

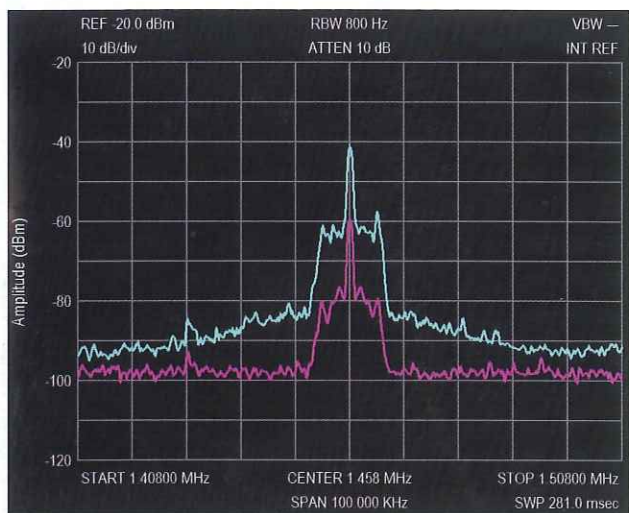
AOR AR8200D handheld receiver reviewed

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AOR AR8200D **Handheld Receiver** **Reviewed**



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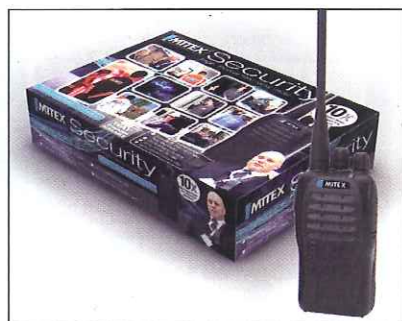
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- Mike Richards takes a look at the AOR AR8200D
- All images supplied by the author

AOR AR8200D

Mike Richards reviews the latest variant of the AOR AR8200 handheld receiver, which is described as an enhanced version of the AR8200MK3.



The AOR AR8200D handheld wide range receiver.

The AR8200 has been one of the best handheld wide range receivers for many years now and the latest release reviewed here is the D suffix. The new model is an AR8200MK3 with the following additional features: voice recording, continuous tone-coded squelch system (CTCSS) decoder, voice inverter, APCO25 decoder and a mini USB connector. Frequency coverage extends from 530kHz through to 3GHz with no breaks and includes demodulation of standard, narrow and wide amplitude modulation (AM/NAM/WAM), narrow, super narrow and wide frequency modulation (NFM/SFM/WFM), upper and lower sideband (USB/LSB) and carrier wave for Morse (CW) signals.

What You Get

The AR8200D is supplied with a useful range of accessories. The operating manual is a printed, single language, 140-page A5 booklet with a supplementary seven-page leaflet describing the new features of the D model. I always prefer a printed operating manual, especially with a complex receiver such as the AR8200D, so this was a plus point. For power, the AR8200D is supplied with a set of four AA, 1800mAh, nickel-metal hydride (NiMH) cells and a plug-top mains power/charger unit. For mobile operation, there was also a cigar lighter power lead that connects to the AR8200D's external power socket on the side panel. The top panel antenna socket was a standard BNC type and a 650mm telescopic whip antenna was supplied. For operation on the lower frequency broadcast bands, there was a small ferrite bar antenna that plugged into a socket on the top panel. Finally, there was a sturdy spring steel belt clip that fixed to the rear of the AR8200D.

