MT REVIEW

Ten-Tec RX-320

By Lee Reynolds

Radio technology has steadily changed over the decades. From tubes and hand-wired tag strips at the start, we've moved to transistors mounted on printed circuit boards, then on to today's mix of compact integrated circuits (ICs) and Surface Mount Devices (SMDs). We're a long way from the heyday of solid, squat Collins, Hammarlund and Eddystone radios with their gently glowing tubes, analog (or mechanical-digital) dials and polished knobs.

One of the newer kids to show up on the radio block in the last decade and a half is the technique of digital signal processing (DSP) – using ICs (really, special purpose computers on a chip) that take a radio signal, digitize it, and then manipulate the digitized radio signal according to whatever the software instructions tell it to do. What used to be done in analog mode with crystal filters or networks of inductors and capacitors, can now be achieved by a chip or two and some software.

Of some significance is the fact that software tells the hardware what to do: Tell a chip (via software) to think that it's a 1.8 kHz SSB filter and it will. Change the software, tell the filter it's now a 6 kHz AM filter, and it behaves accordingly. This will eventually lead in the next decade or so to radios that will change their abilities completely with a push of a button.

In the meantime, we're seeing DSP processing show up in a number of our radio toys, and the manufacturers of said toys are also realizing that computers make very nice "radio control panels."

Okay, a riddle for all you shortwave enthusiasts out there – what is black and rectangular? Smaller than a breadbox? Is deserving of great fame? Has more faces than a Louisiana Congressman confronted by PAC money, yet (unlike the Congresscritter) gives good value for money to the public?

If you said "RX-320" then I'm already preaching to the choir. If, on the other hand, you said "Hunh?" or "RX-320 – isn't that something for Athlete's foot?" then you should read on…

Ten-Tec's Tricky Black Box

Ten-Tec in Sevierville, Tennessee, is known to radio buffs for their ability making military, commercial and amateur-grade radios using DSP techniques. They've extended that knowledge and manufacturing capability into pricing territory formerly occupied only by the higher end, portable, analog, short-wave radios and have produced the RX-320 – a compact 'black box' radio that has no knobs, no lights and only a power switch and a few connectors on the back panel. Sounds plain? You betcha it does…until you combine it with the PC that it was designed to operate with. All of a sudden it turns into a PC/radio hybrid that offers the best of both worlds. Let me explain further –

The RX-320 is designed to be a shortwave receiver covering 100kHz to 30MHz, AM, LSB, USB and CW. Instead of having a regular control panel, it has a serial connection for a PC to talk to, and control software that is run upon that PC. Sensitivity figures are good at about .3uv for 10dB S/N ratio; stability is more than sufficient to handle today's digital modes; and the radio offers up to 34 IF bandwidths.

When you order the RX-320 you receive the unassuming black box itself, a wall transformer to power it (15 VDC), a telescopic whip antenna that screws into the top of the radio (you can use an external antenna as well), the interface software, a male to female DB9 straight-through cable to connect the radio to your PC, a 30 page manual, and an audio patch

There's a lot of power hiding in this little black box... power unleasher when you make the connection between the rear of the RX-320 and your computer.

cable to route the '320's audio into your PC's sound card, headphones or an external speaker (if you choose not to play the '320 back through your system's speakers).

❖ Installation

Plug in the wall transformer, connect the serial cable between the PC and the '320, connect the antenna or screw in the whip and, for simplicity's sake, connect a speaker or headphones to the *External Speaker* jack on the back of the radio. Pop the 3-1/2 inch floppy into the PC, run setup, start the program, set the COM port and you're up and running! If your PC doesn't have a floppy you can download the interface software from the 'net.

Usually the business end of a radio is the front panel; in the case of the RX-320 it's the *rear* panel.

