

## Rugged 1 GHz Disk Recorder

- Single/multi-channel analogue IF recorder
- 800 MHz IF center frequency
- 1 GHz recording bandwidth
- 8- and 16-bit recording modes
- Optimized input filtering
- 16 TB removable Disk Pack
- Built-in down/up-shifting
- Real-time FFT/waterfall display
- Intuitive Graphical User Interface
- Data extraction direct to workstation/network, or portable media (optional)
- Community-standard headers supported



Figure 1: Avalon AE9000FW-1000 Disk Recorder (front view).

### Technical Overview

The **NEW Avalon AE9000FW-1000 SIGINT Disk Recorder** (Figure 1) is designed to record an 800 MHz analogue IF (intermediate frequency) signal at a bandwidth of up to 1 GHz. The upper half of the unit incorporates the Digital and Analogue signal processing electronics. Multi-channel data interfaces are also available. AE9000-FW series recorders also include an interface for networking communications, with support for both fibre optic and copper cable. Protocols supported include: Ethernet (10Gbits/s) and Fibre Channel.

The lower half comprises a pair of removable Disk Packs containing the storage media. The baseline storage configuration comprises eight 1 TB Multi-Level Cell (MLC) solid-state disk drives (SSD) per Disk Pack, giving 16 TB of storage capacity in the most rugged possible package.

AE9000FW-1000 accepts an input IF centre frequency of 800 MHz and supports a recording bandwidth of 1 GHz. The signal is then digitized by a 12-bit ADC (analog to digital converter) followed by digital signal processing to the final recordable data rate.

The recorder can reconstruct the recorded digital samples and output these in their original analogue form. During Stop and Record, the output signal is derived from the Record Input Signal. During Play, the output is derived from the data stored on the disk system. During Stop, Record and Play, the reconstructed analogue output is a 1 GHz bandwidth centered on an 800 MHz IF.

Unlike previous generations of Avalon disk recorders, AE9000FW-1000 records data in a standard computer file format, thereby simplifying the selection and copying of critical sections of recorded data. Data selection typically takes place either at the Tables tab or at the Timeline tab. The user may elect to save extracted data to any of the following optional media targets (see Figure 1): plug-in SATA Archive Disk Drive, attached USB memory device (if permitted), networked disk drive, RAID or SAN. Extracted data files are saved with community-standard "attached" or "detached" headers.

### Graphical User Interface (GUI)

The recorder is controlled from an external pc/laptop using an Avalon-developed GUI application that can be compiled to run under a range of Windows and Linux operating systems. Control is via the recorder's Ethernet control port.

The GUI controls all recorder functions, including: RECORD, PLAY, STOP, Data selection (for extraction/forwarding, etc.), Data handling, including transcription to attached and networked storage media and FFT (waterfall) display. Figures 2-5 show some typical screenshots).

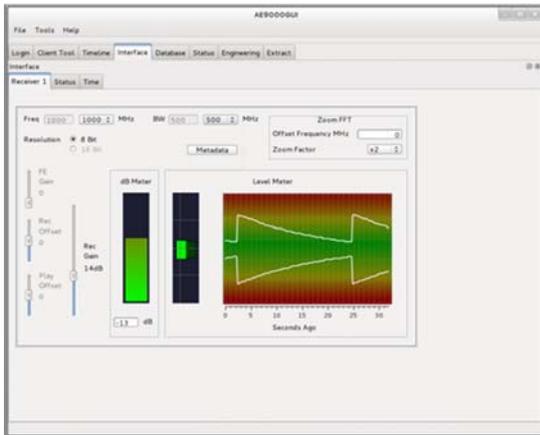


Figure 2: Interface tab.

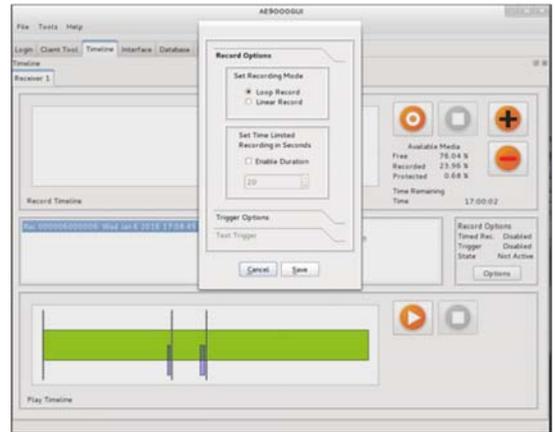


Figure 3: Timeline tab.

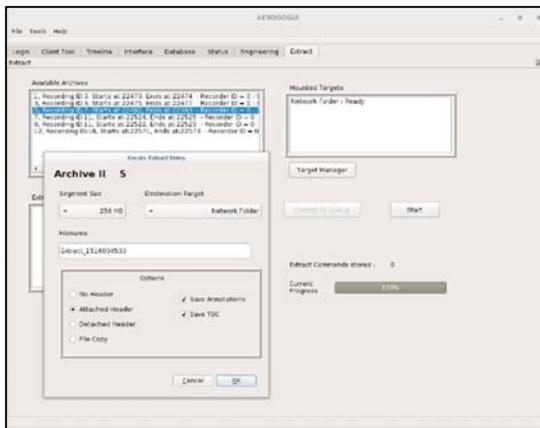


Figure 4: Extract selection.