Technology

The AR8200 is a well-refined analogue, multiple conversion, superheterodyne

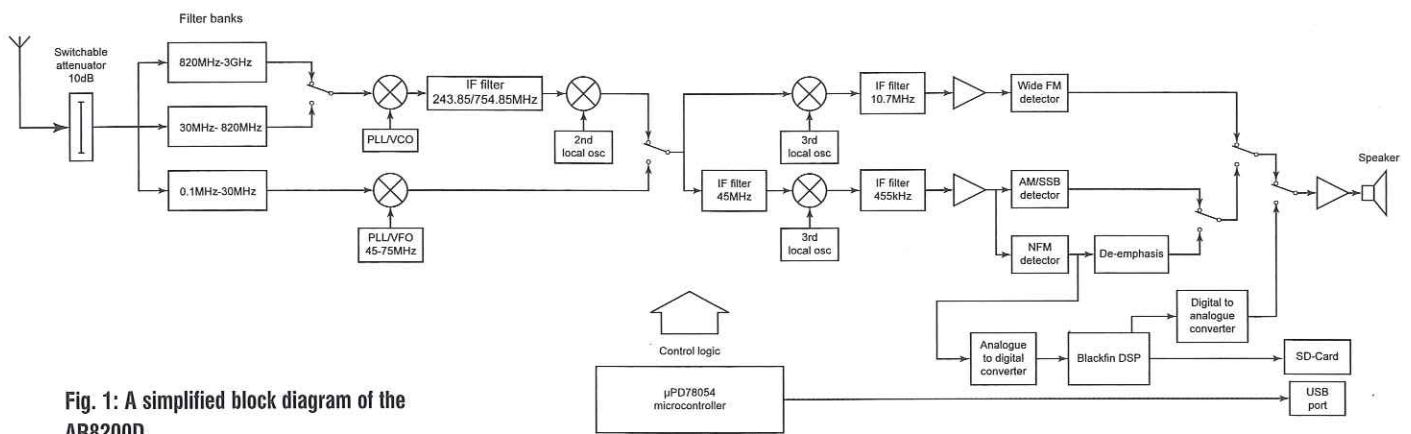


Fig. 1: A simplified block diagram of the AR8200D.

Table 1: AR8200D Front-end Filter Bands

Filter	Pass Band
1	0.1 to 1.9MHz
2	1.9 to 30MHz
3	30 to 75MHz
4	75 to 118MHz
5	118 to 174MHz
6	174 to 300MHz
7	300 to 470MHz
8	470 to 820MHz
9	820MHz to 3GHz

receiver – see Fig. 1. A problem facing all wideband receiver designers is the control of out of band signals. In the AR8200D this is handled by the use of nine front-end filter banks, with their pass bands carefully chosen to align with different users of the frequency range. I've shown the details of the front-end filters in Table 1. The front-end also includes a switchable 10dB attenuator to help control overload in the presence of very strong signals.

The AR8200D employs a mixture of double and triple conversion intermediate frequency (IF) stages that are determined by the tuned frequency. Signals below 30MHz employ dual conversion, with a first IF of 45.05MHz and a 455kHz final IF. The 30 to 540MHz and 1540 to 2040MHz bands employ triple conversion, with a first IF of 754.85MHz followed by 45.05MHz and 455kHz. The 540 to 1540MHz and 2.040 to 3GHz bands also employs triple conversion but with a first IF of 243.85MHz. For wide FM signals, the final IF is 10.7MHz. For all other modes, 455kHz is the final IF and the AR8200D employs a bank of three 455kHz IF filters to provide bandwidths of 3, 9 and 12kHz.



The AR8200D also comes with a printed operating manual, a seven-page leaflet and four AA 1800mAh NiMh cells.

The reference oscillator for the AR8200D uses a temperature controlled crystal oscillator (TXCO).

Handling

The AR8200D is a chunky handheld unit. Nevertheless, all the controls are very well placed. I particularly liked the combination of buttons, rocker and rotary control on the left-hand side panel (Fig. 2). These are all designed to be operated by the thumb of your left hand and worked extremely well for me.

The front panel is dominated by the large display and the keypad and both were very clear and easy to use. The keypad is slightly recessed, which helped to stop accidental operation. In addition, there is a key lock button on the side

panel which, when enabled, allowed me to slip the AR8200D into a pocket while avoiding accidental key presses. The main keypad was a pleasure to use with a positive feel and the buttons were back-illuminated making them very easy to use in poor light.

The top panel has two conventional rotary controls for volume and squelch levels – I prefer the separate controls as opposed to the multi-function controls used by many scanners.

The backlit liquid crystal display (LCD) unit was very clear, with a useful text size of approximately 4mm.

Although not waterproof, all the external connections were well protected from general dust and moisture with either rubber bungs or slide on covers.



Rear view of the AR8200D with the battery compartment cover removed.



Fig. 2: The layout of the buttons, rocker, rotary control on the left-hand side panel.

New Select button to access voice recording, ACPCO25, Voice inverter and CTCSS

Operation

The AR8200D, while packed with features, is relatively easy to get to grips with. Tuning to a specific frequency was simply a case of punching-in the frequency in MHz using the keypad and pressing the ENTER key. Once tuned to a frequency, rotating the thumb wheel changed the frequency by the default step for that band. The thumb rocker could also be used to tune and in that case, up and down movement changed the frequency in single steps, while side-to-side movement increased the change to ten times the standard step. This latter option was great for getting around a band quickly. In addition, in the thumb control panel was a MONITOR key to open the squelch, along with a FUNCTION key that activated the secondary functions of the keypad.

