Optima MR450w XP GEM 1.5T MRI

imagination at work

- 1.5T wide-bore system with full 50cm FOV
- Top-of- the-range 44/200 Gradient Performance
- Optical 32 ch RF Chain for up to 30% improved SNR
- Advanced GEM coil technology optimised for parallel imaging
- Sports Injury Applications package for optimum imaging performance e.g. 3D CUBE, Ideal & Cartigram
- Simplified User Interface for speed and ease of use
- Suitable for imaging all anatomies

Optima MR450w + GEM

Qty	Catalogue No.	Description	
Main System			
1	Z53021C	**Optima MR450w GEM with AW**	
		Hardware	
		M7000ZR	MR450W GEM MAGNET
		M7000ZJ	MR450W GEM SYSTEM
		M7000ZP	MR450W GEM SCAN ROOM
		M7000ZK	MR450W GEM SITE COLLECTOR
		M7000JT	Service IP Protection Disabler
		M7000ZM	MR450W GEM PATIENT TABLE
		M7000ZN	MR450W GEM TECH PUBS
		M7000ZT	GEM CURTAIN KIT
		M3335MT	HD LCD Monitor
		M1060MA	VIBROACOUSTIC DAMPING KIT
		M7000GL	Cabinet dollies
		M3335CA	Phantom Cart
		M3335CB	1.5T CALIBRATION PHANTOMS
		M1000MW	WIDE OPERATOR TABLE
		Coils	
		M7000LK	1.5T GEM SUITE (PA + AA + HNU)
		M3340CD	1.5T HD 8CH FOOTANKLECOIL
		M3340CE	1.5T HD 8CH SHOULDER COIL
		M7000FW	1.5T GEM WRIST ARRAY
		M7000FS	1.5T GEM TX/RX KNEE ARRAY
		M7000SC	1.5T GEM Flex Suite, Standard
		Software	
		M7000JE	MR450w GEM SCANTOOLS 22.1
		M7000JS	INHANCE SUITE
		M7000CB	TRICKS
		M7000CP	IDEAL
		M7000HZ	CUBE WITH T1
		M7000JA	PROPELLER 3.0
		M7000CW	FIBERTRAK
		M7000CT	DIFFUSION TENSOR
		M3340AG	SWAN
		M7000FC	BRAIN STAT WITH AIF

		AW Workstation	
		M81531FF	AW VS5 Workstation
		M10501MP	MR PASTING FOR AW4.1 & 4.2
		M81571AH	MR Advanced Review
		M81501RR	RAM Ext 12GB
		M30321BE	Body view
		M30321BD	BRAIN VIEW PLUS
		M30331PL	FLOW ANALYSIS
Hardware			
1	M7000WM	Pre-installation kit for MR450(w) & MR750(w)	
1	M7000WL	Main Disconnect Panel	
2	M1060KN	Remote magnet rundown kit	
1	E88241A	Oxygen monitor	
1	E80331BE	Physician mobile armchair	
1	M7000WP	System cables - A	
1	M7000YS	Gradient cables - A	
1	M1000LH	Warning signs - English	
1	M3335JZ	English Keyboard HDx	
1	M7000LT	PAPER OP MAN-ENGLISH	
1	E88221AB	MR RELAXATION SYSTEM	
		Additional RF Coils	
1	Z53021J	MSK Expert Pack for MR450w	
		M3340CD	1.5T HD 8CH FOOTANKLECOIL
		M3340CE	1.5T HD 8CH SHOULDER COIL
		M7000FW	1.5T GEM WRIST ARRAY
		M7000FS	1.5T GEM TX/RX KNEE ARRAY
1	M7000AS	GEM Peripheral Coil	
		Additional Applications Software	
1	M7000EJ	CartiGram	
		Training	
1	A00121MR	[8+4]-day onsite application training	

Z53021C Optima MR450w GEM with AW

Patient expectations of MR have shifted in recent years, as patients have begun to demand a better, more comfortable scanning experience. Increasing the size of the bore is a good first step, but it's only the beginning. The right system should overcome traditional limitations of wide-bore MR, offering both excellent images and a user-friendly experience. Patients should be more comfortable during their scan, and clinicians more comfortable in making a diagnosis. All the while, organizations should expect their MR system to help them deliver solid financial returns, maintain a high standard of patient safety, and increase the quality of their care.

