

MFJ-784B Tunable DSP Filter

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The advent of digital signal processing (DSP) has generated one of those sea changes in the hobby. Equipment manufacturers are tripping over themselves to incorporate DSP into their high-end boxes, just as they did a decade or so ago when audio filters were all the rage. If you'd like to hop aboard the DSP juggernaut but aren't ready to spring for a whole new radio, MFJ offers the MFJ-784B Tunable DSP Filter, a flexible, outboard DSP unit with appeal to everyone from DXers and contesters to rag chewers and digital-mode enthusiasts.

Like its predecessor, the MFJ-784 *Super* DSP Filter, the unit is built around the Analog Devices ADSP-2105, a 16-bit chip that runs at 12 MHz. The differences between

the '784 and the slightly more expensive '784B mostly boil down to additional bells and whistles—literally in the latter case (a firmware upgrade for the '784 is available). Besides jumper-settable DSP filters for RTTY, HF packet, AMTOR and PACTOR, and a fixed filter for SSTV and fax modes, the '784B has tunable filters for SSB and

BOTTOM LINE

The MFJ-784B is a convenient, economical tunable DSP add-on that's especially effective for CW and data modes. This unit can add new life to older transceivers and might even boost the performance of newer, non-DSP gear.

CW plus tunable high-cut, low-cut and bandpass settings. It also can memorize your top ten favorite custom filters. Noise reduction, notches (manual and auto), AGC, the new *Spotting Tone* and *Filter Talk* features (the "whistles") and a built-in diagnostic routine round out the package. A compact but complete *Instruction Manual* covers everything from "fast start" to "advanced features." Wisely, it includes down-to-earth explanations of DSP and filter theory, making it a good learning tool.

The unit is easy to hook up but needs a 12-V power source. Like any outboard audio filter, it goes between your transceiver's audio output and your speaker or headphones (or your TNC). MFJ recommends a second connection to route the CW sidetone around the filter, but the unit also

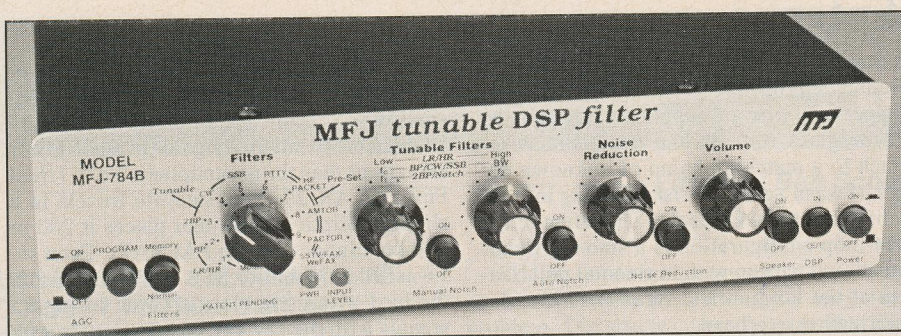


Table 2
MFJ-784B Tunable DSP Filter

Manufacturer's Claimed Specifications

Power requirements: 10-16 V dc, 500 mA (max).

Input-to-output delay: 23 ms

Bandwidth (min/max): CW, 30-700 Hz; SSB, 1000-2500 Hz; RTTY, HF packet, AMTOR and PACTOR, optimized for 2125/2295-Hz mark/space frequencies; SSTV/FAX, 1050-1350Hz and 1450-2350 Hz (dual bandpass).

SSB/CW filter shape factors: Not specified.

Low-cut/high-cut and bandpass frequency ranges: As specified.

Low reject cutoff frequency, 200-2200 Hz;
high-reject cutoff frequency, 1400-3400 Hz;
bandpass filter bandwidth, 30-2100 Hz.

Random noise reduction: up to 20 dB.

Manual notch depth: ≥ 40 dB; auto notch depth, up to 50 dB.

Time to notch: Not specified.

Audio input requirements: 1-2.8 V P-P.

Audio output: filtered audio output,
 ≈ 1.5 V P-P across 600 Ω ;
speaker output, ≈ 2.5 W into 6 Ω .

Size (height, width, depth): 2.4 $\times$ 10 $\times$ 5.8 inches (exclusive of projections).

Note: All measurements were taken at factory-default jumper settings.

Measured in the ARRL Lab

As specified (tested at 13.8 V dc).

As specified.

As specified.

SSB, 1.08 typical; CW, <1.3 at ≈ 300 Hz bandwidth.

As specified.

As specified.

≈ 8 ms.

As specified.