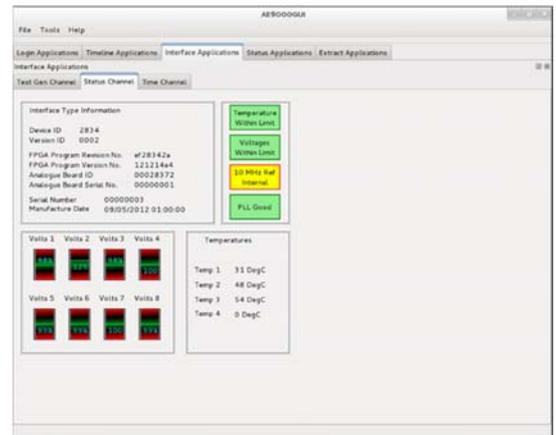


Figure 5: Status tab.

## Real-time FFT/Waterfall Display

AE9000FW-1000 features a powerful real-time FFT function that can be used to visualise the incoming signal prior to, while or after recording. Figure 6 shows typical examples of real-time FFTs.

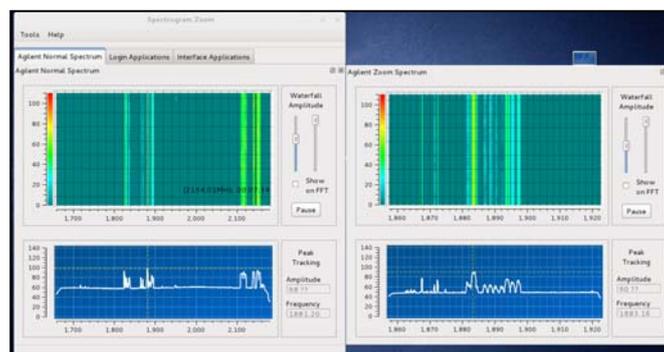


Figure 6: Typical real-time FFT spectra, showing normal plot (left) and 4xzoom plot (right). Tuning frequency: 800 MHz. Bandwidth: 1 GHz.

## Technical Specifications (AE9000FW-1000)

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<b>Number of Channels:</b>	1 standard.
<b>Input Centre Frequency:</b>	800 MHz. Other Ifs available.
<b>RF Bandwidth:</b>	1 GHz (8-bit mode). 500 MHz (16-bit mode).
<b>Input Filtering:</b>	High precision anti-aliasing filtering is provided, as standard
<b>ADC Sample Rate:</b>	3.3 GHz.
<b>ADC Resolution:</b>	Sampling is at 12-bits. <i>Note: In low resolution recording mode, the four least significant bits are discarded by rounding after internal signal processing.</i>
<b>Recording Depth:</b>	High Resolution Mode: 12-bit samples recorded as 2 Bytes (16-bits) Lower Resolution Mode: 1 Byte (with four LSBs discarded by rounding after internal signal processing).
<b>Decimation:</b>	3:2
<b>Record Sample Rate (IQ pairs):</b>	1.1 GHz (8-bits) 550 MHz (16-bits).
<b>Recording Data Rate:</b>	2.2 GByte/sec (1 GHz BW, 8-bits) 2.2 GByte/sec (500 MHz BW, 16-bits).
<b>Recording Duration: (16 TB, no looping)</b>	40 minutes (1 GHz BW, 8-bits) 40 minutes (500 MHz BW, 16-bits) 80 minutes (500 MHz BW, 8-bits).
<b>Spur-free dynamic range:</b>	>55 dB (12/16-bit recording).
<b>Max signal level for FS rec.:</b>	2 dBm (typical) for full-scale recording.
<b>Input impedance:</b>	50 $\Omega$ (nominal).
<b>Input Coupling:</b>	AC.
<b>Output Level:</b>	0 dBm (typical) from full-scale recording.
<b>Output Impedance:</b>	50 Ohms (nominal).
<b>Output Centre Frequency:</b>	800 MHz.
<b>Output Bandwidth:</b>	1 GHz (8-bit mode) 500 MHz (8-bit and 16-bit modes).
<b>Internal Reference Freq.:</b>	10 MHz +/- 1 ppm after 10-minute warm up. <i>Note: The internal sampling and translation oscillator is locked to this reference. This internal reference is available for use by other equipment.</i>
<b>External Reference Freq.:</b>	10 MHz, +10 to +16 dBm, +/- 1 ppm or better to lock the internal reference.
<b>Network Comms. Applications:</b>	Support for fibre-optic or copper cable. Protocols supported: Ethernet (10Gbits/s); CSPF/QSPF - optional.
<b>Data/Control Port:</b>	1 Gb Ethernet (10 Gb Ethernet optional).
<b>Storage Capacity (baseline):</b>	16 TB (16 x 1 TB solid-state disk drives). <i>Note: Other storage configurations (long-life SSD, etc.) optional.</i>
<b>Media Life:</b>	2,500 hours warranted minimum life at maximum bandwidth. Typical media life more than 10,000 hours.
<b>Dimensions:</b>	Full-rack x 4u x 560 mm deep.
<b>Weight:</b>	~ 25 kg.
<b>Power:</b>	100 to 240 Volts, 5 to 2.5 Amps, 47 to 63 Hz, 400 VA (nominal), 500 VA (peak).

**Environmental:**

EMC/RFI: Designed to conform to the applicable sections of MIL-STD-461.

Shock/Vibration: Designed to conform to the applicable sections of MIL-STD-810, and US Navy specifications. Similar construction approved for flight in USAF Rivet Joint and other military and civilian turbo-jet and propeller aircraft.

**System Control:**

Stand-alone, fully-featured Avalon-designed GUI (graphical user interface) running on an external laptop/PC (via Ethernet port).

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**These specifications are provisional and subject to change without notice. Please contact Avalon for full technical details.**

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