learning curve

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Technology Special

Ham Radio Technology: From Bleeding Edge to Retro

Now is an exciting time to be involved with the amateur radio hobby. Technology has always driven our hobby, but the evolving technology of today is making such rapid inroads in amateur radio that it almost takes a score card to keep up. Having been a ham since the early 1960s, I have seen our hobby grow by leaps and bounds, but nothing prepared me for the last ten years!

When I was getting started, vacuum tubes (some of you might remember those little glass tubes that glowed in the dark) were the state of the art and amplitude modulation (AM) was king. Shortly after becoming a ham, I saw single sideband take over from AM and transistor technology surpass vacuum tubes. The primary digital mode of the day was radio teletype (RTTY) unless you count CW as the "original digital mode"! No one had heard of packet radio, PSK31, JT65, or Olivia . . . yet!

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Photo A– The front panel of the SDR Cube is dense but it's all usable, even with my fat fingers. The display is very crisp and easy on the eyes. You control the entire radio from the front panel, no computer, no mouse, no trackball!! (K7SZ photos)

In this month's column we are going to visit some "bleeding edge" technology and take a backwards glance over our shoulders to some retro technology that still has a huge following among many hams.

Software Defined Radios

The three most feared words that most of us old pharts hate to hear are *software defined radios,* or SDRs. That's right; SDRs have seemingly taken over ham radio. It's scary. NO, really, I mean *SCARY*!

Until June of last year, I had nothing but analog rigs in the shack. Now I have four SDRs and I swear, when the lights in the shack are turned out at night, they multiply! Like I said, SDRs are *SCARY*!

First of all, you have to understand I really don't like computers. *Really*, I don't. Computers are a necessary evil, and while I can manipulate commercial software on my computers, when it comes to understanding how the bloody things really work, it's voodoo, black magic, or whatever you want to call it. To say that I have no "computer MoJo" is an understatement.

In the "good 'ol days," we relied on discrete components such as resistors, capacitors, coils/inductors, and all sorts of solid-state parts to make up the hardware for our radios. Nothing was "digital," except maybe the frequency readout on the main tuning dial. On these "analog" radios it was a simple matter to learn basic troubleshooting and how to isolate a problem to a specific part inside the rig. Things were simple.

Then some data-dink decided that we needed to "digitize" everything, and things would be "better." Well, "better" is a relative term, as we soon shall see.

OK, first of all I *do* like data-dinks; after all, I'd be in deep kimchi without them. I have a couple of them on speed-dial for those times I do something insanely goofy and manage to screw up a perfectly good $800 computer. That settled, let's press on and get acquainted with the newest revolution in ham radio: Software Defined Radios.

When we talk about analog radios we are talking about the mainstay of ham radio for over 70 years. The following is a short list of some of the more notable analog rigs: Collins KWM-2 and the S-line; Drake A, B, & C lines and the 2B receiver; all the Heathkit rigs; all the Hallicrafters sets; Ten-Tec Argonauts and Omnis (except the Omni-VII); just to name a few. Everything was nice and easy to understand, God was in His heaven and all was

right with the world. Then came the digital craze and all bets were off.

The idea behind SDRs is to build a simple RF hardware platform and have specialized software in the computer, helped by the audio card, do the heavy lifting by performing all the functions including SSB, AM, CW, data modes, etc. Once the RF signals are digitized and stuffed into a computer running this specialized SDR software, I get lost. Basically, as I understand it, once in the digital realm and all signals are either "ones" or "zeros" (1 or 0), some really sophisticated software can be employed to do some really amazing things with these signals. I get that. Unfortunately, the learning curve on some of these new SDRs is extremely steep—especially the ones that are nothing more than a box with connectors that interface to a computer. Everything is done by a mouse click or a track ball, no buttons, switches, or any of the standard things we are used to on analog sets.

Making the transition from our old, comfortable analog rigs to the new SDR rigs can take some time and effort. Is it worth it? Interesting question. Certainly from the perspective of what these new digital rigs can accomplish, it is. With the current trend of adding digital technology to mainstream radios from the major Japanese companies, Ten-Tec and others, it would stand to reason that the modern ham should become intimately familiar with SDR technology. In a few years we may be looking at a severe lack of analog gear!

Thinking Outside the Box, or "We Don't Need No Stinkin' Computer!"

