

## Digital Dave's Delightful Degen DSP Disclosure – A Review of the Degen DE321

By Dave C. Schmarder, N2DS - Photos courtesy of the author

I have to admit it: I'm totally fascinated with these cheap Chinese radios that are available in our current electronic marketplace. After buying a more expensive Tecsun PL390, and being impressed with it, I decided I'd buy yet another one of these Chinese-made radios.

I have a need for a second set in my computer room/ham shack. I had been shuttling my 390 between here and another room daily, so it was time to buy another radio. The 390 has a lot of features that were not necessary for the computer's location. Plus, a radio small enough to put in my pocket and carry around was also desirable.

I saw the neat little Degen DE321 online, and knew this was the one for me. The major attraction besides the price was the DSP feature. DSP or Digital Signal Processing is now the magic word in radios. I wanted to see what the hubbub was all about and this one fit the bill.

### ❖ The Purchase

The price was a mere \$21 including shipping from China from an online seller. At that price, it is hard to go wrong. These radios are so inexpensive that it isn't worth it for any US retailer to bother selling them. I received my radio exactly three weeks after ordering it.

For all intents and purposes, realistically speaking, there is really no warranty on this stuff bought directly from China. With the allotted short return period and the high cost for returning something, it is assumed that you will just keep the unit and hope it works okay. Being so cheap, I'll buy a radio like this directly from China, but I did choose to buy my Tecsun PL-390 from a US short wave radio retailer for the possibility of needing warranty service. American dealers support the products they sell.

### ❖ First Impressions and Powering Up

The radio was packaged well and in a few minutes I had it up and running. This is a pretty featureless radio. It receives AM, FM and the shortwave broadcast bands. There is an on/off switch as well as volume control, tuning and band switch knobs. The telescoping antenna is for the FM and short wave bands. It's a very simple unit with no bells and whistles.

The accessories include ear buds (for stereo listening on FM), a lanyard that attaches to the corner of the DE321, and a pouch case for keeping the radio clean and sparkling. The manual is



on a mini-CD and is read using your computer's PDF reader. I popped the disc in and had a read, but the radio is so simple that the manual was of little use. Manuals for other Chinese sets are on this disc, too, and it was fun to browse a few of the other models.

Here pictured with my old 1965 General Electric P-965a radio is the DE321 for size comparison. It looks like six of these would fit inside the GE. The DE321 is about 4-3/4 inches long, 3 inches tall and nearly 7/8 inch thick. (120 × 74 × 21 mm)

The FM frequency coverage of the DE321 has two bands, making it a world radio. The first FM position 87.9 to 108 MHz is for the US and much of the rest of the world; the second FM band is the less common 64 to 87.9 MHz. I believe the reason that the two bands are included is so the same dial scale can be used wherever the radio is sold. The MW (AM) band is a single range 522 to 1710 kHz.

There are eight shortwave bands. The ranges are 5.70 to 6.40 MHz (49m), 6.80 to 7.50 MHz (41m), 9.30 to 10.0 MHz (31m), 11.60 to



12.20 MHz (25m), 13.55 to 14.15 MHz (22m), 15.10 to 15.90 MHz (19m), 17.20 to 18.0 MHz (16m), and 21.30 to 21.95 MHz (13m). Missing are the less popular "tropical bands" of 60, 75, and 90 meter bands.

The battery supply consists of two AA cells, either rechargeable or disposable types. I'm using a pair of the "hybrid" or low discharge batteries. I started using these in my camera,

rather than the old style NiCad batteries. They are worth the extra money! The DE321 does not have a USB charging jack, so the batteries must be charged externally.

### ❖ Tuning In with the Degen DE321

The DE321 works fine, but being a cheap and featureless device, you might want to tone down your expectations. First, the audio is very good! The speaker diameter is only two inches or 50mm and they get all they can out of this little transducer. The audio is loud and clear and the sound is clean. The FM sound is even better with the stereo ear buds.

The volume control is the old fashioned potentiometer type, with smooth volume transitions. This is an improvement over the stepped audio control settings in the Tecsun PL390.

### ❖ Technical Tidbits

The tuning system was a mystery to me until I did some online investigating. Is this a digital or analog radio? Turns out it is both, but mostly digital. I looked at the Silicon Labs website and found that the SI4844 chip appears to match what the Degen DE321 radio has inside.

The rotary tuning control is a simple analog potentiometer. A thumb wheel knob is connected to the pot and the slide rule style dial is moved by a dial cord. Therefore the readout accuracy won't be great, but it will tell you where in the band you are tuned.

The receiving frequency is determined by the voltage sent to the silicon labs chip via a variable resistor voltage divider. The chip then translates this voltage into a specific channel frequency step.

A slide switch on top of the radio selects the band. This switch selects a point on a precision resistor ladder to tell the chip which band you want to use. No RF switching is used.

