meter or to use a VOM tester as an output meter. (Connect the VOM tester to the 500 Ω terminal after setting it to AC 50 V range and measure the output voltage.) Follow the adjustment procedures shown in Table 1. The use of an excessively high test oscillator output will make adjustment difficult as the receiver may become saturated. Maintain the output at a minimum necessary level.

1. MAINTENANCE

(1) Removal of case

The top cover can be removed by loosening the three top black screws and four right and left side decoration screws.

The bottom plate can be removed by loosening the six screws with which the bottom plate is fastened to the chassis. The hyzex legs have nothing to do with the removal of the bottom plate.

(2) Replacement of fuse

If the receiver fails to operate because of fuse failure, first check for the causes. If there is anything wrong, repair it completely before replacing the fuse.

To replace the fuse, rotate the fuse holder counter-clockwise. The holder comes off. Use a 2A glass enclosed fuse. Be sure not to use a piece of thin metal wire as a substitute even as an emergency measure.

(3) PILOT LAMP

If the pilot lamp is found defective, replace it with an 8V swan-base baby lamp.

(4) Resistors

Defective resistors may be replaced with those within ±10% of specified values for practical purposes. For example, you may safely use a 500 kΩ resistor in place of a 470 kΩ one.

(5) Vacuum tubes, transistors and diodes

For the replacement of vacuum tubes, it is advisable to use tubes of the same brand. As for transistors, even a slight short circuit in the pattern can cause damage. So special care should be taken when checking the pattern.

(6) Gears

Lubricate the double gears and bearings of the dial with quality sewing machine oil once a year. Be sure to clean the gears before oiling.

