

WiNRADiO's G305i Wide Coverage Radio

By Lee Reynolds KD1SQ

Australia's WiNRADiO Communications continues to work on expanding, updating and improving their product line. So far they've done a stellar job of producing reasonably priced PC-oriented software-defined shortwave receivers with great performance for the consumer and commercial markets. The G303i/e and G313i/e series have all been reviewed in earlier *MT* editions. Not resting on their laurels, the guys at the research labs have come up with an interesting new addition to their DC-to-Daylight product line (the WR series). With a few consumer level exceptions, these products have been aimed largely at the professional market.

This new receiver is aimed directly at the consumer market and is intended to replace the now venerable WR-1550e. WiNRADiO's new G305 series comes in both internal and external versions. We tested the G305i, the PC PCI slot card version. In both physical appearance and pricing terms it bears a resemblance to the G303i LF/MF/HF receiver, but don't let that mislead you – this device has a different ancestry to the '303 line and is stated by the manufacturer to primarily be a VHF/UHF receiver with improved LF/MF/HF receiving abilities added on.

First thoughts:

This was something I found intriguing. DC to Daylight receivers are reasonably common, but hobbyist experience says that in this price range they're usually much better scanners than they are HF receivers, often suffering from susceptibility to overload, limited reception modes, poor stability and worse selectivity. The wideband receivers that can do a good job are usually far more expensive devices at three or four times the cost – the ICOM IC-R9000 and IC-R8500 and some AOR models come to mind as two examples of good wideband receivers.

I own an R8500. It's a beautifully built and thought out receiver with excellent performance in general and outstanding sensitivity on VHF/UHF. There's one thing that it is not, however, and that is a good scanner. It's a communications receiver, not a scanner. You use things like communications receivers to ferret out the weak, elusive signals. You use them for casual monitoring of a few channels, because their scanning speed is so slow or because the relay switched front ends will drive you mad with their clicking. You use them to find the good stuff that you then use lesser devices – scanners – to monitor full time.

Scanners, on the other hand, are often designed in such a way that manual tuning across frequencies is less than easy or intuitive; they

support a limited number of reception modes and are really built to be able to store and scan large numbers of frequencies automatically.

Communications receivers and scanners are complimentary to each other in the shack, but are really two different things; making a single radio to do both things well is hard. It'll be interesting to see if the G305i falls into the communications receiver or scanner camp – or sits somewhere between.

For comparison and testing purposes I had available an ICOM IC-R8500, ICOM IC-R75, ICOM IC-PCR1500, WiNRADiO G303i, Bearcat BC796D and Radio Shack PRO-2006. Antennas used were an Alpha-Delta DX-Ultra and a TRAM discone, both feeding into 8-port Stridsberg multi-couplers so all receivers and scanners saw exactly the same signal.

Specs:

The specifications of this radio don't look too bad at all, given its intended audience and purpose. If I lived in the New Jersey Meadowlands where ambient RF levels are extremely high, I might expect problems with desense or crossmod. (Then, again, almost *any* radio would have problems in that kind of RF environment.) Claimed sensitivity, dynamic range and stability all look to be adequate for the job for which the receiver is intended.

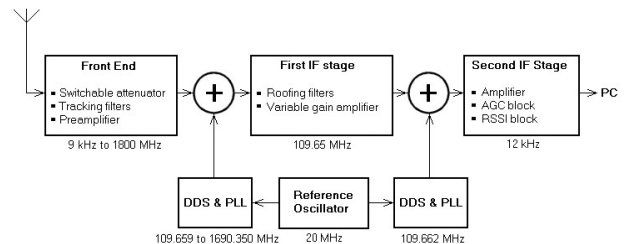
Block Diagram/What's Inside:

Looks like a nice straightforward design; roughly analogous to the G303i/G313i line.

Being built on the same common mother card design, the G303i and the G305i initially look almost identical, but internally, the G305i is very different from the G303i. The component count is higher, the front end board is twice the size of the G303's and the optional Wide FM module (if included) is entirely new. (Again, let me emphasize, this is not a G303 with VHF/UHF capability; this is a VHF/UHF receiver with LF/MF/HF abilities added in. I use the G303i for comparison purposes solely because it's still the closest relative.)

