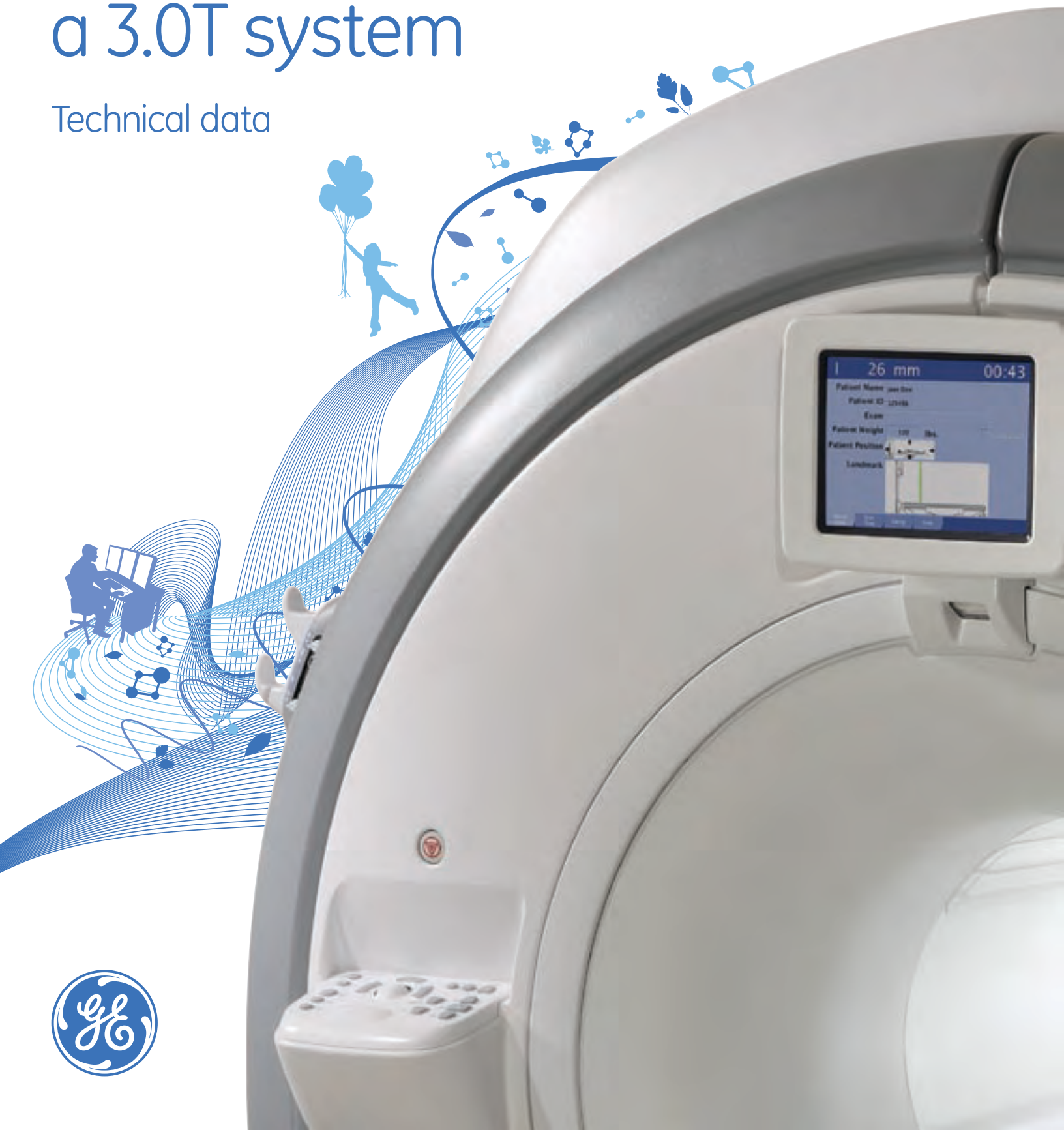
GE Healthcare

Discovery™ MR750, a 3.0T system

Technical data



Simply Powerful – Powerfully Simple.

Discovery™ MR750 3.0T

Simply Powerful – providing the power, precision and performance for advanced clinical and academic studies. Making the routine exams fast and the advanced exam routine. Powerfully Simple – no longer "What ifs," but "Right nows." And that's just for starters. Because Discovery MR750 3.0T lets you break the barriers of traditional 3.0T MR scanning.

Start from a position of power.

The strongest gradients. Proven 3.0T magnet reliability. Patient-tailored real-time SAR management. Unique optical RF technology. Fast reconstructions. Discovery MR750's stunning new technologies take 3.0T MR imaging where it's never gone before. So you can push the system hard – without the system pushing back. Discovery MR750 3.0T. MR beyond boundaries. To give you every edge.

Swifter. Smoother. Simpler.

Decrease patient preparation time. Reduce exam steps. Increase overall scanner efficiency. Discovery MR750 makes routine exams fast, advanced exams routine, and every scan a study in speed.

Break free from barriers.

Image without traditional scanning limits. See with new clarity. With fast, higher-accuracy scans. Excellent anatomical coverage. Excellent spatial resolution. Discovery MR750 3.0T delivers premium clinical and research performance across today's most challenging MR studies.

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Overview

Simply Powerful

The industry's most powerful whole-body gradients. Precise high-bandwidth optical RF receiver chain. Proven 3.0T magnet reliability. The Discovery™ MR750 3.0T combines advanced MR technologies in a system of excellent power, precision and performance.

Strongest whole-body gradients

Delivering ultra powerful 50 mT/m amplitude and 200 T/m/s slew-rate, the Discovery MR750 3.0T gradients easily handle today's challenging MR studies–with exceptional thermal management that frees you to develop advanced applications. Employing unique feed-back and feed-forward control loops, the eXtreme Gradient Driver (XGD) produces precise, high-fidelity waveforms during play-out, for superb results in spectroscopy, PROPELLER 2.0, EPI-fMRI, and emerging applications based on complex acquisition schemes.

Exclusive optical RF technology

OpTix, an exclusive optical RF technology, enables up to 32 channels of data reception that maximize signal-to-noise ratio (SNR), system stability, and acquisition speed while providing a platform for advanced clinical research and development. By minimizing electrical noise along the imaging chain, OpTix improves overall image quality for your facility and, most importantly, for your patients.

Advanced acceleration technology

The development of high-density coils has accelerated imaging speeds through parallel imaging techniques. The Discovery MR750 3.0T's new parallel imaging technology, ARC™ (Auto-calibrating Reconstruction of Cartesian data), reduces scan times while eliminating misregistration errors and artifacts that are caused by traditional techniques that use a calibration scan. The system's gains in reconstruction processing performance open the door for data-intensive studies once thought impractical.

Streamlined image acquisition

With up to 32 channels of data reception, the Discovery MR750 3.0T architecture is designed for high-channel-count imaging, and for up to 128 channels in the future. So you can use all elements, receivers, and processors to make practical use of high-density coils, parallel imaging, and volumetric acquisitions. The result: high-definition MR images and instant access to the full range of leading-edge GE technologies for consistent, reliable image quality.

High performance with real-time system optimization

PERFORM 2.0 automatically fine-tunes system SAR modeling, personalizing it for every patient. Additionally, PERFORM 2.0 provides scanning efficiency with its proprietary gradient waveform algorithm, managing limitations due to peripheral nerve stimulation (PNS). Push protocol parameters and acquisition speeds to the limit — without risking patient safety or slowing down the system.


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Overview

Powerfully Simple

Advanced technology doesn't necessarily mean complexity. Discovery™ MR750 3.0T combines technology advances with ease-of-use to provide excellent clinical imaging and workflow efficiency that give you an edge.

Express Exam streamlined workflow

The Express patient table, IntelliTouch Technology, in-room operator console (iROC) and highly automated user interface create the Discovery MR750 3.0T system's streamlined workflow. Express Exam helps you improve patient care by letting you keep your focus where it's needed most – on your patient. With Express Exam, entire exams are completed in just a few steps – due to the automated acquisition, processing, and networking capabilities of the Discovery MR750 3.0T's user interface.

Exclusive Express patient table design

The Discovery MR750 3.0T's Express patient table simplifies scan preparation, cuts time between exams, and improves patient safety. Featuring the Liberty™ 2.0 Docking System, the detachable table lets you fully prepare a patient for an exam outside of the scan room, to reduce patient anxiety and maximize scanner productivity. The Express patient table can be extracted from the bore and exam room in less than 30 seconds by one technologist, so patient safety is never compromised.

IntelliTouch patient positioning

Boost exam productivity with IntelliTouch patient positioning, by eliminating the need for laser alignment and reducing the steps to position patients. The Discovery™ MR750 3.0T system automates many routine landmarking tasks to simplify patient preparation and reduce errors. For patients needing pinpoint alignment, lasers may be used to select or confirm landmark positioning.

Convenient in-room operator console (iROC)

Simplify exam preparation and reduce the time between patients with the Discovery MR750 3.0T's high-resolution, color in-room operator console. Consolidating all controls in one place, the iROC provides real-time interactive control to help ensure any necessary changes in patient setup are related quickly back to the user. There's no need for the technologist to leave the room, so patient reassurance and comfort are enhanced. Continually displaying pertinent information and scanner status to the user closes the loop between your patient and your hospital or radiology information system, with the goal of reducing errors and improving throughput.

Enhanced clinical performance with advanced applications

Applications drive procedure growth, and the Discovery MR750 3.0T system supports a comprehensive suite of clinical applications that optimize image quality for all patients and technologists. Combining advanced hardware, workflow, and applications, the Discovery MR750 3.0T helps ensure high-quality images are efficiently acquired for every patient, and every exam is completed with superb quality and simplicity.

IDEAL, a unique GE acquisition technique, differentiates fat and water for clear, consistent tissue contrast without artifacts.

LAVA-Flex offers volumetric abdominal imaging with short breath-hold periods and clear tissue contrast, with water-only and fat-only separation.

VIBRANT-Flex provides the unique capability to acquire sagittal or axial 3D images of both breasts with excellent fat suppression in the same time it takes to image only one breast.

A GE-exclusive technique, **Cube**™ replaces several slice-by-slice, plane-after-plane 2D acquisitions with a single 3D volume scan – providing sub-millimeter isotropic volume data from a single acquisition.

TRICKS is a leading application for time-resolved MR angiography because of its simplicity, reliability and inherent ability to add dynamic flow information without sacrificing spatial resolution.

PROPELLER 2.0 significantly reduces motion artifacts and optimizes tissue contrast, in all planes, helping visualize even small or subtle lesions without compromising image resolution or prolonging scan time.

3.0T Magnet technology

The foundation for quality and flexibility

When it comes to image quality and applications flexibility, no other component of an MRI system has greater impact than the magnet architecture.

The Discovery™ MR750 3.0T MR system features GE's 3rd generation 3.0T magnet design, and features a high-homogeneity short-bore superconducting magnet for excellent image quality. The open appearance of the magnet helps ease patient anxiety while the zero-boil-off technology effectively eliminates helium refills, reducing operating costs and maximizing uptime.

Easy siting, affordable operation

The Discovery MR750 3.0T magnet is one of the most compact systems available. Complemented by GE's active shielding technology, the Discovery MR750 3.0T can be installed almost anywhere.

