



# AR6000

9kHz - 6GHz

Super Wide-band Multi-mode Receiver

Photo of receiver with rack option HRE5001



[www.aorja.com](http://www.aorja.com)



# Continuous coverage from 9kHz to 6GHz!



In recent years, frequency bands above 3 GHz are populated with new signal standards such as MLS, STL and FPU. These new signals in the so-called C-band and S-band offer services such as ISM, WiMAX, etc..., which cannot be received with conventional wideband receivers. Not only the frequency coverage, but also high sensitivity and high reception accuracy are required for optimum performance. All over the world, frequency bands over 2.5 GHz are used for new digital cellular services such as LTE-Advanced, TD-SCDMA, and WCDMA/HSPA.

This is where AOR's new AR6000 receiver replies to such new needs by offering world's first wide-band communication receiver with frequency coverage up to 6000MHz, based on revolutionary broadband reception and digital signal processing technology introduced with the AR-ALPHA, AR2300 and AR5001D receivers.

On all frequencies, AR6000 provides excellent reception characteristics and can be used for signal analysis and signal strength measurement. Typical commercial applications are wide-area radio monitoring, interference detection and investigation, field-strength measurements, frequency analysis, radio propagation research, close range detection of illegal eavesdropping devices such as wiretap bugs and hidden wireless cameras.

## ■ Main features

**Super wide-band:** AOR is the world's first commercial receiver manufacturer to introduce a receiver with continuous coverage from 9kHz to 6GHz, in 1Hz step increments (2Hz over 3.15GHz). Unlike spectrum analyzers, it offers outstanding sensitivity, selectivity and reception stability. Thanks to its small size (30 x 22 x 10 cm), light weight (5 kg) and 13.5V power requirements, it can be easily carried around and used outdoors. AR6000 represents a ground breaking new concept to your signal measuring needs.

**Ultra low noise down converter:** The 3.15 GHz to 6 GHz portion is realized by cleverly designed, internal down conversion circuitry, offering ultra-low noise figures comparable to high-end microwave-only receivers.

**Distributed constant circuit:** To ensure low noise performance and minimal performance deterioration over time and environmental variations, AR6000 is based on distributed constant circuitry, carefully designed by CAD/CAM and is therefore much superior to conventional lumped element circuit based receivers.

**SDR architecture:** Signals are processed digitally from the 3<sup>rd</sup> IF stage for better performance compared to typical analog receivers which require a detection circuit with a separate filter. The firmware of the high speed DSP is upgradable with great possibilities of customization to meet future diverse needs.

**Direct conversion:** For LF, MF and HF (9kHz~25MHz), signals from the antenna are converted directly to digital baseband format through a single frequency conversion. This method based on LSI circuitry provides high selectivity and greatly reduces image effects.

**Zero IF system:** While AR6000 applies direct conversion for frequencies below 25MHz, for higher frequencies the Zero IF system is used. Incoming radio signals are processed using synchronous detection driven by a local oscillator whose frequency is identical to, or very close to the carrier frequency of the intended signals. This method reduces image effects and allows output of a clean digital I/Q signal.

**Digital I/Q output:** After the A/D conversion, the analog IF signal becomes a quadrature demodulation zero-IF signal. This signal has two components known as I (In-phase) and Q (Quadrature). I/Q signals are expressed on a complex plane, even at the same angular frequency; the digital signal can be processed clockwise and counterclockwise. With the option board IQ5001, digital I/Q can be output through USB 2.0 for demodulation by PC.



**Highly accuracy reference frequency:** When connected to the AR6000 communications receiver, the GP5001 GPS receiver improves the frequency stability from +/- 0.1ppm to +/- 0.01 ppm; by using the GPS pulse signal (one pulse per second) for an accurate time base of the local oscillator circuit. +/- 0.01ppm frequency stability of the 10MHz internal master oscillator is achieved when synchronized to a GPS signal.

**Outstanding signal level correlation:** The signal input level from the antenna is tightly correlated to the analog 15MHz wide, 45.05MHz IF output and readings of the signal meter. Variations less than +/-1.5dB throughout all bands! Ideal for signal spectrum analysis, precise signal level measuring and demodulation, system calibration etc...

**Up to 240 hours of audio recording:** Demodulated audio can be easily recorded as a PC compatible wav file with the built-in SD media recorder. Approximately 8 hours of recording per 1 GB. Max. SD size: 32GB (approx. 240 hours). Squelch recording function to avoid blanks.

**Numerous powerful features:** High-speed scan & search, two-band & offset reception, High-speed FFT spectrum display on built-in LCD screen with selectable bandwidth 400kHz to 10MHz, CTCSS, DCS, DTMF, AFC, voice inversion, auto-notch, noise blanker, noise reducer, analog video out, etc...



