

ALIGNMENT

- () Turn on your high input impedance voltmeter and allow it to warm up.

NOTE: The Receiver can be aligned with instruments or without instruments. Instrument alignment may result in a slight increase in sensitivity. However, it requires the use of

an RF generator that can deliver a signal from 3.5 MHz to 30 MHz. If a generator is available, plug it in and turn it on at this time to allow it to warm up. DO NOT USE A VOLT-OHMMETER OR LOW-IMPEDANCE METER DURING THE ALIGNMENT PROCEDURE.

ALIGNMENT PREPARATION

PRESETTING CONTROLS

- () Set the front panel controls and switches to the following positions:

FUNCTION – STBY
CONVERTER – HF
PRESELECTOR – Any
R.F. ATTEN – Fully clockwise
BAND – 3.5
MAIN TUNING – 0.00
AGC – OFF
RF GAIN – Fully clockwise and pushed in
MODE – USB
AF GAIN – PWR OFF

Refer to Figure 5 (fold-out from Page 110) for the following steps.

- () Set each of the following controls on the IF/audio circuit board to the center of its rotation: BIAS ADJ, METER ZERO, and METER FULL SCALE.
- () Set the +15 ADJ control on the power supply/BFO circuit board to the center of its rotation.

REAR PANEL CONNECTIONS

- () Insert the LMO load into the LMO OUT phono socket.
- () Connect an 8 Ω speaker to the SPEAKER phono socket.

NOTE: The Receiver was wired for operation from either a 120 Vac or 240 Vac power source. In the following steps, connect the Receiver to the ac power source for which it has been wired.

CAUTION: When the line cord plug is connected to an ac outlet, ac voltage will be present at several places under the chassis. Be careful that you do not contact this voltage or an electrical shock may result.

- () Insert the female end of the power cord into the 120/240 Vac power socket. Plug the power cord into an ac power source.

PRELIMINARY ADJUSTMENTS

- () Adjust your voltmeter to read +15 volts dc.
- () Connect the voltmeter negative lead to the Receiver chassis assembly.
- () Rotate the AF GAIN control to the 9 o'clock position.
- () Turn the FUNCTION switch to OPR.
- () Refer to Figure 6 and touch or connect the meter dc volts lead to lug 10 of the FUNCTION switch. This lug has an orange wire connected to it.

Refer to Figure 5 (fold-out from Page 110) for the location of internal controls in the following steps.

- () Adjust the +15 ADJ control for +15 Vdc.
- () Refer to Figure 7 and position the meter dc volts lead against the AGC connector on the RF Amplifier Switch-Board.
- () Adjust the BIAS ADJ control for +3.5 Vdc.
- () Disconnect the voltmeter test leads and temporarily set them aside.
- () Adjust the METER ZERO control for a zero S-meter reading.
- () Rotate the RF GAIN control fully counterclockwise.
- () Adjust the METER FULL SCALE control until the S-meter needle just "pegs."
- () Rotate the RF GAIN control fully clockwise.
- () Turn the FUNCTION switch to the STBY position.

