

CereTom[®] Elite

User Manual

1-NL3000-060 Revision 38



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Intended use of the system

The CereTom Elite computed tomography (CT) system is intended to be used for x-ray computed tomography applications for anatomy that can be imaged in the 25cm aperture, primarily head and neck.

The CT system is intended to be used for both pediatric and adult imaging and as such has preset dose settings based upon weight and age. The CT images can be obtained either with or without contrast.

Clinical Benefit

Computed Tomography (CT) provides real time imaging of bone, soft tissue and blood vessels that can provide detailed information to diagnose, plan treatment for, and evaluate many conditions in adults and children. Additionally, the detailed images provided by CT scans may eliminate the need for exploratory surgery.

Consumer information

Proprietary rights

NeuroLogica®, CereTom® Elite and NEU-CT-GENIII® Scanner Driver System (SDS) are registered trademarks of Samsung HME America, Inc., in the United States, other countries, or both. Catphan® is a registered trademark of Phantom Laboratory, Inc. ACR Appropriateness Criteria® is a registered trademark of the American College of Radiology. Image Gently® is a registered trademark of Society for Pediatric Radiology.

Legal disclaimer

Samsung HME America, Inc. is the legal manufacturer of this device and continues to operate under the trade name (dba) NeuroLogica Corp. For consistency with product labeling and historical documentation, the name "NeuroLogica" is used throughout this User Manual. References to "NeuroLogica" and "Samsung Healthcare USA" refer to the same legal manufacturer.

This user manual is intended as a guide for material supplied by NeuroLogica Corp. It provides the operator with necessary information to carry out specific procedures and maintain NeuroLogica produced equipment. Use this manual in conjunction with instruction and training supplied by qualified NeuroLogica personnel.

Any information or descriptions contained in this manual may not be reproduced and released to any of the general public or used in conjunction with other professional instruction without written consent of NeuroLogica Corp., USA – a subsidiary of Samsung. Direct any written inquiries to the appropriate address found in the section “Contact information”.

Unauthorized copying of this user manual may not only infringe copyright but also reduce the ability of NeuroLogica Corp. to provide accurate and up-to-date information to users: limited and restricted operators, and administrators.

This user manual, though complete and accurate, may not provide answers to undocumented changes or unexpected results that could occur from system anomalies.

Contact information

Keep user information readily available to contact Customer Service about general assistance or reporting on serious incidents (should they occur).

In the case of a serious incident or adverse event, please notify NeuroLogica at the below contact information and establishments local competent authorities.

To provide any comments, suggestions, or corrections to this user manual, please write to and include chapter title and page number:

NeuroLogica Corporation	
Customer Service	14 Electronics Avenue, Danvers, MA 01923 USA
USA and Canada	1-888-564-8561
International	1-978-564-8561
Email	support@samsunghme.com

If you have any questions about faults or errors on the system, battery or charge issues, or mechanical issues with the scanner, contact a **Technical Representative**.

If you have questions about the clinical use of your system, building protocols, creating MPRs, imaging artifacts, creating a clinical workflow or process, logging in or access issues, and general usage of the system, contact **Customer Service**.

Winckels Medical Devices Expertise	Australian Sponsor	Brazilian Authorized Distributor
Europe Bergerweg 18 6085 AT Horn The Netherlands +31 (0)475 582285 Tel +31 (0)475 582278 Fax EU REP  2862	Level 8/15 Talavera Road PO Box 646 North Ryde NSW 2113 Australia M +61 (0) 412 563 016 Tel T +61 (0) 2 8115 1535 Tel F +61 (0) 2 8114 1599 Fax Customer Service: 1-800 060 168	VR Medical Importadora e Distribuidora de Produtos Médicos Ltda Rua Batataes, 391, conj. 11, 13 e 8º andar CEP: 01423-010 – São Paulo CNPJ: 04.718.143/0001-94 Resp. Técnica: Dra. Cristiane Aparecida de Oliveira Aguirre- CRF-SP 21079 Registro ANVISA nº: 80102511464

Damage in transportation

Closely examine all packages at the time of delivery. If you see damage, notate **“damage in shipment”** on all copies of the freight bill **before** you accept or sign for delivery (by the hospital receiving agent).

Whether damage is noted immediately or concealed (noticed after delivery), damage **MUST** be reported to carrier **immediately** upon discovery, or within 14 days after receipt, and content and containers held for inspection by carrier.

Keep in mind – the transportation company **will not** pay a claim for damage if an inspection is not requested within the 14-day period.

User requirements

The equipment can *only* be operated by users who have received professional medical education and training, such as radiologic technologists, physicians, radiologists, and other medical specialists.

Users should be trained professionals who are certified to operate such systems **before** scanning or diagnosing patients. This training must include medical and x-ray education, as well as NeuroLogica applications training.

Everyone that uses this equipment must read, understand, and follow all instructions, precautions, and warnings.

Keep this user manual near the equipment. It is important to review the procedures and safety precautions periodically.

Essential Performance

The CereTom Elite has the following essential performance factors mitigated by design:

- Over Radiation Protection
- Re-scan prevention
- Stray Radiation exposure prevention
- Diagnostic performance

About this user manual

The instructions in this user manual describe how to use the NeuroLogica CereTom Elite Computed Tomography (CT) system, manufactured by NeuroLogica Corp. CereTom Elite is the trade name for the CT system and NL3000 is the device model.

The manual applies to both old and new colors of CereTom Elite.

This user manual **does not** provide medical explanations but does suggest potential applications for some of the software features. This user manual describes potential safety problems and how to avoid them.

Anyone who operates this system should have received training **before** attempting to scan or diagnose patients, to include medical and x-ray education, in addition to NeuroLogica applications training.

This manual is made available in electronic format to the customer as part of each product delivery.

For electronic manuals, please go to:
<https://usa.samsunghealthcare.com/computed-tomography/corporate/manuals>.

Translation of this manual is available for any country that does not allow for English labeling. Please reach out to NeuroLogica directly if translation is required.

Identified symbols and system classifications

The specifications and details of this user manual may change in order to improve the product or to enhance its performance.

Throughout this user manual, a yellow triangle with a black border and exclamation point is used to draw attention to those conditions or situations that fit one or more of the following criteria, which are definitions from ANSI Z535.5:



DANGER Indicates a hazardous situation, which if not avoided will result in death or serious injury.



WARNING Indicates a hazardous situation, which if not avoided could result in death or serious injury.



CAUTION Indicates a hazardous situation, which if not avoided could result in minor or moderate injury.

Conventions used in this user manual

Table 1: Conventions used in this user manual

Convention	Use
Commands to perform actions	To perform a string of commands, this user manual will present them as follows: Customize > System . This means click Customize and then click System .
Bold	When content refers to commands, windows, screens, dialog boxes, popups, tabs, buttons, options, keyboard keys, statuses, and modes, these items appear in bold for faster identification, especially in a procedure.
<i>Italic</i>	Identifies a word that is emphasized for your attention.
Numbered steps	Numbered paragraphs represent sequential steps that require you to take the action in the sequence provided – unless otherwise instructed. Procedures that are numerical mean that the sequence is important to follow. You may perform some procedures out of the recommended sequence; however, the results may vary.
Notes	The appearance of a note is as such: Note Indicates additional information to help you operate this product.
Hyperlink (an electronic cross-reference)	A cross reference appears in the electronic (.pdf) user manual as a hyperlink. To retrieve an electronic copy of this user manual (in .pdf), click Help > User Manual from the workstation. A hyperlink is a quick way to go to another area of the user manual with a simple click. Hyperlinks appear like this: “ Understanding the types of users ” on page 90. In this case, hover the mouse pointer over the gray hyperlink text. Hold the Ctrl key on your keypad and click the mouse button. After you click the hyperlink, the hyperlink takes you to the referenced area in the user manual.

Convention	Use
Click vs right-click	In this user manual, click means to press the left mouse button. This user manual never says 'left click' as it is assumed that is the traditional way to click; however, it does point out when to right click the mouse button.

Understanding the use of “you” in this user manual

Unless specifically noted, the implied “you”, in this user manual, is the user/operator. It is assumed users/operators are certified and medically trained personnel, qualified to use these systems.

The following identifies those actions each user is permitted to perform:

Administrator	Full access to the system and its configurations. Can create protocols, User ID's and passwords, as well as access all functions of the system.
Limited operator	Modified access to the system. Users with Limited access can modify protocols during scanning but cannot create and save protocols; and have no access to system configuration.
Restricted operator	Users with Restricted access can scan with the system but are unable to make any changes to protocol parameters while scanning, they also have no access to system configurations.

Active and inactive objects

When a menu command, option, button, tab, field, is gray, the item is not active or enabled. When an item is gray, it can mean additional or required tasks must be completed first or you do not have permission to access that option. An active menu command, option, button, tab, and field mean you can use the item to perform an action. Active items are blue and/or highlighted.

Applicable versions of CereTom Elite

This manual is applicable to all versions of CereTom Elite, despite the color variations.



Figure 1: Current cover (left) and former cover (right)

Chapter 1 Compliance and Safety Requirements

It is important that you are aware of and familiar with compliance and safety requirements to ensure you, the patient, and the systems are safe at **all** times.

IEC classification and symbols



In accordance with International Safety Standard IEC 60601-1, the CereTom Elite CT scanner is classified as Type B; Class 1 internally powered equipment, and continuous connection to the supply mains in standby state and for specified loading.

Type B equipment provides an adequate degree of protection against shock, in particular regarding:

- Allowable leakage current.
- Reliability of the protective earth connection.
- (In accordance with the International Safety Standard IEC 60601-1), the manufacturer is not responsible for any consequences caused by the unauthorized modification of this equipment.
- Earth leakage current.



WARNING Equipment is not suitable for use in the presence of a flammable anesthetic mixture of air or with oxygen or nitrous oxide.



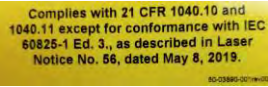
WARNING Equipment is not suitable for use with oxygen or oxygen-enriched atmospheres.

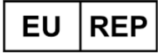
Mode of operation is a continuous connection to the supply mains in standby state and for specified loading conditions.

The CereTom Elite CT scanner is patient-environment equipment.

Table 2: Applicable symbols

Symbol	Description
	Alternating current
	Protective earth (ground)
	Functional Earth
	Caution: consult accompanying documents
	Caution: risk of electrical shock
	Electrostatic sensitive devices

Symbol	Description
	Type B equipment
	X-ray warning
	X-ray source assembly emitting
	Non-ionizing radiation
	Warning: laser in use
	Warning: Laser Radiation Do Not Stare Into Beam Class 2 Laser Product
	Laser Output and Standards Information Label
	Warning: FDA Laser Information
	Warning: high temperature
	Emergency switch
	Crush warning
	Foot/toe crush warning when lowering machine
	System up
	System down
	Load limit for scan board
	Temperature limits
	Keep away from rain for packaging
	Humidity limit for packaging

Symbol	Description
	Warning: battery charging
	Fuse usage
	Follow Instructions for User
	Legal Manufacturer Symbol
	Date of Manufacture
	Catalogue Number
	Serial Number
	Caution
	To indicate separate collection for waste of electronic equipment
Rx Only	Prescription Device
	Medical Device Symbol
	CE Mark or Conformité Européenne ; number below CE represent Notified Body number
	Intertek ETL (Edison Testing Laboratories) Mark
	European Authorised Representative Symbol



WARNING This x-ray unit may be dangerous to patients and operators unless safe exposure factors and operating instructions are observed.

Environmental specifications



CAUTION The specified environment must be constantly maintained: 24-hours a day, seven days a week.

Table 3: Operating environment

Operating	
Ambient temperature	15° C to 35° C (59° F to 95° F)
Relative humidity	20% to 85% (non-condensing)
Altitude	0-3010 m (0-10,000 ft.)
Storage	
Temperature	-25° C to 70° C (-13° F to 158° F)
Relative humidity	20% to 85% (non-condensing)
Powering system	
Time period prior to powering the system	24 hours ¹

Considerations when preparing gantry for use



CAUTION Check for obstructions before moving and system setup.



CAUTION Monitor scanner motion to prevent collision with surrounding environment and foreign objects.



CAUTION Press red **EMERGENCY STOP** button immediately in case of abnormal or unexpected motion.



WARNING Verify scanner is on its centipedes (fully down position) prior to positioning patient at scanner entrance.



WARNING Make sure all extremities are not under scanner while lowering or raising it.



WARNING Keep patient in view. Ensure that the patient can be seen when the operator is near the LCD (touch screen) and **EMERGENCY STOP** button. Never leave the patient unattended when the patient is in the gantry.

NeuroLogica advises complying with local regulations and/or site recommendations as specified by the facility physicist or certified representative for the following:

- Use mobile x-ray protective-shielding devices. Technologists should be in the correct location and consider wearing personal radiation protective equipment.

¹ If the system is in a facility outside the noted operating temperature, it is recommended to allow the noted time for the system to acclimate to the environment.

- A radiation safety plan in the working-area boundaries, to include, as needed, mobile x-ray protective shielding devices. Otherwise assign a larger, working area to avoid radiation to the public. Effective dose for people outside the working area should be less than 0.25mSv annually (equals to 5 uSv weekly). The air kerma rate 0.3 meters away from the working area will be smaller than 2.5 uGy/h. Have monitoring and personal dose management for occupational exposure and related public health care personnel.
- There should be a working plan before scanning. The plan should include CT condition, time, location, working area, scanning plan, and site-clearing method; clearly state the responsibilities of working, protection and management personnel. Keep a good record of the whole process.
- Restrict the working control and monitor area. Place obvious warning signs at the control-area boundaries to prevent unauthorized personnel from entering. Installation of a working status indication light is recommended.
- In accordance with the safety plan, self-monitor during the scanning process. A certified radiation representative should monitor the working area and take measurements immediately if abnormal circumstances are detected. Additionally, this should be reported to the local environmental administrative and health departments. There should be public notice in the working area, to include the nature of work, time, location, control area, name of the working department, person in charge of the project, contact telephone number, radiation report telephone number.

Site specification

Table 4: Site specification

Issue	Comment
Receiving area	Secured
Packing material and waste	Near availability of a trash receptacle for dunnage
Room dimensions for use	10ft x 10ft room with a finished level floor; recommend the room be well lit
Power availability	120 VAC/15-amp wall outlets (2x)
Floor flatness	< 0.120in. (3mm) over 10in. (250mm)

Note For good image quality, the recommended practice is to keep the system free from vibration and to maintain the flatness specification noted.

Table 5: System operating parameters

Operating voltage	100-240 VAC
Operating frequency	50Hz-60Hz
Apparent resistance of supply mains at 120VAC	0.3 ohms
Operating current at 120VAC	13 amps

Heat dissipation	1672 watts
------------------	------------

Table 6: Battery operating parameters

Operating voltage	42-54.4 VDC
Output current _(peak)	48.6 amps

Hazardous substances

Table 7: Hazardous substances table

Substance/material	≅ Weight/system
Lead	7.48kg (16.5lbs.)
Cadmium	0.035kg (0.078lbs.)
Mercury	0kg (0lbs.)
Hexavalent chromium	0kg (0lbs.)
PolyBrominated Biphenyls (PBB)	<0.45kg (<1lbs.)
PolyBrominated Diphenyl Ethers (PBDE)	<0.45kg (<1lbs.)

Part numbers and product-marking plates

Table 8: Core-system-component part numbers and product-marking plate locations

Component	Part number	Product-marking plate locations
CereTom Elite gantry	0-NL3000-000	Near the main input plug or on the side of the system. See Figure 10.
CereTom Elite workstation	10-00028-001	On the back of the workstation.
QA phantom	10-00011-001	On the back of the phantom.

Note The applicable components making up the CereTom Elite CT scanner is identified with the nameplate statement “This product complies with radiation performance standards, 21 CFR sub-chapter J.”

Table 9: Core-system component dimensions and weight

Component	Size (inches) (w x h x d)	Size (centimeters) (w x h x d)	Weight (lbs)	Weight (kg)
CereTom Elite system	52in. x 60in. x 28.7in.	134in. x 153in. x 72.89in.	966lbs	438kg



Figure 2: Scanner dimensions

Locating the product-marking plate



Figure 3: Product-marking plate on side of scanner

Class 1 Type B medical devices

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 to radio communications. To provide reasonable protection against such interference, this product complies with emission limits for Class 1 medical devices as stated in EN 60601-1-2.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment is found to cause interference (which can be determined by switching the equipment on and off), the user should attempt to correct the problem using one or more of the following measures:

- Re-orient or relocate the affected device(s).
- Increase the separating space 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 the service representative for further suggestions.

NeuroLogica Corp. is not responsible for any interference caused either by the use of interconnect cables other than those recommended or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

To comply with the regulations applicable to an electromagnetic interface for a **Group 1 Class A** medical device, note the following:

- 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 in violation of the European Union's Medical Device Directive and FCC regulations.



CAUTION Ensure there is no potentially detrimental interaction of system's irradiation with a patient's active and implantable medical devices and/or body-worn and active medical devices.



CAUTION Do not use devices that intrinsically transmit radio waves, such as a cellular phone, radio transceiver, mobile radio transmitter, radio-controlled toy, and so on. Use of these devices near this equipment could cause this equipment to malfunction. Keep power of these devices turned off when near this equipment.

- Medical staff in charge of this equipment are required to instruct technicians, patients, and other people who may be around this equipment to fully comply with the above regulations.

Focal spot

The x-ray tube has a single, focal spot with nominal dimensions of 1.0mm wide by 1.0mm long, with a range of 1.0 to 1.4mm, as defined by IEC 60336. The spot does not move by more than ± 0.2 mm due to thermal expansion in any direction. The tube does have a positional tolerance of ± 1 mm from the end of the anode and from the window.

Filtration

The x-ray tube's total filtration of the irremovable layers is 4.5mm of aluminum.

Source to Detector Distance (SID)

The SID value is 408.593mm.

Compliance statement

Note All editions and years of revisions for standards noted in this chapter are static as of **Revision 31** of this *CereTom Elite User Manual*.

The CereTom Elite system complies with the regulatory requirements of the following:

- CAN/CSA C22.2 No 601.1-M90 (1990), 2nd Edition, Medical Electrical Equipment - Part 1: General Requirements for Safety.
- CAN/CSA C22.2 No 60601-1-08 Medical electrical equipment - Part 1: General Requirements for Basic Safety and Essential Performance.
- CAN/CSA C22.2 No 60601-1-14 Medical electrical equipment - Part 1: General Requirements for Basic Safety and Essential Performance.
- CENELEC EN 60601-1 2nd Edition, Medical Electrical Equipment - Part 1: General Requirements for Safety, including Amendment A1:1993 and A2:1995.
- IEC 60601-1:2005 Medical electrical equipment - Part 1: General Requirements for Basic Safety and Essential Performance, 3rd Edition.
- IEC 60601-1:2012 Medical electrical equipment - Part 1: General Requirements for Basic Safety and Essential Performance
- IEC 60601-1-1 (2000) 2nd Edition: Medical Electrical Equipment, Part 1: General Requirements for Safety- Collateral Standard: Safety Requirements for Medical Electrical Systems.
- IEC 60601-1-2:2007 Ed3.0 Medical Electrical Equipment - Part 1-2: General Requirements for Basic Safety and Essential Performance - Collateral Standard: Electromagnetic Compatibility - Requirements and Tests Ed2.1 (Edition 2:2001 Consolidated with Amendment 1:2004).

- IEC 60601-1-2:2014 Ed4.0 Medical Electrical Equipment - Part 1-2: General Requirements for Basic Safety and Essential Performance - Collateral Standard: Electromagnetic Disturbances
- IEC 60601-1-3:2008 Ed3.0 Medical Electrical Equipment-Part 1-3: Collateral Standard: General Requirements for Radiation Protection in Diagnostic X-ray Equipment.
- IEC 60601-1-3:2012 Medical Electrical Equipment-Part 1-3: Collateral Standard: General Requirements for Radiation Protection in Diagnostic X-ray Equipment.
- IEC 60601-1-4 (2000) Edition 1.1 Consolidated Edition, Medical Electrical Equipment Part 1-4: General Requirements for Safety – Collateral Standard: Programmable Electrical Medical Systems.
- IEC 60601-1-6:2010 Ed3.0 Medical Electrical Equipment - Part 1-6: General Requirements for Basic Safety and Essential Performance - Collateral Standard: Usability.
- IEC 60601-1-6:2012 Ed3.1 Medical Electrical Equipment - Part 1-6: General Requirements for Basic Safety and Essential Performance - Collateral Standard: Usability.
- IEC 60601-2-32 (1994) Part 2-32, Particular Requirements for Safety sections 2.32 Specification for Associated Equipment of X-ray Equipment.
- IEC 60825-1:2014 Safety of Laser Products - Part 1: Equipment Classification, and Requirements 3rd Ed.
- IEC 60825-1:2007 Safety of Laser Products - Part 1: Equipment Classification, and Requirements 2nd Ed.
- IEC 62133:2012 Secondary Cells and Batteries Containing Alkaline or Other Non-acid Electrolytes - Safety Requirements for Portable Sealed Secondary Cells, and for Batteries Made from them, for use in Portable Applications.
- IEC 62366:2007 Application of Usability Engineering to Medical Devices.
- IEC 60601-2-44:2009 Ed3.0 Medical Electrical Equipment - Part 2-44: Particular Requirements for the Basic Safety and Essential Performance of X-ray Equipment for CT.
- IEC 60601-2-44:2012 Medical Electrical Equipment - Part 2-44: Particular Requirements for the Basic Safety and Essential Performance of X-ray Equipment for CT.
- IEC 62304:2015 Ed1.1 Medical Device Software – Software lifecycle processes
- NEMA XR-25 Specifies an Equipment Feature for CT Scanners to Produce Dose-related Notification and Alert Messages to Inform Operators Prior to Scanning if the Estimated Dose Would Exceed the Preset Levels.
- NEMA XR-29 Standard Attributes on CT Equipment Related to Dose Optimization and Manual.
- International Electrotechnical Commission (IEC) International Standards Organization, when applicable.
- Intertek Testing Service (ITS), an independent testing laboratory.
- Medical Device Good Manufacturing Practice Manual Issued by the FDA (Food and Drug Administration). Department of Health, USA.
- NeuroLogica Corporation is ISO 13485:2016 and MDSAP certified.

EMI/EMC terms

Electromagnetic Compatibility

Electromagnetic Compatibility (EMC) is the branch of electrical sciences that studies the unintentional generation, propagation, and reception of electromagnetic energy with reference to the unwanted effects (**Electromagnetic Interference (EMI)**) that such energy may induce. The goal of EMC is the correct operation, in the same electromagnetic environment, of different equipment, which uses electromagnetic phenomena and the avoidance of any interference effects.

In order to achieve this, EMC pursues two different kinds of issues. Emission issues are related to the unwanted generation of electromagnetic energy, to the countermeasures that should be taken in order to reduce such generation, and to avoid the escape of any remaining energies into the external environment. Susceptibility or immunity issues, in contrast, refer to the correct operation of electrical equipment in the presence of unplanned electromagnetic disturbances.

Interference, or noise, mitigation, and hence EMC is achieved by addressing both emission and susceptibility issues, that is., quieting the sources of interference, making the coupling path between source and victim less efficient, and making the potential victim systems less vulnerable.

Electromagnetic Interference

Electromagnetic Interference (EMI), also called **Radio Frequency Interference (RFI)** is an unwanted disturbance that affects an electrical circuit due to electromagnetic radiation emitted from an external source. The disturbance may interrupt, obstruct, or otherwise degrade or limit the effective performance of the circuit. The source may be any object, artificial or natural, that carries rapidly-changing electrical currents, such as an electrical circuit, the sun, or the northern lights.

Susceptibility

Susceptibility is the capability of an electronic system to respond to unwanted electrical energy.

EMI/EMC compliance

This equipment complies with IEC 60601-1-2 EMC standard for medical devices.

The CereTom Elite system is suitable to be used in an electromagnetic environment, as per the limits and recommendations described in the tables hereafter:

- Emission compliance level and limits (Table 11).
- Immunity compliance level and recommendations to maintain equipment clinical utility (Table 12, Table 13, and Table 14).

Note This system complies with the above-mentioned EMC standard when used with supplied cables. If different cable lengths are required, contact a qualified service representative for advice.

Table 10: Acronyms and abbreviations

Acronym and abbreviation	Definition
CT	Computed Tomography
HIS	Hospital Information System
PACS	Picture, Archiving, and Communication System
RIS	Radiology Information System
SCU	Service Class User
SCP	Service Class Provider
CBV	Cerebral Blood Volume
CBF	Cerebral Blood Flow
MTT	Mean Transit Time
AEC	Automatic Exposure Control



WARNING Medical electrical equipment needs special precautions regarding EM needs to be installed and put into service according to EMC information provided in accompanying documents.



CAUTION Portable and mobile RF communications equipment can affect medical electrical equipment.



CAUTION Do not use or stack the equipment or system with other equipment and if adjacent or stacked use is necessary, the equipment or system should be observed to verify normal operation in the configuration in which it will be used.

Note The EMC tables and other guidelines included in this user manual provide information to the user essential in determining the suitability of the equipment or system for the electromagnetic environment of use, and in managing the electromagnetic environment of use; to permit the equipment or system to perform its intended use without disturbing other equipment and systems or non-medical electrical equipment.

Note 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 to radio-frequency communication services. The user might need to take mitigation measures, such as relocating or re-orienting the equipment.

Table 11: Emission Declaration for CereTom Elite system

The CereTom Elite system is intended for use in the electromagnetic environment specified below. The user of the CereTom Elite system should ensure it is used in such an environment.		
Emissions test	Compliance	Electromagnetic environment guide
RF emissions CISPR 11	Group 1	The CereTom Elite system uses RF energy only for internal function. Therefore, the RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class A	The CereTom Elite system is predominantly intended for use in non-domestic environments and not directly connected to the public mains network. The CereTom Elite system is predominantly intended for use (for example, in hospitals) with an appropriate power supply and the recommended shielding for portable use.
Harmonic emissions, IEC 61000-3-2	Class A	
Voltage fluctuations/ flicker emissions, IEC 61000-3-3	Complies	

Table 12: EMC Immunity Declaration for the CereTom Elite system

CereTom Elite system is intended for use in the electromagnetic environment specified below. The user of the CereTom Elite system should ensure it is used in such an environment.			
Immunity test	IEC 60601-1-2 test level	Compliance level	Electromagnetic environment guidance
Electrostatic Discharge (ESD) IEC 61000-4-2	± 8 kV contact ± 2 kV, ± 4 kV, ± 8 kV, ± 15 kV air	± 8 kV contact ± 2 kV, ± 4 kV, ± 8 kV, ± 15 kV air	Floors should be wood, concrete, or ceramic tiles. 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 ± 1 kV for input/output lines	± 2 kV for power supply lines ± 1 kV for input/output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	± 1 kV line-line ± 2 kV line-ground	± 1 kV line-line ± 2 kV line-ground	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	0% UT; 0.5 cycle At 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315° 40% UT; 5 cycles 70% UT; 25 cycles 0% UT; 250 cycles	0% UT; 0.5 cycle At 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315° 40% UT; 5 cycles 70% UT; 25 cycles 0% UT; 250 cycles	Mains power quality should be that of a typical commercial or hospital environment. If the user of the CereTom Elite system requires continued operation during power interruptions, it is recommended that the CereTom Elite system be powered from its internal batteries.
Power frequency (50/60Hz) magnetic field IEC 61000-4-8	30 A/m, 50Hz or 60Hz	30 A/m, 50Hz or 60Hz	Power-frequency magnetic-fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
Clause 8.10	Per Table 9	Per Table 9	Reference to said table in IEC 60601-1-2: 2014

Countermeasures against EMC related issues

Generally, it is very difficult to grapple with issues related to EMC. It may take a variable amount of time and cost to identify issues causing interference.

General countermeasures of electromagnetic interference with other equipment:

- Electromagnetic interference may be alleviated by positioning other equipment far from system.
- Electromagnetic interference may be mitigated by changing relative location (installation angle) between system and other equipment.
- Electromagnetic interference may be eased by changing wiring locations of power/signal cables of other equipment.
- Electromagnetic influence may be reduced by altering the power-supply path of other equipment.
- Electromagnetic environment specified (Table 12 and Table 13).

Table 13: EMC Immunity Declaration

CereTom Elite system is intended for use in the electromagnetic environment specified below. The user of the system should ensure 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	3 Vrms 150kHz to 80MHz	V1 = 3 Vrms	Portable and mobile RF communications equipment should be used no closer to any part of the CereTom Elite system, including cables, than the recommended separation distance calculated from the equation appropriate for the frequency of the transmitter. Recommended separation distance: see Table 14.

CereTom Elite system is intended for use in the electromagnetic environment specified below. The user of the system should ensure it is used in such an environment.			
Immunity test	IEC 60601-1-2 test level	Compliance level	Electromagnetic environment guidance
Radiated RF IEC 61000-4-3 (alternative method: IEC 61000-4-21)	3 Vrms 80MHz to 2.5GHz	$E1 = 3 \text{ V/m}$	$d = \left[\frac{3.5}{V_1} \right] \sqrt{P}$ $d = \left[\frac{3.5}{E_1} \right] \sqrt{P}$ 80 MHz to 800 MHz $d = \left[\frac{7}{E_1} \right] \sqrt{P}$ 800 MHz to 2.5 GHz Where P is the maximum power rating in watts and d is the recommended separation distance in meters. Field strengths from fixed transmitters, as determined by an electromagnetic site survey, should be less than the compliance levels (V1 and E1). Interference may occur in the vicinity of equipment marked with the following icon: 

Table 14: Recommended separation distances

Recommended separation distances between portable and mobile RF communications equipment and the CereTom Elite system			
CereTom Elite system is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The user of the CereTom Elite system can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the CereTom Elite system as recommended below, according to the maximum output power of the communications equipment.			
Rated maximum output Power (P) if transmitter Watts (W)	150kHz to 80MHz Separation distance meters ²	80MHz to 800MHz Separation distance meters ²	800MHz to 2.5GHz Separation distance meters ²
0.01	.12	.12	.23
0.1	.38	.38	.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23
For transmitters rated at a maximum output power not listed above, the separation distance is estimated using the equation in the corresponding column, where P is the maximum output power rating of the transmitters in Watts (W) according to the transmitter manufacturer.			
Note At 80MHz and 800MHz, separation distance for higher frequency range applies.			
Note These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people.			

Use recommendations

This product complies with IEC 60601-1-2 standard for medical devices and with radio frequency emission requirements per CISPR11 Group 1 Class A standard limits. The CereTom Elite system is predominantly intended for use in hospitals.

Do not use devices that 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. Keep the power to these types of devices turned off when near this equipment.

² Separation distance according to frequency of transmitter (m)

Adhering to the distance separation (recommended in Table 14) between 150kHz and 2.5GHz, 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 maintain its essential performance by continuing to safely acquire controlled, radiological, x-ray exposures in a mobile radiography environment. For example, a 1W mobile phone (800MHz to 2.5GHz carrier frequency) will be put 2.3 meters apart from the CereTom Elite system (in order to avoid image interference risks).

The use of accessories, transducers, and cables, other than those specified, may result in degraded, electromagnetic compatibility of the CereTom Elite system.

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 requirements.

Installation recommendations

This system complies with above-mentioned EMC standard when used with supplied cables.

In order to minimize interference risks, the following requirements apply.

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.

Adjacent components and equipment

The CereTom Elite system should not be used adjacent to or stacked with other equipment; if adjacent or stacked use is necessary, the CereTom Elite system should be tested and verified to make sure normal operation in the configuration in which it is used. Consult NeuroLogica and Facility Technical Support staff regarding device/system configurations.

Static magnetic field limits

In order to avoid interference on the CereTom Elite system, static-field limits from the surrounding environment are specified. Static field is specified less than <1 Gauss around the unit.

Electrostatic discharge environment and recommendations

- In order to reduce electrostatic-discharge interference, install a charge-dissipative floor-material to avoid electrostatic charge-buildup.
- The relative humidity must be at least 30 percent.
- The dissipative material must be connected to the system ground-reference.

Facility IT-NETWORK

The CereTom Elite system utilizes the IT-NETWORK for the customer (as applicable) to communicate with the modality worklist and for supplemental, image-storage space. As part of the installation, the applicable IT-NETWORK is reviewed to create the appropriate setup to the system. Setup is done to ensure no potential concerns arise with the system.



CAUTION It is possible that the IT-NETWORK connection from the system could result in previously unidentified issues to the respective population. Should this occur, please contact Customer Service right away to identify, analyze, evaluate, and resolve the issue(s).



CAUTION It is possible that any changes to the IT-NETWORK made by the facility could introduce a new issue where Customer Service needs to be contacted to address the concern, right away.

Changes to the IT-NETWORK include – but are not limited to the following:

- Changes in network configuration
- Connection to additional items
- Disconnection to items
- Updating equipment
- Upgrading equipment

Hazard Information

Please review this material before using the system and observe basic, common-sense safety rules when operating this scanner.

General safety considerations and statements

Review the following before using the system and observe basic, common-sense safety rules when operating the scanner:

- Become familiar with the functional hardware to help recognize serious problems.
- Do not use scanner if it appears damaged or fails.
- Wait for qualified personnel to correct any problem.

- | | | |
|---|----------------|---|
|  | WARNING | The health software is installed on a medical device and is required for its operation. In order to securely remove the software from use, the system must be decommissioned. |
|  | WARNING | Modification of this equipment is <i>not</i> allowed. |
|  | CAUTION | All non-medical electrical equipment will comply with relevant IEC and ISO safety standards. |
|  | CAUTION | Federal law restricts the use of this device without a prescription by a physician. |
|  | CAUTION | Always store and/or use the unit in a well-ventilated area. Keep air pollution to a minimum. Keep floor clean at all times. |
|  | CAUTION | Do not touch parts of non-medical electrical equipment in patient environment and patient simultaneously. |
|  | CAUTION | For disposal of any material emanating from the system; follow local regulations. |
|  | CAUTION | This system was designed for use by individuals trained in CT system operation. The user should be familiar with this user manual before scanning patients. |
|  | CAUTION | It is the user's responsibility to make sure that after installation or subsequent modification, the system will be in compliance with the requirements of collateral standard IEC 60601-1. |
|  | WARNING | Installation of this product is performed in accordance with Installation Manual (1-NL3000-059). All installation processes and qualified personnel are outlined in that document. |
|  | WARNING | Proper disposal of batteries is required to ensure compliance with environmental safety guidelines. Contact authorized NeuroLogica representative for instructions. |
|  | WARNING | Observe safety-exposure factors and operating procedures to protect patients from physical harm during contact with this x-ray scanner. |
|  | WARNING | Observe safety requirements to prevent excessive dose exposure to patients and/or operator. |
|  | CAUTION | Improper system usage could endanger patients and/or users and void the warranty if not operated correctly. |
|  | CAUTION | Should the workstation encounter a computer-related virus, be sure to contact Technical Support for assistance with removing said virus from the equipment. |
|  | CAUTION | Radiation dose exposure to patients should not exceed maximum of 1Gy CTDI. |

**CAUTION**

For proper disposal of material at equipment's end-of-useful life; contact NeuroLogica for instructions.

**CAUTION**

Equipment in which protection against electric shock relies on basic insulation *only* should not be used in this system.

Laser safety

The laser itself is mounted internally to the disk assembly, which spins (as prescribed by the control panel) within the system's bore. Therefore, the laser's output light will always be aimed at, and rotating within the bore itself.

Laser parameters

- Wavelength = 650nm
- Output Power = 2mW

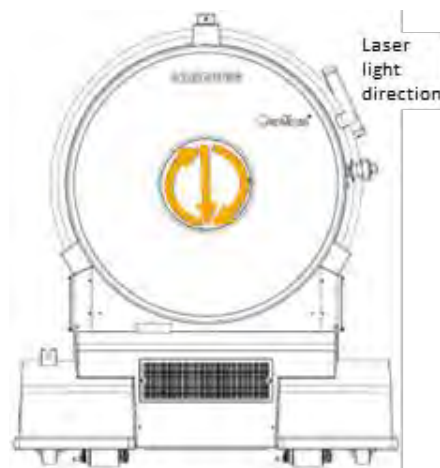


Figure 4: Laser aperture's direction

**WARNING**

Complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed. 3., as described in Laser Notice No. 56, dated May 8, 2019.

This statement will be a label placed on the User Interface side of the system

**WARNING**

Viewing the laser output with certain optical instruments (for example, eye loupes, magnifiers, and microscopes) within a distance of 100mm may pose an eye hazard.

**CAUTION**

Instruct the patient to close his/her eyes before activating (turning **ON**) the alignment light.

**CAUTION**

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

**CAUTION**

Class 2 laser radiation when open. **Do not stare into the beam or view directly with optical instruments.**



CAUTION Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.



CAUTION The warning label (below, for “laser in use”) is located on the front of the scanner cover and also inside the scanner to identify the presence of a laser.

Scanner mobility safety



CAUTION Due to the mobility of the system, an external interlock is not available; however, a prescribed scan can, at any time, be terminated from the scanner or the workstation. When the user activates the scan, a 10-second, countdown-clock, scan delay (adjustable to 99 seconds) triggers. This countdown allows the user time to perform needed tasks before the scan begins.



CAUTION To prevent healthcare provider injuries, the scanner and workstation should not be moved simultaneously by a single healthcare professional. When moving the scanner about the facility, NeuroLogica recommends (in the absence of the Scanner Drive System (SDS)) that at least two people move the scanner (lengthwise, only). Be especially cautious when moving the system on an inclined floor. To prevent population injuries, a single healthcare professional ***should never*** move the scanner and workstation at the same time when the system is not connected to the SDS.



WARNING To prevent involuntary movement, do not position scanner on an incline while in **Transport** mode.



WARNING Contact Technical Support for assistance when movement is required on an incline.

Note Be sure there are no obstacles in front of the scanner while you move the scanner.



CAUTION Check to ensure proper clearance is provided to allow removal of patients from the scanner in case of a power failure. This is accomplished by moving patient’s support (after unlocking wheel-locks) away from scanner.



CAUTION To prevent patients’ entrapment or entanglement with accompanying equipment, slowly move scanner away from patient using the LCD (touch screen) while observing patient.



CAUTION Do not station or operate the system on an uneven floor. The flatness requirement is 3mm over a distance of 250mm.



CAUTION Prior to transporting the scanner, verify that power cord is unplugged from wall to avoid damage to cord and outlet. Verify that ethernet cable is unplugged from workstation to avoid damage to cable and connector.

Floor level (even)

For proper operation, the system must be operated on an even, level, hard surface.

Carpeting

Do not use the system on a carpeted floor. Poor image quality could result due to unevenness of the floor.

Electrical safety



WARNING The system's external AC power cord should be checked prior to use to verify there are no exposed wires or damaged insulation/prongs. Damaged prongs could result in sparking and fire. In case of such damage, contact Customer Service immediately.



CAUTION Check to ensure the AC outlet is working properly before plugging in the system's AC power cord.



WARNING To prevent electrical shock, do not connect items that are not specified as part of the system.



WARNING To prevent electrical shock, do not remove the covers from the equipment. The covers protect the user and the patient from moving parts or electrical shock. Hazardous voltages are present within this equipment. The covers provide protection from radiation exposure given off from the x-ray tube. The covers also protect the equipment.



WARNING An electrical shock hazard: no user should apply serviceable parts; refer to qualified service personnel for any service.



WARNING Always electrically isolate this equipment from the main electrical supply before cleaning and disinfecting it to prevent short-circuiting or possible electrical shock.



WARNING Never position the mobile system in a manner that prohibits access to unplugging it or prohibits pressing the **EMERGENCY STOP** button.



WARNING To minimize shock hazard, the system chassis must be connected to an electrical ground. The system is grounded through the ground conductor of the supplied, three-conductor power cord. The power cord must be plugged into a three-conductor electrical outlet receptacle. Do not alter the ground connection.



- WARNING** Avoid all contact with any electrical conductor as follows:
- Allow only people who know the proper procedures and use the proper tools to install, adjust, repair, or modify the equipment.
 - Only use this equipment in rooms or areas that comply with all applicable laws (or regulations having the force of law) concerning electrical safety for this type of equipment.
 - The detachable cord is the disconnecting device, which is used to remove mains power from the wall socket.
 - The system is internally powered.



- WARNING** For Class 1 equipment (for example, the workstation cart, AC power cord, and so on) using an alternate internal source: a warning to use the alternate source if the integrity of the protective earth conductor is in doubt.



- WARNING** Do not position the system so that it is difficult to access the AC power cord.



- CAUTION** Protect the system power cord against mechanical damage.

Where the integrity of external, protective conductor in the installation or its arrangement is in doubt, equipment is operated from its internal electrical power source.

Parts of non-medical electrical equipment in the patient environment that, after removal of covers, connectors, and so on, without the use of a tool, may be contacted by the operator during routine maintenance and calibration, will operate at a voltage not exceeding 25VAC or 60VDC or peak value supplied from a source that is separated from the supply mains in accordance by one of the methods described in IEC 60601-1.



- CAUTION** To help prevent tripping hazards, use care in the arranging of any cords (for example, AC cord, ethernet cable, and so on) when connecting to the system/workstation.



- CAUTION** To prevent damaging electrical outlet cords, check to ensure they have been removed and properly stored before transporting the scanner.



- CAUTION** All systems within the patient environment provide the same level of safety as medical equipment complying with IEC 60601-1.



- WARNING** The CereTom Elite CT scanner contains high-voltage circuits for generating x-rays. Only trained and qualified personnel should be permitted access to the internal parts of this equipment.



- CAUTION** Use the **Universal Serial Bus (USB)** terminal located near the **EMERGENCY-STOP (E-STOP)** button for archiving to USB, *only*.



- CAUTION** For proper disposal of material at the end of the useful life of the equipment, contact NeuroLogica for instructions.

Mechanical safety



WARNING In case of unwanted movement or motion, press the **EMERGENCY STOP (E-STOP)** button.



WARNING Physically assist all patients on and off the bed and into position on the scan board. Adjust the bed to the specified height for patient loading and unloading (see “Positioning the patient” on page 84).



WARNING When positioning the scanning platform, be careful when moving the patient support to avoid having it hit the scanner covers.



WARNING Position any lines (IVs and so on) attached to the patient so the lines cannot catch on the scanner during scanner travel.



CAUTION Prevent pinching or crushing of the patient’s extremities. Keep patient’s hands on the side of his/her body. Watch the patient and equipment carefully at all times during scanner movement.



CAUTION To prevent pinching or crushing of the operator’s feet/toes, be sure extremities are not positioned under the scanner when it is being lowered from **Transport** mode to **Scan** mode.

Radiation safety



Figure 5: Dangerous to patient and operator label



WARNING Improperly used x-ray equipment may result in unwanted radiation exposure. Read and understand the instructions in this user manual before attempting to operate this equipment.



CAUTION Use technique factors prescribed by the radiologist or diagnostician. Use a dose that produces the best diagnostic results with the least x-ray exposure.



CAUTION Anyone authorized to use the equipment must understand the dangers posed by excessive x-ray exposure. NeuroLogica recommends use of protective materials and devices.



WARNING Everyone having anything to do with x-rays must take adequate steps to ensure protection against injury.



CAUTION The use of this device requires its users to receive proper training in accordance with local and national laws.



CAUTION **Never** perform calibration with patients in the scanner or while personnel are present in the vicinity of the scanner.



CAUTION Amber indicator lights (on the top of the scanner) illuminate during x-ray exposure.



CAUTION Ensure that there is no potential for detrimental interaction of the system's irradiation with a patient's active implantable medical devices and/or body-worn, active, medical devices.

X-rays can only be produced during the following conditions:

- The scanner is in the down (**Scan** mode) position.
- The **Start** button is activated.
- The workstation is connected.

Fire and explosion safety



DANGER This equipment is not suitable for use in presence of a flammable anesthetic mixture with air or with oxygen or nitrous oxide.



DANGER This equipment is not suitable for use in the presence of oxygen or oxygen-enriched atmosphere.

- Fire regulations for the type of medical area being used should be fully applied, observed, and enforced. Fire extinguishers should be provided for both electrical and non-electrical fires.
- All operators of the CereTom Elite scanner should be fully aware of and trained in the use of fire extinguishers and firefighting equipment, and in local fire procedures.



WARNING Only use extinguishers on electrical or chemical fires that are specifically labeled for those purposes. Using water or other liquids on an electrical fire can lead to fatal or other serious injury.

If it is safe to do so, attempt to isolate the equipment from electrical and other supplies before attempting to fight a fire. This will reduce the risk of electrical shocks.

EMERGENCY STOP button



CAUTION Check the **EMERGENCY-STOP (E-STOP)** button at least one time a month to ensure proper function.



CAUTION Every user should take a few minutes to locate the **E-STOP** before scanning the first patient.



CAUTION In case of emergencies, stop scanner movement immediately by pressing the **E-STOP** red push-button located on the scanner, below the LCD touch screen.

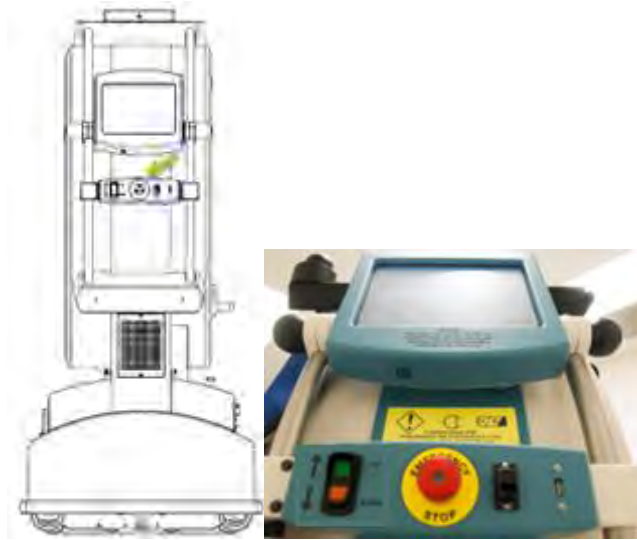


Figure 6: CereTom Elite E-STOP location

Note When **E-STOP** is activated, the moving gantry may overrun by less than 10mm.

Battery safety and information

The **System battery capacity** status icon shows an indication of battery capacity, which is identical to the indicator on the scanner. The user should always check the indicator on the scanner to verify the batteries' status; there are four 12-volt batteries in the scanner.



CAUTION The system unit contains batteries and will always be charging when plugged into AC mains.



CAUTION In case of battery leakage, do not handle the batteries themselves nor continue to operate the system. Contact NeuroLogica for service. See "Contact information" on page 26.

Battery replacement and disposal



WARNING Battery replacement is to be performed by authorized and trained NeuroLogica service personnel, to ensure proper disposal of hazardous material.



WARNING Dispose batteries in accordance with federal, state, and local regulations.



WARNING Do not incinerate batteries.



WARNING Contact an authorized NeuroLogica representative for appropriate product-disposal instructions.

Scanner battery capacity

The range is 0 to 100. Battery voltage and current are used to calculate the system's battery capacity based on charging state.



Figure 7: Scanner battery capacity icon

Run time operation

During normal run-time operation, the battery capacity is calculated one time per second. The **battery capacity** indicator is updated on the scanner's **display screen** as well.

Note The battery capacity indicator on the scanner's display screen is displayed in 5% increments when above 10%. When 10% and below, the displayed capacity is in 1% increments. That is, above 10% capacity, the displayed value is always rounded to the closest multiple of 5 (for example, 93 gets rounded to 95, 42 gets rounded to 40, 47 gets rounded to 45, and so on).

State changes

After each periodic update, capacity is checked to make sure it does not fall below certain thresholds, as follows:

- Low voltage alarm state
When battery capacity goes below 25%, a periodic alarm will sound. It will remain in this state until the user capacity has gone back up to 27% or higher.
- Low voltage lock-out state
When the user capacity goes below 1%, the LCD Main tab's buttons are disabled and starting a scan is prohibited; for example, the ability to move the scanner and certain protocol buttons are disabled. It will remain in this state until the battery capacity has gone back up to 2% or higher. The low voltage alarm will continue to be active in this state.

Predictive scanning

Before each scan, battery usage for that scan is predicted based on the selected load factors (for example, kV, mA, scan time) and is compared against the available battery capacity. If there is not enough battery capacity to scan, a popup appears on the workstation screen. The user can cancel the scan at that time or continue the scan, with the understanding that the scan may abort due to a low-power fault.

Under voltage protection

When the **system battery voltage** drops below the low-voltage cutout-level while unplugged, a system power-down sequence is initiated.

Recovering the system

1. Make sure the system is plugged into an operational wall outlet.

Note If the scanner's LCD screen does not automatically appear, use **Reset** to reboot.

You can insert a paperclip in the right pinhole, labeled **Reset** to reboot the base computer.



WARNING *Do not* use the left-base, power-supply pinhole under the LCD screen. Pressing this will adversely affect the system.

Note The system will not boot up fully until the system reaches 10% charge. This can take up to 2 hours. Full charge can take up to 8 hours.

2. If the system does not resume normal operation as the batteries recharge, there is likely a fault in the battery system; contact NeuroLogica for service.

Workstation

The **Workstation battery capacity** icon shows an indication of the workstation's battery capacity. On the workstation's main screen, place the mouse pointer over the battery icon to see the capacity of the battery, ranging from 0 to 100%. The user should always check the screen to verify the status of the batteries.



Figure 8: Workstation battery capacity icon

Note The system screen provides a way to verify that the scanner is plugged in and charging. If the touch screen is black, the system is not charging and/or the batteries are permanently damaged. A service call is required.



CAUTION The battery system is designed to be replaced by authorized and trained NeuroLogica service personnel, *only*.



CAUTION The workstation will not report the proper battery capacity and status if a network connection is not made.



CAUTION The system can only be charged from a correctly rated wall outlet. A rating information plate is located on the product-marking plate (lower backside panel or lower left side panel, see Figure 9 and Figure 10).



Figure 9: Product-marking plate on side of scanner

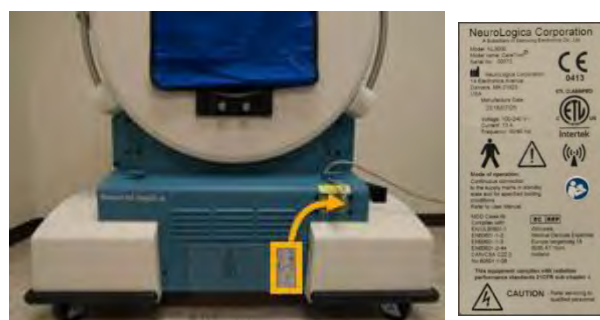


Figure 10: Product-marking plate on back of scanner

Note Systems manufactured on or after September 24, 2016, will have the product-marking plate shown in top left picture affixed on the system as shown in top right picture. Systems manufactured before September 24, 2016, will have the product-marking plate shown in bottom left picture affixed on the system as shown in bottom right picture.



CAUTION The system (including the workstation) should be plugged in at all times when not in **Transport** mode, being transported or in scanning use, to help maintain battery life and proper system operation. Failure to do so could result in permanent battery damage, which will require a service technician to repair.



CAUTION The system may not complete a scan when below 25% battery capacity while unplugged.



CAUTION If the system is unplugged and battery capacity reports to be 0%, permanent battery damage can occur.



CAUTION The system can be charged only from a correctly rated wall outlet.



CAUTION The power cord selection must not be less than 220v/16A, made of 2.08mm (diameter) copper wire in accordance with local power supply cable standards.

Note Medical grade power cords should be used at all times.

Scanner X-ray tube capacity

The percentage of the tube capacity required for a scan = $(\text{kV} \times \text{mA} \times \text{scan time(s)}) / 180000 \times 100\%$. Approximately 0.11% capacity is regained each second during cooling.

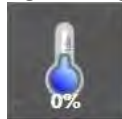


Figure 11: Scanner X-ray tube capacity icon

Maintenance and service



WARNING Equipment maintenance of non-medical electrical equipment should not be performed in the patient environment.



WARNING Maintenance checks and all service must be performed by NeuroLogica trained service personnel. Service personnel use Service manual (1-NL3000-062) to effectively perform needed service and preventive maintenance and inspection on the system. See “Contact information” for NeuroLogica’s contact information.



WARNING The only calibration performed by the user on this system is called **daily calibration** and is described in detail later in this user manual. All other calibration needs that arise must be performed by trained service personnel at NeuroLogica Corp. See “Contact information” for NeuroLogica’s contact information.



CAUTION Service personnel must complete training at NeuroLogica Corp. for the system and its accessories prior to conducting any service activities.

Users are not to perform service or maintenance on the system at any time. This includes battery maintenance.

Note NeuroLogica recommends that a six-month preventive maintenance be conducted by NeuroLogica’s service personnel/trained facility bio-engineer.

NeuroLogica recommends a semi-annual service contract.

Instructions for replacing serviceable parts are identified in the Service Manual (1-NL3000-062)

Cleaning the system

Keep the equipment clean. Remove body fluids to prevent health risk and damage to internal parts.

Note NeuroLogica recommends a solution of $\geq 99\%$ pure Isopropyl Alcohol (IPA) to sufficiently clean the equipment.

When the system is between uses, NeuroLogica recommends keeping it clean as described below.



WARNING Do not use flammable or potentially explosive disinfecting sprays, since resultant vapor could ignite, causing personal injury and/or damage to the equipment.



WARNING In order to prevent short-circuiting or possible electrical shock, do not spray cleaning agents or spill liquid cleaning agents directly onto the machine.



WARNING Always electrically isolate this equipment from the main electrical supply before cleaning and disinfecting it to prevent short-circuiting or possible electrical shock.



CAUTION The unit surfaces may be cleaned with a soft cloth and the recommended solution or a similar mild non-abrasive cleaning solution. General purpose liquid disinfectants may also be used as necessary. Apply the cleaning solution to the cloth, not directly to the unit.



CAUTION To help maintain good working conditions for the system, be sure to keep dust and like debris from collecting in the area. This will keep the cooling fans and filters used throughout the system free of clogging and promote optimum use of the system.

Cybersecurity



WARNING Upon detection of a cybersecurity threat to the system or workstation, do the following:

- Immediately contact Technical Support.
- Discontinue use of system (enabling the **EMERGENCY-STOP** if needed).
- Remove any ethernet and/or wireless connection that has been made with the facilities' IT-network.

Continued use of the system can occur after Technical Support has assessed the situation and provided the go-ahead to do so.

Note NeuroLogica Corp. recommends the customer facility utilizes an IT-network that provides sufficient means of cybersecurity control to help maintain the requirements of HIPAA.

Contraindication(s)

There are no contraindications associated with CT scanning.

Personnel privileges and terminology

Qualified operator

The operator as determined by the healthcare facility and assigned by a user with administrative privileges – who by their education, certification, experience and training, are sufficiently qualified to competently perform clinical scans on the CT system. See “Understanding the types of users” on page 90 for a description of the types of users.

Operator of record

The operator of record is an operator or health care professional currently logged onto the CT system with a unique User ID and password identifier.

Scanning privileges

Scanning privileges are granted to a qualified operator, assigned by a user with administrative privileges, to conduct clinical scans on the CT system. This privilege level allows use of all clinical protocols to scan the patient.

Protocol privileges

Protocol privileges are granted to qualified healthcare professionals, as determined by the healthcare facility, and assigned to users with administrative privileges, who by their education, certification, experience and training, are sufficiently qualified to competently save or modify clinical protocols on the CT system. A healthcare professional with protocol privileges does not necessarily need scanning privileges on the CT system.

Administrative privileges

Administrative privileges are granted to qualified healthcare professionals as determined by the healthcare facility who by their education, certification, experience and training, are sufficiently qualified to competently assign, maintain, and oversee the assignment of personnel to scanning privileges and/or protocol privileges on the CT system administer. Healthcare professionals with administrative privileges do not necessarily need scanning privileges or protocol privileges on the CT system.

Clinical operation

CT system operation that involves scanning patients and/or creating or editing protocols intended for use on patients.

Clinical scanning

CT system operation that involves scanning of patients.

Clinical protocol

A protocol on the system intended for use on patients.

Chapter 2 System Overview

The CereTom Elite CT system lets you scan patients in a room or ward, an Intensive Care Unit (ICU), an Emergency Room (ER), a medical satellite facility, an Operating Room (OR), and a private office or clinic.

This chapter provides a brief introduction to the CereTom Elite system. You will learn how to use the CereTom Elite system in subsequent chapters.

Note Whether you turn on the scanner or the workstation first (see [Chapter 4](#)) does not matter; however, it is advised to power up the CereTom Elite system hardware first, to allow time for the scanner to warm up.

CereTom Elite system

The CereTom Elite is an 8-slice, mobile, battery-operated CT scanner and software system with **Axial**, **Helical**, and **Dynamic**, capabilities. It has eight rows of 1.25mm detectors in the Z axis; with each rotation, the scanner covers 10mm of anatomy. Total coverage is 640mm.

The CereTom Elite core system consists of the scanner, scan board, bed adapter, QA phantom, interface cables, shielding curtains, and CereTom Elite workstation. Consider the following:

- The scanner and workstation communicate using a wireless connection. They also communicate using an ethernet connection, if necessary.
- The CereTom Elite workstation is a computer with custom software that allows the user to employ pre-defined system protocols or devise unique protocols for performing patient studies. It also allows the user to update patient information and store images. The viewing portion of the CereTom Elite workstation allows the user to view images in more detail and includes tools to help facilitate diagnosis by a physician.
- The maximum scout length is 640mm.
- The scanner can create a slice-thickness of 1.25mm, 2.5mm, 5mm and 10mm in **Axial** mode.
 - In **Axial** mode the CereTom Elite scans 10mm of anatomy with each rotation.
- The scanner can create a slice-thickness/spacing of 1.25 x 0.625mm, 1.25 x 1.25mm, 2.5 x 2.5mm, 5.0 x 2.5mm, 7.5 x 5.0mm and 10.0 x 5.0mm in **Helical** mode.
 - In **Helical** mode, the CereTom Elite scans 15mm of anatomy per rotation using a pitch of 1.5.
- The maximum scan length in both Axial and Helical mode is 640mm.
- In **Dynamic** mode, the CereTom Elite scans 10.0mm of anatomy.
- The scanner is compatible with surgical navigation, HIS/RIS and PACS.
- Scan boards are a headboard that supports the patient's head and neck while the patient undergoes a scan or study.



- 1 CereTom or gantry
- 2 Bed with patient on scan board/bed adapter near bore
- 3 CereTom workstation
- 4 Scanner Drive System (SDS)

Figure 12: CereTom Elite system configuration

The LCD touch screen

The **Liquid Crystal Display (LCD)** screen is a touch screen that is located on the side of the scanner. The touch screen displays patient information, machine-positioning buttons, and scanner-status information.

The touch screen contains two tabs that show different information, the **Main** and **Options** tabs. The **Main** tab and the **Options** tab are blue when active, and gray when inactive. To make a tab active, and see what actions you can perform from the tab's panel, press the tab.



Figure 13: Main and Options tabs on the touch screen

The **Main** and **Options** tabs are described later in this user manual. See “Overview of the scanner’s LCD touch screen” on page 73.

The shielding curtains

The shielding curtains diminish radiation to those around the patient.

To learn more about the US and European findings regarding the scatter radiation measurements with opened or no curtains and with closed curtains, see “Scatter radiation” on page 200. To learn how to use the shielding curtains, see “Using the curtains for shielding” on page 88.

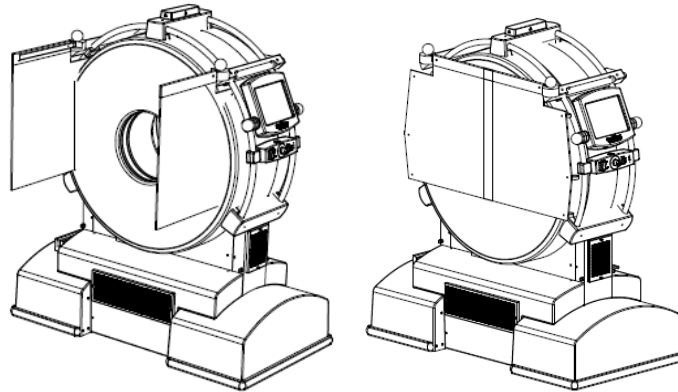


Figure 14: Shielding curtains: opened and closed

The workstation

The workstation is an accompanying part of the scanner; it is the computer and control unit that operates most functions of the system. All basic information related to the workstation (for example, operating distance, warnings and cautions, connectivity, functionality, etc.) appears in [Chapter 4 Basic Workstation Operations](#).

Laptop



Figure 15: CereTom Elite workstation

The workstation is a special laptop, set up either wirelessly or hardwired to the scanner. The hardwire setup uses an ethernet cable to connect the workstation to the scanner.

The administrator makes sure wireless is enabled when creating a wireless connection between the workstation and the scanner (with **System Configuration > Scanner Setup**, using the workstation). See “Remote Support setup” on page 118.

Note Wireless connections can be slower than hardwired connections. If an unexpected delay or disconnection due to environmental/bandwidth interference occurs when using wireless, it is recommended to hardwire an ethernet cable to the scanner for continued communication.



CAUTION **Do not** connect or use equipment beyond what is specified by NeuroLogica Corp.; this practice may lead to a reduced level of system safety.

The recommended distances, provided in Figure 16, relate *only* to distances specified by IEC 60601-1 and **do not** relate to specific distances required for ionizing radiation and/or stray radiation protection for operators and bystanders.

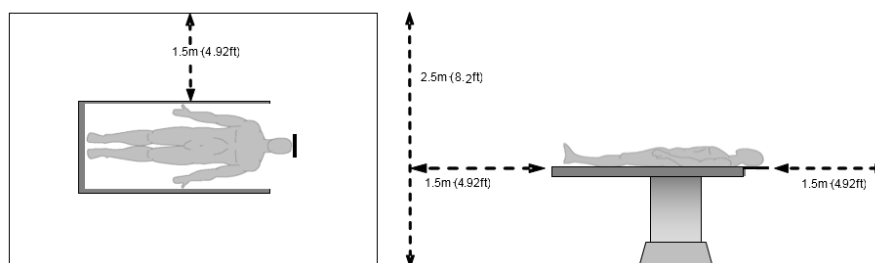


Figure 16: Workstation safe distance location (two views)

Keyboard and mouse

The workstation comes with a keyboard and a mouse (**1** for left-mouse button; **2** right-mouse button).



Figure 17: Workstation keyboard and mouse

Scanner Drive System

The NEU-CT-Gen III Scanner Drive System (SDS) is a self-contained, rechargeable, battery-powered, transportation system that is designed to transport the CereTom Elite CT scanner.



Figure 18: Scanner Drive System

SDS Overview

The NEU-CT-Gen III SDS, through mechanical, pneumatic, and electrical components, gives the scanner mobility when attached to the scanner.

You will learn how to dock the scanner to the SDS later in this user manual.



CAUTION Failure to heed **CAUTION** warnings may cause injury to the user, to others, or damage to the equipment.

SDS considerations before use and when stored

Before using the SDS, consider the following:

- If a problem is detected with the SDS, make sure repairs or adjustments have been made to the SDS **before** using it.
- Make sure the SDS operates easily and freely and all parts work smoothly.
- Check for excess noise, vibration, or a change in ease-of-use. Noise, vibration, or change in ease-of-use can be signs of a problem and a need for servicing.
- During scanner storage or non-use: undock the drive system **before** storing the CereTom Elite scanner to prevent damage to the drive wheels; failure to detach the drive unit from the scanner during extended storage time will result in flat spots on the wheels where they contact the floor.
- Store the scanner in a dry, well-ventilated, climate-controlled area. When not in use, plug the scanner into a 120V (or other compatible) outlet to charge the batteries. Make sure the scanner is locked (see "Locking and unlocking the scanner" on page 77). Store the SDS in Transport mode.

- Docking height: the docking mechanism does not automatically adjust to match the scanner and must match the scanner docking-adapter height; the height is set during installation by NeuroLogica; the mechanism should engage without forcing.

See “Chapter 14 Scanner Drive System” on page 312 for more specific information.

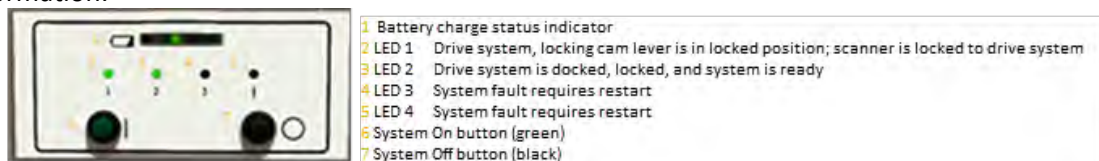


Figure 19: SDS control panel

The joystick

The joystick is attached to a programmable module on the **Scanner Drive System (SDS)** which lets you control and drive the SDS and Scanner when properly docked. See “Joystick features” on page 314 for information on REM421 and REM35 joystick models.



Figure 20: SDS joystick

The silhouette scan board and universal transfer board

A scan board is supplied with the system. The silhouette scan board is always used with an adapter; the universal transfer board is always used with mattress stiffeners.

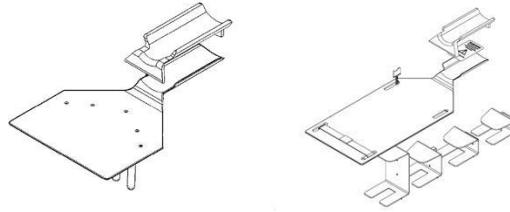


Figure 21: Silhouette scan board and universal transfer board

Parts that potentially come into contact with the patient

While you use the system, be aware that the patient may come into contact with the following parts:

- The CereTom Elite system, especially the painted, external surfaces of the system's scanner cover.
- Silhouette scan board
- Bed Adapter
- Patient Safety Straps
- Universal Transfer Board
- Pediatric and Neonate Scan Platforms

Chapter 3 Basic Scanner Operations

Basic scanner skills include powering on and off the scanner, learning how to use and navigate the touch screen, how to use **E-STOP**, and how to use the Rocker-Switch-Lift **UP** and **DOWN** buttons to lift and lower the scanner.

Scanning basics you should know before you scan a patient, include how your system should be set up, how to position the scanner and patient before the scan, and how to perform a scan.

Powering on and off the CereTom Elite system

The CereTom Elite is not intended to be turned on and off; however, if the system should lose power, *it is advised* to power on the scanner first, to allow time for the scanner to power up.

Consider the following:

- Make sure the scanner is properly plugged in, whenever possible; be sure the outlet provides the required power. Plugging the electrical cord into the wall powers on the system and charges the batteries; the batteries are the only power source that allows the scanner to perform scans.
- When plugging in the scanner, make sure the cable lays flat on the floor to ensure the safety of hospital personnel. In addition, make sure that the floor behind the scanner is free of any obstructions or debris that could interfere with the centipedes during scanning.

Overview of the scanner's LCD touch screen

The LCD touch screen appears on the side of the scanner.

The Main and Options tabs

The touch screen (LCD) contains two tabs: **Main** and **Options**. To make a tab active, press the tab with your finger. Each tab contains buttons, icons, text boxes, and status indicators to perform actions. There are some items that remain on both tabs: **Current Pos/Settings**, **Battery** and **Tube capacity** status, Patient information, **Lift** status, and **Daily Cal** status.

