

Omni Legend

Answers at the Speed of Sight



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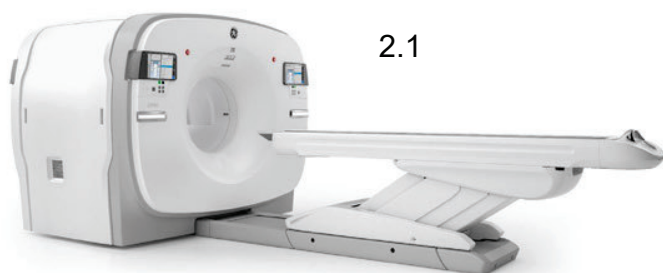
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Overview

Omni Legend is the start of a whole new era of PET/CT. It is the first system we're introducing on our all-new, all-digital Omni platform. The remarkable scalable digital detector design at its core enables an unparalleled increase in true NEMA sensitivity¹. Greater sensitivity may not only lead to faster scan times^{1,2} and lower dose^{1,2}, but also small lesion detectability that is comparable or better than the top-of-the-line digital platform³. Beyond its exceptional detector design, Omni Legend also delivers vast improvements to the entire PET/CT scanning process for more comfortable patient experience, ability to image the diagnostic portion of the theragnostic procedure and short-life tracers used in dynamic protocols, and more. Omni Legend empowers you with greater clinical information across vast numbers of procedures and, additionally, includes our new Precision DL deep learning image processing technology. GEHC PET/CT features and functionalities from current PET/CT scanners are preserved and carried over. Only Omni Legend features all of these critical components in one PET/CT system to deliver answers at the speed of sight.

Omni Legend 16, 21* and 32 are available at several equipment levels, in fixed and mobile* installs.



New Digital Detection Platform

Omni Legend is built on new scalable digital BGO detection technology, combining state of the art silicon photomultiplier technology and electronics with the outstanding stopping power of BGO, allowing tremendous gains in sensitivity, spatial resolution, and energy resolution achieved by 30 mm-thick crystals cut to 4.1x4.1 mm, ultra-high NEMA sensitivity per FOV length, of 46 cps/kBq for the 32 cm, 21 cps/kBq for the 21* cm and 11.8 cps/kBq for the 16 cm AFOV products. Omni Legend not only provides in-PET/CT upgradability from 16 cm to 32 cm AFOV, it features a detector assembly that is designed to allow field upgrade scalability of the Axial FOV up to 128 cm.

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Precision DL

The technological advancements achieved by Omni Legend don't stop with hardware. Precision DL is a deep-learning-based image processing method. It is a sophisticated neural network algorithm trained with thousands of images reconstructed with a variety of different reconstruction techniques, including ToF reconstruction. Omni Legend's exceptional sensitivity combined with Precision DL is the future of PET/CT image quality. Precision DL brings image quality performance comparable to or better than that of a premium digital ToF PET/CT system, at equivalent sensitivity and with a coincidence timing resolution of 385 ps⁴. With Precision DL, you get software engineered to increase small, low contrast lesion detectability as compared to our premium Time-of-Flight-based digital scanner⁵.

Auto Positioning

With a current traditional scanner, an operation for patient positioning requires some manual settings such as scan range determination, centering or landmark setting, and challenges are time-consuming and variation by operators. On the other hands, Auto Positioning activates automatic table elevation motion to the centering height, and cradle motion to the scout start position, with one single click on the touchscreen. Moreover, it safeguards the positioning motion by checking possible collision of the patient body with the PET/CT gantry. Auto Positioning with AI technology realizes the auto scout scan range, anatomical reference detecting and centering by specifying the position and shape in three dimensions. This GE' unique technology provides better patient throughput, ease of use, consistent image quality, standardization, and less error.

Equipment Levels

Omni Legend is Available in 3 axial FOVs, 32 cm, 21* cm and 16 cm. Each is available at three primary configurations consisting of a bundle of SW and/ or HW options. These configurations are dependent on the AFOV and vary per region

- Omni Legend 16/21/32 **Select** is the base configuration,
- Omni Legend 16/21/32 **Plus** is adding additional functionalities, mainly workflow ones,
- Omni Legend 16//21/32 **Elite** is highest specified package adding advanced IQ and Image Processing functionalities.

By providing different standard configurations, we have greatly simplified the process of selecting options; this results in significant time savings during the ordering process, and lower cost compared to the purchase of individual options.

Next to these primary configurations, care-area focused packages around **Whole-Body Dynamic Imaging**⁶, **Radio Therapy** for PET and CT, and **Cardiac** are also available and can be selected in any combination with the Select, Plus and Elite configurations.

Please refer to the PCM for additional details.

PET Technologies

Advanced Quantitative Reconstructions

		Omni Legend 16 Fixed/ Mobile	Omni Legend 21* Fixed/ Mobile	Omni Legend 32 Fixed/ Mobile
VUE Point HD 6.1.2	VUE Point HD utilizes a full 3D Iterative Reconstruction technique with all corrections within the loop. It offers enhanced resolution detector geometry modeling; model-based 3D scatter correction; exclusive randoms corrections based on singles; dead time correction with pileup estimates.	●	●	●
Q.AC	Our Q.AC algorithm helps to ensure that the attenuation coefficients used in image reconstruction are accurate in ultra-low-dose, non-diagnostic CT protocols.	●	●	●
SharpIR	Point Spread Function modeling enhances visual contrast and resolution in both whole-body and brain PET images. SharpIR provides uniform High-Definition resolution over a 70 cm PET FOV.	●	●	●
Q.Clear	Full convergence iterative reconstruction technology for accurate PET quantitation and high image quality, to help with fast and efficient reading and confident diagnosis.	●	●	●
Precision DL	More than a new processing technique, Precision DL is engineered with a sophisticated deep neural network trained on thousands of images made with multiple reconstruction methods, including Time-of-Flight (ToF). The combination of Precision DL and the dBGO-based Omni Digital Detector's ultra-high sensitivity inside Omni Legend enables our vision for the future of PET/CT image quality. Omni Legend's exceptional sensitivity combined with Precision DL is the future of PET/CT image quality. Precision DL brings image quality performance comparable to or better than that of a premium digital ToF PET/CT system, at equivalent sensitivity and with a coincidence timing resolution of 385 ps ⁴ .	●	●	●

● Included ● Optional, configuration-dependent, refer to PCM

PET Technologies (cont.)

Intelligent Motion Management

		Omni Legend 16 Fixed/ Mobile	Omni Legend 21* Fixed/ Mobile	Omni Legend 32 Fixed/ Mobile
Q.Static	Q.Static represents a starting point for adding motion correction techniques to your facility and the opportunity to build towards a full 4D phase-matched workflow. Without disrupting your standard whole-body workflow, Q.Static automatically isolates data when organs are in a low-motion state, thereby correcting for motion across the entire chest or torso. The result is a single image series with reduced blurring from organ motion and therefore more consistent quantitation compared to a static image.	●	●	●
MotionFree 3.12	MotionFree is a software-only solution to derive a respiratory signal from the acquired PET data as an alternative to existing device-based respiratory gating options. It generates a respiratory signal which can be used to automate motion correction of PET images with respiratory motion. MotionFree is designed to be minimally disruptive to the standard workflow, and therefore to be used in every scan.	●	●	●
Q.Freeze	Q.Freeze is designed to combine the quantitative benefits of 4D phase- matched PET/ CT imaging into a single static image. By collecting CT and PET data at each phase of the breathing cycle, then matching the data for attenuation correction purposes, Q.Freeze is designed to facilitate quantitative consistency. None of the acquisition data is wasted, as 100% of the counts collected are combined to create a single static image. The goal – a resulting image that has the dual benefit of frozen patient motion and reduced image noise. Combine with Q.AC to create 4D cine data for attenuation correction of PET images at low dose levels.	●	●	●
Motion Match	Correct the artifacts generated by the physiological activity of the moving organs, such as the heartbeat and respiratory movement, and improve the match ratio of PET and CT as well as the accuracy of PET SUV.	●	●	●
Enhanced AC*	Enhanced AC is intended to correct for cases of PET to CT misregistration caused by respiratory motion. In this method Enhanced AC generates a corrected and registered attenuation map, which is subsequently applied on PET reconstructed data.	●	●	●

● Included ● Optional, configuration-dependent, refer to PCM

PET Technologies *(cont.)*

Workflow Optimized for Quantitation Accuracy

		Omni Legend 16 Fixed/ Mobile	Omni Legend 21* Fixed/ Mobile	Omni Legend 32 Fixed/ Mobile
Auto-In	This feature allows the user to landmark and position the patient remotely at a desired table location from the operator console. This may help minimize exposure of the technologist to radiation from injected patients & improves workflow by reducing the time spent to position the patient.	●	●	●
DQA	The new Daily Quality Assurance (DQA) procedure helps to minimize radiation exposure and optimize efficiency.	●	●	●
Q.Temp	Real Time Temperature Compensation technology that uses the sensors to measure the temperature of each detector unit and individually adjusts the gain in real time to ensure that temperature fluctuations in the scan room do not impact system performance and, therefore, quantitative measurements.	●	●	●
Q.Check	User configurable data integrity check that can help ensure parameters important for quantitative imaging are saved in the patient DICOM data prior to network. It includes blood glucose level, date of last therapy, and ability to note if patient is diabetic.	●	●	●
Q.Prepare	Q.Prepare is designed to facilitate the patient exam preparation. Q.Prepare offers the following functions: <ul style="list-style-type: none"> • Ability to view parameters of prior exams • Compare prior parameters to current exams • Ability to pre-enter study information 	●	●	●
Automatic ACQC	An easy automated and advanced workflow correcting for any attenuation map misregistration using flexible geometrical transforms and enabling quality control. Automatic ACQC is fully integrated in the patient scan workflow, enabling saving technologist time, reproducibility, and reducing manual errors and inter and intra user variability. Automatic ACQC helps reduce overall procedure time and helps with accurate registration.	●	●	●

● Included ● Optional, configuration-dependent, refer to PCM

PET/CT Technologies

Workflow




		Omni Legend 16 Fixed/ Mobile	Omni Legend 21* Fixed/ Mobile	Omni Legend 32 Fixed/ Mobile
Auto Positioning	<p>With a current traditional scanner, an operation for patient positioning requires some manual settings such as scan range determination, centering or landmark setting, and challenges are time-consuming and variation by operators. On the other hands, Auto Positioning activates automatic table elevation motion to the centering height, and cradle motion to the scout start position, with one single click on the touchscreen. Moreover, it safeguards the positioning motion by checking possible collision of the patient body with the CT gantry. Auto Positioning with AI technology realizes the auto scout scan range, anatomical reference detecting and centering by specifying the position and shape in three dimensions. This GE' unique technology provides better patient throughput, ease of use, consistent image quality, standardization, and less error.</p> <ul style="list-style-type: none"> Auto Positioning loads patient to the scan position with just one click. It provides better operational efficiency compared without this function. Auto centering optimizes the radiation dose and image quality, and it helps in in minimizing positioning errors compared to manual positioning. <p>Note: Available only with Omni fixed configuration</p>	●	●	●
Xtream Camera	<p>AI based automatic patient positioning is an innovative, next generation technology. It is powered by the Xtream camera that enables automatic landmark detection and auto patient centering.</p> <p>The Xtream camera captures patient information, then uses a dedicated AI algorithm to detect the anatomical landmark automatically based on protocol input.</p> <p>The Xtream camera provides automatic patient centering by determining the patient center within the scan range and aligning this patient center with CT isocenter automatically.</p>	●	●	●
Xtream Tablet	<p>Xtream Tablet is a multi-purpose user interface on gantry sides and supports following features.</p> <ul style="list-style-type: none"> Wide monitor: 12.1 inch Touch screen operation Patient protocol display and selection Patient information display Assisted Patient Positioning ECG waveform display Collision indication Emergency Patient 	●	●	●


● Included

● Optional, configuration-dependent, refer to PCM

PET/CT Technologies *(cont.)*

Workflow *(cont.)*

		Omni Legend 16 Fixed/ Mobile	Omni Legend 21* Fixed/ Mobile	Omni Legend 32 Fixed/ Mobile
Remote Control Suite* with 3-Video Monitoring System	<p>The Remote-Control Suite is Remote Control Panel with Assisted Video Monitoring System. It is designed to remotely position patients from the scan control room, allowing the technologist to remain isolated from the patient while keep the ability to remotely start and end exam from the console room without going into the gantry room. Help to minimize potential contamination risk between gantry & console rooms. Remote Control Suite includes two main parts: Remote Control Panel, 3 Video Monitoring System.</p> <p>The Remote-Control Panel extends the PET/CT scanner in-room control panel function to the operator desktop. Technologists can control table up/down, cradle in/out, landmark setting, one button loading and one button unloading patient without entering into scan room.</p> <p>3-Video Monitoring System with three high resolution cameras, CCTV 21.6 inch 16:9 monitor and computer, is to assist the technologists for real time observing the landmark laser line and patient status from operation room.</p> <p>Note: Available only with Omni fixed configuration.</p>			

 Included  Optional, configuration-dependent, refer to PCM

PET/CT Technologies (cont.)

Workflow and Patient Experience

		Omni Legend 16 Fixed/ Mobile	Omni Legend 21* Fixed/ Mobile	Omni Legend 32 Fixed/ Mobile
Remote Auto Positioning	Remote Auto Positioning is GE unique technology. Combined with GE Remote Control Suite and AI technology, it helps technologist to use auto patient positioning function remotely from operator room, to realize the auto scout scan range, anatomical reference detecting and centering by specifying the position and shape in three dimensions. Note: Available only with Omni fixed configuration.	●	●	●
Barcode Reader on Gantry	The Barcode Reader is fully integrated into the gantry, and it allows operators to scan patient information or protocols on the gantry side. This unique function realizes a simple and fast workflow.	●	●	●
Bore Pattern	The upper area of the bore has a graphic pattern, which provides a point of focus that is designed to help alleviate anxiety and reduce patient movement.	●	●	●
Bore Light	Ambiance light to improve user experience.	●	●	●

● Included ● Optional, configuration-dependent, refer to PCM

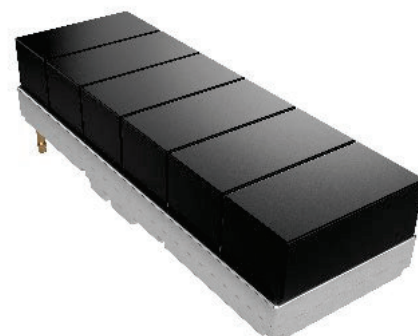


PET Performance Specifications

New Scalable Digital Detection Platform

New detection platform grounds up to harness the power of digital BGO, an innovative detector design with a small crystal size capable of producing high resolution images and exceptional image quality.

The detector material at the core of the LightBurst Digital BGO detector takes PET/CT to the next level. Its high density and stopping power, 4.1x4.1mm pixels and 30 mm thick crystals make it possible to achieve great spatial resolution, energy resolution, and ultra-high NEMA sensitivity per FOV length, of 11.8 cps/kBq for the 16 cm, 20.5 cps/kBq for the 21 cm and 46 cps/kBq for the 32 cm AFOV products. This novel solution of extreme rise in sensitivity and digital detection technology goes beyond just providing a high-quality image. It's what allows to image high count rate tracers beyond FDG for vast number of procedures a staff can execute.



LightBurst BGO- Bismuth Germinate Detector	Omni Legend 16 Fixed/Mobile	Omni Legend 21* Fixed/Mobile	Omni Legend 32 Fixed/Mobile
Detector Technology	Scalable Digital BGO with SiPM 3.3		
Scintillator dimensions [XxYxZ]	4.1 mm x 4.1mm x 30mm		
Number of detector rings	36	48	72
Number of crystals	19008	25344	38016
SiPM Channels	4752	6336	9504
Number of detectors	264 blocks	352 blocks	528 blocks
Axial field of view	16 cm	21 cm	32 cm 3.1
Transaxial field of view	70 cm	70 cm	70 cm 3.2
Slice overlap [%]	User defined 1-50	User defined 1-50	User defined 1-50
NEMA Sensitivity ⁷	11.8 cps/kBq	21 cps/kBq	46 cps/kBq 3.4
Scatter fraction ¹⁵	35%	35%	35% 3.9
Clinical NECR ¹⁵	50kcps @ 2.4kBq/ml	88kcps @ 2.4kBq/ml	200kcps @ 2.4kBq/ml
Peak NECR ¹⁵	125kcps @ 15.8kBq/ml	221.6kcps @ 16.9kBq/ml	500kcps @ 15.8kBq/ml
Coincidence window	6.5 ns	6.5 ns	6.9 ns
Energy resolution	9.85%	9.85%	9.85%
Energy Window	435-580 KeV	435-580 KeV	435-580 KeV

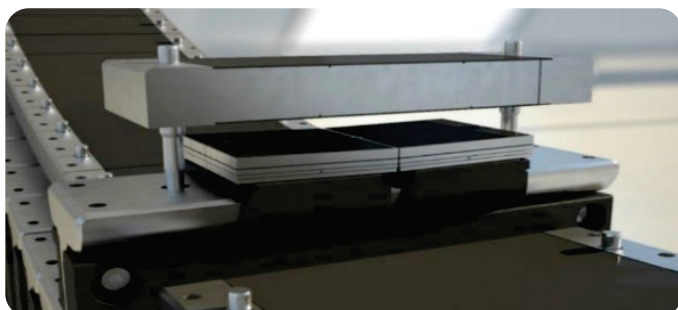
Spatial Resolution	Omni Legend 16 Fixed/Mobile		Omni Legend 21* Fixed/Mobile		Omni Legend 32 Fixed/Mobile	
	VUE Point ⁸	Q.Clear ⁹	VUE Point ⁸	Q.Clear ⁹	VUE Point ⁸	Q.Clear ⁹
Axial @ 1 cm	3.6 mm	2.5 mm	3.6 mm	2.5 mm	3.6mm	2.5 mm
Axial @ 10 cm	3.8 mm	2.7 mm	3.8 mm	2.7 mm	3.8 mm	2.7 mm
Transaxial @ 1 cm	3.8 mm	1.4 mm	3.8 mm	1.4 mm	3.8 mm	1.4 mm
Transaxial @ 10 cm	4.5 mm	1.5 mm	4.5 mm	1.5 mm	4.5 mm	1.5 mm

CT Technologies

Imaging Performance

		Omni Legend 16 Fixed/ Mobile	Omni Legend 21* Fixed/ Mobile	Omni Legend 32 Fixed/ Mobile
Clarity Detector and Data Acquisition System (DAS)	<ul style="list-style-type: none"> Designed as analog cable free between ASIC and Photodiode reducing electronic noise. Designed for up to 90% less heat generation for easier thermal management which is important for consistent IQ. Designed for less electronic noise, up to 44%, for better low signal performance. Optimized post-patient collimator with ability to reduce scatter noise. 	●	●	●
Performix™ 40 Plus X-ray Tube	<ul style="list-style-type: none"> Performix40 Plus X-ray tube provides the needed focal spot stability for all available gantry rotation speeds. A liquid bearing used for the tube rotor results in less bearing wear and is also an enabler of routine, 0.35 second rotation speed scanning. Revolution Maxima offers helical pitches of up to 1.531 while continuing to meet GE's image quality specifications for lower pitch acquisitions. High helical pitches and 0.35 sec rotation speed enables faster scan times which can shorten required breath holds and present less opportunity for motion artifacts from patient and organ movement. Shorter acquisition times can be especially important for younger patients and others who may experience anxiety when getting a CT examination. For example, a 1000 mm full-body trauma scan using a 0.35 second rotation speed and 1.513 pitch can be acquired in as little as 6 seconds. 	●	●	●
4.13.3				
ASiR™ (Adaptive Statistical Iterative Reconstruction)	<ul style="list-style-type: none"> ASiR dose reduction technology: A reconstruction technology that may enable reduction in pixel noise standard deviation. The ASiR reconstruction algorithm may allow for reduced mA in the acquisition of diagnostic images, thereby reducing the dose required.¹⁰ ASiR dose reduction technology: A reconstruction technology that may enable improvement in low contrast detectability 	●	●	●

● Included ● Optional, configuration-dependent, refer to PCM



CT Technologies *(cont.)*

Imaging Performance *(cont.)*

		Omni Legend 16 Fixed/ Mobile	Omni Legend 21* Fixed/ Mobile	Omni Legend 32 Fixed/ Mobile
ASiR-V™	<p>ASiR-V is the technology in GE's family of industry-leading iterative reconstruction techniques.</p> <p>ASiR-V allows healthcare providers to lower dose by 50 to 82% as compared to standard filtered back-projection (FBP) reconstruction at the same image quality¹⁰</p> <p>ASiR-V* combines the speed of ASiR while leveraging design elements found in Veo™, GE's full model-based iterative reconstruction technology. By applying more advanced modeling and optimization technologies in projection- and image-space as part of the iterative reconstruction process, ASiR-V provides dose reduction capabilities beyond that of ASiR.</p> <p>ASiR-V extends the advanced noise and dose reduction technologies of ASiR. Existing iterative reconstruction, such as ASiR, models the noise in a way that is adaptive to the mA, kV and body habitus of the patient.</p> <p>ASiR-V enhances the noise modeling of ASiR in two ways: 1) ASiR-V performs sophisticated statistical modeling of the projection samples by taking into account the confidence of each projection measurement in the reconstruction process; and 2) ASiR-V incorporates the user's special clinical needs, such as enhanced spatial resolution, into the statistical treatment of the samples.</p> <p>Lower dose;</p> <p>ASiR-V reduces dose by 50% to 82% relative to FBP at the same image quality¹¹</p> <p>Low contrast detectability improvement;</p> <p>ASiR-V improves low contrast detectability by 59% to 135% at the same dose*</p> <p>Image Noise improvement;</p> <p>ASiR-V reduces image noise up to 91% at the same dose¹²</p> <p>Spatial resolution enhancement;</p> <p>ASiR-V improves spatial resolution up to 2.07X (107%) at same image noise¹²</p> <p>Artifact reduction;</p> <p>ASiR-V image reconstruction has the capability to reduce low signal artifact such as streak artifact compared to FBP¹²</p>	●	●	●
IQ Enhance	IQ Enhance is a special algorithm that can be prescribed to minimize commonly seen in thin slice helical acquisition.	●	●	●
1024 matrix reconstruction	Revolution Maxima supports 1024 reconstruction matrix.	●	●	●
AAR-Advanced Artifact Reduction	Advanced Artifact Reduction (AAR) Filter significantly reduces streaking artifacts when highly absorbent objects are in the field of view – i.e. large shoulder.	●	●	●

● Included ● Optional, configuration-dependent, refer to PCM

CT Technologies *(cont.)*

Imaging Performance *(cont.)*

		Omni Legend 16 Fixed/ Mobile	Omni Legend 21* Fixed/ Mobile	Omni Legend 32 Fixed/ Mobile
Two Path Dual-Energy Acquisition 4.3	GE's protocol management allows the user to easily configure back to back Axial or helical scans of the same anatomy at two different X-ray energies (kVps). The subsequently acquired dual energy data can be post-processed on console or AW workstation using the Add/Sub function.	●	●	●
Conjugate CB Back Projection	For the 64-slice configuration, the overlapped reconstruction feature enables 128 slices per rotation in axial scanning modes to be produced. This reconstruction technique is intended to improve Z-axis visualization.	●	●	●
Ultra-Kernel 4.14	Adaptive Enhance Level Adjustment (AELA) may improve visual spatial resolution while maintaining pixel noise standard deviation and without introducing new artifacts.	●	●	●
SmartMAR	Smart MAR* helps reduce photon starvation artifacts, such as beam hardening and streak artifacts, caused by metal in the body, such as hip implants.	●	●	●
Overlapped Recon	For the 64-slice configuration, the overlapped reconstruction feature enables 128 slices per rotation in axial scanning modes to be produced. This reconstruction technique is intended to improve Z-axis visualization.	●	●	●
Thinner FWHM at Helical	GE's exclusive helical reconstruction technologies, crossbeam correction, conjugate ray interpolation, and hyper plane helical reconstruction with alpha smoothing methods, deliver slice widths (FWHM) that more closely match the selected nominal slice thickness. For example, a 64 x 0.625 mm acquisition with a pitch of 0.516 will deliver slices with a FWHM of only 0.66 mm.	●	●	●
Short geometry design	Revolution Maxima has an imaging efficient focal spot to isocenter distance of 541 mm. Compared to a system with a 600 mm focal spot to isocenter distance, Revolution Maxima delivers 23% more photons at the detector for the same technique factors.	●	●	●

● Included

● Optional, configuration-dependent, refer to PCM

CT Technologies (cont.)

Dose reduction and optimization

		Omni Legend 16 Fixed/ Mobile	Omni Legend 21* Fixed/ Mobile	Omni Legend 32 Fixed/ Mobile
Organ Dose Modulation	ODM provides reduction of radiation dose via X-ray tube current modulation for superficial organs and tissues, such as breasts while maintaining diagnostic quality without decreasing productivity (as the result of not using externally applied shields). Because attenuation data from the Scan Projection Radiograph is used to determine the mA modulation for acquisitions using Automatic Exposure Control, it is understood that when using externally applied shields that these shields should not be put in place prior to acquiring the scan projection radiograph(s). Placement of externally applied shielding prior to obtaining the scan projection radiograph(s) may adversely affect the AEC performance.	●	●	●
4.13.1				
3D mA Modulation utilizing SmartmA and AutomA	Having this kind of volumetric knowledge before you scan 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. 3D mA modulation acquisitions may reduce dose compared with fixed mA acquisitions ¹³	●	●	●
Dynamic Z-axis tracking	Dynamic Z-axis tracking, using independent movement of the collimator cams, blocks the unused part of the X-ray beam at the beginning and end of helical acquisitions thereby reducing exposure to unnecessary radiation.	●	●	●
OptiDose™	For years GE has followed the ALARA principle in helping its customers optimize dose. GE has provided many tools to help the clinician minimize dose while achieving diagnostic quality images. <ul style="list-style-type: none"> ECG mA Modulation*: For cardiac applications, prospective ECG mA modulation automatically adjusts the mA to minimize the patient's exposure to X-rays – reducing mA during systolic phases of the cardiac cycle. This provides clear images and allows you to reduce mA primarily in the systolic phases of the cardiac cycle – yet gives you enough power to obtain quality images for functional analysis. CT 4Kids: The pediatric protocols are based upon a child's size, age, and weight and tailor the dose to the size of the patient. The Head and Orbit categories are age based. The rest of the categories are height and weight-based protocols. Color Coding Kids™ provides pediatric scan protocols based on the Broselow-Luten system™ Pediatric System. This Color-Coding system is incorporated into the protocol selection on the operator's console. SmartTrack: The tracking collimator keeps the beam focused only on the active detector cells, and makes sub-millimeter scanning possible with high dose efficiency. SmartBeam™: The collimator contains two independently controlled tungsten cams. The rotation of the cams provides continuous variable beam thickness and Z-axis position. The collimator also contains two bowtie beam filters that filter and shape the beam to optimize dose and image performance 	●	●	●
4.13.2				

● Included

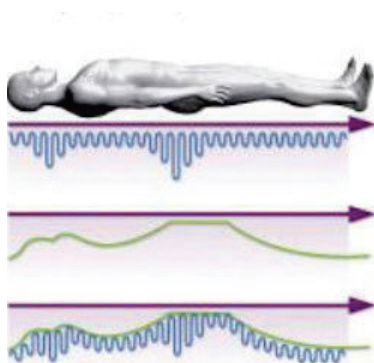
● Optional, configuration-dependent, refer to PCM

CT Technologies *(cont.)*

Dose reduction and optimization *(cont.)*

		Omni Legend 16 Fixed/ Mobile	Omni Legend 21* Fixed/ Mobile	Omni Legend 32 Fixed/ Mobile
Dose Reporting	Dose Reporting: CTDIvol, DLP, Dose Efficiency displays during scan prescription and provides dose information. The CTDIvol, DLP and Phantom size used to calculate dose is automatically saved once the user selects End Exam. DICOM Structured Dose Report generates a CT Dose Report, which can enable tracking of dose (CTDIvol, DLP, Phantom Size, and other metrics) for the patient by the hospital radiation tracking system/ RIS/HIS.	5.6.4 ●	●	●
Dose Check	<p>Dose Check provides users 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 (NEMA).</p> <p>Dose Check provides the following</p> <p>Checking against the Notification Value if the estimated dose for the scan is above your site established dose value.</p> <p>Checking against the 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.</p> <p>Alert Values for Adult and Pediatric with age threshold</p> <p>Audit logging and review capability</p> <p>Protocol Change Control capability</p>	●	●	●

● Included ● Optional, configuration-dependent, refer to PCM



3D mA Modulation

CT Technologies *(cont.)*

Cardiac Applications

		Omni Legend 16 Fixed/ Mobile	Omni Legend 21* Fixed/ Mobile	Omni Legend 32 Fixed/ Mobile
Snapshot Pulse	<p>SnapShot Pulse mode is for low dose imaging of the coronary arteries. SnapShot Pulse can also be used to image structures that are near to the heart and may be affected by heart motion such as thoracic aorta's or pulmonary arteries. Prospective Gating based SnapShot Pulse achieves significant dose reduction compared to CG gated helical acquisition mode.</p>	●	●	●
SnapShot Freeze	<p>SnapShot Freeze is designed to reduce blurring artifacts due to motion in coronary vessels that cannot be addressed by gantry speed alone. Providing up to a 6X improvement, while maintaining high spatial resolution, the reduction in motion artifacts is equivalent to a 0.058s Equivalent Gantry Rotation Speed with Effective Temporal Resolution of 29msec¹⁴</p>	●	●	●
Snapshot Assist	<p>Helps users Optimize ECG-gated CT acquisitions based on patient heart rate characteristics. SnapShot Assist uses the patient's recorded heart rate information to display scan parameters (including scan mode, cardiac phases, padding and pitch) that could be used during the cardiac CT scan.</p> <p>SnapShot Assist generates a cardiac scan parameter recommendation using the patient's ECG analysis and user defined protocol selection algorithm. It uses the patient's recorded heart rate information to predict the heart rate behavior during a CCTA scan to assist the user with optimization of the parameters on a per-patient basis.</p> <p>Acquisition parameters displayed include scan mode (Cine SnapShot Pulse, Helical SnapShot Segment, etc.), cardiac phases, padding, and pitch. User Profiles define scan parameters within the heart rate and variability categories for a specific patient group and cardiac scan mode.</p>	●	●	●
SmartScore Pro	<p>Acquires prospective ECG gating measurements, which provides information that is valuable for scan timing. Using the measurements, the system synchronizes the collection of data with the cardiac cycle.</p>	●	●	●
Cardiac Enhance features 4.15	<ul style="list-style-type: none"> Cardiac Image Filters provides users the capability to reconstruct filtered images using three steps of noise (pixel noise standard deviation) reduction for helical and axial cardiac imaging, which may allow a reduction of mA while maintaining an acceptable level of image performance. ECG mA Modulation: For cardiac applications, prospective ECG mA modulation automatically adjusts the mA to minimize the patient's exposure to X-rays – reducing mA during systolic phases of the cardiac cycle. This provides clear images and allows you to reduce mA primarily in the systolic phases of the cardiac cycle. – yet gives you enough power to obtain quality images for functional analysis. ECG Waveform on the Console allows users to visualize the ECG waveform directly on the CT scanner console during the scan. ECG Viewer / Editor provides users the capability to view and retrospectively modify intervals and adjust location of triggers for cardiac cycles based on the ECG waveform displayed on the console. This capability may improve successful cardiovascular acquisition rate in cases with suboptimal triggers or irregular heartbeats such as PVCs, PACs and arrhythmias. 	●	●	●

CT Technologies *(cont.)*

RT, Interventional and Increased-coverage Applications

		Omni Legend 16 Fixed/ Mobile	Omni Legend 21* Fixed/ Mobile	Omni Legend 32 Fixed/ Mobile
Image Check - Real time reconstruction	Image Check provides 340x340 matrix images for confirming reconstructed image coverage in real time and tracking up to 1800mm length with less than 1 sec delay. Reconstruction time is up to 55 fps.	●	●	●
SmartStep	SmartStep is an interventional mode providing step-and-shoot imaging with in-room viewing and manual X-ray control. The three interventional viewports automatically update each time an exposure is made with the foot pedal.	●	●	●
Volume Shuttle	Revolution Maxima provides for a single-injection 80 mm (2x wider coverage) Volume Shuttle acquisition scan. Volume Shuttle is a repetitive axial scan mode where the table shuttles back and forth between two adjacent axial imaging locations (X-ray is off during table movement). Each location covers 40 mm in the Z-direction for a total of 80 mm of Z- coverage. The shuttle action repeats over a user-defined duration to enable evaluation of tissue changes over time.	●	●	●
Volume Helical Shuttle	Volume Helical Shuttle is a continuous scan technique that is a bi-directional scan mode, covers up to 312.5mm or 500 slices (0.625mm x 500 slice) for 4D imaging. Volume Helical Shuttle provides data with a temporal sampling of 3.2 second up to 140 mm of coverage. Dynamic Pitch Reconstruction extends Z-coverage and improves temporal sampling by utilizing acquired scan data during table acceleration and deacceleration.	●	●	●

● Included

● Optional, configuration-dependent, refer to PCM

CT Performance Specifications

X-Ray Tube		
Performix 40 Plus X-ray Tube		Liquid bearing tube enables 0.35 sec* gantry rotation speed for routine use and with high helical pitch (1.531) enables a 1000 mm scan to be in 6 seconds.
Thermal ratings		<ul style="list-style-type: none"> Maximum Anode Heat Content (Reference: IEC 60613): Maximum X-ray Tube Assembly heat content: 7.7MJ (10.8 MHU) The maximum anode heat capacity: 5 .0 MJ (7 .0MHU) Anode heat dissipation: 1070 KHU/min (13.2kW)
Distance of focal spot to detector		95 cm
Small focal spot	4.12	Dual focal spots: 0.7x0.6 per IEC 60336: 1993, 0.9 x 0.7 per IEC 60336:2005
Large focal spot		Dual focal spots: 0.9x0.9 per IEC 60336: 1993, 1 .2 x 1 .1 per IEC 60336/2005
Maximum power	4.9	72kW (100 kVA)
mA	4.11	mA range at 120kV: 10 to 600 mA, 5 mA increments
CT Performance		
Display field of view	4.7	70 cm with WideView
Scan field of view	4.6	50 cm diagnostic
Minimum slice thickness		0.625 mm
Scan modes	4.2.3	<ul style="list-style-type: none"> Scout: Scout imaging is used for anatomical location in conjunction with scan and recon prescription, to provide an anatomical cross-reference for axial images, and to provide quick feedback to the user as to the anatomy scanned. Revolution Maxima supports real time scout.
	4.2.2	<ul style="list-style-type: none"> Axial: axial slices acquired simultaneously with each 360° rotation, with the time between scans set by the user-selected interscan delay (ISD) or intergroup delay (IGD).
	4.2.1	<ul style="list-style-type: none"> Helical: continuous 360° scanning with table incrementation and no interscan delay. Cine: contiguous axial slices acquired simultaneously with each 360° rotation. Half-scan imaging and segmented reconstruction is supported with acquisitions times of 0 .65 times that of the scan speed. <p>128 slices per Rotation† - The overlapped reconstruction feature enables 128 slices per rotation in Axial scanning modes and delivers improved Z-axis visualization performance relative to non-overlapped reconstruction.</p>
Pitch		Helical Pitch (nominal): 0.516 to 1.531 Cardiac Pitch: 0.16 to 0.325
Rotational speeds (360°)	4.8	Axial: 0.35 [‡] , 0.4 [‡] , 0.5 [‡] , 0.6 [‡] , 0.7, 0.8, 0.9, 1.0, and 2.0 seconds Helical: 0.35 [‡] , 0.4 [‡] , 0.5 [‡] , 0.6 [‡] , 0.7, 0.8, 0.9 and 1.0 seconds Cardiac application [‡] : 0.35, 0.375, 0.40, 0.425, 0.45, 0.475, and 0.50 [‡] seconds
HU scale		-31,743 to 31,743
Reconstruction matrix		512 x 512, 1024 x 1024
Display matrix		1024 x 1024

CT Performance Specifications (cont.)

Clarity Detector		
Number of elements		54,272
Number of rows	4.3	64 rows of 0.625 mm thickness at isocenter 443 reconstructed slices (images) per rotation: under 64ch x 0.625mm, 1.375 helical pitch, 6 rotation, 266mm coverage, 0.1mm recon interval condition
Detector coverage	4.4	up to 40 mm in axial mode up to 80 mm in axial mode with Volume Shuttle
Perfusion coverage		140 mm with Volume Helical Shuttle [‡]
Absorption efficiency		98%
Spatial Resolution		0.28 mm
Data Acquisition System		Clarity detector/ DAS
Image Quality		
Low-contrast detectability On 8 inch (20 cm) Catphan phantom, helical scan		Reconstruction mode: Standard Algorithm with ASiR Object Size: 5 mm % Contrast: 0.32% Dose Level (mGy TDIvol) 10 mm slice: 5.69 mGy Reconstruction mode: Standard Algorithm with ASiR-V* Object Size: 5 mm % Contrast: 0.30% Dose Level (mGy TDIvol) 10 mm slice: 4.87 mGy
CTDI expressed in mGy/100 mA on CTDI head and body dose reference phantoms		Axial head: 16.7 mGy/100 mAs Axial body: 8.7 mGy/100 mAs Helical head: 17.0 mGy/100 mAs Helical body: 8.8 mGy/100 mAs
Noise		Axial: 0.43% at 11.0 mGy CTDIvol with ASiR Reconstruction Algorithm Helical: 0.43% at 11.1 mGy CTDIvol with ASiR Reconstruction Algorithm Axial: 0.43% at 4.95 mGy CTDIvol with ASiR-V* Reconstruction Algorithm Helical: 0.43% at 4.7 mGy CTDIvol with ASiR-V* Reconstruction Algorithm

[‡] Optional

Workspace and Protocols






























Omni Legend Workspace



		Omni Legend 16 Fixed/ Mobile	Omni Legend 21* Fixed/ Mobile	Omni Legend 32 Fixed/ Mobile
Q.Flow	Ease of use and automation: common PET and CT user interface, up to 3 PET prospective reconstructions, up to 8 list mode record/replay Enhanced Graphic Rx: edit scan parameters on scout view, one-click hybrid protocol set-up from CT, auto direct multi-planar reformats, PET copy PMR to copy reconstruction parameters Flexibility: variable acquisition time per bed, multi-bed gated PET, cardiac and respiratory PET gating, integrated PET gating Networking and compatibility: DICOM HIS/RIS, DICOM PET RAW, auto-store and auto-networking.	3.11.1		
3.11.2				
ViP Replay	Volume Interface Protocol (ViP) is an intuitive and comprehensive PET list mode retrospective reconstruction solution. Provides integrated list mode processing for generating a variety of scan types (static, dynamic, gated) from a single acquisition.			
RadRx	Create your own PET/CT protocol from any CT protocol. Automated CTAC creation from CT acquisitions, including contrast enhanced, perfusion and gated CTs. Integrated Average Cine CT protocol for improved attenuation			
PET/CT pediatric protocols	Default protocols specifically designed for FDG oncology pediatric exams based on Broselow-Luten Pediatric System®, which is designed to minimize CT radiation exposure in PET/CT attenuation correction to meet ALARA guidelines.			
Remote table retract	Minimize technologist exposure to patient radiation by allowing the use of operator console-based controls for bed retraction and lowering out of the gantry at the end of the exam.			
Clinical Protocols	Oncology: <ul style="list-style-type: none"> Whole-body PET/CT (Static) Q .Static PET/CT 2 meter scan whole-body PET/CT Cardiology: <ul style="list-style-type: none"> 82Rb/ Ammonia stress/rest protocol FDG Gated PET/CT Neurology: <ul style="list-style-type: none"> Amyloid PET imaging Brain PET All protocols can work with ASiR, ASiR-V, SmartMAR and Q .AC	3.14		

● Included ● Optional, configuration-dependent, refer to PCM

Workspace and Protocols *(cont.)*

Omni Legend Workspace *(cont.)*

		Omni Legend 16 Fixed/ Mobile	Omni Legend 21* Fixed/ Mobile	Omni Legend 32 Fixed/ Mobile
Whole-Body Dynamic Acq.	<p>A flexible SW protocol allowing the ability to acquire temporal images allowing analysis of tracer kinetics over time, overcoming limitations of static imaging (SUV).</p> <p>As part of protocol setup, user sets the system for a preliminary blood-pool acquisition where the patient-based input function is calculated, succeeded by a prescription of the whole-body dynamic acquisition parameters – number of passes, number of bed position per pass, duration of each bed and any pre-pass delays should these be necessary.</p> <p>As output, the system generates a blood pool dynamic series, and a whole-body dynamic series.</p> <p>*Acquisition only. Processing and analysis of the acquired dynamic data is not supported on the system.</p>	N/A		
Direct MPR with Auto-Batch	Automatic real-time direct reconstruction and transfer of fully corrected multiplanar images, in any plane. Up to 10 fps transfer speed in real-time during acquisition to up to four different destinations.			
Prospective Exam Split	Prospective Exam Split allows multi-anatomical exams to be read in separate anatomic sections. This allows specialists to review only those images needed for a given requested procedure. Prospective Exam Split provides users with the capability to specify how to split the exam into separate billing groups for each scan.			
SmartPrep	SmartPrep, which allows intermittent monitoring of IV contrast enhancement in an area of interest. The contrast flow is monitored by Low-Dose scans until the contrast enhancement reaches the preferred point and then the user initiates the scan prescription.			
Dynamic Transition	With SmartPrep procedure, Dynamic Transition allows the scan phase to start automatically when the HU of the transition ROI reaches the desired enhancement threshold.			
AWE Connection	Allows access to applications hosted on an AW Server, right from the PET/CT console for improved workflow and productivity.			
PET Data Storage	2.4 TB List Data Storage, 1.2 TB Sinogram Data Storage and Network Storage Capability. Storage space is amplified by utilizing GE's patented sinogram and list compression technology.			
PET Exam Report	Highlights key aspects from the PET scan including injected dose, uptake time, patient demographics and other important information that is intended to be passed along to reading physicians and streamline their workflow.			
Xtream Injector	A powerful integrated injection option that starts the injection process in synchronization with "Start Scan" to simplify the enhancement exam workflow.			
Data Export	Ensures that the relevant images and reports can be visualized by the referrals in a PC friendly format (MPEG, AVI, etc.)			

 Included  Optional, configuration-dependent, refer to PCM

Workspace and Protocols *(cont.)*

Omni Legend Workspace *(cont.)*

		Omni Legend 16 Fixed/ Mobile	Omni Legend 21* Fixed/ Mobile	Omni Legend 32 Fixed/ Mobile
Compatible peripherals	The USB allows users to store DICOM images and a DICOM Viewer to USB media that can be played back on a PC or laptop with a Window® XP/Vista/7 operating system. Images stored on a USB can be restored to the AW system or Omni Legend system.	●	●	●
Acquisitions	Static, gated, dynamic 3.10.1, 3.10.2, 3.10.3 Multi-static, multi-gated, multi-dynamic Real time list mode coincidence data acquisition for clinical and research applications that provides the opportunity for principal component analysis of the PET raw data (i.e. sinogram) and therefore facilitates user development of advanced motion corrections that eliminate the need of an external respiratory device.	●	●	●
Image matrix sizes	128 x 128, 192 x 192, 256 x 256, 384 x 384	●	●	●
Connect Pro	With the Connect Pro option, the user can view other valuable information about a patient such as allergies, pregnancy status, and medical alerts. This information is gathered from the HIS/RIS using a DICOM connection. Connect Pro can be customized to fit the department's needs by using "filters" to pull only the information in which the user is interested. It can collect more than standard patient demographic information.	●	●	●
AutoVoice	Three pre-recorded voices are available in 13 languages (English-Male, English-Female, Japanese, French, German, Spanish, Mexican Spanish, Italian, Korean, Chinese, Portuguese, Brazilian Portuguese and Russian.).	●	●	●
Copy Series	Automatically copy the parameters of an existing series when "Copy series" is selected. The series parameters include start location, end location, interval, DFOV, A-P center, and R-L center.	●	●	●
Learning Solution	The User Manual contains all the user information required to operate the scanner. It has detailed information as well as step-by-step procedures. The User Manual can be displayed on the Display monitor by clicking on the Learning Solution icon.	●	●	●

● Included ● Optional, configuration-dependent, refer to PCM

Siting Requirements

System	Height	Width	Depth	Weight
Gantry	196 cm / 77"	234 cm / 92"	170 cm / 67"	3208 kg / 7072 lb.
Table	107 cm / 42"	66 cm / 26"	345 cm / 136"	1049 kg / 2312 lb.

Patient Table

Maximum load	500 lb. (226 kg)
Maximum horizontal scannable range	Standard 170 cm with up to full 200 cm (optional)
Vertical scannable range	8 to 205 mm below isocenter
Maximum horizontal speed	137 mm/sec

Patient Table Compatible Options

IV Pole integrated at the foot-end of the table prevents IV lines from becoming crossed and tangled and ensures that the lines stay securely in place on the patient

2 m table extender: Carbon fiber table extender to enable full 2 m scan range for complete head to toe studies. **3.14**

Radiation treatment planning flat table overlay securely lock into the PET/CT .

GE HealthCare integration kit for Varian respiratory patient monitor composed of a table-mounting bracket with connector to support the RPM device; allows respiratory gating with and without radiation treatment planning flat table overlay.

Scan Room

Minimum room size, fixed install – Omni Legend 16/21/32	3462 mm x 7009 mm / 136" x 276"
Room temperature range	18° C (64° F) – 26° C (79° F)
Room cooling requirements	Air cooled, recommended 54,650 BTU/hr with heavy CT utilization
Power Requirements – Omni Legend 16/21/32	100 kVA maximum, 30 kVA average

Control Room

Minimum room size, fixed install – Omni Legend 16/21/32	2743 mm x 3912 mm / 108" x 154"
Room temperature range	18° C (64° F) – 26° C (79° F)
Room cooling requirements	Air cooled. Recommended 3200 BTU/HR
Equipment Room	Optional (depends on the peripheral equipment within the room). Heat and noise output for Power Distribution Unit and computer hardware are low enough to allow inclusion in the patient scanning suite with the table and gantry.

Standards and Regulatory Compliance

5.6

DICOM Conformance Standards

5.6.2

PET sinogram data can be saved as a DICOM file DICOM storage service class

Service Class User (SCU) for image send Service Class Provider (SCP) for image receive DICOM query/retrieve service class

DICOM storage commitment class push

DICOM modality work list 5.6.3

DICOM modality performed procedure step

DICOM Print 5.6.1

Filming Protocol

3M-952 standard

Supported film and hardcopy devices:

- A DICOM print interface is standard on the system
- DICOM basic grayscale and color print via ethernet
- Sterling/AGFA Helios via ethernet
- Postscript level 2 printer via TCP/IP ethernet

HIPAA

Password protected user login and authentication.

Image anonymization tool.

Product network filters restricts access to scanner system by IP address, services type (IE ftp, telnet) and DICOM port number.

User configurable.

Standard, Selectable Items

Language selectable keyboard ConnectPro HIS/RIS interface with performed procedure step

DICOM storage service class

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 laser standard IEC 60825-1:2014. The system's lasers are Class 2 laser products. Laser Radiation - Do not view directly with optical instruments. Do not expose users of telescopic optics. Max power: 0.39 mW. Wavelength: 635 nm.

Omni Legend has been designed to follow PET/CT international standards: ACR, ACRIN, EARL, QIBA

Omni Legend system meets MITA XR-29-2013 Smart Dose standards.

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GE HealthCare is a leading global medical technology, pharmaceutical diagnostics, and digital solutions innovator, dedicated to providing integrated solutions, services, and data analytics to make hospitals more efficient, clinicians more effective, therapies more precise, and patients healthier and happier. Serving patients and providers for more than 100 years, GE HealthCare is advancing personalized, connected, and compassionate care, while simplifying the patient's journey across the care pathway. Together our Imaging, Ultrasound, Patient Care Solutions, and Pharmaceutical Diagnostics businesses help improve patient care from prevention and screening, to diagnosis, treatment, therapy, and monitoring. We are an \$18 billion business with 51,000 employees working to create a world where healthcare has no limits.

Follow us on [Facebook](#), [LinkedIn](#), [Twitter](#), [Instagram](#) and [Insights](#) for the latest news, or visit our website [gehealthcare.com](https://www.gehealthcare.com) for more information.

References:

* Omni Legend 21 cm, Omni Legend mobile and Enhanced AC may not be available at all markets.

1. Omni 32cm / 21cm / 16cm as compared to Discovery MI 25cm / 20cm / 15cm
2. As demonstrated in phantom testing.
3. A. Omni Legend 32cm increases small lesion detectability as compared to Discovery MI 25cm. As demonstrated in phantom testing using a model observer with 4 mm lesions; average of different reconstruction methods within 3%.
B. Omni Legend 21cm has comparable small lesion detectability as Discovery MI 20cm. As demonstrated in phantom testing using a model observer with 5 mm lesions; the comparability between the systems is within 3%.
C. Omni Legend 16cm has comparable small lesion detectability as Discovery MI DR 15.7cm. As demonstrated in phantom testing using a model observer with 5 mm lesions; the comparability between the systems is within 3%.
4. Image quality performance measured using contrast recovery (CR) and background variability (BV). Demonstrated using phantom simulations with inserted spheres and multiple coincidence timing resolutions. Comparisons of Precision DL and VPPXS reconstruction for a system with a timing resolution that produces CR-BV comparable to that of Precision DL.
5. OMNI Legend 32 cm with Precision DL has similar small lesion detectability to OMNI Legend 32 cm with non-ToF reconstruction and increases small, low-contrast lesion detectability by 42% on average as compared to a premium digital ToF PET/CT at matched scan time and injected dose. Detectability using clinical data with an inserted 8 mm diameter liver lesion of known location and 2:1 contrast using a CHO model observer, comparing SNR from Omni Legend 32 cm with QCHD and Precision DL to SNR from Discovery MI 25 cm with QCFX.
6. Processing software is needed for diagnostic purposes.
7. Typical system performance, measured according to NEMA Standards Publication NU2-2018. Sensitivity represents the average of measurements at 0, 10 cm.
8. VUE Point HD - Data measured for typical system with 4 iterations and 34 subsets. Typical system performance measurements represent the mean performance of tested systems
9. Q.Clear - Data measured with Bayesian penalized likelihood reconstruction with $\beta 20$ and time of flight. Typical system performance measurements represent the mean performance of tested systems.
10. In clinical practice, the use of ASiR may reduce CT patient dose and improve low contrast detectability 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.
11. Image quality as defined by low contrast detectability.
12. 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. Low Contrast Detectability (LCD), Image Noise, Spatial Resolution and
13. mA modulation is designed to optimize the dose for user prescribed noise index. It's effect on dose depends on the patient body habitus, and prescribed noise setting.
14. As demonstrated in cardiac phantom testing
15. Typical system performance, measured according to NEMA Standards Publication NU 2-2018.

3.9

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GE HealthCare



Omni Legend, Max Apollo +, Max Crown, Max Elite +, Max Glory

User Manual

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Revision 1

Revision History

Revision	Date	Reason For Change
1	February 2024	Initial release

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1 Read This First

1.1 Important: Radioactive Material Handling

Only employees formally trained in radioactive materials handling and this equipment are authorized by the GE Healthcare Radiation Safety Officer to use radioactive materials to service this equipment.

GE Healthcare Services is required to notify the applicable U.S. state agency PRIOR to any source service event involving radioactive source handling. See NUC/PET Radioactive material guides for specific instruction or contact your EHS Specialist.

1.2 Read this First Introduction

Every reference in this user manual to Omni Legend also refers to Max Apollo +, Max Crown, Max Elite +, Max Glory.

This chapter provides an introduction to the manual, its conventions and contents.

1.3 Purpose of this Guide

This manual provides instructions for safe and effective use of the system. It does not teach Computerized Tomography (CT) or Positron Emission Tomography (PET). This manual assumes the user has sufficient training and knowledge of diagnostic imaging to read, understand and follow its instructions.

Keep this manual with the system at all times. Read and understand its content before using the system for the first time.

This system ships with the following:

- Instructions for Use (IFU)
- PET/CT User Manual (this document)
- CT User Manual (CT UM)
- CT Technical Reference Manual (CT TRM)
- CT Application Tips and Workarounds
- PETCT Technical Reference Manual Addendum for RadioTherapy Planning
- Volume Viewer PET
- PET/CT Service Manual
- Release notes

For module details refer to Omni Legend Product Configuration Master (PCM)

This manual only provides instructions for using the PET/CT system, including CTAC and CT series as they apply to the operation of the PET/CT. Please consult the CT User Manual and CT TRM when operating in standalone diagnostic CT mode.

This manual was originally written in English.

NOTE

Please note that some features/options described in this document may not be supported in all countries or may not be ordered with your system..

The documents listed above can be accessed electronically.

Through the internet

Follow the instructions below to view or download the electronic documents:

1. On your personal/facility computer, go to: <https://www.gehealthcare.com/documentationlibrary>
2. On the search page of the Customer Documentation Portal, enter XXXXXXX [IFU part number] in the search field, and launch the search.
3. The following screen capture is given as an example and is not legally binding.

1	Search
---	--------

Through the console:

Follow the instructions below to view the electronic documents from the console:

1. Insert the USB flash drive (data stick) you wish to view into the USB port of the computer, or click the icon [ADD ICON], and select **Learning Solutions** from the drop-down menu. Click on another desktop such as Exam Rx. [ADD ICON] Do not click on the iconify icon.
2. Select the language in which you want to view the documentation. To exit the user information:
3. Click **File** > **Quit** to exit the user information.

1.4 Safety Notice Conventions

Safe and proper use notices:

This guide uses the following safety notice conventions to emphasize certain safety instructions:



IDENTIFIES A CONDITION OR ACTION FOR WHICH A SPECIFIC HAZARD EXISTS. FAILURE TO HEED A DANGER WARNING WILL RESULT IN SEVERE PERSONAL INJURY, DEATH OR SUBSTANTIAL PROPERTY DAMAGE.






IDENTIFIES A CONDITION OR ACTION FOR WHICH A SPECIFIC HAZARD EXISTS. FAILURE TO HEED A WARNING MAY CAUSE SEVERE PERSONAL INJURY OR SUBSTANTIAL PROPERTY DAMAGE.



IDENTIFIES A CONDITION OR ACTION FOR WHICH A POTENTIAL HAZARD EXISTS. FAILURE TO HEED A CAUTION MAY CAUSE MINOR PERSONAL INJURY OR PROPERTY DAMAGE.

Notices

The following notice symbols are used to emphasize information that is considered important, requires special notice or includes helpful troubleshooting tips.

	IMPORTANT – indicates information where adherence to procedure is crucial or where your comprehension is necessary to apply a concept or effectively use the product.
	NOTE – provides additional helpful information. It may emphasize certain information regarding special tools or techniques, items to check before processing or factors to consider about a concept or task.
	TROUBLESHOOTING TIPS – Troubleshooting tips provide information that allow you to investigate the resolution of some type of problem, locate the difficulty, and make adjustments to solve the problem.

1.5 PET/CT System Description

The PET/CT system includes a fully integrated 3D Positron Emission Tomography and multi-slice Computed Tomography scanner with all available CT diagnostic applications, except hardware gantry tilt.

Due to the overall length of the PET/CT system, the patient table sits on a special base that drives the table between the PET and CT areas of the gantry.

On standard systems, the PET/CT table is rated for a patient weight of 227 kg (500 lb) and the cradle travels up to 1700 mm.

With the two-meter scan range option, the PET/CT table is rated for a patient weight of 181 kg (400 lb) and the cradle travels up to two meters.

Figure 1 Gantry and table of Omni Legend



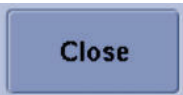

1.6 Manual Conventions

Table 1 Conventions for Mouse Actions

Mouse Action	Description
Click	Move the cursor into position and briefly press the left mouse button to activate a data field, select a soft key or toggle a radio button.
Right-click	Click the right mouse button. This function usually displays a menu.
Left-click	Click the left mouse button.
Middle-click	Click the middle mouse button.
Click and drag	Move the cursor into position, then press and hold the left mouse button, while moving the mouse. Release the button to select the item.
Right-click and drag	Press and hold the right mouse button while moving the mouse.
Middle-click and drag	Press and hold the middle mouse button while moving the mouse.

Conventions for Mouse Actions continued	
Mouse Action	Description
Triple-click	Rapidly click the left mouse button three times. This usually highlights, selects and initiates the function.
Click/highlight	Move the cursor into position, then click the left mouse button to highlight the item and select it.

Table 2 Conventions for Menus, Buttons, Data Fields and Keyboard Keys

Example	Description
Select	Move the cursor over a check box, radio button or tab and click-left to select it.
Press	Press a physical key on the keyboard or button on the gantry.
Ctrl +B	Press and hold the Ctrl key while pressing a keyboard key. In this example, the letter <i>B</i> .
Name in Brackets Close	The exact name as it appears on a soft key or GUI button. 
	An icon or GUI button without a name or label.
Scan Type: (Name in Italics)	A label next to a button or pull down menu or data field. Move the cursor into the data field and click to activate the field to receive typed characters.
<i>Italic Monotype</i>	The actual characters you should type into a data field.
Select Sort > Sort by > date	The same as saying, "Click on Sort to display the submenu, then click or drag to sort by date."

Read This First

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2 Safety

2.1 Safety Introduction

This chapter provides information about safety precautions and procedures. Keep this guide near the console for easy access.

Contact your GE sales representative for information about additional safety and operational training from a GE Applications Specialist.

United States Federal Regulation 21CFR 801.109

Rx Only Caution: Federal law restricts this device to sale by or on the order of a physician.

NOTE

Any serious incident that has occurred in relation to the device should be reported to the manufacturer and the competent authority of the Member State in which the user and /or patient is established.

2.2 Intended Use and Indications for Use

2.2.1 Intended Use

The Omni Legend system is intended for CT attenuation corrected (CTAC), anatomically localized PET imaging of the distribution of positron-emitting radiopharmaceuticals. It is intended to image the whole body, head, heart, brain, lung, breast, bone, the gastrointestinal and lymphatic systems, and other organs. The system is also intended for stand-alone, diagnostic CT imaging. 4.1
2.2

2.2.2 Intended Users

The Omni Legend system is intended to be used by qualified health care professionals.

Omni Legend users traditionally include nuclear medicine and radiology physicians, technologists, and physicists. The nuclear medicine and radiology physicians set the imaging conditions and interpret the obtained images. The technologists and physicists operate the system and ensure calibration for optimal imaging conditions.

Additional users are:

Field Service Engineers for maintenance of the system.

Researchers conducting research activities in compliance with local site and country requirements.

2.2.3 Indications for Use

The GE Omni Legend is a PET/CT system for producing attenuation corrected PET images. It is intended to be used for imaging the distribution and localization of any positron-emitting radiopharmaceutical

in a patient, for the assessment of metabolic (molecular) and physiologic function in patients, with a wide range of sizes and extent of disease, of all ages.

Omni Legend is intended to image the whole body, head, heart, brain, lung, breast, bone, the gastrointestinal and lymphatic systems, and other organs. The images produced by the system may be used by physicians to aid in radiotherapy treatment planning, therapy guidance and monitoring, and in interventional radiology procedures. The images may also be used for precise functional and anatomical mapping (localization, registration, and fusion).

When used with radiopharmaceuticals approved by the regulatory authority in the country of use, the raw and image data is an aid in; detection, localization, evaluation, diagnosis, staging, restaging, monitoring, and/or follow up, of abnormalities, lesions, tumors, inflammation, infection, organ function, disorders, and/or disease, such as, but not limited to, those in oncology, cardiology, and neurology. Examples of which are:

Cardiology:

- Cardiovascular disease
- Myocardial perfusion
- Myocardial viability
- Cardiac inflammation
- Coronary artery disease

Neurology:

- Epilepsy
- Dementia, such as Alzheimer's disease, Lewy body dementia, Parkinson's disease with dementia, and frontotemporal dementia
- Movement disorders, such as Parkinson's and Huntington's disease
- Tumors
- Inflammation
- Cerebrovascular disease such as acute stroke, chronic and acute ischemia
- Traumatic Brain Injury (TBI)

Oncology/Cancer:

- Non-Small Cell Lung Cancer
- Small Cell Lung Cancer
- Breast Cancer
- Prostate Cancer
- Hodgkins disease
- Non-Hodgkins lymphoma
- Colorectal Cancer
- Melanoma

Omni Legend is also intended for stand-alone, diagnostic CT imaging in accordance with the stand-alone CT system's cleared indications for use.

2.2.4 Intended Clinical Benefits and Outcome Parameters

The Omni Legend system is a medical tool that is intended to be used by qualified health care professionals for imaging the distribution and localization of any positron-emitting radiopharmaceutical in a patient, for the assessment of metabolic (molecular) and physiologic function in patients, with a wide range of sizes and extent of disease, of all ages.

The images produced by the system may be used by physicians to aid in radiotherapy treatment planning, therapy guidance and monitoring, and in interventional radiology procedures. The images may also be used for precise functional and anatomical mapping (localization, registration, and fusion).

When used with radiopharmaceuticals approved by the regulatory authority in the country of use, the raw and image data is an aid in; detection, localization, evaluation, diagnosis, staging, restaging, monitoring, and/or follow up, of abnormalities, lesions, tumors, inflammation, infection, organ function, disorders, and/or disease, such as, but not limited to, those in oncology, cardiology, and neurology.

2.2.5 Contraindications

There are no contraindications for using the Omni Legend system.

2.3 Authorized Users

This equipment incorporates a high degree of protection against X-Ray radiation outside the useful beam. But this equipment cannot substitute the essential requirement that every user must take adequate precautions to prevent the possibility of any person carelessly, unwisely, or unknowingly exposing themselves or others to radiation.

Everyone having anything to do with X-Ray equipment must receive proper training and become fully acquainted with the recommendations of the National Council on Radiation Protection and Measurements (NCRP) and the International Commission on Radiation Protection.

NCRP reports are available from:

NCRP Publications

7910 Woodmont Avenue

Room 1016

Bethesda, Maryland 20814-3095

All persons authorized to use the equipment must understand the dangers posed by X-Ray exposure so they can prevent any injury or damage that may result from such exposure. GE Medical Systems urges you to use protective materials and devices to prevent any injury or damage from X-Ray exposure.

2.4 Safety Notice Conventions: Warning Labels and Symbols

This chapter addresses three safety classifications:



THE MOST SEVERE LABEL DESCRIBES CONDITIONS OR ACTIONS WHICH RESULT IN A SPECIFIC HAZARD. YOU WILL CAUSE SEVERE OR FATAL PERSONAL INJURY, OR SUBSTANTIAL PROPERTY DAMAGE IF YOU IGNORE THESE INSTRUCTIONS.



