Mindray DC-3 Diagnostic Ultrasound System

A General-Purpose Color Doppler Ultrasound System
**General Information**

**Dimensions and Weight**
- Height: 1209~1570 mm (47.6~61.8 in)  *Panel and LCD dependent*
- Width: 460mm (18.1 in)
- Depth: 730mm (28.7 in)
- Weight: approx. 91.5kg (201.7 lb.)

**Electrical Power**
- Power supply voltage: 100 ~ 127 VAC or 220 ~ 240 VAC
- Power supply frequency: 50/60 Hz
- Power consumption: 600 VA

**User Interface**

**Operation panel**
- Soft keys for frequent used functions
- Home based and function group design
- Alphanumeric keyboard
- 8-segment TGC with re-mapping functionality at any depth)
- Interactive backlit keys

**Display screen**
- High resolution color LCD
  - Diagonal dimension: 15 inch
  - Resolution: 1024X768
  - Brightness adjustment
- Integrated speaker
  - Volume adjustable

**Ergonomic designs**
- Operation navigation: logical instruction for most operations
- System hibernation: auto switch off transducer transmitting and launch screen saver

**System Overview**

**Applications**
- Abdomen
- Cardiology
- Gynecology
- Obstetrics
- Urology
- Small Part
- Pediatrics
- Musculoskeletal
- Orthopaedics
- Intraoperative
- Peripheral Vascular
- Transcranial Doppler

**Scanning method**
- Electronic convex
- Electronic linear
- Electronic sector

**Transducer types**
- Convex array
- Micro-convex array
- Linear array
- Phased array

**Image Modes**
- B mode
- M mode
- Pulse Wave Doppler (PW)
- Continuous Wave Doppler (CW, Option) *
- CDFI (Color Doppler Flow Imaging)
- Power (Power Doppler Flow Imaging)
- DirPower (Directional Power Doppler Flow Imaging)

**Special imaging features**
- Tissue harmonic imaging
- Steer scanning for linear transducers (B, color/power, PW/CW* independent)
- Trapezoid imaging for linear transducers
- HPRF for PW
- Multi-frequency for both 2D and Doppler imaging

**Display mode**
- Quad/dual display (for B, color and power modes)
- B/C Live (B and color simultaneous comparison display)
- Duplex mode for simultaneous B and PW/CW*
- Triplex mode for simultaneous B, color/power, and PW/CW*
- Time line display: left/right and top/bottom (1:1, 1:2, Full)

**Standard configuration**
- High resolution 15 inch LCD display
- Pulse Wave Doppler
- HPRF
- Color Doppler Flow Imaging
- Power Doppler Flow Imaging
- Directional Power Doppler Flow Imaging
- Tissue Harmonic Imaging
- Trapezoid Imaging
- iBeam (Spatial compounding imaging for linear probe)
- iTouch™ (Automatic image optimization by pressing one button)
- 80G integrated hard disk
- iStation™
- USB ports
- Ethernet port
- S-video out port and cable
- Measurement and calculation software packages
- Multi-language screen display
- Convex transducer 3C5A(2.5/3.5/5.0/H5.0/H6.0MHz)
- DVD-RW

**Software options**
- DICOM 3.0 software
- Free Xros™ Imaging (Anatomic M mode) *
- iScape™ View (Panoramic imaging, or extended field of view)
- Smart3D™ (Freehand 3D)

**Hardware option**
- Transducers
- Needle guide brackets
- ECG module with electrode and cables (AHA/IEC)
- Water-resistant footswitch

**Peripherals**
- Thermal B/W video printer
- Thermal color video printer
- Digital video B/W or color printer
- USB text/graphic printer
- VCR
- DVD recorder

**Imaging processing and presentation**

**System architecture**
- Powerful Multi-beam Parallel Imaging (MBP)
- Fine Tissue Optimization (FTO)
- Transmitting Spectrum Focusing (TSF)
- Innovative Transmitting Apodization (ITA)
- Accurate Vessel Imaging (AVI)

