Easy Tuning for the Uniden HR2510

For easier and safer 10 meter mobileering.

by Carl A. Kollar K3JML

If you were driving down the road and noticed the driver in the car in front of you leaning forward, to the right and down, and staying that way, wouldn't you naturally assume he got his fingers stuck in the heater vent? Many people who enjoy mobile hamming, however, also spend a lot of time in this position, if they are using the nifty little Uniden HR2510 10m mobile rig. On this rig, to tune meticulously from one end of the active SSB portion to the other takes a lot of knob twisting. At the same time, of course, they have to pay attention to their driving. There had to be a better way!

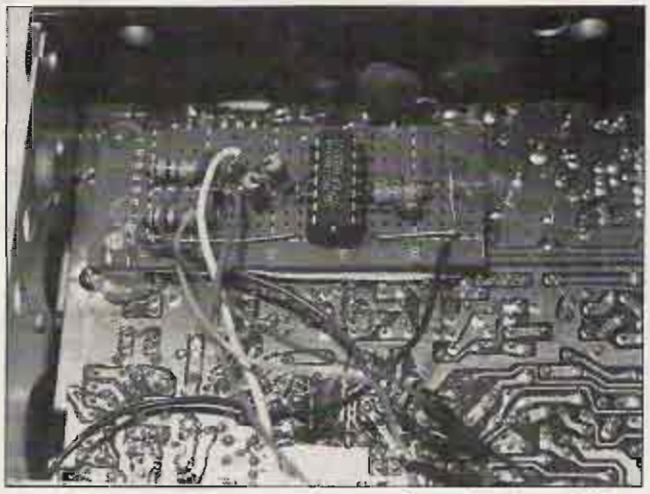

Photo A. Completed circuit built on a portion of perf board. There are only 10 components to install!

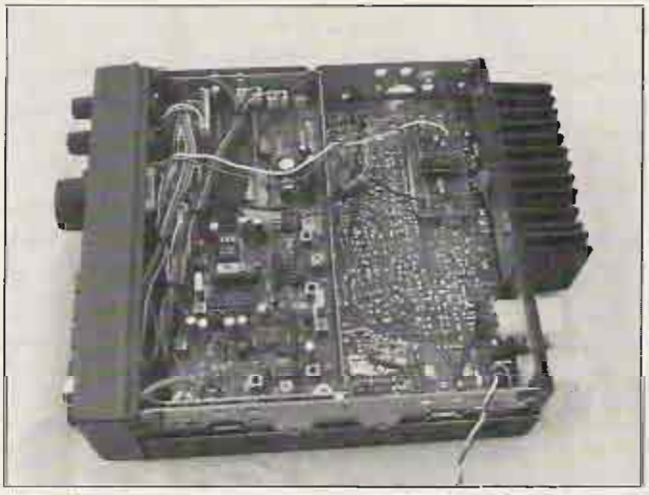

Photo B. Circuit board installed in the HR2510. There's plenty of room for easy mounting.

The Annoyances

The 2510 really is a nice little mobile rig, but some minor annoyances quickly become evident. (1) The up-down button on the mike QSYs in 10 kHz steps only. In my opinion, this makes it useless for fine-tuning the band for SSB stations. I can't think of any time this feature would be useful. (2) It has no offset for 10 meter operation. (3) The receiver RIT control has no disable; you can call stations until you're blue in the face, and not get an answer because you're on different receive and transmit frequencies.

I understand the new HR2600 corrects all these "problems," and that's great, but what if you don't want to go through the hassle of selling your rig and spending more money to get the newer model? The April 1989 issue of *73* features an article by WB9WDH and WA9QDZ called "FM Split for the Uniden HR2510," which pretty well takes care of the repeater offset problem. And, although I haven't seen it yet, I understand there's also a mod that takes care of the receiver RIT problem.

Tuning from the Mike

I needed a nice little mod that would give me useful up-down buttons on my microphone. When you're normally tuning with the front panel knob, you can select 0.1 kHz, 1 kHz, or 10 kHz tuning increments with the span button. The 100 Hz position is the most useful in tuning SSB signals. I needed to make the radio "think" it was receiving its directions from the front panel frequency control, when in actuality it was receiving from the mike buttons.

The first step was to investigate what kind of "signal" the up-down buttons on the mike supplied to the radio. A little investigation found that an "up" depression put a ground on the black mike wire, while a "down" depression put a ground on the white mike wire.

The next question was: What kind of indication from the frequency knob on the front panel did the transceiver need to change frequency up or down? Some physical lead following lead to jack J307 on the main circuit board. (See Figure 1.) A little scope probing soon revealed that for an "up" command, a positive going pulse was needed on J307-3, and for a "down" command, a positive pulse was needed on both J307-2 and J307-3.

Furthermore, these points could be pulled high by an external source to effect the frequency change. They weren't a solid low when not activated, just at ground potential (probably held there by pull-down resistors). I was able to make the frequency change by manually jumping +5V with a wire to these points, just as if I were using the front panel knob. Also, since the radio "thought" that it was receiving its instructions from the frequency knob, the span switch was still effective in determining the tuning increments.

