

# HITACHI

Inspire the Next

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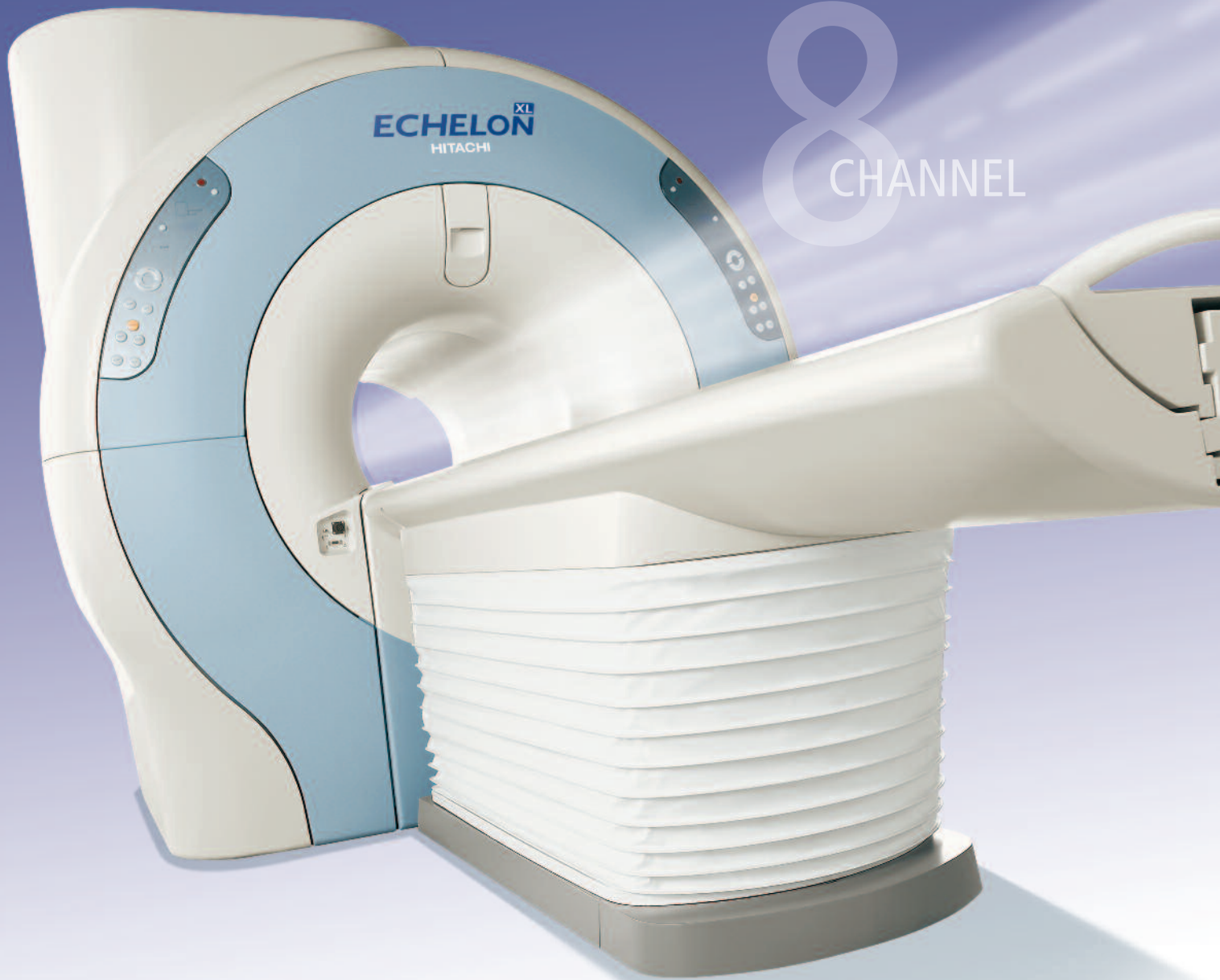
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The Echelon™ platform sets a high standard for fully-featured high performance 1.5T systems that meets the daily demands of MR imaging. And when you get down to specifics, the Echelon XL shines through with performance attributes only Hitachi can put together in one dynamic package. The Echelon platform applies our experience in the site placement of over 1500 MR systems in North America, each Echelon XL represents the Hitachi reputation for high quality, reliability and customer support. There is no comparison in investment value.

