

MFJ-8100 World Band Receiver

I think I reached my frustration tolerance with modern radio equipment when I first saw a friend's new 2-meter mobile rig. This particular transceiver had something on the order of 30 control functions built into the microphone case. All those tiny buttons must have given the design ergonomacist nightmares for a year.

Watching my buddy try to maneuver his car and manage his newest toy was an exercise in both humor and terror for me as a passenger. Certainly it made me long for simpler days. After kissing the ground when my pal dropped me off, I decided to see whether uncomplicated radio listening still could be found in this day and age when bells and whistles rule. This exercise in radio regression lead me back to the world of radio regeneration.

The MFJ-8100 is a giant step backward to the early days of radio listening. The basic concepts behind this receiver design have their roots in the very beginnings of radio although the engineers at MFJ have taken full advantage of modern componentry to get the job done. This provides a design that is both inexpensive and can—with some practice—produce excellent results for any listener.

Regenerative receivers hold an interesting place in radio history. They were the essential improvement over simple crystal detectors that made radio practical for most people in those early days of the medium. To some degree, the design was overshadowed by the "superheterodyne" circuit. Still, simple, inexpensive regenerative receivers remained popular with hobbyists and experimenters well into the 1960s. MFJ revives this design for a new generation and it remains as much fun to use as it must have been for people in the early days of radio.

Build It Yourself

Available as either a kit or in its fully wired-and-tested form, the MFJ-8100 gives you the option of building your own shortwave receiver. The design consists of less than 50 parts and components and can be easily assembled in an evening or two by anyone with basic skills in soldering and assembly techniques. The instruction manual is informative and the majority of the components mount on a single, well-



The MFJ-8100 World Band Receiver can take you back to the days of past receivers.

marked printed circuit board. This is a far cry from the "wood and fahnestock clip" construction techniques of the early days of radio. Also, this receiver comes with a sturdy all-metal case, cover and front panel, which is more than can be said for many modern receivers.

If you run into trouble with either construction or use, MFJ offers technical help by way of an 800 number. I didn't find a need to give the line a call during this project, but I did feel good knowing that it was there if I needed it.

If you are new to the radio hobby, you can learn a great deal about how receivers work by digging in and building this simple circuit. The most basic concepts of radio receiver design that you will encounter during this project will serve as a great foundation of knowledge for further receiver purchases. If you have been around the hobby for a few years or if you are an old-timer who remembers the joys of earlier regenerative receiver designs, you may want to use the MFJ-8100 as bait to get a child or grandchild unglued from the television set. There is a lot of fun packed into building and using this basic receiver.

What Bands?

The receiver tunes the major portions of the shortwave spectrum in five bands. Range A covers 3.5 to 4.3 MHz. Most evenings this band will let the user listen in to 80-meter amateur radio communications in both the CW and SSB modes. You

also should be able to catch shortwave broadcasters in the 90- and 75-meter bands. Range B covers 5.85 to 7.4 MHz. Throughout the afternoon and evening, this range will produce dozens of strong shortwave broadcasts in the 49-meter band. This also covers the currently popular "pirate radio" frequency of 6955 kHz. You also will be able to tune up through many utility maritime and aircraft frequencies into the 40-meter ham band and the 41-meter shortwave broadcast band.

Range C covers 9.5 to 12 MHz. This covers the very active 31-meter shortwave broadcast band, WWV at 10 MHz and the 30-meter ham band as well as some military and utility activity. Range D covers 13.2 to 16.4 MHz. This gives you access to the 20-meter ham band, which often is very active as well as the 21-meter shortwave broadcast band. It further takes you through many utility frequencies, including the 15-MHz signal for WWV and on into the 19-meter shortwave broadcast band. Range E covers 17.5 to 22 MHz, which covers the 16-meter shortwave broadcast band, the 17-meter ham bands, WWV on 20 MHz and the 15-meter ham band. These five frequency ranges are on par with many analog portable receivers currently being produced with additional coverage of many amateur radio frequency ranges left out by these other receivers. Regardless of the time of day, you certainly won't want for signals to add to your log.

Panel layout is the epitome of simplicity: five-position bandswitch, main tuning

What Is Regeneration?

The regenerative receiver circuit was developed by radio pioneer Edwin Armstrong. It represented a significant improvement over crystal or diode detectors by allowing a feedback process to occur. By making it possible for the detector circuit to feed back a portion of its signal repeatedly into the input in a controlled fashion, weak signals are boosted to readable levels. This design allowed early radio hobbyists to hear stations that would have been impossible with previous technology.

Further, it was the early regenerative receiver design that made shortwave listening and what we know now as amateur radio possible. Its tremendous gain and selectivity at very low cost made long-distance radio listening a hobby almost anyone could enjoy.

Edwin Armstrong would go on to invent the superheterodyne circuit as well as develop practical applications for frequency modulation (FM).

