Product Description
The Vivid S5 is a high-performance ultrasound system for cardiovascular and shared services applications. It offers an innovative ergonomic design, superb image quality, advanced connectivity, productivity tools and advanced technology. Compatibility with the Vivid product family offers flexibility in lab configuration and cost-effective upgrade opportunities. Enjoy excellent standard of care, increased diagnostic confidence and a high standard of productivity.

System Architecture
The Vivid S5 is based on GE’s TruScan architecture common to all GE Ultrasound systems, EchoPAC™PC workstation, EchoPAC software and network solutions. It features a software-driven, PC-based platform, raw data storage with advanced post-processing capabilities, complete connectivity, and compatibility with the GE family of cardiovascular ultrasound systems. Innovative tools offer advanced connectivity, and consultation for improved productivity and standard of care.

Coded Harmonics – Produces excellent quality images even from difficult-to-image patients.

Data Acquisition
• Programmable system architecture
• Application-specific channel architecture: the Vivid S5 employs a 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
• Supports phased array, linear and curved array, and non-imaging pencil transducers
• 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
• Digital raw data replay allows for image post processing and uncompromised offline measurement and analysis

Display Screen
• High-resolution, wide field-of-view, flat 15-inch TFT LCD screen
• Display size: 1024 x 768 pixels with 260,000 simultaneous colors available
• Scanner software supports display resolution of 800 x 600 pixel
• Screen tilts at angle of 20° backwards to 10° forward
• Screen swivel at angle: 22° left or right
• Screen can be tilted forward horizontally for mobility and transportation
• Wide-angle visibility
• Digital brightness and contrast adjustment for optimal viewing in different ambient light conditions
• Separate adjustment for external monitor brightness/contrast

Display Formats
• Instant-review screen displays 12 simultaneous loops/images for a quick study review
• Image orientation marker
• Selectable display configuration of duplex and triplex modes: side-by-side or top-bottom during live, digital replay and clipboard image recall
• Single, dual and quad-screen view
• Split-screen view

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
• Stress protocol parameters
• Active mode display
• Parameter annotation follow ASE standard
• Multi-language support for user interface and reports
Tissue Imaging

General
- Variable transmit frequencies for resolution/penetration optimization
- Display zoom with zoom area control
- Variable contour filtering for edge enhancement
- Variable dynamic range and transmit power settings
- Depth range up to 30 cm – probe specific
- Selectable grayscale parameters: gain, reject, gray-maps, DDP, persistence and compression – can be adjusted in live, digital replay and image clipboard recall
- Automatically calculated TGC curves require minimal operator interaction
- Selectable Automatic Tissue Optimization (ATO) of the real-time, 2D-mode image (option)
- Smart depth: automatically optimizing transmit pattern parameters according to scan-depth setting (option)

2D-mode
- Sector tilt and width control
- Coded Octave Imaging (COI): second-generation harmonic tissue imaging providing improved spatial and contrast resolution over conventional imaging – features reduced noise and improved wall definition without sacrificing frame rate making it the tissue modality of choice, in most cases, for all patient groups
- Confocal imaging: allows multiple transmit focal zones over range of view and a high-vector density – probes dependent and user adjustable
- Expanded cardiology performance on the 3S-RS probe including five levels of harmonics and high frame rates
- Harmonic tissue imaging on all linear and convex probes
- Coded Phase Inversion (CPI) for improved contrast resolution
- Variable image width: a reduction either increases frame rate or allows to increase the number of focal zones while maintaining the frame rate – application dependent on linear/convex array probes
- Left/right and 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, compression, reject, anatomical M-mode (option), persistence and replay speed
- Data Dependent Processing (DDP) performs temporal processing, which reduces random noise but leaves motion of significant tissue structures largely unaffected – can be adjusted even in digital replay
- Different gray and colorized 2D maps – user selectable in real-time or in digital replay

