Verasonics®
The leader in Research Ultrasound™

The Vantage® Systems

256, 128, 64 LE , 64 and 32 LE

A Revolutionary Approach to Ultrasound System Architecture

Verasonics has developed a revolutionary ultrasound system architecture that provides researchers and developers a unique, flexible platform for ultrasound innovation across many applications. The Vantage Research Ultrasound Platform uses proprietary software and hardware technologies to provide direct access to raw ultrasound data, while preserving the ability to perform high quality real-time imaging with custom software, at clinically useful frame rates. The design features that make the system so capable in biomedical ultrasound R&D also provide significant advantages to the NDT/NDE, Geophysical and Geotechnical, and Educational disciplines as well.

Unparalleled Flexibility and Speed

The Vantage system is designed to provide the researcher/developer with broad flexibility in defining each of the system's functional components, using a familiar and powerful software interface based on the MATLAB® programming environment. In fact, a single researcher can conceive, implement, and evaluate a new approach to ultrasonic imaging, and ultrasound therapy monitoring or delivery using the Vantage system. From integration of a custom transducer array to incorporation of a custom beamformer, or adding user-defined image processing algorithms, the researcher can develop their own ultrasound system prototype and evaluate it under laboratory or clinical conditions with unprecedented speed.

All-Software Beamforming and Sequence Control

Verasonics' system architecture provides this flexibility to the researcher by eliminating hardware beamformers, and instead uses patented algorithms to perform image reconstruction with highly optimized software, running on a desktop or laptop computer. Consequently, many new acquisition schemes using unconventional transmit beams and transmit/receive sequences can be readily examined using the Vantage system, whereas such approaches typically cannot be implemented usingconventional data flow architectures that are based on hardware beamformers.

Verasonics' Unique Technology Advantages

Vantage Systems include 3 key components:

- The Vantage Data Acquisition system, with state of the art hardware and unparalleled performance, available in several different configurations with optional features
- The Host Controller, purchased through Verasonics. This powerful computer is equipped with a PCI express adapter card, the MATLAB application, custom BIOS, and other libraries and utilities pre-installed by Verasonics.
- The Verasonics Data Acquisition Software (SW) package, provided by Verasonics, including application-level SW, HAL and driver-level SW, installation and self-test utilities to verify full hardware system performance. Also included is a comprehensive suite of example scripts.

Together these provide:

- An open, software-based research ultrasound platform
- Very high frame rate imaging using plane wave transmit beams
- Data acquisition into local memory limited by acoustic travel time, up to 100,000 frames/second
- Extremely rapid RF signal data transfer to host computer
- Well documented, flexible and easy-to-use programming API
- MATLAB scripting environment for development of custom user algorithms and graphical interfaces
- Additional software tools to facilitate control script development, analysis, and debugging
- Rapid integration of custom transducers

Vantage Research Ultrasound System

- A set of over 500 example control scripts (programs) for various transducers and applications, including plane wave imaging, color flow and power Doppler, spectral Doppler, conventional line mode imaging, harmonic imaging, pulse inversion, radiation force and shear wave visualization, coded excitation, and many others. These can be modified or replaced by the user to create novel algorithms.
- Real-time system simulator for off-line development and reprocessing of previous acquired data.

Key System Specifications of the Vantage Platforms

Intended use

The system is intended to be used as a research laboratory tool to acquire, store, display and analyze data. It is not a diagnostic ultrasound system.

Acquisition Module

Choose the Vantage System configuration and options that best meet your research requirements:

	Vantage 32 LE	Vantage 64	Vantage 64 LE	Vantage 128	Vantage 256
CHANNELS					
	64 Tx / 32 Rx	64 Tx / 64 Rx	128 Tx / 64 Rx	128 Tx / 128 Rx	256 Tx / 256 Rx
CONFIGURATIONS					
Standard Frequency (0.5 MHz – 27 MHz)*	✓	✓	✓	✓	✓
High Frequency (1 MHz – 50 MHz)*	N/A	N/A	✓	✓	✓
Low Frequency (50 kHz – 1.5 MHz)*	✓	✓	✓	✓	✓
HIFU	N/A	N/A	✓	✓	✓
External Clock	N/A	N/A	N/A	N/A	✓
LICENSABLE OPTIONS					
Extended Transmit	N/A	N/A	✓	✓	✓
Arbitrary Waveform	✓	✓	✓	✓	✓
Synchronization Triggers	✓	✓	✓	Included	Included
Image Reconstruction	✓	✓	Included	Included	Included
Extended I/O Package	✓	✓	✓	✓	✓
NDE Research Software	✓	✓	✓	✓	✓
FUS Elite Software	N/A	N/A	✓	✓	✓
Volume Imaging Package – Essential	N/A	N/A	N/A	N/A	✓
Volume Imaging Package – Expansion	N/A	N/A	N/A	N/A	✓

** = receive frequency range*

✓ = purchasable configuration or option. All Vantage systems can be reconfigured or upgraded to additional options.