Magnet enclosures

This magnet enclosure system is designed to provide several benefits for the patient and technologist:

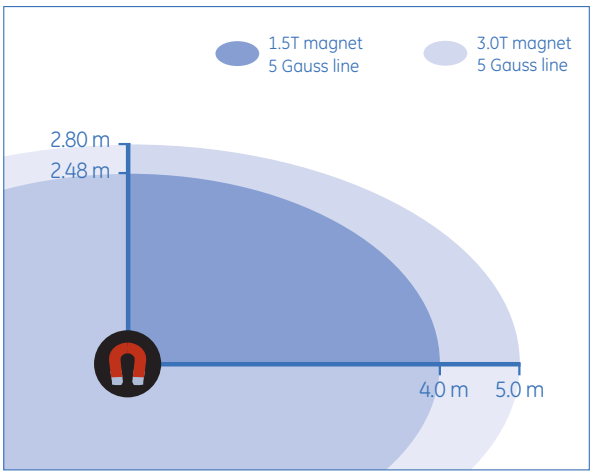
- Patient anxiety is eased, resulting in reduced exam time for uncooperative patients
- Technologists have easy access to the patient
- Dual-sided controls streamline patient setup

Magnet specifications	
Operating field strength	3.0T (127.8 MHz)
Shim coils	18 superconducting
Magnet shielding	Active
EMI shielding factor	97%
Magnet size (without enclosures) (L x W)	<173 cm x 206 cm
Magnet length with enclosures	194 cm
Magnet weight with cryogens	9,750 kg
Long-term stability	< 0.1 ppm/hr over 24-hour period
Cryogen refill period	Zero-boil off*
Fringe field (axial x radial)	5 Gauss = 5.0 m x 2.8 m 1 Gauss = 7.4 m x 4.4 m
Manufacturer	GE Healthcare

*Under normal operating conditions

Patient bore	
Patient Bore (L x W x H)	70 cm x 60 cm x 60 cm
Patient positioning features	Laser alignment guides for patient positioning 32-channel configurations offer dual-sided table, landmarking and control panel
Patient comfort controls and interface	Head or feet first entry Dual-flared patient bore 2 way in-bore intercom system Adjustable in-bore lighting system Adjustable in-bore patient ventilation system
Other	In-room operator console with track ball control

Fringe Field: 3.0T vs. 1.5T



Magnet high-order shim

To fully optimize the magnet homogeneity for your facility, the Discovery™ MR750 3.0T system uses 18 superconducting high-order shim coils to ensure optimum performance for each site's unique environment.

High homogeneity is assured – our Discovery MR750 3.0T magnet provides excellent results for:

- Large FOV imaging up to 48 cm x 48 cm x 48 cm
- Off-center FOV imaging such as knee, shoulder and wrist imaging
- Robust fat saturation techniques required for abdominal, breast and musculoskeletal imaging
- High-performance applications, such as cardiac, fMRI, diffusion tensor and spectroscopy

GE measures the raw homogeneity of a magnet using the Volume Root Mean Square (V-RMS) method that utilizes both measured data on a sphere plus synthesized data using a spherical harmonic expansion of the field.

Diameter of spherical volume-DSV	Typical ppm	Guaranteed ppm
10 cm	0.03	
20 cm	0.05	<0.05
30 cm	0.1	<0.15
40 cm	0.25	<0.50

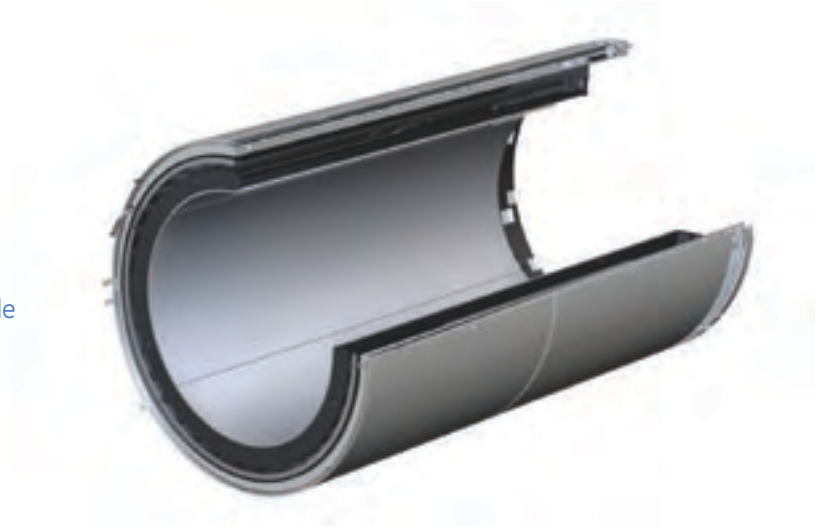
Volume Root-Mean-Square (V-RMS) method is based on 24 measurements in each of 24 planes with linear terms set to zero.

In addition, GE utilizes a Large Volume RMS (LV-RMS) procedure to determine the field homogeneity after integrating the gradients, RF body coil, and system electronics. LV-RMS measurements utilize a large phantom placed within the bore, and because the data is obtained using the entire imaging chain, it reflects the results that clinicians and researchers will experience with day-to-day scanning.

Diameter of spherical volume-DSV	Typical ppm
10 cm	0.02
20 cm	0.03
30 cm	0.08
40 cm	0.27
45 cm	0.53

Large Volume Root-Mean-Square (LV-RMS) method is an imaging-based method with over 173,000 measurements collected over a spherical volume after linear and higher order shims have been adjusted.

Gradient technology



Gradient performance

Premium clinical and research performance is assured with the Discovery™ MR750 3.0T eXtreme gradient Resonance Module (XRM) and eXtreme Gradient Driver (XGD) systems. Gradient speed, accuracy and reproducibility are critical for all acquisitions, but the performance is especially critical in challenging acquisitions and research development.

The gradients are non-resonant and actively shielded to minimize eddy currents. The gradient coil and the RF body coil are integrated into a single module, which are both water- and air-cooled for maximum duty-cycle performance and patient comfort.

Amplitude per axis	50 mT/m
Slew rate per axis	200 T/m/s
Maximum effective amplitude	87 mT/m
Maximum effective slew rate	346 T/m/s
Maximum FOV on X, Y, Z axis	48 cm
Rise time to maximum amplitude	250 µs
Gradient duty cycle	100%

Quiet technology

State-of-the-art clinical imaging demands the routine use of ultra-fast imaging techniques. At 3.0T, the strong gradients interact with the magnetic field to create mechanical forces resulting in acoustic noise. GE's enhanced quiet technology takes a passive approach by employing an acoustic barrier material that reduces acoustic noise without compromising performance. This technology reduces acoustic noise levels by up to 50% when compared with previous designs.

Resistive high-order shim

The Discovery MR750 3.0T gradient is available with five high-order shims to minimize the effect of patient-induced magnet inhomogeneity. In addition to the three linear terms (X, Y, Z), this set includes the five 2nd-order terms (listed below) to shim the field to account for each patient's anatomy and position in the bore.

Higher-order shimming results in improved image quality for all applications, but especially in Spectroscopy, Diffusion Tensor (DT) and Diffusion-Weighted Echo Planar Imaging (DW-EPI), Fat Saturation, VIBRANT breast and MR Echo cardiac applications.

Linear and 2nd-order shim terms	X, Y, Z XY, ZX, ZY, Z^2 $X^2 - Y^2$

Fidelity, accuracy, and reproducibility

Gradient systems have historically been defined in terms of peak amplitude (mT/m) and slew rate of the generated field (T/m/s). While these parameters are important in achieving high temporal resolution parameters, such as TRs and TEs, applications such as fMRI, PROPELLER 2.0, TRICKS, and spectroscopy rely more heavily on gradient fidelity, accuracy, and reproducibility.

Fidelity is defined as the degree to which an electronics system accurately and reproducibly amplifies an input signal. Applied to MR gradient systems, gradient fidelity refers to the system's ability to generate requested waveforms. The high fidelity of the Discovery MR750 3.0T gradients is achieved through the use of innovative design of the digital control architecture within the gradient amplifier. This architecture has two digital control paths.

- Dedicated active feedback loop to regulate current errors.
- Unique feed-forward model to match amplifier output to gradient coil.

Gradient subsystem fidelity, accuracy, and reproducibility parameters	
Gradient integral precision*	0.47ppmFS-s
Shot-to-shot repeatability*	0.16ppmFS-s
Symmetry*	0.32ppmFS-s

* Typical gradient fidelity expressed in a relative scale is derived from the following measurements of integrated errors in micro-Amperes-second (µAs). Gradient integral precision is the maximum integrated current error over a full-scale, echo-planar gradient waveform. Shot-to-shot repeatability is the largest difference between integrated errors across waveforms. Symmetry is the largest difference in integrated current error when comparing positive and negative gradient waveforms.

Gradient system optimization

PERFORM 2.0 incorporates a new proprietary gradient waveform algorithm that manages limitations due to peripheral nerve stimulation (PNS) and therefore enables full use of slew rate for shorter TEs and TRs.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RF technology

The RF technology of the Discovery™ MR750 3.0T system integrates the three major components of the information pipeline: (1) Transmit, (2) Receive and (3) Processing. This close integration enables excellent clinical performance and image quality, especially for data-intensive applications.

RF transmit technology

The RF transmit architecture technology consists of a liquid-cooled 35kW solid-state RF power amplifier combined with an integrated, bandpass, 16-rung quadrature body coil designed to improve RF and signal homogeneity at 3.0T.

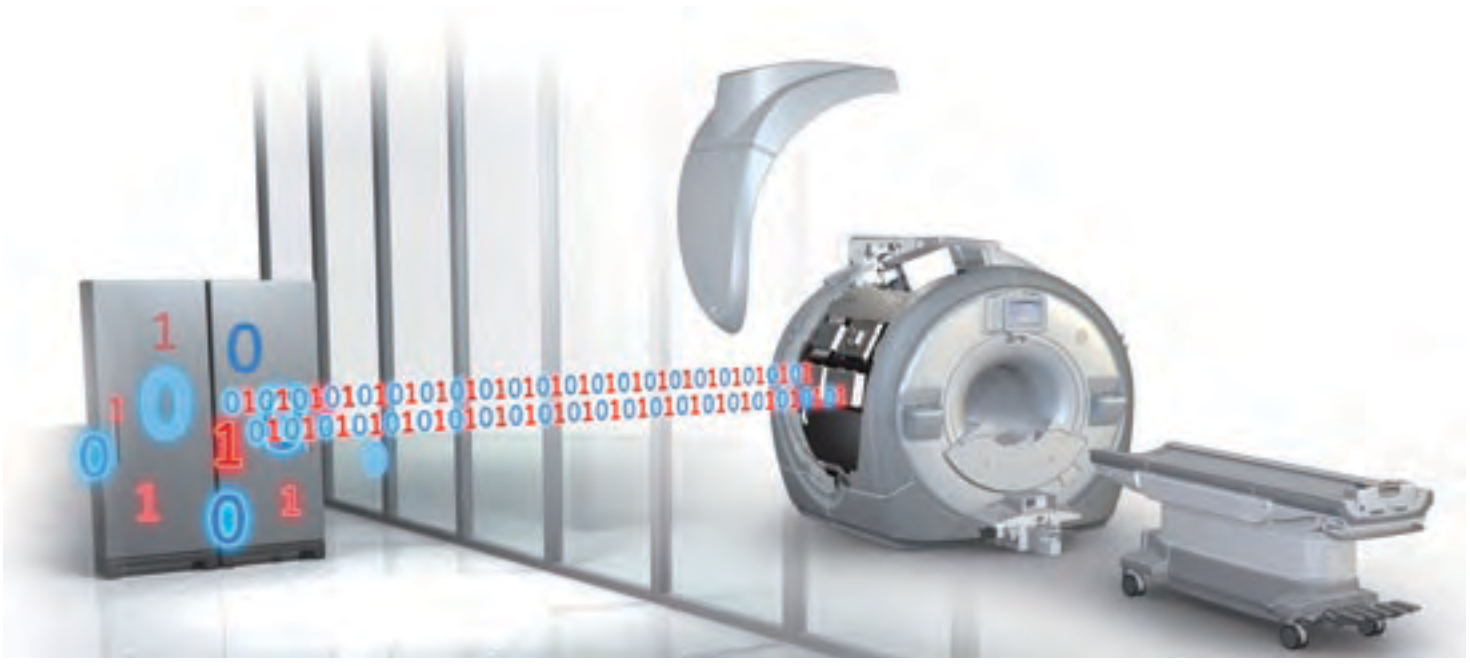
RF system optimization

At 3.0T, staying within FDA- and IEEC-mandated guidelines for Specific Absorption Rate (SAR) can potentially limit the ability to scan efficiently.