M-mode
- Trackball-steerable M-mode line available with all imaging probes – max steering angle is probe dependent
- Simultaneous real-time 2D-mode and M-mode
- M-mode PRF 1 kHz: 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
- Selectable horizontal scroll speed: 1, 2, 3, 4, 6, 8, 12, 16 seconds across display
- Horizontal scroll can be adjusted in live or in digital replay

Anatomical M-mode (option)
- Vingmed®-patented, any plane M-mode display derived from 2D cine loop
- M-mode cursor can be adjusted at any plane
- Can be activated from 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
- Trackball-controlled Region of Interest (ROI) position/size
- Removal of color map 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/tissue priority 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 including variance maps
• More than 65,000 simultaneous colors processed providing smooth display, 2D color maps containing a multitude of color hues
• Simultaneous display of grayscale 2D and 2D with color flow in live or in digital replay
• Color invert: user selectable in live and digital replay
• Variable color baseline: user selectable in live or in digital replay
• Multivariate color priority function gives reliable delineation of disturbed flows even across bright areas of the 2D-mode image
• Color Doppler frequency can be changed independently from 2D for optimal flow

Color Doppler Imaging
• Digital signal processing power maintains high frame rates with large Region of Interests (ROIs) even for very low PRF settings
• Variable Region of Interest (ROI) size in width and depth
• User-selectable radial and lateral averaging for reduction of statistical uncertainty in the color velocity and variance estimates
• Data Dependent Processing (DDP) performs temporal processing and display smoothing with reduced possibility for loss of transient events of hemodynamic significance
• Digital replay for retrospective review or automatic looping of color images allowing for adjustment of parameters such as DDP, baseline shift, color maps, color/tissue priority and color gain even on frozen/recalled data
• Application-dependent multivariate motion discriminator reduces flash artifacts
• “Smart Depth” (option): automatically adjusts transmit pattern parameters according to depth of color ROI

Color Angio (Color Intensity Imaging)
• Angle-independent mode for visualization of small vessels with increased sensitivity compared to standard color flow

Color M-mode
• Variable Region of Interest (ROI) length and position – user selectable
• User-selectable radial averaging for reduction of statistical uncertainty in the color velocity and variance estimates
• 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 (option)
• Vingmed-patented, any plane, color M-mode display derived from color Doppler cine loop
• Anatomical color M-mode available in real-time scan, digital replay or image clipboard recall
• Measurement and analysis capability

Spectral Doppler
General
• Operates in PW, HPRF PW 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
• Frame rate control for optimized use of acquisition power between spectrum, 2D and color Doppler modes in duplex or triplex modes
• Spectral analysis with an equivalent DFT rate of 0.2 ms
• Automatic Spectrum Optimization (ASO) provides a single press, automatic, real-time optimization of PW or CW spectrum scale, and baseline display (option)
• Dynamic gain compensation for display of flows with varying signal strengths over the cardiac cycle
• 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
• Selectable horizontal scroll speed: 1, 2, 3, 4, 6, 8, 12, 16 seconds across display – 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
• Adjustable velocity scale
• Wall filters with a range of 10-3000 Hz (velocity scale dependent)
• Angle correction with automatic adjustment of velocity scale in live, digital replay and image clipboard recall
• Stereo speakers mounted in the front panel
• Display annotations of frequency, mode, scales, Nyquist limit, wall filter setting, angle correction and acoustic power indices

PW/HPRF PW Doppler
• Automatic HPRF Doppler maintains its sensitivity even for shallow depths and with the highest PRFs
• Digital velocity tracking Doppler employs processing in range and time for high-quality spectral displays
• User-adjustable baseline shift in live, digital replay and image clipboard recall
• Adjustable sample volume size of 1-15 mm (probe dependent)
• Maximum sample volume depth 30 cm

Tissue Doppler Imaging
• Myocardial PW Doppler provides real-time Doppler spectral information for specified myocardial motion allowing for instantaneous tissue velocity measurement

