

# Adventures in DXing – AM... FM... XM! - Karl Zuk N2KZ

Bob Edwards was smart. America's leading public radio personality, Edwards decided to migrate from traditional broadcasting to the new world of satellite radio. On October 4, he began a new chapter in his career becoming chairman of the first nationwide public radio station XMPR on channel 133. His foresight of the future of radio is correct. Millions of subscribers are already listening to XM Satellite Radio, with thousands of newcomers joining every month.

I followed in his footsteps two months later. On Christmas Day, I became a believer. I'm a proud new owner of a Delphi MyFi™ handheld XM satellite receiver. Its futuristic technology is amazing. XM's programming is even better. Suddenly, I am in the 21<sup>st</sup> century of radio. I have 137 crystal-clear channels to enjoy, from African music to trucker's talk and half a dozen places where country music's playing. (Hello, Patty Loveless. I sure have missed you, darlin'. )

One channel was very telling. There are six channels dedicated to distinct decades of popular music. I could name nearly every song and artist from the 40s through the 80s, but I was lost with the 90s. Long ago, FM radio stations stopped announcing the titles of popular music. Songs I have heard thousands of times have no identity. All XM radios display song titles, artists' names, and even stock reports and sports scores. If you really like a song or performer, you can program the radio to prompt you when any of the XM channels play your song. It's a new world!

XM Satellite Radio is the beginning of a new era of radio programming. I am a child of the broadcast industry. I was born with a two-transistor AM radio in my hands and was devoted to radio as a career by the time I was 16. After 15 years in radio, I've now worked for all three major TV networks and have been a broadcast professional for over 35 years. It broke my heart to see the rapid decline of radio in the 1990s. The Ma and Pa stations were forced out of business by huge conglomerates. Local content became extinct. Song artists and titles became unspeakable. (Why?) Commercial loads and endless drive-time drivel chased us away.

Multicasting, computer audio and digital time compression schemes made radio unlistenable. Computer and power line noise, combined with very tight station spacing allocations sealed the deal.

Analog radio = lost at sea. Praise satellite radio! I have not had this much fun listening since I was a teenager!

Dozens of channels of commercial-free music await you. You can choose mixes according to decades (the 40s through the 90s), six channels of Country, gospel, more than two dozen rock and pop streams, classical, jazz, blues, urban, dance, Latin, even African. When was the last time you listened to a radio drama or a full un-edited symphony? The amount of programming is almost endless. A dozen channels are devoted to news. Scroll around to find comedy, talk, sports and traffic/weather. It will take you a couple of weeks just to sample all of them.

A lot of fun can be found listening to XM's special events. Several channels broadcast exclusive concerts and interviews with performers, along with classic concerts from the past. It is such pleasure to listen to a singer/songwriter talk about their craft for as long as they like without interruptions. Uninhibited non-commercial radio is not just a breath or fresh air; it is pure oxygen to the deprived refugees of analog commercial radio. I had an awful experience. One day, my XM receiver's rechargeable battery died while I was walking through Manhattan. I was forced to listen to FM again. Horrors!

XM receivers have a wonderful feature allowing you to scroll through the channels three ways, sorting by channel title, artist playing, or current song title. You can program the receiver to search for favorite songs and titles so you don't miss a beat. Even better, you can record up to 5 hours of programming, using a built-in VCR-like timer, to time shift what you can't catch live. The recordings sound great.

One receiver can serve an entire household. My MyFi includes a built-in robust FM transmitter ready to cover several hundred feet from its location. It includes an intelligent sensor that turns off the built-in transmitter's stereo subcarrier when listening to monophonic programs. A handy full-featured remote allows you to control the MyFi without having to get up from what you are doing. Every aspect of this unit and its accessories was well designed and thoughtful.

Satellite radio's sound is crystal clear. No co-channel or adjacent channel interference. Zero noise. Easy reception. Two geosynchronous satellites broadcast 137 clear channels of programming, serving the entire continent day and night. It takes more effort to DX it than analog radio. You'll have to bring your receiver to far-off places like Bermuda, Alaska, The



*Delphi MyFi portable receiver for XM Satellite Radio - courtesy Delphi Electronics.*

Caribbean or Central America to test weak signal pickup. I understand you can actually hear XM at the fringes of “Rock” and “Roll’s” satellite footprints and beyond. Keep in mind that you are really DXing constantly! XM’s satellites orbit high in the sky 22,300 miles above the equator!

XM Radio uses 2.3 GHz S-band microwaves to transmit its program streams. (2332.5 - 2345.0 MHz, in the non-amateur section of our 13cm band -Ed.) XM’s satellites act as a complementary pair for nationwide coverage: “Rock” for the eastern half of the United



*XM repeater panel antenna - photo courtesy Frank Martin*

States and “Roll” for the west. Your receiver automatically chooses which “bird” is strongest wherever you happen to be. Where tall buildings and urban environments may pose reception problems, terrestrial repeaters fill in the gaps. Visit Manhattan to experience the power of XM’s repeaters. I have listened while walking between skyscrapers and even inside buildings with solid reception using the new handheld XM MyFi. The XM transmission system works very well. It’s pretty difficult to discover the locations of their repeater sites.

XM uses panel antennas that look very similar to the vertical columns you’ll often see stacked on cell towers.

At home, using an S-band antenna that is the size of a postage stamp, I can achieve full signal strength of the XM satellites indoors nearly anywhere. You don’t have to be near a window! During a drive home from Michigan, I experienced some fade when the little antenna that sat upon my dashboard rode through some tall mountain passes in Central Pennsylvania. Huge hills of rock to the southwest were required to stop the XM signal, but the fades were momentary.