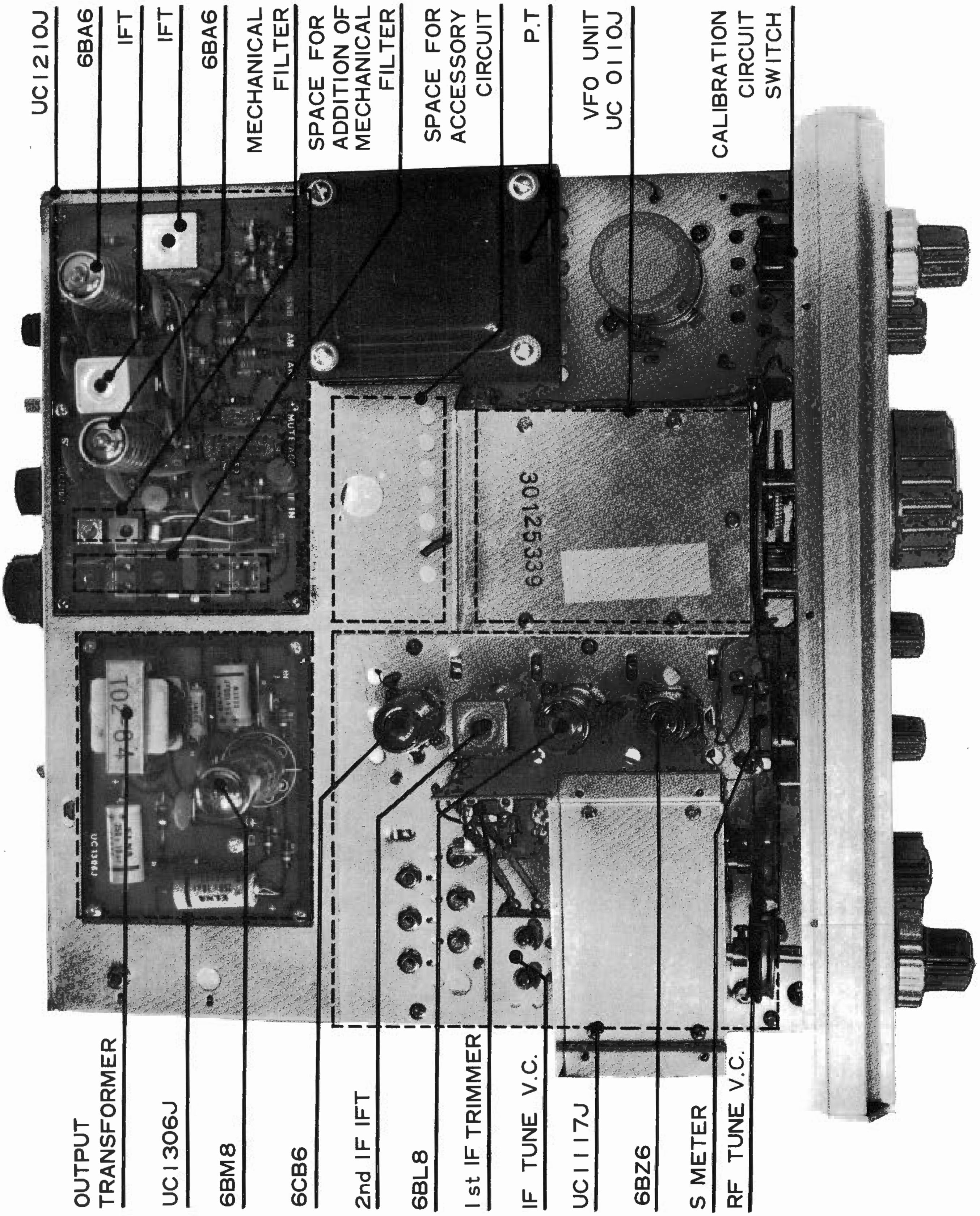
(7) Dust and other foreign substances

After years of use, dust and other foreign substances may adhere to the knobs and panel. Clean with a soft cloth moistened with neutral detergent. Furthermore, dust and other foreign substances tend to accumulate readily inside the set. If these are moistened, it may degrade insulation and cause troubles. Clean the interior from time to time by using a vacuum cleaner or air blower.

