



# **Discovery™ XR656**

## **Digital Radiographic System**

### **Operator Manual**

5402340-1EN Rev. 15

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# IMPORTANT!...X-RAY PROTECTION

X-Ray equipment if not properly used may cause injury. Accordingly the instructions herein contained should be thoroughly read and understood before you attempt to place this equipment in operation. The General Electric Company, Healthcare Division, will be glad to assist and cooperate in placing this equipment in use.

Although this apparatus incorporates a high degree of protection against x-radiation other than the useful beam, no practical design of equipment can provide complete protection. Nor can any practical design compel the operator or his assistant to take adequate precautions to prevent the possibility of authorized or unauthorized persons carelessly, unwisely, or unknowingly exposing themselves or others to direct or secondary radiation.

It is important that everyone having anything to do with x-radiation be fully acquainted with the recommendations of the National Council on Radiation Protection and Measurements as published in NCRP Reports available from NCRP Publications, 7910 Woodmont Ave., Bethesda, MD 20814, and of the International Commission on Radiation Protection, and take adequate steps to insure protection against injury.

It is assumed that all persons authorized to use the equipment are cognizant of the danger of excessive exposure to x-radiation and the equipment is sold with the understanding that the General Electric Company, Medical Systems Division, its agents, and representatives have no responsibility for injury or damage which may result from exposure to x-radiation.

Various protective materials and devices are available. It is urged that such materials and devices be used.

# Medical Device Directive

This product complies with the following requirements:

Council Directive 93/42/EEC concerning medical devices when it bears the following CE marking of conformity: The year of CE marking is 2011.



The location of the CE mark label on the equipment is in the service system manual.

EU Authorized Representative:

GE Medical Systems SCS  
283 rue de la Minière  
78530 BUC, FRANCE

Green QSD 1990 Standard issued by MDD (Medical Devices Directorate, Department of Health, UK).

Medical Device Good Manufacturing Practice Manual issued by the FDA (Food and Drug Administration, Department of Health, USA).

Underwriters' Laboratories, Inc. (UL), an independent testing laboratory.

Canadian Standards Association (CSA).

International Electrotechnical Commission (IEC), international standards organization, when applicable.

GE Healthcare reserves the right to make changes in specifications and features shown herein, or discontinue the product described at any time without notice or obligation.

The original language of this manual is English.

# Contact Information

## Discovery XR656

Discovery XR656 Systems can be sold by the below names and be manufactured by the below manufacturers.

Model Name	Manufacturer (*) Manufacturing Site	Manufacturer address
Discovery XR656	GE Hualun Medical Systems Co., Ltd*	GE Hualun Medical Systems Co., Ltd No. 1, Yong Chang North Road, Beijing Economic & Technological Development Area, Beijing, P. R. China 100176
	GE Medical Systems, LLC	3000 N Grandview Blvd Waukesha, WI 53188 USA

# Revision History

## Revision History

<b>Revision</b>	<b>Date</b>	<b>Description of Change</b>
1	28 JUN 2011	Initial release
2	17 AUG 2011	Add US address, UWB statement, EMC statement and cleaning solutions
3	10 NOV 2011	Grammar error and screen shots updated
4	21 MAR 2012	Updated the EU Authorized Representative information
5	09 MAY 2012	Add Non wireless configuration.
6	06 JUN 2012	Add requirement to meet the 3rd edition IEC60601 standards
7	17 APR 2013	Update QAP Section and iLinq Screenshot
8	27 JUN 2014	Add 120cm grid
9	26 SEP 2014	Minor update
10	12 NOV 2014	Add image recovery
11	17 JAN 2015	Add EAC label and Brazil UWB Certification Information
12	25 MAY 2015	Update image recovery with deleting scenario 2 information
13	14 JUN 2017	1. Deleted original wireless Regulatory statement under Medical Device Directive. 2. Add “How to access the electronic version of a manual on a website” section in Chapter 1 3. Added a new sub_section under Chapter 2. The new sub_section title is Wireless Regulatory Information.
14	28 JUL 2017	Added the year of CE marking under Medical Device Directive.
15	30 OCT 2019	Added UDI Label location and Statement in Chapter 2. Update website link and steps of Customer Documentation Portal in Chapter1.

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# Chapter 1: Introduction

The equipment is intended for use by qualified personnel only.



**WARNING** **United States Federal law restricts this device to sale by or on the order of a physician.**

This Operator Manual should be kept with the equipment and be readily available at all times. It is important for you to periodically review the procedures and safety precautions. It is important for you to read and understand the contents of this manual before attempting to use this product.

This chapter explains the purpose and design of this Operator Manual. It provides information on the organization, chapter format, and graphic conventions that identify the visual symbols used throughout the manual.

## How to access the electronic version of a manual on a website

The Operator Manual is available through the GE Customer Website at:

<https://www.gehealthcare.com/support/support-documentation-library>

**Note:** A file compression/archival (zip/unzip) utility must be installed on the user's computer.

- To obtain the latest version of the manual, go to above link and follow the instructions.
- On the search page of the Customer Documentation Portal, enter the manual part number in the search field, and launch the search.

**Note:** Indicate any additional action like unzipping if appropriate

- The following screen capture is given as an example and is not legally binding

Search field

Document Number	Title	Modality	Products	Document Type	Language	Status	Revision	Publish Date	Actions
Search Results   0 items found									

# Purpose Of This Manual

This manual is written for health care professionals (namely, the radiologic technologist) to provide the necessary information relating to the proper operation of this system. The guide is intended to teach you the system components and features necessary to use it to its maximum potential. It is not intended to teach radiology or to make any type of clinical diagnosis.

# Prerequisite Skills

This guide is not intended to teach radiology. It is necessary for you to have sufficient knowledge to competently perform the various diagnostic imaging procedures within your modality. This knowledge is gained through a variety of educational methods including clinical working experience, hospital based programs, and as part of many college and university Radiologic Technology programs.

# Safety Information

Please refer to [Chapter 2: Safety and Regulatory](#) in this manual. The Safety chapter describes the safety information you and the physicians must understand thoroughly before you begin to use the system. Note that you will find additional safety information throughout your Learning and Reference Guide. If you need additional training, seek assistance from qualified GE Healthcare personnel. The equipment is intended for use by qualified personnel only. This guide should be kept with the equipment and be readily available at all times. It is important for you to periodically review the procedures and safety precautions. It is important for you to read and understand the contents of this guide before attempting to use this product.

## Safety Notices

Safety notices are used to emphasize certain safety instructions. This guide uses the international symbol along with the danger, warning, or caution message. This section also describes the purpose of a Note.



**DANGER** **Danger is used to identify conditions or actions for which a specific hazard is known to exist which will cause severe personal injury, death, or substantial property damage if the instructions are ignored.**



**WARNING** **Warning is used to identify conditions or actions for which a specific hazard is known to exist which may cause severe personal injury, death, or substantial property damage if the instructions are ignored.**



**CAUTION** **Caution is used to identify conditions or actions for which a potential hazard may exist which will or can cause minor personal injury or property damage if the instructions are ignored.**

**IMPORTANT!** An Important comment calls your attention to items that affect your workflow or image quality but do not involve the safety of people or equipment.

**Note:** A Note provides additional information that is helpful to you. It may emphasize certain information regarding special tools or techniques, items to check before proceeding, or factors to consider about a concept or task.

# Graphic Conventions and Legends

**Table 1-1** describes the conventions used when working with menus, buttons, text boxes and keyboard keys.

**Table 1-1** Conventions for menus, buttons, text boxes, and keyboard keys

Example	Describes
Select	Marking an option in a group of check boxes or radial buttons Choosing an option from a drop-down list Activating a tab Highlighting row items
Click [START EXAM]	Clicking a button on a workstation screen.
Press ENTER	Pressing a hard key on the keyboard.
Press CTRL+ALT+DELETE	Pressing a combination of keys on the keyboard. The key that should be clicked first is listed first.
Click and hold SHIFT	Clicking and holding down a hard key on the keyboard.
In the Matrix text box,...	The name of text box in which you can select or type text or the name of a drop-down list from which you select an option.
Type DICOMAE in the...	Text you enter into a text box.
Select Preferences > Worklist.	The path of selecting option(s) in a tree structure.

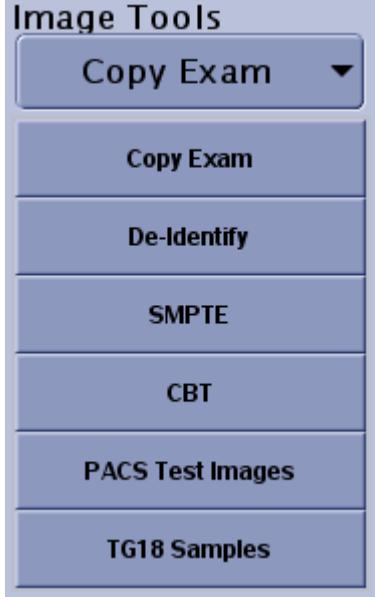
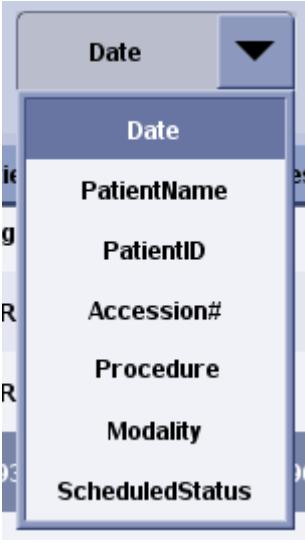
# Software User Interface Controls

This manual refers to “controls” that appear on the software screens. **Table 1-2** describes the most common controls that appear on the software user interface.

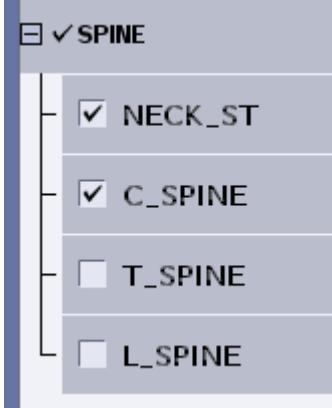
**Table 1-2** Common software user interface controls

Control and Description	Examples	
<b>Button</b> Screen buttons look and act like physical buttons on equipment. A single button performs a specific action, such as opening a new screen or saving settings. A group of two or more buttons provides a choice of settings, such as which acquisition mode is active. The dark blue color indicates which button or buttons are selected.	A single button to start an exam 	Two buttons to select the acquisition mode 

**Table 1-2** Common software user interface controls

Control and Description	Examples
<p><b>Drop down list</b></p> <p>Drop down lists open to reveal several options, but only one option may be selected at a time.</p> <p>Drop down lists may be included on a button or a text box.</p> <p>The presence of a drop down list is indicated by a down-pointing arrow on the right side of the control.</p>	<p>A list from a button Closed</p>  <p>Open</p> 
<p>A list from a text box Closed</p>  <p>Open</p> 	
<p><b>Tab</b></p> <p>Tabs are similar to the tabs on file folders. They categorize related information on a single screen.</p> <p>Clicking on a tab reveals the information related to that tab. Clicking on another tab hides the previous information and reveals a different set of information.</p>	<p>A tab to move between two screens</p> 

**Table 1-2** Common software user interface controls

Control and Description	Examples	
<b>Checkbox</b> Checkboxes indicate selection. A single checkbox shows that an option is active. Multiple checkboxes show that several options are selected.	A single checkbox 	Multiple checkboxes 
<b>Text box</b> Text boxes allow information to be entered using the keyboard.	Text boxes	

# Chapter 2: Safety and Regulatory

This chapter explains the safety considerations, general equipment and patient related precautions, and the symbols used for the safe operation of your equipment. This chapter also includes information about the emergency procedures.

This chapter presents the concepts necessary to successfully operate your system safely.

## X-Ray Protection

X-ray equipment if not properly used may cause injury. Accordingly, the instructions herein contained should be thoroughly read and understood by everyone who will use the equipment before you attempt to place this equipment in operation. GE Healthcare, will be glad to assist and cooperate in placing this equipment in use.

Although this apparatus incorporates a high degree of protection against x-radiation other than the useful beam, no practical design of equipment can provide complete protection. Nor can any practical design compel the operator to take adequate precautions to prevent the possibility of any persons carelessly exposing themselves or others to radiation.

It is important that everyone having anything to do with x-radiation be properly trained and fully acquainted with the recommendations of the National Council on Radiation Protection and Measurements as published in NCRP Reports available from NCRP Publications, 7910 Woodmont Avenue, Room 1016, Bethesda, Maryland 20814, and of the International Commission on Radiation Protection, and take adequate steps to protect against injury.

The equipment is sold with the understanding that GE Healthcare, its agents, and representatives have no responsibility for injury or damage which may result from improper use of the equipment.

Various protective material and devices are available. It is urged that such materials or devices be used.

## Indications for Use

The Discovery XR656 is used to generate radiographic images of human anatomy. It is intended to replace radiographic film/screen systems in all general purpose diagnostic procedures. And this device is not intended for mammographic applications.



**WARNING** United States Federal law restricts this device to sale by or on the order of a physician.

# Contraindication

None known.

# Users

The targeted clinical users include qualified trained doctors, radiographers, or radiologic technologists (RTs) working in various locations. Locations may include orthopedic clinics, radiology imaging centers, hospital radiology departments, or hospital orthopedic departments.

# Safety

The electrical wiring of the relevant rooms complies with all national and local codes, as well as the Regulations for the electrical equipment of buildings published by the Institution of Electrical Engineers. All assembly operations, extensions, re-adjustments, modifications, or repairs are carried out by GE Healthcare Technologies authorized service representatives. The equipment must be used in accordance with the instructions for use.



**WARNING** This X-Ray unit may be dangerous to patient and operator, unless safe exposure factors, operating instructions and maintenance schedules are observed.



**WARNING** To be used by authorized personnel only.



**WARNING** Electric Shock Hazard! Do not remove covers or panels. The Acquisition Console and cabinets contain high voltage circuits for generating and controlling X-rays. Prevent possible electric shock by leaving covers or panels on the equipment. There are no operator serviceable parts or adjustments inside the cabinets. Only trained and qualified personnel should be permitted access to the internal parts of this equipment.



**WARNING** Only GEMS/GEHC validated equipment can be plugged into the outlets in the control room wallbox. Current leakage requirements of non-validated equipment cannot be maintained with high confidence.



**WARNING** All system components, including the OTS (Overhead Tube Suspension), Table, Wallstand, and Operator Console must obtain their power from the Power Distribution Unit (PDU) in the System Cabinet.



**WARNING** Radiographic equipment must be operated by qualified personnel and only after sufficient training.



**WARNING** To avoid the risk of electric shock, this equipment must only be connected to a supply mains with protective earth.



**WARNING** Restrict access to the EQUIPMENT in accordance with local regulations for RADIATION PROTECTION.



**CAUTION** Do not lay any object on the cabinets that would restrict air flow from the top of the cabinet.



**CAUTION** Always be alert to safety when you operate this equipment. You must be familiar enough with the equipment to recognize any malfunctions that can be a hazard. If a malfunction occurs or a safety problem is known to exist, do not use this equipment until qualified personnel correct the problem.



**CAUTION** It is the User's responsibility to provide the means for audio and visual communication between the Operator and the patient.



**CAUTION** Use only manufacturer recommended equipment and accessories.

## Know the Equipment

Read and understand all of the instructions in this Operator Manual before attempting to use the product.

## IEC Equipment Classifications

This product is a stationary general purpose radiographic x-ray system. The following equipment classifications are applicable to this product:

- Equipment classification with respect to protection from electric shock: Class I
- Degree of protection from electric shock: Type B
- Degree of protection against ingress of liquids: IPX0
- Equipment not suitable for use in the presence of a flammable anesthetic mixture with air or with nitrous oxide;
- Mode of operation: Continuous with intermittent loading

This equipment meets the following Safety Standards:

- IEC 60601-1
- IEC 60601-1-1
- IEC 60601-2-32
- IEC 60601-2-7
- IEC 60601-2-28
- IEC 60601-2-54
- IEC 60601-1-3

## UWB (Ultra WideBand) Compliance Statement

### For Japan

The frequency band used for the UWB radio function is also used for radio equipment of other radio systems.

- The use of equipment with UWB radio function shall be limited to indoors, i.e. within environments such as houses, apartments, buildings, etc. Not approved for outdoor use. Even when used indoors, such as at broadcast events, please confirm with the event organizer about the use of UWB radio function as it might cause interference to broadcasting operations.
- The use of equipment with UWB radio function may cause influence to radio astronomy operations, etc. When the equipment is used near a radio astronomy observatory, contact the following address.
- In case that harmful interference to other non-UWB radio equipment (satellite earth station antennas, 5GHz band wireless LAN, mobile phones, etc.) is caused due to the emission from the UWB radio function of the equipment, take discretionary actions, such as to remove the UWB radio equipment from the interfering area. If interference remains, promptly stop the radio emission and contact the following address: Contact us at: \_\_\_\_\_

**Note:** The “UWB radio function” stated in the operation manual refers to the wireless communication function of the UWB radio systems.

### For Canada

## Canada, Industry Canada (IC) Notices

This Class B digital apparatus complies with ICES-003, Issue 4, February 7 2004 and RSS 220, Issue 1, March 2009 and RSS GEN, Issue 3, 2010.

Operation is subject to the following two conditions:

- This device may not cause interference
- This device must accept any interference including interference that may cause undesired operation of the device.

## For United States

### FCC Radiation Exposure Statement



**WARNING** The radiated output power of this device is far below the FCC radio frequency exposure limits. Nevertheless, this device should be used in such a manner that the potential for human contact during normal operation is minimized. To avoid the possibility of exceeding the FCC radio frequency exposure limits, you should keep a distance of at least 20 cm between you (or any other person in the vicinity) and the antenna.

### Interference Statement

These devices comply with Part 15 of the FCC Rules. Operation of the devices is subject to the following two conditions:

- The devices may not cause harmful interference
- The devices must accept any interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy. If the equipment is not installed and used in accordance with the instructions, the equipment may cause harmful interference to radio communications. There is no guarantee, however, that such interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception (which can be determined by turning the equipment off and on), the user is encouraged to try to correct the interference by taking one or more of the following measures:

- Relocate this device.
- Increase the separation between the device and the receiver.
- Connect the device into an outlet on a circuit different from that of other electronics.
- Consult the dealer or an experienced radio technician for help.

**Note:** This device must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product. Any other installation or use will violate FCC Part 15 regulations.

## For Australia

The frequency band used for the UWB radio function is also used for radio equipment of other radio systems. The use of equipment with UWB radio function shall be limited to indoors, i.e. within environments such as houses, apartments, buildings, etc. Not approved for outdoor use.

## For New Zealand

The frequency band used for the UWB radio function is also used for radio equipment of other radio systems.

1. The use of equipment with UWB radio function shall be limited to indoors, i.e. within environments such as houses, apartments, buildings, etc. Not approved for outdoor use.
2. The use of equipment with UWB radio function is not permitted onboard any aircraft.
3. Should interference occur to services licensed pursuant to a radio license or a spectrum license, the chief executive reserves the right to require and ensure that any transmission pursuant to this General User Radio License change frequency, reduce power, or cease operation. Should any of these conditions present themselves, promptly stop the radio emission and contact the address and telephone number listed in the front of this manual.

## Brazil UWB Certification Information

**Figure 2-1** UWB certification for detector



**Figure 2-2** UWB certification for dongle



# Wireless Regulatory Information For EU

## Wireless Parts Included

The following wireless parts are included in this product:

**Table 2-1**

Item	Name	Function	GE P/N	Frequency Band	Transmit Power
1	UWB Host Dongle	UWB host interface to system workstation	5397317-5	6 GHz - 9 GHz	≤ -41.3 dBm/MHz
2	URP Wireless Detector	Wireless detector for Xray imaging	5340000-7	6 GHz - 9 GHz	≤ -41.3 dBm/MHz

## Accessories & Software

The wireless parts come with the following software versions:

**Table 2-2**

Item	Name	Software / Firmware Version
1	UWB Host Dongle	5398846-4 Rev. 2
2	URP Wireless Detector	5420645 Rev. 1

## EU Authorized Representative:

GE Medical Systems SCS

283 rue de la Minière

78530 BUC, FRANCE

## Safety Design in Wireless Link

System will inhibit the x-ray exposure during exam if the wireless image link is poor or broken due to low signal quality or unintended radio frequency (RF) interference. System will recover the wireless link and lift the inhibit when the signal quality exceeds the threshold or the interference stops. Wired connection (tether mode) is provided as a backup option when the RF environment cannot support a reliable wireless link.

## Declaration of Conformity (for RED)

The wireless parts listed above are CE marked according to the provisions of the RED Directive (2014/53/EU). GE Medical Systems LLC., here by declares that these parts are in compliance with the essential requirements and other relevant provisions of Directive 2014/53/EU.

The Declarations of Conformity made under Directive 2014/53/EU are available on the website. Please refer to the section How to access the electronic version of a manual on website under chapter 1.

# Electromagnetic Compatibility



**WARNING** Power line anomalies or electrostatic discharges in all equipment areas may cause the monitor image to become momentarily disrupted or to go to blank; the mouse and/or keyboard may become inoperable or an error may be displayed on the worklist or image viewer screens. the system may recover by itself or you may need to reboot the system. the system may shut itself down, and will require a reboot.



**WARNING** A power surge during image transmission to the workstation after acquisition may cause the image to be lost.



**WARNING** When trying to fix the monitor video loss or inoperable mouse issues, cycling the system power on/off may cause the monitor to display “can’t open boot device error” message. if so, contact ge healthcare service.



**WARNING** For continued safe use of this equipment, use only manufacturer recommended accessories.

## EMC Conformance Statement

### Compliance Statement

This equipment complies with IEC 60601-1-2 Edition 2.1 (2004-11) EMC standards for 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 radio communications.

To provide reasonable protection against such interference, this product complies with the radiated emission standard limits as per CISPR11 Group1 Class A standard limits. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment is found to cause interference (which may be determined by turning the equipment on and off), the user (or qualified service personnel) should attempt to correct the problem by one or more of the following measure(s):

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

Use of accessories, transducers, cables and other parts other than those specified by the manufacturer of this equipment may result in increased emissions or decreased immunity of the equipment.

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

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

The Discovery XR656 systems are predominantly intended for use in non-domestic environments, and not directly connected to the Public Mains Network that supplies buildings used for domestic purposes.

The compatible accessories must be used within the recommended operating conditions outlined in the operation manuals. In addition to calibration and warm-up, other devices must be reset before and after use to ensure accurate dose measurements. Sustained exposure to electromagnetic fields (exceeding the test conditions) may cause false measurements. Failure to follow the recommended use may cause false measurements.

The magnetic field environment from a MRI device located nearby is a risk of interference.

All of the above are required to achieve the Electromagnetic Compatibility for a typical installation of the system. Further detailed data & requirements are described in the Use Recommendations and Installation Recommendations sections.

### Compatibility Tables

This equipment complies with IEC 60601-1-2 Edition 2.1 (2004-11) EMC standards for medical devices.

The Discovery XR656 systems are suitable to be used in an electromagnetic environment, as per the limits & recommendations described in the tables hereafter:

- Emission Compliance level & limits([Table 2-5](#)).
- Immunity Compliance level & recommendations to maintain equipment clinical utility (see [Table 2-6](#) and [Table 2-7](#)).

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

### 1. Electromagnetic Emission

**Table 2-3** Guidance and manufacturer's declaration – electromagnetic emissions

Guidance and manufacturer's declaration – electromagnetic emissions		
The Discovery XR656 is intended for use in the electromagnetic environment specified below. The customer or the user of The Discovery XR656 should assure that it is used in such an environment.		
Emissions Test	Compliance	Electromagnetic environment – guidance
RF emissions, CISPR 11	Group 1	The Discovery XR656 uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.

RF emissions, CISPR 11	Class A	The Discovery XR656 is suitable for use in all establishments other than domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions, IEC 61000-3-2	Class A	
Voltage fluctuations/flicker emissions, IEC 61000-3-3	Complies	

## 2. Electromagnetic Immunity

**Table 2-4** Guidance and manufacturer's declaration – electromagnetic immunity

Guidance and manufacturer's declaration – electromagnetic immunity			
The Discovery XR656 is intended for use in the electromagnetic environment specified below. The customer or the user of the Discovery XR656 should assure that it is used in such an environment.			
Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment Guidance
Electrostatic discharge (ESD), IEC 61000-4-2	+/- 6 kV contact. +/- 8 kV air.	+/- 6 kV contact. +/- 8 kV air.	Floors should be wood, concrete, or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst, IEC 61000-4-4	+/- 2 kV for power supply lines. +/- 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	$\pm 1$ kV differential mode $\pm 2$ kV common mode	$\pm 1$ kV differential mode $\pm 2$ kV common mode	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	< 5% UT (> 95% dip in UT) for 0.5 cycle. 40% UT, (60% dip in UT) for 5 cycles. 70% UT, (30% dip in UT) for 25 cycles. < 5% UT, (> 95% dip in UT) for 5 cycles	< 5% UT (> 95% dip in UT) for 0.5 cycle. 40% UT, (60% dip in UT) for 5 cycles. 70% UT, (30% dip in UT) for 25 cycles. < 5% UT, (> 95% dip in UT) for 5 cycles	Mains power quality should be that of a typical commercial or hospital environment. If the user of the system requires continued operation during power mains interruptions, it is recommended that the system be powered from an un-interruptible power supply or a battery.
Power frequency (50/60 Hz) magnetic field, IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.

**NOTE:** UT is the a.c. mains voltage prior to application of the test level.

**Table 2-5** Guidance and manufacturer's declaration – electromagnetic immunity

Guidance and manufacturer's declaration – electromagnetic immunity			
The Discovery XR656 is intended for use in the electromagnetic environment specified below. The customer or the user of The Discovery XR656 should assure that it is used in such an environment.			
Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment Guidance

Conducted RF, IEC 61000-4-6	3 Vrms, 150 kHz ~ 80 MHz	3Vrms	Portable and mobile RF communications equipment should be used no closer to any part of the Discovery XR656, including cables, than the recommended separation distance calculated from the equation appropriate for the frequency of the transmitter. <b>Recommended Separation Distance</b> $d = \frac{3.5}{E} \sqrt{P}$
Radiated RF IEC 61000-4-3	3V/m 80 MHz~2.5GHz	3V/m	$d = \frac{3.5}{E} \sqrt{P}$ 80 MHz to 800 MHz $d = \frac{7}{E} \sqrt{P}$ 800 MHz to 2.5 GHz where, P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in metres (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey <sup>a</sup> , should be less than the compliance level in each frequency range <sup>b</sup> . Interference may occur in the vicinity of equipment marked with the following symbol: 
NOTE 1 At 80 MHz and 800 MHz, the higher frequency range applies.			
NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.			
a Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the Discovery XR656 is used exceeds the applicable RF compliance level above, The Discovery XR656 should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the Discovery XR656. b Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.			

**Table 2-6** Recommended separation distances between portable and mobile RF communications equipment and the Discovery XR656 – for EQUIPMENT and SYSTEMS that are not LIFE-SUPPORTING

Recommended separation distances between portable and mobile RF communications equipment and the Discovery XR656
The Discovery XR656 is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of The Discovery XR656 can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and The Discovery XR656 as recommended below, according to the maximum output power of the communications equipment.

Rated Maximum Output Power (P) of Transmitter Watts (W)	Separation distance according to frequency of transmitter m		
	150 kHz to 80 MHz	80 MHz to 800 MHz	800 MHz to 2.5 GHz
	$d = \frac{35}{V_1} \sqrt{P}$	$d = \frac{35}{E} \sqrt{P}$	$d = \frac{7}{E} \sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.37	0.37	0.74
1	1.17	1.17	2.33
10	3.69	3.69	7.38
100	11.67	11.67	23.33

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in metres (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE 1 At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by reflection from structures, objects and people.

## Radiation Safety

Always use the Optimal technical factors for each procedure to minimize X-ray exposure and to produce the best diagnostic results. In particular, you must be thoroughly familiar with the safety precautions before operating this system.



**CAUTION** There should be no people other than the patient in the exam room during x-ray exposure. If circumstances require another person to enter the room while x-ray exposures are planned or possible, that person should wear a lead apron in accordance with accepted safety practices.

## Radiation Protection

Because exposure to X-ray radiation may be damaging to health, use great care to provide protection against exposure to the primary beam. Some of the effects of X-ray radiation are cumulative and may extend over a period of months or years. The best safety rule for X-ray operator is “Avoid exposure to the primary beam at all times”.

Any object in the path of the primary beam produces secondary (scattered) radiation. The intensity of the secondary radiation is dependent upon the energy and intensity of the primary beam and the atomic number for the object material struck by the primary beam. Secondary radiation may be of greater intensity than that of the radiation reaching the film. Take protective measures to safeguard against it.

An effective protective measure is the use of lead shielding. To minimize dangerous exposure, use such items as lead screens, lead impregnated gloves, aprons, thyroid collars, etc. The lead screen should contain a minimum of 2.0 mm of lead or equivalent and personal protective devices (aprons, gloves, etc.) must contain a minimum of 0.25 mm of lead or equivalent. For confirmation of the local requirements at your site, please refer to your "Local Radiation Protection Rules" as provided by your Radiation Protection Advisor.



**WARNING** **While operating or servicing x-ray equipment, always keep a distance not less than 2 meters from the focal spot and X-ray beam, protect body and do not expose hands, wrists, arms or other parts of the body to the primary beam.**

## Monitoring of Personnel

Monitoring of personnel to determine the amount of radiation to which they have been exposed provides a valuable cross check to determine whether or not safety measures are adequate. It may reveal inadequate or improper radiation protection practices and potentially serious radiation exposure situations.

The most effective method of determining whether or not the existing protective measures are adequate is the use of instruments to measure the exposure. These measurements should be taken at all locations where the operator, or any portion of the body may be exposed. Exposure must never exceed the accepted tolerable dose.

A common method of determining whether personnel have been exposed to excessive radiation is the use of personal radiation dosimeters. These consist of X-ray sensitive film or thermoluminescent material enclosed within a holder that may be worn on the body. Even though this device only measures the radiation which reaches the area of the body on which they are worn, they do provide a reasonable indication of the amount of radiation received.

## Emergency Procedures

It is not always possible to determine when some components, such as the X-ray tubes, are nearing the end of their operating lives. These components could stop operating during a patient examination.



**WARNING** **The facility must establish procedures for handling the patient in case of the loss of radiographic imaging or other system functions during an exam.**

## Emergency Devices

The system has two types of Emergency buttons:

**Emergency Stop-** when pressed, Lateral Table, OTS and Wallstand motions are halted, generation of X-rays is stopped. The system aborts any data acquisition in progress, and attempts to save all data acquired prior to the abort. Use the Emergency Stop button for patient related emergencies.

**Note:** After Emergency Stop is enabled, there is still longitudinal movement of table available. Use caution when removing patient, if necessary.

**System Emergency Off Button-** when pressed, the power to all system components is removed, stopping all motion and generation of X-rays. The system aborts any acquisitions in progress, and data obtained prior to the abort can become corrupt or lost. Use the System Emergency OFF button for catastrophic emergencies, such as fire or earthquake.



**CAUTION** If you press the Emergency Stop or Emergency OFF buttons during x-ray exposure, the system will abort the data acquisition.

## Emergency Stop

**Note:** Every operator should take a few minutes to locate the Emergency Stops on his or her system before he or she images the first patient.

## General Use Warnings



**WARNING** For continued safe use of this equipment, follow the instructions contained in this Operator Manual. Study this guide carefully before using the equipment and keep it at hand for quick reference. It may be desirable for the facility to print this manual from a standard PC to have a hard copy available within the Radiology department.



**WARNING** Only qualified personnel trained in the operation of this equipment should operate this system. Read and become familiar with all instructions in this manual before using this equipment. If further assistance is needed, please contact GE.



**WARNING** It is the responsibility of the owner to make certain that only properly trained, fully qualified personnel are authorized to operate the equipment. A list of authorized operators should be maintained.



**WARNING** Check for obstructions before moving the system (table, gantry or other); do not drive the system into or onto fixed objects.



**WARNING** If applicable, patient connected lines, tubes, etc. shall be long enough to allow full travel of the system and will not become pinched or pulled.

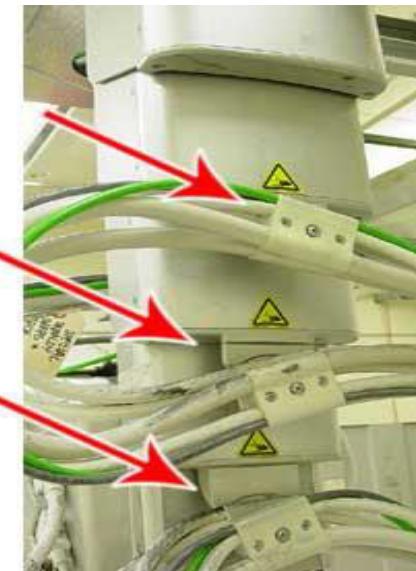


**WARNING** **Potential Pinch Point:** Use table foot pedals with care when lowering the table. Clearance is limited next to the table side cover, and a pinch point may exist for the operator.



**WARNING** **Hand Crushing Hazard:** The back of the OTS column creates pinch points ([Figure 2-3](#)) as the tube head moves up and down. Warn patients and any others in the room to stay away from the column as it is moving.

**Figure 2-3** OTS column pinch points



**WARNING** It is the responsibility of the operator to ensure the safety of the patient at all times. When the table is in use the patient should be monitored by visual observation, use of proper patient positioning, and use of the protective devices provided.



**CAUTION** Keep the patient in full view at all times and never leave the patient unattended while on the table.



**WARNING** Thoroughly check that there is no interference or possibility of collision between the patient and other equipment.



**CAUTION** Please carefully monitor all equipment motions to prevent collisions. Attention shall be drawn during operation to prevent possible injuries that could result from collision of the power-driven equipment parts with other moving or stationary items likely to be in the environment.



**WARNING** Perform periodic maintenance to ensure continued safe use of the equipment. Follow recommended preventative maintenance schedule as outlined in the GE Field Service Manual.



**WARNING** Collision with the OTS may cause minor injury. Ensure there is no one in the path of the OTS during auto-positioning.



**CAUTION** Make sure any other accessories or materials are not located in the primary X-ray beam during exposure that could result in bad image quality.



**WARNING** Some experts believe that use of any keyboard may cause serious injury to hands, wrists, arms, neck, or back.



**CAUTION** Always use GEHC recommended accessories to ensure best performance and to avoid possible hazards.



**WARNING** Do not load non-system software onto the system computer.



**WARNING** For diagnostic X-ray equipment specified to be used in combination with accessories or other items not forming part of the same; attention to the possible adverse effect arising from materials located in the X-ray beam. Refer to the table below for maximum attenuation equivalent of possible materials located in the x-ray beam.

Maximum Attenuation Equivalent mm AL

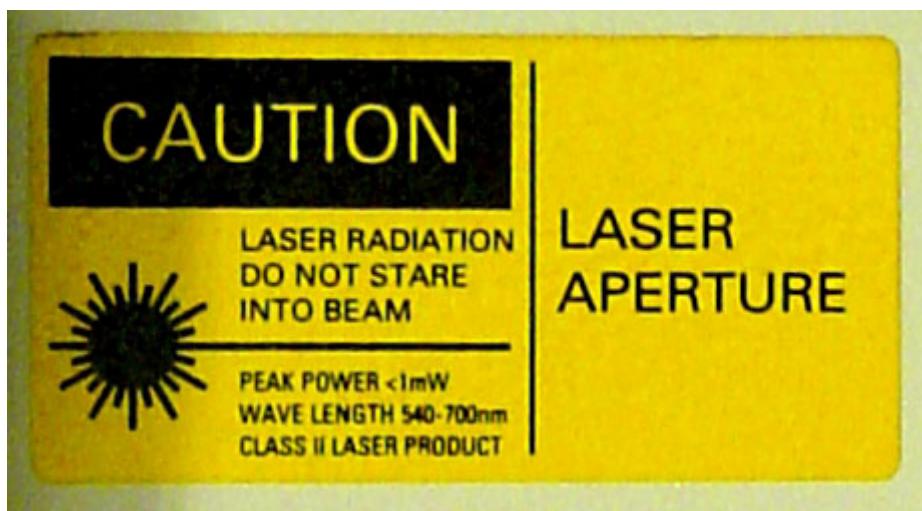
Item	mm AL
Collimator without spectral filters at 70kV	2
Tube minimum filtration at 150 kV	0.8 (IEC 75 kV)
Tube housing minimum filtration at 150 kV	0.3 (IEC 75kV)
Detector Housing at 100 kV	.9
Image Pasting patient barrier	<0.08
Non-elevating table	<1.0
Non-elevating table with carbon-fiber table top	<1.0
Elevating table with floating table top	<0.65
Weight-Bearing Stand	1.08

## Laser Radiation Warnings



**WARNING** The collimator uses lasers to create the linear centering cross beams. Laser radiation. Do NOT stare into beam! When you switch on the linear laser light localizer, make sure no person looks directly into the laser to avoid eye injuries or impaired vision. (Peak power 1 mw / wave length 540-700 nm / class II laser product.)

Figure 2-4 Collimator laser label





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

## Patient Positioning Warnings



**CAUTION** To avoid patient injury, always assist the patient on or off the table at the beginning or end of an exam.



**CAUTION** Make sure that patient connected lines, tubes, etc. are long enough to allow full travel of the system and will not become pinched or pulled.



**WARNING** During patient procedures, ensure the patient's head, hands and feet are completely within the tabletop area. If any portion of the patient's body extends over the edge of the tabletop, serious injury may result.



**WARNING** The technologist must remain close to the patient when the remote control is in use.



**WARNING** The maximum supported weight, with the tabletop fully extended toward the head or foot end of the table, is 320 kg (705 lb.) provided the patient is fully prostrate. The maximum supported weight can be up to 320 kg (705 lbs.), but wherein, the elevating function is not recommended.

Exceeding the limit may cause equipment damage or injury to the patient.



**WARNING** The table is designed to remain stable under normal conditions, but when necessary for special patient loads and positioning, it will move when sufficient force is applied. If no longitudinal movement or if abnormal patient loading is required, modifications must be made to ensure the tabletop is locked longitudinally into position.



**WARNING** The OTS tracks to the wallstand receptor. Use caution when moving receptor in small room configurations. Always be sure that the patient is clear of the OTS before selecting a wallstand configuration.



**WARNING** During auto positioning, watch OTS motorized movement when patient or any other person is under OTS, never leave patient unattended during positioning for examination.



**WARNING** The OTS is designed to remain stable under power on conditions. When power to the system is removed, the OTS may drift up or down.



**CAUTION** The wallstand lateral positioning bar is a hand rest only and is not intended to support a person's full weight. To avoid falls and potential injuries, do not hang or pull on the bar.

## Tabletop Motion Warnings



**WARNING** When the power to the table is off, the tabletop can move freely. To avoid injuries, monitor the tabletop movement.



**WARNING** Prior to raising or lowering the tabletop, ensure there are no obstructions present, above or below.

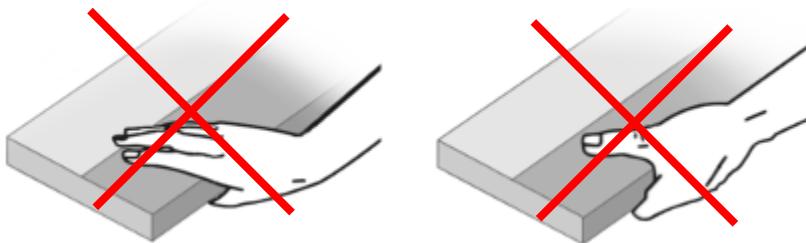


**WARNING** Before the patient gets on or off the tabletop, always press the Table Control Lock button. This momentarily blocks the foot pedal functions and avoids injuries to the patient or damage to the equipment if a control pedal is accidentally engaged.



**WARNING** To avoid injury to fingers and hand do not allow the patient's or operator's fingers to be extended over the edges of the tabletop. Hands must be kept away from table top edges at all times.

**Figure 2-5** Table pinch point



## Digital Detector Warnings



**CAUTION** Do Not Drop.



**CAUTION** Device weighs 4.32 kg (9.52 lbs) without battery.



**CAUTION** Do not use a defibrillator while patient remains in contact with detector.



**CAUTION** Maximum applied weight: 110kg (242 lb) standing; 160kg (352 lb) distributed.



**CAUTION** Operate and store the detector within the temperature range of 0 – 50° C (32 -122°F).

## Pinch Points and Crush Hazard Summary

This section lists the potential pinch points or crushing hazards that exist for various components of the system.

**Table 2-7** Pinch Points and Crush Hazard Summary

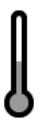
Component	Warning
Table	 <p><b>WARNING</b> <b>Potential Pinch Point:</b> Use table foot pedals with care when lowering the table. Clearance is limited next to the table side cover, and a pinch point may exist for the operator.</p>
Table	 <p><b>WARNING</b> To avoid injury to fingers and hand do not allow the patient's or operator's fingers to be extended over the edges of the tabletop. Hands must be kept away from table top edges at all times.</p>
OTS -Column and Tube	 <p><b>WARNING</b> <b>Potential Pinch Point:</b> The area where the tube connects to the column may create a pinch point when the tube is rotated. Operators should keep their hands on the OTS handle and keep patient's clear while rotating the tube.</p>
OTS - Collimator	 <p><b>WARNING</b> Always grasp the multi-leaf collimator in such a way that neither hand can be pinched or crushed between the handles and the collimator.</p>
Wallstand	 <p><b>WARNING</b> <b>Hand Crush Hazard:</b> Keep your extremities and the patient's extremities away from the pinch areas and the top of the wall-stand arm when tilting the wallstand receptor.</p>
Acquisition Workstation	 <p><b>WARNING</b> <b>Potential Pinch Point:</b> The DVD/CD tray can open and close automatically.</p>

## Symbols

This section explains the symbols used on this system and in its accompanying documents.

# Special Notices

**Table 2-8** Special notices

Symbol	Description
	Dangerous voltage. This indicates an avoidable, dangerous, high voltage hazard.
	This symbol on the equipment indicates the operating instructions should be consulted to ensure safe operation.
	Hand crushing hazard. This symbol indicates that serious injury to the hand may occur.
	Follow Instructions for use
	No stepping or standing on unit. The component on which the symbol appears cannot support the weight of a person. Damage to equipment or injury may occur if the unit is stepped or stood upon.
	Maximum load. This symbol indicates that the component has a maximum weight limit. Damage to equipment or injury may occur if the maximum weight is exceeded.
	Operating temperature. This symbol indicates that the component must be within a minimum and maximum temperature range in order to operate. Damage to equipment may occur if equipment is used at temperatures outside of the specified range.
	Emergency Stop Button. It's used to immediately power down the system (including table, OTS, wallstand, and x-ray tube) and stop image exposure.
	Reference Number.
	Serial Number.

**Table 2-8** Special notices

Symbol	Description
	Date of Manufacture.
	e-IFU symbol. The symbol indicates the instruction for use of the device is supplied in electronic form instead of in paper form.
	Gost Mark. This mark indicates that the Device is confirmed according Russian standards.
	EAC is transcribed as a Eurasian Conformity, the products bearing this mark have passed all conformity assessment (approval) procedures established by technical regulations of the Customs Union and correspond to the requirements of all technical regulations of the Customs Union applied to these products.

## X-ray Tube Operational Symbols

Table 2-9 describes the operational symbols for the system such as X-ray emissions and collimator locations.

**Table 2-9** Operational symbols

Symbol	Description
	X-ray emission is used to indicate the X-ray tube head is emitting X-rays. Take adequate precautions to prevent the possibility of any persons carelessly, unwisely, or unknowingly exposing themselves or others to radiation.
	X-ray source assembly is used to indicate a reference to an X-ray source assembly.
	X-ray tube is used to indicate a reference to the X-ray tube, e.g., to mark the surface of a grid, which is to be oriented towards the X-ray tube.
	Identifies controls or indicators associated with normal rotational speed of the X-ray anode.
	Identifies controls or indicators associated with high rotational speed of the X-ray anode.

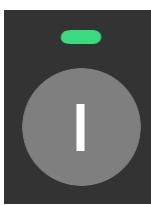
**Table 2-9** Operational symbols

Symbol	Description
	Identifies controls or indicators associated with the selection of a small focal spot or the connection for the corresponding filament.
	Identifies controls or indicators associated with the selection of focal spot or the connection for the corresponding filament. When used with the small focal spot symbol, this symbol applies to the larger focal spot. When used with the large focal spot symbol, this symbol applies to the smaller focal spot.
	Identifies controls or indicators associated with the selection of a large focal spot or the connection for the corresponding filament.

## System Power On and Reset

Table 2-10 describes the power controls of the system, located on the RCIM. (Refer to [Chapter 8: System Hardware Overview-Radiology Control Interface Module \(RCIM\) \(p. 8-4\)](#) for more information.)

**Table 2-10** Power controls

Symbol	Description
	The SYSTEM RESET button is used to reset the system. The button is located on the RCIM. 
	The POWER ON button is used to turn on the power to the system. The button is located on the RCIM. 

## Electrical Type

[Table 2-11](#) describes the electrical protection rating based on system type.

**Table 2-11** Electrical type

Symbol	Description
	Type B Equipment indicates the equipment provides a particular degree of protection against electrical shock regarding leakage current and protective earthing per IEC60601-1.

## Electrical Current

[Table 2-12](#) describes the symbols for the different types of electrical current that may be used on your system.

**Table 2-12** Electrical current types

Symbol	Description
	Alternating Current indicates the equipment is suitable for alternating current only.
	Direct Current indicates the equipment is suitable for direct current only.
	Both direct and alternating currents indicate the equipment is suitable for both direct and alternating current.

## Ground

[Table 2-13](#) describes the different types of grounding used in your system.

**Table 2-13** Ground types

Symbol	Description
	Functional Earth (ground) Terminal indicates a terminal directly connected to a point of a measuring supply or control circuit or to a screening part, which is intended to be earthed for functional purposes.

**Table 2-13** Ground types

Symbol	Description
	Noiseless (clean) earth (ground) identifies any terminal of a specially designed earthing system where noise from earth of leads will not cause a malfunction of the equipment.
	Protective earth (ground) identifies any terminal which is intended for connection of an external protective conductor to protect against electrical shock in case of a fault.
	Frame or chassis identify the frame or chassis terminal.
	Equipotentiality identifies terminals that bring the various parts of equipment or systems to the same potential when connected together. These terminals are not necessarily at earth (ground) potential. The value of the potential may be indicated next to the symbol.

## Collimator

[Table 2-14](#) describes the collimator controls and the radiation field.

**Table 2-14** Collimator descriptions

Symbol	Description
	Control for indicating radiation field by using light.
	Identifies controls for opening the collimator blades, or indicates partially or fully open state.
	Identifies controls for closing the collimator blades, or indicates closed state.
	Indicates the collimator blades are closed. The controlled blades are shown in thicker lines.

**Table 2-14** Collimator descriptions

Symbol	Description
	Indicates the collimator blades are open. The controlled blades are shown in thicker lines.
	Indicates the use of laser radiation.

## Identification and Compliance Plates

Product identification labels can be found on the tops and sides of the cabinets, the rear of monitors, and other exterior surfaces on the equipment. The types of system identification compliance plates are located in [Table 2-15](#).

## Identification Plate and Compliance Plate Locations

**Table 2-15** Identification Plate

Components	Identification Plate	Location
Bridge	5127305	Top of rear end cap
Overhead Tube Suspension (OTS)	5135678-3 or 5135678-4	Rear of largest column.
X-ray Tube Casing MX100 09PS	46-155400G285	Rear of X-ray tube.
X-ray Tube Insert.6-1.25 12.5 degree MX100	2336058	Rear of X-ray tube.
Collimator	5234954	Rear of collimator.
Workstation PC (Z400) Everest System Name Plate for US	5810000-2 5401218	Top front of PC
System Cabinet	5397035	Top of unit, on right side towards front.

<b>Components</b>	<b>Identification Plate</b>	<b>Location</b>
Jedi 80 Rad 1T	2374870	Top of unit, on right side towards front. Also inside system cabinet, on left side of Jedi Control Assembly.
Jedi HV Tank	2186730	Inside system cabinet, on front of Jedi HV Tank
Radiographic Table	5399738	Left side
Table Ion Chamber	5143310	Inside table detector housing.
System Label for China	5400528	Top of cabinet unit
Wall Stand	5374989 (standard arm) 5397837 (extended arm)	Left side of carriage.
Wall Stand Ion Chamber	5143310 (3-cell) 5261064 (4-cell)	Inside wall stand detector housing
Flash Pad Detector (URP)	5340000-3	Top of unit.
Tether Interface Box	5394349	Under cover, on right side.
Detector BIN	5394348	Under cover, on right side.
Flexi-DT Table (purchasable option)	5194670	On lower frame, behind right front wheel.
UDI Label	5727628	Top of cabinet unit.

## NRTL Listed Label

The Nationally Recognized Testing Laboratory (NRTL) label indicates that the assembly is listed or recognized by a nationally recognized testing laboratory (i.e. ETL, UL, CSA)

**Figure 2-6** ETL Listed Label



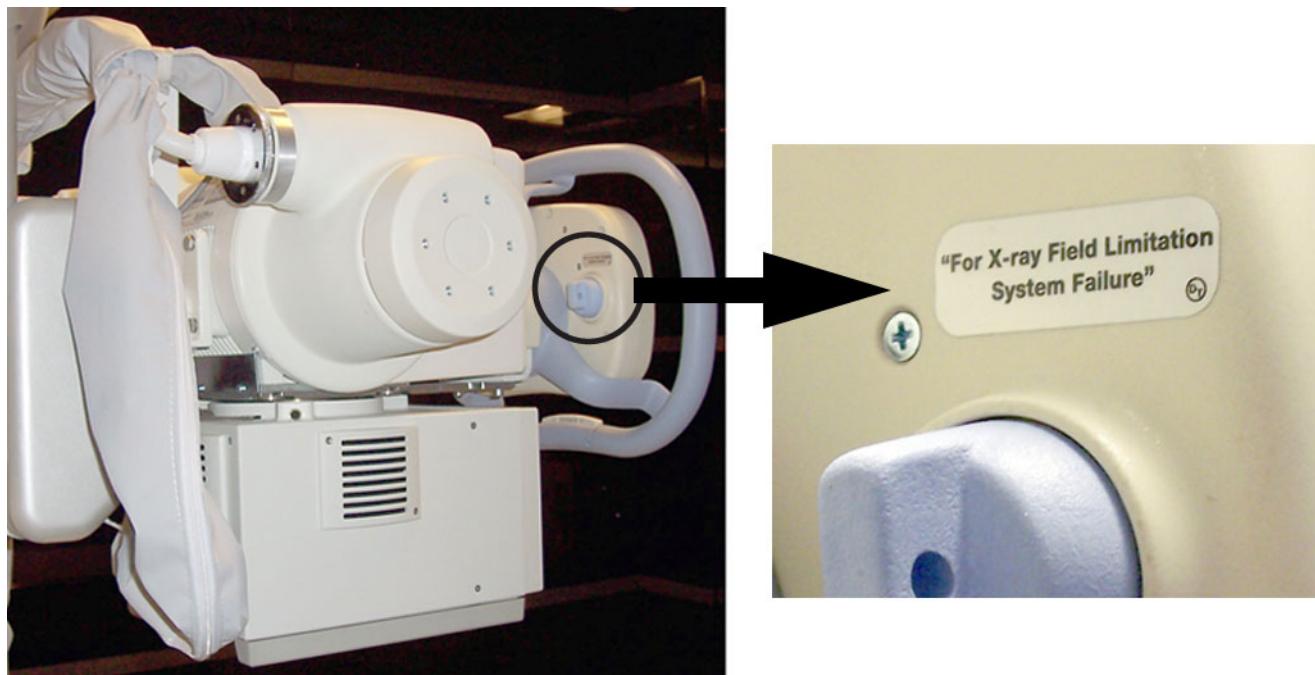
## Table Top Finger-Pinch Warning Labels (2)

**Figure 2-7** Table Top Finger-Pinch Warning Labels



## OTS Label

**Figure 2-8** OTS Label



## Collimator Label

Figure 2-9 Collimator Label

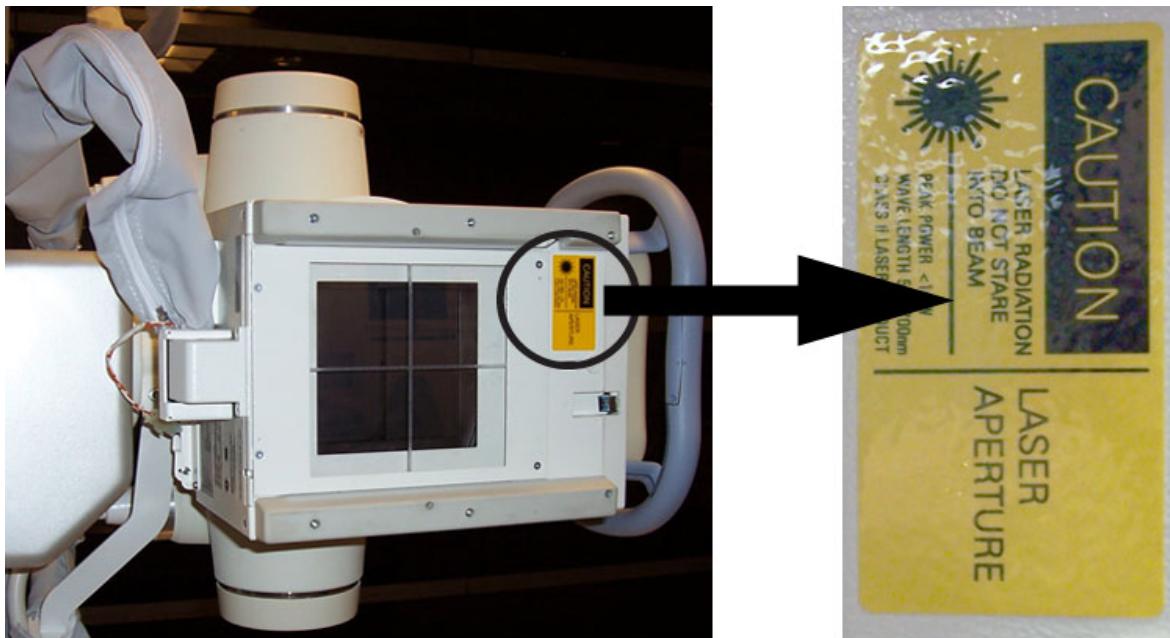
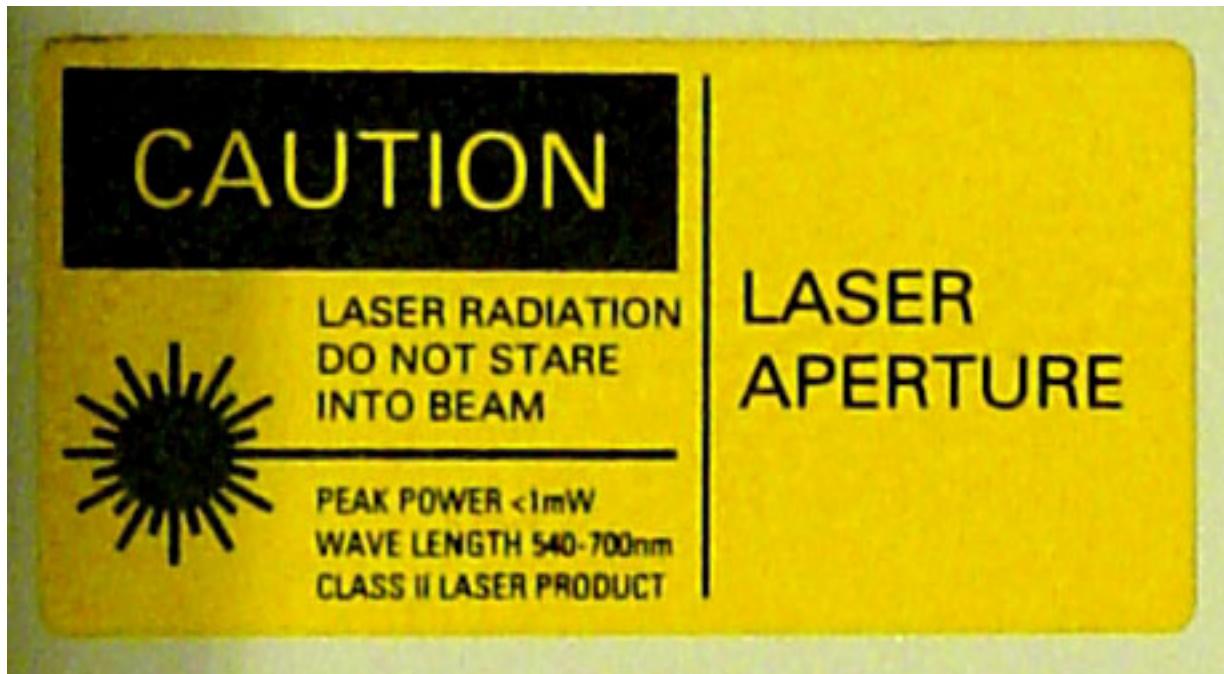


Figure 2-10 Collimator Caution Label



## Lateral Bar Label

Figure 2-11 Lateral Bar Label



“Maximum Load Allowed: 30 kgf”

## Keyboard Label

Figure 2-12 Keyboard Label



## RCIM2 Label

**Figure 2-13** RCIM2 Label



**WARNING** This X-Ray unit may be dangerous to the patient and operator, unless safe exposure factors, operating instructions and maintenance schedules are observed. To be used by authorized personnel only.

## UDI Label

Every Discovery XR656 system has an unique marking for identification. The Unique Device Identification (UDI) marking appears on the product label which is located on system cabinet.

UDI: Unique Device Identifier - A UDI is an unique numeric or alphanumeric identification code assigned to medical devices by the manufacturer of the device. An unique device identification marking is applied to a Product Model that is designated as a medical device as per FDA UDI regulation.

## Regulatory Requirements

**Note:** This equipment generates, uses, and can radiate radio frequency energy. The equipment may cause radio frequency interference to other medical and non-medical devices and radio communications. To provide reasonable protection against such interference, this product complies with emission limits for Group 1 Class A Medical Devices as stated in EN 60601-1-2. However, there is no guarantee that interference will not occur in a particular installation.

**Note:** If this equipment is found to cause interference (which may be determined by switching the equipment on and off), you (or qualified service personnel) should attempt to correct the problem using one or more of the following measures:

- Reorient or relocate the affected devices.
- Increase the space separating 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.

**Note:** The manufacturer 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.

**Note:** To comply with the regulations applicable to an electromagnetic interface for a Group 1 Class A Medical Device, all interconnect cables to peripheral devices must be shielded and properly grounded. The use of improperly shielded and grounded cables may result in the equipment causing radio frequency interference in violation of the European Union Medical Device directive and Federal Communications Commission regulations.

**Note:** Do not use devices which intentionally transmit radio frequency (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 type devices turned off when near the equipment.

The medical staff in charge of this equipment is required to instruct technologists, patients, and other people who may be around this equipment, to fully comply with the above requirement.

This product complies with the following requirements:

Council Directive 93/42/EEC concerning medical devices when it bears the following CE marking of conformity:

**Figure 2-14** CE mark label



## Disposal of Waste

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

**Figure 2-15** Disposal of waste symbol



## Battery Disposal

The separate collection symbol is affixed to a battery, or its packaging, to advise you that the battery must be recycled or disposed of in accordance with local or country laws. The letters below the separate collection symbol indicate whether certain elements (Pb=Lead, Cd=Cadmium, Hg=Mercury) are contained in the battery. To minimize potential effects on the environment and human health, it is important that all marked batteries that you remove from the product are properly recycled or disposed.

For information on how the battery may be safely removed from the device, please consult the service manual or equipment instructions. Information on the potential effects on the environment and human health of the substances used in batteries is available at this url:

<http://www.gehealthcare.com/euen/weee-recycling/index.html>

**Figure 2-16** Battery Disposal symbol



## Pollution Control Label

The following product pollution control information is provided according to *SJ/T11364-2006 Marking for Control of Pollution caused by Electronic Information Products*.

**Figure 2-17** Pollution control symbol



This symbol indicates the product contains hazardous materials in excess of the limits established by the Chinese standard SJ/T11363-2006 Requirements for Concentration Limits for Certain Hazardous Substances in Electronic Information Products. The number in the symbol is the Environment-friendly Use Period (EFUP), which indicates the period during which the toxic or hazardous substances or elements contained in electronic information products will not leak or mutate under normal operating conditions so that the use of such electronic information products will not result in any severe environmental pollution, any bodily injury or damage to any assets. The unit of the period is Year.

In order to maintain the declared EFUP, the product shall be operated normally according to the instructions and environmental conditions as defined in the product manual, and periodic maintenance schedules specified in Product Maintenance Procedures shall be followed strictly.

Consumables or certain parts may have their own label with an EFUP value less than the product. Periodic replacement of those consumables or parts to maintain the declared EFUP shall be done in accordance with the Product Maintenance Procedures.

This product must not be disposed of as unsorted municipal waste, and must be collected separately and handled properly after decommissioning.

## Dose Chart

Use [Table 2-16](#) to compare film speed to dose values.

**Table 2-16** Dose Chart

Expected receptor Default Dose ( $\mu\text{Gy}$ ) at 80 kVp is less than:	Equivalent Film Speed
16.00	100
12.90	125
10.00	160
8.00	200
6.25	250
5.00	320
4.00	400
3.20	500
2.50	640
2.00	800
1.60	1000



**CAUTION** Use the largest possible focal spot-to-skin distance to keep the patient absorbed dose as small as possible.



**CAUTION** If no technical factors are present in the system for any view, the default settings are:

- kV = 40
- ma = 25
- mAs = .25
- SID = 100cm
- Grid = In

These values are placeholders only. No exposures should be made until the user selects values appropriate for the patient size.

## X-ray Source Assembly Filtration

The x-ray source assembly is comprised of the x-ray tube and collimator. Together they provide permanent, non-removable filtration of 2.7 mm aluminum equivalent @ 71 kVp. Additional collimator filtration is user

selectable. Refer to [Chapter 8: System Hardware Overview-Multi-Leaf Collimator \(p. 8-23\)](#) for detailed information.

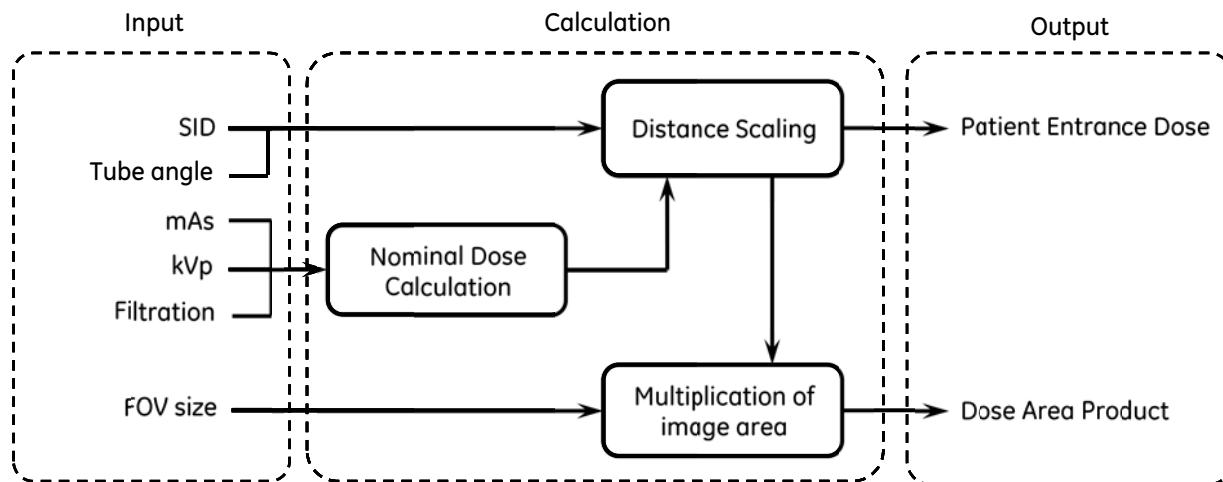


**CAUTION** This system is designed to be used with only the GE MX-100 tube and collimator model number 5234954. Replacement of either of these components with different types may render the system non-compliant to applicable radiation safety standards and regulations.

## Dose/DAP Indication

The Dose/DAP value is predicted by calculation. They are displayed on the image viewer for each exposure. The Dose value is calculated at the position of patient entrance.

**Figure 2-18** Block diagram for Dose/DAP calculation:



The nominal Dose is calculated at the calibrated distance, based on exposure techniques, such as mAs, kVp and additional filtration. The final patient entrance dose is got by correcting with SID and tube angle and the preset patient thickness.

DAP is got by multiplying Patient entrance dose and the image area at that distance.

Increase/decrease of the kVp, mAs, will lead to increase/decrease of Dose and DAP

Increase/decrease of the SID only, will lead to decrease/increase of Dose and DAP

Increase/decrease of the FOV only, will lead to increase/decrease of DAP, but Dose will not change.

## Environmental protection

With the disposal of waste products, residues and equipment accessories that are out of their expected service life, to avoid the impact of environment, please comply with local statute or call GE Service.

# Chapter 3: Pediatrics and small patients

GE Healthcare strongly suggests reducing radiation dose to As Low As Reasonably Achievable (ALARA) in all patients, especially pediatric and small patients, whenever it is determined that an x-ray is necessary. X-ray is an extremely valuable tool for diagnosing injury and disease, but its use is not without risk. This section discusses the importance of minimizing the radiation dose in children and small adults consistent with ALARA principles.

Topics covered include:

- [Pediatric Use](#)
- [Optimize Pediatric Protocols for your facility](#)
- [What Do I Need to Know About?](#)

## Pediatric Use

Radiation exposure is a concern in both adults and children. However, children are more sensitive to radiation. Using the same exposure parameters on a child as used on an adult may result in larger doses to the child. X-ray settings can be adjusted to reduce dose significantly while maintaining diagnostic image quality.

## Optimize Pediatric Protocols for your facility

The protocols supplied with the system represent examples for procedures commonly conducted in radiography. Based on the needs of a particular practice, these protocols may be modified to optimize factors such as image quality or dose reduction.

Work with your team of Radiologists, Medical Physicists and Technologists to evaluate techniques that may reduce radiation dose and provide adequate diagnostic information. In addition to the recommended protocols installed on your system and suggestions in this guide, the following websites offer excellent sources of additional information on how to optimize protocols:

- American College of Radiology (ACR): [www.acr.org](http://www.acr.org)
- Society of Pediatric Radiology (SPR): [www.pedrad.org](http://www.pedrad.org)
- National Cancer Institute (NCI): [www.nci.nih.gov/aboutnci](http://www.nci.nih.gov/aboutnci)
- Image Gently: [www.imagegently.org](http://www.imagegently.org)
- US Food and Drug Administration (FDA): [www.fda.gov](http://www.fda.gov)

# What Do I Need to Know About?

This section presents the concepts necessary to understand Pediatric x-ray imaging. The concepts you need to understand are:

- Radiation Exposure Sensitivity
- Suggestions for Minimizing Unnecessary Dose
- Guidelines for Adjusting Individual Exposure Parameters by patient
- Patient Dose Reporting
- Dose Index Reporting Considerations
- Protocol Database Edit

Everyone shares the responsibility of minimizing pediatrics dose. There are several steps that can be taken to reduce the amount of radiation that pediatrics and small patients receive from x-ray examinations.

## Radiation Exposure Sensitivity

Radiation exposure is a concern in all people of all ages, however, pediatrics are more sensitive to radiation exposure. Radiation risk is higher in the young as they have more rapidly dividing cells than adults. The younger the patient, the more sensitive they are.

## Suggestions for Minimizing Unnecessary Dose

- Image the Anatomical Region Indicated (Collimation): Collimation and anatomical coverage should be carefully considered prior to each exposure. Follow your facility imaging guidelines to determine appropriate collimation.
- Properly Center All Patients: In addition to collimation, centering of intended anatomy should be considered. This is especially true when utilizing AEC/ion chambers. Improper centering over ion chambers may cause more or less than the desired dose which may lead to overexposure or repeat exposure.
- Check Technical Factors Before Exposure: Review technical display carefully before making an exposure to verify selected and intended technique are the same. Pay particular attention to placement of decimal point in display of numerical values.
- Use Pediatric Positioning Accessories: Approved Pediatric positioning accessories are often useful for certain patients and exams. These may be helpful in decreasing motion that may contribute to repeat exposure. Understand your facilities guidelines when implementing these devices.
- Protective Apparel/Barriers/Shielding: When applicable, utilize proper protective measures as they comply with your facility guidelines.
- Consider Patient Radiation Safety Protocols: Ensure understanding and conformance of Patient Radiation Protection Safety and ALARA principles as required by your facility. This includes patient shielding to reduce exposure to unintended areas.

# Guidelines for Adjusting Individual Exposure Parameters by patient

**Adjust Parameters:** The single most important thing you can do is to always use pediatric protocols to avoid over exposure. Protocols based on patient size are installed on the system. There are six patient sizes available: Adult and Pediatric; Small, Medium and Large Patient Size. These protocols should be considered a baseline. GE strongly recommends that you work with your Radiologist and Physicist to determine the lowest possible dose for the desired image quality.

**Figure 3-1** Patient Size

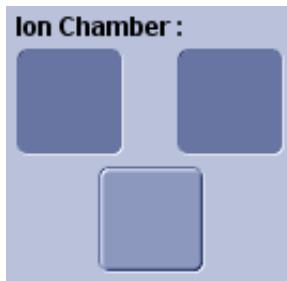


Once patient size is selected, further adjustments to kVp, MAS, Filtration and Grid can be made to further minimize patient dose.

**Automatic - Exposure or Fixed Exposure:** Consideration should be made when utilizing Automatic Exposure (AEC) or Fixed Exposure. Each protocol on your system has been installed with a preset method of exposure; however, GE recommends reviewing each protocol and utilizing the method that will allow for the lowest possible dose.

Use of ion chambers for AEC require careful positioning of patient and should be considered prior to making an exposure. GE recommends that each facility work with your Radiologist and Physicist. Refer to Image Acquisition Chapter located in this operator manual for more information on AEC chambers and sensing areas.

**Figure 3-2** Ion Chamber



## Patient Dose Reporting

Estimates of patient dose are calculated after each acquisition and displayed (optionally) as part of the image annotations. The information is also stored in the DICOM header of each image. Reference Patient Dose Reporting in this operator manual for more information.

- Dose Index Reporting Consideration

Your system is provided with a Dose Index visual indicator. This indicator is displayed as an amount of exposure received by the receptor. These are estimated ranges and can be changed as technical factors are changed. Reference the DEI/DI section of this operator manual for more information.

## Protocol Database Edit

In collaboration with your Radiologist and Physicist, protocol techniques can be changes as a default on your system. This should not replace observing the technical acquisition screen carefully prior to each exposure, but can assist in displaying an appropriate range of techniques for selected pediatric size. Further changes to techniques are recommended based on each individual patient.

Refer to the Protocol Database Edit chapter in this operator manual to ensure proper editing. Always complete a protocol database back up. Should any changes occur to your system, the database back up may be retrieved with saved protocols.

For questions or further information, contact your local GE Healthcare representative.

# Chapter 4: General Information

This chapter explains some of the basic operations and features of the system such as how to start up and shut-down the system software, how to login and log off, and how to view system status and messages.

Refer to [Chapter 8: System Hardware Overview](#) for information about identifying system components.

# System Start Up and Shutdown

This section describes the procedure for starting up and shutting down the system.

The system should remain on at all times for optimal performance. However, a controlled system shut down and start up should be performed once a week as part of routine QAP. Refer to [Chapter 14: Quality Assurance and Maintenance](#) for more information.

If the receptor loses power for 30 minutes or more, reset the system and warm the receptor with active power in “on” state for at least 30 minutes. Refer to [System Emergency OFF Buttons \(p. 4-9\)](#) for more information.

## Start Up

1. Press the Power On button on the RCIM.

**Figure 4-1** Power button on RCIM



2. Wait 3 minutes to get power on the whole system.
  - The system powers up automatically.
  - If enabled, the Login screen appears on the left monitor when the system is ready. Refer to [Login and Log off \(p. 4-3\)](#) for more information.
  - If Login is not enabled, the Worklist appears on the left monitor when the system is ready. Refer to [Chapter 9: Worklist](#) for more information.
3. Wait for the detector to boot. This takes approximately 30 seconds.
  - A message in the system status area will appear: “Detector Boot is in progress. Please wait 29 seconds for the detector boot to complete.”
  - The system is ready when the detector boot message disappears.

## Shutdown

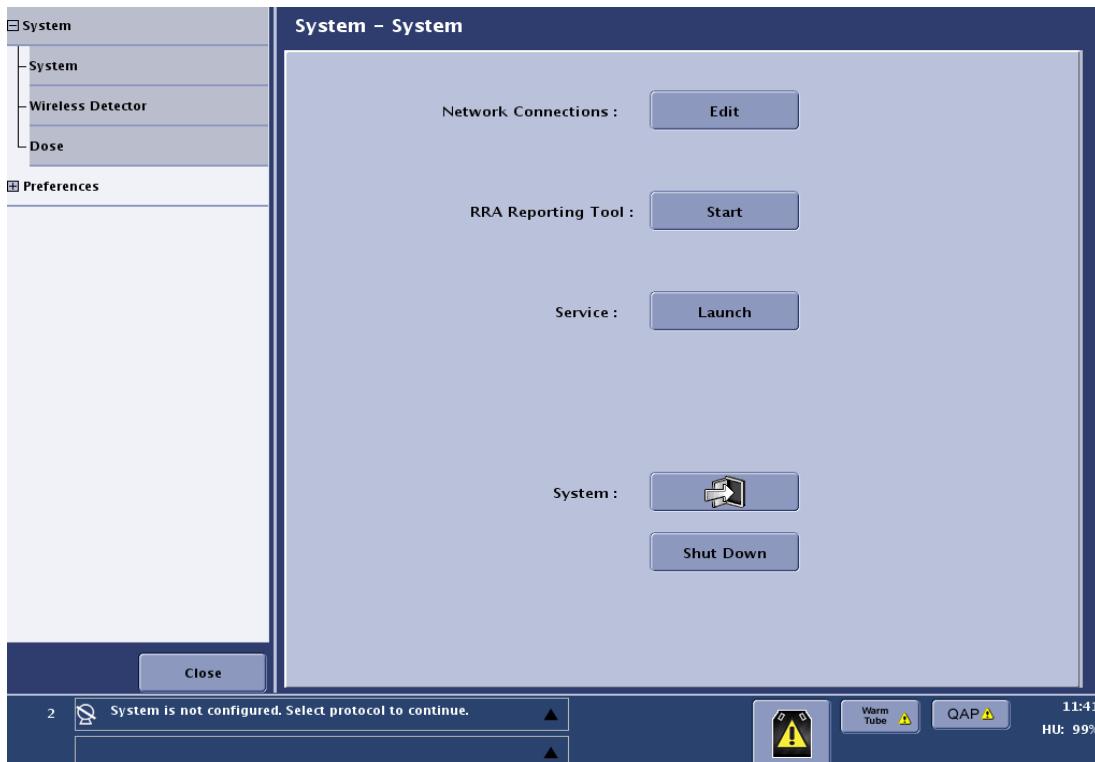


**CAUTION** **Do not to turn the system off if the tube fan is running. Wait for the tube to cool and for the fan to stop.**

1. Close all current exams. (Refer to [Chapter 10: Image Acquisition-End Exam \(p. 10-30\)](#) for more information.)
2. Click the [UTILITY] button at the top of the Worklist screen.

**Figure 4-2** Utility button

3. Select System on the Utilities screen.

**Figure 4-3** Utilities – System screen

4. Click [SHUTDOWN].
  - A message appears: “The system will be shut down. NOTE: Please allow for the tube fan speed to slow (if running high) before shutting down system.”
5. Click [YES] to proceed with shut down.
  - The system powers off and the monitors go blank.
  - [CANCEL] stops the system from shutting down and returns you to the Utilities screen.

**Note:** Wait approximately 30 seconds after a shutdown to power up the system.

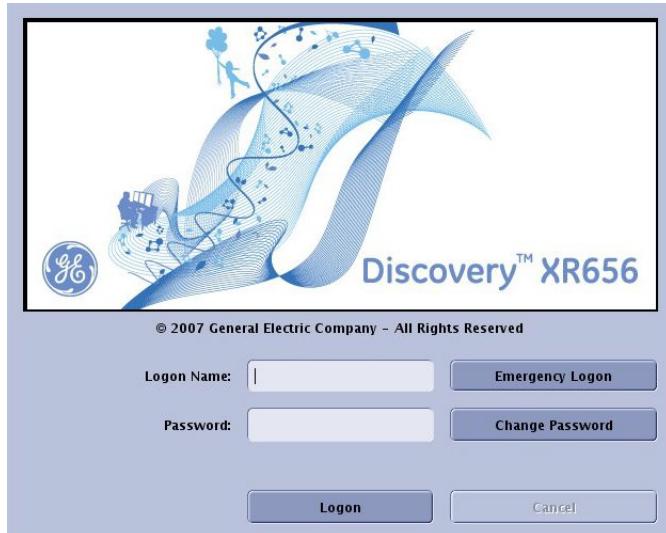
## Login and Log off

The following sections apply if the system is configured to use the Login feature in the Utilities User Interface. Refer to [Appendix A: Login Administration](#) for information on administering the login function.

## Standard Login

The Login screen ([Figure 4-4](#)) appears when the system is started, reset, and after a user logs off. The system may also be configured to display the Login screen if the system has been inactive for a specified period of time (inactivity timeout).

**Figure 4-4** Example login screen.



Follow this process to login to the system.

1. Start up the system or log off the previous user.
  - The Login screen appears.
2. Enter your **Login Name**.
3. Enter your **Password**.
4. Click [LOGIN].
  - The Worklist appears. Refer to [Chapter 9: Worklist](#) for more information.

## Invalid Password Message

Your Password must be entered correctly for you to log in. If the password you entered is not the correct password for the selected User name, an error message will appear in the top portion of the Login screen: “Logon Failed. Check that the CAPS LOCK Key is off. For assistance, contact your system administrator.”

1. Make sure that the correct **Login Name** is displayed in the field. Depending on the configuration, the Login Name may be case sensitive. That is, “aBc” is not the same Login Name as “Abc.”
2. Retype your **Password** carefully. Your password is case sensitive; that is, “xYz” is not the same password as “Xyz.”
3. Click [LOGIN].
  - Contact your technical support group or system administrator if you still are not able to login.

## Emergency Login

Emergency Login is a HIPAA required function to allow quick access to medical systems in the event of an emergency. Depending on the system's configuration, this option may not be available. Refer to [Appendix A: Login Administration](#) to configure the Emergency Login function.

Emergency Login will allow exposures, but does not allow connection to HIS/RIS or PACS hosts.



**CAUTION** **The Emergency Login function should NOT be used when there is time to login normally, when there is time to receive assistance from technical support, or if there is no emergency situation.**

1. Click [EMERGENCY LOGIN].

- You are prompted to enter your name. Enter your name and click [LOGIN]



2. The Worklist screen appears. Refer to [Chapter 9: Worklist](#) for more information.

## Inactivity Time out (Screen Saver)

Depending on the system's configuration, the system may show the Login screen after a specified period of inactivity. The Login screen acts as a screen saver, covering displayed information to protect patient privacy.

The administrator configures if the system will time out and how long the system must be inactive before the Login screen appears. Refer to [Appendix A: Login Administration](#) to configure the inactivity time out function.

To access the system screens, follow the Standard Login or Emergency Login process described above.

## Log Off

1. Close, suspend, or discontinue any open exams, if necessary. (Refer to [Chapter 10: Image Acquisition-End Exam \(p. 10-30\)](#) for more information.)
2. Close the Image Viewer, if necessary.
3. Click [LOGOFF] at the top of the Worklist or Image Management screen.
  - Or open the Utility screen, go to **System** and click [LOGOFF] ([Figure 4-5](#)).

**Figure 4-5** Utilities screen logoff button



- A message appears: “Do you really want to log off?”
4. Click [OK].
    - The Login screen appears.
    - [CANCEL] closes the screen and returns you to the last screen.

## System Interlocks

Your system has a series of interlocks that can place the system in an exposure hold state. When certain conditions exist outside of normal operation, the red LED on the user interface becomes lit.

### Grid Interlock

If the Grid interlock is activated, the Exposure Hold icon will appear on the OTS user interface and at the Acquisition workstation screens. Select the Exposure Hold icon for detailed description on the inhibit condition.

### Automatic Exposure Control (AEC) Interlock

If the tube is not centered laterally and longitudinally on the center ion chamber, the Exposure Hold icon may appear on the OTS user interface and at the Acquisition workstation screens. If the tube is not centered laterally and longitudinally on the center ion chamber, the Exposure Hold icon for detailed description on the inhibit condition.

### OTS Position Interlock

When the X-ray field is outside of the receptor area and/or not in lateral or SID detents, the Exposure Hold icon will appear on the OTS user interface and at the Acquisition workstation screens. Select the Exposure Hold icon for detailed description on the inhibit condition.

**Note:** This interlock is no longer active when the tube angle is  $> +/- 10$  degrees.

## Tube Pivot Interlock

The Tube Pivot interlock LED illuminates when the tube pivot must be rotated to 0 degrees (normal position).

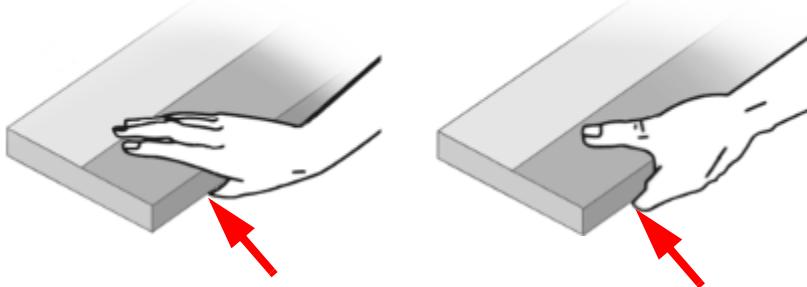
## Free Cassette Interlock

When in Free Cassette mode (using CR or film for Table top receptor) the detector drawer in the table must be pulled out to release the optical sensor that recognizes that the cassette is in place, or the detector must be removed completely. If the Free Cassette mode is selected without releasing this optical sensor, the Exposure Hold icon will appear on the OTS user interface and at the Acquisition workstation screens. Select the Exposure Hold icon for detailed description on the inhibit condition.

## Table Finger Pinch Interlock

The table is equipped with optical sensors beneath the edges of the table between the emergency stop button and table lock button on each side. The sensor stops lateral and longitudinal movement of the table top if fingers or other objects are beneath the table edges, as shown in [Figure 4-6](#).

**Figure 4-6** Finger pinch lock trigger

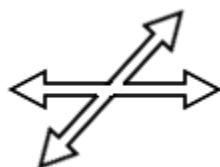


The system will beep and a message will appear on the Acquisition Workstation informing you of the table lock. Exposures will be inhibited until the lock is resolved.

To unlock the table top:

1. Release the Table top positioning foot pedal (if necessary).

**Figure 4-7** Table top positioning foot pedal



2. Remove hands, fingers, or other object from under the table edge.
3. Press the table top positioning foot pedal ([Figure 4-7](#)) two consecutive times (“double-tap”).

4. Hold the foot pedal down and position the table top.

## Emergency Stop

Emergency stop immediately powers down the system—including table, OTS, wallstand, and x-ray tube—and stops image exposure. The digital table and RCIM are equipped with Emergency Stop buttons (Figure 4-8).

To engage: Press the button.

To release: Turn the button clockwise (indicated by the arrows on the button) until it stops, then release.

**Figure 4-8** Emergency Stop buttons

RCIM



Digital Table



Use this procedure to perform an emergency stop and to reset the Emergency Stop button.

1. In an emergency situation, press the Emergency Stop button in with force.
2. Resolve the emergency situation.



**WARNING** When the Emergency Stop button has been activated, the table will move longitudinally only. The table is not locked into position. Exercise extreme caution with your patient when this happens.

3. When normal conditions are confirmed, turn the button clockwise.
4. At the Acquisition workstation, click the [OK] button on the Emergency Stop screen (Figure 4-9).
  - The system will power up automatically.

**Figure 4-9** Emergency Stop screen

## System Emergency OFF Buttons

In the event of a fire, flood, earthquake, or any other catastrophic emergency, all power to the system should be turned off. Pressing the System Emergency OFF button immediately removes all power to the system by removing power to the System Cabinet. Because the system has no time to save data, or shutdown in an orderly fashion, pressing the System Emergency OFF button can corrupt system files or result in loss of patient data.

The facility designer determines the quantity and locations of the Emergency OFF buttons. GE recommends placing at least one Emergency OFF button near the doorway of every room in the system scan suite. Ask your supervisor to show you the location of all the Emergency OFF buttons in the system suite. Follow facility guidelines to report an emergency. Press the System Emergency OFF button (red, circular button located on the wall) in the event of a catastrophic emergency, such as fire or earthquake.

## System Reset

Should the system require a reset, this may take up to 3 minutes to complete.

**Note:** The system will not be available for acquiring images during the reset cycle.

1. If possible, close, suspend, or discontinue any open exams. (Refer to [Chapter 10: Image Acquisition-End Exam \(p. 10-30\)](#) for more information.)
2. If possible, log off the system.
3. Press and hold the RESET button on the RCIM until you hear the beep or the monitor screen goes black with white text. Release the button and wait until the Login or Worklist screen appears.

**Figure 4-10** Reset button on the RCIM

4. Release the button and wait until the Login or Worklist screen appears.
  - As the system resets, various screens will appear on the monitor. This is normal.
  - The system will auto-start and either the Login screen or Worklist screen will appear (depending on how your system is configured) when the system is ready. Refer to [Start Up \(p. 4-2\)](#) for more information.

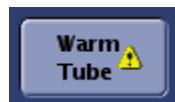
## Tube Warm Up

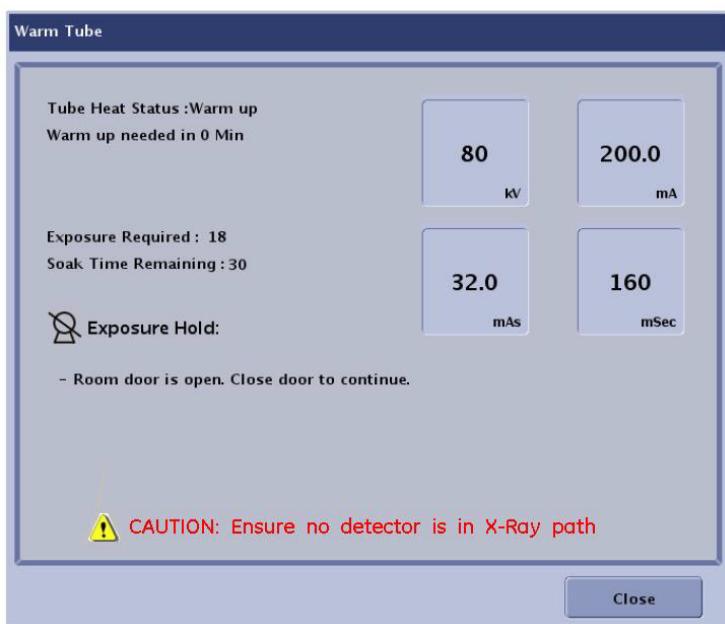
Tube warm up is a procedure that brings the X-ray tube up to a normal operating temperature. The tube has to be brought to this temperature slowly. Tube warm up should be done if no exposures have been made within two hours. This extends the life of the tube.



**CAUTION** Initiating an exposure when the X-ray tube is cold may damage the tube target.

Click [WARM TUBE] ([Figure 4-11](#)) at any time to see the tube heat status.

**Figure 4-11** Warm Tube button

**Figure 4-12** Warm Tube screen
**CAUTION** Ensure no detector is in X-Ray path
**Table 4-1** Warm Tube functions

Function	Description
Tube Heat Status	Shows the current status of the tube.
Warm up needed in __ Min	Shows how many minutes until the tube needs to be warmed. A time of 0 minutes means that the tube must be warmed immediately.
Exposure Required	Shows the number of exposures required to warm the tube.
Soak Time Remaining	Shows how many seconds of soak time remain.
Exposure Hold	Lists any inhibits to making an exposure or warming the tube.
kV	Shows the kV of the current exposure.
mA	Shows the mA of the current exposure.
mAs	Shows the mAs of the current exposure.
mSec	Shows the mSec of the current exposure.
[CLOSE]	Closes the Warm Tube screen.

Follow this process to warm up the tube.



**WARNING** X-rays are generated during tube warm up. Use proper radiation practices at all times.

1. Check the room to make sure it is clear of other personnel before making X-ray exposures.
2. Click [WARM TUBE] on the Worklist screen.

**Note:** Because the tube warming procedure produces x-rays, it cannot be performed when an exam is open. If the tube must be warmed before the exam can begin, suspend the exam and remove the patient and any others from the room before warming the tube. Refer to [Chapter 10: Image Acquisition-End Exam \(p. 10-30\)](#) for more information.

3. Correct any exposure holds.



**CAUTION** Exposures should not be made on any detector during tube warm-up. The system will attempt to mis-align the tube and the detector, but you may need to manually move the tube so that the detector is not exposed during the warm-up sequence. Pay close attention to system message information for instructions to manually move the detector. Exposing the detector may cause a “burned in” image artifact.

4. Press the Hand-switch Prep/Expose button to the Expose position and hold until the **Exposures Required** reads “0”.

**Note:** The exposure hand switch should be held for 18 consecutive exposures to ensure proper tube warm up. The Exposures Required number counts down as each exposure is made.

5. Wait until the **Soak Time** reads “0”.
6. Click [CLOSE] to finish tube warm up.
  - You may now continue taking x-rays.

## Lead Markers

As in any General Radiography procedure, lead marker placement is important to ensure markers are properly recorded on the image. Place the lead marker in an area of patient attenuation. If lead markers are placed in regions of direct radiation (saturation), there is a high risk they will be processed out of the image during image processing. Saturated areas beyond the anatomy are no longer part of the final image. This is most likely to happen on high technique exposures.



**CAUTION** **Exercise care when placing lead markers to guarantee their presence in the final image. Every attempt must be made to assure markers are not located in regions of direct radiation, but are located in regions where some patient attenuation of radiation is present without obstructing the anatomical information of interest.**

## iLinq

iLinq is an optional feature of your system that allows access to remote service and clinical applications support.

The iLinq system lets authorized Service Engineers and Applications Specialists, located at GE Healthcare's Service Support Centers, access X-ray systems (with your permission) to provide the following services:

- Faster Emergency Service response
- Customer Applications training/support
- System troubleshooting and diagnostics
- Accumulate system information for failure analysis, resolution and prediction to assist in maintaining optimal X-ray system performance

**Figure 4-13** iLinq Main Screen


This System ID: EVEREST010      [iLinq Help](#)      [About iLinq](#)      [Close](#)

---

[Contact GE](#)

[Settings](#)

[Messages](#)

[TiP Virtual Assist](#)

**Contact GE Form** (All fields are required, unless indicated)

Reason for Contacting GE:  
 System Problem    Application Question

---

System ID:  
 This System ID (EVEREST010)    Other System ID:

---

System Status:  
 Completely Down    Partially Down    Up

---

Please do not use accents and special characters, for example (~`!@#\$%^&0\*) for the fields that follow:

Problem Description/Question:

Problem Area:	<input type="radio"/> Patient scanning	<input type="radio"/> Patient handling	<input type="radio"/> Image quality / artifacts	<input type="radio"/> Image display	<input type="radio"/> Image post-processing	<input type="radio"/> Networking / archiving	<input type="radio"/> Accessories	Additional Information (Optional) You have 300 characters left.
---------------	--	--	---	-------------------------------------	---	--	-----------------------------------	---

---

Image Number: (Optional)

Exam	Series	Image
<input type="text"/>	<input type="text"/>	<input type="text"/>

---

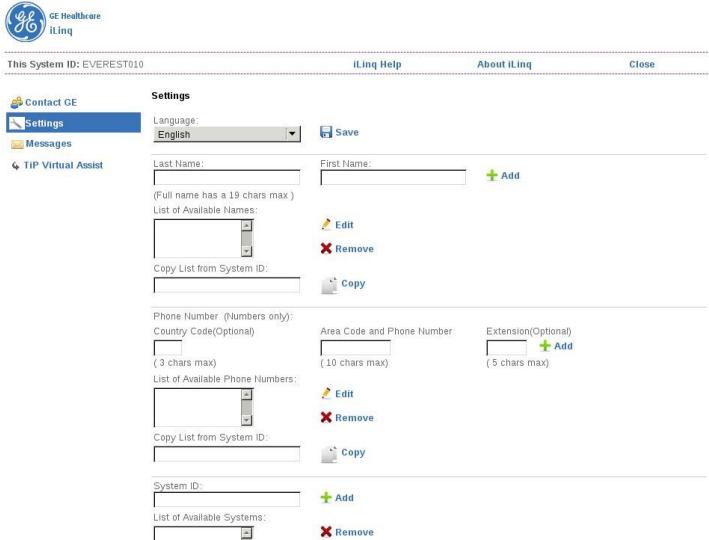
Problem/Question Occurred:  
 Now    Earlier: Date  Hours  Min

---

Temporary Contact: Full name has a 19 chars max

Submitter: <input type="button" value="Select Submit"/>	Last Name <input type="text"/>	First Name <input type="text"/>	
Phone Number: <input type="button" value="Select Phone"/>	Country Code(Optional) <input type="text"/>	Area Code and Phone Number <input type="text"/>	Extension(Optional) <input type="text"/>
	( 3 chars max)	( 10 chars max)	( 5 chars max)

**Table 4-2** iLinq Screen functions

Function	Description
Contact GE	<p>The Contact GE Form allows the electronic submission of a service request or applications question directly to the Online Center.</p> <p><a href="#">Figure 4-14</a> shows the screen you use to report a problem with your system, using the iLinq system.</p>
Settings	<p>The Settings page allows you to enter the default contact information that will display on the Contact GE Form. This includes a list of Contacts, System ID, Phone Number.</p> 
Messages	Receives messages from the Online Center.
Tip Virtual Assist	A tool which offers live Clinical Applications training support. Contact your Applications Specialist or Sales Representative for more information about this feature.
Close	To exit the iLinq feature, click on CLOSE in the upper right corner of your screen. This will return you to the Discovery XR656 system.

**Figure 4-14** iLinq Contact GE screen


This System ID: EVEREST010      [iLinq Help](#)      [About iLinq](#)      [Close](#)

**Contact GE Form** (All fields are required, unless indicated)

Reason for Contacting GE:  
 System Problem    Application Question

---

System ID:  
 This System ID (EVEREST010)    Other System ID:

---

System Status:  
 Completely Down    Partially Down    Up

---

Please do not use accents and special characters, for example (~`!@#\$%^&()\*) for the fields that follow:

Problem Description/Question:

Problem Area:	Additional Information (Optional)   You have 300 characters left.
<input type="radio"/> Patient scanning <input type="radio"/> Patient handling <input type="radio"/> Image quality / artifacts <input type="radio"/> Image display <input type="radio"/> Image post-processing <input type="radio"/> Networking / archiving <input type="radio"/> Accessories	<input type="text"/>

---

Image Number: (Optional)

Exam	Series	Image
<input type="text"/>	<input type="text"/>	<input type="text"/>

---

Problem/Question Occurred:  
 Now    Earlier: Date  Hours  Min

---

Temporary Contact: Full name has a 19 chars max			
Submitter: <input type="button" value="Select Submit"/>	Last Name <input type="text"/>	First Name <input type="text"/>	
Phone Number: <input type="button" value="Select Phone"/>	Country Code(Optional) <input type="text"/>	Area Code and Phone Number <input type="text"/>	Extension(Optional) <input type="text"/>
	( 3 chars max)	( 10 chars max)	( 5 chars max)

**Submit Form**

Use this procedure to connect to the iLinq system when you need to report a problem with your system.

1. Click the [iLinq] icon on the Worklist or Acquisition screens.
2. Click [CONTACT GE].
3. Enter the required information into the Contact GE iLinq screen.
4. Click [Submit Form].
5. Click [CLOSE].

- iLinq closes and returns you to the Worklist or Acquisition screens.

Installation and use of the iLinq system is limited to GE Customers with an X-ray system that is under warranty or covered by a valid GE Service Contract, in accordance with the terms and conditions of the iLinq Agreement or GE Service Contract. The presence of the GE iLinq system alone, at a your site, does not provide you any rights or title to the iLinq system or any license or right to access, use or decompile the iLinq system. Any access to or use of the iLinq system beyond the conditions specified in the iLinq Agreement or GE Service Contract; or any decompilation of the iLinq system by anyone other than GE personnel is prohibited. By signing the iLinq Agreement, you agree to use reasonable effort to protect the iLinq system against damage or loss and to prevent access to, use of or decompilation of the iLinq system by unauthorized personnel.

# Chapter 5: Quick Steps

This section provides an overview of common tasks. Refer to the relevant chapters for detailed information.

## Hardware

The following lists the basic processes for working with the system hardware. Refer to [Chapter 8: System Hardware Overview](#) for more information.

### Emergency Stop button

1. In an emergency situation, press the Emergency Stop button in with force.
2. Resolve the emergency situation.
3. When normal conditions are confirmed, turn the button clockwise.
4. At the Acquisition workstation, click the [OK] button on the Emergency Stop screen.
  - The system will power up automatically.



**WARNING** When the Emergency Stop button has been activated, the table will move longitudinally only. The table is not locked into position. Exercise extreme caution with your patient when this happens.

### Raise and Lower the Digital Table

1. Release the table lock, if necessary.
2. To raise the table, press the Up pedal two consecutive times (“double-tap”). This activates the foot pedal.
3. Hold the foot pedal down until the desired height is reached.
4. Remove your foot from the pedal to stop the movement.
5. To lower the table, press the Down pedal two consecutive times (“double-tap”).
6. Hold the foot pedal down until the desired height is reached.
7. Remove your foot from the pedal to stop the movement.



**WARNING** Before your patient gets on or off the digital table, always press the Table Lock Control button to block the control foot pedal functions momentarily. This avoids inj-

ries to the patient or damage to the equipment if a foot pedal is accidentally stepped on.



## Position the Table Longitudinally and Transversely

1. Release the table lock, if necessary.
2. Press the table top positioning foot pedal two consecutive times (“double-tap”). This activates the foot pedal.
3. Hold the foot pedal down and position the table top.
  - You can float the table top in all directions while the pedal remains held down.
4. Manually move the tabletop in a longitudinal or transverse direction to the desired position.
5. Release the foot pedal to lock the tabletop.



**WARNING** When moving the tabletop, be careful of where your and the patient’s fingers are placed. Do not attempt to move the tabletop without using the foot pedals to release the longitudinal and transverse movement locks.



**WARNING** To avoid injury to fingers and hand of patient and operator caused by table movement, hands must be kept away from table top edges at all times.

## Adjust the Overhead Tube Suspension (OTS) Position

1. Use the Longitudinal Lock Release button to move the OTS along the bridge of the overhead rail system.
  - a) Press and hold the Longitudinal Lock Release button on the User Interface.
  - b) Move the OTS to the desired position.
  - c) Release the Longitudinal Lock Release button.
2. Use the Vertical Lock Release button to move the telescopic column up and down.

- a) Press and hold the Vertical Lock Release button on the User Interface.
  - b) Move the telescopic to the desired vertical position.
  - c) Release the Vertical Lock Release button.
3. Use the Lateral Lock Release button to move the OTS carriage from side to side on the bridge.
    - a) Press and hold the Lateral Lock Release button on the User Interface.
    - b) Move the OTS carriage to the desired position.
    - c) Release the Lateral Lock Release button.
  4. Use the All-Lock, Lock Release button to simultaneously move the OTS in vertical, lateral and longitudinal directions. If detents are on and the OTS is in lateral detent the system will maintain the lateral position but move freely in vertical and longitudinal.
    - a) Press and hold the All-Lock, Lock Release button on the User Interface.
    - b) Move the OTS to the desired position.
    - c) Release the All-Lock, Lock Release button.

**Note:** Detents remain activated if the detent button is selected.

## Adjust the Tube Position

1. Use the Tube Angulation Lock Release button to rotate the tube about the short axis (cranial to caudal).
  - a) Press and hold the Tube Angulation Lock Release button on the User Interface.
  - b) Move the tube unit to the desired angle.
  - c) Release the Tube Angulation Lock Release button.
2. Use the Rotation Detent button on the OTS to rotate the tube about the vertical axis of the telescopic column.
  - a) Press the Rotation Detent button on UI (lower right).
  - b) Rotate the tube unit.
  - c) Release the button to hold position.



**WARNING Potential Pinch Point:** The area where the tube connects to the column may create a pinch point when the tube is rotated. Operators should keep their hands on the OTS handle and keep patient's clear while rotating the tube.

## Rotate the Multi-Leaf Collimator

1. Move the locking lever on the multi-leaf collimator toward the front panel, i.e. toward you. This releases the collimator from the 0 lock-in position.
2. Grasp the multi-leaf collimator with both hands.
3. Rotate it to the desired angle and direction.

4. Return the locking lever to its original position. This prevents further rotation.

**Note:** When the collimator is rotated, the image border is adjusted to the maximum size based on the selected collimator FOV.



**WARNING** Always grasp the multi-leaf collimator in such a way that neither hand can be pinched or crushed between the handles and the collimator.

## General Acquisition

This section outlines the basic acquisition process.

Refer to [Chapter 9: Worklist](#) for more detailed information about adding or selecting procedures to perform.

Refer to [Chapter 10: Image Acquisition](#) for more detailed information about the Acquisition screen functions, how to conduct specific types of exams, and how to end exams.

1. Add or select the procedure from the Worklist.



**CAUTION** Select all procedures for the patient.

2. Click [START EXAM] or [RESUME EXAM].
3. Select the protocols for the exam.
4. Click [ACCEPT].
5. If multiple procedures were selected from the Worklist, choose the exam to perform.
6. Choose the protocol to perform.
7. Select the Patient Size. The system default is Medium Adult.
8. Choose the Receptor: Table, Wallstand, or Table top (cassette).
9. Choose AEC or Fixed mode (if applicable for the protocol).
10. Confirm or adjust the Grid and SID status.

**Figure 5-1** Grid and SID position

Current:	Grid Out	Sid 180 ✓
Recommended:	In	180

- An alert icon appears if the current Grid or SID is not in the recommended position for the technique.
- A checkmark appears if the current Grid or SID is in the recommended position for the technique.

- [Figure 5-1](#) shows the Grid not in the recommended position and the SID in the recommended position.
11. Make technique adjustments as necessary: kV, mA, Focal spot, Cu Filter, and Ion chambers (AEC mode only).
  12. Position the patient on the table or in front of the wallstand as appropriate.



**WARNING** **If using AEC mode, collimation must be active over the ion chambers being used. If it is not possible to collimate over the selected ion chambers, then FIXED mode should be used in order to prevent possible patient over-exposure.**

13. Confirm or adjust the Patient Side field, if applicable.
14. Confirm or adjust the Patient Position field.
15. Confirm or adjust the Asymmetric Collimation (wallstand only).
16. Collimate and shield as appropriate for the exam.
17. Make exposure using the hand-switch.
18. Confirm image quality.
19. Make additional exposures as needed.
20. When all exams are complete, click [CLOSE].

**Note:** Should a detector be connected to the system that is not compatible, a warning message will appear. Please call service.

## Manual Patient Entry (Worklist)

### Add Patient

Use this procedure to enter the patient's information into your system.

1. On the Worklist screen click [ADD PATIENT].
2. Enter the patient information.



**CAUTION** **Make sure the patient's name, ID number, birth date, and gender information are entered correctly.**

3. Click [SAVE] or [START EXAM].

## Edit Patient Information

Patient information can only be edited if manually entered on system and exam has not started. Patient information generated by a HIS/RIS cannot be edited on the system.

1. Select the procedure from the Worklist.
2. Click [PATIENT INFORMATION].
3. Edit the information as necessary.
4. Click [SAVE] to record the changes and return to the Worklist.

## Auto Positioning

This section describes how to use Auto Positioning.

Refer to [Chapter 13: Advanced Applications-Auto Positioning](#) for more detailed information about the Auto Positioning function.

### Auto Positioning from Worklist Screen

Follow this process to initiate Auto Positioning from the Worklist.

1. Confirm or change the **Auto Positioning** selection.
2. Press and hold the AUTO POSITIONING button on the RCIM.



**WARNING** Keep patient and any others in room clear of the OTS as it moves into position.

3. Continue to begin the exam as described in [Chapter 10: Image Acquisition](#).

### Auto Positioning from Image Acquisition Screen

Follow this process to activate Auto Positioning from the Image Acquisition screen.

1. Select the patient procedure from the Worklist or add the patient to the Worklist.
2. Select the exam and view to perform.
3. Adjust exam techniques as appropriate.
4. Confirm or change the **Auto Position** selection.
5. Press and hold the AUTO POSITIONING button on the RCIM.



**WARNING** Keep patient and any others in room clear of the OTS as it moves into position.

6. After motion stops, make final adjustments to the tube position, if necessary.
7. Continue the exam as described in [Chapter 10: Image Acquisition](#) and position the patient.

## Auto Positioning from Remote Control

1. Double Press and hold the button for the desired location.
2. After motion stops, make final adjustments to the tube position, if necessary.
  - The tube will stop moving if the button is released before the tube reaches the selected position or if another location button is pressed. Repeat steps 1 and 2 to resume tube movement.



**WARNING** Keep patient and any others in room clear of the OTS as it moves into position.

## Auto Positioning in Protocol Editor

Auto Positioning defaults for each exam can be configured in protocol editor. Refer to [Chapter 15: Preferences-Protocol Editor Copy Functions](#) for more detailed information on editing protocols.

## Wallstand Auto Image Paste Acquisition (Option)

This section outlines the process to acquire images for an Image Pasting exam.

Refer to [Chapter 13: Advanced Applications-Auto Image Paste](#) for more detailed information about Auto Image Paste.

Refer to [Chapter 9: Worklist](#) for more detailed information on adding or selecting procedures to perform.

Refer to [Chapter 10: Image Acquisition](#) for more detailed information about the Acquisition screen functions, how to conduct specific types of exams, and how to end exams.

1. Place the patient positioner in front of the wallstand and secure the floor locking mechanism.
2. Select the patient from the Worklist (or add patient if necessary).
3. Select the **Image Pasting** protocol from the Select Protocols screen.
  - a) Select the **Image Pasting** category.
  - b) Select the Exam (**Spine** or **Leg**).

4. Click [ACCEPT].
5. On the Acquisition screen, select the view to perform.
6. Select the **Patient Size**.
7. Adjust the technique if necessary.
8. Position the tube at the appropriate SID.
  - If your system has Auto Positioning, select 180cm Vertical from the Auto Position drop-down list and hold down the AUTO POSITIONING button on the RCIM until the tube stops moving.



