

# Set Up Your Own Home FM Radio Transmitter

**Here's A Great Way To Re-Create That Radio Experience With Your Favorite On-Line Music**

by Philip Karras, KE3FL

Far from being the death knell of radio, the Internet can open up new opportunities to enjoy it. And it can also inspire new approaches to that enjoyment, as it did for me recently.

After one of my favorite FM radio shows was moved from standard FM to one of the station's HD broadcasts, I started looking for the show online, eventually acquiring a listing of all the stations in the U.S. that were broadcasting the show and had a live feed on the Internet as well. While doing this I also came across an Internet-only station I really enjoyed, called Folk Alley ([www.folkalley.com](http://www.folkalley.com)), and I've been listening to this station whenever I'm at home.

At first I'd listen to the program using two computers, one upstairs and one downstairs, but the difference in the speed of the PCs seemed to guarantee that they would never be synchronized while playing the music. Then I got an idea.

## What If...

I had a small FM transmitter in my car for use with a CD, iPod, or MP3 player. These neat little transmitters are able to re-broadcast the audio from an MP3 or any player that uses a simple mini-stereo connection cord and simply converts the audio signal to a standard FM broadcast signal at the frequency of your choice. It runs at an extremely low power that's usually good enough for a local radio to pick up, but no one else.

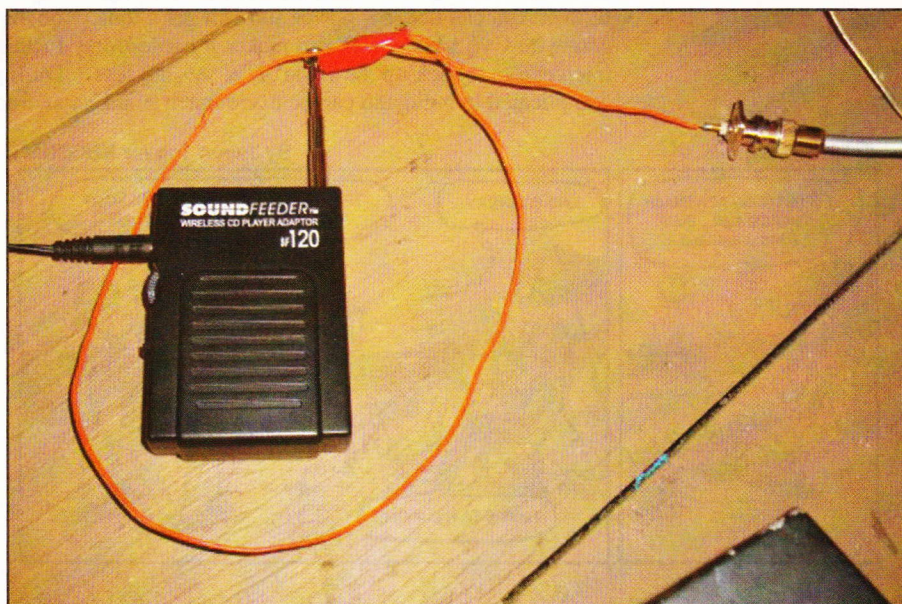
Philip Karras, KE3FL, an engineer/physicist, has been interested in radio since age four. He has served in numerous capacities as an amateur radio volunteer, and his writings have appeared in *QST*, *WorldRadio*, and *Popular Communications*. He can be reached at <http://cs.yrex.com/ke3fl>.

Photo A. The small Arkon SoundFeeder FM transmitter shown hooked up to a longwire antenna. →

*"This got me thinking that maybe there would be a way to use one of these small transmitters to broadcast my Internet music to the FM radios in my house."*

In my junk-box, I had two of these little transmitters, which I'd picked up on sale after the particular model was discontinued. Similar FM transmitters, called SoundFeeders, are still being made by Arkon Resources, Inc., the manufacturer of the two I have. They can be purchased online at [www.arkon.com/fmtransmitter.php](http://www.arkon.com/fmtransmitter.php), or you might find that an Internet search turns up additional sources (it seems every time I look around I find at least one model on sale for under \$10).

In the Washington D.C.-Baltimore area where I live, however, there are no real clear frequencies to use with these extremely weak transmitters. If a frequency isn't taken outright, interference from close stations can make it unusable, so using this method to listen to an mp3 player in the car is not recommended, because every few miles a different "free" station has to be found.