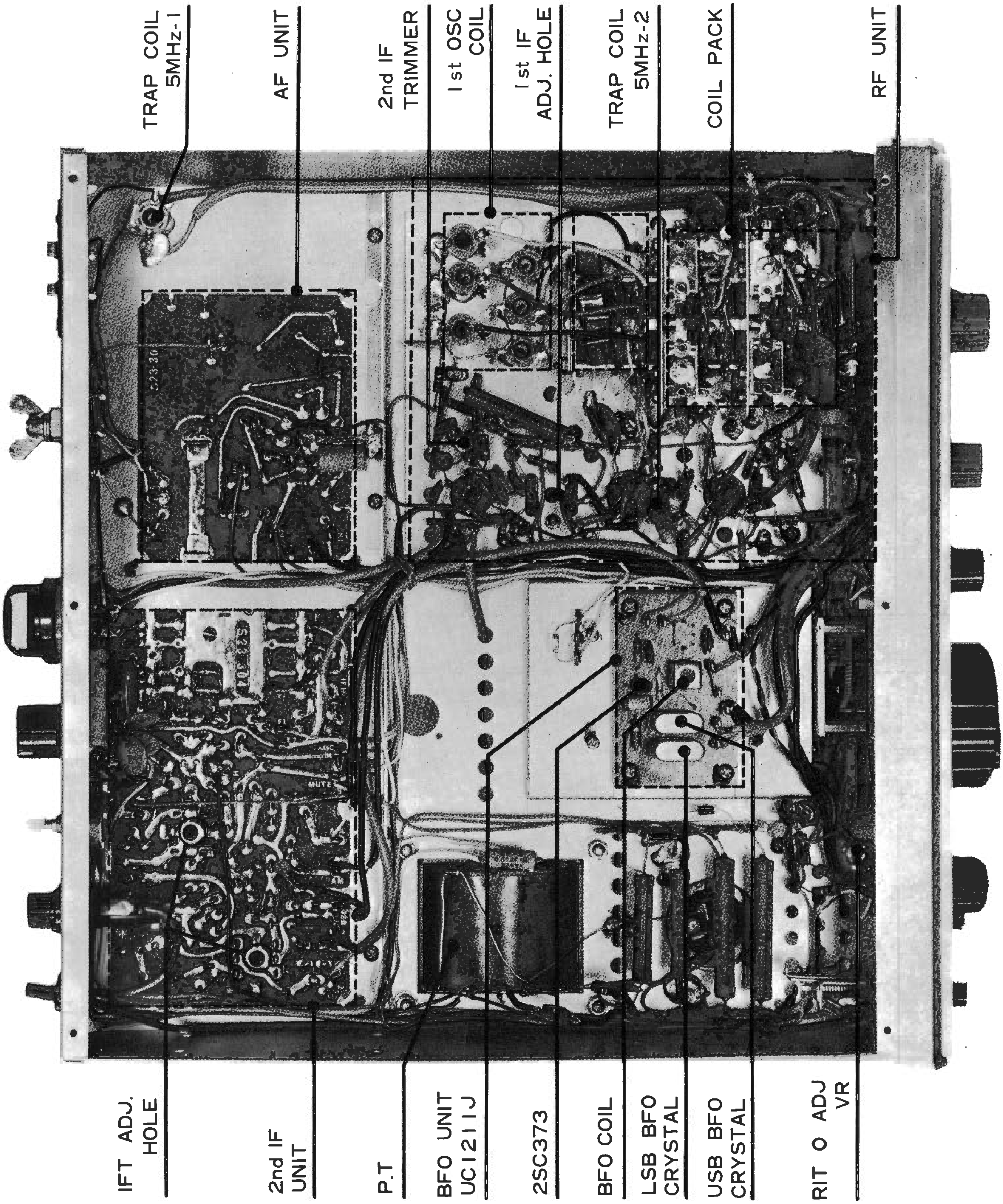
Table 1 ALIGNMENT PROCEDURE

STEP	ADJUSTING ITEM	SIGNAL INPUT	BAND	VFO DIAL	PROCEDURES
1.	2nd IF	Apply 455 kHz to G1 (pin 1) of RF unit V3 6CB6.	Optional	Optional	Rotate RF unit TC3 trimmer, IF unit mechanical filter CF, MF IF transformer IFT 2, 3 cores for maximum output.
2.	1st IF	Apply 5.455 MHz to G1 (pin 2) of RF unit V2a 6BL8.	Optional	500 (Set IF TUNE to 500, too.)	Rotate RF unit IFT1 core for maximum output.
3.	1st IF	Apply 5.855 MHz to G1 (pin 2) of RF unit V2a 6BL8.	Optional	100 (Set IF TUNE to 100, too.)	Adjust RF unit IF trimmers TC1, 2 for maximum output.
4.	Repeat items 2 and 3 several times.				
5.	Adjustment of low band ANT. RF	Apply 3.8 MHz to antenna terminal.	3.5	300 (Adjust RF TUNE to center of 3.5 MHz division.)	Adjust coil pack 3.5 MHz core together with ANT. RF for maximum output.
6.	Adjustment of low band ANT. RF	Apply 14.3 MHz to antenna terminal.	14.	300 (Adjust RF TUNE to center of 14 MHz division.)	Adjust coil pack 14 MHz trimmer together with ANT. RF for maximum output.
7.	Repeat steps 5 and 6 several times.				
8.	Adjustment of high band ANT. RF	Apply 21.3 MHz to antenna terminal.	21	300 (Adjust RF TUNE to center of 21 MHz division.)	Adjust coil pack 21 MHz core together with ANT. RF for maximum output.
9.	Adjustment of high band ANT. RF	Apply 28.3 MHz to antenna terminal.	28.0	300 (Adjust RF TUNE to bottom of 28 MHz division.)	Adjust coil pack 28 MHz trimmer until a maximum output is obtained.
10.	Repeat steps 8 and 9 several times.				
11.	Adjustment of 3.5 MHz X'TAL OSC	Apply 3.8 MHz to antenna terminal.	3.5	300	Rotate 3.5 MHz OSC core for maximum sensitivity.
12.	Adjustment of 7 MHz X'TAL OSC	Apply 7.3 MHz to antenna terminal.	7	300	Rotate 7 MHz OSC core until the sensitivity is maximum.
13.	Adjustment of 14 MHz X'TAL OSC	Apply 14.3 MHz to antenna terminal.	14	300	Rotate 14 MHz OSC core and until the sensitivity is maximum.
14.	Adjustment of 21 MHz X'TAL OSC	Apply 21.3 MHz to antenna terminal.	21	300	Rotate 21 MHz OSC core until the sensitivity is maximum.
15.	Adjustment of 28 MHz X'TAL OSC	Apply 28.3 MHz to antenna terminal.	28.0	300	Rotate 28 MHz OSC core until the sensitivity is maximum.
16.	Lock adjusted cores of Items 11 through 15 to 0 points displaced by a quarter of a rotation from the maximum sensitivity point respectively to ensure a stable OSC oscillation.				
17.	Adjustment of 5 MHz trap coil-1	Apply 5.655 MHz to antenna terminal.	7	300	Adjust trap coil L2 near antenna terminal for minimum output.
18.	Adjustment of 5 MHz trap coil-2	No input signal	7	100	Adjust core of trap coil L11 located on sub-chassis for minimum 5 MHz noise generated near RF TUNE 21 division.
19.	RIT circuit 0	With RIT at 0 in CW condition, receive any, arbitrary frequency and find 0 beat point. Set RIT to OFF and adjust RIT ADJ VR so that previous receiving frequency will be reduced to 0 beat.			

