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Revolution CT

Revolution CT system

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Revolution CT EX Configuration

Revolution CT EX configuration is a breakthrough that delivers high-definition image quality and unique clinical capabilities through the convergence of coverage, spatial resolution, temporal resolution and dose performance – all in one. Until now, CT users have had to compromise between systems that could only provide a sub- set of these capabilities.

The Revolution CT delivers industry leading technical specifications for a premium CT system, including:

- VHD reconstruction, 3D Collimator, and focal aligned detectors provide high-definition image quality, while overcoming the challenges of typical wide detector systems such as cone beam artifacts, HU uniformity, scatter and beam hardening artifacts.
- ASiR-V provides integrated advanced iterative reconstruction technology that reduces noise and reduces low-signal streak artifact at very low signal levels. This technology is designed to deliver reduced noise levels, improved low contrast detectability and may enable a reduction in dose for all clinical applications. In clinical practice, the use of ASiR-V may reduce CT patient dose depending on the clinical task, patient size, anatomical location and clinical practice.

A consultation with a radiologist and a physicist should be made to determine the appropriate dose to obtain diagnostic image quality for the particular clinical task.

Clinical Highlights

(To achieve the full benefits described below, an AW workstation or server with post processing tools may be required. Please consult with your GE sales representative)

Cardiovascular

- One-Beat , High definition, motion free coronary images at any heart
- Whole heart coverage at 160 mm allowing temporal and contrast uniformity across the whole volume.
- Smart Phase: Analyzes the motion of the coronaries throughout the volume to auto-select the best cardiac phase with the least motion.
- SnapShot(TM) Freeze temporal enhanced acquisition: A Intelligent motion correction acquisition technique that is designed to provide a 6x reduction of motion-blur while maintaining high spatial resolution and is demonstrated in

cardiac phantom testing. The reduction in motion artifacts is comparable to a 0.058s equivalent gantry rotation speed with effective temporal resolution of 29 msec, as demonstrated in mathematical phantom testing.

- Arrhythmia management: The system can monitor and alert the user to these situations and also recommend turning on a challenging patient mode. This mode avoids scanning during an irregular beat and can further rescan during the next regular beat using the same contrast bolus.
- Best-in-class spatial resolution at 18.2lp/cm in z-direction and 14.8lp/cm in X-Y direction (measured at 2% MTF).

This spatial resolution provides clear images to help the physician with tasks such as accurately quantifying stenosis in coronary and other vascular structures.

- One-Beat, comprehensive cardiac assessment allows for acquiring motion free coronaries, rest or stress perfusion and functional data in a single beat , giving you a comprehensive assessment and potentially reducing the need for additional imaging tests. Integrated beam hardening reduction capabilities allows for accurate perfusion assessment. The ability to perform stress perfusion with motion free CCTA in a single exam can potentially reduce unnecessary dose by not requiring a rest perfusion exam in case no defects are found in the stress perfusion.
- Whole organ dynamic perfusion: This allows perfusion acquisition of the heart or other organs and tissues with uniform contrast along with integrated beam hardening reduction. The scanner also allows for a flexible aperture size and sampling rate during dynamic perfusion acquisitions. Revolution CT also allows for the ability to acquire a prospectively gated dynamic perfusion acquisition of the whole heart using up to 16 cm of coverage.
- The scanner is also capable of 4D imaging to acquire morphology and perfusion information from a single exam. This can help assess conditions such as congenital heart disease and visualize blood flow through vascular structures.
- TAVR planning: Dedicated TAVR/TAVI protocols allow for mixed acquisitions of the heart, aorta, and femoral arteries, with ECG-gated axial scans and non-ECG- gated axial or helical scans, using only one injection of contrast media, covering 700 mm of anatomy in less than 10 seconds.
- Calcium Scoring: The system also allows single beat acquisition for cardiac calcium scoring
- Triple RuleOut™: The system allows for robust Triple Rule Out studies with

motion free coronaries, PE & aorta evaluation in a single exam. The system can cover the entire thorax anatomy in less than three seconds to provide contrast uniformity at low dose.

Neurology highlights

- Routine non-contrast whole brain scans can be performed in a single rotation without moving the table. VHD reconstruction technology ensures CT number uniformity across the whole brain coverage. Iterative MMAR can reduce the beam hardening artefacts at bone / brain interface and posterior fossa region. Enhanced Contrast can achieve excellent grey white matter differentiation.
- Smart Stroke, the stroke-dedicated hardware, software and post-processing solution on Revolution CT, can help physicians to reduce "CT scan-to-report" time and "door-to-treatment" time, thus to save more brain tissue of patient with stroke. (Post processing solutions are optional purchases)
- Whole brain CT perfusion with 70kVp, ASiR-V, smart collimation and variable sampling can acquire temporally uniform dynamic blood flow information to achieve accurate volumetric perfusion values at lower dose.
- Single phase or dynamic 4D whole brain CTA can be acquired within a single exam of whole brain CT perfusion to achieve comprehensive functional and anatomical assessment of the brain.

Body highlights

- Whole organ diagnosis and follow-up of organs such as the liver, kidneys, and pancreas is enabled by dynamic acquisition modes. The scanner can also acquire multiple images at the same location over time to provide a 4D view to assess vascular flow to these organs.
- Fast body scans enabled by multi-volume 16cm acquisition with excellent image quality allows for reduced breath hold times and shallow breathing. Dose is minimized through the ability to select collimations between 5 mm and 160 mm personalized to each patient.
- Low Dose Lung Cancer Screening protocols

Emergency & Trauma

- The system allows for robust Triple RuleOut™ acquisition for all patients providing One-Beat, high definition, motion free coronaries, PE and aortic dissection in a single exam covering the entire thorax in less than three seconds. ECG gating and mA modulation along with flexible collimations enable low dose acquisition personalized to the patient.
- Flexible scanning modes with 160 mm axial scan, 80 mm helical scan,

table speeds as fast as 300 mm/s, and short inter-group scan delay allows for ultra-fast and versatile whole body and multi-group scanning, thus reducing the effect of breathing and other motion during the poly trauma scan.