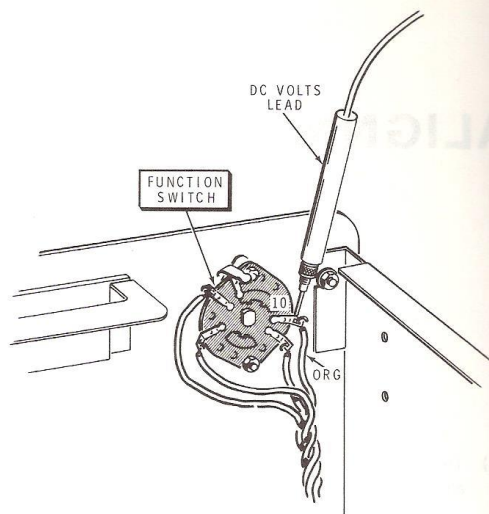


Figure 6

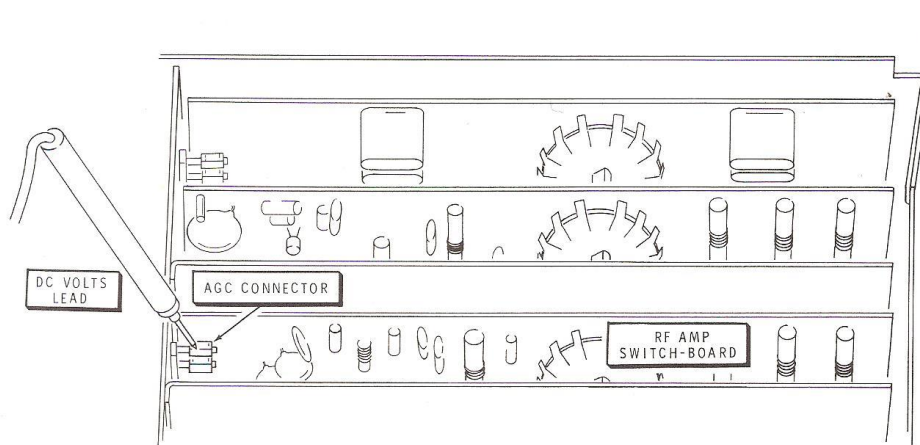


Figure 7

HETERODYNE OSCILLATOR ALIGNMENT

If you have a Heath Model SB-400 or SB-401 Transmitter and plan to use it with this Receiver for transceive operation, perform the following four steps. Otherwise, disregard the following four steps. If at any time in the future you plan to transceive with one of these transmitters, you should perform the following "Heterodyne Oscillator Alignment."

- () 1. Position the Receiver and your transmitter as shown in Figure 8.
 - () 2. Connect a previously prepared 24" length of RG-62U (large) coaxial cable from the HFO OUT phono socket on the Receiver rear panel to the HET. OSC. phono socket on the transmitter rear panel.
 - () 3. Turn the transmitter function switch to the transceive position, turn the transmitter mode switch to the USB position, and set the main tuning to 0.00.
 - () 4. At all times, keep the transmitter band switch in the same position as the Receiver BAND switch.
NOTE: When the Receiver BAND switch is in the 15.0 position, place the transmitter band switch in the 14.0 position.
- () Adjust your voltmeter to read +5 volts dc.
- () Connect the voltmeter common lead to the Receiver chassis assembly.
- () Turn the FUNCTION switch to OPR.

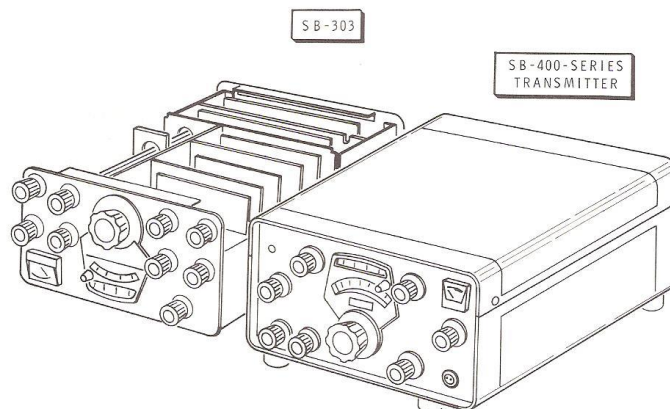


Figure 8

Refer to Figure 9 and the chart on Page 115 for the following steps.

- () Position the meter dc volts lead against the TP connector pin on the heterodyne oscillator Switch-Board.

The coils on the heterodyne oscillator Switch-Board will be adjusted in the following chart. Rotate each coil slug slightly clockwise and/or counterclockwise to obtain a peak meter reading. Then rotate the coil slug either clockwise (CW) or counterclockwise (CCW) as indicated to obtain a voltage decrease in the meter reading. Use the long end of the small plastic alignment tool in these adjustments.