While I couldn't really use these little FM transmitters for their intended purpose in the car, I was able to use them with a nearby radio and the mp3 player I bought for home use. The transmitter just has to be very close to the radio and its antenna. This got me thinking that maybe there would be a way to use one of these small transmitters to broadcast my Internet music to the FM radios in my house.

## Choosing A Frequency

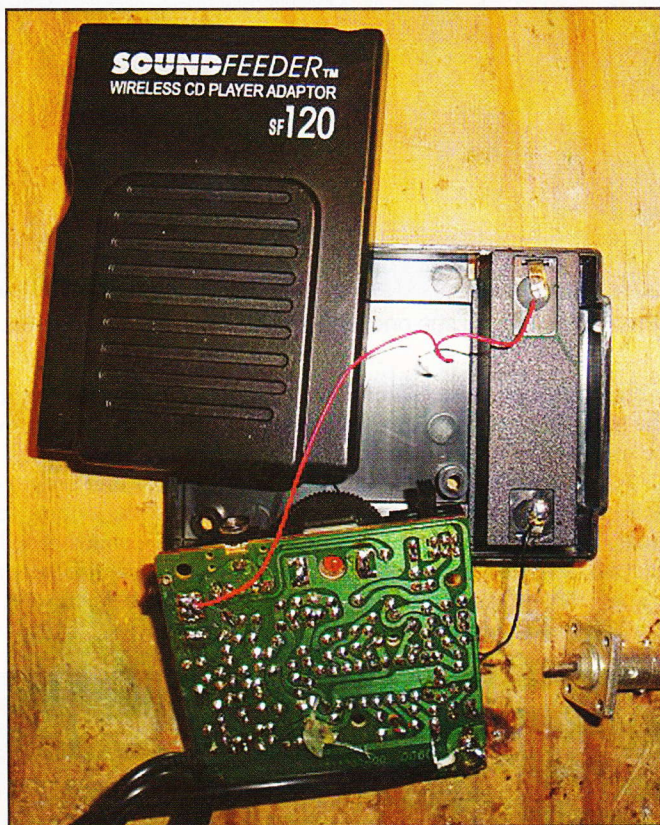
As I expected, this turned out to be difficult, but it was not impossible. First,

there was the job of trying to find a "free" frequency. It seemed that no matter what "free" frequency I found, it wasn't really free to all the radios in the house. Sometimes the radio in the garage could not hear my frequency due to a broadcast station. At other times the radio in the kitchen, just some 60 feet to the west of the radio in the garage, couldn't hear it. When I found a frequency clear enough for these two radios, the good stereo in my living room (which sports a really good homebrew FM broadcast band full-wave loop antenna) would pick up a distant station on that frequency.

Photo B. The SoundFeeder FM transmitter opened up for inspection.



Photo C. The SoundFeeder FM transmitter is connected.



I decided on an interstitial frequency, one in between two poorly received stations. Most of my radios can tune by 100-kHz steps so I was able to use the frequency 88.2 MHz. Since there were only weak competing stations on the adjacent normal FM frequencies of 88.1 and 88.3 MHz, I thought this just might work.

## Hookup

The next step was to hook up my SoundFeeder transmitter to a better/bigger antenna, specifically my 80-meter dipole. This was done with a jumper wire with alligator clips on each end so it connected the SoundFeeder's little telescoping antenna to the center connector on my coax going to the 80-meter dipole. I selected this antenna because the wire extends from one side of the house to the other, and I hoped that a long wire above the entire house would enable the signal to reach radios all over the house (**Photo A**).

To improve the antenna match I redid the antenna connection on the SoundFeeder transmitter. First I opened the SoundFeeder, located the antenna connections, and removed the internal antenna, replacing it with a bit of mini-coax and an external BNC connector (**Photo B**).

Next I tested the modification with the SoundFeeder hooked up to the best antenna I had for the frequency I was using to transmit (88.2 MHz), which was my 144/440 MHz J-pole antenna for the 2-meter ham radio band. This much smaller antenna, with a better method of connection to the transmitter, allowed the signal to reach all the radios in the house with a better quality reception (**Photo C**).

## Tweaking

I learned that sometimes just moving a few feet or adding a bit of height to an antenna is all that's needed to receive a station, including one you don't want. After much experimenting, I did manage to get all the radios to receive my weak broadcast on 88.2 MHz, even the radio in the kitchen. This radio could not tune to 88.2, but I found that when tuned to either 88.1 or 88.3 it would work well enough.

