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# LOGIQ E9

## Product Description

The LOGIQ® E9 is our leadership ultrasound imaging system designed for abdominal, vascular, obstetric, gynecology, neonatal, pediatric, urology, transcranial, cardiac and small parts applications.



## System Architecture

**Agile Acoustic Architecture** – GE's innovative, patented, model-based technology provides vast computational power, ease of imaging, workflow flexibility and product upgrade-ability. The LOGIQ E9 excels in the following areas:

**Exceptional Image Quality** is created through the use of CrossXBeam™, SRI-HD, coded techniques and advanced E-Series transducers.

**Raw Data** is GE's innovative technology that allows a virtual rescan on archived images by applying many of the same scan controls available during the original exam.

**Productivity** features to enable LOGIQ E9 users to maximize their scan productivity – including Scan Assistant and Automatic Optimization.

**Ergonomics** with power-assisted control panel, articulating LCD arm and lightweight transducers combining to make one of the most ergonomic ultrasound systems available.

## General Specifications

### Dimensions and Weight

(Dimensions given with floating keyboard stowed for transport)

- Height: 1410mm, 55.5 in
- Width: 585mm, 23 in
- Depth: 830mm, 32.8 in
- Weight: 135 kg, 298 lbs

### Electrical Power

- Voltage: 100-120 Vac or 220-240 Vac
- Frequency: 50/60 Hz
- Power Consumption maximum of 1.2KVA with peripherals

### Console Design

- 4 Active Probe Ports
- Integrated HDD (at least 150 GB)
- Integrated DVD-R Multi Drive
- On-board storage of thermal printer
- Integrated speakers with sub-woofer for premium sound
- Integrated locking mechanism that provides rolling lock and caster swivel lock
- Integrated cable management
- Front and rear handles
- Easily removable air filters

## User Interface

### Operator Keyboard

- Floating keyboard adjustable in three dimensions:
  - Height
  - Rotation
  - Extension
- Full-sized, backlit alphanumeric keyboard
- Ergonomic hard key layout
- Interactive back-lighting
- Integrated recording keys for remote control of up to 4 peripheral or DICOM devices
- Integrated gel warmer

### Touch Screen

- 10.4 in High Resolution, Color, Touch, LCD screen
- Interactive dynamic software menu
- Brightness adjustment
- User-configurable layout

### LCD Monitor

- 19" High-Resolution LCD
- LCD translation (independent of console):
  - 350 mm, 13.7 in horizontal
  - 90° swivel
- Fold-down and lock mechanism for transportation
- Brightness & contrast adjustment
- Resolution: 1280 X 1024
- Horizontal/Vertical viewing angle of +/- 170°

## System Overview

### Applications

- Abdominal
- Obstetrical
- Gynecological
- Breast
- Small Parts
- Vascular /Peripheral
- Transcranial
- Pediatric and Neonatal
- Musculoskeletal
- Urological
- Cardiac

### Operating Modes

- B-Mode
- M-Mode
- Color Flow Mode (CFM)
- Extended Field of View (LOGIQView, option)
- Power Doppler Imaging (PDI)
- PW Doppler
- CW Doppler
- Volume Modes (3D/4D):
  - 3D Static
  - 4D Real Time (option)
- Anatomical M-Mode
- Coded Contrast Imaging (option)
- Elastography (Option)

### Scanning Methods

- Electronic Sector
- Electronic Convex
- Electronic Linear
- Mechanical Volume Sweep

### Transducer Types

- Sector Phased Array
- Convex Array
- Micro convex Array
- Linear Array
- Matrix Array
- Volume Probes (4D)
  - Convex Array
  - Micro convex Array
  - Linear Array
- Split Crystal

### System Standard

#### Features

- Advanced user interface with high resolution 10.4 inch LCD touch panel
- Automatic Optimization
- CrossXBeam
- Speckle Reduction Imaging (SRI-HD)
- Fine Angle Steer

- Coded Harmonic Imaging
- Virtual Convex
- Patient information database
- Image Archive on integrated CD/DVD and hard drive
- Advanced 3D
- Raw Data Analysis
- Real-time automatic Doppler calcs
- OB Calcs
- Fetal Trending
- Multigestational Calcs
- Hip Dysplasia Calcs
- Gynecological Calcs
- Vascular Calcs
- Urological Calcs
- Renal Calcs
- Cardiac Calcs
- InSite ExC capability
- On-board electronic documentation

### Peripheral Options

- Integrated options for:
  - Digital B&W thermal printer
  - DVD video recorder
  - Digital color thermal printer
- Digital A6 color thermal printer
- External USB printer connection
- DVI-I output available for compatible devices
- Foot Switch, with programmable functionality
- Console Protective Cover

### Display Modes

- Live and Stored Display Format: Full size and split screen - both w/ thumbnails. For still and CINE
- Review Image Format: 4x4, and "thumbnails". For Still and CINE.
- Simultaneous Capability
  - B or CrossXBeam /PW
  - B or CrossXBeam /CFM or PDI
  - B/M
  - B/CrossXBeam
  - Real-time Triplex Mode (B or CrossXBeam + CFM or PDI/PW)
- Selectable alternating Modes
  - B or CrossXBeam /PW
  - B or CrossXBeam + CFM (PDI)/PW
  - B/CW (option)
- Multi-image (split/quad screen)
  - Live and/or frozen
  - B or CrossXBeam + B or CrossXBeam /CFM or PDI
  - PW/M
  - Independent Cine playback
- Time line display

- Independent Dual B or CrossXBeam /PW Display
- CW
- Display Formats
  - Top/ Bottom selectable format
  - Side/Side selectable format
- Virtual Convex

### Display Annotation

- Patient Name: First, Last and Middle
- Patient ID
- Age, Sex and Birth Date
- Hospital Name
  - Date format: selectable:  
MM/DD/YY, DD/MM/YY, YY/MM/DD
- Time format: selectable:  
24 hours, 12 hours
- Gestational Age from LMP/EDD/GA/BBT
- Probe Name
- Map names
- Probe Orientation
- Depth Scale Marker
- Lateral Scale Marker
- Focal Zone Markers
- Image Depth
- Zoom Depth
- B-Mode
  - Gain
  - Dynamic Range
  - Imaging Frequency
  - Frame Averaging
  - Gray Map
  - SRI-HD
- M-Mode
  - Gain
  - Dynamic Range
  - Time Scale
- Doppler Mode
  - Gain
  - Angle
  - Sample Volume Depth and Width
  - Wall Filter
  - Velocity and/or Frequency Scale
  - Spectrum Inversion
  - Time Scale
  - PRF
- Color Flow Doppler Mode
  - Line Density
  - Frame Averaging
  - Packet Size
  - Color Scale: 3 types  
Power, Directional PDI, and Symmetrical Velocity Imaging
  - Color Velocity Range and Baseline
  - Color Threshold Marker
  - Color Gain