Leveraging over a dozen years' 3.0T experience, GE has overcome these limitations on the Discovery MR750 with an exclusive new synergistic SAR management system called PERFORM 2.0. Combining RF body coil design, optimized pulse sequences, detailed predictive SAR modeling during prescription, and real-time SAR feedback and correction during scanning helps ensure high system performance across all applications, tailored for each patient.

The results include fast exams, productivity, patient comfort and improved diagnostic results, scan after scan, patient after patient.

Standard RF transmit architecture	
RF amplifier	Water cooled, small footprint
Maximum output power	35 kW Body 4.5 kW Head
Maximum RF field with integrated body coil	>24 μT
Transmit gain	40 dB coarse/>84 dB instantaneous
RF exciter frequency range	127.72 ± 0.625 MHz
Frequency resolution	<0.6 Hz/step
Frequency stability	14 part per billion (0 to 50C)
Phase resolution	0.005 degree/step
Amplitude control	16 bit with 12.5 ns resolution
Amplitude stability	< 0.1 dB over one min. at rated power
Digital RF pulse control	2 amplitude modulators, 2 frequency/phase modulators
Continuous wave power	100W
RF Coil Transmit drive ports	4 ports
Transmit/Receive Body Coil	Fully integrated 16-rung quadrature birdcage bandpass 60 cm inner diameter Up to 48 cm FOV All anatomy and general applications



OpTix (Optical RF Receive technology)

The OpTix RF system enables high-bandwidth, 16- or 32-channel reception with improved SNR over conventional MR receiver designs. Conventional MR scanner designs place the RF receivers in the electronics room where the MR signal is subject to significant electrical noise prior to being digitized. The OpTix optical RF receivers are located on the magnet system inside the shielded scan room, completely isolated from external noise sources. The MR signal is digitized within the scan room and then optically transmitted to the reconstruction engine in the electronics room. Since losses are inherent with conventional wire designs, the close proximity of the receivers to the patient reduces noise and improves image quality.

Optical RF architecture	
Simultaneous RF receivers	16 or 32
Coil input ports	40 or 136
Quadrature demodulation	Digital
Receiver sampling frequency per channel	80 MHz
Receiver dynamic range at 1Hz BW	>165 dB
Receiver resolution	Up to 32 bits

The OpTix acquisition technology enables high image quality especially for data-intensive (3D) applications. When combined with GE's use of high-density surface coils, the optical receive chain is a critical path for ensuring clear signal reception and data analysis. To ensure that the high-density approach will always be maintained, the scalable Discovery™ MR750 3.0T architecture is designed to expand to 128 channels of simultaneous data acquisition in the future.

Reconstruction processing

Reconstruction performance today is challenged by explosive growth in data, and increased computational complexity. The amount of data to be stored and processed continues to increase with the advances in MR system technology. The Discovery MR750 meets that challenge head-on with innovations in reconstruction to take full advantage of computing power by leveraging both software and hardware technology.

The Discovery MR750 3.0T features a powerful volume reconstruction engine (VRE 2.0) that enables real-time image generation, even when massive parallel-imaging datasets are involved. The reconstruction engine features onboard memory and local raw data storage to support and maintain simultaneous data acquisition and reconstruction under the most demanding applications.

VRE 2.0 uses 64-bit computing, delivering larger acquisition memory and faster performance. Parallel processing and dedicated network cards provide scalable memory and throughput. The acquisition-to-disk feature automatically expands the memory capacity per the demands of the application.

Reconstruction engine - 16 channels configuration	
Peak 2D FFT/second (256 x 256 full FOV)	2700 2D FFTs/second (256 x 256 full FOV)
CPU	Two Dual Core AMD Opteron 2218 CPUs (four 2.6 GHz cores)
Memory	16 GB ECC DDR2 667 RAM
Hard disk storage	2 x 73 Gbytes

Reconstruction engine - 32 channels configuration	
Peak 2D FFT/second (256 x 256 full FOV)	5400 2D FFTs/second (256 x 256 full FOV)
CPU	Four Dual Core AMD Opteron 2218 CPUs (eight 2.6 GHz cores)
Memory	32 GB ECC DDR2 667 RAM
Hard disk storage	4 x 73 Gbytes

RF coils and arrays

High-density arrays that focus coil elements around the anatomy of interest, while providing extended coverage where needed, help to ensure optimal image quality for every procedure. The open and flexible RF architecture of the Discovery™ 3.0T MR750 system also facilitates access to coils developed by other vendors. These attributes lead to the optimal coil for each clinical application and a system that is ready for coils in the future.

Standard coils with each MR system

Transmit/Receive Body Coil

- Fully integrated
- 16-rung quadrature birdcage bandpass
- 60 cm inner diameter
- Up to 48 cm FOV
- All anatomy and general applications

Transmit/Receive Head Coil

- 16-rung quadrature birdcage
- Patient-friendly, split-top design
- 28 cm diameter x 38 cm length
- Head and brain
- Extremities
- Pediatric imaging

There are many optional receiver coils available to configure a Discovery™ MR750 3.0T system to meet specific applications requirements.

The coils listed below are commercially available at the time of printing and are optional with the system. Please contact your local GE sales representative for the most current list.

Coils for neuro MR applications

HD NV Array

- 8-channel, 12-element phased-array design
- Parallel imaging compatible
- Coil dimensions: 66 x 48 x 35 cm (26 x 19 x 14 in)
- 45 cm S/I coverage

HD Brain Array

- 8-channel, 8-element phased-array design
- Parallel imaging compatible
- Coil dimensions: 69 x 38 x 41 cm (27 x 15 x 16 in)
- 24 cm S/I coverage

8-Channel CTL Spine Array

- 8-channel, 14-element phased-array coil
- High SNR, high uniformity, and extensive coverage
- Feet-first or head-first positioning
- Built-in volume neck coil
- Conforms to curvature of spine
- Coil dimensions: 113 x 47 x 24 cm (45 x 18 x 9.4 in)
- 75-cm (29.5-in) in S/I direction for whole spine coverage

32-Channel Brain Coil

- 32-channel planer array design for high signal-to-noise ratio (SNR) and excellent contrast-to-noise ratio (CNR)
- Optimized for fMRI studies
- Parallel imaging compatible in all three planes
- Sliding coil design for ease of patient positioning
- Coil dimensions
  Inner diameter: 24 cm (9.5 in)
  Coil size: 29 cm OD x 30 cm long (11.4 x 11.8 in)
  Base size: 41 cm x 48 cm (16 x 19 in)
- Excellent S/I coverage for imaging the entire head

RF coils and arrays

Coils for body applications

HD Torso Array

- 8-channel, 8-element coil
- Parallel imaging compatible
- Coil dimensions:
  110 x 38 x 33 cm
  (43 x 15 x 13 in)
- 40 cm S/I coverage

32-Channel Torso Array

- 32-channel, 34-elements phased-array design
- Unique array configuration offers complete coverage of the chest, abdomen, and pelvic regions
- High SNR and excellent S/I coverage
- Parallel imaging compatible
- Coil dimensions
  Posterior: 82.5 x 43.9 x 6.4 cm
  (32.5 x 17.3 x 2.5 in)
  Anterior: 91.9 x 53.6 x 3.8 cm
  (36.2 x 21.1 x 1.5 in)
- 48-cm full FOV coverage

HD Breast Array

- 8-channel, 8-element phased-array design
- Optimized for uniformity, parallel imaging and VIBRANT
- Bilateral and unilateral breast imaging
- Biopsy plates available
- Coil dimensions:
  50 x 54 x 25 cm
  (20 x 21 x 10 in)

Coils for body applications

HD Cardiac Array

- 8-channel, 8-element coil
- Optimized for parallel imaging
- Coil dimensions:
  46 x 50 x 13 cm
  (18 x 20 x 5 in)
- 34 cm S/I coverage

Coils for orthopedic applications

HD Knee Array

- Hybrid transmit/tapered phased-array design
- 8-channel, 8-element phased-array design
- High SNR for knee imaging
- Coil dimensions:
  39 x 35 x 19 cm
  (16 x 14 x 8 in)
- 16 cm S/I coverage

HD Foot Ankle Array

- 8-channel, 8-element phased-array design
- Unique “chimney” design adds versatility for high SNR foot and ankle imaging
- Coil dimensions:
  53 x 28 x 33 cm
  (21 x 11 x 13 in)

Coils for orthopedic applications

Quad Lower Extremity Coil

- 12-element, transmit/receive birdcage coil
- Unique "chimney" design adds versatility for ankle and foot imaging
- Sensitive volume covers 22 cm FOV for knee imaging and 28 cm FOV for foot imaging
- Coil dimensions: 48 x 31 x 36 cm (19 x 12 x 14 in)

Shoulder Phased Array

- 3-channel phased-array coil
- Sleeve design
- Comprehensive shoulder imaging
- Homogeneous penetration of the humeral head and neck, rotator cuff, glenoid labrum, acromium process, and glenohumeral articular surfaces

HD Shoulder Phased Array

- 8-channel, 8-element phased-array coil
- Comprehensive shoulder imaging
- Uniform signal of the humeral head and neck, rotator cuff, glenoid labrum, acromium process, and glenohumeral articular surfaces
- Coil dimensions: 25 x 23 x 25 cm (10 x 9 x 10 in)
- 20 cm S/I coverage

HD Wrist Array Coil

- 8-channel, 8-element phased-array coil
- High SNR to enable high spatial resolution images
- Position overhead or at patient's side
- Coil dimensions: 34 x 23 x 14 cm (13 x 9 x 6 in) (includes base)
- 12 cm S/I coverage for wrist and hand

Transmit/Receive Wrist Array Coil

- Quadrature birdcage volume T/R coil
- High SNR to enable high spatial resolution images
- Position overhead or at patient's side
- 40 x 40 x 30 cm (16 x 16 x 12 in)
- 10 cm S/I wrist and hand coverage

General Purpose Flex Coil

- Single-element, receive-only coil
- Versatile
- Coil wraps around anatomy of interest
- Intended for hip, shoulder, brachial plexus, large knee, ankle, thigh, elbow, and neck

Workflow

Express Exam streamlined workflow

The Express patient table, IntelliTouch technology and in-room operator console (iROC) streamline the Discovery™ MR750 3.0T system workflow, helping you to improve patient care by letting you keep your focus where it's needed most – on your patient. With Express Exam, entire exams are completed in just a few mouse-clicks due to the automated acquisition, processing, and networking capabilities of the Discovery MR750 3.0T's user interface.

Discovery Express patient table

Unique to GE, the fully detachable Express patient table incorporates the Liberty™ 2.0 Docking System which improves safety, exam efficiency, and patient comfort.

Safety

Easily docked and undocked by a single operator, the patient table is simple to move in and out of the exam room for patient transport and preparation. These become vital features in those instances where multiple patient transfers can negatively impact patient care or when emergency evacuation is required; the table can be undocked and removed in under 30 seconds with just one technologist. In time-sensitive situations there is no need to remove or disconnect surface coils as the system can automatically disconnect the coils for you. The mobility and safety features of Discovery MR750 patient table can obviate the need for MR-compatible emergency equipment or a second technologist.

Exam efficiency

In addition to being fully detachable, the Discovery MR750 Express patient table includes multiple surface coil connectors. 32-channel systems have dual 32-channel connectors at the foot end of the table, the patient can be fully prepared for an exam outside of the scan room, thus further reducing the necessary steps before starting acquisition.

With a second table, the next patient can be positioned outside the magnet room while the current patient is undergoing an examination.

Discovery MR750 3.0T patient table	
Patient table	Detachable and mobile
Min/max table height	70 to 91 cm, continuous
Patient table drive	Automated, power driven vertical and longitudinal
Longitudinal speed	30 cm/sec (fast) and 0.5 cm/sec (slow)
Vertical speed	4.0 cm/sec
Total cradle length	210.8 cm
Scannable range	205 cm
Positioning precision	+/- 0.5 mm
Maximum patient weight for scanning	227 kg (500 lbs)
Maximum weight for patient guardrails	227 kg (500 lbs)
Patient transport accessories	Self-storing non-ferrous IV pole Positioning pads Immobilization straps Table pad and head coil accessory
32-channel configurations	32-channel coil connectors at the end of the table IntelliTouch Patient Positioning

Patient comfort

The Express detachable table can help reduce patients' anxiety and provide patients personal discretion by preparing them for the exam outside the scan room. Reduced patient table transfers for inpatients or trauma patients can improve overall patient care. The Express patient table offers optional head- or feet-first imaging. Additionally, feet-first positioning facilitates run-off studies and set-up for claustrophobic patients.