- RF Technology and Gradient features that define Hitachi as an innovator focused on patient-friendly MR
- High-field clinical utility with advanced capabilities
- Full featured and flexible – configure the Echelon XL ideally for your MR environment
- Flexibility to upgrade Echelon XL to 16 channel XLS
- Leadership in the guarantee of maximum up-time
- And feet first positioning for all scans - an Echelon exclusive assuring patient comfort and high throughput

**For advanced clinical performance, low lifecycle costs, reliability and the assurance of imaging excellence far into the future, look to Echelon.**

# Echelon 1.5T XL. Power. Speed. Versatility.

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# POWERFUL

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Delivering imaging excellence without compromise. Look beyond Echelon XL equipment features and see the true excellence Hitachi MR technologies add to performance.

Echelon XL Defines What a 1.5T Must be to Truly Offer fully-featured High Performance.

A thorough look at Hitachi and the Echelon XL assures you have an outstanding 1.5T. Echelon XL clearly defines your MR services with unsurpassed patient comfort. A list of superior application features. And the best investment value in MR today.

## The Value Standard in 1.5T MR

- 33/150 gradient system
- 8 channel RF system
- HOAST™ – Higher Order Active Shim Technology
- Multiple coil ports
- VERTEX™ computer system
- An advanced reconstruction engine
- Hitachi service and support that keeps your system at optimal performance and your throughput at maximum

*And the ability to add RAPID™ for parallel imaging and RADAR™ for motion compensation.*

# Feature for Feature, This Is The Best High Performance 1.5T Imaging System You Can Invest in Today – For Everyday Ahead.

## ADVANCED

### Fully-Featured, High-Field Performance, Reliable MR Imaging

#### Magnet System

The heart of Echelon XL is a high performance, superconducting magnet. It delivers high homogeneity and low cryogenic boil-off.

- **Superconducting magnet**
- **Horizontal field**
- **1.5T field strength**
- **Homogeneity: <0.5 ppm@30 cmDSV (VRMS)**
- **Shimming**
  - Passive iron shim
  - Per-patient higher order active shim (HOAST)
- **Active magnetic shielding**
- **5-Gauss fringe field**
  - Axial: 13.1 ft (4.0m)
  - Radial 8.2 ft (2.5m)
- **Helium cryogen**
- **Refill interval**
  - Once every six years with continuous power and HMSA-approved maintenance

#### Gradient System

Echelon XL provides for rapid acquisition of high-resolution images. High peak strength and slew rate allow the user to select short echo times, small fields-of-view, high matrices and thin slices.