- Smart Trauma with clinical ID can enable recon priority for trauma scans, prospective DMPP settings and faster reconstruction throughput.

Pediatrics

- Split second pediatric trauma acquisition of abdomen/pelvis is enabled by wide 160 mm z-coverage, thus reducing the need for sedation and eliminating unnecessary repetition of rescanning young children due to failed sedation, as is the case in 29% of conventional exams, shown in a large trial (British Journal of Anesthesia, 84 (6), 743-8 (2000))
- 70kV scan mode allows for minimizing dose to pediatric patients while preserving excellent contrast to noise ratio and image quality.

Musculoskeletal Imaging

- The Revolution CT can acquire high definition images of the bone with excellent details. Multi-Material Artifact Reduction (MMAR) technology can significantly reduce artifacts from metal objects such as screws and plates.
- 4D dynamic imaging mode can acquire kinetic studies to assess joint articulation up to 16cm coverage.

Dual Energy Capability

Revolution CT features protocols which allow easy configuration of back to back Axial or helical scans of the same anatomy my at two different X-ray energies (kVp's). To further improve registration accuracy patient immobilization may be utilized. The additionally acquired dual energy data can be post-processed on AW Workstation using Add/Sub function to gain additional clinical information.

Key Hardware Components

Gemstone Clarity Detector

The Gemstone Clarity detector features a unique focally aligned layout of the detector sub-modules and a 3D collimator (post patient) to minimize scatter artifacts, ensure HU uniformity & reduce beam hardening artifacts associated with wide coverage systems. Combined with VHD reconstruction technology, the system delivers excellent image quality at full 160 mm coverage to enable whole organ imaging. The Gemstone Clarity detector also features a revolutionary ultra-low capacitance photo diode with new ASIC technology that redefines electronic noise at the quantum limit to less than 3 photons @ 120 keV (3100 electrons). The detector includes acquisition

electronics which allow 4x faster bandwidth and 3x faster trigger rate than previous generations and reduces electronic noise by 25% which may improve image quality and reduce artifacts in low signal conditions as may be encountered in large patients. 3D Collimator Scatter Reduction Technology reduces scatter to primary ratio by more than 50% (R Melnyk, J Boudry, X Liu, and M Adamak, "Anti-scatter grid evaluation for wide- cone CT," Proc. of SPIE, Vol. 9033, 90332P1-7, 2014) and results in significant improvement in image quality and reduction in beam hardening and metal artifacts.

Gemstone Clarity detector specifications:

- Z-Coverage/360 degree rotation: 160 mm
- Number of slices: 512
- Number of detector rows: 256
- Number of detector elements: 212,992 cells with individual electronic/DAS channels
- Sampling rate: Up to 2,496 views per rotation (Up to 8914 Hz)
- Electronic noise: less than 3 photons noise (3100 electrons)
- Effective analog to digital conversion range >2,000,000:1
- Scintillator speed: 0.03us (100 times faster than GOS)
- Afterglow: 0.001% (4 times lower than GOS)
- Radiation damage: 0.03% (20 times less than GOS)
- Scatter to Primary Ratio: <10%
- Detection efficiency: 98% @ 120 kV

Performix HDw tube

The Performix HDw tube is a next generation anode-grounded, metal-ceramic x-ray tube. The tube enables improved spatial resolution via dynamic in-plane focal spot deflection and independent control of the focal spot size in both X and Z-axis which optimizes the focal spot to deliver consistent beam quality across the full 160 mm Z-axis coverage, making it one of the most innovative CT tubes offered today. The design is optimized for exams requiring a large number of scans without tube cooling. It is powered by an onboard high frequency generator capable of ultra-fast kVp switching. Due to the ultrashort exposure times associated with wide coverage scanning, traditional metrics related to tube cooling such as anode heat content & cooling rate lose their relevance. The GE Performix HDw tube includes a standard license that automatically enables the use of tube dependent advanced applications. The use of a third party X-ray tube will

require an additional license for the activation of these features.

Ultra-fast kV Switching Generator

The new generator features 3x faster rise and fall times for kV switching compared to previous generator. This would allow for more time to be spent at the target energy levels and result in better energy separation between the datasets acquired at different kV levels using fast kV switching.

- Generator maximum peak power: 103 kW
- Tube current range: 10-740 mA with 5 mA increments
- Tube voltage: 70, 80, 100, 120, 140 kV. Automatically selected through kV Assist based on patient body habitus and examination type
- Max x-ray tube assembly heat content: 5.0 MJ (6.8 MHU)
- Max continuous heat dissipation: 3.0 kW
- Focal spot size according to IEC 60336/2005: 1.0 x 0.7mm, 1.6 x 1.2mm, 2.0x1.2mm

Gantry and Slipping

Revolution CT's gantry platform has been designed from the ground up to support the demands of today's scanning environment. Exclusive Whisper Drive system technology reduces audible noise during gantry rotation at 0.28s by more than 50% compared to a typical belt driven system thus improving patient comfort (audible gantry noise is measured at 69 dBA). The contactless slipping transfers power and data to and from the rotating side of the gantry (slip ring) to the stationary side through contactless RF technology. This eliminates carbon dust due to brush wear- out in typical CT systems thereby increasing the reliability of the system. In addition, the gantry frame features redundant fail-safe mounts for all major components that is designed and tested to stringent standards to ensure safe and reliable operation even at fast rotation speeds.

- Aperture: 80 cm
- Focus-to- detector Distance: 109.7 cm
- Focus-to- isocenter Distance: 62.6 cm
- Scan FOV: 50 cm
- Rotation speeds: 0.28s, 0.35s, 0.5s, 0.6s, 0.7s, 0.8s, 0.9s, 1.0s per 360° acquisition
- Temporal resolution: 140ms cardiac temporal resolution without using SnapShot Freeze. 29ms effective temporal resolution using SnapShot Freeze. (As demonstrated in mathematical phantom testing)(AW workstation or server with CardIQ Xpress 2.0 required to process SnapShot Freeze data)

- Data chain bandwidth: 40 Gbps
- Table and gantry control panels: Define both internal and external scan planes to ± 1 mm accuracy. Activated any time during exam (with tube stationary)
- Front and rear integrated gantry LCD Display: Display patient information, ECG data from the integrated ECG module, built-in patient breathing lights and countdown timer, cardiac gating indicator light and patient information videos
- Flexible cable manage system with coordinated straps attached to the gantry sides to keep cables connected to the gantry away from the floor and to reduce clutter

Operator Console

The Revolution CT scanner desktop allows simultaneous scanning, image reconstruction, display, processing and analysis, as well as networking and archival.