**WARNING** **Keep patient and any others in room clear of the OTS as it moves into position.**

9. Stand the patient in front of the patient positioner.
10. Determine the Center of Interest (COI) with the ruler included on the patient positioner.
11. Enter the COI value on the OTS control screen. Press the [+] and [-] buttons on the control screen to enter the COI.
12. Instruct the patient to close his or her eyes.
13. Turn on the collimator light.



**WARNING** **Laser radiation. Peak power 1 mw / wave length 540-700 nm / class II laser product.**  
**Do NOT stare into beam! When you switch on the linear laser light localizer, make sure no person looks directly into the laser to avoid eye injuries or impaired vision.**

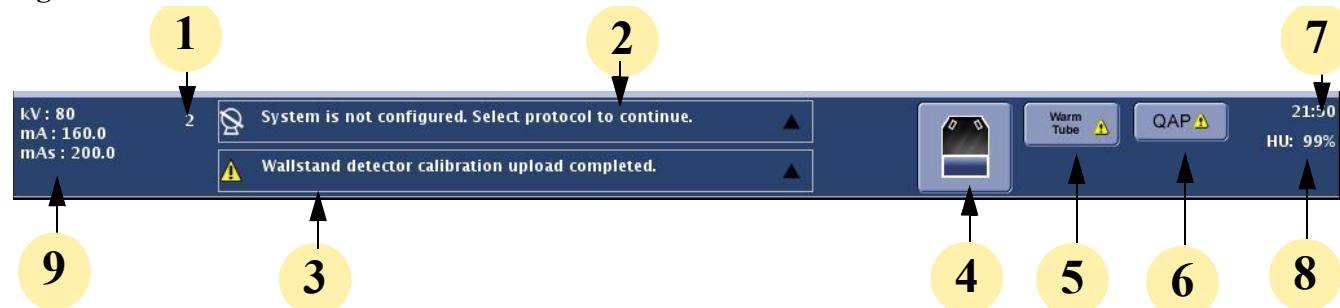
14. Aim laser light at top of desired image field.
  - You may do this by either rotating the tube or by keeping the tube at 90° and moving the column vertically.
15. Press [HEAD] on the OTS control screen.
16. Aim laser light at the bottom of the desired image field.
  - You may do this by either rotating the tube or by keeping the tube at 90° and moving the column vertically.
17. Press [FOOT] on the OTS control screen.
18. Adjust the lateral collimation, if necessary.
19. Press the [SET] button on the OTS control screen when finished.
  - The OTS will move into position.
20. Make exposure using the hand switch. Hold the exposure button down until all exposures have been made.
  - Press the OTS control screen or the Emergency Stop button on the RCIM to stop acquisition.



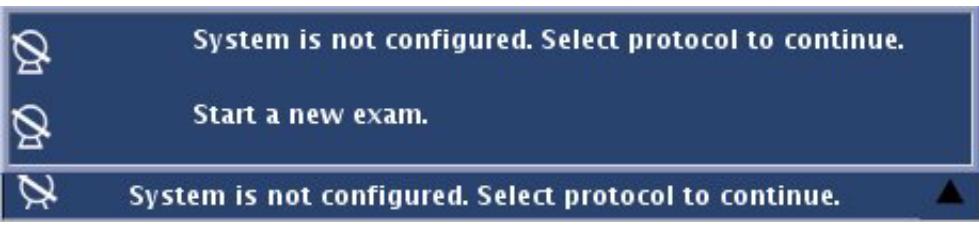
# Chapter 6: Status Bar

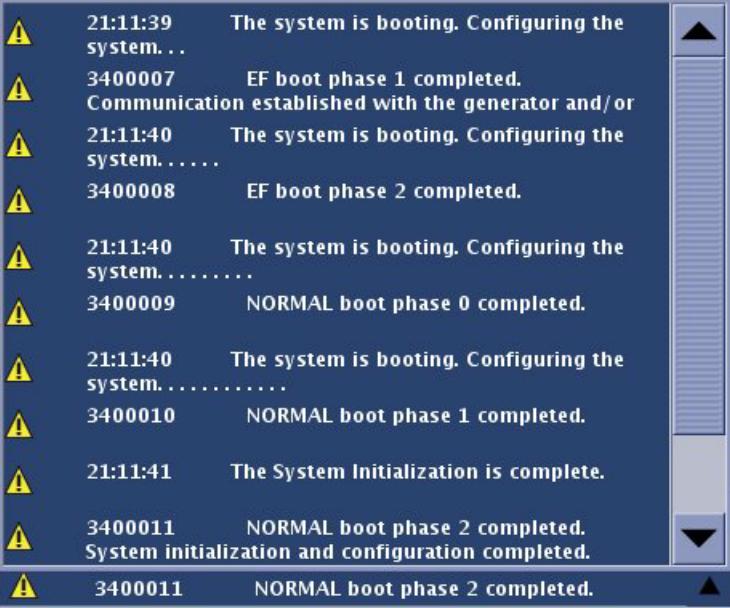
## Overview

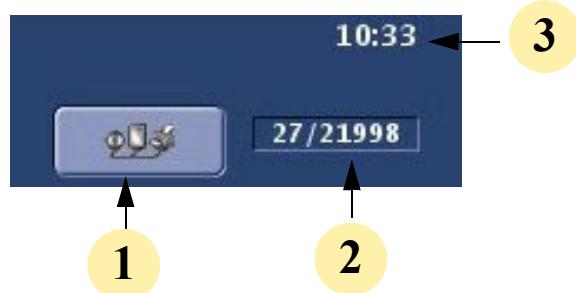
**Figure 6-1** Status Bar-Worklist Screen



**Table 6-1** Status Bar Icons

Item	Description
1	Inhibits Counter <ul style="list-style-type: none"> <li>• Displayed only when there are available Inhibits</li> <li>• Displays actual number of inhibits in the Inhibit Bar</li> </ul>
2	Inhibits Bar <ul style="list-style-type: none"> <li>• A system inhibit icon will display within the Inhibit Bar when an Inhibit message is present</li> <li>• The Inhibit Bar will display only when there are Inhibits available</li> <li>• When the user selects the Inhibit Bar, it expands and displays a list of all interlocks and error conditions preventing an exposure.</li> </ul> 

Item	Description
3	<p>System Message Bar</p> <ul style="list-style-type: none"> <li>When the user selects the System Message Bar, it expands and displays all previous system status messages since the last system restart.</li> </ul>  <pre> 21:11:39 The system is booting. Configuring the system... 3400007 EF boot phase 1 completed. Communication established with the generator and/or 21:11:40 The system is booting. Configuring the system..... 3400008 EF boot phase 2 completed. 21:11:40 The system is booting. Configuring the system..... 3400009 NORMAL boot phase 0 completed. 21:11:40 The system is booting. Configuring the system..... 3400010 NORMAL boot phase 1 completed. 21:11:41 The System Initialization is complete. 3400011 NORMAL boot phase 2 completed. System initialization and configuration completed. 3400011 NORMAL boot phase 2 completed. </pre>
4	Digital Detector icon
5	<p>Warm Tube</p> <p>Refer to <a href="#">Chapter 4: General Information-Tube Warm Up (p. 4-10)</a> for more information.</p>
6	<p>QAP Button</p> <p>Refer to <a href="#">Chapter 14: Quality Assurance and Maintenance (p. 14-1)</a> for more information.</p>
7	System Time
8	<p>Heat Units Remaining</p> <p>Shows the percentage of heat units remaining.</p>
9	<p>Secondary Technique Display:</p> <p>Displays the technique values that the generator has loaded.</p> <p><b>Note:</b> Could be the previous exposure techniques performed.</p>

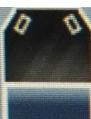
**Figure 6-2** Status Bar-Image Management Screen**Table 6-2** Status Bar Icons

Item	Description
1	Transfer Log
2	Images Remaining How many images have been taken / How many images are allowed
3	System Time

## Digital Detector Status

**Table 6-3** Digital Detector Status

Icon	Description
	Digital Detector - Indicating no less than 50% remaining power.
	Digital Detector – Tethered
	Digital Detector – Sleep Mode

Icon	Description
	Digital Detector- No detector registered to the system
	Digital Detector – Failed Communication
	Digital Detector – DOCKED
	Discharging Digital Detector Battery – 2 green bars - 100% - 50% capacity
	Discharging Digital Detector Battery – 1 green bar - 49% - 25% capacity
	Discharging Digital Detector Battery – 1 yellow bar - 24% - 1% capacity
	Discharging Digital Detector Battery – 1 red bar - 0% capacity

Icon	Description
	Charging Digital Detector Battery – 2 green bars - 100% capacity
	Charging Digital Detector Battery – Toggle between 1 green bar and 2 green bars - 51% - 100% capacity
	Charging Digital Detector Battery – Toggle between 1 yellow bar and 1 green bar - 26% - 50% capacity
	Charging Digital Detector Battery – Toggle between 1 red bar and 1 yellow bar - 0% - 25% capacity

**Table 6-4** Digital Detector Status for Non Wireless Configuration

Icon	Description
	Digital Detector – Tethered
	Digital Detector- No detector registered to the system
	Digital Detector – DOCKED

# Chapter 7: Digital Detector

This section outlines the basic detector functions, usage, care, and specifications.

## Detector Overview

Detector primary functions are:

- To convert x-ray data into digital image data.
- To transfer the digital data to an external workstation for processing and display.

The detector is an x-ray imaging device. It consists of an array of 2022 x 2022 pixels (40.4 x 40.4 cm). Each pixel is attached to a data acquisition circuit that converts incoming x-ray signal to 14-bit digital data.

The detector is constructed from a carbon fiber. The front face contains a graphite x-ray imaging window. The back of detector contains safety warnings. Detector enclosure is identified as applied part.

**Figure 7-1** Detector Overview



**Note:** The back of detector contain screws, do not take exposure with back face.

## Panel

The panel consists of a thin-film amorphous silicon integrated circuit on a glass substrate with a cesium iodide scintillator. The scintillating material absorbs the x-rays and converts the energy to light. The light is converted into a charge that is digitized by the detector electronics.

## Electronics

The primary function of the readout electronics is to convert the charge into digital image data. This data is then transmitted to the system through a wireless link or an ethernet connection.

## Physical Appearance / Finish

The detector unit is designed to be installable as 1) an external patient access/contact surface and 2) a non-external patient access/contact surface.

Detector surfaces have been treated with a finish to allow a smooth and easily cleanable surface. Care shall be taken to protect the surface from scratches.

## Nameplates and Markings

A label on the back of the detector contains the GE part number. Refer to [Chapter 7: Digital Detector-Back of the Digital Detector \(p. 7-4\)](#) for more information.

## Detector Handling

The device contains sensitive electronics that are susceptible to vibration, shock, drop, and impact.

When handling the device, use the handle and/or use both hands to manipulate the detector into the correct anatomical position for the exam.

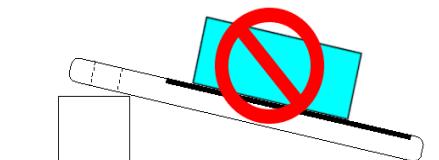


**WARNING** **Do not swing the device into hard surfaces, especially corners, as this may scratch the cover, create image quality artifacts, or damage the electronics inside.**

**Special Instructions if the detector is dropped:** Inspect the exterior for any possible cracks. Run Detector Check to test the detector. It will be clear if the electronics are not functioning. Other possible failures may include communication problems, image quality degradation, and loss of power. If any or all of these occur, call your GE Service Representative.

- Do not drop objects onto the detector.
- Do not use the detector as a stretcher to lift a patient.
- Do not drop the detector at any time.
- Do not prop the device on an edge, against wall or bed. Keep detector in cradle, bracket, or other GE-supplied container.
- Do not use unapproved chemical cleaners. Refer to [Chapter 7: Digital Detector-Cleaning \(p. 7-18\)](#) for more information.
- Do not immerse detector into water or other liquids.
- Do not use a defibrillator while patient remains in contact with detector.
- Do not place other objects or patients on the detector if it is not on a flat surface, as shown in [Figure 7-2](#).

**Figure 7-2**



Detector surfaces have been treated with a finish to provide a smooth and easily cleanable surface. Take care to protect the surface from scratches.



**WARNING** Extra precautions should be taken if the device will be exposed to excessive amounts of bodily fluids or liquids.

The detector is designed to prevent some liquids or particulate matter from getting inside the cover. It can sustain a temporary splash or spray, but it is not designed to be immersed in liquid (not even temporarily).

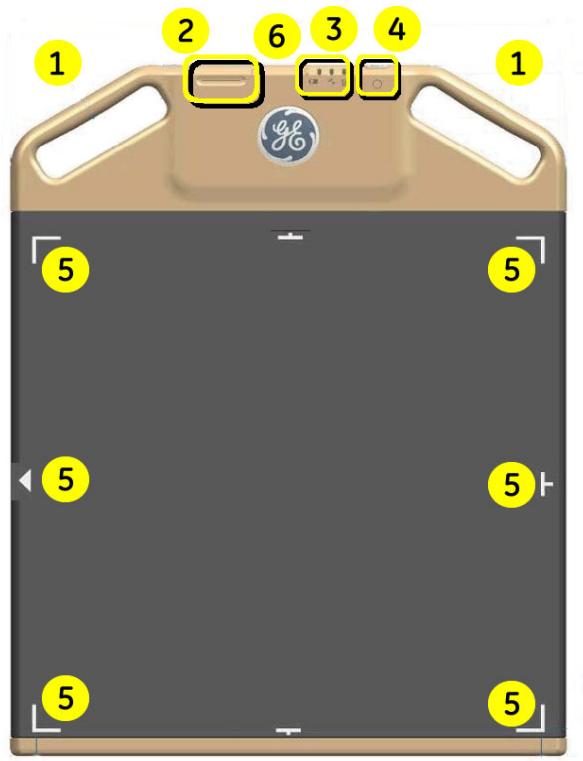
## Hardware Overview

### Appearance

#### Front of the Digital Detector

- Front of the digital detector

**Figure 7-3** Front of the Digital Detector



**Table 7-1** Front of the Digital Detector

Item	Description
1	Handles
2	Battery
3	Indicator Lights
4	Power Button

**Table 7-1** Front of the Digital Detector

Item	Description
5	Detector Area (inside the white marks)
6	Antenna (inside the detector)

- Labels on the front of the digital detector

**Figure 7-4** Labels on the Front of the Digital Detector**Table 7-2** Labels on the Front of the Digital Detector

Item	Description
1	Centerline
2	Do not defibrillate (IEC 5841 w/line)
3	RF transmitter (IEC 5140)
4	This side toward X-ray source (IEC 5338)

## Back of the Digital Detector

- Back of the digital detector

**Figure 7-5** Labels on the Back of the Digital Detector

- Labels on the back of the digital detector

**Table 7-3** Labels on the Back of the Digital Detector

Item	Description
1	FCC Approval and FCC ID Number (YYJ-5406102)
2	Refer to Instructions (ISO 7010-M002)
3	Type B Applied Part (IEC 5840)
4	Do not X-ray this side (IEC 5338 with cross)
5	Maximum applied weight: 110kg (242 lb) concentrated; 160kg (352 lb) distributed <b>Note:</b> When the entire back surface is supported, the detector will operate within 5 seconds after applying or removing a load of 110kg onto a 45mm diameter area at any location of the detector front cover. When the entire back surface is supported, the detector will operate within 5 seconds after applying or removing a load of 160kg applied uniformly distributed across the whole detector.

## Detector Top

**Figure 7-6** Detector Top**Table 7-4** Detector Top

Item	Description
1	Power Button: Push to toggle between On and Off mode.
2	Indicator Lights
3	Detector ID Insert - See <a href="#">Chapter 15: Preferences-Adding A New Detector Identified By Color and Shape (p. 15-14)</a>
4	Blank Detector ID Insert - See <a href="#">Chapter 15: Preferences-Adding A New Detector Identified By Name (p. 15-14)</a>
5	Battery
6	Battery Latch

## Detector Base

**Figure 7-7** Detector Docking Connector



**Table 7-5** Detector Docking Connector

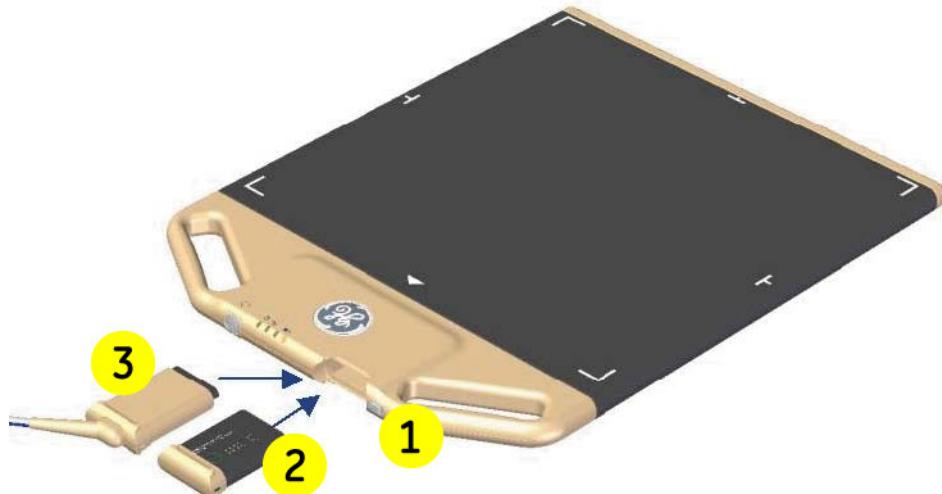
Item	Description
1	Detector Docking Connector

## Accessories

### Battery and Tether

The battery and the tether plug share the same connector. Only one of these can be plugged in at a time.

**Figure 7-8** Detector Battery and Tether



**Figure 7-9** Detector Battery and Tether

Item	Description
1	Latch
2	Battery
3	Tether



**WARNING** The operator should not touch the pins on the tether cable connector and patient simultaneously.



**WARNING** Do not touch the battery pins and patient simultaneously when replacing detector batteries.



**WARNING** The operator should not touch the pins on the detector charging connector and patient simultaneously.



**WARNING** The operator should not touch the pins on the TIB tether connector and patient simultaneously.



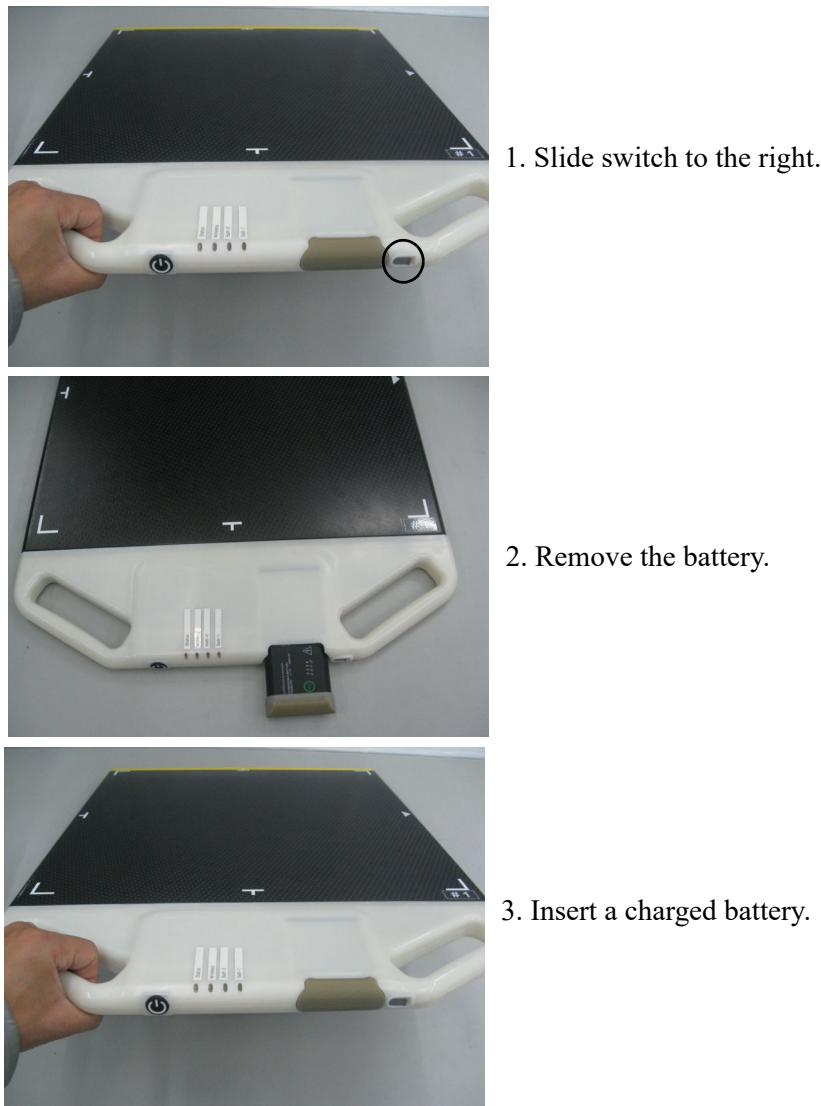
**WARNING** The operator should not touch the TIB fuse holder and patient simultaneously.



**WARNING** Detector tethered cable may cause a trip hazard.

## Replace the battery

**Figure 7-10** Replace the battery



## Battery Charging

Use the detector charging bin or battery charger when battery indicator is less than 10%.

**Figure 7-11** Battery Charger



**Figure 7-12** Detector Charging BIN

**NOTE:** Use detector charging BIN or battery charger as battery charges.

### Tether Interface Box (TIB)

The standard attachable tether is 7m in length. Optional tether lengths are available in 4m or 10m.

The tether is used with the digital detector when:

- The detector battery is low;
- The detector is unable to connect to wireless signal;
- Use with Non Wireless Configuration. For more information see ([Non-Wireless Configuration](#)).

**Figure 7-13** Attachable tether

## Connection

One end connects to TIB and one end connects to detector.

**Figure 7-14** Connect with TIB



**Figure 7-15** Connect with detector



## Detector Grid

The Digital Detector grid is integrated with a holder that fits the detector exactly. The grid fits over the detector handle and has raised edges to fit around the detector. Once together, you may handle the grid and detector as one unit.

The arrows on the grid surface show the direction of the grid lines, which run horizontally.

**Figure 7-16** Detector Grid**Table 7-6** Detector Grid

Item	Description
1	Grid (6:1 grid ratio horizontal is standard, 8:1 grid ratio horizontal is optional)
2	Detector

The detector automatically detects when the grid is properly in place. If the grid has been improperly placed on the back of the detector, the detector will not function. The detector reports to the system when the grid is attached to or detached from the detector.

## Grid Attachment

The bottom edge of the detector should be placed into the bottom lip of the grid holder while held in the vertical position with the carbon graphite cover (on the front of the detector) facing the inside of the grid holder. Then press the detector into the top edge of the grid holder. Be careful to not pinch your fingers or clothing when assembling.

While in use, keep a firm grasp on both the grid holder and the detector. The markings for the active area are clearly shown on the exterior surface of the grid holder.

## Grid Handling

The grid is a sensitive device containing delicate mechanical structures. It is made of very thin pieces of lead (Pb) and interspersed with Aluminum (Al).

- Do not drop the grid.
- Do not allow objects to hit/impact the grid.
- Do not immerse grid in water or other liquid.
- Do not peel labels or vinyl covering.
- Inspect the grid for physical damage before use.
- Clean the grid regularly (between each patient) with an approved chemical. Refer to [Chapter 7: Digital Detector-Cleaning \(p. 7-18\)](#) for more information.

## Detector Holder

When using the Detector Holder, do not place the upper bracket over the antenna of the detector. This can cause problems with the wireless link. Refer to [Figure 7-17](#).

**Figure 7-17** Detector Holder



**Table 7-7** Detector Holder

Item	Description
1 	<b>CAUTION</b> Covering the Detector Antenna may cause interference with wireless signal.

## Use

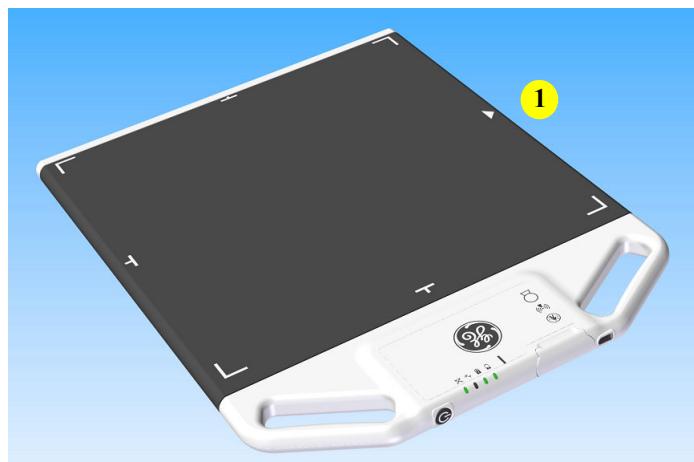
### Power On and Power Off

#### On/Off

The detector can be turned off by using the pressing the black power button for four seconds. The detector can be turned on by pressing the black power button for one second.

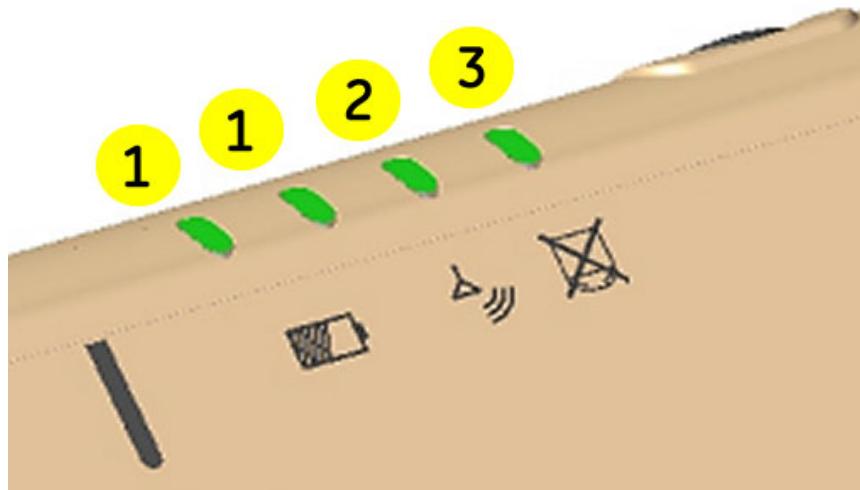
### Detector Alignment

To aid in proper alignment of the detector with respect to the X-ray source, there are alignment marks centered on the front side (imaging side) of the detector. The arrow represents the default head-up display orientation. See [Figure 7-18](#).

**Figure 7-18** Head Up Arrow**Table 7-8** Head Up Arrow

Item	Description
1	Head Up Arrow

## Indicator LED's

**Figure 7-19** Indicator LED's

**Table 7-9** Indicator LED's

Item	Description
1	<p>Battery LED's</p> <ul style="list-style-type: none"> <li>• Green, Green: Battery no less than 50% remaining power</li> <li>• Off, Green: Battery remaining power between 25% and 49%</li> <li>• Off, Yellow: Battery remaining power between 1% and 24%</li> <li>• Off, Red: Battery no remaining power</li> <li>• Off, Off: Detector in sleep mode</li> </ul>
2	<p>Wireless Link LED</p> <ul style="list-style-type: none"> <li>• Green: Wireless Link Connected</li> <li>• Red: No Wireless Link</li> <li>• Off: Detector in sleep mode</li> </ul> <p><b>Note:</b> The LED is always Red for Non Wireless Configuration. See (<a href="#">Non-Wireless Configuration</a>) for more information.</p>
3	<p>Detector LED</p> <ul style="list-style-type: none"> <li>• Green: Detector Ready</li> <li>• Off: Detector Off (in sleep mode)</li> <li>• Red: Detector Fault Condition</li> </ul>

The various states of the Indicator LED's are shown in the illustrations below.

**Figure 7-20** Battery no less than 50% remaining; Wireless link connected; Detector ready

**Figure 7-21** Battery remaining between 25% and 49% ; Wireless link connected; Detector ready



**Figure 7-22** Battery remaining between 1% and 24% ; Wireless link connected; Detector ready



**Figure 7-23** Battery no remaining power; Wireless link connected; Detector exposure not allowed



**Figure 7-24** Battery no less than 50% remaining; No Wireless link; Detector exposure not allowed



**Figure 7-25** Detector off (in sleep mode)



**Figure 7-26** Detector fault condition



In this condition the battery LED's may be lit to show the condition of the battery.

## Electro-magnetic Interference

The detector has been designed and tested to meet all IEC regulations in regard to electro-magnetic (EM) susceptibility (and EMC).

However, there are no regulations for low frequency EM fields. All flat panel detectors have some susceptibility to these EM fields.

This detector is robust to EM fields up to 0.1mG over a broad low frequency range (DC - 250kHz).

It has been found that some common equipment in clinical environments can generate EM fields well over 0.1mG. Some measurements have shown 4mG field strengths which can cause artifacts on x-ray images.

EM fields are reduced by the square of the distance between the EM source and the detector. Thus, moving the EM source twice as far away will reduce the field strength by 4 times.

General suggestions:

- Keep IV pumps, patient monitoring, feeding pumps 1 meter or more away from any detector surface.
- Consider turning off equipment that cannot be moved.
- Change the patient or detector orientation /position to maximize distance from any equipment.

Possible sources of EM fields:

- IV pumps
- Monitors
- Feeding pumps
- Patient monitors
- ECG equipment
- EMG equipment
- Infusion pumps
- RF ablators
- Powered surgical equipment
- Heaters
- Air conditioners
- Refrigerators

## Cleaning

All exterior surfaces—detector, tether, and grid—should be cleaned after each exam.

- The detector and grid must be allowed to dry before use.
- Do not leave disposable wipes or cleaning cloths on the detector or grid for more than 60 seconds.
- Let the detector dry at least 60 seconds between cleanings.

The following chemicals and products have been tested and approved by GE for cleaning the detector grid, and tether.

- Bleach - 50 % mix with water (5-8% household Bleach)
- Glutaraldehyde <5%, Polyethylene Glycol <20% (In the form of Cidex Plus 28)
- Isopropyl Alcohol 70% concentration
- Hydrogen Peroxide 15-40% concentration (In the form of Diversy Butchers)

# Specifications

## Detector Size and Weight

**Table 7-10** Detector size and weight specifications

Item	Specification
Overall detector size • Including handle • Not including tether	Thickness: 24mm Width: 452mm Height: 580mm
Image Size The active area of the x-ray panel	2022 x 2022 pixels or 40.4 x 40.4 cm (15.9 in X 15.9 in)
Weight Not including the tether or grid	Weighs 4.32 kg (9.52 lbs) without battery; 0.18 kg (0.40 lbs) battery

## Environmental Constraints

This section describes the environmental conditions that the detector is designed to withstand.

The Digital Detector operates within an optimal temperature range for better performance. Should the maximum detector temperature be reached, it will power down in an attempt to allow for it to cool.

It is recommended to power down the detector for 10 minutes to allow for cooling when the warning message is displayed. This message will display in the message log of the user interface when the surface temperature has reached 39 degrees Celsius. For optimal cooling time the detector should be removed from detector tray, powered off and inserted into charging bin or other safe area.

If the detector has not been allowed to cool, an expose inhibit will be placed. This will occur at 40 degrees Celsius.



**CAUTION** Operation or storage outside of these constraints may cause damage to the detector.

**Table 7-11** Environmental Constraints

Item	Operating Environment Constraints	Non Operating Environment Constraints
	This column contains additional operating environmental constraints, within which the subsystem function and performance capabilities shall be in compliance.	This column defines additional Non-operating environmental constraints, within which the subsystem function and performance capabilities shall be in compliance, when returned to the operational state, within operating environment conditions.
Ambient <ul style="list-style-type: none"> <li>• Temperature</li> <li>• Humidity</li> <li>• Pressure</li> </ul>	<ul style="list-style-type: none"> <li>• External ambient temperature range: +15 °C to +35 °C.</li> <li>• Rate of temperature change: 10 °C per hour</li> <li>• Ambient humidity range: 30% to 60%, non condensing.</li> <li>• Rate of humidity change: 30% per hour.</li> <li>• The operating altitude range of the system shall be -30 meters up to +3,000 meters relative to sea level.</li> </ul>	<ul style="list-style-type: none"> <li>• External ambient temperature range: -20°C to +60 °C (except for Detector), -5°C to +50°C (only for Detector)</li> <li>• Rate of temperature change: 20 °C per hour</li> <li>• Ambient humidity range: 10% to 85% relative humidity (non condensing), 100% relative humidity (including condensing).</li> <li>• Rate of humidity change: 30% per hour.</li> <li>• The non-operating altitude range of the packaged system shall be -30 meters up to +3,000 meters to support transport at high altitude and for any exceptions the shipping containers should be appropriately labeled.</li> </ul>
Mechanical Stress & Vibration Forces	The detector assembly shall not be exposed to operating vibration spectrum exceeding the following parameters: <ul style="list-style-type: none"> <li>• Type: Random</li> <li>• Frequency Range: 20 to 350 Hz</li> <li>• Magnitude: 0.006g<sup>2</sup> /Hz at 10-350 Hz</li> <li>• Duration: 8 hours/axis (x, y, z)</li> </ul>	The detector assembly shall not be exposed to non-operating vibration spectrum exceeding the following parameters: <ul style="list-style-type: none"> <li>• Type: Random</li> <li>• Frequency Range: 10 to 2000 Hz</li> <li>• Magnitude: 6 m/s<sup>2</sup> RMS or 0.02g<sup>2</sup> /Hz at 10-2000 Hz</li> <li>• Duration: 15 minutes/axis (x, y, z)</li> </ul>

<b>Item</b>	<b>Operating Environment Constraints</b>	<b>Non Operating Environment Constraints</b>
Shipping & Storage Environment	Not applicable.	<p>The non-operating shipping conditions shall be -20 to +60 with the detector and packing.</p> <p>The shipping container shall protect the detector from vibration of 2 Grms for 8 hours in the x, y, and z axes, random vibration from 10 to 2000 Hz such that the image quality is not degraded.</p> <p>Cargo hold during shipment shall be within the atmospheric pressure range of 700-1100hPa</p>

# Chapter 8: System Hardware Overview

## Configurations

The Discovery XR656 system is available in 5 configurations:

- Wall stand only system (with standard or extended arm)— One GE FlashPad\* wireless detector
- Table only system— One GE FlashPad wireless detector
- Table and wall stand (standard or extended arm)— One Shared GE FlashPad wireless detector
- Table and wall stand (standard or extended arm)— Two GE FlashPad wireless detectors
- Overhead Tube Suspension (OTS) only - Include generator, workstation and shared single or multiple GE FlashPad detectors.

\*FlashPad is the trademark of General Electric Company.

**Note:** Tabletop, detector, PA bar, Lateral bar, Image Pasting barrier, Table Hand Grips, Compression band and Wall Stand receptor front panel are applied parts. These parts may be handled by patients.

# Component Identification

The Discovery XR656 system is made up of several major components and sub-components. [Figure 8-1](#) shows the main components. Refer to the individual sections within this chapter for more detailed information about each component and its related sub-components.

**Note:** Several components are available options. Your system may not have all of the components shown here.

**Figure 8-1** Major system components



# Available Accessories

**Figure 8-2** Available Options



1. [Table Hand Grips and Compression Band \(Option\)\(p. 8-51\)](#)
2. [Auto Image Paste Patient Positioner \(Option\)\(p. 8-58\)](#)
3. [Radiographic Mobile Tables \(Option\)\(p. 8-60\)](#)
4. [Wallstand with Extended Arm \(Option\)\(p. 8-61\)](#)
5. [Weight-Bearing Stand \(Option\)\(p. 8-62\)](#)

# Acquisition Workstation

The Acquisition Workstation ([Figure 8-3](#)) has its own dedicated computer and image data base. The Workstation applications are based on a graphical, multi-screen, mouse-driven interface. Images, lists, menus, and control panels are displayed within graphical screens on the workstation's monitor. You make your selections using buttons, menus, and control panels.

The workstation has several components:

- A computer unit with internal hard disk unit for system software and image storage, and a DVD-R/CD-RW combination drive
- Monitor



**WARNING** Monitors are of non-diagnostic quality. Any diagnostic/medical interpretation must be completed on a diagnostic quality review monitor.

- An alphanumeric keyboard, mouse, and pad
- Radiology Control Interface Module (RCIM)
- Console hand-switch

The Acquisition workstation supports many functions:

- Image acquisition using the digital receptor or free cassette
- Image display and manipulation
- Image transfer to other workstations using the DICOM standard
- Image transfer to a recordable CD or DVD

**Figure 8-3** Acquisition Workstation



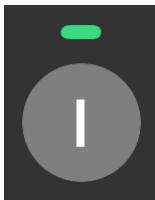
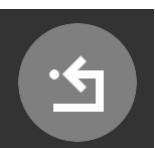
**Note:** Images displayed on the operator console image viewer are not intended for diagnostic use.

## Radiology Control Interface Module (RCIM)

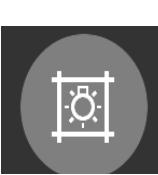
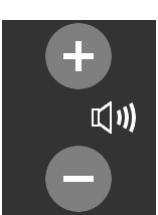
The Radiology Console Interface Module (RCIM) ([Figure 8-4](#)) controls the power and reset functions for the system. The RCIM has the power on button, reset button, an emergency stop button, and indicator lights. These functions are described in [Table 8-1](#).

The RCIM is placed at the workstation between the monitors and the keyboard.

**Figure 8-4** RCIM**Table 8-1** RCIM controls

Control	Description
1. Emergency Stop button	 <p>Immediately powers down the system (including table, OTS, wallstand, and x-ray tube) and stops image exposure.</p> <p>To engage: Press the button.</p> <p>To release: Turn the button clockwise (indicated by the arrows on the button) until it stops, then release.</p> <p>Refer to <a href="#">Chapter 4: General Information-Emergency Stop (p. 4-8)</a> for more information.</p>
2. Power On button	 <p>Turns the power ON for the entire system.</p> <p>Refer to <a href="#">Chapter 4: General Information-System Start Up and Shutdown (p. 4-2)</a> for more information.</p>
3. Reset button	 <p>Shuts down and re-starts the system in the event of software failure.</p> <p>Refer to <a href="#">Chapter 4: General Information-System Start Up and Shutdown (p. 4-2)</a> for more information.</p>
4. Expose Hold indicator	 <p>Lights up when there is some inhibit to taking exposures. Click the Expose Hold button on the Worklist or Acquisition screens or the OTS control screen for a list of all current inhibits.</p>
5. Tube Overheat indicator	 <p>Lights up when the tube is too hot to continue taking exposures. Allow the tube to cool until the LED turns off.</p>

**Table 8-1** RCIM controls

Control	Description
6. X-ray Exposure indicator	 <p>Lights up when x-rays are being emitted, including tube warm up and QAP.</p> <p>The system beeps as X-rays are produced when the Prep/Expose button on the Hand-switch is pressed. The tone ends when the exposure is terminated or completed.</p>
7. Auto Positioning button	 <p>Initiates automated system positioning, if enabled for your system. Refer to <a href="#">Chapter 13: Advanced Applications-Auto Positioning (p. 13-4)</a> for more information.</p>
8. Collimator field light button	 <p>Turns the collimator field light on or off.</p>
9. Volume control buttons	 <p>Adjusts the volume of the system beeps.</p>

## Hand Switch

Exposures are made with the console Hand-switch. The Prep/Expose button on this switch has three positions: OFF, PREPARE, and EXPOSE (Figure 8-5 and Table 8-2).

**Figure 8-5** Console hand-switch and holder

- Active components for this product:
1. PREPARE (target rotating)
  2. EXPOSE
  3. COLLIMATOR LIGHT (Not active on this product)

**Table 8-2** Hand-switch positions

Position	Description
OFF 	The OFF position is when no pressure is applied to the Prep/Expose button on top of the Hand-switch.
PREPARE 	PREPARE is the next position on the Hand-switch. When it is partially pressed, it brings the rotor up to speed and heats the filament. PREPARE also checks the system interlocks and verifies the system is ready to make an exposure. If you release the button, it returns to OFF.
EXPOSE 	<p>The EXPOSE position is when the button on the Hand-switch is fully depressed. This produces X-rays that are recorded. Release the Prep/Expose button after the exposure is completed.</p> <p>The system beeps as X-rays are produced. The tone ends when the exposure is terminated or completed. The X-ray exposure indicator on the RCIM also lights up when X-rays are produced.</p>

Use this procedure to operate the console Hand-switch to prepare and record exposures.

1. Make sure your patient and the console are set up for the procedure.
2. Press the Prep/Expose button to the PREPARE position.
  - When the PREPARE function is completed, the READY message appears on screen.
3. Press the Prep/Expose button to the EXPOSE position.
  - The exposure is taken.

**Note:** A procedure must be selected prior to attempting an exposure or an error will occur.

4. Release the Prep/Expose button after the exposure is completed.

## High Throughput Mode

The system will enter High Throughput Mode if Prep or Expose is activated 8 or more times within 5 minutes. When in this mode, the rotor will remain engaged for 90 seconds after the Prep or Exposure is finished. The High Throughput Mode will remain active until the Prep and Expose rate has decreased to less than 5 within 5 minutes. This mode allows rapid exposures for extended periods by reducing the amount of tube heating due to Rotor On/Off cycling. All other exposure and acquisition functions remain the same.

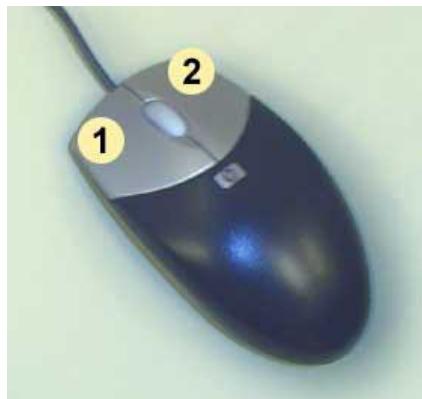
## Mouse Controls

The mouse (Figure 8-6) is a hand-operated device that you maneuver across the surface of a pad. As you do, the on-screen cursor mimics the movement of the mouse, allowing you to move among screens and between monitors. For instance, moving the mouse to the right causes the on-screen cursor to move to the right. The selections are made by clicking the left button.

The mouse pointer (or cursor) will automatically move between monitors as the far right and left edges are reached.

When typing information into a screen, the mouse pointer must be on the same monitor as the screen, or the text will not be entered. If the mouse pointer moves to the other monitor, click the mouse in the screen where you are typing.

**Figure 8-6** The mouse



1. Left Button
2. Right Button

**Table 8-3** Mouse actions

Mouse Action	Description
Click	Press and release the left mouse button to select an item, activate a button or icon, or set an insertion point at the cursor's location. The action performed depends on the item that is being clicked.
Click and drag	Press and hold the left mouse button down while moving the cursor to the desired location. This is used to select multiple items, move items, or use annotation tools.

## Bar Code Scanner (Option)

The bar code scanner is a fast, easy way to enter data into the system. The bar code scanner allows you to aim at a printed bar code on paper and scan the information into the system. The printed bar code information comes from a RIS or HIS system through a network.

The scanner reads the bar code information and enters it into the selected text box. An audible beep sounds as the system detects and automatically enters the information. Some bar code scanners move the mouse cursor to the next text box for you. Others require you to manually move the cursor to the next text box.

**Figure 8-7** Bar code scanner

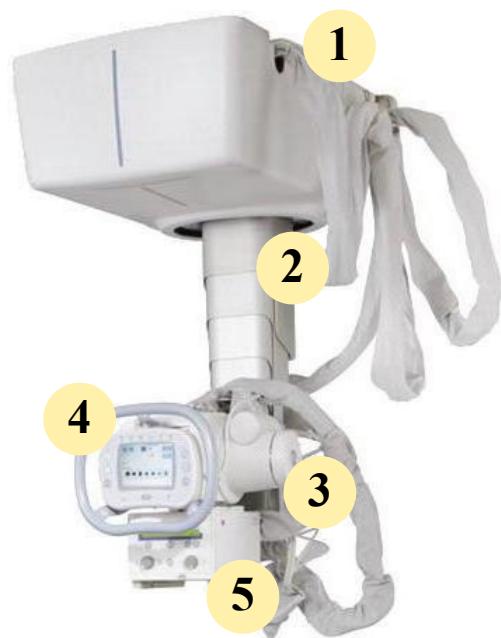


**CAUTION** **Laser Light. Do not stare into beam, IEC class 2 laser product 630 - 680 nM, 1.0 mW Laser.**

# Overhead Tube Suspension (OTS)

The Overhead Tube Suspension (OTS) is the positioning device that supports the X-ray tube and OTS User Interface. The OTS has available movement on 5 axes for use in advanced applications. The suspension provides convenient movement and accurate positioning of the equipment.

**Figure 8-8** Overhead Tube Suspension (OTS)



The X-ray OTS consists of the following major elements:

1. Overhead stationary rail and lateral bridge
2. Telescopic column and carriage
3. X-Ray tube and housing
4. OTS User Interface
5. Multi-leaf collimator  
(Refer to [Multi-Leaf Collimator\(p. 8-23\)](#).)

## OTS User Interface

The OTS User Interface (Figure 8-9 and Table 8-4) allows you to make receptor, FOV, kV and mAs selections without returning to the Acquisition Workstation. This interface also provides the functions to move the OTS in multiple directions.

**Note:** FOV (field of view) can only be changed on the OTS User Interface.

**Note:** Changing exposure parameters or receptors on the OTS User Interface or the Acquisition Workstation will result in a change to both.

**Figure 8-9** OTS User Interface

18 - Located on  
the back of the  
OTS

**Table 8-4** OTS User Interface functions

Control	Description
1. Ready LED indicator	Indicates the exposure interlocks are satisfied (green light). The indicator flashes when the key switch (#18) is in the OVERRIDE position.
2. Auto Image Paste Prep LED indicator	Indicates that the system is preparing for an Auto Image Paste acquisition. (Not active in this product.) Refer to <a href="#">Chapter 12: Image Management</a> for more information.
3. Inhibit LED / Exposure Hold indicator	Indicates the exposure interlock is active (red light), which inhibits exposure. When the Exposure Hold is active, press the [EXPOSE HOLD] button on the OTS Control Screen to see a list of the current inhibits. Refer to <a href="#">OTS Control Screen(p. 8-15)</a> for more information.
4. Manual Collimator LED indicator	Indicates when the system has switched to manual collimation mode (green + yellow steady light). In this mode, the collimator field of view (FOV) is not limited to the receptor area. If the key switch is in OVERRIDE position, the manual collimation LED flashes (green + yellow blinking light).

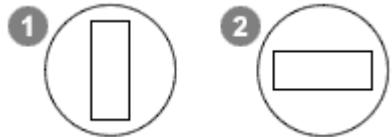
**Table 8-4** OTS User Interface functions

Control	Description
5. Lateral Detent LED indicator	 <p>Indicates that the OTS is at lateral detent.</p>
6. SID Detent LED indicator	 <p>Indicates that the tube is at the SID specified by the protocol.</p>
7. Longitudinal Lock Release control	 <p>Releases the lock to allow longitudinal motion of the OTS. The lock is active when you release the button. The LED is lit when button is pressed. The Longitudinal lock is an electromagnetic type lock and remains activated when the power is off.</p> <p><b>Note:</b> In emergencies, the tube unit can be moved against the force of the OTS locks.</p>
8. Lateral Lock Release control	 <p>Releases the lock to allow lateral motion of the OTS. The lock is active when you release the button. The LED is lit when button is pressed. The Lateral lock is an electromagnetic type lock and remains activated when the power is off.</p> <p><b>Note:</b> In emergencies, the tube unit can be moved against the force of the OTS locks.</p>
9. Detent control	 <p>Activates the configured lock detent positions for all axes. The Locks activate when you position the tube in these positions. A longitudinal detent position is present when the digital wallstand is in the horizontal position.</p>
10. Tube Angulation Lock Release control	 <p>Releases the lock to allow tube angulation. The lock is active when you release the button. The LED is lit when the button is pressed. The Angulation lock is an electromagnetic, spring applied type. It remains on when the system power is off.</p> <p>Refer to <a href="#">Tube Angulation(p. 8-20)</a> for more information.</p>
11. Vertical Lock Release control	 <p>Releases the lock to allow vertical motion of the OTS. The lock is active when you release the button. The LED is lit when button is pressed. The Vertical lock is an electromagnetic, spring applied, type. It remains on when the system power is off.</p> <p><b>Note:</b> In emergencies, the tube unit can be moved against the force of the OTS locks.</p>

**Table 8-4** OTS User Interface functions

Control	Description
12. Column pivot release control	 <p>Releases the column lock to allow for pivot of tube arm. Refer to <a href="#">Column Rotation(p. 8-19)</a> for more information.</p>
13. All-lock Lock Release control	 <p>Releases the lock to allow vertical, lateral and longitudinal motion of the OTS. The lock is active when you release the button. The All Transitional Locks Released LED (#16) is lit when button is pressed. Detents remain activated if the detent button is selected. <b>Note:</b> In emergencies, the tube unit can be moved against the force of the OTS locks.</p>
14. Detent Mode Active LED indicator	 <p>Indicates that the OTS is in detent mode.</p>
15. Collimator Field Light control	 <p>Toggles the collimator field light ON or OFF. The light ON time is controlled by the system configuration.</p>
16. All Transitional Locks Released LED indicator	 <p>Indicates that all locks are released (green light).</p>
17. OTS control screen	 <p>Displays and controls exposure settings. Refer to <a href="#">OTS Control Screen(p. 8-15)</a> for more information.</p>

**Table 8-4** OTS User Interface functions

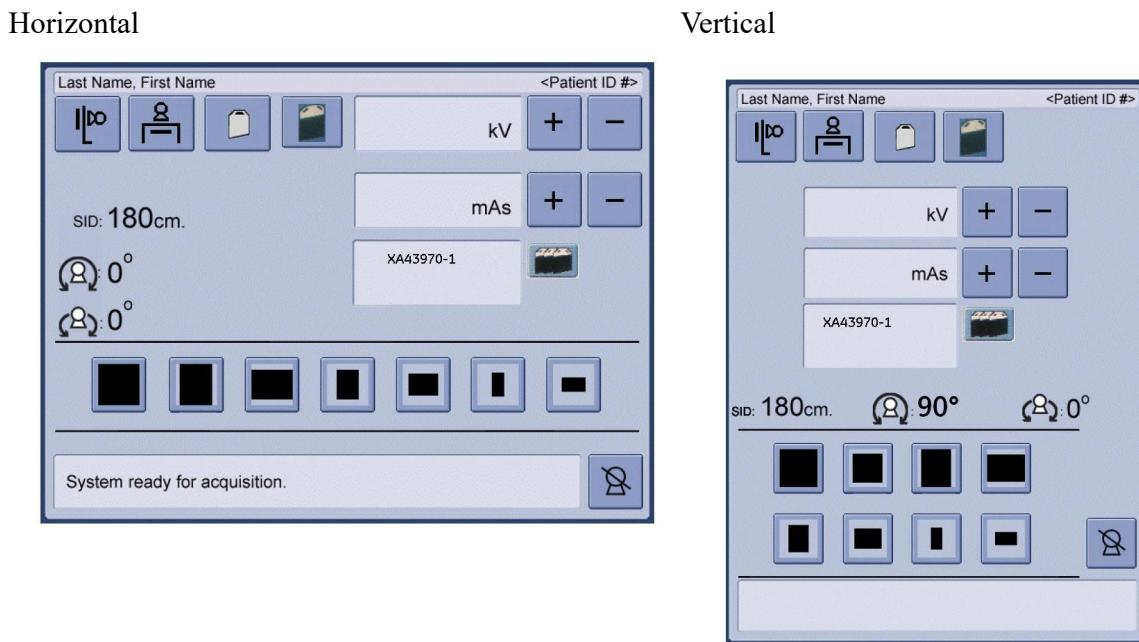
Control	Description
18. Key Switch control  	<p>Located on the back of the OTS User Interface, this key switch is intended for use when an x-ray field limitation system failure has occurred. The OVERRIDE position disables the exposure hold interlocks and allows exposure. In the digital table and digital wallstand applications, the full receptor area and SID = 100cm is used when in OVERRIDE position.</p> <p>Engaging OVERRIDE mode shuts down certain system functions, including auto-shutters and tissue equalization. This may effect image quality.</p> <p>If OVERRIDE is engaged, return the switch to the NORMAL position at the end of the exam.</p> <p>1) Normal Position 2) OVERRIDE Position</p>  <p><b>IMPORTANT!</b> The tube will not track to the receptor when OVERRIDE mode is engaged.</p> <p><b>Note:</b> In override mode, AEC mode will not be enabled. Exposures must be fixed with manual.</p> <p><b>WARNING</b>  If the key switch OVERRIDE is selected, you must ensure the collimator field of view matches the receptor and the tube is aligned to the selected receptor. Use the collimator field light to match the X-ray field to the receptor.</p>

## OTS Control Screen

The OTS control screen displays the SID, tube angle, and collimator rotation. The control screen allows you to change the kV, mAs, receptor, and FOV. The control screen is able to change orientation from horizontal to vertical as the OTS is rotated (Figure 8-10).

Auto Image Paste and VolumeRAD protocols have alternative OTS control screens. Refer to [Chapter 12: Image Management](#) and [Chapter 13: Advanced Applications](#) for more information.

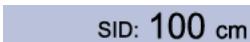
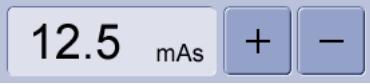
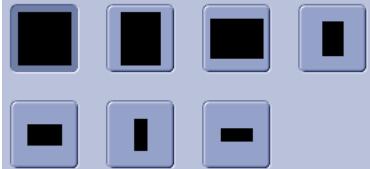
**Figure 8-10** OTS control screen in horizontal and vertical orientation.



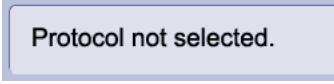
**Table 8-5** OTS control screen functions

Item	Description
Patient Name  NEW20080612115246	If enabled on your system, shows the patient name for the current exam. If this feature is not enabled, the field will be blank.
Receptors  Receptor:  [Detector Icons]	Selects the receptor. The availability of the receptor depends on if it is enabled through the protocol setup on the Acquisition Workstation. If the receptor is not defined in the selected preset procedure, the receptor is not selectable from the OTS.
[Wireless Detector Icon]	Multiple Wireless Detector Icon. Refer to <a href="#">Figure 8-11</a> for more information.

**Table 8-5** OTS control screen functions

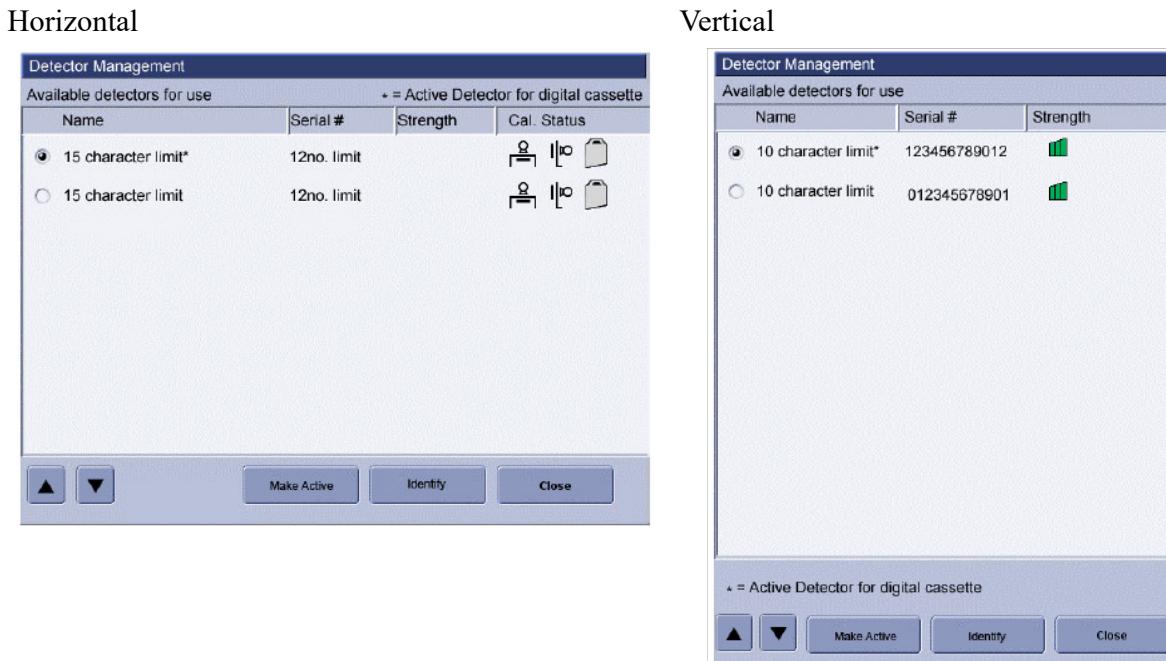
Item	Description
SID 	Displays the SID value in digital table and wallstand applications. The SID display is blank if you have selected table-top mode or if tube angulation exceeds +/- 45 degrees of receptor.
Tube Angle 	Displays the tube angulation in degrees.
Column Rotation 	Displays the column rotation in degrees.
kV 	Increases or decreases the exposure kV. Press and release the button to adjust the value by 1 kV. Hold the button down to adjust the value by 5 kV.
mAs 	Increases or decreases exposure mAs. The range is based on the focal spot selected at the Acquisition Workstation. If AEC mode is selected at the Acquisition Workstation: <ul style="list-style-type: none"><li>• This control is disabled</li><li>• The display value is blank until the exposure is completed</li></ul>
Image Size (FOV) 	Selects the Field of View (FOV) for the exposure. Sizes are (in order from largest to smallest): <ul style="list-style-type: none"><li>• 41x41cm</li><li>• 35x41cm</li><li>• 41x35cm</li><li>• 24x30cm</li><li>• 30x24cm</li><li>• 18x24cm</li><li>• 24x18cm</li></ul> <p><b>Note:</b> In addition, the actual size of the FOV and its corresponding SID are shown on the collimator display, OTS interface, wall stand display and user acquisition console. Care should be taken to ensure the FOV for the specified exam is correct prior to the exposure.</p>

**Table 8-5** OTS control screen functions

Item	Description
[EXPOSURE HOLD] 	Appears when there is some condition that prevents an x-ray from being taken, such as the exam room door being open or the tube is not in alignment with the receptor. Press the button to view a list of all errors and interlocks that are preventing the exposure. The items are removed from the list as they are corrected. The button disappears when all errors and interlocks are corrected.
System Status Messages  	Displays the last system status message.

## Multiple Wireless Detector Pop-up Window

Wireless Detector Window allows the user to select a primary wireless detector on the overhead tube system. Once the intended detector is selected, click the Make Active button. This will designate the selected detector as primary.

**Figure 8-11** Multiple Wireless Detector Pop-up Window

## Overhead Stationary Rail and Lateral Bridge

The overhead rail system consists of the stationary rails (ceiling mounted) and a bridge that travels longitudinally along the rails. Guide bearings maintain alignment of the bridge with the rails and the X-ray table. The Longitudinal Lock Release button on the User Interface controls the motion of the bridge along the rails.

The Discovery XR656 also has an optional extended bridge available. Refer to [Lateral Bridge Lengths\(p. 8-63\)](#) for more information.

## Telescopic Column and Carriage

The telescopic column ([Figure 8-8](#)) permits vertical travel of the X-ray tube unit. The Vertical Lock Release button on the User Interface controls the vertical motion. The vertical load is balanced by a spring counterpoise system within the carriage. The counterpoise system is equipped with a safety-locking feature to prevent the tube unit from falling in the event of spring or main cable failure. Adding an accessory, such as a collimator extension cylinder, may cause the suspension to be slightly out of balance. The carriage rides laterally within the bridge. The Lateral Lock Release button on the user interface controls the lateral motion.



**CAUTION** Collimator accessory weight may not exceed 2.2 kg (5 pounds). Use special care when using such an accessory since the tube unit tends to descend when the Vertical lock is released.



**CAUTION** The OTS shall not be auto positioned with accessories attached to the collimator rails.



**CAUTION** Injury may occur should the OTS lose power while an accessory is attached to the collimator.

## Longitudinal and Lateral Detents

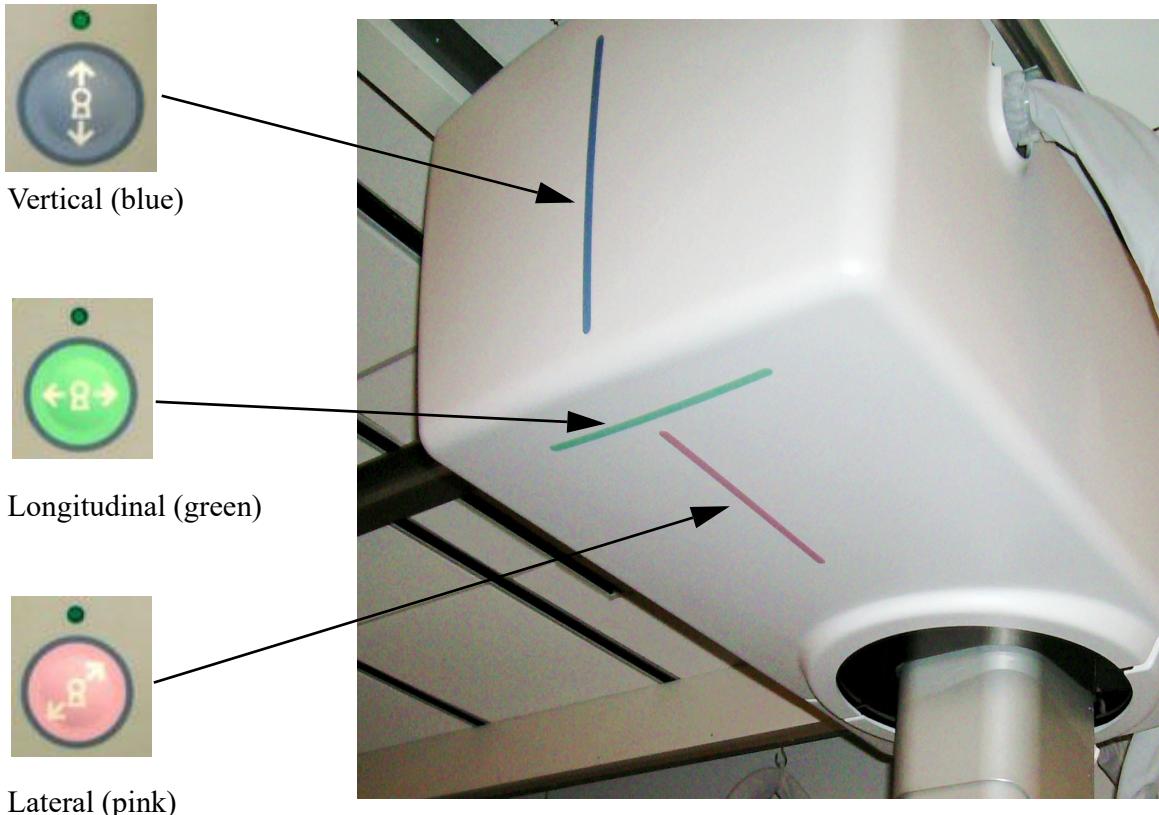
The suspension is equipped with Longitudinal and Lateral detents to automatically apply the locks and signal the collimator when the tube is positioned at specific SIDs (Source Image Distance), for digital table or wallstand procedures. The locks are actuated through calibrated SID detents. For the table, the lateral detent is set at the table's lateral center line. For the wallstand, the lateral detent is set at the wallstand lateral center line, and the longitudinal detent is set at SID 180cm (72 inches) and 100cm (40 inches). Selections are made at the time of installation and usually with the focal spot over the longitudinal table and the wallstand center line.

## Axes Indicators

The Discovery XR656 shows axes indicators on the carriage (Figure 8-12). These axes markers are color coded to match the release controls on the OTS user interface. The colors for the 3 axes are as follows:

- Green - Longitudinal axes
- Pink - Lateral axes
- Blue - Vertical axes

**Figure 8-12** Axes indicators and corresponding OTS release controls



## Vertical Detent

There is a calibrated vertical detent for the OTS column that sets the locks when the X-Ray tube is at 100cm (40 inches) above the receptor or film. This detent position is selectable at system installation.

## Column Rotation

The telescopic column can be rotated +/- 135 degrees for better positioning. The degree of column rotation is indicated on the OTS user interface. Column rotation detent is set at 0 degrees.

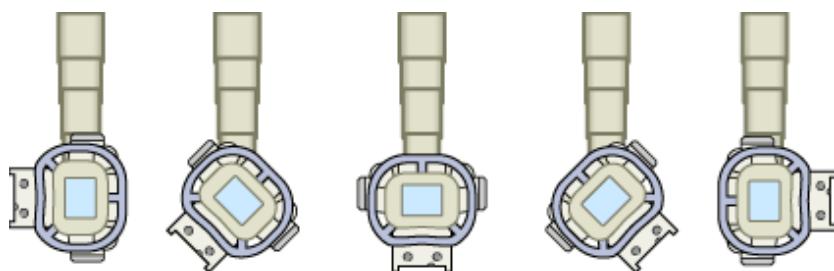
**Figure 8-13** Column rotation



## Tube Angulation

The X-Ray tube and collimator can be angulated about the short axis (cranial or caudal direction). The degree of tube angulation is indicated on the OTS user interface. Tube angulation detents are located at 0 and +/-90 degrees.

**Figure 8-14** X-ray tube angulation



## Tube and Column Positioning Instructions

### Adjust the Overhead Tube Suspension (OTS) Position

The OTS components can be moved in several directions to properly position the unit during a patient examination. The User Interface is used to control the motions. Use this procedure to learn how to position the OTS.

**Note:** The steps of this procedure can be performed in any order and not all of the steps are required. You do not have to follow this exact sequence. This procedure is intended to help you learn the various methods of positioning the OTS.

1. Use the Longitudinal Lock Release button to move the OTS along the bridge of the overhead rail system.
  - a) Press and hold the Longitudinal Lock Release button on the User Interface.
  - b) Move the OTS to the desired position.
  - c) Release the Longitudinal Lock Release button.
2. Use the Vertical Lock Release button to move the telescopic column up and down.
  - a) Press and hold the Vertical Lock Release button on the User Interface.
  - b) Move the telescopic to the desired vertical position.
  - c) Release the Vertical Lock Release button.
3. Use the Lateral Lock Release button to move the OTS carriage from side to side on the bridge.
  - a) Press and hold the Lateral Lock Release button on the User Interface.
  - b) Move the OTS carriage to the desired position.
  - c) Release the Lateral Lock Release button.
4. Use the All-Lock, Lock Release button to simultaneously move the OTS in vertical, lateral and longitudinal directions.
  - a) Press and hold the All-Lock, Lock Release button on the User Interface.
  - b) Move the OTS to the desired position.
  - c) Release the All-Lock, Lock Release button.

**Note:** Detents remain activated if the detent button is selected.

## Adjust the Tube Position

For certain exams, you may need to angle and/or rotate the tube in order to include all of the required anatomy in the FOV. Use this procedure to adjust the position of the tube.

**Note:** The steps of this procedure can be performed in any order and not all of the steps are required. You do not have to follow this exact sequence. This procedure is intended to help you learn the various methods of positioning the tube.

1. Use the Tube Angulation Lock Release button to rotate the tube about the short axis (cranial to caudal).
  - a) Press and hold the Tube Angulation Lock Release button on the OTS user interface.
  - b) Move the tube unit to the desired angle.
  - c) Release the Tube Angulation Lock Release button.
2. Use the Rotation Detent Release lever to rotate the tube about the vertical axis of the telescopic column.
  - a) Press the Rotation Detent button on UI (lower right).
  - b) Rotate the tube unit.
  - c) Release the button to hold position.



**WARNING** **Potential Pinch Point:** The area where the tube connects to the column may create a pinch point when the tube is rotated. Operators should keep their hands on the OTS handle and keep patient's clear while rotating the tube.

# Multi-Leaf Collimator

The multi-leaf collimator allows you to adjust the radiation field size to the anatomy (Figure 8-15 and Table 8-6). This collimator can be used in either the manual or automatic mode. This section describes the controls and basic features of the collimator.



**WARNING Hot Surface!** The housing can be heated if the light localizer is switched on for longer periods of time. Please do not touch the lamp housing until it has been cooled down in order to prevent burning.

**Figure 8-15** Collimator controls



**Table 8-6** Collimator controls

Item	Description
1. Spectral Filter Selection	Displays the spectral filter selections. The options are 0, 0.1, 0.2 and 0.3 mm of Cu. Press the button to change the filtration.
2. Message	Displays messages when Exposure Hold is active and providing information concerning the positioner interlocks that are disabling the exposure. If there is no Exposure Hold, displays the size of the collimation field (FOV). <b>Note:</b> Messages shown on collimator display are in English. Translated messages appear on the OTS control screen (refer to <a href="#">OTS Control Screen(p. 8-15)</a> and the acquisition workstation).

**Table 8-6** Collimator controls

Item	Description
3. SID display	Displays the current Source Image Distance. Press the [+] and [-] buttons to switch the SID between 100 and 180 cm (40 and 72 in).
4. Lateral collimator field size	Adjusts the lateral field size. Turning the dial to the left closes the collimator, turning to the right opens the collimator.
5. Collimator light switch	Turns the collimator light on and off. Cutout can also be performed automatically via an internal time switch. The operating time can be configured in steps of up to 90 seconds.
6. Vertical collimator field size	Adjusts the vertical field size. Turning the dial to the left closes the collimator, turning to the right opens the collimator.
7. Measuring tape	Contains a measuring tape to determine SID.

## Collimator Display

The multi-leaf collimator has a display that provides information about the collimator. [Figure 8-16](#) and [Table 8-7](#) explain the information displayed on the collimator.

**Figure 8-16** Multi-leaf collimator display**Table 8-7** Multi-leaf collimator display

Item	Description
1	X-ray Field of View (FOV) <ul style="list-style-type: none"> <li>• PBL = automatic format collimation system</li> <li>• Manual = manual mode of collimation</li> </ul>
2	Spectral Filter Selection display
3	Width and Height display of collimated X-ray field
4	Film-Focus Distance (SID) display

**Note:** The display of the SID and collimator FOV can be configured for either English or metric units.

**Note:** To check automatic collimation functionality, switch to automatic mode, then select an FOV different from current size. Check that the FOV is automatically adjusted to the newly selected FOV. To undersize the current FOV, manually turn the collimator knobs. If FOV does not match collimator display in either auto or manual mode, contact a GE service representative.

## Collimator Field and Linear Laser Lights

The collimator light switch toggles both the centering cross and the linear laser lights on and off (Figure 8-17). The centering cross is used to display the longitudinal and transverse axis of the exposure field on the receptor or directly on the patient. This identifies the field that will be exposed. The linear laser light provides an axis mark, which is lined up with the centering mark on the handle of the digital receptor. This allows you to verify that your collimator is centered with the receptor. The laser light slider is used to open and close the aperture for the laser light, allowing you to show or hide the laser beam.

**Figure 8-17** Collimator lights



1. Linear laser light aperture and slider
2. Centering cross light



**WARNING** **Laser radiation. Do NOT stare into beam!** When you switch on the linear laser light localizer, make sure no person looks directly into the laser to avoid eye injuries or impaired vision. (Peak power 1 mw / wave length 540-700 nm / class II laser product.)

## Automatic or Manual Collimator Modes

The automatic collimator mode allows you to select preset collimation field sizes. When in the manual mode, you have to rotate the knobs and set the field size. In the Tabletop application, the manual mode is always active.

In the Digital Table application, manual mode is active when:

- Tube Angulation is  $> \pm 10$  degrees
- SID is  $< 90\text{cm}$  or  $> 130\text{cm}$
- Tube is not positioned over the table
- In the Digital Wallstand application, manual mode is active when:
  - Tube angulation is  $> 100$  degrees or  $< 80$  degrees with the wallstand in the vertical position
  - Tube angulation is  $> \pm 10$  degrees with the wallstand in the horizontal position

## Exposure Inhibit Conditions

The collimator will display messages indicating an inhibit condition that must be cleared before exposures can be taken.

## Accessory Rail Locking Lever

The locking lever (Figure 8-18) locks the compensating filters, templates, etc. inserted in the accessory rails of the multi-leaf collimator in place to prevent them from falling out.

**Note:** To remove an accessory from the collimator, the locking lever must be pressed in until the compensating filter, templates etc., can be removed.



**WARNING** QAP accessory (flat field phantom) must be removed before power off.

**Figure 8-18** Collimator Locking Lever



## Rotating the Multi-leaf Collimator

For certain exams, such as extremities, you may need to align the collimator field with the anatomy to be exposed. The collimator can be rotated 90 degrees around the vertical axis, by releasing the collimator locking lever (Figure 8-19).

**Figure 8-19** Rotating the collimator





**WARNING** Always grasp the multi-leaf collimator in such a way that neither hand can be pinched or crushed between the handles and the collimator.

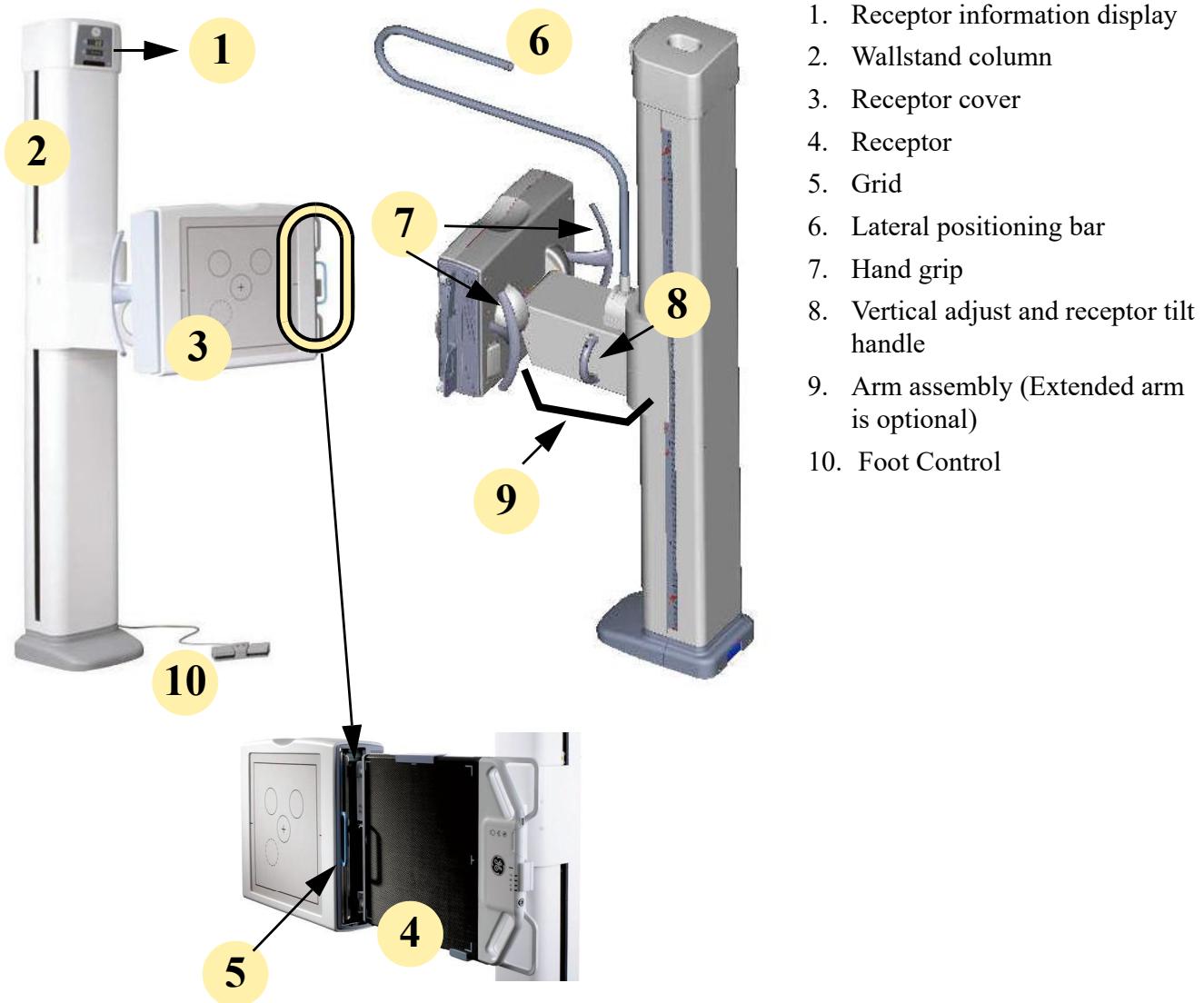
Follow this process to rotate the collimator around the vertical axis.

1. Move the rotating locking lever on the collimator toward the front panel, i.e. toward you. This releases the collimator from the 0 lock-in position.
2. Grasp the multi-leaf collimator with both hands.
3. Rotate it to the desired angle and direction.
4. Return the locking lever to its original position. This prevents further rotation.

# Digital Wallstand

The digital wallstand (Figure 8-20) contains the digital receptor, which can be moved to accomplish different radiographic procedures.

**Figure 8-20** Wallstand



Care should be taken when placing lead markers on the receptor to ensure proper visualization on the digital image. Refer to [Chapter 4: General Information-Lead Markers \(p. 4-13\)](#) for lead marker information.

Wallstand characteristics:

**IMPORTANT!** The wallstand is **not** a weight-bearing device.

- The vertical height of the receptor is adjustable to facilitate proper positioning.
- The tilt feature allows you to tilt the receptor –20° to +90° in order to acquire extremity or special imaging exams.
- Positive beam limitation (automatic collimation) is available at 1 meter (40 inches) and 1.8 meter (72 inches) SID for 0° tilt and 1 meter (40 inches) SID for 90° tilt. Adjustments outside this range require manual collimation.
- Exposures can be made with the receptor tilted from –20° to +90°.
- AEC is available at any SID or receptor tilt.
- Motorized to enable advanced applications. Refer to [Chapter 13: Advanced Applications](#) for more information.
- The inherent filtration of the wallstand front panel is less than 0.8 mm of aluminum equivalent at 100 kVp.
- Wallstand receptor cover is identified as applied part.

**Note:** You should instruct your patient to use the lateral bar and the hand grips when you are positioning the patient at the wallstand.



**CAUTION** Make sure your patient does not use the wallstand as a support.

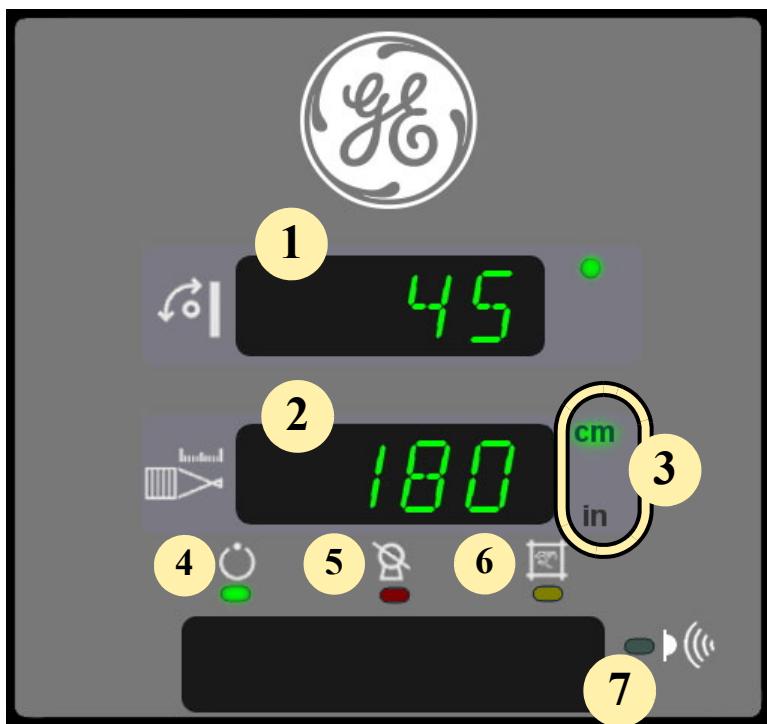


**CAUTION** If the patient leans on the wallstand with enough force, the locks may release and the receptor will lower slowly.

## Receptor Information Display

The receptor information display at the top of the wallstand column (Figure 8-21) shows the tilt of the receptor, the currently installed grid, and exposure readiness information.

**Figure 8-21** Receptor information display



1. Tilt angle display
2. Installed or selected grid display
3. Grid unit indicator lights
  - cm - centimeters
  - in - inches
4. Exposure Ready indicator light
5. Exposure Hold indicator light
6. Manual Collimation indicator light
7. Remote IR Receiver

## Position the Receptor

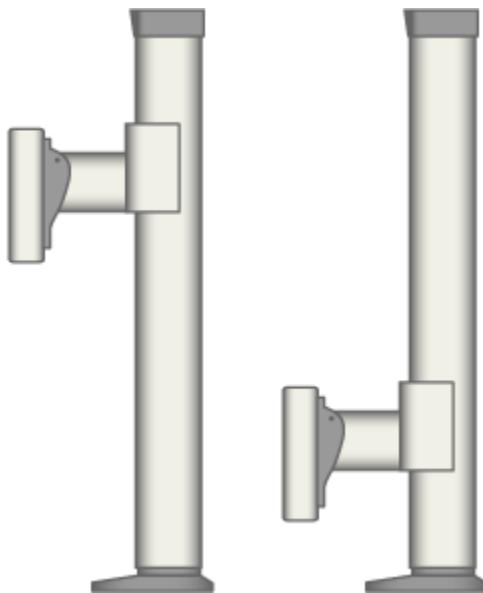
The wallstand receptor placement may be adjusted vertically or tilted.

### Vertical Adjustment

The receptor arm assembly can be moved vertically (Figure 8-22) in one of three ways:

- Using the Vertical Adjust and receptor Tilt Handle.
- Using the foot control.
- Using the positioning remote. Refer to [Positioning Remote Control\(p. 8-52\)](#)for more information.

**Figure 8-22** Receptor and arm vertical movement



**CAUTION** Patients should be clear of the wallstand when vertical movement is in process.



**CAUTION** Be careful of the handgrips that stick out below the wallstand when positioning wheelchair patients under the wallstand.

### Vertical Adjust and Detector Tilt Handle

1. Grasp the handle and depress the inner switch ([Figure 8-23](#)).
2. Move the arm up or down.
3. Release the switch when the desired height is reached.

**Figure 8-23** Vertical adjust and receptor tilt handle



## Foot Control

The foot control (Figure 8-24) moves the receptor vertically.

1. Press the UP or DOWN pedal two consecutive times (“double-tap”) and hold. This activates the foot pedal.
2. Hold the foot pedal down until the desired height is reached.
3. Release the pedal to stop movement.

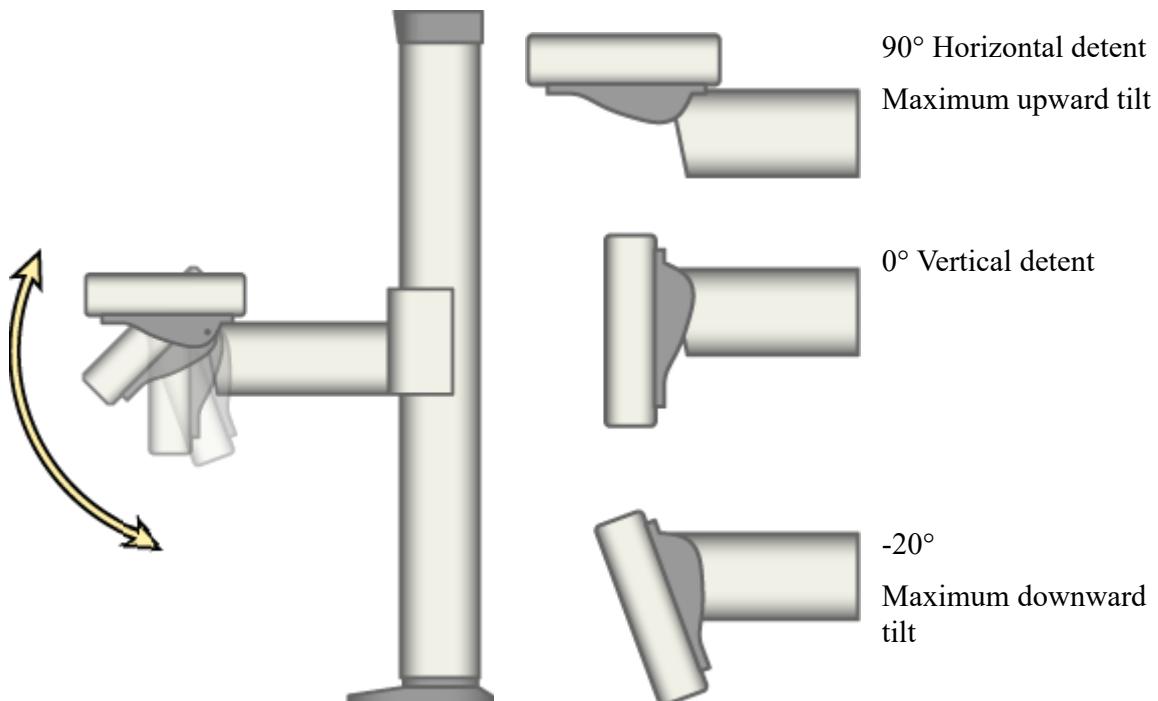
**Figure 8-24** Foot control



## Tilt

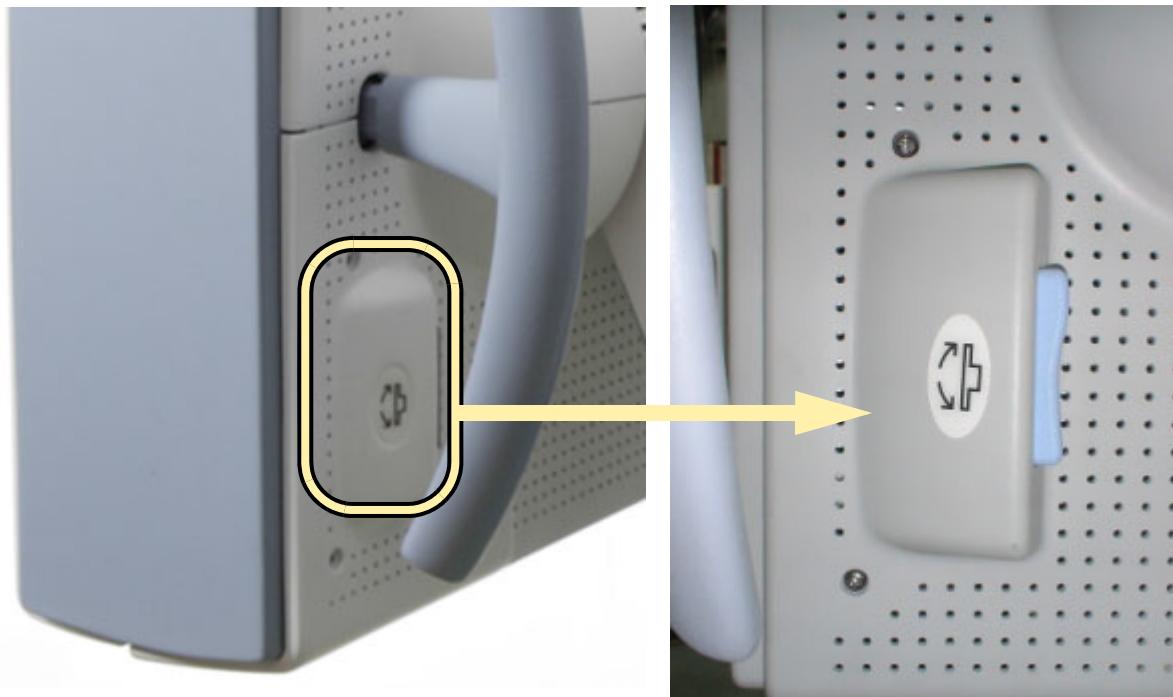
The wallstand receptor can be tilted at any angle within the range of  $90^\circ$  (horizontal) to  $-20^\circ$  (Figure 8-25). Detents for the receptor tilt are located at  $0^\circ$  (horizontal) and  $90^\circ$  (vertical). Lateral detents on the OTS are active when positioning to the wallstand.

**Figure 8-25** Wallstand receptor tilt range



The tilt lock release button is located in the lower corner of the back of the receptor (Figure 8-26).

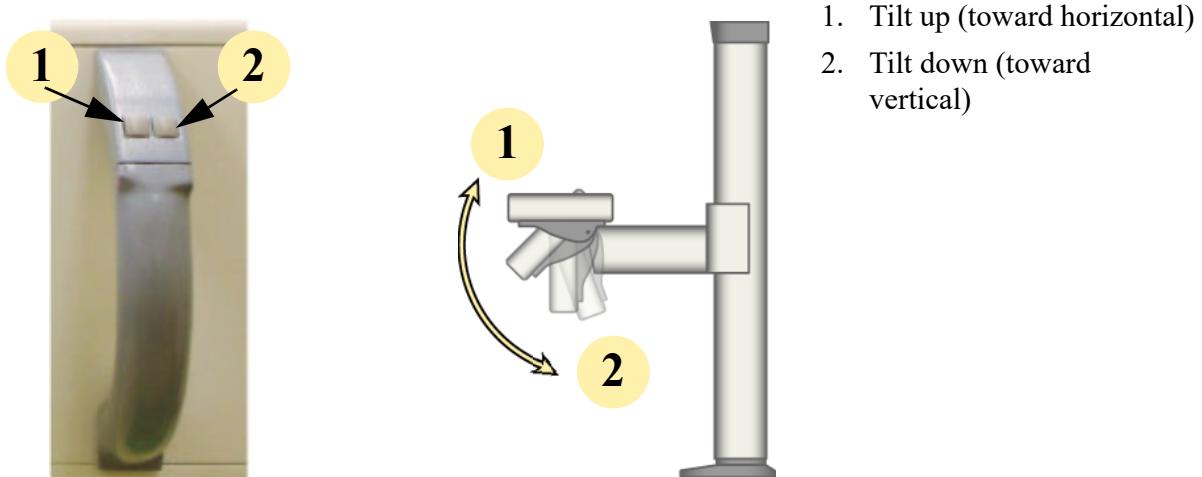
**Figure 8-26** Tilt lock release



### Vertical Adjust and Detector Tilt Handle

1. Press and hold a tilt button (Figure 8-27) until desired position is reached.
2. Release the tilt button to stop tilting.

**Figure 8-27** Tilt buttons on vertical adjust and receptor tilt handle

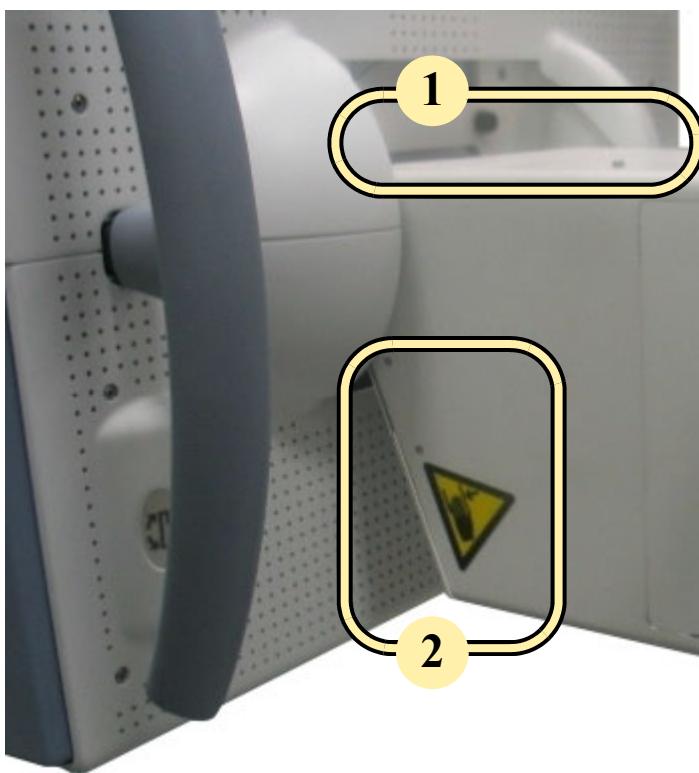


The wallstand may also be tilted using the remote control. Refer to [Positioning Remote Control\(p. 8-52\)](#) for more information.



**WARNING** **Hand Crush Hazard:** Keep your extremities and the patient's extremities away from the pinch areas ([Figure 8-28](#)) and the top of the wallstand arm when tilting the wallstand receptor.

**Figure 8-28** Pinch areas (back of the receptor)



1. Top of the wallstand arm - pivot point
2. Bottom of the wallstand arm - crush area between back of the receptor and the end of the arm



**CAUTION** Patients should be clear of the wallstand when tilting is in process.

## Insert or Remove Grids

Refer to [Grids\(p. 8-48\)](#) for more information about available grids and grid accessories.

You have the choice of acquiring images with or without the grid. Grid exams require inserting the proper grid. Grids are stored in the wall mounted accessories holder.



**CAUTION** **Grid handling:** Handle grids with care and place in accessories holder when not in use. Dropping the grid could cause damage and reduced image quality.

To remove the grid, use the handle to pull the grid out of the wallstand or accessories holder. To insert it, slide the grid through the groove at the lateral side of the wallstand until it rests completely in the slot. An interlock within the receptor senses the new grid.

**Figure 8-29** Wallstand Grid (partially inserted)



## Positioning Bars and Hand Grips



**CAUTION** Make sure your patient does not use the handgrips or positioning bar for support.

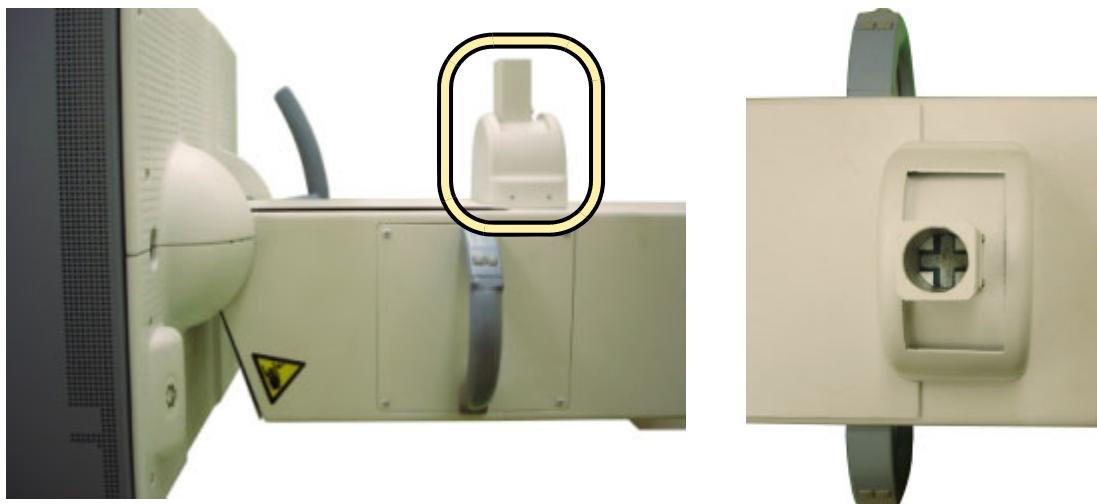


**CAUTION** Be careful of the handgrips that stick out below the wallstand when positioning wheelchair patients under the wallstand.

### Remove or Attach the Lateral Positioning Bar

The wallstand is equipped with a lateral positioning bar ([Figure 8-30](#)) to aid in patient positioning. The lateral positioning bar allows for greater patient stability when performing exams in the upright position. The lateral positioning bar socket is located on the wallstand arm assembly, behind the receptor ([Figure 8-30](#)).

The bar may be rotated 90° (parallel to the receptor front) to move it out of the way without removing it from the wallstand.

**Figure 8-30** Lateral positioning bar socket (side and top views)

Use this procedure to remove, insert, rotate, and move the lateral positioning bar.

1. To remove or insert the bar: pull or insert the bar straight from or into the bar socket.
2. To rotate the bar: pull the bar partway out of the socket, turn it 90°, and re-insert it in the new direction.
3. To move the bar from left to right push the bar back toward wallstand column and move to the desired side.



**CAUTION** This bar is a hand rest only and is not intended to support a person's full weight. To avoid falls and potential injuries, do not hang or pull on the bar.



**CAUTION** If the patient pulls on the lateral bar with enough force, the locks may release and the receptor will lower slowly.



**CAUTION** Use care not to drop lateral bar when handling. Place on accessories holder when not in use.



**CAUTION** Remove the lateral bar at the minimum receptor height, as you feel ergonomic. Do not have the later bar installed if you want to move the receptor to maximum height, unless your ceiling is high enough.

## Ion Chambers

Photo-timing is controlled using three ion chambers similar to the device used in conventional radiographic systems.

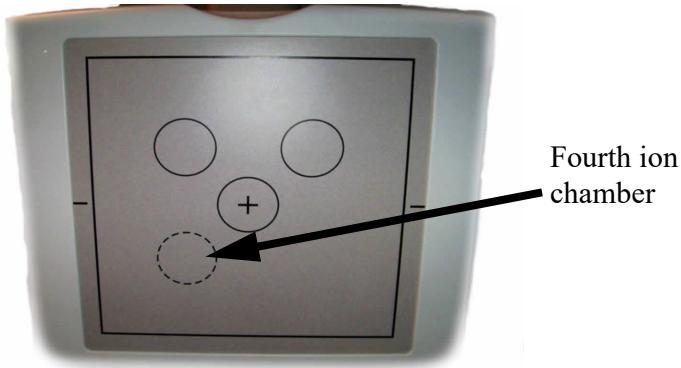
The Discovery XR656 wallstand receptor may be equipped with an additional AEC ion chamber. The fourth chamber is more effective when the receptor is used horizontally under a mobile table accessory (Extended arm option).

- Refer to [Chapter 10: Image Acquisition-Automatic Exposure Control \(AEC\) \(p. 10-23\)](#) for more information about AEC exposures and ion chamber selection.

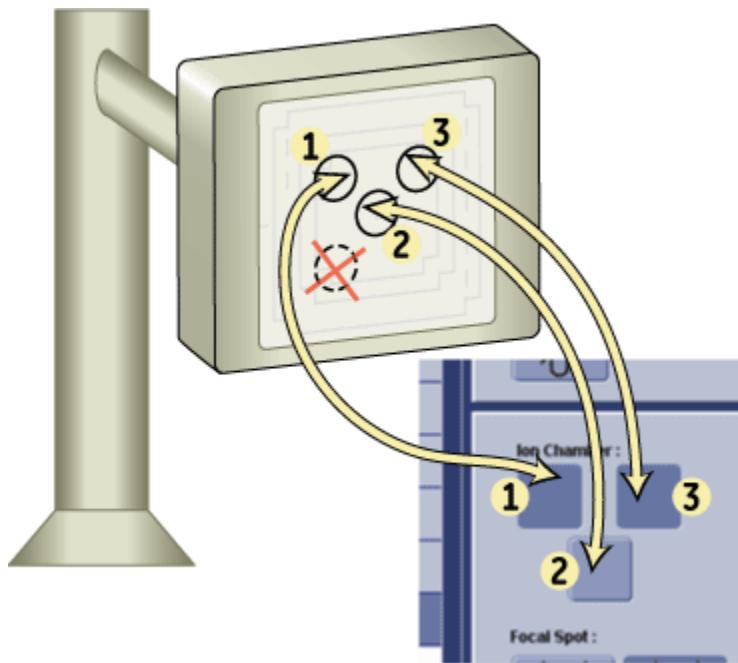
**Note:** The following figures are for illustrative purposes only and do not represent true scale.

The ion chambers are round with the fourth chamber shown on the wallstand as a dashed outline ([Figure 8-31](#)).

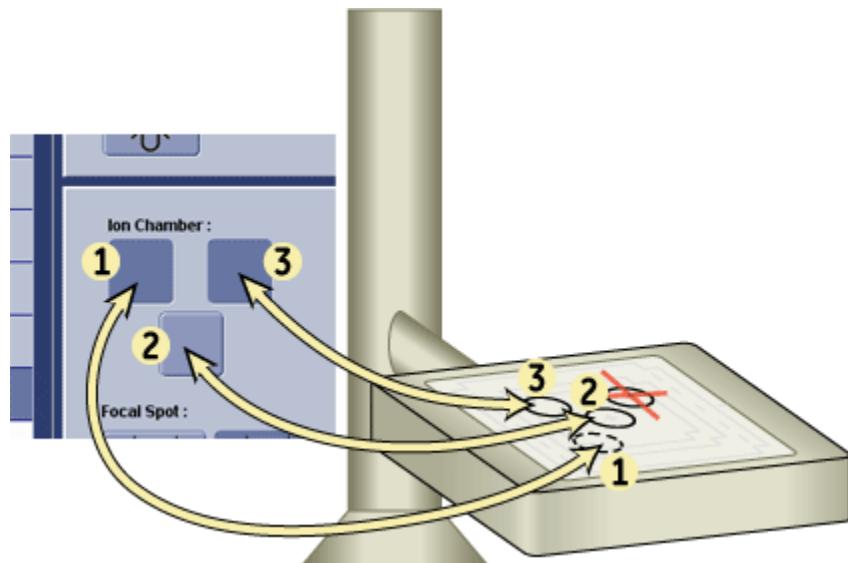
**Figure 8-31** Front of wallstand receptor with four ion chambers



When the receptor is at or near 0° (vertical), the three main chambers are active and the fourth (lower left) is disabled ([Figure 8-32](#)).

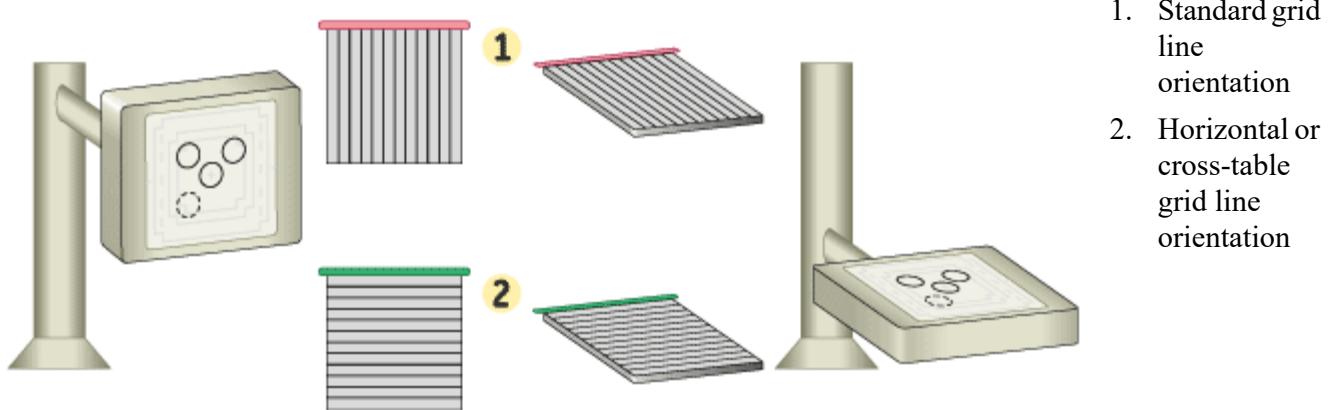
**Figure 8-32** Receptor in vertical configuration

When the receptor is at or near 90° (horizontal), the fourth chamber becomes enabled and the top right chamber becomes disabled (Figure 8-33). On the Image Acquisition screen ion chamber selection, the “dashed” ion chamber is assigned to position 1.

**Figure 8-33** Receptor in horizontal configuration

The wallstand will determine the angle of the receptor and switch configurations appropriately. When the receptor is at an intermediate angle, only the center chamber (2) will be available for selection from the Image Acquisition screen.

The cross table grid may be used when the receptor is in the horizontal position (Figure 8-34).

**Figure 8-34** Grid use

## Mobile Table

A mobile table accessory can only be used with an extendable arm wallstand. Refer to [Radiographic Mobile Tables \(Option\)\(p. 8-60\)](#) for more information about available mobile stretchers.

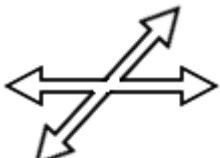
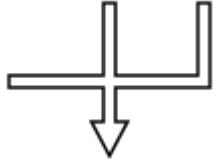
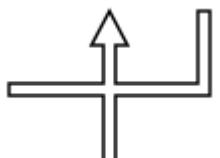
## Digital Table

The table includes the digital receptor, or Digital Detector removable grid, foot pedals, and Emergency Stop buttons.

**Figure 8-35** Digital Table Components

# Components

**Table 8-8** Digital table components

Item	Description
1. Tabletop	The table dimensions are 225cm (89 in) in length and 89cm (35 in) in width. Its inherent filtration is less than 0.75 mm of aluminum equivalent at 100 kVp. The tabletop can be moved longitudinally and transversely for easy patient positioning. Even when it is fully extended, it can support a supine patient weighing up to 220 kg (485 lbs.). And the maximum supported weight can be up to 320 kg (705 lbs.), wherein, the elevating function is not recommended. Tabletop is identified as applied part.
2. Elevating Base with Telescopic Covers	The elevating base raises and lowers the tabletop from 570 mm to 820 mm ±10mm from the floor level. (22 in - 32 in)  The telescopic covers are assembled in two levels. Their purpose is to cover the table power supply and the electronic and mechanical components located in the table base. This is essential when the tabletop is raised or lowered.
3. Table Top Positioning Foot Pedals	<p>This pedal allows you to move the table in all directions: longitudinally and transversely. This is known as a floating tabletop.</p>  <p>Press the pedal twice and hold down to move the table top.</p>
4. Down Pedal	 <p>The Down pedal lowers the digital table down. Press the pedal twice and hold down to lower the table.</p>
5. Up Pedal	 <p>The Up pedal raises the digital table up. Press the pedal twice and hold down to raise the table.</p>
6. Table Lock Control Buttons	 <p>There are two lock buttons located on the left and right sides of the table, near the head and foot of the table. They are used to prevent the table up-down and tabletop movement. The lock is engaged when the button is lit.</p>

**Table 8-8** Digital table components

Item	Description
<p>7. Emergency Stop Buttons</p> 	<p>There are two Emergency Stop buttons located on the left and right sides of the table. These buttons are used to remove power from the table in an emergency. Refer to <a href="#">Chapter 4: General Information-Emergency Stop (p. 4-8)</a> for more information.</p> <p></p> <p><b>WARNING</b> When the Emergency Stop button has been activated, the table top will be able to be moved longitudinally base on table top is not locked into position. Exercise extreme caution with your patient when this happens.</p>
<p>8. Manual Receptor Position Button</p>	<p>The Manual Detector Position button is used for receptor placement if auto-tracking fails.</p> <p><b>Note:</b> This button only appears on systems with a fixed receptor.</p>
<p>9. Optical pinch sensor area</p>	<p>The sensors detect a hand or other body part below the surface of the table and lock the table movement to prevent injury. The system will sound an audible tone when the finger pinch lock is activated.</p> <p>Refer to <a href="#">(p. 8-44)</a> for more information.</p>
<p>10. Hand Grips</p> 	<p>Two hand grips are optional with the system. These serve to keep the patients' hands away from the tabletop edges and to give patients a feeling of security. The grips are not intended to support the weight of patients.</p> <p>For increased patient safety, the patient hand grips can be used during all examinations. The grips slide onto the side rails of the tabletop. They can be locked in place in any position along the side rails with the thumbscrews.</p> <p>Refer to <a href="#">Table Hand Grips and Compression Band (Option)(p. 8-51)</a> for more information.</p>
<p>11. Abdominal Compression Band (clamp only shown)</p> 	<p>The Abdominal compression band option is a fabric band, secured at the table edge, by the clamp shown. The compression band allows the user to place the band over the patient to provide IVP compression as requested by the Radiologist. Patients should be monitored at all times and not be left unattended.</p> <p>Refer to <a href="#">Table Hand Grips and Compression Band (Option)(p. 8-51)</a> for more information.</p>

**Note:** The table is equipped with a collision detection system. If contact is made between the tabletop and a foreign object, such as a stool, while lowering the tabletop, the requested motion automatically stops until the collision condition is removed. This is accomplished by either clearing the foreign object from the tabletop movement path or by requesting the reverse movement of the tabletop.