❖ Interface

The manufacturer-supplied software is quite reasonable in terms of quality, features, and performance; it's excellent for getting your toes wet with this rig before you go on to choose the software that really makes your boat float! Not too simple, not too fancy, it won't scare the neophyte and it won't disgust the experienced listener. The interface offers a virtual front panel display for the radio that resembles a real Ten-

Tec box and offers many of the controls you'd expect to find on a physical radio.
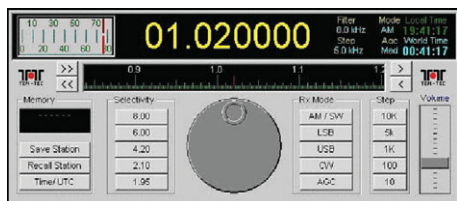
Where things start to get interesting is when you check out the 'Spectrum' and 'Memories' options –
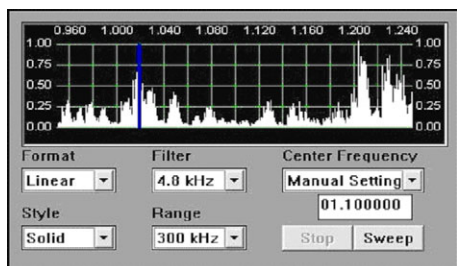
'Spectrum' (above) is a dandy little application that will quickly mute the radio, sweep it across a user-selected portion of the radio spectrum and plot the results in graph form. Here I chose the local AM band as an example. You can see just where the activity is and clicking on a peak with your mouse tunes the radio to that frequency.
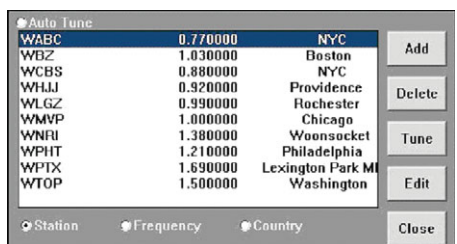
"Memories" is the control for a nice, simple frequency database you can configure

❖ What's inside

Ten-Tec did a nice job of designing the radio and managed to achieve a good balance between cost of manufacture, price and performance. Like many modern radios (later than, say, 1996 or so), when you crack the lid and take a look inside you are struck by the Spartan appearance of the boards. (You suffer the same effect, only far worse, when you look inside the high-end Watkins-Johnson HF-1000 or the Ten-Tec RX340, because they are equally spare-looking but cost about $4,000 each!)

❖ How well does it work?

I'd say that it does extremely well overall; the price/performance ratio is extremely good. It's an excellent SWBC radio and with the stronger broadcasters you can open up the bandwidth to improve fidelity to equal or exceed that of your car radio on AM. It does very nicely on sideband, stability is excellent, and the wide selection of IF filters helps winkle stuff out of the mush.

Most useful of all, it's also very capable as a receiver for digital utility transmissions as well. This radio combined with your PC's sound card makes for a very nice starter station for ALE, HFDL, RTTY, PSK31 and SITOR decoding – I'd have happily assassinated any given individual for this kind of capability at this price just fifteen years ago.

I tested the '320 against an ICOM R-75, both radios being fed from a Stridsberg HF multicoupler; anything the R-75 could hear was equally listenable on the '320. This is a $300 radio that acquits itself creditably against devices costing much more.

The only negative observation I have to make against this radio is that sensitivity below about 1.2MHz drops off fairly quickly. This is a combination of two things – deliber-

ate design to prevent troubles with overload – and minor miscalculation – it dropped off more than was anticipated. Modifications to correct this do exist and information is available on the Internet on how to perform them. Users who have performed these modifications have stated that the radio goes on to perform very well across its entire frequency span as a result.

Pros –
Very good performance/cost ratio
Stable
Extremely flexible due to wide range of interface software availability
No image problems (normally a bugbear of radios in this price range)
34 IF bandwidth filters from 300 kHz to 8 kHz are available to the user
Tuning steps down to 1Hz available (again, not normally available in this price class)

Cons –
No RF attenuator available
No RF gain control
Sensitivity drops off drastically below 1.2 MHz
Comparatively slow 1200 Baud serial interface

But wait! There's more! (As they say…)

❖ Two interesting late developments

First of all, the basic RX-320 has been established as being easily modifiable to provide the 12kHz IF output required for DRM reception (DRM is a digital audio transmission mode that bids fair to become the transmission standard of the future on shortwave)! I've tested this myself – it's easy and it works – all you need once the mod is done is the DRM decoding software, which is available in both commercial and shareware versions.