One of the first tasks when using a scanner is to search for active

frequencies and the AR8200D offers a number of solutions here. The simplest is to use the dual variable frequency oscillator (VFO) facility to enter the start frequency in VFO A and the end frequency in VFO B. Once the frequencies are set, just press and hold the 2VFO key and the receiver will commence a search between the two frequencies using the default channel steps. Once a station is detected, the search stops so you can listen to the traffic and perhaps choose to store the frequency. To help with storage there are 10 quick memories set aside while in VFO Search mode. When the AR8200D stops on a frequency of interest, pressing the ENTER key stores the frequency into a quick memory. As an alternative search, the VFO SEARCH can be set to automatically store the first 30 active frequencies it encounters to memory bank J. Any spurious signals or carriers can be cancelled by pressing the PASS key.

The AR8200D comes with a number of preset search ranges: civil airband, VHF private mobile radio (PMR), marine band, United States Air Force (USAF), Band II VHF, 2m amateur band, 70cm amateur band, 23cm amateur band and low band (Lo) PMR.

There is no Close Call or similar wideband capture feature on the AR8200D. However, the AR8200D does include a very useful band scope function. This produces a spectrum plot with a bandwidth of up to 10MHz, as shown in Fig. 3. Vertical lines on the display indicate active frequencies, where the height of the line is proportional to the signal strength. The audio is muted during band scope operation but you can monitor any of the signals on the scope by moving a marker

using the thumb rocker and pressing the MONITOR button. The display has a peak hold feature that ensures all signal indications are retained. I found this a very powerful way to locate active channels and probably more useful than Close Call for frequency spans of 10MHz or less.

Once you've found and stored all your favourite frequencies, you can use the AR8200D to manage the memory locations and to scan through groups of memories. The 1,000-memory capacity of the AR8200 is arranged in 20 banks, with 50 memories in each bank. In addition to storing the frequency and mode, each entry can have a 12-character text tag that is shown on the display whenever that channel is selected. You can also set the name of each bank using a 12-character field. Naming each entry and bank is well worth the effort because it makes subsequent operation so much simpler. These details can be edited more easily using a computer and I'll cover that in more detail later. The scanning options of the AR8200D are very powerful and you can set dwell periods and numerous other options in the same way as with earlier versions of the AR8200.

Voice Recording

In previous versions of the AR8200, voice recording was available via a separate plug-in module but this has now been fully integrated. The AR8200D has a micro Secure Digital (micro SD) card slot in the bottom panel (Fig. 4). The review model was supplied with a 4GB micro SD card and an SD adapter – 4GB capacity should be adequate for most listeners and provides around 65 hours of recording time. You can have as many SD cards as you like and use

larger capacity cards if necessary.

The recording format employed was a WAV file with 18kHz sample rate, 16-bit mono recording.

Starting a recording was a case of pressing and holding the SELECT key on the side panel (Fig. 2) until the light emitting diode (LED) flashes. There was some confusion here because the button is labelled SELECT but in the instruction leaflet, it's referred to as the CONTROL key and CONTROL switch. To stop the recording, you just press the SELECT button again.

Recording was automatically activated whenever the squelch opened. As a result, the file contained continuous traffic. This was particularly useful for monitoring lightly used channels because you could leave the AR8200D running in the background and review the traffic at your convenience. In order to prevent unmanageably large files, the software automatically splits long recordings into a series of 100MB files.

While you could replay and scroll through the recordings on the AR8200D, I found it much simpler to extract the micro SD card and playback the files on a PC using a media player, for example, Windows Media Player.

CTCSS Decoder

The CTCSS decoder provides the facility to decode the CTCSS tone being used by a signal and to set the CTCSS squelch to operate only to that tone. Operation was a bit fiddly because you had to double click the SELECT button until you heard three beeps and then press and hold the CLEAR key on the keypad to display the CTCSS options. Once the setup was complete, any detected CTCSS tones would be displayed at the bottom of the display. You could also set the AR8200D to use the CTCSS tone to control the squelch.

Voice Inverter

One simple technique for scrambling the audio on analogue radio links is to invert the frequency of the transmitted audio. The new AR8200D includes a voice inverter that can unpick those signals and make them readable again. This is a basic level of encryption and it's doubtful you'll find much activity in the UK.

APCO25 Decoder

APCO P25 is a digital radio system that's used by the police and State services in the US and performs a similar role



Fig. 3: The AR8200D band scope in action.



Fig. 4: The micro SD and mini USB sockets are underneath a flap on the bottom panel.

to that of the terrestrial trunked radio (TETRA) system in the UK. As a result, the inclusion is only of limited use for UK based listeners. You might find some APCO P25 signals in areas where the US military are based and in a few other scattered areas. Because of the lack of APCO P25 activity in the UK, I was unable to test this.

USB Interface

The provision of a micro USB port in the bottom panel of the AR8200D was a very welcome improvement because it enabled the receiver to be connected to a computer using a standard USB cable. When plugged into a Windows computer, the AR8200D installs as a standard universal asynchronous receiver/

transmitter (UART) COM port, so can be accessed using dedicated software.