**WARNING** When the Manual Detector Position Button is pressed, the automatic receptor tracking mechanism is disabled. To re-enable automatic receptor tracking, move the OTS.



**WARNING** Before your patient gets onto or off from the digital table, always press the Table Lock Control button to block the foot pedal functions momentarily. This avoids injuries to the patient or damage to the equipment if a foot pedal is accidentally stepped on.



**WARNING** To avoid injury to fingers and hand of patient and operator caused by table movement, hands must be kept away from table top edges at all times.

## Raise and Lower the Digital Table

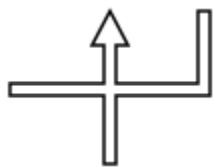
The height of the digital table can be adjusted to make it easier for your patient to get on and off the table and for you to position the patient for the examination.



**WARNING** Before your patient gets on or off the digital table, always press the Table Lock Control button to block the control foot pedal functions momentarily. This avoids injuries to the patient or damage to the equipment if a foot pedal is accidentally stepped on.

Use this procedure to raise and lower the digital table.

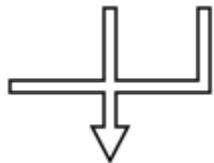
1. Release the table lock, if necessary.
2. To raise the table, press the Up pedal two consecutive times (“double-tap”). This activates the foot pedal.

**Figure 8-36** Up pedal

3. Hold the foot pedal down until the desired height is reached.

**Note:** The tabletop automatically stops when it reaches its maximum height of 820 mm (32.0 inches).

4. Remove your foot from the pedal to stop the movement.
5. To lower the table, press the Down pedal two consecutive times (“double-tap”).

**Figure 8-37** Down pedal

6. Hold the foot pedal down until the desired height is reached.

**Note:** The tabletop automatically stops at a safety point to prevent toe pinches. To reach the minimum height, double-tap the foot pedal again and the system will track to the lowest position.

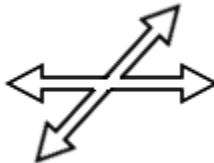
7. Remove your foot from the pedal to stop the movement.

## Position the Table Longitudinally and Transversely

### 4 way table position

The digital table position can be adjusted in the longitudinal and transverse directions for greater patient positioning flexibility. Use this procedure to position the tabletop in the longitudinal and transverse directions with respect to the X-ray tube.

1. Release the table lock, if necessary.
2. Press the table top positioning pedal ([Figure 8-38](#)) two consecutive times (“double-tap”). This activates the foot pedal.

**Figure 8-38** Table top positioning foot pedal

3. Hold the foot pedal down and position the table top.
  - You can float the table top in all directions while the pedal remains held down.
4. Manually move the tabletop in a longitudinal or transverse direction to the desired position.
5. Release the foot pedal to lock the tabletop.



**WARNING** When moving the tabletop, be careful of where your and the patient's fingers are placed. Do not attempt to move the tabletop without using the foot pedals to release the longitudinal and transverse movement locks.

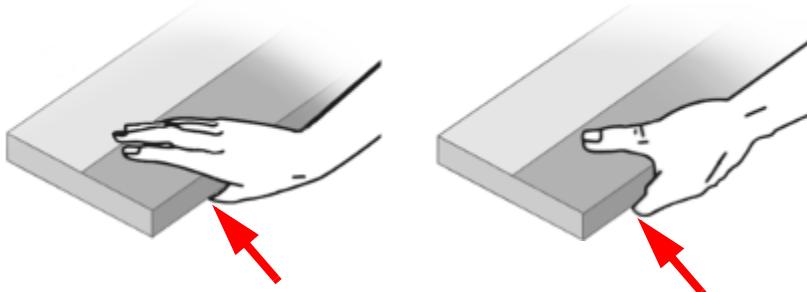


**WARNING** To avoid injury to fingers and hand of patient and operator caused by table movement, hands must be kept away from table top edges at all times.

## Finger Pinch Lock Release

The table is equipped with optical sensors beneath the edges of the table between the emergency stop button and table lock button on each side. The sensor stops lateral and longitudinal movement of the table top if fingers or other objects are beneath the table edges, as shown in [Figure 8-39](#).

**Figure 8-39** Finger pinch lock trigger

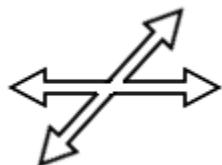


The system will beep and a message will appear on the Acquisition Workstation informing you of the table lock. Exposures will be inhibited until the lock is resolved.

To unlock the table top:

1. Release the table top positioning foot pedal (if necessary).

**Figure 8-40** Table top positioning foot pedal



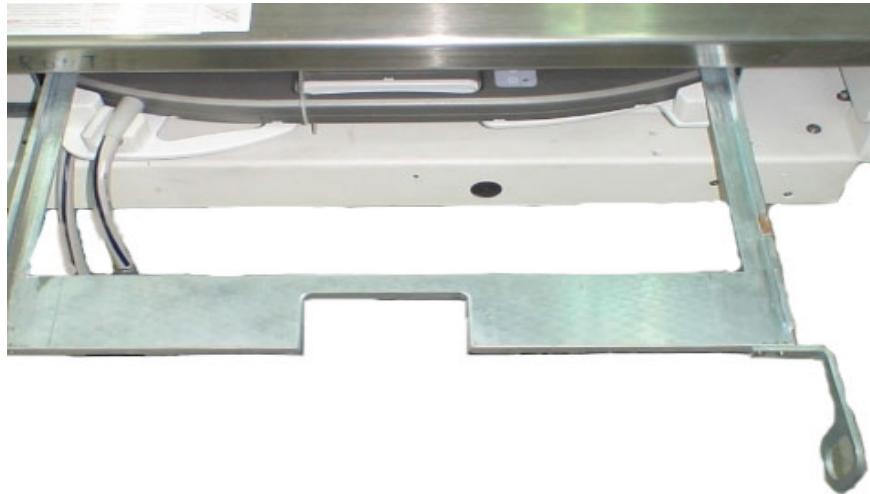
2. Remove hands, fingers, or other object from under the table edge.
3. Press the foot pedal ([Figure 8-40](#)) two consecutive times (“double-tap”).
4. Hold the foot pedal down and position the table top.

## Grid Loading and Removal

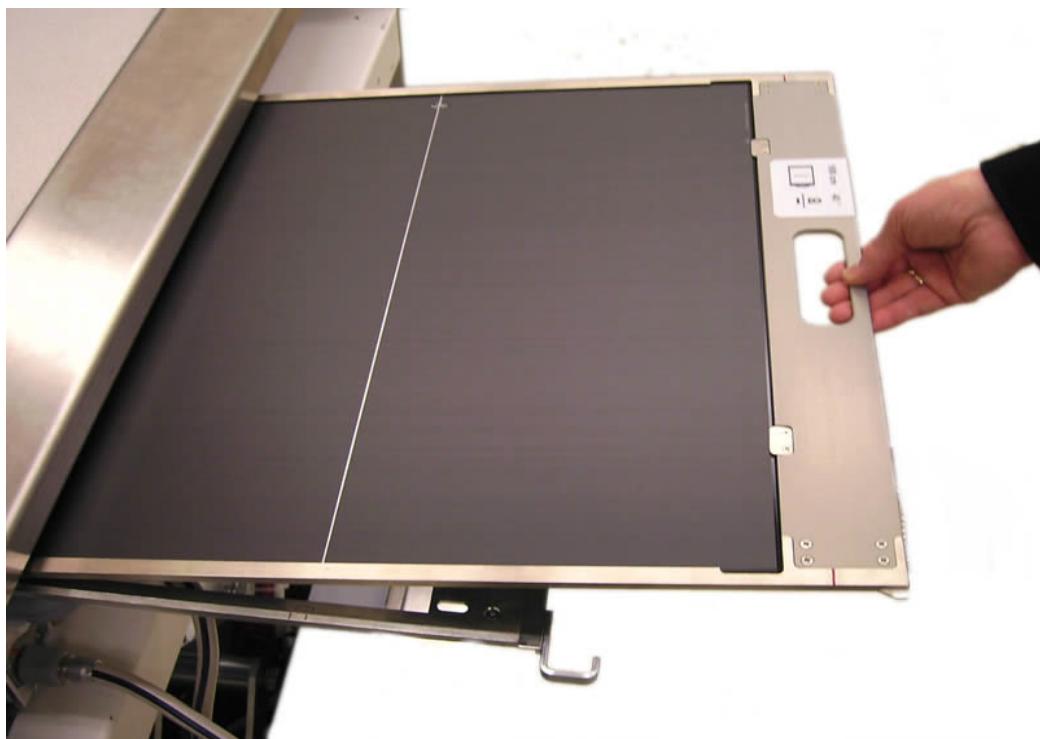
Follow the procedure below for grid loading. For grid removal, follow the procedure below in reverse order.

Refer to [Grids\(p. 8-48\)](#) for more information about the grids.

1. Pull out the grid tray.



2. Install the grid with the “tube side” label facing up. Refer to [Grids\(p. 8-48\)](#) for more information.



3. Push in the grid tray.

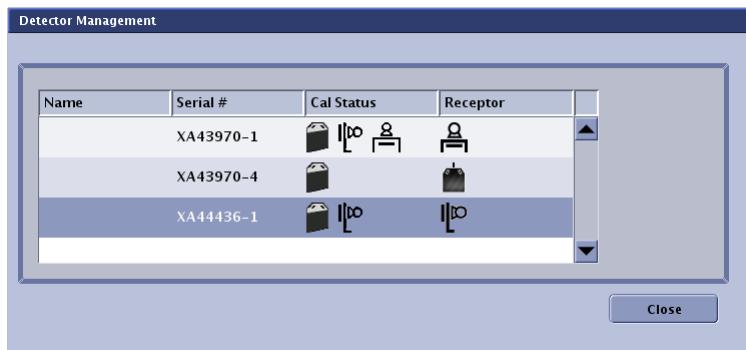
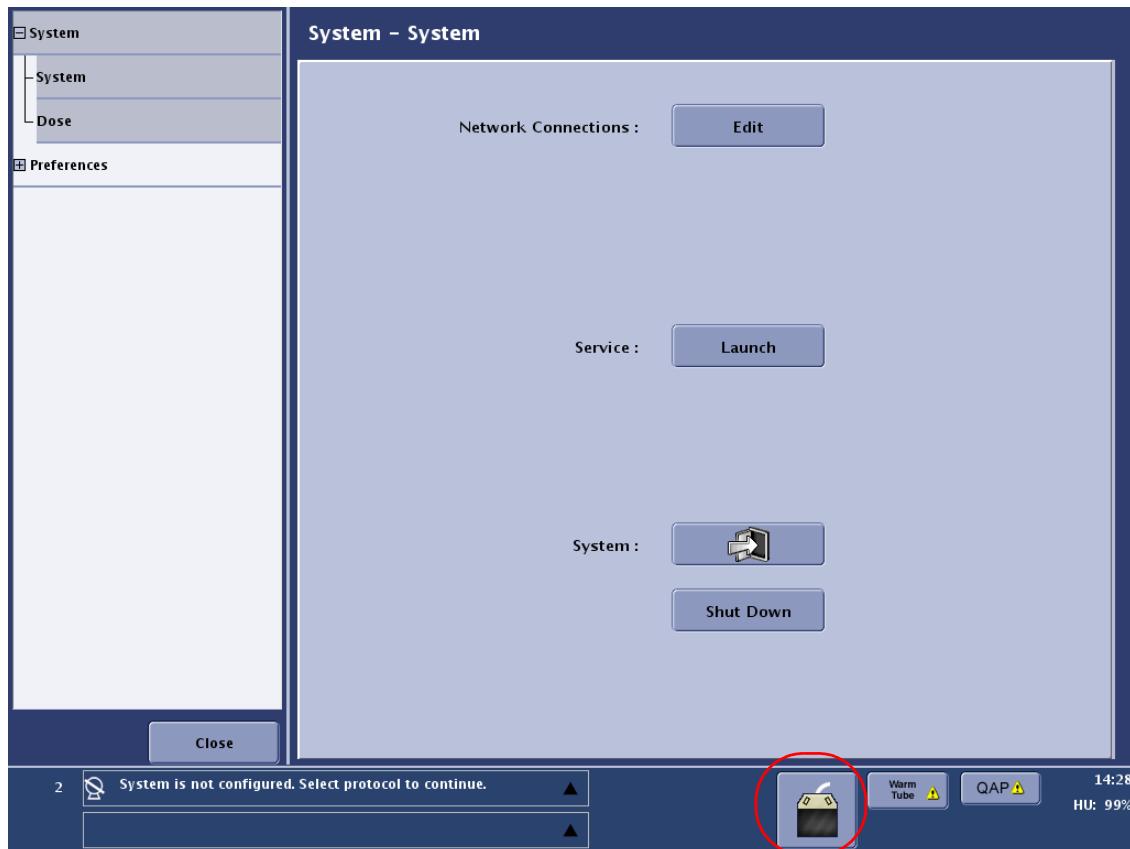
# Non Wireless Configuration

The FlashPad wireless detector shall be used the following way when system is configured as Non Wireless Configuration:

- Tether Cable for non detector tray exposures
- Via docking connector when inserted in detector tray

For more information regarding Non Wireless Configuration see ([Non-Wireless Configuration](#)).

## Detector Management



Click Detector Icon on the status bar will launch the Detector Management Window. The Detector Management Window will display the detector serial numbers, calibration status of detector and which Receptor the Detector is connected with.

# Accessories and Optional Equipment



**WARNING** For continued safe use of this equipment, use only manufacturer recommended accessories.



**WARNING** Accessories should be properly attached to the table and positioned so as not to interfere with system motions.

## Grids

The grids and specifications are described in [Table 8-9](#).

Refer to [Digital Table\(p. 8-39\)](#) and [Digital Wallstand\(p. 8-28\)](#) for more information about inserting or removing grids.

**Figure 8-41** Grid front and back

Front



Back



The back of the grid does not have a center line.

The front of the grid has a center line and an x-ray transparent “Tube side” label.



**Table 8-9** Grid specifications

Grid	Application and Label	Range (cm)	Orientation	Ratio	Lines/cm
180 cm wallstand grid	Wallstand 0 degree 	145-245	Vertical	13:1	70
130 cm wallstand grid	Wallstand 0 degree 	90-190	Vertical	10:1	70
100 cm wallstand grid	Wallstand 0 degree 	90-118	Vertical	13:1	70
130cm wallstand horizontal grid	Wallstand 90 degrees 	90-190	Horizontal	10:1	70

**Table 8-9** Grid specifications

Grid	Application and Label	Range (cm)	Orientation	Ratio	Lines/cm
100cm Table grid	Radiographic Table 	90-120	Vertical	12:1	70
120cm Table grid	Radiographic Table 	102-146	Vertical	13:1	70
120cm Wallstand grid	Wallstand 0 degree 	102-146	Vertical	13:1	70
Portable Detector Grid	Digital Detector used as digital cassette	100-180	Horizontal	6:1 8:1 (optional)	70



**WARNING** Handle grids carefully. Dropping a grid may damage it. Place grids in a holder when not in use.

## Grid and Accessories Holder

A holder to store grids and QAP phantoms is available for optional purchase. It is recommended that grids and phantoms be stored in the holder when not in use. The holder is mounted on the wallstand and can store up to 4 grids and phantoms.

**Figure 8-42** Holder with grids and phantom



## Table Hand Grips and Compression Band (Option)

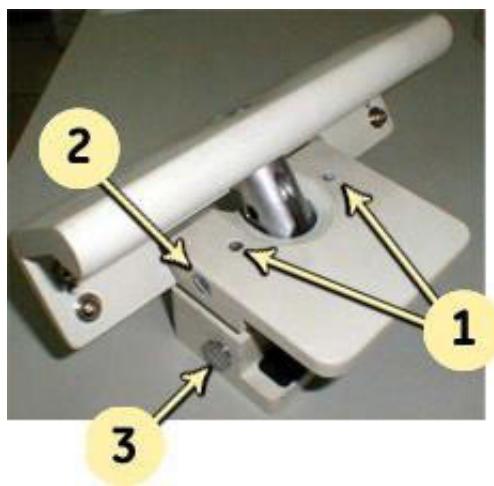
There are two optional accessories available for the digital table:

- Abdominal compression band (with clamp)
- Patient hand grips

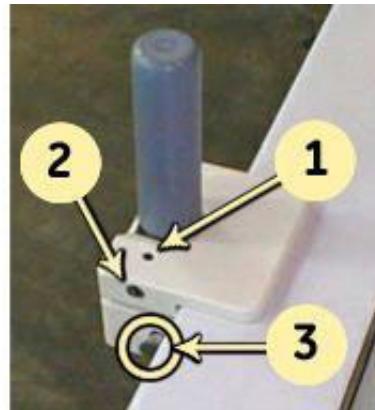
The compression band clamp and hand grips (Figure 8-43) slide onto the side rails of the tabletop. They can be locked in place in any position along the side rails with the thumbscrews.

**Figure 8-43** Table accessories overview

Compression Band (clamp only shown)



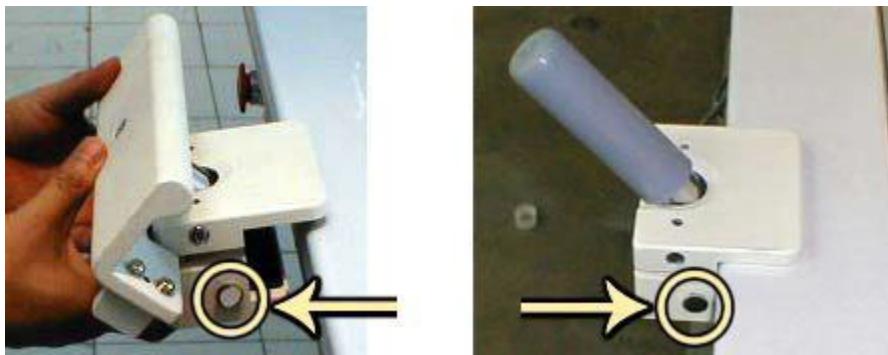
Patient Hand Grip



1. Adjustment screw
2. Safety screw
3. Lock

## Installation

1. Depress the lock to release the clamp or hand grip (Figure 8-44).

**Figure 8-44** Clamp and hand grip released

2. Position the clamp or hand grip; then depress the handle.
3. Lock the compression band or hand grip ([Figure 8-45](#)).

**Figure 8-45** Clamp and hand grip locked

## Positioning Remote Control

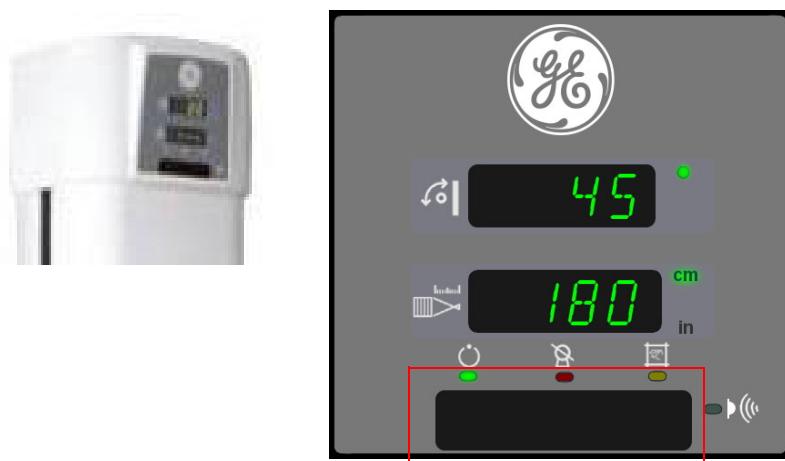
### General Information and Use

The positioning remote control ([Figure 8-51](#)) allows you to move the system into a pre-configured position or move the wallstand receptor.

**Note:** The Auto Positioning functions (the buttons in the gray area, items 5-9 in [Figure 8-51](#)) only work if the Auto Positioning advanced application option is purchased (refer to [Chapter 13: Advanced Applications-Auto Positioning \(p. 13-4\)](#) for more information). For systems without Auto Positioning, the remote control will still change the FOV, tilt the wallstand receptor, raise or lower the wallstand receptor, and turn the collimator light on and off.

**Note:**

1. Aim the remote directly at the OTS.
  - For Collimator (FOV) and Tube positioning (Auto Positioning), aim the remote at the sensor area (black ring) at the top of the OTS column. ([Figure 8-46](#)) and the wallstand display. Two red LED lights show that the sensor area is receiving the remote control signal.

**Figure 8-46** OTS column remote control sensor area**Figure 8-47** Wallstand remote control sensor area

**IMPORTANT!** The remote must have a direct line of site to the OTS or wallstand. Any people or objects between the remote control and the component will prevent or stop system movement.

When using Auto Positioning functions, the OTS user interface may move between the remote and the column sensor and interrupt positioning. You may need to move (e.g., stand to the side of the column) in order to re-establish the line of sight.

2. Double-click and hold a button to begin movement.
  - [Table 8-10](#) describes the functions of the remote control.
3. Release the button when desired position is reached.
4. If movement is interrupted, repeat steps 1 - 3.

## Removing The Batteries

The remote control uses 2 AA (LR6) batteries. Remove batteries from the Positioning Remote Control when storing for over two months.

1. Remove the battery cover.

**Figure 8-48** Removing The Battery Cover

2. Remove the batteries from the Positioning Remote Control.

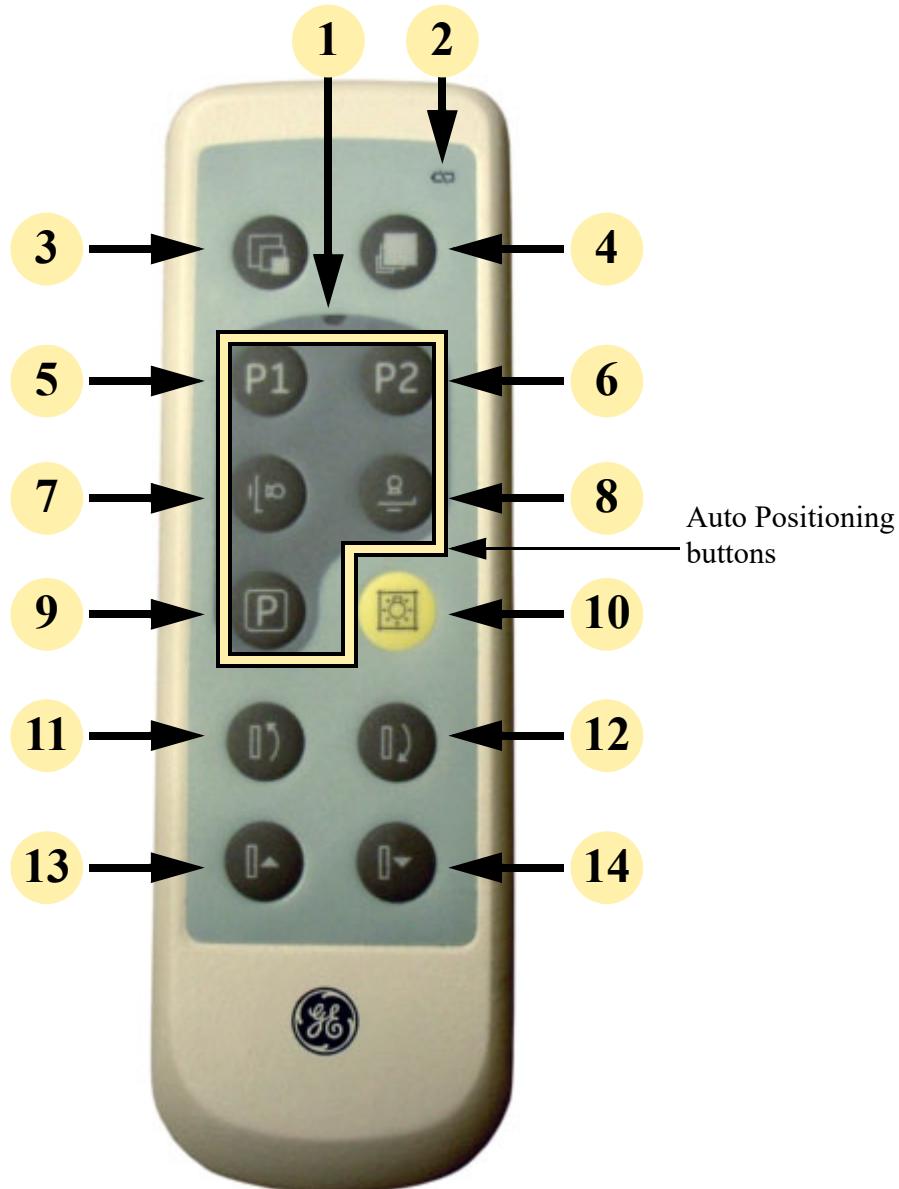
**Figure 8-49** Orientation of the Batteries

3. Re-insert the battery cover into the remote control.

**Figure 8-50** Re-inserting the battery cover

## Remote Control Functions

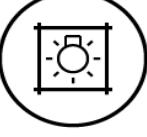
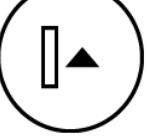
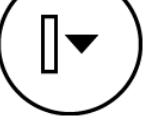
Figure 8-51 Positioning remote



**Table 8-10** Positioning remote functions

Control		Description
1. Remote control active indicator		<p>A green light indicates that the remote control is emitting a signal.</p> <ul style="list-style-type: none"> <li>• If the light is on but the component does not move, reposition or re-aim the remote and try again.</li> <li>• If the light does not come on when a button is pressed, insert or replace the batteries.</li> </ul>
2. Battery Low indicator		<p>Indicates when the remote control batteries are low and need replacement. The remote control uses 2 AA (LR6) batteries.</p>
3. FOV small to large		<p>Opens the collimator blades to the default positions shown on the OTS control screen in sequence.</p> <p><b>Note:</b> The collimator light must be on for this function to work.</p>
4. FOV large to small		<p>Closes the collimator blades to the default positions shown on the OTS control screen in sequence.</p> <p><b>Note:</b> The collimator light must be on for this function to work.</p>
5. Programmable button 1		<p>Programmable button for auto positioning. The function of this button is facility-specific and is programmed by GE Service at installation.</p> <p>Refer to <a href="#">Chapter 13: Advanced Applications-Auto Positioning (p. 13-4)</a> for more information.</p>
6. Programmable button 2		<p>Programmable button for auto positioning. The function of this button is facility-specific and is programmed by GE Service at installation.</p> <p>Refer to <a href="#">Chapter 13: Advanced Applications-Auto Positioning (p. 13-4)</a> for more information.</p>
7. Wallstand position (upright)		<p>Moves the tube into position for an upright wallstand exam.</p> <p>Refer to <a href="#">Chapter 13: Advanced Applications-Auto Positioning (p. 13-4)</a> for more information.</p>

**Table 8-10** Positioning remote functions

Control		Description
8. Table position (horizontal)		<p>Moves the tube into position for a table exam.</p> <p>Refer to <a href="#">Chapter 13: Advanced Applications-Auto Positioning (p. 13-4)</a> for more information.</p>
9. Park		<p>Moves the tube to its “park” position when not in use.</p> <p>Refer to <a href="#">Chapter 13: Advanced Applications-Auto Positioning (p. 13-4)</a> for more information.</p>
10. Collimator light		Turns the collimator light on and off.
11. Tilt wallstand receptor up		Tilts the receptor up.
12. Tilt wallstand receptor down		Tilts the receptor down.
13. Raise wallstand receptor		Raises the receptor.
14. Lower wallstand receptor		Lowers the receptor.

## Auto Image Paste Patient Positioner (Option)

Auto Image Paste is a purchased option for the Discovery XR656. The positioner is used to determine the correct Center of Interest (COI) and to protect the patient from the moving receptor during image paste acquisition.

Refer to [Chapter 13: Advanced Applications-Auto Image Paste Patient Positioner without Integrated Foot Step \(for Wallstand\) \(p. 13-20\)](#) for more information.

## System Cabinet

The system cabinet ([Figure 8-52](#)) houses the electronics for the Discovery XR656. GE Service personnel can open the front of the cabinet to access the electronics.

The cabinet dimensions are as follows:

- Height: 130.17cm (51.25 in.) NOTE: Height does not including the back flange at the top of the cabinet
- Width: 90.80cm (35.75 in.)
- Depth: 71.75cm (28.25 in.)

**Figure 8-52** System cabinet



**Figure 8-53** System cabinet with front open



## Radiographic Mobile Tables (Option)

There are table options available for purchase to use with the Discovery XR656 system. [Table 8-11](#) describes each option.

**Table 8-11** Tables and maximum load capacity

Table Description	Maximum Load Capacity
Mobile Elevating Table – Flexi-DT Elevating, mobile, battery powered  <p><b>Note:</b> In China, The Power Cable for Mobile Elevating Table should be labeled for “CCC” certification.</p>	200 kg / 440 lbs
Fixed height, mobile, high capacity 	295 kg / 650 lbs
Fixed height, carbon fiber table 	200 kg / 441 lbs

## Wallstand with Extended Arm (Option)

An wallstand with an extended arm is required for taking exposures under a mobile radiographic table ([Figure 8-54](#)).

The wallstand arm lengths are as follows:

- Standard Arm: 91 cm
- Extended Arm: 125 cm

Length is measured from the front panel to the back of the column cover.

**Figure 8-54** Extended arm wallstand with mobile table



## Digital Detector Accessories

### [Cross Table Holders](#)

Two detector holders for cross table exams are available.

- Flexi-Holder II Detector and Cassette Stand (option)
- Table top (standard)

**Figure 8-55** Cross table holders

Flexi-Holder II Detector and Cassette Stand (optional) Table top (standard)



## Weight-Bearing Stand (Option)

The weight-bearing stand is used with the wallstand receptor to acquire images of lower legs and feet while the patient is standing. The maximum load capacity is 204 kg (450 lbs.).



**WARNING** Always lock the wheels before allowing the patient on the stand.

**Figure 8-56** Weight-bearing stand

Side view



Example of use



## Lateral Bridge Lengths

There are several lateral bridge lengths available for different room and system configurations.

- 2 meters (78.74 inches) bridge (option)
- 3 meters (118.11 inches) bridge (standard)
- 4.5 meters (177.17 inches) bridge (option)

# Chapter 9: Worklist

The Worklist is the starting point for patient set up and selecting procedures for acquisition. All exams begin from this screen.

The Worklist information and functions are based on DICOM standards.

This chapter explains the procedures for entering data into the system and setting up a patient.

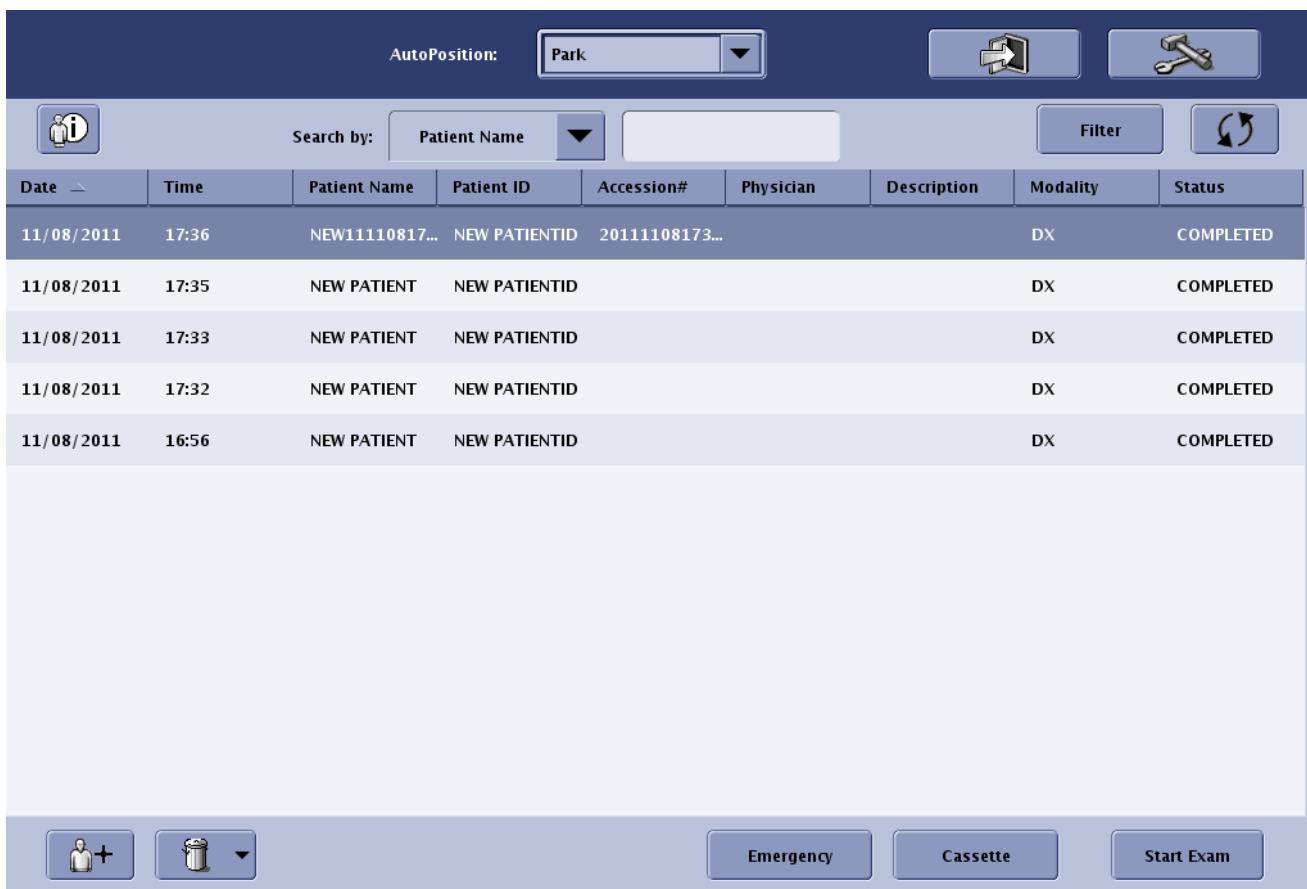
## Overview

The Worklist ([Figure 9-1](#)) shows scheduled, completed, discontinued, and suspended procedures.

The majority of the Worklist is the Patient List. The Patient List is a large table made of columns and rows. Each row in the list is a procedure, or exam, to be performed. A patient may have multiple procedures (rows) on the Worklist.

Procedures listed can be classified under two categories:

- Locally entered procedures: This category refers to procedures entered directly on the system workstation by manually entering the information. Locally entered procedures are only available to the unit or workstation that they were entered on. They do not update automatically and no other units or workstations can access them.
- Hospital Information System (HIS) or Radiology Information System (RIS) Procedures: This category refers to procedures that the Worklist can automatically update from the central HIS/RIS database. Other units or workstations can be configured to access these procedures.

**Figure 9-1** Worklist screen

[Table 9-1](#) lists and describes all the functions on the Worklist screen.

**Table 9-1** Worklist Functions

Function	Description
Auto Positioning  Auto Positioning: <b>Table-Center-100</b>	If enabled, selects a pre-defined position for the x-ray tube. Pressing and holding the AUTO POSITIONING button on the RCIM initiates movement to the selected position.  If Auto Positioning is not enabled on your system, the control does not appear.  Refer to <a href="#">Chapter 13: Advanced Applications-Auto Positioning (p. 13-4)</a> for more information.
[UTILITIES]  	Opens a screen where system settings (such as Network and Printer connections) and preferences may be changed. If the Login function is enabled, the preferences you are allowed to change will vary depending on your level of access.  Refer to <a href="#">Chapter 15: Preferences</a> for more information.

**Table 9-1** Worklist Functions

Function	Description
<p>[LOG OFF]</p> 	<p>If the Login function is enabled, clicking this button logs the current user off of the system.</p> <p>Refer to <a href="#">Chapter 4: General Information-Login and Log off (p. 4-3)</a> for more information.</p>
<p>[PATIENT INFORMATION]</p> 	<p>Shows the Patient Information screen for the selected procedure.</p> <p><b>Note:</b> Patient information can only be edited if manually entered on system and exam has not started. Patient information generated by a HIS/RIS cannot be edited on the system.</p> <p>Refer to <a href="#">Add or Edit Patient Information (p. 9-13)</a> for more information.</p>
<p>Search</p> 	<p>Searches for procedures by the selected column name in the drop-down list and the search criteria entered into the text box.</p> <p>Refer to <a href="#">Search (p. 9-5)</a> for more information.</p>
<p>[REFRESH LIST]</p> 	<p>Updates the Worklist view with new information from the HIS or RIS, which shows changes to the procedure records. Also removes any filters that have been applied.</p> <p>Refer to <a href="#">Refresh (p. 9-9)</a> for more information on automatically refreshing the Worklist.</p>
<p>[FILTER LIST]</p> 	<p>Displays a Worklist query screen and filters the RIS or HIS records to find procedures that meet specific criteria.</p> <p>Refer to <a href="#">Filter List (p. 9-6)</a> for information on how to filter the Worklist.</p>
<p>Patient List Area</p> 	<p>Shows all procedures scheduled for examinations during a working day. Procedures on the list may be downloaded from the RIS/HIS or may be created locally.</p> <p>The list may be sorted by column, searched, or filtered. Refer to <a href="#">Manage List / Find Procedures (p. 9-5)</a> for more information.</p> <p>The time period displayed is configurable. Refer to <a href="#">Chapter 15: Preferences-Worklist (p. 15-17)</a> for information on changing the time period displayed.</p>
<p>[ADD PATIENT]</p> 	<p>Allows you to enter patient information and adds the patient to the Patient List.</p> <p>Refer to <a href="#">Add or Edit Patient Information (p. 9-13)</a> for more information.</p>

**Table 9-1** Worklist Functions

Function	Description
[DELETE] or [DELETE ALL] 	Switches between [DELETE] and [DELETE ALL] to remove procedures from the Worklist. [DELETE] - Removes the selected procedure or procedures from the Patient List. [DELETE ALL] - Removes all completed and discontinued procedures from the Patient List. <b>Note:</b> [DELETE] or [DELETE ALL] does not remove procedures from the RIS or HIS or remove any exam images from the image database. Refer to <a href="#">Delete Procedures (p. 9-11)</a> for more information.
[START EXAM] or [RESUME EXAM] 	Starts, continues, or appends the selected procedure. The button name changes depending on the Scheduled Status of the selected procedure. If the selected procedure has a Status of “Suspended”, the button name changes to [RESUME EXAM].
[EMERGENCY EXAM] 	Begins an exam without selecting a procedure from the Patient List or adding the patient. The system will assign a unique tracking number as the Patient Name. Refer to <a href="#">Chapter 10: Image Acquisition-Conduct an Emergency Exam (p. 10-22)</a> for more information. The tracking number is the date and time the exam was initiated. The time is recorded to the second.
[CASSETTE EXAM] 	Begins a cassette exam. Cassette exams allow exposures to be taken without any digital patient record or image storage. Refer to <a href="#">Chapter 10: Image Acquisition-Conduct a Cassette Exam (p. 10-20)</a> for more information.

## Patient List Columns

[Table 9-2](#) describes the columns on the Worklist. This information comes from what has been entered in the Patient Information screen. Refer to [Overview \(p. 9-1\)](#) for detailed descriptions of the information presented.

**Table 9-2** Worklist columns

Column	Description
Patient Name	The full name of the patient as entered in Add Patient/Patient Information screen.
Patient ID	The patient's medical record number or any number that distinguishes the patient.
Accession #	The patient's accession number.
Description	Detail information for every procedure,anatomy name etc..

**Table 9-2** Worklist columns

Column	Description
Date	The date the procedure is scheduled to occur. On locally added procedures, the current date is the default.
Time	The time the procedure is scheduled to occur. On locally added procedures, the current time is the default.
Birth Date	The date of patient birth.
Birth Time	The time of patient birth.
Physician	The name of the physician who perform the exam.
Modality	The modality of the procedure.
Status	<p>The status of the procedure. Available options are:</p> <ul style="list-style-type: none"> <li>• Scheduled – procedure has been created but not started.</li> <li>• Completed – procedure has been closed.</li> <li>• Suspended – procedure was started then interrupted.</li> <li>• Discontinued – procedure was opened but cannot be completed.</li> <li>• In progress – procedure is currently in progress.</li> </ul>

## Manage List / Find Procedures

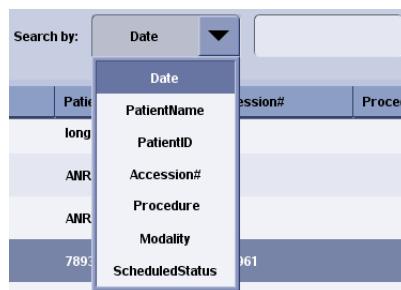
The Worklist has several features that allow you to find patients and procedures quickly and to organize the list to your preferences.

Search, Filters, and Sorting allow you to control the display of the procedures in the Worklist.

### Search

The Search feature finds procedures by column.

Search by column drop-down list



1. Click the button on the Search By drop-down list to select the column you want to search.

- If the column you want is already selected, begin at step 3.
2. Select the column. For example, Patient Name.
    - The list is sorted by the selected column in alphabetical or numerical order.
  3. Type the search criteria into the text box.

**Note:** The text box is not case sensitive.

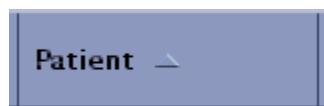
- The list automatically goes to the first procedure that matches the entered criteria.
- If the list is long enough, it will scroll to the first item so that it appears at the top of the list.
- If no procedures match what you have typed, the list de-selects all procedures and places the closest match at the top of the Worklist.

## Sort by Column

Sorting allows you to organize the procedures by the column of your choice.

1. Click the column heading you want to sort, or choose the column in the Search By drop-down list. For example, if you want to see all the procedures that have a status of “Suspended”, click the “Status” column heading.
  - An arrow appears in the column heading to indicate which column is currently being sorted.
2. Click the column heading again to switch between ascending and descending order.
  - An up-pointing arrow indicates that the column is sorted in ascending order. That is, sorted in alphabetical order or numerical order from smallest to largest.
  - A down-pointing arrow indicates that the column is sorted in descending order. That is, sorted in reverse alphabetical order or numerical order from largest to smallest.

**Figure 9-2** Column with ascending sort

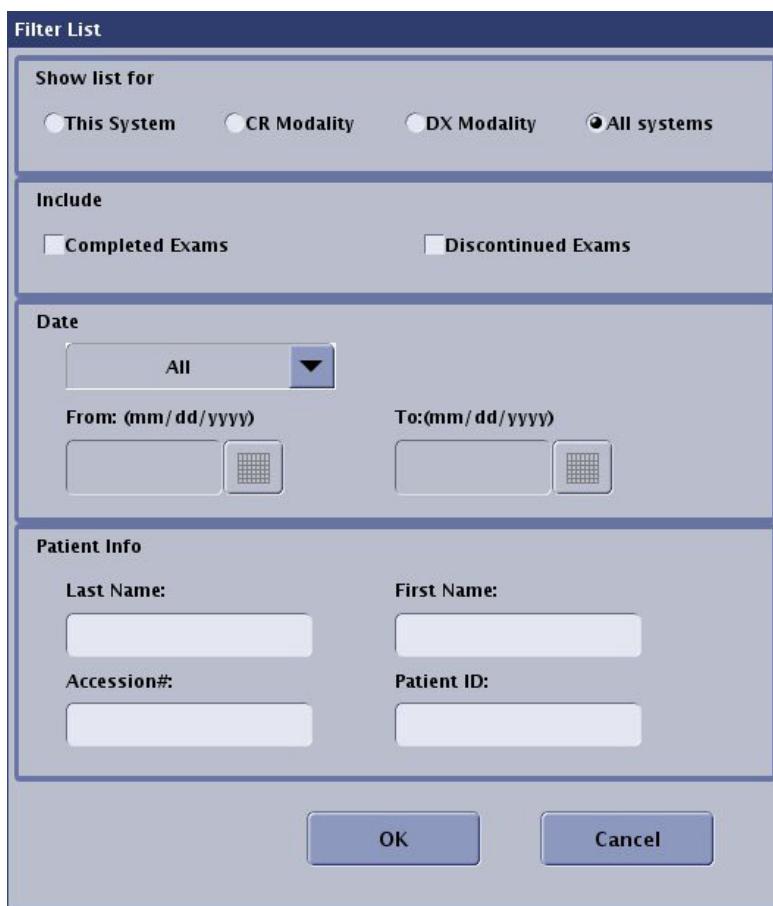


## Filter List

Use filters to only display items corresponding to your chosen criteria, e.g., exams taken only within a specified time period, patients whose last names begin with the letter ‘J’, or patient IDs beginning with the digits ‘547’.

Filters cannot be saved.

Clicking [REFRESH] will remove any filter that has been applied.

**Figure 9-3** Worklist filter screen

The filter screen has several options for accepting or rejecting the information from the Worklist. [Table 9-3](#) describes the filter screen functions.

**Table 9-3** Filter Acceptance/Rejection Buttons

Function	Description
Filter List	Filters the Worklist items by system or modality. <ul style="list-style-type: none"> <li>• This system – procedures entered locally on the unit.</li> <li>• CR modality – procedures for Computed Radiography.</li> <li>• DX modality - procedures for digital x-ray.</li> <li>• All systems – procedures for all modalities.</li> </ul>
Include	Allows you to include or exclude completed or discontinued exams in the filter.
Date	Allows you to select the date of exams to filter by. <ul style="list-style-type: none"> <li>• All – procedures scheduled for any date</li> <li>• Range - procedures scheduled for a specified range of time</li> <li>• Today – procedures scheduled for the current date</li> </ul>
From (mm/dd/yyyy) To (mm/dd/yyyy)	When the “Range” option is selected for the date, allows you to enter dates or pick dates from a calendar screen.

**Table 9-3** Filter Acceptance/Rejection Buttons

Function	Description
Patient Information	<p>Allows you to filter based on data from the Patient Information screen.</p> <p>Available options are:</p> <ul style="list-style-type: none"> <li>• Last Name</li> <li>• First Name</li> <li>• Accession #</li> <li>• Patient ID</li> </ul> <p>The filter may be restricted by any or all of these fields. Leaving a field blank means that it will not be included in the filter.</p>
[OK]	Applies the filter and returns you to the results on the Worklist.
[CANCEL]	Clears the Filter screen and returns you to the Worklist.

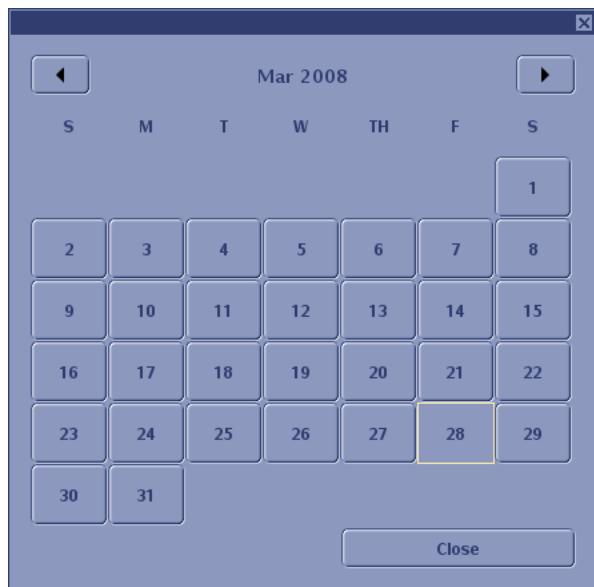
Follow this process to filter the Worklist.

**Note:** The fields may be completed in any order.

1. Click [FILTER LIST] on the Worklist screen.
  - The Filter Screen appears
2. Select the **Show list for** option.
3. Select the **Include** options.
4. Select the **Date** option.
5. If you selected **Range** for the Date option, enter or select the **From** and **To** dates.
  - The current date appears in both the **From** and **To** fields by default.
  - To select dates from the calendar:
    - Click the [CALENDAR] button.

**Figure 9-4** Calendar button

- The Filter calendar screen appears with the current date selected.

**Figure 9-5** Filter calendar screen

- a) Click [◀] to select the previous month, if necessary.
  - b) Click [▶] to select the next month, if necessary.
- ◀      Mar 2008      ▶
- c) Click a date to select it.  
– The calendar closes automatically when a date is clicked.
  6. Enter any **Patient Information** you want to filter by.
    - You do not need to enter full words or numbers into these text boxes.
    - Entering more information into these text boxes will reduce the number of results.
    - Entering less or no information into these text boxes will increase the number of results.

**Note:** The Patient Information text boxes are case sensitive.

7. Click [OK].
  - The Filter screen closes and the Worklist screen appears with only those procedures that met all of the filtering criteria.
  - If no procedures met all the criteria, the Worklist will be blank.
8. Click [REFRESH] to remove the filter.

## Refresh

The system may be configured to automatically refresh the Worklist with data from the HIS/RIS on a regular basis (such as every 10 minutes). However, if your system does not automatically refresh—or you want to refresh the list before the scheduled time—you are able to refresh the list manually.

The Refresh feature also removes any filtering that has been applied. Refer to [Filter List \(p. 9-6\)](#) for more information.

## Manual Refresh

Follow this process to manually refresh the Worklist.

9. Click [REFRESH] on the Worklist.
  - The Worklist updates with HIS/RIS data and removes any filtering.

**Note:** Refresh does not remove locally added procedures.

**Note:** You will not be able to make selections or access Worklist functions while the Worklist is refreshing.

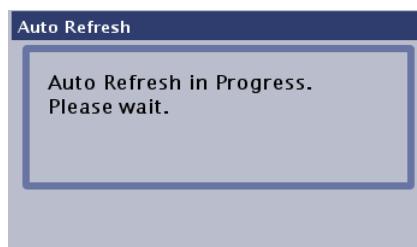
## Auto Refresh

The Auto Refresh interval is set on the Preferences – Worklist screen in System Utilities. Refer to [Chapter 15: Preferences-Worklist \(p. 15-17\)](#) for more information.

When the system auto refreshes, a message ([Figure 9-6](#)) appears: “Auto Refresh in progress. Please wait.” The message remains until the refresh process is complete.

**Note:** You will not be able to make selections or access Worklist functions while the Worklist is refreshing.

**Figure 9-6** Auto refresh message



## Select Procedures

Use the following processes to select a patient from the Worklist. This process assumes the patient already exists on the system. If the patient is not on the Worklist, you must add the patient first. Refer to [Overview \(p. 9-1\)](#) for more information.

### Select a Single Procedure

1. Close or suspend any open exams, if necessary. Refer to [Chapter 10: Image Acquisition-End Exam \(p. 10-30\)](#) for more information.
  - The Worklist screen appears.
2. Select the procedure from the Worklist.
3. Refer to [Chapter 10: Image Acquisition](#) to conduct the exam.

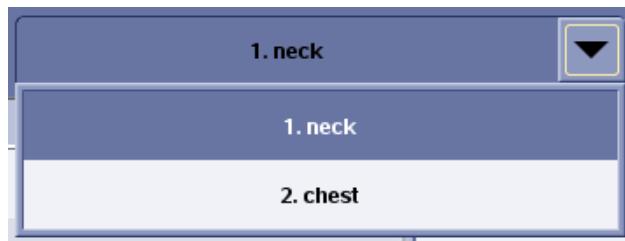
## Select Multiple Procedures

You may select multiple procedures for the same patient to begin image acquisition.

**Note:** The Patient Name, Patient ID #, and Exam Date must match exactly in order to be selected.

1. Sort the Worklist by Patient Name, if necessary.
2. Click on all the procedures that are to be selected.
3. Click on [START EXAM]
4. Select matching protocol from list in drop down menu.

**Figure 9-7** Selecting Protocol From Drop Down Menu



5. Continue to select protocols to match the protocol in the drop down list.
6. Click on [ACCEPT] when all exams have had a protocol assigned.

## Delete Procedures

You may remove procedures from the Worklist individually or all completed, discontinued, and locally added procedures at once.

The [DELETE] button is able to switch between individual delete or delete all.

**Note:** Deleted procedures cannot be recovered or “undeleted.”

To switch the button between “Delete” and “Delete All”:

1. Click on the small arrow on the right side of the button.
  - A list appears with the available actions.

**Figure 9-8** Delete button options



2. Click the action you want to perform.

- The system performs the action and the button name changes to the selection you made. The button will perform the selected action each time it is clicked until you change it.

**Note:** [DELETE] or [DELETE ALL] does not remove procedures from the RIS or HIS. [DELETE] or [DELETE ALL] does not remove any exam images from the image database.

## Delete a Single Procedure

1. Select the procedure to delete.
2. Click [DELETE]. If necessary, switch the button to [DELETE].
  - A message appears: “Are you sure that you would like to delete the selected items?”
3. Click [OK] to delete the procedures.
  - [CANCEL] retains the procedures and the Worklist appears.

## Delete All Completed, Discontinued, and Local Procedures

1. Click [DELETE ALL]. If necessary, switch the button to [DELETE ALL].
  - A message appears: “All Completed, Discontinued, and locally scheduled exams will be deleted from this list. Any suspended exams will need to be individually deleted.”
2. Click [OK] to delete the procedures.
  - The selected procedures are deleted and the Worklist appears.
  - [CANCEL] closes the message, retains the procedures, and takes you back to the Worklist.

## Delete Suspended Procedures

Suspended procedures cannot be deleted unless their status is changed to “Completed” or “Discontinued”

1. Select the suspended procedure to delete.
  - A message appears: “The patient entry you are trying to delete is still in progress. Would you like to mark the patient as ‘Completed’ / ‘Discontinued’ and proceed with deletion?”
2. Click [COMPLETE] or [DISCONTINUE].
  - [COMPLETE] changes the Status to of the procedures to “Completed.” If enabled, any acquired images are auto pushed, auto printed, and sent to PACS.
  - [DISCONTINUE] changes the Status to “Discontinued.” Any acquired images are marked as Discontinued and the information is sent to PACS.
  - [CANCEL] closes the message and returns you to the Worklist without deleting procedures.
  - The procedures are removed from the Worklist.

# Add or Edit Patient Information

## Overview

The Add Patient ([Figure 9-9](#)) and Patient Information screens allow you to enter patient and procedure information before starting an exam or to view the information at any time.

**Note:** This screen may also be known as the Medical Procedure Card or MPC.

- To add a patient to the Worklist, click [ADD PATIENT] and enter or select the appropriate information.

**Note:** Make sure the patient's name, ID number, birth date, and gender information are entered correctly.



**CAUTION** Use only standard alphanumeric characters to complete the screen.

- To view the patient information from the Worklist or Image Management screens, select the exam then click [PATIENT INFORMATION]. Patient information is not editable when launched from the Image Management screen.
- To view the patient information from the Acquisition or Image Viewer screens, click [PATIENT INFORMATION]. Patient information is not editable when launched from these screens.

Patient Information provided by the HIS/RIS cannot be edited.

Patient Information entered locally is editable until the exam is started. It is not editable after the exam is started or in progress.

**Note:** The Patient Information button is unavailable when multiple exams are selected at the same time.

**Figure 9-9** Add Patient or Patient Information

The screenshot shows the 'Add Patient' window with two main sections: 'Patient' and 'Exam'.

**Patient Section:**

- First Name: [Text Box]
- Middle Name: [Text Box]
- Last Name: [Text Box]
- Gender: [Dropdown] set to 'Other'
- Age: [Text Box] and [Dropdown] set to 'Years'
- Patient ID: [Text Box]
- Birth Date (mm/dd/yyyy): [Text Box]
- Birth Time (HH:MM 24Hr): [Text Box]

**Exam Section:**

- Accession #: [Text Box]
- Status: [Dropdown] set to 'SCHEDULED'
- Operator: [Text Box]
- Performing Physician: [Text Box]
- Referring Physician: [Text Box]
- Exam Date(mm/dd/yyyy): [Text Box] set to '02/24/2011'
- Scheduled Exam Time (hh:mm): [Text Box] set to '22:12'
- Study ID: [Text Box]
- Modality: [Text Box] set to 'DX'
- Procedure Description: [Text Box]

Buttons at the bottom: Start Exam, Save, Cancel.

**Table 9-4** Patient Information description

Function	Description
<b>Patient Section</b>	
First Name	Identifies the patient's first name.
Middle Name	Identifies the patient's middle name or initials.
Last Name	<p>Identifies the patient's last name.</p> <p><b>Note:</b> Emergency Exams automatically fill this field with a system-generated identification, which is the word "NEW" followed by a date and time stamp of the second the Emergency Exam button was clicked. For example: NEW050622140345. The exam was initiated in year 05, month 06, day 22, hour 14, minute 03, and second 45.</p>
Gender	Defines the sex of the patient. By default, "Other" is selected when the screen first opens.
Patient ID	Identifies the patient's medical record number or any number that distinguishes the patient. This number must be unique.

**Table 9-4** Patient Information description

Function	Description
Birth Date	<p>Identifies the patient's birthday in the format mm/dd/yyyy. If the date is not entered in the correct format, the screen will show the date field in red when [START EXAM] or [SAVE] is clicked.</p>  <p>In the above example, the year was entered with only 2 digits ("45" instead of "1945").</p>
Birth Time	Identifies the patient's birth time in the 24-hour format HH:MM
Age	Identifies the patient's age. The field updates with the correct age when the Birth Date is entered.
<b>Exam Section</b>	
Accession Number	Identifies the exam's accession number.
Operator	<p>Identifies the operator's name or initials. You can use the drop-down list to select commonly used names, or type the name into the drop-down list box.</p> <p>Refer to <a href="#">Chapter 15: Preferences-Preset Names (p. 15-19)</a> for information on adding names to the drop-down list.</p>
Performing Physician	<p>Identifies the Radiologist or performing physician. You can use the drop-down list to select commonly used names, or type the name into the drop-down list box.</p> <p>Refer to <a href="#">Chapter 15: Preferences-Preset Names (p. 15-19)</a> for information on adding names to the drop-down list.</p>
Referring Physician	<p>Identifies the referring physician. You can use the drop-down list to select commonly used names, or type the name into the drop-down list box.</p> <p>Refer to <a href="#">Chapter 15: Preferences-Preset Names (p. 15-19)</a> for information on adding names to the drop-down list.</p>
Exam Date (mm/dd/yyyy):	Exam day.
Study ID	Displays the procedure ID number.

**Table 9-4** Patient Information description

Function	Description
Status	<p>Displays the status of the selected exam.</p> <p>When adding a patient, the only option is “Scheduled”.</p> <p>Patient Information options are:</p> <ul style="list-style-type: none"> <li>• Scheduled - The procedure has been added to the Worklist, but the exam has not started.</li> <li>• Suspended - An exam was started but interrupted before completion. The exam may be resumed at a later time.</li> <li>• Complete - The exam is one that has been “Closed” on the Acquisition screen or marked as “Complete” on the Patient Information screen. Completed exams are sent to the PACS (where available).</li> <li>• Discontinued - The procedure was opened, but no exposures were taken. The exam may be started at a later time or the procedure deleted.</li> <li>• In progress - The exam is currently in progress.</li> </ul>
Study Description:	Display the description of study.
Modality	Displays the modality of the exam. The abbreviation for x-ray is DX.
Scheduled Exam Time (hh:mm)	The scheduled exam time.
Procedure Description	Procedure description.
[START EXAM]	<p>Displays the Select Protocol screen in preparation for making exposures. Refer to <a href="#">Chapter 10: Image Acquisition-Select or Change Protocols (p. 10-12)</a> for more information. This also adds the patient name to the Worklist.</p> <p><b>Note:</b> This button does not appear if the Patient Information screen is opened from the Image Viewer or Image Management screens.</p>
[SAVE]	<p>Adds the patient to the Worklist or saves changes and closes the Add Patient/Patient Information screen.</p> <ul style="list-style-type: none"> <li>• If the Save button is selected but all of the data fields have not been filled in, a new patient is created anyway.</li> <li>• If no patient name has been entered, then the patient name will be listed as “New Patient”. This allows you to start an exam quickly.</li> </ul>
[CANCEL]	Erases all newly entered information and closes the Add Patient/Patient Information screen without updating the Worklist.

## Add Patient



**CAUTION** Use this procedure to enter the patient’s information into your system.

1. Open the Worklist screen.
  - The Patient Worklist screen appears.
2. Click [ADD PATIENT].
  - The Add Patient screen appears.
3. Enter the patient information.



**CAUTION** Make sure the patient's name, ID number, birth date, and gender information are entered correctly.

4. Click [SAVE] or [START EXAM].
  - Click [SAVE] to add the patient to the Worklist and return to the Worklist screen.
  - Click [START EXAM] (if available) to add the patient to the Worklist and begin Acquisition.
  - Click [CANCEL] to close the Add Patient screen without saving changes.

**Note:** For a new exam on a existing patient, the patient information cannot be edited.

## Edit Patient Information

Patient information can only be edited before any procedure has been started.

**Note:** Patients generated through a RIS/HIS cannot be edited on the system.

**Note:** You may only edit patient information for one procedure at a time. If multiple procedures are selected, the [PATIENT INFORMATION] button is disabled.

1. Select the procedure from the Worklist.
2. Click [PATIENT INFORMATION].
  - The Patient Information screen appears.
3. Edit the information as necessary.
4. Click [SAVE] to record the changes and return to the Worklist.
  - Clicking [CANCEL] closes the Patient Information screen without saving changes.

# Chapter 10: Image Acquisition

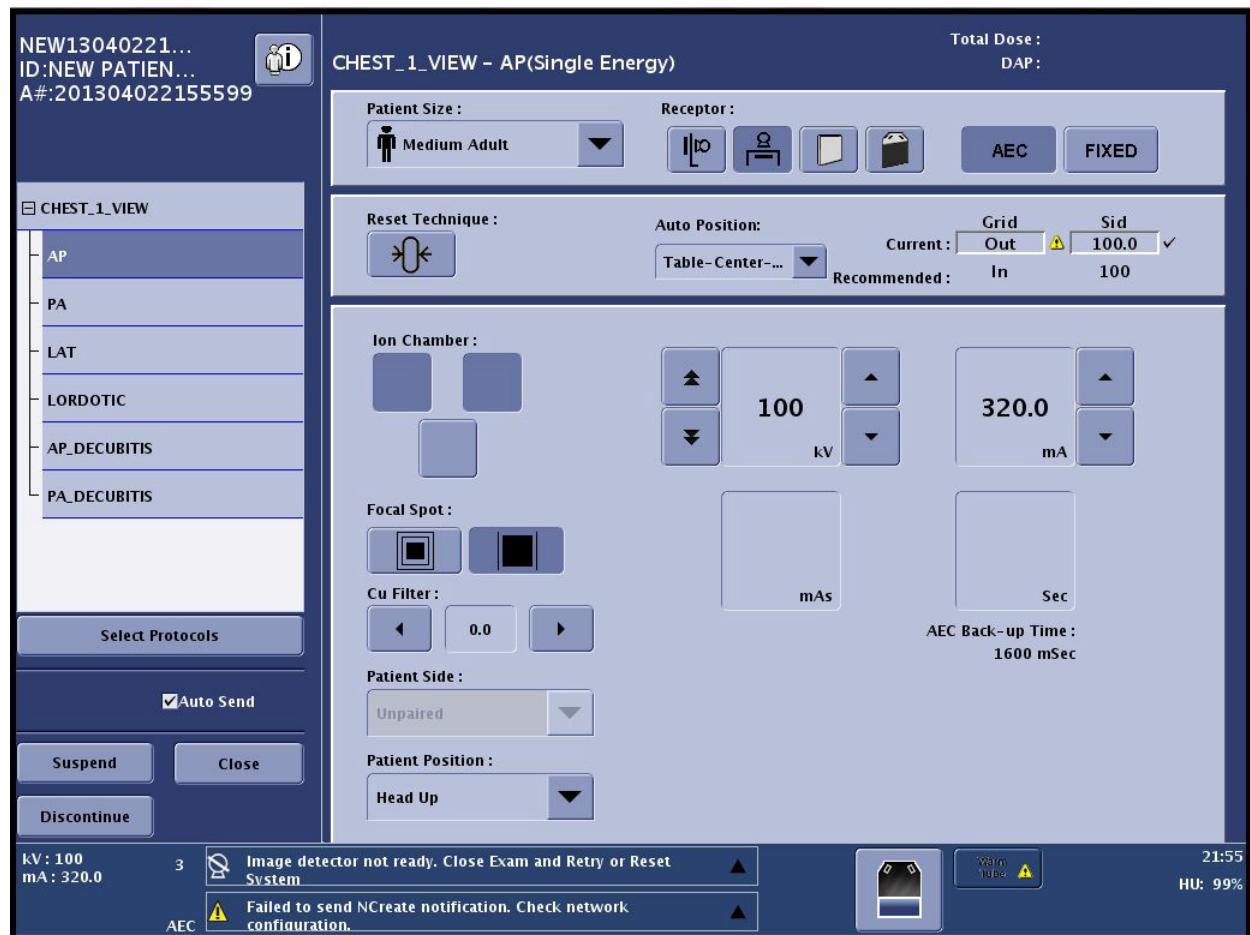
This section details the process of acquiring images using the Digital Detector or free cassette.

## Overview

The Acquisition screen (Figure 10-1) is where the exam is set up and exposure details are adjusted. This screen appears when you click the [START EXAM], [EMERGENCY EXAM], or [CASSETTE EXAM] buttons on the Worklist or [START EXAM] from the Add Patient screen.

**Note:** If you clicked the [CASSETTE EXAM] button, the Acquisition screen will present a limited set of options. Refer to [Conduct a Cassette Exam \(p. 10-20\)](#) for more information about cassette exams.

**Figure 10-1** Acquisition screen



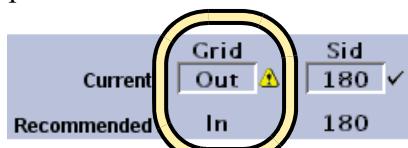
**Table 10-1** Image Acquisition functions

Function	Description
Patient identification 	Identifies the patient name and patient identification number for the current procedure.
[PATIENT INFORMATION] 	Displays Patient Information screen for the current procedure. Refer to <a href="#">Chapter 9: Worklist-Add or Edit Patient Information (p. 9-13)</a> for more information.
Exam 	If multiple exams were selected from the Worklist, switches between exams for protocol selection, technique adjustment, and acquisition. This drop-down list does not appear if a single exam was selected, or if the exam was initiated with the Emergency Exam or Cassette Exam buttons on the Worklist.
Protocol list 	Lists the available views for the exam and shows which view is currently active.
[SELECT PROTOCOLS] 	Brings up the Select Protocols screen to add, remove, or change protocols. Refer to <a href="#">Select or Change Protocols (p. 10-12)</a> for more information.
Auto Send 	If Auto Send is enabled, automatically sends acquired images to a pre-determined location on exam close. Refer to <a href="#">Chapter 15: Preferences-Auto Send (Auto Push) (p. 15-26)</a> for more information.
[SUSPEND] 	Ends the exam with the intent of continuing at a later time. Does not initiate auto send or auto print, if enabled. Refer to <a href="#">End Exam (p. 10-30)</a> for more information.

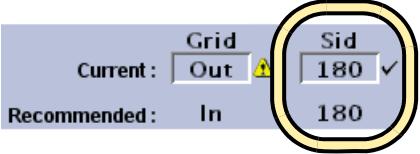
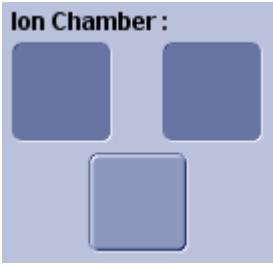
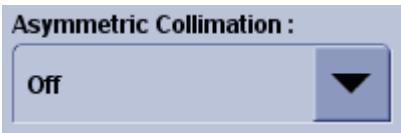
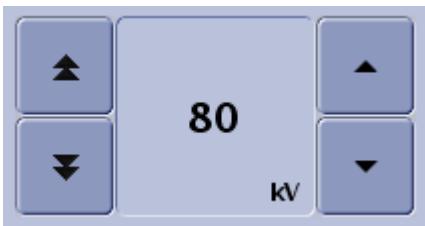
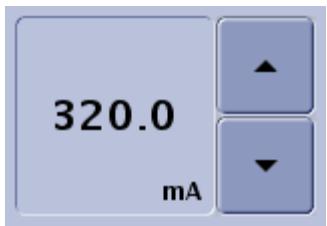
**Table 10-1** Image Acquisition functions

Function	Description
<p>[CLOSE]</p> 	<p>Closes the procedure. If enabled, [CLOSE] sends billing information to the PACS system, auto sends, and auto prints acquired images.</p> <p>Refer to <a href="#">End Exam (p. 10-30)</a> for more information.</p>
<p>[DISCONTINUE]</p> 	<p>Ends the exam when the procedure has been opened but the exam cannot continue.</p> <p>Refer to <a href="#">End Exam (p. 10-30)</a> for more information.</p>
<p>Protocol information</p> <p><b>NECK_ST – AP(Single Energy)</b></p>	<p>Identifies the currently selected protocol and view. Also identifies if the protocol is for a Single Energy, Dual Energy, Image Pasting, or VolumeRAD exam.</p>
<p>Total Dose:</p> <p><b>Total Dose : 0.0 mGy</b></p>	<p>Displays the total entrance dose at the corresponding distance.</p> <p>Refer to <a href="#">Patient Dose Reporting (p. 10-8)</a> for more information.</p>
<p>Total DAP:</p> <p><b>Total DAP : 3.2 dGycm^2</b></p>	<p>Displays the entrance dose estimate multiplied by the field-of-view area at the corresponding distance from receptor after an exposure is taken.</p>
<p>Patient Size:</p> <p><b>Patient Size :</b></p> 	<p>Selects the size of the patient being x-rayed.</p> <p>Available options are:</p> <ul style="list-style-type: none"> <li>• Small Pediatric</li> <li>• Medium Pediatric</li> <li>• Large Pediatric</li> <li>• Small Adult</li> <li>• Medium Adult</li> <li>• Large Adult</li> </ul> <p><b>Note:</b> Pediatric techniques are set at different system speeds than adult techniques. For example, the system speed for a pediatric exam of 70 kV at 32 mAs is 800. The default system speed for an adult exam of 70 kV at 32 mAs is 400.</p>

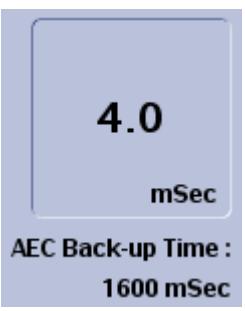
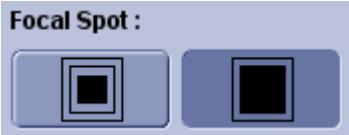
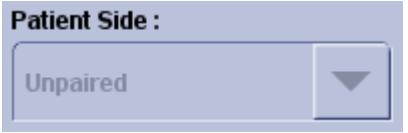
**Table 10-1** Image Acquisition functions

Function	Description
Receptor: 	Selects the receptor for the protocol. The available receptors depend on your system configuration and on the selected protocol. Not all receptors are available for every protocol. In order from left to right, the options are: <ul style="list-style-type: none"> <li>• Wallstand</li> <li>• Table</li> <li>• Film/CR Cassette</li> <li>• Detector (Table Top Mode)</li> </ul> <b>Note:</b> The generator limits exposure time to two (2) seconds for all receptors.
[AEC] and [FIXED] (mode) 	Selects AEC or FIXED modes. Refer to <a href="#">Automatic Exposure Control (AEC) (p. 10-23)</a> for more information about AEC.
Reset Technique: 	Resets the technique to the default protocol settings.
Auto Position 	Selects a pre-defined position for the x-ray tube. Pressing and holding the AUTO POSITIONING button on the RCIM initiates movement to the selected position. If Auto Positioning is not enabled on your system, the control does not appear. Refer to <a href="#">Chapter 13: Advanced Applications-Auto Positioning (p. 13-4)</a> for more information.
Grid position 	Shows the current grid position and the recommended grid position for this technique. The alert icon indicates that the grid is not in the recommended position. A checkmark indicates that the current grid position matches the recommended position. <b>Note:</b> Exposure may not be inhibited if the current grid position is not the recommended position.

**Table 10-1** Image Acquisition functions

Function	Description
<b>SID</b> 	Shows the current SID and the recommended SID for this technique. The alert icon indicates that the SID is not at the recommended position. A checkmark indicates that the current SID matches the recommended SID. <b>Note:</b> Exposure may not be inhibited if the current SID is not the recommended SID.
<b>Ion Chamber:</b> (AEC mode only) 	If in AEC mode, selects the ions chambers to use. <b>Note:</b> When in AEC mode, at least one ion chamber must be selected. Any combination of chambers is allowed. <b>Note:</b> When in AEC mode, the body part must cover the selected ion chambers in order to achieve the proper exposure. Refer to <a href="#">Automatic Exposure Control (AEC) (p. 10-23)</a> for more information about AEC.
<b>Asymmetric Collimation:</b> 	Allows enabling and selection of Asymmetric Collimation for the wall stand receptor. Available options are: <ul style="list-style-type: none"> <li>• Top</li> <li>• Bottom</li> <li>• Off</li> </ul> <b>Note:</b> Asymmetric collimation is only available if the wall stand receptor is selected.
<b>kV</b> 	Adjusts the kV. The up/down buttons on the right of the field adjust the kV by one unit. The buttons on the left of the field adjust the kV by 5 units. The kVp selection range is 40-150, in 1 kVp increments.
<b>mA</b> 	Adjusts the mA. The mA selection is in Renard steps. The available selections are: 10, 12.5, 16, 20, 25, 32, 40, 50, 64, 80, 100, 125, 160, 200, 250, 320, 400, 500, 640. <b>Note:</b> Not all mA and mAs selections are available at all kV settings.

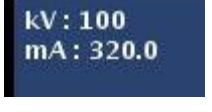
**Table 10-1** Image Acquisition functions

Function	Description
mAs 	<p>Adjusts the mAs.</p> <p>The mAs selection is in Renard steps. The available selections are: 0.1, 0.12, 0.16, 0.20, 0.25, 0.32, 0.40, 0.50, 0.64, 0.80, 1.0, 1.25, 1.6, 2.0, 2.5, 3.2, 4.0, 5.0, 6.4, 8.0, 10.0, 12.5, 16.0, 20.0, 25.0, 32.0, 40.0, 50.0, 64.0, 80.0, 100.0, 125.0, 128.0, 160.0, 200.0, 250.0, 256.0, 320.0, 400.0, 500.0, 512.0.</p> <p><b>Note:</b> Not all mAs selections are available at all kV settings.</p> <p>If in AEC mode, shows the calculated mAs for the current kV and mA after exposure.</p>
mSec 	<p>Shows the exposure time for the technique with the current kV, mA, and mAs settings after exposure is completed.</p> <p>If in AEC mode, the AEC back-up time is displayed below the Sec field.</p> <p>The AEC default backup time is two (2) seconds.</p>
Focal Spot: 	<p>Selects a large or small focal spot.</p>
CU Filtration: 	<p>Selects the amount of copper filtering. The selectable range is 0.0mm, 0.1mm, or 0.2mm.</p> <p>The recommended amount of filtering is shown below the selection area.</p>
Patient Side: 	<p>If conducting an exam on paired anatomy (for example, extremities), selects the side of the patient being x-rayed.</p> <p>Options are:</p> <ul style="list-style-type: none"> <li>• Both</li> <li>• Left</li> <li>• Right</li> </ul> <p>If conducting an exam on unpaired anatomy, the control is disabled and displays "Unpaired", as shown here.</p>

**Table 10-1** Image Acquisition functions

Function	Description
Patient Position: 	Selects the patient position relative to the receptor. The available options change if the currently selected protocol view is for paired or non-paired anatomy. For paired anatomy, the available options are: <ul style="list-style-type: none"> <li>• Digits to Head</li> <li>• Digits to Feet</li> <li>• Digits to Front</li> <li>• Digits to Back</li> </ul> For unpaired anatomy, the available options are: <ul style="list-style-type: none"> <li>• Head Up</li> <li>• Head Down</li> </ul> <b>Note:</b> The above lists of positions for paired and unpaired anatomy are a general guidelines only. Some views have different options.
Heat Units Remaining 	Shows the percentage of heat units remaining.
System status and message bar 	Displays the last system status and message.
[QAP] 	When the yellow alert icon is present, indicates that QAP should be performed to ensure continued image quality. <b>Note:</b> QAP cannot be performed when the Image Acquisition or Image Viewer screens are displayed. End the exam before attempting to perform QAP. Refer to <a href="#">Chapter 14: Quality Assurance and Maintenance (p. 14-1)</a> for more information.

**Table 10-1** Image Acquisition functions

Function	Description
<p>[WARM TUBE]</p> 	<p>Displays the tube warming status. When the yellow alert icon is present, the tube must be warmed before images may be acquired.</p> <p><b>Note:</b> Because the tube warming procedure produces x-rays, it cannot be performed when an exam is open. If the tube must be warmed before the exam can begin, suspend the exam (refer to <a href="#">End Exam (p. 10-30)</a> for more information) and remove the patient and any others from the room before warming the tube.</p> <p>Refer to <a href="#">Chapter 4: General Information-Tube Warm Up (p. 4-10)</a> for more information.</p>
<p>[EXPOSE HOLD]</p> 	<p>Appears when there is some condition that prevents an x-ray from being taken.</p> <p>Click the button to view a list of all errors and interlocks that are preventing the exposure. The items are removed from the list as they are corrected. The button disappears when all errors and interlocks are corrected.</p>
<p>[iLinq]</p> 	<p>Connects to iLinq remote support services.</p>
<p>[Secondary Technique Display]</p> 	<p>Displays the technique values that the generator has loaded.</p> <p><b>Note:</b> Could be the previous exposure techniques performed.</p>

## Patient Dose Reporting

Estimates of patient dose are calculated after each acquisition and optionally displayed as part of image annotations. This information is also stored in the DICOM header of each image (the RAW image and its corresponding PROCESSED image) and cannot be edited or modified by the operator.

- Entrance Dose (unit: mGy) is an estimate of entrance dose (air-kerma) at a distance X in front of the wall-stand cover or above the tabletop, depending on which receptor was used for acquisition. The default X is 25cm (~ 10 in) but can be modified to site preference by service.

Entrance dose is stored in DICOM header tag (0018,1405) in units of  $\mu$ Gy.

- Dose Area Product or DAP (unit: dGy·cm<sup>2</sup>) is the entrance dose estimate multiplied by the field-of-view area at the corresponding distance from receptor.

DAP is stored in DICOM header tag (0018,115e) in units of dGy·cm<sup>2</sup>.

**Note:** The patient dose estimates are accurately calculated using (1) current system and technique settings and (2) measured values collected during system install/calibration. They are not actual per-image measurements of patient dose.

**Note:** The radiation dose is inversely proportional to the square of the focal spot to skin distance.

In manual override mode and Free Cassette mode, the SID displayed on the collimator is used to calculate the DAP.

## Dose Reporting Tool

The Dose Reporting Tool allows a user to export dose relevant data within a specific time frame.

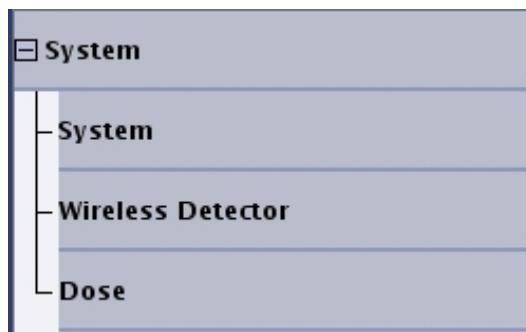
The Excel spreadsheet includes the following exported information:

- Patient Name
- Patient ID
- Patient Age
- Operator
- Patient Size
- Anatomy
- Receptor
- FOV (Field of View)
- KV
- mAs
- Time
- Protocol Name
- DAP (Dose Area Product)

## How to Export

The Dose Reporting Tool allows a user to export dose relevant data within a specific time frame.

1. Insert CD/USB.
2. Click on Utilities.
3. Select System-Dose.

**Figure 10-2** System-Dose

4. Select time frame by clicking on calendar icon.

**Figure 10-3** Time Frame

The screenshot shows the 'System - Dose' interface. At the top, there are two sets of date and time input fields. The first set, labeled 'From:', has a date of '06/03/2008' and a time of '19:17'. The second set, labeled 'To:', has a date of '06/05/2008' and a time of '16:12'. To the right of each date field is a small calendar icon. To the right of each time field is a 'Reset' button: 'Reset to Last Export' for the 'From:' row and 'Reset to Now' for the 'To:' row. Below these fields are two large blue buttons: 'Export To CD' on the left and 'Export To USB' on the right.

5. Remove CD/USB while export is complete.

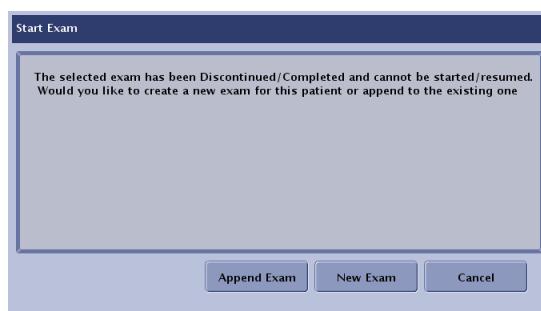
**Figure 10-4** Sample Report

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Patient Name	Patient ID	Patient Age	Operator Name	Patient Size	Anatomy	Receptor	FOV	kVp	mAs	expo:	Protocol	DAP
2													
3	John Doe	11111	12	Suzi Tech	LARGE_PEDIATRIC	HIP	TABLE	410.00000	70	5	31.5	SHOULDER	2.300988
4	John Doe	11111	12	Suzi Tech	LARGE_PEDIATRIC	PELVIS	TABLE	300.00000	70	6.3	31.5	PELVIS	0.954728
5	Jane Doe	32456	43	Suzi Tech	MEDIUM_ADULT	CHEST	WALLSTAND	410.00000	120	1	19	CHEST	1.744153
6	Jane Doe	34356	35	Suzi Tech	MEDIUM_ADULT	SHOULDER	TABLE	300.00000	65	3.2	6	SHOULDER	0.54257
7	Adam Smith	35478	21	Suzi Tech	SMALL_ADULT	HAND	DIGITALCASSE	410.00000	55	2	20	HAND	1.003513
8	Mary Jones	8979	2	Suzi Tech	SMALL_PEDIATRIC	ELBOW	DIGITALCASSE	410.00000	50	1	8	ELBOW	1.003555
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21													
22													
23													
24													
25													

## Re-start Completed or Discontinued Exams

Procedures with a Status of “Completed” or “Discontinued” cannot be re-opened. However, you may create a new exam or append the existing exam.

1. Select the procedure(s) from the Worklist.
2. Click [PATIENT INFORMATION] to verify the patient, if necessary.
3. Click [RESUME EXAM].
  - A message appears: “The selected exam has been Discontinued/Completed and cannot be started/resumed. Would you like to create a new exam for this patient or append to the existing exam?”

**Figure 10-5** Start a discontinued or completed exam message

4. Click the button of the action to perform.
  - [APPEND EXAM] creates a new series within the existing exam and opens the Select Protocols screen.
  - Note:** The new exam will be placed under the same accession number as a new series. Check your facility's conformance standards before selecting this option because it may effect HIS/RIS or PACS formats.
  - [NEW EXAM] creates a new exam and series for the patient and opens the Select Protocols screen.
  - [CANCEL] closes the message and returns you to the Worklist.
5. Refer to [Select or Change Protocols \(p. 10-12\)](#) to continue with the exam.

## Resume Suspended Exams

Suspended exams may be resumed at any time. The process of resuming a suspended exam is the same as starting a new exam.

1. Select the exams from the Worklist.
2. Click [RESUME EXAM].

**Note:** Protocol selections and technique changes are not saved in a suspended exam. Protocols must be re-selected and techniques must be re-set.

## Select or Change Protocols

The Select Protocols screen ([Figure 10-6](#)) appears when you click [START EXAM] on the Worklist or Add Patient screen or when you click [SELECT PROTOCOLS] on the Acquisition screen.

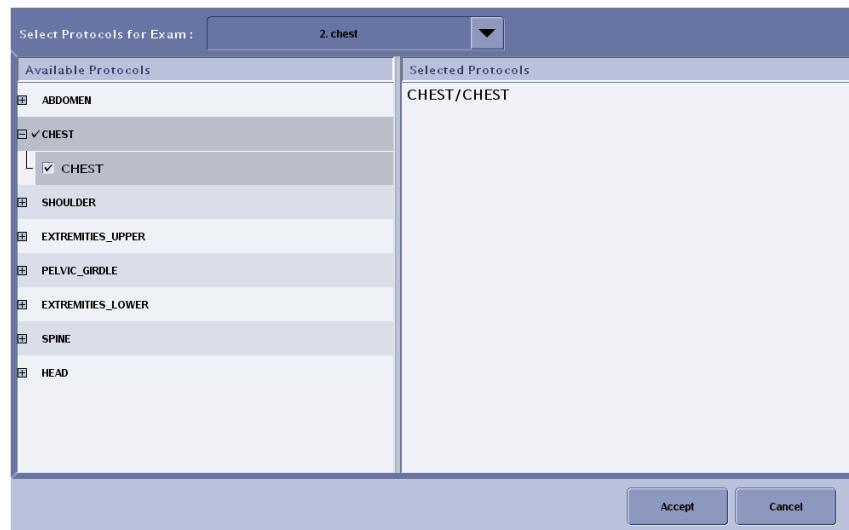
**Note:** The protocols supplied with the system represent examples for procedures commonly conducted in radiography. Based on the needs of a particular practice, these protocols may be modified to optimize factors such as image quality or dose reduction. Work with your team of Radiologists, Medical Physicists and Technologists to evaluate techniques that may reduce radiation dose and provide adequate diagnostic information.

The select protocols screen is divided into two halves: Available Protocols on the left and Selected Protocols on the right.

- Available Protocols lists all the protocols currently listed in the database, categorized by anatomical region: for example, head, chest, spine, and abdomen. Each category expands to show the exam(s) for that category.
- Selected Protocols lists all currently selected protocols in the following format: anatomy / exam. This list automatically updates as protocols are selected or removed.

Refer to [Chapter 15: Preferences-Protocols \(p. 15-37\)](#) for information on adding protocols to the protocol database.

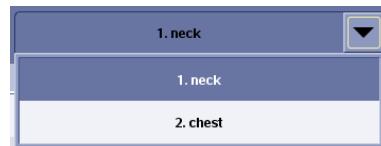
**Figure 10-6** Select Protocols



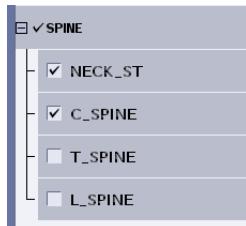
Use this process to select or change protocols for a procedure.

1. If multiple procedures were selected from the Worklist, select the procedure from the drop-down list.

**Figure 10-7** Select procedure



2. Click on an anatomical category (Available Protocols side) to open it.
  - The category expands to show the available exams.
  - Click on the anatomical category name again to close it.
3. Click on an exam to select it.
  - A checkmark appears in the box to the left of the exam name.
  - A checkmark appears next to the category name. This indicates that the category has at least one exam selected.

**Figure 10-8** Selected exams

- The category and exam name appear in the Selected Protocols list.
4. Click the exam again to de-select it.
    - The category and exam name are removed from the Selected Protocols list.
  5. Repeat process until all exams are selected for all procedures.
  6. Click [ACCEPT] when finished.
    - The Select Protocols screen closes.
    - The Acquisition screen appears.
    - [CLOSE] removes the selections and returns you to the Worklist.
  7. Refer to [Conduct a Table Exam \(p. 10-15\)](#), [Conduct a Wallstand Exam \(p. 10-17\)](#), [Conduct a Table Top Exam \(p. 10-19\)](#), or [Conduct a Cassette Exam \(p. 10-20\)](#) to continue the exam.

## Automatic Protocol Assist (Option)

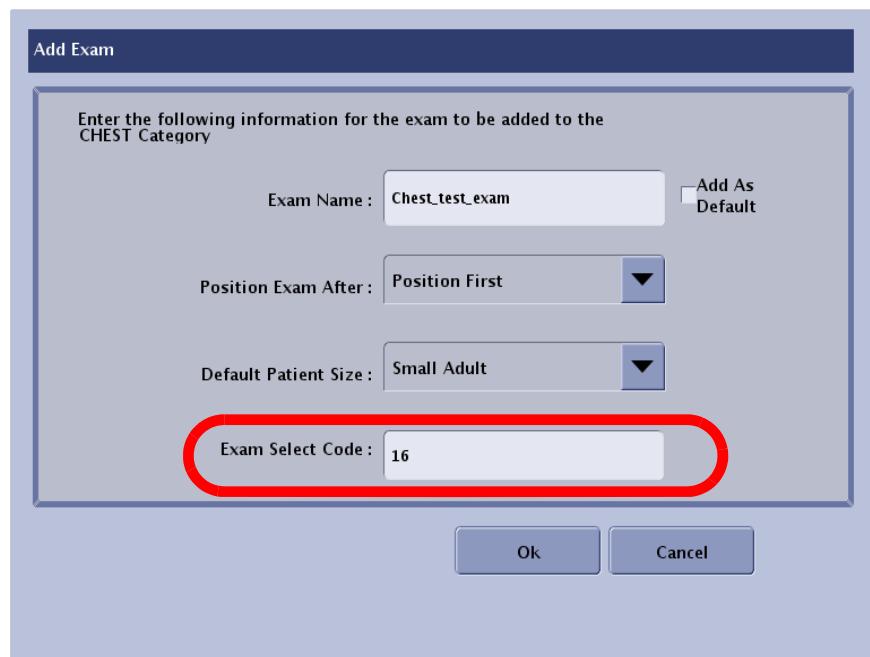
Automatic Protocol Assist (APA) is a feature that eliminates the protocol selection process and takes you directly to the Acquisition screen for the appropriate exam view after selecting the patient from the Worklist. This feature is designed to help provide better ease of use.

For APA to function, the system protocol database must have matching values for the Requested Procedure Code from the selected Exam in the HIS/RIS Worklist. The Acquisition screen will open with the first view of the first exam selected.

- If multiple Scheduled Procedure Step (SPS) entries are selected at the same time, the error message will indicate which protocol codes received from the HIS/RIS did not match.
- If your system has Automatic Protocol Assist enabled but you have manually added a patient or began an Emergency Exam, the following message will appear after you click the [START EXAM] button: “None of the protocol codes match with any of the existing protocols in the database. Please select them manually.” Click the [OK] button to dismiss the message and proceed to select the protocols as previously described.

You are still able to change or select additional protocols from the Acquisition screen using the previously described process.

Automatic Protocol Assist codes are added or edited through the **Exam Select Code** field on Add Exam or Edit Exam screen ([Figure 10-9](#)) of the Edit Protocol Database preferences. Refer to [Chapter 15: Preferences-Add or Edit Exam \(p. 15-41\)](#) for more information.

**Figure 10-9** Add Exam screen

## Conduct a Table Exam

This section describes the adjustments required when conducting a table exam.

Refer to [Chapter 5: Quick Steps-General Acquisition \(p. 5-4\)](#) for an overview of the entire acquisition process.

Follow this process to conduct a table exam.

**Note:** If you need to interrupt the exam and resume it at a later time, click the [SUSPEND] button. You will be returned to the Worklist.

1. Select the Exam and View to perform from the protocol list.
2. Select the **Patient Size**. The system default is Medium Adult.

**Note:** To optimize processing for the best image quality, Patient Size should be confirmed for each view. Available options are:

- Small Pediatric
- Medium Pediatric
- Large Pediatric
- Small Adult
- Medium Adult
- Large Adult



**WARNING** It is critical to select the proper patient size on the Acquisition screen. The incorrect Patient Size may result in an unnecessarily large radiation dose or multiple exposures.

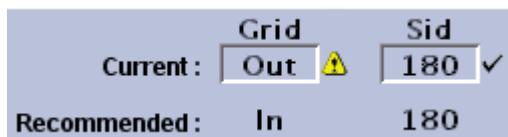
3. Select the Table Receptor, if necessary ([Figure 10-10](#)).

**Figure 10-10** Receptors: Table receptor selected



4. Select [AEC] or [FIXED] mode (if applicable for the protocol).
5. Confirm or adjust the **Grid** and **SID** status.

**Figure 10-11** Grid and SID position



- An alert icon appears if the current Grid or SID is not in the recommended position for the technique.
- A checkmark appears if the current Grid or SID is in the recommended position for the technique.
- [Figure 10-11](#) shows the Grid not in the recommended position and the SID in the recommended position.

**Note:** You may still be able to take exposures even if the grid or SID are not in the recommended positions.

6. Make technique adjustments as necessary: **kV**, **mA**, **Focal spot**, **Cu Filter**, and **Ion chambers** (AEC mode only).

**Note:** Click [RESET TECHNIQUE] at any time to reset the technique to the default protocol settings.

7. Position the patient on the table.

**Note:** When in AEC mode, the body part must cover the selected ion chambers in order to achieve the proper exposure.

8. Confirm or adjust the **Patient Side** field, if applicable.
9. Confirm or adjust the **Patient Position** field.
10. If your system has auto positioning, select the position from the Auto Position drop-down list and hold down the AUTO POSITIONING button on the RCIM until the tube stops moving. A message will appear in the Message Log area to confirm that the tube is in place. Refer to [Chapter 13: Advanced Applications-Auto Positioning \(p. 13-4\)](#) for more information.
11. Collimate and shield as appropriate for the exam.



**WARNING** If using AEC mode, collimation must be active over the ion chambers being used. If it is not possible to collimate over the selected ion chambers, then FIXED mode must be used in order to prevent possible patient over-exposure.

12. Have the patient suspend respiration, if required.
13. Make exposure using the hand-switch.
  - The image appears on Image Viewer screen (right monitor).

**Note:** On average, a preview image appears on the Image Viewer screen in less than 3 seconds after a single exposure, and the corresponding fully processed image appears in less than 9 seconds. A Dual Energy image set will take on average less than 15 seconds to appear on the Image Viewer screen after acquisition.

## Conduct a Wallstand Exam

This section describes the adjustments required when conducting a wallstand exam.

Refer to [Chapter 5: Quick Steps-General Acquisition \(p. 5-4\)](#) for an overview of the entire acquisition process.

Follow this process to conduct a wallstand exam.

**Note:** If you need to interrupt the exam and resume it at a later time, click the [SUSPEND] button. You will be returned to the Worklist.

1. Select the Exam and View to perform from the protocol list.
2. Select the **Patient Size**. The system default is Medium Adult.

**Note:** To optimize processing for the best image quality, Patient Size should be confirmed for each view. Available options are:

- Small Pediatric
- Medium Pediatric
- Large Pediatric
- Small Adult
- Medium Adult
- Large Adult



**WARNING** It is critical to select the proper patient size on the Acquisition screen. The incorrect Patient Size may result in an unnecessarily large radiation dose or multiple exposures.

3. Select the wallstand Receptor, if necessary.

**Figure 10-12** Receptors: Wallstand receptor selected

4. Select [AEC] or [FIXED] mode (if applicable for the protocol).
5. Confirm or adjust the **Grid** and **SID** status.

**Figure 10-13** Grid and SID position

- An alert icon appears if the current Grid or SID is not in the recommended position for the technique.
- A checkmark appears if the current Grid or SID is in the recommended position for the technique.
- [Figure 10-13](#) shows the Grid not in the recommended position and the SID in the recommended position.

**Note:** You may still be able to take exposures even if the grid or SID are not in the recommended positions.

6. Make technique adjustments as necessary: **kV**, **mA**, **Focal Spot**, **Cu Filter**, and **Ion Chambers** (AEC mode only).

**Note:** Click [RESET TECHNIQUE] at any time to reset the technique to the default protocol settings.

7. Position the patient in front of the wallstand.

**Note:** When in AEC mode, the body part must cover the selected ion chambers in order to achieve the proper exposure.

**Note:** Some facilities may be equipped with a 4-cell ion chamber wallstand. Refer to [Chapter 8: System Hardware Overview-Ion Chambers \(p. 8-37\)](#) for more information about how this affects ion chamber selection and patient positioning when used horizontally with a mobile table accessory.

8. Confirm or adjust the **Patient Side** field, if applicable.
9. Confirm or adjust the **Patient Position** field.
10. Confirm or adjust the **Asymmetric Collimation**, if applicable.
11. If your system has auto positioning, select the position from the Auto Position drop-down list and hold down the AUTO POSITIONING button on the RCIM until the tube stops moving. A message will appear in the Message Log area to confirm that the tube is in place. Refer to [Chapter 13: Advanced Applications-Auto Positioning \(p. 13-4\)](#) for more information.
12. Collimate and shield as appropriate for the exam.



**WARNING** If using AEC mode, collimation must be active over the ion chambers being used. If it is not possible to collimate over the selected ion chambers, then FIXED mode must be used in order to prevent possible patient over-exposure.

13. Have the patient suspend respiration, if required.

14. Make exposure using the hand-switch.

- The image appears on Image Viewer screen (right monitor).

**Note:** After the first exposure, a preview image appears in less than 5 seconds. It takes about 10 seconds for a fully processed image to appear on the Viewer screen. A Dual Energy exam will take approximately 15 seconds to appear on the Image Viewer screen.

## Conduct a Table Top Exam

This section describes the adjustments required to conduct a digital exposure outside of a detector tray.

Follow this process to conduct an exam with the detector outside of a detector tray.

**Note:** If you need to interrupt the exam and resume it at a later time, click the [SUSPEND] button. You will be returned to the Worklist.

1. If multiple procedures were selected from the Worklist, select the procedure from the exam drop-down list.
2. Select the **Exam** and **View** to perform from the protocol list.
3. Select the **Patient Size**. The system default is Medium Adult.

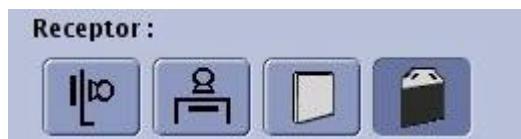
**Note:** To optimize processing for the best image quality, Patient Size should be confirmed for each view. Available options are:

- Small Pediatric
- Medium Pediatric
- Large Pediatric
- Small Adult
- Medium Adult
- Large Adult



**WARNING** It is critical to select the proper patient size on the Acquisition screen. The incorrect Patient Size may result in an unnecessarily large radiation dose or multiple exposures.

4. Select the Detector Icon [Table Top Mode].

**Figure 10-14** Receptors: Detector [Table Top Mode] selected

5. Make other technique adjustments as necessary.
  - You are able to adjust the kV, mA, and Focal Spot.

**Note:** Click [RESET TECHNIQUE] at any time to reset the technique to the default protocol settings.

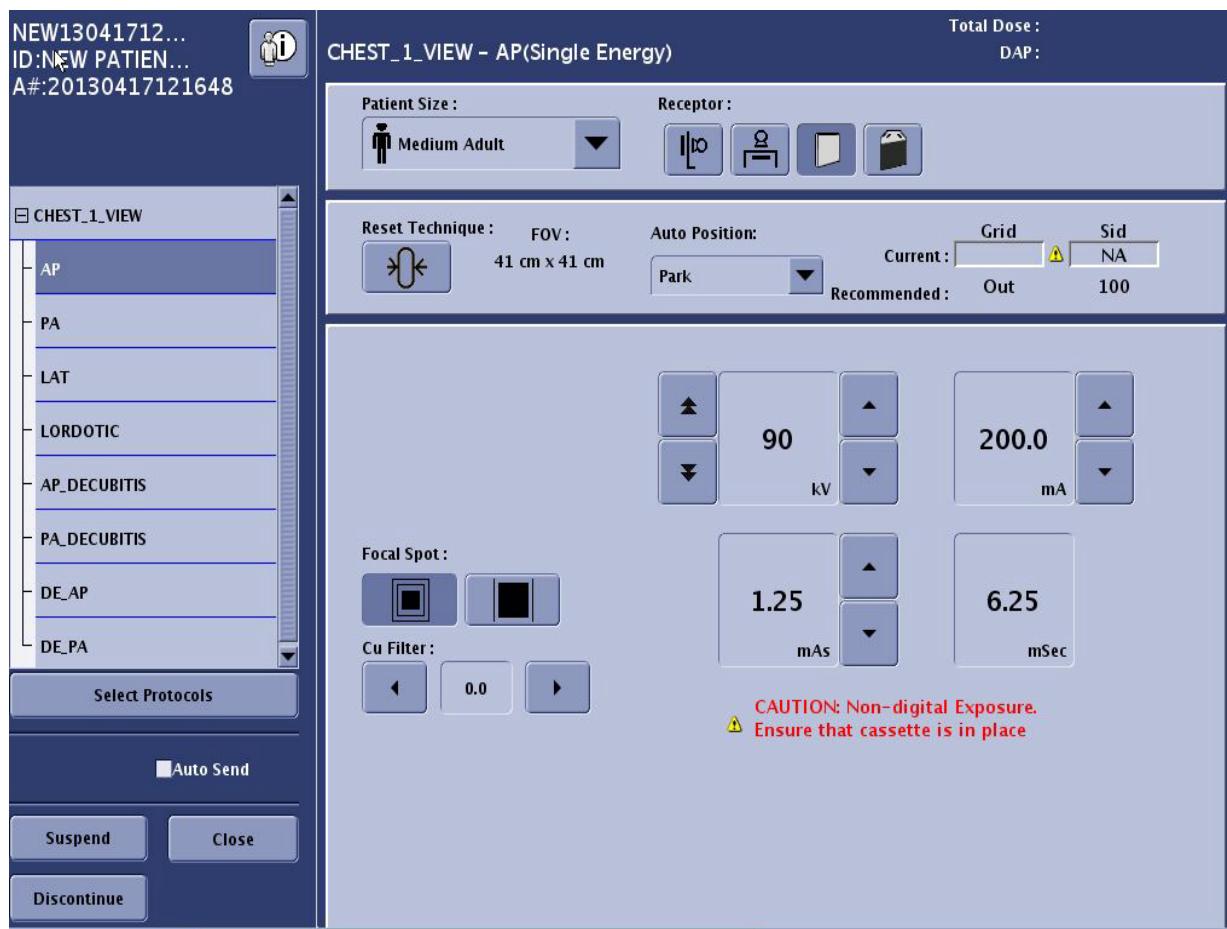
6. Position the detector under the patient.
7. Confirm or adjust the **Patient Side**, if applicable.
8. Collimate and shield as appropriate for the exam.
9. Have the patient suspend respiration, if required.
10. Make exposure using the hand switch.
  - The image appears on Image Viewer screen.

**Note:** After the first exposure, a preview image appears in less than 5 seconds. It takes about 10 seconds for a fully processed image to appear on the Viewers screen.

## Conduct a Cassette Exam

The Cassette Exam function takes an x-ray without digital image acquisition and storage or electronic information sending and retrieval. This is for use with a traditional Film Screen or CR cassette.

When the cassette receptor is selected, a message appears near the bottom of the screen: “CAUTION: Non-digital Exposure. Ensure that film is in place.”

**Figure 10-15** Cassette exam Acquisition screen

Follow this process to conduct a Cassette Exam.

1. Click [CASSETTE EXAM] from the bottom of the Worklist screen.

**Note:** Because a cassette exam does not use digital image storage, you do not select procedures from the Worklist.

**Figure 10-16** [CASSETTE EXAM] button on Worklist

- The Select Protocols screen appears.
2. Select the protocols to perform.
  3. Click [ACCEPT].
    - The Acquisition screen appears in Cassette Exam mode.

4. Select the Exam and View to perform from the protocol list.



5. Make technique adjustments as necessary for the appropriate body part being imaged: **kV** and **mAs**

**Note:** For film and CR cassette work, use your site's routine techniques as with any other Xray system. For ease of use, these techniques can be programmed into the protocol database. Refer to [Chapter 15: Preferences-Edit Protocol Database \(p. 15-40\)](#) for more information.

6. Change the **Cu Filter** selection, if necessary.
7. Position the patient with the cassette as appropriate for the exam.
8. Collimate and shield as appropriate for the exam.
9. Have the patient suspend respiration, if required.
10. Make exposure using the hand-switch.
11. Click [CLOSE] to end the exam.
  - The Worklist appears.
12. Process the cassette as necessary, depending on the media.

## Conduct an Emergency Exam

Emergency Exam is a function that allows a patient to be x-rayed without selecting the patient from the Worklist or adding the patient to the Worklist.

**Figure 10-17** Emergency Exam button



Emergency Exam is used in the following situations:

- Medical emergency – The patient needs an x-ray taken immediately.
- No patient information available – There is no patient information to enter due to the patient's medical condition. For example, the patient was found unconscious with no identification.

When the [EMERGENCY EXAM] button is clicked, the system assigns a unique tracking number as the Patient Name. The tracking number is the word "NEW" followed by a date and time stamp of the second the Emergency Exam button was clicked. For example: NEW070422140345. In this example, the number sequence means that the exam was initiated in year 07, month 04, day 22, hour 14, minute 03, and second 45.

The tracking number is used as the Patient Name on image annotation and as the Patient ID.

**Note:** When the patient information becomes available, images can be copied into the appropriate Worklist selection. The selection can be populated to the Worklist either by HIS/RIS or manual entry. Refer to [Chapter 12: Image Management-Open Exams and Images \(p. 12-7\)](#) for more information.

Once initiated, an emergency exam is conducted the same way as any other exam.

Follow this process to conduct an emergency exam.

1. Click [EMERGENCY EXAM] from the bottom left of the Worklist.
  - The Select Protocols screen appears. Refer to [Select or Change Protocols \(p. 10-12\)](#) for more information.
2. Select the protocols for the exam.
3. Click [ACCEPT].
  - The Acquisition screen appears.
4. Select the protocol to perform from the Protocol List.
5. Acquire images. Refer to [Conduct a Table Exam \(p. 10-15\)](#), [Conduct a Wallstand Exam \(p. 10-17\)](#), or [Conduct a Table Top Exam \(p. 10-19\)](#) for more information.