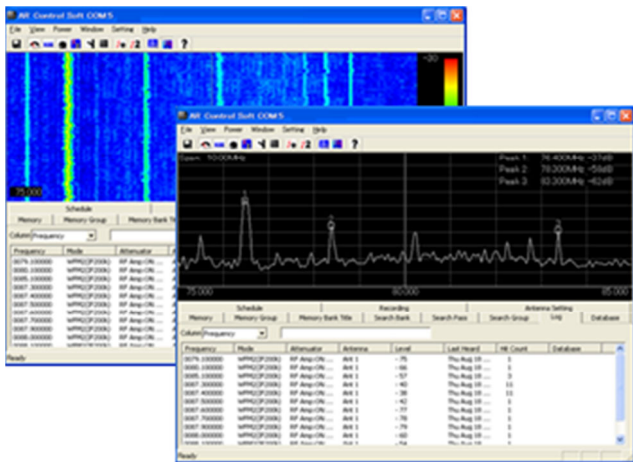
# Accessories and software to optimize the performance

## ■ Software



**Standard control software:** (Free to download from our website)

Our control software provides powerful features such as spectrum display (selectable bandwidth 400kHz to 10MHz), waterfall display, memory management, memory & bank scan, search, event scheduler, activity logging, audio recording, etc... it even allows to simultaneously control several receivers with one PC.



**I/Q software:** (only supplied with IQ5001 hardware option)

This software developed by MICROTELECOM allows, in addition to receiver control, the possibility to store (on a hard disk) and playback a full 0.9MHz ( $\pm 450$  kHz) bandwidth with no loss of quality!

AR6000 is the world's first receiver of its class to offer an optional digital I/Q output (USB 2.0 compatible isochronous transfer). The information held in the I/Q signal is almost identical to a 1 MHz bandwidth ( $\pm 500$  kHz) of analog I.F. 30 bit each for I and Q, high-speed output with sampling rate of 1.125 Msample/sec (two complement fixed point data).



## ■ Optional accessories

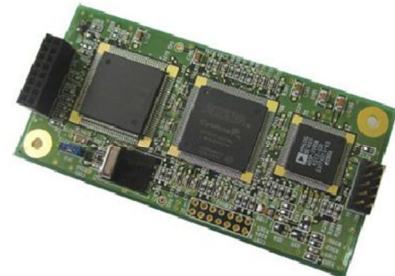
**I/Q output board – IQ5001:** Enables output of a 0.9MHz wide digital I/Q baseband signal, to be captured, stored and played-back on a PC with the supplied AR-IQ2 software. Frequency coverage 100kHz – 6GHz. Factory installed board.



**GPS receiver – GP5001:** Improves the frequency stability of AR6000 from  $\pm 0.1$ ppm to  $\pm 0.01$ ppm, by using the GPS pulse signal for an accurate time base of the local oscillator circuit.



**APCO P-25 decoder board:** Enables decoding of APCO P-25 digital voice communication (non-encrypted, conventional mode). Factory installed board.



**Ethernet controller - ARL2300:** Allows remote control, 10MHz spectrum display, remote listening and audio recording of your AR6000 receiver, through the local network and Internet. Selectable audio bit rate.



**Rack mount kit - HRE5001:** EIA standard 19 inch rack mount kit for your AR6000 receiver. Front panel fitted with external speaker and handles.



# AR6000 Specifications

## GENERAL

Frequency range	9kHz to 6 GHz
Frequency resolution	1Hz (2Hz - Frequency above 3.15GHz)
Tuning steps - program	1Hz to 999.999kHz (2Hz - Frequency above 3.15GHz)
Receiving mode	USB/LSB, CW, AM, FM, WFM, FM-Stereo, APCO P-25 Optional
Number of VFO	5 (A through E)
Memory channel	2,000 channels (50 channels x 40 Memory banks)
Memory bank	40 banks (each bank can be customized between 5 to 95 channels)
Pass frequencies	1,200 frequencies or 1,200 frequency ranges 30 frequencies(ranges) x 40 banks
Priority channel	1 (one)
Selected memory channel	100 channels through memory banks
Typical scanning speed	Approx. 100 channels/steps per second
Antenna impedance	50Ω
Operating temperature range	0°C to +50°C / 32°F to 122°F
Frequency stability	Less than ±0.1ppm after warm-up (5 minutes). Less than ±0.01ppm with optional GPS unit.
Power supply requirement	10.7V to 16V DC, 2.0A @ 12V
Audio output	> 1.5W 10% T.H.D. (8Ω)
Power consumption *	Stand-by: 400mA, Max. Audio : 1.5A
Dimensions *	304mm(D) x 220mm(W) x 97mm(H)
Ground system	Negative ground
Weight*	5kg. (11 lb.)