**Intelligent digital imaging process**
- iTouch™: *automatic image optimization*
- IP(image processing): *one key for B and color image fast optimization*
- Q-click™: *quick adjustment for parameters displayed on screen*

**Imaging platform**
- All digital broad band beam-former
- 1024 digital processing channel technology
- Display depth
  - Minimum: 26 mm, transducer dependent
  - Maximum: 308 mm, transducer dependent
- Focus
  - 1~4 focus points selectable (depth dependent)
  - Up to 8 focal positions selectable (depth dependent)
- Wideband processing technology
  - Fundamental frequencies: 3 steps
  - Harmonic frequencies: 2 steps
  - Doppler frequencies: 2 steps
- Gray scale: 256 levels
- Total system dynamic range: 192dB
- Zoom
  - RAZ (regional acoustic zoom) * and pan zoom
  - PIP (picture in picture)
  - Zoom ratio (up to 400%)
  - For real-time or frozen images

**B mode**
- Acoustic Power (10~100%, 6% step)
- Gain (0-100%)
- TGC (8 segments, with re-mapping functionality at any depth)
- Frame Rate (up to 396 f/s, probe dependent)
- Focus Number (1~4)
- Focus Position (8 steps)
- Scan Range (N, M1, M2, W)
- Line Density (L, H)
- Steer (-6°, 0, 6°)
- TSI (General, Muscle, Fat, Fluid) *tissue specific imaging*
- Display Dynamic Range (up to 100dB)
- Frame Average (0~7)
- Noise Rejection (0~3)
- Image enhancement (off, 1~5)
- IP (1~8) *image processing including Dynamic Range, Edge Enhance, Frame Average, Smooth, AGC, Noise Rejection*
- Colorize Map(1~7)
- Gray Map (Map1~Map8)
- Gray Transform
- Gray Rejection
- γ correction (0~3)
- Rotate (0°, 90°, 180°, 270°)
- Reverse (left/right, up/down)

**M mode**
- Display mode: Scroll
- Sweep Speed (1, 2, 4, 8 s/screen)
- Gain (0~100%)
- Display Dynamic Range (up to 100dB)
- M soften (0~4)
- Gray Map (Map1~Map8)
- Time mark (On, Off)
- Colorize Map (1~7)

**Color mode**
- Gain (0~29dB)
- Frequency (2 frequencies)
- Frame Rate (up to 448f/s, probe dependent)
- Steer (-12°, -6°, 0°, 6°, 12°)
- PRF (1.3kHz~14.5kHz)
- Scale (±2.3cm/s to ±246cm/s, up to 492cm/s in one direction, probe dependent)
- Baseline (17 levels)
- Map (1~11) *color map*
- Wall Filter (0~7)
- Line density (L, H)
- Packet size (0~4)
- Flow state(L, M, H)
- Smooth (0~4)
- Persistence (0~4)
- Contrast (0~3)
- Priority (0~100%)
- Map Reverse
- Focus Position (10 levels)
- B/C Wide (On, Off) *automatically adjust the B image size according to the color ROI*
- ROI Color (Off, Red, Green, Blue, Cyan, Mag, Yellow, White)
- B/C Live (On, Off)
- Image Display (On, Off)

**PW/CW** mode

*CW mode is available only with phased array transducers.

- PW frequency (2 frequencies)
- PRF (1.3kHz~11.4kHz)
- PW Scale (±6.1cm/s~±291.7cm/s, up to 583.4cm/s in one direction, probe dependent)
- CW Scale (±0.61m/s~±15.04m/s, up to 30.08m/s in one direction, probe dependent)
- Baseline (9 levels)
- Sweep speed : 1, 2, 4, 8s/screen
- Sample Volume (0.5~15mm)
- Sample Volume Depth (up to 308mm)
- Steer (-12º, -6º, 0º, 6º, 12º)
- Angle correlation (-80º~80º)
- Colorize Map (1~7)
- Wall Filter (7 levels, scale dependent)
- Auto Trace (Vmax, Vmean, Vmode)
- Triplex (On, Off)
- Threshold (0~5)
- Trace Area (Below, Above, All)
- Trace smooth (off, 1~4)
- Audio (on, off)
- Time mark (On, Off)
- Full screen (On, Off)