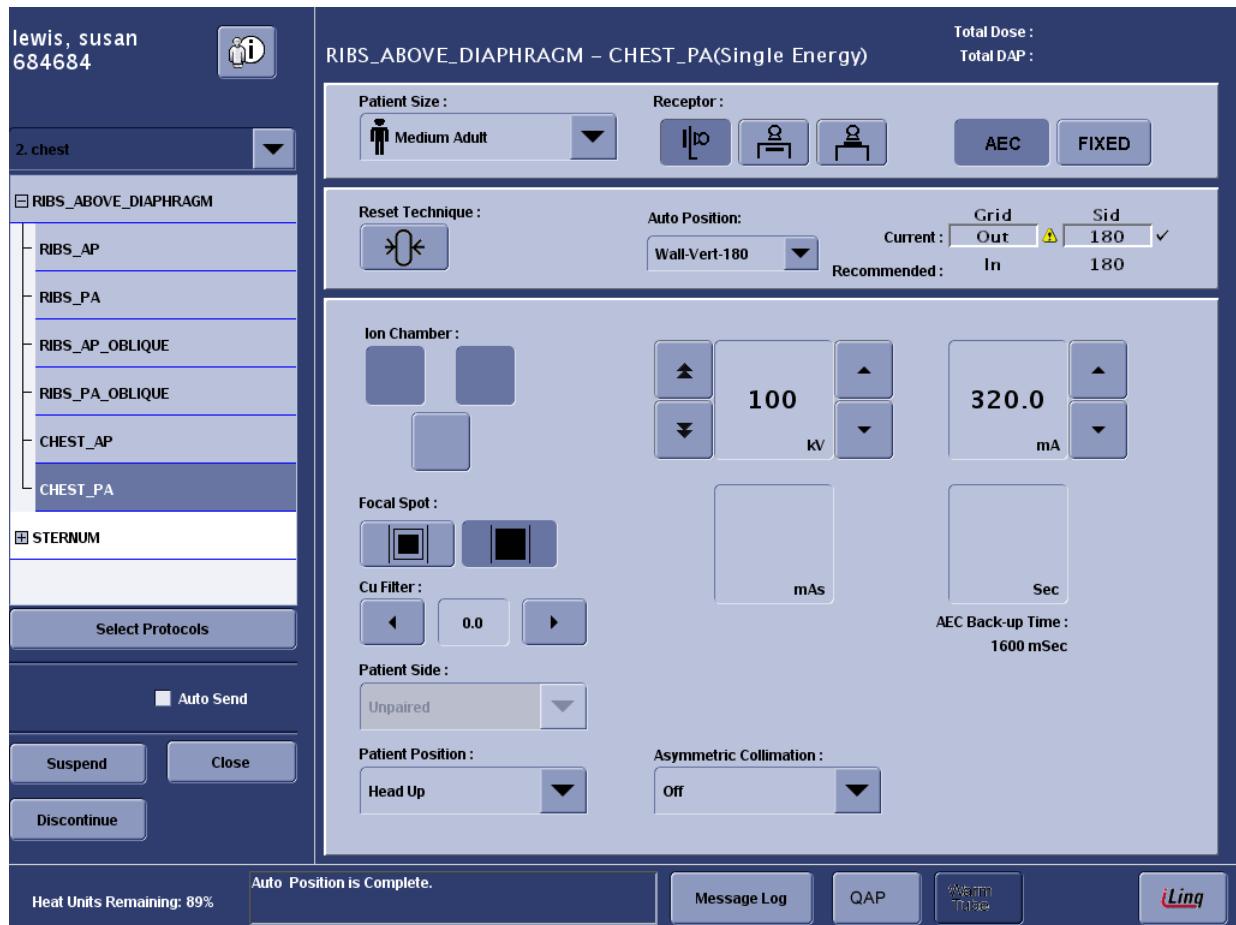
## Automatic Exposure Control (AEC)

The Automatic Exposure Control automatically terminates an X-ray exposure to produce optimum quality images. AEC automatically compensates for changes in patient thickness, opacity, and different technique factors of mA, kVp, and SID. Proper patient positioning is very important. In extreme cases of misalignment, some radiation bypasses the patient and ends the exposure prematurely, causing underexposed images. Conversely, positioning the heaviest patient area over the receptor sensing area may cause overexposed image areas. You should become familiar with the size and location of each receptor. With such knowledge, you can develop proper positioning techniques of each anatomical area and be able to duplicate your positioning for every patient. This also helps you produce uniform quality images regardless of patient thickness or opacity. This system feature, AEC, automatically selects the mAs and exposure time, eliminating the need for you to select them.

Many default techniques are AEC based in order to optimize image processing. The exposure time and mAs are automatically selected when you are in AEC mode, producing uniform quality images.

## Acquisition Screens

[Figure 10-18](#) shows an example of an AEC exposure setup. For AEC mode, exposure time and mAs are not selectable; therefore, these parameters are empty on the Acquisition screen. This example provides an example an AEC exposure with Chest AP selected.

**Figure 10-18** Example AEC setup of a normal chest exposure

After the exposure has been completed, the console automatically displays the exposure time (mSec) and mAs values ([Figure 10-19](#)).

**Figure 10-19** Example AEC exposure completed (normal operation)

The Applications software sets two limits for AEC operation: 512 is the maximum mAs. 2 seconds (2000 milliseconds) is the maximum exposure time.

**Note:** When either one of the above limits is reached, the Applications software terminates the exposure. For example, [Equation 10-1](#) demonstrates that with a console selection of 250 mA, the system reaches the 2000 millisecond maximum exposure limit before it would reach the 512 mAs limit.

#### Equation 10-1 AEC exposure limit calculation

$$\text{(the 250 mA console selection)} \times \text{(2000 milliseconds)} = \text{500 mAs}$$

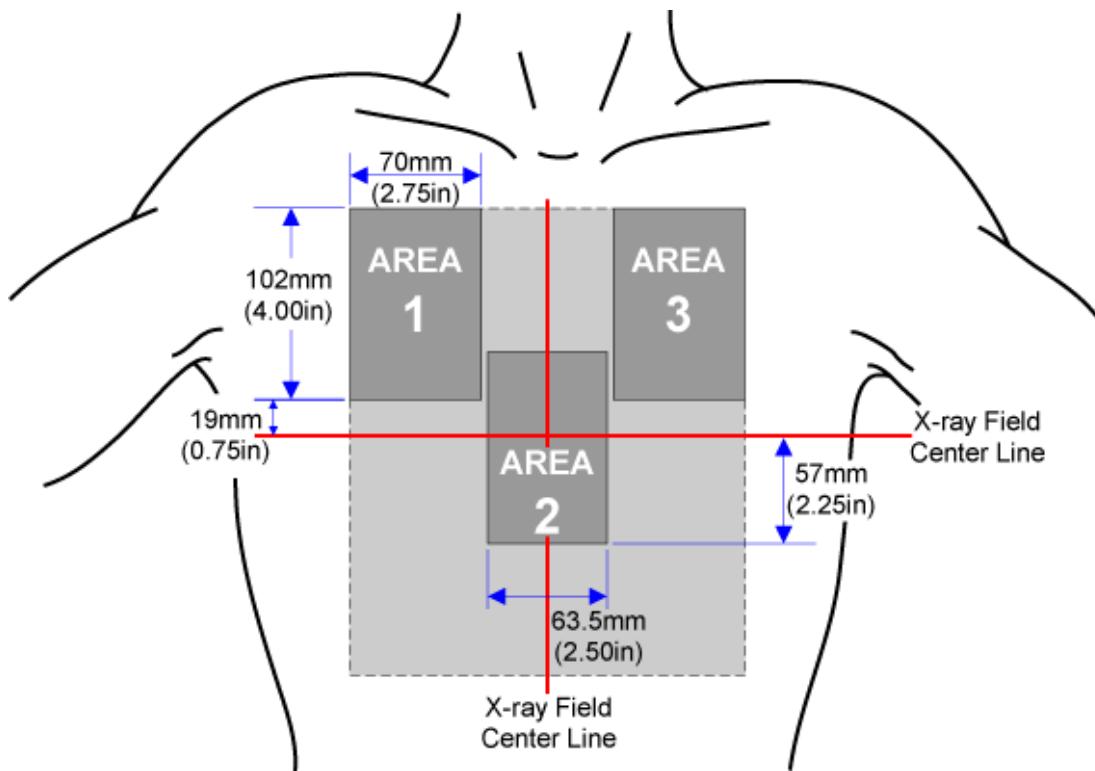
**Note:** The Applications software also uses a built-in formula to set limits for AEC operation in addition to the two limits stated above. This formula limits mAs to a value less than 512 mAs and exposure time to a value less than 2000 mSec, depending upon the technique selected. Due to these limitations, you may reach an AEC limit even with a mAs value less than 512 mAs and with an exposure time less than 2000 mSec. If either of these events occur, the Applications software terminates the exposure.

## Ion Chamber Detectors

Ion Chamber Detectors have three sensing areas ([Figure 10-20](#)). Sensing Area 2 is located at the center of the X-ray beam. While Area 1 and Area 3 can be selected to cover an exposure of two symmetrical parts of the

body, such as the lungs or the kidneys, care should be taken to center the patient and receptor areas accordingly.

**Figure 10-20** Sensing areas



The position of the sensing areas are shown in relation to the area of a 210 mm x 248 mm (8.25in x 9.75in) Collimator Light Field.

## Applications for Detector Sensing Areas

The receptor sensing areas should be used as described in the following sections. You should become familiar with their locations and recommended use. The sensing areas are numbered 1 through 3.

### Areas 1 and 3

Areas 1 and 3 are used to cover symmetrical body parts. For example, acquiring a chest radiograph includes the lungs, which are proportional parts of the body. In this application, Area 1 and 3 must be located in line with radiation transmitted through the left and right lung fields. This ensures these areas are not influenced by variations in tissue opacity caused by the heart or vertebrae.

If the patient is improperly positioned and the sensing areas are exposed to direct radiation, the photo timed exposures will be too short and the films underexposed. The opposite is true if the patient's thoracic spine or sternum are positioned over the sensing areas.

**Note:** Areas 1 and/or 3 are to be used with full-sized fields of 10x12 inches (254x305mm) or larger.

### Area 2

The center of the X-ray beam is Area 2. The basic positioning requirements are also important when using this area. Misalignment may result in unusable images. Care should be taken when positioning the anatomical area of interest over Area 2.

When using Area 2, you may want to align the X-ray tube to the center line of Area 2 before positioning the patient. It is also recommended you collimate the light field to an area of  $8\frac{1}{4} \times 9\frac{3}{4}$  inches (210x 248 mm). Your light field will then be centered on Area 2 and encompasses the inner sides of Area 1 and 3. Then, when you are positioning your patient and using only Area 2, a light field  $2\frac{1}{2} \times 4\frac{1}{2}$  inches (54x114 mm), if properly centered, defines that area and can be used to align a specific region of the body.

Positioning of the patient's anatomical area of interest within the light field and readjusting the light field to the desired size, ensures the receptor sensing area is aligned with the area of interest in the patient.

**Note:** Area 2 must be selected by itself whenever the X-ray field is less than 10x12 inches (254x305 mm) and in instances where the collimator field size is reduced to less than 10x10 inches (254x254 mm).

## Applications

Applications for the receptor sensing areas are given in [Table 10-2](#) with the areas appearing as three adjacent square buttons. The dark-colored buttons indicate the currently selected area or areas.

When in AEC mode, at least one ion chamber must be selected. Any combination of chambers is allowed.

**Figure 10-21** AEC Areas

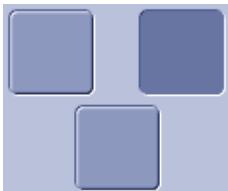
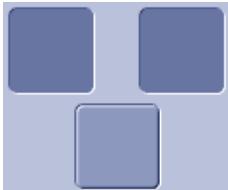
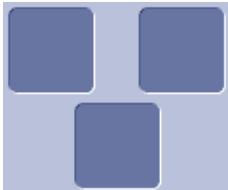


**Note:** When creating or editing protocols, the ion chambers are named L, R, and C on the Exam Menu screen. Refer to [Chapter 15: Preferences-Protocols \(p. 15-37\)](#) for more information.

**Table 10-2** Detector sensing areas

Area(s) Selected	Application	Patient Positioning
Area 2 	Controls the exposure for an area of interest at the center of the X-ray field.	The patient's area of interest is in the X-ray field center.

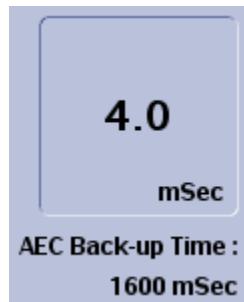
**Table 10-2** Detector sensing areas

Area(s) Selected	Application	Patient Positioning
Area 1 	Controls the exposure for an area of interest at the upper left quadrant of the full size radiograph.	The patient's area of interest is in the upper left quadrant of the X-ray field.
Area 3 	Controls the exposure for an area of interest at the upper right quadrant of the full size radiograph.	The patient's area of interest is in the upper right quadrant of the X-ray field.
Areas 1 and 3 	Controls the exposure for two symmetrical parts of the body, such as lungs or kidneys. Because Area 2 is not selected when using areas 1 and 3 for this application, the vertical column should not affect the exposure, providing the patient is correctly positioned.	The patient's area of interest is aligned with sensing Areas 1 and 3.
All Areas 	Controls the exposure to allow the average density of the entire radiograph to approximate the value of the pre-selected density.	The patient's area of interest is within the boundary of the X-ray field.

## AEC Limitation Messages

The AEC feature optimizes patient images and helps you to obtain precise exposures. Many default techniques are AEC based in order to optimize image processing. The exposure time and mAs are automatically selected when you are in AEC mode, producing uniform quality images. The system displays messages to inform you when the AEC feature reaches its limit.

When acquiring AEC images, the AEC Back-up time is displayed below the mSec area. After the exposure is taken, the current mSec is displayed ([Figure 10-22](#)).

**Figure 10-22** mSec and AEC back-up time on Acquisition screen

When an AEC exposure reaches the back-up time limit, a message appears on screen: "The AEC back-up time has been reached." Click [OK] to close the message. The system will not allow you to continue taking exposures for the current protocol. To resume image acquisition, select another protocol and continue the exam.

The backup time is calculated from the following three conditions:

- A 2000 millisecond limit
- A 500 mAs limit or 512 mAs limit (based on the nearest Renard step)
- An X-ray tube protection 'formula' limit

In this instance, the maximum exposure time reached may cause the digital image to be underexposed. You may wish to change the mA selected to avoid reaching one of these limitations in a subsequent exposure.

In addition to the limits provided by the Applications software, the system also has a maximum mAs limit for AEC operation.

- The maximum mAs limit ensures that if an AEC exposure exceeds 512 mAs, the maximum mAs limit terminates the exposure at values less than 600 mAs.
- Whenever the maximum mAs integrator limit ( $550 \text{ mAs} \pm 10 \text{ mAs}$ ) is reached during an AEC exposure, a message appears: "The AEC back-up time has been reached."

**Note:** The regular occurrence of this message may be evidence of a malfunction in your system. Call your service engineer to assess the situation.

## Acquire AEC Images

Acquiring images in the AEC mode requires precise light alignment and patient positioning.



**WARNING** **Collimation must be active over the AEC chambers being used or FIXED mode must be used in order to prevent possible patient over-exposure.**

Use this process to produce images with the AEC feature.

1. Open an exam from the Worklist and select the protocols.
  - The Acquisition screen appears.
2. Select the protocol to perform.

3. Change the **Patient Size**, if necessary.



**WARNING** It is critical to select the proper patient size on the Acquisition screen. The incorrect Patient Size may result in an unnecessarily large radiation dose or multiple exposures.

4. Change the **Receptor**, if necessary.
  5. Click [AEC], if necessary.
    - Depending on the current protocol, AEC may already be selected by default.
    - The AEC mode displays the Ion Chamber selections.
    - The Fixed mode removes the Ion Chamber selections.
    - You are able to alter this selection at any time to accommodate the requirements of a specific examination.
  6. Change the selected **Ion Chambers**, if necessary.
    - Selected (active) AEC cells will appear highlighted on the acquisition screen.
  7. Make other technique adjustments as necessary.
    - You are able to adjust the kV, mA, and Focal Spot.
  8. Confirm or select the **Cu Filter**, if necessary.
  9. Position the patient so that the anatomy of interest is centered over the selected AEC cells.
- Note:** The body part must cover the selected ion chambers in order to achieve the appropriate exposure.
10. Collimate the light field to encompass the detection area being used.
  11. Collimate to the desired area. This ensures the receptor sensing area is aligned with the patient's anatomy.
  12. Confirm the Patient Position. Change if necessary.
  13. Make the exposure.
  14. If the AEC Back-up Reached message appears: Click [OK].
    - The message closes.
  15. Observe technique settings and continue exam.

## End Exam

There are several ways to end an exam: Suspend, Close, and Discontinue. Each method is used for a specific purpose to cover a variety of different situations.

**Figure 10-23** Buttons used to end exams

## Suspend

Suspend is for situations when you must leave the exam but intend to resume it at a later time. Suspending an exam does not initiate auto send or auto print functions (if enabled). Images acquired from a suspended exam do not appear on the Image Management screen. Any acquired images are stored in a temporary database until they are committed to the permanent storage database upon closure of the exam.

## Close

Close is used when the exam is complete; that is, you have acquired all images and do not intend to continue. If enabled, Close sends the images to PACS and initiates auto print and auto send functions. The images are committed to the permanent storage database and the exam appears on the Image Management screen. This is the only exam end option available when conducting a cassette exam.

## Discontinue

Discontinue an exam when you have opened the procedure but cannot continue the exam. Any images that were acquired are marked so that they are not used by PACS.

When an exam is discontinued, you must provide the reason for discontinuing the exam. The system sends the status and reason together to the HIS/RIS.

The available reasons are:

- Doctor cancelled procedure
- Equipment failure
- Incorrect procedure ordered
- Patient allergic to media/contrast
- Patient died
- Patient refused to continue procedure
- Patient taken for treatment or surgery
- Patient did not arrive
- Patient pregnant
- Change of procedure for correct charging
- Duplicate order
- Nursing unit cancel
- Incorrect side ordered
- Discontinue for unspecified reason
- Incorrect worklist selection

**Note:** The reason for discontinuing an exam cannot be seen on the Worklist or Patient Information. The information is added to the DICOM header.

Use this procedure to discontinue an exam.

1. Click [DISCONTINUE] from the bottom of the Acquisition screen.

- A message appears: “Please select a reason for discontinuing this exam.”
2. Select the option that best describes why the exam is being discontinued.
    - Choose “Discontinue for unspecified reason” if no other options describe the current situation.
  3. Click [OK].
    - The message closes and the Worklist screen opens.
    - The status of the procedure changes to “Discontinued” on the Worklist.
    - If multiple procedures were selected, the discontinued status applies to all procedures that were open when the exam was discontinued.
    - Click [CANCEL] to close the message and return to the Acquisition screen.

## Image Recovery

If a single energy exposure has been made, but no processed (or preview) image displayed image recovery will start. During this time, the acquisition screen is disabled for 30 seconds.



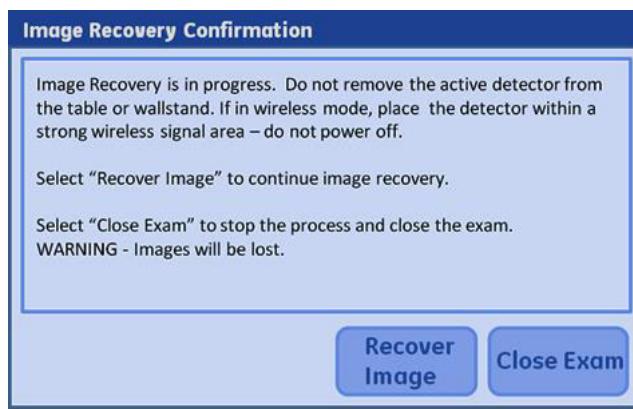
**WARNING** Do not reset the system at any time- image recovery will not occur and images will be lost.

After 30 seconds, the Suspend, Close and Discontinue button will be enabled. When the Suspend or Close button is selected, a message will display (Figure 10-24).



**WARNING** Selection of Discontinue will stop image recovery.

**Figure 10-24** Image Recovery Confirmation



During this time, do not remove the active detector from the table or Wallstand. If in wireless mode place the detector within a strong wireless signal area – do not power off. Select the ‘Recover Image’ button to continue image recovery. Select the ‘Close Exam’ button to stop the recovery process and close the exam.



**WARNING Images will be lost if the recovery process is stopped.**

When the image is recovered, it will appear on the viewer.

# Chapter 11: Image Viewer

The Image Viewer screen ([Figure 11-1](#)) appears once an exposure is taken in a started exam or when an image series is chosen from the Image Management screen for review. This screen is where images are adjusted and viewed.

**Note:** This chapter covers Image Viewer functions for single energy and dual energy images.

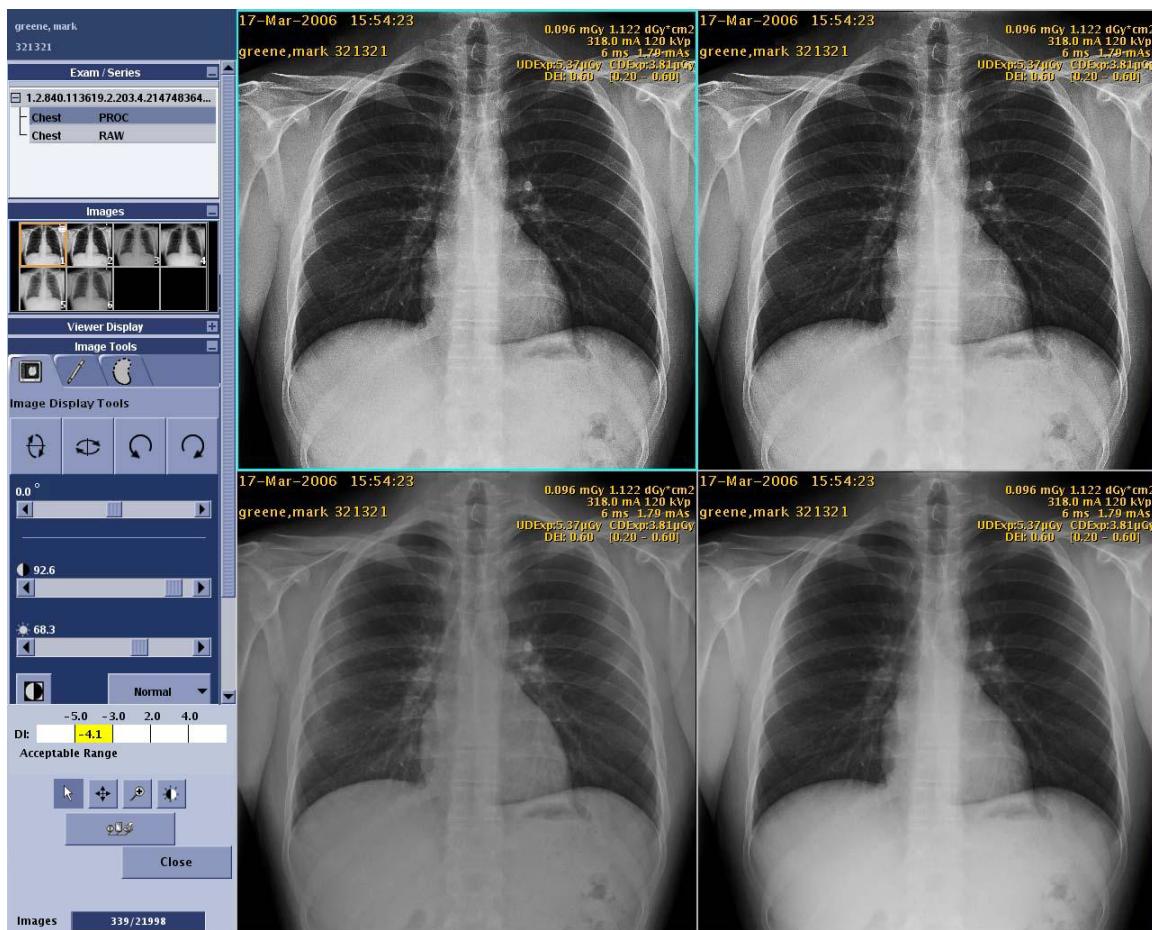
## Overview

The Viewer shows all images in the study. All series within the study are listed and can be seen in the Viewer.

The left side of the screen contains all the image selection and adjustment tools. Most of the tools are categorized into panels that can be selected to reveal different functions.

The majority of the screen ([Figure 11-1](#)) is devoted to image display. The images on the right side of the screen update as adjustments are made. You are able to view single or multiple images at once. When viewing multiple images, an aqua border identifies the currently selected image.

[Table 11-1](#) describes the functions for the Image Viewer screen.

**Figure 11-1** Image Viewer screen**Table 11-1** Image Viewer screen functions

Function	Description
Patient identification  greene, mark ID:321321	Identifies the Patient Name and Patient ID as entered on the Patient Information screen.
Exam / Series	Collapsible panel that contains a list of exams and series within the exams.  The Viewer shows all images in the study. All series within the study are listed and can be seen in the Viewer.  Refer to <a href="#">Select Images to View (p. 11-4)</a> for more information.
Images	Collapsible panel that shows small previews of all images in the selected series and highlights the currently selected image.  Refer to <a href="#">Select Images to View (p. 11-4)</a> for more information.

**Table 11-1** Image Viewer screen functions

Function	Description
Viewer Display	<p>Collapsible panel that allows you to adjust how many images are viewed at once and image size.</p> <p>Refer to <a href="#">Change Image Display (p. 11-5)</a> for more information.</p>
Image Tools	<p>Collapsible panel that contains tools to adjust images. Tools are divided by category into three tabs:</p> <ul style="list-style-type: none"> <li>• Image Display Tools – Refer to <a href="#">Adjust Images (p. 11-6)</a></li> <li>• Annotation – Refer to <a href="#">Annotate and Mask Images (p. 11-9)</a></li> <li>• Image Processing – Refer to <a href="#">Re-process Images (p. 11-17)</a></li> </ul>
<p>DEI (Detector Deviation Index)</p>  <p>DI: <span style="background-color: #ffffcc; border: 1px solid black; padding: 2px;">3.9</span></p> <p>Acceptable Range</p>	<p>If enabled, displays the dose received by the receptor and whether the dose is within an acceptable range for the anatomy.</p> <p>You may need to re-take images that show doses below the acceptable range. Refer to <a href="#">Chapter 15: Preferences-DI (Deviation Index) (p. 15-33)</a> for more information.</p> <p><b>Note:</b> Depending on your system's configuration, the DEI may only show a numerical value. Refer to <a href="#">Chapter 15: Preferences-Image Viewer (p. 15-29)</a> to configure the Detector Exposure Index.</p>
Pointer controls	 <p>Changes the action of the pointer when clicked and dragged on the image.</p> <p>Refer to <a href="#">Change Pointer Controls (p. 11-21)</a> for more information.</p>
<p>[NETWORK STATUS]</p>  <p>Network Status</p>	<p>Opens the Transfer Log screen to show status of printed and sent exams on the network.</p> <p>Refer to <a href="#">Chapter 12: Image Management</a> for more information.</p>
<p>[FILM MANAGER]</p> 	<p>Allows manual print and configuration for multiple images.</p> <p>Refer to <a href="#">Print Images (p. 11-25)</a> for more information.</p>
<p>[MANUAL PRINT]</p> 	<p>Allows setup and printing of the currently selected image.</p> <p>Refer to <a href="#">Print Images (p. 11-25)</a> for more information.</p>
<p>[CLOSE]</p>  <p>Close</p>	<p>Closes the Image Viewer screen and prompts you to save any changes to images.</p> <p>Close also initiates auto print and auto push, if enabled.</p> <p>Refer to <a href="#">Save Changes to Images (p. 11-32)</a> for more information.</p>

**Table 11-1** Image Viewer screen functions

Function	Description
Image database size 	Shows how many images are currently saved to the local database and approximately how many more images the database can accommodate.
System status 	Displays the last system status message. <b>Note:</b> To clear the system status area, open the Message Log and close it again.
[LOG]	Brings up the message log since the last system re-start.

## Tool Panel Selection

The following sections describe the tool panels available on the left side of the Image Viewer screen.

Tool panels may be expanded or collapsed by clicking the [+] or [-] buttons on the right side of the panel's title bar. If necessary, a scrollbar appears along the right edge of the tool panels that allows you to scroll and see all the tools.

**Figure 11-2** Tool panels collapsed

## Select Images to View

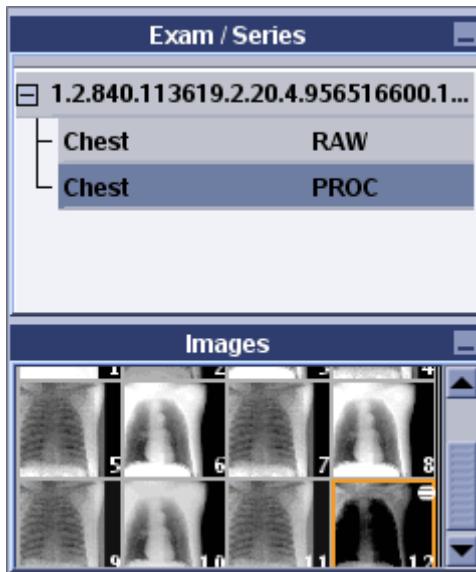
The Exam/Series panel ([Figure 11-3](#)) allows you to select which exam or series of images to view.

**Note:** When viewing or adjusting images from a completed exam, always work with processed images.

The Images panel shows previews of all images in the selected series. The panel shows up to 8 image previews at a time. If there are more than 8 images in the series, a scrollbar appears on the right to allow you to see the rest of the images.

The image that is currently selected in the Image Viewer is shown with an orange border and a white dot in the upper right corner.

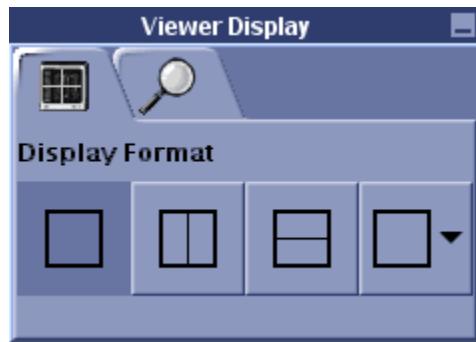
To view an image, click an image preview.

**Figure 11-3** Exam/Series and Images panel

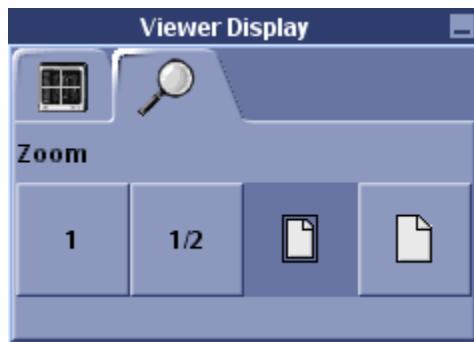
## Change Image Display

The Viewer Display panel controls how many images appear in the Viewer screen at one time and adjusts the magnification of each image.

The Display Format tab ([Figure 11-4](#)) buttons allow you to view up to 9 images at one time.

**Figure 11-4** Viewer Display panel – Display Format tab

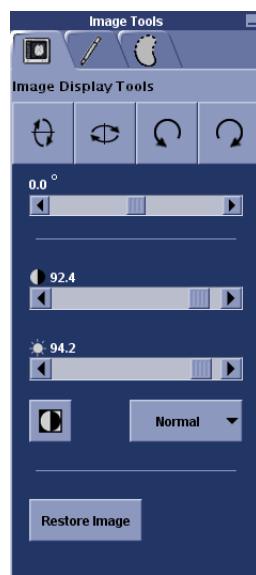
The Zoom tab ([Figure 11-5](#)) changes the size of the selected image when shown in the Viewer. [Table 11-2](#) describes the Zoom options.

**Figure 11-5** Viewer Display panel – Zoom tab**Table 11-2** Zoom tool descriptions

Tool	Description
Zoom One 	Shows default the image size where one pixel on the receptor equals one pixel on the screen.
Zoom Half 	Reduces the image to 50%.
Fit To Screen 	Scales the image to fit within the Image Viewer screen.
True Size 	Shows the image in the exact size it was acquired from the receptor (one centimeter on the receptor equals one centimeter on screen).

## Adjust Images

The Image Display Tools panel ([Figure 11-6](#)) contains the tools to flip, rotate, adjust brightness, adjust contrast, invert, and apply windowing to the selected image. [Table 11-3](#) describes each tool and how it functions.

**Figure 11-6** Image Tools palette – Image Display Tools tab**Table 11-3** Image Display Tools descriptions

Tool	Description
Contrast 	Adjusts the differences between dark and light on the selected image. <ul style="list-style-type: none"> <li>Move the slider right for more contrast (towards pure black and white).</li> <li>Move the slider left for less contrast (towards uniform gray).</li> </ul>
Brightness 	Lightens or darkens the selected image. <ul style="list-style-type: none"> <li>Move the slider right for a lighter image.</li> <li>Move the slider left for a darker image.</li> </ul>
Invert 	Reverses light and dark areas of the selected image.

**Table 11-3** Image Display Tools descriptions

Tool	Description
Windowing	<p>Applies windowing to the selected image.</p> <p>Available options are:</p> <ul style="list-style-type: none"> <li>• Normal - image as acquired</li> <li>• Hard - adjusts the image towards black and white</li> <li>• Soft - adjusts the image towards gray</li> </ul> <p>The Discovery XR656 system uses a “Smart Windowing” algorithm to optimize image quality. Smart Windowing is an automated, image-based, and technique-independent method of selecting brightness and contrast for image display. Earlier methods mostly relied on technique information (kVp, dose level, etc.) to set brightness/contrast, making them more prone to operator and system errors.</p>
Vertical Flip	
Horizontal Flip	
Rotate Left	
Rotate Right	
Free Rotation	<p>Rotates the selected image both clockwise and counter-clockwise. The range is -180° to 180°.</p> <ul style="list-style-type: none"> <li>• Click the end buttons to rotate the image in 0.1 degree increments.</li> <li>• Click and drag the slider to spin the image.</li> <li>• Move the slider right to rotate the image clockwise.</li> <li>• Move the slider left to rotate the image counter-clockwise.</li> </ul>
Restore Image	

# Annotate and Mask Images

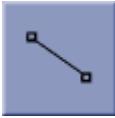
The Annotations/Mask panel contains the tools to annotate images. [Table 11-4](#) describes the tools and their functions.

Image annotations are divided into two categories:

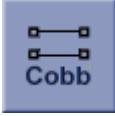
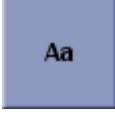
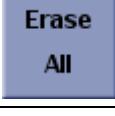
- Image annotation – Lines, ellipses, Cobb angle, user annotation (notes), and RL markers added by the operator to measure or bring attention to a section of the image. You draw or place these annotations on the image as appropriate. Refer to [Add Image Annotations \(p. 11-13\)](#) for more information.
- System annotation – Information that is kept by the system, such as identifying information, exposure and acquisition information, and processing information. These annotations are displayed as text at the corners of the image. You may select which annotations appear, but you cannot control where the annotations are placed. Refer to [Customize System Annotations \(p. 11-12\)](#) for more information.



**Table 11-4** Annotations/Mask tool descriptions

Tool	Description
	Places a line on the image that you may re-size, move, or angle. Line specifications are shown in the User Measurements annotation at the bottom right corner of the image.

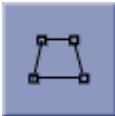
**Table 11-4** Annotations/Mask tool descriptions

Tool	Description	
Ellipse 	Places an ellipse (circle or oval) on the image that you may re-size, move, or re-shape. Ellipse specifications are shown in the User Measurements annotation at the bottom right corner of the image.	
Cobb 	Places a Cobb angle (two lines) on the image that you may re-size, move, or angle. Cobb angle specifications are shown in the User Measurements annotation at the bottom right corner of the image.	
User Annotation 	Places a text box on the image that you may add notes into.	
Hide and Show 	Temporarily removes image annotations from the image. When annotations are hidden, the button name changes to [SHOW]. Click [SHOW] to see the annotations.	
Erase 	Deletes the selected image annotation. <b>Note:</b> Deleted annotations cannot be recovered.	
Erase All 	Deletes all image annotations. <b>Note:</b> Deleted annotations cannot be recovered.	
RL 	Places a Right or Left marker on the image for reference. <b>Note:</b> RL markers are only available when the image is open in a live exam. Only one marker may be placed on an image.	
Apply to slices 	This button only appears for images acquired during a VolumeRAD exam. Allows you to copy the annotations to all slices in the series.	
Quality Control Tags 	This button only appears for images acquired during a VolumeRAD exam. Allows you to apply the quality control mark to all slices in the series. Refer to <a href="#">Chapter 13: Advanced Applications-Annotate Slices (p. 13-64)</a> for more information about using this feature in VolumeRAD exams. Refer to <a href="#">Apply Quality Check Indicator (Auto Tag) (p. 11-23)</a> for more information about the quality mark.	

**Table 11-4** Annotations/Mask tool descriptions

Tool	Description
Full 	<p>Places all available system annotation on the image.</p> <ul style="list-style-type: none"> <li>Patient information (top left corner) exam date and patient identification</li> <li>Study information (top left corner) exam identification</li> <li>Series information (top left corner) series identification</li> <li>Image information (top left corner) image identification</li> <li>Acquisition information (top right corner) dose and DAP</li> <li>Hospital information (top right corner) the name of the facility where the image was acquired</li> <li>X-ray parameters (top right corner) the mA, kVp, ms, mAs, and DEI of the exposure</li> <li>RRA information (bottom left corner) if RRA is enabled and the image was rejected, shows the RRA classification and reason (RRA must be purchased and enabled for this annotation to be available)</li> <li>Anatomy information (bottom left corner) the protocol used to acquire the image</li> <li>Processing information (bottom left corner) the look used to process the image</li> <li>User measurements (bottom right corner) size and angle measurements for line, ellipse, and Cobb annotations</li> </ul> <p>Display parameters (bottom right corner) the size of the image and the zoom</p>
Partial 	Displays ONLY the facility name, dose information and technical factors.
None 	Removes all system annotations from the image. System annotations can be re-applied by clicking [FULL], [PARTIAL], or [CUSTOM].
Custom 	Brings up a screen ( <a href="#">Figure 11-7</a> ) that allows you to choose which system annotations appear. Refer to <a href="#">Customize System Annotations (p. 11-12)</a> .

**Table 11-4** Annotations/Mask tool descriptions

Tool	Description
Manual Shutter 	<p>Manually adjusts the image shutter.</p> <p>Collimation is detected using image-based processing. In some cases, the FOV detected by the system does not match the actual exposed FOV. Use the Manual Shutter tool to correct this.</p> <p><b>Note:</b> This function is only available when the image is open in a live exam or for re-processed images.</p> <p>Refer to <a href="#">Adjust Image Shutter (Crop Image) (p. 11-15)</a> for more information.</p>



## Customize System Annotations

Follow this process to customize the system annotations that appear on the image.

1. Select the Image Tools panel – Annotation tab if necessary.
2. Click [CUSTOM].
  - The Annotation screen ([Figure 11-7](#)) appears.

**Figure 11-7** Custom Annotation selections

3. Select (check) the annotations you want to appear.
4. Adjust the Font Size, if necessary.
  - The available font sizes are:
    - -2 (smallest)
    - -1
    - N (Normal: default setting)
    - +1
    - +2
    - +3 (largest)

**Note:** GE Service personnel can change the default Font Size at your request.

5. Click [OK].
  - [CANCEL] closes the screen and leaves the selections unchanged.

## Add Image Annotations

**Note:** All image annotations initially appear in the same place (center of image) and are the same shape, size, or angle. It is possible to have multiple annotations of the same kind stacked on top of each other.

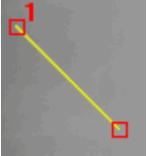
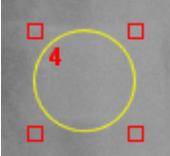
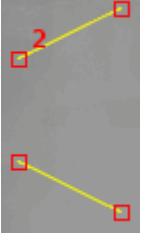
Follow this process to add image annotations.

1. Select the image to annotate, if necessary.
2. Click the button of the annotation to insert.

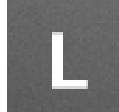
**Note:** Selected image annotations are yellow with red handles. Unselected image annotations are aqua without handles.

3. Move, re-size, or change the angle of the annotation as described in [Table 11-5](#).

**Table 11-5** Image annotation instructions

Tool	Instructions
Line	 <p>Select the line.</p> <ul style="list-style-type: none"> <li>To move: Click and drag the middle of the line.</li> <li>To change the angle or re-size: Click and drag one of the square handles at the ends of the line.</li> </ul>
Ellipse	 <p>Select the ellipse.</p> <ul style="list-style-type: none"> <li>To move: Click and drag the ellipse by its edge (not on a handle).</li> <li>To change shape or re-size: Click and drag a square handle.</li> </ul>
Cobb	 <p>Select the Cobb.</p> <ul style="list-style-type: none"> <li>To move: Click and drag the middle of a line.</li> <li>To change the angle or re-size: Click and drag one of the square handles at the ends of the line.</li> </ul>
User Annotation	 <p>Select an annotation from the list or click in the “CUSTOM” text area of the Text Annotation screen.</p>  <p>Type your comment. Click [OK].</p> <ul style="list-style-type: none"> <li>To move: Click and drag by the red square on the top left corner of the text box.</li> <li>To edit: Double-click the User Annotation. Make your changes on the Text Annotation screen.</li> </ul> <p>Refer to <a href="#">Chapter 15: Preferences-Preset Names (p. 15-19)</a> for more information about configuring the pre-set annotation list.</p>

**Table 11-5** Image annotation instructions

Tool	Instructions
RL Marker 	<p>Select the RL marker.</p> <ul style="list-style-type: none"> <li>• To move: Select the marker and drag to the desired area.</li> <li>• To switch between R and L: Click the RL button.</li> </ul> <p><b>Note:</b> Only one RL marker is inserted per image.</p>

## Delete Image Annotations

Follow this process to remove image annotations.

**Note:** It is not possible to recover deleted annotations.

1. Select the annotation.
2. Click [ERASE] or [ERASE ALL].
  - If [ERASE ALL] was clicked, a message appears: “Would you like to remove all annotations from the selected image?”
3. Click [YES].
  - All annotations are removed.

**Note:** The process to remove image annotations from VolumeRAD images is different from other acquisition types.

## Adjust Image Shutter (Crop Image)

The system has the ability to detect the collimated edges of the image and may apply shutters to mask the collimated areas. Refer to [Automatic Shutter \(p. 11-17\)](#) for more information.

The Manual Shutter function allows you adjust the automatically applied (default) shutter for viewing and printing.

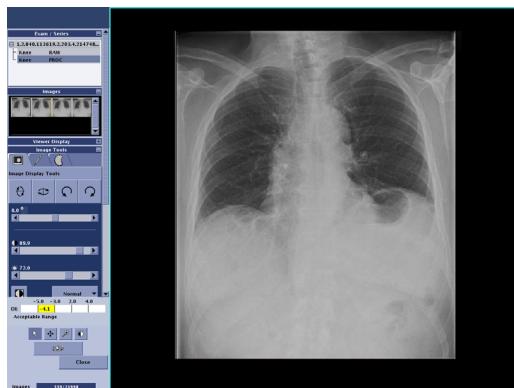
You can only adjust the shutter of images in an active exam or of re-processed images.

**Note:** To view hidden areas of a cropped image, use the Manual Shutter and drag the red corner handles to the edges of the image.

**Note:** The Manual Shutter is not available for images acquired during a VolumeRAD exam.

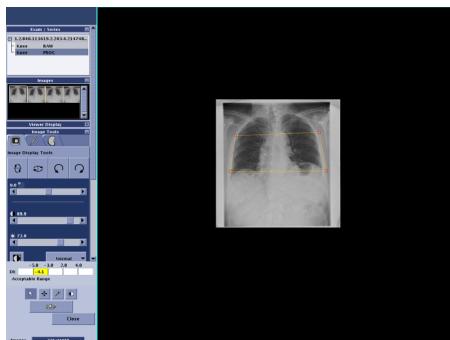
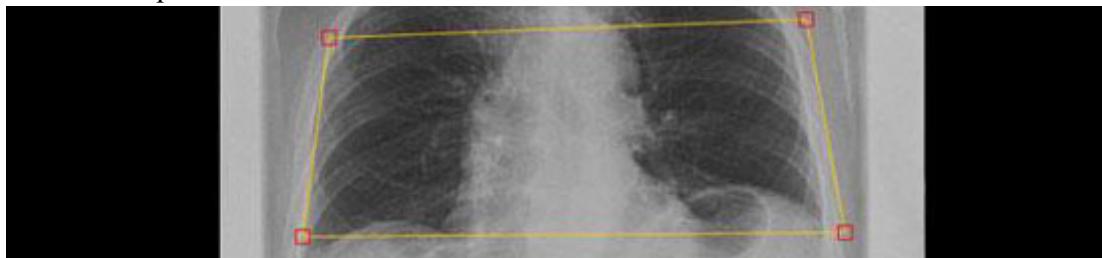
Follow this process to adjust the shutter of an image.

1. Select the image.

**Figure 11-8** Image before adjusting shutter

## 2. Click [MANUAL SHUTTER].

- The image will be shown in reduced size so that you are able to see the edges (Figure 11-9).
- The shutter appears as a yellow box with red handles (Figure 11-10). Anything outside of the box will be blacked out when the shutter is applied.

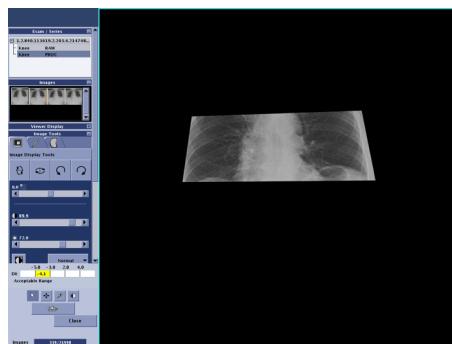
**Figure 11-9** Editing the manual shutter**Figure 11-10** Close up of manual shutter

## 3. Click and drag the red corner handles or the yellow side lines to the desired shape and size.

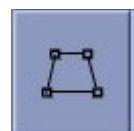
**Note:** Any image annotations (line, Cobb, ellipse, R/L marker) that are outside of the yellow lines (visible image area) will be lost when the exam is closed. Make sure that annotations are within the active image area. Manual shutters do not affect system annotations.

## 4. Click [MANUAL SHUTTER] to apply the adjustment.

- If the image does not return to its selected size, click the Zoom buttons on the Viewer Display panel to re-select the viewing size. Refer to [Change Image Display \(p. 11-5\)](#) for more information.

**Figure 11-11** Image after adjusting shutter

5. Click [MANUAL SHUTTER] again to edit. ([Figure 11-12](#)).

**Figure 11-12** MANUAL SHUTTER

## Automatic Shutter

Automatic shuttering or masking of the image occurs two ways:

- Automatic Collimator Edge Detection (ACED) uses system feedback from the position of the collimators to provide masking of the image.
- The Intelligent Collimator Edge Detection (ICED) algorithm relies solely on image information in order to locate any collimation edges present in an x-ray radiograph when the system is in override mode or when the collimator is turned. This allows the system to provide a shuttered image on the viewer regardless of where the collimated image edges lie on the receptor.

The Discovery XR656 is able to detect collimation edges present in an x-ray radiograph. This allows the system to provide a shuttered image on the viewer.

In the event of incorrect automatic shuttering, the image can be recovered by manually re-shuttering the image to visualize the desired anatomy and then re-processing with the same look.

## Re-process Images

Image re-processing allows the system to extract more information from an already acquired image by changing the processing settings instead of taking additional exposures.

Re-processing can be performed on any image that has a corresponding raw data set. Images can be re-processed both in live exams and in review mode.

Re-processing creates a new image in the “PROCESSED” series.

**Note:** When closing an exam or closing patient in review mode, you must select to save changes to images or the re-processed images will not remain in the series. Refer to [Save Changes to Images \(p. 11-32\)](#) for more information.

The initial image processing is determined by the default that is configured for the protocol. Refer to [Chapter 15: Preferences-Image Processing \(p. 15-50\)](#) for more information.

**Table 11-6** describes the settings used to re-process an image.

**Figure 11-13** Image Tools panel – Image Processing tab



**Note:** Current image processing setting is shown at the top of the Image Processing tab.

**Table 11-6** Reprocessing tool descriptions

Function	Description
Anatomy	Changes the anatomical region.
View	Changes the view.
Image Type	Displays the image type of the acquisition. Images cannot be re-processed with a different image type than originally acquired.
Patient size	Changes the patient size.

**Table 11-6** Reprocessing tool descriptions

Function	Description
Look	<p>Changes the processing look.</p> <p>Looks are the way an image is processed to be viewed by a radiologist for interpretation.</p> <p>Looks are pre-defined combinations of brightness, contrast, edge enhancement, and tissue equalization.</p> <p>Factory Look descriptions:</p> <ul style="list-style-type: none"> <li>• Factory Look 1 – similar to analog film, low edge, no TE</li> <li>• Factory Look 2 – low CR look, low edge, moderate tissue contrast</li> <li>• Factory Look 3 – moderate CR look, low edge, TE</li> <li>• Factory Look 4 – highly digital look, high edge, high TE</li> <li>• Custom looks – The system allows you to build up to 5 custom looks in any combination of parameters. Refer to <a href="#">Chapter 15: Preferences-Image Processing (p. 15-50)</a> for more information on building custom looks.</li> </ul>
[REPROCESS]	<p>Applies the changes and re-processes the image.</p> <p>Re-processing creates a new image in the series.</p> <p><b>Note:</b> The button does not become enabled until the Look is selected.</p>
[EDIT PROC]	<p>Displays Image Processing Preference Editor screen that allows you to view the Factory look settings or create custom looks.</p> <p>Refer to <a href="#">Chapter 15: Preferences-Image Processing (p. 15-50)</a> for more information about building custom looks.</p>
[DE RESTORE]	Recovers Dual Energy processing. That is, sends the raw data through Dual Energy processing again to create new soft tissue and bone images. The button is disabled if the image was acquired with a single energy or Image Pasting (if enabled) protocol.
[REPASTE]	If enabled, opens a screen to allow manual alignment of Image Pasting acquisitions.

## Deviation Index (DI)

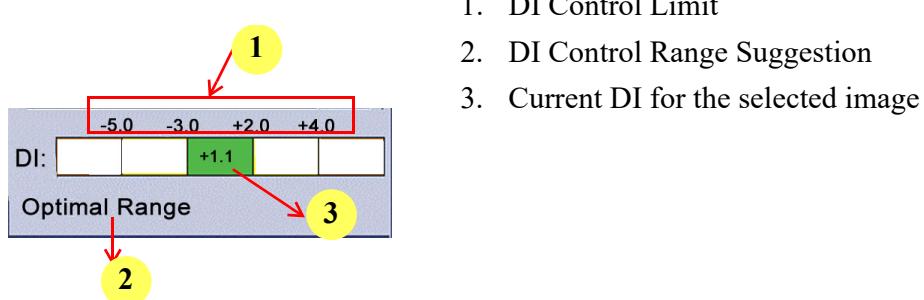
The direct connection between the level of detector exposure and optical density is well established in film-screen radiography, but this is not the case in digital radiography because of automatic image processing optimizing image looks. In order to provide detector entrance dose information, DEI feature is provided to the users, displaying a way for customers to understand detector exposure level. For each acquired image, the DEI provides 3 estimates values:

- Deviation Index (DI): A unitless index that gives the user an indication of the exposure level of an acquisition, relative to a target exposure level defined in the system.

- Exposure Index (EI): A unitless value that estimates the detector exposure assuming that the x-ray technique (e.g., kVp, Cu filtration) used is the same as that of the calibration technique.
- Compensated Detector Exposure (CDExp): Estimate of exposure in  $\mu\text{Gy}$  based on the actual x-ray technique (e.g., kVp, Cu filtration) used for the acquisition under simulated clinical condition.

In particular, DI provides a visual indicator to the user. The display method for DI, DI range, and Target exposure can be configurable in the user preference. Refer to [Chapter 15: Preferences-DI \(Deviation Index\) \(p. 15-33\)](#) for more information.

**Figure 11-14** DI graphical display



**Table 11-7** Examples of visual range DI displays

Display	Description
 DI: -7.1	Low DI = Out of Desired range [lower than Target Exposure Index]
 DI: -3.3	Low DI = Acceptable Range [Slightly lower than Target Exposure Index]
 DI: +1.1	Optimal DI = Optimal Range [Matches Target Exposure Index]
 DI: +3.7	Acceptable DI = Acceptable Range [Slightly higher than Target Exposure Index]
 DI: +5.1	High DI = Out of desired range [Higher than Target Exposure Index]

**IMPORTANT!** Default DI ranges and default Target EI are provided as guidelines. These guidelines should not be considered as strict requirements of retakes/re-exposures. DI ranges, Target EI adjust-

ment, and retake rules should be ultimately determined by the appropriate staff at your facility who will determine them based on Image Quality and Patient Entrance Dose.

## Corrective Actions

If DI values become consistently outside of the acceptable range, the user may consider following corrective actions depending on Image quality and Patient Entrance Dose after confirming that imaging conditions are appropriate (e.g. collimation and shuttering, unusual body habitus, presence of prosthetics, shielding, AEC):

- (A) Image quality and Patient Entrance Dose are acceptable - Adjust ‘Customer Target EI’ in User Preference by changing the value in ‘Target EI Adjustment.’
- (B) Images are saturated and/or Patient Entrance Dose is higher than expected - Decrease mAs and/or kV value.
- (C) Images quality is poor and/or Patient Entrance Dose is lower than expected - Increase mAs and/or kV value.
- (D) If DI is within the acceptable range, detector entrance dose is expected range but the image quality is poor, the image may need adjustment through customization of Image Processing Looks.

**IMPORTANT!** DI result using Default Target EI should NOT be used as the sole justification factor for determining X-ray technique.

## Exceptions to Corrective Actions

The following conditions may achieve a properly exposed image but still result in divergence from acceptable DI range. These should be treated as special cases, and no corrective actions may necessary.

- (A) The presence of external patient shielding (i.e., lead apron) in the field of view can result in an unexpectedly low DI (and EI/CDExp). The presence of shielding can be confirmed by viewing the image.
- (B) Non-optimal FOV (field of view) for examined protocol/anatomy can result in deviation from acceptable DI range. The presence of significant collimation regions or too large collimation can be confirmed by viewing the image.

**Note:** User must select the appropriate FOV for the anatomy imaged, and use proper collimation at all times.

## Change Pointer Controls

The pointer control buttons ([Figure 11-15](#)) change the action of the pointer when it is clicked and dragged on an image.

**Figure 11-15** Pointer control buttons



The pointer controls allow you to perform other functions that are not available in any other tool panel.

Follow this process to change the pointer controls. [Table 11-8](#) describes the action of each control.

1. Select the image to act upon, if necessary.
2. Click the pointer control to use.
3. Click and drag the pointer on the selected image.

**Table 11-8** Pointer Controls description

Tool	Description
Select Image 	When viewing multiple images, selects the image to act upon. This is the default pointer behavior.
Pan Image 	Moves the image within the viewing area.
Image Magnifying Glass 	Shows a small part of the image at 3 times magnification.
Change Image Brightness / Contrast 	<p>Changes the brightness and contrast by dragging the pointer instead of using the Image Display Tools controls.</p> <ul style="list-style-type: none"> <li>• Contrast: Click and drag the pointer vertically. Up is more contrast, down is less contrast.</li> <li>• Brightness: Click and drag the pointer horizontally. Right is brighter, left is darker</li> </ul> <p>Moving the pointer diagonally will change both brightness and contrast in proportion to the angle of movement. That is, if you move the pointer at a perfect 45° angle, brightness and contrast will change equally; however, if you move the pointer at a 20° angle (more horizontally) the brightness will change more than the contrast.</p> <p>There is an option to enable “speed” control for this function that sets how fast the brightness and contrast changes on the image. GE Service personnel enable the option and it is configurable through preferences. Refer to <a href="#">Chapter 15: Preferences-Image Viewer (p. 15-29)</a> for more information.</p>

# Apply Quality Check Indicator (Auto Tag)

If Auto Tag is enabled, the quality check symbol indicates that an image is of acceptable quality and allows the image to be auto printed and auto pushed (if enabled). Refer to [Chapter 15: Preferences-Auto Tag \(Quality Check\) \(p. 15-22\)](#) to enable Auto Tag.

The quality check indicator is a “T” that appears in a white box at the bottom right corner of the image ([Figure 11-16](#)). The quality check indicator is on by default. Removing the indicator means that the image is not acceptable and will not be auto printed or auto pushed and will remain on the local database only.

**Note:** The quality check indicator is only available in live exams.

- To remove the quality check indicator, click the white box so that the “T” disappears.
- To restore the quality check indicator, click the white box so that the “T” reappears.

**Figure 11-16** Quality check indicator



## Repeat/Reject Analysis (RRA)

The Repeat/Reject Analysis (RRA) feature, if enabled, provides a way for you to categorize and provide a reason for images that you have removed the quality check indicator from.

RRA data is saved on the system for 100 days and may be exported as a report.

**Note:** Refer to [Chapter 13: Advanced Applications-Repeat/Reject Analysis \(RRA\) \(p. 13-13\)](#) for more information about configuring RRA and exporting RRA data and report.

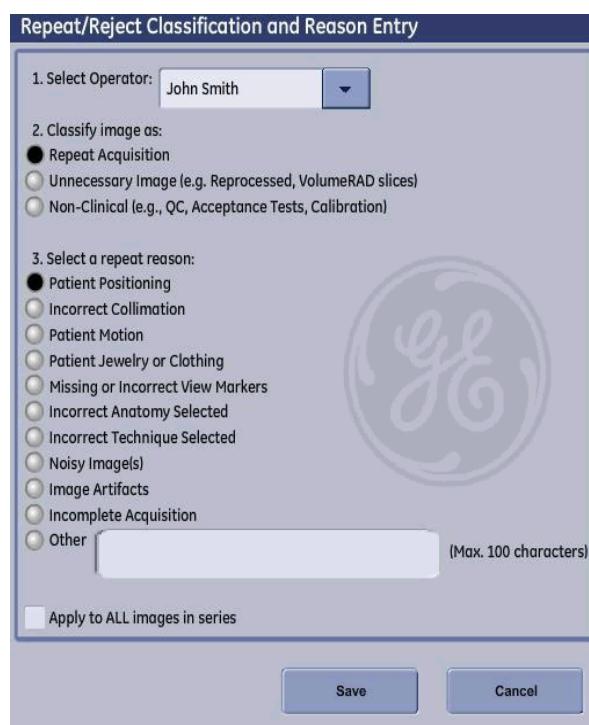
1. In a live exam, remove the quality check indicator from an image.
  - The Repeat/Reject Classification and Reason entry dialog box appears ([Figure 11-17](#)).
2. Select your name (or other identifying information) from the **Select Operator** drop down list.
3. Select the **Classify Image As** radio button.
  - Available options are:
    - Repeat acquisition - the image is not desired and its corresponding acquisition needs to be repeated.
    - Unnecessary Image - the image is not required, such as the original of an image that was reprocessed or a VolumeRAD slice
    - Non-Clinical - the image was produced as part of maintenance, QAP, calibration, or acceptance testing
4. If the image is classified as a Repeat Acquisition, **Select a Repeat Reason**.
  - Skip to step 5 for images classified as Unnecessary or Non-Clinical.
  - Available options are:
    - Patient Positioning
    - Incorrect Collimation
    - Patient Motion

- Patient Jewelry or Clothing
- Missing or Incorrect View Markers
- Incorrect Anatomy Selected
- Incorrect Technique Selected
- Noisy Image(s)
- Image Artifacts
- Incomplete Acquisition
- Other (Provide a reason in the text box. The text box can hold a maximum of 100 characters.)

**IMPORTANT!** The RRA tool is not linked to service requests. Any system issues must be reported to service.

5. If desired, check the “Apply to ALL images in series” check box. This will apply the same Classification and Repeat Reason to all rejected images in the entire series.
6. Click [SAVE] to retain your changes.
  - [CANCEL] closes the screen and keeps the quality indicator mark in place.

**Figure 11-17** Classify Image and Select Repeat Reason



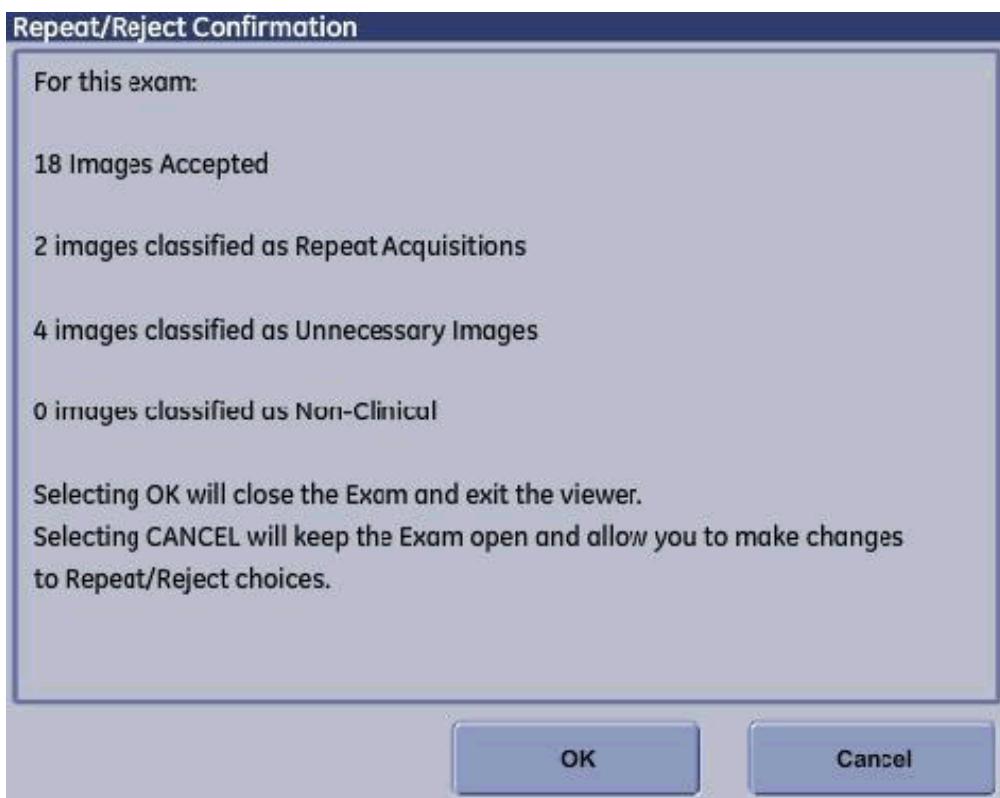
Depending on the RRA Preferences selection, the Repeat/Reject Confirmation screen ([Figure 11-18](#)) may appear when you close the exam. The screen displays the following information:

- The number of **Images Accepted** (images with the quality indicator mark) in the exam
- The number of **Images Classified as Repeat Acquisitions** in the exam
- The number of **Images classified as Unnecessary Images** in the exam
- The number of **Images classified as Non-Clinical** in the exam

1. Select [OK] to close the exam and exit the Image Viewer screen.
2. [CANCEL] keeps the exam open and allows you to change the Repeat/Reject choices.

**Note:** Refer to [Chapter 13: Advanced Applications-RRA Confirmation Screen \(p. 13-14\)](#) for more information about enabling this screen to appear.

**Figure 11-18** RRA confirmation on exam close



## Print Images

Images can be printed from the system in two ways: Manual Print and Auto Print.

### Auto Print

The system can be configured to perform an automatic print upon closure of the exam. Preferences are accessed from the Utilities screen. Refer to [Chapter 15: Preferences-Auto Print \(p. 15-23\)](#) for information on configuring Auto Print. Settings entered on the Preferences Auto Print screen will be the default setting for printer preferences on the system, even when Auto Print is off (not enabled).

### Manual Print

Film Manager and Manual Print allow you to print images on demand.

- Film Manager allows configuration and printing of multiple images in a series.
- Manual Print allows configuration and printing of the currently selected image.

**Figure 11-19** Manual print buttons – Film Manager and Manual Print

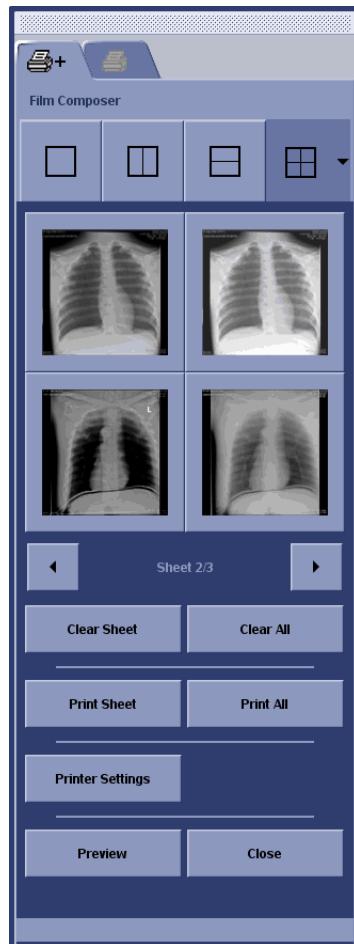


## Print Multiple Images

Follow this process to print multiple images.

1. Click [FILM MANGER].
  - The Film Composer screen ([Figure 11-20](#)) appears.

**Figure 11-20** Film Composer screen - after images are added

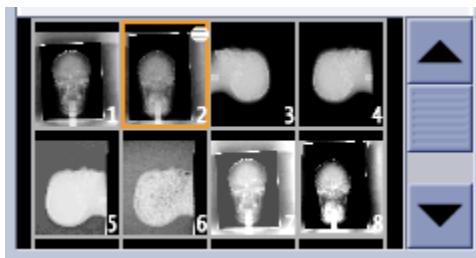


2. Select the number of images you want to appear on a sheet.
  - If there are more images in the series than will fit on the sheet, use the Sheet [ $\leftarrow$ ] and [ $\rightarrow$ ] buttons to configure the printing options for each sheet.

**Note:** You are able to change the number of images for each sheet individually; however, changing the format will remove any images that already exist on the sheet.

3. Use the mouse to click and drag the image thumbnails from the Images panel ([Figure 11-21](#)) to the Film Composer screen.

**Figure 11-21** Images - Processed panel



4. Use the buttons to confirm and adjust the print settings.
  - Click [PREVIEW] to see how the images are positioned on the sheet.
  - Click [CLEAR SHEET] to remove images from the currently displayed sheet.
  - Click [CLEAR ALL] to remove images from all sheets.
  - Click [PRINT SHEET] to print the currently displayed sheet.
  - Click [PRINT ALL] to print all sheets.
5. Click [PRINTER SETTINGS] to confirm or adjust the printer configuration. (Refer to [Figure 11-23](#) and [Table 11-9](#) for more information.)
6. Click [CLOSE] when finished.

## Print Current Image

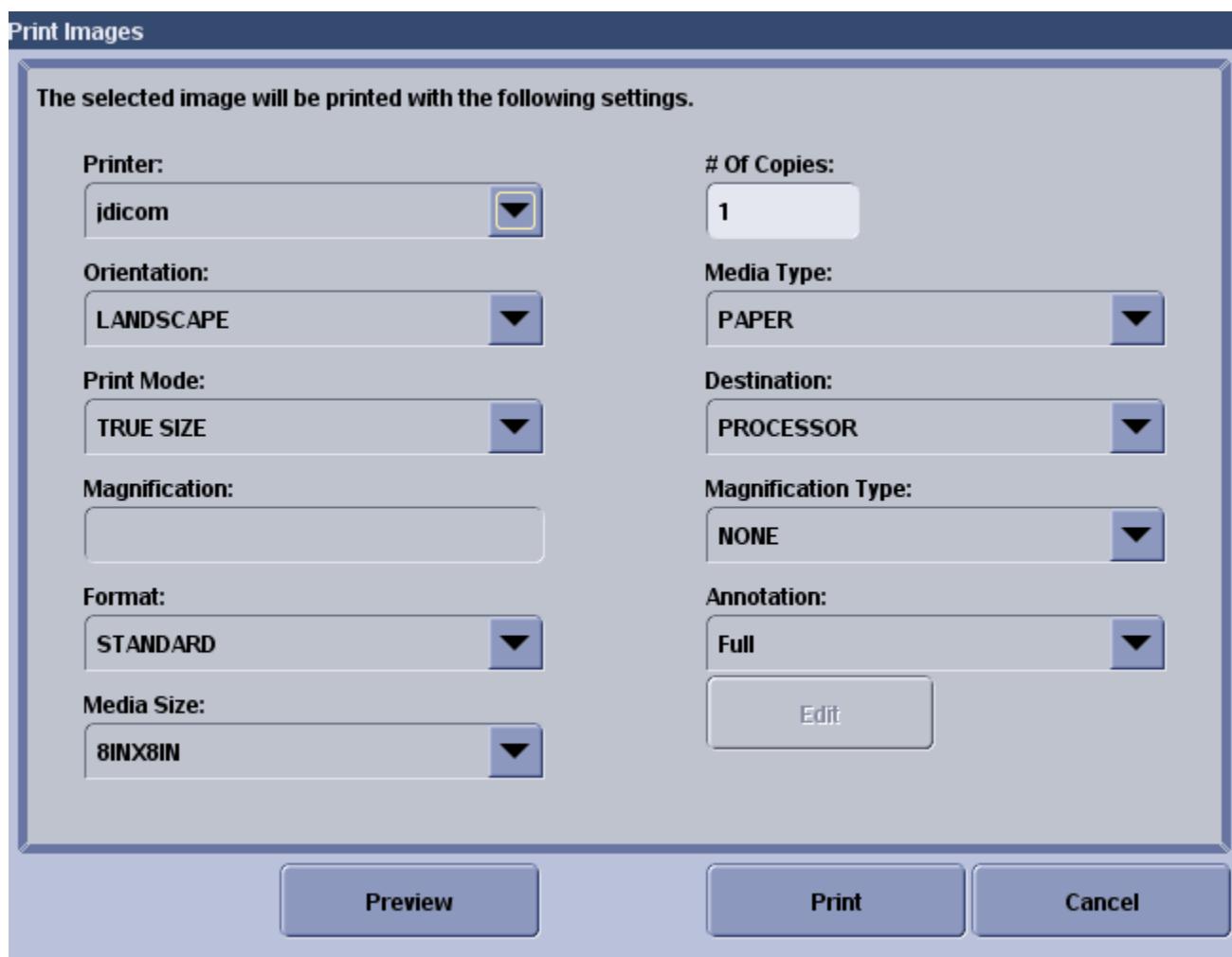
Follow this process to print a single image.

1. Select the image from the Images tool panel, if necessary.
2. Click [MANUAL PRINT].
  - The Print Images screen appears.
3. Adjust the settings as indicated in [Table 11-9](#).
4. Click [PREVIEW] to confirm that the image placement is correct.
  - If the image placement is incorrect (as shown in [Figure 11-22](#)), click [CANCEL] to return to the Print Images screen and adjust the settings.
  - If the image placement is acceptable, click [PRINT] to print the image.

**Figure 11-22** Example of Print Preview with incorrect settings



5. Click [PRINT] to print the image.
  - [CANCEL] closes the Print Images screen without printing and returns you to the Image Viewer screen.

**Figure 11-23** Print Images screen

**Table 11-9** Print Images field description

Field	Description
Printer	Lists all available printers configured for your system.
Orientation	Selects vertical or horizontal orientation of the image on film or paper. Available options are: <ul style="list-style-type: none"><li>• Landscape</li><li>• Portrait</li></ul>
Print Mode	Selects what size to print the image. Available options are: <ul style="list-style-type: none"><li>• True Size</li><li>• Fit to Film</li><li>• Reduce Size</li><li>• Orthopedic Magnification (if enabled) (Refer to <a href="#">Chapter 13: Advanced Applications-Orthopedic Magnification (p. 13-11)</a> for more information.)</li></ul>
Magnification	If Reduce Size is selected as the Print Mode, allows you to enter the percent by which the image will be reduced. The accepted range is between 40% and 90%. If True Size or Fit to Film is selected as the Print Mode, the text box remains disabled.
Format	Selects the print format. Available options are: <ul style="list-style-type: none"><li>• Standard</li><li>• 35 mm</li><li>• 40 mm</li></ul>
Media Size	Shows the available sizes that are configured for the selected printer.
# of Copies	Defines how many copies to print.
Media Type	Selects the type of media to print on. Available options are: <ul style="list-style-type: none"><li>• Paper</li><li>• Clear film</li><li>• Blue film</li></ul>
Destination	Selects the destination. Available options are: <ul style="list-style-type: none"><li>• Processor</li><li>• Magazine</li></ul>

**Table 11-9** Print Images field description

Field	Description
Magnification Type	Selects the magnification type. Available options are: <ul style="list-style-type: none"><li>• Cubic</li><li>• None</li></ul>
Annotation	Selects the amount of annotation to print on the image. Available options are: <ul style="list-style-type: none"><li>• Full</li><li>• Partial</li><li>• Custom</li><li>• None</li></ul> Refer to <a href="#">Annotate and Mask Images (p. 11-9)</a> for more information.
[EDIT]	If Custom Annotation was selected, brings up a screen that allows you to choose the annotation to print on the image. Refer to <a href="#">Annotate and Mask Images (p. 11-9)</a> for more information.
[PREVIEW]	Shows how the image will appear on the film or paper with the current settings.
[PRINT]	Prints the image.
[CANCEL]	Cancels printing.

## Orthopedic Magnification (Option)

Orthopedic Magnification is an option that allows you to introduce a fixed amount of magnification percentage so that the image size will match previously calibrated orthopedic templates.

**Note:** GE Service personnel enable Orthopedic Magnification and enter the Configurable Magnification Factor (CMF) through the Services User Interface. The CMF is the amount of magnification applied to all Orthopedic Magnification functions. Only GE Service personnel are able to change the CMF. Each facility determines the changes to the default CMF. Consult your Medical Physicist for assistance on dose concerns.

Only processed images will have Orthopedic Magnification applied. The raw images remain as acquired.

## Send Images

If Auto Send is enabled, acquired images are automatically sent to a pre-determined location on exam close. Refer to [Chapter 15: Preferences-Auto Send \(Auto Push\) \(p. 15-26\)](#) for information on configuring Auto Send.

## Save Changes to Images

You have the option to save or discard the changes you have made to images when you close the Image Viewer screen or end the exam.

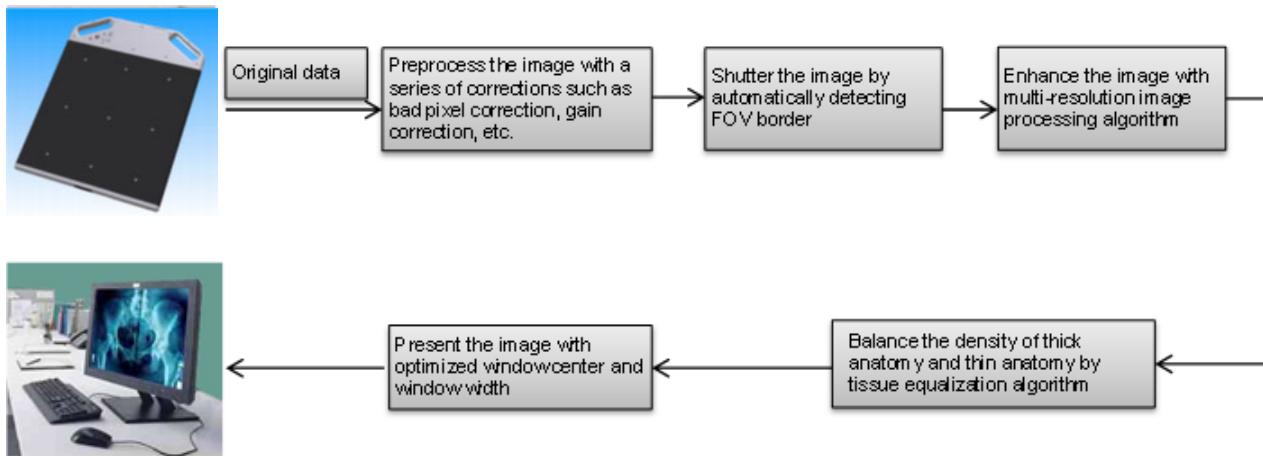
1. If in a live exam, click [CLOSE] on the Acquisition screen.
2. If in review mode, click [CLOSE] on the Image Viewer screen.
  - A message appears: “Would you like to save the changes made to the images?”
3. Click [YES].
  - [NO] closes the Image Viewer screen without saving changes.

# Chapter 12: Image Management

## Image Processing

The Image Processing preferences allow you to view the settings of default factory looks or to create up to five (5) custom looks. Image Processing Preferences also allow you to change which look is the default for the anatomical view.

**Figure 12-1** Description of Image Processing



The Image Management screen ([Figure 12-2](#)) shows all the images stored in the selected database source. This screen is used to manage images, copy images to exams, transfer images to network hosts, or save images on CD/DVD.

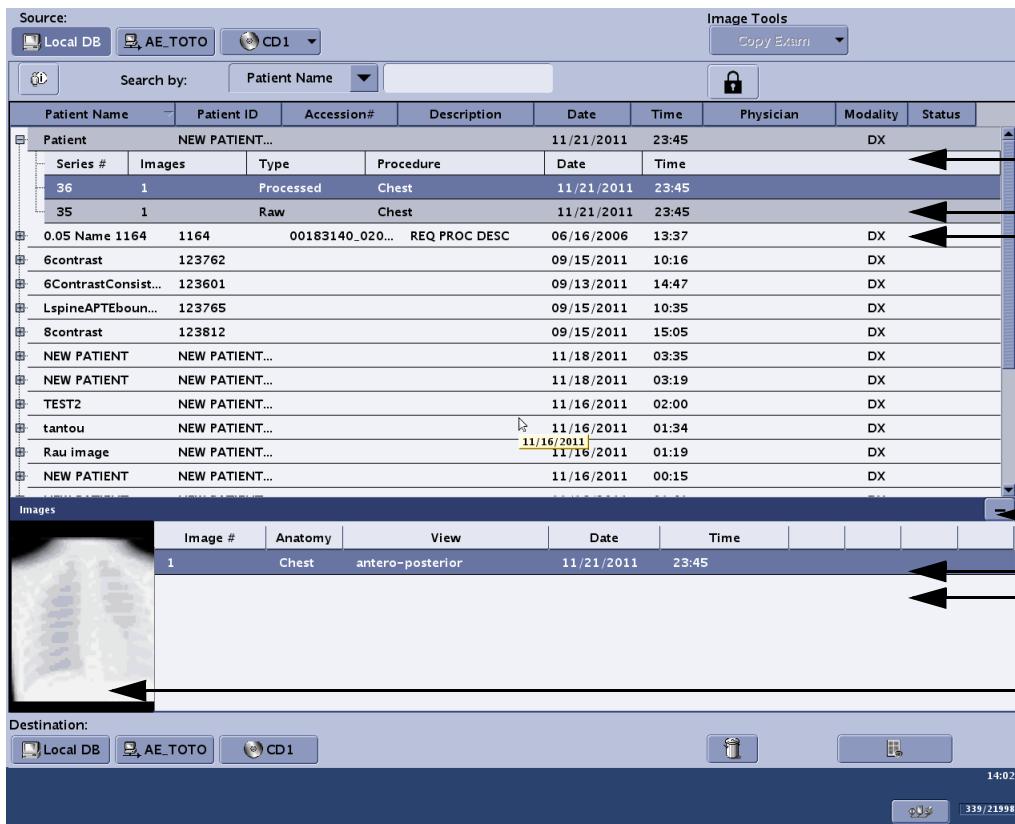
## Overview

The majority of the Image Management screen is devoted to the exam list. Images are organized by exam. Each exam is a row. If multiple exams were acquired in the same session, each exam has its own row on the list. The exam expands to show the series.

Within each exam are “series” of images. A series is a collection of one or more images acquired in a session. Each protocol is a series. A new series is created when a completed exam is appended.

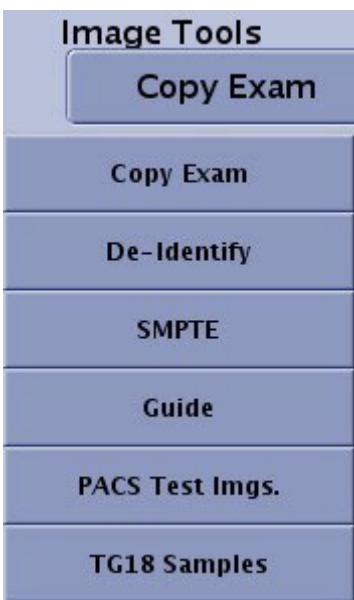
There are two types of image series: raw and processed. Raw images are the exact images that were acquired. Processed images are the raw images with specific processing and image adjustments (such as brightness and contrast) applied. It is possible to create several processed images from one raw image.

Individual images reside within the series. Clicking a series or clicking the [+] button opens the image details section of the Image Management screen. In the Image Details section, each row is an image. Selecting a row makes a small preview image, or “thumbnail,” appear. The image may be opened for viewing, adjustment, or deletion.

**Figure 12-2** Image Management screen

1. Selected exam
2. Series in exam
3. Image detail button
4. Images in selected series
5. Preview of selected image

**Table 12-1** Image Management screen functions

Function	Description
Image Tools 	Performs various functions on selected exams. Available options are: <ul style="list-style-type: none"> <li>Copy Exam – Allows all exam images for a patient to be copied to another patient, to another location, or to CD/DVD. Refer to <a href="#">Copy Exams and Images (p. 12-7)</a> for more information.</li> <li>De-identify – Makes an anonymous copy of the exam (removes all patient identifying information, including Name, ID, and accession number). Refer to <a href="#">Make Exam Anonymous (De-Identify) (p. 12-12)</a> for more information.</li> <li>SMPTE – Allows services personnel to access the SMPTE pattern for system calibration.</li> <li>Guide – Allows for viewing of the Operator Manual. This is installed by GE Service Personnel.</li> <li>PACS Test Images – Loads a set of calibration images that are used to test the quality of images sent to PACS or printers.</li> <li>TG18 Samples – Loads a set of test images that are used to calibrate the display monitor.</li> </ul> <p><b>Note:</b> It is not expected that you will need to access the SMPTE pattern, PACS test images, or sample images during the course of normal work. Test images are used to calibrate the system or to determine the cause of image quality problems.</p>
Source locations 	Selects the source of images to view (e.g., the local unit, a network host, or a CD/DVD). Refer to <a href="#">Open Exams and Images (p. 12-7)</a> for more information.
[PATIENT INFORMATION] 	Shows the Patient Information screen for the selected procedure. <p><b>Note:</b> Patient Information cannot be edited once an exam has started.</p> Refer to <a href="#">Chapter 9: Worklist-Add or Edit Patient Information (1)</a> for more information.
Search by 	Searches for exams by sorting the selected column (shown in the drop-down list) and searches for text entered into the text box. Refer to <a href="#">Search List (p. 12-6)</a> for more information.
[LOCK] or [UNLOCK] 	Locks the selected exams from deletion. If a locked exam is selected, the button name changes to [UNLOCK]. [UNLOCK] removes the lock from the selected exams. Refer to <a href="#">Lock Exams from Deletion (p. 12-11)</a> for more information.

**Table 12-1** Image Management screen functions

Function	Description
Exam, series, and images list  	<p>Lists the images saved in the local database categorized by exams and series. The following information is displayed:</p> <ul style="list-style-type: none"> <li>• Exams - the exams saved in the local database</li> <li>• Series detail - the series for the selected exam</li> <li>• Image list - the images for the selected series</li> <li>• Image preview - a representative thumbnail of the selected image.</li> </ul> <p><a href="#">Figure 12-2</a> shows how the information is organized.</p>
Destination  	<p>Selects where images are to be copied or saved. The first button switches between the local unit and any configured network hosts.</p> <p>Refer to <a href="#">Copy Exams and Images (p. 12-7)</a> for more information.</p>
[DELETE]  	<p>Deletes the selected exams, series, or images from the local database.</p> <p>Refer to <a href="#">Delete Exams, Series, or Images (p. 12-11)</a> for more information.</p>
[VIEWER]  	<p>Opens the Image Viewer screen and shows the images in the selected series. Images may be adjusted on the Image Viewer screen.</p> <p>Refer to <a href="#">Chapter 11: Image Viewer</a> for more information.</p>
[TRANSFER LOG]  	<p>Shows a list of transferred exams and their destinations.</p> <p>Refer to <a href="#">Copy Exams and Images (p. 12-7)</a> for more information.</p>
Database size  	<p>Shows how many images are currently saved to the local database and approximately how many more images the database is able to accommodate.</p> <p>Refer to the following sections for more information:</p> <ul style="list-style-type: none"> <li>• <a href="#">Copy Exams and Images (p. 12-7)</a> to save images to another database or disk</li> <li>• <a href="#">Delete Exams, Series, or Images (p. 12-11)</a> to remove images</li> </ul>
System status  	<p>Displays the last system status message.</p>
[MESSAGE LOG]  	<p>Displays the message log since the last system re-start.</p>

# View Patient Information

When accessed from the Image Management screen, the Patient Information screen displays exam information about the acquired images in the lower left corner ([Figure 12-3](#)). All other patient information is as described in [Chapter 9: Worklist-Add or Edit Patient Information \(1\)](#).

**Figure 12-3** Patient Information from Image Management screen

The screenshot shows the 'Patient Information' dialog box. In the 'Patient' section, First Name is 'kerry', Middle Name is blank, Last Name is 'weaver', Patient ID is '12345', Birth Date is blank, Age is blank, and Gender is 'Other'. In the 'Exam' section, Accession # is '0987673', Operator is 'Gutfaison', Performing Physician is blank, Referring Physician is blank, Status is blank, Study Description is blank, Modality is 'DX', Exam Date is blank, and Exam Time is '10:20'. At the bottom, there is a message: '# of Exposures : 2' and '# of Non Digital Exposures : 0'. This message is highlighted with a yellow oval.

# Load Images from a CD or DVD

Follow this process to access images stored on a CD or DVD.

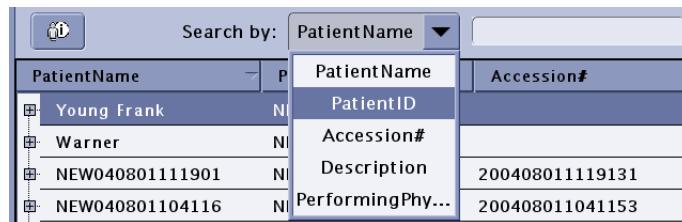
1. Insert the disk with images into the CD or DVD drive.
2. Click Source [CD1].
  - The exam list updates to show the images stored on the disk.
3. Select the exams.
4. Copy the exams to the Local database. Refer to [Copy Exams and Images \(p. 12-7\)](#) for more information.
5. Click the [LOCAL] Destination button.
  - A message appears: "Selected images will be copied to (destination name). Select OK to confirm."
6. Click [OK].
7. Open the exams from the Local database.

**Note:** If the exams are being viewed on a computer that has the DICOM viewer installed, images may be viewed directly from the disk.

## Search List

The Search feature finds procedures by column.

**Figure 12-4** Search by column drop-down list



1. Click the button on the Search By drop-down list to select the column you want to search.
  - If the column you want is already selected, begin at step 3.
2. Select the column. For example, Patient ID.
  - The list automatically sorts the selected column.
3. Type the search criteria into the text box. For example, you are looking for patients whose names begin with “J”, so you would type “j” into the text box.

**Note:** The text box is not case sensitive.

4. Continue typing the search criteria.
  - The list automatically selects the first procedure that matches what you have typed into the text box.
  - If no procedures match what you have typed, the list de-selects all procedures and places the closest match at the top of the exam list.

## Sort by Column

Sorting allows you to organize the procedures by the column of your choice.

1. Click on the column heading you want to sort, or choose the column in the Search By drop-down list. For example, you want to see all the procedures that were performed by a specific physician, so you click on the “Performing Physician” column heading.
  - An arrow appears in the column heading to indicate which column is currently being sorted.
2. Click the column heading again to switch between ascending and descending order.
  - An up-pointing arrow indicates that the column is sorted in ascending order. That is, sorted in alphabetical order or numerical order from smallest to largest.
  - A down-pointing arrow indicates that the column is sorted in descending order. That is, sorted in reverse alphabetical order or numerical order from largest to smallest.

**Figure 12-5** Column with ascending sort

## Open Exams and Images

Follow this process to open exams and images for viewing.

1. Click the [+] button to the left of the exam name to open it.
  - The series for the exam expands below the exam.
2. Click the series to open it (or, select the series and click [+] to see image details).
  - The image detail opens.
3. Select the image.
  - A preview thumbnail appears.
4. Click the image (or, select the image and click [VIEWER]).
  - The selected series opens on the Image Viewer screen with the selected image displayed.

## Copy Exams and Images

Exams (including all series and images) may be copied to a network host or to a CD/DVD. The images from one exam may be copied to another exam.

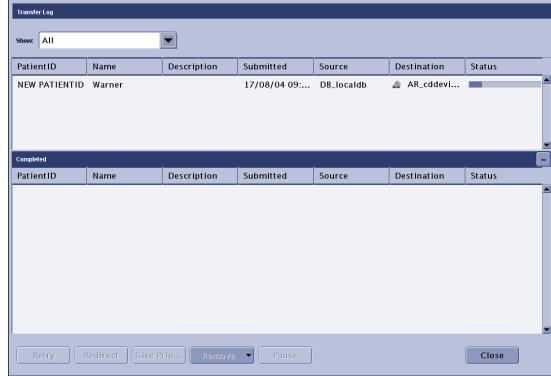
**Note:** Copying exams does not remove the exam from its original location.

## Copy Exams to a Network Host

Exams may be copied from the local database to a configured network location or vice versa. Exams cannot be copied from one network host to another network host. Refer to [Chapter 15: Preferences-Network Connections \(1\)](#) for information about configuring network hosts.

1. Select the exams to copy.
2. Click [DESTINATION].
  - A message appears: “Images will be copied to (host name). Select OK to confirm.”
3. Click [OK].
  - If there is a problem and the exams cannot be copied to the selected network host, a message appears: “The network destination is not responding. If the problem persists contact your network administrator.”
4. Click OK to close the message. Make sure that the unit is properly connected to the network or try copying the exams at a later time.

- To see the status of the exams being copied, click [TRANSFER LOG] at the bottom of the Image Management screen.
  - The Transfer Log screen ([Figure 12-6](#)) appears.
5. Click [CLOSE] to close the screen and return to the Image Management screen.

**Figure 12-6** Transfer Log screen

## Copy Images to Another Exam

This process is used to copy images from one exam to another. Copying images is used to consolidate images from multiple exams to a single exam and to reconcile patients to exams. For example, images taken for an emergency exam can be assigned to the patient's real name once the patient's information is known. Another example is to assign images that were acquired for the wrong Worklist entry to the correct patient.

Images are copied to procedures that appear on the Worklist. Once the copy is complete, the procedure is marked as "Completed" on the Worklist and the new exam appears on the Image Management screen. Images may be copied to procedures with the status of Suspended, Discontinued, or Scheduled. Images may not be copied to procedures with a status of Completed.

**Note:** You can only copy the images from one exam at a time.

**Note:** You cannot copy images to multiple Worklist procedures.

1. If necessary, create a Worklist procedure entry for the patient with the appropriate information.
  - a) On the Worklist screen, click [ADD PATIENT].
  - b) Enter the patient's information. Refer to [Chapter 9: Worklist-Add or Edit Patient Information \(1\)](#) for more information.
  - c) Click [SAVE].
2. On the Image Management screen, select the exam to copy.
3. Switch the [IMAGE TOOLS] button to COPY EXAM, if necessary.

- The Copy Exam screen appears.



- The Copy Exam screen shows all Worklist entries with the status of “Scheduled”, “Discontinued”, or “Suspended”.

- Search or Filter the exam list to locate the destination exam.
- Select the exam where you want the images copied to.
- Click [OK].
  - A message appears: “Images will be copied to the selected exam. Images will not automatically be removed from the source exam. The destination exam will be marked as Completed.”
- Click [OK].
  - The message closes.
  - A message appears: “Copying Images”
  - [CANCEL] stops the copy process, closes the message, and returns you to the Image Management screen.
  - All series and images are copied to the exam.

## Copy Exams to a CD or DVD

Exams may be copied to a CD or DVD for archiving purposes, to send to a location that is not within the network, or to include with a patient’s medical records.

**Note:** The discs used for copying images must be recordable. That is, the disk should be labeled “CD-R” or “DVD-R” (recordable).

**DO NOT** use re-writable (CD-RW or DVD-RW) disks. The system cannot write to this type of disk.

**Note:** You cannot copy exams to a disk that already has exams or other information saved on it. You will receive a message, “CD is not blank. Please insert a blank CD to proceed” when you attempt to copy images to the disk. Always use a new, blank disk.

- Open the disk tray. (Select Eject from the [CD1] drop-down list.)

**Note:** Pressing the Eject button on the workstation PC does not open the disk tray. When working on the Image Management screen, always use the Eject option from the [CD1] drop-down list (Figure 12-7).

**Figure 12-7** CD 1 button drop down list



2. Insert a blank disk into the tray.
3. Click Source [CD1] to close the disk tray.
4. Select the exams to copy.
5. Click the **Destination** [CD1].
  - The CD Write screen appears.



- [DESELECT ALL] unchecks all exams on the list.
  - [STORE OPTIMALLY] determines which exams to copy to best utilize the space on the disk. It will automatically uncheck exams that cannot fit on the disk.
  - [WRITE] begins the copying process.
  - [CANCEL] closes the screen and returns you to the Image Management screen.
6. Confirm the exams to be copied. Uncheck any exams that you do not want saved to the disk.
  7. Click [WRITE].
    - The disk begins copying. The light on the front of the computer flashes yellow as the data is being written.
    - To see the status of the exams being copied, click [TRANSFER LOG] at the bottom of the Image Management screen.
    - The Transfer Log screen appears.
    - Click [CLOSE] to close the screen and return to the Image Management screen.
    - When complete, the disk tray will open and close.
  8. After the system finishes the disk, open the exams on the disk to ensure that the disk has the data written to it. Refer to [Load Images from a CD or DVD \(p. 12-5\)](#) for more information.
  9. Remove the disk.

10. Label the disk and store in a safe place.

## Delete Exams, Series, or Images

Exams, series, and images may be deleted from the local database from the Image Management screen.

Follow this process to delete exams, series, and images.

1. Select the **Local** source, if necessary.

**Note:** Items cannot be deleted from a CD, DVD, or network locations.

2. Unlock exams, if necessary.

- Refer to [Lock Exams from Deletion \(p. 12-11\)](#) for more information.

3. Select the items to delete.

- The items may be exams, series with an exam, or images within a series. Multiple items may be selected and deleted at once.

4. Click [DELETE].

- A message appears: “Are you sure that you would like to delete the selected items?”

5. Click [OK].

- The message closes.
- The items are deleted from the Image Management screen.
- [CANCEL] closes the message and the items remain on the Image Management screen.

## Lock Exams from Deletion

The Image Management screen allows you to prevent, or “lock”, exams from being deleted. The exam can only be deleted if the lock is removed, or “unlocked.” The lock prevents exams from being deleted by other operators and from Auto Delete. Refer to [Chapter 15: Preferences-Image Management \(1\)](#) for more information about Auto Delete.

Locked exams can still be copied, transferred, and viewed.

Only exams can be locked. Individual series or images cannot be locked.

Follow this process to lock and unlock exams.

1. Select the exams to lock.

- Multiple exams may be selected and locked at once.

2. Click [LOCK].

- The lock icon appears in the status column of all selected exams.



- The [LOCK] button changes to [UNLOCK].

## Unlock Exams

Follow this process to unlock exams so that they may be deleted.

1. Select the locked exams.
  - The Unlock button becomes active.
2. Click [UNLOCK].
  - The lock icon is removed from the status column of the selected exams.
  - The exams may now be deleted.

**Note:** You are able to lock or unlock multiple exams even if the selected exams are a mixture of locked and unlocked. Clicking the [LOCK] button will lock all selected exams. Clicking the button again will unlock all selected exams.

## Make Exam Anonymous (De-Identify)

There may be times when you want the name of a patient to be kept confidential to maintain patient privacy. You can do this using the De-Identify feature. This feature allows you to create an anonymous set of images.

The patient examinations are copied and used to create a new patient, with the name “Anonymized patient” and a unique, randomly created Patient ID as shown in [Figure 12-9](#).

**Note:** The original exam is not modified in any way, only a copy is altered.

**Note:** Once an anonymous exam is created, there is no way to recover the patient’s identifying information from the anonymous exam.

The De-Identify option is available from the Image Tools button ([Figure 12-8](#)).

**Figure 12-8** Image Tools button



**Figure 12-9** Anonymous patient



Use this process to make exam images anonymous:

1. Select the exams to make anonymous.
2. Switch the Image Tools button to [DE-IDENTIFY], if necessary.
  - A message appears: “The selected exams will be copied without patient identification. The originals will not be deleted.”

3. Click [OK].
  - The Image Management screen updates with copied, anonymous exams.

# Chapter 13: Advanced Applications

## Dual Energy

### Overview

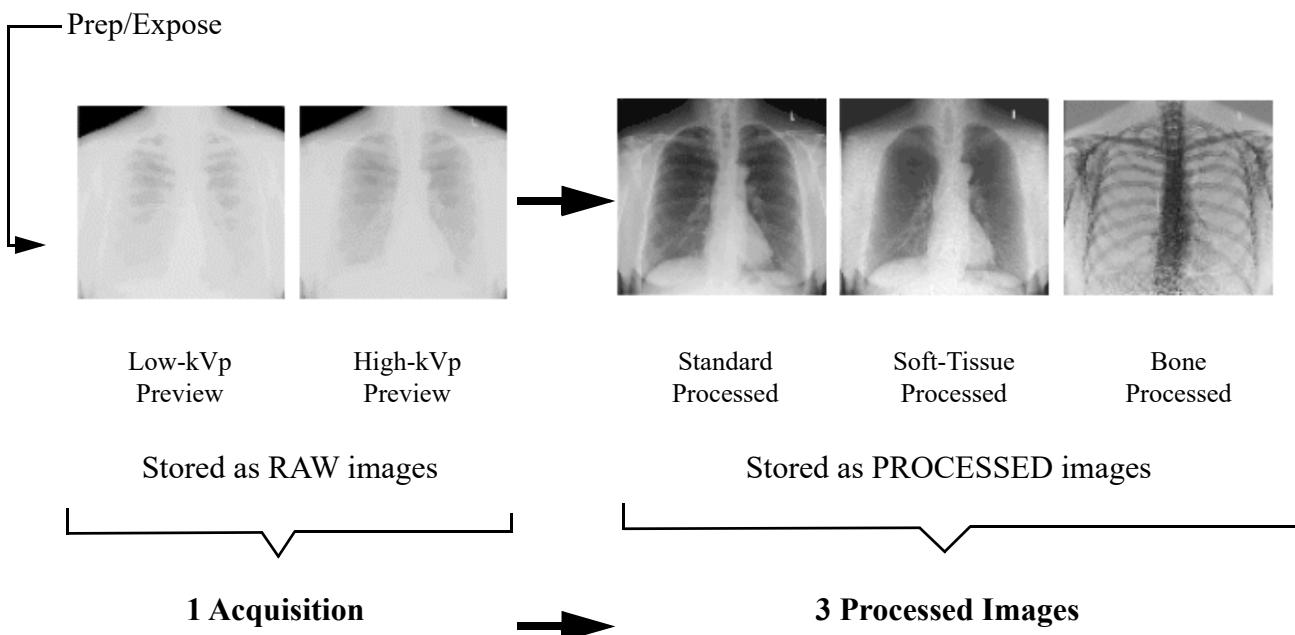
Dual Energy (DE) is an optional imaging technique in which a low-kVp image and a high-kVp image are acquired in rapid succession. The acquired images are processed to create a soft-tissue image and a bone image, which are provided in addition to the standard (high-kVp for chest DE and low-kVp for abdomen) image.

**Note:** Dual Energy is only possible with full digital exams, that is, only the wallstand and table receptors. Dual Energy cannot be performed on a cassette exam.

Dual Energy acquisitions are currently enabled only for Chest and Abdomen AP and PA anatomical views. Dual Energy has significant potential for improving the conspicuity of chest pathology by removing the bone structures and for improving specificity by providing calcification information in the bone image.

### Acquisition and Images

**Figure 13-1** Acquisition and Images



## General Guidelines

Dual Energy acquisition and processing algorithms are optimized for Chest AP/PA and Abdomen AP/PA on adult patients. Use of Dual Energy imaging on other anatomical views and/or pediatric patients may result in degraded image quality.

For Dual Energy acquisitions, it is particularly important for the patient not to move or breathe during the exposure. Excessive whole-body patient motion can result in residual rib contrast in the soft-tissue image.

The Prep/Expose button should be released only after the end of the second exposure beep. Beware that sometimes for large patients, the two beeps merge into one and you hear one long beep. Release the Prep/Expose button after the beep ends.

## Technique Settings and Image Quality for Chest Exams

### Patient Size

The selection of appropriate patient-size setting is needed for:

- correct patient dose allocation between the two exposures
- optimal image quality

The recommended thickness ranges are:

- Small Adult - when the patient measures less than 22cm.
- Medium Adult - when the patient measures between 22cm and 27cm.
- Large Adult- when the patient measures more than 27cm.

### High kVp

Can be set anywhere between 110 and 150. This is usually set to that of the standard (non-DE) chest protocol/technique.

### Low kVp

Can be set anywhere between 60 and 80. In general, a lower low-kVp (default is 60) will result in better “tissue cancellation”. However, for large patients, slightly increasing the low kVp (e.g., to 65 or 70) may improve x-ray penetration and consequently improve the noise characteristics of the resulting soft-tissue and bone images.

### Copper Filtration

Can be set to 0, 0.1 mm, 0.2 mm, or 0.3 mm. In general, less filtration will result in better “tissue cancellation”.

### Grid

The processing algorithms are optimized for chest imaging with grid IN. Removing the grid may degrade image quality.

## Patient Dose

Assuming correct selection of patient-size setting, the entrance dose (air-kerma) of the low-kVp exposure should be equivalent to that of the high-kVp exposure. For a typical two-view chest exam, the Lateral view dose is much higher than that of the PA or AP view. Hence, in general, the dose of a Dual Energy chest exam (low-kVp PA or AP, high-kVp PA or AP, and standard LAT) is approximately 120% to 130% that of a non-Dual Energy chest exam (high-kVp PA or AP and standard LAT).

Dose estimates are not provided for Soft-Tissue and Bone images, since these images are not acquired but derived (created by image processing algorithms). Dose estimates are provided for the acquired (High-kVp and Low-kVp) images of a Dual Energy acquisition.

## Technique Settings and Image Quality for Abdominal Exams

When performing a dual energy exam on the abdomen, set the low and high kV value and the mA for low kV exposure. The system calculates the mA for the high kV exposure.

For abdominal exams, the system uses low kV exposure as the standard processed image (for chest exams the high kV exposure is used).

## Patient Size

The selection of appropriate patient-size setting is needed for:

- correct patient dose allocation between the two exposures
- optimal image quality

The recommended thickness ranges are:

- Small Adult - when the patient measures less than 22cm.
- Medium Adult - when the patient measures between 22cm and 27cm.
- Large Adult- when the patient measures more than 27cm.

## High kVp

Can be set anywhere between 110 and 150. This is usually set to that of the standard (non-DE) chest protocol/technique. In general, a higher high-kVp (default is 120) will result in better “tissue cancellation”. However, for large patients, slightly increasing the high kVp (e.g., to 130 or 140) may improve x-ray penetration and consequently improve the noise characteristics of the resulting soft-tissue and bone images.

## Low kVp

Can be set anywhere between 70 and 85. In general, a lower low-kVp (default is 80) will result in better “tissue cancellation”. However, for large patients, slightly increasing the low kVp (e.g., to 85) may improve x-ray penetration and consequently improve the noise characteristics of the resulting soft-tissue and bone images.

## Copper Filtration

Can be set to 0, 0.1 mm, 0.2 mm, or 0.3 mm. In general, less filtration will result in better “tissue cancellation”.

## Grid

The processing algorithms are optimized for abdominal imaging with grid IN. Removing the grid may degrade image quality.

## Patient Dose

Assuming correct selection of patient-size setting, the entrance dose (air-kerma) of the high-kVp exposure should be approximately 20% to that of the low-kVp exposure. Hence, in general, the dose of a Dual Energy abdominal exam (low-kVp PA or AP, high-kVp PA or AP) is approximately 120% that of a non-Dual Energy abdominal exam (low-kVp PA or AP).

Dose estimates are not provided for Soft-Tissue and Bone images, since these images are not acquired but derived (created by image processing algorithms). Dose estimates are provided for the acquired (High-kVp and Low-kVp) images of a Dual Energy acquisition.

## Dual Energy Image Processing Preferences

Using the Image Processing Preferences editor, separate look attributes (including brightness, contrast, and edge sharpness) can be selected/customized for standard, soft-tissue, and bone images, with the following exceptions:

- Noise Reduction selection is not applicable to Soft-Tissue or Bone images since these types of images already have specialized processing that includes noise suppression.
- Even though Tissue Equalization (TE) can be applied to a Bone image, its application to this “non-standard anatomy” may cause variability in image brightness. It is recommended that TE be turned off (strength and area set to zero) for Bone images. Refer to [Chapter 15: Preferences-Tissue Equalization Overview \(p. 15-56\)](#) for more information.

## Auto Positioning

### Overview

Auto Positioning assists you with the major positioner movements. You then adjust the position as needed for the exposure.

Auto Positioning incorporates angulation of the tube, longitudinal, lateral, rotational and vertical positioning of OTS, table receptor longitudinal positioning, wallstand receptor vertical positioning. Wallstand tilting is also available. Where possible, simultaneous movements will be used to reduce the positioning time.

Auto Positioning is compatible with the following system configurations:

- Table only
- Wallstand only (including extendable arm wallstands)
- Both table and wallstand (including extendable arm wallstands)



**WARNING** Keep patient and any others in room clear of the OTS as it moves into position. The area 180cm in front of the wallstand should be kept clear during Auto Positioning.

## OTS

The OTS has motorized motion for the following axes: Longitudinal, Lateral, Vertical, Column Rotation, and Tube Angulation.

If the distance to the final predefined OTS longitudinal and lateral positions is less than 100mm, the OTS moves directly to all predefined positions.