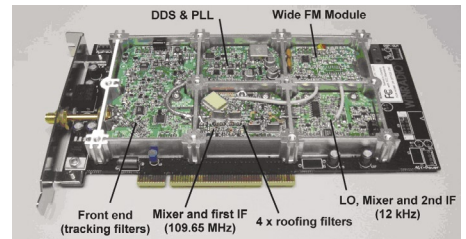
Installation:

Installation was straightforward, just like adding any plug and play device to a PC. No unforeseen problems were encountered. As with other WiNRADiO models and installers, I'd strongly suggest letting the installer put the software into the default location on the hard drive – some of the WiNRADiO plug-ins for the



software don't like being installed to other than the C: drive.

The installer looks and works exactly like the G303/313 installers do. Connect the IF (12 kHz audio) output to your PC's sound card line input, the antenna to the SMA antenna connector, and you're ready to go.



Interface:

The graphical user interface (GUI) closely follows the layout found in the G303/313 line with an easily read frequency display, large S-meter, tuning knob and a real time spectrum display that occupies approximately 20% of the virtual front panel. (This screenshot is from the receiver running the Professional Demodulator option.)

On the far right of the GUI center panel, are the squelch controls – five different types: Level, Noise, Voice, CTCSS and DCS. There's also a switchable preamp, audio filter and AGC control. These are the G305i-specific differences most immediately noticeable. Passband tuning or other draggable operations using the realtime spectrum display are not implemented in the G305i.

How well does it play?

So, it installs easily, has a user interface that is easy to figure out and can be seen to be functionally slanted towards the VHF/UHF side of the spectrum. Is it competent to do what the manufacturer claims it can do?

My testing methods are simple and biased towards the user who wants straightforward feedback: feed a group of receivers the same signal in realtime, wander all over the bands, find interesting things to listen to, see what does a good job



of picking out a given signal and which, if any, fail to perform a given task.

First, I wanted to play with the radio on LF/MF/HF – I remembered reading comments regarding the older WR line, in which users felt that coverage below VHF seemed like an afterthought. I wanted to see if WinRADIo had addressed those concerns.

I ran the radio from 23 kHz up to 30 MHz looking at low frequency beacons, NAVTEX transmissions, AM stations (both weak and extremely strong), amateur transmissions, pirate transmissions, SW broadcast stations, numbers stations and utility stations.

Frequency stability and selectivity were good; the variable selectivity provided by the Professional Demodulator software was very useful

TABLE 1: SPECIFICATIONS

Receiver type: DDS-based dual-conversion superheterodyne with software-defined last IF stage and demodulator

Frequency range: 9 kHz - 1800 MHz (3500 MHz with optional downconverter; except cellular frequencies where required by law)

Tuning resolution: 1 Hz

Mode: AM, AMN, AMS, LSB, USB, CW, FMN Optional: ISB, DSB, FMW

Image/Spurious Rejection: 60 dB

IP3: 0 dBm @ 20kHz

MDS: -135 dBm

Spurious-free Dynamic Range: 90 dB

Phase noise: -148 dBc/Hz @ 100 kHz

RSSI accuracy: 5 dB

RSSI sensitivity: 1 μV

Selectivity (-6dB)

AM	6 kHz
AMN	4 kHz
AMS	4 kHz
LSB, USB	2.5 kHz
CW	500 Hz
FM3	3 kHz
FM6	6 kHz
FMN	12 kHz
FMW (optional)	230 kHz

Scanning speed: 60 channels/s max

Sensitivity (AM/SSB/CW 10dB S/N) (FM 12dB SINAD)

Mode	0.15-500 MHz	500-1800 MHz
AM, AMS	1.7μV	1.85μV
LSB, USB	0.35μV	0.37μV
CW	0.2μV	0.25μV
FM3, FM6, FMN	0.7μV	0.8μV
FMW (optional)	2.0μV	2.0μV

Intermediate frequencies: IF1: 109.65 MHz IF2: 12 kHz

Roofing filter: 2 x 4-pole 20 kHz BW crystal filter

Frequency stability: 10 ppm (0 to 60° C)

Antenna input: 50 ohm (SMA connector)

Output: 12 kHz IF2 output (sound card Line Input compatible)

Form factor: 2/3 length PCI card

Interface: PCI 2.2 compliant

Dimensions

Length: 195 mm (7.68") (excluding mounting bracket)
Height: 99 mm (3.90") (excluding edge connector)
Thickness: 19 mm (0.75") (incl. components on either side)
Weight: 310 g (10.9 oz)

in picking out stations crowded closely together. Strong signal handling was a little better than that of the ICOM IC-PCR1500 once the DSP filters were adjusted for maximum filter lengths.