NOTE: Four of the coils that will be adjusted have two coil slugs. To reach the bottom slug, carefully slide the alignment tool through the hole in the top slug as shown in Figure 10. Be careful not to rotate the top slug when adjusting the bottom slug.

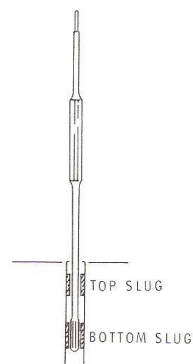


Figure 10

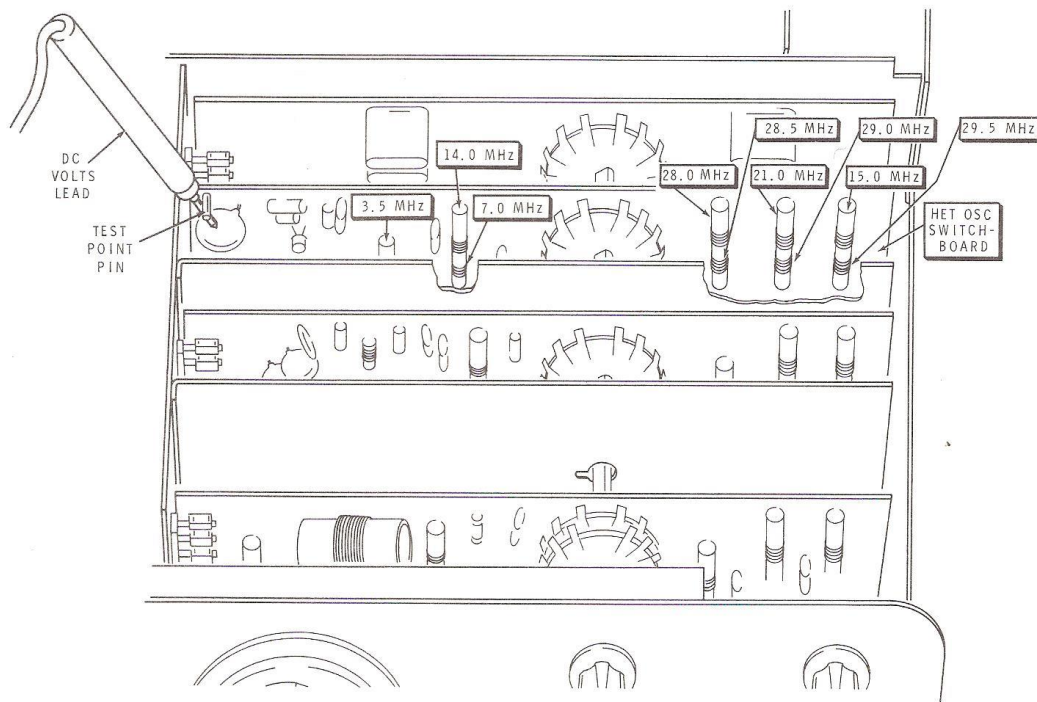


Figure 9

Complete the following adjustments:

BAND SWITCH POSITION AND HET OSC COIL	<p>ROTATE THE SLUG FOR <u>PEAK</u> VOLTAGE. THEN ROTATE IT FOR THE AMOUNT OF VOLTAGE DECREASE SHOWN BELOW. NOTE: IF YOU ENCOUNTER A SECOND PEAK AS YOU ROTATE THE SLUG, DECREASE THE VOLTAGE FROM THE SECOND PEAK.</p>
3.5, L114 7.0, L115 14.0, L116 15.0, L117 21.0, L118 28.0, L119 28.5, L121 29.0, L122 29.5, L123	Clockwise, 0.5 V Counterclockwise, 0.5 V Clockwise, 0.3 V Clockwise, 0.3 V Clockwise, 0.1 V Clockwise, 0.1 V Counterclockwise, 0.1 V Counterclockwise, 0.1 V Counterclockwise, 0.1 V

EXAMPLE: 3.5 MHz — Peak to approximately 3.8 V. Turn slug clockwise for a .5 V decrease to 3.3 V.