■ CHASSIS TOP VIEW



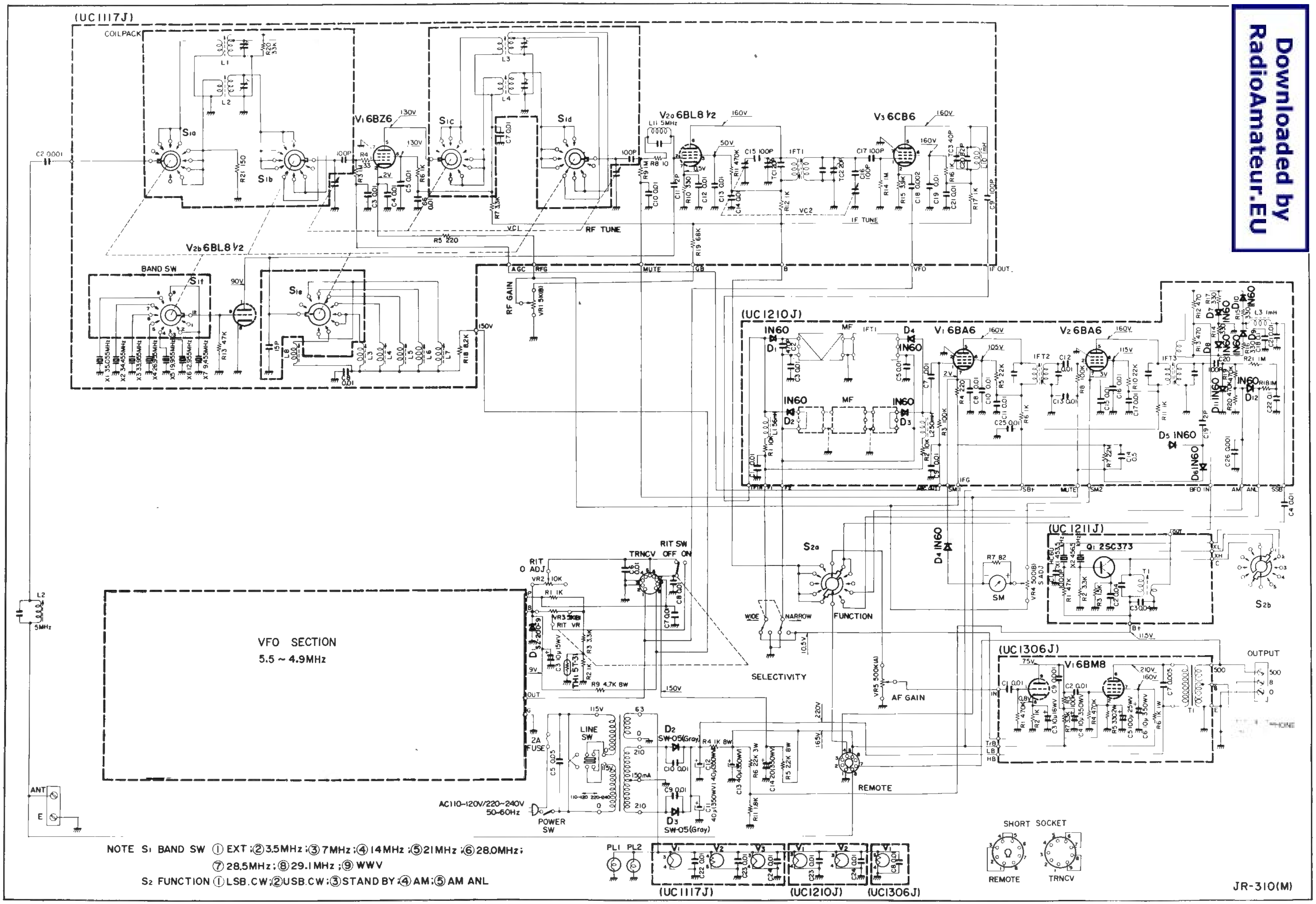
■ CHASSIS BOTTOM VIEW



SPECIFICATIONS

RECEIVING FREQUENCY RANGES:	Double superheterodyne
RECEIVING SYSTEM:	3.5 MHz band 3.5 ~ 4.1 MHz 7 MHz band 7.0 ~ 7.6 MHz 14 MHz band 14.0 ~ 14.6 MHz 21 MHz band 21.0 ~ 21.6 MHz 28.0 MHz band 28.0 ~ 28.6 MHz 28.5 MHz band 28.5 ~ 29.2 MHz 29.1 MHz band 29.1 ~ 29.7 MHz Standard wave WWV 15.0 MHz (EXT band Any band between 3.5 and 30 MHz covering a range of 600 kHz. No crystal provided)
SENSITIVITY:	Less than 1 μV (S/N 10 dB)
SELECTIVITY:	More than 50 dB at ±6 kHz off-tuning
DETECTION:	AM; Diode detector SSB CW; Diode ring demodulator
OUTPUT:	Undistorted maximum power output; 1 W
POWER SUPPLY:	AC 110 — 120V / 220 — 240V, 50/60 Hz
POWER CONSUMPTION:	70 W
TUBES AND SEMICONDUCTORS:	6 tubes, 5 transistors (2 FET's) and 19 diodes
DIMENSIONS:	13″ (330) W × 7-1/16″ (180) H × 12-3/16″ (310) D (mm).
WEIGHT:	19.8 lbs (9.0 kg)

SCHEMATIC DIAGRAM



NOTE S1 BAND SW ①EXT ;②3.5MHz ;③7MHz ;④14MHz ;⑤21MHz ;⑥28.0MHz ;
⑦28.5MHz ;⑧29.1MHz ;⑨WWV
S2 FUNCTION ①LSB.CW ;②USB.CW ;③STAND BY ;④AM ;⑤AM ANL

JR-310(M)

PRODUCT GUIDE

ALL BAND SSB TRANSMITTER

TX-310

The TX-310 transmitter, designed to match the JR-310 in performance and appearance, is an all-band SSB transmitter.

It is capable of LSB, USB and AM CW transmissions. Combined with the JR-310 receiver, it permits transceive operation.