Some DRM testing was in order as well. (I use my G303i with WinRADIo's DRM plug-in and the plug-in works just as happily with the G305i.) Performance was more than acceptable, the main limitation being that of the digital transmission mode itself. DRM always demands a pretty high signal to noise ratio for continuously decoded audio.

Overall, the G305i acquitted itself quite well on HF. Almost as good as the R-75 in a number of cases, the R-75 being a bit better on the weaker stuff. Not bad for a receiver that's designed and intended mainly for VHF/UHF use.

VHF/UHF was the next thing to consider. The first thing looked at was handling of strong signals: with any wideband device there's always a possibility for problems. I ran comparisons of the G305i, R8500 and PCR1500 using extremely strong pager signals as the test input. I use one particular frequency – a transmitter that's within a mile of me – for receiver front end testing. At a separation of 20 kHz from the paging transmitter frequency, the R8500 did best, the PCR1500 was unable to keep signal breakthrough from occurring, and the G305i was about 80% successful at handling such a large signal.

Signal sensitivity was next up for testing, and here I found some deviation from what I expected, given the specs. One standard test I use for VHF reception ability is the standard seven-channel bouquet of NOAA weather transmitters from 162.400 through 162.550 MHz at 25 kHz intervals. At my location, using the R8500, I can receive a signal on all seven frequencies that range from very strong down to "something barely audible in the noise." The G305e only produced signals or signal indications on five of those seven channels. Comparing it to the other radios in the shack, the sensitivity of the G305i seemed to be roughly equal to that of the BC796D. A second G305 series receiver was tested in the same way, in case the first one was an atypically poor performer. Same result. It was time to ask questions – I contacted WinRADIo and Grove Enterprises and queried the results I was getting.

WinRADIo issued this statement as to the matter of slightly decreased sensitivity:

The typical sensitivity of the WR-G305 is within specifications of most high-grade VHF/UHF receivers, i.e. around -113 dBm (0.5μV), typical of other highly acclaimed scanning receivers.

While some of the comparable scanners (including our own earlier model WR-1550e) offer somewhat higher sensitivity, this is usually at the expense of strong signal handling. In this respect the WR-G305e is superior to many general-coverage scanners, offering strong signal performance not typical for this class of products. As a result, it is able to provide optimum performance across the entire HF/VHF/UHF range.

The most frequent criticism of our earlier WR-1550e has been in fact excessive sensitivity

and insufficient strong signal handling, which we have now addressed in the WR-G305e. We believe that the balance is just right in the WR-G305e and customer feedback appears to confirm this.

We do realize that there will be some customers operating outside typical RF-dense urban environments who may require higher sensitivity. For these users we are offering a matching low-noise preamplifier (see <http://www.winradio.com/home/lna-3500.htm>), which, when used in conjunction with the WR-G305, makes it possible to achieve quite extraordinary MDS levels of approx. -140 dBm, certainly more than satisfactory for extraction of the weakest signals from noise.

So, it was a deliberate design choice made when evaluating the tradeoff between high sensitivity and resistance to front end overload. WinRADIo chose improved overload resistance in exchange for slightly reduced sensitivity.

Back to testing – I ran the receiver through its paces: it did well as a VHF/UHF receiver overall. Sensitivity, although lower than some receivers, was in line with many present day scanners; strong signal handling was better than that displayed by many other scanners and receivers, and the AM aero band reception was particularly good. Scanning speed was adequate – much faster than the R8500, for example, although not quite up to the 60 cps claimed (This may be due to the nature of the various squelch types available – some just demand a longer sampling time than regular level-only squelch methods.) The various squelch methods worked as they ought to. Although capable of receiving up to 1800 MHz, there just isn't much up there in my neck of the woods to receive. I did test up to the 1 GHz range, though, finding performance to be good overall.

