MT REVIEW

WiNRADiO's G313i Receiver

By Lee Reynolds

Australia – "Oz" as it is often called – is renowned for kangaroos, Bondi beach, strapping great sheepherders with beards like rhododendron bushes and Foster's Lager. Nowadays, to the radio hobbyist community, it's also known for the WiNRADiO line of receivers and accessories that are targeted at both the consumer and the NGO/government/alphabet agency markets. Until the advent of the G303i PC/receiver card, these were often purchased more for their excellent VHF/UHF capabilities and software than with HF reception in mind.

The WiNRADiO HF-only G303i receiver appeared a few years ago, sporting excellent specifications, software, and (most importantly) performance, quickly establishing itself as one of the best price/performance computer-based HF receivers available to the hobbyist, and making WiNRADiO into a very serious contender in our listener's market.

Since then, these latter-day Wizards of Oz have been working on expanding their line of offerings (the rumored G303e(xternal) should be out before too long) and coming up with an act good enough to follow the G303i – the G313i! So, what is it? Does it offer enough in the way of improved performance and new features to justify buying it, rather than the G303i? How good is it? Let's see…

❖ What is it?

The G313i is a computer-controlled HF receiver built on a two-thirds length PCI card that's plug'n'play compatible with your PC and any reasonably current version of Windows. In the basic version there are only two connections on it – an SMA connector for the antenna and a mini stereo socket for audio out (to either your sound card or amplified speakers.)

Brief Specifications:
Frequency Range: 9kHz – 30MHz
Tuning Resolution: Variable down to 1Hz
Modes: AM, Synchronous AM, USB, LSB, DSB, ISB, CW, FM
Filter Bandwidth: User definable, variable from 1Hz – 15kHz
Frequency Stability: 0.5 ppm
Minimum Discernible Signal (MDS): -137dBm
Spurii-free Dynamic Range: 95dB
Sensitivity: AM (1.5-30MHz) 0.35 uV
USB/LSB (1.5-30MHz) 0.25 uV
CW (1.5-30MHz) 0.07 uV
FM (1.5-30MHz) 0.32 uV

Observations:

These specs are pretty decent and generally represent improvements over the specs for the earlier G303i. MDS (minimum discernible signal), sensitivity, Dynamic Range and stability are all improved upon in the G313i. They're not bad compared to anything else, either.

❖ What's new?

All preceding G303i capabilities exist in the G313i in one form or another, plus –

The G313i's predecessor (G303i) needed to use the host computer's sound card for intermediate frequency (IF) and audio conversion functions. The G313i has its own built-in IF digital signal processing (DSP) section that handles all IF to audio conversion tasks. (This means that you get regular audio out of the barefoot G313i audio jack, unlike the 303, and initial setup of the radio is much simpler.)

Improved receiver specifications *(see above)*
User selectable display of frequency in MHz or kHz *(someone at WiNRADiO was listening to user feedback!)*
Four Variable Frequency Oscillators for easy frequency switching
Automatic Frequency Control (AFC)
Receiver Incremental Tuning (RIT)
Tune to Peak *(tunes to the signal peak within the IF passband)*
Improved real time spectrum scope with user selectable low pass filtering and the ability to zoom in from 20kHz to 4kHz bandwidth to observe a signal more closely
Notch Filter *(frequency and bandwidth user-configurable)*
Noise Blanker
Passband Tuning *(IF Shift)*
Integrated Audio or IF signal recording *(The audio recording is nice and conveniently integrated with the receiver GUI or on-screen visual interface. Being able to record the IF-level signal and play it back allows you to play back that interesting signal while trying different bandwidths, modes, etc.)*
Test and Measurement *(This fires up a number of little tools for measuring FM deviation, AM modulation amplitude, and fre-
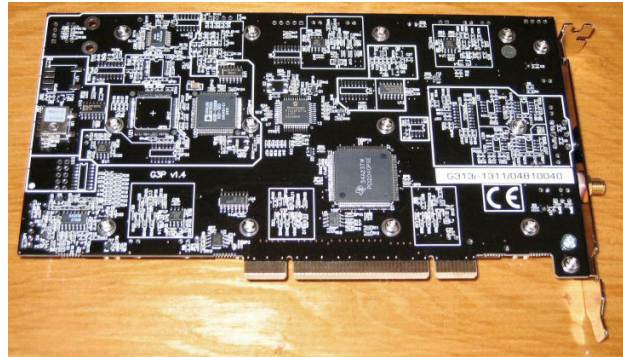