() Turn the FUNCTION switch to STBY.

() Disconnect the voltmeter test leads and temporarily set them aside.

CRYSTAL CALIBRATOR ALIGNMENT

The crystal calibrator circuit is provided to enable you to accurately calibrate (adjust) your tuning dial every 100 kHz and every 25 kHz. Two methods of accurately adjusting this circuit are given in this section: "Calibration to WWV," and "Calibration Using Another Receiver." The WWV method is preferred.

NOTE: For further information on station WWV, refer to a current copy of "The Radio Amateur's Handbook."

When the FUNCTION switch is in the 100 kHz position, you should be able to hear a harmonic (multiple) of the calibration oscillator at every 100 kHz dial marking. In the 25 kHz position, you should be able to hear a harmonic (multiple) of the calibration oscillator every 25 kHz dial marking.

CALIBRATION TO WWV

() Connect an antenna to the HF antenna phono socket on the Receiver rear panel.

() Set the front panel controls and switches to the following positions:

FUNCTION — STBY
 CONVERTER — HF
 PRESELECTOR — Any
 R.F. ATTEN — Fully clockwise
 BAND — 15.0
 MAIN TUNING — 0.00
 AGC — FAST
 RF GAIN — Fully clockwise and pushed in
 MODE — USB
 AF GAIN — 9 o'clock position



- () Turn the FUNCTION switch to OPR.
- () Rotate the PRESELECTOR for maximum noise or signal.
- () Rotate the MAIN TUNING knob back and forth. Station WWV should be heard very close to the "0" mark on the circular dial (within 1 to 3 kHz).
- () Turn the R.F. ATTEN control slowly all the way counterclockwise, then all the way clockwise. Signal strength should diminish, then return to its original loudness.
- () Adjust the MAIN TUNING knob so that the zero-beat tone goes lower and lower in frequency and disappears.
- () Turn the FUNCTION switch to 100 kHz. The tone from the calibrator should be heard. Refer to Figure 11 and adjust 100 kHz ADJ trimmer capacitor C606 on the power supply/BFO circuit board so the calibrator tone goes lower and lower in frequency and disappears. The calibration oscillator is now in zero beat with WWV.
- () Turn the FUNCTION switch to OPR and then back to 100 kHz to be sure you have a true zero beat.
- () When you have a zero beat, turn the FUNCTION switch to STBY.
- () Disconnect the antenna from the Receiver.
- () Turn the BAND switch to 3.5.

CALIBRATION USING ANOTHER RECEIVER

NOTE: Use this calibration procedure if you cannot receive WWV.

- () Set the front panel controls and switches to the following positions:

FUNCTION – STBY
 CONVERTER – HF
 PRESELECTOR – Any
 R.F. ATTEN – Fully clockwise
 BAND – 3.5
 MAIN TUNING – 0.00
 AGC – FAST
 RF GAIN – Fully clockwise and pushed in
 MODE – USB
 AF GAIN – 9 o'clock position