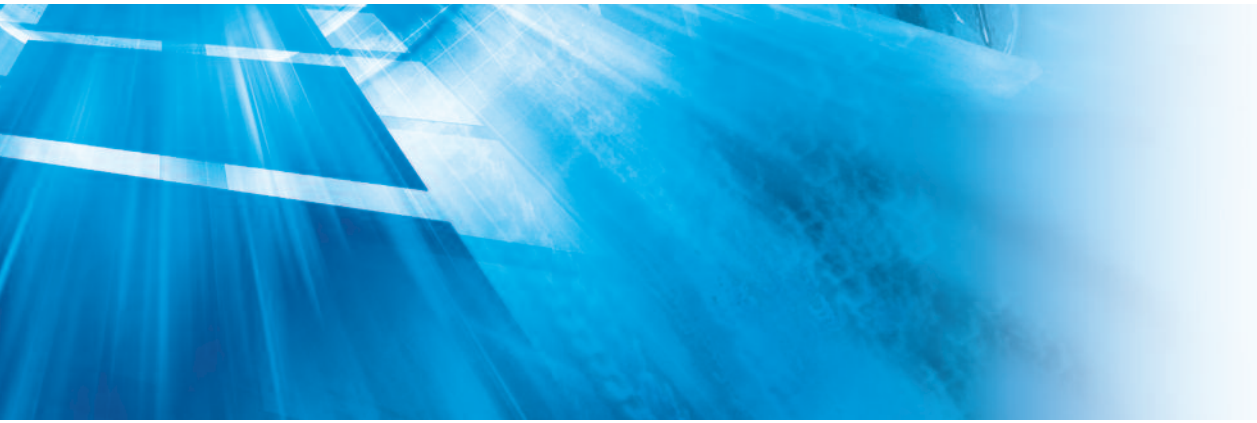
- **Peak strength: 33mT/m**
- **Slew rate: 150T/m/s**
- **Active shielding**
- **Water cooling**
- **Eddy current compensation**
  - Computer-optimized
  - B0 compensation
- **Max average acoustic noise: <120 db**
- **SoftSound™ noise reduction**
  - Mechanical gradient noise dampening
  - Low noise sequence mode

#### Radio Frequency System

Here's the power of versatility. An 8 Channel RF system for advanced applications. Multi-array coil designs for excellent anatomical coverage and signal uniformity. Four tabletop coil plug-in points ensure flexibility. And you can add Hitachi's RAPID™ parallel imaging technology.

- **Solid state transmitter**
  - Peak envelope power: 20kw
- **Digital receiver**
  - 8-channels standard
  - Low noise preamplifiers
- **Available receiver coils**
  - Integrated transmit/receive
  - Quadrature head
  - General purpose coil pair
  - Multiple array coils
    - 8-channel Brain
    - 8-channel Torso
    - 6-channel Cervical spine
    - 8-channel CTL
    - 5-channel Shoulder
    - 8-channel Knee
    - 7-channel Breast
    - 8-channel Foot/Ankle
    - 8-channel Peripheral Vascular
    - 4-channel Wrist
    - 8-channel Neuro Vascular
    - 4-channel Upper Extremity





## Patient Management System

The short bore and wide aperture provide an inviting patient environment without compromising clinical utility. And the large, high-capacity patient table, comfortably supports a broad range of body types.

- Patient aperture: 24in (61cm)
- Table weight limit: 500lb (225kg)
- Table width: 28in (70cm)
- Longitudinal motion: 20cm/s
- Total longitudinal travel: >9 ft (280cm)
- Vertical range: 19.5-33.5in (49.5-85.2cm)
- Class II laser positioning
  - +/-1mm accuracy
  - Automatic movement to isocenter



- **Complete Gantry control panels**

- Table control
  - Up/down
  - In/out (slow/fast)
  - Table position in mm
  - Move to isocenter
  - Stop
  - Release
  - Laser
  - Clear
- Scan control
  - Start/abort/pause

- **Patient amenities**

- Patient communication
  - Two-way intercom
  - Technologist alert system
- Adjustable bore illumination
- Adjustable bore ventilation
- Patient pads and immobilization straps