It features the new "Clarity Operator Environment" designed with your everyday needs in mind. The environment allows for more real time adaptive capabilities thus enabling dramatically improved timing with Smart Prep including automatically transitioning to acquisition in as quickly as 1 second when the set HU threshold is reached. The benefits provided by the new interface include:

- Smart prescription workflow automates scan set up by recommending scan parameters specific to the patient based on scout attenuation and ECG information, in the case of cardiac, to enable consistent image quality & dose performance across scans, irrespective of the technologist expertise level
- Seamless multi-tasking through ability to have multiple patient sessions open with one active patient for acquisition and the rest for post-acquisition tasks
- "Plan ahead" task list as part of scan setup automates repetitive tasks such as reconstructions, image transfer, image processing, etc. without requiring technologist intervention
- Ability to prospectively prescribe multi planar reconstructions for anatomies such as spine as part of the protocol, thus automating the workflow seamlessly
- Clear status visibility across all automated patient tasks without any interaction enables you to focus on the primary task at hand
- Manage your patient flow better with the ability to pre- pare scan

prescription for the next patient while the current patient is getting off the table

- Quickly select scan protocols through global search, anatomical selection or user specific favorites in the newly designed protocol management system
- Facilitates protocol consistency by controlling access to changes and simplifying inputs required
- Integration with AW allows prescribing automatic image processing steps to be performed on the AW / AW Server post acquisition
- Better dose awareness through clearly visible real time projected dose indicator for the selected protocol

Operator console specifications

- Intel Xeon performance processor: 2.60GHz/8-Core CPU (or equivalent)
- Nvidia high performance GPU (or equivalent)
- 64 GB DDR3 unbuffered ECC (or equivalent)
- 24 inch dual monitors with screen resolution of 1920x1200
- Image data storage up to 700,000 uncompressed DICOM images (512x512)
- Scan data storage of 1 TB (up to 1500 scan files are supported)
- DVD-ROM (supports DVD-R, DVD-RW, DVD+R, DVD+RW, DVD+R DL, CD-R, CD-RW)
- USB 3.0 Port for External Hard Disk Drive Connectivity (scan data storage and image data storage are supported)
- Recon Server Xstream enables recon task parallelism and achieves up to 1.8x faster reconstruction throughput than Recon Server Pro
- Image reconstruction speed up to 65 fps with FBP and up to 25 fps with ASiR-V.

System Software

Smart Flow

Simplified, automated scan prescriptions, personalized to the patient and easy-to-use reference protocols make the Revolution CT fast and efficient in patient set-up, prescription & scanning. The following features further help you streamline your workflow.

Protocol Management System

Protocols can be copied, built and edited intuitively using the Protocol Management System.

- GE Reference Protocol: A set of predefined protocols for adult patients that

cannot be modified but can be copied and used. These protocols are factory installed. They have been developed in collaboration with clinical partners to provide users with a convenient and clinical relevant starting point for tailoring your departmental protocols.

- Recently Scanned Protocols: A copy of the last 90 protocols reside exactly as they were used for review purposes only. These protocols can also be copied and used within into your departmental protocols.
- Anatomical Selector: Use the Anatomical Selector area to select a specific anatomical region to show only protocols related to that region.
- Favorites: A user can add to a list of favorite protocols commonly used by your site.

Clinical ID

Clinical ID is designed to streamline the clinical application specific workflow from protocol setup to reconstruction prioritization and automated reformatted views for timely diagnostic decisions. In 2016 summer release, Clinical ID is the integral part of Smart Stroke and Smart Trauma solutions.

AutoVoice™

Auto Voice provides recorded breathing instructions for the patient. Consistent breathing instructions assist with more precise timing during an exam. Auto Voice also provides a pre- message in the SmartPrep feature. The system also comes equipped with microphones at the console and gantry for communicating with the patient. The system has three, pre-recorded messages in ten selectable languages that cannot be deleted. You can also record up to 17 additional messages for each language. Default language options include: Chinese, English (Female) , English (Male), French, German, Italian, Korean, Japanese, Spanish (European), Spanish (Latin America).

Smart Patient Centering

The smart patient centering feature helps to detect suboptimal centering prior to the diagnostic scan. When scout is acquired, the system will assess patient centering. If the patient is off-centered greater than 2 cm, the system will display the table height location and an up or down arrow to indicate the elevation needed to reach that height.

SmartStart (TM)

- Gantry-mounted start scan button and countdown display.
- Facilitates single-technologist operation by allowing start of scan at the gantry, with a visual reminder of time until X-ray initiation

SmartPrep™ with Dynamic Transition

Enables real-time monitoring of IV contrast and a user-selectable mode to dynamically transition to the diagnostic scan phase when a user entered Enhancement Threshold is reached in the Transition ROI.

Trauma Patient entry

Allows patient scans and image display/analysis without entering patient data before scanning.

Prospective Exam Split

Prospective Exam Split allows operator to specify how to split images from a scan into separate requested procedures/accession numbers in protocol management. This capability is especially useful in cases of full body trauma or for chest, abdomen and pelvis exams. Prospective Exam Split works with primary, secondary and reformatted images.

Smart DMPR

Smart DMPR can automatically generate reformatted views with prospectively set window width and window level and automatically transferring these image datasets to the designated PACS destination for fast review and diagnosis.

Digital Tilt

The system has preset protocols that can be selected prospectively, which allows images to be reconstructed at a specified tilt angle. This capability, combined with organ dose modulation and tilted head holder accessory for the patient allows for reducing the dose to sensitive organs such as the eyes while also reducing dental artifacts.