The Optima MR450w with GEM 1.5T MRI scanner from GE Healthcare offers a range of new functionalities, provides a more patient-friendly environment and is a clinical workhorse system for practices of all sizes and specialties.

To improve the patient experience and provide high image quality, no other component of an MRI system has greater impact than the magnet. The Optima MR450w system features a short, wide bore magnet that delivers a large field of view. The magnet geometry has been optimized to reduce patient anxiety by providing more space in the bore and more exams with the patient's head outside of the magnet. The 50cm field of view provides uniform image quality and can reduce exam times since fewer acquisitions may be necessary to cover large areas of anatomy. Complemented by GE's active shielding technology, the Optima MR450w has very flexible installation specifications to provide easy siting. And with zero-boil-off magnet technology, helium refills are effectively eliminated, thus reducing operating costs and maximizing uptime.

Magnet:

- Manufactured by GE Healthcare.
- Operating field strength 1.5T (63.86 MHz).
- Active magnet shielding.
- Zero boil-off Cryogens.
- Magnet length 145cm.
- Patient Aperture 76 cm.
- Patient Bore Diameter 70cm.
- Patient Bore Length 105cm.
- Maximum Field of View 50 cm x 50 cm x 50 cm
- Magnet Homogeneity:

	Typical ppm	Guaranteed ppm
10cm DSV	0.007	0.02
20cm DSV	0.035	0.06
30cm DSV	0.11	0.18
40cm DSV	0.5	0.7
45cm DSV	1.2	1.6
50x50x45cm	2.3	3.6
50cm DSV	3.3	

DSV = Diameter Spherical Volume. Homogeneity for an elliptical volume of 50cm (x,y) by 45cm (z) dimension volume is shown for reference.

- Fringe field (axial x radial).

- 5 Gauss = 4.0 m x 2.5 m.
- 1 Gauss = 6.2 m x 3.7 m.

Optimally designed for patient safety, patient comfort, and efficient workflow, the external features of the Optima MR450w also provide an aesthetically pleasing look and feel that can reduce patient anxiety. The wide open flare of the covers increase the effective bore size and may reduce patient anxiety when entering the scan room or magnet bore. With patient-optimized lighting and air conditioning, the system can be ideally set for each individual, increasing their control of the environment.

Gradients:
Premium clinical performance is enhanced with the Optima MR450w with GEM gradient system. Gradient speed, accuracy, and reproducibility are critical for all acquisitions, but the performance is especially important in challenging acquisitions, such as DWI and PROPELLER.

- Peak Gradient Amplitude = 34 mT/m per axis.
- Peak Gradient Slew Rate = 150 T/m/s per axis.
- Maximum FOV (x, y, z) = 50 cm
- Gradient Duty Cycle = 100%
- Amplifier Current and Voltage = 660 Amps/1650 Volts Peak

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 TR's and TE's, applications such as fMRI, Propeller, 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 Optima MR450w 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
- Innovative feed-forward model to match amplifier output to gradient coil

Gradient subsystem gradient fidelity, accuracy, reproducibility parameters:

- Maximum integrated error: 0.48 ppmFS-s
- Shot-to-shot: 0.16 ppmFS-s
- Symmetry error: 0.32 ppmFS-s

Quiet Technology:
GE has implemented Quiet Technology on critical components of the Optima MR system to reduce acoustic noise and improve the patient environment. This technology enables full use of the gradient platform for excellent image quality, while maintaining a safe environment for the patient. The technology encompasses the gradient coil, RF body coil, and magnet mounting.

OpTix RF Receive Chain:
GE's innovative Optical RF receive technology improves signal detection while simultaneously reducing electrical noise. By locating the receiver electronics on the side of the magnet and close to the origin of the MR signal, interference from external noise sources is reduced thus improving image quality and SNR. The result is a 27% SNR improvement over previous generation, non-optical systems for volumetric scanning.

The use of optical transmission reduces the cabling footprint over conventional copper cable designs and enables high channel count configurations without requiring additional space. The OpTix technology can seamlessly route signals from any coil port to the receivers using a dynamic switching RF hub. To enable the simultaneous use of multiple coils, there are multiple high-density coil connections ports conveniently located where the detachable table docks to the scanner.

