In Review: The AR5001D Digital Receiver

This version of AOR's flagship radio is all about performance

By Ken Reiss, WPCØKR
<radioken@earthlink.net>

"The AR5001D covers from 40 kHz to 3.15 GHz — or from slightly above DC to slightly below daylight . . . You will not be disappointed with this outstanding receiver."

There are very few choices in the high-end communications receiver market, but AOR stands out as one of the best. It has released a digital version of AOR's flagship receiver and it's all about performance, as we'd expect from this company.

What makes digital receivers different is that sometime early in the process, the signal is converted from an analog, unprocessed signal into a digital one. In the case of the AR5001D, the signal enters through the antenna and is amplified with an RF amplifier, just like a normal receiver. Then in the final IF stage (45 MHz), or intermediate frequency, it is converted to digital, and processed by its own independent signal processor. This opens the door to all kinds of digital processing and enhancements that are just not possible with an external DSP unit, or at later stages of the conversion into an audio signal. The result is improved reception in many cases, and more *fun things* you can do with the receiver as a bonus.

For HF reception, a process known as *direct conversion* is used, which converts the received RF signal directly to digital without going through any mixing stages normally found in an analog receiver. The result is excellent performance on HF with a minimum of noise and interference.

Photo A. Ken Reiss, WPCØKR, notes that the AOR AR5001D professional grade communications receiver has "no shortage of receive modes: USB, LSB, CW, AM, Synchronous AM (used for shortwave reception in weak signal conditions), ISB (Independent Side Band with stereo output), FM, Wide FM and even FM Stereo with external speakers or headphones. An optional accessory board will add APCO P-25 digital to the mix." *(Courtesy of AOR Communications)*

Examining the Basics

As a receiver, the AR5001D, **Photo A**, is an excellent example of a class of radio referred to as a *communications receiver.* It's not a good replacement for your average scanner in terms of day-to-day listening — for instance, it's not capable of *trunking*. *(**IN DEPTH**: For an explanation of trunked radio systems, visit <http://bit.ly/GVyehj>. – WPCØKR.)*

What it does do *very well* is perform across a wide range of frequencies. The coverage of the AR5001D is 40 kHz to 3.15 GHz — or from slightly above DC to slightly below daylight.

It can scan, but that's not its primary application. Of course, cellular frequencies are omitted on the U.S. version.

The AR5001D can resolve frequencies to 1 Hz across that wide range, so you can tune virtually any frequency in use. It has both a computer interface and an optional network interface — the ARL5001F or ARL-2300 — which can put the receiver under computer control locally, or across the Internet from a remote location.

*(**BACKGROUND**: "In Review: The AOR ARL 2300 LAN Interface," April 2012 Pop'Comm, page 44, **Photo B**. **NOTE**: We'll spend some time on the control program in an upcoming issue of Pop'Comm. – WPCØKR.)*

There's no shortage of receive modes either. USB, LSB, CW, AM, Synchronous AM (used for shortwave reception in weak signal conditions), ISB (Independent Side Band with stereo output), FM, Wide FM and even FM Stereo with external speakers or headphones! An optional accessory board will add APCO P-25 digital to the mix.

There are five VFOs available. *(**NOTE**: For those new to the communications receiver world, a VFO is a variable frequency oscillator and works like a "working memory." It's not actually stored in memory, and can be tuned immediately to another frequency by turning the dial or digitally entering another frequency. – WPCØKR.)*

Having five VFOs to work with is almost overkill, but they do have specific purposes in some operations.

The A and B VFOs are used to set up a manual search from A to B. The A VFO is the main *working VFO,* but any one of the five can be used that way as long as you're not trying to initiate one of the special procedures, such as a manual search.

VFO C is used for transferring a frequency from a memory channel back to the VFO. VFO D is used to transfer a frequency of interest from a search to the VFO for more experimentation, and VFO E is used to receive frequencies below 25 MHz while in the dual frequency receive mode.

In addition to these five VFO frequencies, there are 40 memory banks of 50 channels each, for a total of 2,000. Each of the 40 memory banks can be adjusted from 5 to 95 channels as desired. That should provide a lot of flexibility for both saving and scanning various services or collections of frequencies.

There are also 1,200 skip memories available — 30 per bank. These are used to bypass frequencies during a search operation. What's unique is that these can be individual frequencies (pager channels for instance) or a frequency range (the whole pager range).

