

GE Healthcare

# Vivid e



## Product Description

The Vivid *e* is a complete miniaturized high performance, ultra-portable ultrasound system, designed for cardiovascular imaging, abdominal, small parts and intraoperative applications.

## System Architecture

The Vivid *e* is based on GE's TruScanScan Architecture, common to all GE Ultrasound systems. Featuring a powerful, flexible PC platform, raw data acquisition and review, DICOM storage, record archiving and management and on-board high capacity hard disk storage. A wide range of connectivity options significantly improve productivity.

## Data Acquisition

- Programmable system architecture
- Application-Specific Channel Architecture: the Vivid *e* employs flexible digital beam-former architecture capable of using up to 1024 channels depending on specific application requirements
- Application specific Digital Beam forming algorithm for each mode
- Beamformer operating frequency range: 1.5-18 Mhz
- Supports Phased Array, Linear and Curved Array
- Receive focusing, aperture, apodization and frequency response are all continuously variable as a function of depth

## Data Processing

- Echo data processing of phase, amplitude and frequency
- Easily upgradeable for future expansions
- Online and offline post processing and measurement analysis
- On board raw data processing capabilities

## Display

- High-resolution, flat 15-inch TFT LCD screen
- Display Pixel: 1024 x 768 pixels with 260 thousand simultaneous colors available
- Instant review screen displays 16 simultaneous loops/images for a quick study review
- Image orientation marker
- Selectable display configuration of Duplex and Triplex modes displays: side by side or top bottom, format size (1/3,1/2,2/3). Can be changed during image recall during live, digital replay and clipboard
- Single, dual and quad screen display

## Display Annotations

- Mechanical Index (MI)
- Thermal Index: application dependent

- Patient name/ID and additional patient information
- Hospital name
- Time/date
- Trackball driven annotation arrows
- Scanning parameters
- Application
- Probe name
- Active mode display
- Parameter annotation follow ASE standard

## Tissue Imaging

### General

- 1024 Digital Processing Channel Technology
- Variable transmit frequencies for resolution/ penetration optimization
- Display zoom with zoom area control
- Variable Contour Filtering: for edge enhancement
- Depth range up to 30 cm – probe specific
- Selectable Grayscale Parameters: Gain, Reject, Data Dependent Processing and Compress – can be adjusted in live, digital replay and image clipboard recall
- 256 shades of gray (VGA)
- 150 dB system internal dynamic range
- 6 TGC ports for image optimization
- Automatic Optimization
  - Auto Tissue Optimization: ATO
  - Auto Spectrum Optimization: ASO
  - Auto TGC

### 2D-mode

- Compound Imaging: multiple co-planar images from different angles are combined into a single, real-time image improving border definition and contrast resolution, plus reduced angular dependence of edges
- Speckle Reduce Imaging: examines the relative difference between neighboring pixel values, determining whether the grayscale variations have a sharp difference or are random with an outcome which is purely dynamic homogenous images
- Virtual Apex offers a broader aperture with near field improvements on sector phased array
- Sector tilt and width control
- Phase Inversion Harmonic Imaging: second-generation harmonic tissue imaging providing improved lateral and contrast resolution over conventional imaging; features reduced noise and improved wall definition; Coded Harmonic Imaging gives improved axial resolution without sacrificing frame rate, making it the tissue modality of choice for all patient groups

- **Variable Image Width:** a reduction either increases frame rate or increases the number of focal zones while maintaining the frame rate – application dependent
- **Dual Focus:** offers additional focal zone for added spatial and contrast resolution from heart base up to apical areas
- **Range focus** with multiple focal zones for vascular and abdominal scanning
- **Up/Down invert, in live, digital replay or image clipboard recall**
- **Digital replay for retrospective review or automatic looping** of images, allowing for adjustment of parameters such as gain, reject, anatomical M-mode, data dependent processing and replay speed
- **Colorized 2D-mode, user selectable in real-time, digital replay**