THIS LABEL IDENTIFIES CONDITIONS OR ACTIONS WHICH RESULT IN A SPECIFIC HAZARD. YOU WILL CAUSE SEVERE PERSONAL INJURY, OR SUBSTANTIAL PROPERTY DAMAGE IF YOU IGNORE THESE INSTRUCTIONS.



THIS LABEL APPLIES TO CONDITIONS OR ACTIONS THAT HAVE POTENTIAL HAZARD. YOU MAY CAUSE MINOR INJURY OR PROPERTY DAMAGE IF YOU IGNORE THESE INSTRUCTIONS.

This chapter uses the international symbol or icon along with the danger, warning or caution message.

Table 3 IEC Standards

Symbol	IEC Standard
	Alternating Current
	On / Power
	Off / Power Off
	Input Power
	Output Power

















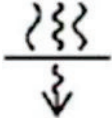



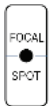

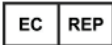
	Type B Equipment
	Protective Earthing Ground
	Functional Earth Ground
	Potential Equalization Conductor
	Warning, Caution - consult accompanying documents
	Electrical Shock Hazard

Table 4 Symbols used in Labeling

Symbol	IEC Standard
Made for	Indicates the Manufacturer (responsible design owner)
by (Made by)	Indicates the Manufacturing Location
	General Warning Sign (may be accompanied with text)
	Refer to instruction manual/booklet

Safety

	Pushing prohibited
	Stepping prohibited
	Manufacturer (responsible design owner)
	Model number
	Serial number
	Date of manufacture
	Prescription Use Only
	X-Ray filtration (Al Equivalent Filtration)
	Minimum filtration

	Radiation of Laser Apparatus
	Large Focal Spot
	Small Focal Spot
	Focal spot location indicator
	Hot surface warning
	Authorized representative in the European Community

The system uses the following caution labels:

Figure 2 Read User Manuals Caution Label — Accessory Panel



AVOID INJURY.

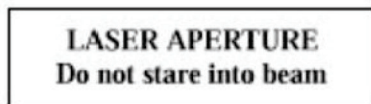
Read and understand information in manuals before operating product.

Figure 3 Laser Caution Label — Bottom of Gantry Cover



LASER RADIATION
DO NOT STARE INTO BEAM
CLASS 2 LASER PRODUCT

Figure 4 Laser Caution Label — Front of Gantry

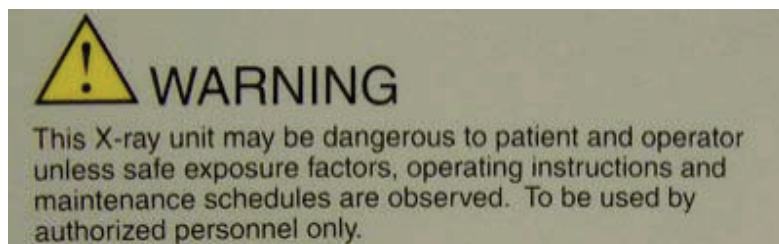


LASER APERTURE
DO NOT STARE INTO BEAM

Figure 5 Step Warning Label — Rear Gantry Cover



DO NOT STEP ON REAR GANTRY COVER

Figure 6 X-Ray Warning Label — Scan Control Interface

THIS X-RAY UNIT MAY BE DANGEROUS TO PATIENT AND OPERATOR
UNLESS SAFE EXPOSURE FACTORS, OPERATING INSTRUCTIONS AND
MAINTENANCE SCHEDULES ARE OBSERVED.

To be used by authorized personnel only.

Figure 7 Load Limit Caution Label — Table

AVOID INJURY.

Do not exceed table maximum capacity of 227 kg (500 lb).

Figure 8 Cradle Caution Label — Table



DO NOT GRASP THE SIDE OF THE CRADLE.

Figure 9 Pinch Caution Label — Table



FINGER PINCHING CAN CAUSE PHYSICAL INJURY.

To prevent pinching of fingers, keep fingers away from this area before operating the switch for cradle OUT.

Figure 10 Movement Caution Label — PDU



PDU CAN MOVE AND DAMAGE CABLES.

Do not lean on or move when connected to power.

Figure 11 Accessory Caution Label — IV Pole



DO NOT LOAD MORE THAN 4.5KG OR 10 POUNDS.

Verify that the extension collar is securely tightened before use.

Figure 12 Accessory Caution Label — Instrument Tray



DO NOT LOAD MORE THAN 9KG OR 20 POUNDS.

Figure 13 Accessory Caution Label — Coronal Head Holder



DO NOT HIT THE ACCESSORY AGAINST THE GANTRY.

Patient injury or equipment damage could result.

Figure 14 Accessory Caution Label — Head Holders and Table Extenders





ACCESSORY MAY FAIL AND CAUSE INJURY IF NOT LATCHED TO CRADLE.
Make sure that accessory is latched to underside of cradle.



EXCESSIVE WEIGHT CAN BREAK ACCESSORY AND CAUSE INJURY.
Do not load more than 34 kg or 75 pounds.

Figure 15 Accessory Caution Label — Long Extender



ACCESSORY MAY FALL AND CAUSE INJURY IF NOT LATCHED TO CRADLE.
Make sure that accessory is latched to cradle.



EXCESSIVE WEIGHT CAN BREAK ACCESSORY AND CAUSE INJURY.
Do not load more than 181.4 kg or 400 pounds.

2.5 General Safety Guidelines

- This product was designed and manufactured to ensure maximum safety of operation. It should be operated and maintained in strict compliance with the safety precautions, warnings and operating instructions contained herein, and in any other documentation specific to the product.
- The system has been designed to meet all the safety requirements applicable to medical equipment. However, anyone attempting to operate the system must be fully aware of potential safety hazards.
- The manufacturer or vendor of the equipment makes no representation, that the act of reading this manual renders the reader qualified to operate, test or calibrate the system.

- The owner should make certain that only properly trained, fully-qualified personnel are authorized to operate the equipment. A list of authorized operators should be maintained.



INFORMATION ON INTERNAL GANTRY COMPONENTS IS PROVIDED FOR USER EDUCATION. THE GANTRY CONTAINS DANGEROUS VOLTAGES AND MOVING PARTS. TO PREVENT ELECTRICAL SHOCK OR CRUSHING INJURIES, DO NOT REMOVE COVERS OR ENTER THE GANTRY. ONLY TRAINED, QUALIFIED SERVICE PERSONNEL MAY REMOVE GANTRY OR OTHER EQUIPMENT COVERS.

- Only qualified service personnel should service the system when covers are off.



THE AUTHORIZED OPERATOR SHOULD ENSURE TO AVOID SPILLAGE OF IV CONTRAST ON THE GANTRY WHILE CONNECTING AND DISCONNECTING IV LINES TO THE PATIENTS. ANY SPILLAGE SHOULD BE IMMEDIATELY CLEANED TO AVOID DAMAGE OF EQUIPMENT.

- Use only GE-approved equipment with this system.
- Do not load any non GE-approved software onto the computer.
- Watch for the electromagnetic compatibility from other hardware.



THIS SYSTEM IS INTENDED FOR USE BY HEALTHCARE PROFESSIONALS ONLY. THIS SYSTEM MAY CAUSE RADIO INTERFERENCE OR MAY DISRUPT THE OPERATION OF NEARBY EQUIPMENT. IT MAY BE NECESSARY TO TAKE MITIGATING MEASURES, SUCH AS REORIENTING OR RELOCATING THE SYSTEM OR SHIELDING THE LOCATION.

2.6 Reporting of Serious Incidents

Any serious incident related to the use of this GE Healthcare device, should be reported to both the manufacturer and the health authority/competent authority where the device is installed.

To report to GE Healthcare, either contact your local service representative or report to In-box.complaints@gehealthcare.com Please provide the following information:

- The catalog number or the model designation of the device as stated on its identification plate affixed on the device
- The System ID / Serial Number / Lot Number of the device

- Date of incident
- Description of incident, including any patient or user impact/injury
- Your contact information (facility, address, contact name, title, and telephone number)

2.7 Radiation Safety



IMPROPERLY USED X-RAY EQUIPMENT MAY CAUSE INJURY. READ AND UNDERSTAND THE INSTRUCTIONS IN THIS BOOK BEFORE YOU ATTEMPT TO OPERATE THIS EQUIPMENT. IF YOU FAIL TO FOLLOW SAFE X-RAY PRACTICES OR IGNORE THE ADVICE PRESENTED IN THE MANUAL, YOU AND YOUR PATIENT RISK EXPOSURE TO HAZARDOUS RADIATION.

Phantom Safety

The PET Annulus Phantom is an external phantom accessory, produced by a source vendor, used for PET calibrations and daily quality checks. The decay half-life for the Germanium 68 isotope (Ge-68) used is approximately nine months. The PET Annulus Phantom should be replaced every 24 months. Regularly check for cracks and damage to the PET Annulus Phantom before use.

Figure 16 Caution Label — PET Annulus Phantom



RADIOACTIVE
MATERIAL



THE PET ANNULUS PHANTOM IS A POSITRON EMITTER WHICH PROVIDES A SOURCE OF IONIZING GAMMA-RAY RADIATION AT 511 KEV ENERGY. EXCHANGING OR HANDLING OF THE SOURCE IN ANY MANNER SHOULD BE PERFORMED ONLY BY QUALIFIED PROFESSIONALS.

It is recommended to hold the phantom by the handle and not by the sides.

Use sources traceable to the National Institute of Standards & Testing (NIST) or your Regional Metrology Organization to calibrate the dose calibrator. Having traceable sources on the dose calibrator assures the validity of patient dose quantities and quantitative image calibrations.

2.8 Electrical Safety



NO USER SERVICEABLE PARTS. Refer service to qualified service personnel. Only allow people who know the proper procedures, and use of the proper tools, to install, adjust, repair, or modify the equipment. To guarantee safe, reliable equipment performance, prepare the site according to GE Medical Systems requirements. If you have any questions about these requirements, contact GE Medical Systems. Fuses blown within 36 hours of being replaced may indicate malfunctioning electrical circuits within the system. Have the system checked by qualified service personnel, and do not attempt to replace any fuse.



PORTABLE RF COMMUNICATIONS EQUIPMENT (INCLUDING PERIPHERALS SUCH AS ANTENNA CABLES AND EXTERNAL ANTENNAS) AT FREQUENCIES NOTED BELOW SHOULD BE USED NO CLOSER THAN 30CM (12 INCHES) TO ANY PART OF THE SYSTEM, INCLUDING CABLES SPECIFIED BY THE MANUFACTURER. OTHERWISE, DEGRADATION OF THE PERFORMANCE OF THIS EQUIPMENT COULD RESULT



USE OF ACCESSORIES, TRANSDUCERS, AND CABLES OTHER THAN THOSE SPECIFIED MAY RESULT IN INCREASED EMISSIONS OR DECREASED IMMUNITY PERFORMANCE OF THE SYSTEM AND RESULT IN IMPROPER OPERATION

2.9 Mechanical Safety

- The Cradle Unlatch Indicator illuminates when the cradle unlocks. An unlocked cradle could move unexpectedly.

- The Interference Light turns on when the cradle reaches a travel limit or encounters an interference. If you press the controls until the table reaches one of the limits, the limit light turns off when you release the controls.

Clear an interference by moving the cradle, or raising the table.



DO NOT USE THE TABLE BASE AS A FOOT REST. YOU COULD ENTRAP AND INJURE YOUR FOOT WHILE LOWERING THE TABLE. DO NOT PLACE YOUR HANDS BETWEEN THE TABLE BASE AND THE TABLE SIDE PANELS.



TO PREVENT PINCHING OR CRUSHING OF THE PATIENT'S EXTREMITIES, KEEP THE PATIENT'S HANDS AND FEET AWAY FROM THE EDGE OF THE MOVING TABLE TOP/CRADLE AND ITS SURROUNDING EQUIPMENT, OR BETWEEN TABLE BASE AND SIDE PANELS OF THE TABLE.

Take special care when positioning physically large patients.

Table capacity: Up to 500 lb (227 kg) with ± 0.25 mm positional accuracy guaranteed.



WHEN USING PATIENT POSITIONING ACCESSORIES, MAKE SURE THERE ARE NO AREAS, WHICH MIGHT CAUSE A PINCH POINT OR INTERFERE WITH PATIENT TUBING OR IV.



WHEN USING ACCESSORIES, MAKE SURE ALL ACCESSORIES ARE PET/CT IMAGING ACCESSORIES. DO NOT USE ACCESSORIES FROM OTHER MODALITIES.



7.5

THE PATIENT POSITIONING STRAPS PROVIDED WITH THE SYSTEM DO NOT SUPPORT THE FULL WEIGHT OF THE PATIENT. THE PATIENT POSITIONING STRAPS SHOULD BE USED TO RESTRAIN THE PATIENT TO THE CRADLE AND LIMIT THE PATIENT MOVEMENT DURING SCAN.

2.10 Laser Safety

The PET/CT system uses a laser alignment light to accurately define the patient scan region.



THE LASER BEAM CAN CAUSE EYE INJURY.

Tell patients to close their eyes before you switch ON the alignment lights. Instruct your patients to keep their eyes closed until you turn OFF the alignment lights.

NOTE

Closely monitor infants and infirm patients to prevent them from accidentally staring into the beam.

Maintenance

- Laser alignment lights do not require user maintenance.
- Qualified service personnel must inspect the lights periodically to assure proper alignment.



LASER RADIATION
DO NOT STARE INTO BEAM
CLASS 2 LASER PRODUCT



LASER RADIATION - DO NOT VIEW DIRECTLY WITH OPTICAL INSTRUMENTS.
DO NOT EXPOSE USERS OF TELESCOPIC OPTICS. CLASS 2 LASER
PRODUCT. MAX POWER: 1MW, WAVELENGTH: 635NM, IEC 60825-1:2014

2.11 Data Safety

To ensure data safety:

- Verify and record the patient's identification before starting a scan.
- Observe and record the patient's orientation, position and anatomical landmarks before starting a scan. Ensure that the patient is positioned within the scan parameters.
- Maintain system image quality by performing daily quality assurance and other maintenance.
- **Connectivity:** Always verify that data transferred to another system was correctly received.
- If the Display Monitor is HP EliteDisplay E190i, verify that the Monitor is configured to **DICOM** protocol:
 1. Select the Main menu on the monitor
 2. Choose **Color**
 3. Choose **DICOM**
 4. Select **Save and Return**



WHEN USING A DISPLAY MONITOR OF TYPE HP ELITEDISPLAY E190I, DISPLAYED IMAGE QUALITY MAY BE AFFECTED IF DISPLAY MONITOR IS NOT CONFIGURED TO “DICOM” PROTOCOL



THE SYSTEM POSTS A WARNING MESSAGE WHEN EXPECTED DISK SPACE REQUIRED TO STORE SCAN DATA FROM THE PRESCRIBED EXAM IS INSUFFICIENT. DELETE PET RAW OR PET LIST DATA FROM THE DATABASE TO FREE UP SCAN SPACE.



THE SYSTEM POSTS A WARNING MESSAGE WHEN EXPECTED IMAGE SPACE REQUIRED TO STORE IMAGES FROM PRESCRIBED RECONSTRUCTION IS INSUFFICIENT. DELETE IMAGES FROM THE DATABASE TO FREE UP IMAGE SPACE.



THE SYSTEM POSTS A WARNING MESSAGE WHEN THE SYSTEM HAS LOW DISK SPACE. THIS IS DUE TO A PARTITION ON THE SYSTEM DISK GETTING TOO FULL. REMOVING IMAGES WILL NOT HELP. CONTACT SERVICE TO HELP WITH RECOVERY. IF YOU REBOOT THE SYSTEM AND SEE THE MESSAGE ASKING IF YOU WANT TO RUN STORELOG, SELECT THE OPTION TO REMOVE THE LOGS.

**WARNING**

THE SYSTEM POSTS A WARNING MESSAGE WHEN THE TABLE ELEVATION CHANGES BETWEEN A CT SCAN AND ITS SUBSEQUENT PET SCAN, WHICH WOULD VOID THE ASSOCIATION AND INDICATE THE CURRENT TABLE HEIGHT IS INVALID. MOVE THE TABLE HEIGHT BACK TO THE HEIGHT OF THE CT SCAN BEFORE PROCEEDING WITH THE SCAN.

**WARNING**

THE SYSTEM POSTS A WARNING MESSAGE WHEN DATA WAS INTERPOLATED TO GENERATE IMAGES. NO SPECIFIC ACTION BY THE USER IS REQUIRED.

**WARNING**

THE SYSTEM POSTS A WARNING MESSAGE PRIOR TO THE MODIFICATION OF ANY EXISTING DATA SET BY A SOFTWARE UTILITY. NO SPECIFIC ACTION BY THE USER IS REQUIRED.

**WARNING**

THE SYSTEM POSTS A WARNING MESSAGE WHEN THE USER SELECTS "END EXAM" AFTER COMPLETING A PET SCAN WITHOUT AN ASSOCIATED CT SCAN THAT CAN BE USED FOR ATTENUATION CORRECTION. NO SPECIFIC ACTION FROM THE USER IS REQUIRED.

**WARNING**

THE SYSTEM POSTS A WARNING MESSAGE IF THERE IS A FAILURE DURING THE ARCHIVE OF PATIENT DATA. CHECK THAT THE ARCHIVE DEVICE IS CORRECTLY CONFIGURED AND ONLINE.

**WARNING**

THE SYSTEM POSTS A WARNING MESSAGE WHEN A NETWORK TRANSFER FAILS TO COMPLETE SUCCESSFULLY. CHECK THAT THE REMOTE DEVICE IS CORRECTLY CONFIGURED AND ONLINE.



THE SYSTEM POSTS A WARNING MESSAGE WHEN A SCAN IS ABORTED DUE TO A FAILURE IN THE ACQUISITION CHAIN. CONTACT SERVICE.



THE SYSTEM POSTS A WARNING MESSAGE WHEN THE LANDMARK CHANGES BETWEEN IMAGE SERIES IN A SINGLE EXAM. DOUBLE CHECK ALL SCAN LOCATIONS BEFORE STARTING A SCAN.



WHEN ENTERING PATIENT ID INFORMATION THE SYSTEM MAY CONTAIN MULTIPLE INSTANCES OF THE SAME PATIENT ID. MULTIPLE SCHEDULE RECORDS CAN BE DUE TO MULTIPLE PROCEDURES BEING ORDERED UNDER SEPARATE ACCESSION NUMBERS OR NEW AND COMPLETED RECORDS IN THE PATIENT SCHEDULE FOR THE SAME PATIENT ID. WHEN ENTERING THE PATIENT ID, VERIFY THAT THE CORRECT ACCESSION NUMBER AND EXAM DESCRIPTION IS SELECTED. SCANNING WITH AN INCORRECT ACCESSION NUMBER MAY CAUSE PROBLEMS RECONCILING EXAMS ON A PACS SYSTEM. PLEASE SEE THE SCHEDULING PATIENTS CHAPTER FOR MORE INFORMATION.

2.12 Auto Positioning Safety



DURING TABLE MOTION TO THE START POSITION, MAKE SURE TO KEEP OBSERVING THE PATIENT FOR POTENTIAL COLLISION OF THE PATIENT BODY WITH THE PET-CT GANTRY DUE TO PATIENT MOTION OR DAMAGE TO DEVICES CONNECTED TO THE PATIENT LIKE INTRAVENOUS INJECTORS, ANASTHESIA MACHINES OR ECG GATING DEVICES.

In case of emergency, press the **Pause** button on the gantry display or any of the motion buttons on the control panel or emergency button to stop the Auto Positioning motion immediately.



THE ACCURACY OF THE SCOUT SCAN RANGE DETERMINED BY THE AUTO POSITIONING OPTION IS AFFECTED BY THE SHEETS/BLANKETS COVERING THE PATIENT BODY, BLOCKAGE OF THE DEPTH CAMERA VIEW BY PEOPLE/ DEVICES AROUND AND /OR ABOVE THE PATIENT TABLE, LIGHTING CONDITIONS AND EXISTENCE OF HIGHLY REFLECTIVE SURFACES. MAKE SURE TO CHECK THE VALIDITY OF THE SCAN RANGE ON THE PATIENT VIDEO SHOWN ON THE GANTRY DISPLAY, AND ADJUST IT MANUALLY ON THE VIDEO WHEN NECESSARY, BEFORE STARTING THE AUTOMATIC TABLE MOTION.



AUTO POSITION OPTION IS NOT APPLICABLE FOR USE WITH FLAT-TABLE TOP. THIS MAY CAUSE TABLE COLLISION WITH GANTRY AND RESULT IN PATIENT INJURY AND PROPERTY DAMAGE

Algorithm-specific safety:

- Prior to starting the scan, be sure to confirm accuracy of the scan range on the screen. User should adjust start-end location as needed. The accuracy of range can be affected by lighting conditions, and patient positioning in relation to the Xstream camera.
- During table movement, it is important to continuously observe patient to avoid collisions, pulled tubing, and maintain patient safety.

2.13 Remote Auto Positioning Safety



KEEP OBSERVING THE PATIENT DURING AUTO TABLE MOVING FROM THE CAMERA MONITORING SYSTEM TO AVOID POTENTIAL COLLISION OF THE PATIENT BODY WITH THE CT GANTRY OR DAMAGES TO DEVICES CONNECTED TO THE PATIENT.



REMOTE AUTO POSITIONING IN THE OPERATION ROOM MUST BE OPERATED TOGETHER WITH ASSISTED VIDEO MONITORING SYSTEM TO ENSURE PATIENT SAFETY.



PLEASE ENSURE THAT THE ASSISTED VIDEO MONITORING SYSTEM WORKS NORMALLY WHEN USING REMOTE AUTO POSITIONING IN THE OPERATION ROOM. REMOTE AUTO POSITIONING IN THE OPERATION ROOM SHOULD NOT BE USED IF THE ASSISTED VIDEO MONITORING SYSTEM IS NOT OPERATIONAL. CONTACT YOUR GE SERVICE REPRESENTATIVE IN CASE ANY SERVICING IS NEEDED.



AUTO POSITION OPTION IS NOT APPLICABLE FOR USE WITH FLAT-TABLE TOP. THIS MAY CAUSE TABLE COLLISION WITH GANTRY AND RESULT IN PATIENT INJURY AND PROPERTY DAMAGE

2.14 Cardiac Imaging Safety



ECG SIGNAL CLARITY AND INTEGRITY MUST BE CONFIRMED PRIOR TO PERFORMING ECG-GATED ACQUISITIONS. ITEMS WHICH MAY REQUIRE ADJUSTMENT OF EQUIPMENT SETTINGS OR POSITIONING, OR PATIENT SETUP INCLUDE:

- ***External Interference***
- ***Atypical Patient ECG (for example: elevated T-Waves, low ECG amplitude or signal strength)***
- ***Suboptimal Patient Connection ECG lead placement should follow recommended guidelines to optimize results.***

If the ECG lead is disconnected during the scan, or the heart rate drops below 30 BPM, the images will be reconstructed as non-gated segment images. This is done to avoid inaccuracy of the z-location of images where necessary.



ENSURE THE ECG PATCHES ARE NOT PAST EXPIRATION DATE AND THAT THE GEL ON THE PADS IS STILL MOIST FOR PROPER CONDUCTION OF THE ECG SIGNAL FOR SUCCESSFUL GATING.



THERE IS A POSSIBILITY THAT THE ECG SIGNAL MAY NOT BE DETECTED BY THE SCANNER DUE TO IMPROPER LEAD PLACEMENTS, OR A LEAD FALLING OFF DURING THE SCAN. IT IS IMPORTANT TO PLACE NEW LEADS ON THE PATIENT BEFORE THE SCAN. MAKE SURE THE LEADS ARE ATTACHED PROPERLY, AND USE ONLY GE RECOMMENDED ECG LEADS.



THE 3D CARDIAC FILTER SHOULD ONLY BE USED IN PET IMAGING WHEN RECONSTRUCTION FILTERS HAVE BEEN TURNED OFF. USING BOTH FILTERS COULD LEAD TO UNINTENDED ADDITIONAL SMOOTHING, RESULTING IN IMAGES WHICH DO NOT MATCH WITH STANDARD NORMS FOR QUANTITATIVE OR DIAGNOSTIC EVALUATION.

2.15 Respiratory Gating Safety



WHEN USING THE VARIAN RESPIRATORY GATING CAMERA, FOLLOW MANUFACTURER'S INSTRUCTIONS FOR INSTALLING THE CAMERA. CONTACT YOUR SERVICE PROVIDER IF ANY HARDWARE IS LOOSE OR MISSING.



MAKE SURE RESPIRATORY GATING CAMERA ASSEMBLY IS PROPERLY MOUNTED AND SECURE ON THE TABLE PRIOR TO EACH USE.



THE RESPIRATORY GATING CAMERA HANDLE IS NOT INTENDED FOR MANUAL EXTRACTION OF THE PATIENT FROM THE GANTRY BORE.

2.16 Accuracy of Measurements

2.16.1 Measure Distance for Axial, Helical, and Cine Images

The straight line distance graphic measure error is less than two times the image pixel size.

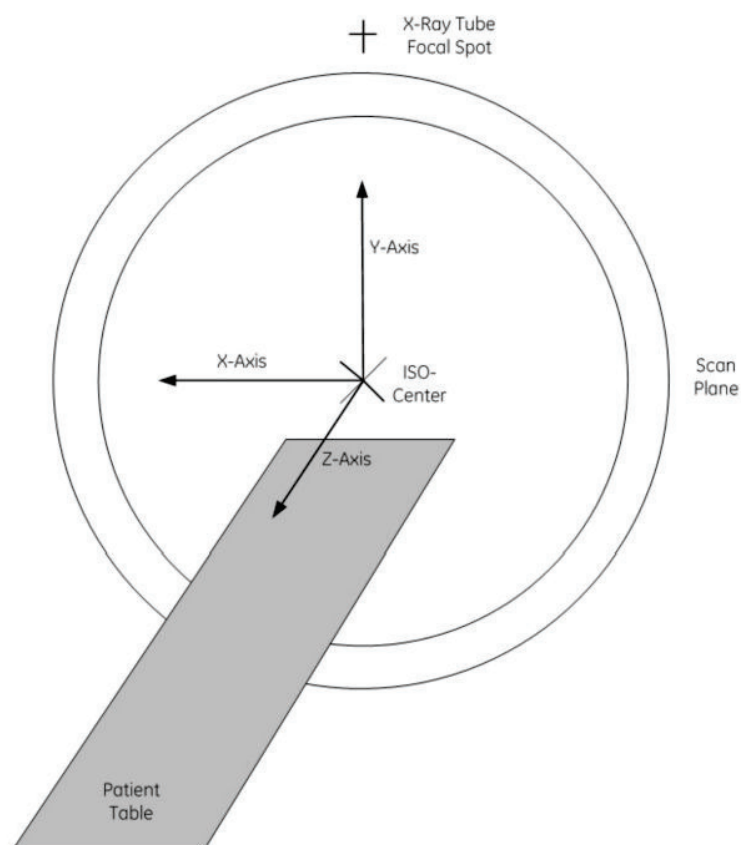


Note that the measurements are accurate only if the trace segments are longer than the slice interval.

2.16.2 Measure Distance for Scout Images

Accuracy of measurements for scout images in the X-direction vary with object thickness and distance from ISO center in the Y-direction. Note that X-axis and Y-axis orientations in the illustration below assume a scout scan plane of 0 degrees. If the scout plane is rotated, X-axis and Y-axis orientations will change accordingly.

Figure 17 Scout Scan Plane



- For measurements of anatomy in the X-direction that are at ISO center (Y):
The straight line distance graphic measure error is less than 5% of the measured distance plus 2 mm.

- For measurements of anatomy in the X-direction that are NOT at ISO center (Y):
The straight line distance graphic measure error is less than 5% of the measured distance plus 2 mm plus 3% of the measured distance per centimeter from ISO center.
- For measurements of anatomy in the Z-direction:
The straight line distance graphic measure error is less than two times the image pixel size.

2.16.3 Measure Angle

Measurement accuracy using the angle graphic is equal to the displayed angle value ± 10 degrees for an angle measured between segments which are five times larger than the image pixel size. Accuracy improves as the length of the segments increase.

2.16.4 ROI

Area measurement accuracy using a region of interest graphic (rectangle, smooth curve, ellipse or free draw) is equal to the displayed area \pm the circumference of the region multiplied by 2/2 (image pixel size). Mean and standard deviation values for the intensity of the pixels in the region are also affected by this accuracy. If the region of interest is rotated, the area measurement can vary up to 5%. Region of interest statistics are based on the pixels inside the graphic defining the region.

2.16.5 Reformat Plane Thickness

Reformat plane thickness equals one pixel.

- If each axial pixel represents 0.5 mm of anatomy, the reformat plane thickness equals 0.5 mm.
- If pixel size equals 0.9766 mm (500 mm / 512), the reformat plane represents a slice of anatomy about one millimeter thick.



BECAUSE OF INHERENT VARIABILITIES IN SUV NUMBERS, SUV IS NEVER THE MOST SIGNIFICANT FACTOR IN THE PET/CT IMAGE INTERPRETATION PROCESS. IT COULD SUPPORT THE VISUAL IMAGE INTERPRETATION IN PET/CT BUT DOES NOT OVERRIDE THE VISUAL READ.

2.17 Operator Console Ergonomics

To optimally use your PET/CT system and reduce the chance of physical strain and fatigue, follow these suggestions while using the operator console.

2.17.1 Posture

Correct posture is very important. To ensure correct posture while sitting at the operator console, follow these basic steps:

1. Face the monitors and keyboard without twisting your body.
2. Sit comfortably erect with the small of your back well supported.
3. Position your forearms parallel to the floor with your wrists straight.
4. Position the screen so your eyes are nearly level with the top of it.
5. Keep both feet flat on the footrest with your thighs parallel to the floor.

If you can not comfortably maintain this posture, make the necessary adjustments to your operator console environment.

2.17.2 Equipment Adjustments

2.17.2.1 Chair

Follow these basic guidelines to adjust the fit and height of your chair for comfort:

- Fit the backrest snugly against your back. Use a back cushion if you have shorter legs.
- Set your chair height so your forearms are parallel with the floor when your hands are on the keyboard. If your feet dangle, you need a footrest.

2.17.2.2 Keyboard

Keyboard height is also important. When typing:

- Your wrists should be as straight as possible.
- Your forearms should be parallel to the floor.
- Your hands and fingers should float over the keys or mouse.

2.17.2.3 Screen

- The recommended viewing distance from the screen is 18-28 inches (45 - 70 cm).
- With your head straight, your eyes should be looking directly at the top of the screen.
- You should look at the screen straight on, not at an angle from the side, top or bottom.
- Glare from the screen can disrupt viewing and cause eyestrain. Do not face a window, and position the screen at right angles to bright light sources.

2.17.2.4 Comfort

Comfort at the operator console indicates that your work area is setup correctly. However, even a well designed area needs frequent adjustment, especially for different users. Take time when positioning yourself to ensure comfort.

If you use the operator console for extended periods (several hours at a time), take short breaks away from the console and perform simple stretching exercises to reduce the chance of fatigue.

2.18 Accessories

IMPORTANT

Use only GE approved equipment with this system.

NOTE

Refer to the CT User Manual (CT UM) shipped with your system for CT-specific approved equipment.

Table 5 GE-Approved Equipment

Type	Manufacturer/Model
Cardiac Trigger Monitor	IVY 7800
Respiratory Monitor	Varian RPM 1.7
	Varian RGSC 1.1
Bar Code Reader	Honeywell 1300g
Partial UPS	Powerware 9355-15-14GE
USB Hard Drive	Seagate FreeAgent 1.0TBUSB 2.0
	Seagate FreeAgent 2.0TBUSB 2.0/3.0
	Apricorn Aegis Padlock Fortress 2.0TB Encrypted
USB Flash Drive	Samsung 64G(GE 8770000-200)
Flat Table Top	DIACOR Flat Table Top (E6315JE, E63151JE)
Injector	Nemoto Kyorindo
	Medrad



CONNECTING ELECTRICAL EQUIPMENT TO THE ACCESSORY PANEL EFFECTIVELY CREATES A MEDICAL ELECTRICAL SYSTEM, AND CONNECTING NON-APPROVED ELECTRICAL EQUIPMENT CAN RESULT IN A REDUCED LEVEL OF SAFETY.



ACCESSING USB PORT WITH UNAPPROVED DEVICES IS NOT ALLOWED BY THE SYSTEM AND MAY CAUSE A SYSTEM HANG. PLEASE FOLLOW GE-APPROVED EQUIPMENT LISTED ABOVE TO AVOID ISSUES WITH THE SYSTEM.



WITH EACH USE, CHECK ALL ACCESSORIES FOR DAMAGE AND REMOVE THEM FROM USE IF DAMAGED OR CRACKED.



AUTO POSITION OPTION IS NOT APPLICABLE FOR USE WITH FLAT-TABLE TOP. THIS MAY CAUSE TABLE COLLISION WITH GANTRY AND RESULT IN PATIENT INJURY AND PROPERTY DAMAGE

2.18.1 IV Pole Safety

Tighten the pole prior to use, and do not to hang excess weight on it.



THE IV POLE MAY BEND WHEN EXCESS WEIGHT IS PLACED UPON IT. ENSURE NO MORE THAN 4.5 KG OR 10 LB IS PLACED ON THE IV POLE.



TIGHTEN THE IV POLE EXTENSION COLLAR BEFORE USE TO PREVENT AN ACCIDENTAL CHANGE IN HEIGHT DURING USE.

2.18.2 Table Tray Safety

Care should be taken to limit the amount of weight and the objects placed on the tray.



THE MAXIMUM ALLOWABLE WEIGHT ON THE TABLE TRAY IS 9 KG OR 19.8 LB.



STRAP DOWN OBJECTS THAT MAY TIP OVER WITH THE PROVIDED VELCRO STRAP.

2.18.3 Gantry Strap Safety



GANTRY STRAP SHOULD ONLY BE USED FOR CARDIAC MONITOR, SMARTVIEW/SMARTSTEP CABLES. PLACING INJECTOR LINES THROUGH THE GANTRY STRAP COULD CAUSE INTERFERENCE ISSUE AND PATIENT HARM.



GANTRY STRAPS ARE DESIGNED TO HOLD CABLES FOR ACCESSORIES. DO NOT USE FOR LIFTING OR SUPPORT.



ENSURE THAT ALL CABLES ATTACHED TO GANTRY OR HUNG IN GANTRY STRAP DO NOT PRESENT A TRIP HAZARD OR LOOP WHICH COULD BE CAUGHT WHEN MOVING PAST THE CABLES.

2.18.4 Systems With Metal-Free Cradles and Accessories



7.5

THE HEAD HOLDER MAY CRACK, POSSIBLY INJURING THE PATIENT'S HEAD OR NECK, IF THE PATIENT TRIES TO BRACE HIMSELF OR HERSELF ON THE HEAD HOLDER DURING POSITIONING. THE HEAD HOLDER AND CRADLE EXTENDER ARE ONLY DESIGNED TO SUPPORT 75 POUNDS (34 KG). ASK THE PATIENT TO MOVE UP INTO THE HEAD HOLDER OR MANUALLY HELP THE PATIENT INTO POSITION.



PREVENT DAMAGE TO METAL-FREE ACCESSORIES. CAREFULLY EXAMINE THE METAL-FREE CLASP ASSEMBLY ON THE ACCESSORY AND THE CATCH ON THE CRADLE BEFORE ATTEMPTING TO ATTACH THE ACCESSORY FOR THE FIRST TIME.



EXCESSIVE WEIGHT CAN BREAK AN ACCESSORY AND CAUSE INJURY. DO NOT LOAD MORE THAN 181.4 KG OR 400 POUNDS .

To latch an accessory:

- Align the accessory tongue with the pocket at the end of the cradle.
- Keep fingers clear of the cradle.
- Push the tongue all the way into the pocket until it latches into place.
- Rubber shims may have been installed on the head holder or foot extender for a tighter fit. Push the latch forward until you hear a click. Verify that the latch is fully latched.

To unlatch an accessory:

- Pinch the two L-shaped parts together and pull it out of the cradle.
- An alternate method is to apply a light force to the catch in the direction to pull it out of the cradle.

Proper operation

- Keep the accessory tongue and cradle pocket clean and free of fluids and debris.
- Keep the latch and cradle pocket area clear of sheets, drapes, pads or any item that could interfere with proper latching and cause damage.

Positioning

Positioning patient anatomy over the area where the head holder or cradle extension attaches to the cradle may produce images where the contrast between two adjacent rotations is different. Make sure the area of interest, especially the head, is properly positioned in the head holder or on the cradle extension.

2.19 Maintenance, Cleaning and Disinfection

- To guarantee safe, reliable equipment performance, the site must be prepared according to GE Healthcare requirements, as specified in the Pre-Installation Manual.

- There are no user serviceable parts in this system. The product should be installed, maintained, and serviced by qualified service personnel according to procedures laid down in the product service manuals.
- The system in whole or in part should not be modified in any way without prior written approval by GE Healthcare.
- Planned maintenance must be carried out regularly to ensure safe operation of the equipment.
- For user maintenance of the system and performance tests, refer to the maintenance and calibration chapters in the Technical Reference Manual.

2.19.1 Environmental Concerns



This symbol indicates that the waste of electrical and electronic equipment must not be disposed of as unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer for information concerning the decommissioning of your equipment.

2.19.2 General Cleaning and Disinfection

General Cleaning Background: cleaning should be done by site personnel (e.g., technologists or housekeeping personnel) unless otherwise indicated in the following maintenance schedules.

Keep the equipment clean. Remove body fluids and/or contrast spills to prevent health risk and damage to internal parts. Thorough cleaning, including prompt removal of soil, is essential for adequate processing and will reduce the risk of infection for patients.

Ensure system components or accessories are not worn out, cracked, or torn to ensure proper cleaning and disinfection. Replace worn out components or accessories immediately.

Item	Required Maintenance	Service Interval
General	Clean	As required
Patient Cradle	Clean pads and inside of the cradle.	Between each patient
Pads, Straps, Patient Accessories 7.5	Clean all areas that were touched by the patient. Clean other areas as needed	Between each patient
Head Holder Insert	Inspect for bodily fluids, dispose and replace if saturated	Between each patient

2.19.3 Cleaning and Disinfection Agents

Do not clean connectors on the cables for ECG, respiratory equipment, etc. If you need to clean these components, contact GE Service.

Use dry use cleaning for electronic components.

The following cleaners and disinfectants have been evaluated based on their chemical compatibility with the device materials. The cleaners and disinfectants listed here may not be available in all countries. Follow hospital procedures for infection control in compliance with local regulations.

Keep the equipment clean. Remove body fluids and/or contrast spills to prevent health risk and damage to internal parts. See 5881700-1xx for detailed Cleaning and Disinfection Instructions for Use. Follow cleaning/disinfection agent manufacturer instructions for disinfection contact time.

Inspect to ensure visual cleanliness prior to disinfection. Cleaning is the removal of visible soil (for example, organic and inorganic material) from objects and surfaces and normally is accomplished manually or mechanically using water with detergents or enzymatic products. Thorough cleaning is essential before disinfection because inorganic and organic materials that remain on the surfaces of instruments interfere with the effectiveness of these processes.

Disinfection should follow recommendations for low- to intermediate-level disinfection as defined in CDC guidance www.cdc.gov/hicpac/pdf/guidelines/disinfection_nov_2008.pdf. The system surfaces are noncritical surfaces and are disinfected with low- to intermediate-level disinfectants. Ensure the appropriate contact time as defined by the disinfectant manufacturer.

In situations that arise requiring a sterile field, ie interventional procedures, alternative means/ barriers should be used. The system is rated for Intermediate-Level disinfection, in cases of non-intact skin, ie open wound, a barrier should be applied. Additionally, upon inspection of the head holder insert, if saturated in bodily fluids please dispose and replace.

Apply cleaning/disinfection solutions to a lint-free cloth or use a wipe. Spraying directly onto the system can damage parts like the tilt centers and control panels.

The following cleaning and disinfection agents in the list below are approved for use on the product by GE Healthcare and are USA EPA registered disinfectants agents:

- Sani-Cloth® Bleach Wipes*
- Sani-Cloth® Prime*
- Sani-Cloth® HB
- Clorox Healthcare™ Bleach Germicidal Cleaner Spray*
- Clorox Healthcare™ Bleach Germicidal Wipes*
- Clorox Healthcare™ Hydrogen Peroxide Cleaner Disinfectant Wipes*
- Clorox Multi Surface Cleaner + Bleach*
- Micro-kill Bleach Solution*
- Micro-kill Bleach Germicidal Bleach Wipes*

*denotes effectivity claims made by governing bodies or manufacturers for Covid-19.

The following cleaning and disinfection agents are approved for use on the product by GE Healthcare but are not on the USA EPA list ***which may be used for facilities outside of the United States..***

- 10% Bleach Solution (Common household bleach, diluted 1:10-mix 1 part bleach with 9 parts tap water, disinfection wet time of 5 minutes)
- Distel
- Incidin Plus
- Perasafe

Follow the labeled instructions of the cleaning agent manufacturer and observe the dilution/concentration and contact time instructions. Use tap (utility) water for dilution.

Always clean and disinfect the equipment between each patient.

NOTE

As preferred cleaning and disinfection practices change and new products become available, GE Healthcare continues to test the material compatibility of these agents for GE devices. See <https://cleaning.gehealthcare.com/?cmpid=covid-quick-links> for any newly qualified agent.



WHEN USING ANY OPEN CELL FOAM (SPONGES WITHOUT COATING), ALWAYS PLACE A BARRIER BETWEEN THE PATIENT'S SKIN AND THE SPONGE. IF SPONGES ARE SOILED, DISCARD THEM AS THEY CANNOT BE CLEANED OR DISINFECTED.

2.20 Regulatory Information

2.20.1 Applicable Regulations and Standards

This product complies with the requirements of the following regulations and standards:

- Code of Federal Regulations, Title 21, Part 820 Quality System Regulation
- Code of Federal Regulations, Title 21, Sub chapter J Radiological Health

Federal U.S. law restricts this device for sale by or on the order of a physician.

GE Healthcare is ISO 13485 certified.

- Applicable standards of the Canadian Standards Association (CSA)
- Applicable standards of the American National Standards Institute (ANSI) / Association for the Advancement of Medical Instrumentation (AAMI)
- Applicable standards of the International Electrotechnical Commission (IEC)

The Omni Legend PET/CT scanners comply with the following applicable main standards of the International Electrotechnical Commission (IEC):

- IEC 60601-1:2005+ A2:2020 (Ed. 3.2)
- ANSI/AAMI ES60601-1:2005 / A2:2021
- CAN/CSA C22.2 No.60601-1:2014 / A2:2022
- IEC 60601-1-2:2014 + A1:2020 (Ed. 4.1)
- IEC 60601-1-3:2013 + A2:2020 (Ed. 2.2)
- IEC 60601-2-44:2016 (Ed. 3.2)
- IEC 60601-1-6:2013 + A2:2020 (Ed. 3.2)
- IEC 62304:2015 (Ed. 1.1)
- IEC 62366-1:2015 + A1:2020 (Ed. 1.1)
- IEC 60825-1:2014 (Ed. 3)
- IEC 62471:2006 (Ed. 1)

The system is classified as a Class I, IPX0 equipment, not suitable for use in the presence of a flammable anaesthetic mixture with oxygen or nitrous oxide. It is rated for continuous operation with intermittent loading. No sterilization is applied. The patient table cradle is considered a Type B applied part.

All portions of Omni Legend systems are suitable for use in the patient environment.

The system should be used only with GE approved equipment.

2.20.2 Operating Environment

2.20.2.1 System Power Rating

The system power rating specification during normal operation is per the following rating:

- Power Input: 380/400/420/440/460/480V, 3~
- Power Momentary: 100 kVA
- Power Continuous: 30 kVA
- Frequency: 50/60 Hz

2.20.2.2 Operation

The system operates within specification and without degradation of function or performance in an environment with the following conditions:

- Temperature: 18°C to 26°C (64°F to 79°F)
- Relative Humidity: 30% to 60% (non-condensing)
- Altitude: Up to 3000 meters (9842 feet)

- Atmospheric pressure: 70 - 106 kPa

2.20.2.3 Shipping

The system can withstand the following shipping conditions for up to two weeks:

- Temperature: -40°C to +50°C
- Humidity: 10% to 90% (including condensing)
- Altitude: Up to 5,500 meters (-1,800 feet to 18,000 feet)
- Atmospheric pressure: 50.5 - 106 kPa

2.20.2.4 Storage

The system can withstand the following storage conditions for up to six months:

- Temperature: 0°C to 30°C
- Relative Humidity: Up to 70% (non-condensing)
- Altitude: Up to 5,500 meters (-1,800 feet to 18,000 feet)
- Atmospheric pressure: 50.5 - 106 kPa

2.21 Electromagnetic Compatibility

This equipment complies with 60601-1-2:2014 + A1:2020 (Ed. 4.1) EMC standard for medical electrical equipment.

Omni Legend systems are suitable to be used in the electromagnetic environment, as per the limits and recommendations described in the tables hereafter:

- Emission Compliance level and limits ([Table 6 on page 42](#))
- Immunity Compliance level and recommendations to maintain equipment clinical utility ([Table 7 on page 43](#)).

NOTE

This system complies with above mentioned EMC standard when used with supplied cables up to maximum lengths referenced in the MIS MAPS or system cable interconnect diagrams.

This equipment generates, uses, and can radiate radio frequency energy. The equipment may cause radio frequency interference to other medical and non-medical devices and radio communications.

To provide reasonable protection against such interference, this product complies the radiated emission as per CISPR 11 Group 1 Class A standard limits.

Detailed requirements and recommendations about the power supply distribution and installation are listed in the Site Preparation Manual.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment is found to cause interference (which may be determined by turning the equipment on and

off), the user (or qualified service personnel) should attempt to correct the problem by one or more of the following measure(s):

- Reorient or relocate the affected devices
- Increase the separation between the equipment and the affected device
- Power the equipment from a source different from that of the affected device
- Consult the point of purchase or service representative for further suggestions

The manufacturer is not responsible for any interference caused by using other than recommended interconnect cables or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the users' authority to operate the equipment.

All interconnect cables to peripheral devices must be shielded and properly grounded, except when technologically prohibited. Use of cables not properly shielded and grounded may result in the equipment causing radio frequency interference.

Do not use devices which intentionally transmit RF signals (cellular phones, transceivers, or radio controlled products) in the vicinity of this equipment as it may cause performance outside the published specifications.

The PIM document (Pre-installation Manual) contains the recommended separation distances.

The medical staff in charge of this equipment is required to instruct technicians, patients, and other people who may be around this equipment to comply fully with the above equipment. In order to achieve the Electromagnetic Compatibility for a typical installation, further detailed data and requirements are described in the Site Preparation Manual.

2.21.1 Electromagnetic Emission

Table 6 IEC 60601-1-2 Compliance Table

EMC Emissions Guidance & Declaration for Omni Legend systems		
IEC 60601-1-2 Compliance Table (per IEC6061-1-2: 2014 + A1:2020 (Ed. 4.1); Section 7.3)		
Omni Legend systems are intended for use in the electromagnetic environment specified below. The customer or the user of Omni Legend systems should assure that it is used in such an environment.		
Emissions Test	Compliance	Electromagnetic Environment Guidance
RF emissions CISPR 11	Group 1	Omni Legend systems use RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class A	


IEC 60601-1-2 Compliance Table continued		
EMC Emissions Guidance & Declaration for Omni Legend systems		
<i>IEC 60601-1-2 Compliance Table (per IEC6061-1-2: 2014 + A1:2020 (Ed. 4.1); Section 7.3)</i>		
<i>Omni Legend systems are intended for use in the electromagnetic environment specified below. The customer or the user of Omni Legend systems should assure that it is used in such an environment.</i>		
Emissions Test	Compliance	Electromagnetic Environment Guidance
Harmonic emissions IEC 61000-3-2	Not applicable	Omni Legend systems are suitable for use in all professional health-care facility environments other than domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Voltage fluctuations/flicker emissions IEC 61000-3-3	Not applicable	


2.21.2 Electromagnetic Immunity

Table 7 IEC 60601-1-2 Compliance Table

EMC Immunity Guidance & Declaration for Omni Legend systems			
<i>IEC 60601-1-2 Compliance Table (per IEC6061-1-2: 2014 + A1:2020 (Ed. 4.1); Tables 4-9)</i>			
<i>Omni Legend systems are intended for use in the electromagnetic environment specified below. The customer or the user of Omni Legend systems should assure that it is used in such an environment.</i>			
Immunity Test	IEC 60601-1-2 Test Level	Compliance Level	Electromagnetic Environment Guidance
Electrostatic discharge (ESD) IEC 61000-4-2	±8 kV contact ±15 kV air	±8 kV contact ±15 kV air	Floors should be wood, concrete, or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	±2 kV for power supply lines, 100kHz rate ±1 kV for input/output lines, 100kHz rate	±2 kV for power supply lines, 100kHz rate ±1 kV for input/output lines, 100kHz rate	Mains power quality should be that of a professional healthcare facility environment.
Surge IEC 61000-4-5	±1 kV line-line ±2 kV line-earth	±1 kV line-line ±2 kV line-earth	Mains power quality should be that of a professional healthcare facility environment.

IEC 60601-1-2 Compliance Table continued			
EMC Immunity Guidance & Declaration for Omni Legend systems			
IEC 60601-1-2 Compliance Table (per IEC6061-1-2: 2014 + A1:2020 (Ed. 4.1); Tables 4-9			
Omni Legend systems are intended for use in the electromagnetic environment specified below. The customer or the user of Omni Legend systems should assure that it is used in such an environment.			
Immunity Test	IEC 60601-1-2 Test Level	Compliance Level	Electromagnetic Environment Guidance
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	< 0% U_T for 5 seconds	0 % U_T for 5 seconds	Mains power quality should be that of a professional healthcare facility environment. If the user of Omni Legend systems requires continued operation during power mains interruptions. It is recommended that Omni Legend systems be powered from an uninterruptible power supply.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	30 A/m	30 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a professional healthcare facility environment.
Radiated fields in close proximity IEC 61000-4-39	65A/m at 134.2kHz (PM 2.1kHz 50%) 7.5A/m at 13.56MHz (PM 50kHz 50%)	65A/m at 134.2kHz (PM 2.1kHz 50%) 7.5A/m at 13.56MHz (PM 50kHz 50%)	Close proximity radiated fields should be at levels characteristic of a typical location in a professional healthcare facility environment
NOTE U_T equals the alternating current mains voltage prior to application of the test level.			

IEC 60601-1-2 Compliance Table continued			
EMC Immunity Guidance & Declaration for Omni Legend systems			
IEC 60601-1-2 Compliance Table (per IEC6061-1-2: 2014 + A1:2020 (Ed. 4.1); Tables 4-9			
Omni Legend systems are intended for use in the electromagnetic environment specified below. The customer or the user of Omni Legend systems should assure that it is used in such an environment.			
Immunity Test	IEC 60601-1-2 Test Level	Compliance Level	Electromagnetic Environment Guidance
Conducted RF IEC 61000-4-6	6 V _{RMS} in ISM bands 150 kHz to 80 MHz	6 V _{RMS} in ISM bands 150 kHz to 80 MHz	<p>Portable and mobile RF communications equipment should be used no closer to any part of the Omni Legend systems, including cables, than the recommended separation distance calculated from the equation appropriate for the frequency of the transmitter Recommended Separation Distance (Table 8 on page 47)</p> $d = \left[\frac{3.5}{f} \right] \sqrt{P}$ <p>Where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m).</p> <p>Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey should be less than the compliance level in each frequency range. Interference may occur in the vicinity of equipment marked with the following symbol:</p> 

IEC 60601-1-2 Compliance Table continued			
EMC Immunity Guidance & Declaration for Omni Legend systems			
IEC 60601-1-2 Compliance Table (per IEC6061-1-2: 2014 + A1:2020 (Ed. 4.1); Tables 4-9			
Omni Legend systems are intended for use in the electromagnetic environment specified below. The customer or the user of Omni Legend systems should assure that it is used in such an environment.			
Immunity Test	IEC 60601-1-2 Test Level	Compliance Level	Electromagnetic Environment Guidance
Radiation RF Fields / Proximity Fields from Wireless Transmitters IEC 61000-4-3	3 V/m 80 MHz to 2.7GHz 80% AM 1kHz 9 V/m to 28 V/m spot frequencies: 385, 450, 710, 745, 780, 810, 870,930, 1720, 1845, 1970,2450, 5240, 5500, 5785 MHz PM 18 Hz or 217 Hz (50% duty cycle) (Table 9 on page 48)	3 V/m 9 V/m to 28 V/m spot frequencies: 385, 450, 710, 745, 780, 810, 870, 930, 1720, 1845, 1970, 2450, 5240, 5500, 5785 MHz PM 18 Hz or 217 Hz (50% duty cycle) (\Table 9 on page 48)	<p>Portable and mobile RF communications equipment should be used no closer to any part of the Omni Legend system, including cables, than the recommended separation distance calculated from the equation appropriate for the frequency of the transmitter Recommended Separation Distance (Table 8 on page 47)</p> $d = \left[\frac{3.5}{3} \right] \sqrt{P}$ <p>(800 MHz to 2.7 GHz (Table 8 on page 47)</p> $d = \left[\frac{7}{3} \right] \sqrt{P}$ <p>Where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey should be less than the compliance level in each frequency range. Interference may occur in the vicinity of equipment marked with the following symbol:</p> 
<ul style="list-style-type: none"> Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast, and TV broadcast can not be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which Omni Legend systems are used exceeds the applicable RF compliance level above, Omni Legend 			

IEC 60601-1-2 Compliance Table continued			
EMC Immunity Guidance & Declaration for Omni Legend systems			
IEC 60601-1-2 Compliance Table (per IEC6061-1-2: 2014 + A1:2020 (Ed. 4.1); Tables 4-9			
Omni Legend systems are intended for use in the electromagnetic environment specified below. The customer or the user of Omni Legend systems should assure that it is used in such an environment.			
Immunity Test	IEC 60601-1-2 Test Level	Compliance Level	Electromagnetic Environment Guidance
<p>systems should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating Omni Legend systems.</p> <ul style="list-style-type: none"> Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m. <p>NOTE</p> <p>These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people.</p>			

Table 8 IEC 60601-1-2 Compliance Table

Recommended separation distances between portable and mobile RF communications equipment for Omni Legend systems			
IEC 60601-1-2 Compliance Table (per IEC6061-1-2: 2014 + A1:2020 (Ed. 4.1) Table 9)			
Omni Legend systems are intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of Omni Legend systems can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and Omni Legend systems as recommended below, according to the maximum output power of the communications equipment.			
Rated Maximum Output Power (P) of Transmitter Watts (W)	Separation distance according to frequency of transmitter		
	150 kHz to 80 MHz $d = \left[\frac{3.5}{3} \right] \sqrt{P}$ Separation Distance meters	80 MHz to 800 MHz $d = \left[\frac{3.5}{3} \right] \sqrt{P}$ Separation Distance meters	800 MHz to 2.7 GHz $d = \left[\frac{7}{3} \right] \sqrt{P}$ Separation Distance meters
0.01	0.12	0.12	0.23
0.1	0.37	0.37	0.74
1	1.17	1.17	2.33
10	3.69	3.69	7.38

IEC 60601-1-2 Compliance Table continued			
Recommended separation distances between portable and mobile RF communications equipment for Omni Legend systems			
IEC 60601-1-2 Compliance Table (per IEC6061-1-2: 2014 + A1:2020 (Ed. 4.1) Table 9)			
Omni Legend systems are intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of Omni Legend systems can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and Omni Legend systems as recommended below, according to the maximum output power of the communications equipment.			
100	11.7	11.7	23.3
<p>For transmitters rated at a maximum output power not listed above, the separation distance can be estimated using the equation in the corresponding column, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.</p> <p>NOTE</p> <p>At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.</p> <p>NOTE</p> <p>These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people.</p>			

Table 9 Spot Frequencies

Spot Frequency (MHz)	Band (MHz)	Service	Maximum Power (Watts)
385	380-390	TETRA 400	1,8
450	430-470	GMRS 460 FRS 460	2,0
710	704-787	LTE Band 13,17	0,2
745			
780			
810	800-960	GSM 800/900 TETRA 800 IDEN 820 CDMA 850 LTE Band 5	2
870			
930			
1720	1700-1990	GSM 1800 CDMA 1900 GSM 1900 DECT	2
1845			

Spot Frequencies continued			
Spot Frequency (MHz)	Band (MHz)	Service	Maximum Power (Watts)
1970		LTE Band 1, 3 , 4, 25 UTMS	
2450	2400-2570	Bluetooth WLAN 802.11 b/g/n RFID 2450 LTE Band 7	2
5240	5100-5800	WLAN 802.11 a/n	0,2
5300			
5785			

2.21.3 Limitations Management

Adhering to the distance separation recommended in [Table 8 on page 47](#) between 150 KHz and 2.7 GHz, will reduce disturbances recorded at the image level but may not eliminate all disturbances.

However, when installed and operated as specified herein, the system will continue to acquire, display, and store diagnostic quality images safely.

* For example, a 1 W mobile phone (800 MHz to 2.7 GHz carrier frequency) shall be put 2.3 meters apart from the Omni Legend system (in order to avoid image interference risks).

2.21.4 Use Limitation

2.21.4.1 Environment of Intended Use

This medical device is evaluated to the IEC60601-1-2 standard for electromagnetic emissions and immunity levels in the Professional Healthcare Facility environment category. See sections in this manual for the electromagnetic disturbance compliance levels this product meets including a list of wireless communications services evaluated.

Examples of Environment of Intended Use

The PET/CT System is exposed to EM sources generally from LAN and WLAN, mobile phones, paging systems, computers, printers, monitors and other medical devices.

Environment Exclusions

This medical device is not suitable for use in certain hospital environments. Electrical devices that are brought into the PET/ CT System room that generate intense EM disturbances *have not* been considered per the IEC60601-1-2 standard. Also, the PET/CT System compliance levels do not guarantee that other equipment in the room that is EM sensitive is not impacted. The IEC60601-1 safety standard requires additional testing and/or risk assessment for compliance and patient/ operator safety of the PET/CT system.

Examples of Excluded Environment

PET/CT System is exposed to EM from High Frequency surgical equipment or short-wave therapy equipment.

2.21.4.2 Installation Requirements and Environment Control

In order to minimize interference risks, the following requirements shall apply:

1. Cable shielding and grounding

All interconnect cables to peripheral devices must be shielded and properly grounded. Use of cables not properly shielded and grounded may result in the equipment causing radio frequency interference.

2. This product complies with radiated emissions, per CISPR 11 Group 1 Class A standard limits.

Omni Legend systems are predominantly intended for use, in non-domestic environments, and not directly connected to the Public Mains Network. Omni Legend systems are predominantly intended for use (e.g. in professional healthcare facility environments) with a dedicated supply system, and with a X-ray shielded room.

The emissions characteristics of this equipment make it suitable for use in industrial areas and hospitals (CISPR 11 Class A). If it is used in a residential environment (for which CISPR 11 Class B is normally required) this equipment might not offer adequate protection for radio-frequency communication services. The user might need to take mitigation measures, such as relocating or reorienting the equipment.

3. Subsystem and accessories power supply distribution

All components, accessories subsystems, and systems which are electrically connected to Omni Legend systems, must have all AC power supplied by the same power distribution panel and line.

4. Stacked components and equipment

Omni Legend systems should not be used adjacent to or stacked with other equipment; if adjacent or stacked use is necessary, observe Omni Legend systems in order to verify normal operation in this configuration.

5. Low frequency magnetic field

In case of digital Omni Legend systems, the gantry (digital detector) shall be apart 1 meter from the generator cabinet. These distance specifications will minimize the low frequency magnetic field interference risk.

6. Static magnetic field limits

In order to avoid interference on Omni Legend systems, static field limits from the surrounding environment are specified. Static field is specified less than 1 Gauss in the examination room and control area. Static field is specified less than 3 Gauss in the technical room.

7. Electrostatic discharge environment and recommendations

In order to reduce electrostatic discharge interference, install charge dissipative floor material to avoid electrostatic charge buildup.

Maintain a relative humidity of at least 30 percent.

3 ALARA

3.1 ALARA Introduction

This chapter describes how to optimize CT X-ray scan technique to provide the best quality images at the lowest possible dose to the patient.

Although this PET/CT scanner was designed and manufactured to meet all the safety requirements for the normal operation of this equipment, you have the responsibility to choose the tracer activity, scan type and CT X-ray technique that provides the highest quality image with the lowest possible exposure to the patient.

ALARA stands for As Low As Reasonably Achievable. Follow facility guidelines and best practices to make sure every patient, regardless of his or her age, size and body type receives the minimum possible exposure during every exam. Not only does this mean choosing the best combinations of activity and technique, it means taking the time to explain the process and what you expect from the patient during the procedure, to minimize the need for rescans due to unexpected patient motion.

Please refer to the CT User Manual and CT TRM shipped with your system for CT specific ALARA and dose reduction information.

3.2 Dose Features and Technology

3.2.1 Pediatric Protocols

A full range of pediatric protocols are available based on a child's size, age and weight to tailor the dose or treatment accordingly.

The pediatric head, orbit and miscellaneous categories are age based protocols. The other anatomical categories contain height and weight based protocols.

3.2.2 CT Dose Reports

CTDI_{vol}, DLP (Dose Length Product) and Dose Efficiency are displayed during scan prescription and provide patient dose information. The system automatically saves the CTDI_{vol}, DLP and phantom size used to calculate dose when **End Exam** is clicked. The system saves the Dose Report as a DICOM Secondary Screen Capture in **Series 999**. You can film, archive and/or network the Dose Report after the scan is completed.

The hospital radiation tracking system HIS/RIS can use the CT Dose Report to track individual patient dose. The system saves the DICOM Structured Dose Report (SR) as **Series 997**. Network the DICOM SR Dose Report to an Advantage Windows workstation and review it with the Reporting Tool, or send **Series 997** information to any workstation that can read a DICOM Structured Report format.

The system displays the CT SmartStep/SmartView accumulated exposure time on the Dose Text Page and the DICOM Structured Dose Report.

3.2.3 Q.AC

The Q.AC option provides CTAC processing modifications designed to improve CTAC accuracy in regions of low CT signal. Q.AC may provide improvements in quantitation in very large patients and also offers the ability to utilize very low CT techniques when CT scans are used only for the CTAC (PET-only), and not for CT diagnostic or localization purposes.

There are specific GE PET/CT protocols which use ultra-low dose CT techniques (ULDAC) provided on the GE protocol tab. The CT parameters in these protocols have been optimized for use with the Q.AC filter option and should not be modified except for the scan range. These ULDAC protocols should not be used with other CT reconstruction filters.