Pros:

- I particularly like the various squelch types, especially the DSP-based ones that offer the only realistic hope of a reliable HF channel squelch for the hobbyist.
- Deliberately lowered sensitivity – although I am an advocate of the more, the better, it's quite possible that cranking the G305's sensitivity up higher could have resulted in a receiver that could suffer badly from overload and mixing problems.
- Good strong signal handling ability.
- The HF reception is nice; it works well and the receiver has no obvious problems doing its job there.
- The G305e does nicely on DRM – there are still so very few real DRM receivers around that it's good to see another well-executed one come into existence.
- With the addition of the Advanced Digital Suite software (an optional extra), the G305e can gain a number of very nice abilities and tools, such as NAVTEX decoding, ACARS decoding, CTCSS/DTMF search and decoding, Packet Radio reception, FAX reception, and some nice audio adjustment tools. It's nice to have an all-in-one ACARS receiver, for example. The ADS with its mix of VHF and HF tools makes a lot more sense as a purchase now that it has a new wideband receiver with which to take advantage of all of them.

Cons:

- No out of the box ability to listen to broadcast FM (hard to do with presently available DSP

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mands that entries be made in both the Mode and (transmitter) Power boxes before it will save the card entry. As you can see from Figure 1 it was happy with a 0 in the Power box.

Using the "Find" button, the card file can be searched via the call sign for any previous loggings. A New card can then be generated or the original card Updated using the buttons of the same names.

Finally, the Log Capture utility allows you to "... enter additional data into the USA contacts log either by importing ADIF files from other software or entering the contacts manually from old printed logs."

More Than a Clock

The "Clock" tab, shown in Figure 2, displays a six-digit clock of either local or GMT time. It also has a timer feature, which reminds the operator to identify their station every ten minutes. This is via a voice message at the one-minute marks and once again if the ten minutes lapses without an ID.

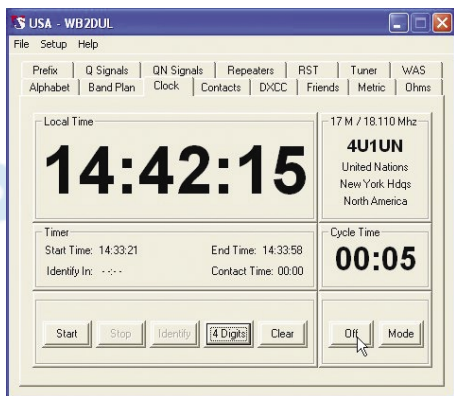


Figure 2- Clock, stopwatch and beacon station identifier/propagation guide

At the right of the clock screen is a simple but useful propagation tool. The user chooses a ham band, for example, 14 MHz. Then the display shows the frequency and location of beacon stations transmitting in that band in real-time. That is, as they transmit in a staggered sequence, the active station's frequency and location is displayed. Beacon station information is available for 14, 18, 21, 24 and 28 MHz ham bands.

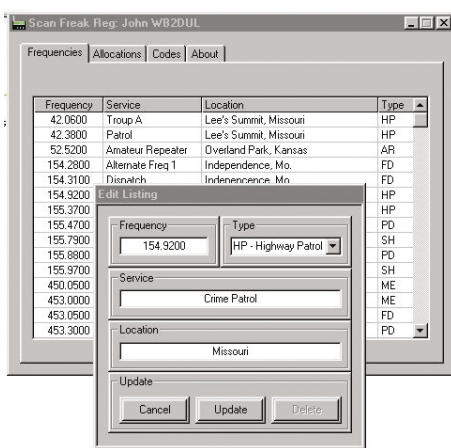
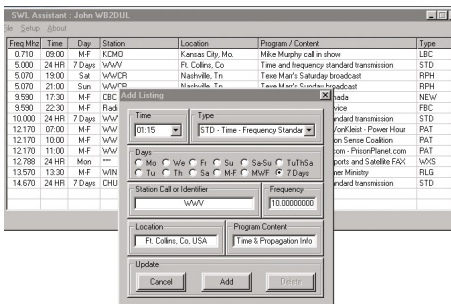
Using this method, the user can tell which frequencies are currently open to which areas of the world from their location – all in less than five minutes.