Ergonomics

With one hand and one simple motion, the integrated arm boards and IV pole can be optimally positioned to support the patient for safe transport and injections. This unique capability of the Discovery™ MR750 table also makes it ideally suited for multi-station exams with no scan room intervention, such as time-resolved vascular imaging.

High-density coil interface

Discovery MR750 3.0T technology takes the guesswork out of coil plug-in and identification by automatically identifying the coil that is connected. Through prominent visual indicators near the coil connection port, it allows the technologist to ensure a secure coil connection, every time, for every procedure.

IntelliTouch patient positioning

IntelliTouch Technology enhances exam productivity by eliminating the need for laser alignment and reduces the number of steps for patient preparation.

For those patients where pinpoint alignment is desired, lasers may be used for either the selection or confirmation of landmark positioning.

The Discovery MR750 3.0T system has automated many routine tasks to both simplify patient preparation and reduce errors.

With IntelliTouch Technology, the following tasks can be completed:

- Landmark the patient
- Activate the surface coil
- Center the patient in the bore
- Start scanning
- Acquire, process and network images

Workflow

Dual system control panels

For operation on either side of the scanner, two ergonomically designed control panels are integrated into the front of the system enclosures. These panels incorporate backlit buttons to guide the user to the next logical step in exam setup. A trackball and select buttons guide the use of the in-room operator console.

From the system control panels you can:

- Position the table
- Home position
- Stop table
- Control multiple levels of in-bore ventilation and lighting
- Enter patient weight
- Enter patient orientation and patient position
- AutoStart – initiate the scanner to automatically acquire, process, and network images

In-room operator console (iROC)

Simplify exam preparation and reduce the time between patients with the Discovery™ MR750 3.0T optional high-resolution, color in-room operator console. By consolidating all controls into one place, the iROC provides real-time feed-back to the user to help ensure that any necessary changes in patient setup are quickly and clearly related back to the user. The iROC also enables the user to visualize cardiac and respiratory waveforms directly in the exam room – eliminating the need for the technologist to leave the room and improving the patient experience.

Mounted on the front of the magnet, the display provides real-time interaction with the scanner and the host computer. The user has direct control or selection of the following:

- Display of patient name, ID, study description
- Display and entry of patient weight
- Display and entry of patient orientation and patient position
- Cardiac waveform display and EKG lead confirmation with gating control: trigger select, invert and reset
- Respiratory waveform display
- IntelliTouch Technology landmarking
- AutoStart – initiate the scanner to automatically acquire, process, and network images
- Display connected coils and coil status
- Display of table location and scan time remaining
- Screen saver

The iROC simplifies patient workflow by reducing the time burden of today's most challenging exams. Together, the significant advances of the Discovery MR750 3.0T improve care by enabling technologists to help maintain their focus where it is needed the most – on the patient.

In-Room Operator Console	
Display	12.1" LCD Panel XGA 1024 x 768 dot resolution
Interface	High-speed fiber-optic serial data connection carrying video data, diagnostic data and USB data

iROC patient setup.

iROC scan-time.

iROC gating waveform.

iROC coil connection.

Workflow

Discovery™ MR750 scan interface

The Discovery MR750 3.0T scan interface incorporates many features designed to lighten the workload of the technologists, beginning with an optimized, intuitive and flexible 3-plane graphic localizer process.

The Discovery MR750 includes an automated protocol-driven workflow and user interface designed for consistency in generating high-quality imaging for all patients and from all technologists. Designed for efficiency, the Discovery MR750 3.0T computer platform is built upon a parallel, multiprocessor design that delivers the simultaneity and speed needed for advanced clinical operation. Productivity, efficiency and streamlined data management are assured through simultaneous scanning, reconstruction, filming, archiving, networking and post-processing.

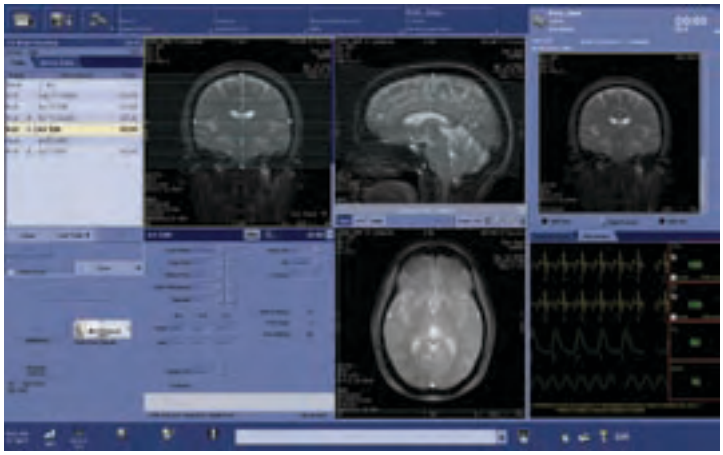
Though the protocol-driven workflow can dramatically simplify and automate image acquisition and processing, the flexibility that is synonymous with GE systems is maintained. If desired, the user can have complete control of exact sequence parameters for site optimization and patient specific situations.

Modality worklist

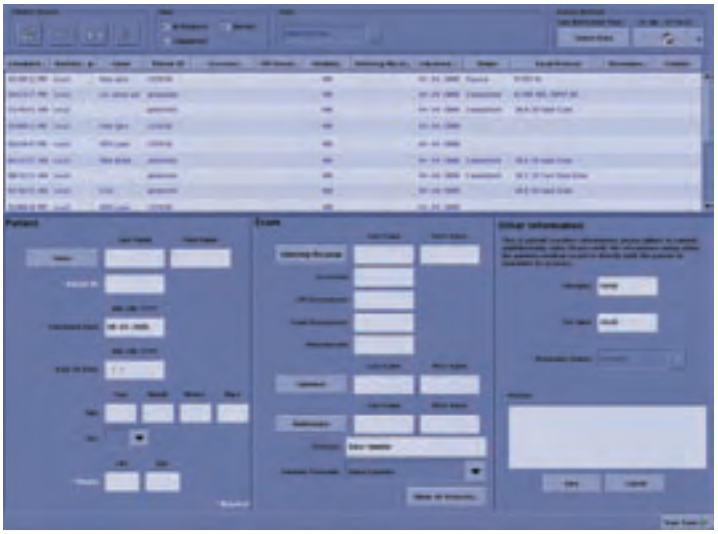
The modality worklist (MWL) provides an automated method of obtaining exam and protocol information for a patient directly from a DICOM Worklist server. For sites with full DICOM connectivity, once a patient has been selected from the MWL, a new session is opened on the host interface and the iROC will highlight the relevant exam details. For sites that do not have full connectivity, minimal data entry (patient number and weight) is necessary prior to starting a new session. Additional data fields for patient-sensitive information such as allergies, pre-medication, pregnancy status, and history are provided.

The Discovery MR750 MWL provides complete control of the MRI protocol prescription. The protocol may be selected well in advance of the patient's arrival at the MR suite, thereby simplifying exam preparation and reducing necessary work by the technologist during the time-critical procedure.

The ConnectPro software enables the DICOM worklist server class for the Discovery MR750 3.0T Operator's Console. This software may require separate gateway hardware to connect non-DICOM-compatible HIS/RIS systems to the MR system.



Discovery MR750 3.0T scan interface.



Modality Worklist.

Protocol libraries and properties

The Discovery™ MR750 system provides the user with complete control of protocols for simple prescription, archiving, searching, and sharing. The protocols are organized into two main libraries, GE Optimized and Site Authored. For quick search and selection, each protocol may be archived with independent properties based on patient demographics, anatomy, type of acquisition, or identification number. For commonly used protocols, a favorites flag may be used for quick selection from the Modality Worklist or for sharing across other libraries.

Adult and Pediatric Protocol libraries for simple management of exams.

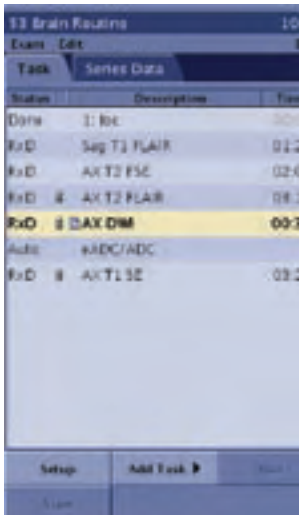
Each protocol or series can be saved with user-defined properties to simplify search and selection for future use. Favorite protocols can be highlighted for quick selection from the Modality Worklist or other libraries.

ProtoCopy

Standard on every Discovery MR750 3.0T system, the ProtoCopy feature enables a complete exam protocol to be shared with the click of a mouse. The exam protocol can originate from either a library or previously acquired exam. This enables routine archive of protocols for emergency backup and simple management of libraries across multiple systems.

Workflow Manager

Once a protocol has been selected for an exam, it is automatically loaded into the Workflow Manager. The Workflow Manager controls image prescription, acquisition, processing, visualization, and networking and may fully automate these steps if requested.



The Workflow Manager automatically loads the protocol and controls image prescription, acquisition, processing, and visualization.

Inline viewing

Inline viewing allows the user to conveniently view, compare, and analyze images without having to switch to the Browser. Simply select the series to view from the Workflow Manager and the images are displayed along with standard image display tools. Image comparisons can be easily done by selecting multiple series at a time. The integrated viewer allows the user to seamlessly move between scanning and image viewing.

Workflow

AutoStart™

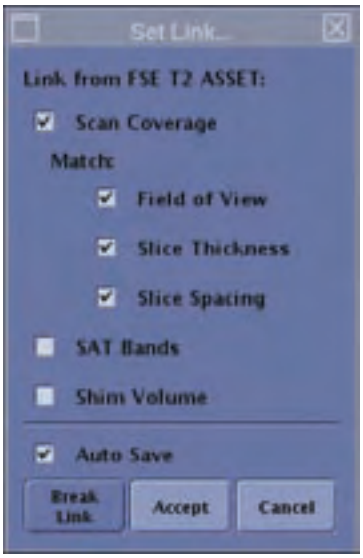
If AutoStart is selected, once the landmark position has been set and the technologist exits the scan room, the Workflow Manager will automatically start the acquisition.

Linking

Linking automates the prescription of images for each series in an exam. Once the targeted anatomical region has been located the Linking feature combines information from a prescribed imaging series to all subsequent series in the Workflow Manager. All series that have been linked may automatically be prescribed (Rx) and no further interaction will be needed by the technologist to initiate the scan.

The user has control over which specific parameters can be linked together. Series can have common fields of view, obliquity, slice thickness, anatomical coverage, saturation bands, or shim volumes. Multiple series can be linked together and saved in the Protocol Library or edited in real time. Linking may be used with any anatomy and with any acquisition.

Once the first volume is prescribed, all other subsequent series with the same planes can be automatically prescribed and acquired.



Linking.

AutoScan™

With AutoScan enabled, the Workflow Manager will sequentially go through the list of prescribed series without any user interaction. Once a series has been completed, the next series will be scanned automatically. For series requiring contrast, the system will await user interaction.

AutoVoice™

The AutoVoice feature will ensure that consistent and repeatable instructions are presented to the patient for each and every exam. User selectable, pre-recorded instructions are presented at defined points in the acquisition. This helps ensure that the patient is in the right position and is fully aware of the next step in the acquisition process. AutoVoice is particularly helpful during breath-hold exams. The AutoVoice feature includes instructions in over 14 languages and the user can create and include their own unique voice instructions for local needs.