# Only Hitachi Has The Clinical Performance Attributes To Optimize Each Scan.

# FOCUSED

## VERTEX™ Computer System

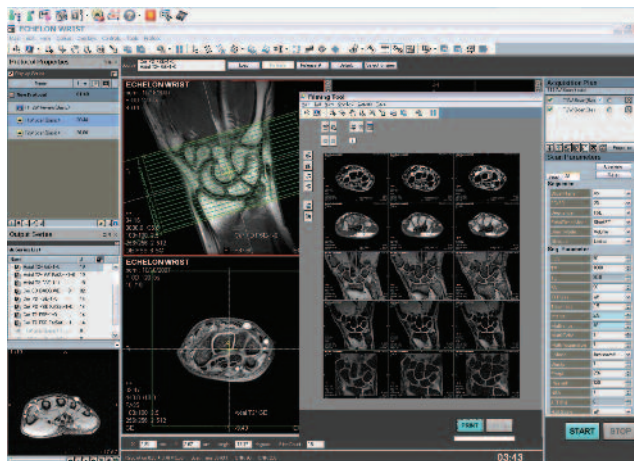
The Echelon XL computer system integrates a dual core CPU and an advanced scan/reconstruction engine. This parallel processing design assures maximum workflow and patient throughput.

### CPU

- Core2Duo microprocessor
- 3GB RAM
- Display
  - 24in LCD color monitor
  - Display matrix:1920x1200
- Magnetic disk
  - 250GB
  - Stores up to 400,000 images (256x256)
- DVD-RAM archive
  - Media capacity: 9.4GB
  - Stores up to 60,000 images (256x256)
- CD writer (includes auto-launching PC viewer software)

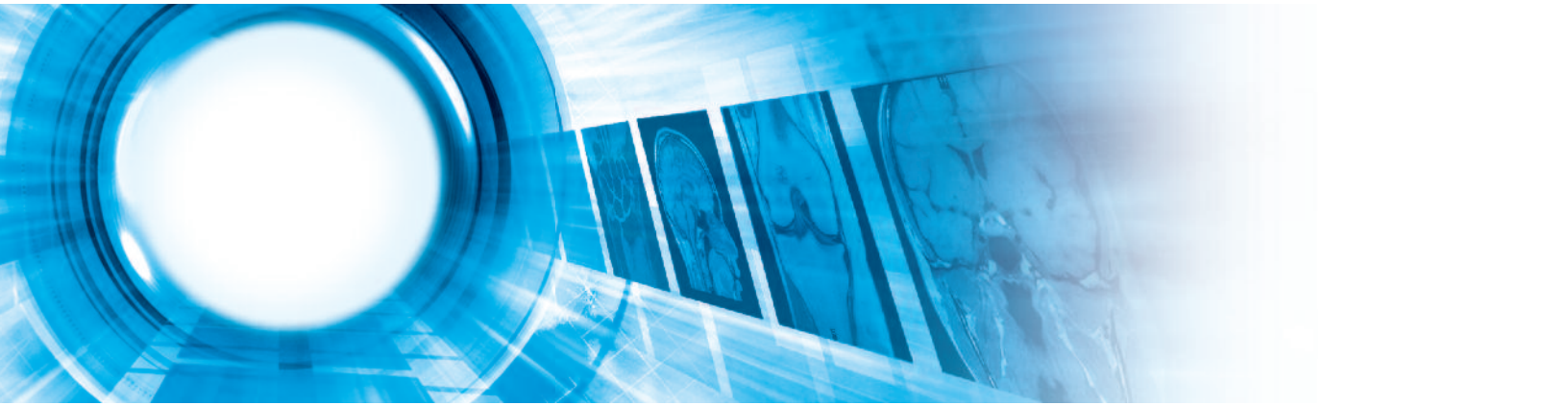
### Scan/Reconstruction Engine

- Multiple processors
  - Data acquisition
  - Pulse sequence control
  - Digital receiver
  - Image reconstruction
  - Post-image reconstruction
- 1GB per channel RAM
- Simultaneous scan and reconstruction



The powerful computer architecture of Echelon enables uninterrupted completion of complex post processing tasks while users multi-task (scanning, archiving and filming). Post processing and image transfer tasks status are reviewable in the Job Queue dialog.





## ORIGIN™ MR Operating Software

A Windows® based operating software that guides the user through demanding clinical applications and protocols. From patient registration through scan set-up to image archiving –ORIGIN™ driven operating software is easy to understand.