Active and inactive buttons

In general, buttons that appear on the **Main** and **Options** tabs are active when blue. Inactive buttons are gray.

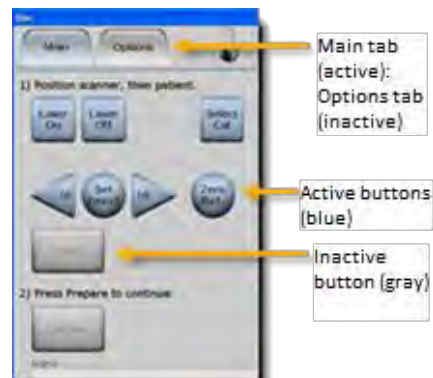


Figure 22: Button status

Main tab

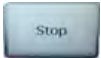
The **Main** tab contains various buttons, symbols, and information to perform actions; see Table 15: Main tab buttons and actions for a brief overview.



Figure 23: Main tab

Table 15: Main tab buttons and actions

Button	Description	Action
	Laser On and Laser Off	Turns on and off the laser. The scanner must be in Scan mode before the Laser On and Laser Off buttons are active.
	Select Cal	Performs a daily calibration and QA. Daily calibration is required before beginning a scan if the system has not been used within a 12-hour period. Be sure to close the lead curtains, if fitted, before starting the daily calibration. A QA is performed to verify the system's state and to perform image-quality verification. See "Performing a daily (air) calibration from the LCD touch screen" on page 180.

Button	Description	Action
		See “Starting Quality Assurance from the touch screen” on page 183; “Starting Quality Assurance from the workstation” on page 186.
	Set(mm)	Opens numerical keyboard for entering length of scanner movement.
	Directional arrows	Controls the movement of the scanner in either direction using the length entered from the Set(mm) button. See “Moving the scanner for manual transport” on page 82.
	Zero Ref	Sets the scanner to zero before starting a scout or scan.
	Stop	Stops the current movement.
	Prepare	Starts a protocol.

Options tab

The **Options** tab contains various buttons, icons, and information; see Table 16: Options tab buttons and actions for a brief overview.



Figure 24: Options available when Dose Check is enabled and not enabled

Table 16: Options tab buttons and actions

Button	Description	Action
	Scan Delay	Adjusts the scan delay countdown.

Button	Description	Action
	Transfer	Transfers a previous scan's images from the Reconstruction computer to the workstation or USB device.
	Emergency Patient	Registers an emergency patient to allow scanning if there is no patient registered from the workstation. If Dose Check is enabled, this option will not be available.
	Finalize	Completes the current patient and clears current patient information from the scanner. If Dose Check is enabled, this option will not be available.
	Training Mode On and Off	Toggles the scanner in or out of Training mode. Training mode allows you to use the scanner without activating x-ray exposures. See "Using Training mode to simulate a scan for training purposes", on page 230.

Dialog and toggle buttons

Dialog buttons that include an ellipsis indicate that a popup appears after the button is pressed. For example, press the **Scan Delay...** button which will display **scan-delay time options**.

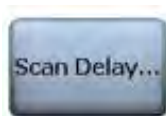


Figure 25: Dialog button with ellipsis



Figure 26: Select Scan Delay times popup

Toggle buttons are buttons that, when pressed, act one way and then when pressed again, have the opposite action.

The five icons that remain constant on the Main and Options tabs

There are five icons that appear on both the **Main** and **Options** tabs in the same location: at the top-right corner of the touch screen.

Table 17: Constant icons on Main and Options tabs on touch screen

Status bar icon	Status bar icon name	Status description
	Lock status	Identifies if the LCD screen is locked or unlocked.
	System state	Identifies the system's current state. The orb changes color depending on the state the system is in. See Table 19 on page 103 for a list of the different orb colors and system states they identify.
	Charging status	Identifies whether the scanner is plugged in and charging
	USB connection status	Identifies if a USB device is plugged into the scanner.
	Workstation connection status	Identifies if the scanner is currently connected to scanner.

The inactive and active modes are pictured in Figure 27, below; inactive items are gray, and active items are in color.

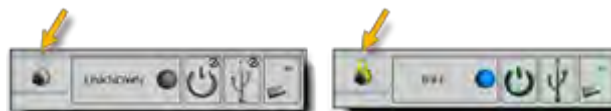


Figure 27: Touch screen's inactive icons (left) and active icons (right)

Locking and unlocking the scanner

You can lock the touch screen if the scanner will be unattended. Locking the touch screen removes any patient data from view.

1. Press the **Lock /Unlock** button.



Figure 28: Lock/Unlock button

The numeric keypad popup appears.

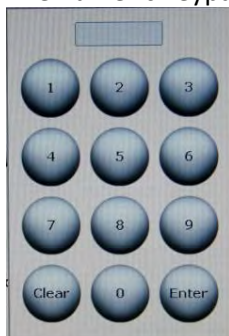


Figure 29: Numeric keypad popup

2. Enter the three-digit code: 911.

The padlock color represents whether the scanner is locked or unlocked, unlocked mode, gray, or locked mode, yellow.



Figure 30: Unlocked and locked padlock

Identifying the scanner's state

The **System state** orb changes color as different actions are performed. See Table 19 on page 103 to learn what state the system is in and the colored orb that correlates to that state.

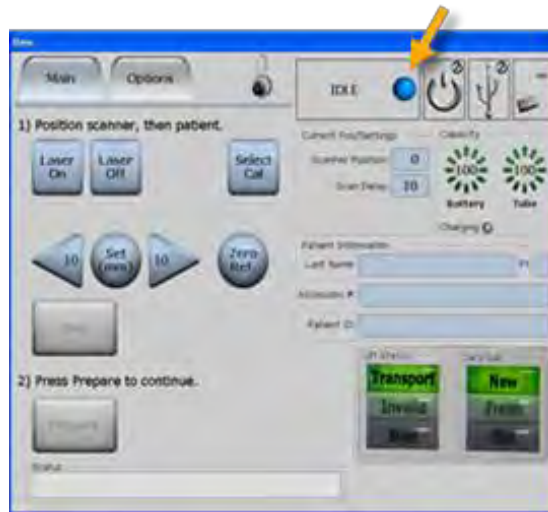


Figure 31: Scanners state in Idle mode

Identifying if the system is plugged in or not

If the system is plugged in, the following shows:

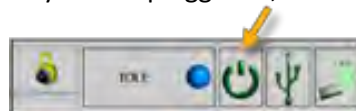


Figure 32: System plugged in

If the system is not plugged in, the following shows:

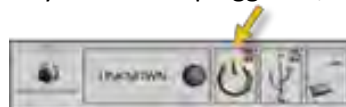


Figure 33: System not plugged in

Identifying if the system is using a USB connection

If there is an active USB connection, the following shows:

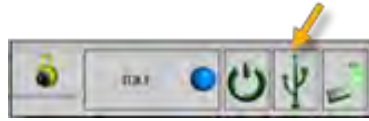


Figure 34: System USB connected

If there is no active USB connection, the following shows:



Figure 35: System USB not connected

Check that the USB is properly inserted in the USB port.

Identifying if the workstation is connected to the scanner

If the workstation is connected to the scanner, the following shows:



Figure 36: Workstation connected to scanner

If the workstation is not connected to the scanner, the following shows:



Figure 37: Workstation not connected to scanner

Check that the workstation is properly connected wirelessly or by an ethernet cable.

The administrator makes sure wireless is enabled when creating a wireless connection between the workstation and the scanner (with **System Configuration > Scanner Set Up**, through the workstation).

Note Make sure that the wireless setup in System Configuration has been done before making a wireless connection between the workstation and the scanner. See *Assigning general settings* on page 113 and *Remote Support setup* on page 118.

Wireless connections can add lag time as compared with a hardwired setup. If an unexpected delay or disconnection occurs when using wireless, it is recommended to hardwire an ethernet cable to the scanner for continued communication.

Current Position(POS)/Settings

The **Current Pos/Settings** feature includes the scanner's position and the scan delay countdown before a scan begins.



Figure 38: Current Pos/Settings

Battery capacity status

The **Battery** icon indicates the remaining scanner battery percentage available. See “Battery safety and information” on page 58. Below the **Battery** icon is the **Charging** icon, which lights up when the battery is charging.



Figure 39: Battery capacity percentage and Charging icon

X-Ray tube capacity status

The **Tube** icon indicates the remaining tube capacity percentage available.

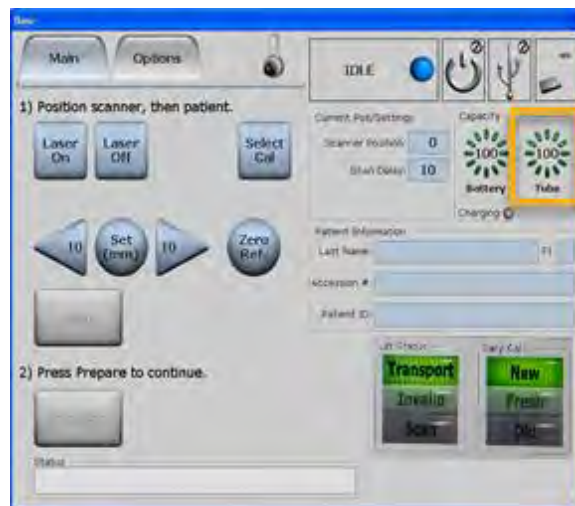


Figure 40: X-Ray tube capacity and percentage

Patient information

The patient information that appears on the touch screen allows you to confirm that the correct patient information will appear on the scan you perform. To learn more about how to enter patient information, see “Registering the patient” on page 211.



Figure 41: Patient information

Lift status and Daily Cal status

The **Lift** status indicates if the scanner is in **Transport**, **Invalid**, or **Scan** mode. The **Daily Cal** status indicates the status or freshness of the daily (air) calibration: **New**, **Fresh**, or **Old**. See “Moving the scanner” on page 82 for more information on **Lift** status. See “Performing a daily (air) calibration from the LCD touch screen” on page 180.

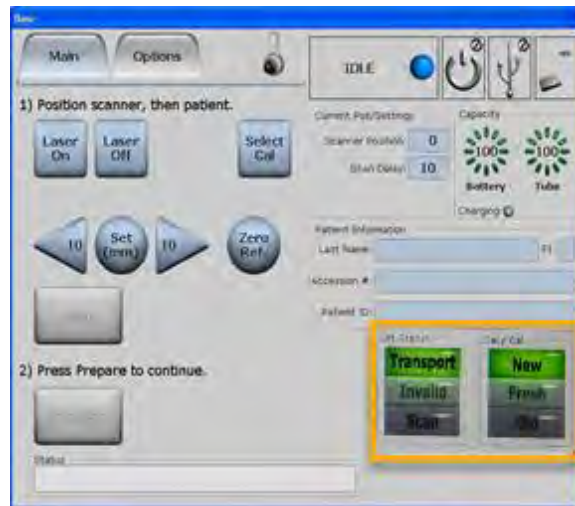


Figure 42: Lift and Daily Cal status

Moving the scanner for manual transport

The Rocker-Switch-Lift **UP** (green) and **DOWN** (red) buttons are located on the side of the scanner, near the touch screen. These **UP** and **DOWN** buttons prepare the scanner to move up for transporting or down for positioning the scanner for scanning a patient.

1. Press and hold the Rocker-Switch-Lift **UP** button to raise the scanner for transport.

Notice the touch screen: the **Lift Status** changes from **Scan**, to **Invalid**, and then to **Transport** mode. When the **Lift Status** is in **Transport**, you can move the scanner, manually.



Figure 43: Lift Status: Scan, Invalid, and Transport modes

2. Manually position the CT scanner, using the double-curved handles on the sides of the device, so the back of the scanner's largest opening rests at least 1 foot (30cm) from a wall.

The device will move away from the patient as it performs the scan.

Positioning the scanner before a scan

1. Press and hold the Rocker-Switch-Lift **DOWN** button until it lowers the scanner and reaches **Scan** status.



Figure 44: Rocker-Switch-Lift Up and Down buttons

Notice on the touch screen: the **Lift Status** changes from **Transport**, to **Invalid** and then to **Scan**. Wait for the **Lift Status** to be in the **Scan** status before you begin a scan.

The Set, Left and Right move buttons will become activate.



Figure 45: Active Left and Right buttons, and Set (mm) button

2. To change the distance the scanner will move, perform the following:
 - Press **Set (mm)** to open a pop-up keyboard.
 - Enter the value to indicate how far to move the scanner forward or backward in mm.
 - Press the **Enter** button to set the movement distance.



Figure 46: Pop-up keyboard and Enter

3. Do one of the following:
 - Press the forward or backward button to move the scanner forward or backward the distance indicated.
4. Press the **Stop** button to stop the scanner's movement.



Figure 47: Stop motion button

5. Align the patient bed with scanner opening to prevent a collision with patient, patients support and/or any life supporting devices prior to scanning.

Note: Be sure the floor is clear of debris or anything that can cause interference with the scanner's translate centipedes.



CAUTION Ensure there is adequate clearance for the scanner to move the prescribed distance during the scout and/or scan.

6. Make sure the patient's bed is locked.



CAUTION Make sure to lock the patient bed or scan table to prevent it from moving during the scan.

7. Adjust the bed height so that the patient is centered within the bore.

Positioning the patient



WARNING Prior to scanning, properly position the patient to ensure that extremities, hair, life support equipment, and so on have sufficient clearance to prevent patient injury with the scanner itself and/or when used with accessories/options.



WARNING Ensure the patient support is properly positioned (height and alignment) to prevent injury during scanning.



WARNING Make sure the foot pedal brake on the patient support/bed is engaged to prevent it from moving during the scan.



WARNING ***Never*** raise or lower the scanner when a patient is positioned in the system's bore. ***Always*** slide the patient support away from the system ***before*** raising or lowering the system itself.



CAUTION The following instructions for patient positioning should be performed in accordance with NeuroLogica Corp.'s clinical training.

Note To determine where personnel should stand during a scan, consult with the hospital physicist. NeuroLogica recommends a distance of 8-10 feet.

1. Attach bed adapter to the bed.



Figure 48: Bed adapter without posts insertion

2. Attach the silhouette scan board to the bed adapter by inserting the scan board into the adapter block.



Figure 49: Bed adapter with T-square

3. Tighten the Bed Adapter to the scan board by turning the T-square handles until two (2) clicks are heard.



Figure 50: Attaching the scan board with bed adapter to patient's bed

4. Position the patient until the patient's head rests on the pad of the scan board as shown below.



Figure 51: Positioning the patient on the bed

5. Position the patient in front of the scanner opening. The patient's shoulders should rest flat against the face of the device.
 - Make sure the patient is centered in the scanner bore.



Figure 52: Ensuring placement of patient's neck directly under rotating laser light

6. Lock the gurney or bed wheels before proceeding with scan.

Positioning the scanner using the laser light

The scanner provides a rotating laser-light to guide you to properly position the patient. The laser indicates the center of the scan plane. The laser light is centered on the actual x-ray beam at all times. For multi-slice protocols, this means that the laser light will indicate the middle position of all simultaneous acquisitions being acquired. There is no offset between the laser-light plane and the actual scan-plane. The accuracy of the position of the laser plane, with respect to the scan plane, should be ± 2 mm.

To activate the laser light on the touch screen

1. Press the **Laser On** button on the touch screen.



Figure 53: Laser On button



Figure 54: Phantom with laser light

The laser will automatically shut off, 30 seconds after pressing the **Laser On** button to activate the laser. Alternatively, you can terminate the laser by clicking the **Laser Off** button.

See the precautions regarding the laser in “Laser safety” on page 52.

2. Consider the following:

- If the patient is conscious, request the patient remain still with eyes closed throughout the entire scan.
- If the patient is unconscious, secure the patient.
- Follow the appropriate facility guidelines when scanning unconscious patients if the patient's eyes remain open.

Using the curtains for shielding

Using shielding curtains is recommended when performing equipment calibrations and patient scans, to ensure maximum efficiency and patient safety.

1. Unroll the back curtain ensuring that the curtain lies flat against the back of the scanner.

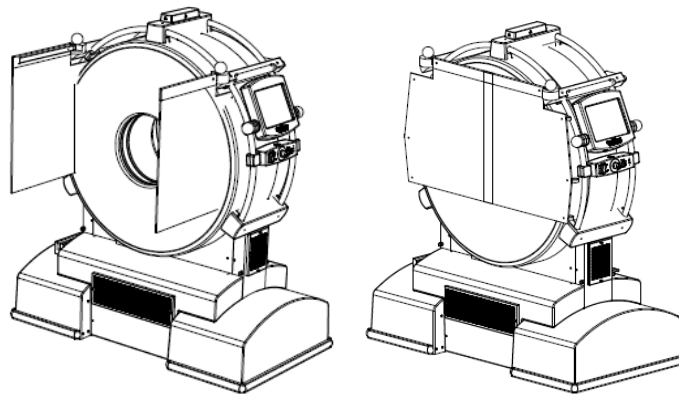


Figure 55: Shielding curtains open and then lying flat

2. Check to ensure that the patient is properly positioned and comfortable.
3. Position the front curtains, using the adjustment knobs, as close to the patient as possible to minimize the space between them.

Note For calibrations, the curtains should be completely closed against the front of the scanner.

The lead (shielding) curtain minimum thickness is 0.5mm.



Figure 56: Shielding curtains positioned with knobs

4. Before scanning the patient, check to ensure that nothing interferes with the patient's life support or other external medical devices.

Operating the E-STOP button

1. Press the **E-STOP** button to perform the following:
 - Stop the system (if it loses control).
 - Stop all system motion and x-ray.
 - Remove power from the gantry drives and x-ray system.
 - If the CereTom Elite starts to move unexpectedly.
2. Make sure to resolve the situation.

Note When **E-STOP** is activated, the moving gantry may overrun by less than 10mm.

Restoring the system from E-STOP

If you have pressed **E-STOP** to stop the system, follow these steps to restore the system, using **E-STOP**.

1. Make sure any hazard is removed.
2. Twist the **E-STOP** button clockwise until the button pops out to restore the system.

Rebooting the system

If your scanner needs to be rebooted, unwind a paperclip and gently insert the clip into the **right**-side pin-hole, underneath the touch screen, to reboot the system. Look for the **Reset** label and arrow on the side of the touch screen.



WARNING *Do not* use the left-base power-supply pinhole under the touch screen. Pressing this will adversely affect the system.

Chapter 4 Basic Workstation Operations

Basic workstation information includes understanding the different kinds of user access, learning how to power on and off the workstation, and getting familiar with the workstation screen, menus and tabs.

Note *It is advised* to power up the CereTom Elite system hardware first, to allow time for the scanner to warm up, then power-up the workstation once the scanner power-up has completed.

Understanding the types of users

There are three **User Levels** available on the workstation: administrator, limited operator, and restricted operator. User ID's and passwords can be created for individual users and specific User Levels can be assigned to each user. The following define the access levels for each User Level.

Administrator	Full access to the system and its configurations. Can create protocols, User ID's, and passwords, as well as access all functions of the system.
Limited	Modified access to the system. Users with Limited access can modify protocols during scanning but cannot create and save protocols; has no access to system configurations.
Restricted	Users with Restricted access can scan with the system but are unable to make any changes to protocol parameters while scanning, they also have no access to system configurations.

Powering on and off the workstation

1. Press the **Power on** button on the workstation's laptop computer.



Figure 57: Workstation's Power on button (in this illustration, workstation mounted in SDS)

Note Depending on the workstation, the **Power on/off** button may not be in this location.

The workstation will boot up and the **Login** popup appears.

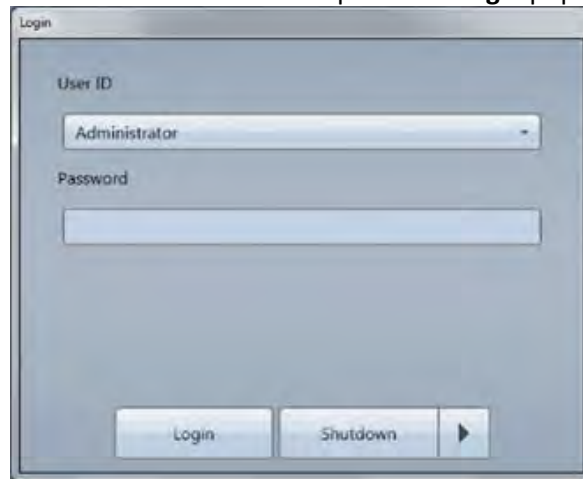


Figure 58: Login popup

Logging in to the workstation

To gain access to the workstation application, you must provide the system with credentials. These credentials consist of a **User ID** and **password**. Make sure you have a valid user ID and password before you log into the system.

If you do not have a valid user ID and password, ask your supervisor or administrator for one.

1. Click the **User ID** dropdown and select your User ID.



Figure 59: User ID dropdown box

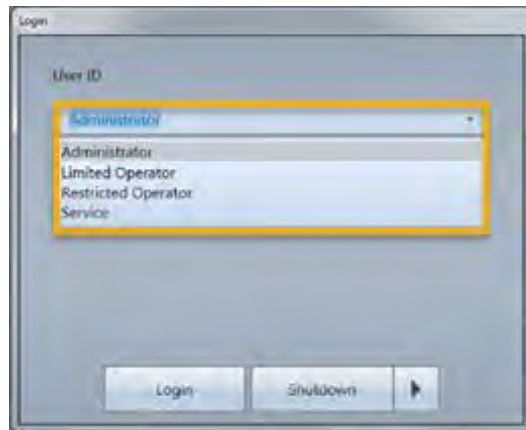


Figure 60: User ID dropdown list

2. Click in the **Password** field and type your password. Passwords are case sensitive.



Figure 61: Password text box

3. Click the **Login** button.
If the user ID and/or password are invalid, a prompt appears to re-enter the information.

Note You have a limited number of login attempts before the system locks the account. An administrator can unlock the account. See “System and User Configuration and Setup” on page 106 for more details about unlocking an account.

When the user ID and password are verified, you are logged into the system.

The main screen of the workstation software appears with the **Patient Registration** tab open.

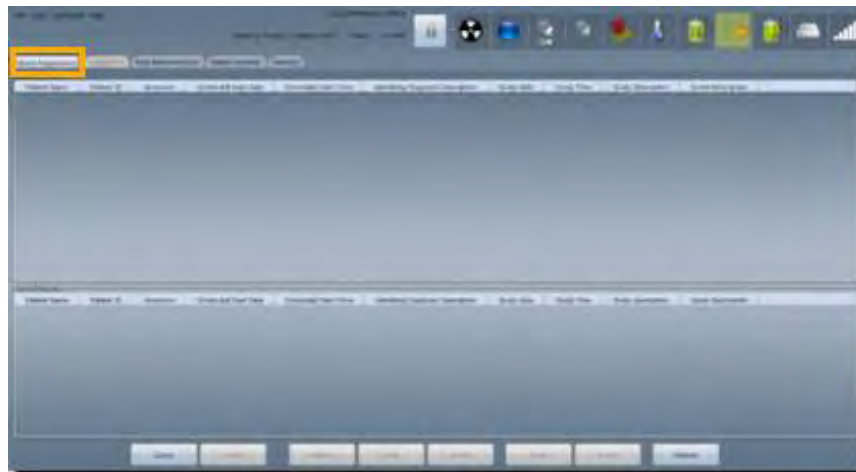


Figure 62: Patient Registration tab

4. Verify that the correct User ID appears at top center of the screen.

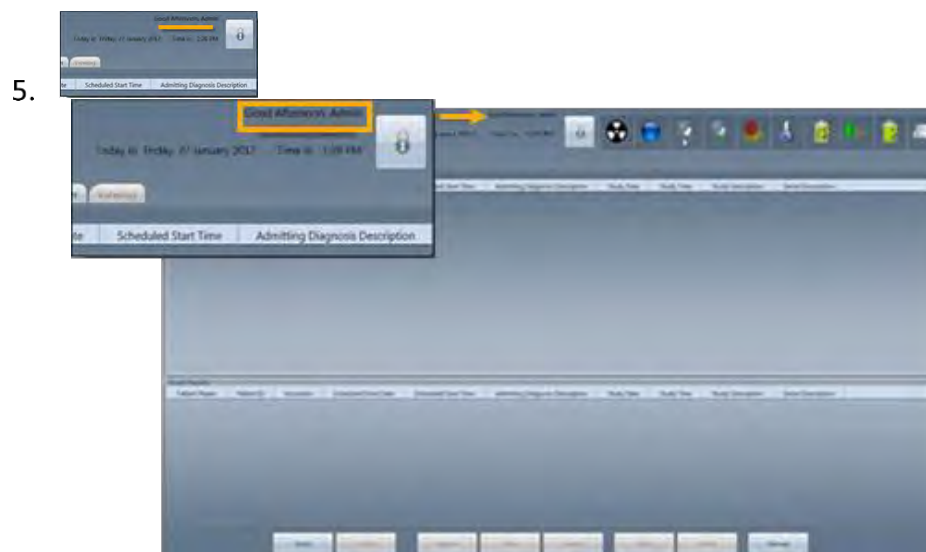


Figure 63: User ID, current date, and time

If the correct User ID **does not** appear, contact your supervisor or administrative user to verify the account.

Locking and unlocking the workstation system

The **Lock** button indicates whether your system is in **Lock** or **Unlock** mode. This button is a toggle, if the workstation is locked, the **Unlock** button shows, if the workstation is unlocked, the **Lock** button shows.

To prevent unwanted personnel from accessing the system, you should lock the workstation if you intend to leave the area for any period. When you lock the workstation, it remains **on**, but no one can access it without supplying a User ID and password.

Using Lock if you need to step away from the workstation

1. Click the **Lock** button located at top-and center of the workstation screen.



Figure 64: System Lock button

The **Lock/Unlock System** popup appears.



Figure 65: Lock/Unlock popup

2. Enter the User ID and password by selecting the option from the dropdown and entering information in the **Password** field.
3. Do one of the following:
 - Click the **Lock** button to lock your system.
When you select this option the **Lock** button changes to the **Unlock** button.
 - Click the **Cancel** button to return to your work.

Using Unlock to view your work

1. Click the **Unlock** button.

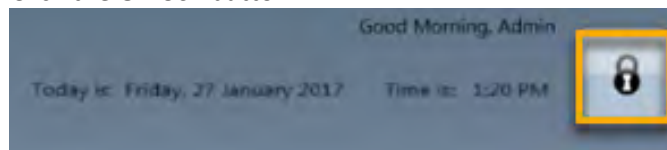


Figure 66: Unlock button

The **Lock/Unlock System** popup appears



Figure 67: Lock/Unlock System popup to lock the workstation

2. Enter the user ID and password by selecting the options from the dropdown and entering information in the **Password** field.
3. Do one of the following:
 - Click the **Unlock** button to unlock the system.
When you select this option the **Unlock** button changes to the **Lock** button.
 - Click the **Cancel** button to return to your work.

Navigating around the workstation's main screen

The workstation screen shows similar information, even if the screen elements change when you perform different actions. These constant screen elements are as follows:

Main menu options	Appears in the top left corner of the screen and shows the File , Tools , Customize , and Help commands.
User, date, and time	Appears in the center of the screen and displays a greeting for the user, the signed-in user's name, the current date, and time.
Scanner and workstation status	Appears in the top right corner of the screen and displays status information for both the scanner and workstation.

The main screen to the workstation software always opens with the **Patient Registration** tab open.

Brief overview of the main menu

The main menu provides access to the basic functions from the commands: **File**, **Tools**, **Customize**, and **Help**.

The main menu appears on every screen and is always located in the same location, regardless of what you are doing.



Figure 68: Main menu

Note To select commands, click the first command and the subsequent commands. For example, if you see **Customize > System** that means, click **Customize** from the main menu and then click **System**.

Brief overview of the File menu

When you log off, restart, or shutdown the application and/or the workstation, you must use your User ID and password to log back in.

Logging off the system

1. Click **File** from the main menu.

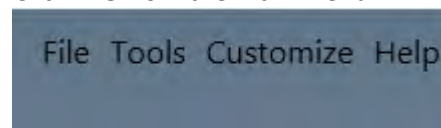


Figure 69: File menu

The **File** Dropdown appears.

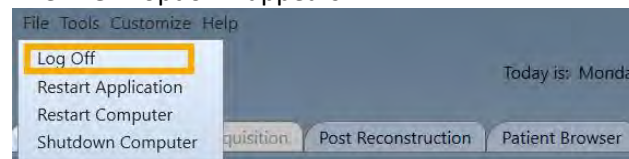


Figure 70: File > Log Off

2. Click **Log Off** from the dropdown to Log Off the workstation software. The **Login** popup appears.

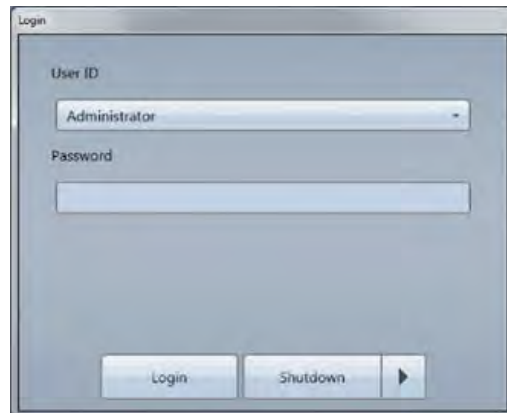


Figure 71: Login popup

This is also the login and shutdown portal. You can login or shutdown the workstation from this popup.

Restarting the application

You can restart the workstation in two ways: restarting the application only and not turning off the workstation or restarting both the application and the workstation.

1. Click **File** from the main menu.

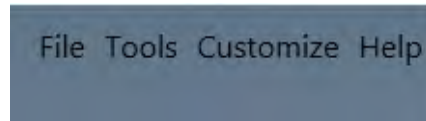


Figure 72: File menu

The File dropdown appears

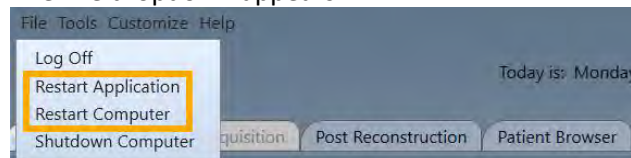


Figure 73: Restart popup

2. Perform one of the following:
 - Click **Restart Application** to restart only the scanner application.
 - Click **Restart Computer** to restart both the scanner application and workstation.

The following **Restart Application** or **Restart Computer** popup appears.



Figure 74: Restart Application or the Restart Computer popup

3. Perform one of the following:
 - Click the **Yes** button to perform the selected restart.
 - Click the **No** button to return to the screen.

Shutting down the workstation

To power off the workstation.

1. Click **File** from the main menu.

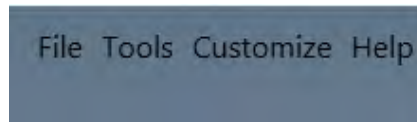


Figure 75: File menu

The File dropdown appears

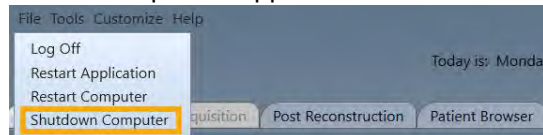


Figure 76: Shutdown computer

2. Click **Shutdown Computer** from the dropdown.

The **Shutdown Computer** popup appears.

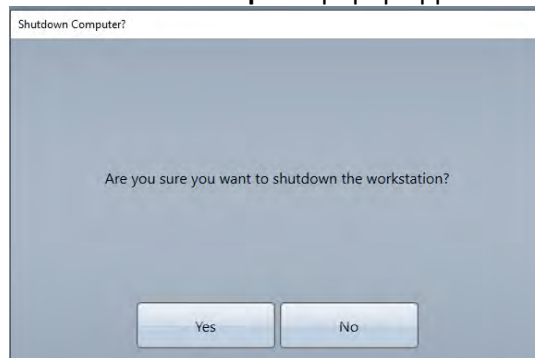


Figure 77: Shutdown Computer popup

3. Perform one of the following:
 - Click the **Yes** button to shutdown the workstation.
 - Click the **No** button to return to the screen.

Brief overview of the Tools menu

This menu provides you with tools to store and print, set up protocols, and test your system to ensure it is operating as specified.

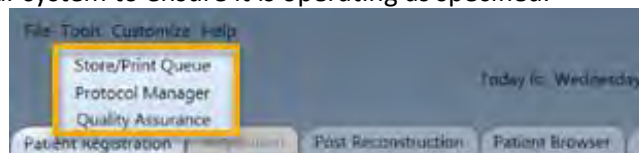


Figure 78: Tools dropdown menu

1. Click **Tools** from the main menu.
2. Click one of the following from the dropdown:

Store/Print Queue	The Store/Print Queue displays the status of studies being archived. You will learn more about how to store to various media later in this user manual; see page 106.
Protocol Manager	Allows users with Administrative privileges to create, modify, delete, and/or upload protocols to the scanner. You will learn more about how to use Protocol Manager later in this user manual; see page 158.
Quality Assurance (QA)	The tool that verifies the system is at its optimum performance. You will learn more about QA later in this user manual; see page 180.

Brief overview of the Customize menu

This menu provides you with tools to set up system and define user profiles.

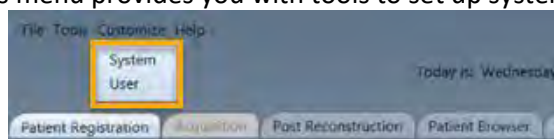


Figure 79: Customize dropdown menu

1. Click **Customize**, then one of the following sub commands from the dropdown list:

System	Allows users with Administrative privileges to customize site-related settings; see “Chapter 5 System and User Configuration and Setup” on page 106.
User	Allows you to customize layouts in the system as well as set the password. See “User Configuration” on page 152.

Getting Help from the Help menu

NeuroLogica Help includes an online user manual and information about the system. It also provides remote support from NeuroLogica **Technical Support** for file transfer, remote upgrades, or system review and support. When you enter a six-digit number, **Technical Support** will take control of the system to retrieve files or review the issue in question.

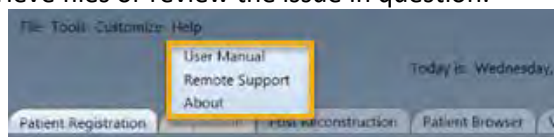


Figure 80: Help dropdown menu

Getting an online user manual

To open a .pdf version of this user manual perform this procedure.

1. Click **Help** from the main menu.
2. Click **User Manual** from the dropdown list.
A PDF version of this manual will be opened.

Getting remote support

1. Click **Help** from the main menu.
2. Contact NeuroLogica Technical Support.
See “Contact information” on page 26.
3. Click **Remote Support** from the dropdown list.
The **Support Connection** window appears.

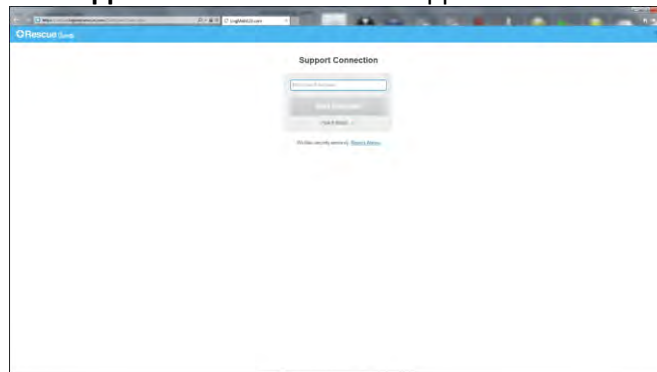


Figure 81: Support Connection browser window

When connected to **Remote Support**, a NeuroLogica **Technical Support** representative will supply a six-digit code to start a remote support session, which allows the support representative to review your system and troubleshoot the issue.

Getting information about the product and NeuroLogica

To get additional information about the product and NeuroLogica:

1. Click **Help** from the main menu.
2. Click **About** from the dropdown list.
The **About Us** popup appears.



Figure 82: About Us popup

The following information is found:

Version(s)	Identifies the current software versions for the system.
Licensed To	Identifies who the product is licensed to.
Station AE Title	Identifies the title for your workstation (for PACS purposes).
Licensed Packages	Identifies any licensed packages available on the system.

Getting to know the status bar

The status bar appears in the top-right portion of the screen. The status bar gives you a quick view of the system’s current state. Details for the icons on the status bar are in the tables below.



Figure 83: Scanner and workstation status bar

Table 18: Status bar identification

Status bar icon	Status bar icon name	Status description
	Radiation status	Identifies x-ray as on or off. The icon changes from a gray/black icon when x-ray is off, to a rotating yellow/black icon when x-ray is on.

Status bar icon	Status bar icon name	Status description
	System state	Identifies the current system's state. The orb changes color depending on the state the system is in. See Table 19, for a list of the different orb colors and system states they identify.
	Scanner position	Identifies the system's current position relative to its zero reference.
	System centipede status	Identifies whether the scanner centipede status is engaged or disengaged for transport: Green Centipedes are engaged. Red Centipedes are disengaged.
	System E-STOP status	Identifies when E-STOP is engaged. The icon will flash when E-STOP is pressed.
	System tube capacity status	Indicates the remaining tube-capacity percentage available. The capacity values are color coded as follows: Blue 100% - 51% Yellow 50% - 15% Red 14% - 0%
	Workstation battery capacity status	Indicates the remaining workstation battery capacity available. The capacity values are color coded as follows: Green 100% - 21% Yellow 20% - 11% Red 10% - 0% You will be prompted to plug the workstation into an outlet to charge if the battery capacity is low; a scan cannot be completed when the battery capacity is 10% or lower. When the workstation reaches the red capacity range, the system will shut down. A message informs you that the system will shut down due to low batteries. The lightning bolt icon signifies that the workstation is currently charging and goes away when unplugged.

Status bar icon	Status bar icon name	Status description						
	System air freshness status	Indicates the air freshness status; it is recommended that air calibration be performed: • Every eight (8) hours. • When the air freshness status falls below 50%. • If the scanner is moved to an area with a dramatic change in humidity and/or temperature. The calibration values are color coded as follows: <table><tr><td>Green</td><td>100% - 51% (new)</td></tr><tr><td>Yellow</td><td>50% - 25% (fresh)</td></tr><tr><td>Orange</td><td>24% - 0% (old)</td></tr></table> After calibration it returns to 100%.	Green	100% - 51% (new)	Yellow	50% - 25% (fresh)	Orange	24% - 0% (old)
Green	100% - 51% (new)							
Yellow	50% - 25% (fresh)							
Orange	24% - 0% (old)							
	Scanner battery capacity status	Indicates the remaining scanner battery capacity available. The capacity values are color coded as follows: <table><tr><td>Green</td><td>100% - 51%</td></tr><tr><td>Yellow</td><td>49% - 25%</td></tr><tr><td>Red</td><td>24% - 0%</td></tr></table> The lightning bolt icon signifies that the scanner is currently charging and goes away when unplugged.	Green	100% - 51%	Yellow	49% - 25%	Red	24% - 0%
Green	100% - 51%							
Yellow	49% - 25%							
Red	24% - 0%							
	Workstation free disk space status	Indicates the available disk space for image storage. The available space values are color coded as follows: <table><tr><td>Green</td><td>100% - 51%</td></tr><tr><td>Yellow</td><td>50% - 20%</td></tr><tr><td>Red</td><td>19% - 0%</td></tr></table>	Green	100% - 51%	Yellow	50% - 20%	Red	19% - 0%
Green	100% - 51%							
Yellow	50% - 20%							
Red	19% - 0%							
	Wireless signal indicator	Indicates the wireless signal strength between the scanner and workstation.						

The system changes states as it performs different actions. The following table indicates what state the system is in and the colored orbs that correlate to that state.

Table 19: System state orbs

Orb	Color	State
	Dark gray	The system is in an unknown state: not connected to the scanner; no communication is present.

Orb	Color	State
	Light gray	The system is powering up or down.
	Dark purple	The system is busy.
	Purple	The system is completing air calibration.
	Light purple	The system is archiving.
	Blue	The system is idle.
	Green	The system is ready.
	Light yellow	The system is planning.
	Dark yellow	The system is preparing.
	Light orange	The system is in reconstruction.
	Dark orange	The system is scanning.
	Pink	The system is not ready.
	Red	The system is in fault.

The Workstation tabs

To perform a patient examination, you will use the following five workstation tabs:

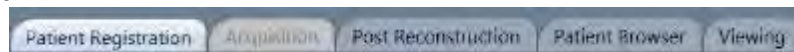


Figure 84: Workstation tabs to perform a patient examination

These five tabs include active tabs which will be blue, and inactive tabs which will appear gray. The active tabs are **Patient Registration**, **Post Reconstruction**, and **Patient Browser**. The **Acquisition** and **Viewing** tabs require additional steps to be performed before they become active.

The following actions are available in each tab:

Patient Registration	Allows you to register a patient either manually or from the hospital's database sites.
Acquisition	Allows you to select a protocol and perform an examination. This tab is inactive until a patient is registered.
Post Reconstruction	Allows you to manipulate raw data in different parameters and settings after your scan is completed.
Patient Browser	Allows you to view, manipulate, and archive scans already performed.
Viewing	Allows you to view patient images. This tab is inactive until a study is loaded from Patient Browser.

In the following chapters, you will learn how to perform necessary steps to conduct a patient examination and learn how to manipulate and store the data you acquire.

Chapter 5 System and User Configuration and Setup

A user with administrative privileges must set up the CereTom Elite system configurations for other users. System configuration is used to set up the scanner to meet site-specific needs. Most windows contain self-explanatory instructions and refer to elements that are known to the administrative user with radiological education and training.

Configuration includes setting up user permissions, or access privileges to manage other users, as well as servers, what is available through settings, presets, and other preferences for the use of the system at a site. Many system configurations are permissible to the administrator, *only*. While other configurations are permissible to users without administrator access.

Note You must have administrative access privileges and be logged in as an administrator to set configurations for the site.

Incorrect changes to the system configuration may make the system inoperative.

The following table shows all the **System Configuration** options that appear when you click **Customize>System** and provides a brief description of each.

Table 20: System Configuration tabs

Tab name	Description
General Settings	Allows the administrator to set system configurations such as hospital name, wireless settings, and dose report settings.
User Accounts	Allows the administrator to create and edit user accounts and permissions.
DICOM Servers	Allows the administrator to set up DICOM servers for archiving, such as PACS or HIS/RIS.
DICOM Setting	Allows the administrator to view and configure DICOM tags for HIS/RIS, MPPS, and Patient, Study, Series, and Image modules.
Dose Configuration	Allows the administrator to set up dose notifications, dose alerts, and configure dose limits for specific scans.
Windowing Presets	Allows the administrator to view and modify kernel, and window and level presets.
Audit Trail Viewer	Allows the administrator to view and log all changes as well as actions in the system, including user logins, patient registrations, and series updates.
Image Orientation	Allows the administrator to view and modify how images are oriented in the system.

Setting user accounts

Only a user with administrative access can update another user's account, add a new user, delete a user, and lock or unlock a user's access.

1. Click **Customize > System** from the main menu.
The **System Configuration** dialog box appears.
2. Click the **User Accounts** tab.

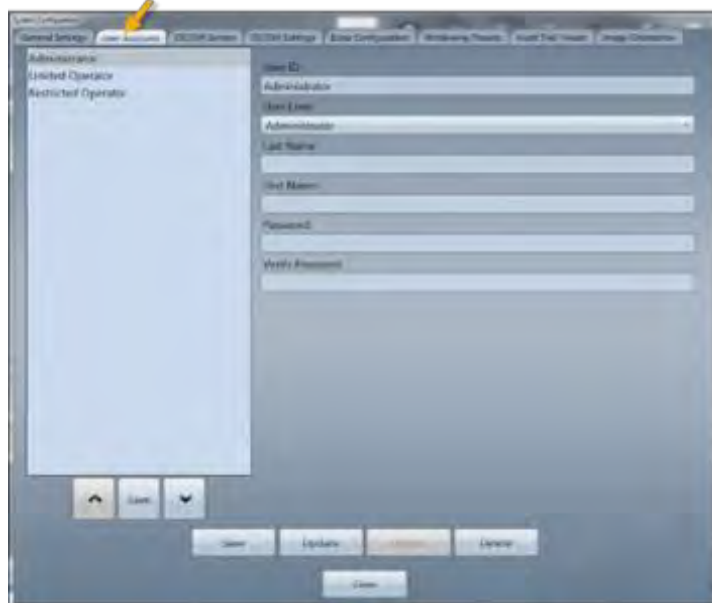


Figure 85: User Accounts tab

3. For the **User ID** field, enter the user ID name.
4. For the **User Level** field, enter one of the following user levels:

Administrator	Full access to the system and its configurations. Can create protocols, User ID's and passwords, as well as access all functions of the system.
Limited operator	Modified access to the system. Users with Limited access can modify protocols during scanning but cannot create and save protocols; has no access to system configuration.
Restricted operator	Users with Restricted access can scan with the system but are unable to make any changes to protocol parameters while scanning, they also have no access to system configuration.

5. For the **Last Name** field, enter the user's last name.
6. For the **Enter First Name** field, enter the user's first name.
7. For the **Password** field, enter the user's password.

Note The password must contain 8 to 12 characters, and must include one number, one symbol and one letter.

8. For the **Verify Password** field, re-enter the user's password to confirm the password.

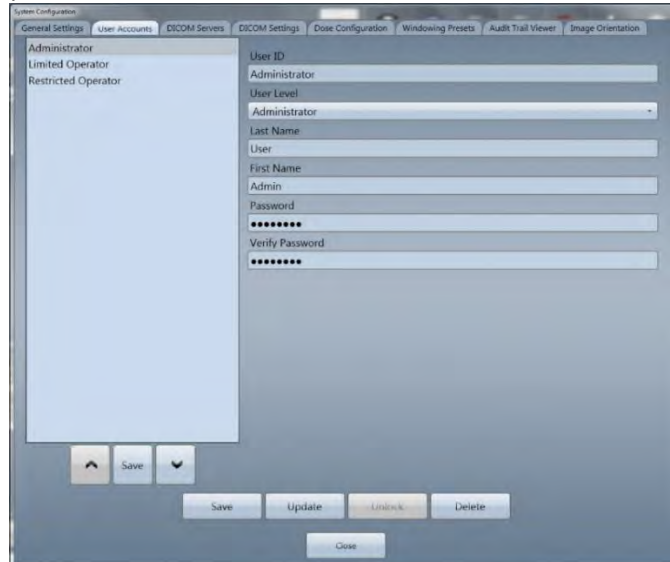


Figure 86: User account fields filled in

9. Click the **Save** button.
The user is added to the list.

The **Save Aborted** popup appears if your password does not meet the rule for passwords. If this is the case, return to the step above, and fulfill the password rule.

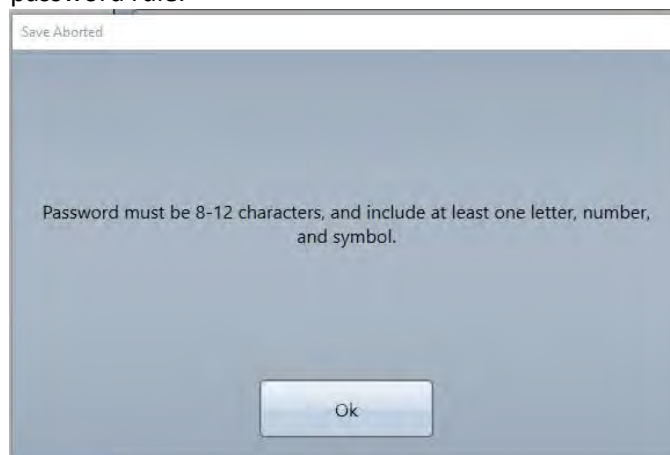


Figure 87: Save aborted popup

10. Click the **Close** button to exit.

Setting or updating the user's information

1. Click **Customize > System**, from the main menu.
The **System Configuration** dialog box appears.

2. Click the **User Accounts** tab.
3. Select a user from the list of users.

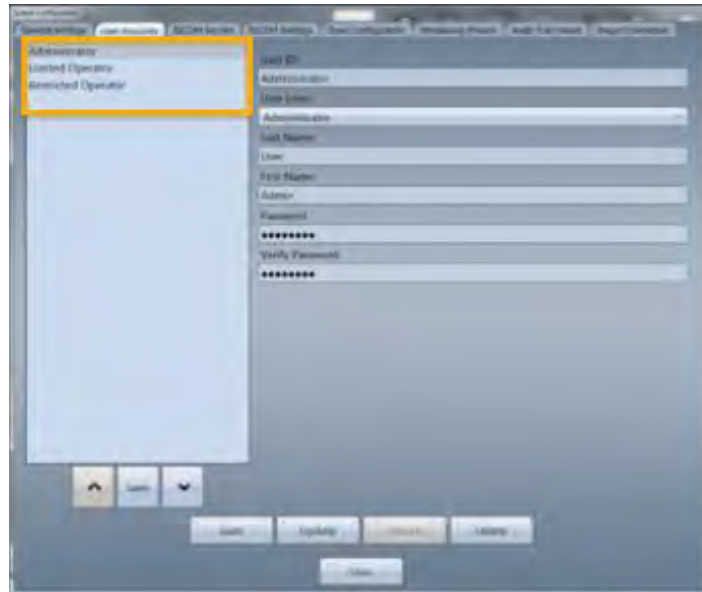


Figure 88: List of users

4. Modify the user's information; for example, password, or user's first and last name.

Note The password must be 8-12 characters and include at least a letter, number, and symbol.

The user's changes take effect after clicking the **Update** button. It is recommended that you log off and log back on and check that the password is working.

5. Click the **Update** button to keep the change(s).

The **Update Aborted** popup appears if your password does not meet the rule for passwords. If this is the case, return to the step above, and fulfill the password rule.

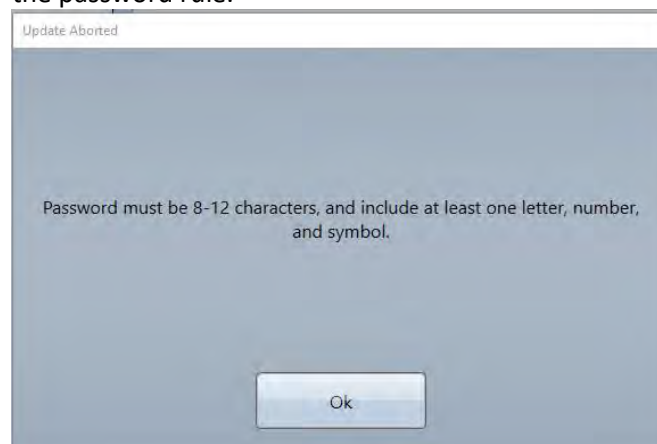


Figure 89: Update Aborted popup message

6. Click the **Close** button to exit.

Unlocking a user

1. Click **Customize > System** from the main menu.
The **System Configuration** dialog box appears.
2. Click the **User Accounts** tab.
3. Select the user to unlock from the list of users in the panel.

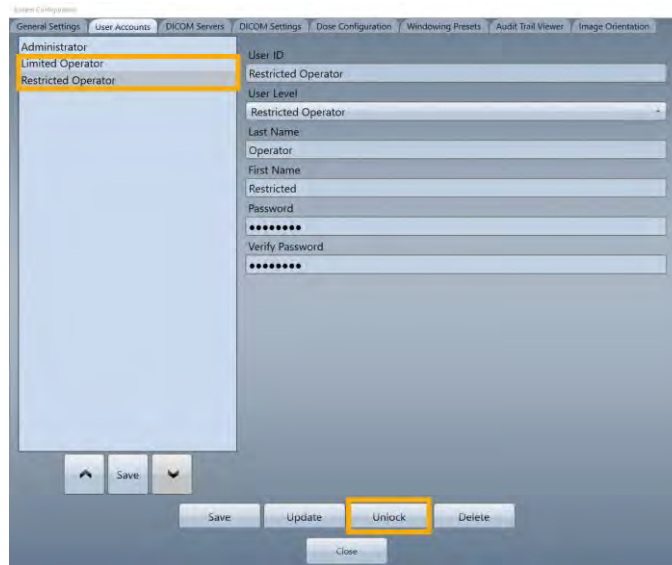


Figure 90: Unlock User

4. Click the **Unlock** button.
The **Action Succeeded** popup appears and the User ID will be unlocked.



Figure 91: Action Succeeded popup

5. Click the **Ok** button in the **Action Succeeded** popup.
6. Click the **Close** button to exit.

Deleting a user

Note The Administrator user cannot be deleted.

1. Click **Customize > System** from the main menu.
The **System Configuration** dialog box appears.
2. Click the **User Accounts** tab.
3. Select the user to delete from the list of users.

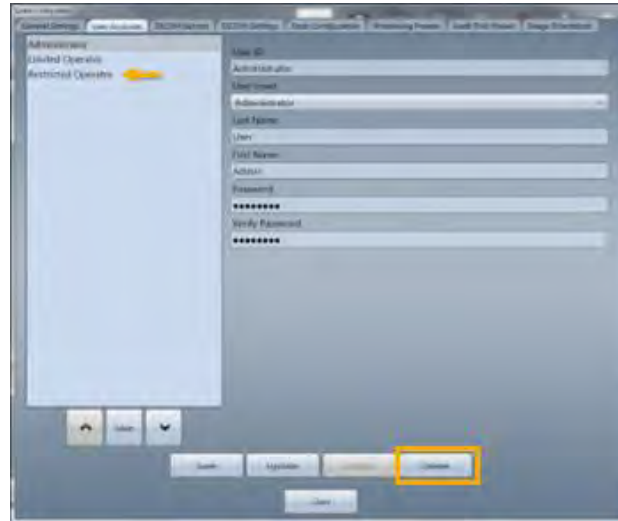


Figure 92: List of all available users

4. Click the **Delete** button.
The **Action Succeeded** popup box appears.

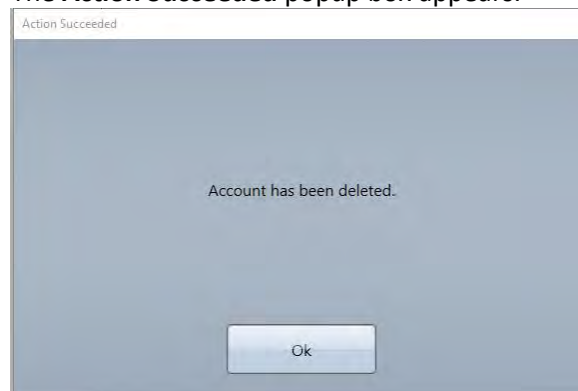


Figure 93: Action Succeeded popup

5. Click the **Ok** button in the **Action Succeeded** popup.
6. Click the **Close** button to exit.

Modifying the order of the user in the accounts list

1. Click **Customize > System**.

The **System Configuration** dialog box appears.

2. Click the **User Accounts** tab.
3. Select the user order to modify from the list of users in the panel.
4. Click the **Down** arrow to move the user down the list.

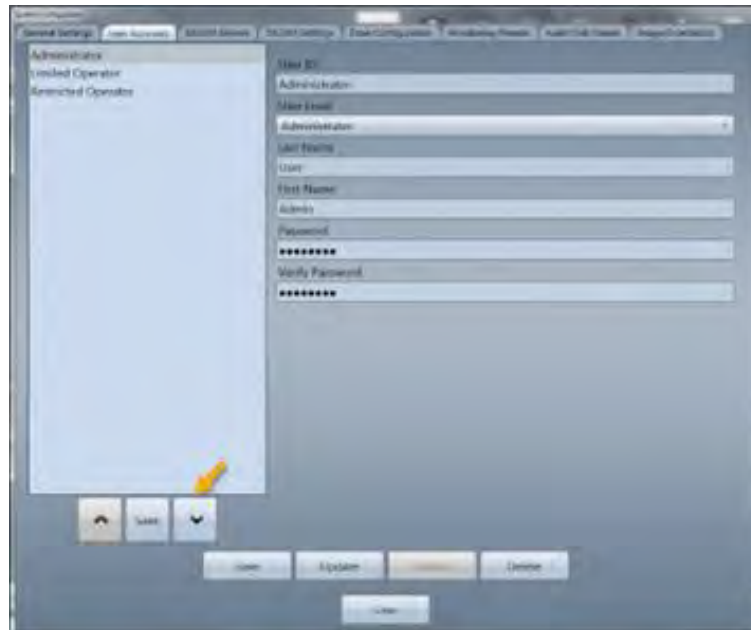


Figure 94: Down arrow

5. Click the **Up** arrow to move the user up the list.

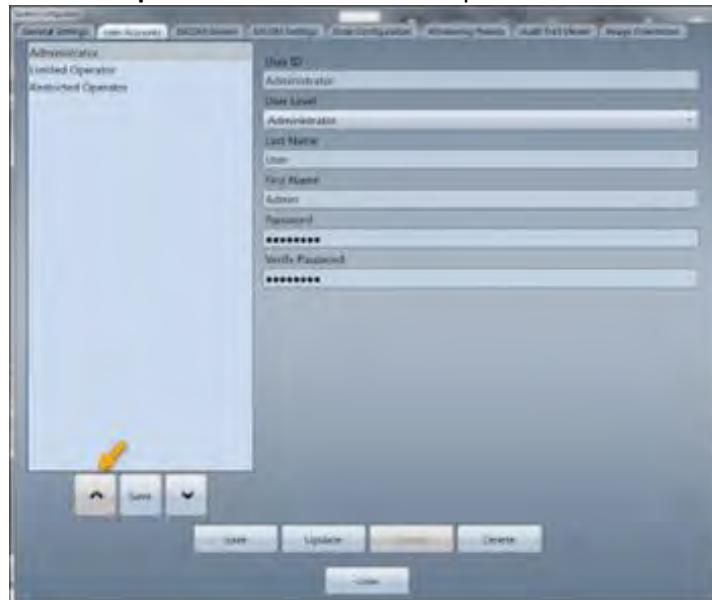


Figure 95: Up arrow

The **Up** arrow will not activate until you move down the list of users.

6. Click the **Save** button under the user list to keep the new user list order.

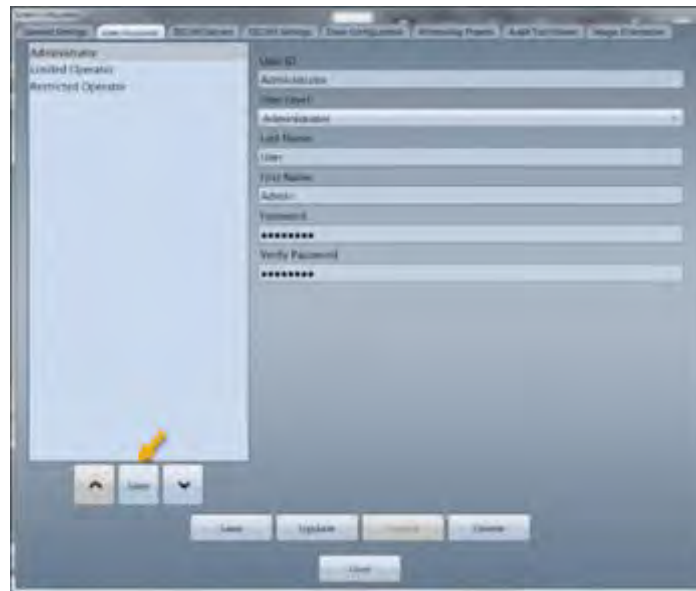


Figure 96: Save button for list order

7. Click the **Save** button next to the **Update** button to keep other changes.

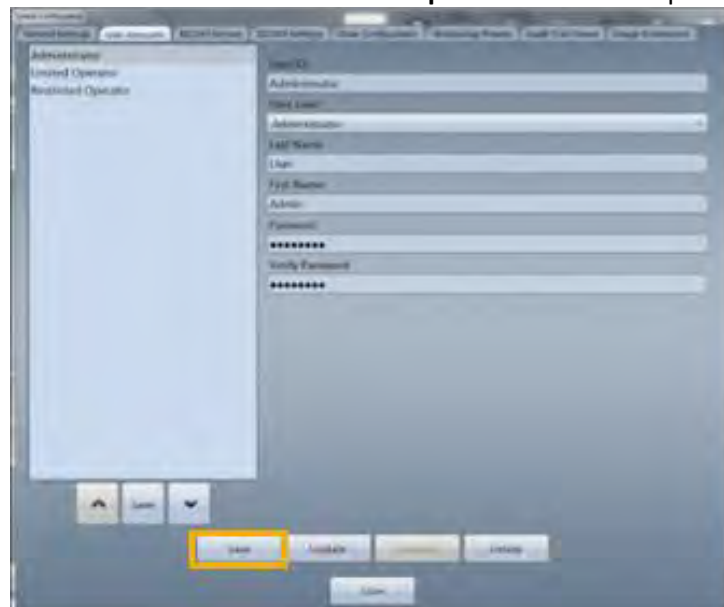


Figure 97: Save button

8. Click the **Close** button to exit.

Assigning general settings

Perform the following to set how the hospital, workstation's application, scanner, and remote support are configured.

1. Click **Customize > System** from the main menu.
The **System Configuration** dialog box appears.
2. Click the **General Settings** tab.

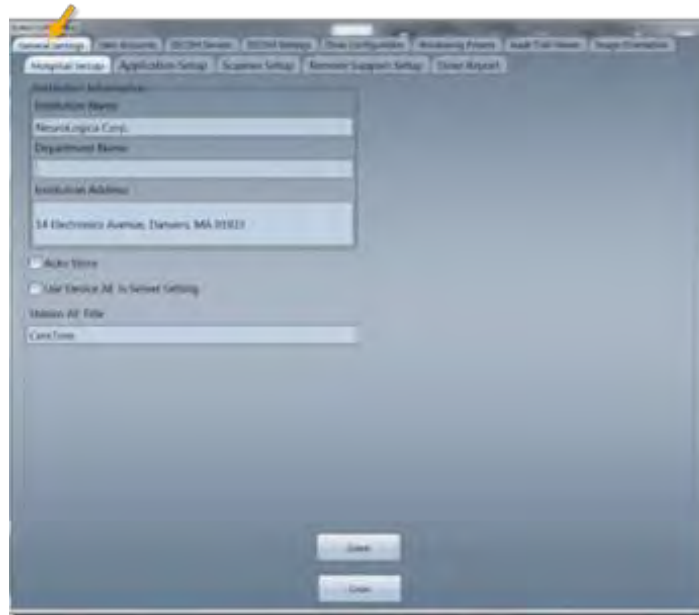


Figure 98: General Settings tab

The following tabs are available to the administrator, *only*:

Hospital Setup	Sets up hospital information specific to the site.
Application Setup	Sets up the application information the user will experience.
Scanner Setup	Sets up scanner IP address information.
Remote Support Setup	Sets up IP address information to allow NeuroLogica remote support.

The following sections provide detailed information related to the options available in the **General Settings** tabs.

Hospital Setup subtab

1. Click **Customize > System** from the main menu.
The **System Configuration** dialog box appears.
2. Click the **General Settings** tab.
3. Click the **Hospital Settings** subtab.

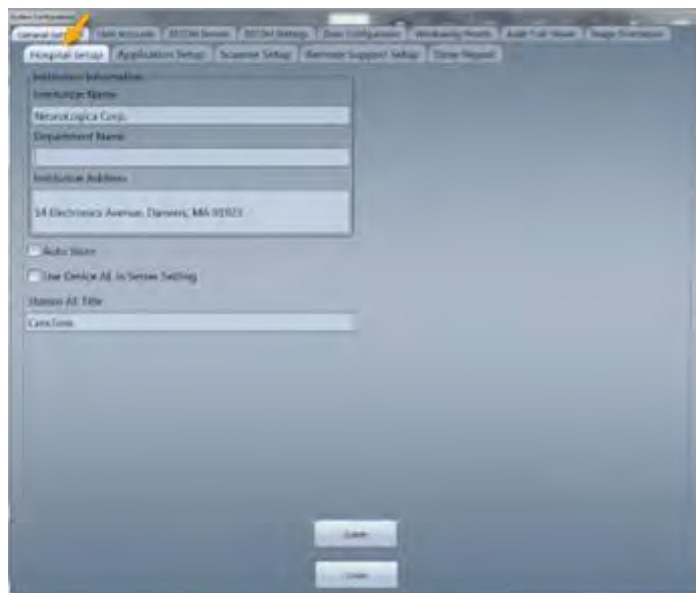


Figure 99: General Settings > Hospital Setup tab

4. Enter the institution name in the **Institution Name** field.

Note The name appears on all images.

5. Enter the department name in the **Department Name** field.
6. Enter the institution address in the **Institution Address** field.
7. Click the following options that are applicable:
 - When **Auto Store** is selected and you Finalize a scan, the system will automatically send images to the **Default PACS** server defined on the **DICOM Servers** tab. (see **System Configuration > DICOM Servers > Servers**). The status of your export will appear in the bottom right of the **Patient Browser** screen.
 - Click the **Use Device AE in Server Setting** option to apply the CereTom Elite AE title tag to DICOM when the operator archives the image data to PACS.
 - If enabled when sending images to **PACS**, this option will include the CereTom Elite AE setting as a **DICOM** tag.
8. Enter the system name (for example CereTom Elite) in the **Station AE Title** field.
9. Click the **Save** button to keep your changes.
The **Save Successful** popup appears.
10. Click the **Ok** button on the **Save Successful** popup.
11. Click the **Close** button to exit.

Application setup subtab

1. Click **Customize > System** from the main menu.
The **System Configuration** dialog box appears.
2. Click the **General Settings** tab.
3. Click the **Applications Setup** subtab.

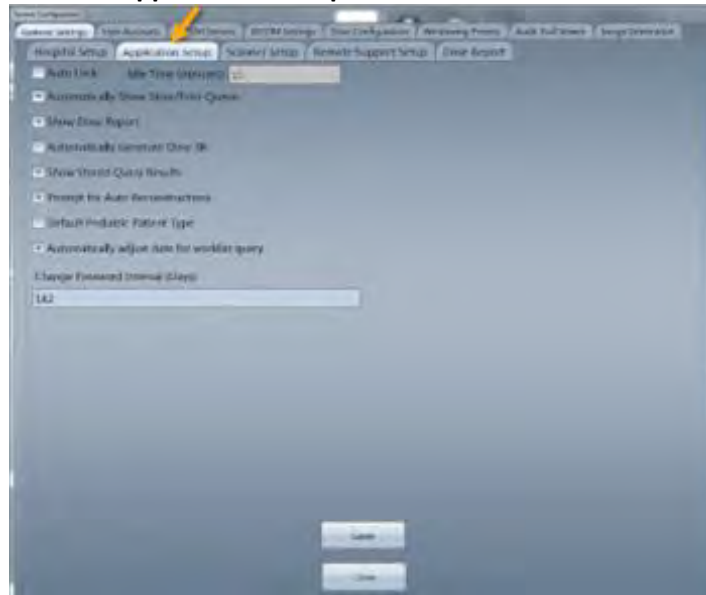


Figure 100: General Settings > Application Setup tab

4. Click and/or enter information for the following options that apply:

Auto Lock	The Auto Lock feature can be used to automatically lock the workstation screen after a user defined Idle Time is reached.
Automatically Show Store/Print Queue	Allows the user to automatically display the Store/Print Queue status when images are set to archive to a network device.
Show Dose Report	Displays the Dose Report on the screen when the Finalize button is clicked. A dose report will not be generated until the operator clicks the Finalize button on the Acquisition tab.
Automatically Generate Dose SR	Generates a Dose SR (Structured Report) along with the dose report when the Finalize button is clicked.
Show Stored Query Results	Displays the Stored Results at the bottom of Patient Registration .
Prompt for Auto Reconstruction	Allows the user to automatically start any additional reconstructions added to a scan series after the examination is completed.
Default Pediatric Patient Type	If selected, the Protocol Manager will default to the pediatric protocols.

