

GE Healthcare

Discovery XR656 HD Digital Radiographic System

Operator Manual

5496960-1EN

Rev. 15

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BOOK 3 of 3

**Discovery XR656 HD
Digital Radiographic System**

Operator Manual English

5496960-1EN

Revision 15

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Discovery XR656 HD Upgrade

X-RAY Caution

Though this equipment is built to the highest standards of electrical and mechanical safety, the useful x-Ray beam becomes a source of danger in the hands of the unauthorized or unqualified operator. Excessive exposure to x-radiation causes damage to human tissue.

Therefore, adequate precautions must be taken to prevent unauthorized or unqualified persons from operating this equipment or exposing themselves or others to its radiation.

Before operation, persons qualified and authorized to operate this equipment should be familiar with the recommendation of the International Commission on Radiological Protection, contained in the latest Annals of the ICRP, and with applicable national standards and should have been trained in use of the equipment.

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 2018.



EU Authorized Representative:

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Turkish importer:

Importer Name :
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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 HD

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

Model Name	Discovery XR656 HD	
Manufacturer (*)	GE Hualun Medical Systems Co. Ltd.	
Manufacturer address	No.1 Yong Chang North Road Beijing Economic Technological Development Zone Beijing 100176 China	
Manufacturing site	GE Hualun Medical Systems Co. Ltd.	GE Medical Systems, LLC.
Manufacturing site address	No.1 Yong Chang North Road Beijing Economic Technological Development Zone Beijing 100176 China	3000 North Grandview Blvd. Waukesha, WI 53188 United States

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for IEC 60601-1-2:2014**

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Chapter 1: Introduction

The equipment is intended for use by qualified personnel only.



CAUTION 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. 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 used throughout the manual.

How to access the manual on the website

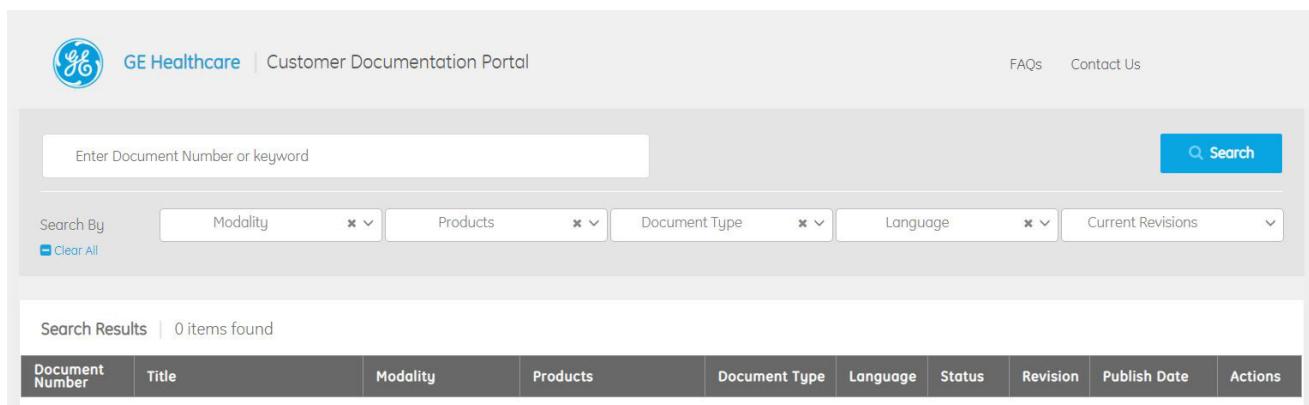
The current version of the Operator Manual is available at GE Healthcare's Support Documentation Library website.

1. In a Web browser access the Library at: <https://www.gehealthcare.com/documentationlibrary>.

Figure 1-1 Support Documentation Library Web Page



2. Click **Enter Customer Documentation Portal**.

Figure 1-2 Customer Documentation Portal

Searching the Customer Documentation Portal

The Customer Documentation Portal has several options for finding a document.

Search by entering document name, number, or keyword.

1. In the **Search** text box, enter the document's name, number or a keyword. Be as specific as possible, to limit the number of results.
2. Click **Search**.

The results are listed in the **Search Results** area.

Note: You can use the search menus to narrow down the search results, as described in the next section.

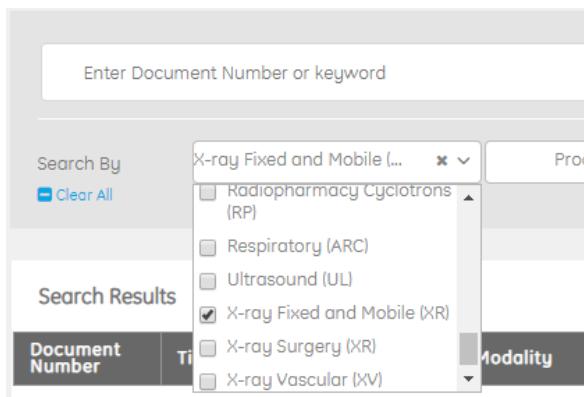
Search by menu selections

The Customer Documentation Portal allows you to search by using any one or all of the following menu categories:

- Modality
- Products (a Modality must be selected)
- Document Type
- Language
- Current Revisions

To search for the Discovery XR656 HD Operator's Manual, for example, follow these steps:

1. Click on the **Modality** menu and select **X-Ray Fixed and Mobile (XR)**.



2. Click on the **Products** menu and select **XR Discovery XR656 HD**.
3. Click on the **Document Type** menu and select **User and Operator Manual**.
4. Click on the **Language** menu select **English**.
5. Click on **Current Revisions**.
 - a To view only the current versions, select **Current Revisions**.
 - b To view current versions and prior versions, select **All Revisions**.
6. Click **Search**.

Documents that meet the search criteria are listed in the **Search Results** area.

Document Number	Title	Modality	Products	Document Type	Language	Status	Revision	Publish Date	Actions
5402340-1EN	Discovery XR656 English Operator Manual	X-ray Fixed and Mobile (XR)	XR Discovery XR656	User and Operator Manual	English (EN)	Current	14	Nov 21, 2017	
Eaton 9130 UPS	Eaton 9130 UPS User Guide	X-ray Fixed and Mobile (XR)	Multiple Products	User and Operator Manual	English (EN)	Current	3	Feb 26, 2013	

7. To download the document click on the document's down-arrow icon in the **Actions** column.
8. In the **Copyright** alert window, click **Accept**.

The document file is copied to the **Downloads** folder.

DICOM Statement on the website

You can find the DICOM statement under the category “Radiography and Fluoroscopy” by the web <https://www.gehealthcare.com/products/interoperability/dicom/xray-mammography-dicom-conformance-statements>.

IHE Statement on the website

You can find the IHE statement by the web <https://www.gehealthcare.com/products/interoperability/ihe/xray-mammography-acquisition-systems-ihe-integration-statements>.

Privacy and security information on the website

You can find the Privacy and security information by the web <https://www.gehealthcare.com/productsecurity/products>.

Technical Manual Updates

When operating or servicing GE Healthcare products, please contact your GE Healthcare representative for the latest version of product documentation. Product documentation may also be available on-line at the GE Healthcare support documentation library.

Scope Of This Manual

This manual is intended for health care professionals trained in radiological science, and is intended to introduce you to the system components and features. It is not intended to teach radiological science or make any type of clinical diagnosis.

Any service activities including but not limited to preparation for installation, assembling, adjustment, calibration, maintenance (which includes quality control), repairs (which includes FRU parts lists for ordering and the replacement) can be only done by technical specialists authorized and trained by the manufacturer (or by the manufacturer's authorized representative). Authorized and trained technical specialists have access to all technical documentation necessary to provide to customers during its service life. Should you have any questions or need some special privilege related to service operations or security prevention, please feel free to contact the manufacturer's authorized representative.

Prerequisite Skills

It is necessary for you to have sufficient knowledge to competently perform the various procedures within your modality.

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. 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 A hazardous situation which, if not avoided, will result in death or serious injury.



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



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

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.

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.

Graphic Conventions and Legends

The following table 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.
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.
CTRL+SPACE key	Pressing the hard keys on the keyboard. Input method switch between English and Chinese/Japanese/Korean, applicable for Chinese/Japanese/Korean user interface.
SHIFT(Left)+SHIFT(Right) key	Pressing the hard keys on the keyboard. Input method switch between English and Russian, applicable for Russian user interface.
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. The following table describes the common controls.

Table 1-2 Common software user interface controls

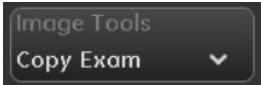
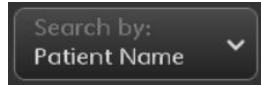
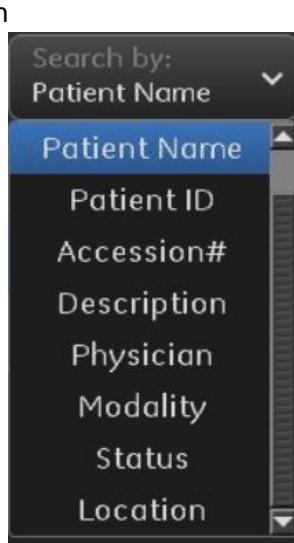
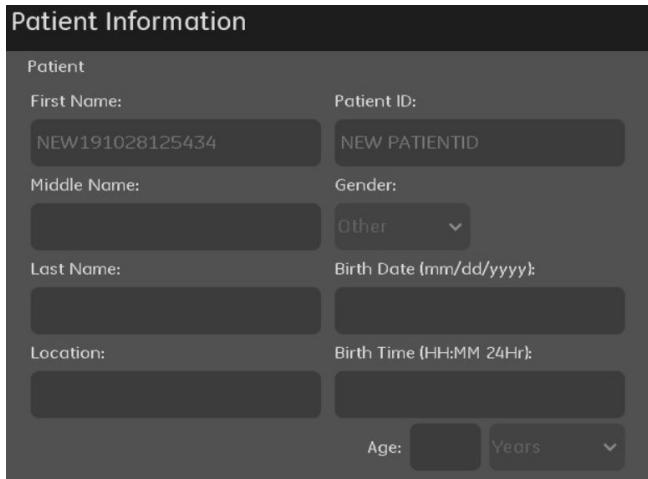
Control and Description	Examples	
Button Screen buttons look and act like physical buttons on equipment. A button performs a specific action, such as opening a new screen or saving settings. A group of two or more buttons provides a choice of settings, such as which receptor mode is active. Dark blue indicates that the button or buttons are selected.	A button to start an exam. 	Group of buttons to select the receptor mode 
Drop down list Drop down lists open to reveal several options, but only one option may be selected. Drop down lists may be included on a button or a text box. A drop down list is indicated by a down-pointing arrow on the right of the control.	A list from a button Closed  Open 	A list from a text box Closed  Open 

Table 1-2 Common software user interface controls

Control and Description	Examples	
Check box Check boxes indicate a selection. A single check box shows that an option is active. Multiple check boxes show that several options are selected.	A single check box 	Multiple check boxes 
Text box Text boxes allow information to be entered using the keyboard.	Text boxes 	

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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 includes information about the emergency procedures.

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

X-Ray Protection

X-rays make up x-radiation, a form of electromagnetic radiation. 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 HD is intended to generate digital radiographic images of the skull, spinal column, chest, abdomen, extremities, and other body parts in patients of all ages. Applications can be performed with the patient sitting, standing, or lying in the prone or supine position and the system is intended for use in all routine radiography exams. Optional image pasting function enables the operator to stitch sequentially acquired radiographs into a single image.

The Discovery XR656 HD incorporates AutoGrid, which is an optional image processing software installed as a part of the systems Helix image processing software. AutoGrid can be used in lieu of an anti-scatter grid to improve image contrast in general radiographic images by reducing the effects of scatter radiation. When the VolumeRAD option is included on the system, the system can generate tomographic images of human anatomy including the skull, spinal column, chest, abdomen, extremities, and other body parts in patients of all ages.

When the VolumeRAD option is used for patients undergoing thoracic imaging, it is indicated for the detection of lung nodules. VolumeRad generates diagnostic images of the chest that aid the radiologist in achieving superior detectability of lung nodules versus posterior-anterior and left lateral views of the chest, at a comparable radiation level.

This device is not intended for mammographic or dental applications.



WARNING **The system monitor(s) should not be used to make diagnostic decisions.**



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

Contraindication

None known.

Users

Clinical users include trained doctors, radiographers, or radiologic technologists (RTs). 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 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 All system components, including the Overhead Tube Suspension (OTS), Table, Wall Stand, 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 60601-1-2
- IEC 60601-1-3
- IEC 60601-1-6
- IEC 60601-2-28
- IEC 60601-2-54

Software Name and Version

APP CD delivery with the system: V1

APP USB delivery with the system: V2

Refer to software Media label or call service

Radio Equipment Directive (RED) Conformance

Wireless Components

The following wireless components are included in the Discovery XR656 HD X-ray System:

Table 2-1 Wireless Components

Component	Function	GE Healthcare or Mfg. P/N	Frequency Band	Transmit Power	Software/Firmware Version
Access Point	Wireless interface to host PC	5720157-1 (RoW)	5150 MHz to 5350 MHz	≤ 23 dBm	6.5.0.0-4.3.0.0_56428
	Wireless interface to host PC	5845913-2(RoW)	5150 MHz to 5350 MHz	≤ 23 dBm	6.5.1.5-4.3.1.9_73904
Wireless Detector (10 x 12 in)	Wireless detector for X-ray imaging	5771012	5150 MHz to 5350 MHz	≤ 23 dBm	
Wireless Detector (14 x 17 in)	Wireless detector for X-ray imaging	5771417	5150 MHz to 5350 MHz	≤ 23 dBm	
Wireless Detector (17 x 17 in)	Wireless detector for X-ray imaging	5771717	5150 MHz to 5350 MHz	≤ 23 dBm	

Accessories and Software

Refer to the previous table for software and firmware versions.

EU Authorized Representative:

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

RED Declaration of Conformity

The access point (AP) and digital wireless detectors are CE marked according to the provisions of the RED Directive (2014/53/EU). GE HUALUN MEDICAL SYSTEMS CO. Ltd, hereby declares that these parts are in compliance with the essential requirements and other relevant provisions of Directive 2014/53/EU.

Detail information for detector refer to DOC2022719.

The Declarations of Conformity made under Directive 2014/53/EU are available for viewing on the website. See [Chapter 1: Introduction-How to access the manual on the website \(p. 1-2\)](#).

FlashPad HD Detector Certification Information

Korean Certification Information

Manufacturer: Varex Imaging Corporation;

Model Number: FlashPad HD 3543/ FlashPad HD 2530/ FlashPad HD 4343;

Registration No: R-REM-vrx-XRpad24336/ R-REM-vrx-XRpad23025/ R-R-vrx-FlashPadHD4343.

Brazil-ANATEL Mark



Thailand RCA B.E.2498 QR code



China-CMIIT

25×30cm (10×12 英寸) 平板探测器 CMIIT ID: 2017AJ5303

35×43cm (14×17 英寸) 平板探测器 CMIIT ID: 2017AJ5305

43×43cm (17×17 英寸) 平板探测器 CMIIT ID: 2020AJ7346

不得擅自更改发射频率、加大发射功率（包括额外加装射频功率放大器），不得擅自外接天线或改用其它发射天线。

使用时不得对各种合法的无线电通信业务产生有害干扰；一旦发现有干扰现象时，应立即停止使用，并采取措施消除干扰后方可继续使用。

使用微功率无线电设备，必须忍受各种无线电业务的干扰或工业、科学及医疗应用设备的辐射干扰。

不得在飞机和机场附近使用。

Nigeria-NCC

Connection and use of this communications equipment is permitted by the Nigerian Communications Commission

Electromagnetic Compatibility

Introduction

This document specifies the Electromagnetic Compatibility (EMC) for product Optima XR656 HD. For each product, there are compliance statements, compatibility tables, use recommendations and installation recommendations.

EMC Conformance Statement

Compliance Statement

This equipment complies with IEC 60601-1-2 Edition 3 (2007-03), (YY0505-2012 only for China) Electromagnetic Compatibility (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 (GB4824-2013 only for China) Group 1 Class A standard limits. However, there is no guarantee that interference will not occur in a particular installation.

This equipment needs special precautions regarding EMC and needs to be installed and put into service according to the EMC information provided in the accompanying documents. Portable and mobile RF communications equipment can affect this equipment.

However, there is no guarantee that interference will not occur in a particular installation.

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

- Reorient or relocate the affected devices.
- Increase the separation between the equipment and the affected device (see recommended separation distances).
- Power the equipment from a different source than the affected device.
- Consult your service representative for further suggestions.

The manufacturer is not responsible for any interference caused by non-recommended interconnect cables or by unauthorized changes or modifications to the 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. Improper cabling may result in the equipment causing radio frequency interference.

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

Fixed X-ray machines are susceptible to Electromagnetic Interference (EMI) from radio frequencies, magnetic fields, and transient in the air or power leads. They also generate EMI. This equipment complies with limits as stated on the EMC label. However, there is no guarantee that interference will not occur in a particular installation. Possible EMI sources should be identified before the unit is installed. The magnetic field environment from a MRI device located nearby is a risk of interference. The presence of a broadcast station or broadcast van may also cause interference.

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



WARNING **This system is intended for use by healthcare professionals only. This system may cause radio interference or may disrupt the operation of nearby equipment. It may be necessary to take mitigation measures, such as re-orienting or relocating the system or shielding the location.**



WARNING **This medical electrical equipment/system needs special precautions regarding Electromagnetic Compatibility (EMC) and needs to be installed and put into service according to the EMC information provided in the accompanying documents.**



WARNING Portable and mobile RF communications equipment can affect this medical electrical system. Make sure those communication equipment are powered off before they are taken near this equipment / system.



WARNING The use of ACCESSORIES, transducers and cables other than those specified, with the exception of transducers and cables sold by the manufacturer of the EQUIPMENT or SYSTEM as replacement parts for internal components, may result in increased EMISSIONS or decreased IMMUNITY of the EQUIPMENT or SYSTEM.



WARNING The EQUIPMENT should not be used adjacent to or stacked with other equipment and that if adjacent or stacked use is necessary, the EQUIPMENT should be observed to verify normal operation in the configuration in which it will be used.



CAUTION Power line anomalies or electrostatic discharges to the system may cause a CD/DVD or USB write failure error. A new CD/DVD or USB should be used and the image rewritten.



CAUTION Power line anomalies or electrostatic discharges in all equipment areas may cause the monitor image to become momentarily disrupted or to go 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 require a reboot.



CAUTION A power surge during image transmission to the workstation after acquisition may cause the image to be lost. The system will operate normally after the power surge, but the image must be reacquired.



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 "cannot open boot device error" message. If so, contact GE Healthcare service.



WARNING **The equipment may be interfered with by other equipment, even if that other equipment complies with CISPR EMISSION requirements.**

Compatibility Tables

This equipment complies with IEC 60601-1-2 Edition 3 (2007-03) and YY0505-2012 only for China EMC standards for medical devices. The Discovery XR656 HD systems are suitable to be used in an electromagnetic environment, as per the limits and recommendations described in the following tables:

- Emission Compliance level and limits (Table 2-1).
- Immunity Compliance level and recommendations to maintain equipment clinical utility (see Table 2-2 and Table 2-3).

Note: This system complies with EMC standard when used with supplied cables. If different cable lengths are required, contact a qualified service representative.

Electromagnetic Emission

Table 2-2 Guidance and Manufacturer's Declaration - Electromagnetic Emissions

The Discovery XR656 HD is intended for use in the electromagnetic environment specified below. The customer or the user of the Discovery XR656 HD system should assure that it is used in such an environment.		
Emissions Test	Compliance	Electromagnetic Environment -Guidance
RF emissions, CISPR 11 (GB4824-2013 only for China)	Group 1	The Discovery XR656 HD system 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 (GB4824-2013 only for China)	Class A	The Discovery XR656 HD system 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 (GB17625.1 only for china)	Not Applicable	
Voltage fluctuations/ flicker emissions, IEC 61000-3-3 (GB17625.2 only for china)	Not Applicable	

Electromagnetic Immunity

Table 2-3 Guidance and Manufacturer's Declaration - Electromagnetic Immunity

The Discovery XR656 HD system is intended for use in the electromagnetic environment specified below. The customer or the user of the Discovery XR656 HD system 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 (GB17626.2 only for china)	± 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 (GB17626.4 only for china)	± 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 (GB17626.5 only for china)	± 1 kV line(s) to line(s) ± 2 kV line(s) to earth	± 1 kV line(s) to line(s) ± 2 kV line(s) to earth	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(GB17626.11 only for china)	<5 % U_T (>95 % dip in U_T) for 0,5 cycle	Not Applicable	The Discovery XR656 HD system that are not LIFE-SUPPORTING and for which the RATED input current exceeds 16 A per phase are exempt from the testing.
	40 % U_T (60 % dip in U_T) for 5 cycles	Not Applicable	
	70 % U_T (30 % dip in U_T) for 25 cycles	Not Applicable	
	<5 % U_T (>95 % dip in U_T) for 5 s	<5 % U_T (>95 % dip in U_T) for 5 s	Mains power quality should be that of a typical commercial or hospital environment. If the user of the Discovery XR656 HD system requires continued operation during power mains interruptions, it is recommended that the Discovery XR656 HD system be powered from an un-interruptible power supply or a battery.

Power frequency (50/60 Hz) magnetic field, IEC 61000-4-8 (GB17626.8 only for china)	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: U_T is the a.c. mains voltage prior to application of the test level.			

Table 2-4 Guidance and Manufacturer's Declaration - Electromagnetic Immunity

The Discovery XR656 HD system is intended for use in the electromagnetic environment specified below. The customer or the user of the Discovery XR656 HD system 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 (GB17626.6 only for china)	3 Vrms, 150 kHz to 80 MHz	3Vrms	Portable and mobile RF communications equipment should be used no closer to any part of the Discovery XR656 HD system, including cables, than the recommended separation distance calculated from the equation appropriate for the frequency of the transmitter. Recommended Separation Distance $d = 1,2\sqrt{P}$
Radiated RF IEC 61000-4-3 (GB17626.3 only for china)	3 V/m, 80 MHz to 2.5 GHz	3V/m	$d = 1,2\sqrt{P}$ 80 MHz to 800 MHz $d = 2,3\sqrt{P}$ 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 ^a , should be less than the compliance level in each frequency range ^b . 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 HD system is used exceeds the applicable RF compliance level above, The Discovery XR656 HD system 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 HD system.			
b. Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.			

Table 2-5 Recommended separation distances between portable and mobile RF communications equipment and the Discovery XR656 HD system.

<p>The Discovery XR656 HD system is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the Discovery XR656 HD system can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the Discovery XR656 HD system as recommended below, according to the maximum output power of the communications equipment.</p>			
Rated Maximum Output Power of Transmitter Watts (W)		Separation distance according to frequency of transmitter (m)	
		150 kHz to 80 MHz $d = 1,2\sqrt{P}$	80 MHz to 800 MHz $d = 1,2\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23
For transmitters rated at a maximum output power not listed above, the 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 absorption and reflection from structures, objects, and people.			

Use Recommendations

This product complies with IEC 60601-1-2 Edition 3 (2007-03) and YY0505-2012 only for China EMC standard for medical devices and with radio frequency emission requirements per **CISPR11 Group1 Class A and GB4824-2013 Group1 Class A** only for china standard limits. The system is predominantly intended for use in hospitals. Accuracy of LOADING FACTORS, Reproducibility of the RADIATION output in RADIOGRAPHY, AUTOMATIC CONTOL SYSTEM and Image quality is the system essential performance. Do not use devices which intentionally transmit RF Signals (Cellular Phones, Transceivers, or Radio Controlled Products) in the vicinity of this equipment as it may cause performance outside the published specifications. Keep the power to these types of devices turned off when near this equipment. Adhering to the distance separation recommended in Table 2-4, between 150 kHz and 2.5 GHz, will reduce disturbances recorded at the image level but may not eliminate all disturbances. However, when installed and operated as specified herein, the system will maintain its essential performance and basic safety. For example, a 1W mobile phone (800 MHz to 2.5 GHz carrier frequency) shall be put 2.3 meters apart from the system (in order to avoid image interference risks). The use of accessories, transducers, and cables other than those specified may result in degraded ELECTROMAGNETIC COMPATIBILITY of the system. The medical staff in charge of this equipment is required to instruct technicians, patients, and other people who may be around this equipment to comply fully with the above equipment requirements.

Installation Recommendations

This system complies with the EMC standard when used with supplied cables up to maximum lengths referenced in the system Pre-Installation manual. In order to minimize interference risks, the following requirements apply.

Cable Shielding and Grounding

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

Subsystem and Accessories Power Supply Distribution

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

Stacked Components and Equipment

The system should not be used adjacent to or stacked with other equipment. If adjacent or stacked use is necessary, the system should be tested and verified in order to ensure normal operation. Consult qualified personnel regarding system configurations.

Low Frequency Magnetic Field

Not applicable.

Static Magnetic Field Limits

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

Electrostatic Discharge Environment and Recommendations

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

System Cable Information

For Discovery XR656 HD system cable details refer to the Pre-installation manual 5643942-1EN and Discovery XR656 HD MIS Chart.

Table 2-6 OTS Cable List

ITEM	DESCRIPTION	LENGTH	CONNECTIONS	SHIELDED
1	MIS CABLE-Standard Length OTS CAN	15M (49.21FT)	OTS to Cabinet	Yes
2	OTS MIS Cable-Standard length Stator, Fan and Pressure Switch	15M (49.21FT)	OTS to Cabinet	Yes
3	OTS MIS Cable-Standard Length 120 VAC	15M (49.21FT)	OTS to Cabinet	No
4	OTS MIS Cable-Standard Length High Voltage Anode	15M (49.21FT)	OTS to Cabinet	Yes
5	OTS MIS Cable-Standard Length High Voltage Cathode	15M (49.21FT)	OTS to Cabinet	Yes

ITEM	DESCRIPTION	LENGTH	CONNECTIONS	SHIELDED
6	OTS MIS Cable-Standard Length Ground	15M (49.21FT)	OTS to Cabinet	No

Table 2-7 Table Standard Length MIS Cable

ITEM	DESCRIPTION	LENGTH	CONNECTIONS	SHIELDED
1	Table Ion chamber MIS cable	16M (52.49FT)	Table to Cabinet	Yes
2	Table Detector Ethernet MIS cable	50M (164.04FT)	Table to Computer	Yes
3	Table Power MIS cable	16M (52.49FT)	Table to Cabinet	No
4	Table DPS MIS cable	16M (52.49FT)	Table to Cabinet	No
5	Table Can MIS cable	16M (52.49FT)	Table to Cabinet	Yes
6	Table Ground MIS cable	16M (52.49FT)	Table to Cabinet	No
7	Table Emergency Stop MIS cable	16M (52.49FT)	Table to Cabinet	Yes
8	TOMO Trigger	15M (49.21FT)	Table Stand to Cabinet	Yes

Table 2-8 Standard Wall Stand (WS)

ITEM	DESCRIPTION	LENGTH	CONNEC-TIONS	SHIELDED
1	Substitute 5146500-1 for Rohs compliance, FeiTian II WS CAN and CANopen Cable	15M (49.21FT)	Wall Stand to Cabinet	Yes
2	Substitute 5146500-30 for Rohs compliance, FeiTian II WS ION Chamber Cable	15M (49.21FT)	Wall Stand to Cabinet	Yes
3	Substitute 5146500-3 for Rohs compliance, FeiTian II WS DPS Power Cable	15M (49.21FT)	Wall Stand to Cabinet	No
4	Substitute 5146500-2 for Rohs compliance, FeiTian WS Power Cable	15M (49.21FT)	Wall Stand to Cabinet	No
5	Substitute 5146500-5 for Rohs compliance, FeiTian II WS Ground Cable	15M (49.21FT)	Wall Stand to Cabinet	No
6	WS Detector Ethernet MIS cable	50M (164.04FT)	Wall Stand to Computer	Yes
7	TOMO Trigger	15M (49.21FT)	Wall Stand to Cabinet	Yes

Table 2-9 Ext Wall Stand (WS)

ITEM	DESCRIPTION	LENGTH	CONNEC-TIONS	SHIELDED
1	Substitute 5146500-1 for Rohs compliance, FeiTian II WS CAN and CAN open Cable	20M (65.62FT)	Wall Stand to Cabinet	Yes
2	Substitute 5146500-30 for Rohs compliance, FeiTian II WS ION Chamber Cable	20M (65.62FT)	Wall Stand to Cabinet	Yes
3	WS Detector Ethernet MIS cable	50M (164.04FT)	Wall Stand to Computer	Yes
4	Substitute 5146500-3 for Rohs compliance, FeiTian II WS DPS Power Cable	20M (65.62FT)	Wall Stand to Cabinet	No
5	Substitute 5146500-2 for Rohs compliance, FeiTian WS Power Cable	20M (65.62FT)	Wall Stand to Cabinet	No
6	Substitute 5146500-5 for Rohs compliance, FeiTian II WS Ground Cable	20M (65.62FT)	Wall Stand to Cabinet	No
7	TOMO Trigger	15M (49.21FT)	Wall Stand to Cabinet	Yes

Table 2-10 TIB

ITEM	DESCRIPTION	LENGTH	CONNEC-TIONS	SHIELDED
1	TIB Power Cable	20M (65.62FT)	TIB to Cabinet	No
2	TIB Ethernet Cable	25M (82.02FT)	TIB to Computer	Yes
3	FlashPad Tether with Plug Asm, 7m	7M (22.97FT)	TIB to Detector	Yes
4	TIB Ground Cable	25M (82.02FT)	TIB to Cabinet	No

Table 2-11 Wireless AP

ITEM	DESCRIPTION	LENGTH	CONNECTIONS	SHIELDED
1	12VDC Cable	20M (65.62FT)	AP to Cabinet	Yes
2	Wireless AP Ethernet Cable	25M (82.02FT)	AP to Computer	Yes
3	wireless AP power supply DC extension cable	0.3M (0.98FT)	Between AP and Cabinet	Yes
4	Wireless AP power supply DC extension cable with 2.1/5.5-mm center-positive circular plug	0.3M (0.98FT)	Between AP and Cabinet	Yes

Table 2-12 System Computer

ITEM	DESCRIPTION	LENGTH	CONNECTIONS	SHIELDED
1	FeiTian Image Monitor Cable (Viewer Monitor)	3M (9.84FT)	Monitor to power cable from Cabinet	No
2	Jedi CAN, PC to Cabinet	20M (65.62FT)	Computer to Cabinet	Yes
3	System CAN, PC to Cabinet	20M (65.62FT)	Computer to Cabinet	Yes
4	Substitute 5146500-24 for Rohs compliance, FeiTian Magic PC Ground Cable	18M (59.06FT)	Computer to Cabinet	No
5	Substitute 5146500-21 for Rohs compliance, FeiTian II Magic PC Power Cable	3M (9.84FT)	Computer to power cable from Cabinet	No
6	PC, Monitor Power Cable	20M (65.62FT)	Connect PC and Monitor cable to Cabinet	No

Table 2-13 RCIM II

ITEM	DESCRIPTION	LENGTH	CONNECTIONS	SHIELDED
1	RCIM, PC to Cabinet (26 PIN HD D-SUB CABLE)	20M (65.62FT)	RCIM II to Cabinet	Yes

Table 2-14 Chargers BIN

ITEM	DESCRIPTION	LENGTH	CONNECTIONS	SHIELDED
1	G3A BIN Ethernet cable	25M (82.02FT)	Chargers BIN to Computer	Yes
2	Power input cable right angle in G3A Project	1.5M (5FT)	Chargers BIN to Hospital power	No

Note: The actual working channels and transmit power are defined by the country code configured on the AP and detector.

Wireless Communication Information

Table 2-15 Wireless module specification

Item	Lower Frequency (GHz)	Upper Frequency (GHz)	Max. Transmit Power	Modulation
AP	5.15	5.85	+23dBm (+18dBm per chain)	BPSK, QPSK, 16-QAM, 64-QAM
Detector	5.15	5.85	+22dBm(+17dBm per chain)	BPSK, QPSK, 16-QAM, 64-QAM

Radiation Safety

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



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

Radiation Protection

Because exposure to X-ray radiation may be damaging to health, use care to provide protection against exposure to the primary beam. Effects of X-ray radiation are cumulative and may extend over a period of months or years. 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.

To minimize dangerous exposure, use 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.

**CAUTION**

While operating or servicing x-ray equipment, always keep a distance not less than two 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.

Personnel Monitoring

Monitoring personnel to determine the amount of radiation exposure can determine if safety measures are adequate. It may reveal inadequate radiation protection practices. These measurements should be taken at all locations where the operator 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 possible to determine when components, such as the X-ray tubes, are nearing the end of their operating lives. These components could stop operating during a patient examination.

**CAUTION**

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 Emergency buttons:

Emergency Stop - when pressed, Lateral Table, OTS and Wall Stand motions are stopped, and X-ray generation 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.

System Emergency Off Button - when pressed, the power to all system components is removed, stopping all motion and X-ray generation. 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.

Note: After either emergency button is enabled, longitudinal table movement is available. Use caution when removing patient



CAUTION If you press the Emergency Stop or Emergency OFF buttons during x-ray exposure
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



CAUTION 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.



CAUTION 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.



CAUTION 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.



CAUTION 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. must be long enough to allow full travel of the system and not become pinched or pulled.

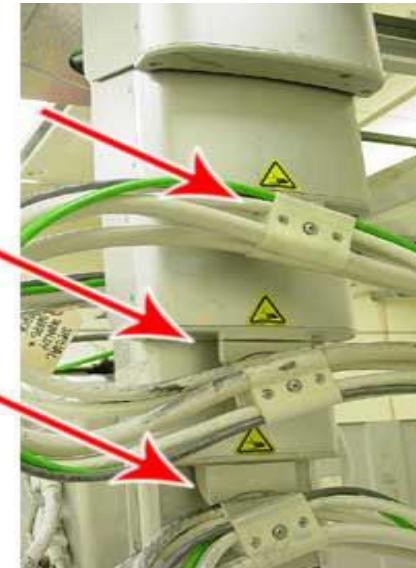


CAUTION Potential Pinch Point: Use table foot pedals with care when lowering the table. Clearance is limited next to the table side cover, and a pinch point may exist for the operator.



CAUTION **Hand Crushing Hazard:** The back of the OTS column creates pinch points 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 2-1 OTS column pinch points



WARNING It is the operator's responsibility to ensure patient safety 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.



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



CAUTION 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 Healthcare Field Service Manual.



CAUTION 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 objects or materials are not located in the primary X-ray beam during exposure that could result in poor image quality.



CAUTION 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.



CAUTION Do not load non-system software onto the system computer.



WARNING 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.

Table 2-16 Maximum Attenuation Equivalent mm AL

Item	mm AL
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	<0.7

Item	mm Al
Standard arm wall stand front panel	<0.6
Extended arm wall stand front panel	<0.6
Stretcher Table, GST-2	<1.0
Weight Bearing Cover	≤ 1.2

Laser Radiation Warnings



CAUTION The collimator uses lasers to create the linear centering cross beams. Looking into the laser could cause eye injuries or impaired vision. Do not stare into beam. When you switch on the linear laser light localizer, make sure no one looks directly into the laser. (Peak power 1 mw / wave length 650 nm / class II laser product.)

Figure 2-2 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.



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 THIS SYSTEM IS NOT DESIGNED FOR USE IN CLOSE PROXIMITY TO AN EXTERNAL DEFIBRILLATOR!

Never use an external defibrillator on a patient that remains in contact with the digital detector or any part of the Fixed Rad X-Ray system. This X-ray table must be treated as a conductive surface and removed well away from a patient before defibrillation is attempted. If any part of the Fixed Rad X-ray table remains in contact with a patient when the defibrillator is discharged, voltage may be conducted through the patients body and into the system. This may be hazardous to anyone who may come in contact with the system and could damage the detector.

Always consult the instructions for use of any external defibrillator that may be used on a patient being imaged on the Fixed Rad X-ray table."



WARNING Remain close to the patient when using the remote control.



WARNING The maximum table weight capacities can be referenced at [Table 2-26 on page 35](#).



CAUTION 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.



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



CAUTION During auto positioning, watch OTS motorized movement when patient or any other person is under OTS, never leave the 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.



WARNING The wall stand lateral positioning bar is a hand rest and is not intended to support a person's weight. To avoid falls and potential injuries, do not hang or pull on the bar.

Tabletop Motion Warnings



CAUTION When the power to the digital table is off, the tabletop can move freely in the longitudinal direction. To avoid injuries, monitor the tabletop movement.



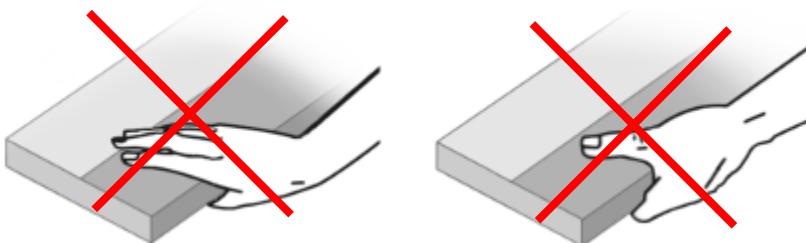
WARNING Prior to raising or lowering the tabletop, ensure there are no obstructions present, above or below.



WARNING Before the patient gets on or off the tabletop, 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.



CAUTION 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 2-3 Table pinch point

Digital Detector Warnings



WARNING **Do Not Drop.**



WARNING **Do not use an external defibrillator while patient remains in contact with detector.**



CAUTION **Do not use this system when an internal defibrillator is discharging.**



CAUTION **Maximum load is 100kg (220lbs.) concentrated; 150 kg (330lbs.) distributed. Do not exceed these maximum loads.**



CAUTION **Operate the detector within the temperature range of 15° C to 32° C (59°F to 90°F). Store the detector within the temperature range of -5° C to 50° C (23°F to 122°F).**



CAUTION **A Detector Battery must be kept in the detector at all times. This includes imaging in both wireless and tethered modes. Failure to do so may cause damage to the detector.**

Pinch Points and Crush Hazard Summary

This section lists the potential pinch points or crushing hazards.

Table 2-17 Pinch Points and Crush Hazard Summary

Component	Warning
Table	 <p>CAUTION 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.</p>
Table	 <p>CAUTION 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>WARNING Potential Pinch Point: The area where the tube connects to the column creates 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>CAUTION 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>
Wall Stand	 <p>CAUTION Hand Crush Hazard: Keep your extremities and the patient's extremities away from the pinch areas and the top of the wall stand arm when tilting the wall stand receptor.</p>
Acquisition Workstation	 <p>WARNING Potential Pinch Point: The DVD/CD tray can open and close automatically.</p>

Symbols

This section explains the symbols used with this system and documents.

Special Notices

Table 2-18 Special notices

Symbol	Description
	Dangerous voltage. This indicates an avoidable, dangerous, high voltage hazard.
	Attention, consult accompanying documents.
	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 on.
	Maximum load. The component has a maximum weight limit. Damage to equipment or injury may occur if the maximum weight is exceeded.
	Operating temperature. 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, wall stand, and x-ray tube) and stop image exposure.

Table 2-18 Special notices

Symbol	Description
	Warning: Ionizing radiation.
	CAUTION: X-RAYS
	Reference Number.
	Serial Number.
	Manufacturer.
	Date of Manufacture.
	e-IFU symbol. Instruction for use of the device is supplied in electronic form instead of in paper form.

X-ray Tube Operational Symbols

The following table describes the operational symbols for the system such as X-ray emissions and collimator locations.

Table 2-19 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.

Table 2-19 Operational symbols

Symbol	Description
	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.
	Controls or indicators associated with normal rotational speed of the X-ray anode.
	Controls or indicators associated with high rotational speed of the X-ray anode.
	Controls or indicators associated with the selection of a small focal spot or the connection for the corresponding filament.
	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.
	Controls or indicators associated with the selection of a large focal spot or the connection for the corresponding filament.
	Do not X-ray. This symbol indicates to not image this side of detector handle.

System Power On and Reset

The following table describes the power controls of the system, located on the RCIM2. (Refer to [Chapter 8: System Hardware-Radiology Control Interface Module \(RCIM2\) \(p. 8-6\)](#) for more information.)

Table 2-20 Power controls

Symbol	Description
	The System Reset button is located on the RCIM2.

Table 2-20 Power controls

Symbol	Description
	The Power On button is used to turn on the power to the system. The button is located on the RCIM2. 

Electrical Type

The following table describes the electrical protection rating based on system type.

Table 2-21 Electrical type

Symbol	Description
	Type B applied part.

Electrical Current

The following table describes the symbols for the different types of electrical current that may be used on your system.

Table 2-22 Electrical current types

Symbol	Description
	The equipment is suitable for alternating current only.
	The equipment is suitable for direct current only.
	The equipment is suitable for both direct and alternating current.

Ground

The following table describes the different types of grounding used in your system.

Table 2-23 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.
	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.

Collimator

The following table describes the collimator controls and the radiation field.

Table 2-24 Collimator descriptions

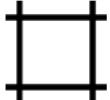
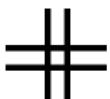
Symbol	Description
	Control for indicating radiation field by using light.
	Controls for opening the collimator blades, or indicates partially or fully open state.
	Controls for closing the collimator blades, or indicates closed state.

Table 2-24 Collimator descriptions

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

Identification and Compliance Labels

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 labels are

located below.

Identification and Compliance Labels Locations

Table 2-25 Identification labels

Components	Location
Bridge	Top of rear end cap of Bridge.
System Name Plate/System Rating Plate	Top of cabinet unit.
OTS X-Ray Overhead Tube Suspension	Rear of largest column.
X-ray Tube Casing MX100	Rear of X-ray tube.
X-ray Tube Insert 0.6-1.25	Rear of X-ray tube.
Collimator	Left side.
Workstation PC	Top front of PC.
Everest System Name Plate for US (if applicable)	Top front of PC.
System Cabinet	Top of unit, on right side towards front.
Jedi 80 Rad 1T	Top of cabinet unit, on right side towards front. Also inside system cabinet, on left side of Jedi Control Assembly.
Jedi HV Tank	Inside system cabinet, on front of Jedi HV Tank.
Radiographic Table	Right side.
Table Ion Chamber	Inside table detector housing.
System Label for China	Top of cabinet unit.
Wall Stand	Left side of carriage.
Wall Stand Ion Chamber	Inside wall stand detector housing.
FlashPad HD Detector	Rear of unit.
Tether Interface Box	Left side.
Detector BIN	Left side.
Grid Box	Left side.
UDI Label	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).



Warning Labels on System Components

Digital Table Labels

Figure 2-4 Table Warning Label position



Table 2-26 Digital Table Warning Labels list

Item	Description	Label
1	Table pinch point label	<p>WARNING TO AVOID INJURY TO FINGERS AND HANDS OF PATIENT AND OPERATOR CAUSED BY TABLE TOP MOVEMENT, HANDS MUST BE KEPT AWAY FROM TABLE TOP EDGES AT ALL TIMES.</p> <p>警告 床面板运动时禁止患者或操作者的手和手指置于床面板下方，以避免造成伤害。</p> 

Table 2-26 Digital Table Warning Labels list

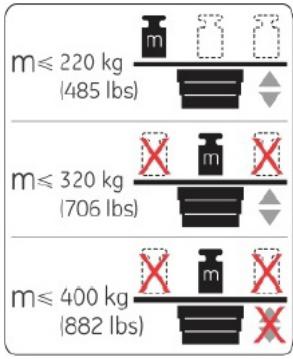
Item	Description	Label
2	Patient load label	 <p>m ≤ 220 kg (485 lbs)</p> <p>m ≤ 320 kg (706 lbs)</p> <p>m ≤ 400 kg (882 lbs)</p>
		 <p>WARNING</p> <ol style="list-style-type: none"> 1. The table can be moved vertically when the load is less than or equal to 220 kg (485 lbs), located in the center of the tabletop end and the tabletop is positioned in the center. 2. The table can be moved vertically when the distributed load over the table is less than or equal to 320 kg (706 lbs) and the tabletop is positioned in the center. 3. The table cannot be moved vertically and the tabletop shall be positioned in the center when the distributed load over the table is more than 320 kg (706 lbs) and less than or equal to 400 kg (882 lbs).  <p>WARNING Patients who weigh over 220 kg (485 lbs) should only get on and off from the center of the front or rear side of the table. (Maximum weight 400 kg (882 lbs))</p>

Table 2-26 Digital Table Warning Labels list

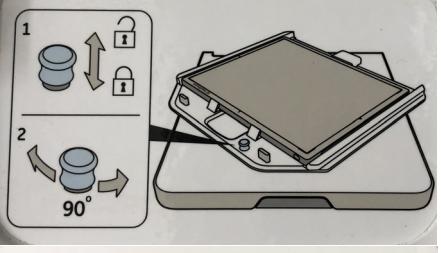
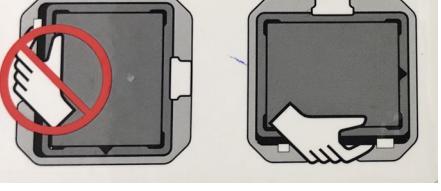
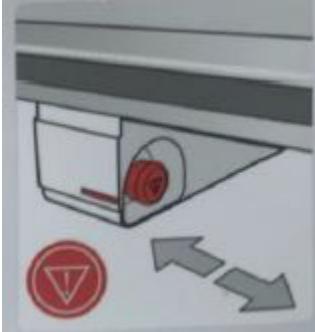
Item	Description	Label
3	Inhibition warning label	
4	Tray load label Tray Rotation label Detector remove notice	  

Table 2-26 Digital Table Warning Labels list

Item	Description	Label
5	Label for emergency stop	Front e-stop cover 
	Rear e-stop cover	

Wall Stand Labels

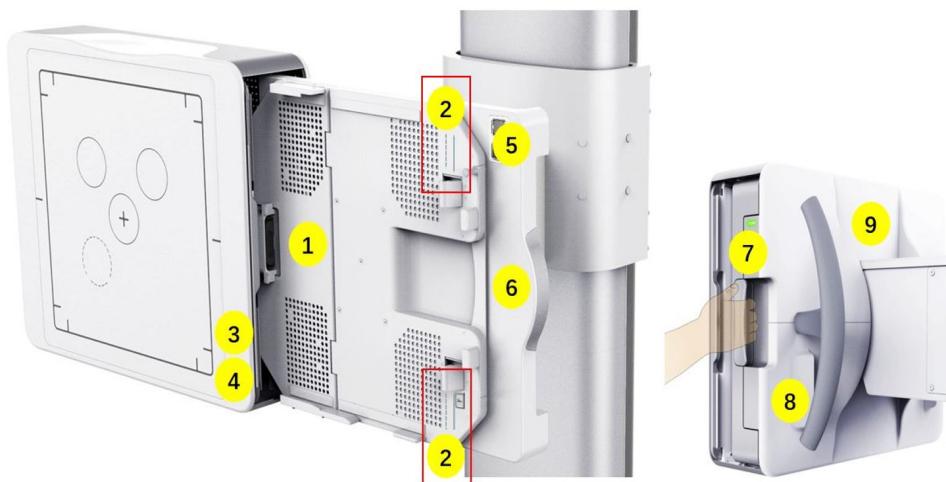
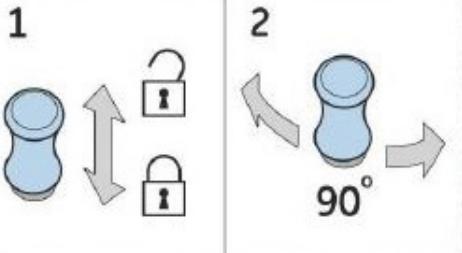
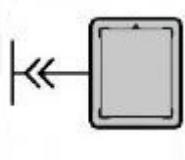
Figure 2-5 Wall Stand warning Labels position

Table 2-27 Wall Stand Warning Labels list

Item	Description	Label
1	WS housing half tray label	
2	Dotted Lines and Solid Lines	
3	IEC TYPE B SYMBOL	
4	WS Housing load label	
5	housing slide tray label	

Item	Description	Label
6	WS housing rotation tray label	
7	Wall Stand Housing indicator label	
8	Cover switch label	
9	Warning label for Wall Stand	WARNING RESIDUAL RADIATION HAZARD! DO NOT STAND BEHIND IMAGE RECEPTOR

OTS Label

Figure 2-6 OTS Label



For X-Ray Field Limitation System Failure.

Collimator Label

Figure 2-7 Collimator Label

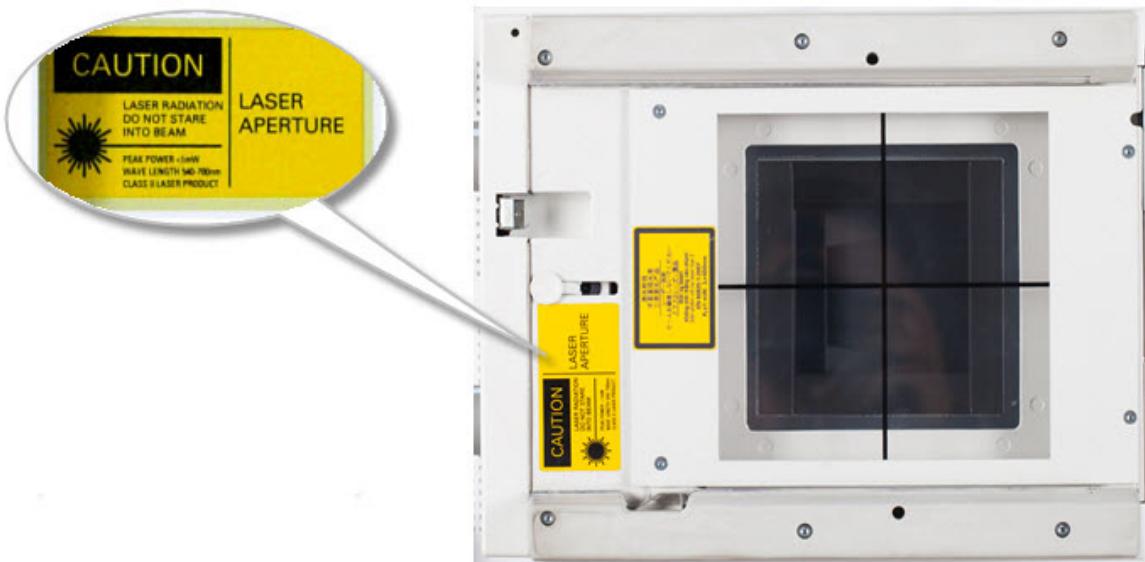


Figure 2-8 Collimator laser label



Lateral Bar Label

Figure 2-9 Lateral Bar Label



Maximum Load Allowed: 30 kgf (66.1 lbs)

Keyboard Label

Figure 2-10 Keyboard Label



RCIM2 Label

Figure 2-11 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.

System Cabinet Labels

Table 2-28 System Cabinet Labels

Symbol	Description
	Do not stand.
	Do not sit.

UDI Label

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

A UDI is an unique numeric or alphanumeric identification code assigned to medical devices by the manufacturer of the device. The UDI marking is applied to a product model that is designated as a medical device per Different Regions UDI Requirements.



No.	Description
1	Product Name
2	UDI Bar Code
3	UDI Number

Regulatory Requirements

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 interference, this product complies with emission limits for Group 1 Class A Medical Devices as stated in EN 60601-1-2. 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 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.

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.

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 Communications Commission regulations.

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 2-12 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 2-13 Disposal of waste symbol



Battery Disposal

The separate collection label is affixed to a battery, or its packaging, to indicate 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 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:

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

Figure 2-14 Battery Disposal symbol



Pollution Control Label

The following product pollution control information is provided according to SJ/T11364-2014 Marking for Restriction of Hazardous Substances caused by electrical and electronic products.

Figure 2-15 Pollution control symbol



This symbol indicates the product contains hazardous materials in excess of the limits established by the Chinese standard GB/T 26572 Requirements of concentration limits for certain restricted substances in electrical and electronic products. The number in the symbol is the Environment-friendly Use Period (EFUP), which indicates the period during which the hazardous substances contained in electrical and electronic products will not leak or mutate under normal operating conditions so that the use of such electrical and electronic 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.

China ROHS Information (only for China)

有害物质的名称及含量

表 2-29 产品中有害物质的名称及含量

部件名称	有害物质					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
系统控制台	×	○	○	○	○	○
立式摄影架	×	○	○	○	○	○
摄影床 (含手柄, 压缩带)	×	○	○	○	○	○
系统柜	×	○	○	○	○	○
X 射线管悬吊装置	×	○	○	○	○	○
X 射线管组件	×	○	○	○	○	○
限束器	×	○	○	○	○	○
高压发生器	×	○	○	○	○	○
探测器充电仓	×	○	○	○	○	○
平板探测器	×	○	○	○	○	○

本表格依据 SJ/T 11364 的规定编制。

○：表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。

×：表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求。

- 此表所列数据为发布时所能获取的最佳信息

由于缺少经济上或技术上的合理可行的替代物质或方案，此医疗设备运用以上一些有害物质来实现设备的预期临床功能，或给人员或环境提供更好的保护效果。

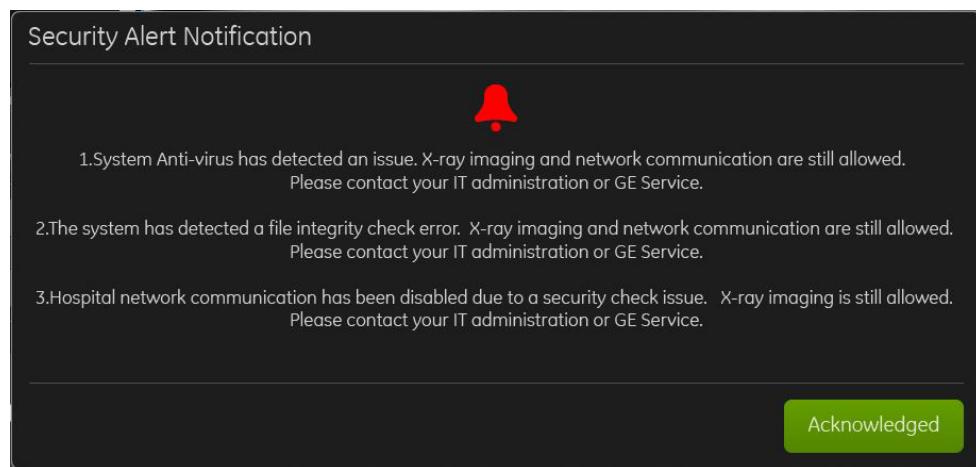
Privacy and Security

The Discovery XR656 HD Privacy and Security Manual, 5888888-1EN, describes Privacy and Security

considerations of the use of Discovery XR656 HD System. This manual describes the expected intended use, the included Privacy and Security capabilities, how they are configured and used, and recommended secure setting values.

Security Alert Notification

A blinking red bell in the information area indicates a security alert. Click on the bell to open a window that will describe the notification possibilities.



Dose Chart

See the following table to compare film speed to dose values.

Table 2-30 Dose Chart

Expected receptor Default Dose (μGy) 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 = 0.25
- 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

X-ray source components filter X-ray source components by the X-ray tube and beam restraints. X-ray source components equivalent filter 1.1mm aluminum @ 75kV.

The beam splitter is equivalent to 2.0 mm aluminum / 70 kV, which combines to produce an inherent filtration of not less than 2.7 mm aluminum equivalent (@ 70 kVp).

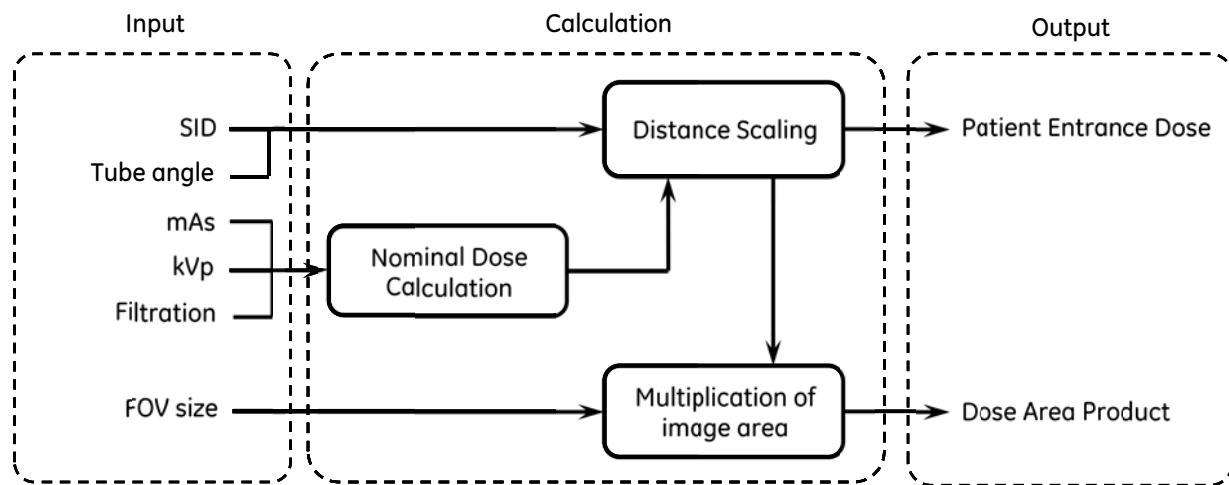
You can select an additional beam splitter filter. Refer to [Chapter 8: System Hardware-Multi-Leaf Collimator \(p. 8-26\)](#) for detailed information.



CAUTION This system is designed to be used only with the GE Healthcare MX100 X-ray tube assembly and collimator model number Collimator AL01C II eL. 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 2-16 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 Healthcare 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.

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

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 sources of additional information on how to optimize protocols:

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

What Do I Need to Know?

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

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 for people of all ages. 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, consider the centering of the intended anatomy. 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 require 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.

Adjusting Individual Exposure Parameters by Patient

Adjust Parameters: 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. We strongly recommend that you work with your Radiologist and Physicist to determine the lowest possible dose for the desired image quality. The following can be referenced for pediatric sizing:

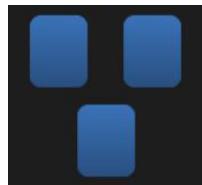
- ~11 kg (24 lb); recumbent length 75 cm (29.5 in).
- ~21 kg (46 lb); 113 cm (44.5 in) standing height.
- ~52 kg (115 lb); 156 cm (61.5 in) standing height.

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 Healthcare 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 Healthcare 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.

The system also provides the Dose Structured Reporting (RDSR) option. RDSR provides separation of radiation exposure data from image data through the use of a new series (997). The 997 series file is not viewable on the system. Graphical reference to this feature can be found on [Chapter 12: Image Management-Image Management screen \(p. 12-3\)](#).

Protocol Database Edit

In collaboration with your radiologist and physicist, you can adjust default protocol techniques on your system. This should not replace carefully observing the technical acquisition screen prior to each exposure. The default protocols 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 GE Healthcare representative.

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Chapter 4: General Information

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

See [Chapter 8: System Hardware](#) 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 shutdown and start up should be performed once a week as part of routine QAP. See [Chapter 14: Quality Assurance and Maintenance](#) for more information.

Start Up

Press the Power On button on the Radiology Control Interface Module (RCIM2).

Note: There is a green LED for Power On button on RCIM2. The lit green LED means the power input is On. If the LED is not On, confirm that there is power input to the system.

Figure 4-1 Power button on RCIM2



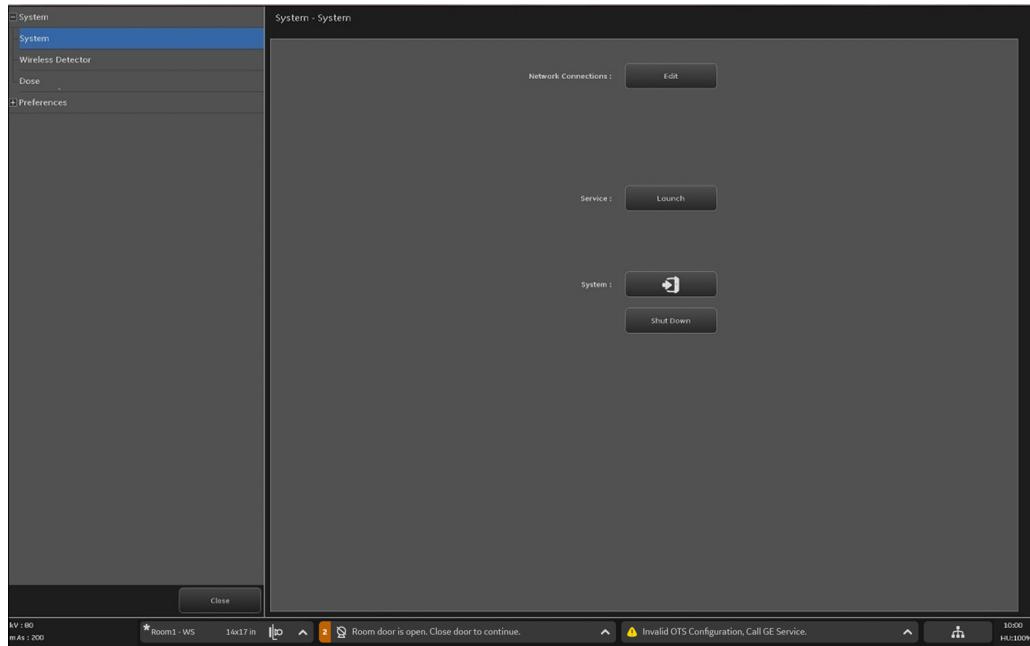
- If enabled, the Login screen appears on the monitor when the system is ready. See [Login and Log off \(p. 4-3\)](#) for more information.
- If Login is not enabled, the Worklist appears on the monitor when the system is ready. See [Chapter 9: Worklist](#) for more information.

Shutdown

1. Close all open exams.
2. Click the Utilities button at the top of the Worklist screen.

Figure 4-2 Utilities button

3. Select System on the Utilities screen.

Figure 4-3 Utilities – System screen

4. Click [SHUTDOWN].

Note: Allow for the tube fan speed to slow (if running high) before proceeding.

5. Click [YES] to proceed with shut down, or [CANCEL] to return to the Utilities screen.

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

Note: Systems with an Uninterruptable Power Supply (UPS)

For proper system and UPS integration to occur, you must wait one minute before power to the system is restored. If not, you must press the power button on the RCIM and then the computer power switch to successfully link both the system and UPS. *One minute is the default UPS power cycle.

Note: Power Off - Systems with an Uninterruptable Power Supply (UPS)

When performing a shutdown, the GE Healthcare X-ray system, desktop computer and monitor will power down. The UPS will display “Battery Mode - Load Protected” and an orange status indicator light will be visible. The UPS will sense that the computer and monitor are powered down (kW and kVa will be at 0.0). After one minute of the system being off, the UPS will have no indicator lights displayed and will display “Press to Start - Load Not Powered.” Once a user is ready to Power On the system using the

GE Healthcare RCIM, both the X-ray system and UPS will power up together. See [Power button on RCIM2](#).

Login and Log off

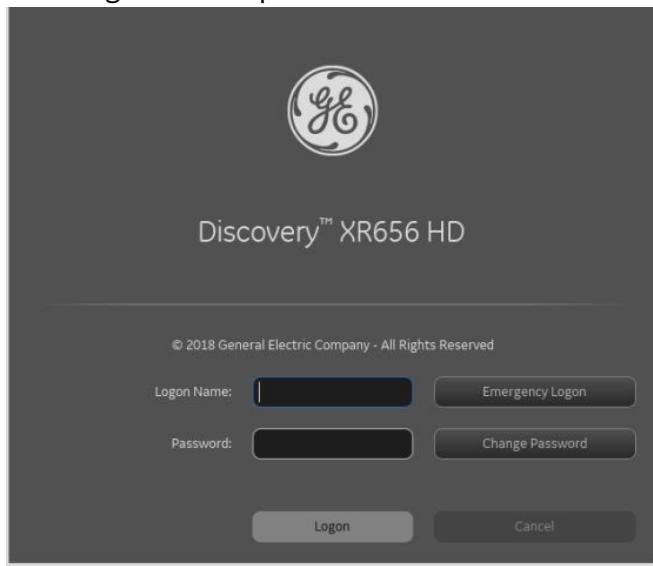
The following sections apply if the system is configured to use the Login feature in the Utilities User Interface. See [Appendix A: Login Administration](#) for information on administering the login function.

Standard Login

The Login screen 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).

Follow these steps to login to the system.

1. Start up the system or log off the previous user.
 - The Login screen opens.



2. Enter your Login Name.
3. Enter your Password.
4. Click Logon.
 - The Worklist appears. See [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 incorrect, 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."

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. See [Appendix A: Login Administration](#) to configure the Emergency Login function.

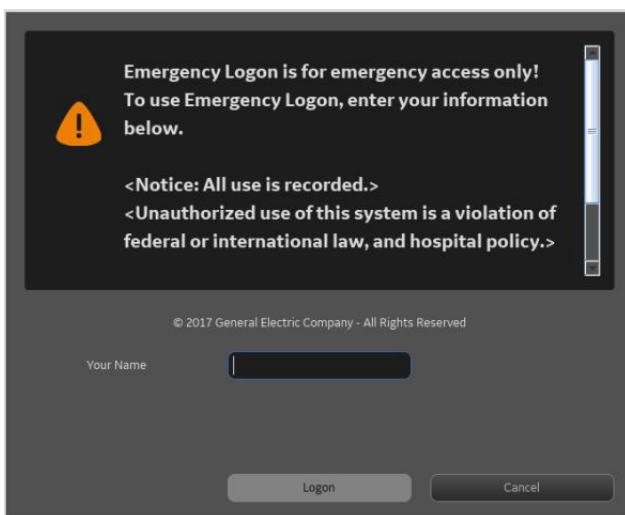
Emergency Login will allow exposures, but does not allow access to settings and network configuration.

Note: To protect patient privacy, exporting images to CD/DVD is not available, when the system is logged in emergency mode.



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 Logon.
 - You are prompted to enter your name. Enter your name and click Logon.



2. The Worklist screen appears.

Inactivity Time out (Auto Log Off)

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. See [Appendix A: Login Administration](#) to configure the inactivity time out function.

Log Off

1. Close, suspend, or discontinue any open exams. See [Chapter 10: Image Acquisition-End Exam \(p. 10-31\)](#).
2. Close the Image Viewer.
3. Click the Log off button.

Figure 4-4 Utilities screen log off button



4. Click OK to log off or Cancel to return to the current session.

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 white 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).

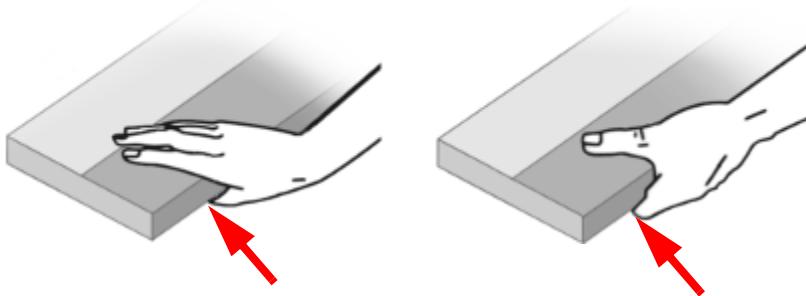
Cassette and detector Table Top Interlock

When in Cassette mode or detector Table Top mode, the Exposure Hold ICON will appear if OTS center with Table/Wall Stand receptor while detector is pushed into Table/Wall Stand. Select the Exposure Hold ICON for the 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. And the Table Lock Control Buttons will also keep flashing to remind the user when the finger pinch lock is activated.

Figure 4-5 Finger pinch lock trigger



To unlock the table top:

1. Release the Table top positioning foot pedal.

Figure 4-6 Table top positioning foot pedal



2. Remove hands, fingers, or other object from under the table edge. And make sure the light of the Table Lock Control Buttons goes out.
3. Press the table top positioning foot pedal two consecutive times.
4. Hold the foot pedal down and position the table top.

Emergency Stop

Press the emergency stop button to immediately power down the system—including table, OTS, wall stand, and x-ray tube, and stops image exposure. The table and RCIM2 are equipped with Emergency Stop buttons.

To release: Turn (RCIM2) or pull (table) the e-stop button to release.

Figure 4-7 Emergency Stop buttons



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.

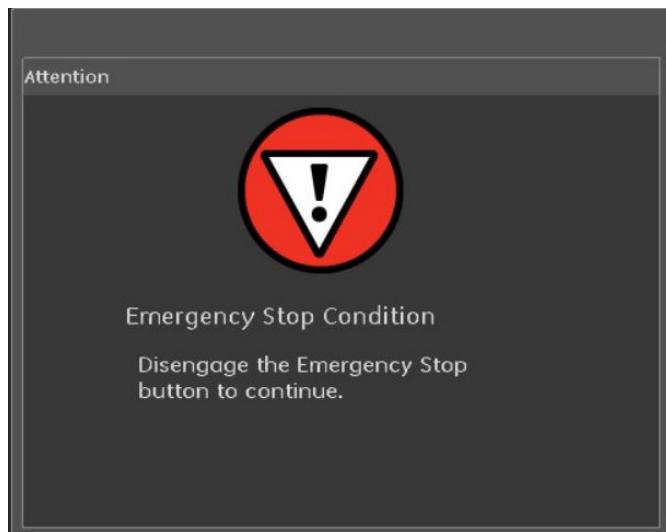
Follow these steps to perform an emergency stop and to reset the Emergency Stop button.

1. Press the Emergency Stop button.

Resolve the emergency situation.

2. When normal conditions are confirmed, turn (RCIM2) or pull (table) the e-stop button to reset. The system will power up.

Note: If turn the e-stop button on RCIM2 to reset, turn the button clockwise (indicated by the arrows on the button) until it stops, then release.

Figure 4-8 Emergency Stop screen

After the emergency stop recovery has completed, and as soon as it is safe to do so, perform a system reset.

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. We recommend placing at least one Emergency Off button near the doorway of every room in the system scan 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

Follow these steps to reset the system. This process could take up to three minutes to complete.

1. Close, suspend, or discontinue any open exams. See [Chapter 10: Image Acquisition-End Exam \(p. 10-31\)](#).
2. Log off of the system.
3. Press and hold the Reset button on the RCIM2 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 4-9 Reset button on the RCIM2

- 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.

Note: Systems with an Uninterruptable Power Supply (UPS)

For proper system and UPS integration to occur, once a system reset occurs and begins to boot back up, you must press the computer power switch to successfully link both the system and UPS.

Note: Reset - Systems with an Uninterruptable Power Supply (UPS)

When performing a reset, the GE Healthcare X-ray system, desktop computer and monitor will all power down. The UPS will switch into “Battery Mode - Load Protected” and an orange status indicator light will be visible. The X-ray system will automatically power up the X-ray equipment however, you must press the desktop computer Power On button for proper syncing.

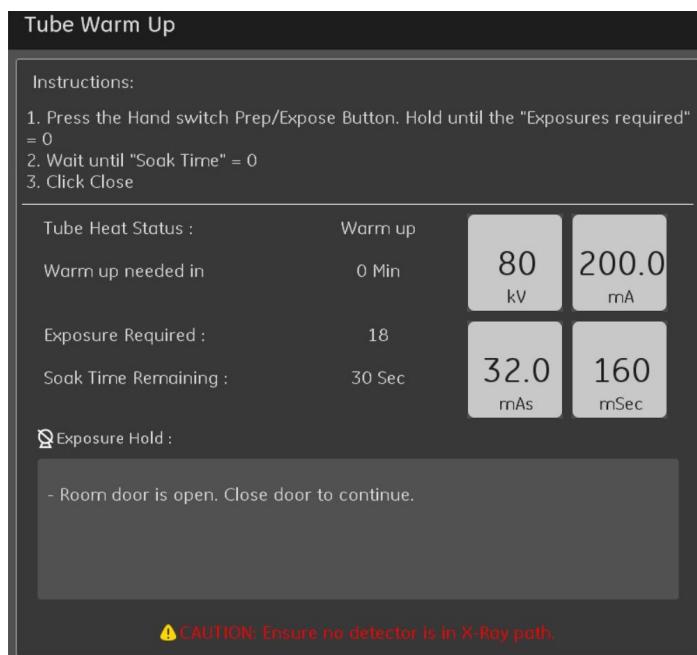
Tube Warm Up

Use the Tube Warm Up if two hours have elapsed since the last exposure. A warning icon will display when tube warm up is needed. The Warm Up can extend the life of the tube.

Figure 4-10 Tube Warm Up Warning Icon

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

Click the Warm Tube button to see the tube warm up status.

Figure 4-11 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 these steps 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 personnel before making X-ray exposures.
2. Click the Warm Tube button 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. See [Chapter 10: Image Acquisition-End Exam \(p. 10-31\)](#).

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 Handswitch 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.

Identification of Radiographs

Identification of images ensures proper anatomical reference. Properly placed image (lead markers) markers will be included in the field of view. All users are recommended to follow their institutions' guidelines for image marker implementation.

Note: Use of electronic/annotated markers as part of post processing is not recommended as a primary method of image identification because of potential user error in identifying anatomical regions.

Image Markers

If image markers are placed in regions of direct radiation (saturation), they could be processed out of the image. Saturated areas beyond the anatomy would not be part of the final image. This is most likely to occur to over exposed images.

In cases where image markers become processed out of the image, you can manually adjust the electronic shutters to include the marker on the final image.

Note: Adjusting electronic shutters may cause Detector Exposure Index (DI) result to change. For instructions on how to adjust the electronic shutter, see [Chapter 11: Image Viewer](#).



CAUTION **Exercise care when placing image 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

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

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

Installation and use of the iLinq system is limited to GE Healthcare 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.

Figure 4-12 iLinq Main Screen

The screenshot shows the iLinq Main Screen with the following interface elements:

- Header:** GE Healthcare iLinq
- Top Bar:** This System ID: GEXRENG05, iLinq Help, About iLinq, Close
- Main Navigation:** Contact GE (selected), Messages
- Form Title:** Contact GE Form (All fields are required, unless indicated)
- Reason for Contacting GE:** System Problem Application Question
- System ID:** This System ID (GEXRENG05)
- System Status:** Completely Down Partially Down Up
- Note:** Please do not use accents and special characters, for example (~!@#\$%^&*) for the fields that follow.
- CAUTION:** Information that can be used to identify a patient or other individual, either directly or indirectly, should not be entered in the field below.
- Problem Description/Question:** Brief Summary You have 2000 characters left. (A large text input area is shown.)
- Image Number (Optional):** Exam Series Image
- Problem/Question Occurred:** Now Earlier Date Hours Min
- Submitter:** Full name has a 19 chars max
Last Name First Name
Phone Number

Table 4-2 iLinq Screen functions

Function	Description
Contact GE	The Contact GE Healthcare Form allows the electronic submission of a service request or applications question directly to the Online Center.
Messages	Receives messages from the Online Center.
Close	To exit the iLinq feature, click on CLOSE in the upper right corner of your screen. This will return you to the Optima XR656 HD system.

Report a problem through iLinq

Follow these steps to connect to the iLinq system and report a problem.

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

Installation and use of the iLinq system is limited to GE Healthcare customers with an X-ray system that is under warranty or covered by a valid GE Healthcare Service Contract, in accordance with the terms and conditions of the iLinq Agreement or GE Healthcare Service Contract. The presence of the GE Healthcare iLinq system alone, at 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 Healthcare Service Contract; or any decompilation of the iLinq system by anyone other than GE Healthcare 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 more information.

Hardware

This following lists the basic processes for working with the system hardware. See [Chapter 8: System Hardware..](#)

Emergency Stop button

1. In an emergency, press the Emergency Stop button.
1. Resolve the situation.
2. When normal conditions are resumed, turn (RCIM2) or pull (table) the e-stop button to reset.

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 caution with your patient.**

Raise and Lower the Table

1. Release the table lock.
2. To raise the table, tap the Up pedal two consecutive times to activate the foot pedal.
3. Hold the pedal down until the proper height is reached.
4. Remove your foot from the pedal to stop the movement.
5. To lower the table, tap the Down pedal two consecutive times.
6. Hold the foot pedal down until the proper height is reached.
7. Remove your foot from the pedal to stop the movement.



CAUTION **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.**

Figure 5-1 inhibition warning label

Position the Table Longitudinally and Transversely

1. Release the table lock.
2. Tap the table top positioning foot pedal two consecutive times to activate the pedal.
3. Hold the foot pedal down and manually move the tabletop in a longitudinal or transverse direction into position.
4. 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

Use the Longitudinal Lock Release button to move the OTS along the bridge of the overhead rail system.

1. Press and hold the Longitudinal Lock Release button on the User Interface.
2. Move the OTS to the desired position.
3. Release the Longitudinal Lock Release button.

Use the Vertical Lock Release button to move the telescopic column up and down.

1. Press and hold the Vertical Lock Release button on the User Interface.
2. Move the telescopic to the desired vertical position.
3. Release the Vertical Lock Release button.

Use the Lateral Lock Release button to move the OTS carriage from side to side on the bridge.

1. Press and hold the Lateral Lock Release button on the User Interface.
2. Move the OTS carriage to the desired position.
3. Release the Lateral Lock Release button.

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.

1. Press and hold the All-Lock, Lock Release button on the User Interface.
2. Move the OTS to the desired position.
3. Release the All-Lock, Lock Release button.

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

Adjust the Tube Position

Use the Tube Angulation Lock Release button to rotate the tube about the short axis (cranial to caudal).

1. Press and hold the Tube Angulation Lock Release button on the User Interface.
2. Move the tube unit to the desired angle.
3. Release the Tube Angulation Lock Release button.

Use the Rotation Detent button on the OTS to rotate the tube about the vertical axis of the telescopic column.

1. Press the Rotation Detent button on UI (lower right).
2. Rotate the tube unit.
3. Release the button to hold position.



WARNING **Pinch Point:** The area where the tube connects to the column creates a pinch point when the tube is rotated. Keep your hands on the OTS handle and keep patient's hands clear while rotating the tube.

Rotate the Multi-Leaf Collimator

1. Move the locking lever on the multi-leaf collimator toward the front panel. This releases the collimator from the 0 lock-in position.

2. Using both hands, rotate the multi-leaf collimator to the proper angle and direction.
3. Return the locking lever to its original position.

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



CAUTION **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.

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

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

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

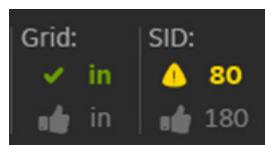
1. Add or select the procedure from the Worklist.



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.
8. Choose the Receptor: Table, Wall Stand, Wireless Digital Detector or Cassette mode.
9. Option: Choose AEC or Fixed mode.
10. Confirm or adjust the Grid and SID status.

Figure 5-2 Grid and SID status



- An alert icon appears if the current Grid or SID is not in the recommended status for the technique.
- A checkmark appears if the current Grid or SID is in the recommended status for the technique.
- Figure 5-2 shows the Grid is in the recommended status and the SID is not in the recommended status.

11. Make technique adjustments: kV, mA, Focal spot, Cu Filter, and Ion chambers (AEC mode only).

12. Position the patient on the table or in front of the wall stand as appropriate.



CAUTION **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.

Manual Patient Entry (Worklist)

Add Patient

Follow these steps to enter the patient's information into your system.

1. On the Worklist screen click Add Patient.
2. Enter the patient information.
3. Click Save or Start Exam.

Edit Patient Information

Patient information can only be edited if manually entered on system and the 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.
4. Click Save.

Auto Positioning

See also: [Chapter 13: Advanced Applications-Auto Positioning](#).

Start Auto Positioning from Worklist Screen

Follow these steps to start Auto Positioning from the Worklist.



CAUTION Keep patient and others clear of the OTS as it moves into position.

1. Confirm or change the **Auto Positioning** selection.
2. Press and hold the Auto Positioning button on the RCIM2.
3. Continue to the exam as described in [Chapter 10: Image Acquisition](#).

Auto Positioning from Image Acquisition Screen

Follow these steps to activate Auto Positioning from the Image Acquisition screen.



CAUTION Keep patient and others clear of the OTS as it moves into position.

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 RCIM2.
6. After motion stops, make final adjustments to the tube position.
7. Continue the exam as described in [Chapter 10: Image Acquisition](#).

Auto Positioning from Remote Control



CAUTION Keep patient and others clear of the OTS as it moves into position.

1. Double Press and hold the button for the desired location.
2. After motion stops, make final adjustments to the tube position.

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.

Auto Positioning in Protocol Editor

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

Chapter 6: Status Bar

Overview

Figure 6-1 Status Bar and Worklist Screen

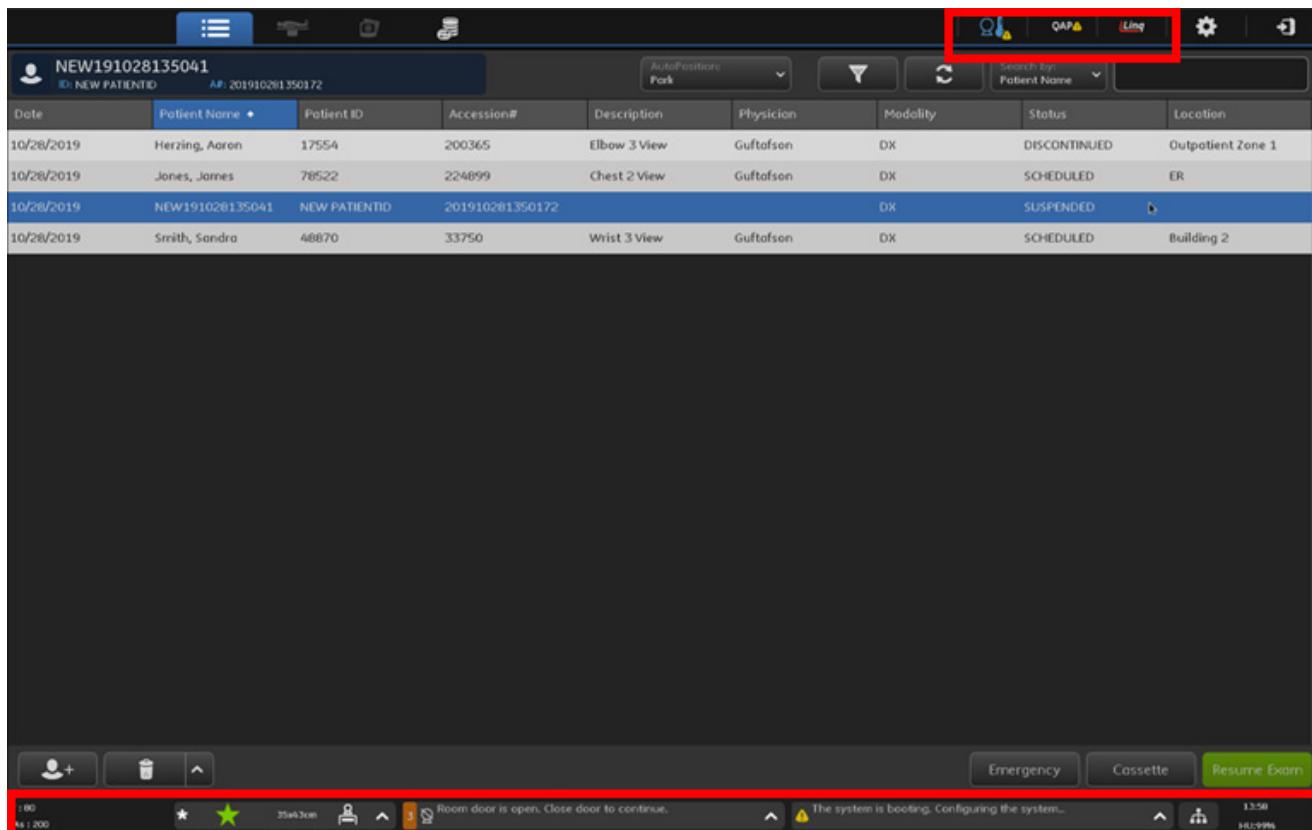


Table 6-1 Status Bar Icons

Item	Description
 kV : 80 mAs : 200	Secondary Technique Display: Displays the technique values that the generator has loaded. Note: Could be the previous exposure techniques performed.
	Transfer Log
 * ★ 35x43cm	Digital Detector icon

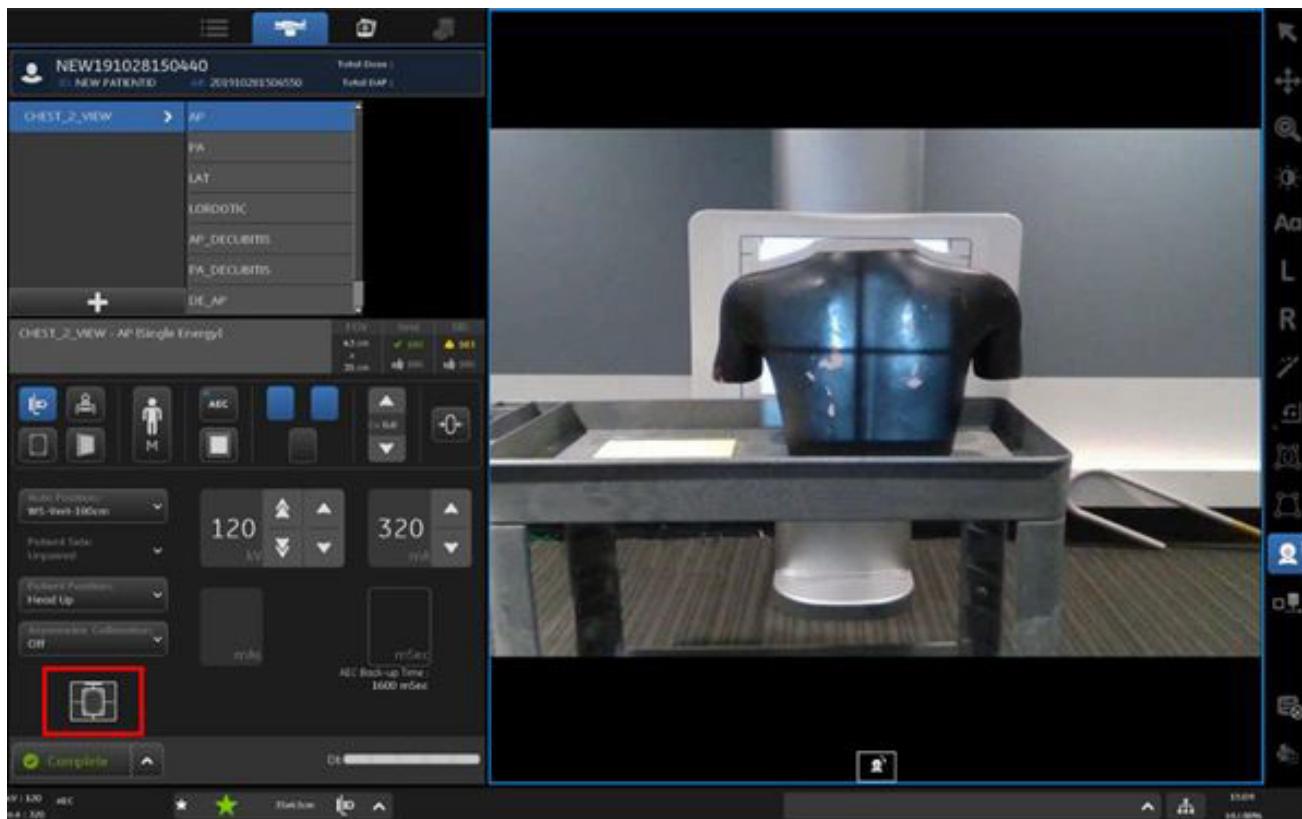
Item	Description
	<p>Inhibits Bar</p> <ul style="list-style-type: none"> • A system inhibit icon will display within the Inhibit Bar when an Inhibit message is present • Displays only when there are Inhibits available • When the user selects the Inhibit Bar, it expands and displays a list of all interlocks and error conditions preventing an exposure.
	<p>System Message Bar</p> <ul style="list-style-type: none"> • When the user selects the System Message Bar, it expands and displays all previous system status messages since the last system restart.
	System Time
	<p>Heat Units Remaining</p> <p>Shows the percentage of heat units remaining.</p>

Table 6-2 Worklist Status Bar Icons

Item	Description
	<p>Tube Warmup</p> <p>Refer to Chapter 4: General Information-Tube Warm Up (p. 4-9).</p>
	<p>QAP Button</p> <p>Refer to Chapter 14: Quality Assurance and Maintenance (p. 14-1).</p>
	<p>iLinq Button</p> <p>Connects to iLinq remote support services. Refer to Chapter 4: General Information-iLinq (p. 4-12).</p>

Table 6-3 Detector Orientation Status icons

Detector Orientation	Table		Wallstand		DC	CR/Film
	14x17in	17x17in	14x17in	17x17in		
Detector not docked						No icon displayed
Detector docked + Tray in + Landscape		N/A		N/A		
Detector docked + Tray in + Portrait						
Other condition: (docked; but not tray in, or not in Landscape/Portrait position...)						