- **Log-on screen**
  - Normal and Audit user privileges
- **MR software launcher**
- **Patient information management**
  - Registration window
    - User-defined data fields
    - Automated study ID assignment
    - Rapid registration mode
  - Registration from HIS/RIS
  - Patient data correction feature
- **Patient directory**
  - Directory management through drag-and-drop
  - Patient/study view
  - Modality worklist management
  - Search capability
- **Patient scanning**
  - Protocol library organized by anatomical groups
    - User-defined protocols
  - Graphical selection
  - Exam window
    - Multiple viewports for easy set-up
    - 2-point and 3-point positioning
    - Multi-angle positioning
    - Image centering function
    - Interactive scan
    - Easy sequence selection and parameter adjustment
    - Basic and advanced parameter screens
- **Preview window for quick review of completed scans**
  - Independent patient windows
- **Processing tasks**
  - Max/Min intensity projection (MIP)
  - Multi-planar reconstruction (MPR)
  - Vascular volume rendering
  - Addition/subtraction
  - T1- and T2-calculated images
  - Multislice Dynamic analysis
  - Diffusion analysis
    - ADC
    - Isotropic DWI
  - Post-reconstruction functions
    - Filtering
- **Film, archive, and network functions**
  - Flexible filming options
  - Drag-and-drop archiving/restoring
  - DICOM 3.0 compliant
    - Print
    - Query/retrieve
    - Storage
    - Storage commitment
    - Modality worklist management
  - Workflow Plus - IHE Scheduled Workflow profile support
  - Security features
    - Login with password
    - Normal and Audit user privileges
    - Timeout
    - Audit log
- **Image review tools**
  - WW/WL
  - Magnify
  - Pan
  - ROI
  - Image Rotation
  - Measurement
  - Cine
  - Comment/Label
  - Statistics



- **Sentinel™ remote customer support**
  - Remote system and cryogen monitoring
  - Remote desktop
  - Image download



# Advanced Applications for Outstanding Clinical Utility.

# VERSATILE

## Clinical Suites

Echelon XL's Neurological, Orthopedic, and Body imaging capability is delivered by powerful gradient technology, sensitive receiver coils and a wide range of flexible pulse sequences and acquisition and protocol enhancements.

## Pulse Sequences

- **Spin echo (SE)**
  - Up to 4 echoes
- **2D/3D gradient echo (GE)**
- **Inversion recovery (IR)**
  - FLAIR
  - STIR
  - Magnitude and Real (Real-IR) reconstruction
- **Fast spin echo**
  - Echo factors: 2-256
  - User-defined inter-echo time
  - User-defined echo allocation
    - ADA
    - Centric
    - Anti-centric
    - Sequential
  - Single shot FSE
    - Ultra-fast acquisition
    - Ultra-high EF for MRCP plus MR urography and MR myelography
  - Driven equilibrium
    - Increases SNR and contrast without increasing TR
    - Reducing TR can decrease scan time while retaining SNR and contrast
  - Prime FSE
    - Excellent depiction of anatomy in the presence of prostheses

- **Fast Inversion Recovery (FIR)**
  - Echo factors: 2-256
  - Inversion time: 20-8000ms
  - Driven equilibrium
  - Magnitude and Real (Real-IR) reconstruction
- **Steady-State Acquisition Rewound Gradient Echo (SARGE)**
  - RF-spoiled (RSSG) provides T1 weighting
  - Rephase SARGE provides flow compensation to reduce artifacts
  - Balanced (BASG) provides high SNR and bright fluids
  - Time-reversed (TRSG) T2-weighted fluoro acquisition
- **Diffusion-weighted acquisitions**
  - Single shot SE-EPI
  - B-factor: 0-2000 sec/mm<sup>2</sup>
  - Fat saturation
  - IR pulse

## Acquisition & Protocol Enhancements

Echelon XL offers multiple methods for fat suppression, motion compensation and many other image quality features. Combine these with the host of other attributes standard with the Echelon XL and the result is high quality images.

