

PRC-74 Lower Sideband Conversion

This conversion will add lower sideband reception and transmission capability to the RT-794/PRC-74 transceiver. An optional modification to the clarify/calibrate function is also included to increase the vernier tuning range to facilitate operation.

The conversion works by shifting the IF injection from the frequency generator module from 1750 kHz on USB to 1747 kHz for LSB. When used with the existing 1750 kHz IF filter, this will allow the lower side band to be received and transmitted on the PRC-74. In order to provide correct dial readout in the LSB mode, this conversion also includes a modification to the frequency synthesizer. This modification allows the synthesizer frequency to be "pulled" up 3 kHz in the LSB mode to compensate for the injection frequency shift to permit LSB reception and transmission.

Parts Needed

- RT-794/PRC-74 Transceiver (A, B, or C version)
- SPDT Toggle Switch
- 1747 kHz Crystal
- Subminiature, SPDT Relay, with 5 volt low current coil
- .001 uf Disc ceramic capacitor
- 5 VDC reed relay, radio shack catalog no. 275-232 or similar
- 5 Volt 3 terminal regulator (LM 7805)
- 15-60 pf Trimmer capacitor
- BNC Coaxial Connector with Ground Lug
- 36 inches No.22 stranded hookup wire
- Tube of Quick drying Epoxy cement
- .6 uH RF Choke

Additional Parts for Clarifier/Calibrate Modification (Allows for extended tuning vernier)

- Push Button Switch
- Small selector knob to replace larger existing clarify/calibrate knob

Tools

- Phillips Screw Driver
- Straight Screw Driver
- Pliers
- Electric Drill with 1/16th inch, 1/4 inch and 3/8 inch bits
- Soldering Iron
- Tin Lead Solder
- Gas Torch
- Solder Braid and Flux (Optional)
- Voltmeter
- Frequency counter
- RF signal generator
- Wire hook made from coat hanger wire (To remove TCXO cover)

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Conversion Steps:

Preparation for Conversion

Note: Make sure the radio is working properly on all modes and frequencies prior to starting this conversion.

- a. Set radio frequency to 2.000 MHz
- b. Remove front panel mounting screws from right and left sides(total of 4). Set them aside
- c. Turn radio bottom side up. Remove front panel retaining screw in middle of chassis
- d. Remove Final Amplifier module
 1. Set tune and load switches in the middle of their rotations such that slots in the amplifier side of the couplers face the top of the chassis
 2. Disconnect P-801 and P-802
 3. Disconnect wires from TB 801. Mark each wire so it can be reconnected to the same terminal during the reassembly phase.
 4. Unscrew 4 screws retaining final amplifier module to radio chassis
 5. Slide module out through top of chassis
 6. Loosen antenna and ground wire attachments to front of amplifier module. Disconnect wires and set amplifier assembly aside.
- e. Remove remaining Chassis to front panel retaining screw located at the forward end of the space for the final amplifier
- f. Fold back front panel exposing the rear of the front panel components

Modifications to the Front Panel

- a. Adding the USB/LSB switch
 1. Unsolder Wires from “ANT and “GND” binding posts and set aside.

2. Remove the ""ANT" and "GND" binding posts from front of radio. These will not be reused.
 3. With a 3/8 inch drill, Enlarge the Hole through which the former "ANT" binding post was located to fit a BNC jack
 4. Mount the BNC connector and Ground Lug in the "ANT" hole. Secure BNC connector and ground lug with mounting nut.
 5. Solder the red and black twisted pair of wires that were removed from the Binding posts onto the BNC connector and ground lug. The black wire should be connected to the ground lug, the red wire should be connected to the center terminal of the BNC jack.
 6. Mount the SPDT toggle switch and ground lug in the hole formerly occupied by the "GND" binding post. Secure with lock washer and nut. Attach 3 - 18 inch wires to the terminals of the switch.
- b. Optional steps for extended range tuning vernier:
1. Remove the "Clarify/Calibrate" knob from the radio
 2. Drill a hole for a push button switch immediately above the location of the "Clarify/Calibrate" switch. Do not make this hole too far up the chassis or you will interfere with the kHz and 10 kHz tuning dials
 3. Mount the Push button switch in the hole drilled above the old "Clarify/Calibrate" Switch.
 4. Unsolder the wires from one terminal of the old Calibrate microswitch. Connect it to one side of the new push button switch. Do not remove the old Calibrate microswitch.
 5. Unsolder the wires from the other terminal of the old calibrate microswitch and attach the wires to the remaining terminal of the new push button switch.
- c. Modification of the Synthesizer Module
1. Remove the frequency synthesizer module by first undoing the output coaxial cable from the synthesizer input to the RF module, then undoing the four captive screws retaining the synthesizer module to the chassis.