- Sampling Bandwidth 80MHz.
- Surface coil Receive ports 136

Volume Reconstruction Engine 2.0 (VRE):
The backbone of any high-channel count receiver system is the reconstruction architecture. The Optima MR450w utilizes the latest dual-core 2.6 GHz processing technology with the VRE 2.0 recon architecture. With its 36 GB of memory, acquisition-to-disk technology, and 13000 2D FFT/s frame rate, the VRE delivers the processing power to quickly reconstruct high-resolution 3D volumetric data.

In-Room Operator Console:
By consolidating all controls in a convenient place, the in-Room Operator Console (iROC) provides real time feedback to the operator to improve exam room efficiency. With a high-resolution, 12.1-inch color LCD monitor located just above the MR450w gantry, the display of patient set-up, coil-connection, and real time physiologic waveforms (EKG, peripheral, and respiratory) makes exam preparation a breeze.

The iROC provides real-time feedback and/or edit of the following parameters:

- Display of patient name, ID, and study description.
- Display and entry of patient weight.
- Display and entry of patient orientation/position.
- AutoStart automatically starts data acquisition once the technologist closes the scan room door.
- Cardiac & respiratory waveform display.
- Landmarking information, table position, and scan time.
- Coil connection status.

For sites that also purchase CADStream (version 5.2 or higher), the iROC can display the SurLoc breast biopsy planning screens.

GEM Express Patient Table with IntelliTouch Technology:
Unique to GE, the fully detachable GEM Express Patient Table incorporates the Liberty Docking System to improve safety, exam efficiency, and patient comfort over fixed-table solutions. 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 from the scan room in less than 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.

GEM Express patient table

- Patient table: Detachable and mobile
- Min/max table height: 70 to 93 cm, continuous
- Patient table drive: Automated, power driven vertical and

- longitudinal
- Longitudinal speed: 30 cm/sec (fast) and 0.5 cm/sec (slow), 15 cm/sec for patient positioning
- Total cradle length: 210.8 cm
- Total cradle travel: 278.1 cm
- Scannable range: 205 cm
- Maximum patient weight for scanning: 227 kgs (500 lbs)
- Maximum patient weight (detached and mobile): 227 kgs (500 lbs)
- Maximum lift capacity: 227 kgs (500 lbs)
- Patient transport accessories: Self-storing non-ferrous IV pole; Positioning pads; Immobilization straps
- Landmarking: Laser alignment with S/I and R/L alignment and/or IntelliTouch Landmarking Capability
- Coil connection ports: Two high density auto-coil sensing connection ports

Each patient who requires an MR examination is unique—with respect not only to age and gender, but dimensions of size, proportion, physical frailty, tendency towards claustrophobia, and of course, unique clinical circumstances that require the exam. With the uniqueness of the patient in mind, GE Healthcare engineered the new GEM Suite surface coil technology. GEM, or Geometry Embracing Method, incorporates an approach to MR imaging that reflects the importance of conforming the geometry of the equipment and technology to that of the patients.

The combined features of the entire Suite are designed to facilitate high-resolution, high signal-to-noise (SNR) imaging from the top of the head down to the feet, while maximizing the comfort of patients across many different shapes, sizes, and situations. In general, a significant source of patient motion during an MR exam is the result of discomfort or anxiety. By addressing the sources of discomfort and anxiety, the GEM Suite approach aims to help reduce patient motion and improve the quality of the overall exam.

Coil Mode Configuration:
The 1.5T GEM Suite was designed to reduce multiple physical coil changes within a single exam and between different exams, and to improve patient comfort. The system will automatically select the coil mode configuration that best fits the selected region of interest.

GEM Express Table & Posterior Array (PA):
The GEM Express Patient Table is a mobile patient transport device that includes an embedded high-density, posterior RF array. Fully detachable, the GEM Express patient table offers numerous benefits for patients and radiographers.

Geometric Optimization:
The GEM PA has optimal coil element geometry for each patient and targeted anatomy. The GEM PA uses optimized element layouts for the cervical-to-thoracic spine transition, thoracic and lumbar spine, and the body. This approach maximizes the signal-to-noise ratio by matching the geometry of the coil elements to the anatomical size and shape of the anatomy. The PA is designed to support parallel imaging in all 3 scan planes, and the system will automatically select the appropriate subset of coil elements based upon the prescribed field-of-view. The Express patient table also includes an innovative and adjustable comfort tilt feature to lift the patient's neck and conform to the patient's natural anatomy, to increase patient comfort.