With all the emphasis on marrying computers to radio platforms, it took someone like George Heron, N2APB, and Juha Niinikoski, OH2NLT, to do some serious thinking outside-the-box to come up with a rig that is in a class by itself! George, Juha, and Joe Everhart, N2CX, are "doers." They are the design dream team behind Midnight Design Solutions, the innovative company that brought us the NUE-PSK digital modem, and now the SDR Cube, a stand-alone tiny SDR that does not need a computer to work! As a matter of fact, the official motto of the SDR Cube design team is (with apologies to Humphrey Bogart and Alfonso Bedoya in *The Treasure of Sierra Madre*), "We don't need no stinkin' computer!"

The idea arose from listening to complaints of portable/mobile ham operators who were frustrated because they had to drag a laptop or Netbook into the field with their radio gear in order to operate from remote locations. The SDR evolved by incorporating a computer sound card and all the processing firmware in the tiny 4-inch cube itself! The SDR Cube has a graphic LCD display along with knobs, switches, jacks, etc., just like a "real radio" (photo A), but that is where the similarity ends. All the processing of the analog to digital signals is done *inside* the SDR Cube itself (photo B), with no need for a computer to run the show. Clever, huh?

The SDR Cube is a rather unique little piece of gear. First is its size: roughly four inches per side; a neat little cube! The rig, as it comes from the manufacturer, is capable of SSB, CW, and data modes. The SDR Cube transceiver is all-band capable, with general-coverage receive and replaceable transmit modules providing simultaneous coverage for each HF ham band. It uses Soft Rock modules for the RF deck, so this little gem is definitely multi-band: just plug in the desired Soft Rock module and you are on the air! The rig can be purchased pre-built or in kit form and the website (http://www.sdr-cube.com/) gives the various configurations and prices for this little SDR. My sources also hear that the

SDR Cube line is expanding soon to incorporate a 20W RF power amplifier, a GPS timing unit, and an amplified stereo speaker system. This will make a regular "Cube-Line"!

Cute is a great adjective for this tiny radio. It is relatively easy to learn to operate and there is built-in expandability right from the factory. The back of the Cube (photo C) features the in/output jacks, power jack, and data jack. There is even a jack to hook up the NUE-PSK digital modem to the SDR Cube. Data modes such as PSK31, RTTY, and CW are instantly available simply by plugging in the NUE-PSK digital modem! Now that is technology I can live with!

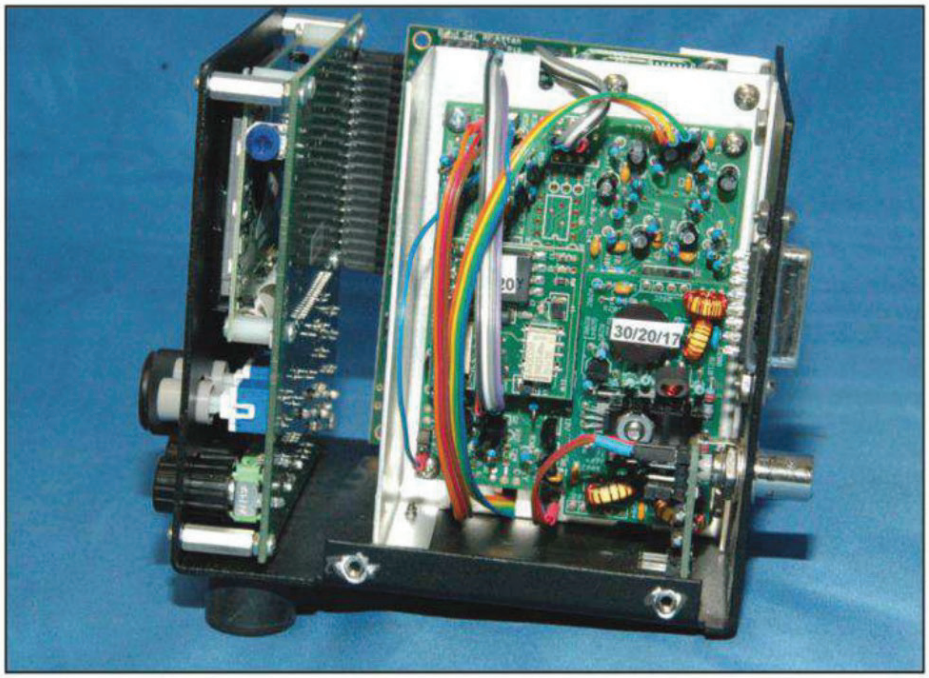

Photo B– An interior shot of the SDR Cube shows a bit of the technology involved. Notice that the Softrock band modules plug in and can be changed in about 30 seconds, which includes removing and reinstalling the case cover.