The chip is externally programmed to establish the exact frequency ranges. The programming is done with precision resistors connected to certain pins. So, if you move to a different part of the world, you will only need to change the resistors. The MW band is set to select 9- or 10-kHz steps. All this is outlined in Silicon Labs PDF files available at the documents tab on their website. Look for the application notes – AN602.pdf.

There is a small LED that indicates when you are tuned correctly. The tuning appears to

have a "frequency locking" effect, but it is just the receiver stepping from one frequency to another. You are either tuned or not tuned to a station. One can't just tune on to a station as with an analog tuned radio.

The DE321 is not a superheterodyne receiver, which has been the radio design norm for the past 70 years. There is no usual intermediate frequency, mixers, or variable analog oscillators. The analog signal comes in and is converted to a digital format. After the processing, the digital signal is converted to analog audio to be amplified. According to the chip spec sheet, there are no coil alignments, and no tracking adjustments. It all just works!

## ❖ Daytime Reception

I am in a mostly fringe signal level reception area. There are a couple of strong FM stations, but they are not too close. The same is true on the MW (AM) band. The strongest stations are an 800 watt station about 10 miles away and a couple of 5-kw daytimers about 12 miles from me.

The FM section picks up the stronger stations very well. I found the low end of the band has surprisingly good reception. The short telescoping antenna, which usually portends mediocre low end of the band reception, nevertheless received fairly distant NPR stations at the bottom of the dial quite well.

The MW/AM band hears the moderate to strong signal strength stations well. The weaker stations aren't usable. The ferrite antenna coil is not very large and this impacts the receiver sensitivity.

I then switched to shortwave. The first station I heard was Radio Havana. They generally have a good signal here, so it wasn't a surprise. I was able to hear other stations on several of the bands.

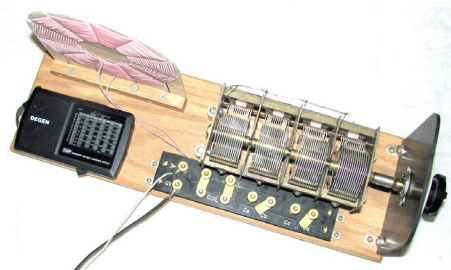
## ❖ Nighttime Reception

One thing I noticed at night was that as a MW station faded, the radio would quickly cut out and then come back on. By carefully adjusting the tuning control, I was able to minimize this effect.

This DE321 will not dig down into the noise for the weak DX (distant stations). It is one of those sets that only gets the low hanging fruit, so plan on listening only to the big signal stations. I did occasionally hear some of the weaker stations, but not regularly.

## ❖ Some Hot Rodding Tips

I'm not the type of guy who leaves things alone. I'm always thinking about my friends



### RELATED WEBSITE LINKS

Silicon Labs Si4844 IC: [www.silabs.com/products/audiovideo/amfmreceivers/Pages/Si4840-44.aspx](http://www.silabs.com/products/audiovideo/amfmreceivers/Pages/Si4840-44.aspx)

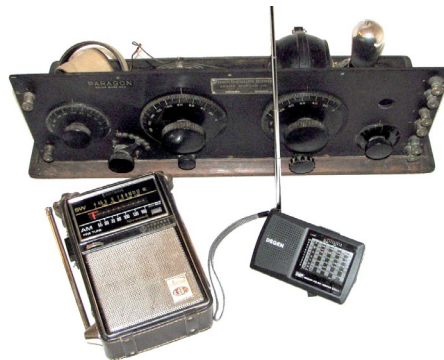
Ultralight DX Yahoo! Group: <http://groups.yahoo.com/group/ultralightdx>

1923 Paragon Radio Compared with More Modern Counterparts <http://makearadio.com/restoration/paragon-radio-restoration.php>

Antenna coupler project as mentioned in the article and shown in the picture <http://makearadio.com/misc-stuff/antennatuner.php>

over at the Yahoo! UltralightDX Group and how they might make this radio really sing. Here are a couple of thoughts, but first realize these ideas have not been tested and can possibly result in the destruction of your radio. First, disconnect the 100k ohm tuning pot, and replace it with an external ten turn 100k ohm pot. The radio will be easier to tune. Second, get a big ferrite bar and wind it with Litz wire and then connect it in place of the small internal ferrite bar. That should improve the sensitivity!

If you have an external wire antenna and a ground, the DE321 can be placed near a coil connected to the outside antenna and ground for very good reception, day or night. I use my old 1923 Paragon radio that is connected to the outside antenna. I tried my crystal radio antenna coupler too, and that helped the reception, allowing many stations to overcome my in-room computer noise.



## ❖ Conclusion

The purchase of the Degen DE321 was pleasant and hassle free. Although it doesn't receive as well as expensive radios, I never expected it to. This leaves open the possibility of DX reception under less than optimum conditions.

Would I buy again? Yes I would.

I will buy more of those little Chinese DSP radios. DSP is the way to go.

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