

The MFJ 9420D (D = Deluxe)

MFJ's adapter makes their small SSB transceiver into a bare-bones CW rig. A few simple upgrades (phone jack, CW filter, RIT) move it into the CW mainstream.



The MFJ series of single-band transceivers has become very popular in the amateur community. Of all the radios, I believe that the MFJ 9420 is the most versatile. With its extremely effective speech processor, the MFJ 9420 is a potent, lightweight and compact portable, mobile and fixed-station rig.

Although the MFJ 9420 is primarily a SSB radio, it can also work CW with the addition of an adapter board. The MFJ-415 CW Adapter lowers the frequency of the MFJ 9420 to the CW portion of the band with the push of a switch. It also provides side-tone monitoring and semi-break-in keying.

Several excellent reviews have already been written about this radio.¹ The purpose

of this article is to show you how to significantly enhance the '9420, especially for CW operation.

Headphone Jack

This is the only enhancement that applies to SSB and CW operation. The MFJ 9420 does not have a headphone jack. This can be a *real problem* for late-night, quiet listening. I also wear 'phones much of the time when operating CW. A headphone jack is also handy for mobile operation. You can use it to connect the MFJ 9420 audio output to a CD-to-tape player adapter (such as a RadioShack #12-1951) to give you plenty of audio. The 1-W audio output of the MFJ 9420 is inadequate in a noisy mobile environment. (This audio level is fine for 16 or 32-Ω headphones, but you might want to include a 10 or 20-Ω series resistor if you use 4 or 8-Ω phones.—Ed.)

I wanted to add a 1/8-inch stereo jack to match most modern headphones and CD-to-tape adapters. Because the MFJ 9420 output audio amplifier has a balanced speaker output, the headphone jack must be isolated from ground. I accomplished this by using an enclosed PC-board mount jack mounted in an enlarged hole on the back panel. Figure 1 shows the wiring diagram. This DPDT jack is perfect for this application. The jack requires a 1/8-inch hole, so I drilled a 3/8-inch hole and insulated the nut from the chassis with a 1/4-inch fibershoulder washer. (See Figure 2.) This washer is a little too thick for the shaft length of the jack, but a few swipes of the fiber washer over a flat file fixed that. While I was at it, I made the speaker removable by adding a plug and jack to the speaker wires. (See Figures 1 and 3.)

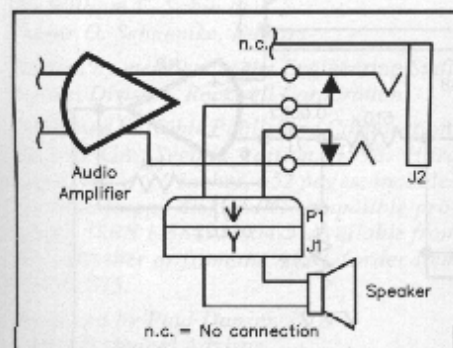


Figure 1—Schematic of the new headphone jack and speaker connections. Equivalent parts may be substituted. See Note 2 for suppliers' addresses.
P1, J1—Two-pin polarized, interlocking connectors (RS 274-222)
P2—1/8-inch stereo jack, enclosed, closed circuit (RS 274-246) mounted with a 1/4-inch fiber shoulder washer (Mouser #534-4711). See Figure 2.