CW Doppler
• Highly sensitive steerable CW available with all phased array and pencil probes

Cine Memory
• High-fidelity loops and images may be reviewed by scrolling or by running cine loops
• TruScan architecture offers broad post-processing capabilities of recalled images and loops allowing manipulation of parameters such as gain, baseline, color maps, sweep speeds and cine speed
• “Image Clipboard” for thumbnail storage and review of saved images and loops
• Trackball-controlled cine review

Uninterruptible Power Supply (option)
• Uninterruptible Power Supply automatically saves data and turns off the system in case of power failure or accidental shutdown

Physiological Traces
• Integrated ECG or external ECG lead input
• High-resolution display of the ECG trace
• User-adjustable trace gain/position control
• User pre-settable trace gain/position control
• Automatic QRS complex detection

Analysis Program
• Personalized measurement protocols allow individual set and order of measurement and analysis items
• Measurements can be labeled seamlessly by using protocols or post assignments
• Bodymark icons for location and position of probe
• Cardiac calculation package including extensive measurements and display of multiple repeated measurements
• Vascular measurements package
• Measurements assignable to protocol capability
• Parameter annotation follow ASE standard
• Measurements assignable to report generator
• Doppler auto trace function with automatic calculations in both live and digital replay
• Seamless data storage and report creation
• Measurements are summarized in worksheets – individual results can be edited or deleted
• User-assignable parameters
• Report templates can be customized on board
• ASE-based default text modules (English) – user customizable
• Image view during reporting
• Ability to export reports in PDF format
• Generate report templates by the Report Designer or import from EchoPAC PC
• InSite™ capability
• Ilinq™ capability

Stress Echo (option)
• Stress package with memory buffer offers pharmaceutical, treadmill and bicycle stress exam protocols with user-configurable templates and shuffle mode
• Reference loop display during acquisition for comparing resting images to each stress level (dual screen)
• Advanced and flexible stress-echo examination capabilities
• Stress treadmill-exercise with more than 90 seconds of raw data continuous capture
• Possibility of extensive post-processing of images under review
• Wall motion scoring (Bulls-eye and segmental)
• Template Editor to customize the number of stress levels, number of views, number of heart cycles, and systolic or full-cycle capture
**OB Application Module (option)**
- OB package for fetal growth analysis containing more than 100 biometry tables
- Dedicated OB/GYN reports
- Fetal graphical growth charts
- Growth percentiles
- Multi-gestational calculations (up to four)
- Programmable OB tables
- Expanded worksheets
- User-selectable fetal growth parameters based on European, American or Asian methods charts
- GYN package for ovary and uterus measurements and reporting

**Intima-Media Thickness (IMT) Measurement Program (option)**
- Automatic measurements (patent pending) of carotid artery Intima-Media Thickness (IMT) on any acquired frame
- On-board IMT package provides non-interrupted workflow – fully integrated with M&A, worksheet, archiving and reporting functions
- Robust algorithm provides quick, reliable measurements which can be stored to the on-board archive for review and reporting
- IMT measurement can be made from frozen images or images retrieved from archive
- IMT package supports measurements of different regions of the intima in the carotid vessel (e.g., Lt./Rt./CCA/ICA etc.)
- Frame for IMT measurement can be selected in relation to the ECG waveform

**User Interface**
- Ergonomic Flex Fit design with left/right swivel and up/down arm-mobility of keyboard and monitor permitting both physiological sitting or standing operation
- Easy-to-learn user interface with intelligent keyboard
- Keyboard with application-specific assignable rotaries and push buttons for primary controls
- Interactive back-lighting of application-specific push buttons
- Full-size, alphanumeric keyboard with adjustable backlighting
- Application-specific secondary controls available through slide bars operated by a four-way rocker
- Slide pot TGC curve with six pots
- Dedicated rotary for overall gain for 2D-mode
- Dedicated rotary for M-mode, CFM or Doppler controlled by active mode
- 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
- Support for international keyboard characters in 12 languages
- Integrated speakers
- Probe and gel holders on both sides of keyboard
- User-programmable FLEX button for easy access to an often-used function in global and on application level