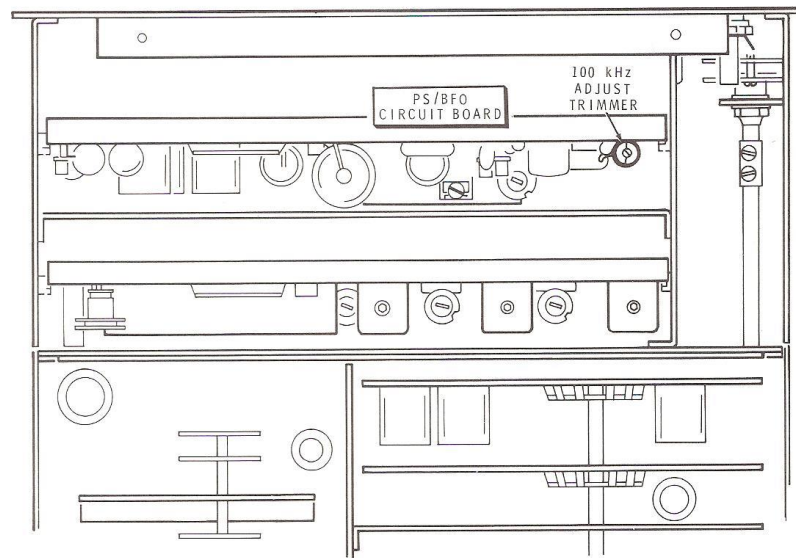


Figure 11

- () Connect the SB-303 Receiver's HF antenna input to an antenna and antenna input of another receiver capable of receiving WWV at 2.5 MHz, 5 MHz, or 10 MHz. If this is not possible, a receiver tuned to a standard broadcast station, operating at an even multiple of 100 kHz or 25 kHz, can be used.
- () Turn the SB-303 Receiver's FUNCTION switch to 100 kHz, and rotate the AF GAIN control fully counterclockwise, just to the point where it starts to click off.
- () Tune the other receiver to WWV or a standard broadcast station as described.
- () Refer to Figure 11 and adjust 100 kHz ADJ trimmer capacitor C606 on the SB-303 power supply/BFO circuit board until you hear the calibrator tone in the other receiver go lower and lower in frequency and disappear. NOTE: When WWV is used, the period when no tone modulation is present allows easier identification of the zero beat.
- () Turn the SB-303 Receiver's FUNCTION switch to OPR and then back to 100 kHz to be sure you have a true zero beat.
- () Turn the SB-303 Receiver's FUNCTION switch to STBY and disconnect the other receiver. The other receiver will no longer be needed.

LMO SHIFTER AND DIAL ADJUSTMENTS

LMO SHIFTER ADJUSTMENT

The purpose of this adjustment is to insure that the LMO remains at zero beat when it is shifted from one sideband to the other.

- () Set the MAIN TUNING to 3.8 MHz.
- () Turn the FUNCTION switch to 100 kHz.
- () Adjust the MAIN TUNING for a loud calibrator tone.
- () Rotate the PRESELECTOR for maximum S-meter reading.
- () Alternately increase the AF GAIN control and adjust the MAIN TUNING until the calibrator tone goes lower and lower in frequency and disappears (zero beat).
- () Rotate the AF GAIN control to a comfortable listening level.
- () Turn the MODE switch to LSB. NOTE: Be very careful not to move the MAIN TUNING.
- () The calibrator tone may or may not be heard. If the tone is not heard, turn the MODE switch back and forth between USB and LSB to be sure the tone is not heard (zero beat) in either switch position. If it is still not heard, proceed to the "Dial Calibration" section. If a tone is heard in either switch position, perform the remaining steps, and then proceed to the "Dial Calibration."
- () Adjust the MAIN TUNING so the tone is not heard in the USB position of the MODE switch. Then turn the MODE switch to LSB.
- () Refer to Figure 12 and adjust the LSB ADJUST coil on the LMO until the tone goes lower and lower in frequency and disappears. NOTE: It may be necessary to increase the AF GAIN control while adjusting the LSB ADJUST coil. This LSB ADJUST coil is adjusted with a small screwdriver through a hole in the RTTY circuit board.

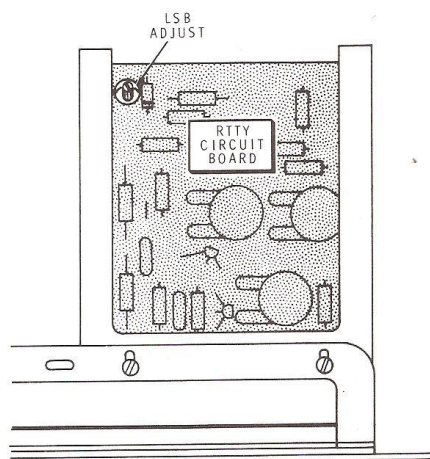


Figure 12

- () Turn the MODE switch back and forth between USB and LSB to be sure the tone is not heard in either switch position. It may be necessary to repeat the previous step if a tone is heard.
- () Rotate the AF GAIN control to the 9 o'clock position.
- () Turn the MODE switch to USB.