- Image plane selection
  - Transverse
  - Sagittal
  - Coronal
  - Single and double oblique
  - Multi-slice, multi-angle
- Prescan
  - RF power adjustment
  - Center frequency
  - Shim adjust
- User-defined regional shim

- Fat suppression
  - RF fat saturation
  - Fast STIR (FIR)
  - STIR
  - Water excitation
  - In- and out-of-phase gradient echo
- Motion compensation
  - Gradient rephasing
  - Up to 8 presaturation pulses
  - Walking presaturation
  - Cardiac gating with arrhythmia rejection
  - Peripheral pulse gating with arrhythmia rejection
  - Respiratory gating
  - Diaphragm navigation echo
- User-variable bandwidth
- Dual slice acquisition
- Rectangular field-of-view
- Anti-aliasing
- User-defined inter-echo time
- Half scan and 3/4 scan
- Half echo
- Asymmetric measurement imaging (AMI)
- Real-time image quality tool
- Natural™
  - Optimal image uniformity

- **Imaging parameters**

Echelon XL imaging parameters are the foundation for outstanding performance. Powerful gradients and RF subsystem provide sub millimeter slice thicknesses and short echo and inter-echo times.

- Slice thickness
  - 2D: 0.7- 100mm
  - 3D: 0.05-5mm
- FOV: 3-50cm
- TR: 1.3-20,000ms
- TE: 0.5-7,680ms
- TI: 20-8,000ms
- Inter-echo time (IET)
  - FSE: 4.4-30ms
  - EPI: 0.4-7ms
- Flip angle (FA)
  - SE: 3-120
  - GE: 3-90
- Signals averaged: 1-99
- 3D multi-slab: 32
- Maximum number of 2D slices
  - 256 (512x512)
- Maximum number of 3D slices
  - 512 (512x512)
- Acquisition matrices
  - Up to 1024x1024
- Reconstruction matrices
  - Up to 2048x2048



## VascularSuite

Vascular imaging capability is empowered by comprehensive sequences and post-processing tools – the crucial components for high quality imaging of vascular structures.

- **Non Contrast MRA (VASC™)**

- For patients with renal insufficiency
- Arterial and Venous applications

- **Time of Flight (TOF)**

- 2D and 3D
- Minimum TE: 0.7ms
  - Multi-slab support on 3D acquisitions up to 32
  - MTC
  - Sloped slab profile (SSP™)

- **Bolus MRA**

- 3D RF-spoiled SARGE (RSSG)
- K-space filling techniques defined by user
- Breath hold
- Fluoro triggering (FLUTE™)
- Time-resolved MRA (TRAQ™)

- **Image Processing and Review**

- Max/Min intensity projection (MIP)
- Vascular volume rendering
- Multi-planar reconstruction (MPR)

# Your Echelon XL Comes with the Industry's Most Comprehensive Ownership Experience.

# COMPLETE

Echelon XL continues the Hitachi tradition of advancing MR systems beyond the technology you expect with cost-effective siting and operation. Echelon's remarkable design attributes make it accommodating to existing facilities and easily planned into new construction. As an acknowledged leader in imaging placements, Hitachi offers a wealth of site planning experience and a proven system for efficient siting, installation and start-up.