Figure 6-2 Detector Orientation Status on the Workstation Monitor

Digital Detector Status

Table 6-4 Digital Detector Status in Detector Option drop down list

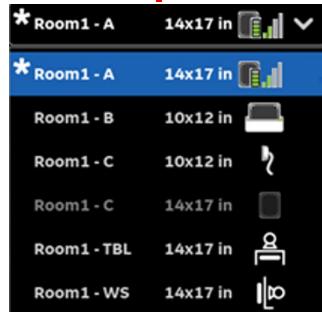
For primary detector:

States	Icons
Wirelessly Connected	Battery>75%
	50%<Battery<=75%
	25%<Battery<=50%
	10%<Battery<=25%
	Battery<=10%
No Signal/ no connection	
Tethered	
In Table Housing	
In WS Housing	
Sleep timeout	

For secondary detector:

Default State	
Tethered	
In Table Housing	
In WS Housing	

Detector Management



Click the drop down icon.

A list of registered detectors opens.

The primary detector will have an asterix (*) next to it. When you select a detector from the list, the system will reassign that to be the primary detector.

Chapter 7: Flashpad HD 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:

- 4288 x 4288 (42.60 × 42.60 cm) for 17 x 17 in / 43 x 43 cm.
- 3524 x 4288 (34.96 × 42.60 cm) for 14 x 17 in / 35 x 43 cm.
- 2508 x 3004 (24.8 x 29.76 cm) for 10 x 12 in / 25 x 30 cm.

Each pixel is attached to a data acquisition circuit that converts incoming X-ray signal to 16-bit digital data.

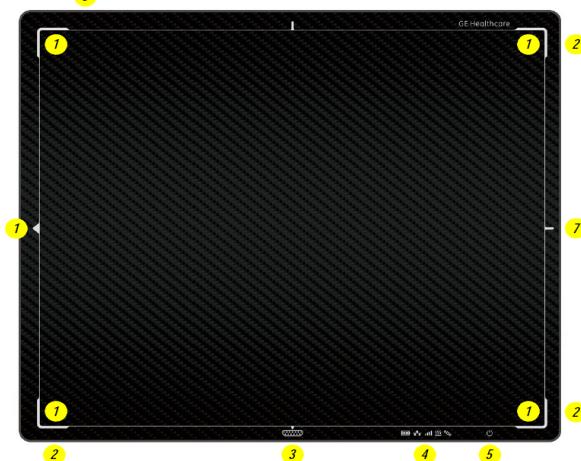
The detector is constructed from carbon fiber faces in a metal frame. The front face contains a X-ray imaging window. The back face contains safety warnings.

Figure 7-1 10 x 12 inch Digital Detector



Figure 7-2 14 x 17 inch Digital Detector



Figure 7-3 17 x 17 inch Digital Detector

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.

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.



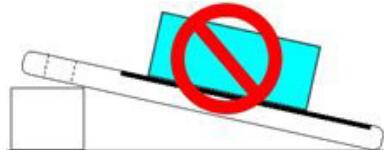
CAUTION **Do not swing the device into hard surfaces, especially corners, as this may scratch the cover, create image quality artifacts, or damage the electronics inside.**

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 Healthcare 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.
- Do not place other objects or patients on the detector if it is not on a flat surface, as shown below.
- Do not place the device on an edge, against the wall or bed. Keep the detector in a cradle, detector tray, or other GE Healthcare supplied container.
- Do not use unapproved chemical cleaners.

- Do not immerse detector into water or other liquids.
- Do not use an external defibrillator while patient remains in contact with detector.
- Do not use this system when an internal defibrillator is discharging.
- Do not place objects on detector if it is not lying flat

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 **Take extra precautions should if the device will be exposed to 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).

A three-axis accelerometer inside monitors the shock events. The Digital Detector can record “Bump Events” as a result of mishandling. Refer to Health Page Detector Bump Report on page 15-68 for more information.

Note: In the event that the detector is dropped or receives an impact, a QAP should be performed and passed before imaging is attempted.

Hardware Overview

Features are typical for all detector sizes.

Detector Front

Figure 7-4 Front of the Digital Detector

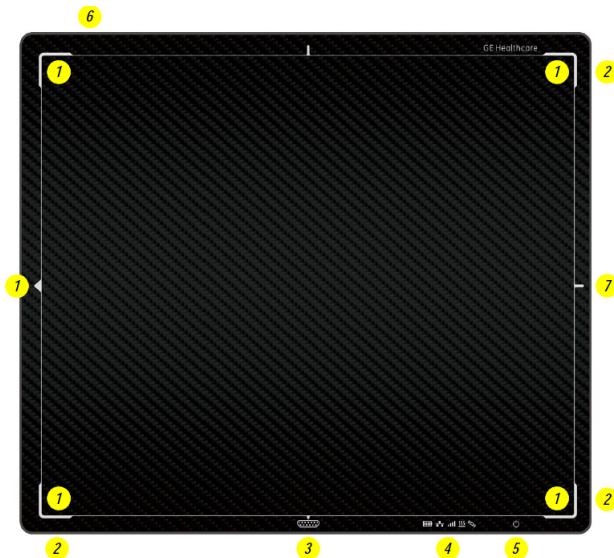


Table 7-1 Front of the Digital Detector

Item	Description
1	Detector Active Visible Area (Imaging area inside the white marks) - The arrow represents the Head Up orientation and edge is scalloped.)
2	Wireless Antenna Windows (Locations indicated by #2 in Figures 7-4 and 7-5).
3	Tether Connection or Docking Connection.
4	Indicator Display.
5	Power Button.
6	ID Label.
7	Battery.

Detector Edge Features

Figure 7-5 Detector Antenna, Tether Connection, Indicator Display and Power Button



Item	Description
1	Scalloped Edge, Head Up Side.
2	Wireless Antenna Window.
3	Tether Connection or Docking Connection.
4	Indicator Display.
5	Power Button.

Figure 7-6 Indicator Display Details

Item		Description
1		Detector Battery - 4 bars: >75% to ≤100%
		Detector Battery - 3 bars: >50% to ≤75%
		Detector Battery - 2 bars: >25% to ≤50%
		Detector Battery - 1 bar: >10% to ≤25%
		Detector Battery Low: ≤10%, Below charge for exposures
		No Detector Battery
2		LAN Connection
		No LAN Connection
3		Wireless Connectivity - 4 bars - Excellent signal
		Wireless Connectivity - 3 bars - Good signal
		Wireless Connectivity - 2 bars - Low signal
		Wireless Connectivity - 1 bar - Very Low signal
		No Wireless Connectivity
4		Temperature Warning
5		Shock Warning

Figure 7-7 Detector ID Label**Figure 7-8** Detector Battery

Item	Description
1	Detector Battery
2	Wireless Antenna Window

Detector Grid

Overview

The Digital Detector grid is integrated with a holder that fits the detector. The grid and detector are keyed to allow for proper alignment and attachment. Once together, you may handle the grid and detector as one unit with the same weight limits.

Figure 7-9 Detector Grid

The markings on the grid surface show the direction of the grid lines.

Item	Description
1	Grid Front (6:1 grid ratio is standard, 8:1 grid ratio is optional). Grid choice is available for 10 x 12 in (25 x 30 cm), 14 x 17 in (35 x 43 cm), and 17 x 17 in (43 x 43 cm) Flashpad HD detectors. See Appendix B: Specifications-Grid (p. B-7) .
2	Grid Back
3	Grid Line Indicators show direction of grid lines. Gaps between indicators show center of grid/detector.

Attaching the Grid

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.

Ensure the head up arrow on the grid is aligned to the head up arrow on the detector, 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.
- Inspect the grid for physical damage before use.
- Clean the grid between each use. See [Chapter 14: Quality Assurance and Maintenance](#). The detector automatically detects when the grid is properly in place. If the grid is on backwards, the system will alert you on the Acquisition Screen.

Detector Handle (Option)

Detector Handle with Grid

A grid is integrated within a holder that contains a handle for transport and patient positioning.

Once together, the grid and detector may be handled as one unit with the same weight limits and inserted into the charging bin or storage area of the system.

The handle with grid may be used on the imaging side of the detector as an imaging grid (Refer to Figure 7-11), or it may be installed on the non-imaging side of the detector to serve as a handle for transporting the detector (Refer to Figure 7-12). When placed on the imaging side of the detector, the system will detect when the grid is properly in place. If attached correctly, the handle allows access to the detector power button, indicator display, and charging/tether connection.

The detector handle can be placed into the optional charging bin, which will allow for the Flashpad HD detector to receive a charge.

Figure 7-10 Detector Handle with Grid

Item	Description
1	Grid Front (6:1 grid ratio is standard, 8:1 grid ratio is optional). Grid choice is available for 14 x 17 in (35 x 43 cm) and 17 x 17 in (43 x 43 cm) Flashpad HD detectors.
2	Grid Back
3	Grid Line Indicators show direction of grid lines. Gaps between indicators show center of grid/detector.
4	Latch
5	Latch Lock



CAUTION Do not use the Detector Handle as a pry lever during patient positioning. Do not apply more than 25 lbs (11.34kg) of force to the handle, as shown.



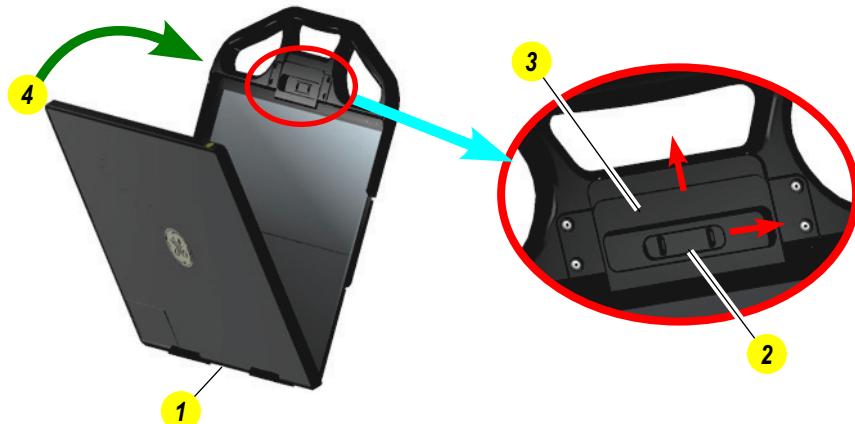
Attaching Handle with Grid to Detector

Grid on the Imaging Side

- With the detector charging connector (1) positioned at the bottom of the handle, and the head up arrow aligned, set the bottom edge of the detector into the channel clips.

2. Slide the latch lock (2) to the side and pull up on the latch (3) to allow the detector to insert past the latch.
3. Insert the detector into the handle with grid and ensure latch closes over detector fully and the magnetic latch lock slides back into the starting/locked position.

Figure 7-11 Attaching Handle with Grid to Detector



Item	Description
1	Detector charging connector positioned at the bottom of the handle
2	Slide latch lock over
3	Pull up on latch
4	Rotate the detector into position

Grid on the Non-Imaging Side

Figure 7-12 Handle with Grid on Non-Imaging Side of Detector



Follow the same process as described above to attach the handle with grid to the non-imaging side of the detector. The imaging side of the detector faces away from the grid as shown in Figure 7-12 above.

Detector Handle without Grid

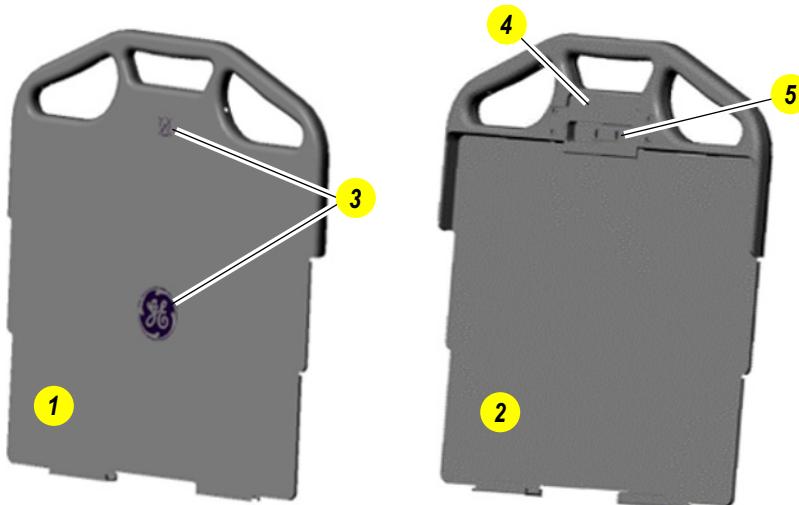
The detector handle may be attached onto the digital detector for transport and patient positioning.

Once together, the handle and detector may be used as one unit with the same weight limits. The detector handle without grid is white in color to help differentiate it from the handle with grid (black).



CAUTION **The Detector Handle is only to be attached and used on the non-imaging side of the detector. Do not image through the handle to the imaging side of the detector.**

Figure 7-13 Detector Handle without Grid



Item	Description
1	Handle Back
2	Handle Front
3	Markings to indicate back side (non-imaging side) of detector
4	Latch
5	Latch Lock



CAUTION **Do not use the Detector Handle as a pry lever during patient positioning. Do not apply more than 25 lbs (11.34kg) of force to the handle, as shown.**



Attaching Handle without Grid to Detector

Follow the same process as described above ([Grid on the Non-Imaging Side \(p. 7-12\)](#)) to attach the handle to the non-imaging side of the detector. The imaging side of the detector faces away from the handle as shown in Figure 7-14 below

Figure 7-14 Handle Correctly installed on Non-Imaging Side of Detector



Detector Operation

Detector Modes: On, Off, and Sleep Modes

Power ON - Idle Mode

The digital detector is powered on and is ready for imaging.

In this mode, the digital detector indicator display will turn off after several seconds to save detector battery power. Press and release the detector power button to turn this display back on.

When the detector is powered on, press and release the power button to turn the detector indication on.

When the detector is powered on, press and hold the power button for several seconds then release to turn off the detector.

Power OFF Mode

The digital detector is powered off and consumes no power.

To turn it on, press and hold the power button. The detector will go through the boot-up cycle and will be ready for exposures.

Sleep (Low Power) Mode:

The digital detector has a low power consumption mode.

Once placed in the bin, the detector will automatically transition to low power mode while its battery is being charged.

The detector will transition to power on mode automatically when removed from the bin when the Fix Rad charging bin is powered on.

The digital detector can be set to turn off automatically at a designated time to save battery power. See [Chapter 15: Preferences-Detector Sleep Time \(p. 15-17\)](#).

Battery Replacement and Charging

Battery Replacement

Figure 7-15 Battery Replacement



To replace the detector battery:

1. Push the two buttons toward the center until the battery rises slightly from the slot.
2. Pull the battery from the slot.
3. Insert the replacement battery into the slot with the label side up. Gently push the battery fully into the slot until it clicks into place.

Note: If the battery is inserted upside down, it will not fully seat in the slot. Remove it and turn it over. The 25 x 30 cm (10 x 12 inch) Flashpad HD detector uses a specific size battery (Model # XRpak LBP-2). The 35 x 43 cm (14 x 17 inch) and the 43 x 43 cm (17 x 17 inch) Flashpad HD, use the same specific size battery (Model # XRpak2 LBP).



CAUTION **A Detector Battery must be kept in the detector at all times. This includes imaging in both wireless and tethered modes. Failure to do so may cause damage to the detector.**

Desktop Battery Chargers (Option)

If the system is on or charging the Digital Detectors will charge when in the bin of the system.

Backup batteries should be stored and charging in the Desktop Battery Chargers.

Note: Do not let detector batteries discharged to less than 10%.

Figure 7-16 Desktop Battery Chargers



Figure 7-17 Desktop Battery Charger cover two type batteries



Note: Desktop Battery Charger cover two type batteries (if applicable), power on or off when needed. The dust cover protects the charger connector.

Detector Charging Bin (Option)

The Detector Charging Bin is used to charge, store, pair and register the digital detectors. It also has storage space for the clip-on grid. The Bin can be mounted to a wall.

The detectors are inserted into the Detector Bin at the direction of imaging side at front.

Figure 7-18 Detector Charging Bin

Note: The bin can also be mounted to a wall. Please contact your GE Healthcare Representative.

Note: The detectors are inserted into the detector bin at the direction of imaging side at front.

Figure 7-19 Detector Charging Bin label and Location

Tether and Tether Interface Box (TIB) (Option)

Figure 7-20 Attachable Tether

Tether Handling

To ensure maximum tether life, follow these guidelines:

- Clean the tether after each use with an approved cleaning chemical. See Chapter 14 for complete cleaning instructions.
- Untwist the tether periodically. The colored stripe on the tether shows if it is twisted.
- Do not jerk or pull on the tether.
- Do not step on the tether.
- Do not run over the tether with the unit, cart, table or other equipment.
- Do not use the tether as a handle.
- Do not bend or fold the tether sharply, especially at the points where the tether connects to the detector and to the unit.

Tether Use

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

The tether should be kept in the storage compartment unless currently being used. Use the tether under these conditions:

- Low Digital Detector battery. Tether the system to continue imaging.
- Connectivity issues between the Digital Detector and the system.
- Complete loss of connectivity between the Digital Detector and the system. You can use the tether until your Service Engineer can diagnose and repair the problem.
- QAP
- Register Detector

Note: It will not charge detector battery with tether connection.



CAUTION **Do not touch the pins on the docking cable connector and patient simultaneously.**



CAUTION **Do not touch the pins on the tether cable connector and patient simultaneously.**



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



CAUTION **Do not touch the pins on the detector charging connector and patient simultaneously.**



CAUTION Do not touch the pins on the TIB tether connector and patient simultaneously.



CAUTION Do not touch the TIB fuse holder and patient simultaneously.



WARNING Detector tethered cable may cause a trip hazard.

Detector Holder (Option)

The detector holder is used for positioning the detector on the table top. Use caution when placing the detector on the table top to ensure it will not fall.

Two detector holders for cross table exams are available.

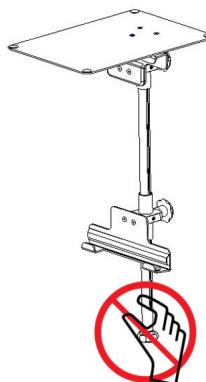
- Lateral Detector Holder (Option)
- Mobile Detector Holder (Option)



CAUTION The bracket of the detector holder may cause interference with wireless connectivity. Confirm your wireless connectivity when placing the antenna area within the detector under the bracket.

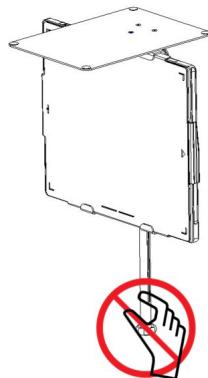


CAUTION Do not reverse when moving the cross table detector holder, otherwise, the upper pallet and under pallet may slide and cause injury.

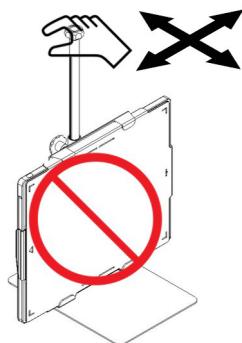




WARNING Do not reverse or incline the cross table detector holder when detector is attached, otherwise, the detector may slide and drop, and the pallet may slide and cause injury.



WARNING Do not take away the cross table detector holder when detector is attached, otherwise, the detector may slide and drop.



WARNING Do not release the lower knob when the detector is attached, otherwise, the detector may fall.

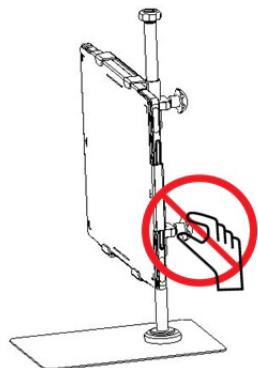


Figure 7-21 Detector Holder



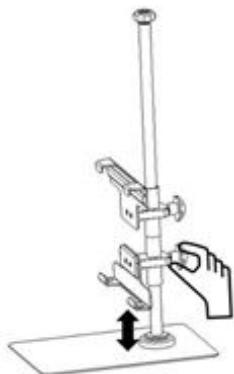
Mobile Detector Holder



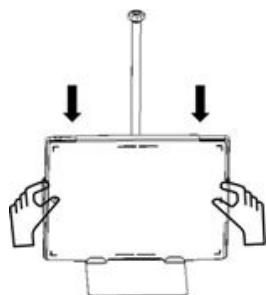
Lateral Detector Holder

Secure the detector on Lateral detector holder

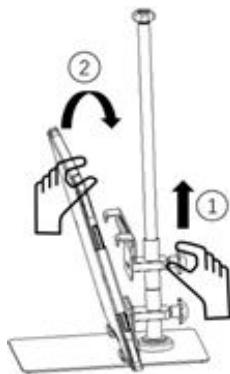
1. Release the two knobs, and adjust the height of the lower hook and then lock the lower knob.



2. Put the detector on the lower hook.



3. Hold the detector with one hand, tilted away from the holder and move the upper hook above the detector.

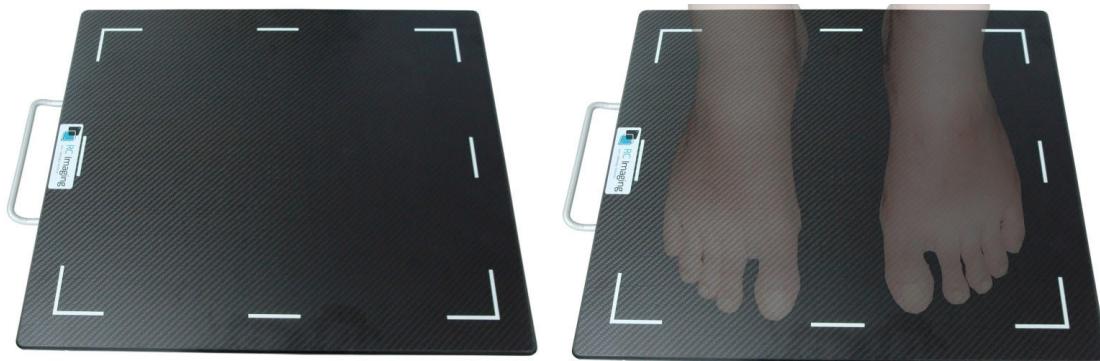


4. Push the detector into its vertical position and lower the upper hook into position to secure the detector.
5. Clip the detector with the upper hook, and lock the upper knob.

When removing the detector, hold the detector with one hand, and release the upper knob with the other hand.

Weight Bearing Cover for FlashPad HD (Option)

The Detector Weight Barrier Cover supports the patient standing load without making contact with the detector below and protects the detector from damage. It is a strong and light weight device that provides high degree of protection to the FlashPad detector against patient mass. The Detector Weight Barrier Cover must be mounted over detector during X-ray imaging of patient feet (patient in standing position). The handle attached with the Weight Barrier Cover makes it easier to carry.

Figure 7-22 Weight Bearing Cover

See [Appendix B: Specifications-Weight Bearing Cover \(p. B-7\)](#).

Detector Grip (Option)

The Detector Grip is an option to be placed on the non-image side (side with label). It will increase the friction in order to hold the detector more firmly during operation.

Figure 7-23 Detector Grip

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.
- Turn on the EMI Reduction feature. See the Preferences chapter for information on how to do this.

Note: 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.

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

Detector Compatible Check

If the detector firmware is not compatible, there will be a message in the system message bar, "Digital Cassette (table/wal stand) detector is not compatible with the system, please call service to determine the compatibility." If it is in the exam window, there will be related inhibit messages "Digital Cassette (Table/Wall Stand) detector firmware is incorrect. Call service to perform detector firmware download."

Note: If the detector is not fully calibrated on the system, there will be messages: "Detector calibration data is corrupt or absent in the system. Call service to perform calibrations," when performing the exams by using the receptor without calibration data.

SAR test results data

The following tables provide SAR test data.

FlashPad HD 2530

FlashPad HD 2530 antenna location and separation distance

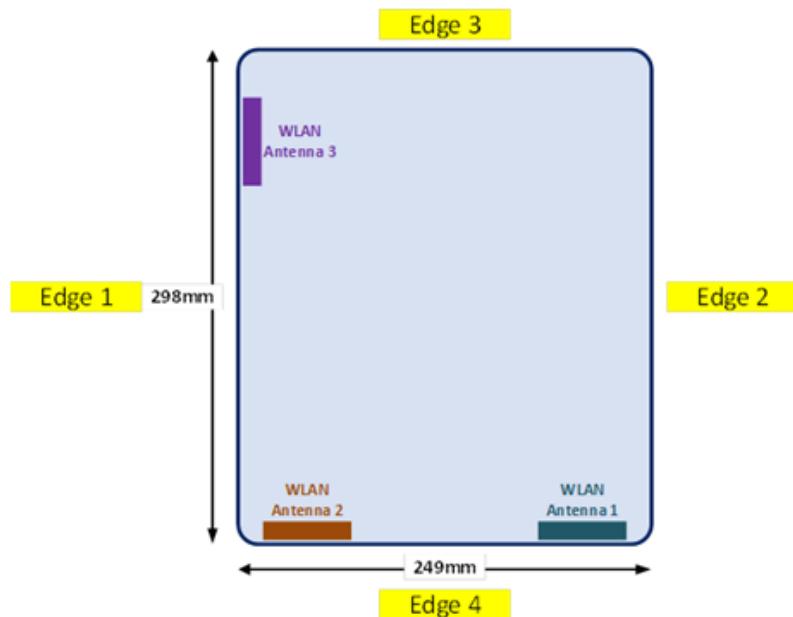


Table 7-2 FlashPad HD2530 separation distance for antenna to edge:

Antenna	To Edge 1 (mm)	To Edge 2 (mm)	To Edge 3 (mm)	To Edge 4 (mm)
WLAN Antenna 1	227	22	298	0
WLAN Antenna 2	22	227	298	0
WLAN Antenna 3	0	227	58	240

SAR Test Results

Table 7-3 SAR Test Results

Band	Mode	Test Position	Gap (mm)	Antenna	Ch.	Freq. (MHz)	Power Drift (dB)	Measured 10g SAR (W/kg)
WLAN 5 GHz	802.11a 6Mbps	Front Face	0 mm	Ant 1	52	5260	0.01	0.196
WLAN 5 GHz	802.11a 6Mbps	Rear Face	0 mm	Ant 1	52	5260	0	0.189
WLAN 5 GHz	802.11a 6Mbps	Edge 2	0 mm	Ant 1	52	5260	0	0.00134
WLAN 5 GHz	802.11a 6Mbps	Edge 4	0 mm	Ant 1	52	5260	0.05	0.414
WLAN 5 GHz	802.11a 6Mbps	Edge 4	0 mm	Ant 1	36	5180	0.09	0.237
WLAN 5 GHz	802.11a 6Mbps	Edge 4	0 mm	Ant 1	64	5320	0.07	0.439
WLAN 5 GHz	802.11a 6Mbps	Front Face	0 mm	Ant 2	52	5260	0	0.191
WLAN 5 GHz	802.11a 6Mbps	Rear Face	0 mm	Ant 2	52	5260	0	0.21
WLAN 5 GHz	802.11a 6Mbps	Edge 1	0 mm	Ant 2	52	5260	-0.06	0.00495
WLAN 5 GHz	802.11a 6Mbps	Edge 4	0 mm	Ant 2	52	5260	0	0.624
WLAN 5 GHz	802.11a 6Mbps	Edge 4	0 mm	Ant 2	36	5180	0	0.278

Table 7-3 SAR Test Results

Band	Mode	Test Position	Gap (mm)	Antenna	Ch.	Freq. (MHz)	Power Drift (dB)	Measured 10g SAR (W/kg)
WLAN 5 GHz	802.11a 6Mbps	Edge 4	0 mm	Ant 2	64	5320	0	0.37
WLAN 5 GHz	802.11a 6Mbps	Front Face	0 mm	Ant 3	52	5260	0	0.265
WLAN 5 GHz	802.11a 6Mbps	Rear Face	0 mm	Ant 3	52	5260	0	0.248
WLAN 5 GHz	802.11a 6Mbps	Edge 1	0 mm	Ant 3	52	5260	0.04	0.314
WLAN 5 GHz	802.11a 6Mbps	Edge 3	0 mm	Ant 3	52	5260	0	<0.001
WLAN 5 GHz	802.11a 6Mbps	Edge 1	0 mm	Ant 3	36	5180	-0.04	0.304
WLAN 5 GHz	802.11a 6Mbps	Edge 1	0 mm	Ant 3	64	5320	-0.09	0.477
WLAN 5 GHz	802.11a 6Mbps	Front Face	0 mm	Ant 1	116	5580	0	0.221
WLAN 5 GHz	802.11a 6Mbps	Rear Face	0 mm	Ant 1	116	5580	0	0.193
WLAN 5 GHz	802.11a 6Mbps	Edge 2	0 mm	Ant 1	116	5580	0	0.00406
WLAN 5 GHz	802.11a 6Mbps	Edge 4	0 mm	Ant 1	116	5580	0	0.323
WLAN 5 GHz	802.11a 6Mbps	Edge 4	0 mm	Ant 1	100	5500	0	0.517
WLAN 5 GHz	802.11a 6Mbps	Edge 4	0 mm	Ant 1	140	5700	0	0.441
WLAN 5 GHz	802.11a 6Mbps	Front Face	0 mm	Ant 2	116	5580	0	0.229
WLAN 5 GHz	802.11a 6Mbps	Rear Face	0 mm	Ant 2	116	5580	0	0.206
WLAN 5 GHz	802.11a 6Mbps	Edge 1	0 mm	Ant 2	116	5580	0.04	0.00632
WLAN 5 GHz	802.11a 6Mbps	Edge 4	0 mm	Ant 2	116	5580	0.09	0.238
WLAN 5 GHz	802.11a 6Mbps	Edge 4	0 mm	Ant 2	100	5500	0	0.21
WLAN 5 GHz	802.11a 6Mbps	Edge 4	0 mm	Ant 2	140	5700	0	0.115
WLAN 5 GHz	802.11a 6Mbps	Front Face	0 mm	Ant 3	116	5580	0	0.359
WLAN 5 GHz	802.11a 6Mbps	Rear Face	0 mm	Ant 3	116	5580	0	0.371
WLAN 5 GHz	802.11a 6Mbps	Edge 1	0 mm	Ant 3	116	5580	-0.01	0.553
WLAN 5 GHz	802.11a 6Mbps	Edge 3	0 mm	Ant 3	116	5580	0	<0.001
WLAN 5 GHz	802.11a 6Mbps	Edge 1	0 mm	Ant 3	100	5500	-0.02	0.683
WLAN 5 GHz	802.11a 6Mbps	Edge 1	0 mm	Ant 3	140	5700	0.07	0.586

FlashPad HD 3543

FlashPad HD 3543 antenna location and separation distance

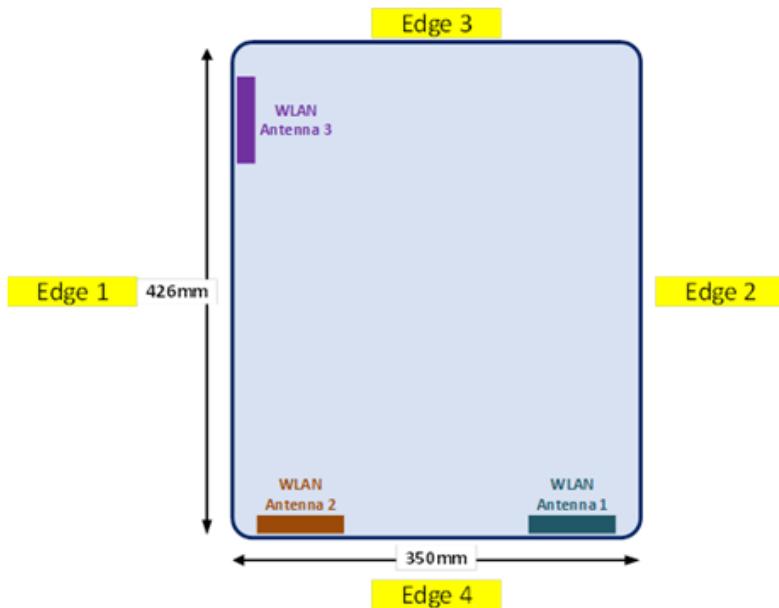


Table 7-4 FlashPad HD3543 separation distance for antenna to edge:

Antenna	To Edge 1 (mm)	To Edge 2 (mm)	To Edge 3 (mm)	To Edge 4 (mm)
WLAN Antenna 1	325	25	426	0
WLAN Antenna 2	25	325	426	0
WLAN Antenna 3	0	350	59	367

SAR Test Results

Table 7-5 SAR Test Results

Band	Mode	Test Position	Gap (mm)	Antenna	Ch.	Freq. (MHz)	Power Drift (dB)	Measured 10g SAR (W/kg)
WLAN 5 GHz	802.11a 6Mbps	Front Face	0 mm	Ant 1	52	5260	0.07	0.126
WLAN 5 GHz	802.11a 6Mbps	Rear Face	0 mm	Ant 1	52	5260	0	0.14
WLAN 5 GHz	802.11a 6Mbps	Edge 2	0 mm	Ant 1	52	5260	0	0.00246
WLAN 5 GHz	802.11a 6Mbps	Edge 4	0 mm	Ant 1	52	5260	0	0.591
WLAN 5 GHz	802.11a 6Mbps	Edge 4	0 mm	Ant 1	36	5180	-0.02	0.26
WLAN 5 GHz	802.11a 6Mbps	Edge 4	0 mm	Ant 1	64	5320	0	0.492
WLAN 5 GHz	802.11a 6Mbps	Front Face	0 mm	Ant 2	52	5260	0	0.091
WLAN 5 GHz	802.11a 6Mbps	Rear Face	0 mm	Ant 2	52	5260	0	0.124
WLAN 5 GHz	802.11a 6Mbps	Edge 1	0 mm	Ant 2	52	5260	-0.09	<0.001

Table 7-5 SAR Test Results

Band	Mode	Test Position	Gap (mm)	Antenna	Ch.	Freq. (MHz)	Power Drift (dB)	Measured 10g SAR (W/kg)
WLAN 5 GHz	802.11a 6Mbps	Edge 4	0 mm	Ant 2	52	5260	0.07	0.307
WLAN 5 GHz	802.11a 6Mbps	Edge 4	0 mm	Ant 2	36	5180	-0.05	0.248
WLAN 5 GHz	802.11a 6Mbps	Edge 4	0 mm	Ant 2	64	5320	-0.01	0.183
WLAN 5 GHz	802.11a 6Mbps	Front Face	0 mm	Ant 3	64	5320	0	0.191
WLAN 5 GHz	802.11a 6Mbps	Rear Face	0 mm	Ant 3	64	5320	0	0.182
WLAN 5 GHz	802.11a 6Mbps	Edge 1	0 mm	Ant 3	64	5320	0.07	0.494
WLAN 5 GHz	802.11a 6Mbps	Edge 3	0 mm	Ant 3	64	5320	0	<0.001
WLAN 5 GHz	802.11a 6Mbps	Edge 1	0 mm	Ant 3	36	5180	-0.09	0.264
WLAN 5 GHz	802.11a 6Mbps	Edge 1	0 mm	Ant 3	64	5320	-0.03	0.468
WLAN 5 GHz	802.11a 6Mbps	Front Face	0 mm	Ant 1	116	5580	0	0.161
WLAN 5 GHz	802.11a 6Mbps	Rear Face	0 mm	Ant 1	116	5580	0.1	0.167
WLAN 5 GHz	802.11a 6Mbps	Edge 2	0 mm	Ant 1	116	5580	0	0.00123
WLAN 5 GHz	802.11a 6Mbps	Edge 4	0 mm	Ant 1	116	5580	-0.07	0.348
WLAN 5 GHz	802.11a 6Mbps	Edge 4	0 mm	Ant 1	100	5500	0.08	0.326
WLAN 5 GHz	802.11a 6Mbps	Edge 4	0 mm	Ant 1	140	5700	0.06	0.154
WLAN 5 GHz	802.11a 6Mbps	Front Face	0 mm	Ant 2	116	5580	0	0.255
WLAN 5 GHz	802.11a 6Mbps	Rear Face	0 mm	Ant 2	116	5580	0	0.25
WLAN 5 GHz	802.11a 6Mbps	Edge 1	0 mm	Ant 2	116	5580	-0.08	<0.001
WLAN 5 GHz	802.11a 6Mbps	Edge 4	0 mm	Ant 2	116	5580	0.07	0.366
WLAN 5 GHz	802.11a 6Mbps	Edge 4	0 mm	Ant 2	100	5500	0.02	0.328
WLAN 5 GHz	802.11a 6Mbps	Edge 4	0 mm	Ant 2	140	5700	0.04	0.237
WLAN 5 GHz	802.11a 6Mbps	Front Face	0 mm	Ant 3	116	5580	0	0.269
WLAN 5 GHz	802.11a 6Mbps	Rear Face	0 mm	Ant 3	116	5580	0	0.267
WLAN 5 GHz	802.11a 6Mbps	Edge 1	0 mm	Ant 3	116	5580	-0.02	0.539
WLAN 5 GHz	802.11a 6Mbps	Edge 3	0 mm	Ant 3	116	5580	0	<0.001
WLAN 5 GHz	802.11a 6Mbps	Edge 1	0 mm	Ant 3	100	5500	0.01	0.535
WLAN 5 GHz	802.11a 6Mbps	Edge 1	0 mm	Ant 3	140	5700	0.09	0.268

FlashPad HD 4343

FlashPad HD 4343 antenna location and separation distance

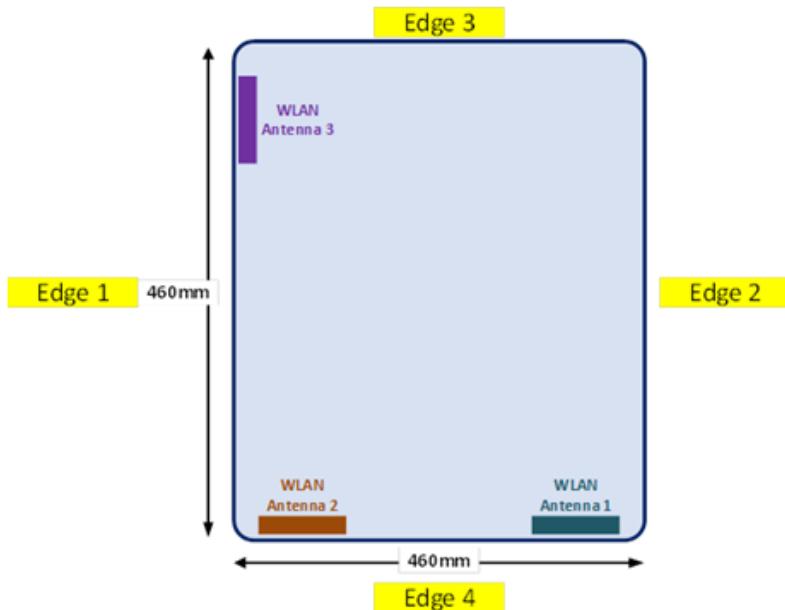


Table 7-6 FlashPad HD 4343 separation distance for antenna to edge:

Antenna	To Edge 1 (mm)	To Edge 2 (mm)	To Edge 3 (mm)	To Edge 4 (mm)
WLAN Antenna 1	385	45	400	<5
WLAN Antenna 2	45	385	400	<5
WLAN Antenna 3	<5	400	62	369

SAR Test Results

Table 7-7 SAR Test Results

Mode	Test Position	Gap (mm)	Antenna	Ch.	Freq. (MHz)	Power Drift (dB)	Measured 10g SAR (W/kg)
802.11a 6Mbps	Front Face	0 mm	Ant 1	52	5260	-0.12	0.122
802.11a 6Mbps	Bottom Face	0 mm	Ant 1	52	5260	-0.13	0.114
802.11a 6Mbps	Edge 2	0 mm	Ant 1	52	5260	0	0.001
802.11a 6Mbps	Edge 4	0 mm	Ant 1	52	5260	0.07	0.227
802.11a 6Mbps	Edge 4	0 mm	Ant 1	36	5180	-0.12	0.248
802.11a 6Mbps	Edge 4	0 mm	Ant 1	64	5320	-0.06	0.199
802.11a 6Mbps	Front Face	0 mm	Ant 2	52	5260	-0.17	0.172
802.11a 6Mbps	Bottom Face	0 mm	Ant 2	52	5260	-0.18	0.186
802.11a 6Mbps	Edge 4	0 mm	Ant 2	52	5260	-0.09	0.425
802.11a 6Mbps	Edge 4	0 mm	Ant 2	36	5180	0.18	0.304

Table 7-7 SAR Test Results

Mode	Test Position	Gap (mm)	Antenna	Ch.	Freq. (MHz)	Power Drift (dB)	Measured 10g SAR (W/kg)
802.11a 6Mbps	Edge 4	0 mm	Ant 2	64	5320	0.06	0.337
802.11a 6Mbps	Edge 1	0 mm	Ant 2	52	5260	0	0.001
802.11a 6Mbps	Front Face	0 mm	Ant 3	52	5260	-0.11	0.166
802.11a 6Mbps	Bottom Face	0 mm	Ant 3	52	5260	-0.04	0.202
802.11a 6Mbps	Edge 3	0 mm	Ant 3	52	5260	0	0.001
802.11a 6Mbps	Edge 1	0 mm	Ant 3	52	5260	0.06	0.425
802.11a 6Mbps	Edge 1	0 mm	Ant 3	36	5180	-0.09	0.343
802.11a 6Mbps	Edge 1	0 mm	Ant 3	64	5320	0.06	0.479
802.11a 6Mbps	Front Face	0 mm	Ant 1	116	5580	0.04	0.211
802.11a 6Mbps	Bottom Face	0 mm	Ant 1	116	5580	-0.16	0.198
802.11a 6Mbps	Edge 2	0 mm	Ant 1	116	5580	0	0.001
802.11a 6Mbps	Edge 4	0 mm	Ant 1	116	5580	0.07	0.262
802.11a 6Mbps	Edge 4	0 mm	Ant 1	100	5500	-0.07	0.303
802.11a 6Mbps	Edge 4	0 mm	Ant 1	140	5700	-0.02	0.291
802.11a 6Mbps	Front Face	0 mm	Ant 2	116	5580	-0.13	0.167
802.11a 6Mbps	Bottom Face	0 mm	Ant 2	116	5580	-0.17	0.150
802.11a 6Mbps	Edge 4	0 mm	Ant 2	116	5580	-0.06	0.171
802.11a 6Mbps	Edge 4	0 mm	Ant 2	100	5500	-0.12	0.186
802.11a 6Mbps	Edge 4	0 mm	Ant 2	140	5700	-0.1	0.232
802.11a 6Mbps	Edge 1	0 mm	Ant 2	116	5580	0	0.001
802.11a 6Mbps	Front Face	0 mm	Ant 3	116	5580	-0.12	0.206
802.11a 6Mbps	Bottom Face	0 mm	Ant 3	116	5580	0.11	0.223
802.11a 6Mbps	Edge 3	0 mm	Ant 3	116	5580	0	0.001
802.11a 6Mbps	Edge 1	0 mm	Ant 3	116	5580	-0.04	0.254
802.11a 6Mbps	Edge 1	0 mm	Ant 3	100	5500	0.06	0.255
802.11a 6Mbps	Edge 1	0 mm	Ant 3	140	5700	-0.13	0.226

Chapter 8: System Hardware

Configurations

The Discovery XR656 HD system is available in these configurations:

- Wall stand only system (with standard or extended arm)
- Table and wall stand (standard or extended arm)
- Overhead Tube Suspension (OTS) only
- Table only

*FlashPad HD is the trademark of General Electric Company.

Note: The following are applied parts or parts subject to the requirements of applied parts, and may be handled by patients. Tabletop, detector, PA bar, lateral bar, image paste patient barrier, table hand grips, compression band, wall stand receptor front panel and chin rest, clip-on grid, detector grip, walls stand detector housing covers, wall stand housing tray handle, step stool, detector handle, detector holder, Mobile Table, and detector weight barrier cover are applied parts or parts subject to the requirements of applied parts.

Component Identification

The Discovery XR656 HD system is made up of several major components and sub-components. The following table shows the main components. Refer to the individual sections within this chapter.

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

Table 8-1 Major system components

<p>Acquisition Workstation (p. 8-5)</p> 	<p>Overhead Tube Suspension (OTS) (p. 8-13)</p> 
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[Digital Wall Stand \(p. 8-31\)](#)



[Digital Table \(p. 8-52\)](#)



[Chapter 7: Flashpad HD Digital Detector \(p. 7-1\)](#)



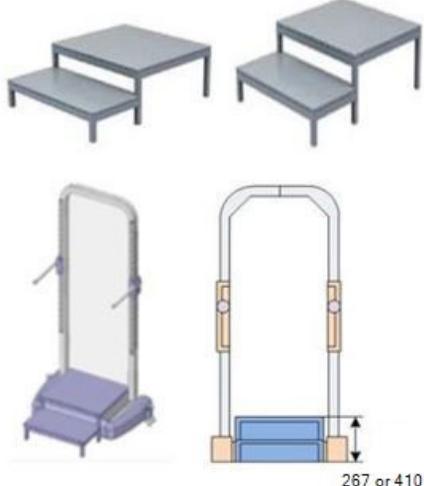
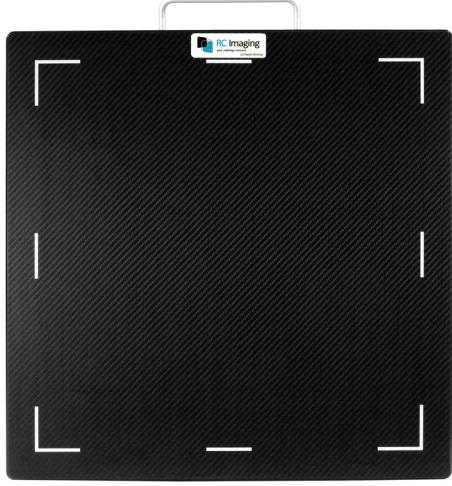
[System Cabinet \(p. 8-30\)](#)



Available Accessories

Table 8-2 Major Available Options

<p>Table Hand Grips and Compression Band (Option) (p. 8-68)</p> 	<p>Auto Image Paste Patient Positioner (Option) (p. 8-76)</p> 
<p>Radiographic Mobile Tables (Option) (p. 8-76)</p> 	<p>Detector Holder (Option) (p. 7-19)</p> 

<p>Grids (p. 8-62)</p> 	<p>Step Stool (Option)</p>  <p>The accessory is to be used by itself or in addition to the image paste patient barrier.</p>
<p>Eaton UPS Model 9Sx700 (optional)</p> 	<p>Weight Bearing Cover for FlashPad HD (Option) (p. 7-22)</p> 

Acquisition Workstation

The Acquisition Workstation has its own dedicated computer and image data base. The Workstation applications are based on a mouse-driven graphical user interface.

The workstation has several components:

- A computer with internal hard disk for system software and image storage, and a DVD-R/CD-RW combination drive, or a USB flash 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 (RCIM2)
- Console hand-switch

The Acquisition workstation supports:

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

Figure 8-1 Acquisition Workstation



Radiology Control Interface Module (RCIM2)

The Radiology Console Interface Module (RCIM2) (controls the power and reset functions for the system. The RCIM2 has the power on button, reset button, an emergency stop button, and indicator lights.

The RCIM2 is placed at the workstation between the monitors and the keyboard.

Figure 8-2 RCIM2**Table 8-3** RCIM2 controls

Control	Description	
1. Emergency Stop button		Immediately powers down the system (including table, OTS, wall stand, and x-ray tube) and stops image exposure. To release: Turn the button clockwise (indicated by the arrows on the button) until it stops, then release. See Chapter 4: General Information-Emergency Stop (p. 4-7) .
2. Power On button		Turns the system power On. See Chapter 4: General Information-System Start Up and Shutdown (p. 4-1) . Note: There is a green LED for Power On button on RCIM2. The lit green LED means the power input is On. If the LED is not On, confirm that there is power input to the system.
3. Reset button		Shuts down and re-starts the system in the event of software failure. See Chapter 4: General Information-System Start Up and Shutdown (p. 4-1) .
4. Expose Hold indicator		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.
5. Tube Overheat indicator		Lights up when the tube is too hot to continue taking exposures. Allow the tube to cool until the LED turns off.

Table 8-3 RCIM2 controls

Control	Description
6. X-ray Exposure indicator	 <p>Lights up when x-rays are being emitted, including tube warm up and QAP. 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. See Chapter 13: Advanced Applications-Auto Positioning (p. 13-5).</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 8-3 Console hand-switch and holder

- Active components for this product:
1. Prepare (target rotating)
 2. Expose
 3. Collimator light

Table 8-4 Hand-switch positions

Position	Description
Off 	The Prep/Expose button is not pressed.
PREPARE 	Prepare is the next position on the Hand-switch. When pressed partially, 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 	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. 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 RCIM2 also lights up when X-rays are produced.

Prepare and Record Exposures

Follow these steps to prepare and record exposures with the hand switch.

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

1. Set up the patient and the console 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.
4. Release the Prep/Expose button.

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 Exposure 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 lets 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.

Figure 8-4 The mouse



1. Left Button
2. Right Button
3. Scroll Wheel

Table 8-5 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 8-5 Bar code scanner

Camera (Option)

An optional camera can be installed. The result is a live video of the patient. The camera improves technologist visibility for patient alignment to ensure proper coverage.

The camera complies with US FDA performance standards for laser products except for deviations pursuant to Laser Notice No. 50 dated June 24, 2007.

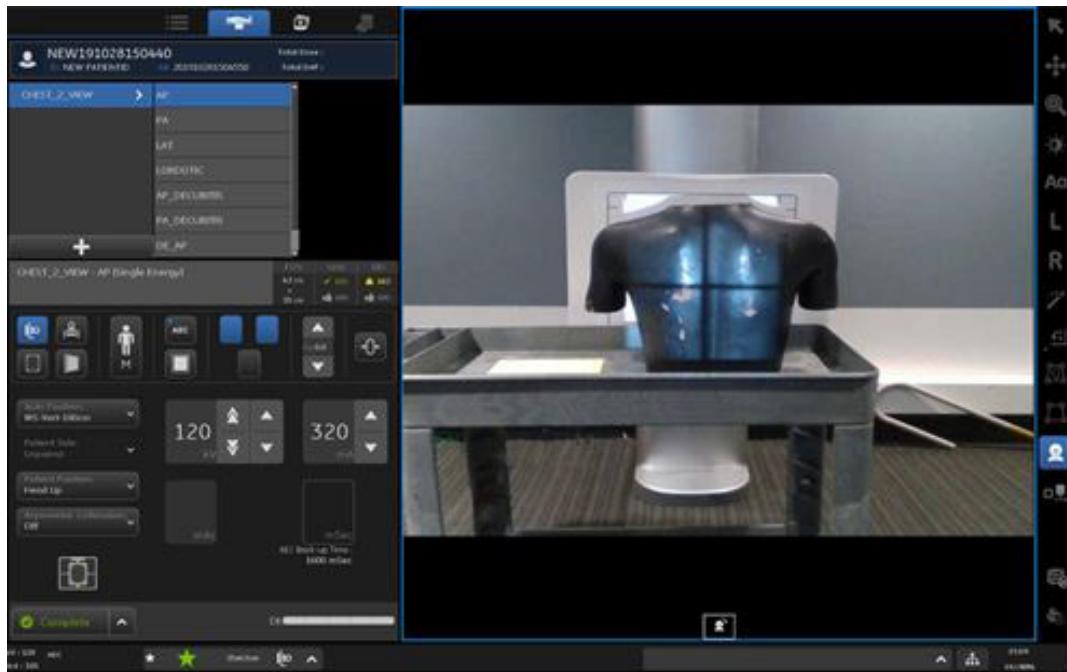
Figure 8-6 Camera ON - Pre Acquisition

Figure 8-7 Camera ON - Post Acquisition

For specifications, see [Camera D415 \(optional\) \(p. B-10\)](#).

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 (See [Multi-Leaf Collimator \(p. 8-26\).](#))

OTS User Interface

The OTS User Interface (Figure 8-9 and Table 8-6) 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**Table 8-6** 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.
3. Inhibit LED / Exposure Hold indicator	 Indicates the exposure interlock is active (white 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. See OTS Control Screen (p. 8-18) .

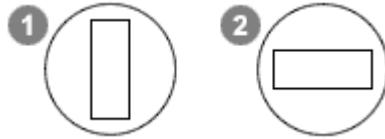
Table 8-6 OTS User Interface functions

Control	Description
4. Manual Collimator LED indicator	 <p>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).</p>
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 keep pressing the button. The LED is lit when button is pressed. The green color of this button is corresponding to the green line on the OTS carriage as a reminder that this button is always a longitudinal motion lock no matter what angulation the Tube is. Note: The longitudinal movement is available when the system power is off.</p>
8. Lateral Lock Release control	 <p>Releases the lock to allow lateral motion of the OTS. The lock is active when you keep pressing the button. The LED is lit when button is pressed. The pink color of this button is corresponding to the red line on the OTS carriage as a reminder that this button is always a lateral motion lock no matter what angulation the Tube is. Note: The lateral movement is available when the system power is off.</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 wall stand is in the horizontal position.</p>

Table 8-6 OTS User Interface functions

Control	Description
10. Tube Angulation Lock Release control	 <p>Releases the lock to allow tube angulation. The lock is active when you keep pressing the button. The LED is lit when the button is pressed.</p> <p>See Tube Angulation (p. 8-24).</p> <p>Note: The rotation is unavailable when the system power is off. In emergencies, the tube unit can be moved against the force of the OTS lock.</p>
11. Vertical Lock Release control	 <p>Releases the lock to allow vertical motion of the OTS. The lock is active when you keep pressing the button. The LED is lit when button is pressed.</p> <p>The blue color of this button is corresponding to the blue line on the OTS column as a reminder that this button is always a vertical motion lock no matter what angulation the Tube is.</p> <p>Note: The vertical movement is available when the system power is off.</p>
12. Column pivot release control	 <p>Releases the column lock to allow for pivot of tube arm.</p> <p>See Column Rotation (p. 8-24).</p> <p>Note: The column rotation is unavailable when the system power is off. In emergencies, the tube unit can be moved against the force of the OTS lock.</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.</p> <p>Detents remain activated if the detent button is selected.</p> <p>Note: 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>

Table 8-6 OTS User Interface functions

Control	Description
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. See OTS Control Screen (p. 8-18).</p>
18. Key Switch control (Located on the back of the OTS)	 <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 wall stand 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>IMPORTANT! The tube will not track to the receptor when OVERRIDE mode is engaged.</p> <p>Note: In override mode, AEC is not enabled. Exposures must be manually configured with fixed parameters.</p> <p>WARNING 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 column 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.

Auto Image Paste and protocols have alternative OTS control screens. See: [COI on OTS control screen](#) and [Chapter 13: Advanced Applications](#).

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

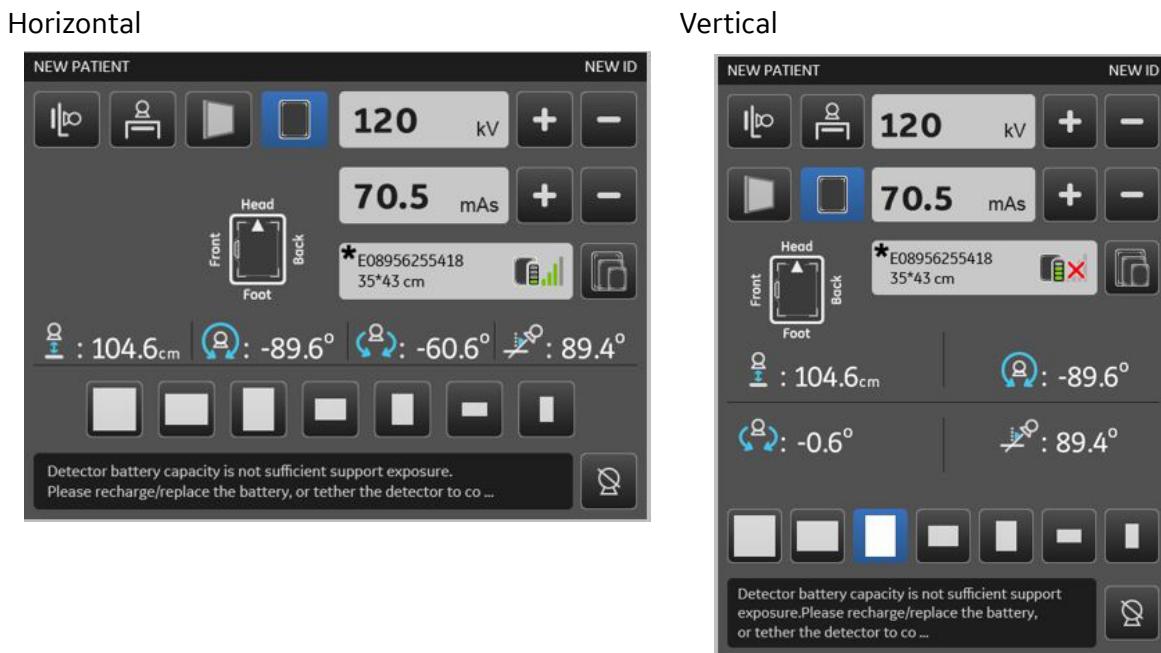


Table 8-7 OTS control screen functions

Item	Description
Patient Information 	If enabled on your system, shows the patient name for the current exam. If this feature is not enabled, the field will be blank. Patient name, date of birth, patient ID can be shown on the top of OTS screen
Receptors 	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.
Detector orientation 	See Chapter 6: Status Bar-Detector Orientation Status Icons (p. 6-4) .

Table 8-7 OTS control screen functions

Item	Description
Detector status 	Display the active detector status in current receptor: Primary tag, Detector Name, Connection status, Detector size
	Multiple Wireless Detector Icon. See Figure 8-11 .
SID 	Displays the SID value in digital table and wall stand 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.
Central Ray Angle 	Display the central ray angulation in degrees.
kV 	Increases or decreases the exposure kV. Press and release the button to adjust the value by 1 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">• This control is disabled• The display value is blank until the exposure is completed

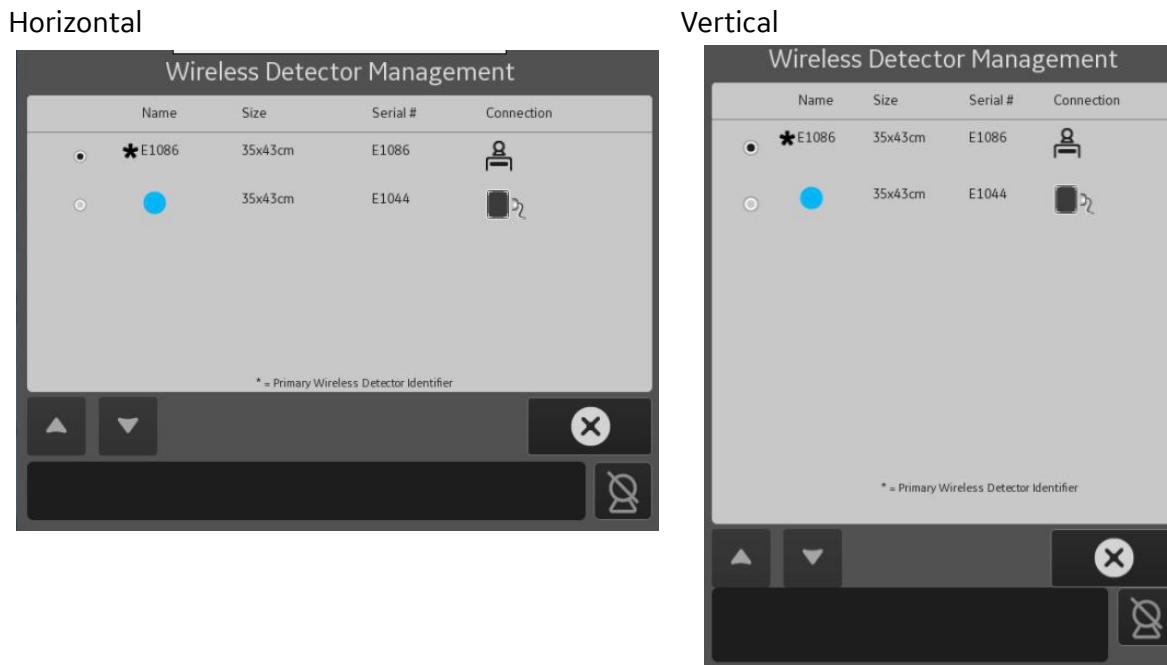
Table 8-7 OTS control screen functions

Item	Description
Image Size (FOV)	<p>Selects the Field of View (FOV) for the exposure.</p> <p>Sizes are (in order from largest to smallest):</p> <ul style="list-style-type: none"> • 43x43cm • 35x43cm • 43x35cm • 24x30cm • 30x24cm • 18x24cm • 24x18cm <p>Note: 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>
[EXPOSURE HOLD]	<p>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.</p> <p>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.</p>
System Status Messages	<p>Displays the last system status message.</p> <div style="border: 1px solid black; padding: 5px; background-color: #f0f0f0; margin-top: 5px;"> Detector battery capacity is not sufficient support exposure. Please recharge/replace the battery, or tether the detector to ... </div>

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, it will be made as primary. The newly selected detector, will now sort to the very top of the list.

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 HD also has an optional extended bridge available. See [Lateral Bridge Lengths \(p. 8-77\)](#).

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.

Detent Control

Detent is that system provides a position lock in each axis to aid in centering the x-ray tube to the image receptor (table and Wall Stand receptor).

Enable button and LED indicator

By default, the Detent is not activated. To enable, it needs to press the detent button on the OTS UI. With this, the corresponding axis of OTS will be locked if it moves to the pre-defined detent position.

When press detent control button, detent mode active LED indicator will be lighted or off to indicate detent function is enabled or disabled.

Operation when Detent Control is enabled

When OTS is not at detent position with Detent Control is enabled

- Move OTS by pressing each axis lock release button or all lock release button with slow move speed, there is a lock for movement stop of each axis when OTS get to image receptor centering position.
- Move OTS by pressing each axis lock release button or all lock release button with high move speed, the detent lock position can be bypassed.

When OTS is at detent position with Detent Control is enabled

- Press individual axis lock release button can allow movement out of lock position.
- Press all lock release button at table, the system will maintain the lateral and vertical position but can move freely in longitude.
- Press all lock release button at WS mode, the system will maintain the lateral and longitude position but can move freely in vertical.

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 wall stand 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 wall stand, the lateral detent is set at the wall stand lateral center line, and the longitudinal detent is set at SID 180cm (72 inches) and 100cm (40 inches).

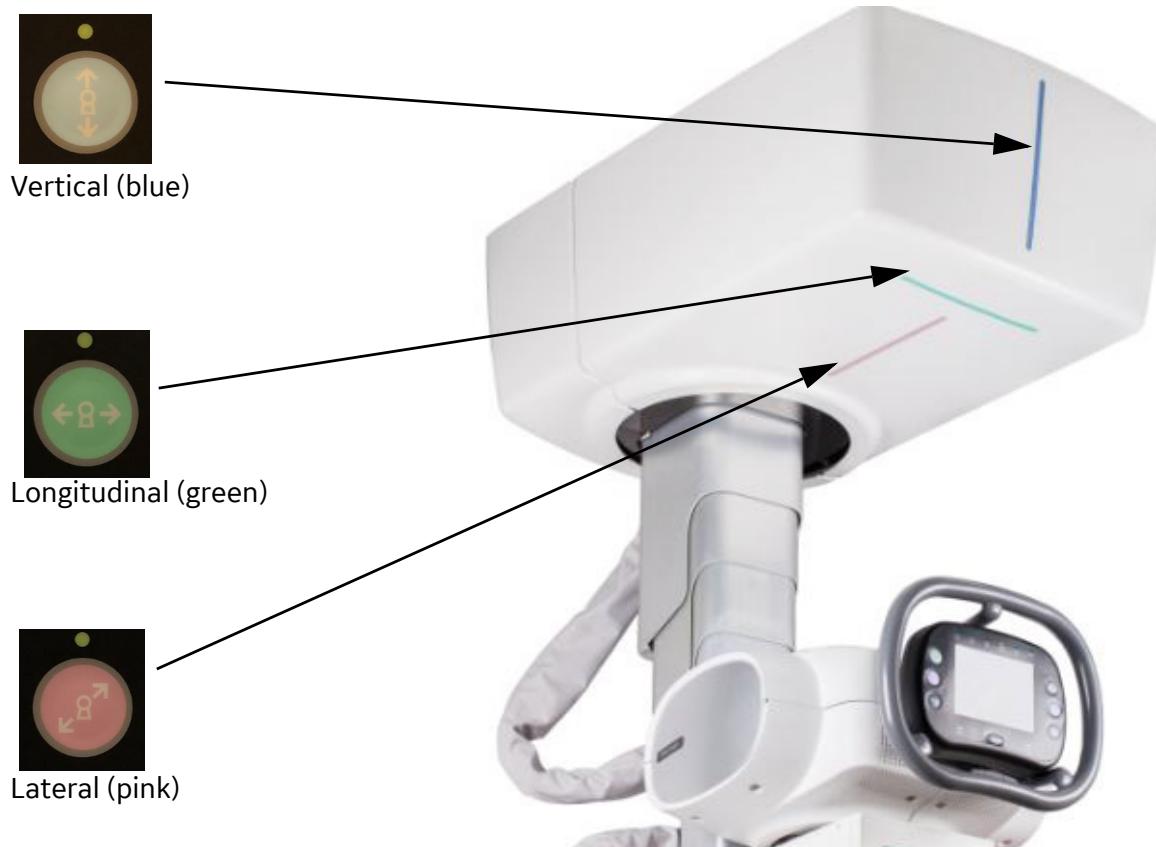
Selections are made at the time of installation and usually with the focal spot over the longitudinal table and the wall stand center line.

Axes Indicators

The Discovery XR656 HD shows axes indicators on the carriage. 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.

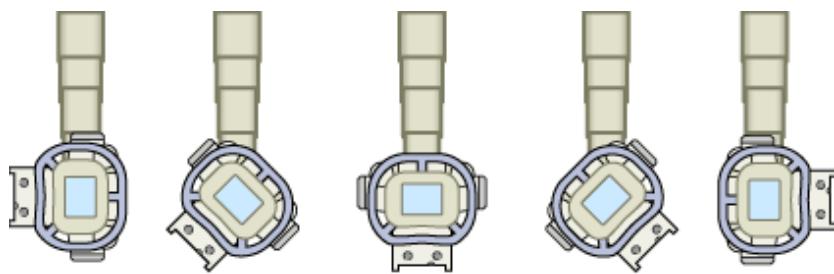
Figure 8-13 Column rotation



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 button 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 (see [Table 8-8](#)). This collimator can be used in either the manual or automatic mode. This section describes the controls and basic features of the collimator.

Figure 8-15 Collimator controls

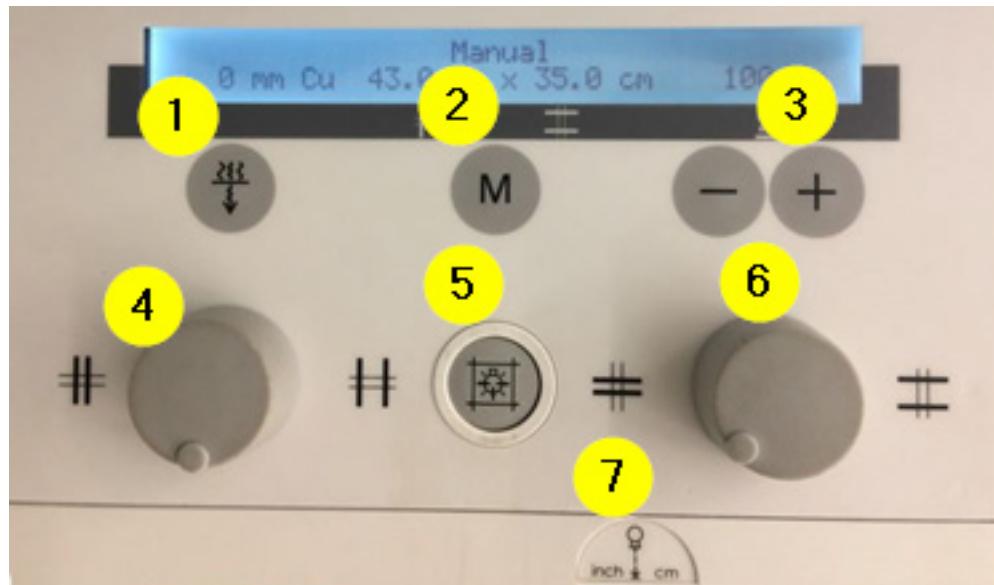


Table 8-8 Collimator controls

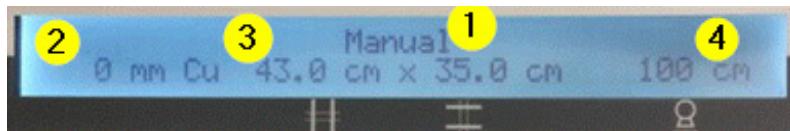
Item	Description
1. Spectral Filter Selection	Displays the spectral filter selections. The options are 0, 0.1, 0.2 and 0.3 mm of Cu. Press the button to change the filtration.

Table 8-8 Collimator controls

Item	Description
2. Message	Displays messages when Exposure Hold is active and providing information concerning the positioner interlocks that are disabling the exposure. Note: Messages shown on collimator display are in English. Translated messages appear on the OTS control screen (refer to OTS Control Screen (p. 8-18)) and the acquisition workstation.
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 Multi-leaf collimator display**Table 8-9** Multi-leaf collimator display

Item	Description
1	X-ray Field of View (FOV) <ul style="list-style-type: none"> • PBL = Positive-Beam Limitation (Automatic format collimation system) • Manual = manual mode of collimation
2	Spectral Filter Selection display
3	Height * Width 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 Healthcare 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. 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



CAUTION **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 650 nm / class II laser product.)**

Auto Collimator Light On

You can set the collimator light to come on automatically under the following conditions:

- Free floating the table top.
- Moving the wall stand or OTS when tracking to the wall stand automatically.
- Manually changing Image Size (FOV) on the OTS control screen through use of the digital preset selections.

1. From the Service User Interface navigate to **Configuration->Position**.

- Set the **Collimator Auto Light On** to Yes.



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 wall stand application, manual mode is active when:
 - Tube angulation is > 100 degrees or < 80 degrees with the wall stand in the vertical position
 - Tube angulation is $> \pm 10$ degrees with the wall stand 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 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 Rotating the collimator



CAUTION 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.

System Cabinet

The system cabinet houses the electronics for the Discovery XR656HD. GE Healthcare Service personnel can open the front of the cabinet to access the electronics.

Figure 8-20 System cabinets



Digital Wall Stand

The digital wall stand contains the digital receptor, which can be moved to accomplish different radio-graphic procedures.

Figure 8-21 Wall Stand



1. Receptor information display
2. Wall Stand column
3. Receptor cover
4. Grid
5. Receptor
6. Lateral positioning bar (See [Figure 8-42](#))
7. Hand grip
8. Vertical adjust and receptor tilt handle
9. Arm assembly (Extended arm is optional)
10. Foot Control
11. Light ring
12. Detector lock (option available for table or wall stand detector tray)

Table 8-10 light ring status

Light status	Description
White	System is not ready for exposure. Select the exposure hold icon for information.
Green	System is ready for exposure.
Blinking white	Override switch is on. System is not ready for exposure.
Blinking green	Override switch is on. System is ready for exposure.

Note:

- Light ring is out when wall stand is powered off.
- Once E-stop releases successfully, light ring follows status in this table.

13. Be careful when placing lead markers on the receptor to ensure proper visualization on the digital image. See [Chapter 4: General Information-Identification of Radiographs \(p. 4-11\)](#) for lead marker information.

Wall Stand characteristics:

IMPORTANT! The wall stand 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. See [Chapter 13: Advanced Applications](#).
- The inherent filtration of the wall stand front panel is less than 0.6 mm of aluminum equivalent at 100 kVp.
- Wall Stand 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 wall stand.



WARNING Make sure your patient does not use the wall stand as a support.

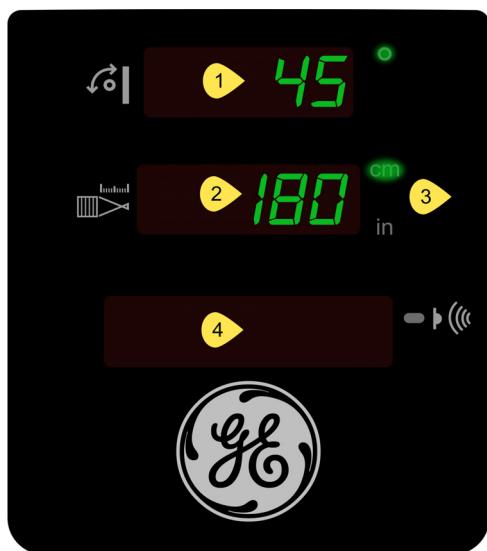


CAUTION If the patient leans on the wall stand with enough force, the locks may release and the receptor will lower slowly.

Receptor Information Display

The receptor information display at the top of the wall stand column shows the tilt of the receptor, the currently installed grid, and exposure readiness information.

Figure 8-22 Receptor information display



1. Tilt angle display
2. Installed or selected grid display
3. Grid unit indicator lights
 - cm - centimeters
 - in - inches
4. Remote IR Receiver

Position the Receptor

The wall stand receptor placement may be adjusted vertically or tilted.

Vertical Adjustment

The receptor arm assembly can be moved vertically by using:

- The Vertical Adjust and receptor Tilt Handle.
- The foot control.
- The positioning remote. See [Positioning Remote Control \(p. 8-69\)](#).

Figure 8-23 Receptor and arm vertical movement



CAUTION Patients should be clear of the wall stand when vertical movement is in process.



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

Vertical Adjust and Detector Tilt Handle

1. Grasp the handle and depress the inner switch.
2. Move the arm up or down.
3. Release the switch when the desired height is reached.

Figure 8-24 Vertical adjust and receptor tilt handle

Foot Control

The foot control moves the receptor vertically.

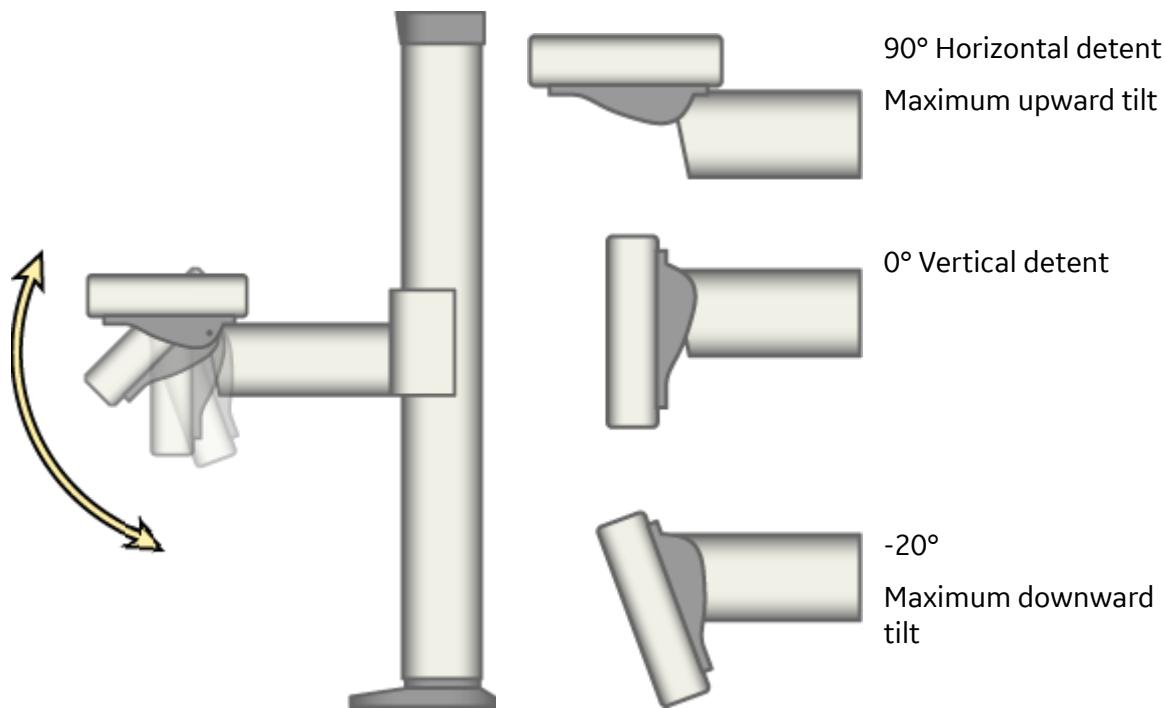
1. Press the UP or DOWN pedal two consecutive times and hold. This activates the foot pedal.
2. Hold the foot pedal down until the desired height is reached.
3. Release the pedal to stop movement.

Figure 8-25 Foot control

Tilt

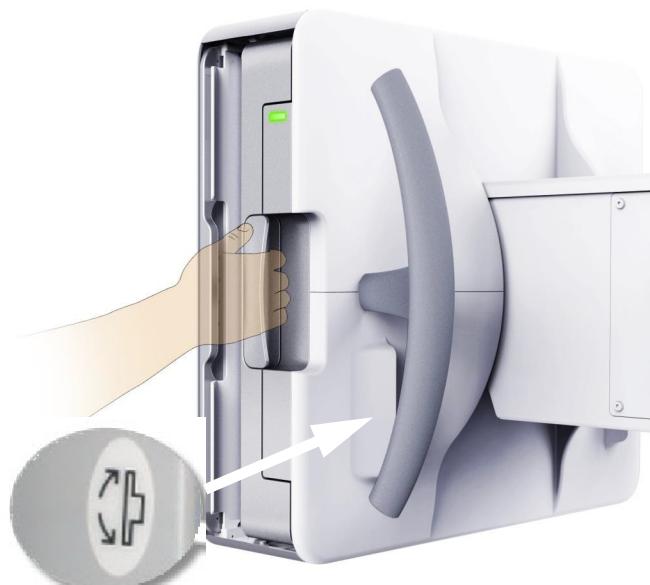
The wall stand receptor can be tilted at any angle within the range of 90° (horizontal) to -20°. Detents for the receptor tilt are located at 0° (horizontal) and 90° (vertical). Lateral detents on the OTS are active when positioning to the wall stand.

Figure 8-26 Wall Stand receptor tilt range



The tilt lock release button is located in the lower corner of the back of the receptor, if applicable.

Figure 8-27 Tilt lock release



Vertical Adjust and Detector Tilt Handle

1. Press and hold a tilt button until desired position is reached.
2. Release the tilt button to stop tilting.

Figure 8-28 Tilt buttons on vertical adjust and receptor tilt handle

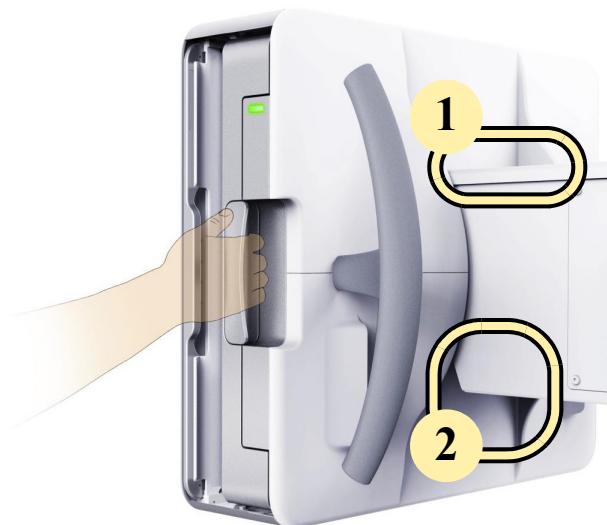


The wall stand may also be tilted using the remote control. See [Positioning Remote Control \(p. 8-69\)](#).



CAUTION

Hand Crush Hazard: Keep your extremities and the patient's extremities away from the pinch areas and the top of the wall stand arm when tilting the wall stand receptor.

Figure 8-29 Pinch areas (back of the receptor)

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



CAUTION Patients should be clear of the wall stand when tilting is in process.

Insert or Remove Grids

See [Grids \(p. 8-62\)](#) 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 wall stand or accessories holder. To insert it, slide the grid through the groove at the lateral side of the wall stand until it rests completely in the slot. An interlock within the receptor senses the new grid.

Figure 8-30 Wall Stand Grid (partially inserted)



Grid use in vertical and horizontal position:

Table 8-11 Grid Use

Receptor in Vertical Position	Grid Line Orientation	Grid in Wall Stand
Receptor in horizontal Position	Grid Line Orientation	Grid in Wall Stand

Wallstand Grid Lock (Option)

To lock the grid in Wallstand, push in the grid until the Pin is into the Mechanical Lock. To unlock the grid, upwards release the Trigger.

Figure 8-31 Wallstand Grid Lock

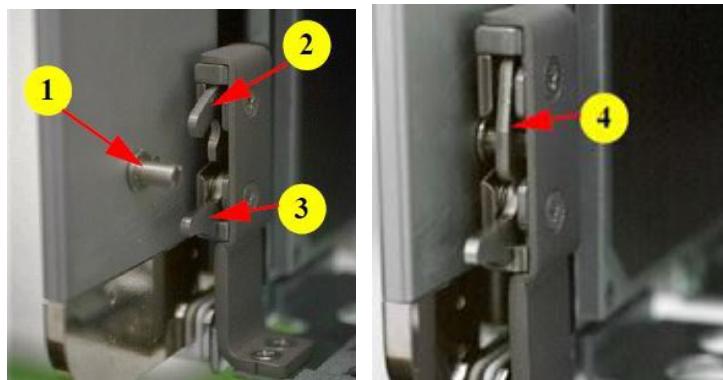


Table 8-12 Digital table components

Item	Description
1.	Pin
2.	Mechanical lock
3.	Trigger
4.	Grid is locked

Wall Stand Housing

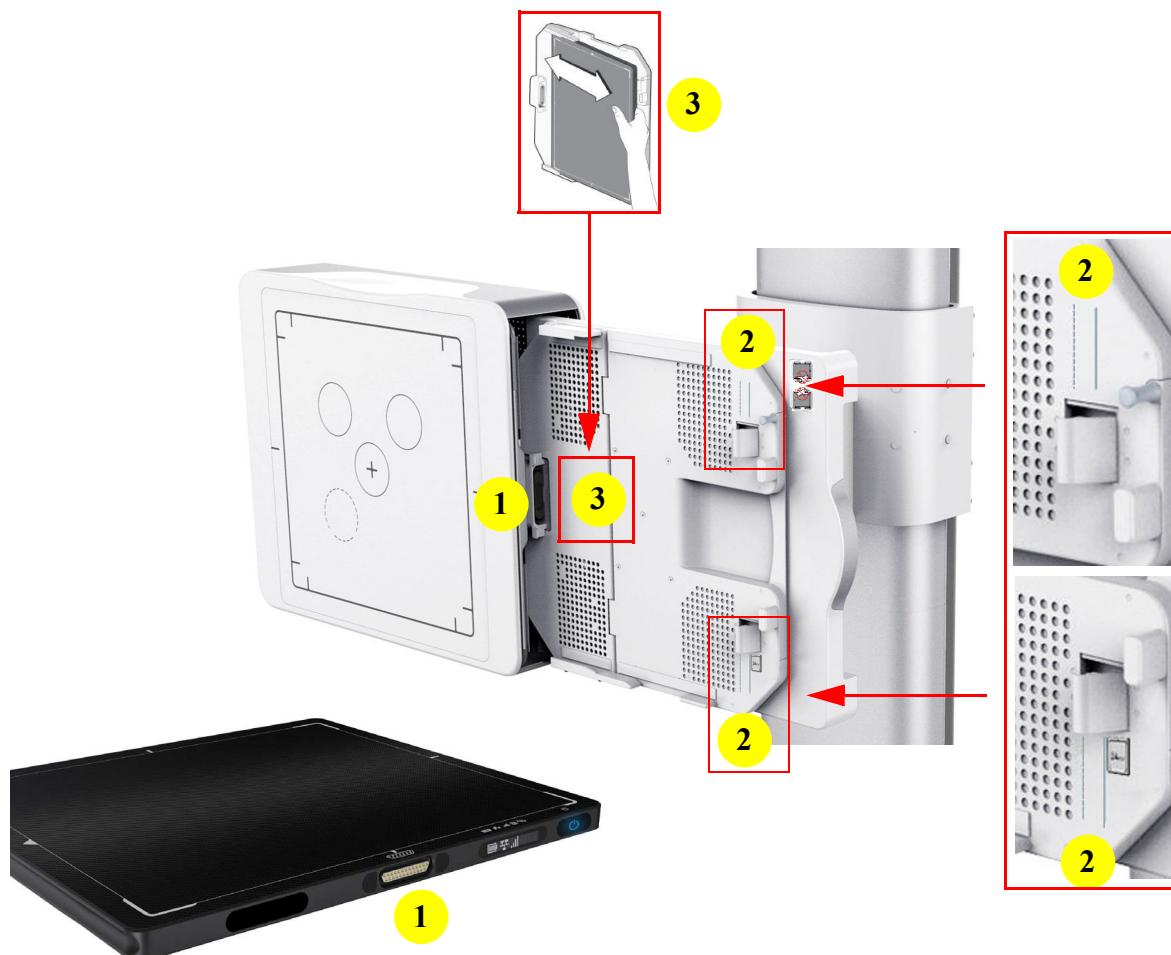
Open or Close the Detector Housing

Press the trigger inside of the handle to pull the housing out of the wall stand or push it to insert the detector in the wall stand housing.

After you open the wall stand housing, you will see warning labels to help you insert or remove detectors.

Figure 8-32 Open the Wall Stand Housing



Figure 8-33 After Opening Detector Housing tray in Wall Stand

Item	Description
1. Docking Connector	Insert the detector into the wall stand tray. The direction of detector connector must be to the wall stand docking connector.
2. Dotted Lines and Solid Lines	When inserting the detector into the wall stand tray, push the detector to the dotted lines of the wall stand tray.
3. Insert or Remove detector	Use one hand to position the detector at the dotted line

Insert or Remove Detector

1. Using two hands, slide the upper and lower side of the detector through the hook on the up and down of the detector housing tray.

Figure 8-34 Use two hands to insert the detector into the wall stand housing tray



2. For the 14 x 17 in (35 x 43 cm) detector, use one hand to push the detector to the dotted line, and direct the detector side with docking connection to the connector on the detector housing tray until the detector fits the dotted lines on the tray.