If the distance to the final predefined OTS longitudinal and lateral positions is greater than 100mm, the OTS moves vertically to within 100mm of the highest position before moving the longitudinal, lateral, column rotation and tube angulation axes to their final predetermined positions.

Once the lateral and longitudinal axes are within 100mm of their final positions, the vertical axis can begin motion to its final position.

**Note:** Auto-positioning may fail when the OTS cannot achieve 120cm (48in) SID position due to ceiling height limitations. Please lower the table or WS height to enable the OTS to achieve the desired SID distance.

## RCIM

An AUTO POSITIONING button is provided on the RCIM ([Figure 13-2](#)).

Pressing and holding the AUTO POSITIONING button enables positioner motion.

- If the button is released at any time during the motion, all movement stops.
- If the button is reactivated, motion will resume from where it stopped.

**Figure 13-2** AUTO POSITIONING button on RCIM



## Pre-defined Positions

There are several pre-defined positions. These positions may be defined as the default position for a view or be selected from the Worklist and Acquisition screens. Some positions below are based on optional configurations or only available with the 120cm grid.

The pre-defined positions are:

- WS-Vert-180 (Wallstand receptor, vertical orientation, SID at 180cm)
- WS-Vert-150 (Wallstand receptor, vertical orientation, SID at 150cm - for systems with cross-table VolumeRAD)
- WS-Horz-120cm (Wallstand receptor, horizontal orientation, SID at 120cm - for systems with the 120cm grid)
- WS-Vert-120cm (Wallstand receptor, vertical orientation, SID at 120cm - for systems with the 120cm grid)
- WS-Vert-100 (Wallstand receptor, vertical orientation, SID at 100cm)
- WS-Horz-100 (Wallstand receptor, horizontal orientation, SID at 100cm)
- WS-Stretcher-100 (Extendable Arm Wallstand receptor, SID at 100cm)
- Table-Head-100 (Table receptor, over Head position, SID at 100cm)
- Table-Center-100 (Table receptor, over Center position, SID at 100cm)
- Table-Foot-100 (Table receptor, over Foot position, SID at 100cm)
- Table-Head-120 (Table receptor, over Head position, SID at 120cm - for systems with the 120cm grid)
- Table-Center-120 (Table receptor, over Center position, SID at 120cm - for systems with the 120cm grid)
- Table-Foot-120 (Table receptor, over Foot position, SID at 120cm - for systems with the 120cm grid)
- Park (Service personnel configure this position to the facility's specification)

**Note:** These are the default positions. Your facility may define up to 10 additional custom positions. Custom positions are entered by GE Service personnel through the Services interface.

**Figure 13-3** Auto Position drop down with custom position



## Auto Positioning Messages

Several different messages appear in the System Status Area when Auto Positioning is in progress. The messages and the conditions that they describe are shown in [Table 13-1](#).

**Table 13-1** Auto Positioning conditions and messages

Condition	Message
Auto Positioning motion has begun.	“Auto Position in Progress”
Auto Positioning motion has completed (successful). <b>Note:</b> A beep will also sound when the motion is complete.	“Auto Position Complete”
Auto Positioning motion stopped because the switch was released early.	“Auto Position Stopped: early switch release”

## Initiate Auto Positioning

Auto Positioning is available both during and outside of live exams.

You can start Auto Positioning from the Acquisition workstation:

- Worklist screen - With the patient exam closed, the Worklist screen provides an Auto Position selection for Wallstand, Table, or Park.
- Image Acquisition screen - With the patient exam open, each valid protocol is mapped to one of the pre-defined positions as defined in the protocol.

In either situation, pressing and holding the AUTO POSITIONING button on the RCIM initiates motion toward the predefined position.

### Auto Positioning from Worklist Screen

Follow this process to initiate Auto Positioning from the Worklist.

1. Confirm or change the **Auto Positioning** selection ([Figure 13-4](#)).
2. Click and hold the AUTO POSITIONING button on the RCIM until you hear the beep or see the message “Auto Position Complete” in the System Status Area.
  - The OTS begins moving into the selected position 1–2 seconds after pressing the buttons.
  - If the button is released at anytime, motion is disabled and the locking function is applied.
  - If applicable, the wallstand receptor moves to its predefined position.

**Note:** Auto tracking of the OTS to the wallstand will not be enabled until the Auto Positioning is completed or a wallstand or OTS lock button is pressed.

3. Continue to begin the exam as described in [Chapter 10: Image Acquisition](#).

**Figure 13-4** Worklist screen with Auto Positioning control



## Auto Positioning from Image Acquisition Screen

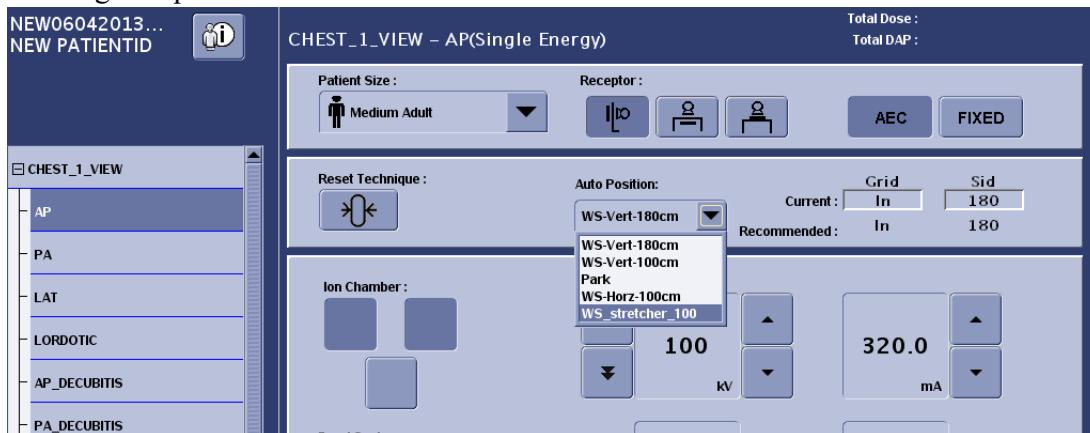
Follow this process to activate Auto Positioning from the Image Acquisition screen.

1. Select the patient procedure from the Worklist or add the patient to the Worklist.
2. Select the exam and view to perform.
3. Adjust exam techniques as appropriate.
4. Position the patient on the table or in front of the wallstand as appropriate.
5. Confirm or change the **Auto Position** selection ([Figure 13-5](#)).
  - The available options are determined by the selected protocol and view.
6. Click and hold the AUTO POSITIONING button on the RCIM until you hear the beep or see the message “Auto Position Complete” in the System Status Area.
  - The OTS begins moving into the selected position 1–2 seconds after pressing the buttons.
  - If the button is released at anytime, motion is disabled and the locking function is applied.
  - If applicable, the wallstand moves to its predefined position.

**Note:** Auto tracking of the OTS to the wallstand will not be enabled until the Auto Positioning is completed or a wallstand or OTS lock button is pressed.

7. After motion stops, make final adjustments to the tube position, if necessary.
8. Continue the exam as described in [Chapter 10: Image Acquisition](#).

**Figure 13-5** Image Acquisition screen with Auto Position control



## Auto Positioning from Infrared Remote

Auto Positioning may be activated from the optional remote control. Refer to [Chapter 8: System Hardware Overview-Positioning Remote Control \(p. 8-52\)](#) for more information.

## Auto Positioning Preferences

This section describes the settings for configuring Auto Positioning on your system.

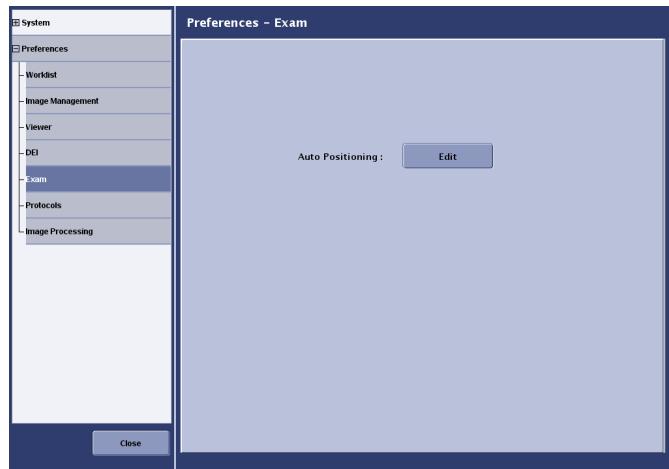
Refer to [Chapter 15: Preferences](#) for more information about other settings.

## Select Default Auto Positioning for Receptors

The Exam screen allows you to set a default Auto Position for each receptor.

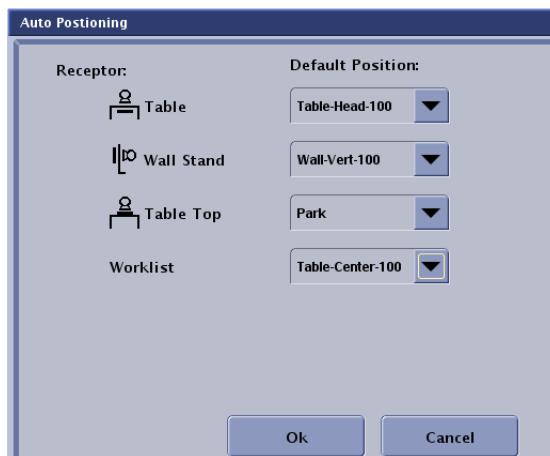
- From the Utilities screen, open **Preferences > Exam** ([Figure 13-6](#)).

**Figure 13-6** Preferences Exam



- Click the **Auto Positioning** [EDIT] button.
  - The Auto Positioning screen appears ([Figure 13-7](#)).

**Figure 13-7** Auto Positioning screen



- Select the default position for each applicable receptor. [describes the available positions for the receptors.](#)

## Auto Positioning receptor selections

<b>Receptor</b>	<b>Options</b>
Table	<p>Available options are:</p> <ul style="list-style-type: none"> <li>• Table-Head-100</li> <li>• Table-Center-100</li> <li>• Table-Foot-100</li> <li>• Table-Head-120 (for systems with 120cm grid)</li> <li>• Table-Center-120 (for systems with 120cm grid)</li> <li>• Table-Foot-120 (for systems with 120cm grid)</li> <li>• WS-Vert-150 (for cross table VolumeRAD)</li> <li>• Park</li> <li>• Any custom positions defined for this receptor</li> </ul>
Wallstand	<p>Available options are:</p> <ul style="list-style-type: none"> <li>• WS-Vert-100</li> <li>• WS-Vert-180</li> <li>• WS-Horz-100</li> <li>• WS-Horz-120</li> <li>• WS-Vert-120</li> <li>• Park</li> <li>• Any custom positions defined for this receptor</li> </ul>
Table Top	<p>Available options are:</p> <ul style="list-style-type: none"> <li>• Park</li> <li>• Any custom positions</li> </ul>
Worklist	<p>Available options are:</p> <ul style="list-style-type: none"> <li>• Table-Center-100</li> <li>• Table-Center-150 (for systems with cross-table VolumeRAD)</li> <li>• Wall-Vert-100</li> <li>• Wall-Vert-180</li> <li>• Table -Center-120</li> <li>• Table-Foot-120</li> <li>• Table-Head-120</li> <li>• Park</li> <li>• Any custom positions</li> </ul>

# Orthopedic Magnification

## Overview

Orthopedic Magnification is an option that allows you to introduce a fixed amount of magnification percentage so that the image size will match previously calibrated orthopedic templates.

This section provides instruction on printing images with Orthopedic Magnification.

**Note:** The functions described in this section are only available if Orthopedic Magnification is enabled. GE Service personnel enable Orthopedic Magnification and enter the Configurable Magnification Factor (CMF) through the Services User Interface. The CMF is the amount of magnification applied to all Orthopedic Magnification functions. Only GE Service personnel are able to change the CMF.

Only processed images will have Orthopedic Magnification applied. The raw images remain as acquired.

## Print Images

The following sections describe how to print images with Orthopedic Magnification function available from the Image Viewer screen.

### Print Single Image

Follow this process to print the currently selected image with Orthopedic Magnification.

1. Select the image to print.
2. Click [MANUAL PRINT].
  - The Print Images screen ([Figure 13-8](#)) appears.
3. Set the **Print Mode to Orthopedic**.
  - The **Magnification** field displays the CMF entered on the Services User Interface.
4. Adjust the other settings as described in [Chapter 11: Image Viewer-Print Images \(p. 11-25\)](#).
5. Click [PREVIEW] to see how the final print will appear.
6. Click [PRINT] to print the image.

**Figure 13-8** Print Images screen with Orthopedic Print Mode selected

## Print Multiple Images

Follow this process to print multiple images through the Film Composer with Orthopedic Magnification applied.

1. Select the series to print.
2. Click [FILM MANAGER].
  - The Film Composer screen (Figure 13-9) appears.
3. Select the number of images to appear on each sheet.
4. Click and drag image thumbnails from the Series panel to the sheet composer area.
5. Click [PRINTER SETTINGS].
  - The Print Images screen appears.
6. Set the **Print Mode** to **Orthopedic** as described in [Print Single Image \(p. 13-11\)](#) above.
7. Print the sheet or sheets. Refer to [Chapter 11: Image Viewer-Print Images \(p. 11-25\)](#) for more information.

**Figure 13-9** Film Composer screen

## Orthopedic Magnification Preferences

The following sections describe the preferences that are available to configure Orthopedic Magnification functions. Refer to [Chapter 15: Preferences](#) for more information about configuring other preferences.

## Configure Default Print Settings and Auto Print

You may select Orthopedic Print as a default print setting for manual printing and auto print.

1. From the Worklist screen, click [UTILITIES].
2. Select **Preferences > Image Management**.
3. Click Auto Print [EDIT].

- The Default Print/Auto Print screen (Figure 13-10) appears.

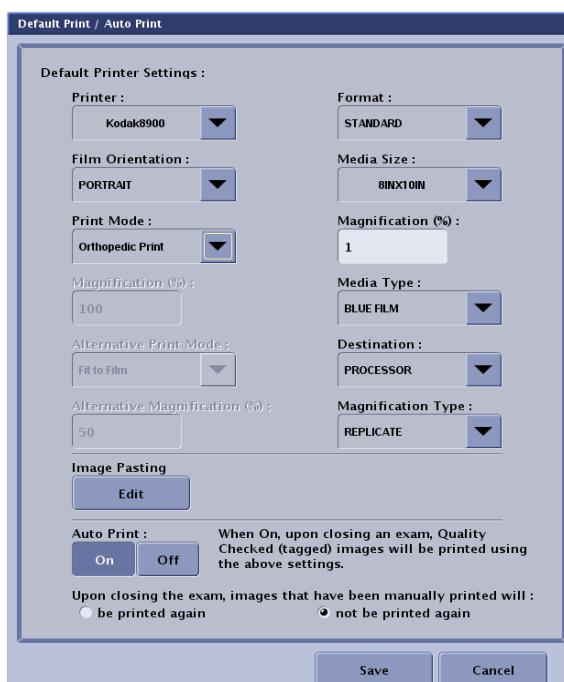
4. Set the **Print Mode** to **Orthopedic Print**.

**Note:** When “Orthopedic Print” is selected as the Print Mode, Alternative Print Mode is disabled.

**Note:** When “Orthopedic Print” is selected as the Print Mode, all images printed through Auto Print will have magnification applied.

5. Click [SAVE] to retain your changes.

**Figure 13-10** Auto Print settings for Orthopedic Magnification



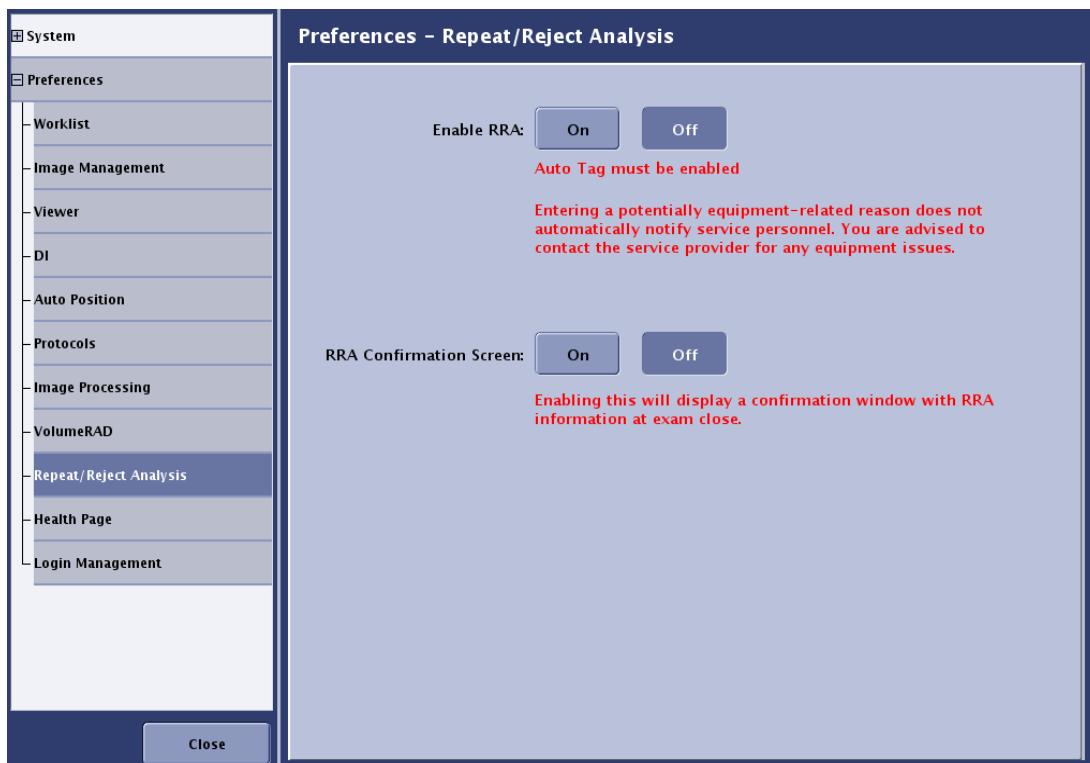
## Repeat/Reject Analysis (RRA)

RRA is an option that allows classification and tracking of images that are considered unsuitable for diagnostic purposes. The repeated and rejected images are retained on the system and can be exported at any time. The system allows periodic generation of a statistical RRA report with Clinical Repeat Rate.

The Auto Tag function must be enabled (ON) in order to enable RRA on the system. Refer to [Chapter 15: Preferences-Auto Tag \(Quality Check\) \(p. 15-22\)](#) for more information about enabling Auto Tag.

**IMPORTANT!** The RRA tool is not linked to service requests; any system issues must be reported to service.

**Figure 13-11** Preferences - Repeat/Reject Analysis



## Enable RRA

Follow this process to enable or disable RRA:

1. From the Worklist screen, click [UTILITIES].
2. Ensure Auto Tag is enabled on the system. Refer to [Chapter 15: Preferences-Auto Tag \(Quality Check\) \(p. 15-22\)](#).
3. Select **Preferences > Repeat/Reject Analysis**.
4. Click Enable RRA [ON] to enable the function.
  - Enable RRA [OFF] disables the function. RRA will be automatically disabled if Auto Tag is disabled.
5. Click [CLOSE].
6. Configure the preset names for the Operators, if necessary. Refer to [Chapter 15: Preferences-Preset Names \(p. 15-19\)](#).

## RRA Confirmation Screen

The RRA Confirmation Screen selection controls the presence of the confirmation screen displayed on the viewer when the exam is closed. This screen provides a summary of the RRA classified images in the exam.

Follow this process to enable or disable RRA Confirmation Screen:

1. From the Worklist screen, click [UTILITIES].
2. Select **Preferences > Repeat/Reject Analysis.**
3. Click RRA Confirmation Screen [ON] to enable the function.
  - RRA Confirmation Screen [OFF] disables the function.
4. Click [CLOSE].

## Export RRA Data and Report

The system stores RRA data for the last 100 days. This data may be exported in a report to a disk or USB device.

**IMPORTANT!** RRA data is not saved with system backups. RRA data should be exported prior to performing any software updates to the system.

**IMPORTANT!** RRA Data cannot be exported on DVD. Only CDs and USB devices can be used for RRA export.

The exported data includes a summary report in html format ([Figure 13-12](#)) and a Microsoft excel spreadsheet ([Figure 13-13](#)) with acquisition and classification details for all repeated and rejected images on the system. The spreadsheet also contains JPEG links for all repeated and rejected images on the system.

The Excel spreadsheet includes the following information for each repeated/rejected image:

- |                           |                      |                         |
|---------------------------|----------------------|-------------------------|
| • System ID               | • Anatomy            | • mA                    |
| • Automatic Protocol Code | • View               | • SID (mm)              |
| • Acquisition Date        | • Acquisition Type   | • Grid Status           |
| • Acquisition Time        | • Link to JPEG Image | • Filtration (mm Cu)    |
| • Processing Date         | • Patient ID         | • Manual/AEC            |
| • Processing Time         | • Accession Number   | • Ion Chambers Selected |
| • RRA Classification      | • Size Selection     | • DAP                   |
| • Repeat Reason           | • kVp                | • DEI                   |
| • Operator Name           | • mAs                | • DEI Limits            |

**IMPORTANT!** The RRA export data does not contain patient names; however, patient ID numbers, image JPEGs, and accession number data are present. Proper HIPAA or privacy and internal or local confidentiality standards should be practiced.

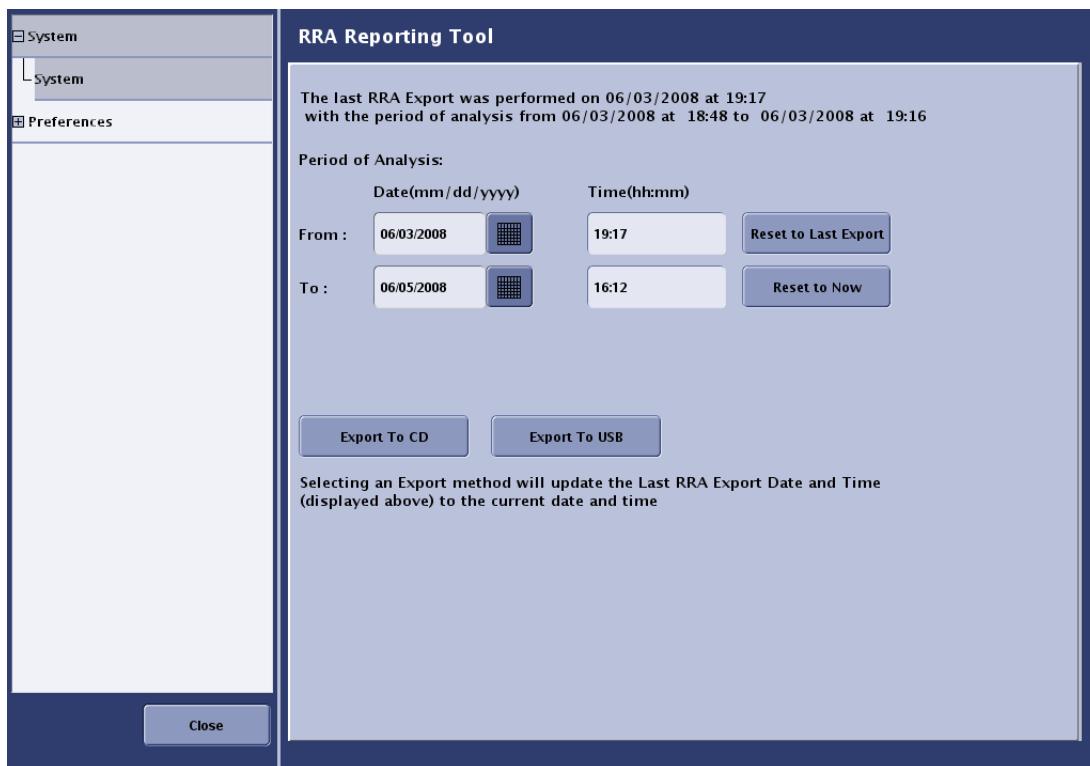
**Figure 13-12** Example of RRA Report (html)

REPEAT / REJECT ANALYSIS		Analysis period: Start Date/Time: 01 January 2008 04:00 End Date/Time: 09 January 2008 18:30		
Generated on/for: Date: 23 January 2008 Time: 02:14 Site: General Hospital System ID: RAD12345		Results for: Technologist: ALL Acquisition Type: ALL Anatomy: ALL View: ALL		
Repeat Reason	Number of Repeat Acquisitions	Percentage of Repeat Acquisitions		
Patient Positioning	13	31.7%		
Incorrect Collimation	7	17.1%		
Patient Motion	8	19.5%		
Patient Jewelry or Clothing	0	0.0%		
Missing or Incorrect View Markers	0	0.0%		
Incorrect Anatomy Selected	2	4.9%		
Incorrect Technique Selected	5	12.2%		
Noisy Images(s)	3	7.3%		
Image Artifacts	2	4.9%		
Incomplete Acquisition	0	0.0%		
OTHER	1	2.4%		
<b>Total Number of Acquisitions</b>		<b>1237</b>	<b>Non-Clinical Acquisitions *</b> (e.g., QC, Acceptance Tests, Calibration)	
Standard	1146		Standard	12
Dual Energy	78		Dual Energy	0
Image Paste	0		Image Paste	0
VolumeRAD	13		VolumeRAD	61
<b>Repeat Acquisitions</b>		<b>41</b>	<b>Total Number of Processed Images</b>	
Standard	39		Accepted Images	1180
Dual Energy	2		Images from Repeat Acquisitions	238
Image Paste	0		Images from Non-clinical Acquisitions	0
VolumeRAD	0		Unnecessary Images	681
<b>Clinical Repeat Rate</b>		<b>3.3%</b>		
* This data does not represent initial or additional radiation exposure to a patient, and it is NOT taken into account when calculating the Clinical Repeat Rate.				

**Figure 13-13** Example of detailed RRA data (partial screen)

Microsoft Excel - RRA Image Data.xls								
I	J	K	L	M	N	O	P	
1	Operator Name	Anatomy	View	Acquisition Type	Link to JPEG Image	Patient ID	Accession#	Size Selection
2	John Doe	CHEST	postero-anterior	STANDARD	Repeat Acquisition_Patient Motion_John Doe_11/29/06_11:14:34_CHEST postero-anterior STANDARD	09301984	9302484	MEDIUM ADU
3	John Doe	CHEST	postero-anterior	STANDARD	Repeat Acquisition_Patient Positioning_John Doe_11/29/06_12:56:34_CHEST postero-anterior STANDARD	09301985	9302485	LARGE ADU
4	John Doe	CHEST	postero-anterior	STANDARD	Repeat Acquisition_Incorrect Collimation_John Doe_11/29/06_13:33:34_CHEST postero-anterior STANDARD	09301986	9302486	LARGE ADU
5	John Doe	CHEST	postero-anterior	STANDARD	Repeat Acquisition_Patient Positioning_John Doe_11/30/06_14:26:34_CHEST postero-anterior STANDARD	09301987	9302487	LARGE ADU
6	John Doe	CHEST	postero-anterior	STANDARD	Unnecessary Image_Unnecessary Image_John Doe_12/01/06_15:47:34_CHEST postero-anterior STANDARD	09301988	9302488	LARGE ADU
7	John Doe	CHEST	postero-anterior	STANDARD	Non-clinical_Non-clinical_John Doe_12/01/06_16:11:34_CHEST postero-anterior STANDARD	09301989	9302489	MEDIUM ADU
8	Jane Smith	CHEST	postero-anterior	STANDARD	Non-clinical_Non-clinical_Jane Smith_12/01/06_17:01:34_CHEST postero-anterior STANDARD	09301990	9302490	MEDIUM ADU
9	Jane Smith	THUMB	antero-posterior	STANDARD	Non-clinical_Non-clinical_Jane Smith_12/02/06_18:12:34_THUMB antero-posterior STANDARD	09301991	9302491	MEDIUM ADU
10	Jane Smith	THUMB	antero-posterior	STANDARD	Repeat Acquisition_Equipment Failure_Jane Smith_12/10/06_19:12:34_THUMB antero-posterior STANDARD	09301992	9302492	MEDIUM ADU
11	Jane Smith	CHEST	postero-anterior	STANDARD	Repeat Acquisition_Patient Motion_Jane Smith_12/11/06_20:12:34_CHEST postero-anterior STANDARD	09301993	9302493	MEDIUM ADU
12	Jane Smith	CHEST	left-lateral	STANDARD	Repeat Acquisition_Under-exposed or Noisy_Jane Smith_01/08/07_21:12:34_CHEST left-lateral STANDARD	09301994	9302494	MEDIUM ADU
13	Jane Smith	CHEST	postero-anterior	STANDARD	Repeat Acquisition_Under-exposed or Noisy_Jane Smith_01/09/07_22:33:34_CHEST postero-anterior STANDARD	09301995	9302495	MEDIUM ADU
14	Jane Smith	CHEST	postero-anterior	STANDARD	Repeat Acquisition_Under-exposed or Noisy_Jane Smith_01/09/07_23:23:34_CHEST postero-anterior STANDARD	09301996	9302496	MEDIUM ADU
15	Jane Smith	ANKLE	oblique	SOFT-TISSUE	Repeat Acquisition_Patient Motion_Jane Smith_01/20/07_23:23:35_ANKLE oblique SOFT-TISSUE	09301996	9302496	MEDIUM ADU
16	Jane Smith	ANKLE	oblique	BONE	Repeat Acquisition_Patient Motion_Jane Smith_01/20/07_23:23:35_ANKLE oblique BONE	09301996	9302496	MEDIUM ADU
17	Jane Smith	SPINE	left-lateral	SOFT-TISSUE	Repeat Acquisition_Patient Motion_Jane Smith_01/20/07_23:23:36_SPINE left-lateral SOFT-TISSUE	09301996	9302496	MEDIUM ADU
18	Jane Smith	SPINE	left-lateral	BONE	Repeat Acquisition_Patient Motion_Jane Smith_01/20/07_23:23:36_SPINE left-lateral BONE	09301996	9302496	MEDIUM ADU
19	Jane Smith	THUMB	oblique	STANDARD	Non-clinical_Non-clinical_Jane Smith_02/03/07_07:11:34_THUMB oblique STANDARD	09301997	9302497	MEDIUM ADU
20	Sue Jones	THUMB	oblique	STANDARD	Non-clinical_Non-clinical_Sue Jones_02/03/07_08:45:34_THUMB oblique STANDARD	09301998	9302498	MEDIUM ADU
21	Sue Jones	CHEST	postero-anterior	STANDARD	Non-clinical_Non-clinical_Sue Jones_02/03/07_09:54:34_CHEST postero-anterior STANDARD	09301999	9302499	MEDIUM ADU
22	Sue Jones	CHEST	postero-anterior	VOLUMEAD	Unnecessary Image_Unnecessary Image_Sue Jones_02/03/07_09:54:35_CHEST postero-anterior VOLUMEAD	09301999	9302499	MEDIUM ADU
23	Sue Jones	CHEST	postero-anterior	VOLUMEAD	Unnecessary Image_Unnecessary Image_Sue Jones_02/03/07_09:54:35_CHEST postero-anterior VOLUMEAD	09301999	9302499	MEDIUM ADU
24	Sue Jones	CHEST	postero-anterior	VOLUMEAD	Unnecessary Image_Unnecessary Image_Sue Jones_02/03/07_09:54:36_CHEST postero-anterior VOLUMEAD	09301999	9302499	MEDIUM ADU
25	Sue Jones	CHEST	postero-anterior	VOLUMEAD	Unnecessary Image_Unnecessary Image_Sue Jones_02/03/07_09:54:36_CHEST postero-anterior VOLUMEAD	09301999	9302499	MEDIUM ADU
26	Sue Jones	LSPINE	L5-S1	STANDARD	Repeat Acquisition_Equipment Failure_Sue Jones_02/04/07_10:55:34_LSPINE L5-S1 STANDARD	09302000	9302500	MEDIUM ADU
27	Sue Jones	CHEST	left-lateral	STANDARD	Repeat Acquisition_Equipment Failure_Sue Jones_02/04/07_11:22:34_CHEST left-lateral STANDARD	09302001	9302501	MEDIUM ADU
28	Sue Jones	CHEST	postero-anterior	STANDARD	Repeat Acquisition_Equipment Failure_Sue Jones_02/11/07_12:11:34_CHEST postero-anterior STANDARD	09302002	9302502	MEDIUM ADU
29	Sue Jones	ABDOMEN	antero-posterior	STANDARD	Repeat Acquisition_Incorrect Anatomy Selected_Sue Jones_02/12/07_13:05:34_ABDOMEN antero-posterior STANDARD	09302003	9302503	MEDIUM ADU
30	John Doe	CHEST	postero-anterior	STANDARD	Repeat Acquisition_Incorrect Technique Selected_John Doe_02/12/07_07:12:32_CHEST postero-anterior STANDARD	09302104	9302604	MEDIUM ADU
31	John Doe	THUMB	lateral	STANDARD	Repeat Acquisition_Patient Positioning_John Doe_02/12/07_08:25:34_THUMB lateral STANDARD	09302005	9302505	MEDIUM ADU
32	Jane Smith	THUMB	lateral	STANDARD	Repeat Acquisition_Image Artifacts_Jane Smith_02/13/07_06:24:24_THUMB lateral STANDARD	09202006	9202506	MEDIUM ADU
33	Jane Smith	ABDOMEN	antero-posterior	STANDARD	Repeat Acquisition_Under-exposed or Noisy_Jane Smith_02/13/07_10:51:34_ABDOMEN antero-posterior STANDARD	09302107	9302607	MEDIUM ADU
34	Jane Smith	ABDOMEN	antero-posterior	STANDARD	Repeat Acquisition_Under-exposed or Noisy_Jane Smith_02/14/07_11:22:34_ABDOMEN antero-posterior STANDARD	09302008	9302508	MEDIUM ADU
35	Jane Smith	CHEST	left-lateral	STANDARD	Repeat Acquisition_Incorrect Collimation_Jane Smith_02/15/07_05:12:37_CHEST left-lateral STANDARD	09333009	9333509	LARGE ADU
36								

You can create and export RRA reports from the RRA Reporting Tool screen shown in [Figure 13-14](#).

**Figure 13-14** RRA reporting tool screen**Table 13-2** Repeat/Reject Analysis functions

Function	Description
Previous export information	<p>Provides the date and time of the last RRA export and the time period covered in the last export.</p> <p>The text is as follows:</p> <p>The last RRA Export was performed on (date) at (time) with a period of analysis from (date) at (time) to (date) at (time).</p>
From date	Defines the beginning date of the current export. You may either enter the date directly into the text box or click the calendar button to select a date.
From time	Defines the beginning time of the current export.
[Reset to last Export]	Sets the From date and From time to the end date and time of the previous export. This ensures that there is no gap in reporting between exports.
To date	Defines the end date of the current export. You may either enter the date directly into the text box or click the calendar button to select a date.
To time	Defines the end time of the current export.
[Reset to now]	Sets the To date and To time to the current date and time.
[EXPORT TO CD]	Exports the RRA data to a CD.
[EXPORT TO USB]	Exports the RRA data to a USB device (such as a flash drive).

Follow this process to export RRA data:

1. On the Worklist screen, click [UTILITIES].
2. Select RRA Reporting Tool [START] button.
3. Set the **From** date and time
4. Set the **To** date and time
5. Insert a blank CD-R into the disk tray or connect a USB (minimum 64 MB) device to a USB port on the acquisition workstation.

**IMPORTANT!** The system cannot export RRA data to CD-RW or DVD.

6. Click [EXPORT TO CD] or [EXPORT TO USB] as appropriate.
  - A message appears: “Number of images in report: \_\_\_\_  
Press Continue to write on CD or USB.  
Press Cancel to cancel export.”
7. Click [CONTINUE].
8. Wait for the export to complete.
9. Remove the CD or USB device.
10. Click [CLOSE].

## Not Enough Space to Save RRA Images

If the disk or USB device does not have enough storage space to save all the RRA images, the following message will appear. “RRA data exceeds media capacity.

Select Continue to export without JPEGs.

Select Cancel to cancel export.”

Clicking [CONTINUE] will export the Report and Data spreadsheet only. Images will not be saved.

There are two options to retain images:

- Obtain a USB device with larger storage capacity and repeat the steps to export the data.
- Reduce the export interval and complete multiple exports to additional disks or USB devices.

Follow this process to save the JPEG data to additional disks or USB devices.

1. Click [CANCEL] to stop the export.
2. Obtain additional disks or USB devices.
3. Change the **To** date and time so that the report interval is shorter.
4. Click [EXPORT TO CD] or [EXPORT TO USB] as appropriate.
5. Click [CONTINUE] on the message to export the data.
  - If you still do not have enough space, click [CANCEL] to stop the export and change the **To** date to create an even shorter interval.

6. Wait for the export to complete.
7. Remove the disk or USB device.
8. Insert a new disk or connect a new USB device.
9. Click [RESET TO LAST EXPORT] to change the **From** date and time.
10. Repeat steps 3-9 until all data is exported.
11. Click [CLOSE].

## Auto Image Paste

### Overview

Auto Image Paste is a purchasable advanced application that allows x-ray imaging of patient anatomy, such as spine and legs, that are larger than the current receptor's 41cm field of view. Previously, in film or CR, this was accomplished by the use of a "long" cassette.

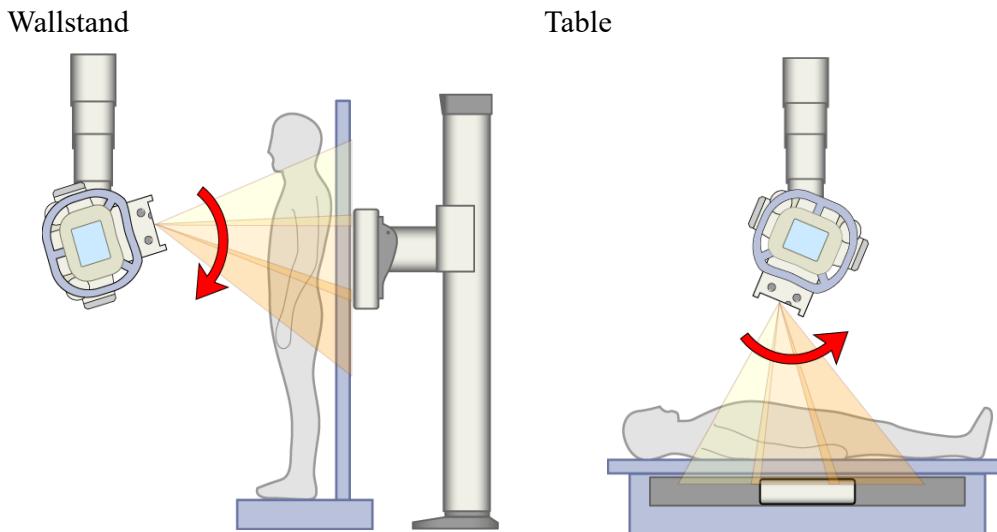
Auto Image Paste is available at the Wallstand and Table receptors.

The system acquires 2–5 exposures in sequence then digitally pastes them together to form a single image.

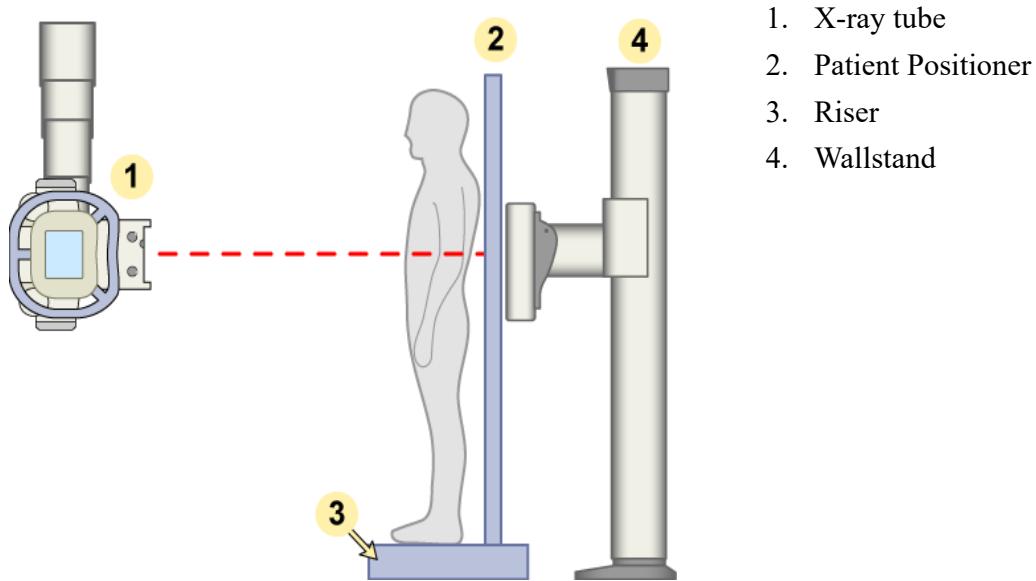


**WARNING** All final pasted images should be reviewed by a qualified health care professional for alignment and measurement accuracy before being used for diagnosis.

**Figure 13-15** Illustration of acquisition



The red arrow indicates the progress of tube movement as images are acquired.

**Figure 13-16** Overall setup for Auto Image Paste at the wallstand

## Auto Image Paste Patient Positioner without Integrated Foot Step (for Wallstand)

The patient positioner ([Figure 13-17](#)) is used in wallstand exams to determine the correct Center of Interest (COI) and to accurately re-construct images.



**CAUTION** To ensure patient safety and paste accuracy, Auto Image Paste should not be performed at the Wallstand without the Patient Positioner in place and locked into the floor pegs.



**CAUTION** To ensure patient safety, leaning on the Patient Positioner is prohibited.



**CAUTION** Patient Positioner is not intended to support a person's full weight. To avoid falls and potential injuries, make sure your patient does not use the Patient Positioner as a support.

Rulers are provided on the riser and on the lateral positioning bars to determine the COI.

**Note:** The maximum weight the patient positioner without integrated foot step can support is 204kg (450 lbs.).

**Figure 13-17** Patient positioner without integrated foot step



1. Lateral positioning bars
2. Mylar backing
3. Floor locks (one on each side)
4. Riser

## Lock Positioner in Place

The positioner locks into place in front of the wallstand receptor. Locking the positioner ensures that it is at the appropriate distance from the receptor, that it will not move during acquisition, and that the patient does not fall.



**CAUTION** Lock both sides of the positioner before allowing the patient to stand on the riser. The positioner could move and cause the patient to fall.



**CAUTION** The receiving holes in the floor may collect debris or catch the heel of a shoe. Use the provided plugs (Figure 13-18) to fill the receiving holes when the positioner is not in use.

**Figure 13-18** Floor plug



1. Align positioner with the receiving holes in the floor.

**Figure 13-19** Positioner and receiving hole



2. Push the lock lever down so that the pin goes into the hole ([Figure 13-20](#)).

**Figure 13-20** Lock lever pushed down



3. Push the back of the lock lever down to lock ([Figure 13-21](#)).

**Figure 13-21** Lever in locked position

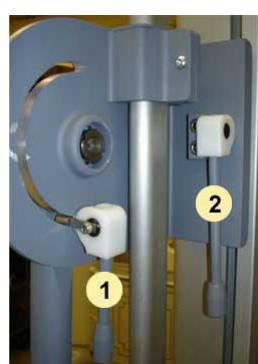


4. Lock the other side.

Unlock the positioner by pressing the front of the lock lever down (so that it is horizontal, as show in [Figure 13-20](#)) and letting the lever rise up.

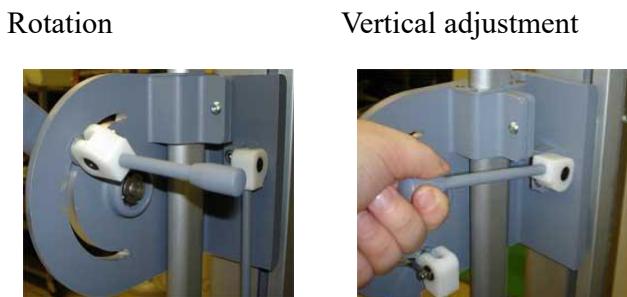
## Move Lateral Positioning Bars

There are two locks on the back of the lateral positioning bars ([Figure 13-22](#)): to rotate the bar and to adjust the vertical placement.

**Figure 13-22** Lateral Positioning Bar locks

1. Rotation lock lever
2. Vertical adjustment lock lever

1. Pull the lock lever 90° from its locking position ([Figure 13-23](#)).

**Figure 13-23** Levers in the unlocked position

2. Move the lateral positioning bar to the desired height or rotation.

Place lock lever back into the locked position ([Figure 13-22](#)).

## Auto Image Paste Patient Positioner with Integrated Foot Step (for Wallstand)

The patient positioner ([Figure 13-24](#)) is used in wallstand exams to determine the correct Center of Interest (COI) and to accurately re-construct images.



**CAUTION** To ensure patient safety and paste accuracy, Auto Image Paste should not be performed at the Wallstand without the Patient Positioner in place and locked into the floor pegs.



**CAUTION** To ensure patient safety, leaning on the Patient Positioner is prohibited.



**CAUTION** Patient Positioner is not intended to support a person's full weight. To avoid falls and potential injuries, make sure your patient does not use the Patient Positioner as a support.

Rulers are provided on the riser and on the lateral positioning bars to determine the COI.

**Note:** The maximum weight the patient positioner with integrated foot step can support is 220Kg (485 lbs.).

**Figure 13-24** Patient positioner with Integrated Foot Step



1. Lateral positioning bars
2. Mylar backing
3. Floor locks (one on each side)
4. Foot Step

**Table 13-3** Symbols on Patient Positioner

Symbol	Description
	Hand crushing hazard. This symbol indicates that serious injury to the hand may occur.
	Follow Instructions for use

Symbol	Description
	Leaning on the Image Paste Patient Barrier is prohibited. This symbol is used to warn the operator and patient not to lean on the barrier.
	Safe Working Load of Lateral Positioning Bar.
	Lock - Engaged
	Unlock - Disengaged
	Lock Release- Pull pin to release lock and move lateral positioning bar

## Lock Positioner in Place

The positioner locks into place in front of the wallstand receptor. Locking the positioner ensures that it is at the appropriate distance from the receptor, that it will not move during acquisition, and that the patient does not fall.



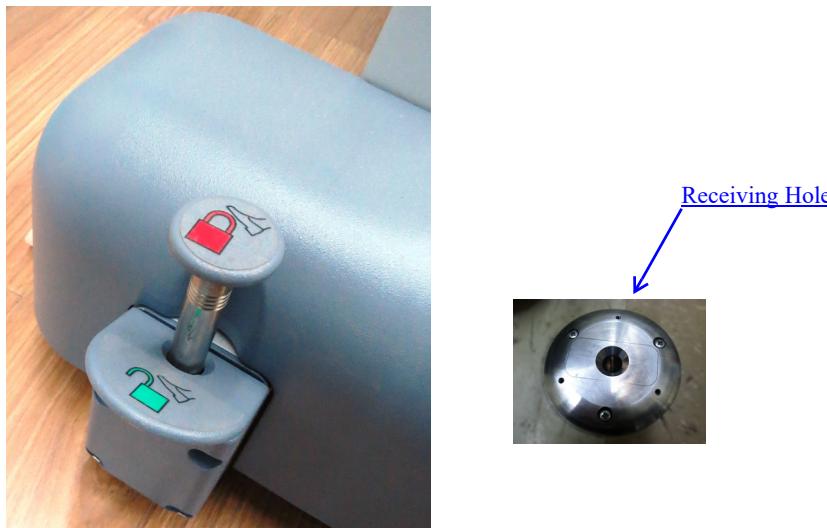
**CAUTION** Lock both sides of the positioner before allowing the patient to stand on the riser. The positioner could move and cause the patient to fall.



**CAUTION** The receiving holes in the floor may collect debris or catch the heel of a shoe. Use the provided plugs (Figure 13-25) to fill the receiving holes when the positioner is not in use.

**Figure 13-25** Floor plug

1. Align positioner with the receiving holes in the floor.

**Figure 13-26** Positioner and receiving hole

2. Press the Lock Lever down so that the pin goes into the hole. Press down enough to lock up ([Figure 13-27](#)).

**Figure 13-27** Lock Lever pressed down and in lock position

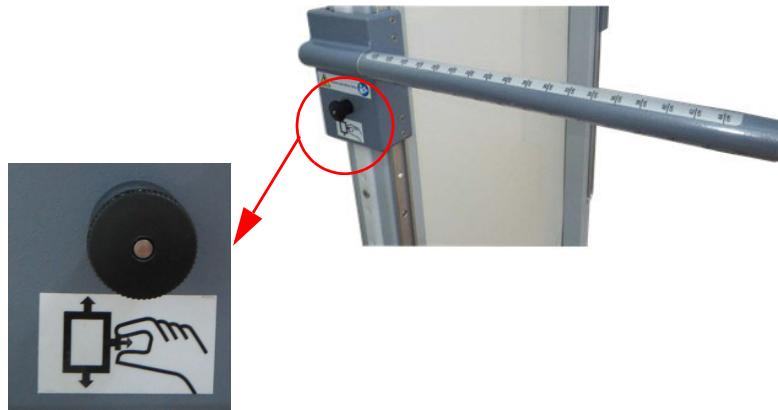
3. Lock the other side.

Unlock the positioner by treading the cap of the lock lever (as show in Figure 13-26) and the lock lever will rebound automatically.

## Move Lateral Positioning Bars

1. Hold the Lateral Positioning Bar and pull the lock release to adjust the vertical placement. (Figure 13-28).

**Figure 13-28** Lock release in the unlocked position



2. Move the lateral positioning bar to the desired height and then release, thus the positioning bar will be locked.



**Note:** The maximum weight the lateral positioning bar can support is 55Kg (122 lbs.).

## Select Auto Image Paste Protocol

To acquire pasted images, you must define the top and bottom of the coverage area. The system calculates the number of images required to create the pasted image once the coverage area is defined.

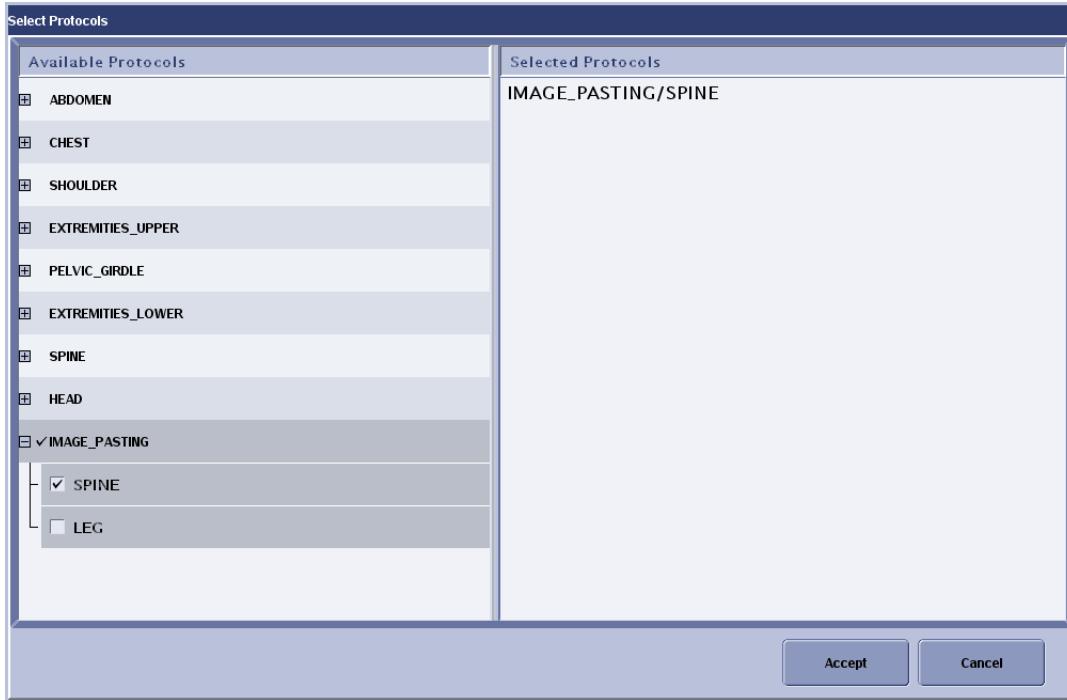
During acquisition, the tube and receptor move into position to expose the top of the coverage area. The tube and receptor automatically move into position to acquire the exposures. Exposures will always begin at the top of the coverage area (head) and move downward (towards the feet) in sequence.

Follow this process to conduct an Auto Image Paste exam.

1. For wallstand exams, place the patient positioner in front of the wallstand and secure the floor locking mechanism. Refer to [Lock Positioner in Place \(p. 13-21\)](#) for more information.
2. Select the patient from the Worklist (or add patient if necessary).
3. Select the Auto Image Paste protocol from the Select Protocols screen (Figure 13-29).

- a) Select the Image Pasting category.
  - b) Select the Exam (Spine or Leg).
4. Click [ACCEPT].

**Figure 13-29** Protocol selection for Auto Image Paste

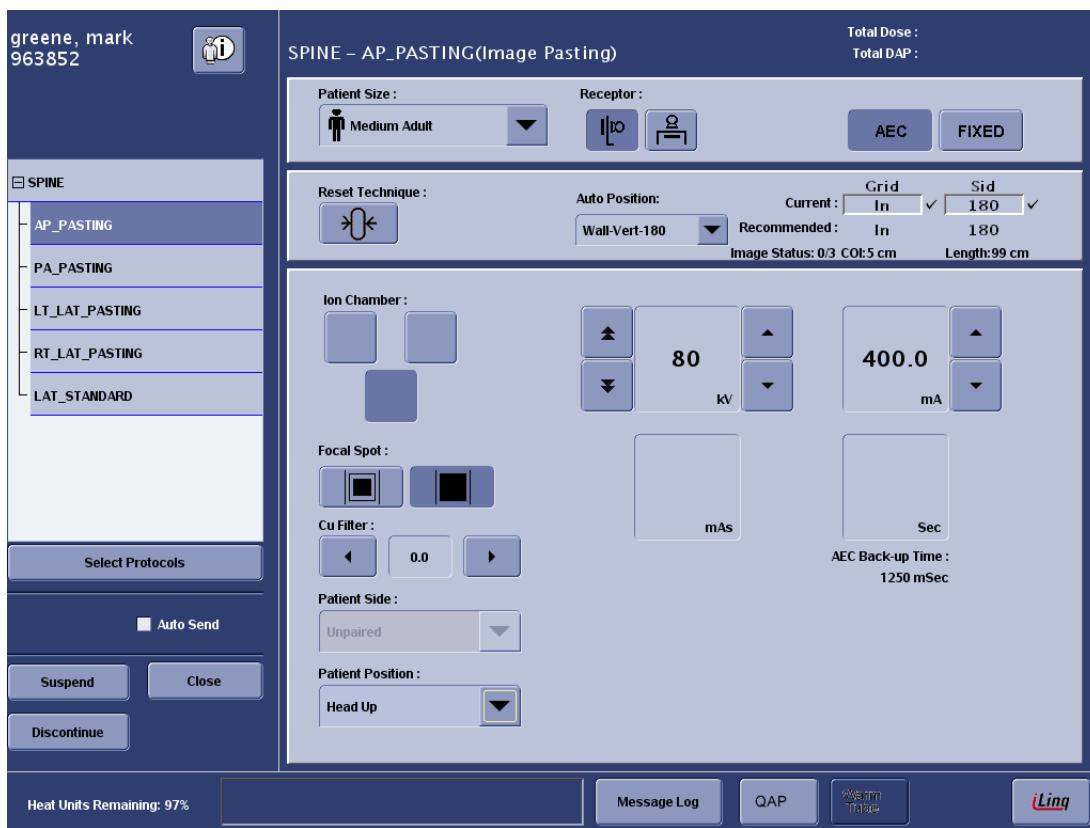


Continue with [Conduct Wallstand Exam \(p. 13-28\)](#) or [Conduct Table Exam \(p. 13-33\)](#).

## Conduct Wallstand Exam

Follow this process to conduct an Auto Image Paste exam at the wallstand.

1. On the Acquisition screen ([Figure 13-30](#)), select the view to perform.
2. Select the Wallstand Receptor, if necessary.

**Figure 13-30** Acquisition screen for Auto Image Paste—before acquisition

3. Select the **Patient Size**.
4. Adjust the technique on the Acquisition screen.

**Note:** Settings are applied to all acquired images.

- There is no “asymmetric collimation” selection.
- The [RESET TECHNIQUE] button resets to default technique for selected application. [RESET TECHNIQUE] will reset HEAD and FOOT coverage areas; therefore, you must redefine the coverage area.

5. Position the tube at the appropriate SID.
  - If your system has auto positioning, select the position from the Auto Position drop-down list and hold down the AUTO POSITIONING button on the RCIM until the tube stops moving. The system will beep and a message will appear in the Message Log area to confirm that the tube is in place. Refer to [Chapter 13: Advanced Applications-Auto Positioning \(p. 13-4\)](#) for more information.

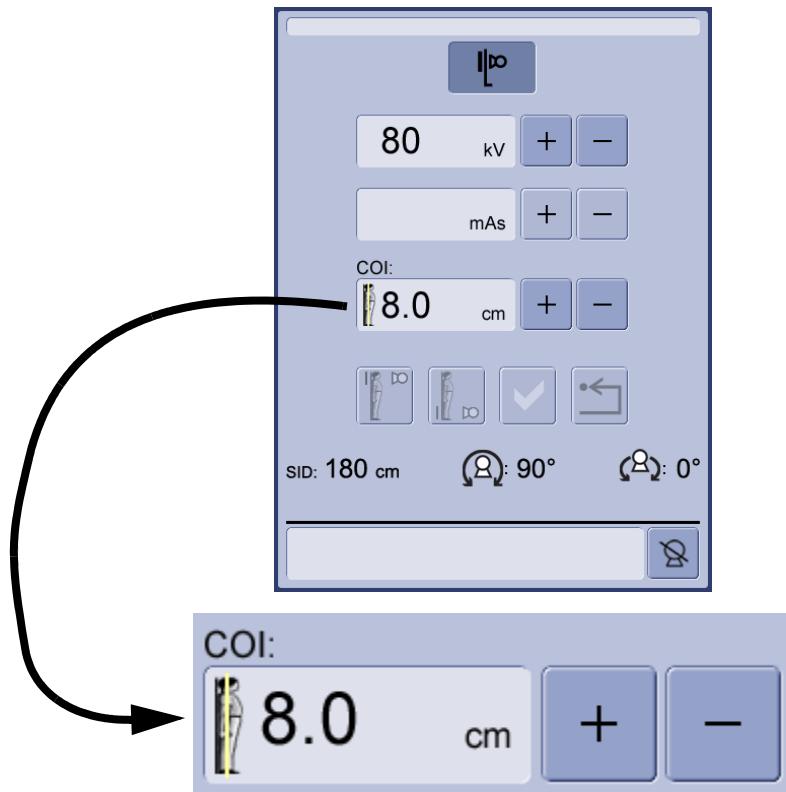


**WARNING** Keep patient and any others in room clear of the OTS as it moves into position.

6. Position the patient in front of the patient positioner.
7. Determine the Center of Interest (COI) with the ruler included on the patient positioner.

8. Enter the COI value on the OTS control screen. Press the [+] and [-] buttons on the OTS control screen to enter the COI ([Figure 13-31](#)).

**Figure 13-31** COI on OTS control screen

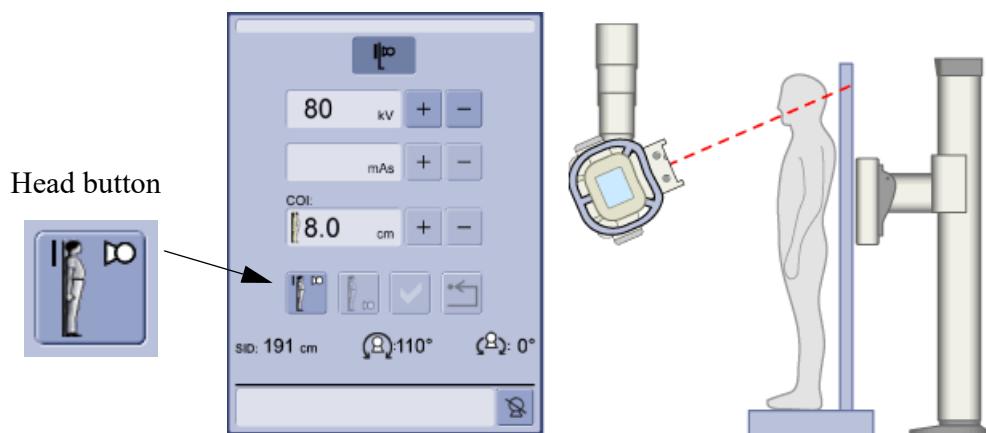


9. Activate the detents.  
10. Instruct the patient to close his or her eyes.  
11. Turn on the collimator light.



**WARNING** **Laser radiation. Peak power 1 mw / wave length 540-700 nm / class II laser product.**  
**Do NOT stare into beam! When you switch on the linear laser light localizer, make sure no person looks directly into the laser to avoid eye injuries or impaired vision.**

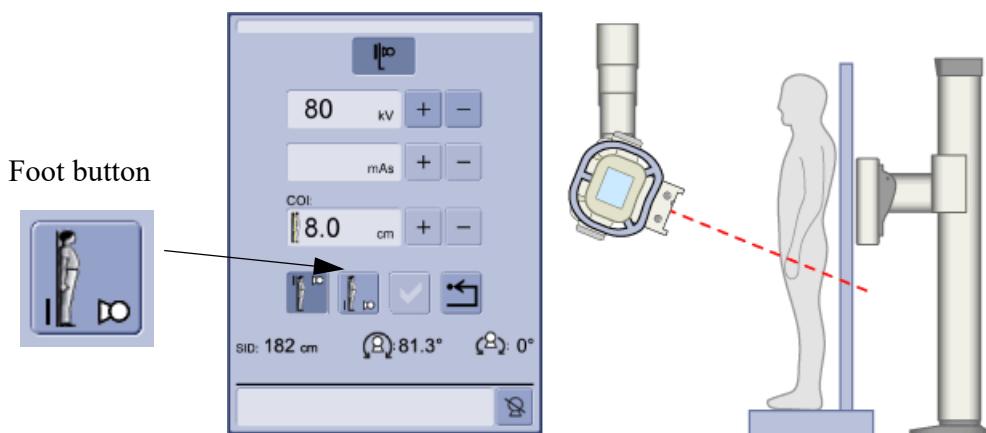
12. Aim laser light at top of desired image field ([Figure 13-32](#)).  
  - You may do this by either angulating the tube or by keeping the tube at 90° and moving the column vertically.  
 13. Press [HEAD] on the OTS control screen ([Figure 13-32](#)).  
  - If the [HEAD] button does not become enabled, check the following:
    - Reposition the tube to lateral detent of the wallstand receptor.
    - Make sure that column rotation is at 0°.
    - Set the system to NORMAL mode (instead of OVERRIDE mode).

**Figure 13-32** Define top of coverage area

14. Aim laser light at the bottom of the desired image field ([Figure 13-33](#)).

- You may do this by either angulating the tube or by keeping the tube at 90° and moving the column vertically.

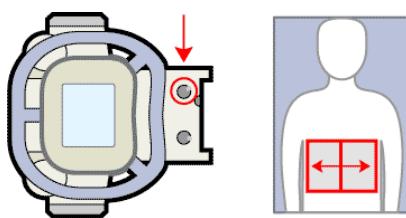
15. Press [FOOT] on the OTS control screen ([Figure 13-33](#)).

**Figure 13-33** Define bottom of converge area

**Note:** Press [RESET] on the control screen ([Figure 13-34](#)) to erase the COI, HEAD, and FOOT settings.

**Figure 13-34** [RESET] button

16. Adjust the lateral collimation.

**Figure 13-35** Collimate for exam

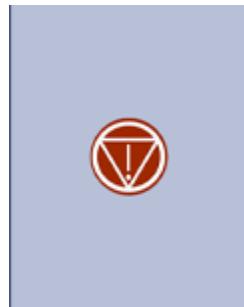
**Note:** Auto Image Paste registration can cause narrowing of the field. Do not collimate too tightly, because the outer 1-2 cm may be collimated in the pasted image.

17. Press the [SET] button ([Figure 13-36](#)) on the OTS control screen when finished.

**Figure 13-36** [SET] button

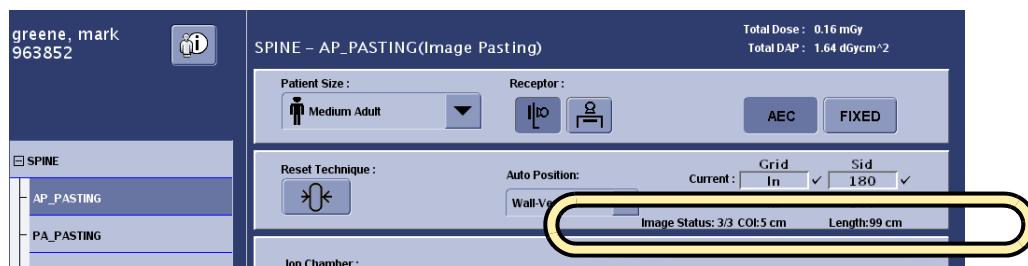
**Note:** The wallstand receptor, tube, or both may move. Warn the patient to hold still.

- If the area is not within the acceptable range for the protocol, the [HEAD], [FOOT], and [SET] buttons become disabled and a message appears in the status area. Press [RESET] and start over.
- Once you press [SET], the lateral and vertical collimation knobs on the OTS are locked out. That is, turning the knobs will not change the collimation.
- Once you press [SET], if you change the SID or Tube angle, you will need to re-press the [SET] button before acquisition is allowed.
- Moving the tube out of lateral detent will inhibit exposures until the tube is re-positioned.
- Press the OTS control screen ([Figure 13-37](#)) or the Emergency Stop button on the RCIM to stop the tube movement.

**Figure 13-37** Stop tube movement from OTS control screen

18. Make exposure using the hand switch.

- Hold the exposure button down until all exposures have been made. The Image Count area under the SID and Grid information counts down each image as it is exposed ([Figure 13-38](#)). Releasing the switch early will terminate Auto Image Paste processing. Any acquired images will still be able to be manually pasted. Refer to [Re-paste \(p. 13-41\)](#) for more information.
- If exposure stopped because of early hand switch release or if you want to retake the exposure with the same COI, head, and foot settings, press the [SET] button on the OTS control screen to reset the tube to its initial position and use the hand switch to make the exposure.

**Figure 13-38** Image Status on Acquisition screen

- The sub-images appear on the Viewer screen as they are acquired and a pasted image appears approximately 10 seconds later.
19. Continue with [Chapter 13: Advanced Applications-Image Viewer \(p. 13-39\)](#) to view, re-paste, or process images.

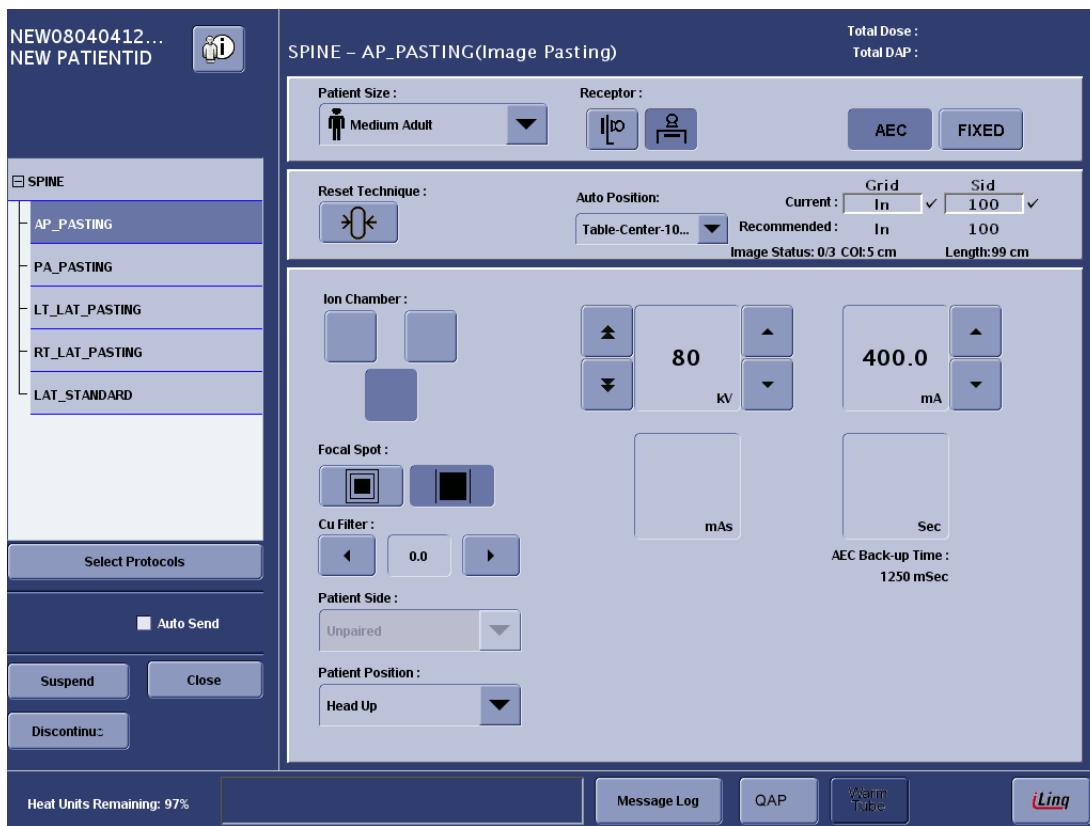
## Conduct Table Exam

Table paste coverage is limited due to detector travel range. The patient anatomy should lie 8.8 cm (3.5 inches) within the ends of the receptor travel range. If anatomy of interest is longer than the coverage area, it may be necessary for the technologist to determine exactly which anatomic structures should have priority in the image field (e.g., hip joint versus ankle joint). The technologist may need to consult with a physician for clarification.

Table paste acquisitions should be performed at SID of 100cm (40 in) or 120cm if configured. When marking the coverage area with the tube, the tube angles cannot exceed 27° in either direction.

Follow this process to conduct an Auto Image Paste exam on the digital table.

- On the Acquisition screen ([Figure 13-30](#)), select the view to perform.

**Figure 13-39** Acquisition screen for Auto Image Paste—before acquisition

2. Select the Table **Receptor**, if necessary.
3. Select the **Patient Size**.
4. Adjust the technique on the Acquisition screen.

**Note:** Settings are applied to all acquired images.

- If the exam is performed in a head-down position, you must manually flip the pasted image prior to sending, printing, or closing the exam. Refer to [Image Flip \(for Table exams\) \(p. 13-45\)](#) for more information.
  - The [RESET TECHNIQUE] button resets to default technique for selected application. [RESET TECHNIQUE] will reset HEAD and FOOT coverage areas; therefore, you must redefine the coverage area.
5. Position the tube to the table center at 100cm or 120cm (if configured) SID and in lateral detent.
    - If your system has auto positioning, select the position (Table Center 100 cm) from the Auto Position drop-down list and hold down the AUTO POSITIONING button on the RCIM until the tube stops moving. The system will beep and a message will appear in the Message Log area to confirm that the tube is in place. Refer to [Chapter 13: Advanced Applications-Auto Positioning \(p. 13-4\)](#) for more information. Otherwise, manually place the tube and detector at 100cm or 120cm (if configured) SID in the center table position and in lateral detent.

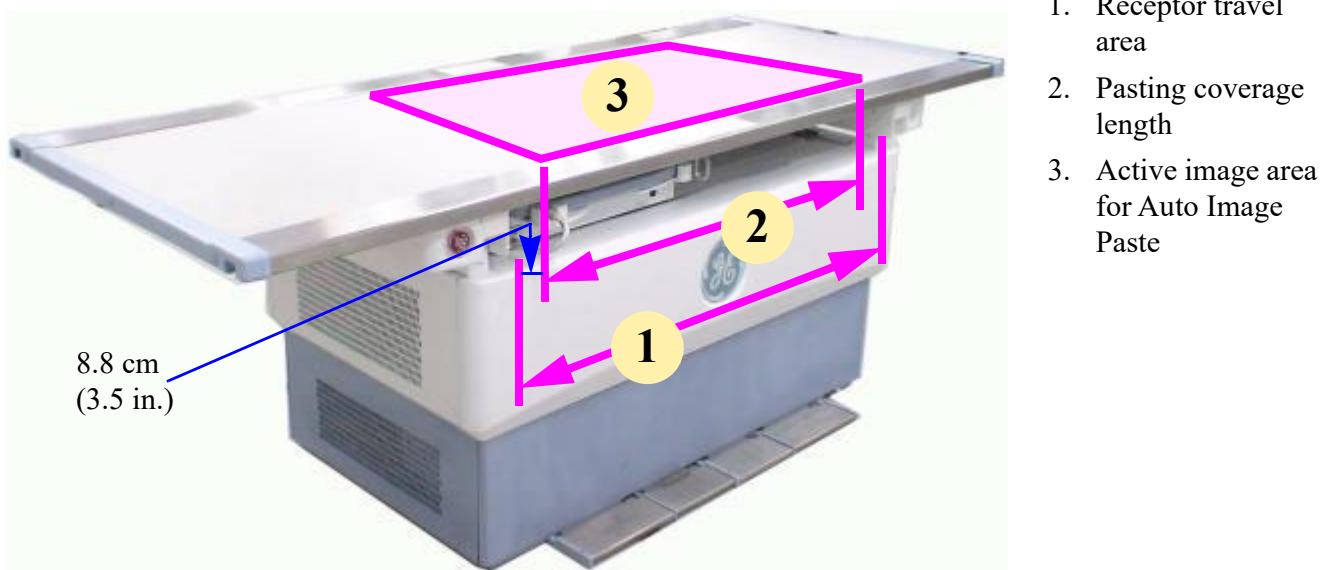


**WARNING** Keep patient and any others in room clear of the OTS as it moves into position.

6. Engage the detents lock.
7. Adjust table height so that you can comfortably reach and see the OTS UI control screen. Maintain a 100cm or 120cm (if configured) SID.
8. Position the patient on the table at the center of the light field.

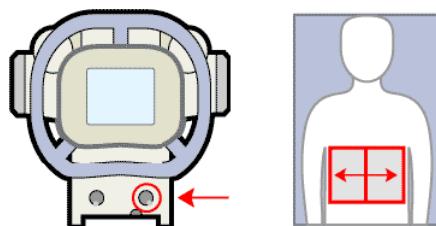
**IMPORTANT!** Patient anatomy must be placed 8.8 cm (3.5 in.) from the ends of the receptor travel area ([Figure 13-40](#)).

**Figure 13-40** Active image area for Auto Image Paste



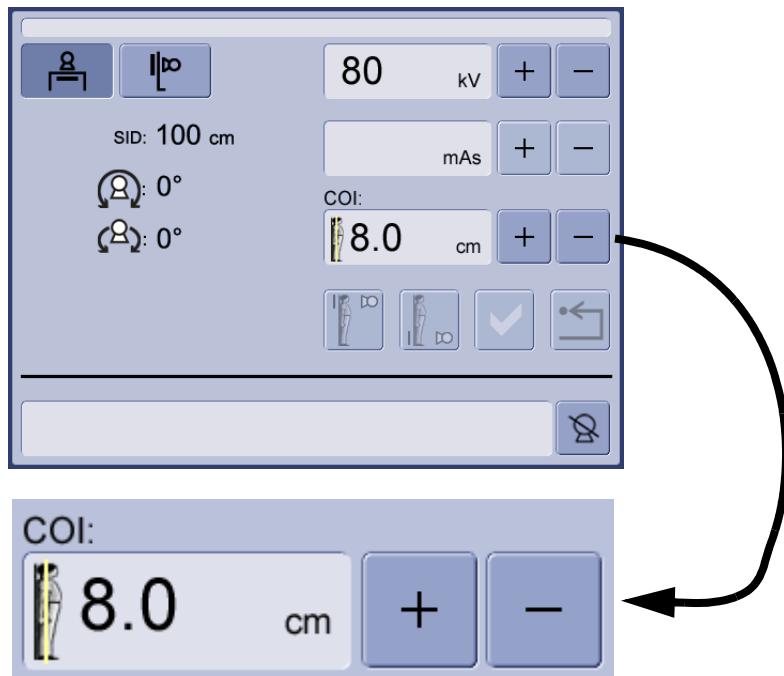
9. Adjust the lateral collimation.

**Figure 13-41** Collimate for exam



**Note:** Auto Image Paste registration can cause narrowing of the field. Do not collimate in too tightly.

10. Using positioning calipers or a ruler, measure the distance from the table top to the mid point at the level of the patient's desired anatomy. This will be your COI.
11. Enter the COI value on the OTS control screen. Press the [+] and [-] buttons on the OTS control screen to enter the COI ([Figure 13-42](#)).

**Figure 13-42** COI on OTS control screen

12. Activate the detents.
13. Instruct the patient to close his or her eyes.
14. Turn on the collimator light.

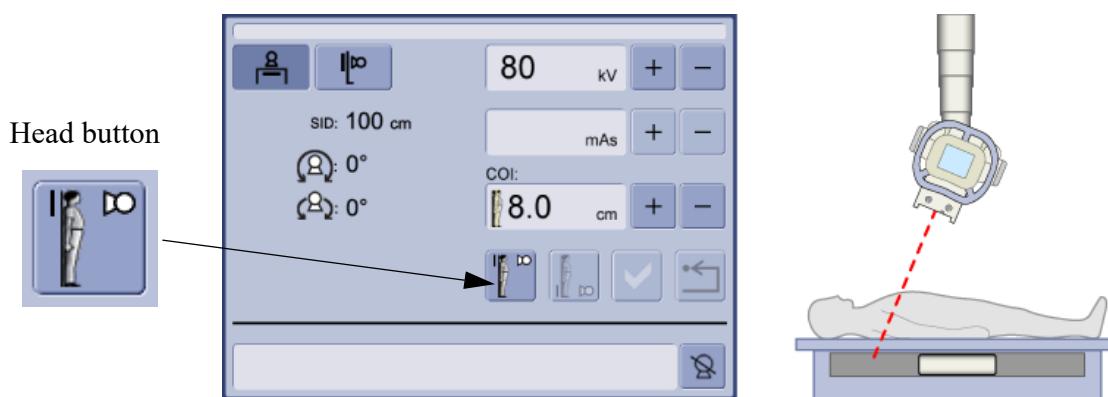


**WARNING** **Laser radiation. Peak power 1 mw / wave length 540-700 nm / class II laser product.**  
**Do NOT stare into beam! When you switch on the linear laser light localizer, make sure no person looks directly into the laser to avoid eye injuries or impaired vision.**

15. Aim laser light at top of desired image field ([Figure 13-43](#)).
  - You may do this by either angulating the tube or by keeping the tube at 0° and moving the column horizontally.

**Note:** The maximum tube angle is +/- 27°.

16. Press [HEAD] on the OTS control screen ([Figure 13-43](#)).
  - If the [HEAD] button does not become enabled, check the following:
    - Reposition the tube to lateral detent of the wallstand receptor.
    - Make sure that column rotation is at 0°.
    - Set the system to NORMAL mode (instead of OVERRIDE mode).

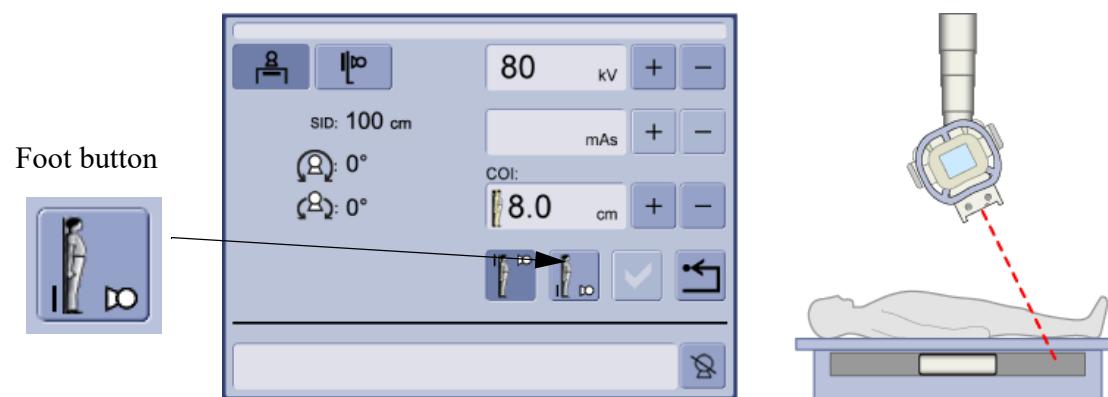
**Figure 13-43** Define top of coverage area

17. Aim laser light at the bottom of the desired image field ([Figure 13-44](#)).

- You may do this by either angulating the tube or by keeping the tube at  $0^\circ$  and moving the column horizontally.

**Note:** The maximum tube angle is  $+/ - 27^\circ$ .

18. Press [FOOT] on the OTS control screen ([Figure 13-44](#)).

**Figure 13-44** Define bottom of converge area

**Note:** Press [RESET] on the control screen ([Figure 13-45](#)) to erase the COI, HEAD, and FOOT settings.

**Figure 13-45** [RESET] button

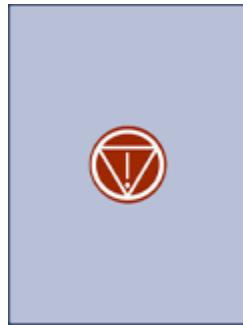
19. Make any adjustments to the lateral collimation.

20. Press the [SET] button ([Figure 13-46](#)) on the OTS control screen when finished.

**Figure 13-46** [SET] button

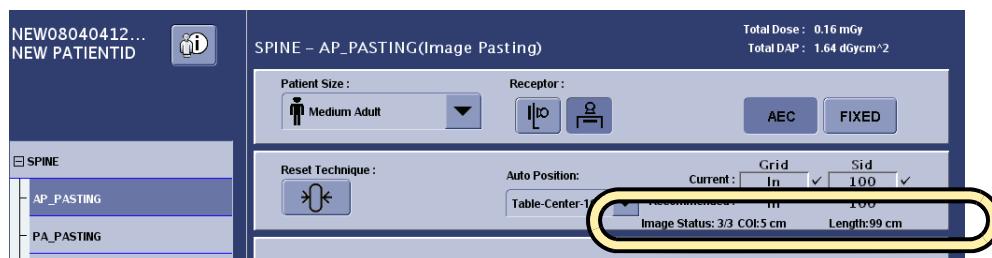
**Note:** The receptor, tube, or both may move. Warn the patient to hold still.

- If the area is not within the acceptable range for the protocol, the [HEAD], [FOOT], and [SET] buttons become disabled and a message appears in the status area. Press [RESET] and start over.
- Once you press [SET], the lateral and vertical collimation knobs on the OTS are locked out. That is, turning the knobs will not change the collimation.
- Once you press [SET], if you change the SID or Tube angle, you will need to re-press the [SET] button before acquisition is allowed.
- Moving the tube out of lateral detent will inhibit exposures until the tube is re-positioned.
- Press the OTS control screen (Figure 13-47) or the Emergency Stop button on the RCIM to stop the tube movement.

**Figure 13-47** Stop tube movement from OTS control screen

21. Make exposure using the hand switch.

- Hold the exposure button down until all exposures have been made. The Image Count area under the SID and Grid information counts down each image as it is exposed (Figure 13-48). Releasing the switch early will terminate Auto Image Paste processing. Any acquired images will still be able to be manually pasted. Refer to [Re-paste \(p. 13-41\)](#) for more information.
- If exposure stopped because of early hand switch release or if you want to retake the exposure with the same COI, head, and foot settings, press the [SET] button on the OTS control screen to reset the tube to its initial position and use the hand switch to make the exposure.

**Figure 13-48** Image Status on Acquisition screen

- The sub-images appear on the Viewer screen as they are acquired and a pasted image appears approximately 10 seconds later.

22. Continue with [Image Viewer \(p. 13-39\)](#) view, re-paste, or process images.

## Alternate Auto Image Paste Acquisition Workflows

The following sections provide instructions for the acquisition of specific anatomy.

### Leg Paste (at wallstand)

Improper COI determination on Leg anatomy may result in no image below the ankle. The following process correctly determines the COI for Leg anatomy and results in a complete image.

**Note:** This process is for Auto Image Paste on the Leg anatomy only. COI determination and patient positioning for the Spine anatomy remains the same.

1. Position the patient as far posterior on the riser as is comfortable (there is no need to have the patient's heel touching the Mylar backing of the patient positioner).
2. Determine the COI at a point that is just posterior to the lateral malleolus.
3. Enter the COI value on OTS screen.
4. Set the HEAD and FOOT positions with the tube stand at approximately the midpoint of what will be the tube travel (typically **knee height** of the patient) using the laser light/tube angle method.
5. Set the HEAD center point, using the laser light, slightly HIGHER than normal (i.e., 5cm—or 2 in—above the top of the anatomy you intend to acquire—e.g. iliac crest).
6. Set the FOOT center point as low as possible to intersect just below the ankle joint.
7. Press [SET].
  - If you receive an error after pressing [SET], reposition the patient, check the accuracy of the COI, and repeat steps 4-7.

Complete setup and acquisition as described in [Conduct Wallstand Exam \(p. 13-28\)](#).

## Image Viewer

Each acquired image is a “sub-image.” After the sub-images are processed, the system aligns and pastes the sub-images into a single “composite” image. The pasted composite is one long image that has continuous anatomical content with the same processing applied throughout.

The following images are stored for the exam and are available for viewing:

- The acquired raw sub-images in the “RAW” series (2–5 images, depending on the protocol and the size of the coverage area)
- The processed sub-images in the “PROC” series (1 processed image for each raw image)
- 1 processed pasted composite image in the “PROC” series (no “raw” pasted composite images are displayed or stored)
- Any re-processed sub-images or re-pasted sub-images and pasted composite images in the “PROC” series

All image zoom, annotation, adjustment tools (brightness, contrast, windowing, rotation, etc.), and re-processing are available for the pasted composite image and the sub-images. The controls function the same as for non-pasting acquisitions. Refer to [Chapter 11: Image Viewer](#) for more information about image adjustment.

The pasted composite image is treated as one image entirely. Image adjustments are applied equally to the entire pasted composite image.

DEI is not shown for derived images. This includes Dual Energy subtraction images (soft tissue and bone) and pasted composite images.

## View Pasted Composite Image

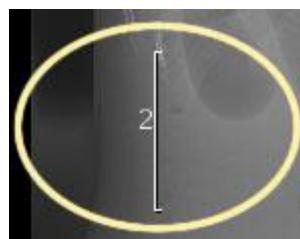
The pasted composite image ([Figure 13-49](#)) appears automatically after acquisition and processing is complete.

**Figure 13-49** Image Viewer screen with pasted composite image



The registration markers (brackets) show the general area of pasted overlap ([Figure 13-50](#)). Use the Image Magnifying Glass function to review registration quality.

**Figure 13-50** Close-up of registration marker



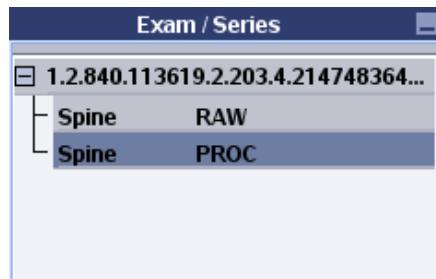
## Select Images

The Exam/Series panel shows two kinds of series:

- Raw images – the individual sub-images that were acquired.
- Processed images – one processed image for each raw image plus one pasted composite image

Re-pasting adds 1 re-processed sub-image for every raw image and 1 pasted composite image to the same processed series.

**Figure 13-51** Exam/Series panel



## Re-Process Images

The Image Processing tab of the Image Tools panel (Figure 13-52) contains the tools to re-process and repaste sub-images and pasted images.

Refer to [Change Looks Processing \(Vertical Equalization\) \(p. 13-44\)](#) or more information.

**Figure 13-52** Image Tools panel – Image Processing tab



## Re-paste

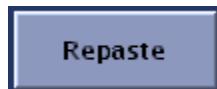
Re-pasting allows you to manually correct the alignment of the sub-images and create a new composite image.

Re-paste is used in the following situations:

- If the exposure was ended before all acquisitions were taken (therefore the system could not process the sub-images into a pasted composite image).
- If the pasted composite image is not properly aligned.

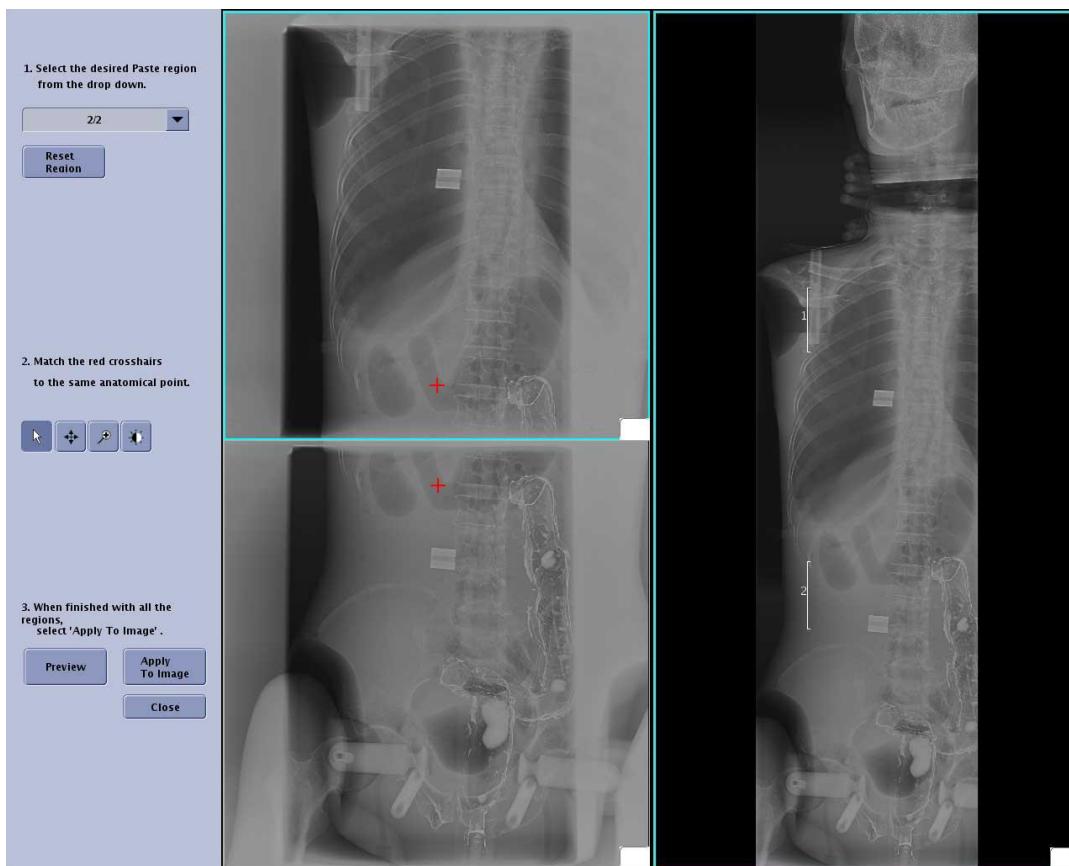
The Re-pasting screen ([Figure 13-54](#)) is accessed by clicking the [REPASTE] button ([Figure 13-53](#)) on the Image Tools - Image Processing tab.

**Figure 13-53** Re-paste button



The Re-pasting screen shows two sets of images. The left half shows the selected pasting region (the overlapped area between 2 sub-images). The left half is also the work area where you set the alignment. The right half shows a preview of the pasted image.

**Figure 13-54** Re-pasting screen



Follow this process to manually re-paste images.

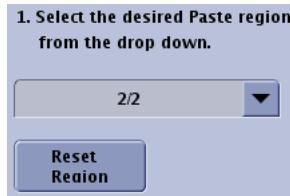
**Note:** Please disable the PO frame before attempting this process.

1. On the Image Tools panel, click the Image Processing tab.
2. Click the [REPASTE] button.

**Note:** It may take a few moments for images to appear.

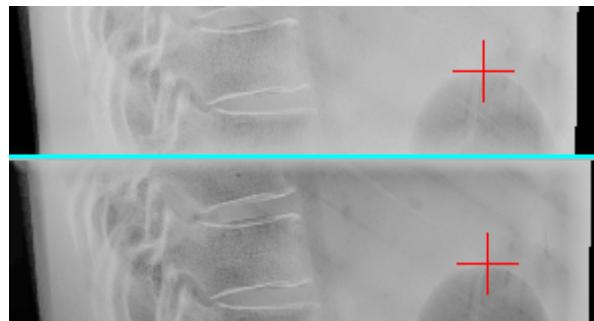
3. Select a region to re-paste from the drop-down list ([Figure 13-55](#)). For example: 1/2, 2/2.
  - [RESET REGION] removes any manual re-pasting from the selected region.

**Figure 13-55** Select region drop-down list.



4. Click and drag on a red cross-hair to move it ([Figure 13-56](#)).

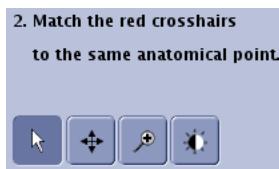
**Figure 13-56** Cross-hairs



5. Place the cross-hairs at the same anatomical reference point on image.

- The mouse control buttons ([Figure 13-57](#)) change the action of the cursor when used on images. Refer to [Chapter 11: Image Viewer-Change Pointer Controls \(p. 11-21\)](#) for more information about these functions.
- Use the Image Magnifying Glass on a region image to zoom in on anatomical regions for better cross-hair placement.
  - a) Click the [IMAGE MAGNIFYING GLASS].
  - b) Click and drag the mouse on a region image to select an area to magnify.
    - The image size will increase in proportion to the selected area.
  - c) To remove magnification, double-click the magnified image.

**Figure 13-57** Mouse controls



6. Repeat steps 3–5 for all regions, if necessary.
7. Click [PREVIEW] to check the registration ([Figure 13-58](#)).

**Note:** Preview is only to check image alignment. Full image processing parameters are not applied to the preview.

**Note:** It may take several moments for the preview to appear on the right half of the screen.

**Figure 13-58** Preview and Apply to Image buttons



8. When satisfied with image alignment, click [APPLY TO IMAGE] (Figure 13-58).
  - [APPLY TO IMAGE] initiates the system to perform the following tasks:
    - Apply the new registration and all processing
    - Re-process sub-images (creates new sub-images)
    - Create new pasted composite image
    - Add re-pasted images to the existing processed series
  - You will automatically be returned to the main Image Viewer screen.
9. Click [CLOSE] to leave the manual re-pasting screen and return to the Image Viewer screen if you do not want to apply registration to the image.

## Change Looks Processing (Vertical Equalization)

A custom look can be changed or applied through the Image Processing Preferences Editor screen.

Refer to [Chapter 15: Preferences-Build Custom Looks \(p. 15-52\)](#) for more information about looks processing.

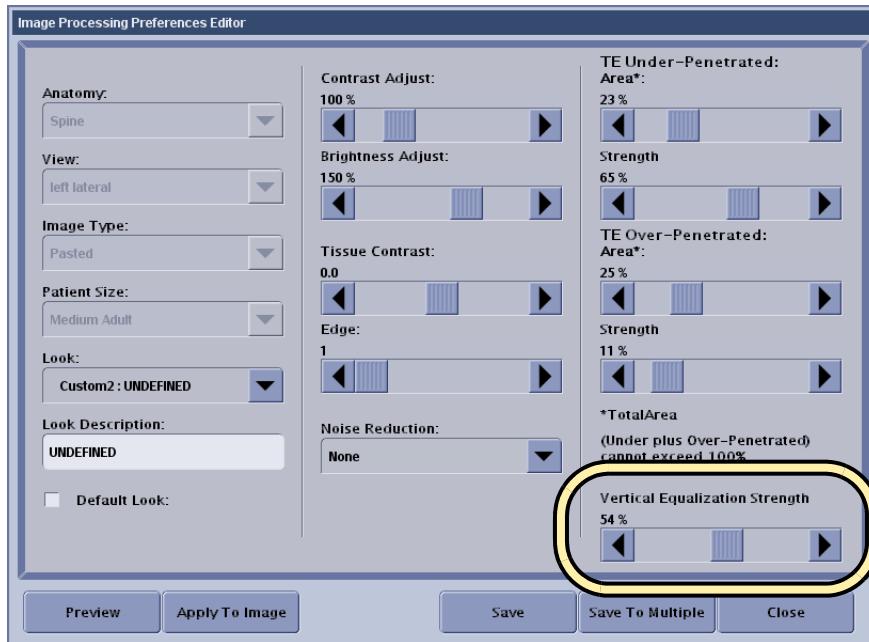
For Auto Image Paste acquisitions, the Image Processing Preferences Editor allows adjustment of vertical equalization strength.

1. Select the **Image Processing Tab** from the Image Tools panel.
2. Click [EDIT PROC].
  - The Image Processing Preferences Editor screen (Figure 13-59) appears on the left monitor.
3. Select an undefined custom look from the **Look** drop-down.
4. Enter a name for the **Look Description**.
5. Adjust the parameters as described in [Chapter 15: Preferences-Build Custom Looks \(p. 15-52\)](#).
6. Adjust the **Vertical Equalization Strength**.
7. Click [PREVIEW] to see the effect of the changes.
  - The preview is shown on the Image Viewer screen.
  - Continue to adjust the look as necessary.
8. When satisfied with the looks processing, click [SAVE].

9. Click [APPLY TO IMAGE].

10. Click [CLOSE].

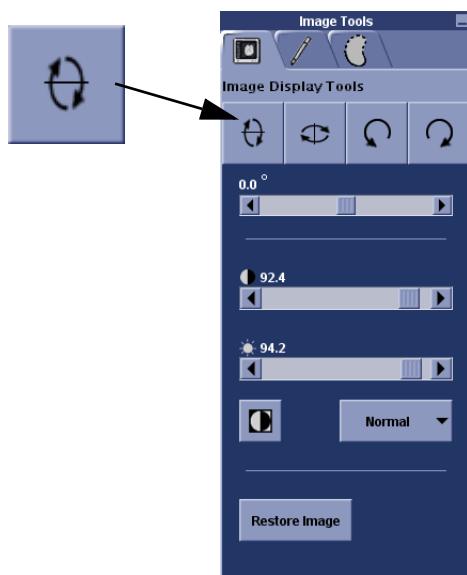
**Figure 13-59** Image Processing Preferences Editor screen



## Image Flip (for Table exams)

If the exam is performed in a head-down position, you must manually flip the pasted image prior to sending, printing, or closing the exam.

1. Select the image (if necessary).
2. Click the Vertical Flip button on the Image Tools panel– Image Display Tools tab (Figure 13-60).

**Figure 13-60** Image Tools panel—Image Display Tools tab

## Print Pasted Images

The process for printing images from an Auto Image Paste acquisition is the same as for standard images. Refer to [Chapter 11: Image Viewer-Print Images \(p. 11-25\)](#).

You have the option to preview before printing. If the print size of the pasted composite image is larger than can be printed on a single piece of film or paper, the preview will show multiple pages.

## Preferences

This section covers the preferences setting specific to Auto Image Paste. All other settings are as described in [Chapter 15: Preferences](#).

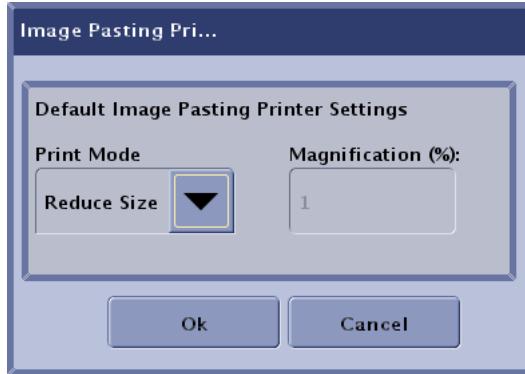
### Configure Default Print/Auto Print Settings

Print settings for Auto Image Paste are accessed from the Image Management preferences, Auto Print settings.

1. From the Worklist screen, click [UTILITIES].
2. Select **Preferences > Image Management**.
3. Click Auto Print [EDIT].
  - The Default Print/Auto Print screen ([Figure 13-61](#)) appears.

**Figure 13-61** Default Print / Auto Print screen

4. Click Image Pasting [EDIT].
  - The Image Pasting Print screen (Figure 13-62) appears.

**Figure 13-62** Image Pasting Print screen

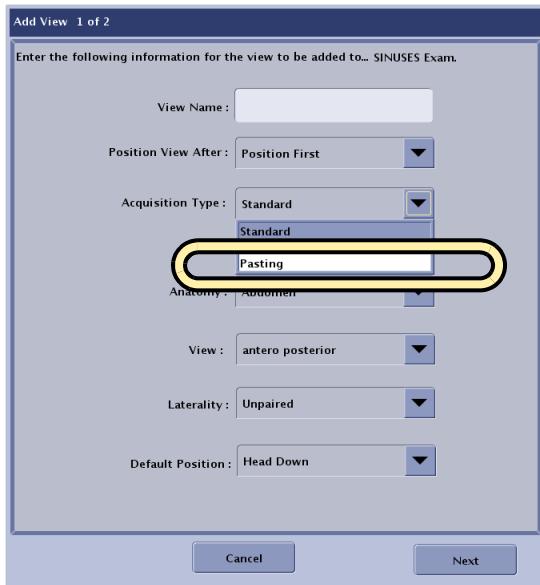
5. Select the Print Mode from the drop-down list.
  - Available options are:
    - True – prints image in actual size across multiple films
    - Fit-to-film – fits the image to the selected film size
    - Reduce size – prints images with the displayed Magnification (%) factor
    - Orthopedic Print – if Orthopedic Magnification is enabled, applies a pre-configured magnification factor to the image
    - None – will not print composite images
6. Click [OK] to apply the setting.
  - [CANCEL] closes the screen without changing the setting.
7. Complete the Default Print/Auto Print screen as described in [Chapter 15: Preferences-Auto Print \(p. 15-23\)](#).

## Add or Edit Auto Image Paste Protocols

Protocol editing for Auto Image Paste (Figure 13-63) is similar to standard exams except for the following differences:

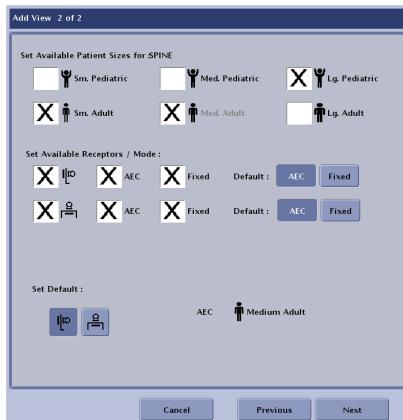
- Select an **Acquisition Type of Pasting**

**Figure 13-63** Add View screen (1 of 2)



- There is no table or cassette receptor option.

**Figure 13-64** Add View screen (2 of 2)



## Edit Image Processing

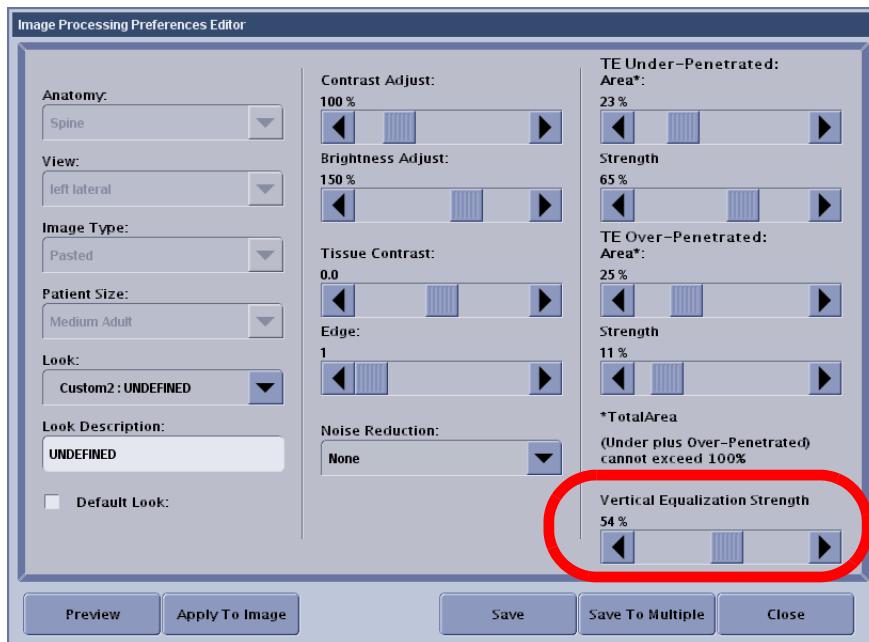
The Image Processing editor allows you to select an **Image Type** of “Pasting” for specific anatomy and views.

- The Image Type “Pasting” is only available if one of the following **Anatomy** is selected:
  - Spine
  - Legs
- The only **Views** that allow Auto Image Paste processing are:
  - Spine: AP, PA, Left LAT, and Right LAT

- Legs: AP and PA

The Vertical equalization strength slider appears (Figure 13-65) if “Pasted” is selected for the Image Type.

**Figure 13-65** Image Processing Preferences Editor screen



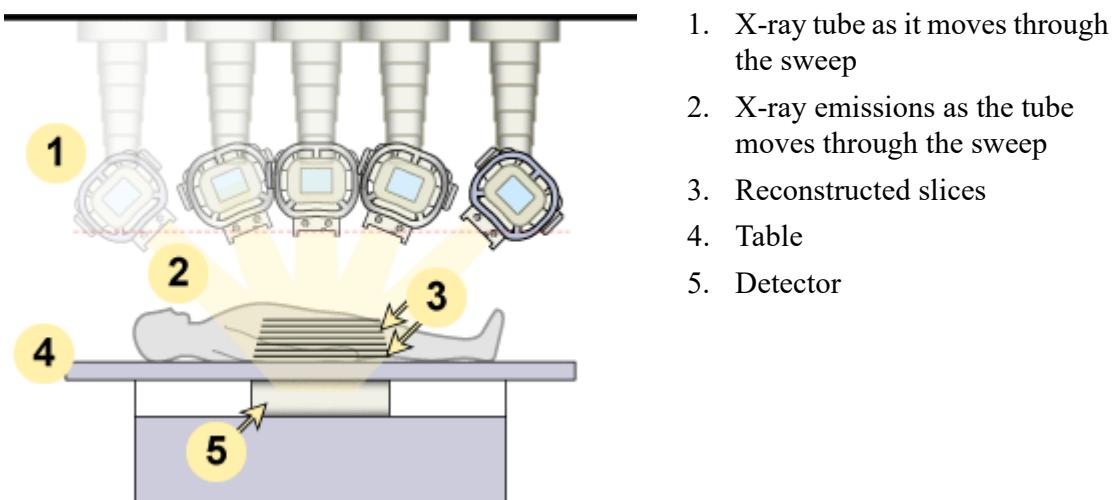
## VolumeRAD

VolumeRAD<sup>TM</sup> is a purchasable option. This appendix describes the option and provides instruction about conducting tasks that differ from standard acquisitions.