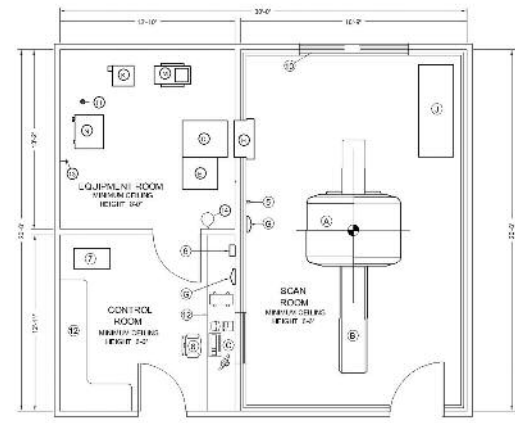
## Component Dimensions

- **Gantry**
  - Length: 63in (1600mm)
  - Width: 82.7in (2100mm)
  - Height: 86.6in (2200mm)
  - Bore diameter: 24in (610mm)
  - Weight: 13200lbs (6000kg)
- **Patient table**
  - Length: 92.5in (2381mm)
  - Width: 28in (700mm)
  - Height
    - Up: 33.5in (852mm)
    - Down: 19.5in (495mm)
- **Computer**
  - QWERTY keyboard
  - 2-button mouse with scroll
- **LCD monitor**
  - 24in. LCD monitor
- **MR Cabinets**
  - RFIP Cabinet
    - Width 32in (813mm)
    - Depth 48in (1219mm)
    - Height 74in (1880mm)
  - GCPA Cabinet
    - Width 28in (711mm)
    - Depth 31in (787mm)
    - Height 74in (1880mm)
  - Helium Compressor
    - Width 18in (457mm)
    - Depth 21in (533mm)
    - Height 21in (533mm)
  - Heat Exchanger
    - Width 30in (762mm)
    - Depth 28in (711mm)
    - Height 34in (864mm)

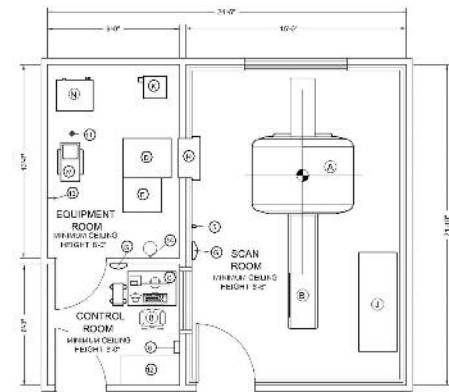
- Sense Unit
  - Width 32in (813mm)
  - Depth 16in (406mm)
  - Height 42in (1067mm)

## Siting Considerations

- **RF-shielded scan room**
  - RF noise <0dB V/m from 10-80 MHz
- **Air conditioning**
  - Scan room
    - Ambient operating temp: 68-75°F (20-24°C)
    - Max. allowable temp change: 2.5°C/hr
  - Equipment and Control rooms
    - Ambient operating temp: 68-82°F (20-28°C)
- **AC power**
  - Voltage: 3 phase AC 460, 480V (60Hz)
  - Frequency 50/60 Hz +/- 1% or less
  - Capacity 75 kVA
- **Typical room size**
  - Scan room
    - 26.5 x 16.5ft (8.0 x 5.0m)
    - Min. ceiling height: 8.5ft (2.60m)
  - Equipment room
    - 13.1 x 12.8ft (4.0 x 3.9m)
    - Min. ceiling height: 8ft (2.45m)
  - Control room
    - 12.9 x 12.8ft (3.9 x 3.9m)
    - Min. ceiling height: 8ft (3.9m)
- **5 gauss line magnetic leakage flux**
  - Axial: 13.1ft (4.0m)
  - Radial: 8.2ft (2.5m)



Typical Floor Plan Figure 1



Alternate Floor Plan Figure 2

Figure 1 shows a typical floor plan. Figure 2 shows an alternative floor plan for placement where available space is at a premium.





Echelon XL customers can count on proven Hitachi service and applications support to ensure a comprehensive approach to maximum uptime, image quality and productivity. Your success is assured on the foundation of Hitachi Ltd., a leading global electronics company with more than 90 years of invention and accomplishment.

Hitachi offers a full range of products, including MR, CT and Ultrasound. All deliver outstanding uptime and value over the life of the product through system and application upgrades that are part of the ownership experience. All include Hitachi's extensive customer support and exceptional business planning to enhance customer success.