Enhanced Xstream Injector (Requires a compatible Bayer or Nemoto Injector system)

The Enhanced Xstream Injector provides synchronization of the start of the scan and the start of the contrast injector using the start scan button on the Scan Control Interface or the gantry controls. The Enhanced Xstream Injector also allows setting of the contrast injector parameters within the CT scan protocol and creation of an Injector Report at End Exam of what was delivered by the injector. The system and injector are operated independently after the start scan button is pressed on the system.

System Software

Volume High Definition Reconstruction

The system features state of the art image reconstruction technology designed to mitigate cone beam artifacts associated with wide coverage systems. In addition, the algorithm preserves temporal uniformity and

provides excellent image quality at full 160 mm coverage. It further reduces variation in iodinated contrast HU uniformity across the full 160 mm Z coverage, typically caused due to heel effect. In addition, Multi-Material Artifact Reduction (MMAR) technology utilizes material physics learnings from GSI incorporated in single energy acquisition. In conjunction with the 3D Collimator, this reduces beam hardening artifacts due to iron, bone, metal & other dense objects.

Iterative Reconstruction: ASiR-V

Integrated advanced iterative reconstruction technology (ASiR-V) reduces noise, even at very low signal levels. The ASiR-V algorithm focuses primarily on the modeling of the system noise statistics, objects, and physics and de-emphasizes the modeling of the system optics. The most time-consuming portion of the IR process is the modeling of the system optics. By excluding the most time-consuming component, system optics, and focusing on the other terms during the IR process, significant image quality improvement can be achieved without paying a large penalty in reconstruction speed. The advanced system noise model includes the modeling of the data acquisition system (photon noise and electronic noise) as well as noise characteristics of the reconstructed images. The photon noise model includes characterization of the photon statistics as it propagates through the imaging chain. The modeling of the reconstructed image noise includes characterization of the scanned object, using information obtained from extensive phantom and clinical data. This technology is designed to deliver reduced noise levels, improved low contrast detectability and may enable up to 82% reduction in dose when compared to FBP for all clinical applications.

Smart Dose technologies

Automatic Exposure Control (AEC)

AEC is a versatile and powerful tool designed to tailor the scanner's radiation output to each patient based on the patient's size, age, shape and attenuation and the user's requested level of image noise/quality criterion. AEC technology uses estimated patient attenuation values to adjust the mA dynamically in order to achieve the requested level of image noise/quality criterion.

3D Dose Modulation Utilizing SmartmA

Volumetric knowledge prior to scanning allows you to personalize protocols and optimize dose for every patient, large and small. During the scan, real-time, 3D dose modulation helps deliver consistent image quality because it automatically accounts for the changing dimensions of your

patient's anatomy. In addition, the system provides guidance to assist in centering the patient to maximize the benefit of mA modulation.

Organ Dose Modulation

Organ Dose Modulation (ODM) builds on the SmartmA feature to enable even further patient dose reduction. By reducing the mA exposure profile as a function of the X-ray tube angle, radiosensitive organs towards the anterior surface of the patient, such as the eyes, breasts and thorax, can benefit from enhanced dose reduction while the overall image noise is still maintained.

kV Assist

kV Assist makes it easy to select optimal kV settings for the patient being scanned. It recommends tube voltage and current to achieve the lowest dose while meeting desired image quality goals.

70 kV Scanning

70 kVp scan mode enables low dose pediatric and small patient scans

ECG Modulated mA

For cardiac applications, prospective ECG dose modulation automatically adjusts the mA to minimize the patient's exposure to X-rays – reducing mA, and thus dose, near the beginning and end of each prescribed phase range. Up to 3 phase ranges are selected within a heart cycle with different mA levels. The peak mA for the first phase range is automatically determined based on noise index set by the user. The user can also select the relative mA level for an optional second or third phase range, set as a percent of the mA level of the first phase range. This provides clear images and allows you to reduce dose yet provides motion free, high quality images for functional and anatomical analysis within a heart cycle

Color Coding for Kids

Based on the Broselow-Luten Pediatric System, the Color Coding for Kids was developed to help operator to select the correct pediatric CT protocol. The system divides the protocols into nine color zones based on height and weight, and incrementally increases scan technique as the patient's size increases. This arrangement of protocols assists you in reducing the variations in pediatric protocol selection. If the patient weight is unavailable, a Broselow-Luten Tape can also be used to obtain the weight based on the length.

Smart Dose technologies

- Smart Track: Advanced hardware and software for X-ray beam tracking minimizes patient dose.

- Smart Beam: Optimizes X-ray beam filtration independently for body, head, and cardiac applications.
- Soft Shutter: This capability reduces the over-beaming dose in helical scans by using an advanced reconstruction algorithm for helical scans that makes better use of acquired data through intelligent view weighting and back projection.
- Dose Check: Provides the user with tools to help them manage CT dose in clinical practice and is based on the standard XR-25-2010 published by The Association of Electrical and Medical Imaging Equipment Manufacturers Association (NEMA). Dose Check provides the following:
 - o Checking against a Notification Value if the estimated dose for the scan is above your site established value
 - o Checking against an Alert Value where the user needs specific authority to continue the scan at the current estimated dose without changing the scan parameters if the estimated dose exceeds the alert value
 - o The ability to define Alert Values for Adult and Pediatric with age threshold
 - o Audit Logging and Review capabilities
 - o Protocol Change Control capabilities provided by robust protocol management interface
- Dose Computation, Display & Reporting: CTDIvol (CTDI volume), DLP (Dose Length Product), and Dose Efficiency computation and display during scan prescription provide dose information to the operator. Dose Reporting saves the CTDIvol, DLP, and phantom type in a DICOM Structured Dose Report and a secondary screen capture. Series and cumulative exam values are saved. Saved values can be networked or archived.

DICOM Interchange

DICOM Interchange allows the saving of any image from the database, along with a PC viewer using Internet Explorer, to a CD-R or DVD-R without marking the exam/series or image as archived for exam transfer between stations that are not networked or pass along to referring physicians or patients. For detailed information, please reference DICOM conformance statement.

