Reliable versatility

Philips HD5 ultrasound system specifications

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Table of contents

1	**Introduction**	**3**
1.1	Applications	3
1.2	Key performance features	3
2	**System overview**	**4**
2.1	System architecture	4
2.2	Imaging modes	4
	2D mode	4
	M-mode	4
	Anatomical M-mode	4
	Doppler	5
	Pulsed wave (PW) Doppler	5
	Continuous wave (CW) Doppler	5
	Color Doppler	5
	Tissue Harmonic Imaging (THI)	6
	Color Power Angio imaging (CPA)	6
	3D grayscale imaging	6
	Expanded field of view	6
3	**System controls**	**7**
3.1	Optimization controls	7
	2D Opt signal processing	7
	iSCAN one-button intelligent optimization	7
3.2	Control panel and user interface	7
4	**Workflow**	**8**
4.1	Display annotation	8
4.2	Image presentation	8
4.3	Cineloop review	8
4.4	Exam documentation	8
4.5	Connectivity	9
5	**Transducers**	**10**
5.1	Transducer selection	10
	Sector array	
	S4-2 broadband sector array	10
	Curved arrays	
	C5-2 broadband curved array	10
	C8-4v broadband curved array	10
	Linear array	
	L12-3 broadband linear array	10
5.2	Transducer application guide	11
6	**Measurement and analysis**	**12**
6.1	Measurement tools	12
6.2	QLAB analysis	12
6.3	Clinical option analysis packages	13
	General imaging analysis	13
	OB/GYN and fertility analysis	13
	Cardiac analysis	13
	Vascular analysis	13
7	**Physical specifications**	**14**
	Physical dimensions	14
	High mobility cart	14
	Control panel	14
	Display	14
	Footswitch	14
	ECG and physio	14
	Localization options	14
	Power requirements	14
	Power cords	14
	Electrical safety standards	14
	Environmental temperature	14
8	**Maintenance and services**	**15**
	Maintenance	15
	Services	15

1. Introduction

The HD5 combines digital broadband beamforming and an impressive range of imaging modes for HD performance across your patient population.

1.1 Applications

- Abdominal
- Small parts and superficial
- Pediatric
- Musculoskeletal
- Neonatal
- Urology
- Obstetrical
- Gynecological and fertility
- Vascular
- Transcranial Doppler
- Cardiac

1.2 Key performance features

- iSCAN one-button image optimization
- True broadband beamforming based on Philips extensive expertise in digital ultrasound
- Sector, curved, and linear transducers to support exam requirements
- Workflow support with DICOM connectivity and easy data recording, study guide tutorial, and USB ports

HD5 System

2. System overview

The HD5 system facilitates image acquisition with easy controls designed for automatic optimization around clinical requirements.

2.1 System architecture

- RoHS-compliant cart design
- All-digital broadband beamformer
- Microfine 2D focusing with dynamic focal tuning
- 232 dB full time input dynamic range
- 1,024 digitally processed channels
- Continuously variable steering in 2D, color, and Doppler modes
- Gray shades: 256 (8 bits) in 2D, M-mode and Doppler spectral analysis
- Acquisition frame rate: greater than 310 frames per second in high frame rate mode (dependent on transducer, field of view, depth and angle)
- Built-in Philips Remote Services connectivity* allows for faster response to clinical questions and technical issues
- Proven XRES technology for adaptive real-time image enhancement (no on/off)

2.2 Imaging modes

- Philips Microfine 2D focusing
- Philips Color Power Angio (CPA)
- Directional Color Power Angio
- M-mode
- Anatomical M-mode
- Color M-mode
- Pulsed wave Doppler
- High PRF pulsed wave Doppler
- Continuous wave Doppler
- 3D
- Color compare mode
- Dual mode
- Duplex for simultaneous 2D and Doppler
- Triplex mode for simultaneous 2D, Doppler, and color or CPA
- 2D optimization signal processing
- Tissue Harmonic Imaging (THI)
- Intelligent Doppler
- Reconstructed zoom with pan (read zoom)
- Philips high-definition zoom (write zoom)
- Trapezoidal imaging
- Adaptive Doppler
- Adaptive color Doppler

2D mode

- Microfine 2D focusing
- Frame rate selection
- 16-level digital reconstructed zoom with pan
- Variable level high-definition zoom
- Image orientation marker
- Cineloop image review (up to 1,000 B/W frames)
- Persistence, adjustable in real time and cineloop review
- Selectable compression curves
- Sector size and steering control
- Selectable line density
- Up to eight transmit focal zones plus separation control
- Dual imaging (single and two buffer)
- Philips Chroma imaging with multiple color maps