**Wideband Probes**
- Electronic selection between three solid-state and one standalone Doppler probe connectors

<table>
<thead>
<tr>
<th>PROBE</th>
<th>FREQUENCY RANGE</th>
<th>CATALOG #</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phased Array Sector Probes</td>
<td></td>
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<tr>
<td>3S-RS</td>
<td>1.5 – 3.6 MHz</td>
<td>H4000PD</td>
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<tr>
<td>5S-RS</td>
<td>2.0 – 5.0 MHz</td>
<td>H4000PC</td>
</tr>
<tr>
<td>7S-RS</td>
<td>3.5 – 8.0 MHz</td>
<td>H4000PE</td>
</tr>
<tr>
<td>10S-RS</td>
<td>5.0 – 11.5 MHz</td>
<td>H4000PF</td>
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<tr>
<td>Linear Array Probes</td>
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<tr>
<td>8L-RS</td>
<td>4.0 – 13.0 MHz</td>
<td>H40402LT</td>
</tr>
<tr>
<td>12L-RS</td>
<td>6.0 – 13.0 MHz</td>
<td>H40402LY</td>
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<tr>
<td>Convex Array (Curved) Probes</td>
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<tr>
<td>4C-RS</td>
<td>1.8 – 6.0 MHz</td>
<td>H4000SR</td>
</tr>
<tr>
<td>8C-RS</td>
<td>4.0 – 11.0 MHz</td>
<td>H40402LS</td>
</tr>
<tr>
<td>e8C-RS</td>
<td>4.0 – 11.0 MHz</td>
<td>H40402LL</td>
</tr>
<tr>
<td>Doppler Pencil Probes</td>
<td></td>
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<tr>
<td>2D(P2D)</td>
<td>2.0 MHz</td>
<td>H4830JE</td>
</tr>
<tr>
<td>6D(P6D)</td>
<td>6.0 MHz</td>
<td>H4830JG</td>
</tr>
</tbody>
</table>
**Biopsy Bracket Support (option)**

- On-screen biopsy Guide-Line, Guide-Zone and depth measure for "Civco" multi-angle biopsy bracket, supporting probe models
  - 3S-RS
  - 4C-RS
  - 8L-RS
  - 12L-RS

**Supported Applications (probe dependent)**

- Cardiac
- Vascular
- Pediatric
- Neonatal cephalic
- Transcranial (adult cephalic)
- Abdominal
- Gynecological
- Obstetrical
- Musculoskeletal including Superficial
- Small Parts
- Breast

**Advanced Options**

**Contrast Imaging**

- All contrast agents should be used as described on the label by the contrast agent manufacturers

**LVO Contrast (option)**

- LV Contrast (on 3S-RS and 5S-RS probes) enhances delineation of the LV border in combination with ultrasound contrast agents. The new implementation of GE’s Coded Phase Inversion (CPI) provides high-resolution detection of contrast in the LV cavity and excellent suppression of myocardial tissue signals.

* Harmonic imaging for supporting contrast agent imaging was developed by Schering."

**Image Management and Archiving**

- Built-in patient archive with images/loops, patient information, examination information and texts, measurements and report
- Raw data workflow: ultimate workflow with instant access data management
- Data are either stored internally or to a remote archive (EchoPAC or Image Vault server)
- Raw data allows changes to gain, baseline, color maps, sweep speeds, etc. for recalled images and loops
- DICOM 3.0 Image Format: DICOM incorporates raw image data information with all its data management flexibility into the image communication standard DICOM
- Images can be directly stored or exported in DICOM format to a DICOM server (PACS) (option – see DICOM Network Connectivity)
- Image clipboard for stamp-sized preview images to allow recalling images or loops of choice directly
- 2D and CFM data at maximum frame rate may be reviewed by scrolling or by running cine loops
- Internal archive data can be exported to removable image storage through DVD/CD-RW, USB flash card (option), Magnet-Optical Disk in Raw-Data and DICOM format
- Internal hard disk: for storing programs, application settings, ultrasound images and patient archive
- Over 80 Gbyte disk space for exam archive storage
- Configurable HTML-based report function
- Report template designer package
- Raw-Data, DICOM, AVI, MPEG and JPEG export
- Built-in DVD writer (supports CD-R and DVD-R)