**ECG**

- Gain
- Position
- Trigger mode (single, dual, AT, timer)
- HR display

**Power/DirPower** mode

- Display Dynamic Range (up to 70dB)
- Power Map (1~8)
- Line density (L, H)
- Packet Size (L, M, H)
- Smooth (0~4)
- Persistence (0~4)
- Contrast (0~3)
- Priority (0~4)
- Reverse (On, Off)
• B/C wide (On, Off) automatically adjust the B image size according to the ROI
• LVR (off, 1~7) Low velocity resistance
• Focus Position (10 levels)
• ROI color (Off, Red, Green, Blue, Cyan, Mag, Yellow, White)
• B/C Live (On, Off)
• Image Display (On, Off)

**Free Xros™ M+ (option)**
• Free Xros™ M is also called anatomical M mode
• Available on all convex, linear and phased array probes
• Based on real-time imaging or cine loop of B mode
• Sweep Speed (1, 2, 4, 8 s/screen)
• Image Enhance (off, 1~3)
• Gray Map (Map1~Map8)
• Colorize Map (1~7)
• Time mark (On, Off)
• Store and review Free Xros™ images
• Store and review cineloop
• All M measurement items available

**iScape™ View (option)**
• iScape™ view is also called extended field of view imaging, or panoramic imaging.
• Available on all linear array probes
• Based on real-time imaging of B mode (not available in Color or Power mode)
• Displays up to 40cm in length (frame rate and scanning speed dependent)
• Rotate (1°/step)
• Colorize Map (1~7)
• Zoom (10%~400%), Actual Size, Fit Size
• Store and review iScape™ images
• Store and review cineloop
• All 2D measurement items available, except depth, profile and histogram

**Smart3D™ (option)**
• Smart3D™ is also called freehand 3D.
• Available on all convex, linear and phased array probes without sensor
• Method (Linear, Fan)
• Distance (1~50cm)
• Angle (10°~80°)
• Rendering (Surface, Max, Min, X-ray)
• Threshold (0~63)
• Contrast (0~39)
• Brightness (0~39)
• Colorize Map (1~7)
• Single or quad display
• Rotate
• Store and review Smart3D™ images
• Cut

**Cineloop**
• Support 2D, M, Spectral Doppler, Color, Power, DirPower
• Simultaneous and independent review in duplex/triplex mode
• ECG wave for retrospective review
• Capacity:
  - B, Color, Power, DirPower: Maximum >1200 Frames
  - M, Spectral Doppler: Over 131s
• Variable cine playback speed
• User-define start and end frame of cine storage
• Permanent storage in hard disk and display in real-time and duplex modes
• iVision: Slides show function

**iStation**
  Intelligent patient information management platform
• Quick image and cine storage
• Auto image review: *automatic browser, icon review*
• Offline analysis system
• Professional clinical reports with images embedded
• Integrated search engine for patient information
• Intelligent data backup
• Support DICOM worklist from server and file transportation in DICOM format on internet (option)

**Storage**
• 80 GB integrated hard drive
• Standard DVD R/W
• USB ports
• Still images storage format: BMP, JPG, DCM and FRM (defined by Mindray, supporting offline analysis function)
• Cine loops storage format: AVI, DCM and CIN (defined by Mindray, supporting offline analysis function)

**Measurement and Calculation**

**General Measurement package**
- Software packages for various specific clinical use
General Measurement package

- General B mode measurement
  - Depth
  - Distance
  - Angle
  - Area
  - Volume
  - Ratio
  - Cross Line
  - Parallel Line
  - Trace Length
  - B Profile
  - B Histogram