- PDI
- Spectrum Inversion
- Doppler Frequency
- TGC Curve
- Acoustic Frame Rate
- CINE Gage, Image Number / Frame Number
- Body Pattern: Multiple human and animal types
- Application Name
- Measurement Results
- Operator Message
- Displayed Acoustic Output
  - TIS: Thermal Index Soft Tissue
  - TIC: Thermal Index Cranial (Bone)
  - TIB: Thermal Index Bone
  - MI: Mechanical Index
- % of Maximum Power output
- Biopsy Guide Line and Zone
- Heart Rate

## General System Parameters

### System Setup

- Pre-programmable Categories
- User Programmable Preset Capability
- Factory Default Preset Data
- Languages: English, French, German, Spanish, Italian, Portuguese, Russian, Greek, Swedish, Danish, Dutch, Finnish, Norwegian
- OB Report Formats including Tokyo Univ., Osaka Univ., USA, Europe, and ASUM
- User Defined Annotations
- Body Patterns
- Customized Comment Home Position

## Complete User Manual available on board through Help (F1)

User Manual and Service Manual are included on CD with each system. A printed manual is available upon request.

## CINE Memory/Image Memory

- 384 MB of CINE Memory
- Selectable CINE Sequence for CINE Review
- Prospective CINE Mark

- Measurements/ Calculations & Annotations on CINE Playback
- Scrolling timeline memory
- Dual Image CINE Display
- Quad Image CINE Display
- CINE Gauge and CINE Image Number Display
- CINE Review Loop
- CINE Review Speed

## Image Storage

- On-board database of patient information from past exams
- Storage Formats:
  - DICOM – compressed/ uncompressed, single/ multiframe, with/ without Raw Data
  - Export JPEG, WMV (MPEG 4), and AVI formats
- Storage Devices:
  - USB Memory Stick: 64MB to 4GB (for exporting individual images/clips)
  - CD-R storage: 700MB
  - DVD storage: -R (4.7GB)
  - Hard Drive Image Storage: ~112GB
- Compare old images with current exam
- Reload of archived data sets

## Connectivity & DICOM

- Ethernet network connection
- Wireless LAN (optional)
- DICOM 3.0 (optional)
  - Verify
  - Print
  - Store
  - Modality Worklist
  - Storage Commitment
  - Modality Performed Procedure Step (MPPS)
  - Media Exchange
  - Off network / mobile storage queue
  - Query / Retrieve
- Public SR Template
- Structured Reporting – compatible with vascular and OB standard
- InSite ExC capability

## Physiological Input Panel (Option)

- Physiological Input
  - ECG, 1 channel
  - PCG, 1 channel
  - AUX, 1 channel

- Dual R-Trigger
- Pre-settable ECG R Delay Time
- Pre-settable ECG Position
- Adjustable ECG Gain Control
- Pre-settable PCG Position
- Adjustable PCG Gain Control
- Pre-settable AUX Position
- Adjustable AUX Gain Control
- Automatic Heart Rate Display

## Report Writer (Option)

- On-board reporting package automates report writing
- Formats various exam results into a report suitable for printing or reviewing on a standard PC
- Exam results include patient info, exam info, measurements, calculations, images, and comments
- Standard templates provided
- Customizable templates

## Scanning Parameters

- Displayed Imaging Depth: 0 – 36 cm
- Minimum Depth of Field: 0 – 2 cm (Zoom) (probe dependent)
  - Maximum Depth of Field: 0 – 36 cm (probe dependent)
- Continuous Dynamic Receive Focus / Continuous Dynamic Receive Aperture
- Adjustable Dynamic Range
  - Adjustable Field of View (FOV)
- Image Reverse: Right/ Left
- Image Rotation of 0°, 180°

## Digital B-Mode

- Adjustable:
  - Acoustic Power
  - Gain
  - Dynamic Range
  - Frame Averaging
  - Gray Scale Map
  - Frequency
  - Line Density
  - Scanning Size (FOV or Angle - depending on the probe, see probe specifications)
  - B Colorization
  - Reject
  - Suppression
  - SRI-HD

## Digital M-Mode

- Adjustable:
  - Acoustic Power
  - Gain
  - Dynamic Range

- Gray Scale Map
- Frequency
- Sweep Speed
- M Colorization
- M Display Format
- Rejection

## Anatomical M-Mode

- M-mode cursor adjustable at any plane
- Can be activated from a CINE loop from a live or stored image
- M & A capability
- Available with Color Flow Mode

## Digital Spectral Doppler Mode

- Adjustable:
  - Acoustic Power
  - Gain
  - Dynamic Range
  - Gray Scale Map
  - Transmit Frequency
  - Wall Filter
  - PW Colorization
  - Velocity Scale Range
  - Sweep Speed
  - Sample Volume Length
  - Angle Correction
  - Steered Linear
  - Spectrum Inversion
  - Trace Method
  - Baseline Shift
  - Doppler Auto Trace
  - Time Resolution
  - Compression
  - Trace Direction
  - Trace Sensitivity

## Digital Color Flow Mode

- Adjustable:
  - Acoustic Power
  - Color Maps, including velocity-variance maps
  - Gain
  - Velocity Scale Range
  - Wall Filter
  - Packet Size
  - Line Density
  - Spatial Filter
  - Steering Angle
  - Baseline Shift
  - Frame Average
  - Threshold
  - Accumulation mode
  - Sample Volume Control
  - Flash Suppression

## Digital Power Doppler Imaging

- Adjustable:
  - Acoustic Power
  - Color Maps, including velocity-variance maps
  - Gain
  - Velocity Scale Range
  - Wall Filter
  - Packet Size
  - Line Density
  - Spatial Filter
  - Steering Angle
  - Frame Average
  - Threshold
  - Accumulation mode
  - Sample Volume Control
  - Flash Suppression