2. Disconnect the black wire from pin 4 of the synthesizer terminal board (Ground) and cut the wire at the mounting tab at the other end. (The black wire from the chassis harness will be connected through the

terminal board mounting screw when the radio is reassembled.) Drill a small hole in the shield between the power connector compartment and the 1 /10 kHz crystal oscillator compartment at a point on a line between connector pin 4 and the rear end of the calibrate capacitor stator. Solder an 18 gage copper wire between the open rotor ground tab on the clarify variable capacitor and route it to the rear of the compartment. Be sure that it doesn't interfere with the rotor of the clarify capacitor.

3. Position the 5 volt reed relay on the surface of the shield at the back of the compartment. Attach the other end of the copper wire from the clarify control stator (ground) to one end of the coil and one switch contact.
4. Attach one end of a 6 uh choke to pin 4 of the output terminal board (The body of the choke should be in the connector compartment.). Insulate the other wire of the choke and run it through the hole drilled in the shield between the connector compartment and the 1/10 kHz crystal oscillator compartment. Solder this wire to the other end of the coil of the reed relay. Solder the 15-60 pf trimmer capacitor between the stator of the calibrate capacitor and the other reed relay switch contact post. Remember to point the trimmer adjustment toward the bottom of the synthesizer chassis (terminal board side) so that it can later be adjusted. If 5 volts is now applied to pin 4 of the synthesizer terminal board the relay should close creating a ground path for one leg of the trimmer capacitor. Use some quick drying Epoxy glue between the relay and the shield behind the reed rely to fix the relay in position.
5. Drill a small hole in the main chassis of the radio under the location of the trimmer capacitor adjustment. Make this hole large enough so an adjustment tool can be inserted after the synthesizer is installed to set the LSB synthesizer frequency.
6. Mount the synthesizer module back in the main chassis. Check to make sure the output coax cable is not pinched between the synthesizer chassis and the main chassis. Make sure that the trimmer adjustment is visible through the hole in the main chassis. Reconnect the synthesizer RF output connector to the RF module Reconnect the power wires to their terminals on the TB 601 terminal board. Remember, the black wire is connected to the screw mounting the

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terminal board, located next to pin 4, and not to pin 4 of the terminal board.

d. Main chassis Re-assembly

1. Reattach the radio front panel by first aligning the couplers on the knob shafts with those on the front of the modules. Route the wires from the USB/LSB switch in front of the RF module and in the direction of the frequency standard module. Make sure they don't pinch when the panel is secured. Secure the front panel with the 4 side plate screws and the two chassis support screws.
 2. Remount the Final Amplifier module by first running the two coax cables through their holes in the main chassis. Attach the ANT and Ground lugs from the new BNC connector and ground lug to their respective terminals of the final amplifier module. Align the tune and load controls so that the couplers will permit the module to be reinserted.
 3. Reinsert the module making sure that the two coaxial cables from the module are not pinched. Secure the 4 mounting screws, reattach the coax connectors, and reconnect the wires to the final amplifier terminal board.
- e. LSB Oscillator Crystal Installation
1. Disconnect the three wires to TB 501 at the Frequency Generator Module. Disconnect P501 from J402 at the IF/Audio Module and P502 from J1 on the RF module.
 2. Loosen the two screws retaining the Frequency generator module and remove the module.
 3. Remove the module cover from the frequency generator module by loosening and removing the three screws on the top side of the module. Set the cover and the screws aside.
 4. Turn the module such that the component side of the module faces up.
 5. Locate the TCXO Module. It is the large metal box located inside the Frequency Generator module.
6. Disconnect the wires from each of the 3 terminals located on the side of the TCXO module. Mark the wires for reconnection during the reassembly phase.

7. Remove the two screws securing the TCXO module to the Frequency Generator module chassis. Set them aside for future reassembly. Remove the TCXO.

Modifying the TCXO to permit lower sideband.

8. Clamp TCXO module in a vice, positioning the vice jaws as low on the sides of the TCXO as possible, allowing maximum protrusion of the TCXO above the vice jaws.
9. Locate the solder joints holding the top of the TCXO case. Scrape them with a wire brush to remove paint.
10. With drill and 1/8th inch diameter bit, drill two holes in TCXO module cover. Locate the holes near the corners diagonally opposite of each other on the cover. **DO NOT ALLOW THE DRILL TO PENETRATE MORE THAN 1/8 TH OF AN INCH INTO THE MODULE BELOW THE COVER OR YOU MAY DAMAGE THE TCXO ELECTRONICS.**
11. Heat the perimeter of the cover of the TCXO Module with a gas torch to melt the solder that secures the cover to the TCXO housing. Insert a wire hook through one of the holes previously drilled in the cover and pull on the hook. As the solder melts the cover should pull off. You may have to insert the wire hook in the other hole to free the other half of the cover.
12. Remove the TCXO cover and discard it.
13. Observe the TCXO module. All modules will have space to package the additional crystal and the subminiature relay included as part of the kit. For some versions of the TCXO it will be easier to locate the second crystal directly on top of the first, with the relay off to the side, in close proximity to the two crystals. In other versions, there is sufficient space to package the second crystal and the relay in the box, in an area close to the original crystal. Once you have selected the best physical locations for the relay and the crystal, use some quick drying epoxy glue to secure them in place.
14. To wire the TCXO to switch between Crystals, first unsolder one leg of the existing crystal from the lead that connects it to the circuit board. Run a lead from the disconnected pin of the existing 1750 kHz crystal and solder it to the normally closed contact (NC) of the relay.