- General M mode measurement
  - Distance
  - Time
  - Slope
  - Heart Rate
  - General Color mode measurement
  - Color velocity

- General PW/CW* mode measurement
  - Velocity
  - Acceleration
  - Resistance index
  - Spectrum trace
  - Heart rate

Clinical Analysis Packages

- Obstetrics
  - Fetal measurement
  - Fetal weight calculation
  - Calculation items, such as HC/AC, FL/AC, FL/BPD, AXT
  - Amniotic fluid index
  - Fetal biophysical profile
  - Fetus Doppler measurement
  - Multi-fetus exam
  - Estimated delivery date display
  - Growth Curve: Four curves display for comparison

(GA calculation formulas include but may not be limited to the following: Tokyo, Hadlock, Jeanty, Hohler, Merz, Kurtz, Sabbagha, Hansmann, Rempen, Osaka, Chitty, O'Brien and Warda. EFW formulas include Hadlock1, Hadlock2, Hadlock3, Hadlock4, Shepard, Merz1, Merz2, Hansmann, Tokyo, Osaka and Campell.)
- Cardiac
  - Left ventricular function measurement
    - Single Plane Ellipse method
    - Biplane Ellipse method
    - Bullet method
    - Simpson’s method
    - Simpson’s Single Plane Ellipse method
    - Simpson’s Biplane Ellipse method
    - Cube method
    - Teichholz method
    - Gibson method
  - Left ventricular
  - Right ventricular
  - Aortic
  - Main pulmonary artery
  - Mitral valve
  - Tricuspid valve
  - Pulmonary valve
  - Pulmonary vein valve
  - Volume flow
  - Heart rate
  (Cardiac calculation results include but may not be limited to the following items: HR, EDV, ESV, SV, CO, EF, CI, SI, LV Mass, LVMWI, FS, MVCF, ET, PHT, MV-Area, VTI, MPG, MV-IRT, MV-DcT, RVSP, AoV-Area, RV-ET, RV-AcT, RV-PEP, RV-AcT/ET, RV-STI, PV DcT, PV-SF and Volume Flow.)

- Gynecology
  - Endometrium
  - Uterus
  - Uterine cervix
  - Uterus/cervix
  - Ovary
  - Follicle

- Small Parts
  - Thyroid

- Urology
  - Prostate
  - Left/right Seminal Vesicle
  - Left/right Renal
  - Left/right Adrenal
  - Residual Volume
  - Left/right Testicular

- Orthopedics
- Hip angle: BL, IL, ARL, Angle between BL/ARL, Angle between BL/IL

- **Peripheral Vascular**
  - Left/right Distal Common Carotid Artery
  - Left/right Middle Common Carotid Artery
  - Left/right Proximal Common Carotid Artery
  - Left/right Distal Internal Carotid Artery
  - Left/right Middle Internal Carotid Artery
  - Left/right Proximal Internal Carotid Artery
  - Left/right Distal External Carotid Artery
  - Left/right Middle External Carotid Artery
  - Left/right Proximal External Carotid Artery
  - Left/right Distal Vertebral Artery
  - Left/right Middle Vertebral Artery
  - Left/right Proximal Vertebral Artery
  - Left/right Distal Subclavian Artery
  - Left/right Middle Subclavian Artery
  - Left/right Proximal Subclavian Artery
  - Left/right Distal Subclavian Vein
  - Left/right Middle Subclavian Vein
  - Left/right Proximal Subclavian Vein
  - Left/right Bulbillate
  - Innominate Artery
  - Left/right Upper Extremity
  - Left/right Lower Extremity
  - Volume flow
  - Stenosis

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**System Setup**

**User define functions**
By user-define function, users could

- Customize twenty four user-define exam modes, including but not limited to
  - Exam mode name
  - Imaging parameters
  - General measurement items for each imaging mode
  - Measurement packages
  - Obstetric formula
  - Comment library
  - Body mark library