Figure 8-35 Use one hand to push the detector into the wall stand housing tray



3. Push the detector to the dotted line, and position the detector at the solid lines.

Figure 8-36 .!Push detector to solid lines

4. For the 17 x 17 inch detector, use one hand to push the detector into the detector housing tray, and secure it at the tray stopper.



Note: Do not release the detector until the detector has been secured in the wall stand tray.

- The detector can be inserted or removed only while the tray is in the portrait position.
- The 17 x 17 inch detector cannot be rotated.
- If you insert the digital detector into the wall stand housing and remove it from the docked connection in less than three seconds, the detector will need to have the power cycled for the system to recognize it.



WARNING **Film Cassette, CR and small detector (10*12) are not allowed to be inserted into Table/WS Tray.**

Wall Stand Tray rotation

Note: The 17 x 17 inch detector cannot be rotated.

You can rotate the detector for landscape or portrait positioning.

Figure 8-37 Rotate the tray for detector landscape or portrait

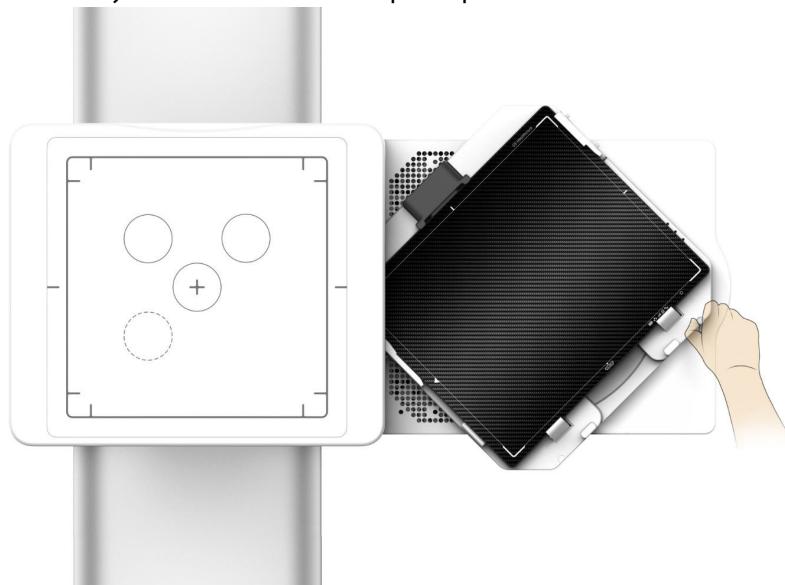
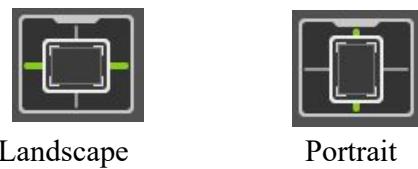


Figure 8-38 Detector tray in landscape position



Note: The detector can not be removed while the tray is in Landscape position.

Figure 8-39 WS Detector Landscape or Portrait



Housing Configuration

There are two configurations for the detector insertion: Right configuration and left configuration.

Figure 8-40 Right configuration**Figure 8-41** Left configuration

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 wall stand when positioning wheelchair patients under the wall stand.

Remove or Attach the Lateral Positioning Bar

The wall stand is equipped with a lateral positioning bar ([Figure 8-42](#)) 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 wall stand arm assembly, behind the receptor ([Figure 8-42](#)).

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

Figure 8-42 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 wall stand 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.

**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 radio-graphic systems.

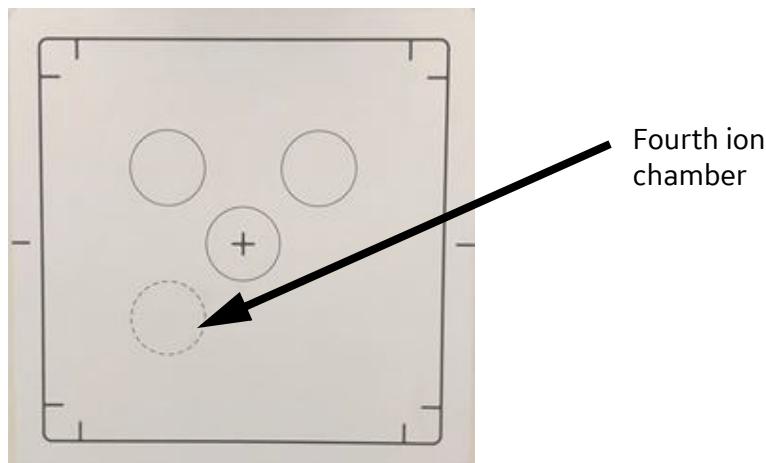
The Discovery XR656 HD wall stand receptor may be equipped with an additional AEC ion chamber. The fourth chamber is more effective when the receptor is used horizontally under a mobile table accessory (Extended arm option).

- See [Chapter 10: Image Acquisition-Automatic Exposure Control \(AEC\) \(p. 10-24\)](#) about AEC exposures and ion chamber selection.

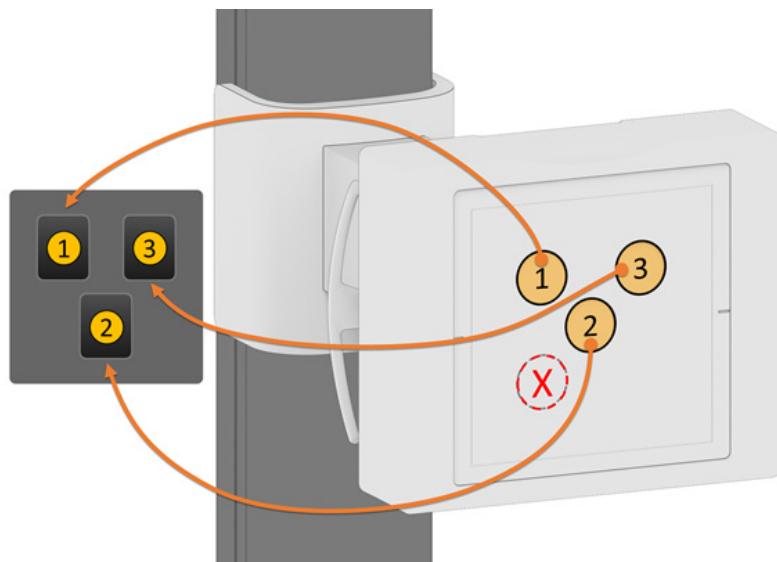
Note: The following figures are for illustrative purposes only and do not represent true scale.

The ion chambers are round with the fourth chamber shown on the wall stand as a dashed outline.

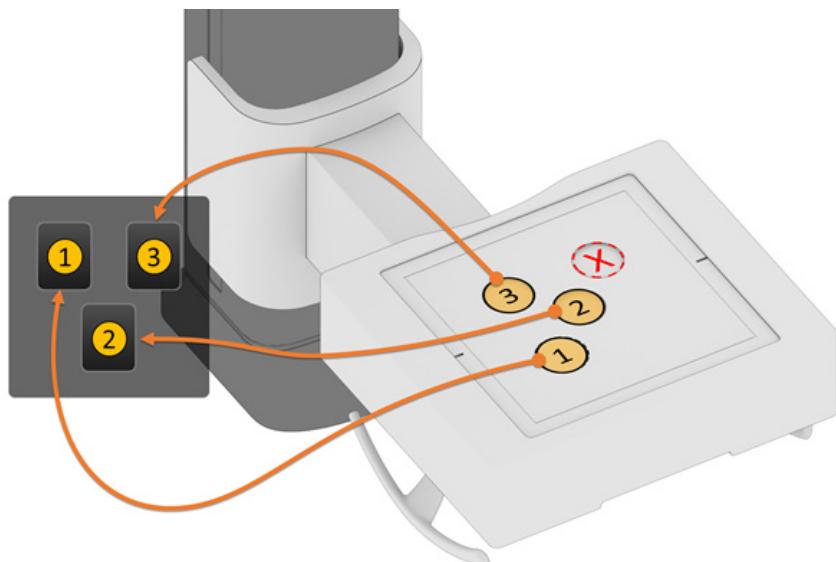
Figure 8-43 Front of wall stand receptor with four ion chambers



When the receptor is at or near 0° (vertical), the three main chambers are active and the fourth (lower left) is disabled.

Figure 8-44 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. On the Image Acquisition screen ion chamber selection, the “dashed” ion chamber is assigned to position 1.

Figure 8-45 Receptor in horizontal configuration

The wall stand 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.

Wall Stand with Extended Arm

An wall stand with an extended arm is required for taking exposures under a mobile radiographic table.

The wall stand 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 8-46 Extended arm wall stand with mobile table



Note: The mobile table is only indicative of which mobile table can be configured according to different regions.

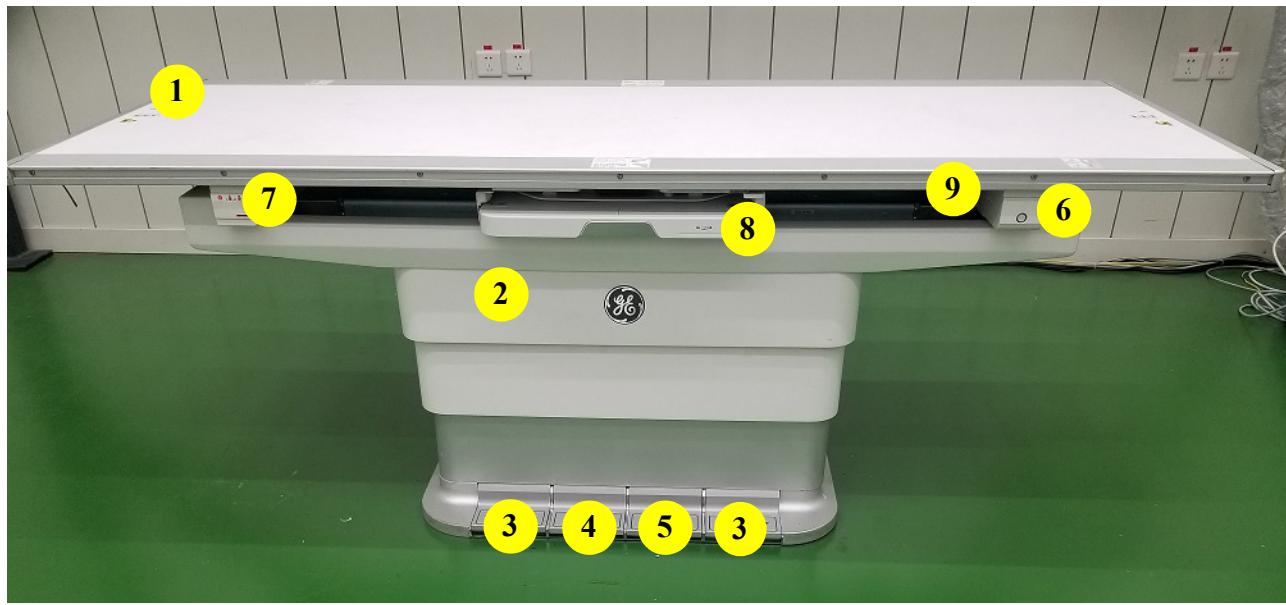
Mobile Table

A mobile table accessory can only be used with an extended arm wall stand. See [Radiographic Mobile Tables \(Option\) \(p. 8-76\)](#) about available mobile stretchers.

Digital Table

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

Figure 8-47 Digital Table Components



Components

Table 8-13 Digital table components

Item	Description
1. Tabletop	The table dimensions are 240cm (94 in) in length and 93cm (37 in) in width. Its inherent filtration is less than 0.7 mm of aluminum equivalent at 100 kVp. The tabletop can be moved longitudinally, transversely and elevated for easy patient positioning and can support a patient weighing up to 320 kg (706 lbs.). Tabletop is identified as applied part.
2. Elevating Base with Telescopic Covers	The elevating base raises and lowers the tabletop from 500mm (+10)mm to 850mm (-10mm) from the floor level. (20 in - 33 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.

Table 8-13 Digital table components

Item	Description
3. Table Top Positioning Foot Pedals 	This pedal allows you to move the table in all directions: longitudinally and transversely. This is known as a floating tabletop. Press the pedal twice and hold down to move the table top.
4. Down Pedal 	The Down pedal lowers the digital table down. Press the pedal twice and hold down to lower the table.
5. Up Pedal 	The Up pedal raises the digital table up. Press the pedal twice and hold down to raise the table.
6. Table Lock Control Buttons 	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.
7. Emergency Stop Buttons 	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. See Chapter 4: General Information-Emergency Stop (p. 4-7) .  WARNING 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.
8. Detector Tray Override 	The Detector Tray Override is used for receptor placement if auto-tracking fails.
9. Optical pinch sensor area	The sensors detect a hand or other body part below the surface of the table and lock the table movement to prevent injury. Table Lock Control Buttons(# 6) will flash when the finger pinch lock is activated. See Finger Pinch Lock Release (p. 8-57) .

Table 8-13 Digital table components

Item	Description
10. Hand Grips 	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. 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. See Table Hand Grips and Compression Band (Option) (p. 8-68) .
11. Abdominal Compression Band (clamp only shown) 	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. See Table Hand Grips and Compression Band (Option) (p. 8-68) .

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 detector tray override is pressed, the automatic receptor tracking mechanism is disabled. To re-enable automatic receptor tracking, move the OTS.



CAUTION 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.



CAUTION 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. This activates the foot pedal.

Figure 8-48 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.

4. Remove your foot from the pedal to stop the movement.
5. To lower the table, press the Down pedal two consecutive times.

Figure 8-49 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 two consecutive times. This activates the foot pedal.

Figure 8-50 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.

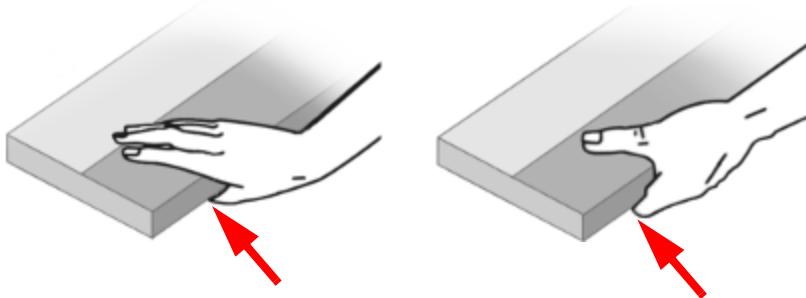


WARNING To avoid injury to fingers and hand of patient and operator caused by table movement, hands must be kept away from table top edges at all times.

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. And the Table Lock Control Buttons will also keep flashing to remind the user when the finger pinch lock is activated.

Figure 8-51 Finger pinch lock trigger



To unlock the table top:

1. Release the table top positioning foot pedal.
2. Remove hands, fingers, or other object from under the table edge. And make sure the light of the Table Lock Control Buttons goes out.
3. Press the foot pedal two consecutive times.
4. Hold the foot pedal down and position the table top.

Grid Loading and Removal

To remove the grid, position the tabletop to the front end first, use the handle to pull the grid out of the table detector housing. To insert it, slide the grid in the groove up to the detector holder until it rests completely in the slot. An interlock within the receptor senses the grid.



See [Grids \(p. 8-62\)](#).

Table Detector Housing

Table Detector Housing

Hold detector housing handle to pull out or push in the table detector housing.

Figure 8-52 Table Detector Housing

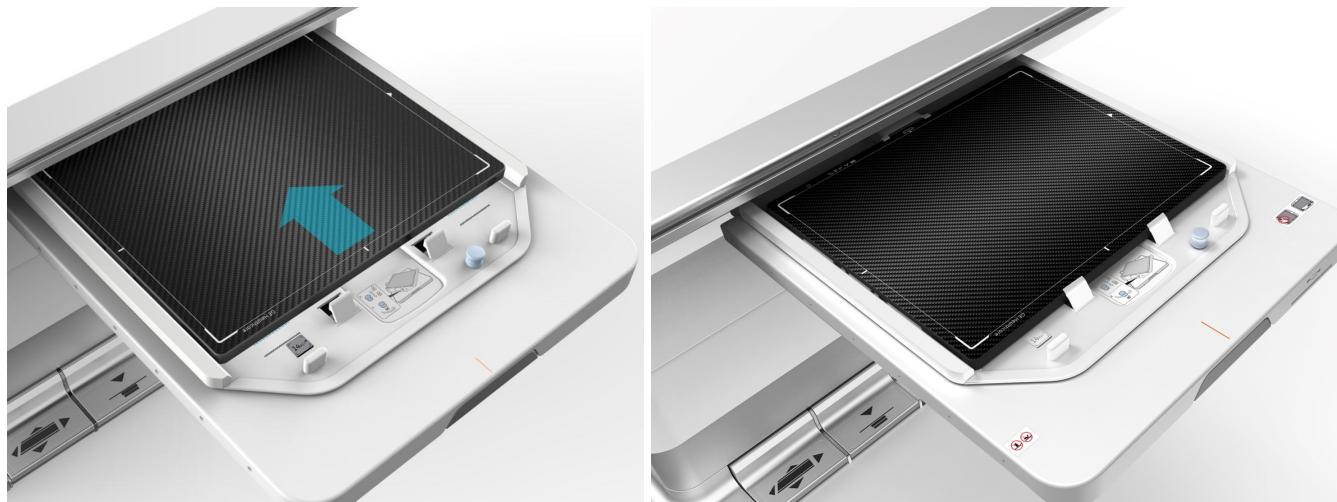
Move Table Detector Housing

Press the buttons and hold detector tray to move detector housing to left or right direction.

Figure 8-53 Move Table Detector housing

Insert or Remove Detector

For the 14 x 17 inch detector, when inserting the detector into the table receptor tray, push detector to the dotted lines of on the table detector tray, And then let go to the solid lines of on the table detector tray.

Figure 8-54 Insert Or Remove The Detector To The Table Detector Tray**Figure 8-55** detector locked with the flipper

For 17 X 17 inch (43 x 43 cm) detector, insert the detector until the tray stoppers are in contact with the edge of the detector (shown by the red arrows).

Figure 8-56 17 x 17 in (43 x 43 cm) Detector Insertion

WARNING **Film Cassette, CR and small detector (10*12) are not allowed to be inserted into Table/WS Tray.**

The receptor tray is not a weight-bearing device. Imaging cannot be performed with the tray pulled out. A user must either remove the Flashpad HD detector from the tray (to be a table top exam) or reinsert the detector into the table (to be a docked table exam).

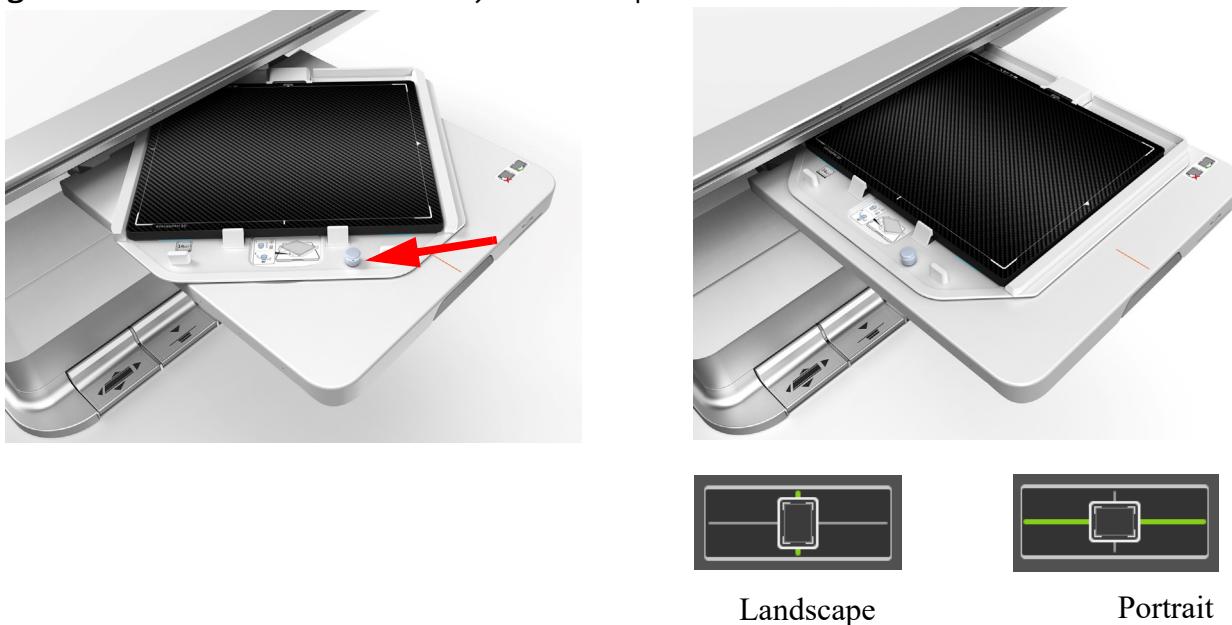
If you insert the digital detector into the table or wall stand housing and quickly remove it from the docked connection in less than three seconds, the detector will need the power cycled so the system recognizes it.

Rotate Table Detector Tray

Note: 17 x 17 in (43 x 43 cm) detector cannot be rotated.

Pull out the knob to rotate the detector tray.

Figure 8-57 Rotate Table Detector Tray to Landscape or Portrait



Note: Detector only can be inserted or removed while table detector tray is in the portrait position.

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.

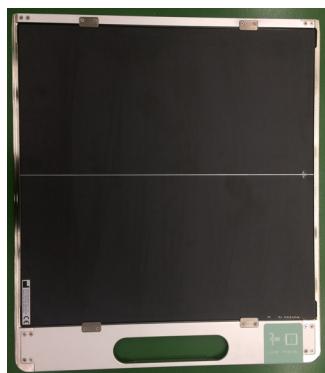
Grids

The Discovery XR656 HD system has several grids available for optional purchase. The grids and specifications are described in [Table 8-14](#).

See [Digital Table \(p. 8-52\)](#) and [Digital Wall Stand \(p. 8-31\)](#) about inserting or removing grids.

Figure 8-58 Grid front and back

Front



Back



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

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



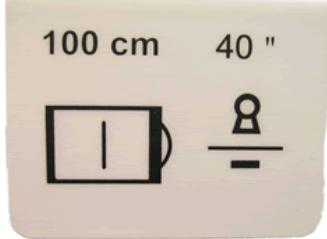
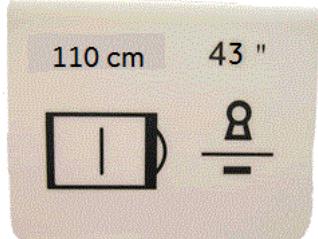
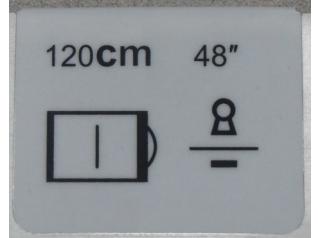
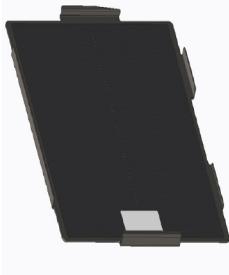
Table 8-14 Grid specifications

Grid	Application and Label	Range (cm)	Orientatio n	Ratio	Lines/ cm
180cm wall stand grid 	Wall Stand 0 degree 	145-245	Vertical	13:1	70

Table 8-14 Grid specifications

Grid	Application and Label	Range (cm)	Orientation	Ratio	Lines/cm
130cm wall stand grid	Wall Stand 0 degree 	90-190	Vertical	10:1	70
120cm wall stand grid	Wall Stand 0 degree 	102-146	Vertical	13:1	70
100cm wall stand grid	Wall Stand 0 degree 	90-118	Vertical	13:1	70
130cm wall stand horizontal grid	Wall Stand 90 degrees 	90-190	Horizontal	10:1	70

Table 8-14 Grid specifications

Grid	Application and Label	Range (cm)	Orientation	Ratio	Lines/cm
100cm Table grid	Radiographic Table 	90-120	Vertical	12:1	70
110cm Table grid	Radiographic Table 	95 - 130	Vertical	12:1	70
120cm Table grid	Radiographic Table 	102-146	Vertical	13:1	70
Portable Detector Grid	Digital Detector used as digital cassette 	85-190 90-190	Horizontal	6:1 8:1 (optional)	70



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

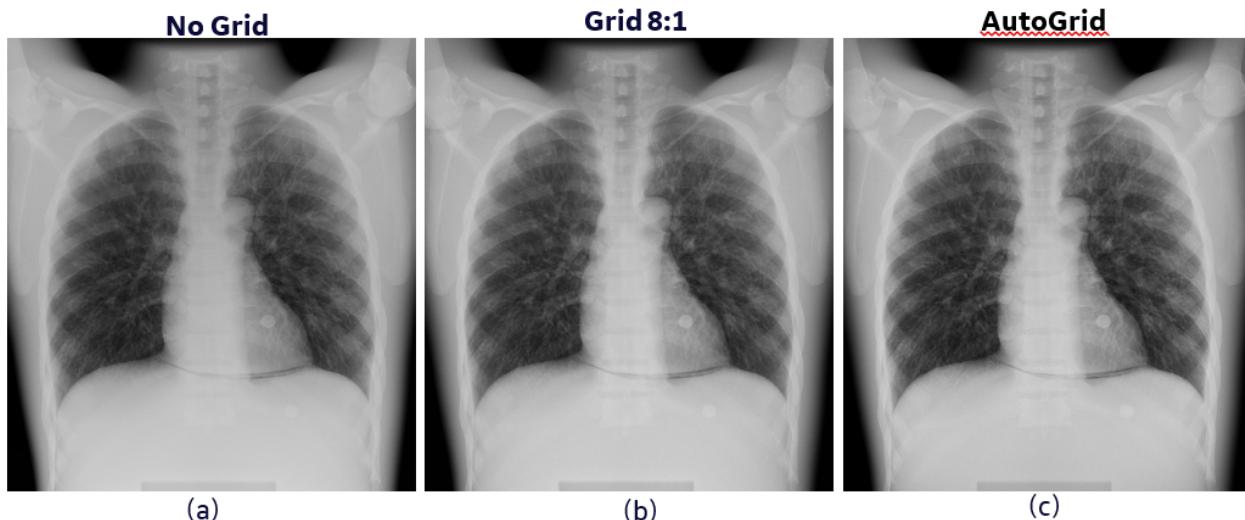
AutoGrid (option)

AutoGrid is an optional image processing software. AutoGrid can be used in lieu of a physical anti-scatter grid to improve image contrast in general radiographic images by reducing the effects of scatter radiation. The AutoGrid software provides equivalent image contrast to the use of a physical grid.

The AutoGrid software can be configured at three global strength options (Low, Medium and High). The strength indicates the amount of scatter reduction that will occur during image processing. The Low strength correspond to the amount of scatter reduction that would occur through using a 6:1 ratio grid, Medium an 8:1 grid and High a 12:1 ratio grid.

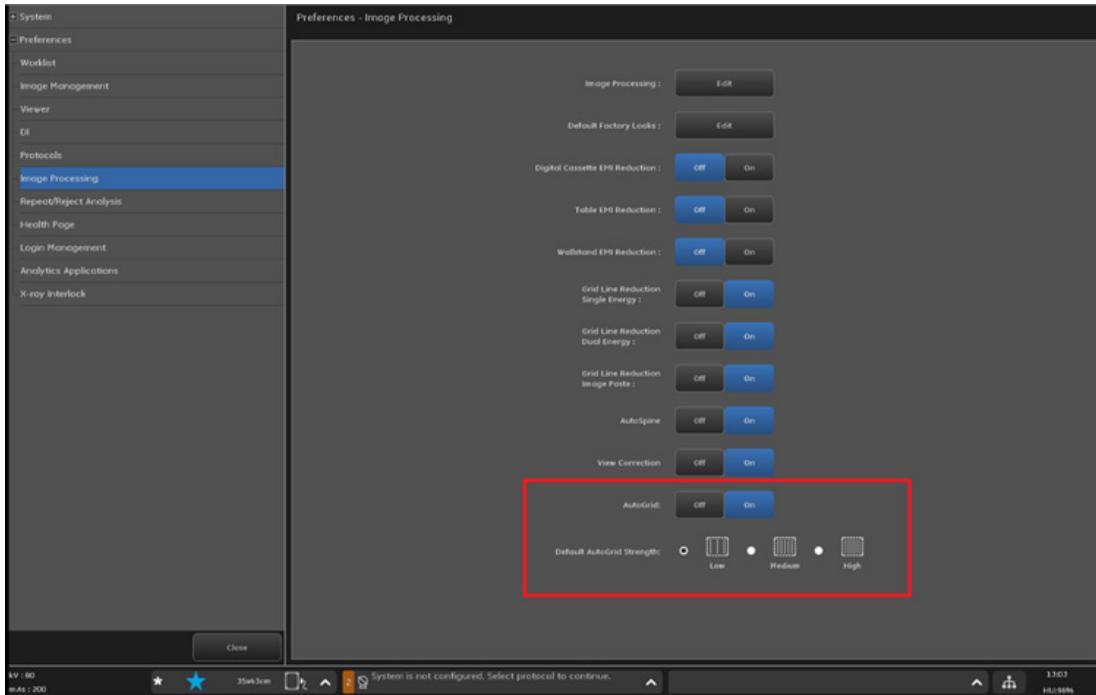
The AutoGrid software, when activated, will automatically be applied to DC (Digital Cassette) mode acquisitions where the protocol recommends the use of a grid but no physical grid is applied.

Note: Autogrid can only be applied when the detector is not within a detector tray.



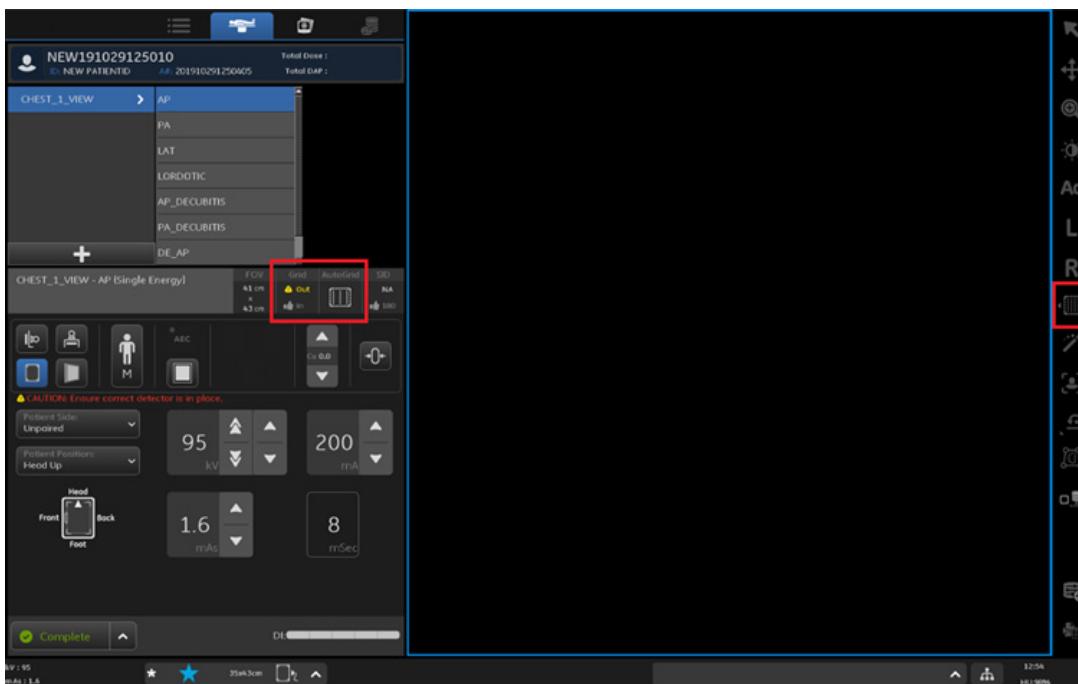
Note: The AutoGrid software options shall be configured within the Service User Interface. A GE Healthcare Field Service Representative must be contacted.

Once the software feature is engaged by the GE Healthcare field representative, a user can enable or disable the AutoGrid algorithm from the system utilities screen. The user will be able to select the default AutoGrid strength (Low, Medium or High).



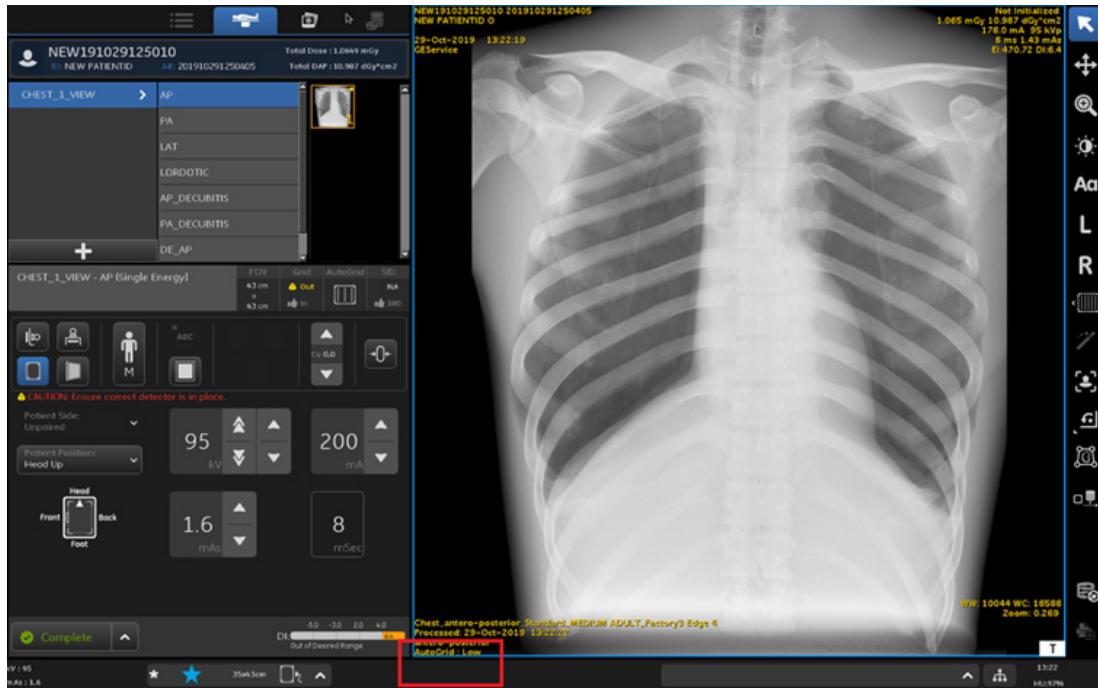
AutoGrid Pre-acquisition

Note: The protocol is stating a grid should be used. The user has not attached a physical grid therefore, the system is preparing for AutoGrid capability.



AutoGrid Post-acquisition

Note: The image was created without a physical grid. The user's choice, as set within preferences, displays the default AutoGrid Strength applied. The user can accept the default strength or manually change to a different strength via the Quick Toolbar.



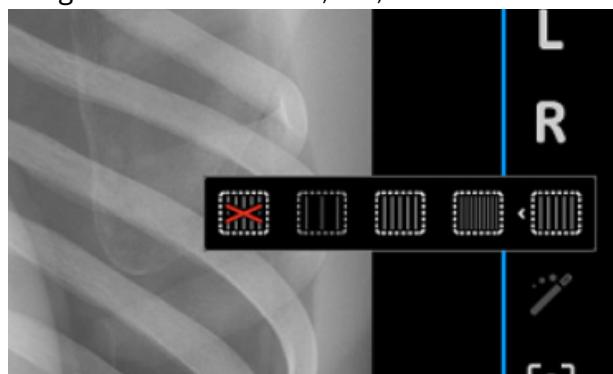
AutoGrid Post-acquisition strength choices

Note: Selecting the AutoGrid icon within the Quick Toolbar provides additional choices. Make a selection and an additional processed image will be displayed in the thumbnail image section.

Red X - signifies no AutoGrid strength.

Gray icon - signifies an AutoGrid strength already applied to the current image.

*Choices from left to right are: No AutoGrid, 6:1, 8:1 and 12:1



Grid and Accessories Holder (Option)

Grid Box, 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 wall stand and can store up to 4 grids and phantoms.

Figure 8-59 Holder with grids and phantom



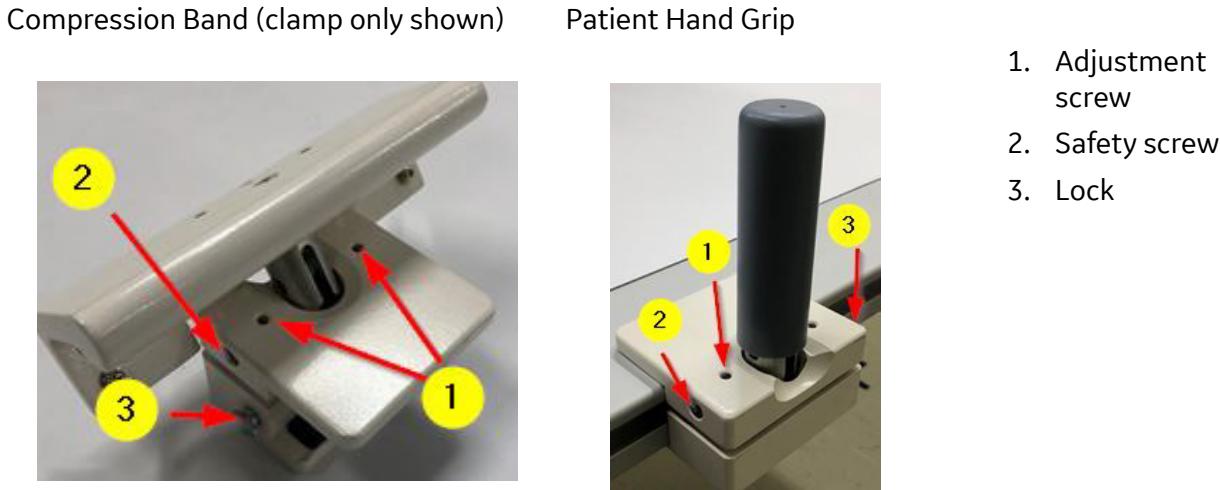
Table Hand Grips and Compression Band (Option)

There are two optional accessories available for the digital table:

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

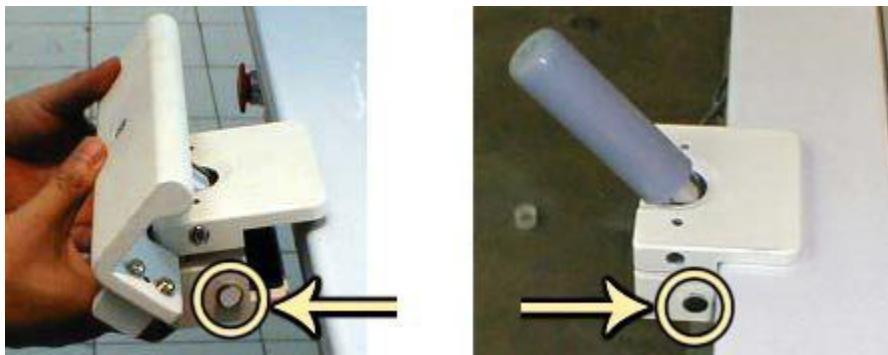
The compression band clamp and hand grips slide onto the side rails of the tabletop. They can be locked in place in any position along the side rails with the thumbscrews.

Figure 8-60 Table accessories overview



Installation

1. Depress the lock to release the clamp or hand grip.

Figure 8-61 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 8-62 Clamp and hand grip locked

Positioning Remote Control

General Information and Use

The positioning remote control ([Figure 8-68](#)) allows you to move the system into a pre-configured position or move the wall stand receptor.

Note: The Auto Positioning functions (the buttons in the gray area, items 5-9 in [Figure 8-68](#)) only work if the Auto Positioning advanced application option is purchased (see [Chapter 13: Advanced Applications-Auto Positioning \(p. 13-5\)](#)). For systems without Auto Positioning, the remote control will still change the FOV, tilt the wall stand receptor, raise or lower the wall stand 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 and the wall stand display. Two red LED lights show that the sensor area is receiving the remote control signal.

Figure 8-63 OTS column remote control sensor area**Figure 8-64** Wall Stand remote control sensor area

IMPORTANT! The remote must have a direct line of sight to the OTS or wall stand. 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 8-15](#) 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.

Figure 8-65 Removing The Battery Cover

1. Remove the battery cover.
2. Remove the batteries from the Positioning Remote Control.

Figure 8-66 Orientation of the Batteries

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

Figure 8-67 Re-inserting the battery cover

Remote Control Functions

Figure 8-68 Positioning remote

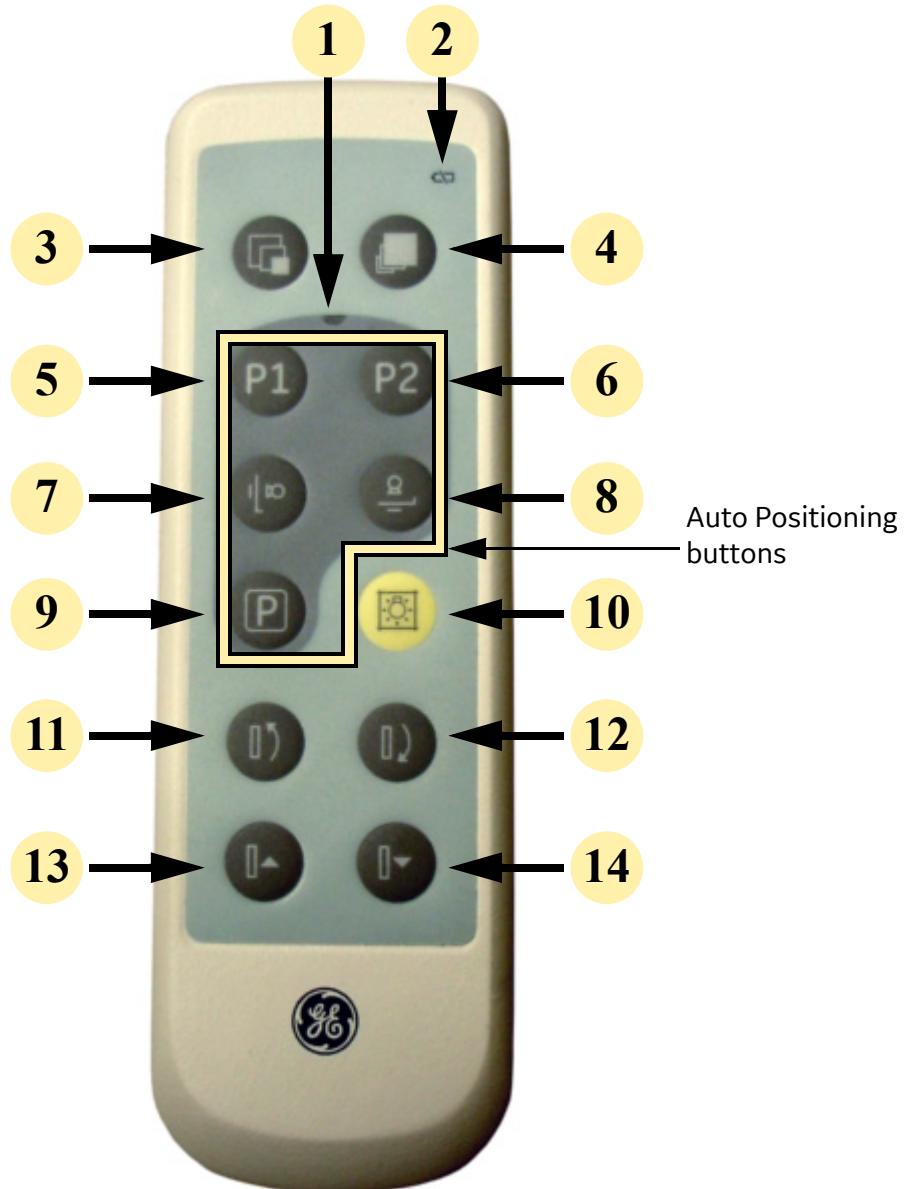


Table 8-15 Positioning remote functions

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"> • If the light is on but the component does not move, reposition or re-aim the remote and try again. • If the light does not come on when a button is pressed, insert or replace the batteries.
2. Battery Low indicator		<p>Indicates when the remote control batteries are low and need replacement.</p> <p>The remote control uses 2 AA (LR6) batteries.</p>
3. FOV small to large		<p>Opens the collimator blades to the positions shown on the OTS control screen in sequence.</p> <p>Note: The collimator light must be on for this function to work.</p>
4. FOV large to small		<p>Closes the collimator blades to the positions shown on the OTS control screen in sequence.</p> <p>Note: 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 Healthcare Service at installation.</p> <p>Default Position: None.</p> <p>See Chapter 13: Advanced Applications-Auto Positioning (p. 13-5).</p>
6. Programmable button 2		<p>Programmable button for auto positioning. The function of this button is facility-specific and is programmed by GE Healthcare Service at installation.</p> <p>Default Position: None.</p> <p>See Chapter 13: Advanced Applications-Auto Positioning (p. 13-5).</p>

Table 8-15 Positioning remote functions

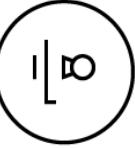
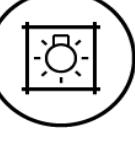
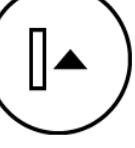
Control		Description
7. Wall Stand position (upright)		<p>Moves the tube into position for an upright wall stand exam. Default Position: WS-vert-180cm. See Chapter 13: Advanced Applications-Auto Positioning (p. 13-5).</p>
8. Table position (horizontal)		<p>Moves the tube into position for a table exam. Default Position: Table-center-100cm. See Chapter 13: Advanced Applications-Auto Positioning (p. 13-5).</p>
9. Park		<p>Moves the tube to its “park” position when not in use. See Chapter 13: Advanced Applications-Auto Positioning (p. 13-5).</p>
10. Collimator light		Turns the collimator light on and off.
11. Tilt wall stand receptor up		Tilts the receptor up.
12. Tilt wall stand receptor down		Tilts the receptor down.
13. Raise wall stand receptor		Raises the receptor.

Table 8-15 Positioning remote functions

Control		Description
14. Lower wall stand receptor		Lowers the receptor.

Auto Image Paste Patient Positioner (Option)

Auto Image Paste is a purchased option for the Discovery XR656 HD. 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.

See [Chapter 13: Advanced Applications-Auto Image Paste Patient Positioner with Integrated Foot Step \(for Wall Stand\) \(p. 13-22\)](#).

Radiographic Mobile Tables (Option)

There are table options available for purchase.

Table 8-16 Tables and maximum load capacity

Description	Maximum Load Capacity
Fixed height, carbon fiber table 	200 kg / 441 lbs
Fixed height, mobile, high capacity 	220 kg / 485 lbs
Stretcher Table, GST-2 	220 kg / 485 lbs

Digital Detector Accessories

Cross Table Holders

Two detector holders for cross table exams are available. See [Chapter 7: Flashpad HD Digital Detector-Detector Holder \(Option\) \(p. 7-19\)](#).

- Lateral Detector Holder (Option)
- Mobile Detector Holder (Option)

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 meters (157.48 inches) bridge (option)

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

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:** Information is entered manually on the system workstation. 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:** These procedures can be updated automatically on the Worklist from the central HIS/RIS database. Other units or workstations can be configured to access these procedures.

Figure 9-1 Worklist screen

The screenshot displays a software interface for managing medical procedures. At the top, a header bar includes the patient's name, Doe, John, and a unique identifier, 3234567890123456. Below the header is a toolbar with various icons. The main area is a large table titled "Worklist" with the following columns: Date, Patient Name, Patient ID, Modality, Procedure, Status, Description, and Last Update. The table contains numerous rows, each representing a procedure entry. The "Status" column consistently shows "IN PROGRESS". The "Description" column often includes the text "IN PROGRESS". The "Last Update" column shows dates ranging from 2023-09-01 to 2023-09-07. The bottom of the screen features a navigation bar with icons for Emergency, Cassette, Start Exam, and other system controls.

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

Table 9-1 Worklist Functions

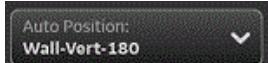
Function	Description
	Click to return to the Worklist screen.
Detector option dropdown list 	Display the active detector status in current receptor: Primary tag, Detector Name, Connection status, Detector size. Select the detector in the list to switch primary detector. Only primary detector can be connected with wireless for digital cassette exposure.
Auto Positioning 	If enabled, selects a pre-defined position for the x-ray tube. Pressing and holding the AUTO POSITIONING button on the RCIM2 initiates movement to the selected position. If Auto Positioning is not enabled on your system, the control does not appear. See Chapter 13: Advanced Applications Auto Positioning .
[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. See Chapter 15: Preferences .
[LOG OFF] 	If the Login function is enabled, clicking this button logs the current user off of the system. See Chapter 4: General Information Login and Log off .
[PATIENT INFORMATION] 	Shows the Patient Information screen for the selected procedure. Note: 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. See Add or Edit Patient Information (p. 9-13) .
Search 	Searches for procedures by the selected column name in the drop-down list and the search criteria entered into the text box. See Search (p. 9-7) .
[REFRESH LIST] 	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. See Refresh (p. 9-10) for more information on automatically refreshing the Worklist.

Table 9-1 Worklist Functions

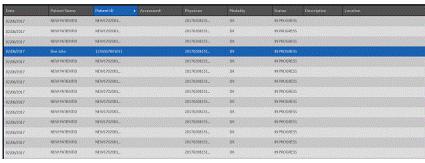
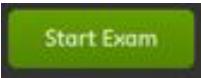
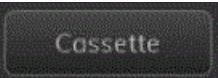
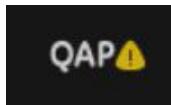
Function	Description
<p>[FILTER LIST]</p> 	<p>Displays a Worklist query screen and filters the RIS or HIS records to find procedures that meet specific criteria.</p> <p>See Filter List (p. 9-8) for information on how to filter the Worklist.</p>
<p>Patient List Area</p> 	<p>Shows all procedures scheduled 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. See Manage List / Find Procedures (p. 9-6).</p> <p>The time period displayed is configurable. See Chapter 15: Preferences Worklist 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>See Add or Edit Patient Information (p. 9-13).</p>
<p>[DELETE] or [DELETE ALL]</p> 	<p>Switches between [DELETE] and [DELETE ALL] to remove procedures from the Worklist.</p> <p>[DELETE] - Removes the selected procedure or procedures from the Patient List.</p> <p>[DELETE ALL] - Removes all completed and discontinued procedures from the Patient List.</p> <p>Note: [DELETE] or [DELETE ALL] does not remove procedures from the RIS or HIS or remove any exam images from the image database.</p> <p>See Delete Procedures (p. 9-12).</p>
<p>[START EXAM] or [RESUME EXAM]</p> 	<p>Starts, continues, or appends the selected procedure.</p> <p>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].</p>
<p>[EMERGENCY]</p> 	<p>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.</p> <p>See Chapter 10: Image Acquisition Conduct an Emergency Exam.</p> <p>The tracking number is the date and time the exam was initiated. The time is recorded to the second.</p>
<p>[CASSETTE]</p> 	<p>Begins a cassette exam. Cassette exams allow exposures to be taken without any digital patient record or image storage.</p> <p>See Chapter 10: Image Acquisition Conduct a Cassette Exam.</p>

Table 9-1 Worklist Functions

Function	Description
	When the yellow alert icon is present, it indicates that QAP should be performed to ensure continued image quality. Note: QAP cannot be performed when the Image Acquisition or Image Viewer screens are displayed. End the exam before attempting to perform QAP. See Chapter 14: Quality Assurance and Maintenance for more information.
	Displays the tube warming status. When the yellow alert icon is present, the tube must be warmed before images can be acquired. 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. See Chapter 10: Image Acquisition Conduct a Cassette Exam . Remove the patient and any others from the room before warming the tube. See Chapter 4: General Information Tube Warm Up .
[PATIENT ACQUISITION TABLE] 	Grayed out until an exam is started.
[IMAGE REVIEW] 	Grayed out until an exam is started, an acquisition is made and then allows the user to make various changes to the image.
[IMAGE MANAGEMENT] 	Allows a user to review completed exams, transfer images to the local database, reopen exams, resend exams, and transfer completed exams to various blank media types.

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. See [Overview \(p. 9-2\)](#) for detailed descriptions.

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.

Table 9-2 Worklist columns

Column	Description
Accession #	The patient's accession number.
Description	Detail information for every procedure, anatomy name etc..
Date	The date the procedure is scheduled. On locally added procedures, the current date is the default.
Time	The time the procedure is scheduled. On locally added procedures, the current time is the default.
Birth Date	The date of patient's birth.
Birth Time	The time of patient's 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"> • Scheduled – procedure has been created but not started. • Completed – procedure has been closed. • Suspended – procedure was started then interrupted. • Discontinued – procedure was opened but cannot be completed.

Manage List / Find Procedures

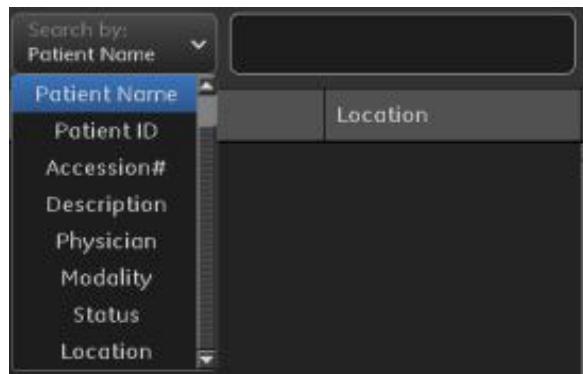
The Worklist has several features that allow you to find patients and procedures quickly and to organize the list to your preferences.

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.
2. Select the column.
3. Enter 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 search 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.
 - 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.
 - A down-pointing arrow indicates that the column is sorted in descending order.

Figure 9-2 Column with descending sort



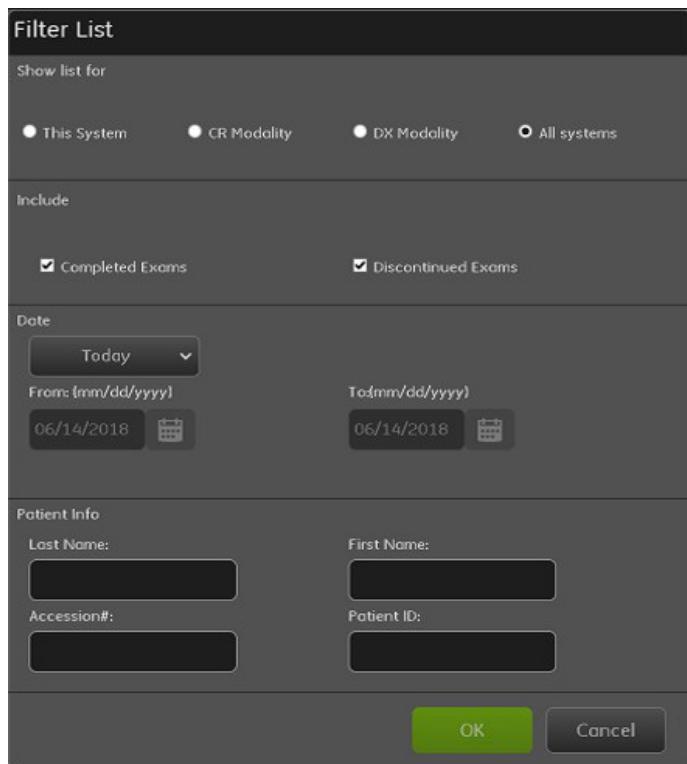
Filter List

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 Filter Acceptance/Rejection Buttons

Function	Description
Filter List	<p>Filters the Worklist items by system or modality.</p> <ul style="list-style-type: none"> • This system – procedures for this unit only. • CR modality – procedures for Computed Radiography. • DX modality - procedures for digital x-ray. • All systems – procedures for all modalities.
Include	Allows you to include or exclude completed or discontinued exams in the filter.

Table 9-3 Filter Acceptance/Rejection Buttons

Function	Description
Date	Allows you to select the date of exams to filter by. <ul style="list-style-type: none"> • All – procedures scheduled for any date • Range - procedures scheduled for a specified range of time • Today – procedures scheduled for the current date
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.
Patient Information	Allows you to filter based on data from the Patient Information screen. Available options are: <ul style="list-style-type: none"> • Last Name • First Name • Accession # • Patient ID 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.
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.
 - b) Click [▶] to select the next month.
 - c) Click a date to select it.
 - The calendar closes automatically when a date is clicked.
6. Enter the 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. See [Filter List \(p. 9-8\)](#).

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.

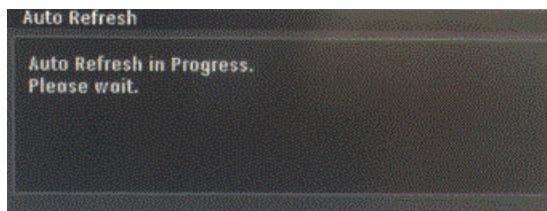
Note: You will not be able to make selections or access Worklist functions while the Worklist is refreshing.

Auto Refresh

The Auto Refresh interval is set on the Preferences – Worklist screen in System Utilities. See [Chapter 15: Preferences Worklist](#).

When the system auto refreshes, a message 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.



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. See [Overview \(p. 9-2\)](#).

Select a Single Procedure

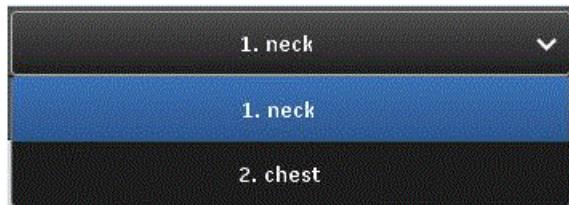
1. Close or suspend any open exams, if necessary. See [Chapter 10: Image Acquisition End Exam](#).
 - The Worklist screen appears.
2. Select the procedure from the Worklist.
3. See [Chapter 10: Image Acquisition](#) to conduct the exam.

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 the matching protocol from list in drop down menu.

Figure 9-6 Select Protocol From Drop Down Menu

5. Continue to select protocols to match the protocol in the drop down list.
6. Click 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 arrow on the right side of the button.
 - A list appears with the available actions.

Figure 9-7 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.
 - A message appears: “Are you sure that you would like to delete the selected items?”
3. Click OK to delete the procedures, or click Cancel to return to the Worklist without deleting the procedure.

Delete All Completed, Discontinued, and Local Procedures

1. Click 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 or click Cancel to return to the Worklist without deleting the procedures.

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 or Cancel.
 - 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.

Add or Edit Patient Information

Overview

The Add Patient ([Figure 9-8](#)) 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. Press the hard keys (CTRL + SPACE key) on the keyboard. Input method switch between English and Chinese/Japanese/Korean, applicable for Chinese/Japanese/Korean user interface. Press the hard keys (SHIFT(Left)+SHIFT(Right) key) on the keyboard. Input method switch between English and Russian, applicable for Russian user interface.



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



WARNING 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 9-8 Add Patient or Patient Information

Table 9-4 Patient Information description

Function	Description
Patient Section	
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>Note: 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.

Table 9-4 Patient Information description

Function	Description
Patient ID	Identifies the patient's medical record number or any number that distinguishes the patient. This number must be unique.
Birth Date	Identifies the patient's birthday in the format mm/dd/yyyy.
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.
Exam Section	
Accession Number	Identifies the exam's accession number.
Operator	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. When operator name is not defined or designated, system will use login user name as operator name. See Chapter 15: Preferences Preset Names for information on adding names to the drop-down list.
Performing Physician	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. See Chapter 15: Preferences Preset Names for information on adding names to the drop-down list.
Referring Physician	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. See Chapter 15: Preferences Preset Names for information on adding names to the drop-down list.
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"> • Scheduled - The procedure has been added to the Worklist, but the exam has not started. • Suspended - An exam was started but interrupted before completion. The exam may be resumed at a later time. • 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). • Discontinued - The procedure was opened, but no exposures were taken. The exam may be started at a later time or the procedure deleted.
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. See Chapter 10: Image Acquisition Select or Change Protocols. This also adds the patient name to the Worklist.</p> <p>Note: 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"> • If the Save button is selected but all of the data fields have not been filled in, a new patient is created anyway. • 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.
[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, or click Cancel to return to the Worklist without saving the changes.

Chapter 10: Image Acquisition

This section details the process of acquiring images using the Digital Detector or free cassette.



CAUTION **The operator cannot change the detector connection mode before the image is displayed on the monitor after the exposure.**

Overview

The Acquisition screen is where the exam is set up and exposure details are adjusted. This screen appears when you click the Start Exam, Emergency, or Cassette buttons on the Worklist or Start Exam from the Add Patient screen.

Note: If you clicked the Cassette button, the Acquisition screen will present a limited set of options. See [Conduct a Cassette Exam \(p. 10-21\)](#) for more information about cassette exams.

Figure 10-1 Acquisition screen

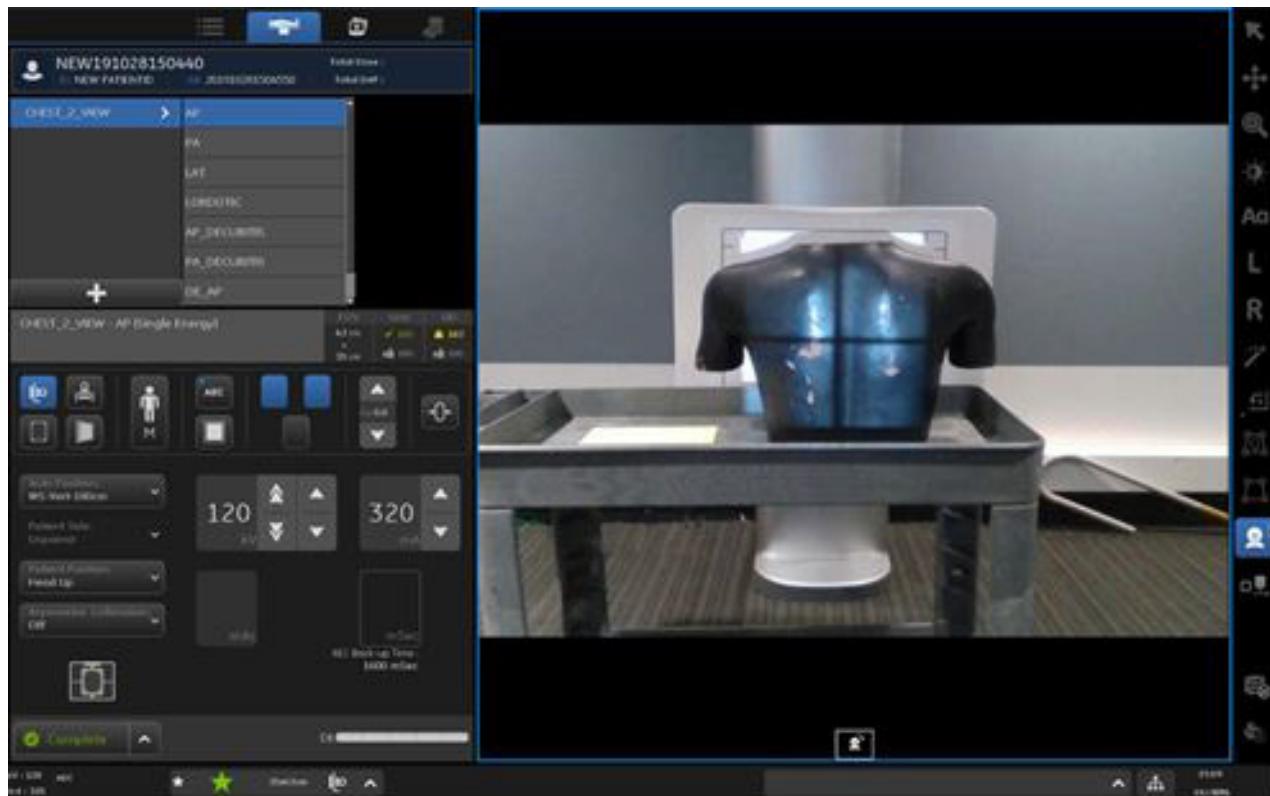


Table 10-1 Image Acquisition functions

Function	Description
Patient identification 	Identifies the patient name and patient identification number for the current procedure.
	Displays Patient Information screen for the current procedure. See Chapter 9: Worklist-Add or Edit Patient Information (p. 9-13) 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. See Select or Change Protocols (p. 10-13) for more information.
Auto Send 	If Auto Send is enabled, automatically sends acquired images to a pre-determined location on exam close. See Chapter 15: Preferences-Auto Send (Auto Push) (p. 15-25) 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. See End Exam (p. 10-31) for more information.
[COMPLETE] 	Closes the procedure. If enabled, Complete sends information to the PACS system. If the user has configured the system to auto send or auto print, these actions will occur once this button is clicked See End Exam (p. 10-31) for more information.

Table 10-1 Image Acquisition functions

Function	Description
<p>[DISCONTINUE]</p> 	<p>Ends the exam when the procedure has been opened but the exam cannot continue.</p> <p>See End Exam (p. 10-31) for more information.</p>
<p>Protocol information</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>Detector Option dropdown list</p> 	<p>Click the dropdown list to select detector configured. Please see the Table 6-4 to know more detector status icons.</p>
<p>Total Dose:</p> 	<p>Displays the total entrance dose at the corresponding distance.</p> <p>See Patient Dose Reporting (p. 10-9) for more information.</p>
<p>Total DAP:</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>For Switzerland or per customer request, the unit of DAP display can be customized. The setting can be found in the SUIF (Service User Interface) – Configuration – General – DAP Display Unit (dGy*cm²/cGy*cm²/mGy*cm²/Gy*cm²/Gy*m²). This setting only impacts the DAP display on the UI, and doesn't apply to the value in the image DICOM header. Please contact service for details.</p>

Table 10-1 Image Acquisition functions

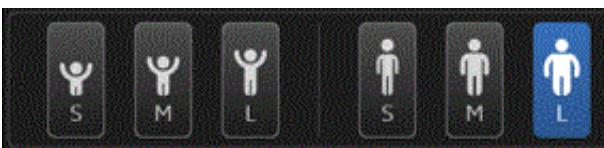
Function	Description
Patient Size: 	Selects the size of the patient being x-rayed. Available options are: <ul style="list-style-type: none"> • Small Pediatric • Medium Pediatric • Large Pediatric • Small Adult • Medium Adult • Large Adult  Note: Pediatric techniques are set at different system speeds 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.
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"> • wall stand • Table • Film/CR Cassette • Detector (Table Top Mode) Note: The generator limits exposure time to two (2) seconds for all receptors.
[AEC] and [FIXED] (mode) 	Selects AEC or FIXED modes. Blue mark for AEC mode and Grey mark for Fixed mode. See Automatic Exposure Control (AEC) (p. 10-24) for more information about AEC.

Table 10-1 Image Acquisition functions

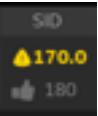
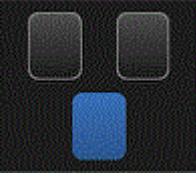
Function	Description
Reset Technique: 	Resets the technique to the default protocol settings.
Auto Position 	Selects a pre-defined position for the x-ray tube. Pressing and holding the Auto Positioning button on the RCIM2 initiates movement to the selected position. If Auto Positioning is not enabled on your system, the control does not appear. See Chapter 13: Advanced Applications-Auto Positioning (p. 13-5) .
FOV 	Show the FOV selected.
Grid status 	Shows the current grid status and the recommended grid status for this technique. The alert icon indicates that the grid is not in the recommended status. A check mark indicates that the current grid status matches the recommended status. Note: Exposure may not be inhibited if the current grid status is not the recommended status.
SID 	Shows the current SID and the recommended SID for this technique. The alert icon indicates that the SID is not at the recommended status. A checkmark indicates that the current SID matches the recommended SID. Note: Exposure may not be inhibited if the current SID is not the recommended SID.
Ion Chamber: (AEC mode only) 	If in AEC mode, selects the ion chambers to use. Note: When in AEC mode, at least one ion chamber must be selected. Any combination of chambers is allowed. Note: When in AEC mode, the body part must cover the selected ion chambers in order to achieve the proper exposure. See Automatic Exposure Control (AEC) (p. 10-24) .

Table 10-1 Image Acquisition functions

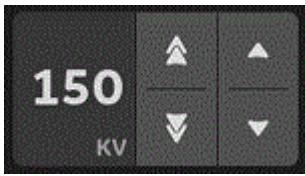
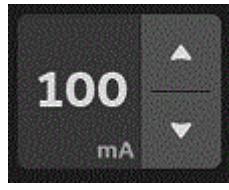
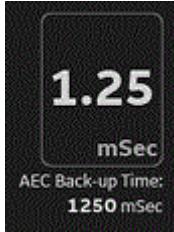
Function	Description
Asymmetric Collimation: 	Allows enabling and selection of Asymmetric Collimation for the wall stand receptor. Available options are: <ul style="list-style-type: none"> • Top • Bottom • Off Note: Asymmetric collimation is only available if the wall stand receptor is selected.
kV 	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 10 units. The kVp selection range is 40-150, in 1 kVp increments.
mA 	Adjusts the mA. The mA selection is in Renard steps. The available selections are: 10, 12.5, 16, 20, 25, 32, 40, 50, 63, 80, 100, 125, 160, 200, 250, 320, 400, 500, 630, 800, 1000. Note: Not all mA and mAs selections are available at all kV settings.
mAs 	Adjusts the mAs. The mAs selection is in Renard steps. The available selections are: 0.25, 0.32, 0.40, 0.50, 0.63, 0.8, 1.0, 1.25, 1.6, 2.0, 2.5, 3.2, 4.0, 5.0, 6.3, 8.0, 10, 12.5, 16, 20, 25, 32, 40, 50, 63, 80, 100, 125, 160, 200, 250, 320, 400, 500, 630. Note: Not all mAs selections are available at all kV settings. If in AEC mode, shows the calculated mAs for the current kV and mA after exposure.
mSec 	Shows the exposure time for the technique with the current kV, mA, and mAs settings after exposure is completed. If in AEC mode, the AEC back-up time is displayed below the Sec field. The AEC maximum backup time is two (2) seconds.

Table 10-1 Image Acquisition functions

Function	Description
Focal Spot: 	Selects a large or small focal spot.
CU Filtration: 	Selects the amount of copper filtering. The selectable range is 0.0mm, 0.1mm, 0.2mm or 0.3mm.
Patient Side: 	If conducting an exam on paired anatomy (for example, extremities), selects the side of the patient being x-rayed. Options are: <ul style="list-style-type: none"> • Both • Left • Right If conducting an exam on unpaired anatomy, the control is disabled and displays "Unpaired", as shown here.
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. <p>For paired anatomy, the available options are:</p> <ul style="list-style-type: none"> • Digits to Head • Digits to Feet • Digits to Front • Digits to Back <p>For unpaired anatomy, the available options are:</p> <ul style="list-style-type: none"> • Head Up • Head Down <p>Note: The above lists of positions for paired and unpaired anatomy are a general guidelines only. Some views have different options.</p>
Auto send 	If Auto Send is enabled, acquired images are automatically sent to a predetermined location on exam close. See Chapter 15: Preferences-Auto Send (Auto Push) (p. 15-25) .

Table 10-1 Image Acquisition functions

Function	Description
Heat Units Remaining 	Shows the percentage of heat units remaining.
[WARM TUBE] 	<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>Note: Because the tube warming procedure produces x-rays, it cannot be performed when an exam is open. If an exam is already opened and the warm tube icon is noticed, please suspend the exam (refer to End Exam (p. 10-31)) and remove the patient and any others from the room before warming the tube.</p> <p>See Chapter 4: General Information-Tube Warm Up (p. 4-9).</p>
[EXPOSE HOLD] 	<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>
[Secondary Technique Display] 	<p>Displays the technique values that the generator has loaded.</p> <p>Note: Could be the previous exposure techniques performed.</p>
[Detector orientation] 	<p>See more status icons of detector orientation in Chapter 6: Status Bar-Detector Orientation Status icons (p. 6-4).</p>

More information of Digital Detector Status refer to [Chapter 6: Status Bar-Digital Detector Status in Detector Option drop down list \(p. 6-4\)](#).

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 μGy .

- Dose Area Product or DAP (unit: $\text{dGy}\cdot\text{cm}^2$) 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 $\text{dGy}\cdot\text{cm}^2$.

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:

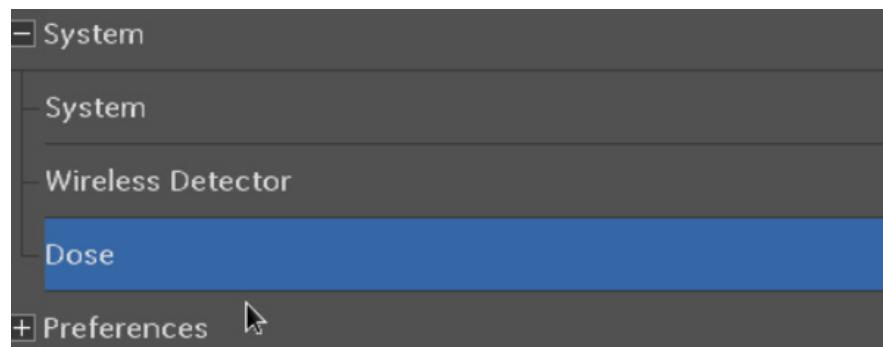
- Patient Name
- Patient ID
- Patient Age
- Operator
- Patient Size
- Anatomy
- Receptor
- FOV (Field of View)
- KV
- mAs
- Time
- Protocol Name
- DAP (Dose Area Product)

The system also provides Dose Structured Reporting (option). For more information see [Chapter 3: Pediatrics and Small Patients-Patient Dose Reporting \(p. 3-4\)](#).

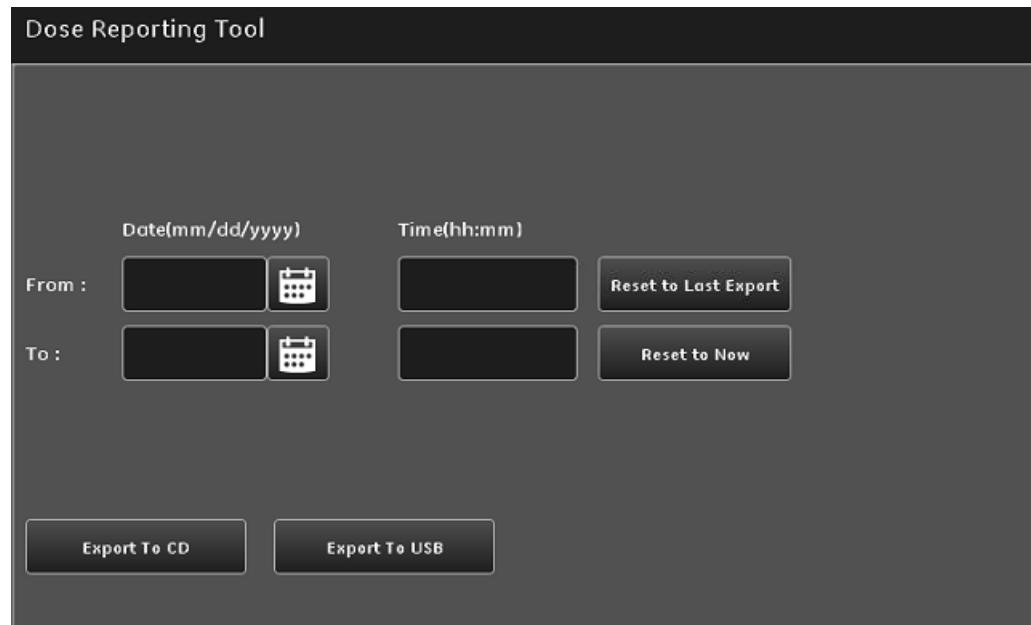
How to Export

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

5. Remove CD/USB while export is complete.

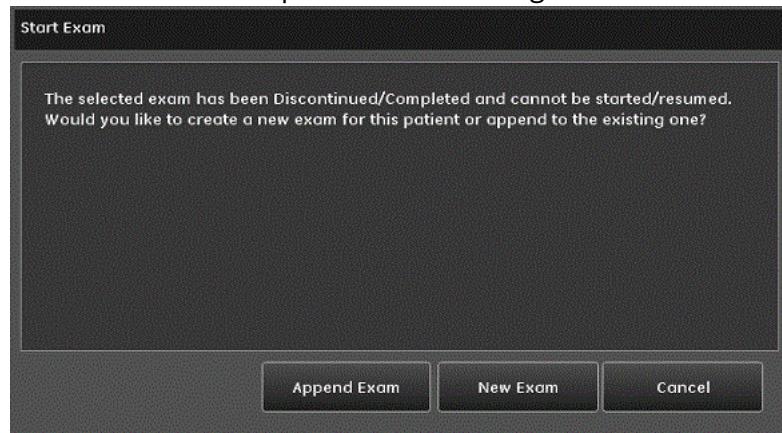
Figure 10-4 Sample Report

Patient Name	Patient ID	Patient Age	Operator Name	Patient Size	Anatomy	Receptor	FOV	KvP	mAs	Exposure	Protocol Name	DAP(dGy-cm²)
3 *NEW171009144620*	NEW PATI	20	Suzi Tech	MEDIUM_AChest		DIGITALCASSETTE	430.00000	75	319.9667	2000	CHEST_1_VIEW	1215.997559
4 *NEW171009144620*	NEW PATI	26	Suzi Tech	MEDIUM_AChest		DIGITALCASSETTE	430.00000	75	198.996	995	CHEST_1_VIEW	756.262024
5 *NEW PATIENT	NEW ID	43	Suzi Tech	MEDIUM_ACAbdomen		DIGITALCASSETTE	430.00000	40	12.42904	39	ABD_1_VIEW	9.629348
6 *NEW PATIENT	NEW ID	35	Suzi Tech	MEDIUM_ACAbdomen		DIGITALCASSETTE	430.00000	40	12.7381	39	ABD_1_VIEW	9.868787
7 *NEW PATIENT	NEW ID	36	Suzi Tech	MEDIUM_ACAbdomen		DIGITALCASSETTE	430.00000	40	12.69507	39	ABD_1_VIEW	9.835455
8 *NEW171010103569*	NEW PATI	20	Suzi Tech	MEDIUM_AChest		DIGITALCASSETTE	430.00000	40	0.488365	3	CHEST_1_VIEW	0.378359

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 Start 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 one?”

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. See [Select or Change Protocols \(p. 10-13\)](#) 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 reselected and techniques must be reset.

Select or Change Protocols

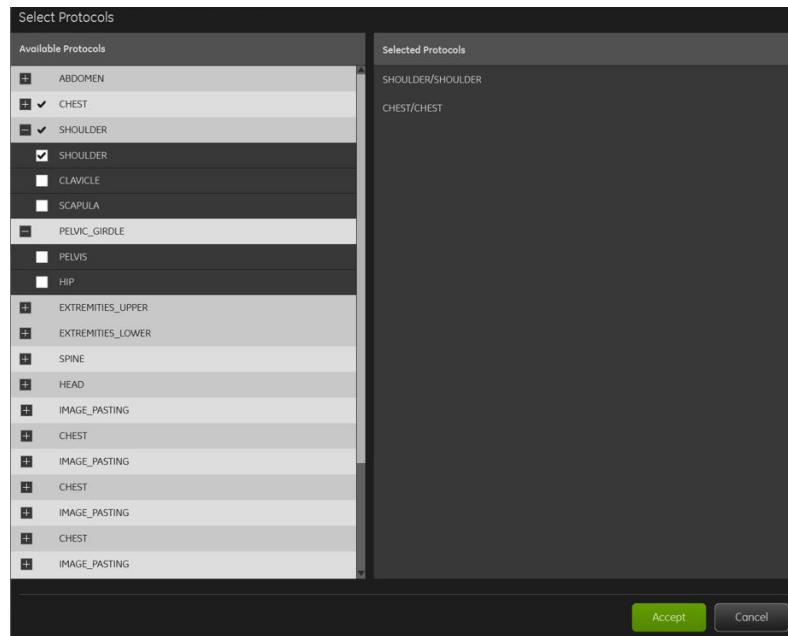
The Select Protocols screen ([Figure 10-6](#)) appears when you click Start Exam on the Worklist or Add Patient screen or when you click Select Protocols on the Acquisition screen.

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.

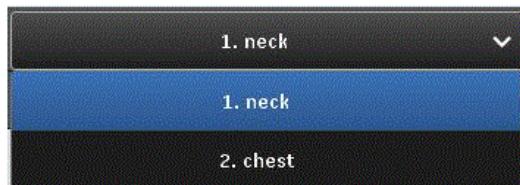
- Available Protocols lists all the protocols currently listed in the database, categorized by anatomical region: for example, head, chest, spine, and abdomen. Each category expands to show the exam(s) for that category.
- Selected Protocols lists all currently selected protocols in the following format: anatomy / exam. This list automatically updates as protocols are selected or removed.

See [Chapter 15: Preferences-Protocols \(p. 15-38\)](#) for information on adding protocols to the protocol database.

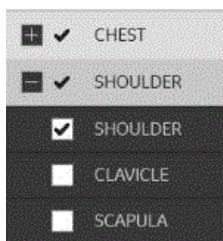
Figure 10-6 Select Protocols

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.
 - The Select Protocols screen closes.
 - The Acquisition screen appears.
 - Click Close to remove the selections and returns you to the Worklist.
 7. See [Conduct a Table Exam \(p. 10-16\)](#), [Conduct a Wall Stand Exam \(p. 10-18\)](#), [Conduct a Table Top Exam \(p. 10-20\)](#), or [Conduct a Cassette Exam \(p. 10-21\)](#) to continue the exam.

Automatic Protocol Assist (Option)

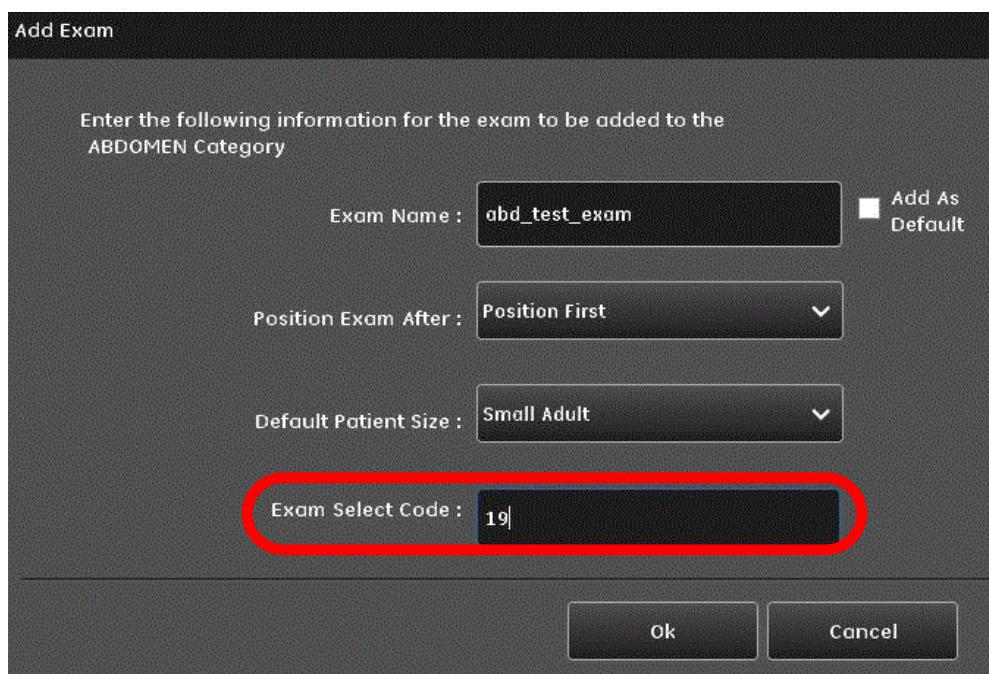
Automatic Protocol Assist (APA) is a feature that eliminates the protocol selection process and takes you directly to the Acquisition screen for the appropriate exam view after selecting the patient from the Worklist. This feature is designed to help provide better ease of use.

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. See [Chapter 15: Preferences-Add or Edit Exam \(p. 15-43\)](#).

Figure 10-9 Add Exam screen

Conduct a Table Exam

This section describes the adjustments required when conducting a table exam.

See [Chapter 5: Quick Steps-General Acquisition \(p. 5-5\)](#) 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 Suspend. 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:

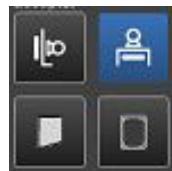
- Small Pediatric
- Medium Pediatric
- Large Pediatric
- Small Adult
- Medium Adult
- Large Adult



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 status



- An alert icon appears if the current Grid or SID is not in the recommended status for the technique.
- A checkmark appears if the current Grid or SID is in the recommended status for the technique.
- [Figure 10-11](#) shows the Grid is in the recommended status and the SID is not in the recommended status.

Note: You may still be able to take exposures even if the grid or SID are not in the recommended status.

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 RCIM2 until the tube stops moving. A message will appear in the Message Log area to confirm that the tube is in place. See [Chapter 13: Advanced Applications-Auto Positioning \(p. 13-5\)](#).

11. Collimate and shield as appropriate for the exam.



CAUTION 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..

Conduct a Wall Stand Exam

This section describes the adjustments required when conducting a wall stand exam.

See [Chapter 5: Quick Steps-General Acquisition \(p. 5-5\)](#) for an overview of the entire acquisition process.

Follow this process to conduct a wall stand 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

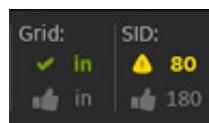


WARNING It is critical to select the proper patient size on the Acquisition screen. The incorrect Patient Size may result in an unnecessarily large radiation dose or multiple exposures.

3. Select the wall stand Receptor, if necessary.

Figure 10-12 Receptors: wall stand 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 status

- An alert icon appears if the current Grid or SID is not in the recommended status for the technique.
- A checkmark appears if the current Grid or SID is in the recommended status for the technique.
- [Figure 10-13](#) shows the Grid is in the recommended status and the SID is not in the recommended status.

Note: You may still be able to take exposures even if the grid or SID are not in the recommended status.

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. 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 RCIM2 until the tube stops moving. A message will appear in the Message Log area to confirm that the tube is in place. See [Chapter 13: Advanced Applications-Auto Positioning \(p. 13-5\)](#) for more information.

8. Position the patient in front of the wall stand.

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 wall stand. See [Chapter 8: System Hardware-Ion Chambers \(p. 8-49\)](#) for more information about how this affects ion chamber selection and patient positioning when used horizontally with a mobile table accessory.

9. Confirm or adjust the Patient Side field, if applicable.
10. Confirm or adjust the Patient Position field.
11. Confirm or adjust the Asymmetric Collimation, if applicable.
12. Collimate and shield as appropriate for the exam.



CAUTION 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.

Conduct a Table Top Exam

This section describes the adjustments required to conduct a digital exposure outside of the wall stand detector tray or table docked position.

Follow this process to conduct an exam with the detector outside of wall stand detector tray or table docked position.

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.

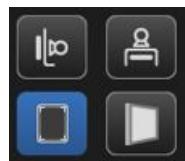
Note: To optimize processing for the best image quality, Patient Size should be confirmed for each view. Available options are:

- 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, mAs, cu filter 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. Select the right detector as primary detector (refer to [Chapter 6: Status Bar-Detector Management \(p. 6-6\)](#)). Then ensure the power button LED of the primary detector which will be used for exposure is blinking.



WARNING Please make sure the primary(*) detector is in place before exposure.