## Continuous Wave Doppler (Option)

- Steerable CW mode includes Adjustable:
  - Acoustic Power
  - Gain
  - Dynamic Range
  - Gray Scale Map
  - Transmit Frequency
  - Wall Filter
  - CW Colorization
  - Velocity Scale Range
  - Sweep Speed
  - Angle Correction
  - Spectrum Inversion
  - Trace Method
  - Baseline Shift
  - Doppler Auto Trace
  - Compression
  - Trace Direction
  - Trace Sensitivity

## Automatic Optimization

- Optimize B-Mode image to improve contrast resolution.
- Selectable amount of contrast resolution improvement (low, medium, high)
- Auto-Spectral Optimize – adjusts baseline, invert, PRF (on live image), and angle correction

## Coded Harmonic Imaging

- Available on all 2D and 4D probes, except M4S

## Coded Contrast Imaging (Option)

- Available on 3CRF, S1-5, C1-5D, IC5-9D, 9L-D, ML6-15D, RAB2-5D, RSP6-16D, RIC5-9D, M5S-D
- 2 Contrast Timers
- Timed Updates: 0.05 – 10 seconds
- Accumulation mode, six levels
- Maximum Enhance Mode
- Flash
- Time Intensity Curve (TIC) Analysis
- The LOGIQ E9 is designed for compatibility with most commercially available ultrasound contrast agents. Because the availability of these agents is subject to government regulation and approval, product features intended for use with these agents may not be commercially marketed nor made available before the contrast agent is cleared for use. Contrast related product features are enabled only on systems for delivery to an authorized country or region of use.

## LOGIQView (Option)

- Extended Field of View Imaging
- Available on the following probes: 9L-D, 11L-D, ML6-15D, L8-18i-D, 3CRF, C1-5D, M6C-D, IC5-9D, RIC5-9D, RAB 2-5D, RAB4-8D, RNA5-9D, RSP6-16D, M4S-D, M5S-D, S1-5, S4-10, 6S-D
- For use in B-Mode
- CrossXBeam is available on linear probes
- Auto detection of scan direction
- Pre or post-process zoom
- Rotation
- Auto best fit on monitor
- Measurements in B-Mode

## 3D

- Allows unlimited rotation and planar translations
- 3D reconstruction from CINE sweep

## Advanced 3D

- Acquisition of Color data
- Automatic rendering
- 3D Landscape technology
- 3D Movie

## Real Time 4D (Option)

- Acquisition Modes:
  - Real Time 4D
  - Static 3D
- Visualization Modes:
  - 3D Rendering (diverse surface and intensity projection modes)
  - Sectional Planes (3 Section planes perpendicular to each other)
  - Volume Contrast Imaging-Static (optional)
  - Tomographic Ultrasound Imaging (optional)
- Render Mode:
  - Surface Texture, Surface Smooth, max-, min- and X-ray (average intensity projection), mix mode of two render modes
- Curved 3 point Render start
- 3D Movie
- Scalpel: 3D Cut tool
- Display Format:
  - Quad: A-/B-/C-Plane/3D
  - Dual: A-Plane/3D
  - Single: 3D or A- or B- or C-Plane
- Automated Volume Calculation - VOCAL II (optional)
- Betaview

## Volume Navigation (Option)

- Available on the C1-5D, S1-5, 9L-D, ML6-15D, 3CRF, IC5-9, S4-10 and L8-18i-D, M5S probes
- Sensor-based acquisition
- Position Markers
- Needle tip tracking
- Tru3D feature includes:
  - Display of data in: Main-, Parallel-, Angular-Mode
  - Render Modes: Gray Surface, Texture, Min-, Max-, Average-Intensity
  - Measurements: distance, angle, area, volume
  - 3D Movie

## Scan Assistant (Option)

- Factory Programs
- User -defined programs
- Steps include image annotations, mode transitions, basic imaging controls and measurement initiation

## Elastography (Option)

- Available on ML6-15-D, 9L-D, IC5-9-D and C1-5-D probes

## TVI (Option)

- Myocardial Doppler Imaging with color overlay on tissue image
- Available on the sector probes
- Tissue color overlay can be removed to show just the 2D image, still retaining the tissue velocity information
- Curved Anatomical M-mode: free (curved) drawing of M-mode generated from the cursor independent from the axial plane
- Q-Analysis: Multiple Time -Motion trace display from selected points in the myocardium

## Virtual Convex

- Provides a convex field of view
- Compatible with CrossXBeam
- Available on all linear and sector transducers 9L-D, 11L-D, ML6-15-D, L8-18i-D, RSP6-16-D, M4S-D, M5S-D, S1-5, S4-10. 6S-D, 6Tc

## SRI-HD

- Speckle Reduction Imaging
- Provides multiple levels of speckle reduction
- Compatible with Side by Side DualView Display
- Compatible with ALL linear, convex and sector transducers
- Compatible w/ B-Mode, Color, Contrast Agent and 3D/4D imaging

## CrossXBeam

- Provides 3,5,7, or 9 angles of spatial compounding
- Live Side by Side DualView Display
- Compatible with:
  - Color Mode
  - PW
  - SRI-HD
  - Coded Harmonic Imaging
  - Virtual Convex
- Available on the following probes: 9L-D, 11L-D, ML6-15D, L8-18i-D, 3CRF, C1-5D, M6C-D, IC5-9D, RIC5-9D, RAB 2-5D, RAB4-8D, RNA5-9D, RSP6-16D

## Controls Available While "Live"

- Write Zoom
- B/M/CrossXBeam-Mode

- Gain
- TGC
- Dynamic Range
- Acoustic Output
- Transmission Focus Position
- Transmission Focus Number
- Line Density Control
- Sweep Speed for M-Mode
- Number of Angles for CrossXBeam
- PW-Mode
  - Gain
  - Dynamic Range
  - Acoustic Output
  - Transmission Frequency
  - PRF
  - Wall Filter
  - Spectral Averaging
  - Sample Volume Gate
    - Length
    - Depth
  - Velocity Scale
- Color Flow Mode
  - CFM Gain
  - CFM Velocity Range
  - Acoustic Output
  - Wall Echo Filter
  - Packet Size
  - Frame Rate Control
  - CFM Spatial Filter
  - CFM Frame Averaging
  - CFM Line Resolution
  - Frequency / Velocity Base Line Shift