*(**IN DEPTH**: Read a 19-page overview of the AR-5001D from AOR at: <http://bit.ly/GMxMlG>**Photo C**. – WPCØKR.)*

More Advanced Features

As if all that isn't enough, the AR5001D has a few more tricks up its sleeve. There is a very useful spectrum display that appears on the main screen, **Photo D**. With a selectable span between 0.4 and 10 MHz, it's enough coverage to be useful for both HF and VHF/UHF users. *(**NOTE**: We're talking here about the width of the AR5001D spectrum scope. On HF it would be adjusted to a width about 0.4 or 0.5 — maybe as wide as 1 MHz. On VHF/UHF it would be adjusted to 5- or 10-MHz wide to see what's happening around you. – WPCØKR.)*

The spectrum display is very tightly integrated into the controls of the receiver. Pressing the *FUNC* key for two seconds will activate the display. Pressing the key again for two seconds will deactivate it.

You can use the main dial to change the received frequency, or press the *CLR* key and use a marker to explore the band. I was worried that the display wouldn't be deep enough to provide meaningful information, but it is more than adequate, and a lot of fun to play with.

The '5001D is capable of monitoring up to three frequencies at the same time: One on HF and two that must be within 5 MHz of each other on VHF/UHF.

It's a neat system if you have a need for it. The dual band receiver — one HF and one VHF/UHF — is a bit more common and works well.

Play (With) the SD Card

A slot on the front of the receiver below the AF gain and squelch controls will take a standard SD card. The card can be used for recording activity over the air, or for storing and retrieving as a set of memories.

Saving memories will give you a chance to name them, so that they can be recalled later. Usually you need a computer connection to do this, so having the function right on the receiver is a great bonus. At the price of SD cards, an unlimited set of memories could be built easily, if you have the time to fill up all 2,000 memories more than once. Recordings are automatically named, but can be renamed if desired.

Once data is entered into the memories, the user has the option to enter an alpha tag along with the frequency and channel information. These will display in the memory mode, making it much easier to keep track of what you're listening to. Of course, a com-

PRODUCT REVIEW

In Review: The AOR ARL 2300 LAN Interface

By Ken Reiss, WPCØKR

"The ARL 2300 is a very cool application of computer and radio technologies coming together where the whole is much greater than the sum of the parts."

The ARL2300 Ethernet Controller by AOR is a network interface that allows you to hook your AR 2300, **Photo A**, or AR 5001D receiver directly to a computer network, and then if you desire, to the Internet. While the radio selection is a bit narrow, if you have one of these high-end receivers, you'll probably want this interface to go with it.

*(**IN DEPTH**: See the AR 2300 receiver at <http://bit.ly/A8owxO>; the AR 5001D at <http://bit.ly/Aor44e>. – Ed.)*

The interface provides over-the-network access and control to the basic functions of the receiver. All five VFOs are available, but no memory functions can be controlled. There is also a view of the spectrum display so you can find stations nearby.

Hardware Set Up Is a Snap

Hardware set up of the ARL 2300 is very simple, **Photo B**. You plug a cable from the AUX jack on your receiver to the receiver port on the LAN interface, and an audio connection from either the line out or speaker out jack. If you choose the line out jack, you will not have volume control through the software, but must rely on your computer's audio settings to control volume. Finally, a LAN cable connects from the Ethernet port on the 2300 to an open port on your switch or router.

There is no option for wireless control, so you'll need a wired network with an empty port. One other item that you'll need to be aware of is that a DIP switch on the receiver needs to be flipped so that power will be provided to the unit. There is a power jack on the rear panel, but a quick read of the manual explains why there's no power supply included.

Bonjour . . .

Depending on the complexity of your local system, things may get interesting from there, or it may be very straightforward. In theory, the ARL 2300 will use the Bonjour protocol from Apple to make itself available on the network through a Web browser, **Figure 1**. This requires that you have the Bonjour software on your system. Macs, of course, will have it installed already. If you use Windows and the Safari browser, you'll have it also. If you're using something else — Internet Explorer or Firefox for instance — you may need to download and install an add-on before you can find the receiver.

One step that will make it much easier to find the unit is to use the Bonjour browser interface. I have used Safari since it first came out and never had a reason to use this, so I didn't know it was there. Once I found it, everything was a piece of cake.

Click the bookmarks in Safari and then Bonjour in the collections. Look for the http on the Arlan-X device and follow the directions for logging in as the administrator. X will be replaced with a number representing the number of the device on your local network.

