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 intra-operative applications.

System Architecture

The Vivid e is based on GE's TruScanScan Architecture, common to all GE Ultrasound systems. Featuring a poweful, 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 - 18Mhz
- 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
- On line and off line post processing and measurment 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, Frame Average and Compress – can be adjusted in live, digital replay and image clipboard recall
- 256 shades of gray (VGA)
- 172 dB system internal dynamic range
- 6 TGC ports for image optimization
- Automatic Optimization
  - Auto Tissue Optimization: ATO
  - Auto CFM Optimization: ACO
  - Auto Spectrum Optimization: ASO

2D-mode

- 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; CHI 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
- Multi Focus: offers additional focal zone for added spatial and contrast resolution from heart base up to apical areas
- 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, Frame Average 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 800Hz, 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
- 9 user assignable Colour 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 Colour 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)
- 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
- Application-dependent Multivariate Motion Discriminator reduces flash artifacts

PDI
(Power Doppler Imaging)

- Angle-independent mode for visualization of small vessels with increased sensitivity compared to standard color flow

Color M-Mode

- 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 5-1500 Hz (velocity scale 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

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

Analysis Programs
- Comprehensive Cardiac calculation package
- Bodymark icons for location and position of probe
- Vascular measurements package
- Full M&A Calculation Package with
- Real Time Auto Doppler Calculations (application specific)
- Measurements assignable to protocol capability
- Parameter annotation follow ASE standard
- Seamless data storage and report creation
- Measurements are summarized in worksheets – individual results can be edited or deleted
- User-assignable parameters
- Insite-II™ capability
- Comprehensive OB package option

User Interface

Operation Keyboard
- Easy-to-learn user interface with intelligent keyboard
- Keyboard with application-specific push buttons for primary controls
- Full-size, alphanumeric keyboard with backlighting
- Application-specific secondary controls available through dual rotation and pushbuttons
- 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
- Wideband Probes

Probe	Frequency Range	Catalog #
Phased Array Sector		
3S-RS	1.5 – 4.0 MHz	H4000PD
Linear Array		
8L-RS	4.0 - 12.0 MHz	H40402LT
Convex Array (Curved)		
4C-RS	2.0 - 5.5 MHz	H4000SR
Intraoperative		
i12L-RS	4.0 - 10.0 MHz	H40402LW

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 storage and review of stored images and loops
- 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
- DICOM Verification
- DICOM Print

DICOM Network Connectivity

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

- 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

Accessories (options)

- Replacement battery
- Replacement hard disk
- Safety lock

Mobile Cart (optional)

- 4 outlet power strip and isolation transformer
- Hand-rest and handles
- 4 Wheels: 2 swivel, 2 fixed
- Adjustable peripherals shelves

Inputs and Outputs

- SVGA video out
- Audio out

- 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 V AC
- 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.

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 biopharma-
ceutical
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 clini-
cians
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