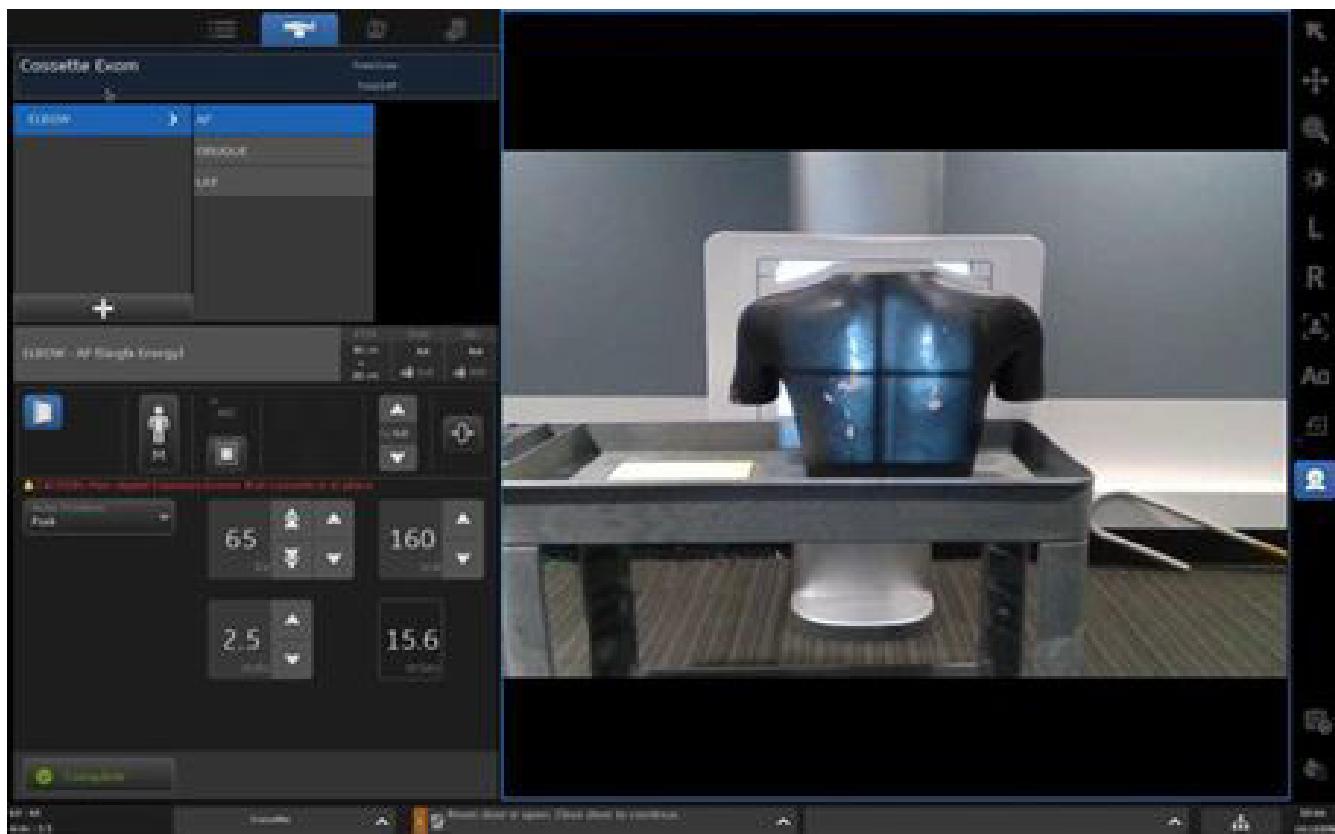
Figure 10-15 Power button LED

11. Make exposure using the hand switch.
 - The image appears on Image Viewer 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.

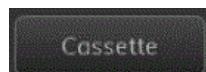
When the cassette receptor is selected, a message appears near the bottom of the screen: "CAUTION: Non-digital Exposure. Ensure that film is in place."

Figure 10-16 Cassette exam Acquisition screen

Follow this process to conduct a Cassette Exam.

1. Click Cassette 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 10-17 Cassette 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.



5. Make technique adjustments as necessary for the appropriate body part being imaged: kV, mAs, mA and Focal Spot.

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. See [Chapter 15: Preferences-Edit Protocol Database \(p. 15-41\)](#).

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 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 10-18 Emergency 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 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 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. See [Chapter 12: Image Management-Open Exams and Images \(p. 12-10\)](#) 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 from the bottom left of the Worklist.
 - The Select Protocols screen appears. See [Select or Change Protocols \(p. 10-13\)](#).
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. See [Conduct a Table Exam \(p. 10-16\)](#), [Conduct a Wall Stand Exam \(p. 10-18\)](#), or [Conduct a Table Top Exam \(p. 10-20\)](#) 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 10-19](#) 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 10-19 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 10-20 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

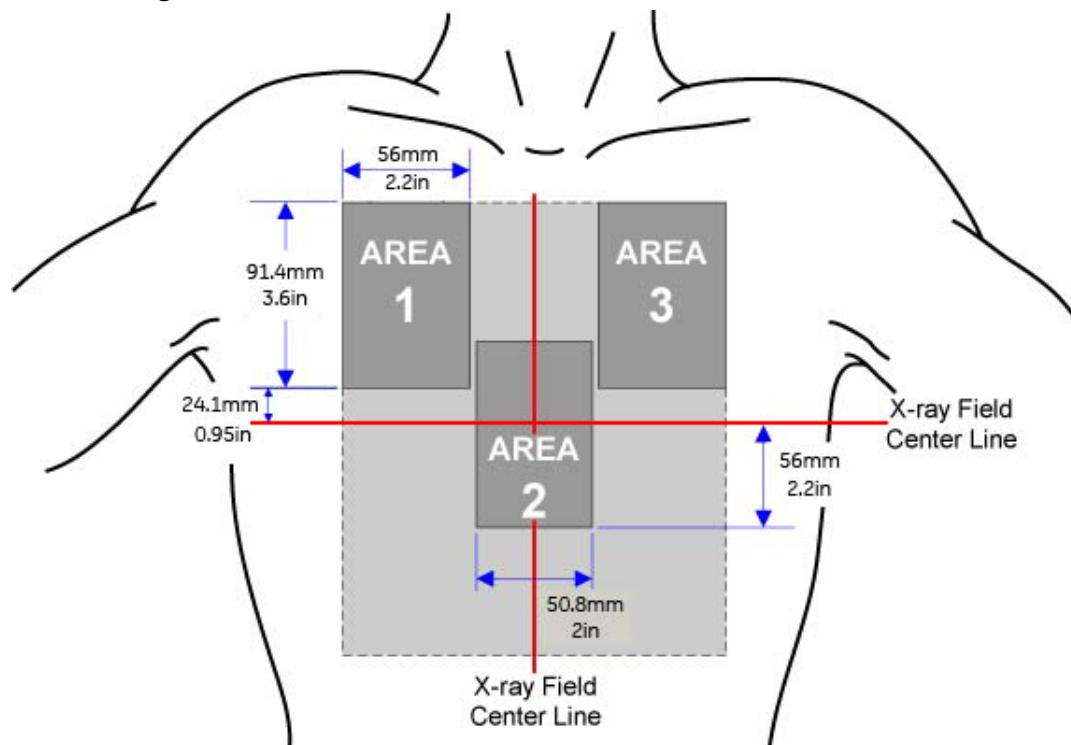
$$\text{(the 250 mA console selection)} \times \text{(2000 milliseconds)} = 500 \text{ mAs}$$

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

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 10-21 Sensing areas



The position of the sensing areas are shown in relation to the area of a 214 mm x 231 mm (8.4in x 9.1in) 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 radiography 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 10 x 12 in (254 x 305mm) 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 $8\frac{1}{4} \times 9\frac{3}{4}$ in (210 x 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 2.5 x 4.5 in (54 x 114 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 10 x 12 in (254 x 305 mm) and in instances where the collimator field size is reduced to less than 10 x 10 in (254 x 254 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.

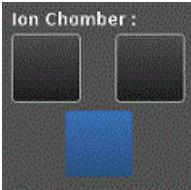
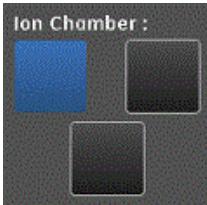
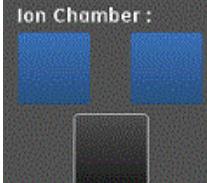
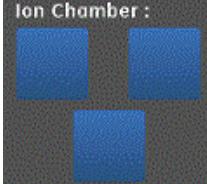
When in AEC mode, at least one ion chamber must be selected. Any combination of chambers is allowed.

Figure 10-22 AEC Areas



Note: When creating or editing protocols, the ion chambers are named L, R, and C on the Exam Menu screen. See [Chapter 15: Preferences-Protocols \(p. 15-38\)](#).

Table 10-2 Detector sensing areas

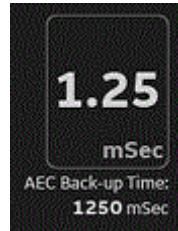
Area(s) Selected	Application	Patient Positioning
Area 2 	Controls the exposure for an area of interest at the center of the X-ray field.	The patient's area of interest is in the X-ray field center.
Area 1 	Controls the exposure for an area of interest at the upper left quadrant of the full size radiograph.	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 vertebral 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 10-23 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 cover 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 10-24 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.

Complete

Complete 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.

Critical Care Suite (CCS)

This operator manual provides information relating only to the XR646 HD and XR656 HD. For information pertaining to the Critical Care Suite / Quality Care Suite, reference these manuals:

- Advanced Operator Manual (Not available in all regions).
- Critical Care Suite / Quality Care Suite - Standard operator manual.

Chapter 11: Image Viewer

The Image Viewer screen 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.

User are allowed to switch from acquisition screen to image viewer screen whenever image is open.

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 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.

Note: There is an alternate monitor display color available through service configuration. Please contact service for details.

Figure 11-1 Image Viewer screen

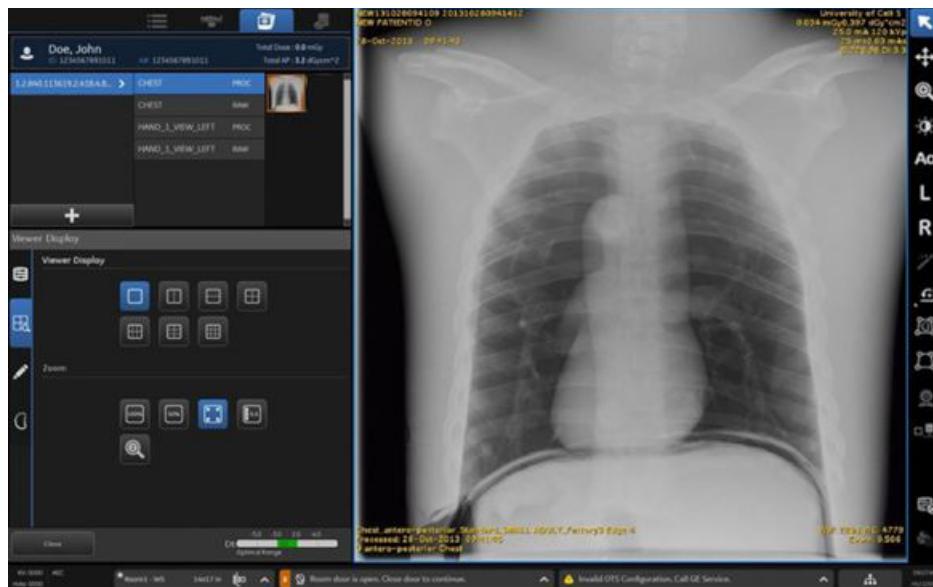


Table 11-1 Image Viewer screen functions

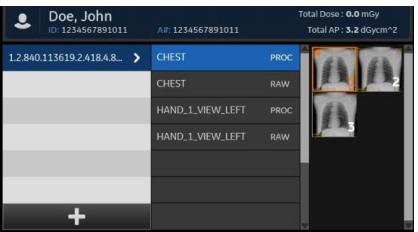
Function	Description
Patient identification 	Identifies the Patient Name and Patient ID as entered on the Patient Information screen.
Exam / Series 	Collapsible panel that contains a list of exams and series within the exams. The Viewer shows all images in the study. All series within the study are listed and can be seen in the Viewer. See Select Images to View (p. 11-5) .
Images Thumbnails 	Image thumbnails that shows small previews of all images in the selected series and highlights the currently selected image. See Select Images to View (p. 11-5) .
Viewer Display 	Collapsible panel that allows you to adjust how many images are viewed at once and image size. See Change Viewer Display (p. 11-6) .
Image Tools 	Collapsible panel that contains tools to adjust images. Tools are divided by category into three tabs: <ul style="list-style-type: none">• Image Display Tools – See Adjust Images (p. 11-7)• Annotation – See Annotate and Mask Images (p. 11-9)• Image Processing – See Re-process Images (p. 11-19)

Table 11-1 Image Viewer screen functions

Function	Description
DI (Detector Deviation Index) 	If enabled, displays the deviation of measured dose from the expected dose and whether the dose is within an acceptable range for the anatomy. You may need to re-take images that show doses below the acceptable range. See Chapter 15: Preferences-DI (Deviation Index) (p. 15-34) . Note: Depending on your system's configuration, the DI may only show a numerical value. See Chapter 15: Preferences-Image Viewer (p. 15-28) to configure the Detector Exposure Index.
Pointer controls 	Changes the action of the pointer when clicked and dragged on the image. See Change Pointer Controls (p. 11-28) .
[Transfer Log] 	Opens the Transfer Log screen to show status of printed and sent exams on the network. See Chapter 12: Image Management .
[FILM MANAGER] 	Allows manual print and configuration for multiple images. See Print Images (p. 11-32) .
[MANUAL PRINT] 	Allows setup and printing of the currently selected image. See Print Images (p. 11-32) .
[CLOSE] 	Closes the Image Viewer screen and prompts you to save any changes to images. Close also initiates auto print and auto push, if enabled. See Save Changes to Images (p. 11-38) .
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.

Figure 11-2 Tool panels collapsed

Select Images to View

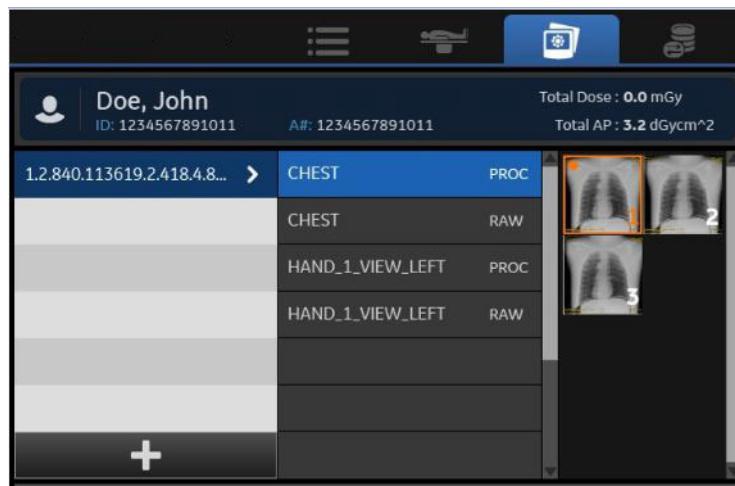
The Exam/Series panel ([Figure 11-3](#)) allows you to select which exam or series of images to view.

Note: When viewing or adjusting images from a completed exam, always work with processed images.

The Images panel shows thumbnails of all images in the selected series. The panel shows up to 8 image thumbnails 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 yellow dot in the upper right corner.

To view an image, click an image preview.

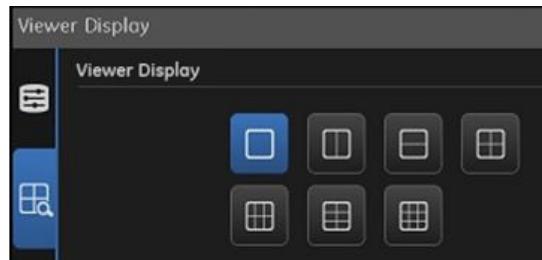
Figure 11-3 Image Tool Panel - Exam/Series /Images Thumbnails

Change Viewer Display

The Viewer Display controls how many grids appear in the Image Viewer screen at one time and adjust the magnification of the image in every grid.

The Viewer Display ([Figure 11-4](#)) allows you to view all images in up to 9 grids at one time.

Figure 11-4 Viewer Display - Viewer Display Panel



The Zoom panel ([Figure 11-5](#)) changes the zoom level of the selected image when shown in the Viewer. [Table 11-2](#) describes the Zoom options.

Figure 11-5 Viewer Display - Zoom panel

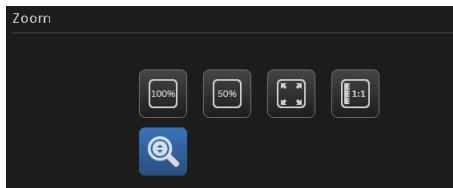


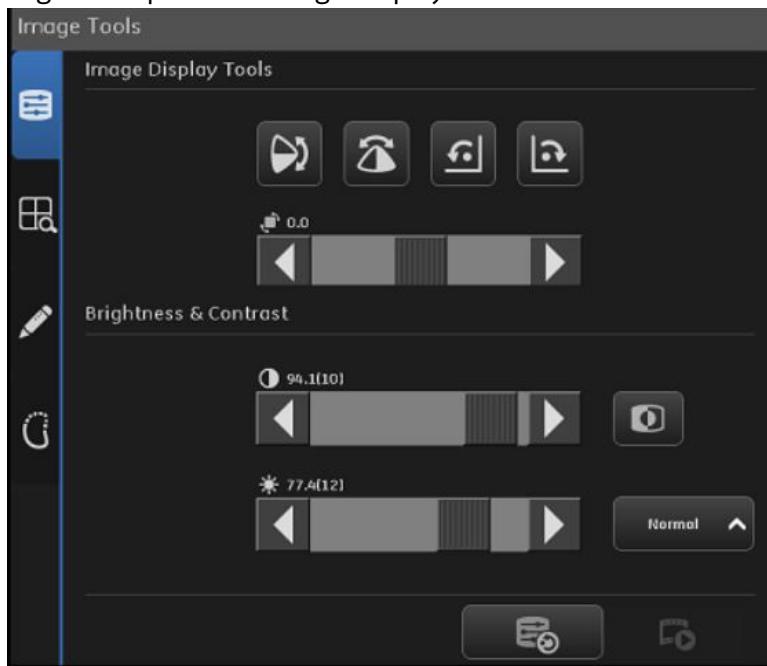
Table 11-2 Zoom tool descriptions

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



Note: The values shown above (94.1 and 77.4) are slider bar positions. The values will change when you adjust them when viewing the image.

Numbers shown in parenthesis, are the Contrast and Brightness values showing deviation from GE Healthcare default image processing parameters. The values could also represent, any custom image processing created by the user per the Edit Proc screen. See [Chapter 15: Preferences-Deviation \(p. 15-58\)](#).

Table 11-3 Image Display Tools descriptions

Tool	Description
Contrast	<p>Adjusts the differences between dark and light on the selected image.</p> <p>• Move the slider right for more contrast (towards pure black and white).</p> <p>• Move the slider left for less contrast (towards uniform gray).</p> <p>• 0 is GE Default Factory Image Processing.</p> <p>• User can create custom looks by moving sliders.</p> <p>• Numbers displayed after customizing = Contrast deviation from Default Factory Image Processing.</p>

Table 11-3 Image Display Tools descriptions

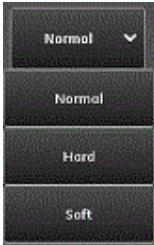
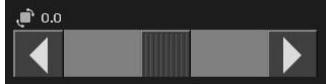
Tool	Description
Brightness 	<p>Lightens or darkens the selected image.</p> <ul style="list-style-type: none"> Move the slider right for a lighter image. Move the slider left for a darker image. 0 is GE Default Factory Image Processing. User can create custom looks by moving sliders. Numbers displayed after customizing = Brightness deviation from Default Factory Image Processing.
Invert 	Reverses light and dark areas of the selected image.
Windowing 	<p>Applies windowing to the selected image.</p> <p>Available options are:</p> <ul style="list-style-type: none"> Normal - image as acquired Hard - adjusts the image towards black and white Soft - adjusts the image towards gray <p>The Discovery XR656 HD 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 	Flips the selected image 180 degrees on the horizontal axis; that is, switches top for bottom.
Horizontal Flip 	Flips the selected image 180 degrees on the vertical axis; that is, switches left for right.
Rotate Left 	Rotates the selected image counter-clockwise in 90 degree increments.
Rotate Right 	Rotates the selected image clockwise in 90 degree increments.

Table 11-3 Image Display Tools descriptions

Tool	Description
Free Rotation 	Rotates the selected image both clockwise and counter-clockwise. The range is -180° to 180°. <ul style="list-style-type: none"> • Click the end buttons to rotate the image in 0.1 degree increments. • Click and drag the slider to spin the image. • Move the slider right to rotate the image clockwise. • Move the slider left to rotate the image counter-clockwise.
Restore Image 	Removes all adjustments and returns the selected image to its original state.

Annotate and Mask Images

The Annotations/Mask panel contains the tools to annotate images. [Table 11-4](#) describes the tools and their functions.



CAUTION **The measurement annotation may differ from actual value, its accuracy and stability are not guaranteed. The measurement baseline is Tabletop or WS front panel or Detector surface depending on selected receptor, some correction ratio should be applied according to object position.**

Image annotations are divided into two categories:

- Image annotation – Lines, ellipses, Cobb angle, user annotation (notes), and R/L 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. See [Add Image Annotations \(p. 11-14\)](#).
- 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. See [Customize System Annotations \(p. 11-13\)](#).

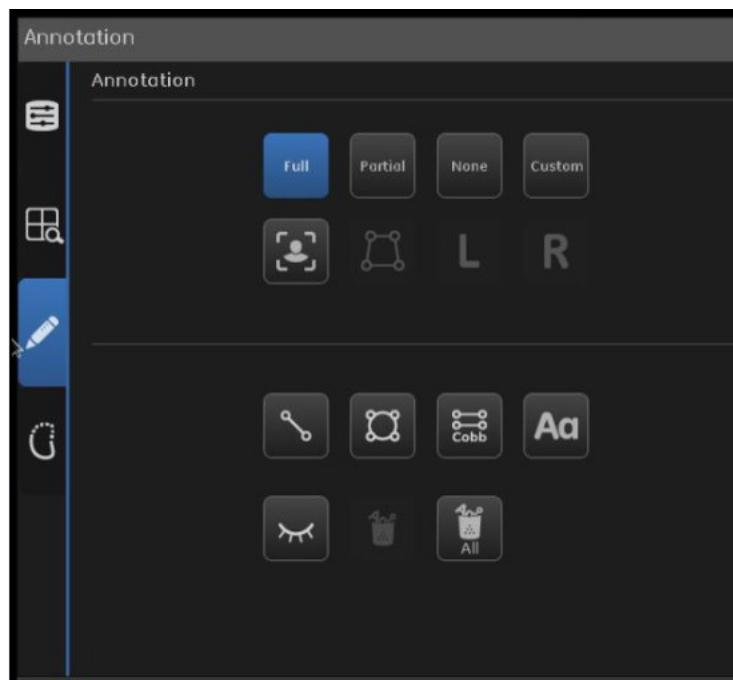


Table 11-4 Annotations/Mask tool descriptions

Tool	Description
Line	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.
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 hides image annotations from the image. When annotations are hidden, the button name changes to [SHOW]. Click [SHOW] to see the annotations.

Table 11-4 Annotations/Mask tool descriptions

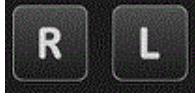
Tool	Description
Erase 	Deletes the selected image annotation. Note: Deleted annotations cannot be recovered.
Erase All 	Deletes all image annotations. Note: Deleted annotations cannot be recovered.
RL 	Places a Right or Left marker on the image for reference. Note: R/L marker is available when the image is taken in acquisition or after being reprocessed at anytime. Only one marker may be placed on an image.

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"> • Patient information (top left corner) exam date and patient identification • Study information (top left corner) exam identification • Series information (top left corner) series identification • Image information (top left corner) image identification • Acquisition information (top right corner) dose and DAP <ul style="list-style-type: none"> - For Switzerland or per customer request, the unit of DAP display can be customized. The setting can be found in the SUIF (Service User Interface) – Configuration – General – DAP Display Unit(dGy*cm²/cGy*cm²/mGy*cm²/Gy*cm²/Gy*m²). This setting only impacts the DAP display on the UI, and doesn't apply to the value in the image DICOM header. Please contact service for details. • Hospital information (top right corner) the name of the facility where the image was acquired • X-ray parameters (top right corner) the mA, kVp, ms, mAs, and DEI of the exposure • 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) • Anatomy information (bottom left corner) the protocol used to acquire the image • Processing information (bottom left corner) the look used to process the image • User measurements (bottom right corner) size and angle measurements for line, ellipse, and Cobb annotations <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 (Figure 11-7) that allows you to choose which system annotations appear. See Customize System Annotations (p. 11-13) .

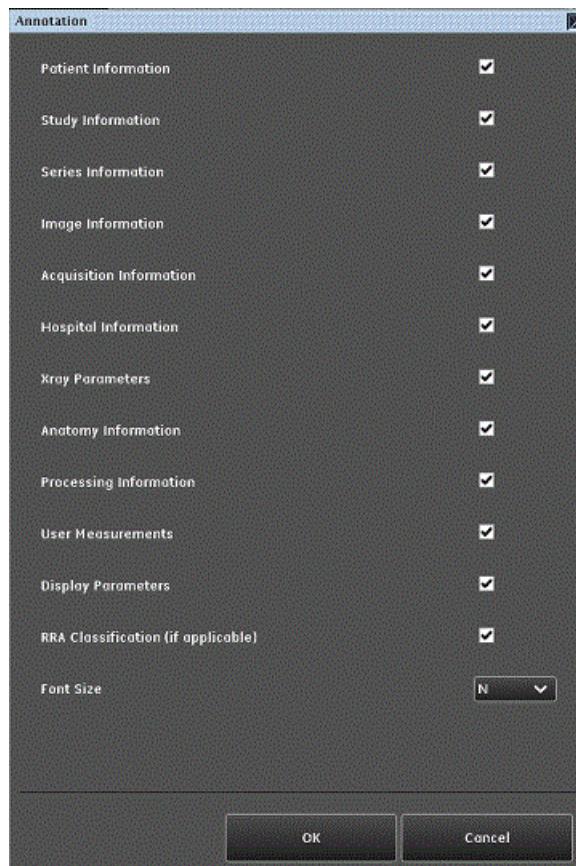
Table 11-4 Annotations/Mask tool descriptions

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>Note: This function is only available when the image is open in a live exam or for re-processed images.</p> <p>See Adjust Image Shutter (Crop Image) (p. 11-16).</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.

Note: GE Healthcare Service personnel can change the default font size at your request.

- The available font sizes are:
 - -2 (smallest)
 - -1
 - N (Normal: default setting)
 - +1
 - +2
 - +3 (largest)

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"> • To move: Click and drag the middle of the line. • To change the angle or re-size: Click and drag one of the square handles at the ends of the line.
Ellipse	<p>Select the ellipse.</p> <ul style="list-style-type: none"> • To move: Click and drag the ellipse by its edge (not on a handle). • To change shape or re-size: Click and drag a square handle.

Table 11-5 Image annotation instructions

Tool	Instructions
Cobb	<p>Select the Cobb.</p> <ul style="list-style-type: none"> • To move: Click and drag the middle of a line. • To change the angle or re-size: Click and drag one of the square handles at the ends of the line.
User Annotation	<p>Select an annotation from the Preset list or click in the “CUSTOM” text area of the Text Annotation screen, click on the image where the operator intend to add annotation.</p>  <p>Type your comment.</p> <p>Click [ADD] to add annotation in center and close the window.</p> <ul style="list-style-type: none"> • To move: Click and drag by the red square on the top left corner of the text box. • To edit: Double-click the User Annotation. Make your changes on the Text Annotation screen. • Custom text can be highlighted, copied and then pasted using specific keyboard commands. To copy custom text, highlight the text entry and use CTRL + C. To paste the text, click on the User Annotation icon again, navigate to the custom tab and press CTRL + V. See Chapter 15: Preferences-Preset Names (p. 15-20) about configuring the pre-set annotation list.
RL Marker	 <p>Select the RL marker.</p> <ul style="list-style-type: none"> • To move: Select the marker and drag to the desired area. • To switch between R and L: Click the R/L button. <p>Note: 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.

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. See [Automatic Shutter \(p. 11-18\)](#).

The Manual Shutter function allows you adjust the automatically applied (default) shutter for viewing and printing.

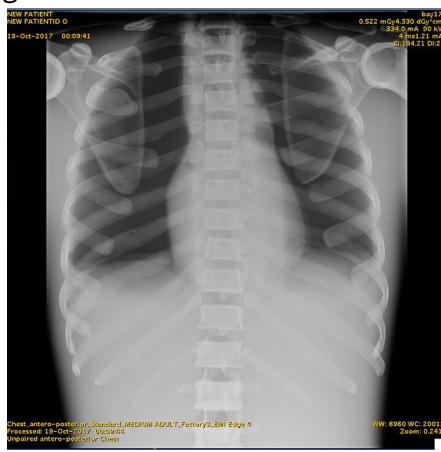
You can only adjust the shutter of images in an active exam or of re-processed images.

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.

Follow this process to adjust the shutter of an image.

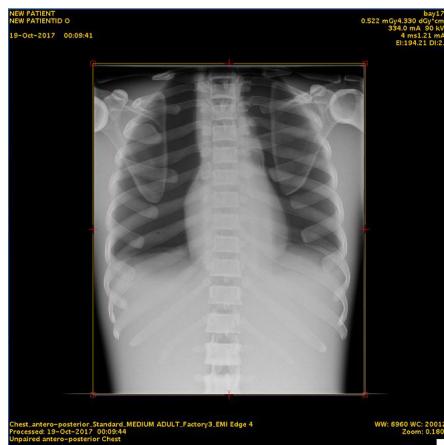
1. Select the image.

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.

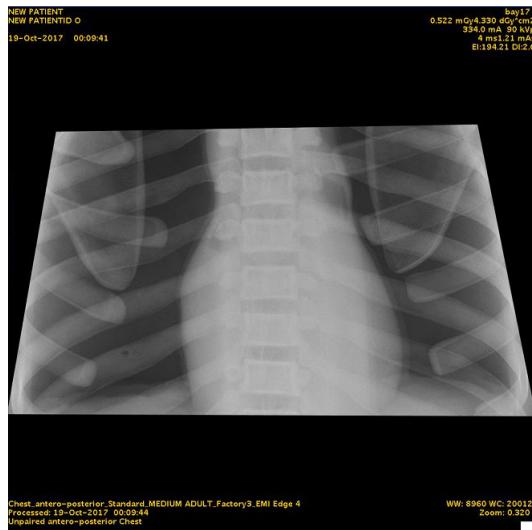
Figure 11-9 Editing the manual shutter**Figure 11-10** Close up of manual shutter

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. See [Change Viewer Display \(p. 11-6\)](#).

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 HD 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.

Manual Shutter Auto Reprocess

Manually adjusts the image shutter and Reprocess the image in the new area after shutter with default IPLooks function. Manual Shutter Auto Reprocess button will display on quick tool bar in Image Viewer page as a quick button, which is only active when user check in the button in Preference page, see operation in [Chapter 15: Preferences-Quick Tool bar Edit \(p. 15-33\)](#).

Note: Manual Shutter Auto Reprocess can apply on Image Pasting exam view screen.

Note: This function is only available when the image is open in a live exam or for re-processed images.

Note: After the manual shutter is selected, a warning will display in the screen to alert that one or more image annotation placed outside of the defined image area will be erased after image auto reprocessed.

Figure 11-13 Manual Shutter Auto Reprocess button



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.

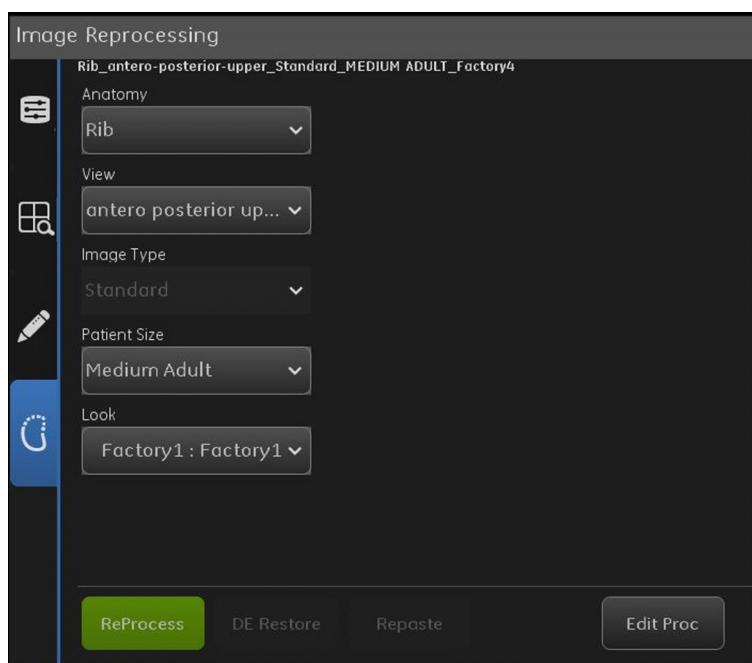
Re-processing can be performed on any image that has a corresponding raw data set. Images can be re-processed both in live exams and in review mode.

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. See [Save Changes to Images \(p. 11-38\)](#).

The initial image processing is determined by the default that is configured for the protocol. See [Chapter 15: Preferences-Image Processing \(p. 15-51\)](#).

Table 11-6 describes the settings used to re-process an image.

Figure 11-14 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.
Look	Changes the processing look. 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. Factory Look descriptions: <ul style="list-style-type: none"> • Factory Look 1 – similar to analog film, low edge, low tissue contrast. • Factory Look 2 – CR look, medium edge, medium tissue contrast. • Factory Look 3 – CR look, moderate edge, moderate tissue contrast. • Factory Look 4 – Digital look, high edge, high tissue contrast. • Custom looks – The system allows you to build up to 5 custom looks in any combination of parameters. See Chapter 15: Preferences-Image Processing (p. 15-51) for more information on building custom looks.

Table 11-6 Reprocessing tool descriptions

Function	Description
[REPROCESS]	Applies the changes and re-processes the image. Re-processing creates a new image in the series. Note: The button does not become enabled until the Look is selected.
[EDIT PROC]	Displays Image Processing Preference Editor screen that allows you to view the Factory look settings or create custom looks. See Chapter 15: Preferences-Image Processing (p. 15-51) for more information about building custom looks.
[REPASTE]	If enabled, opens a screen to allow manual alignment of Image Pasting acquisitions.
[DE RESTORE]	Recovers Dual Energy processing. 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.

Smart Process

IP Looks comparison can be used by [Preview All] in Image Processing Preferences Editor[Edit Proc] in Viewer.

Select [Multiselect] to choose IP looks for comparing.

Click on [Compare] for selected IP Looks Comparison.

Note: Two IP looks are allowed to compare.

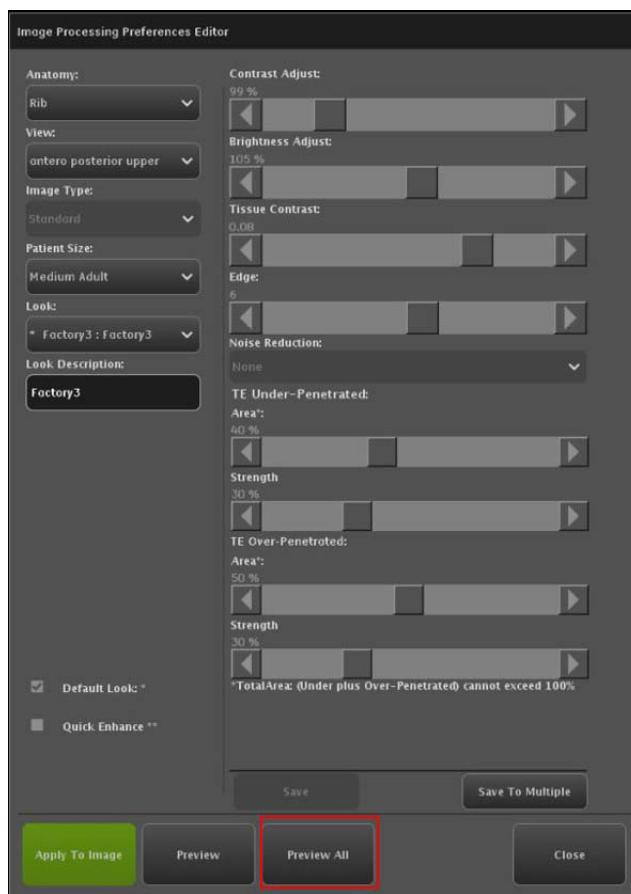
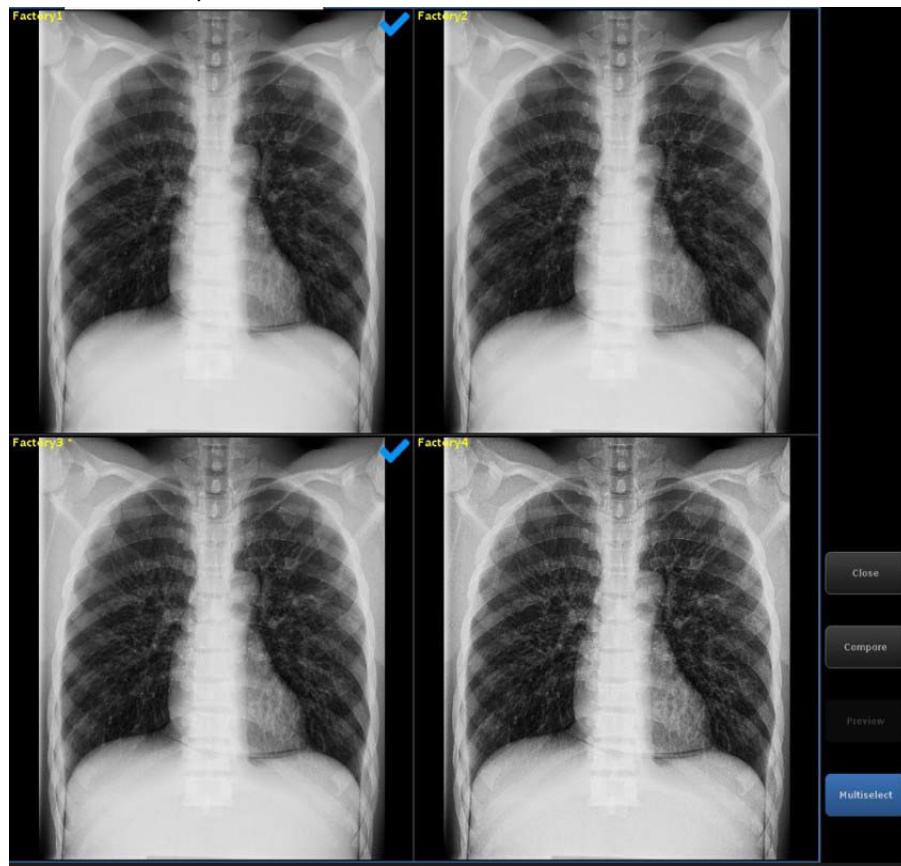
Figure 11-15 Preview All in Edit Proc

Figure 11-16 Multi-select to compare

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 2 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.

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. See [Chapter 15: Preferences-DI \(Deviation Index\) \(p. 15-34\)](#).

Figure 11-17 DI graphical display

1. DI Control Limit.
2. DI Control Range Suggestion.
3. Current DI for the selected image.

Table 11-7 Examples of visual range DI displays

Display	Description
	Low DI = Out of Desired range [lower than Target Exposure Index]
	Low DI = Acceptable Range [Slightly lower than Target Exposure Index]
	Optimal DI = Optimal Range [Matches Target Exposure Index]
	Acceptable DI = Acceptable Range [Slightly higher than Target Exposure Index]
	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 adjustment, 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.

Quick tool bar

The system provides the function of customizing the viewer Quick Toolbar. See [Chapter 15: Preferences-Quick Tool bar Edit \(p. 15-33\)](#).

Note: There are icons that cannot be disengaged. Select Image, Restore Image and Film Manager must always remain on the Quick Toolbar.

Table 11-8 Quick tool bar

Tool	Description
Select Image 	When viewing multiple images, selects the image to act upon. This is the default pointer behavior. More information please refer to Change Pointer Controls
Pan Image 	Moves the image within the viewing area. More information please refer to Change Pointer Controls
Image Magnifying Glass 	Shows a small part of the image at 3 times magnification. More information please refer to Change Pointer Controls
Image Interactive Zoom 	Free Zoom More information please refer to Change Pointer Controls
Change Image Brightness / Contrast 	Changes the brightness and contrast by dragging the pointer instead of using the Image Display Tools controls. More information please refer to Change Pointer Controls
Add User Annotation 	Places a text box on the image that you may add notes into. More information please refer to Annotate and Mask Images
Add RL Marker 	Places a Right or Left marker on the image for reference. More information please refer to Annotate and Mask Images
Manual Shutter Auto Reprocessing 	More information please refer to Manual Shutter Auto Reprocess
Perform Quick Enhance 	Applies another predefined image processing look as assigned in the IP Looks editor tool. This can be either a Factory or Custom IP Look. More information please refer to Chapter 15: Preferences-Build Custom Looks (p. 15-53)
Patient Orientation Frame 	More information please refer to Chapter 15: Preferences-Patient Orientation Frame (p. 15-31)
Rotation/Flip 	 More information please refer to Adjust Images
Add Manual Shutter 	More information please refer to Adjust Image Shutter (Crop Image)

Tool	Description
Line/Ellipse/Cobb 	 More information please refer to Annotate and Mask Images
Erase Annotation 	More information please refer to Annotate and Mask Images
Erase All Annotation 	More information please refer to Annotate and Mask Images
Invert 	Reverses light and dark areas of the selected image.
Manual Print 	More information please refer to Print Images
Restore Image 	Removes all adjustments and returns the selected image to its original state.
Film Manager 	More information please refer to Print Images
Autogrid 	Autogrid is only available if a physical grid has not been used to make the acquisition. Once user clicks on the Autogrid icon, several grid ratio choices are available. Once a selection is made, a new image and thumbnail will be created. A user's choices will be Low, Medium or High. 
Integrated camera option for viewing the patient and the examination area 	When the camera is active, a blue background color to the icon will appear. If the camera is turned off, a grayed out appearance will result for the icon. Note: In order for the Camera icon to display, a GE Healthcare Field Service Representative must engage the option in the service menu. After this occurs, a user can choose in the preferences menu, whether the Camera will default to ON for every exam.

Note: Manual Shutter button and Manual Shutter Auto Reprocess button should be independent function. It is to say Manual Shutter Auto Reprocess button should be invalid, when Manual Shutter button is in operating. And Manual Shutter button should be invalid, when Manual Shutter Auto Reprocess button is in operating.

Change Pointer Controls

The pointer control buttons ([Figure 11-18](#)) change the action of the pointer when it is clicked and dragged on an image.

Figure 11-18 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 11-9](#) 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 11-9 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.
Image Interactive Zoom 	When the user selects the free zoom tab, the mouse wheel is activated. The user can navigate on the image and select the area on the image to zoom in/out by using wheel in the mouse. Double-click the image to return to 'Fit To Screen' level.

Table 11-9 Pointer Controls description

Tool	Description
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"> • Contrast: Click and drag the pointer vertically. Up is more contrast, down is less contrast. • Brightness: Click and drag the pointer horizontally. Right is brighter, left is darker <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 Healthcare Service personnel enable the option and it is configurable through preferences. See Chapter 15: Preferences-Image Viewer (p. 15-28).</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). See [Chapter 15: Preferences-Auto Tag \(Quality Check\) \(p. 15-23\)](#) 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 11-19](#)). 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 11-19 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.

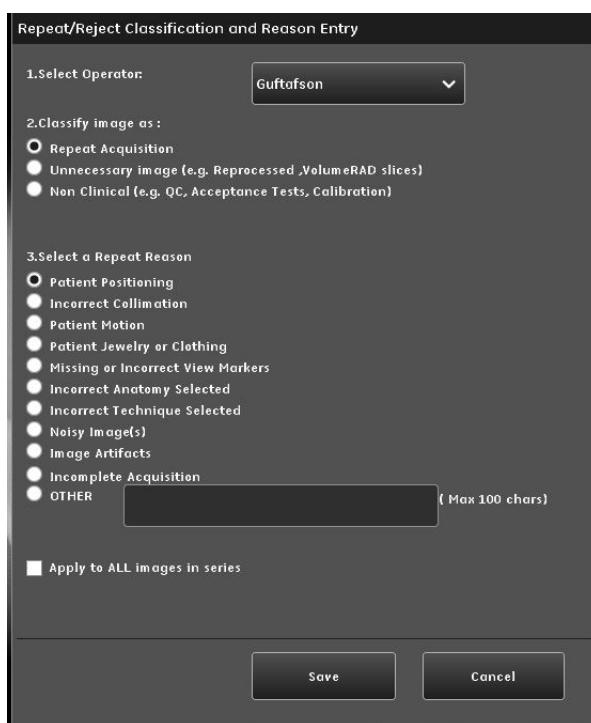
RRA data is saved on the system for 100 days and may be exported as a report.

Note: See [Chapter 13: Advanced Applications-Repeat/Reject Analysis \(RRA\) \(p. 13-15\)](#) 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 11-20](#)).
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.
 - 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.

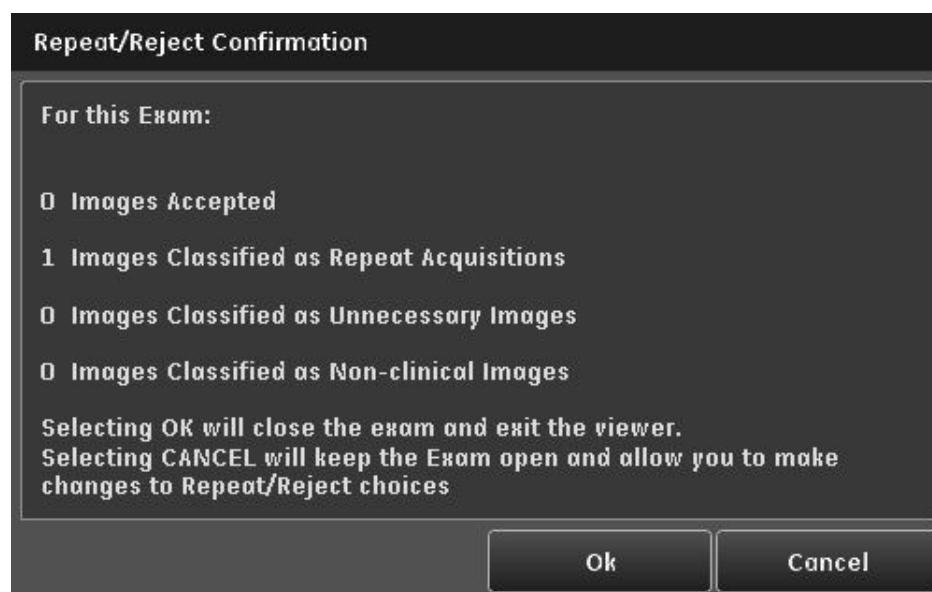
5. If desired, check the “Apply to ALL images in series” check box. This will apply the same Classification and Repeat Reason to all rejected images in the entire series.
6. Click [SAVE] to retain your changes.
 - [CANCEL] closes the screen and keeps the quality indicator mark in place.

Figure 11-20 Classify Image and Select Repeat Reason

Depending on the RRA Preferences selection, the Repeat/Reject Confirmation screen ([Figure 11-21](#)) 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: See [Chapter 13: Advanced Applications-RRA Confirmation Screen \(p. 13-16\)](#) about enabling this screen to appear.

Figure 11-21 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. See [Chapter 15: Preferences-Auto Print \(p. 15-24\)](#) 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.



No.	Description
1	Quick Print button
2	Film Composer button

Quick Print

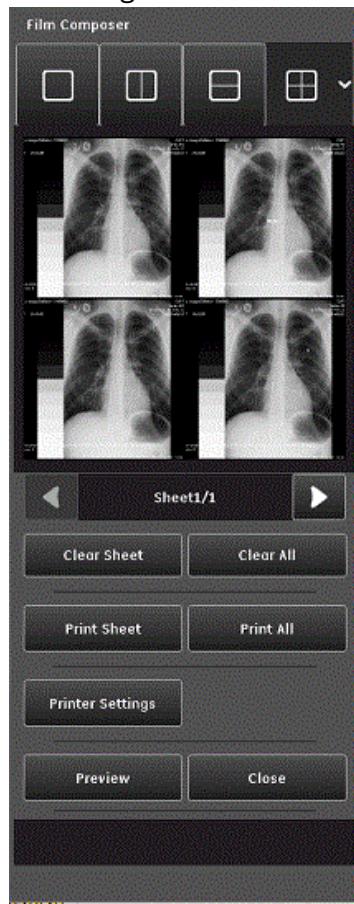
Follow this process to print a single image.

1. Select the image from the Images tool panel, if necessary.
2. Click on [QUICK PRINT].
 - The Print Images screen appears.
3. Adjust the settings as indicated.
4. Click on [PREVIEW] to confirm that the image placement is correct.
 - If the image placement is incorrect, click on [CANCEL] to return to the Print Images screen and adjust the settings.
 - If the image placement is acceptable, click on [PRINT] to print the image.

Print Multiple Images

Follow this process to print multiple images.

1. Click [FILM Composer].
 - The Film Composer screen opens.

Figure 11-22 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 [**<**] and [**>**] 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 11-23](#)) to the Film Composer screen.

Figure 11-23 Processed Image Panel

4. Use the buttons to confirm and adjust the print settings.
 - Click [PREVIEW] to see how the images are positioned on the sheet.

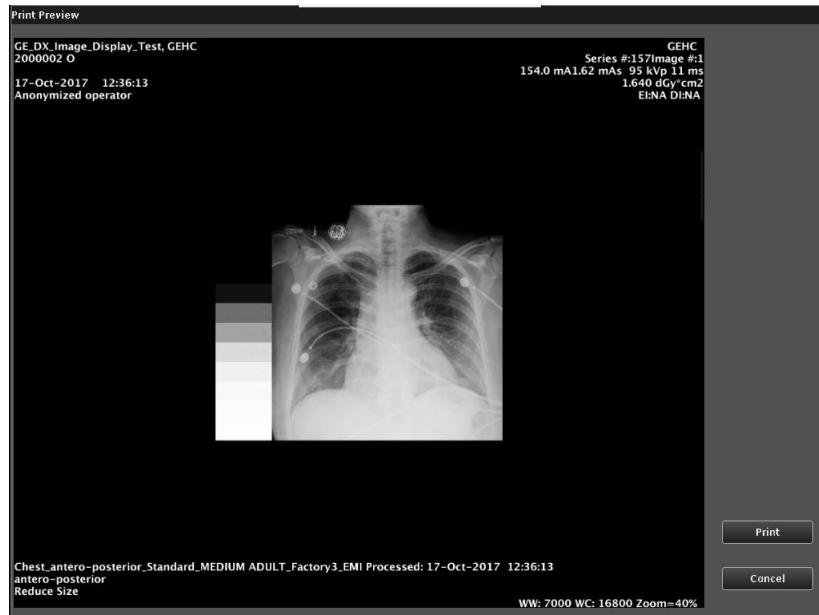
- Click [CLEAR SHEET] to remove images from the currently displayed sheet.
 - Click [CLEAR ALL] to remove images from all sheets.
 - Click [PRINT SHEET] to print the currently displayed sheet.
 - Click [PRINT ALL] to print all sheets.
5. Click [PRINTER SETTINGS] to confirm or adjust the printer configuration. (See [Figure 11-25](#) and [Table 11-10](#).)
 6. Click [CLOSE] when finished.

Print Current Image

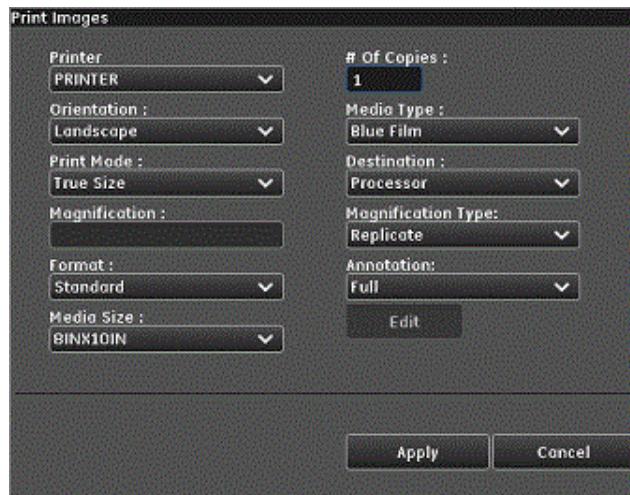
Follow this process to print a single image.

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 11-10](#).
4. Click [PREVIEW] to confirm that the image placement is correct.
 - There is ruler shown on the top right of the previewed image. Total is 10 cm (3.93 in). Each scale of the ruler corresponds to 1 cm (0.39 in) length on the TableTop or on the Wallstand housing panel. For Image Pasting images (if applicable), each scale of the ruler corresponds to 1 cm (0.39 in) length on the COI plane.
 - If the image placement is incorrect (as shown in [Figure 11-24](#)), 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 11-24 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 11-25 Print Images screen**Table 11-10** 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"> • Auto L/P • Landscape • Portrait
Print Mode	Selects what size to print the image. Available options are: <ul style="list-style-type: none"> • True Size • Fit to Film • Reduce Size • Orthopedic Magnification (if enabled) (See Chapter 13: Advanced Applications-Orthopedic Magnification (Option) (p. 13-12).)
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.

Table 11-10 Print Images field description

Field	Description
Format	Selects the print format. Available options are: <ul style="list-style-type: none">• Standard• 35 mm• 40 mm
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">• Paper• Clear film• Blue film
Destination	Selects the destination. Available options are: <ul style="list-style-type: none">• Processor• Magazine
Magnification Type	Selects the magnification type.
Annotation	Selects the amount of annotation to print on the image. Available options are: <ul style="list-style-type: none">• Full• Partial• Custom• None See Annotate and Mask Images (p. 11-9).
[EDIT]	If Custom Annotation was selected, brings up a screen that allows you to choose the annotation to print on the image. See Annotate and Mask Images (p. 11-9).
[APPLY]	Apply the current setting.
[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 Healthcare 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 Healthcare 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

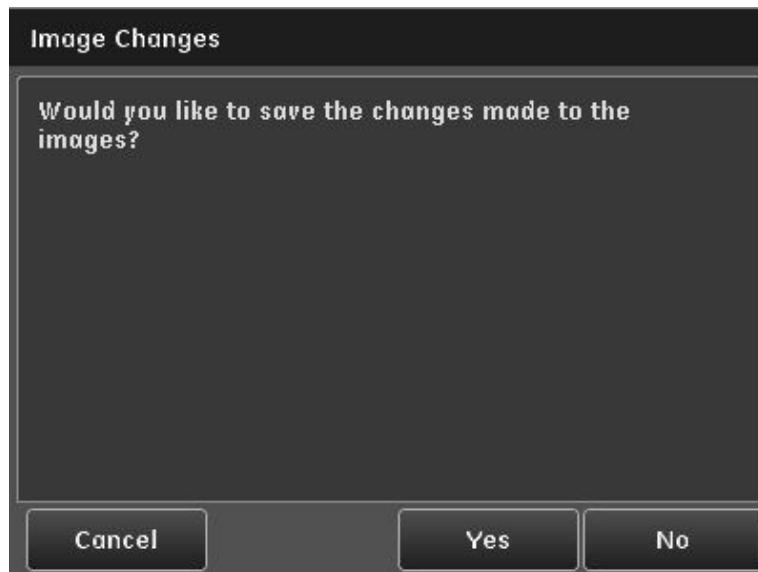
If Auto Send is enabled, acquired images are automatically sent to the pre-determined location immediately after the exam is closed. See [Chapter 15: Preferences-Auto Send \(Auto Push\) \(p. 15-25\)](#) for information on configuring Auto Send.

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. During an exam, click [Close] / [Suspend] / [Discontinue] on the Image Acquisition screen.
2. If in review mode, click [Close] on the Image Viewer screen.
3. A message appears: "Would you like to save the changes made to the images?"

Figure 11-26



- Click [YES], save the changes made to the images.
- Click [NO], close the Image Acquisition screen/the Image Viewer screen without saving changes.

- Click [Cancel], stay at the Image Acquisition screen/the Image Viewer screen without saving changes.

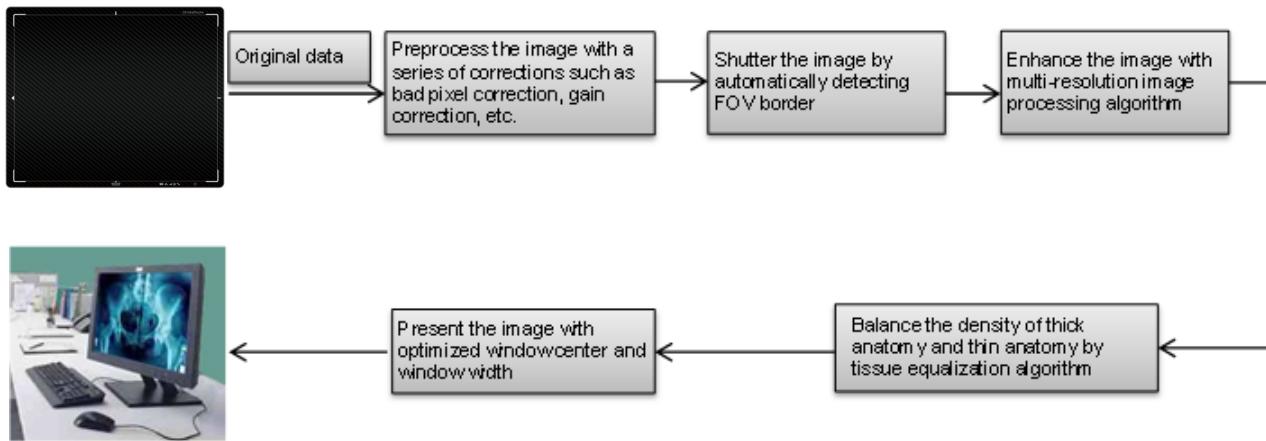
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Chapter 12: Image Management

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 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.

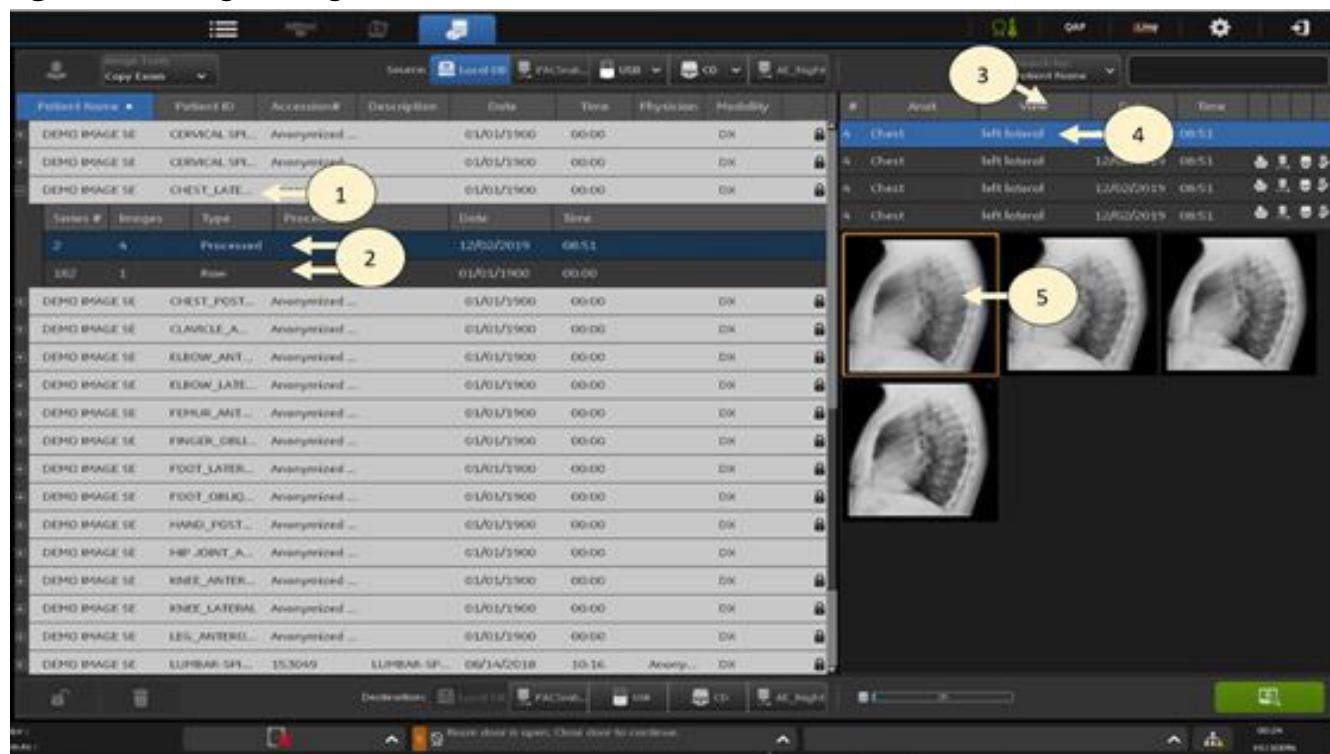
Overview

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. Thumbnail 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"> Copy Exam – Allows all exam images for a patient to be copied to another patient. See Copy Exams and Images (p. 12-10) for more information. De-Identify – Makes an anonymous copy of the exam (removes all patient identifying information, including Name, ID, and accession number). See Make Exam Anonymous (De-Identify) (p. 12-16) for more information. SMPTE – Allows services personnel to access the SMPTE pattern for system calibration. Guide – Allows for viewing of the Operator Manual. This is installed by GE Healthcare Service Personnel. PACS Test Images – Loads a set of calibration images that are used to test the quality of images sent to PACS or printers. TG18 Samples – Loads a set of test images that are used to calibrate the display monitor. <p>Note: 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, USB or a CD/DVD).
[PATIENT INFORMATION] 	Shows the Patient Information screen for the selected procedure. <p>Note: Patient Information cannot be edited once an exam has started.</p> <p>See Chapter 9: Worklist-Add or Edit Patient Information (1) for more information.</p>
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. <p>See Search List (p. 12-8) for more information.</p>
[LOCK] or [UNLOCK] 	Locks the selected exams from deletion. If a locked exam is selected, the button name changes to [UNLOCK]. <p>[UNLOCK] removes the lock from the selected exams.</p> <p>See Lock Exams from Deletion (p. 12-15) for more information.</p>

Table 12-1 Image Management screen functions

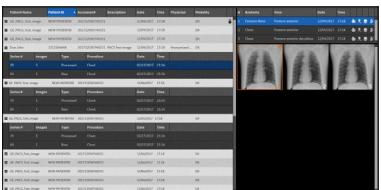
Function	Description
Exam, series, and images list	<p>Lists the images saved in the local database categorized by exams and series. The following information is displayed:</p> <ul style="list-style-type: none"> • Exams - the exams saved in the local database • Series detail - the series for the selected exam • Image list - the images for the selected series • Image preview - a representative thumbnail of the selected image. <p>Figure 12-2 shows how the information is organized.</p> 
Destination	Selects where images are to be copied or saved. The first button switches between the local unit and any configured networks hosts or destinations.
[DELETE]	Deletes the selected exams, series, or images from the local database. See Delete Exams, Series, or Images (p. 12-15) for more information.
[VIEWER]	Opens the Image Viewer screen and shows the images in the selected series. Images may be adjusted on the Image Viewer screen. See Chapter 11: Image Viewer for more information.
[TRANSFER LOG]	Shows a list of transferred exams and their destinations. See Copy Exams and Images (p. 12-10) for more information.
Database size	<p>Shows the percentage of images currently saved to system database capacity.</p> <p>See the following sections for more information:</p> <ul style="list-style-type: none"> • Copy Exams and Images (p. 12-10) to save images to another database or disk • Delete Exams, Series, or Images (p. 12-15) to remove images 
Filmed/Printed	Image has been filmed or printed.
Sent to PACS	Image has been sent to PACS.
Saved/Archived	Image has been saved/archived.

Table 12-1 Image Management screen functions

Function	Description
MPPS confirmation 	Image has received MPPS confirmation. Note: For more information see Chapter 15: Preferences-Send MPPS N-Create and N-Set notification to this network host. (1) .
System status message 	Displays the last system status message.
System message bar 	When you select the system message bar, it expands and displays all previous system status messages since the last system restart.

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

Patient Information

Patient First Name: NEW PATIENT	Patient ID: NEW PATIENTID
Middle Name:	Birth Date (mm/dd/yyyy):
Last Name:	Birth Time (HH:MM 24Hr):
Gender: Other	Age: [] Years []
Exam Accession#:	Status:
Operator: Guftafson	Study Description:
Performing Physician: Guftafson	Modality: DK
Referring Physician: Guftafson	Performed Exam Time (hh:mm) 14:44
Exam Date(mm/dd/yyyy) 10/08/2017	# of Exposures: 1 # of Non Digital Exposures: 0 Exam Dose: 1.07 mGy Exam DAP: 11.03 dGycm ²

Save Cancel

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. See [Copy Exams and Images \(p. 12-10\)](#) 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.

Load Images from a USB

The recommendations for importing USB images are:

- Size for Bulk Exchange: 1 TB
- Size for Single Exchange: 16+ GB.
- File type format: FAT 32 only.
- USB 3.0 or later.

Follow this process to access images stored on a USB.

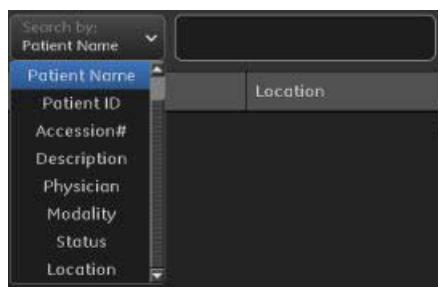
1. Insert the USB with images into the USB 3.0 port.
2. Click Source [USB].
The exam list updates to show the images stored on the disk.
3. Select the exams.
4. Copy the exams to the Local database. See Copy Exams and Images (p. 12-6) for more information.
5. Click the [LOCAL] Destination button.
An alert opens: “Selected images will be copied to (destination name).”
6. Click [OK] to confirm.
7. Click Source [USB drop down arrow] and select **Eject** to unmount the USB.
8. 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 USB.
- If the USB is not ejected via the Image Management Screen as the first step prior to removing the USB, the unmounting of the USB will not be recognized by the GE Healthcare workstation. If a USB was removed prior to ejecting, you must perform a system reset to correct the unmounting process.

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.

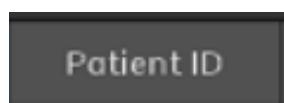
Note: The text box is not case sensitive.

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 descending 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

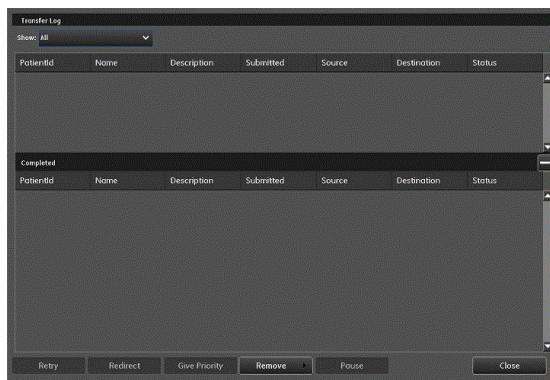
Exams (including all series and images) may be copied to a network host or to a CD/DVD. The images from one exam may be copied to another exam.

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. See [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.

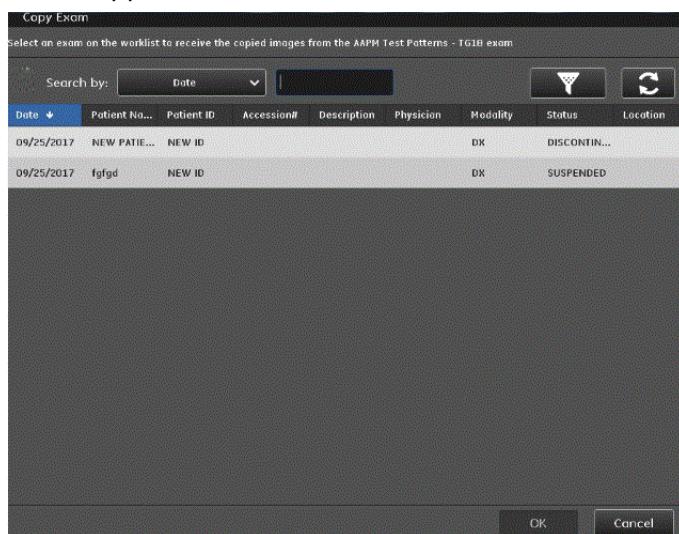
Images are copied to procedures that appear on the Worklist. Once the copy is complete, the procedure is marked as "Completed" on the Worklist and the new exam appears on the Image Management screen. Images may be copied to procedures with the status of Suspended, Discontinued, Completed, or Scheduled.

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. See [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, DVD or USB

Exams may be copied to a CD, DVD and USB for archiving purposes, to send to a location that is not within the network, or to include with a patient's medical records.

Note: If CD or DVD discs are used for copying images, they 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 disk.

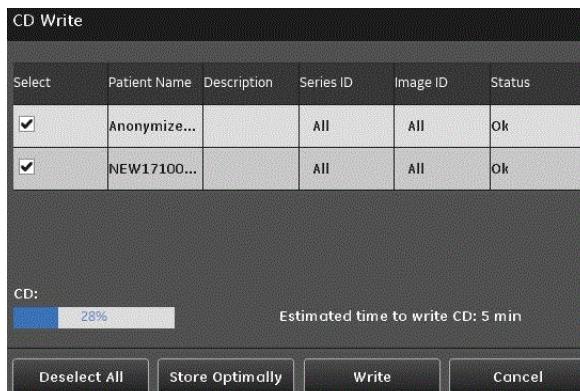
CD or DVD Method

1. 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.

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.

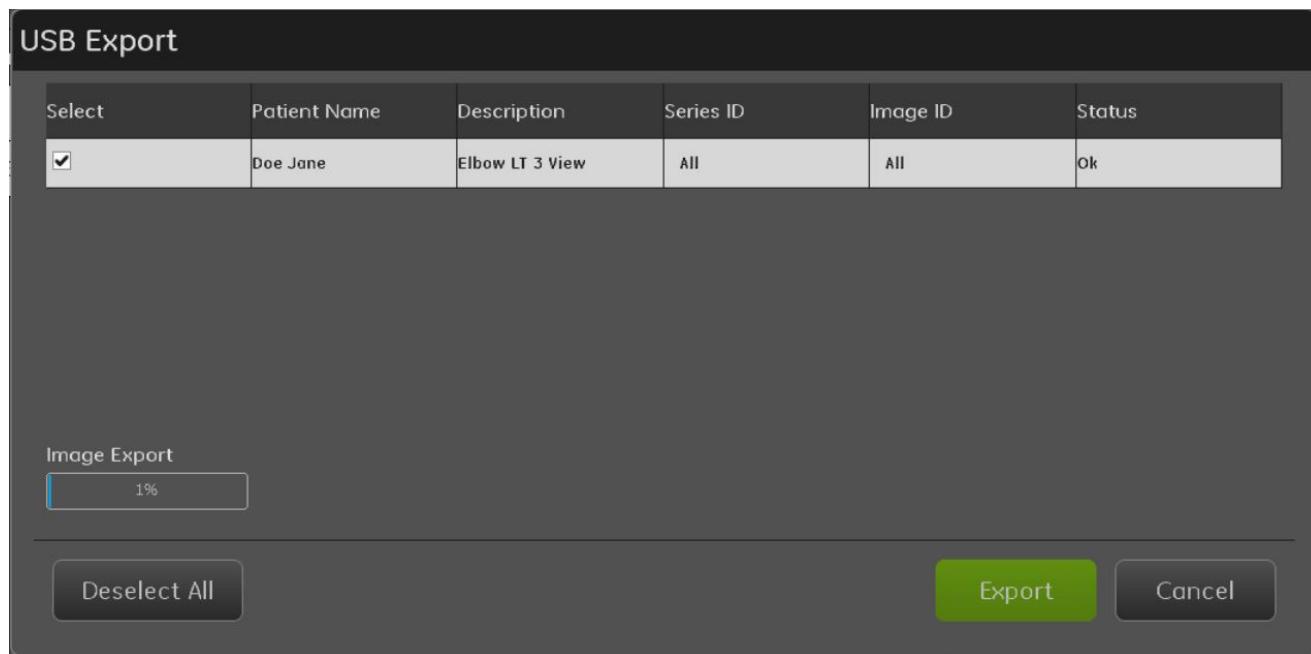


- [DESELECT ALL] unchecks all exams on the list.
 - [STORE OPTIMALLY] determines which exams to copy to best utilize the space on the disk. It will automatically uncheck exams that cannot fit on the disk.
 - [WRITE] begins the copying process.
 - [CANCEL] closes the screen and returns you to the Image 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. See [Load Images from a CD or DVD \(p. 12-7\)](#) for more information.
 9. Remove the disk.
 10. Label the disk and store in a safe place.

USB Method

Below are the recommendations for importing USB images.

- For Bulk Exchange: 1 TB
 - For Single Exchange: 16+ GB.
 - File type format: FAT 32 only.
 - USB version: 3.0 or later.
1. Insert USB into systems USB 3.0 port.
 2. Select the exams to copy.
 3. Click the Destination [USB].
 - [DESELECT ALL] unchecks all exams on the list.
 - [STORE OPTIMALLY] determines which exams to copy to best utilize the space on the USB. It will automatically uncheck exams that cannot fit on the USB.
 - [WRITE] begins the copying process.
 - [CANCEL] closes the screen and returns you to the Image Management screen.



4. When copying is finished, click Source [USB drop down arrow] and select “Eject” to unmount the USB.

Note: If the USB is not ejected via the Image Management Screen as the first step prior to removing the USB, the unmounting of the USB will not be recognized by the GE Healthcare workstation. If a USB was removed prior to ejecting, you must perform a system reset to correct the unmounting process.

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, USB or network locations.

2. Unlock exams, if necessary.

- See [Lock Exams from Deletion \(p. 12-15\)](#) 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. See [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.

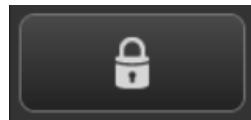
Follow this process to lock and unlock exams.

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 12-8](#).

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 12-7](#)).

Figure 12-7 Image Tools button

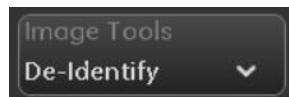
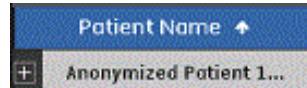


Figure 12-8 Anonymous patient



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.

Helix Workstation (Option)

This is an optional configuration of the Fixed RAD systems that customers can use for any post processing work or image recon without occupying an entire X-ray system and delaying the next patient exam. It will help with patient throughput and workflow.

The feature name Helix Workstation is because this workstation will not be tied to other parts of the X-ray subsystems (positioner, generator, tube...) used for patient scanning.

The Helix Workstation uses the same user interface with the Fixed RAD system. The image processing chain is identical to the image chain found on the full system.

Workstation Allowances:

- Modify Images; this includes Reprocess/Restore/Repaste/Reconstruct - Single Energy/Dual Energy/Image Pasting/VolumeRAD images. Images may originate from a GE Healthcare 646/656 HD system or a GE Healthcare Optima 240 mobile unit; they can then be sent to the Helix Workstation for further review or adjustment. Once image review is complete on the Helix Workstation, a user can send images to a PACS server or send back to the original fixed rad equipment it derived from. *You cannot restore images back to a portable unit.
- Backup/Export Images. A user can backup or export exams/images to CD/DVD/USB or select a PACS server for archiving.
- Delete/Lock Images. A user can delete images the Helix Workstation has on it or lock certain exams.
- Remote Servicing. A GE Healthcare service representative can remotely connect to the Helix Workstation to collect logs/ images/ snapshots for further analysis if any abnormalities occurs. The data collection can also be done manually using CD/DVD or USB blank media.

Note: If a GE Healthcare 646/656 HD system or a GE Healthcare Optima 240 mobile unit does not have AutoGrid engaged, then it cannot be applied on the Helix Workstation. This is due to specific dicom tags of an AutoGrid capable image.

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Chapter 13: Advanced Applications

Dual Energy (Option)

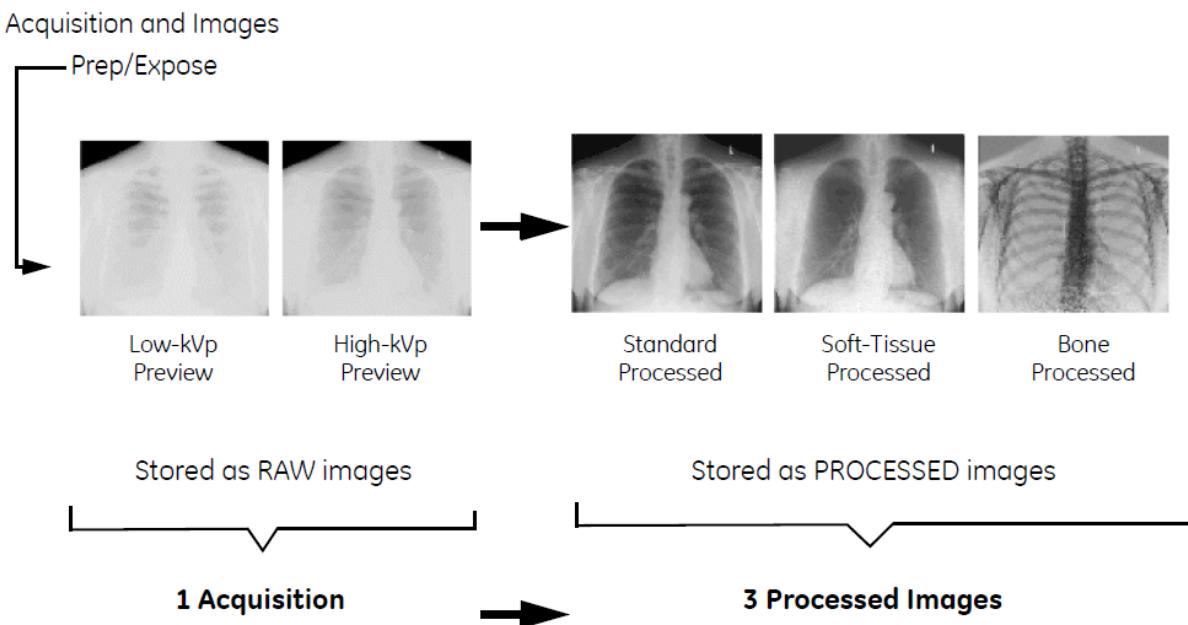
Overview

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 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 performed at the wall stand or table receptors. Dual Energy cannot be performed on a cassette exam.

Dual Energy acquisitions are 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



General Guidelines

Dual Energy acquisition and processing algorithms are optimized for Chest AP/PA and Abdomen AP/PA on adult patients. Dual Energy imaging on other anatomical views or pediatric patients may result in degraded image quality.

For Dual Energy acquisitions, it is important for the patient to remain still during the exposure. Excessive whole-body patient motion could result in residual rib contrast in the soft-tissue image.

You should release the Prep/Expose button only after the end of the second exposure beep. Be aware that for large patients, the two beeps could possibly merge into one and you would hear one long beep.

Release the Prep/Expose button after the beep ends.

Technique Settings and Image Quality for Chest Exams

Patient Size

Appropriate patient-size selection is required 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

High kVp can be set between 110 and 150. This is usually set to that of the standard (non-DE) chest protocol/technique.

Low kVp

Low kVp can be set between 60 and 80. In general, a lower low-kVp (default is 60) will result in better tissue cancellation. However, for large patients, increasing the low kVp (e.g., to 65 or 70) may improve x-ray penetration and improve the noise characteristics of the soft-tissue and bone images.

Copper Filtration

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 the correct 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 higher than that of the PA or AP view. 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

High kVp can be set 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, increasing the high kVp (e.g., to 130 or 140) may improve x-ray penetration and improve the noise characteristics of the soft-tissue and bone images.

Low kVp

Low kVp can be set between 70 and 85. In general, a lower low-kVp (default is 80) will result in better tissue cancellation. However, for large patients, increasing the low kVp (e.g., to 85) may improve x-ray penetration and consequently improve the noise characteristics of the soft-tissue and bone images.

Copper Filtration

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 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 or 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 have specialized processing that includes noise suppression.
- Tissue Equalization (TE) can be applied to a Bone image. However its application to this nonstandard anatomy may cause variability in image brightness. We recommended that TE be turned off (strength and area set to zero) for Bone images.

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, wall stand receptor vertical positioning. Wall Stand 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
- OTS only
- Wall Stand only (including extendable arm wall stands)
- Both table and wall stand (including extendable arm wall stands)



CAUTION **Keep patient and any others in the room clear of the OTS as it moves into position. The area 180cm in front of the wall stand 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.

RCIM2

An AUTO POSITIONING button is provided on the RCIM2.

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 13-1 AUTO POSITIONING button on RCIM2



Pre-defined Positions

There are seven pre-defined positions. These positions may be defined as the default position for a view or be selected from the Worklist and Acquisition screens.

The pre-defined positions are:

- WS-Vert-180 (Wall Stand receptor, vertical orientation, SID at 180cm)
- WS-Vert-100 (Wall Stand receptor, vertical orientation, SID at 100cm)

- WS-Horz-100 (Wall Stand receptor, horizontal orientation, SID at 100cm)
- WS-Stretcher-100 (Extendable Arm Wall Stand 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)
- 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 Healthcare Service personnel through the Services interface.

Auto Positioning Messages

Several different messages appear in the System Status Area when Auto Positioning is in progress.

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). Note: 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.

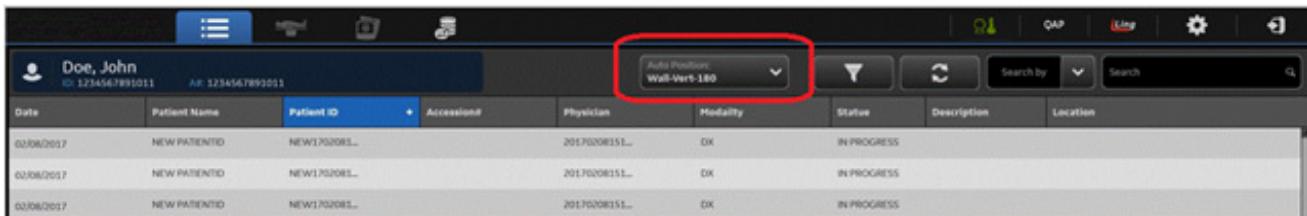
You can start Auto Positioning from the Acquisition workstation:

- **Worklist screen** - With the patient exam closed, the Worklist screen provides an Auto Position selection for Wall Stand, Table, or Park.
- **Image Acquisition screen** - With the patient exam open, each valid protocol is mapped to one of the predefined positions as defined in the protocol.

In either situation, pressing and holding the Auto Positioning button on the RCIM2 initiates motion toward the predefined position.

Auto Positioning from Worklist Screen

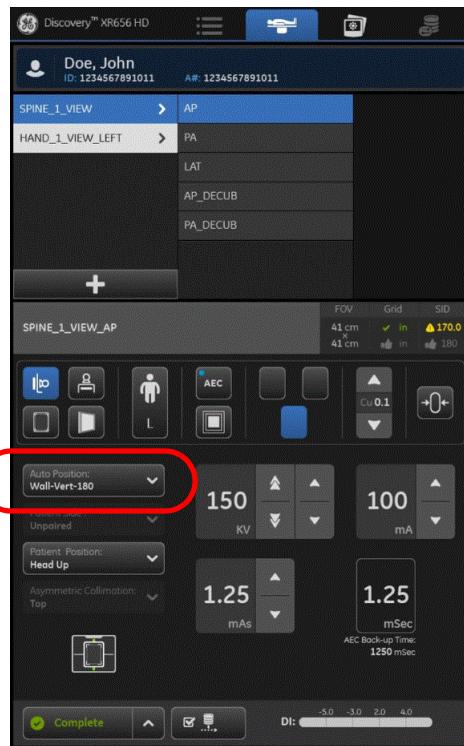
Figure 13-2 Follow this process to initiate Auto Positioning from the Worklist.Worklist screen with Auto Positioning control.



1. Confirm or change the Auto Positioning selection.
 - The available options are:
 - Table-Center-100
 - Wall-Vert-100
 - Wall-Vert-180
 - Park
 - Any custom positions
2. Click and hold the Auto Positioning button on the RCIM2 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 wall stand receptor moves to its predefined position.
3. Begin the exam.

Auto Positioning from Image Acquisition Screen

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

Figure 13-3 Image Acquisition screen with Auto Position control

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 wall stand as appropriate.
5. Confirm or change the Auto Position selection.
 - The available options are determined by the selected protocol and view.
6. Click and hold the Auto Positioning button on the RCIM2 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 wall stand moves to its predefined position.

Note: Auto tracking of the OTS to the wall stand will not be enabled until the Auto Positioning is completed or a wall stand or OTS lock button is pressed.

7. After motion stops, make final adjustments to the tube position, if necessary.
8. Continue the exam.

Auto Positioning from Infrared Remote

Auto Positioning may be activated from the optional remote control.

Auto Positioning Preferences

This section describes the settings for configuring Auto Positioning on your system.

Auto Position Customization

The Utilities, Preferences, Auto Position, Auto Position Edit button will allow you to follow prompts and create a custom Auto Position.

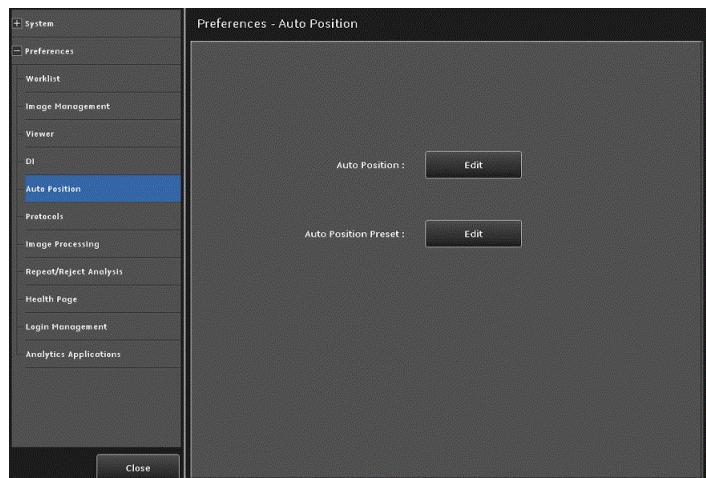
 Generic Menu Name  AutoPosition  Add Position 	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center; padding: 5px;"><u>Add Auto Position</u></th> <th style="text-align: center; padding: 5px;">INSTRUCTIONS</th> </tr> </thead> <tbody> <tr> <td style="padding: 10px;"> Objective: Add a new auto position. Prerequisites: Select a type of position: • Absolute Position • Table Position • Wallstand Position </td> <td style="padding: 10px;"> Step 1 of 4 • Select on the left side, if this position is going to be used in Table Exams, Wallstand Exams or if it is an absolute position independent of the receptor. • Select [CONTINUE] to proceed to the next step. OR • Select [CANCEL] to abort. </td> </tr> </tbody> </table>	<u>Add Auto Position</u>	INSTRUCTIONS	Objective: Add a new auto position. Prerequisites: Select a type of position: • Absolute Position • Table Position • Wallstand Position	Step 1 of 4 • Select on the left side, if this position is going to be used in Table Exams, Wallstand Exams or if it is an absolute position independent of the receptor. • Select [CONTINUE] to proceed to the next step. OR • Select [CANCEL] to abort.
<u>Add Auto Position</u>	INSTRUCTIONS				
Objective: Add a new auto position. Prerequisites: Select a type of position: • Absolute Position • Table Position • Wallstand Position	Step 1 of 4 • Select on the left side, if this position is going to be used in Table Exams, Wallstand Exams or if it is an absolute position independent of the receptor. • Select [CONTINUE] to proceed to the next step. OR • Select [CANCEL] to abort.				