## Controls Available on "Freeze" or Recall

- Automatic Optimization
- SRI-HD
- CrossXBeam – Display non-compounded and compounded image simultaneously in split screen
- 3D reconstruction from a stored CINE loop
- B/M/CrossXBeam Mode
  - Gray Map Optimization
  - TGC
  - Colorized B and M
  - Frame Average (loops only)
  - Dynamic Range
- Anatomical M Mode
- Max Read Zoom to 8x
- Base Line Shift
- Sweep Speed
- PW Mode
  - Gray Map
  - Post Gain
  - Baseline shift

- Sweep Speed
- Invert Spectral wave form
- Compression
- Rejection
- Colorized Spectrum
- Display Format
- Doppler Audio
- Angle Correct
- Quick Angle Correct
- Auto Angle Correct
- Color Flow
  - Overall Gain (loops and stills)
  - Color Map
  - Transparency Map
  - Frame Averaging (loops only)
  - Flash Suppression
  - CFM Display Threshold
  - Spectral Invert for Color/Doppler
- Anatomical M-Mode on cine loop
- 4D
  - Gray Map, Colorize
  - Post Gain
  - Change display – single, dual, quad sectional or rendered

## Measurements / Calculations

### General B-Mode

- Depth & Distance
- Circumference (Ellipse / Trace)
- Area (Ellipse / Trace)
- Volume (Ellipsoid)
- % Stenosis (Area or Diameter)
- Angle between two lines

### General M-Mode

- M-Depth
- Distance
- Time
- Slope
- Heart Rate

### General Doppler Measurements/ Calculations

- Velocity
- Time
- A/B Ratio (Velocities / Frequency Ratio)
- PS (Peak Systole)
- ED (End Diastole)
- PS/ED (PS/ED Ratio)
- ED/PS (ED/PS Ratio)
- AT (Acceleration Time)
- ACCEL (Acceleration)

- TAMAX (Time Averaged Maximum Velocity)
- Volume Flow (TAMEAN and Vessel Area)
- Heart Rate
- PI (Pulsatility Index)
- RI (Resistivity Index)

### Real-time Doppler Auto Measurements / Calculations

- PS (Peak Systole)
- ED (End Diastole)
- MD (Minimum Diastole)
- PI (Pulsatility Index)
- RI (Resistivity Index)
- AT (Acceleration Time)
- ACC (Acceleration)
- PS/ED (PS/ED Ratio)
- ED/PS (ED/PS Ratio)
- HR (Heart Rate)
- TAMAX (Time Averaged Maximum Velocity)
- PVAL (Peak Velocity Value)
- Volume Flow (TAMEAN and Vessel Area)

### OB Measurements / Calculations

- Gestational Age by:
  - GS (Gestational Sac)
  - CRL (Crown Rump Length)
  - FL (Femur Length)
  - BPD (Biparietal Diameter)
  - AC (Abdominal Circumference)
  - HC (Head Circumference)
  - APTD x TTD (Anterior/Posterior Trunk Diameter by Transverse Trunk Diameter)
  - FTA (Fetal Trunk Cross-sectional Area)
  - HL (Humerus Length)
  - BD (Binocular Distance)
  - FT (Foot Length)
  - OFD (Occipital Frontal Diameter)
  - TAD (Transverse Abdominal Diameter)
  - TCD (Transverse Cerebellum Diameter)
  - THD (Thorax Transverse Diameter)
  - TIB (Tibia Length)
  - ULNA (Ulna Length)
- Estimated Fetal Weight (EFW) by:
  - AC, BPD
  - AC, BPD, FL
  - AC, BPD, FL, HC

- AC, FL
- AC, FL, HC
- AC, HC
- BPD, APTD, TTD, FL
- BPD, APTD, TTD, SL
- Calculations and Ratios
  - FL/BPD
  - FL/AC
  - FL/HC
  - HC/AC
  - CI (Cephalic Index)
  - AFI (Amniotic Fluid Index)
  - CTAR (Cardio-Thoracic Area Ratio)
- Measurements / Calculations by: ASUM, ASUM 2001, Berkowitz, Bertagnoli, Brenner, Campbell, CFEF, Chitty, Eik-Nes, Ericksen, Goldstein, Hadlock, Hansmann, Hellman, Hill, Hohler, Jeanty, JSUM, Kurtz, Mayden, Mercer, Merz, Moore, Nelson, Osaka University, Paris, Rempen, Robinson, Shepard, Shepard/Warsoff, Tokyo University, Tokyo/Shinozuka, Yarkoni
- Fetal Graphical Trending
- Growth Percentiles
- Multi-Gestational Calculations (4)
- Fetal Qualitative Description (Anatomical survey)
- Fetal Environmental Description (Biophysical profile)
- Programmable OB Tables
- Over 20 selectable OB Calcs
- Expanded Worksheets

### GYN Measurements/ Calculations

- Right Ovary Length, Width, Height
- Left Ovary Length, Width, Height
- Uterus Length, Width, Height
- Cervix Length, Trace
- Ovarian Volume
- ENDO (Endometrial thickness)
- Ovarian RI
- Uterine RI
- Follicular measurements
- Summary Reports

### Vascular Measurements/ Calculations

- SYS DCCA (Systolic Distal Common Carotid Artery)
- DIAS DCCA (Diastolic Distal Common Carotid Artery)
- SYS MCCA (Systolic Mid Common Carotid Artery)

- DIAS MCCA (Diastolic Mid Common Carotid Artery)
- SYS PCCA (Systolic Proximal Common Carotid Artery)
- DIAS PCCA (Diastolic Proximal Common Carotid Artery)
- SYS DICA (Systolic Distal Internal Carotid Artery)
- DIAS DICA (Systolic Distal Internal Carotid Artery)
- SYS MICA (Systolic Mid Internal Carotid Artery)
- DIAS MICA (Diastolic Mid Internal Carotid Artery)
- SYS PICA (Systolic Proximal Internal Carotid Artery)
- DIAS PICA (Diastolic Proximal Internal Carotid Artery)
- SYS DECA (Systolic Distal External Carotid Artery)
- DIAS DECA (Diastolic Distal External Carotid Artery)
- SYS PECA (Systolic Proximal External Carotid Artery)
- DIAS PECA (Diastolic Proximal External Carotid Artery)
- VERT (Systolic Vertebral Velocity)
- SUBCLAV (Systolic Subclavian Velocity)
- Automatic IMT
- Summary Reports