### Overview

VolumeRAD (3-D radiography) involves a series of low dose exposures during a single sweep with a stationary receptor and the tube moving within a limited angular range. After a VolumeRAD acquisition, the system reconstructs a number of planes (slices) parallel to the receptor. These slices show anatomical structures at different depths.

VolumeRAD removes overlapping/overlying structures and enhances the conspicuity of structures in the different slices.

**Figure 13-66** Simplified overview of VolumeRAD acquisition and reconstruction

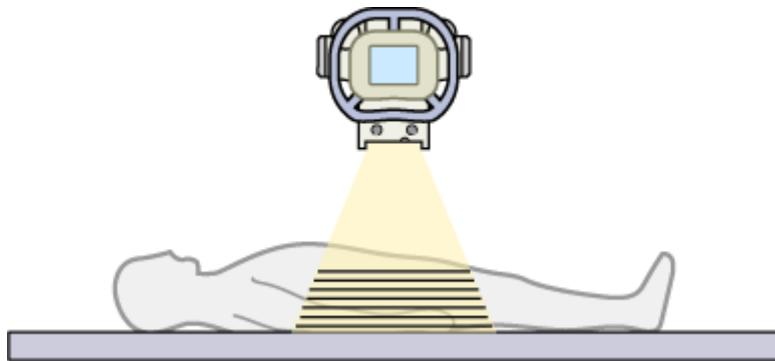
1. X-ray tube as it moves through the sweep
2. X-ray emissions as the tube moves through the sweep
3. Reconstructed slices
4. Table
5. Detector

## Reconstruction

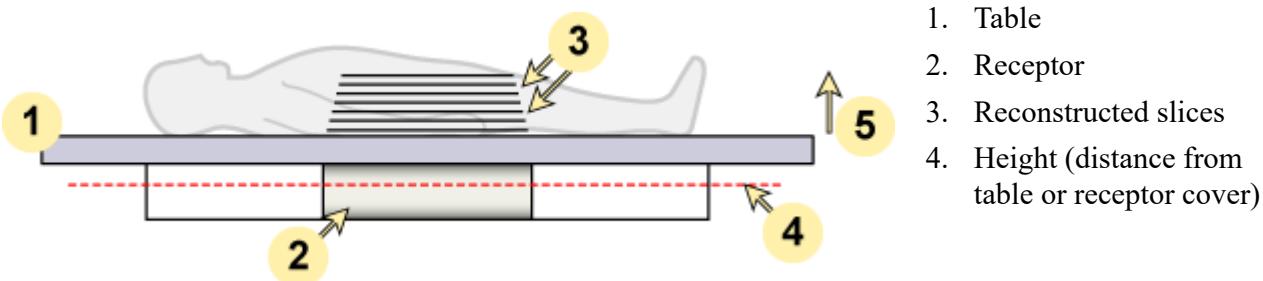
Once the acquisition is complete, the system begins to process the data into slices.

Each slice is an image visualizing the anatomy at that distance from the table or wallstand surface.

The anatomy covered in a slice decreases as the distance from receptor at which it is reconstructed increases. This is due to the “cone beam” effect ([Figure 13-67](#)).

**Figure 13-67** Cone beam effect

You are able to control slice settings through re-processing or technique preferences. Refer to [Image Viewer \(p. 13-60\)](#) and [Reconstruction Preferences \(p. 13-68\)](#) for more information.

**Figure 13-68** Illustration of slice reconstruction for a table exam

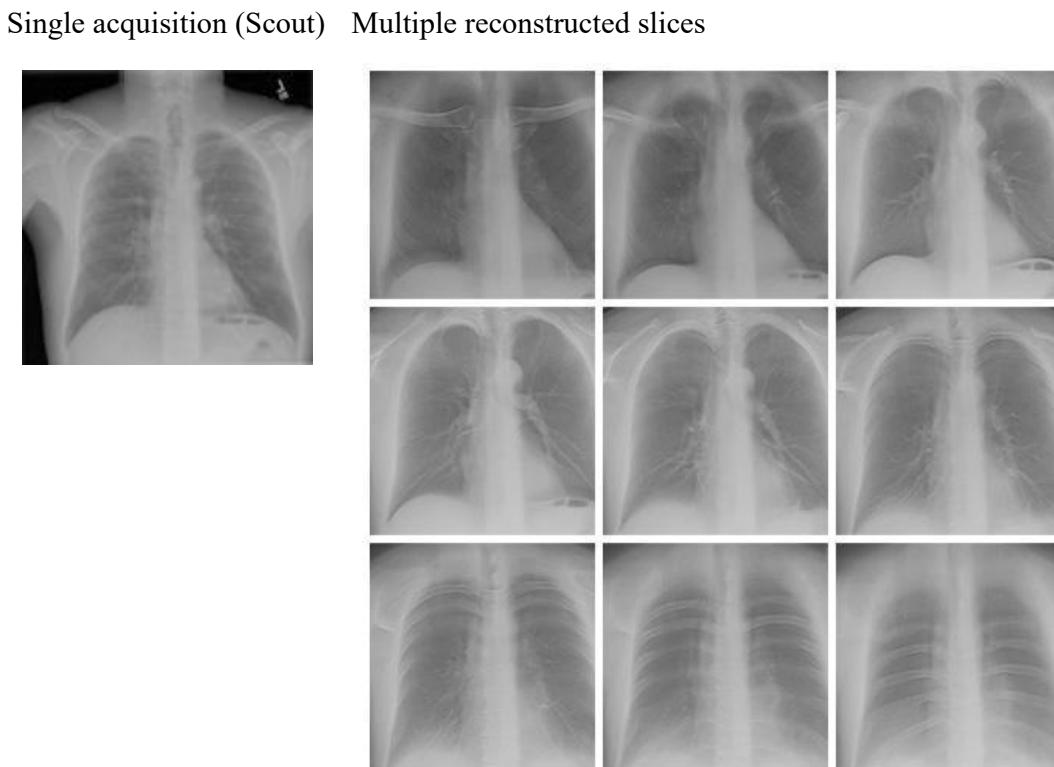
1. Table
2. Receptor
3. Reconstructed slices
4. Height (distance from table or receptor cover)

Standard linear tomography allows visualization of a plane within the body by simultaneous movement of the x-ray tube and the film, thereby blurring out structures above and below the selected plane. VolumeRAD takes multiple exposures during a single tomographic sweep with a fixed receptor, and reconstructs the data in order to visualize multiple planes from the surface of the receptor up through the imaged anatomy.

In a single energy acquisition, all the anatomical structures are crisp and visible, but the image is flat; there is no sense of depth. In a VolumeRAD slice, only structures within the viewed slice are crisp, while adjacent but out-of-slice structures are blurred. By viewing multiple slices in sequence, one can determine the depth and shape of a structure.

For example, a single energy acquisition will show that there is a foreign object in the chest cavity on the right or left side. A series of VolumeRAD slices will show if the object is inside the lung or just below the surface of the skin, if the object is closer to the posterior or anterior of the chest, and if it is shaped more like a disk or more like a sphere.

**Figure 13-69** Example of VolumeRAD reconstruction



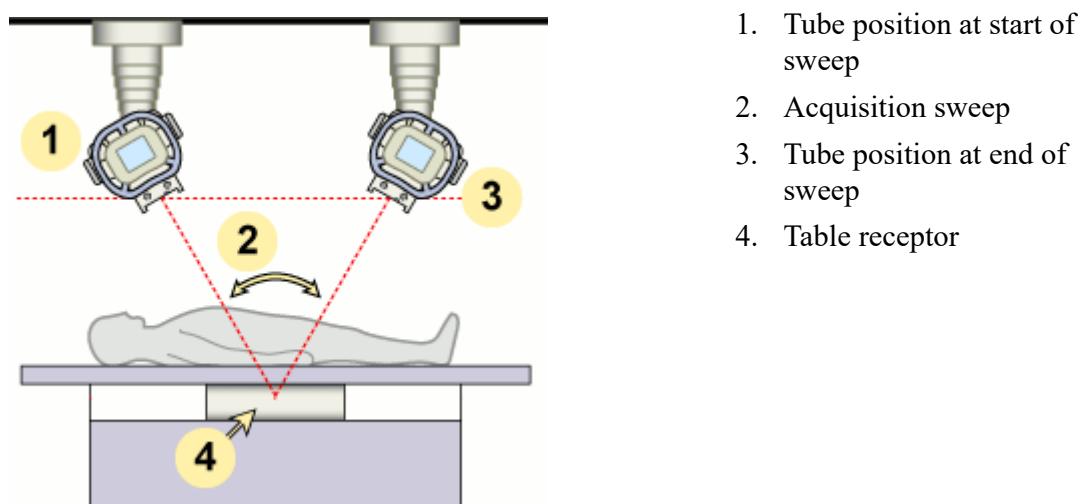
## Configurations

VolumeRAD is a purchasable option that is available at both the table and the wallstand.

**Note:** The figures are used for illustration only. They do not necessarily represent the actual size.

### Table

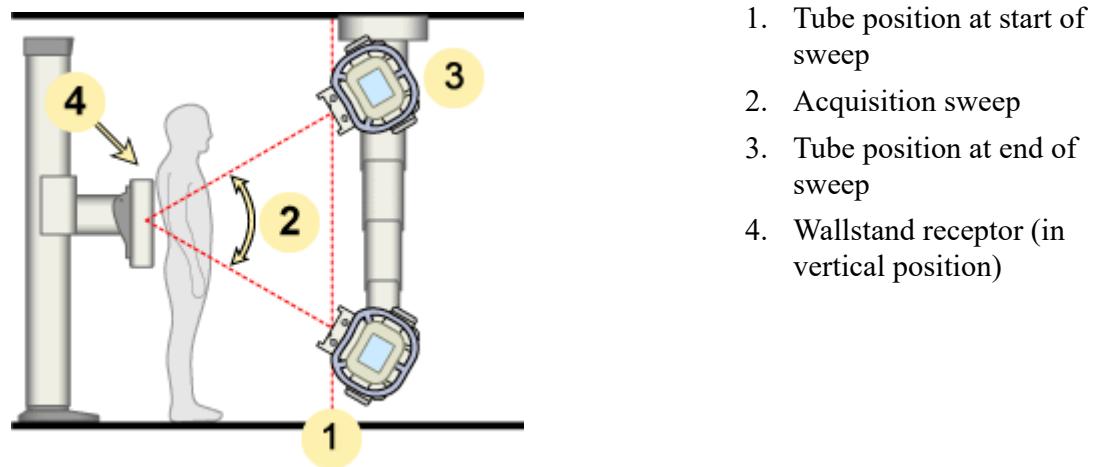
In a table configuration, the OTS moves in the longitudinal direction while the x-ray tube angulates to point to the table receptor.

**Figure 13-70** Table configuration

1. Tube position at start of sweep
2. Acquisition sweep
3. Tube position at end of sweep
4. Table receptor

## Wallstand

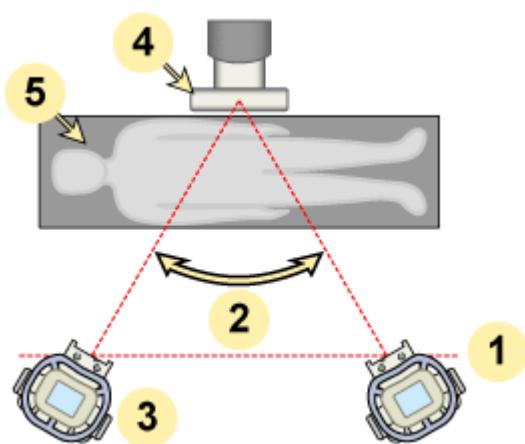
For standard wallstands with the patient in an upright position, the OTS moves vertically while the x-ray tube angulates to point to the receptor.

**Figure 13-71** Wallstand configuration – vertical

1. Tube position at start of sweep
2. Acquisition sweep
3. Tube position at end of sweep
4. Wallstand receptor (in vertical position)

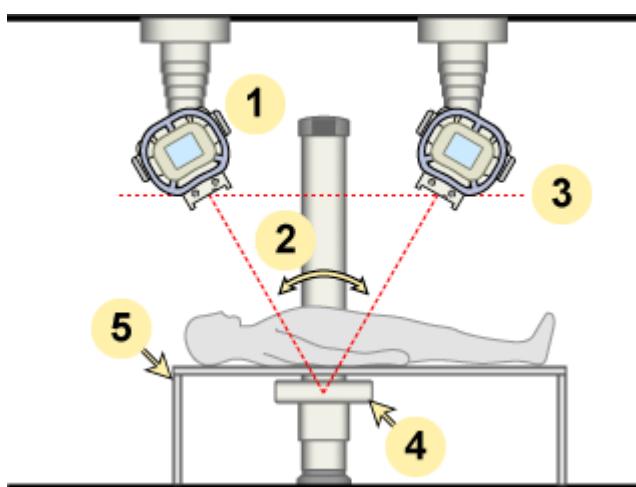
Wallstands may be used to conduct cross table exams with the patient supported on a mobile table or stretcher ([Figure 13-72](#)). The OTS moves in the lateral direction while the x-ray tube angulates to point to the detector.

Place the receptor in the vertical position. Place the patient in supine position with the left shoulder against receptor cover.

**Figure 13-72** Cross Table VolumeRAD Lumbar Spine exam

1. Tube position at start of sweep
2. Acquisition sweep
3. Tube position at end of sweep
4. Wallstand receptor (in vertical position)
5. Patient in supine position (left shoulder against receptor cover) on stretcher

Extended arm wallstands may be used with the receptor in a horizontal position with the patient supported on a mobile table or stretcher (Figure 13-73). The OTS moves in the longitudinal direction while the x-ray tube angulates to point to the receptor.

**Figure 13-73** Extended arm wallstand configuration - horizontal

1. Tube position at start of sweep
2. Acquisition sweep
3. Tube position at end of sweep
4. Wallstand receptor (in horizontal position)
5. Patient in supine position on stretcher

## Safety Warnings

All other caution, warning, and danger statements in this manual still apply to VolumeRAD, with the addition of the following:



**WARNING** Make sure that there are no people or objects in the tube's path during the sweep. Collision may result in injury or irreparable damage.



**WARNING** Keep patient and any others in room clear of the OTS as it moves into position. The area 180cm in front of the wallstand should be kept clear during Auto Positioning.

## Equipment

### OTS User Interface

OTS control screen for VolumeRAD Scout (Figure 13-74) is very similar to a standard exam screen.

The function is the same as for a single energy exposure:

- VolumeRAD x-ray techniques kV and mAs; these settings are synchronized with the acquisition workstation. Press the [+] and [-] buttons to adjust the kV or mAs.
- The screen displays actual SID, Tube Angle, and Column Rotation.
- The Image Size can be selected.

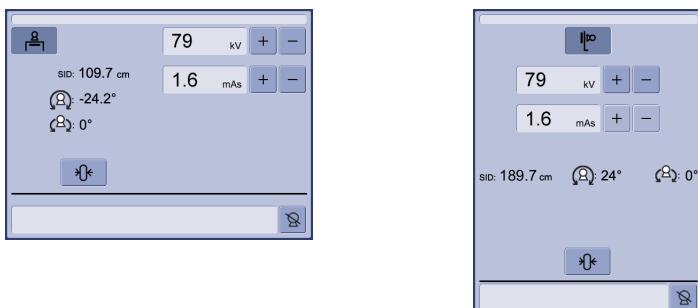
Refer to [Chapter 8: System Hardware Overview-Overhead Tube Suspension \(OTS\) \(p. 8-10\)](#) for more information.

**Figure 13-74** OTS UI screen for VolumeRAD (horizontal and vertical presentation)



Upon completion of the Scout acquisition, the OTS control screen switches to the VolumeRAD sweep mode (Figure 13-75).

**Figure 13-75** OTS UI screen after Scout acquisition (sweep mode)



Only the selected receptor icon is displayed on OTS control screen.

The screen has a “Retake Scout” button (Figure 13-76) that has the same function as the one on the Acquisition screen.

**Figure 13-76** Retake Scout button on OTS



## Image Acquisition

The following sections describe how to take acquisitions and view them.

A VolumeRAD acquisition consists of two main parts:

- Scout – a standard, single energy acquisition used to determine the exposure settings and patient positioning. Once the exposure is made, you confirm that the settings are correct. Multiple Scouts may be taken to ensure that the sweep acquisition is correct.
- Sweep – the system takes multiple, low-dose exposures as the tube travels through the arc. The system then creates the “slices” to visualize the anatomy at various depths. Additional sweeps should only be made if the patient moved during the sweep and the slices are not of acceptable quality.

This section is an overview of the entire acquisition process from selecting the patient on the Worklist through completing the sweep on the acquisition screen.

## Protocol Selection

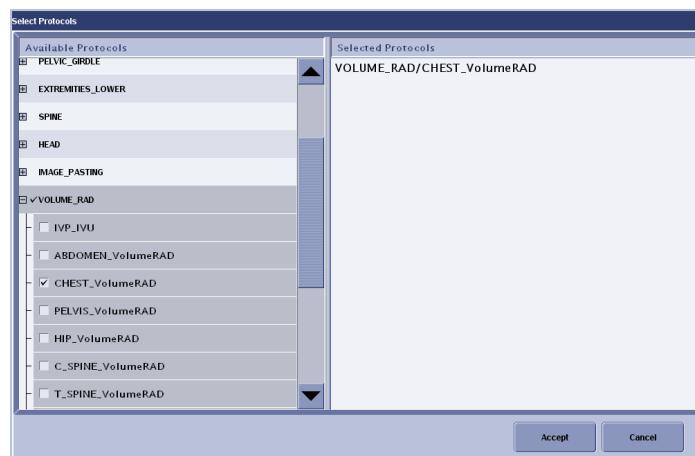
After you select the patient procedure from the Worklist, the Select Protocols screen [Figure 13-77] appears.

Select the anatomy and exam(s) to perform. [Chapter 10: Image Acquisition-Select or Change Protocols \(p. 10-12\)](#) for more information.

Automatic Protocol Assist (APA)—if enabled—functions the same as for other exams.

**Note:** The default is to have all the VolumeRAD protocols placed in a separate category; however, your protocol database may have been configured to place the VolumeRAD protocols into anatomical categories (e.g., the VolumeRAD/Chest exam may be placed in the Chest category.)

**Figure 13-77** Select Protocols screen



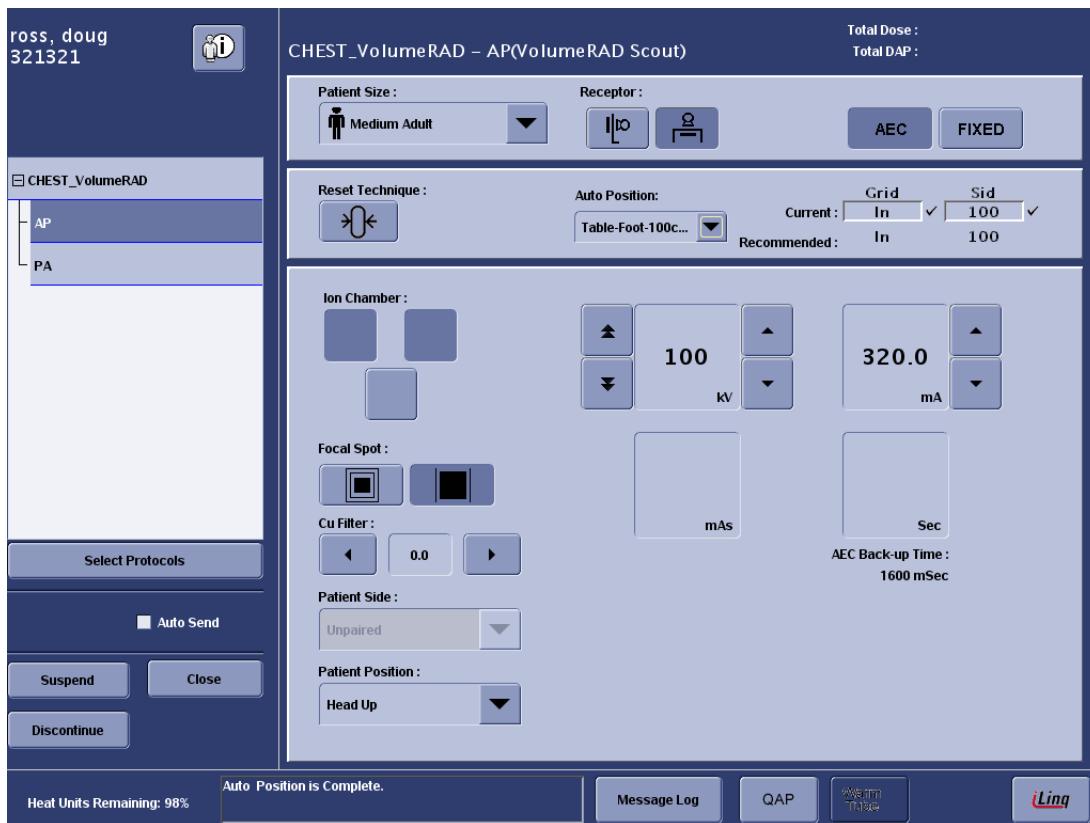
## Scout Acquisition

You need to perform a Scout image acquisition before the VolumeRAD acquisition begins. Images from Scout acquisitions are called VolumeRAD Scout images, which are no different from single energy images. The purpose of VolumeRAD Scout acquisition are:

- To confirm that the patient is correctly positioned.
- To get the VolumeRAD acquisition technique setting guideline.

The screen to acquire the VolumeRAD Scout (Figure 13-78) is the same as the screen used for any other single energy acquisition.

**Figure 13-78** VolumeRAD Scout screen (before acquisition)



8. Select the **View**.
  - Cross table views may be abbreviated as “X\_Table” in the view list.
9. Select the **Patient Size**.
10. Select the **Receptor**.
  - For cross table protocols, the cross table receptor icon will be selected (Figure 13-79).

**Figure 13-79** Cross table receptor icon



**Note:** A VolumeRAD sweep with the cross Table Receptor selected will result in a lateral sweep. This is used for recumbent stretcher patient lateral spine exams. Selecting VolumeRAD at the wallstand receptor will result in a vertical sweep. The patient will be imaged in the erect AP/PA position.

11. Select the mode (**AEC** or **Fixed**).

**Note:** When in AEC mode, the body part must cover the selected ion chambers in order to achieve the proper exposure.

**Note:** The Scout may be either in FIXED or AEC mode, but the VolumeRAD sweep will always be a FIXED mode exposure with the technique controlled by the system.

12. Confirm or adjust the **Grid** and **SID** status.

- For cross table exams, the SID is 150 cm.

13. Make technique adjustments as necessary: **kV**, **mA**, **Focal spot**, **Cu Filter**, and **Ion chambers** (AEC mode only).

**Note:** FOV cannot be less than 10x10cm.

**Note:** Click [RESET TECHNIQUE] at any time to reset the technique to the default protocol settings.

14. Confirm the **patient's position**.

15. Take the Scout acquisition – prep and expose the same way as for a standard exam.

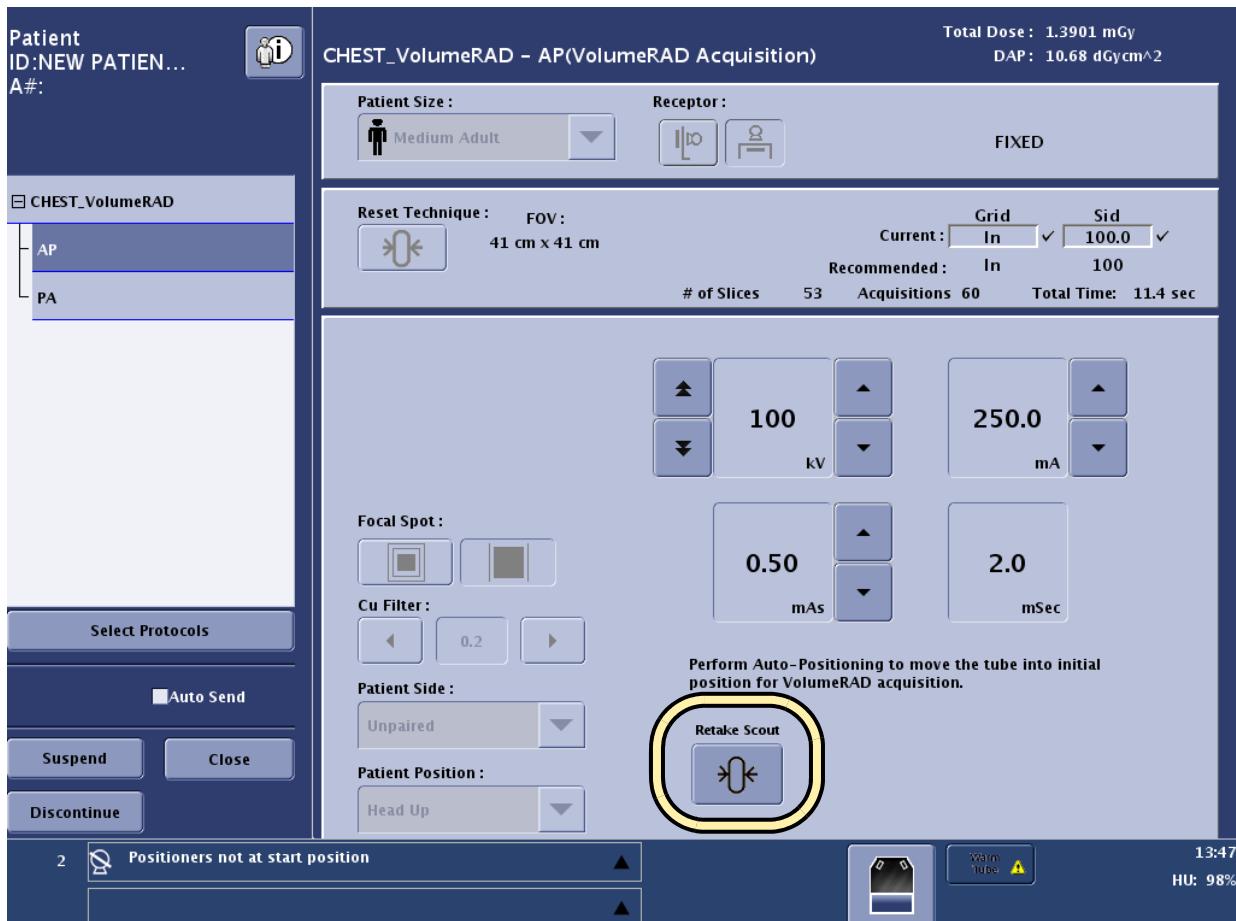
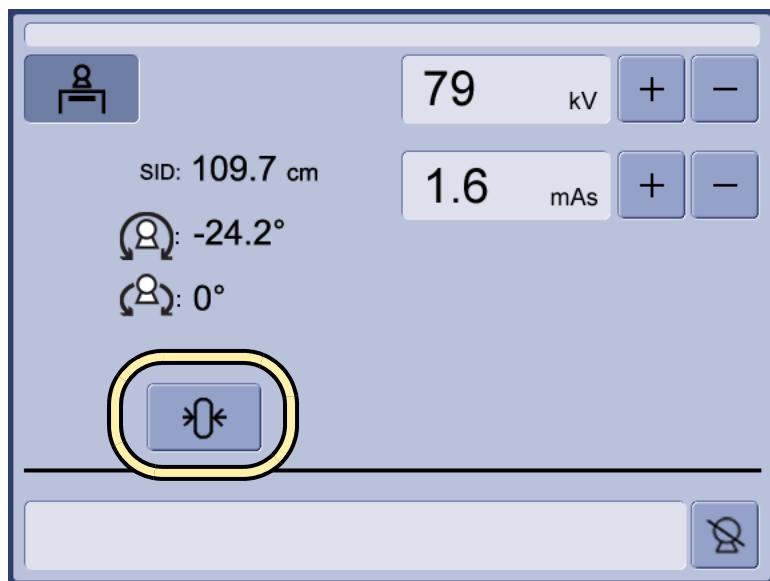
- The Scout image appears on Image Viewer screen (right monitor) and is saved to the database.

16. Confirm the Scout:

- Desired anatomy is imaged
- Exposure is correct
- Image is of acceptable quality

17. If the Scout is not acceptable:

- a) Click the [RETAKE Scout] button on either the Acquisition screen or OTS control screen ([Figure 13-80](#)).
- b) Make adjustments to the patient position and settings as necessary.
- c) Prep and expose to acquire a new Scout image.

**Figure 13-80** Retake Scout button on Acquisition screen (after Scout acquisition)**Figure 13-81** Retake Scout button on OTS control screen (after Scout acquisition)

## VolumeRAD Sweep Acquisition

Once the Scout acquisition is complete, the system console switches to the VolumeRAD acquisition screen ([Figure 13-82](#)).

The number of slices, number of exposures, and total acquisition time are displayed.

The following information is retained from the Scout acquisition, but cannot be changed:

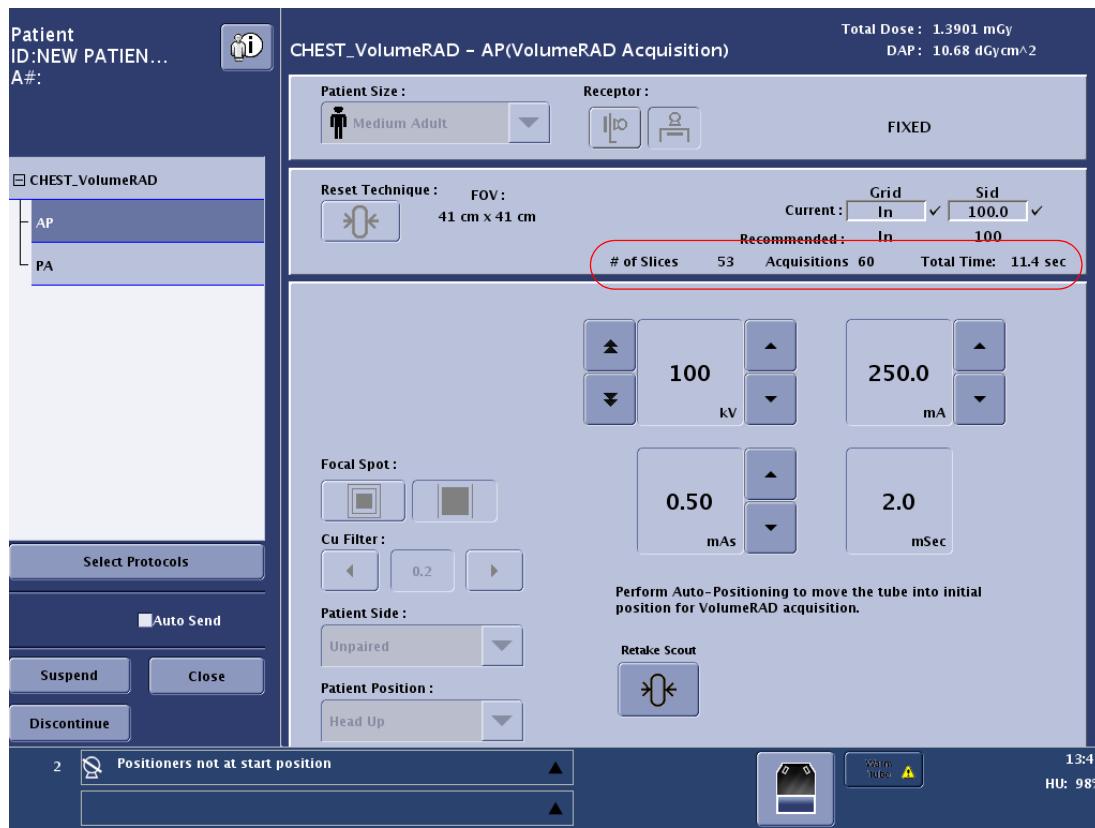
- Patient Size
- Receptor
- Cu Filter
- Patient Side
- Patient Position

**Note:** If you adjust the table height after the Scout, the OTS will track the table height change and maintain the SID. X-ray acquisition will be inhibited during the vertical tracking.

1. Press and hold the AUTO POSITIONING button on the RCIM until the tube has moved into position.  
(Do this step even if the Auto Positioning feature was not purchased for your system.)

**Note:** Exposures will be inhibited until the tube has been re-positioned for the sweep.

- The system will beep when the tube has reached position.
2. Have patient suspend respiration, if required.
    - The Total Time ([Figure 13-82](#)) shows the total time (in seconds) for the sweep to complete, therefore it is the length of time the patient must remain still. No VolumeRAD acquisition sweep will be longer than 12 seconds.

**Figure 13-82** VolumeRAD Acquisition sweep screen

3. Prep and expose.
4. Hold the expose button down until the sweep has finished and the acquisitions have been made – wait until the system stops beeping.
  - Raw images begin to appear on the viewer.
  - Processed reconstructed slices will appear. Depending on how many processed images there are, it may take up to a few minutes for all the images to appear.

**Note:** There are a fixed number of Raw images and Reconstructed slices. The number of images depends on the anatomy being imaged. Refer to [Acquisition Charts \(Default Reconstruction Properties\) \(p. 13-75\)](#) for more information.

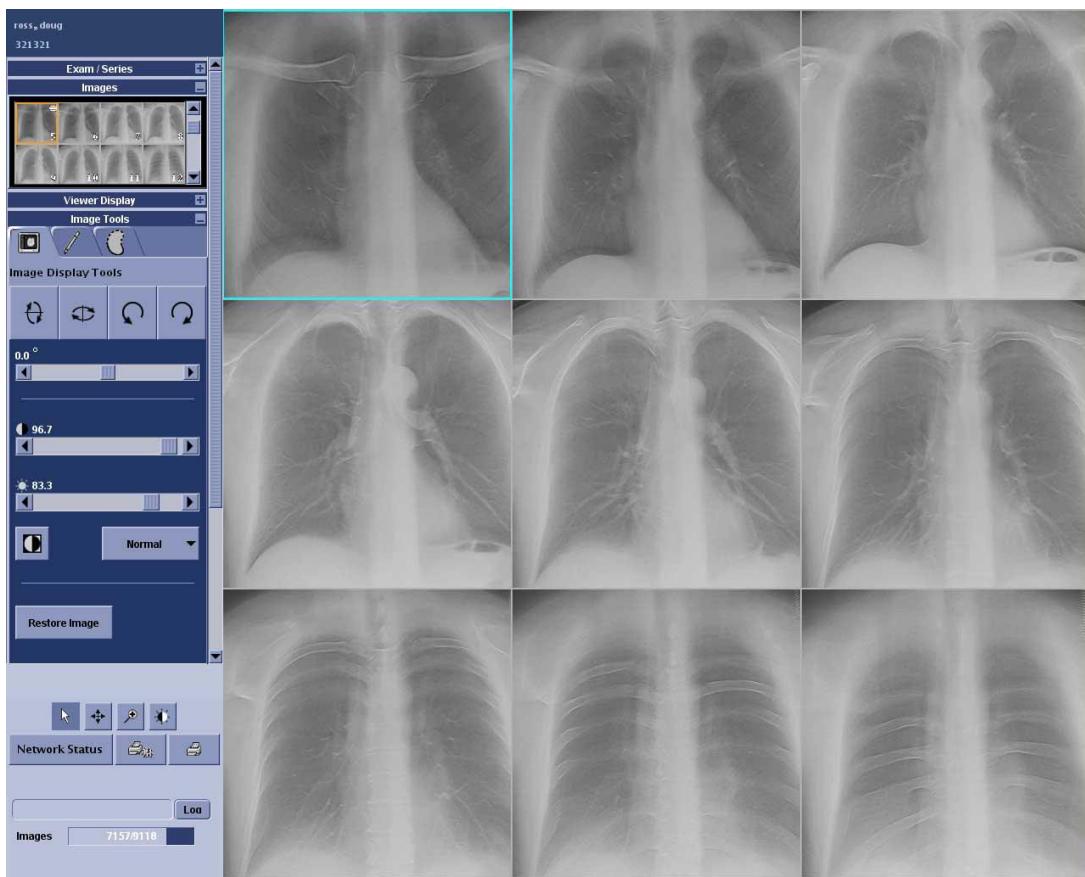
- Adjust the images and slice processing as described in Image Viewer section.

## Image Viewer

For most functions, the Image Viewer controls for VolumeRAD are the same as for standard acquisitions. This section details the controls specific to VolumeRAD.

Refer to [Chapter 11: Image Viewer](#) for more information.

**Note:** The DEI indicator (if enabled) does not appear for reconstructed VolumeRAD slices. The manual shutter is also not available for VolumeRAD slices.

**Figure 13-83** Image Viewer screen for VolumeRAD showing multiple slices

## Adjust Images

Any adjustments made on one slice (contrast, brightness, rotation, etc.) are applied to all slices in the series. If there are multiple series, the adjustment will only be applied to slices within the same series as the selected image.

**Note:** Brightness/Contrast adjusted through the mouse control button may not be shown on all the images of the series until another panel, tool, or image is selected.

## View Slices

The Image Viewer displays all acquisitions and reconstructed slices.

To view slices in sequence, use the Page Up and Page Down keys on the keyboard.

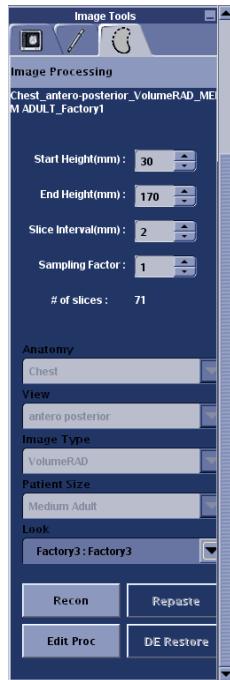
**Note:** Slices will always appear in order with the slice closest to the receptor first and progressing to the last slice, which is farthest from the receptor.

## Reprocess Images (Adjust Slices)

In addition to the standard reprocessing functions described in [Chapter 11: Image Viewer-Re-process Images \(p. 11-17\)](#), the Image Processing tab on the Image Tools panel ([Figure 13-84](#)) allows you to change the number of slices by adjusting the start height, end height, slice interval, and sampling factor.

Adjust the processing as described in [Table 13-4](#).

**Figure 13-84** VolumeRAD Image Tools panel – Image Processing tab



**Table 13-4** VolumeRAD Image Tools panel features

Function	Description
Current processing <b>Chest_antero-posterior_VolumeRAD_ME M ADULT_Factory1</b>	Shows the current image processing settings.
Start Height (mm) <b>Start Height(mm) : 30</b>	Selects the distance from the table top or receptor cover at which the first slice is reconstructed.
End Height (mm) <b>End Height(mm) : 170</b>	Selects the distance from the table top or receptor cover at which the last slice is reconstructed.
Slice Interval (mm) <b>Slice Interval(mm) : 2</b>	Selects the distance between slices. The range is 1-50mm.

**Table 13-4** VolumeRAD Image Tools panel features

Function	Description
Sampling Factor  	<p>Selects the amount of data used for each slice.</p> <p>As in conventional tomography, the slice thickness (n) is determined by the sweep angle. The VolumeRAD sampling factor is 1. VolumeRAD allows the user to include additional data on either side of the nominal slice (n) for inclusion for the reconstructed slice.</p> <p>A number of “virtual” slices are created for every actual slice. The system then averages the information from the virtual slices above and below into the actual slice. Sampling Factor selects the number of virtual slices used to create the actual slice.</p> <p>The Sampling Factor is always an odd number. The maximum selectable range is determined by the Start and End Heights and Slice Interval.</p> <p><b>Note:</b> Changing the Sampling Factor does not change the total number of slices.</p>
# of slices  	Displays the calculated number of slices based on Start Height, End Height and Slice Interval. Adjust these factors to change the number of slices.
Anatomy	Displays the anatomical region.
View	Displays the anatomy view. For example, antero-posterior.
Image Type	Displays the image type for this exam (i.e., VolumeRAD).
Patient size	Displays the patient size. For example, large adult, small pediatric, etc.
Look	<p>Selects the processing look.</p> <p>Refer to <a href="#">Chapter 15: Preferences-Image Processing (p. 15-50)</a> for more information.</p>
[RECON]  	<p>Applies retrospective reconstruction with the selected parameters and factory look. The retro recon slices will be in a new series.</p> <p>When in review mode, re-processing will create new images in the series.</p>
[EDIT PROC]	<p>Brings up a screen that allows you to view the Factory look settings or create custom looks.</p> <p><b>Note:</b> Noise and Tissue Equalization (TE) adjustment is not available for VolumeRAD reprocessing.</p> <p>Refer to <a href="#">Chapter 15: Preferences-Image Processing (p. 15-50)</a> for more information about building custom looks.</p>

## Annotate Slices

The Annotation tab of the Image Tools panel for VolumeRAD (Figure 13-85) is similar to standard images with the addition of functions to apply or remove image annotations from all slices in a VolumeRAD series. Refer to [Chapter 11: Image Viewer-Annotate and Mask Images \(p. 11-9\)](#) for more information about the basic functions.

**Note:** The manual shutter (cropping) is not available for VolumeRAD slices.

**Figure 13-85** VolumeRAD Image Tools panel- Annotation tab



### Add Image Annotations

1. Select the image to annotate, if necessary.

2. Click the button of the annotation to insert.

**Note:** Selected image annotations are yellow with red handles. Un selected image annotations are aqua without handles.

3. Move, re-size, or change the angle of the annotation. Refer to [Chapter 11: Image Viewer-Add Image Annotations \(p. 11-13\)](#) for more information.

4. To apply the annotation to all slices in the series:
  - a) Select the annotation.

- b) Click [APPLY TO SLICES] from the panel.

- The annotation is applied to all images.

**Note:** The system will only apply one annotation at a time to all slices. If you have multiple annotations that you wish to apply, repeat steps 4a and 4b for each annotation.

### Delete Image Annotations

Follow this process to remove image annotations.

**Note:** It is not possible to recover deleted annotations.

1. Select the annotation.
2. Click [ERASE] or [ERASE ALL].
  - If [ERASE] was clicked, a message appears: “Would you like to erase this annotation for all images in the series or just this one image?”
  - If [ERASE ALL] was clicked, a message appears: “Would you like to erase all annotations from all images in this series or just this one image?”
3. Click [ALL] or [ONE].
  - [ALL] removes the annotation(s) from all images in the series.
  - [ONE] removes the annotation(s) from the current image only.

## Apply Quality Control Tags

The quality check indicator marks images of acceptable quality that will be auto printed and auto pushed upon exam close. Refer to [Chapter 11: Image Viewer-Apply Quality Check Indicator \(Auto Tag\) \(p. 11-23\)](#) for more information.

Quality control tags may be applied to all images in a VolumeRAD series or to specific slices.

**Note:** Quality Control Tags are only available during live exams.

Follow this process to apply quality control tags.

1. Select an image in the series.
2. Click [QUALITY CONTROL TAGS].
  - The Quality Control Tags dialog box ([Figure 13-86](#)) appears.

**Figure 13-86** Quality Control Tags dialog box



3. Select the slices to which the tag should be applied.
  - **All** applies the tag to all slices.
    - If your system has Auto Tag set to ON, all slices have the quality control tag already applied by default.
  - **Slices** allows you to type the number of the slice(s), a range of slices, or a combination of single slices and ranges.
    - If your system has Auto Tag set to ON, the tags will be **removed** from all images that are not within the entered Slices range. If the Slices range is left blank, tags will be removed from the entire series.

Refer to [Chapter 15: Preferences-Image Management \(p. 15-21\)](#) for information about turning Auto Tag ON or OFF.

4. Click [APPLY].
  - [CANCEL] closes the dialog box without applying tags.

## Print Slices

VolumeRAD slices are printed using the same methods as for standard exams. Refer to [Chapter 11: Image Viewer-Print Images \(p. 11-25\)](#) for more information.

## Image Management

Systems that have VolumeRAD will have the capacity to store up to 8,930 images total (raw and processed). Typically, this means the system will retain approximately 4,000 image instances.

Image management functions for VolumeRAD exams are the same as for standard exams. Refer to [Chapter 12: Image Management](#) for more information.

Because of the number of images created during a VolumeRAD exam, use a recordable DVD disk (DVD-R) when archiving images or saving images to disk. Refer to [Chapter 12: Image Management-Copy Exams to a CD or DVD \(p. 12-9\)](#) for more information about the procedure.

**Note:** Exams cannot be saved to a re-writable disk (DVD-RW or CD-RW).

## Preferences

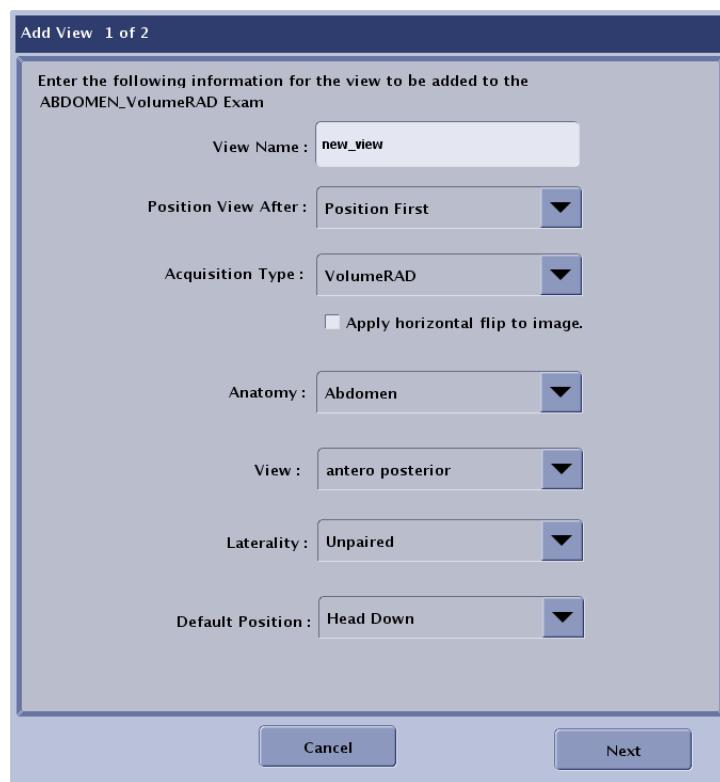
### Protocol Editor (Scout)

The protocol editor for VolumeRAD is essentially the same as for other protocols. This section describes the specific differences to edit or add VolumeRAD protocols.

**Note:** Protocol editing only applies to the Scout acquisition.

Refer to [Chapter 15: Preferences-Protocols \(p. 15-37\)](#) for more information about the basic protocol editing process.

When adding or editing a view for VolumeRAD, select the Acquisition Type of VolumeRAD (Figure 18)

**Figure 13-87** Set preferences – Add (or Edit) View 1 of 2

Clicking the “Next” button switches the screen to protocol default setup for VolumeRAD Scout. The Scout can be either AEC or Fixed acquisition mode.

**Figure 13-88** Set preferences – Add (or Edit) View 2 of 2

## Wallstand and table exams

**Edit View 2 of 2**

Set Available Patient Sizes for : ABDOMEN\_VolumeRAD

<input checked="" type="checkbox"/> Sm. Pediatric	<input type="checkbox"/> Med. Pediatric	<input checked="" type="checkbox"/> Lg. Pediatric
<input checked="" type="checkbox"/> Sm. Adult	<input checked="" type="checkbox"/> Med. Adult	<input checked="" type="checkbox"/> Lg. Adult

Set Available Receptors / Mode :

<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> AEC	<input type="checkbox"/> Fixed	Default : <input type="checkbox"/> AEC <input checked="" type="checkbox"/> Fixed
<input checked="" type="checkbox"/>	<input type="checkbox"/> AEC	<input checked="" type="checkbox"/> Fixed	Default : <input type="checkbox"/> AEC <input checked="" type="checkbox"/> Fixed
<input type="checkbox"/>	<input type="checkbox"/> AEC	<input type="checkbox"/> Fixed	Default : <input type="checkbox"/> AEC <input checked="" type="checkbox"/> Fixed

Set Default :

<input type="checkbox"/>	<input checked="" type="checkbox"/>	AEC	
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Cancel Previous Next

## Cross table exams

**Edit View 2 of 2**

Set Available Patient Sizes for : C\_SPINE\_VolumeRAD

<input checked="" type="checkbox"/> Sm. Pediatric	<input checked="" type="checkbox"/> Med. Pediatric	<input checked="" type="checkbox"/> Lg. Pediatric
<input checked="" type="checkbox"/> Sm. Adult	<input checked="" type="checkbox"/> Med. Adult	<input checked="" type="checkbox"/> Lg. Adult

Set Available Receptors / Mode :

<input type="checkbox"/>	<input type="checkbox"/> AEC	<input type="checkbox"/> Fixed	Default : <input type="checkbox"/> AEC <input checked="" type="checkbox"/> Fixed
<input type="checkbox"/>	<input type="checkbox"/> AEC	<input type="checkbox"/> Fixed	Default : <input type="checkbox"/> AEC <input checked="" type="checkbox"/> Fixed
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> AEC	<input type="checkbox"/> Fixed	Default : <input type="checkbox"/> AEC <input checked="" type="checkbox"/> Fixed

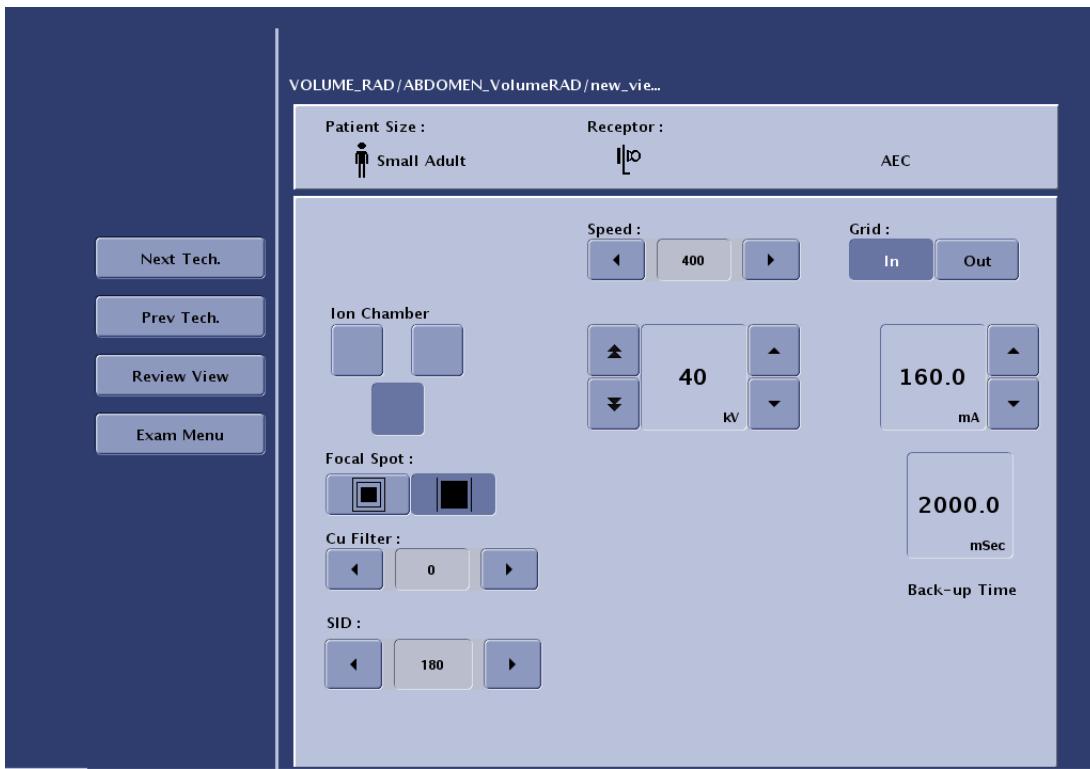
Set Default :

<input type="checkbox"/>	AEC	
--------------------------	-----	--

Cancel Previous Next

Clicking “Next” button switches the screen to Techniques selection for VolumeRAD Scout. The technique screen UI for a VolumeRAD Scout acquisition is similar to a single energy acquisition.

**Figure 13-89** Set preferences – Technique selection



5. Select the default Grid, Focal Spot, Cu Filter and Film Speed for Scout.
6. Select the SID.
  - For Wallstand, select SID of 100cm or 180cm.
  - For Table, the recommended SID is 100cm (display only) or 120cm if configured.
7. Select the default kV, mA for Scout. If the Scout acquisition mode is Fixed, then mAs is also adjustable.
8. If Scout is in AEC mode, select default Ion Chambers for AEC Scout.

## Reconstruction Preferences

Reconstruction preferences define the slice parameters (start and end height, slice interval, etc.) used to create the slices for the protocol. Reconstruction preferences may also be applied to multiple protocols.

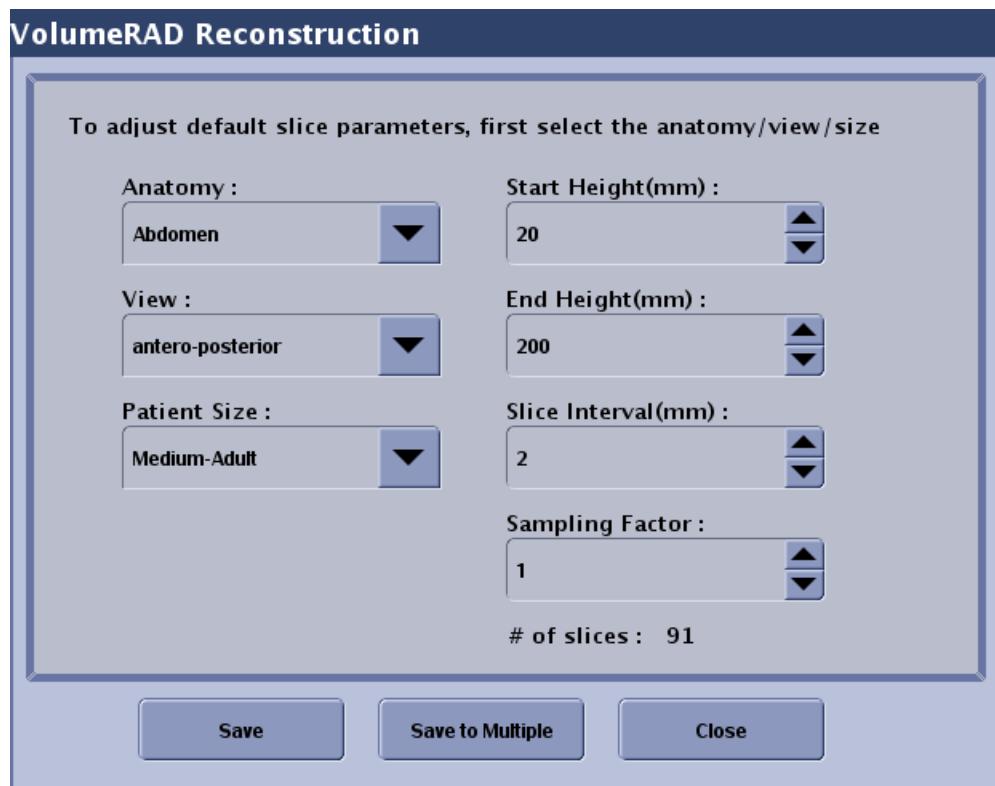
The Image Viewer screen contains tools to create reconstructions for an individual exam. Refer to [Reprocess Images \(Adjust Slices\) \(p. 13-61\)](#) for more information.

Follow this process to change the reconstruction preferences.

1. From the Worklist screen, click [UTILITIES].
2. Select **Preferences** > VolumeRAD.
3. Click VolumeRAD Reconstruction [EDIT].

- The VolumeRAD Reconstruction screen (Figure 13-90) appears.

**Figure 13-90** VolumeRAD Reconstruction

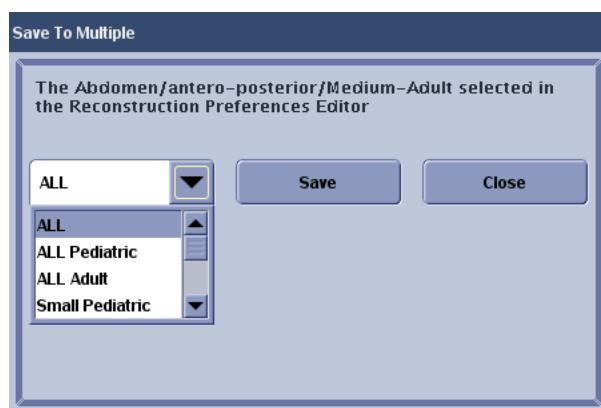


4. Select the **Anatomy**.
5. Select the **View**.
6. Select the **Patient Size**.
7. Adjust the parameters as described in [Table 13-5](#).

**Table 13-5** VolumeRAD reconstruction parameters

Function	Description
Start Height (mm)	Selects the distance from the table top or receptor cover at which the first slice is reconstructed.
End Height (mm)	Selects the distance from the table top or receptor cover at which the last slice is reconstructed.
Slice Interval (mm)	Selects the distance between slices. The range is 1-50mm.
Sampling Factor	Selects the amount of data used for each slice.  As in conventional tomography, the slice thickness ( $n$ ) is determined by the sweep angle. The VolumeRAD sampling factor is 1. VolumeRAD allows you to include additional data on either side of the nominal slice ( $n$ ) for inclusion for the reconstructed slice.  A number of “virtual” slices are created for every actual slice. The system then averages the information from the virtual slices above and below into the actual slice. Sampling Factor selects the number of virtual slices used to create the actual slice.  The Sampling Factor is always an odd number. The maximum selectable range is determined by the Start and End Heights and Slice Interval.  <b>Note:</b> Changing the Sampling Factor does not change the total number of slices.
# of slices	Displays the calculated number of slices based on Start Height, End Height and Slice Interval. Adjust these factors to change the number of slices.

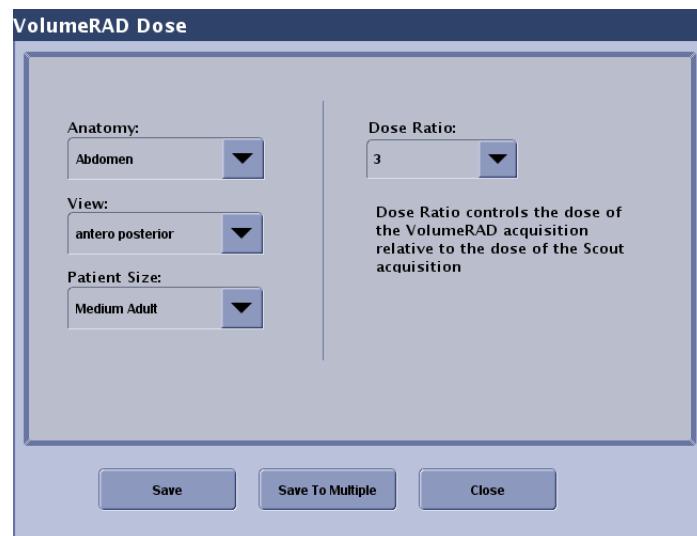
8. When finished adjusting parameters, click [SAVE] or [SAVE TO MULTIPLE].
  - [SAVE] applies the parameters to the currently selected patient size.
    - A message appears: “Save changes?”
    - Click [YES].
  - [SAVE TO MULTIPLE] applies the parameters to multiple patient sizes within the selected anatomy ([Figure 13-91](#)).
    - The Save to Multiple screen appears.
    - Select the **Patient Size** to save the new look to.
    - Click [SAVE].

**Figure 13-91** VolumeRAD Reconstruction - save to multiple

## Dose Preferences

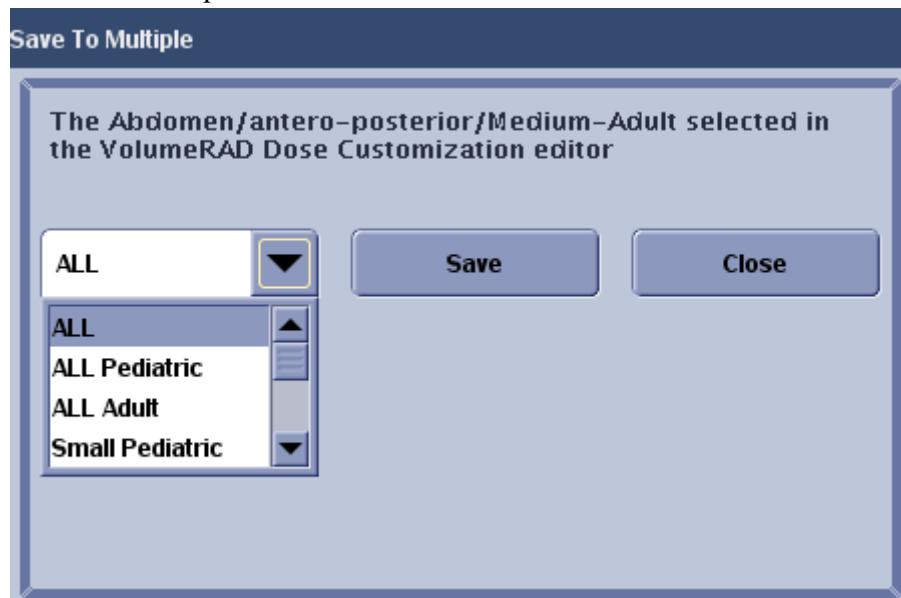
Dose ratio is a multiplier that allows you to control the dose for the VolumeRAD sweep over the dose for the Scout. For example, a dose ratio of 3 means that the VolumeRAD sweep will be performed at 3 times the dose of the Scout for that exam.

1. From the Worklist screen, click [UTILITIES].
2. Select **Preferences > VolumeRAD**.
3. Click VolumeRAD Reconstruction [EDIT].
  - The VolumeRAD Reconstruction screen ([Figure 13-92](#)) appears.
4. Select the **Anatomy**.
5. Select the **View**.
6. Select the **Patient Size**.
7. Select the **Dose Ratio**.

**Figure 13-92** VolumeRAD Dose

8. When finished, click [SAVE] or [SAVE TO MULTIPLE].
  - [SAVE] applies the ratio to the currently selected patient size.
    - A message appears: “Save changes?”
    - Click [YES].
  - [SAVE TO MULTIPLE] applies the ratio to multiple patient sizes within the selected anatomy.
    - The Save to Multiple screen appears ([Figure 13-93](#)).
    - Select the **Patient Size** to save the new look to.
    - Click [SAVE].

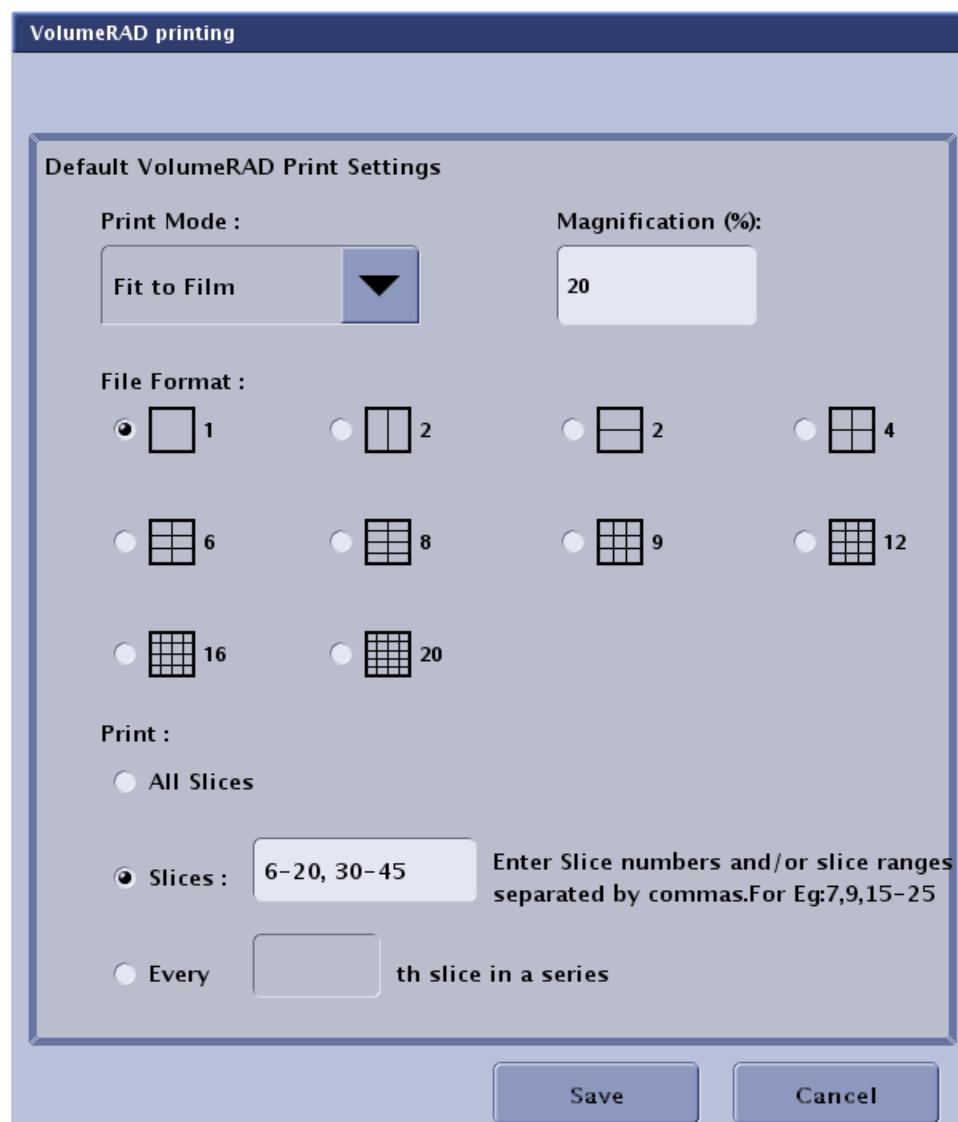
**Figure 13-93** Save Dose to multiple



## Auto Printing Preferences

The following process describes how to configure auto printing for VolumeRAD only. Refer to [Chapter 15: Preferences-Auto Print \(p. 15-23\)](#) for more information about configuring general auto print functions.

1. From the Worklist screen, click [UTILITIES].
2. Select **Preferences > Image Management**.
3. Click Auto Print [EDIT].
  - The Default Print/Auto Print screen appears.
4. Click VolumeRAD [EDIT].
  - The VolumeRAD Printing screen ([Figure 13-94](#)) appears.
5. Complete the information as described in [Table 13-6](#).
6. When finished, click [SAVE] to retain your changes.
7. Click [CLOSE].

**Figure 13-94** VolumeRAD auto printing preferences

**Table 13-6** VolumeRAD Auto print functions

Function	Description
Print Mode	Provides options on the size of the image data printed. Available options are: <ul style="list-style-type: none"><li>• True Size</li><li>• Fit to Film</li><li>• Reduced Size</li></ul>
Magnification	Allows you to enter the percent by which the image will be reduced. The accepted range is between 40% and 90%.
File Format	Selections allow the number of images that may be printed on a single sheet of film or paper. Some selections control the orientation of the images on the page: for example, 2 images per page may be side by side or one on top of the other.
Print	Selects which slices will be printed. Available options are: <ul style="list-style-type: none"><li>• All Slices – Prints all slices in a series.</li><li>• Slices – Prints only the slices or ranges that are entered into the text box.</li><li>• Every <u>  </u> the slice in a series – Prints only a select number of slices for the series. For example, entering “4” into the text box means that only every 4th slice will be printed.</li></ul>

## Workflow Summary

1. Select the patient from the Worklist (or add the patient).
  2. Start or Resume the exam.
  3. Select VolumeRAD protocol.
    - The Acquisition screen appears.
  4. Align tube to receptor (if enabled, use auto positioning).
  5. Position the patient to the receptor.
  6. Select the appropriate FOV for the anatomy.
- Note:** FOV cannot be less than 10x10cm. Additional manual collimation is not possible with a small FOV.
7. Collimate and shield as appropriate for the exam.
  8. Adjust the technique for the Acquisition screen as needed.
  9. Take Scout acquisition.
  10. Verify that the image is acceptable and that the patient is properly positioned.

11. Perform Auto-positioning to move the tube into initial position for VolumeRAD acquisition.
12. Take VolumeRAD acquisition (sweep).
13. Review images on the Viewer screen.
  - If necessary, adjust or reprocess acquisition to adjust slices until desired reconstruction is obtained. Refer to [Reprocess Images \(Adjust Slices\) \(p. 13-61\)](#) for more information.
14. Manually print selected slices if desired. Refer to [Print Slices \(p. 13-66\)](#) for more information.
15. Close the exam to perform Auto Print/Auto Send.

**Note:** If the exam is closed and then re-opened in order for a physician to view images, the Scout must be repeated before any additional VolumeRAD sweeps can be performed. This is because the technique settings for the sweep are derived from the Scout.

## Acquisition Charts (Default Reconstruction Properties)

There are a fixed number of Raw images and Reconstructed slices for a VolumeRAD exam. The number of images depends on the anatomy being imaged. The chart lists the default reconstruction properties for Standard and Cross Table VolumeRAD exams by Anatomy, View, and Patient Size.

**Note:** This chart shows the properties that existed on the system when it was shipped from GE Healthcare. Reconstruction properties can be changed through Preferences.

[Table 13-7](#) shows the default reconstruction properties for a VolumeRAD exam.

**Table 13-7** Default reconstruction properties for VolumeRAD

Anatomy	View	Patient Size	Start Height (mm)	End Height (mm)	Slice Interval (mm)	Sampling Factor	# of Slices	Dose Ratio	Sweep Angle	# of Acquisitions
Abdomen	antero-posterior	Small Adult	20	180	5	1	33	5	20	25
		Medium Adult	20	200	5	1	37	5	20	25
		Large Adult	20	250	5	1	47	5	20	25
		Small Pediatric	10	70	5	1	13	5	20	25
		Medium Pediatric	10	80	5	1	15	5	20	25
		Large Pediatric	10	100	5	1	19	5	20	25
Abdomen	IVP-IVU	Small Adult	60	120	10	1	7	5	20	25
		Medium Adult	70	150	10	1	9	5	20	25
		Large Adult	80	160	10	1	9	5	20	25
		Small Pediatric	20	40	5	1	5	5	20	25
		Medium Pediatric	20	60	5	1	9	5	20	25
		Large Pediatric	20	80	10	1	7	5	20	25

**Table 13-7** Default reconstruction properties for VolumeRAD

<b>Anatomy</b>	<b>View</b>	<b>Patient Size</b>	<b>Start Height (mm)</b>	<b>End Height (mm)</b>	<b>Slice Interval (mm)</b>	<b>Sampling Factor</b>	<b># of Slices</b>	<b>Dose Ratio</b>	<b>Sweep Angle</b>	<b># of Acquisitions</b>
Ankle-joint	antero-posterior	Small Adult	10	90	4	1	21	5	40	30
		Medium Adult	10	100	4	1	24	5	40	30
		Large Adult	10	120	4	1	29	5	40	30
		Small Pediatric	5	40	2	1	19	5	40	30
		Medium Pediatric	5	50	2	1	24	5	40	30
		Large Pediatric	5	60	2	1	29	5	40	30
Ankle-joint	lateral	Small Adult	10	90	4	1	21	5	40	30
		Medium Adult	10	100	4	1	24	5	40	30
		Large Adult	10	120	4	1	29	5	40	30
		Small Pediatric	5	40	2	1	19	5	40	30
		Medium Pediatric	5	50	2	1	24	5	40	30
		Large Pediatric	5	60	2	1	29	5	40	30
Cervical-spine	antero-posterior	Small Adult	10	180	5	1	35	10	40	60
		Medium Adult	15	200	5	1	38	10	40	60
		Large Adult	20	220	5	1	41	10	40	60
		Small Pediatric	5	80	5	1	16	10	40	60
		Medium Pediatric	5	90	5	1	18	10	40	60
		Large Pediatric	5	100	5	1	20	10	40	60
Cervical-spine	left lateral or X-table lateral	Small Adult	80	140	5	1	13	12	30	60
		Medium Adult	80	170	5	1	19	12	30	60
		Large Adult	80	220	5	1	29	12	30	60
		Small Pediatric	40	90	5	1	11	12	30	60
		Medium Pediatric	40	120	5	1	17	12	30	60
		Large Pediatric	40	130	5	1	19	12	30	60
Chest	antero-posterior	Small Adult	20	220	5	1	41	10	30	60
		Medium Adult	20	280	5	1	53	10	30	60
		Large Adult	20	320	5	1	61	10	30	60
		Small Pediatric	20	100	5	1	17	10	30	60
		Medium Pediatric	20	140	5	1	25	10	30	60
		Large Pediatric	20	180	5	1	33	10	30	60

**Table 13-7** Default reconstruction properties for VolumeRAD

<b>Anatomy</b>	<b>View</b>	<b>Patient Size</b>	<b>Start Height (mm)</b>	<b>End Height (mm)</b>	<b>Slice Interval (mm)</b>	<b>Sampling Factor</b>	<b># of Slices</b>	<b>Dose Ratio</b>	<b>Sweep Angle</b>	<b># of Acquisitions</b>
Chest	postero-anterior	Small Adult	20	220	5	1	41	10	30	60
		Medium Adult	20	280	5	1	53	10	30	60
		Large Adult	20	320	5	1	61	10	30	60
		Small Pediatric	20	100	5	1	17	10	30	60
		Medium Pediatric	20	140	5	1	25	10	30	60
		Large Pediatric	20	180	5	1	33	10	30	60
Facial-bones	lateral	Small Adult	5	100	4	1	25	10	40	60
		Medium Adult	5	120	4	1	30	10	40	60
		Large Adult	5	150	4	1	37	10	40	60
		Small Pediatric	5	60	4	1	15	10	40	60
		Medium Pediatric	5	70	4	1	17	10	40	60
		Large Pediatric	5	80	4	1	20	10	40	60
Facial-bones	postero-anterior	Small Adult	20	100	4	1	21	10	40	60
		Medium Adult	20	130	4	1	29	10	40	60
		Large Adult	20	170	4	1	39	10	40	60
		Small Pediatric	5	80	4	1	20	10	40	60
		Medium Pediatric	10	90	4	1	21	10	40	60
		Large Pediatric	10	100	4	1	24	10	40	60
Foot	lateral	Small Adult	10	90	2	1	41	5	40	30
		Medium Adult	10	100	2	1	46	5	40	30
		Large Adult	10	120	2	1	56	5	40	30
		Small Pediatric	5	40	2	1	19	5	40	30
		Medium Pediatric	5	50	2	1	24	5	40	30
		Large Pediatric	5	60	2	1	29	5	40	30
Foot	oblique	Small Adult	10	100	2	1	46	5	40	30
		Medium Adult	10	120	2	1	56	5	40	30
		Large Adult	10	130	2	1	61	5	40	30
		Small Pediatric	10	40	2	1	16	5	40	30
		Medium Pediatric	10	50	2	1	21	5	40	30
		Large Pediatric	10	60	2	1	26	5	40	30

**Table 13-7** Default reconstruction properties for VolumeRAD

Anatomy	View	Patient Size	Start Height (mm)	End Height (mm)	Slice Interval (mm)	Sampling Factor	# of Slices	Dose Ratio	Sweep Angle	# of Acquisitions
Hand	lateral	Small Adult	5	70	2	1	34	5	40	30
		Medium Adult	5	80	2	1	39	5	40	30
		Large Adult	5	100	2	1	49	5	40	30
		Small Pediatric	5	40	2	1	19	5	40	30
		Medium Pediatric	5	50	2	1	24	5	40	30
		Large Pediatric	5	60	2	1	29	5	40	30
Hand	postero-anterior	Small Adult	5	50	2	1	24	5	40	30
		Medium Adult	5	60	2	1	29	5	40	30
		Large Adult	5	70	2	1	34	5	40	30
		Small Pediatric	2	20	2	1	10	5	40	30
		Medium Pediatric	2	30	2	1	15	5	40	30
		Large Pediatric	2	40	2	1	20	5	40	30
Hip-joint	antero-posterior	Small Adult	20	160	5	1	29	10	40	60
		Medium Adult	20	170	5	1	31	10	40	60
		Large Adult	20	190	5	1	35	10	40	60
		Small Pediatric	10	100	5	1	19	10	40	60
		Medium Pediatric	10	120	5	1	23	10	40	60
		Large Pediatric	10	140	5	1	27	10	40	60
Hip-joint	X-table lateral	Small Adult	20	160	5	1	29	10	40	60
		Medium Adult	20	170	5	1	31	10	40	60
		Large Adult	20	190	5	1	35	10	40	60
		Small Pediatric	10	100	5	1	19	10	40	60
		Medium Pediatric	10	120	5	1	23	10	40	60
		Large Pediatric	10	140	5	1	27	10	40	60
Knee	antero-posterior	Small Adult	10	120	2	1	56	5	40	40
		Medium Adult	10	140	2	1	66	5	40	40
		Large Adult	10	160	2	1	76	5	40	40
		Small Pediatric	5	80	2	1	39	5	40	40
		Medium Pediatric	5	90	2	1	44	5	40	40
		Large Pediatric	5	100	2	1	49	5	40	40

**Table 13-7** Default reconstruction properties for VolumeRAD

Anatomy	View	Patient Size	Start Height (mm)	End Height (mm)	Slice Interval (mm)	Sampling Factor	# of Slices	Dose Ratio	Sweep Angle	# of Acquisitions
Knee	lateral	Small Adult	10	120	2	1	56	5	40	40
		Medium Adult	10	140	2	1	66	5	40	40
		Large Adult	10	160	2	1	76	5	40	40
		Small Pediatric	5	80	2	1	39	5	40	40
		Medium Pediatric	5	90	2	1	44	5	40	40
		Large Pediatric	5	100	2	1	49	5	40	40
Lumbar-spine	antero-posterior	Small Adult	10	100	4	1	24	10	40	60
		Medium Adult	10	120	4	1	29	10	40	60
		Large Adult	10	140	4	1	34	10	40	60
		Small Pediatric	5	60	4	1	15	10	40	60
		Medium Pediatric	5	70	4	1	17	10	40	60
		Large Pediatric	5	80	4	1	20	10	40	60
Lumbar-spine	left lateral or X-table lateral	Small Adult	80	140	4	1	16	12	30	60
		Medium Adult	80	170	4	1	24	12	30	60
		Large Adult	80	220	4	1	36	12	30	60
		Small Pediatric	40	90	4	1	14	12	30	60
		Medium Pediatric	40	120	4	1	21	12	30	60
		Large Pediatric	40	130	4	1	24	12	30	60
Paranasal-sinus	lateral	Small Adult	5	100	2	1	49	10	40	60
		Medium Adult	5	120	2	1	59	10	40	60
		Large Adult	5	150	2	1	74	10	40	60
		Small Pediatric	5	60	2	1	29	10	40	60
		Medium Pediatric	5	70	2	1	34	10	40	60
		Large Pediatric	5	80	2	1	39	10	40	60
Paranasal-sinus	postero-anterior	Small Adult	20	100	2	1	41	10	40	60
		Medium Adult	20	130	2	1	56	10	40	60
		Large Adult	20	170	2	1	76	10	40	60
		Small Pediatric	5	80	2	1	39	10	40	60
		Medium Pediatric	10	90	2	1	41	10	40	60
		Large Pediatric	10	100	2	1	46	10	40	60

**Table 13-7** Default reconstruction properties for VolumeRAD

Anatomy	View	Patient Size	Start Height (mm)	End Height (mm)	Slice Interval (mm)	Sampling Factor	# of Slices	Dose Ratio	Sweep Angle	# of Acquisitions
Pelvis	antero-posterior	Small Adult	20	180	5	1	33	10	40	60
		Medium Adult	20	200	5	1	37	10	40	60
		Large Adult	20	250	5	1	47	10	40	60
		Small Pediatric	10	70	5	1	13	10	40	60
		Medium Pediatric	10	80	5	1	15	10	40	60
		Large Pediatric	10	100	5	1	19	10	40	60
Shoulder	antero-posterior	Small Adult	5	150	5	1	30	5	40	60
		Medium Adult	5	200	5	1	40	5	40	60
		Large Adult	5	220	5	1	44	5	40	60
		Small Pediatric	5	100	5	1	20	5	40	60
		Medium Pediatric	5	120	5	1	24	5	40	60
		Large Pediatric	5	140	5	1	28	5	40	60
Temporo-mandibular-joint	lateral	Small Adult	5	100	2	1	49	10	40	60
		Medium Adult	5	120	2	1	59	10	40	60
		Large Adult	5	150	2	1	74	10	40	60
		Small Pediatric	5	60	2	1	29	10	40	60
		Medium Pediatric	5	70	2	1	34	10	40	60
		Large Pediatric	5	80	2	1	39	10	40	60
Thoracic-spine	antero-posterior	Small Adult	10	100	4	1	24	10	40	60
		Medium Adult	10	120	4	1	29	10	40	60
		Large Adult	10	140	4	1	34	10	40	60
		Small Pediatric	5	70	4	1	17	10	40	60
		Medium Pediatric	5	80	4	1	20	10	40	60
		Large Pediatric	5	90	4	1	22	10	40	60
Thoracic-spine	left lateral or X-table lateral	Small Adult	80	140	4	1	16	12	30	60
		Medium Adult	80	170	4	1	24	12	30	60
		Large Adult	80	220	4	1	36	12	30	60
		Small Pediatric	40	90	4	1	14	12	30	60
		Medium Pediatric	40	120	4	1	21	12	30	60
		Large Pediatric	40	130	4	1	24	12	30	60

**Table 13-7** Default reconstruction properties for VolumeRAD

<b>Anatomy</b>	<b>View</b>	<b>Patient Size</b>	<b>Start Height (mm)</b>	<b>End Height (mm)</b>	<b>Slice Interval (mm)</b>	<b>Sampling Factor</b>	<b># of Slices</b>	<b>Dose Ratio</b>	<b>Sweep Angle</b>	<b># of Acquisitions</b>
Wrist	lateral	Small Adult	5	70	2	1	34	5	40	30
		Medium Adult	5	80	2	1	39	5	40	30
		Large Adult	5	100	2	1	49	5	40	30
		Small Pediatric	5	40	2	1	19	5	40	30
		Medium Pediatric	5	50	2	1	24	5	40	30
		Large Pediatric	5	60	2	1	29	5	40	30
Wrist	postero-anterior	Small Adult	5	50	2	1	24	5	40	30
		Medium Adult	5	60	2	1	29	5	40	30
		Large Adult	5	70	2	1	34	5	40	30
		Small Pediatric	2	20	2	1	10	5	40	30
		Medium Pediatric	2	30	2	1	15	5	40	30
		Large Pediatric	2	40	2	1	20	5	40	30

# Chapter 14: Quality Assurance and Maintenance

This chapter explains the Quality Assurance and Maintenance process for your system. To assure continued performance of this X-ray equipment, a periodic inspection program must be established. Daily functional checks should be part of this program.

## Quality Assurance Process

The Quality Assurance Process (QAP) consists of a series of tests that should be performed weekly on your system to quantify image quality. Many of the background tasks in this procedure have been automated and require the acquisitions to be performed in the prescribed order.

### Types of Quality Tests

There are two types of quality tests:

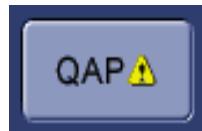
- Detector Check: A Detector Test is a quick test to check for detector quality. This test can be part of a daily check or completed if the detector was dropped or suspected to be dropped. Detector Check does not require making exposures and the pass or fail results are not included in the results history. The Detector Check test can be performed in approximately 30 seconds.
- QAP: QAP is a complete quality test that requires taking exposures of a flat field phantom and a MTF phantom. The results (pass or fail) are recorded in a results history summary. The QAP test can be performed in approximately 15 minutes. A detector check is automatically performed as part of QAP.

### When to Perform QAP

QAP should be performed

- On a scheduled, weekly basis.
- When the alert icon appears on the QAP button (Figure 14-1) located at the bottom of the Worklist or Acquisition screens.
- When there is a perceived loss of image quality.
- When a critical detector bump event has occurred. ([Chapter 15: Preferences-Health Page \(p. 15-63\)](#))

**Figure 14-1** QAP button with alert icon



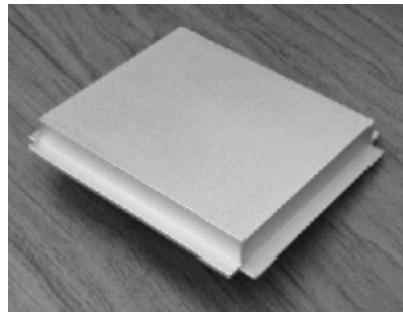
## Phantoms

There are two types of phantoms used in the QAP process. The first phantom is the Flat-Field Phantom and the second is the MTF Phantom. The system prompts you as to which phantom to use from the respective acquisition screens. There are recommended exposure techniques for the phantoms. The exposure is automatically set by the system but you should verify the settings prior to making an exposure.

The flat-field phantom (Figure 14-2) is used to check the following factors:

- Brightness Non uniformity Global
- Brightness Non uniformity Local
- Signal to Noise Ratio (SNR) Non uniformity
- Artifacts Number of Bad Pixels

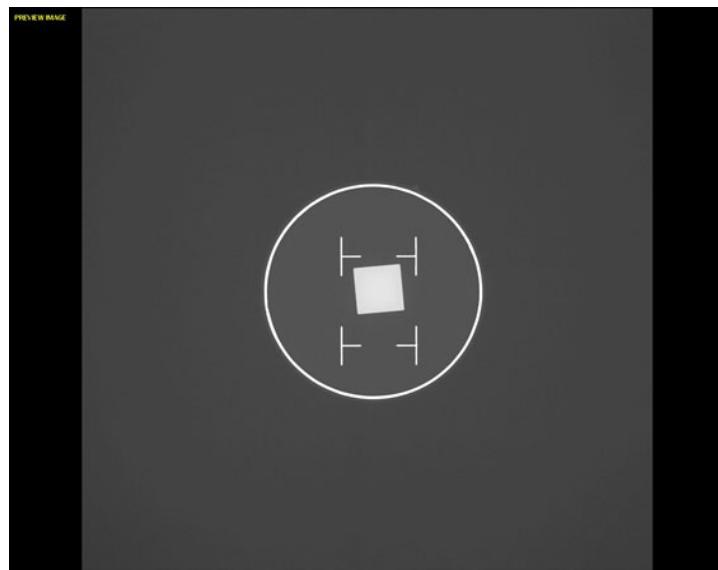
**Figure 14-2** Flat-field phantom



The MTF phantom is used to check MTF (Modulation Transfer Function).

**Figure 14-3** MTF phantom



**Figure 14-4** MTF phantom exposed

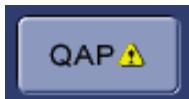
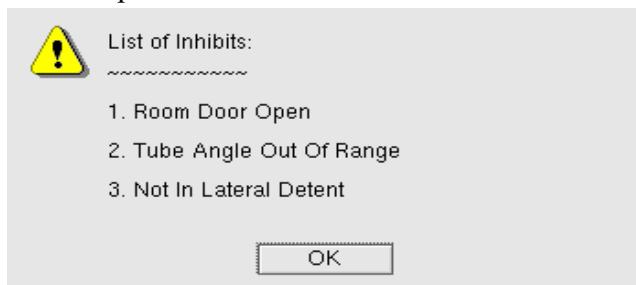
## Acquisition Screen Overview

There are several acquisition screens used during the QAP process. These screens are automatically loaded into the acquisition system at the beginning of the QAP procedure.

When the QAP icon, located on the bottom of the Worklist and Acquisition screens, is activated, the first acquisition screen is displayed. The left and center panes of the screen contain buttons to control the program. The right pane provides information and instructions.

Table 14-1 lists the symbols that appear on QAP screen and describes their function.

**Table 14-1** QAP symbols

Symbol	Description
	QAP button. Begins QAP when clicked on the Worklist screen. The yellow alert icon appears when QAP should be performed to ensure system performance.
	Exit. Closes QAP and returns you to the Worklist.
	Inhibit. The button appears when there is an inhibit or interlock preventing image acquisition. Click the button to bring up a list of inhibits (Figure 14-5). Unlike the Acquisition screen, the list of inhibits does not update automatically as the conditions are corrected. Click [OK] to close the list and click [INHIBIT] again to view an updated list.
<p><b>Figure 14-5</b> Example list of inhibits</p> 	
	Table Receptor. Begins QAP testing when detector is inserted in table tray.
	Wallstand Receptor. Begins QAP testing when detector is inserted in wall-stand tray.
	Digital Cassette. Begins QAP testing when detector is not in table or wall-stand tray.
	Back. Takes you back to the previous screen. This button is disabled while tests are being performed.

Symbol	Description
	Abort. Stops QAP and returns you to the QAP Start screen.

## Perform QAP

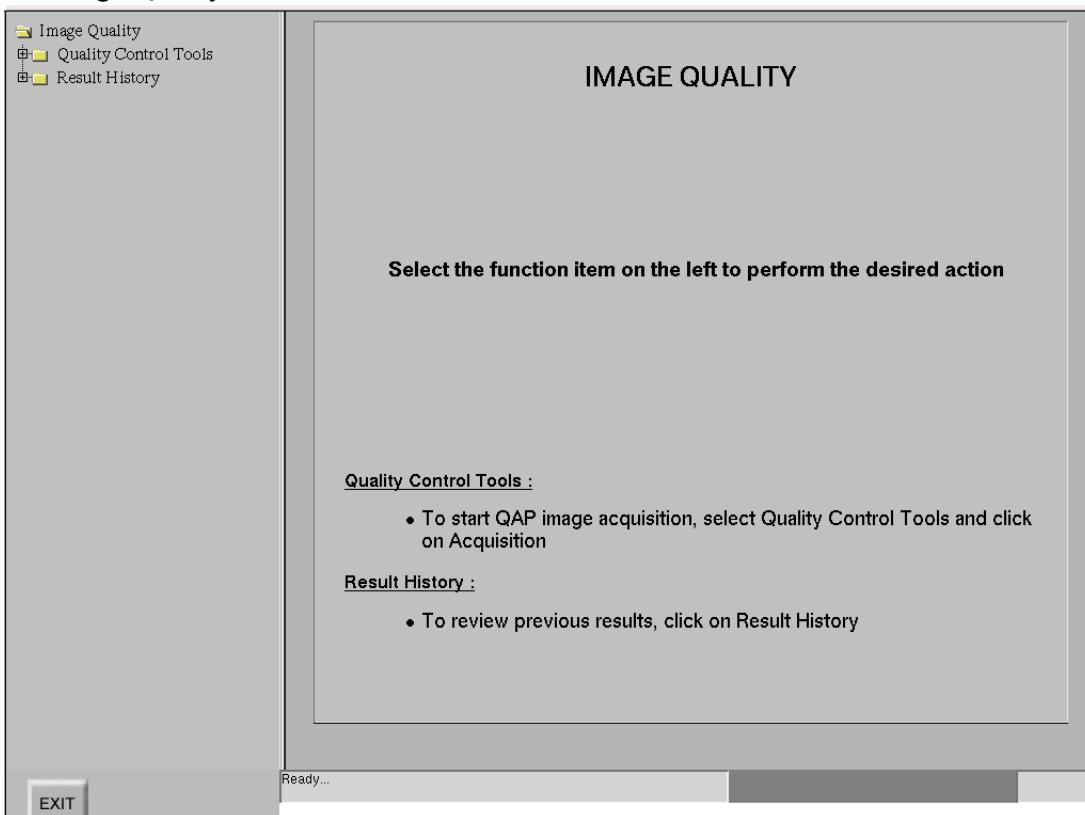
Before starting quality tests, be sure to do the following:

- Close or suspend any open exams.
- Close any exam being reviewed.
- Clear all objects from detector and beam path (QAP only).

The QAP process begins when the QAP button is selected. The button is located at the bottom of the Worklist or Acquisition screen.

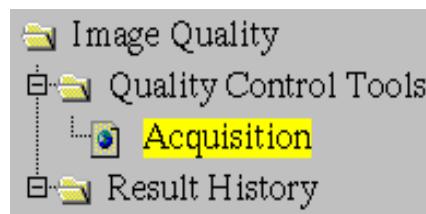
**Note:** QAP cannot be performed if an exam is open or being reviewed.

1. If performing QAP in detector tray, insert detector in table or wallstand. (QAP can be completed in either the table, wallstand or tabletop)
2. Detent or center the tube to the detector.
3. Clear all objects from detector and beam path.
4. Click the [QAP] button on the Worklist screen.
  - The Image Quality screen appears (Figure 14-6).

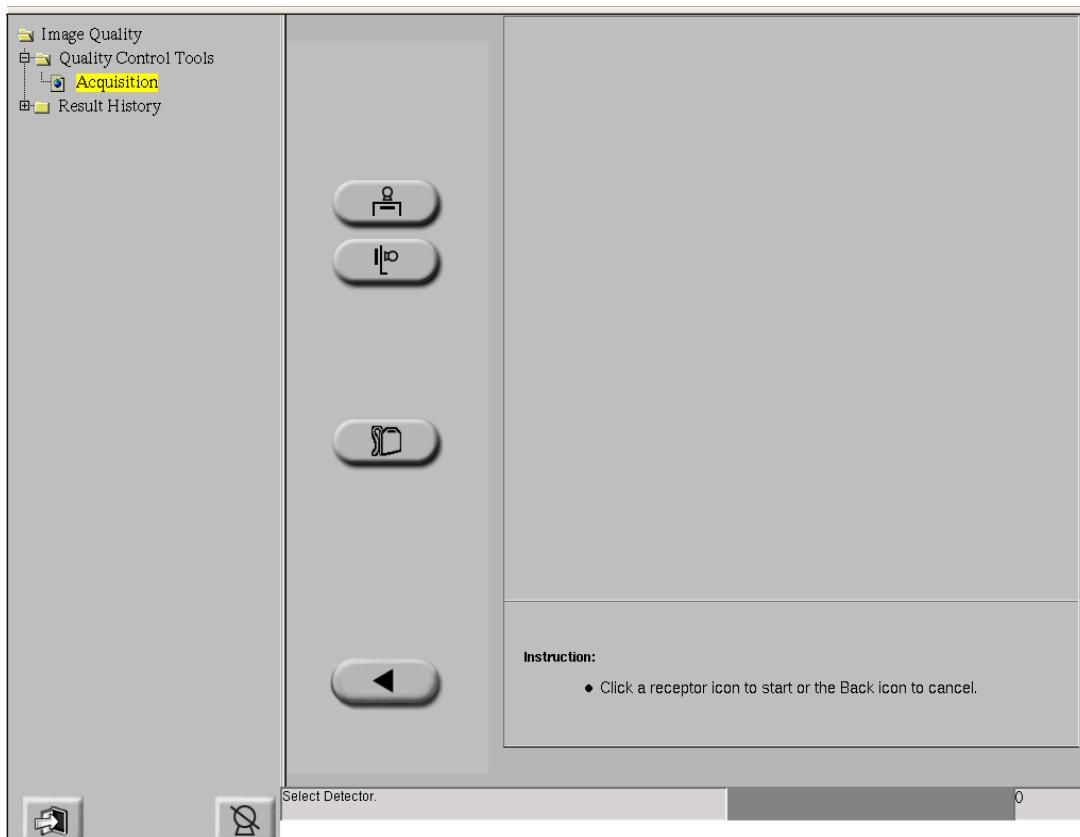
**Figure 14-6** Image Quality screen

5. From left pane, open **Quality Control Tools > Acquisition**. (Figure 14-7)

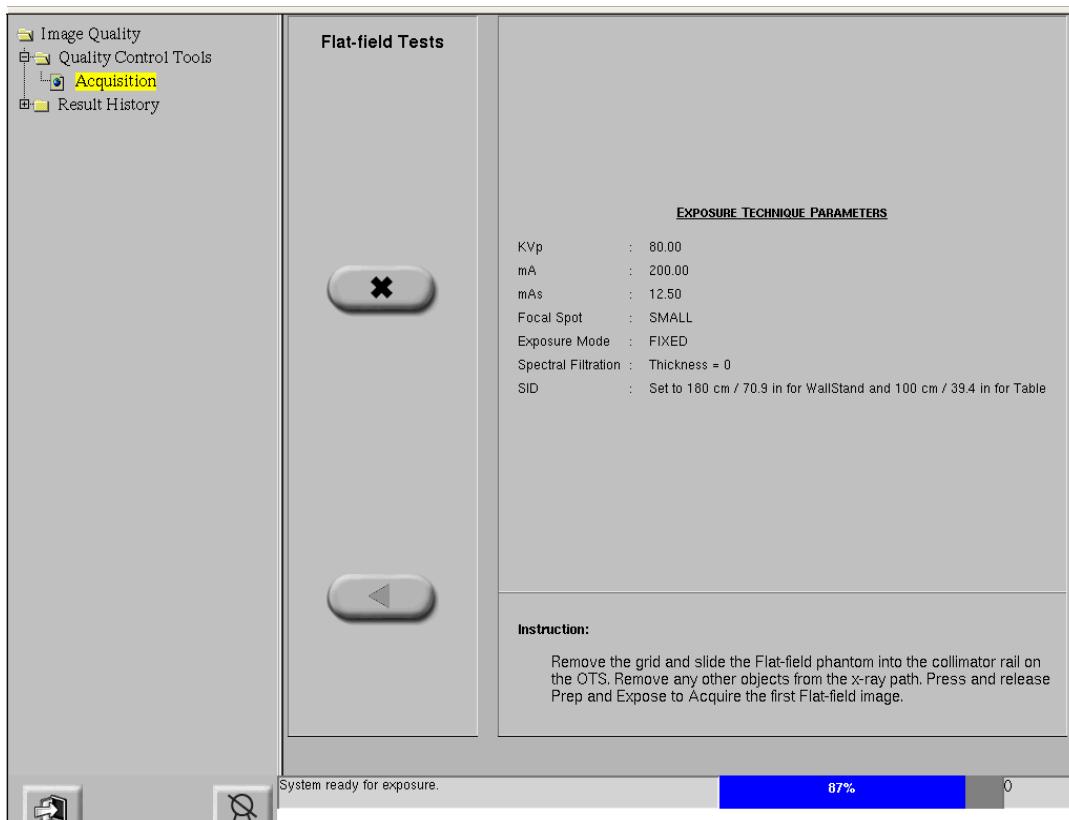
- Selecting Acquisition.

**Figure 14-7**

- The Start screen appears (Figure 14-8).

**Figure 14-8** Start screen

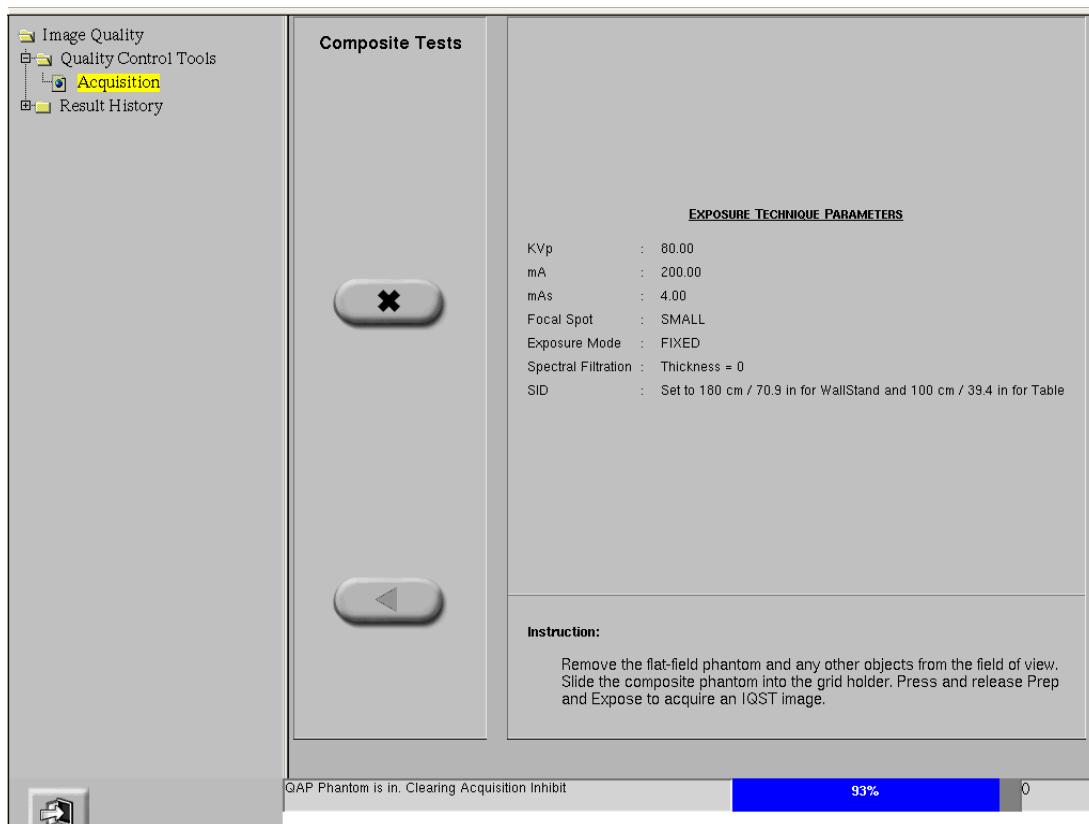
6. Select the detector receptor to perform QAP.
  - Click on QAP. The Detector Check will begin.
  - The Flat-field Tests screen appears (Figure 14-9).

**Figure 14-9** Flat-field Tests screen

7. Follow the instructions at the bottom of the Flat-field Tests screen:
  - a) Remove the grid (if necessary)
  - b) Insert flat field phantom into the collimator rail.
  - c) Remove any objects from the x-ray path.
  - d) Prep and Expose the flat-field phantom.
8. Wait for the exposure sequence to complete.
  - The phantom image appears on the right monitor (Figure 14-10).

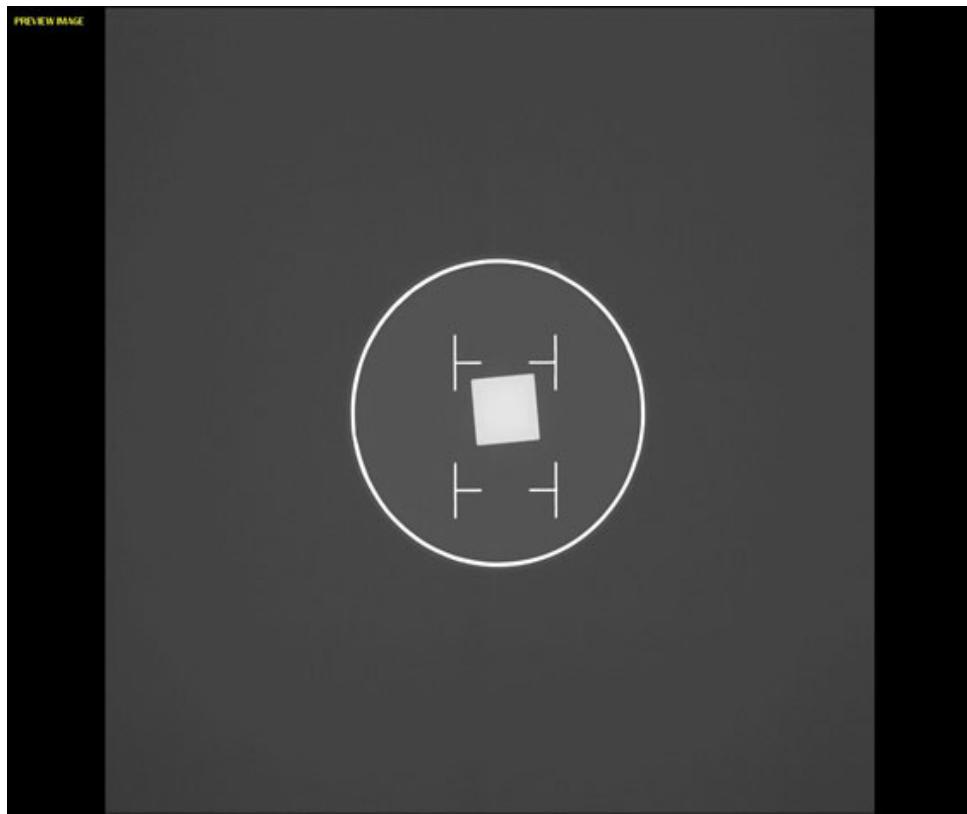
**Figure 14-10** Flat-field phantom image

9. Prep and Expose the flat-field phantom again.
  - The Composite Tests screen appears (Figure 14-11).

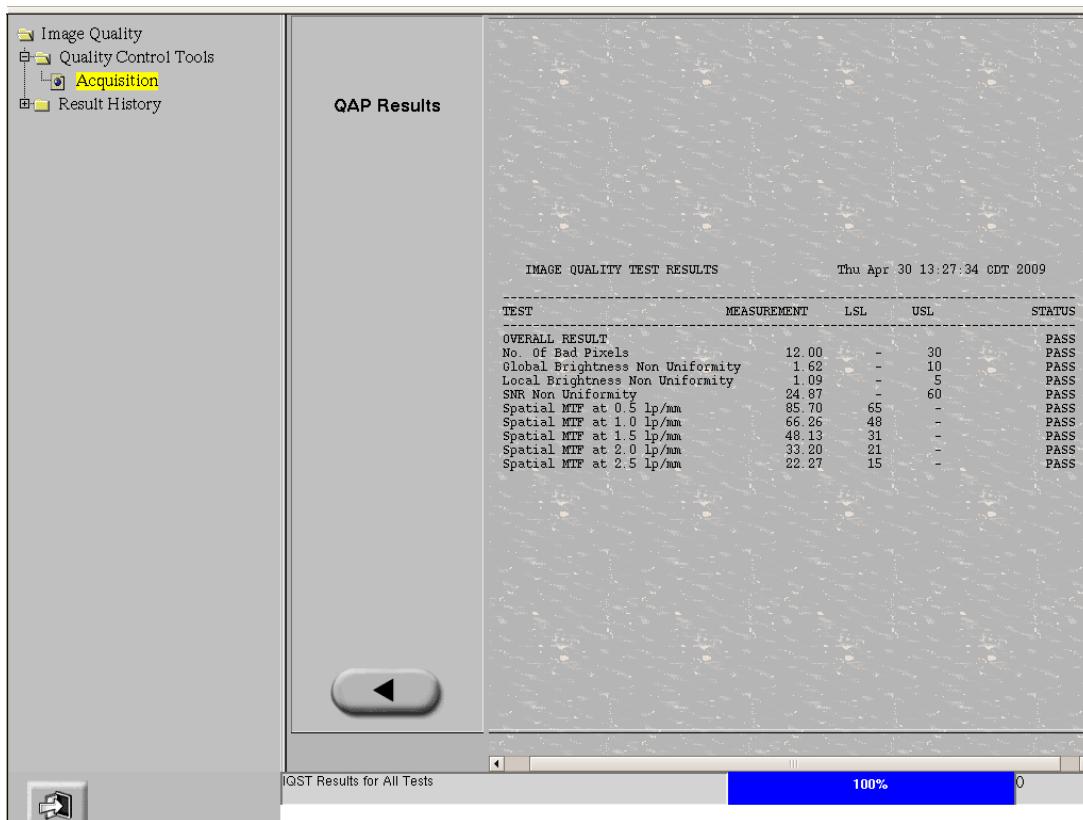
**Figure 14-11** Composite Tests screen

10. Follow the instructions at the bottom of the MTF Tests screen:

- Remove the flat-field phantom or any other objects from the field of view.
- Insert the MTF phantom into the grid holder.
- Prep and Expose the MTF phantom.
  - The phantom image appears on the right monitor (Figure 14-12).
  - The Image Quality Test Results appear.