Keep in mind you have entered the world of microwaves. I live in a wood frame house with cedar shingles. If you have aluminum siding, or metal screens on your windows, any chance of receiving S-band will be found outdoors. Remove the screens and, voila! Instant major signal strength.

Experiment with reception to locate your best antenna location. S-band is high enough in frequency to exhibit some of the same properties as visual light. The signals may be found in unusual and illogical places and directions. I found XM’s signal strongest through a window of a second story bedroom facing southwest where I could “see” the satellites with an unobstructed view. On the north side of my house, I found a few isolated, and useful, places where the signal was reflecting nicely. If your entertainment center is away from the southwest, there is still hope! Sometimes XM’s signals penetrate into the wildest places.

Stuck in a steel or brick building or another hostile S-band environment? Delphi Electronics, the manufacturer of the MyFi and several other models of XM radios, has just announced another breakthrough: a satellite signal repeater for your home. Install just one XM S-band antenna where good reception is available. Connect the antenna to the home repeater. The XM programming stream now becomes available to your entire house. The homebound signal will require small receiver modules to capture the repeater’s output and deliver it to your XM receiver. No longer will you need to install an antenna for each and every receiver in your house. The XM signal will be everywhere!

My MyFi came with four satellite antennas. One is built into the unit and is adequate for unobstructed areas and urban use where terrestrial repeaters are active. The “home use” antenna is about the size of a brownie and is the performance leader. Another antenna, about the size of a postage stamp, is provided for car use. It is a close second. A fourth antenna, which looks like a small cigar, is meant to wear on your clothes as you walk around. It’s pretty anemic in pickup. You also get two docking stations that your MyFi slides into, allowing you to connect external power supplies and adapt to car or home stereos



*The MyFi display at CES 2005, Las Vegas - photo courtesy Frank Martin.*



*XM repeater at Mt. Harvard near Los Angeles - photo courtesy Frank Martin*

directly. A lot of gadgets come in the box. Delphi thought of everything!

If you want to align your antenna using the scientific method, there is a very useful diagnostic system built into XM units. With the unit off, press 2 - 0 - 7 and then the XM button (push in on the scroll wheel). The unit will

turn on. Press the display button three or four times and the first diagnostic screen will appear. Adjust your antenna until you see a very low digital bit error rate (BER) down to 0.0 and high carrier to noise ratio (C/N) of at least 7.0 or above. I've seen it go as high as 15 or beyond. The little arrays built into the XM antennas are broad enough to resolve both satellites, simultaneously, with excellent strength if you find a sweet spot. I have yet to experience any indication of rain fade or sun outages. If you are aligned correctly, you will be receiving two satellites, so if one is blocked by a rare alignment with the sun, no program loss should occur.

At my QTH, just north of New York City, the XM satellites can be found at approximately 209 degrees (east coast bird) and 244 degrees (west coast bird) to the southwest. It's roughly just to the right of where you would point a TV antenna towards the city (remember those?) The dual satellites act as a redundant pair. While in the car, watching the diagnostics, you can watch your receiver trade-off from one satellite to another for best signal. The result is seamless. You'll never know you are switching back and forth.

XM receivers do include some technical comedy. Digital signals are either resolved or not heard at all. The receiver designers felt these transitions were too abrupt. They cured this "problem" using a very subtle hiss generator to emulate an analog fade out. When the BER gets sufficiently high and tentative, the hiss generator fades on to ease your ride to silence. Sometimes this works.

Another defense against signal errors incorporates a store, delay, and decode to analog scheme. The digital stream is received, stored, processed and resolved. When the signal is broken, an amount of delayed material is used to cover the gaps. When you have too long an interruption, like riding under a large steel bridge, the audio may echo before it dies.

I experience this effect frequently trying to resolve a satellite signal on my commuter train. I've also seen dropouts a second or two after the break in signal. If you are driving at a fast speed, and pass by a large obstruction, the reception will break several seconds after you pass under the bridge when the signal died to

your receiver. Delayed reality!

Audio quality on XM sounds like a typical FM radio station. There is a decent amount of compression and occasional raspy digital artifacts. Music channel dynamics average about 20 db or more peak-to-peak. The channels used for sports play-by-play and local traffic reports have a much lower sampling rate. You will be convinced that computers have captured the planet when you listen to traffic! XM's local traffic reports are much better than traditional radio, mentioning average rates of speed on highways, weather conditions and very thorough coverage of every major artery.

Three web sites can provide you with everything you might ever want to know about XM Radio. Their home site, <http://www.xmradio.com>, is a multi-paged library describing every channel, all the available radios and accessories, and XM's subscription plans. You could spend hours surfing through two independent user sites: <http://www.xmfan.com> and <http://www.xm411.com>. Both are sophisticated, professional and authoritative sites regarding listener preferences, technical advice, installation ideas and much, much more. Also check out <http://www.delphi.com> for the latest news from XM's primary receiver manufacturer. Several other major manufacturers offer XM ready radios: Audiovox, Polk, Crestron, Pioneer, Alpine and Sony. XM Radio is also available by subscription via the Internet.

It's easy to spot someone who has not experienced satellite radio. Their comments are predictable: "I can't imagine paying for radio" or "It can't be that much better than FM."

After you try XM, you'll wonder how you lived without it. Satellite radio is simply the most important technological advance for radio listeners in decades. XM's diverse programming and well-engineered delivery system adds up to one word: **fun**.

– Karl, N2KZ