DIAL CALIBRATION

- () Remove the knob from the main tuning shaft.
- () Zero beat the calibrator tone at 3.6 MHz.
- () Set the adjustable index line in the center of the circular dial window.

Refer to Figure 13 for the following steps.

- () Wrap the long portion of the long allen wrench with tape to avoid shorting it to the light sockets.
- () Place a screwdriver through the hole in the dial escutcheon (located directly above the main tuning shaft) and into the LMO dial drive shaft.
- () Hold the LMO drive shaft on zero beat and loosen the setscrew in the circular dial bushing. Turn the circular dial until the "0" is directly under the adjustable index line. Now tighten the setscrew.

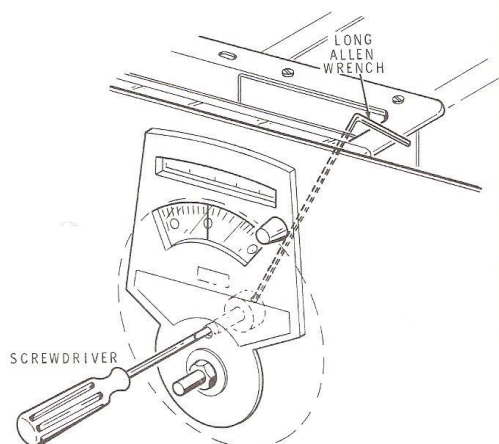


Figure 13

- () Make sure the circular dial turns freely and the nylon spiral follower is properly engaged in the spiral before proceeding. It may be necessary to loosen and retighten the setscrew again.
- () Turn the FUNCTION switch to STBY.
- () Replace the knob on the main tuning shaft.

RF AND IF ALIGNMENT

NOTE: The remaining Receiver alignment can be performed with instruments or without instruments. Instrument alignment requires the use of an ac VTVM and an RF generator that can deliver a signal from 3.5 MHz to 30 MHz. If these instruments are available, proceed to "Instrument Alignment" on Page 121. Otherwise, proceed with "Alignment Without Instruments."

ALIGNMENT WITHOUT INSTRUMENTS

Alignment without instruments is accomplished by using the crystal calibrator as a signal source. No antenna is required.

- () Set the MAIN TUNING to 3.5 MHz.
- () Turn the FUNCTION switch to 100 kHz.
- () AGC to Fast.
- () R.F. ATTN fully clockwise.

Refer to Figure 14 for preselector settings in the following steps. NOTE: The positions shown in the Figure are approximate reference points only.

- () Set the PRESELECTOR to the 3.5 MHz position.
- () Adjust the MAIN TUNING for a maximum S-meter reading.