M-mode

- Available with all imaging transducers
- Selectable sweeping rates
- Time markers: 0.1 and 0.2 seconds
- Chroma colorization with multiple color maps
- M-mode review for retrospective analysis of M-mode data
- Full-screen M-mode display
- Color M-mode on the S4-2 and C5-2 transducers

Anatomical M-mode

- Uses 2D image as a basis for M-mode analysis at a defined line, independent of transducer orientation
- M-mode line perpendicular to the anatomy, even in abnormally shaped or positioned hearts
- Provides data on direction, position and timing of any single echo received from any point of the tissue for M-mode analysis in any direction, for examining cardiac chamber diameters, LV regional wall motion and location of accessory pathways
- Anatomical M-mode trace can be generated or modified post freeze
- Anatomical M-mode on S4-2 transducer

Doppler

- Display annotation including Doppler mode, scale (cm/sec or kHz), pulse repetition frequency, wall filter setting, gain, acoustic output status, sample volume size, normal or inverted, angle correction, grayscale curve
- Adaptive Doppler
- Intelligent Doppler imaging – automatically maintains optimal angle-to-flow to assist in delivering Doppler velocity measurements (available with vascular and general imaging application packages on the L12-3 linear transducer only)
- Adjustable frequency and velocity display ranges
- Eight-position zero baseline shift
- Normal and invert display around horizontal zero line
- Selectable sweep speeds
- Selectable grayscale curve for optimal display
- Selectable display format (1/3-2/3, 1/2-1/2, 2/3-1/3)
- Full-screen Doppler display
- Doppler review for retrospective analysis of Doppler data

Pulsed wave (PW) Doppler

- Available on all imaging transducers
- Adjustable sample volume size: .05 – 2.63 cm
- Displays tissue movement and blood flow in 2D and PW Doppler simultaneously
- Triplex mode – displays tissue movement and blood flow in 2D, color or CPA and PW Doppler simultaneously
- High-PRF capability in all modes including duplex and triplex

Continuous wave (CW) Doppler

- Available on the S4-2 sector transducer
- Steerable through 90°
- Maximum velocity range: 19 m/sec

Color Doppler

- Adaptive color automatically optimizes color or Color Power Angio frequencies
- Color compare – simultaneously displays real-time Color Power Angio, color Doppler and grayscale images side-by-side
- Automatic color invert – automatically inverts color maps to maintain selected color coding when the linear steering angle passes through vertical
- Available on all imaging transducers
- Cineloop review
- Chroma 2D colorization with multiple color maps
- 256 color bins
- Continuously variable color steering
- Trackball-controlled color region of interest: size and position
- Maps, filters, color sensitivity, line density, smoothing, echo write priority, color persistence, gain and baseline optimized automatically by preset or is user selectable
- Velocity and variance displays
- Color and 2D line density control
- Selection of color bar display units

* Service agreement required for access to Philips Remote Services. Access to the internet required. Not all remote features available in all countries; contact your local Philips representative for details.

Tissue Harmonic Imaging (THI)

- System processing of second harmonic frequencies (nonlinear energy) in tissue
- Extends high performance imaging capabilities to all patient body types
- Available on the S4-2, C5-2, and L12-3 transducers
- Image display virtually free of artifacts

Color Power Angio imaging (CPA)

- Highly sensitive mode for small vessel visualization
- Available on all imaging transducers
- Fully user-configurable
- Cineloop review
- User-definable presets
- Multiple maps including directional CPA
- Directional CPA
- Individual controls for gain, filters, sensitivity, echo write priority and color invert
- Adjustable CPA region of interest: size and position
- User-selectable persistence
- User-selectable blend levels
- TGC control
- Write priority

3D grayscale imaging

- Available with Ob/Gyn application
- Provides a qualitative volume display of 2D data set
- Available on all imaging transducers
- Individual controls for manipulating the on-screen 3D rendering and display options

Expanded field of view

- Trapezoidal imaging
- Expands field of view on linear array transducers up to 15° on each side in vascular and general imaging applications

3. System controls

Controls on the HD5 automatically adjust imaging parameters and provide quick optimization for superb imaging results.