Figure 1 - Bottom of the G313i

Figure 2 - Top view

quency errors between tuned and received frequency. Useful for digital types or het chasers on the AM broadcast band, an audio spectrum analyzer will let you measure a signal's frequency spectrum distribution and power peaks.)*

The S-Meter now also handles dynamic display of maximum and minimum values for a signal "Range mode" and signal level as a floating averaged value for a user settable interval (1-99 seconds) "Average mode."

Improved spectrum analyzer – as well as the smaller spectrum analyzer that G303i owners will be familiar with. The G313i now has available a larger full screen display (that replaces the normal receiver control display). The large spectrum display has been set up so that all receiver control functions are accessible within it (a nice ergonomic touch) and there are new or improved functions added to both such as – 15.6Hz finest tuning stepping, low pass filtering, smoothing of the spectrum display and trace averaging.
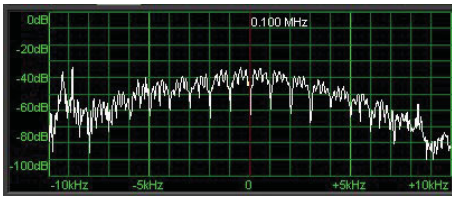
❖ How did it do?

Figure 3 - LORAN spectrum on G313i

I wanted to be able to get a fair estimate of how the new G313i compared to its older sibling, so I ran both concurrently in the same test bed (P4 2.4GHz system with 1GB RAM running Windows XP Professional) and fed them from the same antenna via a Stridsberg multicoupler. Just to be sure the audio wasn't inadvertently compromised, each receiver was fed into its own Logitech Z340 amplified speaker system.

This receiver comes with a CD-ROM containing the drivers for the card and the application that controls the receiver. Also supplied are an audio cable, 84 page *User's Guide*, SMA-BNC adaptor and a small indoor antenna to get you started – same complement as the G303i.

Before I installed the beast, I gave it a thorough looking-over and compared it to the 303' – they use a common PCB template (see figure 1) that is laid out identically, so any differences between the two must be either in the software or inside the heavily shielded RF section (see figure 2).

I was planning to pop the lid and take photographs, but discovered that the lid of the RF section has a clear plastic shield glued to it that prevents you from easily opening it up. The temptation was strong, but, seeing as I don't own it, the insides will have to remain a mystery for a little longer. (Maybe I'll abuse *my* 303' and take a peek in there instead!) Installation was simple and posed no problems. No system restart was necessary, either.

The first thing that struck me at starting up the software was the real time spectrum display's speed – the built-in IF DSP is *fast!* I was running the G313i against the 303' in real time and the G313i made the 303's display look leisurely by comparison while showing far greater detail (see figure 3) The next thing to hit me was the fact that the audio from the G313i was being heard about a quarter of a second ahead of the audio from the 303' – again, evidence that the DSP section in the G313i is running ahead of the G303i's DSP via the sound card.

A quick check of the XP Task Manager's Performance display indicated that the G313i was consuming about 22% of the system's 2.4GHz CPU as opposed to a more modest 10% for the G303i. Tuning the radio up and down in frequency caused much higher CPU cycle consumption spikes, but this effect is common to both models. Basic checks of the setup indicated that the twin radio installations weren't causing problems to each other and that the G313i was able to satisfactorily run a number of third party XRS plug-in programs that you can obtain from the XRS radio web site.

On-screen radio interface ergonomics are good (see figure 4), but, in my opinion, are beginning to approach the limits of what can comfortably be displayed and handled in such a layout.

Figure 4 - 1230 kHz with no spectrum display

❖ On the air –

So, the radio's installed and working properly – how well does it play? First check is how well the DSP bandwidth filters work. I have a local 10kW AM station about a mile from where I live that puts 9 or 10 millivolts of signal into my antenna. That does a reasonable job of trying to blast through any filters I throw at it.