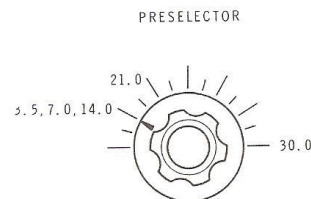


Figure 14

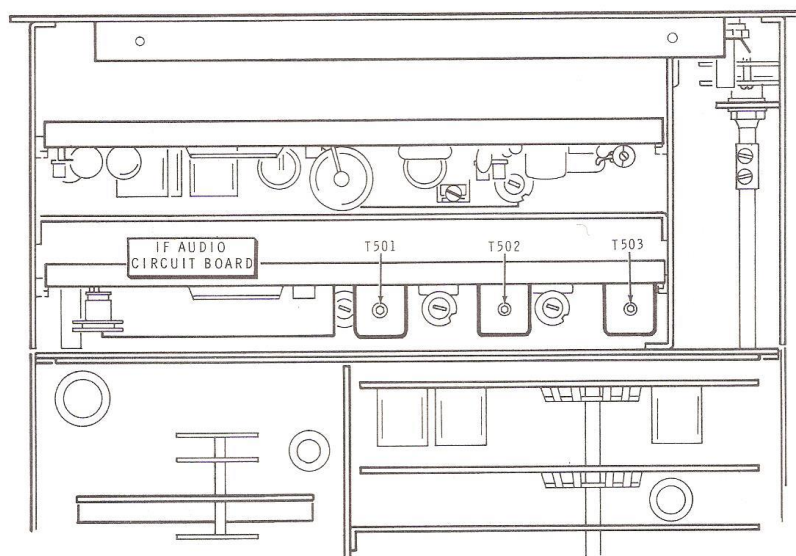


Figure 15

- () Refer to Figure 15 and adjust IF transformers T501, T502, and T503 for a maximum S-meter reading with the large alignment tool.
- () Readjust the three IF transformers for a maximum S-meter reading.
- () Refer to Figure 16 and adjust mixer coil L202 for a maximum S-meter reading.
- () Readjust coil L202 for a maximum S-meter reading.

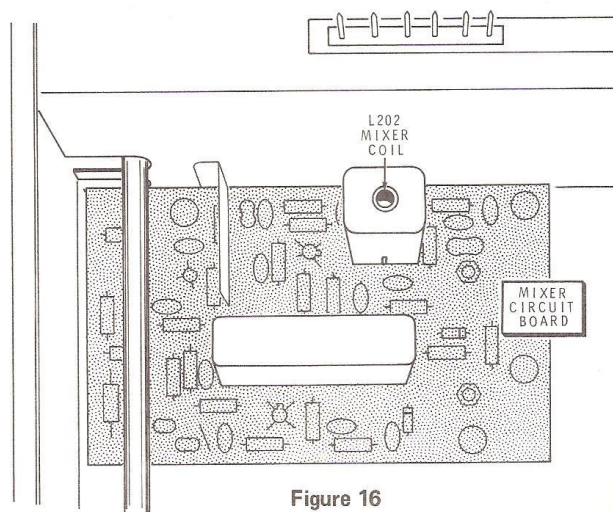


Figure 16

Refer to Figure 17 for the following steps.

NOTE: All antenna coils, referred to in the following steps, are on the antenna Switch-Board and all RF coils are on the RF amplifier Switch-Board. Use the small alignment tool.

- () Adjust the 3.5 MHz antenna coil, L101, for a maximum S-meter reading.
- () Adjust the 3.5 MHz RF amplifier coil, L108, for a maximum S-meter reading.
- () Set the BAND switch to 7.0, and adjust the MAIN TUNING for a maximum S-meter reading. Leave the PRESELECTOR in the same position.
- () Adjust the 7.0 MHz antenna coil, L102, for a maximum S-meter reading.
- () Adjust the 7.0 MHz RF amplifier coil, L109, for a maximum S-meter reading.
- () Set the BAND switch to 14.0, and adjust the MAIN TUNING for a maximum S-meter reading.
- () Adjust the 14.0 MHz antenna coil, L103, for a maximum S-meter reading.
- () Adjust the 14.0 MHz RF amplifier coil, L111, for a maximum meter reading.
- () Set the BAND switch to 21.0.
- () Set the MAIN TUNING to 21.0 MHz and then adjust the MAIN TUNING for a maximum S-meter reading.
- () Set the PRESELECTOR to 21.0 MHz.
- () Adjust the 21.0 MHz antenna coil, L104, for a maximum S-meter reading.
- () Adjust the 21.0 MHz RF amplifier coil, L112, for a maximum S-meter reading.
- () Set the BAND switch to 29.5, and rotate the MAIN TUNING to 29.9 MHz.
- () Set the PRESELECTOR to the 30.0 MHz reference point.
- () Adjust the 28.0 MHz antenna coil, L105, for a maximum S-meter reading.
- () Adjust the 28.0 MHz RF amplifier coil, L113, for a maximum S-meter reading.
- () Set the FUNCTION switch to STBY.
- () Turn the AF GAIN to PWR. OFF.