So, there I had it--all the elements I needed to design my circuit. I needed an interface which would intercept the up-down mike switch depressions, create a pulse train for easy tuning, and route those pulses to the appropriate points to continuously tune the

radio from the mike, just by holding the button down. The result of that design is shown in Figure 2.

Circuit Workings

The 4001 is a CMOS quad 2 input NOR gate. On any one gate, with either or both input high, the output is low; with both inputs low, the output is high. Sections A and B are configured as an astable multivibrator to generate the clock pulses needed to eliminate the need to depress the mike button for each tuning increment.

The rate at which the tuning takes place (clock frequency) is determined by the 0.1 µF capacitor and the 470k resistor. The 4.7 megohm input resistor is generally 10 times the value of the timing resistor, and contributes to 50% duty cycle as well as independence of the clock frequency from supply voltage variations. With the values shown, you get about 2 pulses per second, apparently a comfortable tuning rate. You can fine tune SSB signals without overshooting the target frequency or tuning too slowly.

The output of the multivibrator (pin 4) is fed to pins 12 and 8 of the other 4001 sections, which are used as gated inverters. (The gating is what we're after; the inverting has no serious consequences for our application). At this point, the pulse train goes nowhere until one of the other gate leads is grounded (ultimately by either the up or down mike button). If the "up" mike button is pressed, pin 13 of section C is grounded, and a pulse train is output from pin 11 through the 1k isolation resistor to the white wire on J307, causing the HR2510 to increment one digit per pulse.

If the "down" button is pressed, a ground is placed on pin 9 or section D of the 4001. Also, the diode between pins 13 and 9 become forward-biased and applies a near-ground on pin 13 of section C. This causes a pulse train at both pins 10 and 11, through the isolation resistors and on to the white and gray wires on J307. This, in turn, causes the HR2510 to decrement one digit per pulse for as long as the button is held down. The circuit is simple, but it serves very well as the interface to accomplish our purpose.

Building the Circuit

My prototype was built on a portion of perf board with a pad-per-hole configuration purchased from Radio Shack. The component count (10) is so low, I didn't take time to try to design and etch a printed circuit board. It took me half an hour to build the circuit (see Photo A). Fabricating a PCB would have taken longer than that.

Using the layout shown in Figure 3, mount the components. In most cases, you can make connections using the extra length of the component leads. For those of you who are using the Radio Shack circuit board, the Component Mounting Guide table may help. After placing the parts (as shown in solid lines), and

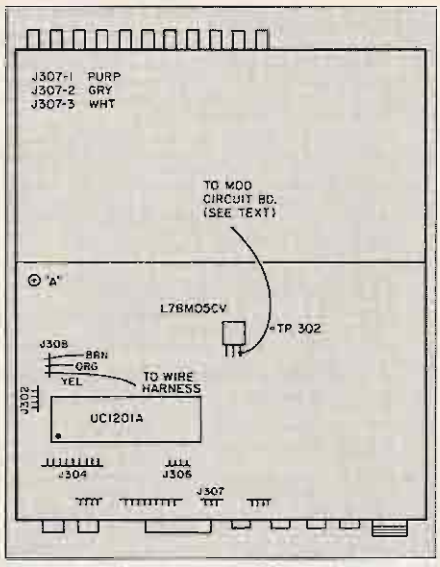

Figure 1. The opened HR2510. Front panel faces down.

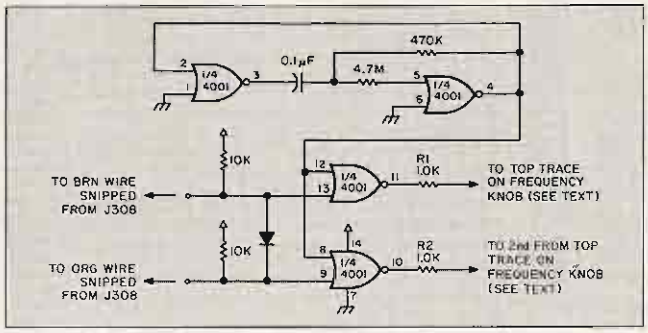

Figure 2. Schematic for the mike tuner interface, which fits into the HR2510.

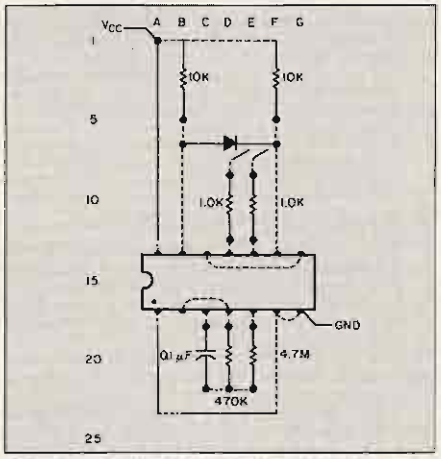

Figure 3. Parts placement for the mike tuner interface.

the wires underneath (in broken lines), make the proper connections.