Photo A. The AOR ARL2300 Ethernet Controller provides connections for either the AR 2300 (shown) or the AR 5001D receiver and interfaces it to the Internet via the Ethernet. *(Courtesy of AOR)*

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Photo B. *In Review: The AOR ARL 2300 LAN Interface,* appeared in April 2012's *Pop'Comm.* "We'll spend some time on the control program in an upcoming issue," WPCØKR said.

Photo C. A 19-page tutorial on the AR5001D receiver by Authority On Radio (AOR) Communications can be found online in PDF form at: <http://bit.ly/GMxMlG>. *(Courtesy of AOR)*

Photo D. The AR5001D's main screen spectrum display has a selectable span between 0.4 and 10 MHz and is tightly integrated into the controls of the receiver. *(Courtesy of AOR)*

Photo E. To see and listen to the AOR AR5001D receiver in action, visit the *YouTube* video at: <http://bit.ly/GPfD4L>. *(Internet screen grab)*

puter interface makes entering the data a lot easier, but it can be done right from the front panel on the receiver.

Scanning and Searching

The AR5001D is fundamentally a communications receiver, *not a scanner.* That said, though, it is a very good conventional scanner. There are modes available to scan a particular bank, or to link a group of banks together in a *Bank Link* screen.

There is also the possibility to scan up to 100 select channels, no matter where they might be stored. The scan can resume when the signal drops, or after a preset delay, regardless of whether or not the signal has stopped.

In a very pleasant surprise for this class of receiver, there is also a scan delay function that allows you to set a time between 0.1 and 9.9 seconds to wait for a reply after the activity drops on a particular channel. *Nice!*

*(**WATCH** and **LISTEN**: To the AR5001D communications receiver in action: <http://bit.ly/GPfD4L>, **Photo E**. – WPCØKR.)*

Voice scan will only stop on channels that have voice activity. This can help prevent the receiver from getting locked on channels with little or no activity, carriers or interference. This mode can also be applied to a search, which is probably more useful.

The receiver also features CTCSS and DCS, which is also unusual for a communications receiver — except others from AOR, *of course.* These tone squelch systems only work in the NFM mode, and only on frequencies above 25 MHz, which is the only place they're used.

They make a huge difference in interference rejection in busy urban areas. I did not encounter any issues with receiver overload or adjacent channel interference in testing.

This is truly an excellent receiver. With the tone squelch and scan delay, it is a most-capable conventional/APCO25 scanner. You simply will not be disappointed with this receiver.

Cyber Search

The cyber search function is one of the features that is only possible with the digital circuitry at the heart of this receiver. It allows a search of up to 100 channels per second looking for activity and pretty much searches them all at once. The results are displayed as it finds activity. Pressing the *MHz* key will transfer the active frequency to VFO C, which can then be transferred to a memory, or edited as you like.

There is also an *autostore* function that will store located frequencies into Bank 39. Of course, once the bank fills up, the *autostore* will stop.

Options: A Short List

While there aren't many, and most are not necessary, there are a few options for the receiver. We've mentioned the LAN interface and the P25 decoder if you want to decode APCO-25 transmissions. There's an antenna selector switch available which adds two more antenna inputs to the two that are already there. That's a total of four, controllable by automatic selection from software or the front panel.

Another option provides an *ultra-stable* and very accurate 0.01ppm reference standard by using the GPS system frequency standard.

And finally, the I/Q unit allows for 1 MHz of bandwidth to be dumped to a computer hard drive for later analysis and review. Clearly these two options are for very high-end professional systems, or intelligence gathering operations.

In Summary . . .

I didn't come across a kitchen sink anyplace in the AR5001D, but that is truly the only thing that's missing for a communications receiver. *(**NOTE**: In fairness, I should point out that I haven't found one in any competing receiver, either. – WPCØKR.)*

If it had a method of receiving trunked communications — which could be added through the software control interface — it would be the ultimate all-around general scanner.

There are no nits to pick, except for having to hold the power button for two seconds in order to turn the receiver off. But once you know that, it's just fine. Remembering to push and hold, it just takes a little getting used to.

At a list price of $4,799, the AR5001D is clearly aimed at the professional and serious amateur market. If you get a chance to play with one, you should, but if it's within your price range, you will not be disappointed with this outstanding receiver. For more information, visit: <http://www.aorusa.com/>. – WPCØKR