**Figure 14-12** MTF phantom image

11. Review the results.
  - If Pass: QAP is complete. Click [EXIT] to return to Worklist screen.
  - If Fail: Refer to [Chapter 14: -Failed QAP](#) (p. 14-12) for more information.
12. Log off and perform a controlled shutdown and start up. Refer to [Chapter 4: -System Start Up and Shut-down](#) (p. 4-2) for more information.

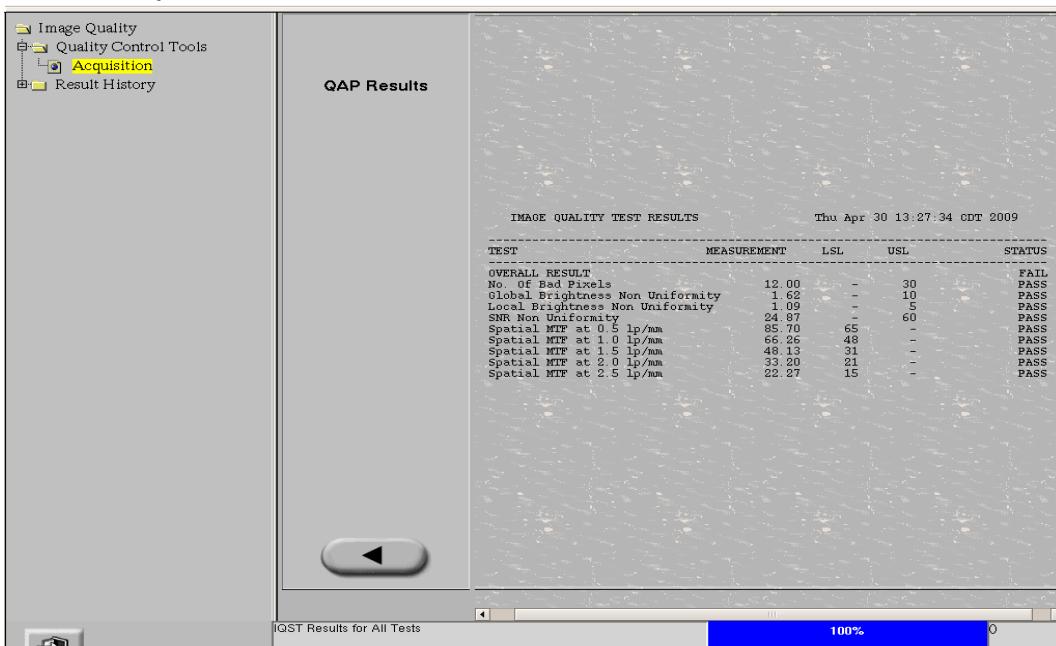
**Figure 14-13** QAP Results screen

## Failed QAP

**Note:** In the event of a failed QAP test, repeat the QAP procedure to confirm the failure. This section identifies common problems to check.

If a single failure is confirmed, call to schedule service. The system is operational, although inspection and potential calibration are needed.

If multiple failures are confirmed, image quality may be effected; cease use of the unit and call for immediate service.

**Figure 14-14** Failed QAP results

13. The system prompts you if the QAP test has failed and indicates which portion was affected by displaying messages. The following list provides information to correct the problem.
- If the flat-field tests fail, check the collimator blade position and make sure they are fully open, i.e. the collimator blades are not in the field of view.
  - If the MTF phantom test fails, a message appears (Figure 14-15).

**Figure 14-15** QAP Phantom not found message

- Check that the flat-field phantom is not in the collimator rail.
- Check that the tube and detector are vertically aligned.
- Check that the MTF phantom is inserted completely into the grid holder.

## Result History

After QAP is complete, the system generates a test summary page. The result summary table contains descriptive names, measured values, test specifications and pass/fail status.

A minimum of 25 QAP test results are maintained.

Follow this process to view the results of previous QAP tests.

1. From the left pane, click Result History.
  - The Result History screen appears.
2. Click on a test entry in the list to select it.
3. Click [SELECT].
  - The test details appear.

**Figure 14-16** Result History

The screenshot shows a software application window titled "Result History". On the left, a sidebar lists "Image Quality", "Quality Control Tools", and "Result History". The main area has a title "Result History" and a sub-section "Instructions" containing the text: "Select one result entry to view and then press 'Select' or select one or more results to archive". Below this is a table of test entries:

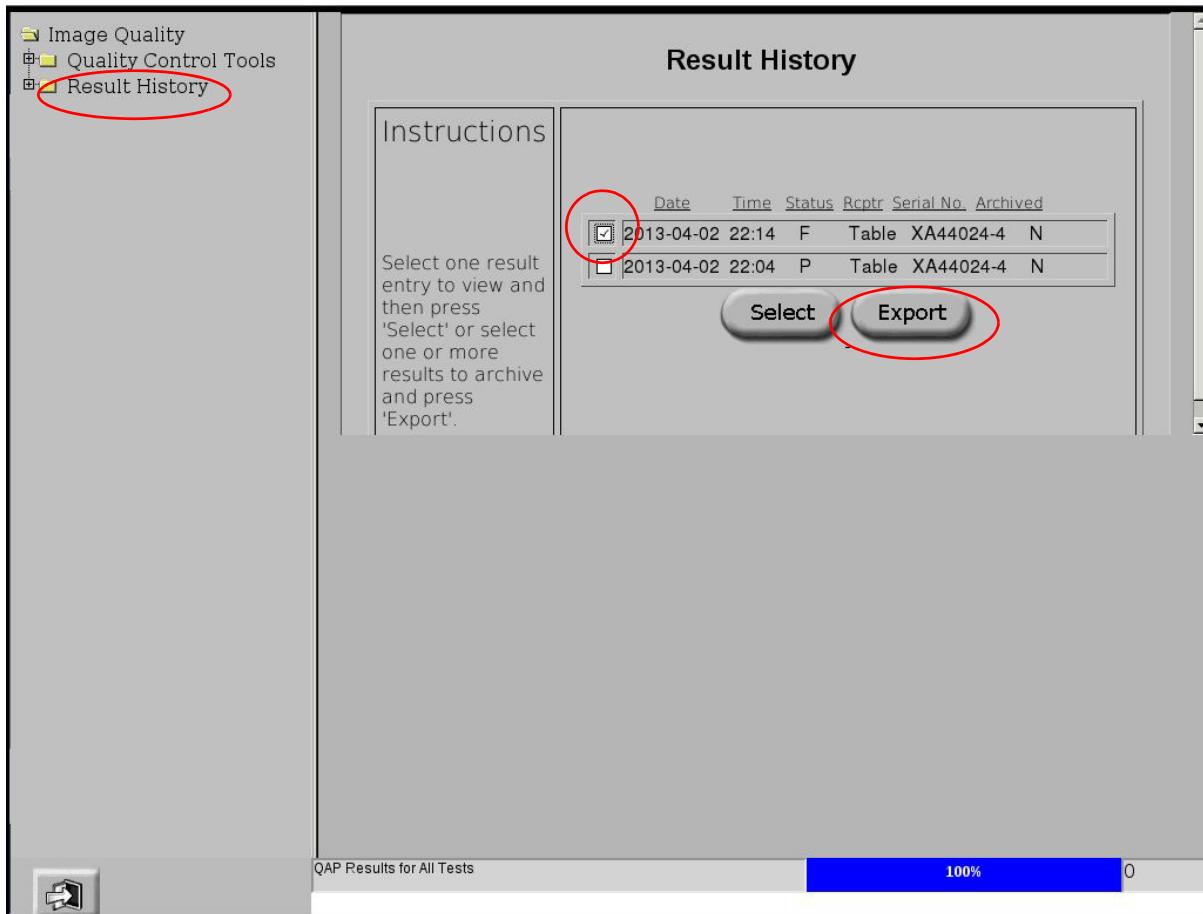
Date	Time	Status	Rcpt	Serial No.	Archived
2013-04-16	13:22	P	DC	XA44024-3	N
2013-04-15	13:10	P	Table	XA44024-3	N
2013-04-15	12:54	P	WS	XA44024-3	N
2013-04-15	11:46	P	WS	XA44024-3	N
2013-04-15	11:42	F	WS	XA44024-8	N
2013-04-15	11:37	F	WS	XA44024-8	N

At the bottom are "Select" and "Export" buttons. Below this is a large panel titled "IMAGE QUALITY TEST RESULTS" with the date "Tue Apr 16 13:22:27 CDT 2013" and "Detector Serial No.: XA44024-3". It contains a table of test results:

TEST	MEASUREMENT	LSL	USL	STATUS
OVERALL RESULT				PASS
No. Of Bad Pixels	0.00	-	30	PASS
Global Brightness Non Uniformity	20.97	-	30	PASS
Local Brightness Non Uniformity	3.30	-	5	PASS
SNR Non Uniformity	17.26	-	60	PASS
ARC Digital	-	-	-	PASS
ARC Analog	-	-	-	PASS
Electronic Noise	4144	-	5600	PASS
Correlated Noise	9.280000%	-	15%	PASS

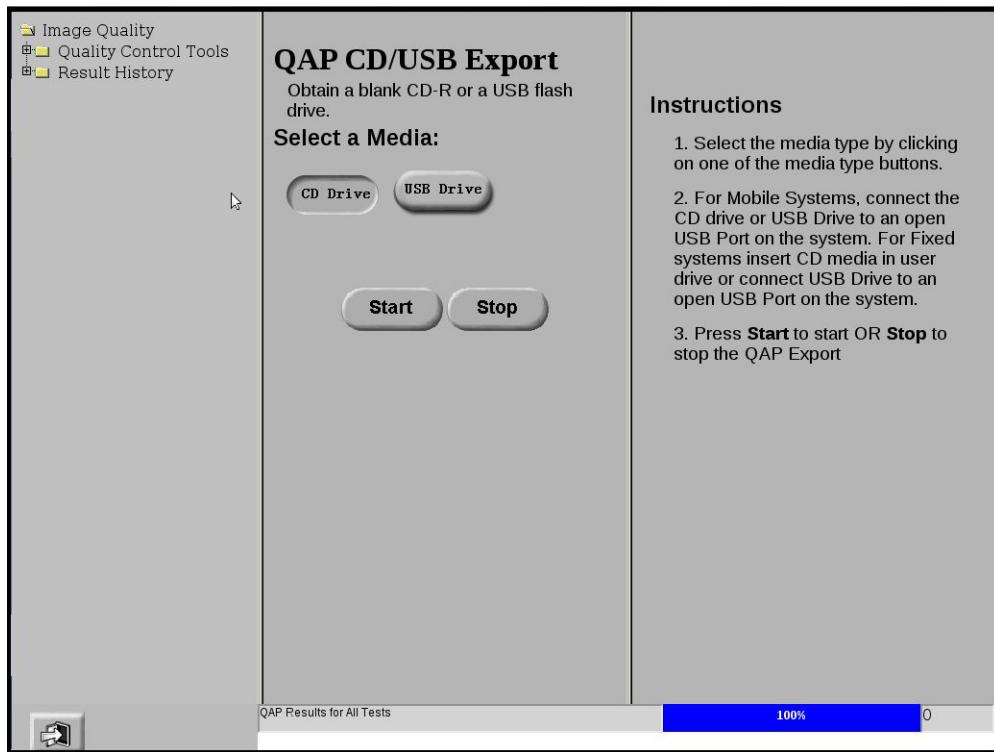
## QAP CD/USB Export

Figure 14-17 QAP Export Screen



Follow the below process to do QAP Export.

1. On the left hand side, click [Result History].
2. Select the results you wish to export by checking the box located next to the date.
3. Click on [EXPORT].
  - The QAP Export Page will appear (Figure 14-18)

**Figure 14-18** QAP CD/USB Export Screen

4. Select a media type. Media type can be USB or CD>
5. Click [START] to start QAP export.

**Note:** Results that are exported can be viewed on a personal PC.

# Maintenance

## General

In order to assure continued safe performance of this x-ray equipment, a periodic maintenance program must be established. Functional Checks will not indicate that this x-ray system is performing to specifications. Only regular periodic maintenance can locate potential problems. It is the owner's responsibility to arrange for this service. Periodic maintenance should be performed as specified in the maintenance schedule of the service manual by qualified personnel. Descriptions and scheduled frequency of the required periodic maintenance are provided in the Service Manual (# 5343956-2EN) supplied with the equipment.

Inspection intervals are based on average daily use of one eight hour shift. More frequent inspection is appropriate where equipment use is above average.

Aside from routine maintenance, any abnormal noise, vibration or unusual performance should be reported immediately to a GE representative. Before calling for service, however, be sure the equipment is being operated in accordance with the foregoing instructions.



**WARNING** Failure to perform the periodic inspection and maintenance could allow deteriorating conditions to develop without being detected. This deterioration could result in equipment failures which could cause serious injury or equipment damage.



**WARNING** Electric shock hazard! The OTS suspension contains no user serviceable components. Do not attempt to disable these components or remove any trim covers. Refer service to qualified personnel.

## Qualified Service

Safe equipment performance also requires the use of service personnel specially trained on the medical x-ray apparatus. GE and its associates, maintain a world-wide organization of stations from which one may obtain skilled x-ray service. If desired, arrangements can usually be made to furnish periodic and/or emergency service on a contract basis. A GE representative will be glad to discuss this plan.

## General Cleaning and Disinfecting

This equipment should be cleaned frequently, particularly if corroding chemicals are present. Use a cloth moistened in warm soapy water (use mild soap) to clean the trim and nameplate of the Operator's Controls. Wipe with a cloth moistened in clean water. Do not use cleaners or solvents of any kind as they may dull the finish or blur the lettering. Polish with a pure liquid or paste wax. Other surfaces of the equipment can be cleaned using a clean cloth moistened slightly with a good mild cleaner and polish acceptable for use on enameled metal surfaces. Before each use, equipment surfaces that contact the patient should be cleaned with an EPA registered, low-level disinfection or sanitizing agent.

For general cleaning of Table and Wallstand plastic and patient barrier surfaces use a soft non-lint cloth moistened with Ethanol (ethyl alcohol 95% minimum). For OTS plastic handle the chemical used should be of a pH between 7 to 9.

Never use cleaners or solvents of any kind if you are uncertain of the nature of the cleaning agent.



**CAUTION** In the event of equipment contacting broken skin or being used with infected or immune compromised patients, the equipment should be cleaned using EPA cleared and EPA registered high-level disinfecting agents.

**Note:** Be sure to follow the label instructions and pre-cautions for use, storage, and disposal of all disinfecting agents.

## Detector Cleaning

All exterior surfaces—detector, tether, and grid—should be cleaned after each exam.

- The detector and grid must be allowed to dry before use.
- Do not leave disposable wipes or cleaning cloths on the detector or grid for more than 60 seconds.
- Let the detector dry at least 60 seconds between cleanings.

The following chemicals and products have been tested and approved by GE for cleaning the GE detector, grid, and tether.

- Bleach - 50% mix with water (5-8% household Bleach)
- Glutaraldehyde <5%, Polyethylene Glycol <20% (tested as Cidex Plus 28)
- Isopropyl Alcohol 70% concentration
- Hydrogen Peroxide 15-40% concentration

## User Service and Maintenance

GE x-ray equipment contains operating safeguards to ensure maximum safety. Before calling for service, be certain proper operating procedures are being used.

This equipment should be cleaned frequently, particularly if corroding chemicals are present. Use a cloth slightly moistened in warm, soapy water (use mild soap) to clean the trim, table top and operator's controls. Wipe with a cloth slightly moistened in clean water. Do not use cleaners or solvents of any kind as they may dull the finish or blur the lettering.



**CAUTION** Only trained and qualified service personnel should be permitted access to the internal parts of the equipment. Be sure that the room disconnect is turned OFF before opening access doors or removing enclosure panels.

Once a month inspect patient safety and support devices for signs of excessive wear, improper adjustment, or other indications that adjustment, repair, or replacement is required. In case of doubt about condition of this equipment, contact a GE Service representative.

Once a month, external parts and exposed tracks, on which rollers move, should be wiped to remove any foreign material that may have accumulated. If the tracks are wiped with a rag slightly moistened in oil, sufficient lubrication will be provided to insure smooth operation.



**CAUTION** Personal caution should be used when removing any accumulating foreign material.

## Periodic Maintenance Schedule

Refer to

- 5343951-8EN Discovery XR656 PM Checklist Part A
- 5343951-8EN Discovery XR656 PM Checklist Part B

# Chapter 15: Preferences

Preferences allow a super-user with the appropriate level of access to customize the system. This chapter explains the Preferences available to you and how to activate or change the preferences for your facility, such as:

- Predefine X-ray procedure parameters so that any stored procedure may be retrieved from memory, allowing you to access technique factors programmed for that type of procedure.
- Enable automatic networking and printing features.
- Customize system default annotations and image orientation.
- Create preferences for image processing.
- Save commonly used operator and physician names in your system for later recall.

# Accessing Preferences

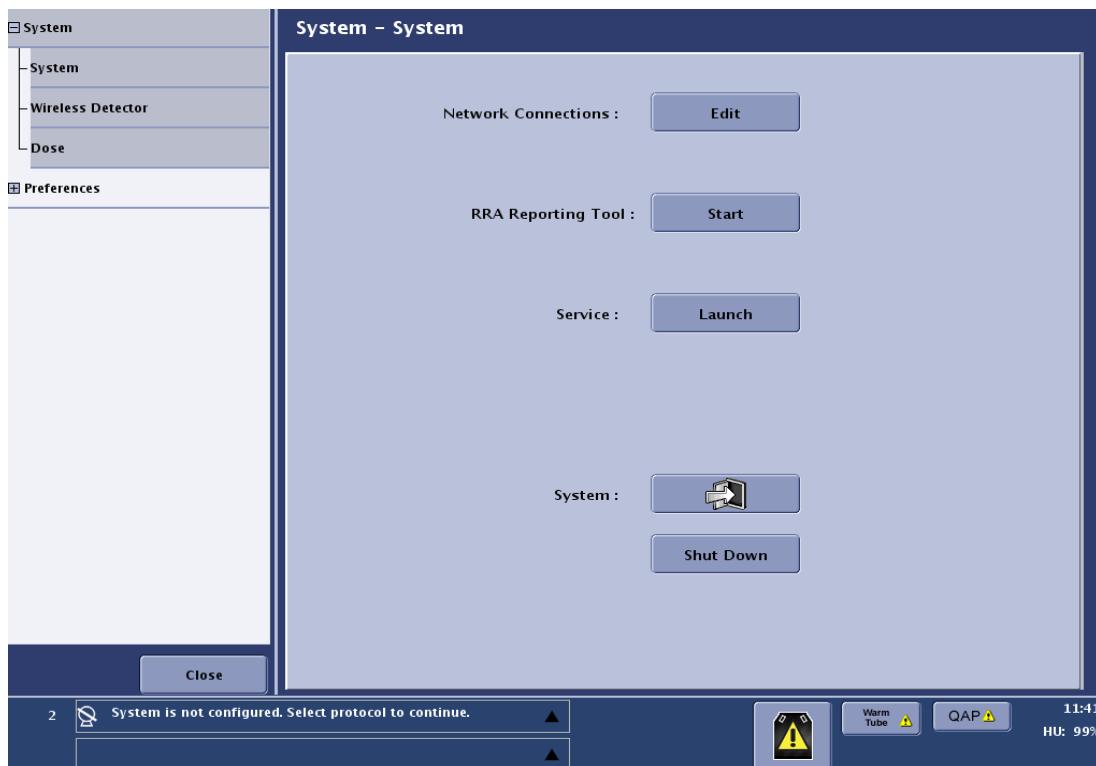
Preferences are set on the Utilities screen (Figure 15-2), which is accessed by clicking the [UTILITIES] button on the Worklist.

**Figure 15-1** Utilities button



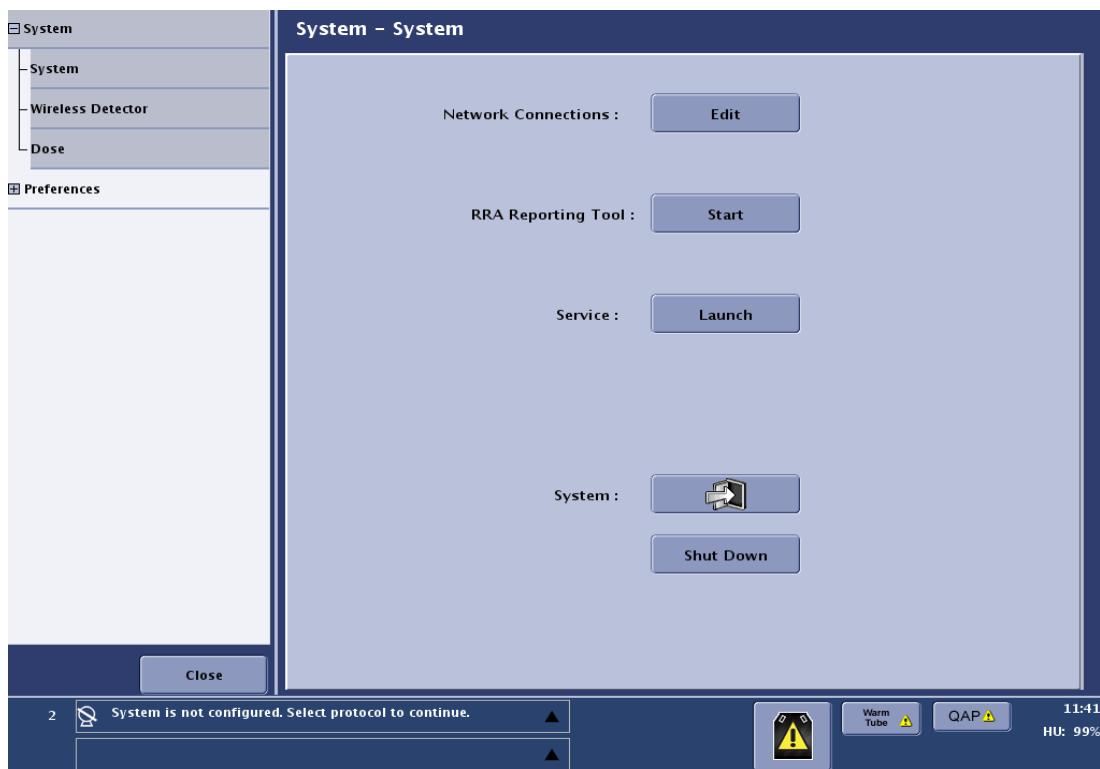
**Note:** You must be logged in as a user with the appropriate level of access in order to set preferences.

**Figure 15-2** System Utilities screen



## System

This section provides instructions for setting your system preferences for network and printer connections. The Services Desktop, Log Off, and Shut Down functions are also available from this screen. Refer to [Chapter 4: General Information](#) for more information about logging off and Shut Down.

**Figure 15-3** System Utilities screen

## RRA Reporting Tool

Refer to [Export RRA Data and Report \(p. 13-15\)](#) for information about exporting RRA data.

## Dose Reporting Tool

Refer to [Dose Reporting Tool \(p. 10-9\)](#) for information about exporting data.

# Network Connections

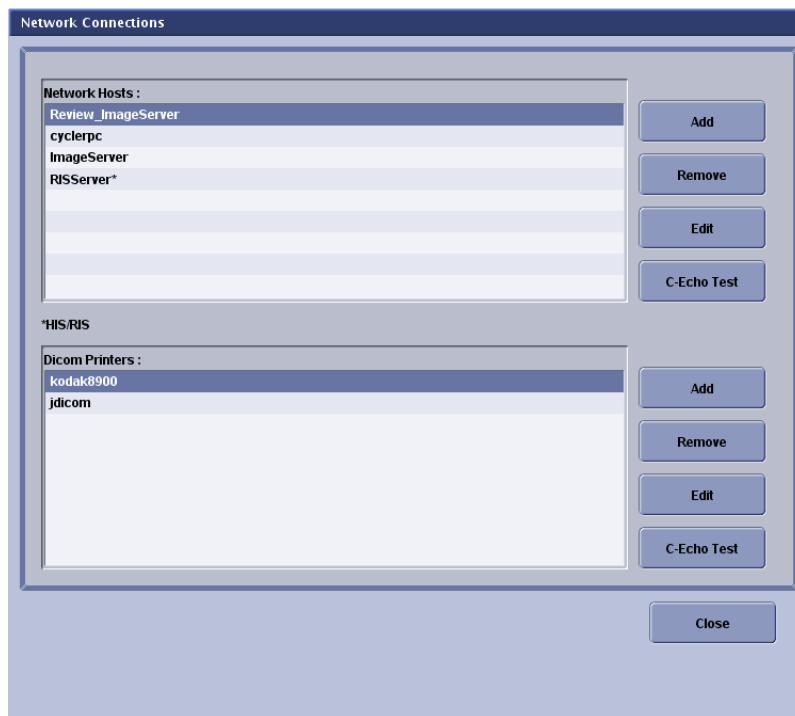
Network and printer connections are configured through the Utilities System-System screen. This screen allows qualified service personnel to define the Digital Imaging and COmmunication in Medicine (DICOM) send destinations.

Network connections may be added, removed, or edited from this screen.

Follow this process to access the Network Connections screen.

1. On the Worklist screen, click [UTILITIES].
  - The System-System screen appears.
2. Click [NETWORK CONNECTIONS].
  - The Network Connections screen ([Figure 15-4](#)) appears.

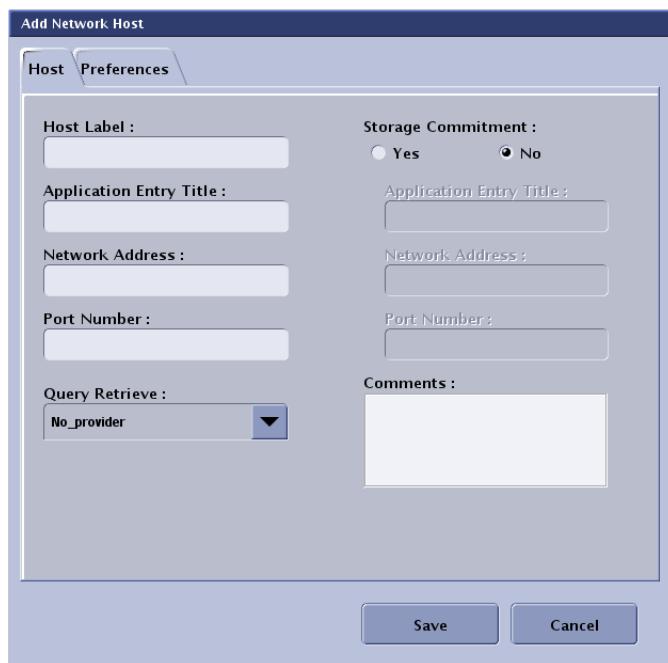
**Figure 15-4** Network Connections screen



## Add or Edit Network Host

Adding and editing network hosts use very similar process and the same screens as shown in [Figure 15-5](#) and [Figure 15-6](#). [Table 15-1](#) and [Table 15-2](#) describe the fields in detail.

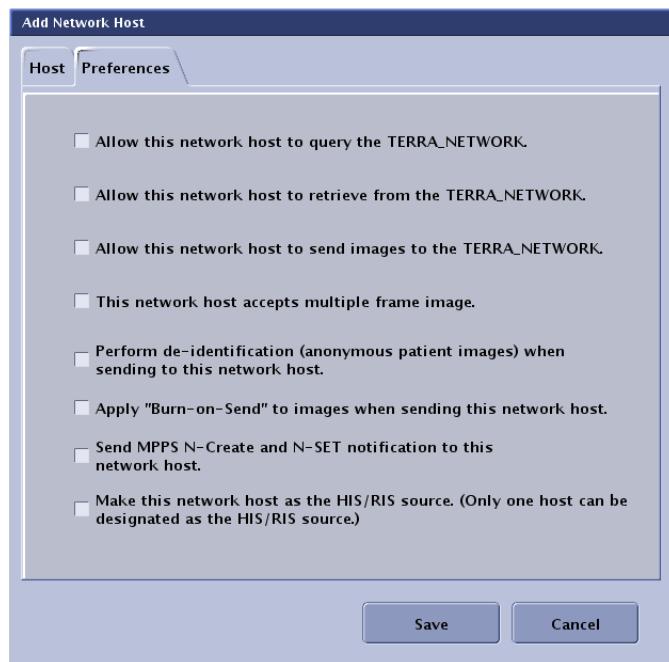
1. Click the appropriate button to add or edit hosts:
  - If editing an existing connection, select the network host and click [EDIT].
  - If adding a new connection, click [ADD].
2. Complete requested information for both tabs (see [Table 15-1](#) and [Table 15-2](#)) and click [SAVE] to add the network host or save the changes.

**Figure 15-5** Add Network Host – Host tab**Table 15-1** Add Network Host – Hosts tab description

Function	Description
Host Label	The name of the host that appears in the Network Hosts lists and on the Image Management screen. <b>Note:</b> Host labels cannot have spaces in the name. Use underscores (_ ) to separate words.
Application Entry Title	The DICOM application title.
IP Address	The IP address of the network host.
Port Number	The port number for the network host.
Query Retrieve	Sets the type of information the host will provide on query from another host. Available options are: <ul style="list-style-type: none"> <li>• No provider</li> <li>• Study</li> <li>• Patient</li> </ul>
Storage Commitment	Designates if the host will store image data.
Storage Commitment - Application Entry Title	The DICOM application title.
Storage Commitment - Network Address	The IP address of the storage database.
Storage Commitment - Port Number	The port number of the storage database.

**Table 15-1** Add Network Host – Hosts tab description

Function	Description
Comments	Allows you to add notes about the network host or configuration.

**Figure 15-6** Add Network Host – Preferences tab**Table 15-2** Add Network Host – Preferences tab description

Function	Description
Allow this host to query the (system name)	Allows this host to search and filter the system.
Allow this host to retrieve from the (system name)	Allows this host to open and display exams from the system.
Allow this host to send images to the (system name)	Allows the host to send images to the system.
This network host accepts multiple frame image.	Allows multiple frame images to be sent to this network host.
Perform de-identification (anonymous patient images) when sending to this network host.	Automatically de-identifies any images that the system sends to this host. Refer to <a href="#">Chapter 12: Image Management-Make Exam Anonymous (De-Identify) (p. 12-12)</a> for more information about de-identification.

**Table 15-2** Add Network Host – Preferences tab description

Function	Description
Apply “Burn-On-Send” to images when sending to this network host.	Burns the VOI LUT (Look-Up Tables) into the DICOM header to be displayed by PACS.  Leaving his option unselected sends all available VOI LUTs to the DICOM header for PACS to query and apply.  <b>Note:</b> PACS should be configured to read the first VOI LUT for proper display of images on the Acquisition workstation.
Send MPPS N-Create and N-Set notification to this network host.	This node acts as the Destination for receiving the MPPS N-Create & N-Set Notification. When configured for MPPS, the System sends information like which exam is in progress, when a Study is completed, how many images were acquired, and what was the radiation dose to which the patient was exposed during that session, etc.
Make this host the HIS/RIS source. (Only one host can be designated as the HIS/RIS source.)	Designates the host as the DICOM Worklist provider. Defining the Radiology Information System (RIS) and Hospital Information System (HIS) host allows you to download patient worklists from those networks to your system.  <b>Note:</b> Only one HIS/RIS source may be designated on the system. Selecting this option will de-select any other hosts as the HIS/RIS source.

## Remove Network Host

Follow this process to remove a network host.

1. From the Network Connections screen, select the network host.
2. Click [REMOVE].
  - A message appears: “Are you sure you want to remove (host name)?”
3. Click [YES].
  - [CANCEL] closes the message and returns you to the Network Connections screen without removing the connection.
  - The network host is removed.

## Perform C-Echo Test

Use this function when you want to check to see if the system is communicating with a particular network host.

1. Select a host from the Network Hosts list.
2. Click [C-ECHO TEST].
  - A message appears to notify you if the test passed or failed.
  - A “passed” message means that the network host is working and that you can retrieve exams from it or transfer exams to it.

## Failed C-Echo Test

A “failed” message means that the system could not contact the network host.

Perform the following tasks to resolve the problem:

- Re-try the test at a later time. The host may be temporarily unavailable.
- Confirm the host configuration on the Edit screen.
- If the problem persists, contact your technical support group or system administrator.

## Printers

Follow this process to access the Network Connections screen.

1. On the Worklist screen, click [UTILITIES].
  - The System-System screen appears.
2. Click [NETWORK CONNECTIONS].
  - The Network Connections screen ([Figure 15-7](#)) appears.

**Figure 15-7** Network Connections screen

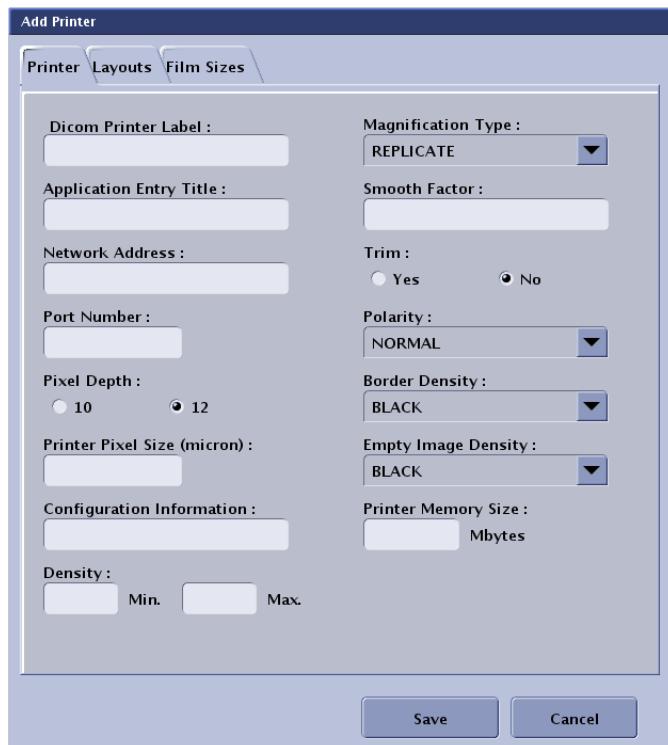


## Add or Edit DICOM Printers

Adding and editing printers use very similar process and the same screens shown in [Figure 15-8](#), [Figure 15-9](#), and [Figure 15-10](#). [Figure 15-8](#), [Table 15-4](#), and [Table 15-5](#) describe the fields in detail.

1. If Editing an existing printer's configuration, select the printer from the DICOM Printers list and click [EDIT].
  - If adding a new printer, click [ADD].
2. Complete requested information for all tabs (see [Figure 15-8](#), [Table 15-4](#), and [Table 15-5](#)) and click [SAVE] to add the printer or save the changes.

**Figure 15-8** Add Printer screen – Printer Tab

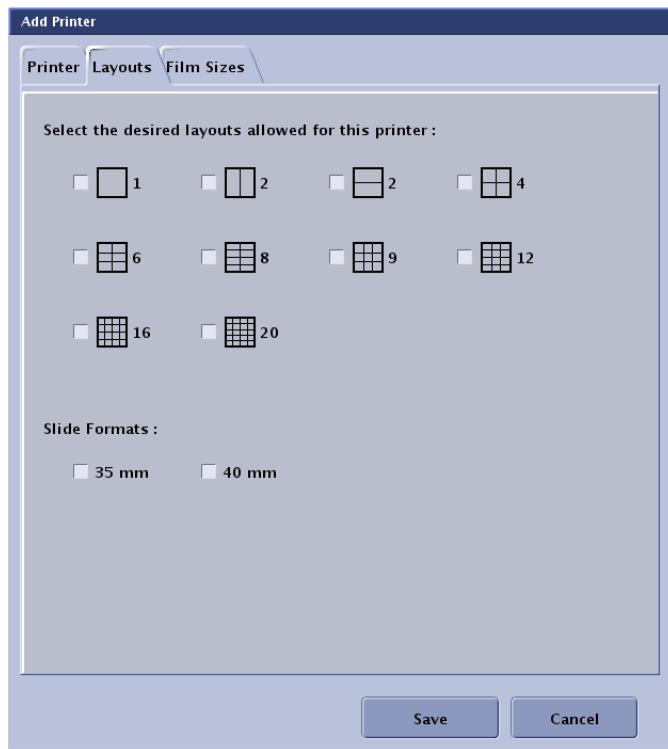


**Table 15-3** Add Printer screen– Printer Tab description

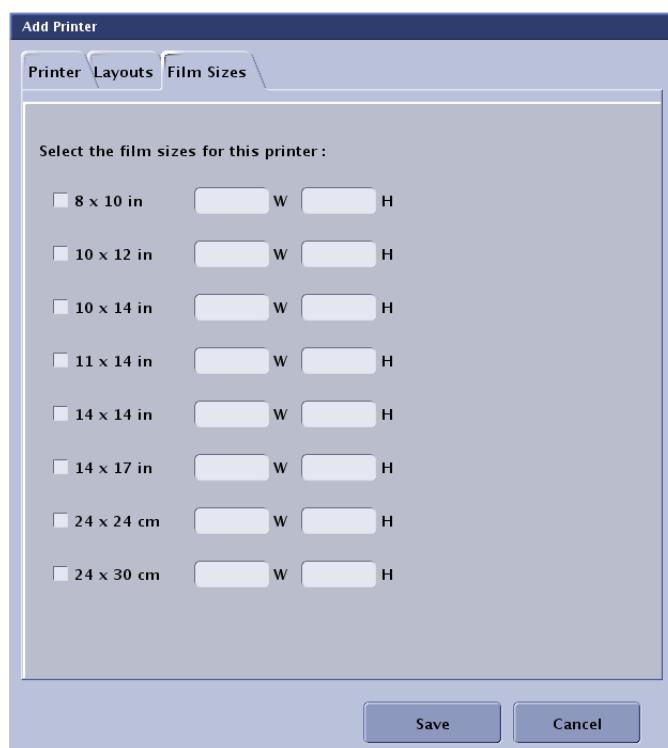
Function	Description
DICOM Printer Label	The name of the printer that appears in the DICOM Printers list and on the print setup screens. <b>Note:</b> DICOM printer labels cannot have spaces in the name. Use underscores ( _ ) to separate words.
Application Entry Title	The DICOM application title.
Network Address	The IP address of the printer.
Port Number	The port number of the printer.

**Table 15-3** Add Printer screen—Printer Tab description

Function	Description
Pixel Depth	The resolution of the printer.
Printer Pixel Size (micron)	Designates the pixel size the printer uses. This is specified by the printer manufacturer.
Configuration Information	A place for you to add notes about the printer or configuration.
Density	Sets the minimum and maximum density range.
Magnification Type	Available options are: <ul style="list-style-type: none"> <li>• Replicate</li> <li>• Bilinear</li> <li>• Cubic</li> <li>• None</li> </ul>
Smooth Factor	Sets the image smoothing factor.
Trim	Designates if there is to be trim or not.
Polarity	Available options are: <ul style="list-style-type: none"> <li>• Normal</li> <li>• Reverse</li> </ul>
Border Density	Sets the color of the image border. Available options are: <ul style="list-style-type: none"> <li>• Black</li> <li>• White</li> </ul>
Empty Image Density	Sets the color of areas that have no image printed. Available options are: <ul style="list-style-type: none"> <li>• Black</li> <li>• White</li> </ul>
Printer Memory Size	Designates the memory size of the printer. This is specified by the printer manufacturer.

**Figure 15-9** Add Printer screen – Layouts tab**Table 15-4** Add Printer screen– Layouts Tab description

Function	Description
Select the desired layouts allowed for this printer	Selections allow the number of images that may be printed on a single sheet of film or paper. Some selections control the orientation of the images on the page: for example, 2 images per page may be side by side or one on top of the other.
Slide formats	Selections allow the slide formats available for the printer, if any.

**Figure 15-10** Add Printer – Film Sizes tab**Table 15-5** Add Printer screen— Film sizes description

Function	Description
Film sizes (8 x 10in)	Selects the sizes of film available for the printer.
Pixel size: W (width)	Sets how wide the film is in pixels. This value is provided by the printer manufacturer based on what the printer supports.
Pixel size: H (height)	Sets how high the film is in pixels. This value is provided by the printer manufacturer based on what the printer supports.

## Remove DICOM Printer

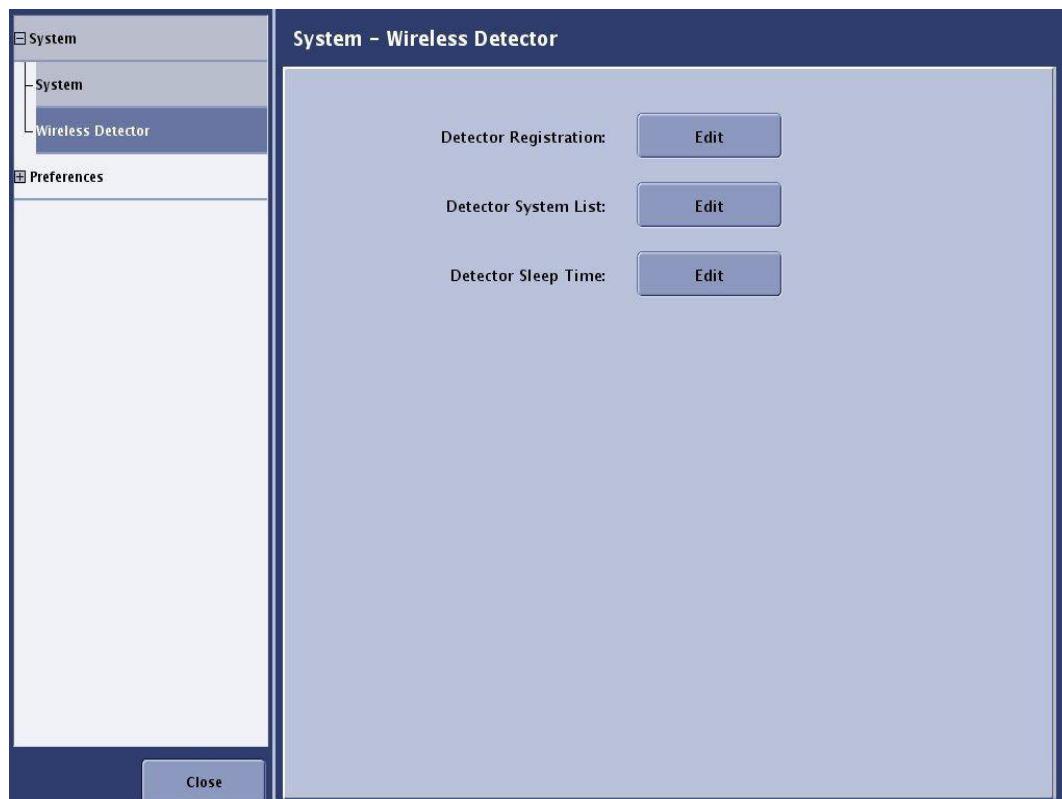
Follow this process to remove a printer.

1. From the Network Connections screen, select the printer.
2. Click [REMOVE].
  - A message appears: “Are you sure you want to remove (printer name)?”
3. Click [YES].
  - [CANCEL] closes the message and returns you to the Network Connections screen without removing the connection.
  - The printer is removed.

# Wireless Detector

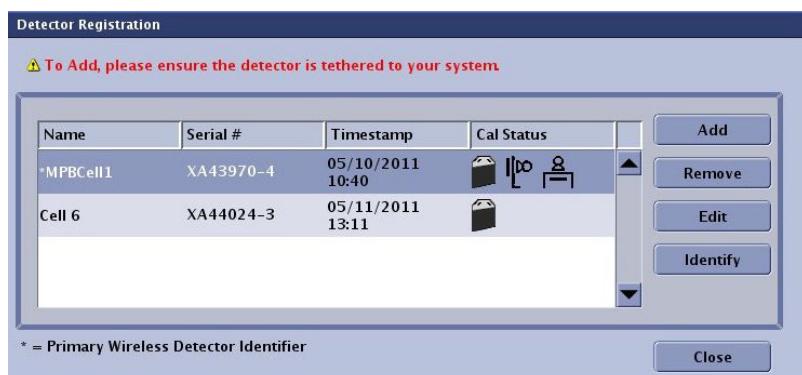
A detector must be registered with the system prior to the first use. The registration is accomplished by connecting the detector and system with the tether cable. The use of the tether ensures the intended detector is being associated to the system.

**Figure 15-11** System - Wireless Detector



# Detector Registration

**Figure 15-12** Detector Registration

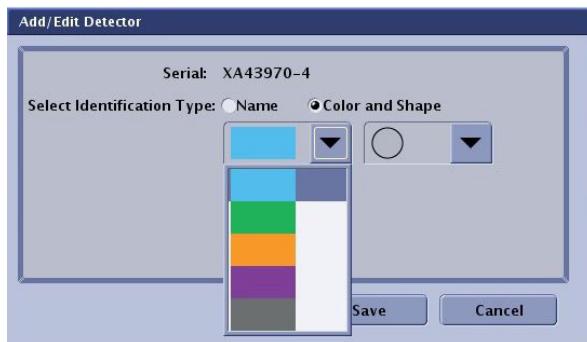


**NOTE:** The Primary detector is identified by an asterisk (\*).

**NOTE:** Should a detector be connected to the system that is not compatible, a warning message will appear.  
Please call service.

## Adding A New Detector Identified By Name

**Figure 15-13** Add BY Name

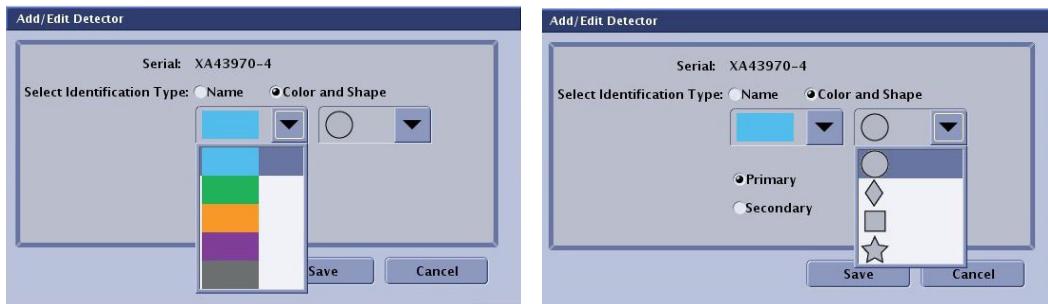


1. Tether the detector you wish to register to the system.
2. Press the [Add] button on the Detector Registration screen.
3. Choose Name for the Select Identification Type.
4. Enter the Digital Detector Name.
5. Choose to make the Digital Detector PRIMARY or SECONDARY.
6. Press [Save]. The Digital Detector is now registered with the system.
7. Label the Digital Detector with the Detector Name.

**NOTE:** The following characters are not recognized when naming detector:

'  
=   
\   
{   
}

## Adding A New Detector Identified By Color and Shape

**Figure 15-14 Add By Color and Shape**

1. Tether the detector you wish to register to the system.
2. Press the [Add] button on the Detector Registration screen.
3. Choose Color and Shape for the Select Identification Type.
4. Choose the Color and Shape from the pull down menus.
5. Choose to make the Digital Detector PRIMARY or SECONDARY.
6. Press [Save]. The Digital Detector is now registered with the system.
7. Insert the plastic tag with the appropriate shape and color into the indent on the handle of the Digital Detector. See following figure.

Available Inserts:

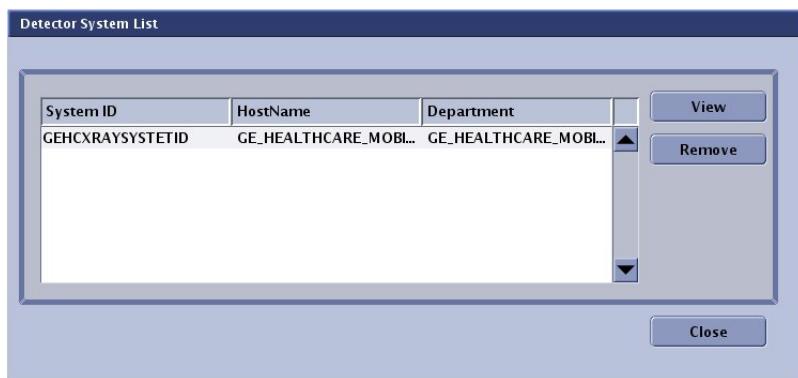
Colors: Purple, Blue, Green, Gray, Orange.

Shapes: Star, Diamond, Circle, Square.



## Detector System List

**Figure 15-15** Detector System List



The Detector System List contains the names of the Systems the Digital Detector has been registered with. The Digital Detector can be registered with up to 20 systems. This list is contained in the memory of the Digital Detector and goes with the Digital Detector from system to system.

## Detector Sleep Time

**Figure 15-16** Detector Sleep Time



The digital detector can be set to transition to sleep mode at a designated time to save the battery power of the detector. If the detector sleep time is set to 15 minutes, it will transition into sleep mode 15 minutes after the last exposure on the system. To take the detector our of sleep mode, press the black button on the handle of the detector for one to two seconds. The detector will be ready for exposures within 10 seconds.

The available increments are 15, 30, 45mins and Never.

**Note:** Never indicates the detector shall not go to sleep when the detector is in wireless mode.

# Worklist

Worklist preferences are available from the Utilities screen.

1. On the Worklist screen, click [UTILITIES].
2. Select **Preferences > Worklist**.

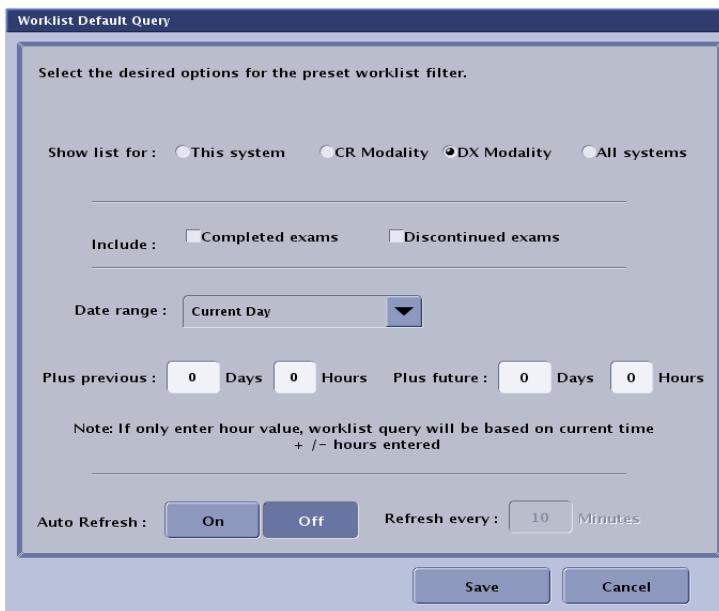
**Figure 15-17** Preferences – Worklist screen



## Default Query

The Worklist Default Query controls the amount of HIS/RIS information that appears on the Worklist and allows you to enable and configure the auto-refresh function.

1. Complete or edit the Worklist Default Query screen ([Figure 15-18](#)). [Table 15-6](#) describes the fields in detail.
2. Click [SAVE] to change the Default Query.

**Figure 15-18** Worklist Default Query screen**Table 15-6** Worklist Default Query description

Function	Description
Show list for	Determines Worklist items by system or modality. <ul style="list-style-type: none"> <li>• This system – exams for this unit only</li> <li>• CR modality – exams for Computed Radiography.</li> <li>• DX modality – exams for Digital X-ray.</li> <li>• All systems – exams for all modalities</li> </ul>
Include	Allows you to include or exclude completed or discontinued exams on the Worklist.
Date Range	Selects the date range of scheduled procedures to show on the Worklist. Available options are: <ul style="list-style-type: none"> <li>• All</li> <li>• Current Day</li> </ul>
Plus previous __ Days __ Hours	Shows procedures that are scheduled for the specified time before the selected date range. <b>Note:</b> If the “Days” value is left blank, the worklist query will be based on current time plus the number of hours entered.
Plus future __ Days __ Hours	Shows procedures that are scheduled for the specified time after the selected date range. <b>Note:</b> If the “Days” value is left blank, the worklist query will be based on current time minus the number of hours entered.
Auto Refresh [ON] [OFF]	Turns Auto Refresh on or off. Refer to <a href="#">Auto Refresh (p. 15-19)</a> for more information.

**Table 15-6** Worklist Default Query description

Function	Description
Refresh every ___ Minutes	If Auto Refresh is [ON], sets how often (in minutes) the Worklist refreshes. The interval may be between 1 and 9999 minutes.

## Auto Refresh

The Worklist Auto-Refresh feature automatically refreshes the Patient Worklist at predefined time intervals.

**Note:** You will not be able to make selections or access Worklist functions while the Worklist is refreshing.

**Note:** For large facilities, it is recommended that the auto refresh interval be set to a short time, for example, every 1 or 2 minutes. The system will refresh more often, but each refresh will take less time to complete.

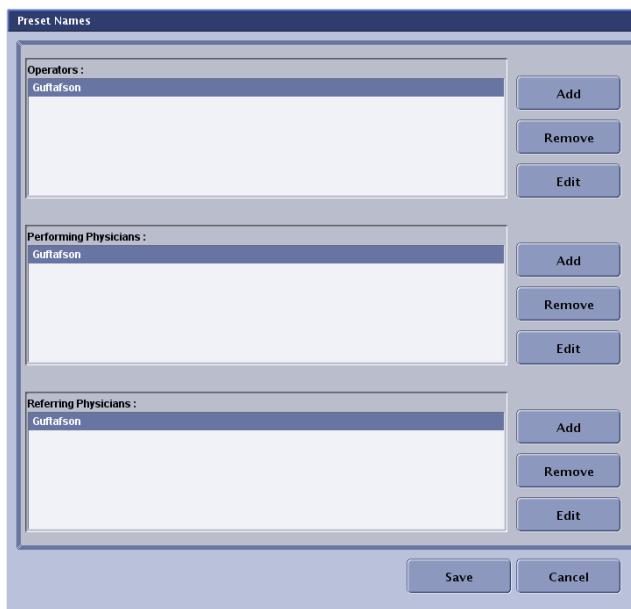
## Preset Names

The Preset Names screen ([Figure 15-20](#)) allows you to add, remove, or edit the names that appear on the Add Patient/Patient Information screen's Operators, Performing Physicians, and Referring Physicians drop-down lists ([Figure 15-19](#)). Operator names must be created if RRA is enabled. Refer to [Chapter 13: Advanced Applications-Repeat/Reject Analysis \(RRA\) \(p. 13-13\)](#) for more information.

**Figure 15-19** Drop-down lists on the Add Patient screen

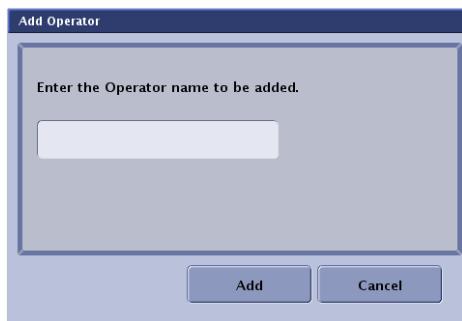
Follow the procedures below to Add, Edit, or Remove Preset Names.

1. When finished, click [SAVE] to retain the changes.

**Figure 15-20** Preset Names screen

## Add Preset Names

1. Click [ADD] for the appropriate group.
2. Type the name to add.
3. Click [ADD].



## Edit Preset Names

1. Select the name to change.
2. Click [EDIT] for the group.
3. Edit the name as appropriate.
4. Click [SAVE].

## Remove Preset Names

1. Select the name to remove.

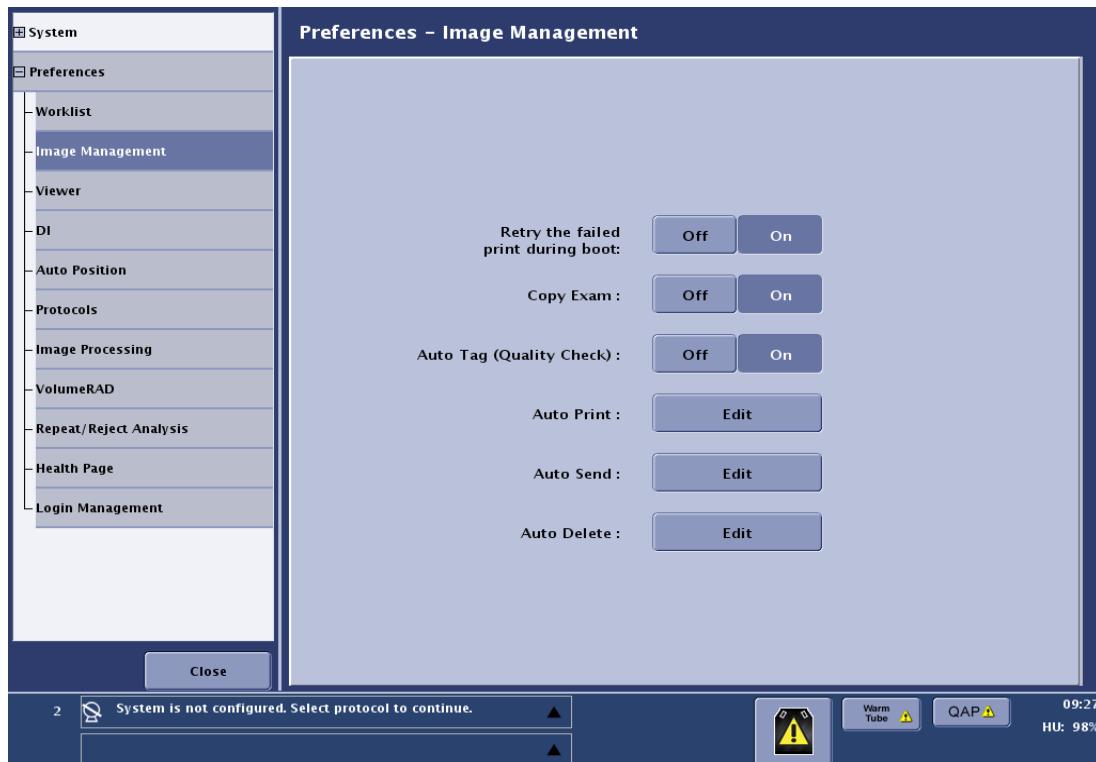
2. Click [REMOVE] for the group.
  - Click [OK] to remove the name.
  - Click [NO] to keep the name.



## Image Management

Image Management preferences allow you to enable and configure the Copy Exam, Auto Tag, Auto Print, Auto Push, and Auto Delete functions.

**Figure 15-21** Preferences – Image Management



## Retry Failed Print

The setting is to control whether system shall automatically retry the failed print tasks during software boot.

- If it is On, system shall automatically retry the failed print tasks during software boot.
- If it is Off, system shall not automatically retry the failed print tasks during software boot.

## Copy Exam

Enabling the Copy Exam function allows exams to be copied between the local databases and network hosts. It also allows exams to be copied to a CD or DVD.

There is no configuration for this function; it is either enabled (ON) or disabled (OFF).

Follow this process to enable or disable Copy Exam:

1. From the Worklist screen, click [UTILITIES].
2. Select **Preferences > Image Management**.
3. Click Copy Exam [ON] to enable the function.
4. Copy Exam [OFF] disables the function.
5. Click [CLOSE].

## Auto Tag (Quality Check)

Enabling Auto Tag (or Quality Check) provides an indicator on the Image Viewer screen to mark an image of acceptable quality. Auto Print and Auto Delete can be configured to act upon images that have the Quality Check mark.

There is no configuration for this function; it is either enabled (ON) or disabled (OFF).

**Note:** This function must be enabled first in order for the RRA feature to become enabled. Refer to [Chapter 13: Advanced Applications-Repeat/Reject Analysis \(RRA\) \(p. 13-13\)](#) for more information.  
Disabling this function automatically disables the RRA feature.

Follow this process to enable or disable Auto Tag:

1. From the Worklist screen, click [UTILITIES].
2. Select **Preferences > Image Management**.
3. Click Auto Tag [ON] to enable the function.
  - Auto Tag [OFF] disables the function. Disabling Auto Tag will automatically disable RRA as well.
4. Click [CLOSE].

## Auto Print

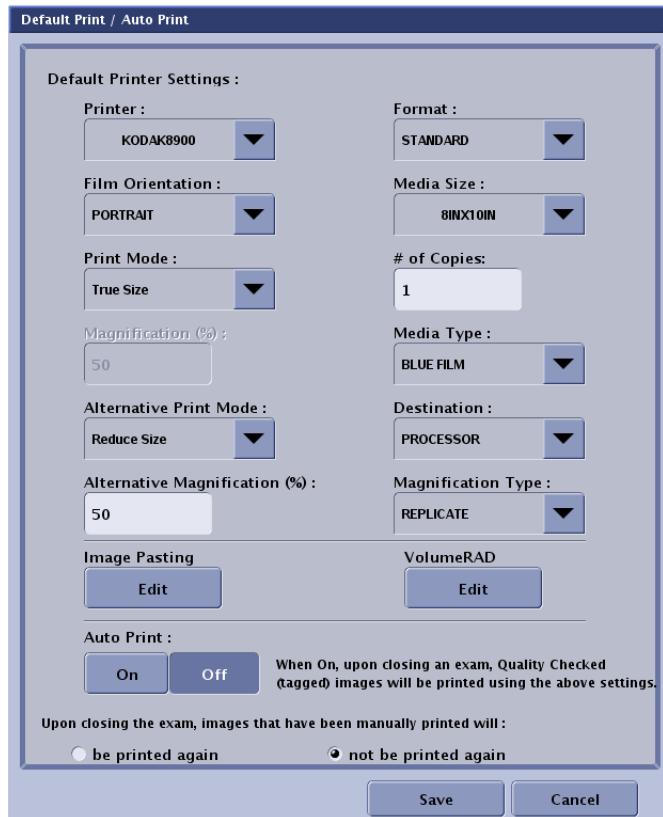
Default Print/Auto Print ([Figure 15-22](#)) allows you to configure your printer parameters. This is done so that you do not need to select all the parameters each time you print an image. Settings entered on this screen will be the default setting for printer preferences on the system, even when Auto Print is off (not enabled).

You can select a primary and alternative location as well as how many copies you want each time you print.

Follow this process to configure Auto Print.

1. From the Worklist screen, click [UTILITIES].
2. Select **Preferences > Image Management**.
3. Click Auto Print [EDIT].
  - The Default Print/Auto Print screen appears.
4. Complete the information as described in [Table 15-7](#).
5. When finished, click [SAVE] to retain your changes.
6. Click [CLOSE].

**Figure 15-22** Auto Print



**Table 15-7** Auto Print Functions

<b>Function</b>	<b>Description</b>
Printer	Lists the printers and laser cameras connected to your system.
Film Orientation	Sets if the image will print on the film horizontally or vertically. Available options are: <ul style="list-style-type: none"><li>• Portrait – vertical film orientation</li><li>• Landscape – horizontal film orientation</li></ul>
Print Mode	Provides options on the size of the image data printed. Available options are: <ul style="list-style-type: none"><li>• True Size</li><li>• Fit to Film</li><li>• Reduce Size</li><li>• Orthopedic Magnification (if enabled)</li></ul>
Magnification (%)	If Reduced Size is selected as the Print Mode, allows you to enter the percent by which the image will be reduced. The accepted range is between 40% and 90%. If True Size or Fit to Film is selected as the Print Mode, the text box remains disabled.
Alternate Print mode	Available options are: <ul style="list-style-type: none"><li>• Reduce Size</li><li>• Left/Right Justified</li><li>• Fit to Film</li></ul>
Alternative Magnification (%)	Allows you to enter an image reduction factor for the secondary printer.
Format	Allows you to choose the formats available for the selected printer. Available options are: <ul style="list-style-type: none"><li>• Standard</li><li>• Slide</li><li>• Superslide</li></ul>
Media Size	Allows you to choose the size of the media available for the selected printer.
Media Type	Allows you to choose the media types available for the selected printer. Available options are: <ul style="list-style-type: none"><li>• Paper</li><li>• Clear Film</li><li>• Blue Film</li></ul>

**Table 15-7** Auto Print Functions

<b>Function</b>	<b>Description</b>
Destination	Allows you to choose the destinations available for the selected printer. Available options are: <ul style="list-style-type: none"><li>• Magazine</li><li>• Processor</li></ul>
Magnification Type	Allows you to choose the magnification types available for the selected printer. Available options are: <ul style="list-style-type: none"><li>• Replicate</li><li>• Bilinear</li><li>• Cubic</li><li>• None</li></ul>
Image Pasting [EDIT]	If Image Pasting is enabled, opens a screen to select printing options for pasted composite images. Refer to <a href="#">Chapter 13: Advanced Applications-Preferences (p. 13-46)</a> for more information.
VolumeRAD [EDIT]	If VolumeRAD is enabled, opens a screen to select printing options for VolumeRAD series. Refer to <a href="#">Chapter 13: Advanced Applications-Preferences (p. 13-66)</a> for more information.
Auto Print [ON] [OFF]	If Auto Tag is enabled, turning Auto Print [ON] will automatically print all images that have the Auto Tag mark when the Image Viewer screen is closed. [OFF] disables the Auto Print function.
Upon closing the exam...	Allows the choice to automatically re-print or to not print any images that were printed manually from the Image Viewer screen.
[SAVE]	Saves the current selections and values as the default printing configuration.
[CANCEL]	Closes the Auto Print screen without saving your changes.

## Orthopedic Magnification

Orthopedic Magnification is an option that allows you to introduce a fixed amount of magnification percentage so that the image size will match previously calibrated orthopedic templates.

**Note:** The functions described in this section are only available if Orthopedic Magnification is enabled. GE Service personnel enable Orthopedic Magnification and enter the Configurable Magnification Factor (CMF) through the Services User Interface. The CMF is the amount of magnification applied to all Orthopedic Magnification functions. Only GE Service personnel are able to change the CMF.

You may select Orthopedic Print as a default print setting for manual printing and auto print.

**Note:** When “Orthopedic Print” is selected as the Print Mode, Alternative Print Mode is disabled.

**Note:** When “Orthopedic Print” is selected as the Print Mode, all images printed through Auto Print will have magnification applied.

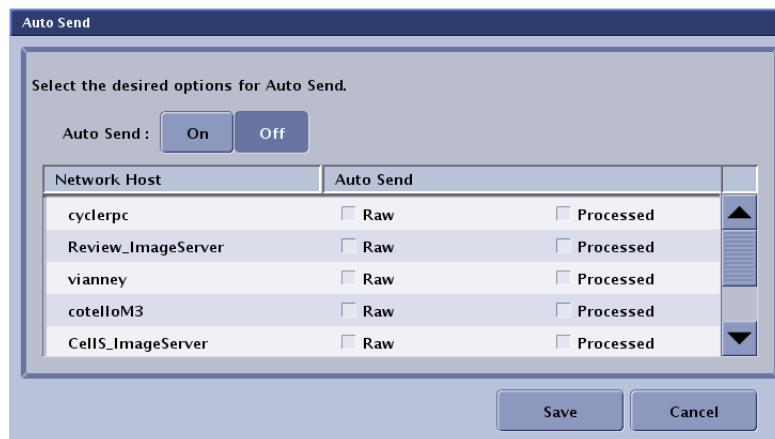
## Auto Send (Auto Push)

Auto Send automatically transfers images to another network device when the exam is closed. Auto Send is enabled and configured from the Utilities – Preferences screen.

Follow this process to configure Auto Send.

1. From the Worklist screen, click [UTILITIES].
2. Select **Preferences > Image Management**.
3. Click Auto Push [EDIT].
  - The Auto Send screen appears.
4. Complete the information as described in [Table 15-8](#).
5. When finished, click [SAVE] to retain your changes.

**Figure 15-23** Auto Send



**Table 15-8** Auto Send Functions

Function	Description
Auto Send [ON] [OFF]	Turns Auto Send on or off. Selecting On allows you to configure the default Auto Send settings.
Network Host column	Lists the available network locations where images may be transferred. Refer to <a href="#">Network Connections (p. 15-4)</a> for information about how to configure the available Network Hosts.
Auto Send column	Allows you to choose which images are sent to each network host. You may choose either Raw or Processed, both, or none. Leaving both choices unselected means that no images will be sent to the network host.
[SAVE]	Saves your selections as the default settings and closes the Auto Send screen.
[CANCEL]	Closes the screen without saving your changes.

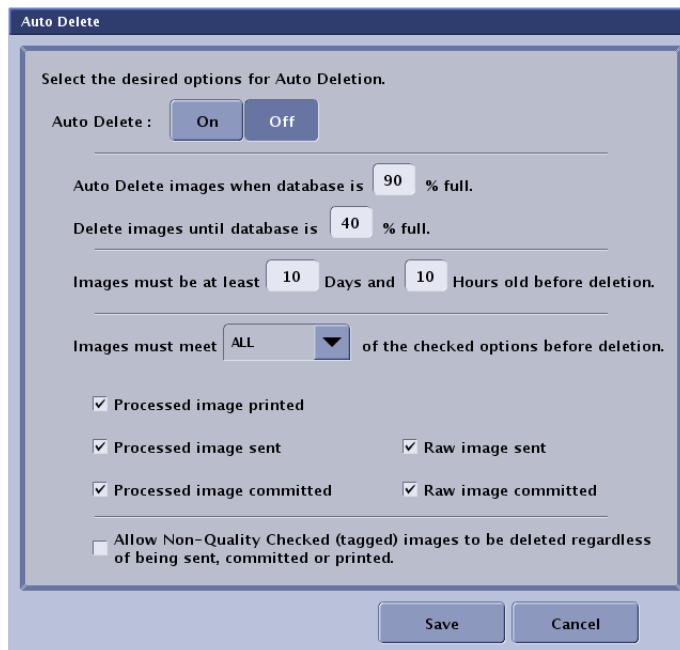
## Auto Delete

Auto Delete automatically deletes images when the image database does not have enough space. Auto Delete is enabled from the Utilities – Preferences screen.

Follow this process to configure Auto Delete.

1. From the Worklist screen, click [UTILITIES].
2. Select **Preferences > Image Management**.
3. Click Auto Delete [EDIT].
  - The Auto Delete screen appears ([Figure 15-24](#)).
4. Complete the information as described in [Table 15-9](#).
5. When finished, click [SAVE] to retain your changes.
6. Click [CLOSE].

**Figure 15-24** Auto Delete



**Table 15-9** Auto Delete functions

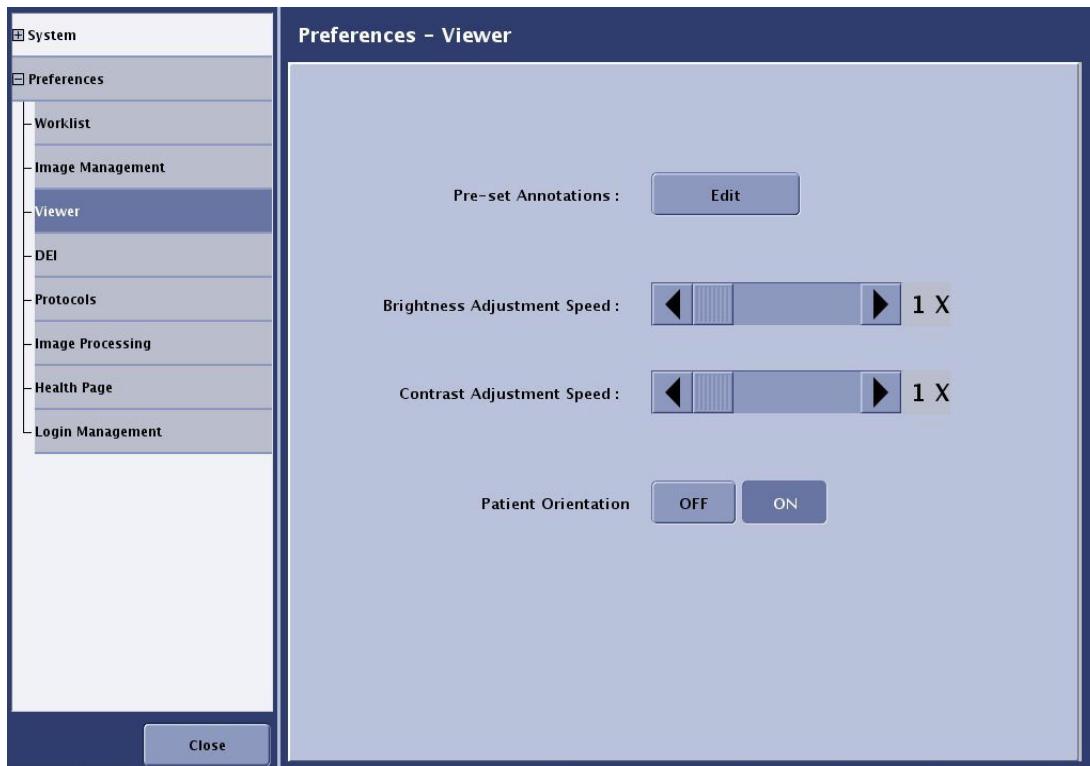
Function	Description
Auto Delete [ON] [OFF]	Turns Auto Delete on or off.
Auto Delete images when database is ___ % full.	Specifies when to auto delete images based on database size.

**Table 15-9** Auto Delete functions

Function	Description
Delete images until database is __% full.	Specifies how many images to delete based on database size.
Images must be at least __ Days old before deletion.	Specifies how old (in days) an image must be for it to be deleted. Images that are less than the entered number will not be deleted.
Images must meet __ of the checked options before deletion.	Allows you to constrain the deletion of raw and processed images based upon checkbox selection (see below). Available options are: <ul style="list-style-type: none"><li>• All</li><li>• Any</li><li>• None</li></ul>
Processed image printed	Selecting the Print parameter allows auto deletion of images that have been printed.
Processed image sent	Allows auto deletion of processed images with no errors that have been sent to another viewing station.
Processed image committed	Allows auto deletion of processed images that have been sent to a long term device with storage commitment capability. Storage commitment for a network host is configured from the System – System screen, Network Connections.
Allow Non-Quality Checked (tagged) images to be deleted regardless of being sent, committed or printed.	Allows auto deletion of any images that do not have the Auto Tag (Quality Check) mark. <b>Note:</b> If any of the images in the series have the Auto Tag (Quality Check) mark, the series will not auto delete.
[SAVE]	Saves your changes and closes the screen.
[CANCEL]	Closes the screen without saving changes.

# Image Viewer

**Figure 15-25** Preferences - Viewer screen

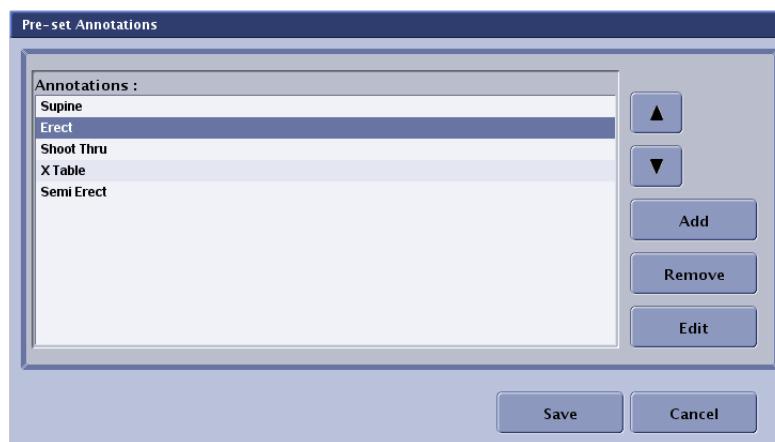


## Configure Pre-set Annotations

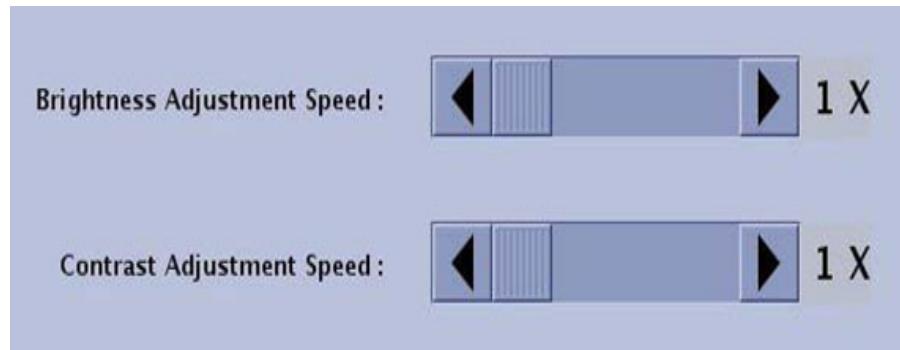
Viewer Preferences allow you to add, edit, or remove pre-set annotations.

Follow this process to configure pre-set annotations.

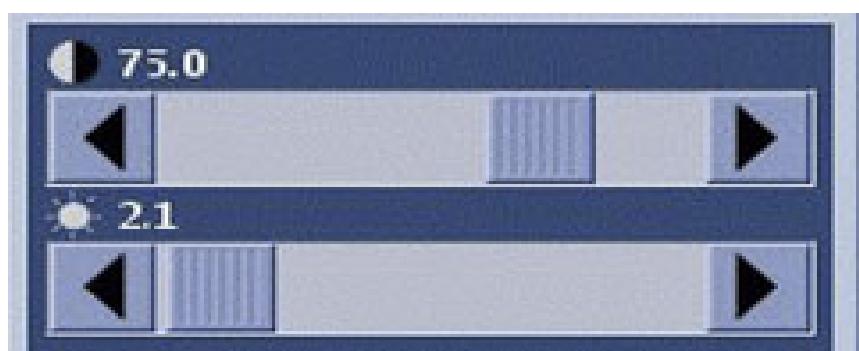
1. From the Worklist screen, click [UTILITIES].
2. Select **Preferences > Viewer**.
3. Click Pre-set Annotation [EDIT].
  - The Pre-set Annotations editing screen ([Figure 15-26](#)) appears.

**Figure 15-26** Pre-set Annotation editing

4. Adjust the speed of brightness and contrast.
  - There are 5 grades in the speed of brightness and contrast ([Figure 15-27](#)).

**Figure 15-27** Brightness and Contrast Adjustment Speed

- The selected grades will influence the speed of brightness and contrast in Viewer screen ([Figure 15-28](#)).
- Figure 15-28** Grades in the speed of brightness and contrast Viewer screen

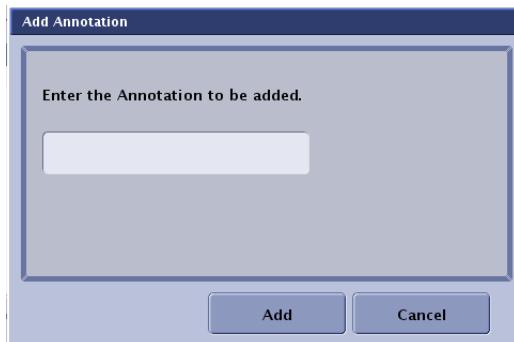


5. To change the order of the list, select the annotation.
6. Click the [▲] or [▼] button to move the item up or down the list.
7. Continue with [Add Pre-set Annotation \(p. 15-31\)](#), [Edit Pre-set Annotation \(p. 15-31\)](#), or [Remove Pre-set Annotation \(p. 15-31\)](#).

8. When finished, click [SAVE] to retain your changes.
9. Click [CLOSE].

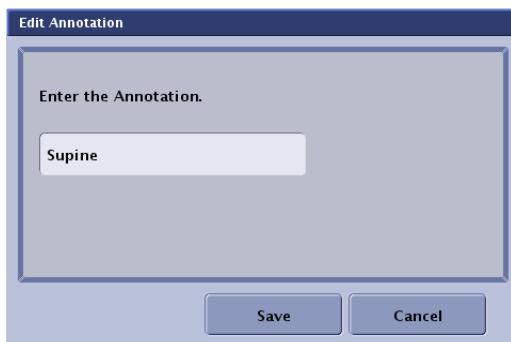
## Add Pre-set Annotation

1. From the Pre-set Annotations screen, click [ADD].
2. Enter the text of the annotation.
3. Click [ADD].



## Edit Pre-set Annotation

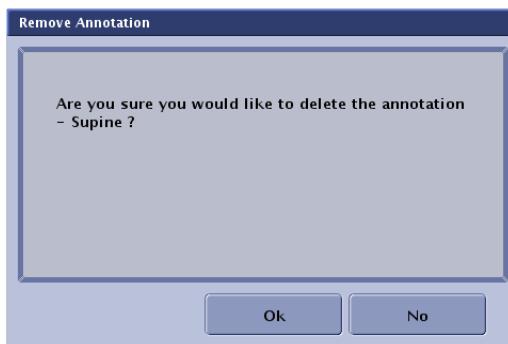
1. From the Pre-set Annotations screen, select the annotation.
2. Click [EDIT].
3. Edit the text of the annotation.
4. Click [SAVE].



## Remove Pre-set Annotation

1. From the Pre-set Annotations screen, select the annotation.
2. Click [REMOVE].
  - A message appears: "Are you sure you would like to delete the annotation – (annotation name)?"

3. Click [OK].

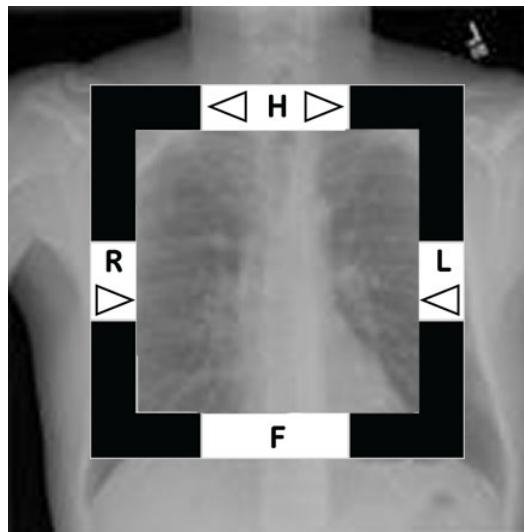


## Patient Orientation Frame

The Patient Orientation Frame:

- Is a frame that appears as an overlay on the image.
- allows the operator to change the patient orientation of an image.
- can be toggled On and OFF with the Patient Orientation Frame icon on the Quick Tools menu.
- default setting is OFF. The default setting can be changed to ON via the Preferences menu.

**Figure 15-29** Patient Orientation Frame



To change the orientation while in the acquisition screen:

4. Rotate the image to the desired orientation.
5. Rotate the Patient Orientation Frame to designate the desired patient orientation:
  - a) Use the H arrows to rotate the Patient Orientation Frame as needed.
  - b) Use the L arrow or R arrow to obtain the correct Left-Right orientation.

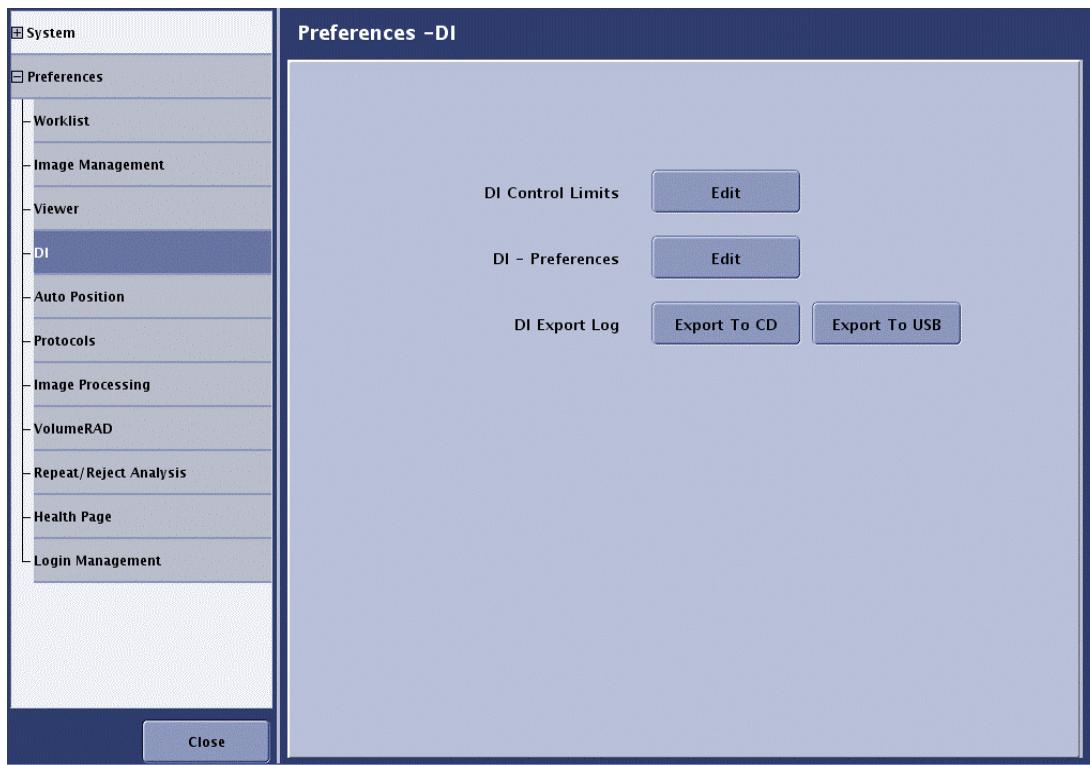
6. When you close the exam confirm YES to save the changes. The original image will be saved with:
  - ◆ The new orientation markers
  - ◆ The corrected DICOM orientation tag

**NOTE:** When used in the Image Acquisition mode, changes made with the Patient Orientation Frame on the image will modify the DICOM orientation tag. Changes must be saved when closing to maintain the changes.

When used in the Image Viewer mode, changes made with the Patient Orientation Frame will create a new second image when saved at closing. The new image will have the new DICOM orientation tag and a private DICOM tag with the original orientation of the original image.

## DI (Deviation Index)

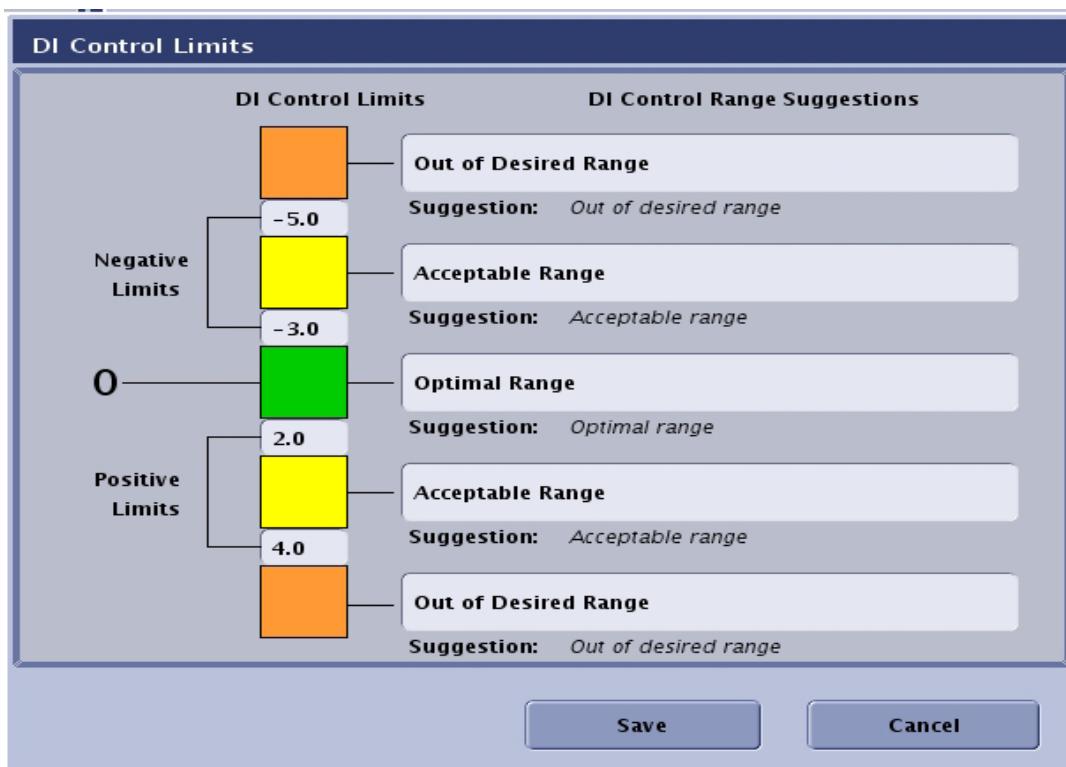
**Figure 15-30** Preferences - DI screen



The DI screen allows you to specify the DI limits, change the Target Exposure Index, and to export the DI log file.

### DI Control Limits

DI (Deviation Index) estimates the deviation of measured Exposure Index from the Target exposure Index.

**Figure 15-31** Preferences - DI Control Limits

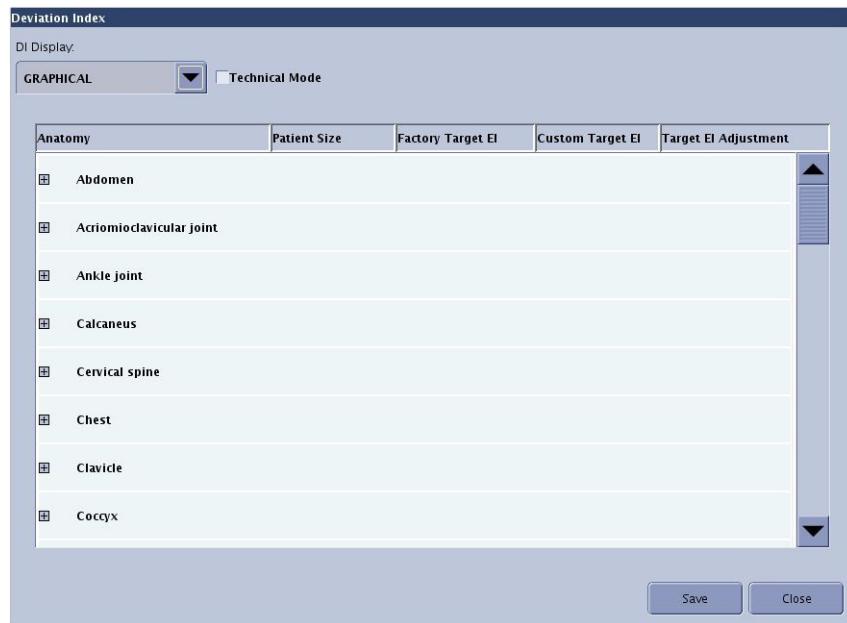
The DI Control Limits screen lets you customize your DI Control Limits, as well as the DI Control Range Suggestions.

## Deviation Index Preferences

The Deviation Index screen allows you to control if or how the Deviation Index is displayed on the Image Viewer screen and to change the lower and upper limits for anatomical views.

Follow this process to change the Deviation Index settings.

1. From the Worklist screen, press [UTILITIES].
2. Select Preferences > Deviation Index.
3. Press Deviation Index Preferences [EDIT].
  - The Deviation Index screen ([Figure 15-34](#)) appears.
4. Continue with [Change the DI Display \(p. 15-35\)](#) or [Change the Target EI \(Exposure Index\) \(p. 15-35\)](#).

**Figure 15-32** Deviation Index screen

## Change the DI Display

1. On the Detector Index screen, click the **DI Display** drop-down list to open it.
2. Select the display option.
  - Available options are:

– No Display		In this example, there is no DI information displayed on the Image Viewer screen.
– Numerical		In this example, only numerical DI information is displayed on the Image Viewer screen.
– Graphical		In this example, DI information is displayed is both numerically and graphically on the Image Viewer screen. This is the recommended display option.

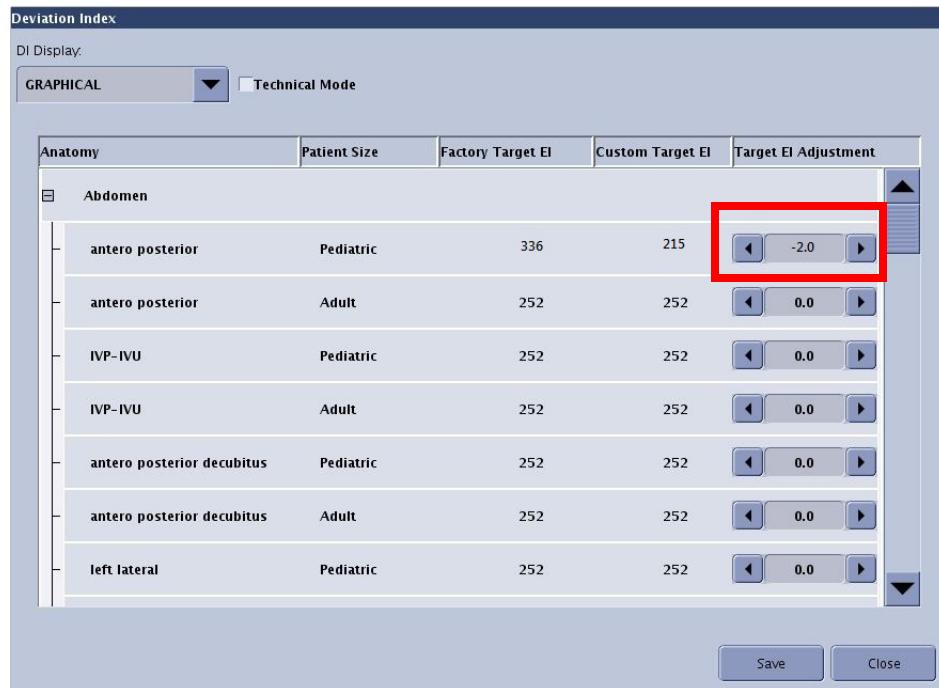
3. Click [SAVE] to apply the change and close the screen.
  - [CLOSE] closes the screen without saving the changes.

## Change the Target EI (Exposure Index)

1. Open the Target EI table listed in **Preferences > DI > Preferences - DI**.
2. Click an anatomical category to expand the list.

3. Adjust the Custom Target EI as appropriate for the view by changing the Target EI Adjustment factor.
4. Click the category to close. Repeat for all applicable anatomical categories.
5. Click [SAVE] when finished to apply the changes and close the screen.
  - [CLOSE] closes the screen without saving the changes.

**Figure 15-33** Change the Target EI.



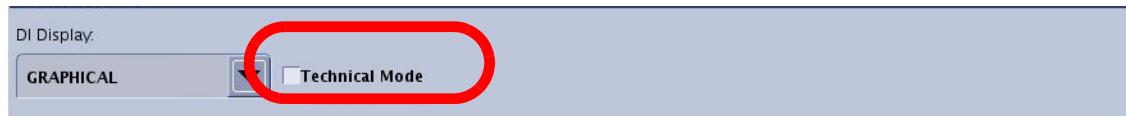
## Enable or Disable Technical Mode

Technical Mode is a special setting that configures the system for image quality testing and receptor calibration. When Technical Mode is enabled, DEI is calculated using the central area of the image (512 pixels x 512 pixels) regardless of the imaged anatomy.

**IMPORTANT!** Do not acquire exam images when Technical Mode is enabled. The use of Technical Mode is reserved for image testing and calibration purposes only.

The checkbox (Figure 15-34) indicates if Technical Mode is enabled. Check or uncheck the box as appropriate and click [SAVE] to apply the change and close the screen.

**Figure 15-34** Technical Mode checkbox



## Export the Deviation Index Log

The DI log records the exposure levels of images. DI Export provides DI range information by anatomy and view in Excel format for easy reference and off-line reading. Any resulting change must then be manually entered into the system. Medical Physicists or Super Users in your facility can review and adjust ranges based on default techniques. In addition, range changes may be necessary when system speed defaults are changed or beam filtration is added. Ranges may also be edited due to site preference of Physicist or Physician.

Follow this process to export the DI log onto a CD, DVD or USB.

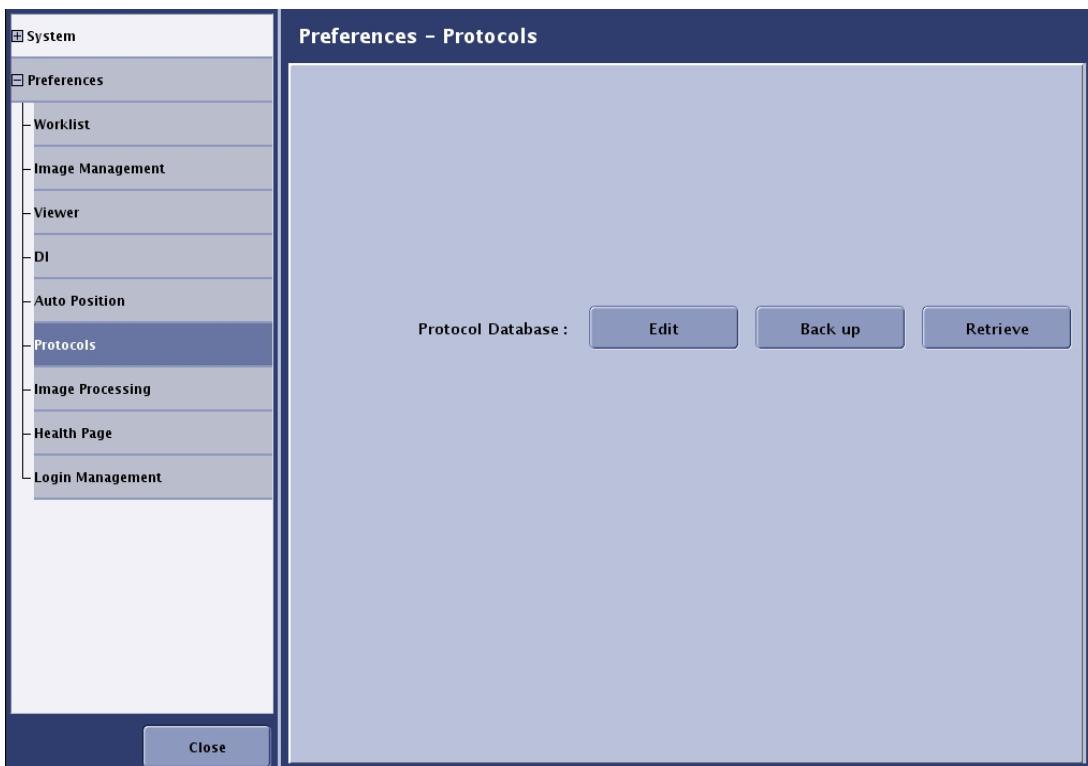
1. Insert a blank CD-R, DVD-R and USB disk.
2. From the Worklist screen, click [UTILITIES].
3. Select **Preferences > DI**.
4. Click the **DI Export Log** [EXPORT] or [EXPORT TO USB] button.
5. Remove the disk when export is complete.

## Auto Position

The Exam preferences configure settings for Auto Positioning. Refer to [Chapter 13: Advanced Applications-Auto Positioning \(p. 13-4\)](#) for more information.

## Protocols

Protocols preferences allow you to create backup copies of the protocol database, retrieve saved backups, and create new protocols.

**Figure 15-35** Preferences - Protocols screen

## Backup Protocol Database to CD or DVD

The Backup function allows you to save the entire protocols database (parameters) to a CD or DVD. This is important when editing protocols; backup ensures that the current database stays intact. Backup is also important in case of system failure and all protocol information is lost. If necessary, the old database can be retrieved and used.

Follow this process to back up the database to a CD or DVD.

**Note:** Always use a new, blank CD-R or DVD-R for each back up.

**DO NOT** use re-writable (CD-RW or DVD-RW) disks. The system cannot write to this type of disk.

1. Insert a blank disk into the disk tray.
2. From the Worklist screen, click [UTILITIES].
  - The Utilities screen appears.
3. Select **Preferences > Protocols**.
4. Click [BACK UP].
  - A message appears: "Press OK to continue with Protocol Database back up."
5. Click [OK].
  - A message appears: "Protocol Database back up in progress. Please Wait. This might take 2-3 minutes."
    - [CANCEL] stops the database backup.

- When backup is complete, a message appears: “The Protocol Database back up operation is successful.”
6. Click [OK] to dismiss the message.
  7. Remove the disk from the tray.
  8. Label the disk and store it in a safe place.

## Retrieve Protocol Database from CD or DVD

The Retrieve function allows you to recover a protocol database that was saved to a CD or DVD.

**Note:** When retrieving, the procedures saved on the disk will overwrite all of the procedures on the system.

Follow this process to retrieve a protocol database from CD or DVD.

1. From the Worklist screen, click [UTILITIES].
  - The Utilities screen appears.
2. Select **Preferences > Protocols**.
3. Insert the disk with the saved protocols database into the tray.
4. Click [RETRIEVE].
  - A message appears: “Press OK to continue with Protocol Database retrieve.”
5. Click [OK].
  - The saved protocol database is loaded onto the system.
6. Remove the disk from the tray. Store the disk in a safe place.

# Edit Protocol Database

The Protocol Editor allows you to create custom acquisition protocols. Use this screen to create, edit, or remove categories, exams, and views.

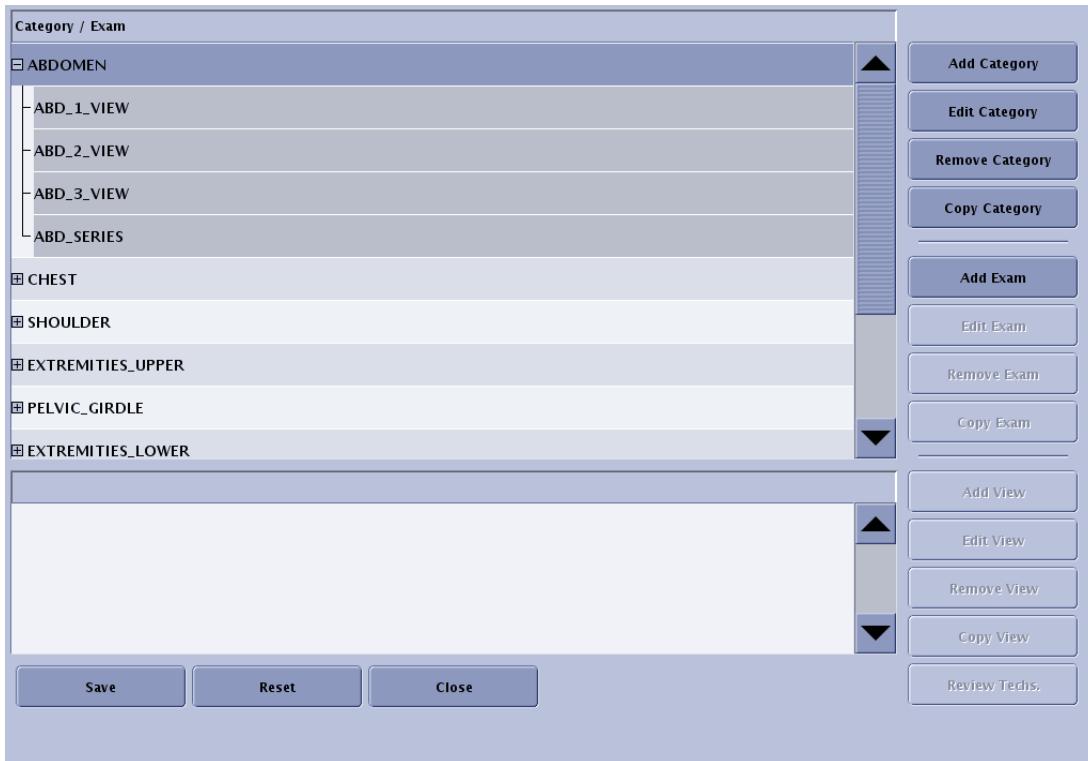
**Note:** Names of categories, exams, and views cannot contain spaces. Use underscores ( \_ ) to separate words (for example, “Neck\_AP”).

**Note:** It is recommended that you back up the database to CD before and after custom changes are made. Refer to [Backup Protocol Database to CD or DVD \(p. 15-38\)](#) for more information.

Follow this process to access the Protocol Database Editor.

1. From the Worklist, select [UTILITIES].
2. Select **Preferences > Protocols**.
3. Click [EDIT].
  - The Exam Menu appears ([Figure 15-36](#)).
4. Continue with [Add or Edit Category \(p. 15-41\)](#), [Add or Edit Exam \(p. 15-41\)](#) or [Add or Edit View \(p. 15-42\)](#)

**Figure 15-36** Exam Menu

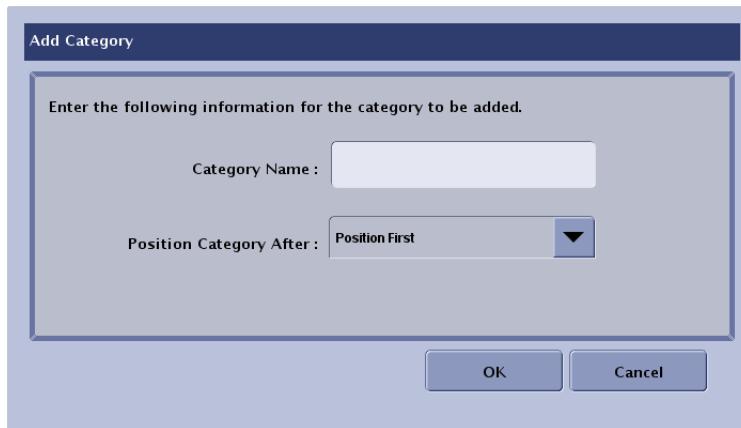


## Add or Edit Category

**Note:** The screens and process to edit a category are the same as for adding a category.

From the Exam Menu:

1. Click [ADD CAT] or [EDIT CAT].
  - If editing a category, select the category first, then click [EDIT CAT].
  - The Add Category (or Edit Category) screen appears.



2. Type a **Category Name**. (Use underscores instead of spaces.)
3. From the **Position Category After** drop-down list, select the placement of the new category on the category list.
4. Click [OK].
5. Continue with [Add or Edit Exam \(p. 15-41\)](#).