### **M-mode**

- **Trackball Steerable M-mode line** available with all imaging probes – max steering angle is probe dependent
- **Simultaneous real-time 2D- and M-mode**
- **M-mode PRF 559 Hz**, all image data acquired are combined to give high-quality recording regardless of display scroll speed
- **Digital replay for retrospective review of spectral data**
- **Several top-bottom formats, side-by-side format and time motion only format** – can be adjusted in live or digital replay
- **8 Selectable horizontal scroll speed:** 1, 2, 3, 4, 6, 8, 12, 16 seconds across display
- **Horizontal scroll can be adjusted in live or digital replay** across bright areas of the 2D-mode image
- **Anatomical M-mode** – M-mode cursor can be adjusted at any plane. Can be activated from real-time scan, digital replay or image clipboard recall
- **Anatomical Color M-mode** available in real-time scan, digital replay or image clipboard recall **Measurement and Analysis capability**

## **Color Doppler**

### **General**

- **Steerable Color Doppler** available with all imaging probes – max steering angle is probe dependent
- **10 user assignable Color maps**
- **Trackball-controlled ROI**
- **Color map can be removed from the tissue during digital replay**
- **Digital replay for retrospective review of Color or Color M-mode data** allowing for adjustment of parameters such as Color Map and Color Gain even on stored data
- **PRF Settings:** user selectable

- **Advanced Regression Wall Filter** gives efficient suppression of wall clutter
- **For each encoding principle, multiple-color maps** can be selected in live and digital replay – variance maps available
- **More than 65,000 simultaneous colors** processed, providing a smooth display two-dimensional color maps containing a multitude of color hues
- **Simultaneous display of grayscale 2D and 2D with Color Flow**
- **Color Invert:** user selectable in live and digital replay
- **Variable Color Baseline:** user selectable in live and digital replay
- **Color Doppler frequency** can be changed independently from 2D for optimal flow

### **Color Doppler Imaging**

- **Variable ROI size** in width and depth
- **ACE™ (Adaptive Color Enhancement)** – Application-dependent Multivariate Motion Discriminator reduces flash artifacts
- **User-selectable Spatial Averaging** for reduction of statistical uncertainty in the color velocity and variance estimates
- **Digital replay for retrospective review or automatic looping** of color images, allowing for adjustment of parameters such as baseline shift, color maps, and color gain even on frozen/recalled data

### **PDI (Power Doppler Imaging)**

- **Directional power Doppler imaging** combines the advantage of Power Doppler imaging with color-coded information about blood flow direction
- **Angle-independent mode** for visualization of small vessels with increased sensitivity compared to standard color flow

### **Color M-Mode**

- **Directional power Doppler imaging** combines the advantage of Power Doppler imaging with color-coded information about blood flow direction
- **Variable ROI length and position** – user selectable
- **8 Selectable horizontal scroll speed** 1, 2, 3, 4, 6, 8, 12, 16 seconds across display – can be adjusted during live, digital replay or image clipboard recall
- **Real-time 2D image** while in Color M-mode
- **Same controls and functions** available as in standard 2D Color Doppler

### **Anatomical Color M-mode**

- **Vingmed-patented, any plane Color M-mode display** derived from Color Doppler cine loop
- **Measurement and Analysis capability**

# Spectral Doppler

## General

- Operates in PW, HPRF and CW modes
- Trackball Steerable Doppler available with all imaging probes – max steering angle is probe dependent
- Selectable Doppler optimization
- Real-time duplex or triplex operation in PW Doppler mode for all velocity settings
- 2D and Color Doppler modes in duplex or triplex modes
- Dynamic Reject gives consistent suppression of background – user selectable in real-time, digital replay or image clipboard recall
- Digital replay for retrospective review of spectral Doppler data
- Several top-bottom formats, side-by-side format and time-motion only format – can be adjusted in live or digital replay
- 8 Selectable horizontal scroll speed – can be adjusted in live or digital replay
- Adjustable Spectral Doppler Display Parameters: gain, reject, compress, color maps – can be adjusted in live or digital replay
- User-adjustable baseline shift – in live, digital replay and image clipboard recall
- Adjustable velocity scale
- Low velocity reject with range 7-1600 Hz (PRF dependent)
- Angle correction with automatic adjustment of velocity scale – in live, digital replay and image clipboard recall
- Inbuilt stereo speakers
- Display annotations of frequency, mode, scales, PRF, low velocity reject setting, angle correction, acoustic power indices