Automatically adjust date for worklist query	When activated, automatically sets the query date to the current date.
Change Password Interval (Days)	Sets the number of days before a password change is required.

- Click the **Save** button to keep your changes.
- Click the **Close** button to exit.

Scanner setup subtab

- Click **Customize > System** from the main menu.
The **System Configuration** dialog box appears.
- Click the **General Settings** tab.
- Click the **Scanner Setup** subtab.

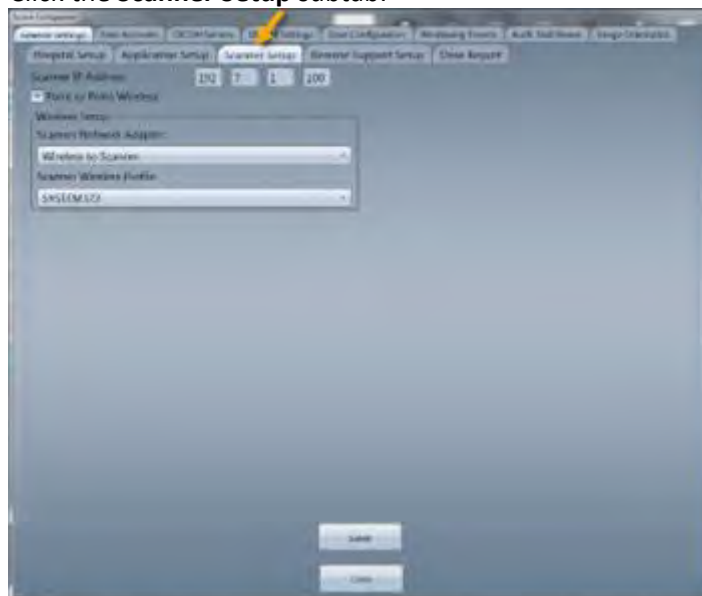


Figure 101: General Settings > Scanner Setup tab

- Click and/or enter information for the following options that apply:

Scanner IP address	Sets the scanner's IP address in the field(s).
Point to Point Wireless	Sets up wireless information regarding the connection from the workstation to the scanner. For Scanner Network Adapter, enter the adaptor, for example, Wireless to Scanner. For Scanner Wireless Profile, enter the wireless identifier in the field.

- Click the **Save** button to keep your changes.
- Click the **Close** button to exit.

Remote Support setup subtab

1. Click **Customize > System** from the main menu.
The **System Configuration** dialog box appears.
2. Click the **General Settings** tab.
3. Click the **Remote Support Setup** sub tab.

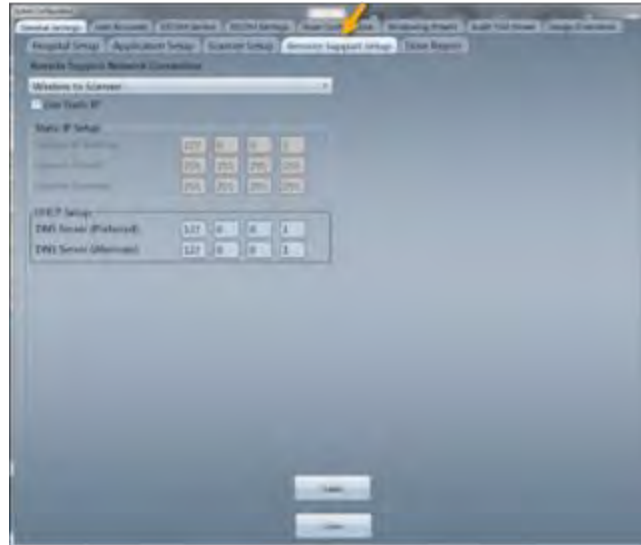


Figure 102: General Settings > Remote Support Setup tab

4. Click the **Remote Support Network Connection** dropdown to select one of the following network connections:
 - Wireless to Scanner
 - Wired to Network
5. Click the **Static IP Setup** option to enter the **Static IP Setup** data for the following:
 - System IP Address
 - System Subnet
 - System Gateway
6. Enter the **DHCP Setup** to enter IPs for the following:
 - DNS Server (Preferred)
 - DNS Server (Alternate)
7. Click the **Save** button to keep your changes.
8. Click the **Close** button to exit.

Managing DICOM servers

Digital Imaging Communication in Medicine (DICOM) is the definition of the acronym **DICOM**. **DICOM** servers are used to export images from the scanner. The **System Configuration > DICOM Servers** tab allows a user with administrative rights to access all the **DICOM** devices connected to the scanner.

See **DICOM** standards on the **NEMA.org** website for a full description of settings and actions that are available.

Note You must have administrative privileges and be logged in as an administrator to access and modify DICOM servers.

Incorrect changes to the system configuration may make the system inoperative.

DICOM servers are set up by the **field service engineer** and the appropriate IT personnel at the hospital.

1. Click **Customize > System** from the main menu.
The **System Configuration** dialog box appears.
2. Click the **General Settings** tab.
3. Click the **DICOM Servers** tab.

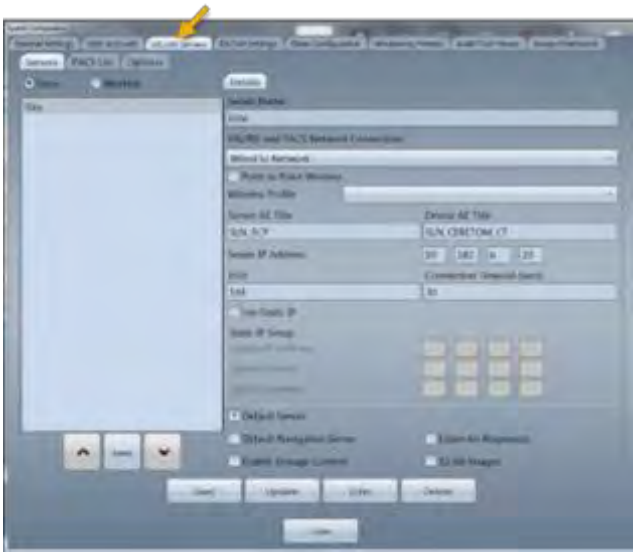


Figure 103: DICOM Servers tab

The following tabs appear:

Servers	Lists existing servers based on type: Store and Worklist. Store: Identifies a storage server. Worklist: Identifies servers in a database you can query from. Also displays server details and options, with controls for saving, updating, deleting and echoing servers.
----------------	---

PACS List	Displays a list of PACS by Server Name , Type , and In List to send to by default.
Options	Displays controls for PACS Options and HIS/RIS Options .

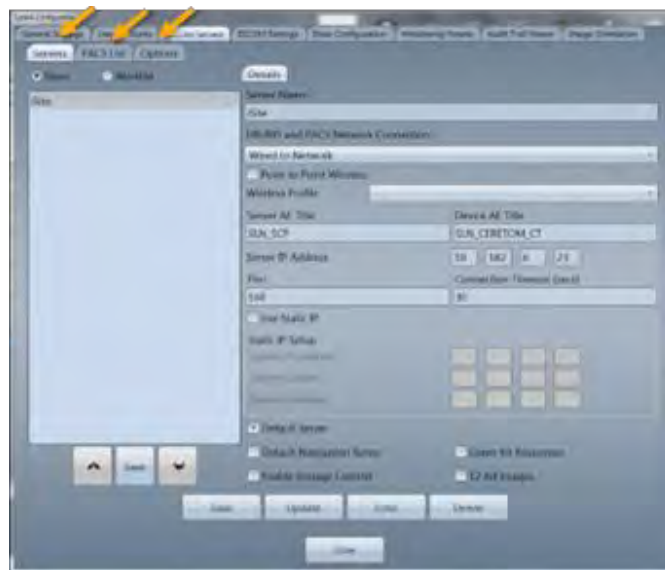


Figure 104: DICOM Servers tabs

- Go to the following sections to assign specific actions to the **DICOM** server.

Assigning a server as a store or worklist server

- Click **Customize > System** from the main menu.
The **System Configuration** dialog box appears.
- Click the **DICOM Servers** tab.
The **Servers** tab is active.

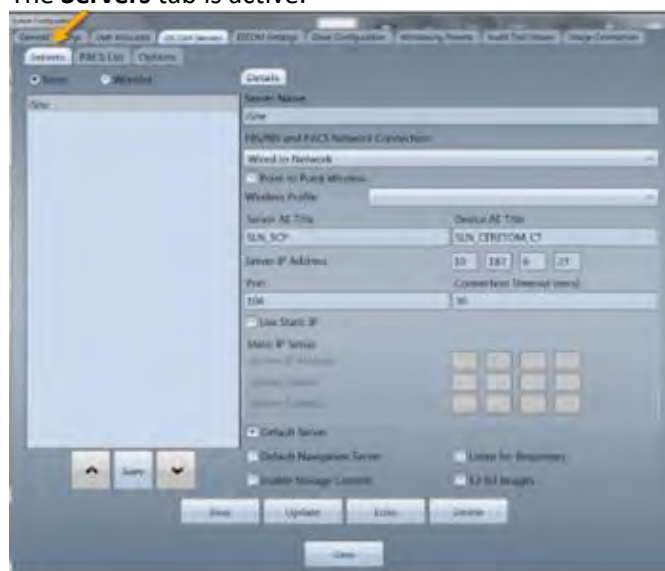


Figure 105: DICOM Servers > Servers tabs

3. Click one of the following options:

Store	A storage server, typically a PACS server that archives images and patient information. The images and data can later be imported from the server to another system or the same system. It is partly a backup and partly a waypoint for transferring data from the system the scans were acquired on to another system for viewing.
Worklist	A database of patient information that can be queried to generate a list of patients based on name, modality, procedure date, and other variables. These patients are usually hosted on a server within the facility, and the information can be pulled from the server when trying to acquire all of a patient's information before a procedure is run. This eliminates the need to manually enter patient information at the time of the procedure.

4. Under **Details**, enter the server's name in the **Server Name** text box.
5. For the **HIS/RIS** and **PACS Network Connection**, click the dropdown to identify the following:
- Wireless to Scanner
 - Wired to Network
6. Click the **Point to Point Wireless** check box if it applies.
7. Click the **Wireless Profile** dropdown to select the appropriate profile.
8. In the **Server AE Title** text box, enter the server AE title.
9. In the **Device AE Title** text box, enter the CereTom Elite AE title.
10. In the **Server IP Address** text boxes, enter the server IP address.
11. In the **Port** text box, enter the port identifier.
12. In the **Connection Timeout** text box, enter the number of seconds before the connection timeout is activated.
13. Click the **Use Static IP** option to identify the following:
- System IP Address
 - System Subnet
 - System Gateway
14. To set the server as a default server, click the **Default Server** check box.
15. To set the server as the default surgical navigation server, click the **Default Navigation** check box.

16. To enable the storage commitment, click the **Enable Storage Commit** check box to send a message back to system that confirms the storage was successful; it is an extra confirmation from **PACS** that the images were received.
17. To gather responses, click the **Listen for Responses** check box.
For every image that is sent, the system will wait for acknowledgement before sending the next image.
18. To gather 12-bit images, click the **12-bit Images** check box.
19. Click the **Save** button, to keep your work.

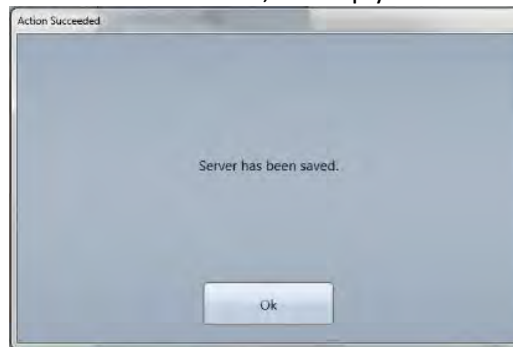


Figure 106: Action Succeeded popup message – Server saved

The new server should appear in list box to the left.

20. Click the **Ok** button.
21. Click the **Close** button to exit.

Modifying a server

1. Click **Customize > System** from the main menu.
The **System Configuration** dialog box appears.
2. Click the **DICOM Servers** tab.
3. Click server type: **Store** or **Worklist**.
4. Select a server from the list.
5. Modify the parameters.
See “Assigning a server as a store or worklist server” on page 120.
6. When all your changes are made, click the **Update** button.
A message appears that explains the update was successful and includes the update(s).

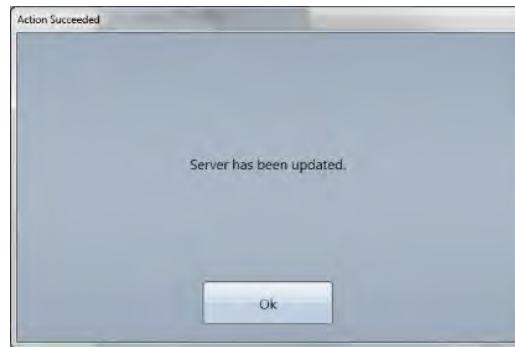


Figure 107: Action Succeeded popup message – Server updated

7. Click the **Ok** button.
8. Click the **Close** button to exit.

Echoing a server

1. Click **Customize > System** from the main menu.
The **System Configuration** dialog box appears.
2. Click the **DICOM Servers** tab.
3. Click a server type: **Store** or **Worklist**.
4. Select the server to echo from the list.
5. Click the **Echo** button.
The status of the server appears.

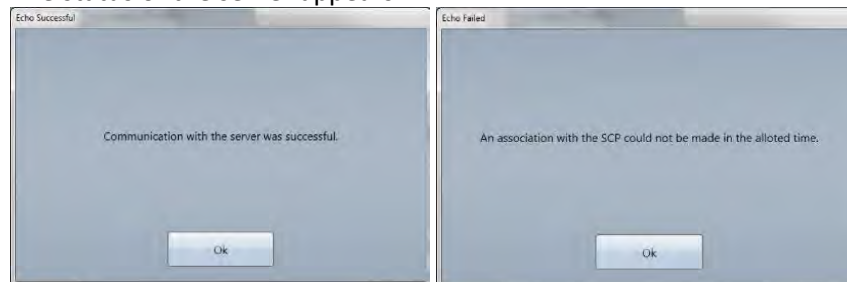


Figure 108: Echo Successful and Echo Failed popup messages

6. Click the **Ok** button.
If the echo is unsuccessful, determine why and repeat step 5 until you are successful.
7. Click the **Close** button to exit.

Deleting a server

1. Click **Customize > System** from the main menu.
The **System Configuration** dialog box appears.

2. Click the **DICOM Servers** tab.
3. Click a server type: **Store** or **Worklist**.
4. When the server you want to remove is available, click the server from this list.
5. Click the **Delete** button.
The server is removed from the list; the **Action Succeeded** popup appears.
6. Click the **Ok** button.
7. Click the **Close** button to exit.

Moving a server up and down the server list

1. Click **Customize > System** from the main menu.
The **System Configuration** dialog box appears.
2. Click the **DICOM Servers** tab.
3. Click a server type: **Store** or **Worklist**.
4. Select the server to move up or down the list.
5. Click the **Up** arrow to move the server up the list; click the **Down** arrow to move the server down the list.

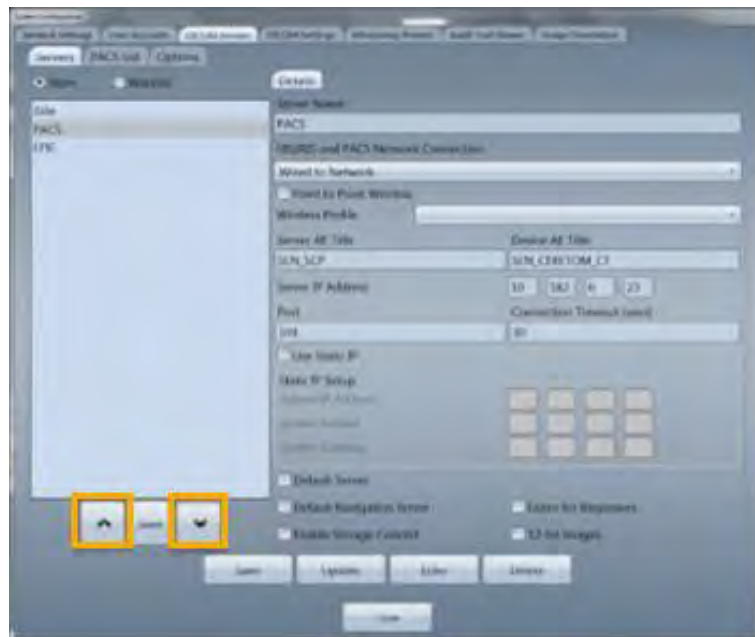


Figure 109: Up and Down (arrow) buttons to move up and down server list

6. Click the **Save** button to save the server order.

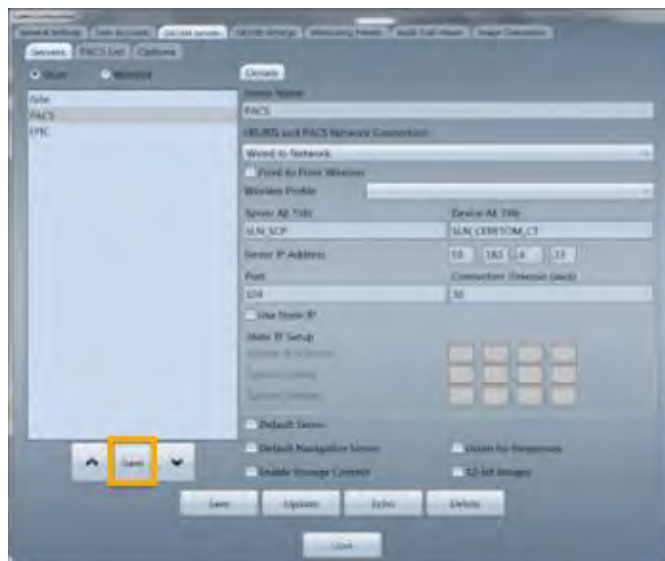


Figure 110: Save button

The **Action Succeeded** popup appears.

7. Click the **Ok** button.
8. Click the **Close** button to exit.

Saving DICOM servers to a PACS list

1. Click **Customize > System** from the main menu.
The **System Configuration** dialog box appears.
2. Click the **DICOM Servers** tab.
3. Click the **PACS List** tab to view available servers.



Figure 111: DICOM Servers > PACS List tab

4. Double-click the light-gray checkmark under **In List**. Each checkmark adds the server to the **PACS** listing. The checkmark turns green when active.
5. Click the **Save** button.
The **PACS List Saved** popup appears.

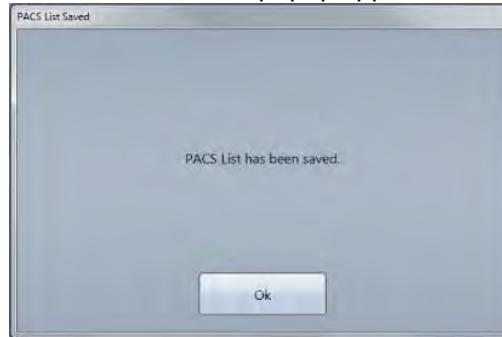


Figure 112: PACS List Saved popup message – PACS saved

6. Click the **Ok** button.
7. Click the **Close** button to exit.

Selecting PACS options

1. Click **Customize > System** from the main menu.
The **System Configuration** dialog box appears.
2. Click the **DICOM Servers** tab.
3. Click the **Options** tab.

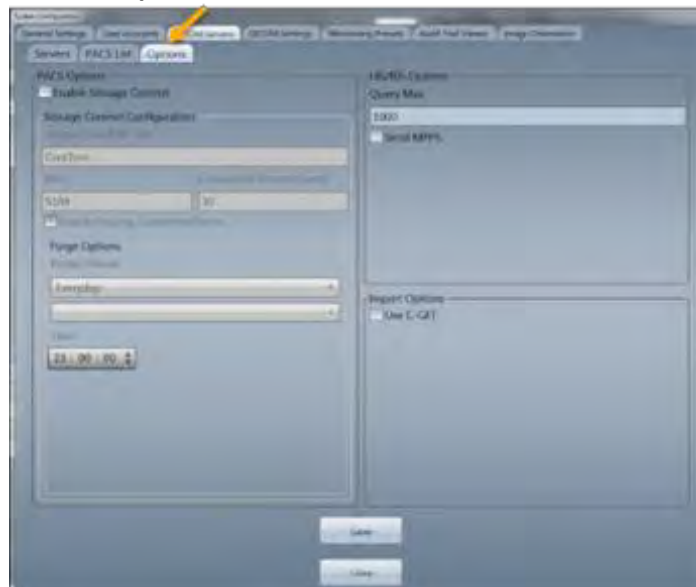
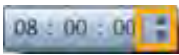


Figure 113: DICOM Servers > Options tab

4. Under **PACS Options**, click the **Enable Storage Commit** to verify that patient information and data archived to the PACS server was received.
 - If **Enable Storage Commit** is not selected, it is assumed and accepted that the data was received.
 - If **Enable Storage Commit** is selected, the workstation sends a request to the PACS server to verify that the data was received.
5. If the **Enable Storage Commit** check box is selected, perform the following:
 - Enter the appropriate title in the System Called AE Title text box.
 - Enter the port identifier in the Port text box.
 - Enter the number of seconds before a connection timeout in the Connection Timeout (secs) text box.
 - Enter 30 seconds or 60 seconds.

6. Under **Purge Options**, make selections based on the understanding that any studies archived to the **PACS** server are deleted from the workstation on a regular basis, depending on the selected interval; identify the following:

Purge Interval	Select one of the following from the dropdown: Everyday , Weekly , or Monthly . When you select the first Purge Interval dropdown and select Weekly or Monthly , the inactive dropdown is active to let you select the day of the week or the first of the month.
Time	Changes the hour, minute, and second interval; Use the buttons to increase those time elements.  Figure 114: Time (increase and decrease time) arrows

7. Under the **HIS/RIS Options**, enter the maximum number of results sent back from a query worklist in the **Query Max** text box.
There is no maximum limit.
8. Click the **Send MPPS** check box to apply a service that allows a modality to better coordinate with image storage servers by giving the server a list of objects to send before or while sending such objects.
9. Under **Import Options**, click the **Use C-GET** check box to pull information from a PACS server when importing *from* the server (as opposed to archiving to it).

The administrator sets this to pull from PACS from anywhere, so the machine does not have to be set up as a reliable destination on the PACS machine. PACS typically needs to equate a computer's IP address with an AE Title; however, C-GET accepts that the calling IP is a legitimate device.

The NeuroLogica CereTom Elite scanner automatically uses **C-Move** when importing from PACS. If the operator wants to use C-GET instead, the user can select C-Get.

10. Click the **Save** button.
The **PACS List Saved** popup appears.

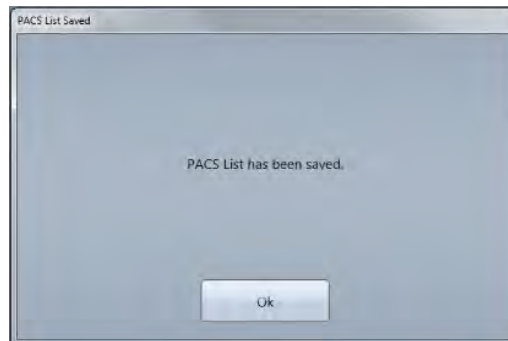


Figure 115: PACS List Saved popup

11. Click the **Ok** button.
12. Click the **Close** button to exit.

Assigning DICOM settings

DICOM settings include many kinds of settings. The administrator can add or remove optional information to be displayed using actions described in this section.

See **DICOM** standards on the **NEMA.org** website for a full list and description of **DICOM** tags.

Note You must have administrative privileges and be logged in as an administrator to access and modify DICOM settings.

Incorrect changes to the system configuration may make the system inoperative.

1. Click **Customize > System** from the main menu.
The **System Configuration** dialog box appears.
2. Click the **DICOM Settings** tab.



Figure 116: DICOM Settings tabs (six)

- Click the **HIS/RIS Query** tab to select the types of **HIS/RIS** query results the user will see when performing a **HIS/RIS** query.
See "Selecting PACS options" and go to step 6, for more information.

Note Even numbered **DICOM** tags are public **DICOM** tags as per the **DICOM** standard. Odd numbered **DICOM** tags are vendor specific.

Green checkmarks are optional **DICOM** tags and orange checkmarks are required per the **DICOM** standard and cannot be modified.

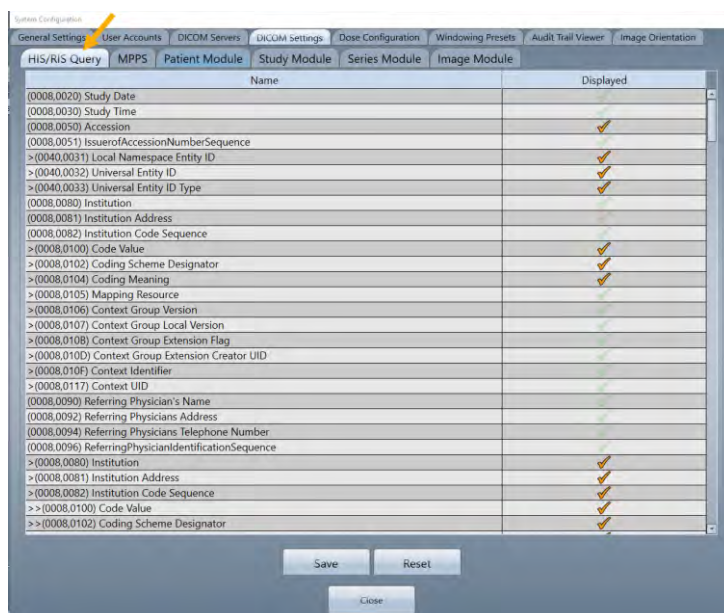


Figure 117: DICOM Settings > HIS/RIS Query

4. Click the **Modality Performed Procedure Step (MPPS)** tab to select the types of **MPPS** information the user will see.

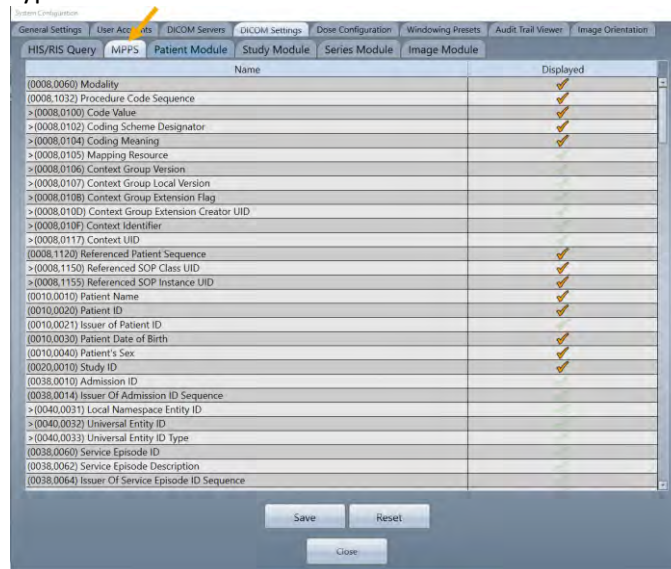


Figure 118: DICOM Settings > MPPS

5. Click the **Patient Module** tab to select the types of **Patient Module** information the user will see.

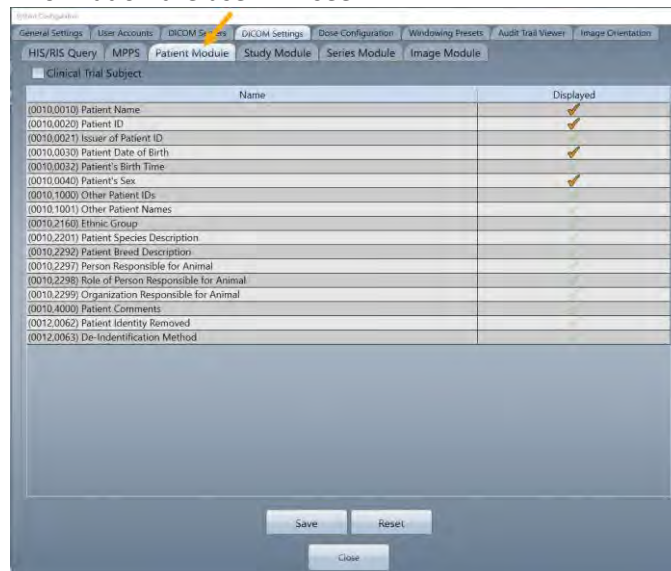


Figure 119: DICOM Settings > Patient Module

6. Click the **Study Module** tab to select the types of **Study Module** information the user will see.

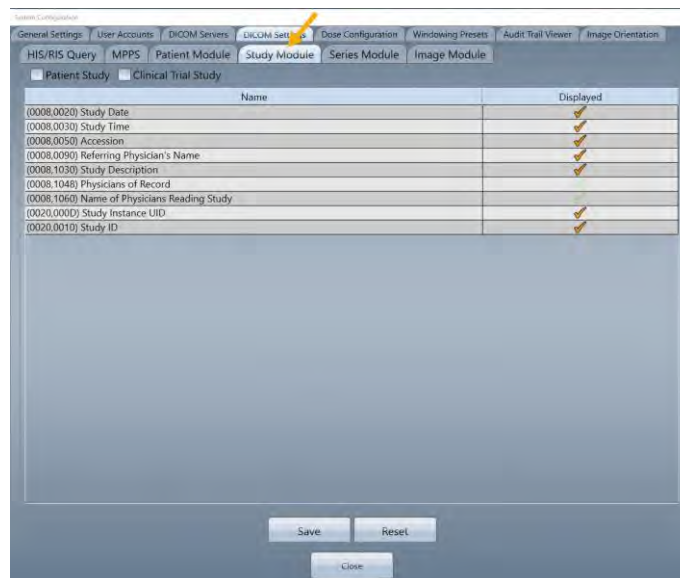


Figure 120: DICOM Settings > Study Module

- Click the **Series Module** tab to select the types of **Series Module** information the user will see.

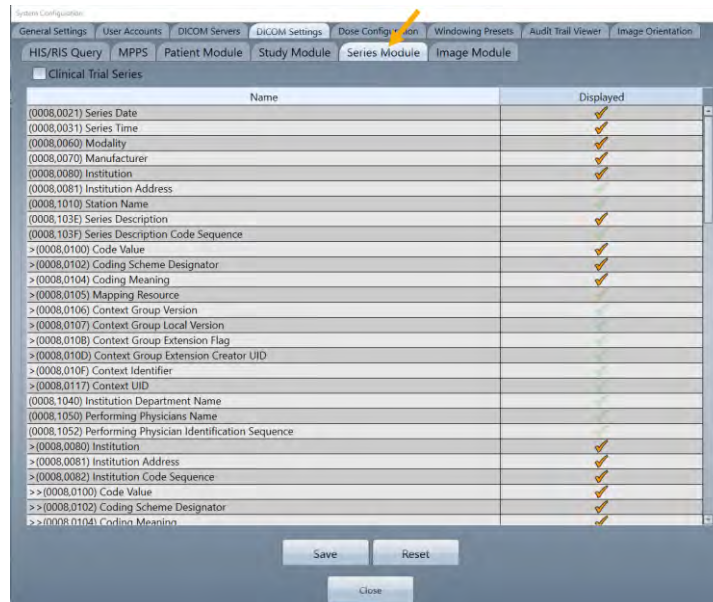


Figure 121: DICOM Settings > Series Module

- Click the **Image Module** tab to select the types of **Images Module** information the user will see.

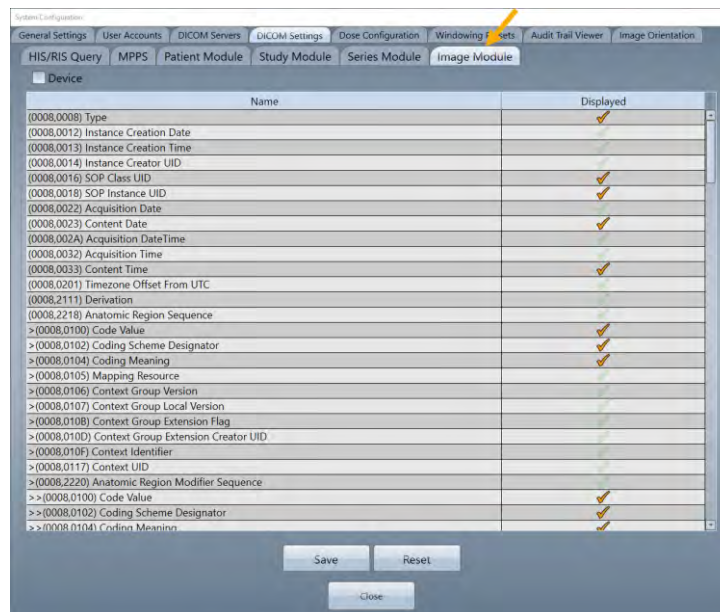


Figure 122: DICOM Settings > Image Module

9. Click the **Save** button to save your changes.
10. Click the **Close** button to exit.

Assigning dose report

The **dose report** is created at the end of the scan and can be customized to include specific **DICOM** tags.

Note You must have administrative privileges and be logged in as an administrator to access and modify dose report settings.

1. Click **Customize > System** from the main menu.
The **System Configuration** dialog box appears.
2. Click the **General Settings** tab.
3. Click the **Dose Report** tab.



Figure 123: Dose Report tab

4. Select the **DICOM** tags you want to see in the **dose report**.
A **dose report** is generated after the exam is finalized; the black area includes dose report information like the following.

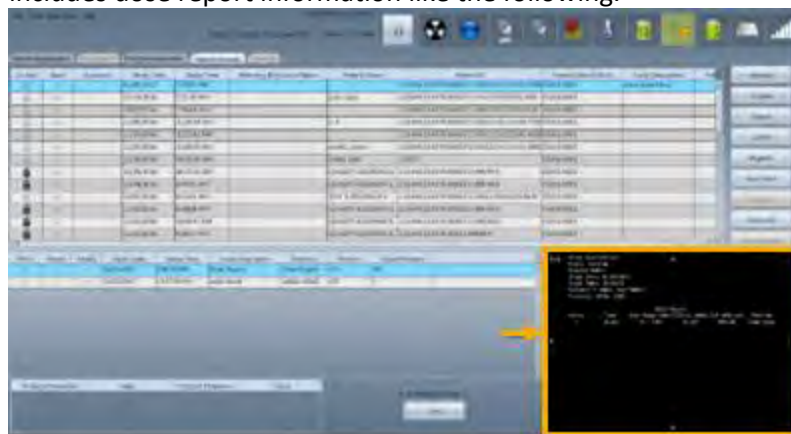


Figure 124: Generated dose report

5. Click the **Save** button.
6. Click the **Close** button to exit.

Applying dose configuration

Note You must have administrative privileges and be logged in as an administrator to access and modify dose configurations.

Incorrect changes to the system configuration may make the system inoperative.

Note You can check the **Audit Trail** to review the audit log that details what dose limit was removed, by whom, and the date and time it took place.

Dose configuration consists of both **Dose Notification** and **Dose Alerts**.

Dose Notification	Notifies the user when a planned CTDI _{vol} and/or DLP value of a single series will exceed the defined value.
Dose Alert	Notifies the user when the planned CTDI _{vol} and/or DLP value from the combination of all planned series will exceed the defined value set in System Configuration . Dose Alerts represent a value which would be well above an institution's established CTDI/DLP range for the given examination and warrant a more stringent review and consideration before proceeding.

Setting Dose Check

1. Click **Customize > System** from the main menu.
The **System Configuration** dialog box appears.
2. Click the **Dose Configuration** tab.
3. Click the **Dose Check** tab.

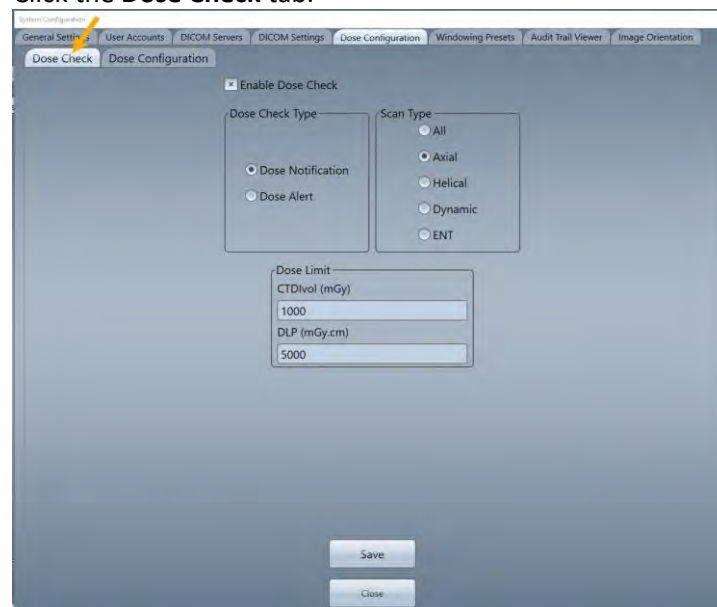


Figure 125: Dose Configuration > Dose Check

4. Click one of the following **Dose Check Type** options:

Dose Notification	Notifies the user when a pre-defined CTDI _{vol} or DLP value will be exceeded on a series-by series basis.
--------------------------	---

Dose Alert	Notifies the user when a pre-defined CTDI _{vol} or DLP value will be exceeded from a combination of all planned series or scans.
-------------------	---

Note The default **Dose Alerts** which are set at 1000mGy CTDI and 500mg*cm DLP are designed to prevent the patient from receiving any possible deterministic effects due to excess dose. However, the system allows these values to be modified by the user. Any modifications to the **Dose Alerts** should be made by qualified medical personnel.

5. Click one from the following **Scan Type** options.

All	Identifies all scan types.
Axial	Identifies only Axial scan types.
Helical	Identifies only Helical scan types.
Dynamic	Identifies only Dynamic scan types.

6. Define the **Dose Limit** by entering the following:
- Enter the CTDI_{vol} (mGy) value in the text box.
 - Enter the DLP (mGy*cm) value in the text box.

7. Click the **Save** button.

The **Save Successful** popup appears.

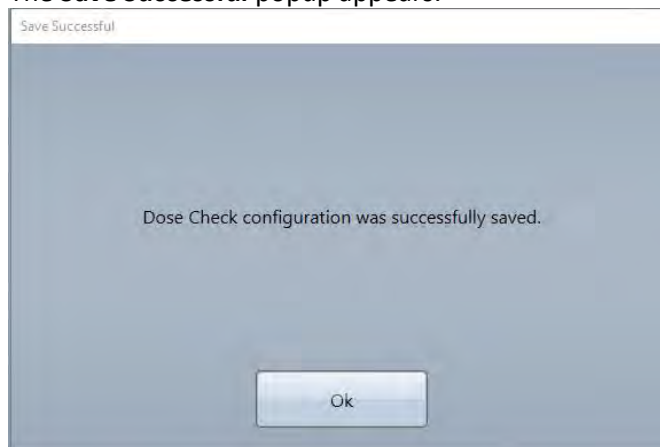


Figure 126: Save Successful popup

8. Click the **Ok** button.
9. Click the **Close** button to exit.

Assigning dose configuration to a patient protocol

Dose Configuration limits are used to prevent users from selecting kV or mA values that are not appropriate for the given patient types, such as pediatrics etc.

- 1. Click **Customize > System** from the main menu.
The **System Configuration** dialog box appears.
- 2. Click the **Dose Configuration** tab.
- 3. Click the **Dose Configuration** subtab.

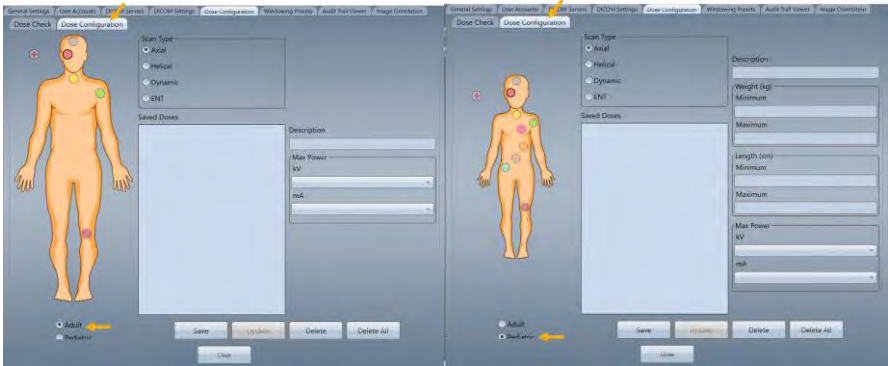


Figure 127: Dose Configuration > Dose Configuration for Adult and Pediatric

- 4. Click one of the following:

Adult	Selecting Adult shows the pre-defined adult protocols stored by anatomical area.
Pediatric	Selecting Pediatric shows the pre-defined pediatric protocols stored by anatomical area.
Trauma	The Trauma orb can be used to store protocols commonly used for emergency scans.

- 5. Click the colored orb that marks the anatomical region to apply the dose to.

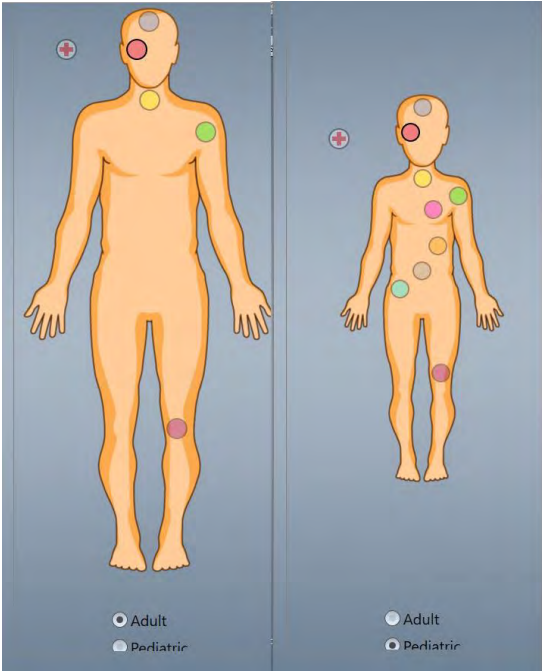


Figure 128: Anatomical orbs

- 6. Click a scan type from the following list:

Axial	Identifies only Axial scan types.
Helical	Identifies only Helical scan types.
Dynamic	Identifies only Dynamic scan types.

- Enter a description for the **Dose Configuration** in the **Description** text box.
- For **Pediatrics** enter the **Minimum** and **Maximum Weight** and **Length** information.
- Under the **Max Power** settings, click the **kV** dropdown and select the maximum allowed kV.
- Click the **mA** dropdown box and select the maximum allowed mA.

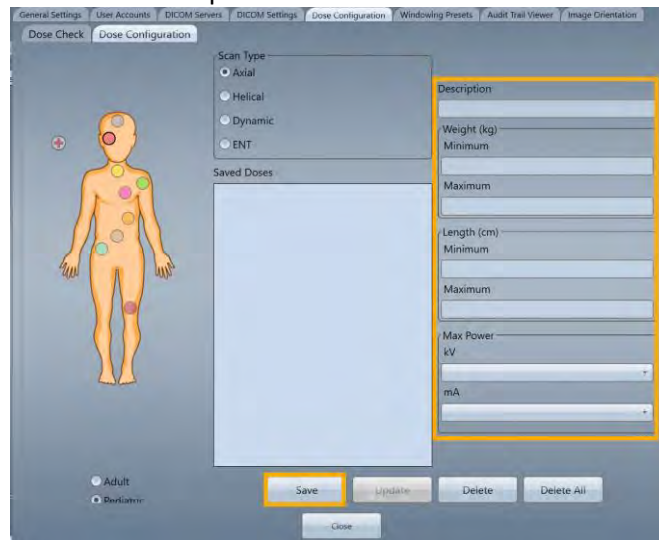


Figure 129: Pediatric Dose Configuration Parameters

- Click the **Save** button to save your work.
If the level overlaps an existing level, you are prompted to adjust.

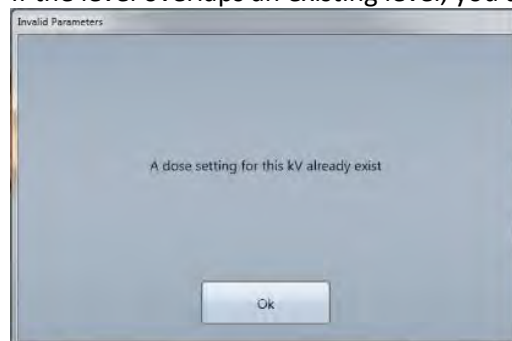


Figure 130: Invalid Parameter popup message – Dose setting kV already exists

If the save is successful, the **Save Successful** popup appears.

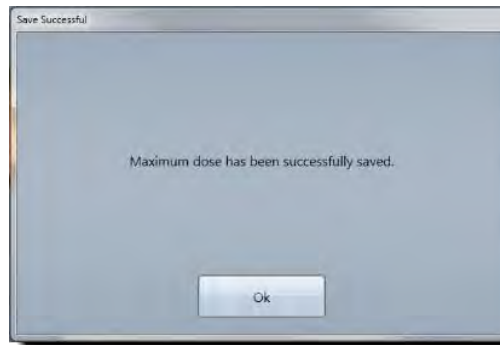


Figure 131: Save Successful popup message – Maximum dose saved

12. Click the **Ok** button.
13. Under the **Saved Doses** list box, check that your dose configuration appears, if so, go to the next step.
14. Click the **Close** button to exit.

Updating saved dose

To modify a saved **Dose Configuration**.

See [Setting Dose Check on page 134](#) and/or [Assigning dose configuration to a patient protocol on page 135](#).

1. Click **Customize > System** from the main menu.
The **System Configuration** dialog box appears.
2. Click the **Dose Configuration** tab.
3. Select the desired **Saved Dose** from the **Saved Doses** list.

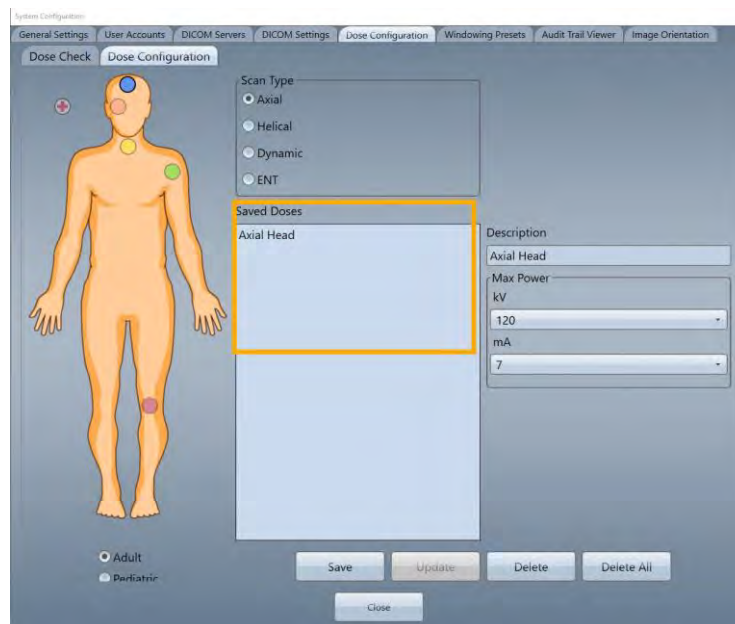


Figure 132: Saved Doses List

4. Modify the **kV** or **mA** values as necessary.
5. Click the **Update** button.

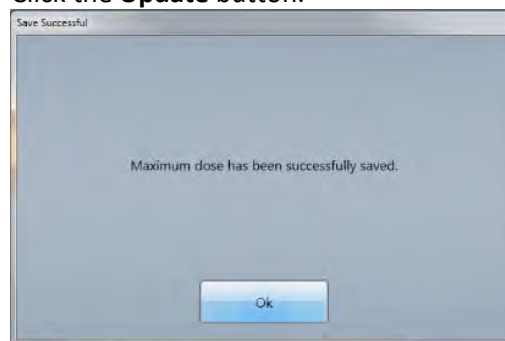


Figure 133: Save Successful popup message – Maximum dose saved

6. Click the **Ok** button.

Note If the level overlaps an existing level, you are prompted to adjust.

7. Click the **Close** button to exit.

Deleting a saved dose limit

To remove a saved **Dose Configuration**.

1. Click **Customize > System** from the main menu.
The **System Configuration** dialog box appears.
2. Click the **Dose Configuration** tab.

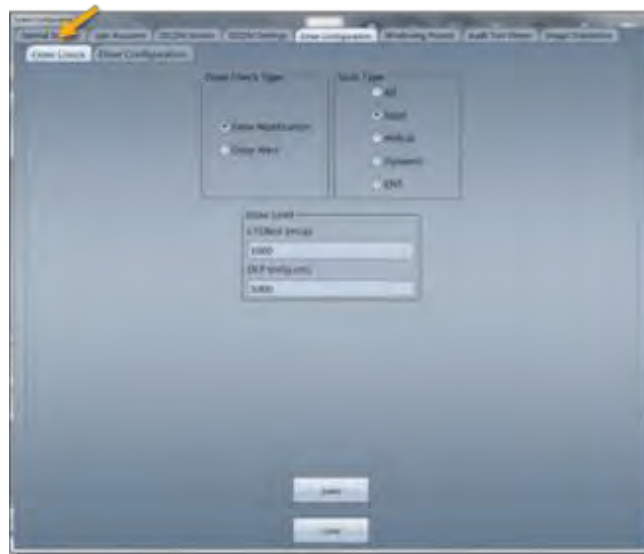


Figure 134: Dose Configuration > Dose Check tab

3. Click an already saved dose under the **Saved Doses** list.
4. Perform one of the following:
 - To delete a saved dose from the Saved Doses list and clear the restriction, select the dose and click the **Delete** button.
 - To delete all the saved doses in the Saved Doses list and clear all restrictions saved, click the **Delete All** button, which returns all settings for that particular selection to the maximum scanner default.

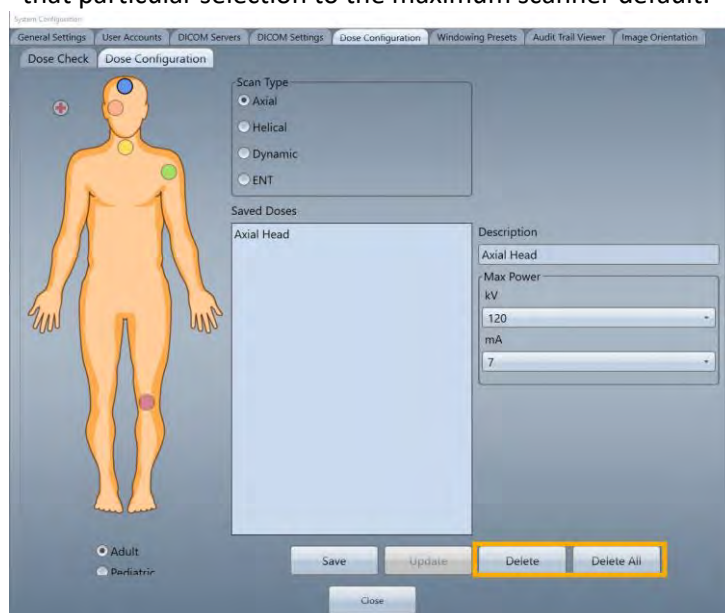


Figure 135: Delete and Delete All buttons

Note If there are no saved doses or limits, the operator will be able to scan using the maximum 140kV and 7mA available on the scanner.

- Click the **Save** button.
The save success message appears and, because the **CTDIvol (mGy)** and **DLP (mGy.cm)** are empty, there is no longer a limit applied.

The **Save Successful** popup appears.

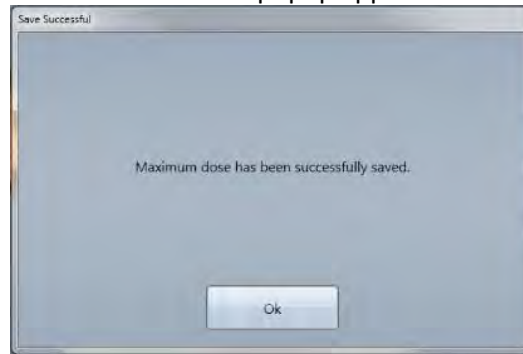


Figure 136: Save popup message – Maximum dose saved

- Click the **Ok** button.
- Click the **Close** button to exit.

Applying Windowing Presets

Windowing presets allow you to define window width and center presets for specific anatomical locations as well as specific reconstruction kernel presets. An Administrative User can delete or update the default Window Presets as well as create new Windowing Presets.

Note You must have administrative privileges and be logged in as an administrator to access and modify the windowing presets.

Editing Kernel Presets

Note Kernel presets are pre-installed in the system; kernel presets can be set and modified.

- Click **Customize > System** from the main menu.
The **System Configuration** dialog box appears.
- Click the **Windowing Presets** tab.

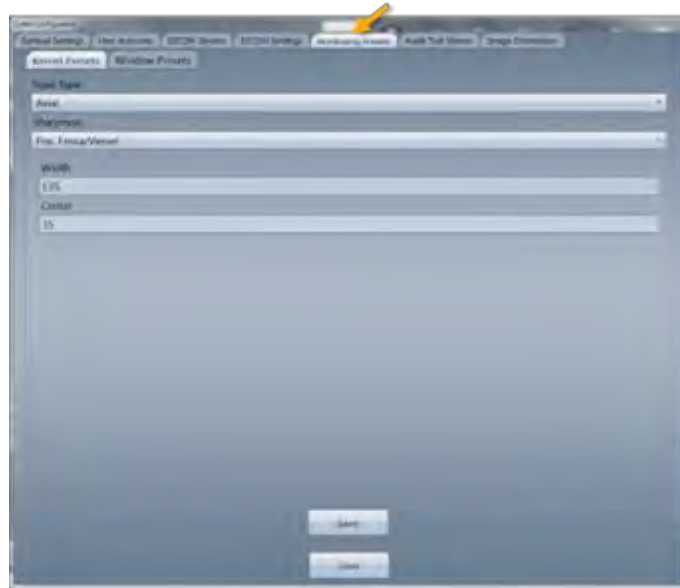


Figure 137: Windowing Preset tab

3. Click the **Kernel Presets** subtab.

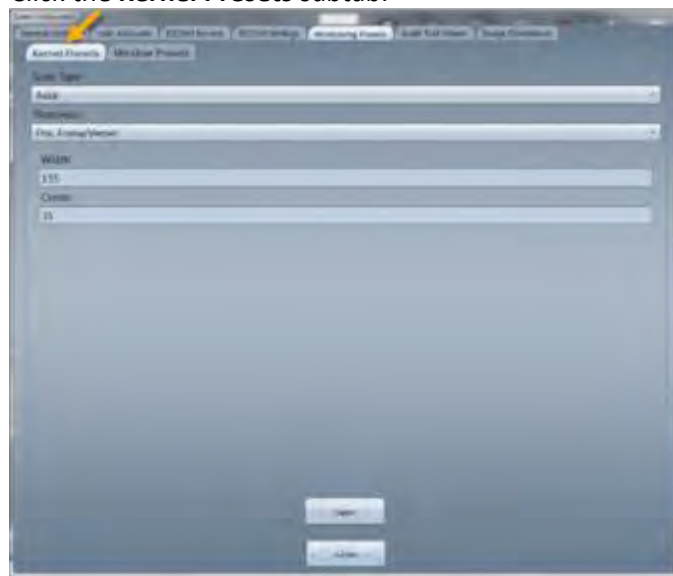


Figure 138: Windowing Presets > Kernel Presets tab

4. Click the **Scan Type** dropdown to select one of the following scan types:
 - Scout
 - Axial
 - Helical
 - ENT
5. Click the **Sharpness** dropdown to select a sharpness from the list. **Sharpness** is the reconstruction algorithm, and the available Sharpness values are based on the scan type.

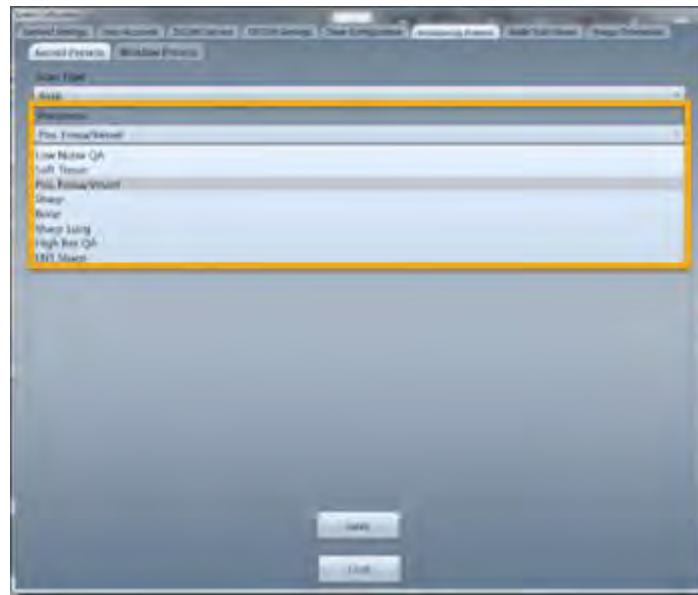


Figure 139: Sharpness dropdown

6. Enter the window width in the **Width** text box.

Window width describes the range of Hounsfield units, or shades of gray, displayed across the image. The **Window Width** controls the contrast of the image. Low Hounsfield numbers below the range are displayed as black, while High Hounsfield numbers above the range are displayed as white.

7. Enter the window center in the **Center** text box.

Window Center describes the Hounsfield number in the center of the Window Width. **Window Center** controls the brightness or density of the image.

8. Click the **Save** button to save your work.
The **Action Succeeded** popup appears.

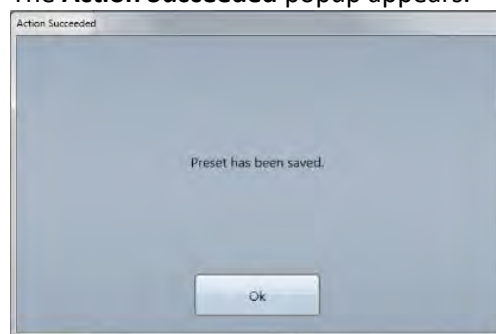


Figure 140: Action Succeeded popup message – Preset saved

9. Click the **Ok** button.
10. Click the **Close** button to exit.

Setting Window Presets

Window presets allow you to define **Window Width** and **Window Center** presets for specific anatomical locations, such as bone, brain, lung, and soft tissue.

1. Click **Customize > System** from the main menu.
The **System Configuration** dialog box appears.
2. Click the **Windowing Presets** tab.
3. Click the **Window Presets** subtab.

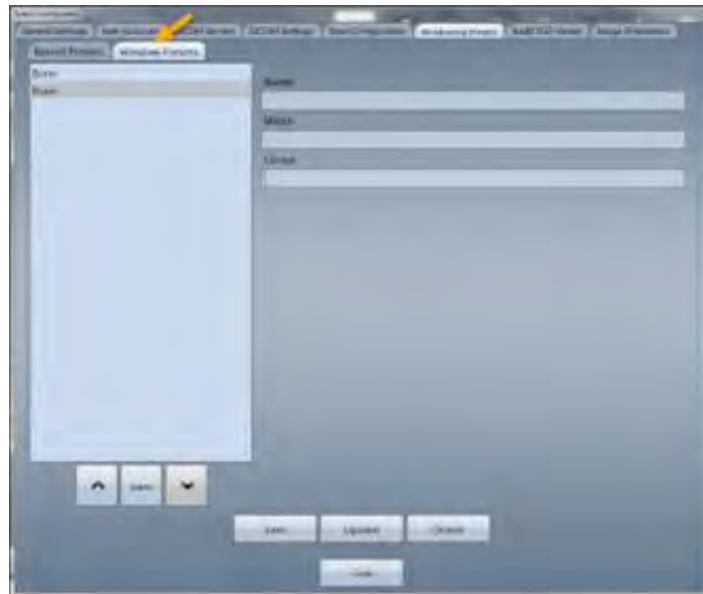


Figure 141: Window Presets tab

4. Enter the name of the window preset in the **Name** text box.

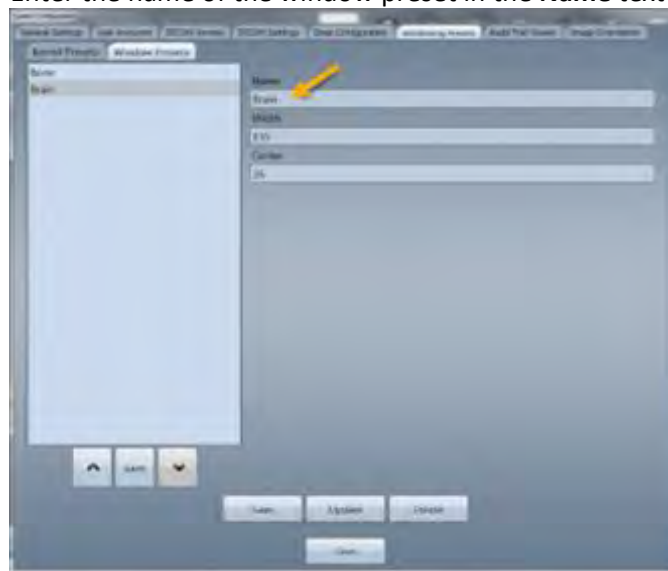


Figure 142: Window Presets > Name

5. Enter the width of the window preset in the **Width** text box.

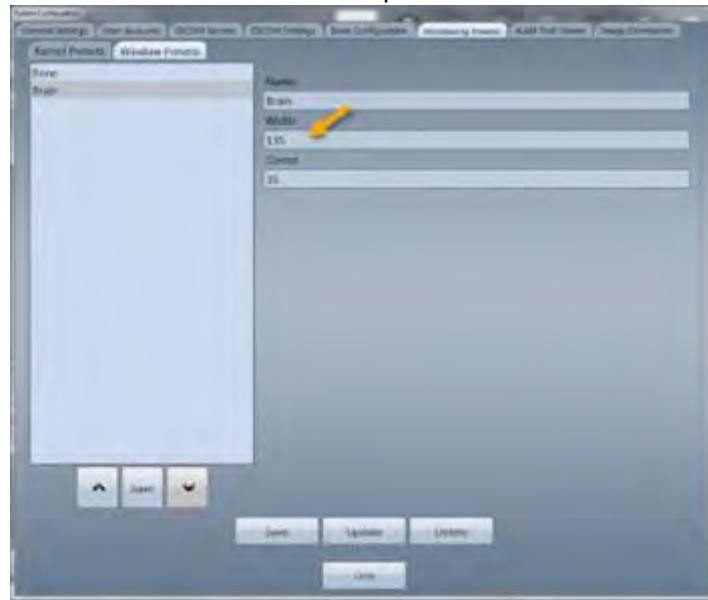


Figure 143: Window Presets > Width

6. Enter the center of the window preset in the **Center** text box.

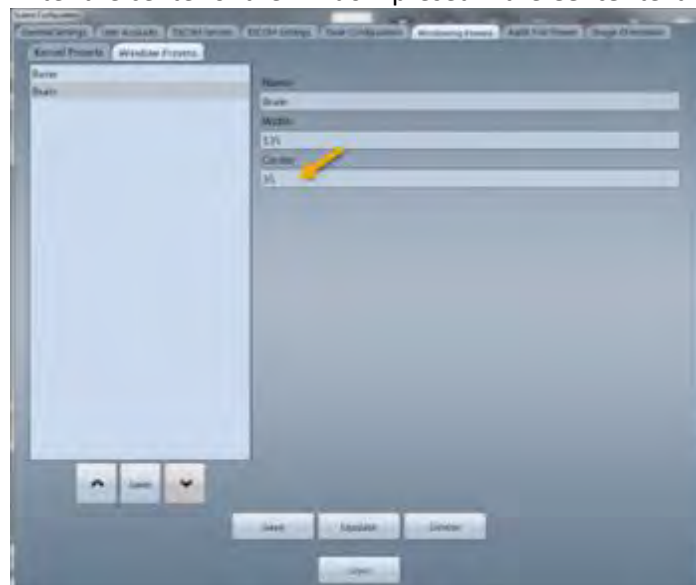


Figure 144: Window Presets > Center

7. Click the **Save** button to save your work.
The **Action Succeeded** popup appears.

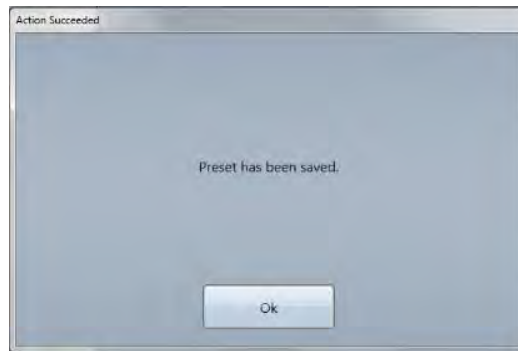


Figure 145: Action Succeeded popup message – Preset saved

8. Click the **Ok** button.
9. Click the **Close** button to exit.

Editing a window preset

1. Click **Customize > System** from the main menu.
The **System Configuration** dialog box appears.
2. Click the **Windowing Presets** tab.
3. Click the **Window Presets** subtab.
4. Click a preset that exists in the **Window Presets** listing.

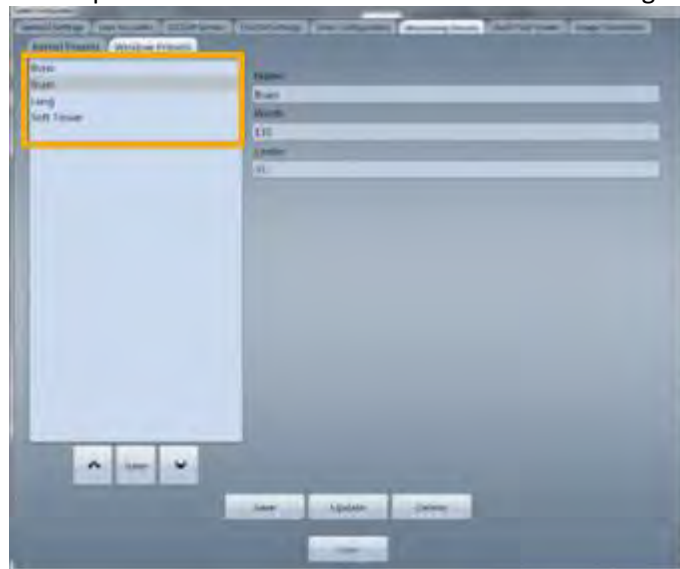


Figure 146: Listing update

5. To edit the preset, make changes in the **Name**, **Width**, and/or **Center** text boxes.
6. Click the **Save** button to save your changes.
The **Action Succeeded** popup appears.