- PT_ET_ULDAC, PT_2m_WB_ULDAC
- PT_Q.Static_ULDAC

These protocols maintain PET quantitative accuracy using low technique CT acquisitions. The protocols may be used if PET-only imaging is requested in both adult and pediatric patients. For more information on Q.AC, see the [CT Use for PET Attenuation Correction](#) chapter.

3.3 Suggestions to Minimize Dose

3.3.1 Question the necessity of the PET or CT examination

How appropriate is this PET or CT study? The patient's physician and the radiologist have the responsibility to determine whether the patient needs a PET/CT examination, in place of other effective, lower dose, modalities. The radiologist should review the indications and appropriate technique prior to every scan. The radiologist should consider the number of previous scans each patient may have received, the reasons for the scan, and the possibility of gathering the same diagnostic information with a lower dosage modality.

The benefits of the exam must always exceed the overall risk.

3.3.2 Scan only the designated organ or anatomical region

Set the scan range to capture only the designated organ or anatomical region of interest to avoid unnecessary exposure.

3.3.3 Center all patients in the gantry Scan Field of View (SFOV)

When the patient is properly centered in the SFOV, the bow tie filters deliver dose to the anatomy of interest and increase filtration to the remaining areas. AutomA and SmartmA reduce unnecessary radiation exposure to a well centered patient. The system may under expose or overexpose an improperly centered patient when the table is set too far above or below isocenter.

3.3.4 Use pediatric positioning accessories

Use a papoose board and neonatal immobilizers when necessary to secure the patient and keep her still. These accessories help prevent the need for repeat exams with additional dose, due to patient motion.

3.3.5 Create a kid friendly environment

Pictures of animals on the wall or ceiling, stuffed animals and games are all effective ways to help pediatric and small children remain calm and cooperative. Use age appropriate explanations to prepare children for their procedures before they enter the scan room. Explain the need to lay very still and listen to the voice in the gantry. Gaining patient cooperation in advance reduces the need for repeat studies and additional dose because the patient moved during the study.

Remember that your attitude and demeanor affects your patient. Try to remain calm and cheerful throughout the procedure. A child will quickly respond and react to impatience, hostility and stress. Try not to turn a bad day into somebody else's traumatic life experience.

3.4 PET Dose Reporting Considerations

The administered PET radiopharmaceutical dose is determined according to the PET/CT ordering physician's prescription. Most institutions have a radiopharmaceutical dosage chart which takes into consideration age and body composition.

Please refer to local radiopharmaceutical regulations and facility guidelines to determine patient dose requirements.

The system saves a DICOM Screen Capture of the PET Exam Report as Series 990. This report captures the administered PET radiopharmaceutical dose as well as other parameters about the PET exam, such as patient demographics, protocol and exam notes. You can film, archive and/or network the PET Exam Report after the scan is completed.

3.5 Pediatric Patients and Small Children

This section contains information and suggestions to modify protocols and optimize dose for pediatric patients. Follow the most updated guidelines as adopted by your facility for planning and designing the proper PET CT imaging for your pediatric patients. ^{1, 2, 3}

While radiation exposure is a concern for all people of all ages, pediatrics are more sensitive to radiation exposure due to their rapidly dividing cells. The younger the patient, the higher the radiation exposure risk.

3.5.1 Adjust parameters by size, weight, height and indications

To avoid overexposure, always select pediatric protocols based upon the patient age, weight, height and indications. The PET/CT system arranges the recommended pediatric protocols by colors, following the Broselow-Lutem Pediatric System, with each color representing a specific height/weight range. Review these baseline protocols with the radiologist and medical physicist to determine the

lowest possible dose for the desired image quality of the diagnostic image. Consider the size of the anatomy of interest as well as the weight and height of the patient before proceeding to scan. The area of interest may be larger or smaller than the patient's weight might suggest.²

3.5.2 Optimize pediatric protocols for your facility

Work with the facility radiologists, medical physicists and CT technologists to evaluate and establish techniques to reduce radiation dose, yet still provide adequate diagnostic information. Consult the following websites for additional information to optimize scan protocols on your PET/CT system.

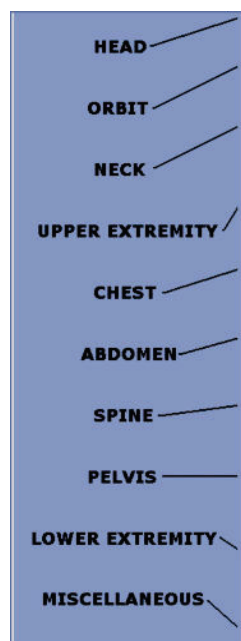
- American College of Radiology (ACR): <http://www.acr.org>
- Society of Pediatric Radiology (SPR): <http://www.pedrad.org>
- National Cancer Institute (NCI): <http://www.nci.nih.gov>
- Image Gently: <https://www.imagegently.org>
- FDA: <http://www.fda.gov>
- Society of Nuclear Medicine: <https://www.snmmi.org>
- European Association of Nuclear Medicine: <http://www.eanm.org>

3.5.3 Pediatric Protocol Selector

The Pediatric Protocol Selector provides age based protocol selection areas for Head, Orbit and Miscellaneous exams and a color coding system for Neck, Upper Extremity, Chest, Abdomen, Spine and Pelvis. It is recommended to build and select pediatric protocols based on age, height and weight.

Enter the pediatric patient's weight in the **New Patient** field to display the appropriate color code area to match the anatomical selection.

Enter the patient information and click **Pediatric** to display the pediatric anatomical selector.

Figure 18 Pediatric Anatomical Selector

3.5.4 Color Coding for Kids protocol selection

Based on the Broselow-Luten Pediatric System, the Color Coding for Kids system helps the user select the correct pediatric CT protocol. The system divides the protocols into nine color zones, based on height and weight, and incrementally increases the scan technique as the patient size increases. This protocol arrangement reduces variations in pediatric protocol selection. You can also use the Broselow-Luten Tape to obtain the weight, based upon the height, if you don't know the patient's weight.

Select an anatomical area to display a corresponding protocol category window, similar to the one shown in the figure below. Verify the system selected the correct color, based on the new patient information, or select the color that corresponds to the patient size to display the corresponding list of available protocols.

NOTE

The GE Pediatric abdomen tab contains a PET/CT protocol for each color selection to copy into the User tab and modify for facility use.

Figure 19 Pediatric Protocol Category window

GE Pediatric abdomen

Color Selection

- 1 Pink
6.0-7.5 kg (13.2-16.5 lbs)
58.5-66.5 cm
- 2 Red
7.5-9.5 kg (16.5-20.9 lbs)
66.5-74.0 cm
- 3 Purple
9.5-11.5 kg (20.9-25.4 lbs)
74.0-84.5 cm
- 4 Yellow
11.5-14.5 kg (25.4-32.0 lbs)
84.5-97.5 cm
- 5 White
14.5-18.5 kg (32.0-40.8 lbs)
97.5-110.0 cm
- 6 Blue
18.5-22.5 kg (40.8-49.6 lbs)
110.0-122.0 cm
- 7 Orange
22.5-31.5 kg (49.6-69.5 lbs)
122.0-137.0 cm
- 8 Green
31.5-40.5 kg (69.5-89.3 lbs)
137.0-150.0 cm
- 9 Black
40.5-55.0 kg (89.3-121.3 lbs)

Protocol List

36.1.1	Abd 6.0-7.5 kg (13.2-16.5 lbs)
36.1.2	PTCT_HB_pink 6-7.4 kg (13.2-16.3 lbs)
36.1.3	
36.1.4	
36.1.5	
36.1.6	
36.1.7	
36.1.8	
36.1.9	
36.1.10	
36.1.11	
36.1.12	
36.1.13	
36.1.14	
36.1.15	

Copy Done Set As Default

Next Prior

If there are no protocols available for the selected anatomical area, a blank Pediatric Protocol Category window opens. If you did not enter a weight into the **New Patient** field, the system defaults to the most recently selected weight and color.

If you entered a weight into the **New Patient** window and try to select a different color/weight, the system displays an error message similar to the one shown in #concept_d41_5nl_qtb/SL5415348-1280550. Click **OK** to acknowledge your protocol selection does NOT match the patient size.

The system enforces weight-specific protocols for all anatomical areas except the Head, Orbit and Miscellaneous lists. The protocols in these three lists are usually defined by patient age, instead of patient height/weight.

Figure 20 Protocol Category Warning

WARNING

Selected color is not suitable for the entered patient weight of 29 kg (65 lbs).

OK

The color/weight selector labels include the zone ranges for weight and length, the zone color and the zone number, as listed in #concept_d41_5nl_qtb/SL13878575-1280550.

Table 10 Color Code Table

Zone Number	Zone Color	Zone Weight (kg)	Zone Weight (lb)	Zone Length (cm)
1	Pink	6.0 - 7.5	13.2 - 16.5	59.5 - 66.5
2	Red	7.5 - 9.5	16.5 - 20.9	66.5 - 74.0
3	Purple	9.5 - 11.5	20.9 - 25.4	74.0 - 84.5
4	Yellow	11.5 - 14.5	25.4 - 32.0	84.5 - 97.5
5	White	14.5 - 18.5	32.0 - 40.8	97.5 - 110
6	Blue	18.5 - 22.5	40.8 - 49.6	110 - 122
7	Orange	22.5 - 31.5	49.6 - 69.5	122 - 137
8	Green	31.5 - 40.5	69.5 - 89.3	137 - 150
9	Black	40.5 - 55.0	89.3 - 121.3	NA

3.5.5 References

- ¹ Alessio AM, Kinahan PE, Manchanda V, Ghioni V, Aldape L, Parisi MT. Weight-Based, Low-Dose Pediatric Whole-Body PET/CT Protocols. JNM 2009 50:1570-1578. Fahey, FH. Dosimetry of Pediatric PET/CT. JNM 2009; 50:1483-1491. Straus J, Franzius C, Pluger KU, Juergens, et al. Guidelines for 18F-FDG PET and PET-CT imaging in paediatric oncology. Eur J Nucl Med Mol Imaging 2003 30:BP115-24,
- ² Fahey, FH. Dosimetry of Pediatric PET/CT. JNM 2009; 50:1483-1491.
- ³ Straus J, Franzius C, Pluger KU, Juergens, et al. Guidelines for 18F-FDG PET and PET-CT imaging in pediatric oncology. Eur J Nucl Med Mol Imaging 2003 30:BP115-24.

ALARA

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4 System Introduction

4.1 System Introduction

This chapter describes the functionality of system hardware and basic application screens and buttons.

4.2 System Hardware

4.2.1 Gantry and Table

Figure 21 PET/CT Gantry and Table

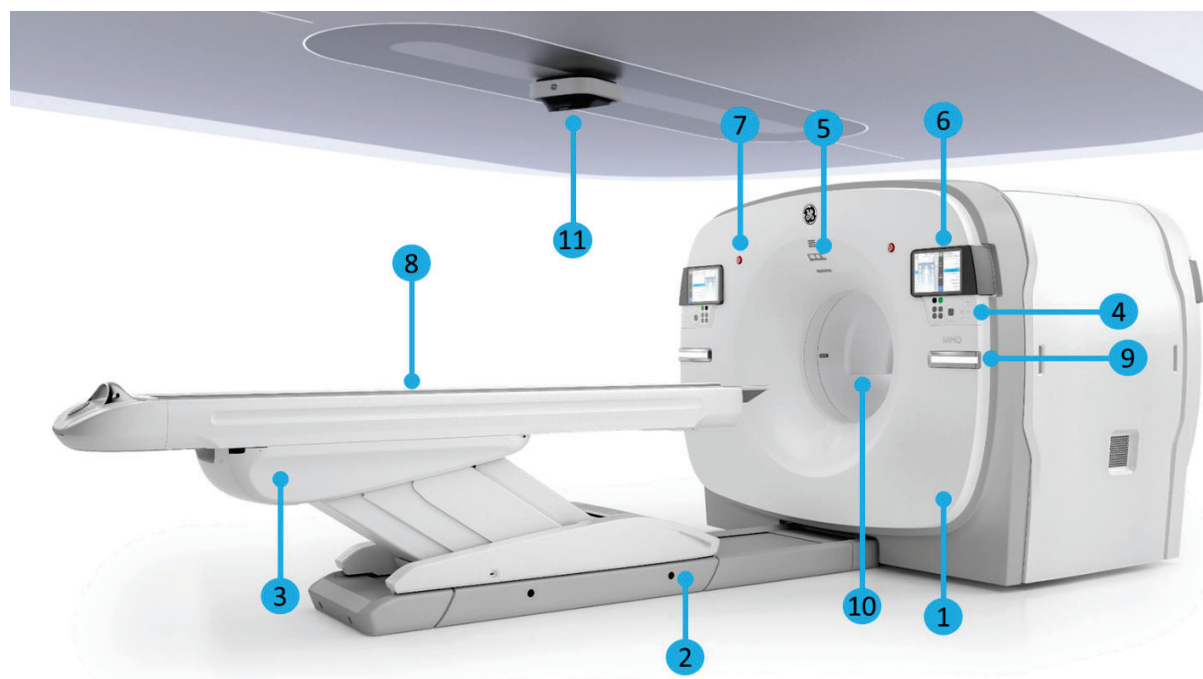


Table 11 Gantry and Table

Number	Description
1	Gantry
2	Patient Transport The buttons on the Gantry Control Panel drive the Patient Table between CT and PET scan positions.

3	Patient Table Supports the Patient Cradle and PET/CT accessories. The table will support 500 lb (227 kg) during normal operation. When the two meter table extension is inserted, the table will support 400 lb (181 kg).
4	Gantry Control Panel See Gantry Control Panel on page 63
5	Gantry Display, Breathing Lights and Laser Port Refer to Gantry Control Panel on page 63
6	Gantry Touch Display including Calibration Mode Indicator (refer to Gantry Touch Display on page 68)
7	Left Emergency Stop Switch One of five on the system. See System Emergency Buttons.
8	Patient Cradle Supports up to 500 lb (227 kg).
9	Right Light Belt
10	Gantry bore, including bore light with different intensity levels.
11	Xtream camera (optional) for Auto Positioning option.

NOTE

Hardware Tilt is not available with the PET/CT gantry. Digital Tilt is available for CT standalone scans only. Refer to CT user manual for instructions.

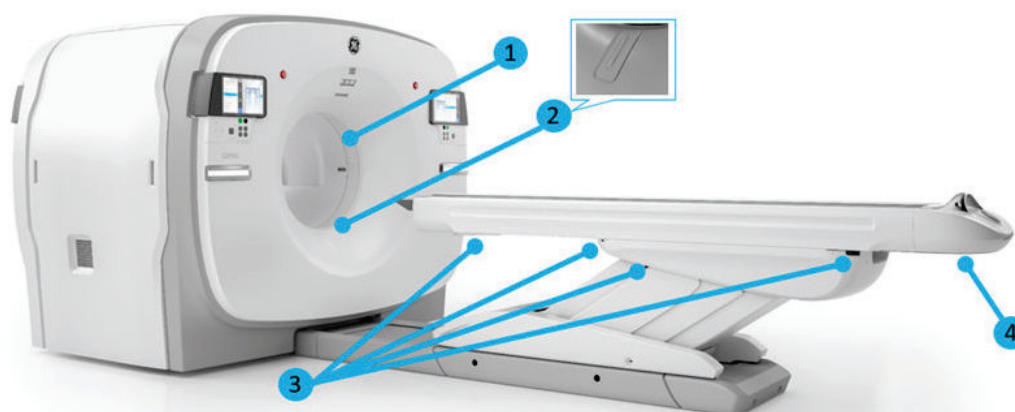
Figure 22 Mylar Window and Collision Sensors

Table 12 Mylar Window and Collision Sensors

Number	Description
1	<i>CT Mylar Window</i> The system checks this window for dried contrast and body fluids during the Fast Calibration sequence.
2	<i>Collision Sensor (front gantry cover)</i> This sensor prevents collisions between the optional two-meter table extension and the gantry.
3	<i>Collision Sensors (both sides of table)</i> Prevents the table from crushing objects left in its path when the table is lowered. To reset, raise the table, remove the object and retry. Touching these strips also stops downward motion.
4	<i>Pressure Plate</i> Stops downward motion when the table makes contact with a foreign object. The pressure plate consists of the entire bottom cover at the foot end of the table. To reset, raise the table, remove the object and retry. Pressing the plate also stops downward motion.



TO PREVENT DAMAGE TO THE BORE AND/OR MYLAR WINDOW, MONITOR THE DISTANCE BETWEEN THE BOTTOM OF THE TABLE AND THE GANTRY WHENEVER YOU LOWER THE TABLE MORE THAN 200 MM BELOW ISOCENTER.



IF THE TABLE IS LOWERED WITH ANYTHING IN THE RED X AREA, AS INDICATED IN THE FIGURE BELOW, THE TABLE COULD BE DAMAGED ALONG WITH THE EQUIPMENT OR OBJECT UNDER THE TABLE.


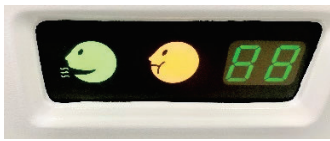

Figure 23 Restricted area under the table



USE OF ANY CRADLE EXTENSION ACCESSORIES SUCH AS THE TABLE EXTENSION, HEAD HOLDER, 2 METER TABLE TOP, CORONAL HEAD HOLDER, AND PHANTOM HOLDER ARE NOT ACCOUNTED FOR IN THE TABLE GANTRY INTERFERENCE MATRIX. THEREFORE, ADDITIONAL CARE NEEDS TO BE TAKEN TO CLOSELY MONITOR ANY TABLE UP/DOWN, IN/OUT MOVEMENT TO AVOID CONTACT OF THE EXTENDED ACCESSORY WITH THE GANTRY.

All PET/CT gantries have the same Gantry Control Panel in four separate locations: left front cover, right front cover, left rear cover and right rear cover. On PET/CT systems with the PET Scanning Productivity option, the **Laser Alignment Light** buttons turn on all the lasers. Regardless of the control panel and button locations, all functional descriptions remain the same.

Table 13 Gantry components

	OMNI Touch Display and Control Panel
	<p>Breathing Lights:</p> <p>Green Face Blinks: Get ready to hold breath.</p> <p>Yellow Face Solid: Hold breath during count down. Counter next to face.</p> <p>Green Face Solid: Return to normal breath.</p>
	External Alignment Laser Port

4.2.1.1 Gantry Control Panel

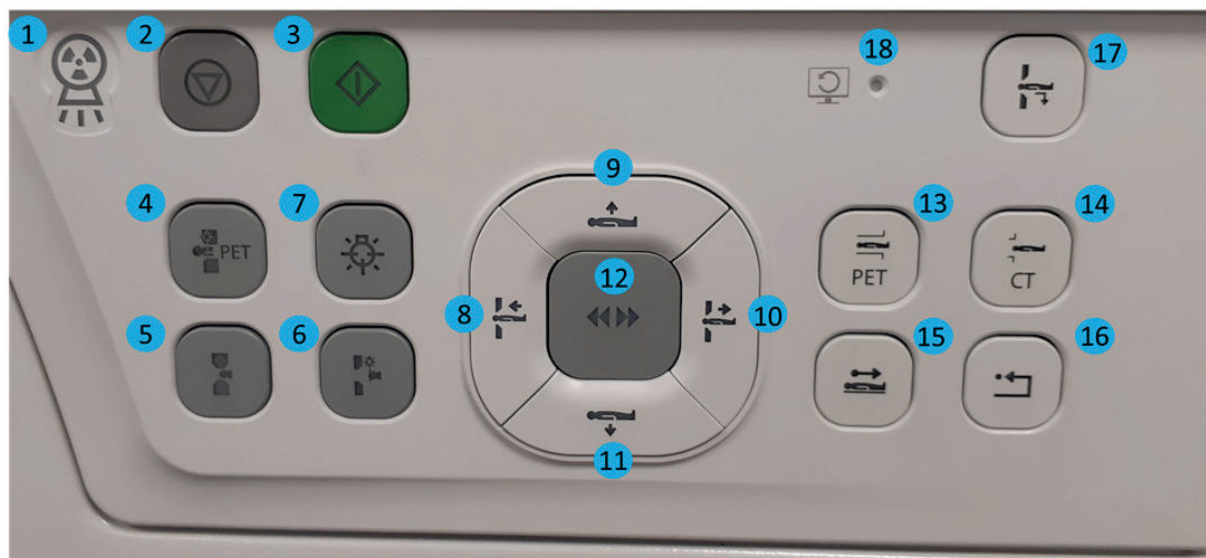





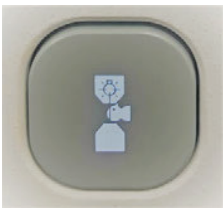













Figure 24 Gantry Control Panel

Table 14 Gantry Control Panel

Num-ber	Icon	Function	Description
1		X-ray Exposure Indicator	Lights during CT X-ray exposures, such as Tube Warmup, Fast Calibrations, Image QA, scout scans and series acquisitions. Icon when lit: 
2		Stop Scan	Once the scan starts, the Stop Scan button activates. Press Stop Scan to immediately stop the scan in progress. When pressed, it: <ul style="list-style-type: none"> • Stops the prep display and X-ray exposure • Turns off the laser alignment lights. • Halts all gantry and table motions • Cradle and base also unlatch and must be latched before initiating a scan.
3		Start Scan	Press Start Scan to initiate the scan sequence from the Gantry, instead of the Scan Control Interface, if you plan to stand beside the patient during the scan. Confirm the scan prescription and press the Move to Scan button on the Scan Control Interface to initiate the sequence. The Start Scan button on the Scan Control Interface and the Gantry flashes for 30 seconds before timing out. Press any Start Scan button to start the scan. If the button times out, press the solid green Start Scan button to re-initiate the scan sequence and activate the flashing button. If you plan to stay in the scan room during a CT X-Ray exposure, wear X-Ray protection to prevent needless radiation exposure.
Landmarks: Use one of the following landmark buttons to set the landmarks manually.			
4		PET Landmark	Move the patient into position over the PET scan field and press the PET Landmark button to set the landmark during PET First or PET Only studies. If the system has the PET Scanning Productivity option, enable the rear alignment lights and press PET Landmark to landmark the region of interest to the rear lasers. The system uses the same S/I labeling conventions as the internal landmark. You must press one of the landmark buttons to scan.

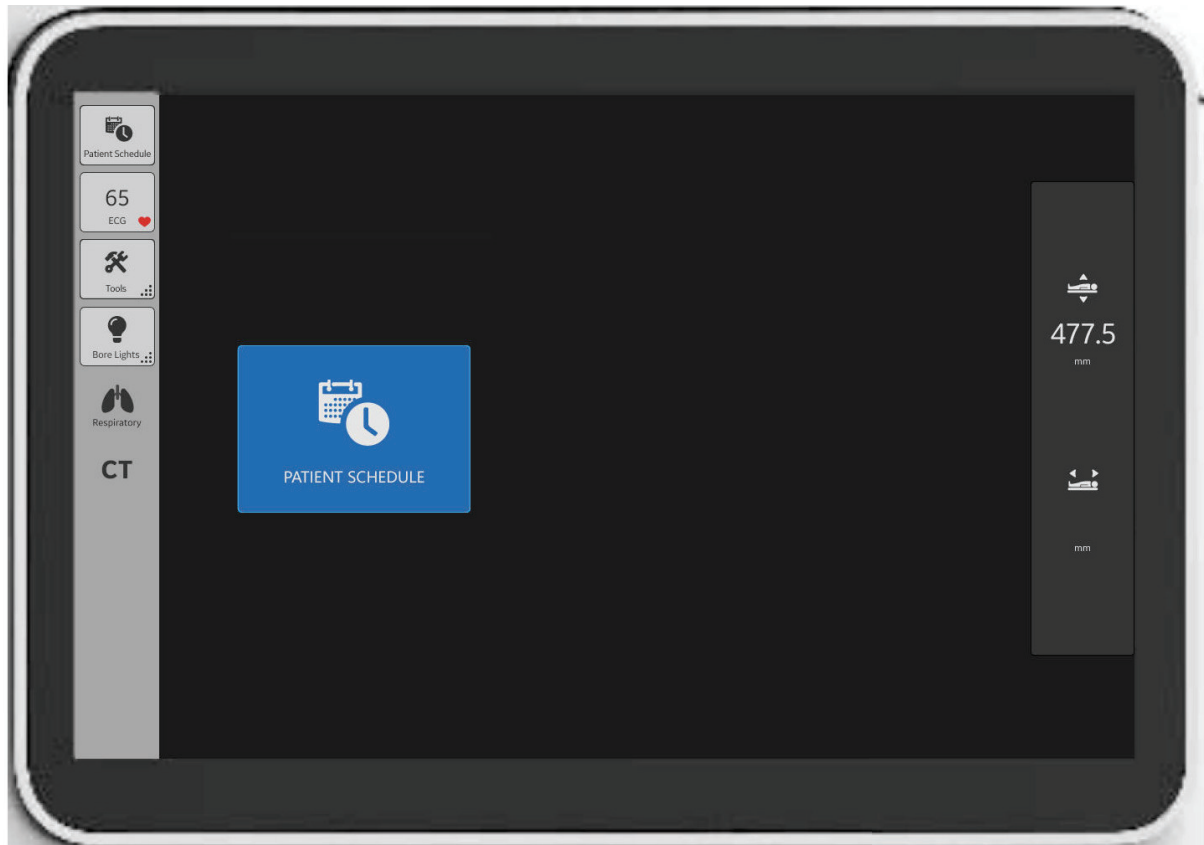
Gantry Control Panel continued			
Number	Icon	Function	Description
5		Internal Landmark (CT)	Press the Internal Landmark button to set the landmark to the region of interest beneath the internal CT alignment lights. The Internal Landmark sets the region in the center of the CT Scan Field of View (SFOV) as the 0 location. This annotates all anatomy from 0 to the top of the patient's head as Superior (S) and all anatomy from 0 to the patient's feet as Inferior (I). The system labels the 0 position, S0.0, on the scan screen. You must select a landmark to scan.
6		External Landmark	<p>Press the External Landmark button to set the landmark to the region of interest beneath the external alignment lights. The system uses the same S/I labeling conventions as the internal landmark. You must press one of the landmark buttons to scan.</p> <p>The gantry display then shows a table location approximately 240 mm, depending on table characterization. The location number displays because the system calculates its table location numbers based on the distance between the external and internal laser alignment lights.</p>
NOTE The Auto Positioning option can assist user to set landmark, position and load patient automatically. For more information, refer to Automatic and Remote Patient Positioning and Scout Acquisition with Auto Positioning Option (section 10.7.3)			
7		Laser Alignment Light	<p>Press a Laser Alignment button once to turn on all the alignment lasers and start an internal timer. Press the Laser Alignment button again to toggle the alignment lights OFF. The lights automatically turn off when the internal timer counts down to 0.</p> <p>Always tell your patients to shut their eyes before you turn ON the alignment lights, and keep them shut until you turn OFF the lights and tell them it is safe to open them.</p>
8		Cradle In	Press and hold the Cradle In button to slowly drive the cradle toward the Gantry. The LED next to the button continues to blink until the cradle reaches its destination. Press and hold the Fast Speed button at the same time to increase cradle speed.

Gantry Control Panel continued			
Number	Icon	Function	Description
9		Table Up	Press and hold Table Up to slowly raise the Patient Table. Press and hold the Fast Speed button at the same time to increase the table height speed.
10		Cradle Out	Press and hold Cradle Out to slowly drive the cradle away from the Gantry. The LED next to the button continues to blink until the cradle reaches its destination. Press and hold the Fast Speed button at the same time to increase cradle speed.
11		Table Down	Press and hold Table Down to slowly lower the Patient Table. Press and hold the Fast Speed button at the same time to lower the table more quickly.
12		Fast Speed	Press and hold with the Table Up/Down, Cradle In/Out or PET/CT scan position buttons to increase the speed in the corresponding direction.
13		PET Scan Position	Press and hold to drive the Patient Table to the PET Scan position toward the rear of the Gantry. The LED next to the button continues to blink until the table reaches its destination.
14		CT Scan Position	Press and hold to drive the Patient Table to the CT Scan position toward the front of the Gantry. The LED next to the button continues to blink until the table reaches its destination.

Gantry Control Panel continued			
Number	Icon	Function	Description
15		Cradle Lock Release	During an emergency, press Cradle Lock once to release the cradle, so you can quickly pull the patient out of the gantry bore. Press Cradle Lock a second time to re-latch the cradle.
16		Table Reset	<p>If you press an Emergency Stop button, press the flashing Table Reset button to restore communications to the console and gantry.</p> <p>If the gantry loses power, restore power; then press Table Reset.</p> <p>If the table stops because it makes contact with a foreign object when you lower it, raise the table, clear the obstruction, and continue.</p>
17		Home	<p>Press and hold the Home button to simultaneously retract the cradle and drive and lower the Patient Table to the load position.</p> <p>If performing a DQA or PET calibration, when the DQA indicator blinks green, press and hold the Home button to raise the table and bring it to DQA phantom loading height.</p> <p>Two-meter table option: You must remove the table extender in order to drive the table to the load position. The table extender will make contact with the collision sensor on the Gantry Front Cover, and halt table motion. Remove the table extender, then press the Home button to drive the table to the load position.</p>
18		Operator Console Reset	When the Operator Console (OC) is unresponsive, press this button on gantry with a pin to reset. The buttons on the control panel will flash after this button is pressed. If there is no change to the OC in 10 to 20 seconds, turn off the OC power directly and then power on the OC after 10 seconds.

4.2.1.2 Gantry Touch Display

Figure 25 Gantry Touch Display



A touch screen display is mounted above the gantry control panel on the left and right sides of the gantry front cover. The touch screen display provides the following functions:

- Select patient to start scan.
- Set up the Automatic Patient Positioning and Scout scanning with Auto Positioning option installed.
- Display gantry and table position information.
- Display PET Gamma Count Rate and PET Scan Time.
- Display multiple system status.
- Display patient and exam information.
- Display Patient ECG waveform.
- Control internal bore lights.
- Start Breathing demo.
- Play movie.

The Gantry Touch Display Interface is divided into three areas: The Toolbar, the Main Function Area and Right Information area.

Figure 26 Gantry Touch Display Indicators

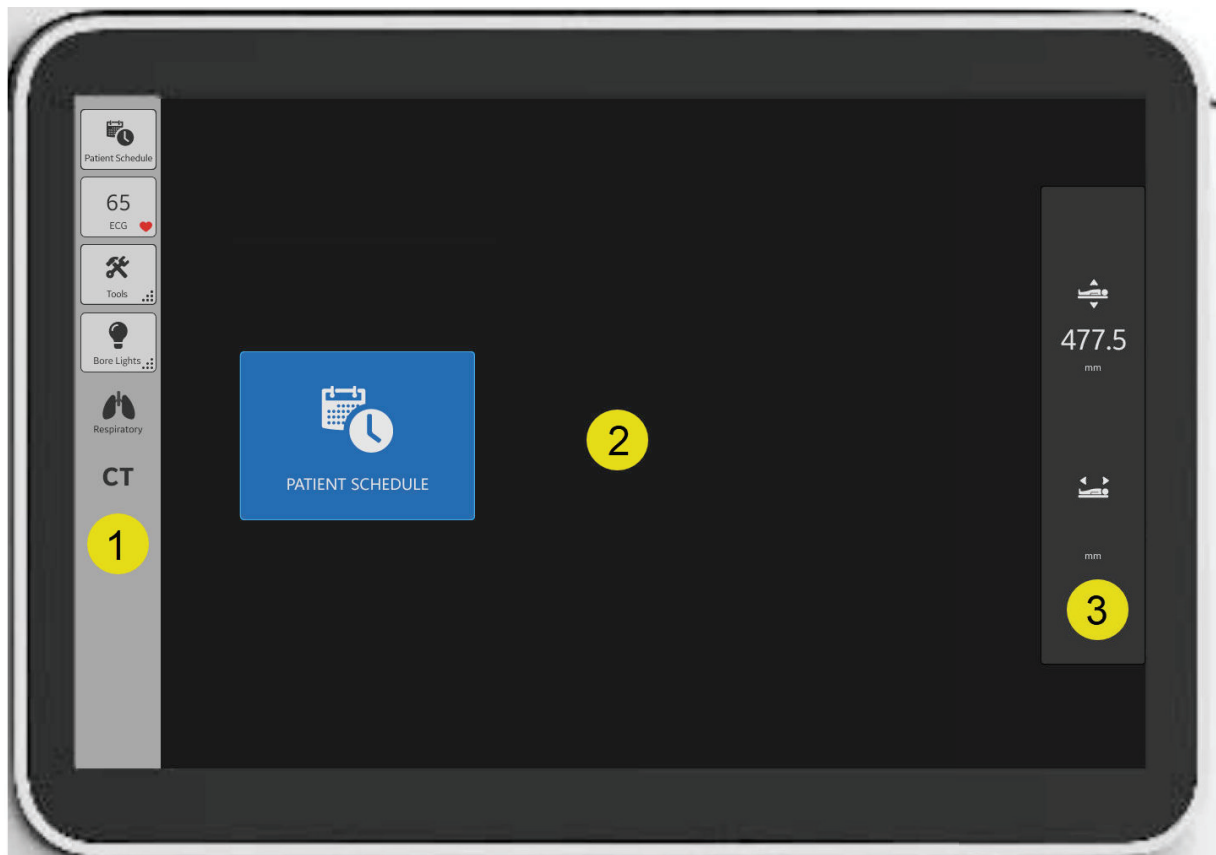


Table 15 Gantry Touch Display Areas


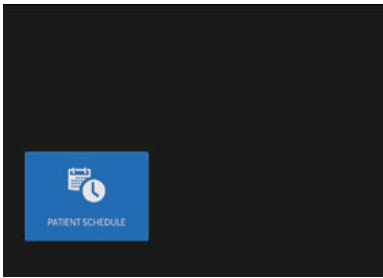

Number	Icon	Description
1		Left Toolbar
2		<p>Main Function Area</p> <p>In this area different information and functionalities are displayed according to system status. Follow instructions in Gantry Touch Display – Interfaces.</p>
3		<p>Right Information Area:</p> <ul style="list-style-type: none"> • Table/Cradle Information • PET Gamma Count Rate • PET Scan Time Information <p>Note: PET Gamma Count Rate and PET Scan Time Information are displayed during hybrid scan only. Refer to Scan Interface for details.</p>

Figure 27 Rear Cover Indicators

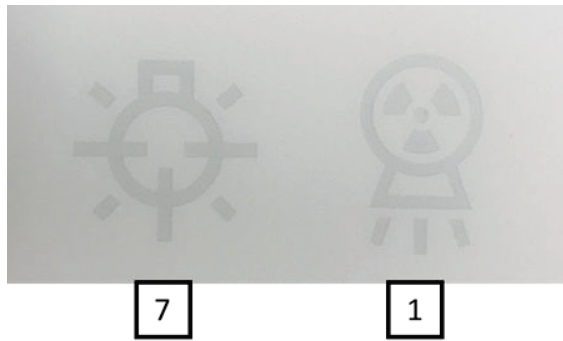






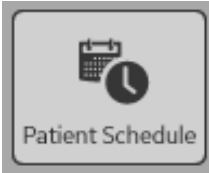
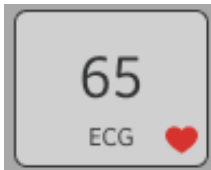
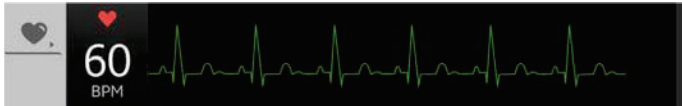
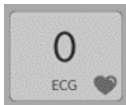



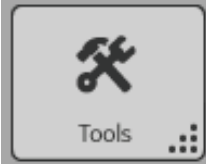
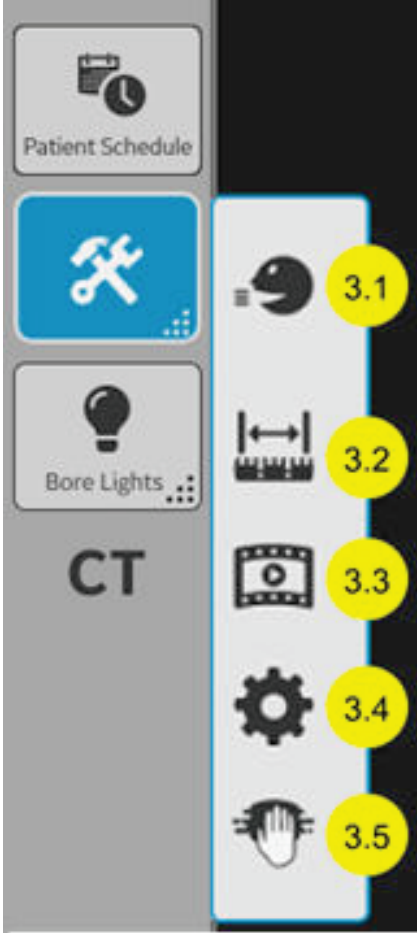
Table 16 Gantry Touch Display Indicators

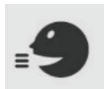
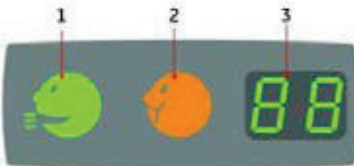




Number	Icon	Indicator/Status Area	Description
Right Information Area 			
NOTE These buttons and this information are presented on all screens. Additional buttons and information are displayed during different screen modes. Follow instructions in Gantry Touch Display – Interfaces .			
2		Table Positioning	<p>Table position indicators display updates in real time as you raise and lower the patient table.</p> <p>Pressing this icon will display or hide the Elevation and Longitudinal table indicator:</p>  <ul style="list-style-type: none"> The Elevation indicator displays the vertical height of the table, ± 0.5 mm, in relation to ISO center. The Longitudinal table/cradle indicator displays the position of the cradle based on the established anatomical reference of the patient. This reference is established using the internal, external or PET landmark. The number is preceded by an 'S' if the position is superior to the reference point or an 'I' if the position is inferior to the reference point.


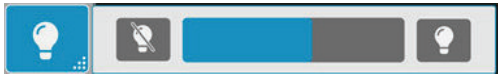




Gantry Touch Display Indicators continued			
Number	Icon	Indicator/ Status Area	Description
3		Cradle Unlatched Indicator	<p>Displayed when:</p> <ul style="list-style-type: none"> The cradle is unlatched due to excessive resistance. The Emergency Stop button is pressed. <p>The Cradle Lock button is pressed to toggle the cradle to the unlatched position.</p>
4		Interference Indicator	<p>The Interference light illuminates when cradle has encountered interference or reached travel limit (in/out and up/down).</p> <p>In the case of interference, you may need to raise or lower the table or determine if resistance is being caused by any patient restraints, accessories or by the patient.</p> <p>The light also illuminates if there is 4.5 kg (10 lb) of resistance during cradle moving in/out.</p>






Gantry Touch Display Indicators continued			
Num-ber	Icon	Indicator/Status Area	Description
Left Toolbar <div></div> <p>NOTE</p> <p>Some indicators and tools are displayed only in specific screens. Refer to the description of each indicator below for more information.</p>			
1		Patient Schedule	Press this icon to open the Patient Schedule.

Gantry Touch Display Indicators continued			
Number	Icon	Indicator/ Status Area	Description
2		Cardiac Gating Indicator	<p>The heart in the right bottom corner lights when the Cardiac Gating Monitor is connected to the Accessory Panel and the leads are connected to the patient.</p> <p>You can press this icon to display or hide the heart rate and Electrocardiogram, ECG:</p>  <p>If the ECG leads are not connected to patient the heart will be grayed out:</p>  <p>If the ECG connection has an error, a warning indication will be displayed:</p> 

Gantry Touch Display Indicators continued			
Num-ber	Icon	Indicator/Status Area	Description
3		Tools	<p>Press this icon to access list of tools available for use.</p> 

Gantry Touch Display Indicators continued			
Num-ber	Icon	Indicator/ Status Area	Description
3.1		Breath hold Light	<p>Pressing this allows you to demonstrate to the patient how to use the Breath hold Light and Countdown Timer.</p>  <ul style="list-style-type: none"> • A blinking green light indicates get ready to hold your breath. • A solid yellow light indicates to hold your breath. • Count down indicator counts down the seconds remaining until the patient can breathe. • A solid green light indicates the patient can breathe again. <p>Press the icon to play the AutoVoice message and practice breathing with the patient before starting the exam. You can select AutoVoice during CT series scans from the console.</p>
3.2		Table Move- ment Limits	<p>Press this icon, you can view the current scannable range based on the table position on the Gantry Display.</p> <p>NOTE</p> <p>The “Scannable Range” is calculated based on a limit and collision matrix, taking into account the table height and thereference point position.</p>
3.3		Movie	Click to view movie that helps explain examination procedures to patients.
3.4		Settings	Press this icon to set the functions of the Gantry Display.
3.5		Clean Mode	Press this icon to clean the screen surface.

Gantry Touch Display Indicators continued			
Num-ber	Icon	Indicator/Status Area	Description
4		Bore Light	<p>Press this icon to open light intensity control, to change the intensity accordingly to your and Patient`s preferences.</p>  <p> Press the Off button to turn the lights off.</p> <p> Press the On button to turn the lights fully on.</p>  <p>Press and adjust the scroller to set preferred intensity (fully on, fully off, or any value in between).</p> <p>NOTE</p> <p>You can also control the bore lights remotely from operator console using 'Bore Lights' button on the display desktop area (See 4.4 PET/CT Application Display Windows on page 133) or on the Remote Auto Positioning (if option is installed).</p>
5		Respiratory Gating Indicator	Displayed when Respiratory Gating Monitor is connected to the Accessory Panel .

Gantry Touch Display Indicators continued			
Number	Icon	Indicator/ Status Area	Description
6	 or 	PET Table Base Location Indicator	CT icon displays when Patient Table Base reaches CT position. PET icon is displays when Patient Table Base reaches PET position. When Table Base is in between CT and PET positions, no icon is displayed.
7		Laser Light Indicator	<p>The Laser Light Indicator is illuminating when the laser alignment button light is on. Normally, this light is ON only when positioning a patient.</p> <div style="display: flex; align-items: center;">  <div style="margin-left: 10px;">  <p>FOR PATIENT SAFETY, IT IS IMPORTANT TO ALWAYS HAVE PATIENTS CLOSE THEIR EYES ANYTIME THE LASER ALIGNMENT LIGHT IS ON.</p> </div> </div>

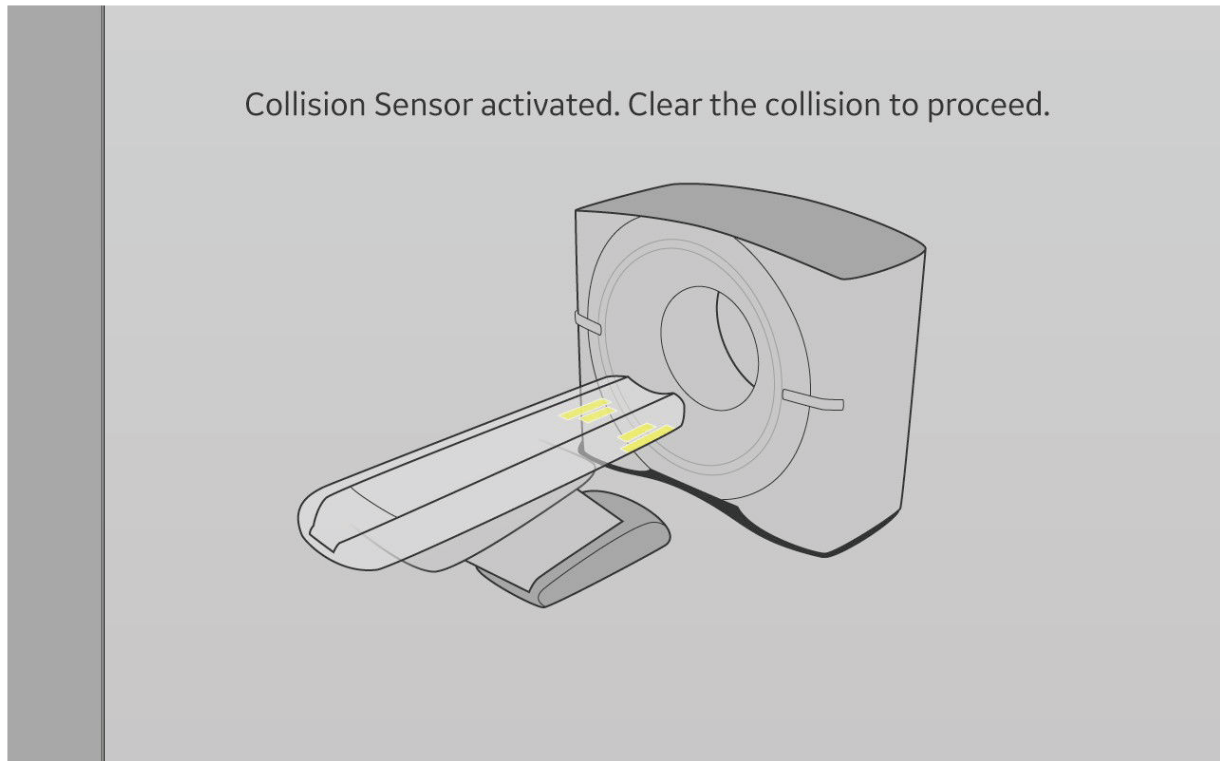
4.2.1.2.1 Collision

When a collision sensor on the table or gantry detects that a collision has occurred, the ***Collision Status Indicator*** is displayed on the Gantry Display:

- A table collision sensor or pressure plate makes contact with a foreign object.
- The optional 2m table extender makes contact with the Front Gantry Cover.
- The interference matrix, created during table characterization, senses that the cradle will run into the gantry covers when the table height is too low. The interference matrix stops table motion before the collision occurs.
- The Indicator displays the scanner image and highlights the triggered collision sensor.

According to the indicated position, find the location where the collision occurred, and move the table or clear the colliding object.

Figure 28 Collision Indicator



4.2.1.2.2 Emergency Stop

Table 17 System Emergency Buttons



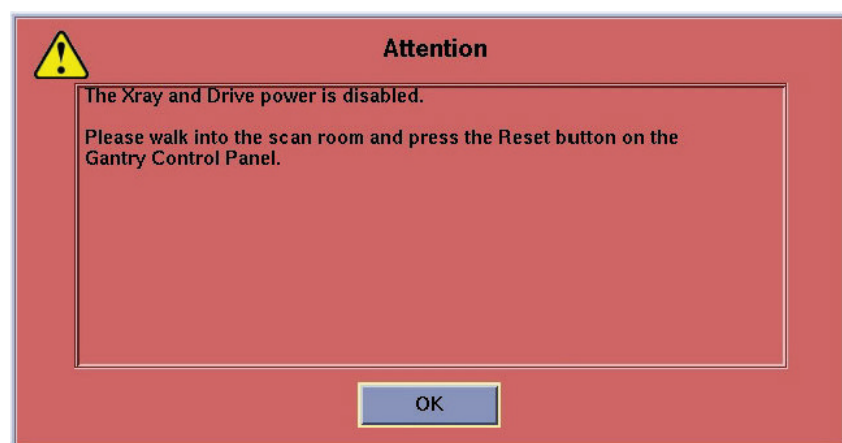
Number	Button	Indicator/Key	Description
1		Emergency Stop Button	Press the Emergency Stop button to halt all table and gantry motion, stop any active X-ray, turn off the alignment lights, if enabled, and unlatch the cradle and patient transport. The system aborts any scan in progress, discards the associated data and attempts to save all data acquired prior to the abort.
2		System Emergency OFF Button	<p>Press the System Emergency OFF button (red circular button located on the wall close to the operator console) in the event of a fire, flood, earthquake or any other catastrophic emergency, to power off the system. Pressing the System Emergency OFF immediately deactivates all power to the system.</p> <p>To reset the Emergency OFF Button:</p> <ol style="list-style-type: none"> 1. Activate mains power supply to the system using the Main Disconnect Panel / switch. Power to the Power Distribution Unit (PDU), operator console, and system electronics will be restored. 2. Press the Reset gantry key on the gantry panel. Power to the gantry drives, X-ray system and table drive will be restored. <p>NOTE</p> <p>In the event of using System Emergency OFF, the system has no time to save data, or shutdown in an orderly fashion, thus can corrupt system files or result in loss of patient data.</p>

Figure 29 Attention message - Reset



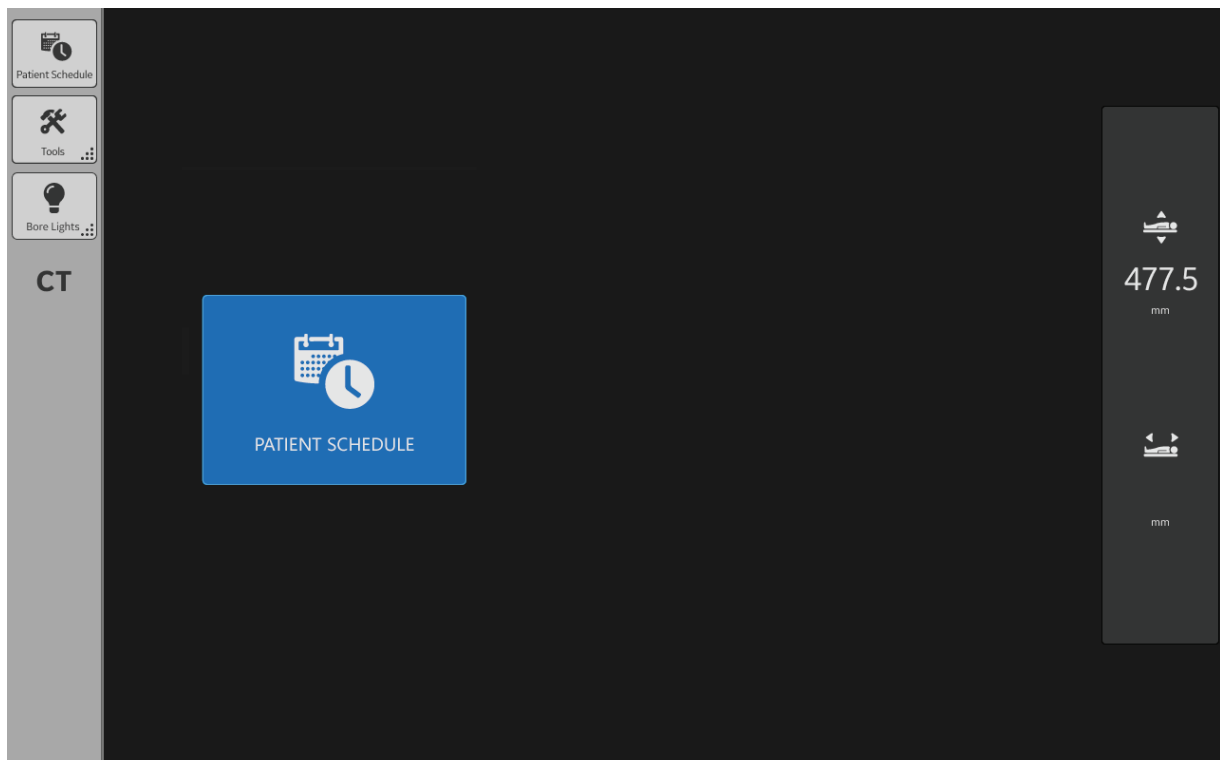
4.2.1.2.3 Gantry Touch Display - Interfaces

The Gantry Display Interface can display the following status:

- Idle Interface
- New Patient Interface
- Scout Scanning Interface
- Scan Interface
- Configuration Interface
- PET Calibration and DQA Interface

4.2.1.2.3.1 Idle Interface

Figure 30 Gantry Touch Display – Idle Interface



Click on **Patient Schedule** to open Patient Schedule window and select patient from the list.

Figure 31 Patient Schedule

Name	Patient ID	Accession#	Gender	Age	Exam Description	Date/Time
Jonathan Moore	400-89-067	2019030001	M	78	Chest Routine	08:30 02/28
Akira Shamaoko	5871-4809	2019030002	F	60	C-Spine	08:35 02/28
Tad Wells	891-7512	2019030003	M	58	Abd/Chest Abd Pelvis (with)	08:40 02/28
Robert Sullivan	648-14985	2019030004	M	72	Abd/ Pelvis	08:45 02/28
Wendy Krause	8945-1231	2019030005	F	59	Head CTA	08:50 02/28
Suzy Armstrong	900-12358	2019030006	F	71	Chest/ Abd/ Pelvis	08:55 02/28

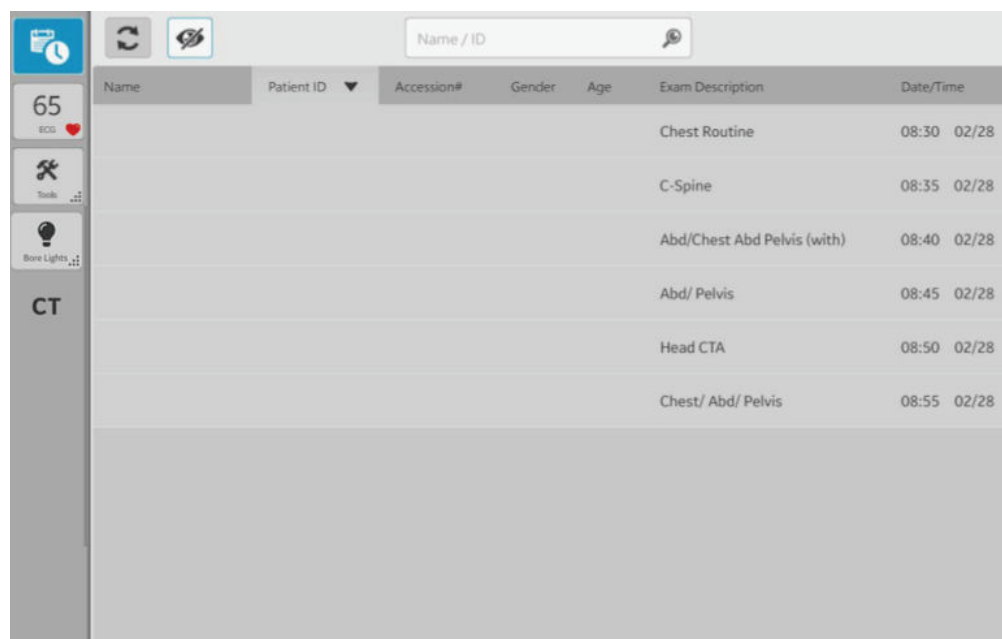
Table 18 Patient Schedule Icons

1		Patient List
2		Refresh
3		Hide Patient Information
4		Search Box

Patient Schedule includes patient list, Refresh, hide patient information and Search Box. Each column in the patient list can contain the Patient's Name, ID, Date of Birth or Age, Exam Date and Time, Exam Description, Exam Session Number, etc. The list can be sorted by Name, ID or Exam Date and Time. Press the header of the corresponding column to sort the column ascending or descending. The user can select which content displayed in the patient list. If changes are needed, please contact GE field engineer or application representative.

Patient list information is obtained from the RIS server. If you need to refresh the listed information, you can press the Refresh icon on the Toolbar. If you need to hide a patient's private information (Name, ID, Date of Birth, or Age), you can press the Hide Patient Information icon. Press the icon again to redisplay the patient information.

Figure 32 Patient Schedule with Hide Patient Information option activated



Name	Patient ID	Accession#	Gender	Age	Exam Description	Date/Time
					Chest Routine	08:30 02/28
					C-Spine	08:35 02/28
					Abd/Chest Abd Pelvis (with)	08:40 02/28
					Abd/ Pelvis	08:45 02/28
					Head CTA	08:50 02/28
					Chest/ Abd/ Pelvis	08:55 02/28

The user can drag the scroll bar on the right of the Patient List to look through patients. The user also can find the patient by searching function with the Patient Name or ID in Search Box, then select the patient to create new exam. The Gantry Display will enter the New Patient Interface. If you want to exit Patient Schedule without selecting any patients, you can press the Patient Schedule icon in the top left corner to exit Patient Schedule.

4.2.1.2.3.2 New Patient Interface

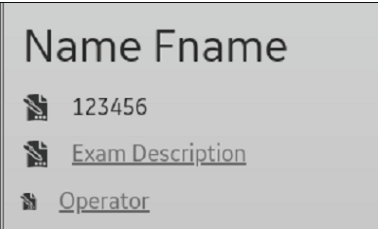
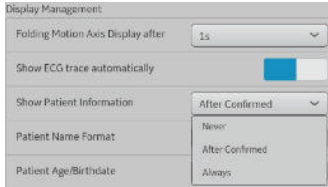

In the New Patient Interface, the user needs to confirm patient information, select desired anatomical area and protocol.


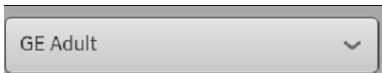
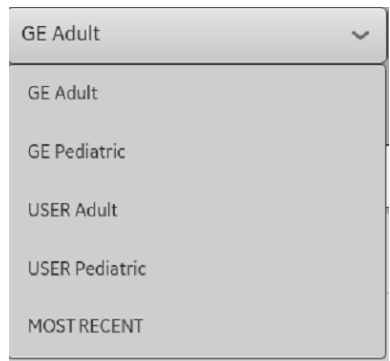
Figure 33 New Patient Interface

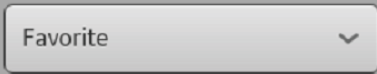
The screenshot displays the 'New Patient Interface' with the following components and numbered callouts:

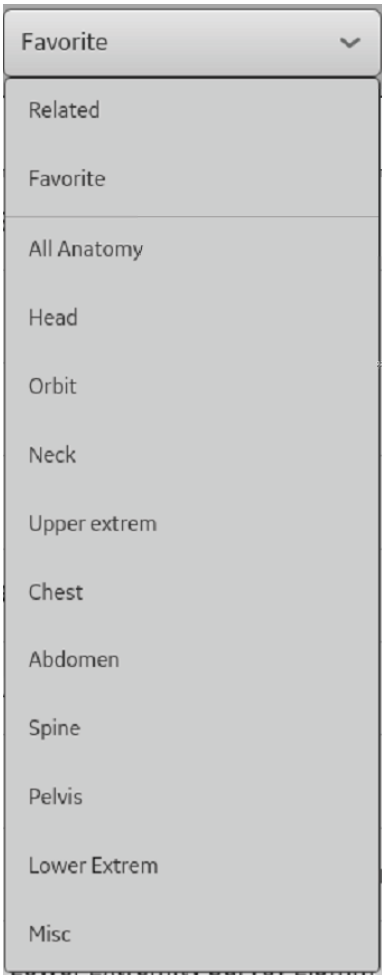

- 1**: Patient information section containing 'Name Fname', '123456', 'Exam Description', and 'Operator'.
- 2**: 'GE Adult' dropdown menu.
- 3**: 'Favorite' dropdown menu.
- 4**: Empty text input field.
- 5**: List of exam protocols including '21.16 PTCT_Brain', '22.1 Sinus Supine Helical + DMPR', '23.1 C-Spine C5-C7 Axial', '24.1 Shoulder 2.5mm + DMPR', '25.39 PTCT_Rb_Rest-Stress', '26.31 PTCT_ET', '27.1 L-Spine 3 Level Axial', '28.1 Pelvis for Fracture + DMPR/SmartmA', '29.1 Lower Extremity Survey 2.5mm', and '30.1 Quality Assurance'.
- 6**: Human body diagram with anatomical icons for brain, eye, lungs, stomach, and joints.
- 7**: Vertical navigation bar on the right with a top icon and a '0 mm' scale indicator.
- 8**: Confirmation button with a checkmark icon at the bottom right.

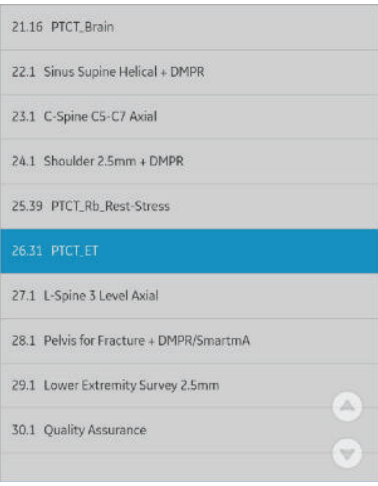

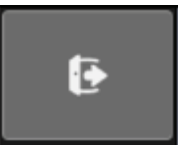

Table 19 New Patient Interface Icons

1	 <p>The screenshot shows a patient information panel with the title 'Name Fname'. Below the title, there are three entries, each with a small icon and text: '123456', 'Exam Description', and 'Operator'.</p>	<p>Patient Information</p> <p>Patient information and exam description is displayed at the top left of the interface. User need to confirm this information before scan. If you need to change patient, you can press the Patient Schedule icon on the Left Toolbar and reselect from the list.</p> <p>The display of patient and exam description can be switched On/Off from Touch Display or Console, as described below.</p> <ul style="list-style-type: none"> From Touch Display (remote or from scan room): <p>From the left tool bar, press on Tools -> Settings -> Preference (See Configuration Interface)</p> <p>Under Display Management, turn On/Off Show Patient Information.</p>  <p>NOTE</p> <p>You can also show/hide Exam Description, Radiotracer Name and Selected Protocol Name from the Preference Interface on Touch Display, under Display Management:</p> 
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		<ul style="list-style-type: none"> From Console User Interface - in Patient Orientation Area:  <p>NOTE</p> <p>If you need to change Patient Information default display status, please contact GE field engineer or application representative.</p>
2		<p>Protocol Category Selection Box</p> <p>Click this box to toggle between GE and User protocol, for both Adults and Pediatrics.</p> 

3	 A rectangular button with a light gray gradient background. The word "Favorite" is centered in a dark gray font. A small downward-pointing chevron icon is located on the right side of the button.	<p>Protocol Anatomy Selection Box</p> <p>Click this box to toggle between protocols categorized by anatomy.</p> <p>In addition to anatomy:</p> <ul style="list-style-type: none">• User can select <i>Favorite</i> option to access protocols added to Favorite list specified by user (See Build a Protocol).• User can select <i>Related</i> option to look for the most relevant protocols according to Exam Description of the selected Exam. <p>NOTE</p> <p>Related Protocol is compatible with CT protocols only. For more information refer to CT User Manual shipped with your system.</p>
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4		<p>Keywords Search Box</p> <p>Use this field to type in keywords of the desired protocol for a quick search.</p>

5		<p>Protocol List</p> <p>List of protocols displayed based on the prescribed categories and keywords.</p> <p>Select the desired protocol to proceed.</p>
6		<p>Examination anatomy Selector and Selection Icon</p> <p>User can press on anatomical area or press one of the nine icons, each represent different anatomies, or select anatomical area in the Protocol Selection Box to choose protocol</p>
7		<p>Exit button</p> <p>Use this Exit button to Exit to main window on touch screen.</p>
8		<p>Confirm Button</p> <p>Click this button to confirm patient information and protocol selection and proceed to Scout scanning Interface (if the selected protocol does not have a scout scanning, it directly goes to the Scan Interface).</p>

4.2.1.2.3.3 Scout Scanning Interface

In the Scout Interface, user checks the position of the patient and confirm/sets the scan range of scout.