AOR provides some free basic software through their Workshop program for the AR8200MK3 and AR8600MK2 receivers. However, this was rather outdated and could only handle COM ports in the range 1 to 4. A better solution is to go for the third party offerings from BuTel and SysLabs. BuTel provides a very good memory management package that allows you to download, upload and generally edit the memory allocations. SysLabs offers similar control, which can also be used to remotely control tuning and scanning. Of these two offerings, I found BuTel to be the easiest to use and generally most useful. Both companies offer a free trial period, so you can try before you decide.

Performance

On the lower frequencies, performance was acceptable and the AR8200D tuned down to 100kHz with reduced performance. The supplied medium wave bar antenna provided limited sensitivity but was fine for occasional use and the reception of local broadcast stations. On the South Coast, I couldn't resolve BBC Radio 4 on **198kHz** using the bar antenna.

When presented with an external HF antenna (in the form of the Wellbrook ALA1530), the front-end overloaded with high signal levels from broadcast stations. However, this was brought under control by switching-in the 10dB attenuator.

I tried the AR8200D on the HF amateur bands and it did well, providing the 10dB attenuator was activated. The 50Hz step size on single sideband (SSB) and

CW worked well and made reasonably accurate SSB tuning possible.

Moving on to the VHF bands, the performance improved significantly with good sensitivity and excellent demodulated audio. The provision of WFM on VHF was useful, although there was no stereo decoder and the headphone jack provided mono output to one earpiece only. I found the general search and scanning facilities to be very good and the analogue squelch control provided very fine control of the squelch threshold.

It's well worth using the AR8200D with external software to manage the memories because well organised and documented memories make field work so much easier. Although the scanning and searching worked well, the scan/search rate was rather slow in comparison to many modern scanners and provided a maximum rate of just 37.42 steps per second.

Specification:

Frequency range:	530kHz to 3GHz (Performance between 100 and 530kHz is available but not guaranteed)
Tuning steps:	0.05, 0.1, 0.2, 0.5, 1, 2, 5, 6.25, 8.33, 9, 10, 12.5, 20, 25, 30, 50 and 100kHz
Receive modes:	WFM, NFM, SFM, WAM, AM, NAM, USB, LSB and CW
Sensitivity:	
500kHz to 2MHz	AM: 3.5µV (10dB S/N)
2MHz to 30MHz	SSB: 1.5µV (10dB S/N) AM: 2.5µV (10dB S/N)
30MHz to 470MHz	SSB: 0.3µV (10dB S/N) AM: 0.7µV (10dB S/N) NFM: 0.35µV (12dB SINAD) WFM: 1.0µV (12dB SINAD)
470MHz to 1GHz	NFM: 0.5µV (12dB SINAD) WFM: 1.5µV (12dB SINAD)
1.0GHz to 1.3GHz	NFM: 1.0µV (12dB SINAD)
1.3GHz to 3GHz	NFM: 2.5µV (12dB SINAD)
Selectivity:	SSB/AM: 3kHz (-6dB), 9kHz (-60dB) AM/SFM: 9kHz (-6dB), 20kHz (-40dB) WAM/NFM: 12kHz (-6dB), 25kHz (-40dB) WFM: (150kHz (-3dB), 380kHz (-20dB)
Power consumption:	190mA (nominal), 145mA (standby) and 25mA (power save)
Supply:	Four internal AA cells or 12V DC external supply
Dimensions (H x W x D):	143 x 61 x 39mm
Weight:	196g (335g including batteries)
Memory channels:	1,000 in 20 banks of 50
Select scan channels:	50
Priority channels:	1
Search banks:	40
Pass channels:	50 per search bank and 50 for VFO search
Scan/Search rate:	37.42 steps per second maximum

summary

The AR8200D has a long pedigree and the latest version adds a few useful extras. Of these, the integral voice recording and provision of a standard USB port were the most useful for UK based listeners. The receiver is very capable and includes many advanced settings, so it's worth spending some time with the operating manual to avoid getting in a pickle. Operation below 30MHz is usable with care but if this is your main area of interest, you should look elsewhere. The AR8200D is best viewed as a competent VHF/UHF scanner with medium wave and HF as a bonus. The band scope proved to be a very effective way to view and capture activity.

The AR8200D costs £599.95 including VAT at 20 per cent (plus £8.50 for UK mainland delivery) and is available from Waters & Stanton. Orders placed before the end of March 2014 will also receive a free soft case for the AR8200.

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<http://wsplc.com>

My thanks to Waters & Stanton for the loan of the review model and to AOR Japan for their technical support.