15. Run a wire from the normally open contact (NO) of the relay to one leg of the added 1747 kHz crystal. Connect the other leg of the added crystal to the undisturbed leg of the existing 1750 kHz crystal. Connect a wire from the contact going to the relay switch arm and run it to the wire to the circuit board that was previously disconnected from the existing 1750 kHz crystal. Solder one end of the relay coil to chassis ground in the TCXO housing. The other end of the coil should

be connected to an 8-inch long piece of hookup wire. When no voltage is applied to the relay coil the 1750 kHz crystal will be connected. When the relay coil is energized, the 1747 kHz crystal will be switched into the circuit. (The other end of the wire connected to the coil will later be strung through the bottom of the Frequency Generator module and will run to the output end of a +5 volt regulator. Input for the regulator comes from the USB/LSB switch.)

16. When components are secured and wired correctly, remount the open TCXO housing into the Frequency Generator chassis. Once this is done, run the wire from the relay coil through the bottom of the Frequency generator housing, for later connection when the radio is reassembled.
17. Check for clearance between the electronics in the open TCXO chassis and the frequency generator cover. You will need to insert a plastic sheet or piece of cardboard in-between the TCXO Electronics and the module cover to prevent the possibility of short circuit. When correctly positioned, tape the insulator in place and reinstall the Frequency generator module cover. Secure this cover with the 3 screws previously removed.
18. Reinstall the Frequency generator module into the PRC-74 chassis, making sure to feed all of the wire extending through the bottom of the frequency generator module through the chassis, so it is not pinched in the module mounting.
19. Secure the module mounting with the two captive fasteners extending from the bottom of the chassis.
20. Re-connect the coaxial cables to their sockets on the IF/Audio and RF modules. Connect the black wire, red wire and the red/white wire to terminal board TB 501.

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f. Final electrical connections

1. Find the wire from the wiper arm of the SPDT LSB/USB switch. This will be the one going to the center terminal on the switch.)
2. Attach an additional wire to the red wire at pin 2 of TB 501. Join and solder this wire to the wire from the wiper arm of the SPDT USB/LSB switch.

3. Mount the 3 terminal regulator chip to the main chassis. There is a clear space forward of the Gain control board which would be suitable to mount the voltage regulator
 5. Find the wire from the LSB terminal of the USB/LSB switch. Connect it to the input terminal of the 5-volt regulator. Connect the wire from the relay coil, running through the bottom of the frequency generator module to the output terminal of the 5-volt regulator.
 6. Connect a wire between the output of the 5-volt regulator and pin 4 of TB 601 at the frequency synthesizer module. (This is the pin to which the coil of the reed relay is connected. It will shift the synthesizer frequency in the LSB mode.
- g. Alignment and checkout
1. Connect 12 volts DC to the power connector of the transceiver and an H-250 handset to one of the PRC-74 audio input connectors. Set the radio to the USB mode.
 2. Turn the radio on. Check for +9 volts at pin 2 of TB 501. Tune radio to a frequency in the 80 or 75 meter band. I use 3800 kHz. Set a signal generator to 3801 kHz @ 1 uV output. Connect the signal generator output to the antenna input. Set the RF gain control to full CW rotation. Adjust the "Peak Noise" control for maximum audible signal from the handset earpiece. Adjust the RF gain for a comfortable listening level. Press the pushbutton switch and check for normal calibrate operation.
 3. Set the USB/LSB switch to LSB. With a voltmeter check for 9 volts on the input to the voltage regulator IC and 5 volts on the output. Check also for 5 volts on the crystal switching relay. Check for + 5 volts on pin 4 of the TB 601 at the frequency synthesizer.
 4. Return the USB/LSB switch to the USB mode. Calibrate the unit by depressing the pushbutton switch and depressing the tuning vernier and rotating until an audible zero beat is heard. Connect a frequency counter to the RF module synthesizer output into the balanced mixer.

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This test point is a post mounted on the side of the little metal box on the bottom of the RF module near the balanced mixer unit ((the balanced mixer is marked HAC Z-701. The wire from pin 3 of the balanced mixer is connected to this post. If you set an operating frequency of 3800 kHz on the front panel switches, The synthesizer frequency should read 4550 kHz. (1750 kHz above the operating frequency.)

5. Set the USB/LSB switch to LSB. Using a plastic tuning tool, adjust the trimmer capacitor installed in the synthesizer module through the access hole drilled earlier in the main chassis. Set the trimmer such

that the counter reads a frequency of 4547 kHz. Setting the LSB synthesizer offset is now complete. Disconnect the counter.

6. Disconnect the signal generator and connect an antenna. Tune around the 80, 75 and 40 meter bands and enjoy LSB!!! Try USB on 20 meters.

If you have questions or need assistance call or write:

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