- DICOM Storage Service Class
- Service Class User (SCU) for image send
- Service Class Provider (SCP) for image receive
- Service Class User (SCU) for storage commitment
- DICOM Query/Retrieve Service Class

- DICOM Modality Worklist
- DICOM Modality Performed Procedure Step

Image Networking

Exams can be selected and moved between the Revolution CT and any imaging system supporting the DICOM protocol for network send, receive and pull/query. Image transfer time using DICOM protocols is > 16fps on a 1000baseT network.

For US and Canadian Customers, this quotation includes access to the DoseWatch Explore application for a period of time concurrent with the system warranty. DoseWatch Explore is an introductory dose management software application that provides you secure access, via any PC with internet access, to dose and protocol data from this system. An InSite connection to the system and completion of the registration process is required to use the DoseWatch Explore application.

Warranty: The published Company warranty in effect on the date of shipment shall apply. The Company reserves the right to make changes. All specifications are subject to change. Regulatory Compliance: This product is designed to comply with applicable standards under the Radiation Control for Health and Safety Act of 1968. Laser alignment devices contained within this product are appropriately labeled according to the requirements of the Center for Devices and Radiological Health.

This product complies with the performance standards of 21 CFR, sub-chapter J, and the applicable IEC 60601-1 series.

This product complies with NEMA Standard XR29-2013 / MITA Smart Dose Standard.

See the Pre-Installation manual for details of the siting requirements for GE Revolution CT.

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Rev CT English keyboard

English keyboard

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REVOLUTION STD CABLE SET

Standard cable set for Revolution CT system

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REVOLUTION TABLE

Revolution CT standard table features a next generation table capable of 300mm/s travel speed. This enables faster scanning for longer range anatomies. The table has also been designed with 10x more stiffness to

reduce deflection under heavy load and provide the best possible images even under heavy load conditions. The table features include:

- Controls on gantry for elevation and cradle movement. Foot pedals on both sides of table for fast elevation. Cradle position controlled from OC for prescribed scans. - Integrated ECG module with waveform and configuration through the gantry display. - Workflow hub area with a see through tray to give you the most flexibility in placing scanning related supplies, etc. - IV Pole integrated at the foot-end of the table helps to prevent IV lines from becoming crossed and tangled, and helps keep lines in place during patient travel.

- Vertical Range: 50cm to 103cm (500 lbs)
- Vertical Scannable Range: 73.1cm to 103cm
- Elevation Speeds: 15(+/-3)mm/s and 48(+/-3)mm/s
- Horizontal Range: 200 cm
- Horizontal Scannable Range (metal free)
 - 200cm in Axial
 - 185cm in helical
 - 5-200cm in scout
- Horizontal speed Up to 300mm/s
- Load capacity 227 kg/ 500 lbs maximum allowed with +/-0.06% positional precision over the entire scannable range.

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Low Dose CT Lung Screening Option with Indication For Use

This option provides lung screening reference protocols that are tailored to the CT system, patient size (small, average large), and the most current recommendations from a wide range of professional medical and governmental organizations. Now, qualified GE Healthcare CT scanners with this option are formally indicated for, and can be confidently used by physicians for low dose CT lung cancer screening of identified high-risk patient populations. These protocols deliver low dose, short scan times, and clear and sharp images for the detection of small lung nodules. Early detection from an annual lung screening with low dose CT in high-risk individuals can prevent a substantial number of lung cancer-related deaths.ⁱⁱ All new GE 64-slice and greater CT scanners, and virtually all of the 16-slice CT scanners that GE Healthcare sells are qualified for this screening option. This solution is also available to thousands of qualified GE CT scanners currently in use, increasing access to the quality scanners that satisfy both patient and physician needs. The new protocols, do include the choice for

the user to be able to utilize GE Healthcare's industry-leading technologies such as ASiRTM, ASiR-VTM and VeoTM that are designed to reduce image noise, which is undesirable for physicians looking for small nodules.

This option contains two documents. Lung Cancer Screening Option Reference Protocol Guide, and the Lung Cancer Screening Option User Manual / Technical Reference Manual

i The following GE Healthcare CT scanners are qualified to receive the new low dose CT Lung Cancer Screening Option: LightSpeed 16, BrightSpeed Elite, LightSpeed Pro16, Optima CT540, Discovery CT590 RT, Optima CT580, Optima CT580 W, Optima CT590 RT, LightSpeed Xtra, LightSpeed RT16, LightSpeed VCT, LightSpeed VCT XT, LightSpeed VCT XTe, LightSpeed VCT Select, Optima CT660, Revolution EVO, Discovery CT750 HD, Revolution GSI, Revolution.

ii Moyer V. Screening for Lung Cancer: U.S. Preventive Services Task Force Recommendation Statement. Ann Intern Med. 2014;160:330-338.

<http://www.uspreventiveservicestaskforce.org/Page/Document/Recommendations>

1 REV CT NON-GE TUBE OPT

Tube license software required for use with a third-party tube.

1 Xtream Injector Interface kit - Class IV

Cabling and CT Scanner software required for use with Integrated Injectors.

1 Chair

Chair for CT scanner

1 REVOLUTION DESK - ADJ

REVOLUTION DESK - ADJ

1 Uninterruptible Power Supply for CT systems

Un-Interruptible Power Supply

Un-interruptible Power Supply for CT750 HD, and LightSpeed VCT systems.

Un-interruptible power supply: supply's power to CT console allowing the user to power down system in the event of source power loss; thus preventing the loss of scan data previously acquired before source power loss. This UPS also: -Provides continuous protection to all of the system's major electronics subsystems -Protects the tube from power outages because it continues to provide power for tube cooling. -Minimizes system restart time by continuing to power the thermal control of the DAS and

detector. -Provides enhanced ease of patient removal from the system by keeping the table powered.

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125A Main Disconnect Panel (US)

The 125 Amp CT System Main Disconnect Panel (MDP) serves as the main facility power disconnect source installed ahead of the system PDU. The MDP will disconnect system power on first loss of incoming power, helping to prevent damage to system components. It also includes an automatic restart control circuit which restores power to the CT System PDU after a power outage.