## Urological Calcs

- Bladder Volume
- Prostate Volume
- Lt/Rt Renal Volume
- Generic Volume
- Post-Void Bladder Volume

## Probes (All Optional)

### 3CRF Micro-convex Biopsy Probe

- Applications: Abdomen
- Biopsy Guide: Single-Angle, disposable with a reusable bracket (40442LR)

### C1-5-D Convex Probe

- Applications: Abdomen, OB/GYN, Urology
- Biopsy Guide: Multi-Angle, disposable with a reusable bracket (H40432LE)

### M6C-D Matrix Array Convex Probe

- Applications: Abdomen, OB/GYN, Pediatrics

- Biopsy Guide: Multi-angle, disposable with a reusable bracket (E8385RF)

### IC5-9-D Micro-convex Probe

- Applications: OB/GYN, Urological
- Biopsy Guide: Single Angle, Disposable with a disposable bracket (E8385MJ) or reusable bracket (H40412LN)

### S1-5 Sector Probe

- Applications: Abdomen, OB/GYN
- Biopsy Guide: Multi-angle, disposable with a reusable bracket (H4908SD)

### S4-10 Sector Probe

- Applications: Pediatrics, Neonatal
- Biopsy Guide: Multi-angle, disposable with a reusable bracket

### M4S-D Sector Probe

- Applications: TCD

### M5S-D Sector Probe

- Applications: Cardiac, TCD

### 6S-D Sector Probe

- Applications: Pediatric Cardiac, Pediatric Abdomen

### 9L-D Linear Probe

- Applications: Vascular, Small Parts, Pediatric, Abdomen
- Biopsy Guide: Multi-angle, disposable with a reusable bracket (H4906BK)

### 11L-D Linear Probe

- Applications: Vascular, Small Parts, Abdomen
- Biopsy Guide Available: Multi-Angle, disposable with a reusable bracket (H40432LC)

### ML6-15-D Matrix Array Linear Probe

- Applications: Small Parts, Vascular, Neonatal, Pediatrics
- Biopsy Guide Available: Multi-Angle, disposable with a reusable bracket (H40432LK)

### L8-18i-D Linear Probe

- Applications: Small Parts, Vascular, Intraoperative

### RAB2-5-D Convex Volume Probe

- Applications: Abdomen, OB/GYN
- Biopsy Guide: Single Angle, disposable with a reusable bracket (H4601AE), single angle, reusable (H48621W)

### RAB4-8-D Convex Volume Probe

- Applications: Abdomen, OB/GYN, Pediatrics
- Biopsy Guide: Single Angle, disposable with a reusable bracket (H4601AE)

### RIC5-9-D Convex Volume Probe

- Applications: OB/GYN, Urology
- Biopsy Guide: Single Angle, Reusable (H46721R)

### RNA5-9-D Convex Volume Probe

- Applications: Neonatal, Pediatrics
- Biopsy Guide: Single Angle, disposable with a reusable bracket (H46701AF), single angle, reusable (H468651DG)

### RSP6-16-D Linear Volume Probe

- Applications: Small Parts, Vascular, Pediatrics
- Biopsy Guide: Single Angle, disposable with a reusable bracket (H47001AD), single angle, reusable (H46721W)

### P2D CW Split Crystal Probe

Applications: Cardiac, Vascular

### P6D CW Split Crystal Probe

Applications: Cardiac, Vascular

### 6Tc Trans-esophageal Probe

Applications: Cardiac

## External Inputs and Outputs (not including on-board peripherals)

- DVI-I
- Audio Stereo Out

- Ethernet
- Multiple USB 2.0 ports

## Safety Conformance

### The LOGIQ E9 is:

- Classified to UL 60601-1 by a Nationally Recognized Test Lab
- Certified to CAN/CSA-C22.2 No. 601.1-M90 by an SCC accredited Test Lab
- CE Marked to Council Directive 93/42/EEC on Medical Devices
- Conforms to the following standards for safety:
  - EN 60601-1 Medical electrical equipment –Part 1: General requirements for safety
  - EN 60601-1-1 Medical electrical equipment – Part 1-1 General requirements for safety – Collateral Standard: Safety requirements for medical electrical systems
  - EN 60601-1-2 Medical electrical equipment –Part 1-2 General requirements for safety – Collateral Standard: Electromagnetic compatibility – requirements and tests
  - EN 60601-1-4 Medical electrical equipment Part 1-4 General requirements for safety – Collateral Standard: programmable electrical medical systems
  - EN 62366 Medical Devices – Application of Usability Engineering to Medical Devices
  - EN 60601-2-37 Medical electrical equipment – Part 2-37: Particular requirements for the safety of ultrasonic medical diagnostic and monitoring equipment
  - ISO 10993-1 Biological evaluation of medical devices – Part 1 Evaluation and testing
  - NEMA UD2 Acoustic output measurement standard for diagnostic ultrasound equipment
  - NEMA UD3 Standard for real time display of thermal and mechanical acoustic output indices on diagnostic ultrasound equipment (MI, TIS, TIB, TIC)
  - EMC Emissions Group 1 Class A device requirements as per Sub clause 4.2 of CISPR 11