The Repeater feature is formatted to store VHF/UHF ham repeater loggings such as offset between input and output frequency and access tone frequency. However, it could be used as a very basic scanner log. The other tabs in USA are charts and formulae mostly useful to hams.

PTB's USA is useful and very simple to use. There it squarely hits its mark. A rig control feature and auto rig frequency and mode transfer into the card file would be a very useful added feature. Since many of the features run in the free demo version you should give USA version 1.10 a try. But, for the princely sum of \$20 for the full registered version, USA is good value for money.

Scanner & Shortwave

If you don't need all the features of USA, some of the individual operating modules are available as separate downloads. Also on the PTB website you'll find two other programs – SWL Assistant and Scanner Freak. These programs, seen in Figures 3 & 4 respectively, are easy to use logging programs customized for their radio application.



For example, in SWL Assistant, double clicking on a line in the main window brings up the entry box. This is the smaller box in Figure 3. Clicking on the "Type" box opens a drop-down menu with thirty-four station-types from "ALC - Airline Corporate Comm" to "WXS - Weather Satellite." The list covers just about all the types of stations found on shortwave. Scanner Freak has fifty types of stations found in the VHF/UHF spectrum.

These logs can be sorted by simply clicking on a column. Download the demo versions for free or pay \$2 each to have fully registered versions. A data link to receivers, at least for the SWL Assistant, would be a great addition. That's my two dollars, I mean two cents worth. Oh, and by the way, they will work in Windows 98SE as well as XP. (I just had to throw that in.)

15 Years - In a Blink !

So much has changed in technology and the world since I was given the privilege of starting a column on the strange subject of computers and radios. Having worked in microelectronics and military communications, I had been living with the marriage of the two since 1980.

But, even 11 years later in 1991, when I started the Computers & Radio column, commercially available radio programs were few and far between. There may have been about nine of them available, and some were pretty rough. In

the early years I did more beta testing and bug chasing for these new radio software companies than writing... all gratis. I wanted to help and encourage the new industry mature. And so it did, maybe peaking about 1998.

Today, my search for new, different and useful radio programs has become almost as hard as when I started. The difference now is that it's hard to find a unique program among all the thousands of software applications that exist.

My entire career as technologist and business executive was in the insanity and pressure of the high tech world, with 18 hour days. My dream was to someday retire and spend my last days looking out my window at the beauty of the surrounding forest – all while decoding shortwave utility stations from around the world, many of which I had visited in my career.

But as the ancient Greeks said, "Men plan and gods laugh." The world has changed in ways we could not imagine fifteen years ago. The power and the universality of the PC. Instant worldwide communication and news. The rise of the Internet and the fall of shortwave and, with it, the extinction of unencrypted utility stations. The end of the cold war and the spread of worldwide terrorism. Losing freedoms in the name of freedom. I don't understand it anymore, or perhaps I never did.

But one thing is still good: I enjoy hearing from readers. And when they tell me that they enjoy the column and my efforts, life is good. So till next time, thank you readers and MT for fifteen years.

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- horsepower/soundcard abilities, so it's done instead as a standalone internal FM tuner which is an optional extra.)
- No CTCSS/DCS search – this is likely to be added in future software releases.
- No ability to follow trunk systems or decode P25 digital signals (WR says this is in the works).
- An antenna duplexer is needed if you want to use both a good VHF/UHF antenna and a good LF/MF/HF antenna without having to manually switch them.
- Deliberately lowered sensitivity – this is a two-edged blade which appears as both a Pro and a Con. Slightly lowered sensitivity means that you will miss the very weakest signals. On the other hand, you're much less likely to find your local 50 kW AM station mixing in with the signals on 3.5 MHz.

Summary:

In my opinion, the G305i receiver is a very usable wideband communications receiver that incorporates a greater number of scanner-like abilities than has been the norm up until now. As with the G303 series, I would say that the Professional Demodulator option is mandatory; you give up too many useful abilities if you don't have it. If you want a flexible, all-in-one solution to your desire for both scanning and LF/MF/HF reception, you could do far worse than to acquire one of these devices, especially for the price.

The G305e (\$619.95) and G305i (\$519.95) WinRADiO receivers are available from Grove Enterprises. Call 800-438-8155 or email order@grove-ent.com for more information.