Symmetric Scan:
The Express patient table and embedded GEM coil is designed to accommodate head-first or feet-first imaging for all supported exams. The integrated PA is symmetrically positioned within the patient

supporting cradle, and coil connection ports are located at both ends of the detachable table. This design enables all components of the GEM Suite to support either patient orientation and help ensure the most comfortable patient position. Whole body imaging may also be supported in the feet-first orientation.

GEM Posterior Array Specifications:

- Length: 100 cm (39.4 in)
- Width: 40 cm (15.7 in)
- S/I Coverage: 100 cm (39.4 in)
- Head-first or feet-first imaging
- Elements: 40

Additional patient tables may be purchased for use with the same Optima MR450w with GEM Suite system. The integrated posterior array is an optional accessory with each additional table.

Patient Comfort Pads:
To improve patient comfort and safety, the GEM Suite includes an innovative set of Patient Comfort pads. The pads are designed with variable density foam that uniquely compresses based on patient geometry and weight. Certain sections of the GEM Suite pads are designed to compress more easily than others and this optimal design may minimize pressure points and improve patient comfort. The pads have been designed to support a wide range of patient sizes and weights. The pad coating is strong, easily cleanable, and processed with an Ultra-Fresh treatment. An anti-skid undersurface reduces pad movement and thus may simplify setup and egress.

GEM Head & Neck Unit with comfort tilt (HNU)
The GEM HNU is a standard component of the GEM Suite. The HNU consists of four imaging components: a head base-plate, an anterior neuro-vascular face-array, the GEM cervical array, and the open face adapter. The coil maybe positioned at either end of the GEM table to support head-first or feet-first imaging. The open-face design provides a patient-friendly feel. The base plate may be used with the dedicated GEM cervical array for C-spine imaging. Alternatively, the base plate may be used with the open face adapter to accommodate cervical spine exams in large or claustrophobic patients. Improved access and patient comfort may be achieved through elevation of the superior end of the coil. The HNU with anterior NV Face-Array consists of 21 elements arranged to provide parallel imaging support in all 3 planes.

Head Neck Unit NV Specifications

- Length: 49.5 cm (19.5 in)
- Width: 38.8 cm (15.3 in)
- Height: 36.8 cm (14.5 in)
- Weight of HNU base: 5.0 kgs (11.0 lbs)
- Weight of Anterior Adapter: 2.6 kgs (5.8 lbs)
- S/I Coverage: 50 cm (19.7 in), when combined with the PA and AA
- R/L Coverage in head mode: 24 cm (9.4 in)
- R/L Coverage for NV: 50 cm (19.7 in), when combined with the PA and AA
- Head-first or feet-first imaging
- Up to 28 elements in the FOV, when combined with the PA and AA

Head Neck Unit Cervical Specifications

- Length: 49.5 cm (19.5 in)
- Width: 38.8 cm (15.3 in)
- Height: 33.6 cm (13.2 in)
- Weight of Cervical Adapter: 1.7 kgs (3.7 lbs)
- S/I Coverage: 28 cm (11 in)
- R/L Coverage: 24 cm (9.4 in)
- Head-first or feet-first imaging
- Up to 20 elements in the FOV, when combined with the PA

Head Neck Unit with Open Face Adapter Specifications

- Length: 49.5 cm (19.5 in)
- Width: 38.8 cm (15.3 in)
- Height: 25.7 cm (10.1 in)
- Weight of Open Face Adapter: 1.3 kbs (2.8 lbs)
- S/I Coverage: 28 cm (11.0 in) with all 7 elements
- R/L Coverage: 24 cm (9.4 in)
- Head or Feet-first imaging
- Up to 12 elements in the FOV, when combined with the PA

GEM Anterior Array (AA)
The GEM AA is a standard component of the GEM Suite that facilitates chest, abdomen, pelvis, and cardiac imaging. The GEM AA is lightweight, flexible, thin and pre-formed to conform to the patient's size and shape. With 54 cm of S/I coverage, the coil permits upper abdominal and pelvic imaging without repositioning the patient. The 16 element electrical design supports parallel imaging in all 3 planes.