Secondly, I think Ten-Tec must have been spying on the listener/hacker community; a new model replacing the RX-320 – the RX-320**D** – has been announced that already has the DRM modification incorporated into it *plus* the RF front end has been modified to fix the lack of sensitivity at the lower frequencies.

In summing up, this is an excellent radio at a great price ($300) with a large amount of third-party front-end software available for it that effectively turns it into many different radios (see following page). Not only does it cover the shortwave bands well, it can now also keep your listening up to date by handing you the ability to receive DRM signal on a platter! What's not to like? I just wish I had a few more of 'em in the shack!

RF board

DSP Board

O N THE BENCH

Software for the RX320

By Lee Reynolds

You may have read the foregoing observations on the basic, out of the box Ten-Tec RX-320. Now I'll cover the aspect of owning such a radio that's the *real* fun – all the different front end control packages you can get for the device. That's the way you interact with your radio, and (unlike a traditional radio) if you don't like the ergonomics of your rig's software you can just drop in another front panel and set of abilities to replace the disliked one!

Some packages suit the needs of program listeners, others are aligned more with the interests of utility fans; one or two even serve the listener who wants to put his radio onto the Internet! A lot of software is available for this radio, so let's get down to it. I'll be assessing programs for the Windows 98 (or better) environment only this time around, but I know there are a least a *few* pieces of software out there for running the '320 with a Mac or LINUX box.

❖ Freeware Programs

GNRX320 is a nice piece of code that was written by Gerd Niephaus. It's stable, easy to install and is light on system resource use, so you'll easily be able to run it on that old Pentium 200 system you have in the basement. The front panel layout (below) is clean and intuitive, although lacking any on-screen simulation of a tuning knob (mouse wheel frequency tuning has been added with version 1.30, though!). Access to all available filters, tuning steps and other RX-320 functions is provided. Gerd also added an implementation of passband tuning that can be quite useful. This program has two useful add-on programs that make it of interest to both the program *and* utility listener –

GNPDB – a database for displaying and manipulating the ILGRadio broadcast database. It can be used in standalone mode if you so desire, but if used with GNRX320 it can be used to look up the frequency that the RX-320 is tuned to *or* it can tune the RX-320 to frequencies of interest you are finding in the database.

GNKFDB - uses the Klingenfuss "Super Frequency List" database (this one's good for utility listeners!). It works in a similar way to GNPDB but is limited to tuning the radio to the result of searches in the K'fuss database – you can't get the database to look up a frequency you've just set the '320 to.

All in all, solid, easy to use, and the add-

on programs make it a very useful program for the general-purpose listener.
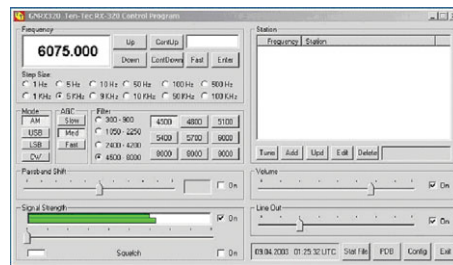
RX320 is, again, a nicely done piece of code. A '320 enthusiast by the name of Clifton Turner wrote it but he hasn't produced any updates for it in a while, maintaining that the final version(s) have been released. Installation is simple. All '320 features are available and the software adds a few more that the '320 alone cannot provide, such as a tuning scheduler, passband tuning, bandscope, a miniature controller that occupies minimal screen real estate, easy to program memory buttons, automatic filter selection by mode and programmable data mode (FAX, RTTY, etc.) frequency offsets. Again, there's a useful ancillary program available –

DB320 – an interactive ILGRadio database for use with RX320. Again, crafted to work with its companion '320 program, the database will automatically look up the frequencies you tune your '320 to or tune the '320 to frequencies you look up in the database.

