AR2300

High Performance Black-Box Receiver

Black-Box version of AR5001D Receiver
Radio monitoring from 40kHz to 3150MHz
The future of radio monitoring.

AR2300 is capable of recording demodulated audio directly to the built-in SD media recorder. Compact and readily available, SD memory card are immune to Vibrations and produce no mechanical noise, unlike motor-driven media such as tape or discs.

The AR2300 can accommodate up to 32GB SDHC card, allowing up to 240 hours of total recording time using PC compatible WAV format. The typical continuous recording time with 1GB SD card is about 8 hours. The recording time can be extended when squelch operation is employed.

Typical application of AR2300 includes:
- Signal detection
- Signal detection
- Signal search in frequency and memory scan mode
- Spectrum occupancy and on-the-air monitoring
- Coverage and field-strength check
- Signal and spectrum analysis through an optional I/Q board with supplied AR-IQ software.

Detailed applications:
- Monitoring of given frequencies, e.g. storage of 1 to 2000 frequencies, receiving modes, antenna port, attenuator settings, constant monitoring of one frequency or scanning of selected frequencies.
- Searching in a frequency range with freely selectable start and stop frequency and step widths of 0.01 kHz (10Hz) to 999.99 kHz.
- Detection of undesired emissions including pulsed emissions.
- Detection of unlicensed transmitters communicating illegally or interfering with licensed transmission.
- Protection against tapping by detecting miniature transmitters (bugs).
- Monitoring of one's own radio exercises in a service band and monitoring of selected transmissions.
- Remote-controlled operation via an optional LAN controller in coverage check and monitoring systems.

Technical Features:
- Computer controlled Black-Box
  All functions of the AR2300 can be used with lap-top or desk-top PC that runs under Windows XP or newer OS. The AR2300 can be controlled remotely through an optional LAN controller.
- Super Wide Range
  Continuous frequency coverage: 40 kHz to 3.15 GHz in 1 Hz step with 1ppm frequency accuracy. (Frequency accuracy can be optimized to 0.01ppm with an optional GPS receiver.)
- Multi-Mode reception
  High performance digital signal processing circuitry offers variety of reception modes as well as decoding options. Receiving mode includes USB/LSB, CW, AM, SAM, FM, Wide FM and FM stereo. The decoding modes include CTCSS, DCS, DTMF and APCO P-25 by an optional P-25 decoder.
- High-Performance analog front-end
  The RF front-end is carefully designed by CAD to obtain optimum performance across the entire frequency range of 40kHz to 3.15GHz.
- Digital Signal Processing
  The 45.05MHz IF signal is processed by the independent signal processor for signal demodulation and recovery. No AGC circuitry is used in the analog stage to ensure accurate level reading as well as to offer IF output signal level linearity against RF input signal.
- Direct Sampling Architecture (40 kHz . 25 MHz)
  The AR2300 employs 14bit/65Ms/s direct sampling receiver architecture for VLF, LF and HF band. The direct sampling architecture assures high IMD and IP3 characteristics.
- Direct digital synthesizer (DDS) local oscillator
  Direct digital synthesizer is employed for the 1st local oscillator that ensures fast frequency switching for memory channel scanning and frequency band search operation.
- Simulations reception and monitoring
  Simultaneous reception on HF (below 25MHz) and VHF-UHF (above 25MHz) frequencies are possible. For the frequencies above 25MHz, absolute dual-channel reception within an IF bandwidth is possible. Thus, triple channels can be monitored simultaneously.
- Analogue VIDEO demodulation
  Composite video output is provided to monitor FM modulated analogue type wireless security camera or frequency search operation for bug transmitters.
- SD Audio recorder
  AR2300 is capable of recording demodulated audio directly to the built-in SD media recorder. Compact and readily available, SD memory card are immune to Vibrations and produce no mechanical noise, unlike motor-driven media such as tape or discs. The AR2300 can accommodate up to 32GB SDHC card, allowing up to 240 hours of total recording time using PC compatible WAV format. The typical continuous recording time with 1GB SD card is about 8 hours. The recording time can be extended when squelch operation is employed.
- Wideband and high-performance IF output
  45.05MHz of intermediate frequency (IF) analogue output with 15MHz bandwidth is provided for the external peripherals when use AR2300 as receiver front-end. Between 25MHz to 3GHz, the analog IF output is correlated within ±1.5dB to the antenna input by accurate signal source with traceability, thus accurate signal monitoring or measurement is possible with appropriate measurement antennas.

Lightweight net-book PC can be used as control head for the AR2300. (PC not included.)
The AR2300 is capable of using GPS pulse signal for the accurate time base for the local oscillator circuit. 0.01ppm frequency accuracy for the 10MHz internal master oscillator is obtained when synchronized to the GPS signal source. The optional digital I/Q output board is capable of acquiring GPS data for time-stamping on digital I/Q data.

Digital I/Q board and PC software
When an optional I/Q interface board is installed, up to 1MHz of digital I/Q output can be recorded to the hard drive of computers operating under Windows environment for later playback and analysis without any loss of quality. This feature allows for unattended logging, signal classification and signal analysis. PC Control software for Windows XP, VISAT and 7 is supplied with the board.

APCO P-25 Digital Voice Decoder
APCO P-25 Digital Voice Decoder option is available for the demodulation of project 25 (P25) digital voice communication which are popular in North American for the government and public safety communications.