3.1 Optimization controls

- 2D Opt signal processing with 2X multi-line parallel processing and frequency compounding
- Sharpens lateral beam profile for finer dot size
- Reduces speckle artifacts for increased image clarity
- 2D Opt key with up to five settings for patient-specific optimization in 2D and color Doppler
- iSCAN one-button intelligent optimization
- In 2D vascular, Ob/Gyn, and general imaging, one-button automatic adjustment of TGC and receiver gain to achieve optimal uniformity and brightness of tissues in most exams

The HD5 control panel puts the features and functions you use most often within easy reach.

3.2 Control panel and user interface

- Easy-to-learn graphical user interface
- Primary controls readily accessible and logically grouped
- Commonly used secondary controls located on soft keys for quick access; soft key functions change dynamically based on the currently active mode, preset or system function
- Other secondary controls accessible through on-screen menus
- Alphanumeric QWERTY keyboard with globalization key for conversion to local language (English, French, German, Italian, and Spanish)
- User selectable keyboard input language (Simplified Chinese)
- Trackball with Select and Enter keys for easy system navigation
- Integrated stereo speakers
- Imaging mode keys: 2D, Color Power Angio imaging, M-mode, color Doppler, pulsed wave Doppler (PW)
- 2D image controls: depth, dual left, dual right, freeze, THI, and zoom focus
- Image enhancement controls: dynamic range, focus, gain, persistence, post-processing map, and smooth
- Patient specific optimization keys: 2D Opt, Transducer (transducer select), and THI
- Quantitative controls: caliper, calc, erase, trackball
- Doppler or color controls: angle and steer, spectral, scale, baseline, gain, power, volume, duplex, and triplex
- Image acquisition keys: review, report, VCR, acquire, and two print keys supporting external print and video options
- Annotation controls: text, erase, arrow, and bodymarker
- Function keys: microphone, patient, preset, and setup
- Four option keys activated with additionally purchased features
- Online Help key
- Optional On-Line Support Request feature* provides quick response to clinical questions and technical issues
- Optional Proactive Monitoring* helps prevent unscheduled downtime
- Lateral gain compensation (LGC) slide pot controls
- Time gain compensation (TGC) slide pot controls
- Review and report keys

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4. Workflow

The HD5 provides tools that support exam needs as well as department workflow.

4.1 Display annotation

- On-screen display of all pertinent imaging parameters for complete documentation, including: transducer type and frequency range, active clinical options and optimized presets, display depth, TGC curve, grayscale, color map, frame rate, dynamic range, compression and contrast enhancement, color gain, color image mode, and hospital and patient demographic data
- Displayed data can be turned off for generating images used in publication and presentation
- Sector width and steering markers
- 2D Opt setting and iSCAN icons
- Real-time display of Mechanical Index (MI)
- Real-time display of Thermal Index (TIb, TIc, TIs)
- Quick text – allows easy annotation any time during exam
- Text – places, moves, erases, modifies, or appends predefined text labels, typed text, and arrows
- Body markers – displays body-part icons appropriate for active preset and indicates relative transducer position
  - Body Marker location and type can be saved to user-defined preset
  - Icons selectable via trackball scroll and soft keys
- Dual orientation marker to indicate the active buffer for two-buffer dual display
- VCR indicator allows user to know when VCR is recording
- Annotation erased with start of new study
- End Exam Key: closes study, sends images to printer, and returns user to Patient ID screen for more efficient workflow
- Improved OB reporting: automatically adds trending graphs to report

4.2 Image presentation

- Up or down
- Left or right
- Multiple duplex image formats (1/3-2/3, 1/2-1/2, 2/3-1/3)
- Depth to 30 cm (exam and transducer specific)

4.3 Cineloop review

- Acquisition, storage in memory, and display in real-time and duplex modes of up to 1,000 frames (four minutes in Quick Review) of 2D and color images for retrospective review and image selection
- Single frames of Doppler data and M-mode images can be archived to print or electronic media
- Supports two-buffer dual imaging mode of up to 500 frames per buffer
- Trackball control of frame-by-frame image selection
- Variable playback speed
- Trim capability
- Functions in 2D and Tissue Harmonic Imaging, M-mode, PW Doppler, CW Doppler, color Doppler, and Color Power Angio imaging modes