This program works well and presents an appearance that's more radio-like than the one shown by RX320. You may find it more familiar and usable as a result. A good workhorse for the program listener.
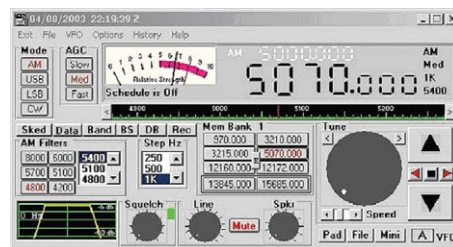
SCAN320 – written by Tom Lackamp, SCAN320 was created (as the name suggests) to address the needs of those who want to be able to scan a number of different frequen-

cies. The basic '320 hardware has no built-in ability to perform scanning itself, but this program adds LF/HF scanning as well as anything in the consumer-grade market can. Squelch-based scanning *isn't* implemented in this package, but five different modes of scanning are available – memory, band, limit, continuous and file scanning (where the file can be a file created by the RX320 program above!)

Again, the "front panel" model owes more to Windows than to physical receiver design. Additional features include fully programmable tuning/recording (and scheduling thereof), dual range S-meter, dual VFOs, 24 direct access filters, passband tuning and 160 scratchpad memory positions. There's also a nice add-on or two –

SCAN320DB – once again, an interactive database access tool that works with SCAN320. This particular database front end is a little different in that it possesses a receiver mini-control panel that it displays along its top edge. You can minimize SCAN320 and run all operations entirely from the database viewer itself.

B-LOG – is an integrated logging utility that works nicely with the other two components. If you've been looking for a logger but didn't want to spend too much money, the price for this one can't be beaten.

This program is definitely one for the utility listener who wants to monitor a number of frequencies for activity.
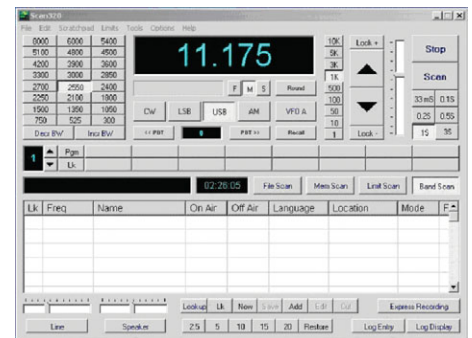

❖ Commercial Offerings

First up is **ERGO 4.0** – from Creative Express (http://www.swldx.com). ERGO is a very interesting approach to computer-radio integration that was designed with the program listener in mind, I think. This program can provide a simple receiver control panel for a number of different radios along

with built-in interfaces to the ILGRadio database, HFCC database, Fineware SWBC files and Whamlog database. All these databases make for a *very* comprehensive index of what's on when and where on the bands, and via which transmitter sites.

ERGO also has some very useful built-in propagation tools that access Internet data sources for up to the minute forecasts which are then used to give you nicely integrated visual displays of signal paths between two points and the usable frequencies between those points. Good stuff if you're trying to get that elusive signal from Nibi-Nibi and need to know when your best chance of hearing it will be. Add in the ability to process received audio using the DSP abilities of your sound card, linking audio clips to database and logger entries, and receiver control via a local network or the Internet – you've got something that's definitely worth a much closer look.

This package is for the hardcore SW broadcast band DXer – with the full complement of databases and its real-time propagation forecasting abilities, it'll tell you when and where *you* should be listening for that elusive DX target! It also supports a number of radios other than the RX-320.
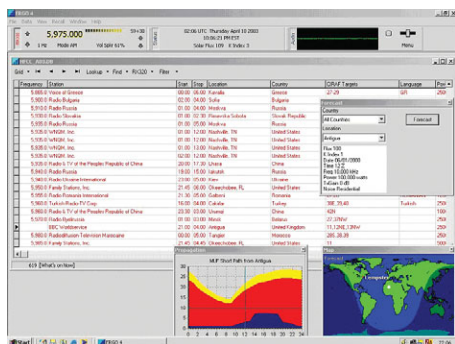
N4PY – is the brainchild of N4PY, Carl Moreschi (**http://www.ralabs.com/n4py/**) who produces control software for the Ten-Tec range. If you've grown used to the software that Ten-Tec provided with the RX-320 you'll find that this package bears a fairly close resemblance to it in certain ways. This product *will* run under Windows 3.1 - unlike any of the others – and displays modest system requirements. Passband tuning is implemented, one touch selection of a band is useful and a bandscope is implemented. This is a "fewer frills" package but is quite workmanlike in its attitude to getting the job done. If you own a Ten-Tec Pegasus then this software can run the Pegasus as the host radio and use the RX-320 as a client that will follow tuning changes on the Pegasus. No integration/link with the ILGRadio database exists.
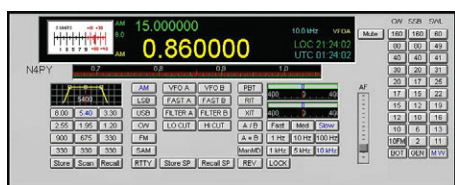