- Absolute Position - Designated for any position that a user wants to create (Not associated with Table or Wall Stand).
- Wall Stand Position - A custom auto position to be used at this receptor.
- Table Position - A custom auto position to be used at this receptor.

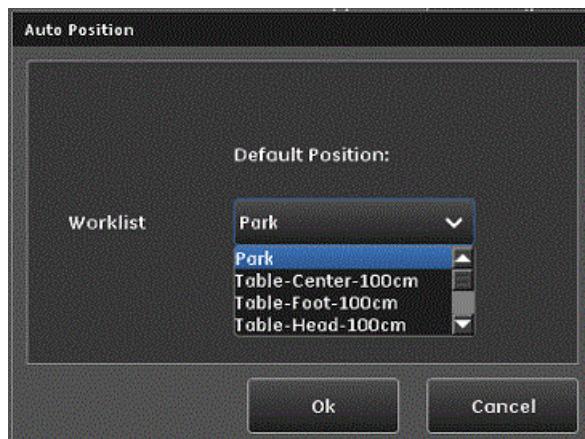
Select Default Auto Positioning for Receptors

The Exam screen allows you to set a default Auto Position for each receptor.

1. From the Utilities screen, open Preferences > Auto Position.

Figure 13-4 Preferences Auto Position

2. Click Auto Positioning Auto Position Preset.
The Auto Positioning screen opens.

Figure 13-5 Auto Positioning screen

3. Select the default position for each applicable receptor. The following table describes the available positions for the receptors.

Table 13-2 Auto Positioning receptor selections

Receptor	Options
Table	<ul style="list-style-type: none"> Table-Head-100 Table-Center-100 Table-Foot-100 Park Any custom positions defined for this receptor

Table 13-2 Auto Positioning receptor selections

Receptor	Options
Wall Stand	<ul style="list-style-type: none"> • Wall-Vert-100 • Wall-Vert-180 • Wall-Horz-100 • Park • Any custom positions defined for this receptor
Table Top	<ul style="list-style-type: none"> • Park • Any custom positions
Worklist	<ul style="list-style-type: none"> • Table-Center-100 • Wall-Vert-100 • Wall-Vert-180 • Park • Any custom positions

Orthopedic Magnification (Option)

Overview

The Orthopedic Magnification option lets you 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 Healthcare 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 Healthcare 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 appears.

Figure 13-6 Print Images screen with Orthopedic Print Mode selected

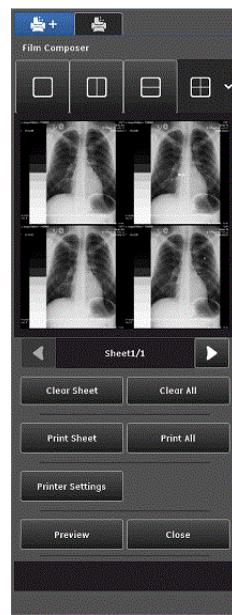


3. Set the Print Mode to Orthopedic.
 - The Magnification field displays the CMF entered on the Services User Interface.
4. Adjust the other settings.
5. Click Preview to see how the final print will appear.
6. Click Print to print the image.

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 appears.

Figure 13-7 Film Composer screen

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.
7. Print the sheet or sheets.

Orthopedic Magnification Preferences

The following sections describe the preferences that are available to configure Orthopedic Magnification functions. Refer to [Chapter 15: Preferences-Orthopedic Magnification \(p. 15-25\)](#) for more information about configuring 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 appears.
4. Set the Print Mode to Orthopedic Print.

Note: When Orthopedic Print is selected as the Print Mode, Alternative Print Mode is disabled. All images printed through Auto Print will have magnification applied.

5. Click Save.

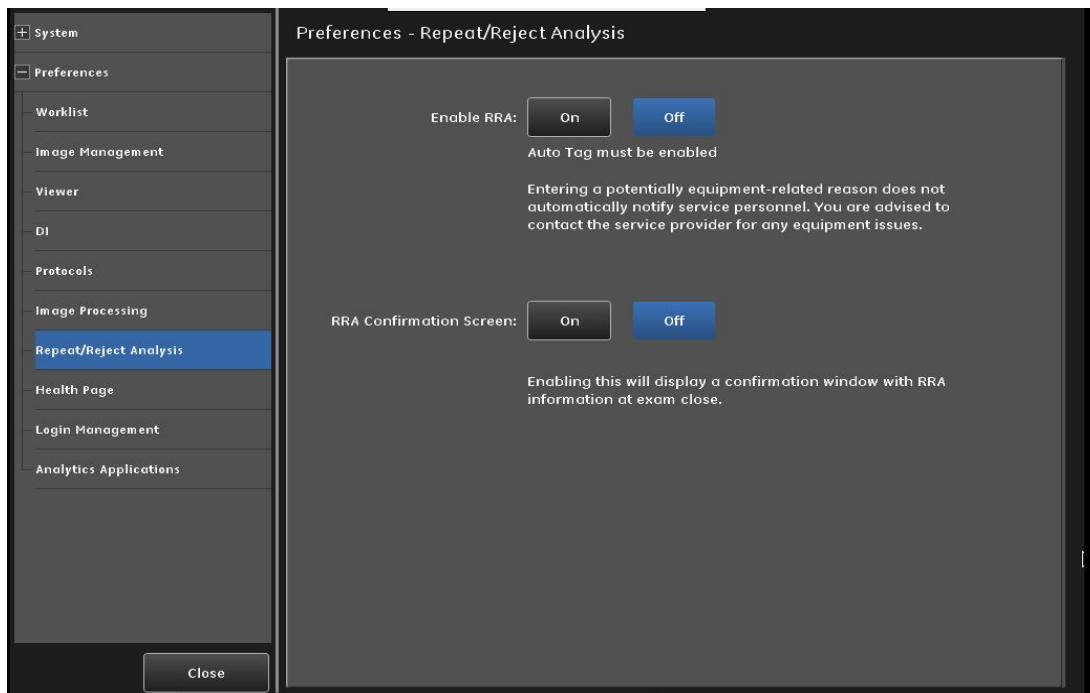
Repeat/Reject Analysis (RRA)

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 \(Quality Check\) \(p. 15-23\)](#) 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 13-8 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 \(Quality Check\) \(p. 15-23\)](#).
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 \(p. 15-20\)](#).

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. 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 13-9](#)) and a Microsoft excel spreadsheet ([Figure 13-10](#)) 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 13-9 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 Image(s)		3	7.3%	
Image Artifacts		2	4.9%	
Incomplete Acquisition		0	0.0%	
OTHER		1	2.4%	
Total Number of Acquisitions		1237	Non-Clinical Acquisitions * (e.g., QC, Acceptance Tests, Calibration)	
Standard		1146	Standard	
Dual Energy		78	Dual Energy	
Image Paste		0	Image Paste	
Volume RAD		13	Volume RAD	
Repeat Acquisitions		41	Total Number of Processed Images	
Standard		39	Accepted Images	
Dual Energy		2	Images from Repeat Acquisitions	
Image Paste		0	Images from Non-clinical Acquisitions	
Volume RAD		0	Unnecessary Images	
Clinical Repeat Rate		3.3%		
* 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 13-10 Example of detailed RRA data (partial screen)

Microsoft Excel - RRA Image Data.xls									
I	J	K	L	M	N	O	P	Q	R
Operator Name	Anatomy	View	Acquisition Type	Link to JPEG Image	Patient ID	Accession#	Size Selecti		
1									
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_12/02/06_18:12:34_THUMB_antero-posterior 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_12/01/06_19:12:34_THUMB_antero-posterior STANDARD	09301992	9302492	MEDIUM	ADU
11	Jane Smith	CHEST	postero-anterior	STANDARD	Repeat Acquisition_Patient Motion_Jane Smith_12/01/06_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_01/18/07_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_01/19/07_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_01/20/07_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	CSPINE	left-lateral	SOFT-TISSUE	Repeat Acquisition_Patient Motion_Jane Smith_01/20/07_23:23:36_CSPINE_left-lateral SOFT-TISSUE	09301996	9302496	MEDIUM	ADU
18	Jane Smith	CSPINE	left-lateral	BONE	Repeat Acquisition_Patient Motion_Jane Smith_01/20/07_23:23:36_CSPINE_left-lateral BONE	09301996	9302496	MEDIUM	ADU
19	Jane Smith	THUMB	oblique	STANDARD	Non-clinical_Non-clinical_Jane Smith_02/02/07_07:11:34_THUMB oblique STANDARD	09301997	9302497	MEDIUM	ADU
20	Sue Jones	THUMB	oblique	STANDARD	Non-clinical_Non-clinical_Sue Jones_02/02/07_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	VOLUMERAD	Unnecessary Image_Unnecessary Image_Sue Jones_02/03/07_09:54:34_CHEST_postero-anterior VOLUMERAD	09301999	9302499	MEDIUM	ADU
23	Sue Jones	CHEST	postero-anterior	VOLUMERAD	Unnecessary Image_Unnecessary Image_Sue Jones_02/03/07_09:54:35_CHEST_postero-anterior VOLUMERAD	09301999	9302499	MEDIUM	ADU
24	Sue Jones	CHEST	postero-anterior	VOLUMERAD	Unnecessary Image_Unnecessary Image_Sue Jones_02/03/07_09:54:36_CHEST_postero-anterior VOLUMERAD	09301999	9302499	MEDIUM	ADU
25	Sue Jones	CHEST	postero-anterior	VOLUMERAD	Unnecessary Image_Unnecessary Image_Sue Jones_02/03/07_09:54:36_CHEST_postero-anterior VOLUMERAD	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

You can create and export RRA reports from the RRA Reporting Tool screen.

Figure 13-11 RRA reporting tool screen

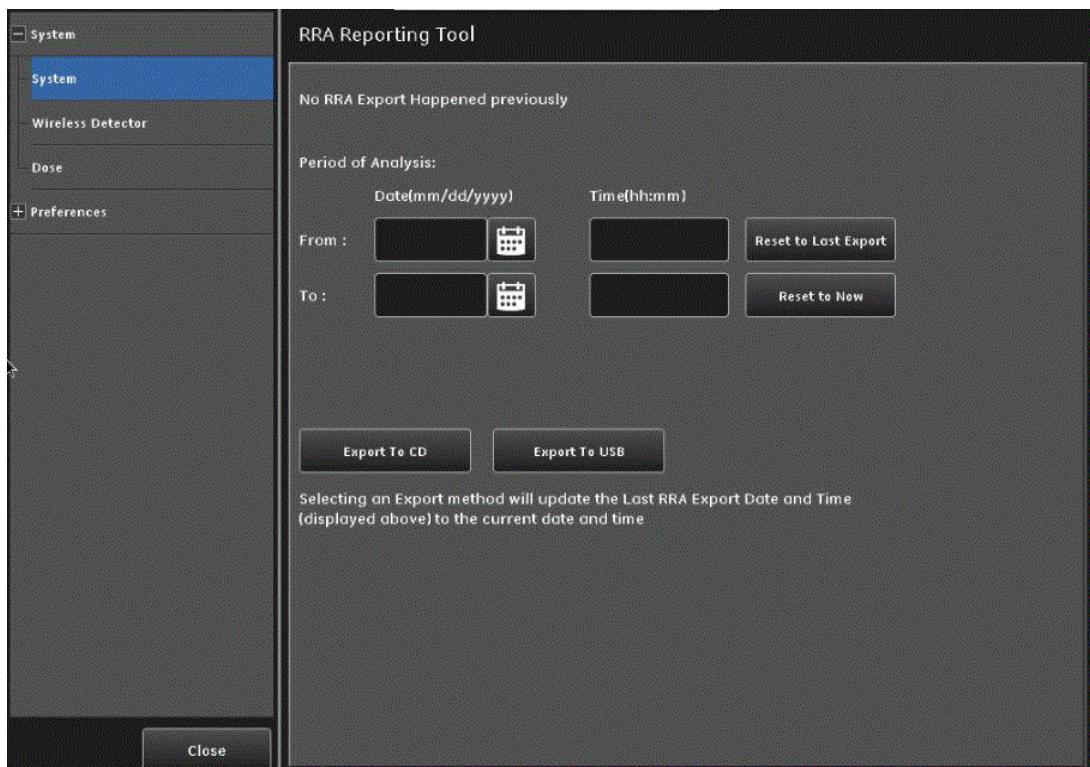


Table 13-3 Repeat/Reject Analysis functions

Function	Description
Previous export information	Provides the date and time of the last RRA export and the time period covered in the last export. The text is as follows: The last RRA Export was performed on (date) at (time) with a period of analysis from (date) at (time) to (date) at (time).
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.

Table 13-3 Repeat/Reject Analysis functions

Function	Description
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 Startbutton.
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.
 - A confirmation message appears.
7. Click Continue.
8. After completion, remove the CD or USB device.
9. Click Close.

Not Enough Space to Save RRA Images

If the storage device does not have enough space to save all of 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 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.
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. Upon completion, remove the disk or USB device.
 7. Insert a new disk or USB.
 8. Click Reset to Last Export to change the From date and time.
 9. Repeat steps for the additional data.
 10. Click Close.

Auto Image Paste (Option)

Overview

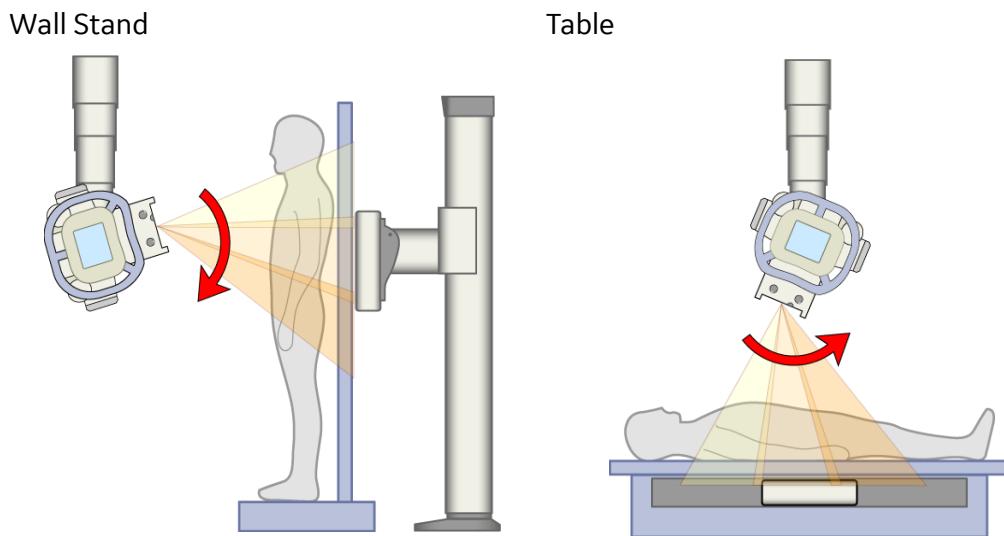
Auto Image Paste is a purchasable advanced application that allows x-ray imaging of patient anatomy, such as spine and legs, that are larger than the current receptor's 43cm field of view. Previously, in film or CR, this was accomplished by the use of a "long" cassette.

Auto Image Paste is available at the Wall Stand and Table receptors.

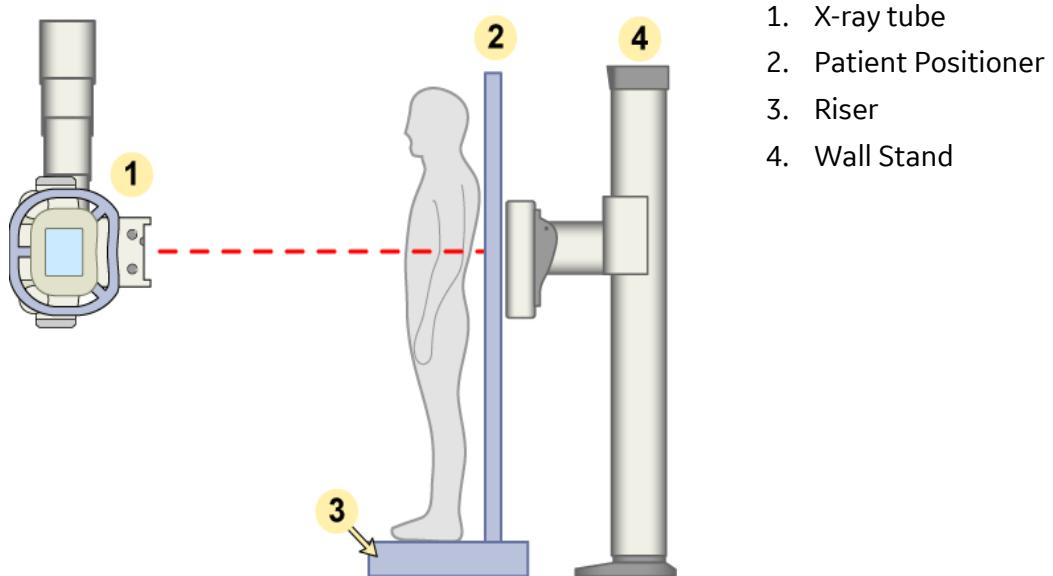
The system acquires 2–5 exposures in sequence then digitally pastes them together to form a single image. Image overlap for pasted images is 7 cm (2.75 inches).



CAUTION All final pasted images should be reviewed by a qualified health care professional for alignment and measurement accuracy before being used for diagnosis.

Figure 13-12 Illustration of acquisition

The red arrow indicates the progress of tube movement as images are acquired.

Figure 13-13 Overall setup for Auto Image Paste at the wall stand

Auto Image Paste Patient Positioner with Integrated Foot Step (for Wall Stand)

The patient positioner ([Figure 13-14](#)) is used in wall stand 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 Wall Stand 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 13-14 Patient positioner with Integrated Foot Step

1. Lateral positioning bars
2. Mylar backing
3. Floor locks (one on each side)
4. Foot Step

Note: Foot step from floor, is 197mm or 170mm (if applicable).

Table 13-4 Symbols on Patient Positioner

Symbol	Description
	Hand crushing hazard. This symbol indicates that serious injury to the hand may occur.
	Follow Instructions for use
	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.

Table 13-4 Symbols on Patient Positioner

Symbol	Description
	Lock - Engaged
	Lock - 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 wall stand 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.**



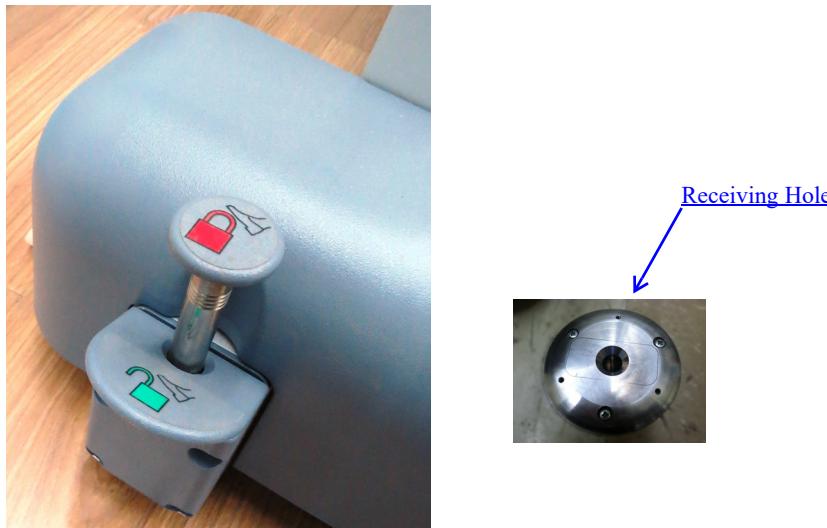
CAUTION **The receiving holes in the floor may collect debris or catch the heel of a shoe. Use the provided plugs to fill the receiving holes when the positioner is not in use.**

Figure 13-15 Floor plug



1. Align positioner with the receiving holes in the floor.

Figure 13-16 Positioner and receiving hole



2. Press the Lock Lever down so that the pin goes into the hole and ends in the locked position.

Figure 13-17 Lock Lever pressed down and in lock position

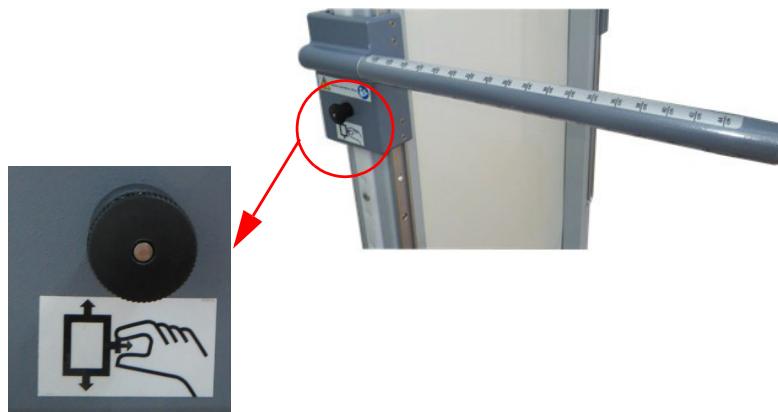


3. Lock the other side.

Unlock the positioner by treading the cap of the lock lever (as show in [Figure 13-16](#)) 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 13-18 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.).

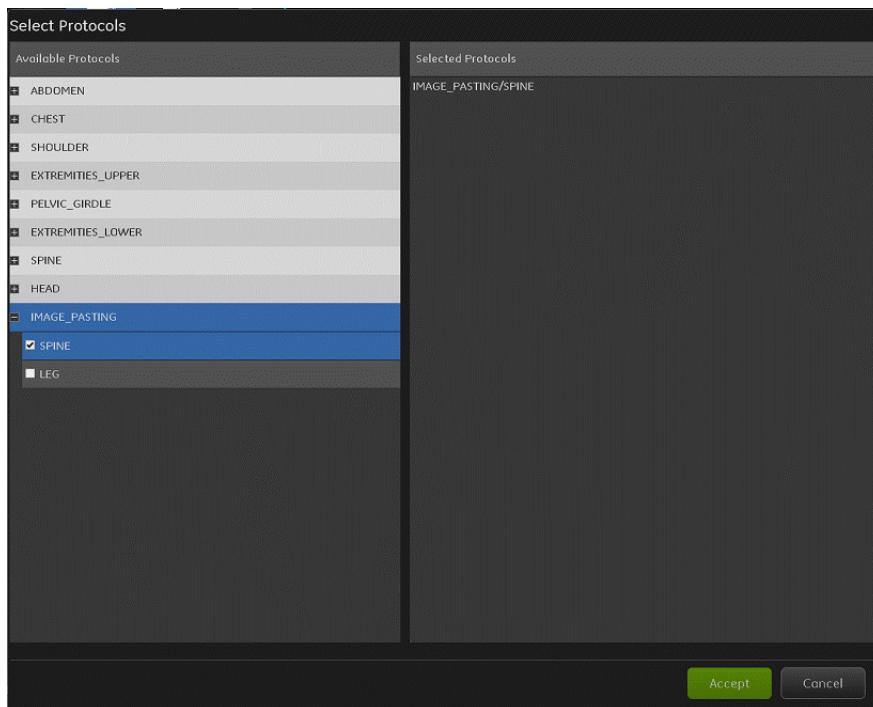
Select Auto Image Paste Protocol

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 wall stand exams, place the patient positioner in front of the wall stand and secure the floor locking mechanism. Refer to [Lock Positioner in Place \(p. 13-24\)](#) 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.
 - a. Select the Image Pasting category.
 - b. Select the Exam (Spine or Leg).
4. Click Accept.

Figure 13-19 Protocol selection for Auto Image Paste

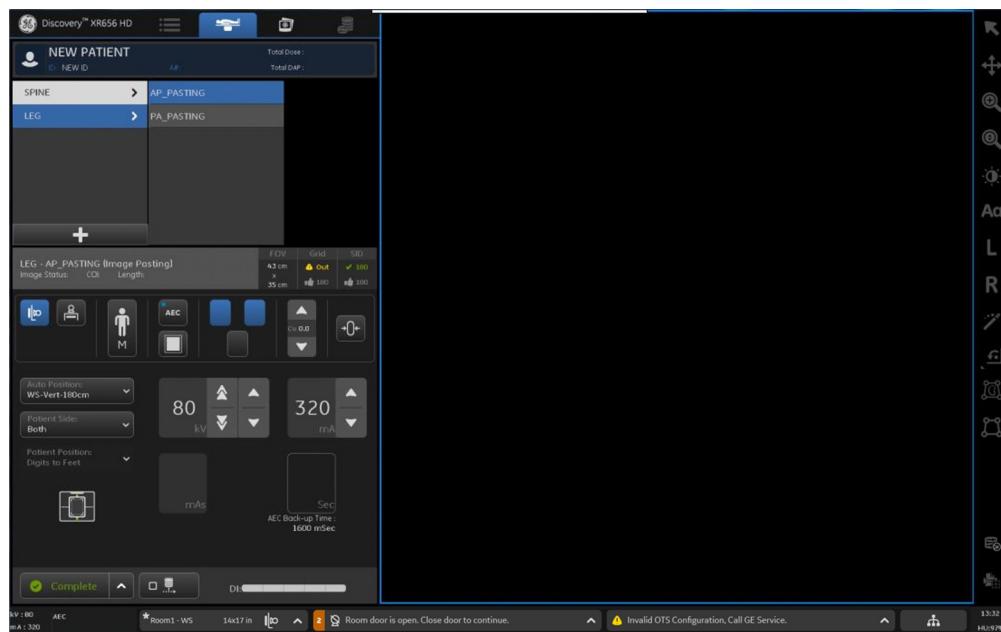
Continue with [Conduct Wall Stand Exam \(p. 13-27\)](#) or [Conduct Table Exam \(p. 13-32\)](#).

Conduct Wall Stand Exam

Follow this process to conduct an Auto Image Paste exam at the wall stand.

1. On the Acquisition screen select the view to perform.
2. Select the Wall Stand Receptor, if necessary.

Note: Allows two to five images to be pasted together with a maximum range of 150 cm or 59 in.

Figure 13-20 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 RCIM2 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 \(p. 13-5\)](#) for more information.

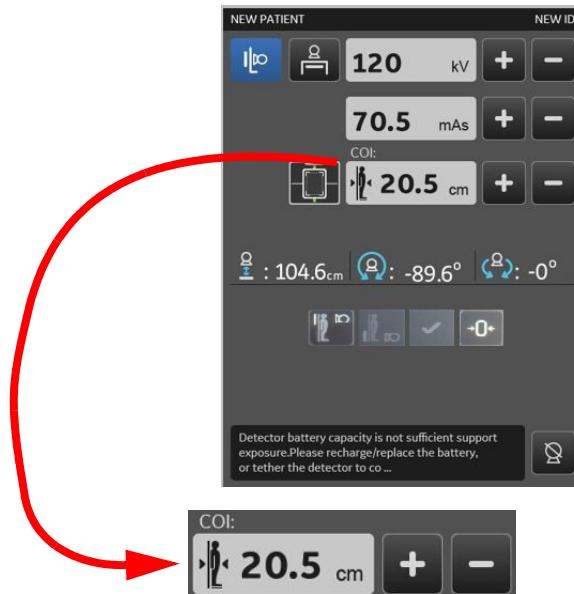
Note: We recommend to use SID180cm, FOV 25cm x 25cm, overlap 7cm as the default parameters.



CAUTION **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.

Note: The COI input is only enabled when the OTS is lateral aligned with the detector center.

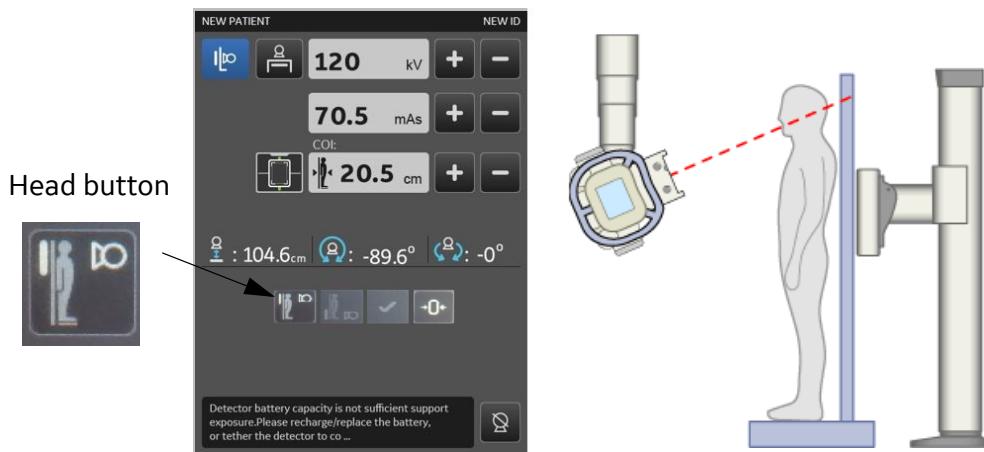
Figure 13-21 COI on OTS control screen

9. Activate the detents.
10. Instruct the patient to close his or her eyes.
11. Turn on the collimator light.



CAUTION **Laser radiation. Peak power 1 mw / wave length 650 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.

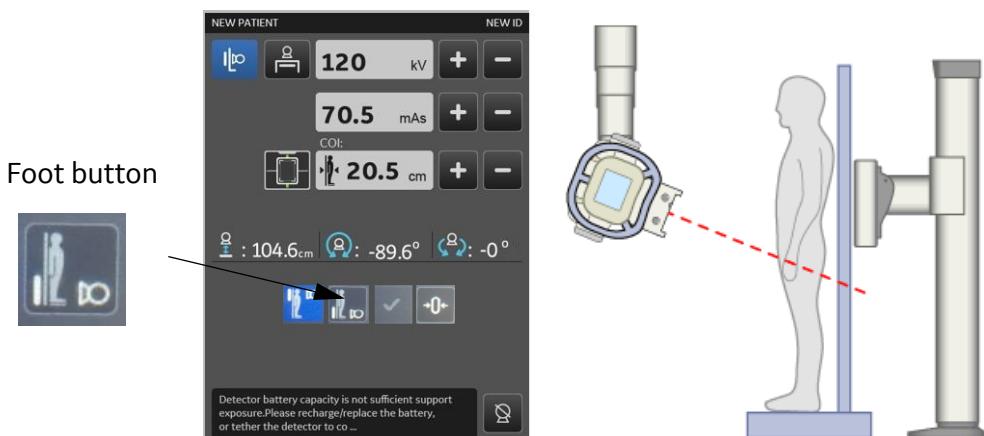
12. Aim laser light at top of desired image field.
 - You may do this by either angulating the tube or by keeping the tube at 90° and moving the column vertically.
13. Press Head on the OTS control screen.
 - If the Head button does not become enabled, check the following:
 - Reposition the tube to lateral detent of the wall stand receptor.
 - Make sure that column rotation is at 0°.
 - Set the system to NORMAL mode (instead of OVERRIDE mode).
 - Make sure the collimator is not rotated.

Figure 13-22 Define top of coverage area

14. Aim laser light at the bottom of the desired image field.

- You may do this by either angulating the tube or by keeping the tube at 90° and moving the column vertically for spine pasting exam.

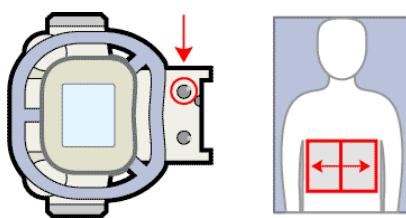
15. Press Foot on the OTS control screen.

Figure 13-23 Define bottom of converge area

Note: Press Reset on the control screen to erase the COI, Head, and Foot settings.

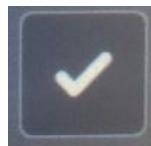
Figure 13-24 Reset button

16. Adjust the lateral collimation.

Figure 13-25 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 on the OTS control screen.

Figure 13-26 Set button

Note: The wall stand 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, Tube angle or Detector orientation, 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 or the Emergency Stop button on the RCIM2 to stop the tube movement.

Figure 13-27 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. Releasing the switch early will terminate Auto Image Paste processing. Any acquired images will still be able to be manually pasted. Refer to [Repaste \(p. 13-40\)](#) for more information.

Figure 13-28 Image Status on Acquisition screen

- If exposure was 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.
- 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 \(p. 13-38\)](#) to view, re-paste, or process images.

Conduct Table Exam

Table paste coverage is limited due to detector 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.

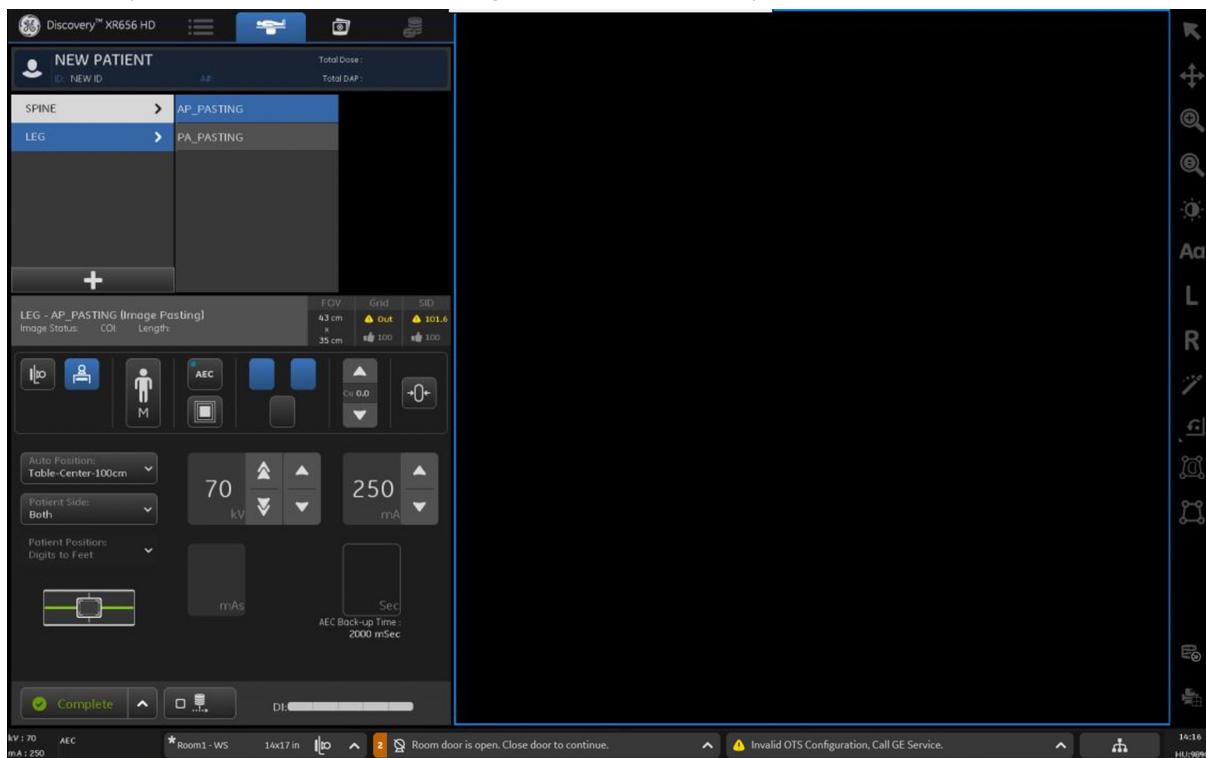
Table paste acquisitions are performed at SID of 100cm (40 in.) by default.

- Using 14 x 17 in (35 x 43 cm) Flashpad HD detector in Portrait orientation, the maximum tube angles is greater than or equal to 28.8 degrees. The maximum Pasting coverage length is greater than or equal to 110cm.
- Using the 14 x 17 in (35 x 43 cm) Flashpad HD detector Landscape orientation, the maximum tube angles is greater than or equal to 27.7 degrees. The maximum Pasting coverage length is greater than or equal to 105cm.
- Using the 17 x 17 in (43 x 43cm) Flashpad HD detector, the maximum tube angles is greater than or equal to 28.8 degrees. The maximum Pasting coverage length is greater than or equal to 110cm.

Follow this process to conduct an Auto Image Paste exam on the digital table.

1. On the Acquisition screen select the view to perform.

Figure 13-29 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 \(for Table exams\) \(p. 13-44\)](#) 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 100 cm 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 RCIM2 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. See [Chapter 13: Advanced Applications-Auto Positioning \(p. 13-5\)](#). Otherwise, manually place the tube and detector at 100 cm SID in the center table position and in lateral detent.



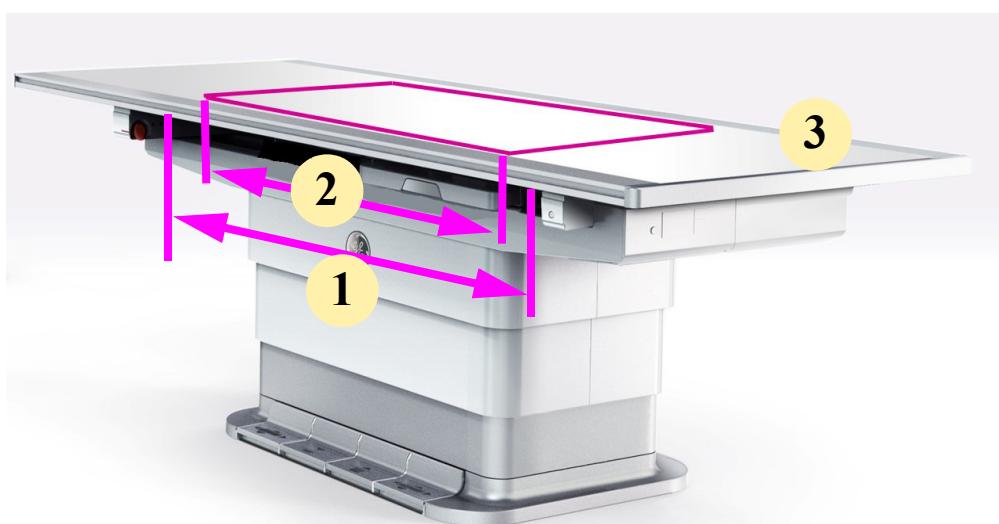
CAUTION **Keep patient and any others in room clear of the OTS as it moves into position.**

6. Engage the detents lock.

7. Adjust table height so that you can comfortably reach and see the OTS UI control screen. Maintain a 100 cm SID.
8. Position the patient on the table at the center of the light field.

IMPORTANT! Patient anatomy must be placed in the active image area, the Pasting coverage length is 1100 mm (Portrait) or 1050 mm (Landscape).

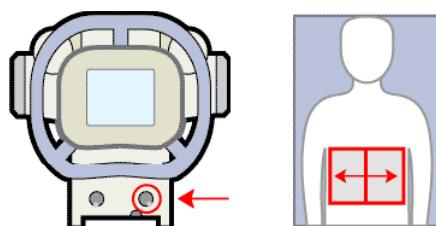
Figure 13-30 Active image area for Auto Image Paste



1. Receptor travel area
2. Pasting coverage length
3. Active image area for Auto Image Paste

9. Adjust the lateral collimation.

Figure 13-31 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 13-32 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.



CAUTION **Laser radiation. Peak power 1 mw / wave length 650 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 13-33](#)).
 - You may do this by either angulating the tube or by keeping the tube at 0° and moving the column horizontally.
16. Press Head on the OTS control screen ([Figure 13-33](#)), the image shows Head button pressed and Foot button is available.
 - If the Head button does not become enabled, check the following:
 - Reposition the tube to lateral detent of the wall stand receptor.
 - Make sure that column rotation is at 0°.
 - Set the system to Normal mode (instead of Override mode).

Figure 13-33 Define top of coverage area

17. Aim laser light at the bottom of the desired image field.

- You may do this by either angulating the tube or by keeping the tube at 0° and moving the column horizontally.

18. Press Foot on the OTS control screen. the image shows Foot button pressed and Set button is available.

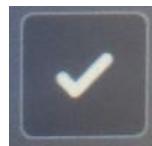
Figure 13-34 Define bottom of converge area

Note: Press Reset on the control screen to erase the COI, Head, and Foot settings.

Figure 13-35 Reset button

19. Make any adjustments to the lateral collimation.

20. Press the Set button on the OTS control screen.

Figure 13-36 Set button

Note: The receptor, tube, or both may move. Warn the patient to hold still.

- After coverage has been acquired, and if a repeat is necessary, click the check mark again to repeat of anatomy to acquire. No re-defining or reset is necessary.
- 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 13-27](#)) or the Emergency Stop button on the RCIM2 to stop the tube movement.

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 13-28](#)). Releasing the switch early will terminate Auto Image Paste processing. Any acquired images will still be able to be manually pasted. Refer to [Repaste \(p. 13-40\)](#) 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.
- 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 \(p. 13-38\)](#) 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 \(at wall stand\)](#)

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 Wall Stand Exam \(p. 13-27\)](#).

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

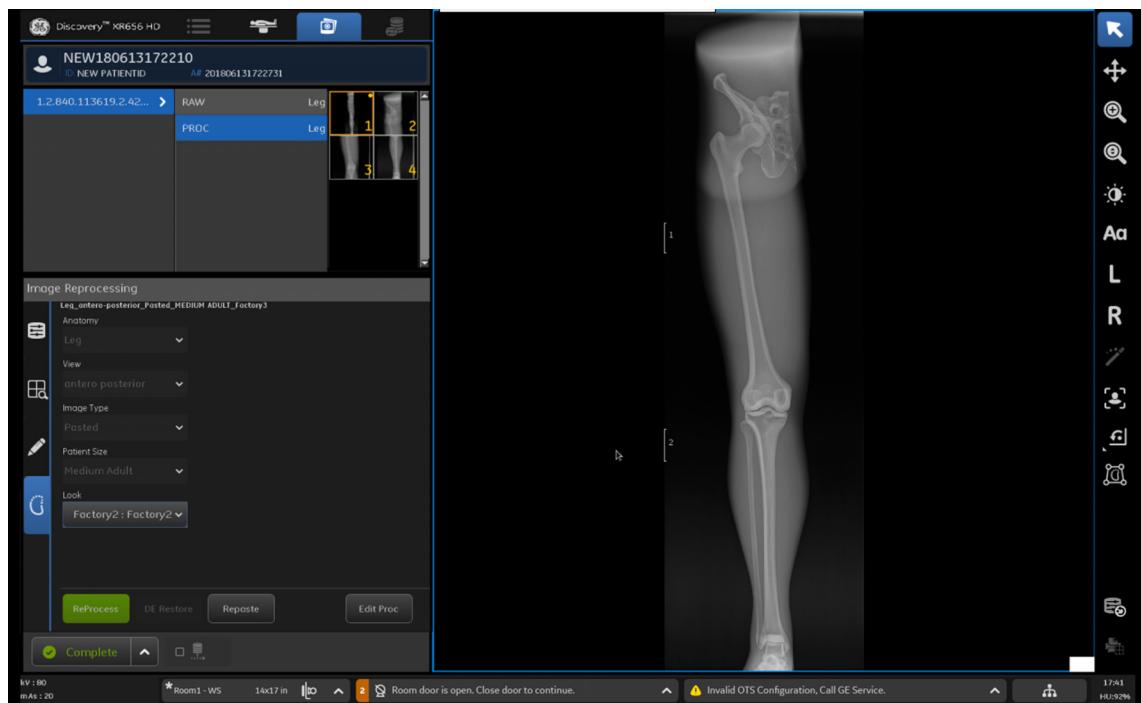
All image zoom, annotation, adjustment tools (brightness, contrast, windowing, rotation, etc.), and re-processing are available for the pasted composite image and the sub-images. The controls function the same as for non-pasting acquisitions. Refer to [Chapter 11: Image Viewer](#) for more information about image adjustment.

The pasted composite image is treated as one image entirely. Image adjustments are applied equally to the entire pasted composite image.

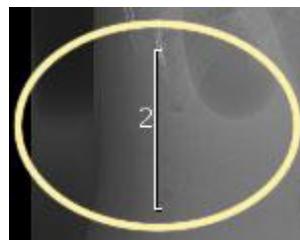
DEI is not shown for derived images. This includes Dual Energy subtraction images (soft tissue and bone) and pasted composite images.

[View Pasted Composite Image](#)

The pasted composite image appears automatically after acquisition and processing is complete.

Figure 13-37 Image Viewer screen with pasted composite image

The registration markers (brackets) show the general area of pasted overlap. Use the Image Magnifying Glass function to review registration quality.

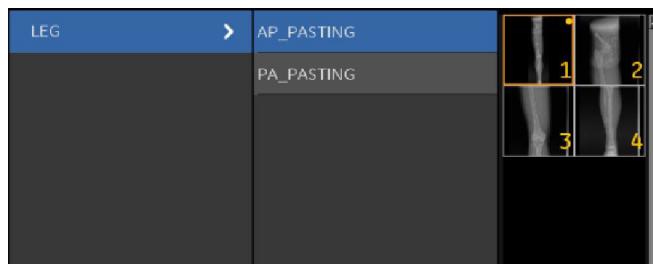
Figure 13-38 Close-up of registration marker

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

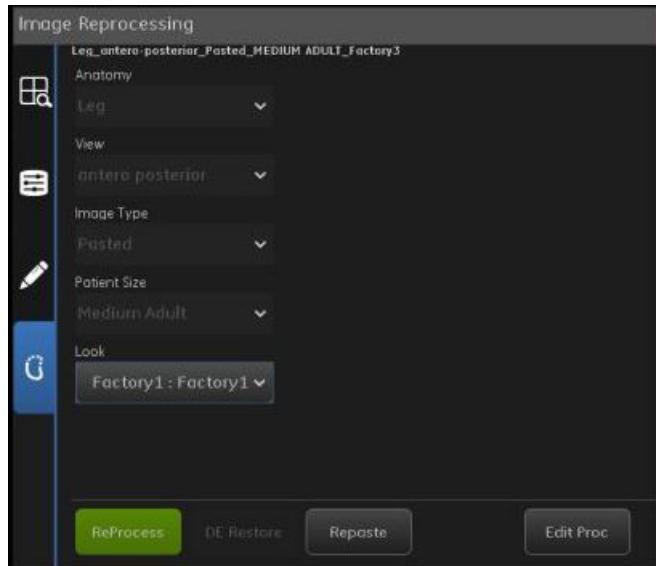
Re-pasting adds 1 re-processed sub-image for every raw image and 1 pasted composite image to the same processed series.

Figure 13-39 Exam/Series panel

Re-Process Images

The Image Processing tab of the Image Tools panel contains the tools to re-process and repaste sub-images and pasted images.

Refer to [Change Looks Processing \(Vertical Equalization\) \(p. 13-43\)](#) for more information.

Figure 13-40 Image Tools panel – Image Processing tab

Repaste

Repasting allows you to manually correct the alignment of the sub-images and create a new composite image.

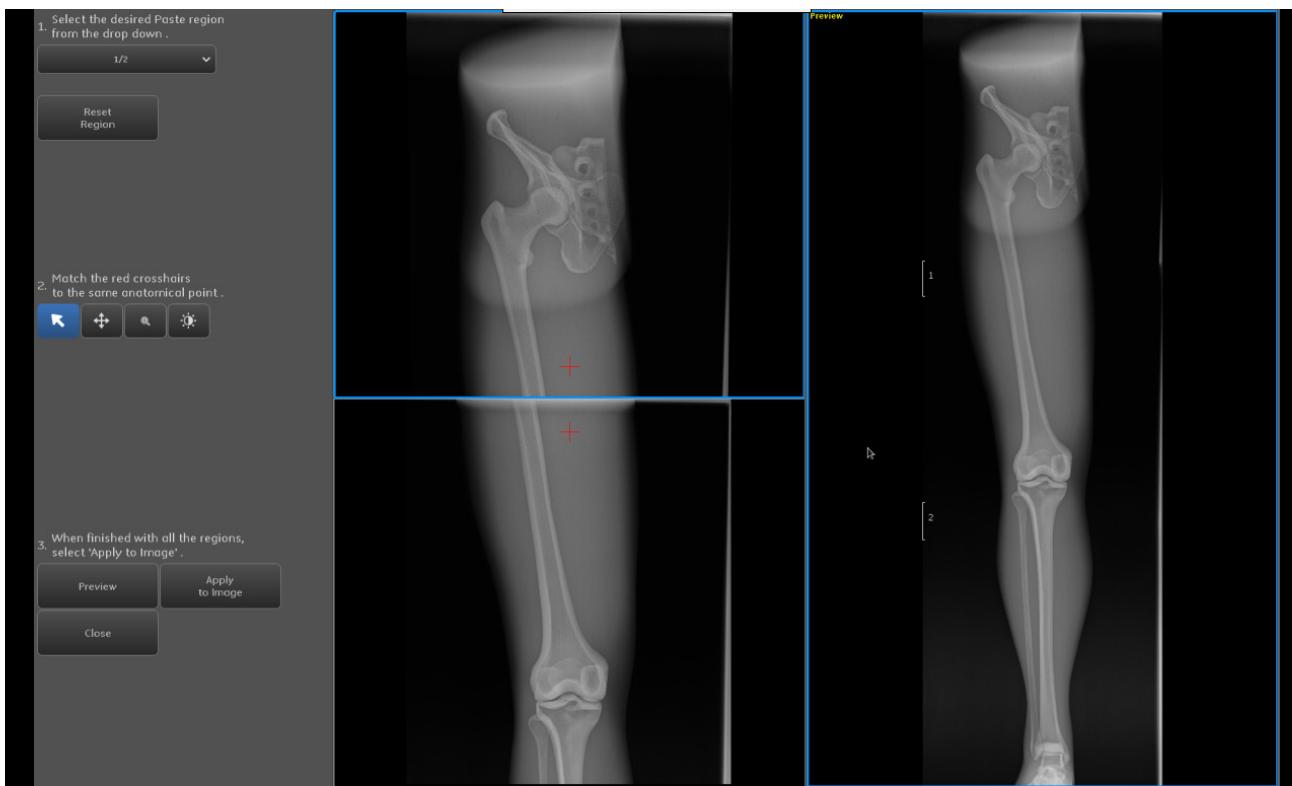
Repaste is used in the following situations:

- 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.
- Mis-use cases: Peristalsis of stomach.

The Repasting screen is accessed by clicking the Repaste button on the Image Tools - Image Processing tab.

The Repasting screen shows two sets of images. The left half shows the selected pasting region (the overlapped area between two 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 13-41 Re-pasting screen



Follow this process to manually repaste images.

1. On the Image Tools panel, click the Image Processing tab.
2. Click the Repaste button.

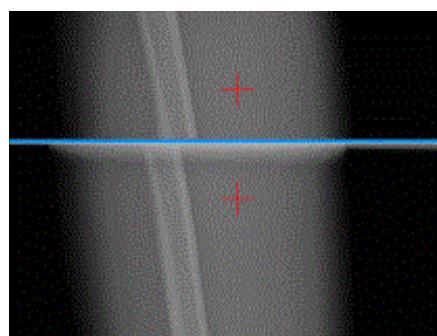
Note: It may take a few moments for images to appear.

3. Select a region to re-paste from the drop-down list. For example: 1/2, 2/2.
 - Reset Region removes any manual re-pasting from the selected region.

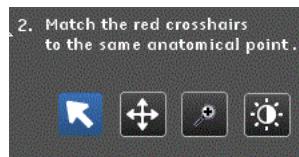
Figure 13-42 Select region drop-down list.



4. Click and drag on a red cross-hair to move it.

Figure 13-43 Cross-hairs

5. Place the cross-hairs at the same anatomical reference point on image.
 - The mouse control buttons change the action of the cursor when used on images. Refer to [Chapter 11: Image Viewer-Change Pointer Controls \(p. 11-28\)](#) 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 13-44 Mouse controls

6. Repeat steps 3–5 for all regions, if necessary.
7. Click Preview to check the registration.

Note: Preview is only to check image alignment. Full image processing parameters are not applied to the preview. It may take several moments for the preview to appear on the right half of the screen.

Figure 13-45 Preview and Apply to Image buttons

8. When satisfied with image alignment, click Apply to Image.
 - 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)

Definition of Vertical Equalization

Equalizes the intensity values of the sub-images for an Image Paste acquisition. It restores the link between image intensity and the density of the tissues through all parts of the pasted image.

A custom look can be changed or applied through the Image Processing Preferences Editor screen.

Refer to [Chapter 15: Preferences-Build Custom Looks \(p. 15-53\)](#) 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 13-46](#)) 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 \(p. 15-53\)](#).
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.

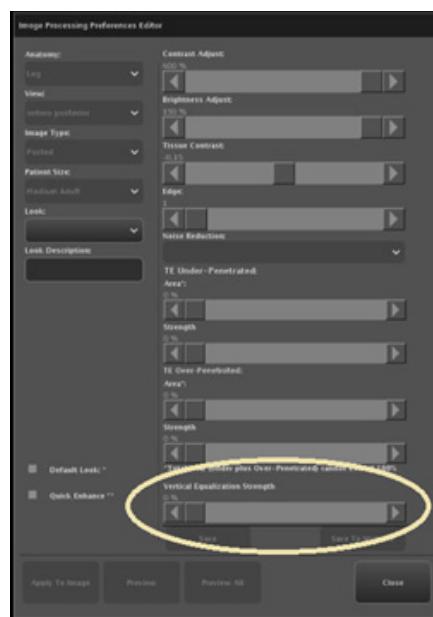
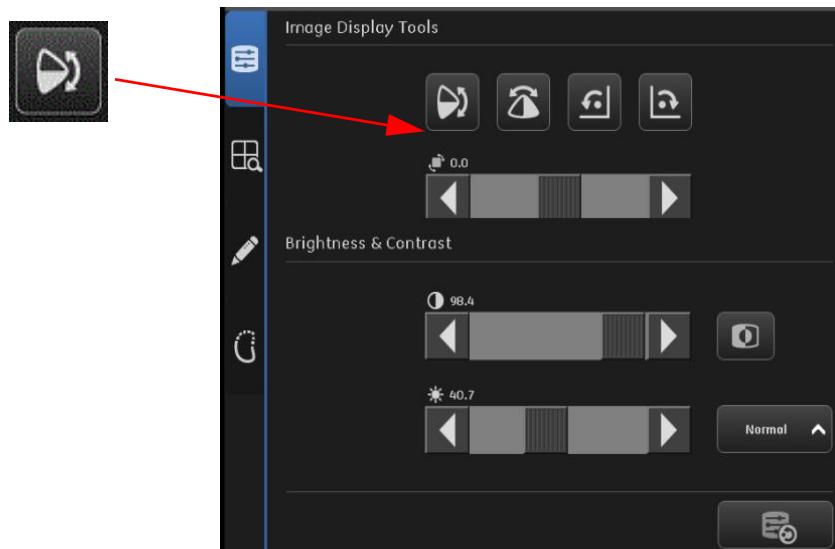
Figure 13-46 Image Processing Preferences Editor screen

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 13-47 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 \(p. 11-32\)](#).

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-Image Management \(p. 15-22\)](#).

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 appears.
4. Complete the information as described in [Table 13-5](#).
5. Click Save then click Close.

Figure 13-48 Default Print/Auto Print

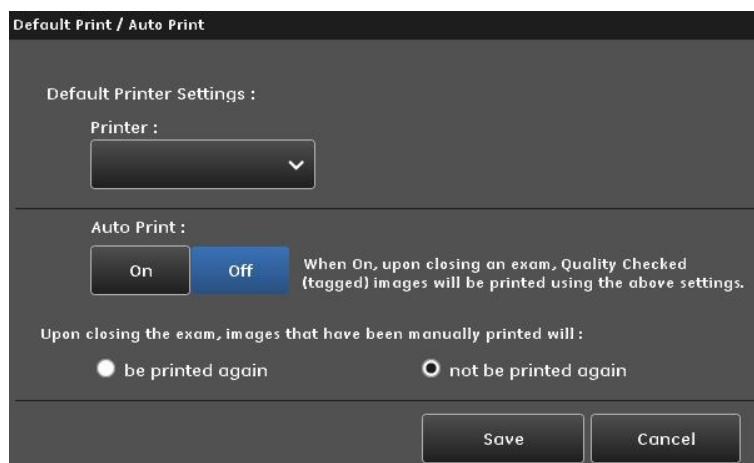


Table 13-5 Auto Print Functions

Function	Description
Printer	Lists the printers and laser cameras connected to your system.

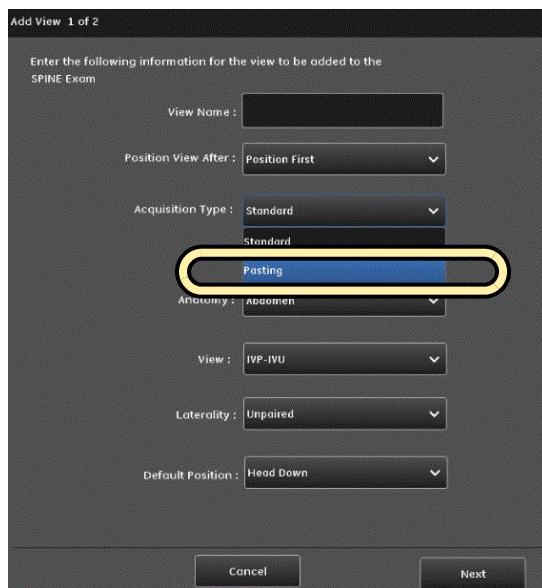
Table 13-5 Auto Print Functions

Function	Description
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.

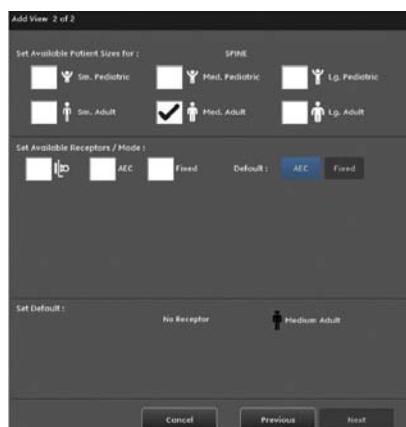
Add or Edit Auto Image Paste Protocols

Protocol editing for Auto Image Paste is similar to standard exams except for the following differences:

- Select an Acquisition Type of Pasting

Figure 13-49 Add View screen (1 of 2)

- There is no table or cassette receptor option.

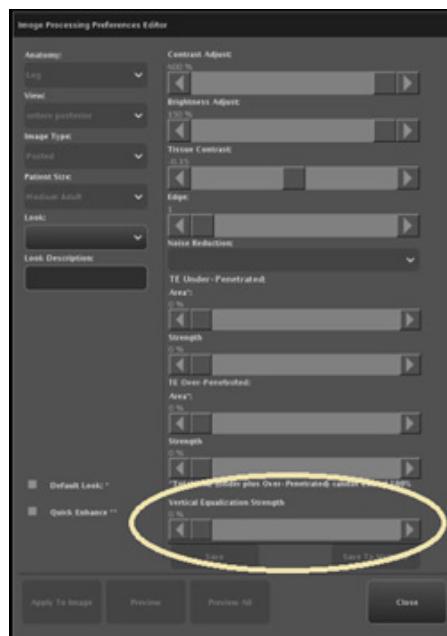
Figure 13-50 Add View screen (2 of 2)

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 if “Pasted” is selected for the Image Type.

Figure 13-51 Image Processing Preferences Editor screen

VolumeRAD (Option)

VolumeRAD* is an option. This section describes the VolumeRAD and provides instruction about conducting tasks that differ from standard acquisitions. (*VolumeRAD is the trademark of General Electric Company.) VolumeRAD will be performed in the table or wall stand only with use of Flashpad HD detectors; consisting of 35x43 cm (14 x 17 in) or 43x43cm (17 x 17 in) sizes.

Overview

Volume RAD involves a series of very 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.

VolumeRAD significantly increases detection sensitivity, enabling the radiologist to confidently detect more lung nodules 13mm - 20mm) than chest x-ray without decreasing specificity.^{o†}

VolumeRAD aids the radiologist in being significantly more accurate in identifying patients that require follow-up* compared to conventional 2-view CXRa.^{o†}

A VolumeRAD tomosynthesis acquisition results in minimal dose to the patient. For chest imaging, the effective dose of a VolumeRAD exam, which includes a standard PA radiograph, is less than 0.1mSv, only 1.6 times greater than a conventional two-view CXR exam^o. Effective Dose is a measure of radiation dose delivered to the patient in terms of an equivalent whole body exposure. It is a standard metric for estimation of the risk of stochastic radiation injury in medical imaging.

Table 13-6 Comparison of average effective dose from a GE Healthcare sponsored multi-center lung nodule detection study[‡]

	Effective Dose
2-View CXR IPA and LAT)	0.06
Thoracic VolumeRad Sweep !Slice Images)	0.09
Annual Average Background Radiation Dose is US**	3.1

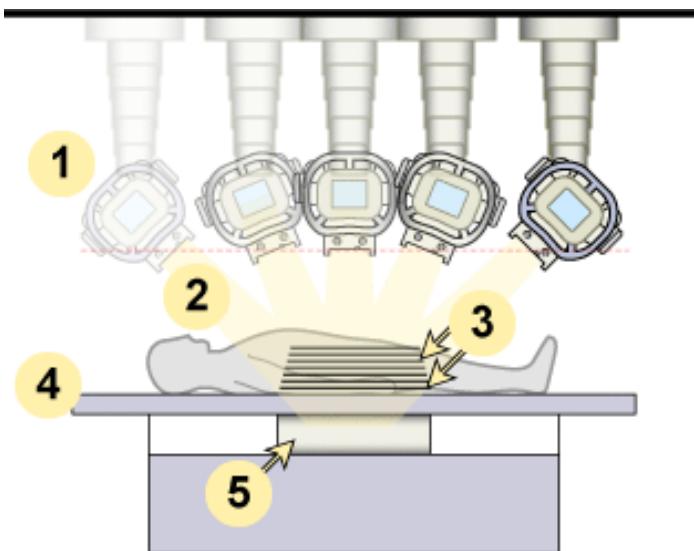
^oResults from a GE-sponsored multi-center clinical trial comparing Volume RAD to conventional two-view chest radiography for physician accuracy in the detection of lung nodules and identification of cases recommended for follow-up and further imaging. No clinical evidence has been established supporting the lung nodule detection claims in patients with active lung or pleural disease that could obscure pulmonary nodules, including fibrosis, emphysema, compressed lung, scarring, severe lung disease, and in patients with objects in or around the lungs that could obscure pulmonary nodules. The effectiveness of the device may vary depending on nodule prevalence and type.

*Follow-up defined as recommendations for further advanced imaging, based upon the Fleischner Society guidelines for pulmonary nodule management. MacMahon, Heber, et al. "Guidelines for Management of Small Pulmonary Nodules Detected on CT Scans: A Statement from the Fleischner Society." Radiology 237.2 (2005): 395-400.

**NCRP. "Ionizing radiation exposure of the population of the United States. National Council on Radiation Protection report no. 160". Bethesda, Md: National Council on Radiation Protection and Measurements, 2009.

[†]Dobbins, J., McAdams H.P., Sabol, J.M., et al. (2013) "Multi-Institution Evaluation of Digital Tomosynthesis, Dual-Energy Radiography, and Conventional Chest Radiography For Detection and Actionability of Pulmonary Nodules." Presented at RSNA 2013, SSJ06-02, In submission for peer-reviewed publication.

Figure 13-52 Simplified overview of VolumeRAD acquisition and reconstruction



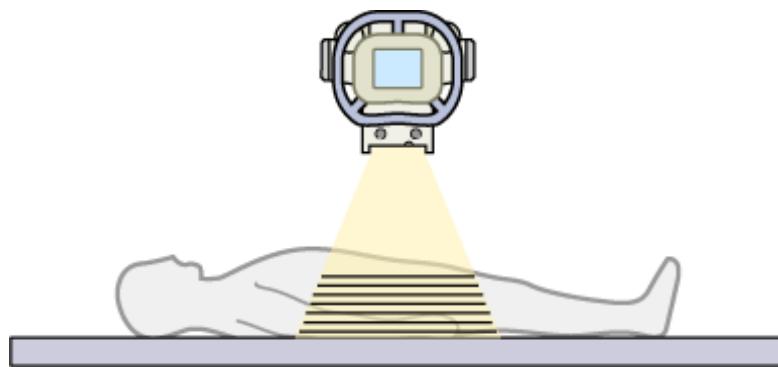
1. X-ray tube as it moves through the sweep
2. X-ray emissions as the tube moves through the sweep
3. Reconstructed slices
4. Table
5. Detector

Reconstruction

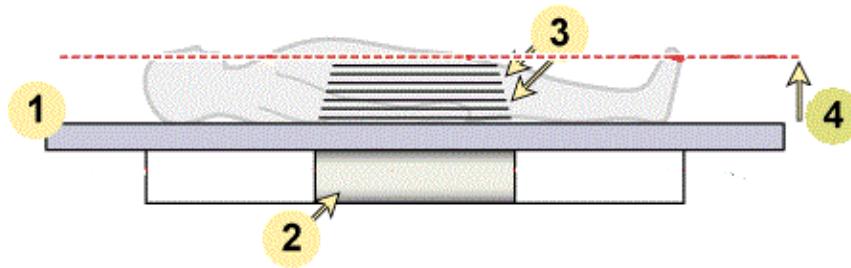
Once the acquisition is complete, the system begins to process the data into slices.

Each slice is an image visualizing the anatomy at that distance from the table or wall stand 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 13-53 Cone beam effect

You are able to control slice settings through re-processing or technique preferences. Refer to [Image Viewer \(p. 13-38\)](#) and [Reconstruction Preferences \(p. 13-71\)](#).

Figure 13-54 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.

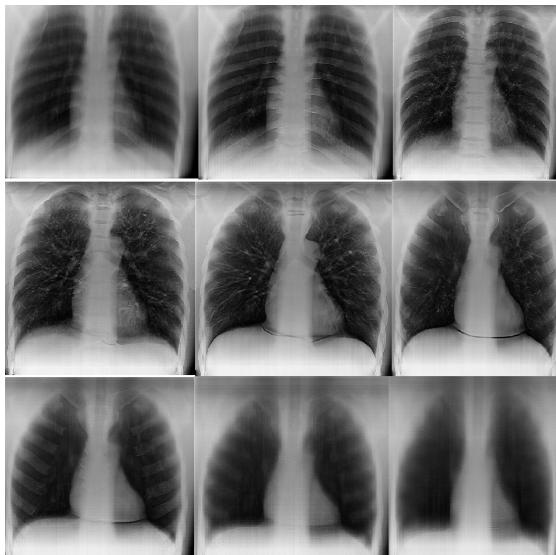
For example, a single energy acquisition will show that there is a foreign object in the chest cavity on the right or left side. A series of VolumeRAD slices will show if the object is inside the lung or just below the surface of the skin, if the object is closer to the posterior or anterior of the chest, and if it is shaped more like a disk or more like a sphere.

Figure 13-55 Example of VolumeRAD reconstruction

Single Acquisition (Scout)



Multiple Reconstructed Slices



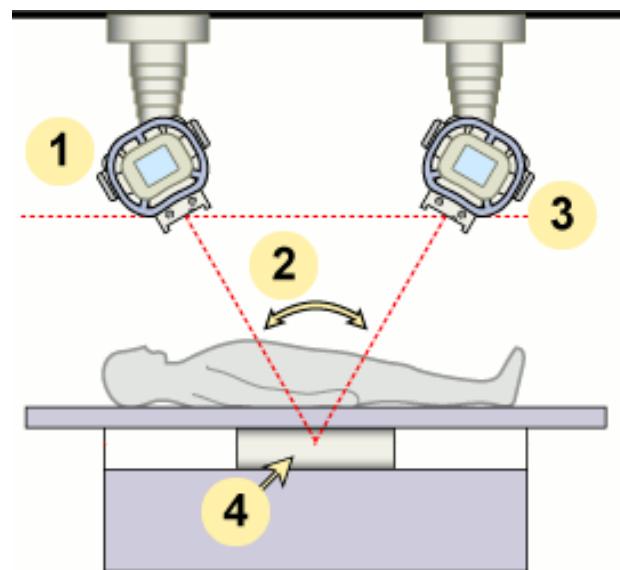
Configurations

VolumeRAD is available at both the table and the wall stand.

Note: The figures are used for illustration only and do not represent the actual size.

Table

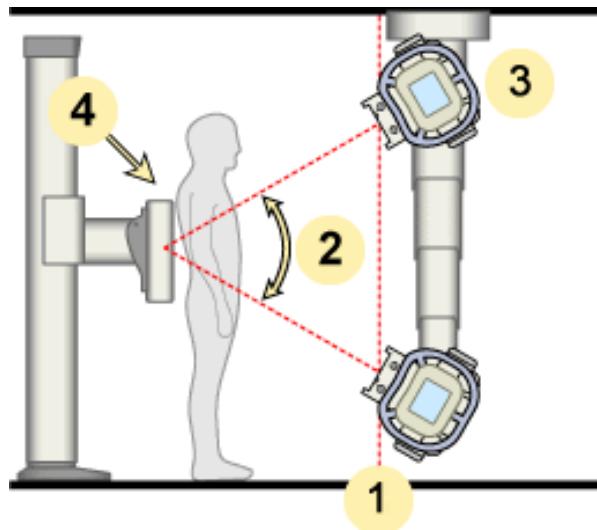
In a table configuration, the OTS moves in the longitudinal direction while the x-ray tube angulates to point to the table receptor.

Figure 13-56 Table configuration

1. Tube position at start of sweep
2. Acquisition sweep
3. Tube position at end of sweep
4. Table receptor

Wall Stand

For standard wall stands with the patient in an upright position, the OTS moves vertically while the x-ray tube angulates to point to the receptor.

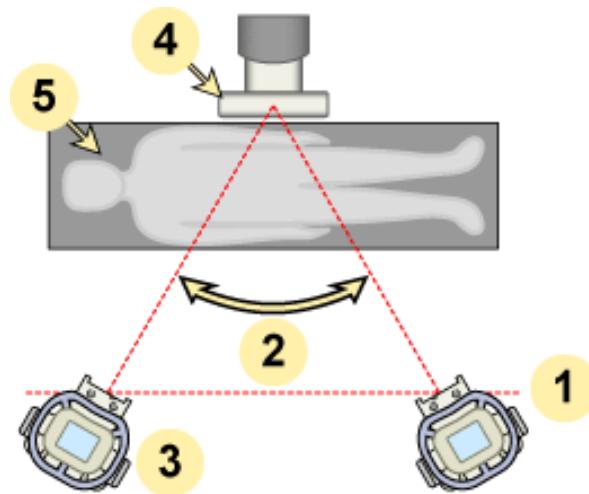
Figure 13-57 Wall Stand configuration

1. Tube position at start of sweep
2. Acquisition sweep
3. Tube position at end of sweep
4. Wall Stand receptor (in vertical position)

Wall Stands may be used to conduct cross table exams with the patient supported on a mobile table or stretcher. The OTS moves in the lateral direction while the x-ray tube angulates to point to the detector.

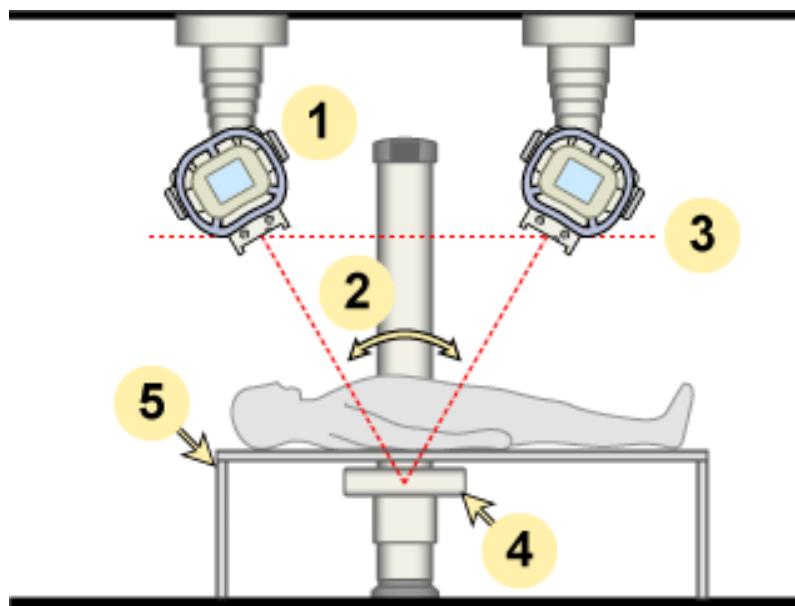
Place the receptor in the vertical position. Place the patient in supine position with the left shoulder against receptor cover. Wall Stand configuration - vertical.

Figure 13-58 Cross Table VolumeRAD Lumbar Spine exam



1. Tube position at start of sweep
2. Acquisition sweep
3. Tube position at end of sweep
4. Wall Stand receptor (in vertical position)
5. Patient in supine position (left shoulder against receptor cover) on stretcher

Extended arm wall stands may be used with the receptor in a horizontal position with the patient supported on a mobile table or stretcher. The OTS moves in the longitudinal direction while the x-ray tube angulates to point to the receptor.

Figure 13-59 Extended arm wall stand configuration - horizontal

1. Tube position at start of sweep
2. Acquisition sweep
3. Tube position at end of sweep
4. Wall Stand receptor (in horizontal position)
5. Patient in supine position on stretcher

Safety Warning

All other caution, warning, and danger statements in this manual 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 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 wall stand should be kept clear during Auto Positioning.

Equipment

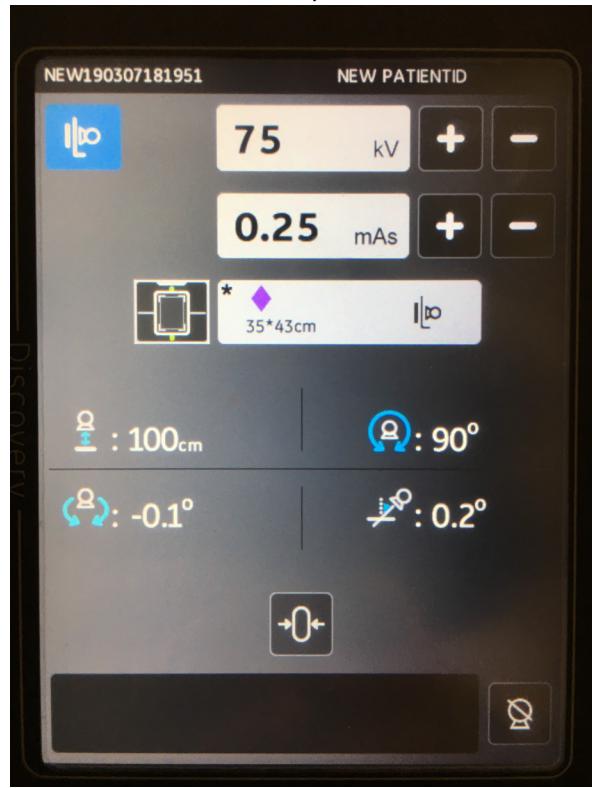
OTS User Interface

OTS control screen for VolumeRAD Scout 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.

Figure 13-60 OTS UI screen for VolumeRAD (horizontal presentation)



Figure 13-61 OTS UI screen for VolumeRAD (vertical presentation)

Upon completion of the Scout acquisition, the OTS control screen switches to the Volume RAD sweep mode.

Figure 13-62 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 that has the same function as the one on the Acquisition screen.

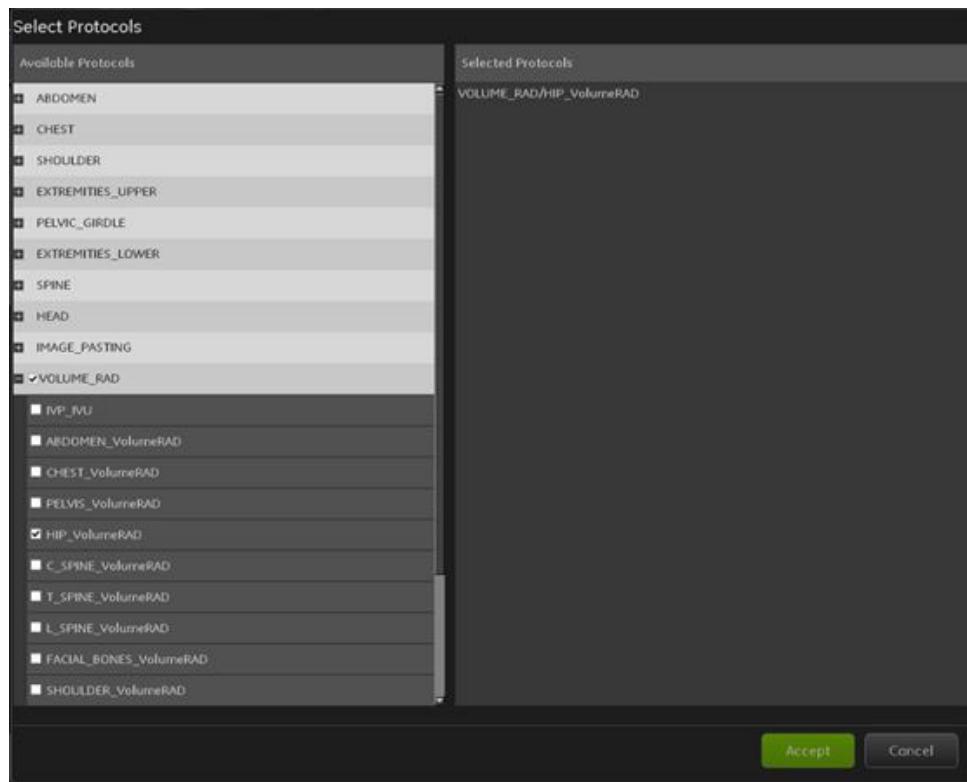
Image Acquisition

The following sections describe how to take acquisitions and view them. A VolumeRAD acquisition consists of:

- **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. For a wall stand VolumeRAD sweep, room configuration will determine the lowest and maximum travel heights. For more information, please contact a GE Healthcare Field Service Engineer.
- **Metal Artifact Reduction (MAR)** - Algorithm to decrease metal artifact undershoot and ripple effect which provides increased definition of anatomy.

Note: When using MAR, reconstruct the data with and without MAR for comparative image review.

Figure 13-63 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 is the same as the screen used for any other single energy acquisition.

Figure 13-64 VolumeRAD Scout screen (before acquisition)

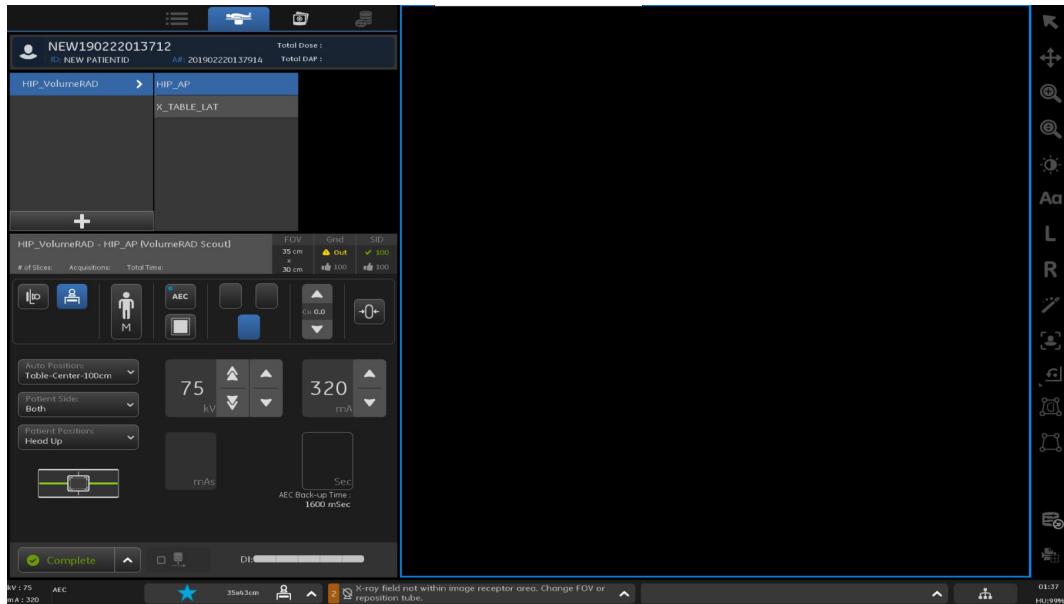
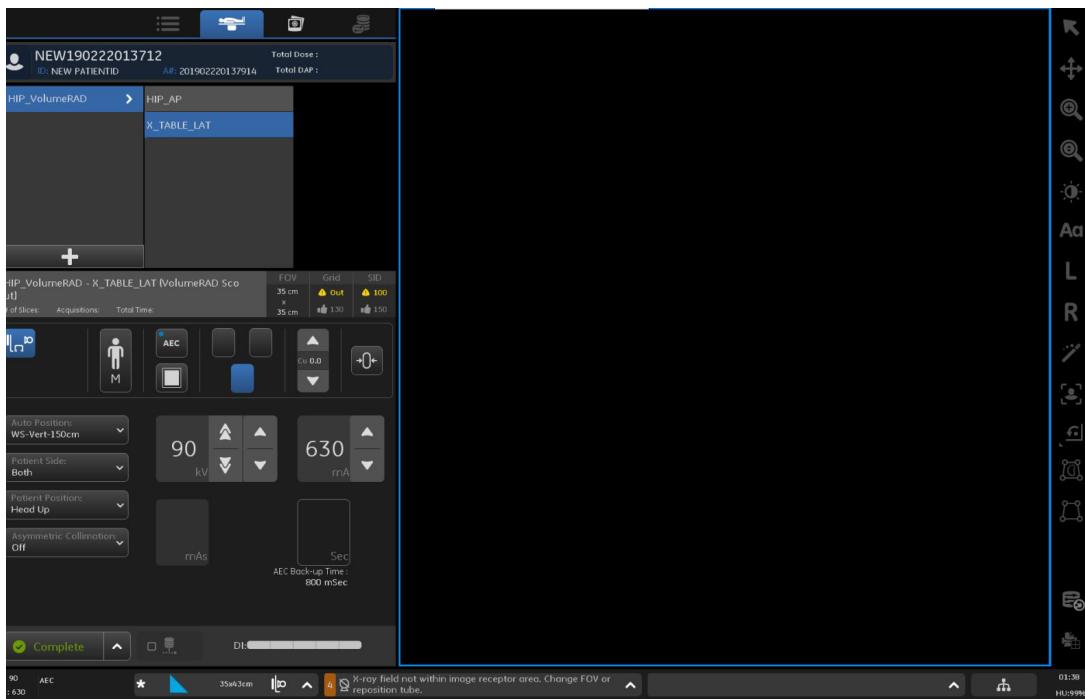


Figure 13-65 VolumeRAD scout screen (before acquisition) if X_Table_LAT



1. Select the View.
 - Cross table views may be abbreviated as "X_Table" in the view list.
2. Select the Patient Size.
3. Select the Receptor.
 - For cross table protocols, select the cross table receptor icon.

Figure 13-66 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 spin exams. Selecting VolumeRAD at the wall stand receptor will result in a vertical sweep. The patient will be imaged in the erect AP/PA position.

4. 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.

5. Confirm or adjust the Grid and SID status.

- For cross table exams, the SID is 150 cm.

6. Make technique adjustments as necessary: kV, mA, Focal spot, Cu Filter, and Ion chambers (AEC mode only).

Note: FOV cannot be less than 10 x 10 cm, 4 x 4 in.

7. Click Reset Technique to reset the technique to the default protocol settings.

8. Confirm the patient's position.

9. 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.

10. Confirm the Scout:

- Desired anatomy is imaged
- Exposure is correct
- image is of acceptable quality

11. If the Scout is not acceptable:

- a Click Retake Scout on either the Acquisition screen or OTS control screen.

- b Make adjustments to the patient position and settings as necessary.

- c Prep and expose to acquire a new Scout image.

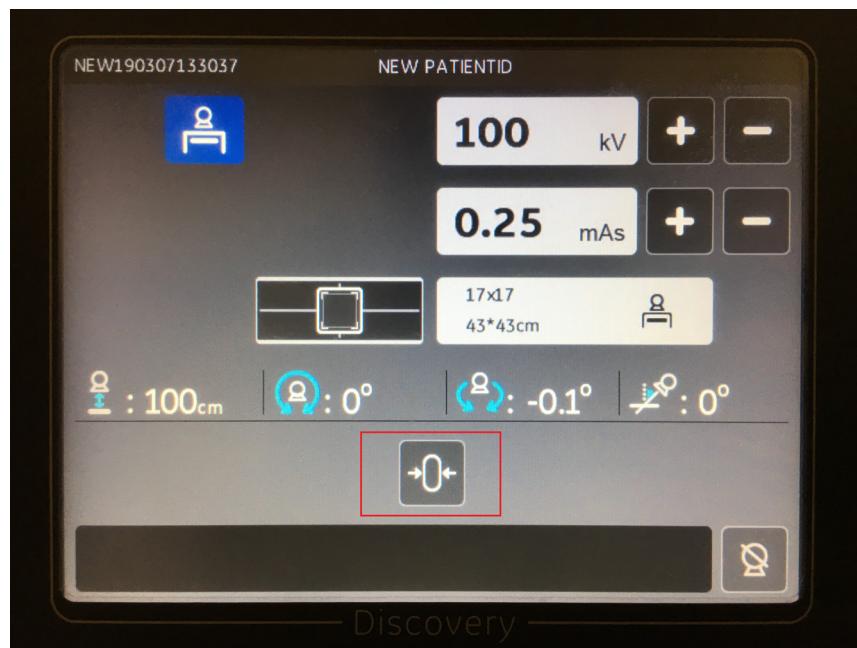
Note: System minimum for Scout Image is 0.25 mAs.

Message on system will state, "minimum mAs reached. VolumeRAD dose may be higher than expected."

Figure 13-67 Retake Scout button on Acquisition screen (after Scout acquisition)



Figure 13-68 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.

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 shows the total time (in seconds) for the sweep to complete, therefore it is the length of time the patient must remain still. No Volume RAD acquisition sweep will be longer than 12 seconds.

Figure 13-69 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.

- Adjust the images and slice processing as described in the 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.

Note: The DI indicator (if enabled) does not appear for reconstructed VolumeRAD slices. The manual shutter is also not available for VolumeRAD 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, perform any of the following:

- Page Up / Page Down keys
- Mouse scroll wheel. [Chapter 8: System Hardware-Mouse Controls \(p. 8-10\)](#)

Note: Ensure the cursor is placed over the image view port to activate scrolling capability.

- Reconstruction Scroll Bar. Located within Image Reprocessing tab. You can click and drag the scroll bar to a slice height of your choosing. [Chapter 13: Advanced Applications-Reconstruction Scroll Bar \(p. 13-66\)](#).
- Cine Mode. Located within Image Tools tab, the Cine Mode button will display. Playback is locked at 15 fps. [Chapter 13: Advanced Applications-Cine Mode \(p. 13-65\)](#).