Anterior Array Specifications

- Length: 55.6 cm (21.9 in)
- Width: 67.3 cm (26.5 in)
- Height: 3.6 cm (1.4 in)
- Weight: 2.8 kgs (6.1 lbs) resting on patient
- 4.1 kgs (9.0 lbs) with cable
- S/I Coverage: 54 cm (21.3 in)
- R/L Coverage: to the full 50 cm (19.7 in) FOV of the system
- Head or Feet-first imaging

- Up to 36 elements in the FOV, when combined with the PA

GEM Flex Suite
The GEM Flex Suite is a versatile set of high density 16ch coils designed to give high quality images in a wide range of applications. The high degree of flexibility is particularly advantageous when imaging patients that do not fit the constraints of rigid coils, improving the patient and technologist experience, and enabling most exams to be completed with the same level of image quality expected from dedicated coils. The Medium and Large coils are included in this system. The Flex Suite is intended to cover a broad range of muscular skeletal applications, including upper and lower extremities of hand, wrist, elbow, knee, ankle, and foot.

GEM Flex Suite specifications

Component	Coverage (W x L)	Wrap Diameter	Elements	Weight
Large	23cm x 70cm	15.5cm - 21.5cm	16	1.0kg
Medium	23cm x 48cm	11.5cm - 15.5cm	16	0.8kg

Additional coils

This system is delivered also with:

- Quadrature birdcage T/R head coil, primarily used for maintenance and system calibrations

ScanTools
The Optima MR450w with GEM scanner comes standard with a package of pulse sequences and applications optimized for 1.5T performance.

Pulse sequences and imaging options:

Spin Echo: The gold standard for generating T1, proton density and T2 images.

Fast-Spin Echo (FSE) and 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.

3D FRFSE: 3D FRFSE is 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.

GRE, FGRE, SPGR and 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 and 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) and 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 and 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) and 3D Phase Contrast (3DPC): These techniques demonstrate flow velocities and directional properties in vessels and other moving fluids such as cerebral spinal fluid and aortic flow.

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 MR angiography 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 provides advanced capabilities by using a wide range of sophisticated algorithms, including:

- ADC maps and eADC maps
- Correlation Coefficients for mapping of motor strip and visual/auditory stimuli
- 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: 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 1D ARC to reduce scan time and minimize parallel imaging artifacts.

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 COSMIC: This is a 3D sequence used to image axial c-spine. COSMIC uses 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.

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 T1 imaging through the cervical spine.

2D FatSat FIESTA: Fast Imaging Employing STeady-state Acquisition (FIESTA) is designed to produce high SNR images extremely rapidly and with excellent contrast between tissues. The contrast relies on a steady state for the transverse magnetization, which builds as a series of radio frequency pulses and special gradient pulses are repeated after an extremely short repetition time, TR. FIESTA accentuates the signal from tissues that have a long T2 and short T1. FIESTA has the capability to suppress the signal from fat, especially to create more contrast between the vasculature and surrounding tissues.

Other Applications included:

3D GradWarp: This is a technique integrated into image reconstruction that helps reduce image distortion by compensating for gradient non-linearities in all three dimensions. This correction differs from the default 2D correction that is conventionally performed by incorporating the slice direction into the processing.

LAVA Flex: LAVA Flex is a 3D FSPGR imaging technique that acquires fat/water in phase and out of phase echoes in a single acquisition. Up to 4 types of image may be reconstructed within one acquisition: in phase, out of phase, water only, fat only. The water only contrast differs from a conventional fat suppressed image in that an inversion prep pulse is not applied for fat suppression. In fact, the fat information is removed leaving a water only image that may potentially be used in place of a LAVA type image. LAVA Flex uses ARC. (Auto Calibrating Reconstruction for Cartesian Sampling), a 2D self-calibrated parallel imaging technique that allows for acceleration in both phase and slice directions for supported coils.

3D Cube: Cube is a technique and replaces several slice-by-slice, plane-after-plane 2D FSE acquisitions with a single 3D volume scan – providing you with T1, T2, T2 FLAIR or PD contrast. 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. ARC parallel imaging helps eliminate artifacts while accelerating image acquisition.