NOTE

Patient Positioning can be performed manually, automatically and or remotely. Refer to [Position the Patient for a Standard PET/CT](#) for instructions on Patient Positioning options.

Information displayed below refers to Scout Scanning with Auto Positioning Option.

Figure 34 Scout Planning Interface with Auto Positioning Option

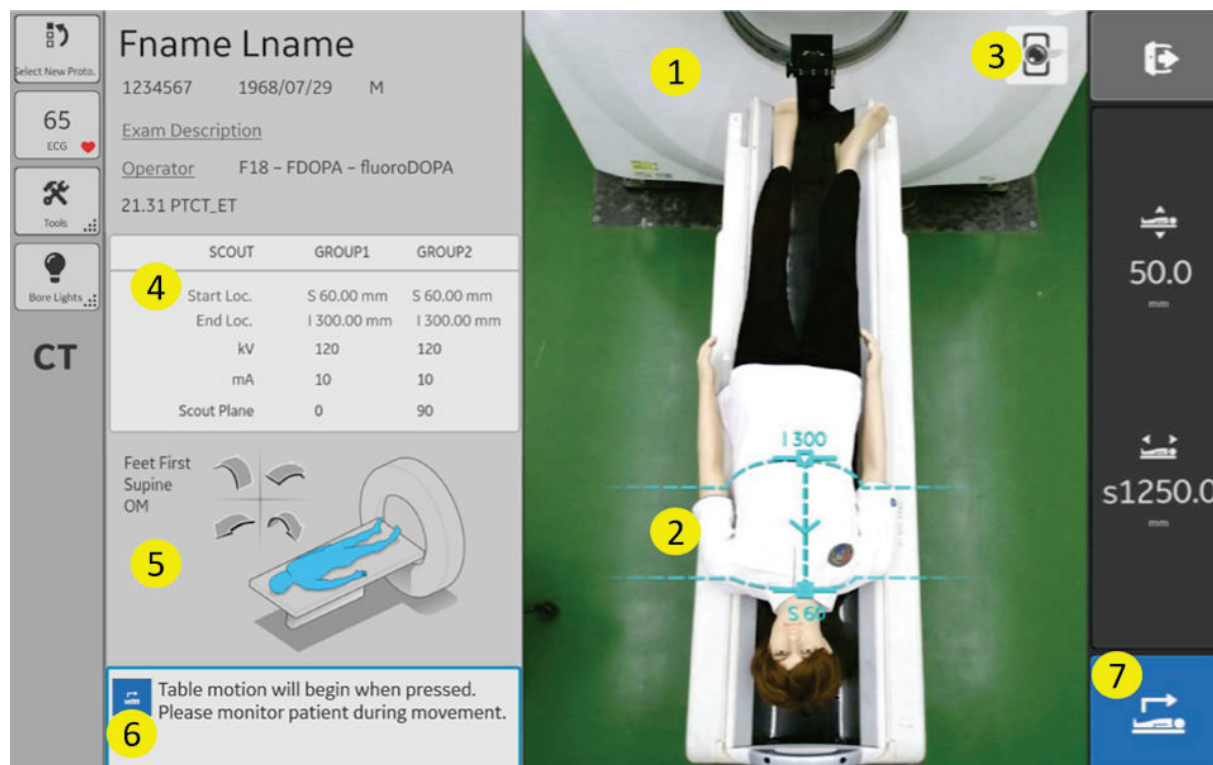
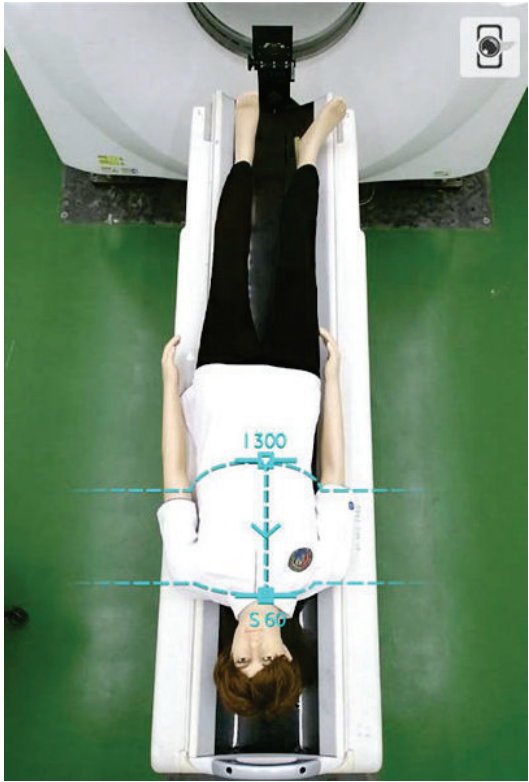



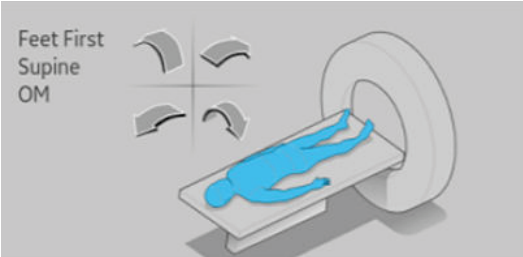
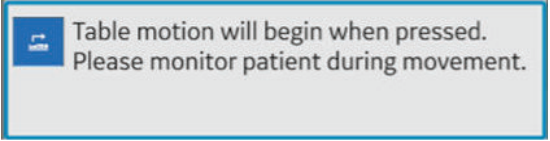



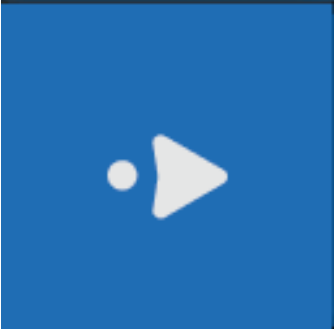


Table 20 Scout Planning Interface Icons

1		<p>Patient Video</p> <p>Streaming video of patient through Xstream camera mounted on the ceiling.</p> <p>The video is used for live planning and confirmation of the scout.</p>
2		<p>Scout Range Indicator</p> <p>Scout Range indicator is automatically displayed based on anatomical reference and scout range set in the protocol selected for examination.</p> <p>User can manually modify scout range by dragging the edges of the scan range to desired location.</p>
3		<p>Camera icon</p> <p>Camera icon indicates that the auto detection algorithm is On,</p> <p>Camera icon with slash indicates that the auto detection algorithm is stopped:</p> 

4	<table border="1"> <thead> <tr> <th>SCOUT</th><th>GROUP1</th><th>GROUP2</th></tr> </thead> <tbody> <tr> <td>Start Loc.</td><td>S 60.00 mm</td><td>S 60.00 mm</td></tr> <tr> <td>End Loc.</td><td>I 300.00 mm</td><td>I 300.00 mm</td></tr> <tr> <td>kV</td><td>120</td><td>120</td></tr> <tr> <td>mA</td><td>10</td><td>10</td></tr> <tr> <td>Scout Plane</td><td>0</td><td>90</td></tr> </tbody> </table>	SCOUT	GROUP1	GROUP2	Start Loc.	S 60.00 mm	S 60.00 mm	End Loc.	I 300.00 mm	I 300.00 mm	kV	120	120	mA	10	10	Scout Plane	0	90	<p>Scout Parameter</p> <p>Scout parameters are inherited from the protocol selected for examination.</p> <p>User can adjust start and end location of the Scout Range. The system sets the optimal table height based on the Scout Range.</p>
SCOUT	GROUP1	GROUP2																		
Start Loc.	S 60.00 mm	S 60.00 mm																		
End Loc.	I 300.00 mm	I 300.00 mm																		
kV	120	120																		
mA	10	10																		
Scout Plane	0	90																		
5		<p>Patient Position Area</p> <p>User can set patient position by pressing the arrow icons to change the head first/feet first orientation and to rotate the model in 90° increments to set supine, prone, left and right decubitus.</p> <p>If Auto Positioning option is installed, the system automatically recognizes patient position. If it is different from protocol settings, system will request user to make modifications.</p>																		

6		<p>Instruction to User Area</p> <p>Follow instructions displayed in this area to proceed.</p>
7		<p>Confirm and Table Move In</p> <p>Confirm Scout planning prescription and patient positioning to start table movement to start scanning position.</p> <p>Monitor patient during table movement.</p> <p>NOTE</p> <p>he icon on this button indicates the table automatic motion direction after click based on actual table elevation motion direction. The animated icon may be one of the below:</p> <div>  </div> <p>If Auto Positioning option is not installed, Confirm button is enabled once Landmark is set. The icon button displays:</p> <div>  </div> <p>If the Pause button is pushed during table movement, user can push the Resume button to resume table movement. The Resume icon looks as follows:</p> <div>  </div>

When the user presses **Confirm** and the **Table Move In** button, table will start moving to start scan position. User can pause table movement at any time using **Pause** button displayed on the screen. User can then continue table movement.

Figure 35 Scout Interface – table move in screen

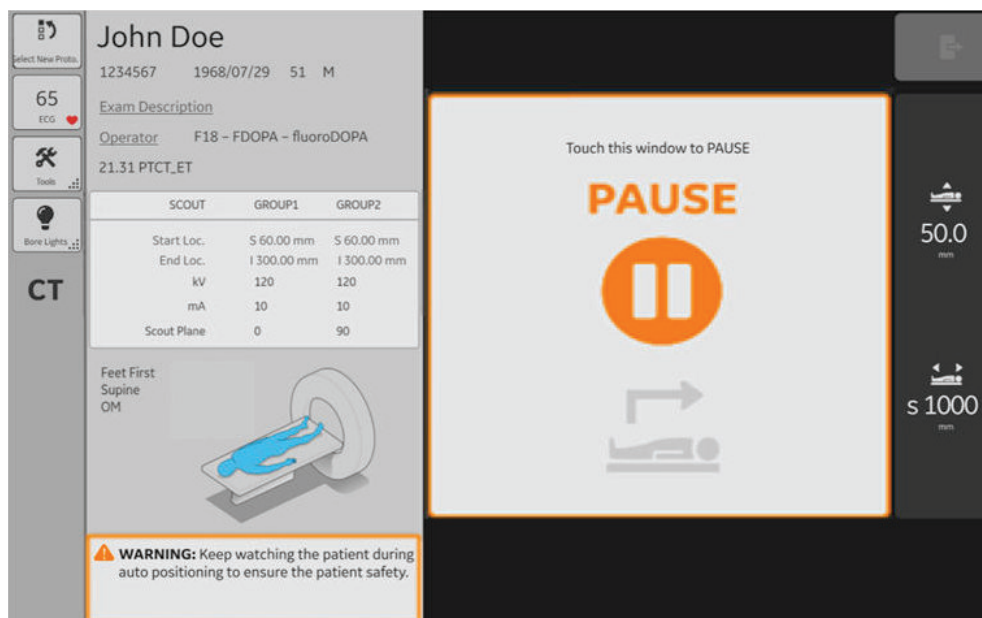
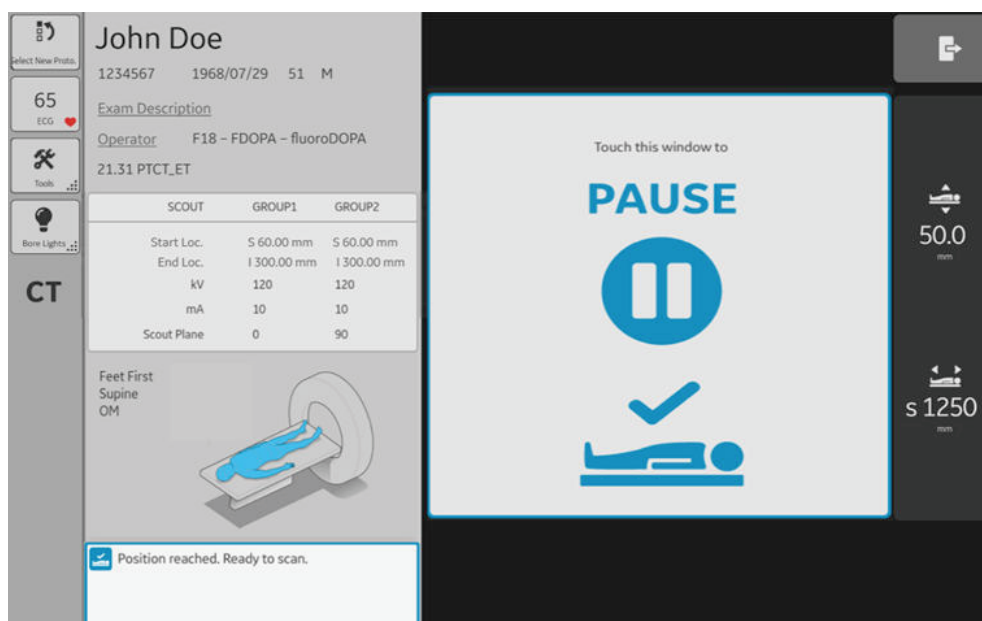


Figure 36 Scan Interface – table moved to start scan position screen

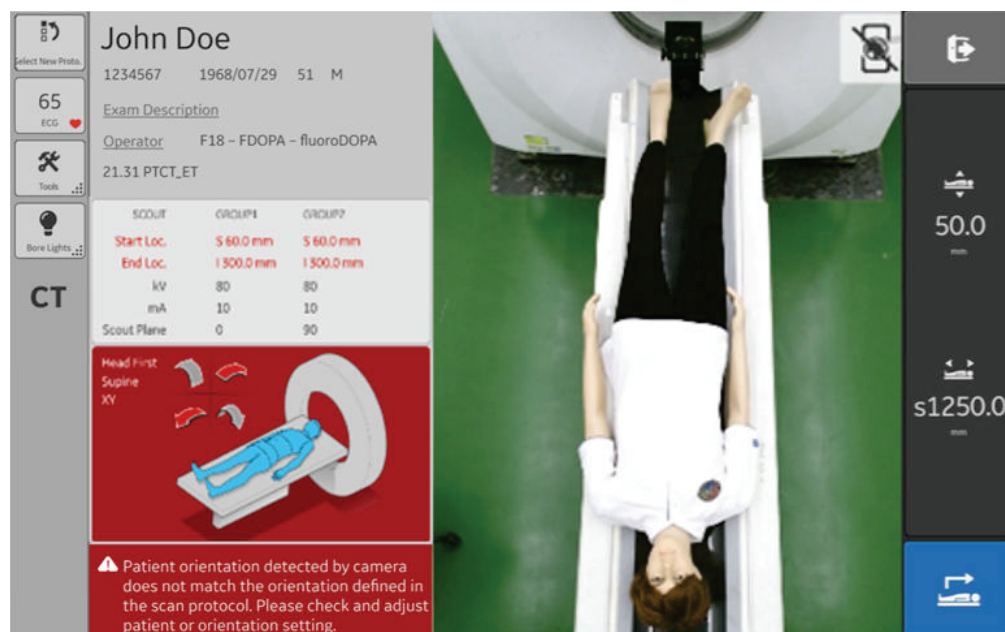


NOTE

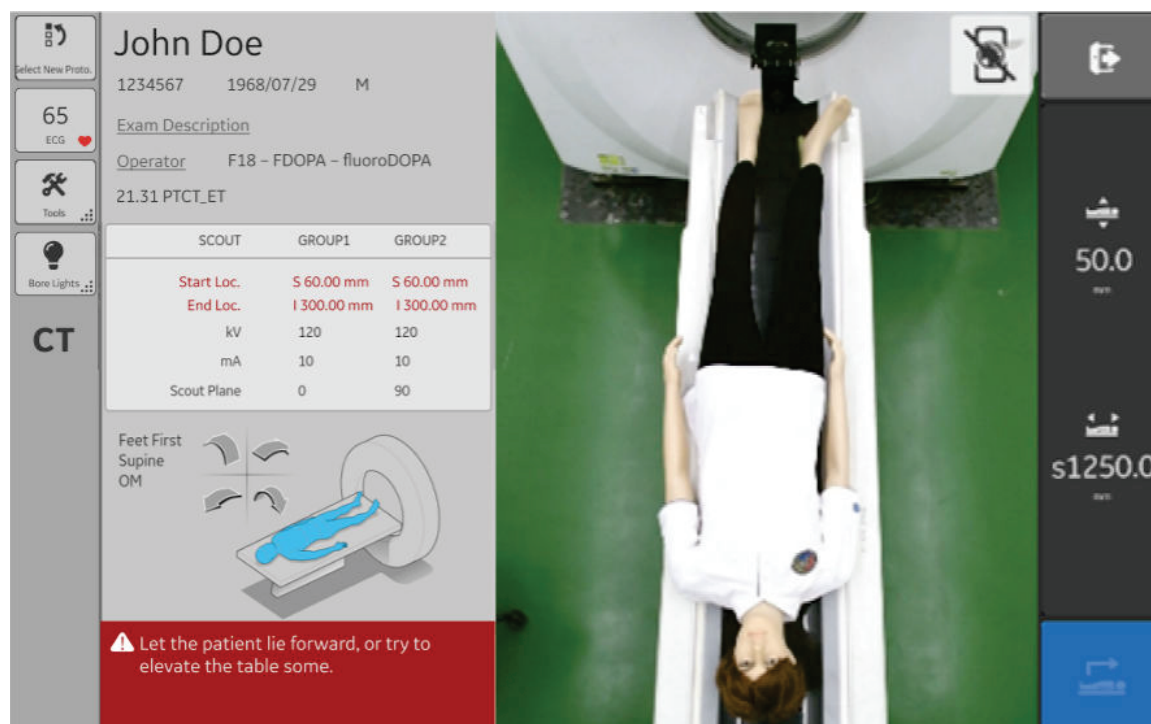
Table base must be in CT scan position in order to start Auto Positioning or Remote Auto Positioning. If the table base is not in CT position, hold and continuously press the **CT Scan Position** button on the Gantry panel until it reaches CT scan position and the CT scan position lights up on the gantry display.



If patient's orientation detected by Xstream camera does not match the orientation defined on the touch screen, the **Table Move In** button is disabled. Read information displayed in the **Instruction to User Area**. User can press the arrow icons to change patient orientation, table move in icon is enabled when both orientations are matched. If **Table Move In** button is disabled and user still want to move table in, manually position patient can be performed by pressing the **Internal** or **External Landmark** button.

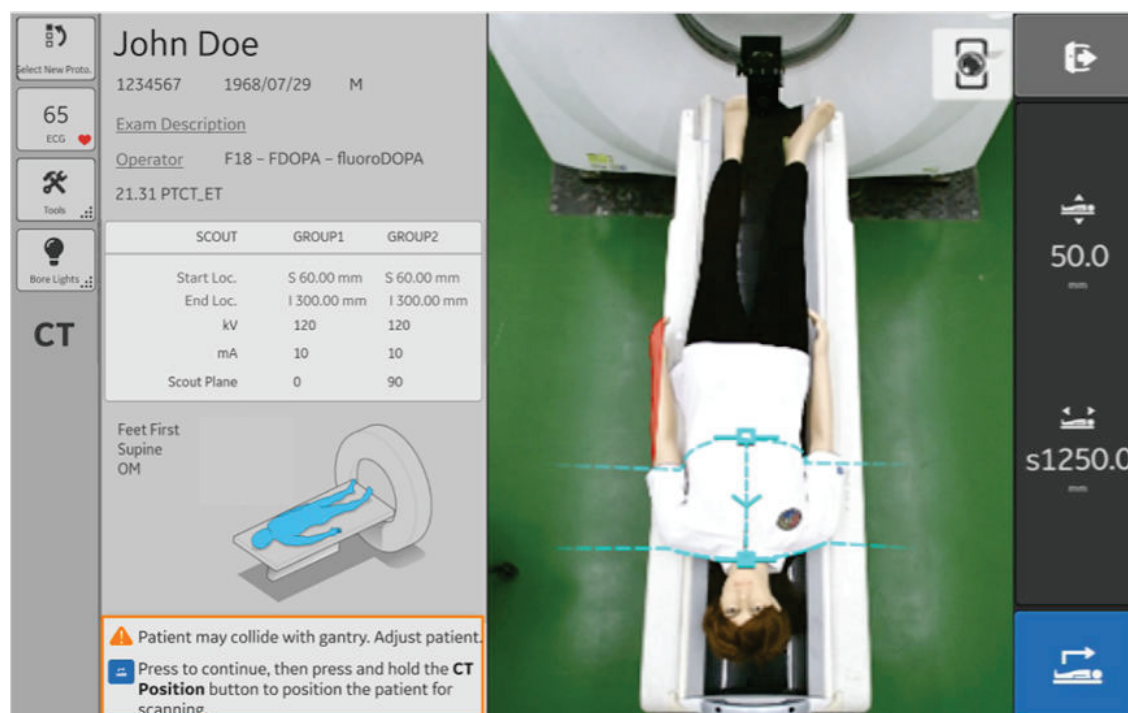
Figure 37 Scout Interface – patient orientation mismatch screen

If table is out of the Xstream mounted camera video range, use the gantry motion buttons to adjust table and cradle height or longitudinal position to allow patient be inside the proper video range.

Figure 38 Scout Interface – patient out of proper video range

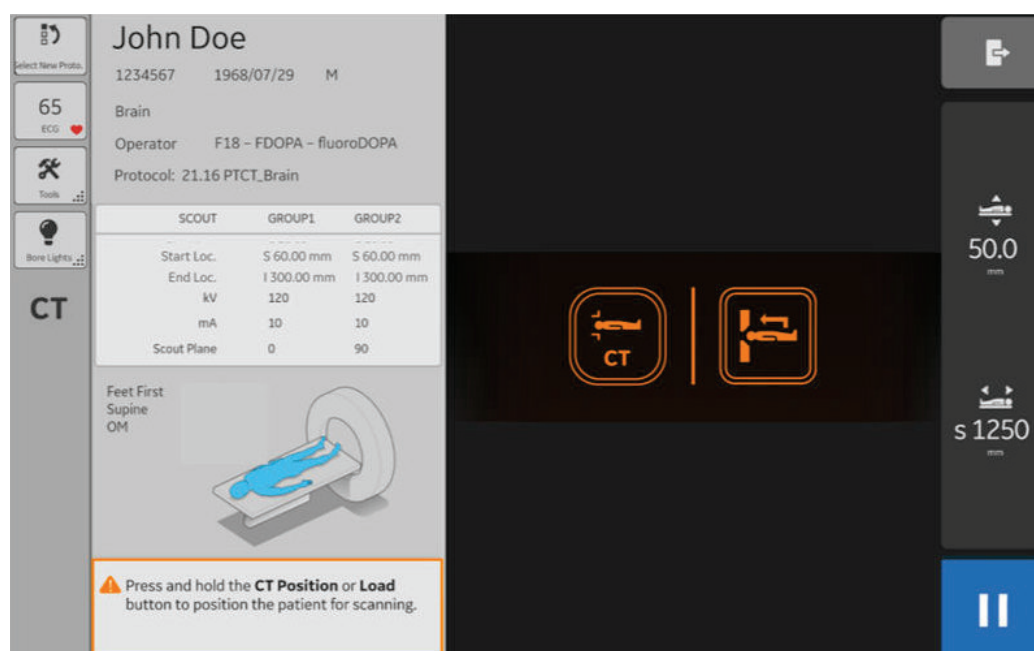
If a collision condition is detected, user needs to clear the collision for the patient in order to move cradle in automatically. Alternatively, user can continue patient positioning manually. Ensure no collision can occur when moving the table manually. Detected Collision location is displayed in **Patient Video**. Follow instructions displayed in **Instruction to User Area** to proceed. Refer to [Remote Auto Positioning](#) below.

Figure 39 Scout Interface – collision detected screen



NOTE

You may still proceed with the positioning process even if the prediction of collision persists, but table motion to start location will be controlled by you (and performed automatically). To do so, press **Confirm** button. Then hold and continuously press the **CT Scan Position** button on the Gantry Control Panel, or the **Load** button on the Remote Control Panel if installed, to move table to the start scantarget position. Motion of the table will stop once target is reached.

Figure 40 Confirming Auto / Remote Auto Positioning under possible collision condition

DURING TABLE MOTION TO THE START POSITION, MAKE SURE TO KEEP OBSERVING THE PATIENT FOR POTENTIAL COLLISION OF THE PATIENT BODY WITH THE PET-CT GANTRY DUE TO PATIENT MOTION OR DAMAGE TO DEVICES CONNECTED TO THE PATIENT LIKE INTRAVENOUS INJECTORS, ANASTHESIA MACHINES OR ECG GATING DEVICES.



KEEP OBSERVING THE PATIENT DURING AUTO TABLE MOVING FROM THE CAMERA MONITORING SYSTEM TO AVOID POTENTIAL COLLISION OF THE PATIENT BODY WITH THE CT GANTRY OR DAMAGES TO DEVICES CONNECTED TO THE PATIENT.

NOTE

At any time during scout planning process, user can exit the examination by pressing the upper right **Exit** button.

4.2.1.2.3.4 Scan Interface

The Scan Interface displays the Preparation Delay Timer and PET information (Gama Count and PET remaining scan time) during PET scan in hybrid scans (right information area height is reduced in

during hybrid scans). This screen also allows the user to quit the examination before and after scan time.

Figure 41 Scan Interfaces Top: hybrid CT pre scan delay screen, Bottom: hybrid CT scan screen

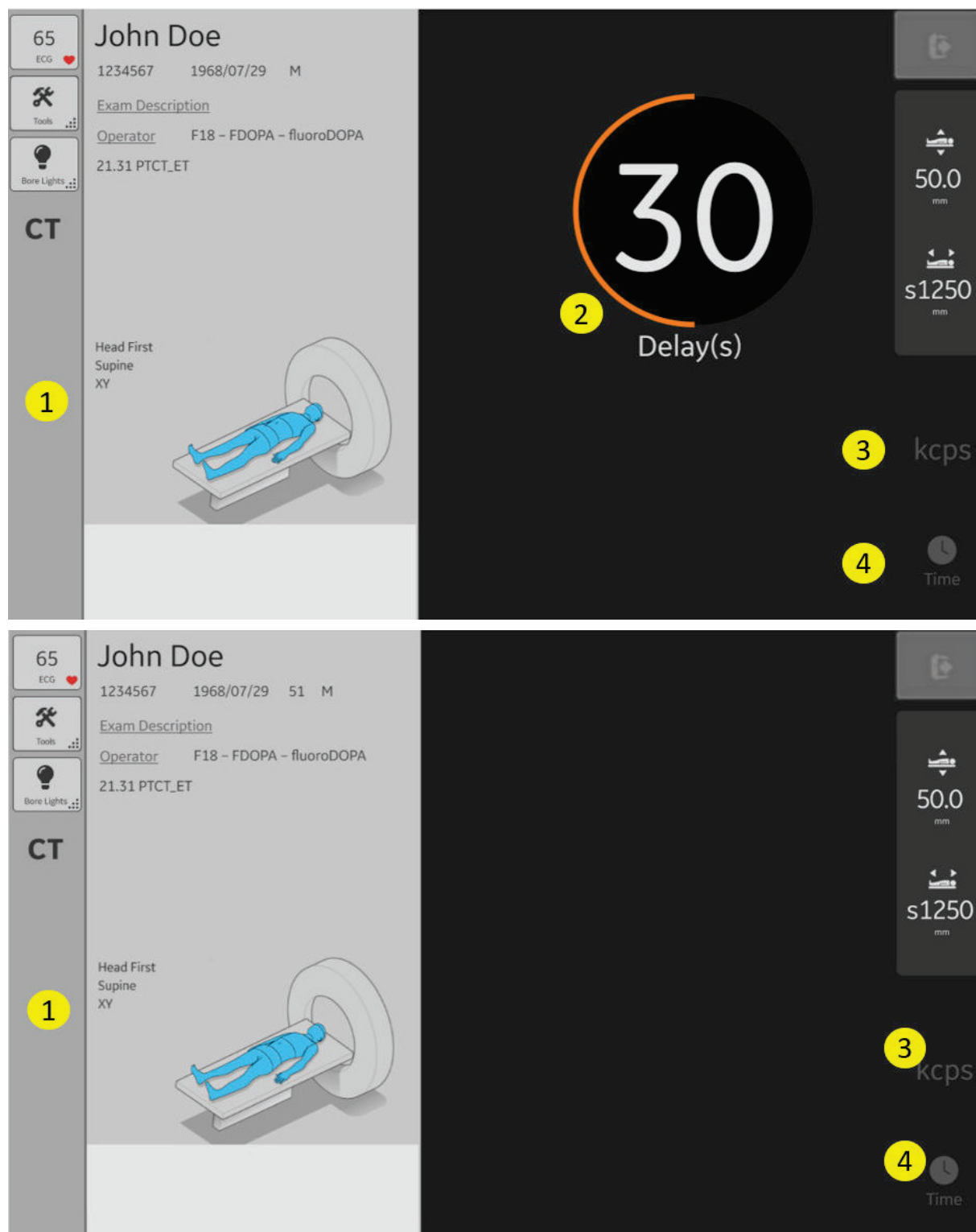


Figure 42 Scan Interfaces: Top: hybrid PET pre scan delay screen, Bottom: hybrid PET scan screen

Figure 43 Scan Interfaces: Top: CT standalone pre scan delay screen, Bottom: CT standalone scan screen

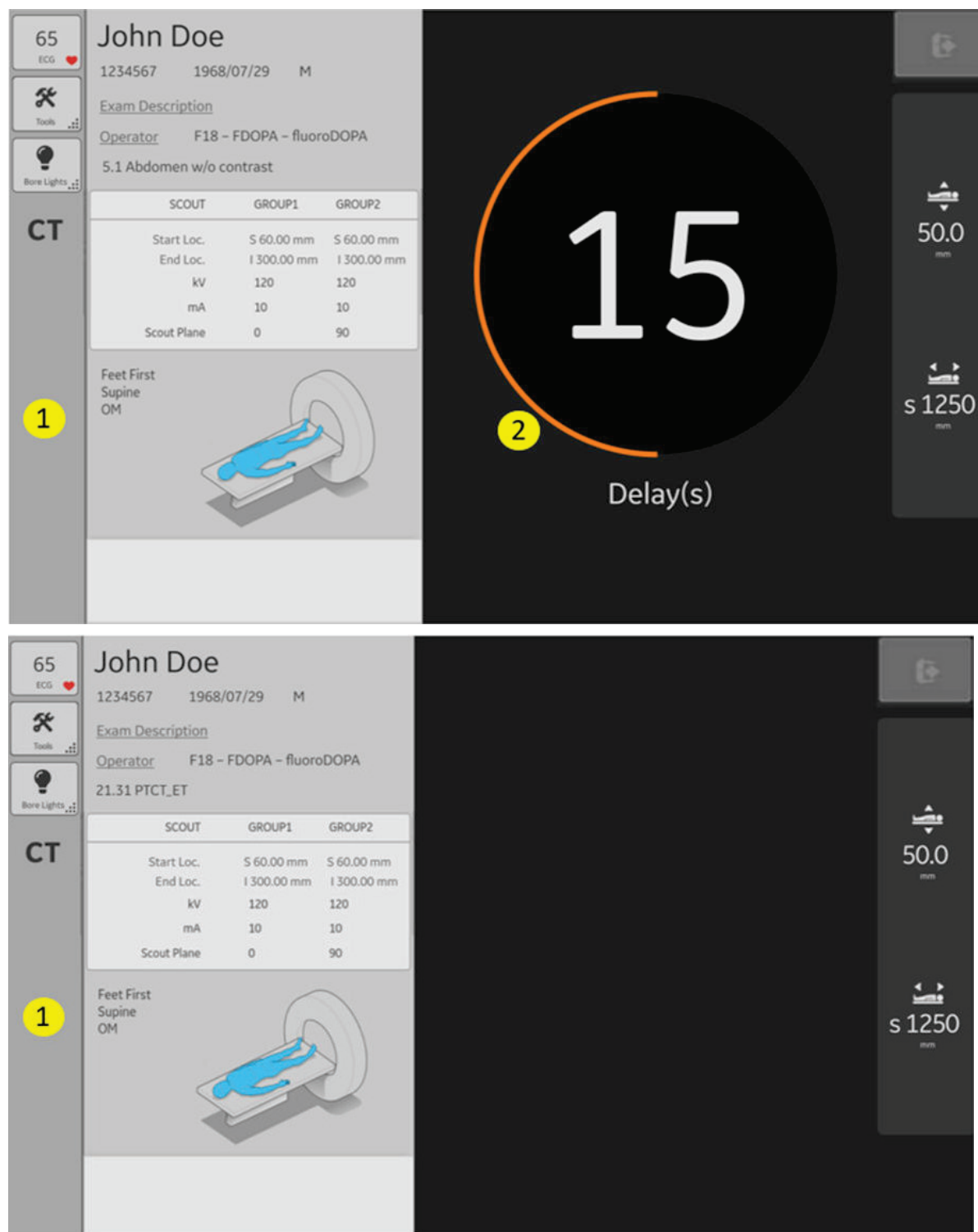


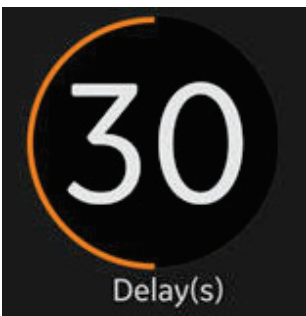
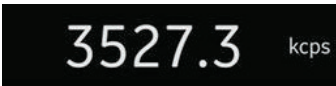
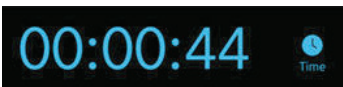


Table 21 Scan Interface Icons

1	 or 	<p>Table Base Location Indicators</p> <p>During CT scan, CT Table Base Indicator is displayed.</p> <p>During PET scan, PET Table Base Indicator is displayed.</p>
2		<p>Prescan delay time.</p> <p>Displays in seconds and counts down a preparation delay before the scan starts.</p> <p>When under 10 seconds remain, the orange bar becomes red.</p>
3		<p>During PET Scan only, the system detects a PET radiation source and displays Gamma Count Rate in units of kilocounts/second.</p> <p>Gamma Count is displayed after scan is approved and table reach scanning position.</p> <p>In CT standalone protocols, the counter does not appear at all.</p>
4		<p>During PET Scan only, PET Remaining Scan Time is displayed in format of hours:minutes:seconds.</p> <p>Scan time counts down until the current PET scan ends.</p> <p>Remaining scan time is displayed after scan is approved and table reach scanning position.</p> <p>In CT standalone protocols, the counter does not appear at all.</p>

4.2.1.2.3.5 Configuration Interface

Users can configure display preference and monitor setup by pressing on **Tools > Settings** from the Left Toolbar.

Press on Preference to configure display preferences including:

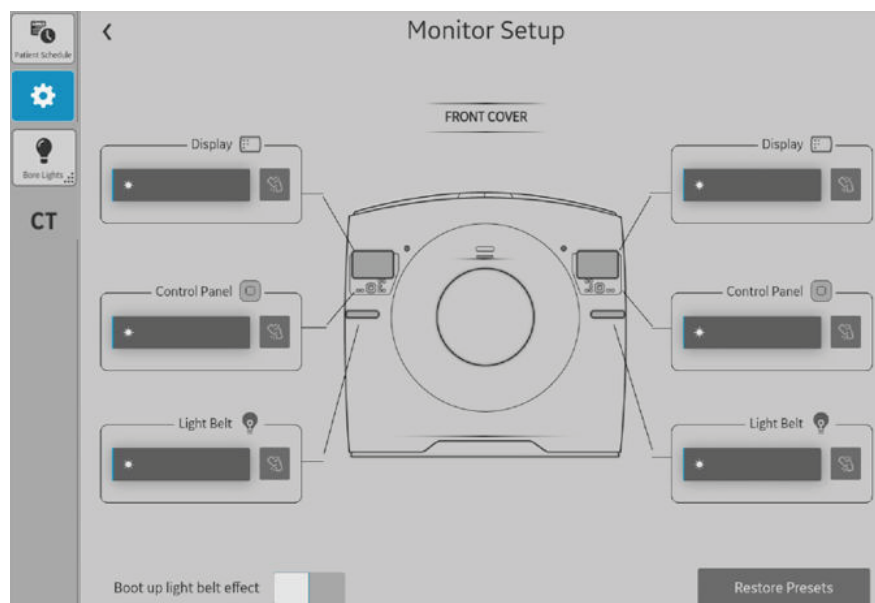
- Protocol Management: Select whether to display Default Protocols (Protocols in Favorite list) or Related Protocols.
- Display Management: Configure show/hide and format of displayed information.
- Patient Schedule Management: configure show/hide information in Patient Schedule.

Figure 44 Configuration Interface - Preference

The screenshot shows the 'Preference' configuration screen. On the left is a sidebar with icons for 'Patient Schedule', 'Settings', and 'Bone Lights', and the text 'CT'. The main area is titled 'Preference' and contains three sections:

- Protocol Management:** A dropdown menu for 'Protocol displayed by default' is set to 'Default Protocols'.
- Display Management:** A list of settings:
 - 'Folding Motion Axis Display after' is set to '1s'.
 - 'Show ECG trace automatically' is a checked toggle.
 - 'Show Patient Information' is set to 'Always'.
 - 'Patient Name Format' is set to 'Alphabetic'.
 - 'Patient Age/Birthdate' is set to 'Birthdate'.
 - 'Show Exam Description' is a checked toggle.
 - 'Show Radiotracer Name' is a checked toggle.
 - 'Show Selected Protocol Name' is a checked toggle.
- Patient Schedule Management:** A toggle for 'Privacy Mode Switched On by Default' is checked. Below it are dropdown menus for:
 - 'Patient Name': 'Hide in Privacy Mode'
 - 'Patient ID': 'Always'
 - 'Accession#': 'Always'
 - 'Age': 'Always'
 - 'Birthdate': 'Always'
 - 'Gender': 'Always'
 - 'Exam Description': 'Always'
 - 'Date/Time': 'Always'

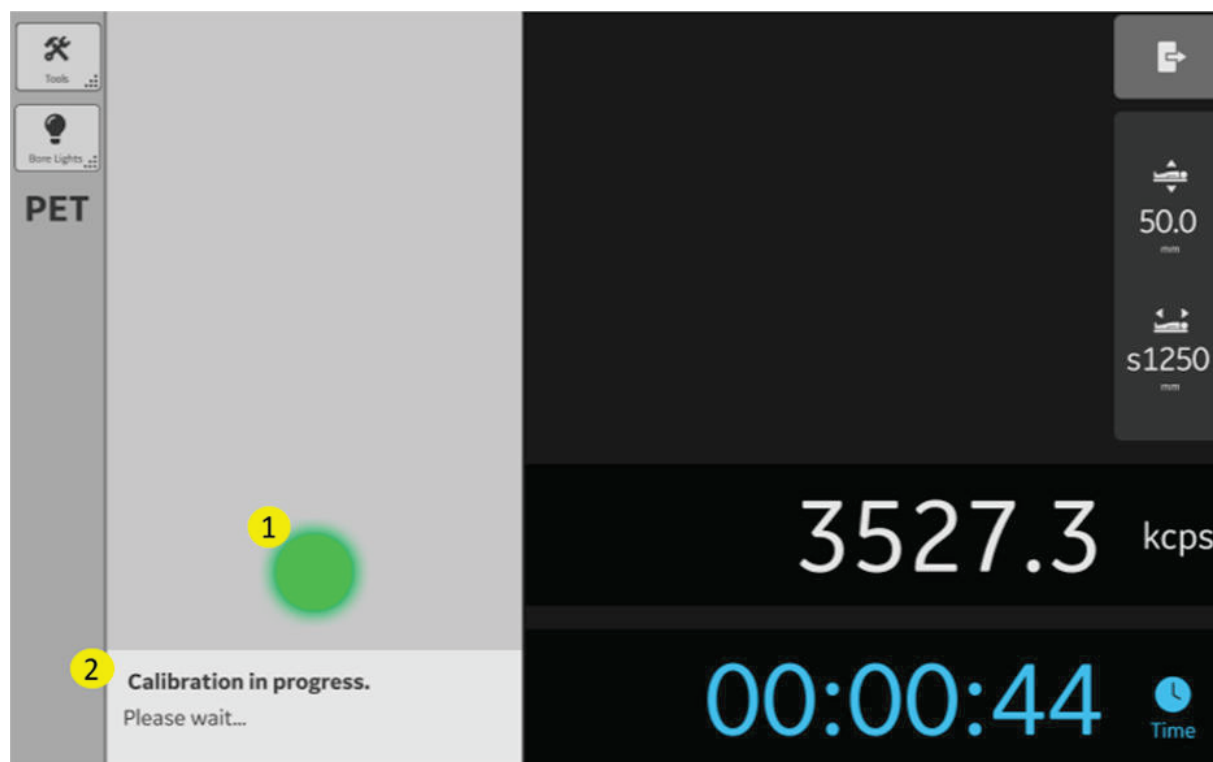
Press **Monitor Setup** to configure brightness of Display, Control Panel backlight and Light Belt.


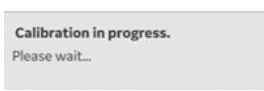
Figure 45 Configuration Interface – Monitor Setup

4.2.1.2.3.6 PET Calibration and DQA Interface

During PET Calibration, Gantry Touch Display provides Calibration process indicator.

Same indication, with the same rules appears also during daily QA (with messages dedicated to DQA).

Figure 46 PET calibration screen**Table 22 PET calibration indicators**

1		Calibration/DQA Mode Indicator	Icon blinks green during planning for DQA or PET calibrations. Icon solid green during DQA or calibrations scan. Icon gray when scan is done (completed or stopped). Otherwise, indication is hidden.
2		Calibration/DQA Status Message	In Instructions to User Area , status of calibration is displayed. Follow instructions when displayed to proceed.

4.2.1.3 Remote Auto Positioning (Optional)

The Remote Auto Positioning is optional and if installed, it allows you to view and use the gantry display and most of the gantry control panel capabilities remotely, from the Operator Console.

These capabilities include the use of Auto Positioning remotely, thus allowing positioning of patients from the operator console. See Automatic and remote patient positioning with Auto Positioning (Optional) section for more details.

All other gantry display capabilities are also available from the Remote Auto Positioning option. See Gantry Touch Display section for more details on the capabilities and how to use them.

When this option is installed, a **Remote Auto Positioning** button is added on the rightmost side of the Scan Monitor Toolbar, on the left console monitor.



The **Remote Auto Positioning** button is available at the console until scout scan is approved, and scout scan position is reached. Then the remote auto positioning view is closed and the button becomes disabled (until current exam is completed).

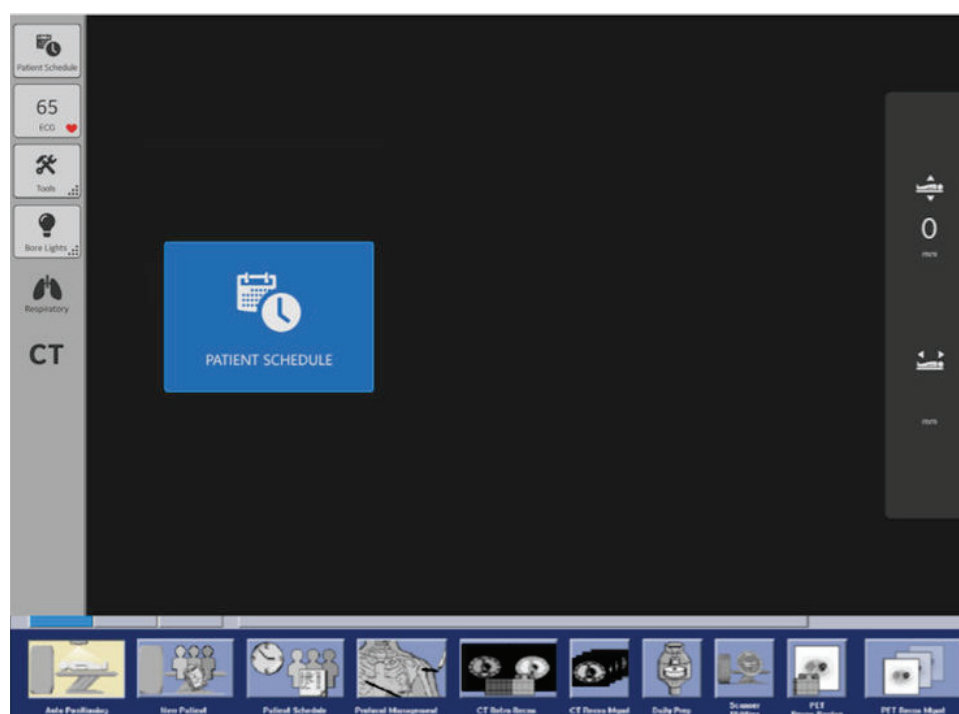
To open or close this the remote view of the gantry display on the console, press the **Remote Auto Positioning** button.

While the **Remote Auto Positioning** button is active, you can also switch from the console view to the remote view by pressing the button and opening or closing the remote auto positioning view.

NOTE

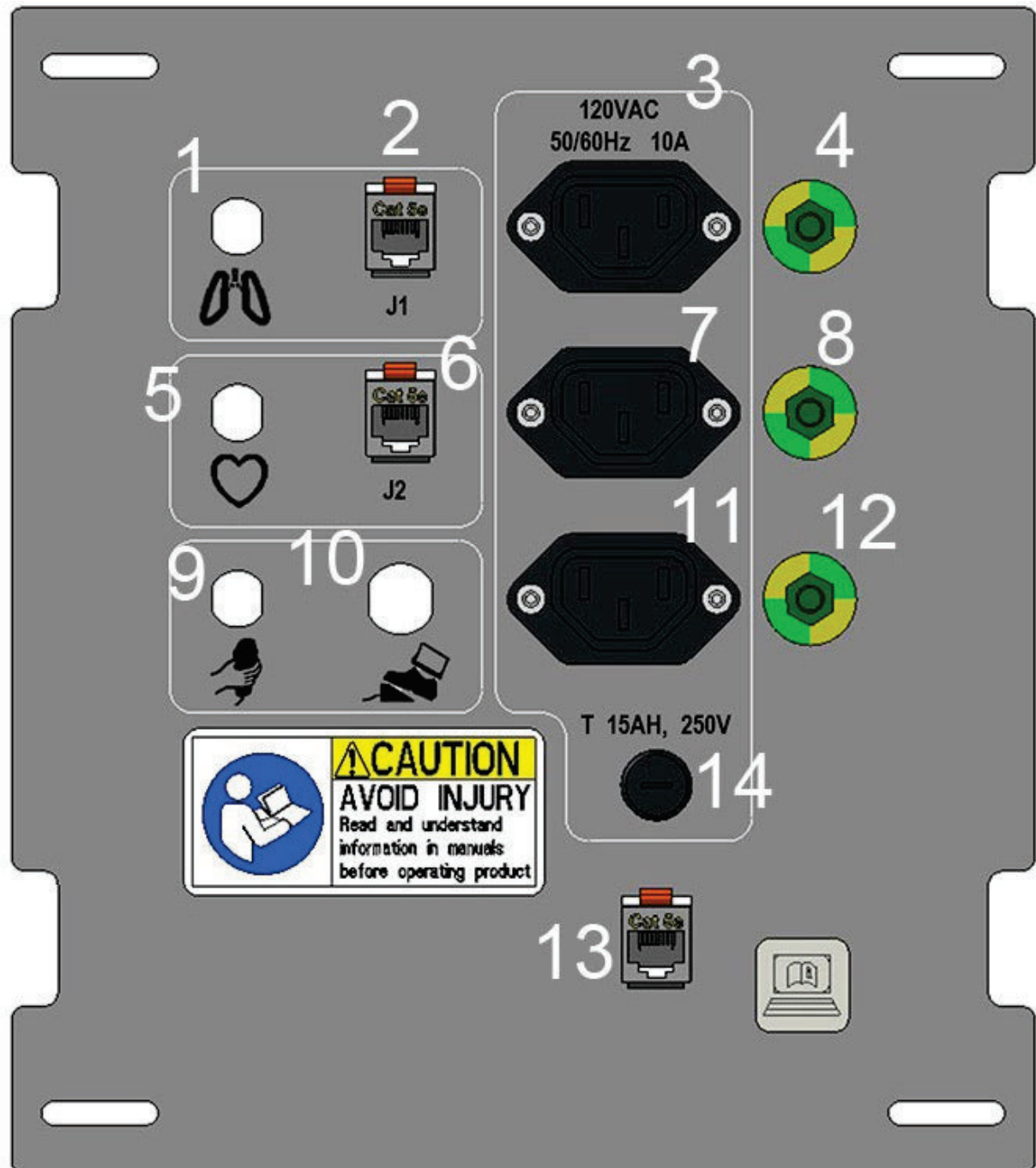
Remote Auto Positioning is optional and can be used only if the Remote Control Kit is also installed. See Remote Control kit for more information on how to operate the Remote Control Kit.

Figure 47 Remote Auto Positioning on Operator Console



4.2.1.4 Accessory Panel

Figure 48 Accessory Panel



Number	Description
1	Respiratory Monitor Receptacle (for gated studies)
2	Respiratory Gating Ethernet Port
3	Respiratory Gating Power Connection
4	Respiratory Gating Equipotential Terminal
5	Cardiac Monitor Receptacle (for gated studies)
6	Cardiac Gating Ethernet Port
7	Cardiac Gating Power Connection
8	Cardiac Gating Equipotential Terminal
9	CT Smartstep Hand Held Controller Receptacle
10	CT Smartstep Foot Pedal Receptacle
11	Spare Power Connection
12	Spare Equipotential Terminal
13	Service Ethernet Port
14	Accessory Panel Fuse

4.2.2 Scanner Support Subsystems

4.2.2.1 Auto Positioning (Depth Xstream Camera)

The automated workflow for patient positioning and Scout scanning uses a Depth Xstream camera to detect the patient orientation and positioning on the table, to calculate the Scan Range of Scout and isocenter of the scanning.

Figure 49 Auto Positioning (Depth Xstream Camera)



4.2.2.2 Power Distribution Unit (PDU)

The PDU provides all the power the system needs for normal operation. It contains a Power / Reset switch which resets all gantry and table power.

Figure 50 PDU



Table 23 PDU

Number	Function	Description
1	Power / Reset	Power On/Off indicator
2	Gantry Enable	Enables/Disables power to the Gantry, Table and Chiller
3	Emergency Stop	Press the Emergency Stop button to halt all table and gantry motion, stop any active X-ray, turn off the alignment lights, if enabled, and unlatch the cradle and patient transport. The system aborts any scan in progress, discards the associated data and attempts to save all data acquired prior to the abort.

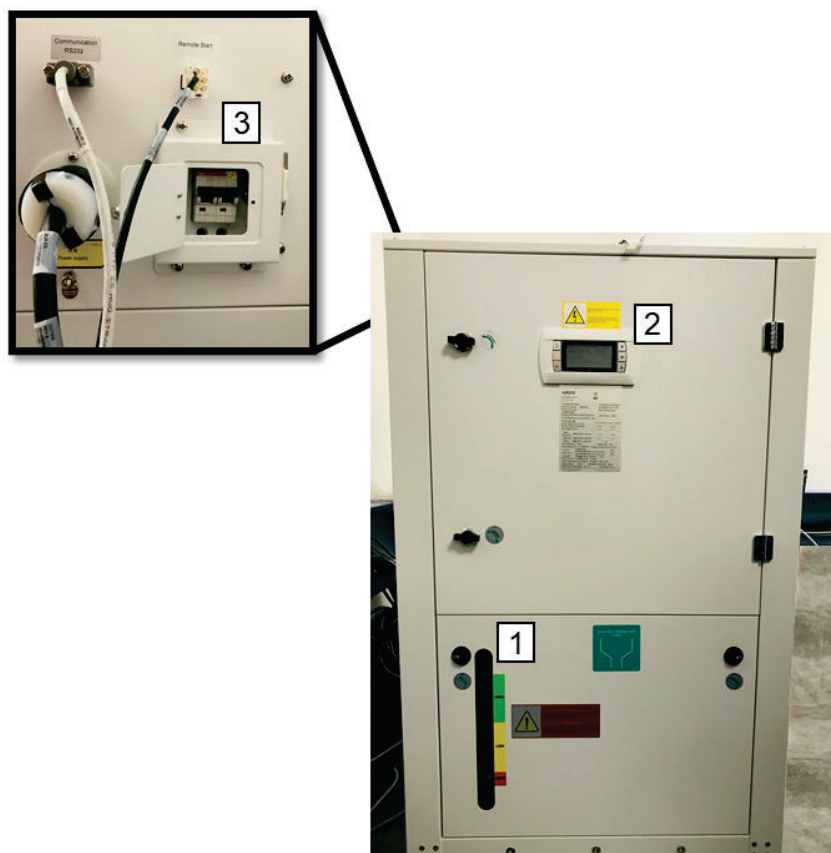
4.2.2.3 PARC (PET Acquisition Recon Controller)

The PARC stores PET raw data and PET list data, and processes PET image reconstruction.

Figure 51 PARC

4.2.2.4 Chiller

The Chiller delivers coolant at a steady temperature and flow to the PET scanner to prevent overheating and ensures consistent image quality.

Figure 52 Chiller**Table 24 Chiller**

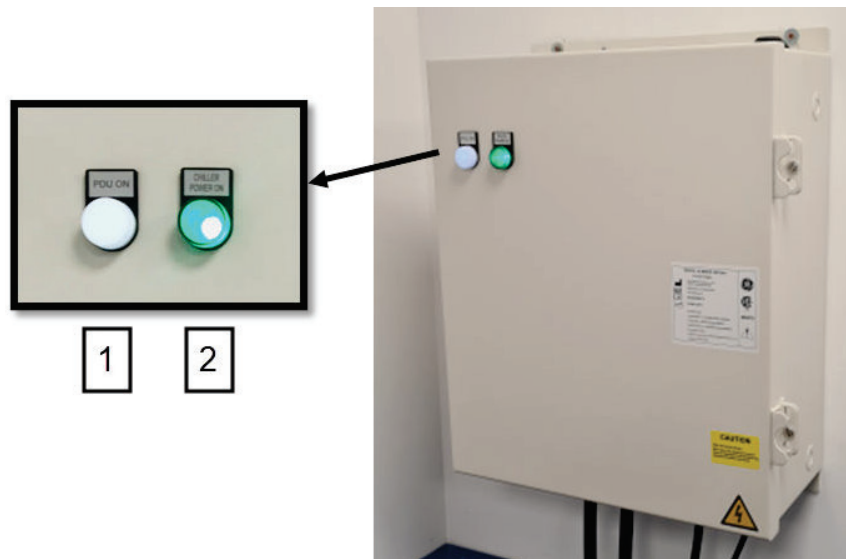
Number	Device Name	Description
1	View Finder	Indicates coolant level.
2	Digital Display	Indicates current coolant temperature.
3	Emergency Breaker Switch	Shuts off power to the unit.



CAREFULLY EXAMINE THE FLOOR FOR POSSIBLE COOLANT LEAK FROM THE PET GANTRY, MANIFOLD, CHILLER OR CONNECTED TUBES TO AVOID SLIPPING

4.2.3 Power Distribution Box (PDB)

The Power Distribution Box (PDB) provides power from the PDU to the Chiller and connection to the UPS (optional).

Figure 53 Power Distribution Box (PDB)**Table 25 Power Distribution Box (PDB)**

Number	Indicator	Description
1	PDU On	Lights when the PDU power is On.
2	Chiller Power On	Lights when the Chiller has power from the PDU.

4.2.4 Operator Console

5.4

7.3

The Operator Console includes the system computer and provides counter space for the Scan Monitor, Display Monitor, Scan Control Interface, Keyboard and Mouse.

Figure 54 Operator Console



5.3

5.4

Table 26 Operator Console


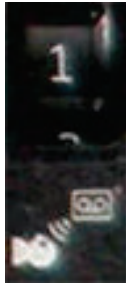
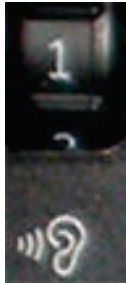
Number	Device Name	Description
1	Keyboard	A standard alphanumeric keyboard to enter text in data fields.
2	Scan Monitor	The left monitor displays the Scan Monitor Toolbar, Daily Prep, Patient Schedule and Exam acquisition windows. During normal operation, the monitors power on and off with the console, and take about 15 minutes to stabilize after power on. Do not adjust the monitor brightness and contrast during the 15 minute stabilization period.







Operator Console continued		
Number	Device Name	Description
3	Display Monitor	The right monitor displays the desktop selection icons and display related desktops. This monitor displays scout images and the Graphic Rx Localizer, as well as the resulting CT and PET images, when the scan protocol dictates.
4	Scan Control Interface	Contains scan control and table motion buttons, the intercom and an Emergency Stop button. See System Emergency Buttons .
5	Standalone Operator Console	Refer to Chapter 25
6	Computer Power On/Off switch	Use this switch to turn off the system power at the end of the day, after the system shutdown sequence completes. This switch can also be used to switch the system off in case of emergency.
7	Mouse	Standard three-button computer mouse. Use the mouse to make selections (click buttons) on the Scan Monitor and Display Monitor.
8	Remote Control Panel (Optional)	<p>Remote Control Panel is optional</p> <p>If installed, use this panel to remotely control laser lights, CT landmark and table movements from the Operator Console.</p> <p>NOTE</p> <p>Remote Control Panel option can be used only if Assisted Video Monitor System (AVIMOS) option is installed as well.</p> <p>The AVIMOS is used to remotely observe the patient during movement while using the Remote Control Panel.</p> <p>See Remote Control kit for more information on how to operate the Remote Control Kit (Remote Control Panel and AVIMOS).</p>






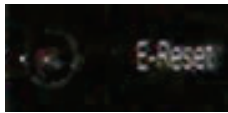
NOTE

CD/DVD can be used when the option CD/DVD Drive is available. Contact your GE representative for details.

Figure 55 Scan Control Interface**Table 27 Scan Control Interface**

Number	Button	Indicator/Key	Description
1		Emergency Stop	Press the Emergency Stop button to halt all table and gantry motion, stop any active X-ray, turn OFF the alignment lights, if enabled, and unlatch the cradle and patient transport. The system aborts any scan in progress, discards the associated data and attempts to save all data acquired prior to the abort.
2		AutoVoice Volume Control	Turn the dial to increase or decrease the volume of the selected AutoVoice message through the gantry speaker.
3		Patient Voice Volume Control	Turn the dial to increase or decrease the volume of the patient's voice to the speaker. The patient microphone in the gantry remains active until you press the Talk Bar to speak.

Scan Control Interface continued			
Number	Button	Indicator/Key	Description
4		Operator Voice Volume Control	Turn the dial to increase or decrease the volume.
5		Intercom/Speaker	Broadcasts the patient's voice and scanner sounds until you press the Talk Bar.
6		Start Scan	Press the flashing Start Scan button to initiate the scan sequence. The button turns solid green during the scan initialization process.
7		Pause Scan	Once the scan starts, the Pause Scan button activates during CT scanning. Press Pause Scan to pause the CT scan sequence after the CT scan in progress. Click Resume on the Scan Monitor to resume the CT acquisition. The Pause Scan button remains inactive during PET image acquisitions.
8		Stop Scan	Once the scan starts, the Stop Scan button activates. Press Stop Scan to immediately stop the scan in progress. Click Resume on the Scan Monitor to resume scanning.
9		Auto In/Retract	<p>Auto In</p> <p>This button activates when the Auto In sequence is enabled from the Auto In user interface. Press and hold the button when it is blinking to move table to the target location</p> <p>Retract</p> <p>After an exam has completed, press the flashing button to move the patient transport to the original position before the Move to Scan location.</p>

Scan Control Interface continued			
Number	Button	Indicator/Key	Description
10		Stop Move	This button activates when you press the flashing Move to Scan button. Press Stop Move to stop cradle motion and/or patient transport motion.
11		Move to Scan	Press the flashing Move to Scan button to move the patient transport between the CT and PET positions and/or drive the patient cradle to the scan position.
12		Talk Bar	Press the Talk Bar and speak into the microphone to the left of the bar to communicate with the patient through the gantry speaker.
13		Intercom/Microphone	Press the Talk Bar and speak into the microphone to talk to the patient through the gantry speaker.
14		X-Ray Exposure Indicator	Lights amber color during all CT X-ray exposures.
15		E-Reset Indicator	Press E-Reset to reengage table and gantry motion after an Emergency Stop.

4.3 PET/CT Application Scan Windows

This section provides an introduction of typical PET/CT Application Scan Windows.

4.3.1 Scan Monitor

Figure 56 Initial Scan Monitor

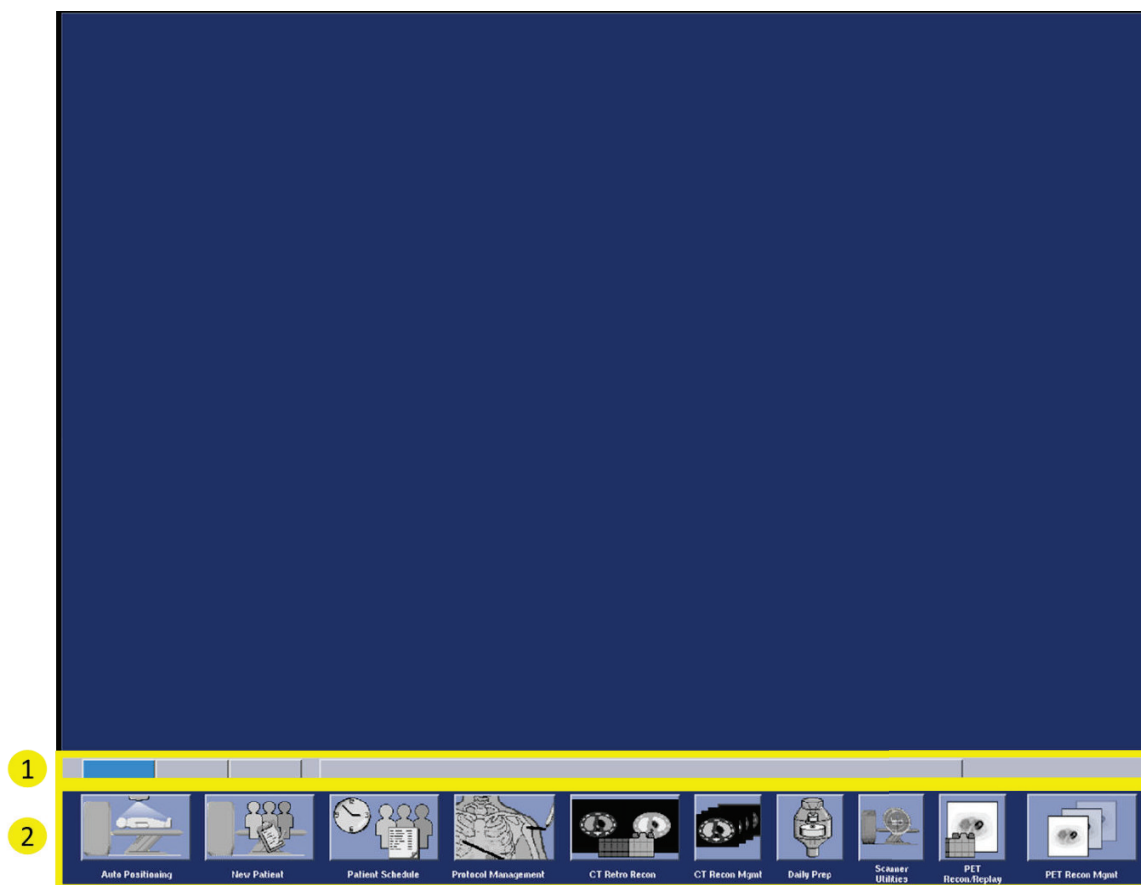


Table 28 Initial Scan Monitor

Number	Name	Description
1	Real Time Information Area	This area displays system status messages and updates in real time during PET/CT acquisitions.
2	Scan Monitor Toolbar	This toolbar provides access to windows and functions used during normal system operation.