During this project, I observed a couple of interesting things. For one, it was intriguing to note that sometimes one frequency worked better than the other; at other times that was reversed. I also discovered that it sometimes mattered which way I tuned to the station, even when using an electronic/digital tuner. When using a



dial tuner with a capacitor, this effect is known as hysteresis, and refers to the fact that a capacitor is not perfectly identical in tuning when going up or coming down to a frequency. It seems that even some digital tuners show this difference, so if you can't find your station when tuning up to it, try tuning down to it from a higher frequency and see if that works.

## Improving The Sound

After I got my system to work fairly well for all radios I use in the house, the next step was to get a better sound. The radio in the living room uses a loop antenna as a long wire connected to only one feed line, which made the reception of some of the commercial stations worse. As a result, I constantly had to change how the antenna was connected to the radio and found that alligator clips made this quite easy (**Photo D**).

At this point, the only option left to improve the signal to all my radios was to put out more power. In looking around for a more powerful FM transmitter, I found a number of kits and pre-built units at Ramsey Electronics (<http://ramseyelectronics.com>). I bought the FM25B kit, which could tune to interstitial frequencies and transmit with up to 25 mW of power. Since the small transmitter was much less than 1 mW, I figured this would be more than enough. (Also, the FCC rules and regulations are pretty strict about using the FM frequencies and they really frown upon those who interfere with anyone else trying to listen to licensed broadcasts!)

I put the kit together in one evening and had it transmitting. I tried a fairly free standard frequency at 107.1 MHz, but the radio in the kitchen, while able to lock onto my station, did not receive it very well. I tried a number of different antenna arrangements for the transmitter, including a longwire, one side of the 80-meter dipole, and one side of the 2-meter J-pole (**Photo E**). This last one seemed to work the best. If I increased the output to about 75 percent of max, all radios worked fine. Unfortunately, at least five of my neighbors might have been able to hear my broadcasting! Luckily, a problem I had encountered earlier showed me how to fix this.

## Troubleshooting Leads To Solution

My transmitting system was set up as described for about a month, then we had



Photo D. Here you see one feed wire to the radio, tuned to 88.20 MHz.

a big electrical storm. When I turned on the transmitter the next day, it could only be received by a very close radio.

After troubleshooting for a while I determined that the problem was with the final transistor. I contacted Ramsey Electronics again and they helped me verify my theory about the final transistor, the only surface-mount part.

While waiting for the new part from Ramsey (which worked like a charm when replaced), I used my downtime wisely and built a converter cable to go from the output (cable connector) to a BNC connector so I could use the 2-meter J-pole as the antenna (**Photo F**). When I hooked this up and changed the frequency to 88.2 MHz—which all the radios

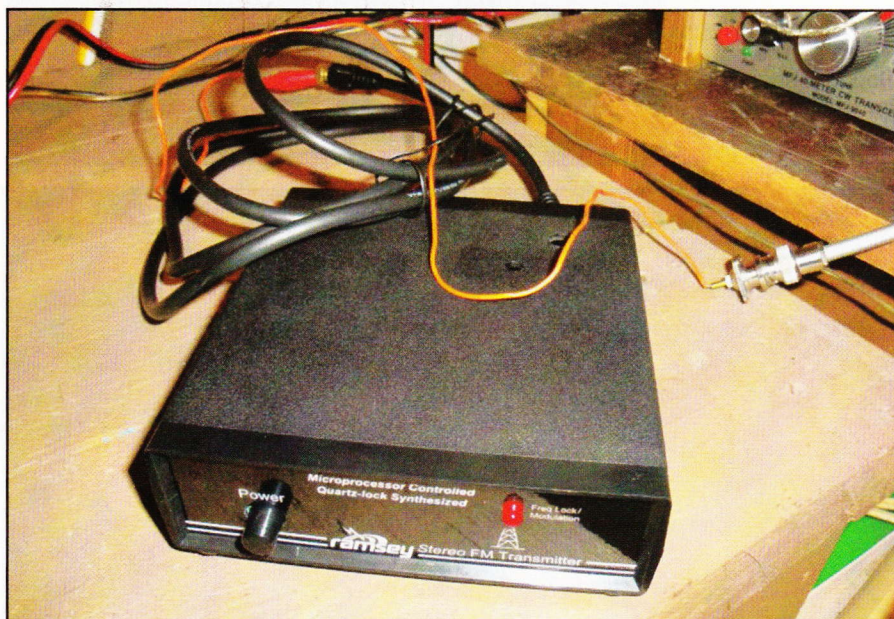


Photo E. The Ramsey FM25B to the longwire antenna.