## Supplement: Cardiac Measurements/Calculations

### B-Mode Measurements

- Aorta
  - Aortic Root Diameter (Ao Root Diam)
  - Aortic Arch Diameter (Ao Arch Diam)
  - Ascending Aortic Diameter (Ao Asc)
  - Descending Aortic Diameter (Ao Desc Diam)
  - Aorta Isthmus (Ao Isthmus)
  - Aorta (Ao st junct)
- Aortic Valve
  - Aortic Valve Cusp Separation (AV Cusp)
  - Aortic Valve Area Planimetry (AVA Planimetry)
  - (Trans AVA)
- Left Atrium
  - Left Atrium Diameter (LA Diam)
  - LA Length (LA Major)
  - LA Width (LA Minor)
  - Left Atrium Diameter to AoRoot Diameter Ratio (LA/Ao Ratio)
  - Left Atrium Area (LAA(d), LAA(s))
  - Left Atrium Volume, Single Plane, Method of Disk (LAEDV A2C, LAESV A2C) (LAEDV A4C, LAESV A4C)
- Left Ventricle
  - Left Ventricle Mass (LVPWd, LVPWs)
  - Left Ventricle Volume, Teichholz/Cubic (LVIDd, LVI Ds)
  - Left Ventricle Internal Diameter (LVIDd, LVI Ds)
  - Left Ventricle Length (LVLd, LVLs)
  - Left Ventricle Outflow Tract Diameter (LVOT Diam)
  - Left Ventricle Posterior Wall Thickness (LVPWd, LVPWs)
  - Left Ventricle Length (LV Major)
  - Left Ventricle Width (LV Minor)
  - Left Ventricle Outflow Tract Area (LVOT)
  - Left Ventricle Area, Two Chamber/Four Chamber/Short Axis (LVA (d), LVA (s))
  - Left Ventricle Endocardial Area, Width (LVA (d), LVA(s))
  - Left Ventricle Epicardial Area, Length (LVAepi (d), LVAepi (s))
  - Left Ventricle Mass Index (LVPWd, LVPWs)

- Ejection Fraction, Teichholz/Cube (LVIDd, LVIDs)
- Left Ventricle Posterior Wall Fractional Shortening (LVPWd, LVPWs)
- Left Ventricle Stroke Index, Teichholz/Cube (LVIDd, LVIDs, and Body Surface Area)
- Left Ventricle Fractional Shortening (LVIDd, LVIDs)
- Left Ventricle Stroke Volume, Teichholz/Cubic (LVIDd, LVIDs)
- Left Ventricle Stroke Index, Single Plane, Two Chamber, Method of Disk (LVI Dd, LVIDs, LVSD, LVSS)
- Left Ventricle Stroke Index, Single Plane, Four Chamber, Method of Disk (LVI Dd, LVIDs, LVSD, LVSS)
- Left Ventricle Stroke Index, Bi-Plane, Bullet, Method of Disk (LVAd, LVAs)
- Interventricular Septum (IVS)
- Left Ventricle Internal Diameter (LVI D)
- Left Ventricle Posterior Wall Thickness (LVPW)
- Mitral Valve
  - Mitral Valve Annulus Diameter (MV Ann Diam)
  - E-Point-to-Septum Separation (EPSS)
  - Mitral Valve Area Planimetry (MVA Planimetry)
- Pulmonic Valve
  - Pulmonic Valve Area (PV Planimetry)
  - Pulmonic Valve Annulus Diameter (PV Annulus Diam)
  - Pulmonic Diameter (Pulmonic Diam)
- Right Atrium
  - Right Atrium Diameter, Length (RAD Ma)
  - Right Atrium Diameter, Width (RAD Mi)
  - Right Atrium Area (RAA)
  - Right Atrium Volume, Single Plane, Method of Disk (RAAd)
  - Right Atrium Volume, Systolic, Single Plane, Method of Disk (RAAs)
- Right Ventricle
  - Right Ventricle Outflow Tract Area (RVOT Planimetry)
  - Left Pulmonary Artery Area (LPA Area)
  - Right Pulmonary Artery Area (RPA Area)
  - Right Ventricle Internal Diameter (RVIDd, RVIDs)

- Right Ventricle Diameter, Length (RVD Ma)
- Right Ventricle Diameter, Width (RVD Mi)
- Right Ventricle Wall Thickness (RVAWd, RVAWs)
- Right Ventricle Outflow Tract Diameter (RVOT Diam)
- Left Pulmonary Artery (LPA)
- Main Pulmonary Artery (MPA)
- Right Pulmonary Artery (RPA)
- System
  - Inferior Vena Cava
  - Systemic Vein Diameter (Systemic Diam)
  - Patent Ductus Arteriosus Diameter (PDA Diam)
  - Pericard Effusion (PEs)
  - Patent Foramen Ovale Diameter (PFO Diam)
  - Ventricular Septal Defect Diameter (VSD Diam)
  - Interventricular Septum (IVS) Fractional Shortening (IVSd, IVSS)
- Tricuspid Valve
  - Tricuspid Valve Area (TV Panimetry)
  - Tricuspid Valve Annulus Diameter (TV Diam)
  - Annulus Diam)

### M-Mode Measurements

- Aorta
  - Aortic Root Diameter (Ao Root Diam)
- Aortic Valve
  - Aortic Valve Diameter (AV Diam)
  - Aortic Valve Cusp Separation (AV Cusp)
  - Aortic Valve Ejection Time (LVET)
- Left Atrium
  - Left Atrium Diameter to AoRoot Diameter Ratio (LA/Ao Ratio)
  - Left Atrium Diameter (LA Diam)
- Left Ventricle
  - Left Ventricle Volume, Teichholz/Cubic (LVIDd, LVI Ds)
  - Left Ventricle Internal Diameter (LVIDd, LVI Ds)
  - Left Ventricle Posterior Wall Thickness (LVPWd, LVPWs)
  - Left Ventricle Ejection Time (LVET)
  - Left Ventricle Pre-Ejection Period (LVPEP)
  - Interventricular Septum (IVS)
  - Left Ventricle Internal Diameter (LVI D)
  - Left Ventricle Posterior Wall Thickness (LVPW)