5.1

4.3.2 Scan Monitor Toolbar

Figure 57 Scan Monitor Toolbar

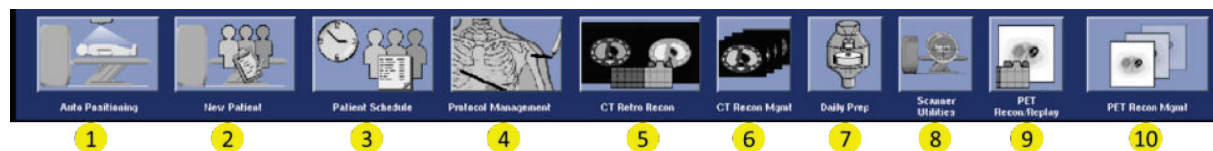


Table 29 Scan Monitor Toolbar

Number	Icon Name	Description
1	Remote Auto Positioning (optional)	Click to open the Remote Auto Positioning window to remotely access Gantry Display Touch Screen . Refer to Automatic and Remote Patient Positioning for instructions on Remote Automatic Patient Positioning Workflow.
2	New Patient	Click to open the New Patient window to start a new patient exam. See Figure 58 on page 121 .
3	Patient Schedule	Click to open the Patient Schedule window described in Schedule Patients .
4	Protocol Management	Click to open the Protocol Management window to build and manage system protocols. Please refer to Build a Protocol for information on protocol management features.
5	CT Retro Recon	Click to retrospectively reprocess CT scan data into new images. Please refer to the CT User Manual and CT TRM shipped with your system for additional information and instructions.
6	CT Recon Mgmt	Click to access the CT reconstruction queue, and pause, resume or delete CT reconstructions. Use this function to save/restore or reserve/release CT scan data. Please refer to the CT User Manual and CT TRM shipped with your system for additional information and instructions.
7	Daily Prep	Click to open the Daily Preparation window to perform CT X-ray Tube Warmup, Fast Calibration and PET Daily QA sequences at the beginning of the scan day. This prepares the system for normal operation. See PET/CT Application Scan Windows .
8	Scanner Utilities	Click to open the Scanner Utilities window. See Figure 60 on page 124 . Follow the instructions in the Calibration chapter to update the PET gain information every quarter to compensate for changes in the PET detector crystals over time.
9	PET Recon/Replay	Click to replay PET list data to create new PET raw data or retrospectively reconstruct PET raw data to create a new image set.
10	PET Recon Mgmt	Click to monitor and manage the PET reconstruction queue.

4.3.3 New Patient Window

Figure 58 New Patient Window

Patient Information

Exam Number 53

Accession Number

Patient ID

Format: LastName^FirstName^Middle^Prefix^Suffix

Patient Name

Sex

Birthdate

Age

Weight

Height

Referring Physician

Radiologist

Operator

History

Exam Description

Protocol Number

Req. Proc. ID

Protocol Selection

Anatomical Selector

Default Protocol

21.16 PTCT_Brain

22.1 Sinus Supine Helical + DMPP

23.1 C Spine C5-C7 Axial

24.1 Shoulder 2.5mm + DMPP

25.39 PTCT_Rb_Rest-Stress

26.31 PTCT_ET

27.1 L-Spine 3 Level Axial

28.1 Pelvis for Fracture + DMPP/Sin

28.1 Lower Extremity Survey 2.5mm

30.1 Quality Assurance

PEDIATRIC

End Exam

Enter PET Tracer Info

View More Information

Auto Positioning

New Patient

Patient Schedule

Protocol Management

CT Retro Recon

CT Recon Mgmt

Daily Prep

Scanner Utilities

PET Recon Replay

PET Recon Mgmt

Table 30 New Patient Window

Number	Name	Description
1	Patient Information	<p>A Patient ID must be entered to activate the other Patient Information data fields and the Protocol Selection area.</p> <p>Yellow data fields are required before selecting a protocol. If a protocol is selected before entering the required data, an attention message will prompt the user. Data typed or imported into this area will display on the scan image annotation and is stored with the exam file.</p> <p>Required data fields can be configured. Refer to the Q.Check Configuration section in Edit Patient and Tracer Information.</p>
2	Anatomical Selector	<p>Click on patient anatomy to display the current list of protocols for that area. The surrounding buttons display the default protocol for that area if one has been selected. The Pediatric button provides access to any specially built protocols for infants and small children.</p>
3	New Patient Window buttons	<p>Click End Exam to close the New Patient window, and discard any data you may have entered or imported into the Patient Information data fields.</p> <p>Click Enter PET Tracer Info to open the initial PET Quantification Information window described in Scan the Patient.</p> <p>Click View More Information to display any additional information about the patient that was entered on the HIS/RIS and imported into the Patient Schedule. Refer to Schedule Patients for more information.</p>

4.3.4 Daily Preparation Window

Figure 59 Daily Preparation Window

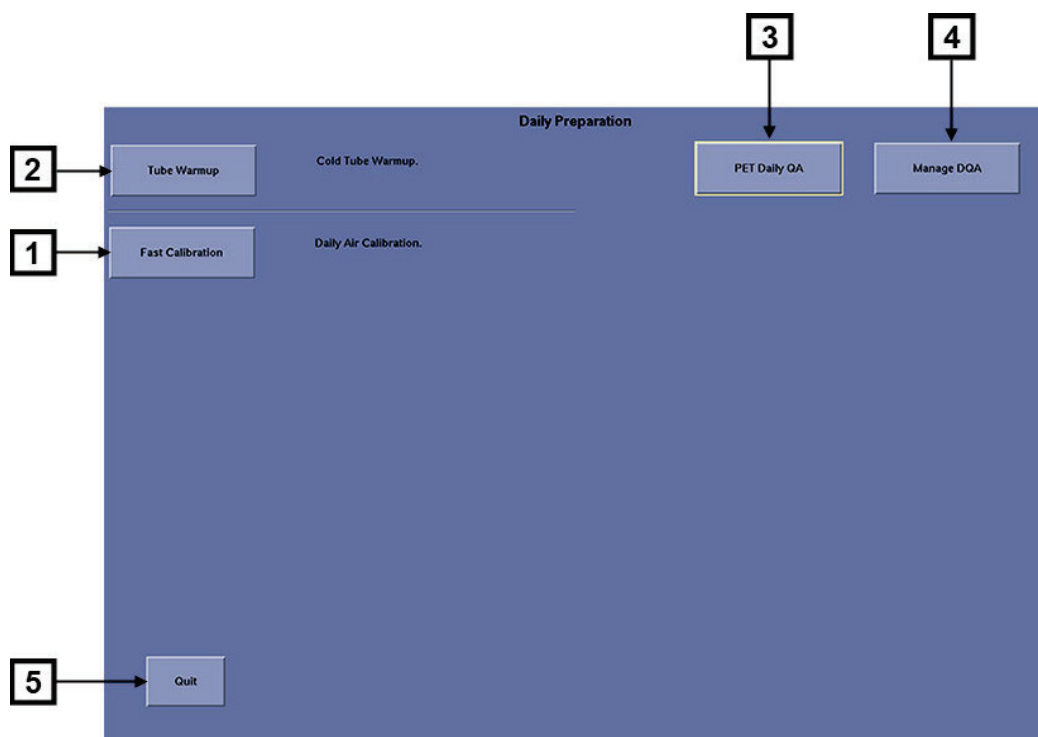


Table 31 Daily Preparation Window

Number	Name	Description
1	Tube Warmup	Click Tube Warmup to bring the CT X-ray tube to optimal operating temperature at the beginning of every scan day, and any time the system prompts for a warmup.
2	Fast Calibration	Click Fast Calibration to run the daily system Fast Calibration, which includes a set of Air Calibrations. Air Calibrations optimize and help maintain CT image quality between system calibrations. For best results, run the Fast Calibration after completing the first CT X-ray Tube Warmup of the day.
3	PET Daily QA	Click PET Daily QA to measure the current state of the PET detector and provide a visual and parametric data report that can be used for quality assurance.
4	Manage DQA	Click Manage DQA to measure the current state of the PET detector and manage prior DQA data that may be used for quality assurance.
5	Quit	Click Quit to close this window.

4.3.5 PET Scanner Utilities Window

Figure 60 PET Scanner Utilities Window

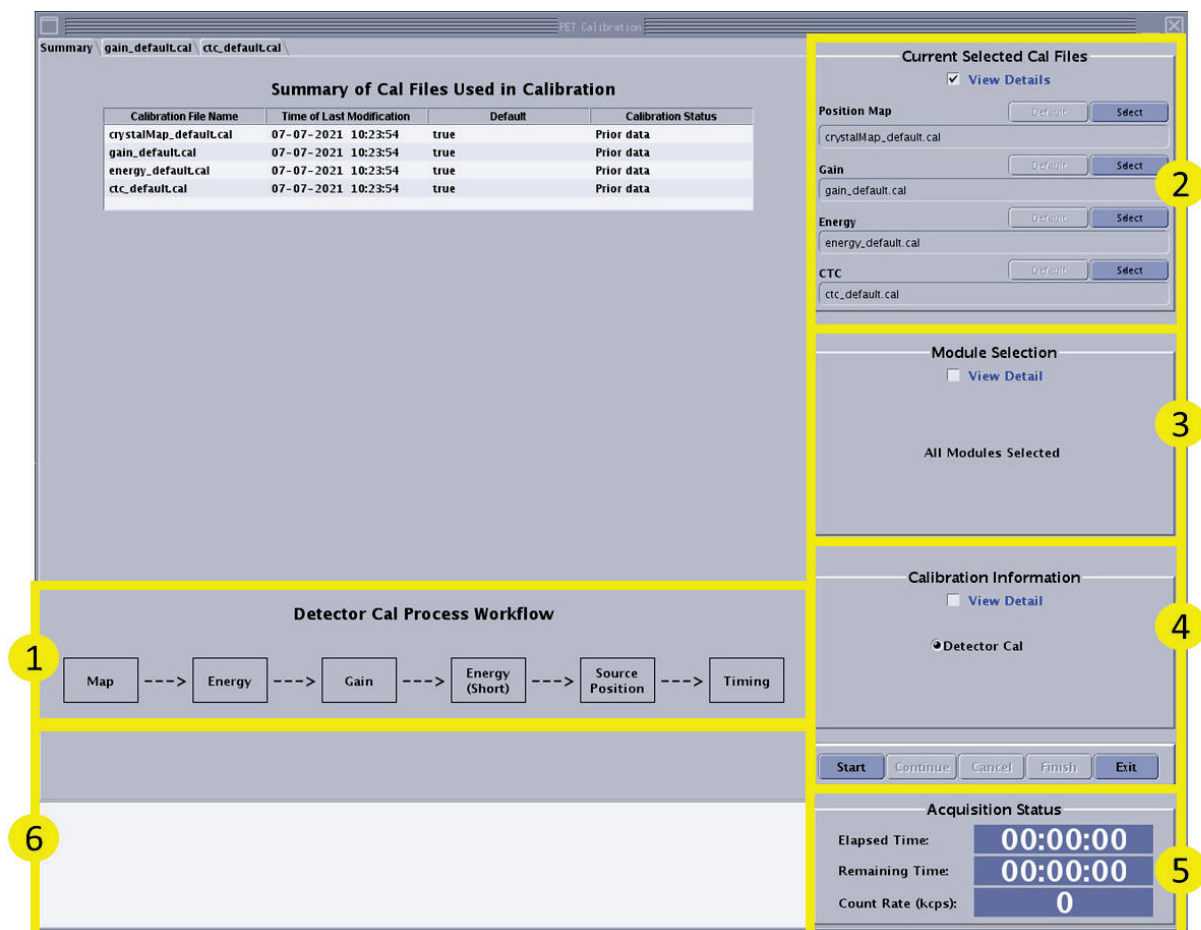


Table 32 PET Scanner Utilities Window

Number	Name	Description
1	Progress Flow	This area displays a flow chart of the selected scanner utility. The boxes turn green to show progress.
2	Current Selected Cal Files	This area is normally reserved for service.
3	Module Selection	This area is normally reserved for service. Open to select individual modules for testing. The default selection is All Modules Selected .
4	Calibration Information	This area is described in Detector Calibration .

PET Scanner Utilities Window continued		
Number	Name	Description
5	System Messages	This area updates in real time to show system progress or display error messages.
6	Acquisition Status	Click Start to display a real-time count of the elapsed time, remaining time and count rate detected during the selected scanner utility.

4.3.6 Scout Series View/Edit Window

Figure 61 Scout Series Scan Plan (top) and Progress bottom Windows

Scout Series Scan Plan (top) and Progress bottom Windows

Top Window:

- Name: ID:1234 Protocol:26.31 PTCT_ET Exam:48 Series:1
- Anatomical Reference: Gantry Display Patient Info. On
- Patient Orientation: Head First
- Patient Position: Supine
- Copy Pt.Orient. PLPosition Anat.Ref.
- Auto Store Auto Transfer Dose Report Auto Transfer Dose SR Report Auto Transfer
- Series Description: CT SCOUT HEAD IN
- Dose Information:

Images	CTDIvol mGy	DLP mGy-cm	Dose Eff. %	Phantom cm
1	0.07	7.99	60.76	Body 32
2	0.07	7.99	60.76	Body 32
- Est. max Z location CTDIvol: 0.14 mGy
- Projected series DLP: 15.98 mGy-cm
- Accumulated exam DLP: 0.00 mGy-cm

Bottom Window:

- Add Scout Delete Selected Scout Gating Off ECG Trace Prior Next
- Scout Num Scan Type Start Loc. End Loc. kV mA Scout Plane Voice Lights Timer Scout VWV / WL
- 1 Scout S50.00 I1100.00 120 10 0 N 1000/-70
- 2 Scout S50.00 I1100.00 120 10 90 N 1000/-70
- End Exam Select New Protocol Next Series Create New Series Repeat Series Series Auto Transfer Auto Scan Confirm Preset List Preset List

System Introduction

Top Screenshot: Pre-Scan Setup

1. Patient Orientation: Head First, Patient Position: Supine

2. Gantry Display Patient Info. On

3. Scan Parameters Table:

Scout Num	Scan Type	Start Loc.	End Loc.	kV	mA	Scout Plane	Voice Lights Timer	Scout WW / WL
1	Scout	350.00	11100.00	120	10	0	8	1000/-70
2	Scout	350.00	11100.00	120	10	90	8	1000/-70

4. Target Table Location: Elevation-mm: 50, Cradle-mm: 100

5. Scan Controls: End Exam, Select New Protocol, Next Series, Create New Series, Repeat Series, Series Auto Transfer, Auto Scan, Scan, Patient List, Patient List

Bottom Screenshot: Scan Progress

6. Real Time Information: Patient Handling, Scanning, Injecting, Delay Timer

7. Scan Progress: Seconds 0 to 20

Scan Parameters Table:

Number	Type	kV	mA	Plane	Start	End
1	Scout	120	10	0	350.00	11100.00
2	Scout	120	10	90	350.00	11100.00

8. Scan Controls: End Exam, Next Series, Repeat Series, Priority Recon, Repeat Last Group, Pause

Table 33 Scout Series Scan Progress Window

Number	Name	Description
1	Patient Orientation Area	This area describes the spacial relationship between the patient and the system. The Patient Orientation icon and Patient Orientation information should always reflect the actual orientation of the patient on the cradle. The label on the Anatomical Reference button should always reflect the actual patient anatomy aligned to the lasers when the landmark button was pressed.
2	Network/Archive Area	Use the buttons in this area to select storage options and storage destinations for the reconstructed images. In this area, you can also use Gantry Display Patient Info control button to hide/show patient information on the gantry touch display.
3	Scout Prescription Area	This area allows the user to prescribe scout scan parameters, and add/remove scans.
Scout Scan Plan		
4	Scout Dose Report Area or Auto-In for remote positioning	Click on Scout Dose Report button in Network Archive Area to display accumulated DLP for scout scan. Click on Auto-In to operate Auto-In feature for remote patient positioning. Refer to Automatic and remote patient positioning and scout acquisition with Auto Positioning (Optional) for more information. When Auto-In is not installed, only Scout Dose is presented.
5	Scout Scan buttons	Use these buttons to initiate the scout acquisition sequence, add scans, display other windows in the protocol, or end the exam.
Scout Scan Progress		
6	Real-Time Information Area	This area displays system status, prompts and messages in real-time.
7	Scan Progress Area	This area updates to provide a visual indication of system progress during the actual scout acquisition.

4.3.7 CT Series View/Edit Window

Figure 62 CT Series View/Edit Window

Table 34 CT Series View/Edit Window

Number	Name	Description
1	Patient Orientation Area	This area describes the spatial relationship between the patient and the system. The Patient Orientation icon and Patient Orientation information should always reflect the actual orientation of the patient on the cradle. The label on the Anatomical Reference button should always reflect the actual patient anatomy aligned to the lasers when the landmark button was pressed. This area also shows the PET scan range and allows a CT Series Description to be entered.
2	Network/Archive Area	Use the buttons in this area to select storage options and storage destinations for the reconstructed images. Rad Rx locks and unlocks the CT scan range to the PET scan range. Show Localizer displays the previously acquired scout image with the Graphic Rx Localizer, so you can visually set the scan range to the patient anatomy of interest.

CT Series View/Edit Window continued		
Number	Name	Description
3	Dose Information Area	This area displays the estimated CT radiation exposure prior to the start of the CT scan and the actual CT radiation exposure upon completion of the scan. The system stores this information in the Dose Report.
4	Tabs Area	The Stopwatch tab contains breathing and autovoice selections, as well as buttons to enter oral and IV contrast. The Axial Slice tab contains CT prospective reconstruction parameters. The Camera tab contains filming parameters.
5	Scan Parameter Area	This area displays the scan parameter selections and scan control buttons.

4.3.8 PET Series View/Edit Window

Figure 63 PET Series View/Edit Window



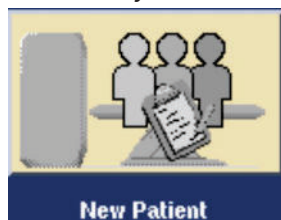
Table 35 PET Series View/Edit Window

Number	Name	Description
1	Patient Orientation Area	<p>This area describes the spacial relationship between the patient and the system. The Patient Orientation icon and Patient Orientation information should always reflect the actual orientation of the patient on the cradle. The label on the Anatomical Reference button should always reflect the actual patient anatomy aligned to the lasers when the landmark button was pressed. This area also shows the CT scan range.</p> <p>Use the Scan Description field to label the PET raw data file.</p> <p>Use the Series Description field to label the PET image data file.</p>
2	Network/Archive Area	<p>Use the buttons in this area to select storage options and storage destinations for the reconstructed images.</p> <p>Rad Rx locks and unlocks the CT scan range to the PET scan range.</p> <p>Show Localizer displays the previously acquired scout image with the Graphic Rx Localizer, so you can visually set the scan range to the patient anatomy of interest.</p>
3	PET Scan Status Area	This area displays a real-time count down of the remaining time for the current PET acquisition, as well as its count rate status.
4	Tabs Area	<p>The Radiation tab contains dose and nuclide/tracer selections.</p> <p>The Heart/Lung tab contains gating parameter selections.</p> <p>The Stack of Images tab contains PET prospective reconstruction parameter selections.</p>
5	Scan Parameter Area	This area displays the scan parameter selections and scan control buttons.

4.3.9 User Interface Conventions

4.3.9.1 Icons

Icons turn yellow when a function is active:



Icons are gray when a function is unavailable:



If you open two functions, one function must operate in the background. The background function displays as an icon with a corner folded over to expose a yellow area. The foreground function displays an icon with yellow box around it.

- Function open and active in the background:



- Function open and active in the foreground:

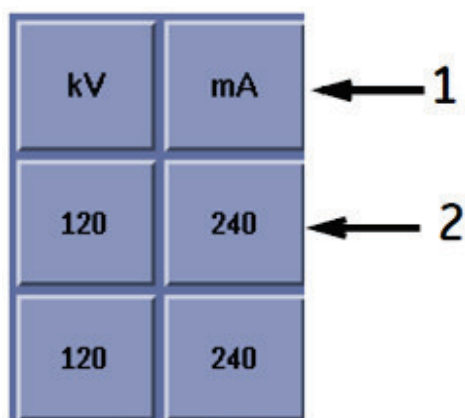


4.3.9.2 Scan Window Parameters

If a scan window contains multiple groups or scans, you have two options to set the values:

- Click the parameter name button to change all the parameters listed beneath it to a single value.
- Click an individual parameter button to change the corresponding value.

Figure 64 Multiple Groups or Multiple Scans



Click a raised parameter name or parameter button to select or type a new value.

Figure 65 Click a Raised Parameter Button

Select the desired kV								
80		100		120		140		Cancel
No. of Images	Thick Speed	Interval (min)	Gantry Tilt	SFOV	kV	mA	Total Exposure Time	
16	2.5 4i	10.000	\$0.0	Large Body	120	240	4.0	
32	2.5 4i	10.000	\$0.0	Large Body	120	240	8.0	

Click a sunken parameter area to highlight the old value and type a new value.

Figure 66 Click a Sunken Parameter Area

Start Loc.	End Loc.
\$50.00	I250.00
\$50.00	I250.00

When the system adjusts a value from the original preset value, it highlights the parameter orange to prompt a review of the change before proceeding.

Figure 67 Orange Highlight — System Value Changed

End Location	No. of Images	Thick Speed
I150.420	47	5.0 12.50 0.625:1

When a parameter is outside the accepted range or the landmark is incomplete, the system highlights it red, and refuses to scan until an acceptable value is selected.

Figure 68 Red Highlight — Parameter Must be Changed to Scan

Images	Scan Type	Start Location	End Location	Scan Direction
1-47	Static VIP Off	I150.420	S0.000	Toward Head

Required data fields are yellow until filled in.

Figure 69 Yellow Data Field — Entry Required

Patient ID	
------------	--

When you select an invalid parameter, the system defaults to the closest acceptable value, and displays a message explaining the change in the message area above the Scan Monitor Toolbar, every time you click on the parameter it changed.

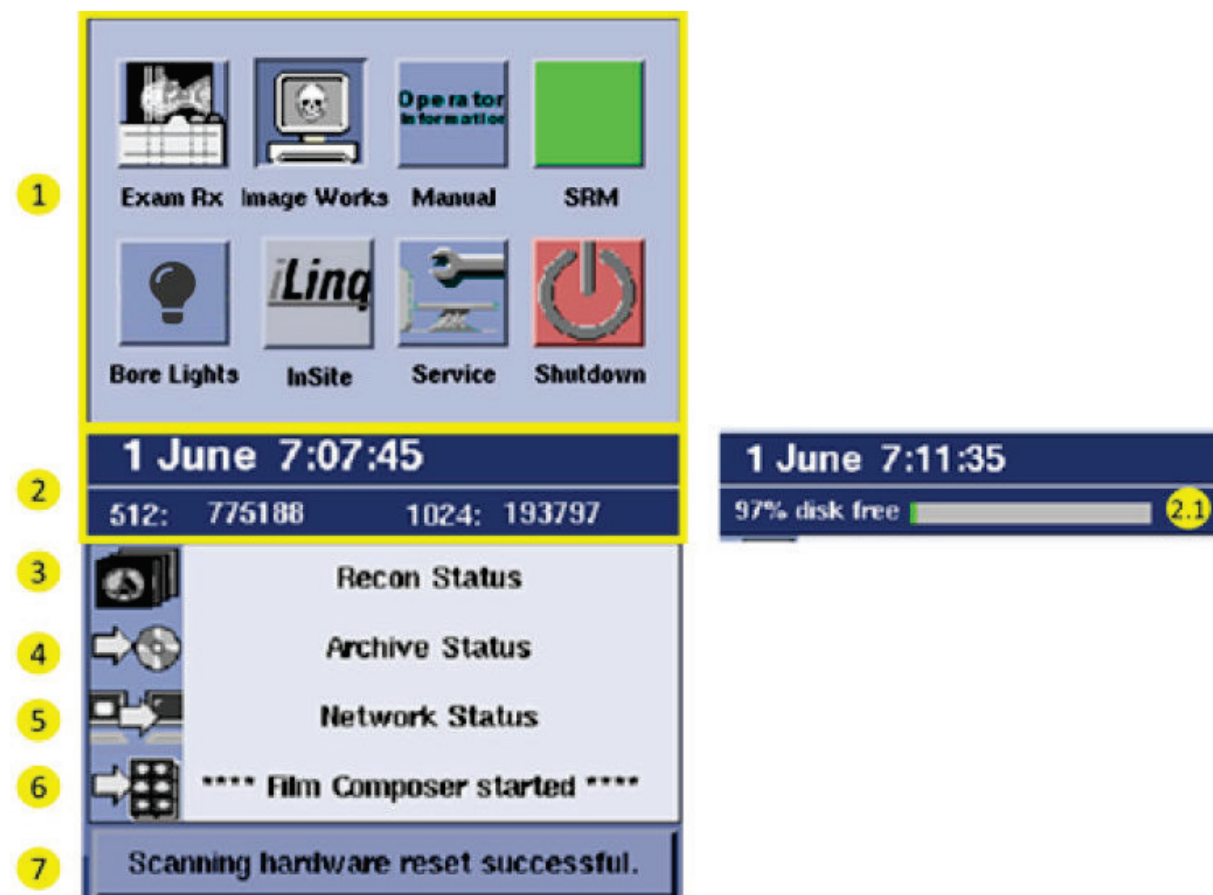
Figure 70 Message Area Explanation

08:59:35 The system reduced mA to the largest value possible at this kV.
--

4.4 PET/CT Application Display Windows

4.4.1 Display Desktop

The Display Monitor opens the Display Desktop in the upper left corner of the window when the system starts the applications software. The Display Desktop provides access to other system functions and displays selected system status information in real-time.

Figure 71 Display Desktop**Table 36 Display Desktop**

Number	Name	Description
1	Desktops	Click one of the buttons to open the corresponding desktop, and activate all the related functions. See Display Desktop Buttons on page 136 .
2	Date/Time/Image Space	Displays the current date, time, and the remaining system disk space for 512 ² and 256 ² matrix CT images.
2.1		Click anywhere on the number of images to display images disk status in percentage.

Display Desktop continued		
Number	Name	Description
3	CT Reconstruction	<p>The Image Reconstruction icon area displays the status as the percent of images completed for the exam, series, and image range for both prospective and retrospective reconstruction.</p> <p>The Image Reconstruction icon area displays the status of both local and remote reconstructions*.</p> <ul style="list-style-type: none"> • Upper line is the status of remote recon for both prospective and retrospective reconstruction*. • Bottom line is the status of local recon as the percent of images completed for the exam, series, and image range for both prospective and retrospective reconstruction. <p>*Remote reconstruction is supported only with the Omni Legend system. It enables Deep Learning Image Reconstruction (optional).</p>
4	Archive	Shows the Save or Restore status for the current or most recently archived exam, series, and image.
5	Network	Shows the Send or Receive status for the current or most recently networked exam, series, and image.
6	Filming	Shows the current or most recent filming status.
7	Current Message Area	<ol style="list-style-type: none"> 1. Click this area to display a list of system information and/or error messages. Click View Log to display the error log. 2. Click Memo to leave messages about the system for the field engineer. Keep the cursor in the menu area when typing the message, then click Save to store the message in the log.

4.4.2 Display Desktop Buttons

Figure 72 Display Desktop Buttons

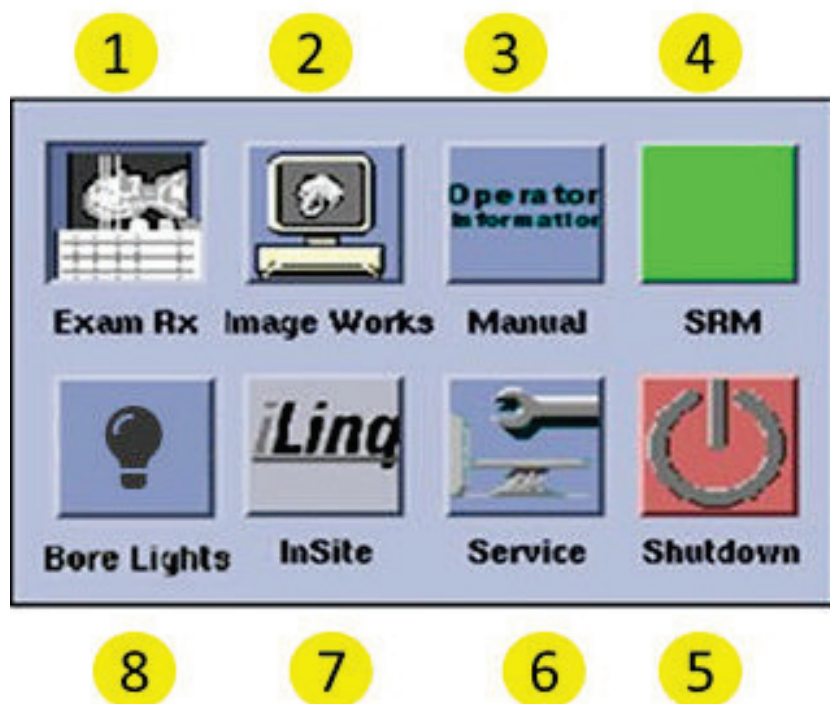
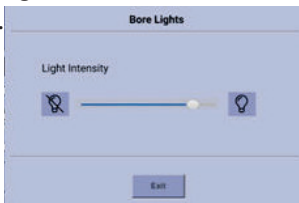


Table 37 Display Desktop Buttons

Number	Name	Description
1	<i>Exam Rx</i>	Click to view images on the Display Monitor as you scan, auto film, manual film, and/or display and apply measurements and other features. See Exam Rx Desktop on page 138 .
2	<i>Image Works</i>	Click to view other exams, archive, network, remove, manual film, apply measurements and other features to an image, reformat in 2D and access optional software features. See Image Works Desktop on page 141 .
3	<i>Manual</i>	Insert the CD-ROM based operator information into the drive and click this button to access the content.
4	<i>SRM</i>	During startup, the button changes from Grey to Red, Yellow, or Green to reflect the current state of the System Readiness Monitor. Click this button to display the System Readiness Monitor, as described in the Power Up and Shutdown the System chapter.

Display Desktop Buttons continued		
Number	Name	Description
5	Shutdown	<p>Click to reboot the system, shutdown the system, or enter Energy Saving Mode, as described in the Power Up and Shutdown the System chapter. If the system has the HIPAA configuration, click this button to logout the user.</p> <p>NOTE</p> <p>The CT Energy Saving Mode does not blink the 3 dots on the gantry panel.</p>
6	Service	<p>Click to open the Common Service Desktop to Save/Restore System State, PET Calibrations and PET DQAs, as described in Calibration. See 4.5 Common Service Desktop on page 142.</p>
7	iLinq	<p>Click to access GE Online Center Engineers and Answerline Applications Specialists and to send and receive scanner related information.</p>
8	Bore Light	<p>Click the bore light button to control bore light intensity remotely. Similar to the Gantry Display, you can set to lights fully off or on using the buttons or slider, or any value in between using the slider.</p>  <p>NOTE</p> <p>You can also control the bore lights from the gantry display (refer to Gantry Touch Display) or by Remote Auto Positioning (if installed).</p>

4.4.3 Exam Rx Desktop

Figure 73 Exam Rx Desktop

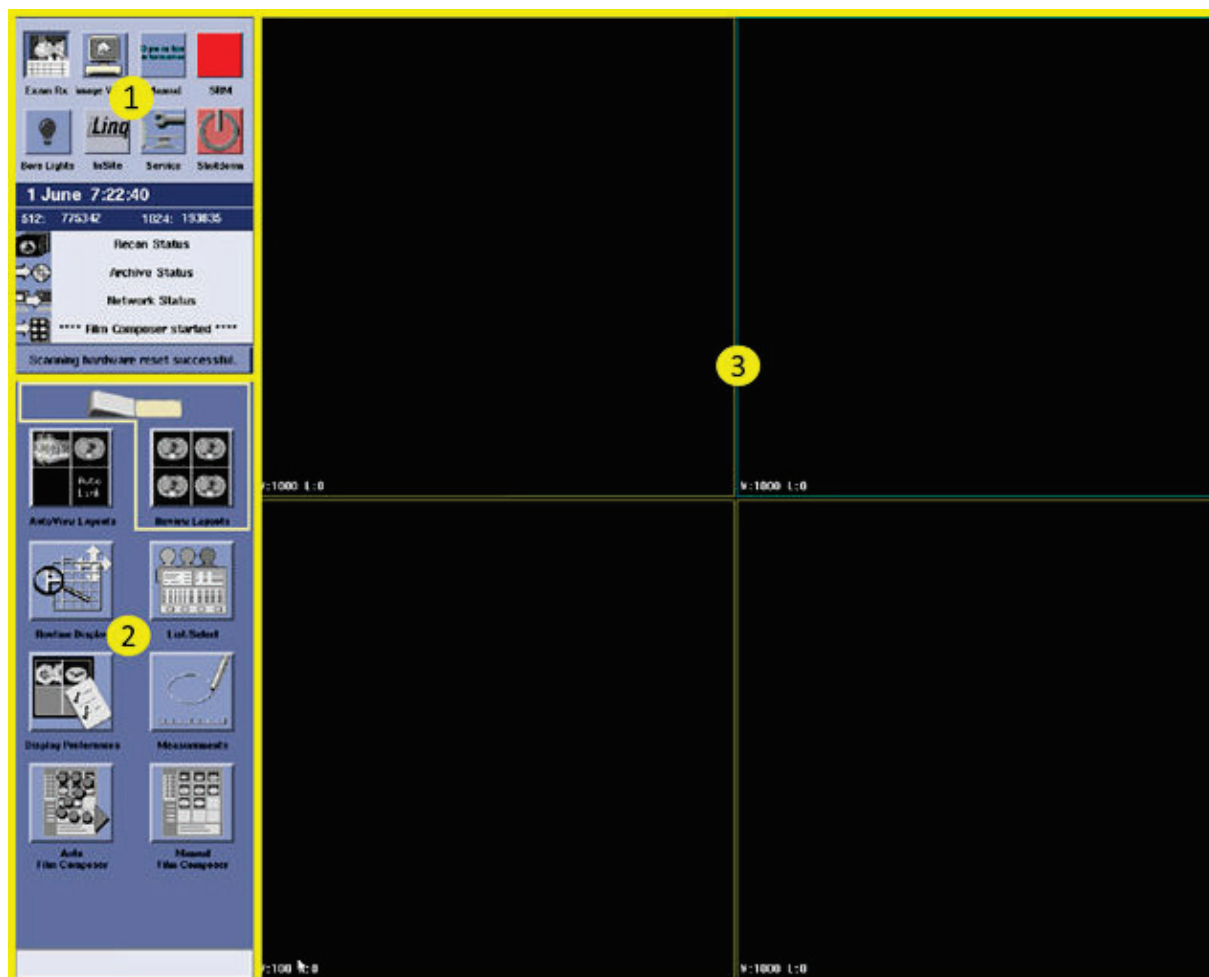


Table 38 Exam Rx Desktop

Number	Name	Description
1	Display Desktop	Provides access to other system functions and displays selected system status information in real time. See Display Desktop on page 133 and Display Desktop Buttons on page 136 .
2	Exam Rx Display Functions	Contains buttons for display, filming, and measurement functions. Please consult the CT User Manual and CT TRM shipped with your system for detailed instructions and information.
3	Image Display Area	The system automatically displays the reconstructed images in this area when you choose AutoView. Use the buttons in Area 2 to select the number of viewports and display format.

4.4.4 Graphic Rx Localizer

Figure 74 Scout Series using Graphic Rx Tools

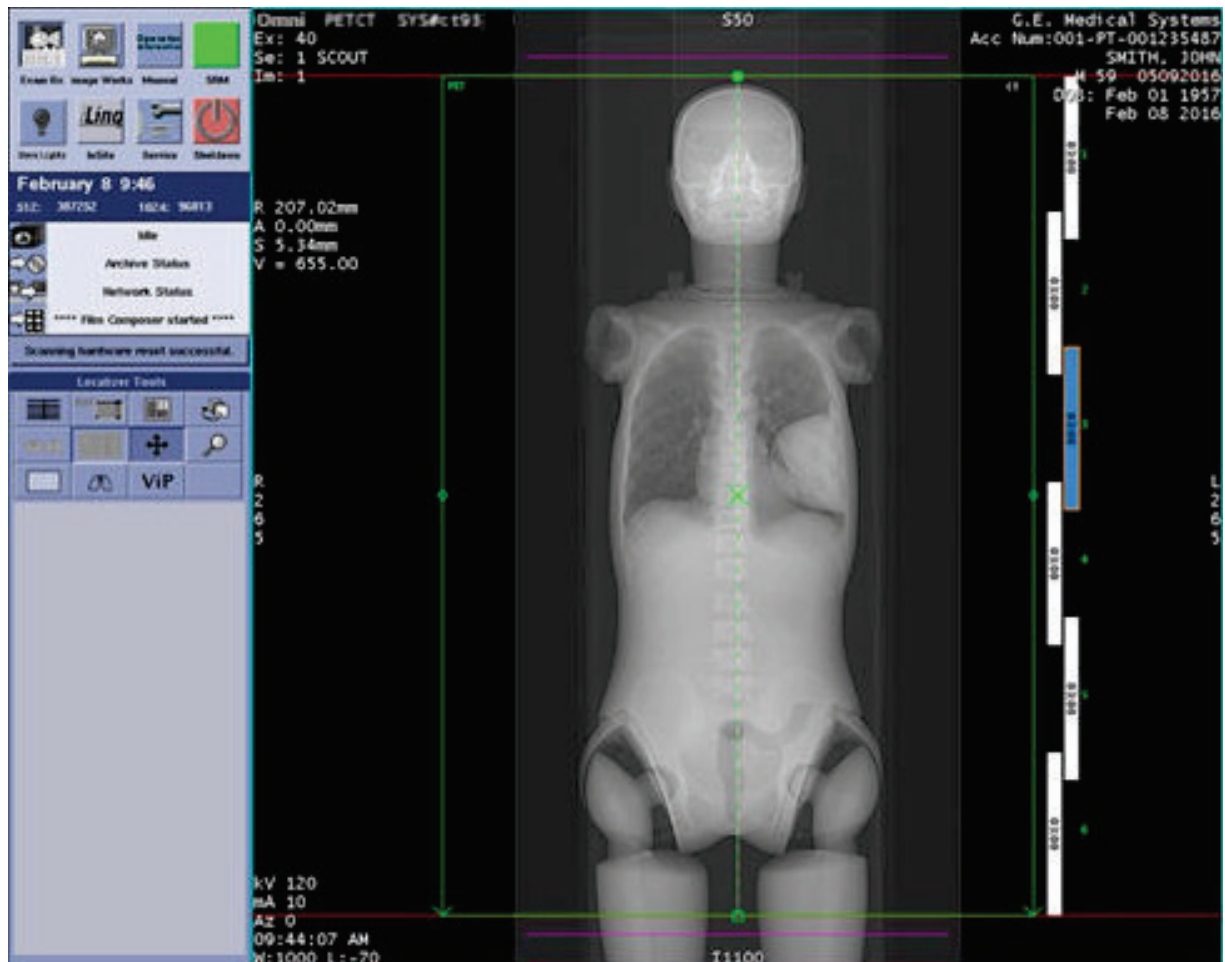


Table 39 Graphic Rx Tools

Number	Description
1	Turn on Show Slices to show a line for each image reconstructed. Turn off Show Slices to show a transparent area of coverage with no slice lines.
2	Turn on Show Dimensions to show Start/End location and DFOV. These parameters are editable.
3	Turn on Change Layout to switch to two screen mode.
4	Turn on Display Normal to return the Roam or Zoom condition to Normal.
5	Turn on Organ Dose Modulation (ODM) to activate ODM regions.
6	Click to Show Irradiation Lines .
7	Roam - Place the cursor on the image and click and drag it to a new location.
8	Zoom - Click and drag to magnify or minify images.
9	Click to Show PET Overlaps .
10	Click to Adjust Respiratory Motion Management Range .
11	Click to Adjust ViP Range .

4.4.5 Image Works Desktop

Figure 75 Image Works Desktop



Table 40 Image Works Desktop

Number	Name	Description
1	Display Desktop	Provides access to other system functions and displays selected system status information in real time. See Display Desktop on page 133 and Display Desktop Buttons on page 136 .
2	Tool Chest	Contains a miscellaneous group of troubleshooting functions and high-level preference settings. See Tool Chest .

Image Works Desktop continued		
Number	Name	Description
3	Image Works Browser	Contains the current list of exams, series and images in the patient database, a toolbar of database functions and a data apps list for display, edit, film and formatting functions. The length of the list varies with the number of available software options. See Image Works Browser and Data Apps List .

4.5 Common Service Desktop

4.5.1 PET Common Service Desktop

Figure 76 PET Common Service Desktop

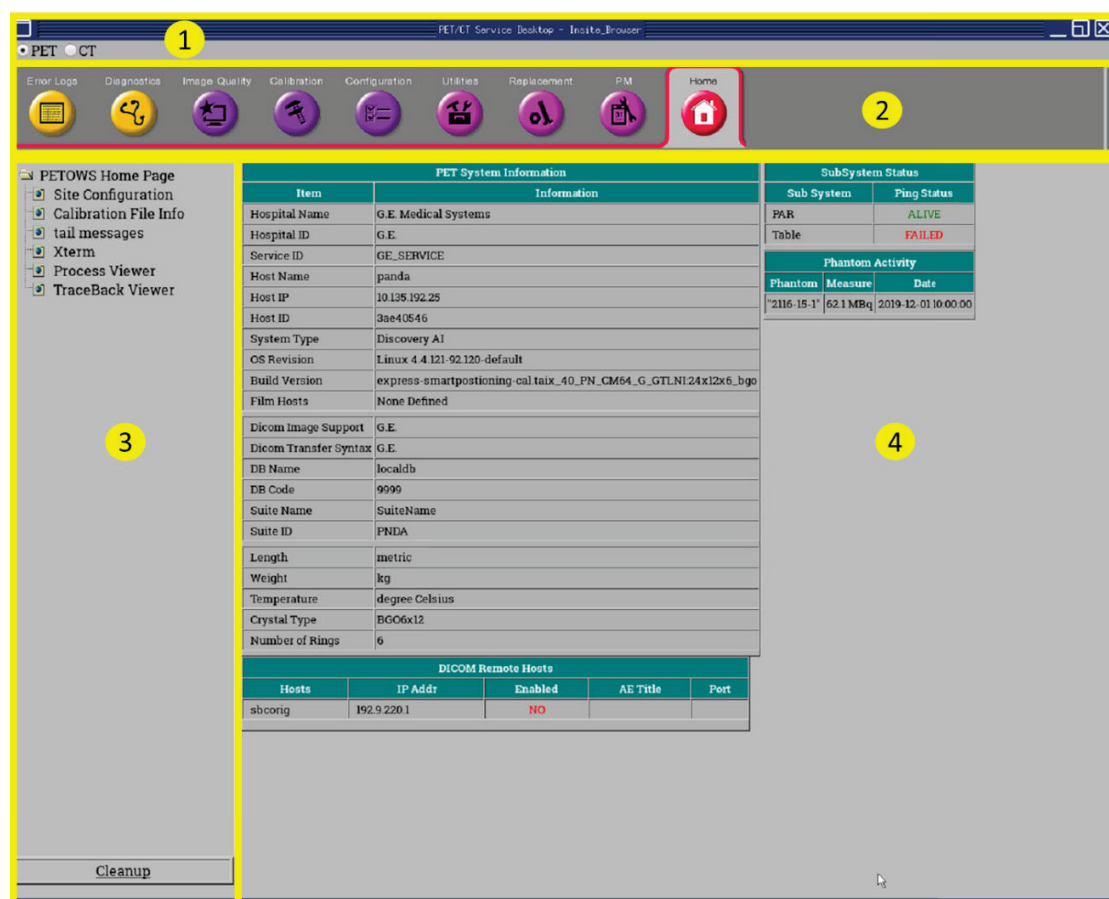


Table 41 PET Common Service Desktop

Number	Name	Description
1	PET/CT Radio Buttons	Select PET for the PET Common Service Desktop. Select CT for the CT Common Service Desktop.
2	Tab Selector Buttons	Click a button to display the corresponding function folders in Area 3 and any related information in Area 4.
3	Folder/Function Area	This area contains one or more folders with software functions. Click the Tab Selector button to update this area.
4	Application Area	When you select one of the functions in Area 3, the Application area updates with information and status messages related to your selection.

4.5.2 CT Common Service Desktop

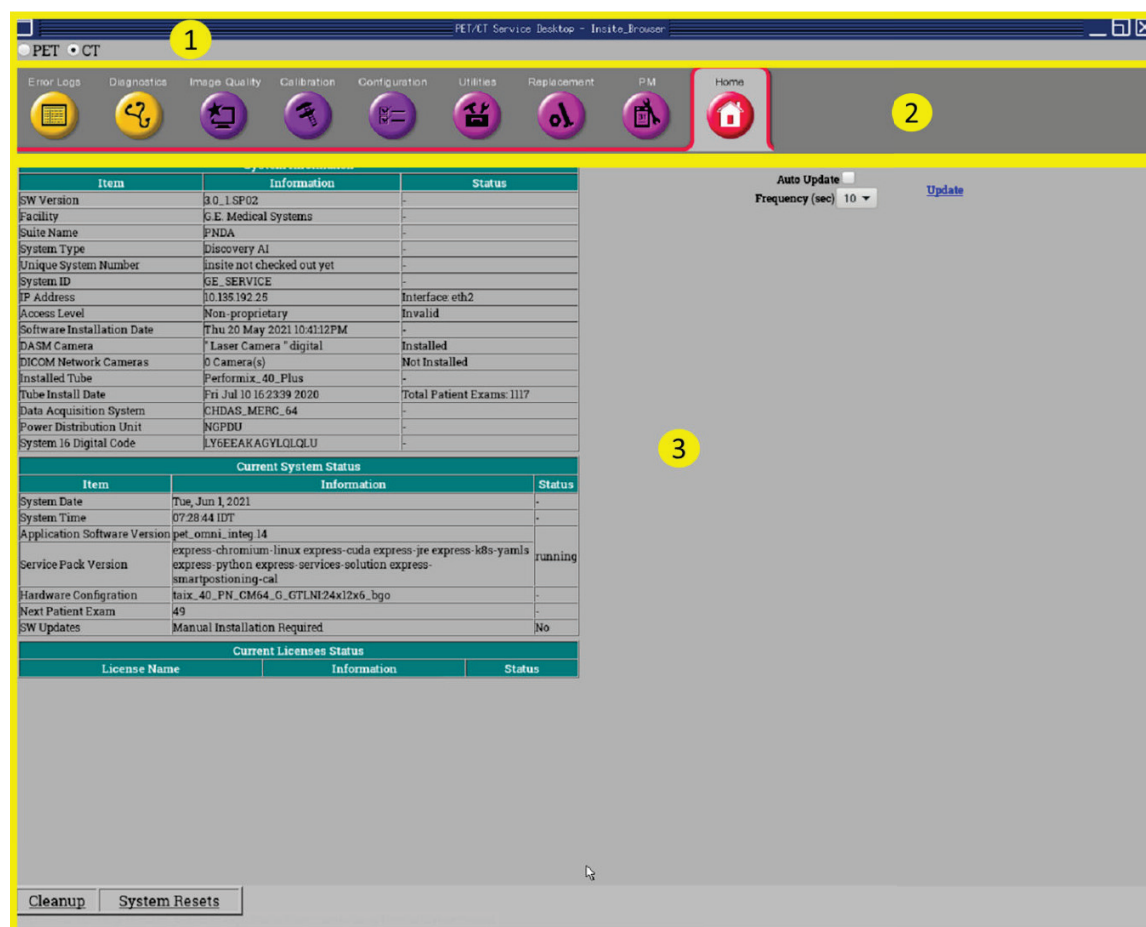
Figure 77 CT Common Service Desktop

Table 42 CT Common Service Desktop

Number	Name	Description
1	PET/CT Radio Buttons	Select PET for the PET Common Service Desktop. Select CT for the CT Common Service Desktop.
2	Tab Selector Buttons	Click a button to display the corresponding function folders and/or any related information.
3	System Information and Status Area	This area contains information about the system, its software and selected subsystems. It also displays the current system status, and contains the System Resets button.

4.6 Tool Chest

From the Display Monitor, click **Image Works** to open the Tool Chest menu in the upper right corner of the screen.

The system also displays a Tool Chest menu with fewer items on both monitors until the applications software starts.

Figure 78 Tool Chest Menu

Tool Chest	1	Autovoice Volume
	2	Check Security
	3	Unmount SSA Key
	4	Unix Shell – Right
	5	Unix Shell – Left
	6	Import License
	7	Turn On Extend HU
	8	Quick Snap
	9	IQ Snap
	10	SPR Snap
	11	Save ECG Traces
	12	Restart Show Loc.
	13	Anon Pat. Level
	14	Export Protocols
	15	Screensaver Time
	16	Audit Log Viewer
	17	IPM Service
	18	System Time Adjustment
	19	Install TG18 Pattern
	20	QA Calculator

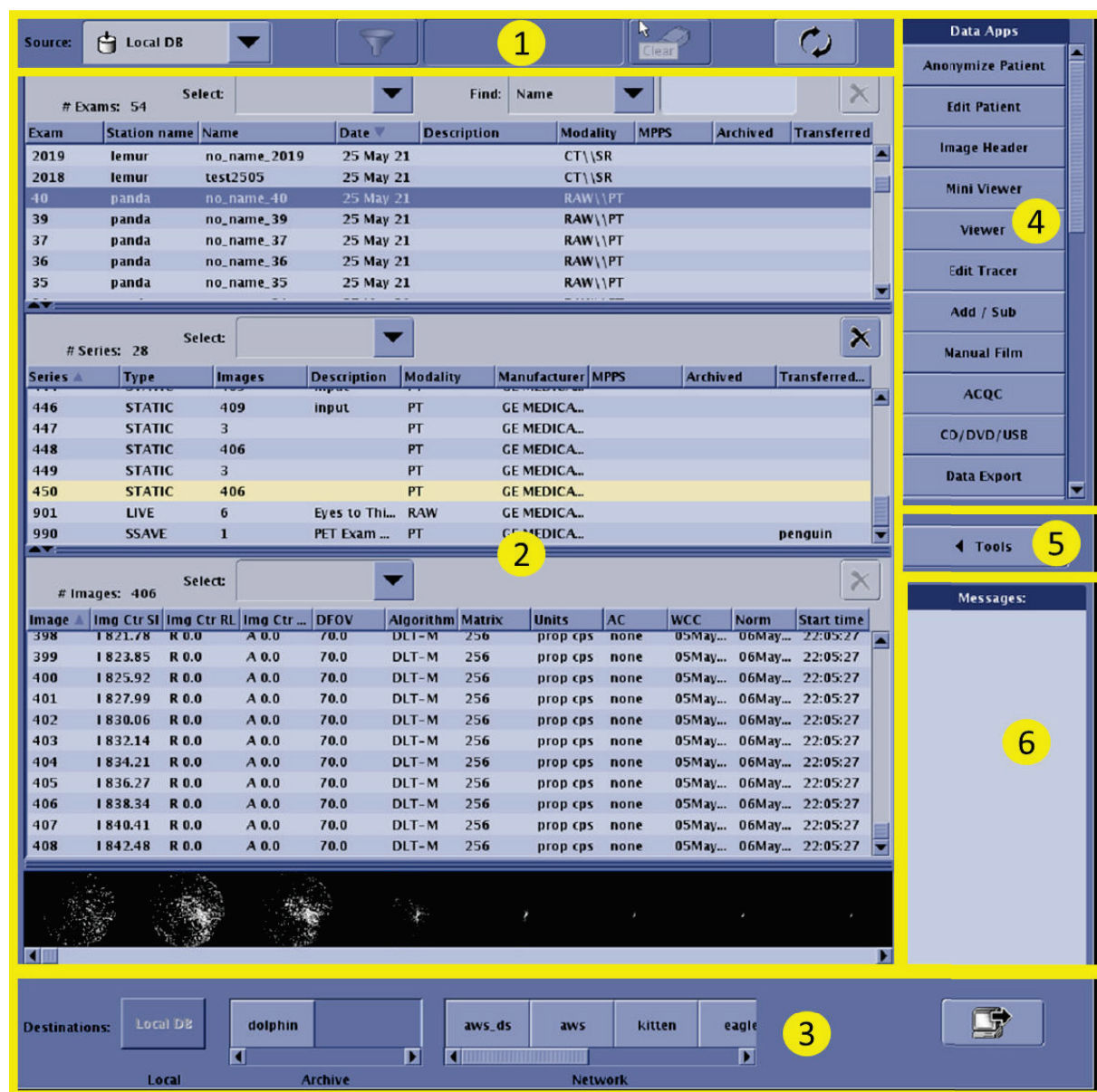
Table 43 Tool Chest Menu

Number	Name	Description
1	FAQ	Frequently Asked Questions (FAQ) option opens up Quick Reference Guide document. This document provides list of frequently asked questions and basic troubleshooting tips.
2	Autovoice Volume	Click to open a slider bar to set the Autovoice volume levels in the scan room.
3	Check Security	Reserved for use by service personnel.
4	Unmount SSA Key	Reserved for use by service personnel.
5	Unix Shell - Right	Reserved for use by service personnel. Opens a Unix shell (window) on the display monitor.
6	Unix Shell - Left	Reserved for use by service personnel. Opens a Unix shell (window) on the scan monitor.
7	Import License	Reserved for use by service personnel.
8	Turn On Extend HU	Click to display extended Houndsfield Units.
9	Quick Snap	Click to collect data for system troubleshooting after completing an exam, as described in Troubleshooting .
10	IQ Snap	Click to reserve anonymized images for system troubleshooting, after completing an exam, as described in Troubleshooting .
11	SPR Snap	System Problem Report Snap. Click to save troubleshooting logs when an error occurs.
12	Save ECG Traces	Click to save the directory of 500 of the most recently acquired ECG files from the designated CT ECG-gated scan type directly to a blank CD-ROM. Please refer to the CT User Manual and TRM shipped with your system for detailed information and instructions.
13	Restart Show Loc.	Click to display the Scout and/or Graphic Rx Localizer, if missing. If Restart Show Loc does not resolve the issue, use the cross-hair cursor to designate the Start/End locations and R/L and A/P centers for the current exam, then reboot the system before the next exam.
14	Anon Pat. Level	Click to display the current level of patient privacy available during Anonymous Mode and/or toggle to the other privacy level, as described in Anonymize the Patient Data .
15	Export Protocols	Click to export user protocols to a CD-ROM.

Tool Chest Menu continued		
Number	Name	Description
16	Screensaver Time	Click to change the screen saver timeout value (between 5 and 60 minutes).
17	Exit VolViewer/Reformat	Click to exit Volume Viewer or Reformat and return to the Image Works Browser when no response is seen for mouse interactions.
18	Audit Log Viewer	Use the Audit Log Viewer to display, search audit logs and export the audit logs. Refer to the CT user manual for more details.
19	IPM Service	Imaging Protocol Manager allows to get protocols from cloud. This Service is compatible with CT protocols only. Refer to CT user manual shipped with your system for additional use instruction.
20	System Time Adjust	Use the System Time Adjustment to adjust the system time. Refer to the CT user manual for more details.
21	QA Calculator	This tool is intended to calculate the F-18 Quantitation Accuracy against known phantom activity.

4.7 Image Works Browser

The Image Works Browser provides access to the patient database and all post-processing, display and data management functions.

Figure 79 Image Works Browser**Table 44 Image Works Browser**

Number	Name	Description
1	Patient List Controls	This includes database selection (local and remote), data-base filtering and database refresh.
2	Patient List	This is the list of patient exams, series, and images on the database.

Image Works Browser continued		
Number	Name	Description
3	Archive / Network Destinations	This is a list of all transfer destinations for archive and network.
4	Data Apps List	This is a list of the Data Apps functions available on the system. See the Data Apps List section for additional information.
5	Configuration Tools	This includes various system tools, including configuration of network hosts.
6	Message Area	This area displays messages related to archive, network or image display.

Figure 80 Image Browser Series Area

Series: 9

Select:

Series ▲	Type	Images	Description	Modality	Manufact...	MPPS	Archived	Transf...
1	SCOUT	2	CT SCOUT HEAD IN	CT	GE MEDL...	In Progr...		
2	PROSP	303	CTAC 3.75 Thick	CT	GE MEDL...			
3	PROSP	303	WB Standard	CT	GE MEDL...			
12	STATIC	57	WB 3D MAC	PT	GE MEDL...			
13	STATIC	57	WB 3D NAC	PT	GE MEDL...			
901	LIVE	8	Eyes to Thighs Emission	RAW	GE MEDL...			
990	SSAVE	1	PET Exam Report	PT	GE MEDL...			
997	SR	1	Dose Record	SR	GE MedL...			
999	SSAVE	1	Dose Report	CT	GE MEDL...			

Table 45 Image Browser Series Area

Name	Description
Series	Lists the series number assigned by the system for the exam. You can change the series numbers of selected series types, if they fall within the designated range of numbers assigned to that series type.
Type	<ul style="list-style-type: none"> SCOUT: The system always lists the CT scout series first PROSP: Any prospectively reconstructed CT series STATIC/GATED/DYNAMIC: Prospectively reconstructed PET series REFMT: PET or CT images reformatted after the exam ends LIVE: PET RAW acquisition data REPLAY: ViP Replay RAW acquisition data LIST: ViP Record data SR: CT Structured Report SSARE: Screen Captures, Series 990 PET Exam Report and Series 999 CT Dose Report
Images	The total number of images in the corresponding file.
Description	The Series Description entered on the View/Edit window.

Image Browser Series Area continued	
Name	Description
Modality	<ul style="list-style-type: none"> • CT: Computed Tomography • PT: Positron Emission Tomography (PET) • RAW: LIVE or REPLAY data • LST: ViP Record • SR: Structured Report
Manufacturer	The manufacturer of the scanner.
MPPS	Performed Procedure Step (Option)
Archived	Indicates whether the series has been archived.
Transferred	Indicates whether the series has been transferred to another workstation.

4.8 Image Works Display Tools

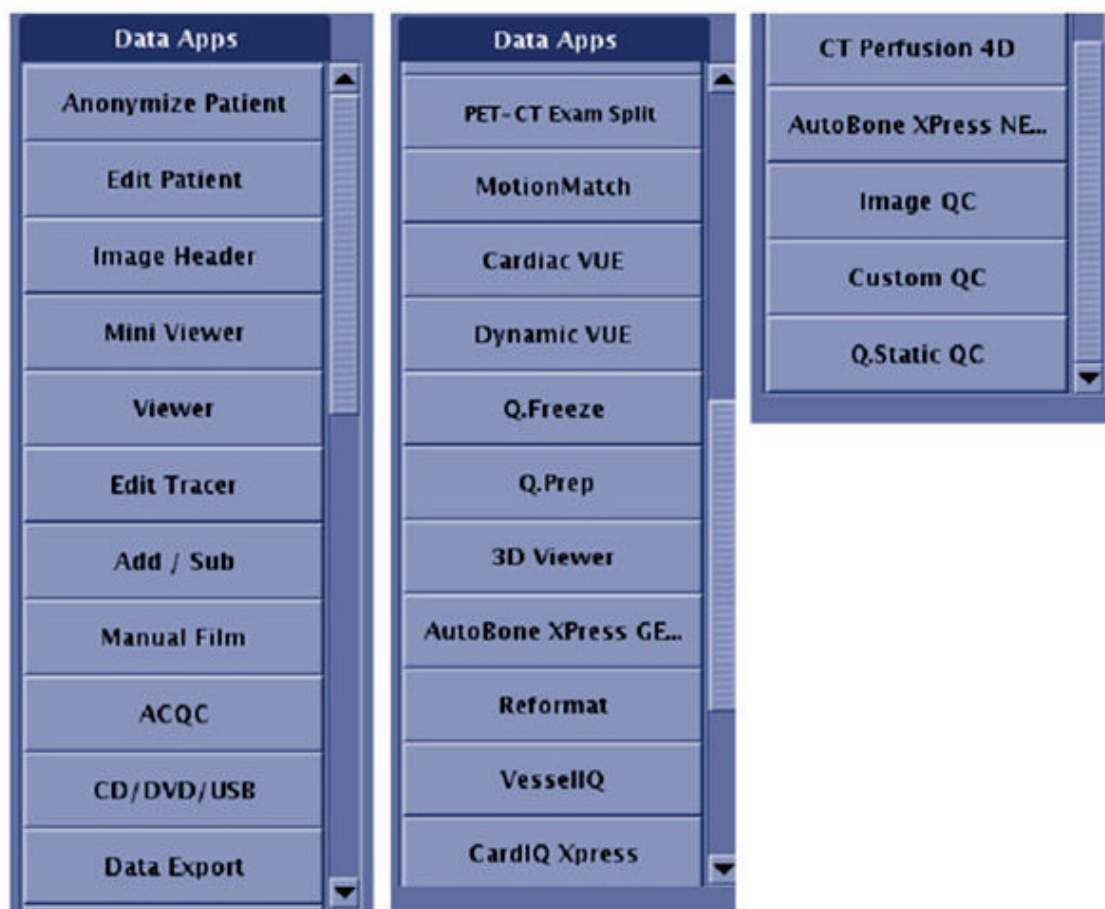
When a function is selected from the Data Apps List (Area 2), Image Works activates and displays the corresponding tools to manipulate and analyze the resulting data (Area 1).

Figure 81 Image Works Display Tools



4.9 Data Apps List

The Data Apps List on your system may differ depending on the options installed. Click and drag the scroll bar or click the arrows to display all the available functions and options.