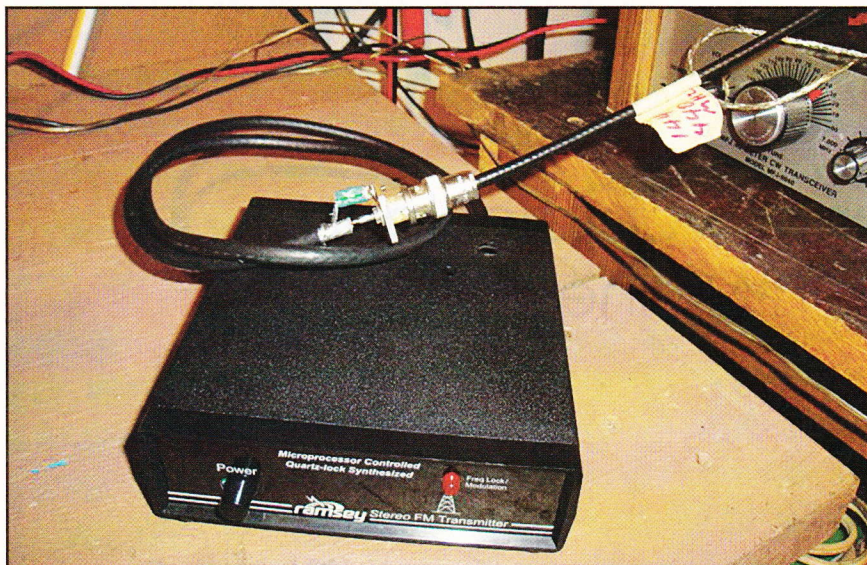


Photo F. The FM25B to the J-pole antenna.

could hear even with the little transmitter—all signals were solid. At this point I lowered the output to almost full counter-clockwise, which I figured was about 1 mW.

With the output now set to somewhere around 1 mW, and using 88.2 MHz, even a good radio outside the house doesn't get

noticeable interference when tuned to either 88.1 or 88.3 MHz. This is a much better arrangement and I was able to hook up the living room FM receiver correctly to the loop antenna, using both input leads. The two radios in the house that cannot tune 88.2 MHz both work fine when set to 88.3 MHz, yet a car radio

about one house away no longer experiences noticeable interference on 88.3 or 88.1 MHz, and is even able to receive very weak stations on those frequencies.

## A Successful Home FM Transmission

As you can see, not only is it possible to pick up the radio programs you lost because they moved to HD radio, you can also get the "radio" experience from all sorts of wonderful special programming you'll find on the Internet. All you need is a little FM transmitter like the one from Arkon, or possibly a more powerful one from Ramsey Electronics, plus some antenna experimentation, and you can put your favorites stations back "on the air" again, at least in your own home.

If you need antennas ideas, you can refer to my previous article in *Pop'Comm* ("Sometimes the Best Antenna Is Not the Best Antenna," September 2003) for suggestions on reducing the quality of your receiving antenna if you're receiving too many stations.

I hope you'll try setting up your own FM transmitter, and that you'll enjoy many hours of your lost music re-found!

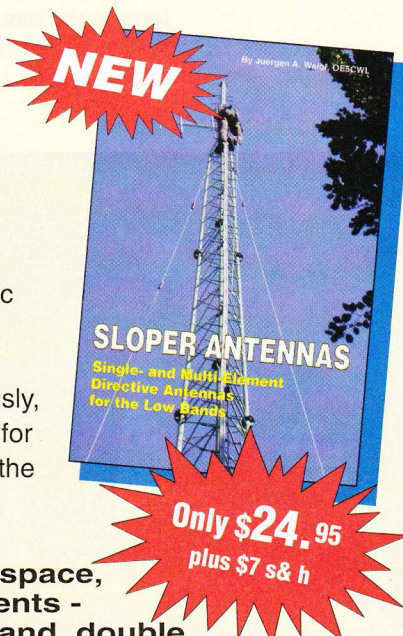
# SLOPER ANTENNAS

By Juergen A. Weigl, OE5CWL

## Single- and Multi-Element Directive Antennas for the Low Bands

With calculations and practical experience, this book shows which basic concepts have to be considered for sloper antennas for the low bands. These fundamentals are supplemented by construction guidelines for directive antennas using a single element or several elements. Previously, gathering all the necessary information to construct an effective sloper for a particular application was tedious and time consuming. You'll find all the information needed for successful home building of the antennas.

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