Software:

Control Software (Standard Accessory)
The AR2300 control software is a strong companion of the AR2300 black-box receiver. The software provides powerful control function running on an MS Windows PC connected to the AR2300 via USB or an optional LAN. The software provides a signal overview using a high-speed spectrum or waterfall display.

Powerful memory channel management features are available to manage and control 2,000 channels allowing to enter alphanumeric channel information. The channel hit-counter and last event (time and signal level) on each memory channel is available to monitor the activity and channel coordination.

AR-IQ Software (Supplied with digital I/Q board)
When an optional digital I/Q board is installed, the I/Q output can be recorded to the hard drive of almost any computers operating under Windows environment for later playback and analysis without any loss of quality. This feature allows for unattended logging, signal classification and signal analysis. The AR-IQ software
**AR2300 SPECIFICATIONS**

### GENERAL

- **Frequency range:** 40kHz to 3.15GHz
- **Frequency resolution:** 1Hz
- **Tuning steps - program:** 1Hz to 999.999kHz in 0.001kHz increments
- **Receiving mode:** USB(LSB), SSB, CW(100), AM(3E), FM(3E), WFM(3E), FM-Stereo(8E), APCO P-25(3E), 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 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:** 50W
- **Power consumption**
  - Stand-by: 200mA
  - Max. Audio: 1.5A
- **Power supply requirement:** DC 10.7V to 16V, 2.0A @ 12V
- **Dimensions:** 285mm(D) x 220mm(W) x 70mm(H)
- **Weight:** 3kg (6.6 lb.)

### RECEIVER

- **Receiver system:** 40kHz - 25MHz Direct conversion
- **Frequency range:** 25MHz - 200MHz
  - Double super-heterodyne
- **Frequency range:** 25MHz - 200MHz
  - Triple super-heterodyne
- **Intermediate frequencies:**
  - 1st: 294.5MHz / 1.7045GHz
  - 2nd: 45.05MHz / 294.5MHz
  - 3rd: 45.05MHz
- **Third-order IMD:**
  - > +20 dBm at 14.1MHz
  - > 0 dBm at 50MHz
  - > +3 dBm at 620MHz
- **Spurious and image rejection:**
  - > 70dB: 40kHz - 25MHz
  - > 50dB: 25MHz - 2GHz
  - > 40dB: 2.5GHz - 3.15GHz
- **Digital IF filter bandwidth:**
  - 200kHz, 500kHz, 1kHz, 3kHz, 6kHz, 15kHz, 30kHz, 100kHz, 300kHz - Receiving mode depended
- **Selectivity:**
  - CW - 500Hz: 3dB: > 380Hz; 60dB: > 500Hz
  - AM - 6kHz: 3dB: > 5.5kHz; 80dB: > 6.9kHz
  - SSB - 3kHz: 3dB: > 2.7kHz; 80dB: > 3.1kHz
  - NFM - 15kHz: 3dB: > 14.2kHz; 80dB: > 15.6kHz
  - WFM - 200kHz: 3dB: > 200kHz; 80dB: > 250kHz
- **Sensitivity:**
  - CW: 500Hz
  - AM: 6kHz
  - SSB: 3kHz
  - NFM: 15kHz
  - WFM: 200kHz

### AUXILIARY FUNCTIONS

- **Simultaneous reception:** Two types of simultaneous reception (dual-watch) are possible.
  - Two band reception
    - One HF (40kHz-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.
  - Triplet reception
    - Triplet responses 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), De-Noise (NR), Noise Blanker, IF Shift, CW Pitch, AGC, AFC, DTMF
- **Power supply requirement:** DC 10.7V to 16V, 2.0A @ 12V
- **Audio output:** > 2W into 8W load
- **Power consumption:**
  - Stand-by: 200mA
  - Max. Audio: 1.5A
- **Memory bank**
  - 40 banks (each bank can be customized)
- **Memory channel**
  - 2,000 channels (50 channels x 40 banks)
- **Pass frequencies:** 1,200 frequencies or 1,200 frequency ranges plus offset reception.
- **Operational frequency ranges:**
  - 40kHz - 25MHz
  - 2.4GHz - 3GHz
  - 25MHz - 2GHz
  - 1GHz - 2.4GHz
  - 4GHz
  - 1GHz to 2.4GHz
  - 2.4GHz to 3GHz
  - 40kHz to 100kHz
  - 100kHz to 1.8MHz
  - 1.8MHz to 25MHz
  - 25MHz to 1GHz
  - 1GHz to 2.4GHz
  - 2.4GHz to 3GHz
  - 40kHz to 3.15GHz

### AUDIO RECORDING

- **Type of recording:** Record/Playback function through SD or SDHC
- **File Format:** Windows compatible WAV file format, RIFF (little-endian)
- **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 - 3.15GHz, N-J connector
- **SD card type:** SD or SDHC card per SD Card Association
- **Typical reference input:** SMA-J connector
- **45.05MHz Analog IF output:** BNC-J connector, 45.05MHz ± 7.5MHz
- **Digital I/Q output (Option):** USB2.0 compatible isochronous transfer
- **Line output:** 3.5mm® stereo-phone jack (3-wire)
- **Accessory:** 8-pin miniature DIN
- **DC Power Input:** 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.
- **V-VIDEO output (Front Panel):** RCA Jack, 75Ω 1V p-p

**Specifications subject to change without prior notice for product improvement or modification. * Power consumptions, size and dimensions are only approximate value. Dimensions do not include projections. ** E. O. E.**