ists.

If you want more than the basic Ten-Tec software can offer but you aren't looking for a replacement with a steep learning curve, then this package may be of interest to you.

SCOPESTATION 3.00.08 – comes from CallSign Software (**http://www.callsign software.com**) and is a member of a range of products made for the Ten-Tec Pegasus, Jupiter, RX-350 and RX-320. This beast has a radio amateur heritage (as you can tell by looking at the design of the front panel) and a feature that makes it particularly well suited to the SWL who has an interest in the ham bands (as well as SW in general). All typical functions are supported well with some additional capabilities that are very welcome. Support of the ILGRadio database is provided – interestingly, so is support for the HamCall radio amateur CD database.

The S-meter is *extremely* tweakable (so much so that I defy anyone to say that it can operate in a way that they *don't* like, once they're done setting it up to their taste), and a very thorough frequency calibration procedure is available for making sure that your '320 is absolutely spot on at all times.

CallSign has also performed a number of neat tricks with band sweeping and signal sampling – you have the conventional frequency sweep and display with the ability to click on interesting looking peaks to tune to a given frequency, more unusually you also have a signal sampling mode that allows you to take a close look at the waveform of any signal you're listening to. (I understand that some users are simply fascinated by this trick!) Another good touch is that have having the software automatically set a zero baseline for signals when using the 'scope helps compensate for unusual noise levels, etc. ADIF file format support is included as well; this enables you to import data from a number of amateur and SWL related programs.

This is a good package for the guy who likes to get into to the nuts and bolts of things and who likes to heavily customize the way the virtual 'front panel' works. A tinkerer's delight!
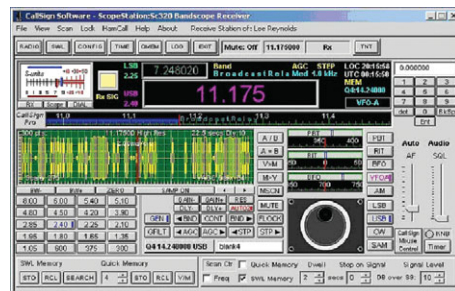
WORLDSTATION 3.1 – produced by DXtra, Inc. (**http://www.dxtra.com**) this is one package that I would very much liked to have included in this overview but the transition from WS2.0 to WS3.1 occurred at just the right time to prevent me from being able to review the newest version. I own 2.0 and

like it a great deal; it offers features that I haven't been able to find anywhere else, but I'd have been reviewing a copy of something that is no longer current. 3.1 promises some remarkable band scanning and multi-radio management capabilities – I'll report on this one at a later time, editor permitting!

Okay, that's a quick take on what's out there for the RX-320 aficionado. Additional packages do exist but space does not permit me to include them all. You might try a web search for –
N4PY
Privalov/Control Panel
Rxtra320
RX320/PDA (Yes, software exists that runs on your Palm Pilot!)
RxWings
DXRadar (Not, strictly speaking, a control package, but it performs a fascinating function!)

I've used all of the above programs and own all but one of the commercial ones. Choosing between them can be difficult, because almost all offer something that, to me, qualifies as a "killer app"! Do some judicious research, kick the tires on a few of these programs and form your own conclusions, but, most importantly, have fun doing so! I did.

Visit MT's website at:

www.monitoringtimes.com