I ran a quick comparison between my ICOM R-8500 (fed from that same antenna/multicoupler) and the G313i. Good results from both radios, but I was delighted to see that the G313i was able to get a couple of kHz closer to the target signal than the '8500 at various (matching) filter bandwidths before AGC pumping and audio blowby became apparent. (I'd say that IF-level DSP bandwidth filtering techniques have matured nicely, and perhaps those vertical filter skirts we see portrayed for such filters in general are a reality at last.)

Next, we take a look at general reception ability from LF up to the high end of HF. The LORAN beacon network comes in nicely at 100kHz, no perceptible difference between the G313i, G303i or R-8500. Various aeronautical and DGPS beacons in the 200-350kHz range, ditto. It's interesting to watch their signals on the real time spectrum display, because you can see the modulation on the sidebands of the signal appear and disappear as the beacon sends its CW i.d.

Actually, you can use this facility to watch any signal and see if it displays any oddities – I always thought that CHU on 3330kHz was a full AM signal until I saw the second's tone modulation appearing only on the upper sideband of the signal. That led me to CHU's web page, looking up its signal specs and then using the G303i's "Study" feature to check how it identified signal components – it did quite well, as a matter of fact, by tagging the 1kHz and 2.25kHz signal components. The much faster and more detailed spectrum display of the G313i made it a lot easier to recognize such signal components even when compared to the G303i.

On AM I sampled local and distant broadcasters with good results, and checked out the synchronous AM detection which is *not* sideband-selectable, but which seems to be much improved over the G303i's version of it by providing a better lock on marginal signals.

Roaming HF from 1710 to 30000 kHz yielded consistently good results on signals ranging from major SW broadcasters to amateurs through digital utility stations. Monitoring of the G313i's frequency stability indicated that it was within manufacturer's specs. Sensitivity of the radio was good and usually exceeded that of the G303i by a small margin and equaled that of the '8500.

All the new features work properly with the possible exception of the Passband Tuning (PBT), which appears to be useful only for the AM modes in its present incarnation. WiNRADiO says that the PBT is still a work in progress and is awaiting user feedback.

The IF recording ability is solid. You can do quite a bit of post-reception processing on the captured sample by switching modes, using the RIT facility to tune across the signal and spectrum segment (20kHz wide), and varying bandwidths or other settings. It's not quite a true spectrum VCR (yet), but you can do a heck of a lot more processing of the received signal than you can with just an audio-level recording. The improved spectrum analyzer works well and offers improved tools for understanding and evaluating what you're seeing,

❖ But wait, there's more!

Some people have asked on the 'net about the G313i and DRM – are there plans to have it handle DRM? I asked WiNRADiO about this and they kindly provided some beta code for me to play with – yes, the G313i *will* handle DRM. You'll still have to pay for a DRM license for the decoder (via the **http://www.drmrx.org** web site), but the application does exist.

The decoder implementation is as well integrated into the interface of the G313i as that of the G303i is and is cosmetically very similar. I tested both decoders ('303 and '313) against each other on Bonaire, Sackville and Kuwait transmissions in real time, and performance was, for all practical purposes, identical. There was perhaps a decibel or so difference in performance with the advantage going to the G313i. Subsequent scrutiny of the log statistics confirmed this impression.

❖ To sum up –

This is just a brief look at the G313i – I could easily have filled two more pages. How do I like it? A lot! If I were choosing between the G303i and the G313i I would select the G313i as a no-brainer. If you're even slightly inclined towards the synergy of combining computers and radio receivers, this device is definitely a major contender for your dollars, as it's the most sophisticated radio of this type in the under-$1000 price class.

It will also give more expensive standalone radios a tight run for their money, too. There are no perceived lacks of performance or dislikes of *anything at all* on my part – a couple of very minor software bugs, a couple of "would be nice" features – but this is true of everything and is purely subjective. The G313i is a number of evolutionary steps above the G303i, offering great tools and signal analysis capabilities that the serious listener can make good use of – all in a single compact package.

Now I have to try to justify to myself buying yet another radio …