Inline processing

The Discovery™ MR750 workflow automates many of the routine tasks that previously required user interaction. This dramatically reduces the workload for the user and helps ensure that consistent and repeatable images are presented for review. Processing steps are automatically completed immediately after the data has been reconstructed and the images saved into the database. These automated processing steps can be saved in the Protocol Library to ensure consistent exam workflow for each type of patient.

For certain tasks, the user must accept the results, or complete additional steps prior to saving the images to the database. In these cases the data is automatically loaded into the appropriate tool, then the system will await further instruction by the user.

Examples of fully automated and partially automated inline processing include:

Diffusion-Weighted Images ADC/eADC Maps	Fully automatic
Diffusion Tensor Images FA/ADC Maps	Fully automatic
Image Filtering: A-E, SCIC, PURE	Fully automatic
T2 Map for cartilage evaluation	Fully automatic
Reformat (Volume Viewer)	Automatic load
FiberTrak	Automatic load
Spectroscopy – Single voxel brain and breast metabolite analysis	Automatic load
Spectroscopy – 2D/3D Chemical Shift Imaging	Automatic load
BrainStat (FuncTool)	Automatic load
IVI (Volume Viewer)	Automatic load
Pasting	Automatic load
SER – Signal Enhancement Ratio (FuncTool)	Automatic load

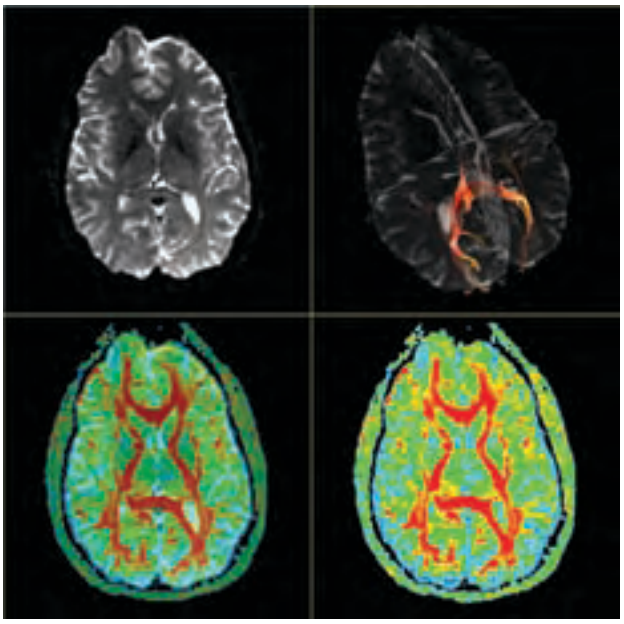
Image fusion

To better visualize tissue and contrast, multiple images from separate acquisitions can be overlaid on one another. With the new Discovery™ MR750 3.0T workflow, high-resolution anatomical images can be automatically fused with functional data or parametric maps for improved visualization for the user.

The data is registered using translation and rotation to ensure accurate fusion. High-resolution 2D and 3D data sets can be fused with the following parametric and computed maps.

The automated workflow features of the system can be used for any anatomy and for any sequence. When combining the technology of AutoStart,™ Linking, Inline Processing, AutoVoice,™ and the AutoScan™ features, an entire exam can be completed with just a few actions.

The flexibility of the Discovery MR750 user interface and acquisition parameters helps ensure that each acquisition is tailored for every patient. However, the technologist steps are kept consistent.



Discovery MR750 3.0T Image fusion	
MR Standard	3D Registration
ADC/eADC	3D Registration
Diffusion Tensor	3D Registration
functional MRI	Reformat
BrainSTAT	3D Registration
SER (Signal Enhancement Ratio)	Reformat
T2 Mapping	Reformat
Spectroscopy (Brain, Prostate and Breast)	Reformat

Workflow

Operator console

The Discovery™ MR750 3.0T system comes equipped with a scan control keyboard assembly that contains intercom speaker, microphone and volume controls, and an emergency stop switch. Start-scan, pause-scan, stop-scan, and table advance to isocenter hot keys are also included.

DICOM

The Discovery MR750 3.0T system generates MR Image, Secondary Capture, Structured Report, and Gray Scale Softcopy Presentation State (GSSPS) DICOM objects. The DICOM networking supports both send and query, retrieve, as well as send with storage commit to integrate with the site's PACS archive. DICOM filming support includes both Basic Grayscale and Basic Color Print Service Classes. Additionally, the Discovery MR750 3.0T system supports the CT and PET image objects for display allowing the user to refer to previous studies.

Discovery MR750 3.0T computing platform	
Main CPU	Dual-Core Intel® Xeon® 5160 3.0 GHz Processor 1.3 GHz System Bus 4 MB full-speed L2 Advanced Transfer Cache 64 Bit word size
Host memory	8 GB DDR 400
Graphics subsystem	Main Display: NVidia® Quadro® FX 1400 - 128 MB DDR Graphics Memory - Spec PROE -03: 51.27 - Spec UGS-04: 29.36 - Spec 3DSMAX –03: 35.61
Cabinets	Single, tower configuration
Disk subsystem	System Disk: 250GB, 7200 RPM, Serial ATA-150 Data Disk: 250 GB 400,000 uncompressed 256 x 256 image files Maximum rates 150 MB/s
Network	3 x Gigabit (10/100/1000) Ethernet Ports

Data storage	
DVD Interchange	DVD-RW Data transfer rate 21.6MB/s Access speed – average random stroke approx. 200 ms Average 35,000 images per 4.7 GB DVD

Filming	
Filming	Drag and Drop filming One-button Print Series One-button Print Page Multi-image formats – 1:1, 2:1, 4:1, 6:1, 9:1, 12:1, 15:1, 16:1, 20:1, 25:1 and 35-mm slide DICOM Basic Grayscale Print Service Class DICOM Basic Color Print Service Class

Control panel

Wide-screen display monitor	
Display monitor	23" Widescreen LCD Flat Panel 1920 x 1200 dot resolution Non-interlaced, flicker-free presentation Contrast ratio 500:1 92kHz horizontal deflection frequency 85 Hz refresh rate Digital DVI Interface

Display	
AutoView	560 x 560 Image Window (standard)
Window/Level (W/L)	7 user-programmable keys on scan control keyboard plus one key for returning to prior setting 6 user-programmable buttons in image viewer Arrow keys on scan control keyboard On-image through middle mouse button Save State stores user-selected image orientation, user annotation and window level
Image display	Zoom/Roam/Flip/Rotate/Scroll Explicit Magnify and Magnifying Glass Image Measurement Tools Grid On/Off Cross Reference/User Annotation Exam/Series Page Hide Graphics/Erase Annotation/Screen Save Accelerator Command Bar Compare Mode/Reference Image/Image Enhance ClariView Image Filtering Smooth and Sharpen Edge Filters Minified Reference Scoutview Cine Paging (up to 4 windows and 128 images/window) Add/Subtract/Edit Patient Data
Image display	256 Image buffer (256 x 256) at 30 fps
Image annotation	Shadowed to permit ease in reading Two graphic/text planes overlay the entire screen Grid placement with anatomical reference on an image Drawing and annotation may be added to and removed from images

ScanTools

Pulse sequences and imaging options

The Discovery™ MR750 3.0T scanner comes standard with a package of pulse sequences and applications optimized for 3.0T performance.

Discovery MR750 3.0T pulse sequences	
Spin Echo	A technique for generating T1, proton density and T2 images.
Fast-Spin Echo (FSE) Fast-Spin Echo XL (FSE XL)	These techniques use echo-train technology to reduce the time for image acquisition. T2 image blurring is minimized by shorter echo spacing.
Fast-Recovery Fast-Spin Echo (FRFSE-XL)	The sequence of choice for high-quality, high-speed, and high-contrast T2-weighted imaging in neurological, body, orthopedic, and pediatric applications. Compared to FSE, FRFSE allows shorter acquisition times or increased slice coverage.
3DFRFSE	A sequence for creating high-resolution, three-dimensional T2-weighted images of all anatomies and is especially useful for MR cholangiopancreatography (MRCP) studies.
Single-Shot Fast-Spin Echo (SSFSE)	An ultra-fast technique that permits complete image acquisition following a single RF excitation. It can acquire slices in less than one second, making it an excellent complement to T2-weighted brain and abdominal imaging and MRCP studies.
VERSE	Variable-Rate Selective Excitation (VERSE) is a unique method of reducing B1 and SAR exposure at 3T with FSE and FRFSE. By modulating the RF and gradient waveforms, SAR is reduced by as much as 60% without compromising image contrast or SNR. VERSE is only compatible with 2D FSE and 2D FRFSE.
MART	By modulating the flip angle train in SSFSE, MART reduces SAR exposure and echo spacing while preserving the MR signal for a longer period of time to reduce blurring and enhance IQ.
GRE FGRE SPGR FSPGR	This suite of gradient-echo techniques uses short TR and TE to generate T1- or T2-weighted images in far less time than conventional SE. The ultra-short TR and TE possible with these sequences also ensure the performance needed for state-of-the-art vascular and contrast-enhanced MRA studies.
2D and 3D Dual Echo Gradient Echo	A vital tool for abdominal imaging. This variation on conventional gradient echo provides a pair of images for which the signals from water and fat either are in-phase or out-of-phase. By design, all of the images acquired within a single breath-hold are in perfect registration.
SPECIAL	Spectral Inversion at Lipids (SPECIAL) is a spectral spatial inversion technique for fat saturation in 3D FGRE pulse sequences.
T1 FLAIR T2 FLAIR	T1 and T2 Fluid Attenuated Inversion Recovery (FLAIR) pulse sequences have been designed expressly for neuro applications. FLAIR allows suppression of signal from cerebrospinal fluid (CSF). In addition to this capability, T1 and T2 FLAIR add extraordinary contrast between white and gray matter to T1- and T2-weighted brain and spine imaging.
Echo Planar Imaging (EPI) FLAIR Echo Planar Imaging	Essential tools for any high-throughput site employing advanced techniques. Echo planar imaging is what enables rapid imaging. And both echo planar and FLAIR echo planar techniques make it easier to generate neuro studies from uncooperative patients who simply refuse to stay still long enough for conventional techniques.
2D and 3D Time of Flight (TOF) Imaging 2D-Gated TOF Imaging	2D TOF Imaging, 2D Gated TOF Imaging, 3D TOF Imaging and Enhanced 3D TOF Imaging are all ideal for MR angiography. Based on conventional gradient echo scanning, TOF imaging techniques rely primarily on flow-related enhancements to distinguish moving from stationary spins.
2D Phase Contrast (2DPC) 3D Phase Contrast (3DPC)	These techniques demonstrate flow velocities and directional properties in vessels and other moving fluids such as CSF and aortic flow.