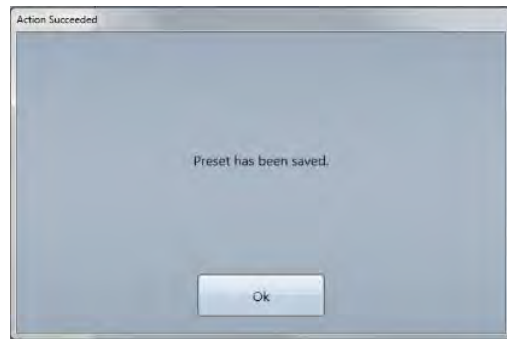


Figure 147: Action Succeeded popup message – Preset saved

7. Click the **Ok** button.
8. Click the **Close** button to exit.

Deleting a preset

1. Click **Customize > System** from the main menu.
The **System Configuration** dialog box appears.
2. Click the **Windowing Presets** tab.
3. Select the preset.
4. Click the **Delete** button.
The **Action Succeeded** popup appears.

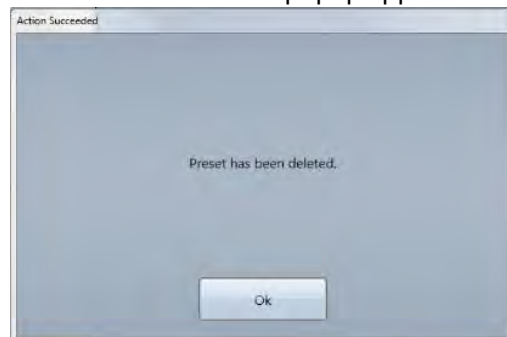


Figure 148: Action Succeeded popup message – Preset deleted

5. Click the **Ok** button.
6. Click the **Save** button to exit.

Setting up the Audit Trail Viewer

The **Audit Trail Viewer** gives a user with administrative access the ability to view all activities performed by anyone logged into the system. This includes changes to protocols, deletion of images, as well as acknowledgement of alerts etc.

Note You must have administrative privileges and be logged in as an administrator to access the Audit Trail Viewer.

1. Click **Customize > System** from the main menu.
The **System Configuration** dialog box appears.
2. Click the **Audit Trail Viewer** tab.

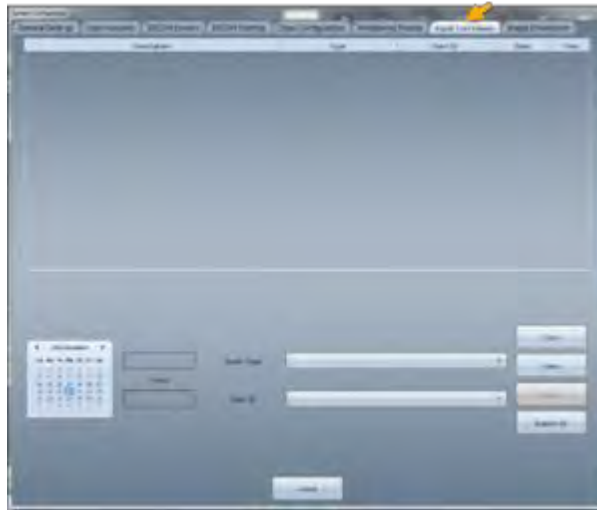


Figure 149: Audit Trail Viewer tab

3. From the **Audit Trail Viewer** tab, use the calendar to select a date range to view.
 - To select a single date, position the mouse pointer in the top box and click the date on the calendar to find audits for that date.
 - To select a date range, click the desired start date on the calendar. This will automatically populate the top box of the **From** range. Click the desired end date on the calendar, which automatically fills the bottom box of the **From** range.

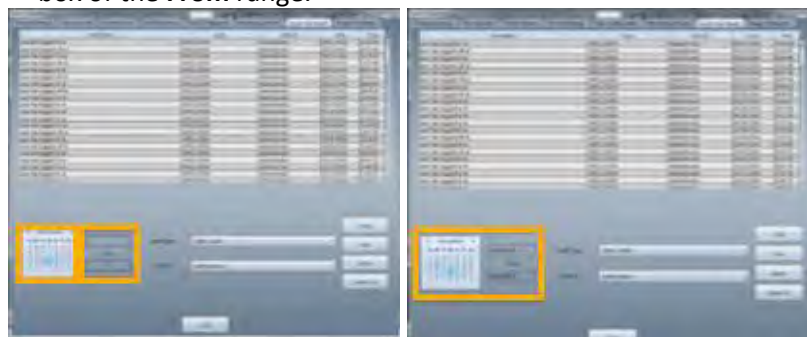


Figure 150: Adding a date or a date span

4. Click the **Audit Type** dropdown to select the type of audit you are searching for.

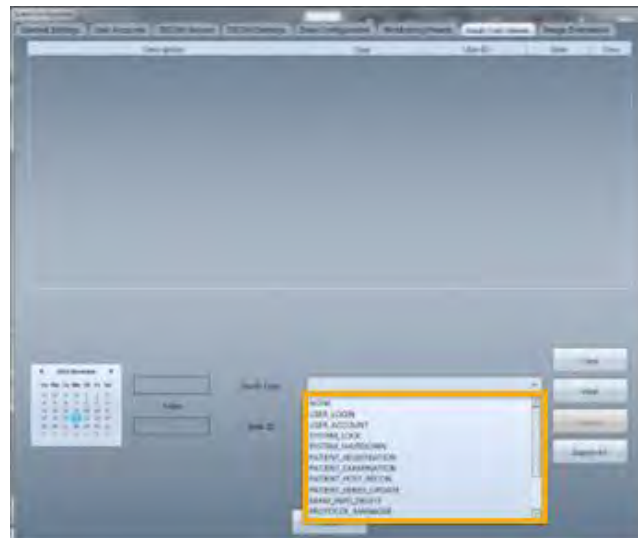


Figure 151: Audit Trail Viewer > Audit Type dropdown

5. From the **User ID** dropdown, click the type of user to track.

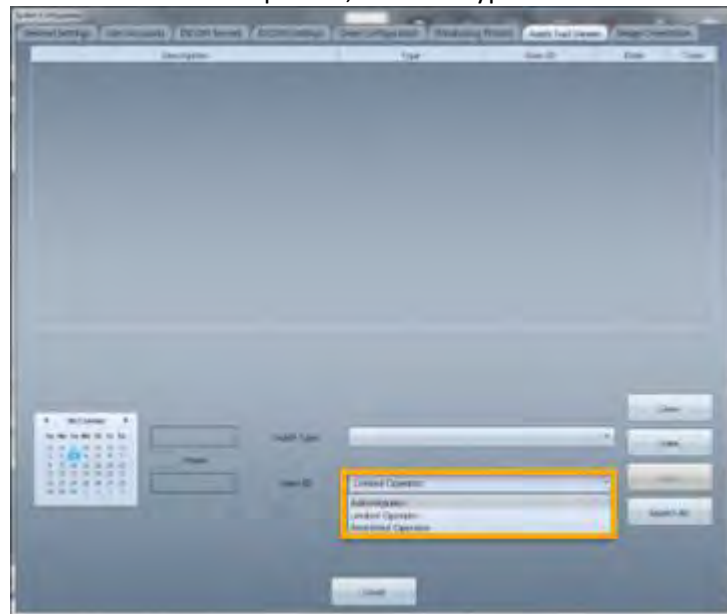


Figure 152: Audit Trail Viewer > User ID dropdown

6. Click the **View** button to see the result of audits that met your criteria.

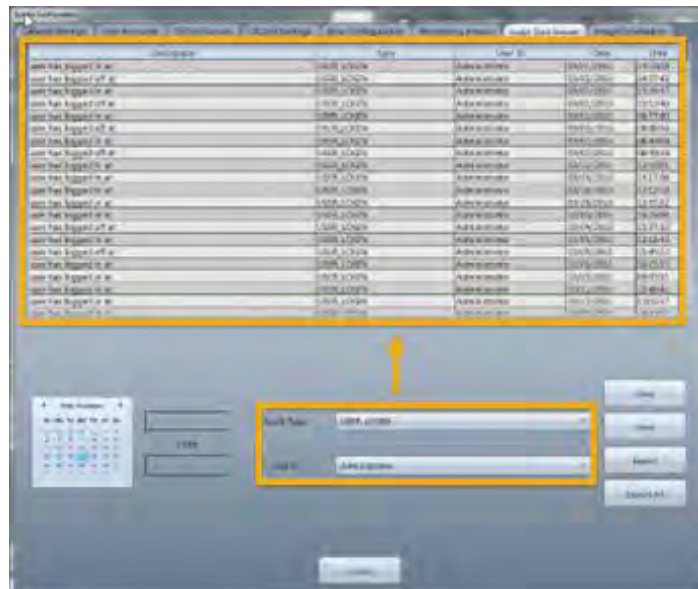


Figure 153: Audit results

7. Perform one of the following:
 - Click the **Clear** button to remove the audit results.
 - Click the **Export** button to export the audit result that you selected to the audit backup file on the system.
 - Click the **Export All** button to export the audit results to the audit backup file on the system.
8. Click the **Close** button to exit.

Setting Image Orientation

NeuroLogica describes patient orientation as if the viewer were looking towards the front of the gantry. In other words, if the patient is lying face up with their head in the gantry, the image orientation displays the patient's Right side on the Left side of the Viewer. If the patient's feet are going into the gantry, the image orientation displays the patient's Left side on the Left side of the Viewer.

Note You must have administrative privileges and be logged in as an administrator to modify image orientation settings.

Changes to image orientation setting will modify the displayed orientation markers on the images.

1. Click **Customize > System** from the main menu.
The **System Configuration** dialog box appears.
2. Click the **Image Orientation** tab.



Figure 154: Image Orientation tab

The top half of the **Image Orientation** screen shows the available patient orientations. The black image orientation square represents the viewing area and shows four different orientation markers: A = anterior, L = left, P = posterior and R = right. If you do not see letters in the image orientation box, select an image orientation from the list.

3. Select the appropriate orientation from the list.
For example, select, **Head First Supine**. In the figure below, the highlighted selection shows the current orientation in the **Current Flip Orientation** field which is not changeable; however, the **New Flip Orientation** lets you change the orientation.
4. Click the **New Flip Orientation** dropdown to select one of the following new-flip orientations:
 - NONE
 - LEFT_AND_RIGHT
 - TOP_AND_BOTTOM
 - BOTH

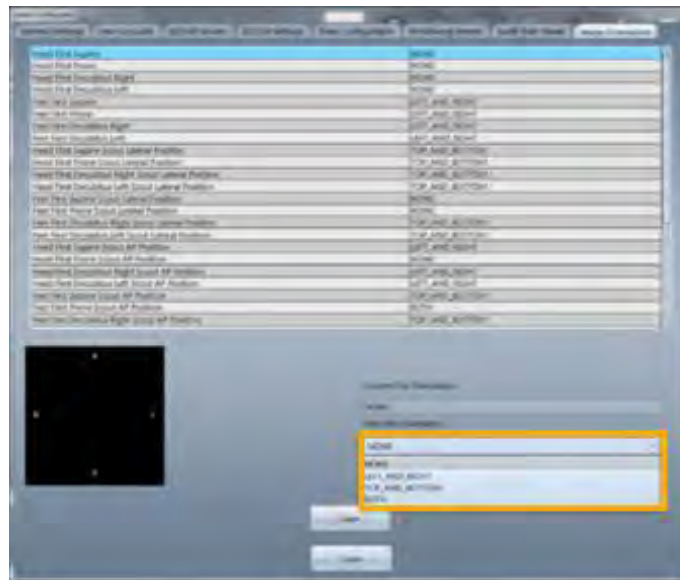


Figure 155: Image Orientation > New Flip Orientation dropdown

5. Click the **Save** button to save changes.

The **Settings Saved** popup appears.

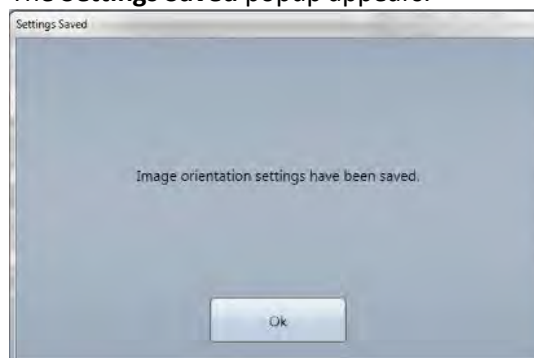


Figure 156: Settings Saved popup message – Image orientation settings saved

6. Click the **Ok** button.
7. Click the **Close** button to exit.

User Configuration

User configuration allows users to change their password for their own account.

Updating your user account

1. Click **Customize > User** from the main menu.
The **User Configuration** dialog box appears.

Note Incorrect changes to user accounts may cause users to be unable to access the system.

The **Update Accounts** tab is the default selection.

2. Modify the following fields associated with your user account by entering relevant information:
 - Last Name
 - First Name
 - Password
 - Verify Password

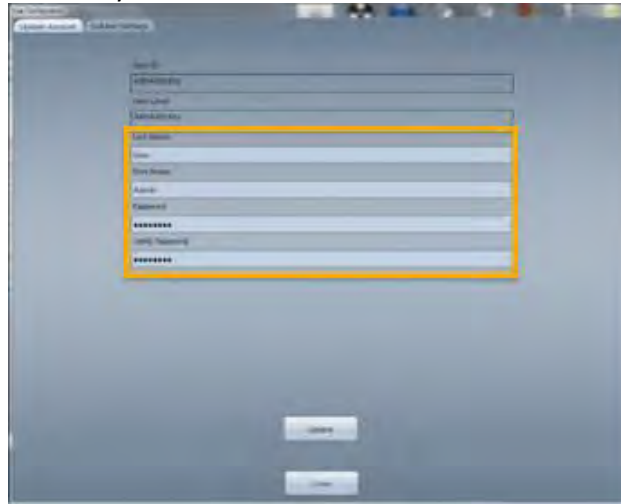


Figure 157: Last Name, First Name, Password, and Verify Password fields

3. Click the **Update** button.
The **Update Succeeded** popup appears.

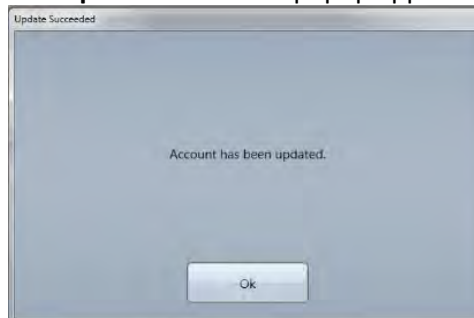


Figure 158: Update Succeeded popup message – Account updated

4. Click the **Ok** button.
5. Click the **Close** button to exit.

Applying column settings to HIS/RIS Query

Allows you to customize the columns of information that appear when viewing the **Hospital Information System (HIS)** and/or **Radiology Information Systems (RIS)** information that is queried.

All users can access user configuration and make changes to the column settings; however limited and restricted operators cannot make their changes to the column headings the default. Only users with administrative access can make column settings a default using the **Make Default** option.

1. Click **Customize > User** from the main menu.
The **User Configuration** dialog box appears.
2. Click the **Column Settings** tab.
There may be no entries that appear, initially.

Note When an option is selected (for example **HIS/RIS Query** or **Patient Browser**), a table is created that lists the columns, along with a check box to indicate whether it will be displayed within the table. Required columns **cannot** be unchecked and are colored orange instead of the default green.

3. Click the **HIS/RIS Query** option.

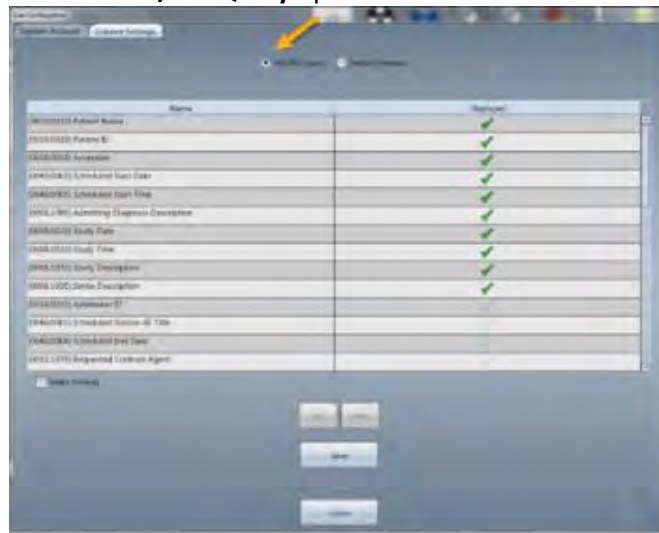


Figure 159: Column Settings dialog box with HIS/RIS Query option

4. Double click the Checkmark under **Displayed** column for the row you want to display or remove if it is already selected.

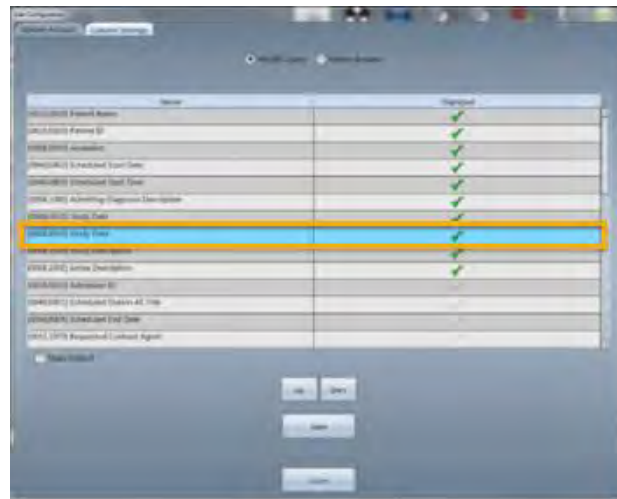


Figure 160: Column Settings with a selected query in HIS/RIS

- Notice that the **Up** and **Dwn** buttons are active when a row is selected.
- Click the **Up** or **Dwn** buttons to move the active selection up or down the list.

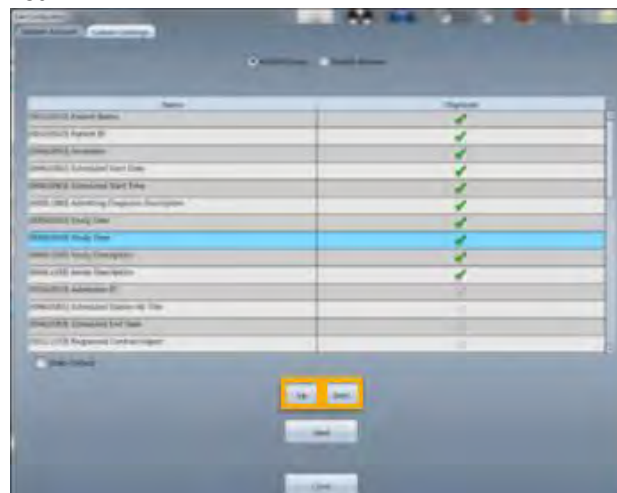


Figure 161: Column Settings with HIS/RIS Query option using Up and Dwn buttons

- If you have administrative privileges, click the **Make Default** option to make the selected column display the default for all users.

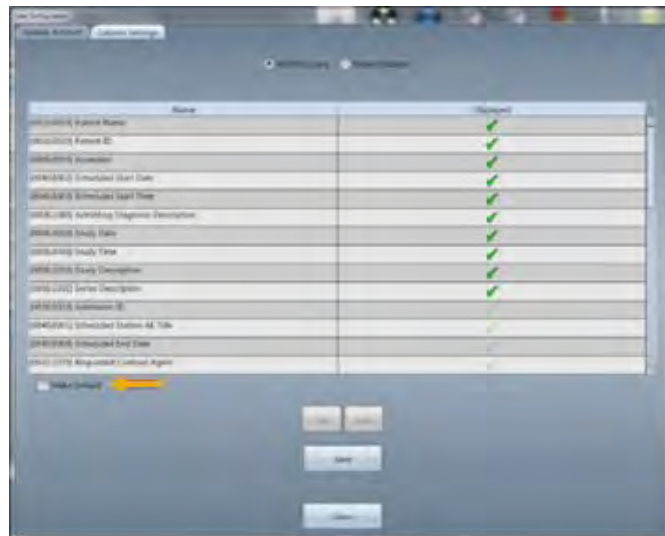


Figure 162: Make Default option

8. Click the **Save** button to keep changes.
9. Click the **Close** button to exit.

Applying column settings to Patient Browser

Allows you to configure the columns of information seen in the **Patient Browser**.

1. Click **Customize > User** from the main menu.
The **User Configuration** dialog box appears.
2. Click the **Column Settings** tab.
3. Click the **Patient Browser** option.



Figure 163: Column Settings with Patient Browser option

4. Click one of the following options:

Patient/Study	Information that appears on the top portion of the Patient Browser that defines patient specific information.
Series	Information that appears on the lower portion of the Patient Browser that defines series specific information.

- Double click the Checkmark under **Displayed** column for the row you want to display or remove if it is already selected.
- Notice that the **Up** and **Dwn** buttons are active when a row is selected.
- Click the **Up** or **Dwn** buttons to move the active selection up or down the list.

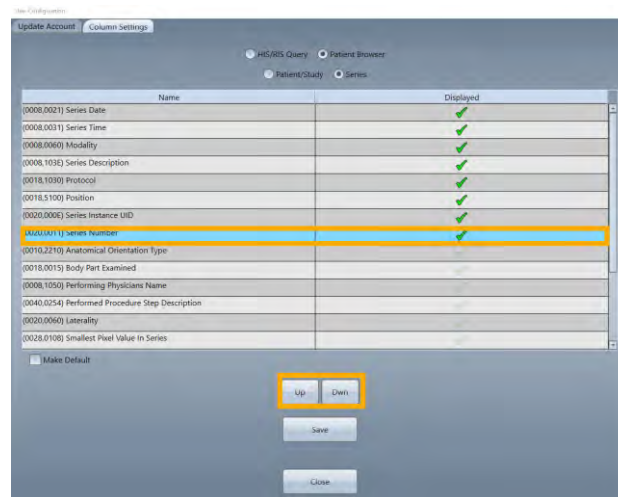


Figure 164: Column Settings with HIS/RIS Query option – using Up and Dwn buttons

- If you have administrative privileges, click the **Make Default** option to make the selected column display the default for all users.



Figure 165: Make Default option

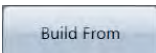
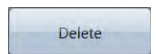
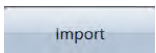
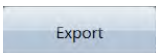
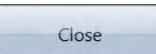
- Click the **Save** button to keep changes.
- Click the **Close** button to exit.

Chapter 6 Protocol Manager

Note You must have administrative privileges and be logged in as an administrator to access Protocol Manager.

Protocol Manager allows a user with administrative privileges to create new protocols, modify existing protocols and delete protocols from the system. **Protocol Manager** provides three patient options: **Adult**, **Pediatric**, or **Trauma** patient.

Table 21: Protocol Manager command buttons

Button	Action
	Allows you to create a new protocol.
	Allows you to create a new protocol from an existing protocol.
	Allows you to modify protocols.
	Deletes a saved protocol.
	Imports previously exported protocols into the workstation.
	Exports protocols to a media device.
	Closes the Protocol Manager dialog box.
	Moves a protocol up or down the ordered list.
	Saves the order of the protocol list.

Note Different patient sizes and attenuations require specific protocols where technical parameters have been adjusted according to the physical characteristics of the patient. It is recommended that you select pediatric protocols when scanning children, rather than selecting adult protocols and modifying technique factors.

Creating a new protocol

1. Click **Tools >Protocol Manager** from the main menu.

The **Protocol Manager** dialog appears.



Figure 166: Protocol Manager for Adult and Pediatric

2. Click one of the following:

Adult	To create and/or scan with adult scan protocols, which are stored by anatomical location.
Pediatric	To create and/or scan with pediatric scan protocols which are stored by anatomical location.
Trauma	The Trauma orb can be used to store protocols commonly used for emergency scans.
☒ Adult ☐ Pediatric	By selecting either an Adult or Pediatric patient, the corresponding list of saved protocols becomes available.

Note Adult and pediatric protocol parameters are customized to meet your requirements in conjunction with local and nationally recognized published guidelines. These protocols **must be** approved by your facility physicist **before** the system's acceptance.



WARNING

Any modification to an existing protocol, or any new protocol created should be reviewed and approved by a radiologist and/or residing medical physicist. Failing to do so could cause a patient to receive an excessive and/or unnecessary dose of ionizing radiation.

Resources for radiation protection of pediatric patients appear below and are for referring physicians with a focus on radiation exposure:

- American Academy of Pediatrics (AAP), <https://www.aap.org>: Search for radiation risk to children from Computed Tomography
- Federal Drug Administration (FDA), <https://www.fda.gov/search>: Search for guidelines for pediatricians regarding medical radiation safety
- American College of Radiology (ACR): <https://www.acr.org/Clinical-Resources/Clinical-Tools-and-Reference/Appropriateness-Criteria>
- Image Gently® and CT scans <https://www.imagegently.org/Procedures/Computed-Tomography>
- Image Gently/FDA Digital Radiography Safety Checklist: <https://www.imagegently.org/Portals/6/Procedures/Attachment%20D.CR.DR%20%20checklist.pdf>

- Click the colored orb corresponding to the appropriate body part.



Figure 167: Adult and Pediatric anatomical orbs, with Head orb selected

Existing protocols in the selected Orb will appear in the **Protocol** list box as seen below. The **New** button will become active.

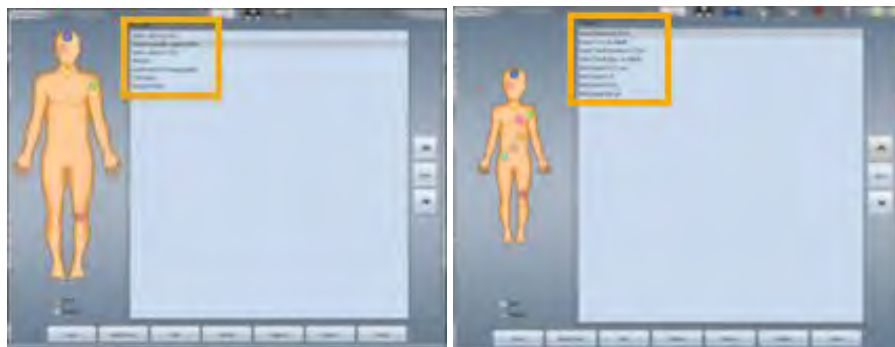


Figure 168: Adult and Pediatric protocol lists

- Click the **New** button to create a new protocol.
The **New Protocol** dialog box appears.



Figure 169: New Protocol dialog box

- Enter **Protocol Information** in the text boxes:

Protocol Description	The name of the protocol as it will be displayed in protocol manager or when selecting a protocol to use for a scan.
-----------------------------	--

Anatomical Reference	References the anatomy that will be scanned.
Default Study Description	This will appear as the DICOM image tag, this description also appears in PACS as a Study Description DICOM tag (00081010).
For Pediatric, Weight (kg) and Length (cm)	Where you enter the weight and length of the pediatric patient.

6. Under **Patient Position**, select one of the following scanning positions from the dropdown:

HFS	Head First-Supine
HFP	Head First-Prone
HFDL	Head First-Decubitus Left
HFDR	Head First-Decubitus Right
FFS	Feet First-Supine
FFP	Feet First-Prone
FFDL	Feet First-Decubitus Left
FFDR	Feet First-Decubitus Right

You can also move the rotating positional handles by hovering the mouse pointer over the handle to select a position.

- The arrows at the feet rotate the patient's orientation from **Head First** to **Feet First**.
- The arrow above the patient rotates the patient's orientation from **Supine** to **Prone** to **Decubitus**.



Figure 170: Patient position handles

7. Under **Protocol's Series**, click the **New** button.
The **New Series** dialog box appears.

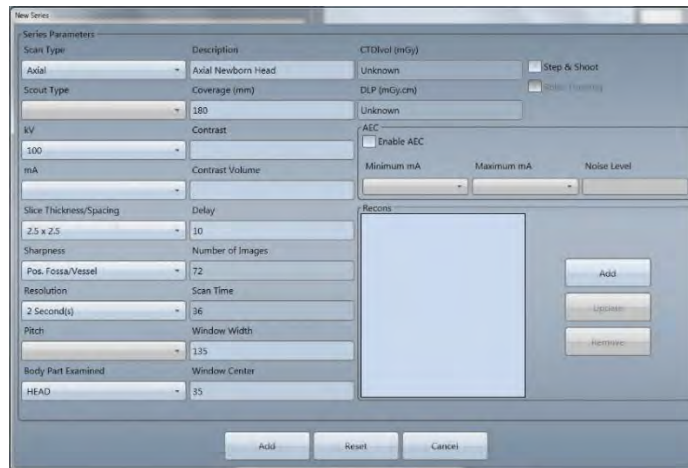


Figure 171: New Series dialog box

8. For **Scan Type**, select one of the following:

- Axial
- Helical
- Dynamic
- Reference
- Scout

9. For **Scout Type**, select one of the following:

- AP
- PA
- Lateral

Scout Type is not available for **Axial**, **Helical**, **Dynamic**, and **Reference** scan modes.

10. For **kV** (scan voltage), select one of the following:

- 100 To set the scan kV to 100.
- 120 To set the scan kV to 120.
- 140 To set the scan kV to 140.

kV is not selectable when using the **Dynamic** scan mode.

See “Identifying load factors” on page 191.

11. For **mA** (scan current), select the desired value from the dropdown.

The available mA range is 1 to 7 mA with an increment of 1.

12. For **Slice Thickness/Spacing**, select the desired value from the dropdown.

Slice Thickness/Spacing is not available for **Scout**, **Dynamic**, or **Reference** scan modes.

13. For **Sharpness**, select the image reconstruction kernel from the following list of kernels:

- Low Noise QA – Not for Clinical Use
- Soft Tissue
- Pos. Fossa/Vessel
- Sharp
- Bone Sharp Lung

- High Res QA – Not for Clinical Use
- Sharpness is not selectable when using the Scout, Dynamic, or Reference scan modes.

14. For **Resolution**, which also refers to scan time, select one of the following options:

- 2 Second(s)
- 4 Second(s)
- 6 Seconds(s)

Resolution is only available for **Axial** and **Reference** scan modes

15. For **Pitch**, which describes how fast the scanner is moving during one rotation of the x-ray tube, select one of the following options:

- 1.0 where the scanner will move 10mm per second.
- 1.5 where the scanner will move 15mm per second.

Pitch is only available for **Helical Scan Types**.

16. For **Body Part Examined**, select the appropriate Body Part from the drop-down menu.

17. For **Description**, enter the desired study description.

18. For **Coverage (mm)**, enter the total scan distance.

Coverage is not available for **Dynamic** and **Reference** scan modes.

19. For **Contrast**, enter the type of contrast given.

20. For **Contrast Volume**, enter the amount of the contrast given.

Contrast is not available for **Reference** and **Scout** scan modes.

21. For **Delay**, enter the delay time that will occur after clicking the **Start Scan** button.

22. **Number of images** is a calculated value based on the Slice Thickness/Spacing and the length of the scan.

23. **Scan Time** is a calculated value based on the protocol parameters selected. Scan time is affected by **Resolution**, **Pitch** and **Scan Length**.

Note Dynamic scan time must be between 30 and 45 seconds.

24. For **Window Width**, enter the range of CT numbers that are distributed over the viewable gray scale of the display device or film.

25. For **Window Center**, enter the CT number in the center of the viewable gray scale.

26. For **CTDIvol (mGy)**, if applicable, the calculated number appears here, depending on other selections.

CT Dose Index Volume (CTDI_{vol} (mGy)), represents the dose for a specific scan protocol, which considers gaps and overlaps between the radiation-dose profiles from consecutive rotations of the x-ray source. The CTDI_{vol} is calculated differently for both the **Axial** and the **Helical** modes:

- For **Axial** scan mode: $CTDI_{vol} = [(N \times T)/I] \times CTDI_w$
- For **Helical** scan mode: $CTDI_{vol} = 1/pitch \times CTDI_w$

27. **Dose Length Product (DLP (mGy.cm))**, is the measure of ionizing radiation exposure during the entire acquisition of images.

Therefore, $DLP (mGy.cm) = CTDI_{vol} (mGy) \times \text{irradiated length (cm)}$.

28. Select the following options, if applicable. See Scanning with special features for more details.

Step & Shoot	Allows you to manually start the Axial scan acquisition from the workstation when scanning a patient who is unable to remain still.
Bolus Tracking	A CT angiography technique that allows you to monitor the administration of contrast to initiate scan at peak contrast enhancement.
Enable AEC	Allows you to automatically adapt the tube current according to the patient's body habitus to achieve the specified image quality at the lowest possible dose.

29. To add a secondary reconstruction for the protocol, click the **Add** button in the **Recons** section.

The **New Reconstruction** popup appears.

Figure 172: New Reconstruction popup

30. Complete following in the **New Reconstruction** popup:

- Enter a description in the **Description** text box to identify the new reconstruction.
 - Click the **Slice Thickness/Spacing** to select a slice thickness and spacing.
 - Click the **Sharpness** dropdown to select a sharpness from the list.
 - Enter the window width in the **Window Width** text box.
 - Enter the window center in the **Window Center** text box.
 - Click the **Streak Removal** check box to reduce streaks in **Axial** scan mode only.
 - Click the **Noise Reduction** check box to reduce noise.
 - Click the **Level** dropdown to select **Low** or **High**.
 - Click **Metal Artifact Removal** to reduce artifacts from Metal that may be in the patient's body.
31. Perform one of the following:
- Click the **Add** button to add the reconstruction protocol to the list.
 - The dialog box closes, and your changes are added to the **Recons** area.
 - Click the **Reset** button to reset the fields to their original data.
 - Click the **Cancel** button to remove your changes and return to the previous dialog box.
32. Click the **Add** button in the **New Series** dialog box.

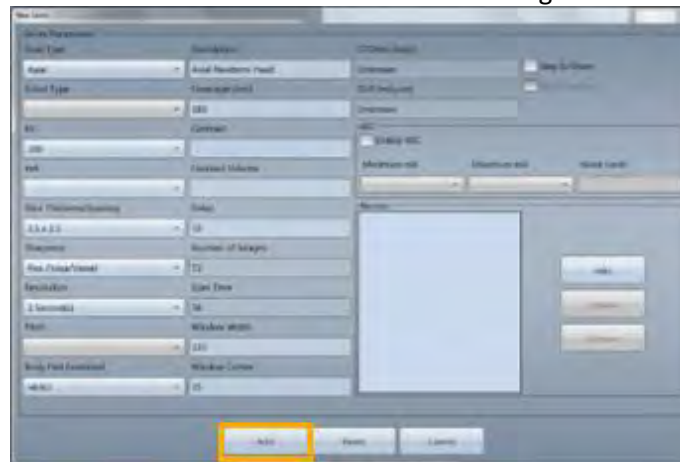


Figure 173: New Series dialog box

33. Repeat steps 7 through 32 to add additional scans to the protocol if necessary.
34. When all required series have been created click the **Save** button on the **New Protocol** dialog box.



Figure 174: Save New Protocol Dialog Box

35. Click the **Close** button to exit.

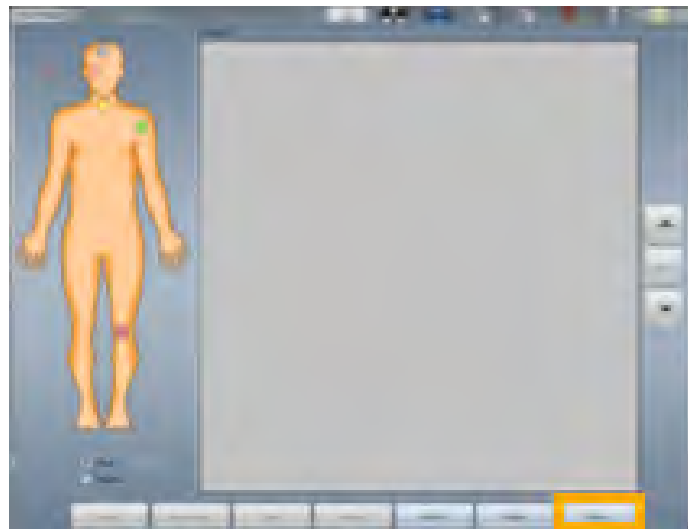


Figure 175: Close Button

Using Build from to create a new protocol

The **Build From** button is used in **Protocol Manager** when you want to create a new protocol from existing protocol.

1. Click **Tools >Protocol Manager** from the main menu.
The **Protocol Manager** dialog appears.

2. Click one of the following:

Adult	To create adult scan protocols, which are stored by anatomical area, here.
Pediatric	To create pediatric scan protocols, which are stored by anatomical area.
Trauma 	The Trauma orb can be used to store protocols commonly used for emergency scans.

Note Protocol parameters are customized to your requirements in conjunction with local and nationally recognized published guidelines. These protocols **must be** approved by your facility physicist **before** the system's acceptance.



WARNING

Any modification to an existing protocol, or any new protocol created should be reviewed and approved by a radiologist and/or residing medical physicist. Failing to do so could cause a patient to receive an excessive and/or unnecessary dose of ionizing radiation.

Resources for radiation protection of pediatric patients appear below and are for referring physicians with a focus on radiation exposure:

- American Academy of Pediatrics (AAP), <https://www.aap.org>: Search for radiation risk to children from Computed Tomography
- Federal Drug Administration (FDA), <https://www.fda.gov/search>: Search for guidelines for pediatricians regarding medical radiation safety
- American College of Radiology (ACR): <https://www.acr.org/Clinical-Resources/Clinical-Tools-and-Reference/Appropriateness-Criteria>
- Image Gently® and CT scans <https://www.imagegently.org/Procedures/Computed-Tomography>
- Image Gently/FDA Digital Radiography Safety Checklist: <https://www.imagegently.org/Portals/6/Procedures/Attachment%20OD.CR.DR%20%20checklist.pdf>

3. Click the colored orb corresponding to the appropriate body part.

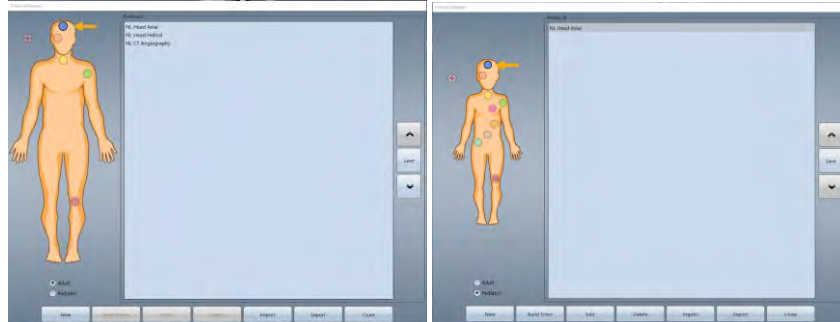


Figure 176: Anatomical orbs

4. Click the protocol you will build from or edit in the **Protocol** list. The **Build From** button will become active.

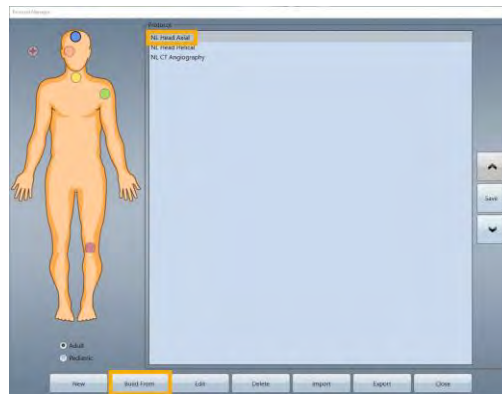


Figure 177: Build From button

5. Click the **Build From** button.
6. The **New Protocol** dialog box appears.



Figure 178: New Protocol dialog box

7. Modify the protocol parameters to meet your needs. Click the **Save** button on the **New Protocol** dialog box to save your changes.
See [Creating a new protocol](#) on page 158 to learn how the fields and options perform to make informed choices on what to change.

Note Be sure to assign the **Build From** protocol a new name **Protocol Description** before you make your additional changes.

8. When all required series have been modified click the **Save** button on the **New Protocol** dialog box.

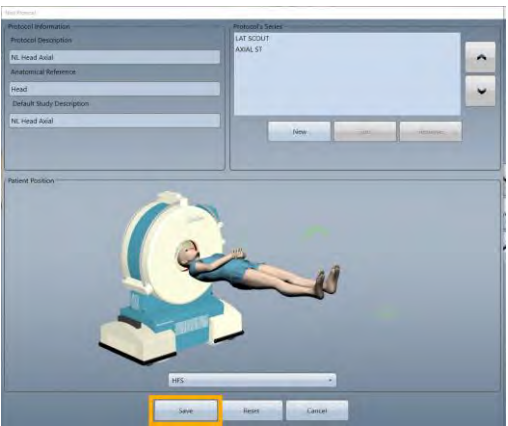


Figure 179: Build from save

9. Click the **Close** button to exit.

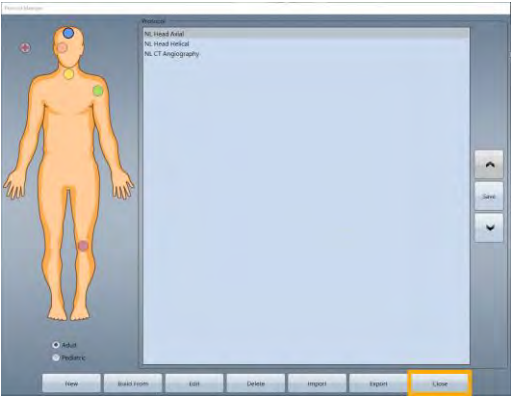


Figure 180: Build from close

Editing an existing protocol

The **Edit** button is used in **Protocol Manager** when you want to modify the parameters of an existing protocol.

1. Click **Tools >Protocol Manager** from the main menu.
The **Protocol Manager** dialog appears.

2. Click one of the following:

Adult	To create adult scan protocols, which are stored by anatomical area, here.
Pediatric	To create pediatric scan protocols, which are stored by anatomical area.
Trauma 	The Trauma orb can be used to store protocols commonly used for emergency scans.

3. Click the colored orb corresponding to the appropriate body part.

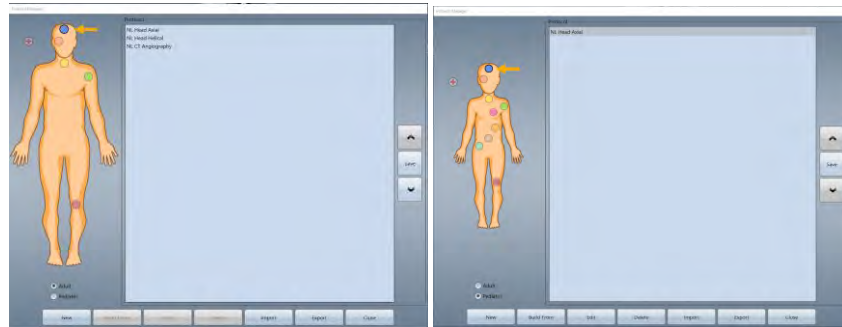


Figure 181: Anatomical orbs

4. Click the protocol you wish to **Edit** in the **Protocol** list. The **Edit** button will become active.

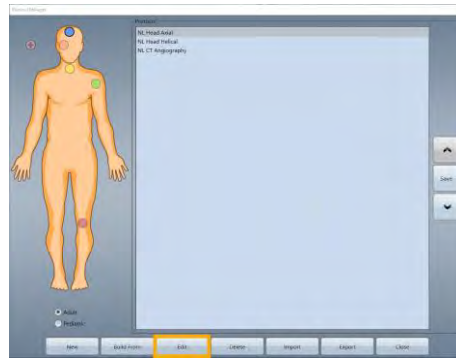


Figure 182: Edit protocol selected

5. Click the **Edit** button.

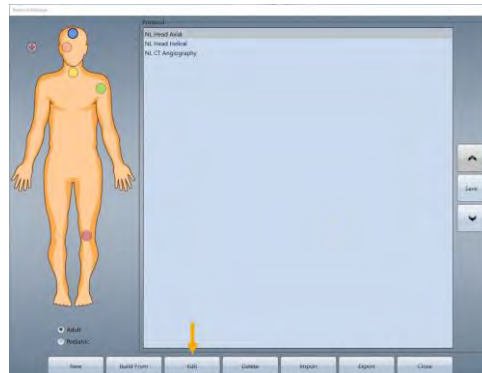


Figure 183: Edit button

6. The **Edit Protocol** dialog box appears.



Figure 184: Edit Protocol dialog box

7. Select the **Series** you wish to edit and click the **Edit** button.



Figure 185: Edit Series

8. Modify the protocol parameters to meet your needs. Click the **Update** button on the **Edit Series** dialog box to save your changes.

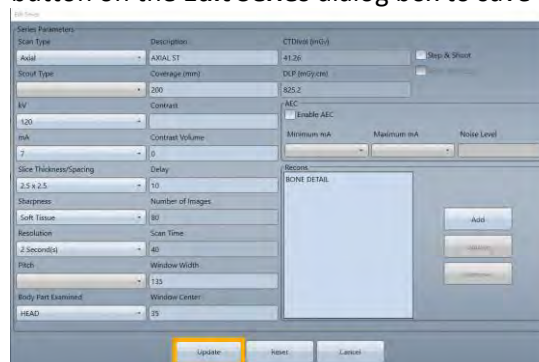


Figure 186: Update series button

9. When all required series have been modified click the **Update** button on the **Edit Protocol** dialog box.



Figure 187: Update protocol button

- Click the **Close** button to exit.

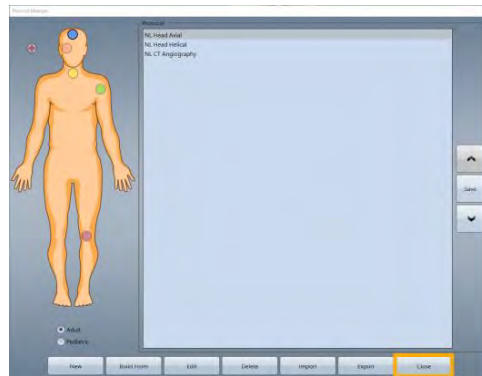


Figure 188: Edit Protocol close

Copying and pasting protocols

To copy and paste protocols from one body part orb to another, including the Trauma orb.

- Click **Tools > Protocol Manager** from the main menu.
The **Protocol Manager** dialog appears.

- Click one of the following:

Adult	To copy and paste adult scan protocols, which are stored by anatomical location.
Pediatric	To copy and paste pediatric scan protocols, which are stored by anatomical location.
Trauma	To copy and paste protocols stored in the Trauma orb.



Figure 189: Protocol Manager for Adult and Pediatric

3. Click the colored orb corresponding to the appropriate body part.

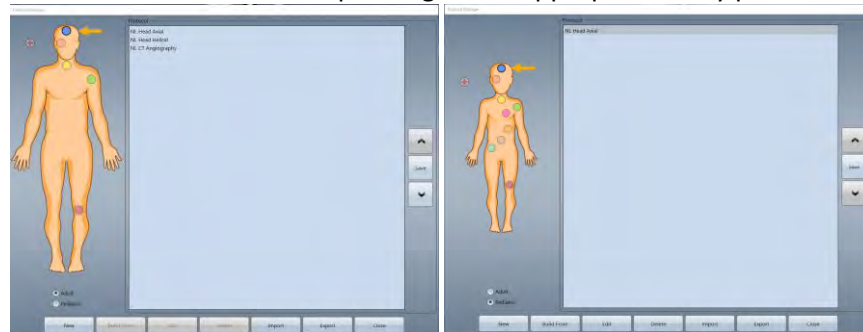


Figure 190: Anatomical orbs, in this case the head orb

4. Review the protocol you would like to copy.
5. Highlight the protocol, right-click to see the floating menu, and click **Copy**.

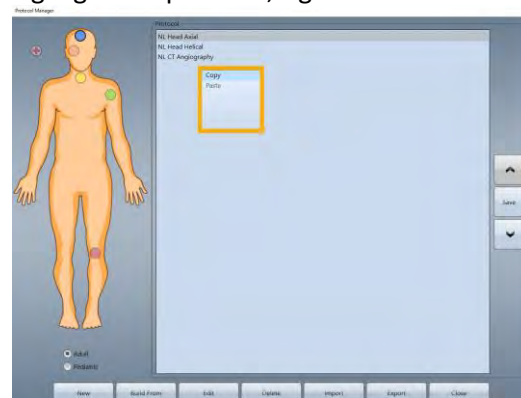


Figure 191: Copy right-click floating menu

6. Go to the body part orb you want to paste the protocol to, which can include the Trauma orb.
7. Right-click to see the floating menu and click **Paste**.

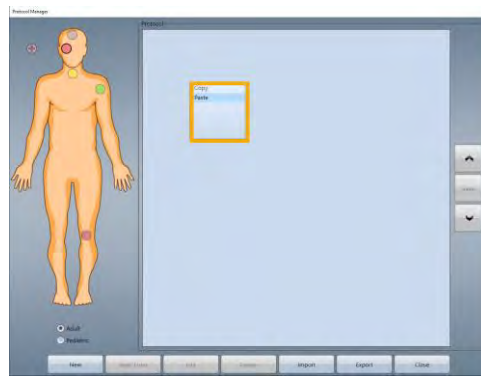


Figure 192: Paste right click floating menu

8. Click **Close** button to exit.

Deleting a protocol

1. Click **Tools >Protocol Manager** from the main menu.
The **Protocol Manager** dialog box appears.

2. Click one of the following:

Adult	To delete adult scan protocols, which are stored by anatomical location.
Pediatric	To delete pediatric scan protocols, which are stored by anatomical location.
Trauma	To delete protocols that are stored ion the Trauma orb.

3. Click the colored orb corresponding to the appropriate body part.
Select the protocol from list to be deleted.

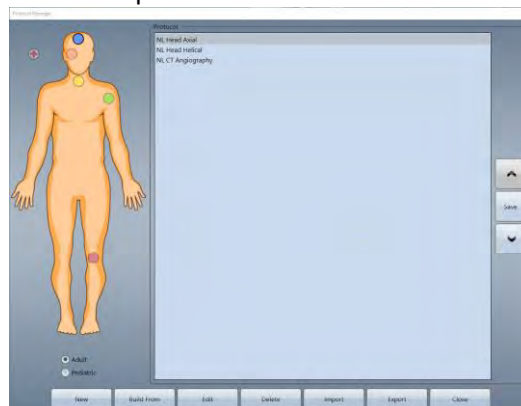


Figure 193: Protocol Manager with a protocol selected

4. Click the **Delete** button.
The **Delete Confirmation** popup appears.

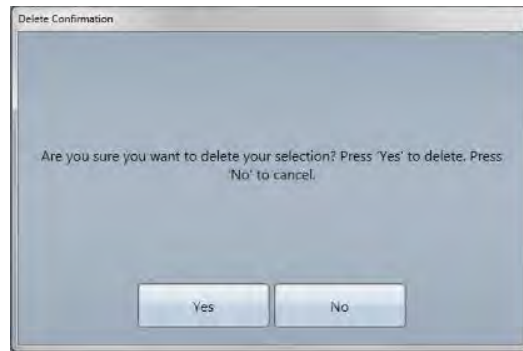
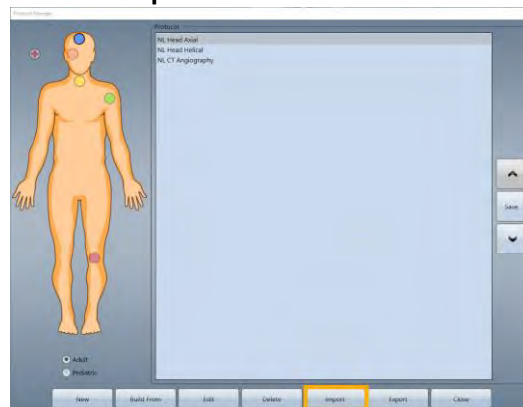


Figure 194: Delete Confirmation popup message – Yes or no to delete selection

5. Perform one of the following in the **Delete Confirmation** popup:
 - Click the **Yes** button to delete the selected protocol.
 - Click the **No** button to return to the **Protocol Manager** dialog box.The **Delete Confirmation** dialog box disappears, and the **Protocol Manager** dialog box appears.
6. Click the **Close** button to exit.

Importing protocols from a storage device

1. Click **Tools >Protocol Manager** from the main menu.
The **Protocol Manager** dialog box appears.
2. Click the **Import** button.



3. The **Select File** popup appears.

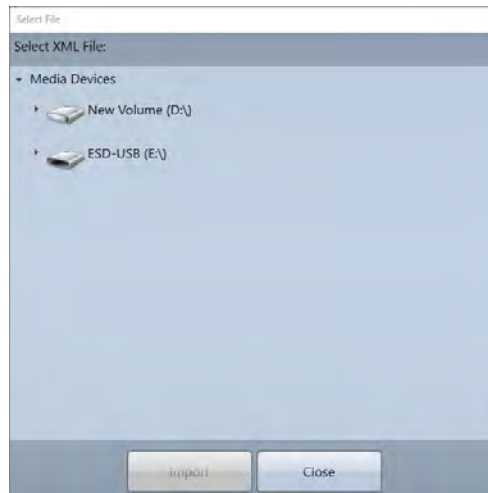


Figure 195: Select File popup

4. Double click the Drive letter that contains the protocols you want to import.

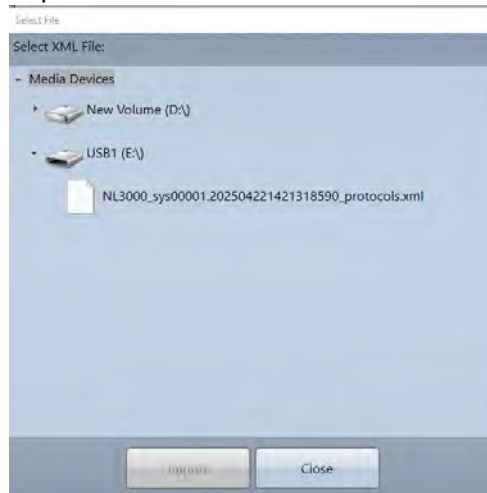


Figure 196: Select file

5. Click the file in the **Select File** popup.



Figure 197: Import button active in Select File when file(s) selected

6. Click the **Import** button.

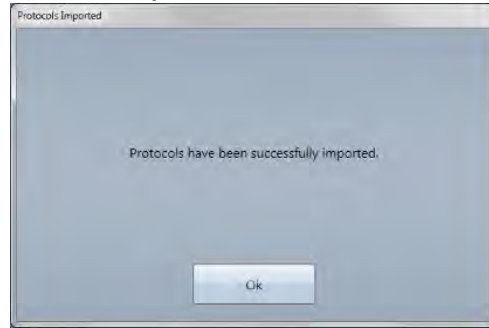


Figure 198: Protocols Imported popup message – Protocols imported

7. The **Protocols Imported** popup appears.
8. Click the **Ok** button.
9. Check that the required files have been imported.
10. Click the **Close** button to exit.

Exporting protocols to a storage device

1. Click **Tools >Protocol Manager** from the main menu.
The **Protocol Manager** dialog box appears.
2. Click the **Export** button.

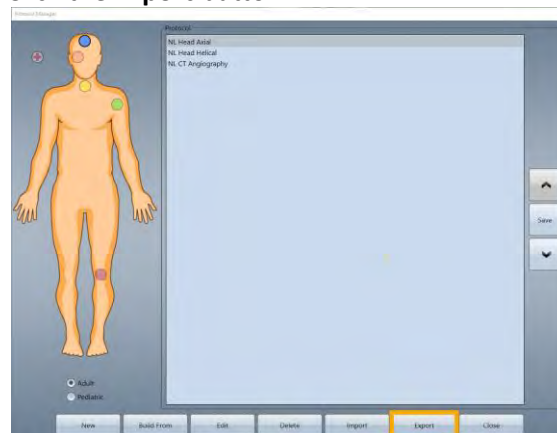


Figure 199: Export button

The **Select Directory** dialog box appears.



Figure 200: Select Directory popup

3. If more than one **Media Device** is available, select the device to use.
4. Click the **Select** button.
5. The **Protocols Exported** popup appears.



Figure 201: Protocols Exported popup message – Protocols exported

6. Click the **Ok** button.
7. Check that the required files have been exported.
8. Click the **Close** button to exit.

Changing the order of protocols in the list

1. Click **Tools > Protocol Manager** from the main menu.
The **Protocol Manager** dialog box appears.
2. Click one of the following:

Adult	To change the order of adult scan protocols, which are stored by anatomical location.
--------------	---

Pediatric	To change the order of pediatric scan protocols, which are stored by anatomical location.
Trauma 	To change the order of protocols stored in the Trauma orb.

- Click the colored orb corresponding to the appropriate body part.
- Click the protocol to move up or down the list.
- Click the **Up** arrow to move the protocol up the list; click the **Down** arrow to move the protocol down the list.

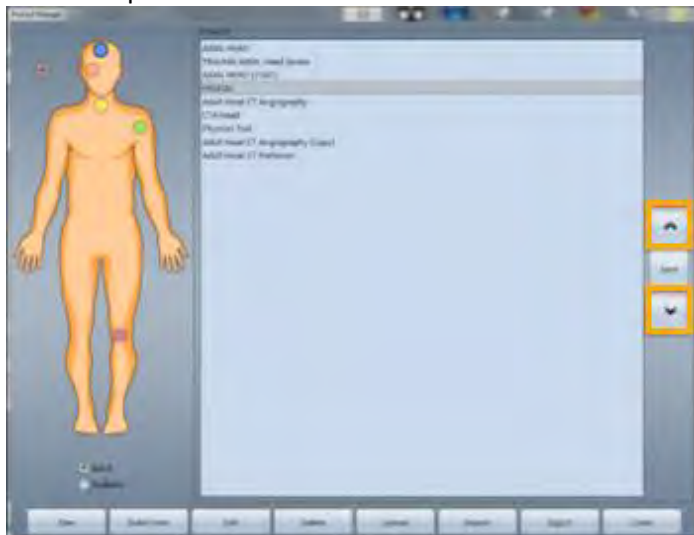


Figure 202: Changing protocol order with Up and Down (arrow) buttons

- When you have finished ordering your protocols, click the **Save** button to save the new ordered list.

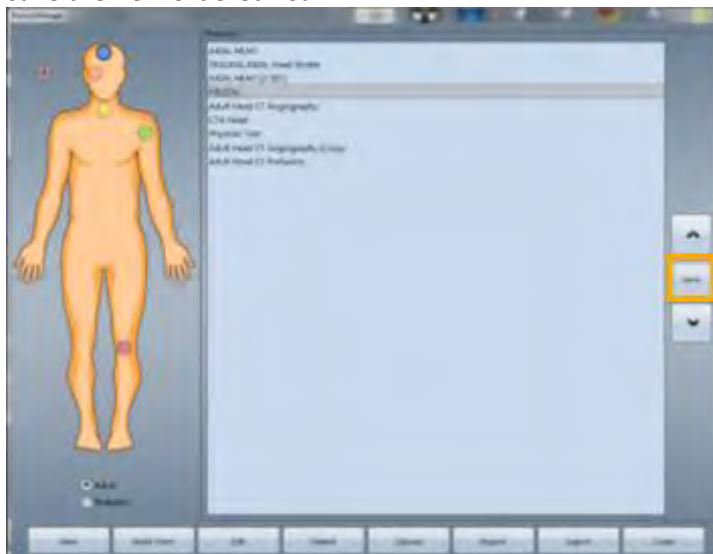


Figure 203: Protocol Save button

- Click the **Close** button to exit.

Chapter 7 Daily Calibration and Quality Assurance

In this chapter, you will learn how to perform daily air calibration and use the **Quality Assurance (QA)** tool that verifies the system is working as specified.

Keep in mind that **before** using the CereTom Elite system, you **must** conduct a **Quality Assurance (QA)** test to verify the system is working as specified.

Performing a daily (air) calibration from the LCD touch screen

Note NeuroLogica recommends that air calibration is performed every 6-8 hours. If the air freshness falls below 50%, or the scanner is moved to an area with a dramatic change in humidity or temperature, perform another air calibration to ensure optimum image quality during patient scanning.

If room-temperature fluctuations have occurred, you may need to perform more than one air calibration. In addition, scanners can drift out of alignment; make sure you perform a **QA Test** with the test phantom **before** scanning a patient.

It is recommended that the scanner is on for at least 60-90 minutes prior to performing the air calibration.

It is recommended that the scanner is plugged in and turned on even when it is not in use.

1. Make sure that nothing is in the bore before starting the daily air calibration.
2. Make sure the shielding curtains (if fitted) are fully closed before beginning.
3. On the touch screen, press the **Select Cal** button on the **Main** tab.



Figure 204: Select Cal button on the Main tab

4. Press the **Daily Cal** button.



Figure 205: Daily Cal button

5. Press the **Accept Protocol** button to continue.
6. Press **Start Daily Cal** to begin daily calibration.
The **Daily Cal** has a built-in delay of ~10 seconds. The calibration takes ~ 4.5 minutes. The progress of the daily calibration appears on the workstation.

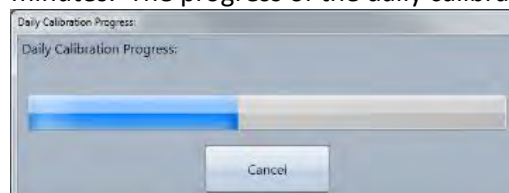


Figure 206: Daily Calibration Progress popup

To stop the scan, press the **Cancel** button.

The **Daily Cal** icon will change to green when it reaches a 100% air freshness.

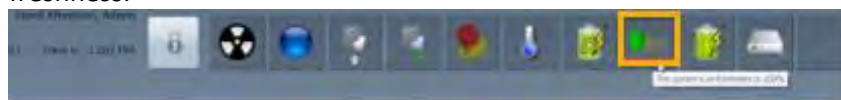


Figure 207: Air freshness icon changes as the air quality drops from green to yellow to red

The QA phantom overview

The **QA phantom** is a device that measures parameters that characterize image quality; these parameters are as follows:

- Uniformity
- Noise
- High-contrast resolution
- Slice width
- Low-contrast resolution
- Sensitometry (contrast scale)

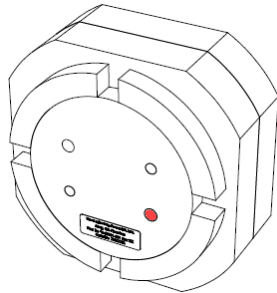


Figure 208: QA phantom

The **QA phantom** is a 20cm diameter disk consisting of a substrate made of **poly methyl methacrylate (PMMA)** containing specific inserts. The uniform area of the disk is used to measure uniformity and noise. Four other parameters are measured by the inserts in the substrate.

The disk is encapsulated in a foam casing that enables it to be correctly positioned in the scanner. In this user manual, when the phantom is referenced, the foam casing is also implicitly referenced.

The **Axial** resolution wire, also called the **Modulation Transfer Function (MTF)** wire, is intended for measuring resolution in the **Axial** plane. Resolution is defined as the ability to distinguish small objects. It is expressed in line pairs per millimeter.

The **slice width wires** are the two inclined wires. They are intended to determine scanner resolution along the Z axis, that is, in the direction that is perpendicular to the **Axial** plane. Resolution along the Z axis is expressed in terms of slice width in millimeters. Although one wire is sufficient to measure the Z axis resolution if its position is accurately known, a second wire is included to confirm the alignment. If the alignment is incorrect, the results of the slice width test will not be accurate.

The low-contrast insert is a compound insert. It is made of two half cylinders of different materials with a known contrast difference between them. The low-contrast insert is intended to measure the contrast resolution of the scanner. The contrast resolution is the ability to measure small differences in x-ray attenuation.

The sensitometry inserts are an air bore, and cylinder made of different materials. They are intended to measure the contrast scaling of the scanner.

The QA scan protocols appear in the following table.

Table 22: Scan protocols used by the QA

	CereTom Elite
Scan voltage	140 kV
Scan current	7 mA
Scan time	6 seconds
Kernel	PostFossa
Slice thickness	10mm

Starting Quality Assurance from the touch screen

To ensure the system is at its optimum, factory-specification level, the workstation provides **QA** tools to verify the system's state and to perform image-quality verification. To maintain consistent image quality over the system's lifetime, you should establish and maintain a regular **QA** program. **QA** results are stored in the Patient Browser. Contact your local service representative to delete **QA** results.

The QA protocol is shipped with the system and appears when you click **Quality Assurance** from the main menu or if the **QA protocol** is selected on the touch screen. You cannot customize or modify the **QA protocol**.

Note The QA test should be conducted per the local (hospital) requirements; scanning the QA phantom is done daily, weekly, or monthly, typically.

Before you begin this section, be sure to run a fresh **Daily Calibration** on the system. See "Performing a daily (air) calibration from the LCD touch screen" on page 180.

Before beginning the **QA protocol**, make sure a **QA phantom** is available and ready to install in the bore.

1. Place the phantom in the bore.
The phantom label should face the front of the scanner and be positioned at the bottom – as shown in the figure below. The red insert should be on the operator's right when facing the scanner. The position of the phantom will greatly affect the QA results.

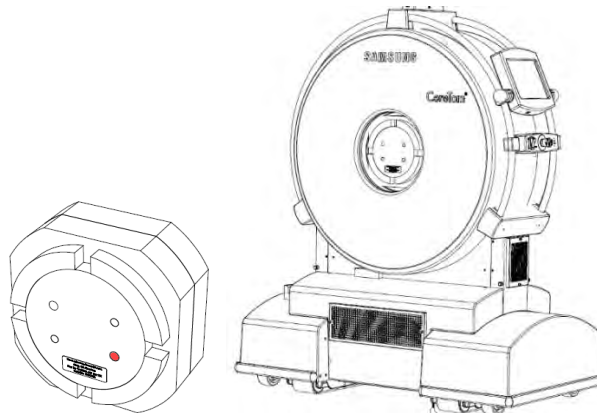


Figure 209: Phantom and phantom in bore

2. On the touch screen, press the **Laser On** button.



Figure 210: Laser On button

3. Align the phantom by lining the QA phantom's etched lines with the laser light.
See the laser precautions in "Laser safety" on page 52.