Transmit:

- Frequency Range:
  - 0.5 MHz to 20 MHz with Standard Frequency configuration*
  - 2 to 42 MHz with High Frequency configuration*
  - 50 to 1500 kHz with Low Frequency configuration*
- Time delay resolution: 4.0 ns
- Programmable pulser voltage: 3.2 to 192 V p-p
- Tri-state drive: + high voltage, - high voltage and ground
- Per-channel programmable: center frequency, pulse width (pulse duty cycle), burst length, polarity and delay
- Per-channel transmit apodization using pulse width modulation
- Max burst length a few microseconds
- Power limit, single channel: up to 100 Watts peak, 8 Watts average (into 50 Ohms)

** Transmit and Receive performance is limited near frequency extremes*

Transmit Options: *(see page 4 for more details)*

- Extended Transmit
- HIFU Configuration
- Arbitrary Waveform Generation Package

Receive:

- Frequency range:
  - 0.5 MHz to 27 MHz with standard configuration*
  - 1 to 50 MHz with High Frequency configuration* (Also includes programmable high pass filter)
  - 50 to 1500 kHz with Low Frequency configuration*
- Programmable anti-aliasing filter cutoff: 5, 10, 15, 20, 30 MHz, (35, 50 MHz with High Frequency configuration)
- 14 bit A/D converters with programmable sample rate up to 62.5 MHz
- Two independent, user-programmable, symmetrical RF data digital filters (23 tap and 41 tap)
- Transmit / receive clock jitter: less than 4ps RMS
- Noise Figure: 1.5 to 3.0 dB over programmable input impedance range of 115 to 3000 Ohms (for 100 Ohm probe impedance)
- Data acquisition into local memory limited only by acoustic travel time, up to 100,000 frames/second

External Synchronization:

- Two trigger inputs and one trigger output
- Master clock input and output for phase locked operation of multiple systems
- Standard feature on the Vantage 256 and Vantage 128; optional on the Vantage 64 LE , Vantage 64 and Vantage 32 LE

Local buffer memory for RF acquisitions:

64 MB/channel. Digital averaging, filtering, and decimation may be performed on data prior to transfer to host computer to improve signal to noise and reduce data bandwidth

Per Channel RF signal accumulation (> 1000 acquisitions)

Data transfer to host computer via 8 lanes PCIe 3.0: sustained data transfer rates up to 6.6 GB/s

Pixel-Oriented Processing: A highly parallelized image reconstruction and beamforming technique using proprietary software

Universal Transducer Adapter permits rapid transducer connector change (requires computer restart)

Computer

- Host controller computer configured and provided with system purchase. GPU compatible model available
- Windows® operating system (LINUX optional)
- MATLAB with Signal Processing Toolbox installed and configured (MATLAB user license not included)

System Control, Simulation and Documentation

- System software includes MATLAB scripts to control Verasonics proprietary beamforming and image processing algorithms, and over 500 ultrasound imaging example scripts
- Individual channel acquisition data and complex reconstruction data available in MATLAB workspace for storage and offline processing, or for custom inline processing in real-time
- User-provided MATLAB functions (scripts or compiled 'mex' files) can be executed in real-time
- Built-in media scattering Simulation Software for evaluating and verifying acquisition and processing sequences; includes transmit beam visualization and script analysis tools. Enables simulation of experiments without acquisition hardware, and facilitates the testing and debugging of scripts
- Documentation includes a Vantage system user guide, an extensive programming reference manual, and a programming tutorial. A series of training videos and recorded training webinars are also available

Adapter Options

UTA 260 Adapters, with single and dual connectors

- Compatible with Verasonics-labeled Transducers and ATL HDI Transducers, including 192- and 256-element probes with high voltage multiplexers. (Example scripts are available for most transducers)
- A 260-MUX UTA is available for the Vantage 64 and Vantage 32 LE to support probes with up to 128 elements.

UTA 360 Adapter enables compatibility with selected VisualSonics MS-series transducers (Vantage 256 only)

UTA 408-GE Adapter enables compatibility with certain Verasonics probes and transducers from GE that use the 408 contact connector

UTA 156-U provides compatibility with selected UltraSonix transducers

1024-MUX provides multiplex connectivity for transducers with up to 1024 elements on system configurations with fewer channels

UTA 256 Direct, for custom transducers with up to 256 elements

UTA 64 LEMO & UTA 128 LEMO, (for all Vantage systems) provides 64 or 128 LEMO series 00 connectors for single element transducers

UTA 160-SH/8 LEMO and UTA 160-DH/32 LEMO, with single or dual Hypertronix connectors and LEMO connectors

UTA 160-SI/8 LEMO and UTA 160-DH/32 LEMO, with single IPEX connector and 8 LEMO connectors