- Can reduce installation time and cost by eliminating delays in obtaining individually enclosed components and on site assembly (ex: main circuit breaker, feeder overcurrent devices, magnetic contactors and UPS emergency power off are combined into a single panel)
- Configuration flexibility - can be used as a stand-alone main disconnect or with the optional partial system UPS. (On systems where the optional partial system UPS is used the main disconnect panel also provides NEC mandated emergency power off control to both the PDU and UPS)
- Designed and tested for GEHC CT products

SPECIFICATIONS

- Automatic restart incorporates an adjustable time delay to delay main power until the power has stabilized for 5 seconds
- One flush wall mounted remote emergency off pushbutton furnished with each system
- UL, cUL and CE labeled

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OCS III MOUNTING PLATE

OCS III MOUNTING PLATE

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MEDRAD Stellant D DualFlow ISI-ready on ceiling mount (85cm post length) with Certegra Workstation

GE Healthcare now offers the Medrad Stellant D injector with Certegra workstation. The dual syringe CT injection system is reliable and easy to use. It features saline flush and DualFlow capabilities allowing users to test vein accesses with saline, and prime patient tubing with saline to save contrast. Medrad Stellant D CT Injection System users are armed with:

- Automation features to help maximize throughput: integrated auto load, auto retract, auto prime and auto syringe sensing
- Save up to 250 protocols
- Quick, easy install and detachment
- Check for air confirmation button and arming on the injector head
- Pressure monitor graph and flow profile preview
- Up to 6 phases including pause and hold capabilities
- Programmable pressure limit
- Colour touch screen
- Either ceiling counterpoise or pedestal-mount configurations

Certegra Workstation

From study set-up and preparation to study administration and results management, the Certegra Workstation serves as a workflow-centralized technologist interface to help users enhance efficiencies and patient care, enabling options such as P3T 2.0 (Personalized Patient Protocol) software environment.

The benefits of DualFlow (simultaneous injection of contrast and saline)

- Provide more uniform attenuation of the right and left ventricles
- Minimize artefacts by achieving proper attenuation levels
- Visualize the right coronary arteries and right ventricles in a single study by achieving more uniform attenuation

Ceiling-mount configuration includes:

- Dual injector head on Overhead Ceiling Counterpoise
- Syringe heat maintainer
- Certegra Workstation with USB drive
- DualFlow software
- ISI-ready software to accept ISI900G integrated injector option†
- Base control unit
- 22.8 m (75 ft) head extension cable
- 7.6m (25 ft) base to display cable
- Power cord, North America
- Power cord, international
- Product information package
- Operations manual
- Installation, customer's operational training at time of installation, and one

year full on-site warranty in Bayer service countries

System Specifications

- Flow Rate (range & increments): 0.1 to 10 ml/sec in 0.1 ml increments
- Volume (range & increments): 1 ml to syringe capacity in 1 ml increments
- Programmable Pressure Limit 200 ml syringe: 325 psi, 2241 kPa
- Scan delay: 0-300 seconds (5 minutes) in 1 second increments
- Pause: 1-900 seconds (15 minutes) in 1 second increments
- Hold: maximum HOLD time is 20 minutes
- Syringes (volume capacity): 200 ml sterile disposable syringe
- Number of phases: 6
- Number of protocols: 250
- Electrical Requirements (VAC/Hz): 100-240 VAC, 50/60 Hz
- Syringe Heat Maintainer Range: 35 °C +/-5, 95 °F +/-9
- Dual Injector Head: 15.5 cm (6.1") H x 30.7 cm (12.1") W x 36.8 cm (14.5") D, 8.1 kg (17.0 lb) without syringe
- Certegra Workstation (CWS): 34.2 cm (13.5") H x 40.0 cm (15.8") W x 30.0 cm (10.2") D, 8.0 kg (17.6 lb)
- Base Unit: 29.2 cm (11.5") H x 27.9 cm (11.0") W x 22.2 cm (8.8") D

1

TABLE SLICKER FOR CT REVO

The GEHC Revolution CT table slicker is specifically designed to maximize contaminant protection. Manufactured to be used in conjunction with the table restraining belts, this slicker adds versatility to your CT procedures. Latex free, it is strongly suggested that the slicker is cleaned with a water/bleach solution prior to every procedure.

Features:

- Table gray cushion sealed in vinyl slicker Dimension 2403 x 788
- Table extender gray cushion sealed in vinyl slicker Dimension 406 x 788
- Cover for catheter bag hanger
- Increase system uptime by protecting table from spills and particulate contaminants
- Easy to install and comfortable for patients
- Will not interfere with normal operation of CT table
- Clear PVC plastic facilitates faster cleanup of blood and fluids

- Prevents contaminant build up in hard to clean areas
- Thermosealed seams and flaps
- Recommended for trauma centers and sites concerned about exposure to blood and fluid-borne disease

1 FOOT SLICKER FOR CT REVOL

The GEHC Revolution CT Foot Switch slicker is specifically designed to maximize contaminant protection. Latex free, it is strongly suggested that the slicker is cleaned with a water/bleach solution prior to every procedure.

1 The Revolution Experience: Clinical Education Program

Revolution CT Customer Excellence Training

The Revolution Experience: Clinical Education Program

22 Days Onsite and 16 Hours of TiP Virtual Assist (TVA) and 2 HQ Classes

This training will begin with a Revolution Partnership Meeting, approximately 4-6 weeks prior to the first onsite training week. The purpose of this meeting is to identify the core group of technologists and radiologists who will participate in onsite training, understand the site's level of prior GE experience, discuss key factors necessary to ensure successful training, identify critical needs and clinical areas of focus, and discuss the preferred timeline and content for the first year of onsite training.

Initial training will include 8 days during a 2 week turnover. The Clinical Applications Specialist will work with staff to introduce them to the Revolution Clarity user interface, review the system components and how they impact clinical scanning, discuss the Revolution protocols and begin patient scanning. Protocol and image quality review will be completed with the radiologist(s).

The timing and content of the follow up visits will be customized to the clinical priorities of the site. Follow up visits will include advanced features and imaging for specific clinical applications such as cardiac and perfusion. Results of technologists assessments at the end of each of the initial training sessions will also be used as a guide for the content and focus of the follow up training. TiP Virtual Assist training will also be used to provide access to GE Clinical Applications Specialists who can answer questions as well as perform virtual troubleshooting, remote observation, image quality checks and to provide additional training.