Discovery™ MR750 3.0T pulse sequences	
SmartPrep™	SmartPrep uses a special tracking pulse sequence to monitor the MR signal through a user-prescribed volume to detect the arrival of an injected contrast bolus and to trigger the acquisition, for optimum contrast enhancement.
Double/Triple IR	These pulse sequences are included to allow black-blood imaging for studies of cardiac morphology. Triple IR adds fat suppression to black-blood imaging.
FastCINE	This pulse sequence is included specifically for studies of cardiac function. Through the use of retrospective gating, it allows full R-R coverage.
iDrive Pro	iDrive Pro brings real-time interactive imaging to the MR system, making it easier to generate detailed diagnostic information on just about any anatomy. This includes organs that are subject to motion artifacts, such as spine, heart, diaphragm and GI tract. The iDrive Pro technique allows the user to change scan parameters on the fly, during scanning, to evaluate the results immediately.
IVI	An interactive user interface that allows operators to remove background from MRA images. The result: angiographic and maximum intensity (MIP) projections in multiple scan planes. The processed images are saved automatically as a distinct series for quick recall.
Reformat	An online tool that allows the operator to convert image data sets from the acquired plane into orthogonal or oblique views. The reformat tool is easy to use and particularly useful for the interrogation of 3D datasets with complex anatomy. Reformatted images can be saved into the database for further review or filming.
FuncTool Performance	FuncTool Performance enables advanced MR-image post-processing using a wide range of sophisticated algorithms, including: ADC maps and eADC maps Correlation Coefficients for mapping of motor strip and visual/auditory stimuli NEI (Negative Enhancement Integral) MTE (Mean Time to Enhance) Positive Enhancement Integral Signal Enhancement Ratio Maximum Slope Increase Maximum Difference Function Difference Function
Auto TR	Auto TR dropdown menu replaces the TR dropdown menu located on the Graphic Rx desktop. Displays lowest TR value of each series.
EPI and DW-EPI	Standard on all systems are gradient echo, spin echo, flair, and diffusion-weighted echo planar imaging. The standard EPI sequence supports single and multi-shot imaging, multi-phase imaging, as well as cardiac gating. Diffusion EPI produces images that can detect acute and hyper-acute stroke with b-value up to 10,000 s/mm2, multi-NEX compatibility and the ability to generate ADC and T2-weighted TRACE images. The FLAIR option suppresses the CSF signal component to ease interpretation.
LAVA – Liver Acquisition with Volume Acceleration	LAVA is a three-dimensional (3D) spoiled gradient echo technique designed specifically to image the liver with unprecedented definition, coverage, and speed. Excellent fat suppression, through a version of the SPECIAL technique customized for the liver, is one of the reasons for the high definition of anatomical structures. The coverage and speed of LAVA are the result of short TR, innovative use of partial k-space acquisition, and advanced parallel imaging. What is the clinical benefit of LAVA? It enables the high-quality 3D MR imaging of the liver during short breath-holding periods.
BRAVO	Brain Volume imaging is a high-resolution 3D imaging technique designed to produce heavily T1-weighted isotropic images of the brain. BRAVO uses 2D ARC to reduce scan time and minimize parallel imaging artifacts.

Imaging options

Imaging options

Pulse sequence imaging options

- ASSET
- ARC™
- Blood Suppression
- Cardiac Gating/Triggering
- Cardiac Compensation
- Classic
- DE Prepared
- EDR
- Flow Compensation
- Fluoro Trigger
- Full Echo Train
- IDEAL
- IR Preparation
- Magnetization Transfer
- MART
- MRCP
- VERSE
- Multi-Station
- Multi-Phase/Dynaplan
- Navigator
- No Phase Wrap
- Real Time
- Respiratory Compensation
- Respiratory Gating/Triggering
- Sequential
- SmartPrep™
- Spectral Spatial RF
- Square Pixel
- T2 Prep
- Tailored RF
- Zip 512/Zip 1024
- 3D Slice Zip x 2 (Z2)/Zip x 4 (Z4)

ASSET Parallel Imaging

Array Spatial Sensitivity Encoding Technique (ASSET) imaging option is a 1D image-based parallel imaging technique used to speed data acquisition. For temporally sensitive acquisitions, ASSET reduces image blurring and motion, enables greater anatomical coverage, and reduces SAR. Parallel imaging acceleration factors ranging from 1-3.0 are supported depending on the coil selected.

With the Discovery™ MR750 3.0T system, the following applications are ASSET parallel imaging enabled.

- 2D FSE
- 2D FRFSE
- 2D FSE-IR
- 2D T1FLAIR
- 2D FSE Double IR
- 2D FSE Triple IR
- 2D T2MAP
- 2D FSE-XL IDEAL
- 2D FRFSE-XL IDEAL
- 2D SSFSE
- 2D SSFSE-IR
- 2D SSFSE MRCP
- 2D SSFSE 3-Plane
- 3D FRFSE
- 3D FRFSE MRCP
- 2D FGRE
- 2D FSPGR
- 2D FIESTA
- 2D FIESTA FastCARD
- 2D FIESTA FastCINE
- 2D MDE
- 2D MFGRE
- 3D TOF GRE
- 3D TOF SPGR
- 3D FGRE
- 3D FSPGR
- 3D FGRE IDEAL
- 3D FSPGR IDEAL
- 3D Fast TOF GRE
- 3D Fast TOF SPGR
- 3D FIESTA
- 3D MDE
- 3D MERGE
- 3D TRICKS
- 3D LAVA
- 3D VIBRANT
- 2D GRE-EPI
- 2D SE-EPI
- 2D DW-EPI
- 2D DT-EPI
- 2D fMRI EPI
- MR Echo Fast GRE Timecourse
- MR Echo FIESTA Timecourse
- MR Echo MDE
- MR Echo Realtime
- MR Echo Function CINE

Imaging options

ARC Parallel Imaging

Auto-Calibrating Reconstruction (ARC) parallel imaging eliminates breath-hold mismatch errors by imbedding the calibration data within the scan data. In addition, this unique reconstruction permits small FOV imaging by minimizing focal parallel imaging artifacts from the exam. Supporting both 1D and 2D acceleration, net acceleration factors of up to 4 can be achieved.

With the Discovery™ MR750 3.0T system, the following applications are ARC parallel imaging enabled.

- 2D FSE
- 2D FRFSE
- 2D FSE-IR
- 2D SSFSE
- 2D SSFSE-IR
- 2D SSFSE MRCP
- 2D SSFSE 3-Plane
- 3D Cube T2
- 3D Cube PD
- 3D Cube T2 FLAIR
- 3D BRAVO
- 3D QuickSTEP
- 3D LAVA
- 3D LAVA-Flex
- 3D Dual Echo
- 3D VIBRANT-Flex

Applications

Neuro applications

PROPELLER 2.0

PROPELLER 2.0, a multi-plane application, significantly reduces motion artifacts caused by voluntary patient movement, and tremor or physiological motion including blood- and CSF-flow artifacts. PROPELLER 2.0 also optimizes SNR, capitalized as striking tissue contrast. PROPELLER 2.0 T2 and T2 FLAIR sequences do not compromise image resolution or increase scan time. When run with a DWI sequence, PROPELLER 2.0 greatly reduces tissue-air and bone-tissue susceptibility artifacts, such as those caused by metal implants.

3D Cube™

A GE-exclusive technique, 3D Cube replaces several slice-by-slice, plane-after-plane 2D FSE acquisitions with a single 3D volume scan – providing you with T2, T2 FLAIR or PD sequences. You can easily reformat sub-millimeter isotropic volume data from a single acquisition into any plane – without gaps, and with the same resolution as the original plane. Our new self-calibrating parallel imaging engine ARC helps eliminate artifacts while accelerating image acquisition.

3D BRAVO

BRAVO incorporates 2D ARC parallel imaging with 3D IR-prepared FSPGR acquisition to produce isotropic T1-weighted volumes. The center of k-space is over sampled and serves as the calibration data for the parallel imaging reconstruction.

3D COSMIC

This is a 3D sequence used to image the axial c-spine. COSMIC (Coherent Oscillatory State Acquisition for the Manipulation of Imaging Contrast) uses a modified fast GRE pulse sequence with steady-state free precession segmented multi-shot centric k-space acquisition. This improves the CNR and SNR of c-spine tissue including the spinal cord, vertebral disks, nerve root canal and contrast between CSF and nerve roots.

2D and 3D MERGE

Multiple Echo Recombined Gradient Echo (MERGE) uses multiple echoes to generate high-resolution images of the C-spine with excellent gray-white matter differentiation. By combining early echoes with high SNR and late echoes with improved contrast, the result is improved cord contrast within the spinal column.

3D FIESTA

3D FIESTA (Fast Imaging Employing Steady-state Acquisition) is a technique that uses an extremely short repetition time (TR) between RF pulses such that high-resolution 3D volume images can be acquired rapidly. The 3D FIESTA technique is especially useful for the rapid acquisition of high-spatial-resolution images of static structures such as cochlea, internal auditory canal, or joints.

3D FIESTA-C

This phase-cycled FIESTA reduces sensitivity to susceptibilities that may be encountered when imaging in the posterior fossa. It provides exquisite contrast that is ideally equated for visualization of the internal auditory canal. It is also ideally suited for T2 imaging through the cervical spine.

IDEAL-FSE

This sequence and reconstruction package acquires multiple echoes at different echo times with a fast-spin echo readout to create water-only, fat-only, as well as in-phase and out-of-phase images. IDEAL is designed for imaging those difficult regions such as the neck and spine where inhomogeneous magnetic fields yield failures with traditional fat saturation techniques.

Diffusion Tensor Imaging with Fiber Tracking

This package expands EPI capability to include diffusion tensor imaging, a technique that acquires diffusion information in up to 150 different diffusion directions. It generates image contrast based on the degree of diffusion anisotropy in cerebral tissues such as white matter. FuncTool capabilities on the console (included with ScanTools) create Fractional Anisotropy (FA), Apparent Diffusion Coefficient (ADC) and T2-Weighted TRACE maps.

The FiberTrak post-processing utility generates eigenvector information from the diffusion tensor acquisition and processing. Using a robust and efficient seeding process, three-dimensional renderings of the diffusion along white matter tracts are generated.

Applications

Functional MRI applications

BrainWave Real Time

BrainWave RT provides real-time acquisition, processing and display of functional results. It allows a single technologist to acquire, process and display BOLD (Blood Oxygen Level Dependent) fMRI studies acquired with synchronized stimuli. It is very comprehensive, equipping you with all the real-time functionality you need – including paradigm control and development, and real-time display of color activation, overlaid on source EPI images.

The main features are:

- 50,000 image storage per series with data acquisition rates up to 20 images/s
- Display of 2D activation maps overlaid over Echo planar source images in real time
- Multiple 2x2 and 4x4 display
- Optional saving of raw data in research mode for off-line analysis with 200,000 images

BrainWave Post-Acquisition on console

This high-performance software allows you to produce, from raw fMRI data, 3D brain renderings displaying functional activation. Display alternatives for these maps include cross-sectional displays, activation Z-maps and composite paradigm displays.

The features include:

- Integration into the operator console
- Special graphic user interface for image analysis
- Data quality check, motion correction, temporal filtering and spatial smoothing to optimize statistical analysis and mapping
- Multiple regression analysis
- The structural MRI scan is segmented using completely automatic threshold and histogram methods and mathematical morphology techniques
- Rapid retrospective motion correction
- Sophisticated visualization techniques including true volume rendering, light box and orthogonal displays

BrainWave Fusion

BrainWave Fusion is an optional package that provides the ability to fuse high-resolution anatomical images with fMRI activation maps and diffusion tensor fiber maps. This package is useful for evaluating the spatial relationship between activation patterns, fiber tracts, and underlying anatomy and pathology.

BrainWave Lite Hardware

BrainWave Lite Hardware provides paradigm-delivering hardware that provides data to paradigm synchronization – thereby paving the way for convenient compatibility with 3rd-party-supplied sensory equipment such as auditory headphones and visual presentation systems. (Not included)

BrainWave Lite Hardware includes:

- A dedicated computer workstation
- Equipment rack and penetration panel waveguide insert
- Cedrus patient response pads, and related cabling and connectors
- It is designed to deliver visual and auditory stimuli and receive a tactile response. The computer includes preset paradigms and software tools to generate custom protocols
- The visual and auditory output can be coupled to fMRI delivery systems purchased separately from other vendors

Spectroscopy applications

Multi-nuclear spectroscopy

The MR750 system supports a Multi-Nuclear Spectroscopy (MNS) option that includes excitation and reception hardware and a software package tailored for non-proton spectroscopy and imaging. This package includes a powerful 8 kW broadband amplifier, broadband RF pulse generator and an 8 channel receiver configuration operating over a frequency range of 10-130 MHz to support the study of nuclei such as 31P, 13C, 19F, 23 Na, 7Li, 129 Xe, and 3He. In addition, spectroscopic test sequences capable of generating signal from the aforementioned nuclei and an MNS-tailored post-processing package called SAGE is provided to aid in the visualization and quantification of spectral data. The MR750 system is capable of supporting both single and dual-tuned RF coils.

The standard MNS package does not include T/R switches, pre-amps, RF coil or optimized applications. T/R switches tuned to 31P and 13C frequencies are available options.

PROBE – PRESS single-voxel spectroscopy

PROBE – PRESS single-voxel spectroscopy allows you to non-invasively evaluate the relative concentrations of in-vivo metabolites and lets you acquire and display volume-localized, water-suppressed H1 spectra in single-voxel mode. The package includes automated recon, acquisition set-up and graphic prescription of spectroscopic volumes.