PROPELLER 3.0: PROPELLER 3.0 has been developed to reduce effect of patient voluntary and physiologic motion (breathing, flow, peristalsis), and reduce magnetic susceptibility artifacts. This pulse sequence helps generate consistently good, diagnostic quality images even for challenging patients and difficult to image anatomies. PROPELLER 3.0 uses innovative radial k space filling pattern that, compared to the Cartesian method, is inherently less sensitive to motions such as CSF and blood flow, breathing, patient tremor or voluntary movements. In addition, a sophisticated motion correction post-processing algorithm is deployed to further reduce effects of rigid motions. The oversampling of the k space center typical for radial k-space filling also yields increased SNR and an excellent tissue contrast. PROPELLER 3.0 has been enabled for T1 FLAIR, T2, T2 FLAIR imaging in all planes, axial diffusion weighted imaging for brain, T2 weighted imaging for cervical spine, excellent T2 weighted imaging for Body, and T2/PD weighted imaging for MSK.

BrainSTAT: BrainSTAT is a standard post processing application that automatically generates parametric maps for Cerebral Blood Flow, Blood Volume, Mean Transit Time, and Time to Peak signal intensity. A Gamma Variate Fitting algorithm is used to automatically calculate the values for the four parametric maps. The maps may be saved in DICOM format and fused with high-resolution anatomic datasets to provide reference to tissue and anatomy. An optional add-on to the Brain STAT package enables the user to automatically, or manually specify the arterial-input function (AIF) based on the temporal form of the signal, to calculate normalized values of the Blood Flow, Blood Volume, Mean Transit Time, and Time to Peak signal intensity based on the vascular flow dynamics of a specific patient.

IDEAL and Flex: Generate consistent tissue contrast and reduce the number of series in an exam with IDEAL. The IDEAL acquisition and reconstruction methods can generate a water-only, fat-only, in-phase and out-of-phase data sets for clear tissue differentiation in a single series. In addition, IDEAL can eliminate susceptibility artifacts common to MR imaging such as incomplete or inaccurate fat saturation and chemical shift. The IDEAL application acquires multiple echoes and uses unique reconstruction routines to generate the four image contrasts and correct correct for errors due to tissue susceptibility. IDEAL is perfectly suited for imaging anatomical regions such as the brachial plexus, neck, spine, chest, foot, ankle, and axilla where where inhomogeneous magnetic fields may yield failures with traditional fat saturation techniques. IDEAL is compatible with Fast Spin Echo, 3D Gradient Echo and parallel imaging.
For fast multi-phase imaging of the abdomen and pelvis, Flex is compatible with LAVA. The efficient LAVA-Flex acquisition uses 2D ARC parallel imaging to eliminate artifacts from breath hold misregistration and incorrect FOV placement in addition to the clear tissue contrasts. (LAVA is included in the Express Exam ScanTools).
For fast multi-phase imaging of the breast, Flex is compatible with VIBRANT. The efficient VIBRANT-Flex acquisition uses 2D ARC parallel imaging to gain higher acceleration factors over ASSET parallel imaging, reduces artifacts from breath hold misregistration, and eliminates artifacts due to incorrect FOV prescription. VIBRANT must be purchased separately.
The IDEAL and Flex method is compatible with ASSET and ARC parallel imaging and is optimized for different anatomies of interest.

TRICKS: TRICKS (Time Resolved Imaging of Contrast KineticS) provides high resolution multi-phase 3D volumes of any anatomy for fast accurate visualization of the vasculature. With segmented complex data recombination, TRICKS can accelerate 3D dynamic vascular imaging without compromising spatial detail. TRICKS also uses elliptic centric data collection for optimized contrast resolution and auto-subtraction for optimized background suppression. The result is time course imaging that does not require timing or triggering, provides high temporal and high spatial resolution, and enables the extraction of optimum phases of data. As a result, TRICKS enables reliable, high quality vascular imaging. TRICKS is compatible with surface coils and supports parallel imaging for even higher temporal resolution.