Figure 82 Data Apps List**Table 46 Data Apps List**

Name	Description
<i>Custom QC</i>	Facility optimized 3D Viewer for PET and CT Quality Control review and fusion.
<i>Image QC</i>	3D Viewer for PET and CT Quality Control review and fusion with GE defaults.
<i>Q.Static QC</i>	Quality Control Comparison of Q.Static and Static PET on Axial and Coronal planes including Fused PET/CT. (This function is optional)
<i>3D Viewer</i>	PET and CT image display and analysis. 5.2
<i>ACQC</i>	Cardiac PET to CT image QC with realignment, if required. (This function is optional) Refer to Chapter 19 AutoACQC (Optional) .
<i>Anonymize Patient</i>	Anonymizes patient data at the exam, series, or image level.

Data Apps List continued	
Name	Description
Cardiac VUE	PET Cardiac Image analysis and reformat (SA, HLA, VLA).
CD / DVD / USB	Creates DICOM Interchange media for transferring data to, or viewing data on, other computers without a network connection.
Data Export	Export images to media or other workstations on the facility network.
Dynamic VUE	Display and analyze PET dynamic images.
Edit Patient	Change patient information after the end of the exam.
Edit Tracer	Change patient quantification information after the end of the exam.
Motion Match	PET and CT respiratory gating and average cine review and post-processing. (This function is optional)
PET-CT Exam Split	Split a PETCT exam into separate exams.
Q.Freeze	PET and CT respiratory gating and average cine review and post-processing to generate motion reduced images. (This function is optional)
Q.Prepare	View and compare critical prescription parameters between prior exams belonging to the same patient.

NOTE

[Table 46 on page 152](#) does not describe all CT Data Apps functions. Refer to the CT User Manual shipped with your system for details on other CT Data Apps functions.

Some of the Apps may be options that are available only upon option purchase.

4.10 PET 3D Viewer Tools

The PET functions Custom QC, Image QC, Q Static QC and 3D Viewer use similar display tools. You may notice some slight layout differences, but all button functions are the same.

4.10.1 3D Viewer Tool Areas

Figure 83 PET 3D Viewer Tool Areas

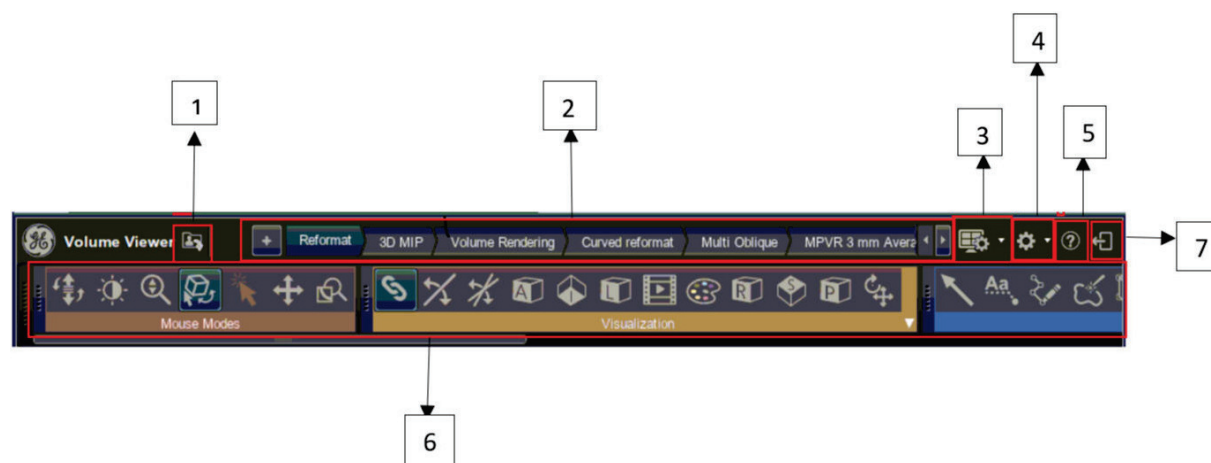


Table 47 PET 3D Viewer Tool Areas

Num-ber	Name	Description
1	MiniBrowser	Dynamic Load / mini-patient list allows loading of additional series on the fly in 3D Viewer viewport by drag and drop.
2	Review Step	The Review Steps window displays layouts and protocols. Any of these layouts or protocols can then be launched by clicking on them.
3	Layout and Review options	Save Layout: save layout or protocol in given anatomies Split layout: Customize screen display Review Manager: Build review scenario and review steps list
4	Preference	Preferences provides a unique access point to customize the preferences in 3D Viewer. Menu List: Display: - Define W/L presets linked to F keys in 3D Viewer Loading: - Bind/split CT multiphase overlapped series Viewports: - Cursor shape, paging mode, ruler style, etc. Annotations: - Viewport annotations Toolbar: - toolbar customization, right click tools access customization Tools: - ROI clone preference, ROI default size, tools behaviour Export: - Save options, output formats. default printer
5	About	Click the question mark to see the version number and license information

PET 3D Viewer Tool Areas continued		
Number	Name	Description
6	Tool Area	These are the standard default PET display tools. You must select a PET series to see the display tools. Display tools can be customized.
7	Exit	Click to Exit 3D Viewer

4.10.2 Mouse Modes

The Mouse Modes provide the ability to change the function of the Left Mouse Button to perform basic image manipulation.

Figure 84 Mouse Modes

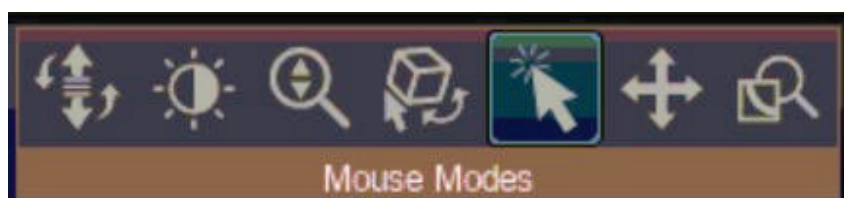

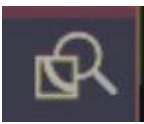



Table 48 Mouse Modes

Icon	Description
	Page/Rotate Page through slices/Rotate Volume
	Zoom
	Select Select a viewport
	Deposit Points Deposit measurement (automatic when selecting a tool)
	Window width / Window level Adjust Window Width and Window Level

Mouse Modes continued	
Icon	Description
	Roam/Pan
	Mag.Glass Magnifying glass
	Blending Factor Adjust fusion % on fused viewports Available only if layout contains a fused viewport

4.10.3 Visualization

The Visualization tools provide the ability to interact with the display of the images.

Figure 85 Visualization

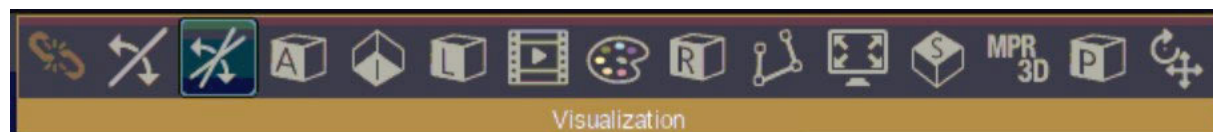
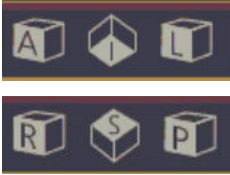
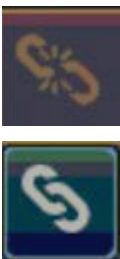


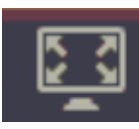
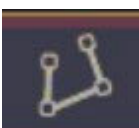
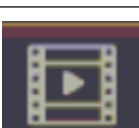

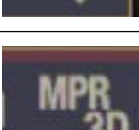
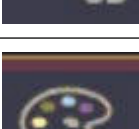


Table 49 Visualization

Icon	Description
	Image Orientation Image Orientation buttons are used to change the planes of 3D or Oblique reformatted images.
	Link/Unlink Link volumes when multiple volumes are loaded to synchronize viewports. All viewports update together. Click Unlink to break the link between volumes. Move the cursor into location on all volumes and click Link to synchronize the viewports

Visualization continued	
Icon	Description
	<p>Simple Oblique Mode</p> <p>The Simple Oblique Mode button displays a line cursor in Reformatted views that is used to define a new plane.</p>
	<p>Multi Oblique Mode</p> <p>The Multi Oblique Mode button displays three oblique planes defined by three adjustable color axes (orange, green, blue).</p>
	<p>Enlarge View</p> <p>Move the cursor over a viewport and select Enlarge View to display the active viewport as the only viewport.</p>
	<p>Trace</p> <p>This Tool offers a guide to create a Curved reformation, a Profile, or an X- Section.</p>
	<p>Cine</p> <p>Allows the user to automatically page through all the slices of a single phase series or control a 4D Cine of multiphase series.</p>
	<p>Rotate / Translate</p> <p>To rotate and translate an image from a specific angle and set degrees of rotation.</p>
	<p>MPR/3D</p> <p>Guides the user through the creation of MPR and 3D views.</p>
	<p>Color</p> <p>Select a Color Map or a Custom Color to apply it to all non-VR viewports.</p>

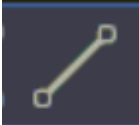

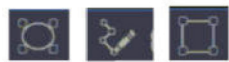
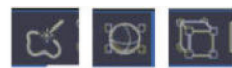

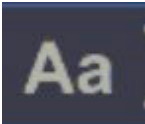
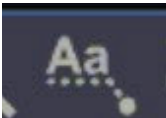
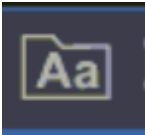

4.10.4 Measure / Annotate

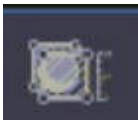

The Measure/Annotate tools allow to perform measurements and annotate the images.

Figure 86 Measure / Annotate



Table 50 Measure / Annotate

Icon	Description
	Straight Distance Use this function to place a line over the image and annotate it with the length. Move the cursor into position, then left-click to place the start point. Move the cursor to the end location and left-click to place the line and display the measurements.
	Curved Distance Deposit multiple points on the image with left click and validate the curved line with right click.
	2D Regions Of Interest 2D ROI types are Elliptical , Free Hand and Rectangular .
	3D Region Of Interest 3D ROI types are Auto-contour , Spherical and Parallelepiped . Right click the 3D ROI and select statistics to be displayed in the viewport from the Statistics menu.
	Arrow Click the Arrow Tool button to deposit an arrow on the screen.
	Annotation Select the Annotate button to deposit an annotation on a viewport.
 	Click (Linked Annotation) to deposit an annotation linked to a structure of interest. Click (Preset Annotations) to deposit or create preset annotations (text annotation or measurement with a predefined label).
	Report Cursor Click the Report Cursor button to deposit a point on the viewports to display a RAS coordinate and the voxel value for the current cursor position.

Measure / Annotate continued	
Icon	Description
	Volume After an object of interest has been segmented, the volume of this object can be assessed by clicking the Volume Measurement tool and then by clicking on the segmented object in the viewport.
	Angle Measurement Click on the image to deposit three points. When depositing an angle on a 3D viewport, the end points will appear as well on all the corresponding 2D viewports.

4.10.5 Export

The Export tools allow you to perform saving of outputs and work.

Figure 87 Export

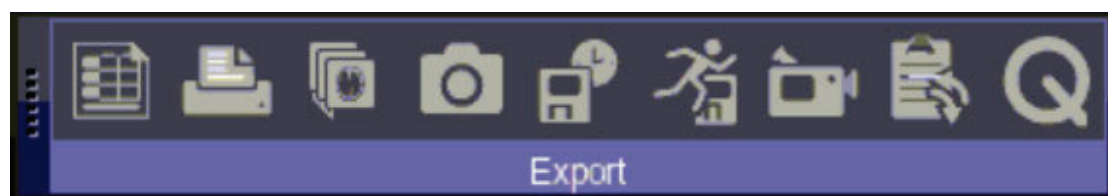


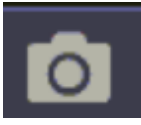

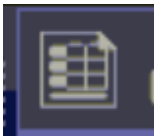
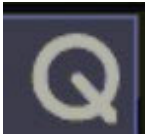

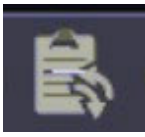



Table 51 Export

Icon	Description
	Batch Creates Rotation , Loop or Oblique batch images based on user prescriptions.
	Save State Saves the current status of 3D Viewer (3D Model, displays, ROIs, etc.) as an additional series of the exam.
	Save Image The default save format is a Screen capture. Refer to Global Preference section in order to adjust preferences for <i>Save Image</i> .
	Quick Export Exports in a single click a batch of rotations of a 3D view or a full batch of contiguous 2D images at the displayed thickness.

Export continued	
Icon	Description
	Summary Table Click to open the Summary Table and display collected measurement performed during the review. See Summary Table section below for more information.
	QTVR Movie Saves multiple projections of a volume rendering as a QuickTime™ movie in the Filmer.
	Movie Creates a comprehensive movie including different rotations, zoom, and pan of the volume.
	Save/Recall Opens the clipboard where segmented objects were sent and stored temporarily within a current 3D Viewer session via right click menu
	Filmer To view the MiniFilmer

4.10.6 Segmentation

Figure 88 Segmentation

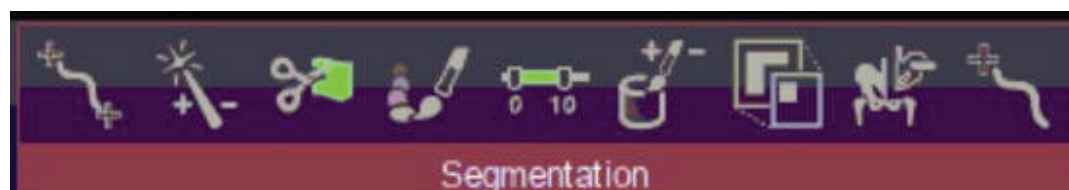

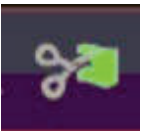

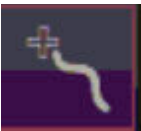
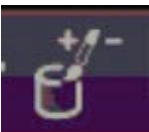
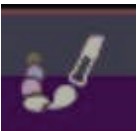

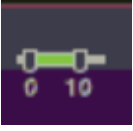



Table 52 Segmentation

Icon	Description
	Auto Select This is the most frequently used tool for CTA and MRA studies.
	Scalpel Draw a structure to cut holding the left mouse button, then select if you want to cut inside or outside the contours. It is also possible to Double click in the view to apply an inside cut. Depth of the cut can be adjusted from the panel.
 	Quick Vessel Trace Allow vessel tracking in one click and two clicks. Length measurement can be performed on the lumen viewports.
	Paint on slices Draw contours of the structure of interest on different slices of the <i>same plane</i> . The volume to keep will be interpolated based of the defined contours
	Quick Paint Paint a structure of interest in all planes to segment with the adjustable brush and press (Apply) to keep only the painted structure.
	Remove Objects Allows you to Remove or Keep isolated objects as well as display removed structures.
	Threshold Threshold the image keeping only voxels within a specified value range.
	Advanced Processing Consolidates many processes: dilate, erode, filters, subtraction methods, close gaps/open bridges, close holds, and extract surface.






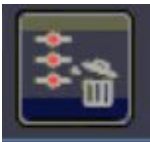
4.10.7 PET

The PET tools allow to perform bookmark the images.

Figure 89 PET



Table 53 PET

Icon	Description
 	Lock/Unlock Bookmark To lock and unlock the bookmark
	Deposit Bookmark Deposits a 3D ROI. Based upon the current threshold value, the software contours the data within the bounding box. The area remains bookmarked until it is deleted or cut.
	Next Bookmark Click Next Bookmark icon to display the next available bookmark in the loaded image series.
	Delete current bookmark To delete current bookmark
	Delete all bookmarks To delete all the bookmarks

4.11 PET ACQC Tools

The following section contains illustrations and descriptions of common tools used during PET ACQC.

When you select PET ACQC, the Image Works Display Tools update to display the tools shown in [Figure 90 on page 163](#).

For information on the AutoACQC application, refer to [Chapter 19 AutoACQC \(Optional\)](#).

Figure 90 PET ACQC Tools

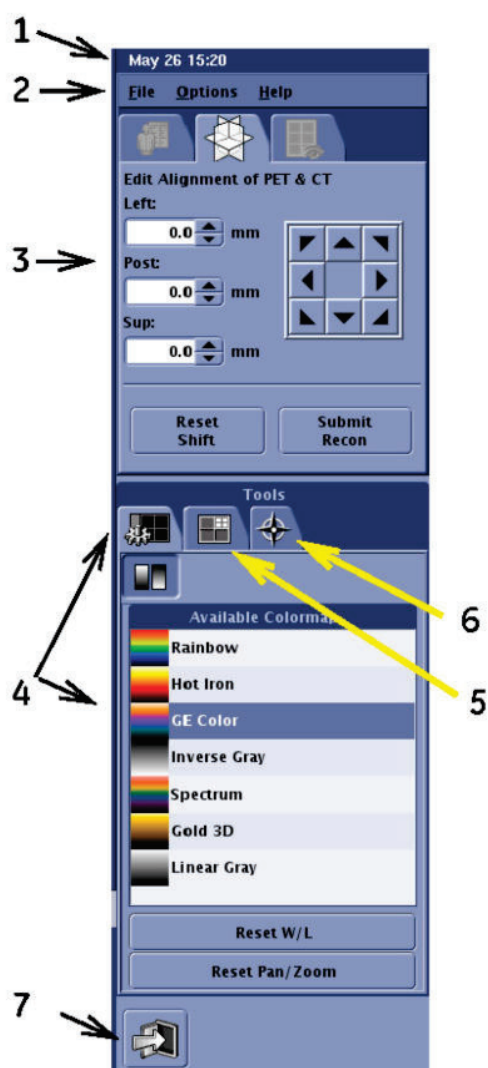
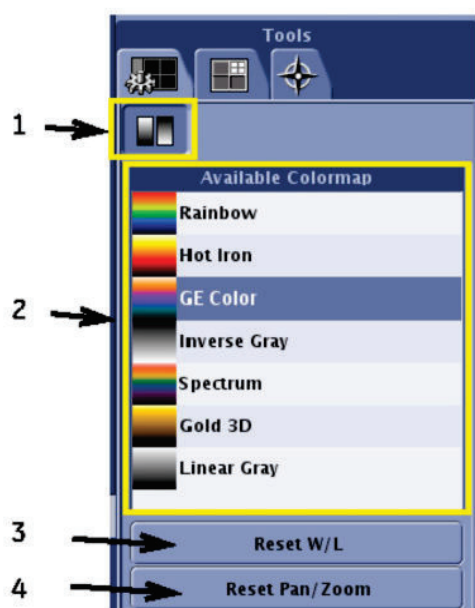


Table 54 PET ACQC Tools

Number	Name	Description
1	Date/Time	The current date and time.
2	Menu	Click on menu name to display its drop-down menu.
3	PET/CT Alignment tab	Type a value in the field, click the up/down arrows next to a field, or click the directional arrows to shift the PET image in the corresponding direction, relative to the CT image. This tab also contains a button to reset the alignment back to the starting point and a button to submit the images for reconstruction with the currently displayed alignment.
4	Display Tool tab	Select this tab to change the appearance of the images on display. Refer to Figure 91 on page 165 .
5	Display View Format tab	Select this tab to change the number of image viewports on display, and configure the contents of the viewports.
6	Display Orientation tab	Select this tab to change the orientation of the display images from the standard transaxial views (axial, sagittal, coronal) to the standard cardiac views (SA, VLA, HLA). The Orientation window displays the Center of the Heart (CoH) coordinates and the angles associated with the reorientation process. This tab also contains a Reset button to restore the cardiac views to the original transaxial orientation.
7	Exit Door	Click to close PET ACQC.

Figure 91 Display Tool Tab**Table 55 Display Tool Tab**

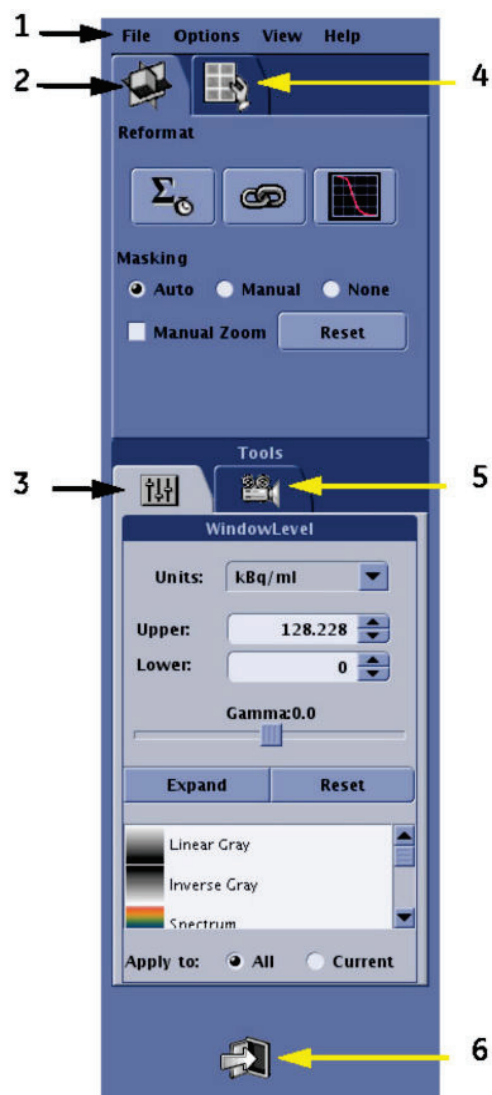
Number	Name	Description
1	Colormap Icon	Always selected in ACQC.
2	Available Colormap	Shows the currently selected color scale. Refer to Figure 91 on page 165 . Click on a colormap to temporarily change the currently displayed study to the new selection. When you load a new exam or start a new session, the colormap returns to the user preference default selection.
3	Reset W/L	Click to reset the PET scaling limits to the min/max default values that the system assigns when you launch ACQC.
4	Reset Pan/Zoom	Click to center the image in the viewport and restore the image to its original magnification.

NOTE

ACQC is not applicable to the Whole-Body Dynamic scan type.

4.12 PET Cardiac VUE Tools

In this manual, the terms, Cardiac VUE and CardIQ Physio, are used interchangeably. CardIQ Physio has more functionality than Cardiac VUE. Cardiac VUE is loaded on the PET/CT system and CardIQ Physio is loaded on the Advantage Workstation (AW).

Figure 92 Cardiac VUE Tools Display**Table 56 Cardiac VUE Tools Display**

Number	Name	Description
1	Menu	Click on a menu name to display its drop-down menu.
2	Reformat tab	Refer to Figure 93 on page 167 .
3	Window Level tab	Refer to Figure 94 on page 168 .
4	Review tab	Click this tab to change the viewport format, or display designated group information in the viewport area to capture on film with the images. Refer to Figure 95 on page 169 .

Cardiac VUE Tools Display continued		
Number	Name	Description
5	<i>Cine</i> tab	Refer to Figure 102 on page 176 .
6	<i>Exit Door</i>	Click to close PET Cardiac VUE.

Figure 93 Cardiac VUE Reformat Tab

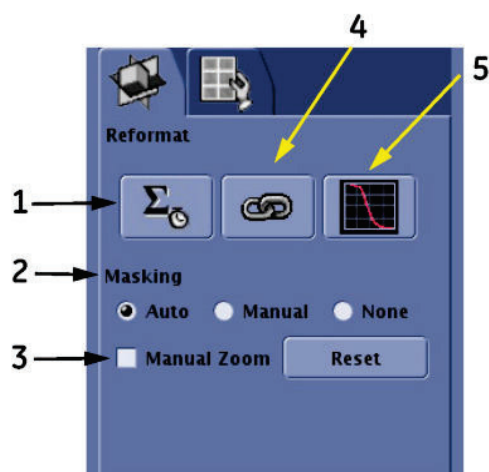


Table 57 Cardiac VUE Reformat Tab

Number	Name	Description
1	Summing button	Click to display the table of bins/frames into which the selected series is divided. Click two or more frames to add the corresponding pixel content together and improve the appearance of the resulting image. For Dynamic Studies, click the Apply Decay Correction check box to compensate for the effect the drop in activity over scan time has on the image brightness.
2	Masking	Click to rescale the colormap to the designated mask area, and disregard the pixels that fall outside the ROI boundaries. <ul style="list-style-type: none"> Auto: The system assigns the mask. Manual: The system displays an ROI that can be resized and recentered over the area of interest. None: The system scales the colormap to include all the pixels in the image.

Cardiac VUE Reformat Tab continued		
Number	Name	Description
3	Manual Zoom	Click the Manual Zoom check box to display an ROI over the coronal and sagittal images that is about the size of the auto mask and centered over the approximate CoH. Resize the ROI to change the image magnification of the VLA, HLA and SA images. Reposition the center of the ROI over the center of the heart. Click Reset to restore the images to the original defaults. Clicking Manual Zoom disables the Auto Mask function.
4	Link button	Click to open a new window that displays the current CoH coordinates and VLA/HLA/SA angles. Enter new CoH and Angle data into the fields. Click Apply to update the image display. If you selected multiple series, you also can apply the CoH and angles to the other series.
5	Filter button	Click to open a selection window and apply a filter if the image was reconstructed without one.

Figure 94 Cardiac VUE Window Level Tab

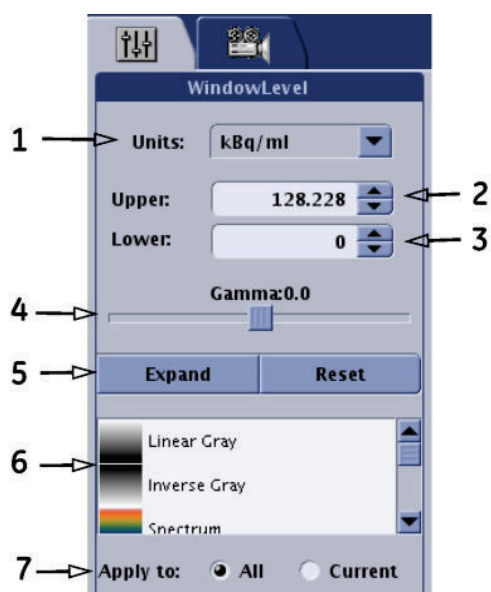


Table 58 Cardiac VUE Window Level Tab

Number	Name	Description
1	Units	Click the arrow to display a menu of scaling options: <ul style="list-style-type: none"> • kBq/ml or uCi/ml: All images scaled to the upper/lower values displayed on the Window Level tab (2, 3). • % Series Max: All images in the series normalized to the maximum pixel value detected in that series. • % Global Max: All images in all the selected series normalized to the maximum detected pixel value.
2	Upper	Click the up/down arrows or enter a new value into the field to change the PET scaling upper limit. You also can click on the gray square at the top of the color bar to the left of the display, and drag to change the colormap scale.
3	Lower	Click the up/down arrows or enter a new value into the field to change the PET scaling lower limit. You also can click on the gray square at the bottom of the color bar to the left of the display, and drag to change the colormap scale.
4	Gamma	Click and drag the slider to expand and compress the colormap scale without changing the upper and lower values.
5	Expand / Reset	Click Expand to change the displayed range of the color bar. Click Reset to return the color bar display to the original colormap range.
6	Colormap selection	Click on a name in the list to apply the corresponding colormap to every image, or every image in the selected series, depending upon the radio button selection. Press F5 to sequence through three color maps preset on the User Preferences window.
7	Apply to	Click the All radio button to apply the colormap selection to all selected series. Click the Current radio button to apply the colormap to the currently selected series.

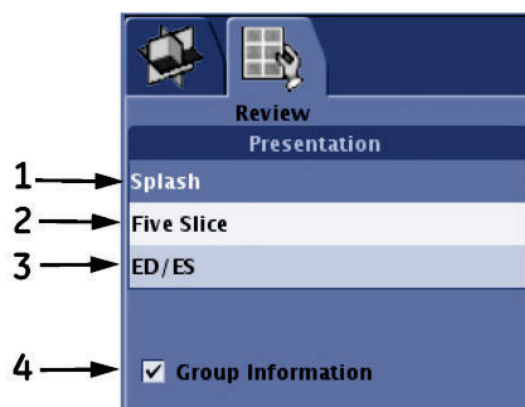
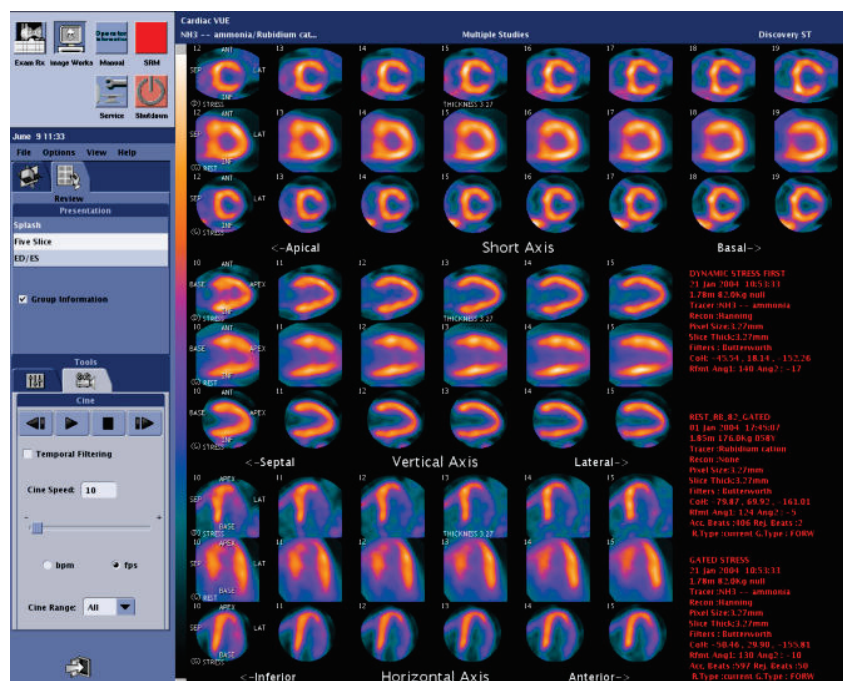
Figure 95 Cardiac VUE Review Tab

Table 59 Cardiac VUE Review Tab

Number	Name	Description
1	<i>Splash</i>	Cardiac VUE defaults to Splash mode when you start the application. The system displays a user selectable number of images per row, and up to nine rows. The system displays the SA, VLA and HLA images for up to three series at once. The number of series you select determines the Splash screen layout. Refer to Figure 97 on page 172 and Figure 98 on page 173 .
2	<i>Five Slice</i>	The system displays three SA and one VLA and one HLA image for up to three series. Click and drag on one of the locator bars to optimize the display angle and CoH, or page through all the SA, VLA and HLA images in the series. Use this function to triangulate and examine by slice. Refer to Figure 99 on page 174 and Figure 100 on page 174 .
3	<i>ED/ES</i>	Available only for gated data, the system displays End Diastolic and End Systolic volumes ranging from largest to smallest. Use this function to check volume, perfusion and wall thickening. Refer to Figure 101 on page 175 .
4	<i>Group Information</i>	Click the Group Information check box to display related information in the viewport area to capture on film. Click Options > Preferences > Group Info:Configure... to select the information you want to display. Refer to Figure 96 on page 171 .

NOTE

The Cardiac VUE screen presentation selection and number of selected series determines the location of the Group Information in the viewport area. The User Preference selections determine the size and content of the Group Information display.

Figure 96 Group Information Display on a Splash Screen**NOTE**

The number of series selected determines the layout of the Cardiac VUE Splash screen.

Figure 97 Three Series Cardiac VUE Splash Screen

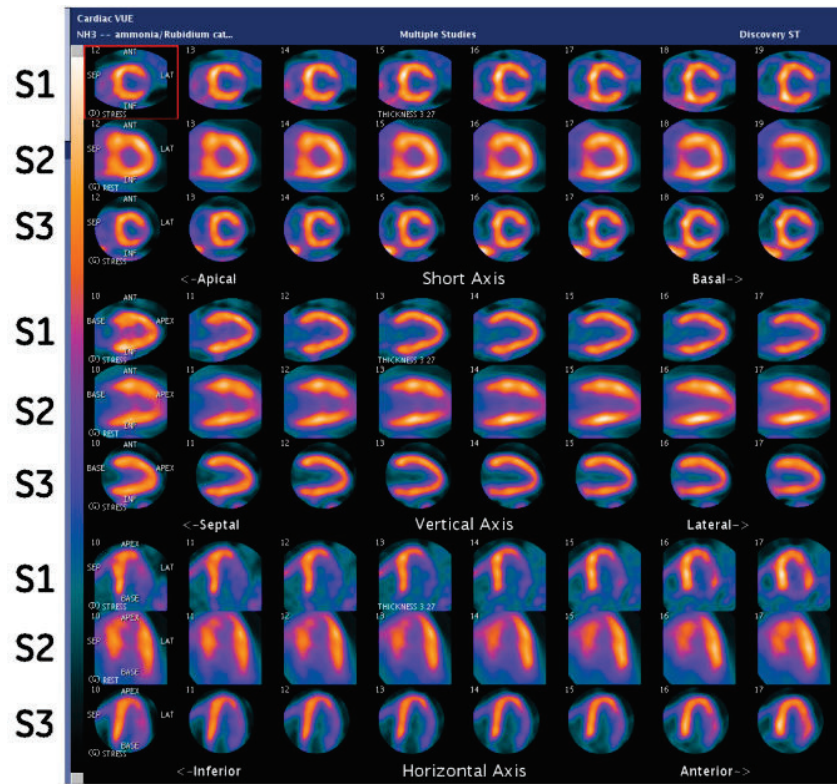
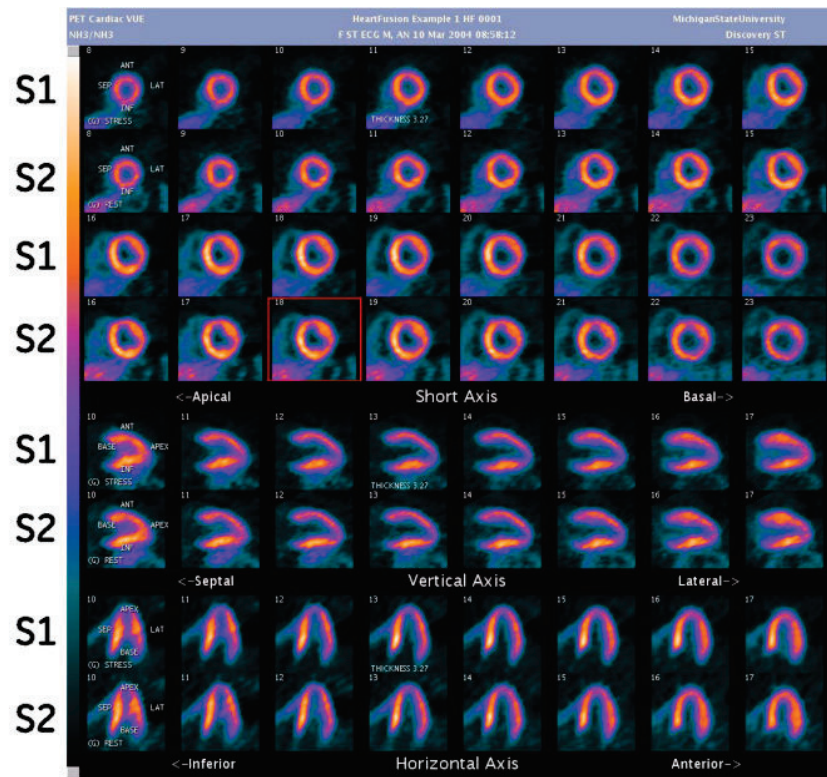


Figure 98 Two Series Cardiac VUE Splash Screen**NOTE**

The number of series you select determines the layout of the Cardiac VUE Five Slice screen.

Figure 99 Two Series Cardiac VUE Five Slice Screen

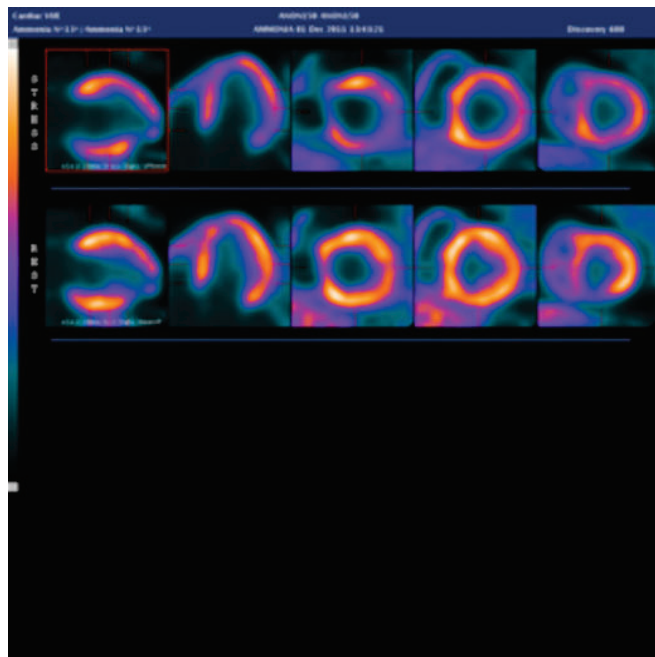
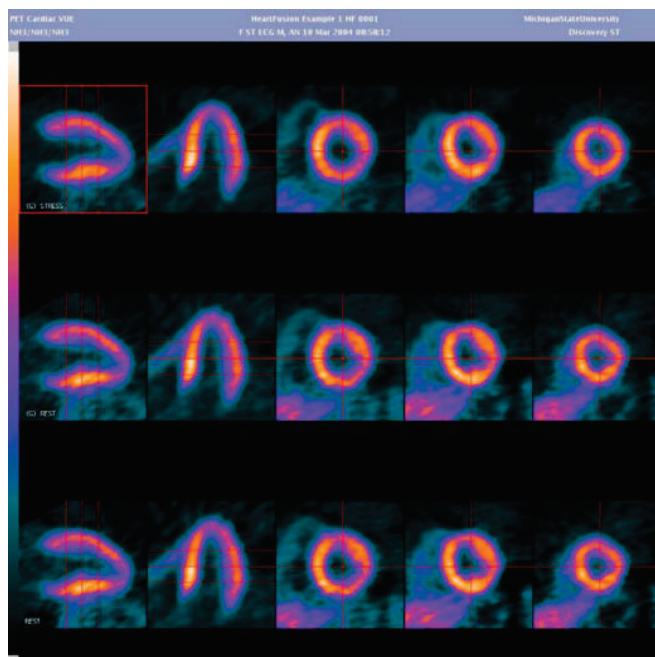


Figure 100 Three Series Cardiac VUE Five Slice Screen



The ED/ES screen displays up to two gated series. In the absence of LVSD (Left Ventricle Segmentation Detection) the number of bins you load determines the number of ED and ES image frames on display.

Table 60 ED/ES Display Table

Number of Bins Loaded	ED Display	ES Display
5 or fewer	unavailable	unavailable
6 to 10	1	4
11 to 14	1	6
15 or 16	1	8
17 or more	unavailable	unavailable

Figure 101 Two Series Cardiac VUE ED/ES Screen

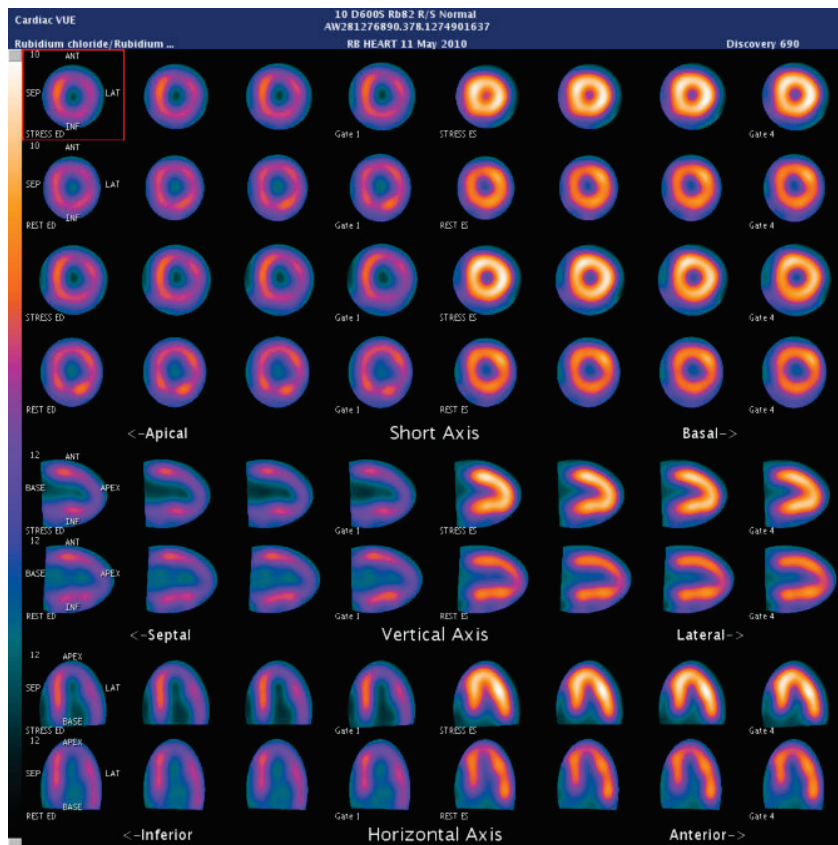
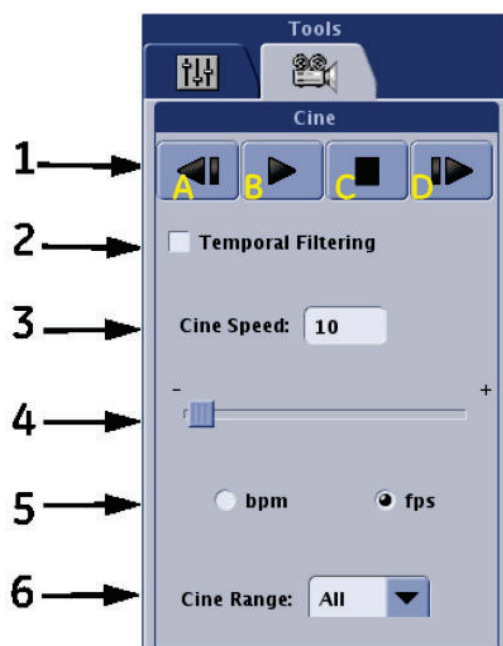


Figure 102 Cardiac VUE Cine Tools**Table 61 Cardiac VUE Cine Tools**

Number	Name	Description
1	Cine buttons	Click on one of the following buttons to control the Cine display. <ul style="list-style-type: none"> A: Step back one bin/frame for each click. B: Play Cine at the designated speed, rate and range. C: Stop Cine motion. D: Step forward one bin/frame for each click.
2	Temporal Filtering	Check the box to enable a smoother visual transition between bins.
3	Cine Speed	Shows the current cine display rate in bpm or fps (5). This field updates when you click and drag on the slider beneath it (4). You also can enter a new value into the field.
4	Cine Speed Slider	Click and drag the slider to the left to decrease the Cine Speed, or to the right to increase the Cine Speed. The Cine Speed field updates to display the current rate of speed.
5	Display Rate Format	Click the corresponding radio button to select the display rate. You can show the Cine in beats per minute or frames per second
6	Cine Range	Defaults to All . Click on the field and type of bins to display in the Cine format.

4.13 PET Dynamic VUE Tools

Figure 103 Dynamic VUE Display Tools

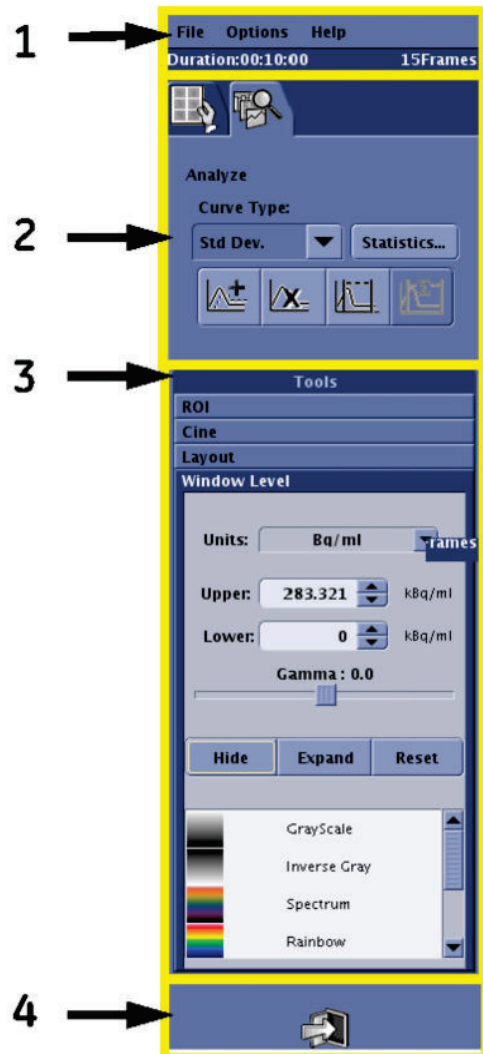


Table 62 Dynamic VUE Display Tools


Number	Name	Description
1	Menu	Click File to display the Dynamic VUE Save menu. Click Options to display a menu of initial functions and parameters to set as defaults. Click Help to display the current software version.
2	Review and Analyze tabs	Click Review to display and navigate through the selected series and optimize the images for analysis by summing, plotting and/or reframing them. Refer to Figure 104 on page 178 . You can display the images in the Matrix, Location or Time window format. Click Analyze to plot curves and display statistics. Refer to Figure 105 on page 180 .
3	Tools Area	Click ROI to display the tools shown in Figure 107 on page 182 . Click Cine to display the tools shown in Figure 109 on page 185 . Click Layout to display the tools shown in Figure 110 on page 186 . Click Window Level to display the tools shown in Figure 112 on page 188 .
4		Click the Exit Door icon to close the Dynamic VUE session.

Figure 104 Dynamic VUE Review Tab

Table 63 Dynamic VUE Review Tab

Button	Description
	<p>Click Matrix to display the images from different locations at a specified time in each column, and from the same location over the range of times in each row.</p> <p>Click and drag on the vertical scroll bar to display sequential locations, from Superior to Inferior.</p> <p>Click and drag on the horizontal scroll bar to display sequential time periods in each row.</p>
	<p>Click Location to observe tracer activity in all locations during a specified time period.</p> <p>Click and drag on the horizontal scroll bar to display sequential time periods in all locations.</p>
	<p>Click Time to observe tracer activity in all times at a specific location.</p> <p>Click and drag on the horizontal scroll bar to display sequential locations in all times.</p>
	<p>Click Sum Over Time to combine data set slices from the same location, across all times, to create a single summed image for each location.</p> <p>You can save the summed data from the File > Save > Save As menu.</p>
	<p>Click Sum over Location to combine data set slices from the same time, across all locations, to create a single summed image for each time.</p> <p>You can save the summed data from the File > Save > Save As menu.</p>
	<p>Click Reframe or Rebin to display a list of the frames in this series, with the option to add frame data together and/or select frames for display during this session.</p> <p>You can save the summed data from the File > Save > Save As menu.</p>
	<p>Click Undo to restore the images to the default display state set on the User Preferences window.</p>



Dynamic VUE Review Tab continued	
Button	Description
	<p>Click Plot Over Time to open the Analyze tab and plot the uptake in the designated region of interest on a selected slice over time.</p> <p>Click on a slice to select it and create a region of interest.</p> <p>Click Plot Over Time to display all the images of the selected location, and any ROIs, over the scan time.</p> <p>Dynamic VUE plots an activity curve along the bottom of the display area.</p> <p>The plot displays the maximum, minimum, mean or standard deviation, based on your Curve Type selection.</p>
	<p>Click Plot Over Location to open the Analyze tab and plot the uptake in the designated region of interest on a selected slice over location.</p> <p>Click on a slice to select it and create a region of interest.</p> <p>Click Plot Over Location to display all the images of the selected time, and any region of interest over the scan range.</p> <p>Dynamic VUE plots an activity curve along the bottom of the display area.</p> <p>The plot displays the maximum, minimum, mean or standard deviation, based on your Curve Type selection.</p>

Figure 105 Dynamic VUE Analyze Tab

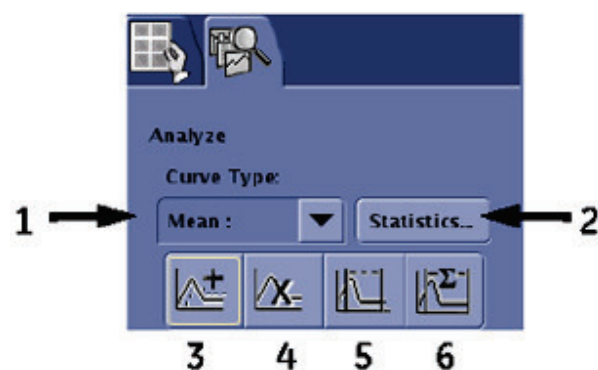




Table 64 Dynamic VUE Analyze Tab

Number	Name	Description
1	Curve Type	<p>Click the arrow to display the list of Curve Types from which to choose. The field displays the currently selected curve type.</p> <ul style="list-style-type: none"> • Max Curve: Display a plot of the maximum detected activity of the image or designated ROI and change the plot heading to Maximum vs. Time or Maximum vs. Location. • Min Curve: Display a plot of the minimum detected activity of the image or designated ROI activity and change the plot heading to Minimum vs. Time or Minimum vs. Location. • Std Dev: Display a plot of the standard deviation curve of the image or designated ROI and change the plot heading to Standard Deviation vs Time or Standard Deviation vs. Location. • Mean Curve: Display a plot of the mean of the image or designated ROI, and change the plot heading to Mean vs Time or Mean vs. Location.
2	Statistics	<p>Click Statistics to open a Dynamic VUE window over the display area that lists the ROI, Std. Dev, Mean, Min & Max value in the units selected in the User Preferences window. Refer to Figure 106 on page 182.</p> <p>Click Save to open a save browser.</p> <p>Choose the file destination (default: Home directory) and file name, then click Save to save the file in ASCII file form as a text file, and close the browser.</p>
3		<p>Click the Add Curve button to draw an additional ROI over the selected image, and add the plot of the curve to the existing display.</p> <ul style="list-style-type: none"> • Click on the ROI to turn it red and activate it. • Click Add Curve to plot the ROI. • Click and drag on the new ROI to resize or reposition. • You can draw up to eight ROIs on an image.
4		<p>Click Delete Curve to remove the most recently deposited ROI from the selected image. You also can click on an ROI to activate it for deletion.</p>



Dynamic VUE Analyze Tab continued		
Number	Name	Description
5		Click Range Bar to toggle the range bar display ON and OFF on the currently displayed curve plot. Range Bar ON: Click and drag on the range bars to refine the range of display. The system only displays the data that falls between the range bars when you click Summed Over Range .
6		Click Summed Over Range to sum all the images between the range bars over time or location, and display the resulting summed images in the top half of the display area.

Figure 106 Statistics Window Example

Dynamic VUE					
Patient Name: 10 D6005 Rb82 R/S Normal		Patient ID: AW281276890.378.1274901637			
Study Date: 11 May 2010		Series Name: +SREST1 RB DYN FBP12mm			
Date: 17 Jun 2010		Frame Time: 00:03:00			
ROI	Location	Mean	Max	Min	Std Dev.
No ROI	S 163.75	3.778	41.261	-14.942	7.143
No ROI	S 160.48	5.101	50.431	-14.181	8.518
No ROI	S 157.21	5.783	51.313	-12.320	8.869
No ROI	S 153.94	5.936	49.605	-9.203	8.682
No ROI	S 150.67	5.932	49.917	-8.738	8.487
No ROI	S 147.40	6.023	49.783	-7.873	8.542
No ROI	S 144.13	6.218	51.863	-8.450	8.826
No ROI	S 140.86	6.496	49.614	-8.566	9.317
No ROI	S 137.59	6.832	58.453	-7.858	10.031
No ROI	S 134.32	7.202	77.403	-6.699	10.959

Units for Mean, Max, Min & Std Dev.: kBq/ml

Save Cancel

Figure 107 Dynamic VUE Tools — ROI

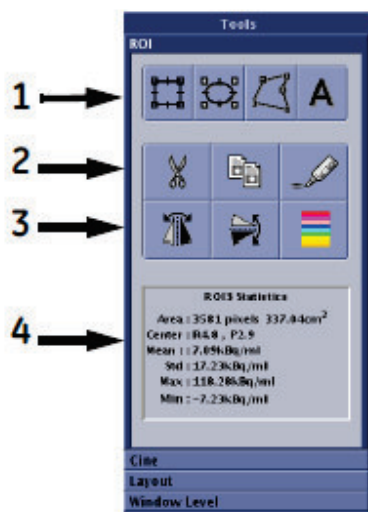
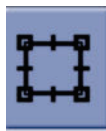

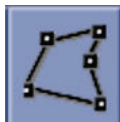





Table 65 Dynamic VUE Tools — ROI

Number	Name	Description
1		<p>Click to deposit a square ROI over the active image.</p> <ul style="list-style-type: none"> Click and drag on the lines to reposition the ROI. Click and drag on the squares to resize the ROI. If the ROI has been plotted to a curve, changing the ROI also updates the activity curve
		<p>Click to deposit an ellipse ROI over the active image.</p> <ul style="list-style-type: none"> Click and drag on the lines to reposition the ROI. Click and drag on the squares to resize the ROI. If the ROI has been plotted to a curve, changing the ROI also updates the activity curve
		<p>Click to deposit a user defined ROI over the active image.</p> <ul style="list-style-type: none"> Move the mouse into position along the edge of the area you plan to analyze, then left-click. Continue to move the cursor and click to deposit segments of line around the region of interest. To finish, move the cursor to the start point and click to close the ROI, or right-click to close the ROI. If the ROI has been plotted for a curve, and you click and drag on a solid square to reshape the ROI, the activity curve also updates.
		<p>Click the User Annotation button to deposit a text cursor on the image and accept user typed text. Move the text cursor into position over the active image, left-click to begin typing, then left-click again to end.</p> <ul style="list-style-type: none"> Click on an existing annotation to edit or delete it. Click ROI/Annotation Properties to open the ROI window and change the font size: Small (10pt), Medium (12pt) or Large (16pt). Refer to Figure 108 on page 185.
2		<p>Click on an ROI or user annotation, then click Cut to remove the ROI or text from the image and transfer it to the clipboard.</p> <p>After you click Cut, you can Paste the ROI or text on one or more images.</p>
		<p>Click on an ROI or user annotation, then click Copy to transfer a copy of the ROI or text to the clipboard.</p> <p>After you click Copy, you can Paste the ROI or text on one or more images.</p>





		Click Paste to use the mouse to deposit the most recently cut or copied text or ROI onto the active image. Roll the cursor over the image and left-click to deposit the ROI or text.
3		Click Flip Left/Right to mirror flip the designated ROI about the center axis of the image, from left to right. Click Flip Left/Right a second time to toggle back to the original orientation.
		Click Flip Top/Bottom to mirror flip the designated ROI about the horizontal axis of the image, from top to bottom. Click Flip Top/Bottom a second time to toggle back to the original orientation.
		Click ROI/Annotation Properties to open the selector window shown in Figure 108 on page 185 . Click the radio button next to a colored square to change the ROI border or annotation to the corresponding color. Type a new ROI label into the data field. Click on existing text and click the Small/Medium/Large radio button to change the annotation font size. Click OK to close the selector window.
4	Status area	Displays the ROI information.

Figure 108 ROI/Annotation Properties Selector Window

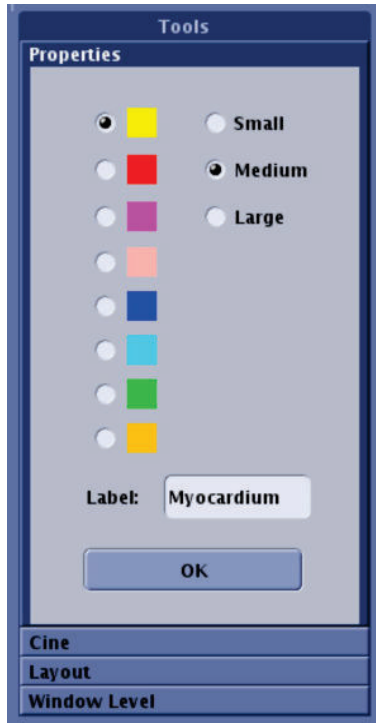


Figure 109 Dynamic VUE Tools — Cine

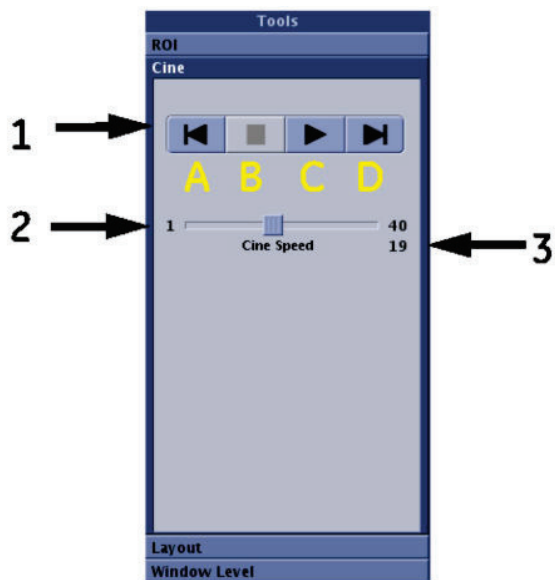


Table 66 Dynamic VUE Tools — Cine

Number	Name	Description
1	Cine buttons	<p>If necessary, click the Review tab, then click on an image to activate it.</p> <p>Click on one of the following buttons to control the Cine display:</p> <ul style="list-style-type: none"> • A: Step back one frame for each click. • B: Stop Cine motion. • C: Play Cine at the designated speed. • D: Step forward one frame for each click.
2	Cine Speed	<p>Click and drag on the slider to increase and decrease the Cine display rate.</p> <p>The system displays the minimum and maximum speed to the left and right side of the slider bar.</p>
3	Current Cine Speed	The system displays the current Cine display speed set by the slider, directly beneath the maximum rate of speed.

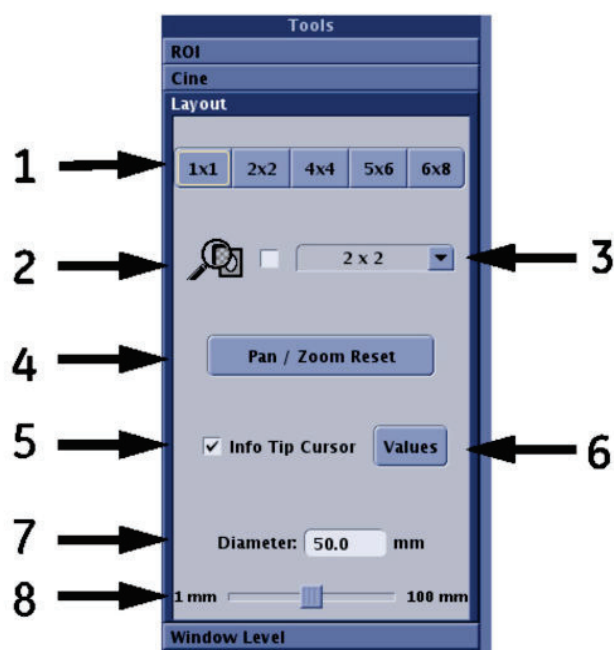
Figure 110 Dynamic VUE Tools — Layout

Table 67 Dynamic VUE Tools — Layout

Number	Name	Description
1	Matrix Layout	Click one of the preset matrix layout buttons to display the corresponding number of images per row and rows per window.
2	Magnifying Glass	<p>Zoom: Check the box to enable the magnify function:</p> <ul style="list-style-type: none"> • Left-click and drag the mouse over the image to zoom. • Release the left mouse button to stop zooming. • Uncheck the box to disable the function. <p>Pan: Click-left over the image and drag to recenter the image in the field of view.</p>
3	User Defined layout	<p>Click the down arrow to display a grid representing the maximum number of image viewports available to the Matrix Review window.</p> <p>Click and drag down to select the number of rows, and drag right to select the number of images in a row.</p> <p>The field updates to show the most recently selected format.</p>
4	Pan/Zoom Reset	Click to resize and recenter the designated image(s) to the default magnification and original center coordinates.
5	Info Tip Cursor	<p>Click the box to toggle the Info Tip Cursor function ON and OFF.</p> <p>Info Tip Cursor box checked: Move the cursor over an area of interest and wait a few seconds while the system analyzes the designated area of interest and temporarily displays the results over the image.</p>
6	Values	<p>Click to open a Info Tip Cursor Display Values selector window that determines the values the Info Tip Cursor displays when enabled and active.</p> <ul style="list-style-type: none"> • Click the check box to enable the display of the corresponding value. Refer to Figure 111 on page 188. • Click OK to accept the current selections and close the Info Tip Cursor Display Values selector window.
7	Diameter	<p>The display field contains the current size of the area to evaluate with Info Tip.</p> <p>Type a new value into the field, or click and drag on the slider (8) to change the Info Tip ROI diameter.</p>
8	Diameter Slider bar	Click and drag to increase and decrease the diameter of the ROI area to evaluate with the Info Tip feature. The Diameter field updates in real time as you drag the slide.

Figure 111 Info Tip Cursor Display Values Selector Window



Figure 112 Dynamic VUE Tools — Window Level

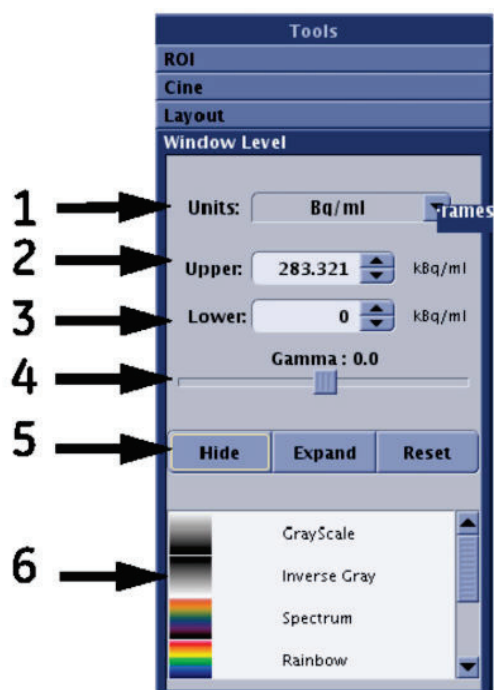


Table 68 Dynamic VUE Tools — Window Level

Number	Name	Description
1	Units	Select the scaling factor, either as a percentage of the upper and lower scaling limit, or as uptake units.
2	Upper Scaling Limit	Click the up/down arrows or type a new value into the data field to change the PET scaling upper limit. You also can click on the gray square at the top of the color bar to the left of the display, and drag to change the colormap scale.
3	Lower Scaling Limit	Click the up/down arrows or type a new value into the field to change the PET scaling lower limit. You also can click on the gray square at the bottom of the color bar to the left of the display, and drag to change the colormap scale.
4	Gamma	Click and drag the slider to expand and compress the colormap scale, and change the intensity of the Dynamic VUE images, without exceeding the designated upper and lower values. The software displays the current slider selected gamma value, from -10.0 to 10.0, in increments of 0.1, to the right of the Gamma: label.
5	Colorbar controls	<ul style="list-style-type: none"> Click Hide to toggle the colorbar along the left side of the display area OFF and change the label to Show. Click Show to turn ON the colorbar and change the button label to [Hide]. Click Expand to restore the colorbar scale to the values displayed in the Upper and Lower data fields. Click Reset to restore all the colorbar parameters to the default values.
6	Colormap list	<p>Click a new color map on the list to change the display.</p> <ul style="list-style-type: none"> Click and drag on the scroll bar to display all the selections. The colormap returns to the default value selected on the User Preferences window when you close the session.