Filtered audio output, 3 V P-P at 1% THD across 600 Ω ; speaker output, 2.7 W at 1% THD into 6 Ω .

has a sidetone filter. A front-panel **INPUT LEVEL** LED (also new on the '784B) helps you calibrate the audio input level using a screwdriver pot on the rear apron. The unit's four, smallish, fluted front-panel knobs have a "tight" feel. The **FILTERS** switch moves easily, but the panel labeling surrounding it is a bit busy for such a small area. Same goes for the labels above the twin **TUNABLE FILTERS** controls.

Rear apron $\frac{1}{4}$ -inch and 3.5-mm phone jacks accommodate both stereo or mono headphones and a speaker (which you can disable with a front-panel button). Other audio connections—including a separate "filtered output" level for your TNC or other device—are via the familiar phono jacks. You also can wire the filter to your TNC and transceiver via separate rear-apron five-pin DIN connectors which include "filtered output" audio and a PTT line connection. A front-panel **VOLUME** control sets a comfortable speaker or headphone level. However, ARRL Lab tests showed that speaker/headphone audio output rolled off sharply above approximately 1700 Hz with the DSP switched off. MFJ says that this was done to eliminate noise and hiss from the chip when DSP is switched out, to make it easier on the

listener. Turning the unit off altogether eliminates the rolloff. "Filtered output" AF response was essentially flat across the amplifier's usable range.

An avid CW op, I first applied the MFJ-784B to my favorite mode on a somewhat noisy 40 meters. The '784B shines on CW. Finding a weaker signal somewhat down in the noise, I used the Spotting Tone to "zero beat" the station. This neat feature helps you center the signal in the filter bandpass by using the left-hand control to match the signal's pitch with an internally generated tone. If you're not tone deaf, you'll find it handy. Then, I used the right-hand control to narrow the bandwidth. Wow! This unit hoisted the watery signal right to the surface while deep-sixing the QRM and noise! Switching in my transceiver's narrowest filter was hardly worth the effort.

SSB results were not quite as dramatic; it takes more practice to find the right trade-off between enhanced selectivity and speech intelligibility. I found using the **LR/HR** (low reject and high reject) position to be quite useful on voice signals. Another user who tilted at 75-meter QRM with the MFJ-784 reports: "With an LSB signal on

my listening frequency of 3839 kHz, I could use the tunable filters to make QRM on 3837 kHz go away. But a signal on 3840 kHz was still a bother—no matter what I did."

Digital-mode enthusiasts—especially those lacking IF filters tailored for such modes—might find the MFJ-784B a real plus to combat QRM and high noise levels. The unit considerably improved readability of troubled signals on HF packet (an already-problematic mode) and easily isolated battered RTTY and AMTOR signals from the noise and QRM and sent them into my TNC.

The unit's **AGC** is commendable, especially for an outboard DSP device. I expected a lot of pumping, but it's fairly smooth and helps bring low-level signals up so you can hear them better. However, under certain conditions, it can dredge up a lot of background noise, as the instruction manual warns. The **NOISE REDUCTION** button and control apply a special filter algorithm to random noise. A variable front-panel control determines how aggressively it attacks. The immediate impression is that it just drops your audio output level, but a closer listen reveals it works well on high-frequency "hiss" or band noise. On weak signals, however, it can add a hollow or "sizzling" noise of its own. While not a panacea against random noise, it helps reduce listener fatigue, if nothing else.

The **MANUAL NOTCH** and **AUTO NOTCH** modes were phenomenal. With the manual notch on, you tweak the **TUNABLE FILTERS** controls to make the offending QRM just disappear. It's *very* easy to get deep notches (one or two) without much dial twiddling. The auto notch is especially effective against heterodynes (up to four) like those encountered on 40 meters at night. An internal jumper lets you set three additional levels of aggression, but the manual warns that the highest setting might impair intelligibility.

Filter Talk is both convenient and cute: push the **PROGRAM** button and it plays back your custom filter memory settings in Morse code (the default speed is a sluggish 5 wpm, but you can bump it up to as high as 30 wpm using internal jumpers). For those who prefer the more prosaic pencil-and-paper approach, the instruction manual includes fill-in-the-blank charts.

The MFJ-784B Tunable DSP Filter would be a welcome complement to many ham shacks, especially if you're not quite ready to trade up to a transceiver with integral DSP. SWLs also would enjoy its features. The MFJ-784B lists for \$249.95. The optional MFJ-1315 power supply is \$14.95. The MFJ-55 firmware upgrade for the MFJ-784 (which, MFJ says, "gives you most features of the MFJ-784B") is \$29.95. *Manufacturer:* MFJ Enterprises Inc., Box 494, Mississippi State, MS 39762; tel, 601-323-5869; fax, 601-323-6551; orders: 800-647-1800.

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