Figure 211: Phantom's etchings appear on top and sides

4. Make sure the **shielding curtains** are fully closed before starting the QA.

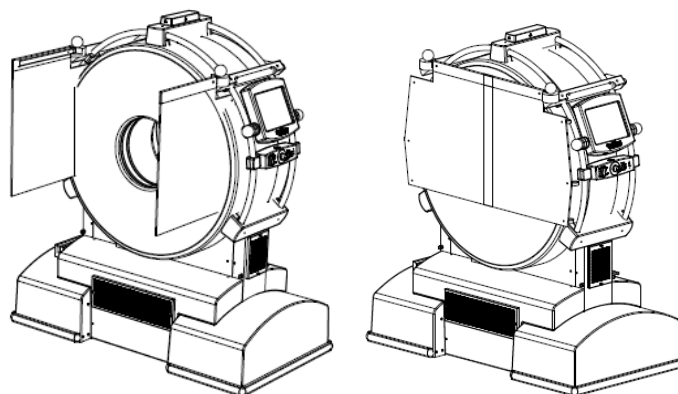


Figure 212: Shielding curtains, opened and closed

5. Press the **Select Cal** button on the touch screen.
6. Press the **QA** button.
7. Press the **Accept Protocol** button.
Wait for the **Scan** button to be activated.
8. Press the **Scan** button to initiate the scan.
To cancel the scan, press the **Cancel** button to return to the **Main** tab and abort the QA.
9. Press the **Start** button.
10. Wait for the QA to appear.

QA Results				
Name	Value			
Radial Resolution At 10%	PASSED: 7.19	HIGH LIMIT: 8.00	LOW LIMIT: 6.50	
Radial Resolution At 50%	PASSED: 4.61	HIGH LIMIT: 5.00	LOW LIMIT: 4.00	
Tangential Resolution At 10%	PASSED: 7.27	HIGH LIMIT: 8.00	LOW LIMIT: 6.50	
Tangential Resolution At 50%	PASSED: 4.53	HIGH LIMIT: 5.00	LOW LIMIT: 4.00	
Slice Width	PASSED: 10.05	HIGH LIMIT: 13.00	LOW LIMIT: 9.00	
Noise	PASSED: 2.30	HIGH LIMIT: 2.70	LOW LIMIT: 1.90	
Low Contrast Resolution	PASSED: 4.27	HIGH LIMIT: 6.00	LOW LIMIT: 4.00	
Uniformity	PASSED: 0.94	HIGH LIMIT: 3.00	LOW LIMIT: 0.00	
CT of Air	PASSED: -984.25	HIGH LIMIT: -970.00	LOW LIMIT: -1010.00	
CT of Teflon	PASSED: 949.81	HIGH LIMIT: 984.00	LOW LIMIT: 914.00	
CT of Acrylic	PASSED: 102.64	HIGH LIMIT: 120.00	LOW LIMIT: 80.00	
Close				

Figure 213: QA results

Note Items in green are passed results. Items in red are failed results. Often positional issues cause failure; reposition the phantom and perform another scan. If you try multiple times and failures persist, call your service representative or **Technical Support**.

11. Review the results.
12. Click the **Close** button on the **QA Results** popup when finished reviewing.
The image of the phantom appears.

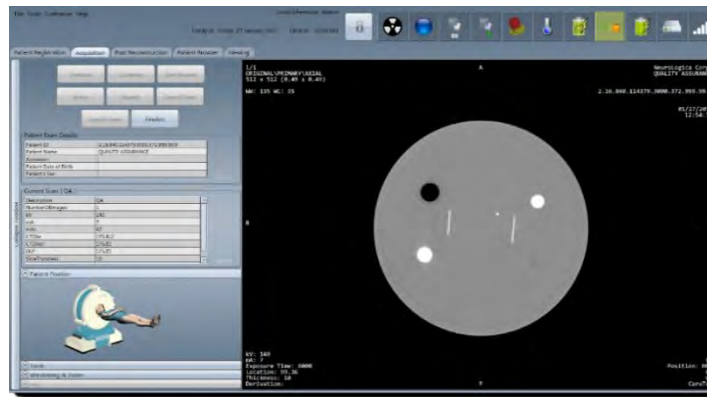


Figure 214: Phantom image

13. Click the **Finalize** button on the workstation to exit the protocol.
14. The QA appears in the **Patient Browser**; however, it is locked.

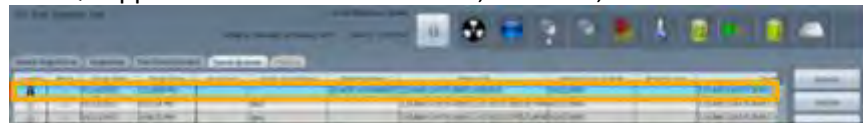


Figure 215: Locked QA results in Patient Browser

Note Please see your service representative to remove locked QA results.

Starting Quality Assurance from the workstation

1. Perform steps 1 through 4 in the procedure “Starting Quality Assurance from the touch screen” on page 183.
2. Click **Tools > Quality Assurance** from the workstation main menu. The **Quality Assurance (QA)** appears.

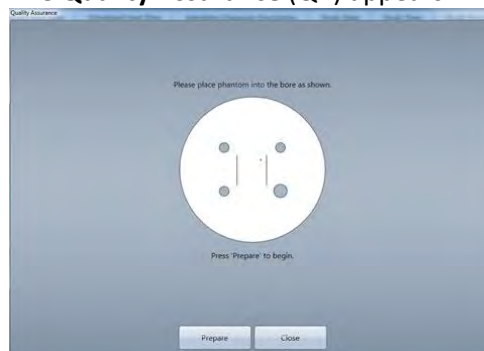


Figure 216: QA phantom orientation

3. Click the **Prepare** button to begin the **QA** procedure.
4. The **System Ready to Scan** popup appears.

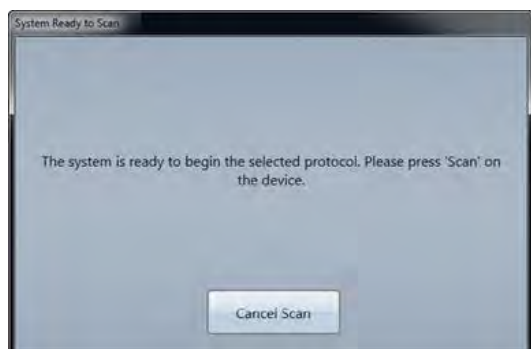


Figure 217: System Ready to Scan popup message – System is ready to begin

5. Go to the scanner and press the **Start** button.
The system will scan the phantom and display the **QA Results** image.

QA Results				
Name				Value
Radial Resolution At 10%	PASSED:	7.19	HIGH LIMIT: 8.00	LOW LIMIT: 6.50
Radial Resolution At 50%	PASSED:	4.61	HIGH LIMIT: 5.00	LOW LIMIT: 4.00
Tangential Resolution At 10%	PASSED:	7.27	HIGH LIMIT: 8.00	LOW LIMIT: 6.50
Tangential Resolution At 50%	PASSED:	4.53	HIGH LIMIT: 5.00	LOW LIMIT: 4.00
Slice Width	PASSED:	10.05	HIGH LIMIT: 11.00	LOW LIMIT: 9.00
Noise	PASSED:	2.30	HIGH LIMIT: 2.70	LOW LIMIT: 1.90
Low Contrast Resolution	PASSED:	4.27	HIGH LIMIT: 6.00	LOW LIMIT: 4.00
Uniformity	PASSED:	0.94	HIGH LIMIT: 3.00	LOW LIMIT: 0.00
CT of Air	PASSED:	-984.25	HIGH LIMIT: -970.00	LOW LIMIT: -1010.00
CT of Teflon	PASSED:	949.81	HIGH LIMIT: 984.00	LOW LIMIT: 914.00
CT of Acrylic	PASSED:	102.64	HIGH LIMIT: 120.00	LOW LIMIT: 80.00

Figure 218: QA results of QA image

Note Items in green are passed results. Items in red are failed results. Often positional issues cause failure; reposition the phantom and perform another scan. If you try multiple times and failures persist, call your service representative or **Technical Support**.

6. Review the results.
7. Click the **Close** button on the results popup when finished reviewing.
8. Click the **Finalize** button on the workstation to exit the protocol.
9. The QA appears in the **Patient Browser**; however, it is locked.

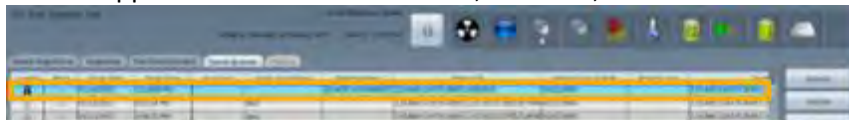


Figure 219: Locked QA results shown in Patient Browser

Note Please see your service representative to remove locked QA results.

Ensuring good image quality

To produce consistent image quality over the system's lifetime, you should establish and maintain a regular **Quality Assurance (QA)** program. **QA** results are stored in the Patient Browser. Please contact your local service representative to delete **QA** results.

1. Compare the results to previous or optimum values and repeat these tests on a regular basis to detect changes in image quality values **before** any problem becomes visible.

Note If you notice degradation in image quality or a change in QA values, schedule a site visit and let service person or imaging physicist run more detailed tests.

Early intervention could prevent a major breakdown.

QA begins with baseline performance data that is acquired during system installation or after the repair or replacement of an x-ray generator-assembly, collimator, detector, Data Acquisition System (DAS) or main power circuitry.

2. Compare subsequent QA results against the baseline. Baseline images can be saved for a visual comparison with QA checks, but measurement values provide a more objective way to monitor quality.



Name	Value
Radial Resolution At 10%	PASSED: 7.19 HIGH LIMIT: 8.00 LOW LIMIT: 6.50
Radial Resolution At 50%	PASSED: 4.61 HIGH LIMIT: 5.00 LOW LIMIT: 4.00
Tangential Resolution At 10%	PASSED: 7.27 HIGH LIMIT: 8.00 LOW LIMIT: 6.50
Tangential Resolution At 50%	PASSED: 4.53 HIGH LIMIT: 5.00 LOW LIMIT: 4.00
Slice Width	PASSED: 10.05 HIGH LIMIT: 13.00 LOW LIMIT: 9.00
Noise	PASSED: 2.30 HIGH LIMIT: 2.70 LOW LIMIT: 1.90
Low Contrast Resolution	PASSED: 4.77 HIGH LIMIT: 6.00 LOW LIMIT: 4.00
Uniformity	PASSED: 0.94 HIGH LIMIT: 3.00 LOW LIMIT: 0.00
CT of Air	PASSED: -984.25 HIGH LIMIT: -970.00 LOW LIMIT: -1010.00
CT of Teflon	PASSED: 949.81 HIGH LIMIT: 984.00 LOW LIMIT: 944.00
CT of Acrylic	PASSED: 102.64 HIGH LIMIT: 120.00 LOW LIMIT: 80.00

Figure 220: Results of QA image after the QA test

Using Axial plane to determine image resolution

The method to determine resolution in the **Axial** plane is to measure the modulation-transfer function of the scanner. A planar section of the **MTF** wire provides a point, called an **impulse**. The impulse is blurred by the imaging system, and the measurement of the blur quantifies the resolution. The blur is quantified by the **MTF** amplitude, which provides a measure of gain for a given object size in line pairs per centimeter (lp/cm).

The **MTF** is measured in two directions, called **radial** and **tangential** directions. The radial direction is along the line that joins the wire to the scanner isocenter. The tangential direction is perpendicular to the radial direction. The **MTF** along each direction produces a curve. The points at which each curve's amplitude is 50% and 10% of its amplitude at zero lp/cm are reported.

The expected results are given below.

Table 23: Modulation Transfer Function direction

Direction	50%	10%
Radial	4.7	7.2
Tangential	4.7	7.2

Using slice width

The method for determining the slice width for the **Axial** mode QA is to take an image of the inclined wire. The scanned section of the inclined wire is a line segment. The scanner blurs a scanned object in the **Axial** plane as well as in the direction perpendicular to it. The image of the inclined wire includes both the **Axial** plane blurring (**MTF**) of the scanner as well as the blurring in the z-direction. The slice width is determined by removing the component of in-plane blurring, by measuring the length of the wire segment and by using the known angle of wire inclination.

Table 24: Slice width

	CereTom Elite
Slice width	10.0 ±1mm

Measuring noise

Noise is measured as the standard deviation of pixel values in a 1cm **Region of Interest (ROI)** at the center of the phantom. The **ROI** selection is automatic. The CTDI₁₀₀ center dose in a standard CTDI head phantom is 145 mGy for this scanning technique. The CereTom Elite noise is measured in a 10mm slice.

Table 25: Noise

	CereTom Elite
Noise	2.3 ±0.4

Measuring low contrast

Low-contrast resolution is measured as the difference between the mean CT values in each half of the low-contrast insert. An **ROI** is automatically selected around the low-contrast phantom and is automatically segmented into halves. Within each **ROI**, the mean pixel value is computed. The two mean values are subtracted.

The expected difference in the mean values is given in the electronic report.
The low contrast should be: 5.0 ± 1.0 HU.

Finding uniformity

A **ROI** is automatically selected in each of five locations in the phantom. One **ROI** is at the center. Four outer **ROIs** are 60 to 70mm from the center of the phantom and spaced 90 degrees apart. A mean value is calculated in each **ROI**. The maximum difference between the means is calculated. The maximum allowable difference between the means is 3 HU.

Separate, independent measurements of the CT numbers of Air, Teflon, and Acrylic (see “Identifying CT contrast scale” on page 190 below) ensure that the overall CT number-scaling of the system is in order. If the uniformity portion of the QA protocol passes (maximum difference is less than or equal to 3 HU), but the mean values of the five **ROIs** are all uniformly high or low in CT number, it is expected that the tests for air, Teflon, and/or acrylic will fail.

Identifying CT contrast scale

Contrast scale represents the attenuation scaling of the scanner. The mean CT numbers of each of the sensitometry objects are calculated and reported.

Table 26: Values of the CT numbers

	Typical	Range
Air	-1000	-1010 to -970
Teflon	974	944 to 984
Acrylic	111	80 to 120

Using performance phantoms

The phantoms (in the following sections) were used for measurement of dose and imaging performance.

Measuring dose

The dose is measured using the standard CTDI head phantom.

Identifying load factors

Table 27: Load factors

kV	Current (mA)	Time (secs)	mAs	Dose exposure (Rad)	Dose exposure (mGy)	Number of scans to achieve 1Gy
Axial						
100	3	1	3	0.55	5.45	183.49
	4		4	0.75	7.3	136.99
	5		5	0.9	9.1	109.89
	6		6	1.1	10.95	91.32
	7		7	1.3	12.75	78.43
	3	2	6	1.1	10.9	91.74
	4		8	1.5	14.6	68.49
	5		10	1.8	18.2	54.95
	6		12	2.2	21.9	45.66
	7		14	2.6	25.5	39.22
	3	4	12	2.9	21.9	45.66
	4		16	2.9	29.2	34.25
	5		20	3.6	36.4	27.47
	6		24	4.4	43.7	22.88
	7		28	5.1	51	19.61
	3	6	18	3.3	32.8	30.49
	4		24	4.4	43.7	22.88
	5		30	5.5	54.7	18.28
	6		36	6.6	65.6	15.24
	7		42	7.7	76.5	13.07
120	1	1	1	0.9	2.95	338.98
	2		2	0.6	5.85	170.94
	3		3	0.9	8.8	113.64
	4		4	1.15	11.7	85.47
	5		5	1.45	14.65	68.26
	6		6	1.75	17.6	56.82
	7		7	2.05	20.5	48.78
	1	2	2	0.6	5.9	169.49
	2		4	1.2	11.7	85.47
	3		6	1.8	17.6	56.82
	4		8	2.3	23.4	42.74
	5		10	2.9	29.3	34.13
	6		12	3.5	35.2	28.41
	7		14	4.1	41	24.39
	1	4	4	1.2	11.7	85.47
	2		8	2.3	23.4	42.74
	3		12	3.5	35.2	28.41
	4		16	4.7	46.9	21.32
	5		20	5.9	58.6	17.06

kV	Current (mA)	Time (secs)	mAs	Dose exposure (Rad)	Dose exposure (mGy)	Number of scans to achieve 1Gy
	6		24	7	70.3	14.22
	7		28	8.2	82	12.20
	1	6	6	1.8	17.6	56.82
	2		12	3.5	35.2	28.41
	3		18	5.3	52.7	18.98
	4		24	7	7.03	142.25
	5		30	8.8	87.9	11.38
	6		36	10.5	105.5	9.48
	7		42	12.3	123.1	8.12
140	1	1	1	0.4	4.15	240.96
	2		2	0.85	8.35	119.76
	3		3	1.25	12.5	80.00
	4		4	1.65	16.7	59.88
	5		5	2.1	20.85	47.96
	6		6	2.5	25	40.00
	7		7	2.9	29.2	34.25
	1	2	2	0.8	8.3	120.48
	2		4	1.7	16.7	59.88
	3		6	2.5	25	40.00
	4		8	3.3	33.4	29.94
	5		10	4.2	41.7	23.98
	6		12	5	50	20.00
	7		14	5.8	58.4	17.12
	1	4	4	1.7	16.7	59.88
	2		8	3.3	33.4	29.94
	3		12	5	50	20.00
	4		16	6.7	66.7	14.99
	5		20	8.03	83.4	11.99
	6		24	10	100.1	9.99
	7		28	11.7	116.8	8.56
	1	6	6	2.5	25	40.00
	2		12	5	50	20.00
	3		18	7.5	75.1	13.32
	4		24	10	100.1	9.99
	5		30	12.5	125.1	7.99
	6		36	15	150.1	6.66
	7		42	17.5	175.1	5.71
	Helical					
100	1	1	1	0.2	1.8	555.56
	2		2	0.4	3.6	277.78
	3		3	0.5	5.5	181.82
	4		4	0.7	7.3	136.99

kV	Current (mA)	Time (secs)	mAs	Dose exposure (Rad)	Dose exposure (mGy)	Number of scans to achieve 1Gy
	5		5	0.3	9.1	109.89
	6		6	1.1	10.9	91.74
	7		7	1.3	12.7	78.74
120	1		2	0.9	2.9	344.83
	2		4	0.6	5.9	169.49
	3		6	0.9	8.8	113.64
	4		8	1.2	11.7	85.47
	5		10	1.5	14.7	68.03
	6		12	1.8	17.6	56.82
	7		14	2.1	20.5	48.78
140	1		4	0.4	4.2	238.10
	2		8	0.8	8.3	120.48
	3		12	1.3	12.5	80.00
	4		16	1.7	16.7	59.88
	5	20	2.1	20.9	47.85	
	6	24	2.5	25.0	40.00	
	7	28	2.9	29.2	34.25	
	CT perfusion					
100	1	30	30	5.5	54.6	18.32
	2		60	10.9	109.2	9.16
	3		90	16.4	163.8	6.11
	4		120	21.8	218.4	4.58
	5		150	27.3	273.0	3.66
	6		180	32.8	327.6	3.05
	Dynamic (Xenon perfusion)					
100	1	16	16	2.9	29.1	34.36
	2		32	5.8	58.2	17.18
	3		48	8.7	87.4	11.44
	4		64	11.6	116.5	8.58
	5		80	14.6	145.6	6.87
	6		96	17.5	174.7	5.72
	7		112	20.4	203.8	4.91



CAUTION When conducting multiple or repeat scans, ensure that the total exposure does not exceed 1Gy CTDI.

Note The **Number of scans** column in Table 27 denotes the exact quantity of scans that result in reaching 1Gy. Be sure to round the value down to its whole number if this column is referenced for any respective reason.

The highest x-ray tube voltage is 140kV and the highest x-ray tube current selection at this voltage is 7mA.

The highest x-ray tube current is 7mA and the highest x-ray tube voltage selection at this current is 140kV.

The nominal x-ray output power is 0.84kW when operating at an x-ray tube voltage of 120kV and x-ray current of 7mA for 4 seconds.

The x-ray tube voltage/current tolerance is $\pm 10\%$.

The nominal x-ray tube voltage is 140kV with 100cfm minimum cooling flow.

The CereTom Elite dose information (21 CFR 1020.33 c)

For a technique of 7.0 mA, 1 second and 120 kV the expected CTDI₁₀₀ center dose is 16.6 mGy. The CTDI₁₀₀ surface dose is 21.8 mGy. The weighted CTDI₁₀₀ dose is 20.1 mGy. For other scanning voltages, these CTDI₁₀₀ values are multiplied by the factors given in the following table.

Table 28: CereTom Elite CTDI₁₀₀ values

CTDI ₁₀₀ Center (C)	CTDI ₁₀₀ Surface (S)	CTDI _w (W)
16.6	21.8	20.1

Table 29: Scan voltage weighting factors for dose calculations

kV	CTDI ₁₀₀ Center (C)	CTDI ₁₀₀ Surface (S)	CTDI _w (W)
140	1.45	1.40	1.41
120	1.0	1.0	1.0
100	0.63	0.66	0.65
80	0.33	0.38	0.37

$$CTDI_w = \left(\frac{2}{3} \times S + \frac{1}{3} \times C \right) \frac{mGy}{s}$$

For allowed scanning techniques NeuroLogica uses the following formula.

$$CTDI_w(kV) = \left(W(kV) \frac{m}{7.0} S \right) CTDI_w(120_{kV})_{mGy}$$

Where **W** is the **kV** relative dose ratio **m** is the x-ray tube current in mA, and **S** is the scan time in seconds. For **Helical** scans we report, consider the following:

$$CTDI_{vol} = \frac{CTDI_w}{Pitch}$$

The dose-length product (DLP) is defined as the product of the $CTDI_{vol}$ multiplied by the scan length.

$$DLP = CTDI_{vol} \times \text{Scan Coverage}$$

The $CTDI_{vol}$ is measured in mGy and the DLP is measured in mGy.cm.

The CereTom Elite dose in air

The dose in air for typical head scan of 120 kV, 6 mA, 4 seconds is 101 mGy. For a maximum technique of 7.0 mA, 4 seconds dose in air values are given by the following table.

Table 30: kV vs. dose in air

kV	Dose in air (mGy)
140	160.78
120	117.06
100	79.95
80	49.63

Note All measurements are averages from ten trials and all measurements were within $\pm 10\%$ of the mean.

Dose linearity with tube voltage and current

The dose or radiation output of the tube is linear with the tube current. The exposures are measured at two different scans at isocenter with and without a CTDI phantom. The following table shows the exposure in the CTDI head phantom.

Table 31: Exposure at two different mAs

120 kV, 20 secs, head CTDI	Exposure at iso (mR)
4 mA	2.22
7 mA	3.87

Table 32: Exposure at two different mAs

120 kV, 4 secs, in air	Exposure at iso
6 mA	1.154
7 mA	1.346

Two linearity factors are computed. The first is the ratio of the exposure at different scan currents; **$F = \text{Exposure (I1)}/\text{Exposure (I2)}$** . The linearity factor is then compared to the current ratio. The F linearity factor should be within 10% of the scan current ration.

$$L_1 = \left| \frac{E(I_1)}{E(I_2)} - \frac{I_1}{I_2} \right| \leq 0.1 \frac{I_1}{I_2}$$

Table 33: Linearity calculations (mGy)

	CTDI head phantom	Air
E_1/E_2	1.743	1.1663
I_1/I_2	1.75	1.1667
L_1	0.007	0.0004
Linearity Test (< 0.1)	0.0004	0.00034

The second linearity factor is computed as described in the IEC 60601-2-44 standard.

$$L_2 = \left| \frac{E(I_1)}{I_1} - \frac{E(I_2)}{I_2} \right| < 0.2 \frac{\left| \frac{E(I_1)}{I_1} + \frac{E(I_2)}{I_2} \right|}{2}$$

Table 34: Linearity calculations in accordance with IEC (mGy)

	CTDI head phantom	Air
$E1/I1$	0.555	0.1923
$E2/I2$	0.553	0.1922
$(E1/I1 + E2/I2)/2$	0.554	0.19225
$L2$	0.002	0.001
Linearity test (< 0.2)	0.0036	0.0052

The radiation output is not linear with respect to the scan voltage; however, it is approximately linear with respect to scan voltage to the power of 2.3, that is $E \propto kV^{2.3}$.

Note Actual results on installed units can vary +20% due to machine and test tolerances.

QA measurements

The QA phantom is typically used to monitor the scanner on site; however, the following phantoms can be used for measuring the imaging performance of the scanner.

Identifying high-contrast resolution

The high-contrast-resolution phantom is a wire placed at the center of a uniform disk. The wire provides an impulse function in the **Axial** plane when it is placed parallel to the scanner-gantry axis-of-rotation. The high-contrast resolution is measured from the **Modulation Transfer Function (MTF)**. Typical **MTF** curves are shown in the following figures. Variations of 10% may occur in measurements due to phantom placement error and measurement inaccuracies.

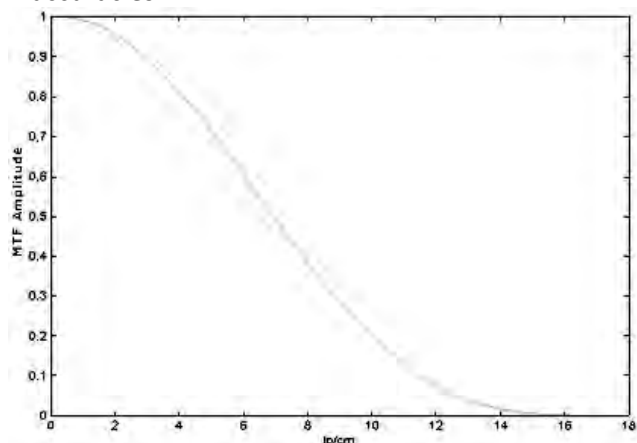


Figure 221: MTF at isocenter, shown for high resolution

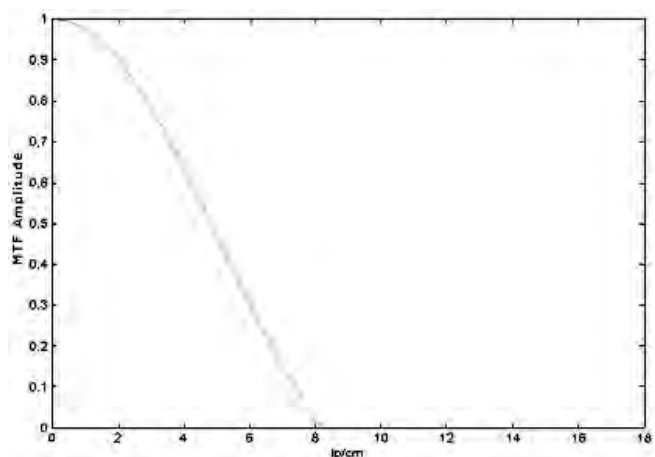


Figure 222: MTF at standard kernel

Noise, uniformity, and mean CT number of water

One of two phantoms may be used in these tests. These are Catphan® 412 or a cylindrical 20cm diameter water cylinder.

The CereTom Elite noise

Noise is measured as the standard deviation at isocenter. The value is $2.1 \pm .2$ HU when the imaging protocol is 140 kV, 42 mAs and standard kernel. This protocol gives a CTDI₁₀₀ center dose of 160 mGy.

Uniformity and Mean CT number

The mean CT number of air is -1000 HU and that of water is 0 HU. The tolerance of the mean CT number will be ± 3 HU. For mean CT numbers measured at different points of the water phantom, the maximum difference in the means will be less than 4 HU.

Low-contrast resolution

The phantom used for low-contrast-resolution measurement is Catphan 412.

The CereTom Elite low-contrast resolution

The **low-contrast resolution** is 3mm at 0.3% contrast when the center CTDI₁₀₀ dose is 160 mGy. The imaging protocol is 140 kV, 42 mAs, 10mm slice thickness, and the standard reconstruction kernel.



Figure 223: Catphan 515 using 120kV, 7mA, 6 secs, and 5mm slice



Figure 224: Catphan 515 scanned using 140kV, 7mA, 6 secs and 5mm slice

Geometric efficiency in the Z axis direction

This is the ratio of the integral of the dose profile integrated over the detector width in Z divided by the total CTDI₁₀₀. The geometric efficiency is 70%.

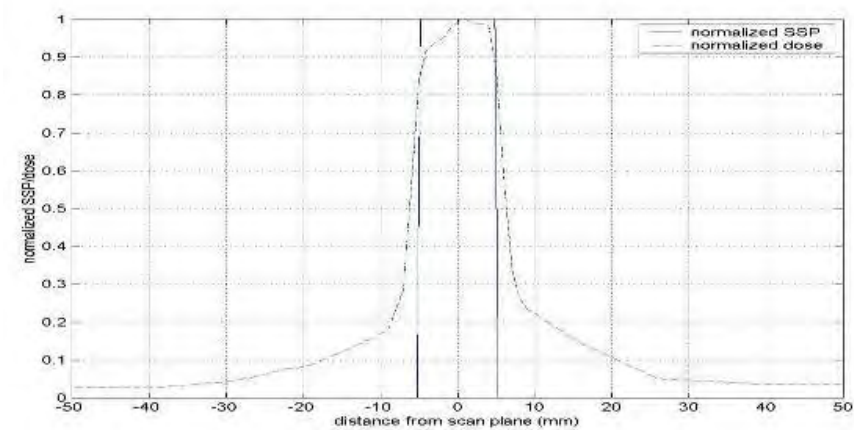


Figure 225: CereTom Elite dose profile

Half-value layer

Table 35: Half-value layer

Scan voltage	100	120	140
Half value	4.9	6.0	6.8

Allowable variations

The following are allowable variations:

Dose	A ±5% variation in dose may occur due to variations between systems and measurement differences. The maximum variation is ±10%.
------	---

High Contrast Resolution	The variation in values on the MTF curve may be $\pm 10\%$. These will occur mainly due to phantom placement errors, measurement inaccuracies and system variations.
Noise	The variation in standard deviation may be $\pm 10\%$ due to variations between systems.
Uniformity	The maximum difference between ROI means in an image is 4 HU. The maximum error in the CT number of water is ± 3 HU.

Scatter radiation



WARNING Exposure to secondary radiation can be harmful, and CereTom Elite usage should only be done under the direct supervision of the facility's qualified **Radiation Safety Officer (RSO)** in compliance with site, local, state, provincial, and national regulations. Only this RSO can perform the calculations necessary to determine what additional safety precautions are necessary, such as shielding, personal protection, and so on.

Note The CereTom Elite scanners are compatible with IRR1999 and EU Directive 96/29/EURATOM.

US charts – curtains opened

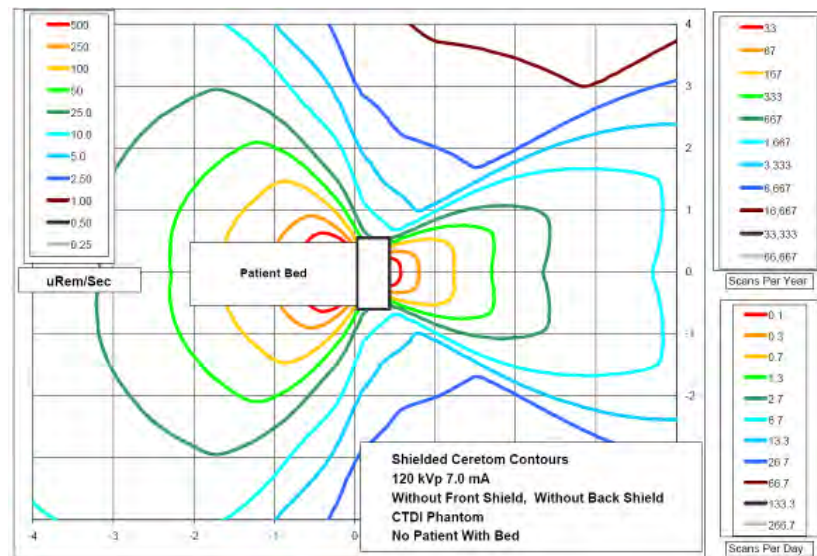
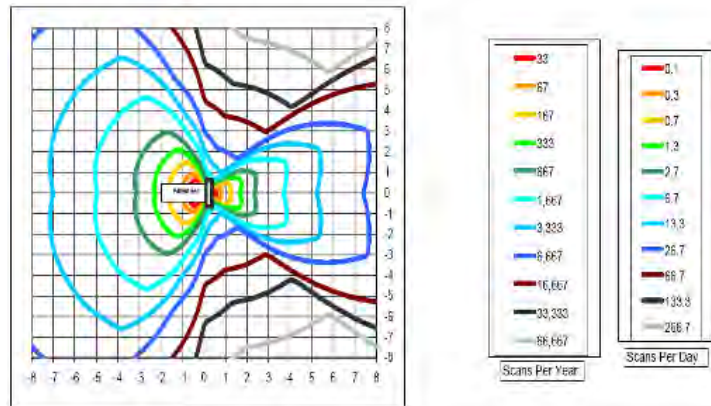


Figure 226: US charts – opened or no curtains chart

Chart measurements represent the horizontal and vertical plane, with open or no curtains.

Note In compliance with IEC 60601-2-44:2009, section 203.11, the previous figure shows the scatter radiation measured at the edge of the gantry in the tomographic plane is $\cong 20\%$ of the scatter radiation measure at the same distance along the axis of rotation in the horizontal plane.



CereTom CT Scatter Radiation at 1.2 and 3 meters from the isocenter.					
Scan / Position	Dose Rate uRem/sec	sec / slice	dose/scan uRem	scans / year	scans/day
1 meter at 45 deg	300.58	2.00	9017	55	0.2
2 meter at 45 deg	74.95	2.00	2248	222	0.9
3 meter at 45 deg	34.48	2.00	1034	483	1.9
1 meter at side	21.59	2.00	648	772	3.1
2 meter at side	5.78	2.00	173	2886	11.5
3 meter at side	2.61	2.00	78	6393	25.6

Assumptions - NeCT1	
Scans per year and scans per day are based upon a total yearly dose of 0.5 Rem	
Dose numbers are air dose and thus more representative of skin dose (not organ dose).	
Assumes no lead vest	
Scatter rates were measured with a CTDI phantom in the beam	
Based upon 250 work days per year	
Scan is at 120 kVp 7.0 mA 15 Slices - Technique is at 14 mAs per slice.	
Scan is Without Back Shield, Without Front Shields, Without Estimated Patient Absorption	

Figure 227: US charts – opened or no curtains data

Chart measurements represent the horizontal and vertical plane with open or no curtains.

US charts – curtains closed

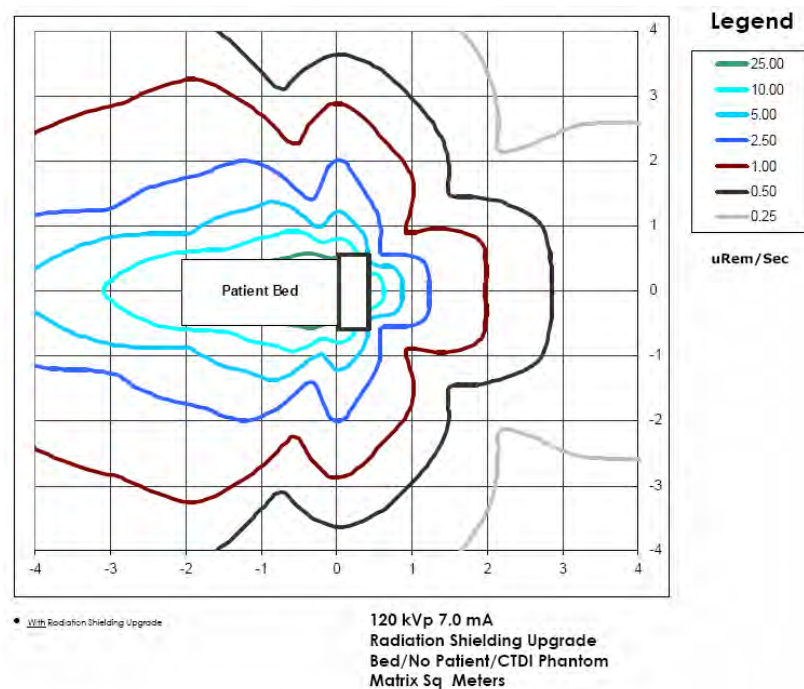


Figure 228: US charts – closed curtains chart and data

Chart measurements represent the horizontal and vertical plane with completely closed curtains.

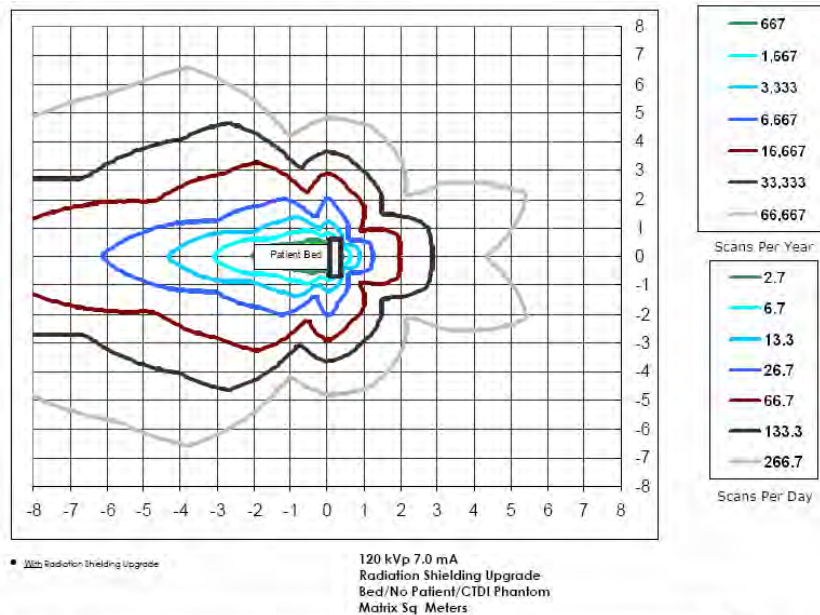


Figure 229: US charts – closed curtains chart and data

Chart measurements represent the horizontal and vertical plane with completely closed curtains.

European charts – curtains open

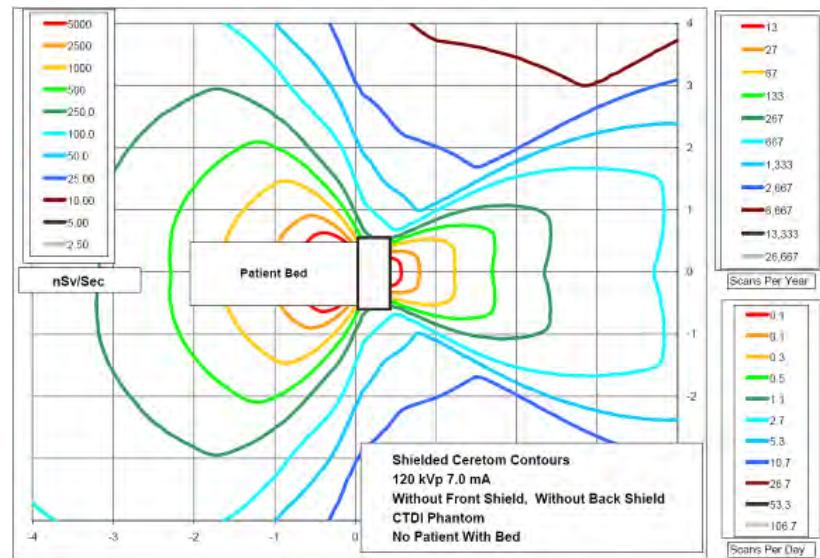


Figure 230: European charts – opened or no curtains chart

Chart measurements represent the horizontal and vertical plane with open or no curtains.

Note In compliance with IEC 60601-2-44:2009, section 203.11, the previous figure shows the scatter radiation measured at the edge of the gantry in the tomographic plane is $\cong 20\%$ of the scatter radiation measure at the same distance along the axis of rotation in the horizontal plane.

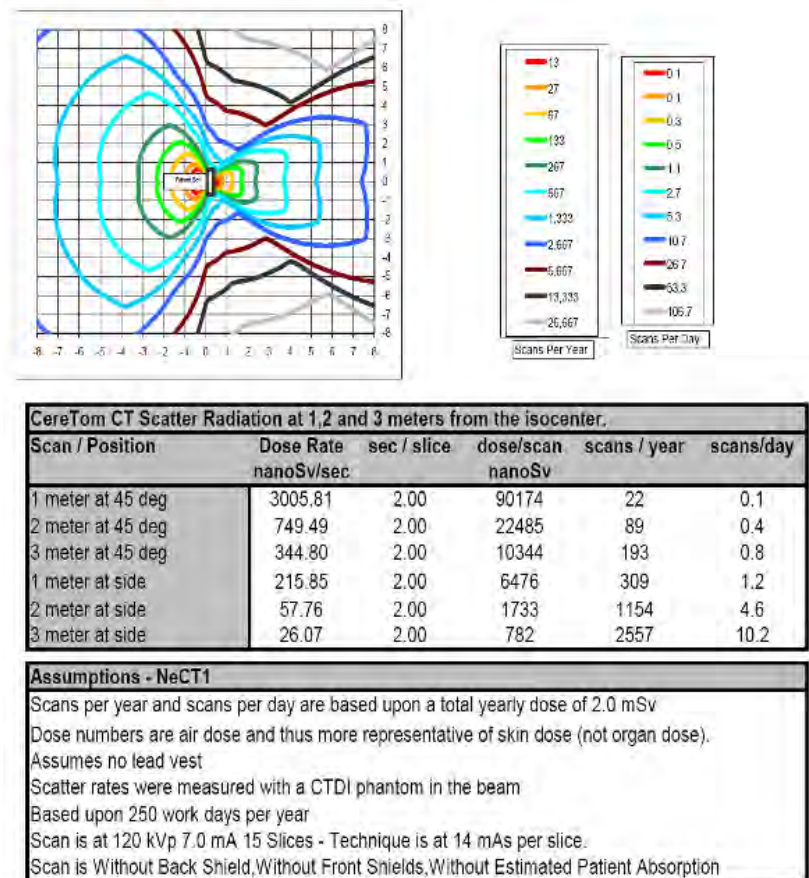


Figure 231: European charts – opened or no curtains chart and data

Chart measurements represent the horizontal and vertical plane with open or no curtains.

European charts – curtains closed

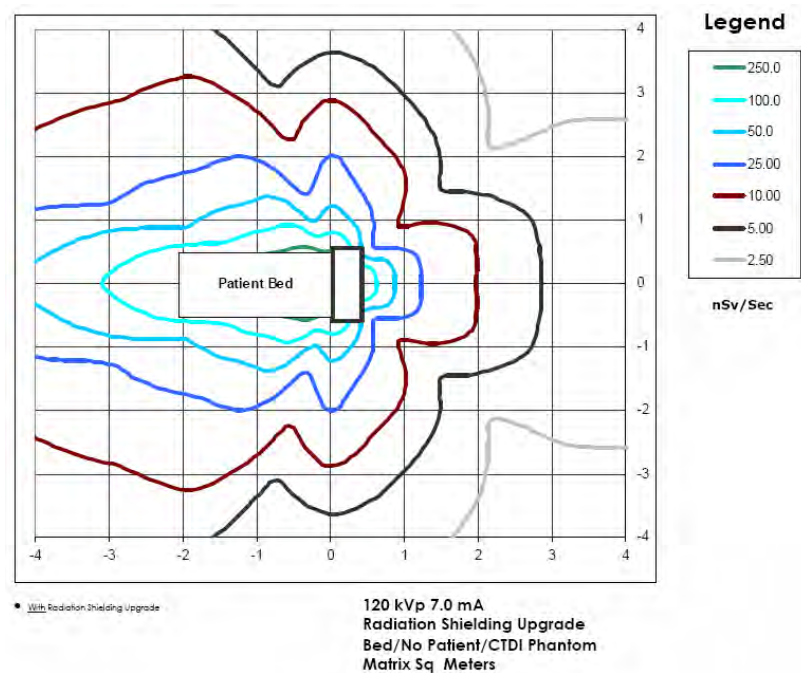


Figure 232: European charts – closed curtains chart

Chart measurements represent the horizontal and vertical plane with completely closed curtains.

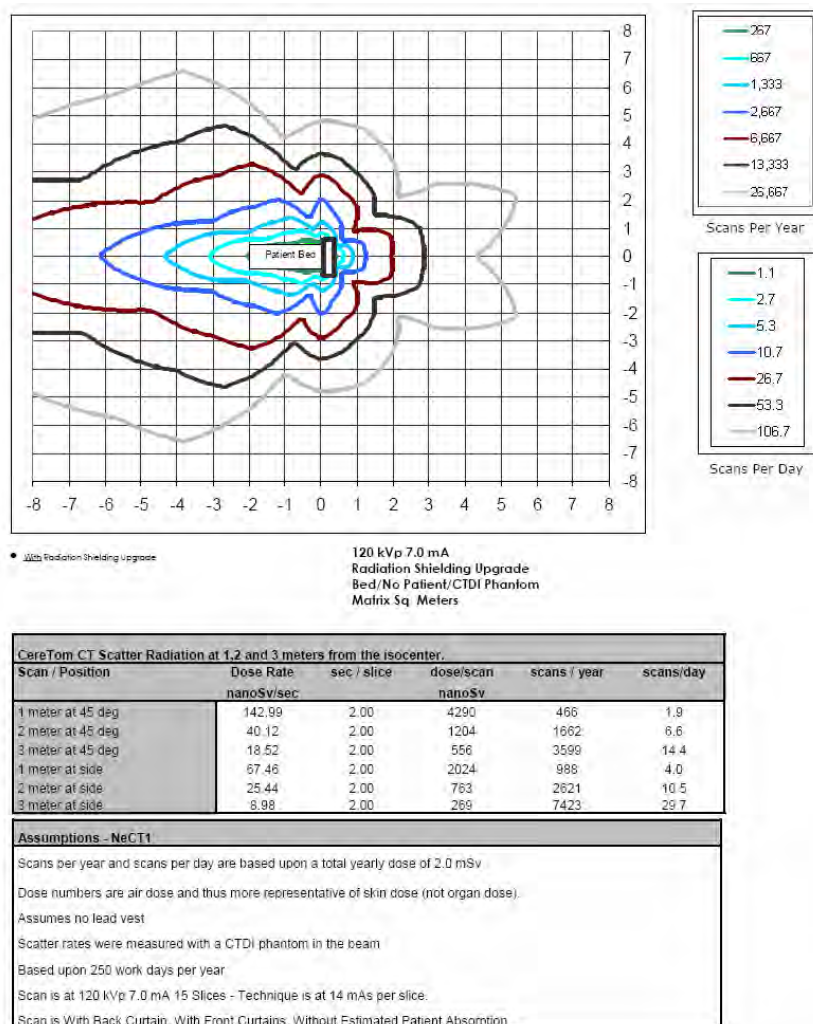


Figure 233: European charts – closed curtains chart and data

Chart measurements represent the horizontal and vertical plane with completely closed curtains.

mAs vs. traditional fixed CT scanners

The CereTom Elite scanners are small-bore scanners designed primarily to scan small anatomy, such as the head and neck. There are significant x-ray geometry and filtration differences that result in a lower x-ray tube current (milliampere-second, mAs) for equivalent patient dose. Because the x-ray tube is closer to the patient than in the large bore scanners, there is a factor of approximately 6x to 7.5x on mAs. The system x-ray filtration is optimized for smaller anatomy and thus there is a 2x factor. Combining the above factors there is approximately a 12x to 15x factor on mAs for equivalent mAs.

CTDI measurements

This section contains a detailed measurement of the CTDI₁₀₀. The dose is measured using a typical scan of 4 seconds at 7mA. The following table lists the center and the surface dose for all scan voltages.

Table 36: The CTDI₁₀₀ for different scan voltages

Scan voltage	CTDI ₁₀₀ center	CTDI ₁₀₀ surface	CTDI ₁₀₀ weighted
140	104.62	131.44613	122.5
120	73.037	94.72125	87.49
100	45.414	61.61775	56.22
80	24.303	36.311625	32.31

The center CTDI₁₀₀ is measured at the center of the CTDI head phantom. The surface dose is the average of surface doses measured at the four different surface locations of the CTDI head phantom. The following table lists the various measurements of the CTDI₁₀₀ surface dose.

Table 37: Surface CTDI₁₀₀ measurements

Scan voltage	Top (0°)	Right (90°)	Bottom (180°)	Left (270°)	CTDI ₁₀₀ surface
140	130.71	134.02	129.93	131.10	131.44
120	96.87	95.52	92.56	96.92	94.72
100	61.73	61.59	61.46	61.68	61.61
80	36.19	36.06	36.80	36.19	36.31

Additional scatter measurements

Additional scatter measurements along the perpendicular plan were also taken using the CTDI head phantom with the back curtain closed and the front curtains partially closed to simulate a real scan; however, it should be noted that the scatter measured with the CTDI phantom *only* is typically higher than the actual scatter radiation from a real patient. Due to the scanner height, the measurements were done at the positions noted in the next figure, which shows how to set up the system for scatter measurements.

The scatter measurements were done using the RadCal survey meter and the 1800cc probe.



Figure 234: System setup for scatter measurements

The scatter was measured using the following scan protocol: 140 kV, 7 mA, 10 seconds. The following table lists the measured scatter per second in the back of the scanner.

Table 38: Scatter in vertical parallel to axis of rotation ($\mu\text{Rem/s}$)

	Distance from iso. (cm)		
	75cm	125cm	175cm
50cm below iso	16.8519	7.1688	4.06725
At iso	19.20525	8.61735	4.52835
50cm above iso	10.94025	6.6729	3.9759
75cm above iso	2.36205	4.6719	3.64095

Table 39: Scatter in vertical plane on patient side (mRem/s)

	Distance from iso. (cm)		
	75 cm	125 cm	175 cm
At iso	0.428	0.155	0.075
50cm above iso	0.375	0.149	0.069
75cm above iso	0.274	0.140	0.070

Note By design, this scanner's frame (about the bore) provides the primary shielding in the vertical plane perpendicular to the axis of rotation, therefore scatter radiation is negligible in this plane.

Chapter 8 Patient Registration

Patient Registration is the first step in the patient scan process.

You can register a patient in the following ways:

- Manually register a patient the **Patient Registration** tab.
- Perform a query to acquire already-entered patient data from the **Hospital Information System (HIS)** or **Radiology Information System (RIS)**.

It is assumed that the workstation is connected to the site's **HIS/RIS** system. If you are not connected, you can always manually register a patient.



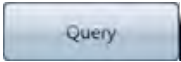
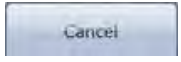
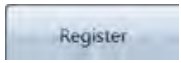
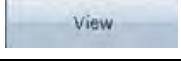
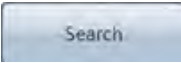
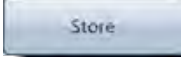
Figure 235: Active Patient Registration tab

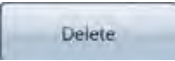
Navigating the Patient Registration screen

Make sure the **Patient Registration** tab is selected.

Notice the buttons at the bottom of the **Patient Registration** dialog box. Many of these buttons are active *only* if you are already connected to the site's **HIS/RIS** or if you clicked the **Query** button, and the list of patients populated in the **Query Results** list. When a patient is selected, the buttons are active.

Table 40: Patient Registration buttons

Patient Registration button	Action
	Searches the HIS/RIS server for scheduled patients. The population of patient information could take several minutes to appear, depending on the number of patient entries the query retrieves after clicking the Query button.
	Cancels the current query. Entries retrieved prior to cancellation appear in the Query Results list and Stored Results if they are moved there.
	Registers the selected patient and takes you to the Acquisition tab to select a protocol to be used for scanning.
	Shows selected patient details.
	Searches queried patient entries for specific information.
	Selects patient(s) from query results and moves them into the Stored Results list.

Patient Registration button	Action
	Removes patient(s) from the Stored Results list.
	Manually enters a new patient and, when completed, takes you to the Acquisition tab to select a protocol to be used for scanning.

Registering the patient

The following procedures show you how to register or enter patient information into the system before scanning a patient. Patients are registered manually or queried from the **Hospital Information System/Radiology Information System (HIS/RIS)**. The system can be configured to add or create specific patient information when the patient is registered.

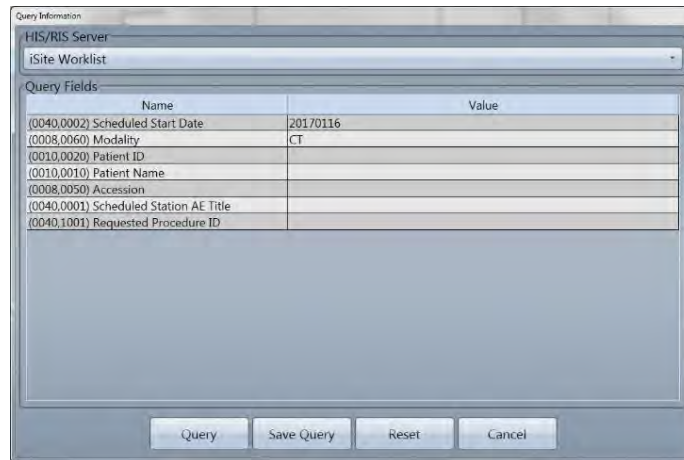
Querying patient information

1. If necessary, click the **Patient Registration** tab on the main screen.



Figure 236: Patient Registration tab

2. Click the **Query** button at the bottom of the screen.
The **Query Information** dialog box appears.



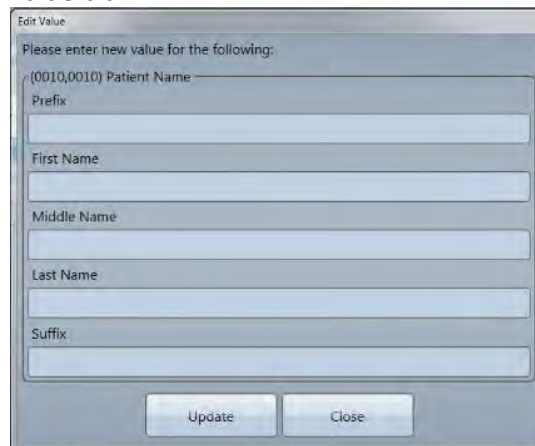
The dialog box is titled "Query Information". It features a dropdown menu for "HIS/RIS Server" and a list box for "iSite Worklist". Below these is a table with two columns: "Name" and "Value".

Name	Value
(0040,0002) Scheduled Start Date	20170116
(0008,0060) Modality	CT
(0010,0020) Patient ID	
(0010,0010) Patient Name	
(0008,0050) Accession	
(0040,0001) Scheduled Station AE Title	
(0040,1001) Requested Procedure ID	

At the bottom of the dialog box are four buttons: "Query", "Save Query", "Reset", and "Cancel".

Figure 237: Query Information dialog box

- Click the **HIS/RIS Server** dropdown and select the worksite to pull data from.
The default worksite appears at the top. If there is no list, see your site administrator to set it up.
- Double-click any of the named **Query Fields** you would like to use to query for patients by entering the value in the **Value** column to query.
A popup associated with the **Query Field** you selected appears. For example, if you double-click the **Scheduled Start Date** row, the **Edit Value** popup appears. Enter the desired start date. Another example would be to click the **Patient Name** row. Again, the **Edit Value** popup appears; however, this time **Patient Name** text boxes are provided so you can type the patient's name to query. You can click any of the **Value** rows to fill in data to help query for the patient you are looking for. You can enter as much or as little information as needed. If no information is available, leave the value blank.



The "Edit Value" popup is titled "Edit Value" and contains the text "Please enter new value for the following:". Below this is a label "(0010,0010) Patient Name".

There are five text input fields for the patient name:

- Prefix
- First Name
- Middle Name
- Last Name
- Suffix

At the bottom of the popup are two buttons: "Update" and "Close".

Figure 238: Edit Value popup for Name

- When you have finished filling in query selections, perform one of the following:

- Click the **Update** button to query based on the newly entered data to help narrow your search.
 - Click the **Close** button to remove any changes and return to the previous **Query Information** popup.
6. When you have finished filling in query selections, perform one of the following:
- Click the **Query** button to retrieve scheduled patients.
 - Click the **Save Query** button to save the query values for future use.
 - Click the **Reset** button to change the query back to the former query.
 - Click the **Cancel** button to remove the changes you made.

A list of patients matching your selected criteria variables populates in the **Query Results** list on the **Patient Registration** tab.

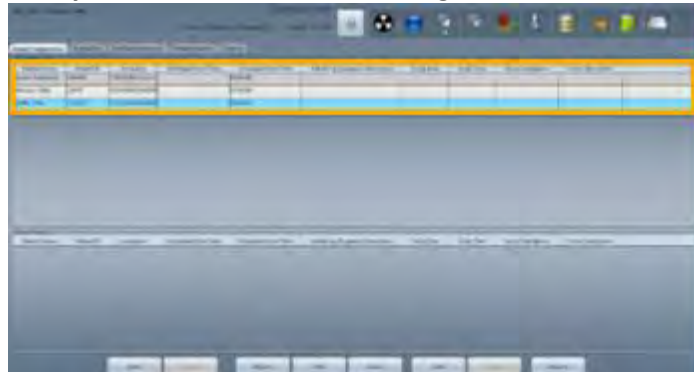


Figure 239: Patient Registration Query Results table

7. Select a patient and click the **Register** button to register the patient for the exam.
- The system enables and opens the **Acquisition** tab. To perform the acquisition steps, see “Performing a scan” on page 221.

Storing patients in the Stored Results list

This list is helpful when multiple patients need to be scanned and a connection to a worksite like **HIS/RIS** is unavailable at the exam location.

1. If necessary, go to the **Patient Registration** tab to query the patients(s).
2. Perform steps 2 through 5 in “Querying patient information” on page 211.
3. Click the **Query** button.
Let the criteria you selected populate into the **Query Results** list area.
4. Select one or more patient entries from the **Query Results** list.
Select patients in the following ways:
 - To select one patient, click anywhere in the patient’s row.
 - To select more than one patient at a time, press and hold the **Ctrl** key and click patient entries until finished and release the **Ctrl** key.

- To select all the patients, press and hold the **Shift** key, click the first patient in the list, then click the last patient to highlight all patients between the first patient selected and the last.
5. Click the **Store** button.



Figure 240: Store button active

6. The patient information you selected appears in the **Stored Results** list at the bottom of **Patient Registration**.

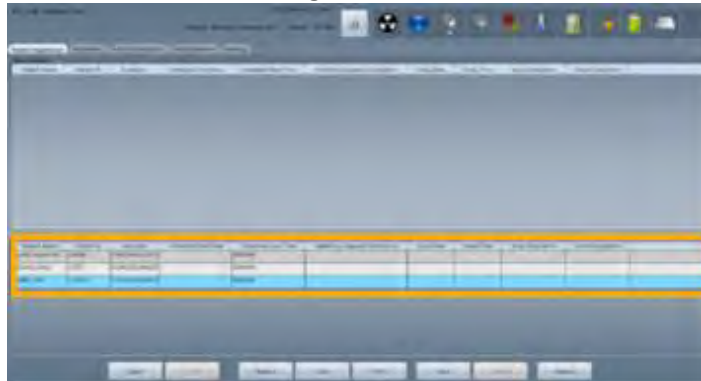


Figure 241: Patient Registration Stored Results table

7. Click the patient you want to select from the **Stored Results** table.
8. Click the **Register** button to register the patient for the exam. The system enables and opens the **Acquisition** tab. To perform the acquisition steps, see “Performing a scan” on page 221.

Manually registering a patient

You manually register a patient for examination when the **HIS/RIS** server is unavailable, the patient cannot be found, and/or was never entered into the system.

1. If necessary, go to the **Patient Registration** tab.



Figure 242: Patient Registration tab

- Click the **Manual** button at the bottom of **Patient Registration**.
The **Exam Information** dialog box appears with the **Patient** tab open.

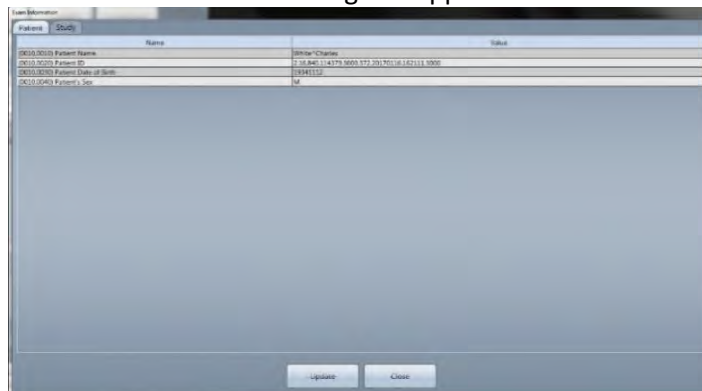


Figure 243: Exam Information dialog box

- For **Patient Name**, double-click the **Patient Name** value.
The **Edit Value** dialog box appears with patient name fields.
- Enter patient name information in the fields provided and click one of the following buttons:
 - Click the **Update** button to save your entries and close the **Edit Value** dialog box.
 - Click the **Close** button to close the **Edit Value** dialog box **without** saving your work.

Notice that the value appears with the last name first, separated by ^, the first name next, separated by ^, the middle name (if you supplied that information), and any other information you entered.

Note The **Patient ID** is automatically generated by the system; you can replace this automated identifier with your patient's hospital ID number.

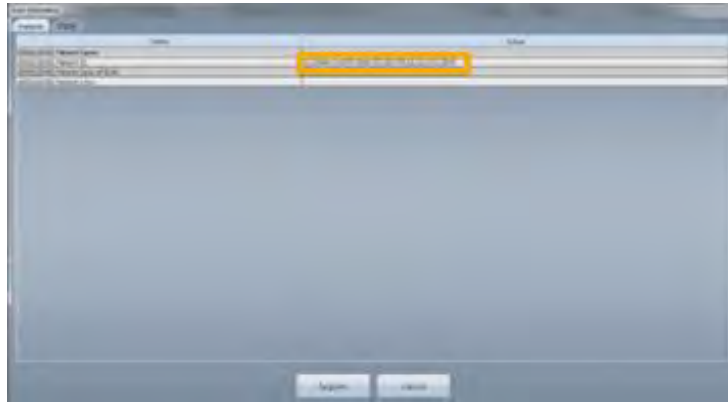


Figure 244: Patient ID field

5. For the **Patient Date of Birth**, perform the following:
 - Double-click the **Patient Date of Birth** field.
 - Enter the patient's birth date in the **Patient date of birth** field.
Be sure to move the cursor to the far left to ensure two digits are included for the month and the day; four digits are required for the year.
 - Perform one of the following:
 - o Click the **Update** button to save your work and close the **Edit Value** dialog box.
 - o Click the **Close** button to close the **Edit Value** dialog box without saving your work.
6. For the **Patient's Sex**, perform the following:
 - Double-click the **Patients Sex** field.
 - Enter the patient sex in the field by entering the appropriate letter:
 - o **F** for Female
 - o **M** for Male
 - o **O** for Other
 - Perform one of the following:
 - o Click the **Update** button to save your work and close the **Edit Value** dialog box.
 - o Click the **Close** button to close the **Edit Value** dialog box without saving your work.
7. Perform one of the following:
 - Click the **Register** button to register your patient data.
 - Click the **Cancel** button to exit without entering your data.

When you click the **Register** button, the system enables and opens the **Acquisition** tab.

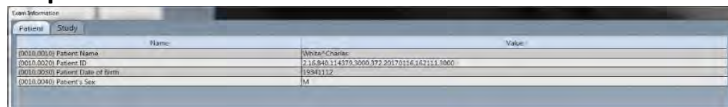


Figure 245: Patient data filled in

After your patient is registered, view the **Patient Exam Details** to ensure your data is correct.
If it is not correct, go to the next step to make the necessary changes.

8. Click the **Expand** link.
The **Exam Information** popup appears.

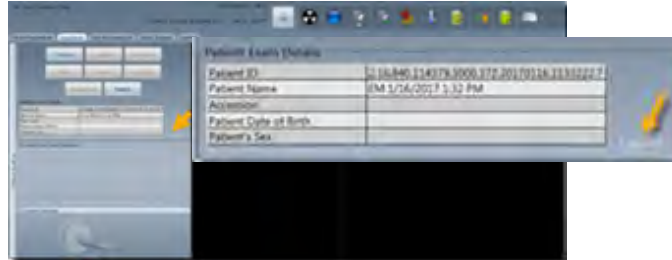


Figure 246: Expand link in context and close up

9. Make your changes in the **Exam Information** popup.
10. Click the **Update** button to save changes.

Viewing patient information

This procedure allows you to view, but not change, patient information.

1. If necessary, click the **Patient Registration** tab on the main screen.



Figure 247: Patient Registration tab

2. Select a patient from the **Query Results** list or the **Stored Results** list.
3. Click the **View** button.
4. Review the patient's information.
This popup presents static information that you cannot change.
5. Click the **Close** button to exit the **View Entry Information** popup.

Deleting patient(s) from a Stored Result list

Patient information can be manually deleted from the **Stored Results** list; you cannot delete patients from the **Query Results** list.

1. If necessary, go to the **Patient Registration** tab.

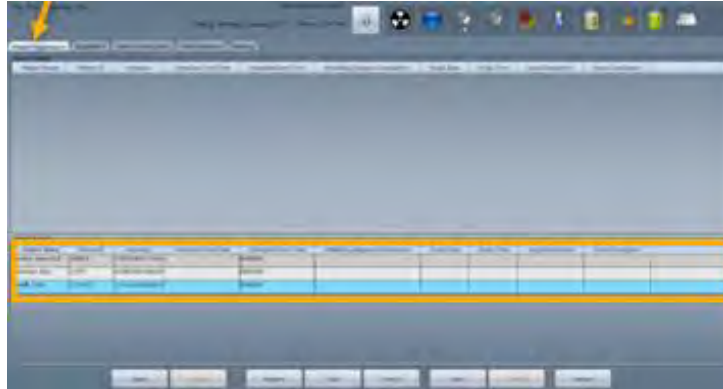


Figure 248: Patient Registration tab

2. Select one or more patients from the **Stored Results** list to delete.
Select patients in the following ways:
 - To select one patient, click anywhere in the patient's row.
 - To select more than one patient at a time, press and hold the **Ctrl** key and click patient entries until finished and release the **Ctrl** key.
 - To select all the patients, press and hold the **Shift** key, click the first patient in the list, then click the last patient to highlight all patients between the first patient selected and the last.
3. Click the **Delete** button.
The patients you selected are removed from **Stored Results** list.

Chapter 9 Patient Scanning

After you register the patient, the **Acquisition** tab automatically opens. The **Acquisition** tab lets you check that the selected patient information is accurate before you perform the scan. The **Acquisition** tab is also where you select protocols for the scan before you scan the patient. A protocol determines the parameters used to acquire patient images.

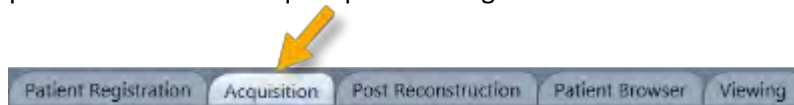


Figure 249: Active Acquisition tab

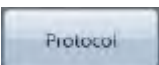
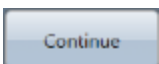
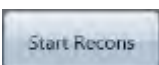
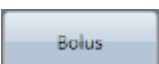
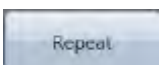
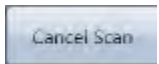
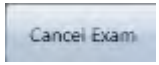
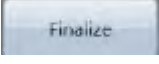
After the protocol is selected, you can scan the patient. See “Performing a scan” on page 221.