## PW/HPRF and CW Doppler

- Automatic HPRF maintains its sensitivity even for shallow depths with the highest PRF
- Digital velocity tracking Doppler employs processing in range and time for high quality spectral displays
- Adjustable sample volume size of 1-16 mm, probe dependent
- Optimized pulsed wave Tissue Doppler for analyzing myocardial motion

## CW Doppler

- Steerable CW with all phased array probes
- PRF 40000 Hz
- 6 spectral colorization maps

## Analysis Programs

- Comprehensive Cardiac calculation package
- Bodymark icons for location and position of probe
- Vascular measurements package
- Real Time Auto Doppler Calculations (application specific)
- Measurements assignable to protocol capability
- Parameter annotation follow ASE standard
- Seamless data storage
- Measurements are summarized in worksheets – individual results can be edited or deleted
- A comprehensive report system allows seamless creation of echocardiographic reports with images, measurements, comments and conclusions
- A template designer to personalize report layouts
- User-assignable parameters
- Comprehensive OB package option

## Wideband Probes

| PROBE                        | FREQUENCY RANGE | CATALOG # |
|------------------------------|-----------------|-----------|
| <b>Phased Array Sector</b>   |                 |           |
| 3S-RS                        | 1.7 – 4.0 MHz   | H4000PD   |
| <b>Linear Array</b>          |                 |           |
| 8L-RS                        | 4.0 – 12.0 MHz  | H40402LT  |
| 9L-RS                        | 3.3 – 10.0 MHz  | H40442LL  |
| <b>Convex Array (Curved)</b> |                 |           |
| 4C-RS                        | 2.0 – 5.5 MHz   | H4000SR   |
| 8C-RS                        | 4.0 – 10.0 MHz  | H40402LS  |
| <b>Intraoperative</b>        |                 |           |
| i12L-RS                      | 4.0 – 10.0 MHz  | H40402LW  |
| <b>Pencil</b>                |                 |           |
| P2D                          | 2.0 MHz         | H45551CA  |

- Biopsy kits are offered for 3S-RS, 8L-RS, 9L-RS and 4C-RS probes

## User Interface

- Easy-to-learn user interface with intelligent keyboard
- Keyboard with application-specific push buttons for primary controls
- 6 Slide pot TGC curve
- Overall gain for 2D-mode, Active Mode, on same rotary
- Digital harvesting of images and loops into image clipboard
- Patient Browser Screen for registration of demographic data and quick review of image clipboard contents
- Fully programmable user presets for probe/application default settings
- Integrated speakers

- Display Screen
- 15" LCD flat screen
- Display Pixel: 1024 x 768
- Screen Tilt Angle: 0 to 160°
- Wide-angle visibility
- Digital brightness adjustment for optimal viewing in different ambient light conditions

### Image Management

- DICOM image format and workflow with instant access data management. Images can be transferred in DICOM format to the EchoPac for review
- 2D and CFM data at maximum frame rate may be reviewed by scrolling or by running cine loops
- Image Clipboard for stamp-sized listing and review of stored images and loops with adjustable cine speed
- Built-in patient archive with images/loops, patient information, measurements and report
- Internal archive data can be exported to Removable Image Storage through DVD/CD-RW, USB flash card and DICOM Media (option)
- Internal Hard Disk: for storing programs, application defaults, ultrasound image and patient archive
- Over 40Gbyte disk-space for exam archive storage
- AVI, MPEG and JPEG export