Inhance suite
The Inhance application suite consists of several sequences designed to provide high-resolution images of the vasculature with short-acquisition times and excellent vessel detail. These sequences include:

Inhance Inflow IR: Inhance Inflow IR is a new angiographic method, which has been developed to image renal arteries with ability to suppress static background tissue and venous flow. This sequence is based on

3D FIESTA, which improves SNR, as well as produce bright blood images. A selective inversion pulse is applied over the region of interest, which inverts arterial, venous, and static tissue. At the null point of the venous blood, an excitation pulse is applied to generate signal. The net result is an angiographic image with excellent background suppression and without venous contamination. Uniform fat suppression is achieved using a spectrally selective chemical saturation (SPECIAL) technique to provide uniform fat suppression, while respiratory gating compatibility reduces respiratory motion artifacts during free-breathing renal exams.

Inhance 3D Velocity: Inhance 3D Velocity is designed to acquire angiography images in brain and renal arteries with excellent background suppression in a short scan time. By combining a volumetric 3D phase contrast acquisition with parallel imaging, efficient k-space traversal, and pulse sequence optimization, Inhance 3D Velocity is faster than previous generations and is capable of obtaining complete neurovascular imaging in 5-6 minutes. Furthermore, background suppression is improved by the optimized pulse sequence design, resulting in better visualization of small branches. Respiratory trigger is also compatible with 3D Velocity to enable abdominal angiography, especially renal arteries. The result is the Inhance 3D Velocity technique offers improved productivity and image quality.

Inhance 3D DeltaFlow is a 3D non-contrast enhanced MRA application for peripheral arterial imaging. Inhance 3D DeltaFlow is based on the 3D Fast Spin Echo technique and it utilizes the systolic and diastolic flow differences to help generate arterial signal contrast. A subtraction of the systolic phase from the diastolic phase images results in arterial only images, with good venous and background suppression. Interleaved acquisition and parallel imaging (ASSET) with optimized k-space trajectory helps reduce motion misregistration and improve vessel visualization respectively. In addition, with the use of partial-Fourier and coronal plane acquisition, the scan time is considerably reduced. Inhance 3D DeltaFlow is a robust 3D NCE MRA technique that provides excellent, high SNR visualization of peripheral arteries.

Inhance 2D Inflow: The Inhance 2D Inflow pulse sequence is designed to acquire angiography images of arteries, which follow almost a straight path, i.e. femoral, poplitial, carotid arteries, etc. Arterial blood flow is faster during systolic phase and slows down during diastolic phase. Inhance 2D Inflow is designed to acquire data during systolic phase and offers the following:

- Optimized spatial saturation gap to improve fat suppression and background suppression. With this saturation gap optimization, higher views per segment (vps up to 48) could be used, resulting in significant scan time reduction.
- Peripheral Gating that minimizes the pulsatile artifacts.
- Optimized View Ordering to improve arterial signal.
- ASSET acceleration compatibility to reduce scan time.
-

Miscellaneous Hardware:
This configurations includes the following hardware:

- Curtain kit for the MR450w magnet
- HD LCD Monitor (Operator console)
- Vibroacoustic Damping kit for the MR450w magnet
- Cabinet Dollies
- 1.5T calibration phantoms and Phantom cart
- Wide Operator Table

Not included here, but mandatory, the following site-dependent and language-dependent items must be quoted separately:

- System cables
- Gradient cables
- Language kit
- Keyboard in local language

The appropriate MDP (M7000WL) and Pre-installation kit M7000WM) must be quoted as well, and can be shipped in advance of the magnet to expedite the site preparation.

AW Workstation
This configuration includes and AW with the following configuration

- M81531FF AW VS5 Workstation
- M10331ND Functool Performance
- M10501MP MR PASTING FOR AW4.1 & 4.2

A local language keyboard must be added to the present configuration.

M1000LH Warning signs - English

This kit contains signage in English that can be posted around the MR suite to remind precautions that ensure the safety of patients, technologists, and other people who come close to the MR system.

E88241A Oxygen monitor

This oxygen monitor from Systech is installed in the magnet room to warn the staff in case the oxygen level becomes too low.

E80331BE Physician mobile armchair

Physician mobile armchair

Specifications :

- "Permanent contact" type armchair
- Adjustable back rest (height and depth)
- High density foam for seat and back rest
- Black, thermoplastic formed arm rests
- Adjustable seat height : 450 to 570 mm

- 5 Wheels
- Charcoal grey

M7000WP System cables - A

Optima MR450w system cables - Configuration A: short ER and short SR.