Refer to the perfboard in Photo A. The 1k resistors between D8 and D12 have leads going into D8, then pulled up through D7 to connect to the HR2510. The same goes for the 1k resistor between E8 and E12. Pull the lead down through E7 and then back up through E8. When the circuit is built, cut off the excess board along row 25 and column J.

Cut six 12-inch lengths of wire. Attach a red wire to A1 on the circuit board (wire from IC pin 14) and a black wire to A3 on the circuit board (wire to pin 1 on the IC). These are your positive and negative supply leads respectively. Connect another wire to the resistor end looped through D8 and D7, and another to the resistor end looped through E8 and E7.

Finally, carefully solder a wire to the anode of the diode (location B6, or even better, the resistor lead at B5) and another to the cathode (location F6, or even better, to the resistor lead at F5). Temporarily, set the board aside.

Installation

With the front panel facing you, and the bottom cover facing up, (the side with the speaker), remove the four side screws holding the cover. Carefully remove the bottom cover, paying particular attention to the wires still attached to the speaker mounted on the cover.

I found it convenient to unsolder the speaker wires and set the bottom cover aside. You can see that there is plenty of room in the rear half of the radio for extra goodies. Press two layers of double stick tape to the bottom of your board, then press it firmly onto the HR2510 circuit board in the left rear corner (see Photo B).

Attach the six wires coming from the circuit board as follows:

1. The ground wire of your circuit board (IC pin 1,6,7, etc.) is routed along the left edge of the chassis and fastened under the screw at point A. (Figure 1)

2. The voltage supply wire (IC pin 14, etc.) is routed toward the center and to the L78MO5CV regulator. Carefully solder to the right hand lead as shown in Figure 1.

3. The lead coming from location D7 (the resistor R1 connected to pin 11 of the IC) is carefully routed down the center and toward the frequency knob. Carefully solder to the top trace on the frequency control circuit board. This is the trace with the white wire attached to it.

4. The lead coming from location E7 (the resistor R2 connected to pin 10 of the IC) is carefully routed down the center and toward the frequency knob and soldered to the next trace down on the frequency control circuit board. This trace has a gray wire attached to it.

5. Refer to Figure 1 and locate J308 with the brown, orange and yellow wires attached. About 1 inch from the connector, cut the brown and orange wires. This will allow easy restoration of the HR2510 to its original configuration.

6. Connect the wire coming from the anode of the diode on your circuit board (location B6 or B5) to the longer brown lead going into the harness snipped from J308. Connect the wire coming from the cathode of the diode (location F6 or F5) to the longer orange lead going into the harness snipped from J308.

7. Installation is now complete. Inspect all wiring before applying power.

Testing

Testing is very simple. Turn on the power. All controls should work normally. Manually turning the frequency control should increase or decrease frequency by the increments selected by the span button.

Now for the good part! Depress and hold the "up" button on the mike. The frequency should slide effortlessly up the band at about 2 increments per second. Try the "down" button. It should slide down the band at the same rate. Isn't this much better than manual tuning?

If you think that this is good, wait until you try it while you're driving!

Conclusion

This project is easy. With the proper care, it should go very smoothly. From start to finish, it should take about 2 hours. It's worth the effort and sure beats selling the whole rig to buy the upgraded version.

If you're a little squeamish about messing around inside your rig, you can send it to me *insured* with a check for $50.00 to cover parts, labor, and return shipping. I'll be happy to modify it and return it within a week of when I get it. Just remember, if it's in warranty, this mod will void your warranty.

Enjoy the easy tuning, and see you on 10m! 73

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Parts List

Qty	Description	Radio Shack Part #	Price
2	10kΩ ¼ W resistor	271-1335	.39, pkg. of 5
1	1N914 diode	276-1122	.99, pkg. of 10
2	1kΩ ¼ W resistor	271-1321	.39, pkg. of 5
1	14 pin IC socket	276-1999	.89
1	0.1µF 50 V capacitor	272-135	.59, pkg. of 2
1	470k ¼ W resistor	271-1354	.39, pkg. of 5
1	4.7M ¼ W resistor	Local TV repair shop	
1	4001 CMOS IC	276-2401	.99
1	project board	276-158A	2.29
1	high bond double stick tape	64-2361	1.99, pkg. of 2

Component Mounting Guide on Radio Shack PCB

Component	Mounting Points
10k resistor	B1 to B5
10k resistor	F1 to F5
1N914 diode	B6 to F6
1k resistor	*D8 and D7 to D12
1k resistor	*E8 and E7 to E12
IC socket, pins 14 to 8	A13 to G13
IC socket pins 1 to 7	A16 to G16
Jumper wire	A17 to A23
Jumper wire	B23 to F23
Jumper wire	A1 to A12
0.1 µF capacitor	C17 to C21
470k resistor	D17 to D21
4.7M resistor	E17 to E21

*See text