Two full service CT Headquarter customer classes are included. Each 4.5 Day

course is designed to introduce the technologist to the Revolution CT system. It is recommended that this course be attended prior to the system turnover. The full service courses include travel and modest living expenses.

This training program must be scheduled and completed within 12 months after the date of product delivery. Onsite training and TVA are delivered Monday through Friday between 8AM and 5PM.

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Revolution CT Ongoing Customer Excellence Training

Revolution CT Ongoing Customer Excellence Training

The Revolution Experience: Continuing Education Program - Years 2 & 3

16 Days Onsite and 16 Hours of TiP Virtual Assist. Delivered during Year 2 and Year 3.

Ongoing training is vital to ensure your staff maintains a high level of CT scanning expertise. To help you achieve your constantly evolving staff needs, GE Healthcare offers a multi-year training package specifically for the Revolution CT. This package is designed to be flexible so that you can tailor the training content to your staff needs over time, whether it is to train new staff, refresh on previous training, or receive training on advanced scanner features, advanced applications or a new product release. Staff members will be assessed at the end of each training session and these assessments will be used to guide future training content. TiP Virtual Assist training will also be used to provide access to GE Clinical Applications Specialists who can answer questions as well as perform virtual troubleshooting, remote observation, image quality checks and to provide additional training.

This training program must be scheduled and completed within 3 years after the date of product delivery. Onsite training and TVA are delivered Monday through Friday between 8AM and 5PM.

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CARDIQ XPRESS REV CT

CardIQ Xpress Reveal is an integrated post processing image analysis software for Cardiovascular CT on GE's Advantage Workstation.

The optional CardIQ Xpress Reveal software can be used to effectively display, reformat and analyze 2D, 3D, and GSI CT images for qualitative or quantitative assessment of the anatomy of the heart and coronary artery vessels from single or multiple cardiac phase image data sets. When used with CardIQ Function, CardIQ Xpress Reveal can also provide functional assessment including relative perfusion information.

CardIQ Xpress Reveal can be launched directly or from within Volume Viewer applications using axial, helical or GSI CT images; including images created using the SnapShot Freeze intelligent motion correction option. It provides the user with both single and multiple cardiac phase analysis protocols for single energy and spectral energy CT images.

The software includes a variety of different 2D, 3D or reformatted protocols including: display of the coronary vessel tree, angiographic view, 2D and 3D rendering of single or multiple coronary artery vessels or grafts, automatic reformation of cross sectional cardiac images into planes along short or long axis of the heart, one-touch cath views for 3D or reformatted images, 3D angiographic view phase registration, color mapped plaque density measurements, IVUS-like views, 3D ejection fraction, 4D aortic and Mitral valve views, relative perfusion, transparency views and beating heart images from single or multiple cardiac phase image data sets.

Clinical applications include: imaging of cardiac morphology, coronary artery imaging and assessment of relative perfusion, assessment of plaque, bypass graft patency, post intervention follow-up and functional assessment.

CardIQ Xpress Reveal combines simplified user workflow with SnapShot Freeze intelligent motion correction imaging.

- Pre-processing the images & models including SnapShot Freeze exams, for faster review
- Loading images into the auto launch area area for real-time review of multiple exams
- Easy switching from one protocol to the other without exiting the application
- Single click one-touch cath views
- Batch movie output within cardiac reformat
- User defined layouts within vessel analysis for simplified viewing and filming
- Multi-phase load to single phase review

The CardIQ Xpress reveal option allows the user to:

- Rendering and display of 2D/3D coronary vascular tree images with automatic vessel tracking & labeling with single click of a protocol. Images can be reviewed in axial, reformat, curved, oblique MPVR, and cross section views

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- Measurements of coronary arteries including stenosis and stenosis length, and density
 - PlaQID to color code non-calcified and calcified plaque with volume measurements.
 - 2D reformat review with predefined views to review all coronary vessels.
 - Color enhanced relative perfusion defect pattern recognition for detection of ischemic heart disease with 4 color patterns
 - Automatically render data for streamlined reading to include: 3D rendered heart, angiographic view, tree VR, and ejection fraction.
 - Reformat standard axial CT images of single or multiple cardiac phases automatically into short, long and two chamber long axis of the heart for easy review
 - Perform functional evaluation of the heart and cine capabilities for multiphase beating heart images with one easy click
 - Extraction of the left ventricle and automated ejection fraction and volume measurements
 - 4D aortic valve and mitral valve views with one touch
 - Ability to select different protocols without exiting the application
 - Pre-defined VR IVUS-like views for virtually determining plaque compositions
 - One touch angiographic view protocol display coronary vessel tree and myocardium with automatic removal of heart chambers for cath comparative view
 - Heart transparency model allowing for full visualization of coronaries in relations to the heart chambers with the ability to fade out the chambers of the heart
 - Oblique reformat views in the standard cath angles for easy analysis of the coronary vessels
 - Load multi-phase images, review the data and decide which phase or phases will be reviewed for further processing by dropping the non-essential phases
 - Phase registration - ability to register images from different cardiac phases into a unique data set. The data set can then be saved as a 3D object and/or used for further analysis

For Revolution CT customers who have SSF in IB CardIQ Xpress Reveal 2.0 and CardIQ Xpress Process. This catalog provides the required upgrade for

CardIQ Xpress Process, enabling it to work with Revolution CT datasets -note its mandatory that the AW or AWS have a minimum of 24GB of RAM for Revolution CT datasets to correctly process with SSF.

System requirements:

- AW Workstation with VolumeShare6 on HP 8400 or later with a minimum of 16GB RAM or a HP Z800 with 24GB of RAM
- Auto Launch and Preprocessing Option
- 2 monitor configuration
- Color Landscape monitor

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SVC PACK A3 WARRANTY

Standard level 3 service package delivered for the warranty period

Technical Service Training

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Technical Service Training

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REVOLUTION CT SVC TRNG

The Revolution CT course takes a blended approach to presenting the material to the learner. This course provides the learner with a prework assignment using computer based training (CBT) followed by an instructor led training (ILT) session. The CBT section of the training consists of equipment safety procedures and sub-system component description, location, and identification. Upon completion of the CBT, the learner shall attend 40 hour in-residence instructor led training event with an exam. The ILT portion of the training will consist of combination of classroom lecture and discussion as well as lab demonstration and performance based activities. The lab activities have been developed to provide the learner with system specific knowledge, reinforce current skills, and develop new skills associated with maintaining the Revolution CT system. The learner will have previously completed training on VCT, HD750, and or LightSpeed 7x and Optima 660.