To accommodate various electronic and scan room configurations and sizes, the Optima MR450w has preset lengths of cables and connector kits to speed system installation. This catalog is for sites with a relatively short distance (10 meters) between the penetration wall and the rear of the MR scanner, and approximately 10 meters between the penetration wall and cabinets in the electronics room. Refer to the pre-installation manual for exact cable lengths and configurations. This cable collection is compatible with fixed and relocatable building configurations.

M7000YS Gradient cables - A

Optima MR450w system cables - Configuration A

M7000WL Main Disconnect Panel

The MR750 / MR450 / MR450w Main Disconnect Panel safeguards the MR system's critical electrical components by providing complete power distribution and emergency-off control.

M3335JZ English Keyboard HDx

English Keyboard HDx

M1060KN Remote magnet rundown kit

The Remote Magnet Rundown Unit supplements the magnet rundown unit provided with the MR system.

M7000WM Pre-installation kit for MR450(w) & MR750(w)

The Pre-installation collector delivers to the site in advance of the magnet and main electronic components. This facilitates the later delivery and installation of supporting electronics. The following are the main components in the Pre-installation collector:

- Heat exchange cabinet for distribution of chilled water.
- Primary Penetration wall panel for support of the penetration cabinet.
- Secondary Penetration wall panel for support of gradient filters, helium cables, and chilled air and water.
- Helium cryocooler hose kit.

E88221AB MR RELAXATION SYSTEM

The provision of music during an MRI examination is acknowledged as a most useful relaxation aid for the sometimes-apprehensive patient. This system provides a high quality stereo signal into the examination room without interfering with the scanner.

The system consists of:

· - Amplifier and Control unit with on/off mains switch and warning light.

· - Integrated microphone plus separate external microphone allowing contact with Examination or Waiting Room.

· - Termination Box.

· - Stereo Acoustic Converter.

· - All relevant plugs, screened cables, etc.

· - lightweight headset with spare covers.

· - Microphone Volume Control and separate controls to headset and speakers.

· - Music on/off switch allowing selection of music before reproduction in other areas.

· - Control room volume adjustment.

· - Serviceable parts outside scan room

· - CD player

Z53021J MSK Expert Pack for MR450w

Compatible with Optima MR450w GEM and Optima MR450w GEM XP, this MSK expert pack includes:

- M7000FW 1.5T GEM WRIST ARRAY
- M3340CD 1.5T HD 8CH FOOTANKLECOIL
- M3340CE 1.5T HD 8CH SHOULDER COIL

- M7000FS 1.5T GEM TX/RX KNEE ARRAY

M7000AS Peripheral Vascular Array for MR450w GEM

The GEM Peripheral Vascular (PV) array is an optional component of the GEM Suite that facilitates imaging of the thighs and lower legs. The high-density layout supports parallel imaging in all 3 planes. The coil incorporates an innovative hinge design between the upper & lower sets of elements to accommodate various patient sizes and simplify patient setup and coil storage. In addition, to improve patient comfort, the lower leg section of the coil is fully supported by the GEM table and not the patient.

GEM PV Array Specifications

- Length: 105 cm (41.3 in)
- Width:
    - 2nd station - 51.6 cm (20.3 in)
    - 3rd station: 64.2 cm (25.3 in)
- Height: 24.8 cm (9.8 in)
- Weight: 9.1 kg (20.0 lb)
- S/I Coverage: 104 cm (49.9 in) overall
    - 2nd station - 52.0 cm (20.5 in)
    - 3rd station - 52.0 cm (20.5 in)
- R/L Coverage: to the full 50 cm (19.7 in) FOV of the system
- Head-first or feet-first imaging
- Up to 35 elements in the FOV, when combined with the GEM Posterior Array.

M7000EJ CartiGram

Cartigram T2 Cartilage Mapping is a non-invasive imaging method for early detection of osteoarthritis. It quantifies the T2 relaxation of knee cartilage and can overlay the quantified parametric maps over high resolution images for clear visualization of the anatomy. The imaging results are color mapped to indicate whether or not the cartilage structure is breaking down and, if so, to what extent. This information can be used to determine the best course of treatment for the individual patient.

In addition, it can be used to monitor the cartilage post-treatment, obviating the need for follow-up arthroscopic surgeries or biopsies.