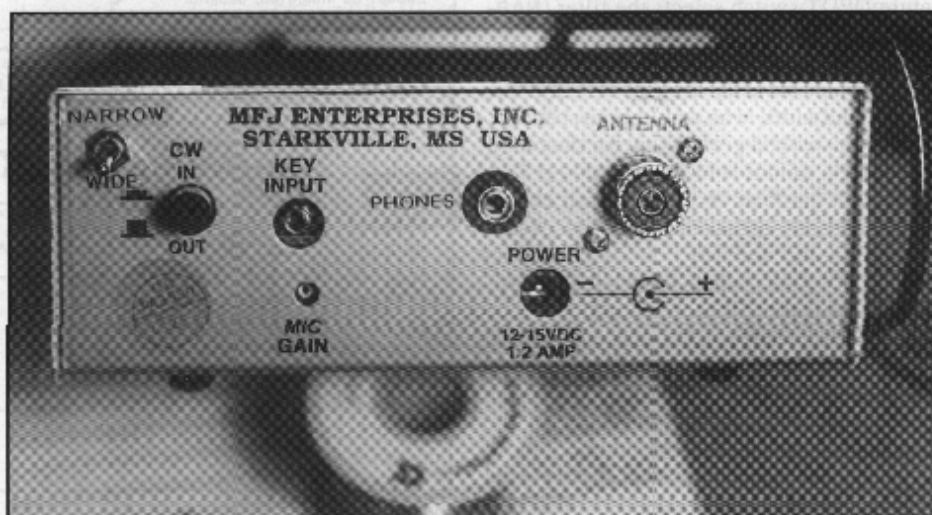


Figure 2—A rear view of the transceiver shows the new CW-filter switch at the upper left and the new headphone jack at the center. The dark circuit around the PHONES jack is a fiber shoulder washer to insulate the jack from the cabinet.

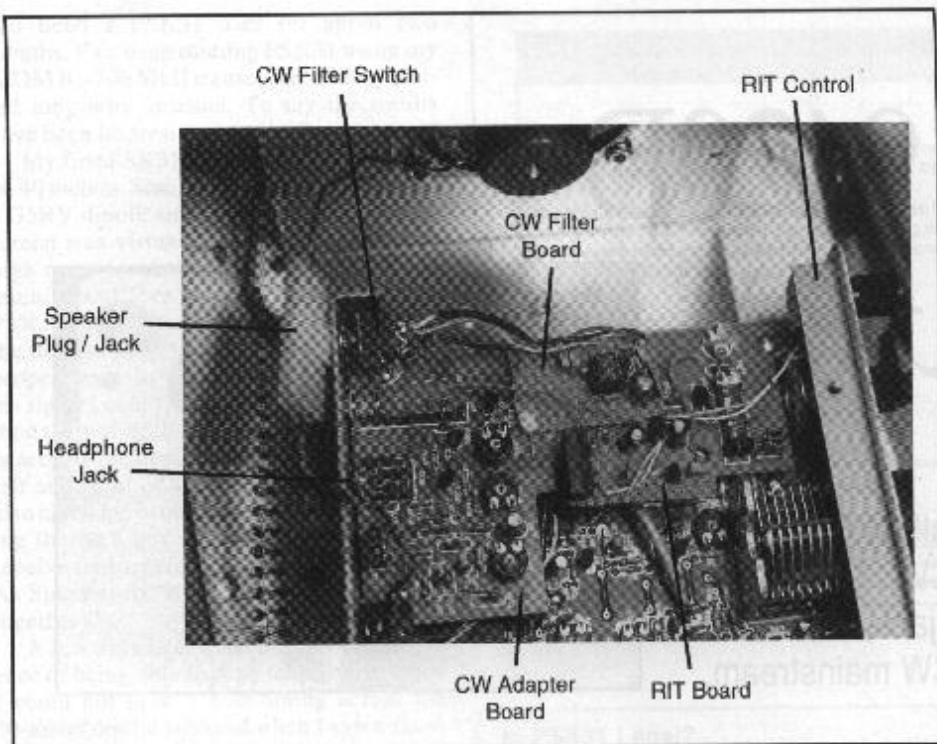


Figure 3—An interior view of the modified transceiver with modifications labeled.

CW Audio Filter

The MFJ 9420 is optimized for SSB. Therefore, no narrow-bandwidth CW filter is available. Because I operate CW most of the time, I wanted a filter.

I built an audio CW filter (see Figure 4) that consists of two band-pass filters, each with a Q of five and unity gain centered on 700 Hz. Pretty much any dual op amp can be used. I had several LM358s in my junk box, so I used one of these. When you build this filter, it's important to closely match the 0.0022 μ F capacitors, 510 k Ω , 1 M Ω and 11 k Ω resistors used in both stages. That is, it doesn't matter if the values vary 5% from those shown, but the actual values of same-value parts used should match within a few percent of each other. A miniature DPDT switch selects the filter (**NARROW**) or bypasses it (**WIDE**).

When I built this unit, I found it centered almost exactly on 700 Hz, and the 3-dB bandwidth was only about 100 Hz. The filter worked great! Now for the tough part—let's mount it in the radio!