- Mitral Valve
  - E-Point-to-Septum Separation (EPSS)
  - Mitral Valve Leaflet Separation (D-E Excursion)
  - Mitral Valve Anterior Leaflet Excursion (D-E Excursion)
  - Mitral Valve D-E Slope (D-E Slope)
  - Mitral Valve E-F Slope (E-F Slope)
- Pulmonic Valve
  - QRS complex to end of envelope (Q-to-PV close)
- Right Ventricle
  - Right Ventricle Internal Diameter (RVIDd, RVIDs)
  - Right Ventricle Wall Thickness (RVAWd, RVAWs)
  - Right Ventricle Outflow Tract Diameter (RVOT Diam)
  - Right Ventricle Ejection Time (RVET)
  - Right Ventricle Pre-Ejection Period (RVPEP)
- System
  - Pericard Effusion (PE (d))
- Tricuspid Valve
  - QRS complex to end of envelope (Q-to-TV close)
- Aorta Distal Coarctation (Coarc Post-Duct)
- Aortic Valve Insufficiency Pressure Half Time (AR PHT)
- Aortic Valve Flow Acceleration (AV Trace)
- Aortic Valve Pressure Half Time (AV Trace)
- Aortic Valve Acceleration Time (AV Acc Time)
- Aortic Valve Deceleration Time (AV Trace)
- Aortic Valve Ejection Time (AVET)
- Aortic Valve Acceleration to Ejection Time Ratio (AV Acc Time, AVET)
- Aortic Valve Area according to PHT
- Left Ventricle
  - Left Ventricle Outflow Tract Peak Pressure Gradient (VLOT Vmax)
  - Left Ventricle Outflow Tract Peak Velocity (LVOT Vmax)
  - Left Ventricle Outflow Tract Mean Pressure Gradient (LVOT Trace)
  - Left Ventricle Outflow Tract Mean Velocity (LVOT Trace)
  - Left Ventricle Outflow Tract Velocity Time Integral (LVOT Trace)
  - Left Ventricle Ejection Time (LVET)
- Mitral Valve
  - Mitral Valve Regurgitant Flow Acceleration (MR Trace)
  - Mitral Valve Regurgitant Mean Velocity (MR Trace)
  - Mitral Regurgitant Mean Pressure Gradient (MR Trace)
  - Mitral Regurgitant Velocity Time Integral (MR Trace)
  - Mitral Valve Mean Velocity (MR Trace)
  - Mitral Valve Velocity Time Integral (MR Trace)
  - Mitral Valve Mean Pressure Gradient (MR Trace)
  - Mitral Regurgitant Peak Pressure Gradient (MR Vmax)
  - Mitral Valve Peak Pressure Gradient (MR Vmax)
  - Mitral Regurgitant Peak Velocity (MR Vmax)
  - Mitral Valve Peak Velocity (MR Vmax)
  - Mitral Valve Velocity Peak A (MV A Velocity)
  - Mitral Valve Velocity Peak E (MV E Velocity)
  - Mitral Valve Area according to PHT (MV PHT)
- Mitral Valve Flow Deceleration (MV Trace)
- Mitral Valve Pressure Half Time (PV PHT)
- Mitral Valve Flow Acceleration (MV Trace)
- Mitral Valve E-Peak to A-Peak Ratio (A-C and D-E) (MV E/ARatio)
- Mitral Valve Acceleration Time (MV Acc Time)
- Mitral Valve Deceleration Time (MV Dec Time)
- Mitral Valve Ejection Time (MV Trace)
- Mitral Valve A-Wave Duration (MV A Dur)
- Mitral Valve Time to Peak (MV Trace)
- Mitral Valve Acceleration Time/Deceleration Time Ratio (MV Acc/Dec Time)
- Stroke Volume Index by Mitral Flow (MVA Planimetry, MVTrace)
- Pulmonic Valve
  - Pulmonic Insufficiency Peak Pressure Gradient (PR Vmax)
  - Pulmonic Insufficiency End-Diastolic Pressure Gradient (PRTrace)
  - Pulmonic Valve Peak Pressure Gradient (PV Vmax)
  - Pulmonic Insufficiency Peak Velocity (PR Vmax)
  - Pulmonic Insufficiency End-Diastolic Velocity (Prend Vmax)
  - Pulmonic Valve Peak Velocity (PV Vmax)
  - Pulmonary Artery Diastolic Pressure (PV Trace)
  - Pulmonic Insufficiency Mean Pressure Gradient (PR Trace)
  - Pulmonic Valve Mean Pressure Gradient (PV Trace)
  - Pulmonic Insufficiency Mean Square Root Velocity (PR Trace)
  - Pulmonic Insufficiency Velocity Time Integral (PR Trace)
  - Pulmonic Valve Mean Velocity (PV Trace)
  - Pulmonic Valve Velocity Time Integral (PV Trace)
  - Pulmonic Insufficiency Pressure Half Time (PR PHT)
  - Pulmonic Valve Flow Acceleration (PV Acc Time)
  - Pulmonic Valve Acceleration Time (PV Acc Time)
  - Pulmonic Valve Ejection Time (PVET)

## Doppler Mode Measurements

- Aortic Valve
  - Aortic Insufficiency Mean Pressure Gradient (AR Trace)
  - Aortic Insufficiency Peak Pressure Gradient (AR Vmax)
  - Aortic Insufficiency End Diastole Pressure Gradient (AR Trace)
  - Aortic Insufficiency Mean Velocity (AR Trace)
  - Aortic Insufficiency Velocity Time Integral (AR Trace)
  - Aortic Valve Mean Velocity (AV Trace)
  - Aortic Valve Velocity Time Integral (AV Trace)
  - Aortic Valve Mean Pressure Gradient (AV Trace)
  - Aortic Valve Peak Pressure Gradient (AR Vmax)
  - Aortic Insufficiency Peak Velocity (AR Vmax)
  - Aortic Insufficiency End-Diastolic Velocity (AR Trace)
  - Aortic Valve Peak Velocity (AV Vmax)
  - Aortic Valve Peak Velocity at Point E (AV Vmax)
  - Aorta Proximal Coarctation (Coarc Pre-Duct)