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CT LS 7X & OPTIMA 660

CT LightSpeed 7x and Optima 660 (Class/Lab)

The CT LightSpeed 7x & Optima 660 course is a differences class and is intended for Engineers who have completed (R0026CT) LightSpeed Pro Training. It will equip the Engineer with system and subsystem theory and hands-on lab activities to address technical service issues for the 32/64-slice

family of scanners (including LightSpeed VCT, LightSpeed VCT XT, LightSpeed VCT Select, and Optima 660. This training must be used within 2 years from the purchase date.

1

CT LIGHTSPEED PRO ADV SER

The LightSpeed Pro Advanced course is intended for engineers servicing LightSpeed Pro 16, LightSpeed RT, and forward production LightSpeed 16/Ultra/Plus (starting in 2004) systems. This course must be taken within 2 years from the purchase date.

12

Meals And Lodging Expense

Meals and Lodging Expense has been developed to allow the customer the convenience of prepaying for their meals and lodging expenses when attending Technical Service Training at the GE Healthcare Institute located in Waukesha, WI.

The price of this convenience is based on a per day basis. Thus a quantity of 1 is equal to 1 day's meals and lodging expense. When purchasing the meals and lodging expense please be mindful of weekend days during the training stay and include 2 days to cover a weekend in the purchase quantity.

Examples: A 5-day course needs a quantity of 5. Any course longer than 5 days should include 2 days to account for the weekend stay. Any course longer than 10 days will require an additional 4 days of the meals and lodging expense to cover the 2 weekends of the stay. Thus a 15-day course would have a quantity of 19 days to cover the 2 weekends of the stay. This expense must be used within 2 years from the purchase date.

Three meals a day Monday thru Thursday, 2 meals on Friday, plus breaks are provided in the onsite cafeteria. The GE Healthcare Institute cafeteria closes Friday after lunch and reopens Monday morning for breakfast. Weekend meals are the responsibility of the customer.

Only for In-resident courses to be taken at the GE Healthcare Institute.

12

Airfare Expense

The AIRFARE EXPENSE has been developed to allow the customer the convenience to prepay their roundtrip Airfare expenses when attending Technical Service Training at the GE Healthcare Institute located in Waukesha, WI. To be used for engineers attending In-Resident Class/Lab courses for Diagnostic Imaging.

Customer will make their Airfare arrangements thru the GE Travel Center.

Specific directions will be provided to the customer upon confirmation of class. Please note that this expense must be used within 2 years of the purchase date

1

CT GLOBAL OPR CONSOLE 6

CT LightSpeed Global Operators Console 6

This course will prepare the GE Field Engineer and In House engineers for servicing the new Global Operators Console 6 (GOC6). This course must be taken within 2 years from the purchase date.

1

OPTIMA CT660 SERVICE (WEB)

Optima CT660 Service (web)

This upgrade course taken online is intended for Support Engineers who have previous LightSpeed VCT training. Topics covered include: New gantry display, new power saving mode, new gantry axial motor and control, new gantry covers removal and installation, safety awareness with gantry cover mounting hardware, new operators console (RIO), load from cold-Saturn detector. This course must be taken within 2 years from the purchase date or it expires without refund.

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Troubleshooting Basics Service (web)

Troubleshooting Basics Service (Web)

This Course is Intended for Individuals Involved in Servicing Medical Equipment. By Taking This Course, You will Learn a Proven Process for Troubleshooting Problems with Medical Equipment. You will Also Learn How to Use Various Tools in a Troubleshooting Situation and How to Interpret Error Messages. This Course Does Not Address How to Troubleshoot Specific Products. It is Recommended That you Have Fundamental Training in a Modality Prior to Taking This Course. This course must be taken within 2 years from the purchase date.

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NETWORKING & DICOM BASIC

Networking and Dicom Basic for DI Service (Web)

Training will prepare engineers on configuring and troubleshooting networks, which use the DICOM protocol for transferring patient data and how to read and use DICOM Conformance Statements.

This course covers the following:

- Introduction to 7 layer OSI and 5 layer TCP/IP protocols (Basic model only)
- Identify hardware used in networking
- Review of the most used networking devices, cables, NIC, switch and routers
- Simple network connection with 2 to 5 devices
- Dicom definitions, theory and configuration

This course must be taken within 2 years from the purchase date.

VCT64 Trade In

Options

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Revolution CT

REV CT TESTED 675LB TABLE

Revolution CT high capacity table features a next generation table capable of 300mm/s travel speed. This enables faster scanning for longer range anatomies. The table has also been designed with 10x more stiffness to reduce deflection under heavy load and provide the best possible images even under heavy load conditions. The table features include:

- Controls on gantry for elevation and cradle movement. Foot pedals on both sides of table for fast elevation. Cradle position controlled from OC for prescribed scans. - Integrated ECG module with waveform and configuration through the gantry display. - Workflow hub area with a see through tray to give you the most flexibility in placing scanning related supplies, etc. - IV Pole integrated at the foot-end of the table helps to prevent IV lines from becoming crossed and tangled, and helps keep lines in place during patient travel.

- Vertical Range: 56cm to 103cm (675 lbs)
- Vertical Scannable Range: 73.1cm to 103cm
- Elevation Speeds: 15(+/-3)mm/s and 48(+/-3)mm/s
- Horizontal Range: 200 cm
- Horizontal Scannable Range (metal free)
 - 200cm in Axial
 - 185cm in helical
 - 5-200cm in scout
- Horizontal speed Up to 300mm/s
- Load capacity 306 kg/ 675 lbs maximum allowed with +/-0.06% positional precision over the entire scannable range.