It isn't that bad. You can install everything without disassembling any of the boards inside the MFJ 9420 (that was one of my goals when I started this project). I built the filter on a small piece of RadioShack perf board material, with leads for +10 V dc, ground, audio in and out. I used two layers of double-sided tape (RS 64-2343) to mount the filter in the large blank area on the CW-adapter board. The first tape layer consists of small pieces placed around solder connections and wires on the bottom of the perf board. The second layer covers the entire bottom of the perf board. The **WIDE/NARROW** switch

is mounted on the back panel near the upper-left corner. Figure 3 shows this all well.

I needed a way to break the audio path without removing any boards. To do this, I located C54 on the main board and rocked it back and forth until the leads broke. I tack-soldered a 1.0- μ F electrolytic capacitor's negative lead to the negative lead broken from the original C54. The positive lead of this new capacitor connects to a common contact on the filter switch through a piece of RG-174 coax with the shield soldered

to ground near the new C54 and near the switch.

Refer to Figure 4: You can pick up the audio input for the filter at pin 4 of the CW Adapter board. The side-tone audio is conveniently bridged onto the main audio line at this point. Solder a wire from pin 4 on the CW Adapter board to the other common contact on the new filter switch. Now, wire the switch so that one position shorts the audio across the switch: the **WIDE** mode. Wire the remaining switch contacts to route the audio through the filter. (The filter switch input, S1B, connects to pin 4 on the CW Adapter board. The filter output switch, S1A, connects to the new 1.0 μ F capacitor.) Solder the new audio filter board's ground to any convenient ground on the CW Adapter board. Solder the +10 V filter wire to a pin on the CW Adapter's **ON/OFF** switch that can provide +10 V. Because the narrow filter is only used for CW reception, I picked the pin that provides +10 V only when the CW Adapter is on.

That's it. Now you can switch a narrow filter in and out when operating CW. This provides a tremendous selectivity advantage. In addition, when you center the received signal in this filter, your transmit offset is exactly 700 Hz (if the transmit offset is properly set).

Receiver Incremental Tuning (RIT)

The MFJ 9420 has no RIT. RIT is not needed for SSB operation, but it's very important for CW, especially when using a narrow filter.

Figure 5 shows my RIT circuit. A 78L06 voltage regulator ensures that the frequency-control voltage stays rock solid. I used a back-biased 1N4004 diode as a varactor. I got this idea from the NorCal 38

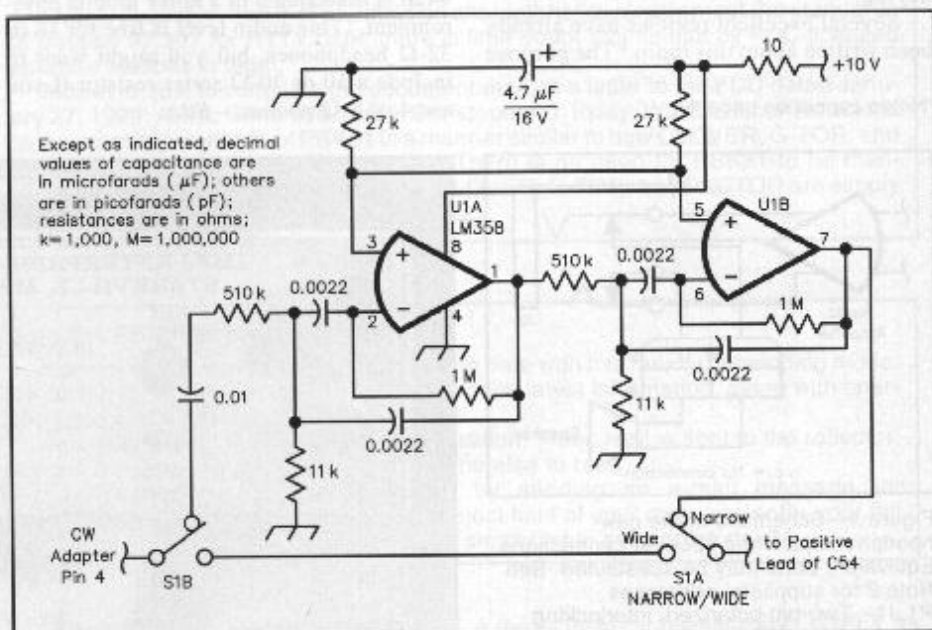


Figure 4—A schematic of the CW filter circuit and its switching. See text for connection details.

K1—SPST 12 V dc normally open SIP reed relay (1.6 k Ω coil, Hofselt #45-191)

S1—DPDT toggle switch (Hofselt #51-270)