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)

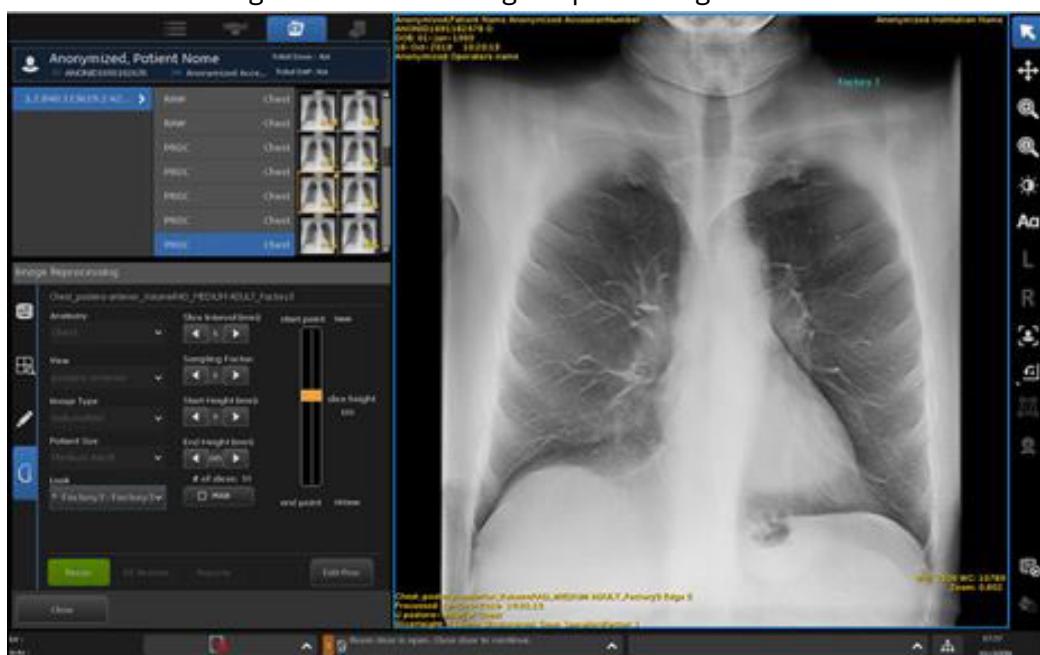
The Image Processing tab lets you change the number of slices by adjusting the start height, end height, slice interval, and sampling factor.

Adjustments made by:

- Free Text Entry - Click in the text box of Slice Interval, Sampling Factor, Start Height or End Height to delete then enter new numeric values.
- Click the left or right arrows to change numeric values.
- MAR (Metal Artifact Reduction) - Selecting the button will either display a check mark or remove the check mark. This will allow you to generate a new series with or without MAR.

Adjust the processing as described in the following table.

Figure 13-70 VolumeRAD Image Tools Panel - Image Reprocessing



VolumeRAD image tools panel – Image Tools

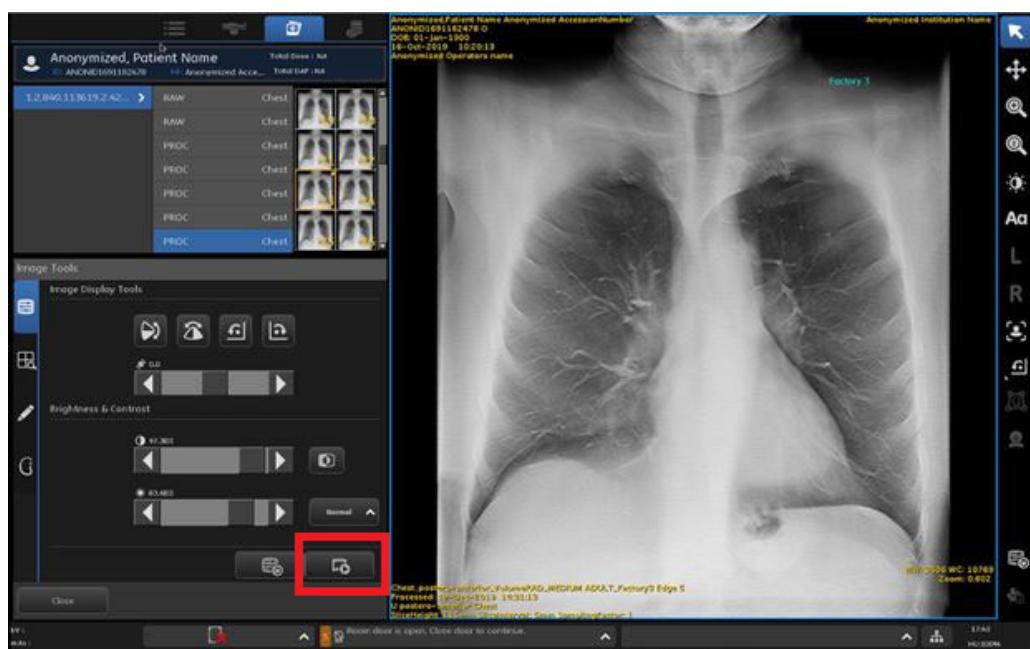
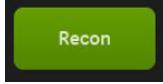


Table 13-7 VolumeRAD Image Tools panel features

Function	Description
Current processing	Shows the current image processing settings. 
Start Height (mm) 	Selects the distance from the table top or receptor cover at which the first slice is reconstructed. A user can also explicitly enter values.
End Height (mm) 	Selects the distance from the table top or receptor cover at which the last slice is reconstructed. A user can also explicitly enter values.
Slice Interval (mm) 	Selects the distance between slices. A user can also explicitly enter values. The range is 1-50 mm.
Sampling Factor 	Selects the amount of data used for each slice. A user can also explicitly enter values As in conventional tomography, the slice (n) is determined by the sweep angle. The VolumeRAD sampling factor is 1. Volume RAD allows the user 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. Note: 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.
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	Selects the processing look.

Function	Description
Recon 	Applies retrospective reconstruction with the selected parameters and factory look. The retro recon slices will be in a new series. When in review mode, re-processing will create new images in the series
Edit Proc	Brings up a screen that allows you to view the Factory look settings or create custom looks. Note: Noise and Tissue Equalization (TE) adjustment is not available for VolumeRAD reprocessing.
Cine Mode 	After a VolumeRAD data set has been processed, a user can start a continuous loop of images acquired. To stop the cine, click the button once again.
Metal Artifact Reduction (MAR) 	Note: MAR by GE Healthcare default is set to Off. All VolumeRAD exams will not create a MAR series unless the following occurs: <ul style="list-style-type: none"> • You click the MAR button after a VolumeRAD scout has been acquired. A checkmark within the MAR button will now display. • After the initial VolumeRAD acquisition has finished loading, a user can retro-recon (post process) and create a new additional MAR series. Note: You can change the default setting by navigating to: Utilities -> Preferences -> VolumeRAD -> Default MAR Mode (Metal Artifact Reduction): On/off. To engage MAR Click the MAR button and a check mark will display (if not already depicted). Retro-recon (post processing) <ol style="list-style-type: none"> 1. After a VolumeRAD acquisition has finished loading, select Viewer ->Image Reprocessing tab. Make any changes necessary to VolumeRAD parameters. 2. Select Look -> choose an image processing look from the drop down list -> click the Recon button. 3. A new series will display. The new series will have the system annotation / processing information "MAR" listed in bottom left corner of the image viewport.

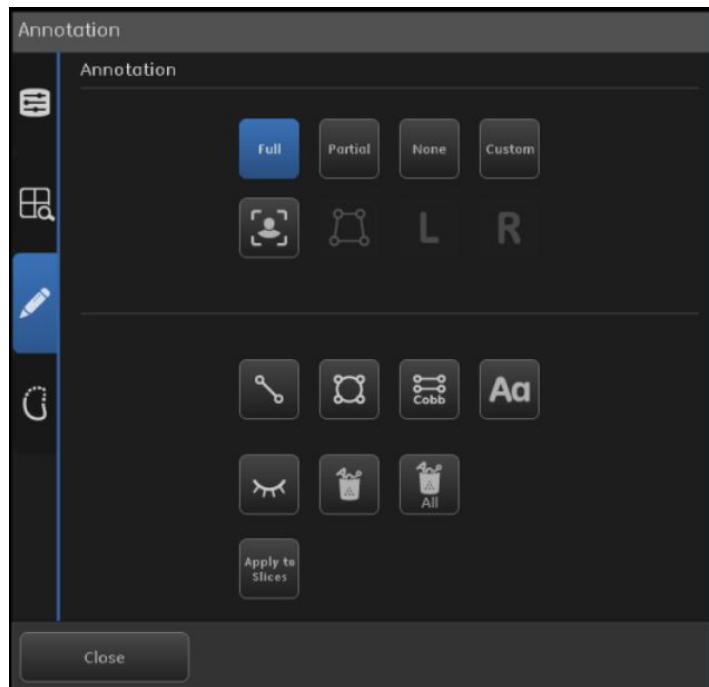
Function	Description
Reconstruction Scroll Bar 	Updates to display the range of VolumeRAD data a user has selected. It can be explicitly entered or adjusted by the user adjusting the start/end heights of the reconstruction scroll bar.

Annotate Slices

The Annotation tab of the Image Tools panel for VolumeRAD is similar to standard images with the addition of functions to apply or remove image annotations from all slices in a VolumeRAD series.

Note: The manual shutter (cropping) is not available for VolumeRAD slices.

Figure 13-71 VolumeRAD Image Tools panel- Annotation tab



Add Image Annotations

1. Select the image to annotate.
2. Click the button of the annotation to insert.
3. Move, re-size, or change the angle of the annotation.

Note: Selected image annotations are yellow with red handles. Unselected image annotations are aqua without handles.

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.
 - A message opens asking you to confirm that you want to erase all images in the series or just the one.
3. Click All, to remove all of the images in the series, or click One to remove the current image.

Apply Quality Control Tags

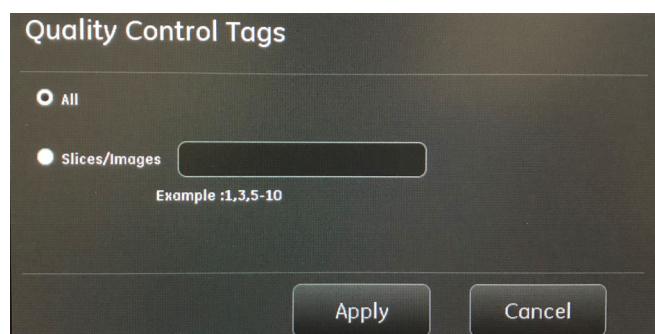
The quality check indicator marks images of acceptable quality that will be auto printed and auto pushed upon exam close.

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. Ensure the Viewer Tab has been selected and series of interest is highlighted
2. Click on the Annotations (Pencil Tool)
3. Click on Quality Control Tags icon.
The Quality Control Tags dialogue box opens.



4. 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/Images" allows you to type the number of the slice(s), a range of slice(s) or a combination of single slice(s) and ranges.
 - If the slices range is left blank, tags will be removed from the entire series.
 - 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."
5. Click Apply, or click Cancel closes the dialog box without applying tags.

Print Slices

VolumeRAD slices are printed using the same methods as for standard exams.

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](#).

Because of the number of images created during a VolumeRAD exam, use a recordable DVD disk (DVD-R) or USB when archiving images or saving images to disk. Refer to [Copy Exams to a CD, DVD or USB](#).

Note: Exams cannot be saved to a re-writable disk (DVD-RW or CD-RW).

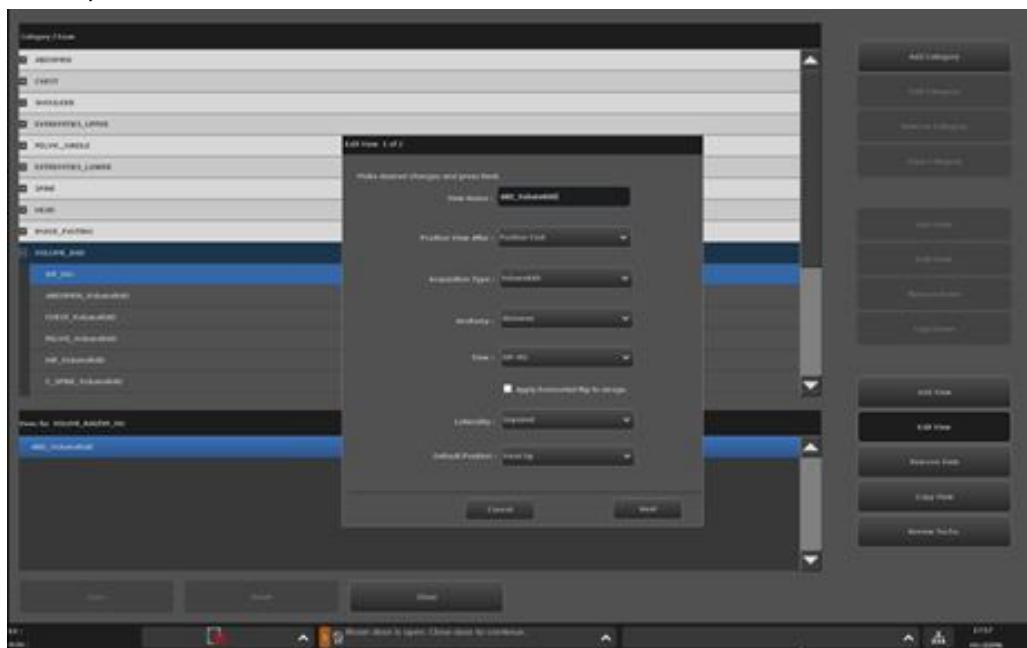
Preferences

Protocol Editor (Scout)

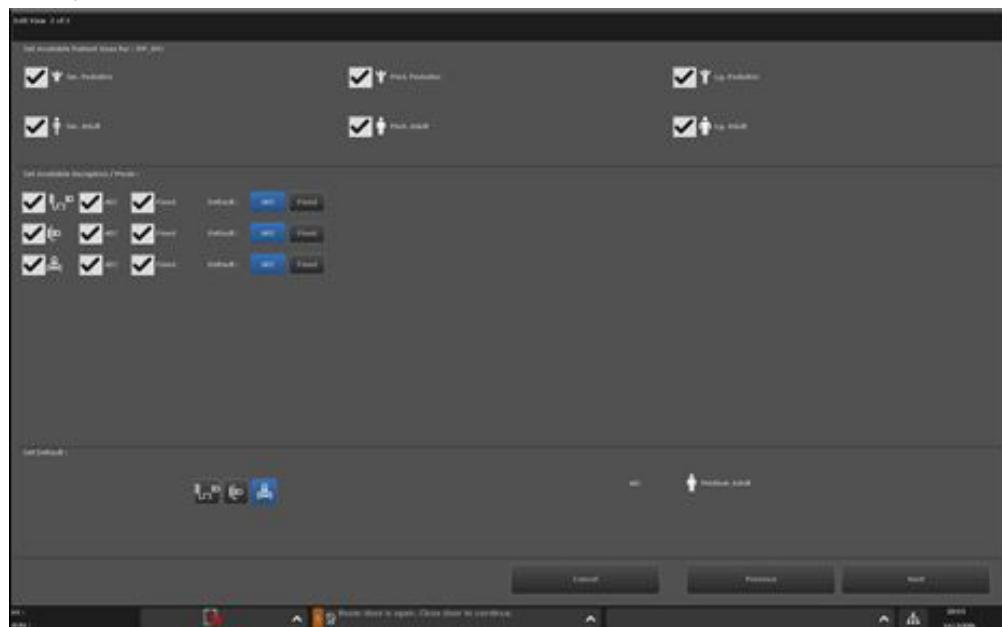
The protocol editor for VolumeRAD is essentially the same as for other protocols. This section describes the specific differences to edit or add VolumeRAD protocols.

Note: Protocol editing only applies to the Scout acquisition.

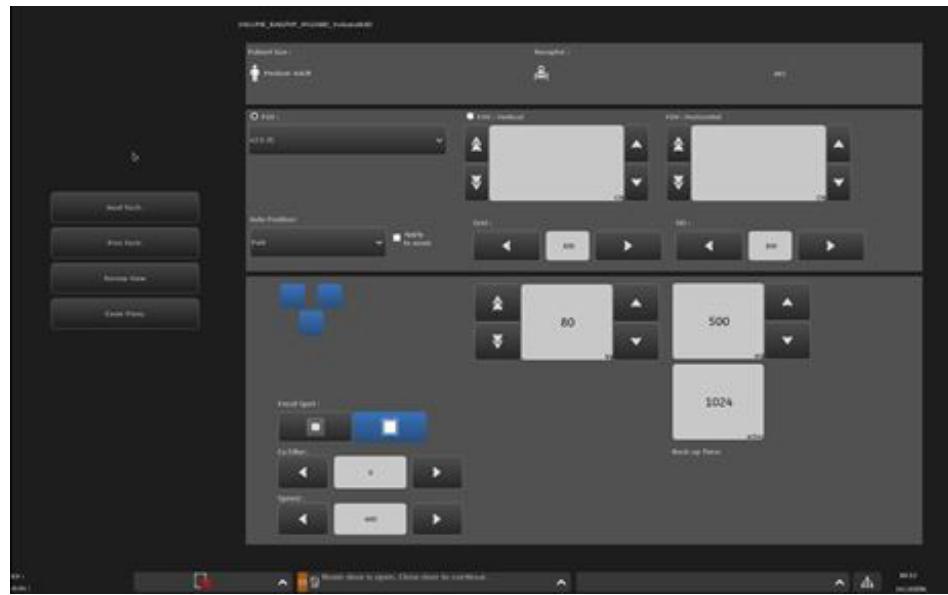
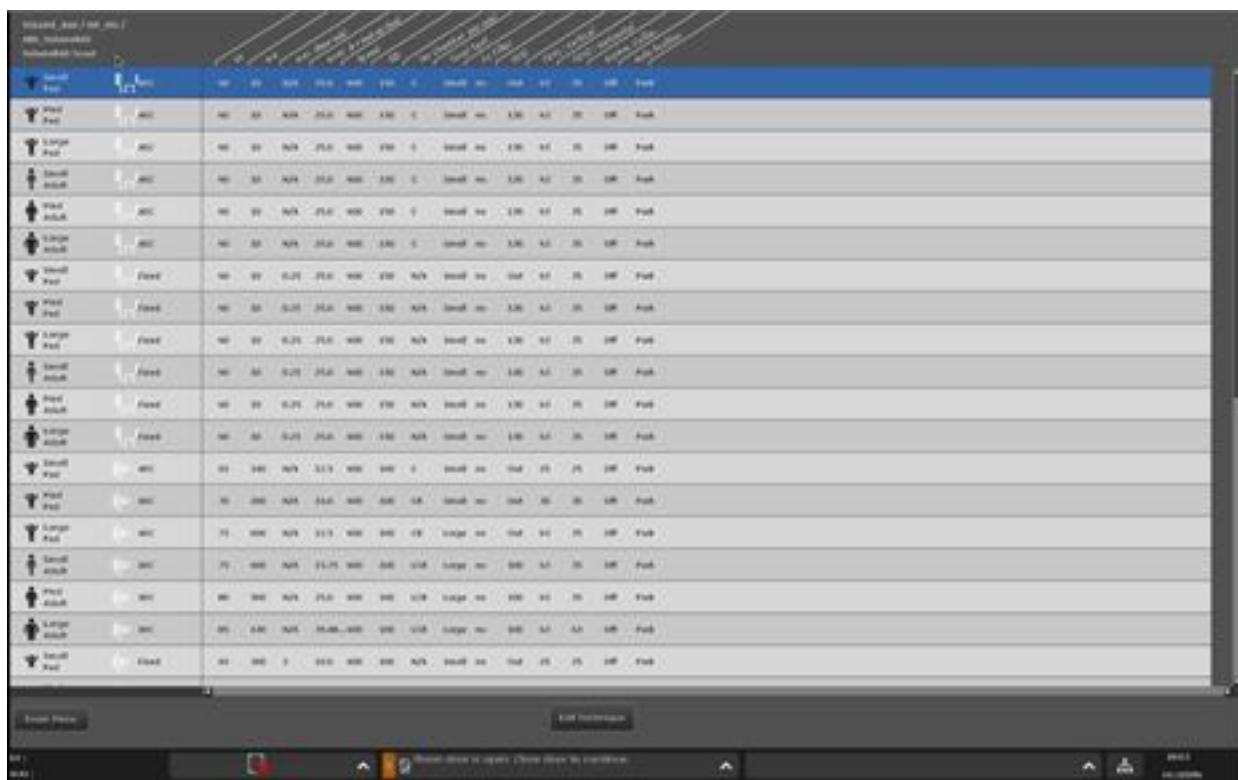
When adding or editing a view for VolumeRAD, select the Acquisition Type of VolumeRAD.

Figure 13-72 Set preferences - Add (or Edit) View 1 of 2

Clicking Next switches the screen to protocol default setup for VolumeRAD Scout. The Scout can be either AEC or Fixed acquisition mode.

Figure 13-73 Set preferences - Add (or Edit) View 2 of 2

Clicking Next switches to a matrix overview of the protocol. From here, a user can visualize at a high level, parameters for specific receptor or body habitus. Using the mouse, highlight a specific row to further review, then click Edit Technique to make adjustments.

Figure 13-74 Set preferences - Technique selection

6. Select the default Grid, Focal Spot, Cu Filter and Film Speed for Scout.
7. Select the SID.
 - For Wall Stand, select SID of 100cm or 180cm.
 - For Table, the recommended SID is 100cm (display only).
8. Select the default kV, mA for Scout. If the Scout acquisition mode is Fixed, then mAs is also adjustable.

- If Scout is in AEC mode, select default Ion Chambers for AEC Scout.

Reconstruction Preferences

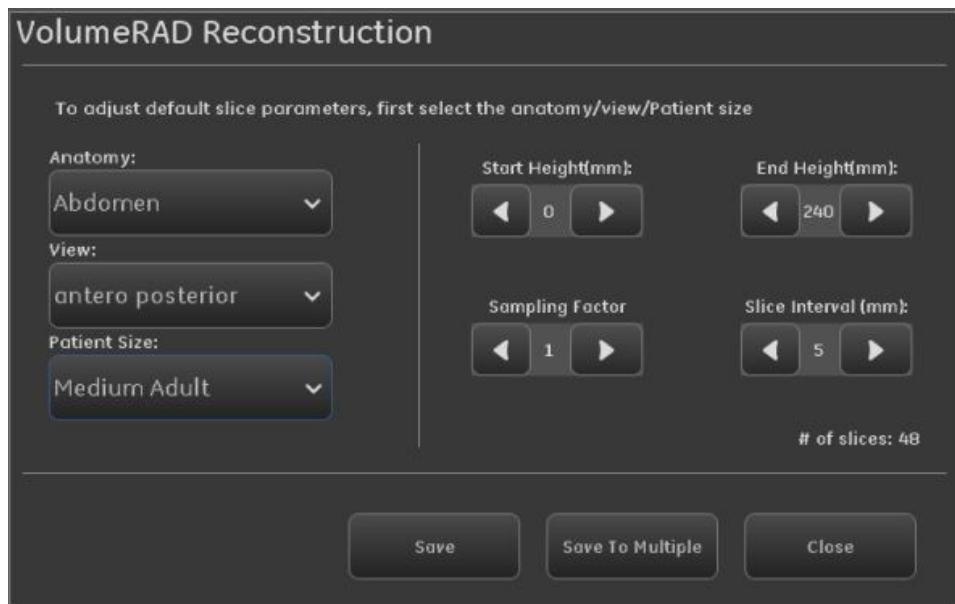
Reconstruction preferences define the slice parameters (start and end height, slice interval, etc.) used to create the slices for the protocol. Reconstruction preferences may also be applied to multiple protocols.

The Image Viewer screen contains tools to create reconstructions for an individual exam.

Follow this process to change the reconstruction preferences.

- From the Worklist screen, click Utilities.
- Select Preferences > VolumeRAD.
- Click VolumeRAD Reconstruction Edit.
 - The VolumeRAD Reconstruction screen appears.

Figure 13-75 VolumeRAD Reconstruction



- Select the Anatomy.
- Select the View.
- Select the Patient Size.

Adjust the parameters as described in the following table.

Table 13-8 VolumeRAD reconstruction parameters

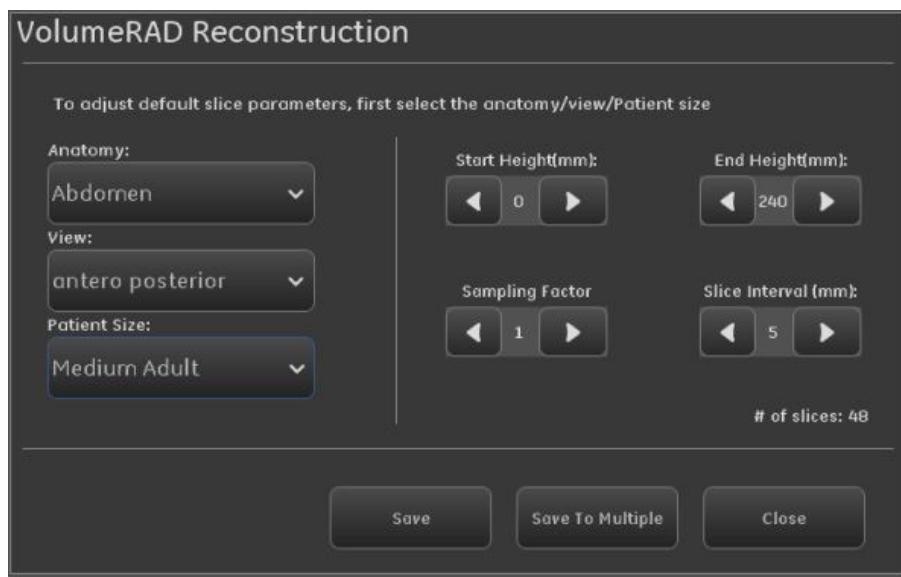
Function	Description
Start Height (mm)	Selects the distance from the table top or receptor cover at which the first slice is reconstructed.

Table 13-8 VolumeRAD reconstruction parameters

Function	Description
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 (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. Note: 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.

7. When finished adjusting parameters, click Save or click Save to Multiple

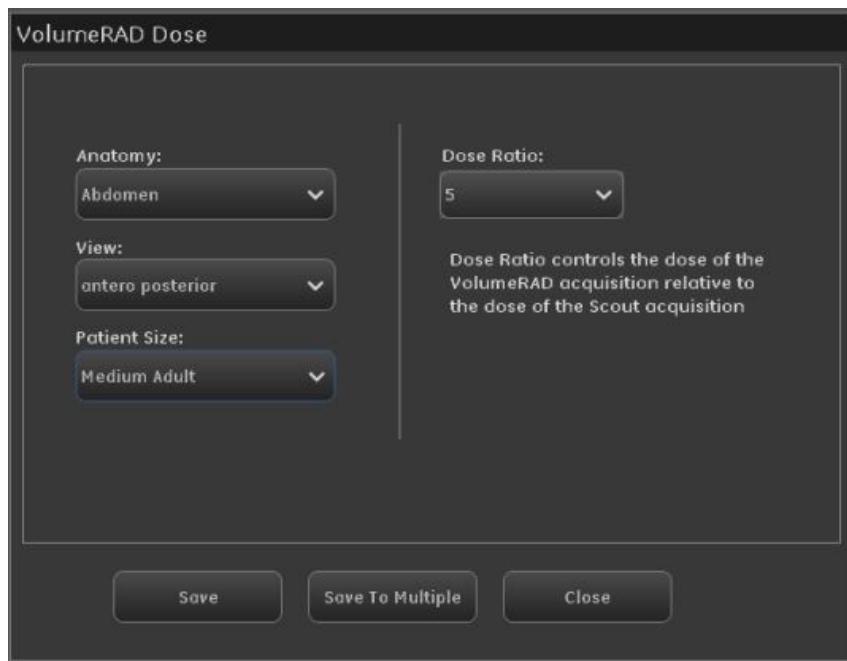
- Save applies the parameters to the currently selected patient size.
 - A message appears: "Save changes?"
 - Click Yes.
- Save to Multiple applies the parameters to multiple patient sizes within the selected anatomy.
 - The Save to Multiple screen appears.
 - Select the Patient Size to save the new look to.
 - Click Save.

Figure 13-76 VolumeRAD Reconstruction - save to multiple

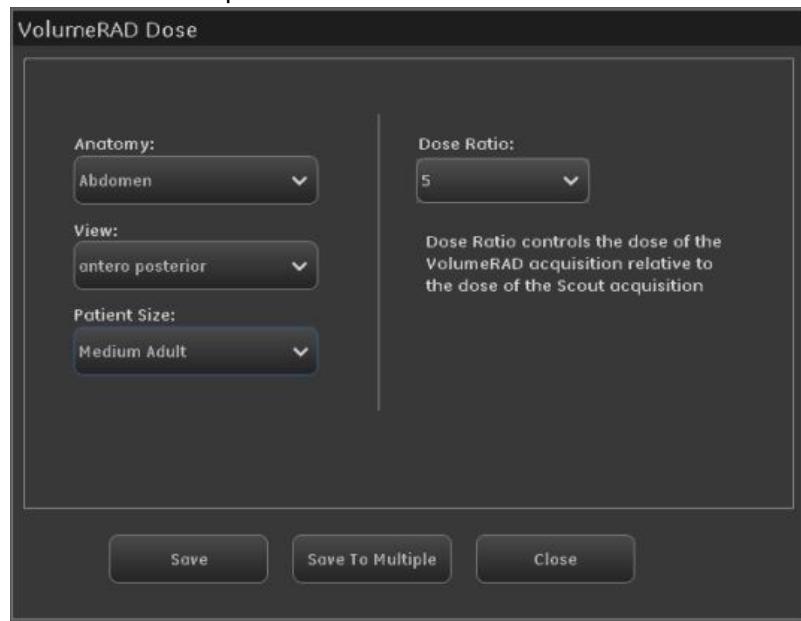
Dose Preferences

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 Dose screen appears.

Figure 13-77 VolumeRAD Dose

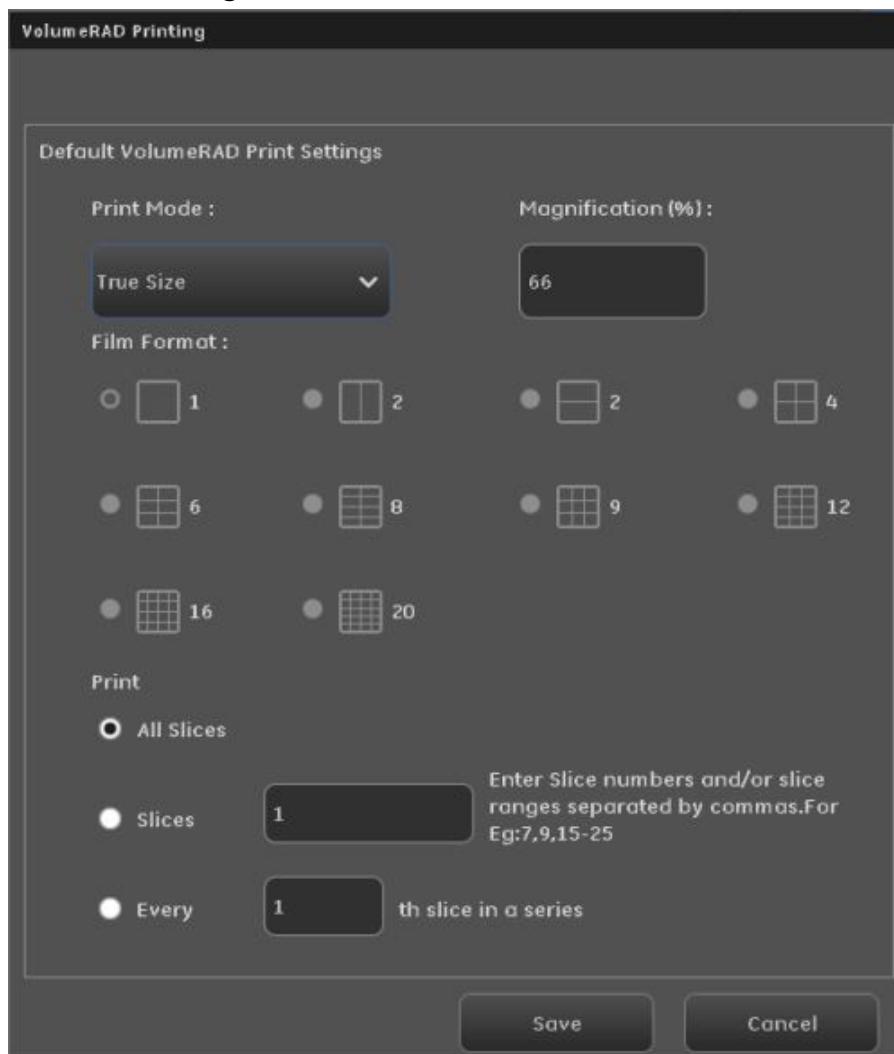
4. Select the Anatomy.
5. Select the View.
6. Select the PatientSize.
7. Select the Dose Ratio.
 - 8. Click Save or Save To Multiple.
 - Save applies the ratio to the currently selected patient size.
 - A message appears: "Save changes?"
 - Click Yes.
 - Save To Multiple applies the ratio to multiple patient sizes within the selected anatomy.
 - The Save to Multiple screen appears .
 - Select the Patient Size to save the new look to.
 - 9. Click Save.

Figure 13-78 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 \(p. 15-24\)](#).

1. From the Worklist screen, click Utilities.
2. Select Preferences> ImageManagement.
3. Click Auto Print Edit.
 - The Default Print/Auto Print screen appears.
4. Click VolumeRAD Edit.
 - The VolumeRAD Printing screen appears.

Figure 13-79 VolumeRAD Printing

5. Complete the information as described in the following table.

6. Click Save and then Close.

Table 13-9

Function	Description
Print Mode	Provides options on the size of the image data printed. Available options are: <ul style="list-style-type: none"> • True Size • Fit to Film • Reduced Size
Magnification	Allows you to enter the percent by which the image will be reduced. The accepted range is between 40% and 90%.

Table 13-9

Function	Description
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"> • All Slices - Prints all slices in a series. • Slices - Prints only the slices or ranges that are entered into the text box • Every_ 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.

Workflow Overview

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 autopositioning).
5. Position the patient to the receptor.
6. Select the appropriate FOV for the anatomy.

Note: FOV cannot be less than 10 x 10 cm (4 x 4 inch). 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.
 - Adjust or reprocess acquisition to adjust slices.
14. Optional: Manually print selected slices.
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.

The following table shows the default reconstruction properties for a VolumeRAD exam.

Table 13-10 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

Anatomy	View	Patient Size	Start Height (mm)	End Height (mm)	Slice Interval (mm)	Sampling Factor	# of Slices	Dose Ratio	Sweep Angle	# of Acquisitions
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

Anatomy	View	Patient Size	Start Height (mm)	End Height (mm)	Slice Interval (mm)	Sampling Factor	# of Slices	Dose Ratio	Sweep Angle	# of Acquisitions
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

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

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

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

Anatomy	View	Patient Size	StartHeight (mm)	EndHeight (mm)	SliceInterval (mm)	Sampling Factor	# of Slices	Dose Ratio	Sweep Angle	# of Acquisitions
Wrist	lateral	SMALL_ADULT	2	50	2	1	25	5	40	30
		MEDIUM_ADULT	2	60	2	1	30	5	40	30
		LARGE_ADULT	2	70	2	1	35	5	40	30
		SMALL_PEDIATRIC	2	25	2	1	13	5	40	30
		MEDIUM_PEDIATRIC	2	32	2	1	16	5	40	30
		LARGE_PEDIATRIC	2	38	2	1	19	5	40	30
Wrist	postero-anterior	SMALL_ADULT	2	40	2	1	20	5	40	30
		MEDIUM_ADULT	2	50	2	1	25	5	40	30
		LARGE_ADULT	2	60	2	1	30	5	40	30
		SMALL_PEDIATRIC	2	25	2	1	13	5	40	30
		MEDIUM_PEDIATRIC	2	32	2	1	16	5	40	30
		LARGE_PEDIATRIC	2	38	2	1	19	5	40	30

Chapter 14: Quality Assurance and Maintenance

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. If checking multiple detectors registered to a system, perform QAP on one detector with your choice of table tray, wall stand tray, digital cassette or with the optional tether cord. The following week, alternate the testing method and use a different receptor.
- 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 \(p. 15-64\)](#))

Note: To ensure optimal performance, restart the system once a week.

Figure 14-1 QAP button with alert icon



Phantoms

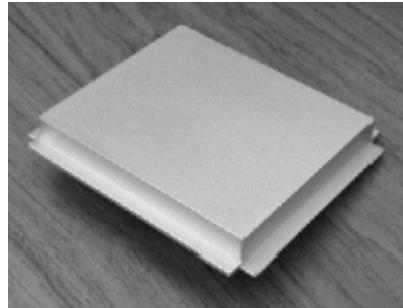
There are two types of phantoms used in the QAP process. The first phantom is the Flat-Field Phantom and the second is the MTF Phantom. The system prompts you as to which phantom to use from the respective acquisition screens. There are recommended exposure techniques for the phantoms. The

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

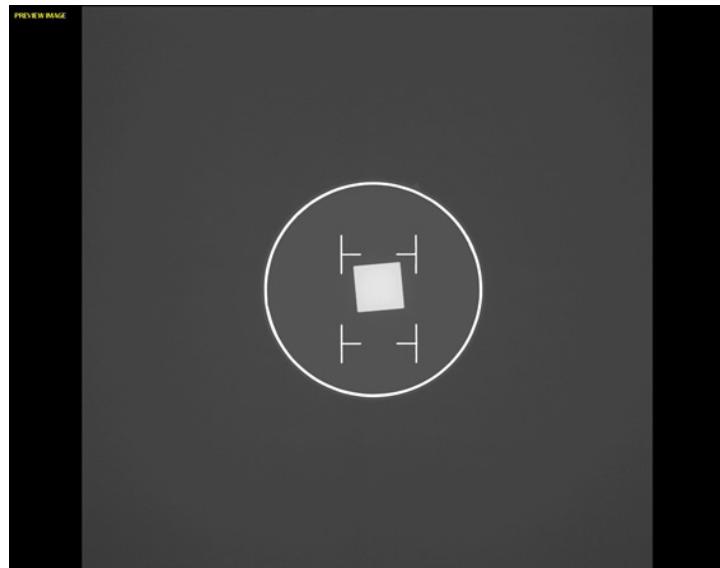
Figure 14-2 Flat-field phantom



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.

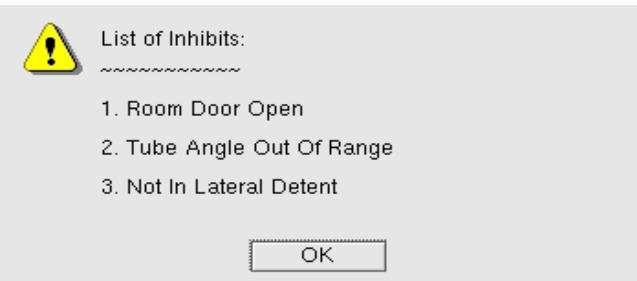
When the QAP icon, located on the bottom of the Worklist and Acquisition screens, is activated, the first acquisition screen is displayed. The left and center panes of the screen contains buttons to control the program. The right pane provides information and instructions.

Table 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.

Table 14-1 QAP symbols

Symbol	Description
	<p>Inhibit. The button appears when there is an inhibit or interlock preventing image acquisition.</p> <p>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> <p>Figure 14-5 Example list of inhibits</p> 
	Table Receptor. Begins QAP testing when detector is inserted in table tray.
	Wall Stand 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. Digital cassette will be recognized within QAP; only if a user makes the detector of interest primary, before entering the QAP program.
	Back. Takes you back to the previous screen. This button is disabled while tests are being performed.
	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).

Note: Please wait at least 60 seconds once the detector is connected before beginning QAP. Performing QAP within this timeframe of 0-60 seconds may FAIL as a result. If so, a repeat QAP to that receptor should be performed.

The QAP process begins when the QAP button is selected. The button is located at the bottom of the Worklist or Acquisition screen.

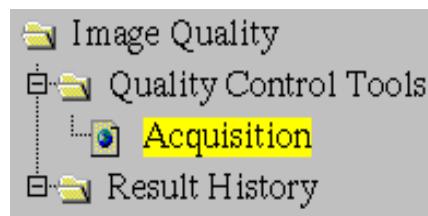
Note: QAP cannot be performed if an exam is open or being reviewed.

1. If performing QAP in detector tray, insert detector in table or wall stand. (QAP can be completed in either the table, wall stand 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 or service utility.
 - The Image Quality screen appears (Figure 14-6).

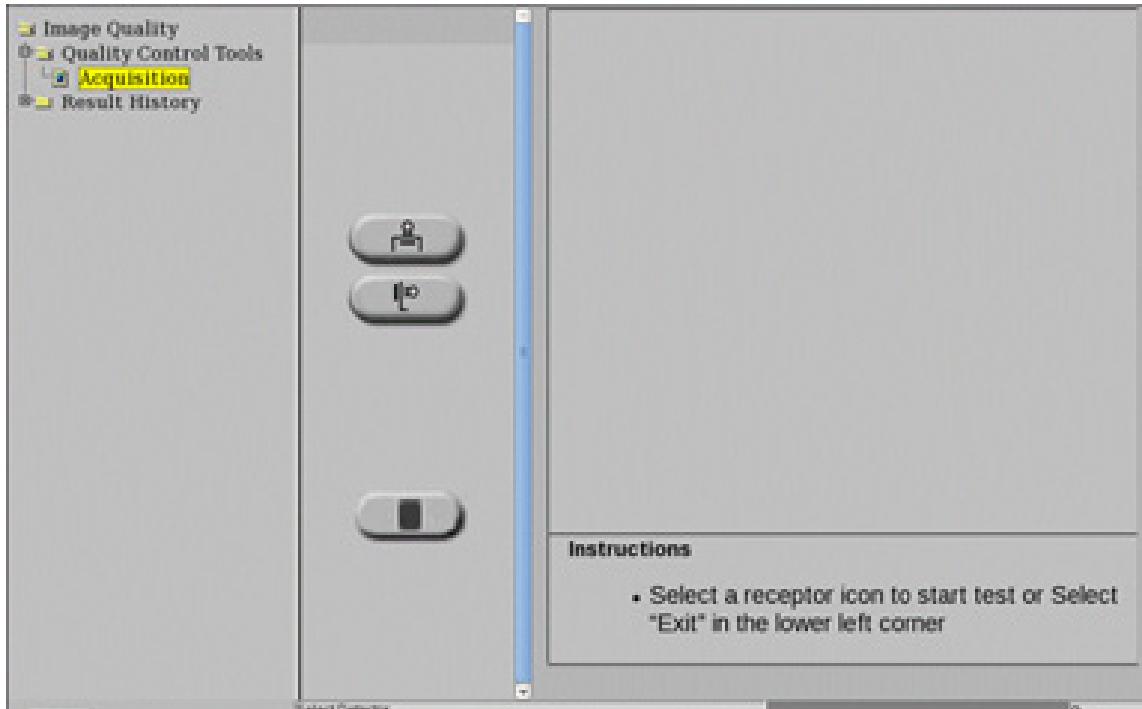
Figure 14-6 Image Quality screen



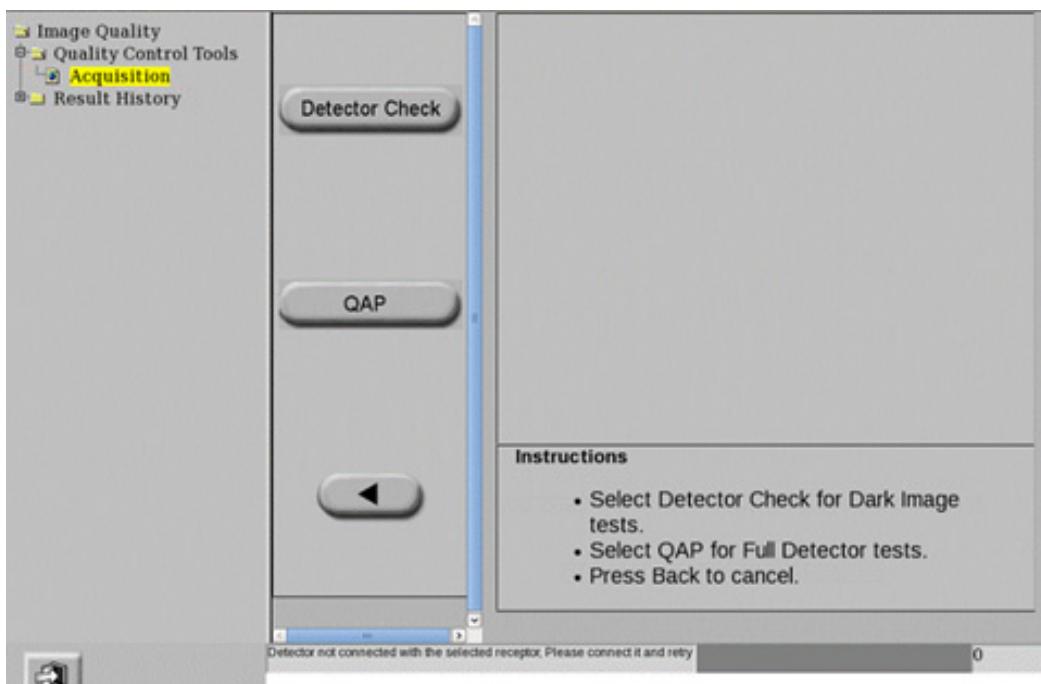
5. From left pane, open **Quality Control Tools > Acquisition**. (Figure 14-7)
 - Selecting Acquisition.

Figure 14-7

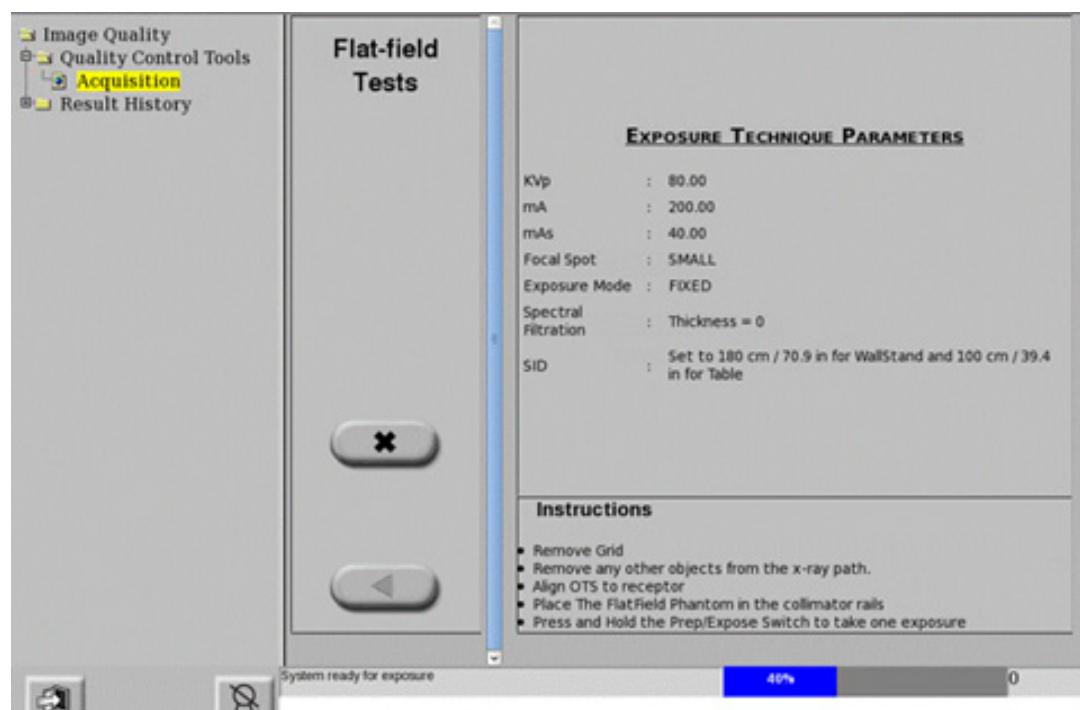
- The Start screen appears (Figure 14-8).

Figure 14-8 Start screen

6. Select the detector receptor to perform QAP.
7. Click on QAP. The Detector Check will begin.

Figure 14-9 Detector Check screen

- The Flat-field Tests screen appears.

Figure 14-10 Flat-field Tests screen

8. Follow the instructions at the bottom of the Flat-field Tests screen:

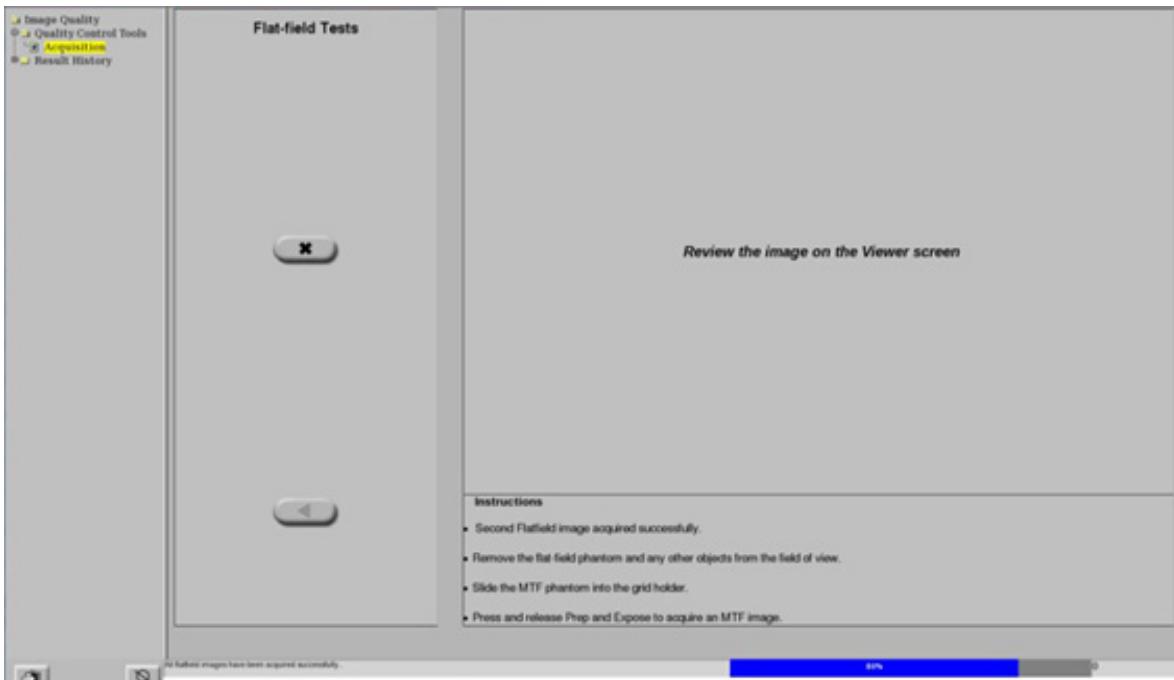
- Remove the grid (if necessary)
- Insert flat field phantom into the collimator rail.

- c) Remove any objects from the x-ray path.
 - d) Prep and Expose the flat-field phantom.
9. Wait for the exposure sequence to complete.
- The phantom image appears on the monitor.

Figure 14-11 Flat-field phantom image

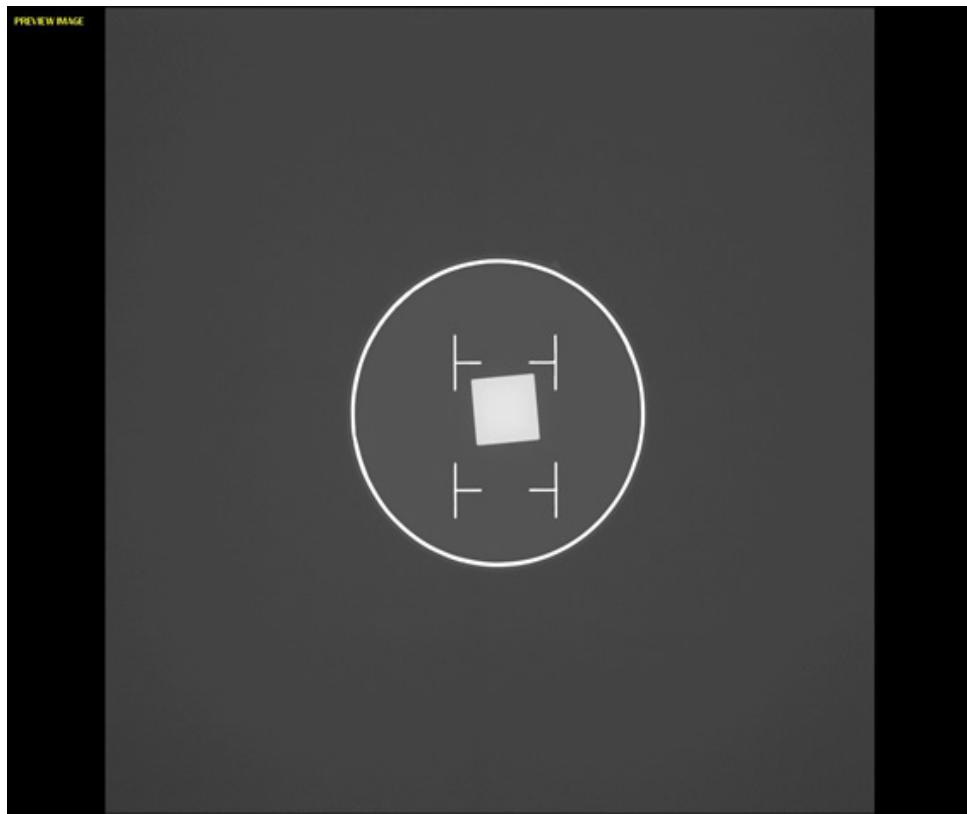


10. Prep and Expose the flat-field phantom again.
- The Tests screen appears (Figure 14-12).

Figure 14-12 Tests screen

11. Follow the instructions at the bottom of the MTF Tests screen:

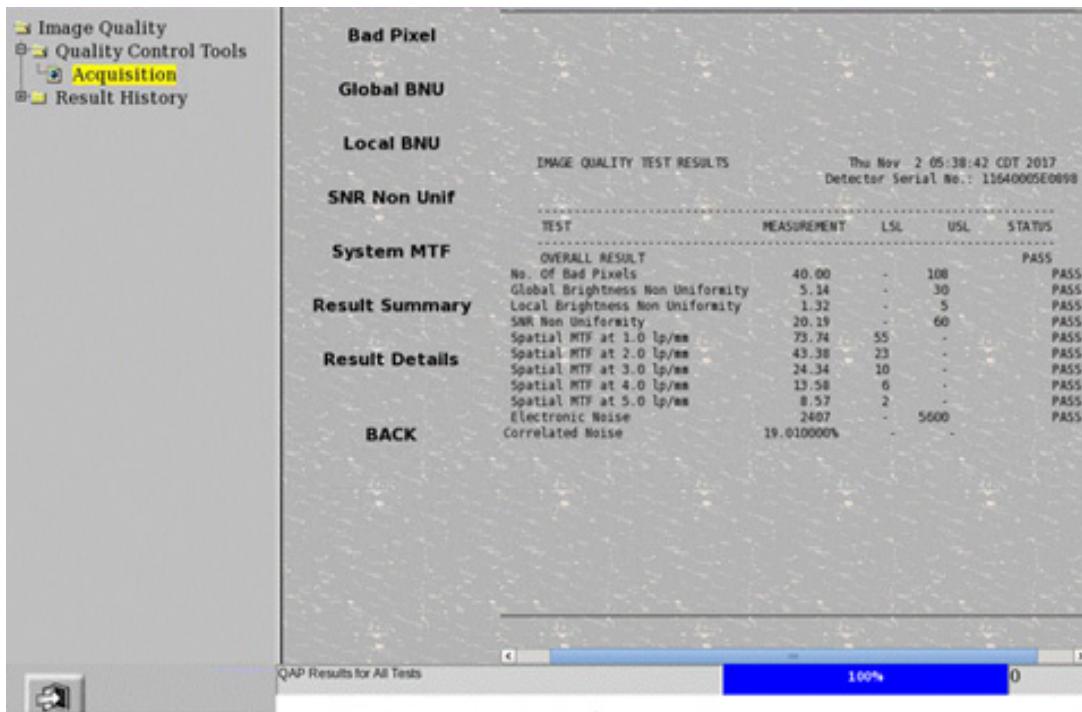
- a) Remove the flat-field phantom or any other objects from the field of view.
- b) Insert the MTF phantom into the grid holder.
- c) Prep and Expose the MTF phantom.
 - The phantom image appears on the monitor ([Figure 14-13](#)).
 - The Image Quality Test Results appear.

Figure 14-13 MTF phantom image

12. Review the results.

- If Pass: QAP is complete. Click [EXIT] to return to Worklist screen.
- If Fail: Refer to [Chapter14: -Failed QAP](#) (p.14-12) for more information.

13. Log off and perform a controlled shutdown and start up. Refer to [Chapter4: -System Start Up and Shutdown](#) (p.4-1) for more information.

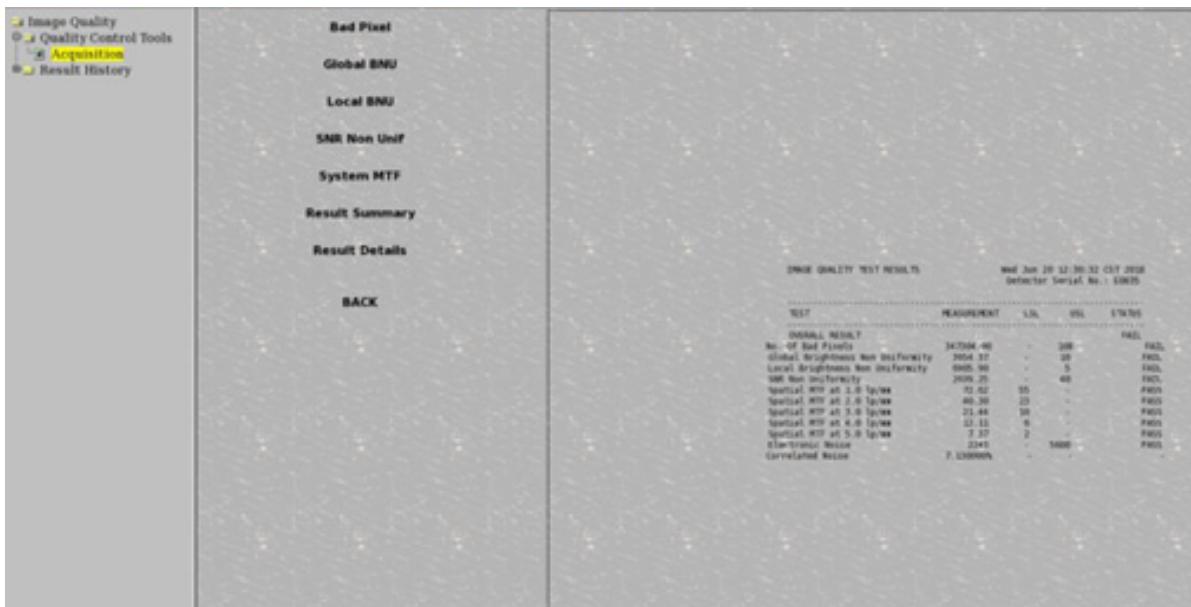
Figure 14-14 QAP Results screen

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 14-15 Failed QAP results

14. 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.
 - 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.

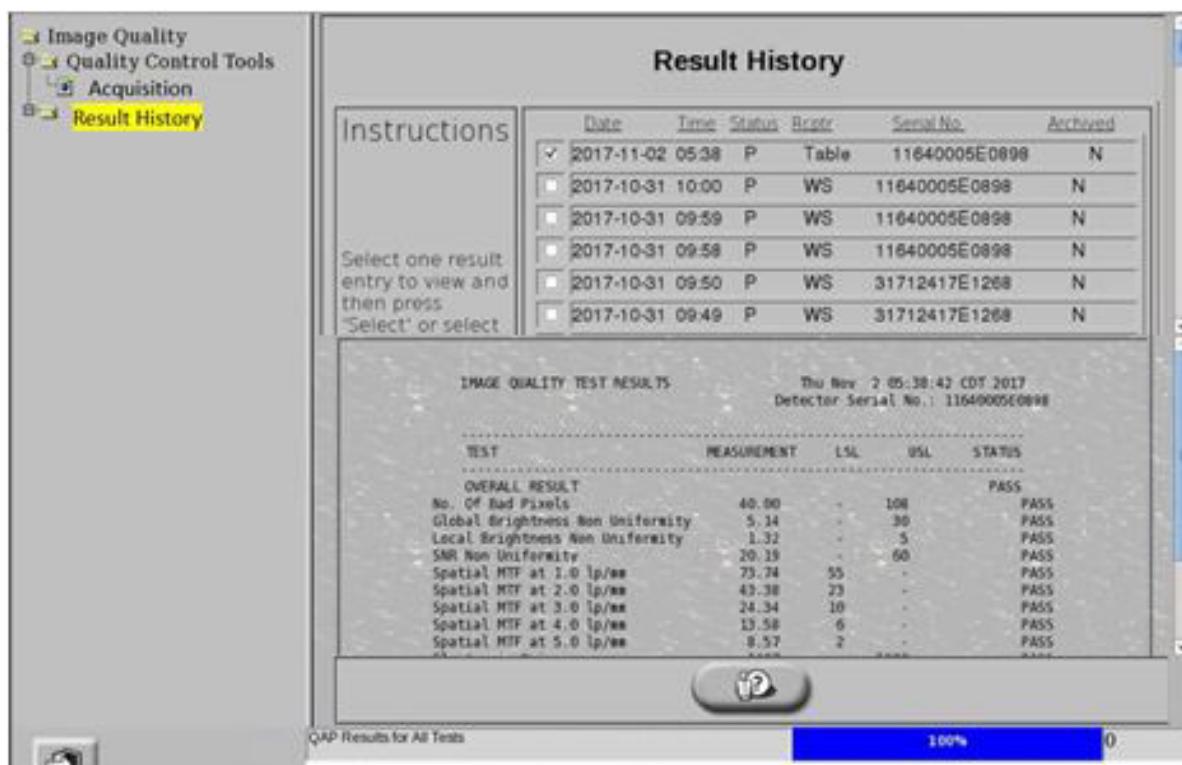
Result History

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.

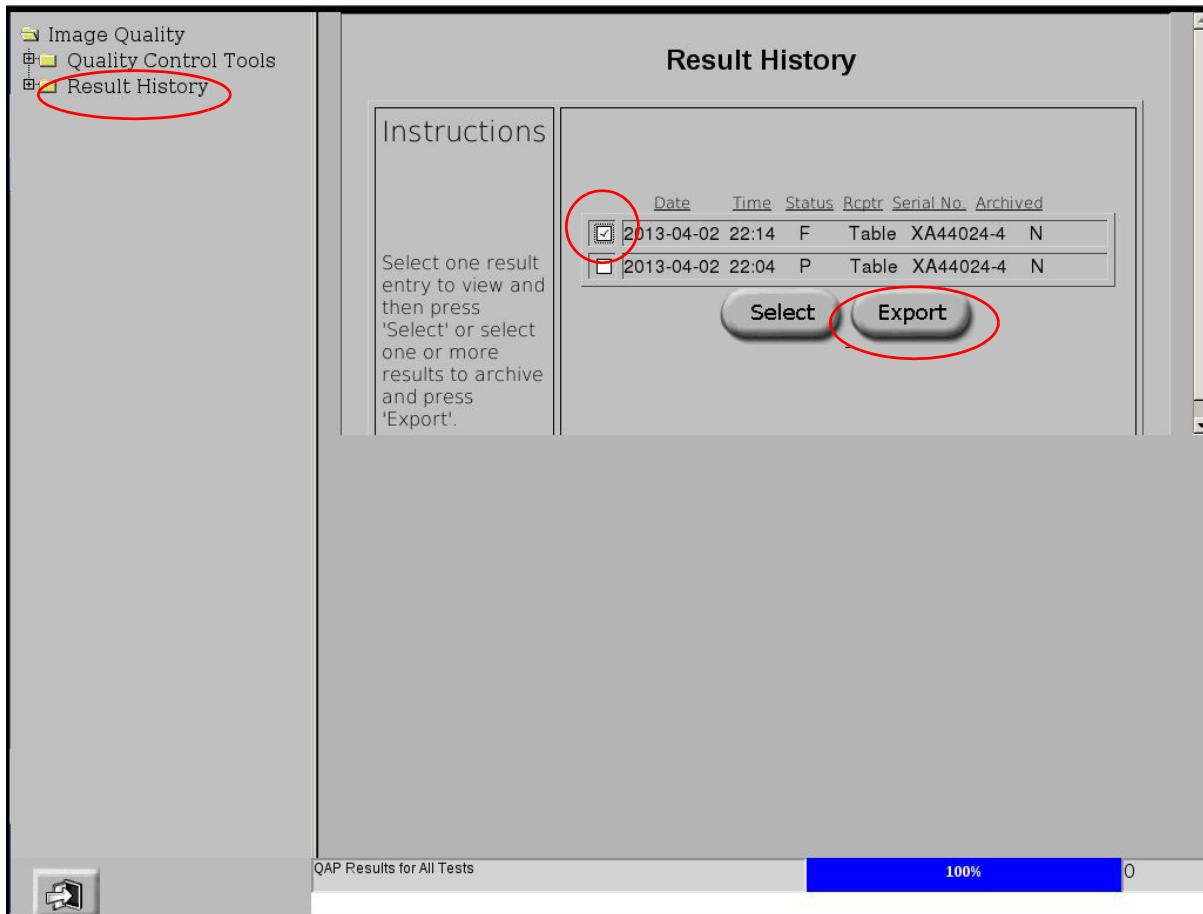
Follow this process to view the results of previous QAP tests.

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

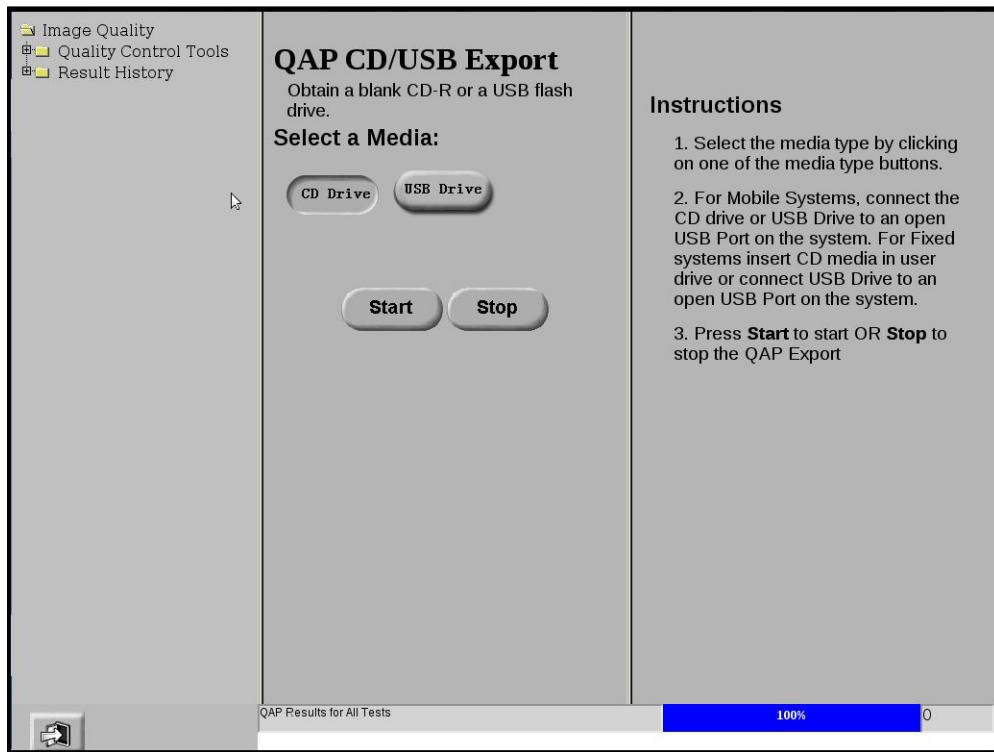
QAP CD/USB Export

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 (# 5643941-2EN) 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 Healthcare 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 Healthcare 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.

The system should have an expected service life of 10 years. Periodic maintenance of the system is required to maintain the system life cycle. The first periodic maintenance will be starting from the 13th month after installation, then it is suggested to do once per 12 months by a GE Healthcare qualified service engineer.

Cleaning and Disinfection

Warnings



CAUTION **This equipment can be damaged by improper handling and by contact with certain chemicals. Failure to follow the precautions described can result in serious injury and equipment damage.**

- Never use cleaners, disinfectants, or solvents of any kind if you are uncertain of the nature of the materials.
- Be sure to follow the label instructions and precautions for use, storage, and disposal of all cleaning and disinfecting agents. Ensure all staff is properly trained and chemical instructions for use are followed precisely.

- DO NOT use non-GE-approved cleaning materials/chemicals or products that have not been evaluated by GE for material compatibility. Damages linked to the use of disapproved chemicals are not covered under product warranty or service contract.
- Do not immerse the device in any liquid, as this may corrode metal contacts and affect signal quality.
- Never autoclave or steam-clean the equipment.
- Do not use the system until thoroughly dry.

Approved Chemicals for Cleaning

The following chemicals are deemed material compatible with the system:

1. Alcohol-Quat solution containing the following active ingredient concentrations:

- 0.25% n-Alkyl dimethyl ethylbenzyl ammonium chlorides
- 0.25% n-Alkyl dimethyl benzyl ammonium chlorides.
- 55.00% Isopropyl Alcohol.

Commercial option: PDI Super Sani-Cloth® Germicidal Disposable Wipes

2. Alcohol-Chloride solution containing the following active ingredient concentration:

- ≤0.5% Benzalkonium chloride
- ≤0.5% Didecyldimethyl ammonium chloride
- ≤0.10% Polyhexamethylene biguanide (PHMB)

Commercial option: Clinell® Universal Wipes

Note:

- Compliance information, questions regarding instructions for use and proper handling of any chemicals should be directed to the disinfectant manufacturer.
- Material compatibility is defined as suitability for use in reprocessing the system without causing any adverse effects to user or patient safety, or system functionality.
- As preferred cleaning and disinfection practices change and new products become available, GE Healthcare continues to test the material compatibility of these agents for GE devices. See <https://cleaning.gehealthcare.com/?cmpid=covid-quick-links> for any newly qualified agent.

Note: Protect the connector pins/screws of the detector tether cable, the detector, the table and wall stand housing docking cable from liquid cleaning, and make sure that the detector is dry prior to putting back into the system.

Detector tether cable connector



Detector connector



Housing docking cable connector



Cleaning and Disinfection Instructions

Introduction

Cleaning and disinfection is vital to maintaining your system and patient safety. Prior to disinfection ensure your device is visually clean as residual inorganic or organic materials may impact disinfection efforts.

These instructions for use include generalized cleaning and disinfection instructions as well as detailed instructions for the patient contact area, the operator contact area and the Compression belt. Depending on your device/configuration some detailed instructions may not be applicable. The pictures are for reference only, please refer to the actual product.

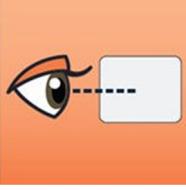
Cleaning/Disinfectant Agents	
	Verify the agent(s) respective wet/contact time for disinfection. Ensure the device remains thoroughly wet for the entirety of the wet/contact time.
	If an agent requires a rinse step, use a lint free cloth and PURW (sterile, neutral pH, critical water) to wipe the part after completing cleaning and disinfection. Ensure the full wet/contact time has been met prior to rinsing.

Spray or Liquid Cleaning/Disinfectant Agents

	<p>If using a cleaner or disinfectant that is in a spray or liquid state, dispense onto a clean lint free cloth to use as a wipe. Ensure multiple cloths are available before beginning the cleaning/disinfecting.</p> <p>Do not spray cleaning agent or disinfectant directly onto the system. Spraying directly onto the system can damage parts.</p>
---	---

General Cleaning Instructions

The following describes the general cleaning instructions for the system. Refer to specific sections for detailed procedures on cleaning the patient contact area, operator contact area and the Compression belt.

Cleaning: Remove the Soil				
				<p>Put on new gloves.</p> <p>Gather approved agent(s).</p> <p>If using a spray, spray onto a clean lint-free cloth to use as a wipe.</p> <p>Wipe all sides of the part, using as many fresh wipes as needed until clean.</p>
				
Ensure the device is visually clean.	Throw away used wipes and gloves.			

Special Considerations: grooves, gaps, and buttons

	
Wrap a wipe around a plastic card or swab.	Place the edge or tip in any edges, gaps and grooves, gently drag the wrapped wipe. Use as many fresh wipes as needed until clean.

General Disinfection Instructions

The following describes the general disinfection instructions for the system. Prior to disinfecting ensure the device is visually clean. Refer to specific sections for detailed procedures on disinfection of the patient contact area, the operator contact area and the Compression belt.

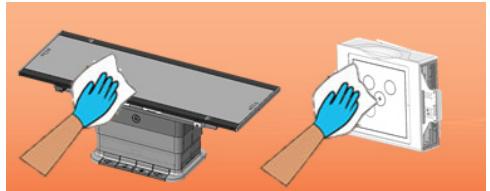
Disinfection: Kill the germs			
			
Put on new gloves.	Gather approved agent(s).	If using a spray, spray onto a clean lint-free cloth to use as a wipe.	Wipe all sides of the part, using as many fresh wipes as needed until clean.
			
Using fresh wipes, wipe the part to thoroughly wet.	Ensure the device stays wet for the wet time of the given agent.	Throw away used wipes and gloves.	

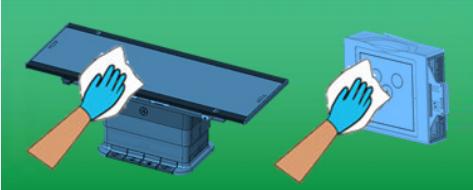
Special Considerations: grooves, gaps, and buttons

	
Wrap a wipe around a plastic card or swab.	Place the edge or tip in any edges, gaps and grooves, gently drag the wrapped wipe. Use fresh wipes each time.

Cleaning and Disinfection of the patient contact area

The patient contact area includes but not limited to Detectors, Tabletop, Wall stand front panel, PA bar, Lateral Bar, Clip on grid, Detector handle, etc.

Cleaning: Remove the Soil			
			
Put on new gloves.	Gather approved agent(s).	Wipe all sides of the patient contact area, using as many fresh wipes as needed until clean.	For grooves, gaps: place wipe over plastic card.
			
Place edge in any gaps or grooves and gently drag, as needed.		Ensure the device is visually clean.	Throw away used wipes and gloves.

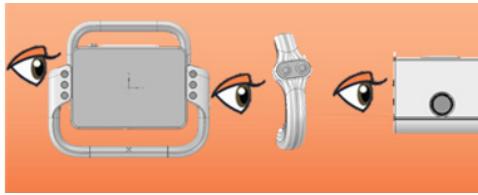
Disinfection: Kill the germs		
		
Put on new gloves.	Wipe all sides of the patient contact area with wipes, using as many fresh wipes as needed.	For grooves, gaps and buttons: place wipe over plastic card.
		
Wipe the patient contact area with fresh wipes to thoroughly wet.	Using fresh wipes, wipe the patient contact area to thoroughly wet.	
		
Ensure the device stays wet for the wet time of the given agent.	Throw away used wipes and gloves.	

Cleaning and Disinfection of the operator contact area

The operator contact area includes but not limited to OTS console, Collimator, Operations buttons on OTS/Wall stand/Table, Table/Wall stand housing Tray, Acquisition Workstation, etc.

Cleaning: Remove the Soil

			
Put on new gloves.	Gather approved agent(s).	Wipe all sides of the operator contact area, using as many fresh wipes as needed until clean.	Wrap wipe over a swab and/or plastic card.

		
Place edge in any gaps or grooves and gently drag, as needed.	Ensure the device is visually clean.	Throw away used wipes and gloves.

Disinfection: Kill the germs

		
Put on new gloves.	Wipe all sides of the operator contact area with wipes, using as many fresh wipes as needed.	Wrap wipe over a swab and/or plastic card.

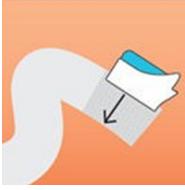
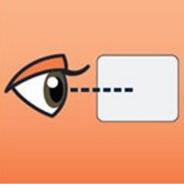
	
Place edge in any gaps or grooves and gently drag, as needed.	Using fresh wipes, wipe the operator contact area to thoroughly wet.

Disinfection: Kill the germs			
			

Ensure the device stays wet for the wet time of the given agent.

Throw away used wipes and gloves.

Cleaning and Disinfection of the Compression belt

Cleaning: Remove the Soil			
			
Put on new gloves.	Gather approved agent(s).	Wipe all sides of the part, using as many fresh wipes as needed until clean.	Wrap a wipe around card, press the edge of the card into Velcro® and push.
			
Using a tightly folded wipe, scrub the Velcro® in a circular motion.	Rinse Velcro®/ straps with critical water (PURW).	Ensure the device is visually clean.	Throw away used wipes and gloves.

Disinfection: Kill the germs			
			
Put on new gloves.	Wipe all sides of the part with wipes, using as many fresh wipes as needed.	Using a tightly folded wipe, scrub the Velcro® in a circular motion.	Wipe the strap with fresh wipes to thoroughly wet.
			
Ensure the device stays wet for the wet time of the given agent.	Throw away used wipes and gloves.		

Inspection and Functional Testing

Following full cleaning and disinfection, the system should be visually inspected for:

- Damage, including but not limited to, corrosion (rust, pitting), cracks, and wear.
- Proper function, including but not limited to, mechanical movements and interlocks, and electrical signaling.
- Missing or removed (buffed off) part numbers

Improperly functioning devices, devices with unrecognizable markings, missing or removed (buffed off) part numbers, damaged and worn devices should not be used.

Storage

After final drying and visual inspection, keep the environment or location clean and dry to minimize the chances of re-contamination.

Additional Information

All users should be qualified personnel with documented expertise, competency and training. Users should be trained on hospital policies and procedures along with current applicable guidelines and standards.

Users should utilize appropriate personal protective equipment (PPE) when processing devices in accordance with the Department of Environmental and Occupational Health and Safety's (OSHA) blood-borne pathogen guidelines or equivalent.

For additional information about cleaning, refer to the recommendations of the Association for Professionals in Infection Control (APIC), the U.S. Food and Drug Administration (FDA), and the U.S. Centers for Disease Control (CDC). For country-specific cleaning/disinfection concerns, check with your local regulatory infection control authorities.

User Service and Maintenance

GE Healthcare 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 Healthcare 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 5643944-1EN Schedule A/B.

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Chapter 15: Preferences

Preferences allow a super-user with the appropriate level of access to customize the system. The Preferences include:

- 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

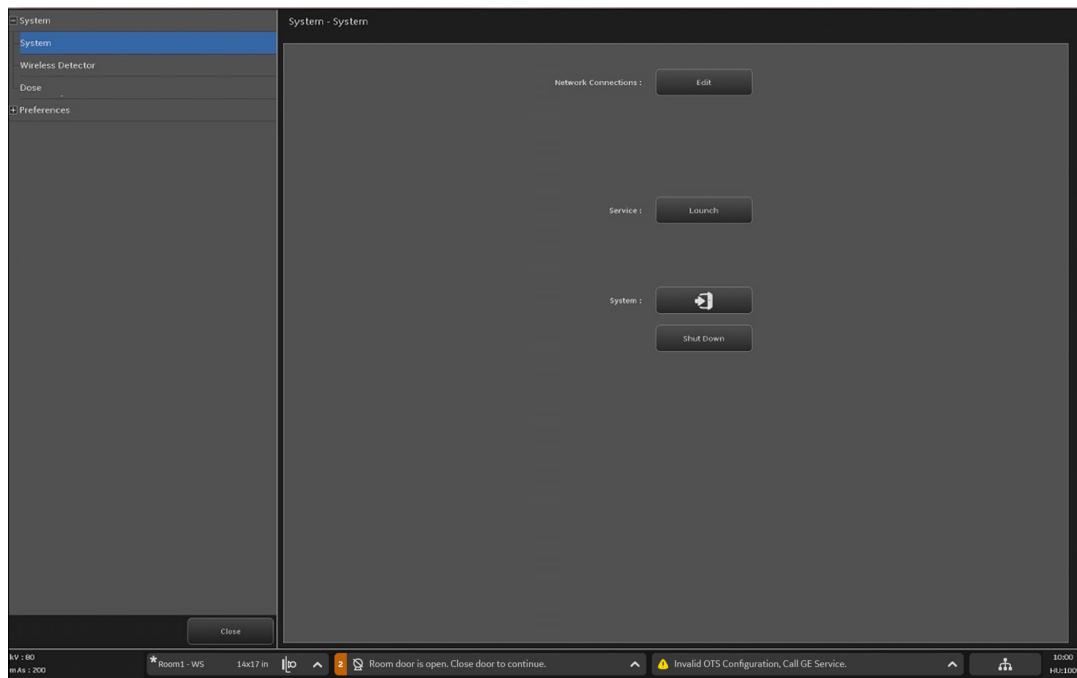
Preferences are set on the Utilities screen, which is accessed by clicking the Utilities button on the Worklist.

Note: You must be logged in with the appropriate level of access in order to set preferences.

Figure 15-1 Utilities button



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.

RRA Reporting Tool

Refer to [Chapter 13: Advanced Applications-Export RRA Data and Report \(p. 13-16\)](#) for information about exporting RRA data.

Dose Reporting Tool

Refer to [Chapter 10: Image Acquisition-Dose Reporting Tool \(p. 10-10\)](#) for information about exporting data.

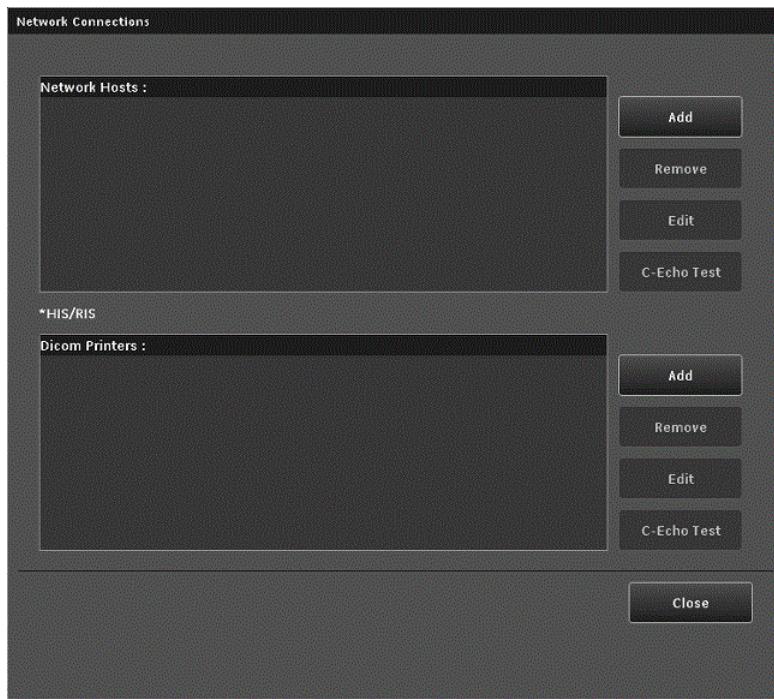
Network Connections

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.

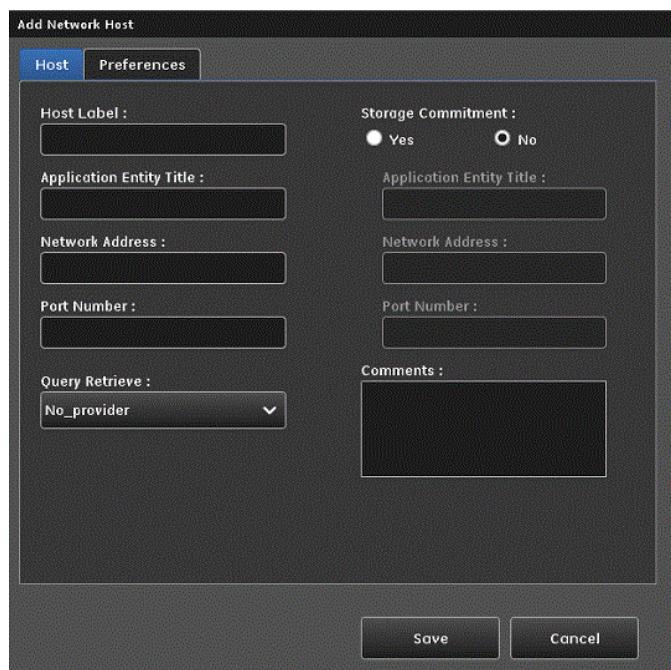
1. On the Worklist screen, click [UTILITIES].
 - The System-System screen appears.
2. Click [NETWORK CONNECTIONS].
 - The Network Connections screen appears.

Figure 15-3 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 15-4](#) and [Figure 15-5](#). [Table 15-1](#) and [Table 15-2](#) describe the fields in detail.

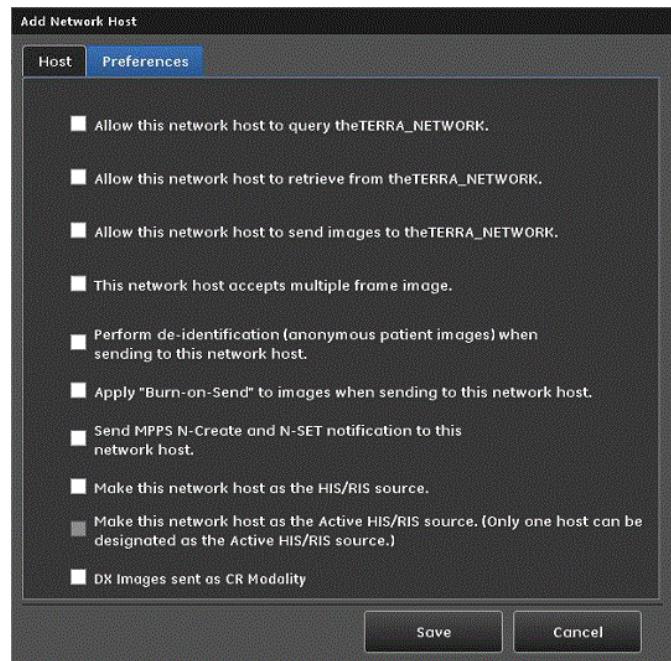
1. Click the appropriate button to add or edit hosts:
 - If editing an existing connection, select the network host and click [EDIT].
 - If adding a new connection, click [ADD].
2. Complete requested information for both tabs (see [Table 15-1](#) and [Table 15-2](#)) and click [SAVE] to add the network host or save the changes.

Figure 15-4 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. Note: 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">• No provider• Study• Patient
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.

Table 15-1 Add Network Host – Hosts tab description

Function	Description
Storage Commitment - Port Number	The port number of the storage database.
Comments	Allows you to add notes about the network host or configuration.