Verasonics Transducers

- **P4-2v:** 64-element phased array probe
- **C5-2v:** 128-element curved array probe
- **L11-5v:** 128-element linear array probe
- **L22-14vX linear array:** 128-element array probe (also available as the L22-14vX LF - Long Focus - for applications requiring a greater elevation focus depth)
- **L35-16vX linear array:** 128-element array probe
- **L22-8v CMUT linear array:** 256-element array probe with HVMux
- **L38-22v CMUT high frequency linear array:** 256-element array probe with HVMux

Specialty Transducers

- **FUS Elite transducers** from Sonic Concepts Inc., high performance transducer pairings for Ultrasound-Guided Focused Ultrasound and HIFU research, from 500 kHz to 2 MHz
- **Matrix Array Transducers** from Vermon, 1024-element (32x32) matrix array transducers at 3 MHz and 8 MHz
- **Row-Column Array Transducer** from Vermon, 2 orthogonal arrays of 128 elements at 6 MHz each
- **NDE 5 MHz Transducers** from Imasonic, 64 or 128 element phased array transducers

Transducers from GE

- **GE L3-12-D:** 256-element linear array probe with HVMux
- **GE C1-6-D:** 192-element curved array probe
- **GE IC5-9-D:** 256-element intracavitary curved array
- **GE M5Sc-D:** 80x3 elements phased array
- **GE 9L-D:** 192-element linear array probe

Available Options and Accessories

Extended Transmit ("extended burst" or "push") Option: Increases the high voltage power supply's capability to support long burst sequences up to several milliseconds. (Specifications available upon request)
Not available on the Vantage 64 or Vantage 32 LE

HIFU Configuration Option: (includes Extended Transmit option) - Includes additional hardware and an external power supply for extended transmit operation up to 1200W continuous average RF power output.
Vantage 256, 128, and 64 LE systems only

Arbitrary Waveform Generation Package: (includes Extended Transmit option) - Permits user-defined sequences of tri-state transitions that can be programmed independently per-channel at 4 ns intervals (250 MHz clock rate)
– GUI-based analog waveform design tool kit included

Extended I/O Package: A hardware and software solution that provides the capability to seamlessly interface encoder, digital and analog data (including physiological input)

NDE Research Software: A software GUI package provides advanced full matrix capture, multi-mode imaging and convenient data acquisition, without the need for MATLAB programming

Volume Imaging Packages: For 2-system or 4-system solutions to acquiring real-time data from up to 1024 element transducers. Includes RDMA licenses, sync module, cables, example scripts and support

Signal Breakout Board: Printed circuit board adapter that plugs into the 260-pin system connector and provides 0.1" headers for ribbon cable connection to custom transducers. Also includes some space for impedance matching elements. Symmetric boards for left and right connectors on dual 260-pin connector Vantage 256 system

Verasonics 260-pin Transducer Backshell Kit: For up to 128 channels. Available to customers who are developing their own transducers, and/or those who want to integrate commercial transducers and have the pin-out information. Available with zero 0hm tuning or unpopulated with pads for tuning elements

GE-408-pin / Verasonics-408-pin Transducer Backshell Kit: As above, but with connections for up to 256 channels, and additional power supply and digital control signals

Multi-System Synchronization Module: provides ability to synchronize 2-8 Vantage systems (up to 2048 channels) to within 2 ns phase offset

260-pin offset adapter: provides test access to RF signals during signal transmit and receive operation

Vantage Systems Advances Technology

Verasonics' research ultrasound solutions provide a platform for ultrasonic, acoustic and material science research and development efforts.

Researchers across the globe frequently publish groundbreaking advancements made with this technology; Verasonics' solutions are often referenced in scientific publications.

Access our Scientific Database at https://verasonics.com/scientific-references-database/ for more information.

Safety Certifications

- IEC 61010-1 3rd Edition (2010) and EN 61010-1:2010 3rd Edition
- UL 61010-1: 2012 and CAN/CSA-22.2 No. 61010-1-12

Power Requirements and Physical Dimensions

- 100V-240V (50-60 Hz)
- Data Acquisition System (L x W x H): 49cm (+10cm clearance) x 28cm x 48cm
- Host Controller (L x W x H): 42cm x 18cm x 47cm
- Total weight of all components: approx. 35-44 Kg depending on configuration

Notes:

Maximum display frame rates may be limited by MATLAB® display software.

MATLAB® is a registered trademark of The MathWorks, Inc.

Windows® operating system is a registered trademark of Microsoft, Inc.

VisualSonics is a registered trademark owned by Fujifilm Sonosite, Inc.

GE is a registered trademark of the General Electric Company

Kolo is a registered trademark of Kolo Medical Inc.

Sonic Concepts is a registered trademark of Sonic Concepts, Inc.

Daxsonics is a trademark of Daxsonics Ultrasound Inc.

Vermon is a trademark of Vermon s.a.

Imasonic is a protected trademark owned by IMASONICS SAS, France.

VERASONICS® is a registered trademark of VERASONICS, Inc.

Verasonics Inc.
11335 NE 122nd Way, Suite 100, Kirkland, WA 98034
www.verasonics.com | sales@verasonics.com | 425.998.9836