The standard sequence consists of three slice-selective RF pulses with crusher gradients. The PRESS sequence makes use of reduced flip angles to decrease minimum TE time of the sequence. The key advantage of PRESS (over STEAM) is that it provides up to twice the SNR and decreased exam time or voxel size. It is the sequence of choice for all hydrogen single-voxel spectroscopy data acquisitions with TE values ≥ 35 ms.

PROBE – STEAM single-voxel spectroscopy

STimulated Echo Acquisition Mode acquires a stimulated echo from the localized volume. The basic sequence consists of three slice-selective 90-degree RF pulses and a set of crusher gradients. Athough STEAM provides more accurate voxel localization, it has inherently lower SNR compared to PRESS. Moreover, since echo times available with STEAM CSI can be shorter, it is better suited than PRESS for chemical species that have shorter T2.

PROBE – 2D CSI

This extends the PROBE-PRESS capabilities with simultaneous multi-voxel in-plane acquisitions. Post-processing, including the generation of metabolite maps, is automatically generated with the FuncTool Performance package.

PROBE – 3D CSI

This extends the PROBE-2D CSI capabilities to add 3D multi-voxel acquisitions. (PROBE 2D CSI is mandatory).

SAGE 7

SAGE 7 (Spectroscopy Analysis by GE, Version 7) allows one to process, display, manipulate, analyze, manage and print in-vivo spectroscopy data via an easy-to-use, graphical interface. This powerful toolkit furnishes a wide array of filters, transformations, correction algorithms, and segmentation and measurement tools to extract the information contained in spectroscopy data. The results of the analysis can be output to a postscript printer and in electronic formats ranging from BMP, EPS and GIF to JPEG, PICT and TIFF. The processing steps can be customized and saved in macros to streamline application of even the most sophisticated routines. (SAGE is standard with the MNS package).

BREASE

This is a TE-averaged PRESS spectroscopy acquisition that provides the necessary biochemical information to help characterize breast anatomy.

Applications

Cardiovascular applications

iDrive Pro Plus

iDRIVE Pro Plus expands the capabilities of standard iDrive Pro with:

- Geometric changes to image plane location, obliquity, rotation, center FOV and FOV size
- Contrast parameters such as spatial pre-saturation on/off, special sat pulses, flow comp and RF spoiling
- Application of a non-selective IR pulse
- Swapping phase and frequency

It starts with an intuitive point-and-click user interface and live, on-image navigation icons. It continues with click-of-the-mouse image book-marking and a suite of localization and drawing tools, and includes capabilities from 10-level undo/redo, built-in time, autoNEX and click-of-the-mouse display/review/save, all to streamline even the most complex exams and manipulations.

MR Echo

MR Echo expands on the capability provided by iDrive Pro Plus and is designed to significantly simplify and reduce cardiac exam times. Presently, patients have to undergo multiple breath-holds to achieve the "whole-heart coverage" for wall motion and other studies. MR Echo employs a bright-blood ultra-fast FIESTA sequence, freezing motion and eliminating the need for breath-holding. An intuitive interface enables the operator to quickly scan the heart in any orientation and to save real time images to the browser through bookmarks. Scan & Save mode enables high-resolution heart imaging and enables multiple functional images over many slices to be prescribed and scanned in a single breath-hold. MR Echo auto-calculates total scan time for the number of prescribed slices enabling each scan to be tailored to the patient's breath-hold capability.

MR Echo also incorporates time course and myocardial evaluation imaging within a dedicated cardiac interface. The operator is able to switch rapidly between pulse sequences, which reduce the scan time required for a comprehensive cardiac MRI exam. Time-course imaging includes both a high contrast-to-noise ratio FGRE pulse sequence and a FIESTA pulse sequence. A new "Lock Coverage" feature within MR Echo time-course imaging automatically maintains start and end slice coverage despite changes in the patient' s heart rate between rest and stress time-course imaging. Myocardial evaluation imaging is also performed within the MR Echo cardiac interface to complete a full assessment of the heart. All the pulse sequences in MR Echo are compatible with the AutoVoice feature in multiple languages to aid the operator workflow.

QuickSTEP

QuickSTEP is an automated multi-station acquisition for the evaluation of the vascular tree. This unique application automatically prescribes, acquires, and combines images from multiple stations for fast acquisition and exam completion. To complete the entire exam in as little as 6 minutes, the system will automatically acquire mask datasets from multiple stations without any user intervention. Secondary images are then acquired at the same independent table positions. The system will automatically subtract the mask images from the secondary dataset and combine the resulting images from the multiple stations into one series. The user only needs to complete a quick review of the data prior to insertion of images into the database.

TRICKS

Time Resolved Imaging of Contrast KineticS (TRICKS) technology uses intricate temporal sampling with complex data recombination to accelerate the temporal resolution of 3D dynamic imaging – without compromising spatial resolution. This technology is now integrated with elliptical-centric data sampling to create the ideal imaging technique for MRA of the lower extremities in even the most challenging circumstances.

Easy to set up and easy to use, TRICKS rapidly generates time-resolved 3D images of blood vessels to meet the challenge of capturing peak arterial phases with minimal venous contamination. With TRICKS, the different vascular phases can be extracted, quickly and easily, after image acquisition.

Fluoro-Triggered MRA

Fluoro-triggered MRA (FTMRA) is designed to capture angiographic images at the precise moment of peak opacification. Rather than automating the image acquisition upon detection of the bolus arrival, FTMRA allows the operator to trigger each acquisition almost instantly (less than 1 second switch over) as soon as the operator is satisfied with the level of vessel enhancement. The result is an interactive, ASSET-compatible, accurate approach to MRA.

2D FIESTA CINE

Fast Imaging Employing STeady state Acquisition is a fully balanced steady-state coherent imaging pulse sequence that has been designed to produce high SNR images at very short TR. The pulse sequence uses fully balanced gradients to re-phase the transverse magnetization at the end of each TR interval. This sequence accentuates the contrast of anatomy with high T2/T1 ratios (such as the cardiac blood pool), while suppressing the signal from tissues with low T2/T1 ratios (such as muscle and myocardium). This enhances the contrast between the myocardium and the blood pool.

3D FatSat FIESTA

3D FatSat FIESTA is software designed for imaging of the coronary arteries. The software acquires 3D images using FIESTA (Fast Imaging Employing STeady-state Acquisition). Fat suppression is applied to accentuate the coronary arteries. The use of VAST (Variable Sampling in Time) technology greatly shortens breath-holding requirements or allows for higher spatial resolution.

2D IR Prepared Gated FGRE

Vital to MRI myocardial assessments, this technique can help distinguish between viable and necrotic tissue and therefore have a major impact on patient management – particularly on revascularization strategies. This pulse sequence uses an IR-prepared, cardiac-gated fast gradient echo sequence to acquire images whose appearance depends on the tissue's T1 relaxation time. The IR-preparation step allows various tissues to be suppressed or enhanced. The IR prep pulse in this sequence is non-selective; i.e., it excites the entire volume inside the body coil, rather than a specific slice. That means that it can suppress both the myocardium and the blood flowing into the slice.

3D IR Prepared Gated FGRE

3D IR Prepared Gated FGRE is an advanced tool for myocardial assessment. It uses VAST (Variable Sampling in Time) technology to acquire extensive volumes of data, rather than merely single slices, during breath-holds, with acquisitions gated to the cardiac cycle. The software applies a non-selective inversion-recovery magnetization preparation step to create T1-weighted tissue contrast and suppress the signal from certain tissues.

Applications

Navigators

This software package is designed for use in conjunction with 3D IR Prepared FGRE or 3D FatSat FIESTA for cardiac imaging. It consists of navigators that make it possible to track the diaphragm and use the information to acquire crisp 3D gradient-echo images of the heart even while the patient breathes.

Cardiac tagging

Used to improve visualization of contractile function, this tagging application combines cardiac-gated FastCINE gradient-recalled echo to acquire data throughout the cardiac cycle, with spatial SAT pulses applied throughout the FOV. Using the operator's choice of diagonal stripes or a grid pattern, tagging is applied once per R-R interval immediately following the R-wave ECG trigger, just before the start of data acquisition.

Fast Gradient Echo using EPI Echo Train

This technique combines a short-TR FGRE (Fast GRadient Echo) pulse sequence with an EPI echo train to acquire multiple views, or phase-encoding steps, per TR. It features uniform RF excitation, centric phase encoding, segmented k-space filling, retrospective gating in FastCARD-ET, EPI-caliber interleaving, and EPI-like acquisition of multiple views in one TR. Multi-phase FGRET is useful for applications such as multi-slice, multi-phase imaging of myocardial function.

Real-Time FGRE-ET

Also known as Fluoro MRI, this pulse sequence uses a short TR FGRE pulse sequence with the ability to acquire multiple views, or phase-encoding steps, per TR via an EPI echo train. The result is a highly useful combination of gradient-echo and EPI features, such as:

- Uniform RF excitation
- Centric phase encoding
- Segmented K-space filling
- Retrospective gating in FastCARD-ET
- Interleaving, as in EPI
- Acquisition of multiple views in a single TR

Used in conjunction with iDrive Pro Plus, the real-time version of this pulse sequence is essentially a single-slice version of standard FGRET. That makes it especially useful for obtaining higher-resolution interactive cardiac images.

StarMap

StarMap is T2 and T2* mapping sequences and processing utilities used to image the heart and other tissues. This technique acquires multiple echoes at different TE times at each location resulting in datasets of images that represent different T2 and T2* weighting. Post-processing of the images is employed to generate maps of the MR signals T2 or T2* signal decay across the echoes.

Body applications

LAVA

LAVA is a three-dimensional (3D) spoiled gradient echo technique designed specifically to image the liver with unprecedented definition, coverage, and speed. Excellent fat suppression, through a spectrally selective inversion pulse customized for the liver, is one of the reasons for the high definition of anatomical structures. The coverage and speed of LAVA are the result of short TR, innovative use of partial k-space acquisition, and advanced parallel imaging

LAVA-Flex

Liver Acquisition with Volume Acceleration with Flex processing. Based on the standard LAVA sequence, LAVA-Flex uses self-encoded 2D ARC parallel imaging and a new reconstruction algorithm to generate water-only, fat-only, in-phase and out-of-phase images from a single scan.

3D Dual Echo

With improvements in parallel imaging and RF coil arrays, volumetric imaging in the body is becoming a standard of care. The 3D Dual Echo sequence produces in-phase and out-of-phase images in a single breath-hold. As a result, the high-resolution images are in perfect alignment, simplifying the diagnostic process. In addition, the improved SNR of the 3D acquisition permits thinner slices than are traditionally available using 2D techniques.

3D FRFSE

Coupled with respiratory gating, this 3D FSE sequence uses a novel "recovery" pulse at the end of each echo train to recapture signal for the next repetition. These features result in high-resolution three-dimensional images for MR cholangiopancreatography (MRCP) studies.

Single-Shot Fast-Spin Echo

An ultra-fast technique that permits complete image acquisition following a single RF excitation. It can acquire slices in less than one second, making it an excellent complement to T2-weighted brain and abdominal imaging and MRCP studies.

Respiratory triggering

For patients who cannot hold their breath, respiratory triggering provides the answer. By synchronizing the acquisition to the respiratory cycle, high-resolution images free of breathing artifacts are obtained.

StarMap

StarMap is T2 and T2* mapping sequences and processing utilities used to image the liver and other tissues. This technique acquires multiple echoes at different TE times at each location resulting in datasets of images that represent different T2 and T2* weighting. Post-processing of the images is employed to generate maps of the MR signals T2 or T2* signal decay across the echoes.

Applications

Breast applications

MRI has been shown to be beneficial in the evaluation of the breast providing high-resolution images of breast anatomy. The Discovery MR750 3.0T system provides a full complement of breast imaging applications and protocols that generate both temporal and spatial resolution for highly detailed diagnostic breast imaging. In addition to the full suite of applications already listed, the following applications have been tailored for use in evaluation of the breast and surrounding tissue.