- QRS complex to end of envelope (Q-to-PV close)
  - Pulmonic Valve Acceleration to Ejection Time Ratio (PV Acc Time, PVET)
  - Right Ventricle
    - Right Ventricle Outflow Tract Peak Pressure Gradient (RVOT Vmax)
    - Right Ventricle Outflow Tract Peak Velocity (RVOT Vmax)
    - Right Ventricle Outflow Tract Velocity Time Integral (RVOTTrace)
    - Right Ventricle Ejection Time (RV Trace)
    - Stroke Volume by Pulmonic Flow (RVOT Planimetry, RVOTTrace)
    - Right Ventricle Stroke Volume Index by Pulmonic Flow (RVOT Planimetry, RVOT Trace)
  - System
    - Pulmonary Artery Peak Velocity (PV Vmax)
    - Pulmonary Vein Velocity Peak A (reverse) (P Vein A)
    - Pulmonary Vein Peak Velocity (P Vein D, P Vein S)
    - Systemic Vein Peak Velocity (PDA Diastolic, PDA Systolic)
    - Ventricular Septal Defect Peak Velocity (VSD Vmax)
    - Atrial Septal Defect (ASD Diastolic, ASD Systolic)
    - Pulmonary Vein A-Wave Duration (P Vein A Dur)
    - IsoVolumetric Relaxation Time (IVRT)
    - IsoVolumetric Contraction Time (IVCT)
    - Pulmonary Vein S/D Ratio (P Vein D, P Vein S)
    - Ventricular Septal Defect Peak Pressure Gradient (VSD Vmax)
    - Pulmonic-to-Systemic Flow Ratio (Qp/Qs)
  - Tricuspid Valve
    - Tricuspid Regurgitant Peak Pressure Gradient (TR Vmax)
    - Tricuspid Valve Peak Pressure Gradient (TV Vmax)
    - Tricuspid Regurgitant Peak Velocity (TR Vmax)
    - Tricuspid Valve Peak Velocity (TV Vmax)
    - Tricuspid Valve Velocity Peak A (TV A Velocity)
    - Tricuspid Valve Velocity Peak E (TV E Velocity)
    - Tricuspid Regurgitant Mean Pressure Gradient (TR Trace)
    - Tricuspid Valve Mean Pressure Gradient (TV Trace)
    - Tricuspid Regurgitant Mean Velocity (TR Trace)
    - Tricuspid Regurgitant Velocity Time Integral (TR Trace)
    - Tricuspid Valve Mean Velocity (TV Trace)
    - Tricuspid Valve Velocity Time Integral (TV Trace)
    - Tricuspid Valve Time to Peak (TV Acc/Dec Time)
    - Tricuspid Valve Ejection Time (TV Acc/Dec Time)
    - Tricuspid Valve A-Wave Duration (TV A Dur)
    - QRS complex to end of envelope (Q-to-TV close)
    - Tricuspid Valve Pressure Half Time (TV PHT)
    - Stroke Volume by Tricuspid Flow (TV Planimetry, TV Trace)
    - Tricuspid Valve E-Peak to A-Peak Ratio (TV E/A Velocity)
- Color Flow Mode Measurements**
- Aortic Valve
    - Proximal Isovelocity Surface Area: Regurgitant Orifice Area (AR Radius)
    - Proximal Isovelocity Surface Area: Radius of Aliased Point (AR Radius)
    - Proximal Isovelocity Surface Area: Regurgitant Flow (AR Trace)
    - Proximal Isovelocity Surface Area: Regurgitant Volume Flow (AR Trace)
    - Proximal Isovelocity Surface Area: Aliased Velocity (AR Vmax)
  - Mitral Valve
    - Proximal Isovelocity Surface Area: Regurgitant Orifice Area (MR Radius)
    - Proximal Isovelocity Surface Area: Radius of Aliased Point (MR Radius)
    - Proximal Isovelocity Surface Area: Regurgitant Flow (MR Trace)
    - Proximal Isovelocity Surface Area: Regurgitant Volume Flow (MR Trace)
    - Proximal Isovelocity Surface Area: Aliased Velocity (MR Vmax)
- Combination Mode Measurements**
- Aortic Valve
    - Aortic Valve Area (Ao Root Diam, LVOT Vmax, AV Vmax)
    - Aortic Valve Area by Continuity Equation by Peak Velocity (Ao Root Diam, LVOT Vmax, AV Vmax)
    - Stroke Volume by Aortic Flow (AVA Planimetry, AV Trace)
    - Cardiac Output by Aortic Flow (AVA Planimetry, AV Trace, HR)
    - Aortic Valve Area by Continuity Equation VTI (Ao Root Diam, LVOT Vmax, AV Trace)
  - Left Ventricle
    - Cardiac Output, Teichholz/Cubic (LVIDd, LVI Ds, HR)
    - Cardiac Output Two Chamber, Single Plane, Area-Length/ Method of Disk (Simpson) (LVAd, LVAs, HR)
    - Cardiac Output Four Chamber, Single Plane, Area-Length/ Method of Disk (Simpson) (LVAd, LVAs, HR)
    - Ejection Fraction Two Chamber, Single Plane, Area-Length/ Method of Disk (Simpson) (LVAd, LVAs)
    - Ejection Fraction Four Chamber, Single Plane, Area-Length/ Method of Disk (Simpson) (LVAd, LVAs)
    - Left Ventricle Stroke Volume, Single Plane, Two Chamber/Four Chamber, Area-Length (LVAd, LVAs)
    - Left Ventricle Stroke Volume, Single Plane, Two Chamber/Four Chamber, Method of Disk (Simpson) (LVIDd, LVIDs, LVAd, LVAs)
    - Left Ventricle Volume, Two Chamber/Four Chamber, Area-Length (LVAd, LVAs)
    - Ejection Fraction, Bi-Plane, Method of Disk (LVAd, LVAs, 2CH, 4CH)
    - Left Ventricle Stroke Volume, Bi-Plane, Method of Disk (LVAd, LVAs, 2CH, 4CH)
    - Left Ventricle Volume, Bi-Plane, Method of Disk (LVAd, LVAs, 2CH, 4CH)
    - Left Ventricle Stroke Index, Single Plane, Two Chamber/Four Chamber, Area-Length (LVsd, LVss, and BSA)
    - Left Ventricle Volume, Single Plane, Two Chamber/Four Chamber, Method of Disk (LVAd, LVAs)
    - Left Ventricle Volume, Apical View, Long Axis, Method of Disk (LVAd, LVAs)
  - Mitral Valve

- Stroke Volume by Mitral Flow  
(MVA Planimetry, MV Trace)
- Cardiac Output by Mitral Flow  
(MVA Planimetry, MV Trace, HR)
- Pulmonic Valve
  - Stroke Volume by Pulmonic Flow  
(PV Planimetry, PV Trace)
  - Cardiac Output by Pulmonic Flow  
(PV Planimetry, PV Trace, HR)
- Tricuspid Valve
  - Cardiac Output by Tricuspid Flow  
(TV Planimetry, TV Trace, HR)

### **Cardiac Worksheet**

- Parameter: lists the mode, the measurement folder, and the specific measurement
- Measured Value: Up to six measurement values for each item. Average, maximum, minimum or last

### **Generic Study in Cardiology**

- Stroke Volume (SV)
- Cardiac Output (CO)