**Note:** Exams and views must be added or copied into the new category in order for it to be fully functional.

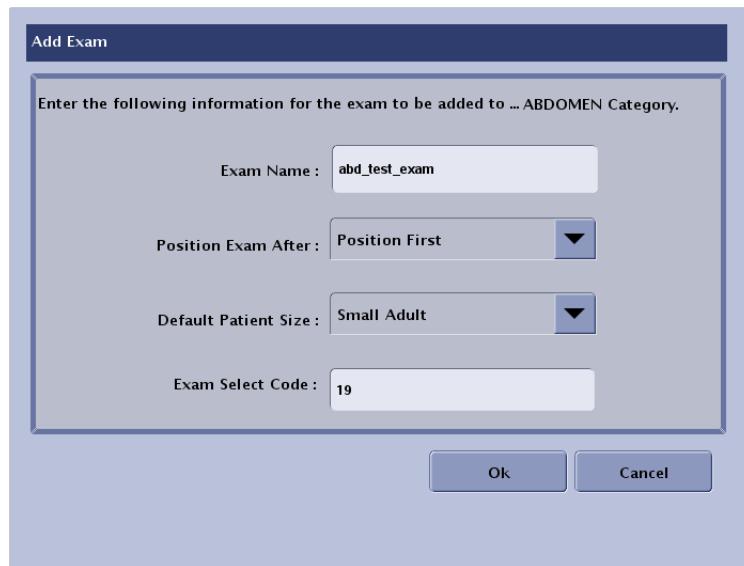
## Add or Edit Exam

**Note:** The screens and process to edit an exam are the same as for adding a exam.

From the Exam Menu:

1. Select the category for the new exam.
2. Click [ADD EXAM] or [EDIT EXAM].

- The Add Exam (or Edit Exam) screen appears



3. Type an **Exam Name**. (Use underscores instead of spaces.)
4. From the **Position Exam After** drop-down list, select the position of the exam within the category.
5. Select the **Default Patient Size** for the exam.
6. Enter the **Exam Select Code** if Automatic Protocol Assist (APA) is enabled on your system.
  - a) Obtain list of local HIS/RIS procedure entry codes.
  - b) Be sure that all other information on the screen, especially the default patient size is correct.
  - c) If your facility is using or building procedures specifically for LEFT and RIGHT sides, make sure that the correct code for the side is added.

**Note:** Procedure codes will be backed up when the Protocol Database is backed up. Refer to [Chapter 15: Preferences-Backup Protocol Database to CD or DVD \(p. 15-38\)](#) for more information.

7. Click [OK].
8. Continue with [Add or Edit View \(p. 15-42\)](#).

**Note:** Exams must be populated with new or copied views after creation in order to be fully functional

## Add or Edit View

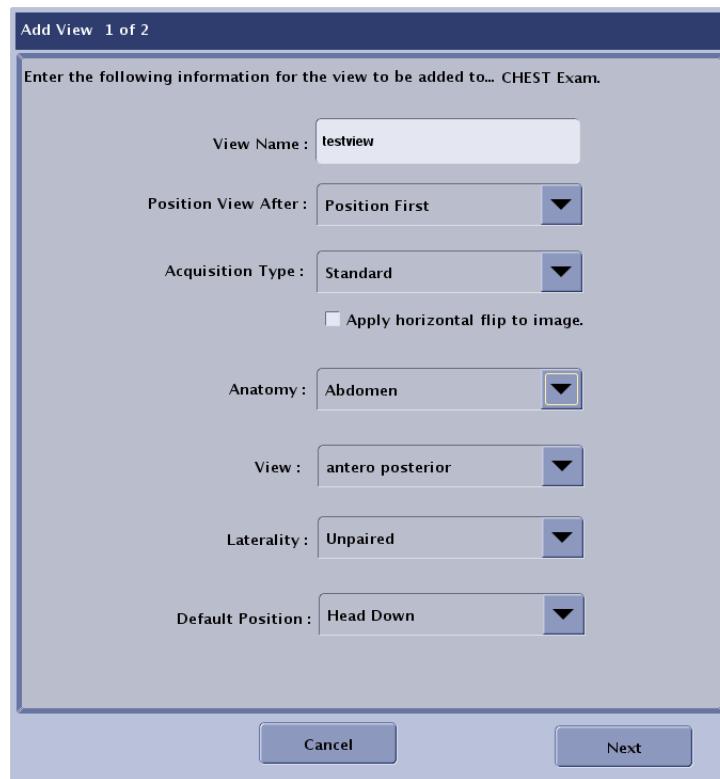
**Note:** The screens and process to edit a view are the same as for adding a view.

This process has multiple screens.

From the Exam Menu:

1. Expand the Category.
2. Select the Exam to add or copy the new view to.
3. Click [ADD VIEW] or [EDIT VIEW].

- The Add View (or Edit View) screen (1 of 2) appears.



- Type a **View Name**. Do not use spaces. Use underscores ( \_) to separate words.
- From the **Position View After** drop-down list, select the placement of the view within the exam.
- Select the **Acquisition Type**.
  - Available options are:
    - Standard
    - Bone
    - Soft Tissue
    - Image Pasting (if enabled on your system) (Refer to [Chapter 13: Advanced Applications-Preferences \(p. 13-46\)](#) for more information.)
    - VolumeRAD (if enabled on your system) (Refer to [Chapter 13: Advanced Applications-Preferences \(p. 13-66\)](#) for more information.)
- Check if **horizontal flip** is to be applied when displaying the image.
- Select the **Anatomy**.

**Note:** The selected anatomy will determine the image processing for the view. Be sure to select the appropriate anatomy for the body part imaged.

- Select the most appropriate **View** (AP, Lat, etc.).
  - The selected anatomy determines which views are available.
- Select the **Laterality**:

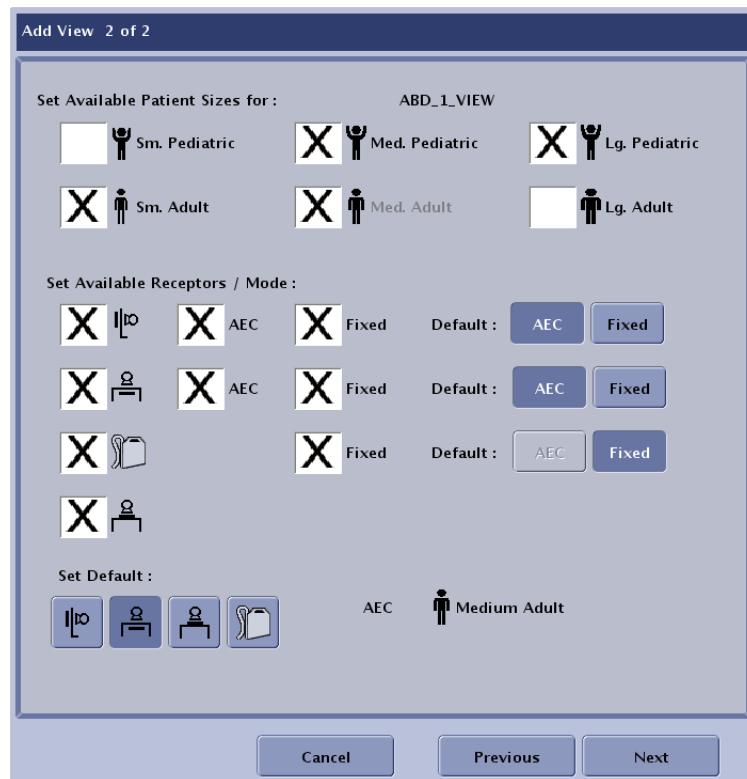
- The selected anatomy determines which laterality options are available.
  - If the anatomy is unpaired, then Unpaired is the only available selection.
  - If the anatomy is paired, the available sections are: Both, Left, and Right.
  - Paired anatomy enables the Patient Side control on the Image Acquisition screen. Refer to [Chapter 10: Image Acquisition](#) for more information.

**11. Select the Default Position:**

- The selected anatomy determines which positions are available. In general:
  - If the anatomy is unpaired, the selections are Head Down or Head Up
  - If the anatomy is paired, the selections are Digits to Back, Digits to Feet, Digits to Front, Digits to Head.

**12. Click [NEXT].**

- The Add View (or Edit View) screen (2 of 2) appears.



**13. Select all Patient Sizes you want available for the view. The default size will automatically be selected.**

**14. Select Receptors and Modes for each selected receptor.**

**Note:** The available receptors that appear on this screen depend upon your system's configuration. Not all systems will have the receptors shown here.

**15. Select the Default Receptor.**

**16. Click [NEXT].**

- The Review screen appears.

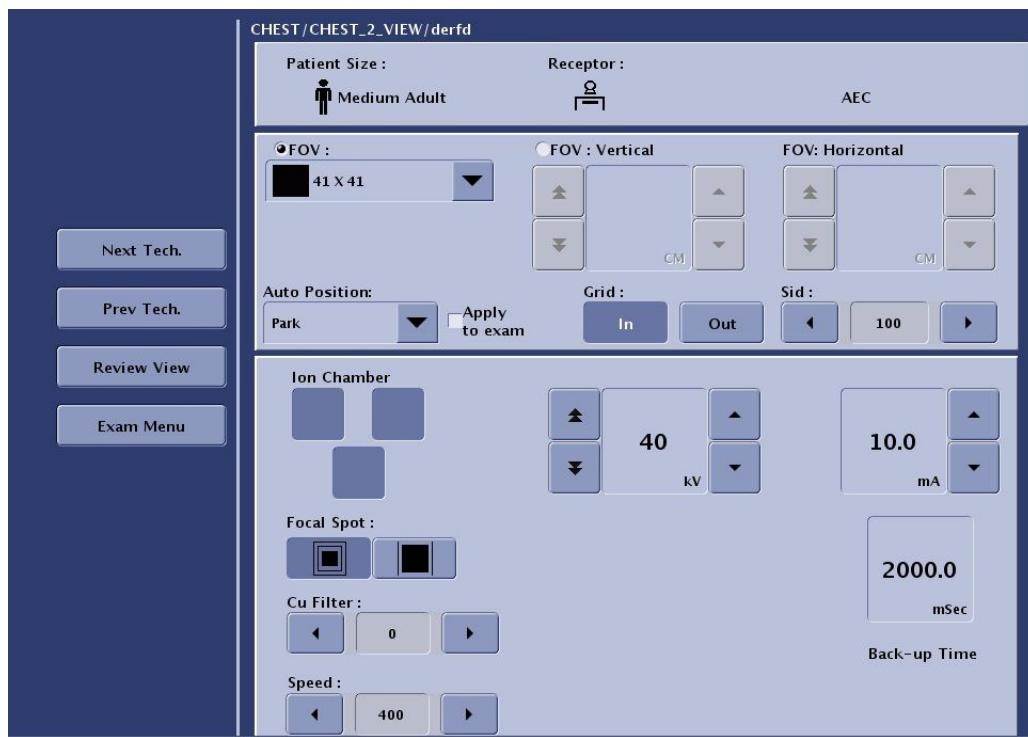
ABDOMEN / ABD_1_VIEW / ABDOMEN_AP Standard Acquisition		Technical Parameters														
		kV	mA	mAs (Fixed Only)	msec (b = Back-Up Time)	Speed	Sid	Ion Chamber (AEC Only)	Focal Spot	Cu Filter	Grid	FOV1 : Vertical	FOV2 : Horizontal	Asym. Collim.	Auto Pos.	
Small Adult	Fixed	75	400	6.4	16.0	400	100	N/A	Large	no	In	41	41	Off		
Med Adult	Fixed	80	500	12.5	25.0	400	100	N/A	Large	no	In	41	41	Off		
Large Adult	Fixed	85	640	20	31.25	400	100	N/A	Large	no	In	41	41	Off		
Small Ped	Fixed	65	200	2	10.0	800	100	N/A	Small	no	Out	25	25	Off		
Med Ped	Fixed	65	250	3.2	12.8	640	100	N/A	Small	no	In	30	30	Off		
Large Ped	Fixed	70	250	6.4	25.6	500	100	N/A	Small	no	In	41	41	Off		
Small Adult	AEC	75	400	N/A	16.0	400	100	LCR	Large	no	In	41	41	Off		
* Med Adult	AEC	80	500	N/A	25.0	400	100	LCR	Large	no	In	41	41	Off		
Large Adult	AEC	85	640	N/A	31.25	400	100	LCR	Large	no	In	41	41	Off		
Large	AEC	70	250	N/A	25.6	500	100	LCR	Small	no	In	41	41	Off		

Exam Menu      Edit Technique

- The default patient size is shown with an asterisk (\*) to the left of the size indicator.

17. Select the patient size to edit.

18. Click [EDIT TECHNIQUE].

**Figure 15-37** Edit Techniques screen

1. Change the technique parameters as appropriate.



**CAUTION** If no technical factors are present in the system, the default settings are:

- kV = 40
- mA = 10 (fixed setting)
- mAs = .05
- SID = 100cm
- Grid = In

No exposures should be made until the user selects values appropriate for the patient size.

2. Upon completion for each view, click [NEXT TECH] to adjust techniques for the next configured patient size.
3. When finished, click [EXAM MENU].
  - The Exam Menu appears.
4. Click [SAVE].
  - A message appears: "Changes made to the Protocol Database will be saved."
5. [RESET] clears all changes to the database since the last time it was saved.

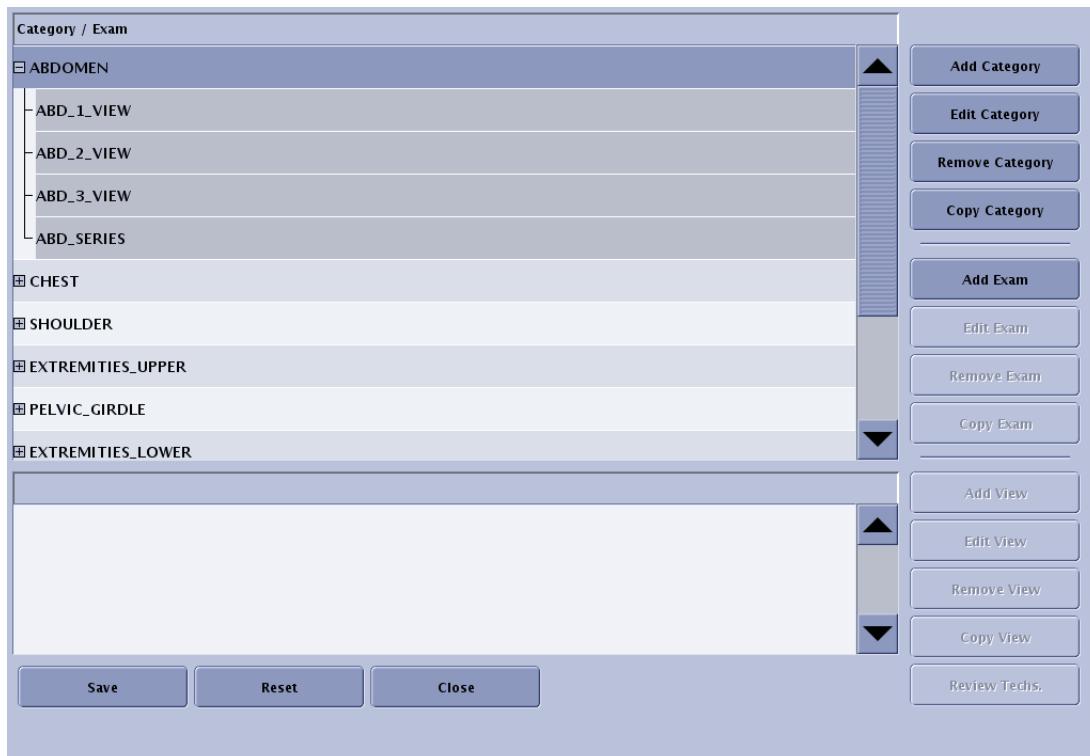
6. Click [OK].
  - The Preferences – Protocols screen appears.
7. Click [CLOSE].
  - A message appears: “Changes have been made to the Protocol Database. Would you like to save these changes?”
8. Click [YES].
  - The Exam Menu screen closes and returns you to the Preferences - Protocols screen.
9. Back up the protocol database when you are finished. Refer to [Backup Protocol Database to CD or DVD \(p. 15-38\)](#) for more information.

## Protocol Editor Copy Functions

Follow this process to access the Protocol Database Editor.

1. From the Worklist, select [UTILITIES].
2. Select **Preferences > Protocols**.
3. Click [EDIT].
  - The Exam Menu appears.

**Figure 15-38** Exam Menu



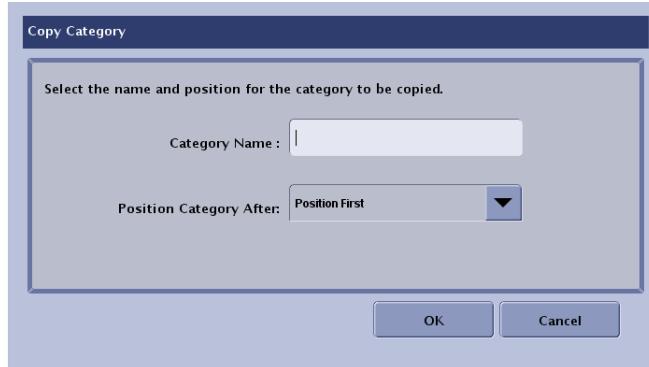
- Continue with [Copy Category \(p. 15-48\)](#), [Copy Exam \(p. 15-48\)](#), or [Copy View \(p. 15-49\)](#).

## Copy Category

1. Select the Category to copy
2. Click [COPY CATEGORY].
  - Enter the new name to use or retype the existing name

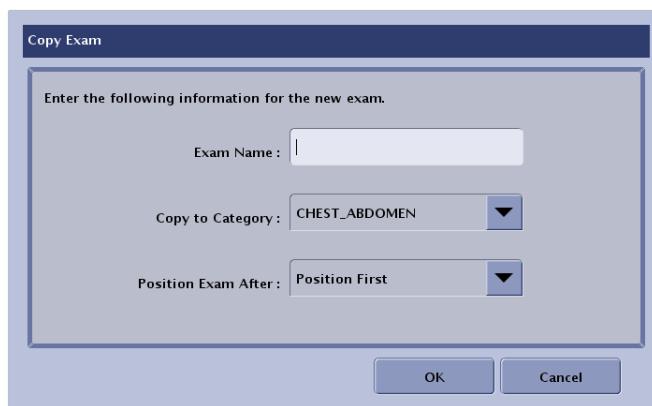
**Note:** If reusing the existing name, be sure to include any underscores in the title.

3. Select the **position** on the Category list.
4. Click [OK].
5. Continue with [Copy Exam \(p. 15-48\)](#).



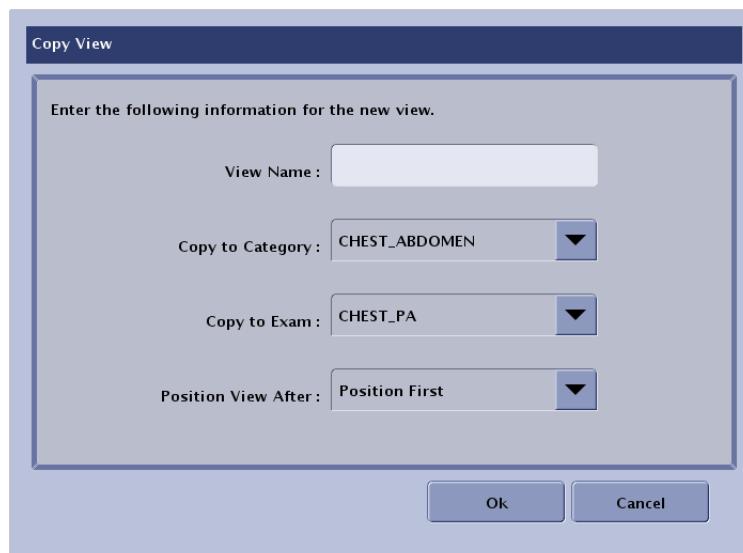
## Copy Exam

1. Select the Exam to copy.
2. Click [COPY EXAM].
3. Enter the new name to use or retype the existing name.
4. Select the **Category** to copy to.
5. Select the position on the **Exam** list.
6. Click [OK].
7. Continue with [Copy View \(p. 15-49\)](#).



## Copy View

1. Select the View to copy.
2. Click [COPY VIEW].
3. Enter the **Exam Name** to use or retype the existing name.
4. Select the **Copy to Category** from the list.
5. Select the **Copy to Exam** from the list.
6. Select the **Position View** from the list.
7. Click [OK].



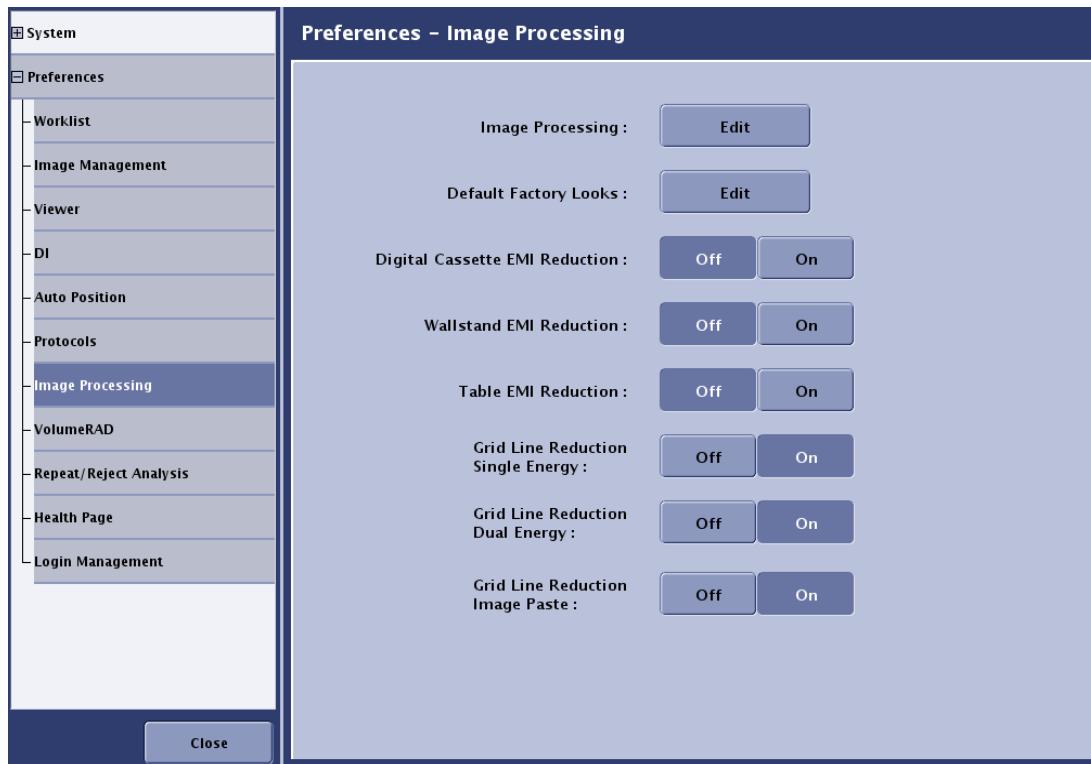
**Note:** Remember to back up the database when finished editing. Refer to [Backup Protocol Database to CD or DVD \(p. 15-38\)](#) for more information.

# Image Processing

The Image Processing preferences allow you to change which look is the default for the anatomical view. Image Processing Preferences also allow you to view the settings of default factory looks or to create up to five (5) custom looks.

**Note:** Custom looks and the default looks mapping can be backed up by having GE Service personnel perform a system backup. It is recommended that a system backup be performed after any change to the default looks mapping or when custom looks are built. Ask your GE Service personnel to perform the system backup at their next visit. GE Service personnel can restore the settings from the backup, if necessary.

**Figure 15-39** Preferences – Image Processing



## Change Default Factory Looks for Exams

The Default Factory Looks screen ([Figure 15-40](#)) allows you to change the default processing setting for all 34 representative anatomical views, and then map this change to related anatomical views. Note that this may over-ride existing default settings.

At the initial applications setup, the radiologist chooses the default look for each anatomical view. Application specialists assign the looks to the system.

Follow this process to change the default factory looks.

1. From the Worklist screen, click [UTILITIES].
2. Select **Preferences > Image Processing**.
3. Click Default Factory Looks [EDIT].
4. Use the drop-down lists to change the default for the desired anatomical views.
5. When finished, click [MAP] to save the changes.
  - A message appears: “Default look settings for selected Representative Anatomical Views will be mapped to related anatomical views.”
6. Click [CONFIRM] to apply the looks settings. [CONFIRM] will close the message and return you to the Image Processing screen.
  - [CANCEL] closes the message and returns you to the Default Factory Looks screen.

**Figure 15-40** Default Factory Looks

Representative Anatomical View	Default Look
24. Hip-joint_lateral	No Change ▼
25. Shoulder_axial	No Change ▼
26. Lumbar-spine_antero-posterior	No Change ▼
27. Lumbar-spine_L5-S1	No Change ▼
28. Lumbar-spine_left-lateral	No Change ▼
29. Neck_antero-posterior	No Change ▼
30. Neck_left-lateral	No Change ▼
31. Pelvis_antero-posterior	No Change ▼
32. Rib_antero-posterior-upper	No Change ▼
33. Thoracic-spine_antero-posterior	No Change ▼
34. Thoracic-spine_left-lateral	No Change ▼

**Map**      **Cancel**

# Build Custom Looks

Looks are the way an image is processed to be viewed by a radiologist for interpretation.

Looks are pre-defined combinations of brightness, contrast, edge enhancement, and tissue equalization (TE). Refer to [Tissue Equalization Overview \(p. 15-56\)](#) for more information.

Factory Look descriptions:

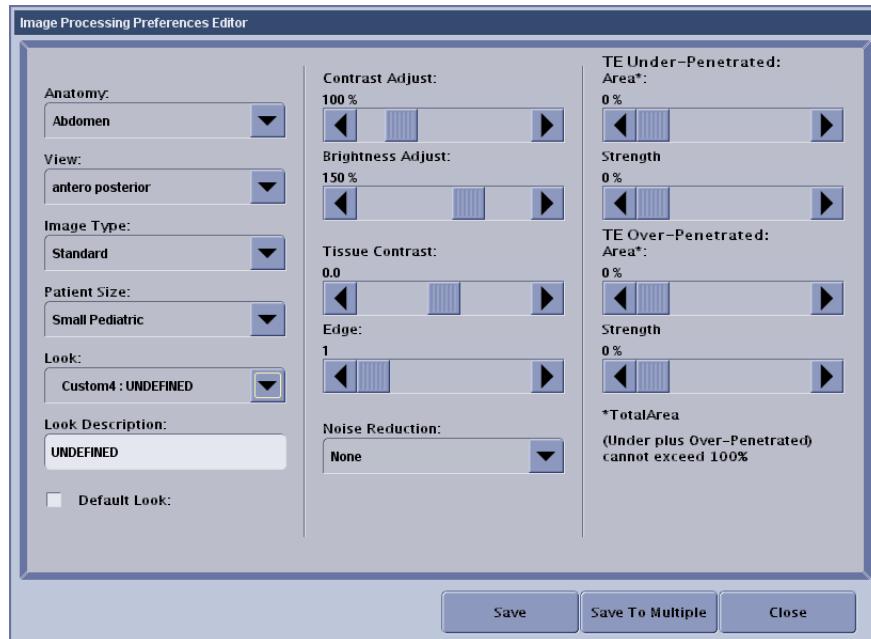
- Factory Look 1 – similar to analog film, low edge, no TE
- Factory Look 2 – low CR look, low edge, moderate tissue contrast
- Factory Look 3 – moderate CR look, low edge, TE
- Factory Look 4 – highly digital look, high edge, high TE

Follow this process to create a new custom look.

**Recommendation:** When building a custom look, start with the factory look that is closest to the desired result. Write down the values and apply them to a new custom process. Then change the applicable variables.

1. From the Worklist screen, click [UTILITIES].
2. Select **Preferences > Image Processing**.
3. Click Image Processing [EDIT].
4. The Image Processing Preference Editor ([Figure 15-41](#)) appears.

**Figure 15-41** Image Processing Preference Editor



5. Select the **Anatomy** (for example: Chest, Abdomen, Lumbar Spine, etc.).
6. Select the **View** (for example: antero-posterior or lateral).
7. Select the **Image Type** (some systems may only have Standard image type available).

8. Select the **Patient Size**. Available options are: Small Adult, Medium Adult, Large Adult, Small Pediatric, Medium Pediatric, or Large Pediatric.

9. Select the **Look**. Choose the first “Undefined” Custom look.

**Note:** If a Factory Look is selected, parameters are read-only. Only Custom processing looks can be changed.

10. Enter new name in **Look Description** to rename the look:

- The system will not accept a new look if the name remains “Undefined.”

11. Check the **Make Default** box to set this look at the default for the selected Anatomy.

12. Adjust parameters as described in [Table 15-10](#). Parameters may be adjusted in any order.

**Table 15-10** Image Processing parameters

Parameter	Definition
Contrast Adjust	<p>Adjusts image contrast. Also known as window width.</p> <ul style="list-style-type: none"> <li>• Move the slider right for more contrast (towards pure black and white).</li> <li>• Move the slider left for less contrast (towards uniform gray).</li> </ul> <p>Range: 25% – 400% with increment of 1%</p>
Brightness Adjust	<p>Adjusts image brightness from 25-210%. Also known as window level.</p> <ul style="list-style-type: none"> <li>• Move the slider right for a lighter image.</li> <li>• Move the slider left for a darker image.</li> </ul> <p><b>Note:</b> Brightness Adjust and Contrast Adjust should not be used for per-image tuning/correction of brightness and contrast. They are used to modify the default look of images from a particular exam. For example, if images from a particular type of exam are appearing consistently lighter than they should be, the Brightness Adjust slider can be moved left to adjust. However, for small alterations of brightness on a particular image, use the Brightness and Contrast controls in the Image Viewer screen.</p>
Tissue Contrast	<p>Controls the general contrast between the thick and thin anatomy.</p> <ul style="list-style-type: none"> <li>• Move the slider right to decrease bone/soft-tissue contrast.</li> <li>• Move the slider left to increase bone/soft-tissue contrast.</li> </ul> <p>Range: -0.15 to 0.15 with 0.01 increments.</p> <p><b>Note:</b> Unlike Tissue Equalization, which controls contrast within under-penetrated (thick) or over-penetrated (thin) areas, Tissue Contrast controls the general contrast <b>between</b> the thick and thin anatomy. For example, Tissue Contrast can be used in combination with Tissue Equalization to define a Chest PA look that is equalized in the lung fields, but with light spine/ribs.</p>

**Table 15-10** Image Processing parameters

Parameter	Definition
Edge	The amount of detail visible in bone structures. Increased edge equals increased detail. <ul style="list-style-type: none"> <li>• Move the slider right to make images sharper.</li> <li>• Move the slider left to make images smoother.</li> </ul> Range: 1 to 10 (discrete setting) with increments of 1
Noise Reduction	Suppresses the mottle noise in denser areas of the anatomy while preserving detail in the rest of the image. Available options are: <ul style="list-style-type: none"> <li>• None – no noise reduction</li> <li>• Low</li> <li>• Medium</li> <li>• High – maximum noise reduction</li> </ul> <b>Note:</b> The noise reduction feature suppresses the mottle noise in denser areas of the anatomy while preserving detail in the rest of the image. The algorithm takes into account tissue penetration and dose reaching the receptor. For example, if two Chest PA images were acquired on the same patient, one with much higher dose than the other, noise reduction may only affect the lower dose (higher noise) image. In general, the lowest Noise Reduction setting that produces the desired image quality should be selected.
TE Settings	See Tissue Equalization section for range and effect of TE sliders. <b>Note:</b> The combined total of the TE Under-penetrated and TE Over-penetrated areas cannot exceed 100%. The slider will automatically stop and a message appears: “The Total Area cannot exceed 100%. Reduce the (Under- or Over-) Penetrated area to proceed.”

13. When finished adjusting parameters, click [SAVE] or [SAVE TO MULTIPLE].
  - [SAVE] applies the parameters to the currently selected patient size.
  - A message appears: “Save changes?”
14. Click [YES].
  - [SAVE TO MULTIPLE] applies the parameters to multiple patient sizes within the selected anatomy.
  - The Save to Multiple screen appears.
15. Select the **Patient Size** to save the new look to.

16. Click [SAVE].



- Click [CLOSE] on the Image Processing Preference Editor.

## Change Image Processing from the Viewer

Changing the image processing from the Image Viewer screen allows the user to preview the effect of different looks (factory or custom) before applying the look to the image.

The Image Processing settings may be accessed from the Image Viewer screen or the Utilities screen.

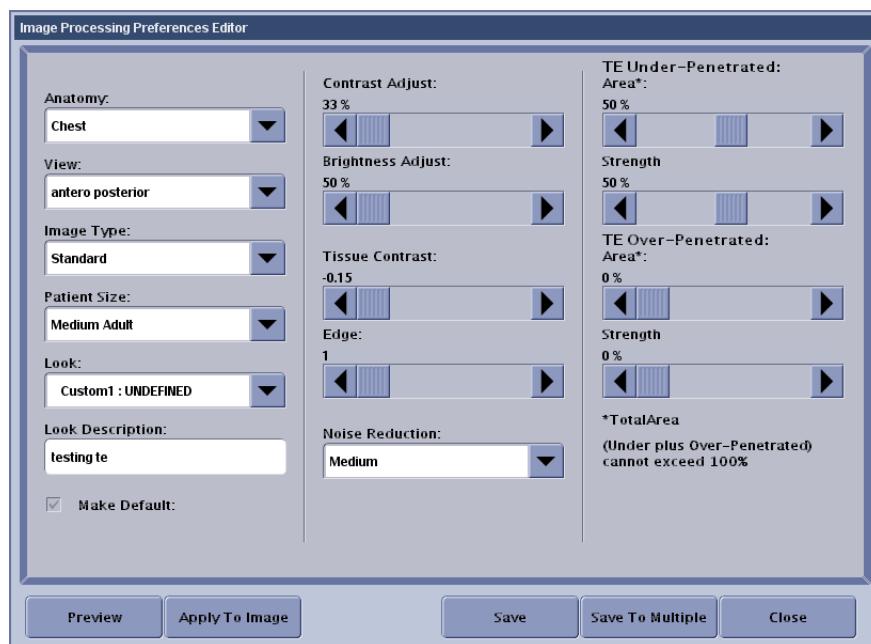
From the Image Viewer screen:

1. Select the **Reprocessing** panel from the tool selection list.
2. Click [EDIT PROC].

Follow the steps listed above to make the processing changes.

When opened from the Image Viewer screen the, Image Processing Preference Editor screen also has a [PREVIEW] and [APPLY TO IMAGE] button.

- [PREVIEW] applies the settings to the currently selected image in the Image Viewer screen so that you can see the effect before saving the changes.
- [APPLY TO IMAGE] creates a new instance of the image processed with the selected look.

**Figure 15-42** Image processing preferences editor screen opened from the Viewer

## Tissue Equalization Overview

Tissue Equalization (TE) is an advanced image-processing algorithm that improves contrast and visibility in over-penetrated and under-penetrated regions of an image without compromising the contrast in other regions of interest. In combination with the wide dynamic range of the digital receptor, TE allows display of more information collected in a single shot, reducing re-takes and increasing throughput.

## TE Usage

### Over-penetrated Regions

An over-penetrated region in an image results from x-rays passing through a relatively less dense region of the anatomy such as soft tissue (skin edge).

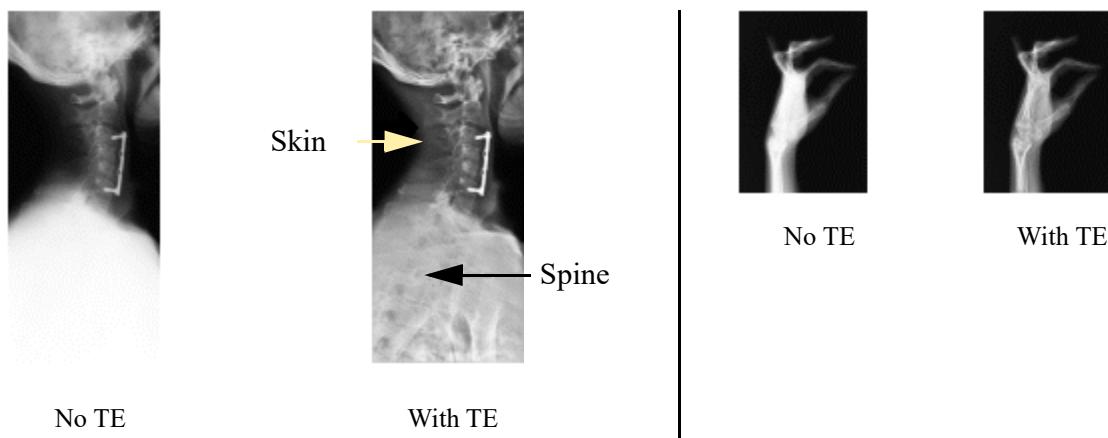
Over-penetrated regions of an image appear darker with reduced contrast. Using TE, the contrast in such regions can be enhanced to improve visualization of soft-tissue. TE can also be used to enhance vessel contrast in lungs. In [Figure 15-43](#), the skin edge around the neck is more clearly defined with TE.

### Under-penetrated Regions

An under-penetrated region in an image results from insufficient x-rays passing through relatively dense anatomical regions. For example, anatomy containing dense tissue (abdomen) and bone (ankles/wrists/shoulders) result in under-penetrated images.

Under-penetrated regions of an image such as the cervical and thoracic spine appear white- white spine obscured by the overlaying anatomy like the white shoulders. Using TE, the overlaying anatomy can be made grayer making the underlying spine more visible ([Figure 15-43](#)). A hand image can similarly be displayed with improved bone contrast. This makes TE an invaluable tool in visualizing the entire bone field.

**Figure 15-43** Comparison with and without Tissue Equalization



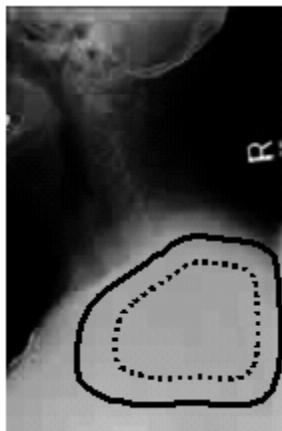
### TE Parameters

TE uses the information in the image to improve visualization. Two user-defined parameters; AREA and STRENGTH; control the extent and amount of TE that is applied to the image. There is an AREA and STRENGTH parameter for over-penetrated regions and an AREA and STRENGTH parameter for under-penetrated regions.

## Area

The AREA parameter defines the extent of application of the TE algorithm to the image. Increasing AREA increases the number of image pixels to which TE is applied. For example, in [Figure 15-44](#), setting the AREA to 30% for under-penetrated region uses the pixels within the dotted ROI. Increasing AREA to 60% increases the number of pixels where TE is applied, as indicated by the solid ROI.

**Figure 15-44** Using the AREA parameter in TE

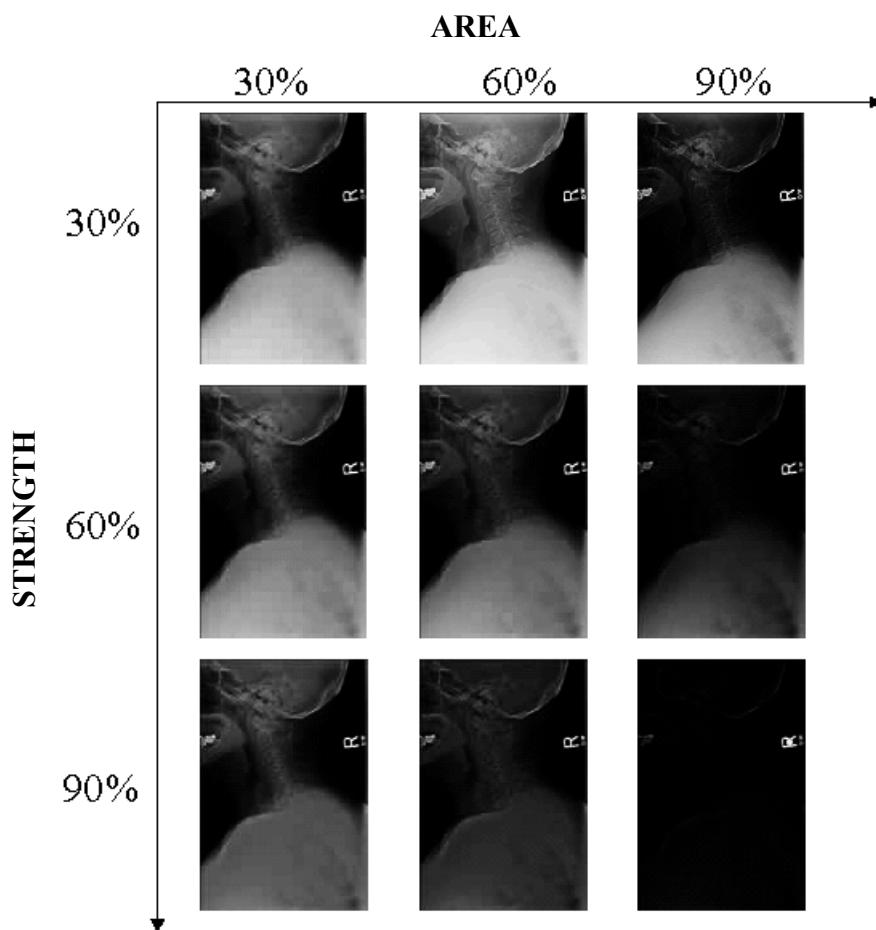


The combined AREA parameters for the over and under-penetrated regions cannot be greater than 100%. For example if the AREA parameter for over-penetrated regions is set to 40%, the AREA parameter for under-penetrated regions cannot be greater than 60% (100-40).

## Strength

The STRENGTH parameter affects the grayness of a region when TE is applied to it. For example, increasing STRENGTH for under-penetrated regions such as shoulders makes a white region grayer. Increasing STRENGTH for over-penetrated regions such as lungs makes a black region grayer. In both cases, increasing STRENGTH generally makes the region grayer.

The effect of varying AREA and STRENGTH in TE is demonstrated in [Figure 15-45](#) for under-penetrated regions. Increasing STRENGTH while keeping the AREA constant makes the pixel grayer in the shoulder region. Increasing AREA extends the region that becomes gray.

**Figure 15-45** Varied TE settings

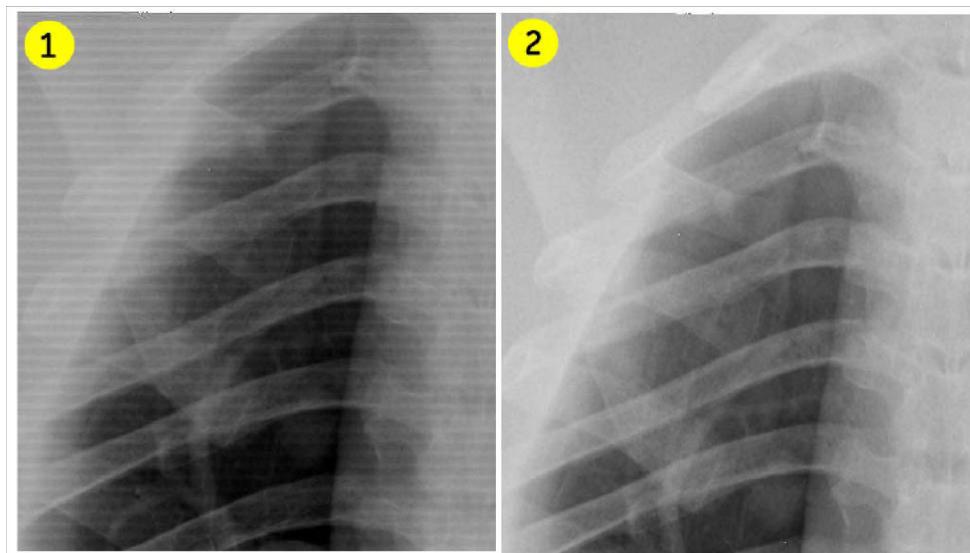
**Note:** Unlike Tissue Equalization, which controls contrast within under-penetrated (thick) or over-penetrated (thin) areas, Tissue Contrast controls the general contrast between the thick and thin anatomy. For example, Tissue Contrast can be used in combination with Tissue Equalization to define a Chest PA look that is equalized in the lung fields, but with light spine/ribs.

## Electromagnetic Interference (EMI) Reduction

### Overview

Image artifacts can be caused when the Digital Detector acts like an antenna, picking up electromagnetic signals emitted by external equipment in the area. Artifacts are periodic lines or bands in the image. EMI artifacts can be intermittent, depending on external signals present, as well as the relative timing between the detector readouts and the peaks of the electromagnetic signals.

To remove EMI artifacts from images you can use an image processing feature called EMI Reduction to try to remove as much of the artifact as possible. EMI reduction occurs prior to the raw image being displayed. Reprocessing an image will have no impact on EMI – if the artifacts are present on an image, they will still be present on a reprocessed image; if the artifacts are absent on an image, they will still be absent on a reprocessed image.

**Figure 15-46** Image with EMI Reduction OFF vs Image with EMI Reduction ON**Table 15-11** EMI Reduction Setting

Number	Definition
1	EMI Reduction OFF
2	EMI Reduction ON

The default setting for EMI Reduction is OFF. In order for EMI Reduction to be performed on any image, the feature must be turned ON. This will only apply to future acquisitions taken after the feature is turned on.

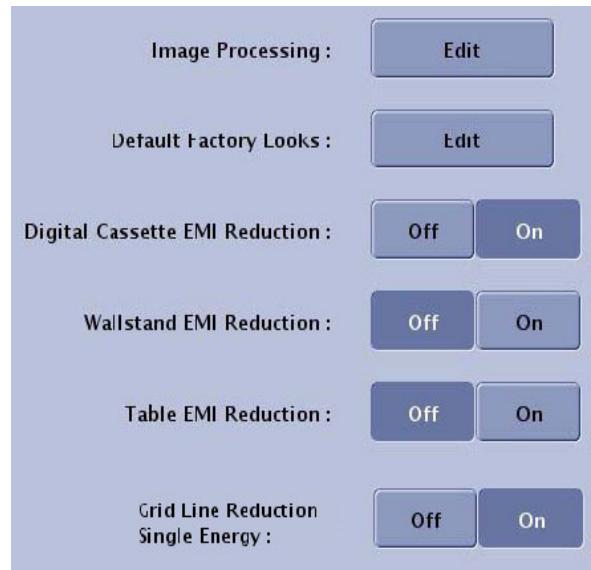
**NOTE:** When EMI Reduction is turned ON it will add approximately 2 seconds to image processing time. With EMI Reduction ON, the final image will include "EMI" in its annotation.

**NOTE:** EMI option is configurable to each individual receptor. Those options are Digital Cassette, Wallstand and Table.

**Figure 15-47** EMI

## Gird Line Reduction: Single Energy

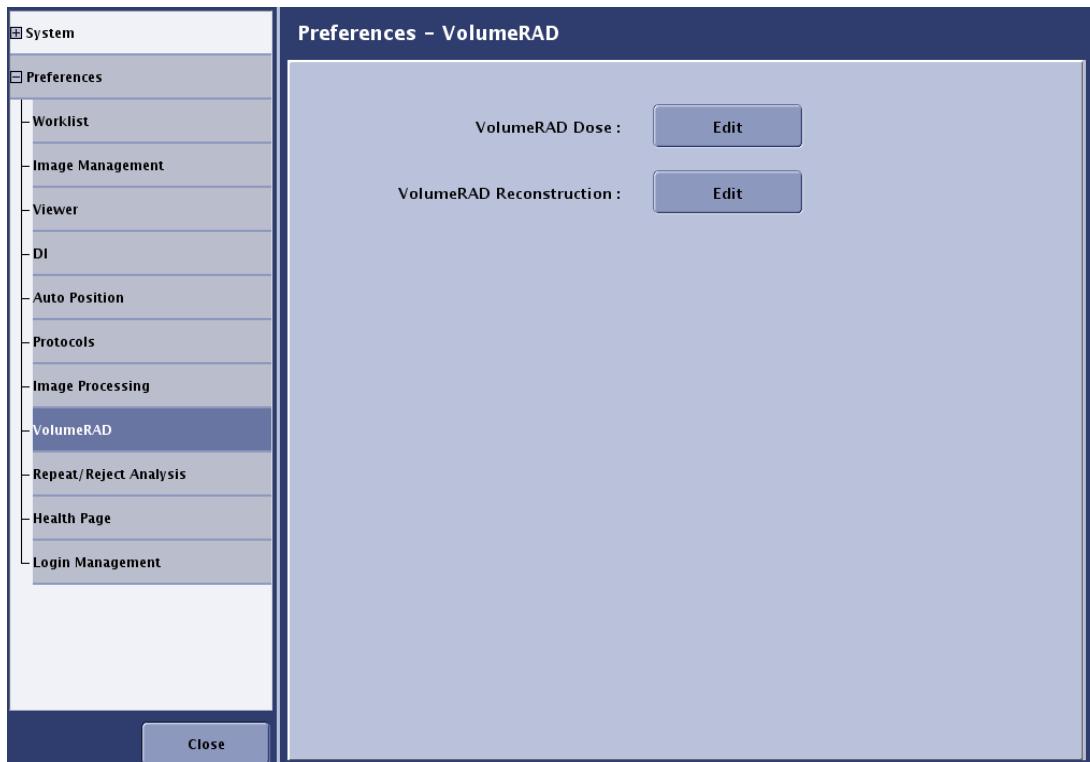
Grid line reduction is to reduce grid line in single energy image. It can be turned on and off in Utility-->Image Processing. Default setting is ON.



**NOTE:** When GLR is turned ON it will add approximately 1 second to image processing time. With GLR ON, the final image will include "GLR" in its annotation.

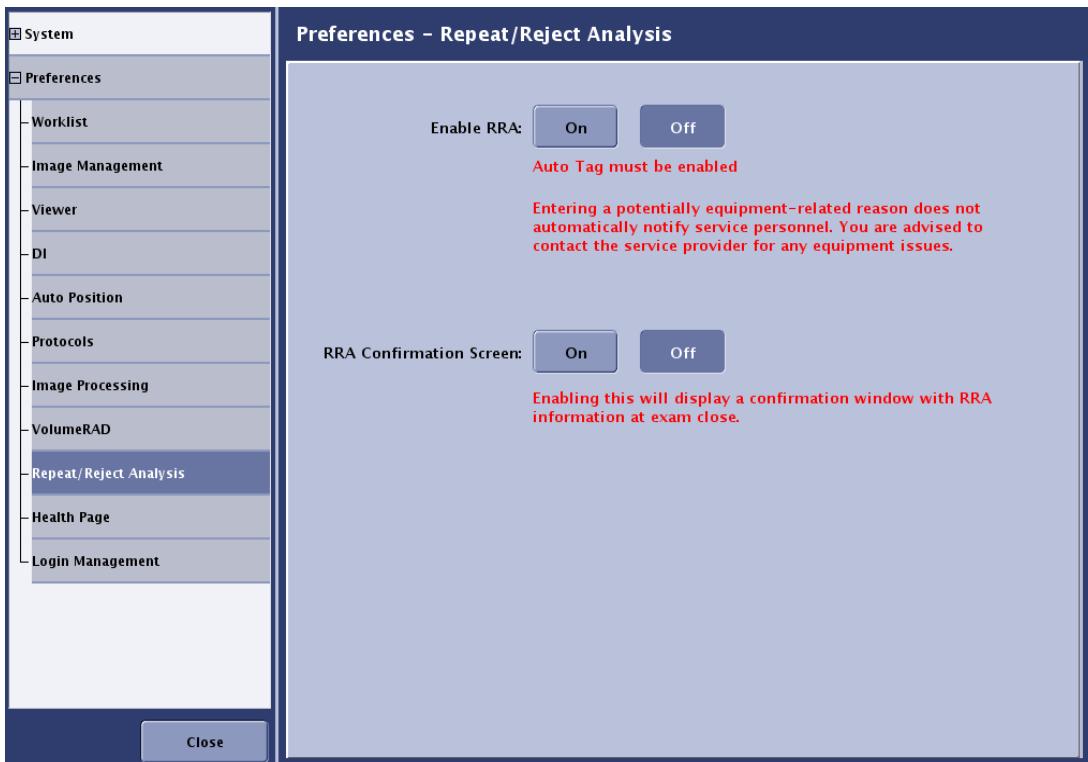
## VolumeRAD

The VolumeRAD preferences configure settings for VolumeRAD. Refer to [Chapter 13: Advanced Applications-VolumeRAD \(p. 13-49\)](#) for more information.

**Figure 15-48** Preferences - VolumeRAD

## Repeat/Reject Analysis (RRA)

Repeat/Reject Analysis is a purchasable application and can be enabled or disabled by the user on site. The RRA preferences allow enabling the RRA feature and the RRA Confirmation Screen on the system. Refer to [Chapter 13: Advanced Applications-Repeat/Reject Analysis \(RRA\) \(p. 13-13\)](#) for more information.

**Figure 15-49** Preferences - Repeat/Reject Analysis

## Health Page

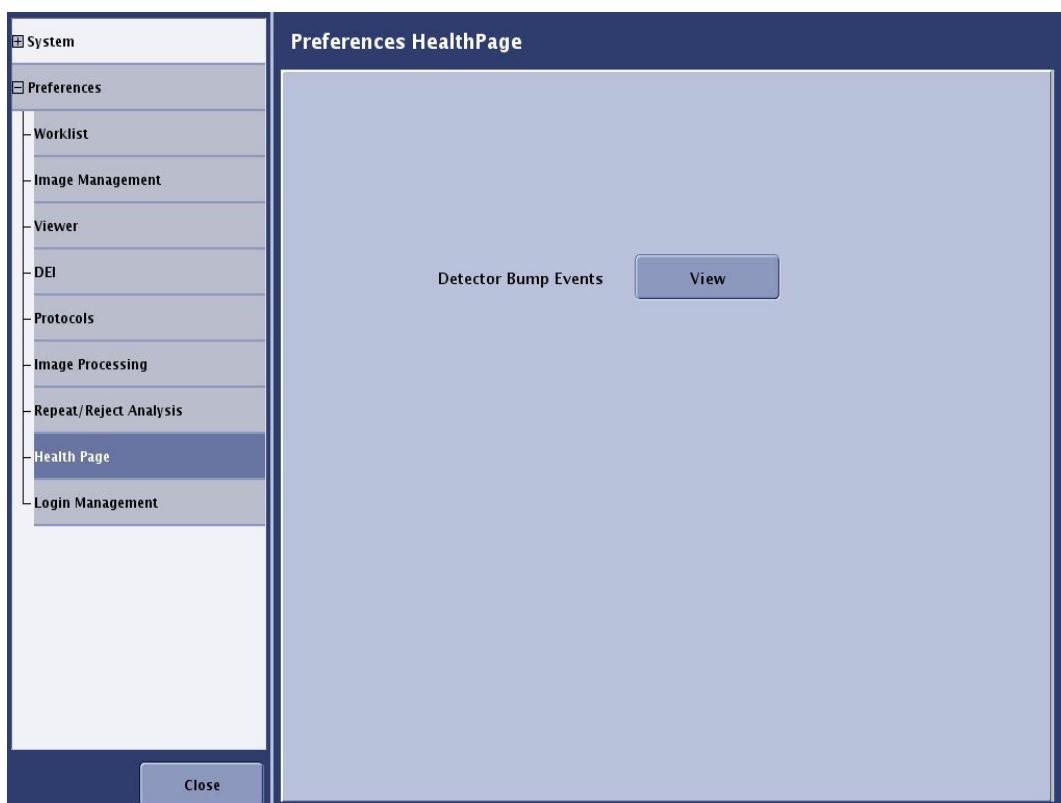
The Health Page provides the user awareness of significant detector bump events that may occur during handling of the detector. The Detector Bump Events Report will aid in identifying patterns of usage that may be causing events so as to correct or modify usage patterns. All users handling a detector should become familiar with the proper detector handling and care section, refer to [Chapter 7: Digital Detector-Detector Handling \(p. 7-2\)](#) for more information.

The Health Page will provide a list of the 10 most recent detector bumps/impact events that occurred to the connected detector(s). These events are stored in the detector until connection is made to the system.

**NOTE:** The communicating detector may be connected through wireless, tether or docked mode.

## To View Detector Bump Event Report:

- Click on Utilities-Preferences-Health Page-Detector Bump Events
- Once you have established detector connection, click [VIEW]

**Figure 15-50** Health page

- The Detector Bump Events report will be listed in the pop-up screen.

**Figure 15-51** Detector Bump Events

Detector Bump Events			
Occurrence	Serial #	Impact (measured in Gs)	Severity
YYYY-MM-DD HH:MM:SS	XA44280-8	x = 0 y = 0 z = 7	Serious (Level 5) or Critical (Level 3)
YYYY-MM-DD HH:MM:SS	XA44280-8	x = -11 y = 0 z = -5	

Connected Detector Stats:  
Serious = #  
Critical = #  
Last Connection Time: YYYY-MM-DD, HH:MM:SS

Close

**Table 15-12** Detector Bump Events

Item	Description
Timestamp	Records Accurate Local Time and Unknown Local Time
Serial #	Serial # of connected detector(s)
Impact	Displays impact of x,y,z axes
Severity	<ul style="list-style-type: none"> <li>• Level 5= Serious Impact (100-199 G's) <ul style="list-style-type: none"> <li>– With a Level 5 impact, a simple warning message will be displayed to the user to let them know to take care or caution when using the detector. This event should be considered a warning of a potentially significant impact. No further action is required by the user.</li> </ul> </li> <li>• Level 3=Critical Impact (&gt;200 G's) <ul style="list-style-type: none"> <li>– With a Level 3 impact an inhibit will be displayed and the QAP flag will appear on the QAP icon. This message should be considered a critical warning and performing QAP is required. After QAP is completed and passed, proceed with exposures. A system reset is not required to continue.</li> </ul> </li> </ul>

**NOTE:** When critical impact is determined, there shall be an exposure inhibit until QAP is completed. In the event of a FAILED QAP, it is recommended to discontinue use of detector and call GE Service.

**NOTE:** If a detector is not communicating with a system, the bump event will be stored in the detector until the detector has reestablished communication with a system. Once the detector has reestablished communication the events will be uploaded to the system for viewing.

## Time Stamp

The detector contains an internal clock which only recognizes actual time when connected to a system. Connection is made through wireless, tether or docking modes. The time noted in the timestamp column is the system time. In wireless mode, when the detector battery is removed the internal detector clock no longer has power to record time. Once battery or tether is used, power is restored to the detector's internal clock.

In the event that a bump event occurs during the time when the detector is not connected, the event will be stored with the last known time.

The timestamp on the Bump Events page displays in red indicates that real time of event is unknown.

# Appendix A: Login Administration

In the effort to provide aid for our customers in complying with the Health Insurance and Portability and Accountability Act (HIPAA), the Enterprise Access Authorization and Audit (EA3) control features have been implemented in this product. It is the facility's responsibility to ensure the proper usage of these features in order to conform to the Privacy Act.

## Enabling EA3 Login

On the Service User Interface, click on the Configuration Tab and select the Advanced Options. Click on the Radio Buttons available to Enable/ Disable the HIPAA option. By default the HIPAA option is disabled.

The Login feature can be turned on or off by your Field Engineer.

## Understanding Local and Enterprise Environments

The login function may be administered at either a local or enterprise level.

Local (or stand-alone) login administration is for a piece of equipment or information system to have its own set of login names and passwords. Each local system needs to have users with admin access set up to administer the login function. From the user's perspective, he or she needs a login name and password for each piece of equipment and information system necessary to perform his or her job.

Enterprise login administration is to use the site's existing login names and passwords to allow access to multiple pieces of equipment and information systems throughout the site. The login function is administered centrally by the site's system administrator because each system sends and receives login information over the network. From the user's perspective, he or she only needs one login name and password to access all equipment and systems necessary to perform his or her job.

For mobile units in an enterprise environment, login information is sent and received only when the unit is connected to the network.

## Understanding Privileges, Groups, and Users

Privileges are the rights to access a system or piece of equipment and perform certain functions. Privileges are assigned to groups. The privileges are created by GE and cannot be changed. They are:

- **GEHC Service** allows access to all functions for service and maintenance personnel.
- **Administrator** allows access to the Login administration and Preferences functions in addition to being able to add procedures to the Worklist, conduct exams, and manage images.
- **Standard and Limited User** only allows access to add procedures to the Worklist, conduct exams and manage images.

Groups are categories of users that have certain privileges assigned. Users get their privileges from groups. A user may be assigned to several groups. Groups are created and assigned privileges by a user with GE Service or Administrator access. If you do not have an enterprise system, the assignment of group privileges will

probably be limited to those who have administrator privileges and those who don't. If your system is set up for enterprise login, your IT person or administrator will be using more of the features.

When equipment is installed in an enterprise environment, the administrator configures the enterprise groups that the equipment will use. That is, the enterprise environment will have groups for many levels of access and job descriptions, the administrator will set the individual piece of equipment to use a sub-set of those groups.

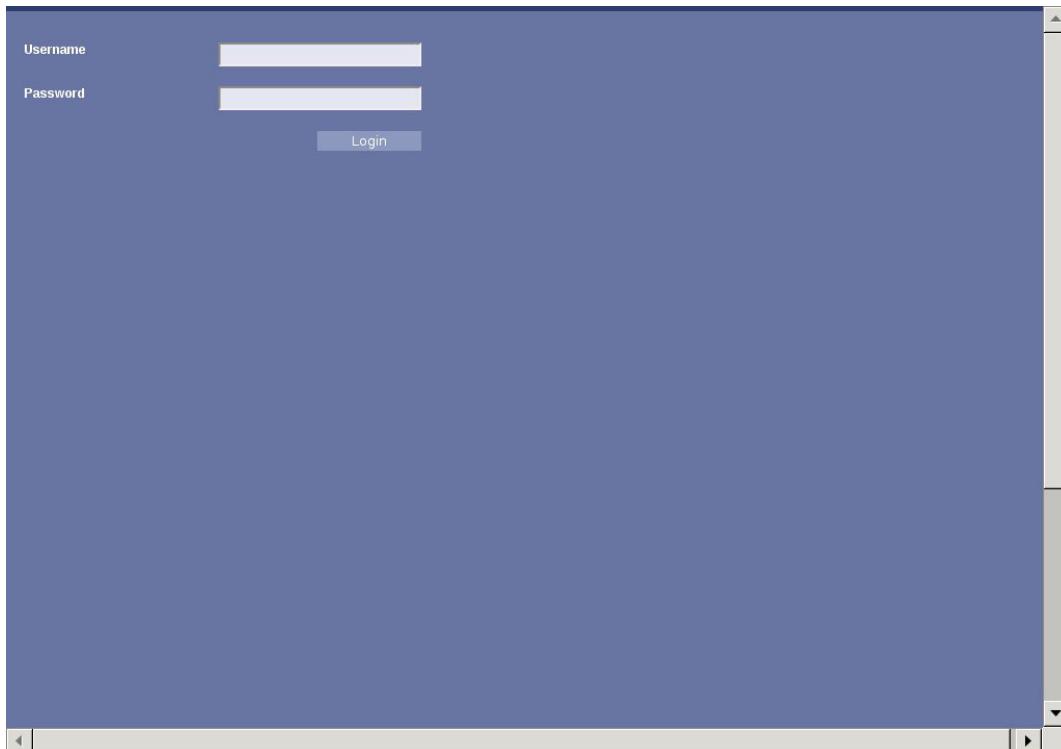
Users are individuals who have permission to use a particular system. Users are created and assigned to groups by a user with GE Service or Administrator access. These administrators may be IT personnel in an enterprise environment, or a site manager or lead tech in stand-alone environments. The administrator adds new users and assigns the users to a group which dictates the level of privileges a person will have. For example, a person named Sue Smith could belong to a group called technologists, radiologists, administrators, or any combination.

When configuring a system (enterprise or local) always create the groups and assign group privileges first, then add individual users to the groups.

## Configure Applications

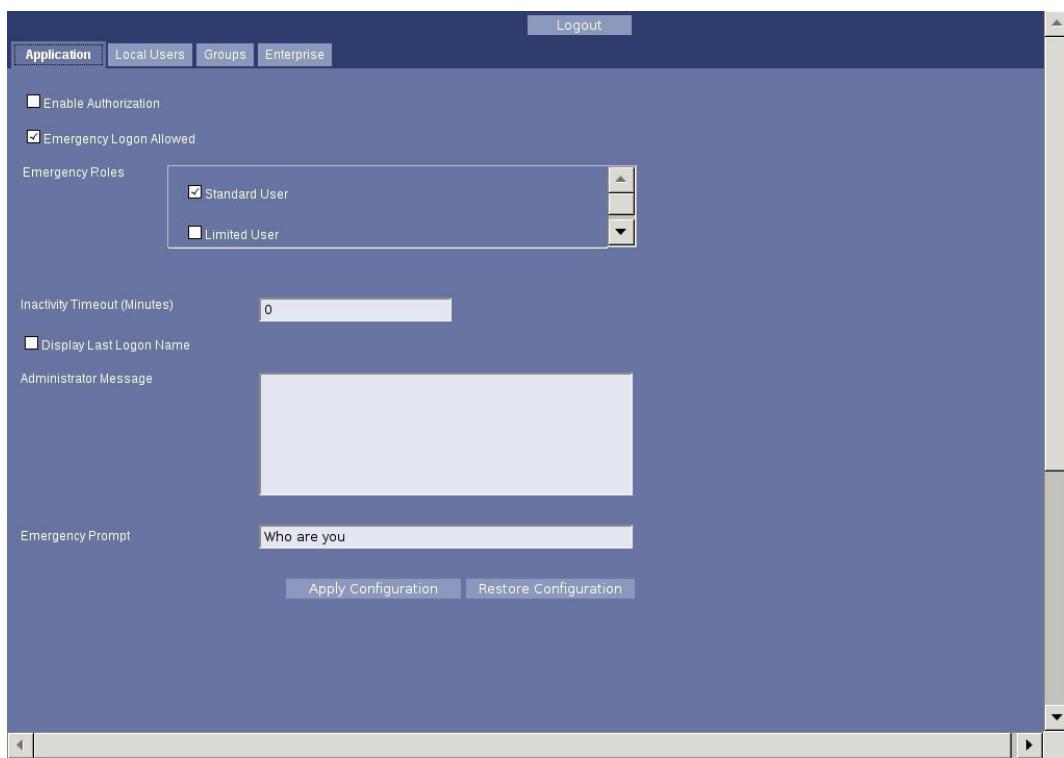
1. On the Worklist screen, click [UTILITIES].
2. Select **Preferences > Login Management**.
3. Click [Edit] and brings up the Administration Screen.

**Figure A-1** Administration Tab



4. Enter your Username and Password.

5. Press [Login].

**Figure A-2** Applications Screen

6. Make your desired selections.

- **Enable Authorization** - Whether or not to enable authorization. If authorization is enabled, anyone logging in through EA3 (both local and enterprise users) must have a role. Anyone without a role will be denied access if authorization is turned on. Note that the role the user has doesn't matter for logging into EA3 (however, some other EA3 client applications can decide which roles can login)
- **Emergency Logon Allowed** - Whether or not to allow emergency access. If EA3 is used in GUI mode, this decides whether or not to display the Emergency login button. If this is disabled, emergency user access is prevented.
- **Emergency Roles** - The roles assigned to the emergency user. The defaults allow an admin to assign a Standard user role, Limited User role, or both roles.
- **Inactivity Timeout (minutes)** - The amount of time (in minutes) that must elapse without any mouse/keyboard, etc. activity before a timeout is generated. When a timeout is generated, the EA3 logon screen is displayed. This value can be any positive integer, or it can be 0. If the value is 0, this indicates NO inactivity timeout (there will never be a timeout event regardless of how much time has elapsed).
- **Display Last Logon Name** - Whether or not to display the username of the last user that has logged in on the EA3 logon screen.
- **Administrator Message** - Under certain circumstances / error conditions, the user of EA3 is asked to contact an administrator. This field allows the administrator to specify contact details for himself / herself and a custom message.
- **Emergency Prompt** - The text that will be displayed to any user logging in as emergency. The user is asked to enter information (usually their actual user name). This text is the text that will appear in that prompt for information.

7. Press [Apply Configuration].

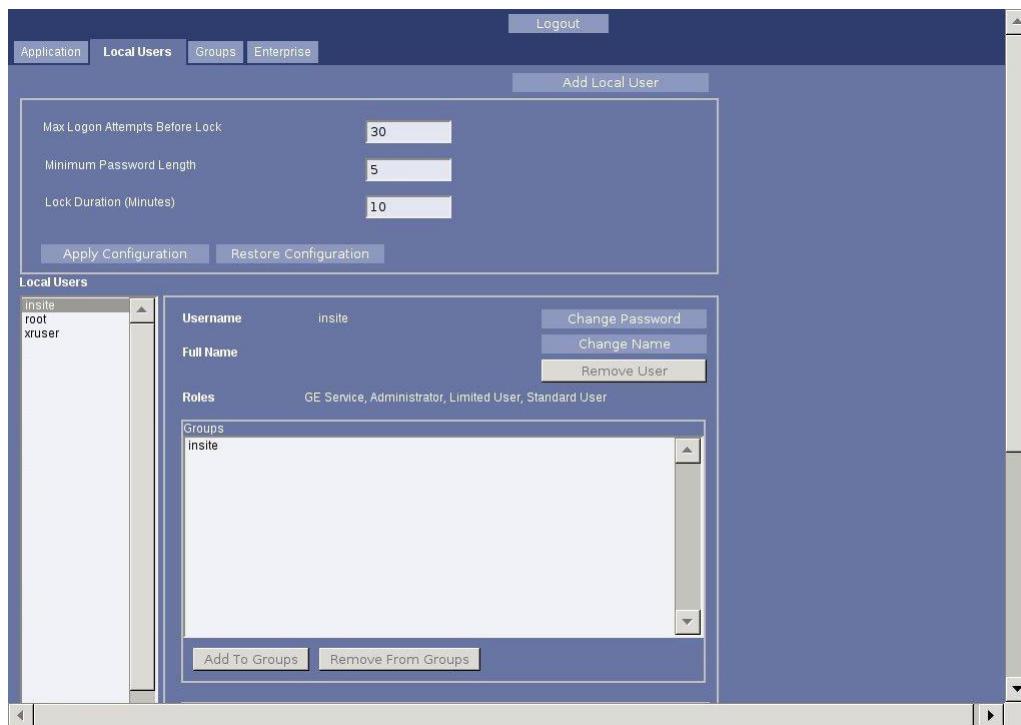
- To make a configuration change, make the necessary changes on the fields, and press the Apply Configuration button. If there was a problem with making the changes (such as an invalid value or a problem contacting the back-end Servlet) you will see a message box indicating this error with a description of the error. If the changes are successful, after the 'Apply Configuration' button is pressed, then you will see a brief message indicating that the changes were applied in a green label. If at any time, you want to revert your changes to what is currently saved on the back-end, you can press the Restore Configuration button. This will undo any changes that you have made that have not yet been saved by pressing the Apply Configuration Button. (Once you press the 'Apply Configuration' button and get the confirmation label, the changes have been applied).

## Configure Local Users

The second tab on the EA3 Administration Component is the Local Users tab. On this tab, you can add users, remove users, change user group memberships, change user names, change user passwords, lock / unlock users, force users to change their password on next login, etc. Below is a screen-shot of the EA3 Administration Component Local Users Tab:

- Select the Local Users tab.

**Figure A-3** Local Users Tab



- Select the choices you wish to have selected.

- Max Logon Attempts Before Lock - The number of failed login attempts a user can make before their account is locked for a certain number of minutes. When a user account is locked, that user will not be allowed to login, even if they provide the correct username/password combination. Either the specified time must elapse before the user can login again, or a user with ADMIN role must login to the EA3

Administration component to unlock the user. Note that locking only applies to local users (enterprise user locking is managed by the enterprise server)

- Minimum Password Length - The minimum length of a new password for a user. Note that if a password is below the minimum password length already, setting this value will have no effect on the password. For example if your password is 8 characters, and someone changes the minimum password length to 10 characters, the 8 character password is still ok. However, next time the user changes their password, they will have to choose a password that is 10 characters or greater. Note that minimum password length only applies to local users (password length restrictions for enterprise users are managed by the enterprise server)
- Lock Duration (Minutes) - The number of minutes a user stays locked for if they become locked because of failed login attempts.
- Apply Configuration - Use the Apply Configuration button to save changes.
- Restore Configuration - Use this button to undo any changes that have not been saved yet. If there are any errors, you will get a popup box describing the error. If it is successful, you will see a green label appear with confirmation information.

**Note:** Users can become locked in one of two ways.

- The user enters too many incorrect passwords. In this case, the user will be locked out for a certain amount of time, even with a correct password. Once the time has elapsed, the user can attempt a login again. An administrator can unlock this user before the lock duration time has elapsed by unchecking Locked under the Local User tab when a user is selected.
- The administrator forcefully locks the user account. In this case, the lock duration does not apply to a user who was forcefully locked by an administrator. They are locked until the administration unlocks them.

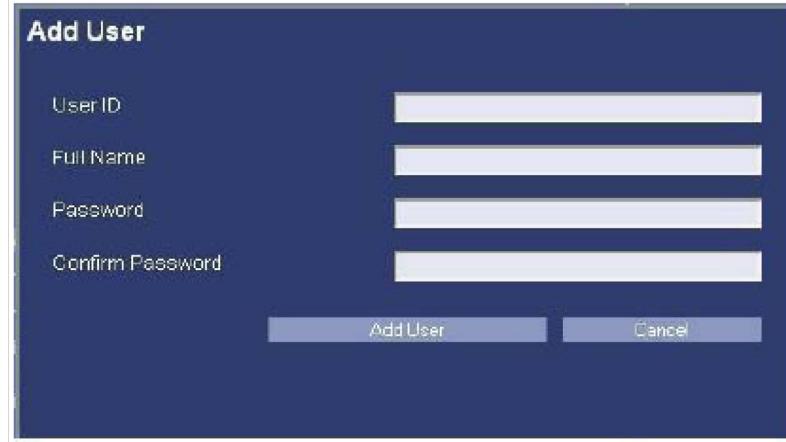
3. Press [Apply Configurations].

## Add a Local User

Once a user is added, it is automatically highlighted in the Local Users list box on the left-hand site, and it is 'in context'. Once a user is in context, all information and buttons in the center panel (i.e. Username, Full Name, Roles, Change Name, Change Password, Remove User, Groups list box, Add To Groups Button, and Remove From Groups button) refer to that user.

1. Press [Add Local User].
- When this button is pressed a popup panel is displayed.
2. Enter the new User ID (which must be unique).
3. Enter a Full Name.
4. Enter a Password.
5. Enter the Confirmed Password.
- If any errors are encountered, you will receive an error messagebox. If you receive the error messagebox, changes were not committed to the database, and you can correct your errors and try again. Possible errors that can be encountered when adding a user are:
  - User ID already exists in the local user database (Choose a different unique username)

- Password does not meet the minimum length requirements (Choose a longer password)
  - Password and Confirm Password box do not match (Make sure the passwords match)
6. Press [Add User].

**Figure A-4** Add User Screen

## Change a User Password

You can select a user to be 'in context' by pressing on the user's id in the 'Local Users' list box on the left side. Only one user can be in context at a time, and if you attempt to choose multiple users, EA3 will select the top-most user that is selected. Once a user is 'in context', you can make any necessary modifications to that user.

**Note:** When you first navigate to the Local Users tab, EA3 will put the first listed local user 'in context' automatically. If there are no local users then there will be no user in context, and all of the buttons in the center panel will be disabled until a user is added.

1. Select User.
2. Press [Change Password].
  - This brings up a popup panel with two textboxes for the password.
3. Make changes to the password.
4. Press [Confirm Change].
  - If you do not want to make the change, simply press Cancel.
  - If the password doesn't meet the minimum length requirements, you will receive an error messagebox. If this occurs, your changes were not saved. Simply make the necessary corrections, and press Confirm Change again.

**Figure A-5** Change Password

## Change a User Full Name

1. Select User.
  2. Press [Change Name].
  3. Make changes to the name.
  4. Press [Confirm Change].
- If you do not want to make the change, simply press the Cancel button.

**Figure A-6** Change Name

## Remove a User

1. Select User.
  2. Press [Remove User].
  3. Press [Confirm Removal].
- If you do not want to make the change, simply press the Cancel button.

**Figure A-7** Confirm Removal

## Add or Remove a User from a Group

All of the groups to which this user belongs are listed in the Groups list box.

1. Press [Add To Groups] or press [Remove From Groups].
- This brings up a popup panel that lists all of the groups that this user is eligible to be added to. If there are no groups that this user is eligible to be added to, you will get an error message box instead of the popup panel. Once you get the popup panel, simply select all of the groups to which you want to add this user (you can select as many as you want at one time).
2. Press [Add Membership] or press [Remove Membership].

**Figure A-8** Add To Groups

**Figure A-9** Remove From a Group

## Change User Roles

Users roles cannot be directly changed from the Local Users panel. Roles are actually associated with groups, and users belong to groups. In order to change the roles for a user, you must change the roles of a group to which that user belongs.

## Locking / Unlocking a User

Once a user is in context, you can see if the user is locked by looking at the status of the Locked check box in the bottom panel. If this is checked, then the user cannot login even with a correct password.

1. To unlock the user, uncheck the check box, and press Apply Configuration button.
2. To lock a user, check the check box and press the Apply Configuration button.

**Note:** If Emergency User is enabled, you can still login through Emergency User while the system is lock.

## Force a User to Change Password on Next Login

Often times if you are an administrator, you would like to force a user to change his or her password the next time they login for security reasons. You can do this using EA3.

1. Select User
2. Check the Change Password on Next Login check box in the bottom panel.
  - If this is checked, then the user will be asked to change their password on the next successful login.

**Note:** Once the user changes the password on the next login the check will be removed from this user.

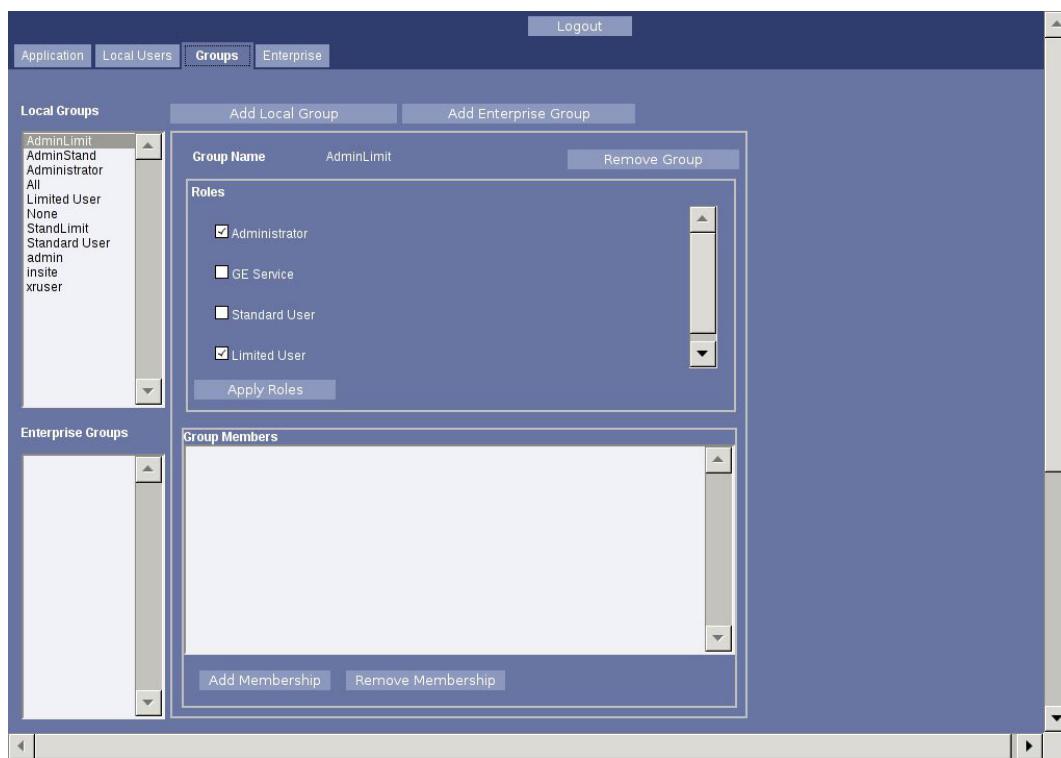
## Some fields may not be selectable if the following conditions occur.

- For Users:
  - Permanent - If a user is permanent, they can never be removed. When a permanent user is in context, the 'Remove User' button will be disabled.
  - Content Not Editable - If a user is flagged as this, then their group memberships cannot be changed. When a 'content not editable' user is in context, the 'Add To Groups', and Remove From Groups' buttons are disabled.
  - Password not changeable - If a user is flagged as this, then the password cannot be changed, and the 'Change Password' button will be disabled.
- For Groups:
  - Permanent - If a group is permanent, it can never be removed. When a permanent group is in context, the 'Remove Group' button will be disabled.
  - Content Not Editable - If a group is flagged as this, then its group members cannot be changed (neither added nor deleted). When a user belongs to a Content Not Editable group, this user cannot be removed from the group (therefore, the group name will not show up when you press 'Remove From Group'). When a user does not belong to a Content Not Editable group, this user cannot be added to the group (therefore, the group will not show up when you press 'Add To Group').
  - Role Not Editable - If a group is flagged as this, then the Roles associated with that group cannot be changed. This property itself does not have a direct impact on what you can do on the Local Users tab.

## Configure Groups

The third tab on the EA3 Administration Component is the Groups tab. On this tab, you can add local groups, add enterprise groups, remove local groups, remove enterprise groups, change group roles, and change group memberships.

1. Press [Groups].

**Figure A-10** Groups window

## Add a Local Group

2. Press [Add Local Group]
  - When this button is pressed a popup panel is displayed.
3. Enter the new group's name (which must be unique).
  - If any errors are encountered, you will receive an error message box. If you receive the error message box, changes were not saved to the database, and you can correct your errors and try again. Possible errors that can be encountered when adding a group are:
    - Group name already exists in the database
    - Application session timeout
  - Once a local group is added, it is automatically highlighted in the Local Groups list box on the left hand side, and it is highlighted. Once a group is highlighted, all information and buttons in the center panel (i.e. Group Name, Remove Group Button, Roles check boxes, Apply Roles button, Group Members list box, Add Membership button, and Remove Membership button) refer to that group.

**Figure A-11** Add Group

4. Press [Add Group].

## Add a Enterprise Group

Adding an Enterprise group is quite similar to adding a local group.

1. Press [Add Enterprise Group].
2. When this button is pressed a popup panel is displayed.
  - If any errors are encountered, you will receive an error message box. If you receive the error message box, changes were not saved to the database, and you can correct your errors and try again. Possible errors that can be encountered when adding a group are:
    - Group name already exists in the database
    - Application session timeout
3. Press [Add Group].
  - Adding an enterprise group doesn't actually add a group to the Enterprise directory server. What it does is give EA3 the ability to manage roles for that group, which should already exist on the Enterprise directory server. So, for example, if you add a group 'All Employees' as an Enterprise group to EA3, and assign that group with the STANDARD role, then any enterprise user that logs in through EA3 and belongs to the 'All Employees' group will have the STANDARD role.
  - You cannot manage the group memberships for Enterprise groups. This is managed by the directory server, not EA3. Therefore, whenever an Enterprise group is in context, both the 'Add Membership' and 'Remove Membership' buttons will be blocked out. This doesn't mean that no one belongs to the Enterprise groups, just that this is managed by the directory server and not EA3.
  - Once an enterprise group is added, it is automatically highlighted in the Enterprise Groups list box on the left-hand site, and it is 'in context'. Once a group is in context, all information and buttons in the center panel (i.e. Group Name, Remove Group Button, Roles checkboxes, Apply Roles button, Group Members list box) refer to that group.

**Figure A-12** Add Enterprise Group

## Manage a Group

You can select a group to be highlighted by pressing on the group's name in either the 'Local Groups' or the 'Enterprise Groups' list box on the left side. Only one group can be highlighted at a time, and if you attempt to choose multiple groups, EA3 will automatically select the top-most group that is selected. Once a group is highlighted, you can make any necessary modifications to that group.

**Note:** When you first navigate to the Groups tab, EA3 will put the first listed local group highlighted automatically. If there are no local groups, then EA3 will put the first listed enterprise group highlighted automatically. If there are no local groups or enterprise groups, then there will be no group highlighted, and all of the buttons in the center panel will be disabled until a group is added.

## Remove a Group

1. Once a group is highlighted, press [Remove Group].
  - This brings up a popup panel asking you to confirm the removal of the group.
2. If you want to remove the group, press [Confirm Removal].
  - If you do not want to remove the group, simply press [Cancel].

**Figure A-13** Remove Group

## Change Group's Roles

Once a group is highlighted, check or uncheck the checkboxes for the Roles you want to give to this group, and press [Apply Roles]. There is a green label confirmation as usual for successfully applied roles. If there is a failure on the back-end (i.e. a problem writing the roles configuration changes), you will receive an error message box with information.

## Add Memberships

1. Once a group is highlighted, press [Add Membership].
- This brings up a popup panel that lists all of the users that are eligible to be added to this group. If there are no users eligible to be added to this group, you will get an error message box instead of the popup panel. Once you get the popup panel, simply select all of the users that you want to add to this group (you can select as many as you want at one time).
2. Press [Add Membership].
- If you do not want to remove the group, simply press [Cancel].

## Remove Memberships

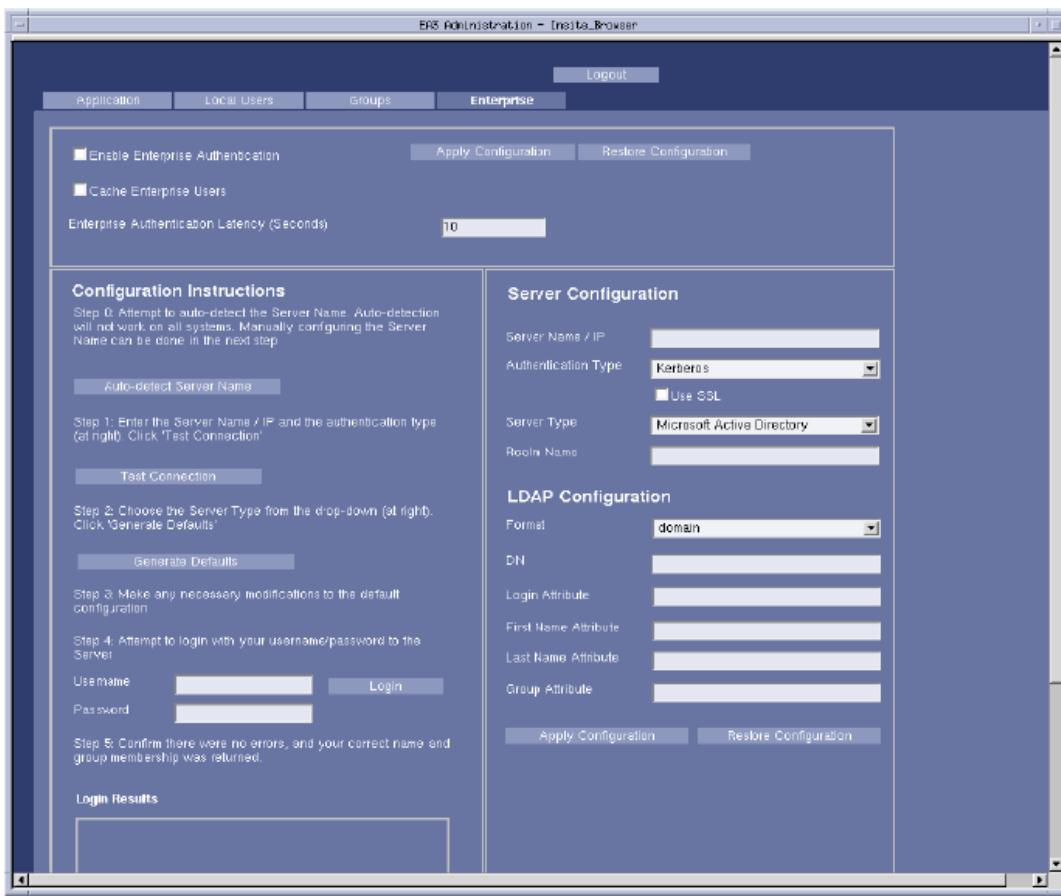
1. Once a group is highlighted, press [Remove Membership].
- This brings up a popup panel that lists all of the users that are eligible to be removed from this group. If there are no users eligible to be removed from this group, you will get an error message box instead of the popup panel. Once you get the popup panel, simply select all of the users that you want to remove from this group (you can select as many as you want at one time).
2. Press [Remove Membership].
- If you do not want to remove the group, simply press [Cancel].

## Configure Enterprise Tab

The last tab on the EA3 Administration Component is the Enterprise tab. On this tab, you can configure the properties necessary to make a connection to an Enterprise directory server (i.e. MSAD, Novell, etc.). The Enterprise Tab is used by the site's IT (Information Technology) or GE Service personnel. It provides connectivity to the site's user database. If you do not have a network established in your hospital or clinic, this tab will not be used.

Things to consider:

- Utilize the enterprise capability whenever possible.
  - Make sure the enterprise groups are granular enough to restrict protocol edit access.
  - The inactivity timeout should be turned on.
1. Press [Enterprise]

**Figure A-14** Enterprise Tab

The following configurations can be made on the top box of this tab:

- Enable Enterprise Authentication - Whether or not Enterprise users should be able to log in. If this is unchecked, only local EA3 users will be able to log in. If this is checked, both local users and enterprise EA3 users will be able to log in (although the local EA3 user database will always be tried first).
- Cache Enterprise Users - Whether or not Enterprise users should be cached once they successfully login. If this is checked, then a local record of an Enterprise user is kept. If at any time that user attempts to login again, and for some reason the Enterprise directory server is not available (i.e. network problems), that user will be granted access if they provide the correct password. If this is unchecked, then an Enterprise user will be denied access in the case that the Enterprise directory server cannot be reached. Note that hashed passwords are cached, the actual password is not cached.
- Enterprise Authentication Latency (Seconds) - The amount of time (in seconds) that the EA3 login process should wait for a response from the Enterprise directory server. Often times, there is a network latency when connecting to servers, and it will be different on different network configurations. If the amount of time is reached without a response from the directory server, the EA3 login process will return a failed login. A value of 5 seconds should be enough time to allow a properly configured directory server to respond, without being too much of an annoyance to the user if the directory server is down (i.e. they will only have to wait at a maximum 5 seconds for the login attempt to return).
- Applying configuration changes on the Enterprise tab top box are the same as mentioned before for the Application tab. Use the Apply Configuration button to commit changes, and the Restore Configuration

- button to undo any changes that have not been saved yet. If there are any errors, you will get a popup box describing the error.
- Additionally, the actual connection to the Enterprise directory server can be made on this tab. You will be modifying properties in the lower two boxes of the Enterprise tab

## Auto Configuration

- Press [Auto-detect Server Name].
  - This attempts to lookup the name of Server Name of the directory server.
  - In some environments, EA3 can try to auto-detect the Enterprise Directory Server. This will only work in some environments (i.e. where DNS allows service lookups). This is just a convenience feature, and will sometimes return with an alert that the auto-detect could not find the server. It is not an error if that message is displayed, simply continue with these steps to configure the Server.
- Enter the Server Name or IP address of the Enterprise directory server that EA3 should connect to, in the Server Configuration box.

**Note:** The system must be able to resolve any IP address or server name. This means the system must either have DNS enabled or the system must have static information in a hosts file (i.e. /etc/hosts).

- Choose the Authentication type that the directory server supports.
  - If it is a Microsoft Active Directory Server, most likely you need to choose Kerberos. If it is a Novell eDirectory Server, most likely you need to choose LDAP. If you do not know, check with the owner of the directory server for information.
  - If the enterprise server supports SSL connections, check the 'Use SSL' checkbox.

**Note:** If you use LDAP authentication without SSL, passwords will be sent in the clear. This is not recommended, and the client is alerted if they attempt to configure this way. With kerberos and non SSL, the authentication is encrypted, but the LDAP traffic is not.

- Press [Test Connection].
  - This tests to see if the machine can connect to the directory server. If the connection is successful, you will see a label with a 'CONNECTION OK' text next to the Test Connection button.
  - If the connection is not successful, you will see a label with a 'CONNECTION BAD' text next to the Test Connection button.
  - If the connection is bad, then there is a problem connecting to the directory server.
  - Possible problems are wrong IP/server name or the system does not have DNS running / cannot resolve the IP address / server name.
  - Once the Test Connection procedure indicates that the connection is good,
- Select the type of directory server (either Microsoft Active Directory, Novell eDirectory, or orhter).
- Press [Generate Defaults] button.
  - This should populate the Realm Name, Format, DN, Login Attribute, First Name Attribute, Last Name Attribute, and Group Attribute fields with default values for that directory server type.
  - If the directory type is MSAD, both the realm name and the DN should be populated. If the directory type is eDirectory, the realm name will be blank. If you are attempting to configure a directory server that is not

- MSAD or Novell eDirectory, the configuration will have to be done manually. You'll need to get the correct LDAP property information from the owner of the directory server.
- If this is a non-MSAD, non-eDirectory server, or is a server with a non-default configuration, it is possible that you may need to change some properties manually. See below for a definition of all of the properties that you can configure.
7. Enter a username and password of a user that resides on the directory server.
  8. Press [Login].
    - You will see login result information in the Login Results section on the bottom of the tab.
    - This will indicate if the login was successful or not.
    - Additionally, it will print out the First Name, Last Name, and any group memberships for the user. You may get a warning if First Name, Last Name, or Group Memberships were not found.
    - Getting this warning means 1 of two things:
    - The LDAP properties are mis-configured (i.e. First Name Attribute, Last Name Attribute, and/or Group Attribute)
    - The user doesn't have a First Name, Last Name, or any Group Memberships configured on the Enterprise directory server.
    - If you get these warnings, you may want to talk with the owner of the directory server to make sure you have everything set up correctly.
    - If the test login succeeded and you are satisfied with the first name, last name, and group membership information, then your Enterprise directory server is properly configured.
  9. Press [Apply Configuration].
    - This makes the configuration changes. Just like other tabs in the Administration component, pressing Restore Configuration will undo any changes made that have not yet been applied.

## Manual Configuration

As mentioned before, if you are connecting to a directory server that is not MSAD or Novell eDirectory, or the directory server you are connecting to has a custom configuration, you may need manually configure some of the properties. Here are definitions of all of the LDAP configuration properties and what they do.

- Format - This is either set to domain or dn. domain is the 'MSAD' way of doing LDAP authentication (i.e <userId>@<realm name>). dn is the other way of doing LDAP authentication, which eDirectory, and most other directory servers use (i.e. loginAttribute=<userId>,<ldap base dn>). If you are connecting to a non-MSAD directory server, it's pretty safe to say that you should use dn.
- DN - This is the LDAP base DN of the LDAP server to which you are connecting. Usually this is the fully qualified domain name separated by a bunch of 'DC=''. For example, if the fully qualified domain name of the directory server is 'example.com', it is likely that the DN will be 'DC=example,DC=com'.
- Login Attribute - This is the LDAP attribute that should be used for the unique identifier of the user. This is what they will use as their user id to login. On MSAD this is 'sAMAccountName', and on eDirectory, it is usually 'cn'. This should be set to whatever the directory server you are connecting to uses as a unique identifier.
- First Name Attribute - This is the LDAP attribute that should be used for the first name of the user.

- Last Name Attribute - This is the LDAP attribute that should be used for the last name of the user.
- Group Attribute - This is the LDAp attribute that should be used to find group memberships for the user. On MSAD, this is 'memberOf'.

**Note:** EA3 finds all instances of this attribute (not just the first, like it does for other attributes). So if a user belongs to more than one group, EA3 will find all memberships.

**Note:** Regarding LDAP parameter configurations, EA3 finds the first instance of the configured attribute for a user, except for Group Membership. So, if you configure the First Name attribute to be an attribute that is listed multiple times, EA3 will assume the first one found during an LDAP query is the correct First Name. For Group Membership, EA3 will find all instances of that attribute.

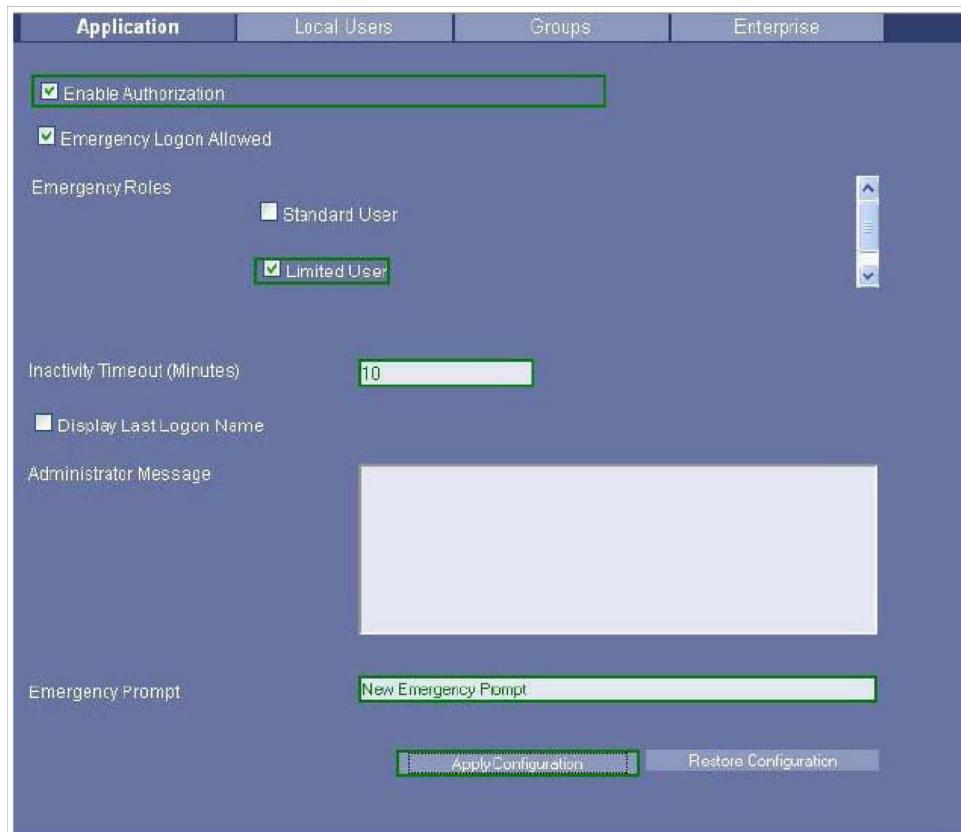
## Field Highlighting for changes

No changes are saved to EA3 on the Administration page unless you press an 'Apply Configuration' button on the normal tabs or a 'Confirmation' button on a popup panel.

- For the 'Apply Configuration' buttons, when they are pressed, and successfully commit information to EA3, you will see a brief (5-second) label appear indicating that the changes have been saved. The same things happen when you Restore Configuration (e.g. after you made some changes and want to revert back and you haven't pressed 'Restore Configuration' yet).

**Note:** If you make changes on one tab (e.g. Application tab), and do not press Apply Configuration, and then you navigate to another tab, your changes will be lost. The next time you navigate to this tab, since the changes were never applied, you will see the old configuration. So, after making changes on a tab, but before navigating to a different tab, you must press Apply Configuration. Also, there are sometimes more than one Apply Configuration button on a given tab, so make sure you press the one associated with the data you changed (the buttons are grouped with the data they manage in a bordered panel).

To help the you understand what fields you may have changed, any changed fields are highlighted with green text / borders, and the Apply Configuration button that must be pressed in order to commit the changes. Below in Figure 5-43 is demonstrating field highlighting. You can see that several fields have changed, and you should press the Apply Configuration button.

**Figure A-15** Highlighted Changes

# Appendix B: Specifications

- X-ray Tube
  - Heat Storage Capacity
    - Anode: 260,000 Joules (350,000 heat units)
    - Tube Unit: 1,110,000 Joules (1,500,000 heat units)
  - Maximum Heat Dissipation Rate
    - Anode: 75,000 heat units per min. (925 watts)
    - Tube Unit: 60,000 heat units per min., blower operating (740 watts)
  - Focal Spot Sizes 0.6 mm/1.3 mm
  - Target Angle 12.5°
  - Maximum Voltage:
    - Anode to Cathode 150 kVp rectified
    - Anode or Cathode to ground 82 kVp
- Ambient operating conditions
  - Ambient temperature: +15° C to +35° C (maximum change 10° C per hour)
  - Relative humidity: 30% to 60% RH, non-condensing (maximum change 30% per hour)
  - Atmospheric pressure: 106 kPa to 70kPa
- Power supply conditions
  - Allowed nominal input voltages: 380, 400, 420, 440, 460 and 480. Three phase with or without neutral
  - Maximum daily voltage variation must fall within +/- 10% of nominal input.
  - Jedi HF 65/80 generators are adaptable to both 50 Hz and 60 Hz supplies.
- Power output
  - Max output:  
[80 kW (1000mA@80kV);  
65 kW (500mA@130kV);  
50 KW(400mA@125kV);]
  - Nominal output:  
[80 kW (800mA@100kV, 0.1s);  
63 kW (630mA@100kV, 0.1s);  
50KW(500mA@100kV, 0.1s);]
- System Specification
  - Highest XRAY TUBE CURRENT @ NOMINAL X-RAY TUBE VOLTAGE: 533mA@150KV
  - Highest X-RAY TUBE VOLTAGE@Highest XRAY TUBE CURRENT: 80kV@1000mA
  - Nominal Shortest Irradiation Time: 2ms
  - Allowable deviation of X-ray tube voltage: <=10%
  - Allowable deviation of X-ray tube current: <=20%
  - Max. CURRENT TIME PRODUCT is 630mAs
- X-ray tube voltage range and the allowable deviation

- Digital adjustment: 40 ~ 150 kW, minimum increment 1kV
  - Allowable deviation: 10%
- X-ray tube current range and the allowable deviation: For AEC mode and Fixed mode
  - Current range:
    - 80 kW: 10 ~ 1000 mA, totally 21 steps;
    - 65 kW: 10 ~ 800 mA, totally 20 steps;
    - 50KW: 10 ~ 630 mA, totally 19 steps;
  - Allowable deviation: 20%
- Time of exposure
  - X-ray tube exposure time range: 2.0 ms ~ 2 s
  - Allowable deviation: ( 10% +1ms)
- X-ray tube current time product range and the allowable deviation
  - Digital steps adjustment: 0.5 mAs ~ 630 mAs
  - Allowable deviation: (10% + 0.2mAs)]
- High-voltage generator - rated power
  - Power (kW) 50, 65 or 80
  - kVp 40 to 150
  - mA 10 to 800 (1000 mA for 80 kW systems)
  - mAs 0.5 to 630
  - Allowable tube voltage range deviation: <±3% ± 2 kVp
- Collimator
  - Automatic and manual X-ray beam collimation
  - Operator selectable added filters: 0.1mm, 0.2mm or 0.3mm copper
- Tilting wall stand system
  - Wall Stand detector housing dimensions: (with detector vertical and covers installed)
    - Height <53 cm
    - Width <69 cm
    - Minimum height from floor to center of panel 28.5 cm (+/-0.5 cm)
    - Maximum height from floor to center of panel 178.5 cm (+/-1.5 cm)
    - Wallstand vertical travel 150 cm (+/-1 cm)
  - The wallstand tilts from -20 to 90 degrees
- 4-directional floating table
  - Elevating range = 57 – 82 cm (20 –32 in) (+/-1 cm)
  - Size of tabletop: 89 cm width x 225 cm length (35 in x 88.6 in)
  - Max. Patient Weight:
    - = 220 Kg/485 lbs. (with full functionality. Includes elevating and 4-directional floating)
    - = 320 kg/705 lbs. (Includes 4-directional floating. Table elevation is not recommended)
- Wireless Digital Detector
  - Detector Size 41 cm x 41 cm
  - Active Matrix 2022 x 2022 pixels

- Image Depth 14 Bit
- Pixel Pitch 200 microns
- Typical Dynamic Range 0.6 uR – 7.8 mR @ RQA5
- Typical DQE 68% (@ 0lp and RQA5, per IEC 62220-1)
- Available options include: Wireless, Docked, or tethered
- Detector Health Page
- Export QAP results
- Detector Association Utilities
- Detector Battery Indicator and Charger
- Digital acquisition, processing & review workstation
  - 2–19” (48cm) LCD Color Monitors (1280x1024 pixels)
  - Hard Disk Storage 320 GB, <19,500 Images
  - RAM 6 GB
  - Image processing times for single exposure exams – times include acquisition and image processing:
    - Fast preview images < 3 seconds
    - Final Conditioned Image Including Auto-Shuttering < 7 seconds
    - Expose to expose time < 5 seconds @ 70% HU
  - Image processing times for multiple exposure exams – times include acquisition and image processing:
    - Dual EnergySubtraction all Images < 15 seconds
    - Auto Image Paste (3 images) < 22 seconds
- UWB communications
  - Wireless point-to-point network between the system and detector for transferring image data
  - Communication over wide 500MHz channels to achieve very high data rates
  - Low output power to limit range to less than 10 meters to increase safety and spectrum reuse
  - Designed to co-exist with 802.11 networks without interference
  - Frequency: 3.168-4.752GHz and 6.336-7.920GHz. Uses Band Group 1 and 3. (Frequencies used are limited by each country's regulations)
  - Max Power Output: -41.3dBm
  - Max PHY Data rate: 480 Mbps
  - Effective Throughput: 30-70 Mbps
  - Standards: WiMedia PHY spec v1.2, WiMedia MAC spec v1.0, Certified Wireless USB spec v1.0
- Dose/DAP Specification
  - Typical Dose/DAP value:  
Dose 90 $\mu$ Gy, DAP 1.05dGy $\cdot$ cm<sup>2</sup>  
for Chest 120kVp, 2mAs, 180cm SID, 41cmX41cm FOV, 25cm patient thickness
  - The acceptable tolerance of displayed Dose/DAP value is  $\pm 30\%$  compared to actual Dose and DAP value.
  - As the Phantom, use a 20cm thick polymethyl-methacrylate (PMMA) rectangular block with sides equal to or exceeding 25cm to be representative of an average patient (the Phantom may be fabricated from layers of material).

## Non-Wireless Configuration

For countries where local regulations and laws have not yet established approval for Ultra Wide Band [UWB] wireless communication, the FlashPad detector shall be used with Tether cable connected and wireless capability disabled when applicable.

The Discovery™ XR656 system shall be configured so that it conforms to the local telecommunication laws and regulations. Please contact your GE Filed Service Engineer for further information or questions.

## Environmental Conditions

<b>Temperature</b>	
Operating	+15° C to +35° C (maximum change 10° C per hour)
Non-Operating Detector	5° C to 25° C
Non-Operating System (except Detector)	-20° C to +60° C (maximum change 20° C per hour)
<b>Humidity</b>	
Operating	30% to 60% RH, non-condensing (maximum change 30% per hour)
Non-Operating	10% to 85% RH, non-condensing (maximum change 30% per hour) 100% RH, including condensing.
<b>Altitude</b>	
Operating	-30 m to +3,000 m relative to sea level
Non-Operating	-30 m to + 3,000 m relative to sea level to support non-pressurized air transport
<b>Atmosphere Pressure</b>	
Operating	106 kPa to 70kPa
Non-Operating	106 kPa to 70 kPa
<b>Audible Noise</b>	
Operating	60 dBA maximum audible noise at any point 1 meter from system