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Kit price: \$59.96

Wired-and-tested price: \$79.95

Available from: MFJ Enterprises Inc., P.O. Box 494, Mississippi State, MS 39762, phone (800) 647-1800.

control, regeneration control, power switch and volume control. That's a far cry from my comrade's multiple-control 2-meter unit. The receiver is powered by a standard 9-volt alkaline battery and the circuit design includes an LED power light to prevent you from forgetting to turn off the receiver when not in use. Still, current consumption of this design is very low and you should get hours of listening out of one battery in keeping with the overall low-cost nature of this project.

Up And Running

Setting up the unit for use also is a simple process. All you need to add to the project is the above-mentioned 9-volt battery, any inexpensive "personal stereo" headphones you happen to have around your house, a simple longwire antenna and a connection to a good earth ground. Most of my listening was conducted using a 40-foot outside longwire antenna, but good results also were obtained with as little as 10 feet of wire strung indoors. An interesting feature of this receiver is its dual headphone jacks. This allows you to share

in the listening experience with someone else making it the perfect receiver for teaching a newcomer about shortwave broadcast or amateur radio.

Once I was set up, I found many of my old friends on the air. BBC, Deutsche Welle, Radio Canada International, Voice of Russia, Voice of America and Radio Netherlands all were there, as were dozens of other signals.

The hardest thing for most folks to get used to when using a regenerative receiver is the "two-fisted" nature of the tuning process. Once you locate a signal, you then must adjust the regeneration control for best listening. Not providing enough regeneration leaves the signal unreadable. Feeding in too much regeneration will result in oscillation, which produces a whistling sound in your headphones. At first, the whistling is a bit of an annoyance, but as you begin to develop your touch with the regeneration control, those whistles become just another tuning tool. You simply adjust them away and get on with the business of logging the stations.

Once you've got the hang of tuning in standard AM shortwave broadcast signals, the next challenge is to turn your regenerative tuning skills to listening in on CW and SSB signals. When listening to CW signals, the regeneration control behaves much like a fine tuning control. You can use it to adjust the CW note to a comfortable tone and copy away. SSB tuning is similar, you adjust the tuning control slightly above or below the signal (depending on if it is USB or LSB) and then fine tune the "duck" sound into a human voice by way of the regeneration control.

Like flying and stout ale, regenerative tuning is a learned experience. But with mastery of the skill comes a great deal of satisfaction and fun. It is a totally different experience from the modern world of push-button tuning augmented by a digital readout. With this receiver, you will have to go back to the days of hunting for your signals. In the process of looking for your favorites, you will be sure to turn up many things you never would have heard otherwise. You also will develop listening skills that will improve your abilities when you turn your attention to more feature-laden receivers.

What's It All About?

OK, so what sets this design apart from your grandfather's "Genny"? Well for starters, you will not be able to enjoy the warm glow of that old 200-series triode tube that was the centerpiece of so many fine old receivers. The classic glass vacuum tube is replaced with a pair of modern field-effect transistors (FETs). Another FET serves as an RF amplifier that helps to dig out many weaker signals that an older

regenerative design might miss completely. Further, the use of an RF stage helps to reduce RFI coming back through the antenna. Also, reasonable audio for the headphones is provided by way of an LM386 integrated circuit amplifier.

These modern components provide a level of stability and overall performance that Grandpa would have sold the farm for. This stability eliminates much of the difficulty associated with regenerative tuning. Tuning is further augmented by the excellent vernier reduction drive on the main tuning control. This feature smoothes out the tuning to make adjustment of the regeneration less twitchy as you span the shortwave spectrum in search of signals. The engineers at MFJ have updated the regeneration control circuit to allow for smooth adjustment that can be tuned up to the point of oscillation without the annoying popping sounds that old-fashioned regen circuits were famous (or infamous) for.

Ham Companion

An intriguing possibility for this receiver is low-budget amateur radio. It would not be too difficult to use this receiver in conjunction with a simple "junk box" QRP CW transmitter circuit. Such a ham station would be both challenging and rewarding to use.

Essentially, you would be taking yourself back to the days when all radio was amateur radio. I found the receiver's performance in the CW portions of the 80-, 40-, 30-, 20-, 17- and 15-meter bands to be sufficient for good single signal copy, again, with careful adjustment. I've used this receiver on several nights to copy the CW bulletins off W1AW. It made me feel like a real "old-timer."

If you're the kind of person who can't leave things alone, the receiver's large case and well-thought-out circuit design lends itself to any one of several modifications. For example, it would not be too difficult to add a simple audio amplifier and speaker to the case to allow listening without the need for headphones. Also, several alternative power resources could be considered. The receiver's low power consumption might make for some interesting experiments with solar power.

All too often, the high price of radio hobby equipment forces us to take things far too seriously. The MFJ-8100's low cost, simple design and relatively easy-to-use control system brings back a lot of fun to the radio listening hobby. If you are looking to try something a bit different or to return to those early days of the radio art, this receiver will take you to all the right places. Personally, I plan to spend some time with this receiver on a regular basis, logging and QSLing stations the "old-fashioned" way. ■