4.14 PET Motion Match Tools

Figure 113 Advantage 4D Tab

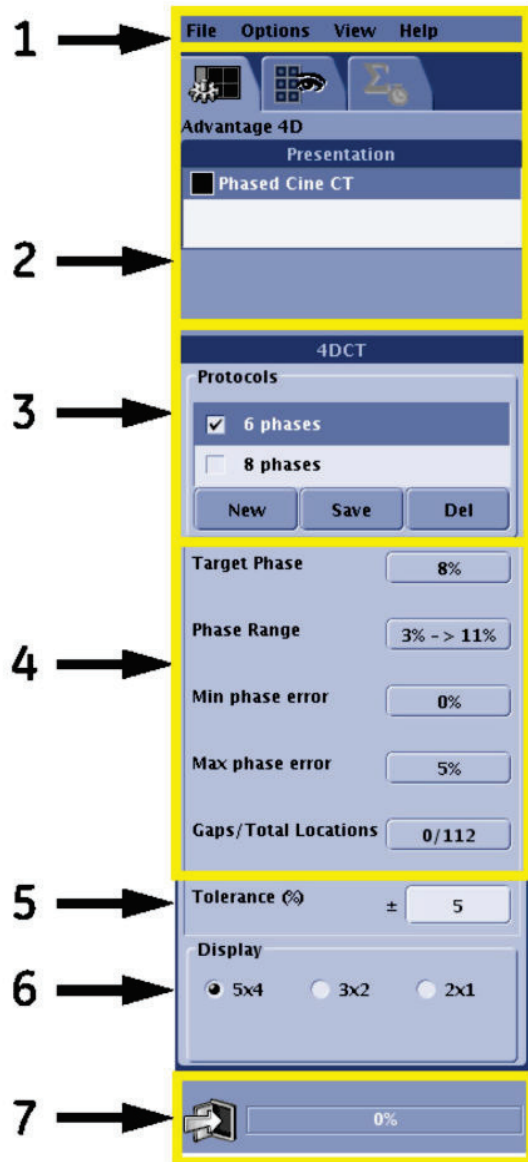


Table 69 Advantage 4D


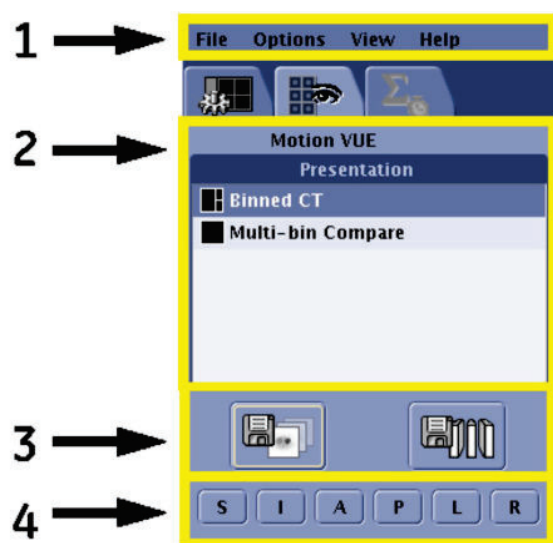
Number	Name	Description
1	Menu	Click on a menu name to display its drop-down menu. See Respiratory Gating for more information.
2	Presentation area	Displays the current list of Advantage 4D protocols. If the list contains multiple presentation protocols, click on the name to change the display to the corresponding presentation.
3	Protocol List	<p>Motion Match ships with two permanent protocols, 6 Phases and 8 Phases. You can not modify or delete these permanent protocols, but you can create additional protocols.</p> <ul style="list-style-type: none"> Click New to create a custom protocol. The length of the cine breathing cycle determines the maximum number phases you can select. Click Save to make the current configuration a new protocol. Click Delete to remove the highlighted custom protocol from the list.
4	Database Information	<p>Lists the Target Phase information used to bin the PET data to the respiratory cycle. You can not edit this information area.</p> <ul style="list-style-type: none"> Target Phase: Current target phase value. Phase Range: Acceptable variance from the target range for inclusion in the respiratory phase. Min Phase Error: Absolute value between the closest image in the selected phase and the selected target phase. Max Phase Error: Absolute value between the farthest image in the selected phase and the selected target phase. Gaps/Total Locations: Number of locations without images/total number of locations that fall outside the target phase.
5	Tolerance	Enter the percentage deviation from the target phase the system may automatically query for images it can use. If all available images fall outside the tolerance, the images can be manually added.
6	Display Format	Click the radio button to select the corresponding viewport layout of CT images in the display area.
7		<p>Click the Exit Door icon to close Motion Match and return to the Image Works browser.</p> <p>You can also click File in the toolbar, and click or drag to Quit.</p>
	Status bar	The status bar updates during longer functions to report progress.

Figure 114 Motion VUE Tab**Table 70 Motion VUE Tab**



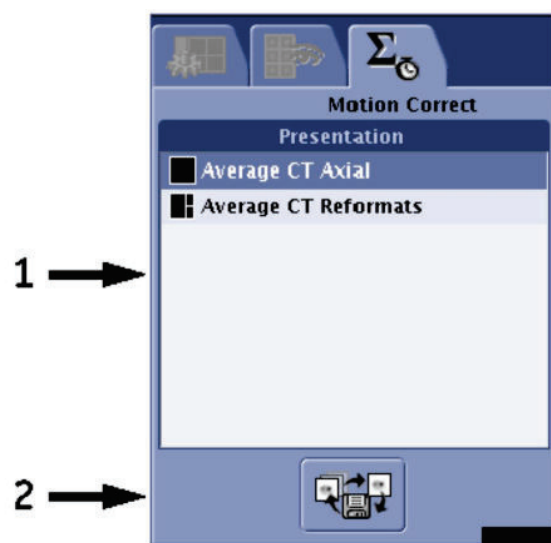
Number	Name	Description
1	Menu	Click on a menu name to display its drop-down menu. See Respiratory Gating for more information.
2	Presentation area	Displays the current list of Motion VUE protocols. The software ships with several permanent presentation protocols. Click on the name to change the display to the corresponding presentation, and update the information on the Layout tab.
3		Click to save the Motion VUE images as Intensity Projections: MIP, min-IP or Average IP.
		Click to save the Motion VUE images. You can save each Target Phase as a separate series to save all Target Phases as a single series, or select individual Target Phases and save them as multiple series or all together in a single series
4	Image Orientation buttons	Click a button to change the active viewport to the corresponding perspective, relative to the patient. <ul style="list-style-type: none"> • S Superior • I Inferior • A Anterior • P Posterior • L Left • R Right

Figure 115 Motion Correct Tab**Table 71 Motion Correct Tab**


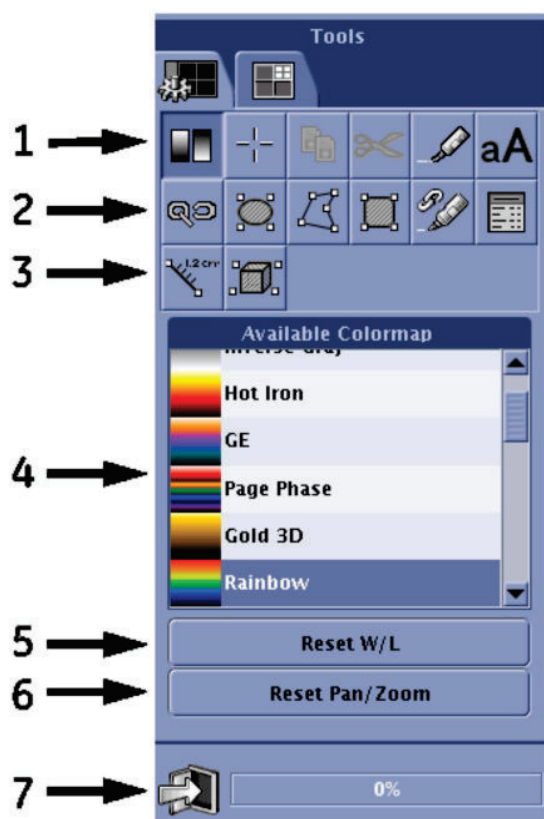

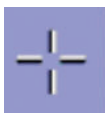
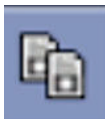


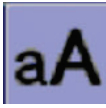






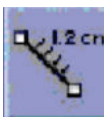
Number	Name	Description
1	Presentation Area	Displays the current list of Motion Correct protocols. Click on the name to change the display to the corresponding presentation and update the information on the Layout tab.
2		Click the Save as Series button to open a new window that displays the default series number and space for a name. <ul style="list-style-type: none"> You can change the series number. Type a unique description into the Series Name field. Click OK to save the averaged Cine CTAC with the exam.

Figure 116 Motion Match Display Tools**Table 72 Motion Match Display Tools**

Number	Icon	Description
1		Click to display the Available Color-map list.
		Click [Report Cursor] to display the coordinates and value of the voxel directly beneath the cursor.
		Click on an ROI or user annotation, then click [Copy] to transfer a copy of the ROI or text to the clipboard. After you click [Copy], you can [Paste] the ROI or text on one or more images.

Motion Match Display Tools continued		
Number	Icon	Description
		Click on an ROI or user annotation, then click [Cut] to remove the ROI or text from the image and transfer it to the clipboard. After you click [Cut], you can [Paste] the ROI or text on one or more images.
		Click [Paste] to use the mouse to place the most recently cut or copied text or ROI onto the active image. Roll the cursor over the image and left-click to place the ROI or text.
		Click the [User Annotation] button to place a text cursor on the image to accept user typed text. Move the text cursor into position over the active image, left-click, begin typing then left-click to end. Click on existing annotation to edit or delete it.
2		Click [Unlink/Link] to link the motion of one viewport to another.
		Click [Ellipse ROI] to place an ellipse ROI over the active image. <ul style="list-style-type: none"> Click and drag on the lines to reposition the ROI. Click and drag on the squares to resize the ROI.

Motion Match Display Tools continued		
Number	Icon	Description
		<p>Click [Polygon ROI] to place a user defined ROI on the image.</p> <ul style="list-style-type: none"> Move the mouse into position along the edge of the area you plan to analyze then left click. Continue to move the cursor and click to place segments of line around the region of interest. To finish, move the cursor to the start point and click to close the ROI. -or- Right-click to close the ROI.
		<p>Click [Rectangular ROI] to place an ROI over the active image.</p> <ul style="list-style-type: none"> Click and drag on the lines to reposition the ROI. Click and drag on the squares to resize the ROI.
		<p>Click [Special Paste] to paste the selected ROI into other viewports, and retain control of the ROI.</p> <p>Click on an ROI to activate it, then click and drag to resize or reposition the active ROI, and all the other pasted ROIs update. If you change the viewport view type, the ROI will not follow.</p>
		<p>Click [ROI Statistics] to display the statistics of the selected ROI. If you select an ROI on a fused image, the software displays both CT units and PET units.</p>
3		<p>Click [Measure] to place a line over the active viewport. The system displays the length and angle of the line (from vertical) over the image viewport until you press [Delete] or [Cut] to remove the information from the image.</p>



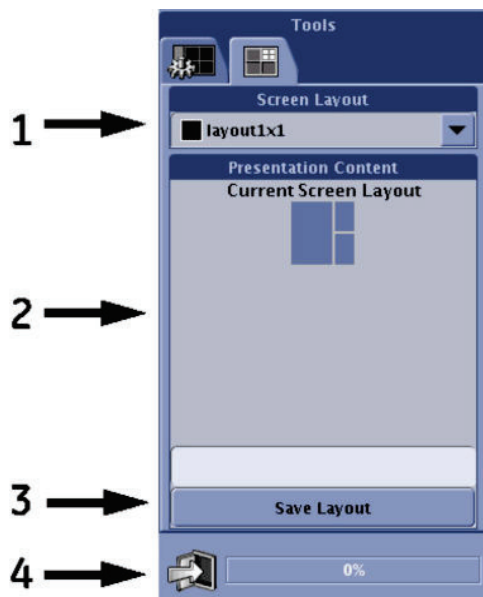

Motion Match Display Tools continued		
Number	Icon	Description
		Load PET Data to activate: Click [Threshold VOI] to create a contour, based on the thresholding value detected within the bounding box.
4	Available Colormap	<p>Click a new colormap on the list to change the display.</p> <ul style="list-style-type: none"> Click and drag on the scroll bar to display all the selections. The colormap returns to the default value selected with User Preferences when you close the session.
5	Reset W/L	Click [Reset W/L] to reset the PET scaling limits to the min/max default values that the system assigns when you launch the Motion Match application.
6	Reset Pan/Zoom	Click to resize and recenter the designated image(s) to the default magnification and original center coordinates.
7		Click the [Exit Door] icon to close Motion Match and return to the Image Works browser. You can also click [File] in the toolbar, and click or drag to [Quit].
	Status bar	The status bar updates during longer functions to report progress.

Figure 117 Motion Match Layout Tab**Table 73 Motion Match Layout Tab**

Number	Name	Description
1	Screen Layout area	Click the arrow to display the list of available layouts. You can create a custom layout and store it on the list.
2	Presentation Content area	This area displays the current presentation selection. If you choose a new presentation from the Motion VUE tab or from the Screen Layout area, this area updates to show the new layout selection.
3	Save Layout	Select a new layout from the Screen Layout area, type a unique description into the field, then click Save Layout to store the corresponding layout on the Motion VUE tab Presentation List.
4		Click the Exit Door icon to close Motion Match and return to the Image Works browser. You can also click File in the toolbar, and click or drag to Quit .

5 Quantitation

5.1 Quantitation Introduction

This chapter describes features available on the systems related to quantitation.

In general, the term quantitation means to measure something. In medical imaging, this may include the size of a feature in the image, the location of features relative to reference structures, the pixel values for a region containing the feature or the total number of features in an image volume. For many of these measurements, the feature or feature borders must be detectable in a biologically varied background, and therefore the contrast and noise in the image become important parts of quantitation.

5.2 System Design

A first element necessary for quantitation in PET is the ability of the detector system to accurately collect as many of the radiopharmaceutical annihilation event gamma rays as possible. To do this, the system must have high sensitivity, a consistent calibration, as well as good energy and timing resolution.

5.2.1 Detector Sensitivity

The detector sensitivity depends upon the physical properties of the scintillation material as well its thickness. The higher the scintillator attenuation coefficient for 511 keV gamma rays, the better it will stop the gamma rays and enable production of scintillation light. The thicker the scintillator, the higher the probability is that an entering 511 keV gamma ray will interact within the scintillator. Both BGO and LYSO, at appropriate thicknesses, contribute to high detector sensitivity. The PET/CT system design includes both choice of detector material as well as sufficient detector thicknesses to enable high system sensitivity, allowing excellent detection capability for any given radionuclide distribution.

5.2.2 Geometric Sensitivity

Another important factor for good sensitivity is the detector geometry. This encompasses the probability that both photons from positron annihilation will reach the detector surface. At the PET scanner isocenter, it can be shown that the geometric efficiency of a point source coincidence event, such as for a lesion, is approximated by $L^2/2D$ where L is the PET detector axial length and D is the detector diameter. A doubling of the scanner axial length approximately quadruples the system sensitivity. The PET/CT system design includes choice of PET detector system length such that a system can be tailored to your clinical needs.

5.2.3 Consistent Calibration

In order to accurately qualify detected gamma rays, a feature available on the PET detector system measures and corrects for changes in PET detector temperature. It is known in the field that changes in detector temperature can contribute to change in sensitivity and event qualification accuracy, which in turn can cause fewer or more events to wind up as qualified for coincidence pairing. The realized

effect is based upon the temperature offset between the calibration temperature and the current temperature. The Q.Temp feature enables real-time tracking and correcting for change in temperature such that the calibration remains consistently applicable as small variations in temperature occur. This contributes to a more consistent quantitation capability with the PET/CT system design.

5.3 Patient Scanning

System functionality for patient scanning is an important contributor to quantitation. This is because accurate customization and selection of scan protocol, as well as consistency with prior studies and institutional procedure protocols is necessary. To assist you, two features are available: Q.Prepare and Q.Check. Further, the VIP Record/Replay feature enables the flexibility to use the same scan data to generate further static, dynamic or gated PET scans from the current scan.

5.3.1 Q.Check

Q.Check provides the capability to ensure that parameters that affect PET SUV computation are entered prior to scanning. You can configure a list of required PET quantitation fields, such as patient weight, injected dose and radionuclide. Then, upon scan prescription a warning is issued if the scan setup is accepted without entering values for the user-configured fields. Three new fields of importance were added: patient blood glucose level and date of last treatment. These fields are also available for review when performing post-study analysis using PET VCAR.

5.3.2 Q.Prepare

The Q.Prepare feature extends the functionality of Q.Check with three important components. The first is the capability to pre-enter information prior to scan prescription within the patient schedule. The second and third components are related and enable reviewing and comparing with the current study prescription any prior study quantitation parameter values. Pre-entry of quantitation information is accessed via the patient schedule while the latter features are launched from the patient list browser as applications.

5.3.3 VIP Record/Replay

The acquired PET coincidence event data (the 'list') can be streamed to disk in real time with VIP Record. When acquired, this data can be 'replayed' with VIP Replay using other scan protocols, for instance with shorter static scan duration, as a gated scan or as a dynamic scan for a bed position. These derivative scans can further include one or more prescribed image reconstructions. Replay scans can be prescribed prior to the start of scanning, such that they execute immediately after the 'live' scan completes.

5.4 Managing the Impact of Patient Respiratory Motion

During PET/CT scanning, patient respiratory motion can have several impacts on the quantitative capability of the resulting image data. In some cases, a mismatch in attenuating material position between CT and PET can cause under or over-correction artifacts. Several features available on the

PET/CT system enable you to mitigate or correct for the quantitative impacts of patient respiratory motion.

5.4.1 CTAC Respiratory Motion Management

The following set of features enables you to manage the degrading impacts of patient respiratory motion in CTAC.

5.4.1.1 RadRx

RadRx allows the prescription of standard diagnostic CT protocols for CTAC in conjunction with PET acquisitions, all within the same exam. RadRx also allows the acquisition of CINE-CT in conjunction with the PET acquisition for MotionMatch.

5.4.1.2 MotionMatch

MotionMatch refers to a subset of features for 4D PET/CT:

- Motion VUE allows you to visualize the images processed with MotionCorrect, Advantage4D using 4D PET data. In addition, retrospective phase-matched CTAC can be used for retrospective phase-matched PET reconstruction in order to generate the most quantitative 4D PET images.
- Advantage4D enables phase assignment to CINE-CT such that it can be matched to gated PET and used for CTAC
- MotionCorrect generates time-averaged CINE-CT for CTAC, to match STATIC PET for attenuation correction

5.4.2 PET Respiratory Motion Management

5.4.2.1 MotionFree (PET Digital Gating)

MotionFree, a PET Digital Data Driven Gating feature, is a fully digital algorithm which measures physiological respiratory motion based on the coincidence events detected by the system. It measures motion signals (waveforms and triggers) out of each field of view utilizing principal component analysis (PCA) technique without an aid of external hardware or a device. It then automatically determines whether the detected motion is respiratory, and is to be corrected.

MotionFree is seamlessly integrated into clinical acquisition protocols, prospectively and retrospectively, which allows the user to correct for motion any time for any patient and for any field of view.

5.4.2.2 Q.Static

Q.Static minimizes the effect of respiratory motion on PET quantitation and image quality by acquiring PET coincidence data only during the quiescent portion of the patient respiratory cycle. This acquisition is integrated into a whole-body PET/CT imaging protocol, making it accessible to standard clinical practice. The Q.Static images are available along with the conventional whole-body PET static images.

5.4.2.3 Q.Freeze and INTEG_Q.Freeze

The Q.Freeze feature represents the pinnacle of quantitative accuracy in the case that respiratory motion degrades the data quality. With input of 4D-CT and gated PET, a robust and reliable 3D global, non-rigid registration algorithm is used on the 4D-PET to register all gates to a reference PET gate. Typically, the gate with least residual motion is chosen as the reference. The output of the Q.Freeze application is a 3D PET image volume following motion correction.

5.5 Image Reconstruction

6.1.2

Iterative image reconstruction techniques have brought dramatic improvements in image quality to PET and SPECT imaging, and the quality of PET images continues to improve as more rigorous implementations are developed. Several features available on the PET/CT systems have been integrated into the image reconstruction process to provide the most accurate quantitation and highest image quality available.

5.5.1 FORE-FBP

FORE-FBP (Fourier REbinning - Filtered Back Projection): is a 2D filtered back projection method that allow you to select a Transaxial filter type and cutoff value. Filter options are Enhanced Hanning, Shepp-Logan, Rectangle, Hanning, and Butterworth .

5.5.2 VUE Point HD

6.1.2

The VUE Point HD (VPHD) image reconstruction algorithm brings several improvements over earlier generations of OSEM iterative reconstruction. One improvement was implementation of ‘native geometry’, whereby forward and back projection, with distance-driven projectors, utilizes knowledge of image space pixel locations as well as physical detector locations. This improves the radial resolution response as well as the statistical modeling of the data within the iterative loop. Another improvement is that this algorithm enables modeling of all corrections in the iterative loop.

5.5.3 Q.Clear

6.1.2

Q.Clear is a quantification method used to iteratively reconstruct PET images to full convergence while maintaining acceptable image quality.

5.5.4 Precision DL

Precision DL is a deep learning-based image processing method intended for PET oncology 18F-FDG images obtained using non-ToF PET systems. Precision DL enhances the non-ToF images to have image quality (IQ) performance similar to PET images obtained using ToF PET systems, including enhancement in image Contrast Recovery (CR), Contrast to Noise Ratio (CNR), and quantitation accuracy. Precision DL bridges the gap between the absence of hardware based ToF technology and the IQ benefits of ToF reconstruction.



PRECISION DL IS TRAINED AND INTENDED ONLY FOR ONCOLOGY 18F-FDG PET IMAGING DATA. DO NOT USE PRECISION DL FOR PROCESSING NON-ONCOLOGY OR NON-18F-FDG IMAGING DATA

5.5.5 SharpIR

6.1.2

The purpose of the SharpIR algorithm is to improve PET image contrast to noise by incorporating information about the PET detector response into the 3D iterative reconstruction algorithm. Using point source measurements, the response is measured for each type of PET detector system that GE offers. The SharpIR algorithm is available in conjunction with all available reconstruction methods.

5.5.6 Attenuation Correction

6.1.2

Attenuation is often the largest correction necessary for quantitative PET image reconstruction. Several features are available to ensure the most accurate attenuation correction possible can be performed. These features consider attenuation mis-alignment between CT and PET ACQC, ensuring full line integrals of attenuation can be calculated using WideView and both of these can be done at the lowest CT dose possible using Q.AC.

5.5.6.1 Attenuation Correction Quality Control

The Attenuation Correction Quality Control application (ACQC) allows you to efficiently align PET and CT images to ensure proper cardiac registration. The application keeps track of image shift then re-reconstructs the PET data with a shifted CT attenuation correction. This can improve scanning efficiency and lower patient dose by allowing re-use of rest CTAC with re-alignment to the PET stress study.

5.5.6.2 WideView

The WideView algorithm increases the CT reconstruction display field-of-view (DFOV) from 50 cm to 70 cm to match the standard PET DFOV. A software re-binning process ensures reliable attenuation estimation outside the 50 cm CT fan. This improves the quantitation locally as well as across all body cross-sections where tissue lies outside a 50 cm diameter.

NOTE

SmartMAR used for Metal Artifact Reduction in CT is not compatible with WideView PET Recon. Apply SmartMAR on secondary recons not used for AC.

5.5.6.3 Q.AC

The Q.AC feature enables the potential use of significantly lower CT dose. The algorithm is designed to maintain accurate HU values even at ultra-low dose CT techniques when the CT is to be used primarily for PET attenuation correction.

5.5.6.4 Enhanced AC

Enhanced AC is intended to correct PET-CT respiratory mismatch.

In this method Enhanced AC generates a corrected attenuation map called **Non diagnostic data – Enhanced AC**, which is later used for PET image reconstruction, where PET-CT respiratory mismatch is eliminated.

5.5.7 Enhanced Attenuation Correction (AC) Option

5.5.7.1 Introduction

Attenuation correction in PET/CT medical imaging is an important part of the image reconstruction process. For achieving high quality functional images, the spatial registration between the two modalities should be accurate.

Respiratory mismatch in clinical PET-CT scans is a common source of image artifacts due to inaccurate attenuation-correction, which is typically seen as erroneously low tracer uptake in the lower lung regions and adjacent organs.

In the Enhanced AC method, standard reconstructed PET-CT images are evaluated, and relevant potential artifacts are analyzed. The artifact characteristics control a CT image reshaping model, which is based on predictable respiratory motion pattern, and provides corrected attenuation map for any final PET image reconstruction.

5.5.7.2 Enhanced AC Reconstruction Overview

Enhanced AC is intended to correct PET-CT respiratory mismatch over the liver and the spleen areas.

In this method Enhanced AC generates a corrected attenuation map called **NON DIAGNOSTIC DATA – ENHANCED AC**, which is later used for PET image reconstruction, where PET-CT respiratory mismatch is eliminated.

In the Enhanced AC method, standard reconstructed PET-CT images are evaluated, and relevant potential artifacts are analyzed. The artifact characteristics control a CT image reshaping model, which is based on predictable respiratory motion pattern, and provides corrected attenuation map for any final PET image reconstruction.

Enhanced AC can be prescribed during live acquisition as well as during retrospective reconstruction or retrospective replay.

5.5.7.3 Enhanced AC Reconstruction Overview

Enhanced AC can be set **On** during a live scan workflow or by retrospective recon/replay scans. By default, Enhanced AC is set to **Off**. The user can turn on this option when creating a user protocol in protocol management.

5.5.7.3.1 Enhanced AC - Live Scan

In the **PET Acquisition** window, under the **PET Reconstruction** tab, click the **Recon option** button to turn it on. Click it again to turn it off, refer to [Figure 118 on page 206](#).



NOTE

Enhanced AC is compatible with Static and Q.Static modes only.

NOTE

Enhanced AC can be activated only in **Measured** attenuation state.

NOTE

In case of multiple recons in one recon queue (e.g., PDL - L, PDL - M, PDL - H) the Enhanced AC output is set according to the number of the selected recons (e.g. Enhanced AC – PDL-L, Enhanced AC - PDL-M, Enhanced AC - PDL – H).

NOTE

Enhanced AC is disabled (grayed out) for PET/CT Cardiac scans, Cine CT scans or when patient is lying on the side.
It is not intended to use for brain scans, or for unusual CTAC series created from multiple different CT scans where the transition between the different CT scan types falls on the region of interest . If selected, no output will be generated.

NOTE

Enhanced AC cannot be used in conjunction with PET DMPR, thus the DMPR output will be the series without the Enhanced AC application.

NOTE

In order to activate the Enhanced AC correction, the scan should include the relevant organs e.g., full lung region and liver.

NOTE

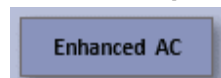
In case of stop scan, Enhanced AC correction will not be performed.

Figure 118 PET Enhanced AC feature selection for live acquisition.

Enhanced AC Off	Enhanced AC On
<p>Select the desired Attenuation Correction Method</p> <p>Measured None Enhanced AC</p> <p>OK Cancel</p>	<p>Select the desired Attenuation Correction Method</p> <p>Measured None Enhanced AC</p> <p>OK Cancel</p>

5.5.7.3.2 Enhanced AC - Retrospective scan (Reconstruction/ Replay mode) 6.1.2

In the **PET Acquisition** window, under the **PET Reconstruction** tab, click the **Recon option** button and click the **Enhanced AC** button to turn it On. Click the button again to turn it off.



Refer to [Figure 119 on page 207](#).

NOTE

Enhanced AC can be activated only in Measured state.

NOTE

6.1.2 Enhanced AC will not be enabled when CTAC shift is set to **Yes**, Normalization is **None** and scatter is **Off**.

NOTE

In order to activate the Enhanced AC correction, the scan should include the relevant organs, i.e., full lung region and liver.

Figure 119 Enhanced AC setup window in retrospective workflow

The screenshot shows the 'Enhanced AC setup window' with the following settings:

- Attenuation:** Type: **Enhanced AC** (selected), Measured, None.
- Open ACQC:** On (selected), Off.
- CTAC Type:** CTAC Series: **CTAC 3.75** (selected), LOW DOSE WB CT 2.5mm.
- Contrast Compensation:** Automatic (selected), On, Off.
- CTAC Shift:** No (selected), L (mm): +0.00, P (mm): +0.00, S (mm): +0.00.
- Correction:** Well Counter: **Sensitivity & Activity** (selected), Sensitivity, None.
- WCC File:** Default (selected), Others.
- Normalization:** Default (selected), Others, None.
- Randoms:** On (selected), Deadtime: On (selected).
- Scatter:** On (selected).

Navigation buttons: Prior, Next, OK, Cancel.

5.5.7.4 Enhanced AC output

Enhanced AC generates new reconstructed PET image volume using a modified attenuation correction map (**Non diagnostic data – Enhanced AC**). When prescribing Enhanced AC, the expected output will be the following:

1. User prescribed series (without the application of enhanced AC reconstruction).
2. Enhanced AC PET series that has the same reconstruction parameters of the prescribed series (described in item no.1) with applied enhanced attenuation correction as part of its reconstruction ([Figure 120 on page 207](#)). Enhanced PET images are marked by **Enhanced AC** in addition to the series description as demonstrated in [Figure 120 on page 207](#) below.

Figure 120 Enhanced AC output series

2	PROSP	495	CTAC 3.75	CT	GE M...
3	PROSP	512	LOW DOSE WB CT 2.5mm	CT	GE M...
307	PROSP	495	NON DIAGNOSTIC DATA - ENHANCED AC	CT	GE M...
401	STATIC	495	Enhanced AC QCHD500	PT	GE M...
402	STATIC	495	Enhanced AC QCHD500 - HPDL	PT	GE M...
403	STATIC	495	QCHD500	PT	GE M...
404	STATIC	495	QCHD500 - HPDL	PT	GE M...
901	LIVE	7	WB PET	R...	GE M...

- CT series, called as **Non diagnostic data – Enhanced AC** (Figure 121 on page 208), is created for the use of the reconstruction engine to generate the Enhanced AC PET images. This series is intended to be used only for Enhanced AC attenuation correction reconstruction and not for diagnostic purposes.



THE 'NON DIAGNOSTIC DATA – ENHANCED AC' SERIES IS TO BE USED ONLY FOR RECON REVIEW AND NOT TO BE USED FOR DIAGNOSTIC PURPOSES.

Figure 121 Non diagnostic data

307	PROSP	495	NON DIAGNOSTIC DATA – ENHANCED AC
-----	-------	-----	-----------------------------------

NOTE

Always use the non-enhanced AC PET series as a reference for clinical diagnosis.

NOTE

The Enhanced AC PET series, better represents the true activity distribution of the PET data. Since the diagnostic CT is not adjusted, there might be some mismatch in the corrected area when reviewing in fused mode (e.g., above the liver), due to the different respiration phases that are still valid.

5.6 Post-Processing Applications

A number of applications are available on AW systems to help you visualize, measure and report findings using the PET and CT data.

5.6.1 PET VCAR

PET VCAR (volume computer assisted reading) allows efficient measurement of multiple image features according to current guidelines, such as use of SUVpeak, per PET Response Criteria in Solid Tumors (PERCIST) recommendations. For longitudinal studies, access to the Integrated Registration feature enables alignment between studies such that previously marked areas can be readily transferred to the current study for user modification and subsequent quantitative assessment. A summary table can be generated to streamline the clinical review process.

5.6.2 CardIQ Physio

The CardIQ Physio application integrates processing, visualization and quantification to evaluate myocardial tissue viability. The left ventricular volume, ejection fraction and myocardial mass can be assessed.

5.6.3 CardIQ Flow

The CardIQ Flow application integrates processing, visualization and quantification to evaluate myocardial tissue viability. The left ventricular volume, ejection fraction and myocardial mass can be assessed.

5.6.4 CortexID

The CortexID application includes a clinically validated review and analysis of PET and PET/CT neurologic exams. Images can be compared with those from age-stratified normal and disease groups. The application also provides orthogonal and re-oriented image volume review.

5.6.5 Integrated Registration

The Integrated Registration application is a powerful, general purpose tool to align image volumes from multiple modalities. It has features to automate registration as well as options to enable the user to customize the registration prior to saving the results. Registration can be constrained to rigid only or to allow non-rigid deformation. This application is compatible with the Advantage SIM MD and other standard treatment planning software.

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6 Power Up and Shutdown the System

6.1 Power Up and Shutdown the System Introduction

This chapter contains instructions to start up, shut down and reboot the system, as well as use the system readiness monitor.

It contains instructions for systems with the standard configuration and the HIPAA configuration. If your system uses the HIPAA feature, please refer to the CT User Manual shipped with your system for detailed instructions to administer and manage user access to the system.

6.2 Apply Power to the PET/CT System

Follow this procedure to apply power to a PET/CT system that lost power due to an unexpected or scheduled power outage. If you discover the system has unexpectedly shutdown overnight or over the weekend, follow facility guidelines or consult your maintenance person or the Service Field Engineer to make sure you can safely apply power to the system.

NOTE

The CT detector has a heater and sensors that determine X-ray tube warmup and fast calibration times. The PET detector also has a chiller to maintain normal operating temperatures. If the system loses power overnight or during the weekend, give it two hours to stabilize before running the Daily Prep functions (Tube Warmup, Fast Calibration and PET Daily QA). Try not to use the system until the PET DQA shows all green indicators. If you calibrate to compensate for a cold system, the gains (and image quality) will continue to drift as the PET detector returns to normal operating temperatures.

1. If necessary, follow facility guidelines to report the power outage, and ask maintenance personnel to restore power to the room.
2. If necessary, restore power to the A1 Disconnect Panel.
3. Follow the instructions in the [Startup the PET/CT System](#) section.
4. Wait at least two hours to warm up the CT X-ray tube and run the Daily Prep procedures.

6.3 Startup the PET/CT System

Follow this procedure to start up the PET/CT system. The system should be rebooted daily for best performance.

NOTE

If an external USB device is connected to the operator console, disconnect the device before powering on the system. The USB device may be reconnected once the system boot is complete and the system readiness monitor (SRM) is green.

Figure 122 Console Power Button



1. Press the console power button to apply power to the PET/CTsystem.
2. The windows flash and display messages as the system initializes and runs through the start up sequences.
3. If your system has the HIPAA configuration, it automatically displays a *HIPAA Logon* window, similar to the one shown below.
 - Follow facility guidelines to enter your *LogonName* and *Password*. Then click **Logon**.
 - To quickly logon during emergencies, click **Emergency Logon**.

Figure 123 HIPAA Logon Window


The HIPAA Logon Window is a software interface for GE. It features a white rectangular area on the left containing the GE logo. To the right of this area is a solid blue vertical bar. Below the white area, the text "© 2008 General Electric Company - All Rights Reserved" is displayed. The login section includes a "Logon Name:" label followed by a text box containing "ctuser", and a "Password:" label followed by an empty text box. To the right of the text boxes are two buttons: "Emergency Logon" and "Change Password". At the bottom of the window are two buttons: "Logon" and "Cancel".

4. If the system is starting up after a full power off, such as power cut off from the A1 Disconnect Panel, you will need to reset the gantry. Press the **Reset** button on the gantry control panel. An alert window opens.

NOTE

The indicator next to the **Reset** button will be flashing.

Figure 124 Gantry Reset Attention Window

5. Click **OK**.
6. Wait for the SRM icon to turn green.

NOTE

The SRM icon may change colors as the system starts up, before turning and staying green.

6.4 Reboot the PET/CT System

Follow this procedure to reboot the PET/CT system.

For best results: Reboot the system at least once every 24 hours, preferably at the beginning of the first shift of the day.

NOTE

If an external USB device is connected to the operator console, disconnect the device before powering on the system. The USB device may be reconnected once the system boot is complete and the SRM is green.

1. Click **Shutdown** on the display monitor to open an attention window.

Figure 125 Attention Window (Standard Configuration)

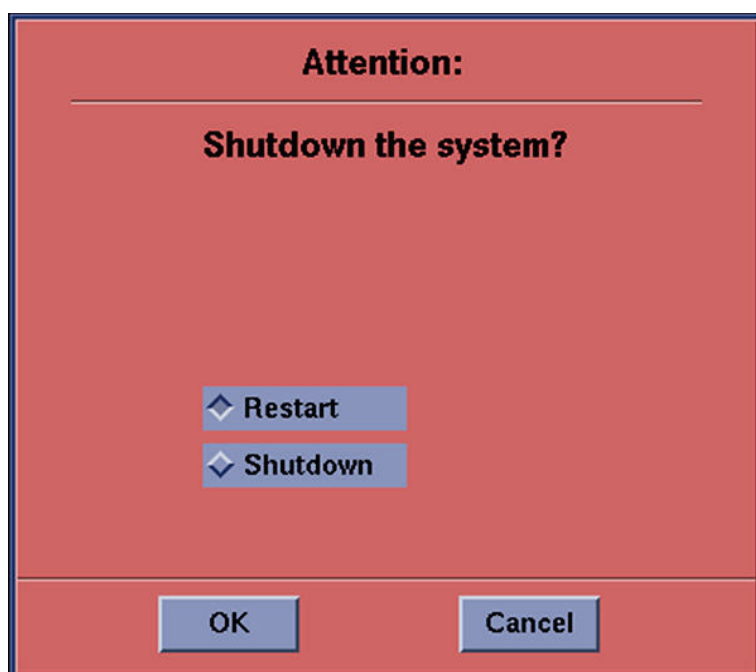
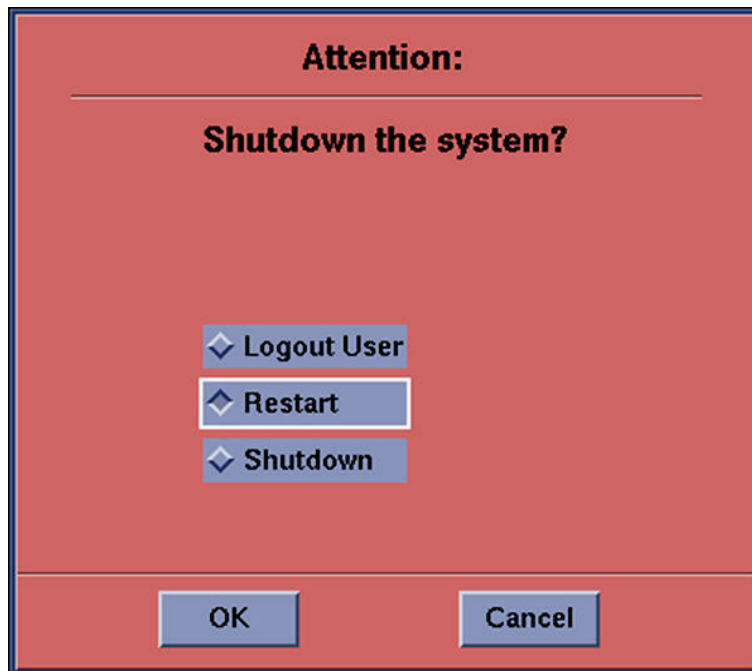


Figure 126 Attention Window (HIPAA Configuration)

2. Select **Restart** and click **OK** to close the window and begin the reboot sequence.

NOTE

The system displays a series of menus and messages during the reboot process.

3. If your system has the HIPAA configuration, it automatically displays a **HIPAA Logon** window similar to the one shown below.
 - Follow facility guidelines to enter your **Logon Name** and **Password**. Then click **Logon**.
 - To quickly logon during emergencies, click **Emergency Logon**.

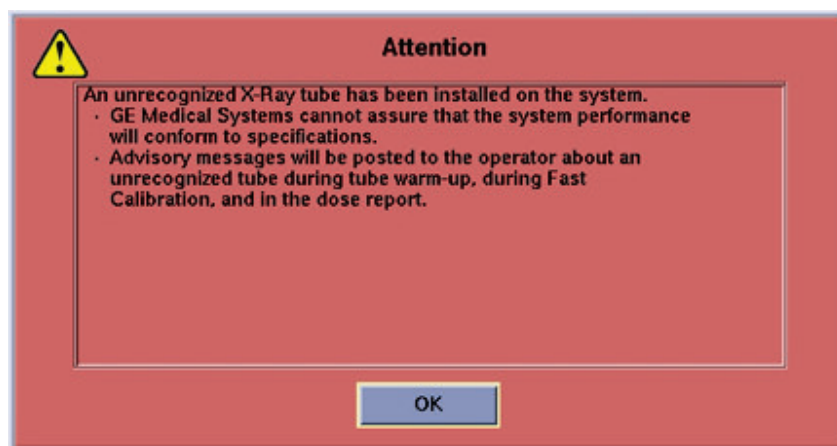
Figure 127 HIPAA Logon Window



4. If your system has the SmartID option, the system verifies the X-Ray Tube ID during startup. If the ID procedure fails, the system displays an attention window. Follow facility guidelines to contact a GE Service Field Engineer.

Click **OK** to close the window and continue the startup process.

Figure 128 SmartID Tube ID Failure Window



5. Wait for the SRM icon to turn green.

NOTE

The SRM icon may change colors as the system starts up, before turning and staying green.

6.5 Shutdown the PET/CT System

Follow this procedure to shutdown the PET/CT system.

1. Click **Shutdown** on the display monitor to open an attention window.

Figure 129 Attention Window (Standard Configuration)

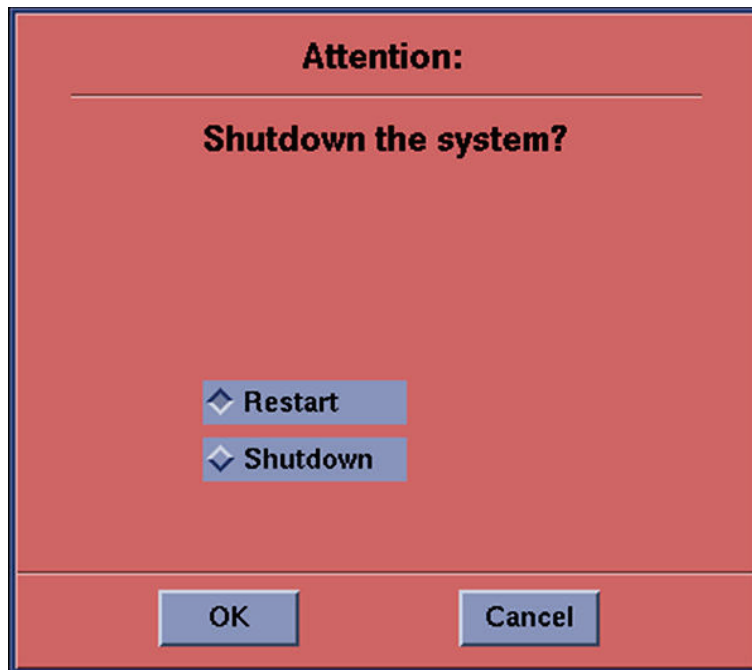
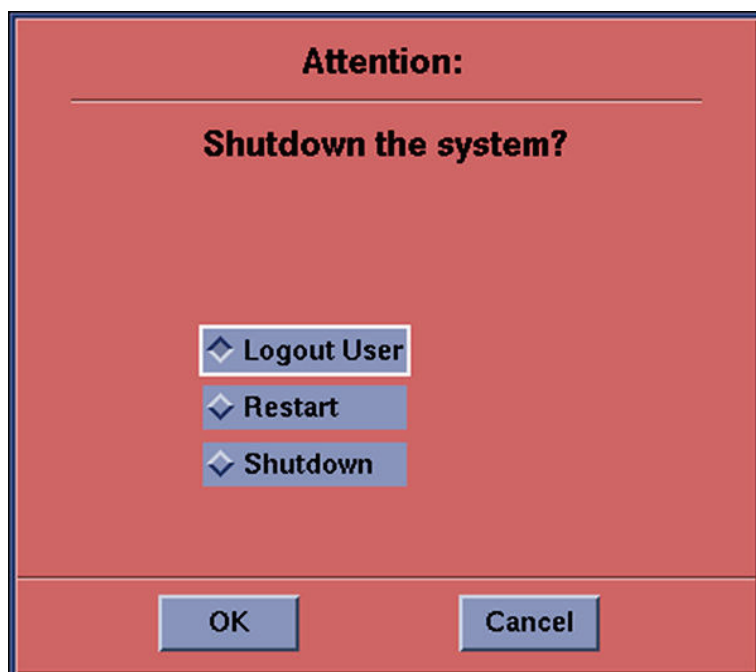


Figure 130 Attention Window (HIPAA Configuration)



2. Select **Shutdown** and click **OK** to close the window and initiate the shutdown process.
When the system successfully completes the shutdown process, it displays the message, "System Halted".
3. Push the console power button to remove power from the console.

NOTE

If you plan to restart the system immediately after completing this shutdown procedure, wait at least two minutes before you turn the console back on to allow system processes to completely cycle off.

4. If you need to remove power to the entire PET/CT system, you can shut off power at the A1 Disconnect Panel.

NOTE

If power is cut off at the A1 Disconnect Panel, follow the instructions in the [Apply Power to the PET/CT System](#) section to recover.

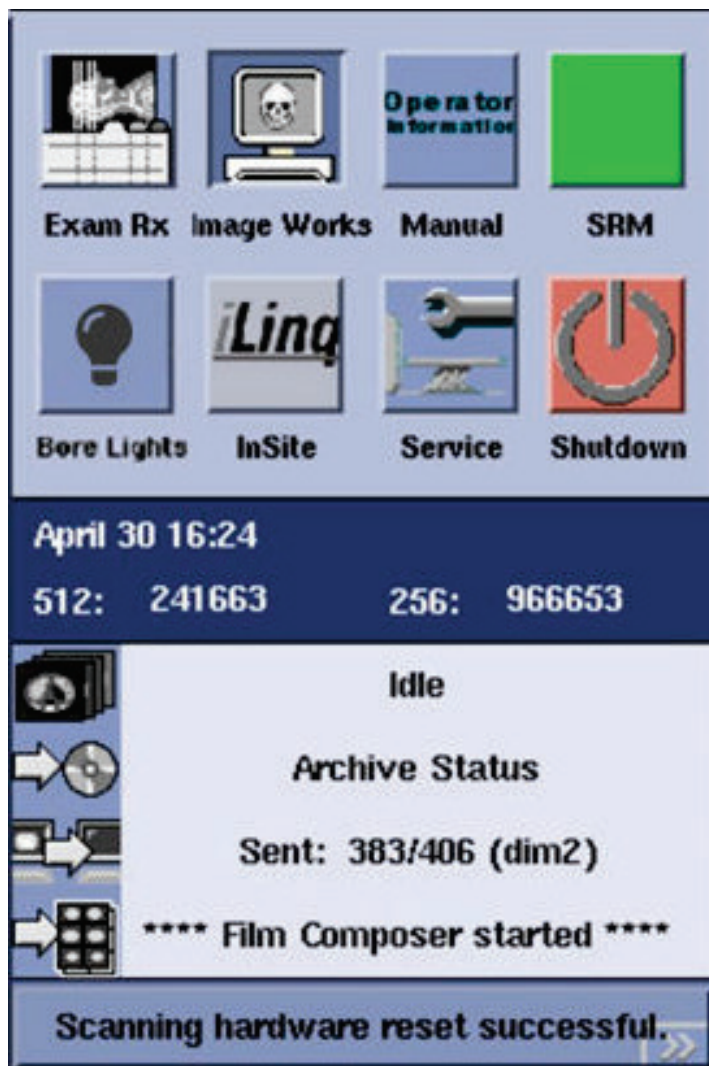
6.6 Using the System Readiness Monitor (SRM)

The System Readiness Monitor (SRM) displays the status of five areas of the PET portion of the system, including PET database consumption. The system continues to monitor these five areas, and refreshes the SRM as long as the system remains active.

Table 74 System Readiness Monitor (SRM) System States

Color	System State
White	Unknown state due to system still running start up sequence and self tests.
Red	The system is not capable of performing all PET scanning functions, or database space is critically low.
Yellow	The system is capable of performing all PET scanning functions at a reduced level of performance, or database space is low.
Green	The system is capable of performing all PET scanning functions at full performance.

Figure 131 System Readiness Monitor (SRM) Icon in Yellow and Green State



1. On the display monitor, click the **SRM** icon to open the System Readiness Monitor. If a yellow or red condition exists, the message area of the window updates with information and instructions, as shown in [Figure 133 on page 223](#).

The System Readiness Monitor displays status for the following areas:

SRM area	Description
PET Calibration	Monitors the frequency of PET DQA and PET Detector Calibration. Turns yellow after one week if DQA is not performed, or two weeks if PET Detector Calibration is not performed.
PET Gantry	Monitors the coincidence link, the controlling unit of the coincidence processor, the detector calibration data, the signal from the detector front-end electronics, the internal electronics voltages, the scanner temperature and humidity, the chiller status, the leak sensors, and the interlocks.
PET Acquisition	Monitors all the subsystems in the PET acquisition chain.
PET Recon	Monitors the reconstruction process and recon queue.
Database	Monitors the capacity status of the Image database, the Sinogram database and the List file database. If any database reaches 90% capacity, the indicator turns yellow. If any database reaches 97% capacity, the indicator turns red. The three databases display directly below the five indicators. Each database displays the percentage of allotted space currently in use.

Figure 132 System Readiness Monitor Window During Normal Operation

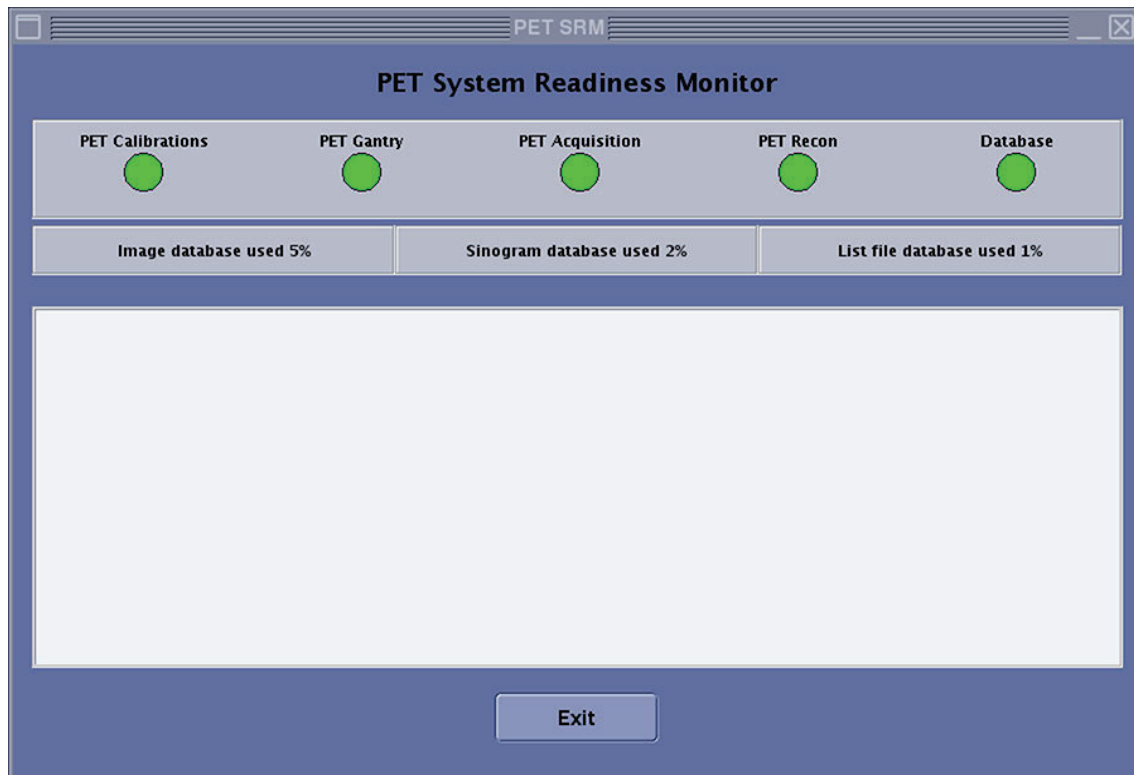
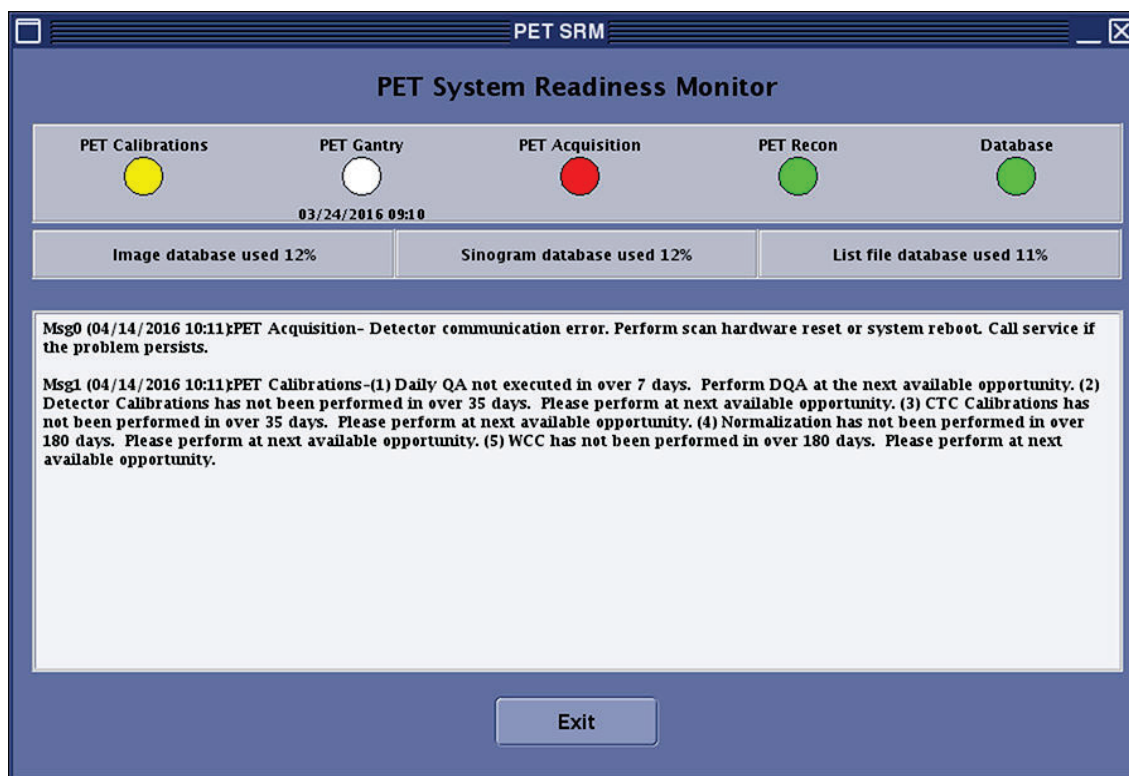


Figure 133 System Readiness Monitor Window with Error Messages

2. Click **Exit** to close the **PET System Readiness Monitor** window.

6.7 Power Up and Shutdown the System Quick Steps

6.7.1 Startup the PET/CT System

1. If an external USB device is connected to the operator console, disconnect the device.
2. Turn the operator console power ON.
3. HIPAA Configuration: Follow facility guidelines to enter your **Logon Name** and **Password**. Then click **Logon**.
4. If needed, press the **Reset** button on the gantry control panel and click **OK** on the related popup.
5. If needed, click **OK** on the motion popup to allow the motion.
6. Wait for SRM icon to turn green.

6.7.2 Reboot the PET/CT System

1. If an external USB device is connected to the operator console, disconnect the device.
2. Click **Shutdown**.

3. Select **Restart** and click **OK**.
4. HIPAA Configuration: Follow facility guidelines to enter your **Logon Name** and **Password**. Then click **Logon**.
5. Wait for SRM icon to turn green.

6.7.3 Shutdown the PET/CT System

1. Click **Shutdown**.
2. Select **Shutdown** and click **OK**.
3. Wait for the “System Halted” message to display.
4. Turn OFF console power.

7 Maintenance

7.1 Maintenance Introduction

This chapter contains the recommended daily, bi-weekly and quarterly schedules to maintain optimal image quality during normal operation. Calibration contains the actual procedures. For detailed descriptions of all the CT tests, please consult the CT TRM and CT User Manual that shipped with your system.

7.1.1 Full System Calibration vs. Maintenance

Typically, the field engineer or facility service person has the responsibility to calibrate the system. He or she will calibrate the system during installation, following major service, such as an X-ray tube or PET detector module replacement or as part of a scheduled Periodic Maintenance (PM). It is the site's responsibility to monitor and maintain this calibration on a daily, bi-weekly and quarterly basis.

7.1.2 Quality Assurance Program (QA)

In order to assure consistent image quality over the system's lifetime, follow facility guidelines to establish and maintain a regular Quality Assurance program.

This chapter contains the recommended daily, bi-weekly and quarterly schedules recommended by GE. Your facility may suggest additional tests and procedures for you to follow. Always defer to the facility guidelines when you establish your QA program for this PET/CT system.

7.2 Maintenance Schedule

7.2.1 Daily Maintenance Schedule

Daily maintenance procedures prepare the system for normal operation. The Tube Warmup, Fast Calibration and PET DQA tests take about 25 minutes to complete, if you run them on a daily basis. Checking the scanner clock, dose calibrator, and other facility clocks should take about five minutes. Total daily maintenance takes about 45 minutes, including rebooting the system, printing and associated paperwork.

Follow these procedures in order.

Table 75 Daily Maintenance Schedule

Maintenance Task	Instruction Location	Time Required			
Reboot the system	Power Up and Shutdown the System	15 minutes			
Warm up the CT X-Ray Tube	Calibration	1 minute			
CT Fast Calibration	Calibration	10 minutes*			
PET DQA** 7.6	Calibration 3.13.1	Annulus phantom age	16 cm	21 cm	32 cm
		New source ~ 55MBq	4 min	4 min	3 min
		1 year old	7 min	6 min	5 min
		2 years old	12 min	11 min	8 min
Scanner and dose calibrator, and facility clock synchronization check	Calibration	5 minutes			
Monitor and Manage Database	Manage Data (Archive and Storage)	10 minutes			
7.6 Scan Sections 1 & 2 of the CT QA Phantom 4.16	Refer to the CT User Manual shipped with your system.	10 minutes			

* If you do not run Fast Calibration every day, it may require up to one hour to complete.

** PET DQA time does not include phantom positioning (estimated at 1 min).

7.2.2 Bi-Weekly Maintenance Schedule

Regular calibration updates optimize image quality and provide the means to discover the potential for image artifacts before you scan a patient. Complete the tasks below once every two weeks to maintain the quality of the acquired images. Total bi-weekly maintenance takes about 30 minutes.

For best result: Run the bi-weekly maintenance procedures as soon as you complete the tasks in the daily maintenance schedule.

Table 76 Bi-Weekly Maintenance Schedule

System Configuration	Maintenance Task	Instruction Location	Total task time*
32 cm	PETDetector Cal**	Calibration	10 minutes
21 cm	PETDetector Cal**	Calibration	11 minutes
16 cm	PETDetector Cal**	Calibration	11 minutes
All	CleanDatabase	Calibration	5 minutes
	ArchivePET DQA data	Calibration	5 minutes

* Total task time is based on using an annulus phantom during its peak use period, at the start of phantom's life.

** PET Detector Calibration process workflow contains the following steps: Map, Energy, Gain, Energy (short), Source position and Coincidence timing calibration. For bi-weekly maintenance run a single iteration of PET Detector Cal process.

7.2.3 Quarterly Maintenance Schedule

The quarterly calibrations provide the system with a benchmark to account for variations in the system over time, and help maintain optimal image quality. Total quarterly maintenance takes about one hour.

For best results: Run the quarterly maintenance procedures as soon as you complete the tasks in the daily and bi-weekly maintenance schedules.

Table 77 Quarterly Maintenance Schedule

System Configuration	Maintenance Task	Instruction Location	Total Task Time
All	PETDetector Cal**	Calibration	Refer to Bi-Weekly Maintenance Schedule
32 cm	3D Normalization	Calibration	9 minutes*
21 cm			10 minutes*
16 cm			11 minutes*
All	Well Counter Correction (WCC)	Calibration	30 minutes to fill the flood phantom 30 minutes to scan and review
32 cm	Establish a new DQA base-line	Calibration	3 minutes*
21 cm	Establish a new DQA base-line	Calibration	4 minutes*

Quarterly Maintenance Schedule continued			
System Configuration	Maintenance Task	Instruction Location	Total Task Time
16 cm	Establish a new DQA baseline	Calibration	4 minutes*
All	Store DQA files	Calibration	10 minutes

* Total task time is based on using an annulus phantom during its peak use period, at the start of phantom's life.

** PET Detector Calibration process workflow contains the following steps: Map, Energy, Gain, Energy (short), Source position and Coincidence timing calibration.

7.3 Phantom Replacement

The PET system uses a Germanium 68 (Ge-68) annulus phantom during calibration. Ge-68 has a decay half-life of about nine months. Because the PET Annulus Phantom activity range corresponds to three half-lives, arrange to replace the PET Annulus Phantom every 24 months. The **DQA View Data** window tracks PET Annulus Phantom activity and displays the number of days remaining until recommended replacement.

Contact your GE representative to order a new PET Annulus Phantom and arrange for its installation. The warranty contract does not cover the cost of this (consumable) phantom.

8 Calibration

8.1 Calibration Introduction

This chapter contains procedures to calibrate the system and prepare it for daily use. Maintenance contains the recommended regular maintenance schedules; this chapter contains the actual procedures. For detailed descriptions of all the CT tests, please consult the CT TRM and CT User Manual that shipped with your system.



RADIATION EXPOSURE:

Procedures described in the following sections require direct handling of radioactive material. To avoid unnecessary exposure, minimize occupancy of the scanner room. Follow facility guidelines to handle and dispose of radioactive substances.