4.4 Exam documentation

Peripherals

- Mitsubishi HS-MD7000 Super-VHS video cassette recorder
  - Resolution: >400 lines
  - Video format: NTSC or PAL
  - Built-in digital time base corrector (TBC) reduces jitter, skew, and color blurring during playback
  - Digital noise reduction
  - Super-fast drive for quick fast forward and rewind (approx. 120 seconds with T-120 tape)
  - Dimensions (h/w/d): 4.9x10.6x14.4 in/ 125x270x366 mm
  - Weight: 14.3 lb/6.5 kg
- Digital B/W thermal printer (USB input)
- Digital color printer (USB input)
- Support of a range of plain paper printers
- Support of up to three peripherals with shelf attachment
- Support of 1D barcode scanner capabilities for MRN field data entry in the Patient ID screen for the following barcode types: Code 39, Code 128, Codabar, UPC, EAN, Interleaved 2 of 5, Reduced Space Symbology, Code 93, and Codablock

Input and output ports

- Six available ports
- USB ports (3)
- Standard USB interface for support of qualified plain paper printers
- Composite video: output to external monitor, VCR or printer (optional)
- Black and white composite video output (optional)
- External print trigger
- LAN connector – used with Philips Remote Services*
- VGA output
- S-video output for VCR (optional)
- Footswitch port for connecting the optional footswitch
- RS-232 port to support data transfer
- User accessible and cleanable air filter

Utilization Reports

- Optional Utilization Reports* provide data to help manage ultrasound assets, track usage, summarize data about exam types, duration, and referrals

4.5 Connectivity

- Three USB ports
- 500 GB hard drive space
- DVD/CD write and read capabilities
- Philips Remote Services connectivity* allows for virtual on-site visits for both clinical and technical support, provides faster resolution to issues and questions
- Direct digital storage of system configuration backup, including user-defined presets and OB trending data, to USB or DVD/CD
- Direct digital storage of single frame color and B/W images to internal hard disk, USB flash and compact disk
- Direct digital storage of B/W and color loops to internal hard disk, USB flash and compact disk
- Integrated multi-session CD allows storage of multiple individual studies to a single disk at different times rather than requiring single batch mode storage
- Integrated single session DVD
- Supports 4.7 GB compact disk
- Ability to export AVI clips and BMP images to USB flash for PC viewing
- Fully-integrated interface
- Extensive image management capability, including thumbnail image review, cineloop editing, and user-configurable patient reporting
- Study manager allows user to digitally acquire, review, and edit complete patient studies
- Exam directory
- Delete and replace recalled image capability
- Multiple study archive formats (palette color, RGB, YBR)
- DICOM 3.0 print and store service class user
- Multiple DICOM servers
- Multiple DICOM presets
- DICOM structured reporting for cardiac and Ob/Gyn
- Configurable print
- User may select images to print from all acquired images
- 10BaseT or 100BaseT Ethernet output
- Site configurable IP address, port and AE title
- Modality performed procedure step (MPPS)
- Modality Worklist
  - Works in conjunction with radiology and cardiology information systems
  - Automatic entry of patient demographics
- Ability to export report into PDF format to USB flash drive for PC viewing or printing
- Study reports available as DICOM images
- System can use lossy JPG image format with user configurable compression ratio

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Not all remote features available in all countries; contact your local Philips representative for details.

5. Transducers

Linear, curved, and sector transducers on the HD5 system support a wide variety of clinical exam requirements.

5.1 Transducer selection

- Electronic switching of up to three imaging transducers
- System supports up to 4 transducers to meet a wide range of clinical needs

Sector array

S4-2 broadband sector array

- 4 to 2 MHz extended operating frequency range
- High-resolution imaging for abdominal, Ob/Gyn, and cardiac applications
- Supports 2D, color, PW and CW Doppler, Tissue Harmonic Imaging and Color Power Angio imaging
- Biopsy kit available

Curved arrays

C5-2 broadband curved array

- 5 to 2 MHz extended operating frequency range
- High-resolution imaging for abdominal and Ob/Gyn applications
- Supports 2D, color, PW Doppler, Tissue Harmonic Imaging, and Color Power Angio imaging
- Multi-angle biopsy kit available

C8-4v broadband curved array

- 8 to 4 MHz extended operating frequency range
- End-fire sector, 11 mm radius of curvature, 135° field of view
- Supports 2D, color, PW Doppler, and Color Power Angio imaging
- Endovaginal applications
- Biopsy kit available

Linear array

L12-3 broadband linear array

- 12 to 3 MHz extended operating frequency range
- 15° of trapezoidal imaging
- High-resolution imaging for superficial applications including vascular, small parts, and musculoskeletal
- Supports 2D, color, Tissue Harmonic Imaging, PW Doppler, and Color Power Angio imaging