- Create new measurement items, or new calculations based on measurement results
- Set volume calculating index
- Assign frequently used functions to user-define buttons on control panel and foot switch
- Adjust key volume, key lightness and trackball speed

**Multi-language**
Screen display, keyboard layout and user manuals support
- English
- French
- German
- Spanish
- Portuguese
- Italian
- Russian
- Chinese

**Operation system**
- Windows™ XP professional Edition with SP2

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### Transducers

**Transducer selection**
- Four transducer ports (3 active, 1 hanger)

<table>
<thead>
<tr>
<th>Model name</th>
<th>Array type</th>
<th>Multi-frequency (MHz)</th>
<th>Doppler frequency (MHz)</th>
<th>Scanning Angle /length</th>
</tr>
</thead>
<tbody>
<tr>
<td>3C5A</td>
<td>Convex</td>
<td>2.5/3.5/5.0 H5.0/H6.0</td>
<td>2.5/3.3</td>
<td>68°</td>
</tr>
<tr>
<td>7L4A</td>
<td>Linear</td>
<td>5.0/7.5/10.0</td>
<td>5.0/5.7</td>
<td>35mm</td>
</tr>
<tr>
<td>6CV1</td>
<td>Endocavity</td>
<td>5.0/6.5/8.0</td>
<td>4.4/5.0</td>
<td>140°</td>
</tr>
<tr>
<td>6LB7</td>
<td>Biplanar</td>
<td>5.0/6.5/8.0</td>
<td>Convex 4.4/5.0 Linear 3.7/4.6</td>
<td>Convex 168° Linear 62mm</td>
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<tr>
<td>10L4</td>
<td>Linear</td>
<td>8.0/10.0/12.0</td>
<td>7.3/8.0</td>
<td>35mm</td>
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<tr>
<td>7L6</td>
<td>Linear</td>
<td>5.0/7.5/10.0</td>
<td>5.0/5.7</td>
<td>56mm</td>
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<tr>
<td>6LE7</td>
<td>Intrarectal</td>
<td>5.0/6.5/8.0</td>
<td>4.4/5.0</td>
<td>62mm</td>
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<tr>
<td>6C2</td>
<td>Micro-convex</td>
<td>5.0/6.5/8.0</td>
<td>4.4/5.0</td>
<td>93°</td>
</tr>
</tbody>
</table>
Inputs and outputs

- Serial port: 1
- Parallel port: 1
- S-video in: 1
- S-video out: 1
- Video in: 1
- Video out: 1
- Audio in: 2
- Audio out: 2
- VGA in: 1
- VGA out: 1
- RGB in: 1
- RGB out: 1
- USB port: 4
- Ethernet: 1
- Remote control: 1
- Footswitch port: 1
- System power in: 1
- Auxiliary power out: 3
- Ground pole: 1
- Equal potential pole: 1
- Microphone port: 1
- Reset button: 1

Operating conditions

- Ambient temperature: 0°C to 40°C
- Relative humidity: 30% to 85% (no condensation)
- Atmospheric pressure: 700 hPa to 1060 hPa

Storage and transportation conditions

- Ambient temperature: -20°C to 55°C
- Relative humidity: 30% to 95% (no condensation)
- Atmospheric pressure: 700 hPa to 1060 hPa

Quality Standards

- ISO 9001:2000
- ISO 13485:2003
**Design Standards**

- UL 60601-1
- CSA C22.2 No. 601-1
- EN 60601-1 and IEC 60601-1
- EN 60601-1-1 and IEC 60601-1-1
- EN 60601-1-2 and IEC 60601-1-2
- EN 60601-2-37 and IEC60601-2-37

**CE Declaration**

DC-3 system is fully in conformance with the Council Directive Concerning Medical Devices 93/42/EEC. The number adjacent to the CE marking (0123) is the number of the EU-notified body that certified meeting the requirements of Annex II of the Directive.

*Not available yet.*