**Excel Export**

- Allows export of all archived measurement and textual patient information in standard Microsoft Excel® files

**EchoPAC Connectivity**

- Connectivity and image analysis capability of Vivid S5 from EchoPAC PC
- EchoPAC PC allows instant access to ultrasound raw data provided by the system
- Comprehensive review, analysis and post-processing capabilities on EchoPAC PC
- Advanced quantitative analysis and post-processing capabilities
- Q-Analysis on raw data from Vivid S5 on EchoPAC PC
- Three user levels help organizing data security requirements
DICOM Media Support
- DICOM media: read/write images on DICOM format

DICOM Network Connectivity (option)
Provides communication to a DICOM server and DICOM printer. Includes:
- Ethernet network connection
- Verification AE
- Image export AE (network storage)
- Modality worklist AE
- Storage commitment
- Performed procedure step
- Storage to DICOM server
- DICOM structured report SCU
- Verify: provides verification of an active connection between the scanner and another DICOM device
- DICOM print

DICOM Modality Worklist (option)
- Modality worklist: gives access to a list of patients provided by a worklist server

DICOM Print (option)
- Allows printing images via a DICOM printer

Database Importation from Vivid™ 3 and Vivid™ 4 Systems (option)
- Provides a one-time database import capability from a Vivid 3 or a Vivid 4 system
- Allows user to review previous exams generated on a Vivid 3 or a Vivid 4 system in DICOM format
- Allows to add examinations to patients already existing in the imported database

Virtual Printer (option)
- Provides the ability to send “Print” commands to any of two printers even when not connected to a printer – upon re-connection of printer, the system automatically produces hard copies from print images saved in chronological succession on disk

MPEGvue (option)
- Using MPEGvue, exams may be stored onto removable media or on remote networked shared drive together with integrated MPEGvue player for viewing on standard PC
- Smart email feature allows transparent transmission of images from a separate PC via email using resident Outlook email client
- Patient management utility on the receiving standard PC provides ability to organize the exams on different sub-directories on the user’s hard disk

Peripherals (options)
- USB black and white video printer with control from system panel
- USB color video printer with control from system panel
- USB inkjet printer
- External MOD 5.25” drive
- USB flash memory card
- USB wireless network interface accessories

Accessories (options)
- Interface cable for External ECG
- Three-pedal foot switch with programmable functionality

Cart
- Probe and gel holder
- Hand rest and handles
- Four swivel wheels – front wheel wheel breaks
- Rear wheels direction lock

Inputs and Outputs
- DVI/VGA video output
- Audio out
- Four USB-2 connectors – two at rear and two at front to support video printers, MOD, flash memory cards
- LAN Ethernet
**Dimensions and Weight**

- Depth: 70 cm/27.6" (approx.)
- Width: 55 cm/21.7"
- Height: 123 cm/48.4" to 143 cm/56.3"
- Minimum height with folded screen: 95 cm/37.4"
- Weight: <70 kg/154 lbs

**Electrical Power**

- Mains-line operation
- Input rating: 100-120/230 VAC
- Power: 500 VA
- Frequency: 50/60 Hz

**Safety**

Built to meet the requirements of:

- The European Medical Devices Directive (MDD) 93/42/EEC (CE Mark)
- NRTL certified (US and Canada)

**Virus Protection**

To minimize virus vulnerability, Vivid S5 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 the Vivid S5.
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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