## RECEIVER

Receiver system	9kHz - 25MHz	Direct conversion
	25MHz - 220MHz	Double conv. super-heterodyne
	220MHz - 360MHz	Triple conv. super-heterodyne
	360MHz - 3.15GHz	Double conv. super-heterodyne
	3.15GHz - 6GHz	Down conversion
Intermediate frequencies	1st - 321.95MHz / 412.05MHz	
	2nd - 45.05MHz	
Third-order IMD (IP3)	> +20 dBm at 14.1MHz	Pre-selector off
Typical Value	> +6 dBm at 50MHz	Preamp off
	> +8 dBm at 620MHz	"
	> 0 dBm at 1250MHz	"
	> +3 dBm at 2450MHz	"
Spurious and image rejection	> 70dB for 40kHz - 25MHz	Preamp off
	> 50dB for 25MHz - 2GHz	"
	> 40dB for 2.0GHz - 3.15GHz	"
Noise Figure (NF)	> 7dB for 25MHz - 1GHz	Preamp on
Typical Value	> 10dB for 1GHz - 2.75GHz	"
	> 12dB for 2.75GHz - 4.6GHz	"
	> 14dB for 4.6GHz - 5.8GHz	"
	> 18dB for 5.8GHz - 6GHz	"

Sensitivity (Specifications not guaranteed for received frequencies below 40kHz.)

Mode	SSB, CW	AM	FM	WFM
Test Method	10dB S/N	10dB S/N	12dB SINAD	12dB SINAD
Filter B/W	3kHz	6kHz	15kHz	200kHz
40kHz to 50kHz	6.0μV	15.0μV	/	
50kHz to 60kHz	4.0μV	10.0μV		
60kHz to 80kHz	3.0μV	7.0μV		
80kHz to 100kHz	1.5μV	4.0μV		
100kHz to 25MHz	0.7μV	2.0μV		
25MHz to 2.75GHz	0.5μV	1.0μV	0.4μV	1.5μV
2.75GHz to 3GHz	0.7μV	1.7μV	0.6μV	2.5μV
3GHz to 3.15GHz	1.5μV	4.0μV	0.6μV	3.5μV
3.15GHz to 4.6GHz	/		0.5μV	
4.6GHz to 5.8GHz			0.7μV	
5.8GHz to 6GHz			1.5μV	

## AUXILIARY FUNCTIONS

Simultaneous reception	Two types of simultaneous reception (dual-watch) are possible.
2 band reception	One HF (9kHz-25MHz) frequency plus one VHF/UHF(25MHz and above) frequency.
Offset reception	Main frequency plus sub-frequency (within ±5MHz from the center frequency) Offset reception is possible only for VHF/UHF.
Triple reception	Triple receptions are possible by combining simultaneous reception mode. I.E. One HF frequency plus offset reception.
Squelch system	CTCSS, DCS
Demodulation Aid	Auto Notch Filter (NOTCH), Noise Reduction (NR), Noise Blanker, IF Shift, CW Pitch, AGC, AFC, DTMF APCO (P-25) Phase 1 conventional mode only (optional)

## AUDIO RECORDING

Type of recording	Record/Playback through SD or SDHC
SD card type	SD or SDHC card per SD Card Association More than 256MB is required. Use card adapter for miniSD and microSD cards. FAT16 and 32 only.
File Format	Windows(R) compatible WAV file format. RIFF (little-endian) data, WAVE audio, Microsoft PCM, 16-bit mono 17.578kHz
Recording time	Approximately 8 hours of continuous recording by 1GB SD Card. Squelch synchronization is possible to eliminate inactive time.

## INPUT & OUTPUT

Antenna Input	ANT 1: 25MHz - 6 GHz, N female ANT 2: 9kHz - 3.15GHz, N female
10MHz reference input	SMA female Typical input: +2dBm for 50Ω
45.05MHz Analog IF output	BNC female, 45.05MHz±7.5MHz Typical output: Antenna input +10dB for 50Ω Frequency range 100kHz - 6GHz.
Digital I/Q output (Optional)	USB2.0 compatible isochronous transfer Digital I/Q output through USB Type-B Jack. Frequency range 100kHz - 6GHz.
12kHz offset output	12kHz offset analog I/Q Φ 3.5mm stereo-phone jack.
Line output	Φ 3.5mm stereo-phone jack.
Accessory	8-pin miniature DIN
DC Power Input	EIAJ MP-121C (5.5 x 2.1mm) plug. Positive center.
External speaker	Φ 3.5mm miniature phone jack (2-wire)
RS-232C	9-pin D-subminiature type (Male) - Firmware update and remote control by PC.
USB	USB Type-A; USB 1.1/2.0 Jack for PC control.
VIDEO output (Rear Panel)	RCA Jack, 75Ω 1V p-p

Specifications not guaranteed for received frequencies below 40kHz.

Specifications subject to change without prior notice for product improvement or modification.

Power consumptions, size and dimensions are only approximate values. Dimensions do not include projections. E. & O. E.



**AOR, LTD.**

2-6-4 Misuji, Taito-ku, Tokyo 111-0055, Japan  
Tel: +81-3-3865-1695 Fax: +81-3-3865-1697  
mail@ajorja.com www.ajorja.com