Figure 15-5 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 send 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 Chapter 12: Image Management-Make Exam Anonymous (De-Identify) (p. 12-16) 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.	<p>Optional configuration. With this option, the VOI LUT will be directly applied on the image pixel data (7FE0,0010), the VOI LUT sequence (0028,3010) will be removed from DICOM header, the Window Width (0028,1051) and Window Center (0028,1050) will be updated to normalized values based on the image bits. Window Center will be 32768 for 16 bits image, or 8192 for 14 bits image.</p> <p>Note: The option “Apply “Burn-on-Send” to images when sending to this network host” can be selected when PACS that does not have the capability of reading or applying VOI LUT data.</p>
Send MPPS N-Create and N-Set notification to this network host.	This node acts as the Destination for receiving the MPPS N-Create and 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.	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.
Make this host the HIS/RIS source. (Only one host can be designated as the HIS/RIS source.)	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 “successful” 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:

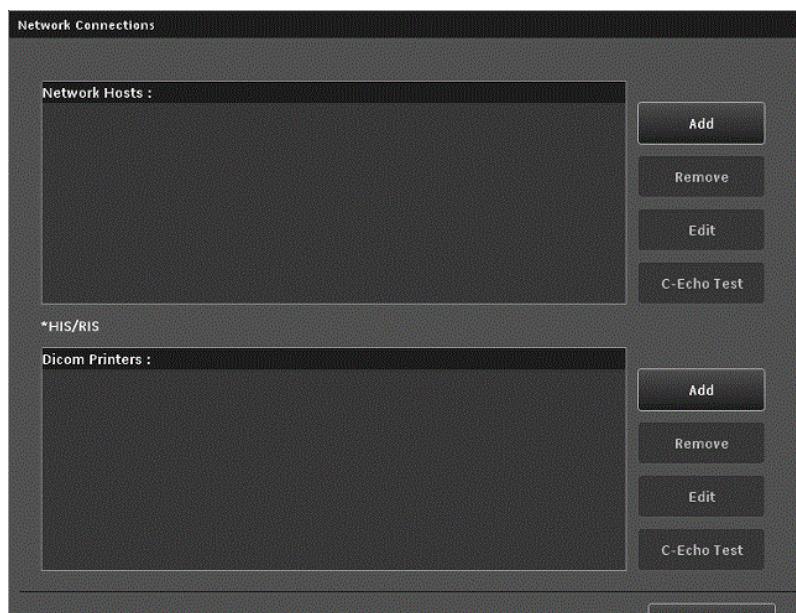
- Re-try the test at a later time. The host may be temporarily unavailable.
- Confirm the host configuration on the Edit screen.
- If the problem persists, contact your technical support group or system administrator.

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 15-6](#)) appears.

Figure 15-6 Network Connections screen



Add or Edit DICOM Printers

Adding and editing printers use very similar process and the same screens shown in [Figure 15-7](#), [Figure 15-8](#), and [Figure 15-9](#). [Figure 15-7](#), [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 15-7](#), [Table 15-4](#), and [Table 15-5](#)) and click [SAVE] to add the printer or save the changes.

Figure 15-7 Add Printer screen – Printer Tab

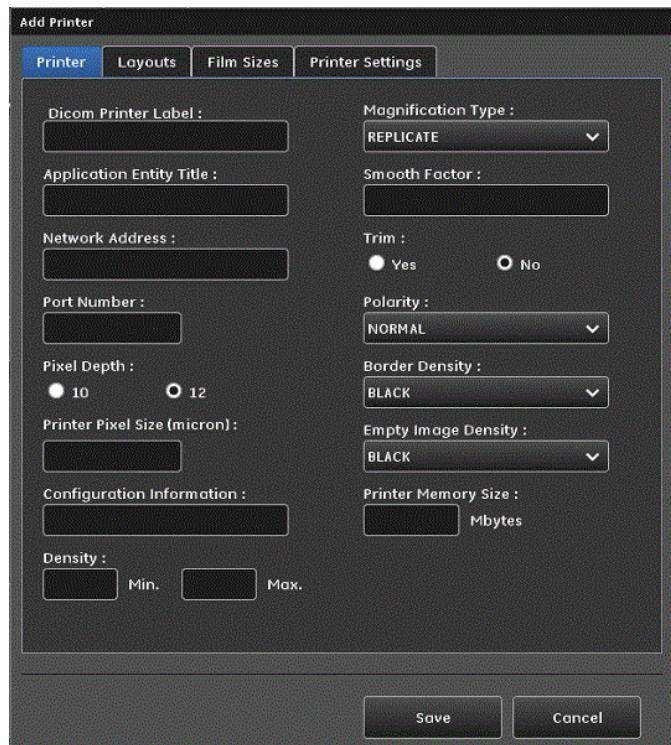
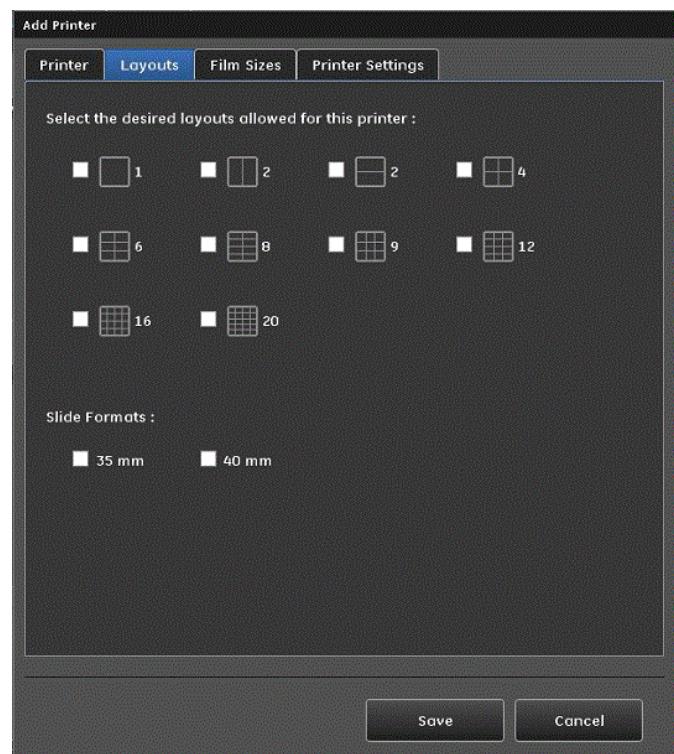


Table 15-3 Add Printer screen– Printer Tab description

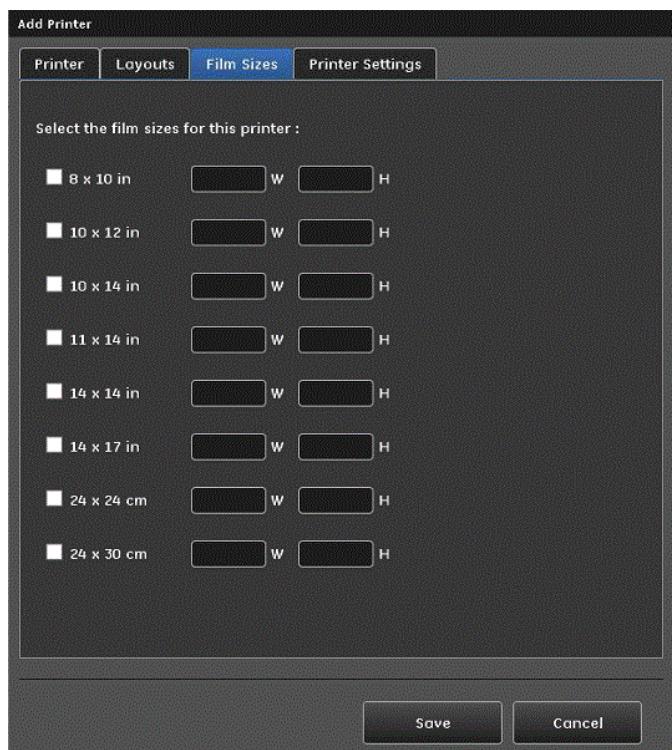
Function	Description
DICOM Printer Label	The name of the printer that appears in the DICOM Printers list and on the print setup screens. Note: DICOM printer labels cannot have spaces in the name. Use underscores (_) to separate words.
Application Entry Title	The DICOM application title.
Network Address	The IP address of the printer.
Port Number	The port number of the printer.
Pixel Depth	The resolution of the printer.

Table 15-3 Add Printer screen- Printer Tab description

Function	Description
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"> • Replicate • Bilinear • Cubic • None
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"> • Normal • Reverse
Border Density	Sets the color of the image border. Available options are: <ul style="list-style-type: none"> • Black • White
Empty Image Density	Sets the color of areas that have no image printed. Available options are: <ul style="list-style-type: none"> • Black • White
Printer Memory Size	Designates the memory size of the printer. This is specified by the printer manufacturer.

Figure 15-8 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 side formats available for the printer, if any.

Figure 15-9 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.

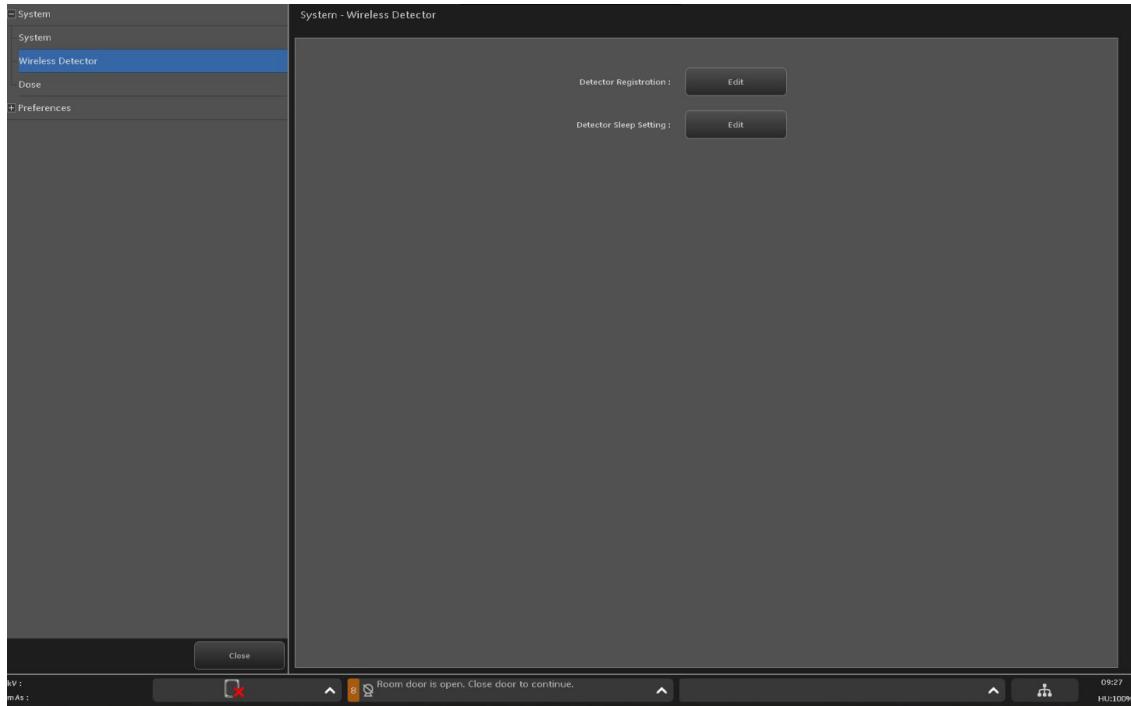
- From the Network Connections screen, select the printer.
- Click [REMOVE].
 - A message appears: "Are you sure you want to remove (printer name)?"
- Click [YES].
 - [CANCEL] closes the message and returns you to the Network Connections screen without removing the connection.
 - The printer is removed.

FlashPad HD Detector

A detector must be registered with the system prior to the first use. Registration is accomplished by placing the detector in the table tray, wall stand tray, charging bin, or connecting the optional tether cord.

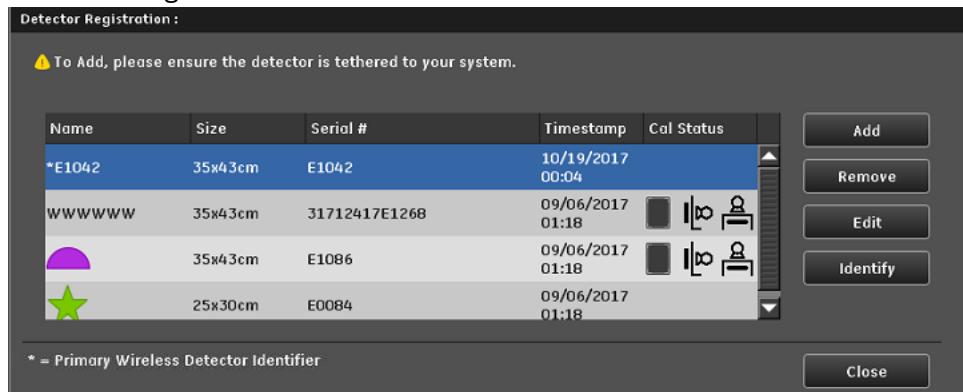
Note: The system will allow up to 10 detectors to be registered to a system.

Figure 15-10 System - Wireless Detector



Detector Registration

Figure 15-11 Detector Registration

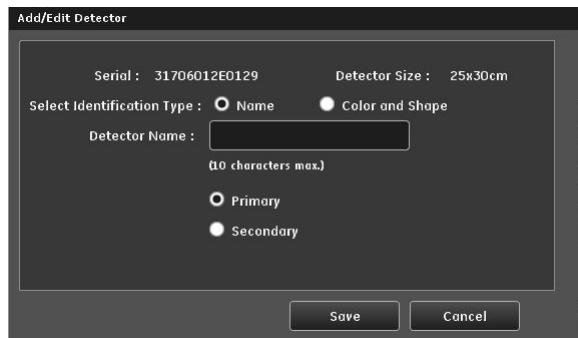


Note: The Primary detector is identified by an asterisk (*).

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 15-12 Add by Name

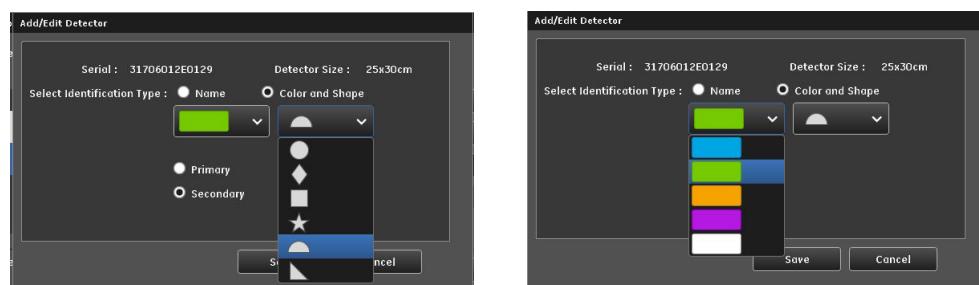


1. Connect the detector you wish to register and wait for successful boot up to take place.
2. Press the [Add] button on the Detector Registration screen.
3. Choose Name for the Select Identification Type.
4. Enter the Digital Detector Name.
5. Choose to make the Digital Detector PRIMARY or SECONDARY.
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: asterix (*), equal sign (=), curly braces ({}), and period (.).

Adding A New Detector Identified By Color and Shape

Figure 15-13 Add By Color and Shape



1. Place the detector you wish to register either in table tray, wall stand tray, charging bin, or connecting the optional tether cord.
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 new Digital Detector **PRIMARY or SECONDARY**.

6. Press [**Save**]. The new Digital Detector is now registered with the system.
7. Apply the label with the appropriate shape and color into the indent on the edge of the Digital Detector.

Removing A Detector

A Digital Detector must be Secondary, not Primary, to remove it from the system. If a Digital Detector is Primary you must change it to Secondary before you can remove it from the system.

1. Select the detector you wish to remove from the system.
2. Press the [Remove] button on the Detector Registration screen
3. Make sure the Digital Detector is Secondary, not Primary.
4. Press [Save]. The Digital Detector is now removed from the system.

Detector Pairing

In order for the detector and host system to communicate with each other, they must be “paired”. This means that they are linked and creates a secure connection to transfer data back and forth between each other. The pairing process allows registered digital detectors to connect wirelessly to the host system.

Note: The digital detector can only be paired with one system at a time to prevent inadvertent connection to another nearby system.

Note: Pairing the detector with another system will only be successful if the detector was previously registered with that system.

Pairing Instructions

As a part of Detector Registration:

Pairing occurs automatically during the Detector Registration Add/Edit process. See [Detector Registration](#) (p. 15-13)

Following the Registration process, the digital detector is ready for use with the system.

When sharing a registered detector with another system:

Sharing is the ability to move registered, compatible detectors between systems. When sharing, you are able to use a detector on multiple systems with no additional configuration required. The act of sharing only requires pairing to be done between the detector and the system to ensure the detector is ready to connect wirelessly to that system.

Pairing a detector can be done the following ways:

- Optional tether:



Connect the detector you wish to pair to the system with the tether. The detector will automatically pair to the system and can then be used for imaging.

- Optional charging bin:



Place the detector you wish to pair into the system bin. The detector will automatically pair to the system and can then be used for imaging.

- Table tray:



Place the detector you wish to pair into the table tray. The detector will automatically pair to the system and can then be used for imaging.

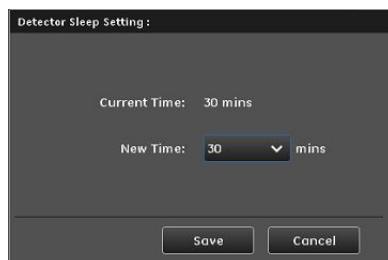
- Wall stand tray:



Place the detector you wish to pair into the wall stand housing. The detector will automatically pair to the system and can then be used for imaging.

Detector Sleep Time

Figure 15-14 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 out 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: For primary detector in wireless mode (portable), the detector sleep time shall be set as above.

For secondary detector, or primary detector in charging bin, the detector shall be by default 15min and not using system setting.

For detector in table/wall stand housing, or tether, does not involve sleep time setting.

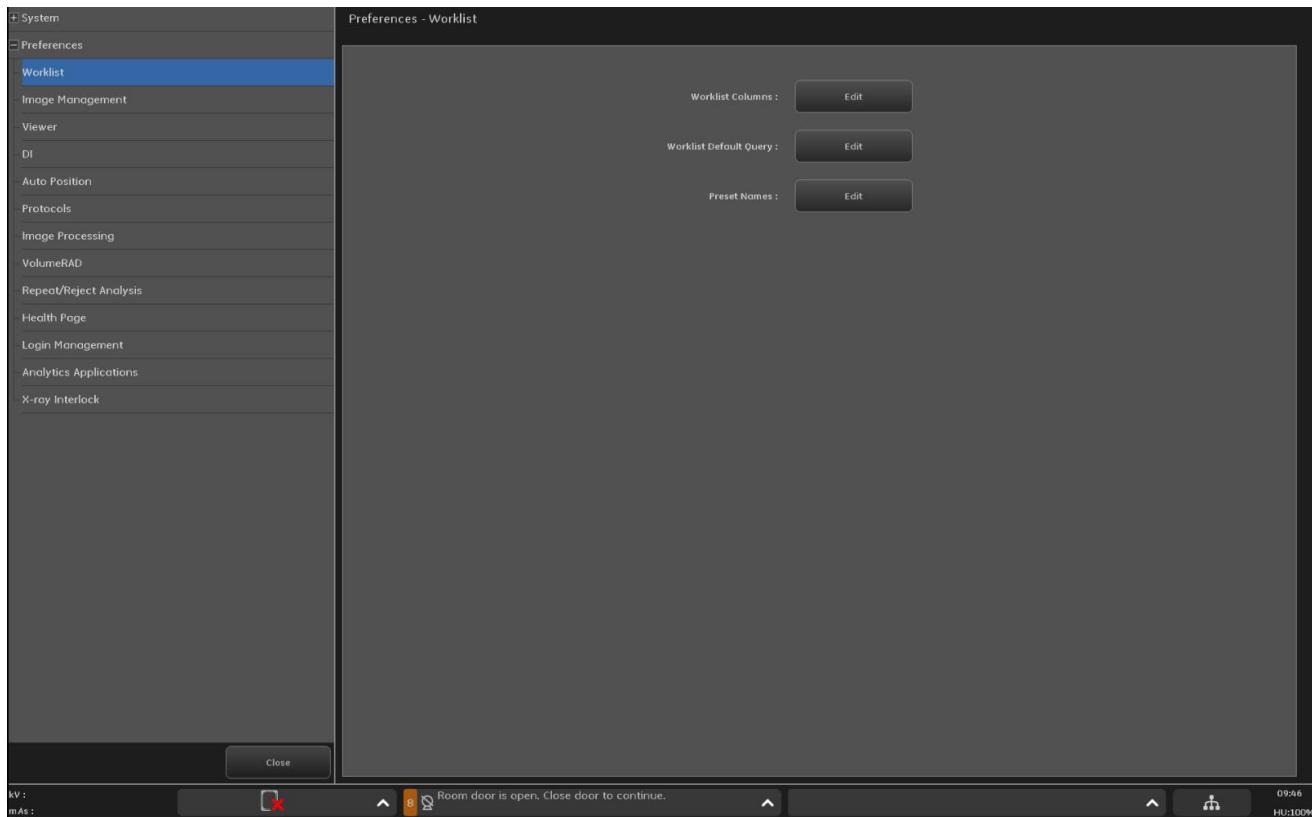
Worklist

Worklist preferences are available from the Utilities screen.

1. On the Worklist screen, click [UTILITIES].

2. Select **Preferences > Worklist**.

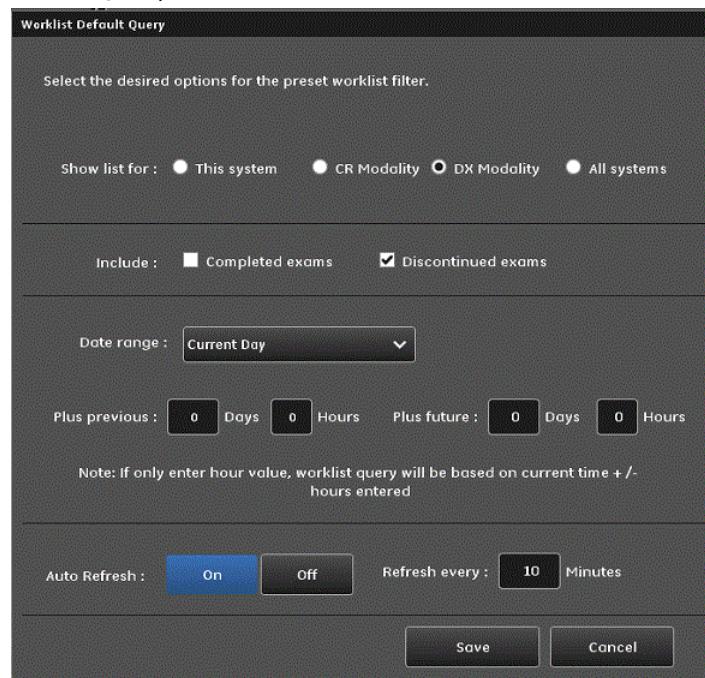
Figure 15-15 Preferences – Worklist screen



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 15-16](#)). [Table 15-6](#) describes the fields in detail.
2. Click [SAVE] to change the Default Query.

Figure 15-16 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"> • This system – exams for this unit only • CR modality – exams for Computed Radiography. • DX modality – exams for Digital X-ray. • All systems – exams for all modalities
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"> • All • Current Day
Plus previous __ Days __ Hours	Shows procedures that are scheduled for the specified time before the selected date range. Note: 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. Note: If the “Days” value is left blank, the worklist query will be based on current time minus the number of hours entered.

Table 15-6 Worklist Default Query description

Function	Description
Auto Refresh [ON] [OFF]	Turns Auto Refresh on or off. Refer to Auto Refresh (p. 15-20) for more information.
Refresh every __ Minutes	If Auto Refresh is [ON], sets how often (in minutes) the Worklist refreshes. The interval may be between 6 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. The system will refresh more often, but each refresh will take less time to complete.

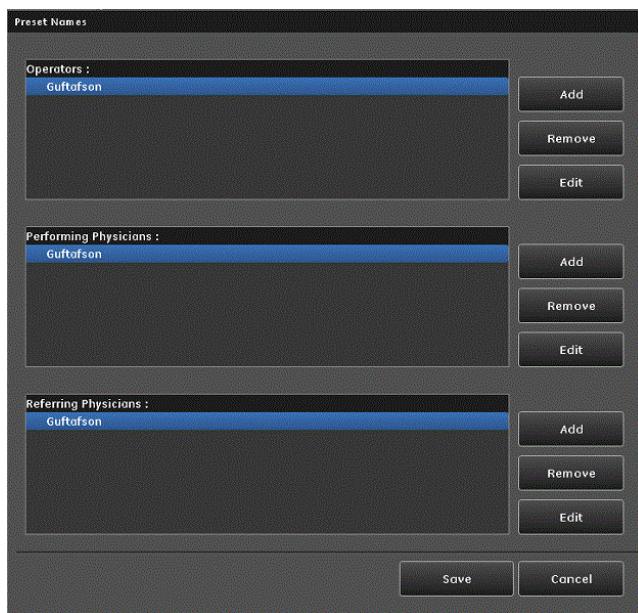
Preset Names

The Preset Names screen ([Figure 15-18](#)) 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 15-17](#)). Operator names must be created if RRA is enabled. Refer to [Chapter 13: Advanced Applications-Repeat/Reject Analysis \(RRA\) \(p. 13-15\)](#) for more information.

Figure 15-17 Drop-down lists on the Add Patient screen

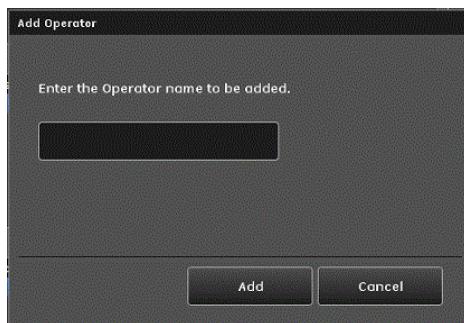
Follow the procedures below to Add, Edit, or Remove Preset Names.

1. When finished, click [SAVE] to retain the changes.

Figure 15-18 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.

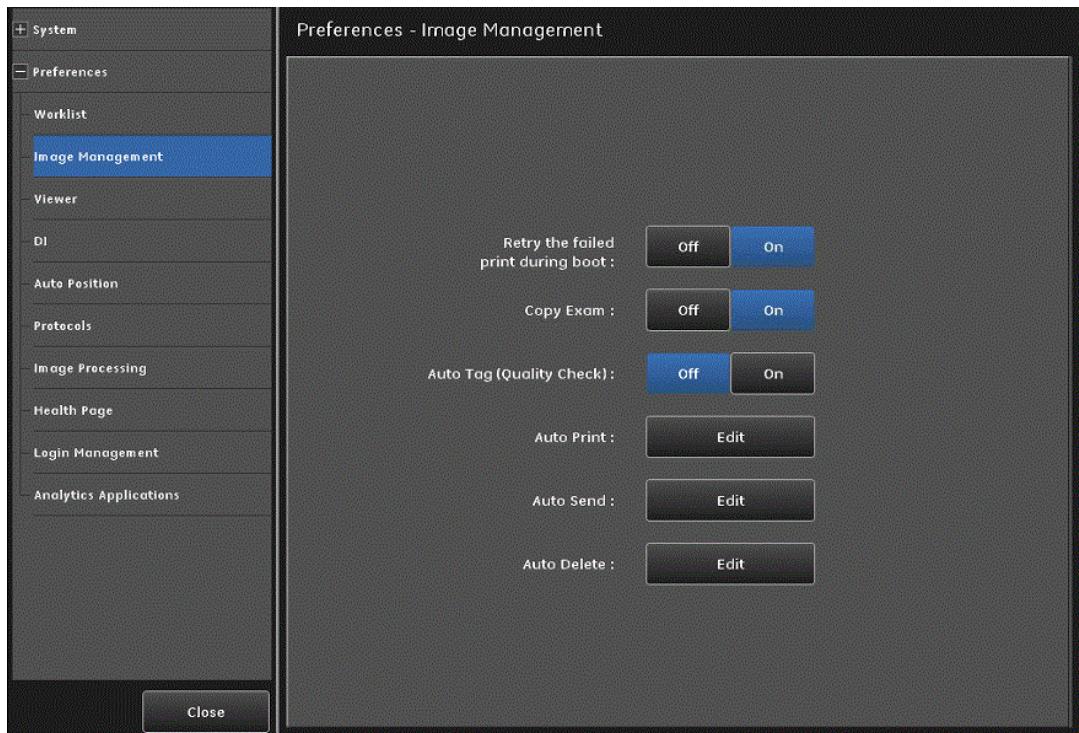
2. Click [REMOVE] for the group.
 - Click [OK] to remove the name.
 - Click [NO] to keep the name.



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 15-19 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 \(RRA\) \(p. 13-15\)](#) 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 lets you 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 the following table.
5. Click [SAVE], then click [CLOSE].

Figure 15-20 Auto Print

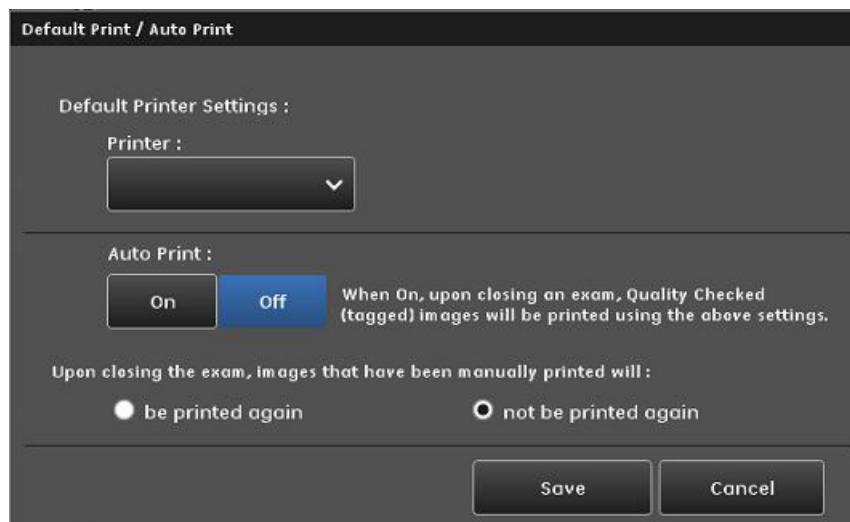


Table 15-7 Auto Print Functions

Function	Description
Printer	Lists the printers and laser cameras connected to your system.
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.

Table 15-7 Auto Print Functions

Function	Description
[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 Healthcare 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 Healthcare Service personnel can 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.

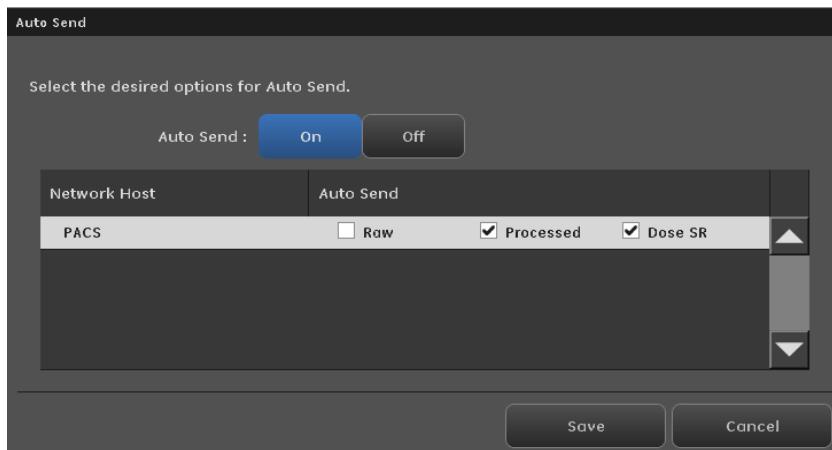
Note: When “Orthopedic Print” is selected as the Print Mode, all images printed through Auto Print will have magnification applied.

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 15-21 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 Network Connections (p. 15-3) 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. Dose SR can be configured whether sending Dose Report automatically or not when RDSR - Radiation Dose Structured Reports (Options) is enable in SUIF-Configuration. For more detail, please contact service center.
[SAVE]	Saves your selections as the default settings and closes the Auto Send screen.
[CANCEL]	Closes the screen without saving your changes.

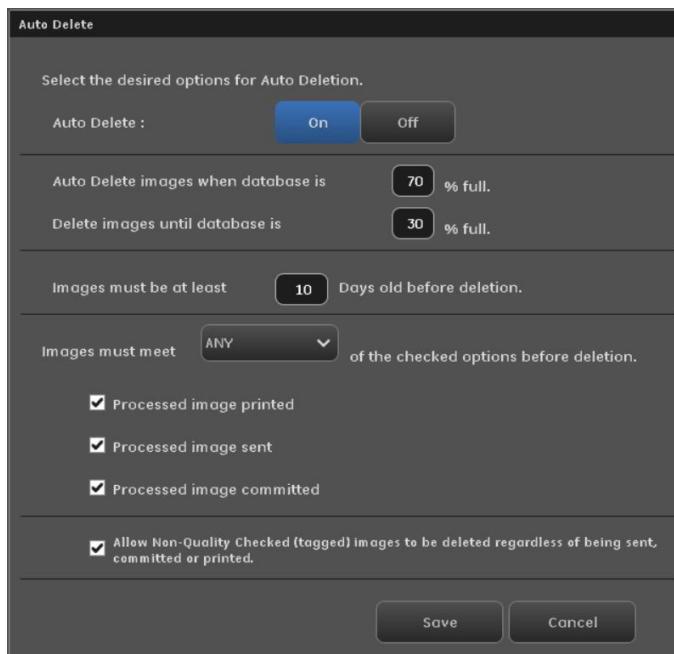
Auto Delete

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.

- From the Worklist screen, click [UTILITIES].
- Select **Preferences > Image Management**.
- Click Auto Delete [EDIT].
 - The Auto Delete screen appears.
- Complete the information as described in the following table.

5. When finished, click [SAVE] to retain your changes.
6. Click [CLOSE].

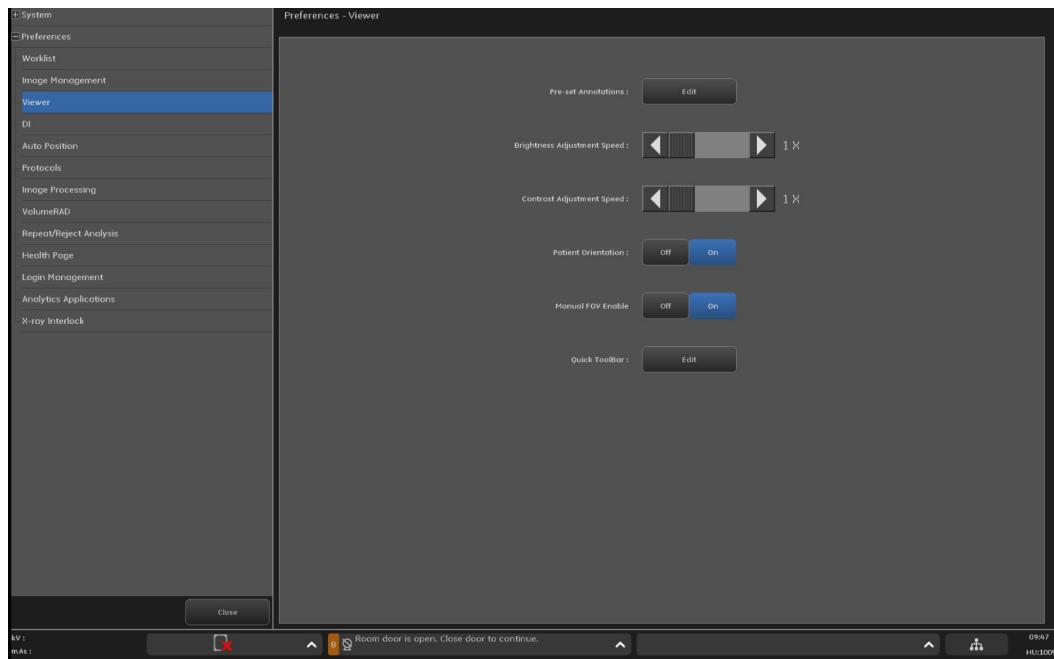
Figure 15-22 Auto Delete**Table 15-9** Auto Delete functions

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.
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"> • All • Any • None
Processed image printed	Selecting the Print parameter allows auto deletion of images that have been printed.

Table 15-9 Auto Delete functions

Function	Description
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. Note: 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 15-23 Preferences - Viewer screen

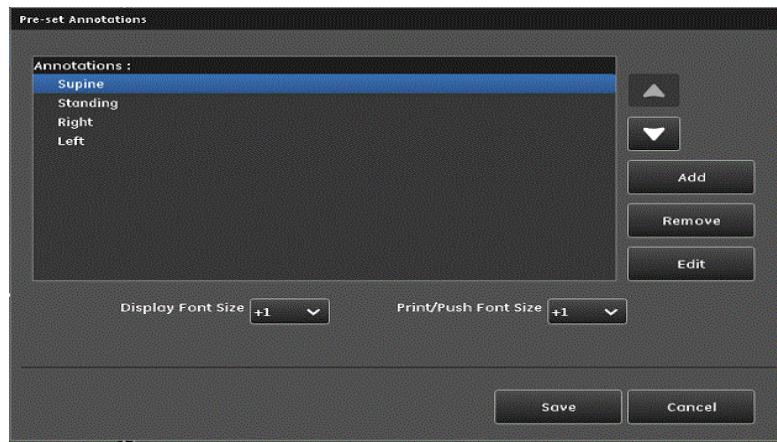
Configure Pre-set Annotations

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 appears.

Figure 15-24 Pre-set Annotation editing



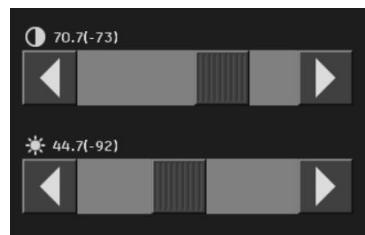
4. Adjust the speed of brightness and contrast.
 - There are five grades in the speed of brightness and contrast.

Figure 15-25 Brightness and Contrast Adjustment Speed



- The selected grades will influence the speed of brightness and contrast in Viewer screen.

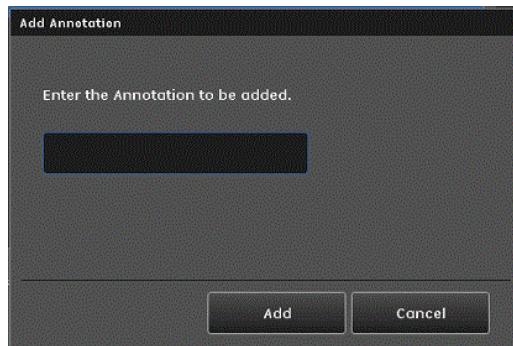
Figure 15-26 Grades in the speed of brightness and contrast Viewer screen



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 \(p. 15-30\)](#), [Edit Pre-set Annotation \(p. 15-30\)](#), or [Remove Pre-set Annotation \(p. 15-30\)](#).
8. When finished, click [SAVE] to retain your changes.
9. Click [CLOSE].

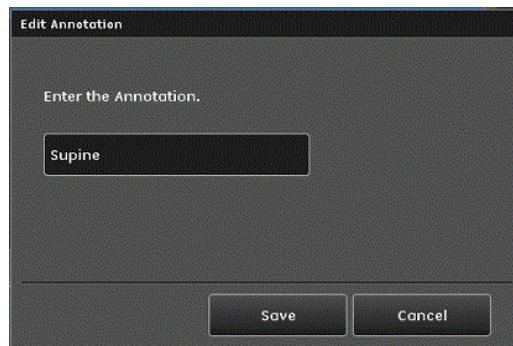
Add Pre-set Annotation

1. From the Pre-set Annotations screen, click [ADD].
2. Enter the text of the annotation.
3. Click [ADD].



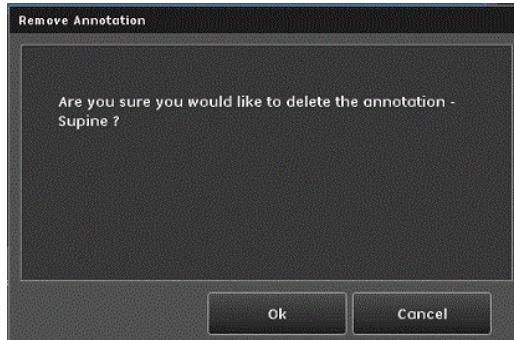
Edit Pre-set Annotation

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].

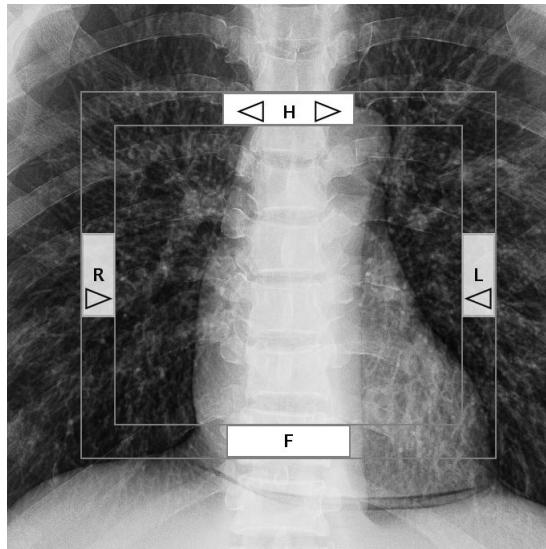


Patient Orientation Frame

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 ON. The default setting can be changed to OFF via the Preferences menu.

Figure 15-27 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.

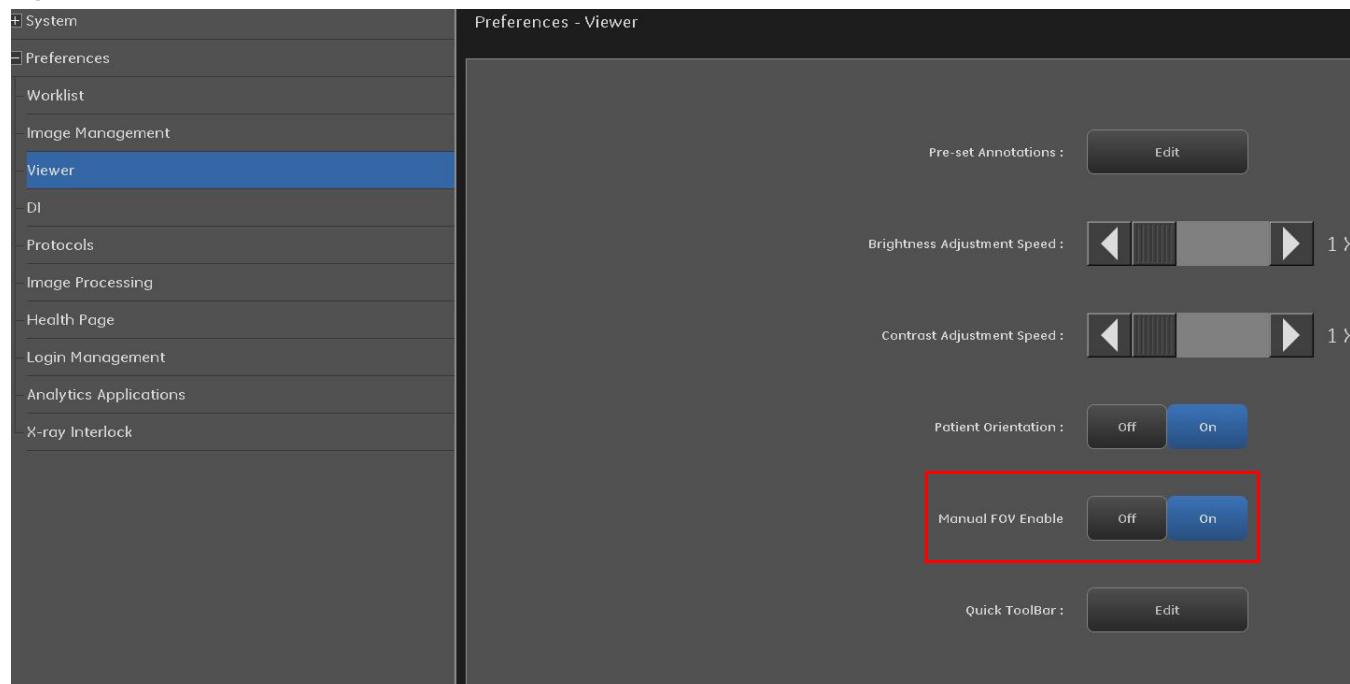
When used in the Image Viewer mode, changes made with the Patient Orientation Frame will create a new second image when saved at closing. The new image will have the new DICOM orientation tag and a private DICOM tag with the original orientation of the original image.

Manual FOV Enable

Auto FOV can be enabled within each protocol. To activate, auto FOV option Utilities>Preferences>Viewer: Manual FOV enable/disable.

By default, manual FOV enable is ON. Having this engaged, a users adjusted collimation will be maintained throughout the same protocol. Changes include: different receptor, view, patient size or AEC/FIXED mode.

Figure 15-28 Manual FOV Enable



Quick Tool bar Edit

Click on the Edit button. A new screen will open and allow you to select the default Quick Toolbar icons that will become the default for all users.

Figure 15-29 Quick Tool Bar Edit

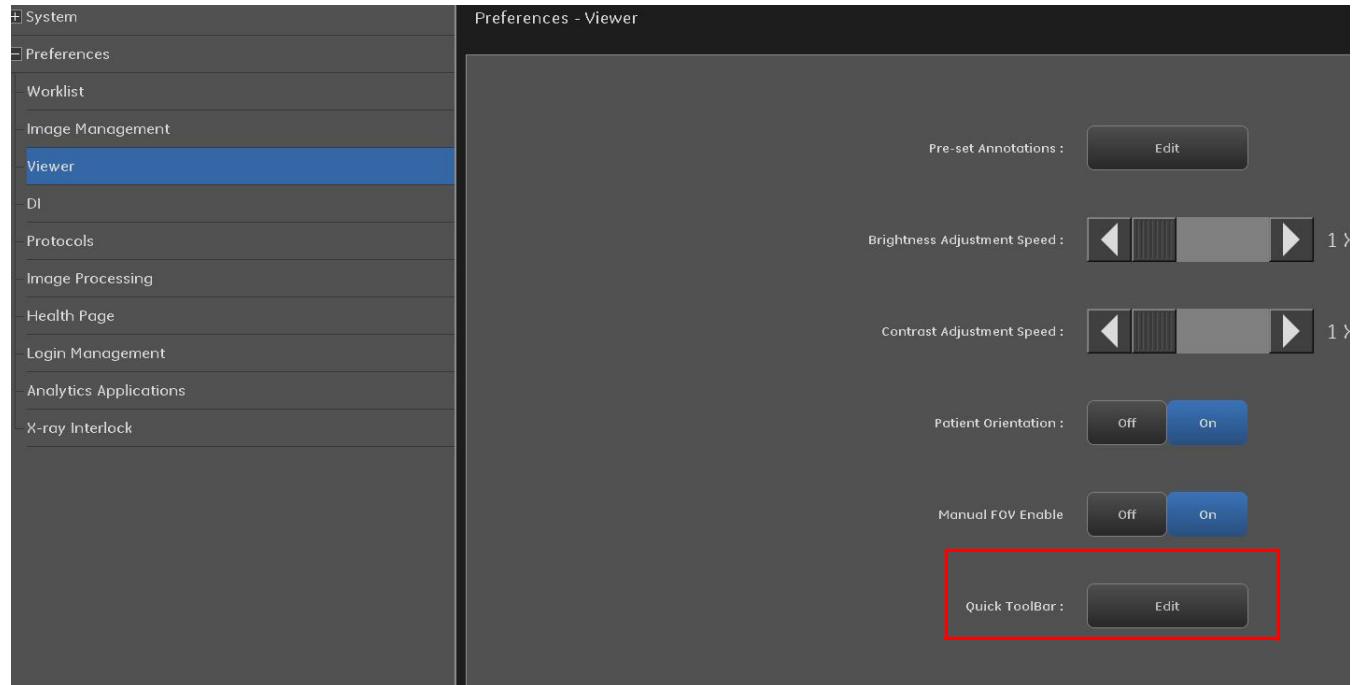


Figure 15-30 Viewer Quick Tools Screen

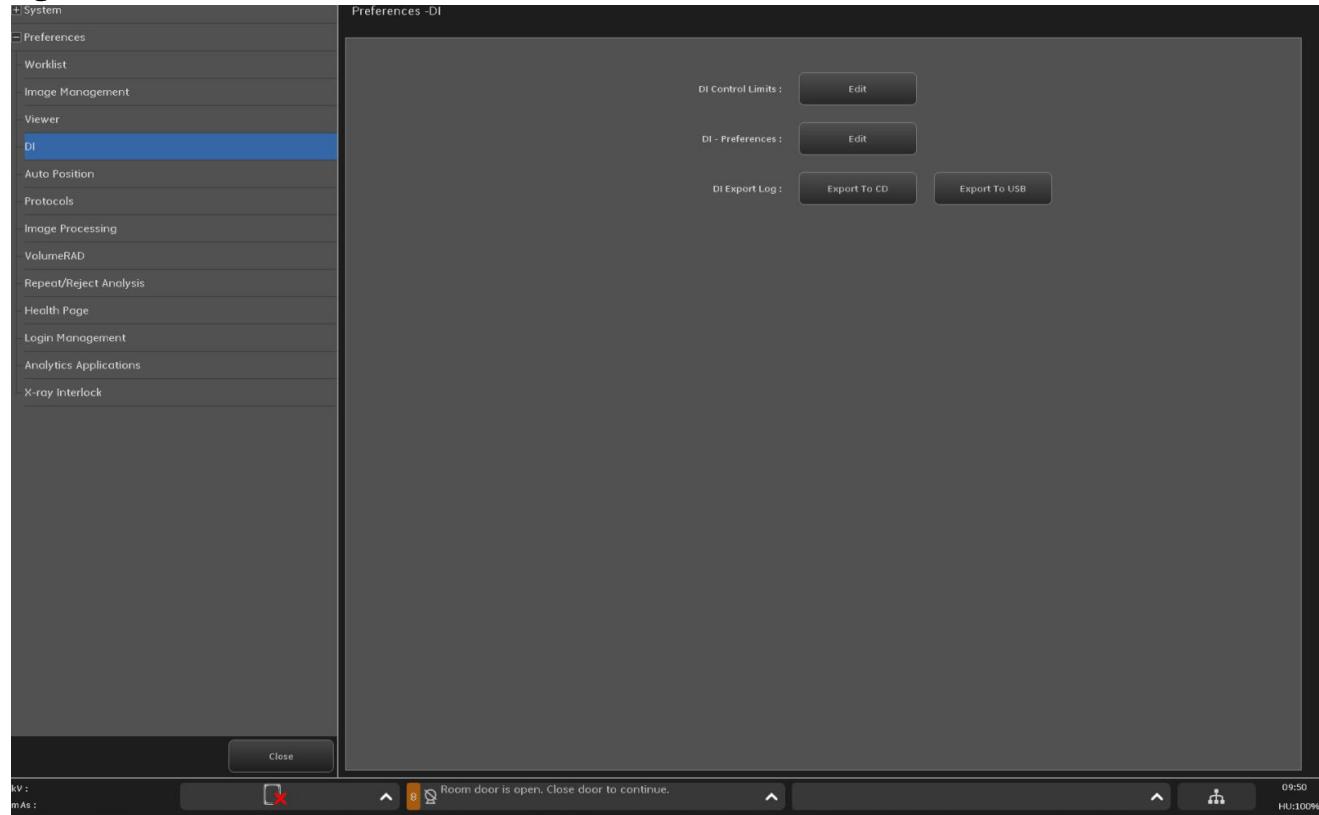


The order of the icons cannot be rearranged. You can only select which default tools will be engaged.

Quick Toolbar customization will reflect once a user opens a live exam and acquires an image or if a user reviews a completed exam through the Image Management screen.

DI (Deviation Index)

Figure 15-31 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 15-32 Preferences - DI Control Limits

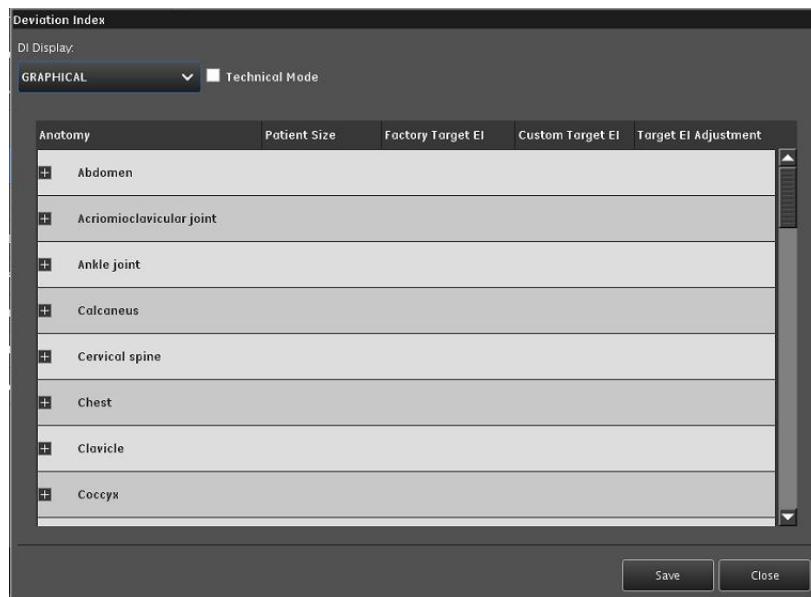
The DI Control Limits screen lets you customize your DI Control Limits, as well as the DI Control Range Suggestions.

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 appears.
4. Continue with [Change the DI Display \(p. 15-36\)](#) or [Change the Target EI \(Exposure Index\) \(p. 15-37\)](#).

Figure 15-33 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:

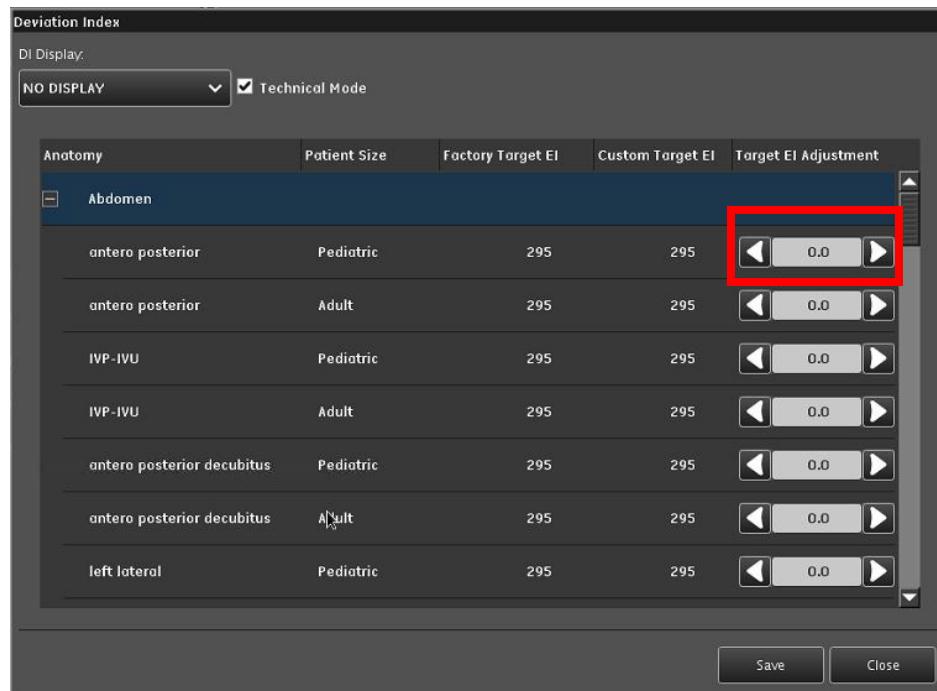
– No Display		In this example, there is no DI information displayed on the Image Viewer screen.
– Numerical		In this example, only numerical DI information is displayed on the Image Viewer screen.
– Graphical		In this example, DI information is displayed both numerically and graphically on the Image 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 15-34 Change the Target EI.

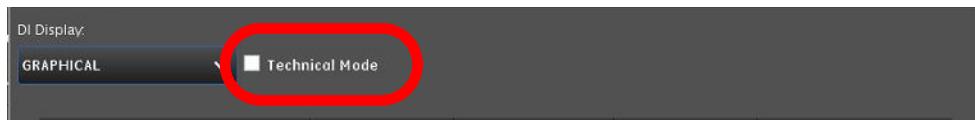


Enable or Disable Technical Mode

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 about 10% central area of the image (1106 pixels x 1348 pixels for 14 x 17 in detector, or 784 pixels x 942 pixels for 10 x 12 in detector, 1348 pixels x 1348 pixels for 17 x 17 in detector.) 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 15-35) 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 15-35 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.

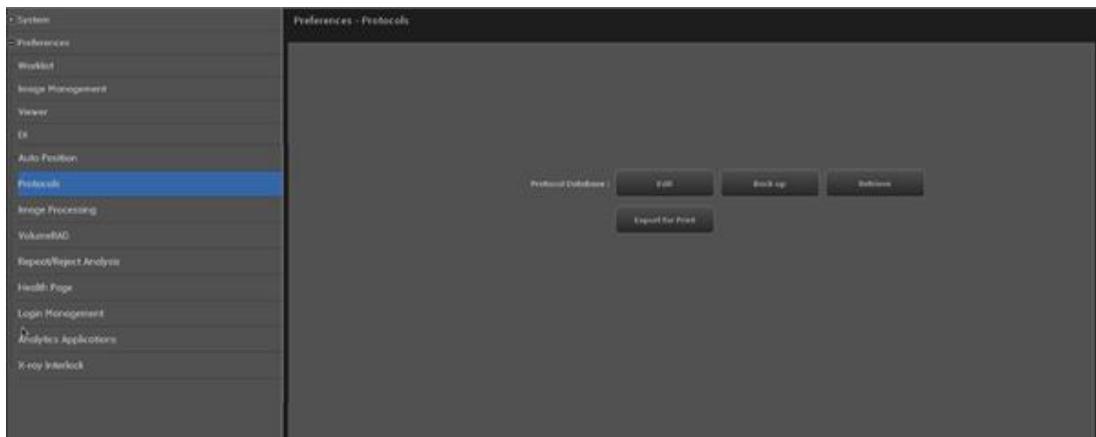
1. Insert a blank CD-R, DVD-R and USB disk.
2. From the Worklist screen, click [UTILITIES].
3. Select **Preferences > DI**.
4. Click the **DI Export Log** [EXPORT] or [EXPORT TO USB] button.
5. Remove the disk when export is complete.

Auto Position

The Exam preferences configure settings for Auto Positioning. Refer to [Chapter 13: Advanced Applications-Auto Positioning \(p. 13-5\)](#) for more information.

Protocols

Protocols preferences allow you to create backup copies of the protocol database, retrieve saved backups, and create new protocols.

Figure 15-36 Preferences - Protocols screen

Backup Protocol Database to CD(DVD) or USB

The Backup function allows you to save the entire protocols database (parameters) to a CD(DVD) or USB. 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(DVD) or USB.

Note: Use a new CD-R, DVD-R or USB 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 the storage media into the disk tray or USB port.
2. From the Worklist screen, click [UTILITIES].
 - The Utilities screen appears.
3. Select Preferences > Protocols.
4. Click [BACK UP]. Make your selection of blank media to use.
 - 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].

Retrieve Protocol Database from CD(DVD) or USB

The Retrieve function allows you to recover a protocol database that was saved to a CD(DVD) or USB.



CAUTION Recommend not to retrieve protocol database from other products.

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(DVD) or USB.

1. From the Worklist screen, click [UTILITIES].
 - The Utilities screen appears.
2. Select Preferences > Protocols.
3. Insert the CD/DVD or USB media with the saved protocols database into the tray or USB 3.0 port.
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.

Export for Print

The Export for Print function allows you to export the protocol database (including technique parameters) to a CD(DVD) or USB Device. The exported electronic files contain both .xls and .csv files that you can review on your personal computer. The following two modes are exported in the .xls file:

- Full Mode which contains all protocol data with APA codes (if applicable).
- Print Friendly Mode which only contains the default protocols data, and pre-formatted to fit A4 paper or Letter paper when printed.

The .csv file will only contain the Full Mode data set.

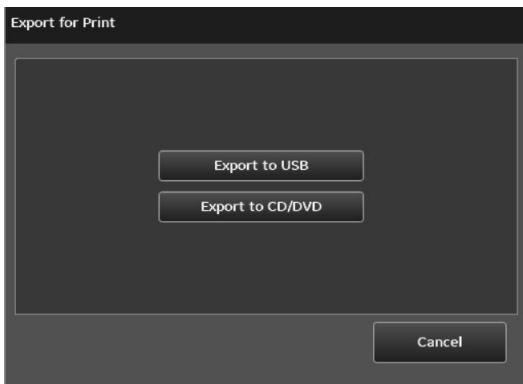
Note: Always use a new, blank CD-R or DVD-R disc for each export.

Note: DO NOT use re-writable (CD-RW or DVD-RW) disc. The system cannot write to this type of disc.

Follow this process to export protocol database for print to a CD(DVD) or USB Device.

1. Attach a CD/DVD drive or compatible USB memory device into a USB 3.0 port.
2. If using a CD/DVD drive, insert a blank CD-R or DVD-R disc into the external drive.
3. From the Worklist screen, press [UTILITIES].
 - The Utilities screen appears.
4. Select Preferences > Protocols.
5. Press [Export for Print].
6. A selection appears on screen to choose either:
 - Export to USB.

- Export to CD/DVD.



7. When the export is completed, a message appears: "The protocol database export operation is successful."

8. Remove the disc or USB from the drive.

Edit Protocol Database

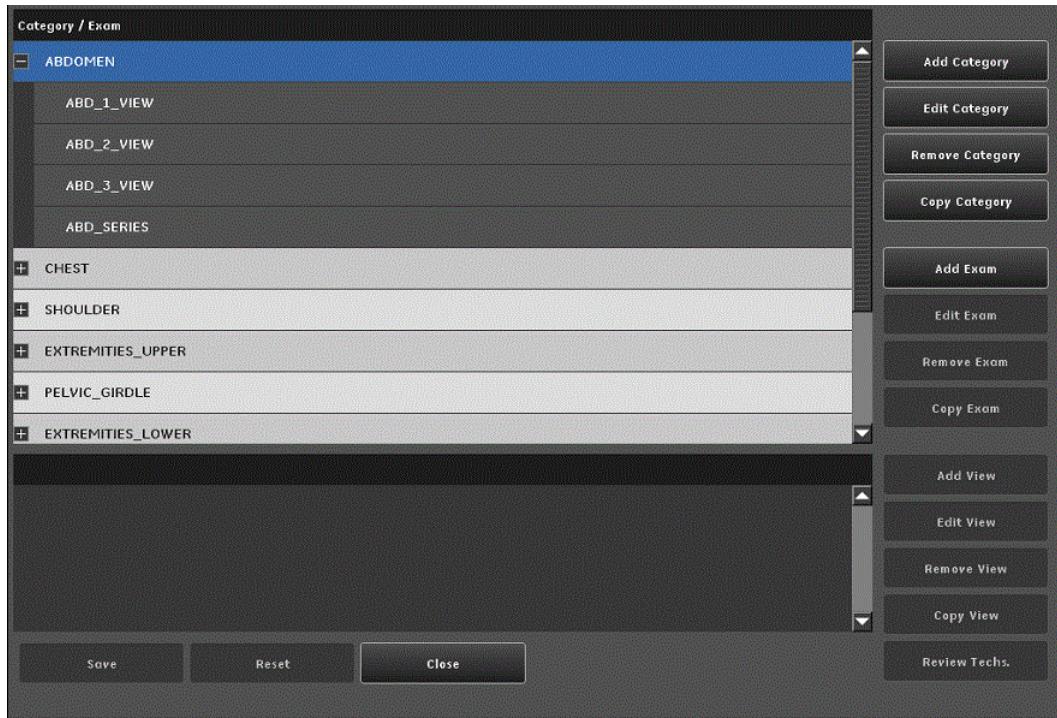
The Protocol Editor allows you to create custom acquisition protocols. Use this screen to create, edit, or remove categories, exams, and views.

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(DVD) or USB before and after custom changes are made. Refer to [Backup Protocol Database to CD\(DVD\) or USB \(p. 15-39\)](#) 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.
4. Continue with [Add or Edit Category \(p. 15-42\)](#), [Add or Edit Exam \(p. 15-43\)](#) or [Add or Edit View \(p. 15-44\)](#)

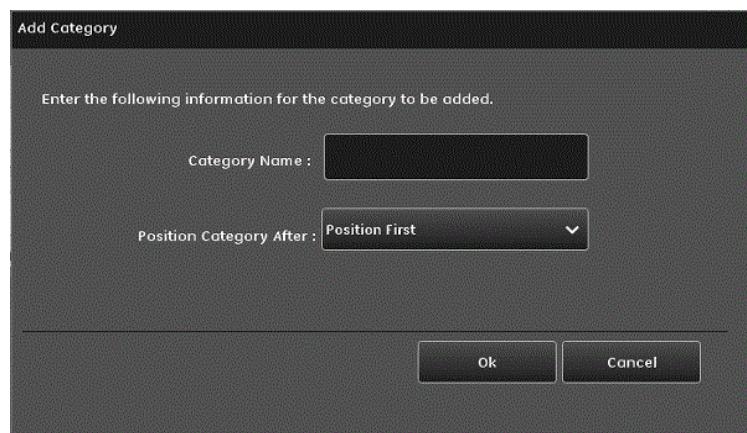
Figure 15-37 Exam Menu

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 Category] or [Edit Category].
 - 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 \(p. 15-43\)](#).

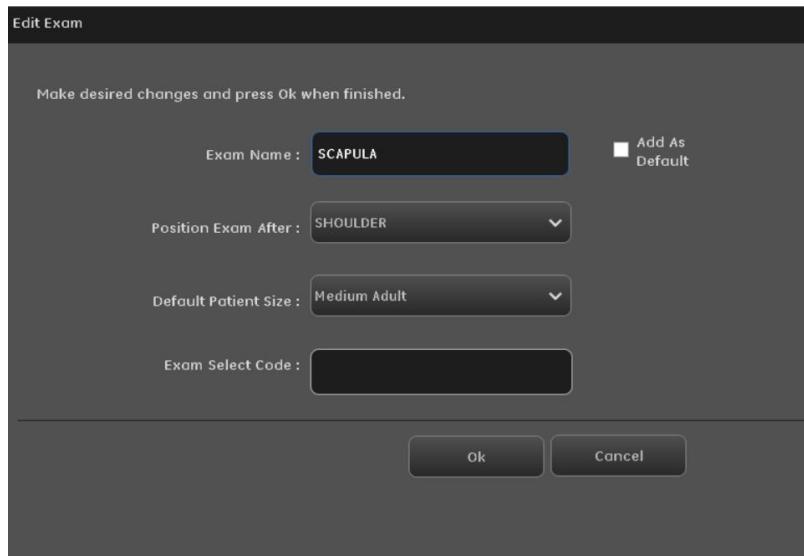
Note: Exams and views must be added or copied into the new category in order for it to be fully functional.

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 opens.



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\(DVD\) or USB \(p. 15-39\)](#) for more information.
7. Click [OK].
 8. Continue with [Add or Edit View \(p. 15-44\)](#).

Note: Exams must be populated with new or copied views after creation in order to be fully functional

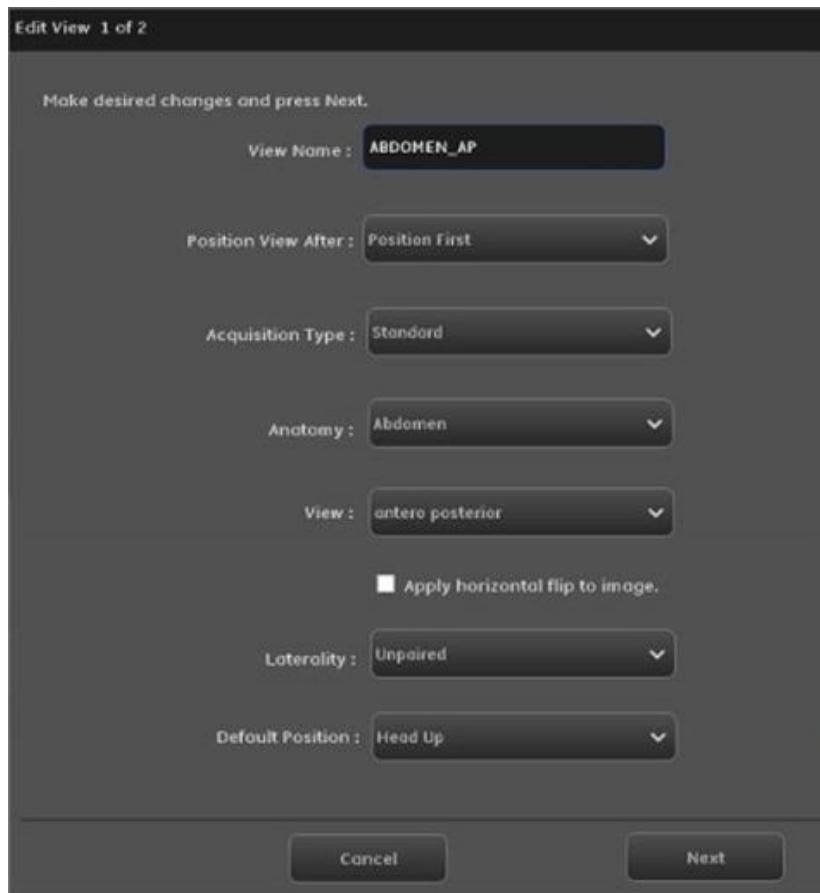
Add or Edit View

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 Edit View 1 of 2 screen opens.

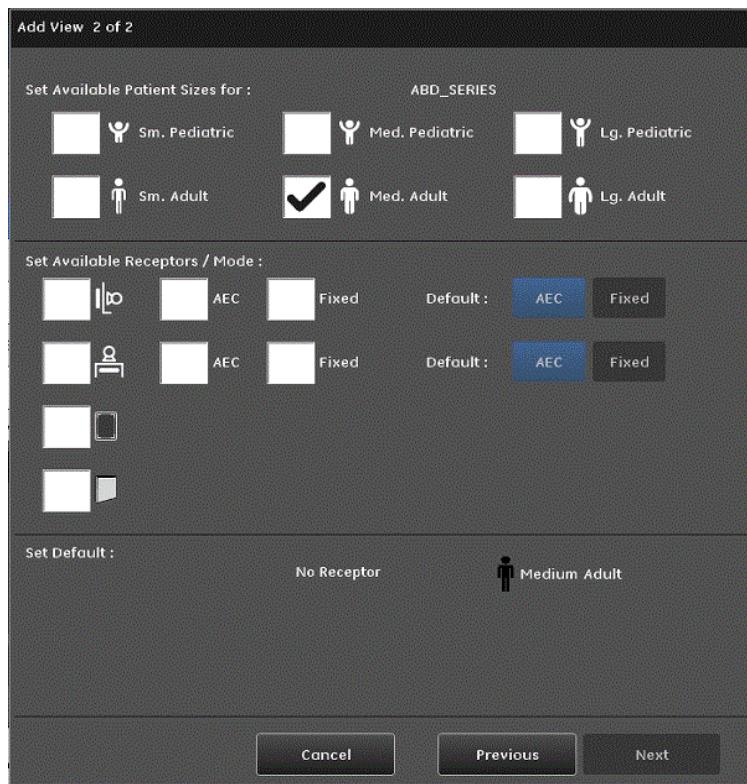


4. Type a **View Name**. Do not use spaces. Use underscores (_) to separate words.
5. From the **Position View After** drop-down list, select the placement of the view within the exam.
6. Select the **Acquisition Type**.
 - Available options are:
 - Standard

- Bone
 - Soft Tissue
 - Image Pasting (if enabled on your system) (Refer to [Chapter 13: Advanced Applications-Auto Image Paste \(Option\) \(p. 13-20\)](#) for more information.)
7. Check if **horizontal flip** is to be applied when displaying the image.
 8. 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.
 9. Select the most appropriate **View** (AP, Lat, etc.).
 - The selected anatomy determines which views are available.
 10. Select the **L 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-Acquire AEC Images \(p. 10-29\)](#) 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].

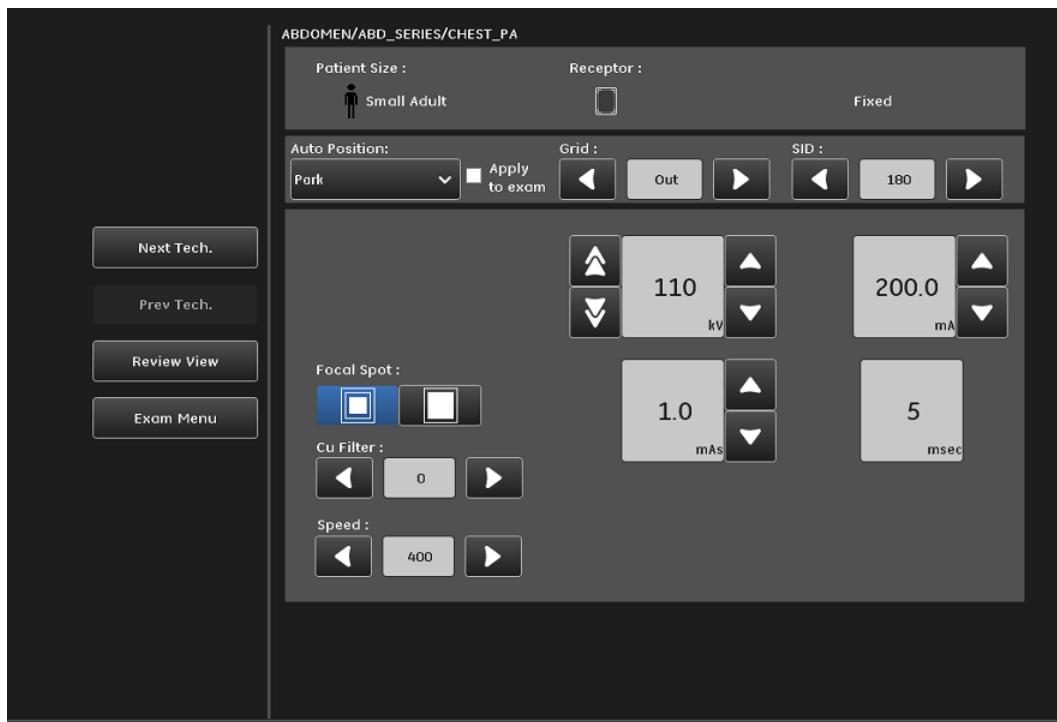
- The Review screen appears.

ABDOMEN / ABD_SERIES / CHEST_PA		kV	mA	mAs (fixed only)	msec (b = back-up time)	Speed	SID	Ion Chamber (as only)	Focal Spot	Cu Filter	Grid	Asymm. Collim.	Auto Position
Standard Acquisition													
Small Adult	Fixed	110	200	1	5.0	400	180	N/A	Small no	Out	Off	Park	
Med Adult	Fixed	120	320	2	6.25	400	180	N/A	Large no	Out	Off	Park	
Large Adult	Fixed	120	500	3.2	6.4	400	180	N/A	Large no	Out	Off	Park	
Small Ped	Fixed	65	100	0.8	8.0	800	180	N/A	Small no	Out	Off	Park	
Med Ped	Fixed	70	100	0.8	8.0	640	180	N/A	Small no	Out	Off	Park	
Large Ped	Fixed	75	100	1	10.0	500	180	N/A	Small no	Out	Off	Park	
Small Adult	AEC	110	200	N/A	5.0	400	180	LR	Small no	180	Off	WS-V...	
* Med Adult	AEC	120	320	N/A	6.25	400	180	LR	Large no	180	Off	WS-V...	
Large Adult	AEC	120	500	N/A	6.4	400	180	LR	Large no	180	Off	WS-V...	
Large Ped	AEC	75	100	N/A	10.0	500	180	LR	Small no	180	Off	WS-V...	
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 15-38 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 = 0.25
- 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.

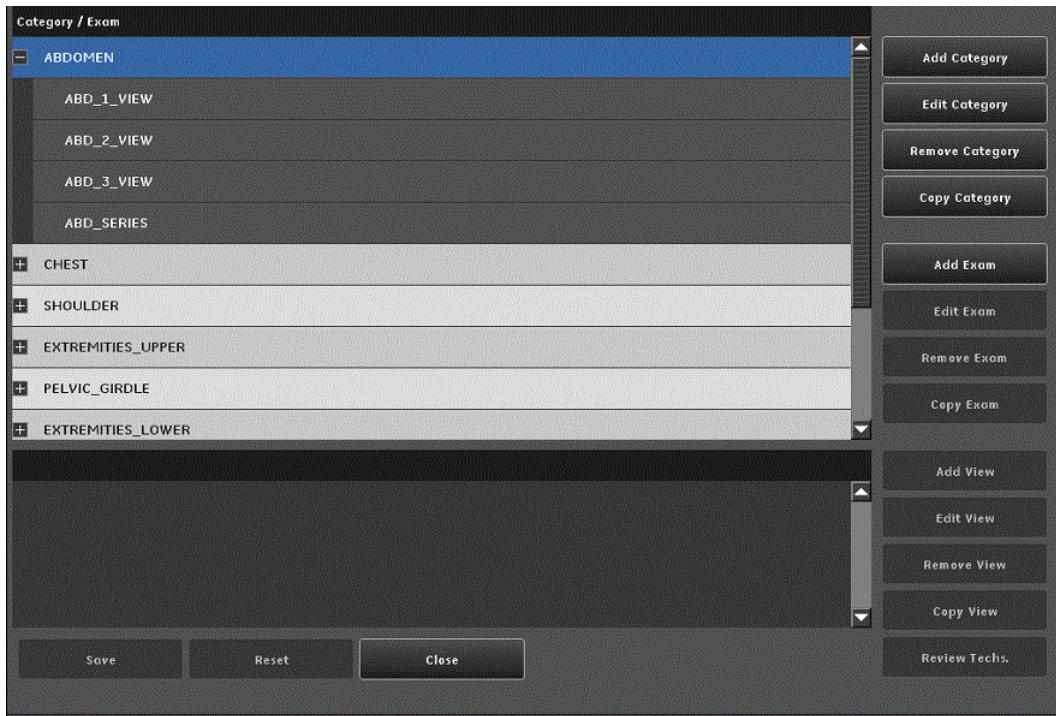
7. Click [CLOSE].
 - A message appears: “Changes have been made to the Protocol Database. Would you like to save these changes?”
8. Click [YES].
 - The Exam Menu screen closes and returns you to the Preferences - Protocols screen.
9. Back up the protocol database when you are finished. Refer to [Backup Protocol Database to CD\(DVD\) or USB \(p. 15-39\)](#) 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.

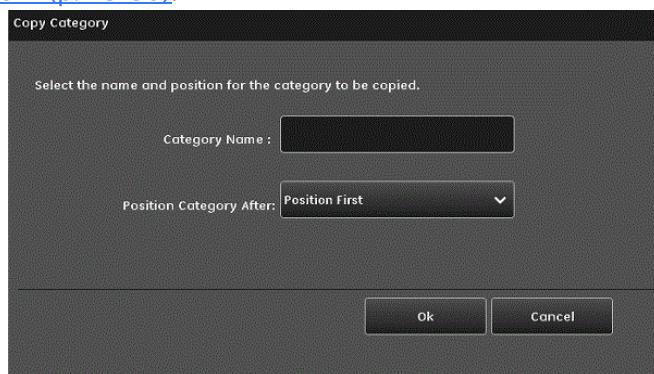
Figure 15-39 Exam Menu



- Continue with [Copy Category \(p. 15-50\)](#), [Copy Exam \(p. 15-50\)](#), or [Copy View \(p. 15-51\)](#).

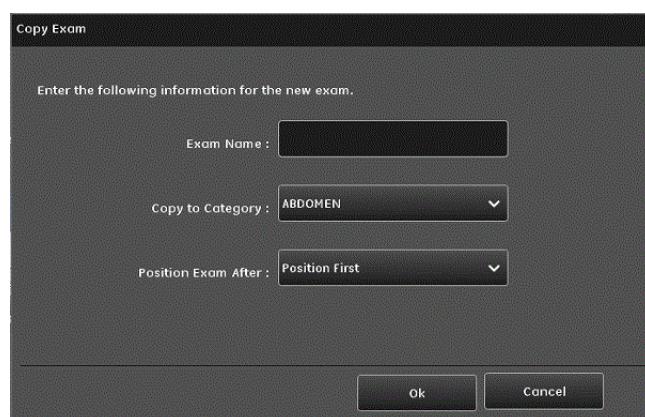
Copy Category

1. Select the Category to copy
2. Click [COPY CATEGORY].
 - Enter the new name to use.
3. Select the **position** on the Category list.
4. Click [OK].
5. Continue with [Copy Exam \(p. 15-50\)](#).



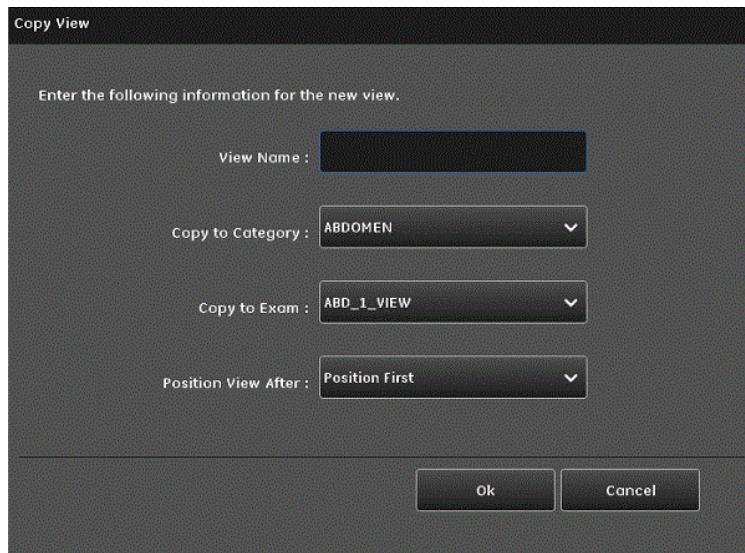
Copy Exam

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 \(p. 15-51\)](#).



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].

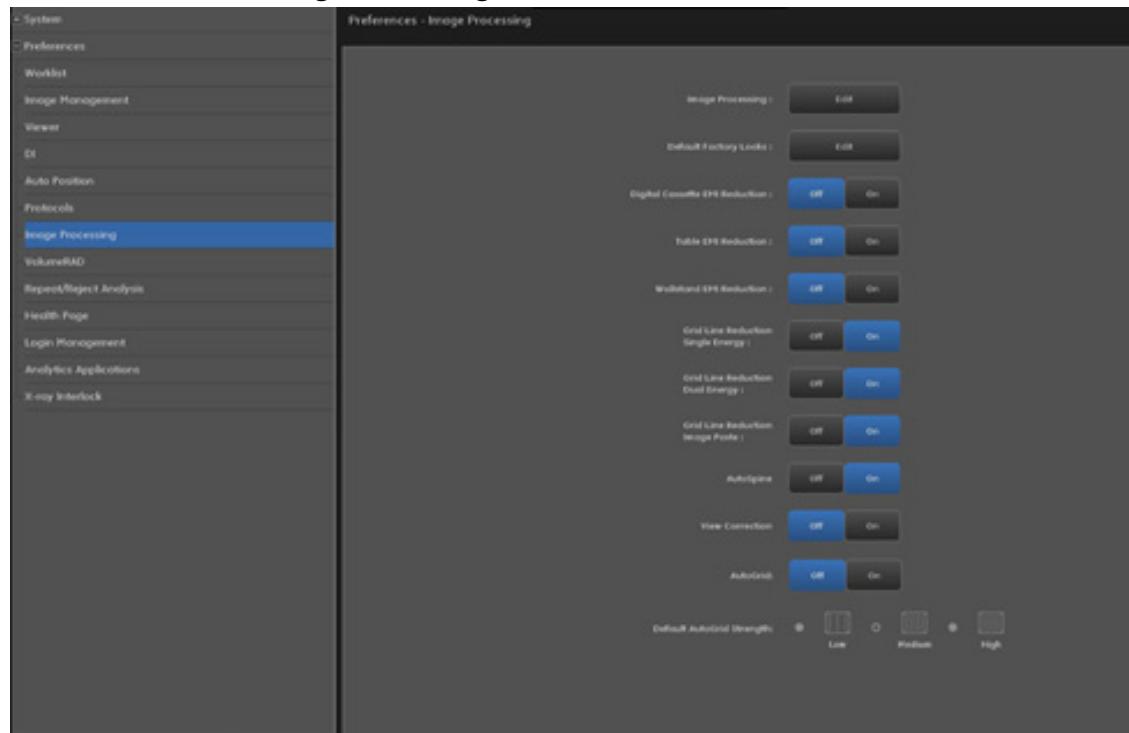


Note: Remember to back up the database when finished editing. Refer to [Backup Protocol Database to CD\(DVD\) or USB \(p. 15-39\)](#) for more information.

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 Healthcare 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. GE Healthcare Service personnel can restore the settings from the backup, if necessary.

Figure 15-40 Preferences – Image Processing

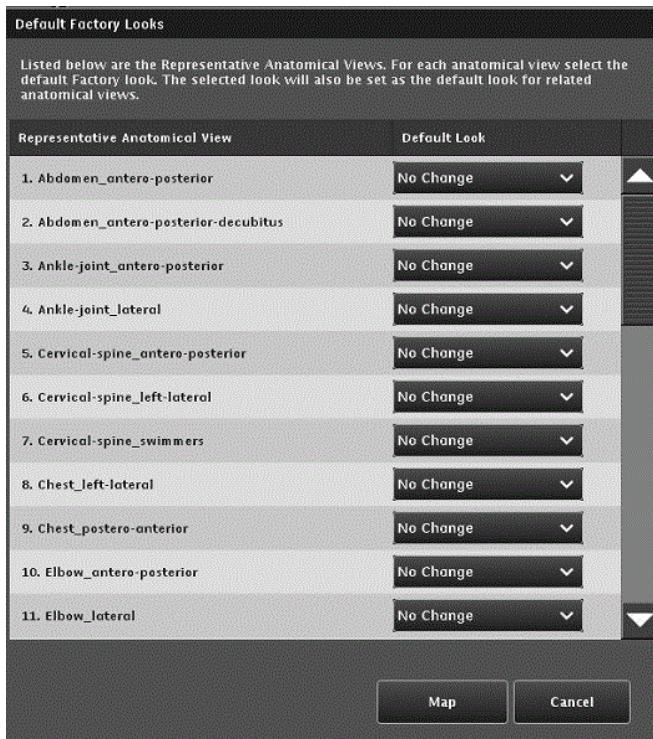
Change Default Factory Looks for Exams

The Default Factory Looks screen lets you 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 15-41 Default Factory Looks

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 \(p. 15-58\)](#) for more information.