The all solid-state generator section employs a high-frequency crystal oscillator and provides top performance.

Incorporating an amplifier type ALC circuit, neon tube type VOX and TVI elimination low pass filter, the TX-310 is a standard SSB transmitter which represents the SSB age.

RATINGS

TRANSMITTING FREQUENCY:
3.5 — 3.575 MHz
7.0 — 7.1 MHz
14.0 — 14.35 MHz
21.0 — 21.45 MHz (28.0 — 28.5 MHz)
28.5 — 29.1 MHz (29.1 — 29.7 MHz)
TYPE OF TRANSMISSION:
A1, A3J (LSB. USB), A3h
RATED POWER INPUT:
20 W
CARRIER SUPPRESSION RATIO:
More than −40 dB
SIDEBAND SUPPRESSION RATIO:
More than −40 dB
UNDESIRED RADIATION STRENGTH:
More than −40 dB (HF band)
More than −60 dB (VHF band)
SSB GENERATION SYSTEM:
Filter system (3.395 MHz)
MICROPHONE INPUT IMPEDANCE:
50 k Ω
TUBES AND TRANSISTORS:
10 tubes and 5 transistors and 9 diodes
DIMENSIONS:
13″ (330) W × 7-1/16″ (180) H × 12-3/16″ (310) D (mm).
WEIGHT:
25.5 lbs (11.6 kg)

COMMUNICATIONS SPEAKER

SP-10

Designed for use with the JR-310, this speaker system for communications equipment has frequency characteristics suitable for SSB speech reception. Unlike ordinary Hi-Fi speakers, the SP-10 is designed to minimize high frequency interference response, thus assuring many hours of short wave communication work without fatigue.

RATINGS

INPUT IMPEDANCE:
8 Ω
MAXIMUM INPUT:
2.5 W
DIMENSIONS:
7-5/16″ (186) W × 7-1/16″ (180) H × 7-7/16″ (190) D (mm).
WEIGHT:
3.5 lbs (1.6 kg)