The following table provides information on the buttons on the **Acquisition** tab and what they are used for. Later you will learn how to set protocols for the scan.



CAUTION When conducting multiple or repeat scans, make sure the total exposure does not exceed maximum limit of 1Gy.

Table 41: Acquisition buttons

Acquisition button	Action
	Allows you to modify the selected protocol or choose a new protocol.
	Authorizes the scanner to move to the next step if applicable.
	Begins any post-reconstructions that were defined during the protocol setup.
	Appears during Bolus Tracking protocol, only to identify bolus tracking settings.
	Allows you to repeat a portion or all the scan.
	Cancels the current scan within a protocol.
	Cancels the entire exam.
	Completes the examination.

Identifying Scan Types

Scan types identify how images are acquired during a scan. The following Scan types are available.

Axial

The **Axial** scan type lets you scan in the **Transverse** plane. Data is acquired as the x-ray tube rotates around the patient.

Helical

The **Helical** scan type acquires data continuously as the x-ray tube rotates around the patient and the scanner translates over the patient in the Z axis.

Helical scan coverage

Helical scan coverage is typically truncated by 1.25cm to cover a half rotation at each end. Figure 250 shows exposure using a radiographic film. The film shows exposure of the **Helical** scan-type coverage of 60mm. X-ray was on for 60mm. It took the scanner one extra second to completely stop after x-rays turned off. Figure 250 also shows exposure length to be 60mm.

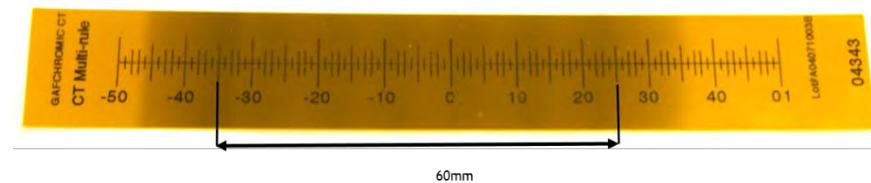


Figure 250: Radiographic film of the ~60mm scan coverage

The number of 1.25mm slices generated is 48, which covers about 60mm. The scanner parallel images start at the laser location and end where the scan ends. Figure 251 shows the scan markers as described above. For a typical **Helical** scan with 23cm coverage, excess dose is 5.4% of scan dose.

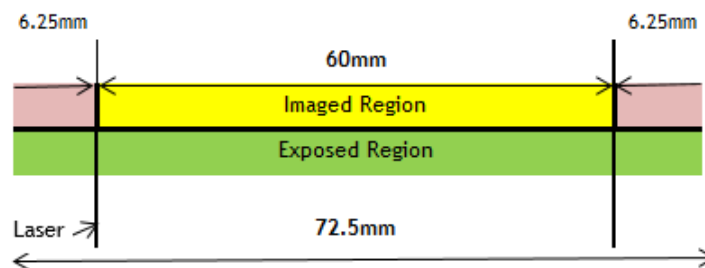


Figure 251: Scan coverage and imaged region for a true coverage of 60mm

Dynamic

The **Dynamic** scan type acquires data at multiple time points over the same anatomic location while the scanner remains stationary; x-ray exposure can be continuous or intermittent.

Reference

The **Reference** scan type acquires a single 10mm slice to review anatomical position or place the **Region of Interest (ROI)** for **Bolus Tracking** scans.

Reference scanning can only be used in conjunction with **Helical** and **Dynamic** scanning during a **CT Angiography (CTA)** or **Perfusion** protocol.

Scout

The **Scout** scan type acquires data continuously as the x-ray tube remains stationary at a designated angle and the scanner translates over the patient in the Z axis. The resulting **2D** projection is used during scan planning.

Performing a scan

You cannot complete this procedure without a registered patient.

Note If the scan needs to be stopped perform the following:

For an immediate or hard stop, press the **E-STOP** button. This stops x-ray, centipede movement, and gantry rotation immediately.

For a controlled stop, press the **Cancel Scan** button.

- From the workstation, go to the **Patient Registration** tab to assign the patient to the scan in one of the following ways:
 - Query an already existing patient from the HIS/RIS.
 - Manually register the patient.
See “Chapter 8 Patient Registration” on page 210.

The **Acquisition** tab will be activated when the patient is registered.

- From the **Acquisition** tab, click the **Protocol** button to open the **Exam Planner** dialog box.

- On the workstation screen, click the appropriate option:

Adult	To scan with adult scan protocols, which are stored by anatomical location.
Pediatric	To scan with pediatric scan protocols, which are stored by anatomical location.
Trauma 	To scan with protocols stored in the Trauma orb.

Note Protocol parameters are customized to meet your requirements in conjunction with local and nationally recognized published guidelines. These protocols **must be** approved by your facility physicist **before** the system’s acceptance.

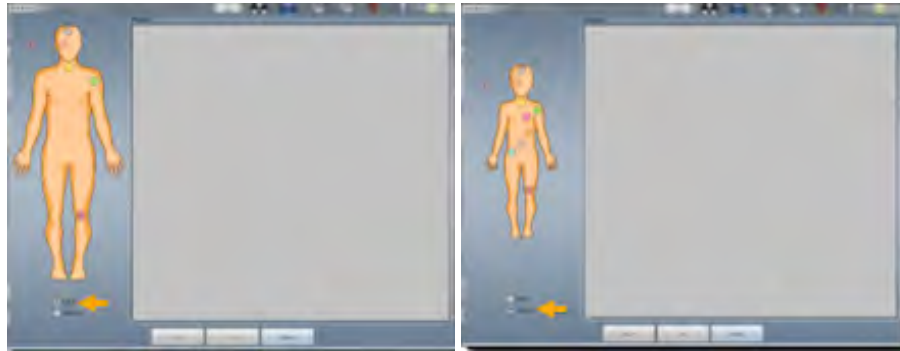


Figure 252: Exam Planner for Adult and Pediatric

4. Click the colored orb corresponding to the appropriate body part you will scan.

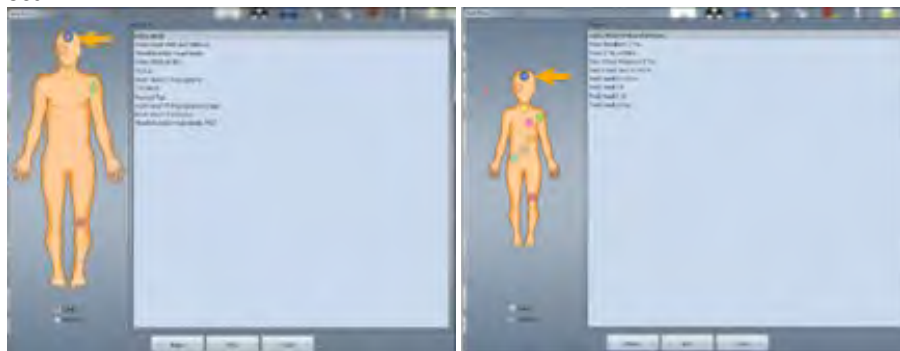


Figure 253: Anatomical orbs, in this case the head orb for Adult and Pediatric

5. Click the appropriate protocol from the list.
6. Click the **Edit** button to review the selected protocol.

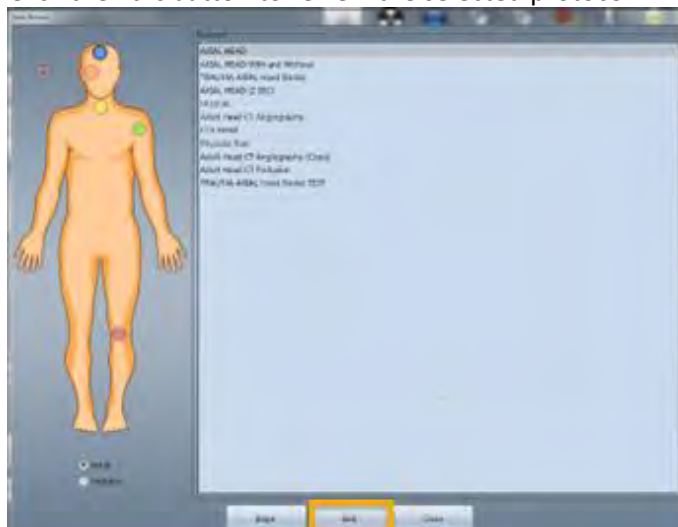


Figure 254: Protocol selected and Edit button active

The **Edit Protocol** dialog box appears.



Figure 255: Edit Protocol dialog box

The **Protocol Information** tab displayed on the left and the Protocol's **Series** boxes displayed on the right show the series that are already created. The **Patient Position** appears identical whether it is for an adult, pediatric, or trauma patient.

Note You can modify a protocol; however, changes you make from **Acquisition** will not be saved permanently. Permanent changes to protocols can only be made in **Protocol Manager**.

Assuming you have the proper user privileges, you can modify protocol parameters such as kV, mA, and coverage at the time of the scan, but the modifications will not be saved for future use.

7. To edit an existing protocol, perform the following:
 - In the **Edit Protocol** dialog box, go to the **Protocol's Series** list box and select the series to modify.
 - Click the **Edit** button.
The **Edit Series** dialog box appears.

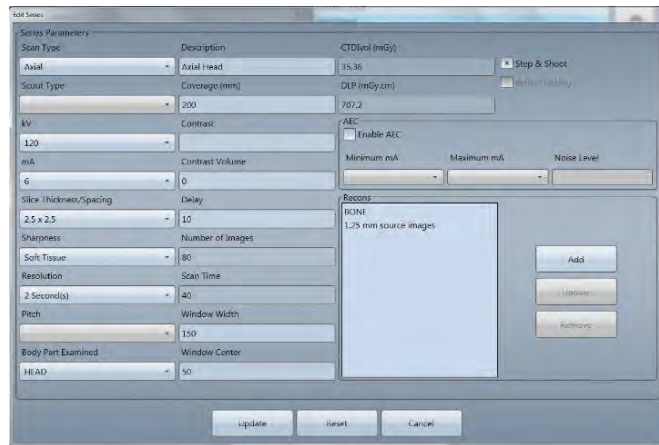


Figure 256: Edit Series dialog box

- Make the desired changes. Select the **Update** button in the **Edit Series** dialog box.
 - Alternatively, click the **Reset** button to remove any changes and return to the previous settings or click the **Cancel** button to return to the previous dialog box.
8. Click the **Update** button on the **Edit Protocol** dialog box.



Figure 257: Update button

9. Set up the patient and scanner.
See "Positioning the patient" on page 84.
10. Make sure the scanner is in **Scan** mode.

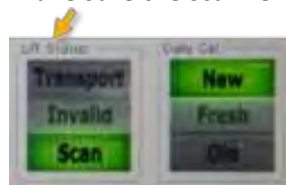


Figure 258: Scan mode

11. On the touch screen, press the **Laser On** button to turn on the laser and use it to align the patient to the scanner.
See “Positioning the scanner before a scan” on page 83.
12. Press the **Zero Ref** button on the touch screen to zero the scanner.

Note If zero reference is not selected when starting your scan, the scanner considers the last known zero reference point to be the origin and start-point for the next scan. **Always** make sure to zero reference the scanner, when you set up a scan.

- Click the **Begin** button on the workstation from the **Exam Planner** dialog box.

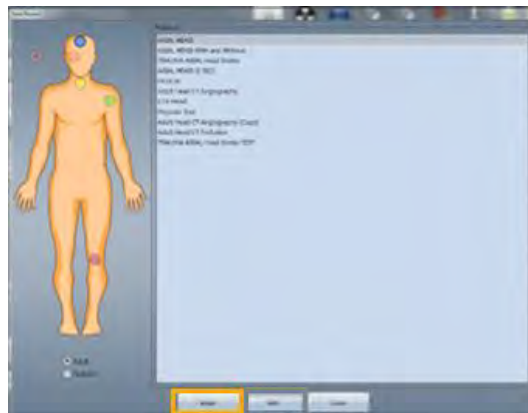


Figure 259: Begin button

The system state orb will change color from yellow to green. The **System Ready to Scan** popup appears.

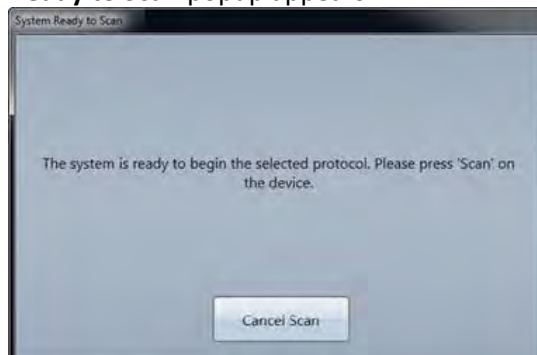


Figure 260: System Ready to Scan popup

14. Press the **Scan** button on the touch screen to acquire your scan.
The pre-set scan delay countdown begins. The green light turns off when the **Scan** button is pressed.



Figure 261: Starting Scan

Note If a second scout is defined in your protocol, press the **Scan** button when ready.

15. If applicable, set your parameters and **Field Of View (FOV)** on your scouts.

Note **FOV** can only be adjusted when two scouts are acquired.

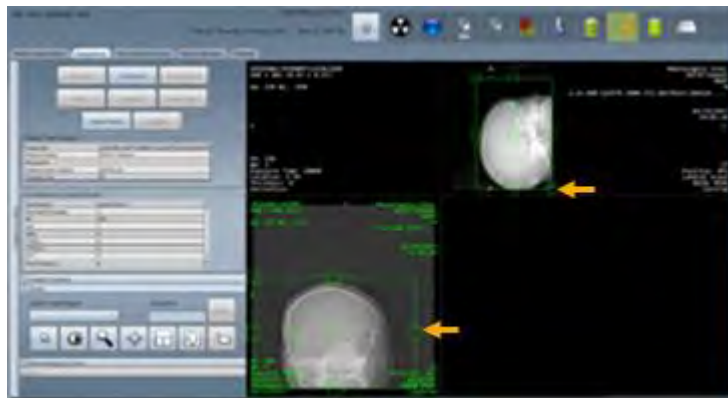


Figure 262: Scouts and FOV button

Scan coverage can be modified by selecting the drag boxes and adjusting the lines and can be centered by clicking on the small green circle and dragging the plan box.

16. Click **Continue** to proceed with your planned scan.
17. The **Pending Scanning Movement** popup appears.

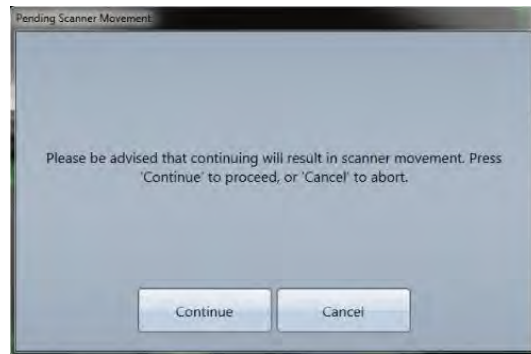


Figure 263: Pending Scanner Movement popup message

18. Click the **Continue** button to scan.
Click the **Cancel** button to cancel the scan.

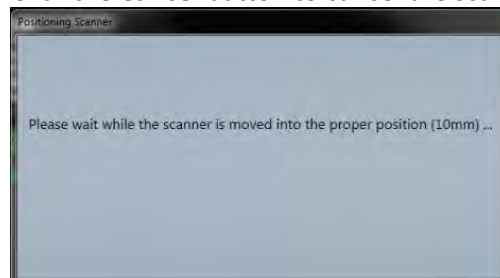


Figure 264: Positioning Scanner popup message – Wait for scanner to move to position

19. The **System Ready to Scan** popup appears.

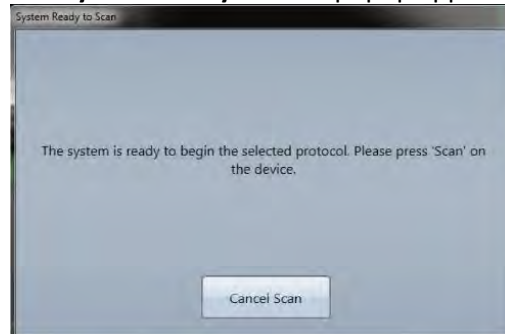


Figure 265: System Ready to Scan popup message – System is ready to begin scan

20. Press the **Scan** button on the scanner touch screen to acquire your scan. The pre-set scan delay countdown begins. The green light turns off when the **Scan** button is pressed.
21. If the **Perform Reconstructions** popup appears, do one of the following:
 - Click the **Yes** button to perform post reconstructions now.
 - Click the **No** button to pause the reconstructions until a later time. When ready, click the Start Recons button.

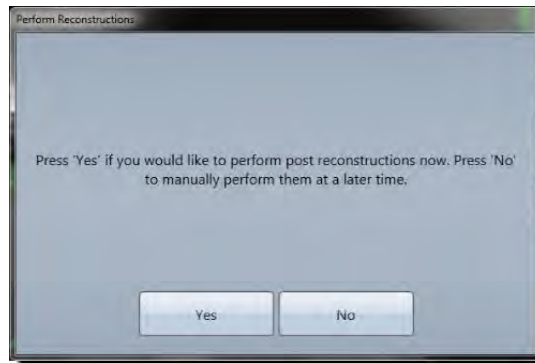


Figure 266: Perform Reconstructions popup message – To perform post reconstructions

22. Use the **Viewing** tools to review the scan.
See “Examining the scanned image with tools” on page 247.
23. Click the **Finalize** button when finished.
The dose report if **Show Dose Report** in **System Configuration** is enabled appears. In addition, the examination details are saved.



Figure 267: Dose report

Changing the scan delay default setting from touch screen

The scan-delay default setting is changed or accepted – **after** the patient and scanner are in position.

1. On the **Options** tab, press the **Scan Delay** button.



Figure 268: Scan Delay button

The **Select Scan Delay** popup appears.



Figure 269: Select Scan Delay popup

2. Press the appropriate delay time you want to set (0 to 22 seconds).
3. Press **Ok** to set the delay time.

Cancelling a scan from the touch screen

This procedure assumes you have started a scan.

1. Press the **Cancel Scan** button on the touch screen at any time during the scanning process to cancel a scan.

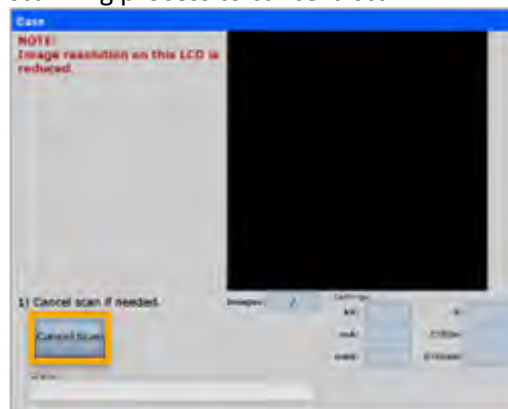


Figure 270: Cancel Scan button on the touch screen

After the **Cancel Scan** button is pressed, the system returns to the **Main** tab. The **Cancel Scan** button stops the scan, however, there may be a delay as the scanner goes through its abort process.

Note If the scan is canceled during an actual exposure, the scanner will stop at the end of that exposure. If you click the **Cancel** button after the scanner has completed its preparation, the scanner will make that exposure and then stop.

Using Training mode to simulate a scan for training purposes

The **Training Mode On** button lets you simulate a scan without emitting radiation.

1. On the touch screen, press the **Training Mode On** button.

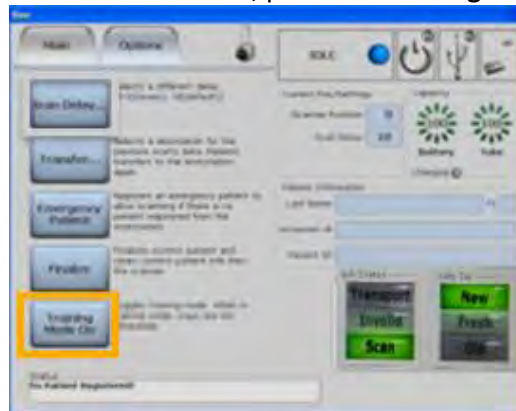


Figure 271: Training Mode On button

The **Training Mode On** button is a toggle button. If **Training Mode On** is showing and you press it, the button changes to **Training Mode Off**. When active, the text 'TRAINING MODE' appears at the lower, left corner of the touch screen as shown in Figure 272.

2. Check that the "**TRAINING MODE**" message appears to indicate that Training mode is active.

Note No x-rays are emitted while in **Training** mode. Use **Training** mode during short scans and from the LCD touch screen, only.



Figure 272: TRAINING MODE message to indicate Training mode on

3. To turn off **Training** mode, press the **Training Mode Off** button. The “TRAINING MODE” message disappears and the **Training Mode On** button appears.

Scanning with special features

The following features are available for use in protocols.

Using the step-and-shoot option

The **Step & Shoot** option in the protocol lets the user control the start of the scan acquisition. This is helpful in the case of an uncooperative or ill patient where motion is an issue.

1. Perform steps 1 through 6 in “Performing a scan” on page 221.
2. If necessary, change the **Scan Type** to **Axial**.
3. Click the **Step & Shoot** option in the **Edit Series** dialog box.



Figure 273: Step & Shoot option in the Edit Series dialog box

4. Click the **Update** button in the **New Series** dialog box.
5. Click the **Update** button in the **Edit Protocol** dialog box.

See steps 9 through 14 in “Performing a scan” on page 221.

6. Click the **Begin** button in the **Exam Planner** dialog box to begin the scan. The state orb will change color from yellow to green. The **System Ready to Scan** popup appears.

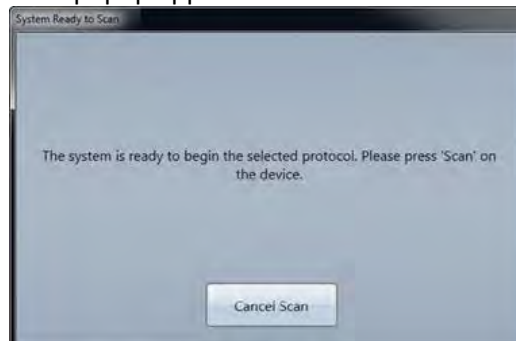


Figure 274: System Ready to Scan popup

7. To continue the scan, go to the scanner and press the **Scan** button on the touch screen. The first set of images are acquired at this position. The **Step & Shoot** popup appears for you to control the next acquisition.



Figure 275: Step & Shoot popup

8. Click the **Shoot** button to start the scan. To cancel the scan, click the **Cancel** button.
9. Continue for the length of the scan.
10. Click the **Finalize** button when finished.

Performing a scan with Automatic Exposure Control

Note Depending on system’s configuration, not all functions may be available to perform this procedure.

Computed Tomography (CT) is responsible for the largest contribution to the collective effective dose to patients in radiology. The challenge to radiologists and medical physicists is to establish adequate image quality with the lowest radiation exposure to the patient.

Tube current (mA) is one of the key technical scanning parameters for adjusting radiation dose in CT. To optimize radiation dose in CT, users can adjust mA either with manually selected values or with the application of Automatic Exposure Control (AEC). **AEC** refers to the automatic adaptation of mA based on user specified image quality and attenuation characteristics of the scanned body region.

Scout scans provide a graph of mA values based on object density and desired noise level. Axial or Helical scans in the protocol can utilize AEC, limiting the mA value of each slice to the minimum necessary to achieve the desired image quality. This ability to modulate the mA throughout the scan to achieve the desired noise level can reduce patient dose.

When using AEC, it is vitally important that the patient is well-centered in the gantry. AEC aims to deliver the specified image quality across a range of patient sizes. The use of AEC may change the planned CTDI_{vol} and DLP values. It tends to increase CTDI_{vol} for large patients and decrease it for small patients relative to a reference patient size.

Note Ensure patients are accurately centered in gantry.

Do not use AEC when any type of metal is going to be scanned.

Do not use AEC with a small FOV, that is, tiny neonatal patients.

Only one Axial or Helical series is allowed within an AEC protocol.

An automatic adjustment of the tube's current cannot occur when the tube potential is changed.

AEC can only be used with the following Sharpness options:

- Soft Tissue
- Pos.Fossa/Vessel
- Sharp

1. Perform steps 1 through 6 in “Performing a scan” on page 221.
2. If necessary, change the **Scan Type** to **Axial** or **Helical**.
3. Under **AEC**, click the **Enable AEC** option.

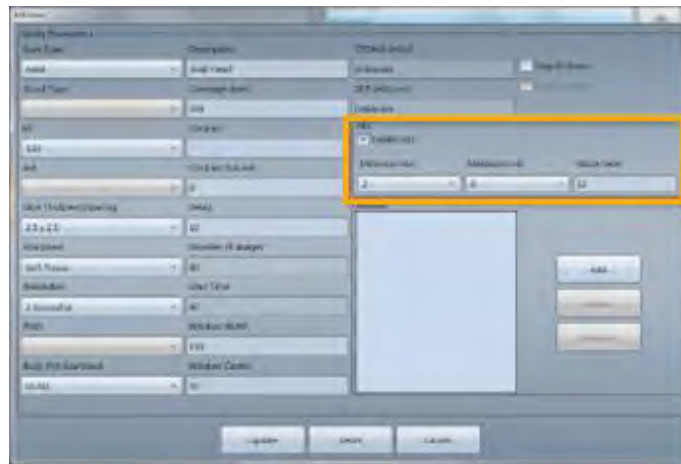


Figure 276: Edit Series dialog box with AEC options selected

4. Select the **Minimum mA** dropdown to set the minimum allowed mA value to be used for scanning. The available range is 1 to 7.
5. Select the **Maximum mA** dropdown to set the maximum allowed mA value to be used for scanning. The available range is 1 to 7.
6. Select the **Noise Level** to set the standard deviation of noise value for the acquired images. The noise range is 1-200.
7. Click the **Update** button in the **Edit Series** dialog box.
8. Click the **Update** button in the **Edit Protocol** dialog box.
9. Make sure your patient and scanner are positioned.
10. Click the **Begin** button in the **Exam Planner** dialog box to begin the scan.
11. To continue the scan, go to the scanner and press the **Scan** button on the touch screen.
12. After the scouts are acquired and the scan region is set, click the **AEC** tab.
13. Click the **Toggle Graph** button to view the graph on the scout.

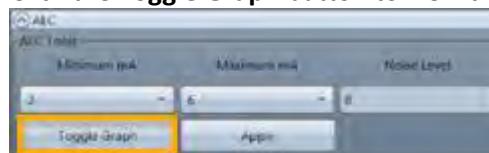


Figure 277: Toggle Graph button

The graphs will now appear on the scout(s). Review the mA modulation to ensure it meets your clinical needs.



Figure 278: Graphs on the scout(s)

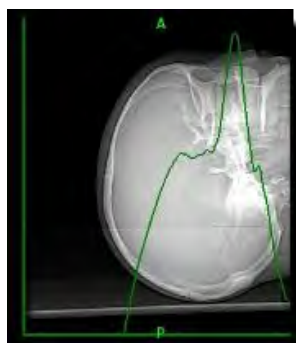


Figure 279: AEC modulation graph

14. To return to the scout parameter view, click the **Toggle Graph** button, again.
15. If changes to the mA or Noise Levels are required, you can modify the Minimum, Maximum mA and Noise Level as needed on the image.

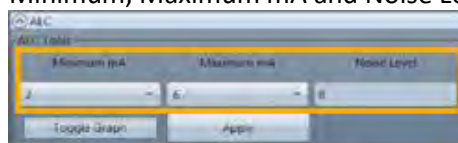


Figure 280: Minimum, Maximum mA and Noise Level

16. When the desired level is achieved according to your department policy, select the **Continue** button to start the scan.
17. Press **Scan** from the touch screen.

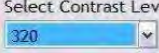
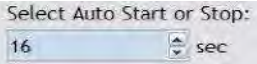
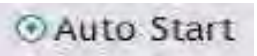
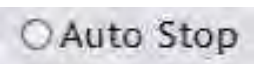
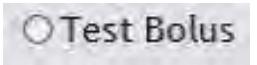
Note While reviewing the scan you will see mA modulation as per your graphs.

18. Click the **Finalize** button.

Performing a CT angiography scan with bolus tracking

CT angiography is a technique that uses contrast to visualize arterial and venous vessels throughout the body. This ranges from arteries serving the brain to those bringing blood to the lungs, kidneys, arms, and legs.

Table 42: Bolus tracking parameters and tools

Option	Description
	Hounsfield Unit detection at the area being monitored – ROI.
	The amount of time allowed to monitor the bolus.
	The scan begins after the specified bolus scan time if no bolus is detected.
	Stops the scan after the specified bolus scan time if no contrast is detected.
	A small amount of contrast is injected, and a timing graph is displayed after specified bolus scan time.

1. Perform steps 1 through 6 in “Performing a scan” on page 221.
2. If necessary, change the **Scan Type** to **Helical** or **Dynamic**.
3. Click the **Bolus Tracking** option.

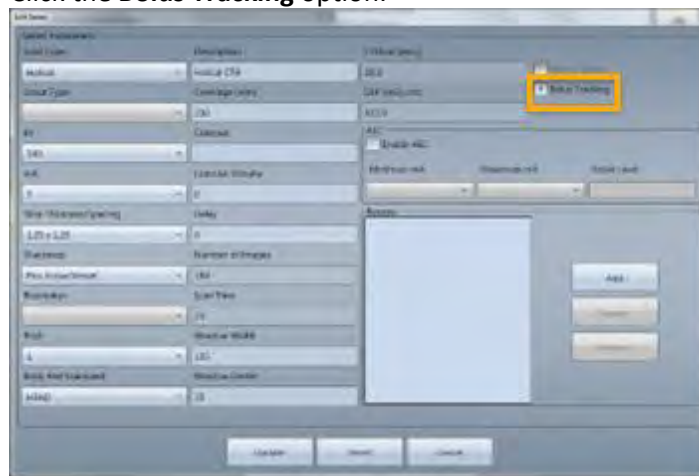


Figure 281: Bolus Tracking option

4. Click the **Update** button in the **Edit Series** dialog box.
5. Click the **Update** button in the **Edit Protocol** dialog box.
6. Click the **Begin** button to acquire the scout(s).

7. To continue the scan, go to the scanner and press the **Scan** button on the touch screen.
8. On the scout, use the Blue lines to plan the helical scan.

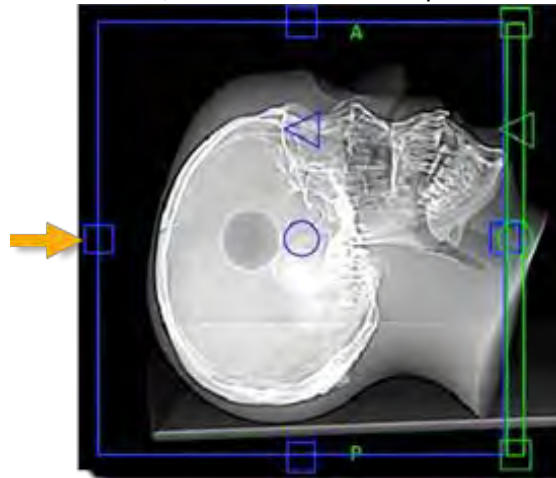


Figure 282: Helical scan lines (blue)

9. Position the Green **Reference** line at the desired anatomical location.

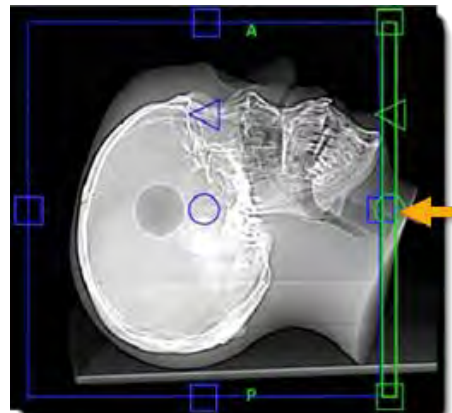


Figure 283: Reference line (green)

Note The distance between the reference and bolus tracking scans cannot exceed 100mm.

10. To move the scout or reference line go to the **Viewing** tools and select **Active Scan Region**.



Figure 284: Active Scan Region – Bolus Reference or Helical CTA

11. Click the **Continue** button to acquire a 10mm reference scan.
The scanner will move to the reference line noted on the scout.
12. Go to the scanner and press **Scan** on the touchscreen.
13. When the image has been reconstructed, click the **Bolus** button to draw an **ROI** on the reference scan.

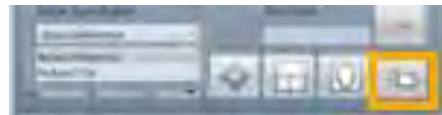


Figure 285: Bolus ROI Tool



Figure 286: ROI on the reference scan

14. Click the **Continue** button.
The **Adjust Bolus Settings** popup appears.

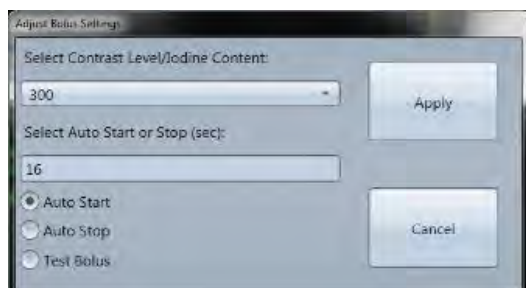


Figure 287: Adjust Bolus Settings popup

15. Modify the Bolus settings as required.
16. Click the **Apply** button.
17. Load the injector and set your desired flow and rate and are the injector.
18. When the scanner is ready, press **Scan** on the touch screen and manually start the injector at the same time.

Note If you are using the **Auto Start** option, the scanner should start automatically when the Contrast Level value in the ROI is exceeded. If contrast is seen in the reference image and the scanner does not start you can select the **Start Scan** button to start the CTA scan manually.



Figure 288: Start Scan button

19. Review the completed scan.

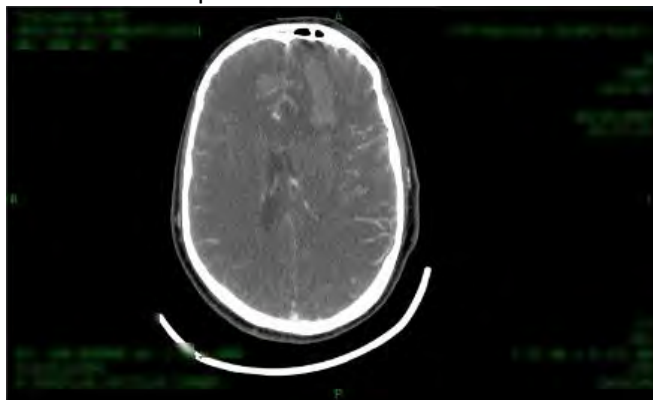


Figure 289: Completed scan with contrast

20. Press the **Finalize** button when complete.

Performing Test Bolus

Test Bolus evaluates the timing of the injected contrast. A small amount of contrast material is injected, and a timing graph is displayed after the specified bolus scan time. When the contrast is detected, the system stops scanning and a report on the recommended delay-time for CTA protocols appears.

1. Perform steps 1 through 6 in “Performing a scan” on page 221.
2. Click the **Bolus Tracking** option.

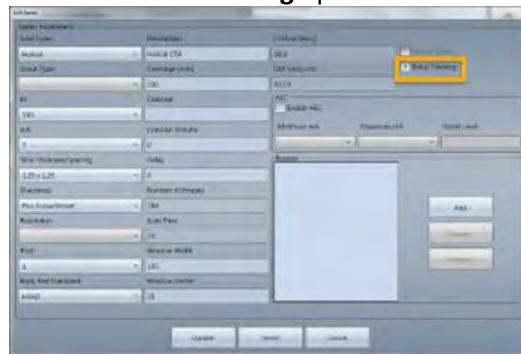


Figure 290: Bolus Tracking option

3. Click the **Update** button in the **Edit Series** dialog box.
4. Click the **Update** button in the **Edit Protocol** dialog box.
5. Click the **Begin** button to acquire the scout(s).
6. To continue the scan, go to the scanner and press the **Scan** button on the touch screen.
7. On the scout, use the Blue lines to plan the helical scan.

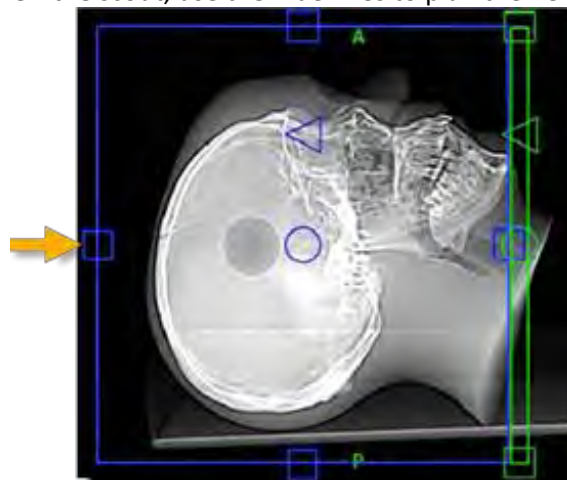


Figure 291: Helical scan lines (blue)

8. Position the Green **Reference** line at the desired anatomical location.

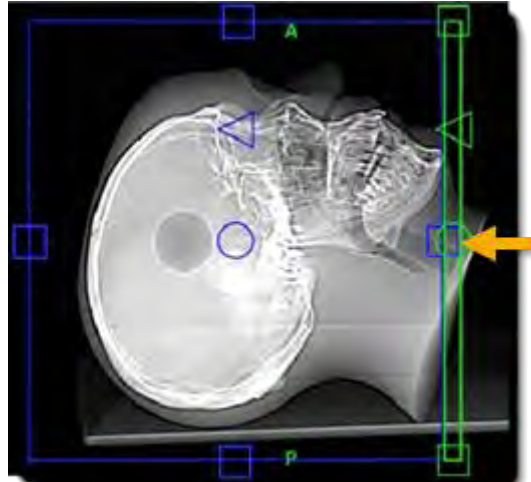


Figure 292: Reference line (green)

Note The distance between the reference and bolus tracking scans cannot exceed 100mm.

9. To move the scout or reference line go to the **Viewing** tools and select **Active Scan Region**.



Figure 293: Active Scan Region – Bolus Reference or Helical CTA

10. Click the **Continue** button to acquire a 10mm reference scan.
The scanner will move to the reference line noted on the scout.
11. Go to the scanner and press **Scan** on the touchscreen.
12. When the image has been reconstructed, click the **Bolus** button to draw **ROI** on the reference scan.

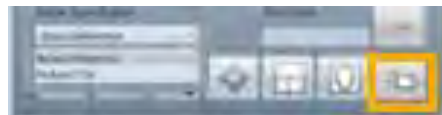


Figure 294: Bolus ROI Tool



Figure 295: ROI on a reference scan

13. Click the **Continue** button.
The **Adjust Bolus Settings** popup appears.

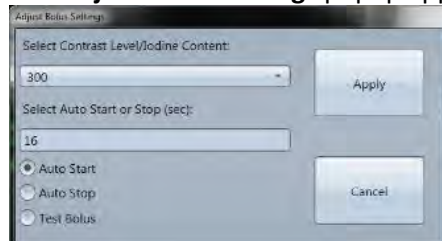


Figure 296: Adjust Bolus Settings popup

14. Select the **Test Bolus** option.
15. Click the **Apply** button.
16. Load the injector and set your desired flow and rate and arm the injector.
17. When the scanner is ready, press **Scan** on the touchscreen and manually start the injector at the same time.
18. The **Bolus Timing Graph** appears and shows the calculated, bolus tracking time.

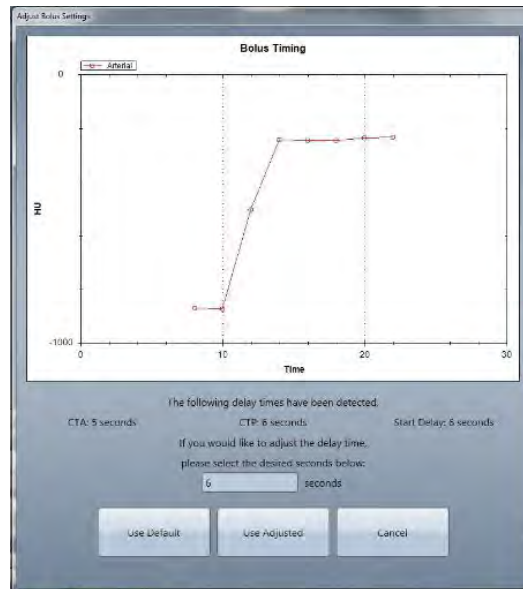


Figure 297: Bolus timing graph

19. Select from one of the following:

Use Calculated	Uses the bolus timing calculated from the Test Bolus scan.
Use Manual	Allows you to manually set the delay time prior to the start of the helical scan.
Auto Start	The scan begins after the specified bolus scan time if no bolus is detected.
Auto Stop	Stops the scan after the specified bolus scan time if no contrast is detected.

20. Click the **Continue** button.
Review completed scan.
21. Press the **Finalize** button when complete.

Performing a CT Perfusion Scan

CT Perfusion (CTP) is a technique used to evaluate cerebral perfusion of the level of blood flow in the brain, by monitoring the initial phase of iodinated contrast material through the vasculature of the brain.

1. Perform steps 1 through 6 in “Performing a scan” on page 221.
2. After selecting the **CT Perfusion** protocol, review the Dynamic CTP options, including the Scan Time and make your selections.

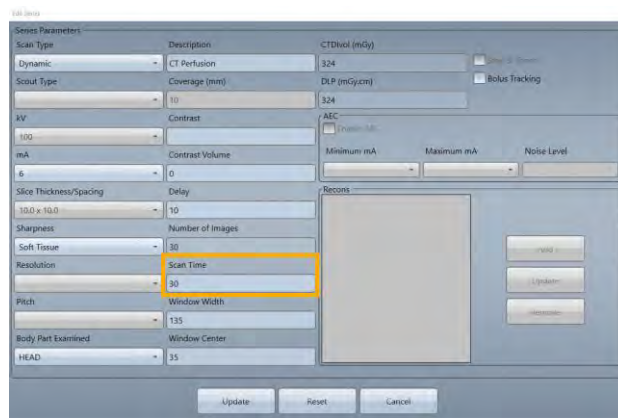


Figure 298: Edit Series CTP Scan Time

3. Click the **Update** button in the **Edit Series** dialog box.
4. Click the **Update** button in the **Edit Protocol** dialog box.
5. Click the **Begin** button to acquire the scouts(s).
6. Perform the scout and set the Dynamic CTP scan location.
7. To move the Dynamic CTP location, use the green circle inside the reference line.
8. Click the **Continue** button.
The scanner will move to the reference line noted on the scout.
9. Load the injector and set your desired flow rate. When the scanner is ready. Press **Start** on the scanner and manually start the injector at the same time.
10. Review completed scan.



Figure 299: Brain Perfusion image

11. Select **Finalize**.

Calculating and creating perfusion maps

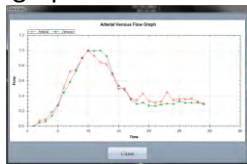
The **CTP** viewer functionality is only possible if the optional perfusion package is set up and enabled on your system. The **CTP** viewer package enables your system to view dynamic scans. A scan must have been performed with perfusion protocols.

1. Select a perfusion patient from **Patient Browser** and select the series to view.
2. To open the image, click the **View Images** button or double-click the series. The **Viewing** tab is enabled, and the **CTP** tab automatically opens.



Figure 300: CTP tools

Table 43: CTP Tools

CTP Viewer tools		
	Perfusion ROI	Select to place the arterial and venous ROIs on the images.
	Calculate Maps	Select to calculate the CT Perfusion maps.
	Reset Maps	Cancels the calculations and returns to Calculation mode.
	Flow Graph	Displays the Arterial Venous Flow graph. 
	Peak Image	Displays the image that has the highest HU value based on the arterial ROI placement.

- Click the **Perfusion ROI** tool.
- Place an **Arterial ROI**.
- Place a **Venous ROI**.
- Click the **Calculate Maps** tool.
- The Perfusion Maps are calculated and displayed:



Figure 301: Perfusion maps

The calculations produce three maps and the perfusion image:

Perfusion Images	Top, left corner
Cerebral Blood Flow (CBF)	Top, right corner
Cerebral Blood Volume (CBV)	Bottom, left corner
Mean Transit Time (MTT)	Bottom, right corner

8. Click the **Flow Graph** tool to display the **Arterial Venous Flow Graph**.

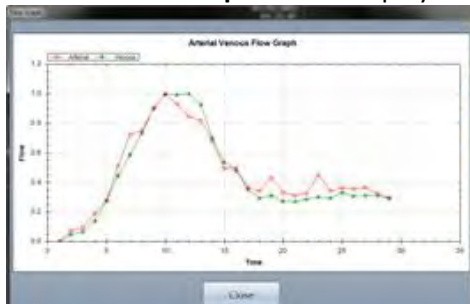


Figure 302: Arterial Venous Flow Graph

This graph displays arterial and venous flow rates with respect to time.

9. Click the **Peak Image** tool to display the **peak image**.
The peak image displays the image that has the highest HU value based on the arterial **ROI** placement.
10. Click **Reset Maps** tool to cancel calculations and return to **Calculation** mode.
11. Click the **Reset** button to reset images back to the original setting(s).
You cannot undo this action.

Examining the scanned image with tools

The image tools can only be used when the **Acquisition** tab is enabled, and an image is displayed, or when images are loaded to the viewer from the Patient Browser tab.

From the **Acquisition** tab, you can zoom, pan, modify window width and center, and change layout; see the table below to understand the basics of what each tool looks like and how it performs.

Using tools on the Acquisition tab

The following table describes some of the tools available to you when the **Acquisition** tab is active. For a comprehensive list, see Table 48: 2D, MPR, 3D, and CTP image tools.

Table 44: Image tools

Image tool	Tool name	Action
	Clear Tool	Used to reset the tool to the default pointer.
	Window Width/Center	Used to adjust window width and center of image.

Image tool	Tool name	Action
	Zoom	Magnifies the image.
	Pan	Adjusts image on X or Y axis.
	Toggle Scouts	Display's or removes scouts from Acquisition.
	Toggle Layout	Changes the layout to 2x2. Repeat process to return to 1x1.
	Scan Region Re-Draw	If scout lines and the scan region is deactivated, it allows you to reactivate.

Chapter 10 Patient Browser

The **Patient Browser** lets you view patient information and the images associated with the patient information after the patient's scan.

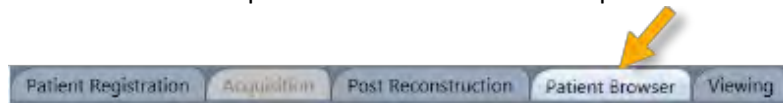
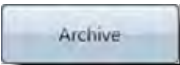
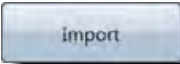
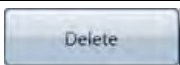
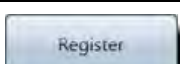
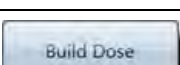
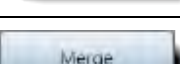
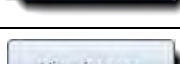


Figure 303: Active Patient Browser tab

The following table identifies those buttons found on the **Patient Browser**.

Table 45: Command buttons

Button	Action
	Selects the archive destination for selected information.
	Imports exam information from PACS or Media .
	Deletes the selected exam information from the Patient Browser tab.
	Reregisters a patient who is already in the system.
	Generates a Dose Report and Dose SR for the selected patient.
	Combines two different image sets.
	Shows patient, study, series, and image information.
	Displays the selected patient images in Viewing .

Navigating the Patient Browser

The **Patient Browser** lets you perform tasks on existing series, for example archiving and previewing the series. This section will introduce you to the **Patient Browser** and identify the symbols, areas, and buttons you can use.

The **Patient Browser** can be broken down into the following sections:

- Exam table
- Series table
- Selected protocol table
- Patient Browser's (initial) active buttons

- Preview window

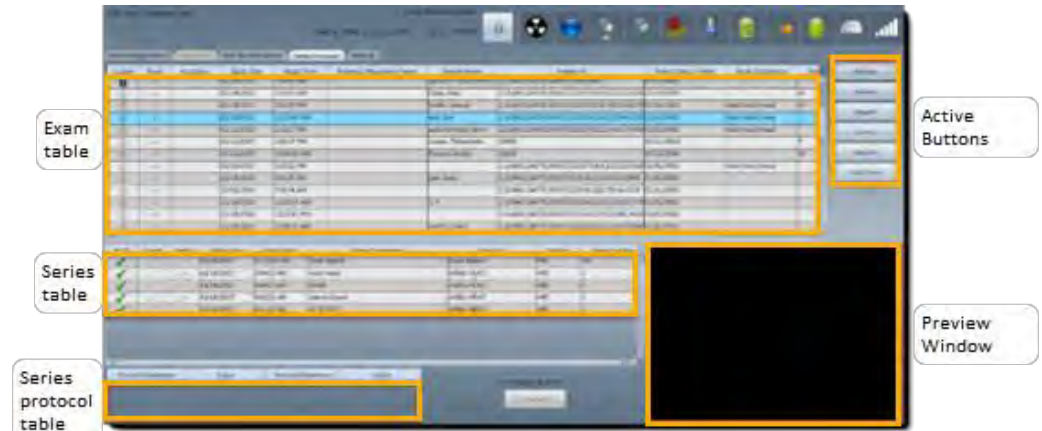


Figure 304: Patient Browser sections

Identifying symbols on Patient Browser

Symbols may appear next to series in the exam and/or series tables. These symbols are more vivid when active; they are identified below as active symbols.

Locked 🔒	Indicates the series is locked and cannot be deleted.
Read/Mark 👁️	Indicates the series is marked to be read or read by the physician.
PACS ✅	Indicates the series has been sent to PACS .
Stored ✅	Indicates the series has been sent to PACS ; the archived series appear below the initial table.
Media 💾	Indicates the series has been sent to a media device, for example USB.

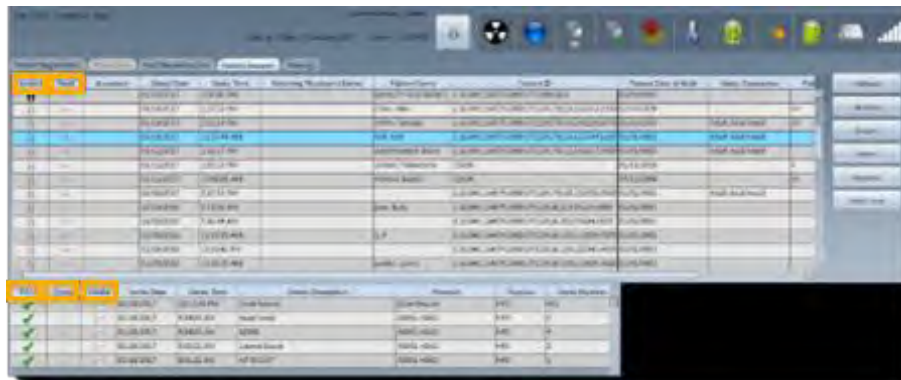


Figure 305 Patient Browser locked, read, PACS and Stored (archived), and media symbols

Using the vertical and horizontal scroll bars on Patient Browser

Navigation scroll bars let you move the lists in the Patient Browser sections up, down, and horizontally to view all available exam information.

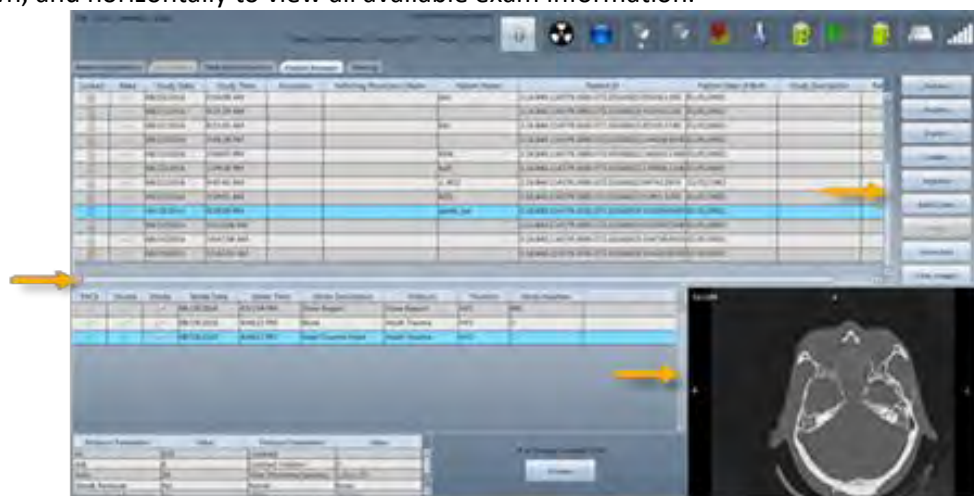


Figure 306 Patient Browser horizontal and vertical scroll bars

Locking a study

1. Click the **Patient Browser** tab.
2. Select the study to lock.
3. Right-click the mouse button.
4. Click **Lock** on the floating menu.

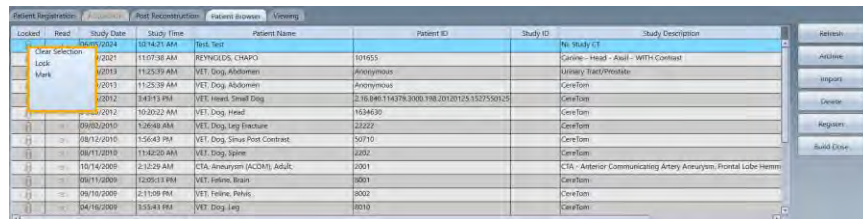


Figure 307: Floating menu - Lock

The **Lock** symbol appears for the selected series.



A series cannot be deleted while in the **Lock** mode.

- To unlock, right-click and click **Unlock**.

Note All **QA** series are locked to prevent deletion. The **QA** series can only be unlocked by your field service representative.

Marking a series to read

- Click the **Patient Browser** tab.
- Select the study to Mark.
- Right-click the mouse button.
- Click **Mark** on the floating menu.

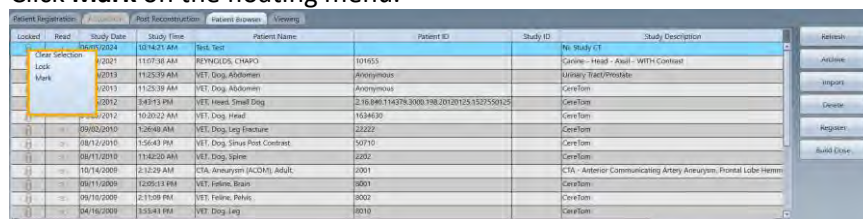


Figure 308: Floating menu – Mark

The **Mark** symbol appears for the selected series.

- To unmark any series right click and click **Unmark**.

Using the preview window

- Click a patient on the exam table.

2. Click a series on the series table.
3. Click the **Preview** button to the right of the **Series Protocol Table**.



Figure 309: Preview Button

4. The selected series will appear in the **Preview** window.

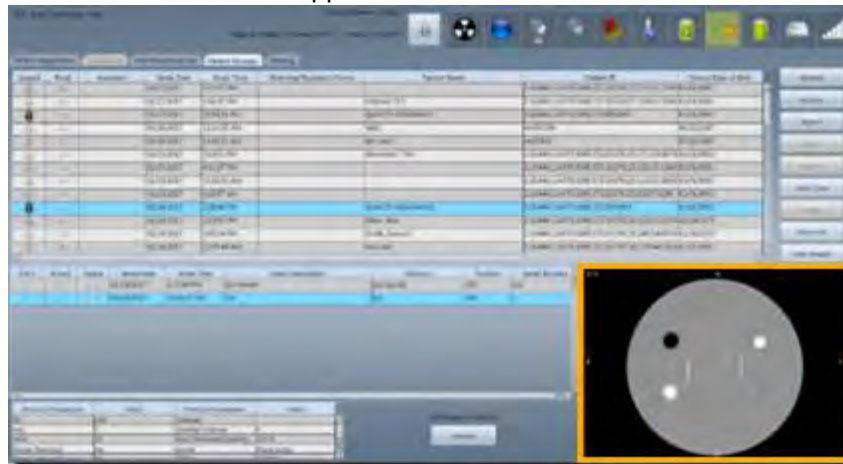


Figure 310: The series appears in the preview window

Archiving patient series

You can archive patients and studies (or series) to PACS, media (USB or CD), or surgical navigation devices.

Archiving to PACS

1. Click the **Patient Browser** tab.
2. Select the patient study for **PACS** in the following way:
 - To select one patient and all associated series, click the patient, and click the **Archive** button.
 - To select specific series for a patient, click the **Ctrl** key, then click each individual series from the **Series** table, and click the **Archive** button.

The **Archive Destination** popup appears.

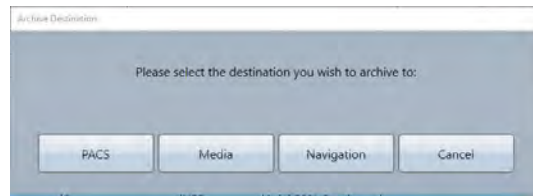


Figure 311: Archive Destination popup

3. Click **PACS** button.
The **Archive to Server** popup appears.
4. Click the **Select Archive Location** dropdown and select a site.

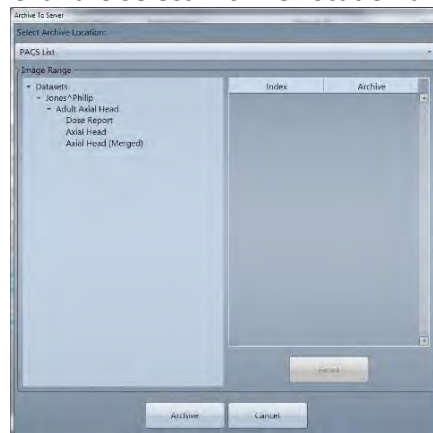


Figure 312: Archive To Server popup

5. Review the **Image Range** items to make sure all those items you selected in step 2 are captured.
6. Click the **Archive** button to begin the archive process.

If enabled the **Store/Print Queue** dialog box will appear to show the status of your image transfer. You can also activate the **Store/Print Queue** dialog box by clicking **Tools > Store/Print Queue** from the main menu.

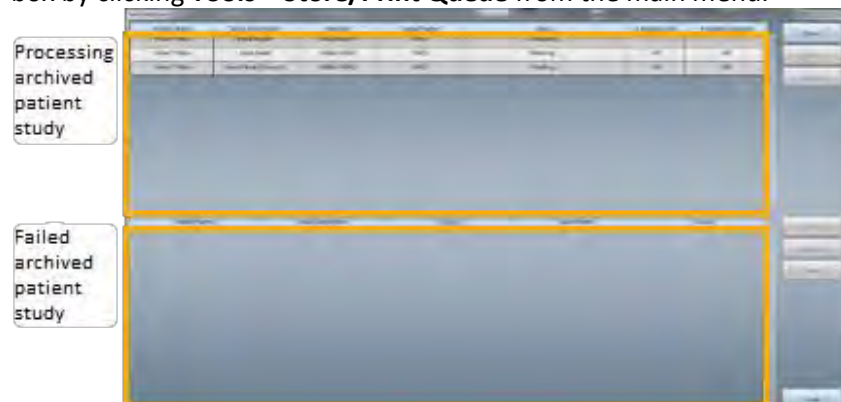
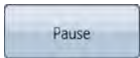
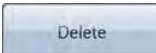
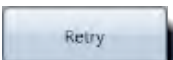
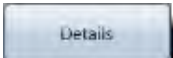
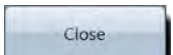


Figure 313: Store/Print Queue dialog box

7. Watch the status of each series:
 - **Pending** informs you that the series is paused because you clicked the **Pause** button.

- **Connecting** informs you that the series is in process of archiving to its targeted location.
 - Each series will move from the top portion of the popup to the bottom portion of the **Store/Print Queue** popup when it has been processed.
8. While the archiving is in process, you can perform one of the following from the buttons in the **Store Print Queue** dialog box.

Table 46: Store/Print Queue buttons

Store and Print Queue button	Action
	When you select one or more series, it temporarily stops the series from being stored. This is a toggle button with the Resume button.
	When you select one or more series, it deletes either a series to be stored, or a series that failed to store.
	When you select one or more series, it tries to archive the selections.
	When you select one or more series, it displays an explanation of why a series failed to store.
	Closes the Store/Print Queue popup.

9. If the series is not successfully stored to its targeted destination, “Store Failed” message appears in the **Failure** column. This means the series was not successfully archived.
10. If there are failed archived series; click the **Retry** button to attempt to archive the series you selected.

Note Any **Storing Failure** status appears in the bottom of the popup to inform you why the failure occurred. If an archive job fails, it will be sent to the **Failed Store/Print Jobs** list.

11. If the job is sent successfully, the series disappears from the queue.
12. When the archiving is complete, click the **Close** button to exit the **Store/Print Queue**.
- You can also click the **Close** button, and the archiving process will continue as you do other tasks.

Archiving to Media

1. Click the **Patient Browser** tab.
2. Select the patient study to archive in the following way:
 - To select one patient and all associated series, click the patient and click the **Archive** button.
 - To select specific series for a patient, press and hold the **Ctrl** key, then click each individual series from the **Series** table, and click the **Archive** button.

The **Archive Destination** popup appears.

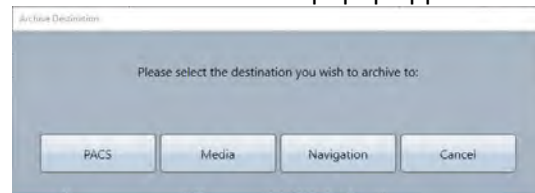


Figure 314: Archive Destination popup

3. If you are archiving to a USB device, insert the USB drive into the USB port.
4. Click the **Media** button.

The **Archive to Media** popup appears.

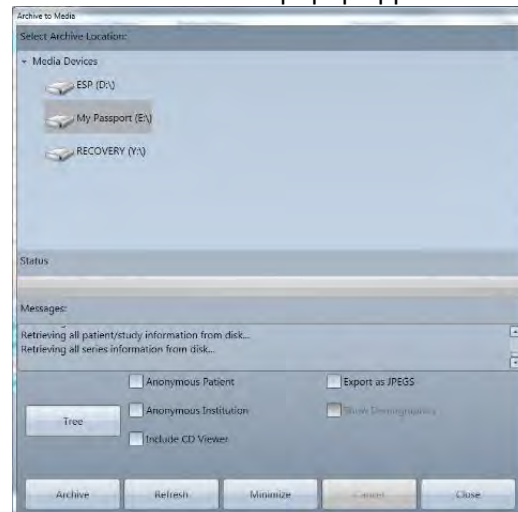


Figure 315: Archive to Media popup

5. Click the targeted drive and path destination.
6. The **Archive** button is active.

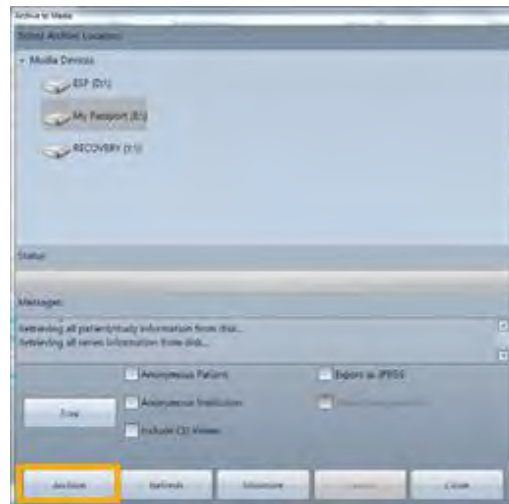


Figure 316: Archive Button active

7. Click the appropriate check boxes for your archive process:

Anonymous Patient	Makes the patient's information anonymous for HIPAA standards.
Anonymous Institution	Makes institutional information anonymous for HIPAA standards.
Include CD Viewer (requires CD viewer software installed)	Includes a CD viewer application to view images from the media.
Export as JPEGs	Exports image files in .JPG format.
Show Demographics	Includes the demographic information in archive if you clicked the Export as JPEGs check box.

8. Click the **Archive** button to begin the archive process.
- The **Cancel** button is active after clicking the **Archive** button; click the **Cancel** button to stop the archive.
9. The **Archive to Media** dialog will update the status when archiving is complete.

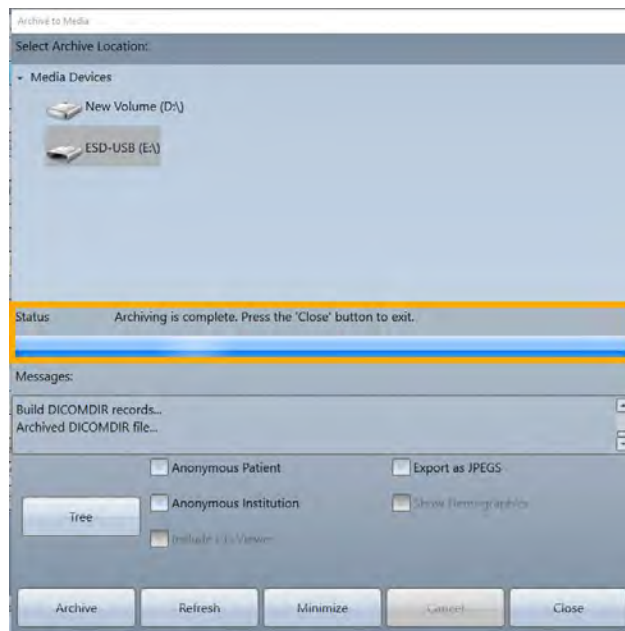


Figure 317: Archiving complete

- Click the **Refresh** button to remove any messages that appear in the **Message** box.
- Click the **Minimize** button to continue working in other areas while the archiving process runs.
 - A disk appears at the bottom; click it to maximize the **Archive to Media** popup.
- Click the **Close** button to exit the **Archive to Media** popup after the archive process is complete.

Archiving to Navigation

1. Click the **Patient Browser** tab.
2. Select the patient study or series.
3. Click the **Archive** button.
4. Click the **Navigation** button.
5. Click the **Select Archive Location** dropdown and select the location.
6. Under **Image Range**, select the image(s) you want to send to navigation. To return to the default selections, click the **Reset** button.
7. Perform one of the following:
 - Click the **Archive** button to send the image to Navigation.
 - Click the **Cancel** button to return to **Patient Browser**.

Importing data

Import allows you to add patient images to the Patient Browser.

Importing from PACS

1. Click the **Patient Browser** tab.
2. Click the **Import** button to import data.
The **Import Location** popup appears.