8.2 Calibrations on the System

NOTE

The order of calibrations is very important.

NOTE

A phantom in annular shape known as the "DQA phantom" or the "DQA calibration phantom" is provided with the system to perform the Detector Calibration, PET Daily Quality Assurance and Normalization. A "WCC phantom" is also provided to perform Well Counter Correction (WCC). 3.13.1
7.6

1. **Detector Calibration**

NOTE

A Cathode Search should be performed by a Field Service Engineer, if needed.

2. **Coincidence Timing Correction**

3. **3D Normalization and Well Counter Correction (WCC)**

Some important points to remember:

- Use an F-18 filled water phantom. The amount of F-18 at the time of acquisition should be 20 MBq (0.5 mCi).
- The activity factor calculated in the Well Counter Correction provides a sensitivity cross calibration between the dose calibrator and the PET imaging system.
- Make sure your dose calibrator clock and the scanner clock are synchronized. A time difference of only two minutes introduces a bias of more than one percent.

- It is essential that you carefully document the amount of dose injected into the fillable phantom. Pre and post measurement of the syringe is needed for accurate Well Counter Corrections.




8.3 Daily Preparation and Calibration

8.3.1 SmarTube™ Tube Warm Up Indicator

The SmarTube™ warm-up feature optimizes system scanning performance by including an indication of the temperature state of the tube. Operating the system in the green zone will maximize the tube life.

Follow the **tube warm up indicator** color displayed on the left side of the system real-time messages area left side according to [Table 78 on page 230](#) below:

Table 78 Tube warm up indicator color code

Color	Picture for demonstration	Indication
Blue		Tube warm up must be performed. Depending on system type. mA may be limited until warm up is performed.
Yellow		Tube warm up should be performed to move the tube to the operating state. There are no restrictions during scanning while in this zone. Time [hh:mm] for indicator to turn blue is displayed.
Green		Tube is at optimal operating state. Time [hh:mm] for indicator to turn yellow is displayed.

Refer to the Revolution Maxima CT User Manual and Technical Reference Manual shipped with your system for additional information.

8.3.2 Warm Up the CT X-Ray Tube

Follow this procedure to bring the CT X-ray tube to its optimal operating temperature. The X-ray tube warm up procedure reduces the possibility of artifacts and may aid in prolonging the life of the tube.

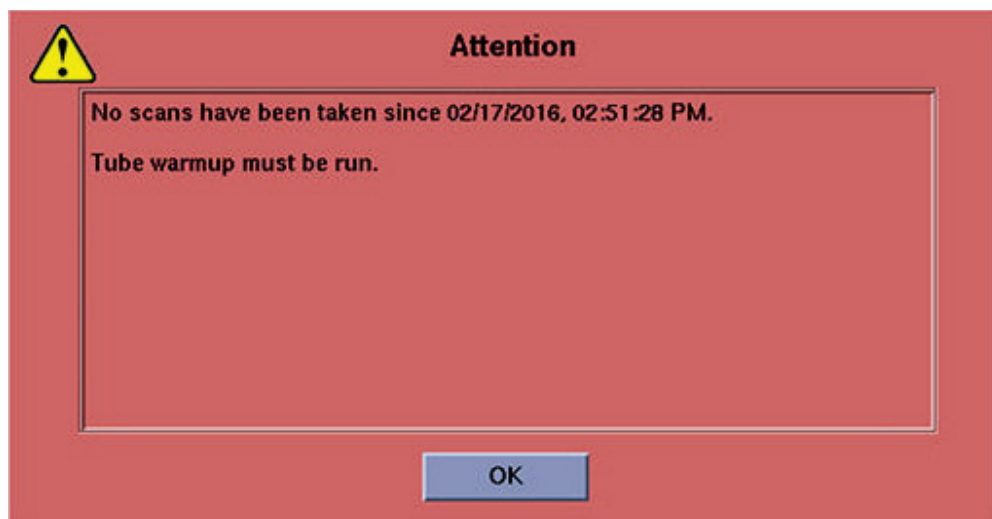
For best care of your tube, never skip tube warm-up. Perform the warm-up when your tube reaches yellow for a faster warm-up process and maximum tube life.

Check the tube state to determine if a tube warm-up is needed before moving patients into the scan room to avoid delays.

An attention message is posted if the scanner has been inactive for more than two hours (See [Figure 134 on page 231](#) below). Perform a tube warm-up any time the system prompts you.

Refer to Revolution Maxima CT User Manual and Technical Reference Manual shipped with your system for additional information.

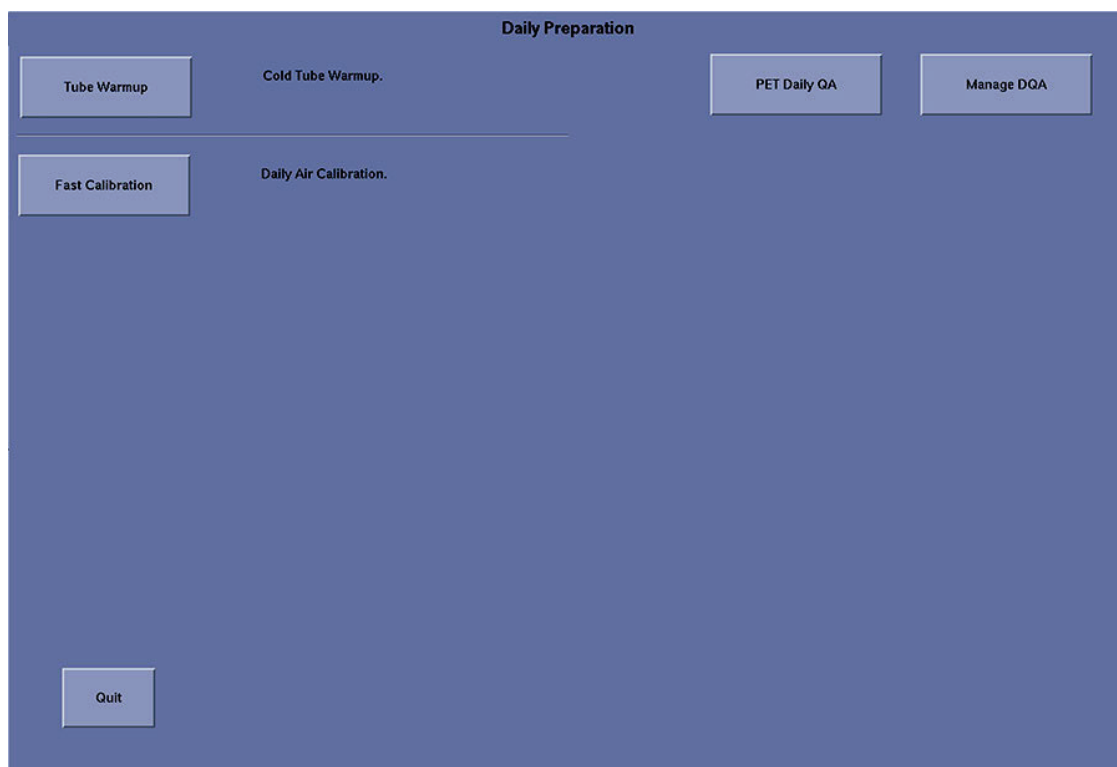
Figure 134 Tube Warmup Message



NOTE

If the system loses power (intentional or unintentional) for more than four hours, wait at least two hours after restoring power to warm up the CT X-ray tube to give the CT detectors time to return to operating temperature.

1. Make sure all personnel leave the scan room before you initiate the scan.
2. Click the **Daily Prep** icon on the scan monitor to open the **Daily Preparation** window.

Figure 135 Daily Preparation Window

3. Click **Tube Warmup**.
The system displays a warning dialog box to advise you that the scanner uses cooling algorithms specifically designed for GE X-ray tubes. Please refer to [Safety](#) for detailed information about using non-GE X-ray tubes.
4. Click **Accept & Run Tube Warmup** to proceed.
The window updates to display a **Cold Warmup Scan List** that updates in real-time.
5. Press **Start Scan** to initiate the warm up sequence.
6. Upon completion of the final warm up scan, the system returns to the **Daily Preparation** window.
7. Click **Quit** to exit the **Daily Preparation** window.

8.3.3 Fast Calibration (Daily Air Calibration)

Follow this procedure to run the daily system Fast Calibration, which includes a set of Air Cals. Air Cals optimize and help maintain CT image quality between system calibrations.

For best results: Run the Fast Calibration upon completion of the first CT X-ray Tube Warmup of the day.

1. Make sure that no one is in the scan room and the gantry bore is free of any objects.
Never run Fast Calibration with a person in the scan room.

2. If necessary, click the **Daily Prep** icon to open the **Daily Preparation** window shown in [Daily Preparation Window](#).

Warm up the tube if more than two hours have elapsed since the last warm-up.

3. Click **Fast Calibration**.

NOTE

If the system has SmartID and detects a non-GE X-ray tube, a window opens with the warning:

“An unrecognized tube has been installed on the system. Fast Calibration techniques are designed specifically for GE Medical Systems X-ray tubes. Follow facility guidelines to contact your service representative. Click **Accept & Run Fast Calibration** to proceed.”

The system runs a DAS convertor check and CT collimator calibration, followed by a two-minute gantry balance check.

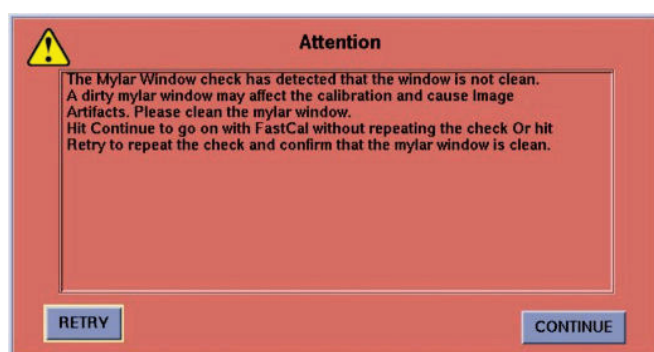
4. Press **Start Scan** to initiate the Dirty Mylar Window Check and Fast Calibration sequence.

NOTE

The CT X-ray tube temperature and length of time since the last Fast Calibration determine the function sequence and the amount of time it takes to finish.

5. If the system detects a dirty mylar window, it opens a warning window and pauses the Fast Calibration.
 - a. Clean the window with a damp cloth to remove dirt and dried contrast.
 - b. Click **Retry** to rerun the dirty mylar window test. If the test passes, the Fast Calibration continues without additional intervention.
 - c. Click **Continue** to resume the Fast Calibration without rerunning the dirty mylar window test.

Figure 136 Dirty Mylar Window Warning



6. After the Fast Calibration completes, click **Quit** to close the **Daily Preparation** window.

8.3.4 PET Daily Quality Assurance

The Daily Quality Assurance (DQA) program measures the current state of the PET detector and provides a visual and a parametric data report that may be used for quality assurance. The process allows you to enter your initials at the start of the DQA procedure. The resultant parametric data report is stored in the database. [DQA Test Descriptions \(Measurement Item and Calculations Performed\)](#) provides a list of DQA tests and calculations.

Synchronization of the scanner, dose calibrator and facility clocks is recommended to assure quantitative accuracy. A time difference of only two minutes introduces a bias of more than one percent for F-18. Other radionuclide differences depend on the half-life. Use of a network time server is the best method for synchronizing your system time, if available.

As part of the installation process, the Field Service Engineer creates a DQA baseline reading for the system. Each subsequent DQA compares itself to this baseline. *You have the responsibility to establish a new baseline reading after running the quarterly calibrations.*

For best results: Always warm up the tube and run the Fast Cals before you initiate the DQA.

This procedure takes up to 12 minutes to complete, depending on the system configuration. (Refer to PET DQA time in [Table 75 on page 226](#)).

1. Remove all phantoms and extenders from the table, and clear the room of radioactive sources.

NOTE

Never run a DQA with a person in the scan room.

2. Click the **Daily Prep** icon to open the **Daily Preparation** window.
3. Click **PET Daily QA** when running DQA on a daily basis.

or

Click **Manage DQA** when setting a new baseline or deleting and managing prior DQA results.

4. Click **Take Current Reading**.

A message window opens with instructions.



5. From the scanner room, note that the calibration-mode indicator icon on the gantry touch display is illuminated and flashing green after pressing **Take Current Reading** (Refer to [Figure 137 on](#)

page 235. This LED indicates that pressing the gantry **Home** button will now move the table to the phantom load position, instead of the patient load position.

Figure 137 Calibration Mode Indicator



6. From the gantry, press and hold the gantry **Home** button until the table stops moving. The table will drive to the pre-calibrated load position, either in the front or the rear of the gantry.

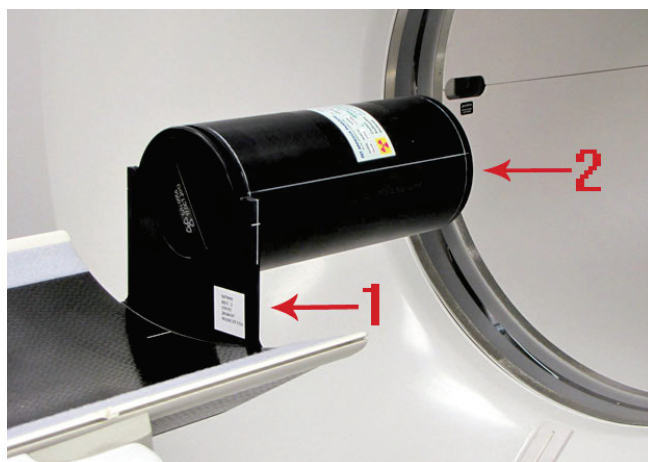
NOTE

The table elevation will reach the calibrated elevation and will not require any manual adjustments. The position (front or rear) can be configured by the Field Service Engineer.

Figure 138 Gantry Home Button



7. Retrieve the phantom holder and mount it to the table cradle tightly. Ensure the phantom holder clips to the cradle securely.

Figure 139 Phantom and Phantom Holder attached to table cradle**Table 79 Phantom Holder and PET Annulus Phantom**

Number	Description
1	Phantom Holder
2	PET Annulus Phantom NOTE for the 32 cm system configuration, use a PET Annulus Phantom with a length of 37 cm

8. Retrieve the Ge-68 PET Annulus Phantom. Mount the annulus phantom on the phantom holder. Ensure the phantom is fully seated on the phantom holder.

NOTE

The phantom should be positioned automatically and should *not* require laser alignment.

Return to the console room.



TO MINIMIZE UNNECESSARY EXPOSURE, MAINTAIN MAXIMUM DISTANCE FROM PET ANNULUS PHANTOM AND MINIMIZE TIME SPENT HOLDING PHANTOM.

If possible, avoid holding the phantom from the sides; always use the handle and the round opening on its end-caps.

9. Click **OK** to proceed with acquisition.

NOTE

The **Take Current Reading** menu may display if **OK** is not pressed within 30 minutes.

10. Press the flashing **Move to Scan** button. The table cradle will drive the phantom to the isocenter of the PET scan field of view.
11. Press the flashing **Start Scan** button to begin acquisition.

NOTE

The calibration-mode indicator LED is turned off when **Start Scan** button is pressed.

12. DQA will proceed to acquire four scans. The progress of each scan is indicated by the green boxes in the bottom left corner of the window.
13. While the DQA is being acquired, check the time synchronization for the scanner, dose calibrator and facility clocks.
14. Upon completion of the DQA, the system defaults to the **View Summary** window, which displays a table of pass or fail information called the **Report for Current Reading**. If the table shows a failure or gives recommended actions, **DO NOT SCAN** patients until you resolve the issue.

Figure 140 on page 239 shows an example of a good View Summary. Figure 141 on page 240 shows an example of a View Summary with two failures and a warning message stating “Update tuning is required”.

15. Click the arrow next to **View Summary** to display a two item, drop-down menu.
 - Click or drag to **View Data** to change the display to a **Graph for Current Reading** panel that provides a graphical display of each DQA test, compared to its baseline, as well as tables of values and red/yellow/green indicators with the following status:
 - Green: The corresponding value falls within the acceptable range of variation from the baseline reading.
 - Yellow: The system shows increased variation from the baseline reading, but you may use the system as long as the graph of the corresponding test is defect-free.
 - Red: The corresponding value falls outside the range of acceptable variation from the baseline reading. Review for corrective action (such as calibration or repair).
 - **Check the DQA Graph** displays homogenous values across each module, block and crystal similar to the values in the baseline.
 - Figure 142 on page 241 shows an example of a good DQA in View Data mode and Figure 143 on page 242 shows an example of a bad DQA with failures.
16. Optional: Click **Print** to create a hard copy of the currently displayed window.
17. Press the flashing **Retract** button to move the table to the phantom unload position.
18. From the scanner room, unmount the annulus phantom and store it in a shielded container.



TO MINIMIZE UNNECESSARY EXPOSURE, MAINTAIN MAXIMUM DISTANCE FROM PET ANNULUS PHANTOM AND MINIMIZE TIME SPENT HOLDING PHANTOM.

If possible, avoid holding the phantom from the sides; always use the handle and the round opening on its end-caps.

19. Remove the phantom holder from the table cradle. Return to the console room.
20. Click **Exit** to close the DQA window, and return to the **Daily Preparation** window.

NOTE

The **Retract** button may flash again if the table has not reached the phantom unload position.

21. Click **Quit** to close the **Daily Preparation** window.

NOTE

Make sure the dose calibrator clock and the scanner clock are synchronized. The system clock is displayed on the display monitor in the Exam Rx Desktop Feature Status Area (see [Exam Rx Desktop Feature Status Area](#)). Verify that the system date and time are correct. A time difference of only two minutes introduces a bias of more than one percent in the measured SUV.

Figure 140 View Summary Window with all DQA Tests Passing (Good DQA)

The screenshot shows a software window titled 'PET DQA' with a menu bar containing 'Take Current Reading', 'View Summary', 'Print', and 'Exit'. The main content area displays a 'PET Daily QC Current Summary Report'.

Device	GE_SERVICE
Date	18/07/2021 19:36
Operator	
Hospital	G.E.MedicalSystems
Manufacturer	GE MEDICAL SYSTEMS
Model	Omni Legend

Items	Status
Coincidence Rate	PASS
Singles	PASS
Block Busy	PASS
Timing Change	PASS
Gain Change	PASS

Elapsed Time: 00:00:00
Remaining Time: 00:00:00
Count Rate (kcps): 2143

Status:
 Current table elevation is incompatible with prescription. Restore elevation to 102.0 mm, or stop scan.
 Current table elevation is incompatible with prescription. Restore elevation to 102.0 mm, or stop scan.
 Please press the 'Move to Scan' button to move to the next scan position.
 Please press the 'Move to Scan' button to move to the next scan position.
 Please press the 'Move to Scan' button to move to the next scan position.
 Please press the 'Move to Scan' button to move to the next scan position.
 Press the 'Start Scan' button to begin acquisition.
 End Acquisition/Calibration Process.
 Press Retract button. Then at the scanner, unmount and store phantom in shielded container.

Figure 141 View Summary Window with One DQA Test Failure and Recommended Actions (Bad DQA)

The screenshot shows the 'PET Daily QC Prior Summary Report' window. It features a menu bar with options: 'Take Current Read...', 'Block Parameters', 'Select Prior', 'View Current Res...', 'View Summary', 'Establish a Baseline', 'Print', and 'Exit'. The 'View Summary' option is currently selected. The report displays the following data:

Device	GE_SERVICE
Date	30/03/2022 11:10
Operator	
Hospital	GEMedicalSystems
Manufacturer	GE MEDICAL SYSTEMS
Model	Omni Legend

Items	Status
Coincidence Rate	PASS
Singles	PASS
Block Busy	PASS
Timing Change	PASS
Gain Change	FAIL

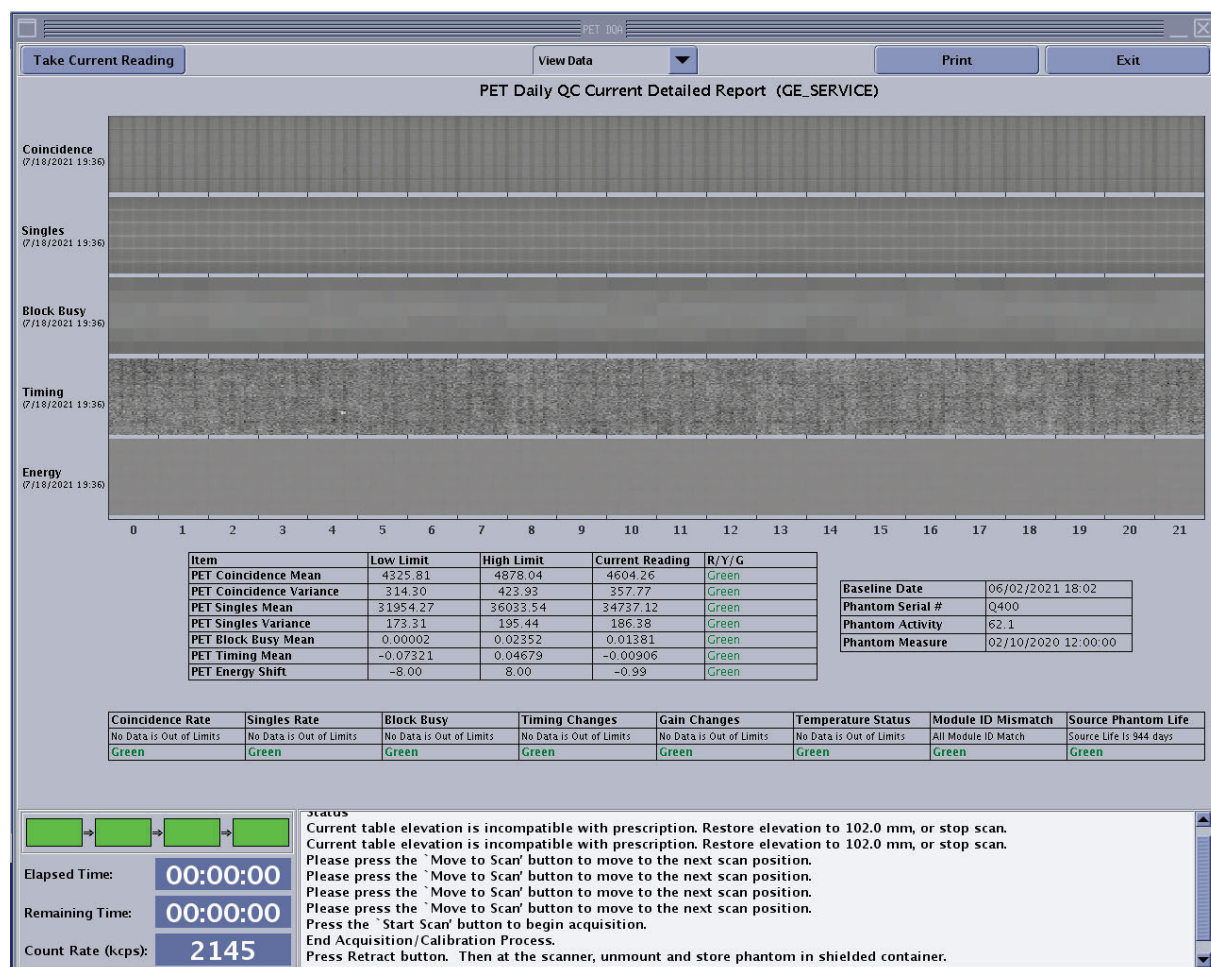
Below the tables, a message box states: 'Update tuning is required'.

At the bottom left, there is a status section with the following information:

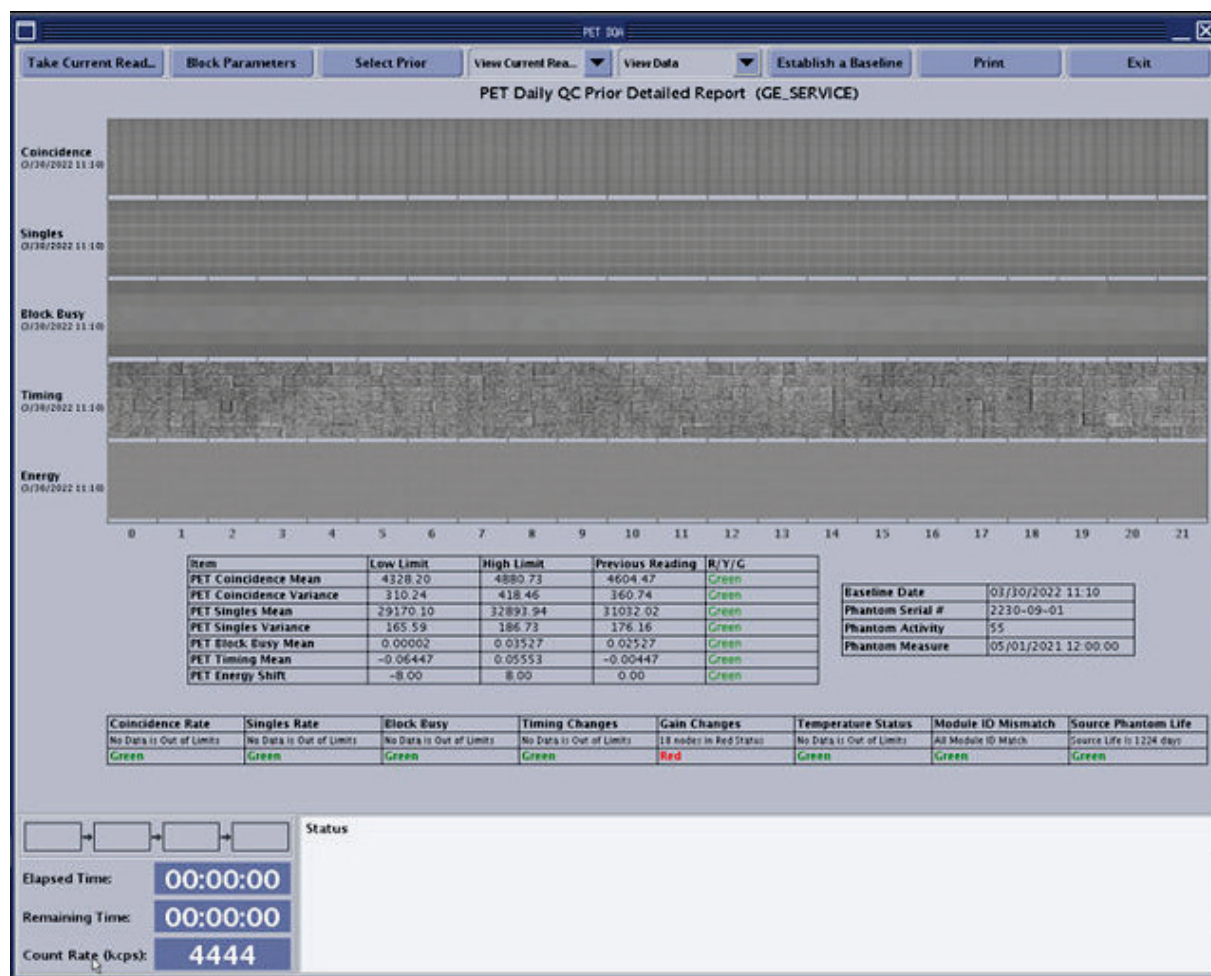
- Elapsed Time: 00:00:00
- Remaining Time: 00:00:00
- Count Rate (kcps): 4442

To the right of this section is a 'Status' label followed by a large empty box.

Figure 142 View Data Window with all DQA Tests Passing (Good DQA)

**NOTE**

Move the cursor over the graphs to display a readout at the bottom of the screen of the corresponding Module, Block, Crystal Row, Crystal Column and Data Value. Move the cursor over the headings to the left of the graphs to display a readout at the bottom of the window of the data values.

Figure 143 View Data Window with Test Failures (Bad DQA)

8.3.5 PET DQA DICOM Reports

Upon completing every DQA, the Summary and Data DQA windows are automatically saved to a patient exam as 2 DICOM secondary screen captures. The Patient Name of the exam will end in Daily QC Results and the Exam Series will be 99. This exam can be filmed, archived and networked after DQA is completed.

8.3.6 DQA Test Descriptions and View Summary Messages

Refer to 8.3.4 PET Daily Quality Assurance on page 234. If one or more DQA tests fail, the system lists recommended actions beneath the **Summary Report** table. This section contains the list of messages the system can display, as well as the recommended actions to correct the failure.

If the corresponding test results fall outside the range of acceptable values, detector calibrations may be recommended or required:

- Yellow: Update tuning is recommended.

- Red: Update tuning is required.

If the temperature falls outside the specified range:

- Yellow: Configuration is outside the normal range. Check room temperature and status.
- Red: Defect detected in configuration. Service attention is required.

If the annulus phantom activity, and phantom life remaining, measured in days, falls below acceptable levels:

- Yellow: Phantom activity low, plan to replace phantom.
- Red: Phantom activity below minimum activity, replace phantom.

The Phantom Life Test is based on the number of coincidence events detected over a period of time.

- The Phantom Life Test will turn Yellow around the 24-month period suggested to replace the phantom, within a few days or months depending on the actual phantom activity and system performance.
- The Phantom Life Test will turn Red about 60 days prior to when the maximum acquisition time is reached. The DQA results will not be displayed when the maximum acquisition time is reached. Thus, the Phantom Life Test in days may be longer than 24 months. The phantom should be replaced when the indicator is Yellow.

Table 80 DQA Test Descriptions (Measurement Item and Calculations Performed)

Measurement Item	Calculation Performed
Coincidence	Displays the number of coincidence events associated with each crystal element. Coincidence directly relates to sensitivity during patient acquisitions.
PET Coincidence Mean	The average of the coincidences for all crystals. This calibration shows overall changes over time, but is not very sensitive to individual crystals or block defects.
PET Coincidence Variance	Standard deviation of coincidence across all crystals. Changes in phantom position on the holder from day to day may appear as changes in Coincidence Variance. Effort should be given to keep the phantom holder clipped tightly to the cradle and to fully seat the phantom in the holder each day.
Singles	Displays the number of individual events detected in each crystal, but defects in timing will not appear in this stripe.
PET Singles Mean	The average of singles for all crystals.
PET Singles Variance	Standard deviation of singles for all crystals.
Block Busy	Displays the fraction of time that each detector block is busy. A high value may indicate noisy electronics or a light leak in the detector. A zero value indicates a loss of signal which should match low values in singles and coincidence.

DQA Test Descriptions (Measurement Item and Calculations Performed) continued	
Measurement Item	Calculation Performed
PET Block Busy Mean	The average of Block Busy for all blocks.
Timing	Displays the calculated timing error for each crystal. Large area patterns may indicate a defect and point to the suspected component. A normal pattern displays random values of block average in the range of minus three to plus three.
PET Timing Mean	The average of timing error for all crystals.
Energy	Displays the peak energy spectrum peak location for each crystal.
PET Energy Shift	The average of the difference in energy peak location of the current reading from the baseline reading for each crystal. Changes in room temperature or changes/drifts in the PET detector strongly influence the PET energy shift. If the intended operating temperature has changed significantly, please run a Detector calibration to remove this temperature or detector shift.

The bottom row of system checks on the **DQA View Data** window contains the individual checks on the module, block or crystal levels, and the corresponding Red/Yellow/Green status. Each module, block or channel must fall within the acceptable range of values in order to display the “Green” status. Starting from left to right:

- **Coincidence Rate:** Checks the coincidence rate of all individual blocks and crystals.
- **Singles Rate:** Measures the singles events (not coincidence) rate detected in each block and crystal.
- **Block Busy:** Measures the block busy in each block.
- **Timing Changes:** Reflects changes in coincidence timing per block.
- **Gain Changes:** Detects the changes in effective anode gain at the block level, at each block and the average gain of all blocks.
- **Temperature Status:** Verifies the temperature sensors inside the PET gantry and detector modules fall within the acceptable range.
- **Module ID Mismatch:** Compares the actual module ID numbers against the list of Module IDs currently stored in the system during calibrations. This is more of a check against calibrations for the Field Service Engineer.
- **Source Phantom Life:** Displays the number of days remaining until time to replace the radioactive annulus phantom used during DQA and calibrations.

8.3.7 Establish a PET DQA Baseline

Follow this procedure to establish a new PET DQA baseline.

For best results: Establish a new baseline once every quarter, after a quarterly calibration, after annulus phantom replacements and after service events where calibrations are performed.

1. Remove all phantoms and extenders from the table, and clear the room of radioactive sources.

NOTE

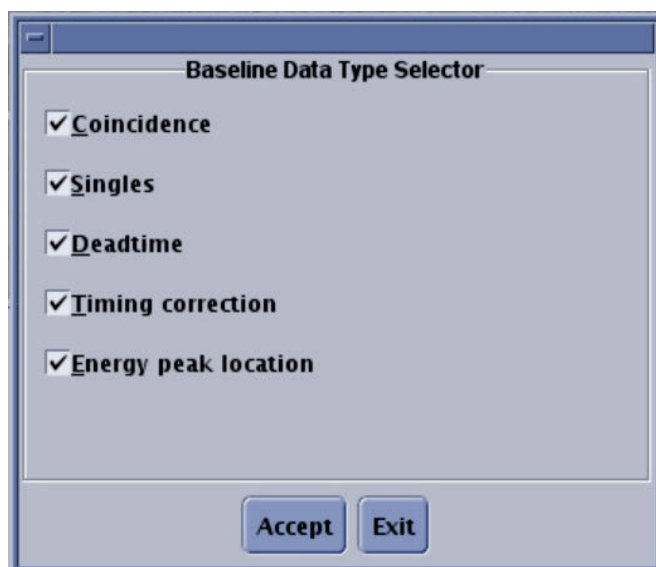
Never run a DQA with a person in the scan room.

2. Click the **Daily Prep** icon to open the **Daily Preparation** window.
3. Click **Manage DQA**.
4. Click **Take Current Reading** and follow the instructions on-screen and in [PET Daily Quality Assurance](#) to complete a DQA.

Alternatively, click **Select Prior** and highlight a previous DQA scan, then click **Select**.

5. Upon completion of the DQA scan, the system defaults to the **View Summary** window and displays a table of pass/fail information called the **Report for Current Reading**.
6. Click the arrow next to **View Summary** to display a two-item, drop-down menu.
 - a. Click or drag to **View Data** to change the display to a **Graph for Current Reading** window and tables of values.
 - b. Make sure all indicators turned green and all graphs appear homogeneous. Investigate and understand any non-Green indications. [8.3.4 PET Daily Quality Assurance on page 234](#) shows an example of a good DQA in View Data mode and [8.3.4 PET Daily Quality Assurance on page 234](#) shows an example of a bad DQA with failures.
7. Click **Establish a Baseline** to open the **Baseline Data Type Selector** window.
Click every *box* to place a check mark and select the corresponding data type.

Figure 144 Baseline Data Type Selector Window



8. Click **Accept** to establish the current PET DQA as the new baseline and close the **Baseline Data Type Selector** window.
9. Optional: Click **Print** to create a hard copy of the currently displayed baseline screen.
10. Click **Exit** to close the DQA window, and return to the **Daily Preparation** window.

11. Click **Quit** to close the **Daily Preparation** window.

8.3.8 Display Additional DQA Readings

The system stores a copy of every DQA reading you acquire, until you remove them from the system. Follow this procedure to display the older DQA readings. The DQA buttons and menu items have the following functions:

- **View Current Reading:** Displays the most recently acquired DQA.
 - **View Baseline Reading:** Displays the baseline of the currently displayed DQA. This function does not provide tables of results.
 - **View Prior Reading:** Displays the selected prior DQA reading.
 - **Ratio Current/Baseline:** Displays a smoothed comparison of the current DQA reading to the baseline DQA reading. This function does not provide tables of results.
 - **Ratio Prior/Baseline:** Displays a smoothed comparison of a prior DQA reading to the baseline DQA reading. This function does not provide tables of results.
 - **Ratio Current/Prior:** Displays a smoothed comparison of the current DQA reading to the selected prior DQA reading. This function does not provide tables of results.
1. Click the **Daily Prep** icon to open the **Daily Preparation** window.
 2. Click **Manage DQA** to open the full **PET DQA** window.

NOTE

From **PET DQA** window, right click along the top menu bar and click the **Enable Full DQA** option to enable the full **PET DQA** window. This enables the **Select Prior**, **View Current Reading** and **Establish a Baseline** buttons.

Figure 145 Enabling Full DQA Menus by right-clicking top Toolbar

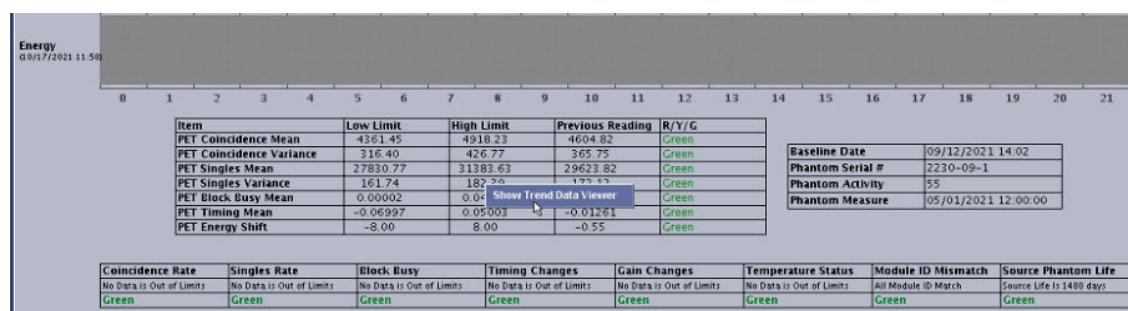


3. Click **Select Prior** to display the list of prior DQA readings currently on the system.
4. Click a prior DQA reading.
5. Click **Select** to display the summary or detailed information of the selected DQA.
Click the arrow next to **View Summary** and click or drag to **View Data** to display the corresponding DQA graphs and tables of results.
6. Click **Exit** to close the **PET DQA** window.
7. Click **Quit** to close the **Daily Preparation** window.

8.3.9 Display DQA Trends and Sinograms

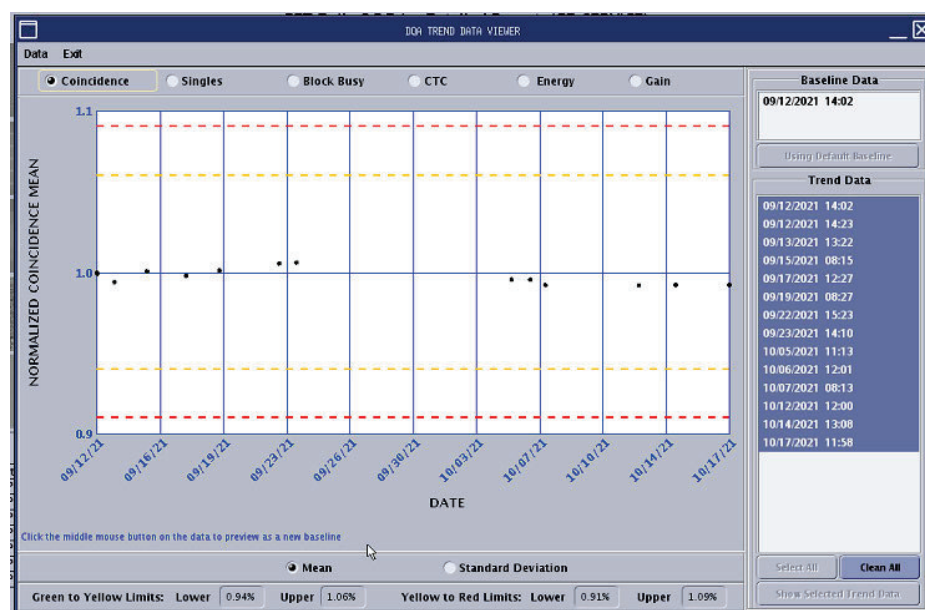
The system provides a method to view trend charts of DQA results over time. Trend charts can be useful in selecting an appropriate baseline and useful in analyzing failures. Open the DQA Trend Data Viewer by right-clicking inside the top table in View Data mode. You can open the DQA Trend Data Viewer either after a current DQA is acquired or by selecting a prior DQA. A menu appears from which you can select **Show Trend Data Viewer**.

Figure 146 Show Trend Data Viewer Menu opened by right-clicking on the View Data top table.



The trend tool can display the trend of DQA results over time for each of the **Mean** and **Standard Deviation** results for **Coincidence**, **Singles**, **Block Busy**, **CTC**, **Energy**, and **Gain DAC**.

Figure 147 DQA Trend Data Viewer shows PET Coincidence Mean Over Time.

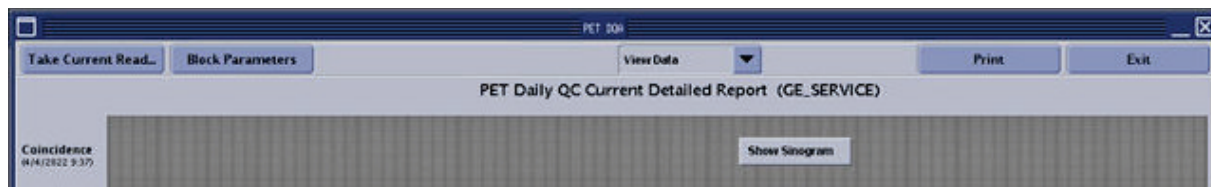


The trend tool shows the Yellow and Red limits for each result.

The system also provides a quick viewer for DQA sinograms. Sinograms can be a useful way to view the PET detector data or assessing if the annulus phantom is well centered in the PET field of view. The Sinogram can be opened by right-clicking inside the Coincidence Graph in View Data mode. The

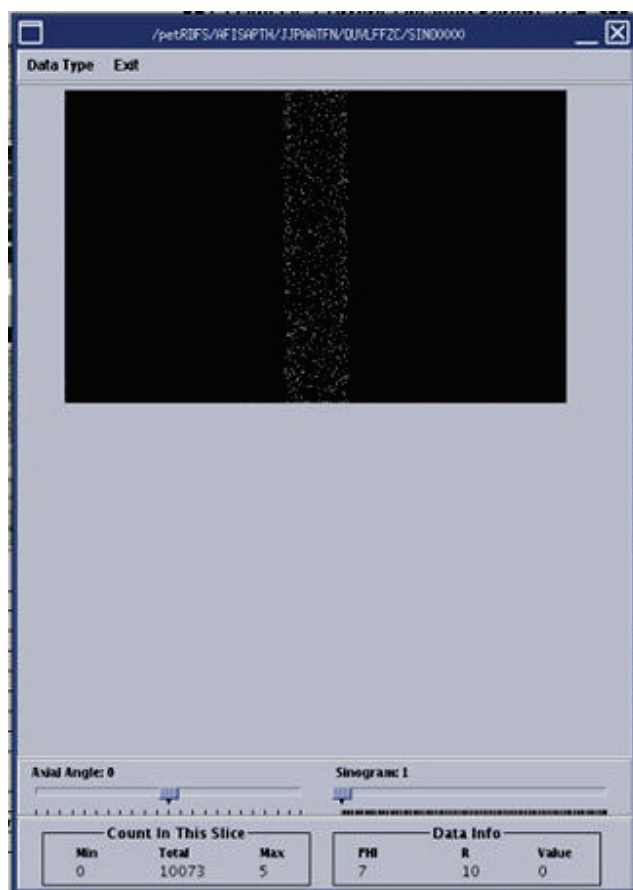
Sinogram can only be opened after a current acquisition is completed, not after the DQA screen is exited. A menu will appear, and **Show Sinogram** can be selected.

Figure 148 Open Show Sinogram Menu by right-clicking on the View Data Coincidence Graph



The Sinogram for a off-centered annulus phantom may appear slightly curved. There is no need to re-take DQA if the phantom is slightly off-centered, as the software automatically corrects for any phantom displacement from the scanner's center line.

Figure 149 PET DQA Sinogram Viewer - Example of Off-centered Annulus Phantom



8.3.10 Save PET Calibrations and DQA Results

Once a week, follow this procedure to archive a backup set of PET calibration and PET DQA files. If necessary, the Field Service Engineer can use these backup files to quickly restore the system to normal operation after system service or a software load.

This procedure requires a USB.

For best results: Save the existing set of DQA files to a new USB every six months, before deleting old DQAs from the system. Store this media in a safe place, and do not use it again.

1. Insert a USB into the USB port on the host console.
2. Click the **Service** icon.
3. Click the **CT** radio button to display the CT Service Desktop.

Figure 150 CT Service Desktop Toolbar



4. Click the **Utilities** icon on the Service Toolbar to open the **Utilities** menu.
5. Click the Utilities folder to display its contents.
6. Click **System State** or **System State - USB** to open the corresponding selection panel.
7. If you use a blank USB for the first time, click **Display Preferences** on the **Save State** window, in addition to the **PET Cal Files** and **PET DailyQA** buttons.
8. Click **Save** and follow the on-screen instructions.
If you inserted a blank USB (recommended) and clicked **Display Preferences**, a format request window opens. Click **Yes** to format the disk before saving the files.
9. After successful completion, a window opens to display, "Save/Restore System State: Completed Successfully."
10. Click **Cancel** to close the **System State Message** log.
11. Click **Dismiss** to close the **System State Save/Restore** window.

8.3.11 Restore PET Calibrations and/or DQA Results

Follow this procedure to retrieve a previously archived set of PET calibrations and/or PET DQA files from the USB and restore them to the system.

NOTE

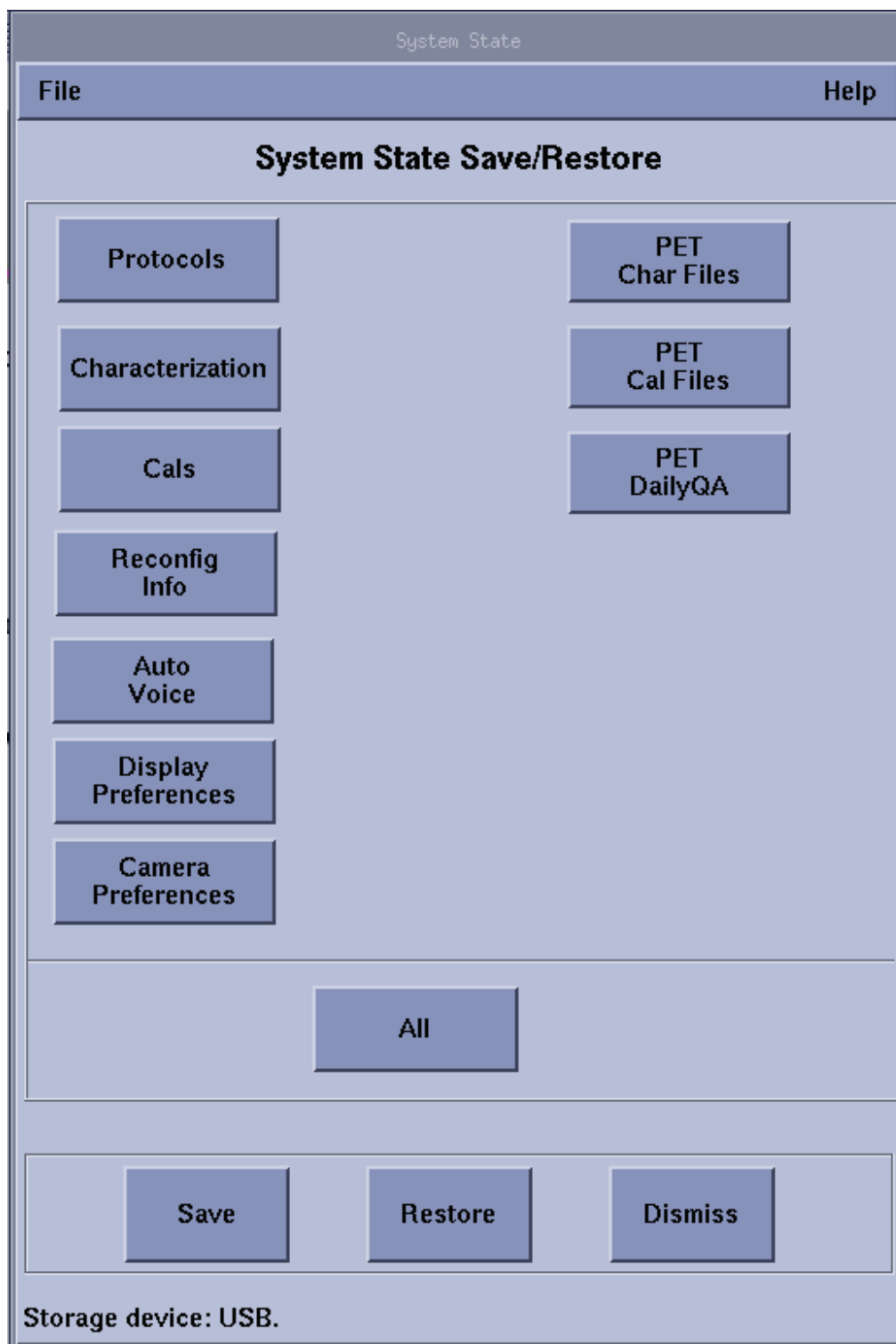
When you restore a previously saved file to the system, it will overwrite any existing data on the system with your selection.

1. Insert the USB with the files you plan to restore into the USB port, located in the media tower or host console.
2. Click the **Service** icon.
3. Click the **CT** radio button to display the CT Service Desktop.

Calibration

4. Click the **Utilities** icon on the Service Toolbar to open the **Utilities** menu.
5. Click the Utilities folder to display its contents.
6. Click **System State** or **System State - USB** to open the corresponding selection window.

Figure 151 Save State Window



7. Click the **PET Cal Files** and/or **PET DailyQA** button.

Each button activates when you click it.

8. Click **Restore** to open a query window.

Click **No** to exit the restore function without retrieving the files.

9. Click **Yes** to replace the existing system files with the selected files on USB.

Upon successful completion, a window opens to display, “Save/Restore System State: Completed Successfully.”

10. Click **Cancel** to close the **System State Message** log.

11. Click **Dismiss** to close the **System State Save/Restore** window.



DO NOT ATTEMPT TO REUSE RESTORED CALIBRATION FILES IF THERE WERE HARDWARE CHANGES (I.E. DETECTOR REPLACEMENT) SINCE THE TIME THESE CALIBRATION FILES WERE CREATED.

Hardware changes should be followed with running new calibrations, otherwise the system may be unable to generate maps for the newly installed hardware.

8.3.12 Delete DQA Files

Each time you run DQA, the system saves the resulting calibration summary files on the PET/CT system disk. The system has the capacity to store hundreds of DQA summary files, but you can delete files to shorten the “prior” file list.

Recommended:

- Keep at least one DQA *per week* for the life of the product.
- Keep at least one DQA *per day* for the past one month.

The Field Service Engineer may find this data useful during service troubleshooting.

For best results: Save the existing DQA list to a new USB before you delete them from the system. Store this archive USB in a safe place and do not use it again. If you reuse the USB, you will overwrite the existing data and permanently lose this information.

1. Click the **Daily Prep** icon to open the **Daily Preparation** window.
2. Click **Manage DQA** to open the **PET DQA** window.
3. Click **Select Prior** to display the list of prior DQA readings currently on the system.
4. Click a prior DQA reading.
5. Click **Delete** to remove the selected DQA reading from the list.

Repeat the highlight **Select/Delete** process, as needed, to remove additional DQA readings from the list.

NOTE

The system refuses to accept multiple selections in order to avoid accidental deletions.

6. Click **Cancel** to close the prior DQA list window.
7. Click **Exit** to close the **PET DQA** window, and return to the **Daily Preparation** window.
8. Click **Quit** to close the **Daily Preparation** window.

8.3.13 Delete Raw DQA Data and Screen Captures from the Patient Database

The system stores the DQA summary information in one system directory and stores the raw data used to create the summary data in the patient database with a **Patient Name** of **DQA**. You can remove the raw data from the system without effecting the DQA summary information.

For best results: Periodically remove the raw data information from the patient database to free up disk space for patient exams.

1. Click **Image Works** to open the patient browser.
2. Click the exams with **Patient Name, DQA** and **DQA** and **Patient Name...Daily QC Results**.
 - Press and hold **Shift** and click to highlight a contiguous group of DQA exams.
 - Press and hold **Ctrl** and click multiple DQA exams.
3. Click **Delete** in the browser toolbar to open the menu.

An alert window prompts: “Do you want to permanently delete the selected items?”
4. Click **Yes** to remove the selected exams and close the popup window.

8.4 Calibration Updates (Every Two Weeks)

8.4.1 Detector Calibration



RADIATION EXPOSURE: FOLLOWING THESE STEPS REQUIRE HANDLING THE SEALED GE-68 (DQA) PHANTOM. TO AVOID UNNECESSARY EXPOSURE, MINIMIZE OCCUPANCY OF THE SCANNER ROOM. FOLLOW FACILITY GUIDELINES TO HANDLE RADIOACTIVE MATERIAL.

Follow this procedure every two weeks to update the PET detector calibration information to compensate for changes in the PET detector over time. PET detector calibration workflow contains the following steps: Map, Energy, Gain, Energy (short), Source position and Coincidence timing calibration. After the Detector Calibration a DQA should be performed.

1. On the console, click the **Scanner Utilities** icon at the bottom of the scan monitor, to open the **Scanner Utilities** window.
2. Click **PET Calibration** to open the **PET Calibration** window with the **Detector Cal** check box selected. The system automatically selects the correct parameters for your PET/CT. Refer to [Figure 152 on page 254](#)

Figure 152 Initial Detector Cal Window

The screenshot shows the PET Calibration window with the following sections:

- Summary of Cal Files Used in Calibration:** A table listing calibration files and their status.
- Detector Cal Process Workflow:** A sequence of steps: Map → Energy → Gain → Energy (Short) → Source Position → Timing.
- Current Selected Cal Files:** A section with checkboxes for Position Map, Gain, Energy, and CTC, each with a 'Default' and 'Select' button.
- Module Selection:** A section with a 'View Detail' button and the text 'All Modules Selected'.
- Calibration Information:** A section with a 'View Detail' button and a radio button for 'Detector Cal'.
- Acquisition Status:** A section showing 'Elapsed Time: 00:00:00', 'Remaining Time: 00:00:00', and 'Count Rate (kcps): 0'.

Calibration File Name	Time of Last Modification	Default	Calibration Status
crystalMap_default.cal	07-07-2021 10:23:54	true	Prior data
gain_default.cal	07-07-2021 10:23:54	true	Prior data
energy_default.cal	07-07-2021 10:23:54	true	Prior data
ctc_default.cal	07-07-2021 10:23:54	true	Prior data

3. Optional: To apply the Detector Cal to individual modules:
 - a. Click the **View Detail** box in the **Module Selection** area to display a Module Selector graphic that represents the individual detector modules. The Module Selector opens with all modules in the green “selected” state and all module numbers listed in the **Module Selection** area, as shown in [Figure 153 on page 255](#).

Figure 153 Detector Cal Window with Module Selection and Calibration Information Details

The screenshot shows the PET Calibration software interface. The main window is titled "PET Calibration" and has a tabbed interface with "Summary", "gain_default.cal", and "ctc_default.cal" tabs. The "Summary" tab is active, displaying a table titled "Summary of Cal Files Used in Calibration".

Calibration File Name	Time of Last Modification	Default	Calibration Status
crystalMap_default.cal	06-21-2023 10:07:29	true	Prior data
gain_default.cal	06-21-2023 10:07:29	true	Prior data
energy_default.cal	06-21-2023 10:07:29	true	Prior data
ctc_default.cal	06-21-2023 10:07:29	true	Prior data

Below the table is a "Detector Cal Process Workflow" diagram showing a sequence of steps: Map → Energy → Gain → Energy (Short) → Source Position → Timing.

On the right side of the window, there are several panels:

- Current Selected Cal Files:** Includes checkboxes for "View Details" and buttons for "Default" and "Select" for Position Map, Gain, Energy, and CTC.
- Module Selection:** Includes a "Module Selector" with a row of 20 green boxes (0-19), a "Module Selected" list showing "0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20", and buttons for "Select All", "Clear All", and "Select Action".
- Calibration Information:** Includes a "View Detail" checkbox, "Calibration Type" (set to "Detector Cal"), "Acquisition Type" (set to "Stop on counts"), and radio buttons for "With Review" and "Without Review" (selected), with an "Iteration" field set to "1".
- Acquisition Status:** Displays "Elapsed Time: 00:00:00", "Remaining Time: 00:00:00", and "Count Rate (kcps): 0".

At the bottom of the right panel are buttons for "Start", "Continue", "Cancel", "Finish", and "Exit".

- b. Click a green box to deselect the corresponding module. The box turns gray and the corresponding module number disappears from the **Module Selection** area.
 - c. Click **Clear All** to deselect all the modules, then click individual boxes to toggle the corresponding module to the green "selected" state and add its number to the now empty **Module Selection** area.
 - d. Click **Select All** to toggle all modules to the green "selected" state and display all module numbers in the **Module Selection** area.
 - e. Click the checked **View Detail** box to close the graphic and display the selection status in the **Module Selection** area. Applies for either "All Modules Selected" or "Individual Module(s) Selected".
4. For bi-weekly calibration:
 - a. Click the **View Detail** box in the **Calibration Information** area to display drop-down menus.
 - b. Select **Stop on counts** under **Acquisition Type**, if not already selected.
 - c. Insert **1** in the Iteration window. A single Detector Cal iteration is sufficient for a bi-weekly calibration of a system that has passed daily maintenance in accordance with [Section 7.2.1](#).

- d. Optional: Review results before accepting them:

The default acquisition mode is **Without Review**. In this mode, the system displays, “All calibration data is saved to the new cal files.” and saves the calibration data after data acquisition and processing are completed. If the number of iterations prescribed is more than one, the system automatically stops when calibration is achieved. Alternately, click the **With Review** radio button and it will provide the option of saving or rejecting the Detector Calibration data.

5. Click **Start** to initiate the Detector Cal sequence on all/selected modules. A pop-up window appears with instructions shown in [Figure 154 on page 256](#).

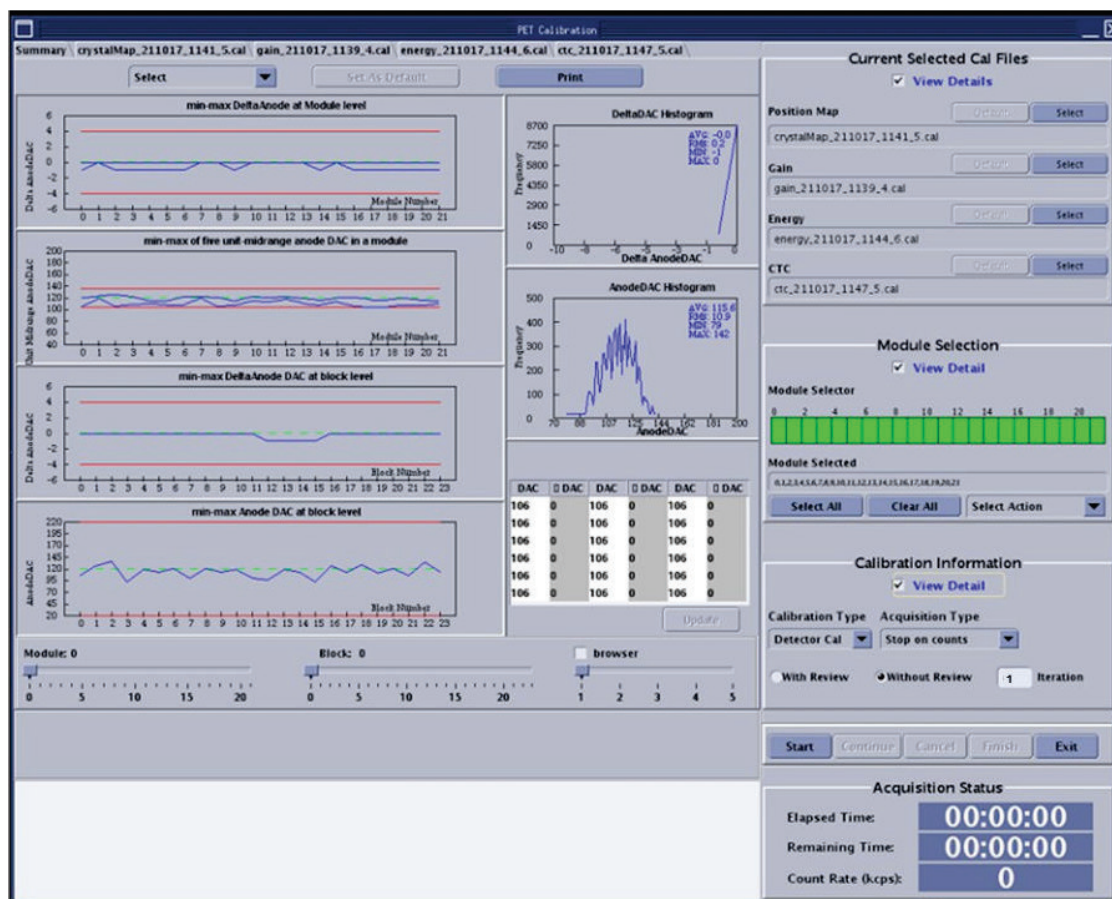
Figure 154 Detector Cal Start Message



6. Follow the instruction for loading the phantom.
For loading the phantom in the scanner room:
 - a. Press/hold the **Home** gantry button (the green light on the front cover of the scanner should be blinking). This moves the table to the load position and the height is also adjusted accordingly.
 - b. Retrieve and attach the phantom holder to the table.
 - c. Retrieve and attach the phantom to the phantom holder.
 - d. Return to the console. Click **OK** on the pop-up menu.
7. Once **OK** is clicked, press the **Move to Scan** button when it flashes. This moves the table to the scan position. Make sure all personnel have left the scan room.
8. Press **Start Scan** when it flashes to initiate the Detector Calibration procedure.
Each step in the Detector Calibration workflow turns green and gray to show system progress. The **Acquisition Status** area updates in real-time and the system displays messages in the status window at the bottom of the screen.
9. The system displays the message, “All calibration data is saved to the new cal files.” upon successful completion of the Detector Calibration.

The system automatically saves the calibration files, if **Without Review** is the selected acquisition mode.

Figure 155 Detector Calibration — Gain Window



NOTE

All values should be within red limit lines

8.4.1 Detector Calibration on page 253 shows an example of a calibrated detector gain. This can be viewed by selecting the **gain_XXXXXX_XXXX_x.cal** tab at the top of the window, when the **Current Selected Cal Files** area is activated by clicking the **View Details** check box.

10. Click **Exit** to close the **PET Calibration** window.
11. Once **Exit** is clicked, the **Source Out** button starts blinking.
Press **Source Out** to move the table to the unload position.
12. Click **Quit** on the main **Scanner Utilities** window.
13. Use the **Home** button on the scanner to retract the phantom to the unload position.
14. Remove the phantom and phantom holder and store in a safe and shielded location.