5.2 Transducer application guide

Transducers				
Transducer	**S4-2**	**C5-2**	**C8-4v**	**L12-3**
Type of array	Sector	Curved	Curved	Linear
Application				
Abdominal 0-4 cm		●		●
Abdominal 5-10 cm	●	●		●
Abdominal > 11 cm	●	●		
GYN vaginal 8-10 cm (maximum depth)			●	
GYN transabdominal < 10 cm		●		
GYN transabdominal > 11 cm		●		
OB vaginal 6-8 cm (maximum depth)			●	
OB 1st trimester 10 – 12 cm (maximum)	●	●		
OB 2nd trimester 12 –18 cm (maximum)	●	●		
OB 3rd trimester 15 – 20 cm (maximum)	●	●		
Pediatrics/neonatal abdominal small		●		
Pediatrics abdominal large	●	●		
Vascular 0 – 3 cm				●
Vascular 3 – 8 cm				●
Cardiac < 50 lb/22.7 kg	●			
Cardiac > 50 lb/22.7 kg	●			
Breast				●
Transcranial Doppler	●			
Small parts < 3 cm				●
Small parts > 3 cm				●
Musculoskeletal				●
Biopsy guides	Reusable	Reusable	Reusable	Reusable

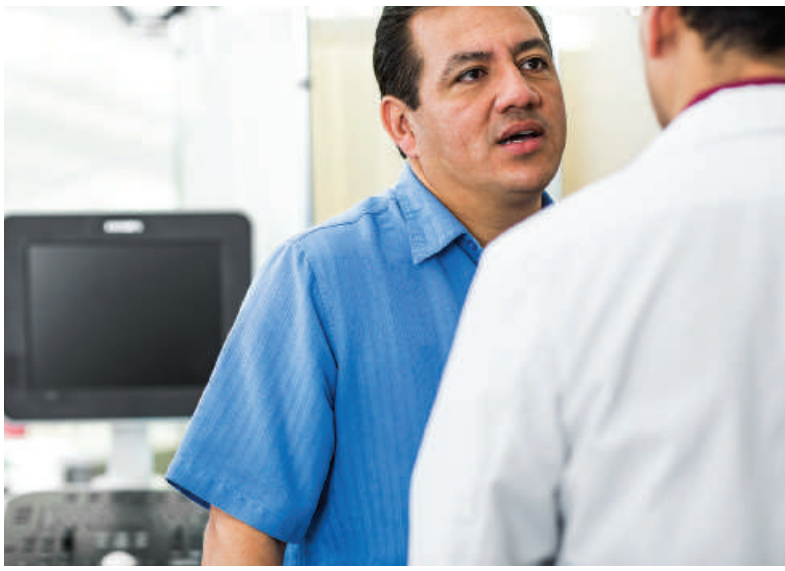
6. Measurement and analysis

6.1 Measurement tools

- 2D distance
- 2D circumference or area by ellipse, continuous trace, trace by points
- 2D curved-linear distance
- M-mode distance (depth, time, slope)
- Manual Doppler distance
- Manual Doppler trace
- Automatic Doppler trace – traces frozen spectral display to calculate and display user-selected measurements in most presets
- Time and slope measurements in Doppler and M-mode
  - Ao dec time
  - MV dec time
  - PA dec time
  - PA acc time
- Doppler values containing PI, RI, S/D indices
- 2D volume
- Heart rate
- Trackball-controlled electronic measurement calipers: eight sets
- User-defined protocols, measurements and equations
- On-the-fly measurement labels
- Fully editable results data sheet
- Integrated patient exam report
- Moveable results box can be moved to any corner of the screen
- User-defined measurements
- User-defined calculations
- User-defined fetal growth tables

6.2 QLAB analysis

- Optional off-line software facilitating advanced quantification for ultrasound
- Region of Interest (ROI) quantification
  - Image data content analysis
  - Contrast intensity analysis
  - Grayscale, Power/Angio
  - Calculate Mean, Median, and Standard Deviation of intensity per frame
  - Graphical display of time vs. intensity data
  - Curve-fit graphical data
  - Compare images and ROIs
- Automated measurement of Intima Media Thickness (IMT)
  - Automatic assessment of the IMT or user selected frame
  - Intended for carotid and other superficial arteries



6.3 Clinical option analysis packages

• Comprehensive measurements, calculations and application-specific reports with imbedded images, including expanded cardiac, vascular, Ob/Gyn, and general imaging capabilities for thorough exam documentation