This completes "Alignment Without Instruments."

If you have RTTY equipment, proceed with "FSK Alignment" on Page 124. Otherwise, proceed to "Final Assembly" on Page 127.

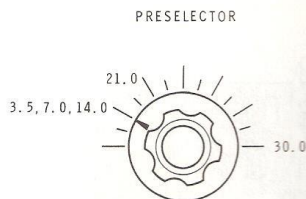


Figure 17A

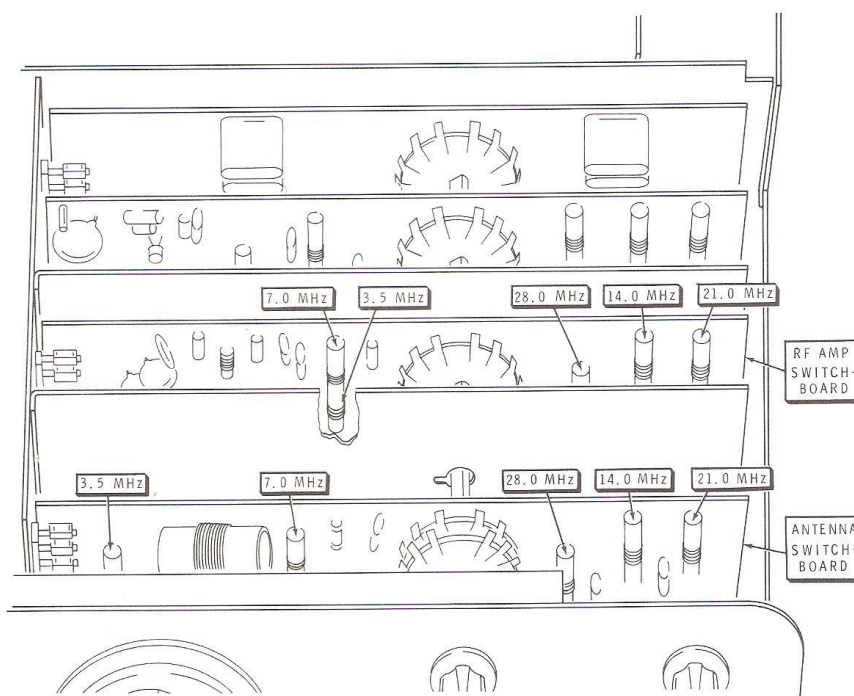


Figure 17

INSTRUMENT ALIGNMENT

Instrument Alignment is accomplished by using an RF signal generator and an ac VTVM. The generator must deliver a signal from 3.5 MHz to 30 MHz. No antenna is required for this alignment.

- () Plug in and turn on the generator and the ac VTVM. Allow both of them time to warm up before proceeding.

Refer to Figure 18 for the following steps.

- () Connect the ac VTVM test leads to the SPEAKER phono socket lugs on the Receiver rear panel.
- () Connect the generator RF output leads to the HF ANT phono socket lugs on the Receiver rear panel.
- () Turn the Receiver FUNCTION switch to OPR.
- () Turn the R.F. ATTEN fully clockwise.
- () Set the MAIN TUNING to exactly 3.5 MHz.

You will need a set of non-conductive hex adjustment tools. You can find them on eBay under ad #151533699586 for \$18.99 (Free Shipping).

The above alignment instructions use the SB-303's built in calibrator. You will need to short the "MUTE" socket on the rear panel and have the LMO resistor plug installed. The LMO resistor plug is simply a 50 ohm ½ watt resistor connected inside an RCA plug. The MUTE socket shorting is an RCA plug with a short between the TIP and ground. Without the MUTING plug you will not be able to use the receiver's built in calibrator.

Have fun.

73

Mike W5RKL