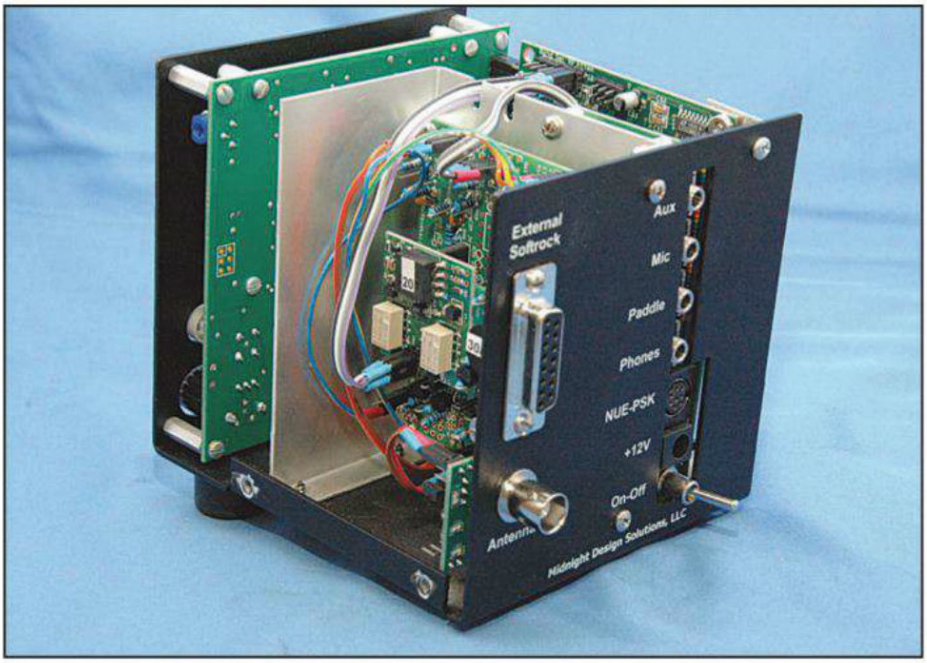

Photo C– Here is the business end of the SDR Cube where all the input/output ports, mic/speaker and power jacks and "ON/OFF" switch are located. Notice that there is a separate jack for the NUE-PSK digital modem to allow PSK, CW, or RTTY operation.

The Midnight Design Solutions SDR Cube transceiver is authentic "bleeding edge" technology. It is truly a one-of-a-kind digital radio system. This kind of creativity is what SDR technology is spawning. The entire Cube-Line will give today's ham radio operator the advantage of a complete multi-mode, multi-band station in a physically small footprint, all at a reasonable cost. While the Cube is at home in the shack, it can also function quite well in a portable role camping/hiking in the bush. The small physical form factor of this rig lends itself nicely to including it in a camper or RV. There's nothing like being able to take your hobby on the road!

Let's Go Retro!

OK, we've seen what the future of ham radio is all about, so let's take a look backward over our shoulders and reconnect with the "original digital mode," CW. The current CW craze is an amazing phenomenon. I am dumbfounded when it comes to the fact that CW is more popular now than before, when it was a requirement for obtaining a ham license. Since the FCC lifted the Morse code requirement, it seems like everyone now wants to learn CW!

The straight telegraph key is the original CW icon. While there is a group, the Straight Key Century Club (SKCC: www.skccgroup.com/), that promotes the use of straight keys, bugs, and "cootie keys," the vast majority of hams who utilize CW use automated keyers with a paddle set to make the dots and dashes. Paddles are a very personal thing among hams. While one paddle set may be your favorite, I might find it difficult, if not nearly impossible, to become comfortable with on the air. To be sure, there are literally hundreds of paddle sets available on the commercial market, and finding one that "fits" you properly can take on the persona of a crusade. My sage advice at this point is to get with some of your local ham club's CW gurus and try out their paddles to find your perfect fit.

K8RA Paddles

At this time, I'd like to invite you into the machine shop of Jerry Pittenger, K8RA, who makes some really nice, relatively inexpensive paddles (see photo D and <http://www.k8ra.com/>). Jerry's line of paddles deserves some serious consideration for the frugal ham. My mainstay paddle set is the K8RA P-6, single lever paddle (http://www.k8ra.com/index_027.htm). Unfortunately, there has been