VIBRANT

VIBRANT is a technique for simultaneous, high-definition fat-suppressed bilateral breast imaging in both the axial and sagittal scan planes. With VIBRANT, imaging is performed without in-plane data interpolation for enhanced data integrity. VIBRANT allows acceleration in both the phase encoding as well as the slice-select direction. The result is high spatial and temporal resolution images that demonstrate exquisite contrast and high lesion conspicuity.

VIBRANT-Flex

VIBRANT-Flex uses a time-efficient dual-echo acquisition with 2D ARC parallel imaging to produce water-only, fat-only, in-phase, and out-of-phase images of the breast in a single scan. This processing enables excellent fat saturation to provide a clear depiction of the underlying breast anatomy.

FSE-IDEAL

Bilateral breast imaging makes fat saturation a challenge. With FSE-IDEAL, water, fat, in-phase, and out-of-phase images can be generated even in the presence of large static-field variations. This sequence produces consistent and reliable images in challenging anatomical areas.

BREASE

BREASE is a TE-averaged PRESS spectroscopy acquisition that provides the necessary biochemical information to help characterize breast anatomy.

Orthopedic applications

3D FIESTA

3D FIESTA's (Fast Imaging Employing Steady-state Acquisition) inherent sensitivity to fluids makes this an ideal sequence for orthopedic applications. In knee imaging, 3D FIESTA uses an extremely short repetition time (TR) between RF pulses such that high-resolution, 3D volume images can be acquired rapidly. The 3D FIESTA technique is especially useful for the rapid acquisition of high-spatial-resolution images of static structures such as cochlea, internal auditory canal, or joints.

FSE-IDEAL

Areas such as the foot/ankle, shoulder, and off-isocenter wrist make fat saturation a challenge. With FSE-IDEAL, water, fat, in-phase, and out-of-phase images can be generated even in the presence of large static-field variations. This sequence produces consistent and reliable images in challenging anatomical areas.

CartiGram

CartiGram is a T2 mapping sequence and processing utility used to image cartilage and other tissues. This technique acquires multiple echoes at different TE times at each location resulting in datasets of images that represent different T2 weighting. Post processing of the images generates maps of the T2 signal decay within each voxel.

Applications

Pediatric applications

PROPELLER 2.0

PROPELLER 2.0's ability to compensate for patient motion makes it an ideal sequence for pediatric imaging where motion often plagues the exams.

Since each blade passes through the center of k-space, PROPELLER 2.0 has unusually low sensitivity to motion artifacts and exceptionally high contrast-to-noise properties. This makes it ideal for producing high-resolution image quality even under challenging circumstances.

Available in all imaging planes, PROPELLER 2.0 provides the contrast and resolution that deliver real clinical impact. T2 FSE PROPELLER 2.0 creates T2-weighted images that are degraded much less by head motion than conventional FSE, with a 25-75% increase in contrast to noise without any time penalty. Imagine acquiring a motion-free scan, every time, and even on the most difficult of patients.

3D Cube™

A GE-exclusive technique, 3D Cube replaces several slice-by-slice, plane-after-plane 2D FSE acquisitions with a single 3D volume scan – providing you with T2, T2 FLAIR or PD sequences. You can easily reformat sub-millimeter isotropic volume data from a single acquisition into any plane – without gaps, and with the same resolution as the original plane. Our new self-calibrating parallel imaging engine ARC helps eliminate artifacts while accelerating image acquisition.

Diffusion tensor imaging with Fiber Tracking

This package expands EPI capability to include diffusion tensor imaging, a technique that acquires diffusion information in up to 150 different diffusion directions. It generates image contrast based on the degree of diffusion anisotropy in cerebral tissues such as white matter. FuncTool capabilities on the console (included with ScanTools) create Fractional Anisotropy (FA), Apparent Diffusion Coefficient (ADC) and T2-Weighted TRACE maps.

The FiberTrak post-processing utility generates eigenvector information from the diffusion tensor acquisition and processing. Using a robust and efficient seeding process, 3D renderings of the diffusion along white matter tracts are generated.

BRAVO

BRAVO incorporates 2D ARC parallel imaging with 3D IR-prepared FSPGR acquisition to produce isotropic T1-weighted volumes. The center of k-space is over sampled and serves as the calibration data for the parallel-imaging reconstruction.

MR Echo and iDrive Pro Plus

Motion-insensitive imaging techniques are paramount for pediatric populations. The real-time interactive capabilities provided by iDrive Pro Plus and the MR Echo application interface are ideally suited for pediatric imaging. By freezing motion and allowing the user to track moving anatomy, these tools help ensure streamlined pediatric exams.

TRICKS

Time Resolved Imaging of Contrast KineticS (TRICKS) technology uses intricate temporal sampling with complex data recombination to accelerate the temporal resolution of 3D dynamic imaging – without compromising spatial resolution. This technology is now integrated with elliptical-centric data sampling to create the ideal imaging technique for contrast-enhanced MRA of the lower extremities in even the most challenging circumstances.

Easy to set up and easy to use, the time-resolved 3D TRICKS application is ideally suited for imaging fast arterial flow. In pediatric populations and/or irregular vascular anatomies where rapid blood flow is common, TRICKS has the speed and resolution to separate arterial and venous flow kinetics. With TRICKS, different vascular phases can be visualized, aiding in the examination of tortuous vessels.

Scan parameters

Slice thickness, FOV, matrix	
Minimum slice thickness in 2D	0.5 mm
Minimum slice thickness in 3D	0.1 mm
Minimum FOV	10 mm
Maximum FOV	480 mm
Min/max matrix	64-1024

2D Spin Echo	
Minimum TR (128 x 128)	7.0 ms
Minimum TR (256 x 256)	7.0 ms
Minimum TE (128 x 128)	2.5 ms
Minimum TE (256 x 256)	2.5 ms

2D Fast-Gradient Echo	
Minimum TR (128 x 128)	2.2 ms
Minimum TR (256 x 256)	2.6 ms
Minimum TE (128 x 128)	0.8 ms
Minimum TE (256 x 256)	0.9 ms

3D Fast-Gradient Echo	
Minimum TR (128 x 128)	0.9 ms
Minimum TR (256 x 256)	1.2 ms
Minimum TE (128 x 128)	0.3 ms
Minimum TE (256 x 256)	0.5 ms

Echo Planar Imaging	
Minimum TR (64 x 64)	4.0 ms
Minimum TR (128 x 128)	5.0 ms
Minimum TR (256 x 256)	5.0 ms
Minimum TE (64 x 64)	1.1 ms
Minimum TE (128 x 128)	1.2 ms
Minimum TE (256 x 256)	1.5 ms
Minimum slice thickness	0.5 mm
ESP at 25 cm FOV	64 x 64: 0.428 ms 128 x 128: 0.668 ms 256 x 256: 1.012 ms
ESP at 48 cm FOV	64 x 64: 0.272 ms 128 x 128: 0.436 ms 256 x 256: 0.684 ms
ESP at 99 cm FOV	64 x 64: 0.176 ms 128 x 128: 0.296 ms 256 x 256: 0.568 ms
Maximum b value s/mm2	10,000
Images/second (64 x 64)	60
Images/second (128 x 128)	24
Images/second (256 x 256)	9
Maximum diffusion tensor directions	150
Minimum shots	1

2D Fast-Spin Echo	
Minimum TR (128 x 128)	10 ms
Minimum TR (256 x 256)	10 ms
Minimum TE (128 x 128)	2.5 ms
Minimum TE (256 x 256)	2.5 ms
Minimum ESP (128 x 128)	2.5 ms
Maximum ETL for SSFSE	262

Note: Optional software packages may be required to achieve certain specifications above.

Siting and other specifications

This section provides an overview of the siting requirements for a Discovery™ MR750 3.0T MR system with a LC300 magnet. More detailed information is available on request.

Typical room layouts	
	System configuration minimum values
Magnet room	
W x D	3.7 m x 6.4 m (12 ft 2 in x 20 ft 11 in)
Control room	
W x D	1.5 m x 2.1 m (5 ft 0 in x 7 ft 0 in)
Equipment room	
W x D	6.7 m x 2.4 m (22 ft 0 in x 8 ft 0 in)

Fringe field		
	Axial	Radial
0.5 mT (5 Gauss)	5.00 m (16.4 ft)	2.8 m (9.19 ft)
0.1 mT (1 Gauss)	7.4 m (24.28 ft)	4.4 m (14.43 ft)

Electrical supply requirements

Supply system recommended configuration:

- 3-phase grounded WYE with neutral and ground (5-wire system)
- Note: Neutral must be terminated inside main disconnect control.

Alternate configuration:

- 3-phase DELTA with ground (4-wire). Recommend corner grounded Delta configuration.

Voltage:

- 480/415/400/380/Vrms

Frequency:

- 50 or 60±3 Hz (380/400/415V); 60±3Hz (480V)

Installation dimensions and weights			
	Width	Height	Weight
LC300 actively shielded magnet assembly – (not including electronics)	2.3 m (7.56 ft)	2.6 m (8.54 ft)	11,253 kg (24,757 lbs)
Express patient table	67 cm (26.13 in)	97 cm (37.83 in)	206 kg (453 lbs)
Control room equipment			99 kg (175 lbs)
MR equipment			2387 kg (5363 lbs)

Siting and other specifications

Power consumption

Power consumption depends on actual usage. The following values are an approximation. They exclude consumption by shield cooler compressor (9 kVA).

Power consumption	
Overnight mode (Sleepmode)	9 kVA
Typical power	41 kVA
Continuous sustained power (> 5 seconds)	99 kVA

Discovery MR750 3.0T water requirements	
Maximum heat removal to customer-supplied water	70 kW
Water flow	114 liters/min (30 gpm) minimum at a maximum temperature of 10 degrees C

Workspace monitor position	
	Maximum field strength
LCD Flat Panel Monitor	5 mT (50 Gauss)

Alternative environments

Modular buildings may also be available (including air-conditioning, heating, chiller, RF shielding, additional magnetic shielding in walls). Contact your local GE representative for GE-certified designs and vendors.

Please ask your local GE project manager for a comprehensive installation and siting manual.

Filming considerations

Filming requires the Discovery™ 3.0T Analog or Digital Filming Interface (purchased separately) unless DICOM Print will be used exclusively for software filming to DICOM Print peripheral devices. An Analog/VDB or Digital/LCAM Camera Interface is typically required for most installations.

Accessory Package

- SPT phantom set with storage cart
- Customer diagnostic software
- Operator manuals
- Patient log books

Emergency stop

Disconnects electrical power from RF and gradient components in the magnet room (duplicate control at the magnet).

Warranty

The published GE warranty in effect on the date of shipment shall apply.

InSite™ Remote Diagnostics

GE's unique remote service and applications support including magnet monitoring. Also allows downloading of applications software such as eFlexTrials program.

Miscellaneous

Optional capabilities

Many features and capabilities listed in this data sheet are optional with a GE Discovery™ MR750 system and are subject to change without notice. Contact a GE representative for the most recent data.

GE regulatory compliance

The Discovery MR750 3.0T system complies with all applicable safety standards, including but not limited to UL60601-1 and IEC60601-1-2 (Electromagnetic Compatibility).

Laser-alignment devices contained within this system are appropriately labeled according to the requirements of the FDA's Center for Devices and Radiological Health (CDRH).

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GE Healthcare provides transformational medical technologies and services that are shaping a new age of patient care. Our broad expertise in medical imaging and information technologies, medical diagnostics, patient monitoring systems, drug discovery, biopharmaceutical manufacturing technologies, performance improvement and performance solutions services helps our customers to deliver better care to more people around the world at a lower cost. In addition, we partner with healthcare leaders, striving to leverage the global policy change necessary to implement a successful shift to sustainable healthcare systems.

Our “healthymagination” vision for the future invites the world to join us on our journey as we continuously develop innovations focused on reducing costs, increasing access and improving quality and efficiency around the world. For more information about GE Healthcare, visit our website at www.gehealthcare.com

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