General imaging analysis

- General abdominal
- Small parts
- Pediatric general
- Musculoskeletal

Ob/Gyn and fertility analysis

- Fetal biometry
- Biophysical profile
- Amniotic fluid index
- Early gestation
- Fetal long bones
- Fetal cranium
- Nuchal thickness
- Other OB measurements
  - 2D echo
  - Fetal heart M-mode
  - Fetal Doppler
  - Echo Doppler
  - User-defined fetal growth tables
- OB calculations and tables are user-definable
- OB trending data for up to ten studies per patient
- Gynecology and fertility
  - Uterus
  - Right and left ovary
  - Right and left follicles

Cardiac analysis

- Volume by area or length method
- M-mode analysis
- Peak and mean gradients
- Pressure half time
- Continuity equation
- Diastolic function
- Cardiac output
- Qp:Qs ratio
- Pulmonary vein analysis
- Valvular analysis
  - Proximal isovelocity surface area (PISA)
  - E/A ratio
- Ventricle analysis
  - Ejection fraction (via Teichholz or cubed method)
  - Simpson's biplane and single plane
  - LV mass
  - IVRT

Vascular analysis

- Abdominal vascular
- Cerebrovascular
- Transcranial vasculature protocols
- Right and left, lower and upper extremity protocols
- Optional tools – percent diameter area reduction
  - Automated finding codes and user comments

7. Physical specifications

Physical dimensions

Depth	73 cm
Height	136 cm
Control panel height (lowest edge)	80 cm
Width	55 cm
Weight	47 kg

High mobility cart

- Easy maneuverability
  - Front handles for portability
  - Four-wheel swivel ability
  - Two-wheel swivel lock and brake
  - Lightweight aluminum frame
- Palm rest
- Back deck provides easy access to hardcopy and documentation devices
- Built-in A/C line conditioner provides isolation from voltage fluctuation and electrical noise interference
- Internal high-capacity impeller fans with automatic speed adjustment to optimize cooling efficiency with minimal audible noise

Control panel

- Supports comfortable operation from standing and sitting positions
- Easy access of controls

Display

- 15-inch (327 x 254 mm)
- Tilt (+60/-90 degrees)
- Swivel (+/- 90 degrees)
- Brightness control, automatic backlight stability (BLS) control (BLS ensures quick warm-up and consistent light output over operational life)
- In-plane switching (SI-PS) panel for viewing angle and grayscale reproduction

Footswitch

- Three pedals
- Includes two user-definable record functions

ECG and physio

- One three-lead ECG input
- One external ECG input
- Two physio input channels (1V, p-p)
- Selectable ECG triggered skipping between 1 and 20

Localization options

Software	English, Simplified Chinese, French, German, Spanish, and Portuguese
Training and user documentation	English, Simplified Chinese, French, German, Spanish, Polish, Portuguese, Indonesian, Bulgarian, Romanian, Czech, and Hungarian
Online help	English, French, German, Simplified Chinese, and Portuguese

Power requirements

Power	1150VA
Power consumed	600VA
Frequency	50 to 60 Hz
Voltage	100 to 240 VAC

Power cords

- Available for electrical standards worldwide

Electrical safety standards

- CSA C22.2 No. 601.1
- IEC 60601-1
- UL 60601-1
- EN 60601-1

Environmental temperature

System	0 – 40° C at 20-80% relative humidity
VCR and printers	0 – 40° C at 80% relative humidity (non-condensing)
Heat dissipation	<2500 BTUs/hour (fully loaded)

8. Maintenance and services

Maintenance

- Proven reliable platform
- Easy customer access to trackball and air filter for cleaning
- Optional service agreements to
  - Contain risk
  - Maximize uptime
  - Access Philips best-in-class service

Service

- Clinical applications support available
- Philips Remote Services connectivity* allows for many advanced service features, including:
  - Virtual on-site visits for both clinical and technical support in order to provide fast resolution to issues and questions
  - Remote clinical education
  - Remote log file transfer reduces downtime by allowing fast diagnosis of problems by call center personnel
  - Online support request
    - Simplifies support engagement
    - Provides fast response to clinical questions and technical issues
    - User can enter request directly on ultrasound system
  - Proactive Monitoring
    - Assists in preventing unscheduled downtime
    - Monitors key system parameters.
    - Sends an alert to Philips call center so action can be taken before system operation is affected
- Optional Utilization Reports provide data to help manage the site's ultrasound assets
  - System and transducer usage information
  - Data on number and types of studies, as well as study duration
  - Provides data for staff credentials and accreditation
  - Helps identify opportunities for outreach and referral communications

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