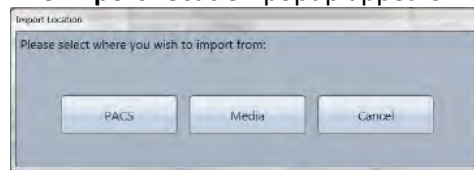


Figure 318: Import Location popup

3. Click the **PACS** button.
The **Import from PACS** popup appears.

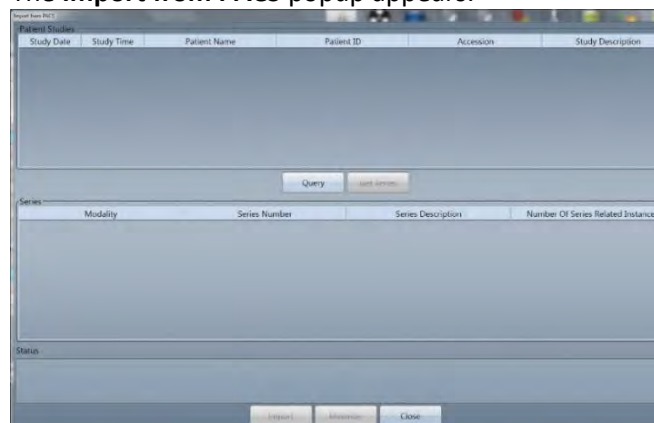


Figure 319: Import from PACS

4. Click the **Query** button.
The **Query Information** dialog box appears.

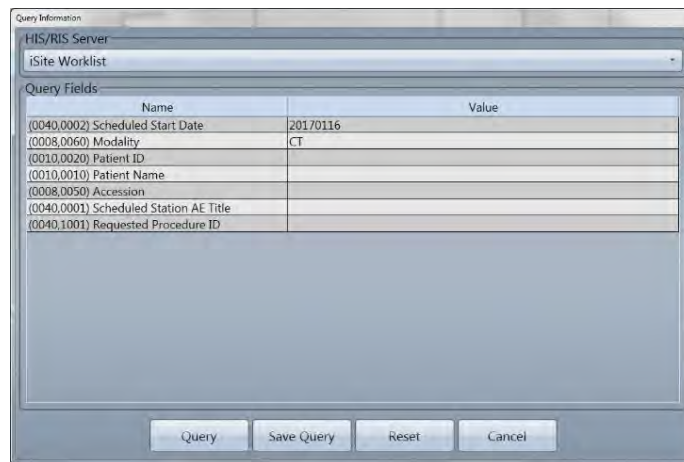


Figure 320: PACS Query Information dialog box

5. Perform the following:
 - Select a **HIS/RIS** server from the dropdown.
 - Set the values to search in your query.
 - Click one of the following buttons:
 - o Click **Query** to save the search results.
 - o Click **Save Query** to save the current search results.
 - o Click **Reset** to clear the query information
 - o Click **Cancel** to exit the **Query Information** popup.
6. From the **Queried** results, select a patient and click the **Get Series** button.

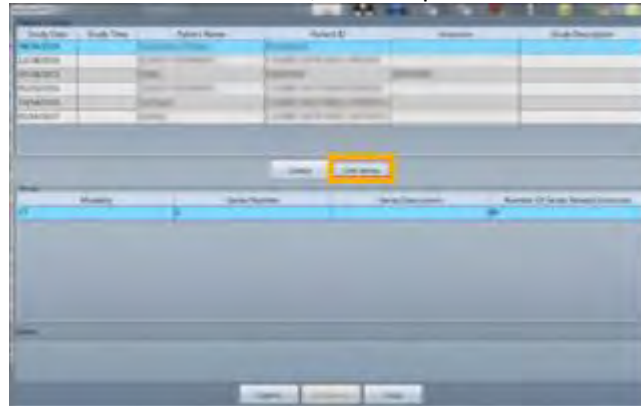


Figure 321: Import PACS dialog box with active Get Series button

7. Click the **Import** button.
8. Click the **Close** button to exit the **Import from PACS** popup.

Importing from media

1. Click the **Patient Browser** tab.
2. Click the **Import** button on **Patient Browser**.

The **Import Location** popup appears.

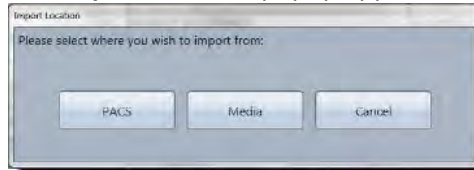


Figure 322: Import Location popup

3. Click the **Media** button.
The **Import from Media** popup appears.

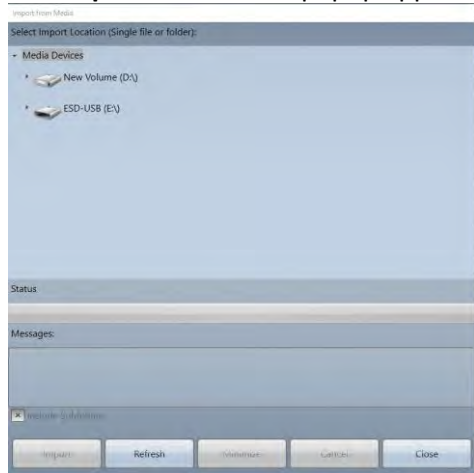


Figure 323: Import from Media popup

4. Click the drive and path where images were previously stored.
The **Import** button is active.

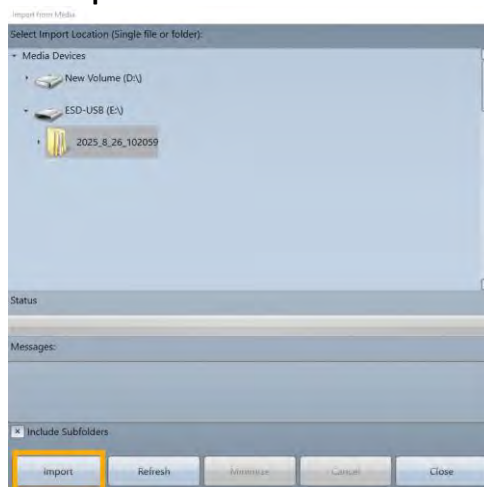


Figure 324: Active Import button

- If necessary, click the **Subfolders** to see the entire path.

5. Click the **Import** button.
The imported images appear in **Patient Browser**.

Delete

1. Click the **Patient Browser** tab.
2. Select the study or the series to delete.
3. Click the **Delete** button.
The **Confirm Deletion** popup appears.



Figure 325: Confirm Deletion popup

4. Click the **Delete** button on the **Confirm Deletion** popup.
The patient data will be deleted from the **Patient Browser**.

Registering a patient from Patient Browser

If additional scans must be performed on a patient that is listed in the **Patient Browser**, you can register them by performing the following:

1. Click the **Patient Browser** tab.
2. Select the patient to register.
3. Click the **Register** button.

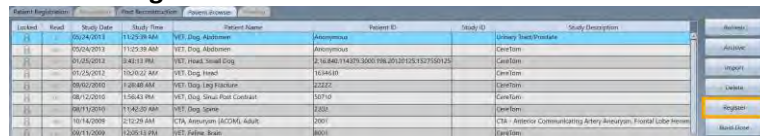


Figure 326: Patient Browser register button

4. The **Create New Study** popup appears.

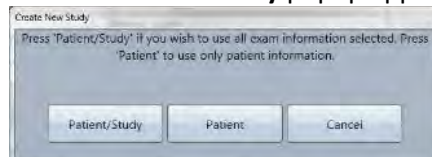


Figure 327: Create New Study popup

5. Perform one of the following:
 - Click the **Patient/Study** button to use all exam information selected, including the accession number.
 - Click the **Patient** button to use only patient information.
 - Click the **Cancel** button to exit the **Create New Study** popup.

Building Dose from Patient Browser

The **Build Dose** button in the Patient Browser allows you to manually create a Dose Report and/or a Dose Structured Report (DoseSR) image which will appear in the Series table when completed.

1. Click the **Patient Browser** tab.
2. Select the patient to use for the **Build Dose**.
3. Click the **Build Dose** button.

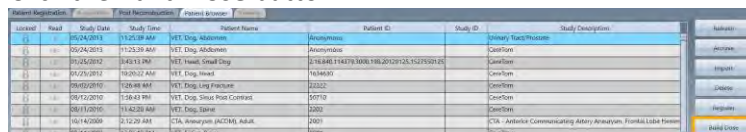


Figure 328: Build Dose button

4. The **Choose Dose Options** popup appears.



Figure 329: Choose Dose Option popup

5. Perform one of the following:
 - Click the **Dose Report** button to build the Dose Report.
 - Click the **Dose Report & Dose SR** to build the Dose Report and DoseSR report.
6. The **Build Dose Please Wait** popup appears.



Figure 330: Build Dose Please Wait popup

7. The Dose Report and/or Dose SR image will be saved in the Series Table. To view the report, select the report and click the **Preview** tab.
8. If the **Dose Build Failed** popup appears, click the OK button, make the necessary changes, and try again.

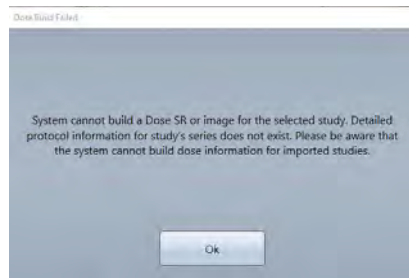


Figure 331: Dose Build Failed popup

Note **Dose Structured Reports (DoseSR)** cannot be viewed in the CereTom Elite system; **Dose SR** can be viewed in **PACS** with the appropriate viewer.

Merging a series

The merge function is used to combine two different series for review.

Note Only series with same patient name, ID, and slice thickness can be merged.

1. Click the **Patient Browser**.
2. Select the study to merge.
The study must include several scans.
3. Select two series to merge by pressing and holding the **Ctrl** key and highlighting the two series.

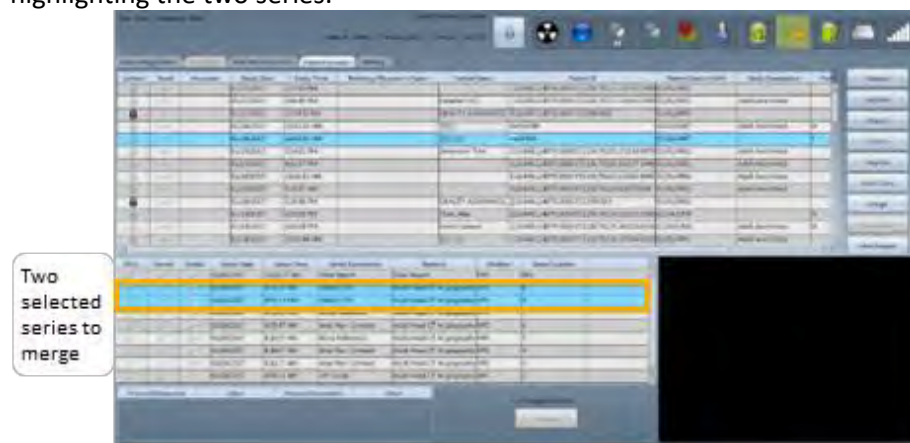


Figure 332: Two series selected to merge

The **Merge** button appears and is active.

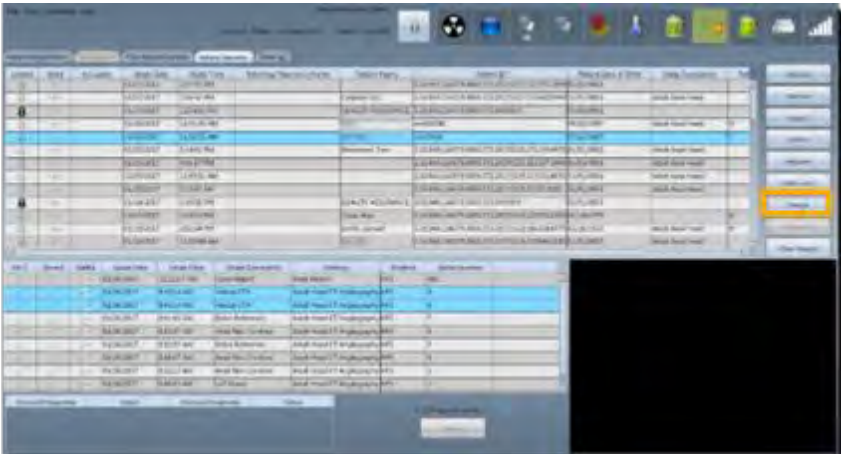


Figure 333: Active Merge button

4. Click the **Merge** button to merge the series.
A **Please Wait** popup appears while the application merges the two series.

Note To merge, the two series must have the same protocol slice thickness and spacing, kernel, and pixel spacing.

- When the **Merge** window appears, one series appears on the left and the other appears on the right: both in scrollable filmstrips.



- The bottom (to be selected images) filmstrip is empty when the window is first displayed. The following four image tools are available to use:

Table 47: Image tools

Image tool	Tool name	Action
	Windowing Width and Level	Adjusts window width and center of image.
	Zoom	Magnifies the image.

Image tool	Tool name	Action
	Pan	Adjusts image on X or Y axis.
	Clear Active	Resets the tool to the default pointer device.



Figure 334: Image viewer without image(s) selected

5. After viewing images, drag each viewed image to the image viewer or the bottom of the filmstrip.

A single selected image appears in a green outline. You can also perform the following:

- To select a single image, click and drag the image.
- To select several images, press the **Ctrl** key, click the images, and drag the images.
 - Alternatively, to select multiple images, right-click and click **Select All**.
- To deselect a single image, click the image – one time (image appears in white outline).
 - Alternatively, to deselect all, right-click the filmstrip and click **Deselect All**.



Figure 335: Selecting images to move to image viewer or bottom filmstrip

6. To reorder bottom filmstrip, drag one or more images to the new location.



Figure 336: Finished filmstrip

7. When finished with the bottom strip, click the **Merge** button.

To stop the merge click the **Close** button to return to the browser.

The application generates a third series with those images. A **Series Saved** popup appears, informing of the merge success or failure. When user returns to browser, it has already been refreshed to show new series. Series are marked as a merged series in its series description **DICOM** tag, which can be shown in the browser. Series is also marked as secondary, rather than primary series.

Using Show Info to view, update, and move a series

1. Click the **Patient Browser** tab.
2. Select the patient.
3. Select a series.
The **Show Info** button appears and is active.
4. Click the **Show Info** button.
The **View/Update Information** dialog box appears.

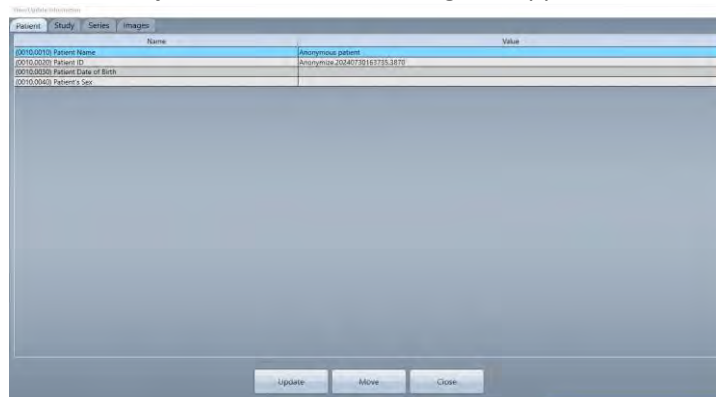


Figure 337: View/Update Information dialog box

The following tabs appear:

Patient	Data about the patient, such as patient name, date of birth, and sex of patient.
Study	Data about the study, such as date, time, and referring physician.
Series	Data about the series, such as the position reference indicator, model, pixel padding value, and series date and time.
Images	Data about the image, such as the instance number (sequential), exposure time.

5. Click the tab(s) to review and update the necessary information.
6. Double-click any editable fields and make your change(s).
7. Click one of the following buttons:
 - Click the **Update** button to save your changes.

Note If information is invalid, you are prompted to correct the information and click **Update** again.

If the field cannot be edited, a prompt appears telling you the selected field is not editable.

- Click the **Move** button to show the **Move Series** popup.

Note The **Move Series** function is used when a scan has been acquired under the wrong patient file or to move a patient that was registered manually to the **Patient Registration** tab. Moving the patient to the **Patient Registration** tab will capture all of the patient's information.

- Click the **Registration** button to move the patient into an existing patient or by manually creating a new patient using the **Patient Registration** process.
- Click the **Cancel** button to exit the **Move Series** popup.
- Click **Browser** to go to the **Patient Browser** tab and move the series.
- Click the **Move** button to confirm moving the series.
- Click the **Cancel** button to exit the **Patient Browser** tab and return to the **View/Update Information** popup.

8. Click the **Close** button to exit the **View/Update Information** popup.

Note An audit log of both the old and new patient series, including the date and time of the change and who performed it is generated.

Modifying a Study scanned with the wrong patient identification

If a patient has been scanned using the wrong identification, the entire study can be corrected.

1. Click the **Patient Browser** tab.
2. Select a series that was scanned with incorrect patient identification to modify the data.
3. Click the **Show Info** button.
The **View/Update Information** dialog box appears.

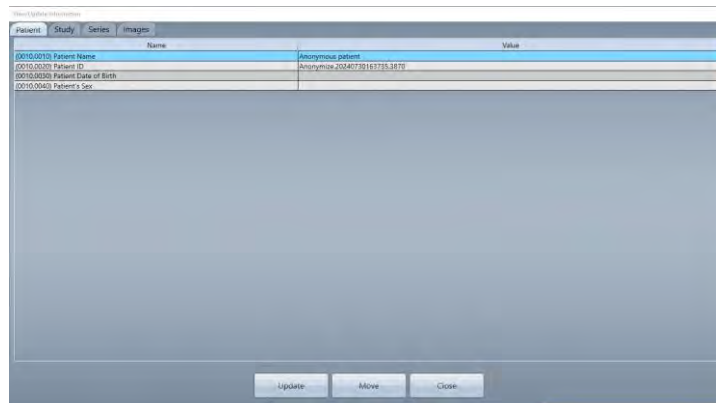


Figure 338: View/Update Information dialog box

4. Double Click the field to be edited.
The **Edit Value** dialog box appears.

Please enter new value for the following:

(0010,0010) Patient Name

Prefix

First Name

Anonymous

Middle Name

Last Name

Patient

Suffix

Update Close

Figure 339: Edit Value dialog box

5. Edit patient details as needed.
6. Click **Update**
7. Click **Update** on the **View/Update Information** dialog box.

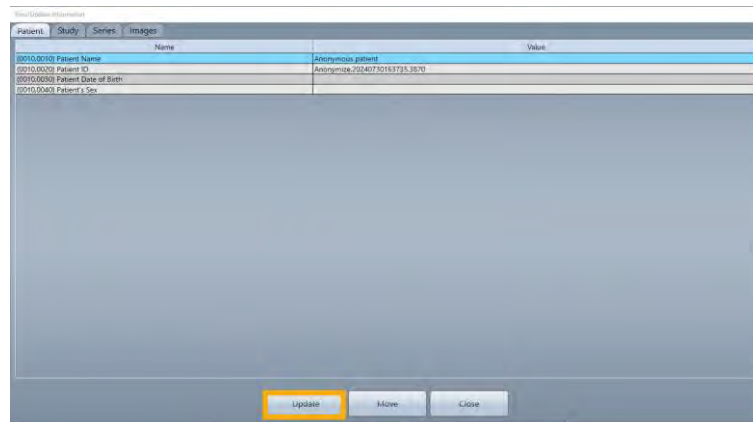


Figure 340: Update View/Update Information

8. All study data will be updated.

Loading a series into view

1. Click the **Patient Browser** tab.
2. Select the patient.
3. Select the series.
4. Click the **View Images** button or double-click the selected series.

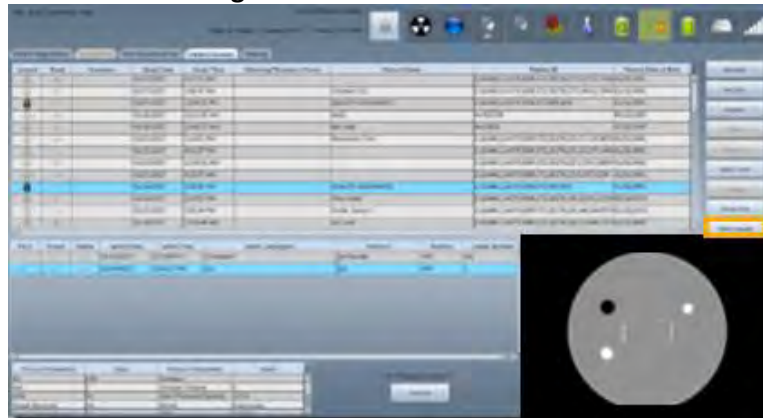


Figure 341: View Images button

The **Viewing** tab opens, and the series appears for viewing and manipulating.

Chapter 11 Viewing Images

Viewing lets you see already scanned images from previous examinations. To view images, select the patient in **Patient Browser** and then select the series to view. To open the image, click the **View Images** button or double-click the series.



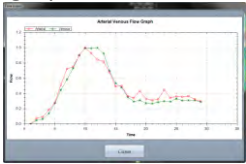
Figure 342: Active Viewing tab

The following tables identify the tools in the **Viewing** tabs that let you manipulate images. Some image tools appear on specific viewing tabs, only. The view tabs are **2D**, **MPR**, **3D**, and **CTP** (if enabled).

Table 48: 2D, MPR, 3D, and CTP image tools

Image tools	Tool name	Action
Common tools		
	Clear Tool	Reset the tool to the default pointer device.
	Window Width/Center	Adjusts window width and center of image.
	Zoom	Magnifies the image.
	Pan	Adjusts image on X or Y axis.
	Invert	Inverts black to white and white to black.
	Capture	Saves a screen capture of selected a viewport.
	Capture all Viewports	Saves screen captures of all visible viewports.
	Reset	Reverts all images back to their original mode.
2D and CTP tools		
	Region of Interest (ROI)	Defines circular ROI and displays the ROI information.
	Arrow	Draws an arrow on the image.
2D, CTP, and MPR tools		

Image tools	Tool name	Action
	Measure (Line)	Draws a line on the image and displays length information.
	Angle	Draws an angle on the image and displays the angle information.
CTP and MPR only tools		
	Undo	Reverses the most recent action taken.
	Redo	Restores the most recent Undo action taken.
2D only tools		
	Text	Create text box for annotation.
	Reverse Image Stack	Reverses the order in which images display.
	Flip Vertically	Flips images up or down.
	Flip Horizontally	Flips images right or left.
	Cine Backward	Cines backward through the images.
	Cine Forward	Cines forward through the images.
	Stop Cine	Stops the cine loop.
MPR only tools		
	Tilt	When selected a White 'steering' wheel allows you to correct a rotated image.
3D only tool		
	Rotate	Rotates the image.
CTP Perfusion only tools		
	Perfusion ROI	Select to place the arterial and venous ROIs on the images.
	Calculate Maps	Select to calculate the CT Perfusion maps.

Image tools	Tool name	Action
	Reset Maps	Cancels the calculations and returns to Calculation mode.
	Flow Graph	Displays the Arterial Venous Flow graph. 
	Peak Image	Displays the image that has the highest HU value based on the arterial ROI placement.

Using keyboard shortcuts

Keys are a quick way to navigate around. The tables below provide navigation and quick (workstation) keyboard keys you can use to move around the information on the **Viewing** tab.

Table 49: Arrow key navigation

Arrow keys	Action
↑ and ↓	To scroll through images.
← and →	To adjust the window level.
Page Up and Page Down	To quickly scroll through images.

Table 50: Function keys

Function keys	Action
F5	To view in Abdomen window.
F6	To view in Brain window.
F7	To view in Lung window.
F8	To view in Mediastinum window.
F9	To view in Bone window.

Setting window width and center

Note Any modifications you make are not saved to the image.

1. Select a patient from **Patient Browser**, select the series to view.
2. To open the image, click the **View Images** button or double-click the series. The **Viewing** tab is enabled and the **2D** viewer opens.

3. The following options allow you to adjust the window width and center of the image.

- Click the Window Width/Center icon on the Tools menu, then while holding the left mouse button down, drag up/down to modify Window Center and right/left to modify Window Width.
- To adjust with a preset, click the **Windowing** dropdown and select a preset.

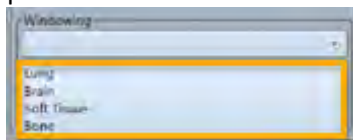


Figure 343: Windowing preset dropdown list

- Type values in the **Width** and **Center** text boxes and click the **Apply** button.

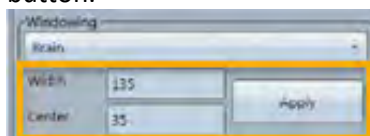


Figure 344: Windowing Width and Center text boxes, and the Apply button

- Right click over an image and use the **Activate Window Tool** option then while holding the left mouse button down, drag up/down to modify Window Center and right/left to modify Window Width.



Figure 345: Right click menu

Viewing images in 2D

2D lets you view scanned images in a **2-Dimensional** space. Standard **2D** mode is used when *only* one dataset is loaded. The default layout is a 2 x 2 grid.

The **Viewing** tab and **2D** viewer opens when you select a dataset from the **Patient Browser**.

1. Select a patient from **Patient Browser** and select the series to view.
2. To open the images, click the **View Images** button or double-click the series. The **Viewing** tab is enabled and the **2D** tab is open.

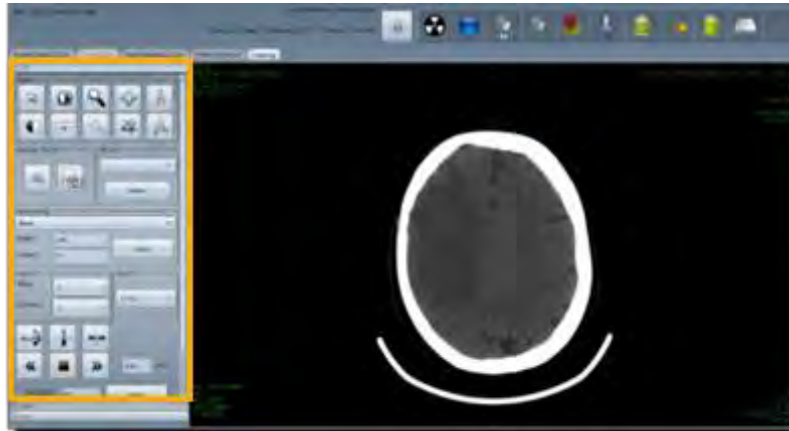


Figure 346: 2D tools

3. Use any of the image tools to manipulate your images.
4. Click the **Reset** button to reset images back to the original setting(s). You cannot undo this action.

Comparing images

Note You can compare two series from the same patient or two series from different patients.

1. Select the patient in **Patient Browser**.
2. Select the first series from the series window.
3. Right-click and click **Mark for Compare** from the menu.

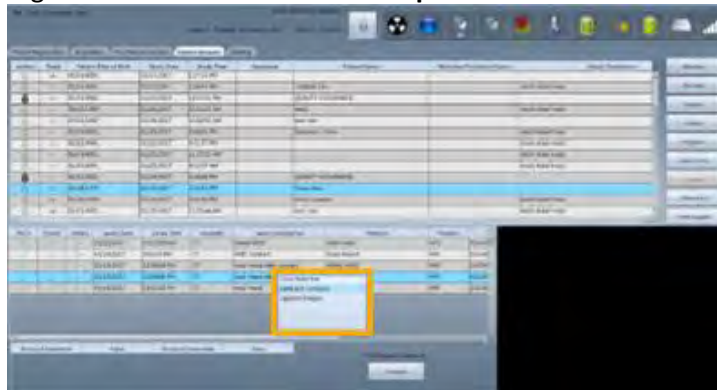


Figure 347: Mark For Compare on the menu

4. Select the second series or a series from a different patient.
5. Right-click and then click **Compare With Selected Series** from the floating menu.

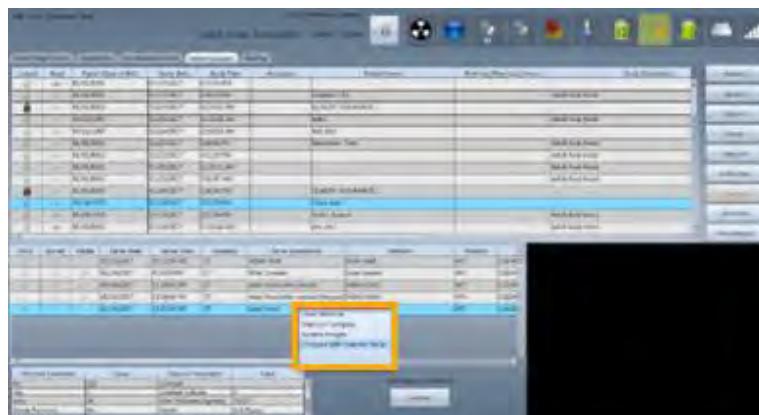


Figure 348: Compare With Selected Series floating menu

Both series are loaded into **Viewing** to compare.

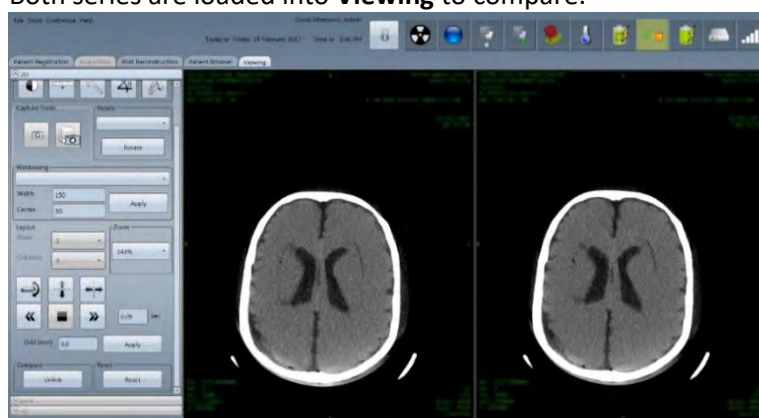


Figure 349: Compared series

- Click the **Link** button to link both images together to view.

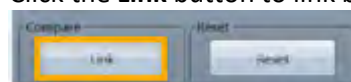


Figure 350: Link button

The **Unlink** button replaces the **Link** button.

- Click the **Reset** button to reset images back to the original setting(s).

Comparing a scout and a scan

- Select a patient from **Patient Browser**.
- Select a scout from the series window.
- Press and hold the **Ctrl** key on the keyboard.

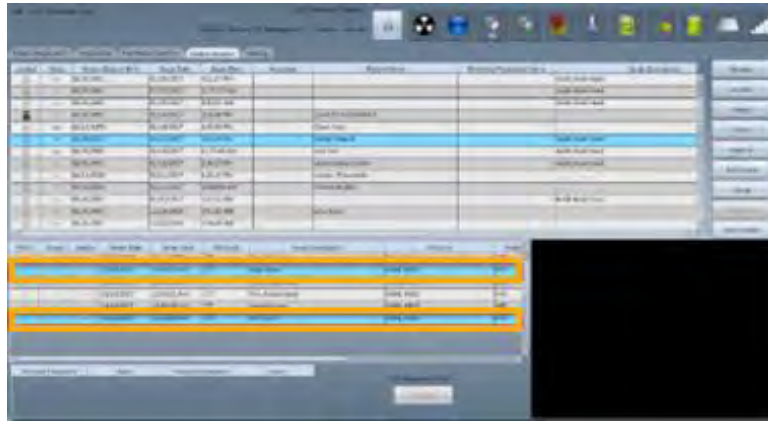


Figure 351: Scout and scan selected to compare

4. Select the scan from the series window. Both images are highlighted.
5. Click the **View Images** button. The scout and the scan appear side by side. A green localizer line appears on the scout.
6. Compare the scout to the scan.

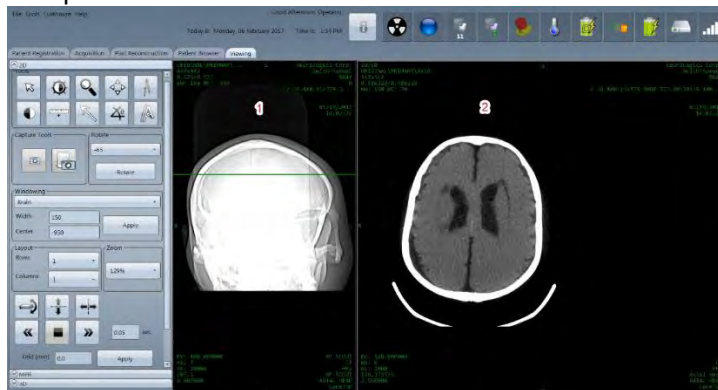


Figure 352: Comparing a scout (1) and a scan (2)

7. To remove the scout, right-click on the scout and click **Hide Scout Viewport**. To return the scout to view, right-click in the viewing window and click **Show Scout Viewport**.

Using the ROI

1. Select a patient from **Patient Browser** and select the series to view.
2. To open the images, click the **View Images** button or double-click the series. The **Viewing** tab is enabled and the **2D** tab is open.
3. Click the **ROI** tool.

4. Move the mouse pointer to the image and click where you want the **ROI** located.
5. Click the left mouse button and drag the green **ROI** diameter to the required size.
6. To lock the **ROI** in place, click the left mouse button a second time.
 - To change the location of the **ROI** or the details of the **ROI**, click the **ROI** or measurements you wish to move. The ROI and its measurements will turn yellow, and the pointer becomes a hand. Click and hold the mouse button on either the ROI or its measurements and drag them to a new location. Click anywhere outside the ROI to freeze it in the new location.
 - When you move the ROI to a different location the measurements of the ROI are automatically updated based on the new location.
7. To remove the **ROI**, anywhere on the **ROI**, right click to see the floating menu, and click the **Delete Annotation**, or click the **ROI** and when it turns yellow, press **Delete** on the keyboard.

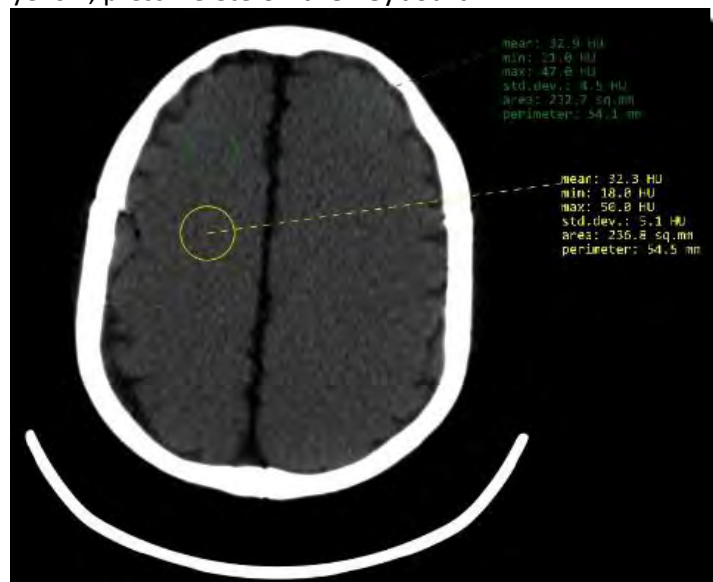


Figure 353: ROI

Using Layout and Rotate in 2D view

Layout lets you alter the number of images presented on the **Viewing** tab.

Rotate lets you turn the images.

1. Select a patient from **Patient Browser** and select the series to view.
2. To open the images, click the **View Images** button or double-click the series. The **Viewing** tab is enabled and the **2D** tab is opened.

3. To adjust the layout of the viewing area, click the **Rows** and/or **Columns** dropdowns to select the number of rows or columns you want to show.

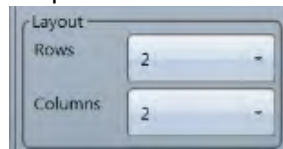


Figure 354: Layout dropdown

4. To rotate the image, click the **Rotate** dropdown and select the number of degrees to rotate the images.



Figure 355: Rotate dropdown

5. Click the **Rotate** button to see the images turn to the new angle.



Figure 356: Rotated Images

Applying a grid to your image(s) in 2D

1. Select a patient from **Patient Browser** and select the series to view.
2. To open the images, click the **View Images** button or double-click the series. The **Viewing** tab is enabled and the **2D** tab is open.
3. Change the size of the grid in the **Grid (mm)** text box.



Figure 357: Grid (mm)

4. Click the **Apply** button to apply a grid over the image.
5. Perform one of the following to remove the grid:
 - Click the **Reset** button.
 - Enter 0 in the **Grid (mm)** text box and click the **Apply** button.

Viewing images in MPR

Multi-Planar Reformation (MPR) allows images to be created from the original **Axial** plane into **Coronal**, **Sagittal** or **Transverse (Axial)** planes. MPR is fast, uses all the attenuation values in the dataset, and can be easily performed on the workstation. **MPR** however, provides only a **two-dimensional (2D)** display of the image data.

Viewer layout is 2 x 2 in the figure below.

1. Select a patient from **Patient Browser** and select the series to view.
2. To open the images, click the **View Images** button or double-click the series. The **Viewing** tab is enabled and the **2D** tab is opened.
3. Click the **MPR** tab.
The **MPR** screen appears.

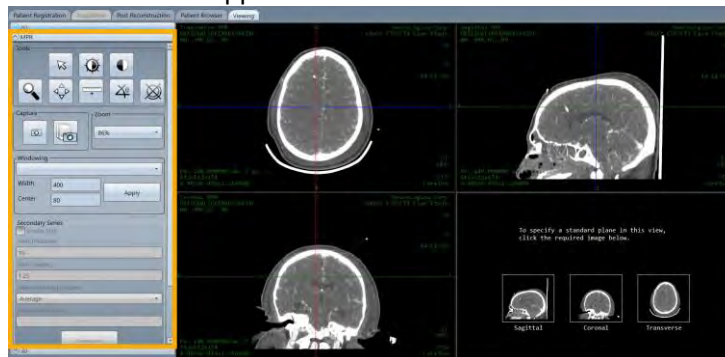


Figure 358: MPR tools

4. Use any of the image tools to manipulate the images.
5. The **Tilt** tool can be used to modify the rotation of the images.
6. Adjust the image angle by moving the circle.

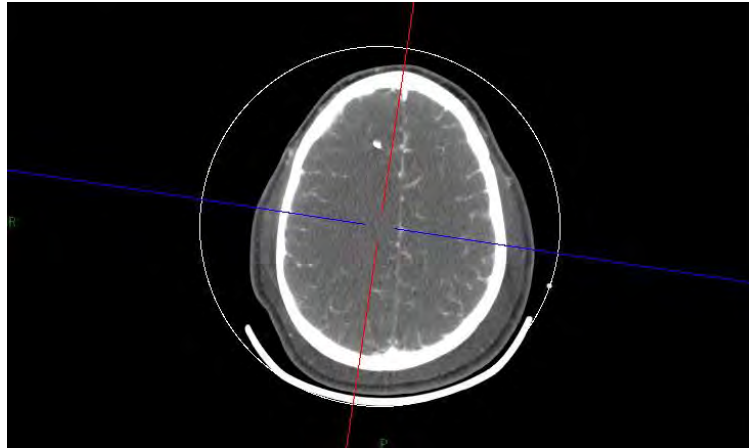


Figure 359: Tilt tool

7. Click the reset button to reset images back to the original settings.

Understanding and using slab

Through the reformation process, axial images are stacked creating a volume, or slab, which can be assessed in different planes. The thickness and spacing of each slab can be varied to meet the needs of the viewer. The reformations can be displayed in an average, maximum, or minimum projection.

MPRs should be created using 1.25mm slices.

Creating the slab

1. Select a patient from **Patient Browser** and select the series to view.
2. To open the images, click the **View Images** button or double-click the series. The **Viewing** tab is enabled and the 2D tab is opened.
3. Click the **MPR** tab. The **MPR** screen appears.
4. Click the **Sagittal**, **Coronal**, or **Transverse** plane to create your slab.



Figure 360: Image formats

5. The **Secondary Series** options are enabled.
6. Select **Enable Slab**.

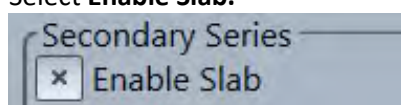


Figure 361: Enable Slab option

The **Enable Slab** option is inactive if no **MPR** view is selected.

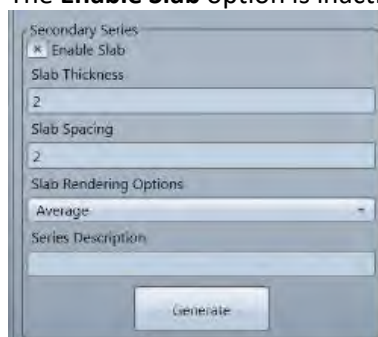


Figure 362: Enable Slab option under Secondary Series

The following options are available in MPR Slab mode:

Slab Thickness	The thickness of the MPR slab.
Slab Spacing	The space between the start of one slab and the next.
Slab Rendering Options	Where you define the pixel values that will be displayed in each slab: options include Average, Maximum Intensity, and Minimum Intensity.
Maximum Intensity	The highest pixel values for all slices within the slab are displayed.
Minimum Intensity	The lowest pixel values for all slices within the slab are displayed.
Average	The pixel values of all slices within the slab are combined and the average value for each pixel is displayed.
Series Description	Text field for naming the series of images created when clicking the Generate button.
Yellow lines	Define the slab thickness. The boxes on the lines allow you to adjust the thickness using the mouse.

Cyan lines	Define the slab FOV and dictate the range of the new series to be generated. The cyan lines are adjustable by clicking and dragging the lines themselves; both lines are moved by clicking and dragging the central circle marker.
Red, blue, and green lines	Define the cross sections of the anatomy being viewed.
Generate	Generates a new series with the name given in the Series Description field, based on the selected MPR view pane.

7. Set the **Cyan** lines to determine the beginning and end of the slab.

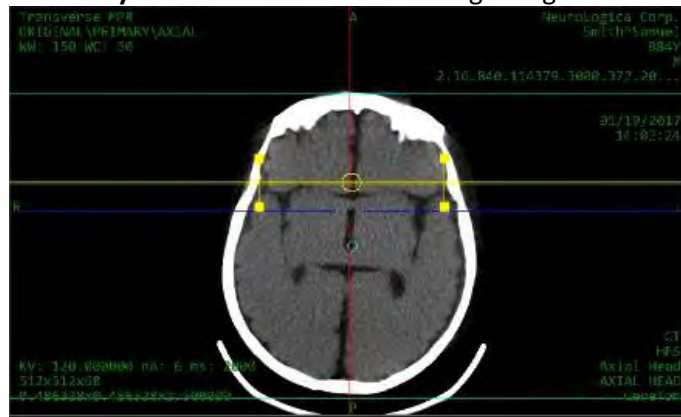


Figure 363: Cyan Line and circle to drag for FOV

8. Use the **Cyan** circle to drag the planned slab if necessary.
9. Define the **Slab Thickness** and **Slab Spacing** in the text boxes.

Slab Thickness	10.000
Slab Spacing	1.25

Figure 364: Slab Thickness and Slab Spacing text boxes

You can also use the **yellow** squares found on the slab thickness display to modify the **Slab Thickness**.

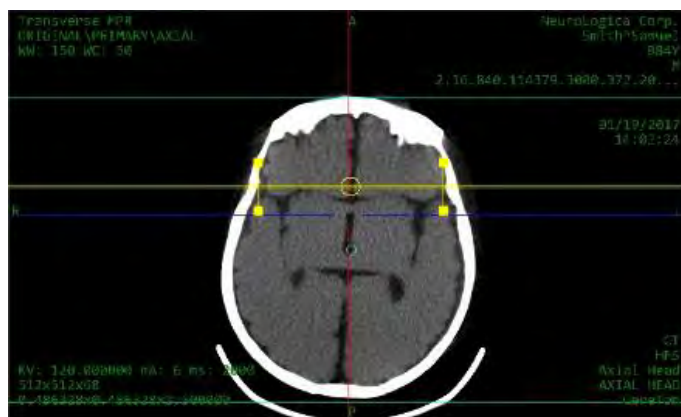


Figure 365: Yellow boxes to manually drag for desired slab thickness

10. Click the **Slab Rendering Options** dropdown to select the appropriate option.

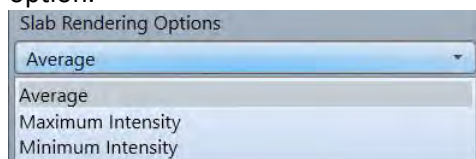


Figure 366: Slab Rendering Options dropdown

11. Select the **Tilt Tool** to correct any rotation on the image.



Figure 367: Tilt Tool

12. Use the mouse pointer to move the white **Tilt** circle.

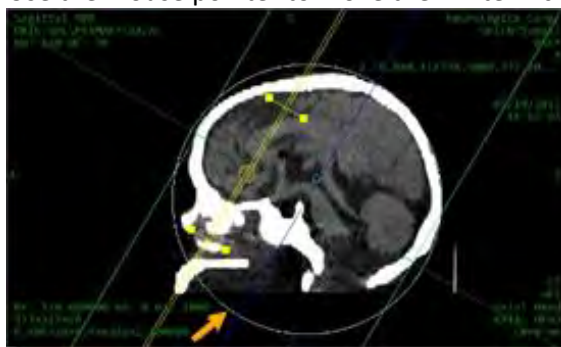


Figure 368: Tilt white circle

Note The circle does not represent the Field of View

13. Enter the slab name in the **Series Description** box.

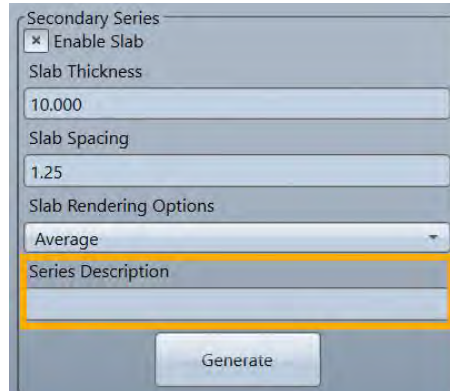


Figure 369: Series Description box

14. The slab can be previewed in the bottom right viewport.

Note Make sure **Zoom** is 100% or below.

Ensure all expected anatomy is included when previewing the created MPR

15. When you are ready to save, click the **Generate** button.
A **Saving Series** popup appears.

When the series is complete, the **Capture Complete** pop-up appears.



Figure 370: Capture Complete popup message – Series saved

The new **MPR** images appear in the **Patient Browser** under the patient with the description in the **Series Description** text field.

Viewing images in 3D

In **3D** viewing, a 3-Dimensional image is created by stacking all the images of a scan on top of one another to create a 3D-volume. The initial display shows the **3D** volume, and a box appears around it. **MPR** planes also appear.

1. Select a patient from **Patient Browser** and select the series to view.
2. To open the images, click the **View Images** button or double-click the series. The **Viewing** tab is enabled and open.

3. Click the **3D** tab.

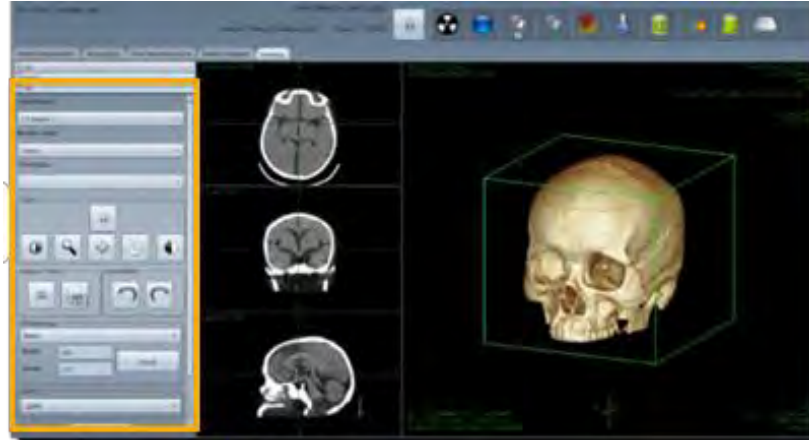


Figure 371: 3D tools

4. To rotate the image up to 360°, click **Rotate** and move the image with the mouse pointer to the rotation of choice.
5. You can change the **Color Presets** from the dropdown menu:

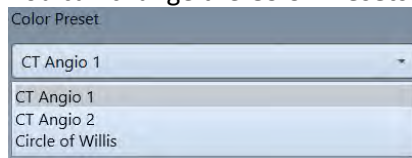


Figure 372: 3D Color Presets

6. You can change the **Render mode** from the dropdown menu:

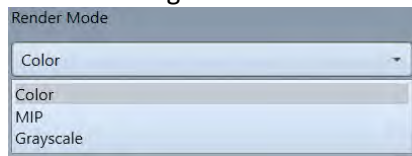


Figure 373: 3D Render modes

7. Click the **Orientation** drop-down box to assign an orientation:

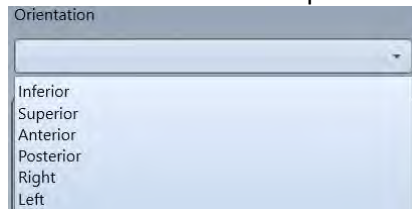


Figure : 3D Orientation options

8. Click the **Reset** button to reset images back to the original setting(s).
You cannot undo this action.

Chapter 12 Post Reconstruction

The system stores multiple patient series of raw data to allow post reconstruction of images. **Post Reconstruction** allows reconstructing of the acquired data using different algorithms, slice thicknesses, or use of image enhancement algorithms, such as **Noise Reduction** and **Windmill Correction**.

Reconstruction Overview

Noise Reduction

Noise appears as grain on the images and is caused by a low signal to noise ratio. This occurs most commonly when a thin-slice thickness is used. It can also occur when the radiation dose is insufficient to penetrate the anatomy being scanned. **Noise Reduction** is a semi-iterative reconstruction technique applied during Post Reconstruction designed to reduce the amount of noise in the images. **Noise Reduction** is recommended for pediatric scanning and for scanning large patients. Currently, the option is only provided for post reconstruction.

Customized Bone Removal

Customized Bone Removal is related to **Iterative Bone Correction** or **Second Pass Beam Hardening Correction**. The correction automatically adjusts the bone correction based on the size and density of the bone in the corrected image.

Metal Artifact Reduction (MAR)

Metal Artifact Reduction (MAR) is an optional feature that can be enabled during post reconstruction.

Streak artifacts and beam hardening are often observed around metal leads, aneurysm clips, epilepsy probes, or metal screws. Numerous factors contribute to these streaks including under sampling, photon starvation, beam hardening, and scatter. The streaks can be reduced using MAR. MAR removes the metal from the image to reconstruct the soft tissue only, and then adds it back, reducing the artifacts.

The performance of the MAR depends on the interpolation methods used in both the metal replacement in the soft tissue images and the interpolation method used for correcting the sinogram.

The MAR correction is only recommended to be used if the streaks due to the metal are deemed to be very disruptive of the reconstructed images and if they are interfering with the anatomical feature of interest.



Figure 374: Active Post Reconstruction tab

The tools available to **Post Reconstruction** are identified in the table below.

Table 51: Viewing tool

Image tools	Tool name	Action
	Stop	Cancels the current post-reconstruction request. All images are generated until you click the Stop button.
	Field Of View	Adjusts the Field Of View (FOV) prior to reconstruction.
	Clear Active	Resets tool to default pointer device.
	Windowing	Adjusts the width and level of selected image.
	Zoom	Magnifies the image.
	Pan	Adjusts the image on X or Y axis.
	Reset	Resets the display to default viewer settings.

Performing Post Reconstruction

The following figure identifies parts of **Post Reconstruction**:

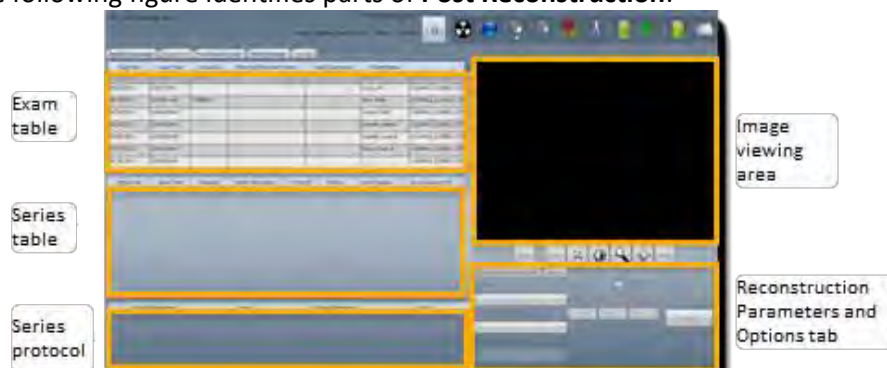


Figure 375: Post Reconstruction areas

1. Click the **Post Reconstruction** tab.

2. Select a study in the **Exam Table**.
When you select a study, all the scanned series for that study appear in the **Series Table**.
3. Click the series to reconstruct.

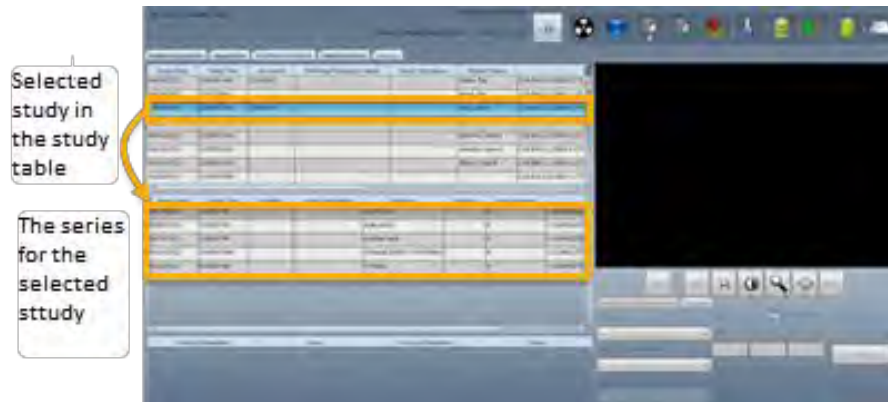


Figure 376: Post Reconstruction study and series tables

4. Click the **Load** button.
The scan or series will load into the viewer. The series protocol table and the **Reconstruction Parameters** and **Options** tabs are active.

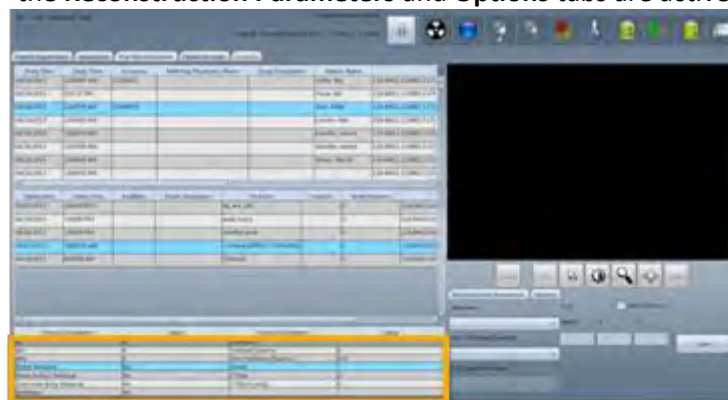


Figure 377: Post Reconstruction series protocol table

5. View the study in Image Viewing Area.

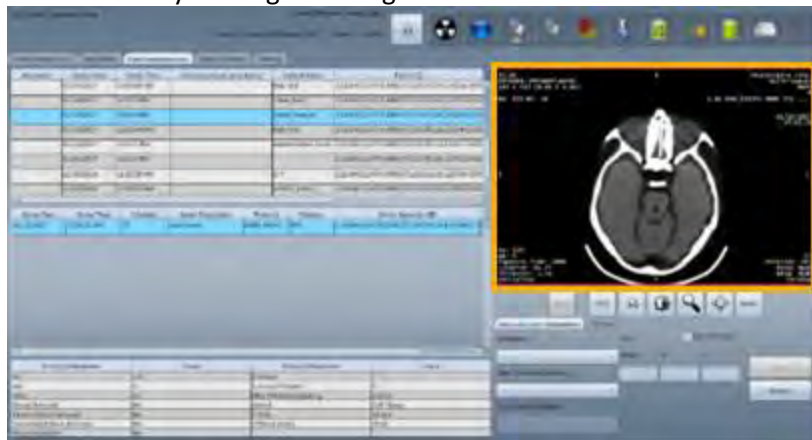


Figure 378: Post Reconstruction viewing image area

6. To modify the **FOV**, perform the following:
 - Click the **FOV** tool, click and drag the mouse to form a square on the image in the **Image Viewing Area**.
 - The size of the square appears in the Width box in the **Reconstruction Parameters and Options** tab.
 - Click the circle in the middle of the FOV square and drag to move the **FOV**.
 - Click one of the two drag boxes on the corners to adjust the size of the box.
 - The **Width** dimension, and **X/Y** coordinates are adjusted as the size changes.
 - The **FOV** size cannot exceed the range of 50 - 250mm square.

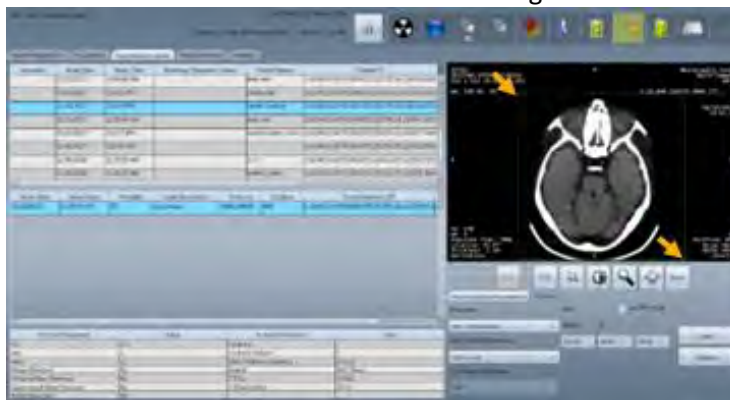


Figure 379: FOV resizing boxes

Note You can also enter a number in the **Width** or X and Y box to define a specific **FOV**. Alternatively, click the **Use FOV Max** option to use the maximum **FOV**.

7. Click the **Sharpness** dropdown to select a reconstruction algorithm from the **Reconstruction Parameters** tab.

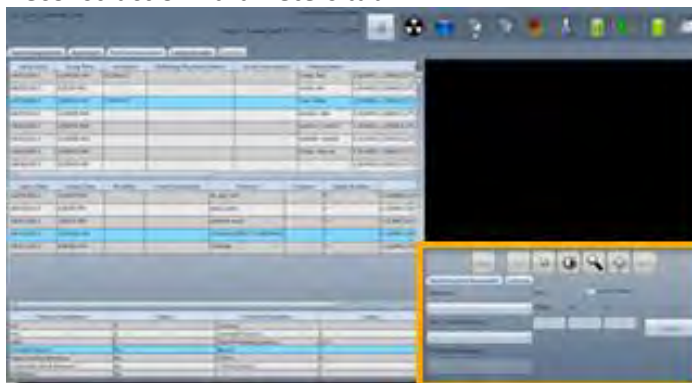


Figure 380: Post Reconstruction's Parameters and Options tabs



Figure 381: Reconstruction Parameters Sharpness dropdown

The sharpness is modified by using one of the following kernels:

- Low Noise QA – Not for Clinical Use
- Soft Tissue
- Pos. Fossa/Vessel
- Sharp
- Bone
- Sharp Lung
- High Res QA – Not for Clinical Use

8. Click the **Slice Thickness/Spacing** dropdown to select.

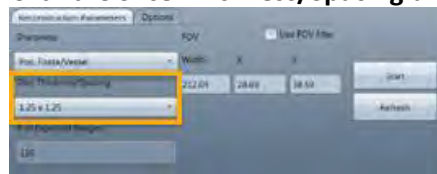


Figure 382: Reconstruction Parameters Slice Thickness/Spacing dropdown

The slice thickness and spacing options are determined by the type of scan that was acquired (Axial vs. Helical):

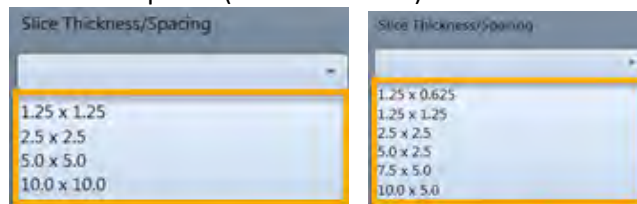


Figure 383: Axial (left) and Helical (right) scan slice thickness options

9. The **# of Expected Images** text box shows the calculated number of images that will be reconstructed based on the parameters used for the reconstruction.

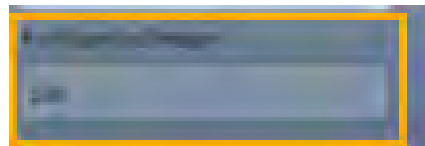


Figure 384: # of Expected Images

10. Click the **Options** tab. The following are only available during **Post Reconstruction**.

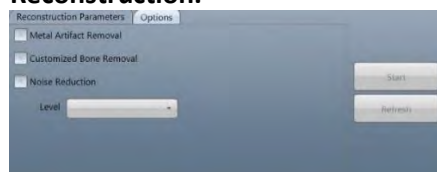


Figure 385: Post Reconstruction Options tab

11. If desired, select the **Metal Artifact Removal** feature.

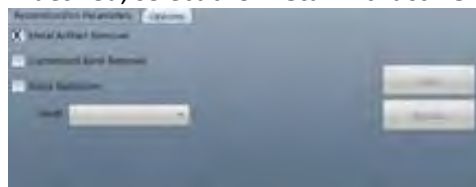


Figure 386: Metal Artifact Removal

12. If desired, select the **Customized Bone Removal** options to correct these elements.

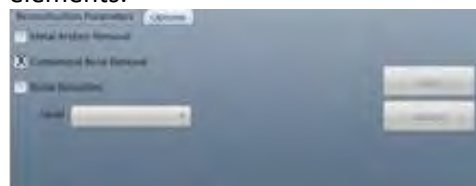


Figure 387: Customized Bone Removal

13. If desired, select **Noise Reduction** then click the **Level** dropdown to select a new noise level either **Low** or **High**.



Figure 388: Noise Reduction

14. Click the **Start** button to generate a new dataset.

When you click the **Start** button, the reconstructed images appear in the viewing pane.

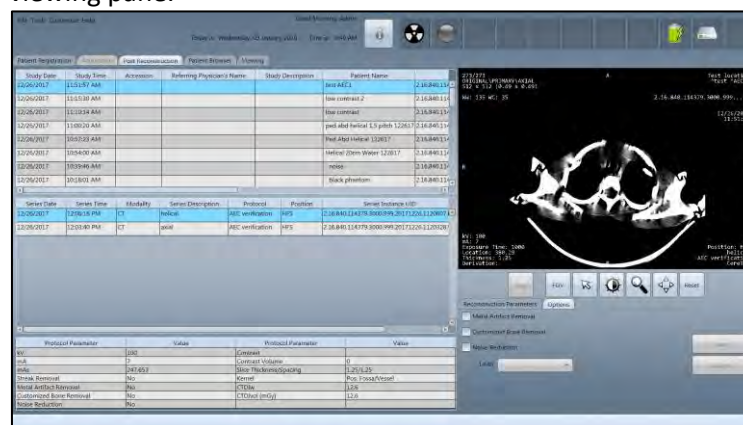


Figure 389: Please wait while the system performs data reconstruction message

15. When the reconstruction is complete, the images appear in **Patient Browser**.

Chapter 13 Accessories and Options

In this chapter, you will learn how to convert a bed, stretcher, or any type of adjustable surface into a scanning platform through the use of scan boards.

To request the catalog(s) to reference product descriptions/details and part numbers for the available accessories/options that are used with the CereTom Elite, see “Contact information” on page 26.

When using a fixed scanner, the table moves from one portion of anatomy to another while the gantry remains stationary. With the CereTom Elite, an in-place scanning platform remains stationary while the gantry or scanner translates from one point to the other to cover the anatomy.

A bed adapter is used as a secure mount to hold a silhouette scan board, which supports the patient’s head. Different beds or scanning platforms require different adapters. NeuroLogica manufactures many different bed adapters to fit a wide variety of hospital beds, stretchers, and Operating Room (OR) tables. The majority of the bed and stretcher adapters are designed to hold a silhouette scan board.

The universal transfer board is used when no bed adapter is available for a particular bed. It is placed under the patient and secured to the bed or stretcher with straps. The board can be used on a bed, stretcher, or in the OR.

Note The Universal Transfer Board may not be applicable for all beds.



WARNING Some accessories require adjoining posts to be inserted into respective mounting holes to be assembled onto the scanner/patient support. Make sure the posts are inserted as straight as possible. If the posts are inserted at an angle, this may deform and/or wear the respective posts prematurely.



WARNING NeuroLogica Corp. recommends that the weight of the patients being positioned on the scan board does not exceed the bed manufacturer’s safe, recommended, operating patient load. Realizing patient safety is of the utmost importance, it is recommended that safe judgment be exercised at all times when it comes to the clinical care of patients. There are a number of varying factors, such as the condition of the bed being used, unique patient anatomy, as well as the proper scan board, adapter installations, and positioning of the patient, per NeuroLogica Corp.’s clinical training guidelines and product labeling. If any excessive wear or damage is noticed to any adapter or scan board, do not use it for a patient scan; contact a qualified service technician to assess, repair, and/or replace the device.

Using bed adapters

Bed adapters are manufactured for specific bed models. Prior to installing the CereTom Elite at a facility, a precise survey is conducted to ascertain the type of bed used the most with the CereTom Elite.

Adapters are classified as follows:

- Adapters that do not have posts and fit onto the frame of the bed by attaching to existing posts (below, left).
- Adapters that do have posts and fit onto the frame by inserting the posts into an existing hole in the frame (below, right).
- Adapters for OR tables, used in surgical cases.
- Adapters for a neonatal scan platform for children.

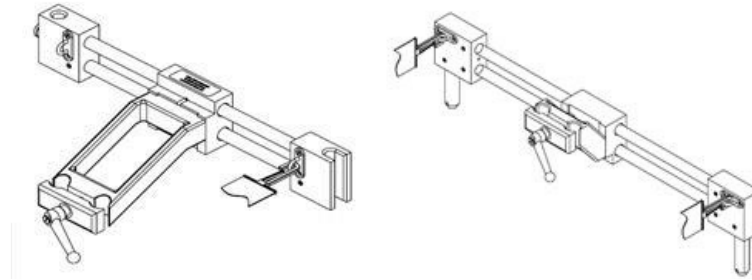


Figure 390: Bed adapter without posts (left) and bed adapter with posts (right)

Using bed adapter safety straps

The bed adapter comes with two straps that attach to the rings on the adapter and can be used to secure the patient to the silhouette scan board.