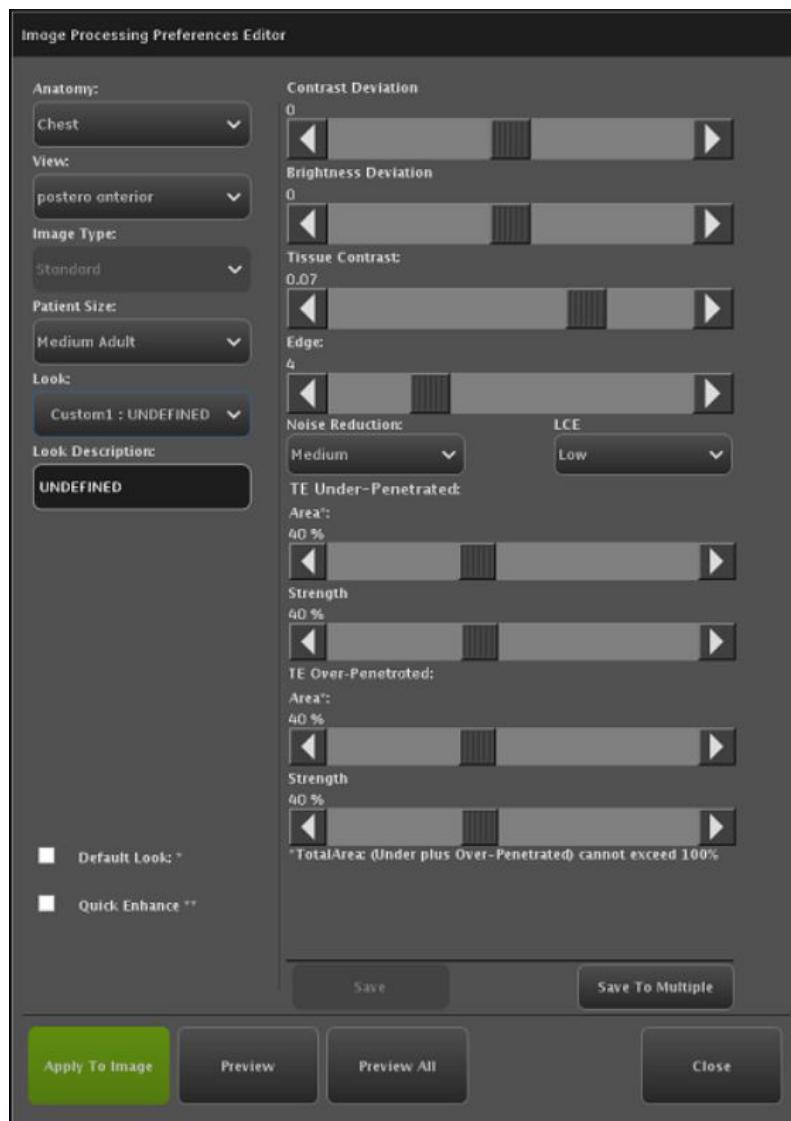
Factory Look descriptions:

- Factory Look 1 – Similar to analog film, low edge, low tissue contrast.
- Factory Look 2 – CR look, medium edge, medium tissue contrast.
- Factory Look 3 – CR look, moderate edge, moderate tissue contrast.
- Factory Look 4 – Digital look, high edge, high tissue contrast.

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 appears.

Figure 15-42 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. Check the Quick Enhance box to set this look as the processing look that occurs when the Quick Enhance button is chosen from the Quick Tools. Note: the default look and the Quick Enhance look cannot be the same. Refer to [Chapter 11: Image Viewer-Quick tool bar \(p. 11-25\)](#)for details on the Quick Enhance button.
13. Adjust parameters as described in the following table. Parameters may be adjusted in any order.

Table 15-10 Image Processing parameters

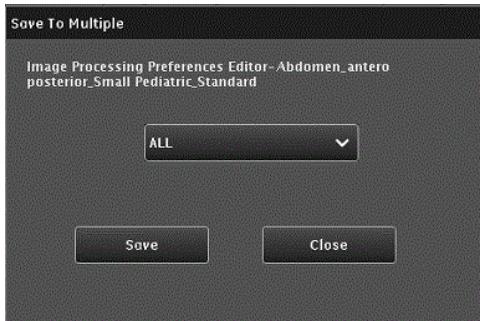
Parameter	Definition
Contrast Adjust	<p>Adjusts image contrast. Also known as window width.</p> <ul style="list-style-type: none"> • Move the slider left for more contrast (towards pure black and white). • Move the slider right for less contrast (towards uniform gray). <p>Range -100 to +100 with increment of 1.</p>
Brightness Adjust	<p>Adjusts the image brightness from -100 to +100 with increment of 1. Also known as window level.</p> <ul style="list-style-type: none"> • Move the slider right for a lighter image. • Move the slider left for a darker image. <p>Note: 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"> • Move the slider right to decrease bone/soft-tissue contrast. • Move the slider left to increase bone/soft-tissue contrast. <p>Range: -0.15 to 0.15 with 0.01 increments.</p> <p>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.</p>
Edge	<p>The amount of detail visible in bone structures. Increased edge equals increased detail.</p> <ul style="list-style-type: none"> • Move the slider right to make images sharper. • Move the slider left to make images smoother. <p>Range: 1 to 13 (discrete setting) with increments of 1</p>

Table 15-10 Image Processing parameters

Parameter	Definition																																				
Detail Preserving Noise Reduction (DPNR)	<p>Suppresses the mottle noise in denser areas of the anatomy while preserving detail in the rest of the image.</p> <table border="1"> <thead> <tr> <th>Anatomy Cases</th><th>Patient Size</th><th>DPNR</th></tr> </thead> <tbody> <tr> <td>Chest Standard</td><td>Medium and Large Adult</td><td>M</td></tr> <tr> <td>Chest Standard</td><td>Small Adult and all Pediatric</td><td>L</td></tr> <tr> <td>Chest DE</td><td>All Adult Sizes</td><td>N</td></tr> <tr> <td>Abdomen Standard</td><td>Medium and Large Adult</td><td>H</td></tr> <tr> <td>Abdomen Standard</td><td>Small Adult</td><td>M</td></tr> <tr> <td>Abdomen Standard</td><td>All Pediatric Sizes</td><td>L</td></tr> <tr> <td>Abdomen DE</td><td>All Adult Sizes</td><td>L</td></tr> <tr> <td>All Small Pediatric Anatomy</td><td>Small Pediatric</td><td>L</td></tr> <tr> <td>All Medium Pediatric w/ 400 speed except above cases</td><td>Medium Pediatric</td><td>NA</td></tr> <tr> <td>All remaining anatomies/views</td><td>All sizes</td><td>N</td></tr> </tbody> </table> <p>Available options are:</p> <ul style="list-style-type: none"> • None – no noise reduction • Low • Medium • High – maximum noise reduction <p>Note: 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.</p>				Anatomy Cases	Patient Size	DPNR	Chest Standard	Medium and Large Adult	M	Chest Standard	Small Adult and all Pediatric	L	Chest DE	All Adult Sizes	N	Abdomen Standard	Medium and Large Adult	H	Abdomen Standard	Small Adult	M	Abdomen Standard	All Pediatric Sizes	L	Abdomen DE	All Adult Sizes	L	All Small Pediatric Anatomy	Small Pediatric	L	All Medium Pediatric w/ 400 speed except above cases	Medium Pediatric	NA	All remaining anatomies/views	All sizes	N
Anatomy Cases	Patient Size	DPNR																																			
Chest Standard	Medium and Large Adult	M																																			
Chest Standard	Small Adult and all Pediatric	L																																			
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Abdomen Standard	All Pediatric Sizes	L																																			
Abdomen DE	All Adult Sizes	L																																			
All Small Pediatric Anatomy	Small Pediatric	L																																			
All Medium Pediatric w/ 400 speed except above cases	Medium Pediatric	NA																																			
All remaining anatomies/views	All sizes	N																																			
LCE (Local Contrast Enhancement)	<p>The LCE feature enhances detail within the lungs. *It can only be applied to Chest Anatomy.</p> <table border="1"> <thead> <tr> <th>LCE - Low</th><th>LCE - Medium</th><th>LCE - None</th></tr> </thead> <tbody> <tr> <td>Chest Anatomy</td><td>Chest Dual Energy</td><td>Chest Anatomy</td></tr> <tr> <td>Large Ped</td><td>All Habitus'</td><td>Large Adult</td></tr> <tr> <td>Small Adult</td><td></td><td>Chest VolumeRAD Exams</td></tr> <tr> <td>Medium Adult</td><td></td><td>Abdomen Dual Energy</td></tr> <tr> <td></td><td></td><td>All other anatomies not listed in this chart</td></tr> </tbody> </table>			LCE - Low	LCE - Medium	LCE - None	Chest Anatomy	Chest Dual Energy	Chest Anatomy	Large Ped	All Habitus'	Large Adult	Small Adult		Chest VolumeRAD Exams	Medium Adult		Abdomen Dual Energy			All other anatomies not listed in this chart																
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Small Adult		Chest VolumeRAD Exams																																			
Medium Adult		Abdomen Dual Energy																																			
		All other anatomies not listed in this chart																																			
TE Settings	<p>See Tissue Equalization section for range and effect of TE sliders.</p> <p>Note: 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."</p>																																				

14. 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?”
15. Click [YES].
- [SAVE TO MULTIPLE] applies the parameters to multiple patient sizes within the selected anatomy.
 - The Save to Multiple screen appears.
16. Select the **Patient Size** to save the new look to.
17. 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.

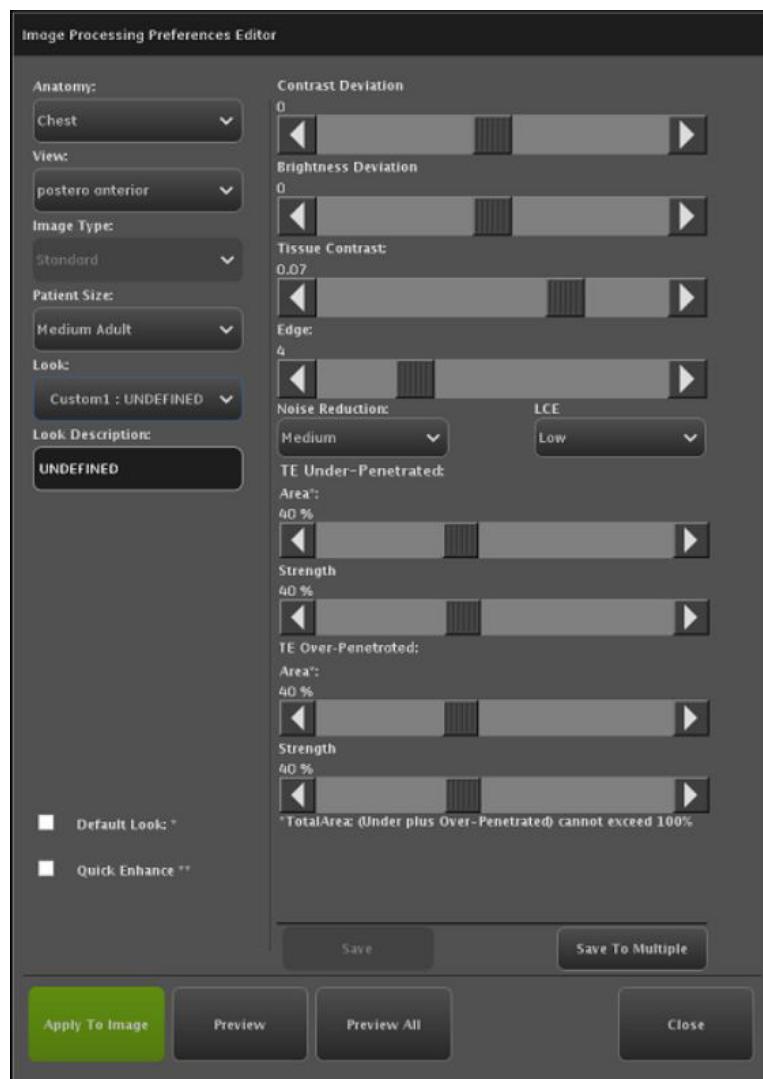
From the Image Viewer screen:

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 15-43 Image processing preferences editor screen opened from the Viewer

Deviation

Factory 1, 2, 3 and 4 are the GE Healthcare default image processing parameters.

Both Contrast and Brightness; provide feedback as to how much change has occurred from the default image processing parameters.

Local Contrast Enhancement (LCE)

- This algorithm is specific to chest anatomy only and provides three settings (Low, Medium, and High) to enhance lung tissue.
- The feature will be inactive for all other anatomy.

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).

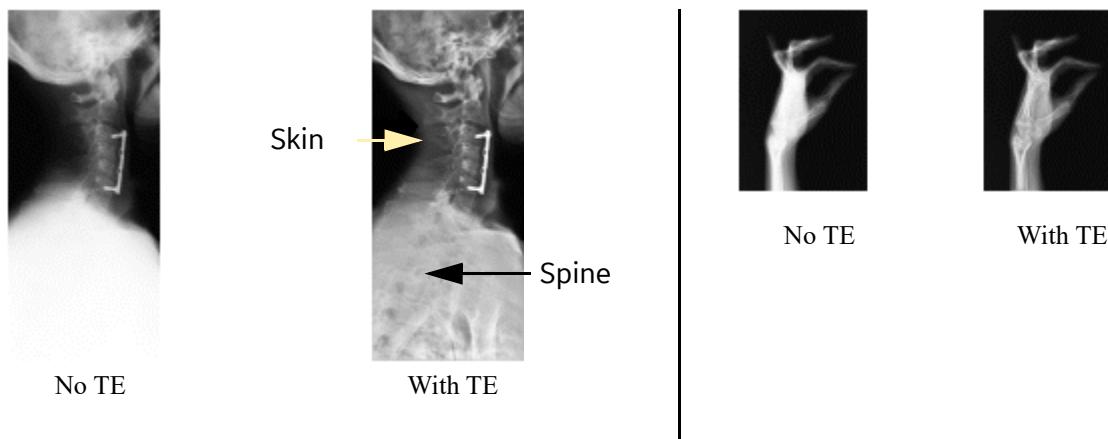
Over-penetrated regions of an image appear darker with reduced contrast. Using TE, the contrast in such regions can be enhanced to improve visualization of soft-tissue. TE can also be used to enhance vessel contrast in lungs. In [Figure 15-44](#), the skin edge around the neck is more clearly defined 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 . A hand image can similarly be displayed with improved bone contrast. This makes TE an invaluable tool in visualizing the entire bone field.

Figure 15-44 Comparison with and without Tissue Equalization



TE Parameters

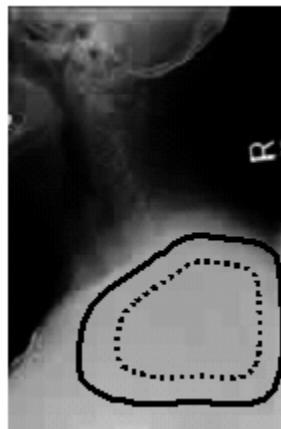
TE uses the information in the image to improve visualization. Two user-defined parameters; AREA and STRENGTH; control the extent and amount of TE that is applied to the image. There is an AREA and STRENGTH parameter for over-penetrated regions and an AREA and STRENGTH parameter for under-penetrated 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 15-45](#), 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 15-45 Using the AREA parameter in TE

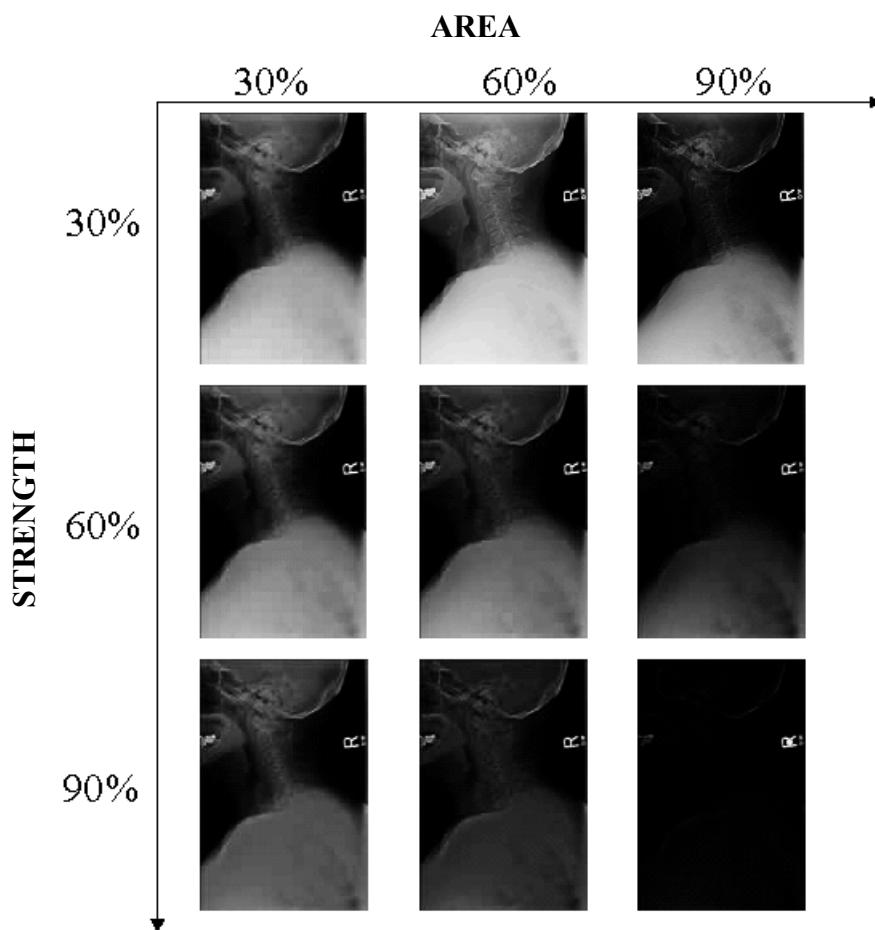


The combined AREA parameters for the over and under-penetrated regions cannot be greater than 100%. For example if the AREA parameter for over-penetrated regions is set to 40%, the AREA parameter for under-penetrated regions cannot be greater than 60% (100-40).

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 15-46](#) 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 15-46 Varied TE settings

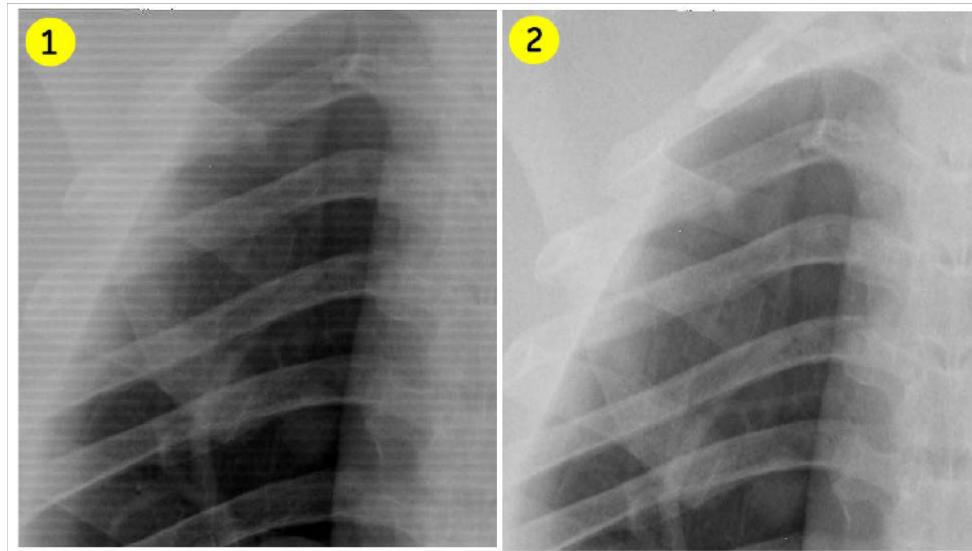
Note: Unlike Tissue Equalization, which controls contrast within under-penetrated (thick) or over-penetrated (thin) areas, Tissue Contrast controls the general contrast between the thick and thin anatomy. For example, Tissue Contrast can be used in combination with Tissue Equalization to define a Chest 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.

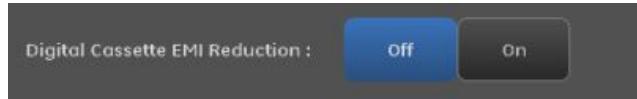
Figure 15-47 Image with EMI Reduction OFF vs Image with EMI Reduction ON**Table 15-11** EMI Reduction Setting

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: The EMI option is configurable to the Digital Cassette only.

Figure 15-48 EMI

Grid 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.

Grid Line Reduction: Image Paste

Grid Line Reduction Image Paste is to reduce grid line in pasting image. It can be turned on and off in Utility-->Image Processing. Default setting is ON. Refer to [Figure 15-40](#)

AutoSpine

AutoSpine is set to ON by default.

AutoSpine controls the vertical equalization (VE) method for pasting image of Spine lateral. When it is ON, VE2.0 method will be used for processing. When it is OFF, VE1.0 (traditional) method will be used for processing. Refer to [Figure 15-40](#)

View Correction

-View Correction is set to OFF by default.

-View Correction is not selectable and in grey when AutoSpine is OFF.

When a user selects a LAT Spine Image Pasting exam, positioning of patient anatomy/view and selection of the view (RT or LT) do not always coincide.

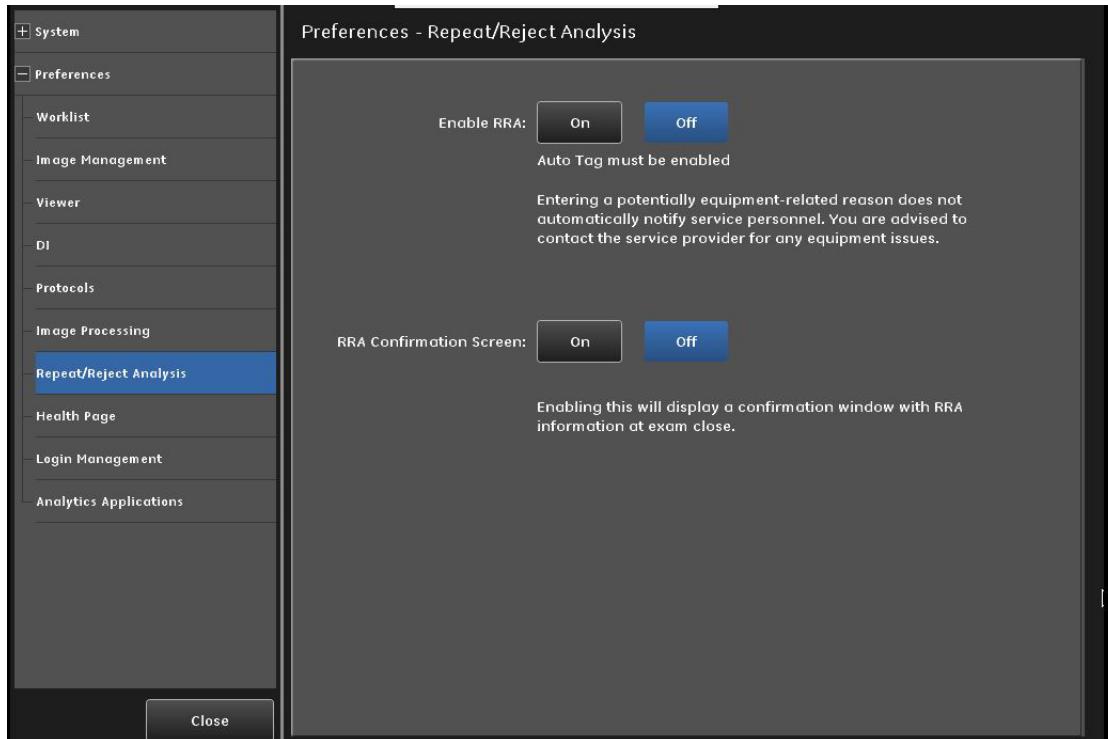
In this case, setting View Correction to ON, will ensure the LAT Spine Image Pasting exams gets processed with GE's newest VE processing (providing better uniformity of the spine equalization).

In general, if "Auto Spine" is set to ON, the LAT Spine Image Pasting exam will automatically update with the newest VE processing. If View Correction is also set to ON, the newest VE processing would be performed even when the customer view selected, is opposite to the actual positioning of the patient. Refer to [Figure 15-44](#).

Repeat/Reject Analysis (RRA)

Repeat/Rject 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/Rject Analysis \(RRA\) \(p. 13-15\)](#) for more information.

Figure 15-49 Preferences - Repeat/Rject 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: Flashpad HD Digital Detector-Detector Handling \(p. 7-3\)](#) for more information.

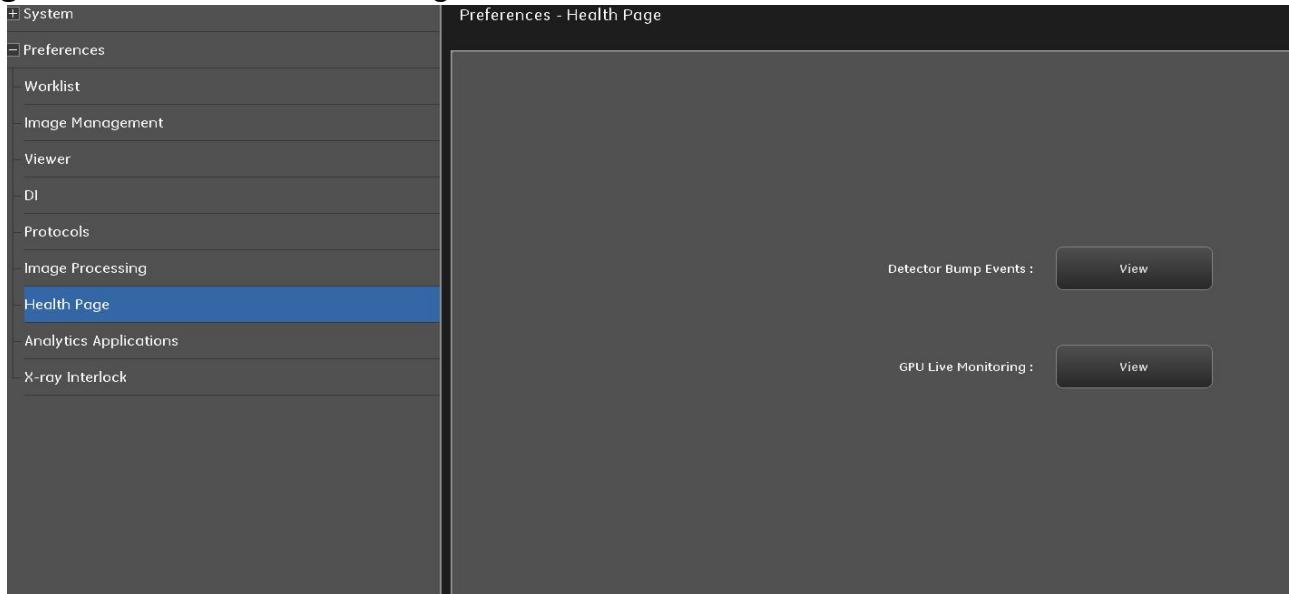
The Health Page will provide a list of the 10 most recent detector bumps/impact events that occurred to the connected detector(s). These events are stored in the detector until connection is made to the system.

Note: The communicating detector may be connected through wireless or tether mode to view a detector bump event.

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 Preferences - Health Page



The Detector Bump Events Report Provides user awareness of significant “bump events” as a result of mishandling.

- Severity levels:
 - Serious Event [No QAP required, but recommended.]
 - Critical Event *QAP required. Exposure inhibit until QAP has PASSED.

Figure 15-51 Detector Bump Events

Detector Bump Events		
Occurrence	Serial #	Severity
03/14/2017 08:40:54	E0081	CRITICAL
03/14/2017 08:33:47	E0081	CRITICAL
03/14/2017 08:33:47	E0081	CRITICAL
03/14/2017 08:33:47	E0081	CRITICAL
03/14/2017 08:28:44	E0081	CRITICAL
03/14/2017	E0081	CRITICAL

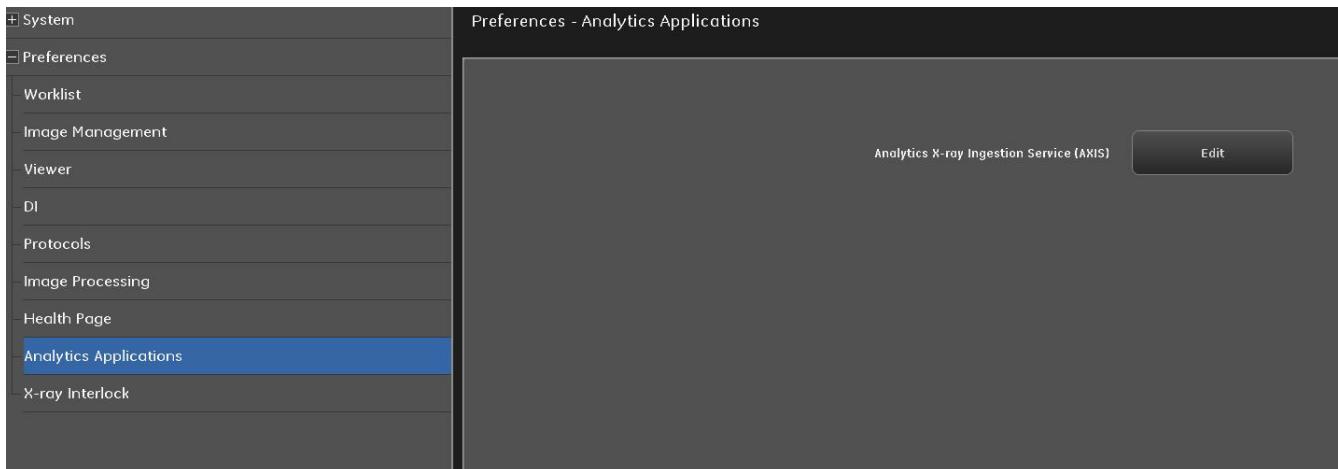
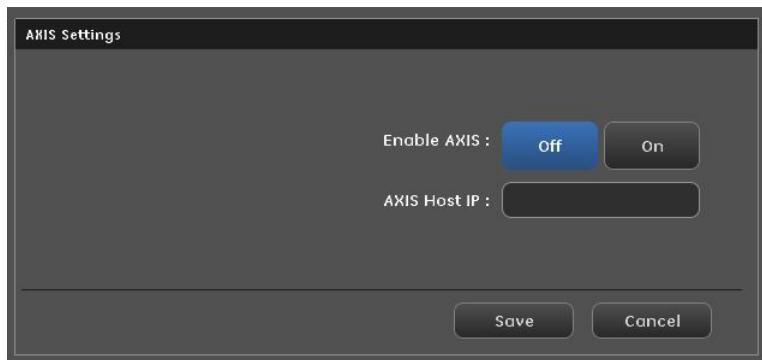
Connected Detector Stats:
Serious = 6
Critical = 58

Close

Analytics Applications

Repeat-Reject Analysis (RRA) analytics is an optional application that lets you measure and track the rate of rejected X-ray images acquired during operation.

X-Ray Quality Application (XQA) is a cloud-based collection of dashboard applications focused on X-Ray department quality assurance needs including tracking and trending Repeat/Reject data. XQA leverages the Analytics X-Ray Ingestion Service (AXIS) to automatically and regularly pull and aggregate X-Ray system data. On the X-Ray system, there is an interface to engage the configuration for the cloud-based Analytics X-ray Ingestion Service (AXIS). Once the Analytics X-ray Ingestion Service (AXIS) Edit button is clicked, you will a window opens to enable the Host IP. Please contact your GE Healthcare Field Engineer for assistance.

Figure 15-52 Analytics Applications**Figure 15-53** AXIS setting

X-ray Interlock

'X-ray Interlock' in Preference Utility UI. Allow user to setup the X-ray interlock condition. ON mean inhibit exposure if current grid in/out mismatch with recommend grid type. OFF means just a warning, not inhibit X-ray.



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Appendix A: Login Administration

This product implements control features that accommodate compliance with the Health Insurance and Portability and Accountability Act (HIPAA), the Enterprise Access Authorization and Audit (EA3). 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 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 Healthcare 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 Healthcare 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 subset of those groups.

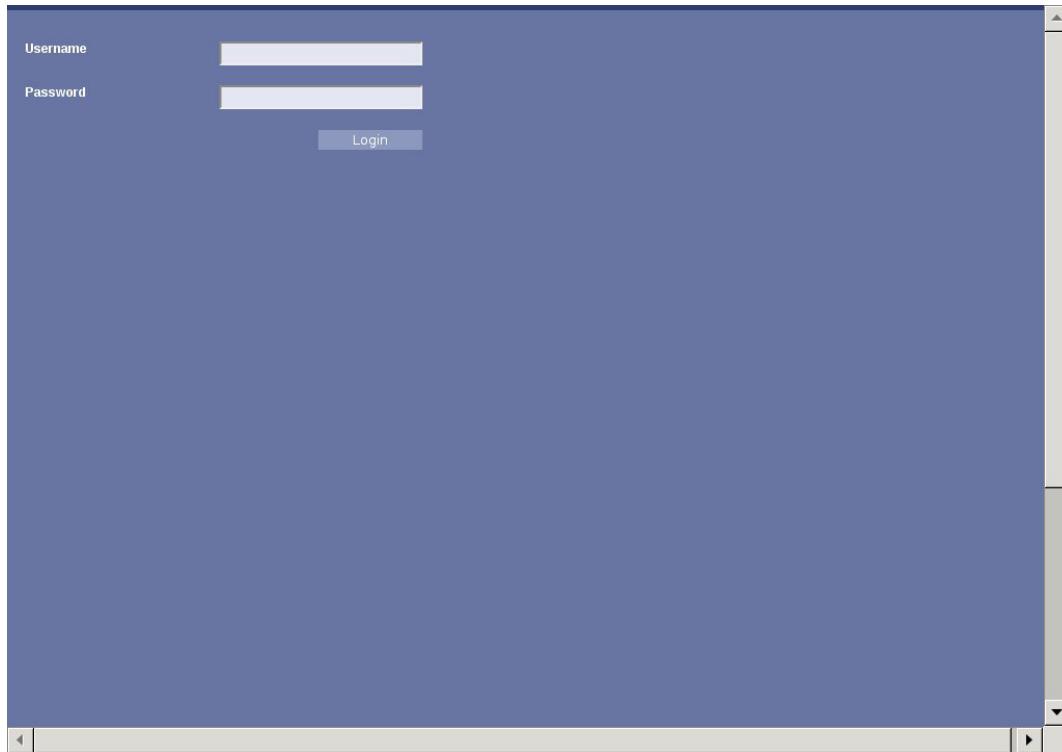
Users are individuals who have permission to use a particular system. Users are created and assigned to groups by a user with GE Healthcare Service or Administrator access. These administrators may be IT personnel in an enterprise environment, or a site manager or lead tech in stand-alone environments. 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.

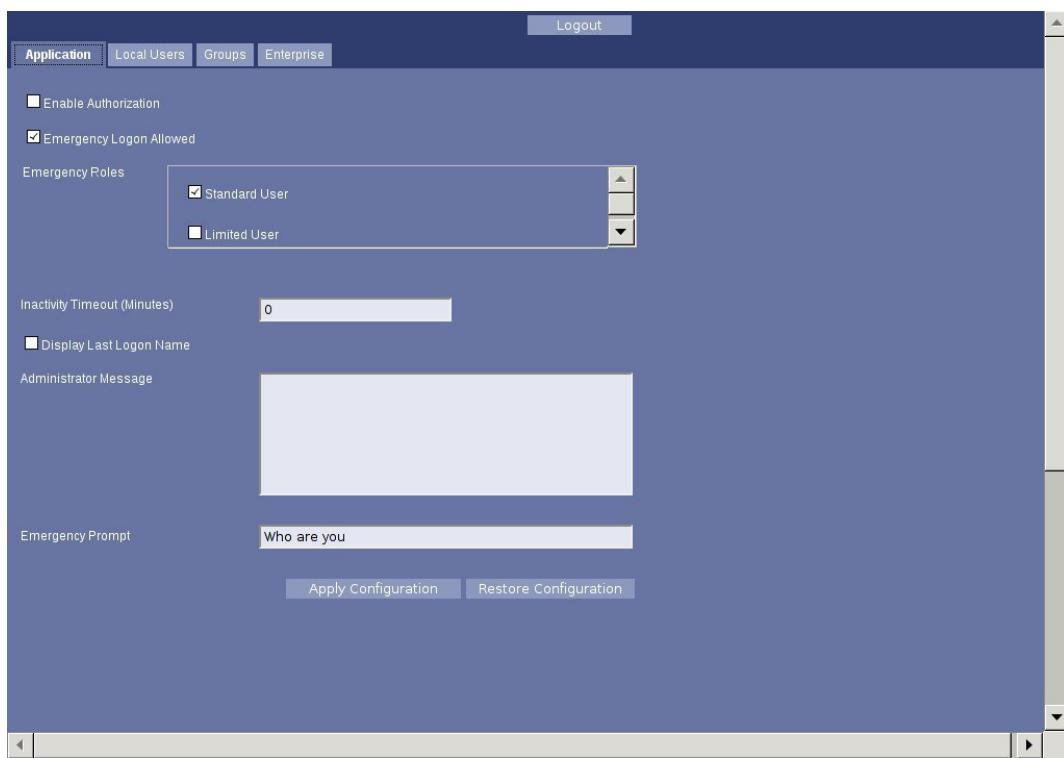
Configure Applications

1. On the Worklist screen, click [UTILTIES].
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

To access the Login Management, select System Utilities > Preferences > Login Management. The system will require you to login to the EA3 Administration Component. 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

- Enter the desired configuration for each option as described below.

- 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 speci-

fied time must elapse before the user can login again, or a user with Advanced or Service 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)

- Lock Duration (Minutes) - The number of minutes a user stays locked for if they become locked because of failed login attempts.
- Minimum Password Length - The password must be a minimum length of X characters where X is specified by the EA3 administrator. By default, X is 5 characters but can be changed via the EA3 administration user interface.

Note: 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 the minimum password length is changed to 10 characters, the 8 character password is still OK. However, next time the user changes their password, they must choose a password that is 10 characters or greater.

- Login Name - The password must not contain the username with which the password is associated.
- Advanced Password Rules - The advanced rule set can be enabled or disabled within the Local Users tab of the EA3 administration user interface.
 - The password must contain at least 1 number
 - The password must contain at least 1 upper case character
 - The password must contain at least 1 lower case character
 - The password must contain at least 1 non-alphanumeric character
 - The password cannot contain 3 or more consecutive characters (i.e. "AA" is allowed, but "AAA" is not allowed.)
 - The password cannot contain a whitespace character
- 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 see a message 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 deselecting 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 an administrator unlocks them.

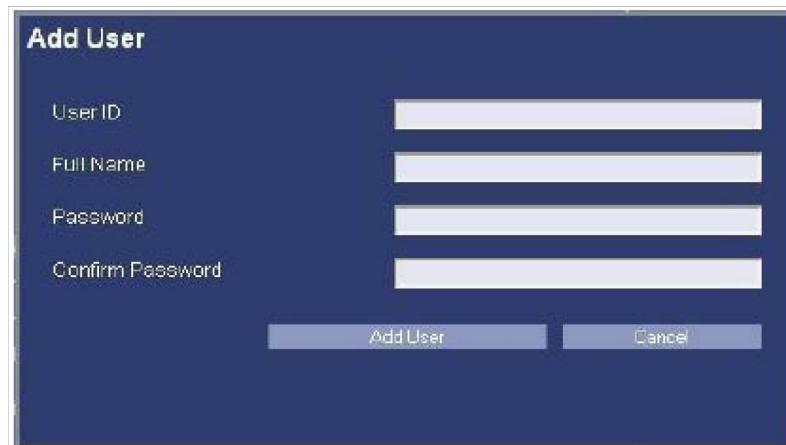
3. Press [Apply Configurations].

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].
- A popup screen is displayed with two text boxes 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 message. If this occurs, your changes were not saved. 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, 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].
 - A popup screen is displayed 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 see an error message instead of the popup screen. Once you see the popup screen, 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 Membership



Figure A-9 Remove Membership

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 checkbox, and press Apply Configuration button.
2. To lock a user, check the checkbox 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 checkbox 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.

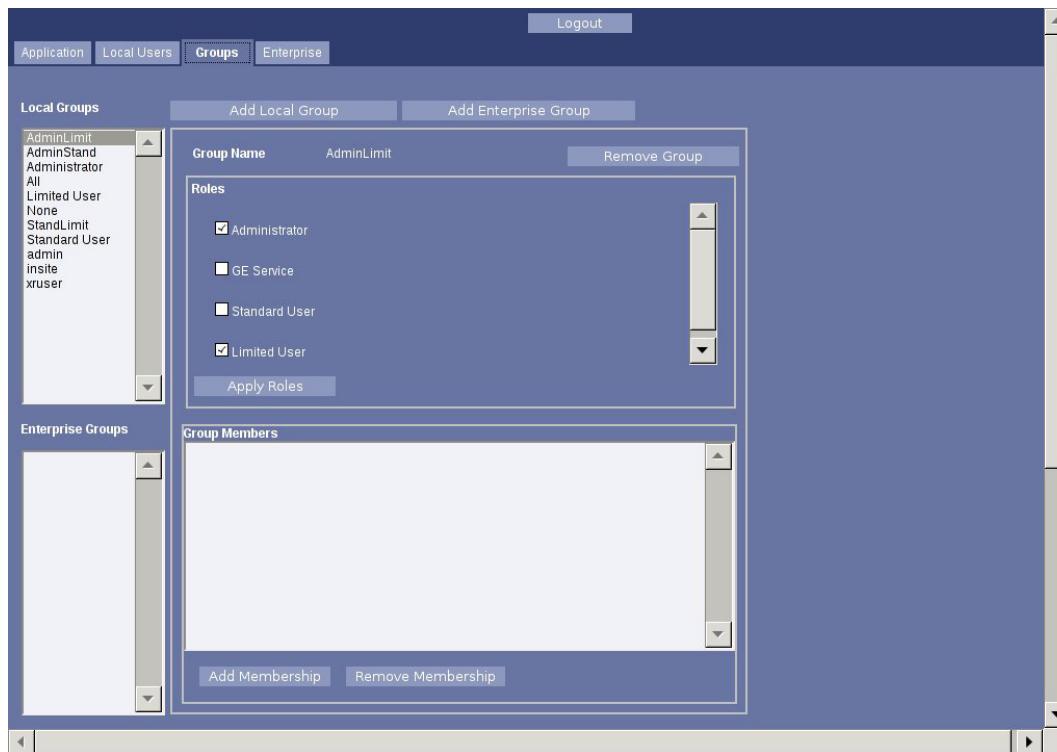
- Content Not Editable - If a user is flagged as this, then their group memberships cannot be changed. When a 'content not editable' user is in context, the 'Add To Groups', and Remove From Groups' buttons are disabled.
- Password not changeable - If a user is flagged as this, then the password cannot 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 lefthand site, 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 checkboxes, 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



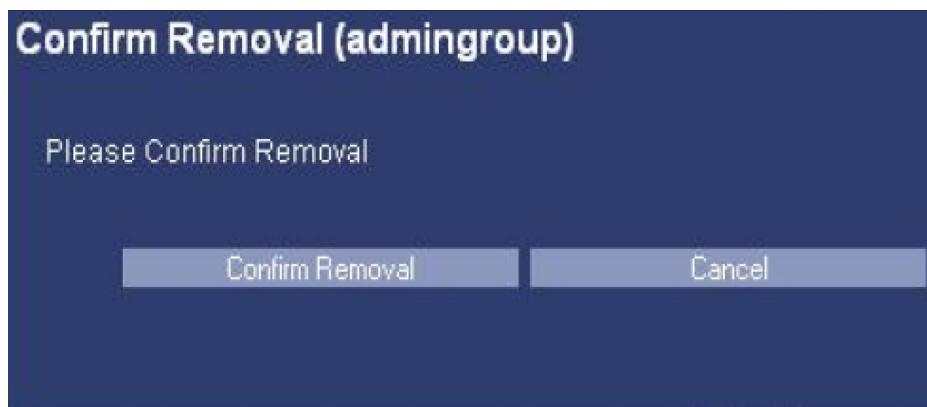
Manage a Group

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].

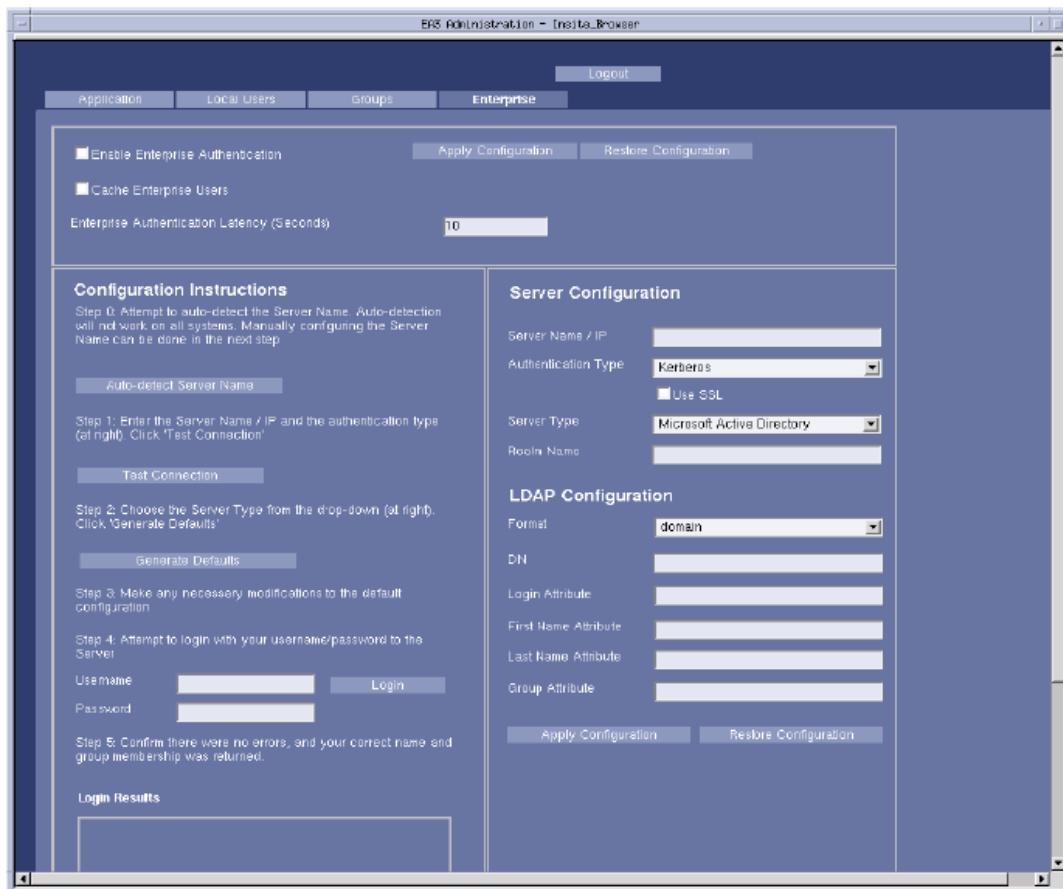
Configure Enterprise Tab

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 Healthcare 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

1. 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.
2. 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).

3. 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.

4. 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,
5. Select the type of directory server (either Microsoft Active Directory, Novell eDirectory, or orhter).
6. 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

The screenshot shows a configuration interface with a dark blue header bar containing tabs: Application, Local Users, Groups, and Enterprise. The Local Users tab is selected. Below the tabs, there are several configuration options:

- Enable Authorization:**
- Emergency Logon Allowed:**
- Emergency Roles:** A dropdown menu showing:
 - Standard User
 - Limited User
- Configurable delay after authentication failure (seconds):** A text input field containing "1".
- Inactivity Timeout (Minutes):** A text input field containing "10", which is highlighted with a green border.
- Display Last Logon Name:**
- Administrator Message:** A large text area containing a single character, likely a placeholder.
- Emergency Prompt:** A text input field containing "New Emergency Prompt", which is highlighted with a green border.
- Custom message to display on login page:** A large text area containing a single character, likely a placeholder.

At the bottom of the interface are two buttons: **Apply Configuration** and **Restore Configuration**.

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Appendix B: Specifications

X-Ray Tube

- Heat Capacity: 350Khu
- Focal Spot: 0.6/1.25 (1.3 IEC)
- Tube Type: Anode Rotation
- Nominal Anode Input Power: 32kW/96kW
- Leakage Radiation: ≤50mR/h at 150kV, 4mA

Note: For the specific and detailed X-Ray Tube specifications, please refer to the accompanying Document of the Tube.

Collimator

- Leakage Radiation parameter: ≤ 0.50 mGy at 150 kV/3mA in 1 m distance from x-ray emission assembly
- Maximum field size [cm] with SID = 100cm: 50cm * 50cm

Storage Conditions

- Environmental Temperature: -20°C~60°C (For Wireless Detector, it's -5°C~50°C)
- Relative Humidity: 10~85%

Operating Conditions

- Environmental Conditions:
 - Temperature: 15°C~32°C
 - Relative Humidity: 20%~75%
 - Atmospheric Pressure: 70kPa~106kPa
- Power Supply Conditions:
 - Voltages: 380/400/420/440/460/480V,3~
 - Frequency: 50/60Hz
 - Input Current: 170A (Momentary), 4.5A (Continuous)
 - Input Power (Momentary): 112kVA
 - Input Power (Continuous): 2.2kVA
- Power Output: 80kW/65kW/50kW Configurable
- Max. Output:
 - When Generator is configured as 80kW: 80kW(800mA@100kV or 1000mA@80kV)
 - When Generator is configured as 65kW: 65kW(500mA@130kV)
 - When Generator is configured as 50kW: 50kW(400mA@125kV or 500mA@100kV)
- Nominal Output:
 - When Generator is configured as 80kW: 80kW(800mA@100kV, 0.1s)
 - When Generator is configured as 65kW: 63kW(630mA@100kV, 0.1s)
 - When Generator is configured as 50kW: 50kW(500mA@100kV, 0.1s)

X-Ray Tube Voltage

- Digital Adjustable
- Adjustment Range: 40kV~150kV
- Minimum Increment: 1kV
- Allowable Deviation: $\leq 10\%$

X-Ray Tube Current

- Digital Adjustable in Multi-step pattern
- Adjustment Range:
 - When configured as 80kW: 10mA~1000mA (totally 21 steps)
 - When configured as 65kW: 10mA~800mA (totally 20 steps)
 - When configured as 50kW: 10mA~630mA (totally 19 steps)
- Allowable Deviation: $\leq 20\%$

Loading Time

- Exposure Time Range: 2.0ms~2s
- Allowable Deviation: $\leq (10\%+1\text{ms})$

X-Ray Tube Current Time Product

- Digital Adjustable in Multi-step pattern
- Adjustment Range: 0.25mAs~630mAs
- Allowable Deviation: $\leq \pm (10\%+0.2\text{mAs})$

AEC (Automatic Exposure Control) Mode

- kVp Range: 40~150kV
- Max. AEC Backup Parameter: 512mAs and/or 2S
- Nominal Shortest Irradiation Time: 2mS

Generator Power (kW)	Nominal Shortest Irradiation Time (ms)	Loading Factor	
		kVp	mA
80	2	80	800
65	2	80	630
50	2	80	500

Dose/DAP Specification

- Typical patient entrance Dose/DAP value: Dose 100 μGy , DAP 1.05dGy $\cdot\text{cm}^2$ for Chest AP exam @120kVp, 2mAs, 180cm SID, 43cmX35cm FOV, default 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).

Length Indicator

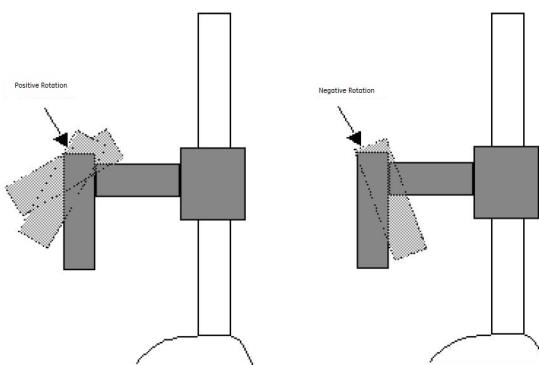
- SID:
 - Deviation between test data and indicated data is within $\pm 5\%$
- Angulation:
 - Wall Stand Detector Tray: Deviation between test data and indicated data is within $\pm 2^\circ$
 - X-Ray Tube: Deviation between test data and indicated data is within $\pm 2^\circ$.

Digital Table

- Height from Tabletop to floor: 500mm~850mm (Allowable Deviation: $\pm 10\text{mm}$)
- The Maximum of Detector Housing Longitudinal Travel Range: 800mm (Allowable Deviation: $\pm 10\text{mm}$).
- Minimum Height of Tabletop: 500mm (Allowable Deviation: 0 ~10mm)
- Tabletop Travel Range:
 - Lateral: 280mm $\pm 10\text{mm}$
 - Longitudinal: 680mm $\pm 10\text{mm}$
- Top of Detector to Table Top OID: 70.0 +/-2.0mm

Digital Wall Stand

- Digital Detector:
 - The Maximum of Detector Vertical Travel Range along the wall stand column: 1500mm $\pm 10\text{mm}$.
 - Detector Negative Rotation Range: $-20^\circ \sim 0^\circ$ (Allowable Deviation: $\pm 2^\circ$)
 - Detector Positive Rotation Range: $0^\circ \sim 90^\circ$ (Allowable Deviation: $\pm 2^\circ$)



- Minimum height from floor to center: 28.5cm (11.2 inches)
- Top of Detector to Wall Stand housing OID: 38.0 +/-2.0mm

OTS

- Column Rotation Angle: $-135^\circ \sim +135^\circ$
- Column Vertical Travel Range: ≥ 1800 mm
- X-Ray Tube Rotation Angle around the Short Axis: $\geq -180^\circ \sim +135^\circ$
- Collimator Rotation Angle around the Vertical Axis: $\geq -90^\circ \sim +90^\circ$

Braking Force

- Digital Table: The braking force of the linear movement ≥ 100 N
- Digital Wall Stand:
 - The braking force of the linear movement ≥ 100 N
 - The braking force of the rotation movement ≥ 100 N
- OTS:
 - The braking force of the lateral movement ≥ 100 N
 - The braking force of the longitudinal movement ≥ 100 N

Load Bearing

- Digital Table: Maximum Weight Capacity is 400kg
- Mobile Table: Maximum Weight Capacity is 220kg (high capacity table), 200kg (carbon fiber table) 220kg (stretcher table, GST-2)
- Digital Wall Stand Detector (Non-Patient Weight Supporting Device): When at horizontal position, supporting weight ≤ 30 kg

Noise

- Noise ≤ 60 dB(A) in non-loading working status (not including the non-continuous or non-periodic noise within 3 seconds.)

Generator/Tube Assembly Parameter under the intermittent operating mode

- Nominal X-Ray Tube Voltage with Highest X-Ray Tube Current obtainable when operated at this voltage:
 - 50KW: 150kV, 320mA
 - 65KW: 150kV, 400mA
 - 80KW: 150kV, 500mA
- Maximum X-Ray Tube Current Highest X-Ray Tube Voltage obtainable when operated at this current:
 - 50KW: 630mA, 79kV
 - 65KW: 800mA, 81kV
 - 80KW: 1000mA, 80kV
- Minimum Current Time Product: 0.25mAs

Digital Detector (FlashPad HD Detector)

- Physical Characteristics
 - Single panel (non-tiled) amorphous silicon detector with a Cesium Iodide scintillator.
 - Detector batteries can provide enough power for 60 exposures per hour and for 4 hours (14 x 17 in)/2 hours (10 x 12 in)/3.5 hours (17 x 17 in).
 - Detectors can support up to 100kg (220 lbs.) standing load and 150kg (330 lbs.) of distribute load.
 - Includes QAP (Quality Assurance Procedure).
 - 43 x 43 cm (17 x 17 in) Detector Dimensions:
 - Width: 460 mm (18.1 in)
 - Length: 460 mm (18.1 in)
 - Thickness 15.5 mm (0.61 in)
 - 35 x 43 cm (14 x 17 in) Detector Dimensions:
 - Width: 384 mm (15.1 in)
 - Length: 460 mm (18.1 in)
 - Thickness: 15.5 mm (0.61 in)
 - 25 x 30 cm (10 x 12 in) Detector Dimensions:
 - Width: 282 mm (11.1 in)
 - Length: 332 mm (13.1 in)
 - Thickness: 15.5 mm (0.61 in)
 - Weight (with battery):
 - 35 x 43 cm (14 x 17 in) Detector: 3.2 kg (7 lbs)
 - 25 x 30 cm (10 x 12 in) Detector: 1.8 kg (4 lbs)
 - 43 x 43 cm (17 x 17 in) Detector: 3.8 kg (8 lbs)
 - Tether Length: 7m; 4m or 10m(optional)
 - Image area:
 - 35 x 43 cm (14 x 17 in) Detector: 34.96 x 42.60 cm (13.76 x 16.77 in)
 - 25 x 30 cm (10 x 12 in) Detector: 24.80 x 29.76 cm (9.76 x 11.71 in)
 - 43 x 43 cm (17 x 17 in) Detector: 42.60 x 42.60 cm (16.77 x 16.77 in)
 - Pixel matrix:
 - 35 x 43 cm (14 x 17 in) Detector: 3524 x 4288 pixels
 - 25 x 30 cm (10 x 12 in) Detector: 2508 x 3004 pixels
 - 43 x 43 cm (17 x 17 in) Detector: 4288 x 4288 pixels.
 - Raw Image File Size:
 - 35 x 43 cm (14 x 17 in) Detector: About 30MB
 - 25 x 30 cm (10 x 12 in) Detector: About 15MB
 - 43 x 43 cm (17 x 17 in) Detector: About 36MB
 - Pixel Pitch: 100 microns

Typical Upper Dynamic Range: 9mR

Typical DQE @ 0lp/mm: 75%

Typical DQE: 75% (0 cy/mm), 60% (1 cy/mm), 40% (3 cy/mm) for RQA5

- Communication
 - System to detector communication utilizes at 5GHz
 - 3 x 3 802.11n wireless network
 - Max PHY Data rate: 450 Mbps
 - 20MHz/40MHz wide channels to increase throughput

Detector Handle

- With grid
 - 6:1 - 1.65kg [3.64lbs](for 14×17 detector)
 - 8:1 - 1.78kg [3.92lbs](for 14×17 detector)
- Without Grid
 - 1.26kg [2.78lbs] (for 14×17 detector)

Grid

- Grid: 6:1 grid ratio horizontal: lp/cm = 70
- Focal Distance = 130cm, Focal Range 100-180cm
- Weight, 10×12 6:1 Grid Assembly: 0.64 Kg (1.40 lbs.)
- Weight, 14×17 6:1 Grid Assembly: 1.23 Kg (2.72 lbs.)
- Optional Grid: 8:1 grid ratio horizontal: lp/cm = 70
- Focal Distance = 130cm, Focal Range 100-180cm
- Weight, 10×12 8:1 Grid Assembly: 0.72 Kg (1.58 lbs.)
- Weight, 14×17 8:1 Grid Assembly: 1.37 Kg (3.02 lbs.)

Weight Bearing Cover

- The cover allows a 590 kg (1,300 lbs) load applied over a 25 cm (9.75 in) area. Weight 5.9 lbs (2.6 kg) (for $35 \text{ cm} \times 43 \text{ cm}$ /14 in \times 17 in detector)
- The cover allows a 196Kg (433 lbs) load applied over a 25cm (9.75in) area. Weight: 2.7 Kg (6.0lbs) (for $43 \text{ cm} \times 43 \text{ cm}$ /17 in \times 17 in detector)

- Dimensions:

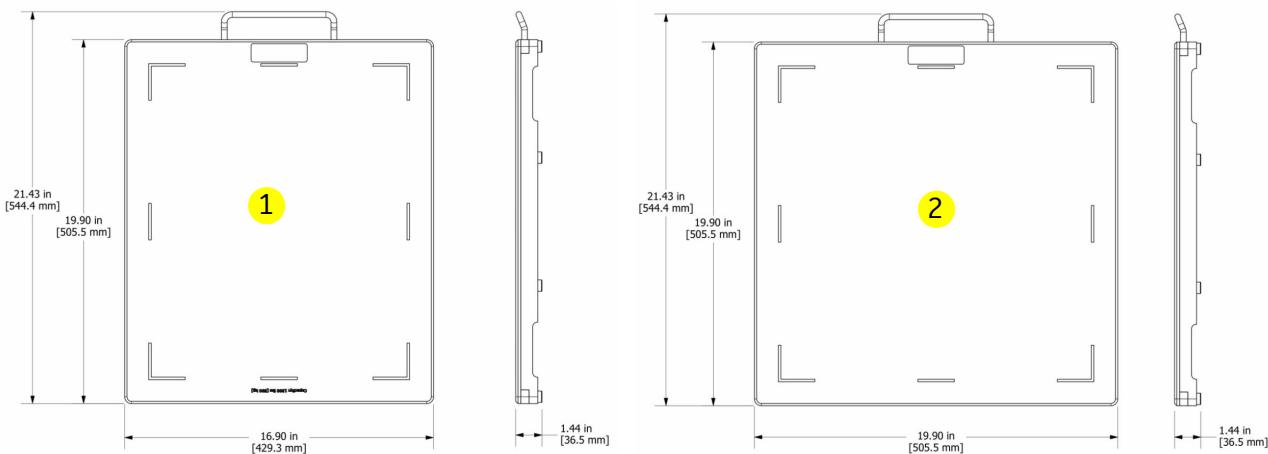


Table B-1 Weight Bearing Cover Dimensions

Items	Description
1	Weight Bearing Cover Dimensions for 35 cm x 43 cm/14 in x 17 in detector
2	Weight Bearing Cover Dimensions for 43 cm x 43 cm/17 in x 17 in detector

Acquisition Workstation

The Acquisition Workstation is the primary interface to the network and provides image post-processing capabilities. The System Controller Module provides single point control, directing and coordinating overall system operation, while monitoring all system modules automatically through software.



Table B-2 Acquisition Workstation Specifications

Monitor	Non-touch 24 in (61 cm) LCD Color Monitors (1920 x 1200 pixels) >=250 cd/m ² calibrated brightness
CPU	Intel Xeon processor, 3.5 GHz, 4 cores / HP Intel Xeon W-2123, 4c/8t
Hard Disk Storage	1 TB Enterprise-Class SATA / 1TB NVMe SSD
RAM	16 GB / 32GB
Image processing times	Fast preview images: <1 second (docked) or <2 seconds (wireless or Tether) Final Conditioned Image including Auto-Shuttering: <6 seconds (docked) or <8 seconds (wireless or tether)
Expose to expose cycle time	< 5 seconds @ 70% HU
Time to boot the system after normal shutdown	<= 180 seconds
System reset time	<= 230 seconds
Image Pasting Acquisition time	< 22 seconds (3 images)

Networking

IHE Compliance for Scheduled Workflow Integration Profile. Images may be transmitted manually or automatically through the DICOM interface to printers, archival devices, servers, or review workstations. System Access and Authorization Control to support HIPAA Compliance

Please refer to the DICOM Conformance Statement for complete definition of supported DICOM connectivity services.

Table B-3 DICOM 3.0 Services

DICOM Modality Worklist (SCU)	Interface with HIS/RIS with programmable auto refresh
DICOM MPPS (SCU)	Feedback the status of exams to the HIS/RIS
DICOM Storage (SCU)	Manual and auto send image (DX or CR IOD) to multiple PACS
DICOM Storage commitment (SCU)	Send commitment state.
DICOM Query/Retrieve (SCU)	Query/Retrieve images from PACS
DICOM Query/Retrieve (SCP)	Provide Query/Retrieve service instance to other system
DICOM Media Exchange	CD/DVD DICOM image export and import.
DICOM Grayscale Print	Manual and Auto print with print layout options at the console
Verification services	C-Echo as SCU and SCP

Table B-3 DICOM 3.0 Services

DICOM Dose Structure Report (Optional)	Send Dose values for each study to an archiving system.
---	---

Table B-4 IHE Integration Profiles

Scheduled workflow	Acquisition Modality: Patient Based Worklist Query/Broad Worklist Query
Patient Information Reconciliation	Acquisition Modality
REM (Optional)	Radiation Exposure Monitoring for Dose structure report

Minimum Printer, 10- and 12-bit printers

- Printed images are not intended for diagnostic use unless produced with a printer capable of at least 1,000 gradations of gray scale (or at least 10 bits)
- Several popular printers have been validated for connectivity and image quality. Recommendations are available from your sales representative.
- Non-DICOM laser cameras will require an upgrade to DICOM connectivity
- GE Healthnet Services** can provide physical network connectivity solutions – Layer 1 and 2 Ethernet (IEEE 802.3) interoperability – and include network components and physical installation
- TVA** (Tip Virtual Assist) is a tool that realizes remote desktop sharing; it can support remote application training.

Auto Protocol Assist (optional)

System will automatically transition directly to the Acquire screen when the protocol code downloaded from the HIS/ RIS (automatically performed with worklist refresh) matches the exam code contained in the protocol database. This tool eliminates the user steps required to select patient exam types and initiate an exam.

Camera D415 (optional)

Resolution	1080p @ 30 fps
FOV	Depth 1280 x 720 @ 90 fps (H x V x D) 69.4° x 42.5° x 77° +/-3°
Range	0.3 m (min.) to >10 m (max.)
Shutter	Rolling
Interface	USB3, USB 2
Vision Processor	D4
Product size	99 x 20 x 23 mm

Eaton UPS Model 9Sx700 (optional)

Dimensions	(H x W x L) 9.9 in x 6.3 in x 13.9 in (25 cm x 16 cm x 35 cm)
------------	---

Specifications	Compliances: FCC compliant / CE Marked Certifications: cULus Listed Wattage: 630 W VA rating: 700 VA Voltage: 120 V Environmental: 0° to 40°C (32° to 104°F) For more information, visit the Eaton website.
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Critical Care Suite (CCS)

This operator manual provides information relating only to the XR646 HD and XR656 HD. For information pertaining to the Critical Care Suite / Quality Care Suite, reference these manuals:

- Critical Care Suite, Quality Care Suite Operator Manual
- Critical Care Suite, Quality Care Suite - Advanced Operator Manual

Dual Energy (optional)

See [Chapter 13: Advanced Applications-Dual Energy \(Option\) \(p. 13-2\)](#)

VolumeRAD (optional)

See [Chapter 13: Advanced Applications-VolumeRAD \(Option\) \(p. 13-48\).](#)

Image Pasting (optional)

See [Chapter 13: Advanced Applications-Auto Image Paste \(Option\) \(p. 13-20\).](#)

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Appendix C (Only for China), if applicable

附录 C (仅限中国)

中国注册信息

医疗器械注册证编号：国械注进 20192060013

产品技术要求编号：国械注进 20192060013

注册人名称：GE MEDICAL SYSTEMS, LLC 通用电气医疗系统有限公司

注册人住所：3000 North Grandview Blvd. WAUKESHA, WI 53188

注册人联系方式：+1-262-544-3011

生产企业名称：GE MEDICAL SYSTEMS, LLC 通用电气医疗系统有限公司

生产企业住所：3000 North Grandview Blvd. WAUKESHA, WI 53188

生产企业联系方式：+1-262-544-3011

生产地址：3000 North Grandview Blvd. WAUKESHA, WI 53188

代理人名称：通用电气医疗系统贸易发展（上海）有限公司

代理人住所：中国（上海）自由贸易试验区意威路 96 号 1 幢

代理人联系方式：400 812 8188

产品名称：数字化摄影 X 射线机

产品型号：Discovery XR656 HD

基本性能

摄影管电压范围 40KV-150KV;

摄影管电流调节范围 10mA- 630mA/800mA/1000mA;

加载时间调节范围 2.0ms-2s;

电流时间积 0.25mAs-630mAs.

生产日期

生产日期见产品标牌

使用期限

产品使用期限为 10 年

中国境内售后服务机构

公司名称：通用电气医疗系统贸易发展（上海）有限公司

地址：中国（上海）自由贸易试验区意威路 96 号 1 檐，邮编：200131

维修服务热线：400 812 8188

Appendix D (Only for China), if applicable

附录 D (仅适用于中国)

中国注册信息

注册证号：京械注准20202060304

注册产品技术要求编号：京械注准20202060304

生产许可证编号：京药监械生产许 20000016 号

生产企业名称：北京通用电气华伦医疗设备有限公司

生产企业住所：北京市北京经济技术开发区永昌北路 1 号

生产地址：北京市北京经济技术开发区永昌北路 1 号,北京市通州区兴贸二街18号1幢1层101GE2区

注册人名称：北京通用电气华伦医疗设备有限公司

注册人住所：北京市北京经济技术开发区永昌北路 1 号

注册人/生产企业联系方式：400 812 8188

产品名称：数字化摄影 X 射线机

型号、规格：Discovery XR656 HD

公司名称：北京通用电气华伦医疗设备有限公司

邮编：100176

产品性能

摄影管电压范围 40KV-150KV;

摄影管电流调节范围 10mA- 630mA/800mA/1000mA;

加载时间调节范围 2.0ms-2s;

电流时间积 0.25mAs-630mAs.

生产日期

生产日期见产品标牌

使用期限

产品使用期限为10年

中国境内售后服务机构

公司名称：通用电气医疗系统贸易发展（上海）有限公司

地址：中国(上海)自由贸易试验区意威路96号1幢，邮编：200131

维修服务热线：400 812 8188

主要结构组成

表 D-1

部件名称	型号	配置 1	配置 2
高压发生器	Jedi 80 RD 1T (型号2374870)	√	√
X 射线管组件	MX100 (管套: 46-155400G285 管芯: 2336058)	√	√
限束器	Collimator AL01C II eL	√	√
系统柜	GCC-C3	√	√
平板探测器	5771717 43cm × 43 cm (17英寸 × 17 英寸)	√	√
平板探测器	5771417 35 cm × 43 cm (14 英寸 × 17 英寸)	选配	选配
	5771012 25cm × 30 cm (10英寸 × 12 英寸)	选配	选配
X 射线管悬吊装置	5135678-8	√	√
图像处理系统	采集工作站/控制台/系统软件	√	√
监视器	彩色显示器	√	√
立式摄影架	标准型 GCWS-C3	√	-
	长臂型 GCEWS-C3	-	√
摄影床	GCTBL-C3	√	-
移动平床	5136793	选配	
	GST-2		
条形码扫描器	-	选配	
承重台	-	选配	
横向平板探测器支架	-	选配	
可移动平板探测器支架	-	选配	
摄影床手柄和压缩带	-	选配	
图像拼接患者定位器及脚凳	-	选配	
探测器充电仓	-	选配	
桌面电池充电器	-	选配	
滤线栅存放架	-	选配	

表 D-1

部件名称	型号	配置 1	配置 2
滤线栅	-	选配	
探测器便携把手（附带滤线栅）	-	选配	
探测器便携把手（无滤线栅）	-	选配	
探测器承重罩	-	选配	
摄像头组件	-	选配	
Helix图像处理系统	-	选配	
不间断电源	-	选配	

摄影床、立式摄影架、平板探测器会在患者环境下使用。

软件信息

软件名称：数字化摄影X射线机应用软件，包含以下组件：

- Discovery XR656 HD 图像处理系统
- Helix 图像处理系统

发布版本： V2

系统网络安全

Discovery XR656 HD 系统专为预期用途而设计，请遵循本产品使用环境中包含的以下隐私和安全保护要求：

- 应当将 Discovery XR656 HD 系统连接到一个加密网络上。
- 应当对 Discovery XR656 HD 系统进行物理加密，这样一来，非预期用户将无法访问系统。
- 应当使用定制用户和密码替换默认的应用用户和密码。
- 应当对包括图像、患者数据、报告和记录在内的外部介质进行加密。不再使用时，应当安全删除数据和 / 或者安全删除媒介。

运行环境

硬件配置：

系统的网络安全相关功能作为设备软件的一部分，只能运行在 Discovery XR656 HD 的设备硬件上。

软件环境：

Discovery XR656 HD 系统基于 HELiOS Linux，它是基于 RedHat Enterprise Linux 的 Scientific Linux 的 GE 版本。

网络条件

- 10 Mbit/s 级以上的以太网络
- 提供静态 IP 地址
- 若使用 GE 远程服务平台，医院网络需要有互联网访问能力
- 设备不支持域集成

安全软件

- 提供对 Linux 标准防火墙 (IPTables) 的图形用户界面配置

推荐的防火墙配置

Discovery XR656 HD 系统受到产品网络过滤器（一种网络防火墙）保护。在默认设置下，只允许通过端口 4010 来支持与 DICOM 的互用性。

GE 建议始终打开防火墙，只保留 4010 端口不会被阻止，并定期检查防火墙设置。

- 提供软件病毒扫描与查杀功能

数据与设备（系统）接口

a) 系统网络接口

系统实现对具备以下功能设备的网络连通性的支持：

数据服务	端口	协议	目的	数据来源限制	数据去向限制
DICOM	4010	TCP	DICOM 协议数据交换	本地主机	HIS/RIS 或 PACS 服务器

b) 存储媒介

系统支持采用本地硬盘、USB 数据存储器或 CD/DVD 光盘对系统内数据进行存储，导入或导出采集的 DICOM 数据和图像。

用户访问控制机制

系统提供相应功能用以控制对敏感信息的访问。访问控制包含用户账户的创建与权限分配。

a) 用户身份鉴别方法

系统支持采用用户名和密码的用户认证，且可以支持使用 LDAP 的企业用户认证服务器。本地用户在急诊等紧急状态下，可直接登录并有限操作系统。

b) 用户类型管理及权限分配

用户的管理包含如下方面：创建账户、维护账户和账户挂起（针对不再使用的账户）。系统提供独立的用户账户，用以创建其他用户账户的系统管理员账户在系统软件装载完成后由系统自动创建。系统支持用户登录功能的配置界面。

访问权限分配是对用户账户管理操作的一部分，系统支持对本地用户的身份分配。系统中定义的用户将被分配以一套操作权限，这一步骤应借由发放基于用户角色的用户组身份来实现。系统允许管理员用户及维护用户设置其它用户账户的用户组身份。

详见附录 A 登录管理。

安全软件更新

GE Healthcare 持续监测适用于其产品的安全漏洞。这包括应用软件、第三方组件和基础操作系统的漏洞。根据 Discovery XR656 HD 系统配置和使用，评估操作系统或其它第三方组件中的已公布漏洞。需要时，GE Healthcare 将为客户提供产品安全性更新 / 补丁。在适用情况下，这些更新将包括操作系统和第三方组件的补丁。

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Appendix E: Electromagnetic Disturbances Compliance Statement for IEC 60601-1-2:2014

Compliance Statement

This equipment complies with IEC 60601-1-2: 2014 Ed4.0 standards for medical devices.

This equipment is predominantly intended for use in Professional healthcare facility environments, except for near active HF SURGICAL EQUIPMENT, the RF shielded room of an ME SYSTEM for magnetic resonance imaging and, where the intensity of EM DISTURBANCES is high.

This equipment is not directly connected to the Public Mains Network that supplies buildings used for domestic purposes.

The environments for which the Discovery XR656 HD is suitable. Relevant exclusions, e.g. hospitals except for near active HF SURGICAL EQUIPMENT, the RF shielded room of an ME SYSTEM for magnetic resonance imaging and, where the intensity of EM DISTURBANCES is high.

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



WARNING **Use of this equipment adjacent to or stacked with other equipment should be avoided because it could result in improper operation. If such use is necessary, this equipment and the other equipment should be observed to verify that they are operating normally.**



WARNING **Use of accessories, transducers and cables other than those specified or provided by the manufacturer of this equipment could result in increased electromagnetic emissions or decreased electromagnetic immunity of this equipment and result in improper operation.**



WARNING **Portable RF communications equipment (including peripherals such as antenna cables and external antennas) should be used no closer than 30 cm (12 inches) to any part of the Discovery XR656 HD, including cables specified by the manufacturer. Otherwise, degradation of the performance of this equipment could result."**

Compatibility Tables

IEC60601-1-2: 2014 Ed4.0 Compatibility Tables

Table E-1 EMISSION limits per environment

Phenomenon	Professional healthcare facility environment
Conducted and radiated RF EMISSIONS	CISPR 11 Group 1 e) Class A f)
Harmonic distortion	N/A See IEC 61000-3-2 b)
Voltage fluctuations and flicker	N/A See IEC 61000-3-3 b)

b) This test is not applicable in this environment unless the Discovery XR656 HD used there will be connected to the PUBLIC MAINS NETWORK and the power input is otherwise within the scope of the Basic EMC standard.

e) Discovery XR656 HD generate or use RF energy only for their internal Functioning.

f) Discovery XR656 HD 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.

Table E-2 ENCLOSURE PORT IMMUNITY TEST LEVELS

Phenomenon	Basic EMC standard or test method	IMMUNITY TEST LEVELS
		Professional healthcare facility environment
ELECTROSTATIC DISCHARGE	IEC 61000-4-2	± 8 kV contact ± 2 kV, ± 4 kV, ± 8 kV, ± 15 kV air
Radiated RF EM fields	IEC 61000-4-3	3 V/m f) 80 MHz – 2,7 GHz 80% AM at 1 kHz
Proximity fields from RF Wireless communications equipment	IEC 61000-4-3	See table 5 -Test specifications for ENCLOSURE PORT IMMUNITY to RF wireless communications equipment
RATED power frequency magnetic fields e)	IEC 61000-4-8	30 A/m g) 50 Hz or 60 Hz

e) During the test, the Discovery XR656 HD may be powered at any NOMINAL input voltage, but with the same frequency as the test signal.

f) Before modulation is applied.

g) This test level assumes a minimum distance between the Discovery XR656 HD and sources of power frequency magnetic field of at least 15 cm.

Table E-3 Input a.c. power PORT IMMUNITY TEST LEVELS

Phenomenon	Basic EMC standard	IMMUNITY TEST LEVELS
		Professional healthcare facility environment
Electrical fast transients / bursts a) l)	IEC 61000-4-4	± 2 kV 100 kHz repetition frequency

Surges a) b) Line-to-line	IEC 61000-4-5	$\pm 0,5 \text{ kV}$, $\pm 1 \text{ kV}$
Surges a) b) Line-to-ground	IEC 61000-4-5	$\pm 0,5 \text{ kV}$, $\pm 1 \text{ kV}$, $\pm 2 \text{ kV}$
Conducted disturbances induced by RF fields c) d)	IEC 61000-4-6	$3 \text{ V}^m)$ $0,15 \text{ MHz} - 80 \text{ MHz}$ $6 \text{ V}^m)$ in ISM bands between $0,15 \text{ MHz}$ and $80 \text{ MHz}^n)$ $80\% \text{ AM at } 1 \text{ kHz}$
Voltage dips p) r)	IEC 61000-4-11	$0\% U_T$; $0,5 \text{ cycle}^g)$ At 0° , 45° , 90° , 135° , 180° , 225° , 270° and $315^\circ q)$ $0\% U_T$; 1 cycle and $70\% U_T$; $25/30 \text{ cycles}^h)$ Single phase: at 0°
Voltage interruptions i) o) r)	IEC 61000-4-11	$0\% U_T$; $250/300 \text{ cycle}^h)$

a) The test may be performed at any one power input voltage within the Discovery XR656 HD voltage range. If the Discovery XR656 HD is tested at one power input voltage, it is not necessary to re-test at additional voltages.

b) All Discovery XR656 HD cables are attached during the test.

c) Calibration for current injection clamps shall be performed in a 150Ω system.

d) If the frequency stepping skips over an ISM or amateur band, as applicable, an additional test frequency shall be used in the ISM or amateur radio band. This applies to each ISM and amateur radio band within the specified frequency range.

g) Applicable only to Discovery XR656 HD connected to single-phase a.c. mains.

h) E.g. 10/12 means 10 periods at 50 Hz or 12 periods at 60 Hz.

i) Discovery XR656 HD with RATED input current greater than 16 A / phase shall be interrupted once for 250/300 cycles at any angle and at all phases at the same time (if applicable). Discovery XR656 HD with battery backup shall resume line power operation after the test. For Discovery XR656 HD with RATED input current not exceeding 16 A, all phases shall be interrupted simultaneously.

l) Direct coupling shall be used.

m) r.m.s., before modulation is applied.

n) The ISM (industrial, scientific and medical) bands between $0,15 \text{ MHz}$ and 80 MHz are $6,765 \text{ MHz}$ to $6,795 \text{ MHz}$; $13,553 \text{ MHz}$ to $13,567 \text{ MHz}$; $26,957 \text{ MHz}$ to $27,283 \text{ MHz}$; and $40,66 \text{ MHz}$ to $40,70 \text{ MHz}$. The amateur radio bands between $0,15 \text{ MHz}$ and 80 MHz are $1,8 \text{ MHz}$ to $2,0 \text{ MHz}$, $3,5 \text{ MHz}$ to $4,0 \text{ MHz}$, $5,3 \text{ MHz}$ to $5,4 \text{ MHz}$, 7 MHz to $7,3 \text{ MHz}$, $10,1 \text{ MHz}$ to $10,15 \text{ MHz}$, 14 MHz to $14,2 \text{ MHz}$, $18,07 \text{ MHz}$ to $18,17 \text{ MHz}$, $21,0 \text{ MHz}$ to $21,4 \text{ MHz}$, $24,89 \text{ MHz}$ to $24,99 \text{ MHz}$, $28,0 \text{ MHz}$ to $29,7 \text{ MHz}$ and $50,0 \text{ MHz}$ to $54,0 \text{ MHz}$.

o) Applicable to Discovery XR656 HD with RATED input current less than or equal to 16 A / phase and Discovery XR656 HD with RATED input current greater than 16 A / phase.

p) Applicable to Discovery XR656 HD with RATED input current less than or equal to 16 A / phase.

q) At some phase angles, applying this test to Discovery XR656 HD with transformer mains power input might cause an overcurrent protection device to open. This can occur due to magnetic flux saturation of the transformer core after the voltage dip. If this occurs, the Discovery XR656 HD shall provide BASIC SAFETY during and after the test.

r) For Discovery XR656 HD that have multiple voltage settings or auto ranging voltage capability, the test shall be performed at the minimum and maximum RATED input voltage.

Table E-4 Signal input/output parts port IMMUNITY TEST LEVELS

Phenomenon	Basic EMC standard	IMMUNITY TEST LEVELS	
		Professional healthcare facility environment	
ELECTROSTATIC DISCHARGE ^{e)}	IEC 61000-4-2	± 8 kV contact ± 2 kV, ± 4 kV, ± 8 kV, ± 15 kV air	
Electrical fast transients / bursts ^{b) f)}	IEC 61000-4-4	± 1 kV 100 kHz repetition frequency	
Surges Line-to-ground ^{a)}	NA ^{a)} IEC 61000-4-5	± 2 kV	
Conducted disturbances induced by RF fields ^{b) d) g)}	IEC 61000-4-6	3 V ^{h)} 0,15 MHz – 80 MHz 6 V ^{h)} in ISM bands between 0,15 MHz and 80 MHz ⁱ⁾ 80% AM at 1 kHz	

^{a)} This test applies only to output lines intended to connect directly to outdoor cables. Discovery XR656 HD is not including this type of cable.
^{b)} SIP/SOPs whose maximum cable length is less than 3 m in length are excluded.
^{c)} Testing may be performed at other modulation frequencies identified by the RISK MANAGEMENT PROCESS.
^{d)} Calibration for current injection clamps shall be performed in a 150 Ω system.
^{e)} Connectors shall be tested per 8.3.2 and Table 4 of IEC 61000-4-2:2008. For insulated connector shells, perform air discharge testing to the connector shell and the pins using the rounded tip finger of the ESD generator, with the exception that the only connector pins that are tested are those that can be contacted or touched, under conditions of INTENDED USE, by the standard test finger shown in Figure 6 of the general standard, applied in a bent or straight position.
^{f)} Capacitive coupling shall be used.
^{g)} If the frequency stepping skips over an ISM or amateur radio band, as applicable, an additional test frequency shall be used in the ISM or amateur radio band. This applies to each ISM and amateur radio band within the specified frequency range.
^{h)} r.m.s., before modulation is applied.
ⁱ⁾ The ISM (industrial, scientific and medical) bands between 150 kHz and 80 MHz are 6,765 MHz to 6,795 MHz; 13,553 MHz to 13,567 MHz; 26,957 MHz to 27,283 MHz; and 40,66 MHz to 40,70 MHz. The amateur radio bands between 0,15 MHz and 80 MHz are 1,8 MHz to 2,0 MHz, 3,5 MHz to 4,0 MHz, 5,3 MHz to 5,4 MHz, 7 MHz to 7,3 MHz, 10,1 MHz to 10,15 MHz, 14 MHz to 14,2 MHz, 18,07 MHz to 18,17 MHz, 21,0 MHz to 21,4 MHz, 24,89 MHz to 24,99 MHz, 28,0 MHz to 29,7 MHz and 50,0 MHz to 54,0 MHz.

Table E-5 Test specifications for ENCLOSURE PORT IMMUNITY to RF wireless communications equipment

Test Frequency (MHz)	Band a) (MHz)	Service a)	Modulation b)	Maximum power (W)	Distance (m)	IMMUNITY TEST LEVEL (V/m)
385	380 – 390	TETRA 400	Pulse modulation ^{b)} 18 Hz	1,8	0,3	27
450	430 – 470	GMRS 460, FRS 460	FM ^{c)} ± 5 kHz deviation 1 kHz sine	2	0,3	28

710	704 –787	LTE Band 13, 17	Pulse modulation ^{b)} 217 Hz	0,2	0,3	9
745						
780						
810	800 –960	GSM 800/900, TETRA 800, iDEN 820, CDMA 850, LTE Band 5	Pulse modulation ^{b)} 18 Hz	2	0,3	28
870						
930						
1720	1700 –1990	GSM 1800; CDMA 1900; GSM 1900; DECT; LTE Band 1, 3, 4, 25; UMTS	Pulse modulation ^{b)} 217 Hz	2	0,3	28
1845						
1970						
2450	2400–2570	Bluetooth, WLAN, 802.11 b/g/n, RFID 2450, LTE Band 7	Pulse modulation ^{b)} 217 Hz	2	0,3	28
5240	5100 –5800	WLAN 802.11 a/n	Pulse modulation ^{b)} 217 Hz	2	0,3	9
5500						
5785						
Note: If necessary to achieve the IMMUNITY TEST LEVEL, the distance between the transmitting antenna and the Discovery XR656 HD may be reduced to 1 m. The 1 m test distance is permitted by IEC 61000-4-3.						
a) For some services, only the uplink frequencies are included. b) The carrier shall be modulated using a 50 % duty cycle square wave signal. c) As an alternative to FM modulation, 50 % pulse modulation at 18 Hz may be used because while it does not represent actual modulation, it would be worst case.						

Table E-6 Essential Performance and Abnormal Phenomena

Essential Performance	Abnormal Phenomena
Accuracy of LOADING FACTORS	Exposure error on monitor
Reproducibility of the RADIATION output in RADIOGRAPHY	Exposure error on monitor
AUTOMATIC CONTROL SYSTEM	Exposure error on monitor
Image quality	Obvious radiation image distortion or degradation producing unusable image; Image artifacts that emulate pathology.

Periodic maintenance of the system is required to maintain the system life cycle. For details of service procedures please refer to Planned Maintenance 5643974-1EN.

Wireless Communication Information

The wireless module specification refer to [Chapter 2: Safety and Regulatory-Wireless Communication Information \(p. 2-18\)](#)

System Cable Information

Refer to [Chapter 2: Safety and Regulatory-System Cable Information \(p. 2-14\)](#)

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Appendix F (Only for Brazil)

Brazil registration information

Product	Digital Radiographic System
Model	Discovery XR656 HD
Description	Aparelho Fixo para Raio-X
CNPJ	00.029.372/0001-40
ANVISA Number	80071260235
Name of Legal Manufacturer	GE HUALUN MEDICAL SYSTEMS CO. LTD.
Address of Legal Manufacturer	Nº 1, North Yong Chang Street, Economic & Technological Development Zone - Beijing 100176 - China
Name of License Holder	GE HEALTHCARE DO BRASIL COMÉRCIO E SERVIÇOS PARA EQUIPAMENTOS MEDICOS-HOSPITALARES LTDA.
Address of License Holder	Av. Magalhães de Castro, 4800 – Andar 10 Conj. 101 e 102, Torre 3 – Cidade Jardim – CEP: 05676-120 – São Paulo/SP – Brasil
Customer Care Phone Number	3004 2525 (Capital) / 08000 165 799 (Other Locations)

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