### Echo Stress Package (option)

- Exercise and pharmacological protocol templates support advanced and flexible stress echo examination capabilities
- Template editor allows user-configuration of existing or creation of new stress templates
- A reference scan is available for stress level comparison (dual screen) during acquisition
- Option for Digital Continuous Capturing of raw image data as part of stress protocol
- Wall motion scoring tools for exam assessment

### DICOM Network Connectivity (option)

- Images transferred in DICOM format to EPPC, alternative workstation or network
- Wireless LAN connection (option)
- Ethernet network connection
- Storage to DICOM server
- DICOM Verification
- DICOM Modality Worklist: gives access to a list of patients from a worklist server (usually HIS)
- DICOM Storage commitment

- DICOM performed procedure step
- DICOM Structured Report
- DICOM Print

### MPEGvue

- Using MPEGVue, exams may be stored onto removable media or on remote networked system together with integrated MPEGVue Player for viewing on standard PC

### Peripherals (options)

- DVD Video Recorder
- USB B/W video printer with control from system panel
- USB color video printer with control from system panel
- USB inkjet printer
- USB flash memory card
- Wireless network interface

### Remote Diagnostic

Insite II is GE's service platform for remote diagnostic.

### Accessories (options)

- Replacement battery
- Replacement hard disk
- Safety lock
- Video converter

### Docking Station (option)

The docking cart quickly converts the compact Vivid *e* into a console configuration. Several options can be integrated within this cart:

- Three transducer connectors
- Height-adjustable keyboard and screen interface
- Extra 17" screen – rises up to assist with group viewing
- External loud speakers improve sound quality
- Integrated USB and 6-socket power strip

### Inputs and Outputs

- VGA video out
- Audio out
- Connectors:
  - USB-2 (to support DVD-RW, video printers, memory stick, etc.)
  - LAN Ethernet
  - USB wireless LAN card
  - DC power input

## Dimensions and Weight

- Depth: 327 mm (13.35 in)
- Width: 340 mm (13.88 in)
- Height: 76.5 mm (3.12 in)
- Weight: approx. 4.6 kg (10.1 lb)

## Electrical Power

- Battery or mains-line operation
- AC Adapter Voltage input: 100-240 VAC
- Frequency: 50/60 Hz
- Power: Max. 130 VA with peripherals

## Safety

- Built to meet the requirements of:
  - IEC60601-1
    - IEC60601-1-1
    - IEC60601-1-2
    - IEC60601-2-37
  - UL60601-1
- The European Medical Devices Directive (MDD) 93/42/EEC
- The Vivid *e* ultrasound unit is a Class I device, type BF, according to Sub-clause 14 of IEC 60601-1
- The Vivid *e* ultrasound unit meets the EMC requirements in EN 55011 (1991/1998) for Group 1. Class A

## Virus Protection

To minimize virus vulnerability Vivid *e* is configured with a minimal set of open ports and with all network services not actively used by the system closed down. This significantly reduces the risk of a virus attack on Vivid *e*. GE is continuously judging the need for additional actions to reduce vulnerability of equipment, this includes vulnerability scanning of our products and evaluation of new security patches for the 3rd party technology used. Microsoft (and other) security patches that addresses serious issues with Vivid *e* will be made available to customers after GE verification of those patches.

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## Healthcare Re-imagined

GE is dedicated to helping you transform healthcare delivery by driving critical breakthroughs in biology and technology. Our expertise in medical imaging and information technologies, medical diagnostics, patient monitoring systems, drug discovery, and biopharmaceutical manufacturing technologies is enabling healthcare professionals around the world to discover new ways to predict, diagnose and treat disease earlier. We call this model of care “Early Health.” The goal: to help clinicians detect disease earlier, access more information and intervene earlier with more targeted treatments, so they can help their patients live their lives to the fullest. Re-think, Re-discover, Re-invent, Re-imagine.

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imagination at work