Figure 391: Safety straps

1. Identify the rings on the bed adapter as highlighted on the Hill-Rom and Sytrker In Touch adapters below.



Figure 392: Hill Rom bed adapter

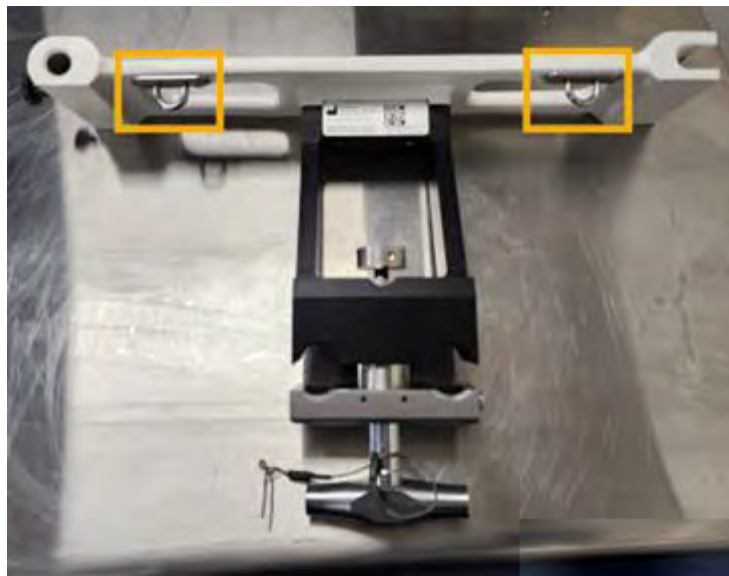


Figure 393: Stryker In Touch bed adapter

2. Connect the hooks on the straps to the rings on the bed adapter as seen below.

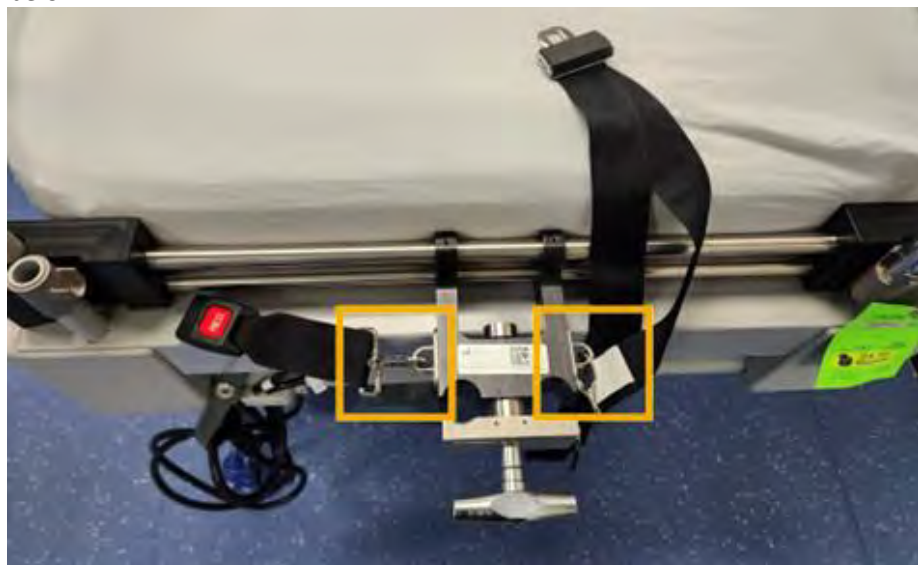


Figure 394: Straps attached to bed adapter

3. Attach the silhouette scan board to the bed adapter.

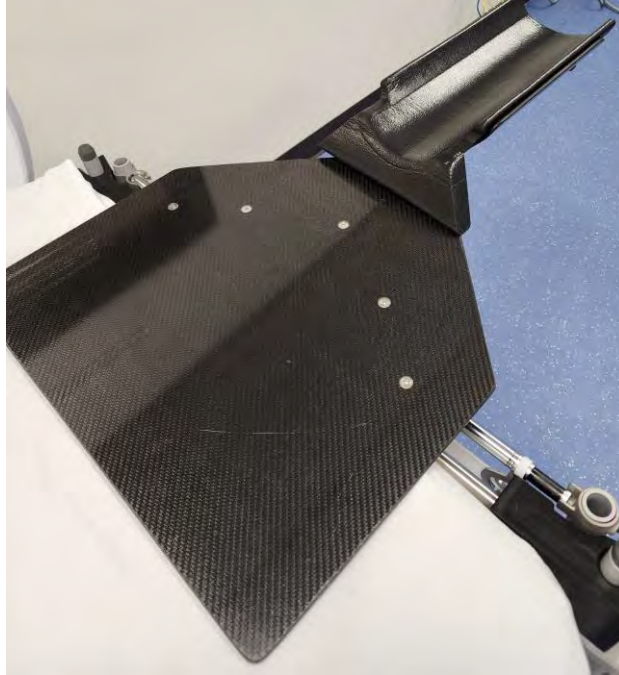


Figure 395: Silhouette scan board attached to bed adapter

4. Position the patient on the Silhouette scan board and position the straps across the patient's shoulders and upper chest to provide support and immobilization.



Figure 396: Patient properly immobilized on scan board

Attaching bed adapter with or without posts

1. Check the bed adapter label and bed model to make sure the adapter is designed to fit the bed.
2. Remove the head board from the bed.
3. Insert the bed adapter **without** posts onto the posts on the bed frame.



Figure 397: Bed adapter without posts insertion (setscrew showing under arrow)

4. Make sure the adapter is flush against the bed frame.
5. Secure the adapter to the posts by adjusting the setscrew (see Figure 397).



Figure 398: Bed adapter T-square

6. Attach the silhouette scan board to the bed adapter by inserting the scan board into the adapter block.



Figure 399: Bed adapter without posts shown being inserted into scan board

Note Ensure that the bed's IV pole does not obstruct or interfere with the Silhouette scan board.

Ensure T-square is properly tightened: listen for two clicks.

7. Press down on the silhouette scan board while tightening the T-square handle until two (2) clicks are heard.
8. Add the cushion to the head holder for the patient's comfort.



Figure 400: Silhouette with cushion shown on head holder

The head board is now ready to receive the patient.

9. Move the patient up into the head holder, making sure the patient is up and high enough in the head holder that the scanner can easily move to the patient's shoulders.



Figure 401: Phantom shown on head holder

10. While the scanner is in **Transport** mode, align the patient with the scanner.
11. Lower the scanner to **Scan** mode and position the scanner over the patient.



Figure 402: Patient position view from behind scanner

12. Make sure the head goes into the bore symmetrically.

The patient is now ready to be scanned.



Figure 403: Patient ready to scan

Transfer boards for adult, pediatric, and neonate patients

Scan boards are customized for adult, pediatric, and neonate patients. Universal transfer boards and silhouette scan boards are used for adults; pediatric and neonate platforms are designed for smaller patients.

Table 52: Scan boards and their weight-bearing restrictions

Scan board / platform	Weight
Neonate scan platform	7.5kg/17lbs
Pediatric scan platform	24.9kg/55lbs
Silhouette scan board	Weight limit of board is equal to the weight limit of the patient bed; weight limit on portion supporting patient head is 7.5kg/17lbs
Universal transfer board	Weight limit of board is equal to the weight limit of the patient bed; weight limit on portion supporting patient head is 7.5kg/17lbs

See also “Parts that potentially come into contact with the patient” on page 72.



WARNING The weight limit for the superior portion of all scan boards (head) cannot exceed 7.5kg or 17lbs.

Using the Universal Transfer Board

The universal transfer board is a carbon-fiber, radiolucent board that is designed to work with any ICU bed or stretcher. The carbon-fiber board comes with a 0.5in. (thick) head board and 2 in. x 5 ft. straps to strap the board to the ICU bed or stretcher. It also comes with 3 in., 4 in., 6 in., and 12 in. bed stiffeners.

You can use the universal transfer board on most beds, tables, or stretchers. Because you can attach the universal transfer board to almost any type of surface, it is used anywhere throughout the hospital including the ICU, OR, and ER. The universal transfer board is placed on the mattress and secured with a strap or placed directly on a surgical table under the cushions. The patient lies on the board with their head in the head holder. The CereTom Elite is moved into position, and the scan is performed.

The universal transfer board is always used with mattress stiffeners. The mattress stiffeners provide a solid surface at the head of the bed to prevent the mattress from sagging when a scan is performed.

Note The universal transfer board is an optional accessory that does not come with the system.

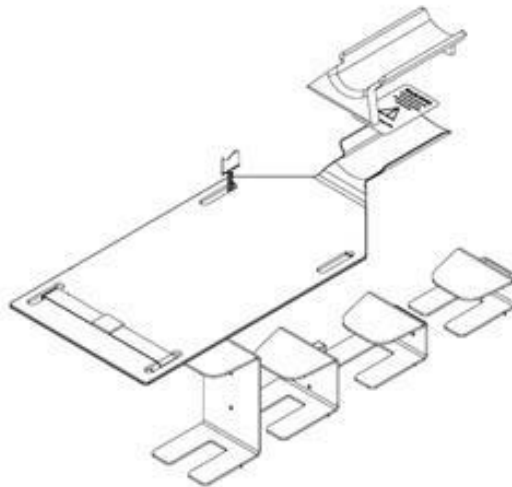


Figure 404: Universal transfer board and bed stiffeners

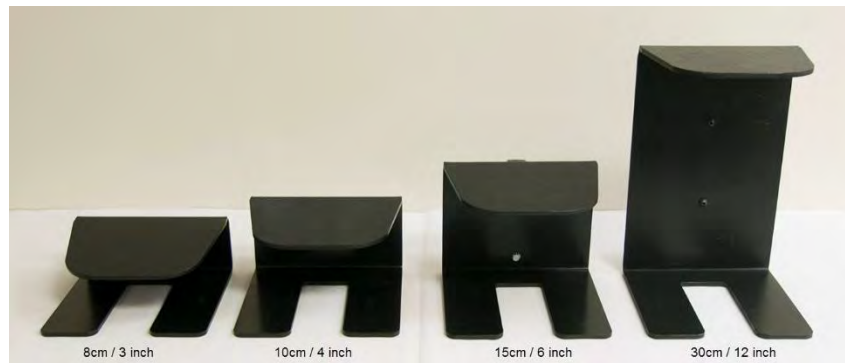


Figure 405: Four types of mattress stiffeners

Note Tipping of the board is the major concern. The universal transfer board **MUST** be securely fastened to the surface prior to placing the patient on the board.

The universal transfer board is stored on the left side of the CereTom Elite for easy transport.



Figure 406: Universal transfer board storage

1. Obey all warning labels when using the scan board.



Figure 407: Scan board warning labels

2. Select the appropriate mattress stiffener for the mattress size and insert.



Figure 408: Mattress stiffener in place

3. The universal transfer board requires mattress stiffeners that provide a solid surface at the head of the bed to prevent the mattress from sagging with the weight of the patient when a scan is performed.
4. Remove the scan board from the side of the scanner.
5. With the proper mattress stiffener properly inserted, apply the universal transfer board on top.
6. Position the board in accordance with the yellow, safety-warning stickers to avoid a tipping hazard. Do not extend the board beyond the mattress for proper placement.



Figure 409: Universal transfer board properly positioned on the bed on a bed stiffener

7. When the board is properly positioned on the bed, secure it by using the safety strap.
8. The safety strap must be attached to the board, passed completely under the bed, and secured on the other side.



Figure 410: Universal transfer board with safety strap installed

9. When the universal transfer board is securely fastened to the bed, transfer the patient to the bed, and secure the upper strap to the patient and the scan board.
10. When the patient is positioned and securely strapped in position the scanner over the patient.
11. Initiate the scan.

Using the pediatric scan platform

Note The Pediatric scan platform is used for larger children that cannot be supported by the infant/neonatal scan platform.

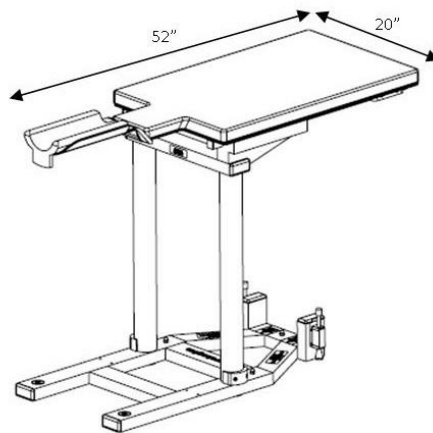


Figure 411: Pediatric scan platform



WARNING The **maximum** weight limit for the Pediatric Scan Platform is 24.9kG/55 lbs.



WARNING The pediatric scan platform is not a transportation device and should never be used to move a child from one location to another.



CAUTION Always secure the child to the scan platform with the safety strap as described below to prevent motion and falls.



WARNING *Never* leave the child unattended on the platform!



CAUTION Read and observe all warning labels.



CAUTION *Never* remove the scan board from the platform in order to use it separately.

Note The pediatric scan platform is used to scan adolescents too large to be scanned on the neonatal scan platform, but too small to be scanned on their regular hospital bed.

1. Place the child on the scan platform and secure with the safety strap.



Figure 412: Child placed on pediatric platform with safety strap (two views)

2. Position the scanner over the platform to ensure the patient is centered using the laser light as a guide.



Figure 413: Pediatric platform positioned by the scanner

3. After the scanner and patient are properly positioned, lock the platform in place by stepping down on the plunger on both sides of the scan platform (see Figure 422).



Figure 414: Platform brake

4. When scan is completed, step on the silver tab to release the brake.

Using the infant and neonate scanning platforms and adapters

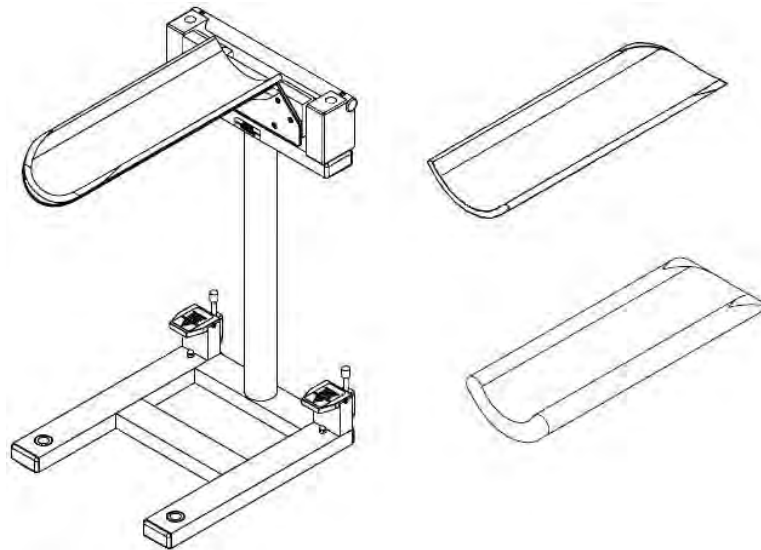


Figure 415: Infant and neonatal scan platform and pads (to the right)



WARNING The **maximum** weight limit for the neonatal scan platform is 7.5kg/17lbs.



WARNING The neonatal scan platform **is not** a transportation device and should **never** be used to move a child from one location to another.



WARNING Always secure the child to the scan platform with the pediatric strap as described in the following procedure, to prevent the child's motion and falls.



WARNING *Never* leave the child unattended on the platform!



CAUTION Read and observe all warning labels.

1. Place the child on the scan platform and secure with the safety strap.



Figure 416: Pediatric strap

2. Drape the strap over the patient and secure one side around the patient with Velcro, then continue with other side.



Figure 417: Applying pediatric strap onto the platform (three views)



WARNING *Never* leave the child unattended on the platform!

3. The neonate or infant patient can be positioned on the platform head-first for head scans, and feet-first or head-first for body scans.



Figure 418: Proper position of neonate/infant for head scans (left) and body scans (right)

4. The patient is now ready to be placed in the scanner.

Note The platform remains stationary during the scan while the scanner moves during the scan.

5. Position the scanner over the platform to ensure the patient is centered using the laser light as a guide.
6. The CereTom Elite is specifically designed for the platform base to fit under the scanner while it is free to travel the entire scan length.



Figure 419: Scanner shown to (easily) slide over platform base (two views)

7. When preparing to scan a neonatal patient's head, position the head first on the platform (as shown below) and slide platform into scanner bore, using laser light to properly position the patient.



Figure 420: Neonate/infant insertion for head scan (two views)

Note Use the same process (in previous step) when you prepare to scan the neonatal patient's chest or abdomen.

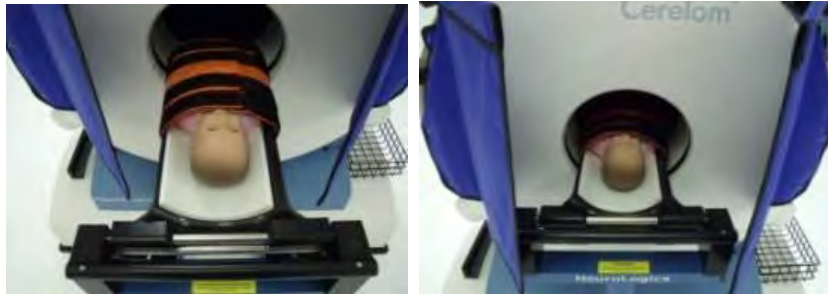


Figure 421: Neonate and infant insertion for body scan (two views)

8. When the patient is properly positioned in the scanner, lock the platform in place by stepping down on plunger on both sides.



Figure 422: Neonate platform foot brake locations

9. When the scan is complete, step on the silver tab to release brakes.

Using the CereTom Elite in the Operating Room

The three methods used to convert the operating table into a scanning platform are as follows:

- An OR table adapter with the silhouette scan board
- Universal Transfer board

It is important to note that all of these devices are used pre, post, and intra-operatively.

Using the Operating Room table adapter

The Operating Room (OR) table adapter functions in the same way as a bed adapter.

1. Attach the OR table and then the silhouette scan board to the adapter.

The OR table adapter has two posts that fit into the adapter supplied by either the OR bed manufacturer or by Mayfield.



Figure 423: OR table adapter

2. Adjust the OR table adapter to the openings in the mount and attach it to the mount.



Figure 424: OR table adapter attached to mount

3. Attach the silhouette scan board to the OR table adapter.
4. Add the padding to the head holder and slide the patient onto the board. You can perform this step at scan time or before the start of surgery. If you perform it prior to surgery, the surgeon may choose to perform the surgery on the head holder.
5. Roll the scanner into place to start the study.

Using the universal transfer board in the OR

The universal transfer board is a carbon-fiber, radiolucent board that is designed to work with most ICU beds or stretchers. The carbon-fiber board comes with a 0.5in. (thick) head board and 2 in. x 5 ft. straps to strap the board to the ICU bed or gurney. It also comes with 3 in., 4 in., 6 in., and 12 in. bed stiffeners.

In addition to using the OR adapter and silhouette board in the OR, the universal transfer board is often used in the OR. The universal transfer board is secured to the surgical table by placing the board under the table cushions (if used) and securing the safety strap to the table by passing the strap under it and securing it on the other side. The board is secured to the table prior to the patient's arrival. The patient is then placed on the table with the patient's head in the head holder. The surgery is performed with the patient on the universal transfer board. When a scan is needed, the CereTom Elite is wheeled into place over the patient's head, and the scan is performed. The universal transfer board is used for almost any non-invasive surgical procedure.

Chapter 14 Scanner Drive System

The Scanner Drive System (SDS) enables you to easily move the CereTom Elite wherever you need it to go. The SDS is designed with an intuitive, variable-speed joystick interface and a solid-state, electric drive that lets you navigate in and out of elevators, over door thresholds, or on any type of floor including carpet, with ease. In addition to providing transport, the SDS serves as a cart for the CereTom Elite workstation. The scanner must be docked to the SDS to move it.



Figure 425: Scanner Drive System

Be sure to read its warnings carefully and completely **before** using the NEU-CT-Gen III SDS. **Do not** attempt to service the SDS. Only skilled service people are permitted to service the SDS. See “Hazard Information” on page 50.



CAUTION Failure to heed these warnings may cause injury to the user, to others, or damage to the equipment.



CAUTION When the SDS is unplugged from the wall, there are no lights or charge status indicators. There is no level of charge status shown.

SDS overview

Be familiar with this section before using the SDS.

SDS considerations before use

Before using the SDS, consider the following:

- If a problem is detected with the SDS, make sure repairs or adjustments are made to the SDS **before** using it.
- Make sure the SDS operates easily and freely, and all parts work smoothly.
- Check for excess noise, vibration, or a change in the ease-of-use. Noise, vibration, or change in ease-of-use can be signs of a problem and a need for servicing.
- During scanner storage or non-use, undock the drive systems **before** storing the CereTom Elite scanner to prevent damage to the drive wheels; failure to detach the drive unit from the scanner during extended storage time will result in flat spots on the wheels where they contact the floor.
- Docking height: the docking mechanism does not automatically adjust to match the scanner and must match the scanner docking-adapter height; the height is set during installation by NeuroLogica; the mechanism should engage without forcing.
- If lock is on, all scanner functions are inactive.

SDS control panel



Figure 426: SDS control panel and description of components

See the table below to identify the indicators.

Table 53: Battery charge, LEDs, and SDS On and Off buttons

Number	Name	Description
1	Battery-charge status indicator	Shows the amount of charge remaining for the SDS.
2	LED 1	Illuminates when drive system is properly docked (mated).
3	LED 2	Illuminates when locking lever is engaged and system is locked.
4	LED 3	Illuminates when drive system is docked, locked, and pressurized.
5	LED !	Illuminates when an error occurs.
6	System On button	Illuminates (green) when the SDS is on.
7	System Off button	Not illuminated (black) when the SDS is off.

SDS features

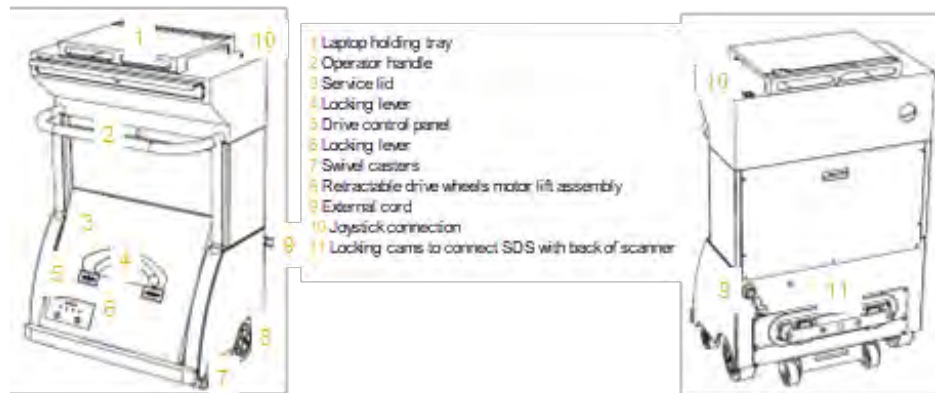


Figure 427: SDS features

Joystick features



Figure 428: SDS joystick (REM421)

Table 54: REM421 joystick features

Symbol	Feature	Action
	Battery gauge	Identifies the battery usage of the SDS, which matches the battery indicator on the SDS control panel.
	On / Off	Powers on and off the joystick.
	Speed up or down	Specific drive setting to adjust speed of the SDS.
	Horn	Sounds the horn.
	For service purposes, only	Not for clinical use.

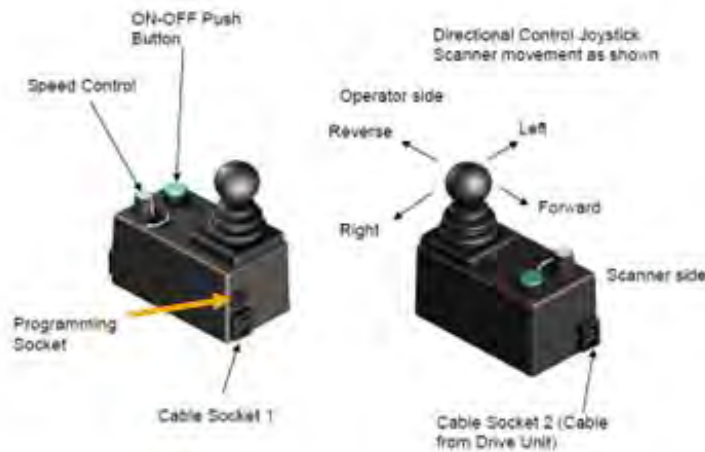


Figure 429: SDS joystick (REM35)

Table 55: REM 35 joystick features

Symbol	Feature	Action
	On / Off	Powers on and off the joystick.
	Speed up or down	Specific drive setting to adjust speed of the SDS.
	Directional joystick	Moves the scanner in the forward, left, reverse, or right direction.

Note The joystick is modular and used on other production items; however, for Scanner Drive system (SDS), only basic features are needed to operate the joystick fully. Therefore, SDS is not affected by some of the joystick's non-critical features.

Your joystick may not look exactly as the one shown in Figure 428; however, the same basic features described in Table 54 apply.



CAUTION The joystick must be programmed by trained personnel. Failure to do so may cause severe damage to equipment and personal injury.

Retractable power cord

Consider the following:

- Retractable power-cord reel and plug location (back of SDS).
- Plug style will vary depending on factory installed elements based on geographic location and voltage requirements.

-  The warning that this uses hazardous voltage.



Figure 430: SDS retractable power cord –retracted (left) and not retracted (right)



CAUTION The system (including the workstation) should be plugged in at all times, when not in **Transport** mode, being transported or in scanning use, to help maintain battery life and proper system operation. Failure to do so could result in permanent battery damage, which will require a service technician to repair.



CAUTION If the system is unplugged and battery capacity reports to be 0%, permanent battery damage can occur.

Note Be sure to keep the workstation plugged in when it is not in use in order to charge the battery. Charge time while off is ~ (approximately) 2 hours; while in use, charge time is ~ 8 hours.

Locating the power-failure, pneumatic, emergency-release safety feature

The pneumatic emergency release is a power failure safety feature that prevents the wheels from retracting if there is a power failure. This manual (push) button will release air pressure to the system in the event of a power failure.



Figure 431: SDS pneumatic emergency release



WARNING Electric shock may occur when plugging this device into wall outlet. Use *only* grounded or hospital grade outlets.



CAUTION When not in transport, the SDS should be plugged in to best prevent its batteries from draining.

Detachable parts and accessories

Attach the joystick cable to drive system by pushing connector into socket as shown.



Figure 432: SDS joystick cable connected to SDS, arrow pointing to release button

Identifying the collision detection bumper switches

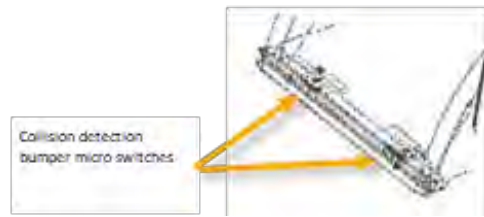


Figure 433: SDS collision detector micro switches

Collision recovery

To recover from a bumper collision, press the joystick **On** and/or **Off** button to reset the system and drive, and/or remove any obstruction at the bumper. See “Joystick features” on page 314 for information on REM421 and REM35 joystick models.

Docking the SDS to the scanner

Training for this equipment is provided by NeuroLogica Corp. or through a NeuroLogica authorized training program. Only authorized personnel are permitted to operate this equipment. See “Contact information” on page 26.

Note Never attempt to slide the locking lever to the unlocked position if the SDS is locked to the scanner, already.

Never position yourself between the SDS and the scanner when the SDS is connected to the scanner.

Never lower the scanner (to Invalid or **Scan** mode) while the SDS is connected to the scanner.

1. Make sure the **drive unit** is unplugged from wall, and the power cord is retracted completely into the unit; also, be sure not to damage the ethernet cable if one is plugged in.
2. Make sure the locking lever is all the way to left side (in the unlocked) position.



Figure 434: Locking lever in unlocked position

3. Press the Rocker-Switch-Lift **UP** (green) button to put the scanner in **Transport** mode (raised) position.



Figure 435: Rocker-Switch-Lift Up and Down buttons

4. Dock the SDS to the scanner by physically pushing the SDS to the scanner until docking adapter on drive is fully engaged in scanner's docking adapter.

When the adapter is successfully engaged in scanner's docking adapter, **LED 1** is no longer illuminated (turned off) on the **SDS** panel. See the table below to identify the indicators.

Table 53 on page 313 to identify the location of the **LED** and a description.

5. Slide the locking lever to right to put the SDS in the locked position (moving left to right).

If the drive unit is properly locked, **LED 2** illuminates.



CAUTION Never stick any part of the body in the locking mechanism at the front of the SDS. This is a pinching point.

6. Push the **ON** (green) button on the **SDS** control panel.

The tensioning cycle begins for a period of no longer than 1 minute, 20 seconds, at which time the tension cycle ends and **LED 3** illuminates. When the pressurizing is achieved, **LED 3** illuminates.

7. Plug the joystick into the drive unit while the SDS is pressurizing.



Figure 436: Joystick plugged into SDS

8. Make sure the **speed adjustment** on the joystick is turned to the slowest speed.
9. When the compressor stops, push the **ON** (green) button on the joystick. The **On** (green) button should remain illuminated (lit).

Note If there is a malfunction in docking, locking, or trouble with the SDS electronically, the right-most **LED !** will illuminate. **LED !** is the fault indicator; if **LED !** illuminates at any time, troubleshoot the situation.

The **SDS** is ready to move the scanner.

10. Set the **speed adjust** to ~ (approximately) half way on the joystick.
11. Use the joystick lever to control scanner motion (speed) and direction.

Undocking the SDS to the scanner

1. Push the **Off** (black) button on **SDS** panel and wait for cycle to end. This may take 20 seconds. You will hear the system depressurizing.
2. Unplug the joystick cable and store it on the joystick.



Figure 437: Joystick connector (attached and unattached)

3. When the system is fully depressurized, slide the locking lever to the unlocked position (moving it right to left). LED 2 will turn off at this time.

4. Wheel the SDS away from the scanner. LED 1 will turn off at this time.



CAUTION To prevent movement/steering problems caused by wheel flat spots, disconnect the SDS from the scanner when done transporting or moving the scanner. Do not store the system and SDS docked together.

Workstation location on SDS



Figure 438: SDS and workstation (laptop computer) in locked storage tray

Cleaning the SDS

NeuroLogica recommends cleaning the SDS between uses as described in the sections below.



WARNING *Before* cleaning the drive system, be sure to disconnect the SDS from the wall outlet (power source). Failure to do so could result in electrical shock and cause severe injury to you and/or damage to electrical components.



CAUTION *Do not* allow electrical components to become wet. For eye and hand protection, it is important to wear safety glasses and rubber gloves, respectively.

Cleaning the outside of the SDS

1. Prepare detergent/disinfectant (regulated by EPA as hospital disinfectant) solution according to instructions on label for correct usage.
 - Use a basin or spray bottle (with product label).

- Use a pump (usually on detergent/disinfectant containers) to dispense the concentrate in the basin or spray bottle, then fill with correct amount of tap water.
- If using a spray bottle, empty and rinse out after use.

Note The stability of the solution is unknown after 24 hours; therefore, fresh preparation of the cleaning solution must be prepared for each day of cleaning.

2. Use swabs moistened with cleaning solution, clean and remove any dust, soil, or foreign matter; allow all components to air dry.
3. Wipe down and clean the frame of device and allow to air dry; return to its storage area.

Note Wash (at 25°C) with neutral detergents, *only*; softening agents **are not allowed**.

The following recommended products are registered by the EPA as hospital disinfectants; these solutions are quaternary ammonium compounds and are used in environmental sanitation of non-critical surfaces:

- TB Quat™ is a cleaning solution manufactured by ABC Compounding Co.
- Wex-cide™ is a disinfectant manufactured by Wexford Labs, Inc., product number Wexcide128.

Maintenance of the SDS



WARNING Maintenance checks and all service must be performed by technicians trained by NeuroLogica Corp. See page 26 for NeuroLogica contact information.

SDS specifications

Table 56: SDS specifications

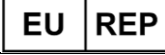
Overall width	26-5/8in. (26.6275cm)
Overall height	42in. (106.68cm)
Overall length	20-1/8in. (51.1175cm)
Height over handle	32 ½in. (82.55cm)
Weight EST	400lbs (151.44kg)
Battery power (2) 12 VDC (33 aH lead acid)	800Wh
Max programmed speed fwd.	1.6MPH
Max recharge time	6.2hrs.
Max continuous operation	8hrs.
Locking and unlocking cycles	20

Hrs transport over floors	2hrs.
Hrs system locked no external power	2hrs.
Max slope holding angle with scanner	7° C (44.6° F)
Max doorway threshold	1in. (2.54cm)
Max elevator threshold	¾in. (1.905cm)
Height to locking adapter	8.59in. - 8.69in.
Max/Min storage temperature	-25° C to 70° C (-13° F to 158° F)
Max/Min operating relative humidity	95%/20%
Max/Min storage relative humidity	85%/20%
Max/Min ambient operating temperature	40° C/5° C (104° F/41° F)

Understanding the symbols and product-marking plate

Table 57: Symbols and product-marking plate

Symbol	Description
	Indicates alternating current.
	Indicates protective earth (ground).
	Indicates a caution: consult accompanying documents.
	Indicates a caution: risk of electrical shock.
	Indicates electrostatic sensitive devices.
	Indicates a warning: high temperature.
	Indicates temperature limits.
	Indicates mechanical deactivation device.
	Indicates a radiation precaution; may be affected by radiation from other sources; may produce interference that affects other equipment.
	Crush warning.
	Foot/toe crush warning when lowering machine.
	Indicates a coil power cord.

Symbol	Description
	Indicates a chain hazard could cause severe personal injury.
	Indicates to keep away from rain for packaging.
	Indicates a humidity limit for packaging.
	Indicates a warning: battery charging.
	Indicates fuse usage.
	Follow Instructions for User
	Legal Manufacturer Symbol
	CE Mark or Conformité Européenne
	Intertek ETL (Edison Testing Laboratories) Mark
	European Authorised Representative Symbol
	Medical Device Symbol

Note Disregarding information on safety is considered ***abnormal use***.

Listing of replacement parts for SDS

To ensure proper compliance requirements of replacement parts, (for example, cables and accessories), parts must be purchased through NeuroLogica Corp.



WARNING Using other manufacturer cables and accessories may affect EMC performance. Unauthorized use of these items will void the warranty and may cause harm to patients, others, and/or equipment.

Table 58: SDS parts and their part number

Item name	Part number	Item name	Part number
Cord Reel	165-200	I/O Controller PCB	162-300
Battery	WKA12-33C	User Interface PCB	164-100
DX Unit	165-101	Lever Arm Ball	165-107
Compressor	165-203	Air Spring	165-205
Joystick CT	165-202-CT	Micro-switch	165-106
Joystick SP	165-202-SP	Wheel 3in. 500lbs	165-220
3-Way In-line Valve	165-104	Casters and Wheel 3in. 500lbs	165-221
Joystick Cable Internal	154-402	Drive Wheel 6in.	165-200
Joystick Cable Receptacle	218-108	R.H. Motor	20014 R
Joystick Cable Detachable	218-107A	L.H. Motor	20015 L
Power Distribution PCB	162-500	Bumper Assembly	241-129

Electromagnetic Comparability Test Report information

Tested by Intertek Testing Services NA, Inc., 70 Codman Hill Road,
 Boxborough, MA 01719
 Report Number Intertek 100067600BOX-002a
 Standards IEC 60601-1-2:2004

Glossary

A

Algorithm	Mathematical filter applied to raw data during CT image reconstruction to remove blurring artifacts inherent to back-projection. Also referred to as a kernel.
Annotation	User comments or text added to an image.
Anterior	Front of the patient's body
Application Entity (AE)	An end point of a DICOM information exchange, including the DICOM network or media interface software; that is, the software that sends or receives DICOM information objects or messages. A single device can have multiple AEs.
Attenuation	The reduction in intensity of a radiation beam as it passes through a substance.
Automatic Exposure Control (AEC)	Software used to adjust or modulate the mA throughout an acquisition to reduce patient radiation dose to a minimum.
Axial scan mode	Data acquisition while the scanner remains stationary. The scanner position may be incremented between exposures to collect data over a longer Z axis range.

B

Beam Hardening	The phenomenon whereby low energy photons are absorbed as the x-ray beam passes through an object, resulting in an increase in the average photon energy of the beam.
Bolus Tracking	Monitors flow of contrast media in vessel and triggers scan at optimal timing. This is a scanner feature to automatically initiate a prescribed Helical scan when a threshold level of contrast enhancement is reached at a specified region of interest.

C

Center X, Center Y	Reconstruction coordinates of an image.
Collimation	Restricts x-ray to only the selected anatomy, minimizing dose to patient and reducing scatter.

Computed Tomography Angiography (CTA)	A test that uses x-rays to provide detailed pictures of the heart and the blood vessels that go to the heart, lung, brain, kidneys, head, neck, legs, and arms. A CT angiogram can show narrowed or blocked areas of a blood vessel.
Computed Tomography Dose Index (CTDI)	An approximate measure of the radiation dose received in a single CT section or slice.
Computed Tomography Dose Index Volume (CTDI _{vol})	Represents the dose for a specific scan protocol, which consider gaps and overlaps between the radiation-dose profiles from consecutive rotations of the x-ray source. The CT dose index volume is noted as CTDI _{vol} . The CTDI _{vol} is calculated differently for both the Axial and the Helical mode: - For Axial scan mode: $CTDI_{vol} = [(N \times T)/I] \times CTDI_w$ - For Helical scan mode: $CTDI_{vol} = 1/\text{pitch} \times CTDI_w$
Computed Tomography Dose Index (CTDI _w) weighted average	The measure of ionizing radiation exposure per slice of data acquisition. CTDI represents the integrated dose along the Z axis from one axial CT scan (one rotation of the x-ray tube).
Computed Tomography (CT) number	Relative value assigned to each pixel to quantify the attenuation occurring in each pixel in comparison with the attenuation of water. The calculated CT number for a given pixel is given in Hounsfield units (HU).
Computed Tomography Perfusion (CTP)	Evaluates cerebral perfusion or level of blood flow in the brain by monitoring the initial passing of iodinated contrast media through the vasculature of the brain.
Contrast media	Used to improve sensitivity and specificity of clinical diagnoses.
Contrast resolution	The ability of a CT system to detect an object with a small difference in linear attenuation coefficient from the surrounding tissue. Also referred to as low-contrast detectability or sensitivity.

D

Digital Imaging Communication in Medicine (DICOM)	Digital Imaging and Communications in Medicine, or DICOM, is a standard that helps people doing work in the field of radiology. The DICOM standard is designed to promote communication and integration between a variety of radiology imaging systems and equipment used in filmless radiology.
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Digital tilt	The ability to correct the image post-acquisition and correct positional inaccuracies prior to sending to PACS.
Dose	Amount of ionizing radiation absorbed by patient per unit mass.
Dose Length Product (DLP)	The measurement of dose for an entire series of CT images. DLP is equal to the calculated dose per section multiplied by the length of a CT acquisition along the Z axis.
Dynamic Host Control Protocol (DHCP)	A standardized network protocol used on Internet Protocol (IP) networks. The DHCP is controlled by a DHCP server that dynamically distributes network configuration parameters, such as IP addresses, for interfaces and services.
Dynamic scan mode	Data acquisition at multiple time points over the same anatomic location(s).

E

Electromagnetic Compatibility (EMC)	The branch of electrical science that studies the unintentional generation, propagation, and reception of electromagnetic energy with reference to the unwanted effects (Electromagnetic interference (EMI)) that such energy may induce.
Electromagnetic Interference (EMI)	A disturbance generated by an external source that affects an electrical circuit by electromagnetic induction, electrostatic coupling, or conduction. The disturbance may degrade the performance of the circuit or even stop it from functioning.

F

Field of View (FOV)	The diameter of the acquired images displayed across the image matrix.
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H

Helical	A CT acquisition where the x-ray tube and scanner move continuously during scanning, yielding a data set in the form of a helix. Also referred to as spiral.
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Hospital Information System/Radiology Information Systems (HIS/RIS)	A Radiology Information System (RIS) is the core system for the electronic management of imaging departments. The major functions of the RIS can include patient scheduling, resource management, examination performance tracking, examination interpretation, results distribution, and procedure billing. RIS complements Hospital information systems (HIS) and Picture Archiving and Communication System (PACS) and are critical to efficient workflow to radiology practices.
Hounsfield Unit (HU)	The unit of the CT number scale assigned to each pixel to quantify relative attenuation.

I

Interscan delay time	Minimum amount of time that must transpire between end of one scan and initiation of next scan. Interscan delay times include idle time between scans to allow tube cooling.
Iterative Bone Correction (IBC)	A feature built into the reconstruction software, which performs a correction on every single Axial image the scanner produces, including both primary series from a scan as well as secondary reconstruction images. Current IBC settings were chosen to provide optimal correction for standard medical imaging; however, the setting can be customized as needed.

K

Kernel	A mathematical filter applied to raw data during CT image reconstruction to remove blurring artifacts inherent to back-projection. Also referred to as an algorithm.
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L

Liquid Crystal Display (LCD)	A form of visual display used in electronic devices in which a layer of a liquid crystal is sandwiched between two transparent electrodes. The application of an electric current to a small area of the layer alters the alignment of its molecules, which affects its reflectivity or its transmission of polarized light and makes it opaque. An LCD is used on the scanner and is a touch screen.
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M

mAs	Tube current-time product: The product of tube current and exposure time per rotation, expressed in units of milliamperere seconds (mAs).
Matrix	Two-dimensional grid numbers arranged in rows and columns.
Maximum Intensity Projection (MIP)	The multiplanar reformation technique that displays only the maximum pixel value along a ray traced through the object to the viewers' assumed perspective in front of the viewing monitor.
Mean Transit Time (MTT)	A common measurement during CT perfusion studies of the brain. Refers to the average transit time, in seconds needed for blood to pass through a given region of brain tissue.
milli Amperage (mA)	Tube current: the number of electrons accelerated across an x-ray tube per unit time, expressed in units of milliamperere (mA).
Modality Performed Procedure Step (MPPS)	A mechanism for modalities to pass information about the imaging performed back to the HIS/RIS or PACS.
Modality Worklist Manager	Scheduled (but not yet scanned) patient list.
Motion artifact	Voluntary and involuntary patient motion during CT scan, appearing as a streak artifact on images; ghosting or blurring of image.
Multiplanar Reformatting (MPR)	The process of displaying CT images in a different orientation from the one used in the original reconstruction. Allows for reformation of images in planes that would otherwise be difficult or impossible to acquire with CT. Requires only image data. Raw data is not utilized.

N

Noise	Random statistical variations in the signal. Can be quantum noise, electronic noise due to lost signal, or artifact noise. Manifests itself as overall graininess of the reconstructed image.
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P

Partial volume artifact	Occurs when an object is only partly positioned within a voxel or is much smaller than the overall voxel volume. The object's attenuation is not accurately represented by the pixel value. Overlapping reconstructions further reduce partial volume artifacts.
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Patient coordinates	References are as follows: X left to right. Y anterior to posterior. Z head to feet.
Patient Browser, local database	Where the already-scanned patient list is stored.
Peak kiloVoltage (kVp)	The penetrating power of the photons coming from the x-ray tube.
Picture Archive and Communications Systems (PACS)	Stores medical information, including 2D images, and 3D medical images. All modern PACS setups will work with DICOM.
Pitch	In Helical mode, it refers to the speed of the scanner movement over the table as the scanner rotates.
Pixel	A single, picture element of image matrix.
Post reconstruction	Prescribing the reconstruction parameters after scan acquisition.
Projection	View of anatomical cross-section from a particular vantage point.
Prone	Patient lying on stomach.
Protocol	Prescribes the acquisition and reconstruction parameters to be used for a scan.

Q

Quality Assurance (QA)	Procedure of performing periodic specified tests or measurements to ensure that a set quality level, as specified by system manufacturer, has not been compromised.
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R

Radiation Safety Officer (RSO)	The person within an organization responsible for the safe use of radiation and radioactive materials as well as regulatory compliance.
Radio Frequency Interference (RFI)	Also called Electromagnetic Interference (EMI), is an unwanted disturbance that affects an electrical circuit due to electromagnetic radiation emitted from an external source.
Raw data	A transmission measurement obtained by the detectors used to mathematically reconstruct the CT image.
Reconstruction filter	Used to ensure accurate anatomy reconstruction. Also allows for either spatial resolution or low-contrast-resolution enhancement.

Region Of Interest (ROI)	Provides a quantitative analysis of the Hounsfield values of a specific anatomic area. A graphic outline in the shape of a circle is placed over an area on the image. Software calculates the average CT number in HU within the ROI.
Resolution	A scan time, per slice, in Axial mode, only.
Retrospective reconstruction	Reconstruction performed after the initial prospective reconstruction. Multiple retrospective reconstructions of raw data are possible, with changes to display FOV, kernel, slice thickness, etc.

S

Scan delay	The time between the initiation of contrast agent administration and CT data acquisition. The chosen scan delay determines the phase of contrast enhancement for a given CT acquisition.
Scan protocol	A list of scanner-load parameters used to perform an x-ray exposure.
Scan types	Axial, Helical, Dynamic, Reference, and Scout.
Scanner Drive System (SDS)	The self-contained, rechargeable, battery-powered transportation system is designed to facilitate transporting the CereTom Elite CT scanner.
Scout	Digital survey radiograph acquired by the CT system for the purpose of prescribing the cross-sectional acquisition. Similar to a conventional radiograph, the scout is produced by translating the scanner over the patient without tube or detector rotation. Also referred to as topogram or scanogram.
Series	A set of images acquired in a scan.
Slice spacing (Spacing)	The distance between the center of one CT slice and the center of the next slice.
Slice thickness	The dimension of a reconstructed CT slice along the longitudinal direction of acquisition (Z axis).
Spatial resolution	The ability of a CT imaging system to display fine details, separately. Given in units of line pairs per centimeter (lp/cm).
Supine	Lying on back.

T

Temporal resolution	The ability of a CT system to freeze motion and provide an image – free of blurring.
Test Bolus	Scan mode used to measure the contrast transit time using a small injection of contrast media.
Threshold	The CT number (Hounsfield Unit (HU)) where bolus tracking tool will trigger the system to begin the scan.

Time Attenuation Curve (TAC)	A graph of the contrast enhancement versus time. TAC is used to determine blood flow rate in seconds for contrast timing.
Time delay	Monitoring delay: Time from injection to the start of monitoring scans.
Transverse plane	Perpendicular to direction of Z axis.

V

Volume Rendering (VR) image or object	A 3D modeling technique that utilizes the entire acquired dataset but adjusts the opacity of the voxels included in the 3D image according to their tissue characteristics.
Voxel	Abbreviation of volume element. Refers to the volume of tissue represented by a pixel in the matrix used to display the CT image.

W

Window Center (WC)	The pixel value given in Hounsfield Units (HU) at the center of the Window Width. Window Center controls the brightness (density) of the CT image.
Window Width (WW)	The range of pixel values assigned a shade of gray in the displayed CT image. Window Width controls the contrast of the CT image.

Appendix A MCS-140 Data Sheet



MCS-140

Stationary Anode X-Ray Tube



Product Description

The MCS-140 is a 140 kV, air cooled stationary anode metal ceramic x-ray source. This source is specifically designed for Imaging Applications.

X-Ray Tube Specifications

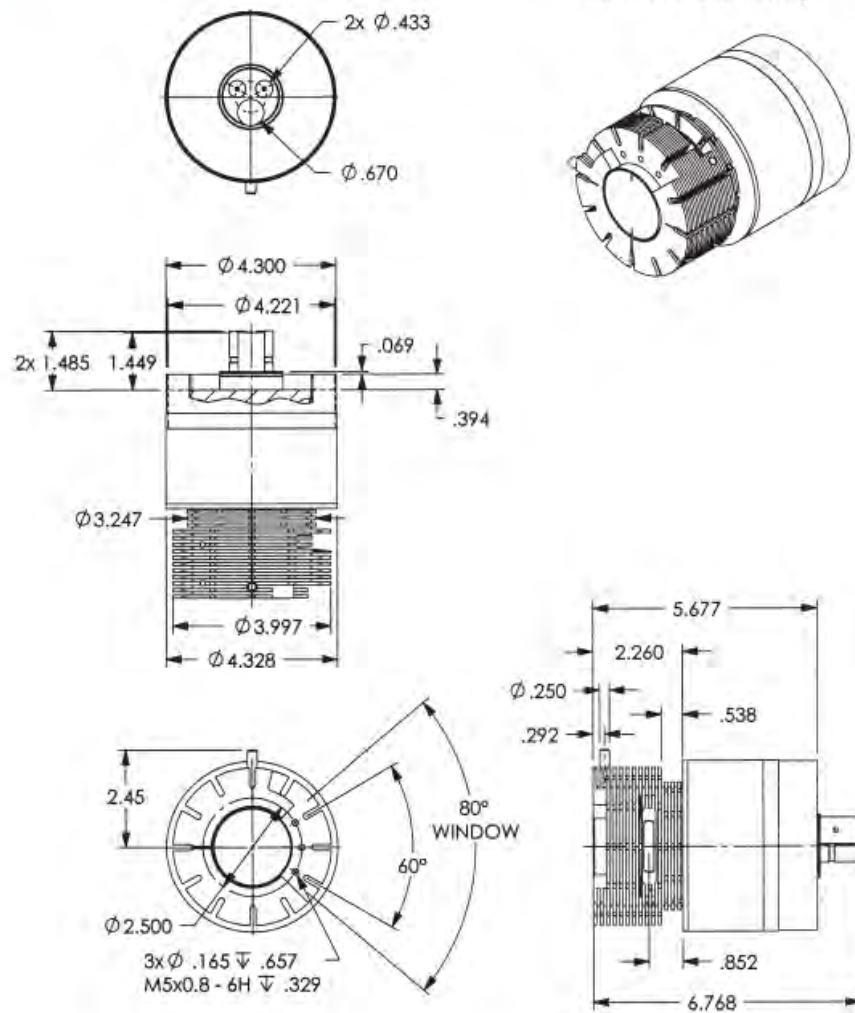
Maximum Peak Voltage	140 kV
Anode to Ground	140 kV
Cathode to Ground	140 kV
Focal Spot - IEC 60336	
Small	1.0 W x 0.8 L
Cooling Medium	Air
Maximum Continuous Rating	
Small	900 W with 100 cfm min cooling flow
Target Material	Tungsten
Target Angle	20°
Radiation Coverage	72°
X-Ray Tube Assembly Permanent Filtration	2.0 mm Be



MCS-140

Housing Outline Drawing

Dimensions are for reference only

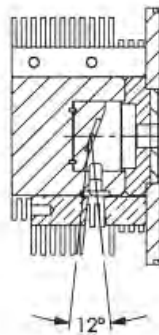
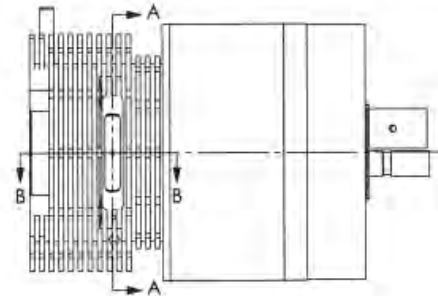
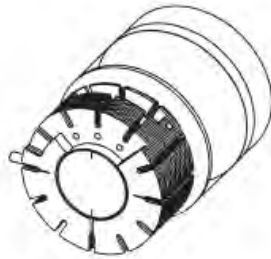


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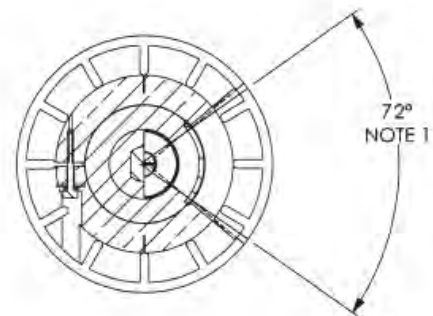


MCS-140

Beam Coverage



SECTION B-B



SECTION A-A

NOTES:

1. FULL BEAM COVERAGE

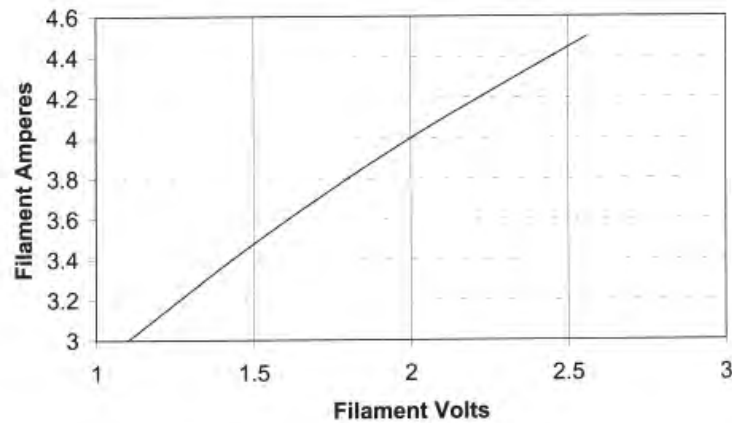
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MCS-140

Rating Charts

MCS-140 Filament Characteristics



WARNING

Beryllium windows transmit a very high level of long wavelength X-radiation, which can injure human tissue. Injury may occur from even very short exposures to the primary X-ray beam. Follow all precautions necessary to avoid radiation exposure to humans.

The radiation dose rate cannot be accurately measured with conventional radiation measurement instruments. Radiation intensity in each installation will vary, and calibration must include the effects of long wavelength X-radiation.

Fumes from beryllium metal (or its compounds) as well as dust can be hazardous if inhaled. During use, corrosion products may occur on the beryllium window, but these should not be scraped off, machined, or otherwise removed. Tube unit disposal should conform to federal, state, and local regulations governing beryllium.



Salt Lake City, UT 1-801-972-5000
 Charleston, SC 1-843-767-3005
www.vareximaging.com

Manufactured by Varex Imaging Corporation

Specifications subject to change without notice.

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Appendix B Error Codes

Table 59: Error code list

Error-code number	Fault description	Explanation	Cause ³	Resolution
0	NO_FAULT	Success. No error occurred	N/A	N/A
1	ACQUISITION_TERMINATED	Not an error	Acquisition has terminated normally (or user clicked Cancel)	N/A
2	XRAY_TEMPERATURE_FAULT	Temperature fault was detected at x-ray tube	X-ray tube overheated	Allow time for x-ray tube to cool down
3	XRAY_ARC_FAULT	An x-ray tube arc was detected	An arc occurred in x-ray tube or the HV Generator	Contact Technical Support for service
4	XRAY_HIGH_MA_FAULT	Monoblock high mA condition detected	Beam current exceeds set value by more than 5% for 100 ms or more	Contact Technical Support for service
5	XRAY_LOW_MA_FAULT	Monoblock low mA condition detected	Beam current is less than 95% of set value for 100 ms or more	Contact Technical Support for service
6	XRAY_LOW_KV_FAULT	Monoblock low kV condition detected	X-ray tube voltage is less than 95% of set value for 100 ms or more	Contact Technical Support for service
7	XRAY_HIGH_KV_FAULT	Monoblock high kV condition detected	X-ray tube voltage exceeds set value by more than 5% for 100 ms or more	Contact Technical Support for service

³ There may be multiple causes that require a trained service technician to conduct an analysis and repair.

Error-code number	Fault description	Explanation	Cause ³	Resolution
8	XRAY_WATCHDOG_FAULT	Monoblock watchdog timeout condition detected	Watchdog timer was not refreshed at a high enough rate	Contact Technical Support for service
9	XRAY_POWER_LIMIT_FAULT	[Placeholder for power limit fault]	N/A	N/A
10	XRAY_INTERLOCK_FAULT	Interlock was de-asserted to generator	E-STOP was activated	Deactivate E-STOP
11	XRAY_BELOW_THRESHOLD	Reference detector values are reading less than threshold value	Indicates x-rays have been turned off (due to errors 2-10 above)	Contact Technical Support for service
12	CANNOT_WRITE_TRANSMIT_QUEUE	When Data Acquisition System (DAS) views are acquired to disk during a scan, they are sent to a Transmit Queue from which they are sent to Recon computer over socket interface (ethernet); if write of view to Transmit Queue fails, this error is flagged	Likely causes of failing this write is if downstream data path is not functioning correctly (ethernet unplugged, scanner app not connected, etc.) during a scan, and transmit queue is full and won't allow any more writes	Contact Technical Support for service
13	INCORRECT_ROTATE_SPEED	Indicates disk detected a rotation speed error	Happens when a problem with tick fence, or has incorrect calibration parameters	Contact Technical Support for service

Error-code number	Fault description	Explanation	Cause ³	Resolution
14	POSITION_ERROR	Centipedes did not move specified distance	Could be caused by incorrect calibration parameters, a centipede jam, an uneven floor	Contact Technical Support for service
15	VELOCITY_ERROR	Centipede velocity not as expected during a Helical scan	Could be caused by incorrect calibration parameters, a centipede jam, an uneven floor	Contact Technical Support for service
16	OFFSET_CAL_FAULT	Offset calibration (done typically at beginning of every scan) has failed	Due to bad view data from Disk Computer Assembly (DCA)	Contact Technical Support for service
17	AIR_CAL_FAULT	Air calibration failed	An object was in the bore	Remove obstacle and perform another air calibration
18	INVALID_PROTOCOL	[Placeholder for invalid protocol error]	N/A	N/A
19	INVALID_COMMAND	[Placeholder for invalid command error]	N/A	N/A
20	INVALID_COMMAND_SEQUENCE	An invalid command sequence was detected	Can happen when Disk Computer Assembly (DCA) receives Start Acq command from Scanner Control app, but is not in a READY mode.	Contact Technical Support for service

Error-code number	Fault description	Explanation	Cause ³	Resolution
21	INVALID_PARAMETERS	[Placeholder for invalid parameter error]	N/A	N/A
22	XRAY_COMMUNICATION_ERROR	Disk has detected a problem with serial port connection to monoblock	HV generator fault, Disk Control Assembly (DCA) fault	Contact Technical Support for service
23	DCB_COMMUNICATION_ERROR	[Placeholder for DCB communication error]	N/A	N/A
24	SUBSYSTEM_COMMUNICATION_ERROR	[Placeholder for subsystem communication error]	N/A	N/A
25	RECON_ERROR	Requested protocol has been rejected by Reconstruction app	Recon computer error	Contact Technical Support for service
26	INSUFFICIENT_TUBE_CAPACITY	When preparing for a scan, this error is flagged if tube capacity is lower than anticipated threshold value for that scan	X-ray tube too hot to perform prescribed procedure	Tube needs time to cool down before scan can be run
27	INSUFFICIENT_BATTERY_CAPACITY	When preparing for a scan, this error is flagged if battery capacity is lower than anticipated threshold value for that scan	Battery was not recharged per instructions	Battery needs to be recharged to minimum level by connecting it to AC outlet before scan can be run

Error-code number	Fault description	Explanation	Cause ³	Resolution
28	ESTOP_INTERLOCK	ESTOP button has been activated	User depressed ESTOP button	After respective issue has been resolved accordingly, user can deactivate E-STOP
29	CENTIPEDE_INTERLOCK	Centipedes are not engaged	System is not positioned in Scan mode	Lower system using Up/Down Rocker-Switch-Lift to position it in Scan mode
30	SAFETY_INTERLOCK	[Placeholder for safety interlock error]	N/A	N/A
31	DAS_DATA_ERROR	Disk Computer Assembly (DCA) has detected a Data Acquisition System (DAS) data error from DCB device	Defective converter board assembly	Contact Technical Support for service
32	DAS_CALIBRATION_ERROR	Tick calibration data is invalid	Disk Computer Assembly (DCA) has detected a Data Acquisition System (DAS) data error from Disk Control Board (DCB)	Contact Technical Support for service
33	HOME_TICK_ERROR	Disk has detected a home tick error from DCB device (no home pulse detected)	Typically this is a dirty/dusty tick fence assembly or defective tick board assembly	Contact Technical Support for service

Error-code number	Fault description	Explanation	Cause ³	Resolution
34	TICK_ERROR	Disk has detected a tick error from DCB device (incorrect number of ticks counted)	Typically this is a dirty/dusty tick fence assembly or defective tick board assembly	Contact Technical Support for service
35	ROTATE_CONTROLLER_ERROR	Rotate drive detected an error while performing homing operation	Base computer assembly interface with rotate motor controller has a fault	Contact Technical Support for service
36	AIR_CAL_WARNING	Result of air calibration was out of tolerance	When requesting a new scan, currently loaded air cal tables were generated from a previously failed air cal; requested scan will be allowed to continue, but images may have artifacts; a popup window to user is presented upon this condition	Contact Technical Support for service
37	RECON_BUSY	[Placeholder for recon busy error]	N/A	N/A
38	INSUFFICIENT_DISK_SPACE	Not enough disk space to store information on the Recon computer	Hard drive on Recon computer does not have enough space for image data	Contact Technical Support for service

Error-code number	Fault description	Explanation	Cause ³	Resolution
39	XBT_Error (Disk HW related)	X-rays were terminated due to a software anomaly	Scans that result in x-ray Below Threshold (XBT) can result in missing images due to system being allowed to complete scan	Contact Technical Support for service

Appendix C Revision History

Table 60: Revision history

Revision	ECO number and effective date	Author	Changes
00	ECO-000139 2006/03/17	Mike Duffy	Release System BOM
01	ECO-000306 2006/07/26	Matt Len	Releasing revision 01 of the user manual.
02	ECO-000311 2006/08/09	Matt Len	Releasing revision 02 of the user manual.
03	ECO-000337 2006/08/22	Matt Len	Release service manual and update user manual.
04	ECO-000399 2006/11/08	Matt Len	Updating user, service and installation manuals for Australian certification.
05	ECO-000414 2006/12/11	Matt Len	Releasing system version 04.00 and supporting documentation.
06	ECO-000495 2007/05/29	Mike Duffy	UPDATE SYS RADIATION DOCS AND USER MANUAL
07	ECO-000759 2008/07/24	Matt Len	Releasing updated NL3000 user manual.
08	ECO-000784 2008/09/09	Matt Len	Updating manual to include NL3000 and NL3100.
09	ECO-000790 2008/09/16	Matt Len	Releasing system version 05.00 software.
10	ECO-000817 2008/12/04	Stephanie Fillion	RELEASING SYSTEM VERSION 05.01 SOFTWARE
11	ECO-000864 2009/02/04	Kacey Oreal	RELEASING SYSTEM VERSION 05.02 SOFTWARE
12	ECO-000921 2009/04/04	Don Fickett	USER MANUAL CERETOM
13	ECO-001103 2009/12/23	Stephanie Fillion	UPDATING NL3XXX USER MANUAL
14	ECO-001164 2010/08/03	David O'Leary	Release V05.05 CereTom/OTOScan SW

Revision	ECO number and effective date	Author	Changes
15	ECO-001405 2011/05/17	Keith Almeida	Release V05.06 CereTom/OTOScan SW
16	ECO-001686 2012/04/12	Christofer Krueger/Matt Dickman	Update to current user practice. Added formatting for all subject headers, figures, and tables. Added Chapter 13 for accessories, Appendix A for the SDS, and Revision History Table
17	ECO-001889 2012/12/05	Christofer Krueger	Update to meet IEC 60601-1 3 rd edition and HC requirements. Added Warnings/Cautions on contraindication, patient support stability, cleaning, PM, and calibration. New Configuration Manager, Main and Options Screen shots for v5.10. Product Catalog references and Battery Parameters were also added.
18	ECO-002008 2013/07/30	Christofer Krueger	Added Caution modement Automatic Exposure Control (AEC) is not offered on this system” to page 17, Section 9.
19	ECO-002012 2013/09/05	Keith Almeida	Added additional 3 rd edition requirements from 60601-2-44 (warnings, cautions, load factors, focal spot, filtration, CTDI100 measurements, scatter measurements, vertical plane measurements). Updates to meet IEC 60825-1 also added.
20	ECO-002167 2014/05/15	Keith Almeida	Updated to reflect changes made to software release V06.01 CereTom/OTOScan
21	ECO-002500 2015/10/09	Keith Almeida	Updated to reflect: changes made to software release V06.02 CereTom/OTOScan (Automatic Exposure Control); Samsung additions; updates from Regulatory group

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22	ECO-002746 2015/12/11	William Dalphin	Updated to reflect: changes made to software release V06.02.01 CereTom/OTOScan; updates from Regulatory and Service groups
23	ECO-002802 2016/03/01	Ninad Gujar	Updated to reflect the correct storage temperature.
24	ECO-002984 2016/08/23	Courtney Poto	Incorporated MPR Slab.
25	ECO-003255 2017/04/13	Cynthia Crow	Applied new template/styles, step-by-step procedures, and workflow for improved audience experience. OTOScan removed from the manual; OTOScan information will (moving forward) be documented in its own manual.
25	ECO-003317 2017/05/19	Cynthia Crow	The latest release of Revision 25 (under ECO-003255) contains the changes as described above; however, ECO-003255 was never distributed. This submission (ECO-003317) includes two notes added to Revision 25 that address registrar concerns: external interlocks and the method of testing for dose-in-air results.
26	ECO-003616 2017/09/21	Cynthia Crow	CereTom changed to CereTom Elite
27	ECO-003762 2017/12/20	Christofer Krueger	Modified the Intended use to match revised 510(k) and info on Metal Artifact Reduction – update figures 359-360
28	ECO-003794 2018/01/12	Christofer Krueger	Table 54, row 20: From 50 C/5 C (122 F/41 F) to 40 C/5 C (104 F/41 F). Remove MFG symbol from table 55. Move International reps and Intended Use sections to the preface.

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29	ECO-004219 2018/11/01	Christofer Krueger	Adding a note above Table 11 on EMC Characteristics. Modified Table 12 to detail the correct standard parameters. Changed title to include "NL3000 CereTom". Added "CereTom" to the "About this Manual" section
30	ECO-004754 2020/03/03	Christofer Krueger	Added details to comply with IEC 60825-1, 3 rd ed. Table 2 and Laser Safety section of Chapter 1. EU MDR updates: Added Serious Injury, Electronic Copy and Clinical Benefit notes to the preface
31	ECO-004919 2020/06/17	Christofer Krueger	Add FDA Laser warning statement and updated the marking plate
32	ECO-005181 2021/01/12	Gina Cunsolo	Added manufacturers symbol to page 3. Removed all references of CereTom. Updated Symbols Table 2 to update the "Refer to instructions." to the booklet symbol. Updated Symbols Table 2 and 55 to add all symbols currently on system label.
33	ECO-006215	Gina Cunsolo	Addition of new CE Mark; update to Brazil representative; correction of EU AR; update to electronic user manual information; updated figure 3 and removed previous marking plate label.
34	ECO-007246	Keith A. Kaser	Added Safety Strap information to Chapter 13
35	ECO-007461 2025/03/12	Keith Kaser	Added additional contact information related to adverse events to resolve Bug# 6322 Added Warning in Safety Information section related to decommissioning system to remove health software to resolve Bug# 6201
36	ECO-007722	Keith Kaser	Updated Product Marking Plate.

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	2026/04/06		Updated 'Follow Instructions for Use Symbol. Updated Footers. Updated entire document Font to Calibri 11. Remove DORO clamp details from Chapter 13. Modified multiple bulleted tables to make them actual tables. Modified all line spacing to 1.0 Made changes to wording and grammar throughout document. Removed scanning from LCD Screen section, since this mode is no longer recommended. Updated all images to remove red callouts and arrows and replace them with gold. Updated laser specification.
37	ECO-008100 2026/07/23	Keith Kaser	Updated link to Electronic Online Manuals Updated contact information email address. Updated product marking plate / system label and company name to Samsung HME America, Inc., dba NeuroLogica Corporation
38	ECO-008214 2026/09/23	Ninad Gujar	Corrected typo on product marking plate / system label

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